

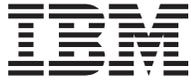


System z9 Business Class
Installation Manual for Physical Planning

GC28-6855-05

Level 05a, March 2010





System z9 Business Class
Installation Manual for Physical Planning

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Note

Before using this information and the product it supports, read the information in “Safety” on page vii, Appendix J, “Notices,” on page J-1, and *IBM Systems Environmental Notices and User Guide*, Z125–5823.

Fifth Edition (March 2009)

This edition, GC28-6855-04, applies to the IBM® System z9® Business Class (z9 BC) server. This edition replaces GC28-6855-03.

Technical changes to the text are indicated by a vertical bar (|) to the left of the change.

There may be a newer version of this document in a **PDF** file available on **Resource Link**. Go to <http://www.ibm.com/servers/resourcelink> and click on **Library** on the navigation bar. A newer version is indicated by a lowercase, alphabetic letter following the form number suffix (for example: 00a, 00b, 01a, 01b).

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Safety

Safety Notices

Safety notices may be printed throughout this guide. **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.

There are no **DANGER** notices in this manual.

World Trade Information

Several countries require the safety information contained in product publications to be presented in their national languages. 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 safety information in your national language with references to the US English source. Before using a US English publication to install, operate, or service this IBM® product, you must first become familiar with the related safety information in the booklet. 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 System z® models can use I/O cards such as PCI adapters, ESCON®, FICON®, Open Systems Adapter (OSA), InterSystem Coupling-3 (ISC-3), or other I/O features which are fiber optic based and utilize lasers or LEDs.

Laser Compliance

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

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)

About This Publication

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

This publication contains information necessary for planning the physical installation of the IBM System z9[®] Business Class (z9 BC) server.

- Chapter 1 provides an introduction to planning for your system and a planning checklist.
- Chapter 2 gives plan views, service clearances, weight distribution, and cooling information for the system.
- Chapter 3 contains information on preparation of the raised floor.
- Chapter 4 provides power and internal battery feature information.
- Chapter 5 includes information on hardware management console and support element communications.
- Chapter 6 contains remote support facility installation planning.
- Chapter 7 discusses cable connectivity information.
- The Appendices provide IBM standard symbols, environmental specifications, acoustics, power installation and power loads, a sample cabling schematic and upgrade paths.

Related Publications

For related publications, go to Resource Link at <http://www.ibm.com/servers/resourcelink>. Select **Library** on the navigation bar on the left.

In addition to these references, there is general computer room planning information on IBM's Resource Link web site (<http://www.ibm.com/servers/resourcelink>).

Education

When planning for your educational needs, you should be aware that the z9 BC Hardware Management Console has an object-oriented interface that is different from the menu-driven interfaces you may have used previously. Operation and navigation through this interface will be a new experience for users not already familiar with similar interfaces. In addition to these differences, there are some key concepts related to system start-up and operation that are important to understand.

To assist in a smooth transition to your new system, it is recommended that your educational plans include some preliminary training for using the Hardware Management Console interface. This education should be provided for operators, system programmers and other users of the Hardware Management Console.

To learn about the interface, consider including the following items for user education prior to system arrival:

- *Hardware Management Console Operations Guide*, SC28-6857.
- *Support Element Operations Guide*, SC28-6858.

There is additional educational material on IBM's Resource Link web site (<http://www.ibm.com/servers/resourcelink>).

Licensed Internal Code

Licensed Internal 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 Internal Code (LIC) is a fundamental component of the IBM System z9 Business Class server and is copyrighted and licensed by IBM. Each z9 BC is delivered with Licensed Internal Code that is customized to the specific machine ordered. The Licensed Internal Code enables the server to operate in accordance with its Official Published Specifications.

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

Relocation of a z9 BC requires that the Licensed Internal Code be reinstalled in the server at the new location. The procedure for relocating a z9 BC, "Discontinuing the System", is in the *z9 BC Installation Manual*, GC28-6852.

How to Send your Comments

Your feedback is important in helping to provide the most accurate and high-quality information. Send your comments by using Resource Link™ at <http://www.ibm.com/servers/resourcelink>. Select **Feedback** on the Navigation bar on the left. You can also send an e-mail to reslink@us.ibm.com. Be sure to include the name of the book, the form number of the book, the version of the book, if applicable, and the specific location of the text you are commenting on (for example, a page number or table number).

Chapter 1. Introduction to Physical Planning

General Planning Activities

This chapter of the Physical Planning Manual is intended to help you with planning pre-installation activities. IBM 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 IBM System z9 Business Class.

System Planning

As part of your system planning activity, you will 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 z9 BC 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.

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.

Site Preparation Checklist

Task/Consideration	Task Assigned (✓)	Target Date	Completed
--------------------	----------------------	-------------	-----------

CHECKPOINT 1

- | | | | |
|---|--------------------------|-------|-------|
| ○ Designate a person in your organization with the responsibility for all phases of site preparation for this system installation | <input type="checkbox"/> | _____ | _____ |
| ○ Review all site planning information with the designated person | <input type="checkbox"/> | _____ | _____ |
| ○ Determine who will actually perform each site preparation task and who will control the marking of this checklist | <input type="checkbox"/> | _____ | _____ |
| ○ Identify communication needs, including Remote Support Facility, cables, modems, switches, telephones, connection panels, etc | <input type="checkbox"/> | _____ | _____ |
| ○ In the Chapter titled, "Cabling and Connectivity" (in this document), read the information about planning now for future cabling needs. In the same chapter, read also about "zSeries Fiber Cabling Services" | <input type="checkbox"/> | _____ | _____ |
| ○ Identify channel needs including: cables, directors, switches, patch panels, etc | <input type="checkbox"/> | _____ | _____ |
| ○ Identify other machine/device needs including: changes to any existing equipment | <input type="checkbox"/> | _____ | _____ |
| ○ Determine the schedule with your IBM marketing representative and fill in the target dates on this checklist | <input type="checkbox"/> | _____ | _____ |

CHECKPOINT 2

- | | | | |
|--|--------------------------|-------|-------|
| ○ Lay out the floor plan. Include stationary obstacles, walls, all computer equipment, locations for power, lighting, heating and cooling, water and fire detection and extinguishing equipment | <input type="checkbox"/> | _____ | _____ |
| ○ If this is a new computer room, see the course, <i>General Information for Planning the Physical Site</i> under "Planning / Physical Planning / zSeries" on Resource Link (http://www.ibm.com/servers/resourcelink) | <input type="checkbox"/> | _____ | _____ |
| ○ Order communication equipment cables, modems, switches, telephones, connection panels, etc | <input type="checkbox"/> | _____ | _____ |
| ○ Order channel equipment cables, directors, switches, patch panels, etc. In the Chapter titled, "Cabling and Connectivity" (in this document), read the information about "zSeries Fiber Cabling Services" to determine your cabling requirements and responsibilities. Your IBM marketing representative can assist you with this task. Other parts of this chapter include fiber optic channel and adapter descriptions and information about the Fiber Quick Connect feature for FICON and ESCON channels. | <input type="checkbox"/> | _____ | _____ |
| ○ If you are planning for a system that will use ESCON or FICON channels, InfiniBand, coupling links, or Open System Adapters (OSA), contact your IBM marketing representative to obtain the document, <i>Fiber Optic Planning (ESCON, FICON, Coupling Links, and Open System Adapters, GA23-0367</i> | <input type="checkbox"/> | _____ | _____ |
| ○ Order other machines/devices, including changes to any existing equipment | <input type="checkbox"/> | _____ | _____ |

Site Preparation Checklist

Task/Consideration	Task Assigned (✓)	Target Date	Completed
--------------------	----------------------	-------------	-----------

CHECKPOINT 3

- | | | | |
|--|--------------------------|-------|-------|
| ○ The computer room is prepared for computer equipment service clearance and floor loading, physical placement based on logical priority, cabling restrictions, and shock and vibration considerations, and electromagnetic compatibility/interference | <input type="checkbox"/> | _____ | _____ |
| ○ Emergency and backup operations planning includes provisions for fire detection, prevention, extinguishing, and control equipment, and storm protection and damage recovery procedures | <input type="checkbox"/> | _____ | _____ |
| ○ There is workspace around equipment, including passageways for movement of people and machines, and includes consideration for lighting and acoustics | <input type="checkbox"/> | _____ | _____ |
| ○ Office equipment and space, including furniture, vending, meeting, and entrance/exit areas have adequate lighting, heating/cooling, and acoustics | <input type="checkbox"/> | _____ | _____ |
| ○ Material and data storage provisions have been satisfied | <input type="checkbox"/> | _____ | _____ |
| ○ Schedule and make changes to existing programs as required | <input type="checkbox"/> | _____ | _____ |
| ○ Schedule and make changes to existing machines/devices as required | <input type="checkbox"/> | _____ | _____ |
| ○ Arrange for installation of cables between work stations, controllers, modems, switches, etc | <input type="checkbox"/> | _____ | _____ |
| ○ Arrange for installation of new power receptacles and wiring | <input type="checkbox"/> | _____ | _____ |
| ○ Define a training program for employees | <input type="checkbox"/> | _____ | _____ |

CHECKPOINT 4

- | | | | |
|--|--------------------------|-------|-------|
| ○ Computer room power should be completed.
electrically clean, dedicated circuits for all computer equipment
sufficient power provided to avoid outages caused by power transients
protection from lightning damage | <input type="checkbox"/> | _____ | _____ |
| ○ Backup power batteries or generators, if required | <input type="checkbox"/> | _____ | _____ |
| ○ Branch circuits, grounding, conduits, phase rotation, emergency controls,
to local electrical code and equipment guidelines | <input type="checkbox"/> | _____ | _____ |
| ○ An adequate number of computer equipment and convenience outlets have
been provided in the locations where they are to be used | <input type="checkbox"/> | _____ | _____ |
| ○ Computer room personnel are adequately trained in power procedures,
including emergency situations | <input type="checkbox"/> | _____ | _____ |
| ○ Review the progress of the communications, channel, and adapter
cabling. Identify and resolve problems and schedule conflicts | <input type="checkbox"/> | _____ | _____ |
| ○ Review the system configuration to make sure there are no physical
problems and that the configuration meets your needs. | <input type="checkbox"/> | _____ | _____ |

Site Preparation Checklist

Task/Consideration	Task Assigned (✓)	Target Date	Completed
--------------------	----------------------	-------------	-----------

CHECKPOINT 5

- | | | | |
|---|--------------------------|-------|-------|
| ○ Air conditioning installation is complete
capacity and controls provided for automatic temperature and humidity levels
filtration system is adequate and maintenance plan established
regular monitoring and testing | <input type="checkbox"/> | _____ | _____ |
| ○ Training for computer room personnel | <input type="checkbox"/> | _____ | _____ |
| ○ If you have elected to do your own I/O cabling, as cables begin to arrive, start installing and labeling them. Label power receptacles as they are installed | <input type="checkbox"/> | _____ | _____ |
| ○ Complete the Systems Assurance Product Review with your IBM marketing representative or Business Partner and the system installers | <input type="checkbox"/> | _____ | _____ |
| ○ Carefully measure the delivery path from the shipper drop-off point to the raised floor install location. Accurate measurements now may prevent installation delays later | <input type="checkbox"/> | _____ | _____ |

CHECKPOINT 6

- | | | | |
|--|--------------------------|-------|-------|
| ○ Complete communication equipment installation, cables, modems, switches, telephones, connection panels, etc | <input type="checkbox"/> | _____ | _____ |
| ○ Complete the Remote Support Facility installation
LAN and communication cables, switches, patch panels, etc | <input type="checkbox"/> | _____ | _____ |
| ○ Prepare IOCP input statements or HCD definitions | <input type="checkbox"/> | _____ | _____ |
| ○ Use the CHPID Mapping Tool on Resource Link to help assign PCHIDs to CHPIDs | <input type="checkbox"/> | _____ | _____ |
| ○ If you have elected to do your own I/O cabling, complete the checkout of system cables as much as possible. Verify that the cables are properly routed, protective end caps are in place, that the processor ends of the cables are safely out of the way for system installation, and that cable safety procedures are followed | <input type="checkbox"/> | _____ | _____ |
| ○ Complete the checkout of the power cables. Test for continuity and polarity, proper grounding, correct phase wiring, and general power safety considerations | <input type="checkbox"/> | _____ | _____ |
| ○ Complete the required changes to the existing programs and data processing units | <input type="checkbox"/> | _____ | _____ |
| ○ Install communication facilities, such as telephone lines and modems | <input type="checkbox"/> | _____ | _____ |

Site Preparation Checklist

Task/Consideration	Task Assigned (✓)	Target Date	Completed
--------------------	----------------------	-------------	-----------

CHECKPOINT 7

- | | | | |
|--|--------------------------|-------|-------|
| ○ Are there any new applications that must be installed/ tested before the new system arrives? | <input type="checkbox"/> | _____ | _____ |
| ○ Do you need to conduct training with computer room personnel: | | | |
| safety? | <input type="checkbox"/> | _____ | _____ |
| security? | <input type="checkbox"/> | _____ | _____ |
| ○ operations? | <input type="checkbox"/> | _____ | _____ |
| other? | <input type="checkbox"/> | _____ | _____ |
| ○ Are there any outstanding hardware changes that need to be made to existing: | | | |
| computer equipment? | <input type="checkbox"/> | _____ | _____ |
| communications equipment? | <input type="checkbox"/> | _____ | _____ |
| site facilities? | <input type="checkbox"/> | _____ | _____ |
| ○ Is the system configuration ready for installation: | | | |
| IOCP input? | <input type="checkbox"/> | _____ | _____ |
| CHPIDs? | <input type="checkbox"/> | _____ | _____ |
| ○ Do you have a comprehensive channel cabling plan in place: | | | |
| are all cables either ordered or on hand? | <input type="checkbox"/> | _____ | _____ |
| do you have a reliable installer ready to go? | <input type="checkbox"/> | _____ | _____ |
| are plans in place for cable connection at remote devices? | <input type="checkbox"/> | _____ | _____ |
| is there a system test plan? | <input type="checkbox"/> | _____ | _____ |
| are you prepared to provide cable labels or labeling information? | <input type="checkbox"/> | _____ | _____ |
| are protective end cap devices in place on all cable connectors? | <input type="checkbox"/> | _____ | _____ |
| are cables routed and coiled out of the way for installation? | <input type="checkbox"/> | _____ | _____ |
| ○ Is the path for moving the new equipment: | | | |
| wide enough? | <input type="checkbox"/> | _____ | _____ |
| high enough? | <input type="checkbox"/> | _____ | _____ |
| free of obstructions? | <input type="checkbox"/> | _____ | _____ |
| ramps ready, if necessary? | <input type="checkbox"/> | _____ | _____ |
| ○ Are floor panels ready? | <input type="checkbox"/> | _____ | _____ |
| ○ Is all furniture and miscellaneous equipment in place or out of the way for installation? | <input type="checkbox"/> | _____ | _____ |
| ○ Is your setup team trained and ready for the arrival of the new equipment? | <input type="checkbox"/> | _____ | _____ |
| ○ Complete the site preparation | <input type="checkbox"/> | _____ | _____ |

ARRIVAL OF NEW EQUIPMENT

- | | | | |
|---|--------------------------|-------|-------|
| ○ Move unit(s) to installation location. | <input type="checkbox"/> | _____ | _____ |
| ○ Place the units according to machine clearance dimensions provided in "Machine and Service Clearance Areas" (in this document). | <input type="checkbox"/> | _____ | _____ |
| ○ Unpack unit(s) according to instructions. | <input type="checkbox"/> | _____ | _____ |
| ○ Call your service provider to install the unit(s). | <input type="checkbox"/> | _____ | _____ |

You may want to make copies of these checklist pages for others assisting in the system installation planning. This might include IBM personnel assisting with the planning process, service providers, vendors, and others in your business who require planning updates.

General Installation Manual for Physical Planning

Information contained on IBM's Resource Link web site (<http://www.ibm.com/servers/resourceLink>.) may be helpful in planning for your raised floor. See "General Information for Planning a Physical Site".

The GIMPP covers the following topics :

Site Installation Coordinator

- Oversees the installation
- Selects contractors and vendors
- Sets and maintains the schedule

Site Selection

- Utility availability
- Environmental considerations
- External access to the site
- Internal access within the site
- External and internal facilities
- Expansion potential

Flooring

- Non-raised floor construction
 - Floor coverings in data center
 - Static electricity
- Raised floor construction
 - Vertical underfloor space
 - Sealed floor
 - Floor panel weight capacity
 - Pedestal system
 - Stringers
 - Grounding
 - Cabling provision
 - Expansion Potential

Emergency Planning

- Monitor environment
 - Computer room
 - Air conditioning equipment
 - Electrical supply
- Periodic inspections
- Hazard prevention/protection
 - Fire
 - Water
 - Lightning
 - Chemical
- Personnel training
 - Emergency plans
 - Emergency equipment
 - Emergency shutdown
 - Emergency evacuation
 - Emergency contacts
- Alarms
- Disaster backup plans

Space and Layout

- Obstacles (walls, columns, etc)
- Weight distribution
- Floor loading
- Machine area
- Service clearance
- Cable placement
 - Restrictive cable lengths
- Power access
- Safety equipment
- Facilities access
- Operator space and facilities
- Work flow
 - Entrances/exits
 - Loading dock access
 - Hallways/doorways
 - Ramps
- Lighting
- Acoustics
- Electro Magnetic Interference
- Proximity to hazards
 - Potential water damage
 - Shock and vibration
 - Chemical hazards
 - Fire danger
 - Lightning protection
- Office space
- Storage space
- Supplies space

Power Considerations

- Dual power installation
 - Proper phase rotation
 - Proper wire size and color
- Watertight power connectors
- Proper grounding
- Adequate circuit breakers
- Emergency power shutoff
 - EPO switch
 - UEPO switch
- Backup system power
 - Uninterruptible power supply
 - Surge protection
 - Brownout protection
 - Lightning protection
- Emergency lighting
- Service and utility outlets
- Obvious labeling

A customized planning aid will be available for your system one day after receipt of your order in manufacturing. You may obtain access to this aid by registering on Resource Link. This planning aid will include unique physical planning requirements based on your system's specific configuration.

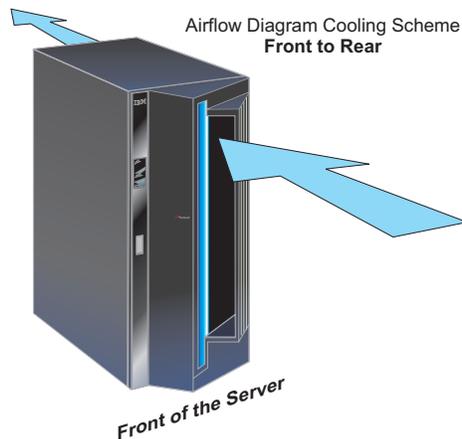
ASHRAE Declaration

ASHRAE Declarations (Metric) for 2096

ASHRAE Class 2 Description	Typical Heat Release	Airflow Nominal Note 1	Airflow Maximum Note 1	Weight Note 2	Overall System Dimensions with Covers	Maximum Elevation	Maximum Dry Bulb Temperature	Maximum Dew Point
	kW	m3/hr	m3/hr	kg	W x D x H (cm)	m	C°	C°
Models R07 & S07 FC1115 & FC1116	5.4	1495	2158	785	78.5 x 157.7 x 194.1	2134	35	21
<p>Note 1 - Airflow is designed to increase as the local ambient room temperature increases. Nominal airflow assumes 25° C ambient. Maximum airflow is based on an ambient of 35° C.</p> <p>Note 2 - Weights provided assume the optional Internal Battery Feature is installed.</p>								

ASHRAE Declarations (English) for 2096

ASHRAE Class 2 Description	Typical Heat Release	Airflow Nominal Note 1	Airflow Maximum Note 1	Weight Note 2	Overall System Dimensions with Covers	Maximum Elevation	Maximum Dry Bulb Temperature	Maximum Dew Point
	kW	cfm	cfm	lbs	W x D x H (in)	ft	F°	F°
Models R07 & S07 FC1115 & FC1116	5.4	880	1270	1730	30.9 x 62.1 x 76.4	7000	95	70
<p>Note 1 - Airflow is designed to increase as the local ambient room temperature increases. Nominal airflow assumes 77° C ambient. Maximum airflow is based on an ambient of 95° F.</p> <p>Note 2 - Weights provided assume the optional Internal Battery Feature is installed.</p>								



Chapter 2. IBM System z9 Business Class Models and Physical Specifications

This chapter provides the following detailed information for the z9 BC.

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



Figure 2-1. z9 BC

Facts you should know about the z9 BC:

- The System z9 Business Class has two models: R07 and S07.
- The System z9 Business Class is **always** a single-frame system
- There are separate shipping containers for the frame covers.
- Feature Codes 7995 and 7996 provide frame tie-down hardware for various height raised floors. Feature Code 7997 provides frame tie-down hardware for a non-raised floor. See Appendix I, “Frame Tie-Down,” on page I-1 for more information
- The System z9 Business Class server can be installed in either a raised floor or non-raised floor environment. You must order FC 7998 to install the z9 BC on a non-raised floor. This feature code provides certain cables qualified for a non-raised floor environment. Refer to your national electric code if you have questions about routing data processing cables in exposed areas.
- **If you are planning an installation on a raised floor in Canada**, the installation must be in accordance with Section 12-020 of the CEC. Certain limitations may apply to non-raised floor applications. In any country, refer to your national electric code if you have questions about routing data processing cables in exposed areas.

Physical Dimensions

Frame-Cover Combination	Width mm (in)	Depth mm (in)	Height mm (in)
Frame A without Covers	750 (29.5)	1171 (46.1)	1921 (75.6)
Frame A with Covers	785 (30.9)	1577 (62.1)	1941 (76.4)

Maximum Weight	Without Internal Battery (IBF)	With Internal Battery (IBF)
kg (lbs)	699 (1542)	785 (1730)
Weight includes covers.		

Shipping Specifications

z9 BCs are shipped two ways:

- Packaged systems are protected with an anti-static poly bag and heavy cardboard and roll on their own casters. This packaging is used only in the 48 contiguous United States.
- Crated systems are protected with wooden shipping boxes and are mounted on pallets requiring commercial lift transportation. This packaging is used for all servers shipped anywhere except the 48 contiguous United States.

Height Reduction - FC 9975

If you have doorways with openings less than 1941 mm (76.4 in) high, you should order Feature Code 9975. This feature reduces the frame height to 1809 mm (71.2 in). The top portion of the frame is shipped in a separate carton, as are the frame side covers. If you also ordered Feature Code 3210, the integrated batteries are shipped separately, and are installed after the top frames and side covers are replaced in the computer room.

Packaged Frames	Width mm (in)	Depth mm (in)	Height mm (in)	Weight kg (lb)
Packaged Frame A	822 (32.4)	1209 (47.6)	1953 (76.9)	770 (1698)
Crated Frames	Width mm (in)	Depth mm (in)	Height mm (in)	Weight kg (lb)
Crated Frame A	927 (36.5)	1308 (51.5)	2225 (87.6)	939 (2070)
Covers	Width mm (in)	Depth mm (in)	Height mm (in)	Weight kg (lb)
Cover Set - Frame A	610 (24.0)	2121 (83.5)	997 (39.5)	59 (130)

IMPORTANT

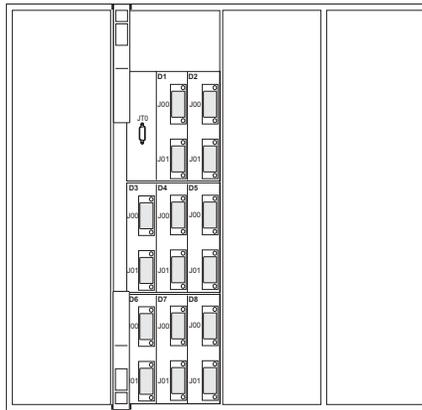
The IBM System z9 Business Class is comprised of some of the most sophisticated and complex electronic equipment ever integrated into one computer. As such, this hardware needs to be protected from negative environmental impacts to ensure the utmost reliability. One of the key factors affecting this reliability is moving the system from the loading dock into the controlled environment of your computer room on the day it is delivered.

To ensure that optimum environmental conditions are maintained, work with your marketing representative to schedule the delivery at a time when you can transport the system components from the point of delivery to the computer room destination without unnecessary delay. Prompt handling upon arrival will prevent any possibility of a problem caused by exposure to temperature extremes, severe weather, or high humidity.

z9 BC Models

There are two models of the System z9 Business Class: R07 and S07. Each model contains user-definable Processor Units (PUs), System Assist Processors (SAPs), specialty processors, such as zAAP (z9 Application Assist Processor) and zIIP (z9 Integrated Information Processor), and spare PUs (used to provide uninterrupted computing if there should be a problem with a working PU). The server models are shown in the following illustration with maximum STI ports installed. The actual number of STI ports for either model is dependent on total system configuration as ordered. Model specifications are described in the Feature Code table on the next page.

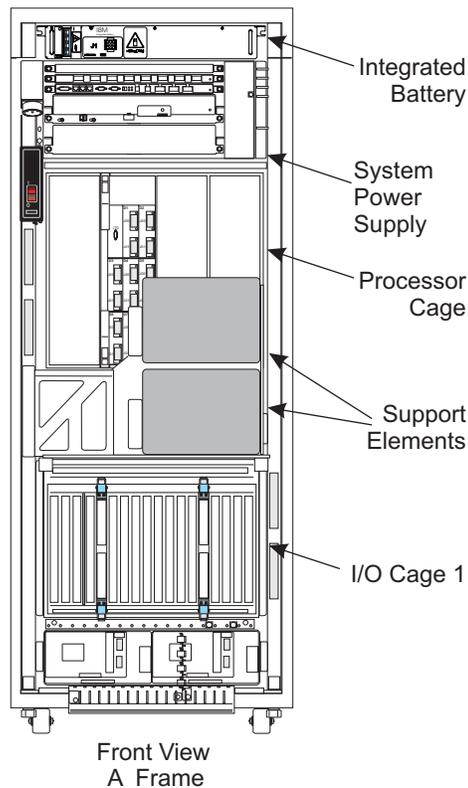
System z9 Business Class Processor Cage
(Models R07 and S07)



Feature Code	Cage Type	Description
FC 1115 (Model R07)	CPC	<ul style="list-style-type: none"> • 1 Book • 0 - 3 CPs • 4 specialty engines • 1 SAP (standard) • 0 - 3 SAPs (optional) • Up to 16 STIs
FC 1116 (Model S07)	CPC	<ul style="list-style-type: none"> • 1 Book • 0 - 4 CPs • 3 specialty engines • 1 SAP (standard) • 0 - 3 SAPs (optional) • Up to 16 STIs
FC 3210	1 pair of batteries	<ul style="list-style-type: none"> • Internal Battery Feature • Available in both models
<p>Notes:</p> <ol style="list-style-type: none"> 1. CP - Central Processor 2. SAP - System Assist Processor 		

Additionally, as shown below:

- Integrated batteries (for emergency backup power) are placed in the topmost positions (front and rear) in the A frame.
- The system power supply is contained in the top of the frame, below the battery positions.
- The system processor is located in the Central Electronics Complex (CEC) cage.
- Input/Output features are installed in the Input/Output (I/O) cage. The I/O cage is in the bottom of the A frame.



You will use the Feature Codes shown in the following table to place your z9 BC order.

Feature Code	Description
1115	Model R07 with 1 I/O cage
1116	Model S07 with 1 I/O cage

Appendix H, "Upgrade Paths," on page H-1 contains illustrations of typical zSeries systems and examples of how they may be upgraded to z9 models.

Differences Between IBM Servers

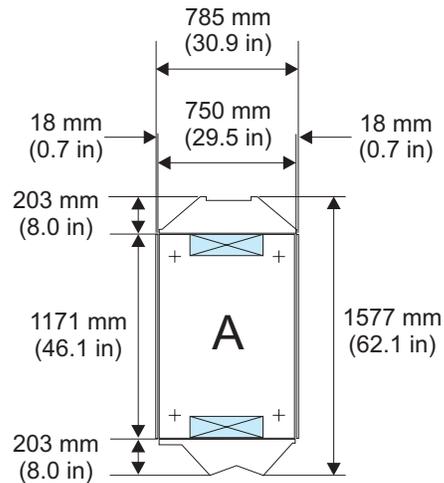
Minimum comparison information is provided here for those who may be placing a System z9 Business Class on a raised floor with previous IBM single-frame servers.

System Family	Width (with covers)	Depth (with covers)	Height (with covers)	Weight (Maximum)
zSeries 800 (2066)	720 mm (28.3 in)	1148 mm (45.1 in)	1810 mm (71.3 in)	545 kg (1201 lbs)
zSeries 890 (2086)	785 mm (30.9 in)	1577 mm (62.1 in)	1941 mm (76.4 in)	785 kg (1730 lbs)
z9 BC (2096)	785 mm (30.9 in)	1577 mm (62.1 in)	1941 mm (76.4 in)	785 kg (1730 lbs)

System z9 BC, z890, and z800 servers always consist of one frame.

If you are replacing an existing IBM server, refer carefully to the *Installation Manual for Physical Planning* (available on the Resource Link web site) to determine actual differences between your installed IBM server and the System z9 Business Class. Plan views, physical dimensions, service clearances, aisle spacing, and power and cooling requirements may be substantially different.

Plan View



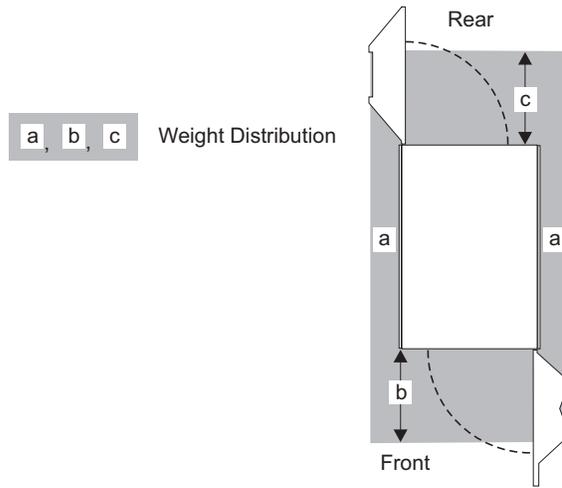
Frame Entry/Exit	Dimension	
	(mm)	(in)
Front	122 x 431	4.8 x 16.9
Rear	122 x 431	4.8 x 16.9

Weight Distribution

The following table shows weights and dimensions used to calculate floor loading for z9 BC. All floor loading calculations are intended for a raised floor environment.

Maximum	Without Internal Battery Feature (IBF)	With Internal Battery Feature (IBF)
Weight kg (lbs)	699 (1542)	785 (1730)
Width mm (in)	750 (29.5)	750 (29.5)
Depth mm (in)	1577 (46.1)	1577 (46.1)
Notes: 1. Weight includes covers. Width and depth are indicated without covers.		

The following figure and table show sample floor loading values for the System z9 Business Class server, with and without the Internal Battery Feature (IBF).



Floor Loading for System z9 Business Class servers without Internal Battery Feature (FC3210)				
Example #	'a' (sides) mm (in)	'b' (front) mm (in)	'c' (rear) mm (in)	Floor Load kg/m ² (lbs/ft ²)
<i>Example 1</i>	25 (1.0)	254 (10.0)	254 (10.0)	594.9 (121.8)
<i>Example 2</i>	25 (1.0)	508 (20.0)	508 (20.0)	485.1 (99.4)
<i>Example 3</i>	25 (1.0)	762 (30.0)	762 (30.0)	416.7 (85.3)
<i>Example 4</i>	254 (10.0)	254 (10.0)	254 (10.0)	423.0 (86.6)
<i>Example 5</i>	254 (10.0)	508 (20.0)	508 (20.0)	353.1 (72.3)
<i>Example 6</i>	254 (10.0)	762 (30.0)	762 (30.0)	309.5 (63.4)
<i>Example 7</i>	508 (20.0)	254 (10.0)	254 (10.0)	336.4 (68.9)
<i>Example 8</i>	508 (20.0)	508 (20.0)	508 (20.0)	286.6 (58.7)
<i>Example 9</i>	508 (20.0)	762 (30.0)	762 (30.0)	255.6 (52.3)
<i>Example 10</i>	762 (30.0)	254 (10.0)	254 (10.0)	288.5 (59.1)
<i>Example 11</i>	762 (30.0)	508 (20.0)	508 (20.0)	249.8 (51.2)
<i>Example 12</i>	762 (30.0)	762 (30.0)	762 (30.0)	225.7 (46.2)

Floor Loading for System z9 Business Class servers with Internal Battery Feature (FC3210)				
Example #	'a' (sides) mm (in)	'b' (front) mm (in)	'c' (rear) mm (in)	Floor Load kg/m² (lbs/ft²)
<i>Example 1</i>	25 (1.0)	254 (10.0)	254 (10.0)	658.4 (134.8)
<i>Example 2</i>	25 (1.0)	508 (20.0)	508 (20.0)	533.8 (109.3)
<i>Example 3</i>	25 (1.0)	762 (30.0)	762 (30.0)	456.2 (93.4)
<i>Example 4</i>	254 (10.0)	254 (10.0)	254 (10.0)	463.4 (94.9)
<i>Example 5</i>	254 (10.0)	508 (20.0)	508 (20.0)	384.1 (78.7)
<i>Example 6</i>	254 (10.0)	762 (30.0)	762 (30.0)	334.7 (68.5)
<i>Example 7</i>	508 (20.0)	254 (10.0)	254 (10.0)	365.2 (74.8)
<i>Example 8</i>	508 (20.0)	508 (20.0)	508 (20.0)	308.7 (63.2)
<i>Example 9</i>	508 (20.0)	762 (30.0)	762 (30.0)	273.5 (56.0)
<i>Example 10</i>	762 (30.0)	254 (10.0)	254 (10.0)	310.8 (63.7)
<i>Example 11</i>	762 (30.0)	508 (20.0)	508 (20.0)	267.0 (54.7)
<i>Example 12</i>	762 (30.0)	762 (30.0)	762 (30.0)	239.7 (49.1)

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

Minimum weight distribution is shown in the shaded area of the illustration on the following page.

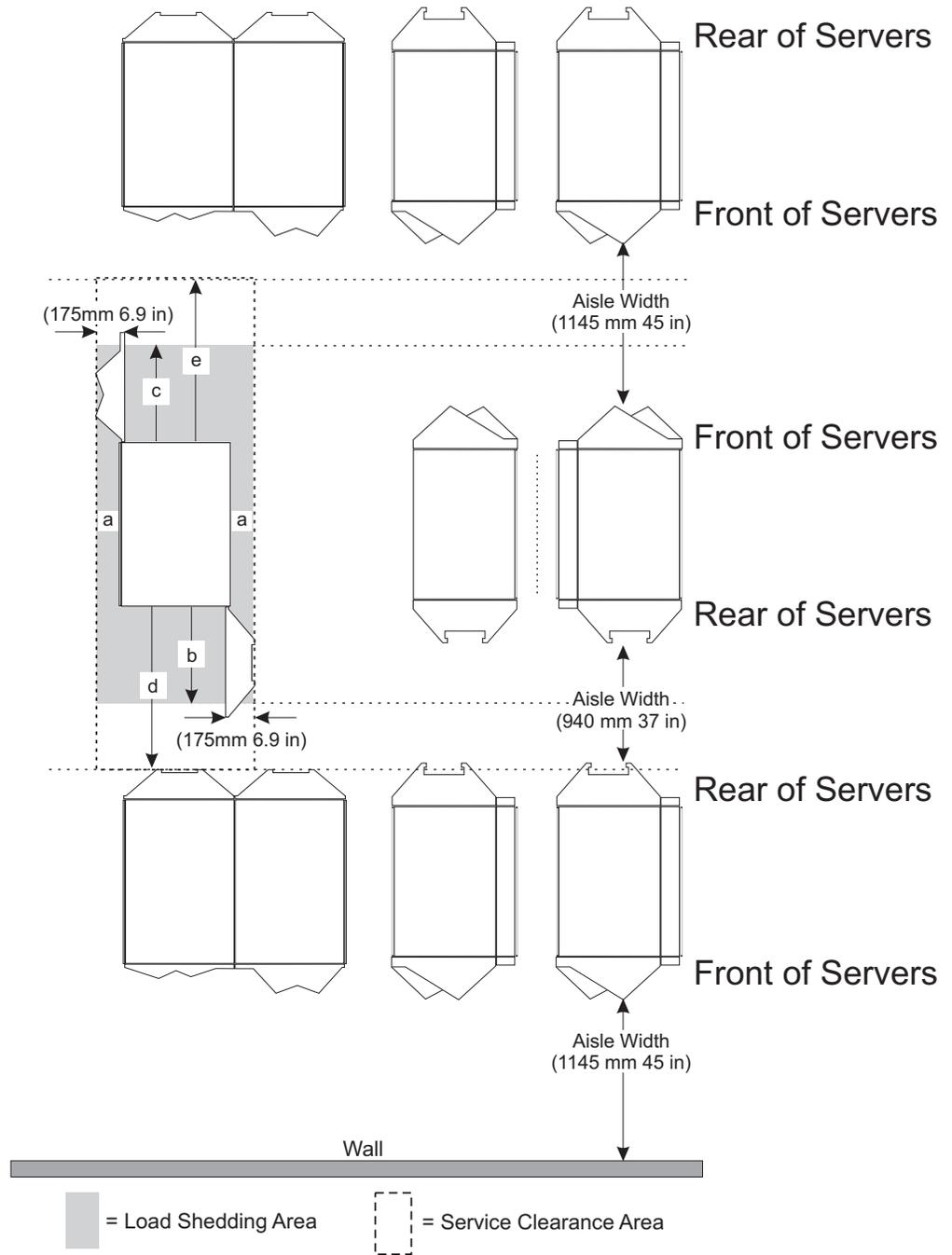
- 'a' = side dimension
- 'b' = front dimension
- 'c' = rear dimension

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, shown on the next page, must be observed:

- Rear dimension 'd' is **940 mm (37 in.)**.
- Front dimension 'e' is **1145 mm (45 in.)**.
- Both 'd' 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 **1145 mm (45 in.)** of clearance while rear-facing rows need only **940 mm (37 in.)**.



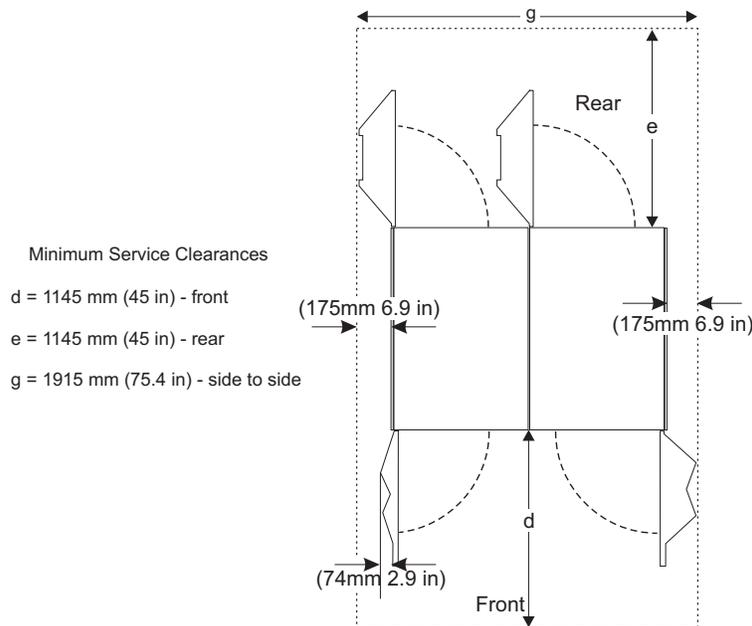
Machine and Service Clearance Areas

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 covers for service access to the system.

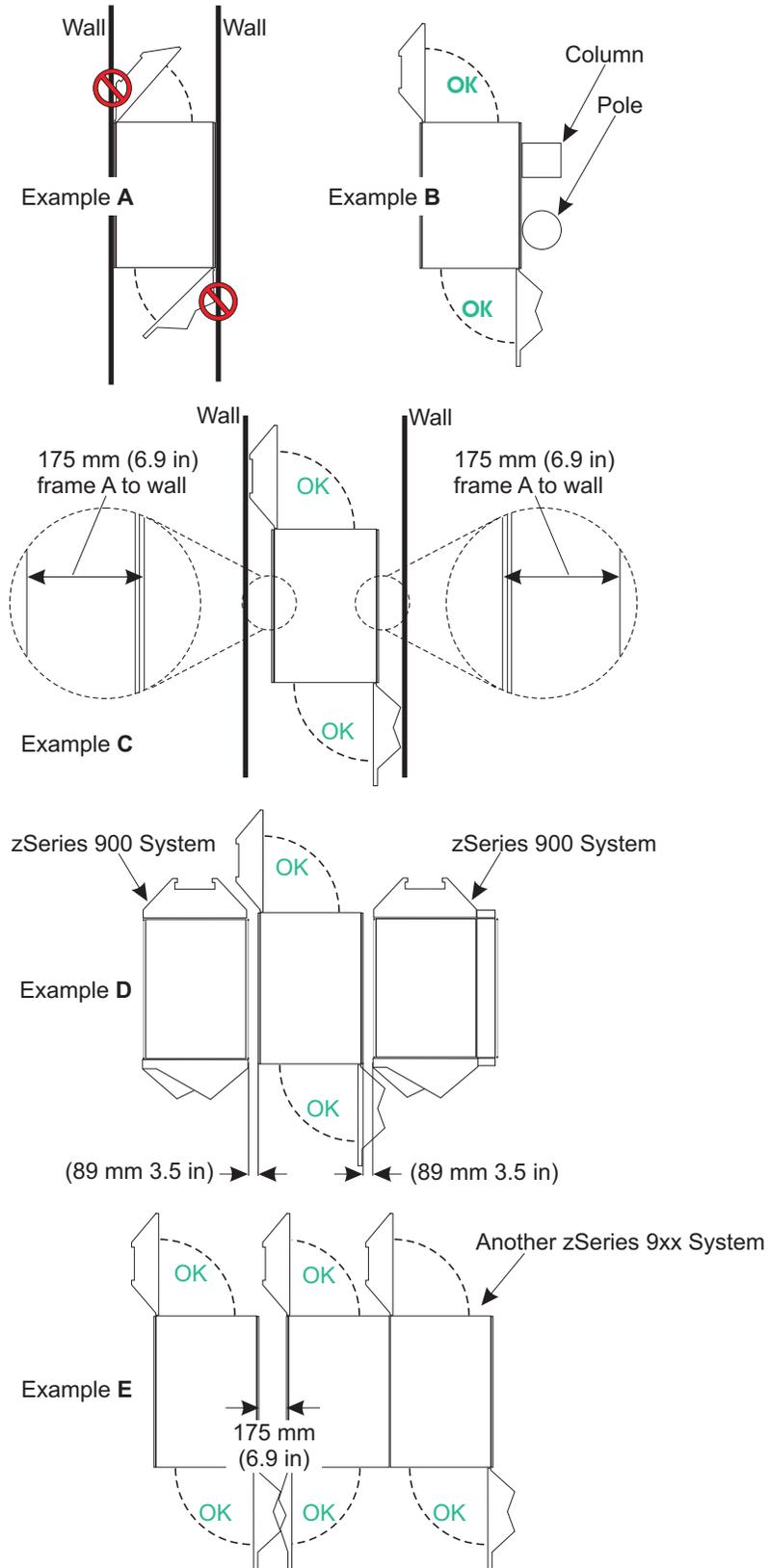
Single Frame	Machine Area M ² / (ft ²)	Service Clearance Area M ² / (ft ²)
A	1.24 M ² / (13.31 ft ²)	3.03 M ² / (32.61 ft ²)

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.

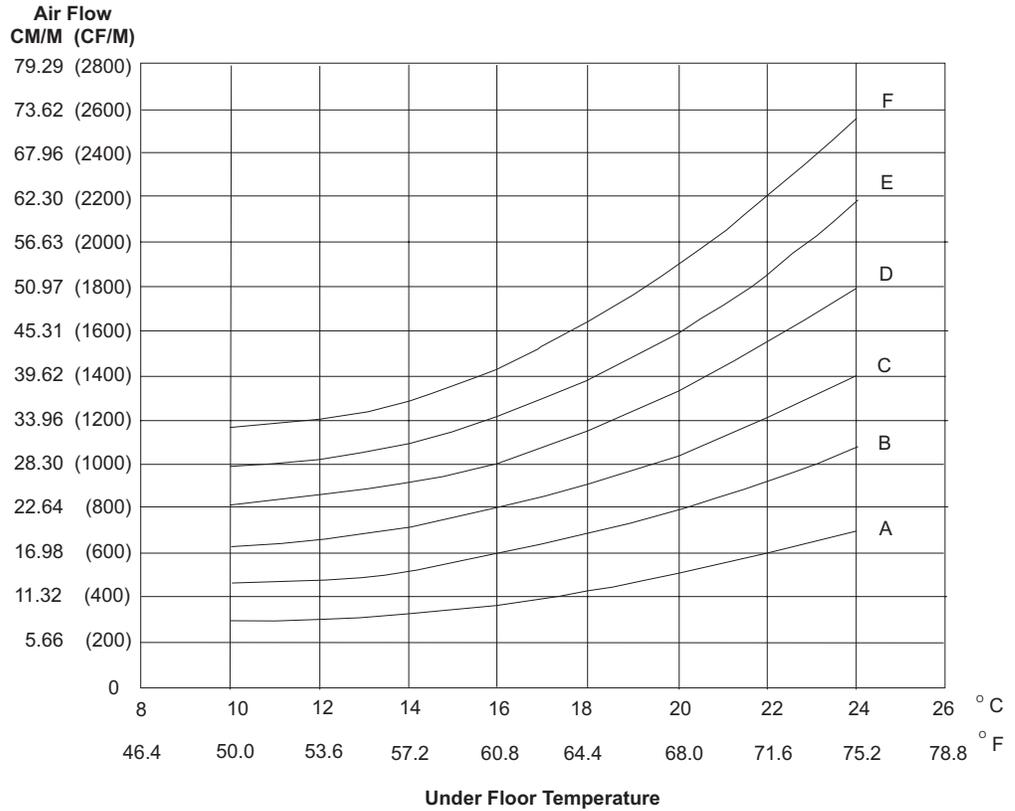


As the figure on the next page shows, the side cover of either the A frame cannot be placed adjacent to a wall (Example **A**), but can be positioned next to obstacles such as poles or columns (Example **B**). The front cover and the rear cover on frame A open 175 mm (6.9 in) wider than the width of the frame (Example **C**). **The front and rear doors access all of the serviceable area in the z9 BC. The system requires specific service clearances to insure 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.** Service clearances can be achieved with most systems installed side cover-to-side cover. Note the exceptions for z9 BC beside z900 and z9 BC beside z9 BC (Examples **D** and **E**).



The following table and chart illustrate how to determine the amount of chilled air your computer room must provide to meet the environmental requirement for your z9 BC server.

General purpose processor with 1 I/O cage	Dedicated CF, ICB only	Dedicated CF, ISC-3 only
Curve B	Curve A	Curve A
* Assumes the maximum supported configuration (5-way)		



Example

- z9 BC Model S07 (FC 1116)
- One I/O cage (FC H024)

Use the cooling air flow table on the previous page to determine that the cooling range for this system is **B**.

Assume that the computer room chilled air system delivers air at 20 degrees C (68 degrees F).

Refer to the curve in the air flow chart on the previous page. Air flow at 20 degrees C (68 degrees F) should be approximately 22.65 M³ (800 ft³).

Considerations for Multiple System Installations

When integrating a z9 BC into an existing multiple-system environment, or when adding additional servers to an installed z9 BC server, consider the following factors:

- **Thermal interactions**

Although computer room floor space is valuable, for optimal cooling, it is recommended that a z9 BC server should have a 1145 mm (45 in) aisle between rows of systems to reduce surrounding air temperature. See “Cooling Recommendations” on page 2-14.

- **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.

- **Inter-system cabling**

Integrated Cluster Bus (ICB) cables linking systems together are limited to 10 meters (33 ft) in length. Because some of that length is used under the covers of the connected systems to reach internal plugging points, the usable length of these system links is further reduced to a maximum of 7 meters (23 ft). See “Integrated Cluster Bus Channel” on page 7-18.

Chapter 3. Guide for Raised Floor Preparation

Conductive Contamination

Attention:

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 in 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 aid of magnifying lenses, this type of contamination can have disastrous impact 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 may 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 IBM Service representative.

General Information

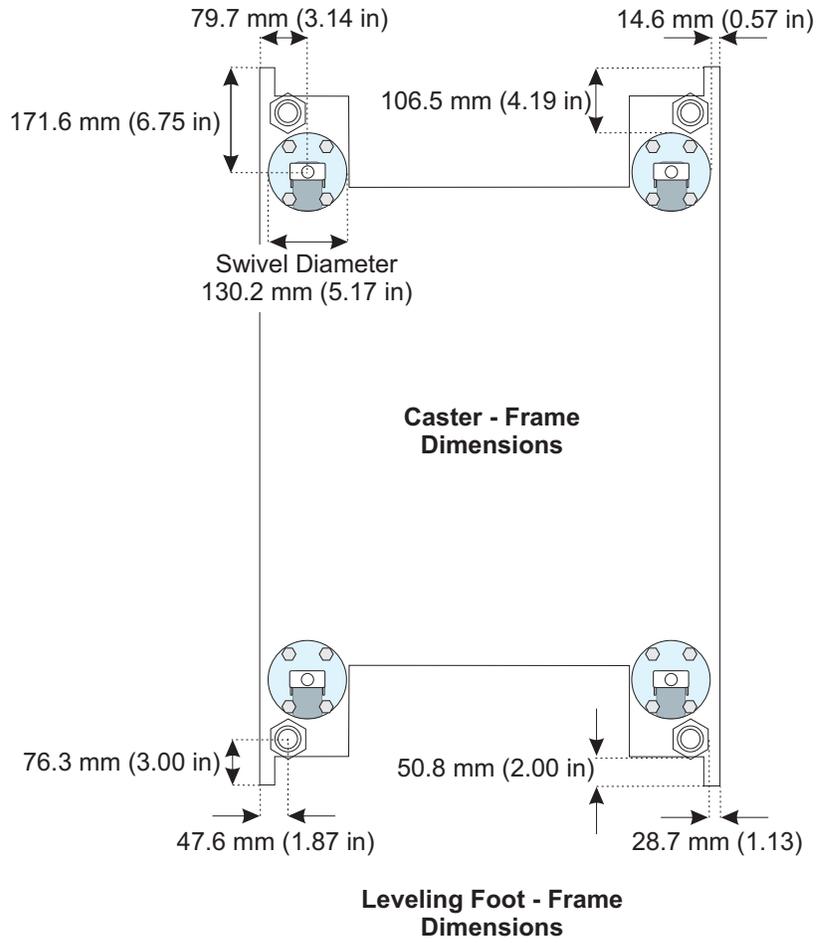
This chapter provides recommendations for making the necessary openings in the raised floor for installation.

The drawings on the following pages are intended only to show relative positions and accurate dimensions of floor cutouts. They are **not** machine templates and are **not** drawn to scale.

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 illustration shows the physical dimensions around the casters. When planning for both the movement and positioning of the system, be aware that each caster swivels in a circle slightly larger than 130 mm (5.1 in) in diameter. Exercise caution when working around floor cutouts.



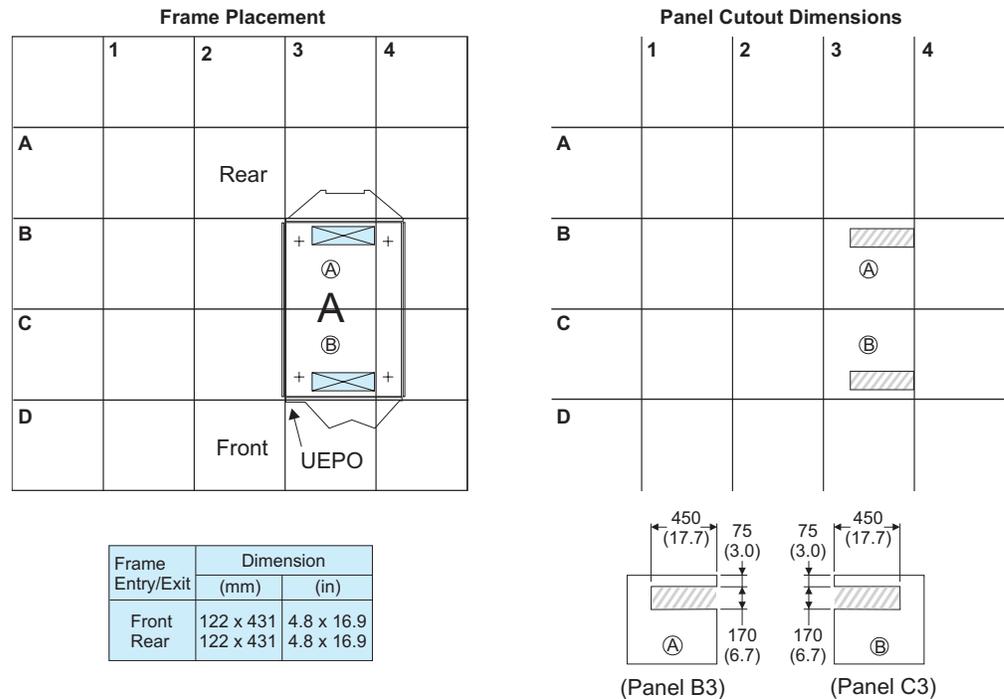
Procedure for Cutting and Placement of Floor Panels

1. Ensure adequate floor space is available to place the frames over the floor panels exactly as shown on the drawing. Refer to Chapter 2 for front-to-back and side-to-side clearances. Use the plan view if necessary. Consider all obstructions above and below the floor.
2. Identify the panels needed, and list the total quantity of each panel required for the installation.
3. Cut the required quantity of panels.

Note: Depending on panel type, additional panel supports (pedestals) may be required to restore the structural integrity of the panel.

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 diagrams to install the panels in the proper positions.

Raised Floor with 610 mm (24 in) or 600 mm (23.5 in) Floor Panels



Extra pedestals are recommended under panels B3 and C3.

Chapter 4. Power Requirements

General Requirements

z9 BCs require a minimum of 2 customer power feeds:

1. Two identical **single- or three-phase** feeds to the A frame.
2. One single-phase feed for customer-supplied service outlets.

The service outlets require standard 100V to 130V or 200V to 240V, 50/60Hz, single-phase power.

z9 BCs operate with:

- 50/60Hz AC power
- **Either** three-phase or single-phase wiring
- Voltages ranging from 200V to 480V (three-phase) and 200V to 415V (single-phase).

Power Installation Considerations

z9 BCs operate from two fully-redundant single-phase or three-phase line cords. These redundant line cords allow the system to survive the loss of customer power to either line cord. If power is interrupted to one of the line cords, the other line cord will pick up the entire load and the system will continue to operate without interruption. Therefore each line cord must be wired to support the entire power load of the system.

Note: The power cord set(s) provided are for use only with this product.

See Appendix E, “Dual Power Installation,” on page E-1 for examples of typical redundant wiring facilities.

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.

3-Phase Power Only

The utility current distribution across the phase conductors (phase current balance) depends on the system configuration. Each front end power supply is provided with phase switching redundancy. The loss of an input phase is detected and the total input current is switched to the remaining phase pair without any power interruption. Depending on the configuration input power draw, the system can run from several minutes to indefinitely in this condition. Since most single phase losses are transients which recover in seconds, this redundancy provides protection against virtually all single phase outages.

Voltage Ranges and Tolerances

Supply Type	Nominal Voltage Range (V)	Voltage Tolerance (V)	Frequency Range (Hz)
Two redundant three-phase line cords	200-480	180-509	47-63

Supply Type	Nominal Voltage Range (V)	Voltage Tolerance (V)	Frequency Range (Hz)
Two redundant single-phase line cords	200-415	180-457	47-63

System Power Rating

Power Supply Source	Frequency (Hz)	Input Voltage Range (V)	Rated Input Current (A)
Three-phase (all)	50/60	200	25
	50/60	208-240	24
	50/60	380-415	13
	50/60	480	10.5
Single-phase (all)	50/60	200	25
	50/60	208-240	24
	50/60	380-415	13

System Power Consumption

The following table provides system power consumption/heat load based on processor usage.

Utility Power (in kW) for general purpose processor with 1 I/O cage*	Utility Power (in kW) for dedicated CF, ICB only	Utility Power (in kW) for dedicated CF, ISC-3 only
5.4	2.9	3.4

Notes:

- * Assumes maximum supported configuration (maximum I/O adapters installed)
- The power factor is approximately unity.
- Input power (kVA) equals heat output (kW).
- For heat output expressed in kBTU per hour, multiply table entries by 3.4.
- Balance:
 - For systems using three-phase power, the system will run unbalanced. Two phases carry equal current and the third phase is used for redundancy in case of a phase fault to one of the other two phases.
- See Appendix E, "Dual Power Installation," on page E-1 for recommendations on utility connections which better balance the current for installations where multiple systems are connected to the same power panel.

Power Estimator Tool

The Power estimator Tool for z9 EC or z9 BC allows you to enter your precise server configuration to produce an estimate of power consumption.

Login to *Resource Link* with any userid. Navigate to *Planning*, then to *Tools*, then to *Power Estimator Tools*. 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 produce an estimation of the power requirements to aid you in planning for your machine installation.

Actual power consumption after installation can be confirmed on the HMC System Activity Display.

Customer Circuit Breakers (CBs)

The maximum permissible CB rating is 30A. In geographic areas where the breaker sizes given are not available, the standard size circuit breaker giving the closest higher numerical value of current rating should be used.

It is recommended that a 30A CB (for 200-240V systems) or a 15A CB (for 480V systems) be used for both system power feeds.

Input Voltage Range (V)	System Rated Current (A)	Circuit Breaker
200V	25A	30 amps
200-240V	24A	30 amps
380-415V	13A	16 amps
480V	10.5A	15 amps

Note: System z server design incorporates Electromagnetic Interference filter capacitors required to block electrical noise from penetrating the power grid. A characteristic of filter capacitors, during normal operation, is high leakage currents. Depending on the server configuration, this leakage current can reach 350mA (350 milliamps). For most reliable operation, **Ground Fault Circuit Interrupter (GFCI), Earth Leakage Circuit Breaker (ELCB) or Residual Current Circuit Breaker (RCCB) type circuit breakers are not recommended for use with System z servers.** By internal design and grounding, System z servers are fully certified for safe operation (compliance with IEC, EN, UL, CSA 60950-1).

However, if leakage detection circuit breakers are required by local electrical practice, **the breakers should be sized for a leakage current rating not less than 500mA** in order to reduce the risk of server outage caused by erroneous and spurious tripping.

Internal Battery Feature (FC3210)

The Internal Battery Feature (IBF), FC 3210, is optional on the z9 BC. In the event of input power interruption to the system, the Internal Battery feature will provide sustained system operation for the times listed in the following table.

Hold-up time (minutes) for general purpose processor with 1 I/O cage	Hold-up time (minutes) for dedicated CF, ICB only	Hold-up time (minutes) for dedicated CF, ISC-3 only
9	20	17

Notes:

1. The numbers shown are approximate for 70° C, batteries no older than 3 years, and full N+1 power (both power supplies in operation).
2. Hold-up times are influenced by temperature, battery age, and fault conditions within the system.
3. * Assumes maximum supported configuration (maximum I/O adapters installed). Actual hold-up times will be longer for less-than-maximum configurations.

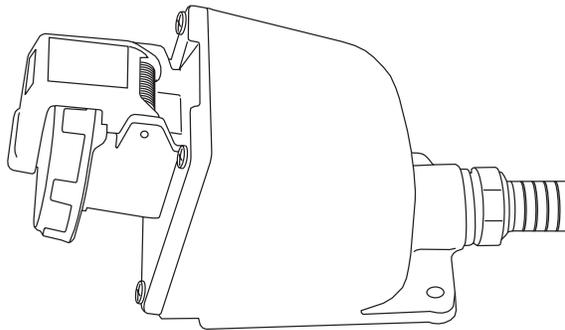
Power Cords, Plugs, and Receptacles

Plugs are shipped with the machine line cords in USA and Canada. The line cord lengths are 4250 mm (14 ft.) except in Chicago, Illinois, USA where the length is 1830 mm (6 ft.). Power plugs in the following table 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.

For countries that require other types of plugs or receptacles, the system is shipped without plugs on the line cords, and you are responsible for supplying and installing both plugs and receptacles.

System Location	Style AWG # of wires	Watertight Plug	Watertight Receptacle
FC 8987 USA, Canada, Japan (200-240 VAC) three-phase / 14 ft.	Type ST #10 AWG 4 wire	30A IEC-309 (provided as part of the cord)	30A IEC-309 430 R9W (not provided)
FC 8986 USA, Chicago (200-240 VAC) three-phase / 6ft.	Type ST #10 AWG 4 wire	30A IEC-309 (provided as part of the cord)	30A IEC-309 430 R9W (not provided)
FC 8983 USA, Canada, Japan (480 VAC) three-phase / 14 ft.	Type DP-1 #10 AWG 4 wire	30A IEC-309 (provided as part of the cord)	30A IEC-309 430 R7W (not provided)
FC 8984 USA, Chicago (480 VAC) three-phase / 6ft.	Type DP-1 #10 AWG 4 wire	30A IEC-309 (provided as part of the cord)	30A IEC-309 430 R7W (not provided)
FC 8988 World Trade (200-480 VAC) three-phase / 14 ft.	Type DP-1 #10 AWG 4 wire	(not provided - see Note 2)	(not specified - see Note 2)
FC 8990 USA, Canada, Japan (200-240 VAC) single-phase / 14 ft.	Type ST #10 AWG 3 wire	30A IEC-309 (provided as part of the cord)	30A IEC-309 330 R6W (not provided)
FC 8989 USA, Chicago (200-240 VAC) single-phase / 6 ft.	Type ST #10 AWG 3 wire	30A IEC-309 (provided as part of the cord)	30A IEC-309 330 R6W (not provided)
FC 8991 World Trade (200-415 VAC) single-phase / 14 ft.	Type DP-1 #10 AWG 3 wire	(not provided - see Note 2)	(not specified - see Note 2)

System Location	Style AWG # of wires	Watertight Plug	Watertight Receptacle
<p>Notes:</p> <ol style="list-style-type: none"> IBM continues to strongly recommend the use of a metal backbox (example shown) with our line cords using IEC-309 plugs. Although in-line connectors and nonmetallic backboxes are available and compatible, they are not recommended. These recommendations are based on the metal backbox providing: <ul style="list-style-type: none"> An added level of protection against a mis-wired phase and ground reversal In some cases, a metal backbox may be better for EMI mitigation <p>You may choose not to use a metal backbox. In this case, please check your local code for specific requirements.</p> 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. The power cord set(s) provided are for use only with this product. 			



Line Cord Wire Colors

The z9 BC three-phase power cords use the following wire colors:

- Cords supplied without a plug:
 - Line 1 - Brown Phase 1 - (labeled "1" on the wire insulation)
 - Line 2 - Black Phase 2 - (labeled "2" on the wire insulation)
 - Line 3 - Gray Phase 3 - (labeled "3" on the wire insulation)
 - Ground - Green/yellow - (labeled "GND" on the wire insulation)

The z9 BC single-phase power cords use the following wire colors:

- Cords supplied with a plug:
 - Line 1 - Brown Phase 1
 - Line 2 - Black Phase 2
 - Ground - Green/yellow
- Cords supplied without a plug:
 - Line 1 - Brown Phase 1 - (labeled "X" on the wire insulation)
 - Line 2 - Blue Phase 2 - (labeled "Y" on the wire insulation)
 - Ground - Green/yellow - (labeled "GND" on the wire insulation)

Line 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, local codes apply.

Grounding Specifications

Every three-phase circuit must contain three-phase conductors and an insulated equipment-grounding conductor. Every single-phase 120 volt branch circuit (used for the Hardware Management Console and service outlets) must contain one phase conductor, a neutral conductor, and an insulated equipment-grounding conductor.

For 250 VAC 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. IBM recommends 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 in parallel with the grounding conductor it contains. Most electrical codes require that branch circuit wiring be located in 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.

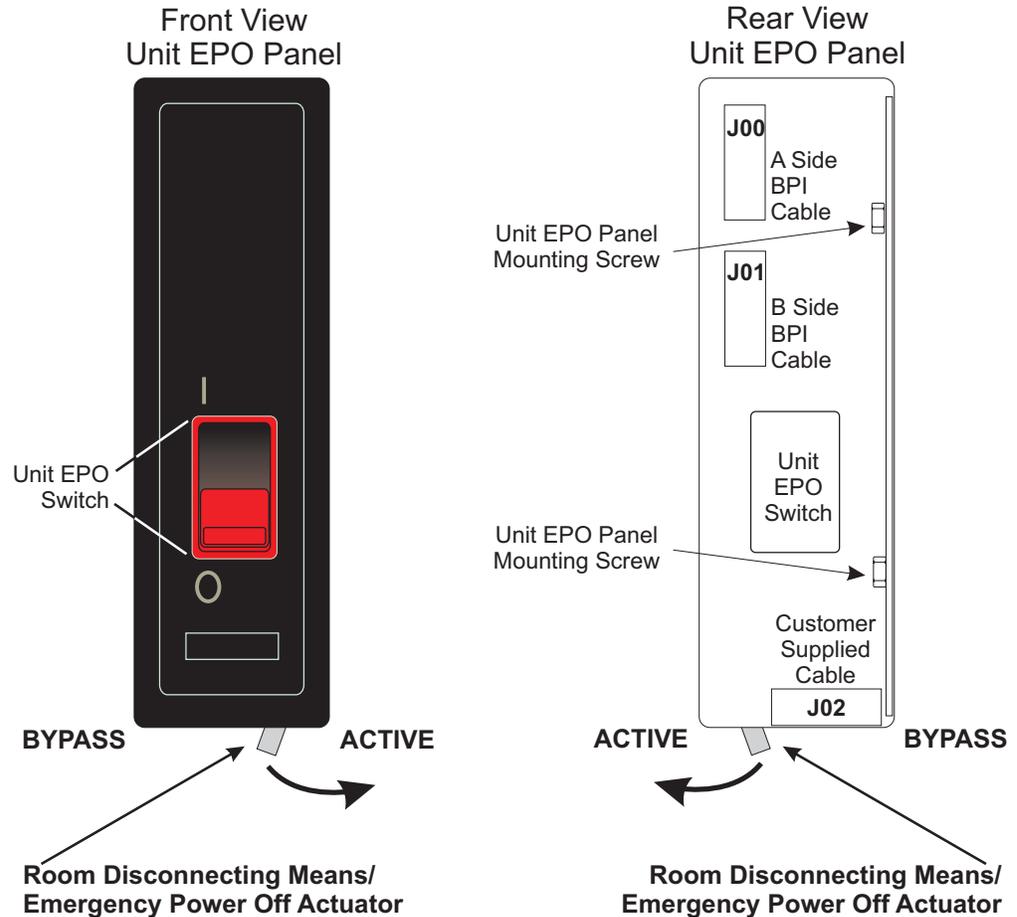
There is information about additional recommendations and requirements for equipment grounding on IBM's **Resource Link** web site (<http://www.ibm.com/servers/resourcelink>). See "**General Information for Planning a Physical Site**".

Service Outlet (Customer-Supplied)

A duplex service tool outlet should be installed within 1.5 m (5 ft) of the system frame. The power requirement is 110V/120V for USA and Canada (other power requirements are country dependent). The service tool outlets should be fed from the same power source as the system. The service tool outlet should be placed on a separate circuit breaker so it can be used when the processor frame circuit breaker is off.

Unit Emergency Power Off (UEPO)

There is a unit emergency power off (UEPO) switch on the front of the primary frame (A Frame) of each system. When tripped, the UEPO switch will immediately disconnect utility and battery power from the machine functional unit. Utility power is confined to the machine power compartment. All volatile data will be lost.

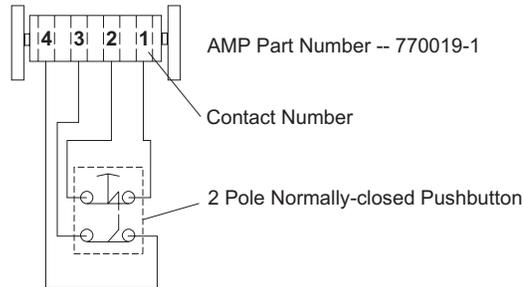


This figure illustrates the back of the machine UEPO panel showing where the room disconnecting means / Emergency Power Off, EPO, cable plugs into the machine. Notice the switch actuator. Once moved to make the cable connection possible, the room disconnecting means / EPO cable must be installed for the machine to power on.

Computer Room Emergency Power Off (EPO)

When the Internal Battery backup feature is installed and the room disconnecting means / EPO is tripped, the batteries will engage and the computer will continue to run. It is possible to attach the computer room disconnecting means / EPO system to the machine UEPO switch. When this is done, tripping the room disconnecting means / EPO will disconnect all power from the line cords and the Internal Battery backup unit. In this event all volatile data will be lost.

To incorporate the IBF into the room disconnecting means / Emergency Power Off (EPO) systems, a cable must be made to connect to the back of the system UEPO panel. The following diagram illustrates how this connection is made.

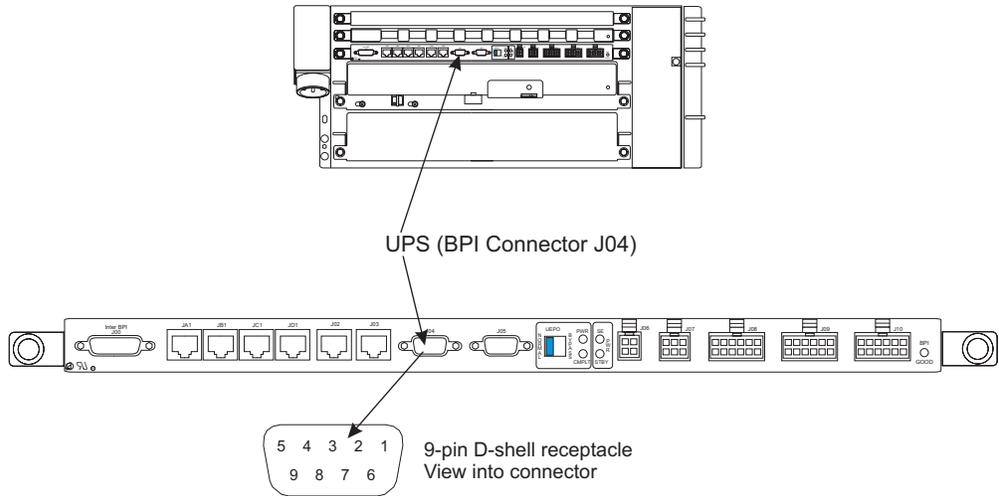


Room UEPO Switch Schematic

In this figure an AMP connector 770019-1 is needed to connect to the system UEPO panel. For room disconnecting means / EPO cables using wire sizes #20 AWG to #24 AWG use AMP pins part number 770010-4. The permissible resistance of the customer connection is 5 Ohms Maximum (~200' of #24 AWG).

Uninterruptible Power Supply (UPS) Control Interface

The z9 BC can accept an external UPS system that uses the AS/400® 4-wire interface. The interface is a standard 9-pin D-shell connector that plugs to J04 on the bulk power interface (BPI) in each power supply. The location and pin assignments are shown below. This interface allows the z9 BC to recognize an online UPS and read its operational status (bypassed, battery low, utility failed). An UPS can be connected to both of the power supplies in the system.



Signal	Type	Description	Pin
UPS BYPASD	Input	Indicates UPS has been byassed. Pull-up resistor on BPI	6
UPS BATT LOW	Input	Indicates UPS has low batteries. Pull-up resistor on BPI	7
UPS ON	Input	Indicates UPS is connected and active. Pull-up resistor on BPI	8
UPS UTIL FAIL	Input	Indicates UPS has detected a loss of utility power. Pull-up resistor on BPI	9
	Ground		5
FR GND	Frame Ground	Cable drain/shield terminated to the frame	4

Pins 1, 2 and 3 are unused.

Chapter 5. Hardware Management Console and Support Element Communications

Support Element

The z9 BC is supplied with a pair of integrated ThinkPad support elements (SE) (FC3067). One is always active while the other is strictly an alternate. Power for the support elements is supplied by the server power supply, and there are no additional power requirements.

Each SE is shipped with two 10/100 Mbps Ethernet LAN adapters. Two 15.24 meter (50 ft) Ethernet cables are supplied to connect the Support Elements to your LAN.

An Ethernet switch is required to connect the Support Elements to a LAN. The switch is supplied with every system order under FC0089.

Note: If you already have an Ethernet switch, you should deselect FC0089 to avoid receiving another switch.

The Ethernet switch requires a single 110/120V outlet for USA and Canada. (Other power requirements are country dependent.)

Hardware Management Console

A Hardware Management Console (FC0081 or later) is required to operate a System z9 Business Class server. A single console can support multiple System z9 Business Class, zSeries, and S/390 servers and can be located remotely to the physical sites.

The Hardware Management Console consists of:

- A processor or system unit, including two Ethernet LAN adapters, capable of operating at 10, 100, or 1000 Mbps and a DVD RAM to install Licensed Internal Code (LIC)
- A flat panel display (described below)
- A keyboard and
- A mouse.

The console requires a customer-supplied table to hold the following:

The keyboard and mouse

A 20-inch flat panel display, 20.0 inches viewable (FC6095)

An IBM 7852-400 modem or equivalent (for remote service support).

The Hardware Management Console requires three 110/120V outlets for USA and Canada. (Other power requirements are country dependent.)

Physical specifications for the Hardware Management Console components are located in Appendix B, "Hardware Management Console Physical Specifications," on page B-1. Physical specifications for the IBM 7852-400 modem are located in "Modems" on page 6-3.

If you have a Hardware Management Console with DVD RAM capability, you may be able to reuse it on your System z9 Business Class server. IBM Hardware

Management Console Feature Codes 0075, 0076, 0077, 0078, and 0079 can all be carried forward from previous server installations and reused.

LAN Connections

Shipped as a LAN connection package, your system will arrive with the following LAN cables for connecting the console to your network:

Type	Description	Part Number	Quantity
Ethernet	15.24 m (50 ft)	41V0143	2

Ethernet cable **P/N 41V0143** connects to either the Ethernet adapter installed with FC0081 or to the Ethernet connector on the connector panel of the processor unit. This cable has RJ-45 connectors on both ends.

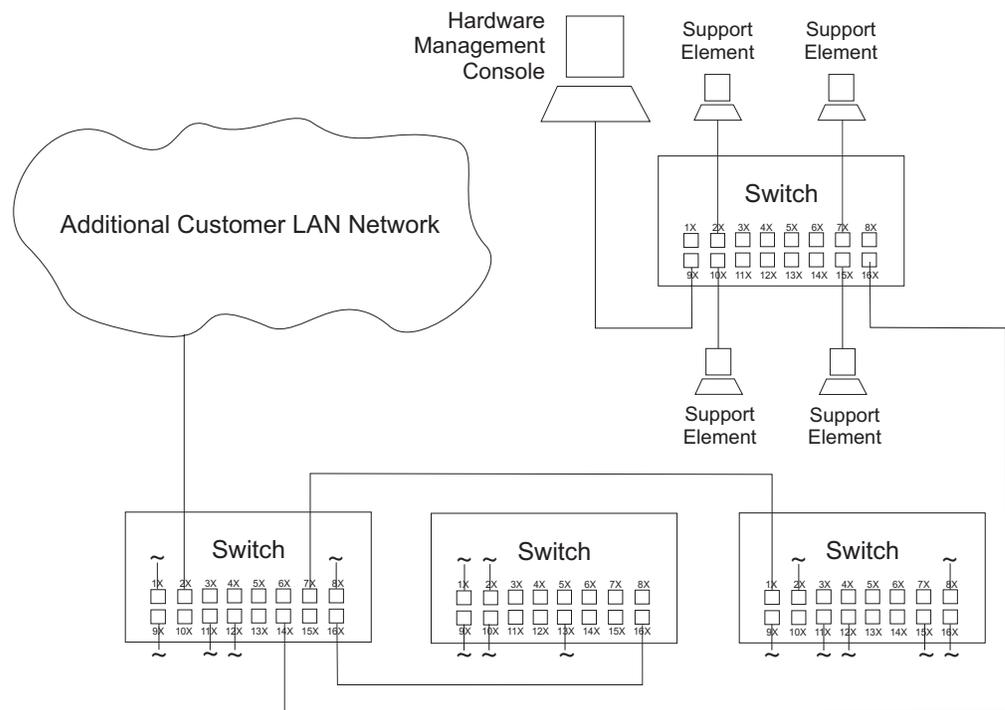
Ethernet LANs can operate at 10, 100, or 1000 Mbps. The Ethernet cable that shipped with your console is Category 5 Unshielded Twisted Pair (UTP) cable that supports a link data rate up to 1000 Mbps.

Ethernet Network Connection Recommendations

To reduce network complexity, IBM recommends that the install team connect the top communication adapters for both the Primary and the Alternate SE and any HMC(s) into a local IBM supplied Switch. This local switch can then be connected to the customer network as required. (See the illustration below).

The secondary network connections (bottom communication adapters in both SEs), if configured, can be installed directly into the customer network or into a second local Switch.

This recommended configuration will greatly reduce the risk of System z9 network-related problems and supply full connectivity to the customer network.



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 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. Multiple LAN adapters in a Hardware Management Console allow that Hardware Management Console to connect to two independent networks. The use of a Token Ring adapter plus an Ethernet adapter can aid in the migration from Token Ring environments to Ethernet environments.
3. Multiple LAN adapters in a Support Element allow two different Hardware Management Consoles to have independent paths to that SE, or to provide redundant paths from one HMC to that SE. The intent is to help ensure a path to the server from an HMC if there is a failure or outage in one of the networks.
4. When configuring multiple adapters the address must be defined in different subnets.

Because you may be connecting this system to existing LANs that use Ethernet adapters, the following Ethernet wiring scenarios are presented:

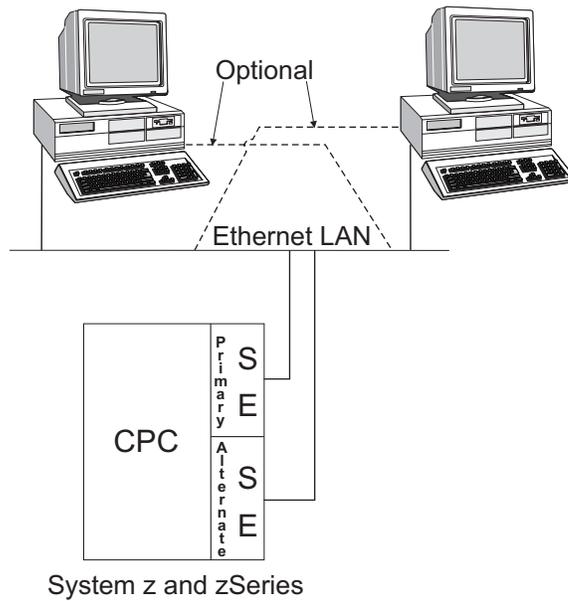
- **Ethernet only - one path wiring scenario**

This “Ethernet only” wiring scenario is intended for enterprises who currently have Ethernet installed and who do not want Token Ring wiring introduced into their environment. This wiring scenario requires that a second Ethernet be specified with the support Elements. The Ethernet features assume the use of 10/100 Mbit Ethernet facilities, requiring the use of CAT-5 Ethernet cabling.

Since the Support Element Ethernet only feature includes two Ethernet adapters, there will be two Ethernet connections available. For this scenario, only the Ethernet cable connected to the Ethernet in the first (top) PCMCIA slot of the support Elements will be used.

The TCP/IP protocol used in Support Element to Hardware Management Console communication is defined for both adapters in the PCMCIA slots of the support Elements.

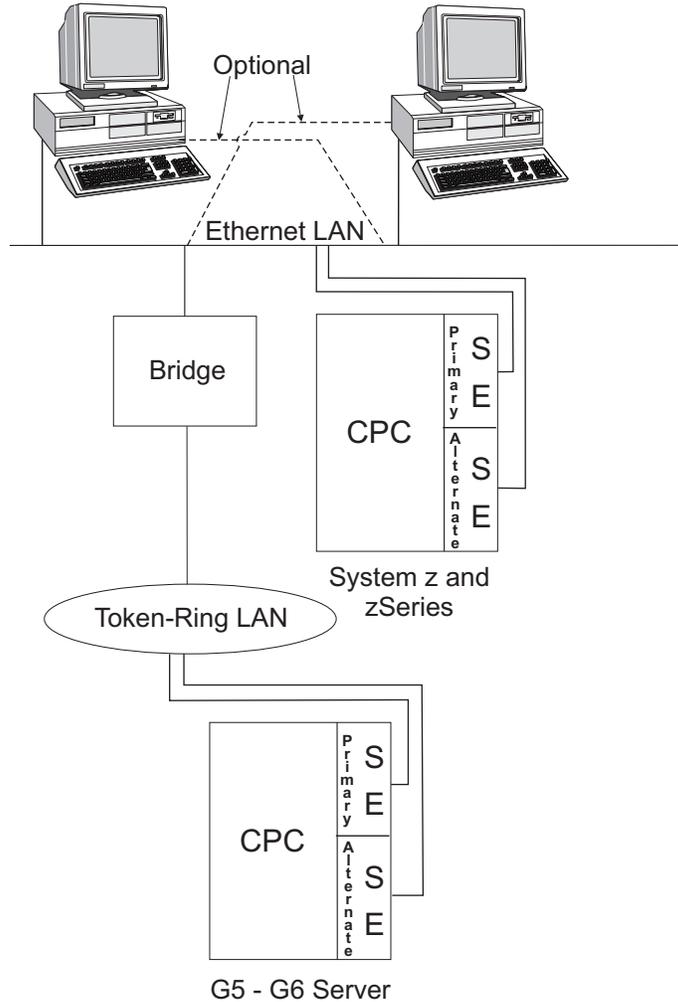
It will be necessary to connect the “top” Ethernet adapter cable to a customer supplied local hub capable of 10/100 Mbit Ethernet rates. It will be necessary to connect the Ethernet from the Hardware Management Console to either the same hub as the support Elements, or to a hub that connects to the Support Element hub.



- **Additional connections to the Ethernet LAN** may be made to expand the connectivity beyond the local Hardware Management Console and Support Element.

If connections to previous generations of IBM Enterprise Server systems are desired, they may be connected using Ethernet-to-Token Ring bridges.

If connection to the enterprise LAN is desired, it is recommended that an Ethernet bridge or router be installed to isolate the Hardware Management Console and Support Element from other systems.



- **Ethernet only - two path wiring scenario**

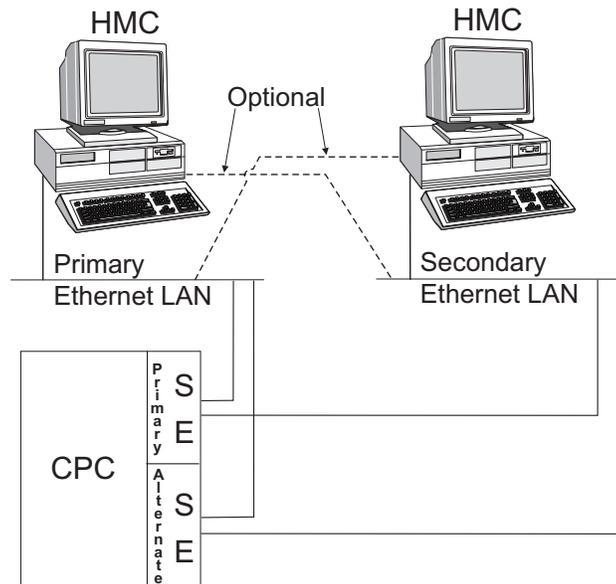
This “Ethernet only” wiring scenario is also intended for enterprises who currently have Ethernet wiring and do not want Token Ring wiring introduced into their environment. The two path scenario is included to provide the possibility of a second, separate and redundant path to the support Elements.

The Ethernet features assume the use of 10/100 Mbit Ethernet facilities, requiring the use of CAT-5 Ethernet cabling. Since the Support Element Ethernet only feature includes two Ethernet adapters, there will be two Ethernet connections available. For this scenario, both the Ethernet cables will be used.

The TCP/IP protocol used in Support Element to Hardware Management Console communication is defined for both adapters in the PCMCIA slots of the support Elements.

It will be necessary to connect the “top” Ethernet adapter cable to a customer supplied local hub capable of 10/100 Mbit Ethernet rates. It will be necessary to connect the Ethernet from at least one local Hardware Management Console to the same hub as the support Elements.

It will be necessary to connect the “bottom” Ethernet adapter cable to a customer supplied local hub capable of 10/100 Mbit Ethernet rates. This second adapter will have to be assigned an address on a separate subnet from the first adapter. Any Hardware Management Consoles attached to either LAN will be able to automatically discover the support Elements, assuming that the LAN network allows Multicast packets to flow and that the support Elements are on the same TCP/IP subnet(s) as the Hardware Management Consoles.

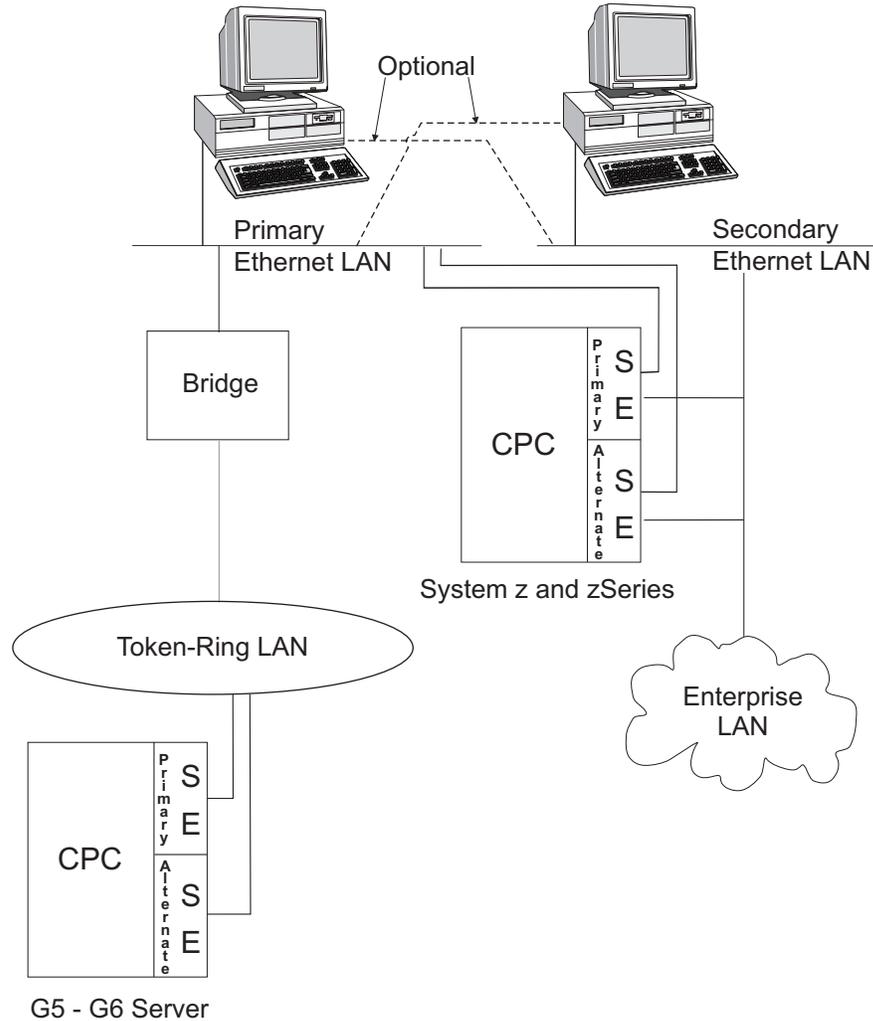


System z and zSeries

- **Additional connections to the Ethernet LAN** may be made to expand the connectivity beyond the local Hardware Management Console and support Elements.

If connections to previous generations of Enterprise Server systems are desired, they may be connected using Ethernet-to-Token Ring bridges.

If connection to the enterprise LAN is desired, it is recommended that an Ethernet bridge or router be installed to isolate the Hardware Management Console and support Elements from other systems.



Trusted Key Entry (TKE)

z9 BCs may have a Crypto Express2 feature for applications where extensive data security is required. For these systems, there is a separate console available for authorized access to the Crypto Express2 feature. This console is named the Trusted Key Entry (TKE) workstation.

The TKE workstation, FC 0839, includes a system unit, 510.5 mm (20 inch) flat panel display, mouse, keyboard, and line cord. The built-in Ethernet adapter supports a link data rate of 10, 100, or 1000 Mbps. A DVD RAM drive is available for installation of Licensed Internal Code.

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 0887, 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:

1. The Smart Card Reader (SCR) is an optional security device that attaches to the TKE.
2. The Smart Card Reader provides swipe card function thus further restricting access to the TKE.
3. Feature Code 0887, 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 SCR and the communication path between the SCR and the TKE workstation.
4. A TKE workstation and the TKE 5.0 level code are co-requisites for ordering the Smart Card reader.
5. Any existing TKE with a code level lower than 5.0 will have to be replaced with a FC0859 TKE and FC 0855 code (level 5.0) to work with a TKE ordered for your System z9 Business Class server.
6. FC 0888 provides the ability to order additional blank Smart Cards. The Smart Card Reader is a co-requisite for ordering additional Smart Cards.

To use the TKE function on System z9 Business Class servers, the Crypto Express2 feature, TKE 5.0 code, and CP Assist for Cryptographic Function (CPACF) must be installed.

- TKE 5.x workstations may be used to control cryptographic functions on System z9 Business Class, System z9 Enterprise Class, z990, z890, z900, and z800 servers.
- TKE 4.x workstations may be used to control cryptographic functions on z990, z890, and previous servers.
- TKE 3.x workstations may be used to control cryptographic functions on z900, z800, and previous servers.

The TKE workstation requires two 110/120 volt outlets in the U.S. and Canada. Power requirements vary in other countries.

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.

Time Synchronization

Synchronized time is possible in a Sysplex environment using External Time Reference (ETR), Server Time Protocol (STP), or a combination of both features in a Coordinated Timing Network (CTN).

Server Time Protocol (STP) (FC 1021) uses ISC-3, ICB-3, or ICB-4 cables to connect between servers. STP can be installed on z9 BC, z9 EC, z890, and z990 servers. z900 and z800 servers can participate in a Sysplex through ETR in a Coordinated Timing Network.

External Time Reference (ETR) (FC 6155) uses MT-RJ ESCON cables to allow connection of two Sysplex Timers for continuous availability. The cable connection at the server is MT-RJ. The Sysplex Timer supports use of an ESCON Duplex connector. An MT-RJ to ESCON Duplex conversion kit is required.

Chapter 6. Remote Support Facility Installation Planning

The Remote Support Facility (RSF) provides communication to a centralized IBM support network for problem reporting and service, as well as providing a means for remote operation of the Hardware Management Console. You may use either an Internet or modem connection for communicating with IBM's Remote Support Facility.

Note that there are some specific services for which a modem is required, rather than an Internet connection:

- External Time Source
- AutoAnswer - if specifically enabled, to allow a customer to access the HMC remotely from an external location.

Choosing a Communications Method for Remote Support

You have three choices for connecting to IBM's Service Support System through the RSF:

- A direct connection from the Hardware Management Console to the Internet. This method is fast, reliable and uses the external customer firewall to control the connection.
- An indirect connection from the Hardware Management Console to the Internet 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.
- Use a modem. This method compared to a direct or indirect Internet is more costly (telephone line, associated equipment, and monthly charges) and slower.

The benefits of either a direct or indirect connection to the Internet will facilitate more rapid problem resolution for your enterprise.

An Internet-based Remote Support Facility (RSF) connection is recommended unless your enterprise security policies prohibit HMC communication with the Internet. The following information is designed to provide your networking team with the information they need to enable the Hardware Management Console to connect securely to the Internet.

Security characteristics of Remote Support Facility communications include:

- RSF requests are always initiated from the HMC to IBM. No inbound connections are ever initiated from IBM's Service Support System.
- All transferred data is encrypted in a high-grade Secure Sockets Layer (SSL) method.
- When the HMC initiates a connection to RSF, it validates the trusted host by its digital signature issued for the IBM Service Support System.
- 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 SSL 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 destinations described under “Server address lists,” 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 port 443. You can configure the proxy server to limit the specific IP addresses to which the HMC can connect. See the “Server address lists” for the IP addresses to use.

Server address lists

Whether you are using a direct connection (the HMC only) or an indirect connection (with a proxy server) for Internet access, the HMC utilizes the following IP addresses and port 443 for all Internet activity:

The following IPv4 addresses work with, and are **required** for, RSF connection to Hardware Management Consoles using Licensed Internal Code at version 2.10.1 or later.

Table 6-1. LIC 2.10.1 and later IPv4 addresses

LIC 2.10.1 and later IPv4 addresses
129.42.26.224
129.42.34.224
129.42.42.224

Internet Protocol version 6 (IPv6) vastly extends the range of available IP addresses. Although IPv6 is not required for remote support facility connection, IBM now offers the capability to migrate to IPv6. The following IPv6 address table is provided as reference. Otherwise use the IPv4 addresses shown above.

The following addresses work with Hardware Management Consoles using Licensed Internal Code at version 2.10.0 or later for RSF connection with IPv6.

Table 6-2. LIC 2.10.0 and later IPv6 addresses

LIC 2.10.0 and later IPv6 addresses
2620:0:6C0:1::1000
2620:0:6C1:1::1000
2620:0:6C2:1::1000

The following Internet Protocol version 4 (IPv4) addresses work with Hardware Management Consoles using Licensed Internal Code at version 2.10.0 or earlier. Any HMC being installed with Licensed Internal Code at version 2.10.1 or later should use the IPv4 addresses in Table 6-1.

Table 6-3. LIC 2.10.0 and earlier IPv4 addresses

for internet access to the System Authentication Server (SAS)	for internet access to IBM Service from North or South America	for internet access to IBM Service from all other regions
129.42.160.48	129.42.160.49	129.42.160.50
207.25.252.200	207.25.252.204	207.25.252.205

Ordering Telecommunication Service

The following section describes the telephone line and modem requirements for the Hardware Management Console Remote Support Facility (RSF).

It is the customer's responsibility to arrange for installation and all costs of common-carrier equipment.

Each Hardware Management Console (HMC) comes with a modem. One telephone line is required for **each** modem installed.

Note: It is recommended that CPCs be assigned to more than one Hardware Management Console phone server.

When ordering telecommunications service, be prepared to identify the following:

- The type of telephone jack required (country dependent)
- The long distance carrier
- The selection of either dual tone multi-frequency (DTMF) or rotary (pulse) to be installed
- Installer of the telephone wiring and jack

The telephone line must be a dial-up (public switched network) analog type* with 24-hour, 7-day-a-week availability.

Note: *Digital telephone lines must not be used.

Modems

All models require a modem for telephone-based RSF. The modem supplied by manufacturing is dependent on the destination country homologation requirements. The general specifications of the supported modems (33K bps and 56K bps models) are:

- Data rate:
 - v34 - 36K bps and below
 - v90 - 56K bps and below
- Tone or pulse dialing
- Standards:
 - v34 - 36K bps:
 - Data: v.34, v.32bis, v.22bis4
 - Error correction: v.42
 - Data compression: v.42 Class 5; v.42bis
 - v90 - 56K bps:

- Data: v.90 - 56 Kflex, enhanced v.34 and below
- Error correction: v.42
- Data compression: Class 5; v.42bis
- Connectors: 1 DB-25F (RS-232C/D), 3 RJ11s
- Country dependent telecommunication cable: 4.6 m (15 ft.)
- Power requirements:
 - v34 - 36K bps:
 - Country dependent wall mount transformer
 - 90-130VAC or 230VAC, single-phase 50/60 Hz
 - v90 - 56K bps:
 - Country dependent line cord: 1.8 m (6 ft.)
 - 100-240VAC, single-phase 50/60 Hz
- Operating temperature requirements: 0-50 °C (32-120 °F)
- Operating relative humidity: 25-80% (no condensation)
- Weight: .9 kg (2.0 lb)
- Size:
 - Width: 158 mm (6.2 in)
 - Depth: 229 mm (9 in)
 - Height: 36 mm (1.4 in)
- Certifications: See the documentation supplied with the modem.

Important:

In countries where the IBM Hardware Management Console modem is not approved by the national communication authority a modem is needed which is in accordance with CCITT standard V.26bis. For non-IBM modems a 7852 equivalent, country-approved modem is required that meets the following specifications:

- Line speed - 9600 bps or greater
- Command set - AT command set for Asynchronous
- Mode - Asynchronous
- Connection - Switched public network

It is the responsibility of the country to approve a local modem in these cases using local procedures.

Chapter 7. Cabling and Connectivity

Cable Installation Planning

Before you place your cable order, consider your future growth needs. You may wish to order cables longer than you need right now to avoid expansion problems in the future.

As processor packaging evolves, internal locations for various cable connections may shift, necessitating longer cables, even though the floor locations of connected devices have not changed.

Fiber optic cable planning, the procurement of fiber optic cables, cable labeling, installation, and documentation are customer responsibilities for new processor installations and for processor MES upgrades from previous systems. IBM offers the zSeries Fiber Cabling Services for individual fiber optic jumper cables and the Enterprise Fiber Cabling Services for structured (trunk) cabling environments to provide connectivity solutions for the data center. Either way, *IBM Network Integration and Deployment Services* can help you with your fiber cabling responsibilities.

The zSeries family fiber optic I/O channel cards use industry-standard cable connectors. These same fiber optic connectors are used in connecting local area and storage area networks, giving the zSeries a standards-based connectivity design.

Following are:

- A description of the zSeries Fiber Cabling Services and the Enterprise Fiber Cabling Services.
- A list of customer fiber optic cabling responsibilities if the services are not elected.
- A description of the System z9 Business Class channel feature connections.
- A description of the Fiber Quick Connect fiber harness feature for ESCON cables.

zSeries Fiber Cabling Services

The system fiber optic cable environment has become much more complex, and proper planning and installation of fiber cabling is critical to maximize the benefits of high-speed protocols such as FICON, Fibre Channel (FC), Coupling Facility links and Gigabit Ethernet. These protocols require planning for different fiber types, new fiber optic connectors, and current and future data rates to determine optimal connectivity and cabling options. Fiber optic cable planning, fiber optic cable procurement, fiber optic cable labeling, installation, and documentation are customer responsibilities. The IBM Network Integration and Deployment Services zSeries Fiber Cabling Services are available to provide jumper cable connectivity to the zSeries system.

The IBM zSeries Fiber Cabling Service offers three fiber cabling options that can provide the IBM zSeries customer with the appropriate level of connectivity. Individual fiber optic jumper cables (vs. trunk cables) are the foundation of these services. The options include various degrees of IBM planning expertise, fiber optic products, and installation services needed to quickly and efficiently integrate the IBM eServer zSeries into the IT infrastructure and minimize installation costs and time. All of the options include cabling documentation for the installed processor.

1. ***Fiber optic jumper cabling package (Option 1)***

- **Planning Services:** Analysis of the zSeries channel configuration and the existing fiber optic jumper cables to determine the appropriate fiber optic jumper cables required for the new zSeries server installation.
- **Fiber Optic Jumper Cables:** IBM will supply the appropriate IBM fiber optic jumper cables up to 31 meters (100 ft) in length and conversion kits or Mode Conditioning Patch (MCP) kits based on the planning analysis.
- **Labeling and Installation Services:** IBM will label and install the fiber optic jumper cables and complete the installation with a detailed connection report.

2. ***Fiber optic jumper cable migration and reuse for a zSeries upgrade (Option 2)***

- **Planning Services:** Sort and organize the disconnected fiber optic cables from the outgoing processor and re-label these cables with the new PCHID address to connect to the new system.
- **Labeling and Installation Services:** Re-label, re-rout, and re-plug your existing fiber optic jumper cables for reuse with the upgraded zSeries server and complete the installation with a detailed connection report.

3. ***Fiber optic jumper cables and installation (Option 3)***

- Supply the fiber optic jumper cables you specify, then label and install the fiber optic jumper cables. Complete the installation with a detailed connection report.

Enterprise Fiber Cabling Services

If you have two or more processors in the data center, a structured fiber optic cable solution should be considered. This solution, besides organizing the jumper cables under the raised floor, provides for a cabling environment which is substantially easier to manage, to change and to increase. In essence, a structured fiber optic cable solution moves many of the cabling challenges away from the processors and I/O devices and allows the cabling connections to be handled in a centralized connection location. IBM offers two Enterprise Fiber Cabling Services packages that allow you to either connect a z9 or zSeries server into an already-structured environment or to provide a structured environment for an entire data center.

1. ***zSeries Fiber Trunk Cabling Services***

- **Planning Services:** Analyze your zSeries channel configuration and your existing fiber optic structured environment to determine the appropriate fiber optic harnesses, trunk cables, and patch panel boxes required.
- **New Fiber Optic Commodities:** Provide the required fiber optic trunk and other commodities to support the zSeries connection installation.
- **Labeling and Installation Services:** Label and install the required fiber optic trunk commodities to connect your new zSeries server to your existing structured fiber cabling infrastructure. Complete the installation with a detailed connection report.

2. ***Enterprise Fiber Cabling Service*** (previously "Fiber Transport Services")

- **Planning Services:** Analyze all of your enterprise processors, devices and existing fiber optic cabling to determine the required fiber optic trunk commodities (harnesses, trunk cables, panel-mounted boxes, and other hardware).
- **New Fiber Optic Commodities:** Provide the required fiber optic trunk and other commodities to support the zSeries environment.
- **Labeling and Installation Services:** Label and install the required fiber optic trunk commodities to connect the processors and devices in your data center. Complete the installation with a detailed connection report.

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*
2. *All purchasing of correct qualified cables*
3. *All installation of any required fiber optic or OSA Express copper cables*
4. *All routing of cables to correct front/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.

FICON Channel Feature

The FICON Express4 feature delivers up to 4 Gbps link data rate to servers, switches, control units and storage devices. FICON channels offer fast, efficient data transfer while allowing reuse of currently installed single mode and multimode fiber optic cables. FICON channels can coexist with ESCON channels on z9 server models.

Configuration Information

The table below 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 z9 and z/VM environments.

Feature Code	Description	Fiber Type
3318 (2 ports)	FICON Express4 SX (Short Wavelength)	multimode 50 and 62.5 micron (variable - maximum 860 m / 2822 ft)
3321 (4 ports)	FICON Express4 LX (Long Wavelength)	single mode 9 micron (unrepeated distance - 10 KM / 6.2 MI)
3322 (4 ports)	FICON Express4 SX (Short Wavelength)	multimode 50 and 62.5 micron (variable - maximum 860 m / 2822 ft)
3323 (2 ports)	FICON Express4 LX (Long Wavelength)	single mode 9 micron (unrepeated distance - 4 KM / 2.5 MI)
3324 (4 ports)	FICON Express4 LX (Long Wavelength)	single mode 9 micron (unrepeated distance - 4 KM / 2.5 MI)

1. FICON Feature Codes 3321, 3322, and 3324 have four channels per feature.
2. FICON Feature Codes 3318 and 3323 has two channels per feature.
3. All FICON Express4 feature codes use LC Duplex connectors.
4. Each Feature Code represents a FICON base adapter with pluggable optic modules.
5. Short wavelength and long wavelength optic modules cannot be mixed on the same FICON base adapter.
6. Short wavelength and long wavelength features (FICON adapters) can coexist in the same I/O cage.

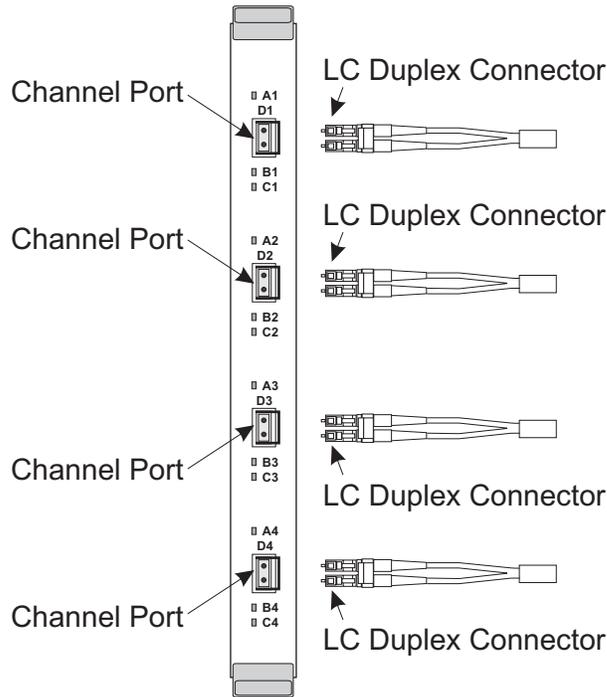
See “FICON References” for information about link distances and light loss budget.

FICON Feature Codes 3319 and 3320 are not orderable on z9 BC, but may be carried forward on an upgrade from a another server.

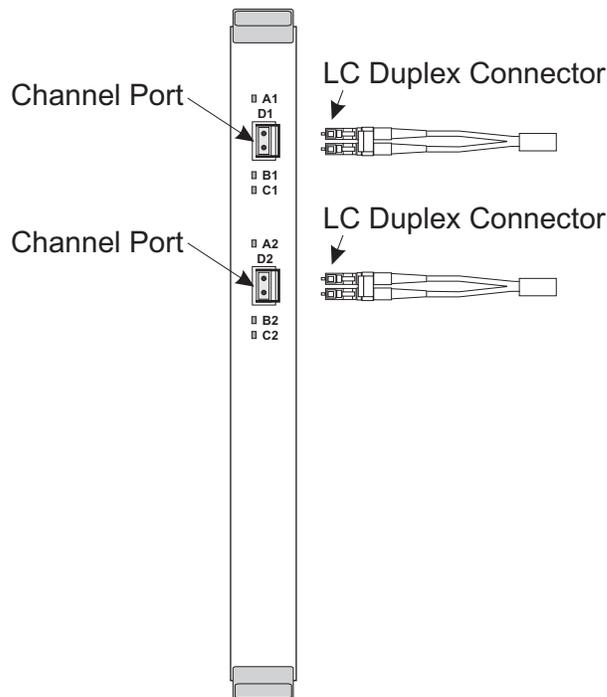
FICON References

The following illustration shows the FICON features, the ports on the features, and the type of fiber optic connector used.

FCs 3321/3322/3324 FICON Express4



FC 3318/3323 FICON Express4



For additional information on planning for FICON channels see:

- *Fiber Optic Link Planning (ESCON®, FICON™, Coupling Links & Open System Adapters, GA23-0367*

- *Fiber Channel Connection (FICON) I/O Interface, Physical Layer, SA24-7172*
- *ESCON and FICON Channel-to-Channel Reference, SB10-7034.*

ESCON Channel Feature

The ESCON channel delivers up to 17 MB/sec link data rate to servers, switches, control units and storage devices. ESCON channels can coexist with FICON on all z9 server models.

The System z9 Business Class system uses the 16 port ESCON feature. Fifteen of the ports are used. The sixteenth port is reserved as a spare.

Configuration Information

The table below shows the ESCON feature description

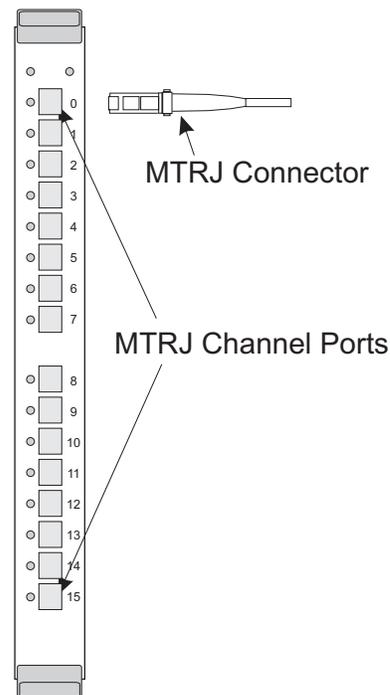
Feature Code	Description	Fiber Type	Connector Type
FC 2323	16-Port ESCON (15 ports plus 1 spare)	Multimode 62.5 micron	MT-RJ

- Use FC 2324 to order channels in 4-port increments.
- The system configuration tool places FC 2324s across an appropriate number of ESCON cards for high availability.
- See “ESCON References” for information about link distances and light loss budget.

ESCON References

The following illustration shows the ESCON feature, the ports on the feature, and the type of fiber optic connector used.

FC 2323 ESCON



For additional information on planning for ESCON channels see:

- *Fiber Optic Link Planning (ESCON[®], FICON[™], Coupling Links & Open System Adapters, GA23-0367*

- *ESCON Physical Layer, SA23-0394*
- *ESCON and FICON Channel-to-Channel Reference, SB10-7034*

ISC-3 Link Feature

ISC-3 links provide Parallel Sysplex connectivity between a coupling facility and production systems using z/OS™ operating systems. ISC-3 links operate at 2 Gbps in peer mode (connection between z9 BC, z9 EC, zSeries 890, zSeries 990, or zSeries 900 systems) at unrepeated distances up to 10 kilometers (6.2 miles).

Configuration Information

The table below describes the ISC-3 feature.

Feature Code	Description	Fiber Type	Connector Type
FC 0218	2-Port ISC-3	9 micron single mode	LC Duplex

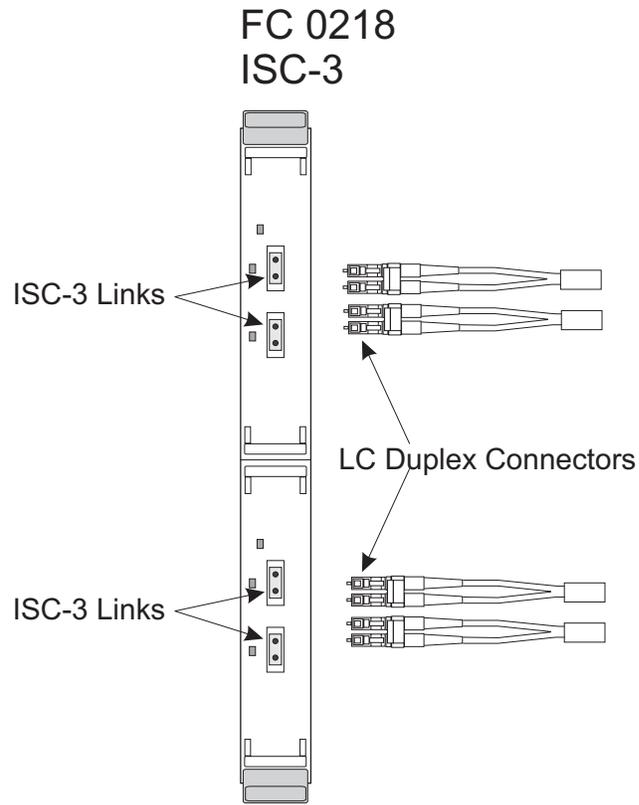
- ISC-3 links are comprised of:
 - FC 0218 - A “daughter” adapter card with two ISC-3 ports per card.
 - FC 0217 - A “mother” card into which can be plugged two “daughter” cards.
 - FC 0219 - LIC that activates the ports on a daughter card. Each port on a daughter card is activated individually.
 - The “mother” card, two “daughter” cards, and the individual port LIC can combine to provide up to four ports per ISC-3 adapter.

Note: On an initial system order, any request for more than two ISC-3 ports automatically generates a minimum of two FCs 0217. This insures maximum ISC-3 availability and efficiency.

- The system configuration tool places the ISC-3 feature port LIC across an appropriate number of cards for high availability.
- See *Fiber Optic Link Planning (ESCON®, FICON™, Coupling Links & Open System Adapters, GA23-0367*, for information about link distances and light loss budget.

ISC-3 Reference

The following illustration shows the ISC-3 feature, the links on the daughter cards, and the type of fiber optic connector that plugs into the transceivers.



OSA-Express LAN Features

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

Configuration Information

The table below lists the OSA-Express features.

Feature Code	Description	Cable Type	Connector Type
FC 2366 *	2-Port Fast Ethernet	Category 5 UTP copper wire	RJ-45
FC 2364 *	2-Port LX Gigabit Ethernet	9 micron single mode	SC Duplex
FC 2365 *	2-Port SX Gigabit Ethernet	50 and 62.5 micron multimode	SC Duplex
FC 1364 *	2-Port LX Gigabit Ethernet	9 micron single mode	LC Duplex
FC 1365*	2-Port SX Gigabit Ethernet	50 and 62.5 micron multimode	LC Duplex
FC 1366 *	2-Port 1000 Base-T Ethernet	Category 5 UTP copper wire	RJ-45
FC 3366	2-Port 1000 Base-T Ethernet	Category 5 UTP copper wire	RJ-45
FC 3364 OSA-Express2	2-Port LX Gigabit Ethernet	9 micron single mode	LC Duplex
FC 3365 OSA-Express2	2-Port SX Gigabit Ethernet	50 and 62.5 micron multimode	LC Duplex
FC 3368 OSA-Express2	1-Port LR 10 Gigabit Ethernet	9 micron single mode	SC Duplex

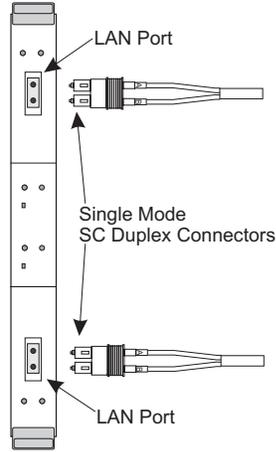
* Feature Codes 2364, 2365, 2366, 1364, 1365, and 1366 are not orderable on a new z9 BC. However, if you are upgrading an existing zSeries server to a System z9 Business Class, and your existing system has these feature codes installed, you can carry them forward for use in your new System z9 Business Class server.

OSA-Express features each have two ports (unless specified otherwise), and are ordered in 2-port increments.

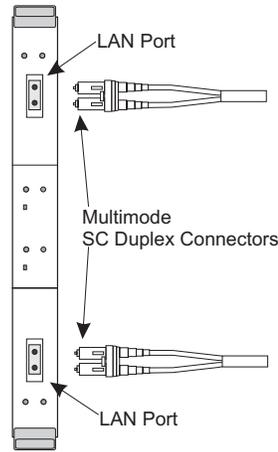
OSA-Express Reference

The following illustrations shows the OSA-Express and OSA-Express2 features, the LAN ports, and the type of fiber optic or copper connectors used.

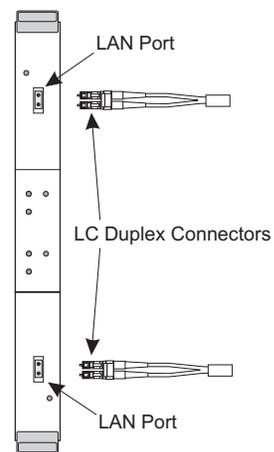
FC 2364*
Gigabit Ethernet



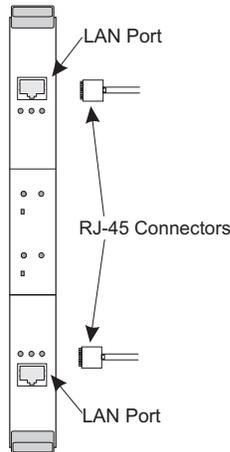
FC 2365*
Gigabit Ethernet



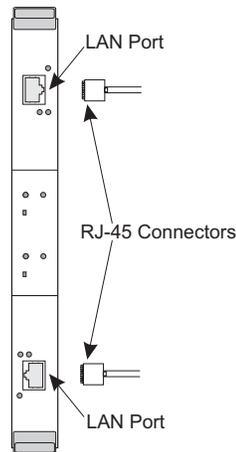
FCs 1364 and 1365
Gigabit Ethernet



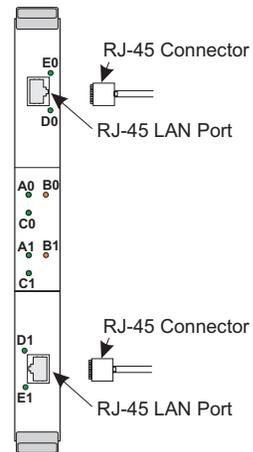
FC 2366*
Fast Ethernet



FC 1366
1000BASE-T Ethernet

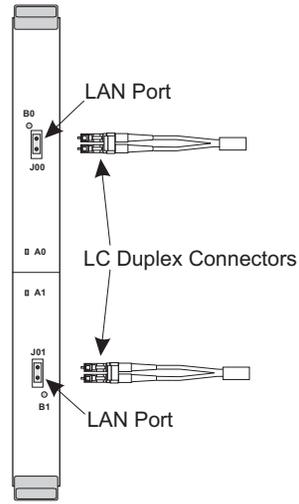


FC 3366
1000Base-T Ethernet-Express2

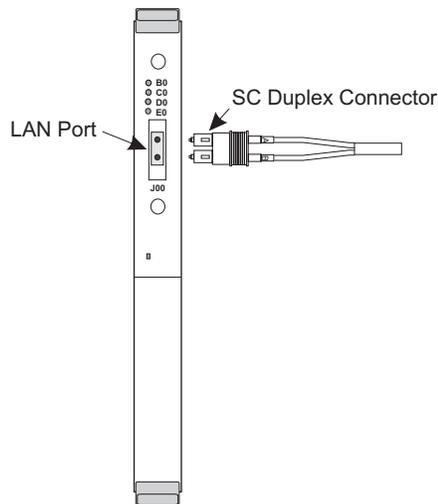


Note: FCs 2364, 2365, 2366, 1364, 1365, and 1366 are not orderable new, but may be carried forward from an existing zSeries server.

FCs 3364 and 3365
OSA-Express2
Gigabit Ethernet



FC 3368
OSA-Express2
10 Gigabit Ethernet LR



For additional information on planning for OSA features see:

- *Fiber Optic Link Planning (ESCON[®], FICON[™], Coupling Links & Open System Adapters, GA23-0367*
- *zSeries: Open System Adapter-Express Customer's Guide and Reference, SA22-7476*
- *OSA-Express Integrated Console Controller User's Guide, SA22-7990*
- *OSA-Express Implementation Guide, SG24-5948.*

External Time Reference (ETR)

The External Time Reference function is an optional feature of the System z9 Business Class. The ETR feature code is 6155. There is one transceiver on each ETR feature that uses an MT-RJ connector. The ETR feature connects to a Sysplex Timer, which uses an ESCON Duplex connector. An ESCON Duplex to MT-RJ conversion kit is required. Each ETR feature should connect to a different Sysplex Timer in an Expanded Availability configuration.

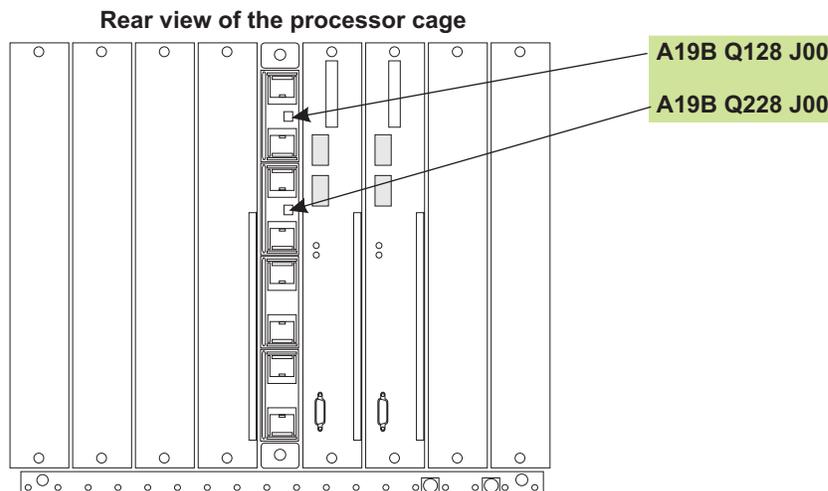
When a quantity of one is ordered, two features are shipped for high availability.

Connectivity Information

- Cable is multimode 62.5 micron fiber optic
- Cable connector is MT-RJ
- See *Fiber Optic Link Planning (ESCON[®], FICON[™], Coupling Links & Open System Adapters, GA23-0367*, for information about link distances and light loss budget.

ETR Location

The following illustration shows the location of the ETR cards.



Ordering ETR Cables

If FC 6155 is ordered, two MT-RJ cables for the ETR feature on the z9 BC will automatically be added to any zSeries Fiber Cabling Service contract, **Fiber optic jumper cabling package option** (see 1 on page 7-2). ETR will automatically be included on any system order that contains ISC-3 or Integrated Cluster Bus features. Contact your local IBM Installation Planning Representative, IBM z9 BC Product Specialist, or IBM Connectivity Services Specialist for details. If you choose not to use this Service, you may purchase the two MT-RJ cables separately, or provide them yourself from another source.

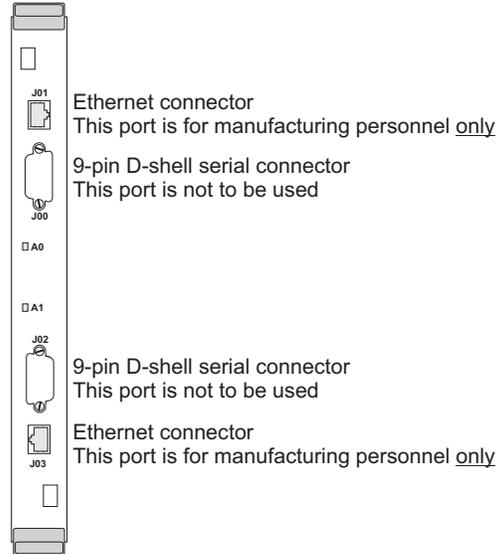
Server Time Protocol

Server Time Protocol (FC 1021) requires no special cables to create timing links with other servers. Depending on the distance between servers in a timing network, you may use ISC-3, ICB-3 or ICB-4 cables to create the Sysplex.

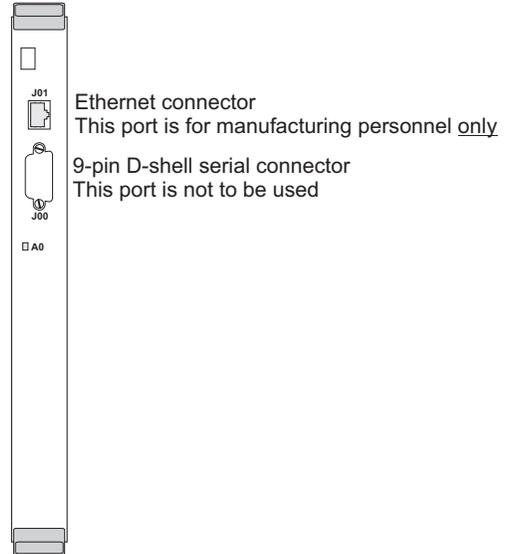
Cryptographic Coprocessor

The cryptographic coprocessor cards have no usable cable connections. There are a pair of connectors for each coprocessor on each feature card, but they are not to be used by customer personnel.

Cryptographic FC 0863



Cryptographic FC 0870

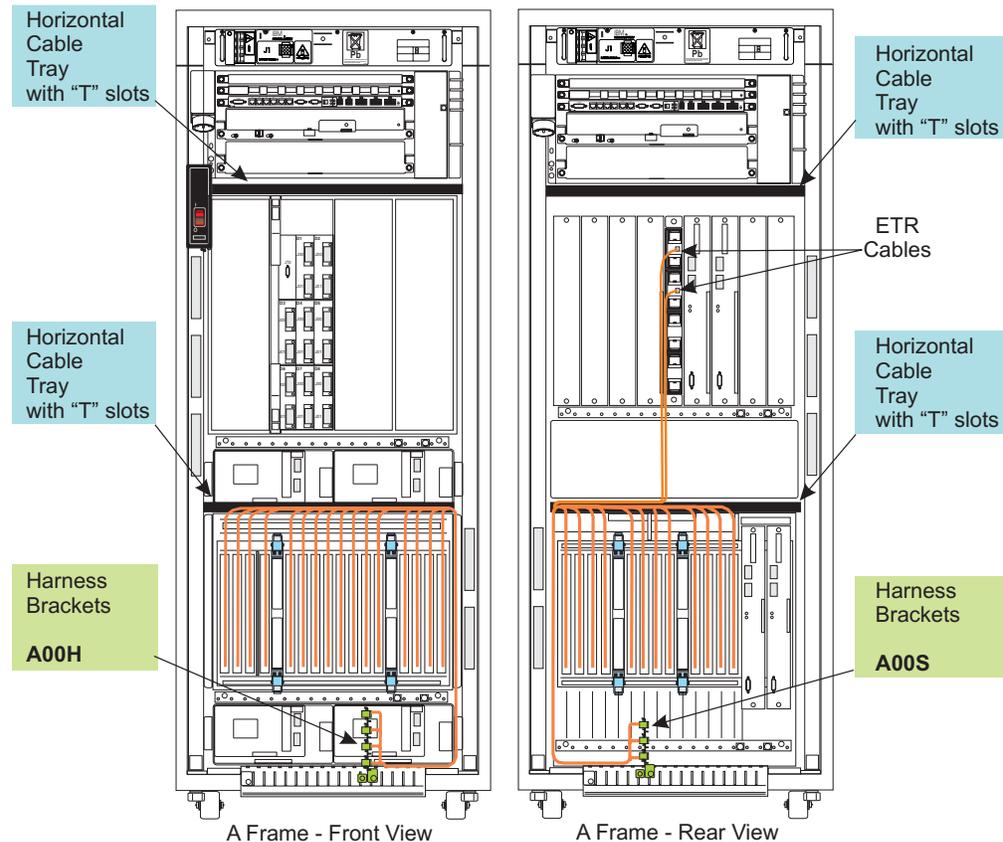


Fiber Quick Connect ESCON Cabling

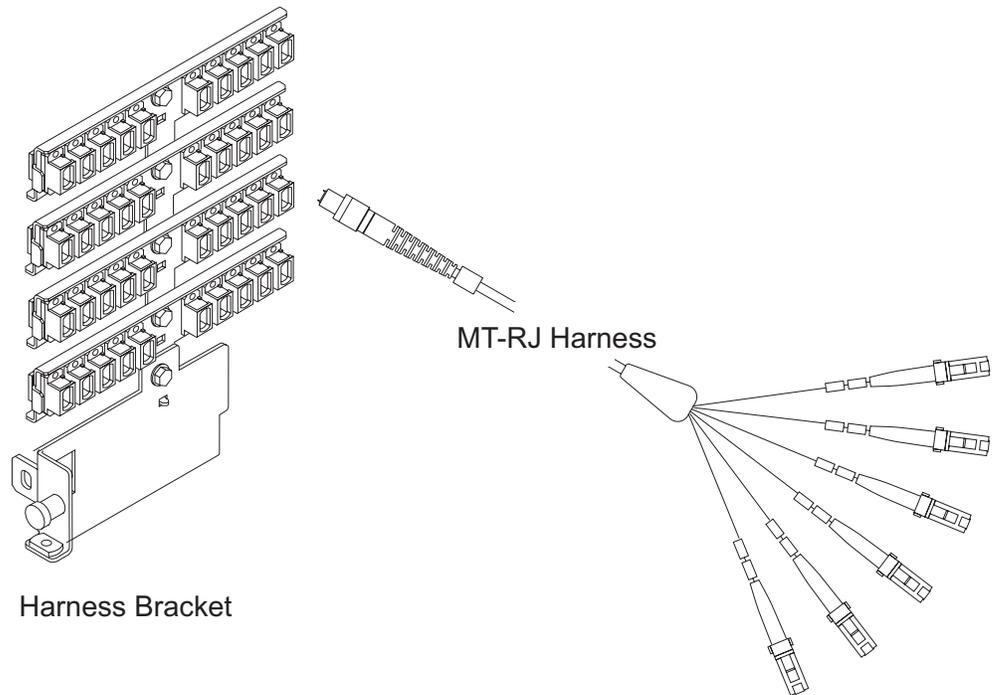
Fiber Quick Connect ESCON harness cabling, harness brackets and mounting hardware are ordered with the z9 BC server as feature codes. The feature codes are FC 7955, 7956, 7957, and 7959, ordered in conjunction with an Enterprise Fiber Cabling Services structured (trunk) solution. The Fiber Quick Connect feature enables trunk cables to connect to ESCON channels using under-the-cover attachment harnesses. These harnesses are installed when your system is built, and your z9 BC arrives ready to connect the trunk cables at your site.

The following illustrations show:

- Where these cables are located in the system.
- Proper cable routing to ensure correct strain relief and design performance.



This illustration shows the Fiber Quick Connect feature hardware.

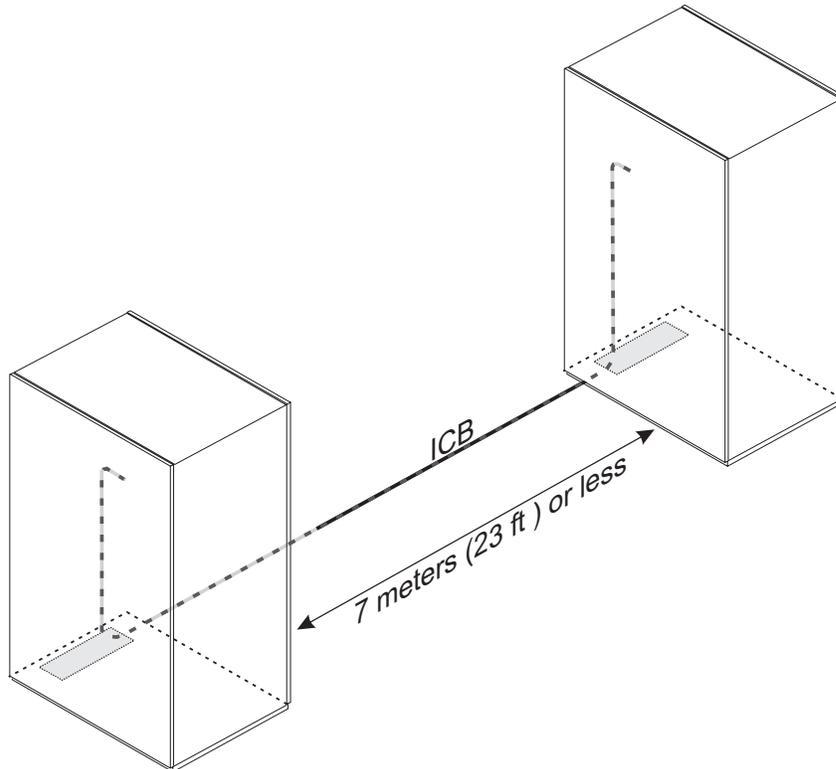


There can be from one to four rows of trunk connectors on the bracket. The trunk brackets use an MTP connector, and the ESCON connectors are routed to the ESCON feature cards in each frame.

If you are planning to use the Fiber Quick Connect feature for ESCON 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 IBM installation planning representative, IBM product specialist, or IBM service representative will provide you with the information necessary to contact Networking Services.

Integrated Cluster Bus Channel

The integrated cluster bus (ICB) uses a Self-Timed Interconnect (STI) to perform coupling communication between systems. If you are planning to install integrated cluster bus links, you will have to place connected devices closer than 10 meters (32.8 feet) to allow for cable routing between equipment. Allow 7 meters (23 feet) between system frames.



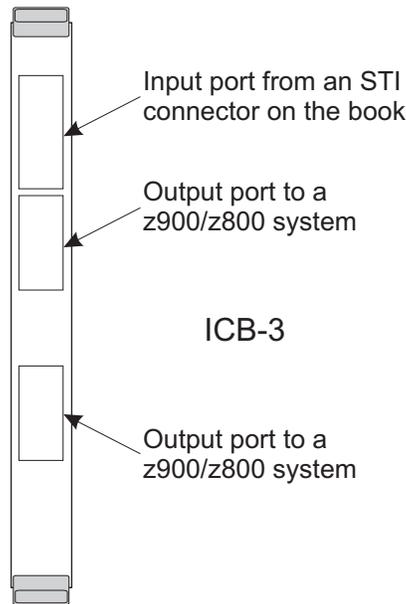
There are two types of ICB links, each with its own unique cable:

- ICB-3 (FC 0993) links connect between a z9 BC and:
 - another System z9 Business Class
 - a z9 Enterprise Class
 - a zSeries 990
 - a zSeries 890.
 - a zSeries 900
 - a zSeries 800.

ICB-3 links operate at 1 GBps and use cable feature code 0227 for all raised floor installations. Cable feature code 0231 is used between a Z9 BC and a z800 or z890 for a **non-raised floor** installation.

FC 0231 cables ordered to connect between either a z890 or a z800 and a Z9 BC must be placed against the z9 BC to which the z890 or z800 will be connected.

Integrated Cluster Bus - 3

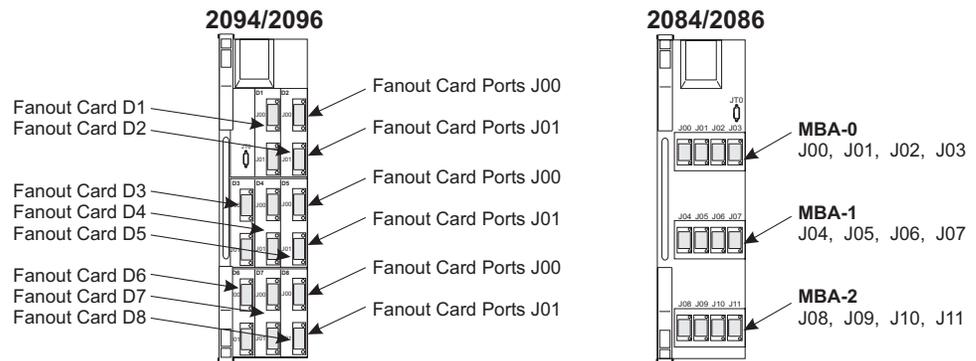


- ICB-4 (FC 3393) cables connect directly between the Memory Bus Adapters of a System z9 Business Class and:
 - another System z9 Business Class
 - a z9 Enterprise Class
 - a zSeries 990
 - a zSeries 890.

ICB-4 links operate at 2.0 GBps and use cable feature code 0228 for all raised floor installations. Cable feature code 0232 is used between a z9 BC and a z890 for a **non-raised floor** installation.

FC 0232 cables ordered to connect between a z890 and a z9 BC must be placed against the z9 BC to which the z890 will be connected.

Integrated Cluster Bus - 4

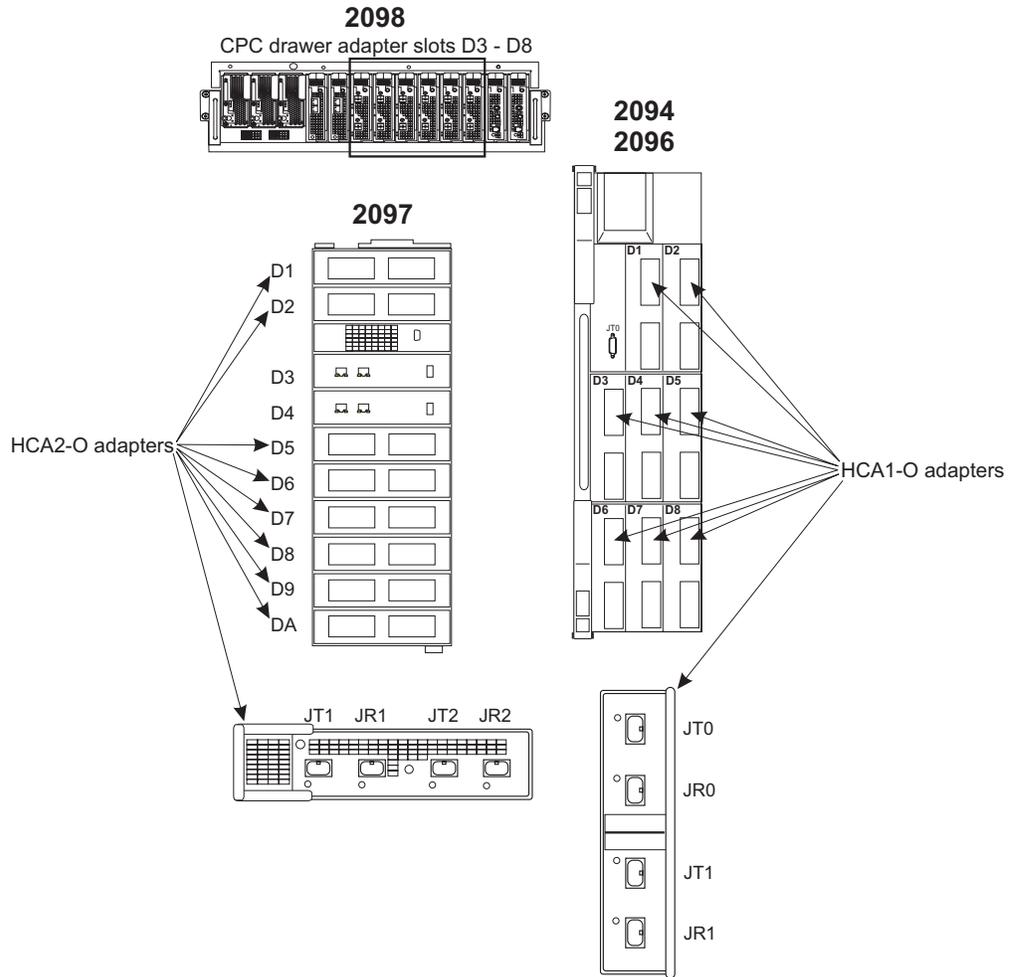


When planning for ICB links, you must order the ICB cable appropriate to the type of connection (ICB-3, or ICB-4) you planned. Note that, for each pair of ICB features, you order only one ICB cable.

InfiniBand fiber optic links

The InfiniBand fiber optic feature (FC 0167) is used to perform coupling communication between systems. If you are planning to install InfiniBand links, you will have to place connected devices no further than 150 meters (492 feet) from each other.

FC 0167 (InfiniBand) provides up to 3.0 GBps between z10 EC and dedicated coupling facilities on z9 EC or z9 BC servers. InfiniBand connects directly from an HCA2-O port on a z10 EC processor book to an HCA1-O port on a processor book on a z9 EC or z9 BC server.



FC 0163 and FC 0167 (12x InfiniBand) are exclusive to System z10 and System z9. Only the cable part numbers in the following table are approved for use. They can be purchased from IBM or through IBM's worldwide distributor. Contact your IBM installation planning representative for additional information.

The following cables are all duplex 24-fiber cable assemblies, SX laser 50 micron, using MPO connectors on both ends.

Table 7-1. InfiniBand cable part numbers for FCs 0163, and 0167 on System z servers

Part Number	Length-Meters	Length-Feet
41V2466	10.0 m	32.8 ft

Table 7-1. InfiniBand cable part numbers for FCs 0163, and 0167 on System z servers (continued)

Part Number	Length-Meters	Length-Feet
15R8844	13.0 m	42.7 ft
15R8845	15.0 m	49.2 ft
41V2467	20.0 m	65.6 ft
41V2468	40.0 m	131.2 ft
41V2469	80.0 m	262.4 ft
41V2470	120.0 m	393.7 ft
41V2471	150.0 m	492.1 ft
42V2083	Custom	Custom

Notes:

1. InfiniBand will not connect to z990 or z890.
2. You must supply InfiniBand cables as you do with other fiber optic systems (FICON, ESCON, OSA).

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. 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 CHPID Mapping Tool, available from Resource Link, 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 CHPID Mapping Tool. The CHPID 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 HCM and HCD after PCHID numbers have been added to the file by the CHPID Mapping Tool. An IOCDS can then be written from a production IODF or IOCP statements can be built for the install diskette.

If upgrading from a 2064 z900 model at EC J10638 or later, use the "Write IOCDS in Preparation for an Upgrade" option in HCD from a production IODF, or the "NOCHKCPC" execution parameter option in IOCP, and write your new IOCDS to the Support Element prior to the upgrade. This eliminates saving the IOCP source to a diskette and running Stand-alone IOCP during the install. Simply tell the install team which IOCDS (A0-A3) you have pre-written with the new configuration.

If you are installing a new processor, transfer the IOCP statements for your configuration to a diskette. If necessary, the IOCP input file can be compressed using a zip-compatible program. When the new system arrives, give the diskette containing the IOCP input statements to the install team.

If you are installing a new processor, instead of using a diskette you can remotely write the IOCDS from an HCD that is running on an installed CPC in the same HMC cluster. Inform the install team that plans are in place to use the "Build and manage S/390 microprocessor IOCDSs" option in HCD to write the IOCDS.

VSE/ESA™ / zVSE™

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 CHPID Mapping Tool, available from Resource Link, to aid you in assigning PCHIDs to CHPIDs. The CHPID Mapping Tool updates the IOCP input and assigns PCHIDs to the CHPIDs.

If upgrading from a 2064 z900 model at EC J10638 or later, use the "CHECKCPC=NO" execution parameter option in IOCP, and write your new IOCDS to the Support Element prior to the upgrade. This eliminates saving the IOCP source to a diskette and running Stand-alone IOCP during the install. Simply tell the install team which IOCDS (A0-A3) you have pre-written with the new configuration.

If you are installing a new processor, transfer the IOCP statements for your configuration to a diskette. If necessary, the IOCP input file can be compressed using a zip-compatible program. When the new system arrives, give the diskette containing the IOCP input statements to the install team.

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 CHPID Mapping Tool, available from Resource Link, 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 CHPID Mapping Tool. The CHPID Mapping Tool updates the IOCP input and assigns PCHIDs to the CHPIDs. Migrate the modified IOCP input file back into HCD after PCHID numbers have been added to the file by the CHPID Mapping Tool. An IOCDS can then be written in preparation for an upgrade using a production IODF.

Note: An IOCP input file that was created by HCD without PCHIDs must be migrated back into HCD after PCHID numbers have been added to the file by the CHPID Mapping Tool. An IOCDS can then be written from a production IODF or IOCP statements can be built for the install diskette.

If upgrading from a 2064 z900 model at EC J10638 or later, use the "Write IOCDS in Preparation for an Upgrade" option in HCD from a production IODF and write your new IOCDS to the Support Element prior to the upgrade. This eliminates saving the IOCP source to a diskette and running Stand-alone IOCP during the install. Simply tell the install team which IOCDS (A0-A3) you have pre-written with the new configuration.

If you are installing a new processor, build an IOCP input data set for your configuration from a production IODF and transfer the IOCP statements to a diskette. In the unlikely event that the IOCP input file exceeds the capacity of the diskette, the IOCP input file can be compressed using a zip-compatible program. When the new system arrives, give the diskette containing the IOCP input statements to the install team.

If you are installing a new processor, instead of using a diskette you can remotely write the IOCDS from an HCD that is running on an installed CPC in the same HMC cluster. Inform the install team that plans are in place to use the "Build and manage S/390 microprocessor IOCDSs" option in HCD to write the IOCDS.

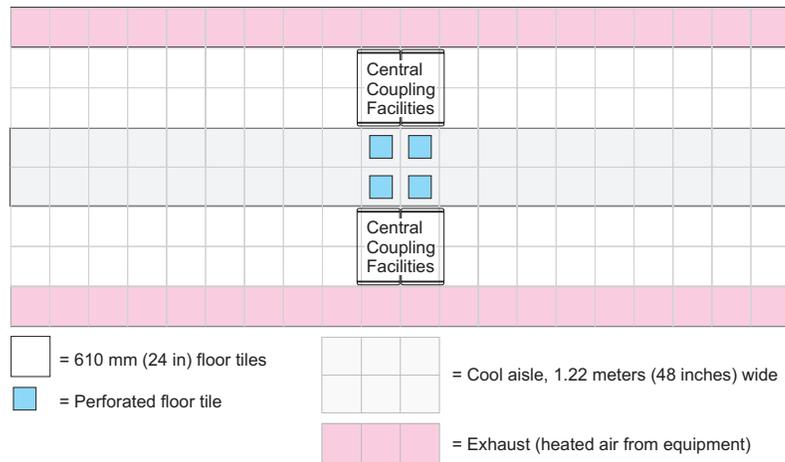
Chapter 8. Parallel Sysplex

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. Consider using the zSeries Fiber Optic Cabling Service to plan your sysplex environment. A list of tasks the Service can perform is provided under “zSeries Fiber Cabling Services” on page 7-2. Different technologies for servers, links and coupling facilities affect your ability to configure a productive sysplex. Following are some guidelines to help you better plan for multiple system interconnection.

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.

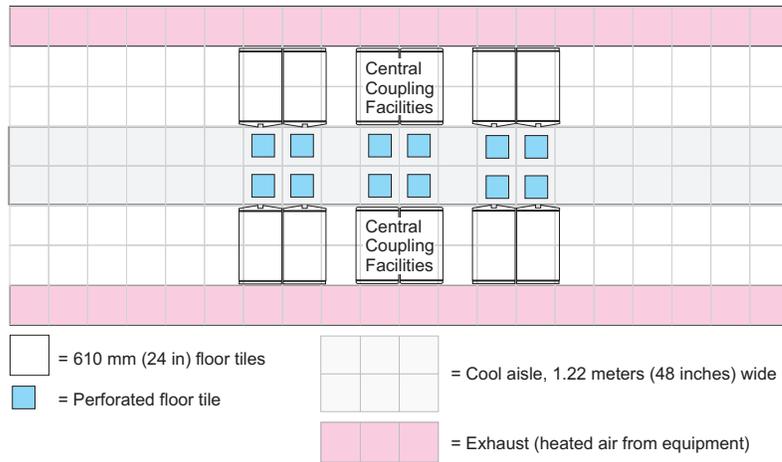
1. Position the coupling facilities (or servers with internal coupling facilities) in the center of an open area of raised floor large enough to accommodate all of the servers and other coupling facilities to which you want to connect.



- 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 2-10). 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” on page 2-14).

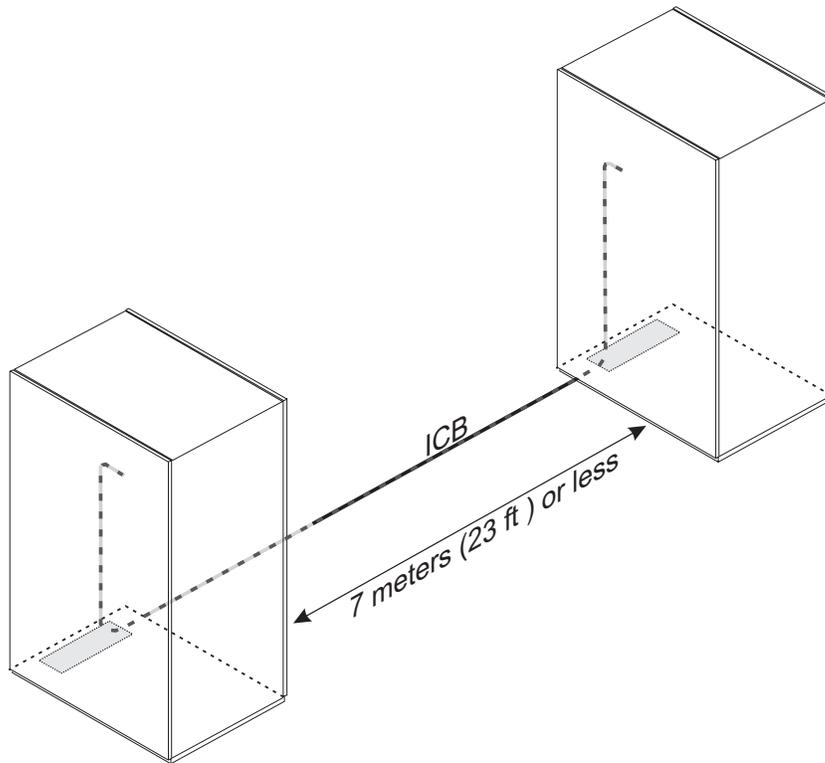
Note: The system air flow illustration shows a minimum aisle width of 941 mm (37 in). Although this width is adequate for a congested computer room floor, it is the **minimum** you should use. An aisle 1.22 m (48 in) wide will better serve the cooling and cabling needs of a Parallel Sysplex

configuration.



- Sysplex connections will be made using ISC-3 and ICB-2, ICB-3, and ICB-4 link cabling.

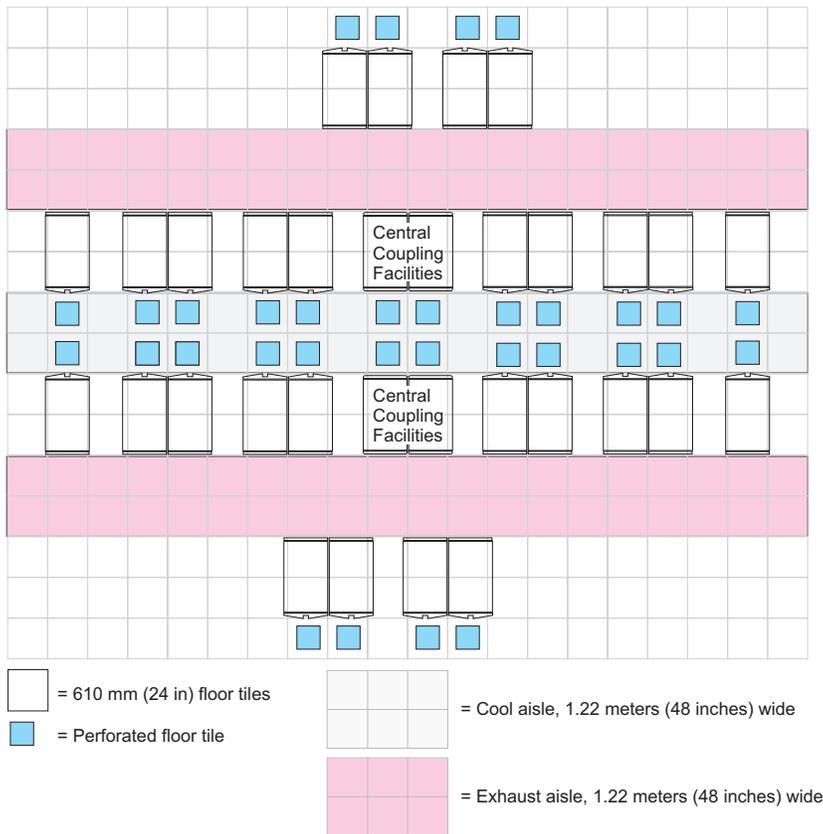
Note: Integrated cluster bus (ICB) links use a Self-Timed Interconnect (STI) to perform coupling communication between systems. If you are planning to install integrated cluster bus channels, you will have to place connected devices closer to each other than 10 meters to allow for cable routing between equipment. Allow 7 meters maximum of real space between system frames.



- As the Parallel Sysplex grows, add new servers evenly on either side of the central coupling facilities.



- As the Parallel Sysplex evolves, you may eventually exceed the 7 meter usable length of ICB cables at the ends of a two-row configuration. At this point, it may be possible to add a third and fourth row, using ISC links, which provide connectivity over greater distances than ICB links. 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 - z9, zSeries, and S/390 servers 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. Hardware Management Console Physical Specifications

Note: This appendix will contain information for the Hardware Management Console components applicable at the time of publication (determined by the edition notice at the front of this document). Specifications for your Hardware Management Console may differ from those presented below.

FC 0084/0090 - Hardware Management Console System Unit

Dimensions	
Height	438 mm (17.3 in.)
Width	216 mm (8.5 in.)
Depth	540 mm (21.3 in.)
Weight minimum configuration as shipped	16.3 kg (36 lbs.)
Weight maximum configuration	25.2 kg (56 lbs.)
Input Power¹	
Voltage switch setting 115 Vac	
Low range input voltage	100 Vac - 127 Vac
Input frequency range	47 - 53 Hz
Voltage switch setting 230 Vac	
High range input voltage	200 Vac - 240 Vac
Input frequency range	57 - 63 Hz
Input kilovolt-amperes (kVA) (approximate)	
Minimum configuration as shipped	0.20 kVA
Maximum configuration	0.55 kVA
Output Power¹	
Heat output in British thermal units (Btu) (approximate)	
Minimum configuration	630 Btu/hr (185 watts)
Maximum configuration	1784 Btu/hr (523 watts)
Environmentals	
Server On - 0 to 914 m (2998 ft)	10° to 35° C (50° to 95° F)
Server On - 914 m (2998 ft) to 2133.6 m (7000 ft)	10° to 32° C (50° to 89.6° F)
Server Off - to 2133 m (7000 ft)	10° to 43° C (50° to 109.4° F)
Shipping	-40° to 60° C (-40° to 140° F)
Humidity Range (operating and storage)	8% - 80%
Note: Power consumption and heat output vary with the number and type of optional features installed and the power-management optional features in use.	

Note: When planning the work area for the Hardware Management Console, remember to allow a suitable space for a full-size keyboard and mouse.

FC 6096 - Flat Panel Display 558.7 mm (22.0 inch) TFT LCD

Dimensions	
Height	378.8mm (14.92 in.)
Width	510.3 mm (20.1 in.)
Depth	241.1 mm (9.49 in.)
Weight with stand	6.35 kg (14.0 lbs)
Input Power	
Input voltage	100 Vac - 240 Vac (+/- 10%)
Input frequency range	50/60 Hz + or - 3 Hz
Rated Current [®]	1.5 Amps
Power Consumption	
Normal operation:	< 32 watts
Standby/Suspend:	< 2 watts (analog or digital)
Active off:	< 1 watt (at 100 VAC and 240 VAC)
Environmentals	
Temperature	
Operating	0° to 40° C (32° to 104° F)
Storage	-20° to 60° C (-4° to 140° F)
Shipping	-20° to 60° C (-4° to 140° F)
Humidity	
Operating	10% to 80%
Storage	5% to 90%
Shipping	5% to 90%

Note: When planning the work area for the Hardware Management Console, remember to allow a suitable space for a full-size keyboard and mouse.

FC 6095 - Flat Panel Display 510.5 mm (20.1 inch) TFT LCD

Dimensions	
Height - minimum	391.7 mm (15.4 in.)
Height - maximum	471.7 mm (18.5 in.)
Width	467.5 mm (18.4 in.)
Depth	259.0 mm (10.2 in.)
Weight with stand	9.3 kg (20.5 lbs)
Input Power	
Input voltage	100 Vac - 240 Vac
Input frequency range	50/60 Hz + or - 3 Hz
Rated Current	1.2 Amps
Power Consumption	
Normal operation:	< 65 watts
Active off:	< 2 watts
Environmentals	
Temperature	
Operating	10° to 35° C (50° to 95° F)
Storage	-20° to 60° C (-4° to 140° F)
Shipping	-20° to 60° C (-4° to 140° F)
Humidity	
Operating	10% to 80%
Storage	5% to 95%
Shipping	5% to 95%

Appendix C. Environmental Specifications

Unless otherwise noted on individual specification pages, the following environmental specifications, based on an altitude from sea level to 2134 meters (7000 feet), apply:

Environment, Operating:¹	
Temperature	10° to 35°C (50°F to 95°F)
Relative Humidity	8% - 80%
Maximum Dew Point	21°C (69.8°F)
Environment, Nonoperating:	
Temperature	10°C to 43°C (50°F to 109.4°F)
Rel Humidity	8% - 80%
Wet Bulb	27°C (80.6°F)
Environment, Shipping:²	
Temperature	-40°C to 60°C (-40°F to 140°F)
Rel Humidity	5% - 100% (no condensation)
Wet Bulb	29°C (84.2°F)
Environment, Storage:²	
Temperature	1°C to 60°C (33.8°F to 140°F)
Relative Humidity	5% -80%
Wet Bulb	29°C (84.2°F)
Notes:	
<ol style="list-style-type: none"> 1. Maximum operating altitude for this product is 2134 m (7000 ft) 2. When provided with an IBM-approved vapor barrier bag and desiccant, the storage specifications shown above are valid for up to 6 months. Otherwise, shipping and storage specifications are valid for two weeks each. 	

Note: Prior to the installation of an IBM system, careful consideration should be given to the computer room environment. If there is any question about potential corrosive gases or level of particulates, contact your IBM representative for assistance in monitoring the environment.

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

Appendix D. Acoustics

This appendix provides information on acoustics for the z9 BC.

Acoustical Noise Emission Levels

Configuration	Declared A-Weighted Sound Power Level L_{Wad} (B)		Declared A-Weighted Sound Pressure Level L_{pAm} (dB)	
	Operating (B)	Idling (B)	Operating (dB)	Idling (dB)
<ul style="list-style-type: none"> • Single-node 2096 server in a standard 610 mm (24-inch) frame • Nominal environmental conditions • EMC skirts installed • Acoustic covers (front and rear) installed on the frame. 	6.9	6.9	52	52
<ul style="list-style-type: none"> • Single-node 2096 server in a standard 610 mm (24-inch) frame • Nominal environmental conditions • Front and rear tailgates in place of EMC skirts • Acoustic covers (front and rear) installed on the frame. 	7.0	7.0	53	53
<p>Notes:</p> <ol style="list-style-type: none"> 1. L_{WAd} is the upper limit A-weighted sound power level. 2. L_{pAm} is the mean A-weighted sound pressure level measured at the 1 meter bystander positions. 3. All measurements made in accordance with ISO 7779, and declared in conformance with ISO 9296. 4. B and dB are the abbreviations for bels and decibels, respectively. 1 B = 10 dB. 				

Relevant International Standards:

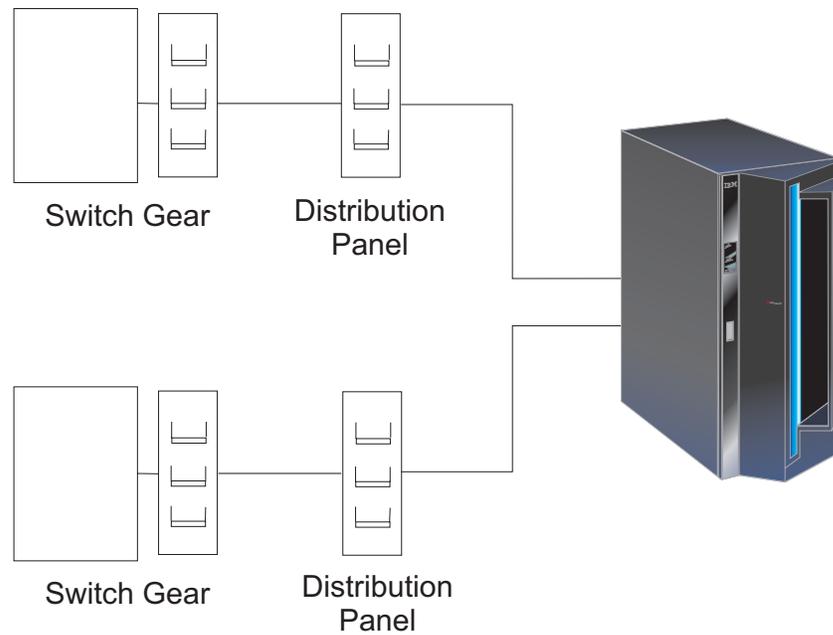
- Measurements: ISO 7779
- Declaration: ISO 9296

Appendix E. Dual Power Installation

The z9 BC models are designed with a fully redundant power system. Each computer has two line cords attached to two power input ports which, in turn, power a fully redundant power distribution system within the computer. To take full advantage of the redundancy/reliability that is built into the computer system, the system **must** be powered from two distribution panels. Here we will present three examples of redundancy.

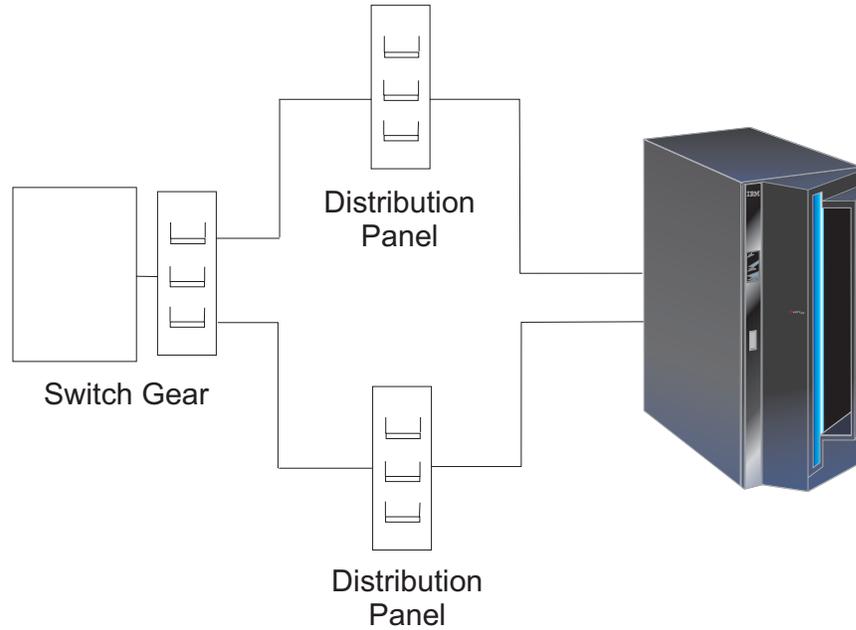
Example 1 (redundant distribution panel and switch gear)

In this example, the computer receives power from two separate power distribution panels. Each distribution panel receives power from a separate piece of building switch gear. This level of redundancy is not available in most facilities.



Example 2 (redundant distribution panel)

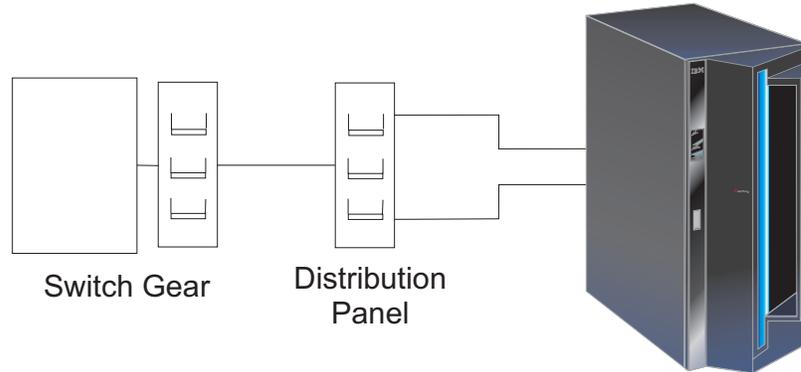
In this example, the computer receives power from two separate power distribution panels. The two distribution panels receive power from the same piece of building switch gear. Most facilities should be able to achieve this level of redundancy. In this case, loss of switch gear (building power) will result in system outage, but loss of one distribution panel will not.



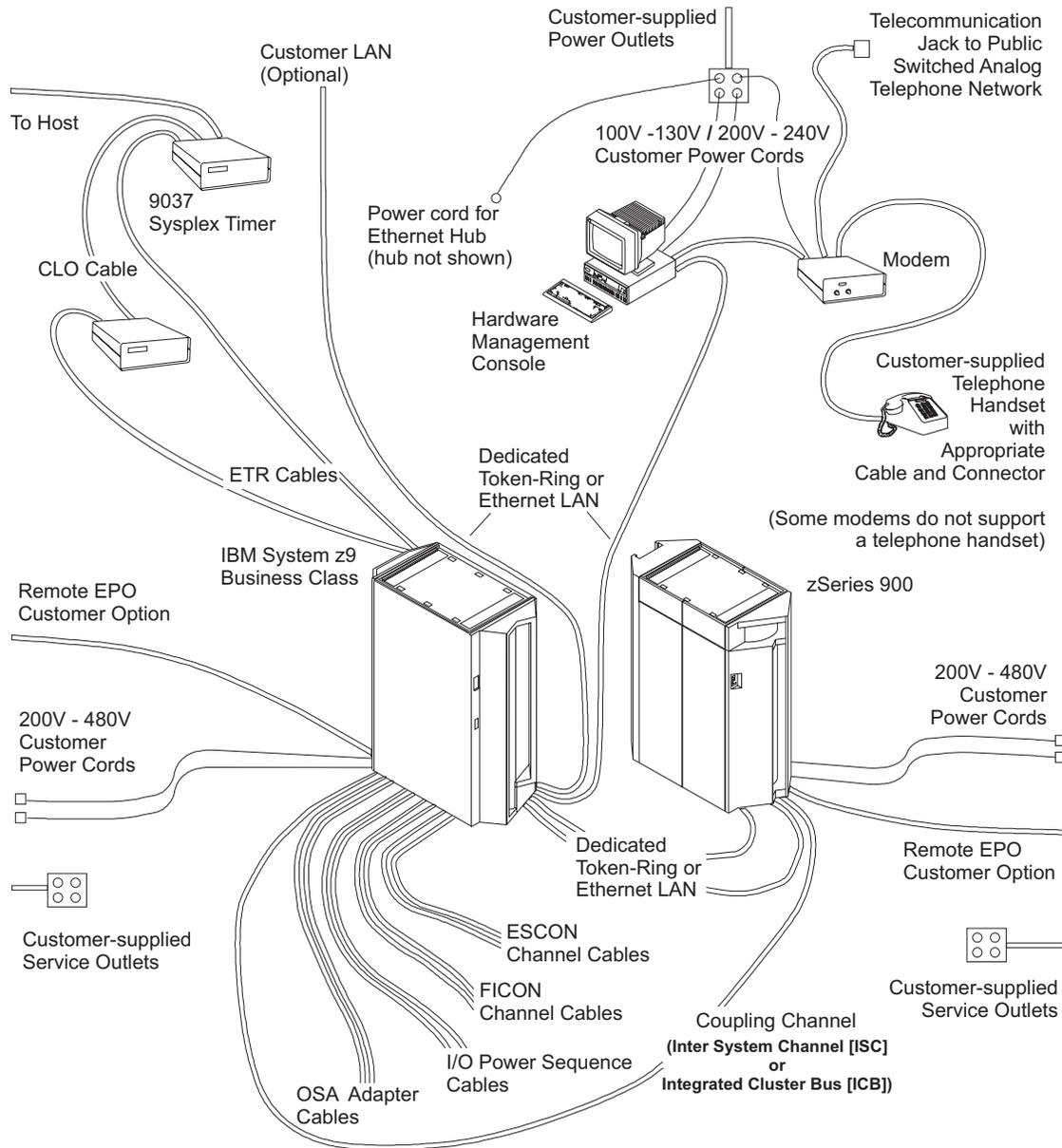
Example 3 (single distribution panel)

In this example, the computer receives power from two separate circuit breakers in a single power panel. This does not make use of the redundancy provided by the processor. It is, however, acceptable if a second power distribution panel is not available.

This type of power distribution will result in system outage in the event of a power failure at either the switch gear or the distribution panel.



Appendix F. Sample System Cabling Schematic



Appendix G. Balancing Power Panel Loads

The z9 BC servers may operate on three phase power. A System z9 Business Class system will always run unbalanced. The current will always be equal on two phases and approximately zero on the third phase. If several unbalanced system configurations are fed from the same power panel, the load on that panel will be unbalanced. Figure G-1 is an example of feeding several loads of this type from two power panels in a way that balances the load among the three phases.

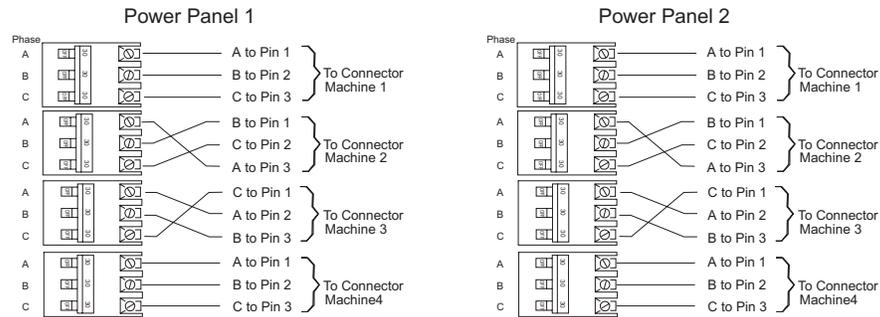


Figure G-1. Power load balancing - three-pole breakers

The method in Figure G-1 requires that the connection from the three poles of each breaker to the three phase pins of a connector be varied. Some electricians may prefer to maintain a consistent wiring sequence from the breakers to the connectors. Figure G-2 shows a way to balance the load without changing the wiring on the output of any breakers. The three-pole breakers are alternated with single-pole breakers. This way the three-pole breakers don't all begin on Phase A.

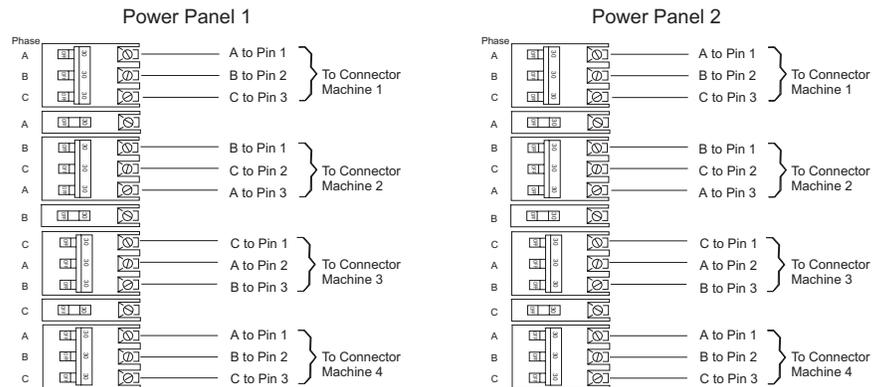


Figure G-2. Power load balancing - alternating three-pole and single-pole breakers

Figure G-3 on page G-2 shows another way of distributing the unbalanced load evenly. In this case, the three-pole breakers are alternated with two-pole breakers.

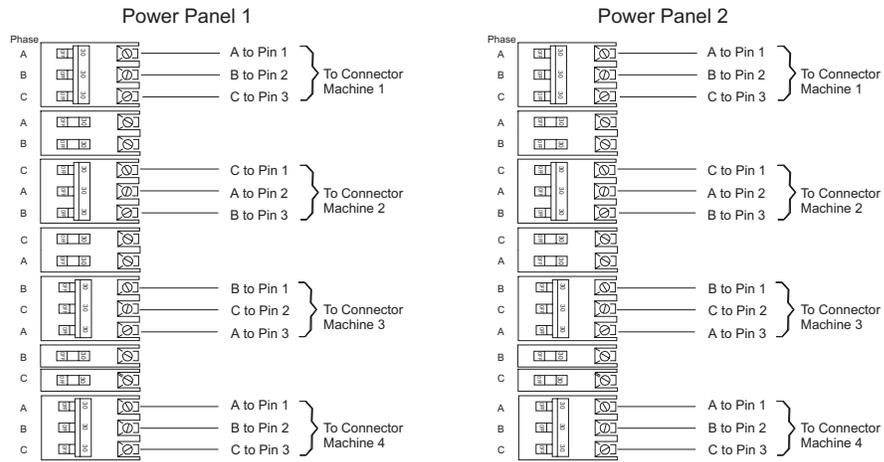


Figure G-3. Power load balancing - alternating three-pole and double-pole breakers

Appendix H. Upgrade Paths

The z800 Model 004 or 2086 (zSeries 890) is upgradeable to either model of 2096 (z9 BC). All upgrades from previous systems will be accomplished by removing the old server (zSeries 800 or zSeries 890) and replacing it with a new one (z9 BC).

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

- weight distribution
- power availability
- power access
- machine and service clearance area
- air conditioning delivery
- thermal interaction
- cable locations
- floor tile cutouts.

Appendix I. Frame Tie-Down

Purpose

The purpose of this installation instruction is to install a frame tie down kit that will provide frame ruggedizing and the floor tie down hardware for securing an IBM frame to a concrete floor beneath a 9" to 13" or 12" to 22" raised floor, or to a non-raised floor environment. This 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.

Scope

The frame tie downs are intended for securing a p-Series or z-Series frame weighing less than 3600 lbs per frame. These tie downs are designed to help secure the frame on a raised floor or non-raised floor installation. This document and its contents (drawings, data, instructions etc.) are provided on AN "AS IS" BASIS, WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OR CONDITIONS OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. We have conducted limited tests, and therefore, not all situations are tested.

Frame tie-down for the 2096 can be either of two choices:

1. A system of adjustable turnbuckles intended to fasten each corner of the server frame to eyebolts installed in the concrete floor beneath your computer room raised floor
2. A pair of stabilizer plates that firmly secure the frame to a non-raised floor.

This appendix describes your responsibilities for either method of frame tie-down before the new server arrives.

Raised Floor Frame Tie-Down

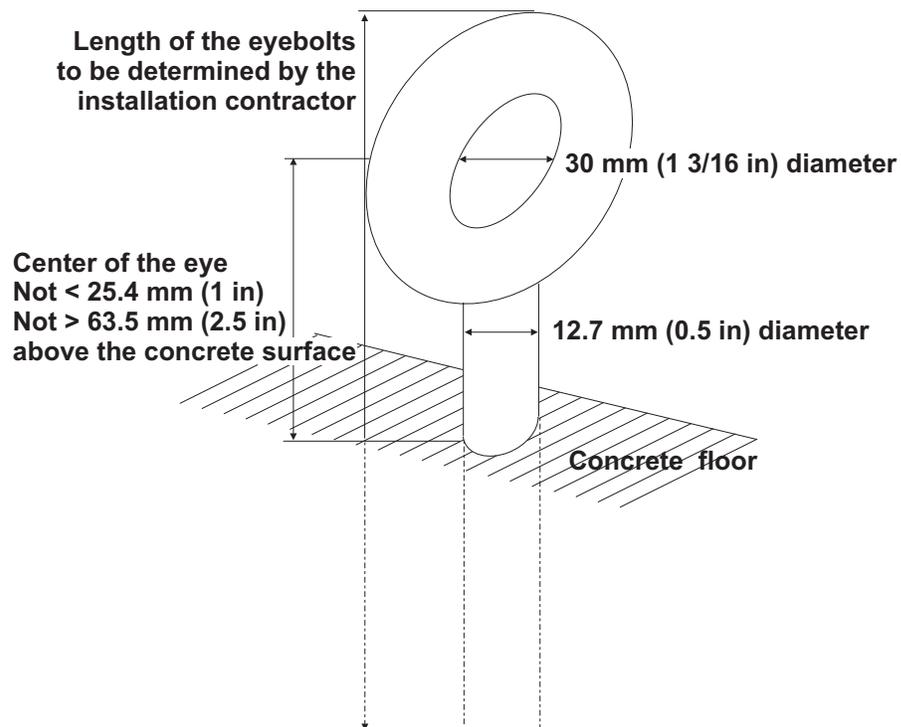
You are responsible for obtaining the services of a qualified consultant or structural engineer to determine what must be done at your particular location to install **four eyebolts per frame** capable of withstanding a pull force of 975.2 kg (2150 lbs) **each**.

Depending on the amount of space between your raised floor panels and the concrete floor beneath it, you will need to order either Feature Code 7996, for raised floors that are 9 to 13 inches above the concrete, or Feature Code 7995, for floors that are 12 to 22 inches above the sub floor.

Installing the Eyebolts

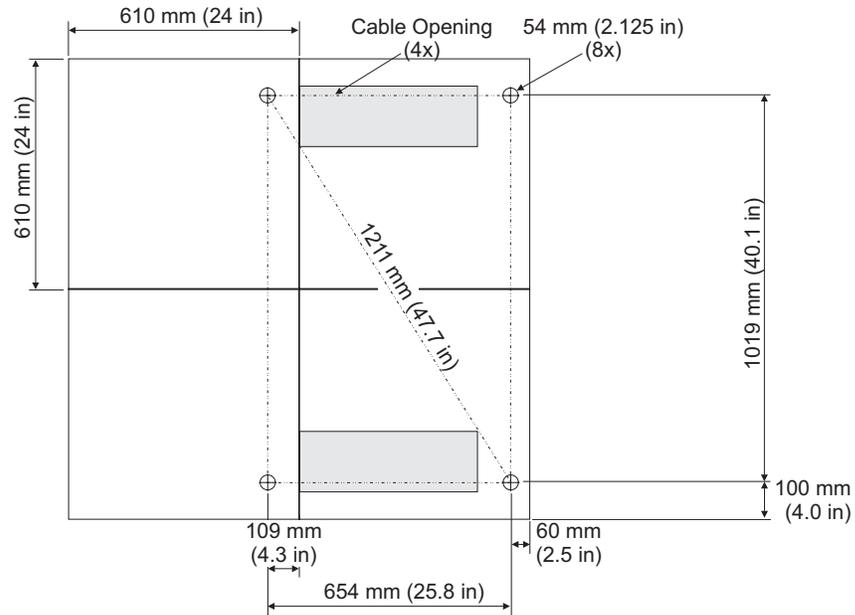
You are responsible for obtaining and installing the eyebolts that will anchor the frame of your 2096 server. Following are the specifications for the eyebolts:

- 12.7 mm (0.5 in) diameter, 13 threads per inch (length to be determined by the qualified contractor who will perform the eyebolt installation)
- Inside diameter of the eye not smaller than 30 mm (1 3/16 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.
- Able to withstand a pull force of 975.2 kg (2150 lbs)

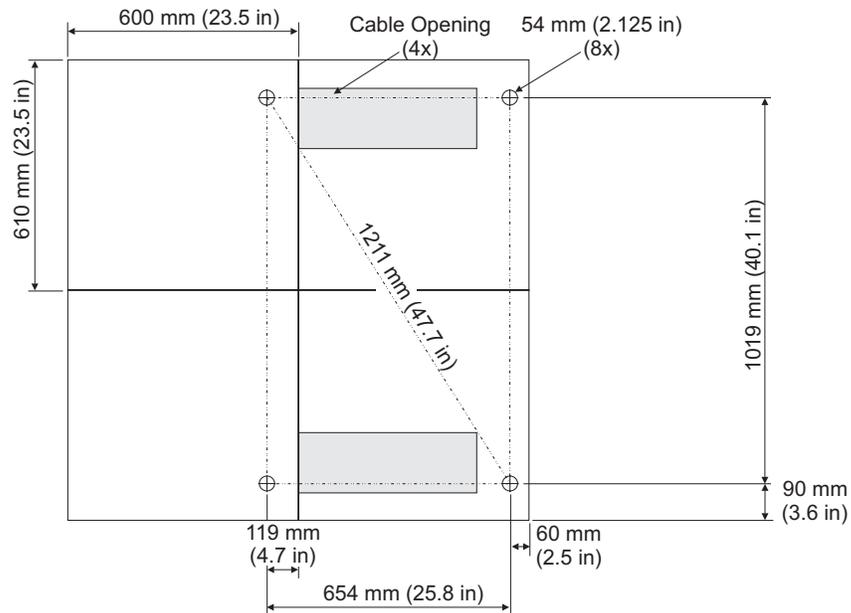


Regardless of which kit you need, the following illustration shows where to cut the floor panels for the turnbuckles to pass through to the eyebolts set in the concrete floor beneath.

Eyebolt positioning for 610 mm (24 in) floor tiles



Eyebolt positioning for 600 mm (23.5 in) floor tiles



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

The remainder of the parts involved in either Feature Code 7995 or 7996 include:

- Side-to-side support bars at EIA unit 38, front and rear
- New cable trays, fastened to side-to-side support bars, where the original cable trays were mounted
- A triangular support bar, hung on two hinges and secured with a vertical stop
- A latch for the triangular support bar
- A pair of stabilizer bars that rest on the raised floor between the corners of each frame
- Four turnbuckle assemblies with fastening hardware that extend through the raised floor and are secured to the eyebolts
- Heavier cover door latches.

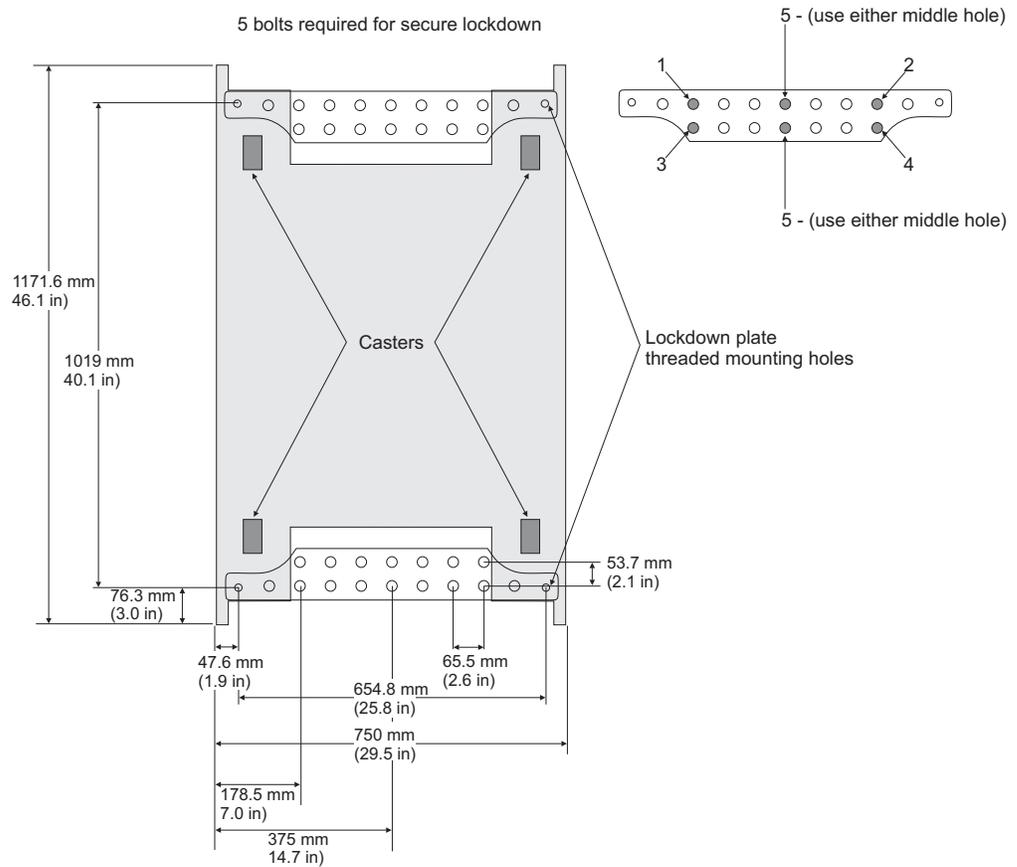
These additional tie-down parts are installed along with the server. The installation instructions are included as an appendix in the 2096 *Installation Manual*, shipped with the server.

Non-Raised Floor Frame Tie-Down

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 **five anchors per stabilizer**, securing the front and rear stabilizers to the concrete floor according to the following illustration.

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

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



The stabilizer fasteners should be heavy duty sleeve anchors, 12 mm (0.5 in) in diameter, capable of withstanding a minimum allowable tensile load in concrete of 1025.1 kg (2260 lb) and a minimum allowable shear load in concrete of 2111.5 kg (4655 lb). 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 stabilizer. Remove the stabilizer to position the server frame. Then re-install the stabilizer and the fasteners before the service provider begins the installation.

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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.

Canadian Department of Communications Compliance Statement

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

Avis de conformité aux normes du ministère des Communications du Canada

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

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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.

European Community contact:
IBM Technical Regulations
Pascalstr. 100, Stuttgart, Germany 70569
Telephone: 0049 (0) 711 785 1176
Fax: 0049 (0) 711 785 1283
email: tjahn@de.ibm.com

EC Declaration of Conformity (In German)

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update: 2004/12/07

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

Korean Class A Compliance Statement

이 기기는 업무용으로 전자파적합등록을 한 기기이오니 판매자 또는 사용자는 이점을 주의하시기 바라며, 만약 잘못 판매 또는 구입하였을 때에는 가정용으로 교환하시기 바랍니다.

Taiwan Class A Compliance Statement

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

警告使用者：
這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。

台灣IBM 產品服務聯絡方式：
台灣國際商業機器股份有限公司
台北市松仁路7號3樓
電話：0800-016-888



Level 05a, March 2010
Printed in USA

GC28-6855-05

