IBM Z and LinuxONE

9175 Installation Manual for Physical Planning
Models ME1 and ML1

GC28-7049-00

Note:

Before you use this information and the product it supports, read the information in "Safety" on page vii, Appendix F, "Notices," on page 205, and *IBM Systems Environmental Notices and User Guide*, Z125–5823.

This edition, GC28-7049-00, applies to IBM z17 (Model ME1) and IBM LinuxONE Emperor 5 (Model ML1).

There might be a newer version of this document in a **PDF** file available on **IBM Documentation**. Go to https://www.ibm.com/docs/en/systems-hardware, select **IBM Z** or **IBM LinuxONE**, then select your configuration, and click **Library Overview** on the navigation bar.

Contents

Safety

Safety notices

Safety notices may be printed throughout this document. **DANGER** notices warn you of conditions or procedures that can result in death or severe personal injury. **CAUTION** notices warn you of conditions or procedures that can cause personal injury that is neither lethal nor extremely hazardous. **Attention** notices warn you of conditions or procedures that can cause damage to machines, equipment, or programs.

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: 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: Heavy equipment — personal injury or equipment damage might result if mishandled. (D006)

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.

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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 notices:

CAUTION: Data processing environments can contain equipment transmitting on system links with laser modules that operate at greater than Class 1 power levels. For this reason, never look into the end of an optical fiber cable or open receptacle. (C027)

CAUTION: This product contains a Class 1M laser. Do not view directly with optical instruments. (C028)

CAUTION: The doors and covers to the product are to be closed at all times except for service by trained service personnel. All covers must be replaced and doors locked at the conclusion of the service operation. (C013)

CAUTION: Ensure the building power circuit breakers are turned off BEFORE you connect the power cord or cords to the building power. (C023)

CAUTION: The battery contains lithium. To avoid possible explosion, do not burn or charge the battery.
Do not: Throw or immerse into water, heat to more than 100°C (212°F), repair or disassemble. (C003)

CAUTION: This equipment is not suitable for use in locations where children are likely to be present. (C052)

World trade safety information

Several countries require the safety information contained in product publications to be provided in their local language(s). If this requirement applies to your country, a safety information booklet is included in the publications package shipped with the product. The booklet contains the translated safety information with references to the US English source. Before using a US English publication to install, operate, or service this product, you must first become familiar with the related safety information in the *Systems Safety Notices*, G229-9054. You should also refer to the booklet any time you do not clearly understand any safety information in the US English publications.

Laser safety information

All IBM Z® and IBM LinuxONE (LinuxONE) models can use I/O cards such as FICON®, Open Systems Adapter (OSA), Network Express, Integrated Coupling Adapter2.0 SR (ICA SR2.0), zHyperLink Express, or other I/O features which are fiber optic based and utilize lasers (short wavelength or long wavelength lasers).

Laser compliance

All lasers are certified in the US to conform to the requirements of DHHS 21 CFR Subchapter J for Class 1 or Class 1M laser products. Outside the US, they are certified to be in compliance with IEC 60825 as a Class 1 or Class 1M laser product. Consult the label on each part for laser certification numbers and approval information.

Laser Notice: U.S. FDA CDRH NOTICE if low power lasers are utilized, integrated, or offered with end product systems as applicable. Complies with 21 CFR 1040.10 and 1040.11 except for conformance with IEC 60825-1 Ed. 3., as described in Laser Notice No. 56, dated May 8, 2019.

CAUTION: Data processing environments can contain equipment transmitting on system links with laser modules that operate at greater than Class 1 power levels. For this reason, never look into the end of an optical fiber cable or open receptacle. (C027)

CAUTION: This product contains a Class 1M laser. Do not view directly with optical instruments. (C028)


CAUTION
LASER
1M
IEC 1068/14

About this publication

This publication contains information necessary for the planning of the physical installation of the 9175 system.

Unless otherwise stated, throughout this document "9175" refers to the IBM® z17™ (Model ME1) or IBM LinuxONE Emperor 5 (Model ML1).

Figures included in this document illustrate concepts and are not necessarily accurate in content, appearance, or specific behavior.

What is included in this publication

This publication contains the following chapters and appendices:

- Chapter 1, “Introduction,” on page 1 provides an introduction to planning for your system and a planning checklist.
- Chapter 2, “Environmental specifications,” on page 29 contains important computer room environmental information.
- Chapter 3, “Models and physical specifications,” on page 45 gives plan views, service clearances, weight distribution, and cooling information for the system.
- Chapter 4, “Guide for raised floor preparation,” on page 101 contains information on preparation of the raised floor.
- Chapter 5, “Power requirements,” on page 109 provides power and line cord information.
- Chapter 6, “Hardware Management Appliance HMC and Support Element communications,” on page 129 includes information on Hardware Management Console and Support Element communications.
- Chapter 7, “Remote Support Facility (RSF) installation planning,” on page 141 contains Remote Support Facility installation planning.
- Chapter 8, “I/O cabling and connectivity ,” on page 145 discusses cable connectivity information.
- Chapter 9, “Parallel sysplex planning,” on page 175 provides information about operating in a Parallel Sysplex® environment.
- The appendices provide standard symbols, cabling specifications, power cabling schematic, and TKE/HMC physical specifications.
  - Appendix A, “IBM standard symbols,” on page 179
  - Appendix B, “Top Exit cabling and Bottom Exit cabling specifications,” on page 181
  - Appendix C, “Dual facilities power distribution installation,” on page 187
  - Appendix D, “HMA and TKE physical specifications,” on page 195
  - Appendix E, “Lift Tool and Service Ladder storage,” on page 201

Related publications

Publications that you will find helpful and that you should use along with this publication are in the following list. The following publications are available on **IBM Documentation**. Go to https://www.ibm.com/docs/en/systems-hardware, select **IBM Z** or **IBM LinuxONE**, then select your configuration, and click **Library Overview** on the navigation bar.

- *9175 Safety Inspection*, GC28-7048
- *Systems Safety Notices*, G229-9054
- *Systems Environmental Notices and User Guide*, Z125-5823
- *Planning for Fiber Optic Links (FICON/FCP, Coupling Links, Open Systems Adapters, zHyperLink Express, and RoCE Express)* , GA23-1410
- *FICON Channel-to-Channel Reference*, SB10-7187
- *Open System Adapter-Express Integrated Console Controller Dual Port User's Guide* , SA23-2266
- *Open Systems Adapter-Express Customer's Guide and Reference*, SA22-7935
- *IBM Z 9175 External Cabling Best Practices Guide* (https://www.ibm.com/support/pages/node/7229729)

Related HMC and SE console information

Hardware Management Console (HMC) and Support Element (SE) information can be found on the console help system.

Licensed Machine Code

Licensed Machine Code is provided in accordance with the terms and conditions of the applicable IBM Customer Agreement or other applicable written agreement between the Customer and IBM.

Licensed Machine Code (LMC) is a fundamental component of the 9175 and is copyrighted and licensed by IBM. Each 9175 is delivered with Licensed Machine Code that is customized to the specific machine ordered. The Licensed Machine Code enables the 9175 to operate in accordance with its Official Published Specifications.

Model upgrades, feature additions, and system engineering changes may require updated Licensed Machine Code for the system. Updated Licensed Machine Code replaces the existing Licensed Machine Code.

Relocation of a 9175 requires that the Licensed Machine Code be reinstalled in the server at the new location. See the "Discontinuing the System" section in the *9175 Installation Manual* for the procedure about relocating a 9175.

Accessibility features

Accessibility features help users who have physical disabilities such as restricted mobility or limited vision use software products successfully. The accessibility features can help users do the following tasks:

- Run assistive technology such as screen readers and screen magnifier software.
- Operate specific or equivalent features by using the keyboard.
- Customize display attributes such as color, contrast, and font size.

Consult assistive technologies

Assistive technology products, such as screen readers, function with the user interfaces found in this product. Consult the product information for the specific assistive technology product that is used to access our product information.

Keyboard navigation

This product uses standard Microsoft Windows navigation keys.

IBM and accessibility

See http://www.ibm.com/able for more information about the commitment that IBM has to accessibility.

How to provide feedback to IBM

We welcome any feedback that you have, including comments on the clarity, accuracy, or completeness of the information.

For additional information use the following link that corresponds to your configuration:

Configuration	Link
IBM z17® Model ME1	https://www.ibm.com/docs/en/systems-hardware/zsystems/9175-ME1?topic=how-send-feedback
IBM LinuxONE Emperor 5 Model ML1	https://www.ibm.com/docs/en/systems-hardware/linuxone/9175-ML1?topic=how-send-feedback

Revisions

A technical change from the previous edition of this document is indicated by a thick vertical line to the left of the change.

Summary of changes

Summary of changes for the *9175 Installation Manual for Physical Planning*, GC28-7049.

Table 1. Summary of changes

Release level	Changes in level
September 2025	This revision contains editorial changes and the following technical changes: • New LinuxONE upgrade offerings added in “System upgrades” on page 67.
August 2025	This revision contains editorial changes and the following technical changes: • Information updated in “Electronic Locking Latch enablement” on page 93.
June 2025	This revision contains editorial changes and the following technical changes: • Clarification provided to table in “Power specifications” on page 114. • Server address clean up in “IPv4 addresses” on page 144 and “IPv6 addresses” on page 144.
May 2025	This revision contains editorial changes and the following technical changes: • References to IBM LinuxONE Emperor 5 Model ML1 added throughout the publication. • Acoustics updated in “Acoustical noise emission levels ” on page 42.
April 2025	This revision contains editorial changes and the following technical changes: • Added *PDU Ethernet Connection* related note in “Power installation considerations (PDU)” on page 111.

Chapter 1. Introduction

This chapter is intended to help you prepare your physical site for the installation of a 9175. Marketing and Installation Planning Representatives are also available to help you with installation planning. Proper planning for your new system will facilitate a smooth installation and fast system start up.

The use of the terms, "server", "processor", "system" and "all models" in this publication refer to the 9175.

System planning

As part of your system planning activity, you must make decisions about where to locate your equipment, who will operate the system, and so on. A good plan ensures that the equipment and materials are ready to use when the 9175 arrives.

The type of software (operating system and application programs) that you intend to use must support the features and devices on the system. You should already be familiar with your software requirements, but may want to contact your IBM marketing representative for information on planning for the software.

Important: You must ensure that you and your IBM marketing representative or Business Partner are thorough when planning for the physical installation of the 9175 system.

The review and completion of the following assessments is recommended:

- "Site planning checklist" on page 3
- **Technical and Delivery Assessment (TDA)**

  Complete with your IBM marketing representative or Business Partner and the IBM service representatives that will be installing your system.
- For cable management best practices and guidelines, see *IBM Z 9175 External Cabling Best Practices Guide* (https://www.ibm.com/support/pages/node/7229729).

Note: All dimensions are considered nominal.

System planning resources

Videos

Review the referenced walk-through videos to familiarize yourself with the power planning requirements of the system.

- For part one, see IBM z16 installation & power planning - Getting started (Part 1 of 3).
- For part two, see IBM z16 installation & power planning - Getting started (Part 2 of 3).
- For part three, see IBM z16 installation & power planning - Getting started (Part 3 of 3).

Site planning files

- To assist in site planning, a 3-D graphic file to be used with CAD software is available at https://www.ibm.com/support/pages/node/7229505.
- To assist in site planning, 3-D computational fluid dynamics files to be used with 6SigmaDCX CFD software, are available at https://www.ibm.com/support/pages/node/7229730.
- To assist in site planning, 2-D drawing files to be used with Microsoft Visio® and AutoCAD® available at https://www.ibm.com/support/pages/node/7229498.

Site planning checklist

The following checklist identifies installation tasks and responsibilities sequentially, and is designed for new installations. If you have to renovate your site, you may need a longer planning cycle.

__ • “Checkpoint 1 - Overview and Configuration” on page 4
__ • “Checkpoint 2 - Software and Operating System” on page 5
__ • “Checkpoint 3 - Virtual Flash Memory” on page 7
__ • “Checkpoint 4 - Sysplex” on page 7
__ • “Checkpoint 5 - Capacity on Demand (CIU, CBU, On/Off CoD)” on page 8
__ • “Checkpoint 6 - FICON Considerations” on page 10
__ • “Checkpoint 7 - Networking Considerations” on page 12
__ • “Checkpoint 8 - Crypto Considerations” on page 12
__ • “Checkpoint 9 - Server Time Protocol (STP)” on page 14
__ • “Checkpoint 10 - Hardware Management Console (HMC) Considerations” on page 16
__ • “Checkpoint 11 - Infrastructure” on page 18
__ • “Checkpoint 12 - Installation” on page 21
__ • “Checkpoint 13 - Machine Arrival” on page 23

Checkpoint 1 - Overview and Configuration

Table 2. Overview and Configuration planning tasks

Task #	Planning Task	Additional Detail	Assignee	Status
1	Have the system installation focal points been identified? Roles must be defined for IBM, Client, and if necessary the Business Partner.	All parties involved (IBM, Client, and IBM Business Partner) should understand each other's roles and expectations. If these relationships are not established by a formal contract, expectations should be documented in letters of understanding. Examples of the roles are: 1. Installation Team 2. Configuration and/or Solution Design 3. Contracts focal point 4. and more...		
2	Is the migration project of a size and/or complexity that it warrants engagement of additional IBM Resources?	If additional resources are required, discuss engagement of the IBM z Client Care team with the IBM seller or Business Partner.		
3	Have the appropriate personnel obtained an IBM Registration ID (`IBMid`) in order to access IBM Resource Link?	IBM Resource Link ID is used for items like Power Estimation Tool, Capacity Upgrades, Capacity on Demand, Customized Planning Aids, and more. After obtaining the `IBMid` at https://www.ibm.com/account/reg/us-en/signup?formid=urx-19776, log into Resource Link at *http://www.ibm.com/support/resourcelink* for access to aforementioned tools. **Note:** All of other product documentation can be found on IBM Documentation at https://www.ibm.com/docs/en/systems-hardware/zsystems/9175-ME1?.		
4	Which sizing tools and methodologies were used to determine the required processor model? __ • IBM Z Processor Capacity Reference (zPCR) __ • IBM zCP3000 __ • Independent Client Capacity Planning Study __ • None	IBM recommends the use of an appropriate tool to validate the processor model. IBM recommends using zPCR or zCP3000 to size a new system.		

Table 2. Overview and Configuration planning tasks (continued)				
Task #	**Planning Task**	**Additional Detail**	**Assignee**	**Status**
5	Has the *Driver 61 Customer Exception Letter* been reviewed?	For any restrictions impacting the installation of the system, review the *Driver 61 Customer Exception Letter* available under IBM Systems Hardware on IBM Documentation at https://www.ibm.com/docs/en/systems-hardware/zsystems/9175-ME1?. Take action as needed.		
6	Are the contractual requirements associated with the IBM Z or IBM LinuxONE acquisition in place and agreed upon?	To avoid delays in shipment and installation of an IBM Z or IBM LinuxONE system, it is **pertinent** that all contractual requirements for the installation, maintenance and software have been reviewed and agreed upon by all parties.		
7	Is there a plan in place to discontinue maintenance contracts for the equipment being displaced?			

Checkpoint 2 - Software and Operating System

Table 3. Software and Operating System planning tasks				
Task #	**Planning Task**	**Additional Detail**	**Assignee**	**Status**
8	Have the operating systems that are intended to run on the system been verified as supported?	Supported Operating Systems: • z/OS V3.1 with PTFs • z/OS V2.5 with PTFs • z/OS V2.4 with PTFs for toleration only, Extended Support Required after Sept 2024 • z/VM 7.4 with PTFs • z/VM 7.3 with PTFs • VSEn V6.3 – 21st Century Software • z/TPF 1.1 with PTFs For Linux distributions, see https://www.ibm.com/support/pages/node/6191619. Ensure all toleration support is installed. If necessary, verify with your ISVs for any software licensed by system machine type and serial number to obtain keys needed to support the system.		

Table 3. Software and Operating System planning tasks (continued)

Task #	Planning Task	Additional Detail	Assignee	Status
9	Have CPU Measurement Facility (CPUMF) Counters (SMF-113) been enabled and continuously run on the current processor(s), prior to being migrated to a new server?	After migration to the new server, validation of installed capacity requires CPUMF Counter (SMF-113) data. Both “Before” and “After” CPUMF Counters data will be critical. Ensure the CPUMF Counters data is captured and kept for analysis. For z/VM, “Before” and “After” peak hour data must be written to disk. For more information, see https://www.ibm.com/support/pages/node/6354583.		
10	Have the High Frequency Throughput Statistics (SMF 98) records been enabled?	It is a recommended best practice to have the High Frequency Throughput Statistics (SMF 98) records as they can help with problem determination for performance concerns. The SMF 98 records should be kept from both *before* and *after* the migration.		
11	Will the system installation include use of IBM z/OS Container Extensions (zCX)?	The IBM Container Hosting Foundation for z/OS, a z/OS software product (5655-HZ1) that satisfies licensing for the enablement zCX, must be ordered or already in place. For more information, see https://www.ibm.com/docs/en/zos/3.1.0?topic=zcx-requirements.		
12	Will the system installation include any home-grown High Level Assembler (HLASM) applications with system-level routines that use macros, the names of which may conflict with HLASM mnemonics for the new system hardware instructions?	System-level routines that use macros may conflict with HLASM mnemonics for the new system hardware instructions. IBM recommends review of support document at https://www.ibm.com/support/pages/tool-compare-ibm-z16-instruction-mnemonics-user-macro-libraries. This is an "as is" tool to help identify conflicts. This program is intended to be run against “Client specific” `maclibs`.		

Checkpoint 3 - Virtual Flash Memory

Table 4. Virtual Flash Memory planning tasks

Task #	Planning Task	Additional Detail	Assignee	Status
13	Will the system installation implement Virtual Flash Memory (VFM)?	Each feature of VFM equates to set amount of memory and that increment can changed from generation. VFM supports the following use cases: • Large Page/Db2/Java™ • Market open transitions • SVC and SA Dumps • Validated Boot for z/OS		
14	Is there a plan or intention to implement Validated Boot for z/OS with this system?	Validated boot for z/OS requires that Pageable link pack area (PLPA)/Common paging be implemented on VFM to use the enforce mode. Without VFM clients will only be able to use audit mode.		

Checkpoint 4 - Sysplex

Table 5. Sysplex planning tasks

Task #	Planning Task	Additional Detail	Assignee	Status
15	Will any of the systems being ordered participate in a Sysplex?	For recommended coupling facility control code levels (CFCC) and required driver/bundle levels for the hardware, review the *Driver 61 Customer Exception Letter* available under IBM Systems Hardware on IBM Documentation at https://www.ibm.com/docs/en/systems-hardware/zsystems/9175-ME1?. **Note:** Systems can only participate in a sysplex with systems from the previous two generations (n-1, n-2).		
16	Has the appropriate amount of memory been considered for the CFCC memory and structure size increases associated with a new level of CFCC?	IBM recommends use of the CFSIZER tool to evaluate estimated memory requirements for resizing structures in the coupling facility (CF) partitions as part of the CF level upgrade. A CF at that new level must be installed and accessible, which isn't always feasible. An alternate method can be found at https://www.ibm.com/support/pages/cfsizer-alternate-sizing-techniques. CF Sizing capability can be found in z/OSMF Coupling Facility Resource Management (CFRM) Policy Editor, in Sysplex Management.		

Table 5. Sysplex planning tasks (continued)				
Task #	**Planning Task**	**Additional Detail**	**Assignee**	**Status**
17	Will the system installation include a hard coded value for the optional HWNAME parameter?	The HWNAME in the Load member should match the hardware processor name in the IODF. For more information, review *z/OS MVS Initialization and Tuning Reference* available on IBM Documentation at https://www.ibm.com/docs/en/SSLTBW_3.1.0/com.ibm.zos.v3r1.ieae200/abstract.htm. HWNAME (and LPARNAME and VMUSERID) are used as "filtering" controls in LOAD*xx* parmlib members. If the customer uses such filtering, then the CEC, LPAR, and guest name must match what's coded in LOAD*xx*, or the subject LOAD*xx* statements will simply be ignored.		
18	Will the installation be implementing a Sysplex between two (or more) systems?	IBM recommends that the LSYSTEM parameter be coded with a Client-specific name. If the LSYSTEM parameter is changed during an upgrade, the remote systems at the other end of an ICA SR or CE LR connection may need to be updated to reflect changes. For more information, see *z/OS MVS Setting Up a Sysplex* available on IBM Documentation at https://www.ibm.com/docs/en/SSLTBW_3.1.0/com.ibm.zos.v3r1.ieaf100/abstract.htm.		
19	Does the system installation plan include updating the CFRM policies for the sysplex(s) migrating to the new system?	New CFRM policies should be created to reflect any changes to the system name, partition identifier, or structures planned as part of the migration.		

Checkpoint 5 - Capacity on Demand (CIU, CBU, On/Off CoD)

Table 6. Sysplex planning tasks				
Task #	**Planning Task**	**Additional Detail**	**Assignee**	**Status**
20	Will the system installation include an upgrade that potentially increases processor capacity using any of the IBM Capacity On Demand (CoD) offerings?	Review the *Capacity on Demand User's Guide* available on IBM Documentation at https://www.ibm.com/docs/en/systems-hardware/zsystems/9175-ME1?. Any time that the System Capacity is altered, there is a potential impact on Contractual agreements with IBM and ISV Software . Please ensure the system environment is set up to use the additional capacity. For example, activation of On/Off Capacity on Demand (OOCoD) would incur charges for additional maintenance.		

Table 6. Sysplex planning tasks (continued)

Task #	Planning Task	Additional Detail	Assignee	Status
21	Will the system installation include installing and/or the removing of Capacity on Demand records?	The installation plan should includes steps to download any required CoD records to the new system. • For a system that is being upgraded that has CoD records, there should be steps to remove CoD records from any machines being displaced. • For an MES frame roll, the records will carry forward to the new system. However, the records must be installed on the existing system to carry over. Staged records will not carry over. Download the On/Off CoD records from IBM Resource Link (https://www.ibm.com/support/resourcelink/) that will be used on the new system.		
22	Has the appropriate IBM representative informed the Solutions Technical Support team about any system(s) being displaced which were enabled for on-line buying?	The appropriate IBM representative should create a request in EngageSupport identifying the old machine type and serial number that was enabled for on-line buying and the replacement machine type and serial number. During a Technology Exchange or Migration Offering upgrade, Resource Link does not automatically get notified. An email to Q2C is required to identify the old machine type and serial number that was enabled for on-line buying, and the replacement machine type and serial number. Q2C will then create the profile for the machine. This only applies if the machine has the on-line buying feature enabled (**FC 9900**).		
23	Will the system installation implement Flexible Capacity for Cyber Resiliency?	Implementing Flexible Capacity requires site-wide planning to correctly set capacity levels on each system in the enterprise. When using Flexible Capacity, be aware to only turn the system down to the ordered active capacity and up to the active capacity plus any capacity in the Flexible Capacity record. Be aware that there are ramifications for activating multiple capacity records. It may be possible that there are not enough PUs available to complete a request. For example OOCoD activation range is based on the active capacity of the system, which can be altered by Flexible Capacity for Cyber Resiliency.		

Checkpoint 6 - FICON Considerations

Table 7. FICON related planning tasks

Task #	Planning Task	Additional Detail	Assignee	Status
24	Will the system install include FICON adapters?	IBM recommends evaluating compatibility of the new system FICON optics with the equipment that is in place. Each FICON optic has the ability to auto negotiate to slower speeds depending on the generation of FICON Technology. For example, the FICON Express32s can auto negotiate to 16 GbE and 8GbE but not slower.		
25	Will the system install include Fiber Channel (FCP)?	Feature Code 0099 (**FC 9900**) can be ordered to help with the migration of World Wide Port Numbers (WWPNs) by providing the I/O serial number part of WWPN Persistence. This will require you to export the old WWPNs from a previous system and import the WWPNs into the new system. For more information, see https://www.ibm.com/support/pages/node/5695785.		
26	Have all FICON directors/ switches that will be attached to the system been qualified as supported on the system (including their firmware levels)?	IBM recommends that all FICON directors/ switches and their associated firmware levels (to be attached to the system) are qualified as supported. This may require updates of switch firmware and/or hardware. For more information, see https://www.ibm.com/support/pages/switches-and-directors-qualified-ibm-zsystems-ficon-and-fcp-channels.		
27	Will the system installation include FICON Express32S LX (**FC 0461**) running at 32 Gbps speed?	Support for the FICON Express32S LX running at 32 Gbps speed has a point-to-point (unrepeated) distance limit of 5 km. This is specific to this adapter.		

Table 7. FICON related planning tasks (continued)

Task #	Planning Task	Additional Detail	Assignee	Status
28	Will the system installation implement IBM Fiber Channel Endpoint Security?	IBM released a statement of direction indicting that with the next IBM Z System, IBM Fiber Channel Endpoint Security (IFCES) will be required for all FICON communication , as well as requiring all Storage vendors to support IFCES on Storage systems made generally available after December 31, 2024. For more information, see https://www.ibm.com/docs/en/announcements/z-linuxone-2q-2024-statement-direction. The solution requires a compatible storage control unit, as well as IBM Guardium Key Lifecycle Manager for key management, and an IBM Feature code associated with Endpoint Security Enablement. IBM recommends verification of the FICON Directors/switches in use (and their associated firmware levels) are qualified for use with the system and support FICON Dynamic Routing (FIDR). Clients should check with their storage vendor to confirm support and implementation timelines.		

Checkpoint 7 - Networking Considerations

Table 8. Networking related planning tasks

Task #	Planning Task	Additional Detail	Assignee	Status
29	Will the system installation include Networking Express or OSA Express adapters in the configuration?	The optics on networking cards operate at a fixed speed and do not auto negotiate to slower speeds. This applies to OSA and Networking Express adapters (for example: system support precludes directly attaching 25 GbE to either 10GbE or GbE).		
30	Will the system installation include Networking Express or OSA Express adapters with 25GbE optics?	25 GbE Networking cards require a technology known as forward error correction (FEC) to function. There are two FEC modes: Fire-Code and Reed-Solomon. Reed-Solomon is the required mode of operation for IBM Z. When connecting 25 GbE RoCE and OSA adapters to a Cisco switch, ensure the option to enable the switches to use “FEC RS-IEEE” is enabled. This will ensure the ports come online with the correct FEC mode in order to function.		
31	Does the system installation plan to implement Shared Memory Communications RDMA (SMC-R)?	Shared Memory Communications Remote is achieved with the Network Express 10G and 25G adapters configured using the NETH function type. For z/OS this requires a networking connection of OSD or OSH to initialize communication (on the same VLAN). IBM recommends network connections are defined with redundancy.		
32	Will the system installation include an OSA-ICC connection (CHPID type OSC)?	OSA-ICC Channels are only supported on OSA Express7S 1.2 GbE LX / SX adapters. For OSA-ICC connections the system can support the use of SSL for a secure connection with OSA-ICC.		
33	Will the system require the backup of any channel customization data from the machine being replaced?	Channel customization data can be exported from a displaced system and restore to the system being installed, if necessary.		

Checkpoint 8 - Crypto Considerations

Table 9. Crypto related planning tasks

Task #	Planning Task	Additional Detail	Assignee	Status
34	Is the CP Assist for Cryptographic Functions (CPACF) (**FC 3863**) included in the system order?	Even if no Crypto feature is ordered, it is advisable to include this no-charge feature as some IBM products and ISVs require CPACF to be available.		

Table 9. Crypto related planning tasks (continued)

Task #	Planning Task	Additional Detail	Assignee	Status
35	Are Crypto Express adapters being ordered with this system?	IBM recommends redundancy when configuring the modes of crypto Hardware Security Modules (HSMs) present on the system to ensure that service operations can be performed without impacting running systems.		
36	Are you familiar with the use of master keys for Crypto?	Clients are responsible for loading master keys to the new system once it is installed. This can be done through ICSF or a Trusted Key Entry (TKE) Workstation. If the installation is a migration from an older platform, IBM recommends the use of ICSF Health Checks. This check will identify the existence of retained keys that are no longer supported and API calls that have been deprecated. For this health check information, see *z/OS Cryptographic Services ICSF Administrator's Guide* available on IBM Documentation at https://www.ibm.com/docs/en/zos/3.1.0?topic=services-zos-cryptographic-icsf-administrators-guide.		
37	Is the system utilizing User Defined Extension (UDX)?	Contact the provider of the UDX for an updated version of the UDX before ordering a new server or before migrating or activating the UDX application.		
38	Will the system be implementing EP11 or PKCS #11 mode?	A TKE workstation and TKE Smartcard Reader is required for EP11 mode.		
39	Is the client aware that some Cryptography solutions have compliance schedules that run outside of GA dates?	FIPS and PCI Certification is done by outside authorities and IBM has no control over the certification schedule. The certification could be awarded significantly after the machine is generally available. For more information, see https://www.ibm.com/docs/en/cryptocards.		
40	Has the level of cryptographic support in software (ICSF) been verified and installed to support the functionality to be exploited, including other systems that share the key repositories (CKDS, PKDS or TKDS)?	IBM recommends that the level of ICSF installed supports the functionality to be exploited, including other systems that share the key repositories (CKDS, PKDS or TKDS).		

Table 9. Crypto related planning tasks (continued)				
Task #	**Planning Task**	**Additional Detail**	**Assignee**	**Status**
41	Does the system installation include TKE?	IBM recommends migrating TKE data from one TKE to another TKE, if needed. For Crypto Express migrations, there are wizards available in the "Configuration Migration Tasks" application. A video walk-through of the application can be found in the IBM Media Center at https://mediacenter.ibm.com/media/1_xd0juqn1. Next level of support can be obtained by contacting IBM Expert labs. The service can be contacted at https://www.ibm.com/products/expertlabs.		

Checkpoint 9 - Server Time Protocol (STP)

Table 10. STP planning tasks				
Task #	**Planning Task**	**Additional Detail**	**Assignee**	**Status**
42	Will Server Time Protocol (STP) be implemented?	The system requires two additional copper networking cables and two IP addresses for every system that is planned to be connected to a Network Timing Protocol (NTP) or Precision Time Protocol (PTP) server.		
43	Is the client familiar with how to assign and re-assign roles when making changes to a CTN?	Members of a Coordinated Timing Network (CTN) can be assigned the role of `Primary`, `Arbiter`, `Backup`, and `Not Configured`. To perform a migration or disruptive action a systems role should be assigned to `Not Configured`. For more information, see *IBM Z Server Time Protocol Guide* available at https://www.redbooks.ibm.com/abstracts/sg248480.html.		

Table 10. STP planning tasks (continued)

Task #	Planning Task	Additional Detail	Assignee	Status
44	Has the client planned to implement n-mode power sensing?	N-mode Power sensing can act if any power source detects a power cord or power side failure on the Current Time Server (CTS). If N-mode power detection is enabled, any power cord or power side failure on the Primary Time Server (PTS) or CTS sends a signal to the Backup Time Server (BTS) to indicate that an N-mode power event happened on the CTS. If the BTS does not receive a message back within 30 seconds that indicates that the PTS is again fully redundant, the BTS takes over the CTS role. For more information, see *IBM Z Server Time Protocol Guide* available at https://www.redbooks.ibm.com/abstracts/sg248480.html.		

Checkpoint 10 - Hardware Management Console (HMC) Considerations

Table 11. HMC planning tasks

Task #	Planning Task	Additional Detail	Assignee	Status
45	Is the planning complete for Hardware Management Appliance (HMA) and Support Element (SE) support requirements (including all local systems) as part of this installation?	Clients must review and complete the *Hardware Management Console and Support Element Network Information Worksheet* available on IBM Documentation at https://www.ibm.com/docs/en/systems-hardware/zsystems/9175-ME1?topic=library-hardware-management-console-support-element-network-information-worksheet prior to the installation of their system. If upgrading a current HMA, make arrangements for the new driver level for this system. Arrangements should be in place to have all the network requirements available at the time of install for HMAs and SEs. Ensure at least one network interface that shares the same subnet for both discovery and HMA functionality. Standalone HMCs, either tower or rack mount, cannot be upgraded to support a 9175 system. Only HMAs can be updated to support the 9175 system. Details for network requirements can be found in *Chapter 6. Hardware Management Appliance HMC and Support Element communications* of this document. For information regarding MCL Driver levels to support Sysplex Connectivity, review the *Driver 61 Customer Exception Letter* available on IBM Documentation at https://www.ibm.com/docs/en/systems-hardware/zsystems/9175-ME1?.		
46	Is there awareness of rules regarding HMC/SE roles and default password changes?	Review users, roles and password changes in the Hardware Management Console Operations Guide to understand role and default password changes prior to installation. Clients should ensure that a Service password has been provided to the installing SSR on the day of installation.		
47	Is there a plan in place to ensure latest Driver and Machine Change Levels (MCLs) are installed on the system?	IBM recommends a plan to stay current on service and engineering change updates. Quarterly updates are recommended.		

Table 11. HMC planning tasks (continued)

Task #	Planning Task	Additional Detail	Assignee	Status
48	Will HMAs be ordered on this system?	IBM recommends that each datacenter have no more than four HMAs. Each HMA feature code equates to two HMAs. Each HMA will be able to support the previous two generation of systems.		
49	Will Network boot for system recovery (**FC 0846**) be implemented as part of the installation?	Before installing a new IBM system, the HMA must have the SE recovery code image available in the Recovery Image section of the manage console recovery task. The minimum requirement for Network Boot for system recovery (**FC 0846**) includes two HMAs at version 2.15.0 (or greater) on every unique network subnet where a Hardware Management Console, Support Element (SE), or Trusted Key Entry (TKE) workstation has been connected. Before installing FC 0846, the network setup to support electronic code load must be complete. For machines that do not use media or do not have access to Remote Support Facility (RSF), the installation is not complete until an FTP has been configured.		
50	Will the installation require IBM Service Support Remote Support Facility (RSF)?	Make sure that the HMC network connections will meet RSF connectivity and bandwidth requirements. As of April 2023, there are new IP address requirements to set up RSF. For more information, and a full description of RSF setup (including the required IP addresses), see *Integrating IBM Remote Support into your Enterprise* available on IBM Documentation at https://www.ibm.com/docs/en/systems-hardware/zsystems/9175-ME1?.		

Checkpoint 11 - Infrastructure

Table 12. Infrastructure planning tasks

Task #	Planning Task	Additional Detail	Assignee	Status
51	Have all required cables been identified and placed on order, if necessary?	All cables are the responsibility of the client. For more information, see *Planning for Fiber Optic Links (FICON/FCP, Coupling Links, Open Systems Adapters, and zHyperLink Express)* available on IBM Documentation at https://www.ibm.com/docs/en/systems-hardware/zsystems/9175-ME1?topic=library-planning-fiber-optic-links, and *IBM Z Connectivity Handbook* available at https://www.redbooks.ibm.com/abstracts/sg245444.html.		
52	Have all cables been labeled as required for installation?	IBM recommends that all cables which connect to this system are properly identified and labeled. At a minimum, the labels should identify the PCHID (Physical Channel ID) number on the cables.		
53	Will Dense Wavelength Division Multiplexers (DWDM) be used for extension of coupling or storage links?	IBM recommends review of the DWDM solutions that have been tested for use with IBM systems to ensure their hardware and firmware are qualified for the configuration, including Server Time Protocol (STP) for the given coupling link type. For more information, see https://www.ibm.com/support/pages/node/6985961.		
54	Are there enough dedicated branch circuit connections for all of the power line cord / PDU feature codes in the system configuration?	Details on electrical service requirements can be found in *Chapter 5. Power requirements* of this document. Clients should verify that all of the necessary power requirements are in place prior to the day of the install. Any missing branch circuit power connections will cause a delay in the installation.		
55	Did a Qualified Electrical Worker (QEW) or equivalent personnel successfully complete the procedure, “Dedicated branch circuit wiring verification before system power-on” on page 124, in *Chapter 5. Power requirements* of this document?	Performing this verification should prevent system damage by *not* connecting to the wrong 3-phase power type or to a miswired receptacle.		

Table 12. Infrastructure planning tasks (continued)

Task #	Planning Task	Additional Detail	Assignee	Status
56	Have power feeds been correctly configured for redundancy to the Power Distribution Units (PDUs)?	To take full advantage of the redundancy/ reliability that is built into the system, make sure the server is powered from two distribution panels. For more information, see Appendix C, "Dual facilities power distribution installation," on page 187.		
57	Is there enough air conditioning and ventilation equipment installed to satisfy the cooling and airflow requirements for the system?	All cooling requirements for the system are detailed in the IMPP. Clients should confirm all required cooling for the system is in place installation prior to system installation.		
58	Are there hot/cold aisle containment requirements in the data center?	Plan placement of the system to ensure hot/ cold aisle containment requirements are met. Reference the IMPP section for further details.		
59	Has the Power Estimator Tool been run for the system installation?	IBM recommends using the Power Estimator Tool available on Resource Link to generate a report of estimated power consumption and weight based on features configured.		
60	Does the chosen location for system installation meet or exceed the requirements as listed in the IMPP for space, floor loading, and service clearance?	These specifications are subject to change from generation to generation. For specifics related to physical site requirements – space, floor loading, and service clearance – see ch3_modelspecs.ditamap#ch3_modelspecs or Chapter 3, "Models and physical specifications," on page 45. Be certain that the raised floor on which the server will be installed can support this weight. Be aware of height and weight restrictions including the areas which the system will travel across to its final installation destination. Additional floor stanchions may need to be added to support system weight.		
61	Is there a plan for the system to acclimate to the installation environment?	IBM recommends that all Server and storage equipment be acclimated to the surrounding environment before being powered on. Otherwise condensation can form on the server . IBM recommends that the shipping bag is to be left on the machine after it is delivered. The IBM SSR will remove it at the appropriate time. See table of recommended hours for the acclimation process in the IMPP. For more information, see "System acclimation" on page 35.		

Table 12. Infrastructure planning tasks (continued)

Task #	Planning Task	Additional Detail	Assignee	Status
62	Will the system installation include options to egress power or I/O cabling through the bottom of the system?	To exit power or I/O cables through the bottom of the system the Bottom Exit Cabling feature (**FC 7804**) must be ordered. If this feature is not ordered, the system will ship with a factory-installed steel plate at the bottom of the system and cables will not be able to egress from the bottom of the frame. Client will required floor panels have access holes marked, cut, and set in place prior to delivery of the system.		
63	Are Fiber Quick Connect brackets and/or mounting hardware needed to secure internal optical trunk cables?	Fiber Quick Connect Bracket and Mounting Hardware "Key Up / Key Down" (**FC 5827**) must be ordered in conjunction with Bottom Exit Cabling (**FC 7804**). Fiber Quick Connect Bracket and Mounting Hardware "Key Up / Key Down" (**FC 5824**) must be ordered in conjunction with Top Exit Enclosure (**FC 5823**). Fiber Quick Connect Bracket and Mounting Hardware "Key Up / Key Up" (**FC 5826**) must be ordered in conjunction with Top Exit Enclosure (**FC 5823**). **Note:** Each of these features are factory installed and have a specified interconnect polarity in preparation for system field installation. **Note:** The Fiber Quick Connect offering (**FC 5827**) no longer ships with cables, and any system that previously received cables from IBM, with this offering, will need to order them separately from a third-party vendor.		
64	Have the appropriate Lift Tool (**FC 3100**) and Extension Ladder (**FC 3101**) features, been ordered?	For each machine ordered, determine whether Lift Tool and Ladder should be ordered to ensure at least one of each is available in the data center. **Important:** If you are ordering the Lift Tool (**FC 3100**) and/or the Extension Service Ladder (**FC 3101**), you must identify sufficient storage space for these items, as described in Appendix E, “Lift Tool and Service Ladder storage,” on page 201.		

Table 12. Infrastructure planning tasks (continued)				
Task #	**Planning Task**	**Additional Detail**	**Assignee**	**Status**
65	Has the Earthquake Kit (**FC 8014** or **FC 8015**) been ordered, if required?	Order the Earthquake Kit (**FC 8014** or **FC 8015**) feature if you require frame ruggedizing hardware to secure the frame and its contents from damages related to vibration and shock experienced in a seismic event. FC 8014 is for *raised* floor environments. FC 8015 is for *non-raised* floor environments. **Note:** If the Earthquake Kit feature is ordered, install the following at this time: • **Raised floor (FC 8014)**: 4 eye bolts (per frame) in concrete floor • **Non-raised floor (FC 8015)**: 8 anchors and 2 lock down plates (per frame) in concrete floor		
66	Has the Height Reduction feature (**FC 9975**) been ordered, if required?	Ensure that there is sufficient height clearance to transport the system into the environment. If height reduction is required, you must order the Height Reduction feature (**FC 9975**).		

Checkpoint 12 - Installation

Table 13. Installation planning tasks				
Task #	**Planning Task**	**Additional Detail**	**Assignee**	**Status**
67	Have the Configuration, Configuration Control Number (CCN), and PCHID reports been made available?	The IBM & Business Partner(s) should be contacted for the reports to reference during the system installation.		
68	Have all impacts to the System cabling infrastructure been addressed?	IBM recommends the usage of the latest Connectivity Mapping Tool (CMT) with the Availability Option, or another I/O mapping method of their choice, to determine the impact of the upgrade on their cabling infrastructure. The client should generate the output reports from the CMT or other method. IBM recommends that these reports be provided to the IBM SSR for use during installation.		

Table 13. Installation planning tasks (continued)

Task #	Planning Task	Additional Detail	Assignee	Status
69	Is the IOCP file ready to be loaded on the system?	When creating a new IOCP, IBM recommends evaluating whether there are any IOCP definitions that need changing or added due to the new Machine Type identifier. For more information, see *Input/Output Configuration Program User's Guide for ICP IOCP* available on IBM Documentation at https://www.ibm.com/docs/en/systems-hardware/zsystems/9175-ME1?topic=library-iocp-users-guide-icp-iocp. Prior to the system installation , IBM recommends generating an IOCP file for each machine to be installed. Provide the file to the installation team. Ensure plans are in place to load the IOCDS onto the system. Ensure procedures are in place for activating the correct IOCP deck following the machine checkout test. This will avoid the loss of customized OSA files. If the system installation requires a different IOCDS, then use an IOCP deck that makes no changes to the previous OSA CHPIDs. If not, the customized OSA files will be lost.		
70	Does the system installation require the move of any Activation Profiles to the new system (from the system being displaced)?	When moving Activation Profile data from an existing to new system, IBM recommends engaging the SSR for assistance with this action.		
71	Has the client contact information for Service Support been defined?	The client contact should reflect someone, or an entity (Operations team) that is available 24x7. This contact must also be registered in the IBM Support Site to enable digital communications between IBM Support and the client. For more information, see https://www.ibm.com/support/pages/node/6492597. Inform the IBM System Service Representative (SSR) and Installation team of the client contact and any other information needed to initiate service for the system.		
72	Is this installation a frame roll MES upgrade?	The system installation plan include the steps (and time) for an upgrade which will reuse existing I/O features. The new system cannot be powered on until those features have been moved into new machine. **Note:** Installation time could take more than one shift (8 hours), and if so, ensure that the proper resources are available for the install.		

Table 13. Installation planning tasks (continued)				
Task #	**Planning Task**	**Additional Detail**	**Assignee**	**Status**
73	Has the *Technical and Delivery Assessment (TDA)* been completed?	Complete the TDA with your IBM marketing representative or Business Partner and the IBM service representatives that will be installing your system.		

Checkpoint 13 - Machine Arrival

Table 14. Machine Arrival planning tasks				
Task #	**Planning Task**	**Additional Detail**	**Assignee**	**Status**
74	Have the requirements for shipment of the system been reviewed and evaluated?	IBM recommends review of the specifications in the IMPP to plan for receiving and placing the system upon delivery. Inspect the location and assess the following before machine arrival (at location): __ • Receiving dock requirements (truck size, lift gate, etc.) __ • Arrival path/docking/unloading area (clearances, load bearing, etc.) __ • Packing material handling (reuse/removal/storage) __ • Install area characteristics (including access) __ • Location rules for movement/disposal if machine is replaced or decommissioned. Additionally, provide IBM with the following delivery information, as necessary: __ • Point of contact (name and phone number) __ • Delivery hours __ • Floor protection requirement (identify dock or inside delivery) __ • Security of audit procedures (valid US ID, COVID restrictions, name(s) ahead of delivery, COI, etc.)		

Table 14. Machine Arrival planning tasks (continued)

Task #	Planning Task	Additional Detail	Assignee	Status
75	Are the responsibilities for delivery and movement of the system to the data center floor understood?	Make sure all Installation personnel in all locations understand that the shipping company has sole responsibility for transporting the system from dock to data center floor or staging location. Only professional movers or riggers should move or transport equipment that falls into this category. IBM incorporates this requirement in the agreement with the shipping company. If the installation team would like the carrier to bring the pallet contents into the data center floor the carrier should be notified.		
76	Have arrangements been made for the timely removal of discontinued or displaced equipment (including packing material) which will be returned to IBM?	Make sure arrangements have been made for the return of any displaced machines or packing material if needed. If packing material has not been ordered, place the return MES, as needed.		

Customized planning aid

A customized planning aid will be available for your system one day after receipt of your order in manufacturing *and* the order has been assigned a serial number.

You may obtain access to this aid by registering on Resource Link® at *http://www.ibm.com/support/resourcelink*. This planning aid will include unique physical planning requirements based on your system's specific configuration.

It is important to note here that the planning aid is not intended to replace this manual. You should be familiar with the contents of this document before you attempt to use the planning aid.

ASHRAE declaration

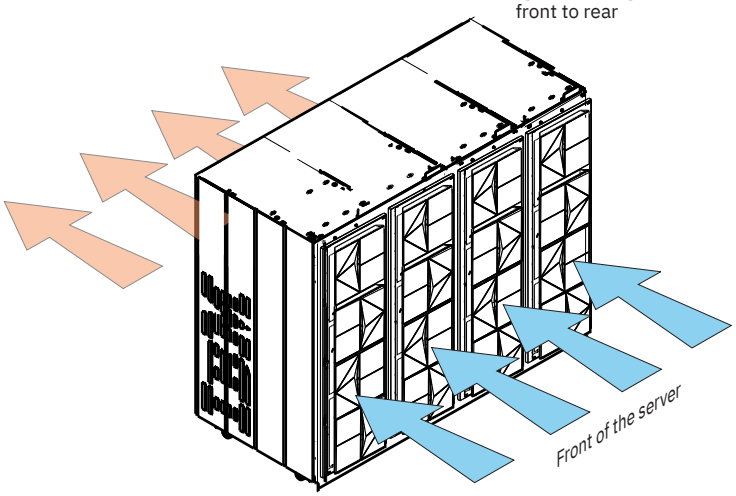
ASHRAE Declarations (Metric) for 9175

ASHRAE Class A3 Description	Typical Heat Release	Airflow Nominal (1)	Airflow Maximum (1)	Weight (2, 5, 6, 7)	Overall System Maximum Dimensions (8)	Maximum Elevation (5, 6)	Maximum Dry Bulb Temperature (4, 5)	Maximum Dew Point (9)
	kW	m3/hr	m3/hr	kg	W x D x H (cm)	m	C°	C°
Minimum Configuration MT 9175 1 CPC drawer (FC 0571)	3.1	1300	2754	491	62.4 x 120.8 x 202	3048 (dry bulb <28° C)	40 (altitude <914 m) (RH <40%)	24
Maximum Configuration MT 9175 4 CPC drawers (FC 0574 or 0575)	31.2	6737	16022	2700	249.6 x 120.8 x 202	3048 (dry bulb <28° C)	40 (altitude <914 m) (RH <40%)	24

ASHRAE Declarations (English) for 9175

ASHRAE Class A3 Description	Typical Heat Release	Airflow Nominal (1)	Airflow Maximum (1)	Weight (2, 5, 6, 7)	Overall System Maximum Dimensions (8)	Maximum Elevation (5, 6)	Maximum Dry Bulb Temperature (4, 5)	Maximum Dew Point (9)
	kBTU/hr	cfm	cfm	lbs	W x D x H (in)	ft	F°	F°
Minimum Configuration MT 9175 1 CPC drawer (FC 0571)	10.5	765	1621	1082	24.6 x 47.6 x 79.5	10,000 (dry bulb <82o F)	104 (altitude <3000 ft) (RH <40%)	75.2
Maximum Configuration MT 9175 4 CPC drawers (FC 0574 or 0575)	106.5	3965	9430	5953	98.4 x 47.6 x 79.5	10,000 (dry bulb <82o F)	104 (altitude <3000 ft) (RH <40%)	75.2

Airflow Diagram Cooling Scheme
front to rear



Notes:

1. Airflow is designed to increase as the local ambient room temperature and/or altitude increases. Minimum airflow assumes an ambient temperature below 23° C (73° F) and altitude below 500 m (1650 ft). Nominal airflow assumes an ambient temperature of 25° C (77° F) and an altitude below 500 m (1650 ft). Maximum airflow is based on an ambient temperature of 40° C (104° F) or an altitude of 914 m (3000 ft).
2. Weights provided assume the following:
   - Optional Earthquake Kit (FC 8014 or 8015) is **not** installed
3. Dimensions do not include top exit cabling feature (FC 5823)
4. For ambient temperatures exceeding 25° C (77° F), the acoustical noise levels of the system may increase significantly as the speeds of the air moving devices increase. See "Acoustics" on page 42 for the declared acoustical noise emission levels for the system.
5. Maximum ambient reduces 1° C (1.8° F) for every 175 m (574 ft) over 900 m (2953 ft). At 3048 m (10,000 ft), maximum allowable ambient temperature is 28° C (82° F).
6. See the elevation label () or tropical climate label () in the *Systems Safety Notices* document to determine **if** there are any elevation limitations or tropical climate limitations for your country.

Chapter 2. Environmental specifications

The 9175 is among the most powerful group of mainframe processors ever built. Technology improvements have placed the 9175 in the top levels of Reliability, Availability, and Serviceability. But it takes more than premium computer equipment to achieve these goals. The data center environment must be able to support the demands that the 9175 capability requires. On the following pages, environmental specifications are presented in tabular and graphic forms to emphasize how important it is that you provide the conditions necessary to utilize all of the power the 9175 offers.

The 9175 is designed to operate in an ASHRAE Class A3 (4th Edition) environment.

Environmental specifications are presented in two categories: Recommended and Allowable. Obviously, meeting the allowable specifications is prerequisite to using the 9175. It is strongly suggested that you strive for a long-term operating environment within the recommended specification range. The powerful computing the 9175 provides generates heat that must be removed from machine. Operating your data center most of the time within the recommended range instead of the allowable range will enhance its overall resiliency, energy efficiency, and reliability.

Unless otherwise noted on individual specification pages, the following environmental specifications, based on an altitude from sea level to 900 meters (2953 feet), apply:

Table 15. Environmental specifications - table format		
Environment, Operating: [9]		
	Recommended [1,6]	**Allowable [2,3,4,5,6]**
Temperature	18°C - 27°C (64.4°F - 80.6°F)	5°C - 40°C (41°F - 104°F)
Low end moisture	-9.0°C (15.8°F) dew point	-12°C (10.4°F) dew point and 8% relative humidity
High end moisture	60% relative humidity and 15°C (59°F) dew point	85% relative humidity and 24°C (72.5°F) dew point
Gaseous contamination	Severity level G1 according to ANSI/ISA S71.04-1985 [7,8]	
Particulate contamination	Cleanliness level of ISO 14644-1 Class 8 [8]	
Allowable environment, Non-operating: [10]		
Temperature	5°C (45°F) to 45°C (113°F)	
Relative humidity	8% to 85%	
Maximum dew point	27°C (80.6°F)	
Gaseous contamination	Severity level G1 as per ANSI/ISA 71.04-1985 [7,8]	
Environment, shipping: [9]		
Temperature	-40°C (-40°F) to 60°C (140°F)	
Relative humidity	5% to 100% (no condensation)	
Maximum wet bulb temperature	29°C (84.2°F)	
Shipping package	IBM-approved packaging for domestic and world trade locations.	
Environment, storage: [11]		
Temperature	1°C (33.8°F) to 60°C (140°F)	
Relative humidity	5% to 80% (no condensation)	
Wet bulb	29°C (84.2°F)	
Shipping package	IBM-approved packaging for domestic and world trade locations.	

Notes:

1. The recommended operating environment specifies a long-term operating environment that can result in the greatest resiliency, energy efficiency, and reliability.
2. The allowable operating environment represents where the equipment has been tested to verify functionality. Due to the stresses that operating in the allowable envelope can place on the equipment, these envelopes should be used for short-term operation, not continuous operation (for example, in the case of a cooling failure).
3. Must derate the maximum allowable temperature 1°C (1.8°F)/175 m (574 ft) above 900 m (2953 ft) up to a maximum allowable elevation of 3050 m (~10,000 ft).
4. The minimum humidity level is the larger absolute humidity of the -12°C (10.4°F) dew point and the 8% relative humidity. These intersect at approximately 25°C (77°F). Below this intersection the dew point (-12°C) represents the minimum moisture level, while above it, the relative humidity (8%) is the minimum. See Figure 1 on page 32 for a graphical explanation of the envelope.

5. For temperatures in the allowable envelope, the acoustical noise levels of the system may increase significantly as the speeds of the air moving devices increase. See “Acoustics” on page 42 for the declared acoustical noise emission levels for the system.
6. Based in research funded by ASHRAE and performed at low relative humidity, the following are the minimum requirements:
   a. Data centers that have non-ESD floors, where people are permitted to wear non-ESD shoes, might want to consider increasing humidity; given that the risk of generating 8 kV increases from 0.27% (at 25% relative humidity) to 0.43% (at 8% relative humidity).
   b. All mobile furnishings/equipment is to be made of conductive or static dissipative materials and bonded to the ground.
   c. During maintenance on any hardware, a properly functioning and grounded wrist strap must be used by any personnel who contacts IT equipment.
7. ANSI/ISA-S71.04. 1985. "Environmental conditions for process measurement and control systems: Airborne contaminants." Instrument Society of America, Research Triangle Park, NC, 1985.
8. See “Conductive contamination” on page 40 for details of the requirements for gaseous and particulate contamination.
9. See “System acclimation” on page 35 for guidance on how long the system must be acclimated before being attached to the power source.
10. For equipment that has been removed from original shipping container and installed but powered down. The allowable non-operating environment is provided to define the environmental range that a non-powered system should be able to experience short-term without being damaged. It assumes that the system has not been contaminated with low deliquescent relative humidity dust, which could damage the equipment and require the system to dry out before powering on. (See “Conductive contamination” on page 40 for details.) Under all conditions, the environment must remain non-condensing. The allowable non-operating environment is meant for abnormal conditions (for example, power or cooling failure). It is expected that the data center will return conditions to the recommended operating conditions within a short period of time. The allowable non-operating environment is not meant to be used for periodic, planned changes from an operating to non-operating condition.

Figure 1 on page 32 shows the environmental specifications in **line graph** format.

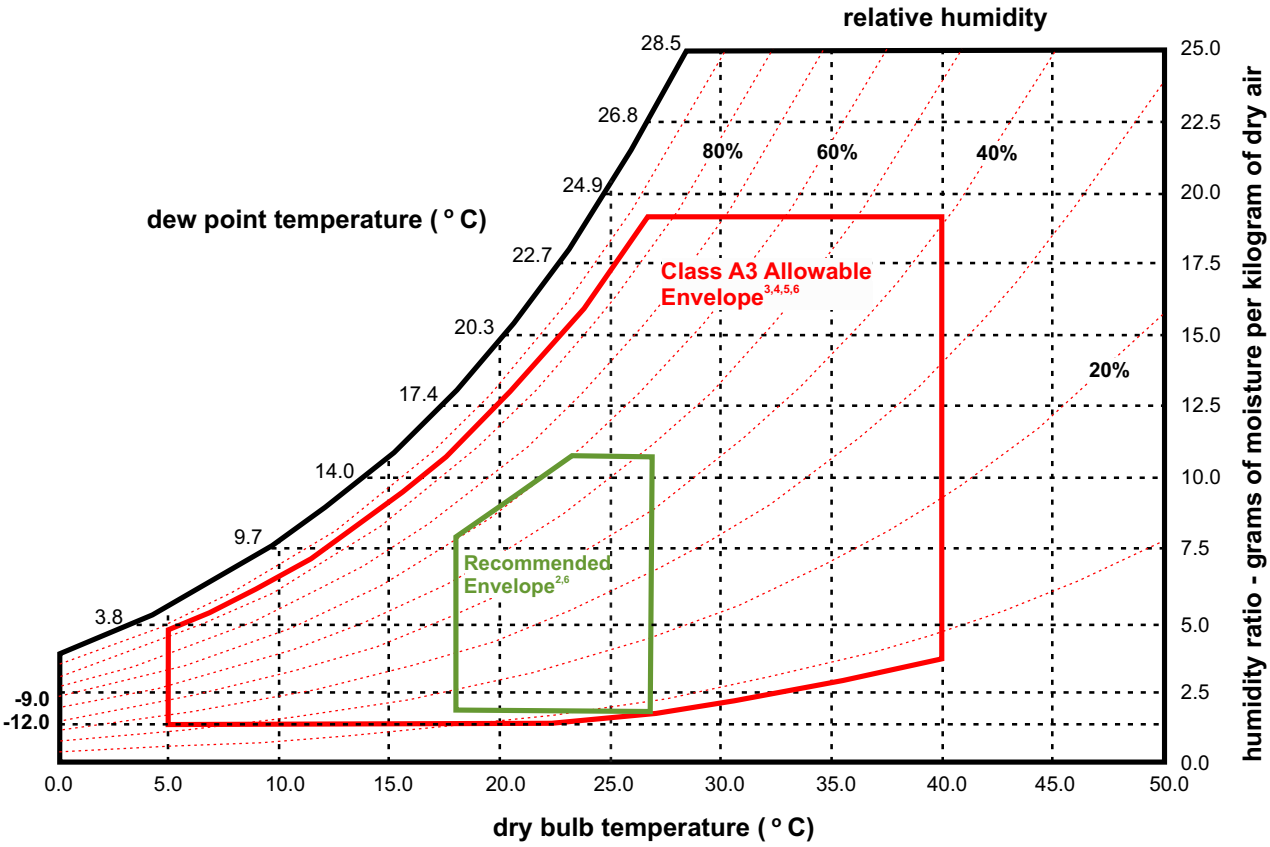


Figure 1. Environmental operating specifications - line graph format

Notes:

1. Psychrometric chart is shown in SI (metric) units and a barometric pressure 101.325 kPa (sea level).
2. The recommended operating environment specifies a long-term operating environment that can result in the greatest reliability and energy efficiency.
3. The allowable operating environment represents where the equipment has been tested to verify functionality. Due to the stresses that operating in the allowable envelope can place on the equipment, these envelopes should be used for short-term operation, not continuous operation, for example in the case of a cooling failure.
4. Must derate the maximum allowable temperature 1°C (1.8°F)/175 m (574 ft) above 900 m (2953 ft) up to a maximum allowable elevation of 3050 m (~10,000 ft).
5. For temperatures in the allowable envelope, the acoustical noise levels of the system may increase significantly as the speeds of the air moving devices increase. See “Acoustics” on page 42 for the declared acoustical noise emission levels for the system.
6. Based in research funded by ASHRAE and performed at low relative humidity, the following are the minimum requirements:
   a. Data centers that have non-ESD floors, where people are permitted to wear non-ESD shoes, might want to consider increasing humidity; given that the risk of generating 8 kV increases from 0.27% (at 25% relative humidity) to 0.43% (at 8% relative humidity).
   b. All mobile furnishings/equipment is to be made of conductive or static dissipative materials and bonded to the ground.
   c. During maintenance on any hardware, a properly functioning wrist strap must be used by any personnel who contacts the system.

Figure 2 on page 33 shows the environmental specifications in **bar graph** format.

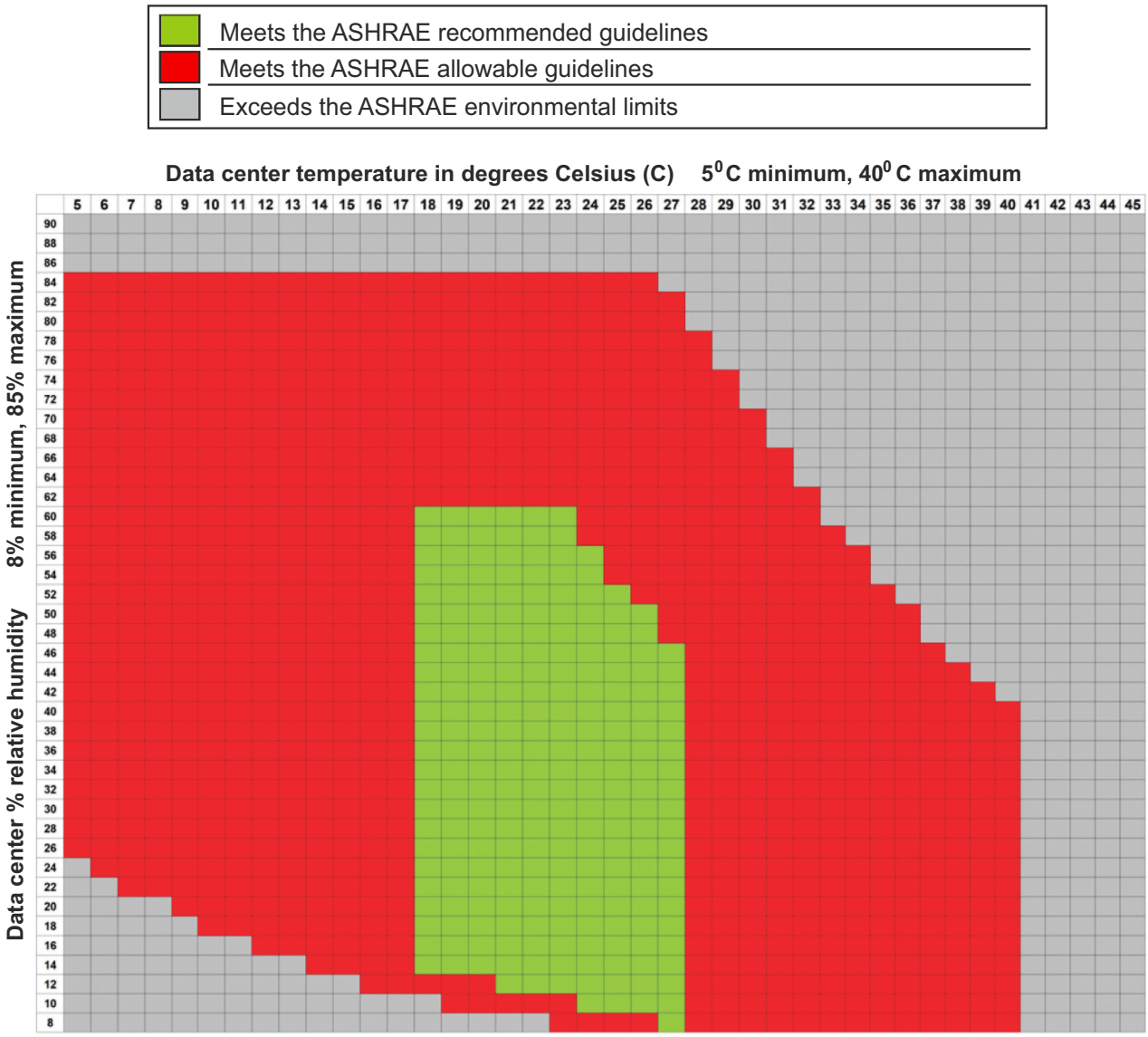


Figure 2. Environmental operating specifications - bar graph format

Notes:

1. Graph is shown in SI (metric) units and a barometric pressure 101.325 kPa (sea level).
2. The recommended operating environment specifies a long-term operating environment that can result in the greatest reliability and energy efficiency.
3. The allowable operating environment represents where the equipment has been tested to verify functionality. Due to the stresses that operating in the allowable envelope can place on the equipment, these envelopes should be used for short-term operation, not continuous operation, for example in the case of a cooling failure.
4. Must derate the maximum allowable temperature 1°C (1.8°F)/175 m (574 ft) above 900 m (2953 ft) up to a maximum allowable elevation of 3050 m (~10,000 ft).
5. For temperatures in the allowable envelope, the acoustical noise levels of the system may increase significantly as the speeds of the air moving devices increase. See “Acoustics” on page 42 for the declared acoustical noise emission levels for the system.

6. Based in research funded by ASHRAE and performed at low relative humidity, the following are the minimum requirements:
    a. Data centers that have non-ESD floors, where people are permitted to wear non-ESD shoes, might want to consider increasing humidity; given that the risk of generating 8 kV increases from 0.27% (at 25% relative humidity) to 0.43% (at 8% relative humidity).
    b. All mobile furnishings/equipment is to be made of conductive or static dissipative materials and bonded to the ground.
    c. During maintenance on any hardware, a properly functioning wrist strap must be used by any personnel who contacts the system.

It is very important the environmental specifications be met immediately in front of the frame of the 9175. Ideally, it would be best if the temperature and humidity controls are good enough to surround the service area of the 9175.

System acclimation

Server and storage equipment (frames) **must** be *gradually* acclimated to the surrounding environment before being powered on.

When server and storage equipment is shipped in a climate where the outside temperature is below the dew point of the destination indoor location, condensation and frost will naturally form on the cooler inside and outside surfaces of the equipment when brought indoors. All IBM products are tested and verified to withstand these phenomena produced under these circumstances. When sufficient time is provided to allow the hardware to gradually acclimate to the indoor environment before attaching it to electrical power, there should be no issues with long term reliability of the system.

General recommendations

- Do *not* attach power to the system before recommended acclimation time. Applying power will cause some features to enter into a stand-by mode even before the system has been formally switched on.
- The system **must** be acclimated before applying power to avoid shorts and other damage due to wet or moist components. Use of vapor barrier bags does *not* negate the need for acclimation.
- If the install/staging area environment allows it, it is recommended to leave the system in the full package, or at least the inner plastic bag (with straps in place), for the time as specified in the following tables.
- Acclimate the system away from perforated tiles, or other sources of direct/forced air, to minimize excessive condensation on or within the equipment. Do *not* blow air at the system to acclimate it faster, as this can increase moisture accumulation within the system and can cause dust from the room to adhere to moist surfaces.
- Where possible, acclimate the system in environments where the temperature is greater than 15°C (59°F), the relative humidity is less than 60%, and the dewpoint is less than 27°C (80°F) to minimize the acclimation time. Cold, humid environments will lead to greater acclimation times.

Determining system acclimation time

1. Determine the shipping condition and lowest temperature that the system was exposed to in the 48 hours prior to it being moved to the staging area or final installation area. Work with your IBM System Service Representative (SSR) and shipping representative if you don't have this information.
   - Use Figure 3 on page 37 if the minimum temperature was between -40°C (-40°F) and 0°C (32°F). Shipments completed in cold weather and were not transported in climate-controlled trucking will need to use this table.
   - Use Figure 4 on page 38 if the minimum temperature was between 0°C (32°F) and 15°C (59°F). Shipments completed in this temperature range, and which were not transported in climate-controlled trucking may use this table. Air shipments followed by transport in warmer conditions may also use this table. If air shipment was followed by non-climate controlled storage and transport in very cold conditions, then use Figure 3 on page 37.
   - Use Figure 5 on page 39 if the minimum temperature was greater than 15°C (59°F). Shipments completed in this temperature range or in climate-controlled conditions may use this table.
2. Once the appropriate acclimation table has been identified, determine the acclimation time for your environment. Determine the *minimum* temperature and *maximum* relative humidity of the room where the system will be acclimated. If the temperature falls between two tabulated values, use the *lower* tabulated temperature. If the relative humidity falls between two tabulated values, use the *higher* tabulated relative humidity. Make a note of the two values indicated at the intersection.
3. The acclimation time is stated as: #h + #h. The first (*left*) number represents the amount of time, in hours, to acclimate the system in the strapped polybag and the second number (*right*) represents the additional time, in hours, the system must be acclimated without any packaging. It is important that this guidance is followed as shown to minimize the risk of incorrectly acclimating your system. If the acclimation time is listed as "X", it is due to either the staging environment being out of

specification for temperature/relative humidity/dewpoint, or the acclimation time exceeds 72 hours (3 days). Contact your IBM SSR for additional guidance in these cases.

4. Once the system has been acclimated as recommended, verify that the outer surface of the system is free of moisture. Request the IBM SSR to verify that the internal components of the system are free of moisture as well. **A system may appear dry on the outside but may still be wet inside.** If moisture is present, continue to acclimate the system without the packaging for an additional 12 hours before re-verifying that it is dry. Continue acclimating and re-verifying in 12 hour intervals while moisture persists. If moisture is still found to be present after 3 days, please contact an IBM SSR for assistance and to troubleshoot the environment in which the system is acclimating.

Example

The system shipment encountered temperatures as low as -12°C (10°F) 48 hours prior to arrival at the customer site.

- Based on this, the appropriate acclimation times can be found in Figure / Table X which provides times for shipments conducted between -40°C and 0°C.

The system is moved into a staging area where the temperature varies from 19°C (66°F) to 23°C (73°F) and the relative humidity varies from 37%RH to 45%RH.

- Use 19°C (the minimum) and 45%RH (the maximum) to determine the acclimation time. As 19°C is greater than 15°C but less than 20°C use the >15°C column. As 45% RH is greater than 40% but less than 60% use the <60%RH row.

The acclimation time in hours for this intersection is: 12h + 48h

- The system must first be acclimated with the bag and straps in place for a minimum of 12 hours. It must then be acclimated without any packaging for a minimum of 48 hours. The total minimum acclimation time is 60 hours (2.5 days). Either leaving the packaging on for the full 60 hours or removing it for the full 60 hours will delay acclimation and result in the need for additional acclimation time.
- At the end of the 60 hours the system is carefully inspected, internally and externally, for any moisture before moving it to its installation location and/or attaching power to the system.

Shipping Temperature: -40C (-40F) to 0C (32F)		Room Temperature deg C (deg F)								
		> 5 (41)	> 10 (50)	> 15 (59)	> 20 (68)	> 25 (77)	> 30 (86)	> 35 (95)	> 40 (104)	> 45 (113)
Room Relative Humidity %	< 8	X	X	X	X	X	X	X	X	X
	< 20	24h + 24h	12h + 24h	12h + 24h	12h + 12h	6h + 24h	6h + 12h	12h + 6h	12h + 6h	X
	< 40	24h + 48h	12h + 48h	12h + 24h	12h + 24h	12h + 12h	12h + 12h	12h + 6h	12h + 6h	X
	< 60	24h + 48h	12h + 48h	12h + 48h	12h + 24h	24h + 6h	24h + 0	24h + 0	24h + 0	X
	< 80	X	24h + 48h	24h + 48h	24h + 12h	24h + 6h	24h + 0	24h + 0	X	X
	< 85	X	X	24h + 48h	24h + 24h	24h + 6h	24h + 0	X	X	X

Figure 3. In-bag (first number) + out-of-bag (second number) acclimation times (in hours) for shipments conducted in very cold conditions (-40°C/-40°F to 0°C/32°F)

Shipping Temperature: 0C (32F) to 15C (59F)		Room Temperature deg C (deg F)								
		> 5 (41)	> 10 (50)	> 15 (59)	> 20 (68)	> 25 (77)	> 30 (86)	> 35 (95)	> 40 (104)	> 45 (113)
Room Relative Humidity %	< 8	X	X	X	X	X	X	X	X	X
	< 20	6h + 24h	6h + 24h	6h + 12h	6h + 12h	6h + 12h	6h + 6h	6h + 6h	6h + 6h	X
	< 40	6h + 48h	6h + 24h	6h + 24h	6h + 12h	6h + 12h	6h + 12h	6h + 12h	6h + 6h	X
	< 60	6h + 48h	6h + 48h	6h + 24h	6h + 24h	12h + 6h	12h + 6h	24h + 0	12h + 0	X
	< 80	X	12h + 48h	12h + 48h	12h + 24h	12h + 24h	24h + 0	24h + 0	X	X
	< 85	X	X	12h + 48h	12h + 48h	24h + 0	24h + 0	X	X	X

Figure 4. In-bag (first number) + out-of-bag (second number) acclimation times (in hours) for shipments conducted in cool conditions (0°C/32°F to 15°C/59°F). Shipments via air may use this table if subsequent transport and storage was in warmer conditions

Shipping Temperature: 15C (59F) and above		Room Temperature deg C (deg F)								
		> 5 (41)	> 10 (50)	> 15 (59)	> 20 (68)	> 25 (77)	> 30 (86)	> 35 (95)	> 40 (104)	> 45 (113)
Room Relative Humidity %	< 8	X	X	X	X	X	X	X	X	X
	< 20	0 + 6h	0 + 6h	0 + 6h	0 + 6h	0 + 6h	0 + 6h	0 + 6h	0 + 6h	X
	< 40	0 + 6h	0 + 6h	0 + 6h	0 + 6h	0 + 6h	0 + 12h	6h + 6h	6h + 0	X
	< 60	0 + 12h	0 + 12h	0 + 12h	0 + 12h	6h + 6h	6h + 6h	6h + 6h	6h + 0	X
	< 80	0 + 12h	0 + 12h	0 + 24h	6h + 12h	6h + 12h	12h + 0	12h + 0	X	X
	< 85	0 + 12h	0 + 24h	0 + 24h	6h + 24h	12h + 6h	12h + 0	X	X	X

Figure 5. In-bag (first number) + out-of-bag (second number) acclimation times (in hours) for shipments conducted in mild/warm conditions or for shipments conducted in climate-controlled-trucking (15°C/59°F and above). Air-shipments conducted in the last 48 hours may not use this table.

Conductive contamination

Semiconductors and sensitive electronics used in current Information Technology equipment have allowed for the manufacture of very high density electronic circuitry. While new technology allows for significant increases or capacity in a smaller physical space, it is susceptible to contamination, especially contamination particles that will conduct electricity. Since the early 1990s, it has been determined that data center environments may contain sources of conductive contamination. Contaminants include; carbon fibers, metallic debris such as aluminum, copper and steel filings from construction, and zinc whiskers from zinc-electroplated materials used in raised floor structures.

Although very small, and at times not easily seen without the visual aide of magnifying lenses, this type of contamination can have disastrous impacts on equipment availability and reliability. Errors, component damage and equipment outages caused by conductive contamination can be difficult to diagnose. Failures may be at first attributed to other more common factors such as lightning events or electrical power quality or even just presumed to be defective parts.

The most common conductive contamination in raised-floor data centers is what is known as zinc whiskers. It is the most common because it is frequently found on the underside of certain types of access floor tiles. Typically, the wood core style floor tile has a flat steel bottom. The steel may be coated with zinc either by a hot dip galvanize process or by zinc electroplate. The zinc electroplate steel exhibits a phenomena which appears as whisker-like growths on the surface. These small particles of approximately 1-2 mm (.04-.08 in.) in length, can break away from the surface and get pulled into the cooling air stream. Eventually they my be ingested by the equipment air, settle on a circuit board and create a problem. If you suspect that you may have this type of problem, contact your service representative.

Airborne particulates (including metal flakes or particles) and reactive gases acting alone or in combination with other environmental factors such as humidity or temperature might pose a risk to the system that is described in this document. Risks that are posed by the presence of excessive particulate levels or concentrations of harmful gases include damage that might cause the system to malfunction or cease functioning altogether. This specification sets forth limits for particulates and gases that are intended to avoid such damage. The limits must not be viewed or used as definitive limits because numerous other factors, such as temperature or moisture content of the air, can influence the impact of particulates or environmental corrosives and gaseous contaminant transfer. In the absence of specific limits that are set forth in this document, you must implement practices that maintain particulate or gas levels that are consistent with the protection of human health and safety. If it is determined that the levels of particulates or gases in your environment have caused damage to the system, there may be a provision of repair or replacement of system or parts on implementation of appropriate remedial measures to mitigate such environmental contamination. Implementation of such remedial measures is a customer responsibility.

Table 16. Contaminant descriptions

Contaminant	**Description**
Gaseous contamination	Severity level G1 as per ANSI/ISA 71.04-1985[1] which states that the reactivity rate of copper coupons shall be less than 300 Angstroms per month (Å/month, ~ 0.0039 µg/cm^2-hour weight gain).[2] In addition, the reactivity rate of silver coupons shall be less than 200 Å/month (~ 0.0035 µg/cm^2-hour weight gain).[3] The reactive monitoring of gaseous corrosivity should be conducted approximately 2 inches (5 cm) in front of the frame on the air inlet side at one-quarter and three-quarter frame height off the floor or where the air velocity is much higher.

Table 16. Contaminant descriptions (continued)	
Contaminant	**Description**
Particulate contamination	Datacenters must meet the cleanliness level of ISO 14644-1 class 8. For data centers without airside economizer, the ISO 14644-1 class 8 cleanliness may be met simply by the choice of the following filtration: • The room air may be continuously filtered with MERV 8 filters. Air entering a data center may be filtered with MERV 11 or preferably MERV 13 filters. • For datacenters with airside economizers, the choice of filters to achieve ISO class 8 cleanliness depends on the specific conditions present at that data center. The deliquescent relative humidity of the particulate contamination should be more than 60% RH.[4] Datacenters must be free of zinc whiskers.[5]

Notes:

1. ANSI/ISA-71.04.1985. "Environmental conditions for process measurement and control systems: Airborne contaminants." Instrument Society of America, Research Triangle Park, NC, 1985.
2. The derivation of the equivalence between the rate of copper corrosion product thickness growth in Å/month and the rate of weight gain assumes that Cu_2S and Cu_2O grow in equal proportions.
3. The derivation of the equivalence between the rate of silver corrosion product thickness growth in Å/month and the rate of weight gain assumes that Ag_2S is the only corrosion product.
4. The deliquescent relative humidity of particulate contamination is the relative humidity at which the dust absorbs enough water to become wet and promote corrosion and/or ion migration.
5. Surface debris is randomly collected from 10 areas of the data center on a 1.5-cm diameter disk of sticky electrically conductive tape on a metal stub. If examination of the sticky tape in a scanning electron microscope reveals no zinc whiskers, the data center is considered free of zinc whiskers.
6. If there is any question about potential corrosive gases or level of particulates, contact your representative for assistance in monitoring the environment.

Beyond the specific information provided in this document, it is recommended that the customer's facility meet the general guidelines published in the *American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) Handbook*.

Acoustics

This section provides information on acoustics for the 9175.

Acoustical noise emission levels

Table 17. Acoustical noise emissions for the 9175

Declared noise emission values in accordance with ISO 9296 (1-8)						
Product description(9): M/T 9175 Models ME1 and ML1	**Declared mean A-weighted sound power level $L_{WA,m}$ (B)**		**Declared mean A-weighted emission sound pressure level $L_{pA,m}$ (dB) ---------- *bystander* ---- *front* ---- *rear***		**Statistical adder for verification K_v (B)**	
	Operating	**Idling**	**Operating**	**Idling**	**Operating**	**Idling**
• ***Typical configuration*** *with ordinary I/O:* Two frames, two processor drawers, three PCIe+ I/O drawers, and one radiator cooling unit • Typical workload • 21° C, 500 m environment	7.5(10)	7.5(10)	60 ---- 77 ---- 71	60 ---- 77 ---- 71	0.3	0.3
• ***Typical configuration*** *with ordinary I/O:* Two frames, two processor drawers, three PCIe+ I/O drawers and one radiator cooling unit • Typical workload • 25° C, 500 m environment	7.7(11)	7.7(11)	62 ---- 79 ---- 72	62 ---- 79 ---- 72	0.3	0.3
• ***Typical configuration:*** Two frames, two processor drawers, three PCIe+ I/O drawers (two with high-powered I/O), and one radiator cooling unit • Typical workload • 25° C, 500 m environment	7.9 (11)	7.9 (11)	64 ---- 80 ---- 73	62 ---- 79 ---- 72	0.3	0.3

Table 17. Acoustical noise emissions for the 9175 (continued)

Declared noise emission values in accordance with ISO 9296 (1-8)						
Product description(9): **M/T 9175** **Models ME1 and ML1**	**Declared mean A-weighted sound power level $L_{WA,m}$ (B)**		**Declared mean A-weighted emission sound pressure level $L_{pA,m}$ (dB)** --- ***bystander*** ——— ***front*** ——— ***rear***		**Statistical adder for verification K_v (B)**	
	Operating	**Idling**	**Operating**	**Idling**	**Operating**	**Idling**
• ***Maximum configuration:*** Four frames, four processor drawers, 12 PCIe+ I/O drawers with high-powered I/O, and two radiator cooling units • Typical workload • 25° C, 500 m environment	8.4	8.1	68 ——— 83 ——— 75	66 ——— 82 ——— 75	0.3	0.3
• ***Typical configuration:*** Two frames, two processor drawers, three PCIe+ I/O drawers (two with high-powered I/O), and one radiator cooling unit • Maximum workload • 40° C, 3048 m environment	9.0	9.0	75 ——— 92 ——— 86	75 ——— 92 ——— 86	0.3	0.3
• ***Maximum configuration:*** Four frames, four processor drawers, 12 PCIe+ I/O drawers with high-powered I/O, and two radiator cooling units • Maximum workload • 40° C, 3048 m environment	9.4	9.4	79 ——— 96 ——— 88	79 ——— 96 ——— 88	0.3	0.3

Notes:

1. Declared level $L_{WA,m}$ is the mean A-weighted sound power level.
2. Declared level $L_{pA,m}$ is the mean A-weighted sound pressure level computed as the arithmetic average of the measurements at the 1-meter bystander positions, or it is measured as the maximum 0.5-meter operator position at the front or rear face with the doors opened.
3. The statistical adder for verification, K_V, is a quantity to be added to the declared mean A-weighted sound power level $L_{WA,m}$, such that there will be a 95% probability of acceptance when using the verification procedures of ISO 9296, if no more than 6.5% of the batch of new equipment has A-weighted sound power levels greater than the sum of ($L_{WA,m}$ + K_V).
4. The quantity $L_{WA,c}$ (formerly called L_{WAd}), can be computed from the sum of $L_{WA,m}$ and K_V.

5. Measurements are made in conformance with ISO 7779 and declared in conformance with ISO 9296, except for the inclusion of some modeled results derived from ISO 7779 measurements.
6. **B** and **dB** are the abbreviations for **bels** and **decibels**, respectively. 1 B = 10 dB.
7. Under certain environments, configurations, system settings and/or workloads, fan speeds are increased which results in higher noise levels.
8. **Notice:** Government regulations (such as those prescribed by OSHA or European Community Directives) may govern noise level exposure in the workplace and may apply to you and your server installation. The actual sound pressure levels in your installation depend upon a variety of factors, including the number of frames in the installation; the size, materials, and configuration of the room where you designate the frames to be installed; the noise levels from other equipment; the room ambient temperature, and employees' location in relation to the equipment. Further, compliance with such government regulations also depends upon a variety of additional factors, including the duration of employees' exposure and whether employees wear hearing protection. IBM recommends that you consult with qualified experts in this field to determine whether you are in compliance with the applicable regulations.
9. All system configurations contain two support elements, two switches, acoustical doors, and are powered using in-rack power distribution units.
10. Meets IT Product Noise Limits for "Generally Attended Data Center" per Statskontoret Technical Standard 26:6.
11. Meets IT Product Noise Limits for "Generally Unattended Data Center" per Statskontoret Technical Standard 26:6.

Relevant international standards:

- Measurements: ISO 7779
- Declaration: ISO 9296

Chapter 3. Models and physical specifications

This chapter provides the following detailed information for the 9175:

- Model and frame descriptions
- Shipping specifications
- Plan view and specifications
- Weight distribution data and service clearances information
- Cooling recommendations

Note: All dimensions are considered nominal.

Figure 6. IBM z17 (Model ME1) Four-frame model

Facts about the 9175:

- **System configuration**
  - The 9175 can be a 1, 2, 3, or 4 frame system depending on your configuration.
  - The 9175 is powered by Power Distribution Units (PDUs).

    Important: The Bulk Power Assembly (BPA) feature is no longer available.
  - The 9175 can be powered from an AC source only. HVDC power source is not supported.
  - The 9175 is radiator-cooled.
  - The 9175 can be installed on a *raised floor* or *non-raised floor*.
  - To enable the carry forward of the Z-Frame into future systems (beyond 9175), the Z Frame First I/O Placement feature (**FC 0352**) can be ordered. This feature forces the PCIe+ I/O drawer install locations to begin at `EIA Z01`.
- **Cable management**
  - For the 9175, bottom exit cabling and top exit cabling for power and I/O are supported.
    - For bottom exit cabling, you must order the bottom exit feature (**FC 7804**).
    - For top exit cabling, you can order one of the following features:
      - Top Exit cabling feature (**FC 5823**) - provides additional enclosure hardware for installation on the top of the frame(s).
      - Base Top Exit cabling feature (**FC 7803**) - provides no additional hardware; cables are routed directly through the top of the frame(s).

        Note: If Base Top Exit cabling feature (**FC 7803**) is ordered, and the bottom exit feature (**FC 7804**) is *not*, a bottom metal seal plate is installed at the bottom of the frame.

    For more information, see Appendix B, “Top Exit cabling and Bottom Exit cabling specifications,” on page 181.
  - If cables are exposed in your system environment, refer to your local and national electric and safety codes for more information.

    If you are planning an installation on a raised floor in Canada, the installation must be in accordance with Section 12-020 of the Canadian Electrical Code. In any country, refer to your national electric code if you have questions about routing data processing cables in exposed areas.
  - Spine cable management hardware in each frame of your system allows you to route the cables from the PCIe+ I/O drawers and the CPC processor drawer to the middle of the frame, which provides accessibility for servicing a machine. The cables can be routed to the bottom of the frame or to the top of the frame. This hardware will always come installed on a C or Z frame.
  - For cable management best practices and guidelines, see *IBM Z 9175 External Cabling Best Practices Guide* (https://www.ibm.com/support/pages/node/7229729).
- **Other considerations**
  - In areas that might be prone to seismic events, the Earthquake Kit feature (**FC 8014 or 8015**) is available. See “Earthquake Kit” on page 86 for more information.
    - **FC 8014** provides frame tie-down hardware to cover *raised floor* heights from 228.6 mm - 330.2 mm (9 in - 13 in), 304.8 mm - 558.8 mm (12 in - 22 in), and 304.8 mm - 914.4 mm (12 in - 36 in).
    - **FC 8015** provides frame tie-down hardware for *non-raised floor* environments.
  - The frames are shipped as separate units, fastened together at install time.

    The 9175, fully configured, can weigh in excess of 2564 kg (5640 lb). **Be certain that the raised floor on which you are going to install the server is capable of supporting this weight.**

> **DANGER: Heavy equipment — personal injury or equipment damage might result if mishandled. (D006)**

- For each frame, there are separate shipping containers for the covers and separate shipping containers for the floating panels as well.

Important: When an incline or ramp needs to be traversed during system transport, the angle of inclination must be less or equal to 10º degrees. Angles that are greater than 10º degrees, pose a safety hazard as well as expose the potential for the system frame to bottom out while transitioning to or from the level surface.

Physical dimensions

This section lists the dimensions for the following:

- Frame dimensions
- Top Exit feature (**FC 5823**)
- Height Reduction feature (**FC 9975**)

Frame dimensions

Notes:

- For systems with two or more frames, there will be frame spacer hardware pre-installed on the system.
  - If the system is being installed on 609 mm (24 in) on-grid floor tiles, the frame spacers must *remain* installed.
  - If the system is being installed on 600 mm (23.6 in) on-grid floor tiles, the frame spacers must be *removed*.
- The installation of side covers is optional on the 9175.

Table 18. A frame dimensions

A frame/cover combination	Width mm (in)	Depth mm (in)	Height mm (in)
Frame A w/o covers	600 mm (23.6 in)	1070 mm (42.1 in)	2015 mm (79.3 in)
Frame A w/ covers	624 mm (24.6 in)	1207 mm (47.5 in)	2023 mm (79.7 in)
Frame A w/ covers and top exit enclosure feature (FC 5823)	624 mm (24.6 in)	1207 mm (47.5 in)	2191 mm (86.3 in)

Table 19. A and Z frame dimensions

A and Z frame/cover combination	Width mm (in) *w/o frame spacers*	Width mm (in) *w/ frame spacers*	Depth mm (in)	Height mm (in)
Frames w/o covers	1200 mm (47.2 in)	1209.5 mm (47.6 in)	1070 mm (42.1 in)	2015 mm (79.3 in)
Frames w/ covers	1224 mm (48.2 in)	1233.5 mm (48.6 in)	1207 mm (47.5 in)	2023 mm (79.7 in)
Frames w/ covers and top exit enclosure feature (FC 5823)	1224 mm (48.2 in)	1233.5 mm (48.6 in)	1207 mm (47.5 in)	2191 mm (86.3 in)

Table 20. A, C, and Z frame dimensions

A, C, and Z frame/cover combination	Width mm (in) *w/o frame spacers*	Width mm (in) *w/ frame spacers*	Depth mm (in)	Height mm (in)
Frames w/o covers	1800 mm (70.8 in)	1819 mm (71.6 in)	1070 mm (42.1 in)	2015 mm (79.3 in)
Frames w/ covers	1824 mm (71.8 in)	1843 mm (72.6 in)	1207 mm (47.5 in)	2023 mm (79.7 in)

Table 20. A, C, and Z frame dimensions (continued)

A, C, and Z frame/cover combination	Width mm (in) *w/o frame spacers*	Width mm (in) *w/ frame spacers*	Depth mm (in)	Height mm (in)
Frames w/ covers and top exit enclosure feature (FC 5823)	1824 mm (71.8 in)	1843 mm (72.6 in)	1207 mm (47.5 in)	2191 mm (86.3 in)

Table 21. A and B frame dimensions

A and B frame/cover combination	Width mm (in) *w/o frame spacers*	Width mm (in) *w/ frame spacers*	Depth mm (in)	Height mm (in)
Frames w/o covers	1200 mm (47.2 in)	1209.5 mm (47.6 in)	1070 mm (42.1 in)	2015 mm (79.3 in)
Frames w/ covers	1224 mm (48.2 in)	1233.5 mm (48.6 in)	1207 mm (47.5 in)	2023 mm (79.7 in)
Frames w/ covers and top exit enclosure feature (FC 5823)	1224 mm (48.2 in)	1233.5 mm (48.6 in)	1207 mm (47.5 in)	2191 mm (86.3 in)

Table 22. A, B, and Z frame dimensions

A, B, and Z frame/cover combination	Width mm (in) *w/o frame spacers*	Width mm (in) *w/ frame spacers*	Depth mm (in)	Height mm (in)
Frames w/o covers	1800 mm (70.8 in)	1819 mm (71.6 in)	1070 mm (42.1 in)	2015 mm (79.3 in)
Frames w/ covers	1824 mm (71.8 in)	1843 mm (72.6 in)	1207 mm (47.5 in)	2023 mm (79.7 in)
Frames w/ covers and top exit enclosure feature (FC 5823)	1824 mm (71.8 in)	1843 mm (72.6 in)	1207 mm (47.5 in)	2191 mm (86.3 in)

Table 23. A, B, C, and Z frame dimensions

A, B, C and Z frame/cover combination	Width mm (in) *w/o frame spacers*	Width mm (in) *w/ frame spacers*	Depth mm (in)	Height mm (in)
Frames w/o covers	2400 mm (94.4 in)	2428.5 mm (95.6 in)	1070 mm (42.1 in)	2015 mm (79.4 in)
Frames w/ covers	2424 mm (95.4 in)	2452.5 mm (96.6 in)	1207 mm (47.5 in)	2023 mm (79.7 in)
Frames w/ covers and top exit enclosure feature (FC 5823)	2424 mm (95.4 in)	2452.5 mm (96.6 in)	1207 mm (47.5 in)	2191 mm (86.3 in)

Top Exit Enclosure Feature (FC 5823)

The top exit cabling enclosure is installed on the top of the machine in the rear. The following table provides the dimensions and weight for the top exit cabling enclosure:

Table 24. Top exit cabling enclosure (FC 5823) measurements

Weight	Width	Depth	Height
12.2 kg (27 lbs)*	598 mm (23.54 in)	1072 mm (42.2 in)	178 mm (7.0 in)

***** The top exit enclosure itself, as it is installed, weighs 11.4 kg (25 lbs).
+ included cable spools and enclosure lids = 22.5 kg (49.5 lbs)
+ *optional* Fiber Quick Connect feature (FC 5824 or FC 5826) = 26.4 kg (58 lbs)

Height Reduction feature (FC 9975)

9175 is composed of a 42 EIA frame. The base frame is 40 EIA with a 2U removable top hat.

If you have doorways that will not fit the 9175, you should order FC 9975. FC 9975 reduces the frame height to 1900 mm (74.8 in). With FC 9975, the 2U top hat, the primary Support Element, and the alternate Support Element are shipped in separate boxes.

Shipping and packaging specifications

The 9175 is shipped as crated systems that are protected with wooden shipping boxes and are mounted on pallets requiring commercial lift transportation. This packaging is used for **all**.

- New shipping container, the "zCrate", has been developed to minimize carbon footprint impact:
  - Includes **both** the system frame as well as its base front and rear doors.

    Note: For each frame, there are separate shipping containers for the covers and the floating panels.
  - If ordered, includes ladder packaged at the rear of the shipping container.
- Each frame is packaged separately in its own individual wooden zCrate.
- Each zCrate has a tilt indicator label located on the external side of the crate. If the indicator is red, the label instructs you on what you should do next.

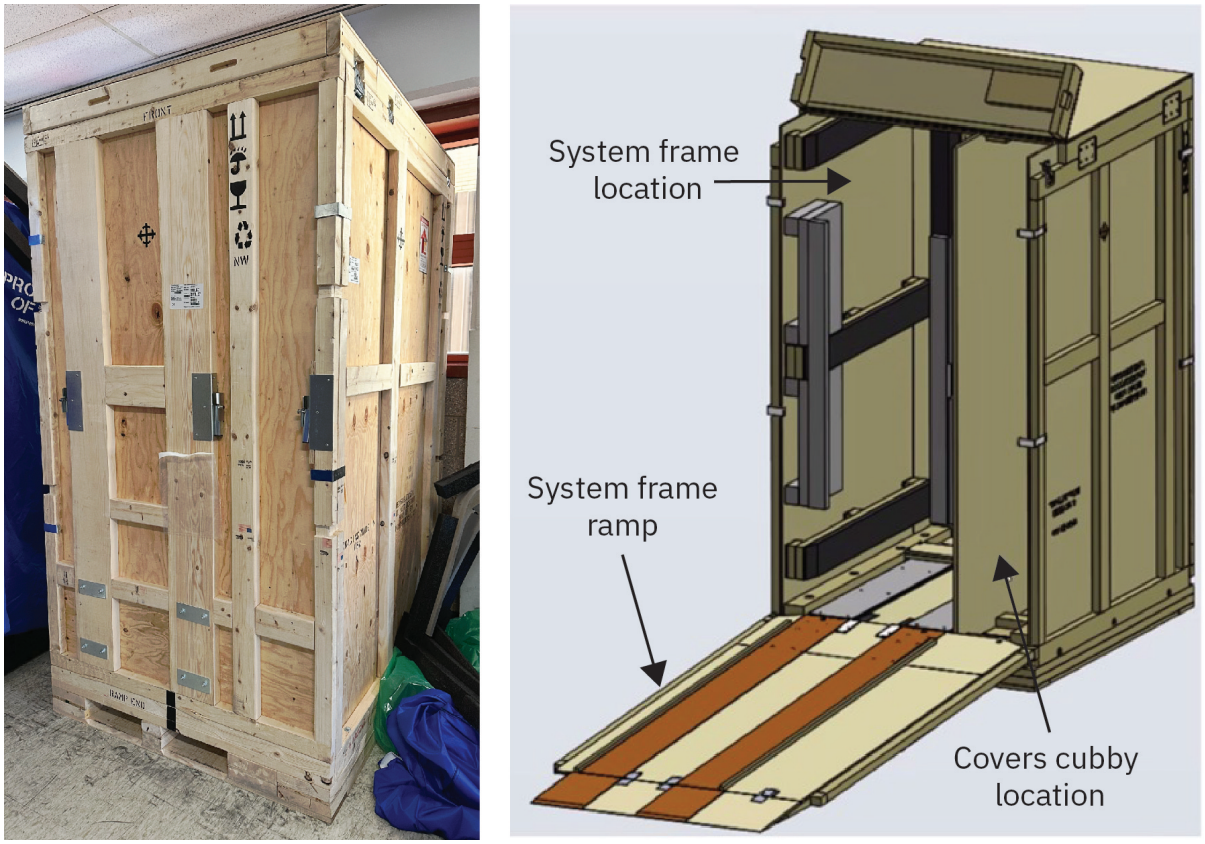


Figure 7. zCrate assembly

The following table provides the physical dimensions and weight of the zCrate. The provided weight does *not* include the frame, front/rear doors, or service ladder inside. The actual weight of the each fully-packed zCrate will vary significantly, depending on the system configuration.

Table 25. Wooden zCrate specifications (per crate)

Weight kg (lb)	Width mm (in)	Depth mm (in)	Height mm (in)
331.2 kg (730 lb)	1188 mm (46.8 in)	1480 mm (58.3 in)	2280 mm (89.8 in)

Within the system packaging, each frame is wrapped in a protective clear green Vapor phase Corrosion Inhibitor (VpCI) bag as shown below:

Planning for system packaging

Important: Depending on your specific system configuration, the 9175 might require additional packaging equipment to ensure safe system transport. This additional packaging will likely be large in size and must be planned for accordingly.

Discuss and prepare the required storage and staging space for your specific system configuration with your IBM marketing representative or Business Partner.

Table 26. 9175 packaging for system delivery

Box Contents	Width mm (in)	Depth mm (in)	Height mm (in)	Weight kg (lb)
Each frame (*1, 2, 3 or 4 frames per your configuration*)	940 mm (37 in)	1346 mm (53 in)	2286 mm (90 in)	1167 kg (2573 lb)[1]
Ship Group (*up to 3x for largest configuration*)	610 mm (24 in)	1016 mm (40 in)	1016 mm (40 in)	32 kg (70 lb)
Lift Tool	559 mm (22 in)	1118 mm (44 in)	889 mm (35 in)	48 kg (105 lb)
1U TKE (*if feature is ordered*)	610 mm (24 in)	1016 mm (40 in)	508 mm (20 in)	18 kg (40 lb)

Note:

1. The actual weight of the each individually packaged frame may vary significantly, depending on the system configuration.

The following equipment must remain on site:

- Ship Group and Tool Kit
- Lift Tool
- Service Ladder

For more information regarding necessary storage space for these items, see Appendix E, “Lift Tool and Service Ladder storage,” on page 201.

Planning for return packaging

Contact your IBM marketing representative or Business Partner to choose the correct Return Package feature code to order and determine a return schedule.

Table 27. Return Packaging for system return or discontinuance

Box Contents	Width mm (in)	Depth mm (in)	Height mm (in)	Weight kg (lb)
z16 plywood frame box (*1, 2, 3 or 4 boxes per your configuration*)	940 mm (37 in)	1346 mm (53 in)	2286 mm (90 in)	1167 kg (2573 lb)[1]
z15 plywood frame box (*1, 2, 3 or 4 boxes per your configuration*)	940 mm (37 in)	1346 mm (53 in)	2286 mm (90 in)	1167 kg (2573 lb)[1]

Cover set packaging

Table 28. Cover set packaging specifications

	Width mm (in)	Depth mm (in)	Height mm (in)	Weight kg (lb)
z16 or z15 cover kit (*1, 2, 3 or 4 kits per your configuration*)	457.2 mm (18 in)	2133.6 mm (84 in)	1016.0 mm (40 in)	49.9 kg (110 lb)
side cover pack	1511.3 mm (59.5 in)	2184.4 mm (86 in)	330.2 mm (13 in)	-

Top Exit Enclosure Feature - FC 5823

The Top Exit Enclosure feature is wrapped in a poly bag for packaging.

Table 29. Top Exit Enclosure Feature packaging specifications

	Width mm (in)	Depth mm (in)	Height mm (in)	Weight kg (lb)
top exit enclosure	599 mm (23.58 in)	336.5 mm (13.25 in)	123 mm (4.8 in)	5.4 kg (12 lb)

Height Reduction Feature - FC 9975

If the Height Reduction feature (FC 9975) is ordered, the top hat, primary Support Element, and alternate Support Element are shipped in separate boxes.

Table 30. Height reduction feature packaging specifications

	Width mm (in)	Depth mm (in)	Height mm (in)	Weight kg (lb)
top hat	660.4 mm (26 in)	1117.6 mm (44 in)	406.4 mm (16 in)	34.1 kg (75 lb)
primary Support Element	609.6 mm[1] (24 in)	1016.0 mm[1] (40 in)	355.6 mm[1] (14 in)	25.0 kg (55 lb)
alternate Support Element	609.6 mm[1] (24 in)	1016.0 mm[1] (40 in)	355.6 mm[1] (14 in)	25.0 kg (55 lb)

Table 30. Height reduction feature packaging specifications (continued)

	Width mm (in)	Depth mm (in)	Height mm (in)	Weight kg (lb)

Note:

1. For two Support Element boxes stacked together on one pallet, the specifications are 609.6 mm x 1016.0 mm x 584.2 mm (24 in x 40 in x 23 in).

IBM z17 (Model ME1) and IBM LinuxONE Emperor 5 (Model ML1) feature codes

IBM z17 (Model ME1) and IBM LinuxONE Emperor 5 (Model ML1) each contain four feature codes based on the maximum number of configurable PUs.

Table 31 on page 56 lists the feature codes. You will use the feature codes to place your IBM z17 (Model ME1) or IBM LinuxONE Emperor 5 (Model ML1) order.

Table 31. Processor descriptions

Feature code	Description
0571	Model ME1/Model ML1 1 CPC drawer 4 DCMs Maximum 43 configurable PUs
0572	Model ME1/Model ML1 2 CPC drawers 8 DCMs Maximum 90 configurable PUs
0573	Model ME1/Model ML1 3 CPC drawers 12 DCMs Maximum 136 configurable PUs
0574	Model ME1/Model ML1 4 CPC drawers 16 DCMs Maximum 183 configurable PUs
0575	Model ME1/Model ML1 4 CPC drawers 16 DCMs Maximum 208 configurable PUs

These models contain Dual Chip Modules (DCMs), user-definable Processor Units (PUs), System Assist Processors (SAPs), and spare PUs (used to provide uninterrupted computing if there should be a problem with a working PU). Model specifications are described in Table 32 on page 57 and Table 33 on page 60.

Table 32. Model ME1 (FC 0209) configurable PUs and options	
Feature code	**Description**
FC 0571 (Max 43 configurable PUs)	• 1 CPC drawer • 0-43 CPs • 0-43 IFLs • 0-42 uIFLs • 0-42 zIIPs • 0-42 uzIIPs • 0-43 ICFs • 0-42 uICFs • 2 IFPs • 5 standard SAPs • 0 additional SAPs • 2 spares • I/O links: – 12 PCIe+ and Short-Range Coupling Fanouts
FC 0572 (Max 90 configurable PUs)	• 2 CPC drawers • 0-90 CPs • 0-90 IFLs • 0-89 uIFLs • 0-89 zIIPs • 0-89 uzIIPs • 0-90 ICFs • 0-89 uICFs • 2 IFPs • 10 standard SAPs • 0 additional SAPs • 2 spares • I/O links: – 24 PCIe+ and Short-Range Coupling Fanouts

Table 32. Model ME1 (FC 0209) configurable PUs and options (continued)	
Feature code	**Description**
FC 0573 (Max 136 configurable PUs)	• 3 CPC drawers • 0-136 CPs • 0-136 IFLs • 0-135 uIFLs • 0-135 zIIPs • 0-135 uzIIPs • 0-136 ICFs • 0-135 uICFs • 2 IFPs • 16 standard SAPs • 0 additional SAPs • 2 spares • I/O links: – 36 PCIe+ and Short-Range Coupling Fanouts
FC 0574 (Max 183 configurable PUs)	• 4 CPC drawers • 0-183 CPs • 0-183 IFLs • 0-182 uIFLs • 0-182 zIIPs • 0-182 uzIIPs • 0-183 ICFs • 0-182 uICFs • 2 IFPs • 21 standard SAPs • 0 additional SAPs • 2 spares • I/O links: – 48 PCIe+ and Short-Range Coupling Fanouts

Table 32. Model ME1 (FC 0209) configurable PUs and options (continued)

Feature code	Description
FC 0575 (Max 208 configurable PUs)	• 4 CPC drawers • 0-208 CPs • 0-208 IFLs • 0-207 uIFLs • 0-207 zIIPs • 0-207 uzIIPs • 0-208 ICFs • 0-207 uICFs • 2 IFPs • 24 standard SAPs • 0 additional SAPs • 2 spares • I/O links: – 48 PCIe+ and Short-Range Coupling Fanouts

CP - Central Processor
SAP - System Assist Processor
IFL - Integrated Facilities for Linux®
ICF - Integrated Coupling Facility
zIIP - z Integrated Information Processor
IFP - Integrated Firmware Processor

u - Unassigned

Table 33. Model ML1 (FC 0210) configurable PUs and options	
Feature code	**Description**
FC 0571 (Max 43 configurable PUs)	• 1 CPC drawer • 0-1 CPs ** • 1-43 IFLs • 0-42 uIFLs • 0 zIIPs • 0 uzIIPs • 0 ICFs • 0 uICFs • 2 IFPs • 5 standard SAPs • 0 additional SAPs • 2 spares • I/O links: – 12 PCIe+ and Short-Range Coupling Fanouts
FC 0572 (Max 90 configurable PUs)	• 2 CPC drawers • 0-1 CPs ** • 1-90 IFLs • 0-89 uIFLs • 0 zIIPs • 0 uzIIPs • 0 ICFs • 0 uICFs • 2 IFPs • 10 standard SAPs • 0 additional SAPs • 2 spares • I/O links: – 24 PCIe+ and Short-Range Coupling Fanouts

Table 33. Model ML1 (FC 0210) configurable PUs and options (continued)	
Feature code	**Description**
FC 0573 (Max 136 configurable PUs)	• 3 CPC drawers • 0-1 CPs ** • 1-136 IFLs • 0-135 uIFLs • 0 zIIPs • 0 uzIIPs • 0 ICFs • 0 uICFs • 2 IFPs • 16 standard SAPs • 0 additional SAPs • 2 spares • I/O links: – 36 PCIe+ and Short-Range Coupling Fanouts
FC 0574 (Max 183 configurable PUs)	• 4 CPC drawers • 0-1 CPs ** • 1-183 IFLs • 0-182 uIFLs • 0 zIIPs • 0 uzIIPs • 0 ICFs • 0 uICFs • 2 IFPs • 21 standard SAPs • 0 additional SAPs • 2 spares • I/O links: – 48 PCIe+ and Short-Range Coupling Fanouts

Table 33. Model ML1 (FC 0210) configurable PUs and options (continued)

Feature code	Description
FC 0575 (Max 208 configurable PUs)	• 4 CPC drawers • 0-1 CPs ** • 1-208 IFLs • 0-207 uIFLs • 0 zIIPs • 0 uzIIPs • 0 ICFs • 0 uICFs • 2 IFPs • 24 standard SAPs • 0 additional SAPs • 2 spares • I/O links: – 48 PCIe+ and Short-Range Coupling Fanouts

CP - Central Processor
SAP - System Assist Processor
IFL - Integrated Facilities for Linux
ICF - Integrated Coupling Facility
zIIP - z Integrated Information Processor
IFP - Integrated Firmware Processor

u - Unassigned

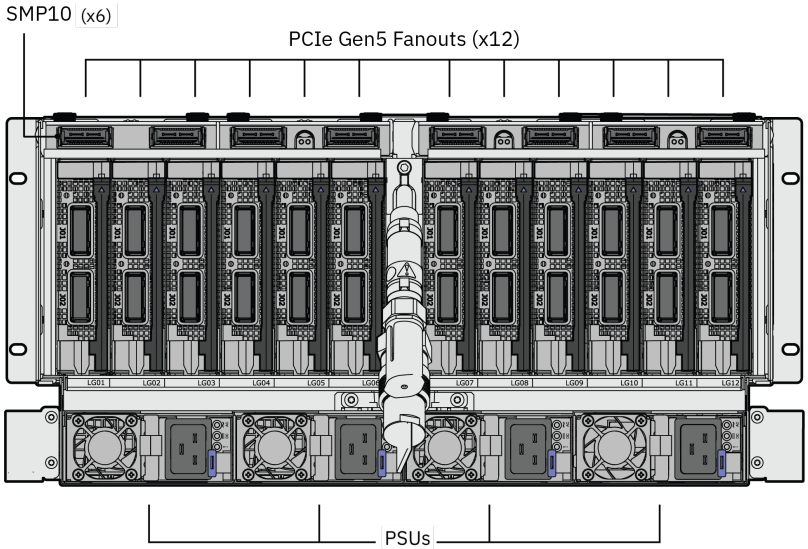
****** 1 CP for GDPS (Geographically Dispersed Parallel Sysplex) Virtual Appliance

CPC processor drawer

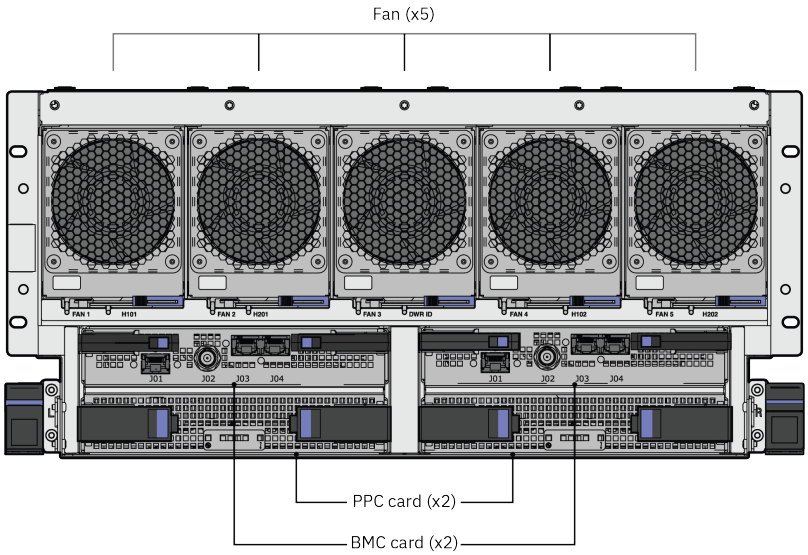
The 9175 supports up to 4 CPC processor drawers. Each CPC processor drawer:

- Is 5 EIA units (5U)
- In the ***rear*** of the CPC drawer:
  - 12 PCIe+ Fanouts plugged in the following locations:

    LG01, **LG02**, **LG03**, **LG04**, **LG05**, **LG06**, **LG07**, **LG08**, **LG09**, **LG10**, **LG11**, **LG12**
  - 6 SMP10 (Symmetric Multi-Processing) ports
  - 4 Power Supply Units (PSUs)



- In the ***front*** of the CPC drawer:
  - 5 Fans
  - 2 Oscillator cards (OSC)
  - 2 Processor Power Control (PPC) cards



CPC Reserve features

The following features are offered to give customers the ability to preserved CPC drawer locations in the 9175 for future growth and usage.

CPC1 Reserve (FC 2933)
Reserves the EIA location **A15** for a future Max90 or Max136 upgrade.

CPC2 Reserve (FC 2934)
Reserves the EIA location **A20** for a future Max136 upgrade.

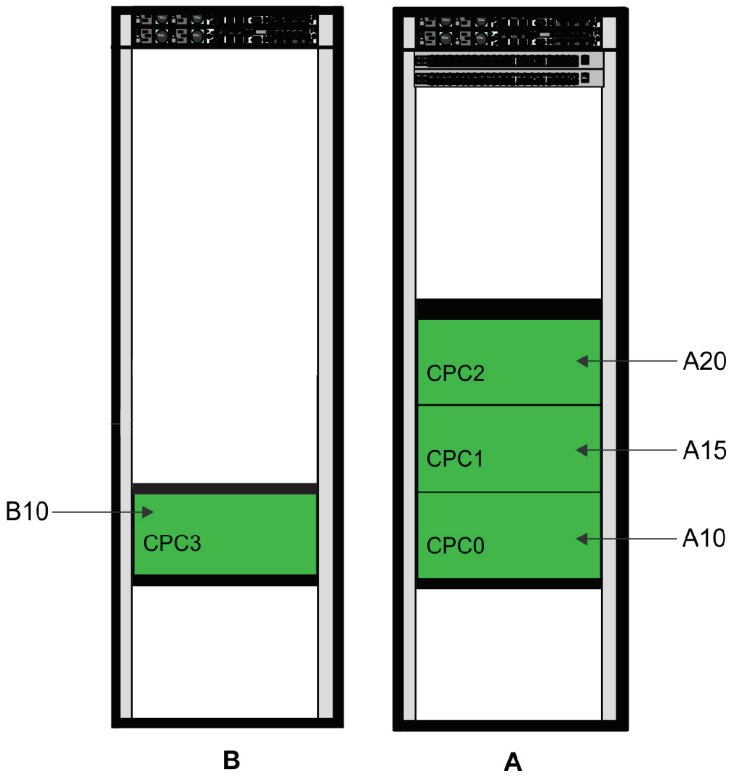


Figure 8. Four possible CPC drawer locations

PCIe+ I/O drawers

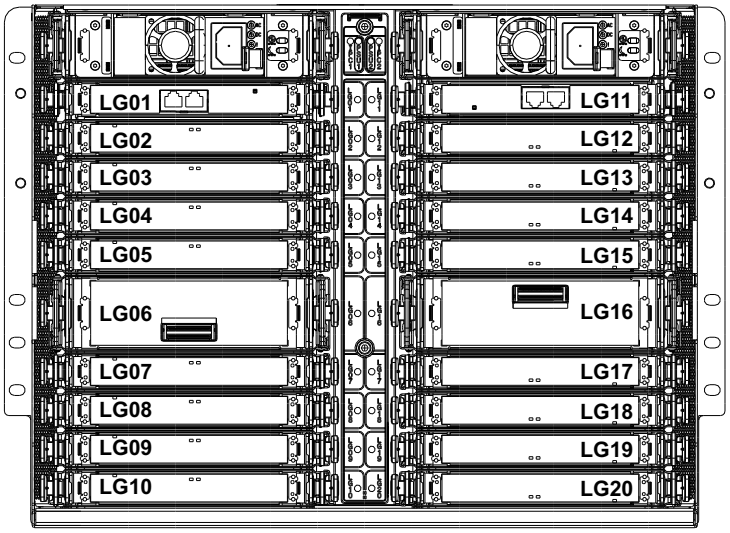
The 9175 supports up to 12 PCIe+ I/O drawers. The number of drawers supported is dependent on the system configuration.

Important: If the 9175 is configured with 1 CPC drawer, a maximum of 6 PCIe+ I/O drawers are supported. If the 9175 is configured with 3 CPC drawers, a maximum of 11 PCIe+ I/O drawers are supported.

Each PCIe+ I/O drawer:

- Is 8 EIA units
- Provides 2 Power Supply Units (PSUs) located at the top of the drawer.
- Provides 16 adapters, with either two or four ports per adapter, over two domains.
- Requires 2 PCIe+ Interconnect cards plugged as both domains will initially be activated. They are plugged in locations **LG06** and **LG16**.
- Requires 2 Base Management Controllers (BMCs) plugged in locations **LG01** and **LG11**.
- The above elements are plugged in the following locations:

Domain 0		**Domain 1**	
top	PSU	top	PSU
LG01	BMC	LG11	BMC
LG02	I/O Adapter	LG12	I/O Adapter
LG03	I/O Adapter	LG13	I/O Adapter
LG04	I/O Adapter	LG14	I/O Adapter
LG05	I/O Adapter	LG15	I/O Adapter
LG06	PCIe+ Interconnect	LG16	PCIe+ Interconnect
LG07	I/O Adapter	LG17	I/O Adapter
LG08	I/O Adapter	LG18	I/O Adapter
LG09	I/O Adapter	LG19	I/O Adapter
LG10	I/O Adapter	LG20	I/O Adapter



PCIe+ I/O drawer rear view

System upgrades

The following upgrades are supported:

- 3931 (IBM z16® (Model A01)) to 9175 (IBM z17 (Model ME1))
- 8561 (z15®) T01 radiator-cooled model to 9175 (IBM z17 (Model ME1))
- 8561 (z15) T01 water-cooled model to 9175 (IBM z17 (Model ME1))
- 3931 (IBM LinuxONE Emperor 4 (Model LA1)) to 9175 (IBM LinuxONE Emperor 5 (Model ML1)
- 8561 (IBM LinuxONE III Model LT1) to 9175 (IBM LinuxONE Emperor 5 (Model ML1)

The following upgrades are **not** supported:

- 3931 (IBM LinuxONE Emperor 4 (Model LA1)) to 9175 (IBM z17 (Model ME1))
- 8561 (IBM LinuxONE III Model LT1) to 9175 (IBM z17 (Model ME1))

An upgrade includes all frames, support cards, and new I/O features.

Important: With the four CPC drawer Maximum 208 configurable PSUs (**FC 0575**) offering, there is an important memory restriction in place. There is no support for MES memory upgrades within the Max208 offering that cross the memory configuration limited offering sizes (8TB, 9TB, and 10TB) based on the initial memory configuration the system was built with.

Differences between IBM servers

Comparison information is provided here for those who may be placing an 9175 on a raised floor with another IBM Z server.

Table 34. Differences between multi-frame servers

System family	Depth (with covers)	Height (with covers)	Width (with covers)	Weight (Maximum)
z14 or Emperor II (3906) *radiator-cooled*	1860.0 mm (73.2 in)	2014.3 mm (79.3 in)	784.9 mm (30.9 in)	2784.6 kg (6139 lb)
z14 or Emperor II (3906) *water-cooled*	1964.0 mm (77.3 in)	2014.3 mm (79.3 in)	784.9 mm (30.9 in)	2801.9 kg (6177 lb)
z15 or IBM LinuxONE III (8561) *radiator-cooled*	1208 mm (47.6 in)	2020 mm (79.5 in)	2424 mm (95.4 in) *4 frames*	2850 kg (6284 lb) *4 frames*
z15 or IBM LinuxONE III (8561) *water-cooled*	1309 mm (51.6 in)	2020 mm (79.5 in)	2424 mm (95.4 in) *4 frames*	3201 kg (7056 lb) *4 frames*
IBM z16 (Model A01) or IBM LinuxONE Emperor 4 (3931) *radiator-cooled*	1207 mm (47.5 in)	2020 mm (79.5 in)	2424 mm (95.4 in) *4 frames*	2850 kg (6284 lb) *4 frames*
IBM z17 (Model ME1) or IBM LinuxONE Emperor 5 (Model ML1) (9175) *radiator-cooled*	1207 mm (47.5 in)	2023 mm (79.7 in)	2424 mm (95.4 in) *4 frames*	2564 kg (5640 lb) *4 frames*

Notes:

1. The installation of side covers is optional on the 9175. For system dimensions *without* covers, see "Physical dimensions" on page 48.
2. This weight does not include the weight for the Earthquake Kit feature (**FC 8014** or **FC 8015**).

   The Earthquake Kit hardware weighs approximately 43 kg (95 lbs).

If you are replacing an existing machine, also refer to the *Installation Manual for Physical Planning* for your existing machine (available on **IBM Documentation**; go to https://www.ibm.com/docs/en/systems-hardware, select **IBM Z** or **IBM LinuxONE**, then select your configuration, and click **Library Overview** on the navigation bar) to determine actual differences between your existing installed machine and the 9175. Plan views, physical dimensions, service clearances, aisle spacing, and power and cooling requirements may be substantially different.

Plan views

The following graphics provide a visual representation of the 9175 physical dimensions.

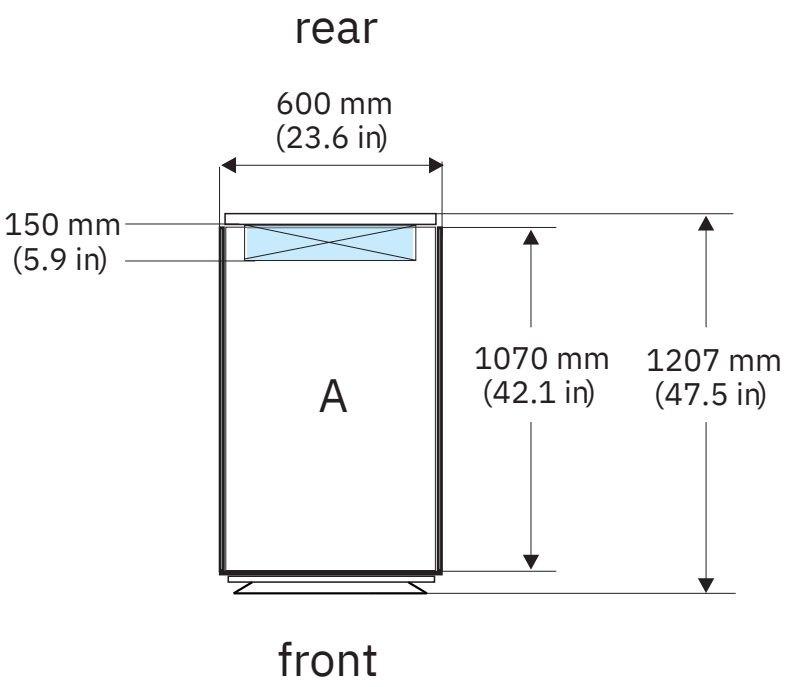
For installations planning to use top exit power cords, the frame openings for these cords are on the top of the left front and right rear corners of the frame.

Notes:

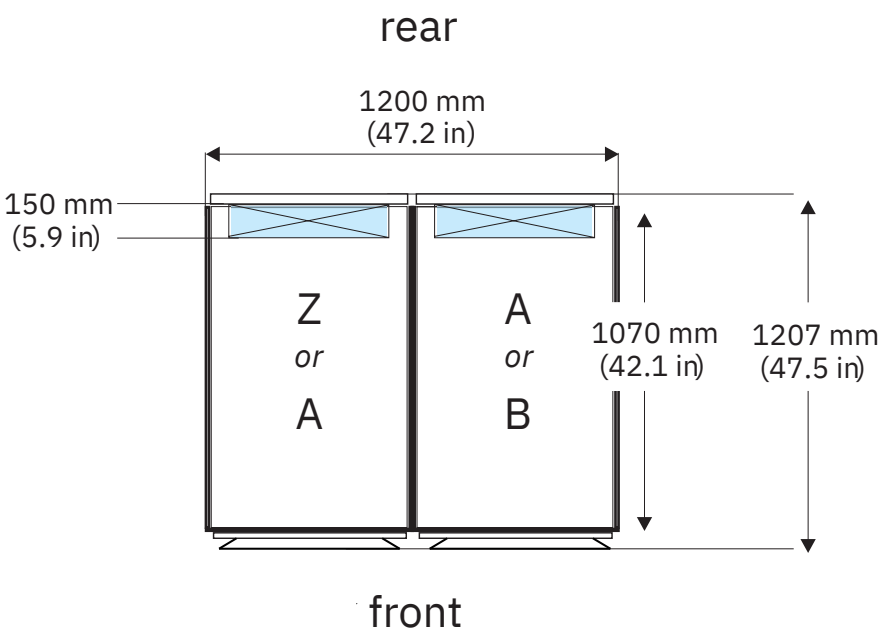
- The 9175 is shipped with frame spacer hardware pre-installed to allow for proper alignment of the system on the floor tiles, when positioning the frames. The overall system width is affected. For more information, see “Physical dimensions” on page 48.
- The physical dimensions provided in the following graphics do *not* include the optional side covers or frame spacer hardware.

Plan views for radiator-cooled system

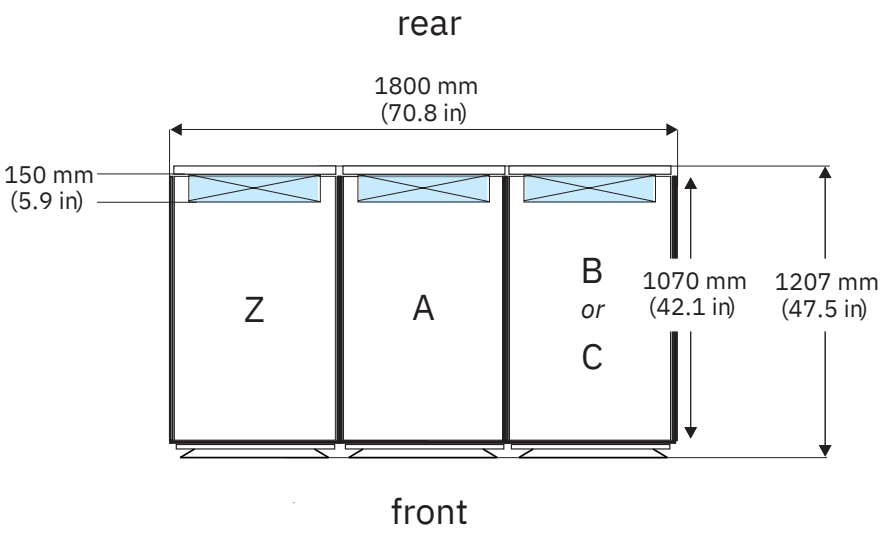
Single frame



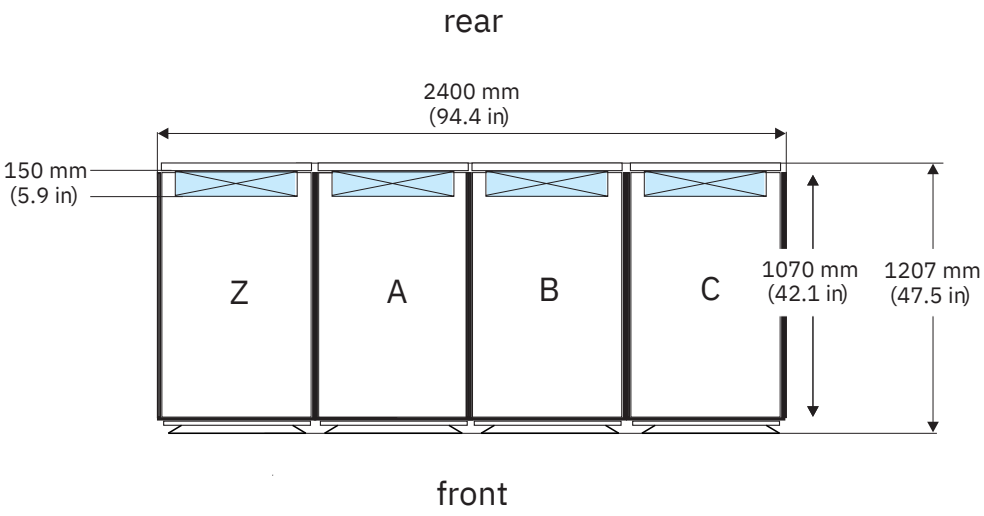
Two frames



Three frames



Four frames


rear
2400 mm
(94.4 in)
150 mm
(5.9 in)
Z
A
B
C
1070 mm
(42.1 in)
1207 mm
(47.5 in)
front

Weight distribution and floor loading

The following topics provide weight and physical dimensions information that are used to calculate weight distribution and floor loading for the 9175. All floor loading calculations are intended for a raised floor environment. If you are using a non-raised floor environment, these floor loading calculations do not apply.

- For system weight examples, see "System weight examples" on page 74.
- For floor loading examples, see "Floor loading examples" on page 75.

The following figures, and tables in "System weight examples" on page 74, show sample floor loading values for the 9175.

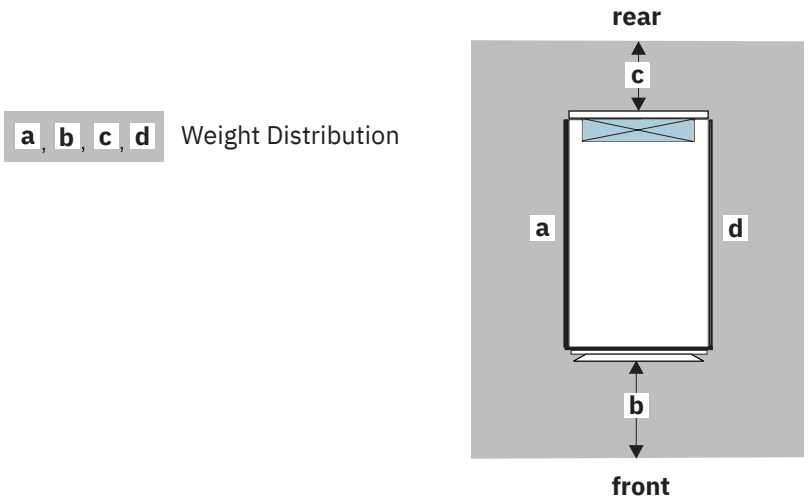


Figure 9. One frame

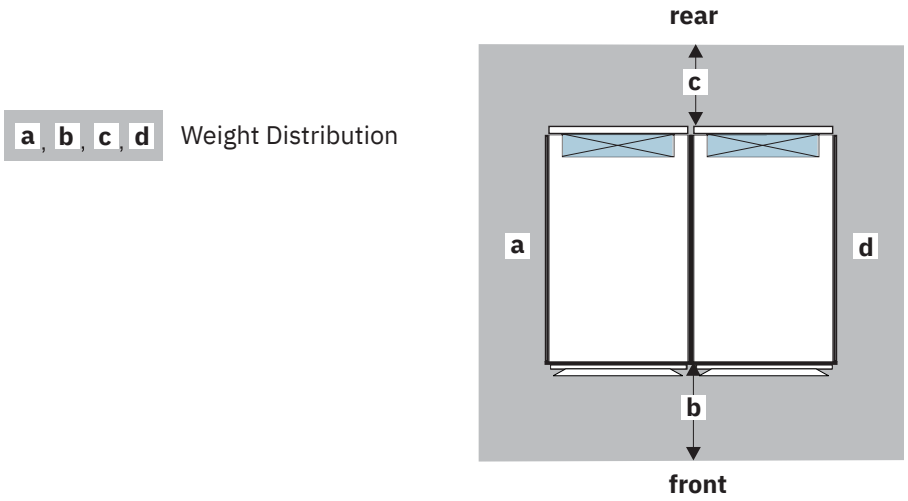


Figure 10. Two frames

a, b, c, d Weight Distribution

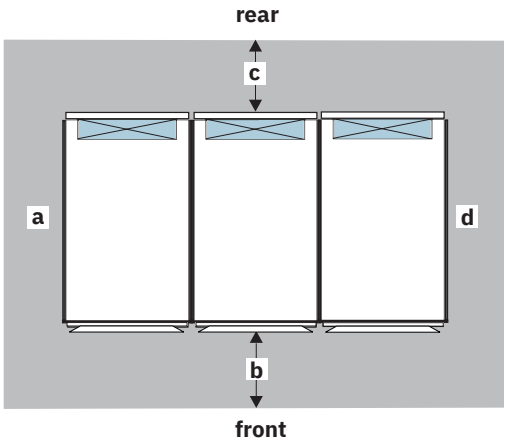


Figure 11. Three frames

a, b, c, d Weight Distribution

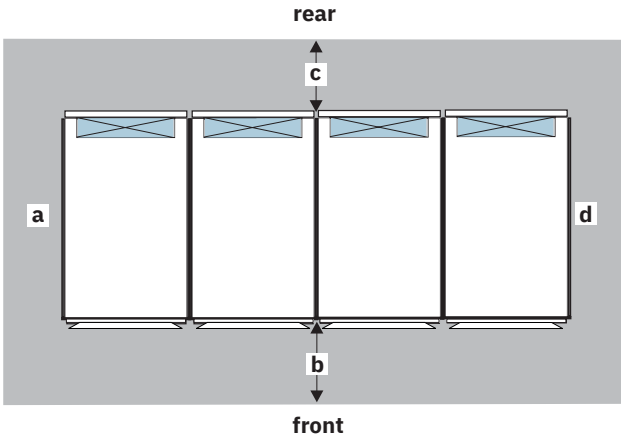


Figure 12. Four frames

All measurements are taken from the outside edge of the machine frame, without covers, unless described otherwise.

- "a" = left side clearance dimension
- "b" = front clearance dimension
- "c" = rear clearance dimension
- "d" = right side clearance dimension

System weight examples

The following table provides weight estimates for the *maximum* system configurations on the 9175.

The **Power and Weight Estimation** tool includes weight data and provides a more accurate weight for your particular configuration. See "Power and weight estimation tool" on page 111.

Attention:

- Due to system weight and machine area variability, you **must** use a floor loading calculator or work with a structural engineer for specific floor loading requirements!
- All weights are approximate and do not include Earthquake Kit hardware.
  - The Earthquake Kit hardware weighs approximately 43 kg (95 lbs).
- All estimated weights reflect a *maximum* populated system for each possible frame configuration.
- Actual weight varies and can only be determined by an exact specification of content.

Table 35. Weights for maximum machine configurations

Frame config	Individual frame weights kg (lbs)				Total weight kg (lbs)
	Z frame	A frame	B frame	C frame	
A	-	698 kg (1539 lbs)	-	-	698 kg (1539 lbs)
ZA	689 kg (1520 lbs)	698 kg (1539 lbs)	-	-	1387 kg (3058 lbs)
ZAC	689 kg (1520 lbs)	698 kg (1539 lbs)	-	508 kg (1120 lbs)	1895 kg (4178 lbs)
AB	-	698 kg (1539 lbs)	663 kg (1461 lbs)	-	1361 kg (3000 lbs)
ZAB	689 kg (1520 lbs)	698 kg (1539 lbs)	663 kg (1461 lbs)	-	2050 kg (4519 lbs)
ZABC	689 kg (1520 lbs)	698 kg (1539 lbs)	663 kg (1461 lbs)	508 kg (1120 lbs)	2558 kg (5639 lbs)

Floor loading examples

The following tables provide *estimated* floor loading values for the various system configurations of CPC and PCIe+ I/O drawers.

Floor loading is a function of system weight, system area, clearance area around the system, and system installation environment (raised or non-raised floor).

Attention: Due to system weight and machine area variability, the following tables cannot cover all of the possible system configurations. The following tables provide the absolute limits of floor loading for a system that meets the requirements for operation and serviceability.

The provided floor loading values are for installed systems. Systems that are surrounded by other equipment, such as in storage, can exceed a floor loading of 976 kg/M^2 (200 lbs/ft^2).

- The ***minimum*** floor loading values are for a stand-alone installation with 5 ft of clearance space all the way around the system. This scenario assumes that the floor is a non-raised floor (15 lbs/ft) and a maximum exterior clearance of 5 ft.
- The ***maximum*** floor loading values are for a system that is being installed in the middle of an existing row. This scenario assumes that the floor is raised floor (25 lbs/ft), there is no side clearance area, a 3 ft hot aisle (rear), and a 4 ft cold aisle (front).

The system weight that is used to calculate the following floor loading values (minimum and maximum) assumes that all of the drawers are maximum plugged. The weight in each instance is the **maximum**.

Note: The Earthquake Kit hardware weighs approximately 43 kg (95 lbs). If this feature is ordered, you must add the following:

2.3 kg/M^2 (5 lbs/ft^2) to the *maximum* floor loading values
1.5 kg/M^2 (3 lbs/ft^2) to the *minimum* floor loading values

The following formula is used to calculate the floor loading values and is provided for your reference. You can use this formula to obtain the floor loading (FL) values for your specific system configuration.

```
FL (lbs/ft²) = k + (w - 120 * n) / ((4 + a + d)*(2 * n + c + b))
```

k = 25 (raised floor environment) *or* 15 (non-raised floor environment)
w = System weight (lbs)
n = Number of frames (1, 2, 3 or 4)
a = Left side clearance dimension
b = Front clearance dimension
c = Rear clearance dimension
d = Right side clearance dimension

See “Weight distribution and floor loading” on page 72 for sample floor loading figures of the 9175.

PDU floor loading (lbs/sqft)

I/O drawers

CPCs		0	1	2	3	4	5	6	7	8	9	10	11	12
1	min	31	34	38	41	43	45	48						
	max	83	97	110	124	89	96	103						
2	min	35	38	41	43	45	48	50	52	52	54	56	58	61
	max	97	110	124	89	96	103	110	116	87	102	106	111	115
3	min	38	41	43	45	48	50	53	52	54	56	58	61	
	max	110	124	89	96	103	110	116	97	102	106	111	115	
4	min	43	45	48	50	53	52	54	56	58	60	59	60	62
	max	90	97	104	110	117	96	101	105	110	114	100	104	107

For kg/sq meter, multiply entry by 4.882

1 frame
2 frames
3 frames
4 frames

Figure 13. Floor loading

Weight distribution and multiple systems

Under typical conditions, service clearances of adjacent products may be overlapped but weight distribution areas should not be overlapped. If weight distribution clearances are overlapped, the customer should obtain the services of a qualified consultant or structural engineer to determine floor loading. Regardless of floor loading, minimum service and aisle clearances must be observed:

- Rear dimension "f" is **914 mm (36.0 in)**.
- Front dimension "e" is **1168 mm (46 in)**.
- Both "f" and "e" are measured from the frame edge (without covers) to the nearest obstacle.
- Cover opening dimensions are also shown.

Note that aisle clearances are not the same between rows of front-facing and rear-facing covers. Front-facing rows require a **minimum** of **1168 mm (46 in)** of clearance while rear-facing rows need a **minimum** of **914 mm (36.0 in)**.

For physical planning purposes, you must verify system placement considering:

- Weight distribution
- Power availability
- Power access
- Machine and service clearance area
- Air conditioning delivery
- Chilled water delivery
- Thermal interaction
- Cable locations
- Floor tile cutouts.

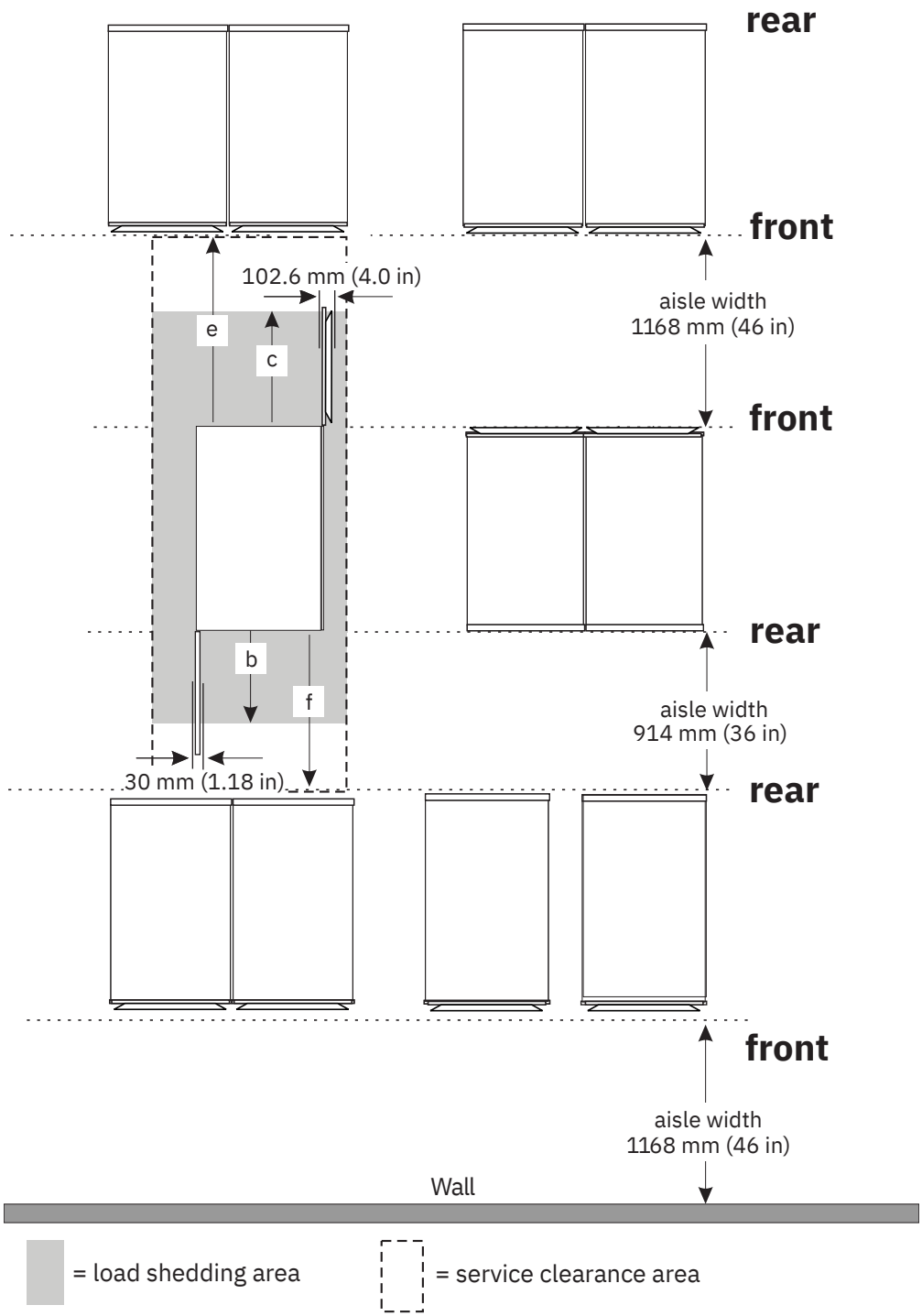


Figure 14. Aisle and service clearances

Structural integrity, seismic support, and system mobility

The 9175 is structurally designed to be transported, installed, relocated, and operated in customer environments without loss of functionality and without structural failure or cosmetic damage. Equipped with certain features, the 9175 is capable to withstand high magnitude earthquake events without functional degradation during and after earthquake events.

This section addresses environmental conditions or the level that the 9175 tested and verified.

Note: The vibration and shock levels given here are the levels that 9175 tested and verified and not the upper limit of what the system can withstand. If you have any environmental conditions higher than specified here, please contact your IBM representatives.

There are three shock and vibration levels:

- Ruggedness (Fragility)
- Operational shock and vibration
- Seismic resistance

Ruggedness (Fragility)

Ruggedness relates to a product's ability to withstand the shipping and relocation environments without structural damage. Product ruggedness is assured through shipping shock, vibration, and horizontal impact testing. Passing the test requirements include no short-term and long-term structural and functional degradation. Ruggedness is a key focus item during the new product design phase. Significant analysis and testing efforts are typically associated with new product and subassembly designs to ensure adequate ruggedness for frames, fragile components, and assemblies. To ensure broad protection against shock and vibration, the subassemblies and minimum and maximum system configurations are subjected to unpackaged and packaged testing to cover possible shipping configurations.

Focus on system level or the frame with its drawers installed include:

- Excessive deflection of chassis during drop test
- Yielding of drawer chassis, frame rails, cages, and subassemblies
- Excessive frame transmissibility

Focus on subassembly level or drawers not installed in a frame include:

- Heatsink retention
- Chip damage due to heatsink loading
- Card interconnect damage
- Card retention and latching
- Card connector fretting wear
- Card and cable connectors
- Power supply assembly fragility
- Cooling components air moving devices
- Hinges and doors

Test levels

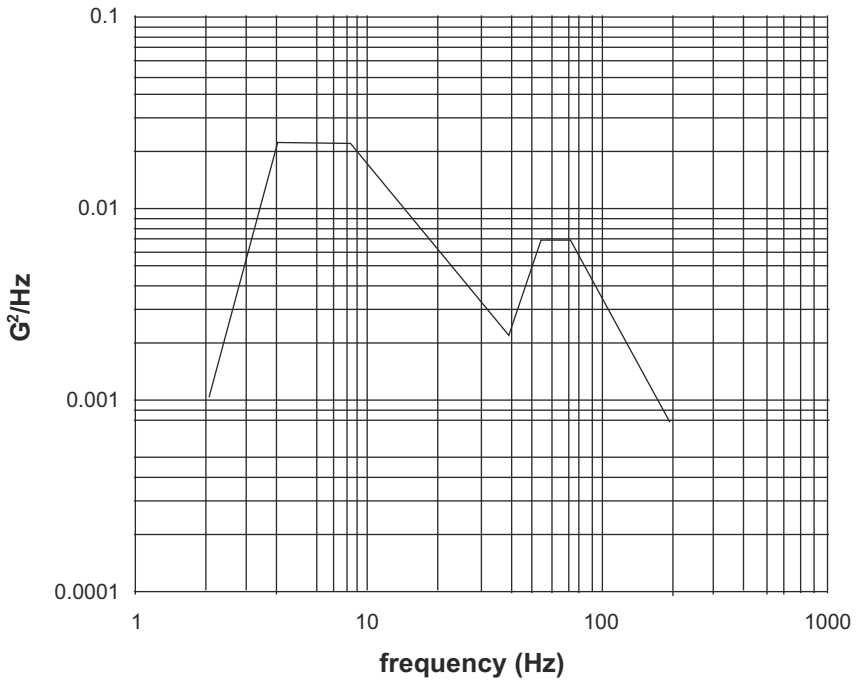
There are two vibration test profiles:

- Sinusoidal at 0.5 g sweep 2 - 200 Hz for a total of 30 minutes
- Random vibration for 15 minutes with power spectral density as shown in Table 36 on page 80.

For system level testing, the system is subjected to vertical direction vibration.

For subassembly testing, the test is conducted on all three perpendicular axes.

*Table 36. Truck, air, rail, and ocean vibration spectrum **

Frequency (Hz)	G^2/Hz (PSD level)	graph representation
2	0.0010	
4	0.0220	
8	0.0220	
40	0.0022	
55	0.0070	
70	0.0070	
75	0.0220	
200	0.0007	

Note: * A rms = 0.8044 G, V rms = 4.508 in/s, D rms = 0.1578 in zero to peak

There are two shock test levels:

- System level or the frame with its drawers installed – *vertical direction*
  10 times free fall drops at 39.3 in/s (1.0 m/s) velocity change
  2 times free fall drops at 55.6 in/s (1.4 m/s) velocity change
- System level or the frame with its drawers installed – *in all four sides horizontal direction*
  1 time at 39.3 in/s (1.0 m/s) velocity change
- Subassembly or drawers level – in all 6 faces
  100 g, 3 ms half sine pulse 2x per face
  50 g, 11 ms half sine pulse 2x per face

Since 1980, the shock test levels that are previously specified and vibration test levels specified in Table 36 on page 80 have been utilized. No documented cases of field problems associated with normal shipping shock and vibration exist.

Operational shock and vibration

Operational shock and vibration relates to a product's ability to withstand normal shock and vibration from its installation environments without functional degradation. Although the shock and vibration sources are typically from the surrounding environment (nearby cooling operating equipment, people walking by or dropping materials, etc.), they also can be self-induced (vibration from fans, blowers, compressors, etc.).

Test levels

All the 9175 systems while running are verified to meet the vertical vibration level given in Table 37 on page 81 and Figure 15 on page 82 without any functional degradation. The 9175 is verified to be able to withstand five vertical shock inputs 3.5 g with 3 ms half sine pulse width.

Table 37. Random vibration PSD profile breakpoint [1]

Class	5 Hz	17 Hz	45 Hz	48 Hz	62 Hz	65 Hz	150 Hz	200 Hz	500 Hz
V1L/V2	$2.0x10^{-7}$	$2.2x10^{-5}$	$2.2x10^{-5}$	$2.2x10^{-5}$	$2.2x10^{-5}$	$2.2x10^{-5}$	$2.2x10^{-5}$	$2.2x10^{-5}$	$2.2x10^{-5}$

Notes:

1. All values in this table are in g^2/Hz.
2. For reference only. No test required.

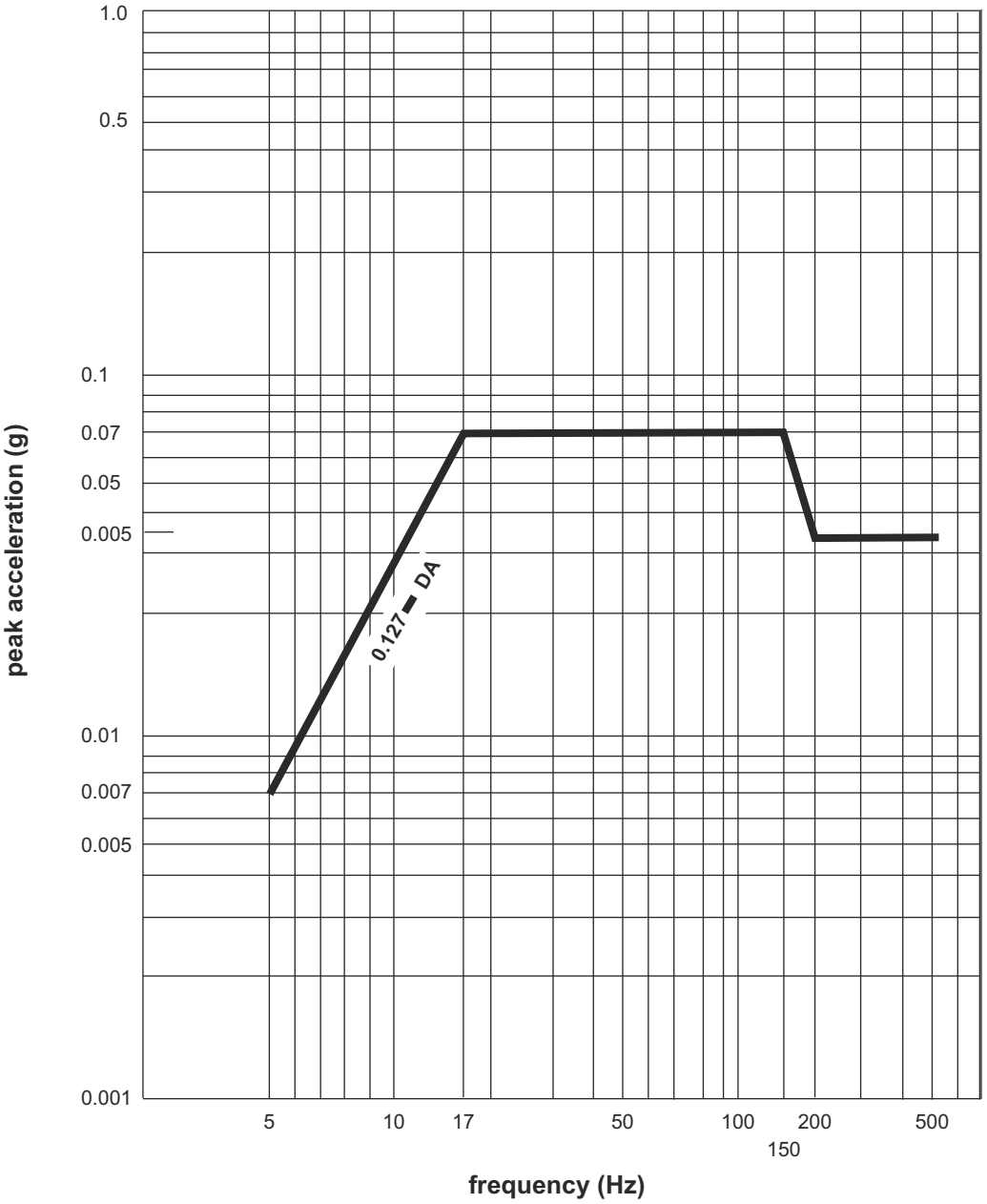


Figure 15. Continuous operational vibration

Documented cases of field problems associated with externally imposed shock and vibration during normal equipment operation are essentially nonexistent.

Seismic (Earthquake) resistance

In earthquake areas, the 9175 equipped with the appropriate earthquake kits are certified to meet requirements ICC IES AC156.

To achieve the most generally applicable results, the required 5% damped response spectrum (RRS) was based on the worst-case scenario parameters for ground level, as defined by IBC and summarized in Table 38 on page 83. Using these parameters, the maximum spectral acceleration values, $\boldsymbol{A_{FLX\text{-}H}}$ and $\boldsymbol{A_{RIG\text{-}H}}$ as defined in AC156, were calculated as shown in the following table.

$$A_{FLX-H} = S_{DS}\left(1 + 2\frac{z}{h}\right) \leq 1.6S_{DS}\ or\ 3.2 \quad \text{and} \quad A_{RIG-H} = 0.4S_{DS}\left(1 + 2\frac{z}{h}\right)$$

Table 38. Parameters used for Required Response Spectrum (RRS)

Test criteria	S_{DS} (g)	z/h	Horizontal		Vertical	
			A_{FLX-H}	A_{RIG-H}	A_{FLX-V}	A_{RIG-V}
ICC-ES AC156	2.5	1.0	3.20	3.00	1.68	0.68

Notes:

- S_{DS} = Design spectral response acceleration at short period
- A_{FLX-H} = Horizontal spectral acceleration calculated for flexible components
- A_{RIG-H} = Horizontal spectral acceleration calculated for rigid components
- A_{FLX-V} = Vertical spectral acceleration calculated for flexible components
- A_{RIG-V} = Vertical spectral acceleration calculated for rigid components

For vertical response, *z* is assumed to be `0.00` for all attachment heights, which results in the follow:

$$A_{FLX-V} = 0.67S_{DS} \quad \text{and} \quad A_{RIG-H} = 0.27S_{DS}$$

A set of three, phase incoherent simulated ground motions were derived using a specialty software and based on the RRS parameters previously defined. The duration of the records were set to `30 seconds`. In order to achieve the minimum acceleration required specified by ASCE 7, it was ensured that the nominal peak shake-table (ground) accelerations were equal to, or exceeding `0.90` $A_{RIG\text{-}H}$ by introducing a spike in the input acceleration.

The above S_{DS} parameters 2.5 g represents the high magnitude covering most of densely populated area in California. As an example S_{DS} values for Los Angeles (1.29 g), San Francisco (2.00 g), Santa Barbara (2.00 g), and San Diego (1.60 g).

In addition, the 9175 was tested to Telcordia NEBS (National Equipment Building Specifications) zone 4 seismic test profile. During and after the test, no system functional interruption was observed with only the front and rear covers opening during testing.

A mainframe computer's structure consists of a frame or rack, drawers with central processor units, I/O equipment, memory, and other electronic equipment. The focus of this structural mechanical analysis and design is on the frame, earthquake stiffening brackets, and frame tie-down methods. The primary function of the frame is to protect critical electronic equipment in two modes. The first mode is during shipping shock and vibration, which provides excitation primarily in the vertical direction. The second mode of protection is protecting the equipment during seismic events where horizontal vibration can be significant. Frame stiffening brackets and tie-downs are features added to mainframe systems that must meet earthquake resistance requirements. Designing to withstand seismic events

requires significant analysis and test efforts because the functional performance of the system must be maintained during and after seismic events. The frame stiffening brackets and anchorage system must have adequate strength and stiffness to counteract earthquake-induced forces, thereby preventing human injury and potential system damage. The frame's stiffening bracket and tie-down combination must ensure continued system operation by limiting overall displacement of the structure to acceptable levels, while not inducing undue stress to the critical electronic components.

Quality screen (Manufacturing stress screening)

One application of shock and vibration technology that falls outside the design function is manufacturing stress screening and field failure analysis of intermittent subassemblies, such as the 9175 power supplies. By subjecting samples of production subassemblies to screening tests, it is possible to detect certain manufacturing, component, and design problems in these subassemblies. Typical tests include thermal cycling and random vibration, followed by burn-in and functional test at a vendor or subassembly manufacturer.

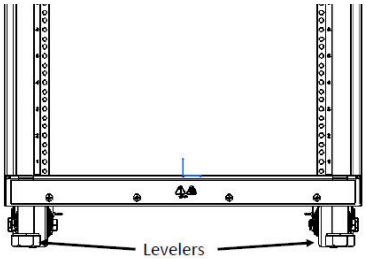
System mobility

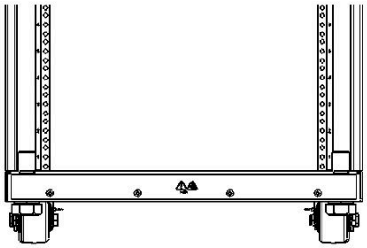
DANGER: Heavy equipment — personal injury or equipment damage might result if mishandled. (D006)

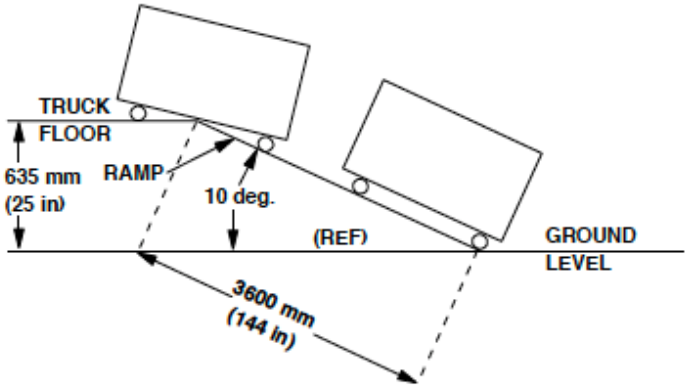
As previously mentioned, all systems are shipped within a fully enclosed wooden and palatalized crate. In addition, the bottom of the system contains two pairs of casters; one pair of fixed casters and one pair of swivel casters. Due to the caster functionality, care must be taken when transporting the system within the wooden crate or when directly rolling the system on its casters.

To ensure safe transportation, a, minimum of 3 people should be available to transport the system. Prior to system relocation, the levers securing the casters must be rotated upward and a maximum of 10° incline is recommended for all ramped surfaces.

When positioning systems with 3 or 4 frames, you must disassemble the system in pairs (2 frames) prior to transporting it into your environment.







Earthquake Kit

The purpose of this section is to describe the parts used to install an Earthquake Kit that will provide frame ruggedizing and the floor tie-down hardware for securing a 9175. The kit is designed to help secure the frame and its contents from damage when exposed to vibrations and shocks, such as those in a seismic event.

- FC 8014 is used on a *raised* floor.
- FC 8015 is used on a *non-raised* floor.

Frame stiffener

Figure 16 on page 86 shows the parts for the inner frame stiffener component of the earthquake kit.

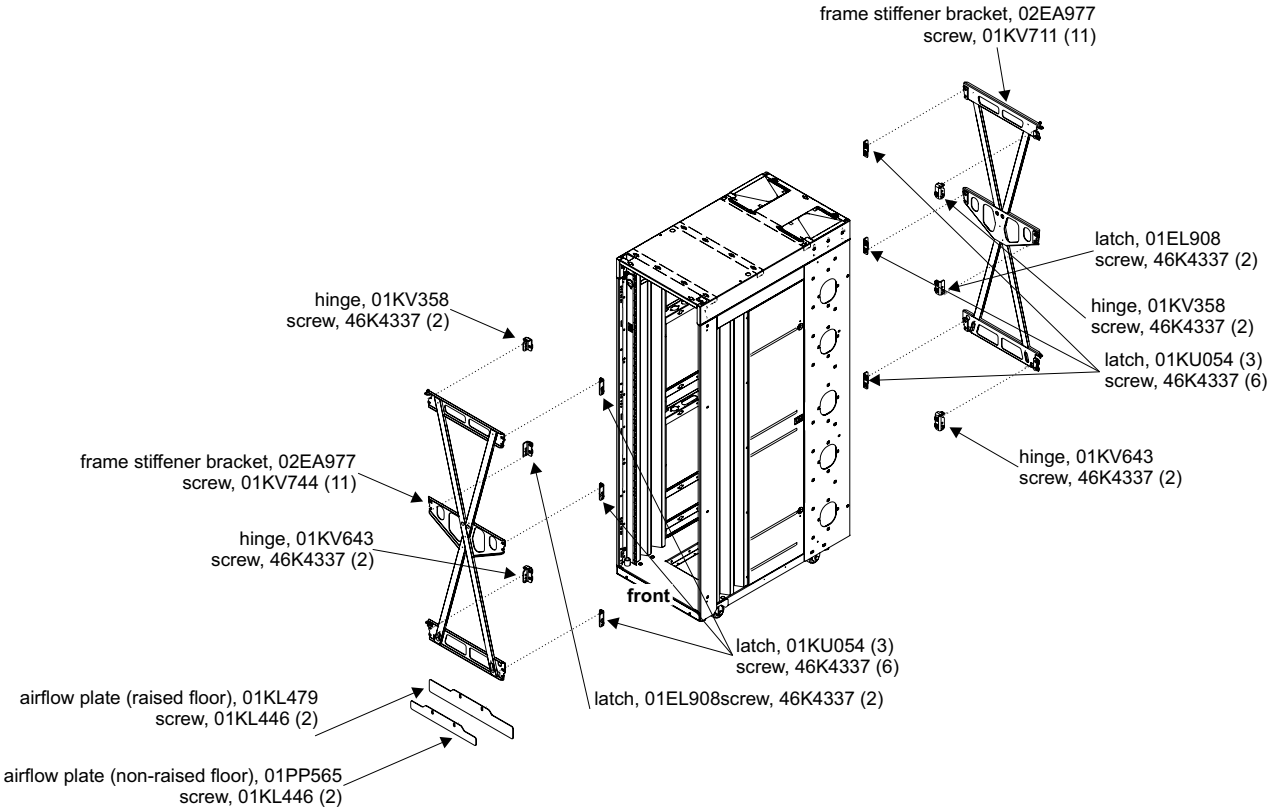


Figure 16. Frame stiffening parts

Raised floor Earthquake Kit

The Earthquake Kit for the 9175 on a raised floor is a system of adjustable turnbuckles intended to fasten each corner of the server frames to eyebolts installed in the concrete floor beneath your computer room raised floor. FC 8014 supplies parts to cover raised floor heights from 241.3 mm to 1320.8 mm (9.5 in - 52 in).

Measure the height from the concrete floor to the top of the raised floor as indicated in Figure 17 on page 87.

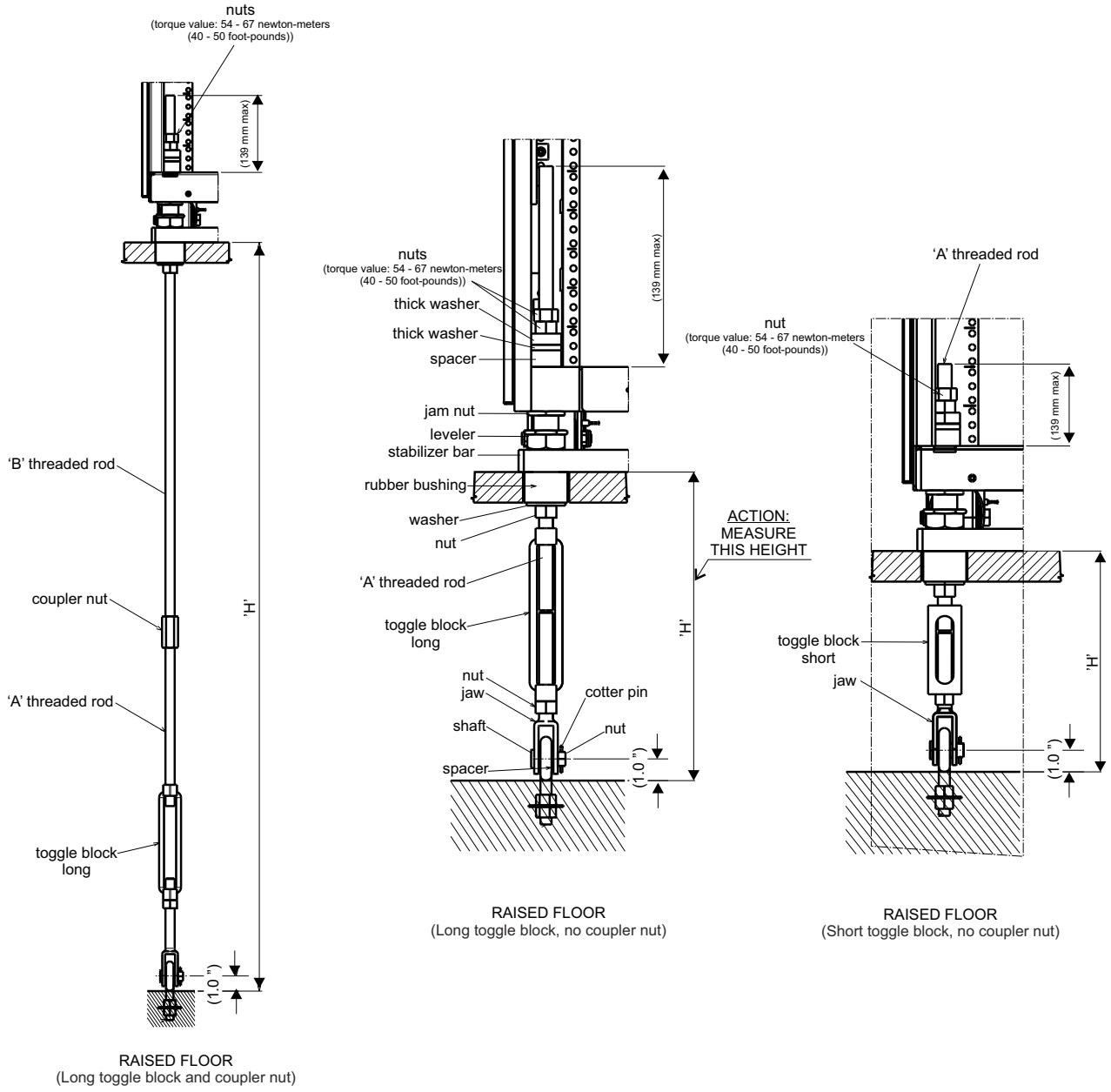


Figure 17. Turnbuckle assembly

Use the raised floor height (specified as **"H"**) and Table 39 on page 88 to determine the specific hardware that you need to select from the Earthquake Kit.

Table 39. Configuration table

Raised floor height "H"	Toggle block	Coupler nut	Threaded rod length "A"	Threaded rod length "B"
9.5 in to 13 in	Short	No	12 in	-
13 in to 17.5 in	Long	No	12 in	-
17.5 in to 25.5 in	Long	No	20 in	-
21.5 in to 29.5 in	Long	No	24 in	-
29.5 in to 37.5 in	Long	Yes	12 in	20 in
33.5 in to 41.5 in	Long	No	36 in	-
41.5 in to 49.5 in	Long	Yes	20 in	24 in
45.5 in to 52 in	Long	Yes	12 in	36 in

Important: Make a note of the measurement information and hardware selection, as it will be needed later in the server installation.

You are responsible for obtaining the services of a qualified consultant or structural engineer to determine what must be done at your particular location to install **four eyebolts**. These eyebolts should be capable of withstanding the appropriate seismic forces for a frame weighing up to 1308 kg (2885 lbs) with the center of gravity 1270 mm (50 inches) from the bottoms of the frame casters and at the center of the frame.

Installing the eyebolts

You are responsible for obtaining and installing the eyebolts that will anchor the frames of 9175. Following are the specifications for the eyebolts:

- The minimum pull out force is 4000 lbs (17.8 kN)
- Inside diameter of the eyebolt is not smaller than 34.9 mm (1 3/8 in)
- Installed so that the center of the eye is not less than 25.4 mm (1 in) nor more than 63.5 mm (2.5 in) from the surface of the concrete floor.

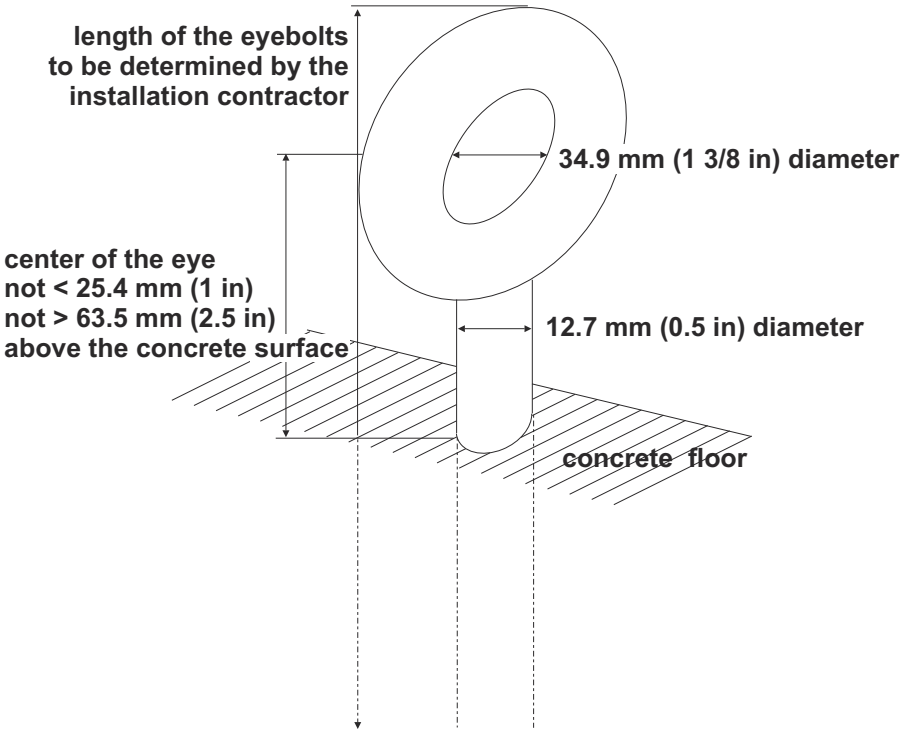
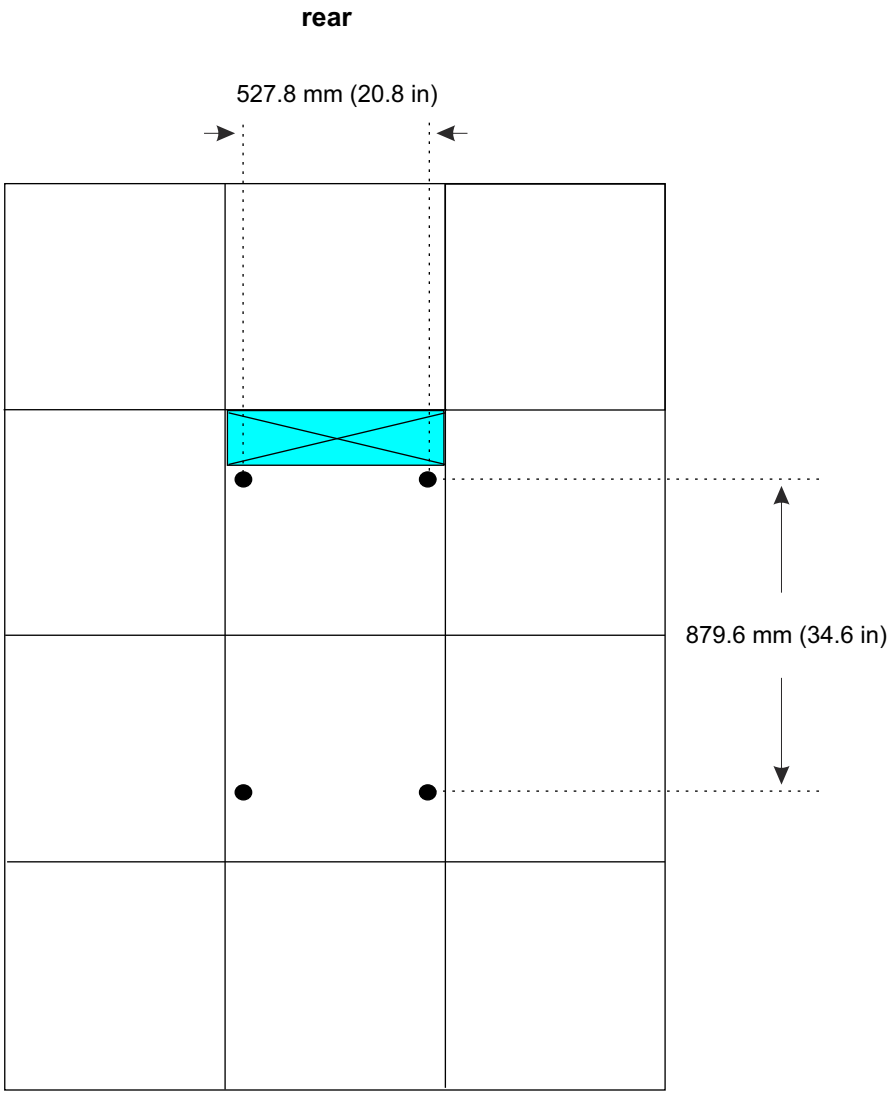


Figure 18. Installing the eyebolts

Regardless of length of the turnbuckles, the following illustration shows where to cut the floor panels for the turnbuckles to pass through to the eyebolts set in the concrete floor beneath.



Additional floor panel pedestals may be necessary to restore structural integrity to the raised floor after making the circular cuts for the turnbuckles. Consult your flooring manufacturer for recommendations.

The installation instructions are included in the *9175 Installation Manual*, which is shipped with the server.

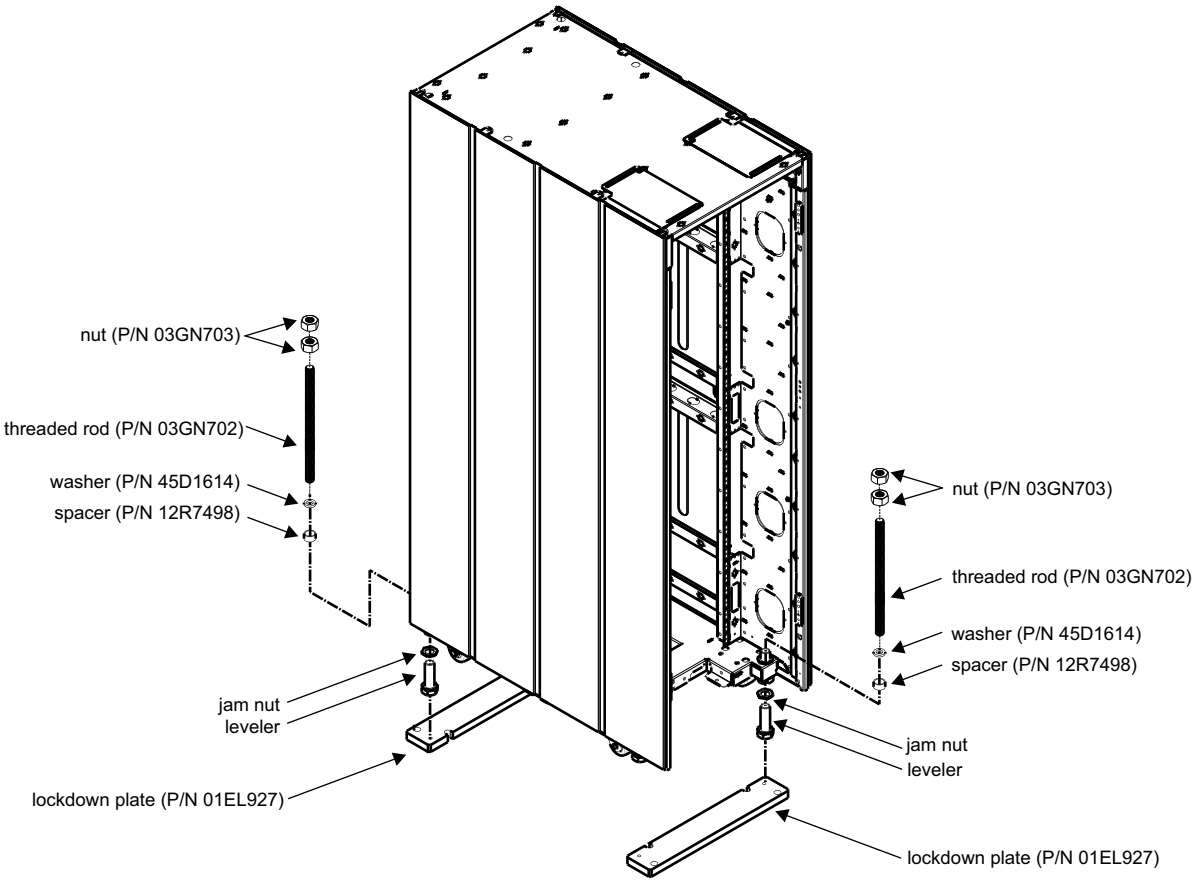
Non-raised floor Earthquake Kit

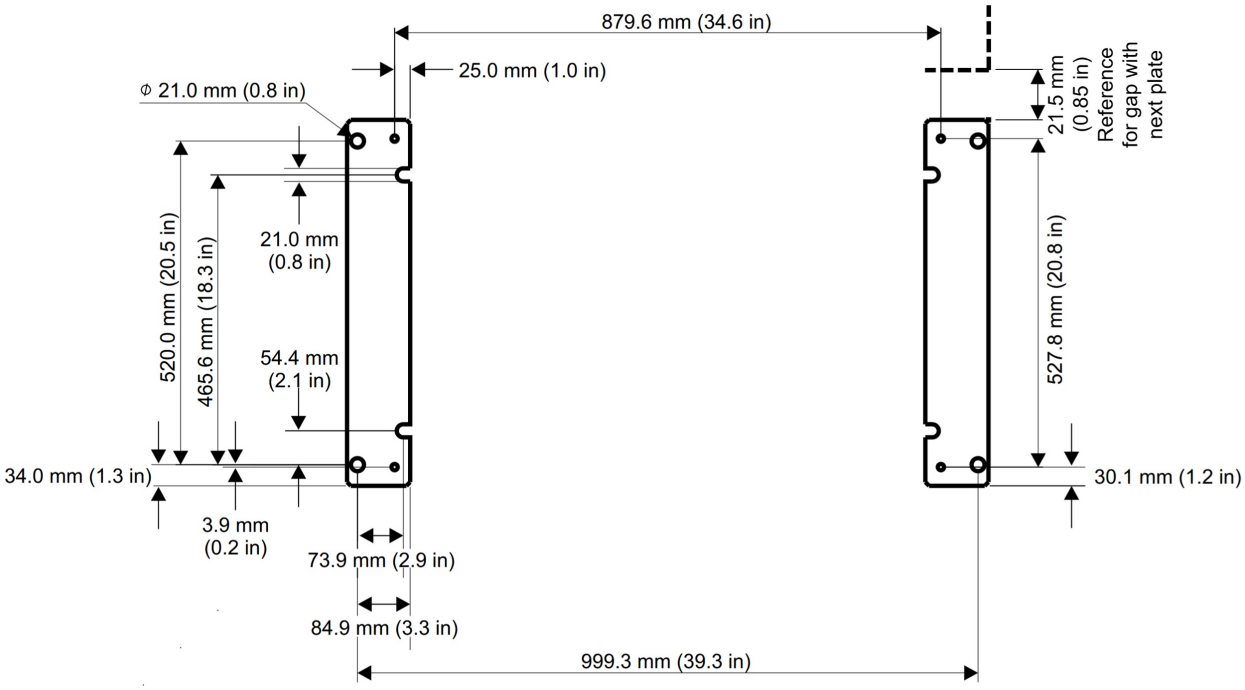
The purpose of this installation instruction is to install an Earthquake kit that will provide hardware for securing the frame to a concrete non-raised floor. This kit (FC 8015) is designed to help secure the frame and its contents from damage when exposed to vibrations and shocks such as those in a seismic event.

You are responsible for obtaining the services of a qualified consultant or structural engineer to determine what must be done at your particular location to install **4 anchors per plate (8 anchors per frame)** and for securing the front and rear lock down plate to the concrete floor according to the following illustration.

Contact your marketing representative well ahead of server delivery to obtain the lock down plate so that the site will be ready when the server arrives.

Use the following illustrations to plan carefully where the anchors that secure the stabilizers must be installed.





floor bolt hole pattern

The lock down plate to concrete fasteners should be a **heavy duty expansion anchor**. The contractor you engage to install the stabilizers will determine the length of the anchors.

When the server arrives, remove the fasteners from either the front or rear lockdown plate. Remove the lockdown plate to position the server frame. Then reinstall the lockdown plate and the fasteners before the service provider begins the installation.

Electronic Locking Latch enablement

Based on the growing need and requests for enhanced system physical security, as well as to satisfy the evolving controlled accessibility, monitoring, and auditability associated with IT equipment, IBM is enabling the ability to exchange the provided mechanical (key activated) locking front and rear door latches with electronic versions.

Unlike to predecessor offerings, IBM z17 (Model ME1) or IBM LinuxONE Emperor 5 (Model ML1) introduces redesigned system doors with an incorporated adapter plate that allows various H3-style swing handle door latches to be installed without the previously required adapter kit. In doing so, the style and sourcing of an electronic latch version has been expanded.

As an example, a Rack Level Security Kit may be procured directly from southco®. For more information about the new *H3-EM - Electronic Locking Swinghandle* from southco®, see https://southco.com/en_us_int/latches/electronic-access-locking-solutions/electronic-cam-latches/h3-em-electronic-locking-swinghandle. These kits must be ordered in multiples, equivalent to the number of system frames, and may require additional hardware (such as electrical wiring) to connect to a facilities security infrastructure. Installation does not require any permanent alteration to the system doors. If installation assistance is desired, contact your Service Provider for additional information. This activity is **not** included with the IBM Z system installation or maintenance.

Attention: If this alteration is completed, the following restrictions apply:

- The electronic locking latch is customer provided, customer installed *and* customer serviced. The SSR is not responsible for installing the latch.
- The Service Provider must be notified of this system alteration and the appropriate provisions enabled to ensure any contracted accessibility to the system is provided. Should this not be done, then a delay in system serviceability may occur.
- The electronic locking latches and any additional enabling hardware (junction box, door sensors, associated wire and cabling, etc.) shall be removed and the originally supplied door latches be reinstalled prior to returning the system to IBM as part of a Technology Exchange/Hybrid or a System MES.

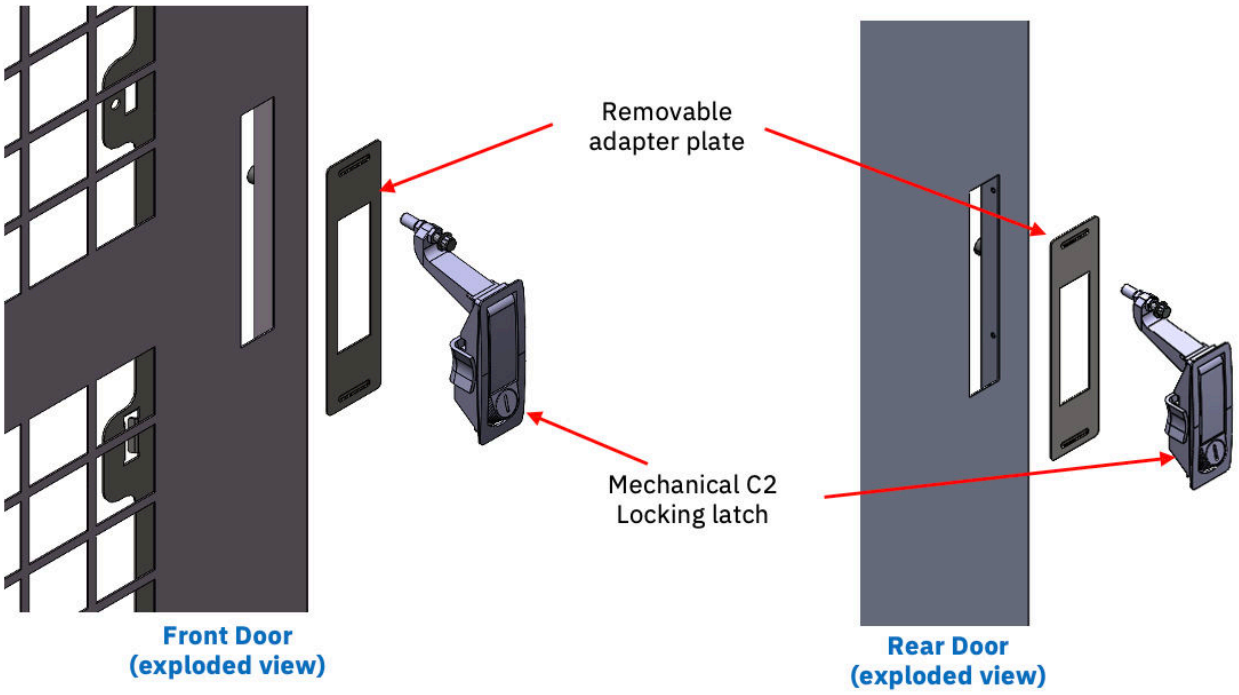


Figure 19. Front and rear door latches

Figure 20. Example electronic locking latch assemblies

Electronic Locking Latch service considerations

It is the *customer's* responsibility to provide the SSR with access to the system at the time of service. If the customer does not, then the system is not serviceable and the customer bears full responsibility for impeding any needed service activity.

For situations in which there are two or more 9175 frames that sit adjacent to one another, the electronic locking latch will not allow the door of the frame to its left to fully open. If this impedes the ability to service components in the adjacent frame, its door can be removed as follows. If removing the door is not an option, ask the customer to open the lock on the adjacent door (to the right of the door being serviced) and swing the adjacent door open to gain clearance.

1. Open the frame door. The door is hinged on the left side.
2. Lift the door to disengage it from its top and bottom hinges, then pull the door away from the frame. Place the door in a safe, out-of-the-way location during servicing.
3. Once servicing is *complete*, hang the door on the hinges by starting at the bottom hinge first, then setting the top hinge on its pin.
4. Close the door.

Machine and service clearance areas

Machine area is the actual floor space covered by the system. Service clearance area includes the machine area, plus additional space required to open the doors for service access to the system.

Table 40. Machine area and service clearance area

Model	Number of frames	Machine area M^2 (ft^2) *w/o doors and side covers*	Machine area M^2 (ft^2) *w/ doors and side covers*	Service clearance area M^2 (ft^2)	Height clearance from floor mm (in)
ME1 or ML1	1 frame	0.642 M^2 (6.91 ft^2)	0.757 M^2 (8.15 ft^2)	front = 0.804 M^2 (8.65 ft^2) rear = 0.571 M^2 (6.15 ft^2)	2472 mm (97.3 in)
ME1 or ML1	2 frames	1.30 M^2 (13.93 ft^2)	1.50 M^2 (16.15 ft^2)	front = 1.52 M^2 (16.30 ft^2) rear = 1.13 M^2 (12.14 ft^2)	2472 mm (97.3 in)
ME1 or ML1	3 frames	1.95 M^2 (20.95 ft^2)	2.24 M^2 (24.12 ft^2)	front = 2.23 M^2 (23.97 ft^2) rear = 1.69 M^2 (18.14 ft^2)	2472 mm (97.3 in)
ME1 or ML1	4 frames	2.60 M^2 (27.97 ft^2)	2.98 M^2 (32.00 ft^2)	front = 2.94 M^2 (31.64 ft^2) rear = 2.25 M^2 (24.14 ft^2)	2472 mm (97.3 in)

Notes:

1. Machine area includes installed covers.
2. Service clearance area must be free of all obstacles. Units must be placed in a way that all service areas are accessible. The weight distribution clearance area extending beyond the service clearance area, such as the area at the outside corners of the units, may contain support walls and columns.
3. A vertical service clearance minimum of 457.2 mm (18 in) above the top of the frame is required, to enable usage of the Lift Tool for service of the Support Elements at the top of the frame. This service clearance also provides clearance for the IBM System Service Representatives (SSRs) if/when they are using the Service Ladder.

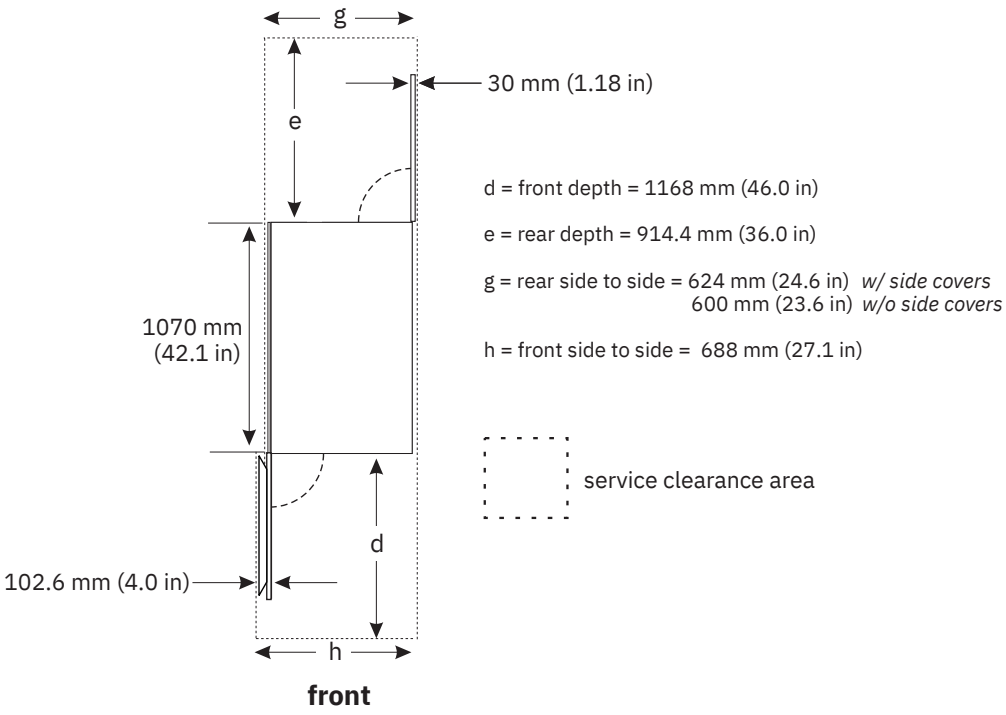


Figure 21. Minimum service clearance area (single frame)

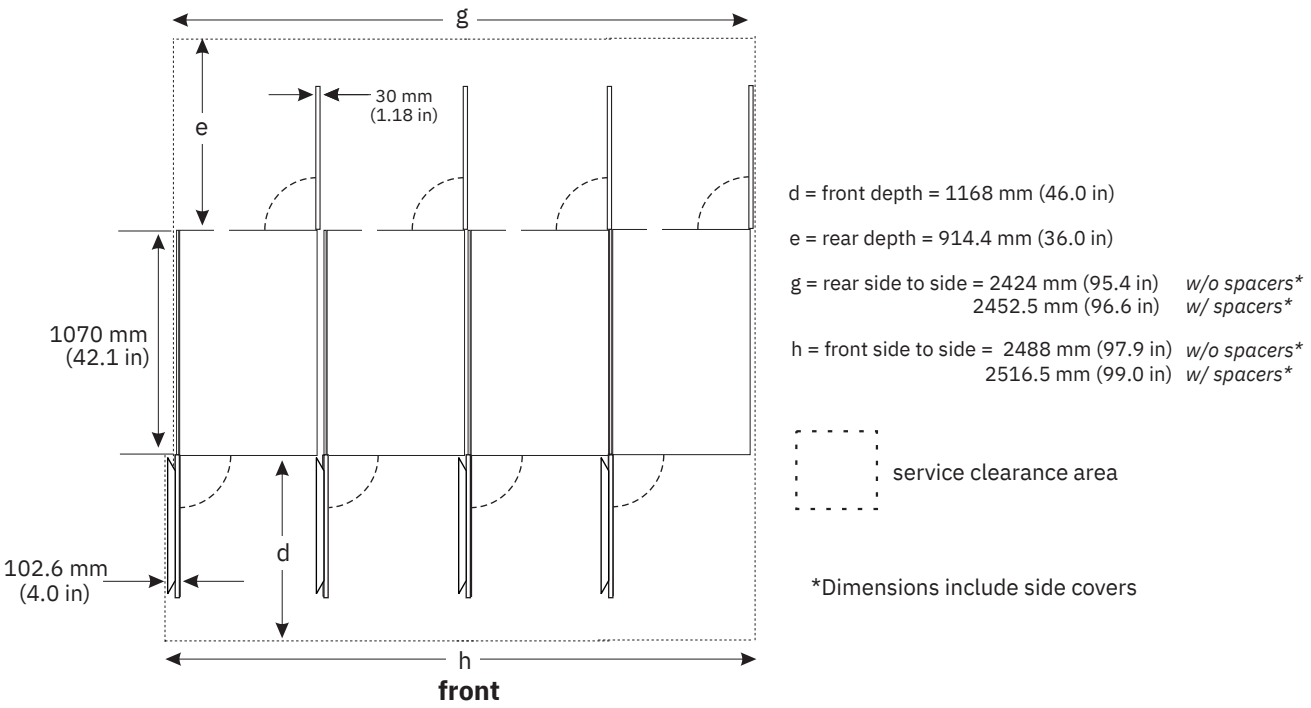


Figure 22. Maximum service clearance area (four frames)

The front and rear doors access all of the serviceable area in the 9175. The system requires specific service clearances to ensure the fastest possible repair in the unlikely event that a part may need to be replaced. Failure to provide enough clearance to open the front and rear covers will result in extended service time.

The following describes some service clearance conditions that must be followed. (See Figure 23 on page 97.)

- The left side cover of the frame cannot be placed adjacent to a wall because of the front and back doors (Example **A**), but can be positioned next to obstacles such as poles or columns (Example **B**).
- The front cover on frame opens 58.3 mm (2.3 in) wider than the width of the frame plus side cover. However, for service repairs, the left side of the front of the machine should be positioned at least 457.2 mm (18 in) from the wall (Example **C**). The right side of the front of the machine should be positioned at least 58.3 mm (2.3 in) from the wall (Example **D**).

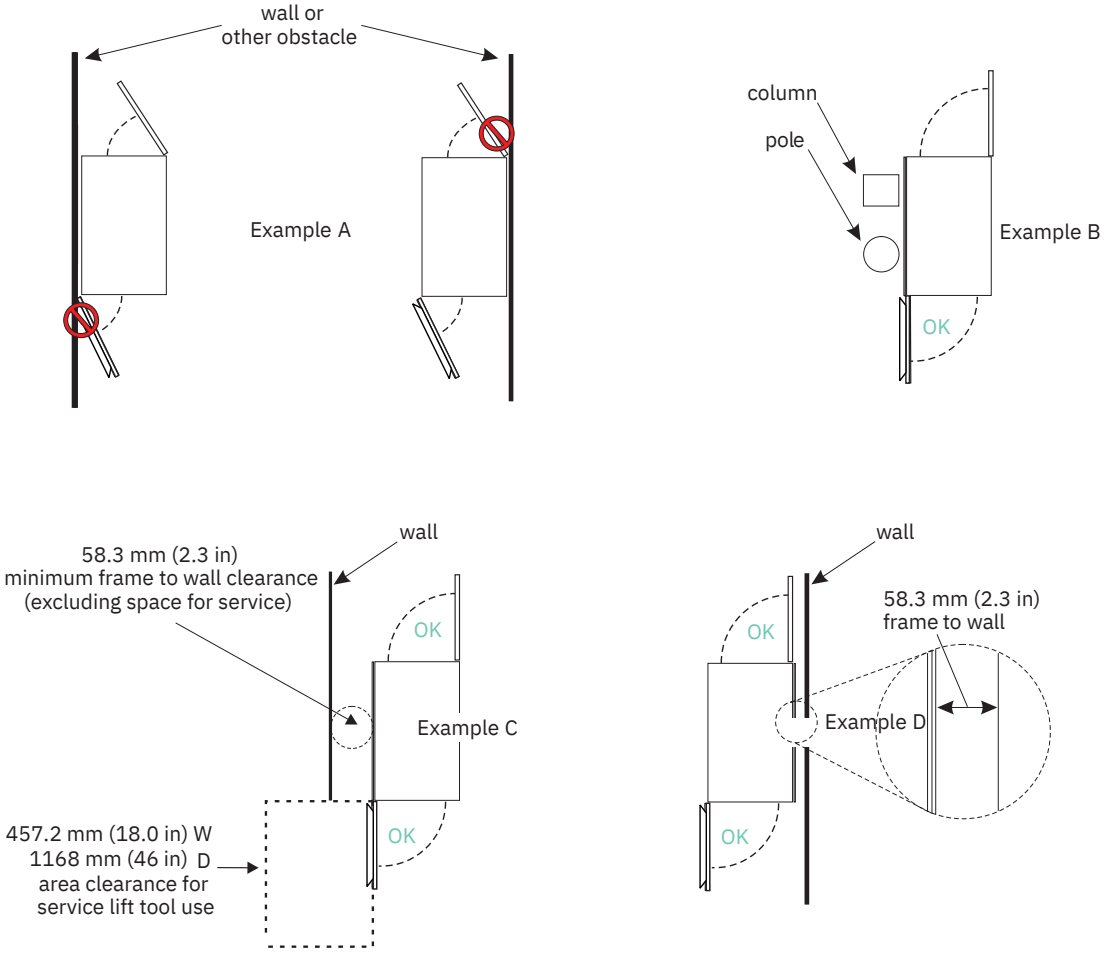


Figure 23. Detailed service clearances

Cooling recommendations for the room

The following illustration does not represent any particular server machine type, and is intended only to show hot and cold airflow and the arrangement of server aisles on the raised floor.

A 9175 uses chilled air, provided at the front of the system from under the raised floor, to cool the system. As shown below, rows of servers must face front-to-front. Chilled air is usually provided through perforated floor panels placed in rows between the fronts of servers (the **cold** aisles shown in the figure). Perforated tiles generally are not be placed in the hot aisles. (If your particular computer room causes the temperature in the hot aisles to exceed limits of comfort for activities like system service, you may add as many perforated tiles as necessary to create a satisfactory comfort level.) Heated exhaust air exits the computer room above the computing equipment.

The cooling requirements that are listed in "ASHRAE declaration" on page 26 provides airflow requirements for a minimally and maximally configured system, and may not represent the cooling requirements for your specific system configuration.

To determine the specific airflow requirements for your system configuration, use the calculator tool available on Resource Link at *http://www.ibm.com/support/resourcelink*.

Refer to Chapter 2, "Environmental specifications," on page 29 for specific data regarding temperature, humidity, and gaseous and particulate contamination.

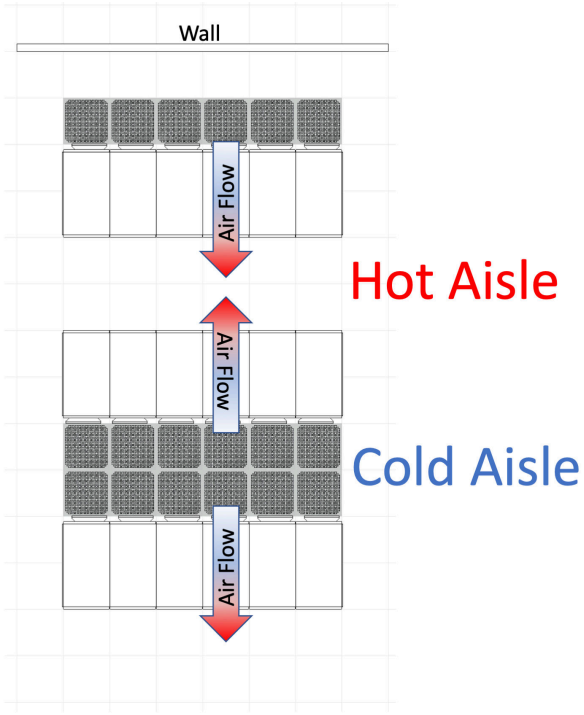


Figure 24. Hot and Cold aisle example

Hot and cold aisle cooling containment

More frequently, data centers are using hot and/or cold aisle cooling containment solutions to help with managing airflow, eliminating hot spots and improving energy efficiency. In most cases, the 9175 system can be used within these aisle cooling containment solutions. Below are general guidelines for assessing the installation of a 9175 in a hot or cold aisle cooling containment solution.

- Partitions used in the aisle cooling containment solution should be self-supporting and not attach to the frame for structural integrity.
- Care should be taken to ensure that the appropriate service clearances are maintained when the system is installed in the cooling containment solution. (See "Machine and service clearance areas" on page 95.)
- Consideration should be given to the airflow requirements of the 9175 system under the intended and abnormal operating conditions to assure sufficient airflow can be provided, particularly in cold aisle cooling containment systems. (See "Cooling recommendations for the room" on page 98.)
- Care should be taken to assure that frames across the aisle will not negatively impact the 9175 operation or conversely the impact of the 9175 on other frame equipment.
- If the cooling containment wall comes down at the rear of the frame, and top exit cabling (**FC 7803**) is being used, you should evaluate the location to ensure that the slider plates can be opened. If interference exists, the Top Exit Enclosure feature (**FC 5823**) should be ordered.

If you have questions regarding the installation of the 9175 in a hot or cold aisle cooling containment solution, please consult your installation planning representative. To assist in planning for a hot and cold aisle cooling containment system, **3-D graphic files** and **3-D computational fluid dynamics models** for use with computer aided design software have been made available on Resource Link at *http://www.ibm.com/support/resourcelink*.

Additionally, with the tendency for hot aisle cooling containment systems to contain warmer and warmer temperatures, service personnel working in these areas must be more cognizant of heat stress hazards and be prepared to work safely under such conditions. Workers who are exposed to extreme heat or work in hot environments may be at risk of heat stress, which is the body's reaction to high temperatures. Preventing heat stress and being proactive about addressing its symptoms can eliminate or drastically reduce potential health risks associated with heat exposure. A common measure, the heat index, combines temperature and relative humidity to establish the human-perceived equivalent temperature, or how hot it "feels". This measure is used frequently in public health communications and can also be applied to hot work environments. The US Department of Labor developed the OSHA Heat Safety Tool app located at Occupational Safety and Health Administration for both the Android and iPhone platforms. The OSHA Heat Stress Tool can be used as a screening tool to allow workers to calculate the heat index for their work site by entering the temperature (degrees F) and % humidity. Based on the calculated heat index, the app displays a risk level including protective measures that should be taken for the risk level. For IBM Service personnel wanting more information, please consult Working in Temperature Extremes Within Data Centers.

Considerations for multiple system installations

When integrating a 9175 into an existing multiple-system environment, or when adding additional systems to an installed 9175, consider the following factors:

- **Thermal interactions**

  Although computer room floor space is valuable, for optimal cooling, it is recommended that 9175 machines have a 1220 mm (48 in) or 1200 mm (47.2 in) aisle between rows of systems to reduce surrounding air temperature. See “Cooling recommendations for the room” on page 98.

- **Floor placement**

  The 9175 must be precisely placed for the cable openings to match the floor cutouts. There is +/- 5 mm (0.2") tolerance for positioning the frame in relation to the floor tiles. This tolerance assumes edging around the tile cutouts that does not exceed 15 mm (0.6 in) width.

  When positioning systems with 3 or 4 frames, you must disassemble the system in pairs (2 frames) prior to transporting it into your environment.

- **Floor loading**

  When trying to optimize floor space utilization, floor loading weight distribution rules may be inadvertently violated by overlapping weight distribution areas of adjacent machines. Obtain the services of a qualified structural engineer if you are uncertain of the floor load assessment for your computer room.

Chapter 4. Guide for raised floor preparation

This chapter provides recommendations and requirements for making the necessary openings in the raised floor for installation.

The drawings on the following pages are intended only to show relative positions and accurate dimensions of floor cutouts.

Raised floor cutouts should be protected by electrically non-conductive molding, appropriately sized, with edges treated to prevent cable damage and to prevent casters from rolling into the floor cutouts.

Casters

The following graphic shows the physical dimensions around the casters. This graphic is an example. See the following sections for more options.

Note: When positioning the server, be aware that the front casters swivels in a circle slightly larger than 121.92 mm (4.8 in) in diameter. The rear casters are fixed. Exercise care when working around floor panel cutouts.

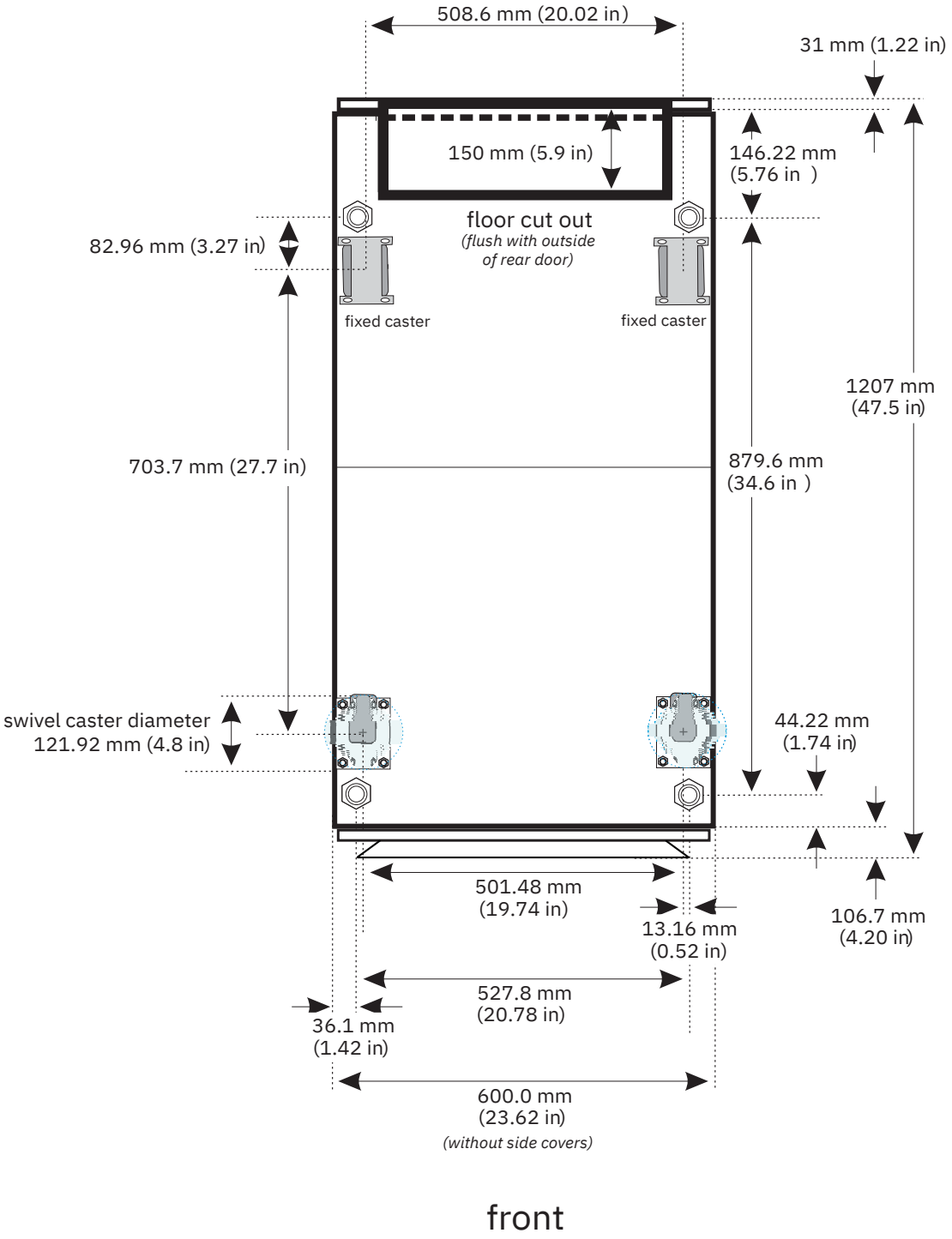


Figure 25. Casters dimensions

Procedure for cutting and placement of floor panels

Important:

9175, fully configured with PDU power, can weigh up to 2564 kg (5640 lb).

The system weights are distributed over multiple frames.

You must be certain that the raised floor on which you are going to install the server is capable of supporting this weight. Contact your floor tile manufacturer and a structural engineer to verify that your raised floor is safe to support the 9175.

Depending on the floor panel type, additional panel supports (pedestals) may be necessary to maintain the structural integrity of an uncut panel, or to restore the integrity of a cut floor panel. Consult the panel manufacturer and the structural engineer to ensure that the panel can sustain the concentrated loads.

Ensure adequate floor space is available to place the frames over the floor panels exactly as shown on the drawing

DANGER: Heavy equipment — personal injury or equipment damage might result if mishandled. (D006)

1. Identify the panels needed, and list the total quantity of each panel required for the installation.
2. Cut the required quantity of panels.
3. Additional panel supports (pedestals) are **recommended** to restore the structural integrity of the cut floor tile panels.
4. When cutting the panels, you must adjust the size of the cut for the thickness of the edge molding you are using. The dimensions shown are finished dimensions.
5. For ease of installation, number each panel as it is cut as shown on the panel specification pages.
6. Use the raised floor diagram to install the panels in the proper positions.
7. The cut floor panels **must** be in place *before* the system is positioned on the floor.

On-grid frame placement

Note: If the Bottom Exit Cabling feature (**FC 7804**) was not ordered, no floor cutout is required.

- **24 in (609 mm) floor panels** - English
  - A cutout depth of 5.9 in (150 mm)
  - A width of 3.0 in (75 mm) of material **must** remain at both ends of the cutout (150 mm x 450 mm cutout)
  - Require the use of frame spacers, which are pre-installed on the system.
- **600 mm (23.5 in) floor panels** - Metric
  - A cutout depth of 150 mm (5.9 in)
  - A width of 75 mm (3.0 in) of material **must** remain at both ends of the cutout (150 mm x 450 mm cutout)
  - Do not require the use of frame spacers, which must be uninstalled from the system before frame placement.

Important: The 3.0 in (75 mm) measurements **does not** include any cutout edge treatment.

The following figures show the floor cutout options and recommended pedestals for *on-grid* frame placement, although other placement options are possible. If your floor cutout design is different from the options that are shown in the follow figures, consult with the floor tile manufacturer or a structural engineer.

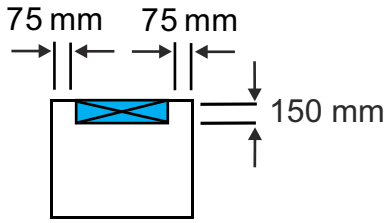


Figure 26. On-grid floor cutout options - 24 in (609 mm) or 23.5 in (600 mm) panels

Important:

Extra pedestals can be placed as shown in the following figure.

These extra pedestals are recommendations. You must decide which, if any, of these recommendations to use.

All pedestals should be adjusted to contact the underside of each floor panel **before** the frames are rolled into place. Depending on your floor panel type, additional supports (pedestals) may be necessary to restore the structural integrity of cut panels.

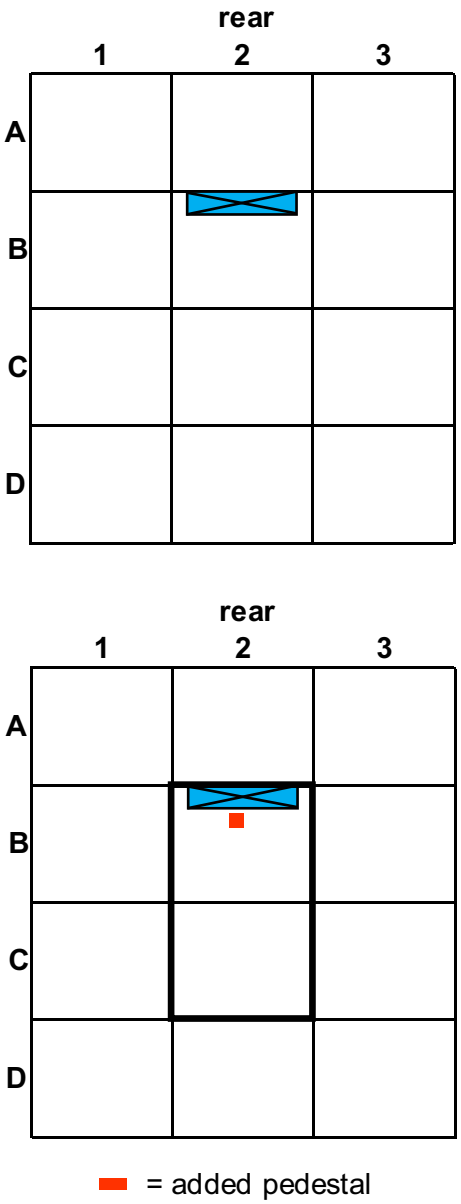


Figure 27. On-grid floor cutouts and minimum number of pedestals - 1 frame

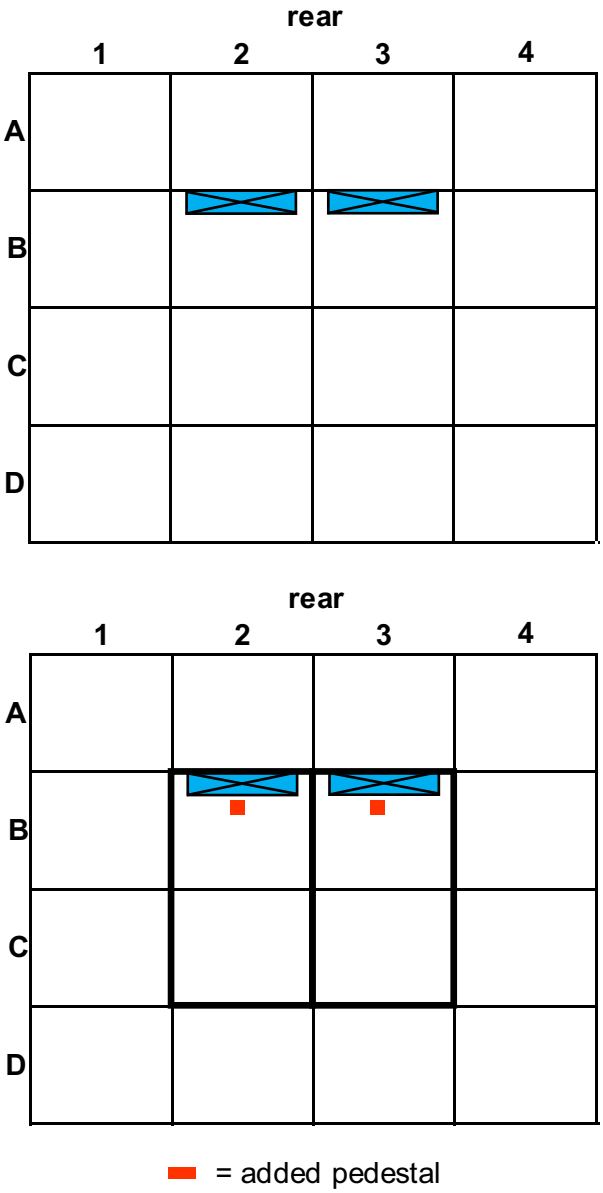


Figure 28. On-grid floor cutouts and minimum number of pedestals - 2 frames

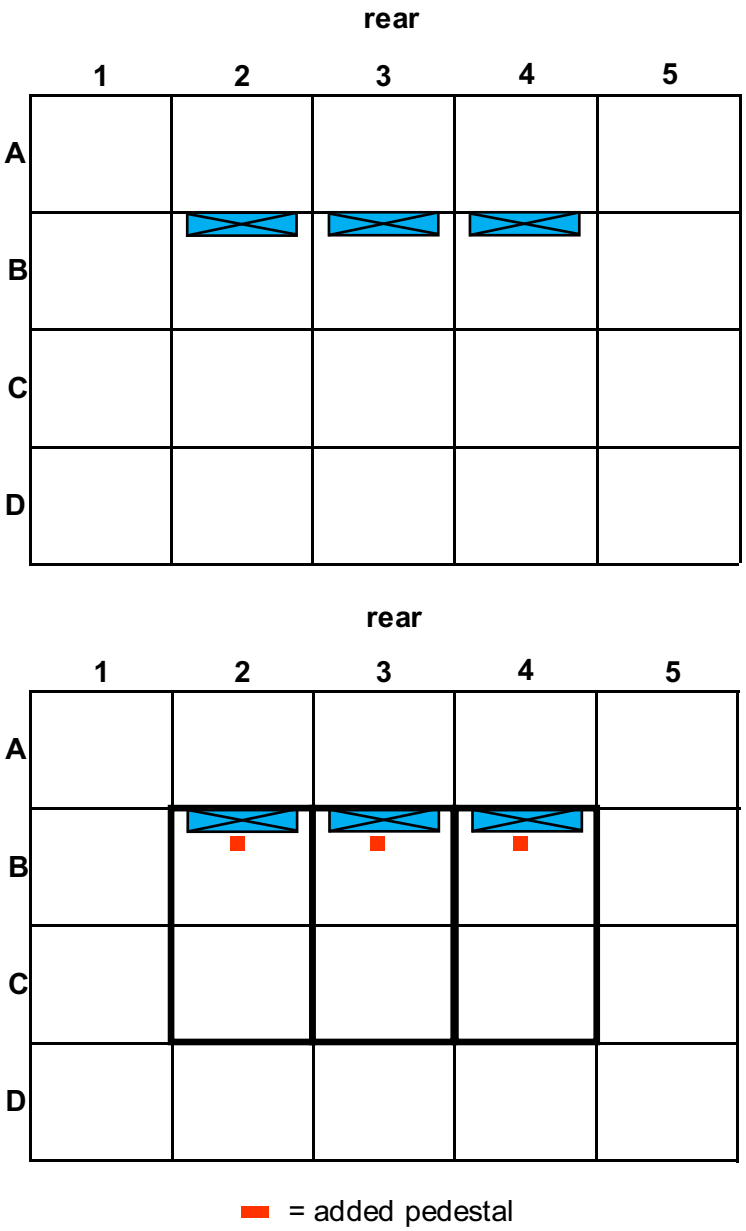


Figure 29. On-grid floor cutouts and minimum number of pedestals - 3 frames

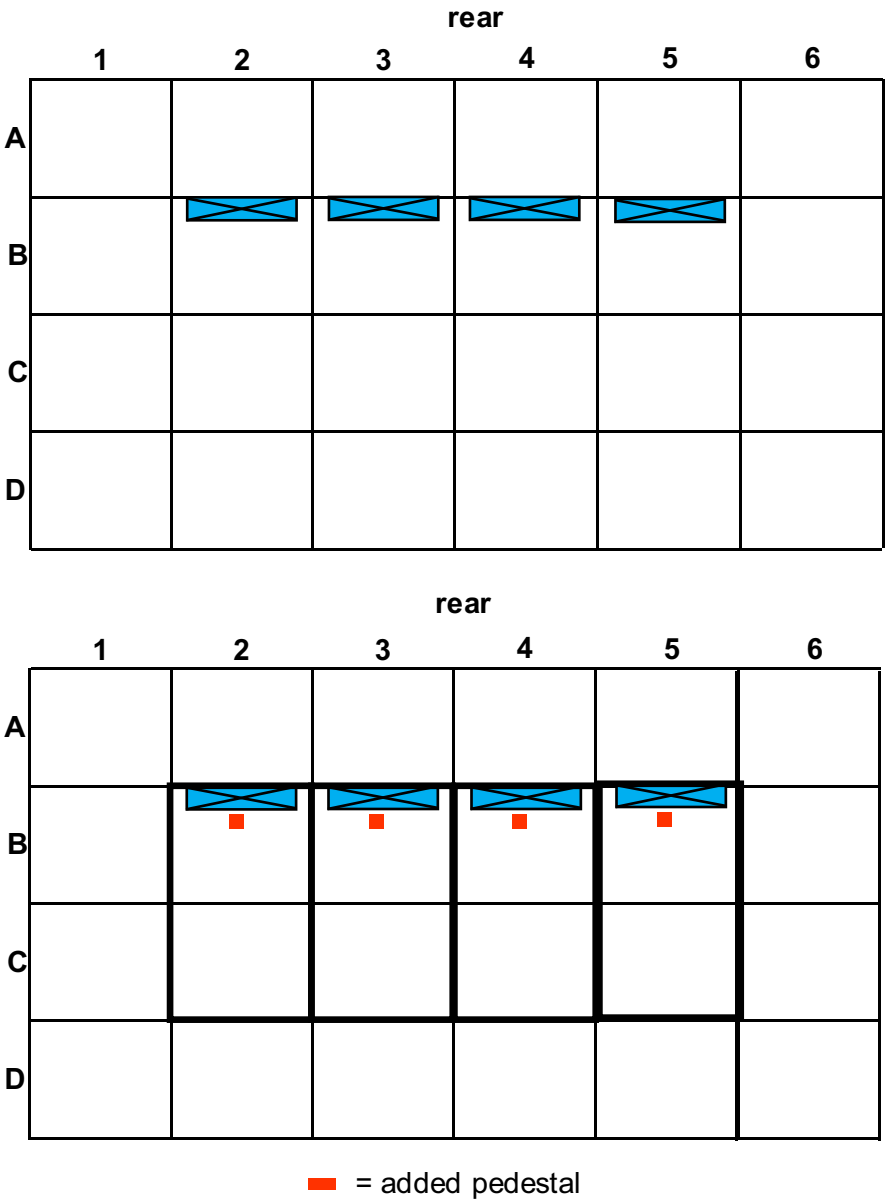


Figure 30. On-grid floor cutouts and minimum number of pedestals - 4 frames

Chapter 5. Power requirements

Unlike the previous system, the 9175 only has one front-end power sub-system topology option.

Power Distribution Unit (PDU) power

Feature code	Description	Line-Line Voltage
FC 0563	60A 3-Phase PDU (DELTA)	200-240V AC *(Low Voltage)*
FC 0564	32A 3-Phase PDU (WYE)	380-415V AC *(High Voltage)*

- Supports a maximum of 12 PCIe+ I/O drawers.
- Supports 2, 4, 6, or 8 PDUs, depending on system configuration.
- Requires 2, 4, 6, or 8 power line cords, depending on number of PDUs.

General electrical power requirements

The 9175 system requires the following power requirements:

System frame

- PDU power
- 2, 4, 6, or 8 PDUs supported
- 2, 4, 6, or 8 power line cords required, depending on number of PDUs
- 3-phase line-line voltage ranges:
  - 60A, 200-240 AC
  - 32A, 380-415V AC

  Note: 480V AC and Higher Voltage DC (HVDC) are not supported.
- Refer to Appendix C, “Dual facilities power distribution installation,” on page 187 for the correct wiring method for your particular power distribution equipment.

Power and weight estimation tool

The power estimator tool for 9175 allows you to enter your precise server configuration to produce an estimate of power consumption. You can also use the tool to calculate the weight of your server.

Log on to Resource Link at *http://www.ibm.com/support/resourcelink*. Navigate to **Tools** > **Power and weight estimation** > **IBM z17 ME1**. Specify the quantity for the features that are installed in your machine. This tool estimates the power consumption for the specified configuration. The tool does not verify that the specified configuration can be physically built.

Note: The exact power consumption for your machine will vary. The object of the tool is to produce an estimation of the power requirements to aid you in planning for your machine installation.

Actual power consumption after installation can be confirmed using the **HMC Environmental Dashboard** task.

Power installation considerations (PDU)

9175 operates from 2, 4, 6, or 8 power cords, depending on system configuration, which provide redundant attachment to the electrical utility. When properly connected to independent branch circuits, they provide system immunity to most types of power outage. See Appendix C, “Dual facilities power distribution installation,” on page 187 for examples of typical redundant wiring facilities.

Note: The power cord sets provided are for use only with this product.

The power supplies at the front end of the system use active resistive load synthesis. Harmonic distortion of the current waveform is small enough that it need not be considered in planning the installation. The power factor is typically 0.95 or higher.

Supply type	input voltage	input frequency	input current rating
2, 4, 6, or 8, 3-phase power cords	200-240 V AC	50/60 Hz (47 to 63 Hz with tolerance)	48A
2, 4, 6, or 8, 3-phase power cords	380-415 V AC	50/60 Hz (47 to 63 Hz with tolerance)	24A

Attention:

- *IBM service personnel:* The task of using a meter and probes to take voltage measurements on receptacles/outlets must be performed by a Qualified Electrical Worker (QEW) or licensed electrician. In countries where IBM service personnel are not qualified to perform this task, the IBM service person must notify the customer that they must arrange for a QEW (a licensed electrician may be considered a QEW) to perform the receptacle testing.
- Contact your local service safety engineer, or your manager for more information.

PDU Ethernet Connection: The PDU features three RJ45 ports, with only one designated for Ethernet connection. This port is exclusively reserved for power monitoring and control purposes by the hardware management firmware, and its use for data center monitoring by customers is strictly prohibited.

PDU specifications

The following tables provide the number of PDUs and number of line cords required based on the number of CPC processor drawers and the number of PCIe+ I/O drawers in the machine configuration.

Table 41. Number of PDUs installed

# of CPC drawers	# of PCIe+ I/O drawers												
	0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	2	2*	2*	2*	4	4	4	N/A	N/A	N/A	N/A	N/A	N/A
2	4	4	4	4	4	4	4	4	6	6	6	6	6
3	4	4	4	4	4	4	4	6	6	6	6	6	N/A
4	6	6	6	6	6	6	6	6	6	6	8	8	8

Note: * For the Z Frame First I/O Placement feature (**FC 0352**), there are *4 PDUs* in these configurations instead of the otherwise 2 PDUs.

PDU locations in the frame

The following figure displays all of the eight possible PDU locations in a four frame system. The PDU number assignments (**PDU-A1**) specify the frame, ***A***, and the EIA locations of the PDUs within the frame.

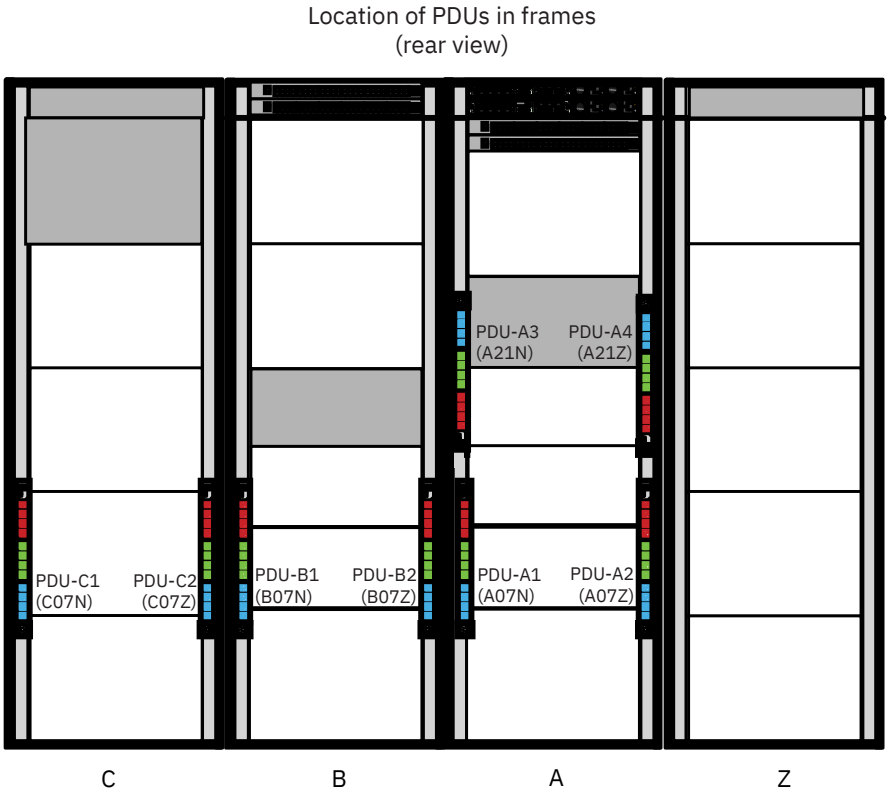


Figure 31. Location of PDUs in the frames

Power specifications

The following tables provide system power consumption based on the number of CPC drawers and the number of PCIe+ I/O drawers with *maximum* configurations.

The **Power and Weight Estimation** tool provides a more accurate estimation of the power consumption for your specified configuration. See “Power and weight estimation tool” on page 111.

Table 42. Maximum utility power consumption (PDU)

FC (# of CPCs)	Number of PCIe+ I/O drawers												
	0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
0571 (1)	4.8 kW	6.2 kW	7.6 kW	9.0 kW	10.4 kW	11.8 kW	13.2 kW	-	-	-	-	-	-
0572 (2)	8.7 kW	10.2 kW	11.5 kW	13.0 kW	14.4 kW	15.8 kW	17.2 kW	18.1 kW	19.1 kW	20.0 kW	20.7 kW	21.5 kW	22.3 kW
0573 (3)	12.7 kW	14.1 kW	15.5 kW	16.9 kW	18.3 kW	19.8 kW	21.2 kW	22.2 kW	23.1 kW	23.9 kW	24.7 kW	25.5 kW	-
0574 *or* **0575 (4)**	17.8 kW	19.2 kW	20.6 kW	22.0 kW	23.4 kW	24.8 kW	26.2 kW	27.2 kW	28.1 kW	28.9 kW	29.7 kW	30.4 kW	31.2 kW

Notes:

- The power used in this table assumes the CPC processor drawer and PCIe+ I/O drawers are maximally configured with highest power features (for example: memory and I/O adapters and fanouts). Also assumed is a maximum system inlet air temperature of 40°C at 945 meters (3100 feet) elevation.
- Typical configurations and data center conditions will result in lower power usage.

Customer circuit breakers

The following table shows the maximum circuit breaker ratings based on input voltage.

Table 43. Circuit breaker ratings based on input voltage

Input Voltage Range (V)	System Rated Current (A)	Circuit Breaker
200 - 240 AC	48A	60/63 A
380 - 415V AC	24A	30/32 A

It is recommended, for simplicity and ease of upgrades, that the circuit breaker ratings in this table be used on all power cords for all installations. The actual power drawn (heat load) by any configuration will not be affected.

Note: Small currents can appear on the server earth ground connection under normal server operation.

For most reliable operation, circuit breakers that react to currents detected on ground (e.g. Earth Leakage Circuit Breakers or Residual Current Circuit Breakers) are not recommended for use with 9175. By internal design and grounding, 9175 is fully certified for safe operation without them (meets IEC, EN, UL, CSA 60950-1 and 62368-1 standards).

However, if leakage detection circuit breakers are required by local electrical practice, they can be used up to 100 mA. To safeguard against spurious tripping:

1. The Data Center ground grid should be constructed in accordance with best practices to avoid significant voltage gradients.
2. The facility power infrastructure should be as reliable as possible.
3. The utility connections from the breaker panel to the power cord input pairs should be reasonably equal in length or at least no one connection should be much shorter than the other.

If spurious tripping is experienced, corrections must be made in one or more of the above areas.

Supported power cords

Plugs are shipped with the machine line cords as described in the following table. Power plugs listed in Table 44 on page 116 are approved for use with specified models and meet the relevant test laboratory or country/test-house standards. The power plug must be connected to a correctly wired and grounded receptacle. The customer is responsible for receptacle wiring.

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)

Table 44. Supported PDU power cords

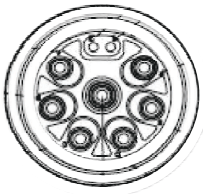
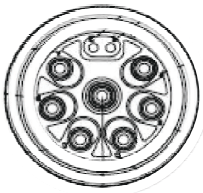
Feature code **Countries** **Voltage** **Amperage** **Phase** **Length** **Wall plug**	**IBM system end**	**Customer end**	**Customer end (pin contacts)**	**Customer facility's branch circuit (Receptacle / Connector)[8]**	**IBM part number of cord[9]**
FC 7946 USA, Canada, CN, LA[2] (except Argentina), & Japan ———— 415 V AC ———— 30 A ———— three phase (WYE) ———— 4.3 m (14 ft) ———— IEC-60309	plug: Souriau UTG 	HBL530P6V02		receptacle type: HBL530R6V02  connector type: HBL530C6V02 	03FM499
FC 7947 World Trade [1] ———— 415 V AC ———— 32 A ———— three phase (WYE) ———— 4.3 m (14 ft) ———— Cut End	plug: Souriau UTG 	Cut End[3]	Cut End (lead labels) L1 L2 L3 N GND	(not specified)	03GN439

Table 44. Supported PDU power cords (continued)

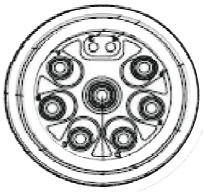
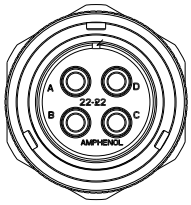
Feature code Countries Voltage Amperage Phase Length Wall plug	**IBM system end**	**Customer end**	**Customer end (pin contacts)**	**Customer facility's branch circuit (Receptacle / Connector)[8]**	**IBM part number of cord[9]**
FC 7948 World Trade [1] ———— 415 V AC ———— 32 A, LSZH ———— three phase (WYE) ———— 4.3 m (14 ft) ———— Cut End ———— low smoke, halogen-free	plug: Souriau UTG 	Cut End[3]	Cut End (lead labels) L1 L2 L3 N GND	(not specified)	03FM501
FC 7971 USA, Canada, CN, LA[2] (except Argentina), & Japan ———— 250 V AC ———— 60 A ———— three phase (Delta) ———— 4.3 m (14 ft) ———— IEC 60309 3P-4W	plug: Amphenol 02WN656 	HBL460P9V05		receptacle type: HBL460R9W  connector type: HBL460C9W 	02WN658

Table 44. Supported PDU power cords (continued)

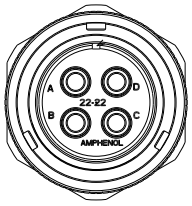
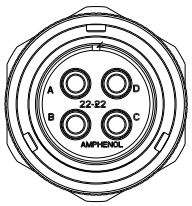
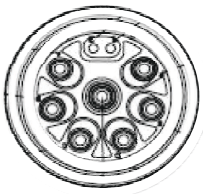
Feature code Countries Voltage Amperage Phase Length Wall plug	**IBM system end**	**Customer end**	**Customer end (pin contacts)**	**Customer facility's branch circuit (Receptacle / Connector)[8]**	**IBM part number of cord[9]**
FC 7972 World Trade [1] ———— 250 V AC ———— 63 A ———— three phase (Delta) ———— 4.3 m (14 ft) ———— Cut End	plug: Amphenol 02WN656 	Cut End[3]	Cut End (lead labels) PH-1 PH-2 PH-3 GND	(not specified)	03NH386
FC 7973 World Trade [1] ———— 250 V AC ———— 63 A, LSZH ———— three phase (Delta) ———— 4.3 m (14 ft) ———— low smoke, halogen-free ———— Cut End	plug: Amphenol 02WN656 	Cut End[3]	Cut End (lead labels) PH-1 PH-2 PH-3 GND	(not specified)	03GN076
FC 7976 World Trade ———— 415 V AC ———— 32 A ———— three phase (WYE) ———— 4.3 m (14 ft) ———— IEC-60309	plug: Souriau UTG 	IEC-309 530P6W		receptacle type: 530R6W  connector type: 530C6W 	03KY961

Table 44. Supported PDU power cords (continued)

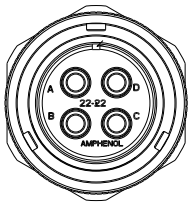
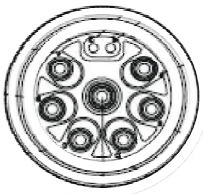
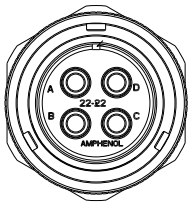
Feature code Countries Voltage Amperage Phase Length Wall plug	**IBM system end**	**Customer end**	**Customer end (pin contacts)**	**Customer facility's branch circuit (Receptacle / Connector)[8]**	**IBM part number of cord[9]**
FC 7977 World Trade ———— 250 V AC ———— 63 A ———— three phase ———— 4.3 m (14 ft) ———— IEC-309	plug: Amphenol 02WN656 	IEC-309 460P9W		receptacle type: 460R9W  connector type: 460C9W 	03KY958
FC 7979 World Trade[1] ———— 415 V AC ———— 32 A ———— three phase (WYE) ———— 4.3 m (14 ft) ———— IEC-60309 (low smoke, halogen-free)	plug: Souriau UTG 	IEC-309 530P6W		receptacle type: 530R6W  connector type: 530C6W 	03KY962

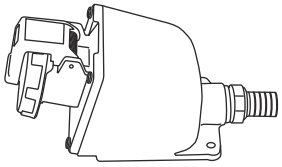
Table 44. Supported PDU power cords (continued)

Feature code Countries Voltage Amperage Phase Length Wall plug	IBM system end	Customer end	Customer end (pin contacts)	Customer facility's branch circuit (Receptacle / Connector)[8]	IBM part number of cord[9]
FC 7980 World Trade ———— 250 V AC ———— 63 A, LSZH ———— three phase (DELTA) ———— 4.3 m (14 ft) ———— IEC-309 (low smoke, halogen-free)	plug: Amphenol 02WN656 	IEC-309 460P9W 		receptacle type: 460R9W  connector type: 460C9W 	03KY959

Notes:

1. World Trade is all countries world-wide except USA, Canada, Mexico, and Japan.
2. CN includes the following geographies: Anguilla, Antigua, Aruba, Bahamas, Barbados, Bermuda, Bonaire, BVI Tortola, Cayman Islands, Curacao, Dominica, Dutch Caribbean, Grenada, Guyana, Jamaica, Montserrat, St. Kitts & Nevis, St. Lucia, St. Martin NA, St. Vincent, Suriname, Trinidad, Turks & Caicos.

   LA includes the following geographies: Argentina, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay, Venezuela.
3. Cut end cord; no plug is provided. Plug is provided by the customer and is electrician-installed. Cut end cords (FCs 7972, 7973, 7947, and 7948) are for special order only, and **not** offered for general availability.
4. It is strongly recommended that you use a metal back box (*example* shown below) with our line cords using IEC-60309 plugs. Although in-line connectors and nonmetallic back boxes are available and compatible, they are not recommended. These recommendations are based on the metal back box providing:
   - An added level of protection against a miswired phase and ground reversal
   - In some cases, a metal back box may be better for EMI mitigation

   You may choose not to use a metal back box. In this case, please check your local code for specific requirements.

5. The customer must obtain the appropriate plugs and receptacles, based on existing electrical codes, where those plugs and receptacles are not provided with the system. These customer-provided plugs and receptacles should be installed by qualified electricians.
6. The power cord set(s) provided are for use only with this product.
7. If you choose to use a Hubbell receptacle, do NOT use the Hubbell C-Series Light Industrial 3.
8. If a receptacle is not available, then the connector that is listed should be used in its place.
9. IBM part numbers are subject to change.

Line cord wire specifications

Line code usage location	Feature code	AWG # Type # of wires	Connector supplied	Bulk outside diameter mm (in)
USA, Canada, CN, LA (except Argentina), & Japan 3-Phase (380-415 V AC), WYE 14 ft	FC 7946	#10 AWG Type ST	Yes	20.0 (0.78)
World Trade 3-Phase (380-415 V AC), WYE 14 ft	FC 7947	9AWG / 6mm2 SOOW / H07RN-F	No	20.7 (0.81)
World Trade 3-Phase (380-415 V AC), WYE 14 ft low smoke, halogen-free	FC 7948	6mm2 H07RN-F EN (LSZH)	No	17.5 (0.68) - 22.2 (0.87)
USA, Canada, CN, LA (except Argentina), & Japan 3-Phase (250 V AC), DELTA 14 ft	FC 7971	#6 AWG Type PPE	Yes	28.5 (1.12)
World Trade 3-Phase (250 V AC), DELTA 14 ft	FC 7972	10mm2 H07RN-F	No	26.2 (1.03)
World Trade 3-Phase (250 V AC), DELTA 14 ft low smoke, halogen-free	FC 7973	#6 AWG Type DP-LS	No	25.9 (1.02)
World Trade 3-Phase (380 - 415 V AC), WYE 14 ft	FC 7976	9AWG / 6mm2 SOOW / H07RN-F	Yes	20.7 (0.81)
World Trade 3-Phase (380 - 415 V AC), DELTA 14 ft	FC 7977	10mm2 H07RN-F	Yes	26.2 (1.03)
World Trade 3-Phase (380 - 415 V AC), WYE 14 ft	FC 7979	6mm2 H07RN-F EN (LSZH)	Yes	17.5 (0.68) - 22.2 (0.87)
World Trade 3-Phase (250 V AC), DELTA 14 ft	FC 7980	10mm2 H07RN-F EN or H07ZZ-F (LSZH)	Yes	20.9 (0.82) - 26.5 (1.04)

Notes:

1. Where plugs are provided, Hubbell is the plug supplier.
2. The customer must obtain the appropriate plugs and receptacles, based on existing electrical codes, where those plugs and receptacles are not provided with the system.
3. The power cord set(s) provided are for use only with this product.

Power line cord physical protection

In US installations, the line cord must meet National Electric Code (NEC) requirements. When line cords are run on the surface of the floor, they must be protected against physical damage (See NEC 645-5). For other countries, the line cord requirements must meet local codes.

Dedicated branch circuit wiring verification before system power-on

The purpose of this procedure is to provide step-by-step instructions on how to ensure data center facilities dedicated branch-circuit electrical receptacles will provide safe and proper power to a 9175 system.

It is highly recommended that these facilities wiring checks be performed and verified on all applicable customer receptacles (especially newly wired ones) BEFORE attaching the PDU power line cords. In-line connectors on AC power whips are also considered receptacles throughout this procedure.

Attention: These measurements should only be performed by a Qualified Electrical Worker [QEW; as defined by OSHA (Occupational Safety and Health Agency) within the United States]; or a national/local equivalent QEW.

OFF-state AC voltage and ground safety checks

Complete the following procedure to perform the OFF-state AC voltage and ground safety checks as follows:

1. Turn **OFF** the corresponding facilities dedicated branch circuit breaker (CB).
2. Check to ensure there is nearly zero AC voltage between each line pin and the ground/earth pin (and receptacle metal housing if applicable).
3. Check to ensure there is nearly zero AC voltage from receptacle ground/earth to building ground/earth (e.g., water pipe, building steel, etc).
4. Measure resistance from the ground pin to the building ground (e.g., water pipe, building steel, etc). This resistance should read *approximately 1 ohm* or less.
5. Repeat the above procedure for all remaining facilities dedicated branch-circuits supplying the IBM Z system.

3-phase DELTA AC voltage checks

For **3-phase DELTA** power only, with PDU Feature Code (FC) 0563, complete the following procedure to verify the proper AC voltage on the 3-phase DELTA dedicated branch-circuit 4-wire/pin receptacles:

1. Turn **ON** the corresponding facilities dedicated branch circuit breaker (CB).
2. Measure the facilities supplied 3-phase voltage at the receptacle; and confirm the IEC 60309 connector housing is *blue*.
3. Ensure 3-phase DELTA (4-wire/pin without a Neutral) line-to-line voltages are **200 - 240 VAC** nominal (3X measurements; 50 Hz or 60 Hz).
4. Turn **OFF** the corresponding facilities dedicated branch circuit breaker (CB).
5. Repeat the above procedure for all remaining facilities dedicated branch circuits supplying the IBM Z system.
6. If any of the voltages are outside the acceptable ranges specified above, have a licensed electrician or installation electrician correct the problem before connecting or powering up the IBM Z system.

3-phase WYE AC voltage checks

For **3-phase WYE** power only, with PDU Feature Code (FC) 0564, complete the following procedure to verify the proper AC voltage on the 3-phase WYE dedicated branch-circuit 5-wire/pin receptacles:

1. Turn **ON** the corresponding facilities dedicated branch circuit breaker (CB).
2. Measure the facilities supplied 3-phase voltage at the receptacle; and confirm the IEC 60309 connector housing is *red*.

3. Ensure 3-phase WYE (5-wire/pin with a Neutral) line-to-line voltages are **380 - 415 VAC** nominal (3X measurements; 50 Hz or 60 Hz).
4. Ensure 3-phase WYE (5-wire/pin with a Neutral) line-to-neutral voltages are **200 - 240 VAC** nominal (3X measurements; 50 Hz or 60 Hz).
5. Turn **OFF** the corresponding facilities dedicated branch circuit breaker (CB).
6. Repeat the above procedure for all remaining facilities dedicated branch-circuits supplying the IBM Z system.
7. If any of the voltages are outside the acceptable ranges specified above, have a licensed electrician or installation electrician correct the problem before connecting or powering up the IBM Z system.

Lead colors for special order cut end line cords (PDU)

Feature code (FC)	IBM part number of cord	Lead labels and corresponding color
FC 7947	03GN439	Line 1 (**L-1**) = Brown Line 2 (**L-2**) = Black Line 3 (**L-3**) = Gray Neutral (**N**) = Blue Ground (**GND**) = Green/Yellow
FC 7948	03FM501	Line 1 (**L-1**) = Brown Line 2 (**L-2**) = Black Line 3 (**L-3**) = Gray Neutral (**N**) = Blue Ground (**GND**) = Green/Yellow
FC 7972	03NH386	Phase 1 (**PH-1**) = Red Phase 2 (**PH-2**) = Black Phase 3 (**PH-3**) = Blue Ground (**GND**) = Green/Yellow
FC 7973	03GN076	Phase 1 (**PH-1**) = Brown Phase 2 (**PH-2**) = Black Phase 3 (**PH-3**) = Gray Ground (**GND**) = Green/Yellow

Notes:

- Leads are individually labeled for identification during system installation.
- IBM part numbers are subject to change.

Grounding specifications

Every utility branch circuit, whether three or single phase, must contain an insulated equipment-grounding conductor that is separate from the phase and neutral conductors within the branch.

For 200 V AC through 240 V AC installations worldwide, the equipment-grounding conductor must match local electrical codes and must be green with or without one or more yellow stripes on the insulation. It is recommended that the ground wire be the same size as the phase conductor wires.

Conduit must not be used as the only grounding means. However, any conduit or cable shield must be connected at both ends in such a way that it is included in the grounding path, and in parallel with the grounding conductor it contains. Most electrical codes require that branch circuit wiring be located in the metallic conduit, or be made from shielded cable, if located under a raised floor. Even when not required by local regulations, some form of shield around the branch circuit wiring is strongly recommended as a means of reducing coupling of high-frequency electrical noise into signal and control cables.

Attention: Electrical bonding for safety is provided through the power line cords. If local codes or client requirements call for additional bonding, use *only* the frame locations which are marked with this symbol:  . Do **not** use the locations marked with this symbol:  , as they are only intended to be used to ground existing parts that were installed in manufacturing.

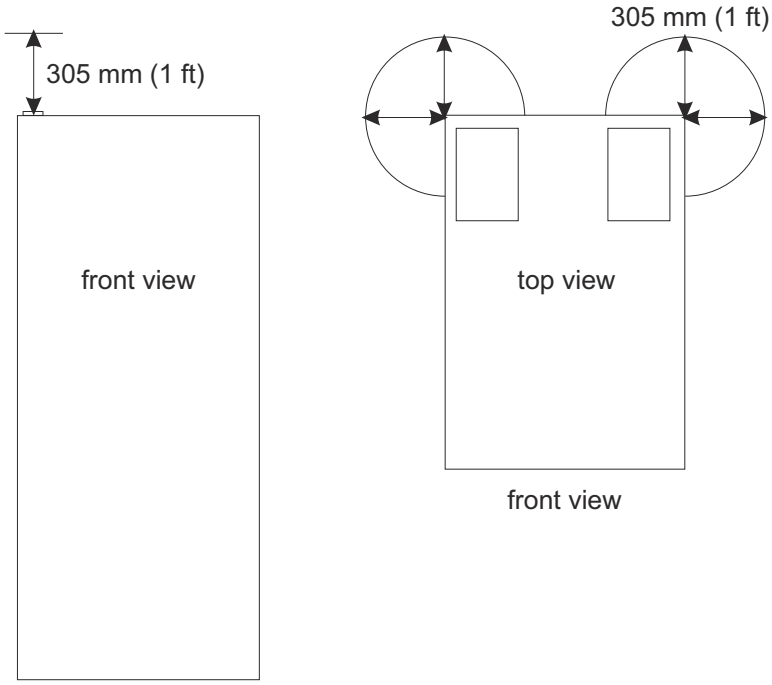
For information about additional recommendations and requirements for equipment grounding, go to Resource Link at *http://www.ibm.com/support/resourcelink*. See **General Information for Planning a Physical Site**.

Power cabling

You can route power cables using the following features:

- Through the top of the frame using the Top Exit cabling feature *with* top exit enclosure (**FC 5823**)
- Through the top of the frame using the Top Exit cabling feature *without* top exit enclosure (**FC 7803**)
- Through the bottom of the frame using the Bottom Exit cabling feature (**FC 7804**).

If you are planning to route the power cables through the top of the frame, your receptacle must drop to within 305 mm (1 ft) of the top of the frame and be no further than 305 mm (1 ft) from the front door or side cover of the frame.



See Appendix B, “Top Exit cabling and Bottom Exit cabling specifications,” on page 181 for information on the top exit cabling feature (FC 5823) and the bottom exit cabling feature (FC 7804).

Chapter 6. Hardware Management Appliance HMC and Support Element communications

The Hardware Management Console (HMC) 2.17.0 can only be run on the Hardware Management Appliance (HMA) on the z17, z16, or z15 HMA. That code level cannot run on a Standalone HMC. The HMC 2.17.0 highlighted enhancements include the following:

- **Dual Control** adds an extra layer of security for critical tasks on the HMC as well as can protect against user mistakes for those critical tasks. Dual control enabled tasks require another level of verification of the actual selections by a user from an approver before they can be run.
- **Remote Code Load** enhancements will provide alerts when remote code load is scheduled, running, and completed. IBM Resource Link will also execute health checks prior to or at scheduling time, and any issues will block remote code load scheduling rather than scheduling failing after further verification on the HMC.
- **Single Sign On (SSO)** will provide federated HMC user logon support using OpenID Connect (OIDC).
- **Manage System Time** enhancements will provide Network Time Security connections to Network Time Protocol (NTP) external time servers. A mix of NTP and Precision Time Protocol (PTP) servers will also be supported, and PTP communication support will now support Unicast in addition to Multicast.
- **Base Control Program internal interface (BCPii) HWIREST/v2** will provide an enhanced security control by mapping a z/OS user to an HMC user, and BCPii v2 requests will be limited to the user permissions of that HMC user. BCPii v2 will also provide asynchronous notification support for requests, and BCPii will now support requests sent to HMC targets enabling additional set of functionality.
- **File system import/export** will enable an option for HMC tasks to import and export files directly to the remote browsing workstation without needing an FTP server or USB device.
- **User data replication** enhancements will now replicate HMC defined user patterns and templates to managed SEs. All HMC users and user data will now automatically be replicated to managed SEs, and clients can more easily use HMC defined users to manage their HMCs and SEs.

Support Element and Hardware Management Appliance

The 9175 provides you with the following two options for management servers:

Dual 1U 2461 Support Elements (2461-SE3) - *Default*
Functions as a Support Element (SE)

Dual 1U 2461 Hardware Management Appliance (2461-VA3) - *FC 0355*
Functions as a Support Element (SE) and Hardware Management Console (HMC)

The two Support Elements or two Hardware Management Appliances share a compact keyboard/monitor/mouse (compact KMM) managed by a single Interface Adapter.

Note: Throughout the rest of this document, "Support Elements" refers to the dual 2461 Support Elements.

Power for the Support Elements or Hardware Management Appliance are supplied by the 9175 power supply, and there are no additional power requirements.

The Support Elements or Hardware Management Appliance on the 9175 connect to the LAN via the customer network switch. Then the Support Elements or Hardware Management Appliance connects to the Ethernet switches in the 9175. The Hardware Management Console also connects to the LAN via the customer network switch.

Note: BCPii v1 and HMC/Support Element (SE) Simple Network Management Protocol (SNMP) are being deprecated. There are no current plans to remove support for BCPii v1 or HMC/SE SNMP, but all future

automation functional enhancements will only be done for BCPii HWIREST/v2 and HMC WebServices APIs.

Ethernet LAN switch support

Important:

A *customer-provided* Ethernet switch or hub, to which the Hardware Management Appliances (HMAs) or Support Elements (SEs) are connected, must be installed to establish customer network connectivity between the Hardware Management Consoles (HMCs) and SEs. The Ethernet switch or hub is connected to the Ethernet ports on the HMAs/SEs. Up to two Ethernet switches or hubs can be customer provided and installed to support up to two customer networks for HMC/SE connectivity.

The following is general information relevant to many Ethernet switches. Refer to the manufacturer's User's Guide that came with your switch or hub for installation instructions.

An Ethernet switch or hub is a standalone unit located outside the frame and which operates on building AC power. The customer-provided switch or hub must adhere to the following specifications:

- 16 auto-negotiation ports
- 1000 Mbps or 1 Gbps data rate
- Full duplex operation only
- Auto-MDIX on all ports
- Port Status LEDs
- 100 to 240 VAC, 50 or 60 Hz power

Ethernet network connection requirements

MUST READ:

This product may not be certified in your country for connection by any means whatsoever to interfaces of public telecommunications networks. Further certification may be required by law prior to making any such connection. Contact an IBM representative or reseller for any questions.

The preceding statement does NOT exclude using the network for private communications, such as connection to the Remote Support Facility.

On the 9175, the install team must connect the Ethernet adapters for any HMC(s) into an Ethernet switch. This switch can then be connected to J03 and J04 on the Support Elements. (See Figure 32 on page 132.)

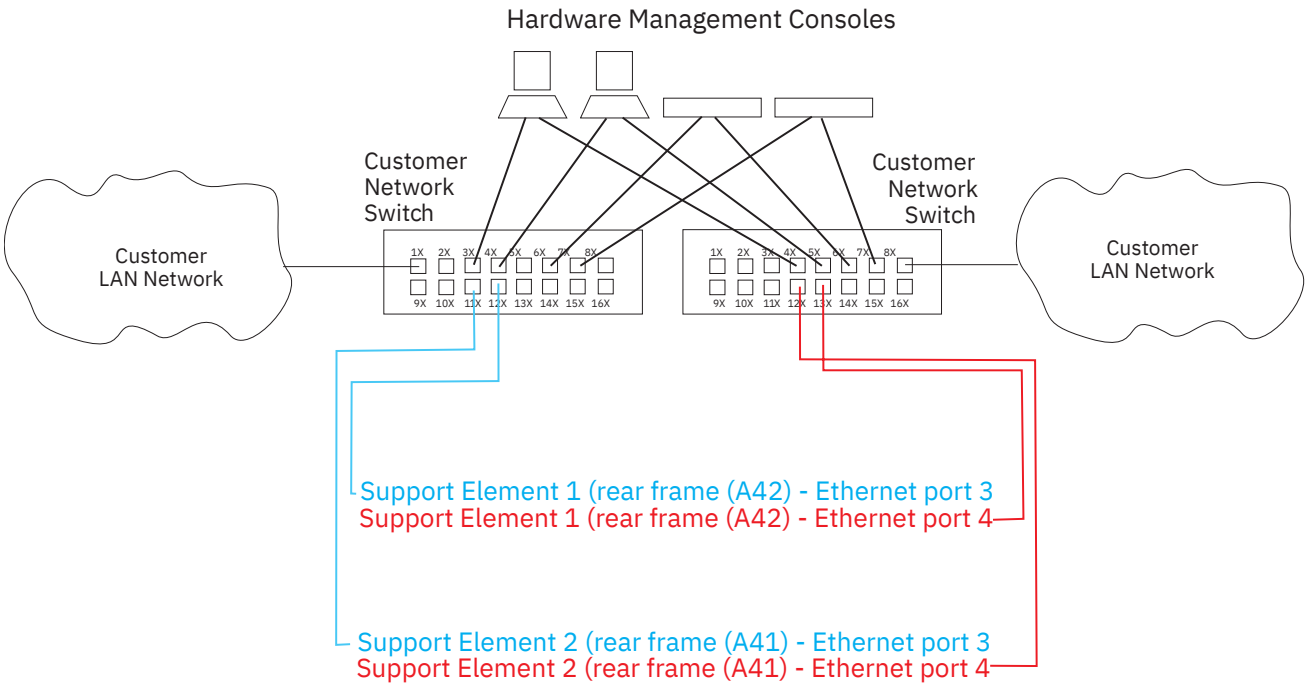


Figure 32. Two-switch configuration

Notes:

1. Connect customer LANs, via Ethernet switches, to Ethernet ports J03 and J04 on the Support Element servers. Customer **LAN 1 should be plugged into Ethernet port J03** on the Support Elements. Customer **LAN 2 should be plugged into Ethernet J04** on the Support Elements.
2. Never connect an HMC directly to Ethernet ports J03 and J04 on the Support Elements.

If the Hardware Management Appliance feature (**FC 0355**) is ordered on the 9175, the dual 1U servers function as a Support Element (SE) and a Hardware Management Console (HMC). See Figure 33 on page 133 for network connection requirements.

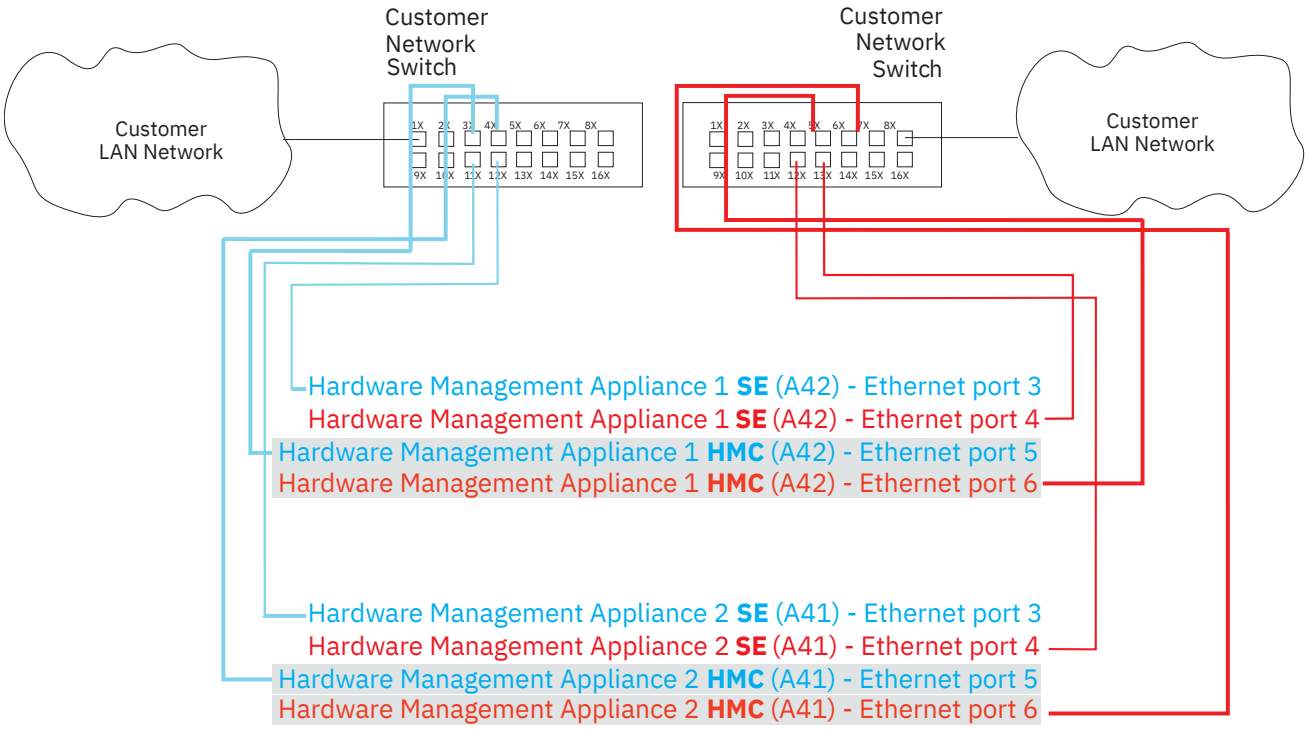


Figure 33. Two-switch configuration with Hardware Management Appliance (FC 0355)

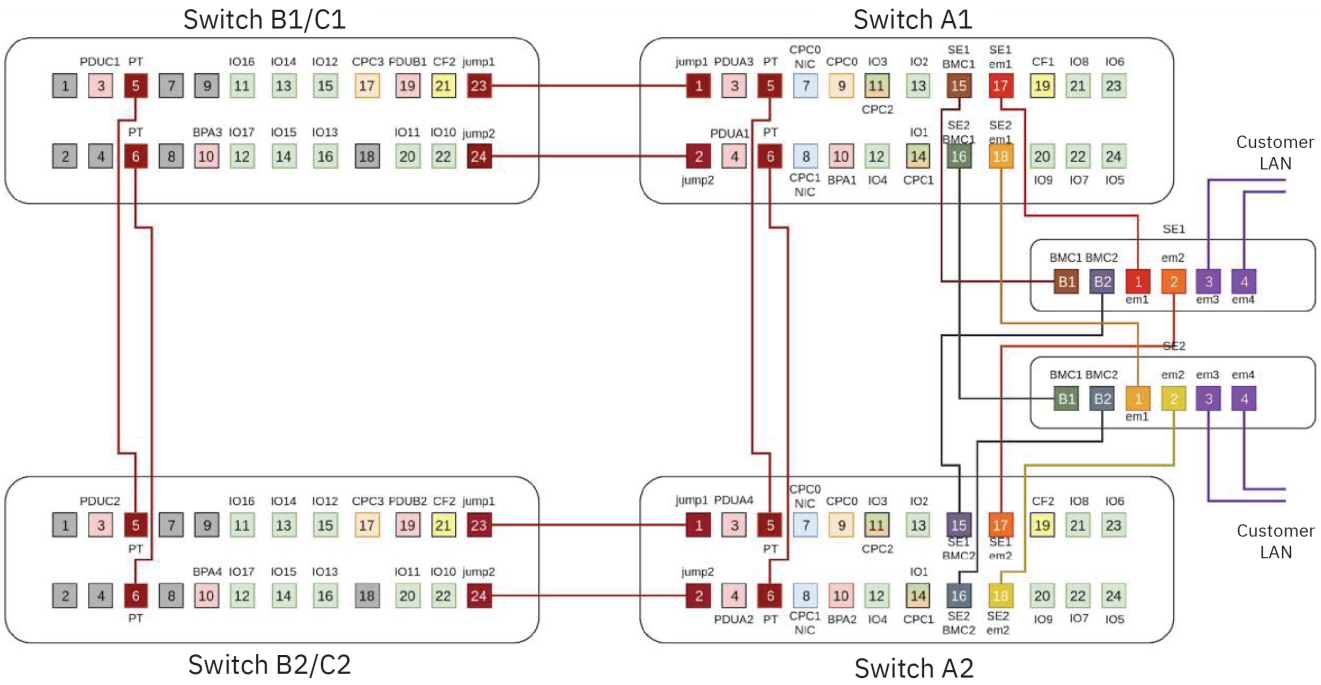


Figure 34. Ethernet Switch assignments

Hardware Management Console and Support Element wiring options

A local Hardware Management Console must be connected to its Support Elements using Local Area Network (LAN) wiring. The Hardware Management Console and the Support Elements both come with Dual Ethernet LAN adapters.

The communication protocol (TCP/IP) used in Support Element to Hardware Management Console communication is defined for both adapters in the Support Elements.

Notes on wiring with multiple adapters:

1. The Hardware Management Console supports dual Ethernet paths to Support Elements. This allows automatic redundant network paths so that the failure of a single network has no affect on Hardware Management Console to Support Element communication.
2. When configuring multiple adapters the address must be defined in different subnets.

Trusted Key Entry (TKE)

The 9175 may have one or more of the following Crypto Express features for applications where extensive data security is required.

FC 0908 or **FC 0909**: Crypto Express8S
FC 0898 or **FC 0899**: Crypto Express7S

For these systems, there is a separate console available for authorized access to the Crypto feature specified. This console is named the Trusted Key Entry (TKE) workstation.

Notes:

- TKE 10.1 (**FC 0883**) is required to manage a Crypto Express8S or Crypto Express7S feature.
- The TKE does not check the IBM Z or LinuxONE processor level. It is the version of the newest HSM on your 9175 that determines what level of TKE you must have. Use this chart to determine the level of TKE you need to manage the HSMs on your 9175:
  - TKE 10.1 is the minimum level of TKE needed to manage a crypto express 8 HSM
  - TKE 9.2 is the minimum level of TKE needed to manage a crypto express 7 HSM

  It is *always* best to be at the most current level of TKE because it can manage any level of HSM.

The supported Trusted Key Entry (TKE) features are as follows:

- The following **table top or tower** TKE workstations include a system unit, flat panel display, mouse, keyboard, and line cord.
  - FC 0058: TKE 2461-TW4
  - FC 0088: TKE 2461-TW3 (*carry forward only*)

  Note: IBM z17 (Model ME1) is the last machine family where the table top or tower hardware server form factor of the Trusted Key Entry (TKE) will be supported. The 1U TKE is available on IBM z17 (Model ME1), and the 1U TKE will be the only supported hardware in the future. For console room use of the 1U TKE, IBM recommends that there is consideration to mount the 1U TKEs in a mini racks with acoustical noise protection.
- The following **rack-mounted** TKE workstations include a system unit and a 1U console unit that holds the flat panel display and the keyboard.
  - FC 0057: TKE 2461-SE4
  - FC 0087: TKE 2461-SE3 (*carry forward only*)
- Optional TKE Tabletop KMM (keyboard, monitor, mouse) - FC 0157
- Optional 1U TKE Rack Mount KMM (keyboard, monitor, mouse) - FC 0156

Attention: FC 0087 and FC 0088 can only be carried forward; however, to use with the 9175, they must be converted by replacing the installed Crypto adapter card with a 4770 TKE Crypto adapter card (FC 0851).

The built-in Ethernet adapter supports a link data rate of 10, 100, or 1000 Mbps. The built-in Ethernet adapter supports a link data rate of 10, 100, or 1000 Mbps.

The TKE workstation attaches to the customer LAN, providing a security-rich, flexible method of providing master key and operational key entry to locally and remotely managed Cryptographic Coprocessor features.

TKE with optional Smart Card Reader (**FC 0891**), allows access to and use of confidential data on the Smart Card, protected by a user defined personal identification number (PIN) code providing secure storage, access, transport and entry of master and operational key parts into the TKE workstation. The following characteristics pertain to the Smart Card Reader:

- The Smart Card Reader is an optional security device that attaches to the TKE.

  FC 0891 contains two Smart Card Readers, two serial port "Y" adapters, two serial cables, and *20* blank smart cards. The cables provide both power source for the Smart Card Reader and the communication path between the Smart Card Reader and the TKE workstation.
  FC 0892 or **FC 0900** provide the ability to order additional blank Smart Cards. The Smart Card Reader is a corequisite for ordering additional Smart Cards.
- TKE logon profiles can be placed on smart cards, which provide enhanced control over the sign on processes.
- A TKE workstation and the TKE 7.2 or later level code are co-requisites for ordering the Smart Card Reader.
- If you currently have the Smart Card Reader feature (FC 0885) and Additional Smart Card feature (FC 0884), they can only be carried forward to TKE 10.0 as follows:
  - The smart card readers can be used on TKE 10.0 without any restrictions.
  - If you have initialized any smart cards as CA, TKE, IBM Enterprise PKCS#11 (EP11), or MCA smart cards, you can use them on your TKE 10.0 system without any restrictions.
  - If you have initialized any smart cards as IA or KPH smart cards, you cannot use them for migration tasks done with Crypto Express7S or Crypto Express8S modules.
  - A smart card from FC 0885 or 0886 can be initialized as any one of the 6 types (CA, TKE, EP11, MCA, IA or KPH) of smart cards on TKE 10.0.

To use the TKE function on 9175, the following must be installed:

FC 0908 or **FC 0909**: Crypto Express8S
FC 0898 or **FC 0899**: Crypto Express7S
FC 0882: TKE 10.0 LIC (Licensed Internal Code)
FC 3863: CP Assist for Cryptographic Function

Power requirements

- The TKE workstation (Tabletop) requires a single-phase feed from *one* customer-supplied outlet that provides one of the following voltage ranges:
  - 100 V AC - 127 V AC (nominal range)
  - 200 V AC - 240 V AC (nominal range)
- The TKE workstation (Rack Mount) requires a single-phase feed from *two* customer-supplied outlets that provide one of the following voltage ranges:
  - 100 V AC - 127 V AC (nominal range)
  - 200 V AC - 240 V AC (nominal range)
- The TKE KMM (Tabletop or Rack Mount) requires a single-phase feed from *one* customer-supplied outlet that provides the following voltage range:
  - 100 V AC - 240 V AC (nominal range)

Power requirements

For your safety, a power cord with a grounded attachment plug is provided to use with this product. To avoid electrical shock, always use the power cord and plug with a properly grounded outlet. IBM power cords used in the United States and Canada are listed by Underwriter's Laboratories (UL) and certified by the Canadian Standards Association (CSA).

Important: The provided TKE power jumper cable supports ***only*** C13-C14 connections. It is the responsibility of the customer to plan for this configuration accordingly.

- The TKE workstation (Tabletop) requires a single-phase feed from *one* customer-supplied outlet that provides one of the following voltage ranges:
  - 100 V AC - 127 V AC (nominal range)
  - 200 V AC - 240 V AC (nominal range)
- The TKE workstation (Rack Mount) requires a single-phase feed from *two* customer-supplied outlets that provide one of the following voltage ranges:
  - 100 V AC - 127 V AC (nominal range)
  - 200 V AC - 240 V AC (nominal range)
- The TKE KMM (Tabletop or Rack Mount) requires a single-phase feed from *one* customer-supplied outlet that provides the following voltage range:
  - 100 V AC - 240 V AC (nominal range)

LAN connections

LAN cabling is a customer responsibility. To connect the TKE workstation with Ethernet to a LAN, a Category 5 Unshielded Twisted Pair (UTP) cable terminated with an RJ-45 connector is required.

Planning to load images to a system from a network (electronic code load)

If you are unable to use a USB flash memory drive or **FC 0846** has been ordered, then you can use the **Manage Console Recovery** task to reload a selected system with a selected Driver 51 code image over the network (electronically). These instructions require actions on this Hardware Management Console (HMC) and the selected target system.

The target system can be any hardware that supports Driver **61**.

During the installation of all systems with **FC 0846** the network setup to support electronic code load needs to be complete. For machines that do not want to use media or do not have access to Remote Support Facility (RSF), the installation is not complete until an FTP server is configured.

The following requirements and planning must be considered before using the capability to network load a target system.

- There must be one HMC at Version 2.17.0 on every unique network subnet where a Hardware Management Console, Support Element (SE), or Trusted Key Entry (TKE) workstation is connected.
- If only a 2.16.0 HMC is available refer to *IBM Z Electronic Code Load target system MCL requirements* (https://www.ibm.com/servers/resourcelink/lib03011.nsf/pages/zElectronicCodeLoadMcl?OpenDocument) and ensure the required MCL is installed.
- BEFORE installing a new IBM z17 (Model ME1) system (that is, with SEs), the HMC must have the SE recovery code image available in the Recovery Image section of the **Manage Console Recovery** task. If it is not visible, the import capability of the **Manage Console Recovery** task can be used.
- All Hardware Management Console customer LAN interfaces on the HMC, running the **Manage Console Recovery** task, must be configured as static. (Do not use DHCP to obtain addresses.)
- The targeted console system must be reachable on a local (same) subnet from at least one of the HMCs customer LAN interfaces.
- The subnet to the target console system must not have a DHCP server on it.
- Multiple HMC servers are allowed on the same subnet serving different targets, but is not recommended.

Important: If you plan to use the electronic code load capability for target HMC or TKE systems at Driver 36 or Driver 41, you **must** ensure that the correct associated MCL is installed on your system before proceeding with the following instructions. Use the appropriate MCL listed below:

- D36C_HMC - MCL P41499.332
- D41C_HMC - MCL P46683.389
- D36C_TKE - MCL P42696.027
- D41C_TKE - MCL P46689.041

Chapter 7. Remote Support Facility (RSF) installation planning

The Remote Support Facility (RSF) provides communication to a centralized support network for problem reporting and other remote support services. Communication with the Remote Support Facility is provided using an Internet connection.

All transmissions are supported using the IBM enhanced support system. Transmission to the support system requires a Domain Name Server (DNS) to be available. It must be configured on the call-home server HMC or proxy server connecting to the internet.

Choosing a communications method for remote support

You must choose method for connecting your server to support system through the Remote Support Facility (RSF):

- A direct connection from the Hardware Management Console (HMC) to the internet. This method is fast, reliable, and uses the external customer firewall to control the connection.
- An indirect connection from the HMC to the internet by using a proxy server. This method has the advantages of the direct connection plus it allows your enterprise the added control of the proxy. Potential additional advantages include the possibilities of logging and audit facilities using the proxy server.

The following information is designed to provide your networking team with the information they need to enable the HMC to connect securely to the internet.

Security characteristics of Remote Support Facility communications include:

- Remote Support Facility (RSF) requests are always initiated from the HMC to IBM. No inbound connections are ever initiated from the support system.
- All communications between the HMC and IBM are secured using Transport Layer Security (TLS). This includes data encryption and host verification.
- Data sent to IBM consists solely of hardware problem information and configuration data. No application or customer data is transmitted.

Using the internet for remote support

The HMC can be enabled to connect directly to the Internet or to connect indirectly, through a proxy server that you provide. The decision to use either a direct or indirect Internet connection for remote support depends on the security and networking requirements of your enterprise.

Hardware Management Console Direct Internet Connection

If your Hardware Management Console can be connected to the Internet, and the external firewall can be set to allow established TCP packets to flow outbound to the IP addresses described in “Server address lists and host names” on page 144, you can use a direct connection between the HMC and the Internet. The use of Source Network Address Translation (SNAT) and masquerading rules to mask the HMC's source IP address are both acceptable.

Hardware Management Console Indirect Connection with Proxy Server

For the Hardware Management Console to communicate successfully, your proxy server must allow connections to the host names and IP addresses that are defined in the section below.

When using an indirect connection, you can choose whether the proxy is to be directed to connect to the support system using an IP address or using a host name. You can control the set of targets for that proxy using either a host name or IP address, depending upon the security policies of your installation. See “Server address lists and host names” on page 144 for the list of host names and IP addresses.

If your installation requires host name addressing, your proxy must be configured with a Domain Name Server.

Server address lists and host names

The internet-facing HMC or SSL Proxy requires outbound TCP/IP connections to be allowed to *esupport.ibm.com* port 443. When possible, use this hostname when you configure firewall and proxy rules. If needed, use the following IP addresses:

Important: It is important that the customer configures the following addresses during the planning phase to properly prepare the customer's network. The customer's network is required to allow connectivity to **both** current and new IP addresses listed in the tables below.

IPv4 addresses

Internet connectivity using IPv4 requires outbound connectivity to port 443 on the following IP addresses:

Table 45. IPv4 IP addresses and effective date notices

IPv4 address	Effective date notices
192.148.6.11	Effective March 1, 2024

IPv6 addresses

Internet connectivity using IPv6 requires outbound connectivity to port 443 on the following IP address:

Table 46. IPv6 IP addresses and effective date notices

IPv6 address	Effective date notices
2620:1f7:c010:1:1:1:1:11	Effective March 1, 2024

Bandwidth requirements

The 9175 HMA Hardware Management Console (HMC) provides you with the option to download full system firmware images (AROMs) over RSF. The image files can be as large as 10 GB in size. Depending on the bandwidth available to the HMC or proxy servers that are used for RSF, downloads may take several hours to complete.

It is recommended that the HMA HMC have at least a 10 Mbps internet connection available, for which a 5 GB file download would take approximately 1 hour.

Chapter 8. I/O cabling and connectivity

This chapter includes the following:

- A description of the top exit cabling and bottom exit cabling features.
- A list of customer fiber optic cabling responsibilities if the services are not elected.
- A description of the 9175 channel feature connections.
- A description of the Fiber Quick Connect harness bracket feature offered for customer FICON cables.

I/O cabling

You can route I/O cables:

- Through the top of the frame using:
  - Top Exit Cabling feature *with* top exit enclosure (**FC 5823**), with or without Fiber Quick Connect (FQC) harness brackets.
  - Top Exit Cabling feature *without* top exit enclosure (**FC 7803**), routing cables directly through the top of the frame
- Through the bottom of the frame using:
  - Bottom Exit cabling feature (**FC 7804**) with or without Fiber Quick Connect (FQC) harness brackets
- Through the bottom or top of the frame using the spine cable management hardware.

See Appendix B, “Top Exit cabling and Bottom Exit cabling specifications,” on page 181 for information on the top exit cabling feature and the bottom exit cabling feature.

Customer fiber optic cabling responsibilities

If you choose to plan and install your own I/O cabling, these are the specific tasks you must complete.

1. All cable planning and support
   - For cable management best practices and guidelines, see *IBM Z 9175 External Cabling Best Practices Guide* (https://www.ibm.com/support/pages/node/7229729).
   - If fiber trunking is ordered and to be used, determine whether “Key Up / Key Up” or “Key Up / Key Down” polarity coupling will be used for Fiber Quick Connect (FQC).
2. All purchasing of correct qualified cables.

   Important: The IBM Fiber Transport System (FTS) trunking feature is not offered with the 9175. The customer is responsible to engage third party vendors to purchase a fiber trunking solution, if desired.
3. All installation of any required fiber optic or OSA-Express copper cables
4. All routing of cables to correct back floor cutouts for proper installation to the machine
5. All labeling of cables with PCHID numbers for proper installation to the machine.

Failure to accomplish these cabling tasks properly could lead to additional service charges during the machine installation in order to correct any problems incurred.

All jumper cables, cable components, and connector options are available through IBM Global Services. Contact your IBM installation planning representative, IBM product specialist, or IBM Connectivity Services specialist for details.

Note: Customer cabling preparation does not include plugging cables into the 9175.

CAUTION: Servicing of this product or unit is to be performed by trained service personnel only. (C032)

FICON channel feature

FICON channels offer fast, efficient data transfer while allowing reuse of currently installed single mode and multimode fiber optic cables.

FICON Express32G
Delivers up to 32 Gbps link data rate to servers, switches, control units and storage devices.

FICON Express32S
Delivers up to 32 Gbps link data rate to servers, switches, control units and storage devices. Provides support for IBM Fibre Channel Endpoint Security.

FICON Express16SA
Delivers up to 16 Gbps link data rate to servers, switches, control units and storage devices. Provides support for IBM Fibre Channel Endpoint Security.

Configuration information

Table 47 on page 147 lists the FICON features. These features support two modes of operation:

- FC - native FICON
- FCP - Fibre Channel Protocol - attachment to SCSI disks in Linux on IBM Z and z/VM® environments.

Table 47. FICON feature codes

Feature code	Description	Fiber type
FC 0388 (4 ports)	FICON Express32G SX (Short Wavelength)	multimode 50 and 62.5 micron
FC 0387 (4 ports)	FICON Express32G LX (Long Wavelength)	single mode 9 micron
FC 0462 (2 ports)	FICON Express32S SX (Short Wavelength)	multimode 50 and 62.5 micron
FC 0461 (2 ports)	FICON Express32S LX (Long Wavelength)	single mode 9 micron
FC 0437[1] (2 ports)	FICON Express16SA SX (Short Wavelength)	multimode 50 and 62.5 micron
FC 0436[1] (2 ports)	FICON Express16SA LX (Long Wavelength)	single mode 9 micron

Notes:

1. This feature can be carried forward to IBM z17 (Model ME1).
2. All FICON Express feature codes use LC Duplex connectors.
3. Each feature code represents a FICON base adapter with pluggable optic modules.
4. Short wavelength and long wavelength optic modules cannot be mixed on the same FICON base adapter.
5. Short wavelength and long wavelength features (FICON adapters) can coexist in the same PCIe+ I/O drawer.

See "FICON references" on page 149 for information about link distances and light loss budget.

The following illustrations show the FICON features, the ports on the feature, and the type of connector used.

Figure 35. FICON Exress32G features

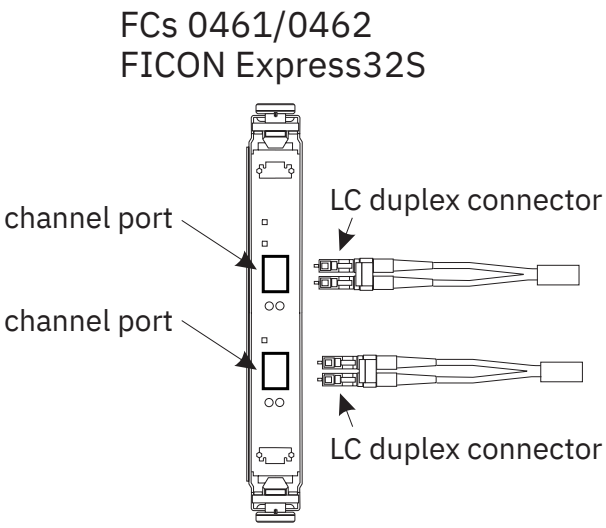


Figure 36. FICON Exress32S features

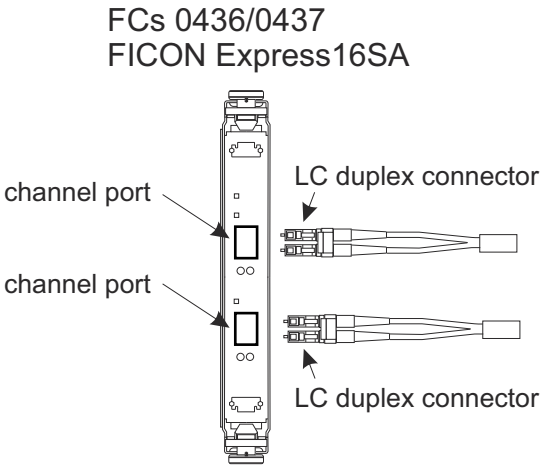


Figure 37. FICON Express16SA features

FICON references

For additional information on planning for FICON channels see:

- *Planning for Fiber Optic Links (FICON/FCP, Coupling Links, Open Systems Adapters, zHyperLink Express, and RoCE Express)* available on IBM Documentation at https://www.ibm.com/docs/en/systems-hardware/zsystems/9175-ME1?topic=library-planning-fiber-optic-links
- *FICON Channel-to-Channel Reference* available on IBM Documentation at https://www.ibm.com/docs/en/systems-hardware/zsystems/9175-ME1?topic=library-ficon-channel-channel-reference

Fiber Quick Connect for FICON cabling

Similar to the previous system, the 9175 no longer offers the IBM Fiber Transport System (FTS) trunking feature. The customer is responsible to engage third party vendors to purchase a fiber trunking solution, if desired.

You can, however, order the Fiber Quick Connect (FQC) brackets and mounting hardware on the 9175 to connect to customer-provided cables in the Top Exit enclosure and/or Bottom Exit tailgate.

Note: It is the customer's responsibility to install the FQC brackets and hardware, or to arrange for the System Service Representative (SSR) to install them. Instructions for installing the FQC brackets can be found in the *9175 Installation Manual*, GC28-7050.

Table 48. Fiber Quick Connect feature codes

Feature code	Description
5824	FQC "Key Up / Key Down" harness bracket and mounting hardware, with Top Exit Enclosure (FC 5823)
5826	FQC "Key Up / Key Up" harness bracket and mounting hardware, with Top Exit Enclosure (FC 5823)
5827	FQC "Key Up / Key Down" harness bracket and mounting hardware, with Bottom Exit tailgate (7804)

The Fiber Quick Connect feature enables trunk cables to connect to FICON channels using under-the-cover attachment harnesses. **It is critical for the customer to determine *prior* to their system order, what polarity of fiber optic trunk coupling – "Key Up / Key Up" or "Key Up / Key Down" – that their datacenter infrastructure will use.** FQC features must then be selected according to Table 48 on page 150.

Note: "Key Up / Key Up" is *not* supported in the Bottom Exit configuration

Figure 38 on page 150 shows the Fiber Quick Connect feature hardware for the Top Exit Enclosure feature. For top exit, the FQC harness bracket has the same shape and structure for both "Key Up / Key Up" and "Key Up / Key Down" polarities, but have different interconnect coupler keying. Figure 39 on page 151 shows the hardware for the Bottom Exit feature.

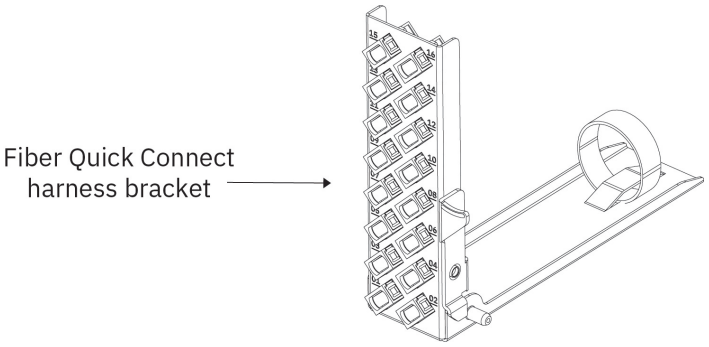


Figure 38. FQC harness bracket and mounting hardware, with top exit (FC 5823)

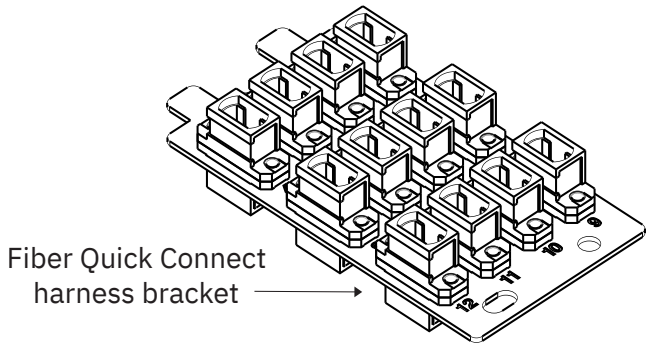


Figure 39. FQC harness bracket and mounting hardware, with bottom exit (7804)

The harness brackets use an MTP connector, and the FICON connectors are routed to the feature cards the frame.

Important Notes:

- A **minimum** of two FQC brackets are required with any frame that contains a Third Party Fiber Trunking feature. A **maximum** of six FQC brackets are supported in the top exit, four FQC brackets in the bottom exit.
- The top exit FQC harness bracket and mounting hardware (either **FC 5824** or **FC 5826**) must be ordered in conjunction with the Top Exit Cabling feature (**FC 5823**). FC's 5823, 5824, and 5826 are not factory-installed but are shipped separately and assembled as part of system installation.
- The bottom exit FQC harness bracket and mounting hardware (**FC 5827**) must be ordered in conjunction with the Bottom Exit Cabling feature (**FC 7804**). The combination of FC 7804 and FC 5827 are factory-installed in preparation for system field installation.
- For more information, refer to the *Planning for Fiber Optic Links (FICON/FCP, Coupling Links, Open Systems Adapters, zHyperLink Express, and RoCE Express)* , GA23-1410 and contact the listed distributors to order any new or additional cabling needed in time for delivery prior to installation.

Figure 40 on page 152 provides the FQC brackets plugging locations along the tailgate for the **Bottom Exit feature (FC 7804)**. Note the possible bracket locations:

- A01R and A01U = first FQC bracket locations
- A01P and A01W = second FQC bracket locations

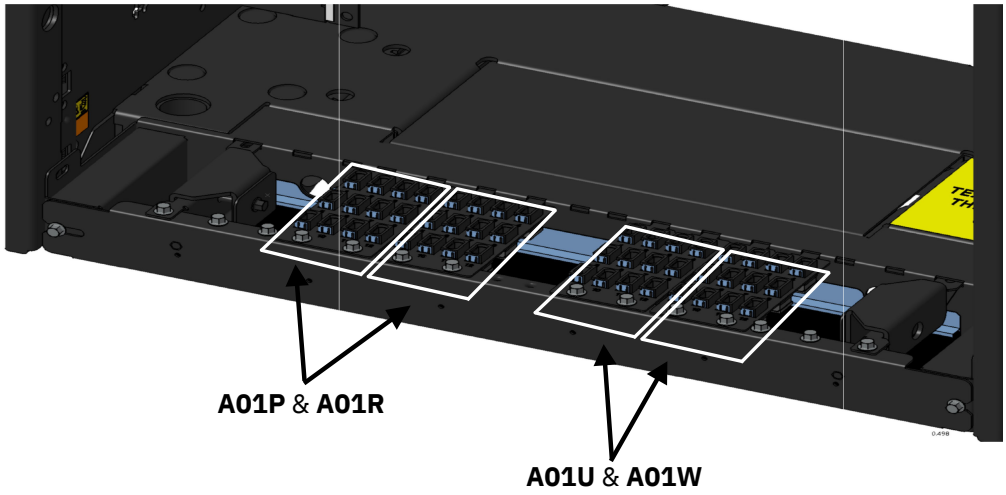


Figure 40. Fiber Quick Connect mounting brackets - Bottom Exit feature (FC 7804)

Figure 41 on page 153 provides the FQC brackets plugging locations on the **Top Exit Enclosure feature (5823)**. The top exit FQC brackets are plugged in a pair, starting at the outer-most bracket locations and moving inward as follows:

- 1 and 6 = first FQC bracket pair locations
- 2 and 5 = second FQC bracket pair locations
- 3 and 4 = third FQC bracket pair locations

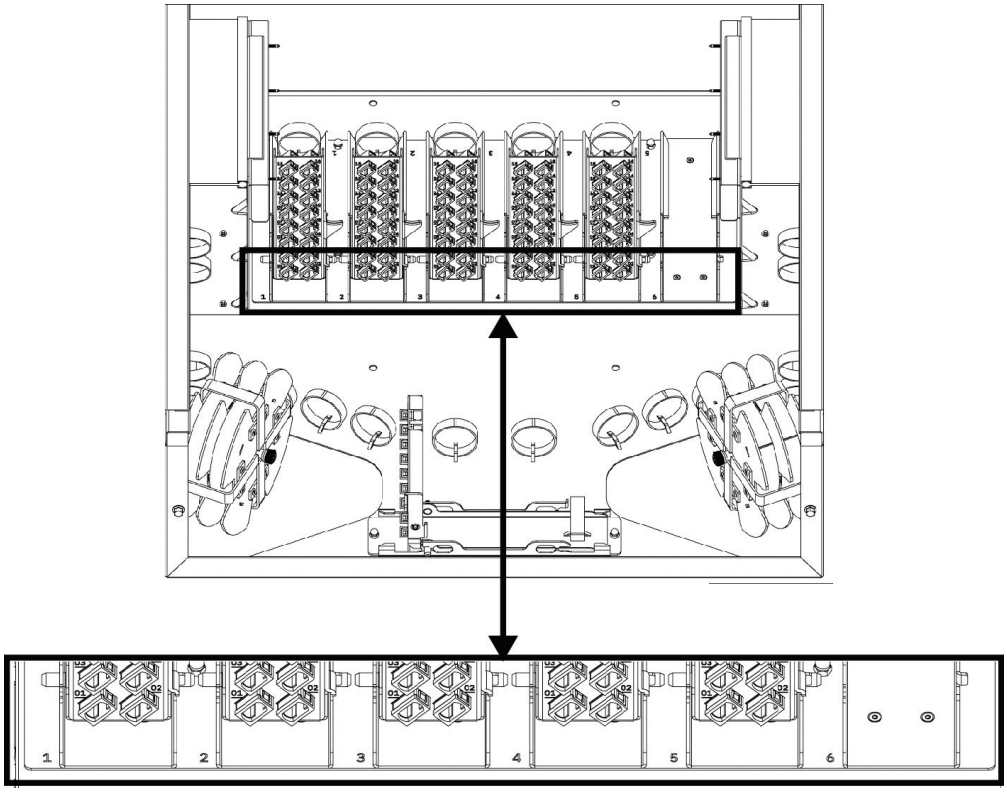


Figure 41. Fiber Quick Connect mounting brackets - Top Exit Enclosure (FC 5823)

If you are planning to use the Fiber Quick Connect feature for FICON channels, contact IBM Networking Services for assistance. Networking Services will help you plan for the trunking cabling solution that meets your individual system requirements. Your installation planning representative, product specialist, or service representative will provide you with the information necessary to contact Networking Services.

OSA-Express features

Open Systems Adapter-Express (OSA-Express) features enable connectivity to industry-standard local area networks (LANs).

Configuration information

Table 49 on page 154 lists the supported OSA-Express features.

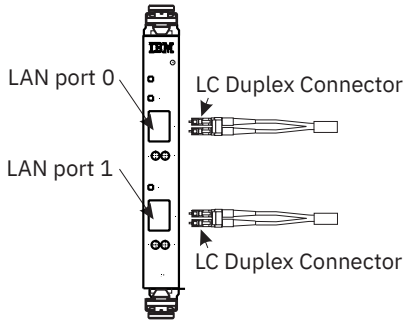
Table 49. OSA-Express feature codes

Feature code	Feature description	Cable description	Connector type
FC 0460 (1 port)	OSA-Express7S 25 GbE LR 1.2	9 micron single mode	LC Duplex
FC 0459 (1 port)	OSA-Express7S 25 GbE SR 1.2	50 and 62.5 micron multimode	LC Duplex
FC 0458 (2 ports)	OSA-Express7S 1000BASE-T 1.2	Category 5 UTP copper wire	RJ-45
FC 0457 (1 port)	OSA-Express7S 10 GbE SR 1.2	50 and 62.5 micron multimode	LC Duplex
FC 0456 (1 port)	OSA-Express7S 10 GbE LR 1.2	9 micron single mode	LC Duplex
FC 0455 (2 ports)	OSA-Express7S GbE SX 1.2	50 and 62.5 micron multimode	LC Duplex
FC 0454 (2 ports)	OSA-Express7S GbE LX 1.2	9 micron single mode	LC Duplex
FC 0446[1] (2 ports)	OSA-Express7S 1000BASE-T	Category 5 UTP copper wire	RJ-45
FC 0445[1] (1 port)	OSA-Express7S 10 GbE SR	50 and 62.5 micron multimode	LC Duplex
FC 0444[1] (1 port)	OSA-Express7S 10 GbE LR	9 micron single mode	LC Duplex
FC 0443[1] (2 ports)	OSA-Express7S GbE SX	50 and 62.5 micron multimode	LC Duplex
FC 0442[1] (2 ports)	OSA-Express7S GbE LX	9 micron single mode	LC Duplex

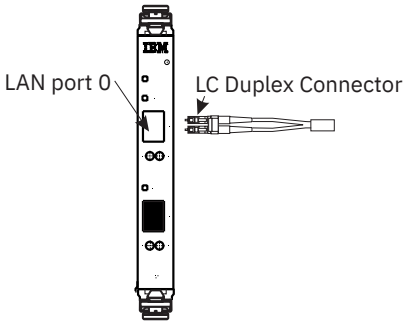
Notes:

1. This feature can be carried forward to IBM z17 (Model ME1).

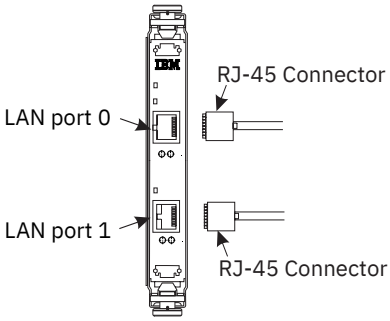
FCs 0454/0455
OSA Express7S
Gigabit Ethernet LX/SX 1.2



FCs 0456/0457
OSA Express7S
10 Gigabit Ethernet LR/SR 1.2



FCs 0458
OSA Express7S
1000Base-T Ethernet 1.2



FCs 0459/0460
OSA Express7S
25 Gigabit Ethernet LR/SR 1.2

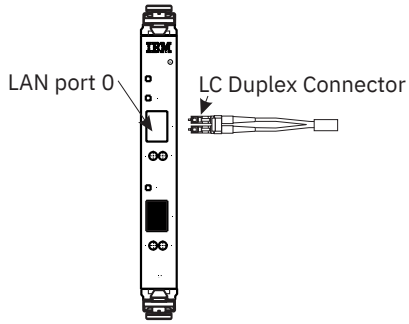


Figure 42. OSA-Express7S 1.2 features

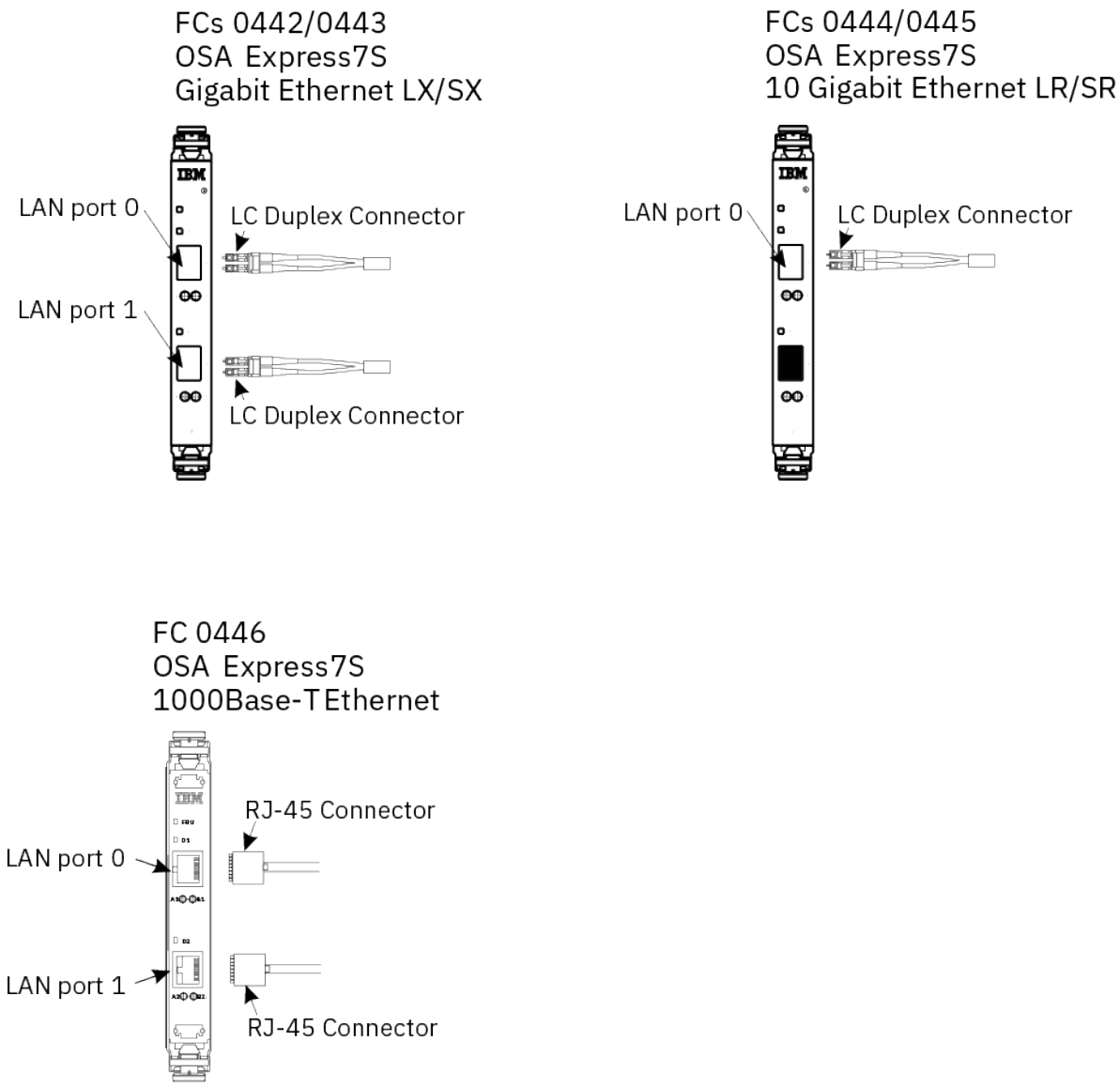


Figure 43. OSA-Express7S features

OSA-Express reference

For additional information on planning for OSA features, see the following publications that are available on IBM Documentation at https://www.ibm.com/docs/en/systems-hardware/zsystems/9175-ME1?topic=related-publications:

- *Open System Adapter-Express Integrated Console Controller Dual Port User's Guide*
- *Open Systems Adapter-Express Customer's Guide and Reference*
- *Planning for Fiber Optic Links (FICON/FCP, Coupling Links, Open Systems Adapters, zHyperLink Express, and RoCE Express)*

Network Express features

Network Express features enable connectivity to industry-standard local area networks (LANs).

Configuration information

Table 50 on page 158 lists the supported Network Express features.

Note: For clients using IBM Network Express 10G or 25G on z/OS versions 2.5 or 3.1, it is recommended to set up a maximum of 16 NETH FIDs on the same adapter when OSH is also enabled.

Table 50. Network Express feature codes

Feature code	Feature description	Cable description	Connector type
FC 0524 (2 ports)	Network Express SR 10G	50 and 62.5 micron multimode	LC Duplex
FC 0525 (2 ports)	Network Express LR 10G	9 micron single mode	LC Duplex
FC 0526 (2 ports)	Network Express SR 25G	50 and 62.5 micron multimode	LC Duplex
FC 0527 (2 ports)	Network Express LR 25G	9 micron single mode	LC Duplex

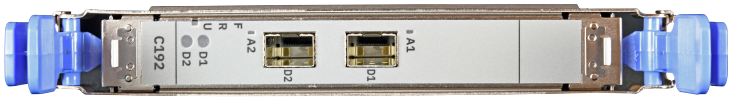


Figure 44. Network Express card(s)

I/O interconnect fanout cards

A PCIe+ Fanout card supports 2 copper PCIe 16 GBps interconnect cables. PCIe+ Fanouts are used to connect the CPC processor drawer to the PCIe+ I/O drawer(s).

Coupling link fanout cards

The 9175 supports the following coupling features.

Feature code	Description	Maximum # of features	Maximum connections	Order increments per feature	Fiber type	Connector type
FC 0216 (2 ports)	Integrated Coupling Adapter2.0 (ICA SR2.0)	48	96 links	1	SX laser 50 micron	MTP
FC 0498 (2 ports)	Coupling Express3 LR 10Gb	64	128 links	1	9 micron single mode	LC Duplex
FC 0499 (2 ports)	Coupling Express3 LR 25Gb	64	128 links	1	9 micron single mode	LC Duplex

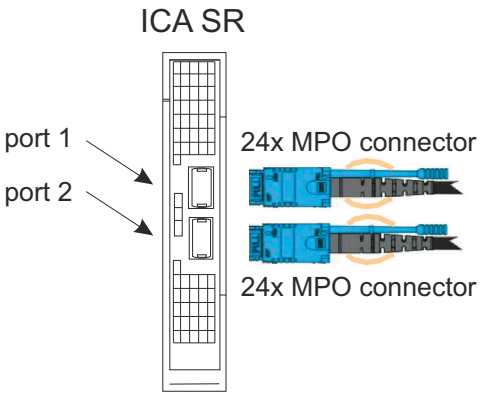
Integrated Coupling Adapter2.0 SR (ICA SR2.0) feature

Integrated Coupling Adapter2.0 (ICA SR2.0) - **FC 0216** feature supports PCIe Gen3 for coupling communication between systems, and it resides in the PCIe fanout slot in the CPC drawer. If you are planning to install PCIe Gen3 Coupling or Sysplex links, you will have to place connected servers no further than 150 meters (492 feet) from each other.

PCIe Gen3 provides up to a 16.0 Gbps* fiber optic connection (8 Gbps in each direction) between IBM z17 (Model ME1), IBM z16 (Model A01), IBM z15 Model T02 , and z15 machines. A PCIe Gen3 fiber optic cable (150 m - 50 micron multimode OM4; 100 m - 50 micron multimode OM3) connects directly to a port on the ICA SR2.0 fanout card. It is recommended that you order ICA SR cabling through Anixter to get IBM qualified cables. For more information, see *Planning for Fiber Optic Links (FICON/FCP, Coupling Links, Open Systems Adapters, zHyperLink Express, and RoCE Express)* .

Note: * The link data rates, (for example, 6.0 Gbps, 8.0 Gbps, and 5 Gbps), do not represent the performance of the links. The actual performance is dependent upon many factors including latency through the adapters, cable lengths, and the type of workload.

- You can order ICA SR2.0 (**FC 0216**) in increments of one feature (2 ports), up to a maximum of 48 features (96 ports). ICA SR2.0 supports up to four CHPIDs per port.
- There are no supported carry forward features.



Coupling Express3 LR features

Coupling Express3 LR 10Gb feature (**FC 0498**) supports long-distance point-to-point coupling communications between IBM z17 (Model ME1), IBM z16, and IBM z15 machines.

Coupling Express3 LR 25Gb feature (**FC 0499**) supports long-distance point-to-point coupling communications between IBM z17 (Model ME1) machines only. This feature cannot be interconnected with the 10Gb version.

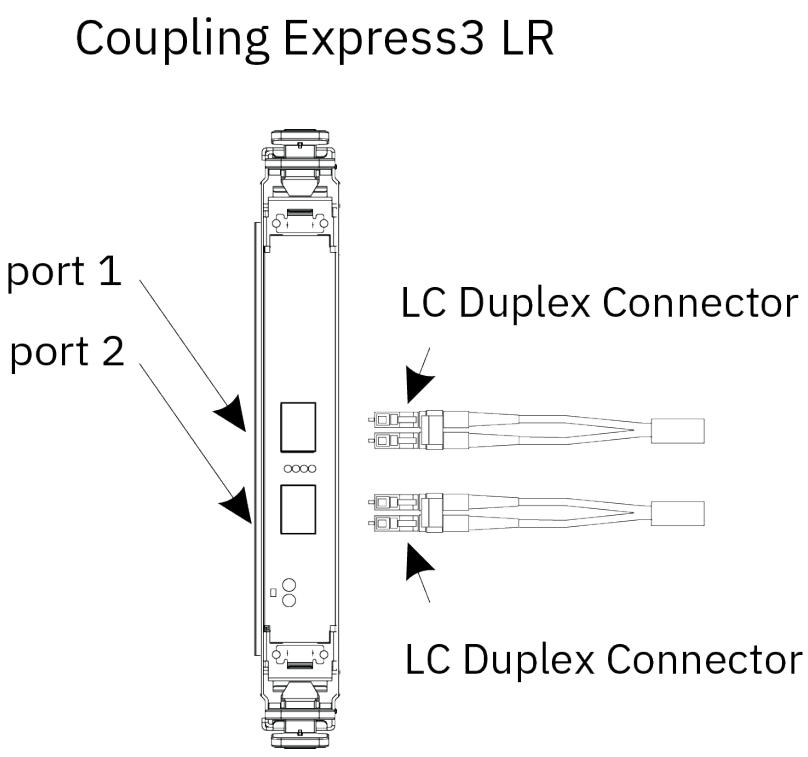
The Coupling Express3 LR adapter connects to a card slot in the PCIe+ I/O drawer.

Coupling Express3 LR is a two-port, Ethernet-based coupling card with a data rate of 10.0 Gbps* and a maximum unrepeated distance of 10 km and a maximum repeated distance of 100 km with a qualified Dense Wavelength Division Multiplexing (DWDM) device. Coupling Express3 LR utilizes a 9 micron single mode cable that connects to the Coupling Express3 LR card using LC Duplex connectors on both ends. It is recommended that you order Coupling Express3 LR cabling through Anixter to get IBM qualified cables. For more information, see *Planning for Fiber Optic Links (FICON/FCP, Coupling Links, Open Systems Adapters, zHyperLink Express, and RoCE Express)* .

Note: * The link data rates, (for example, 6.0 GBps, 8.0 GBps, 5 Gbps, and 10 Gbps), do not represent the performance of the links. The actual performance is dependent upon many factors including latency through the adapters, cable lengths, and the type of workload.

- You can order Coupling Express3 LR (**FC 0498**) 10Gb in increments of one feature (2 ports), up to a maximum of 64 features (128 ports). Coupling Express3 LR supports up to four CHPIDs per port.
- You can order Coupling Express3 LR (**FC 0499**) 25Gb in increments of one feature (2 ports), up to a maximum of 64 features (128 ports). Coupling Express3 LR supports up to four CHPIDs per port.
- There are no supported carry forward features.

Coupling Express3 LR requires the presence of an IFP processor.



IBM Virtual Flash Memory (FC 0644)

IBM Virtual Flash Memory (**FC 0644**) is designed to help improve application availability and to handle paging workload spikes.

Ordering IBM Virtual Flash Memory can cause memory DIMMS to be installed when the machine is configured. Each feature provides 512 GB of memory. You can order up to 12 features.

Note: There is a possibility that ordering IBM Virtual Flash Memory may reduce the maximum orderable customer memory for a given model.

IBM Spyre AI Reserve Slot (FC 0061)

IBM Spyre® AI Reserve Slot (**FC 0061**) is offered for plan-ahead purposes, in support of the IBM Spyre AI Accelerator that will be made available later this year.

The IBM Spyre AI Accelerator card integration provides an IBM Z Level of Integration, Reliability, Availability, and Serviceability (RAS) and Security. This feature enable quick AI stack update cycles in a swiftly changing AI environment.

Ordering **FC 0061** will reserve the desired quantity of PCIe+ I/O drawer slots for Spyre AI Adapters (**FC 0463**) that can be ordered as a future MES. These reserved slots can be ordered in blocks of 8, up to a maximum of 48.

Figure 45. IBM Spyre AI Accelerator card

IBM Spyre AI Accelerator plugging rules

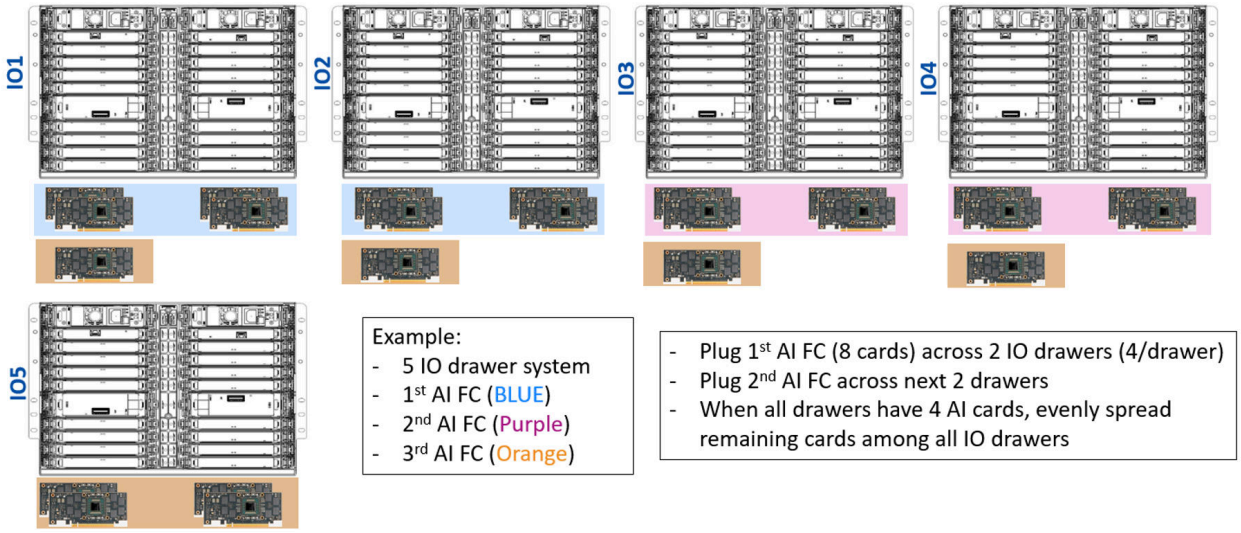
The following plugging rules for IBM Spyre AI Accelerator within the PCIe+ I/O drawer optimize system RAS, power, I/O bandwidth, AI performance, cooling airflow, and acoustics.

- There are 16 I/O slots per 8U I/O drawer
- Start with a minimum of 4 per drawer (base building block with 2 per I/O drawer domain)
- After 4 per drawer, spread cards evenly into the defined plug locations, up to a maximum of 8 per drawer (8 assures drawer power is under its limit when the other slots contain I/O)

IBM Spyre AI Reserve Slot (**FC 0061**) is the plan-ahead feature that places fillers in the correct potential future I/O locations. A future MES to add these cards then, will not require moving other I/O cards/cables or adding PCIe+ I/O drawers, rather just replacing fillers with the IBM Spyre AI Accelerator cards.

Example

The following is an example of how 8x, 16x, and 24x IBM Spyre AI Accelerator cards would be distributed among a 5 I/O drawer system:



Native PCIe adapters

The following features utilize industry standard PCIe adapters (called native PCIe adapters). They physically plug into a mother card that provides Vital Product Data (VPD) and hot-plug capability. The features then plug into the PCIe+ I/O drawer.

Table 51. Native PCIe adapter feature codes

Feature code	Description
FC 0351	IBM zHyperLink Express2.0
FC 0448	IBM Adapter for NVMe1.1
FC 0528	IDAA Internal Storage (15TB)

These native cards do not have CHPID assignments. They have Virtual Functions (VFs) that are defined in IOCP/HCD. PCHIDs are still applicable with native cards.

IBM zHyperLink Express 2.0

The zHyperLink Express2.0 feature is designed to provide fast access to data through reduce latency using point-to-point PCIe Gen3 connections with a maximum cable length of 150 meters (492 feet).

- You can order zHyperLink Express2.0 (**FC 0351**) in increments of 1 feature (2 ports per feature), up to a maximum of 16 features (32 ports).
- There are no supported carry forward features.

zHyperLink Express2.0 requires the presence of an IFP processor. The zHyperLink Express2.0 card requires a customer supplied cable.

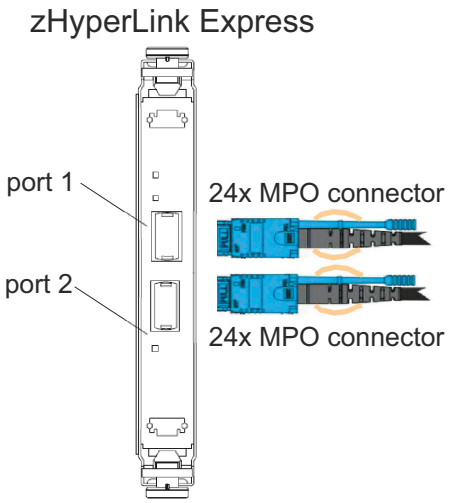


Figure 46. zHyperLink Express2.0 feature

IBM Adapter for NVMe1.1 and IDAA Internal Storage

The IBM Adapter for NVMe (Non-Volatile Memory Express) feature utilizes NVMe to provide IBM LinuxONE Emperor 5 (Model ML1) fast access to data stored on Solid State Drives (SSDs). NVM Express is an open collection of standards and information to fully expose the benefits of non-volatile memory in all types of computing environments from mobile to data center. NVMe™ is designed from the ground up to deliver high bandwidth and low latency storage access for current and future NVMe technologies.

IBM Adapter for NVMe details:

- Only available with both IBM z17 (Model ME1) and IBM LinuxONE Emperor 5 (Model ML1)
- A zero port, single PCHID adapter card
- Order the adapter in increments of 1 feature, with maximum of 16 features
  - You can order the IBM Adapter for NVMe1.1 (**FC 0448**).
  - You can order the IDAA Internal Storage (15TB) (**FC 0528**).

IBM provides the adapter card into which a vendor NVMe SSD can be plugged. The NVMe SSD is customer supplied and installed into the IBM adapter card by the IBM service representative.

Important:

Once installed, any future servicing of the customer supplied NVMe SSD requires a service contract to be in place. The servicing or replacement of the NVMe SSD by an IBM Service Representative is **not** covered under Warranty or Maintenance Agreement.

Attention: The selection and purchase of the SSDs in this feature are the responsibility of the customer. The *IBM LinuxONE NVMe white paper* (https://www.ibm.com/downloads/cas/QK53QV0E) lists the performance of SSDs that IBM has tested for LinuxONE. IBM can only comment on the functionality of the SSDs that have been tested. The customer assumes all risk in, and IBM is not responsible for, the use of SSDs as the functionality or performance may vary.

Notes

- The NVMe SSD must meet the following optional specification items:
  - Support 64 bit PCIe addressing
  - Support Host Controlled Thermal Management
  - Support Thermal Throttling
  - Support single port PCIe x4 only
- Linux on IBM Z:
  - Ubuntu 18.04 LTS with service
  - IBM is working with its Linux distribution partners to include support in future distributions releases
- Specifications:
  - NVM Express 1.2b
  - PCI Express Base Specification Rev 3.1
  - Enterprise SSD Form Factor Version 1.0a (Single Port Only)
  - PCI Express Card Electro-Mechanical Spec. Rev 3.0
- Form Factor:
  - U.2 2.5'' (15 mm) Form factor U.2-compatiable connector (formerly SFF-8639)
  - 25W max power consumption

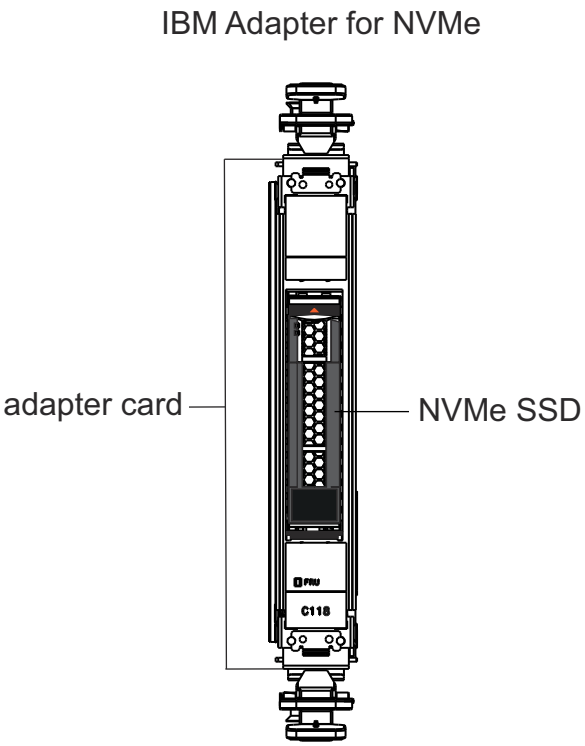


Figure 47. IBM Adapter for NVMe feature

Figure 48. IDAA Internal Storage

The IBM Adapter for NVMe feature resides in the PCIe+ I/O drawer.

Time synchronization

Synchronized time is possible with a 9175 in a Sysplex environment using Server Time Protocol (STP). STP supports Coordinated Timing Networks (CTNs) where the 9175 machines in the network are configured to be in STP timing mode.

Server time protocol

Server Time Protocol (**FC 1021**) requires no special cables to create timing links with other servers.

You can use PCIe Gen3 (ICA SR feature (FC 0176 or FC 0172) fiber optic cables or Coupling Express LR (FC 0433) Ethernet cables to create the Sysplex. IBM z17 (Model ME1) or IBM LinuxONE Emperor 5 (Model ML1) can participate in a timing network with IBM z17 (Model ME1), IBM LinuxONE Emperor 5 (Model ML1), IBM z16 (Model A01), IBM LinuxONE Emperor 4 (Model LA1), IBM z15 Model T02 , IBM LinuxONE III Model LT2, z15, and IBM LinuxONE III.

External Time Source

An STP CTN has the capability of configuring as its time source a Network Time Protocol (NTP) time server or a Precision Time Protocol (PTP) time server that has a pulse per second (PPS) output signal. This type of external time device is available worldwide from several vendors that provide network timing solutions. The NTP and PTP timing networks are connected directly to the oscillator card(s) in the CPC drawer(s) because the NTP or PTP client runs in a firmware partition within the CPC drawer.

Precision Time Protocol (PTP) considerations: To exploit Precision Time Protocol (PTP) for STP, a PTP `TimeTransmitter` (PTP time source) must be present on the existing, Ethernet based management network. In addition, it is recommended that all network devices connected between the PTP time source and the CPC drawer(s) have PTP support enabled.

External Time Source (ETS) IP network considerations: When planning the Ethernet based External Time Source network, it is recommended that one or two subnets corresponding to ETS1 and ETS2 are routable to the desired NTP/PTP time source(s).

Important:

- One NTP or PTP time server can be configured to each PPS port.
- Connecting the pulse per second coaxial cable to the NTP or PTP time server may be done by either customer or service personnel.
- **ETS1**/**ETS2** ports support 1000BASE-T Ethernet connections with auto-negotiation up to 1 GbE full duplex.
- When installing ETS Ethernet cables, consider the minimum recommended bend radius. Generally, it is recommended that the bend radius of solid core Ethernet to be *no less than 8 times* the size of the outer jacket; consult your Ethernet vendor for exact specifications.
- Installation with *top exit (FC 7803) or (FC 5823)* feature:
  - ETS cables should enter the frame through the D hole at the ***top***, ***front*** of the A `frame`.
- Installation with *bottom exit (FC 7804)* feature:
  - ETS cables should be pre-installed and terminated with excess of 5.5 meters from the bottom cable exit point in the back of the A `frame`. This includes the (up to two) Ethernet cables required for **ETS1**/**ETS2** connections and the (up to two) coaxial cables for **PPS0**/**PPS1** (if configured).
  - During installation, these cables should be routed through the hole on the upper portion of the A `frame` and back down to CPC drawer A10/A15.
- For more information, see *IBM Z 9175 External Cabling Best Practices Guide* (https://www.ibm.com/support/pages/node/7229729).

The Ethernet output of the NTP or PTP time server is connected to the input Ethernet connector provided on the oscillator card on the 9175.

- If the 9175 has 1 CPC drawer, the PPS and ETS ports correspond to the oscillator cards as follows:
  - **PPS0** to port J02 of **OSC0** (H101) in CPC0 (A10)
  - **PPS1** to port J02 of **OSC1** (H102) in CPC0 (A10)
  - **ETS1** to port J03 of **OSC0** (H101) in CPC0 (A10)
  - **ETS2** to port J03 of **OSC1** (H102) in CPC0 (A10)

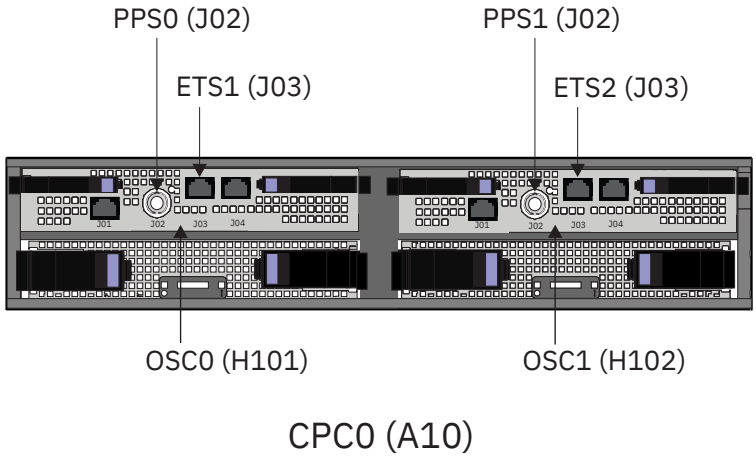


Figure 49. Single CPC drawer configuration - front view

- If the 9175 has *2 or more* CPC drawers, the PPS and ETS ports correspond to the oscillator cards as follows:
  - **PPS0** to port J02 of **OSC0** (H101) in CPC0 (A10)
  - **PPS1** to port J02 of **OSC0** (H101) in CPC1 (A15)
  - **ETS1** to port J03 of **OSC0** (H101) in CPC0 (A10)
  - **ETS2** to port J03 of **OSC1** (H102) in CPC1 (A15)

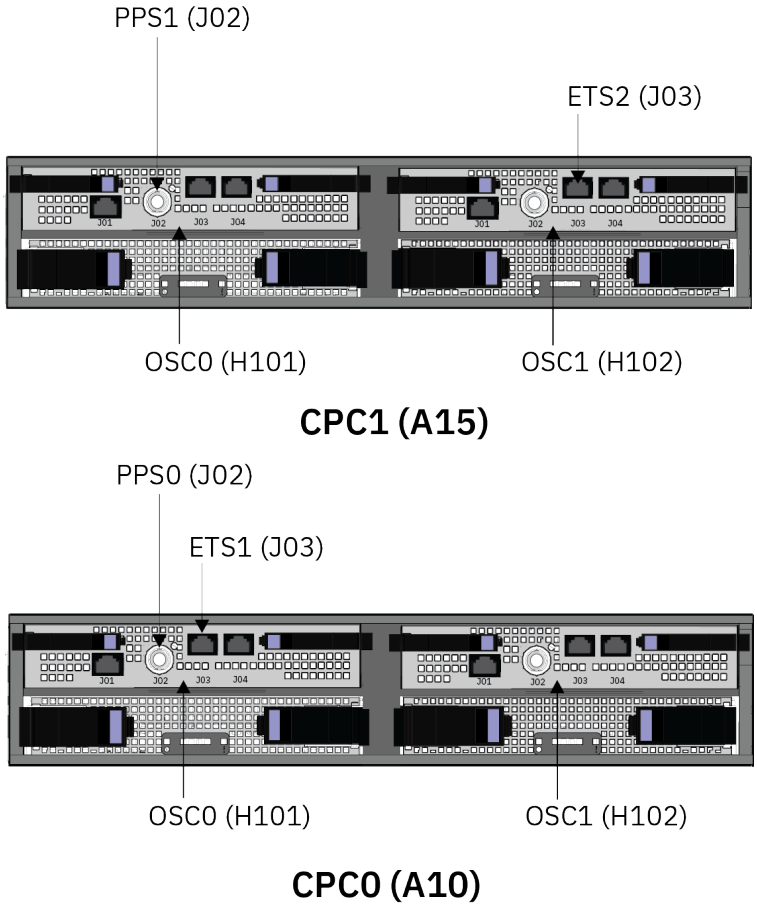


Figure 50. Multiple CPC drawer configuration - front view

The pulse per second (PPS) port on the oscillator cards requires a signal with the characteristics listed in Table 52 on page 170. Your network timing solution vendor can assist with the necessary cabling and signal distribution hardware required to meet these characteristics for your specific machine installation.

With a low signal loss PPS distribution, timing solutions can be achieved to exceed 150 feet (45 meters) between the last distribution point and the oscillator card PPS port.

For the input signal received at the oscillator card PPS port, the rise time/fall time of the PPS signal must be shorter or equal to 50 microseconds.

Table 52. PPS signal characteristics

	Unit of measure	Minimum	Typical	Maximum
Voltage Level LOW	volt	0		0,15
Voltage Level HIGH	volt	3,2		5,2
Rise time	microsecond			50

Table 52. PPS signal characteristics (continued)				
	Unit of measure	**Minimum**	**Typical**	**Maximum**
Fall time	microsecond			50
Pulse width	millisecond	50	125	450

Ordering PPS cables

If you are planning to place this server in an STP-only Coordinated Timing Network using NTP or PTP with pulse per second as the external time source, you must supply the coaxial cables that connect the 9175 to the NTP/PTP server providing the PPS signal.

Note: When installing the PPS cable, you **must** connect the right angle adapter to the cable *before* you connect the cable to the 9175.

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)

Preparing configuration definition

The customer is responsible for preparing a definition of the I/O configuration for the new processor. You should use the PCHID report from the order process configurator as a guide for planning and defining the new configuration. Depending on the current operating environment there may be several methods for accomplishing this.

z/VM

If you use HCM and HCD, develop the configuration using HCM and HCD and store the information in an I/O Definition File (IODF). Otherwise, develop the IOCP statements necessary to define your configuration and use the level of the ICP IOCP program that supports the new processor to verify the input statements. You do not need to initially assign PCHID values to the channel paths in your configuration. You can use the *new* Connectivity Mapping Tool, available from Resource Link at *http://www.ibm.com/support/resourcelink*, to aid you in assigning PCHIDs to CHPIDs. HCM and HCD users must build an IOCP input data set from a validated work IODF and use this as input to the Connectivity Mapping Tool. The Connectivity Mapping Tool updates the IOCP input and assigns PCHIDs to the CHPIDs.

Note: An IOCP input file that was created by HCM and HCD without PCHIDs must be migrated back into a HCM and HCD IODF after PCHID numbers have been added to the file by the CHPID Mapping Tool.

Inform the install team that plans are in place to use the "Build remote IOCDS" option in HCD to write the IOCDS. When you install a new processor that does not contain an IOCDS, you can use HCD to build an IOCP input deck, transfer the data set to the USB flash memory drive, and run the processor's IOCP stand-alone program. For more information, see *z/VM I/O Configuration*, SC24-6291.

21CS VSEn®

Develop the IOCP statements necessary to define your configuration and use the level of the ICP IOCP program that supports the new processor to verify the input statements. You do not need to initially assign PCHID values to the channel paths in your configuration. You can use the Connectivity Mapping Tool, available from Resource Link at *http://www.ibm.com/support/resourcelink*, to aid you in assigning PCHIDs to CHPIDs. The Connectivity Mapping Tool updates the IOCP input and assigns PCHIDs to the CHPIDs.

You can use the option "Build and manage IBM Z cluster IOCDSs, IPL attributes, and dynamic I/O changes" to update the selected I/O configuration data set for one or more processors.

z/OS® HCD

Develop the configuration using HCD. You do not need to initially assign PCHID values to the channel paths in your configuration. You can use the Connectivity Mapping Tool, available from Resource Link at *http://www.ibm.com/support/resourcelink*, to aid you in assigning PCHIDs to CHPIDs. Build an IOCP input data set from a validated work IODF and use this as input to the Connectivity Mapping Tool. The Connectivity Mapping Tool updates the IOCP input and assigns PCHIDs to the CHPIDs. Migrate the modified IOCP input file back into a HCD IODF after PCHID numbers have been added to the file by the Connectivity Mapping Tool. An IOCDS can then be written in preparation for an upgrade using a production IODF.

You can use the option "Build and manage IBM Z cluster IOCDSs, IPL attributes, and dynamic I/O changes" to update the selected I/O configuration data set for one or more processors.

When you install a new processor that does not contain an IOCDS, you can use HCD to build an IOCP input deck, transfer the data set to the USB flash memory drive, and run the processor's IOCP stand-alone program. For more information, see *z/OS Hardware Configuration Definition User's Guide*, SC34-2669.

Note:

Dynamic I/O for Standalone Coupling Facility enables dynamic activation of a new or changed IODF on a standalone coupling facility CPC, without requiring a re-IML or power-on reset (POR). This capability

requires a minimum of IBM z16 (Model A01) firmware support on the coupling facility CPC as well as z14 GA2 or later firmware support on the CPC where the HCD system is running. If you are planning to use the Dynamic I/O for Standalone Coupling Facility capability on a CPC, you must use HCD on z/OS to configure your IODF/IOCDS appropriately for that CPC. No IODF/IOCDS updates are required on the CPC where the HCD itself is running. For more information, see *z/OS HCD User's Guide, SC34-2669*.

Chapter 9. Parallel sysplex planning

This chapter is intended to provide guidance to those customers who operate in a Parallel Sysplex environment. A Parallel Sysplex typically involves multiple processors and coupling facilities, shared I/O devices, and a host of interconnection possibilities. Detailed planning for a Parallel Sysplex is essential to meet technical objectives, such as performance and high availability, within the constraints of a specific raised floor configuration. Different technologies for servers, links and coupling facilities affect your ability to configure a productive sysplex.

The basic premise for a successful Parallel Sysplex installation is to centralize the physical location of the coupling facilities, and then position the sysplex servers around that center. Servers can be placed side-to-side. In addition to bringing the servers closer to the coupling facility, placing your server side-to-side provides for better management of hot and cold air flow.

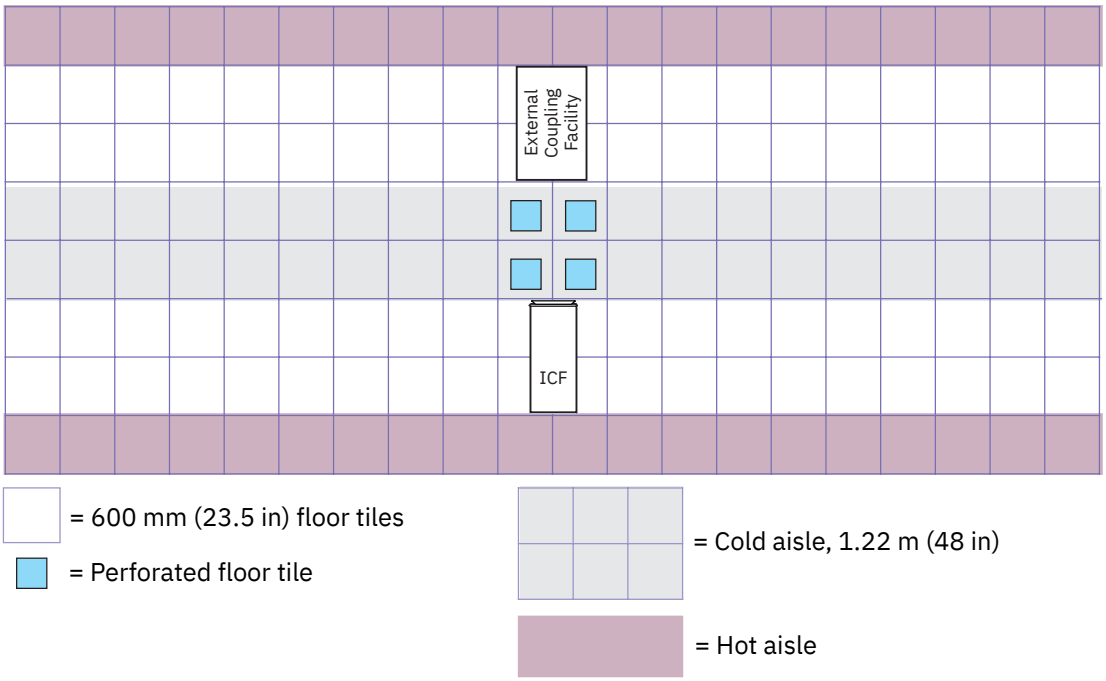
Note:

1. IBM z17 (Model ME1) can only participate in an STP-only timing network.
2. IBM z17 (Model ME1) can only communicate directly with IBM z17 (Model ME1), IBM z16 (Model A01), z15 T01, and z15 T02 using Coupling Express LR or ICA SR coupling links.

Following are some guidelines to help you better plan for multiple system interconnection. These are example configurations that would minimize the distance to the coupling facility.

Important: The IBM z17 (Model ME1) system can be configured with 1, 2, 3 or 4 frames.

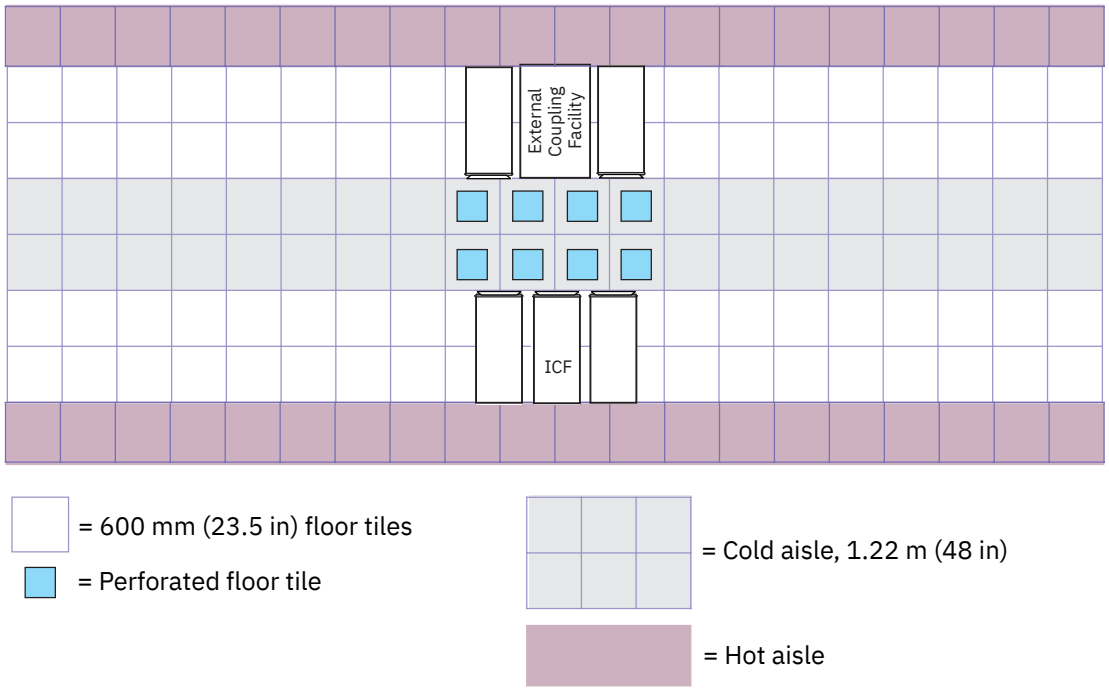
1. Position the coupling facilities (or servers with internal coupling facilities) in the center of an open area of raised floor large enough to accommodate all of the servers and other coupling facilities to which you want to connect.



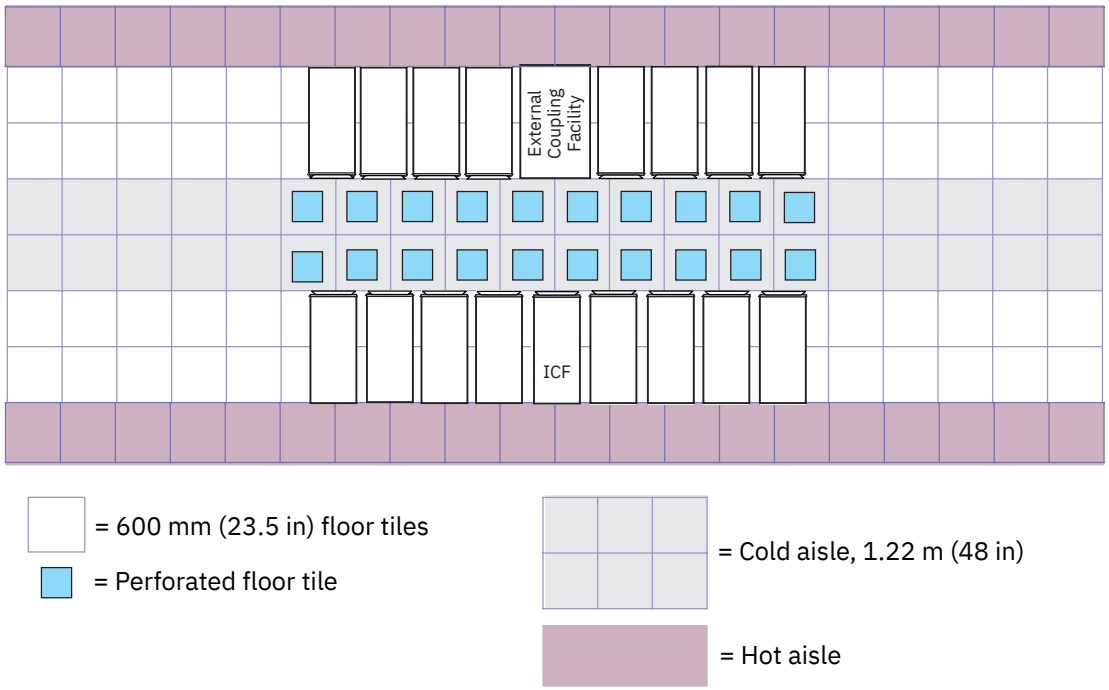
   - Use physical planning information for each type of server/coupling facility you intend to add to the Parallel Sysplex to help determine how much floor space you will need.
   - Remember to consider weight distribution, service clearances, power, and cooling for each piece of equipment you want to include.
2. Arrange the sysplex in two rows, with the fronts of servers and coupling facilities facing each other (see the illustration under “Weight distribution and multiple systems” on page 77). Allow a 1.22 meter (48

inch) aisle width between the rows. Although this may be a larger aisle than you have used before, your Parallel Sysplex will benefit from the improvement in cooling that a wider aisle provides. (See the illustration under “Cooling recommendations for the room” on page 98.)

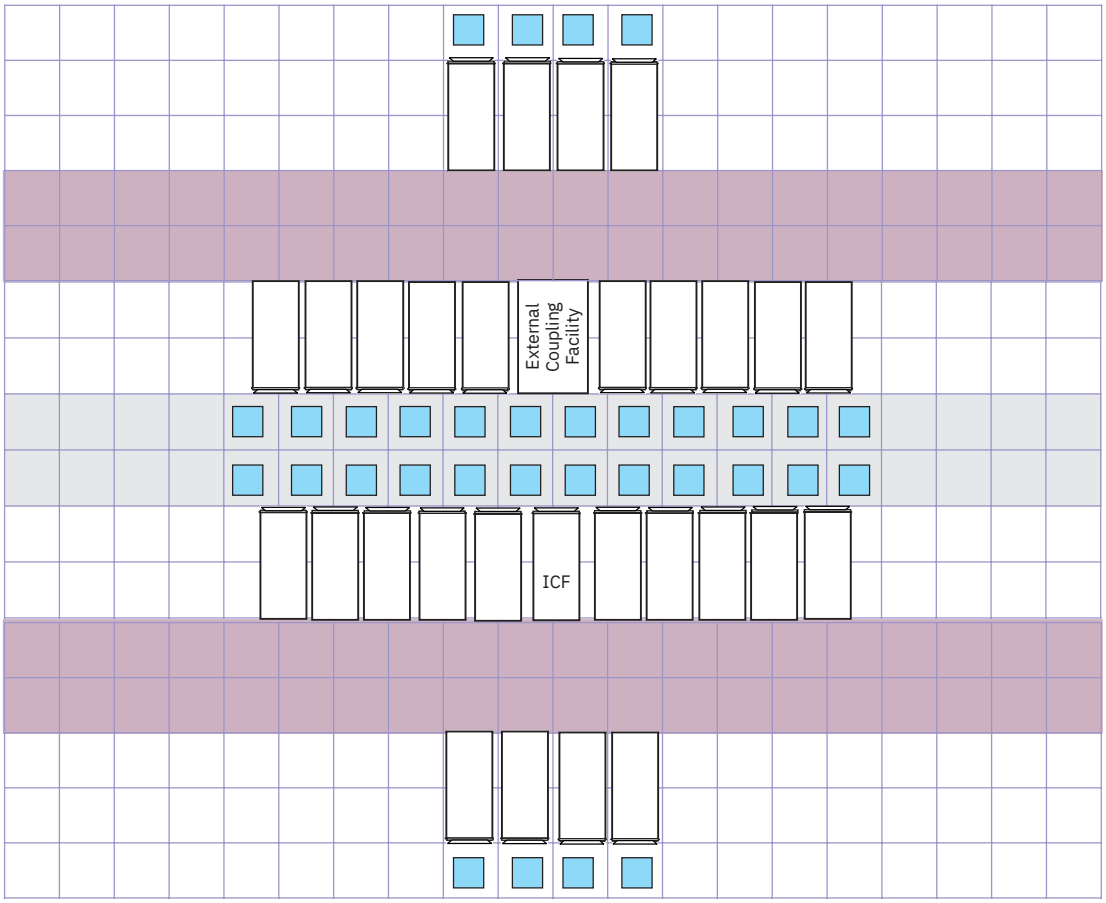
Note: The system air flow illustration shows a minimum aisle width of 941 mm (37 in). Although this width is adequate for a congested computer room floor, it is the **minimum** you should use. An aisle 1.22 m (48 in) wide will better serve the cooling and cabling needs of a Parallel Sysplex configuration.



3. Sysplex connections can be made using Coupling Express LR or ICA SR cabling.
4. As the Parallel Sysplex grows, add new servers evenly on either side of the central coupling facilities.



5. As the Parallel Sysplex evolves, it is possible to add rows using Coupling Express LR or ICA SR coupling links to provide connectivity. With the equipment in these new rows centered on the original central coupling facilities, the Parallel Sysplex now assumes the shape of a diamond.



By following these guidelines, you will be able to configure a Parallel Sysplex, using the minimum amount of floor space, that meets your performance and availability objectives. The use of technology combinations - IBM z17 (Model ME1), IBM z16 (Model A01), z15 T01,and z15 T02 machines and coupling facilities - may complicate your physical planning, but the basic strategies outlined here will result in a successful Parallel Sysplex environment.

Appendix A. IBM standard symbols

In Plan Views:

Cable Entry and Exit Area in the base of the machine. Locating dimensions are measured from the edge of the frame, not the cover. This does not indicate the floor cutout.

Cable Exit Area, recommended

Power Cord exit, 50/60 Hz

Power Cord exit, 400 Hz

Power cords are supplied in 4.2 m (14 ft) lengths unless otherwise noted on the specification page. The length is measured from the symbol ⊕ or ◔.

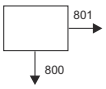
Swinging Gate

Standard equipment outline
(shows the machine with covers closed)

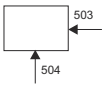
Optional equipment outline

Customer Engineer
Indicator Panel

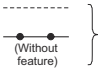
In Cabling Schematics:



Indicates a cable group coming from a machine



Indicates a cable group going to a machine



Service Area Boundary
(Service clearances are measured from the machine with covers closed)

Casters
Locating dimensions are measured from the edge of the frame, not the cover.

Leveling pads or glides
(90 mm [3 1/2 in] typical diameter)
Locating dimensions are measured from the edge of the frame, not the cover.

Legs

Non-raised floor cable exit

Meter location

Unit Emergency Switch

Hinged Covers

Single

Bifold

Offset Bifold

Appendix B. Top Exit cabling and Bottom Exit cabling specifications

On a raised floor, you can route power cables and I/O cables through the top of the frame **and** through the bottom of the frame. On a non-raised floor, you can route power cables and I/O cables through the top of the frame.

Top Exit Cabling specifications

For top exit cabling, you can use one of the following options:

- Top Exit cabling *with* Top Exit Enclosure feature (**FC 5823**)
- Top Exit cabling *without* Top Exit Enclosure feature (**FC 7803**)

Top Exit Cabling with Top Exit Enclosure (FC 5823):

The Top Exit Enclosure is installed at the time of system assembly in the datacenter. Cables exit the system upward through brush elements in the enclosure.

Table 53. Top exit cabling enclosure (FC 5823) measurements

Weight	Width	Depth	Height
12.2 kg (27 lbs)*	598 mm (23.54 in)	1072 mm (42.2 in)	178 mm (7.0 in)

***** The top exit enclosure itself, as it is installed, weighs 11.4 kg (25 lbs).
+ included cable spools and enclosure lids = 22.5 kg (49.5 lbs)
+ *optional* Fiber Quick Connect feature (FC 5824 or FC 5826) = 26.4 kg (58 lbs)

Figure 51 on page 182 shows lid installation and cables exiting through the brush elements. Figure 52 on page 183 shows the Top Exit Enclosure without lids, and the FQC brackets and cable spools installed.

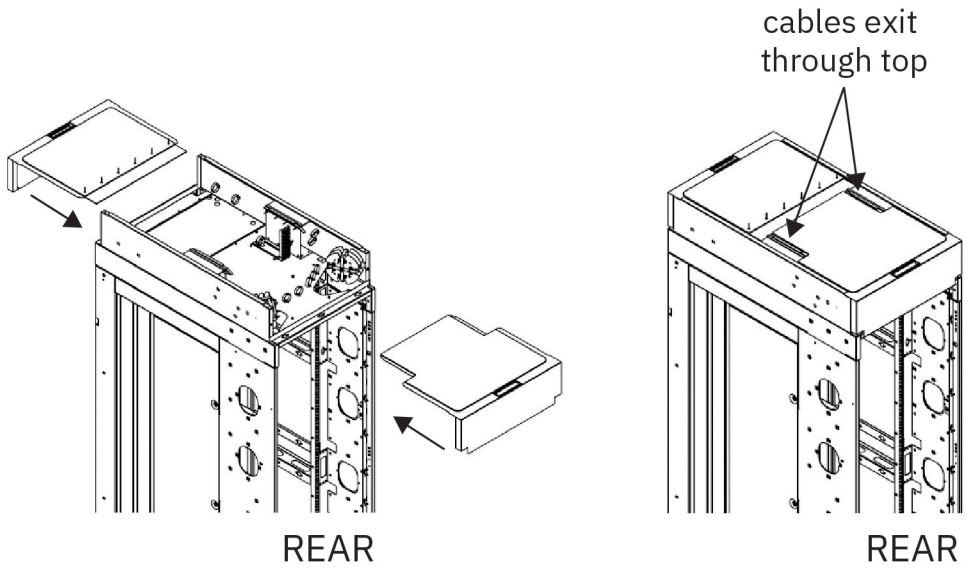


Figure 51. Top Exit Enclosure cabling feature - cables exiting from the top of the enclosure

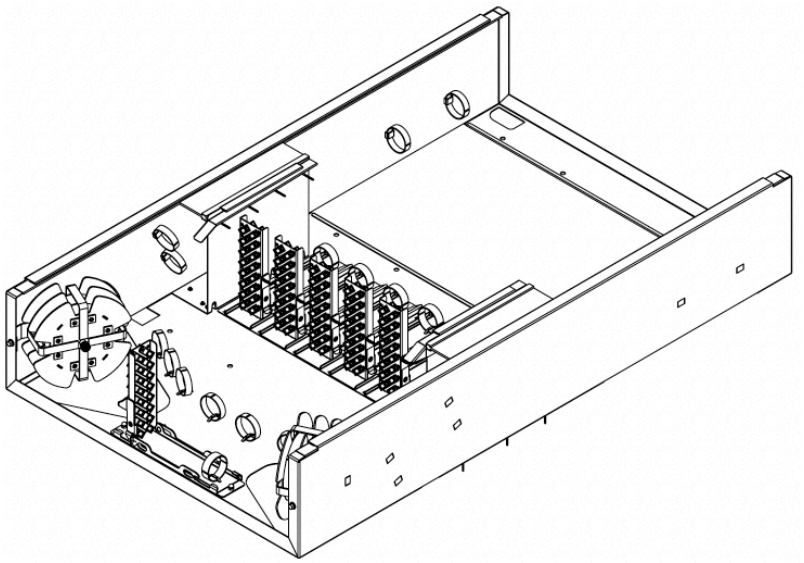
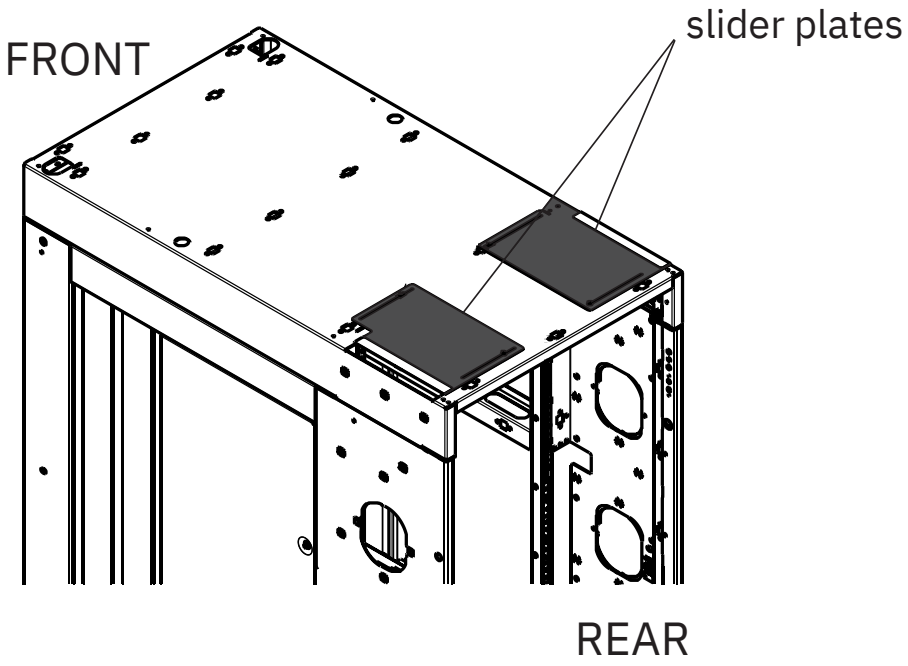


Figure 52. Top Exit Enclosure cabling feature - with FQC brackets and cable spools

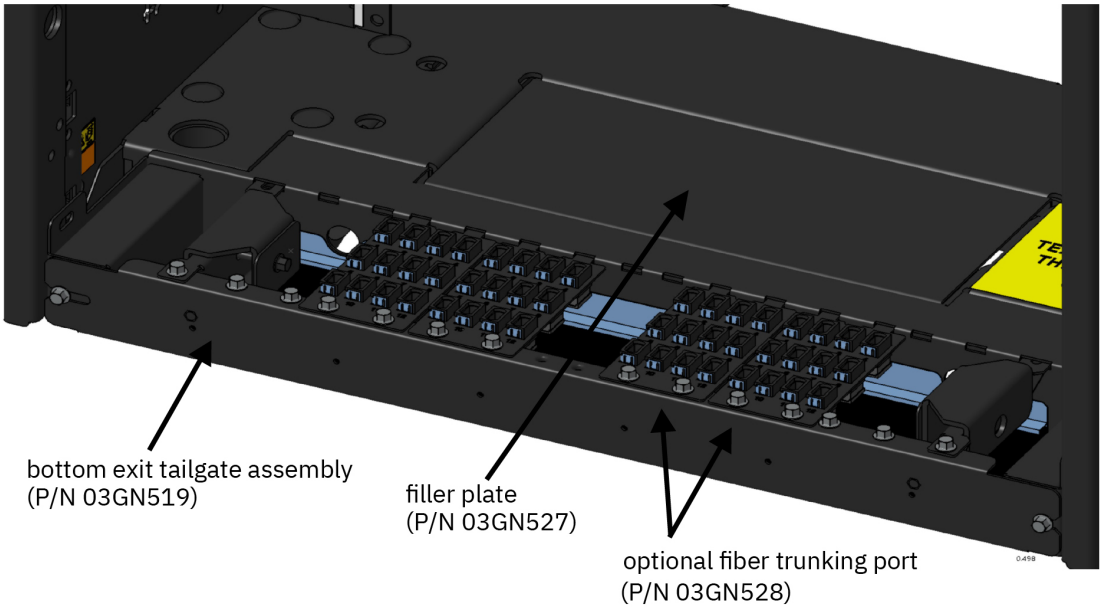
Top Exit Cabling without top exit enclosure (FC 7803):

When routing cables directly through the top of the frame, there are two slider plates on the top of the frame (one on each side of the rear of the frame) that can be slid opened partially and any gaps can be eliminated with self-sticking foam. This foam is pre-installed on the system.



Bottom Exit Cabling specifications

For bottom exit cabling, you must use the Bottom Exit Cabling feature (**FC 7804**).



Appendix C. Dual "facilities power distribution" installation

The 9175 is designed with a fully redundant PDU power system. Each computer has 2, 4, 6, or 8 line cords attached to 2, 4, 6, or 8 power input feeds which, in turn, power a fully redundant power sub-system within the computer. The system line cords should be connected to the installation site's distribution panels accordingly, to ensure system availability is optimized.

The minimum recommended redundant connection requires the line cords from **odd** numbered PDU's (such as **PDU-A1** and **PDU-A3**), to be attached to a customer distribution power panel(s) that is *independent* of the customer distribution power panel(s) to which the line cords from **even** numbered PDU's (such as **PDU-A2** and **PDU-A4**), are attached. This method of connection can prevent a system outage from occurring, caused by the loss of a power distribution panel or the tripping of an upstream breaker that is powering that distribution panel. Additional redundancy, such as independent switchgear, feed transformers, or power substations, can further improve the system's immunity to power outages.

The following figures show the recommended PDU power connections for 9175.

Note: Note that the line cords can exit the system from the top or bottom; top exit cabling is shown for illustrative purposes only.

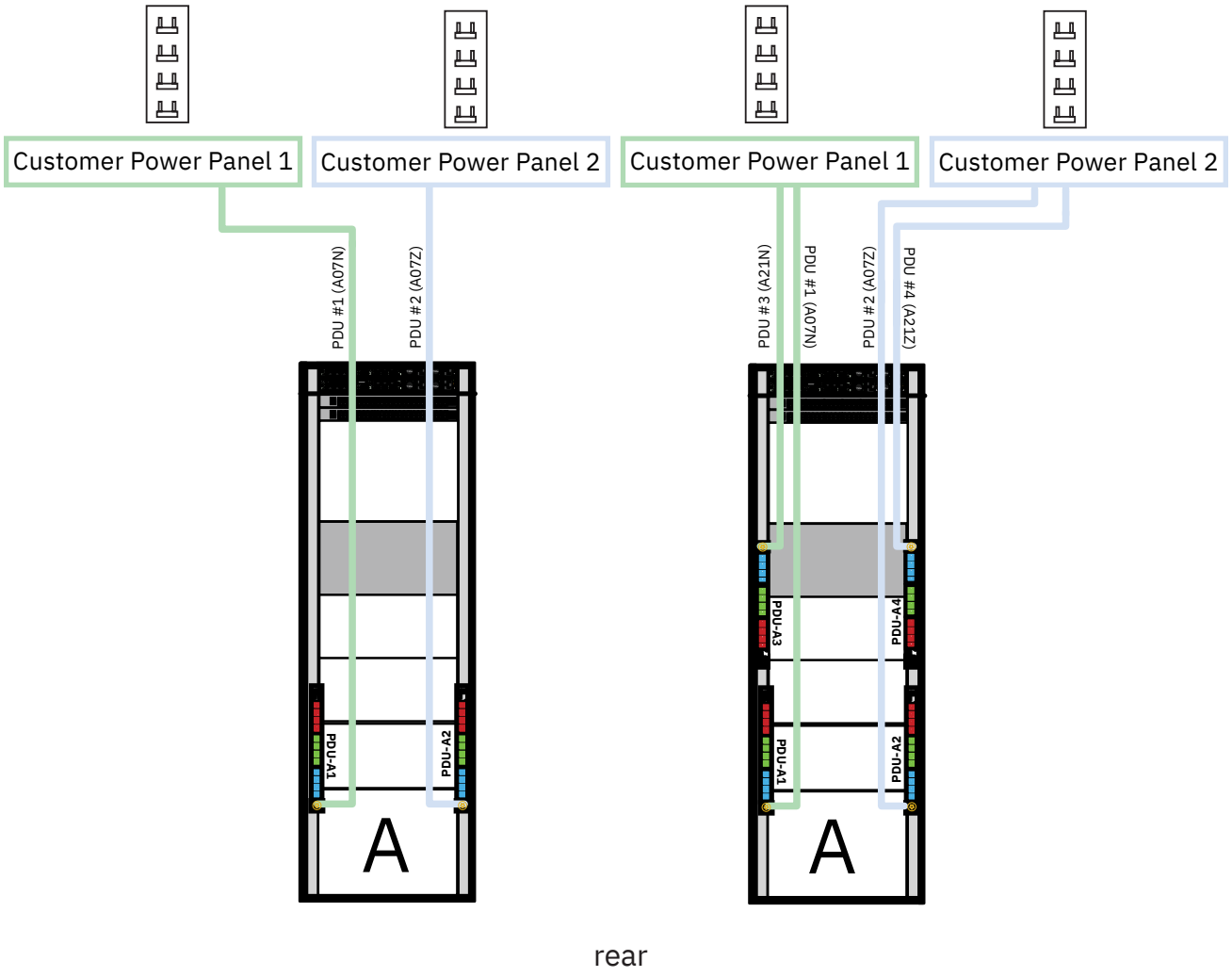


Figure 53. A frame

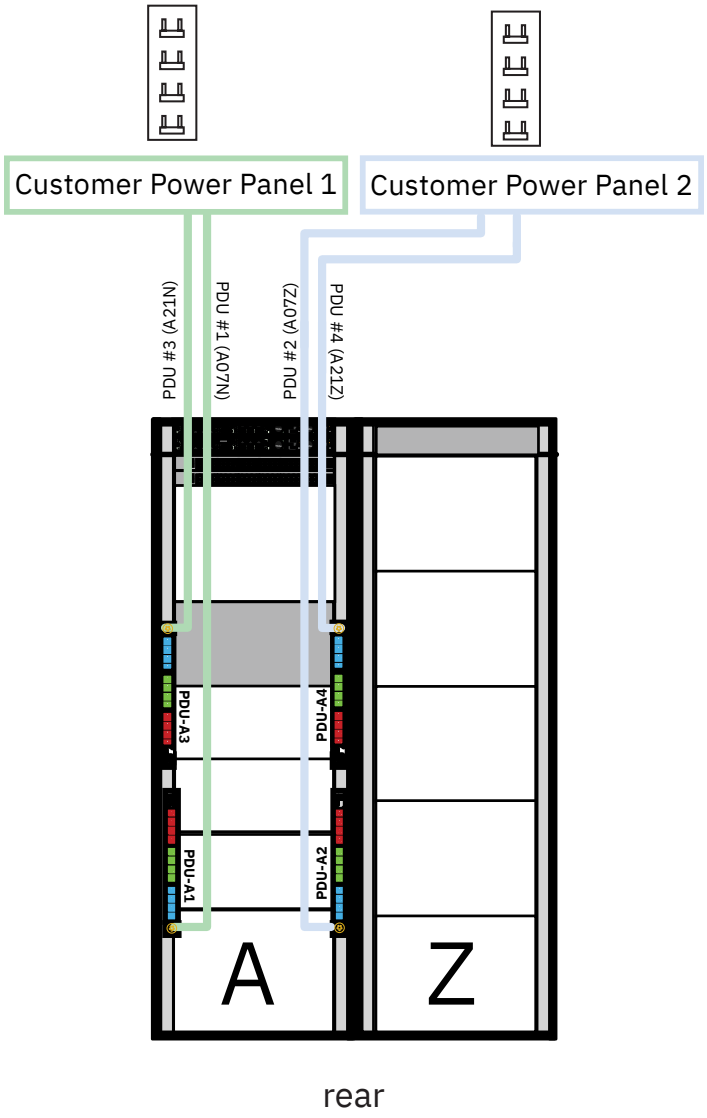


Figure 54. A and Z frames

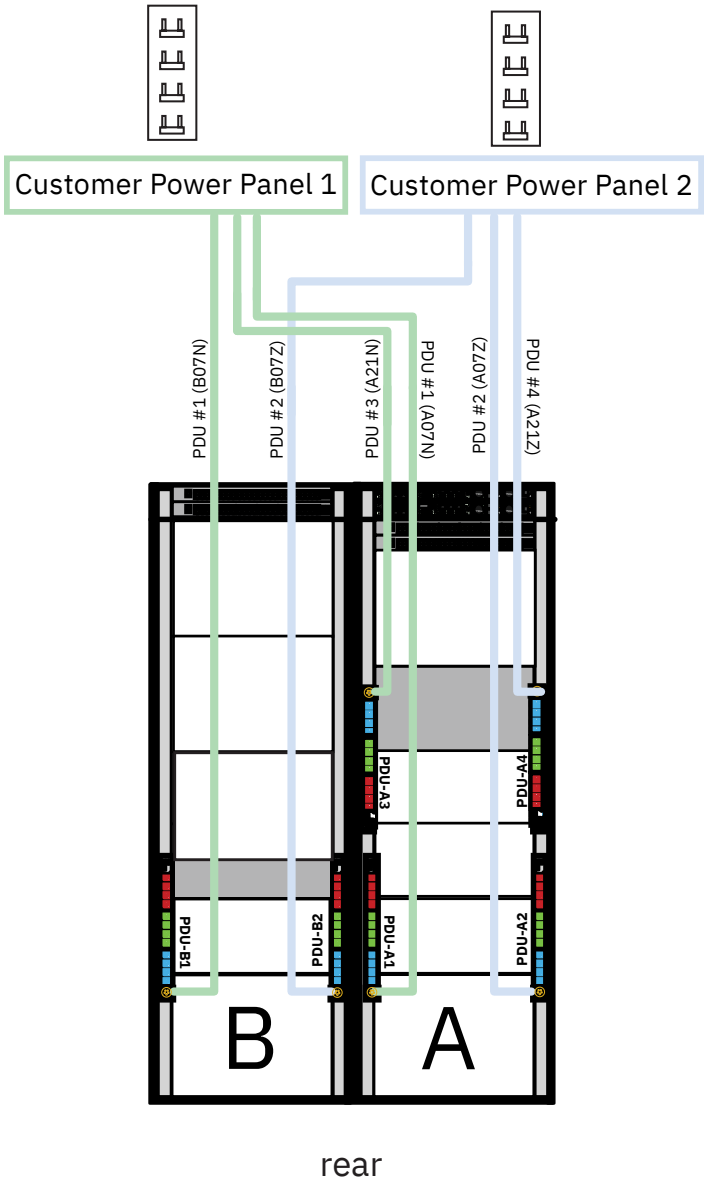


Figure 55. B and A frames

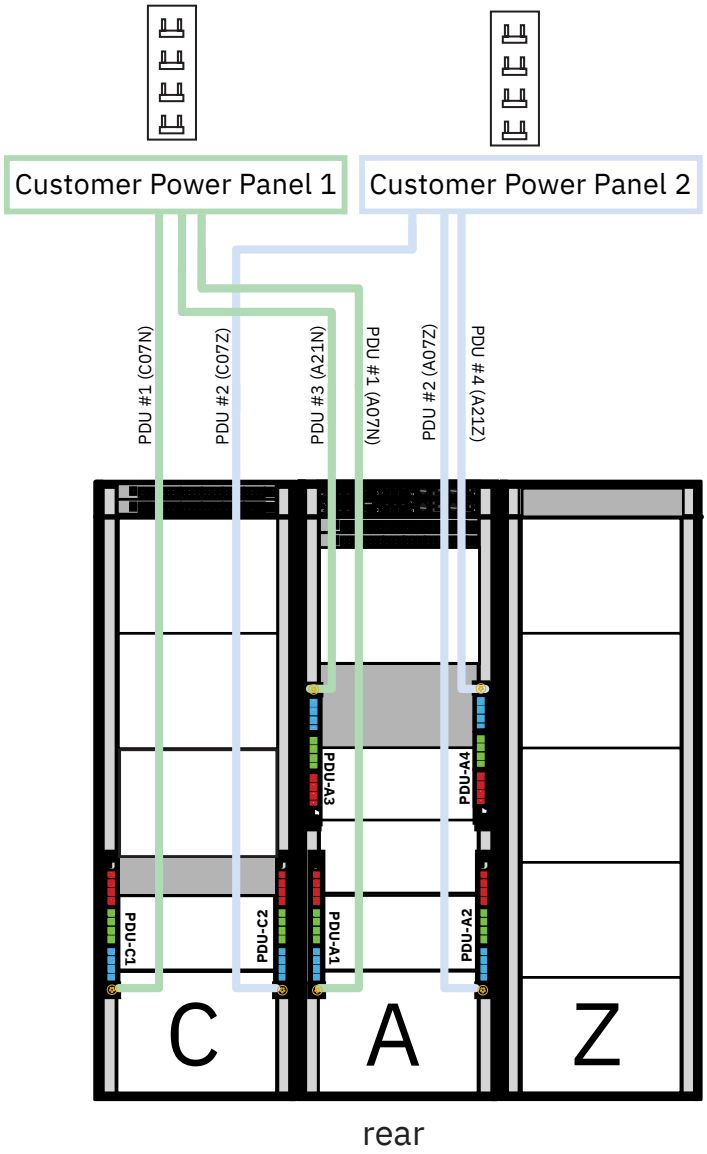


Figure 56. C, A, and Z frames

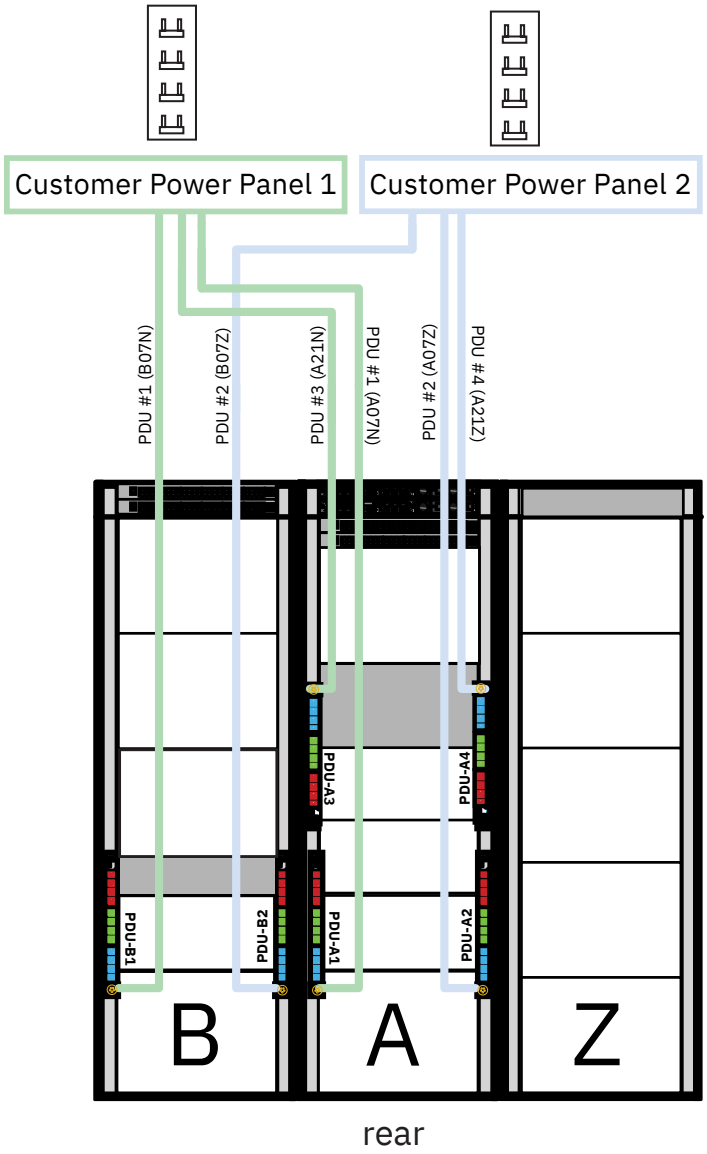


Figure 57. B, A, and Z frames

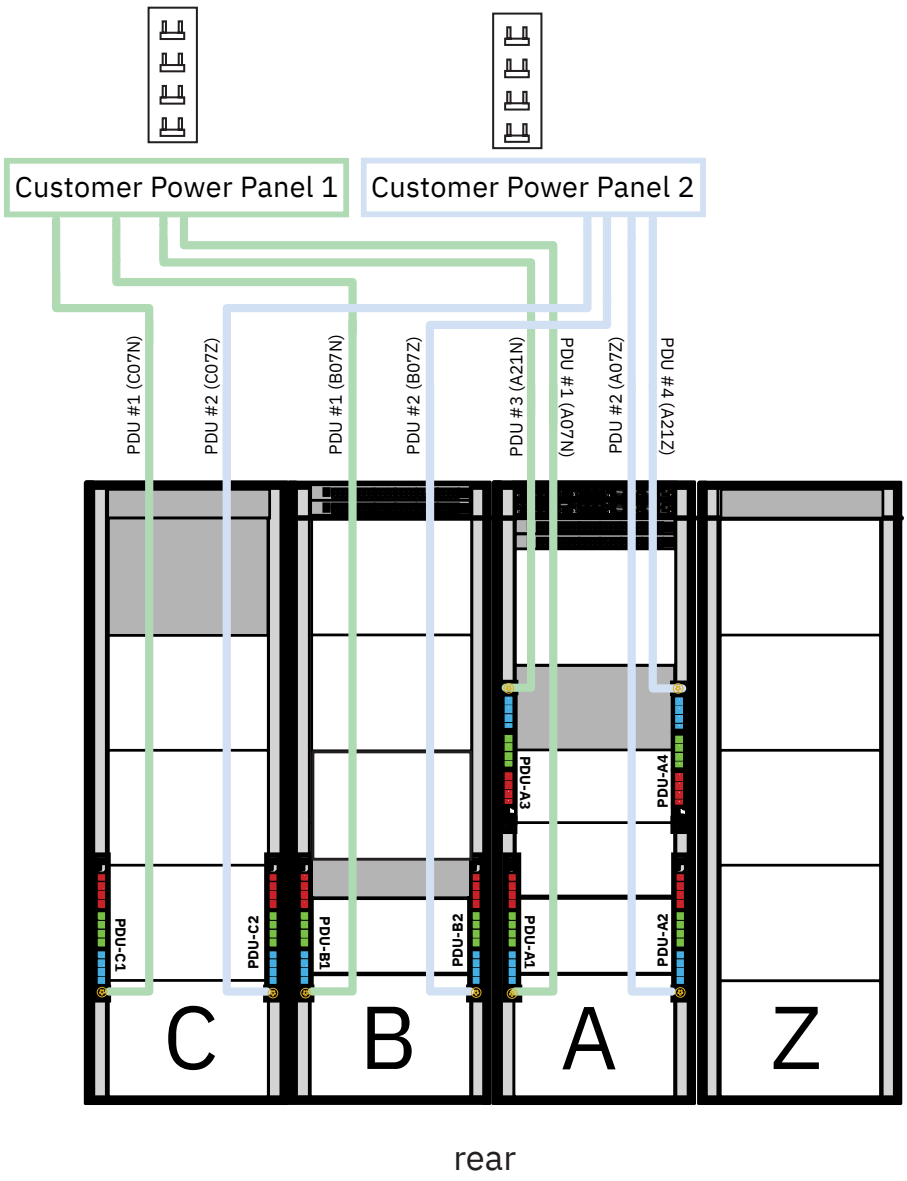
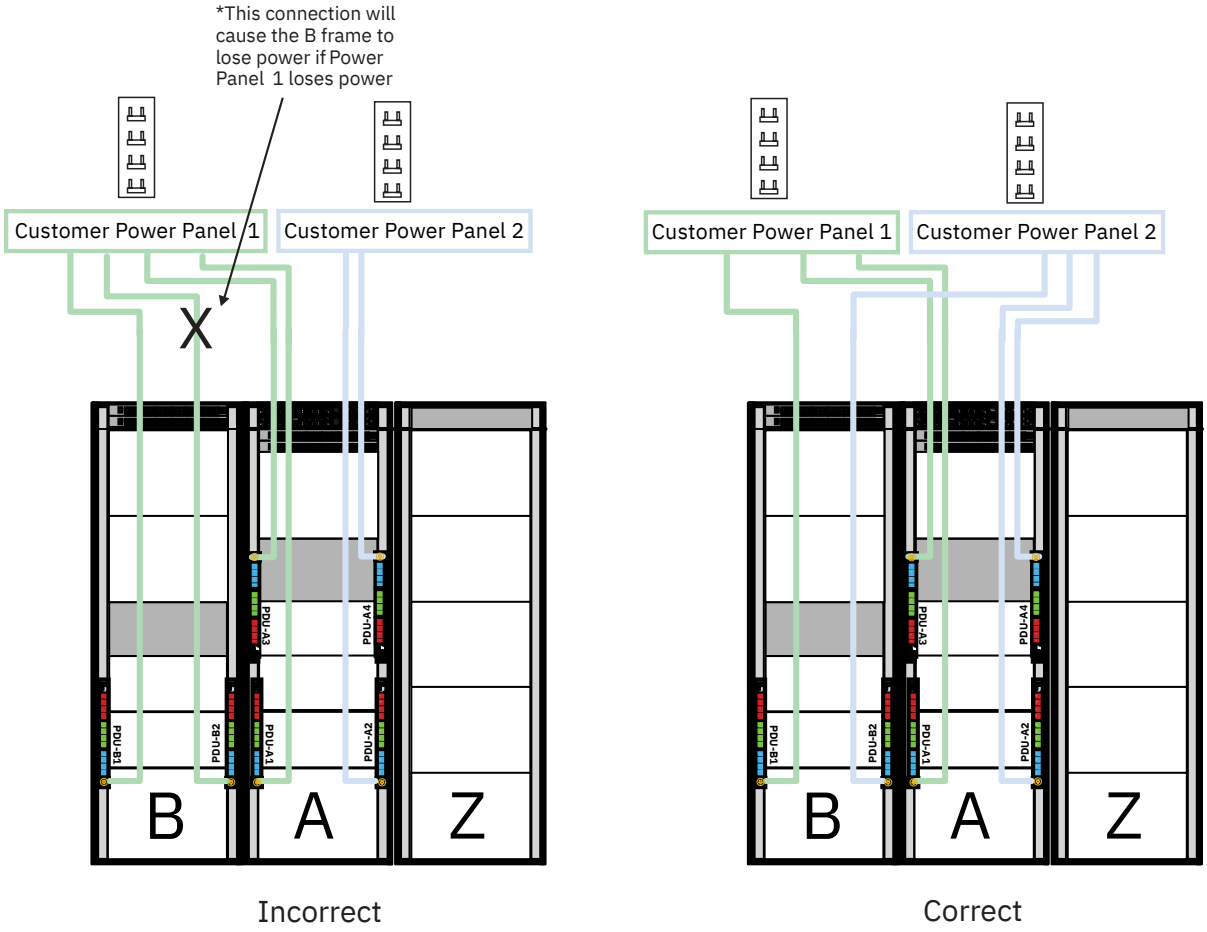


Figure 58. C, B, A, and Z frames

Example (incorrect and correct PDU power connections)



Appendix D. HMA and TKE physical specifications

This section contains information for the Hardware Management Appliance (HMA) and Trusted Key Entry (TKE) components applicable at the time of publication (determined by the edition notice at the front of this document). Specifications may differ from those presented below.

Note: All dimensions are considered nominal.

- 2461 Hardware Management Appliance (*FC 0355*), Table 54 on page 196
- 2461 TKE Rack Mount and Tower (*FC 0057/0058* and *FC 0087/0088*), Table 55 on page 197
- 1U KMM (keyboard, monitor, mouse) console unit, Table 56 on page 199

Table 54. 2461 Hardware Management Appliance (2461-VA3 and 2461-SE4) specifications

CPU:	Environment:	Electrical input:
• 3.4 GHz Intel Xeon E-2226GE *(2461-SE4)* • 3.8 GHz Intel Xeon E3-1275 v6 *(HMA - 2461-VA3)* **Memory:** • RAM: – 64 GB • Type: DDR4, ECC • Slots: 4 • Supports: – 64 GB **Hard drive:** • 2 TB SATA hard drive **Video:** • Display Port **Fans:** • Three front-removable hot-swap fans **Power supply:** • Two 900-watt AC **Integrated functions:** • Six Intel I350 Ethernet ports • Two Intel I210 management Ethernet ports • Eight USB ports (USB 2.0 and USB 3.0)	**Operating:** • Temperature: 5°C - 50°C (41°F - 122°F) • Altitude: 3050 m (~10,000 ft) • Humidity: – Non-condensing: -12°C (10.4°F) dew point – Relative humidity: 8% - 93% **Storage (non-operating):** • Temperature: -40°C - 60°C (-40°F - 140°F) • Relative humidity: 5% - 100% **Air flow:** • 350LFM continuous airflow **Size:** • Height: 4.45 cm (1.75 in) • Depth: 71.12 cm (28.00 in) • Width: 48.26 cm (19 in) • Weight: approximately 15.97 kg (35.2 lb)	• Sine-wave input (47-63 Hz) required • Input voltage low range: – Minimum: 90 Vrms – Maximum: 137 Vrms • Input voltage high range: – Minimum: 180 Vrms – Maximum: 265 Vrms • Input kilovolt-amperes (kVA), approximately: – Minimum: 0.134 kVA – Maximum: 0.988 kVA

Table 55. 2461 TKE Rack Mount and Tower (FC 0057/0058 and 0087/FC 0088) specifications

CPU:	Environment:	Electrical input:
• *2461 TKE FC 0057/0058* – 3.40 GHz Intel Xeon E-2226GE • *2461 TKE FC 0087/0088* – 3.30 GHz Intel Xeon E3-1225 **Memory:** • Minimum: 32 GB • Maximum: – 64 GB (*2461 FC 0057/0058*) – 32 GB (*2461 FC 0087/0088*) • Type: DDR4, ECC • Slots: 4 • Supports: – 64 GB (*2461 FC 0057/0058*) – 32 GB (*2461 FC 0087/0088*) **Hard drive:** • 2 TB SATA hard drive **Video:** • Display Port **Fans:** • Two side-removable hot-swap fans (*2461 TKE FC 0088/0058*) • Five front-removable hot-swap fans (*2461 TKE FC 0087/0057*) **Power supply:** • Two 900-watt AC (on 9175 machines) • C14 inlet **Integrated function:** • Six Intel l350 Ethernet ports • Two Intel l210 management Ethernet ports • Eight USB ports (USB 2.0 and USB 3.0)	• **Operating:** – Temperature: 0ºC - 40ºC (32ºF - 104ºF) – Altitude: 3050 m (~10,000 ft) – Relative humidity: 5% - 90% @ -12ºC (10.4ºF) dew point, non-condensing • **Storage (non-operating):** – Temperature: -40ºC - 70ºC (-40ºF - 158ºF) – Relative humidity: 5% - 100% **Air flow:** • 350LFM continuous airflow **Heat output:** • 757 BTU/hr (222 watts) **Size:** • *2461 TKE FC 0087/0057* – Height: 4.45 cm (1.75 in) – Depth: 71.12 cm (28.00 in) – Width: 48.26 cm (19 in) – Weight: approximately 15.97 kg (35.2 lb) • *2461 TKE FC 0088/0058* – Height: 439.2 mm (17.29 in) – Depth: 492.25 mm (19.38 in) – Width: 215.9 mm (8.5 in) – Weight: approximately 18.59 kg (41.0 lb)	• Sine-wave input (47-63 Hz) required • Input voltage low range: – Minimum: 90 Vrms – Maximum: 137 Vrms • Input voltage high range: – Minimum: 180 Vrms – Maximum: 265 Vrms • Input kilovolt-amperes (kVA), approximately: – Minimum: 0.134 kVA – Maximum: 0.988 kVA

Notes for 1U KMM (keyboard, monitor, mouse) console unit:

The 1U KMM (keyboard, monitor, mouse) console units include:

FC 0157 (for the 2461 TKE Tower unit)
FC 0156 (for the 2461 TKE Rack Mounted unit)

- The following are recommendations for placement of the KMM unit into the customer supplied rack:
  - If you are standing when using the KMM unit, place the unit in EIA locations 21, 22, or 23.
  - If you are sitting when using the KMM unit, place the unit in EIA locations 12, 13, or 14.
  - For special accommodations, you need to make adjustments in the placement of the KMM unit in the rack that meet your needs.
- For USA and Canada, the KMM unit uses one PDU plug position for the AC power supply in the KMM. (Other power requirements are country dependent.)
- **Elevated operating ambient** - If installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack environment might be greater than room ambient. Therefore, consideration should be given to installing the equipment in an environment compatible with the maximum ambient temperature (Tma) specified by the manufacturer.
- **Reduced air flow** - Installation of the equipment in a rack should be such that the amount of air flow required for safe operation of the equipment is not compromised.
- **Mechanical loading** - Mounting of the equipment in the rack should be such that a hazardous condition is not achieved due to uneven mechanical loading.
- **Circuit overloading** - Consideration should be given to the connection of the equipment to the supply circuit and the effect that overloading of the circuits might have on overcurrent protection and supply wiring. Appropriate consideration of equipment nameplate ratings should be used when addressing this concern.
- **Reliable earthing** - Reliable earthing of rack-mounted equipment should be maintained. Particular attention should be given to supply connections other than direct connections to the branch circuit (for example, use of power strips).

Table 56. 1U KMM (keyboard, monitor, mouse) console unit specifications	
1U KMM console unit specifications (FC 0157 - 2461 TKE Tower unit) (FC 0156 - 2461 TKE Rack Mounted unit)	
Dimensions	
Height	45 mm (1.75 in) (in stored position)
Width	440 mm (17.3 in) (main chassis only, slide-rails not included)
Depth	440 mm (17.3 in) (chassis only, bezel in front not included, cable-management arm not included)
Weight	(11 lb) - Console Unit (25 lb) - Console Option Kit
LCD panel	
Size	18.5 inch diagonal
Display area (horizontal x vertical)	381.99 mm x 214.91 mm
Type	TFT active matrix
Pixel pitch (horizontal x vertical)	0.1989 (H) x 0.1989 (V) mm
Video	
Type	Display Port
Input Power	
Input voltage	AC - 100-240 VAC - 1 A (nominal range)
Input frequency range	50-60 Hz
Power Consumption	
Standard usage	9 watts
Maximum	11 watts
Power supply maximum	36 watts
Power saving	< 1 watt (at 100 VAC and 240 VAC)
Environmental - Temperature	
Operating	0° to 50° C (32° to 122° F)
Storage	-20° to 60° C (-4° to 140° F)
Environmental - Humidity	
Operating	20% to 90%
Storage	10% to 90%
Environmental - Altitude	
Operating	Maximum 5000 meters
Storage	Maximum 5000 meters

Appendix E. Lift Tool and Service Ladder storage

The IBM Z Lift Tool (**FC 3100**) and Service Ladder (**FC 3101**) are optional to order, but the customer is required to have at least one of each feature available at each datacenter site that houses an IBM Z system. The same Lift Tool and Service Ladder are used on z15, z16, and IBM z17 (Model ME1).

Lift Tool (FC 3100)

The Lift Tool Kit includes 5 separate components that ship in a single package:

- Lift Table
- Bottom Left Rail
- Bottom Right Rail
- Top Left Rail
- Top Right Rail

These components may be unpacked and stored for future use. The Lift Table may be stored vertically on end or flat, as shown in Figure 59 on page 201 and Figure 60 on page 202. It will balance vertically without restraint.

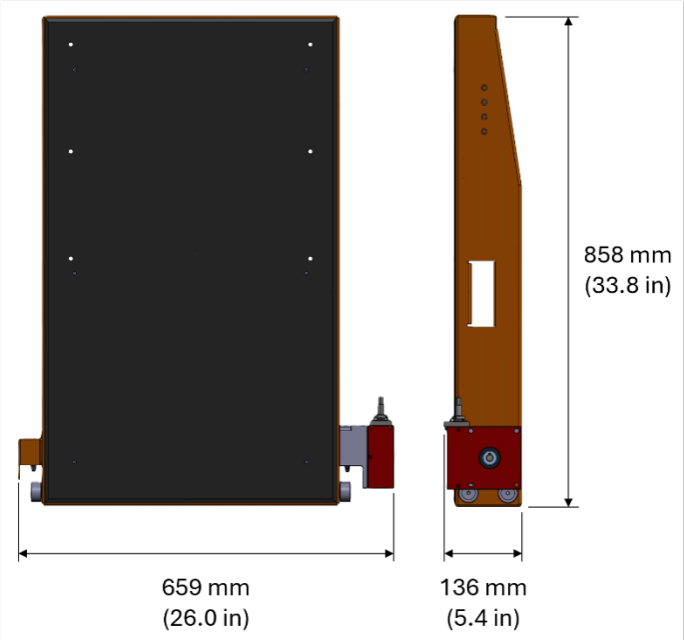


Figure 59. Lift Table dimensions

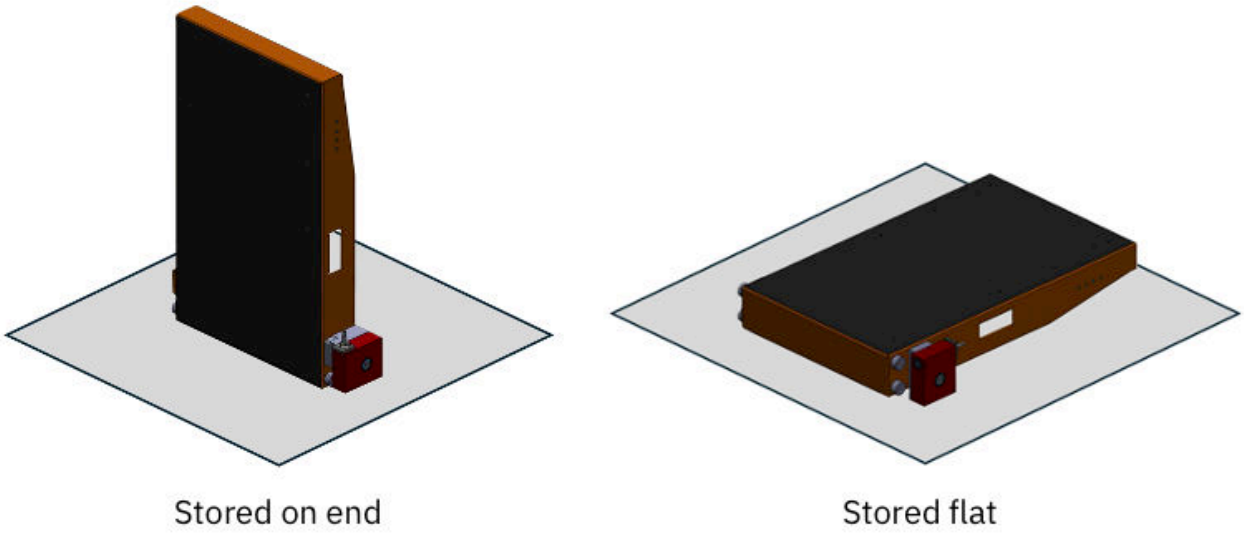


Figure 60. Lift Table storage (vertically on end or flat)

The four Lift Tool rails are similar in size. The maximum dimensions are shown in Figure 61 on page 202.

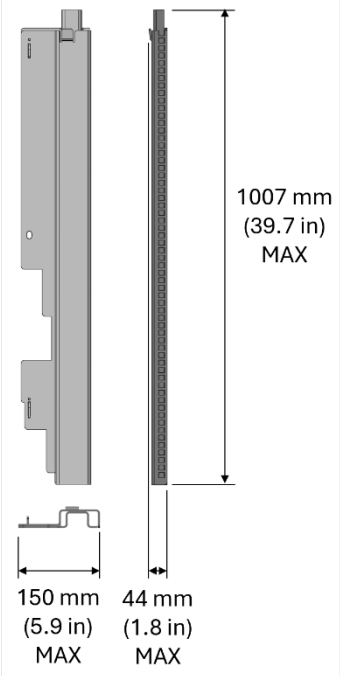


Figure 61. Lift Tool Rail maximum dimensions

The four rails should be stored flat, either side-by-side or in a stack, as shown in Figure 62 on page 203. They can also stand vertically against a wall but must be restrained from tipping. Rails will *not* balance vertically without restraint.

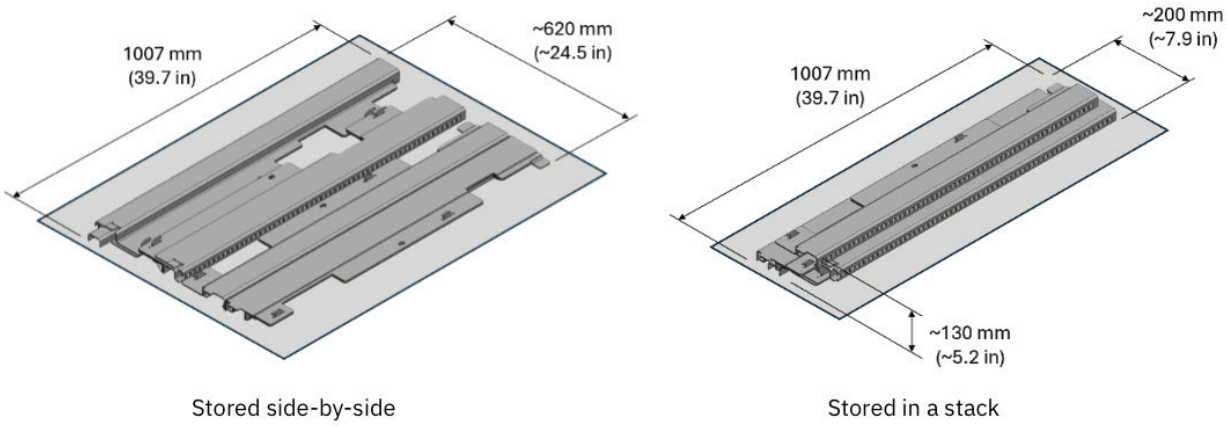


Figure 62. Lift Tool Rail storage (side-by-side or in a stack)

Service Ladder (FC 3101)

For IBM z17 (Model ME1), the Service Ladder ships in the A-Frame zCrate. The Ladder folds for storage as shown in Figure 63 on page 203. It may be stored vertically against a wall or on its side, as shown in Figure 64 on page 204.

Figure 63. Service Ladder dimensions, in a folded state

Figure 64. Service Ladder storage (vertically or horizontally)

Appendix F. Notices

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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

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United Kingdom Notice

This product may cause interference if used in residential areas. Such use must be avoided unless the user takes special measures to reduce electromagnetic emissions to prevent interference to the reception of radio and television broadcasts.

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.

Japan Voluntary Control Council for Interference (VCCI) Notice

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回路分類：6（単相、ＰＦＣ回路付）
換算係数：0

These statements apply to products greater than 20 A per phase, three-phase.

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Um dieses sicherzustellen, sind die Geräte wie in den Handbüchern beschrieben zu installieren und zu betreiben. Des Weiteren dürfen auch nur von der IBM empfohlene Kabel angeschlossen werden. IBM übernimmt keine Verantwortung für die Einhaltung der Schutzanforderungen, wenn das Produkt ohne Zustimmung von IBM verändert bzw. wenn Erweiterungskomponenten von Fremdherstellern ohne Empfehlung von IBM gesteckt/eingebaut werden.

EN 55032 Klasse A Geräte müssen mit folgendem Warnhinweis versehen werden:

"Warnung: Dieses ist eine Einrichtung der Klasse A. Diese Einrichtung kann im Wohnbereich Funk-Störungen verursachen; in diesem Fall kann vom Betreiber verlangt werden, angemessene Maßnahmen zu ergreifen und dafür aufzukommen."

Deutschland: Einhaltung des Gesetzes über die elektromagnetische Verträglichkeit von Geräten

Dieses Produkt entspricht dem "Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG)". Dies ist die Umsetzung der EU-Richtlinie 2014/30/EU in der Bundesrepublik Deutschland.

Zulassungsbescheinigung laut dem Deutschen Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG) (bzw. der EMC EG Richtlinie 2014/30/EU) für Geräte der Klasse A

Dieses Gerät ist berechtigt, in Übereinstimmung mit dem Deutschen EMVG das EG-Konformitätszeichen - CE - zu führen.

Verantwortlich für die Einhaltung der EMV Vorschriften ist der Hersteller:
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Armonk, New York 10504
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Generelle Informationen:

Das Gerät erfüllt die Schutzanforderungen nach EN 55024 und EN 55032 Klasse A.

Electromagnetic Interference (EMI) Statement - Russia

ВНИМАНИЕ! Настоящее изделие относится к классу А.
В жилых помещениях оно может создавать радиопомехи, для снижения которых необходимы дополнительные меры

Electromagnetic Interference (EMI) Statement - Kingdom of Saudi Arabia Notice

قد يتسبب هذا المنتج في حدوث تداخل إذا تم استخدامه في المناطق السكنية.

ويجب تجنب هذا الاستخدام ما لم يتخذ المستخدم تدابير خاصة لتقليل الانبعاثات الكهرومغناطيسية لمنع التداخل مع استقبال البث الإذاعي والتلفزيوني.

تحذير: هذا الجهاز متوافق مع الفئة أ من SASO CISPR 32

في البيئة السكنية، قد يتسبب هذا الجهاز في حدوث تداخل لاسلكي.

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