



BladeCenter HX5 Blade Server Installation and User's Guide



Machine Types: 7873, 7872, 1910, 1909

Note

Before using this information and the product it supports, read the general information in Appendix B “Notices” on page 119, the *Warranty Information* document, and the *IBM Safety Information* and the *Environmental Notices and User Guide* documents on the *IBM Documentation CD*.

The most recent version of this document is available at <http://www.ibm.com/supportportal>.

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Перед установкой продукта прочтите инструкции по технике безопасности.

Pred inštaláciou tohto zariadenia si pečítajte Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

Antes de instalar este producto, lea la información de seguridad.

Läs säkerhetsinformationen innan du installerar den här produkten.

ཐོན་རྐྱེན་འདི་བདེ་སྤྱོད་མ་བྱས་གོང་། རྫོང་གི་ཡིད་གཟབ་
བྱ་འདྲ་མིན་ཡོད་པའི་འོད་སྟེར་བལྟ་དགོས།

Bu ürünü kurmadan önce güvenlik bilgilerini okuyun.

مەزكۇر مەھسۇلاتنى ئورنىتىشتىن بۇرۇن بىخەتەرلىك ئۇچۇرلىرىنى ئوقۇپ چىقىڭ.

Youq mwngz yungh canjbinj neix gaxgonq, itdingh aeu doeg aen
canjbinj soengq cungj vahgangj ancien siusik.

Safety statements

These statements provide the caution and danger information that is used in this documentation.

Important: Each caution and danger statement in this documentation is labeled with a number. This number is used to cross reference an English-language caution or danger statement with translated versions of the caution or danger statement in the *Safety Information* document.

For example, if a caution statement is labeled “Statement 1,” translations for that caution statement are in the *Safety Information* document under “Statement 1.”

Be sure to read all caution and danger statements in this documentation before you perform the procedures. Read any additional safety information that comes with your system or optional device before you install the device.

Statement 1





DANGER

Electrical current from power, telephone, and communication cables is hazardous.

To avoid a shock hazard:

- Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.
- Connect all power cords to a properly wired and grounded electrical outlet.
- Connect to properly wired outlets any equipment that will be attached to this product.
- When possible, use one hand only to connect or disconnect signal cables.
- Never turn on any equipment when there is evidence of fire, water, or structural damage.
- Disconnect the attached power cords, telecommunications systems, networks, and modems before you open the device covers, unless instructed otherwise in the installation and configuration procedures.
- Connect and disconnect cables as described in the following table when installing, moving, or opening covers on this product or attached devices.

To Connect:

1. Turn everything OFF.
2. First, attach all cables to devices.
3. Attach signal cables to connectors.
4. Attach power cords to outlet.
5. Turn device ON.

To Disconnect:

1. Turn everything OFF.
2. First, remove power cords from outlet.
3. Remove signal cables from connectors.
4. Remove all cables from devices.

Statement 2



CAUTION:

When replacing the lithium battery, use only IBM Part Number 33F8354 or an equivalent type battery recommended by the manufacturer. If your system has a module containing a lithium battery, replace it only with the same module type made by the same manufacturer. The battery contains lithium and can explode if not properly used, handled, or disposed of.

Do not:

- Throw or immerse into water
- Heat to more than 100°C (212°F)
- Repair or disassemble

Dispose of the battery as required by local ordinances or regulations.

Note:

Statement 12



CAUTION:

The following label indicates a hot surface nearby.



Statement 21



CAUTION:

Hazardous energy is present when the blade is connected to the power source. Always replace the blade cover before installing the blade.

UL regulatory information

This device is for use only with supported blade chassis.

Chapter 1. Introduction

The IBM BladeCenter HX5 Type 7873, 7872, 1910, and 1909 blade servers are high-density, scalable blade servers ideally suited for high performance and virtualized environments. A BladeCenter HX5 can be combined with the IBM MAX5 for BladeCenter expansion blade to provide memory expansion for medium to large businesses.

The IBM BladeCenter HX5 Type 7873, 7872, 1910, and 1909 blade servers support the following components:

- Up to two multi-core microprocessors
- Up to 16 memory modules (DIMMs)

Note: Combining a BladeCenter HX5 and an IBM MAX5 expansion blade supports up to 40 DIMMs.

- Up to two internal solid state drives (SSDs)
- Expansion devices, such as:
 - Horizontal-compact-form-factor (CFFh) expansion cards
 - Vertical-combination-I/O (CIOv) expansion cards

In addition, you can combine two BladeCenter HX5 blade servers to form a *scalable blade complex*. Combining two BladeCenter HX5 blade servers in a scalable blade complex provides for *FlexNode partitioning*. With FlexNode partitioning, you can deploy the blade servers as a single server or as two independent servers, without changing the physical configuration. The ability to switch between single-partition mode and stand-alone mode is provided through the advanced management module web interface. For more information about scalable blade complexes and FlexNode partitioning, see “Working with a scalable blade complex” on page 12.

Note: You can combine two BladeCenter HX5 blade servers to form a scalable blade complex. You can also combine a single BladeCenter HX5 blade server with an IBM MAX5 expansion blade for expanded memory access. You cannot attach an IBM MAX5 to a scalable blade complex.

For more information about the advanced management module web interface, see the <http://www.ibm.com/systems/support/supportsite.wss/docdisplay?brandind=5000008&Indocid=MIGR-5073887>.

The BladeCenter HX5 blade server is supported in the following BladeCenter chassis:

- IBMBladeCenter H
- IBMBladeCenter HT
- IBMBladeCenter S

For the latest information about the BladeCenter chassis that support the BladeCenter HX5 blade server, see <http://www.ibm.com/servers/eserver/serverproven/compat/us/>.

This *Installation and User's Guide* provides information about setting up the blade server, such as:

- Starting and configuring the blade server
- Installing optional hardware devices
- Installing the operating system
- Performing basic troubleshooting of the blade server

Packaged with the blade server are software CDs that help you to configure hardware, install device drivers, and install the operating system.

To download the latest firmware and device drivers, complete the following steps.

Note: Changes are made periodically to the IBM website. The actual procedure might vary slightly from what is described in this document.

1. Go to <http://www.ibm.com/supportportal/>.
2. Under **Product support**, click **BladeCenter**.
3. Under **Popular links**, click **Software and device drivers**.
4. Click **BladeCenter HX5** to display the matrix of downloadable files for the blade server.

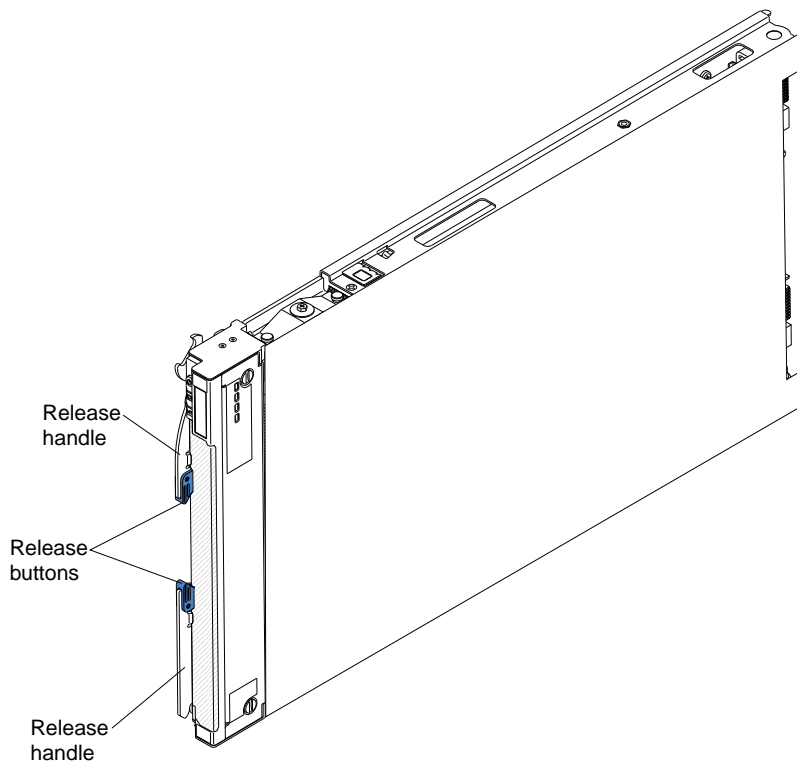
The blade server comes with a limited warranty. For information about the terms of the warranty and getting service and assistance, see the *Warranty Information* document for your blade server. This document is available on the *IBM Documentation* CD. You can obtain up-to-date information about the blade server at <http://www.ibm.com/systems/bladecenter>.

The blade server might have features that are not described in the documentation that comes with the blade server. The documentation might be updated occasionally to include information about those features. Technical updates might also be available to provide additional information that is not included in the blade server documentation.

To obtain the latest and most up-to-date documentation for this product, go to <http://publib.boulder.ibm.com/infocenter/bladectr/documentation/index.jsp>.

You can subscribe to information updates that are specific to your blade server at <http://www.ibm.com/support/mynotifications/>.

The model number and serial number are on the ID label that is located next to the power LED on the blade server bezel. They are also on a label on the side of the blade server that is visible when the blade server is not in the BladeCenter chassis.



A set of blank labels for your blade server comes with the BladeCenter chassis. When you install the blade server in the BladeCenter chassis, write identifying information about the blade server on a label. Then place the label on the BladeCenter chassis bezel. See the documentation for your BladeCenter chassis for recommended label placement.

Important: Do not place the label on the blade server itself or in any way block the ventilation holes on the blade server.

In addition, the system service label, which is on the cover of the server, provides a QR code for mobile access to service information. You can scan the QR code using a QR code reader and scanner with a mobile device and get quick access to the IBM Service Information website. The IBM Service Information website provides additional information for parts installation and replacement videos, and error codes for server support.

The following illustration shows the QR code (<http://ibm.co/114H7dt>):



Figure 1. QR code

Related documentation

Use this information to identify and locate related blade server documentation.

This *Installation and User's Guide* contains general information about the blade server, including how to install supported optional devices and how to configure the blade server. The following documentation is also available:

- *Problem Determination and Service Guide*

This document contains information to help you solve problems yourself, and it contains information for service technicians.

- *Safety Information*

This document contains translated caution and danger statements. Each caution and danger statement that appears in the documentation has a number that you can use to locate the corresponding statement in your language in the *Safety Information* document.

- *Warranty Information*

This document contains information about the terms of the warranty.

- *Environmental Notices and User Guide*

This document contains translated environmental notices.

- *Integrated Management Module User's Guide*

This document explains how to use the functions of the IMM that is installed in an IBM server. The IMM works with IBMSystem x Server Firmware to provide systems-management capability for System x and BladeCenter servers.

- *Advanced Management Module User's Guide*

This document provides information about configuring the advanced management module and managing components that are installed in an IBM® BladeCenter® chassis.

- *Advanced Management Module Command-Line Interface Reference Guide*

This document explains how to use the advanced management module command-line interface (CLI) to directly access BladeCenter management functions. The command-line interface also provides access to the text-console command prompt on each blade server through a Serial over LAN (SOL) connection.

- *Advanced Management Module Messages Guide*

This document provides a complete list of all non-device specific events and recommended actions, sorted by event ID. Device-specific event information is available in the *Problem Determination and Service Guide*.

In addition to the documentation in this library, be sure to review the *Planning and Installation Guide* for your BladeCenter chassis for information to help you prepare for system installation and configuration.

To check for updated documentation, complete the following steps.

1. Go to <http://www.ibm.com/supportportal/>.
2. Under **Product support**, click **BladeCenter**.
3. Under **Popular links**, click **Publications lookup**.
4. From the **Product family** menu, select **BladeCenter HX5**.

You can also find documentation that is related to BladeCenter products at <http://publib.boulder.ibm.com/infocenter/bladectr/documentation/index.jsp>.

The IBM Documentation CD

The IBM *Documentation* CD contains documentation for your blade server in Portable Document Format (PDF). It includes the IBM Documentation Browser to help you find information quickly.

You can run the IBM *Documentation* CD on any personal computer that meets the hardware and software requirements.

Hardware and software requirements

Use this information to determine the minimum hardware and software requirements for the blade server.

The IBM *Documentation* CD requires the following minimum hardware and software:

- Microsoft Windows XP, Windows 2000, or Red Hat Enterprise Linux 5 Server
- 100 MHz microprocessor
- 32 MB of RAM
- Adobe Acrobat Reader 3.0 (or later) or xpdf, which comes with Linux operating systems

Using the Documentation Browser

Use these instructions to start the Documentation Browser.

Use the Documentation Browser to browse the contents of the CD, read brief descriptions of the documents, and view documents, using Adobe Acrobat Reader or xpdf. The Documentation Browser automatically detects the regional settings in use in your system and displays the documents in the language for that region (if available). If a document is not available in the language for that region, the English-language version is displayed.

Use one of the following procedures to start the Documentation Browser:

- If Autostart is enabled, insert the CD into the CD drive. The Documentation Browser starts automatically.

- If Autostart is disabled or is not enabled for all users, use one of the following procedures:
 - If you are using a Windows operating system, insert the CD into the CD or DVD drive and click **Start** → **Run**. In the **Open** field, type

```
e:\win32.bat
```

where e is the drive letter of the CD or DVD drive, and click **OK**.

- If you are using Red Hat Linux, insert the CD into the CD or DVD drive; then, run the following command from the /mnt/cdrom directory:

```
sh runlinux.sh
```

Select your blade server from the **Product** menu. The **Available Topics** list displays all the documents for your blade server. Some documents might be in folders. A plus sign (+) indicates each folder or document that has additional documents under it. Click the plus sign to display the additional documents.

When you select a document, a description of the document is displayed under **Topic Description**. To select more than one document, press and hold the Ctrl key while you select the documents. Click **View Book** to view the selected document or documents in Acrobat Reader or xpdf. If you selected more than one document, all the selected documents are opened in Acrobat Reader or xpdf.

To search all the documents, type a word or word string in the **Search** field and click **Search**. The documents in which the word or word string appears are listed in order of the most occurrences. Click a document to view it. Press Ctrl+F to use the Acrobat search function, or press Alt+F to use the xpdf search function within the document.

Click **Help** for detailed information about using the Documentation Browser.

Notices and statements in this document

Use this information to understand the most common documentation notices and statements and how they are used.

The caution and danger statements in this document are also in the multilingual *Safety Information* document, which is on the *IBM Documentation* CD. Each statement is numbered for reference to the corresponding statement in the *Safety Information* document.

The following notices and statements are used in this document:

- **Note:** These notices provide important tips, guidance, or advice.
- **Important:** These notices provide information or advice that might help you avoid inconvenient or problem situations.
- **Attention:** These notices indicate possible damage to programs, devices, or data. An attention notice is placed just before the instruction or situation in which damage might occur.
- **Caution:** These statements indicate situations that can be potentially hazardous to you. A caution statement is placed just before the description of a potentially hazardous procedure step or situation.
- **Danger:** These statements indicate situations that can be potentially lethal or hazardous to you. A danger statement is placed just before the description of a potentially lethal or hazardous procedure step or situation.

Features and specifications

Use this table to view specific information about the blade server, such as blade server hardware features and the dimensions of the blade server.

Notes:

1. Power, cooling, removable-media drives, external ports, and advanced systems management are provided by the BladeCenter chassis.
2. The operating system in the blade server must provide USB support for the blade server to recognize and use USB media drives and devices. The BladeCenter chassis uses USB for internal communications with these devices.

The following table is a summary of the features and specifications of the BladeCenter HX5 blade server.

Table 1. Features and specifications

<p>Microprocessor: Up to 2 multi-core IntelXeon processors.</p> <p>Note: Use the Setup utility to determine the type and speed of the microprocessors in the blade server.</p> <p>Memory:</p> <ul style="list-style-type: none"> • 16 dual inline memory module (DIMM) connectors • Type: Very Low Profile (VLP) double-data rate (DDR3) DRAM. Supports 2 GB, 4 GB, 8 GB, 16 GB, and 32 GB DIMMs with up to 512 GB of total memory on the system board <p>If two BladeCenter HX5 blade servers are assembled into a scalable blade complex, up to 1 TB is available to the scalable blade complex.</p> <p>If the IBM MAX5 is installed:</p> <ul style="list-style-type: none"> • Supports up to 40 dual inline memory module (DIMM) connectors for up to 1.25 TB of total memory. <p>Note: The BladeCenter HX5 blade server supports memory sparing.</p> <p>Integrated functions:</p> <ul style="list-style-type: none"> • Horizontal-compact-form-factor (CFFh) expansion card interface • Vertical-combination-I/O (CIOv) expansion card interface • Local service processor: integrated management module (IMM) with Intelligent Platform Management Interface (IPMI) firmware • Integrated Matrox G200eV video controller 	<ul style="list-style-type: none"> • Broadcom BCM5709S dual-port Gigabit Ethernet controller • Integrated keyboard/video/mouse (cKVM) controller through IMM • Light path diagnostics • RS-485 interface for communication with the management module • Automatic server restart (ASR) • USB 2.0 for communication with cKVM and removable media drives (an external USB port is not supported) • Serial over LAN (SOL) • Wake on LAN (WOL) • Redundant buses for communication with keyboard, mouse, and removable media drives <p>Predictive Failure Analysis (PFA) alerts:</p> <ul style="list-style-type: none"> • Microprocessors • Memory <p>Electrical input: 12 V dc</p> <p>Size:</p> <p>Single BladeCenter HX5 blade server:</p> <ul style="list-style-type: none"> • Height: 24.5 cm (9.7 in) (6U) • Depth: 44.6 cm (17.6 in) • Width: 2.9 cm (1.14 in) • Maximum weight: 5.6 kg (12.38 lb) <p>2 BladeCenter HX5 blade servers assembled into a scalable blade complex:</p> <ul style="list-style-type: none"> • Height: 24.5 cm (9.7 in) (6U) • Depth: 44.6 cm (17.6 in) • Width: 5.8 cm (2.28 in) • Maximum weight: 11.23 kg (24.76 lb) <p>A BladeCenter HX5 blade server combined with an IBM MAX5 expansion blade:</p> <ul style="list-style-type: none"> • Height: 24.5 cm (9.7 in) (6U) • Depth: 44.6 cm (17.6 in) • Width: 5.8 cm (2.28 in) • Maximum weight: 9.5 kg (21.0 lb) 	<p>Environment:</p> <ul style="list-style-type: none"> • Air temperature: <ul style="list-style-type: none"> – Blade server on: 10°C to 35°C (50°F to 95°F). Altitude: 0 m to 914.4 m (0 ft to 3000 ft) – Blade server on: 10°C to 32°C (50°F to 89.6°F). Altitude: 914.4 m to 2133.6 m (3000 ft to 7000 ft) – Blade server off: 10°C to 43°C (50°F to 109.4°F). Altitude: 914.4 m to 2133.6 m (3000 ft to 7000 ft) – Blade server shipping: -40°C to 60°C (-40°F to 140°F) • Humidity: <ul style="list-style-type: none"> – Blade server on: 8% to 80% – Blade server off: 8% to 80% – Blade server storage: 5% to 80% – Blade server shipping: 5% to 100% • Particulate contamination <p>Attention: Airborne particulates and reactive gases acting alone or in combination with other environmental factors such as humidity or temperature might pose a risk to the server. For information about the limits for particulates and gases, see “Particulate contamination” on page 120.</p>
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What your blade server offers

Your blade server offers features, such as the integrated management module, storage disk drive support, IBM® Systems Director, IBM Enterprise X-Architecture, microprocessor technology, integrated network support, I/O expansion, large system-memory capacity, light path diagnostics LEDs, PCI Express, and power throttling.

- **Integrated management module (IMM)**

The integrated management module (IMM) combines service processor functions, video controller, the remote presence, and blue-screen capture features in a single chip. The IMM provides advanced service-processor control, monitoring, and alerting function. If an environmental condition exceeds a threshold or if a system component fails, the IMM lights LEDs to help you diagnose the problem, records the error in the IMM event log, and alerts you to the problem.

Optionally, the IMM also provides a virtual presence capability for remote server management capabilities. The IMM provides remote server management through industry-standard interfaces:

- Intelligent Platform Management Interface (IPMI) version 2.0
- Simple Network Management Protocol (SNMP) version 3.0
- Common Information Model (CIM)
- web browser.

For more information, see Chapter 6 “Accessing the IMM” on page 109.

- **Dynamic System Analysis (DSA)**

IBM Dynamic Systems Analysis (DSA) collects and analyses system information to aid in diagnosing server problems. DSA collects the following information about the server:

- Drive health information
- Event logs for ServeRAID controllers and service processors
- Hardware inventory, including PCI and USB information
- Installed applications and hot fixes
- Kernel modules
- Light path diagnostics status
- Network interface and settings
- Performance data and details about processes that are running
- RAID and controller configuration
- Service processor (integrated management module) status and configuration
- System configuration
- Vital product data and firmware information

DSA creates a DSA log, which is a chronologically ordered merge of the system-event log (as the IPMI event log), the integrated management module (IMM) chassis-event log (as the ASM event log), and the operating-system event logs. You can send the DSA log as a file to IBM service or view the information as a text file or HTML file.

For more information, see the *Problem Determination and Service Guide*.

- **Hard disk drive support**

The blade server supports up to two solid state drives (SSDs). You can implement RAID 0 or RAID 1 for the SSDs.

- **IBM ServerGuide Setup and InstallationCD**

The *ServerGuide Setup and Installation CD*, which you can download from the web, provides programs to help you set up the server and install a Windows operating system. The ServerGuide program detects installed optional hardware devices and provides the correct configuration programs and device drivers. For more information, see “Using the ServerGuide Setup and Installation CD” on page 105.

- **IBM Systems Director**

IBM Systems Director is a platform-management foundation that streamlines the way you manage physical and virtual systems in a heterogeneous environment. By using industry standards, IBM Systems Director supports multiple operating systems and virtualization technologies for IBM and non-IBM x86 platforms. For more information, see <http://publib.boulder.ibm.com/infocenter/director/v6r2x/index.jsp>.

- **IBM Enterprise X-Architecture**

IBM Enterprise X-Architecture technology combines proven, innovative IBM designs to make your x86-processor-based blade server powerful, scalable, and reliable. For more information, see <http://www.ibm.com/systems/x/hardware/enterprise/xarchitecture.html>.

- **Microprocessor technology**

The blade server supports up to two multi-core IntelXeon microprocessors. For more information about supported microprocessors and their part numbers, see the *Problem Determination and Service Guide*.

Note: The optional microprocessors that IBM supports are limited by the capacity and capability of the server. Any microprocessors that you install must have the same specifications as the microprocessors that came with the servers.

- **Integrated network support** All blade server models come with an integrated Broadcom dual-port Gigabit Ethernet controller. The controller supports connections to a 10 Mbps, 100 Mbps, or 1000 Mbps network through an Ethernet-compatible switch module in the BladeCenter chassis. The controller also supports Wake on LAN® technology.

- **I/O expansion**

The blade server has connectors on the system board for optional expansion cards for adding more network communication capabilities to the blade server.

- **Large system-memory capacity**

The blade server system board supports up to 256 GB of system memory. The memory controller provides support for up to 16 industry-standard registered ECC DDR3 on Very Low Profile (VLP) form factor DIMMs installed on the system board. For the most current list of supported DIMMs, see the ServerProven list at <http://www.ibm.com/servers/eserver/serverproven/compat/us/>.

Note: If two BladeCenter HX5 blade servers are assembled into a scalable blade complex, up to 512 GB of system memory is available to the scalable blade complex.

- **Server expansion**

You can combine two blade servers together to form a scalable blade complex. Through the advanced management module web interface, you can then configure the scalable blade complex to function as a single *hardware partition*, which is single server with up to four multi-core microprocessors and up to 512 GB of system memory.

Combining two blade servers into a scalable blade complex provides you with implementation flexibility through FlexNode partitioning. Through the advanced management module, you can implement the scalable blade complex as a single server or as two independent servers without changing the physical setup of the blade servers. For more information about scalable blade complexes and FlexNode partitioning, see “Working with a scalable blade complex” on page 12.

- **Light path diagnostics**

Light path diagnostics provides light-emitting diodes (LEDs) to help you diagnose problems. For more information, see the *Problem Determination and Service Guide*.

In addition, scalability indicators are available through the front bezel. These indicators enable you to tell whether BladeCenter HX5 blade servers are operating independently or as a single hardware partition.

- **Mobile access to IBM Service Information website**

The server provides a QR code on the system service label, which is on the cover of the server, that you can scan using a QR code reader and scanner with a mobile device to get quick access to the IBM Service Information website. The IBM Service Information website provides additional information for parts installation and replacement videos, and error codes for server support. For the QR code, see QR code information on page Chapter 1 “Introduction” on page 1.

- **PCI Express**

PCI Express is a serial interface that is used for chip-to-chip interconnect and expansion adapter interconnect. With the blade expansion connector, you can add optional I/O and storage devices.

- **Power throttling**

Each blade server is powered by two Enterprise Voltage Regulator-Down (EVRD) 11.0 voltage regulators. By enforcing a power policy known as power-domain oversubscription, the BladeCenter chassis can share the power load between two power modules to ensure sufficient power for each device in the BladeCenter chassis. This policy is enforced when the initial power is applied to the BladeCenter chassis or when a blade server is inserted into the BladeCenter chassis.

The following settings for this policy are available:

- Power module redundancy
- Power module redundancy with blade throttling allowed
- Basic power management

You can configure and monitor the power environment by using the advanced management module. For more information about configuring and using power throttling, see the *Advanced Management Module User's Guide* (available at <http://publib.boulder.ibm.com/infocenter/bladectr/documentation/index.jsp>) or <http://www.ibm.com/supportportal/>.

Reliability, availability, and serviceability features

Three of the most important features in server design are reliability, availability, and serviceability (RAS). These RAS features help to ensure the integrity of the data that is stored in the blade server, the availability of the blade server when you need it, and the ease with which you can diagnose and correct problems.

The blade server has the following RAS features:

- Customer upgrade of flash ROM-resident code and diagnostics
- Power policy 24-hour support center
- Vital product data (VPD) on memory
- Processor presence detection
- Advanced Configuration and Power Interface (ACPI)
- Automatic server restart (ASR)
- Built-in diagnostics using DSA Preboot, which is stored in integrated USB memory.
- Built in monitoring for temperature, voltage, and hard disk drives
- Customer support center 24 hours per day, 7 days a week.¹
- Customer-upgradeable Unified Extensible Firmware Interface (UEFI) code and diagnostics
- ECC protection on the L2 cache
- Error codes and messages
- Integrated management module (IMM)
- Light path diagnostics
- Memory parity testing

1. Service availability varies by country. Response time varies depending on the number and nature of incoming calls.

- Registered ECC DDR3 memory
- Microprocessor built-in self-test (BIST) during power-on self-test (POST)
- Microprocessor serial number access
- PCI PMI 2.2
- PCI Express 1.0a
- POST
- ROM-resident diagnostics
- Service processor that communicates with the advanced management module to enable remote blade server management
- System-error logging
- Wake on LAN capability
- Wake on PCI (PME) capability
- Wake on USB 2.0 capability

IBM Systems Director

IBM Systems Director is a platform-management foundation that streamlines the way you manage physical and virtual systems in a heterogeneous environment.

By using industry standards, IBM Systems Director supports multiple operating systems and virtualization technologies in IBM and non-IBM x86 platforms.

Through a single user interface, IBM Systems Director provides consistent views for viewing managed systems, determining how these systems relate to one another, and identifying their statuses, helping to correlate technical resources with business needs. A set of common tasks that are included with IBM Systems Director provides many of the core capabilities that are required for basic management, which means instance business value. These common tasks include discovery, inventory, configuration, system health, monitoring, updates, event notification, and automation for managed systems.

The IBM Systems Director web and command-line interfaces provide a consistent interface that is focused on driving these common tasks and capabilities:

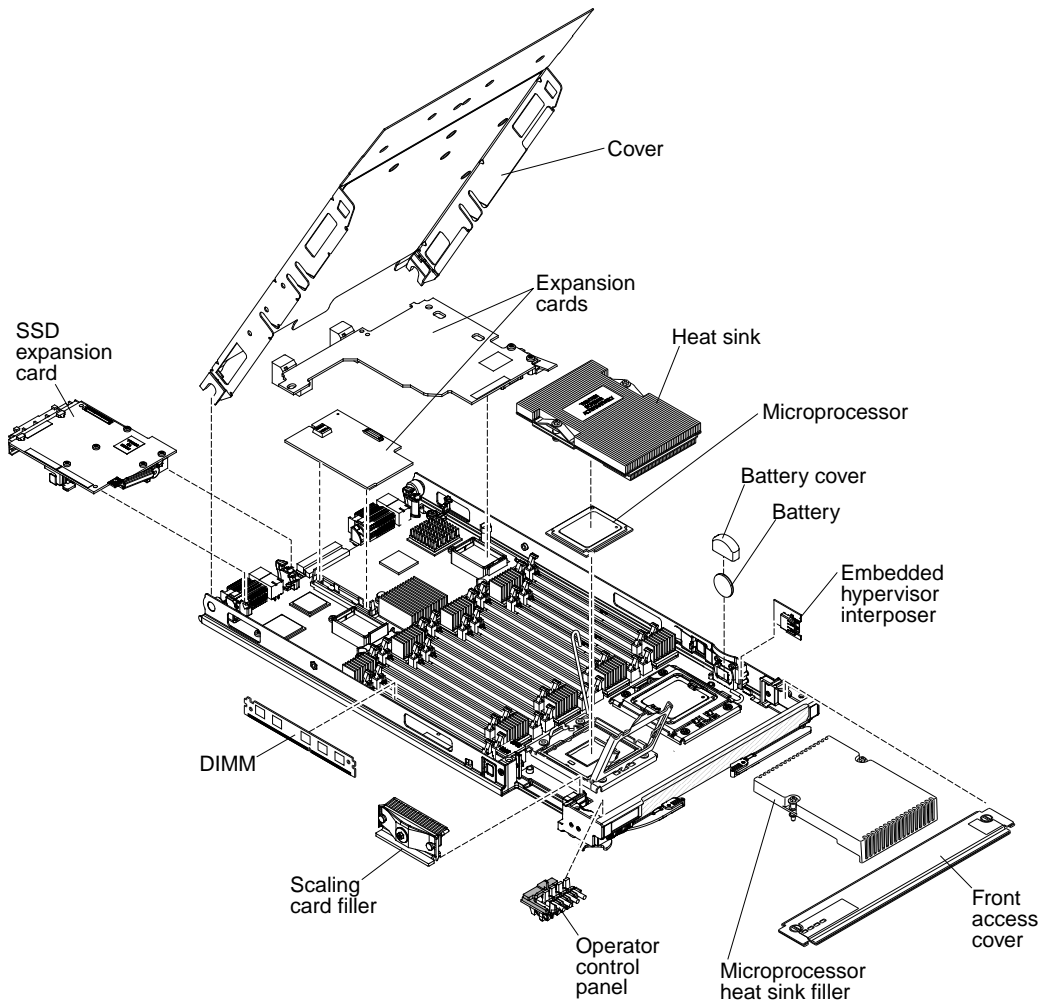
- Discovering, navigating, and visualizing systems on the network with the detailed inventory and relationships to the other network resources
- Notifying users of problems that occur on systems and the ability to isolate sources of the problems
- Notifying users when systems need updates and distributing and installing updates on a schedule
- Analyzing real-time data for systems and setting critical thresholds that notify the administrator of emerging problems
- Configuring settings of a single system and creating a configuration plan that can apply those settings to multiple systems
- Updating installed plug-ins to add new features and functions to the base capabilities
- Managing the life cycles of virtual resources

For more information about IBM Systems Director, see the documentation at <http://publib.boulder.ibm.com/infocenter/director/v6r2x/index.jsp>, and the IBMxSeries Systems Management website at <http://www.ibm.com/systems/management/>, which presents an overview of IBM Systems Management and IBM Systems Director.

Major components of the blade server

Use this information to locate the major components on the blade server. The major components of the blade server include field replaceable units (FRUs), customer replaceable units (CRUs), and optional devices.

The following illustration shows the major components of the blade server.

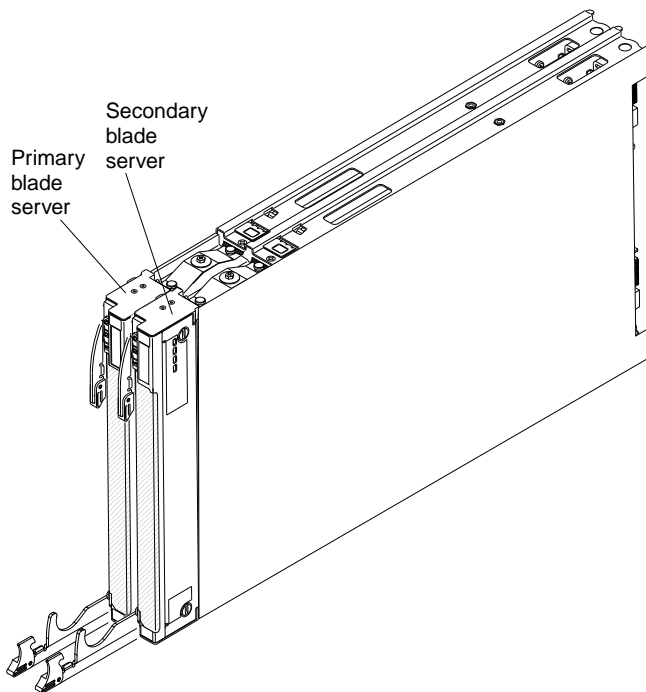


Working with a scalable blade complex

You can assemble two BladeCenter HX5 blade servers together to create a scalable blade complex.

A scalable blade complex supports the following implementation modes:

- **Single partition.** The complex functions as a single server that contains up to four multi-core processors and up to 32 DIMMs. When the complex is implemented as a single hardware partition, the leftmost blade server (as installed in a BladeCenter chassis) is called the primary blade server. The blade server on the right is called the secondary blade server.



- **Multiple partitions (independent partitions).** The blade servers are combined into a scalable blade complex, but each of the blade servers is set up as a single partition.
- **Stand-alone mode.** The blade servers operate independently.

Important: If you install the primary blade server of a scalable blade complex in blade server bay 7 of a BladeCenter H Type 8852 chassis, the secondary blade server is installed in blade server bay 8. The primary blade server receives power from power domain 1 of the chassis and the secondary blade server receives power from power domain 2 of the chassis. The following situations can occur if there is a power loss to either power domain, depending on how the scalable blade complex is implemented:

- If the scalable blade complex is implemented in single partition mode, a loss of power to power domain 1 or power domain 2 results in both blade servers in the scalable blade complex going down.
- If the scalable blade complex is implemented in stand-alone mode, a loss of power to power domain 1 results in the entire scalable blade complex going down. A loss of power to power domain 2 results in the blade server installed in blade server bay 8 going down, but the blade server installed in blade server bay 7 continues to function.

With FlexNode processing, you can toggle between single partition mode and stand-alone mode without having to modify the physical setup of the blade servers. To toggle between modes, use the advanced management module web interface.

For example, assume that you have created a scalable blade complex and defined that complex as a single partition through the advanced management module web interface:

- You can toggle the scalable blade complex to stand-alone mode through the web interface. In stand-alone mode, you can install a different operating system on each blade server and run different applications on each blade server.
- You can then toggle the blade server complex back to a single partition and run applications that take advantage to up to 4 processors and 32 DIMMs. The operating system that is in use is the operating system of the primary blade server.
- Later, you can toggle the complex back to stand-alone mode again to gain access to the operating system on the secondary blade server.

Single partition mode considerations

The following considerations apply to the blade servers in a scalable blade complex that operates as a single hardware partition:

- All UEFI settings (set through the Setup utility) should be the same on both blade servers. If they are not, the settings that are defined for the primary blade server replace the UEFI settings on the secondary server.

Note: When you upgrade the firmware for the blade servers operating in single partition mode, you only have to upgrade the primary blade server. The firmware on the secondary blade server is automatically updated. See “Using the Setup utility” on page 74 for more information about the Setup utility.

- The primary blade server has access to the SSDs on the secondary blade server. However, the SSDs on the primary blade server cannot be combined with the SSDs on the secondary blade server to form a single RAID array. RAID arrays can be formed only using the SSDs within a blade server.
- The primary blade server has access to any I/O expansion cards that are installed in the secondary blade server. However, the I/O expansion cards in the secondary blade server cannot be used for a Serial Over LAN connection.
- The primary blade server has access to any expansion blades that are installed on the secondary blade server.

Important: An expansion blade installed on the secondary blade server cannot be used for a Serial Over LAN connection.

- If you press the power button on one blade server, both blade servers in the partition either power up or power down, depending on the state of the blade servers when you press the power button.

Chapter 2. Power, controls, and indicators

Use this information to view power features, turn on and turn off the blade server, and view the functions of the controls and indicators.

Turning on the blade server

After you connect the blade server to power through the BladeCenter chassis, the blade server can be started in any of the following ways.

- You can press the power button on the front of the blade server (see “Blade server controls and LEDs” on page 16) to start the blade server. The power button works only if local power control is enabled for the blade server. Local power control is enabled and disabled through the advanced management module web interface.

Notes:

1. Wait until the power LED on the blade server flashes slowly before you press the power button. While the service processor in the blade server is initializing and synchronizing with the advanced management module, the power-on LED flashes rapidly, and the power-control button on the blade server does not respond. This process can take approximately 90 seconds after the blade server has been installed.
 2. While the blade server is starting, the power LED on the front of the blade server is lit and does not flash. See “Blade server controls and LEDs” on page 16 for the power LED states.
- If a power failure occurs, the BladeCenter chassis and the blade server can be configured through the advanced management module web interface to start automatically when power is restored.
 - You can turn on the blade server through the advanced management module web interface. For more information about the advanced management module web interface, see the *IBM BladeCenter Advanced Management Module: User's Guide*.
 - You can turn on the blade server through the Wake on LAN feature. The blade server must be connected to power (the power-on LED is flashing slowly), the blade server must be communicating with the advanced management module, the operating system must support the Wake on LAN feature, and the Wake on LAN feature must be enabled through the advanced management module interface.

Note: Procedure to enable the Wake on LAN feature varies depending on the network device. Refer to the documentation that is provided for your network device for more information.

Turning off the blade server

When you turn off the blade server, it is still connected to power through the BladeCenter chassis. The blade server can respond to requests from the service processor, such as a remote request to turn on the blade server. To remove all power from the blade server, you must remove it from the BladeCenter chassis.

Before you turn off the blade server, shut down the operating system. See the operating-system documentation for information about shutting down the operating system.

The blade server can be turned off in any of the following ways:

- You can press the power button on the blade server (see “Blade server controls and LEDs” on page 16). Pressing the button starts an orderly shutdown of the operating system, if this feature is supported by the operating system.

- If the operating system stops functioning, you can press and hold the power button for more than 4 seconds to turn off the blade server.

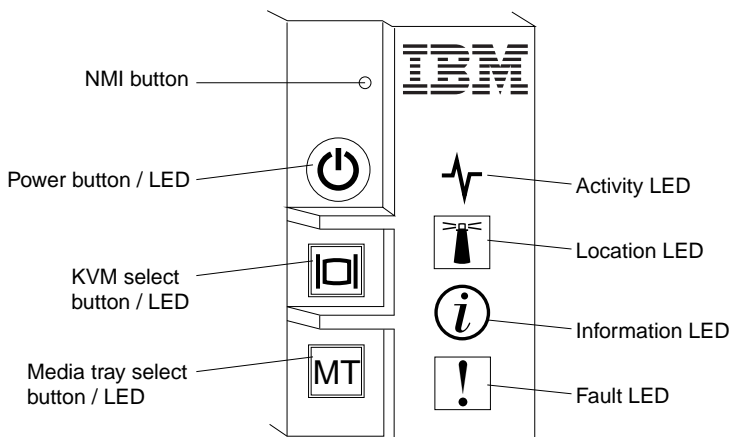
Attention: Pressing the button for 4 seconds forces the operating system to shut down immediately. Data loss is possible.

- You can turn off the blade server through the advanced management module web interface. For more information about the advanced management module web interface, see the *IBM BladeCenter Advanced Management Module: User's Guide*.

Blade server controls and LEDs

Use this information for details about the controls and LEDs on the blade server and IBM MAX5 expansion blade.

The following illustration identifies the buttons and LEDs on the blade server control panel.



NMI button (recessed)

The nonmaskable interrupt (NMI) dumps the partition. Use this recessed button only as directed by IBM Support.

Note: You can also send an NMI event to the selected blade server remotely using the AMM. Refer to the *BladeCenter Advanced Management Module User's Guide* for information pertaining to the proper installation and configuration of Java, operating systems, and browsers that are supported for remote access.

Power button/LED

When the blade server has power, press this button to turn on or turn off the blade server.

Note: The power button works only if local power control is enabled for the blade server. Local power control is enabled and disabled through the advanced management module web interface.

After the blade server is removed from the chassis, press this button to activate the system board LEDs (light path diagnostics). See the *Problem Determination and Service Guide* for more information.

This button is also the power LED. This green LED indicates the power status of the blade server:

- **Flashing rapidly:** The LED flashes rapidly for one of the following reasons:

- The blade server has been installed in a chassis. When you install the blade server, the LED flashes rapidly for up to 90 seconds while the integrated management module (IMM) on the blade server is initializing and synchronizing with the advanced management module.
- The blade server does not have power permissions assigned to it through the advanced management module.
- The BladeCenter chassis does not have enough power to turn on the blade server.
- The IMM on the blade server is not communicating with the advanced management module.
- **Flashing slowly:** The blade server has power and is ready to be turned on.
- **Lit continuously:** The blade server has power and is turned on.

When the blade server is on, pressing this button causes an orderly shutdown of the blade server so that it is safe to remove. This includes shutting down the operating system (if possible) and removing power from the blade server.

Note: If you press the power button on the blade server that is part of a scalable blade complex running as a single partition, both blade servers in the partition power on or shut down.

If an operating system is running, you might have to press the button for approximately 4 seconds to initiate the shutdown.

Attention: Pressing the button for 4 seconds forces the operating system to shut down immediately. Data loss is possible.

KVM select button/LED

Press this button to associate the shared BladeCenter chassis keyboard, video, and mouse (KVM) ports with the blade server. The LED on this button flashes while the request is being processed and then is lit when the ownership of the keyboard, video, and mouse has been transferred to the blade server. It can take approximately 20 seconds to switch the keyboard, video, and mouse control to the blade server.

Using a keyboard that is directly attached to the advanced management module, you can press keyboard keys in the following sequence to switch KVM control between blade servers instead of using the KVM select button:

NumLock NumLock *blade_server_number* Enter

Where *blade_server_number* is the two-digit number of the blade server bay in which the blade server is installed. A blade server that occupies more than one blade server bay is identified by the lowest bay number that it occupies.

If there is no response when you press the KVM select button, you can use the advanced management module web interface to determine whether local control has been disabled on the blade server. See the *IBM BladeCenter Advanced Management Module: User's Guide* for more information.

Notes:

1. The operating system in the blade server must provide USB support for the blade server to recognize and use the keyboard and mouse, even if the keyboard and mouse have PS/2-style connectors.
2. If you install a supported MicrosoftWindows operating system on the blade server while it is not the current owner of the keyboard, video, and mouse, a delay of up to 1 minute occurs the first time that you switch the keyboard, video, and mouse to the blade server. All subsequent switching takes place in the normal KVM switching time frame (up to 20 seconds).

Media tray select button/LED

Press this button to associate the shared BladeCenter chassis media tray (removable-media drives) with the blade server. The LED on the button flashes while the request is being processed and then is lit when

the ownership of the media tray has been transferred to the blade server. It can take approximately 20 seconds for the operating system in the blade server to recognize the media tray.

If there is no response when you press the media-tray select button, you can use the advanced management module web interface to determine whether local control has been disabled on the blade server.

Note: The operating system in the blade server must provide USB support for the blade server to recognize and use the removable-media drives.

Activity LED

When this green LED is lit (flashing), it indicates that there is activity on the network or external storage device.

Location LED

The system administrator can remotely turn on this blue LED to aid in visually locating the blade server. When this LED is lit, the location LED on the BladeCenter chassis is also lit. The location LED can be turned on and off through the advanced management module web interface or through IBM Systems Director. For more information about the advanced management module web interface, see the *IBM BladeCenter Advanced Management Module: User's Guide*. For more information about IBM Systems Director, see the documentation, which is available at <http://publib.boulder.ibm.com/infocenter/director/v6r2x/index.jsp>.

Information LED

When this amber LED is lit, it indicates that an Automatic BIOS recovery (ABR) has occurred. The blade server starts up using the backup UEFI image. See the *Problem Determination and Service Guide*

The information LED can be turned off through the advanced management module CLI, SNMP, or web interfaces or through IBM® Systems Director. For more information about the advanced management module web interface, see the *IBM BladeCenter Advanced Management Module: User's Guide*. For more information about IBM Systems Director, see the documentation, which is available at <http://publib.boulder.ibm.com/infocenter/director/v6r2x/index.jsp>.

Fault LED

When this amber LED is lit, it indicates that a system error has occurred in the blade server. In addition, the fault LED on the chassis system LED panel is lit. See the *Problem Determination and Service Guide*

The fault LED turns off only after the error is corrected.

Note: When the fault LED turns off, you should also clear the IMM event log. Use the Setup utility to clear the IMM event log.

IBM MAX5 LEDs

When there is a fault on the IBM MAX5 expansion blade, the front bezel of the IBM MAX5 expansion blade will appear to have an orange glow. You can press the light path button on the system board of the IBM MAX5 expansion blade to determine which LEDs are lit.

Note: If there is an orange glow, it will be referred to as MEU (Memory Expansion Unit) Fault in the system event log.

The following LEDs are available on the IBM MAX5 expansion blade light path diagnostic panel:

See Light Path Below (LP1)

This amber LED indicates that there is a problem with the BladeCenter HX5 to which the IBM MAX5 expansion blade was attached. If this LED is lit, complete the following steps:

1. Remove the IBM MAX5 expansion blade (see “Removing an IBM MAX5” on page 29).

2. Press the power button on the BladeCenter HX5 blade server to determine which LEDs are lit on the blade server.

The See Light Path Below (LP1) LED is referred to as MEU Look Below in the system event log.

System Board (S BRD)

This amber LED indicates that there is a problem with the system board. If this amber LED is lit, complete the following steps:

1. Install the IBM MAX5 (see “Installing an IBM MAX5” on page 63).
2. Install the BladeCenter HX5 in the chassis (see “Installing a blade server in a BladeCenter chassis” on page 70).
3. Restart the blade server.
4. Check system-event and IMM/AMM logs related to memory and resolve those events (see the *Problem Determination and Service Guide*).
5. If the problem remains, replace the system board on the IBM MAX5(see the *Problem Determination and Service Guide* for instructions).

The System Board (S BRD) LED is referred to as MEU Error in the system-event log.

Light path power (LP2)

This amber LED indicates that one or more LEDs are lit on the IBM MAX5 system board. .

The Light path power (LP2) LED is referred to as MEU LED Power in the system event log.

See the *Problem Determination and Service Guide*

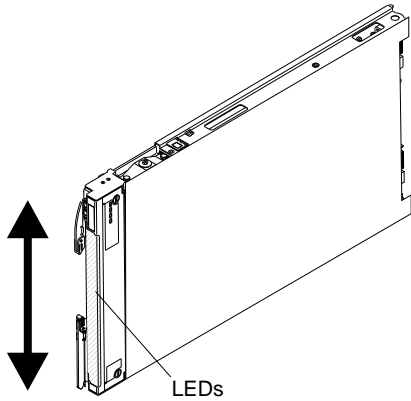
Scalability indicators

The BladeCenter HX5 blade server provides scalability indicators, which are viewable through the front bezel of the blade server when it is installed in a BladeCenter chassis. The scalability indicators remain lit until the blade server is started.

The BladeCenter HX5 blade server can be deployed as a stand-alone blade server. It can also be combined with another BladeCenter HX5 blade server to form a scalable blade complex. When two BladeCenter HX5 blade servers are combined into a scalable blade complex, you can specify that they operate as a single hardware partition or operate in stand-alone mode.

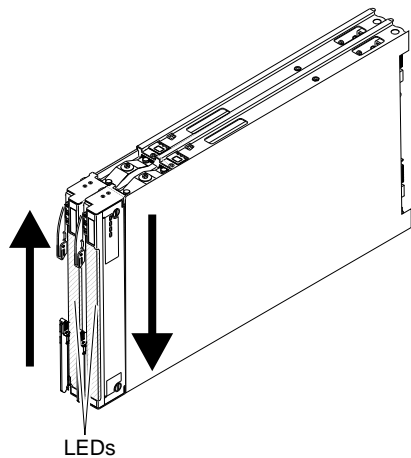
The scalability indicators show whether a BladeCenter HX5 blade server is a stand-alone blade server or a node in a scalable blade complex operating as a single hardware partition.

When a BladeCenter HX5 blade server is a stand-alone blade server, the scalability indicators continually move up and down the front of the bezel.



When a BladeCenter HX5 blade server is part of the scalable blade complex operating in single partition mode, the scalability indicators move up the first blade server, cross over to the second blade server, and then move down the second blade server.

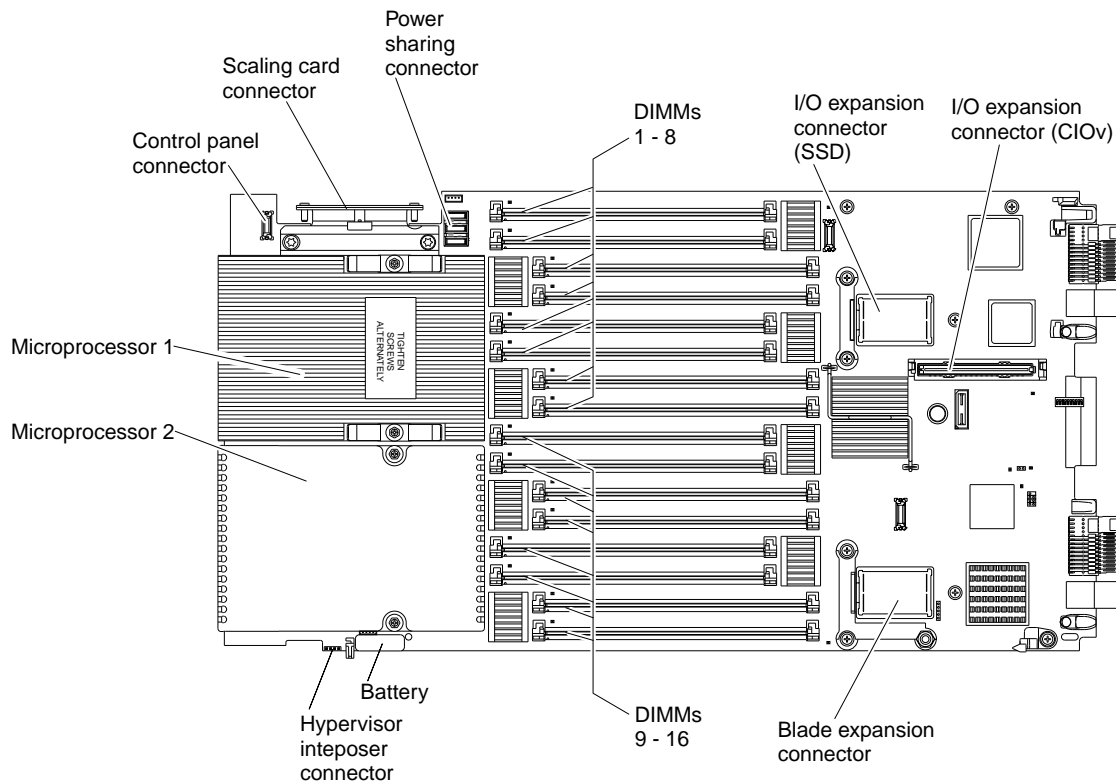
Note: If you have set up a scalable blade complex in single partition mode but when you start the blade servers, the scalability indicators for each blade server seem to be operating independently, there might be a problem with the configuration of the scalable blade complex.



Blade server connectors - BladeCenter HX5

Use this information to locate blade server system board components and connectors for optional devices.

The following illustration shows the system board components, including connectors for user-installable optional devices, in the blade server.

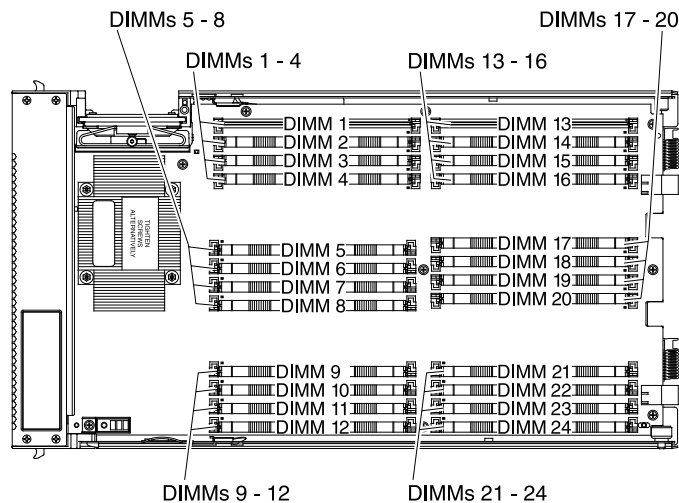


Note: The optional SSD expansion card is installed in the I/O expansion connector (SSD).

Blade server connectors - IBM MAX5

Use this information to locate the IBM MAX5 expansion blade connectors.

The following illustration shows the system board components, including connectors for user-installable optional devices, in the IBM MAX5 expansion blade.



Input/output connectors and devices

The input/output connectors that are available to the blade server are supplied by the BladeCenter chassis. See the documentation that comes with the BladeCenter chassis for information about the input/output connectors.

The blade server has two selection buttons on the control panel: the media tray select button and the keyboard/video/mouse select button. See “Blade server controls and LEDs” on page 16 for information about these buttons and their functions.

The Ethernet controllers on the blade server communicate with the network through the Ethernet-compatible I/O modules in the BladeCenter chassis. Network signals to and from the blade server or any expansion cards are automatically routed to a same-network-interface I/O module through circuitry in the BladeCenter chassis.

Chapter 3. Installing optional devices

Use this information for instructions about installing optional hardware devices in the blade server and assembling blade servers into a scalable blade complex. Some device-removal instructions are provided in case you have to remove one device to install another.

Note: If you are installing devices in a scalable blade complex, remember to install them in both BladeCenter HX5 blade servers in the complex.

Installation guidelines

Use these guidelines before you install the blade server or optional devices.

- Before you begin, read “Safety” on page iii and “Handling static-sensitive devices” on page 23. This information helps you work safely.
- When you install your new blade server, take the opportunity to download and apply the most recent firmware updates. This step helps ensure that any known issues are addressed and that your blade server is ready to function at maximum levels of performance.
- Observe good housekeeping in the area where you are working. Place removed covers and other parts in a safe place.
- Back up all important data before you make changes to disk drives.
- Before you remove a blade server from the BladeCenter chassis, you must shut down the operating system and turn off the blade server. You do not need to shut down the chassis itself.
- Blue on a component indicates touch points, where you can grip the component to remove it from or install it in the blade server, open or close a latch, and so on.
- For a list of supported optional devices for the blade server, see <http://www.ibm.com/servers/eserver/serverproven/compat/us/>.

System reliability guidelines

Use these guidelines to ensure that the blade server meets the proper cooling and system reliability requirements.

- To ensure proper cooling, do not operate the BladeCenter chassis without a blade server or blade filler installed in each blade server bay. See the documentation for your BladeCenter chassis for additional information.
- Each microprocessor socket always contains either a microprocessor dust cover and heat sink filler or a microprocessor and heat sink. If the blade server has only one microprocessor, it must be installed in microprocessor socket 1.
- Make sure that the ventilation holes on the blade server are not blocked.
- The blade server battery must be operational. If the battery becomes defective, replace it immediately. For instructions, see the *Problem Determination and Service Guide*.

Handling static-sensitive devices

To reduce the possibility of damage from electrostatic discharge, observe these precautions.

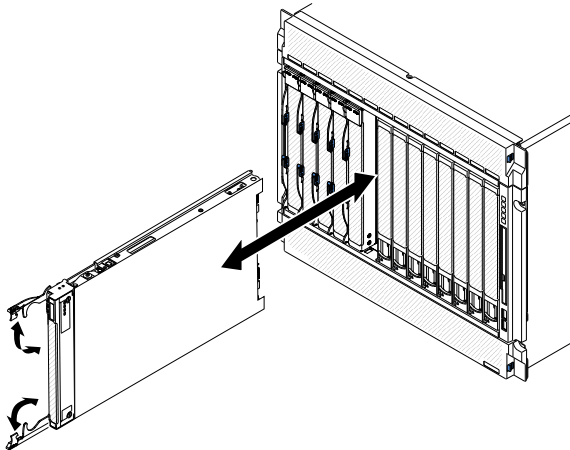
Attention: Static electricity can damage the blade server and other electronic devices. To avoid damage, keep static-sensitive devices in their static-protective packages until you are ready to install them.

- When you work on a BladeCenter chassis that has an electrostatic discharge (ESD) connector, use a wrist strap, especially when you handle modules, optional devices, or blade servers. To work correctly, the wrist strap must have a good contact at both ends (touching your skin at one end and firmly connected to the ESD connector on the front or back of the BladeCenter chassis).
- Limit your movement. Movement can cause static electricity to build up around you.
- Handle the device carefully, holding it by its edges or its frame.
- Do not touch solder joints, pins, or exposed circuitry.
- Do not leave the device where others can handle and damage it.
- While the device is still in its static-protective package, touch it to an *unpainted* metal part of the BladeCenter chassis or any *unpainted* metal surface on any other grounded rack component in the rack in which you are installing the device for at least 2 seconds. This drains static electricity from the package and from your body.
- Remove the device from its package and install it directly into the blade server without setting down the device. If it is necessary to set down the device, put it back into its static-protective package. Do not place the device on the blade server cover or on a metal surface.
- Take additional care when you handle devices during cold weather. Heating reduces indoor humidity and increases static electricity.

Removing the blade server from the BladeCenter chassis

Use these instructions to remove a BladeCenter HX5 blade server or a scalable blade complex from a BladeCenter chassis.

The following illustration shows how to remove a BladeCenter HX5 blade server from a chassis.



Attention:

- To maintain proper system cooling, do not operate the BladeCenter chassis without a blade server or filler module installed in each blade server bay.
- When you remove the blade server, note the blade server bay number. Reinstalling a blade server into a different blade server bay from the one it was removed from can have unintended consequences. Some configuration information and update options are established according to blade server bay number. If you reinstall the blade server into a different bay, you might need to reconfigure the blade server.

To remove a BladeCenter HX5 blade server or scalable blade complex, complete the following steps:

Step 1. Before you begin, read “Safety” on page iii and “Installation guidelines” on page 23.

- Step 2. If the blade server is operating, shut down the operating system.
- Step 3. Press the power button to turn off the blade server (see “Turning off the blade server” on page 15 for more information).

Note: If the blade server is part of a scalable blade complex operating in single partition mode, pressing the power button on one blade server causes both blade servers to shut down.

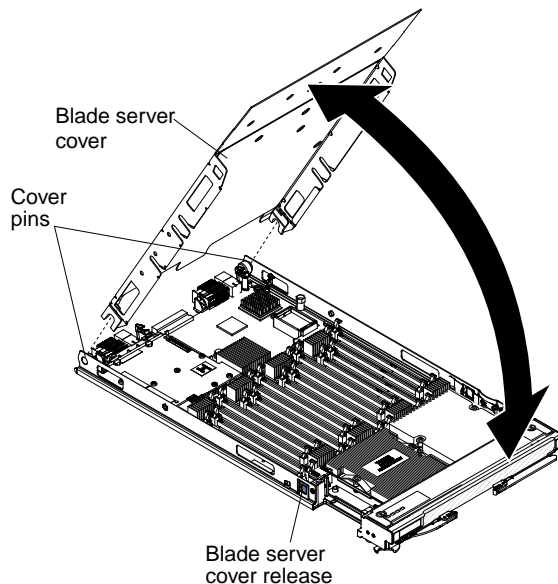
- Step 4. Open the two release handles as shown in the illustration. The blade server moves out of the blade server bay approximately 0.6 cm (0.25 inch).
- Step 5. Pull the blade server out of the bay.
- Step 6. Install either a blade filler or another blade server in the blade server bay within 1 minute.

Removing the blade server cover

Use these instructions to open and remove the cover from a blade server or from the topmost blade server in a scalable blade complex.

To open and remove the blade server cover, complete the following steps.

- Step 1. Before you begin, read “Safety” on page iii and “Installation guidelines” on page 23.
- Step 2. Carefully lay the blade server on a flat, static-protective surface, orienting the blade server with the bezel pointing toward you.
- Step 3. Press the blade server cover release on each side of the blade server, topmost blade server in a scalable blade complex, or expansion unit, and lift the cover away from the blade server, as shown in the following illustration.



- Step 4. Lay the cover flat or store it for future use.

Statement 12



CAUTION:

The following label indicates a hot surface nearby.



Statement 21



CAUTION:

Hazardous energy is present when the blade server is connected to the power source. Always replace the blade cover before installing the blade server.

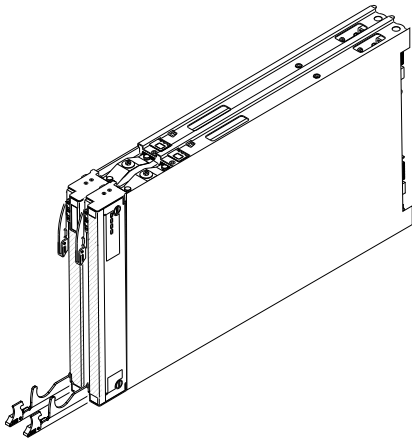
Disassembling a scalable blade complex

If the scalable blade complex came preassembled, you must disassemble it to add components to each of the blade servers in the scalable blade complex.

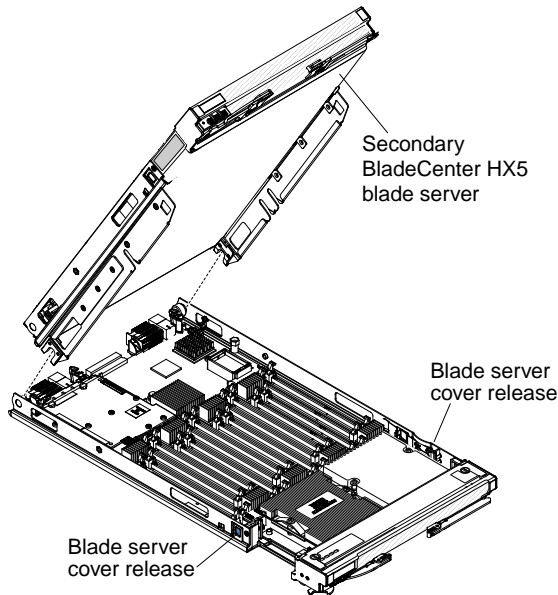
Note: This procedure assumes that you are disassembling a scalable blade complex to install components in each of the blade servers but that you will assemble the blade server back into a scalable blade complex. If you are disassembling the scalable blade complex to use the blade servers as independent, stand-alone blade servers, see the *Problem Determination and Service Guide*.

To disassemble a scalable blade complex, complete the following steps.

- Step 1. Before you begin, read “Safety” on page iii and “Installation guidelines” on page 23.
- Step 2. Remove the cover from the topmost blade server (see “Removing the blade server cover” on page 25 for instructions).
- Step 3. If a blade expansion unit is installed, remove it (see “Removing an expansion unit” on page 31).
- Step 4. Stand the blade servers upright on a clean, flat work surface, with the 2-node scalability card facing up.
- Step 5. Release the lower handles (rotate the lower handles down) to allow the blade servers to sit flat on the work surface



- Step 6. Remove the 2-node scalability card (see “Removing the 2-node scalability card” on page 27 for instructions).
- Step 7. Press the blade server cover release on each side of the blade server and lift the topmost blade server from the bottom blade server as shown in the following illustration.

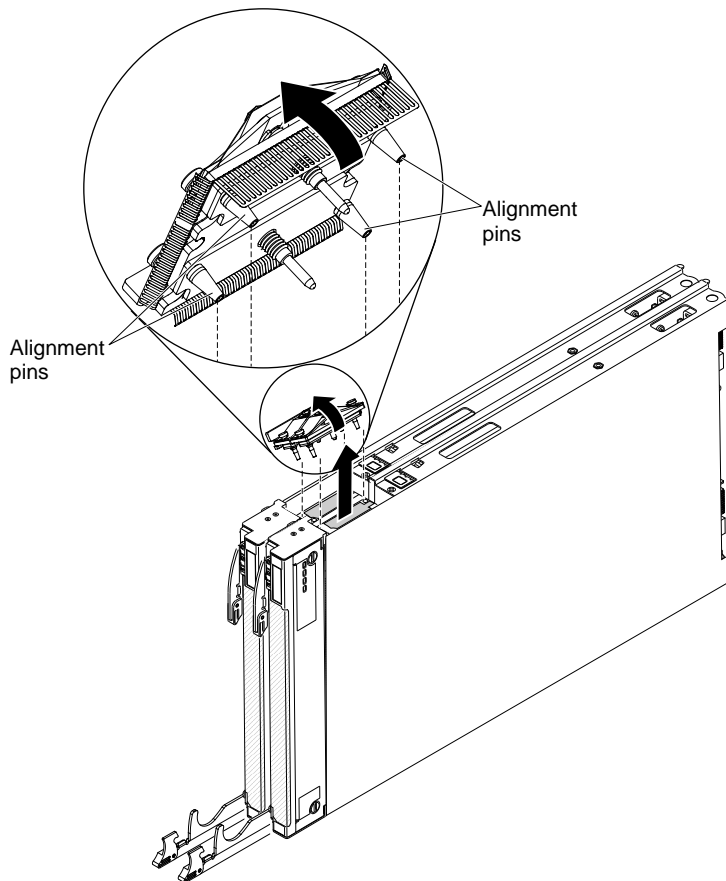


Removing the 2-node scalability card

Use this information to remove the 2-node scalability card from a blade server.

To remove the 2-node scalability card, complete the following steps:

- Step 1. Before you begin, read “Safety” on page iii and “Installation guidelines” on page 23.
- Step 2. Loosen each screw on the 2-node scalability card, using the provided 3/16" hex driver. Alternate the loosening of each screw until both screws are removed.
- Step 3. Lift the 2-node scalability card off both blade servers and store the card in a safe place.



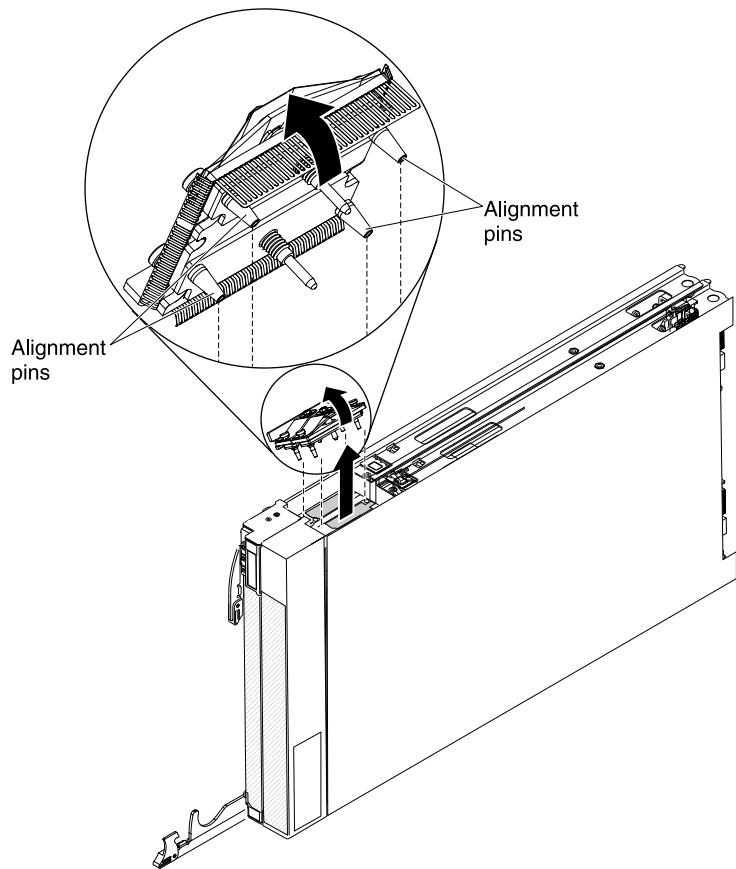
Note: When you remove the 2-node scalability card, the BladeCenter HX5 blade servers are no longer scaled; each blade server operates independently in a chassis.

Removing the IBM MAX5 1-node Scalability card

Use this information to remove the IBM MAX5 1-node scalability card from a blade server.

To remove the IBM MAX5 1-node scalability card, complete the following steps.

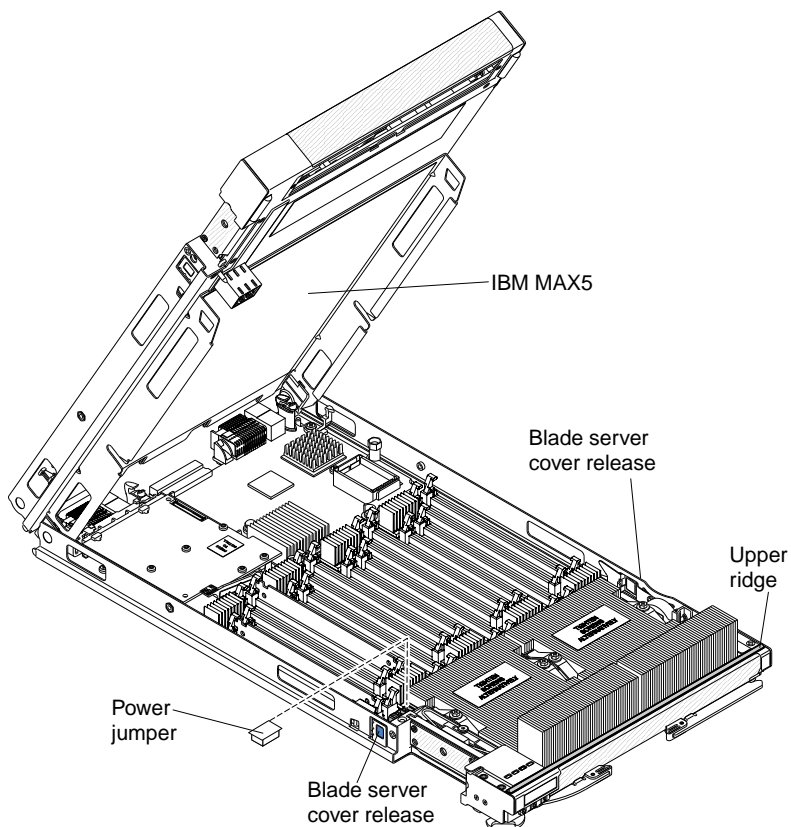
- Step 1. Before you begin, read “Safety” on page iii and “Installation guidelines” on page 23.
- Step 2. Loosen each screw on the 1-node scalability card, using the provided 3/16" hex driver. Alternate the loosening of each screw until both screws are removed.
- Step 3. Lift the 1-node scalability card off of the blade server and expansion blade and store the card in a safe place.



Removing an IBM MAX5

Use these instructions to remove an IBM MAX5.

To remove an IBM MAX5, complete the following steps:



- Step 1. Before you begin, read “Safety” on page iii and “Installation guidelines” on page 23.
- Step 2. Carefully lay the blade server on a flat, static-protective surface.
- Step 3. Remove the IBM MAX5 1-node scalability card (see “Removing the IBM MAX5 1-node Scalability card” on page 28 for instructions).
- Step 4. Remove the IBM MAX5:
 - a. Press the blade server cover release on each side of the blade server and lift the IBM MAX5 from the blade server.
 - b. Rotate the IBM MAX5 open; then, lift the IBM MAX5 from the blade server.
- Step 5. Complete the following steps if you are not going to install another IBM MAX5 expansion blade:

Note: To use a BladeCenter HX5 blade server that has tall heat sinks, you must install another IBM MAX5 expansion blade.

- a. Locate the power sharing connector on the BladeCenter HX5 blade server and install the power sharing cover (see “Blade server connectors - BladeCenter HX5” on page 20).
- b. Remove the EMC gasket from the upper ridge of the “Blade server connectors - BladeCenter HX5” on page 20 blade server if one is installed.

Installing an expansion unit

Use these instructions to install an expansion unit or for the topmost blade server in a scalable blade complex.

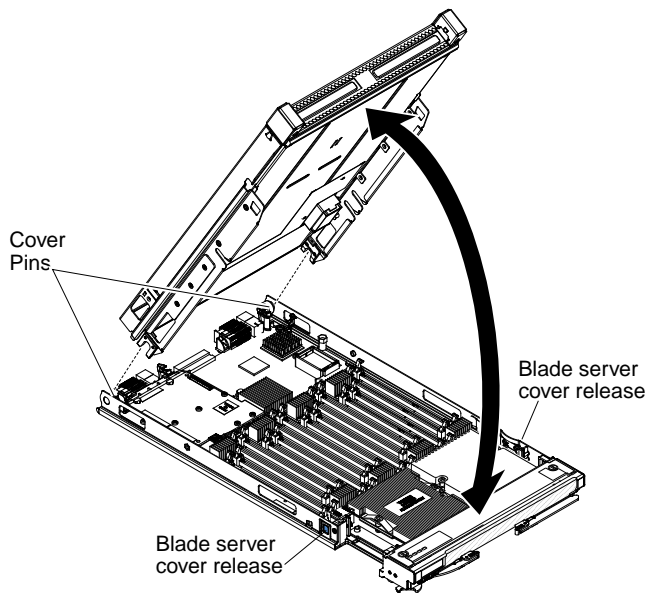
Attention: You cannot insert the blade server into the BladeCenter chassis until the cover is installed and closed. Do not attempt to override this protection.

Statement 21



CAUTION:

Hazardous energy is present when the blade server is connected to the power source. Always replace the blade cover before installing the blade server.

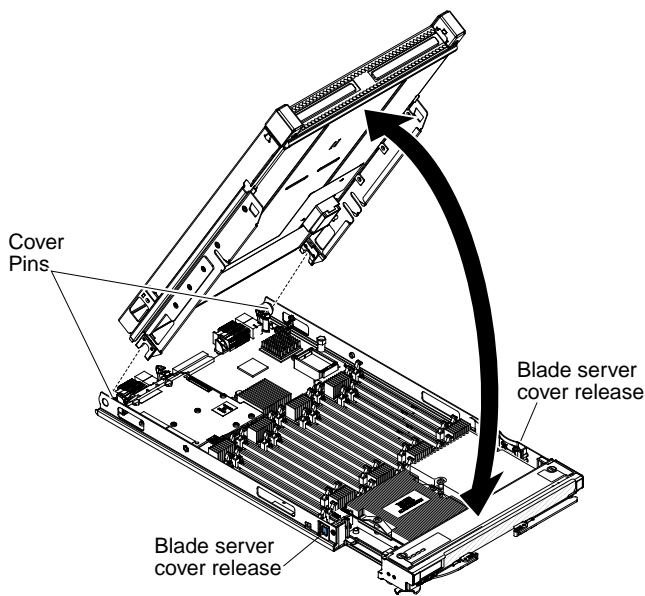


To install and close the blade server cover, complete the following steps:

- Step 1. Before you begin, read “Safety” on page iii and “Installation guidelines” on page 23.
- Step 2. Carefully lay the blade server on a flat, static-protective surface, orienting the blade server with the bezel pointing toward you.
- Step 3. Locate the blade expansion connector and remove the cover if one is installed (see “Blade server connectors - BladeCenter HX5” on page 20).
- Step 4. Touch the static-protective package that contains the optional expansion unit to any *unpainted* metal surface on the BladeCenter unit or any *unpainted* metal surface on any other grounded rack component; then, remove the optional expansion unit from the package.
- Step 5. Orient the optional expansion unit as shown in the illustration.
- Step 6. Lower the expansion unit so that the slots at the rear slide down onto the cover pins at the rear of the blade server; then, pivot the expansion unit down onto the blade server.

Removing an expansion unit

Use these instructions to remove an expansion unit from a blade server or from the topmost blade server in a scalable blade complex.



To open and remove an expansion unit, complete the following steps.

- Step 1. Before you begin, read “Safety” on page iii and “Installation guidelines” on page 23.
- Step 2. If the blade server or scalable blade complex is installed in a BladeCenter chassis, remove it. See “Removing the blade server from the BladeCenter chassis” on page 24 for instructions.
- Step 3. Carefully lay the blade server on a flat, static-protective surface, orienting the blade server with the bezel pointing toward you.
- Step 4. Open the blade server cover (see “Removing the blade server cover” on page 25 for instructions).
- Step 5. Press the blade server cover release on each side of the blade server and lift the expansion unit from the blade server.
- Step 6. Rotate the expansion blade open; then, lift the expansion blade from the blade server.
- Step 7. If additional expansion units need to be removed, repeat steps Step 5 on page 32 and Step 6 on page 32.
- Step 8. If you are instructed to return the expansion unit, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Important: Do not return the blade cover. You will need to install the blade cover from the BladeCenter HX5 on to the new expansion unit. The BladeCenter HX5 blade cover contains the system-service label on the bottom of the cover.

Statement 12



CAUTION:
The following label indicates a hot surface nearby.



Statement 21



CAUTION:

Hazardous energy is present when the blade server is connected to the power source. Always replace the blade cover before installing the blade server.

Installing a DIMM - IBM MAX5

The expansion blade has a total of 24 dual inline memory module (DIMM) connectors. The expansion blade supports 2 GB (Type 7873 models), 4 GB, 8 GB, 16 GB (Type 7873 models), and 32 GB (Type 7873 models) memory DIMMs. Typically, you will install all memory supported by the BladeCenter HX5 blade server before installing memory in the IBM MAX5 expansion blade.

There are two versions of the IBM MAX5 expansion blade, referred to as the IBM MAX5 version 1 and IBM MAX5 version 2 in this document. IBM MAX5 version 2 has a "MAX5" identifying label on the bottom of the front bezel. The functionality of the two IBM MAX5 expansion blades are equivalent except the type of DIMMs supported. The type of DIMMs supported will differ, depending on the version of IBM MAX5 expansion blade installed.

Note: To ensure that all memory installed in the IBM MAX5 expansion blade is recognized by UEFI, make sure that you install a minimum of 2 DIMMs in the BladeCenter HX5 blade server.

The maximum memory speed is determined by the combination of the microprocessor, DIMM speed, DIMM type, and the Operating Modes in UEFI settings. When one quad-rank 16 GB or larger RDIMM is installed with one of the microprocessors listed in the following table, the 16 GB or larger RDIMMs operate at 1066 MHz. You cannot change the **QPI Link Frequency to Minimal Power** through **System Settings → Processors → QPI Link Frequency**.

Table 2. Quad-rank 16 GB RDIMM speed downshift configurations

Description	CRU part number
Intel Xeon E7-2830 Processor, 2.13GHz/24M/6.4GT/s, 8C, 105W	69Y3075
Intel Xeon E7-2850 Processor, 2.00GHz/24M/6.4GT/s, 10C, 130W	69Y3085
Intel Xeon E7-2860 Processor, 2.26GHz/24M/6.4GT/s, 10C, 130W	69Y3095
Intel Xeon E7-4830 Processor, 2.13GHz/24M/6.4GT/s, 8C, 105W	88Y6083
Intel Xeon E7-4850 Processor, 2.00GHz/24M/6.4GT/s, 10C, 130W	88Y6093
Intel Xeon E7-4860 Processor, 2.26GHz/24M/6.4GT/s, 10C, 130W	88Y6103
Intel Xeon E7-8837 Processor, 2.67GHz/24M/6.4GT/s, 8C, 130W	88Y6113
Intel Xeon E7-8867L Processor, 2.13GHz/30M/6.4GT/s, 10C, 105W	88Y6125
Intel Xeon E7-2870 Processor, 2.40GHz/30M/6.4GT/s, 10C, 130W	88Y6151
Intel Xeon E7-4870 Processor, 2.40GHz/30M/6.4GT/s, 10C, 130W	88Y6161

Depending on the memory mode that is set in the Setup utility, the expansion blade can support a minimum of 4 GB and a maximum of 768 GB of system memory. For a current list of supported DIMMs for the expansion blade, see <http://www.ibm.com/servers/eserver/serverproven/compat/us/>.

Memory must be installed in pairs of DIMMs. Observe the following rules with populating the IBM MAX5 expansion blade:

Table 3. DIMM population rules

DIMM Grouping A		
All DIMMs in this group must be the same technology (DRAM size, such as 2 Gbit)		
DIMM 1, DIMM 8	DIMM 2, DIMM 7	All DIMMs must be the same DRAM width (such as 4R x 8)
DIMM 3, DIMM 6	DIMM 4, DIMM 5	All DIMMs must be the same DRAM width (such as 4R x 8)
DIMM Grouping B		
All DIMMs in this group must be the same technology (DRAM size, such as 2 Gbit)		
DIMM 13, DIMM 17	DIMM 14, DIMM18	All DIMMs must be the same DRAM width (such as 4R x 8)
DIMM 15, DIMM 19	DIMM 16, DIMM 20	All DIMMs must be the same DRAM width (such as 4R x 8)
DIMM Grouping C		
All DIMMs in this group must be the same technology (DRAM size, such as 2 Gbit)		
DIMM 9, DIMM 21	DIMM 10, DIMM 22	All DIMMs must be the same DRAM width (such as 4R x 8)
DIMM 11, DIMM 23	DIMM 12, DIMM 24	All DIMMs must be the same DRAM width (such as 4R x 8)

Notes:

- Each DIMM pair must be the exact same size and speed. For example, DIMM 1 and DIMM 8 must be the same size and speed. DIMM 2 and DIMM 7 must be the same size and speed. However, DIMM 1 and DIMM 2 have to be the same technology, but they do not need to be the same size and speed.
- When populating the IBM MAX5, use the DIMMs with the greatest size first. For example, install all 8 GB DIMMs before you install 4 GB DIMMs. Populate the DIMMs according to the DIMM population table for your environment. See Table 4 “System memory configuration for performance” on page 34 through Table 6 “System memory configuration for mirroring with power savings (uses a maximum of 16 DIMMs)” on page 35 for the DIMM population order.

The installation order for DIMMs depends on whether you intend to optimize the DIMM installation for performance or for power saving.

The following table lists the memory configurations and installation order to optimize the IBM MAX5 for performance.

Table 4. System memory configuration for performance

Installed memory	DIMM connector																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
2 DIMMs	X						X																	
4 DIMMs	X						X					X					X							
6 DIMMs	X						X				X	X					X							X
8 DIMMs	X		X			X	X				X	X					X							X
10 DIMMs	X		X			X	X				X	X			X		X			X				X
12 DIMMs	X		X			X	X			X		X	X		X		X			X			X	X

Table 4. System memory configuration for performance (continued)

Installed memory	DIMM connector																								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
14 DIMMs	X	X	X			X	X	X		X		X	X		X		X		X			X		X	
16 DIMMs	X	X	X			X	X	X		X		X	X	X	X		X	X	X			X		X	
18 DIMMs	X	X	X			X	X	X		X	X	X	X	X	X		X	X	X			X	X	X	
20 DIMMs	X	X	X	X	X	X	X	X		X	X	X	X	X	X		X	X	X			X	X	X	
22 DIMMs	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X		X	X	X
24 DIMMs	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

The following table lists the memory configurations and installation order to optimize the IBM MAX5 for power saving.

Table 5. System memory configuration for power saving (uses a maximum of 8 DIMMs)

Installed memory	DIMM connector																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
2 DIMMs	X							X																
4 DIMMs	X		X			X		X																
6 DIMMs	X	X	X			X	X	X																
8 DIMMs	X	X	X	X	X	X	X	X																

Table 6. System memory configuration for mirroring with power savings (uses a maximum of 16 DIMMs)

This configuration mirrors the DIMMs in DIMM Grouping A with the DIMMs in DIMM Grouping B.

Note: Mirroring is supported between DIMM pairs.

Installed memory	DIMM connector																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
4 DIMMs	X							X					X				X							
8 DIMMs	X		X			X		X					X		X		X		X					
12 DIMMs	X	X	X			X	X	X					X	X	X		X	X	X					
16 DIMMs	X	X	X	X	X	X	X	X					X	X	X	X	X	X	X	X	X			

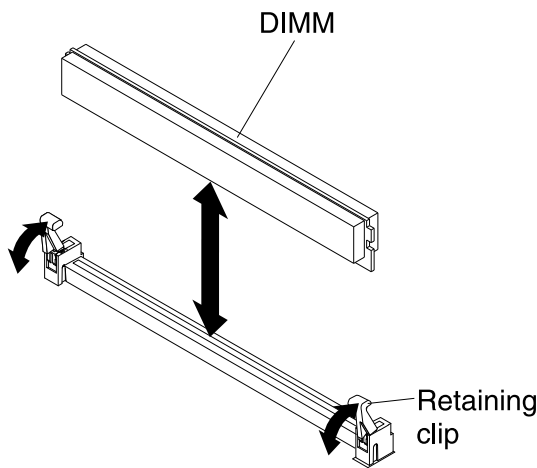
DIMM installation procedure

To install a DIMM, complete the following steps:

- Step 1. Before you begin, read “Safety” on page iii and “Installation guidelines” on page 23.
- Step 2. Read the documentation that comes with the DIMMs.
- Step 3. Locate the DIMM connectors (see “Blade server connectors - BladeCenter HX5” on page 20). Determine the DIMM connector into which you will be installing memory.
- Step 4. If another memory module is already installed in the DIMM connector, remove it (see “Removing a DIMM - BladeCenter HX5” on page 43).
- Step 5. Touch the static-protective package that contains the DIMM to any *unpainted* metal surface on the BladeCenter unit or any *unpainted* metal surface on any other grounded rack component in the

rack in which you are installing the DIMM for at least 2 seconds; then, remove the DIMM from its package.

Step 6. To install the DIMMs, repeat the following steps for each DIMM that you install.



- a. Make sure that both retaining clips on the DIMM connector into which you are installing the DIMM are in the open position (standing straight up).
- b. Turn the DIMM so that the DIMM keys align correctly with the DIMM connector on the system board.

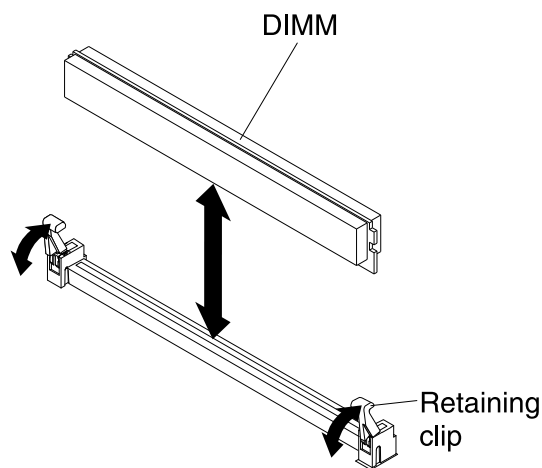
Attention: To avoid breaking the retaining clips or damaging the DIMM connector, handle the clips gently.

- c. Press the DIMM into the DIMM connector. The retaining clips lock the DIMM into the connector.
- d. Make sure that the small tabs on the retaining clips are in the notches on the DIMM. If there is a gap between the DIMM and the retaining clips, the DIMM has not been correctly installed. Press the DIMM firmly into the connector, and then press the retaining clips toward the DIMM until the tabs are fully seated. When the DIMM is correctly installed, the retaining clips are parallel to the sides of the DIMM.

Removing a DIMM - IBM MAX5

Use this information to remove a dual inline memory module (DIMM) from the IBM MAX5 expansion blade.

The following illustration shows how to remove a DIMM from the expansion blade.



To remove a DIMM, complete the following steps:

- Step 1. Before you begin, read “Safety” on page iii and “Installation guidelines” on page 23.
- Step 2. Carefully lay the expansion blade on a flat, static-protective surface.
- Step 3. Open the expansion blade cover (see “Removing the blade server cover” on page 25 for instructions).
- Step 4. Locate the DIMM connectors (see “Blade server connectors - IBM MAX5” on page 21). Determine which DIMM you want to remove from the expansion blade.

Attention: To avoid breaking the retaining clips or damaging the DIMM connectors, handle the clips gently.

- Step 5. Make sure that both retaining clips on DIMM connector into which you will be removing the DIMM are in the open position.
- Step 6. Using your fingers, pull the DIMM out of the connector.

Installing an SSD expansion card

Use this information to install an SSD expansion card.

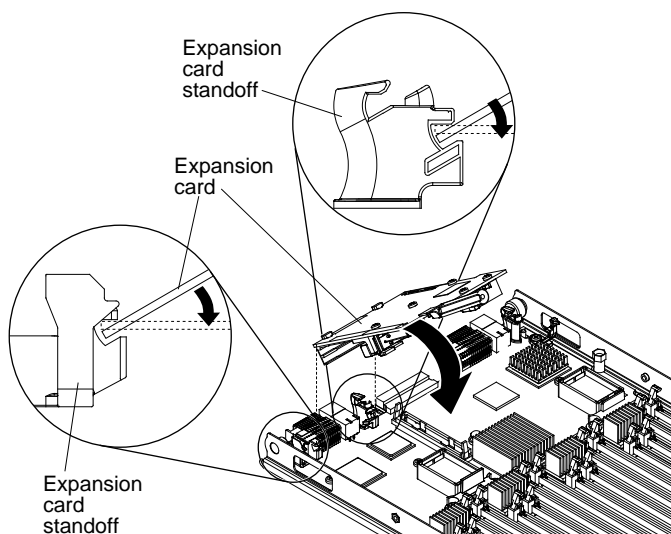
To install an SSD expansion card, complete the following steps:

- Step 1. Before you begin, read “Safety” on page iii and “Installation guidelines” on page 23.
- Step 2. If a CFFh expansion card is installed, remove it (see “Removing a CFFh expansion card” on page 50 for instructions).
- Step 3. Insert the back of the SSD expansion card into the expansion-card standoffs on the blade server and rotate the expansion card down toward the system board.

Note: The expansion card standoff in the middle of the blade server has two slots. The top slot is for the CFFh expansion card. Be sure to insert the SSD expansion card into the bottom slot of the expansion-card standoff that is located in the middle of the blade server.

- Step 4. Carefully push down on the SSD expansion card (pressing on the blue label) until the expansion card is seated.

Note: Make sure that the expansion card lever is in the closed position.

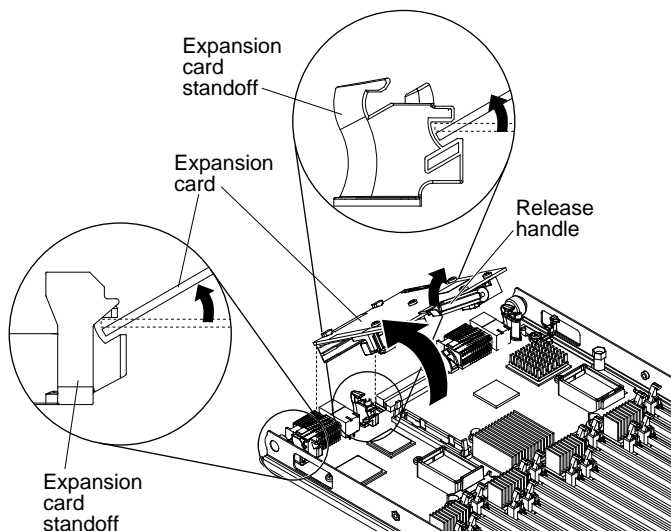


Removing an SSD expansion card

Use this information to remove an SSD expansion card.

To remove an SSD expansion card, complete the following steps:

- Step 1. Before you begin, read “Safety” on page iii and “Installation guidelines” on page 23.
- Step 2. Locate the blue expansion card lever on the SSD expansion card and lift the lever to release the SSD expansion card from the blade expansion connector on the system board.
- Step 3. Rotate the SSD expansion card up and lift it away from the expansion-card standoffs.



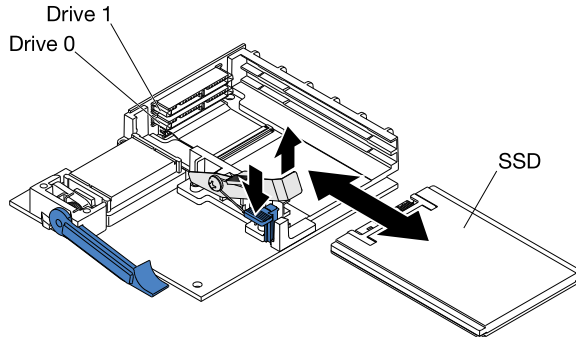
Installing a solid state drive

Use this information to install a solid state drive.

You can install up to two solid state drives in the SSD expansion card. The blade server supports using RAID 0 or RAID 1 when two storage drives are installed. See “Using the LSI Logic Configuration Utility program” on page 83 for information about RAID configuration.

To install a solid state drive, complete the following steps:

- Step 1. Remove the SSD expansion card (see “Removing an SSD expansion card” on page 38 for instructions).
- Step 2. Turn over the SSD expansion card.



- Step 3. Touch the static-protective package that contains the solid state drive to any *unpainted* metal surface on the BladeCenter unit or any *unpainted* metal surface on any other grounded rack component; then, remove the solid state drive from the package.
- Step 4. Slide the solid state drive into the slot until it is firmly seated in the connector.
- Step 5. If you have a second solid state drive to install, repeat steps 3 and 4.
- Step 6. Close the retention lever and secure it with the blue tab.

Note: You might have to press the blue tab before you close the retention lever.

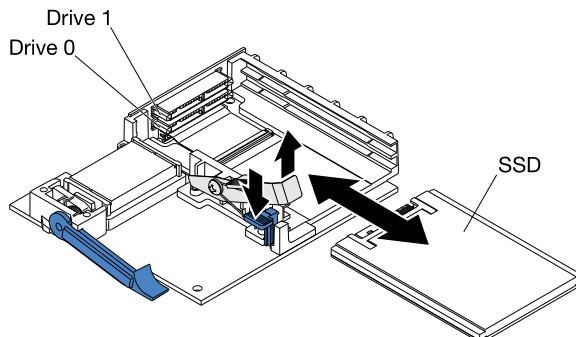
- Step 7. Install the SSD expansion card (see “Installing an SSD expansion card” on page 37 for instructions).

Removing a solid state drive

Use this information to remove a solid state drive.

The blade server has a solid state drive expansion card for installing or removing solid state drives. To remove a solid state drive, complete the following steps:

- Step 1. Before you begin, read “Safety” on page iii and “Installation guidelines” on page 23.
- Step 2. Remove the SSD expansion card (see “Removing an SSD expansion card” on page 38 for instructions).
- Step 3. Turn over the SSD expansion card.



Step 4. Press down on the blue tab. The retention lever automatically opens so that the solid state drive or drives are accessible.

Step 5. Slide the solid state drive out of the slot.

Note: When you remove a drive from the SSD expansion card, consider labeling the drive to indicate the slot from which the drive was removed so that you can install the drive back into the same slot.

Step 6. Close the retention lever and secure it with the blue tab.

Note: You might need to press the blue tab before you close the retention lever.

Installing a DIMM - BladeCenter HX5

The blade server has a total of 16 direct inline memory module (DIMM) slots. The blade server supports very low profile (VLP) DDR3 DIMMs with error code correction (ECC) in 2 GB, 4 GB, 8 GB, 16 GB, and 32 GB capacities.

For a current list of supported DIMMs for the blade server, see <http://www.ibm.com/servers/eserver/serverproven/compat/us/>.

Depending on the memory mode that is set in the Setup utility, the blade server can support a minimum of 4 GB and a maximum of 256 GB of system memory on the system board in a blade server with one processor. If two microprocessors are installed, the blade server can support a minimum of 8 GB and a maximum of 512 GB of system memory.

Memory must be installed in pairs of DIMMs per processor installed. DIMMs must be the same size, speed, and technology within installed pairs.

If a single processor is installed, it can access the first eight DIMM slots. The following table lists the memory configurations and installation order for the BladeCenter HX5 when one processor is installed.

Table 7. System memory configuration for a single processor (1 microprocessor)

Installed memory	DIMM socket							
	1	2	3	4	5	6	7	8
2 DIMMs	X			X				
4 DIMMs	X			X	X			X
6 DIMMs	X	X	X	X	X			X
8 DIMMs	X	X	X	X	X	X	X	X

The following table lists the memory configurations and installation order for the BladeCenter HX5 when two processors are installed.

Table 8. System memory configuration for a two processors (2 microprocessors)

Installed memory	DIMM socket															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
2 DIMMs	X			X												
4 DIMMs	X			X					X			X				
6 DIMMs	X			X	X			X	X			X				
8 DIMMs	X			X	X			X	X			X	X			X

Table 8. System memory configuration for a two processors (2 microprocessors) (continued)

Installed memory	DIMM socket															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
10 DIMMs	X	X	X	X	X			X	X			X	X			X
12 DIMMs	X	X	X	X	X			X	X	X	X	X	X			X
14 DIMMs	X	X	X	X	X	X	X	X	X	X	X	X	X			X
16 DIMMs	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Important: If you are installing memory in a scalable blade complex, you should install the DIMMs to have a balance of memory among processors. Additional memory can be installed in the top-most BladeCenter HX5 of the scalable blade complex blade server so that you do not need to disassemble the scalable blade complex. For example, if you are installing four DIMMs in a scalable blade complex consisting of two BladeCenter HX5 blade servers, you would install two DIMMs (in sockets 1 and 4) of each blade server.

The BladeCenter HX5 blade server supports memory mirroring. When enabled, the first DIMM quadrant is duplicated onto the second DIMM quadrant for each processor.

Notes:

- To enable memory mirroring, the DIMMs installed for each processor must be identical.
- Memory mirroring reduces the available memory by half. For example, if the server has 64 GB of installed memory, only 32 GB of addressable memory is available when memory mirroring is enabled.

If one processor is installed, memory mirroring is set up as follows:

Table 9. Memory mirroring with one processor

DIMM Quadrant	Mirrored Quadrant
DIMM 1, DIMM 2, DIMM 3, DIMM 4	DIMM 5, DIMM 6, DIMM 7, DIMM 8

If two processors are installed, memory mirroring is set up as follows:

Table 10. Memory mirroring with two processors

DIMM Quadrant	Mirrored Quadrant
DIMM 1, DIMM 2, DIMM 3, DIMM 4	DIMM 5, DIMM 6, DIMM 7, DIMM 8
DIMM 9, DIMM 10, DIMM 11, DIMM 12	DIMM 13, DIMM 14, DIMM 15, DIMM 16

The BladeCenter HX5 blade server also supports memory sparing, in which the contents of the failing DIMM are transferred to the spare DIMM.

Notes:

- To enable memory sparing, the DIMMs installed for each processor must be identical.
- Memory sparing reserves memory capacity for failover in the event of a DIMM failure, and the reserved capacity is subtracted from the total available memory. Memory sparing provides less redundancy than memory mirroring does. If a predetermined threshold of correctable errors is reached, the contents of the failing DIMM are copied to the spare memory, and the failing DIMM or rank is disabled. To enable memory sparing through the Setup utility, select **System Settings → Memory**.
- See “Installing a DIMM - IBM MAX5” on page 33 for more information about memory requirements for the IBM MAX5 expansion blade.

If one processor is installed, memory sparing is set up as follows:

Table 11. Memory sparing with one processor

DIMM Pair	Spare Pair
DIMM 2, DIMM 3	DIMM 1, DIMM 4
DIMM 6, DIMM 7	DIMM 5, DIMM 8

If two processors are installed, memory sparing is set up as follows:

To install a DIMM, complete the following steps:

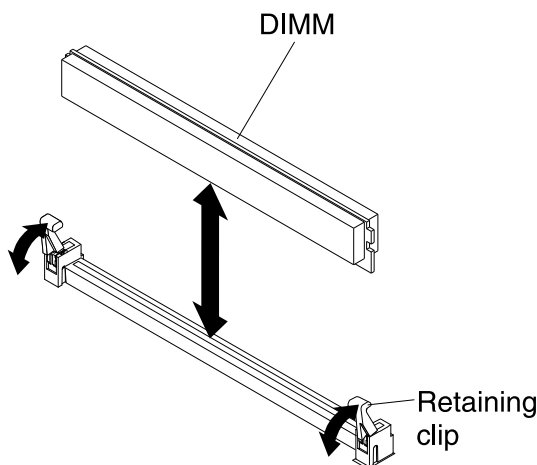
Table 12. Memory sparing with two processors

DIMM Pair	Spare Pair
DIMM 2, DIMM 3	DIMM 1, DIMM 4
DIMM 6, DIMM 7	DIMM 5, DIMM 8
DIMM 10, DIMM 11	DIMM 9, DIMM 12
DIMM 14, DIMM 15	DIMM 13, DIMM 16

Note: If all DIMMs are of the same size, the memory reference code (MRC) sets sparing in the farthest DIMM pair. Otherwise, the largest DIMM pair is set aside as spare.

To install a DIMM, complete the following steps:

- Step 1. Before you begin, read “Safety” on page iii and “Installation guidelines” on page 23.
- Step 2. Locate the DIMM connectors (see “Blade server connectors - BladeCenter HX5” on page 20). Determine the DIMM connector into which you will be installing memory.
- Step 3. If another memory module is already installed in the DIMM connector, remove it (see “Removing a DIMM - BladeCenter HX5” on page 43).
- Step 4. Touch the static-protective package that contains the DIMM to any *unpainted* metal surface on the BladeCenter unit or any *unpainted* metal surface on any other grounded rack component in the rack in which you are installing the DIMM for at least two seconds; then, remove the DIMM from its package.
- Step 5. To install the DIMMs, repeat the following steps for each DIMM that you install:



- a. Make sure that both retaining clips on the DIMM connector into which you are installing the DIMM, are in the open position.
- b. Turn the DIMM so that the DIMM keys align correctly with the DIMM connector on the system board.

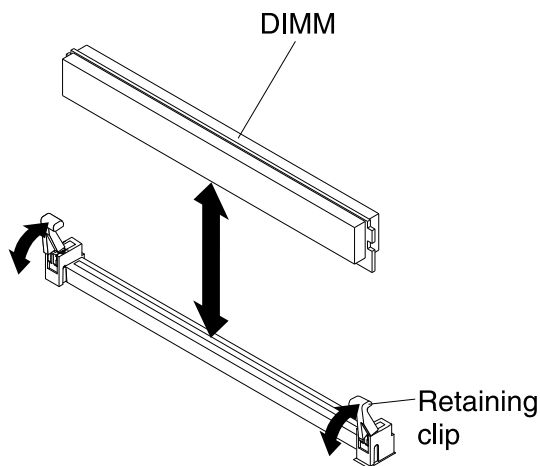
Attention: To avoid breaking the retaining clips or damaging the DIMM connectors, handle the clips gently.

- c. Press the DIMM into the DIMM connector. The retaining clips will lock the DIMM into the connector.
- d. Make sure that the small tabs on the retaining clips are in the notches on the DIMM. If there is a gap between the DIMM and the retaining clips, the DIMM has not been correctly installed. Press the DIMM firmly into the connector, and then press the retaining clips toward the DIMM until the tabs are fully seated. When the DIMM is correctly installed, the retaining clips are parallel to the sides of the DIMM.

Removing a DIMM - BladeCenter HX5

Use this information to remove a dual inline memory module (DIMM) from the blade server.

The following illustration shows how to remove a DIMM from the blade server.



To remove a DIMM, complete the following steps:

- Step 1. Before you begin, read “Safety” on page iii and “Installation guidelines” on page 23.
- Step 2. Locate the DIMM connectors (see “Blade server connectors - BladeCenter HX5” on page 20). Determine which DIMM you want to remove from the blade server.

Attention: To avoid breaking the retaining clips or damaging the DIMM connectors, handle the clips gently.

- Step 3. Make sure that both retaining clips on DIMM connector into which you will be removing the DIMM are in the open position.
- Step 4. Using your fingers, pull the DIMM out of the connector.

Installing a hypervisor key

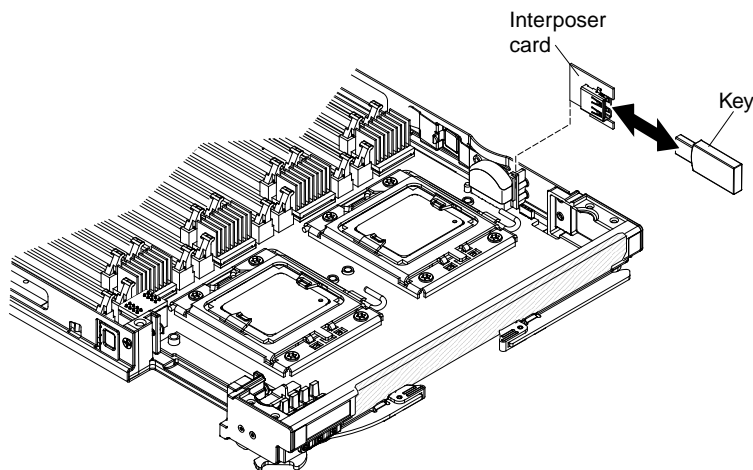
Use these instructions to install a hypervisor key in the blade server.

If you are using the BladeCenter HX5 blade server in a virtualized environment, you might need to install a hypervisor key, depending on the virtualization software that you are using. If you are using a scalable blade complex that is configured as a single hardware partition, install the hypervisor key in the bottom (left) blade server in the complex.

If the blade servers in a scalable blade complex are operating independently, you might have to install a hypervisor key in each blade server. To determine whether you need a hypervisor key, see the documentation that comes with your virtualization software. For more information about virtualization, see <http://www.ibm.com/itsolutions/virtualization/>.

Note: The BladeCenter HX5 supports the option part number 41Y8278, which contains VMWare ESXi 4.0. When you order a replacement, order 42D0545, which is a blade 2 GB USB key.

The following illustration shows the installation of the hypervisor key.

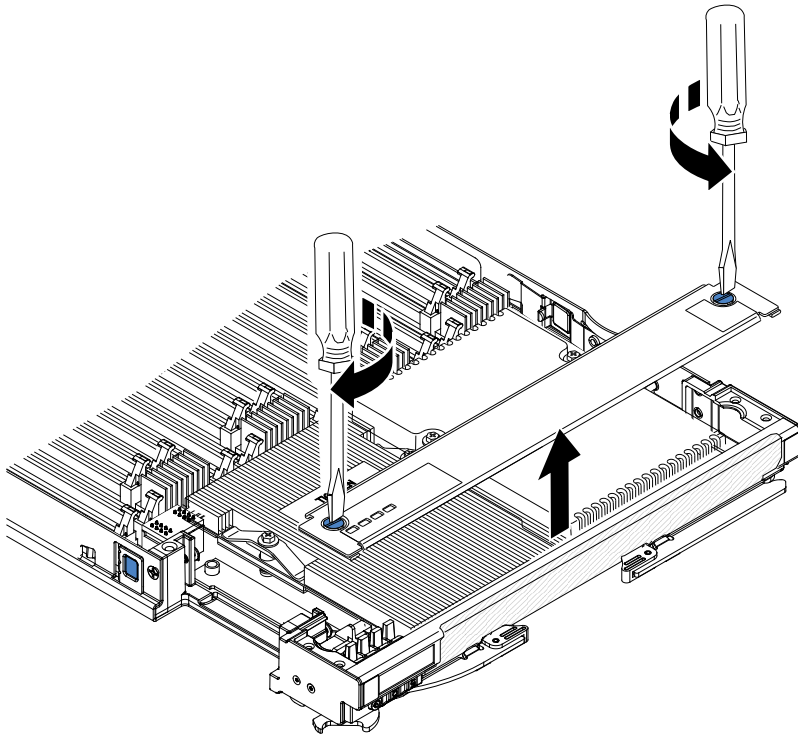


To install a hypervisor key, complete the following steps:

Step 1. Before you begin, read “Safety” on page iii and “Installation guidelines” on page 23.

Step 2. Remove the access panel if you have the standard heat sinks installed.

Note: If you have the tall heat sinks installed, you do not need to remove the access panel.



- a. Using a screwdriver or a coin, turn each of the screws toward the middle of the blade server until they are in the unlocked position.
- b. While you lift the back of the access panel, slide the panel away from the bezel.

Step 3. Remove the hypervisor interposer:

- a. Locate the hypervisor interposer on the system board (see “Major components of the blade server” on page 11).
- b. Press down on the front edge of the hypervisor interposer to disengage the hypervisor interposer from the hypervisor interposer card guide.
- c. Carefully lift the hypervisor interposer up from the system board.

Step 4. Touch the static-protective package that contains the hypervisor key to any *unpainted* metal surface on the BladeCenter unit or any *unpainted* metal surface on any other grounded rack component in the rack in which you are installing the hypervisor key for at least 2 seconds; then, remove the USB module from its package.

Step 5. Install the hypervisor key into the hypervisor adapter:

- a. Orient the connector on the hypervisor key with the connector on the hypervisor adapter.
- b. Use your fingers to push the hypervisor key into the hypervisor adapter.

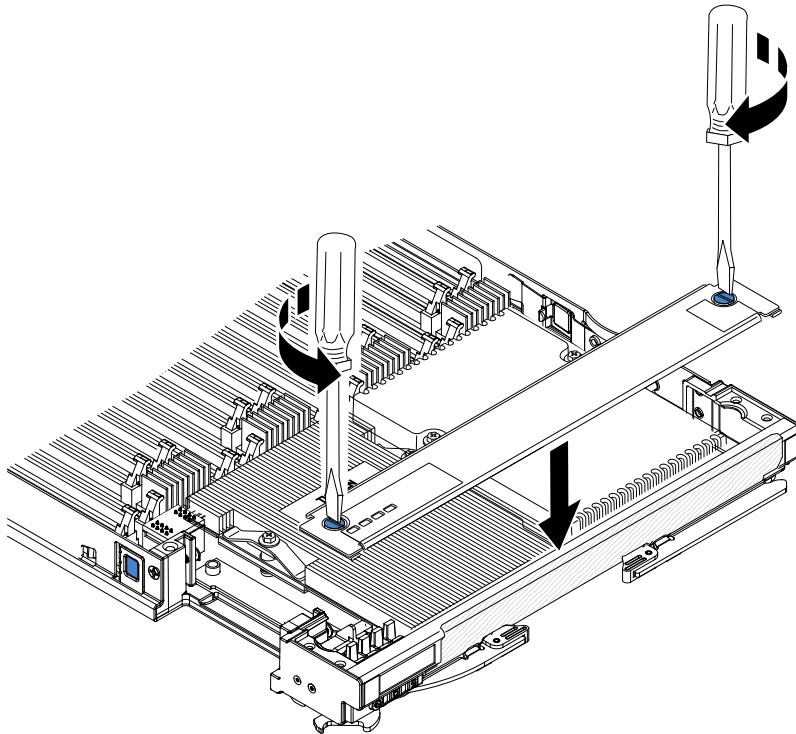
Step 6. Install the hypervisor adapter:

- a. Orient the connector on the hypervisor interposer with the interposer connector on the system board, aligning the pins on the side of the hypervisor interposer with the pinholes on the interposer connector (see “Blade server connectors - BladeCenter HX5” on page 20).
- b. Use your fingers to push the adapter into the connector on the blade server.

Attention: Be careful not to damage the pins on the hypervisor interposer.

Step 7. Install the access panel if you have standard heat sinks installed.

Note: If you have the tall heat sinks installed, you do not need to install the access panel.

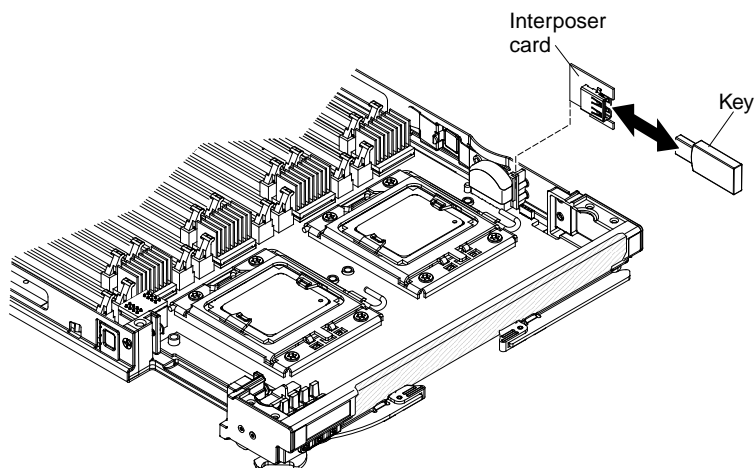


- a. Make sure that the screws on the access panel are in the open position (the screw insert is parallel to the side of the access panel).
- b. Slide the back of the cover under the blade server bezel, aligning the screws with the slots on the blade server.
- c. Using a screwdriver or a coin, turn each of the screws away from the middle of the blade server until it is in the locked position.

Removing a hypervisor key

Use this information to remove a hypervisor key from the blade server.

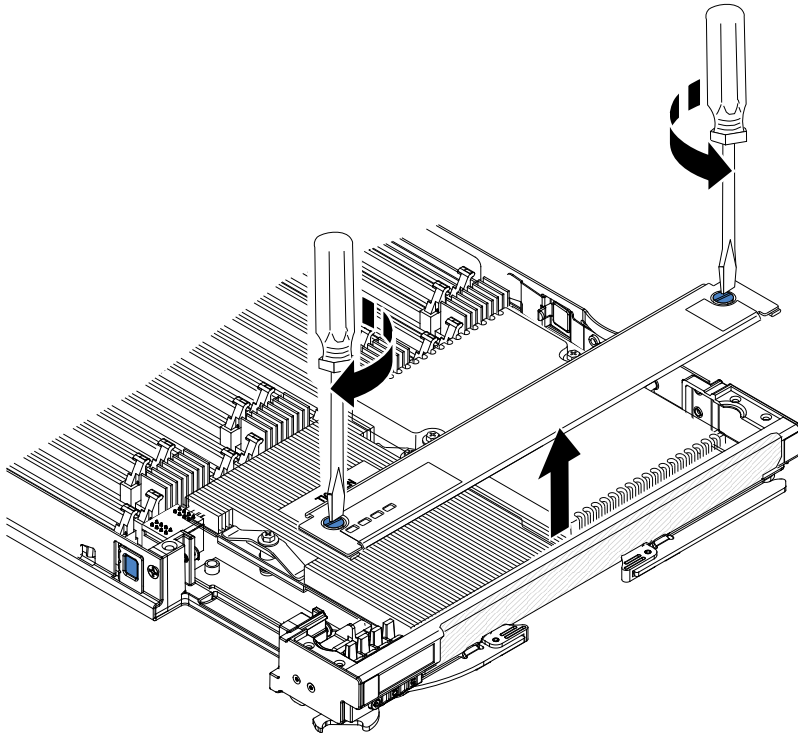
The following illustration shows the removal of a hypervisor key from the blade server.



To remove the hypervisor key, complete the following steps:

- Step 1. Before you begin, read “Safety” on page iii and “Installation guidelines” on page 23.
- Step 2. Remove the access panel if you have the standard heat sinks installed.

Note: If you have the tall heat sinks installed, you do not need to remove the access panel.



- a. Using a screwdriver or a coin, turn each of the screws toward the middle of the blade server until they are in the unlocked position.
 - b. While you lift the back of the access panel, slide the panel away from the bezel.
- Step 3. Locate the hypervisor interposer on the system board (see “Major components of the blade server” on page 11).
 - Step 4. Press down on the front edge of the hypervisor interposer to disengage the hypervisor interposer from the hypervisor interposer card guide.
 - Step 5. Carefully lift the hypervisor interposer up from the system board.
 - Step 6. Pull the hypervisor key away from the hypervisor interposer.

Installing an I/O expansion card

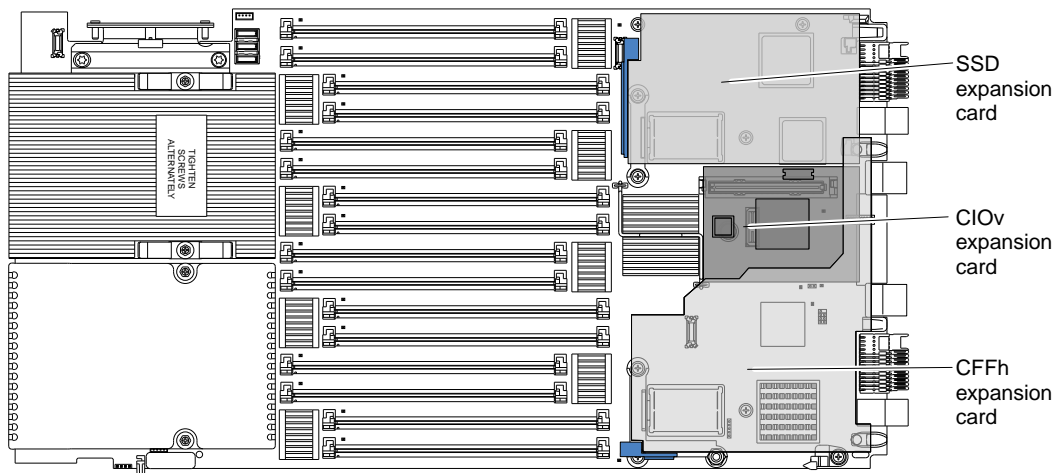
The following sections describe how to install the following expansion cards:

- CFFh expansion cards, for example:
 - QLogic 2-Port 10Gb Converged Network Adapter
 - QLogic Ethernet and 8 GB Fibre Channel Expansion Card
 - 2/4-Port Gb Ethernet Expansion Card
 - 2-Port 40 Gb Infiniband Expansion Card
 - Brocade 2-Port 10 Gb Ethernet Converged Network Adapter
 - Broadcom 2-Port 10 Gb Ethernet Expansion Card
 - Broadcom 2-Port 10 Gb Virtual Fabric Adapter

- Broadcom 4-Port 10 Gb Ethernet Expansion Card
- Emulex Virtual Fabric Adapter
- Emulex Virtual Fabric Adapter Advanced
- Emulex 10 Gb Ethernet Virtual Fabric Adapter 2
- Emulex 10 Gb Ethernet Virtual Fabric Adapter Advanced 2
- Intel 10 Gb 2-Port Ethernet Expansion Card
- CIOv expansion cards, for example:
 - Ethernet Expansion Card
 - QLogic 8 Gb Fibre Channel Expansion Card
 - QLogic 4 Gb Fibre Channel Expansion Card
 - SAS Connectivity Card

Note: A CIOv expansion card is supported for all combinations.

The following illustration shows the cards that are supported in a blade server.



For information about installing an SSD expansion card, see “Installing an SSD expansion card” on page 37.

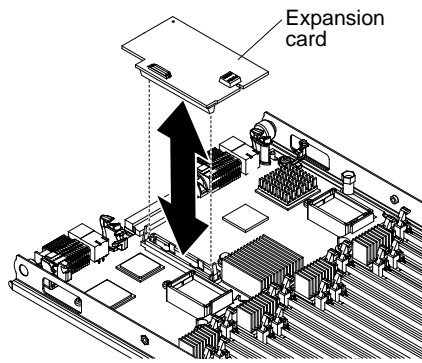
To determine which expansion cards are supported in the BladeCenter HX5 blade server, see <http://www.ibm.com/servers/eserver/serverproven/compat/us/>.

Product documentation for expansion cards is available at “” on page .

Installing a CIOv expansion card

Use these instructions to install a CIOv expansion card in the blade server.

The following illustration shows the location and installation of a CIOv expansion card.



To install a CIOv expansion card, complete the following steps:

- Step 1. Before you begin, read “Safety” on page iii and “Installation guidelines” on page 23.
- Step 2. If a CFFh expansion card is installed, remove it (see “Removing a CFFh expansion card” on page 50 for instructions).
- Step 3. Locate the CIOv expansion connector (see “Blade server connectors - BladeCenter HX5” on page 20).
- Step 4. Touch the static-protective package that contains the expansion card to any *unpainted* metal surface on the BladeCenter unit or any *unpainted* metal surface on any other grounded rack component; then, remove the expansion card from the package.
- Step 5. Orient the connector on the expansion card with the CIOv expansion connector on the system board; then, press the card into the CIOv expansion connector.
- Step 6. Firmly press on the indicated locations to seat the expansion card.

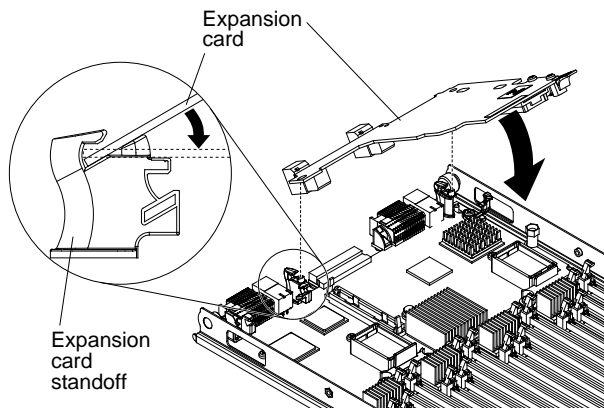
Note: For device-driver and configuration information to complete the installation of the expansion card, see the documentation that comes with the expansion card.

- Step 7. Install the CFFh expansion card, if you removed one from the blade server (see “Installing a CFFh expansion card” on page 49 for instructions).

Installing a CFFh expansion card

Use these instructions to install a compact-form-factor expansion card in the blade server.

The blade server supports a horizontal-combination-form-factor (CFFh) expansion card. The following illustration shows how to install a CFFh expansion card.



To install a CFFh expansion card, complete the following steps:

- Step 1. Before you begin, read “Safety” on page iii and “Installation guidelines” on page 23.
- Step 2. Locate the blade server expansion connector (see “Blade server connectors - BladeCenter HX5” on page 20).
- Step 3. If a cover is installed on the blade expansion connector, remove it by using your fingers to lift the cover from the blade expansion connector.
- Step 4. Touch the static-protective package that contains the expansion card to any *unpainted* metal surface on the BladeCenter unit or any *unpainted* metal surface on any other grounded rack component; then, remove the expansion card from the package.
- Step 5. Orient the expansion card and slide the slots at the back of the card onto the pins on the expansion-card standoff; then, gently pivot the card into the blade server expansion connector.
- Step 6. Firmly press on the indicated locations to seat the expansion card.

Note: For device-driver and configuration information to complete the installation of the expansion card, see the documentation that comes with the expansion card.

Removing an I/O expansion card

The following sections describe how to remove the following expansion cards:

- CFFh
- CIOv

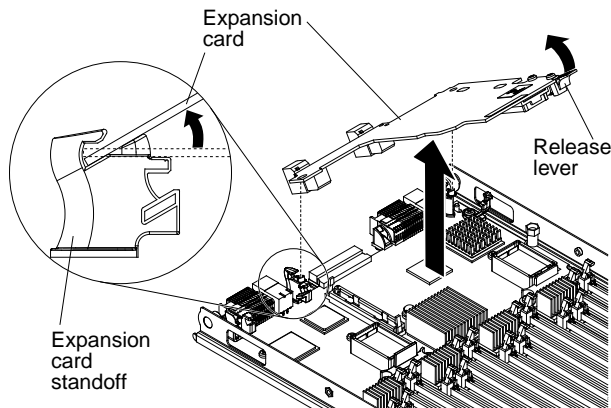
For information about removing an SSD expansion card, see “Removing an SSD expansion card” on page 38.

Removing a CFFh expansion card

Use these instructions to remove a CFFh expansion card from the blade server.

To remove a CFFh expansion card, complete the following steps:

- Step 1. Before you begin, read “Safety” on page iii and “Installation guidelines” on page 23.
- Step 2. Locate the CFFh expansion card. The CFFh card is installed in the blade expansion connector (see “Blade server connectors - BladeCenter HX5” on page 20).
- Step 3. Use your fingers to hold the edge of the CFFh expansion card where it connects to the blade expansion connector; then, lift up on the card.

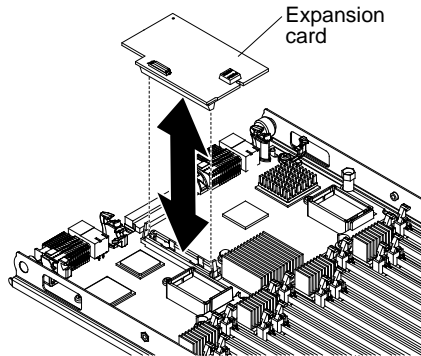


- Step 4. Lift the card away from the expansion-card standoff.

Removing a CIOv expansion card

Use these instructions to remove a CIOv expansion card from the blade server.

The following illustration shows how to remove a vertical-combination-I/O (CIOv) expansion card.



To remove a CIOv expansion card, complete the following steps:

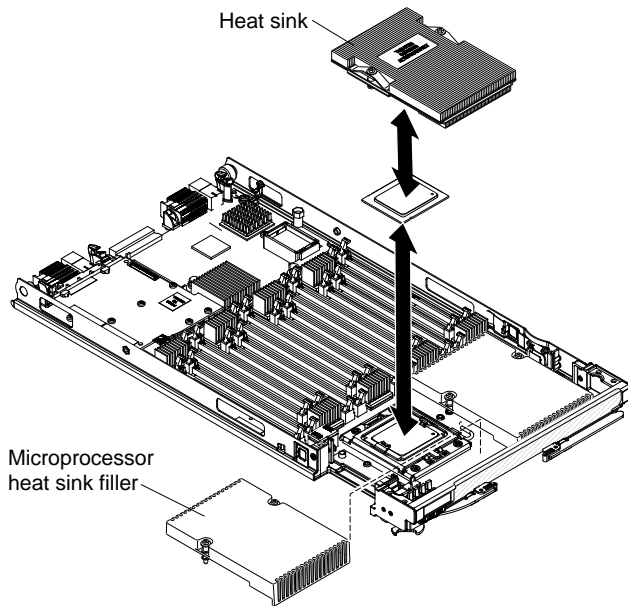
- Step 1. Before you begin, read “Safety” on page iii and “Installation guidelines” on page 23.
- Step 2. Remove the CFFh expansion card, if one is installed (see “Removing a CFFh expansion card” on page 50 for instructions).
- Step 3. Locate the CIOv expansion connector (see “Blade server connectors - BladeCenter HX5” on page 20).
- Step 4. Using your fingers, move the retaining clips away from the CIOv card; then, lift the card out of the connector.

Installing a microprocessor and heat sink

Use this information to install a microprocessor and heat sink in the blade server.

Note: The optional microprocessors that IBM supports are limited by the capacity and capability of the server. Any microprocessors that you install must have the same specifications as the microprocessors that came with the blade server.

The following illustration shows how to install a microprocessor and heat sink in the blade server.



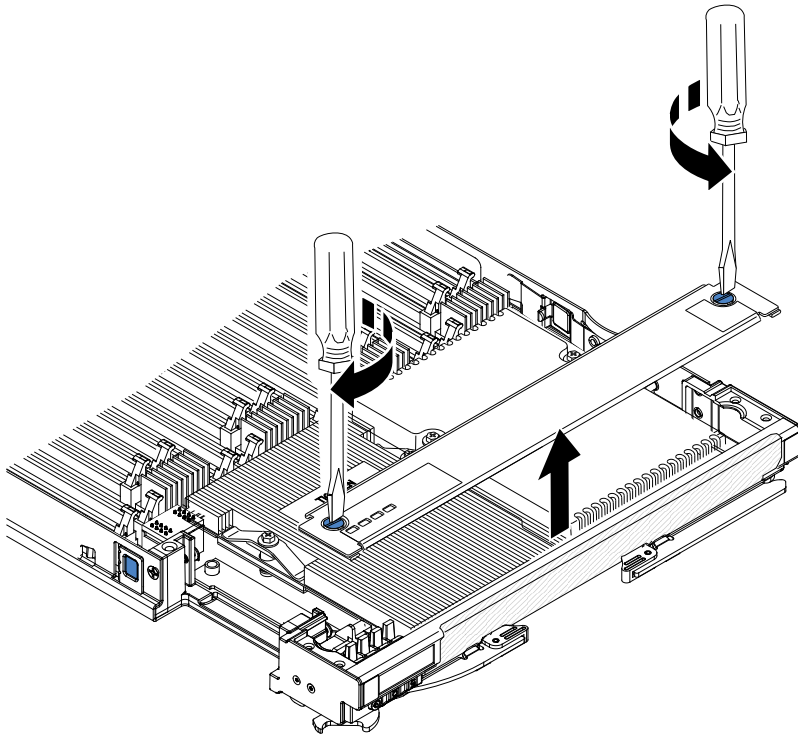
Attention:

1. Do not use any tools or sharp objects to lift the locking lever on the microprocessor socket. Doing so might result in permanent damage to the system board.
2. Do not touch the contacts in the microprocessor socket. Touching these contacts might result in permanent damage to the system board.

To install a microprocessor and heat sink, complete the following steps:

- Step 1. Before you begin, read “Safety” on page iii and “Installation guidelines” on page 23.
- Step 2. Carefully lay the blade server on a flat, static-protective surface.
- Step 3. Remove the access panel if you are installing standard heat sinks.

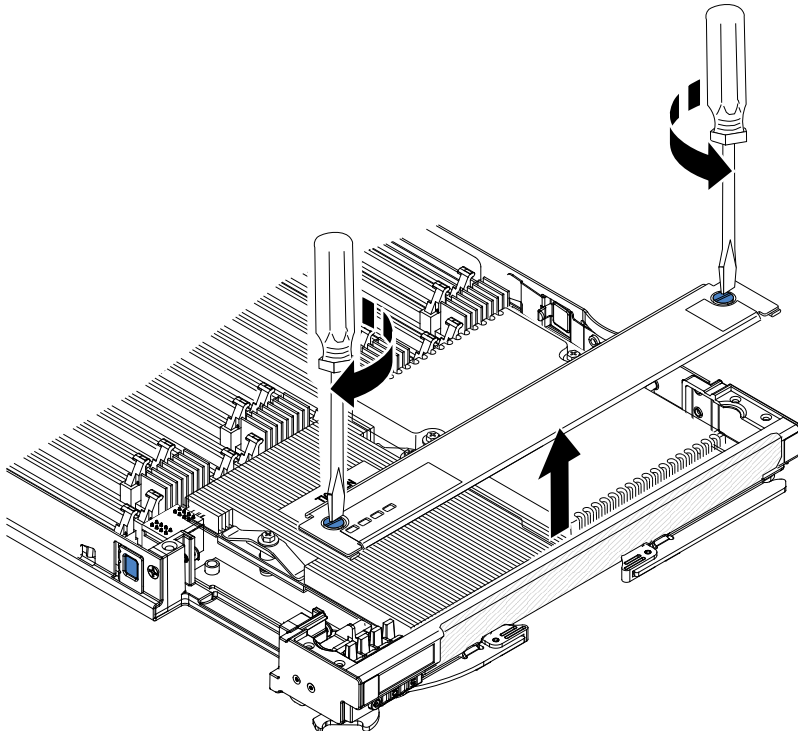
Note: If you installing tall heat sinks, you do not need to remove the access panel.



- a. Using a screwdriver or a coin, turn each of the screws toward the middle of the blade server until they are in the unlocked position.
- b. While you lift the back of the access panel, slide the panel away from the bezel.

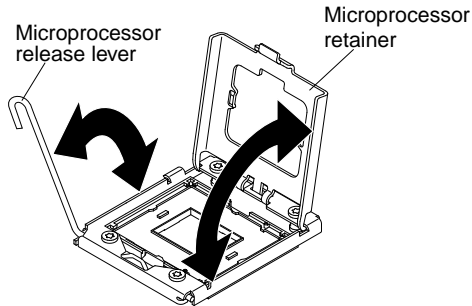
Step 4. Remove the access panel if you have the standard heat sinks installed.

Note: If you have the tall heat sinks installed, you do not need to remove the access panel.



- a. Using a screwdriver or a coin, turn each of the screws toward the middle of the blade server until they are in the unlocked position.
- b. While you lift the back of the access panel, slide the panel away from the bezel.

Step 5. Open the microprocessor socket release lever and retainer.

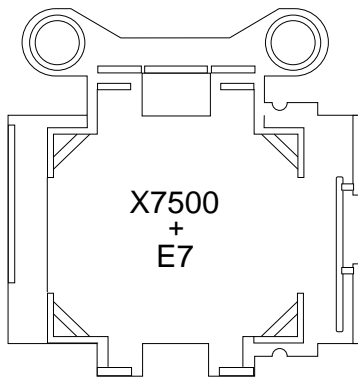


- a. Rotate the release lever on the microprocessor socket from its closed and locked position until it stops in the fully open position (approximately a 135° angle).
- b. Rotate the microprocessor retainer on the microprocessor socket from its closed position until it stops in the fully open position (approximately a 135° angle).

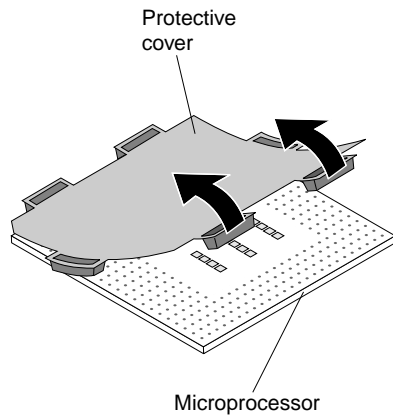
Step 6. If a dust cover is installed over the microprocessor socket, lift the dust cover from the socket and store it in a safe place.

Step 7. Install the microprocessor in the microprocessor installation tool.

Attention: If you are installing E7 series microprocessors in the blade server, you must use the microprocessor installation tool with the text “X7500 + E7” on the bottom of the tool (see the following illustration). Tools that do not have this text on the bottom will not work correctly with the E7 series microprocessors.

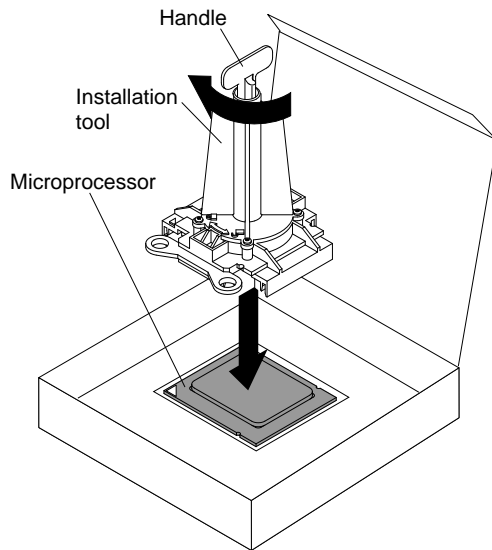


- a. Remove the static-protective bag and the foam surrounding the bag from the box.
- b. Touch the static-protective bag that contains the new microprocessor to any *unpainted* surface on the BladeCenter chassis or any *unpainted* metal surface on any other grounded rack component.
- c. Carefully remove the microprocessor from the static-protective bag, touching only the edges of the microprocessor.
- d. If there is a plastic protective cover on the bottom of the microprocessor, carefully remove it.



- e. Put the microprocessor back in the box, component side down, on the solid piece of foam.
- f. Twist the handle of the installation tool counterclockwise so that it is in the open position.
- g. Using the triangle on the microprocessor to align it with the installation tool, place the microprocessor on the underside of the tool.
- h. Twist the handle of the installation tool clockwise to secure the microprocessor in the tool.

Note: You can pick up or release the microprocessor by twisting the microprocessor installation tool handle.



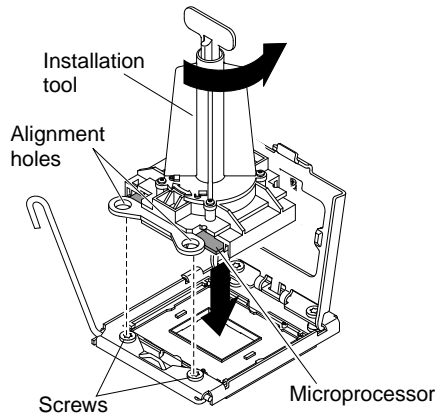
Step 8. Carefully place the microprocessor into the microprocessor socket, using the alignment tabs on the microprocessor with the alignment notches in the microprocessor socket as a guide.

The alignment holes on the tool will not sit flush on the microprocessor bracket screws. However, the holes can be used as a guide to ensure the proper alignment between the microprocessor installation tool and the microprocessor bracket.

Attention:

- Do not press the microprocessor into the socket.
- Do not touch exposed pins of the microprocessor socket.
- Make sure that the microprocessor is oriented and aligned correctly in the socket before you try to close the microprocessor retainer.

- Do not touch the thermal material on the bottom of the heat sink or on top of the microprocessor. Touching the thermal material will contaminate it. If the thermal material on the microprocessor or heat sink becomes contaminated, contact your service technician.



Step 9. Carefully close the microprocessor retainer.

Step 10. Rotate the locking lever on the microprocessor socket to the closed and locked position. Make sure that the lever is secured in the locked position by pressing the tab on the microprocessor socket.

Step 11. If you are reinstalling a heat sink that was removed from the blade server, complete the following steps:

Attention:

- Do not touch the thermal material on the bottom of the heat sink. Touching the thermal material will contaminate it. If the thermal material on the microprocessor or heat sink becomes contaminated, contact your service technician.
- Do not touch exposed pins of the microprocessor socket.
 - a. Make sure that the thermal material is still on the bottom of the heat sink and on the top of the microprocessor.
 - b. Align and place the heat sink on top of the microprocessor in the retention bracket, thermal material side down. Press firmly on the heat sink.
 - c. Align the three screws on the heat sink with the holes on the heat-sink retention module.
 - d. Press firmly on the captive screws and tighten them with a screwdriver, alternating among the screws until they are tight. If possible, each screw should be rotated two full rotations at a time. Repeat until the screws are tight. Do not overtighten the screws by using excessive force. If you are using a torque wrench, tighten the screws to 1.13 ± 0.13 Newton-meters (Nm) (10 ± 0.15 in-lbs).

Step 12. If you are installing a new heat sink, complete the following steps:

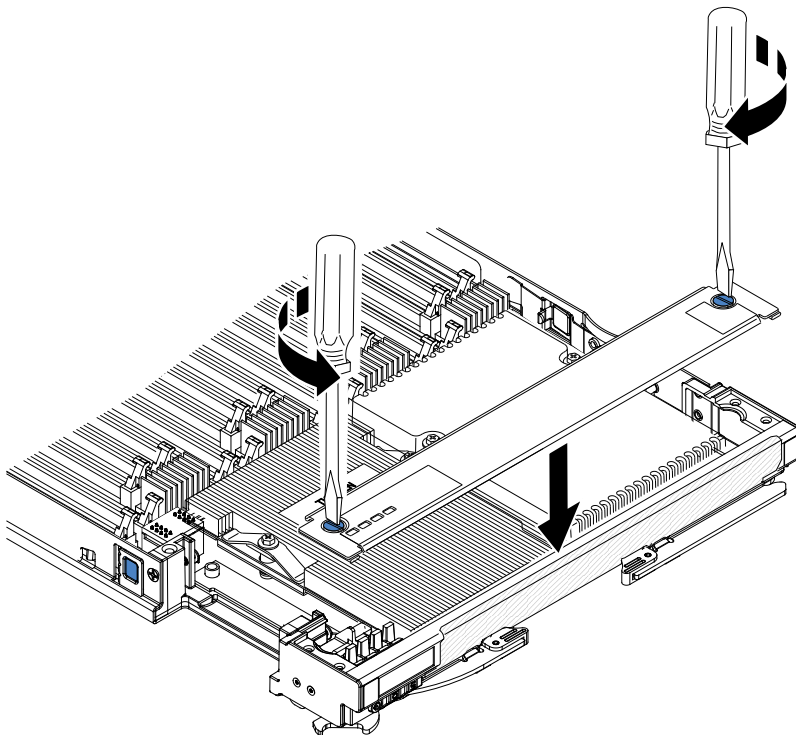
Attention:

- Do not set down the heat sink after you remove the plastic cover.
- Do not touch the thermal material on the bottom of the heat sink. Touching the thermal material will contaminate it. If the thermal material on the microprocessor or heat sink becomes contaminated, contact your service technician.
- Do not touch exposed pins of the microprocessor socket.
 - a. Remove the plastic protective cover from the bottom of the heat sink.

- b. Align and place the heat sink on top of the microprocessor in the retention bracket, thermal material side down. Press firmly on the heat sink.
- c. Align the screws on the heat sink with the holes on the heat-sink retention module.
- d. Press firmly on the captive screws and tighten them with a screwdriver, alternating among the screws until they are tight. If possible, each screw should be rotated two full rotations at a time. Repeat until the screws are tight. Do not overtighten the screws by using excessive force. If you are using a torque wrench, tighten the screws to 1.13 ± 0.13 Newton-meters (Nm) (10 ± 0.15 in-lbs).

Step 13. Make sure that, at a minimum, memory modules are installed in DIMM connectors 1 and 4. See “Installing a DIMM - BladeCenter HX5” on page 40 for more information on installing a memory module.

Step 14. Install the access panel if you removed it earlier.

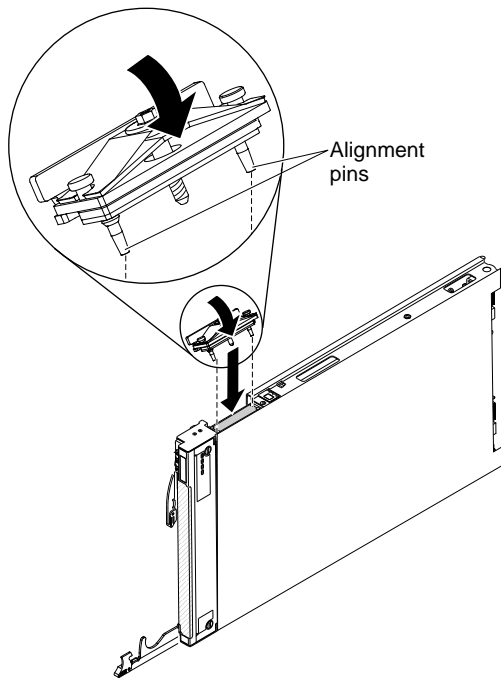


- a. Make sure that the screws on the access panel are in the open position (the screw insert is parallel to the side of the access panel).
- b. Slide the back of the cover under the blade server bezel, aligning the screws with the slots on the blade server.
- c. Using a screwdriver or a coin, turn each of the screws away from the middle of the blade server until it is in the locked position.

Installing the 1-node speed burst card

Use this information to install a 1-node speed burst card in a blade server.

To install a 1-node speed burst card, complete the following steps:



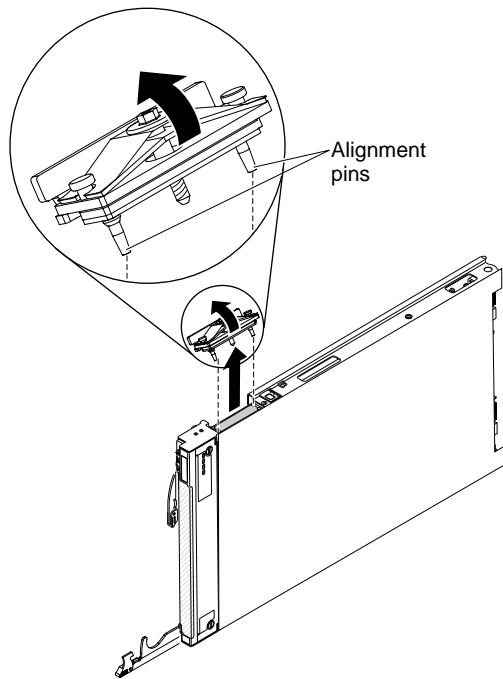
- Step 1. Before you begin, read “Safety” on page iii and “Installation guidelines” on page 23.
- Step 2. Stand the blade server upright on a clean, flat work surface, with the scalability filler connector facing up.
- Step 3. Open the lower handle (rotate the lower handles down) to allow the blade server to sit flat on the work surface.
- Step 4. Remove the scalability filler from the blade server or 2-node scalability card (see “Installing the 2-node scalability card” on page 62). To remove the scalability filler, complete the following steps:
- Using the 3/16" hex driver that is provided with the 1-node speed burst card, loosen the nut that attaches the filler to the blade server.
 - Lift the filler off the blade server.
- Step 5. Align the pins on the bottom of the 1-node speed burst card with the holes on the scalability connector on the blade server.
- Step 6. Press down firmly so that the 1-node speed burst card is flush with the scalability connector on the blade server.
- Step 7. Tighten the screw on the filler by hand to ensure that the screw threads start properly.
- Important:** Always hand tighten the screw before using the 3/16" hex driver.
- Step 8. Using the 3/16" hex driver, tighten the nut that attaches the 1-node speed burst card to the blade server.

Note: If you are using a torque driver, the correct torque is 15 in-lb.

Removing the 1-node speed burst card

Use this information to remove the 1-node speed burst card from a blade server.

To remove the 1-node speed burst card, complete the following steps.



- Step 1. Before you begin, read “Safety” on page iii and “Installation guidelines” on page 23.
- Step 2. Stand the blade server upright on a clean, flat work surface, with the scalability connector facing up.
- Step 3. Open the lower handle (rotate the lower handles down) to allow the blade server to sit flat on the work surface.
- Step 4. Using the 3/16" hex driver that comes with the 1-node speed burst card, loosen the nut that attaches the 1-node speed burst card to the blade server.
- Step 5. Lift the 1-node speed burst card off the blade server.

Completing the installation

To complete the installation, complete the following tasks.

- Step 1. Assemble the scalable blade complex if necessary (see “Assembling a scalable blade complex” on page 60).
- Step 2. Install the IBM MAX5 expansion blade if necessary (see “Installing an IBM MAX5” on page 63).
- Step 3. Close the blade server cover (see “Installing the blade server cover” on page 69).

Statement 21



CAUTION:

Hazardous energy is present when the blade server is connected to the power source. Always replace the blade server cover before installing the blade server.

- Step 4. Reinstall the blade server into the BladeCenter chassis (see “Installing a blade server in a BladeCenter chassis” on page 70).

- Step 5. Turn on the blade server (see “Turning on the blade server” on page 15). If you have just connected the power cords of the BladeCenter chassis to electrical outlets, you must wait until the power LED on the blade server flashes slowly before you press the power button.
- Step 6. For certain optional devices, you might have to run the blade server Setup utility to configure the blade server (see Chapter 4 “Configuring the blade server” on page 73). See the documentation that comes with your optional device for additional information.

Assembling a scalable blade complex

Use this information to assemble a scalable blade complex.

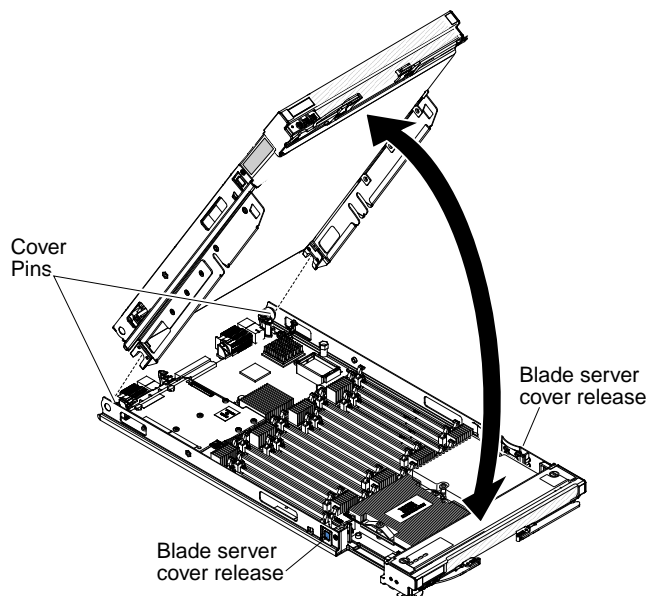
To assemble a scalable blade complex, you will need the following parts:

- Two BladeCenter HX5 blade servers
- 2-node scalability kit, which includes the 2-node scalability card, the scalability tray, and the 3/16" hex driver.

To assemble a scalable blade complex, complete the following steps.

Note: Make sure that you installed a hypervisor key in the primary blade server, if required, to use the scalable blade complex as a single hardware partition in a virtualized environment. To determine whether you need to install a hypervisor key, see the documentation that comes with your virtualization software. For more information about virtualization, see <http://www.ibm.com/itsolutions/virtualization/>.

- Step 1. Before you begin, read “Safety” on page iii and “Installation guidelines” on page 23.
- Step 2. Install the scalability tray in the topmost blade server (see “Installing the scalability tray” on page 61 for instructions).
- Step 3. Attach the blade server with the scalability tray to the bottom blade server.



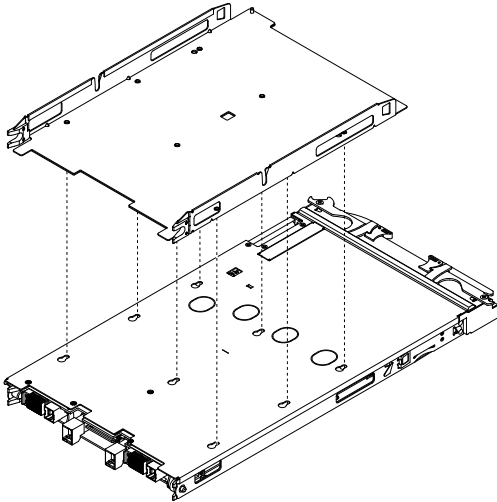
- a. Lower the topmost blade server so that the slots at the rear slide down onto the pins at the rear of the bottom blade server, as shown in the illustration.
 - b. Pivot the topmost blade server to the closed position, as shown in the illustration, until it clicks into place.
- Step 4. Install the 2-node scalability card (see “Installing the 2-node scalability card” on page 62).

Installing the scalability tray

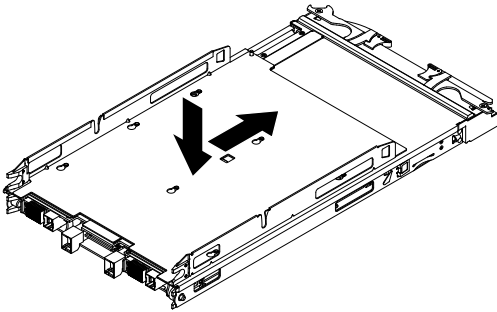
Use this information to install the scalability tray on a blade server.

To install the scalability tray, complete the following steps:

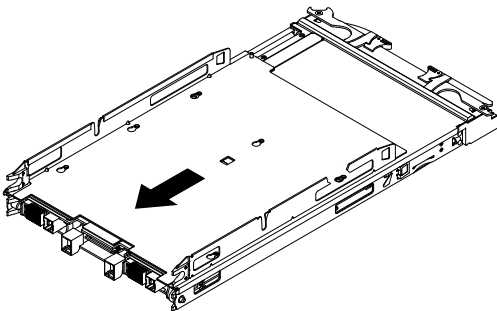
- Step 1. Before you begin, read “Safety” on page iii and “Installation guidelines” on page 23.
- Step 2. Carefully lay the blade server on a flat, static-protective surface, with the cover side down.
- Step 3. Align the scalability tray flush with the blade server in the start position. The pins on the scalability tray should be aligned with the holes in the blade server.



- Step 4. Pressing down firmly on the middle of the tray, slide the scalability tray forward toward the bezel until there is an audible click each side of the blade server.



- Step 5. Attempt to pull the scalability tray back to ensure that the scalability tray is firmly seated.
- Step 6. Look in the holes on each side of the blade server to ensure that the spring plates are engaged.

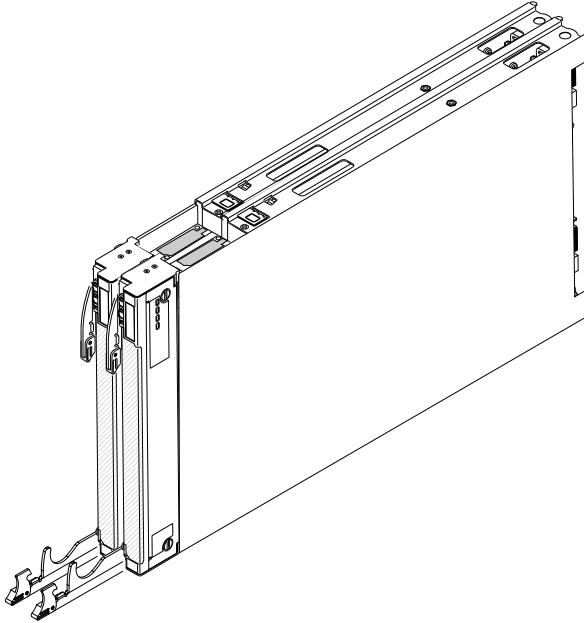


Installing the 2-node scalability card

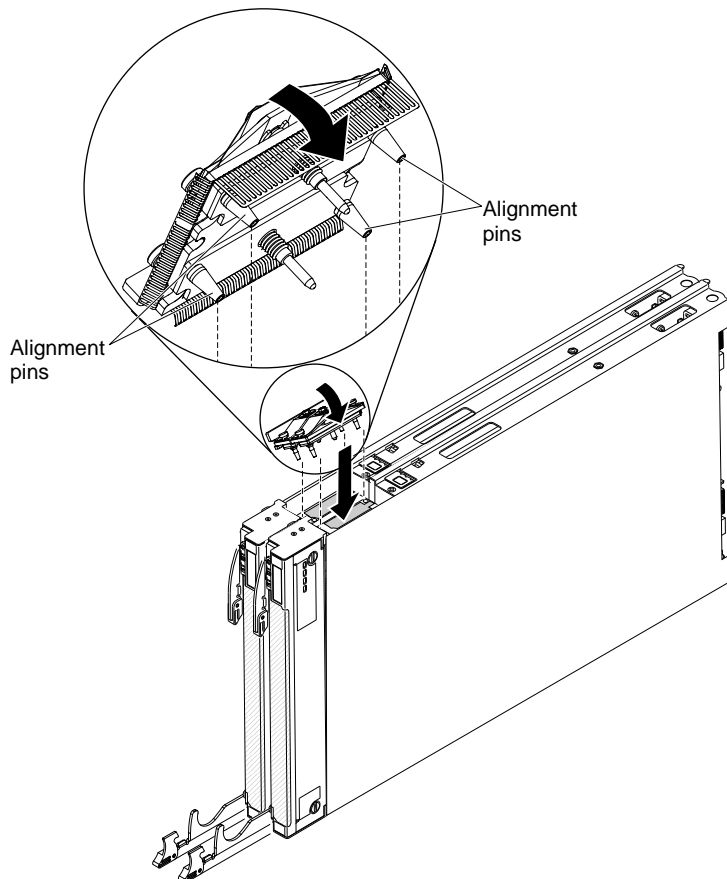
Use this information to install the 2-node scalability card on a blade server.

To install the 2-node scalability card, complete the following steps:

- Step 1. Before you begin, read “Safety” on page iii and “Installation guidelines” on page 23.
- Step 2. Stand the blade servers upright on a clean, flat work surface, with the scalability connector on the blade servers facing up.
- Step 3. Release the lower handles (rotate the lower handles down) to allow the blade servers to sit flat on the work surface.



- Step 4. Align the pins on the bottom of the IBM 2-node scalability card with the holes on the scalability connector on the blade server.
- Step 5. Press down firmly so that the 2-node scalability card is flush with the scalability connector on the blade server.



Step 6. Make sure that the 2-node scalability card is flush with the edge of the blade server.

Step 7. Alternately tighten the screws on the 2-node scalability card by hand to ensure that the screw threads start properly.

Important: Always hand tighten each screw before you use the 3/16" hex driver.

Step 8. Alternately tighten each screw on the 2-node scalability card using the 3/16" hex driver. Alternate the tightening of each screw until both screws are tightened.

Note: If you are using a torque driver, the correct torque is 15 in-lb.

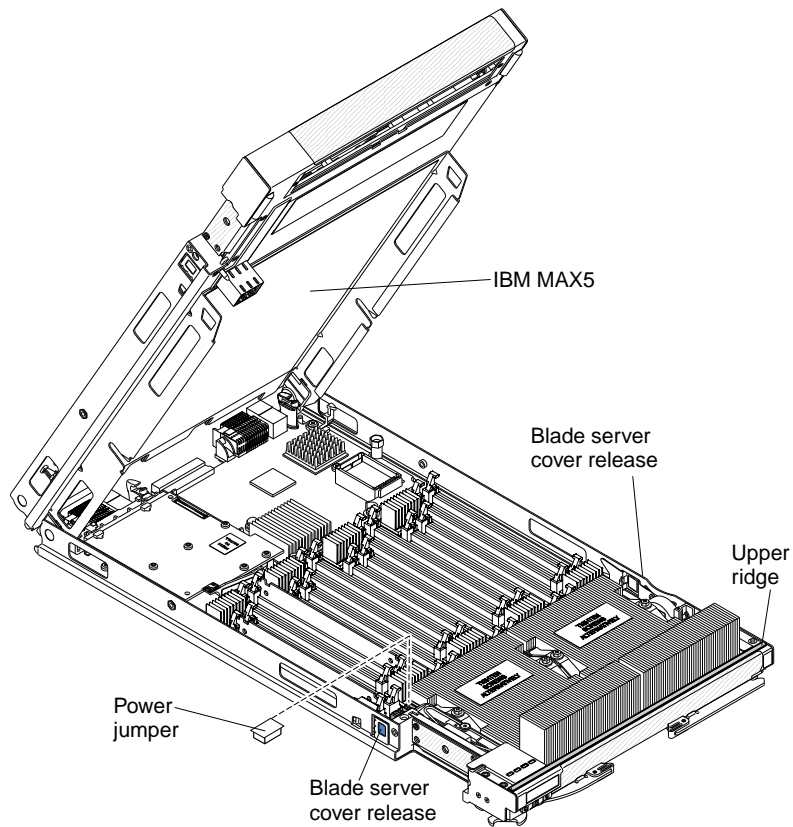
Installing an IBM MAX5

Use these instructions to install an IBM MAX5.

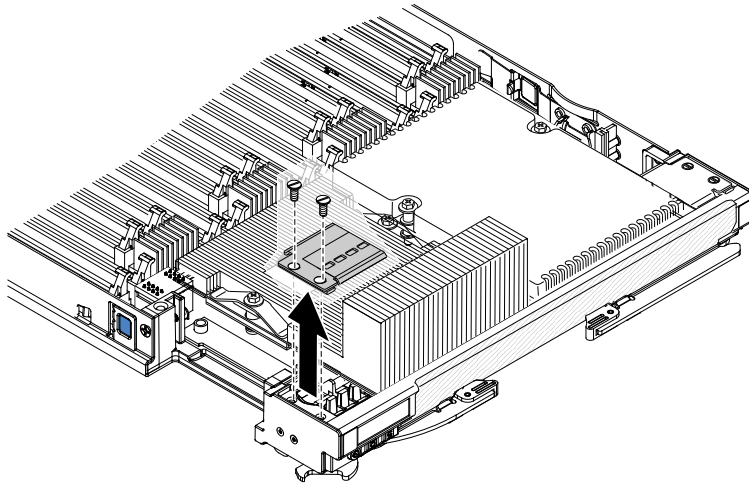
Note: Before installing the IBM MAX5 expansion blade, make sure that you have updated the firmware on the BladeCenter HX5 blade server to the latest level. If you attach and try to use the IBM MAX5 expansion blade without updating the server firmware, you might get unexpected system behavior or the server might not power on. For information about updating the firmware on the BladeCenter HX5 blade server, see “Updating firmware and device drivers” on page 84.

There are two versions of the IBM MAX5 expansion blade, referred to as the IBM MAX5 version 1 and IBM MAX5 version 2 in this document. IBM MAX5 version 2 has a "MAX5" identifying label on the bottom of the front bezel. The functionality of the two IBM MAX5 expansion blades are equivalent except for the type of DIMMs supported. The type of DIMMs supported will differ, depending on the version of IBM MAX5 expansion blade installed. For the list of DIMMs available for your IBM MAX5 expansion blade, see the *Problem Determination and Service Guide* or go to <http://www.ibm.com/supportportal/> for an updated parts listing.

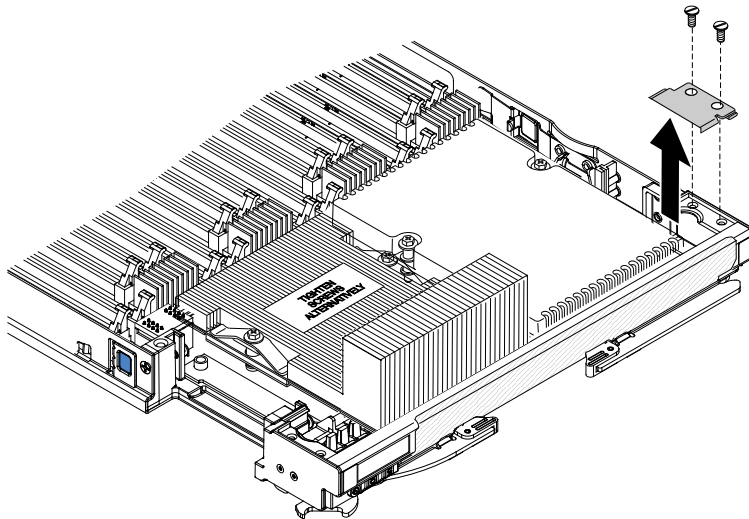
To install an IBM MAX5 expansion blade, complete the following steps.



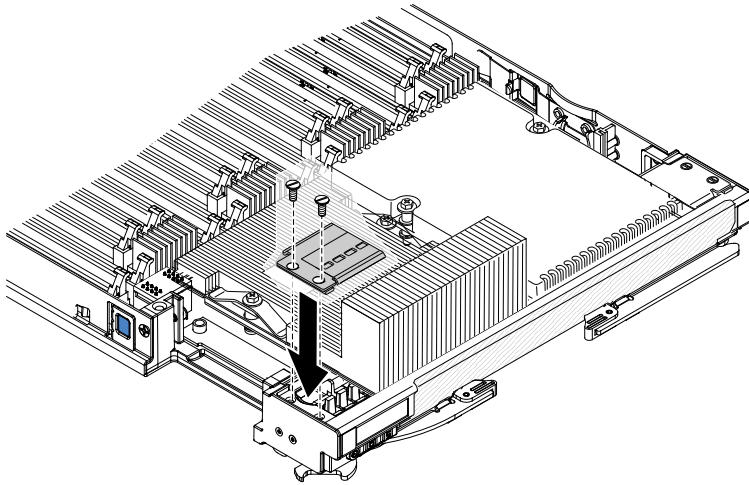
- Step 1. Before you begin, read “Safety” on page iii and “Installation guidelines” on page 23.
- Step 2. Remove the cover on the BladeCenter HX5 blade server if one is installed (see “Removing the blade server cover” on page 25 for instructions).
- Step 3. Locate the power sharing connector on the BladeCenter HX5 blade server and remove the power sharing cover if one is installed (see “Blade server connectors - BladeCenter HX5” on page 20).
- Step 4. There are two types of access panels available on the BladeCenter HX5 blade server, depending on whether tall heat sinks are installed in the blade server. Complete the following steps if you are installing an IBM MAX5 expansion blade on a BladeCenter HX5 blade server that has tall heat sinks:
 1. Remove the operator control panel access panel:



- a. Using a screwdriver, remove each of the screws on the right access panel.
 - b. Lift the access panel away from the blade server.
2. Remove the embedded hypervisor card access panel:

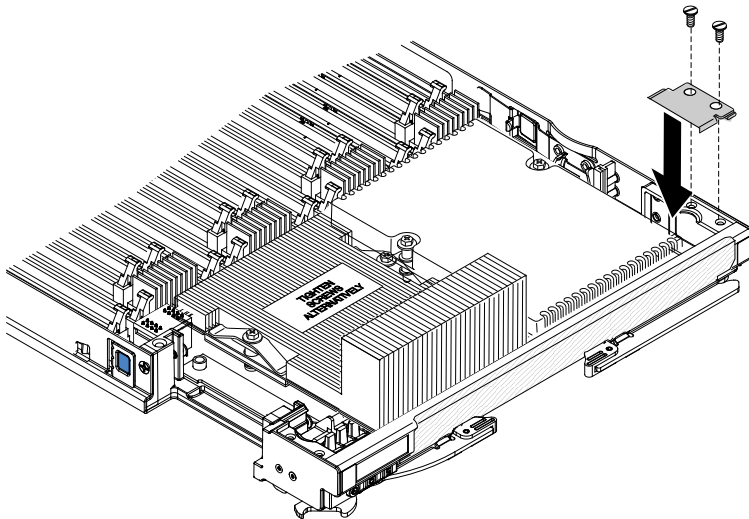


- a. Using a screwdriver, remove each of the screws on the right access panel.
 - b. Lift the access panel away from the blade server.
3. Install the EMC gasket on the upper ridge of the BladeCenter HX5 blade server bezel.
4. Install the operator control panel access panel:



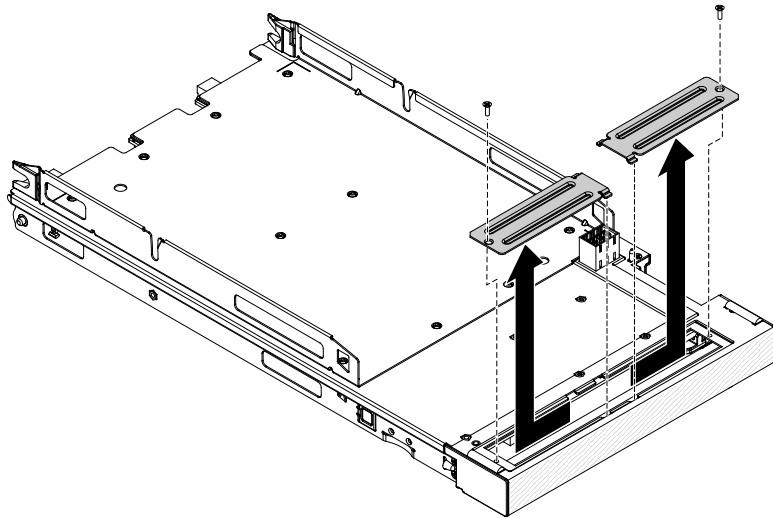
- a. Align the holes in the access panel with the holes in the blade server.
- b. Use a screwdriver to install the screws in the holes of the access panel.

5. Install the embedded hypervisor key access panel:



- a. Align the holes in the access panel with the holes in the blade server.
- b. Use a screwdriver to install the screws in the holes of the access panel.

6. Remove the heat sink access plates on the IBM MAX5 expansion blade.



- a. Lay the IBM MAX5 expansion blade on a flat, static-protective surface, cover side down.
- b. Use a screwdriver to remove both heat sink access plates.

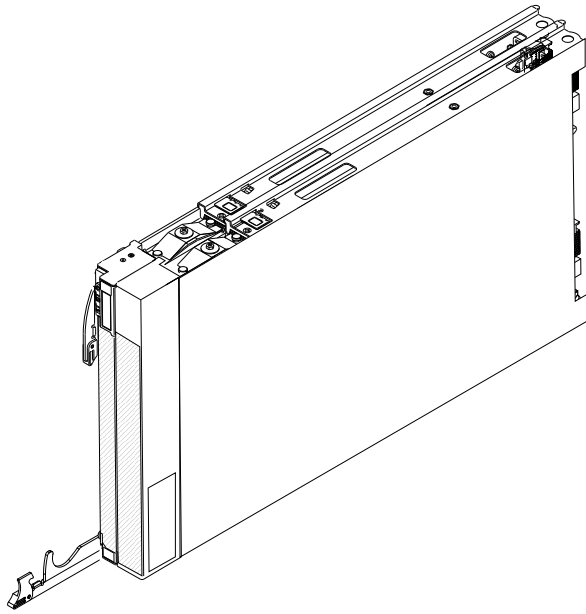
- Step 5. Touch the static-protective package that contains the IBM MAX5 to any *unpainted* metal surface on the BladeCenter unit or any *unpainted* metal surface on any other grounded rack component; then, remove the optional expansion unit from the package.
- Step 6. Orient the IBM MAX5 as shown in the illustration.
- Step 7. Lower the IBM MAX5 so that the slots at the rear slide down onto the cover pins at the rear of the blade server; then, pivot the IBM MAX5 down onto the blade server.
- Step 8. Press the IBM MAX5 firmly into the closed position until it clicks into place.
- Step 9. Install the IBM MAX5 1-node scalability card (see “Installing the IBM MAX5 1-node Scalability card” on page 67 for instructions).

Installing the IBM MAX5 1-node Scalability card

Use this information to install the IBM MAX5 1-node scalability card on a blade server.

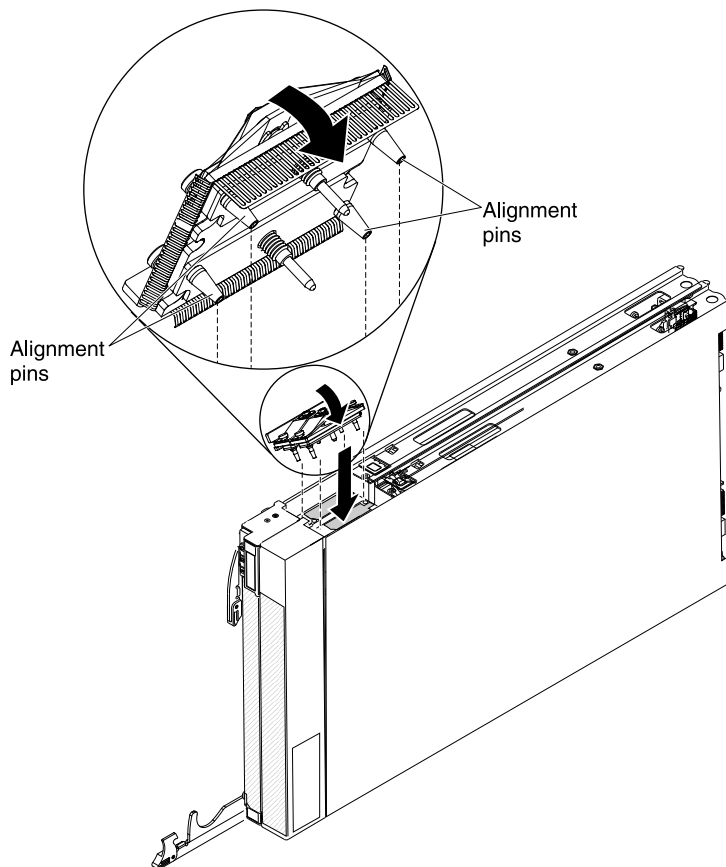
To install the IBM MAX5 1-node scalability card, complete the following steps.

- Step 1. Before you begin, read “Safety” on page iii and “Installation guidelines” on page 23.
- Step 2. Remove the 1-node Speed Burst card (see “Installing the 1-node speed burst card” on page 57) or scalability filler from the blade server, depending on which you have installed. To remove the scalability filler, complete the following steps:
 - a. Using the socket nut driver provided with the scalability kit, loosen the nut that attaches the filler to the blade server.
 - b. Lift the filler off of the blade server.
- Step 3. Install the IBM MAX5 expansion blade (see “Installing an IBM MAX5” on page 63).
- Step 4. Remove the cover for the expansion blade (see “Removing the blade server cover” on page 25 for instructions).
- Step 5. Stand the blade server and expansion blade upright on a clean, flat work surface, with the scalability connector on the blade servers facing up.
- Step 6. Open the lower handles (rotate the lower handles down) to allow the blade server and expansion blade to sit flat on the work surface.



Step 7. Align the pins on the bottom of the IBM MAX5 1-node scalability card with the holes on the scalability connector on the blade server.

Step 8. Press down firmly so that the 1-node scalability card is flush with the scalability connector on the blade server.



Step 9. Make sure that the 1-node scalability card is flush with the edge of the blade server.

Step 10. Alternately tighten the screws on the 1-node scalability card by hand to ensure that the screw threads start properly.

Important: Always hand tighten each screw before you use the 3/16" hex driver.

Installing the blade server cover

Use these instructions to install and close the cover for a blade server or for the topmost blade server in a scalable blade complex.

Attention: You cannot insert the blade server into the BladeCenter chassis until the cover is installed and closed. Do not attempt to override this protection.

Statement 21

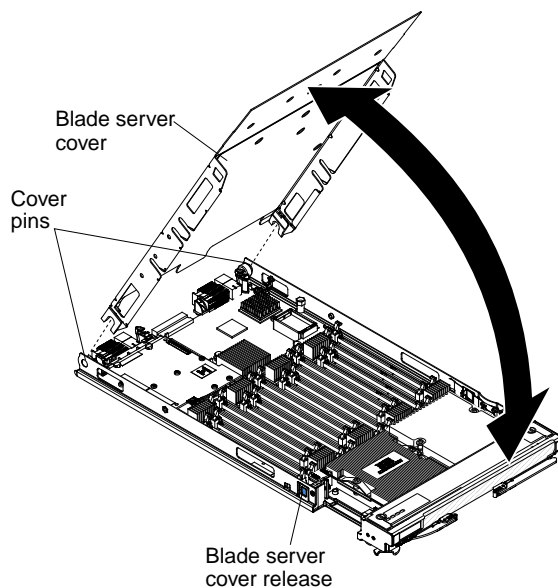


CAUTION:

Hazardous energy is present when the blade server is connected to the power source. Always replace the blade cover before installing the blade server.

To install and close the blade server cover, complete the following steps:

- Step 1. Before you begin, read “Safety” on page iii and “Installation guidelines” on page 23.
- Step 2. Carefully lay the blade server on a flat, static-protective surface, orienting the blade server with the bezel pointing toward you.
- Step 3. Lower the cover so that the slots at the rear slide down onto the pins at the rear of the blade server, as shown in the illustration. Before you close the cover, make sure that all components are installed and seated correctly and that you have not left loose tools or parts inside the blade server.

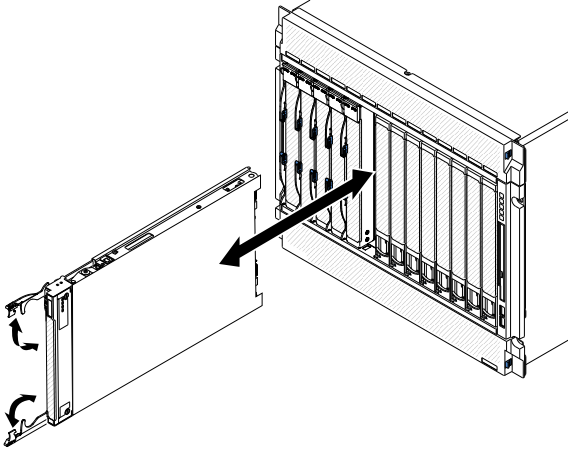


- Step 4. Pivot the cover to the closed position, as shown in the illustration, until it clicks into place.

Installing a blade server in a BladeCenter chassis

Use these instructions to install a BladeCenter HX5 blade server in a BladeCenter chassis.

The following illustration shows how to install a BladeCenter HX5 blade server into a BladeCenter chassis. See the documentation for your BladeCenter chassis for additional information.



Statement 21



CAUTION:

Hazardous energy is present when the blade server is connected to the power source. Always replace the blade cover before installing the blade server.

To install a BladeCenter HX5 blade server, complete the following steps.

- Step 1. Before you begin, read “Safety” on page iii and “Installation guidelines” on page 23.
- Step 2. Select the blade server bay for the blade server; at least one blade server bay is required.

Notes:

1. For BladeCenter chassis that support up to 14 blade servers, when any blade server or device is in blade server bay 7 through 14, power modules must be installed in all four power-module bays. For additional information, see the *Installation and User's Guide* for your chassis.
 2. If you are reinstalling a blade server that you removed, you must install it in the same blade server bay from which you removed it. Some blade server configuration information and update options are established according to blade server bay number. Reinstalling a blade server into a different blade server bay from the one it was removed from can have unintended consequences. If you reinstall the blade server into a different bay, you might need to reconfigure the blade server.
 3. To maintain proper system cooling, do not operate the BladeCenter chassis without a blade server, expansion unit, or filler module installed in each blade server bay.
- Step 3. Make sure that the release handles on the blade server are in the open position (perpendicular to the blade server).
 - Step 4. Slide the blade server into the blade server bay until it stops.

Step 5. Push the release handles on the front of the blade server to the closed position.

Note: After the blade server is installed, the IMM in the blade server initializes and synchronizes with the advanced management module. This process takes approximately 90 seconds to complete. The power LED flashes rapidly, and the power-control button on the blade server does not respond until this process is complete.

Step 6. Turn on the blade server (see “Turning on the blade server” on page 15 for instructions).

Step 7. Make sure that the power LED on the blade server control panel is lit continuously, indicating that the blade server is receiving power and is turned on.

Step 8. If you have other blade servers to install, do so now.

Step 9. Write identifying information about one of the labels that come with the blade servers and place the label on the BladeCenter chassis bezel. See the documentation for your BladeCenter chassis for information about the label placement.

Important: Do not place the label on the blade server or in any way block the ventilation holes on the blade server.

If this is the initial installation of the blade server in the BladeCenter chassis, you must configure the blade server through the Setup utility and install the blade server operating system. See “Updating the blade server configuration” on page 71 and Chapter 5 “Installing the operating system” on page 105 for details.

If you have changed the configuration of the blade server or if you are installing a different blade server from the one that you removed, you must configure the blade server through the Setup utility, and you might have to install the blade server operating system. For more information, see the “Using the Setup utility” on page 74.

Updating the blade server configuration

Use this information to update the blade server configuration.

When the blade server starts for the first time after you add or remove an internal device, you might receive a message that the configuration has changed. The Setup utility automatically starts so that you can save the new configuration settings. See “Using the Setup utility” on page 74 for more information about the Setup utility.

Some devices have device drivers that you must install. See the documentation that comes with each device for information about installing device drivers.

The blade server operates as a symmetric multiprocessing (SMP) server, regardless of how many microprocessors are installed. For optimum performance, you must upgrade the operating system to support SMP. See Chapter 5 “Installing the operating system” on page 105 and your operating-system documentation for additional information.

Chapter 4. Configuring the blade server

There are several components on the blade server that you can configure and several methods for configuring those components.

Note: If you intend to use a scalable blade complex in single partition mode, you must partition the complex before you turn on the blade servers or begin the configuration process. See “Partitioning a scalable blade complex” on page 74 for information.

Typically, you complete the following steps to configure the blade server:

Step 1. Configure the Unified Extensible Firmware Interface (UEFI) firmware for the blade server. You can configure the UEFI firmware by using the Setup utility or the Advanced Settings Utility (ASU). For more information about the Setup utility, see “Using the Setup utility” on page 74. For more information about ASU, see “Using the Advanced Settings Utility (ASU)” on page 79.

Note: For more information about firmware configuration options, see *Introducing UEFI-Compliant Firmware on IBM System x and BladeCenter Servers* at <http://www.ibm.com/systems/support/supportsite.wss/docdisplay?Indocid=MIGR-5083207&brandind=5000008>.

Step 2. Set the boot protocol. To set the boot protocol, use either the Setup Utility or the Preboot Execution Environment (PXE) boot agent utility program. For more information about the PXE boot agent utility program, see “Using the PXE boot agent utility program” on page 78.

Note: You can temporarily redefine the boot order by using the Boot menu program that is provided with the blade server firmware

Step 3. Configure the RAID array.

You can install up to two solid state drives in the blade server and implement RAID level-0 (striping) or RAID level-1 (mirror) arrays in operating systems that are listed on the ServerProven list at <http://www.ibm.com/servers/eserver/serverproven/compat/us/>. For the blade server, you must configure the RAID by using the LSI Configuration Utility program.

Note: If you are implementing a scalable blade complex in single partition mode, you cannot combine the SSD in both the primary and the secondary server to define a RAID array. RAID arrays can be defined using only the SSDs within a blade server.

If an optional RAID expansion card is installed, you can use it to control all the storage drives that are installed in the blade server. See the documentation that comes with the expansion card for information about how to configure the RAID array.

Important: You must create the RAID array *before* you install the operating system on the blade server.

Step 4. Configure the integrated management module (IMM). To configure the IMM, use either the Setup utility or the Advanced Settings Utility (ASU).

Step 5. Update the blade server firmware. For more information about updating blade server firmware, see “Updating firmware and device drivers” on page 84. If you are performing inband updates to firmware on blade servers operating as a single partition in a scalable blade complex, see “Updating firmware for blade servers operating as a single partition” on page 85. If you are updating firmware for blade servers that are operating as independent partitions in a scalable blade complex or you are performing out-of-band updates to firmware for blade servers in a scalable blade complex, see “Updating firmware for each blade server independently” on page 85.

- Step 6. Use IBM FastSetup. IBM FastSetup is a no-cost software tool that helps simplify the maintenance and deployment of selected IBM BladeCenter chassis, servers, and components. The intuitive graphical interface initializes all phases of server setup, including discovery, update, and configuration. Features include templates that enable replication of settings to many servers and automation that reduces hands-on time and user errors. Wizards and other default settings enable customization capabilities. The low-touch, set-once and walk-away feature reduces the hands-on server setup time from days to minutes, particularly for larger deployments. For information about this tool, see <http://www.ibm.com/support/entry/portal/docdisplay?brand=5000008&Indocid=TOOL-FASTSET>.

After you configure the blade server, you can install the operating system and update device drivers (see Chapter 5 “Installing the operating system” on page 105 for more information).

Partitioning a scalable blade complex

Before you configure the blade servers that are part of a scalable blade complex operating in single partition mode, you must partition the scalable blade complex.

For more information about scalable blade complexes and operating modes, see “Working with a scalable blade complex” on page 12.

To partition a scalable blade complex, complete the following steps:

- Step 1. From the advanced management module web interface, click **Scalable Complex → Configuration**.
- Step 2. Select one or more of the blade servers that are part of the complex.
- Step 3. Click **Available actions → Create partition**.

Using the Setup utility

Use these instructions to start the Setup utility.

To start the Setup utility, complete the following steps:

- Step 1. Turn on the blade server (see “Turning on the blade server” on page 15).
- Step 2. Immediately give the blade server control of the BladeCenter unit shared keyboard, video, and mouse ports.
 - If you are managing the blade server by using the BladeCenter system console, press the KVM select button on the blade server (see “Blade server controls and LEDs” on page 16 for information).
 - If you are managing the blade server from a remote location, see the *IBM BladeCenter Advanced Management Module: User's Guide*, *IBM BladeCenter Advanced Management Module: Command-Line Interface Reference Guide*, or *Serial over LAN Setup Guide for IBM BladeCenter* for information and instructions.
- Step 3. When the prompt Press <F1> Setup is displayed, press F1. If you have set an administrator password, you must type the administrator password to access the full Setup utility menu. If you do not type the administrator password, a limited Setup utility menu is available.
- Step 4. Follow the instructions on the screen.

The following menu items are on the Setup utility main menu. Depending on the version of the Unified Extensible Firmware Interface (UEFI), some menu items might differ slightly from these descriptions.

- **System Information**

Select this choice to view information about the server. When you make changes through other choices in the Setup utility, some of those changes are reflected in the system information; you cannot change settings directly in the system information. This choice is on the full Setup utility menu only.

- **System Summary**

Select this choice to view configuration information, including the ID, speed, and cache size of the microprocessors, machine type and model of the server, the serial number, the system UUID, and the details about the memory that is installed in the BladeCenter HX5 blade server and the IBM MAX5 expansion blade.

- **Product Data**

Select this choice to view the system board identifier, the revision level or issue date of the firmware, the integrated management module and diagnostics code, and the version and date.

This choice is on the full UEFI Setup Utility menu only.

- **System Settings**

Select this choice to view or change the server component settings.

- **Adapters and UEFI Drivers**

Select this choice to view information about the adapters and UEFI drivers installed in the server.

Note: Before you configure a UEFI-compatible device, you should update the firmware for your blade server. See “Updating firmware and device drivers” on page 84 for information about how to update the firmware for your blade server.

To configure a UEFI-compatible expansion card, complete the following steps:

1. Select **Please refresh this page first** and press Enter.
2. Select the device driver that you want to configure and press Enter.
3. When you have finished changing settings, press Esc to exit from the program; select **Save** to save the settings that you have changed.

- **Processors**

Select this choice to view or change the processor settings.

- **Memory**

Select this choice to view or change the memory settings related to the BladeCenter HX5 blade server and the MAX5 expansion blade.

Note: Select the **Memory Scaling Affinity** setting to specify whether the memory in the MAX5 expansion blade is distributed to each processor domain (non-pooled) or set up as a separate memory domain (pooled).

- **Devices and I/O Ports**

Select this choice to view or change assignments for devices and input/output (I/O) ports. You can configure the remote console redirection, and enable or disable integrated Ethernet controllers. If you disable a device, it cannot be configured, and the operating system cannot detect it (disabling a device is equivalent to disconnecting the device).

You can also choose to enable or disable adapter option ROM support. Disabling support can potentially improve the time it takes the blade server to start.

- **Power**

Select this choice to view or change Active Energy Manager (AEM) power capping to control power consumption and processor performance states.

- **Operating Modes**

Select this choice to determine operational settings, such as operating mode (acoustic, efficiency, or performance) and memory speed.

– **Integrated Management Module**

Select this choice to view or change the settings for the integrated management module (IMM).

– **POST Watchdog Timer**

Select this choice to view or enable the POST watchdog timer.

– **POST Watchdog Timer Value**

Select this choice to view or set the POST loader watchdog timer value.

– **Reboot System on NMI**

Select this choice to enable or disable restarting the system whenever a nonmaskable interrupt (NMI) occurs. **Disable** is the default.

– **Commands on USB Interface Preference**

Select this choice to specify whether the Ethernet over USB interface is enabled or disabled.

Notes: This option is primarily for older operating systems that have problems with USB communications device class (CDC) Ethernet interfaces. Disabling this option will cause the following issues:

- Online update packages will not work.
- Updates that use Bootable Media Creator (BoMC) will not work because BoMC uses the LAN over USB interface.
- You must install the IPMI device driver to use ASU to change the IMM or UEFI configuration.
- You cannot set the IMM OS Loader watchdog.

– **Network Configuration**

Select this choice to view the system management network interface port, the IMM MAC address, the current IMM IP address, and host name; define the static IMM IP address, subnet mask, and gateway address; specify whether to use the static IP address or have DHCP assign the IMM IP address; save the network changes; and reset the IMM.

– **Reset IMM to Defaults**

Select this choice to reset the IMM to the default settings.

– **Reset IMM**

Select this choice to reset the IMM.

– **Legacy Support**

Select this choice to view or set legacy support.

– **Force Legacy Video on Boot**

Select this choice to enable or disable force INT video support, if the operating system does not support UEFI video output standards. The default is **Enable**.

– **Rehook INT**

Select this choice to enable or disable devices from taking control of the boot process. The default is **Disable**.

– **Legacy Thunk Support**

Select this choice to enable or disable UEFI to interact with PCI mass storage devices that are non-UEFI compliant. The default is **Enable**.

– **System Security**

Select this choice to view or configure security options for Trusted Platform Module (TPM).

- **Network**

Select this choice to view or configure the network device options, such as iSCSI, PXE, and Broadcom.

- **Trusted Platform Module (TPM)**

Select this choice to view and configure TPM settings.

- **Date and Time**

Select this choice to set the date and time for the server. The date is set in *month/day/year* format. The time is set in 24-hour format (*hour:minute:second*).

This choice is on the full UEFI Setup Utility menu only.

- **Start Options**

Select this choice to view or change the start options, including the startup sequence, keyboard NumLock state, PXE boot option, and PCI device boot priority. Changes in the startup options take effect when you start the blade server.

The startup sequence specifies the order in which the blade server checks devices to find a boot record. The blade server starts from the first boot record that it finds. If the blade server has Wake on LAN hardware and software and the operating system supports Wake on LAN functions, you can specify a startup sequence for the Wake on LAN functions. For example, you can define a startup sequence that checks for a disc in the CD-RW/DVD drive, then checks the hard disk drive, and then checks a network adapter.

This choice is on the full UEFI Setup utility menu only.

- **Boot Manager**

Select this choice to view, add, delete, or change the device boot priority, boot from a file, select a one-time boot, or reset the boot order to the default setting.

- **System Event Logs**

Select this choice to access the System Event Manager, where you can view the POST event log and the system-event log.

The POST event log contains the three most recent error codes and messages that were generated during POST.

The system-event log contains POST and system management interrupt (SMI) events and all events that are generated by the baseboard management controller that is embedded in the integrated management module.

Important: If the system-error LED on the front of the server is lit but there are no other error indications, clear the system-event log. Also, after you complete a repair or correct an error, clear the system-event log to turn off the system-error LED on the front of the server.

- **POST Event Viewer**

Select this choice to enter the POST event viewer to view the POST error messages.

- **System Event Log**

Select this choice to view the system-event log.

- **Clear System Event Log**

Select this choice to clear the system-event log.

- **User Security**

Select this choice to set, change, or clear passwords.

You can set, change, and delete a power-on password and an administrator password through this selection. If you set a power-on password, you must type the power-on password to complete the system startup and to have access to the Setup Utility menu.

The password must be from 6 to 20 characters. You can use any combination of ASCII printable characters for the password. Keep a record of your password in a secure place.

If you forget the power-on password, you can regain access to the blade server either by removing the blade server battery and then reinstalling it or by using the power-on password override switch (see the *Problem Determination and Service Guide* for instructions).

An administrator password is intended to be used by a system administrator; it limits access to the full Setup utility menu.

Attention: If you set an administrator password and then forget it, there is no way to change, override, or remove it. You must replace the system board.

- **Save Settings**

Select this choice to save the changes that you have made in the settings.

- **Restore Settings**

Select this choice to cancel the changes that you have made in the settings and restore the previous settings.

- **Load Default Settings**

Select this choice to cancel the changes that you have made in the settings and restore the factory settings.

- **Exit Setup**

Select this choice to exit from the Setup utility. If you have not saved the changes that you have made in the settings, you are asked whether you want to save the changes or exit without saving them.

Using the PXE boot agent utility program

Use the Preboot Execution Environment (PXE) boot agent utility program to select the boot protocol and other boot options and to select a power-management option.

Notes:

1. The blade server does not support Remote Program Load (RPL) selection for the boot protocol option.
2. Enabling PXE might reduce the number of optional expansion modules that your blade server can manage.

To start the PXE boot agent utility program, complete the following steps:

1. Turn on the blade server (see “Turning on the blade server” on page 15).
2. When the Broadcom NetXtreme Boot Agent vX.X.X prompt is displayed, press Ctrl + S. You have 2 seconds (by default) to press Ctrl + S after the prompt is displayed.
3. Follow the instructions on the screen to change the settings of the selected items.

Using the Boot Selection Menu program

The Boot Selection Menu program is a built-in, menu-driven configuration utility program that you can use to temporarily redefine the first startup device without changing settings in the Setup utility.

To use the Boot Selection Menu program, complete the following steps:

Step 1. Turn off the blade server.

Step 2. Restart the blade server.

Step 3. Press F12 (**Select Boot Device**). If a bootable USB mass storage device is installed, a submenu item (**USB Key/Disk**) is displayed.

Step 4. Use the Up Arrow and Down Arrow keys to select an item from the Boot Selection Menu and press **Enter**.

The next time the blade server starts, it returns to the startup sequence that is set in the Setup utility.

Using the Advanced Settings Utility (ASU)

You can use the Advanced Settings Utility (ASU) to modify firmware settings from the command line on multiple operating systems, such as Linux, Windows, and Windows Professional Edition (PE).

You can use the ASU to perform the following tasks:

- Modify selected firmware UEFI settings without restarting the blade server to access F1 settings.
- Modify selected settings in integrated management module (IMM) based blade servers for the IMM firmware and IBMSystem x Server Firmware.
- Modify a limited number of VPD settings on IMM-based blade servers.
- Modify iSCSI boot settings.

For more information about using the ASU, see <http://www.ibm.com/systems/support/supportsite.wss/docdisplay?Indocid=TOOL-CENTER&brandind=5000016>.

Updating the Universal Unique Identifier (UUID)

The Universal Unique Identifier (UUID) must be updated when the system board is replaced. Use the Advanced Settings Utility to update the UUID.

You can download the ASU from the IBM website. To download the ASU and update the UUID, complete the following steps.

Step 1. Download the Advanced Settings Utility (ASU) from <http://www.ibm.com/systems/support/supportsite.wss/docdisplay?Indocid=TOOL-ASU&brandind=5000016>.

Step 2. Select one of the following methods to access the IMM to set the UUID:

- Online from the target system (LAN or keyboard console style (KCS) access)
- Remote access to the target system (LAN based)
- Bootable media containing ASU (LAN or KCS, depending upon the bootable media)

Note: IBM provides a method for building a bootable media. You can create a bootable media using the Bootable Media Creator (BoMC) application from <http://www.ibm.com/systems/support/supportsite.wss/docdisplay?Indocid=TOOL-BOMC&brandind=5000016>. In addition, the Windows-based and Linux-based toolkits are also available to build a bootable media.

Step 3. Copy and unpack the ASU package, which also includes other required files, to the server. Be sure to unpack the ASU and the required files to the same directory. In addition to the application program (asu or asu64), the following files are required:

- For Windows-based operating systems:
 - ibm_rndis_server_os.inf
 - device.cat
- For Linux-based operating systems:
 - cdc_interface.sh

Step 4. After you unpack ASU, use the following command syntax to set the UUID:

asu set SYSTEM_PROD_DATA.SysInfoUUID *uuid_value* [*access_method*]

uuid_value

Up to 16-byte hexadecimal value assigned by you.

access_method

The access method that you selected to use from the following methods:

- Online authenticated LAN access, use the following syntax: [*host imm_internal_ip*] [*user imm_user_id*][*password imm_password*]

Where:

imm_internal_ip

The IMM internal LAN/USB IP address. The default value is 169.254.95.118.

imm_user_id

The IMM account (1 of 12 accounts). The default value is USERID.

imm_password

The IMM account password (1 of 12 accounts). The default value is PASSWORD (with a zero, not the letter O).

Note: If you do not specify any of these parameters, ASU uses the default values. When the default values are used and ASU is unable to access the IMM by using the online authenticated LAN access method, ASU automatically uses the unauthenticated KCS access method.

The following commands are examples of using the user ID and password default values and not using the default values:

Example that does not use the user ID and password default values:

```
asu set SYSTEM_PROD_DATA.SysInfoUUID uuid_value user user_id  
password password
```

Example that does use the user ID and password default values:

```
asu set SYSTEM_PROD_DATA.SysInfoUUID uuid_value
```

- Online KCS access (unauthenticated and user restricted): You do not need to specify a value for *access_method* when you use this access method.

Example:

```
asu set SYSTEM_PROD_DATA.SysInfoUUID uuid_value
```

The KCS access method uses the IPMI/KCS interface. This method requires that the IPMI driver be installed. Some operating systems have the IPMI driver installed by default. ASU provides the corresponding mapping layer. See the *Advanced Settings Utility User's Guide* for more details. You can access the guide from <http://www.ibm.com/systems/support/supportsite.wss/docdisplay?Indocid=TOOL-ASU&brandind=5000016..>

- Remote LAN access. Use the following syntax:

Note: When you use the remote LAN access method to access IMM using the LAN from a client, the *host* and the *imm_external_ip* address are required parameters.

```
host imm_external_ip [user imm_user_id][password imm_password]
```

Where:

imm_external_ip

The external IMM LAN IP address. There is no default value. This parameter is required.

imm_user_id

The IMM account (1 of 12 accounts). The default value is USERID.

imm_password

The IMM account password (1 of 12 accounts). The default value is PASSWORD (with a zero, not a letter O).

The following commands are examples of using the user ID and password default values and not using the default values:

Example that does not use the user ID and password default values:

```
asu set SYSTEM_PROD_DATA.SysInfoUUID uuid_value host imm_ip  
user user_id password password
```

Example that does use the user ID and password default values:

```
asu set SYSTEM_PROD_DATA.SysInfoUUID uuid_value host imm_ip
```

- Bootable media: You can also build a bootable media using the applications available at <http://www.ibm.com/systems/support/supportsite.wss/docdisplay?Indocid=TOOL-CENTER&brandind=5000016..>

Step 5. Restart the blade server.

Updating the DMI/SMBIOS data

The Desktop Management Interface (DMI) must be updated when the system board is replaced. Use the Advanced Settings Utility to update the DMI.

To download the ASU and update the DMI, complete the following steps.

1. Download the Advanced Settings Utility (ASU) from <http://www.ibm.com/systems/support/supportsite.wss/docdisplay?Indocid=TOOL-ASU&brandind=5000016>.
2. ASU sets the DMI in the IMM. Select one of the following methods to access the IMM to set the DMI:
 - Online from the target system (LAN or keyboard console style (KCS) access)
 - Remote access to the target system (LAN based)
 - Bootable media containing ASU (LAN or KCS, depending upon the bootable media)

Note: IBM provides a method for building a bootable media. You can create a bootable media using the Bootable Media Creator (BoMC) application from <http://www.ibm.com/systems/support/supportsite.wss/docdisplay?Indocid=TOOL-BOMC&brandind=5000016>. In addition, the Windows-based and Linux-based toolkits are also available to build a bootable media.

3. Copy and unpack the ASU package, which also includes other required files, to the server. Make sure that you unpack the ASU and the required files to the same directory. In addition to the application program (`asu` or `asu64`), the following files are required:
 - For Windows-based operating systems:
 - `ibm_rndis_server_os.inf`
 - `device.cat`
 - For Linux-based operating systems:
 - `cdc_interface.sh`
4. After you unpack ASU. Use the following syntax: `asu set SYSTEM_PROD_DATA.SysInfoProdName m/t_model [access_method]`
`asu set SYSTEM_PROD_DATA.SysInfoSerialNum s/n [access_method]`
`asu set SYSTEM_PROD_DATA.SysEncloseAssetTag asset_tag[access_method]`

Where:

m/t_model

The server machine type and model number. Type `m t m xxxxyyy`, where `xxxx` is the machine type and `yyy` is the server model number.

`s/n`

The serial number on the server. Type `s n zzzzzzz`, where `zzzzzzz` is the serial number.

`asset_method`

The server asset tag number. Type `asset aaaaaaaaaaaaaaaaaaaaaaaaaaaaaa`, where `aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa` is the asset tag number.

`[access_method]`

The access method that you select to use from the following methods:

- Online authenticated LAN access. Use the following syntax: `[host imm_internal_ip] [user imm_user_id][password imm_password]`

`imm_internal_ip`

The IMM internal LAN/USB IP address. The default value is 169.254.95.118.

`imm_user_id`

The IMM account (1 of 12 accounts). The default value is USERID.

`imm_password`

The IMM account password (1 of 12 accounts). The default value is PASSWORD (with a zero, not the letter O).

Note: If you do not specify any of these parameters, ASU uses the default values. When the default values are used and ASU is unable to access the IMM using the online authenticated LAN access method, ASU automatically uses the following unauthenticated KCS access method.

The following commands are examples of using the user ID and password default values and not using the default values:

Examples that do not use the userid and password default values:

```
asu set SYSTEM_PROD_DATA.SYsInfoProdName m/t_model -user imm_user_id-password imm_password
asu set SYSTEM_PROD_DATA.SYsInfoSerialNum s/n-user imm_user_id -password imm_password
asu set SYSTEM_PROD_DATA.SYsEncloseAssetTag asset_tag -user imm_user_id-password imm_password
```

Examples that do use the user ID and password default values:

```
asu set SYSTEM_PROD_DATA.SysInfoProdName m/t_model
asu set SYSTEM_PROD_DATA.SysInfoSerialNum s/n
asu set SYSTEM_PROD_DATA.SysEncloseAssetTag asset_tag
```

- Online KCS access (unauthenticated and user restricted): You do not need to specify a value for `access_method` when you use this access method.

The KCS access method uses the IPMI/KCS interface. This method requires that the IPMI driver is installed. Some operating systems have the IPMI driver installed by default. ASU provides the corresponding mapping layer. See the *Advanced Settings Utility Users Guide* for more details. You can access the ASU Users Guide from <http://www.ibm.com/systems/support/supportsite.wss/docdisplay?lnocid=TOOL-ASU&brandind=5000016>.

The following commands are examples of using the user ID and password default values and not using the default values:

Examples that do not use the user ID and password default values:

```
asu set SYSTEM_PROD_DATA.SYsInfoProdName m/t_model
asu set SYSTEM_PROD_DATA.SYsInfoSerialNum s/n
asu set SYSTEM_PROD_DATA.SYsEncloseAssetTag asset_tag
```

- Remote LAN access. Use the following syntax:

Note: When using the remote LAN access method to access IMM using the LAN from a client, the *host* and the *imm_external_ip* address are required parameters.

```
host imm_external_ip [user imm_user_id][password imm_password]
```

imm_external_ip

The external IMM LAN IP address. There is no default value. This parameter is required.

imm_user_id

The IMM account (1 of 12 accounts). The default value is USERID.

imm_password

The IMM account password (1 of 12 accounts). The default value is PASSWORD (with a zero, not the letter O).

The following commands are examples of using the user ID and password default values and not using the default values:

Examples that do not use the user ID and password default values:

```
asu set SYSTEM_PROD_DATA.SysInfoProdName m/t_model-host imm_ip -user imm_user_id -password imm_password
```

```
asu set SYSTEM_PROD_DATA.SysInfoSerialNum s/n -host imm_ip -user imm_user_id-password imm_password
```

```
asu set SYSTEM_PROD_DATA.SysEncloseAssetTag asset_tag-host imm_ip -user imm_user_id -password imm_password
```

Examples that do use the user ID and password default values:

```
asu set SYSTEM_PROD_DATA.SysInfoProdName m/t_model-host imm_ip
```

```
asu set SYSTEM_PROD_DATA.SysInfoSerialNum s/n -host imm_ip
```

```
asu set SYSTEM_PROD_DATA.SysEncloseAssetTag asset_tag -host imm_ip
```

- Bootable media: You can also build a bootable media using the applications available from <http://www.ibm.com/systems/support/supportsite.wss/docdisplay?Indocid=TOOL-BOMC&brandind=5000016>.

5. Restart the blade server.

Using the LSI Logic Configuration Utility program

Use these instructions to start the LSI Logic Configuration Utility program.

You can use the LSI Logic Configuration Utility program to perform the following tasks:

- Set the device boot order
- Add or remove devices from the boot list
- Manage the RAID configuration

To start the LSI Logic Configuration Utility program, complete the following steps:

Note: The LSI controller on your blade server is a UEFI compatible device. It can be configured through the Setup utility for your blade server (see “Using the Setup utility” on page 74).

- Step 1. Turn on the blade server, and make sure that the blade server is the owner of the keyboard, video, and mouse.
- Step 2. When the <<<Press Ctrl-C to start LSI Logic Configuration Utility>>> prompt is displayed, press Ctrl+C.
- Step 3. Use the arrow keys to select the controller from the list of adapters; then, press Enter.

Step 4. Follow the instructions on the screen to change the settings of the selected items; then, press Enter. If you select **SAS Topology** or **Advanced Adapter Properties**, additional screens are displayed.

Updating firmware and device drivers

IBM periodically makes UEFI code, service processor (IMM) firmware, diagnostic firmware updates, and device driver updates available for the blade server. Several methods are available to update the firmware for the blade server.

Note: Typically, you update the firmware before you install the operating system and update device drivers after the operating system is installed.

If you are updating the firmware for the blade servers in a scalable blade complex operating in single partition mode, you only must update the firmware for the primary blade server. When you update the firmware for the primary blade server, the firmware for the secondary blade server is updated as well. Device drivers are updated through the operating system.

You can update the firmware and device drivers for the blade server by using one of the following methods.

- Using UpdateXpress System Packs. UpdateXpress System Packs (UXSP) contain an integration-tested bundle of online, updatable firmware and device drivers for your servers. For more information about UpdateXpress System Packs, see <http://www.ibm.com/systems/support/supportsite.wss/docdisplay?Indocid=SERV-XPRESS&brandind=5000008>
- Using the IBM ToolsCenter Bootable Media Creator. You can use IBM ToolsCenter Bootable Media Creator to create bootable media that is suitable for applying firmware updates, running preboot diagnostics, and deploying Windows operating systems on supported systems. Using IBM ToolsCenter Bootable Media Creator, you can create a single bootable image on supported media (such as CD, DVD, ISO image, USB flash drive, or set of PXE files) that bundles multiple IBMBladeCenter tools and updates from UpdateXpress System Packs, which contain Windows and Linux® firmware and device-driver updates. You can also create an *IBM ServerGuide Setup and Installation* CD for deploying Windows operating systems and updates on supported systems. For more information about the Bootable Media Creator, see <http://www.ibm.com/systems/support/supportsite.wss/docdisplay?Indocid=TOOL-BOMC&brandind=5000008>.
- Downloading the firmware and device drivers from <http://www.ibm.com/support/fixcentral/systemx/groupView?query.productGroup=ibm%2FBladeCenter>. Follow the instructions that come with the firmware and device drivers to install them. You must make sure that you update the firmware for each blade server in the scalable blade complex to the same levels before resetting the scalable blade complex. Refer to the following table to select the correct procedure to follow based on your configuration and preferred update method:

Table 13. Procedures to update firmware for blade servers in a scalable blade complex

Scalable blade complex mode	Inband updates	Out-of-band updates
Single partition	“Updating firmware for blade servers operating as a single partition” on page 85	“Updating firmware for each blade server independently” on page 85
Independent partitions	“Updating firmware for each blade server independently” on page 85	“Updating firmware for each blade server independently” on page 85

For more information about updating firmware and the preferred methods, see the Firmware Update Best Practices white paper at <http://www-947.ibm.com/systems/support/supportsite.wss/docdisplay?Indocid=MIGR-5082923&brandind=5000020>.

For additional instructions about updating the firmware before attaching a IBM MAX5 expansion blade, see <http://www.ibm.com/support/entry/portal/docdisplay?Indocid=MIGR-5085756>

Updating firmware for blade servers operating as a single partition

If you are performing inband updates to firmware on blade servers operating as a single partition in a scalable blade complex, updates made to the firmware on the primary blade server are also applied to the secondary blade server.

You can obtain the firmware updates from <http://www.ibm.com/support/fixcentral/systemx/groupView?query.productGroup=ibm%2FBladeCenter>.

Complete the following steps to update the firmware for the blade servers operating as a single partition in a scalable blade complex:

1. Run the IMM firmware update package on the primary blade server.
2. Run the UEFI firmware update package on the primary blade server.
3. Run the FPGA firmware update package on the primary blade server.
4. Run the DSA preboot firmware update package the primary blade server.
5. Restart the scalable blade complex to activate the firmware.

The firmware updates that were made to the primary blade server are applied to the secondary blade server.

Updating firmware for each blade server independently

If you are updating firmware for blade servers that are operating as independent partitions in a scalable blade complex or you are performing out-of-band updates to firmware for blade servers in a scalable blade complex, updates must be applied to each system in the scalable complex independently.

You can obtain the firmware updates from <http://www.ibm.com/support/fixcentral/systemx/groupView?query.productGroup=ibm%2FBladeCenter>.

Complete the following steps to update the firmware for the blade servers:

Note: The blade servers in the scalable blade complex must be at the same firmware levels before they are restarted.

1. Update the IMM firmware on the primary blade server. Then update the IMM firmware on the secondary blade server.
2. Reset the IMM on the primary and secondary systems. Complete the following steps to reset the IMM through the advanced management module web interface:
 - a. Click **Blade Tasks** → **Power/Restart**.
 - b. Click the checkbox next to the blade servers to be reset.
 - c. Click **Available actions** → **Restart Blade System Mgmt Processor**.
 - d. Click **Perform Action**.
3. Update the UEFI firmware on the primary blade server. Then update the UEFI firmware on the secondary blade server.
4. Update the FPGA firmware on the primary blade server. Then update the FPGA firmware on the secondary blade server.
5. Update the DSA preboot firmware on the primary blade server. Then update the DSA Preboot firmware on the secondary blade server.
6. Restart both blade servers to activate the firmware

You can also use an Expect type script to automate advanced management module command-line interface (CLI) commands for updating the firmware for both blade servers. Complete the following steps to use an Expect type script:

1. Download the firmware for the BladeCenter HX5 blade server from <http://www.ibm.com/support/fixcentral/systemx/groupView?query.productGroup=ibm%2FBladeCenter>. Place the files on a TFTP server that is on the same TCP/IP subnet as the advanced management module for the chassis in which the blade servers are installed.

Note: Remember to record the directory location on the TFTP server where you place the files; you will need that location to run the Expect type script.

2. Generate an Expect type script that will log in to the advanced management module CLI, update the firmware for the blade servers, and restart the blade servers when complete.
3. From a computer that is on the same TCP/IP subnet as the advanced management module for the chassis in which the scalable blade complex is installed, run the Expect type script.

Example of an Expect script

The following script illustrates how an Expect type script might be created to update the firmware for both blade servers.

Important: IBM does not provide support for Expect scripts. For more information about using Expect, see the Expect website at <http://expect.sourceforge.net/>. For more information about using the advanced management module CLI, see the *BladeCenter Advanced Management Module Command-Line Interface Reference Guide* at http://publib.boulder.ibm.com/infocenter/bladectr/documentation/topic/com.ibm.bladecenter.advmgmtmod.doc/adv_man_mod_printable_doc.html.

```
#!/usr/bin/expect

#####
#
# This tool has been built from the following sources:
#
# support/FlashMNBladeViaAmm.exp : 1.1
# support/include/Log.exp : 1.9
# support/include/AMM.exp : 1.29
# support/include/MultiNode.exp : 1.1
# support/include/FlashBlade.exp : 1.16
#
#####

#####
#
# Code from source : support/include/Log.exp
#
#####

#####
#
# Globals.
#
#####

log_user 0
exp_internal -f /tmp/diag.txt 0

set fm_logfile ""
set g_normal_timeout_value 30
set timeout $g_normal_timeout_value
```

```

#####
#
# Init the logging system.
#
#####

proc log_init { display_stdout } {
    global fm_logfile

    if { $display_stdout == 0 } {
        log_user 1
    }

    set fm_logfile "/tmp/expect_logs.txt"
}

#####
#
# Log to a directory.
#
#####

proc log_init_directory { directory } {
    global fm_logfile

    set fm_logfile "$directory/ExpectLogs.txt"
    exp_internal -f $directory/ExpectDiag.txt 0
}

#####
#
# Temp hack.
#
#####

proc log_init_custom { logfile } {
    global fm_logfile
    global g_module_name
    global g_test_results_base_dir

    #
    # Cache the module name.
    #

    set g_module_name $logfile

    #
    # Figure out the logfile path.
    #

    test_results_set_base_dir

    #
    # Set it.
    #

    set fm_logfile "$g_test_results_base_dir/Logfile.txt"
}

#####
#

```

```

# Capture a log message with a nice time stamp.                                     #
#                                                                                   #
#####

proc ft_log { message } {
    global fm_logfile

    set date_val [ timestamp -format "%m/%d: %X: " ]

    log_file $fm_logfile
    send_log -- "$date_val $message\n"
    log_file

    send_user -- "$date_val $message\n"
}

#####
#                                                                                   #
# Bail on a critical error.                                                         #
#                                                                                   #
#####

proc ft_error { message } {
    ft_log "ERROR: $message"
    puts "\n\nERROR: $message"
    exit
}

#####
#                                                                                   #
# Code from source      : support/include/AMM.exp                                  #
#                                                                                   #
#####

#####
#                                                                                   #
# Globals.                                                       #
#                                                                                   #
#####

set amm_id ""                               ;# Spawn ID for AMM ssh connection.
set save_amm ""                             ;# Save pointer of original amm value.
set save_target ""                          ;# Save pointer for current AMM state.
set save_userid ""                          ;# Save pointer of original userid value.
set save_password ""                        ;# Save pointer of original password value.
array set g_imm_fw_levels { }              ;# Array of IMM firmware levels.
array set g_uefi_fw_levels { }             ;# Array of uEFI firmware levels.

#####
#                                                                                   #
# Unexpected EOF handler.                                           #
#                                                                                   #
#####

proc eof_handler { } {
    global save_amm save_userid save_password

    ft_log "Unexpected EOF talking to AMM."

    #
    # Clean up any zombies.

```

```

#

catch {close -i $amm_id}
wait -nowait

#
# The AMM closed the connection on us -- try to resume.
#

set amm_id ""

set rv [ amm_login $save_amm $save_userid $save_password ]
set rv [ amm_restore_save_target ]
}

#####
# Save off the current target value.
#
#####

proc amm_save_target { string } {
    global save_target

    set save_target $string
}

#####
# Restore the AMM to its saved target value.
#
#####

proc amm_restore_save_target { } {
    global amm_id save_target

    send -i $amm_id "env -T $save_target\r"

    expect -i $amm_id -exact "OK" {
        return 0
    }

    ft_error "Unable to restore AMM target after disconnect."
}

#####
# Handy function to collect all flash failure logs for a given blade.
#
#####

proc collect_flash_failure_logs { blade } {
    global g_target_blade g_test_results_dir

    #
    # Create a storage space for our output.
    #

    set g_target_blade $blade
    set rv [ test_results_set_cwd ]
}

```

```

#
# Have to be on an MM[N] target.
#

set rv [ amm_set_mm_target ]

#
# Grab the VDBG data from the AMM.
#

ft_log "Blade: $blade -- Collecting AMM vdbg log."

set vdbg_output "$g_test_results_dir/AMM_vdbg.txt"
set rv [ collect_vdbg $vdbg_output ]

if { $rv == 0 } {
    ft_log "Blade: $blade -- Successfully collected AMM vdbg log."
} else {
    ft_log "Blade: $blade -- Failure collecting AMM vdbg log."
}

#
# Grab the FFDC data from the IMM.
#

ft_log "Blade: $blade -- Collecting IMM FFDC logs."

set rv [ imm_ffdc_init_capture $blade ]
set rv [ imm_ffdc_collect_capture $blade ]
set fn [ imm_ffdc_get_service_file_name $blade ]
set rv [ collect_file_from_amm service "." $fn $g_test_results_dir/IMM_FFDC.tgz ]

if { $rv == 0 } {
    ft_log "Blade: $blade -- Successfully collected IMM FFDC data."
} else {
    ft_log "Blade: $blade -- Failure collecting IMM FFDC data."
}

#
# Cleanup.
#

set rv [ imm_ffdc_cleanup_amm $fn ]
}

#####
#
# Reset all of the configured blades in the chassis.
#
#####

proc reset_all_blades { } {
    global blade_presence_bits

    for {set slot 1} {$slot < 15} {incr slot 1} {

        if { ! [info exists blade_presence_bits($slot)] } {
            continue
        }

        set present $blade_presence_bits($slot)
    }
}

```

```

        if {$present == 1} {
            set rv [ reset_blade $slot ]

            if {$rv != 0} {
                ft_log "Blade: $slot did not reboot."
            }
        }
    }
}

#####
#
# Reset a blade via the AMM. Returns 0 on success and 1 on timeout.      #
#
#####

proc reset_blade { blade } {
    global amm_id

    #
    # Reboot the blade.
    #

    send -i $amm_id "reset -T blade\[ $blade\]\r\n"

    expect -i $amm_id "OK" {
        ft_log "Blade $blade: Rebooted host OS."
        return 0
    } timeout {
        return 1
    }
}

#####
#
# Reset a blade via the AMM. Returns 0 on success and 1 on timeout.      #
#
#####

proc reset_blade_gator { blade } {
    global amm_id

    #
    # Gator zap.
    #

    set gator_map    { 1 2 3 4 5 6 7 8 9 a b c d e f }
    set gator_offset [lindex $gator_map $blade_no]

    send -i $amm_id "dbg gator x $gator_offset -Tsystem:mm\[1\]\r\n"

    expect -i $amm_id "OK" {
        ft_log "Blade $blade: Gator zap."
        return 0
    } timeout {
        return 1
    }
}
}

```

```

#####
#
# Reboot the AMM.
#
#####

proc reboot_amm { } {
    global amm_id

    #
    # Reboot the AMM.
    #

    send -i $amm_id "reset\r"

    #
    # The AMM CLI needs to have the session opened until it goes away.
    #

    sleep 10

    ft_log "AMM: Rebooted."

    return 0
}

#####
#
# Set the MM target to the value.
#
#####

proc amm_set_mm_target { } {
    global amm_id

    #
    # We should discover what bay the MM is in, hardcoded to 1 right now.
    #

    set mm 1

    send -i $amm_id "env -T system:mm\[ $mm\]\r"
    expect -i $amm_id -exact "system:mm\[ $mm\]"

    expect -i $amm_id "OK" {
        set rv [ amm_save_target "system:mm\[ $mm\]" ]
        return 0
    }

    return 1
}

#####
#
# Set the CLI target to 'system'.
# Returns 0 on success and 1 on failure.
#
#####

proc amm_set_system_target { } {
    global amm_id

```



```

    send -i $amm_id "env -T system\r"

    expect -i $amm_id "OK" {
        set rv [ amm_save_target "system" ]
        return 0
    }

    return 1
}

#####
#                                     #
# Set the CLI target to a blade.           #
# Returns 0 on success and 1 on failure.   #
#                                     #
#####

proc amm_set_blade_target { blade_no } {
    global amm_id

    send -i $amm_id "env -T system:blade\[ $blade_no \]\r"

    expect -i $amm_id "OK" {
        set rv [ amm_save_target "system:blade\[ $blade_no \]" ]
        return 0
    }

    return 1
}

#####
#                                     #
# Collect the current SOL ready status.    #
#                                     #
#####

proc blade_collect_sol_ready_status { } {
    global amm_id

    send -i $amm_id "sol\r"

    expect -i $amm_id "OK" {
    } timeout {
        return 1
    }

    expect -i $amm_id "SQL Session: Ready" {
        return 0
    }

    return 1
}

#####
#                                     #
# Log into the AMM.                       #
#                                     #
#####

```

```

proc amm_login { amm userid password } {
    global amm_id save_amm save_userid save_password

    #
    # Backup our login creds.
    #

    set save_amm $amm
    set save_userid $userid
    set save_password $password

    #
    # SSH command with no host key checking.
    #

    spawn ssh -o StrictHostKeyChecking=no -o UserKnownHostsFile=/dev/null -l$userid $amm

    set amm_id $spawn_id
    ft_log "AMM: Login -- id: $amm_id"

    #
    # Install an end of file handler to bomb out incase the AMM connection dies.
    #

    expect_after -i $amm_id eof eof_handler

    #
    # Log into the AMM.
    #

    expect {
        "password:" {
            send "$password\r"
        }
    }

    #
    # Make sure we made it.
    #

    expect -exact "system>"
}

#####
#
# Log out of the AMM. (Be nice to the CLI, it won't run commands some times #
# if you close the connection on it too soon). #
#
#####

proc amm_logout { } {
    global amm_id

    #
    # Log out and let the CLI figure out what happened.
    #

    send -i $amm_id "exit\r"
    catch {close -i $amm_id}

    #

```

```

# Reap the child process.
#

wait

ft_log "AMM: Logout -- id: $amm_id"
set amm_id ""
}

#####
#
# Collect the blade info from the AMM.
#
#####

proc collect_blade_info { blade } {
    global amm_id amm g_imm_fw_levels g_uefi_fw_levels

    send -i $amm_id "info -T blade\[ $blade\]\r"

    #
    # Find the BIOS string.
    #

    expect -i $amm_id "BIOS" {

        expect -i $amm_id "Build ID:" {

            expect -i $amm_id "\n" {

                set temp $expect_out(buffer)
                set length [ string length ${temp} ]
                set length [ expr $length - 3 ]

                set uefi_level [string range ${temp} 1 $length]
                set g_uefi_fw_levels($blade) $uefi_level
            }
        }
    }

    #
    # Find the SP string.
    #

    expect -i $amm_id -re "Blade*" {

        expect -i $amm_id "Build ID:" {

            expect -i $amm_id "\n" {

                set temp $expect_out(buffer)
                set length [ string length ${temp} ]
                set length [ expr $length - 3 ]

                set imm_level [string range ${temp} 1 $length]
                set g_imm_fw_levels($blade) $imm_level
            }
        }
    }

    return 0
}

```

```

}

#####
#                                     #
# Collect the blade power state from the AMM.           #
#                                     #
#####

proc collect_blade_power_state { blade } {
    global amm_id amm

    send -i $amm_id "info -T blade\[ $blade\]\r"
}

#####
#                                     #
# Collect a file from the AMM.                         #
#                                     #
#####

proc collect_file_from_amm { remote_directory filename local_copy } {
    global amm userid password

    set command "/usr/bin/curl"
    set arg1 "--silent"
    set arg2 "--user"
    set arg3 "${userid}:${password}"
    set arg4 "ftp://$amm/$remote_directory/$filename"
    set arg5 "-o"
    set arg6 "${local_copy}"

    set run_command [list exec $command $arg1 $arg2 $arg3 $arg4 $arg5 $arg6]

    if {[catch $run_command result]} {
        ft_log "Curl: command crashed with result $result fetching $arg4"
        ft_log "Curl: The command was: ($command $arg1 $arg2 $arg3 $arg4 $arg5 $arg6"
        return 1
    }

    return 0
}

#####
#                                     #
# Delete a file from the AMM.                         #
#                                     #
#####

proc delete_file_from_amm { filename } {
    global amm_id

    send -i $amm_id "files -d ${filename}\r"

    expect -i $amm_id "OK" {
        return 0
    }

    return 1
}

#####

```

```

#                                                     #
# Code from source      : support/include/MultiNode.exp      #
#                                                     #
#####

set multinode_complex [ list ]

#####
#                                                     #
# Build a list of complexes.                               #
#                                                     #
#####

proc populate_complex_list { } {
    global amm_id multinode_complex

    set multinode_entry [ list ]

    send -i $amm_id "scale\r\n"

    expect {

        #
        # Find the complex ID.
        #

        -i $amm_id "Complex ID:" {

            expect -i $amm_id "\n" {
                set temp $expect_out(buffer)
                set complex [ string trimright $temp ]
                set complex [ string range ${complex} 1 4 ]

                set multinode_entry [ list ]
                lappend multinode_entry ${complex}
            } timeout {
                ft_error "parse error"
            }

            exp_continue
        }

        #
        # Find the slots.
        #

        -i $amm_id "Bay: " {

            expect -i $amm_id "\n" {
                set temp $expect_out(buffer)
                set bay [ string trimright $temp ]
                set bay [ string range ${bay} 0 [string length ${bay}] ]

                lappend multinode_entry ${bay}
            } timeout {
                ft_error "parse error"
            }

            exp_continue
        }
    }
}

```

```

        -i $amm_id "No scalable complex found" {
            ft_log "AMM: No multi nodes found."
        }
    }

    lappend multinode_complex $multinode_entry
}

#####
#                                     #
# Return a list element for a given slot configuration.           #
#                                     #
#####

proc get_multinode_list_for_slot { slot_no } {
    global multinode_complex

    set empty [ list ]
    set temp [ list ]

    #
    # Return an empty list if the multinode complex is has nothing.
    #

    set count [ llength $multinode_complex ]

    if { $count == 0 } {
        return $empty
    }

    #
    # Search each list in the multinode complex list.
    #

    foreach temp $multinode_complex {

        #
        # Now seach the sublist.
        #

        foreach temp1 $temp {
            if { $temp1 == $slot_no } {
                return $temp
            }
        }
    }

    return $empty
}

#####
#                                     #
# Send the update command for the blade.                         #
#                                     #
#####

proc flash_update_mn_blade { blade_no firmware_image } {
    global amm_id tftp_server g_normal_timeout_value

    #

```

```

# Tell the AMM no timeout.
#

send -i $amm_id "telnetcfg -t 0\r\n"
expect -i $amm_id -exact "OK"

#
# Populate a list of multi node targets.
#

set slots [ list ]
set slots [ get_multinode_list_for_slot $blade_no ]

#
# Validate it has data.
#

set count [ llength $slots ]

if {$count == 0} {
    ft_error "Unable to find any valid multi node configuration."
    return 1
}

#
# Get a big timeout value while we flash.
#

set timeout 1000

set complex_name [ lindex $slots 0 ]

ft_log "Attempting to flash complex: $complex_name"

#
# Flash each slot number.
#

foreach slot $slots {
    if {$slot == $complex_name} {
        continue
    }

    ft_log "Flashing slot number: $slot"

    #
    # Send the update command.
    #

    send -i $amm_id "update -i $tftp_server -l $firmware_image -T system:blade\[ $slot \]:sp\r\n"

    #
    # Process results.
    #

    set rv 1

    expect {
        -i $amm_id "successful" { set rv 0 }
        -i $amm_id "meant"      { set rv 1 }
        -i $amm_id "failed"    { set rv 1 }
    }
}

```

```

        -i $amm_id "*nable*"    { set rv 1 }
    }

    if {$rv == 0} {
        ft_log "AMM reports flash success for slot $slot"
    } else {
        return ${rv}
    }
}

#
# Restore the timeout and return the rv.
#

set timeout $g_normal_timeout_value

return 0
}

#####
#
# Code from source      : support/include/FlashBlade.exp      #
#
#####

#####
#
# Sometimes the AMM leaves old UPD files hanging around.      #
#
#####

proc purge_old_upd_files { } {
    global amm_id

    #
    # AMM53 series introduced a strange behaviour that needs to
    # be investigated but can be worked around with a delay.
    #

    sleep 20

    #
    # Look for stale files.
    #

    send -i $amm_id "files -T system:mm\[1\]\r\n"

    expect {
        -i $amm_id "Available:" { return }

        -i $amm_id "volatile/*.upd*" {
            puts "\n\n Must delete: $expect_out(buffer)\n\n"
            return
        }
    }
}

#####
#
# Send the update command for the blade.      #

```



```

#                                                                 #
#####

proc flash_update_blade { blade_no firmware_image } {
    global amm_id tftp_server g_normal_timeout_value

    #
    # Get a big timeout value while we flash.
    #

    set timeout 1000

    #
    # Make sure the AMM knows too.
    #

    send -i $amm_id "telnetcfg -t 0\r\n"
    expect -i $amm_id -exact "OK"

    #
    # Populate a list
    #

    #
    # Send the update command.
    #

    send -i $amm_id "update -i $tftp_server -l $firmware_image -T system:blade\[ $blade_no\]:sp\r\n"

    #
    # Process results.
    #

    set rv 1

    expect {
        -i $amm_id "successful" { set rv 0 }
        -i $amm_id "meant"      { set rv 1 }
        -i $amm_id "failed"     { set rv 1 }
        -i $amm_id "*nable*"    { set rv 1 }
    }

    #
    # Restore the timeout and return the rv.
    #

    set timeout $g_normal_timeout_value

    return $rv
}

#####
#                                                                 #
# This loop will flash all blades in a given chassis to a given level of #
# IMM or uEFI firmware via the AMM.                                     #
#                                                                 #
#####

proc flash_all_blades { firmware } {

```

```

global blade_presence_bits

for {set slot 1} {$slot < 15} {incr slot 1} {

    if { ! [info exists blade_presence_bits($slot)] } {
        continue
    }

    set present $blade_presence_bits($slot)

    if {$present == 1} {

        ft_log "Blade: $slot -- Updating to firmware: $firmware."

        set rv [ flash_update_blade $slot $firmware ]

        if {$rv == 0} {
            ft_log "Blade: $slot -- Firmware update success."
        } else {
            ft_log "Blade: $slot -- Firmware update failed."
            set rv [ collect_flash_failure_logs $slot ]
        }

        global amm_id
        send -i $amm_id "\r"
        set rv [ ft_delay 2 ]
    }
}

}

#####
#                                     #
# Script startup -- check usage and assign globals.           #
#                                     #
#####

if {$argc < 6} {
    puts "USAGE: $argv0 <Chassis_Ip> <Userid> <Password> <TftpServer> <TftpFilename> <Blade_No>"
    exit
}

set amm      [lindex $argv 0]
set userid   [lindex $argv 1]
set password [lindex $argv 2]
set tftp_server [lindex $argv 3]
set tftp_filename [lindex $argv 4]
set blade_no  [lindex $argv 5]

#####
#                                     #
# Code start.                                           #
#                                     #
#####

set rv [ log_init 1 ]
set rv [ amm_login $amm $userid $password ]
set rv [ purge_old_upd_files ]
set rv [ populate_complex_list ]
set rv [ amm_set_mm_target ]

```

```
set rv [ flash_update_mn_blade $blade_no $tftp_filename ]

#
# Display user output data.
#

if { $rv == 0 } {
    ft_log "FlashStatusOut: success"
} else {
    ft_log "FlashStatusOut: failure"
}

exit
```

Chapter 5. Installing the operating system

Use these instructions to install the operating system on the blade server.

To install the operating system on a blade server, you can use any of the following methods:

- Use the *ServerGuide Setup and Installation* CD to install a supported Microsoft Windows operating system.
- Download the latest operating-system installation instructions and install the operating system.

Important: The operating system in the blade server must provide USB support for the blade server to recognize and use the keyboard, mouse, and removable-media drives. The BladeCenter unit uses USB for internal communication with these devices.

Using the ServerGuide Setup and Installation CD

Use this information as an overview for using the *ServerGuide Setup and Installation* CD.

The *ServerGuide Setup and Installation* CD contains a setup and installation program that is designed for your blade server. The ServerGuide program detects the blade server model and optional hardware devices that are installed and uses that information during setup to configure the hardware. The ServerGuide program simplifies operating-system installations by providing updated device drivers and, in some cases, installing them automatically.

You can download a free image of the *ServerGuide Setup and Installation* CD or purchase the CD from the ServerGuide fulfillment website at <http://www.ibm.com/systems/x/hardware/enterprise/xarchitecture.html>. To download the free image, click **IBM Service and Support Site**.

Note: Changes are made periodically to the IBM website. The actual procedure might vary slightly from what is in this document.

The ServerGuide program performs the following tasks:

- An easy-to-use interface
- Diskette-free setup and configuration programs that are based on detected hardware
- Device drivers that are provided for the blade server model and detected hardware
- Operating-system partition size and file-system type that are selectable during setup

ServerGuide features

Use this information to determine the ServerGuide features.

Features and functions can vary slightly with different versions of the ServerGuide program. To learn more about the version that you have, start the *ServerGuide Setup and Installation* CD and view the online overview. Not all features are supported on all blade server models.

The ServerGuide program requires a supported IBM blade server that is associated with an enabled startable (bootable) CD drive. In addition to the *ServerGuide Setup and Installation* CD, you must have the operating-system CD to install the operating system.

The ServerGuide program has the following features:

- Sets system date and time
- Detects installed optional hardware devices and provides updated device drivers for most adapters and devices
- Provides diskette-free installation for supported Windows operating systems
- Includes an online readme file with links to tips for the hardware and operating-system installation

Typical operating-system installation

Use this information for a typical ServerGuide operating-system installation.

The ServerGuide program can reduce the time it takes to install an operating system. It provides the device drivers that are required for the hardware and for the operating system that you are installing. This section describes a typical ServerGuide operating-system installation.

Note: Features and functions can vary slightly with different versions of the ServerGuide program.

1. After you have completed the setup process, the operating-system installation program starts. (You will need your operating-system CD to complete the installation.)
2. The ServerGuide program stores information about the blade server model, service processor, hard disk drive controllers, and network adapters. Then, the program checks the CD for newer device drivers. This information is stored and then passed to the operating-system installation program.
3. The ServerGuide program presents operating-system partition options that are based on your operating-system selection and the installed hard disk drives.
4. The ServerGuide program prompts you to insert your operating-system CD and restart the blade server. Then, the installation program for the operating system takes control to complete the installation. The BladeCenter CD drive must be associated with the blade server when this step is performed. When you start the *ServerGuide Setup and Installation* CD, the program prompts you to complete the following tasks:
 - Select your language.
 - Select your keyboard layout and country.
 - View the overview to learn about ServerGuide features.
 - View the readme file to review installation tips for your operating system and adapter.
 - Start the operating-system installation. You will need your operating-system CD.

Installing the operating system without using ServerGuide

Use these instructions to install the operating system on the blade server without using ServerGuide.

If you have already configured the blade server hardware and you are not using the ServerGuide program to install the operating system, complete the following steps to download the latest operating-system installation instructions from the IBM website.

Note: Changes are made periodically to the IBM website. The actual procedure might vary slightly from what is described in this document.

1. Go to <http://www.ibm.com/supportportal/>.
2. Under **Support type**, select **BladeCenter**.
3. Under **Popular links**, select **Operating system installation**.
4. Under **Choose the system you want instructions for**, click **BladeCenter HX5**.
5. From the **Installation** list, select your operating system to display the available installation documents.

Using IBM ServerGuide Scripting Toolkit

The ServerGuide Scripting Toolkit is a collection of system-configuration tools and installation scripts that you can use to deploy software to your IBMBladeCenter blade server in a repeatable, predictable manner. When used with IBM ServerGuide, the ServerGuide Scripting Toolkit provides a total solution for deploying IBMBladeCenter blade servers in an unattended mode.

For more information about using the IBM ServerGuide Scripting Toolkit, see <https://www.ibm.com/systems/support/supportsite.wss/docdisplay?Indocid=TOOL-CENTER&brandind=5000016><https://www.ibm.com/systems/support/supportsite.wss/docdisplay?Indocid=TOOL-CENTER&brandind=5000016>.

Chapter 6. Accessing the IMM

Unlike a baseboard management controller, the IMM does not require IPMI device drivers or USB daemons for in-band IMM communication. Instead, a LAN over USB interface enables in-band communications to the IMM; the IMM hardware on the system board presents an internal Ethernet interface from the IMM to the operating system. LAN over USB is also called the *USB in-band interface* in the IMM web interface.

In a scalable blade complex, each IMM is shown as a LAN over USB device in the operating system. For each blade server in the scalable blade complex to be a unique and known IP address, both blade servers have different default IP addresses. The default IP address for the primary blade server is 169.254.95.118, and the Keyboard Controller Style (KCS) address is 0x6CA8.

For packets to be routed correctly from the host to the IMM, each of the LAN over USB interfaces must appear on a separate subnet to the host. The IMM implements a DHCP server that services only the LAN over USB interface. It assigns the subnet mask on the LAN over USB interfaces for the host to 255.255.255.0.

The following table shows the IP addresses for each of the blade servers in a complex.

Table 14. LAN over USB addresses

Blade server	Logical node ID	IMM IP address	Host address	Host subnet	Host subnet mask	Keyboard Controller Style (KCS) address
Primary	0	169.265.95.-118	169.254.95.-120	169.254.95.0/24	255.255.255.0	0x8CA6
Secondary	1	169.265.96.-118	169.254.96.-120	169.254.96.0/24	255.255.255.0	0x8CA8

LAN over USB devices are not aware of LAN over USB devices in other partitions. If you configure the two blade servers as two independent partitions in a scalable blade complex, each blade server is considered to the primary blade server of the hardware partition that contains that blade server. The logical ID of the primary in each partition is 0 and the default IP address of each primary blade server is 169.254.95.118.

Potential conflicts with the LAN over USB interface

In some situations, the IMM LAN over USB interface can conflict with certain network configurations, applications, or both.

For example, Open MPI (Message Passing Interface) attempts to use all the available network interfaces on a server. Open MPI detects the IMM LAN over USB interface and attempts to use it to communicate with other systems in a clustered environment. The LAN over USB interface is an internal interface, so this interface does not work for external communication with other systems in the cluster.

Resolving conflicts with the IMM LAN over USB interface

Use any of the following actions to resolve LAN over USB conflicts with network configurations and applications.

- For conflicts with Open MPI, configure the application so that it does not attempt to use this interface.
- Take down the interface (run **ifdown** under Linux).

- Remove the device driver (run **rmmod** under Linux).
- Disable the LAN over USB interface from the advanced management module web interface:
 1. Log in to the AMM web interface.
 2. In the navigation pane, click **Blade Configuration** under the **Blade Tasks** heading.
 3. Scroll down to the Service Processor LAN over USB interface on the Blade Configuration web page. The section lists all blades in the chassis that can enable or disable the LAN over USB interface.
 4. Select the check boxes next to the blade servers that you want to enable or disable.
 5. Click **Disable** to disable the LAN over USB interface on the selected blade servers.

Configuring the LAN over USB interface manually

An IMM must be configured to use the LAN over USB interface. The firmware update package or Advanced Settings Utility attempt to perform the setup automatically, if needed. If the automatic setup fails or if you prefer to set up the LAN over USB manually, use one of the following processes.

For more information about LAN over USB configuration on different operating systems, see the IBM white paper *Transitioning to UEFI and IMM* at "" on page .

Installing the LAN over USB Windows device driver

When you install a Windows operating system, there will be an unknown RNDIS device in the Device Manager. IBM provides a Windows INF file that identifies this device. The signed version of the INF file is included in all of the Windows versions of the IMM, UEFI, and DSA update packages. Complete the following steps to install `ibm_rndis_server_os.inf`.

Note: You only have to perform these steps if the server is running a Windows operating system and the `ibm_rndis_server_os.inf` file has not been previously installed. The file only has to be installed once. It is required by Windows operating systems to detect and use the LAN over USB functionality.

1. Obtain a Windows version of the server UEFI code package (see "Updating firmware and device drivers" on page 84 for more information).
2. Extract the `ibm_rndis_server_os.inf` and `device.cat` files from the firmware update package and copy them to the `\WINDOWS\inf` subdirectory.

Note: You can use the `-x path` command-line interface option to extract the files. For more information about this option, see the readme file that comes with the update package.

3. (Windows 2003) Install the `ibm_rndis_server_os.inf` file by right-clicking the file and clicking **Install**. This generates a PNF file of the same name in `\WINDOWS\inf`. (Windows 2008) Click **Computer Management**, then **Device Manager** and find the RNDIS Device. Click **Properties > Driver > Reinstall driver**. Point the server to the `\Windows\inf` directory where it can find the `ibm_rndis_server_os.inf` file and install the device.
4. Click **Computer Management** then **Device Manager**. Right-click **Network adapters** and select **Scan for hardware changes**. A small pop-up confirms that the Ethernet device is found and installed. The New Hardware Wizard starts automatically.
5. When you are prompted Can Windows connect to Windows Update to search for software?, select **No, not this time**. Click **Next** to continue.
6. When you are prompted What do you want the wizard to do?, select **Install from a list or specific location (Advanced)**. Click **Next** to continue.
7. When you are prompted Please choose your search and installation options, select **Don't search. I will choose the driver to install**. Click **Next** to continue.
8. When you are prompted Select a hardware type, and then click Next, select **Network adapters**. Click **Next** to continue.

9. When you are prompted with the statement Completing the Found New Hardware Wizard, click **Finish**.

Note: A new local area connection appears. If the message This connection has limited or no connectivity is displayed, ignore this message.

10. Return to the Device Manager. **IBM USB Remote NDIS Network Device** appears under **Network Adapters**.
11. Use the **Network Configuration** option of the Setup utility to view or set the IP address. See Table 14 “LAN over USB addresses” on page 109 for information about the IP addresses. See “Using the Setup utility” on page 74 for information about the Setup utility.

Installing the LAN over USB Linux device driver

Versions of Linux since RHEL5 Update 3 and SLES10 Service Pack 2 support the LAN over USB interface by default. This interface is detected and displayed during the installation of these operating systems.

See Table 14 “LAN over USB addresses” on page 109 for information about the IP addresses.

Note: Older Linux distributions might not detect the LAN over USB interface, and might require manual configuration. For information about configuring LAN over USB on specific Linux distributions, see the IBM white paper *Transitioning to UEFI and IMM at “”* on page .

The IMM LAN over USB interface requires that the `usbnet` and `cdc_ether` device drivers be loaded. If the drivers have not been installed, use `modprobe` to install them. When these drivers are installed, the IMM USB network interface is shown as a network device in the operating system. To discover the name that the operating system has assigned to the IMM USB network interface, type:

```
dmesg | grep -i cdc_ether
```

Chapter 7. Solving problems

Use these instructions to solve any problems that you might encounter when you install the blade server.

If you install the blade server in the BladeCenter unit and the blade server does not start, perform the following actions:

- Make sure that the BladeCenter unit is correctly connected to a power source.
- Reseat the blade server in the BladeCenter unit (see “Installing a blade server in a BladeCenter chassis” on page 70).
- If the power-on LED is flashing slowly, turn on the blade server (see “Turning on the blade server” on page 15).
- If you have just added a new optional device or component, make sure that it is correctly installed and compatible with the blade server and its components. If the device or component is not compatible, remove it from the blade server, reinstall the blade server in the BladeCenter unit, and then restart the blade server.

If the blade server does not start after you have performed the preceding actions, see the *Problem Determination and Service Guide* for your blade server on the IBM Documentation CD.

Diagnostic tools overview

Use this overview to locate specific diagnostic tools to diagnose and solve hardware-related problems.

The following tools are available to help you diagnose and solve hardware-related problems:

- **POST codes, error messages, and error logs**

The POST error codes indicate the detection of a problem. See the *Problem Determination and Service Guide* for more information.

- **Troubleshooting tables**

These tables list problem symptoms and actions to correct the problems. See the *Problem Determination and Service Guide* for your blade server.

- **Light path diagnostics** Use light path diagnostics LEDs on the system board to diagnose system errors. If the system-error LED on the system LED panel on the front or rear of the BladeCenter chassis is lit, one or more error LEDs on the BladeCenter chassis components also might be lit. These LEDs help identify the cause of the problem. Blade server error LEDs are described in the *Problem Determination and Service Guide* for your blade server.

- **Dynamic System Analysis (DSA) Portable Edition diagnostic program** DSA tests the major components of the BladeCenter unit, including the management modules, I/O modules, removable-media drives, and the blade servers, while the operating system is running. For documentation and download information for DSA, see <http://www.ibm.com/systems/management/>. For more information about diagnostic programs and error messages, see the *Problem Determination and Service Guide*.

Note: If you are unable to find the system error logs in the blade server firmware code, view the advanced management module event log.

- **Dynamic System Analysis (DSA) Preboot diagnostic program** The DSA Preboot diagnostic programs are stored in read-only memory. DSA Preboot collects and analyzes system information, as well as offers a rich set of diagnostic tests to aid in diagnosing server problems. The diagnostic programs collect the following information about the server:

- Drive health information
- Event logs for ServeRAID controllers and service processors
- Hardware inventory, including PCI and USB information
- Light path diagnostics status
- LSI RAID and controller configuration
- Network interfaces and settings
- ServeRAID configuration
- Service processor status and configuration
- System configuration
- Vital product data, firmware, and Unified Extensible Firmware Interface (UEFI) configuration
- Microprocessor, input/output hub, and UEFI error logs
- Scalability Link status

DSA creates a DSA log, which is a chronologically ordered merge of the system-event log (as the IPMI event log), the integrated management module (IMM) chassis-event log (as the ASM event log), and the operating-system event logs. You can send the DSA log as a file to IBM service or view the information as a text file or HTML file.

DSA Preboot offers the following diagnostic tests of your server:

- Microprocessor
- Memory
- IMM I²C
- Optical (CD or DVD) drive
- Hard disk drive
- Ethernet controller

For more information about diagnostic programs and error messages, see the *Problem Determination and Service Guide*.

ServerGuide problems

Use this information to diagnose ServerGuide problems and suggested actions.

The following table lists problem symptoms and suggested solutions.

Symptom	Action
The <i>ServerGuide Setup and Installation</i> CD will not start.	<ul style="list-style-type: none"> • Make sure that the CD drive is associated with the blade server that you are configuring. • Make sure that the blade server supports the ServerGuide program and has a bootable CD (or DVD) drive. • If the startup (boot) sequence settings have been changed, make sure that the CD drive is first in the startup sequence.
The ServerGuide program will not start the operating-system CD.	Make sure that the operating-system CD is supported by the ServerGuide program. See the <i>ServerGuide Setup and Installation</i> CD label for a list of supported operating-system versions.

Appendix A. Getting help and technical assistance

If you need help, service, or technical assistance or just want more information about IBM products, you will find a wide variety of sources available from IBM to assist you.

Use this information to obtain additional information about IBM and IBM products, determine what to do if you experience a problem with your IBM system or optional device, and determine whom to call for service, if it is necessary.

Before you call

Before you call, make sure that you have taken these steps to try to solve the problem yourself.

If you believe that you require IBM to perform warranty service on your IBM product, the IBM service technicians will be able to assist you more efficiently if you prepare before you call.

- Check all cables to make sure that they are connected.
- Check the power switches to make sure that the system and any optional devices are turned on.
- Check for updated software, firmware, and operating-system device drivers for your IBM product. The IBM Warranty terms and conditions state that you, the owner of the IBM product, are responsible for maintaining and updating all software and firmware for the product (unless it is covered by an additional maintenance contract). Your IBM service technician will request that you upgrade your software and firmware if the problem has a documented solution within a software upgrade.
- If you have installed new hardware or software in your environment, check <http://www.ibm.com/systems/info/x86servers/serverproven/compat/us> to make sure that the hardware and software is supported by your IBM product.
- Go to <http://www.ibm.com/supportportal> to check for information to help you solve the problem.
- Gather the following information to provide to IBM Support. This data will help IBM Support quickly provide a solution to your problem and ensure that you receive the level of service for which you might have contracted.
 - Hardware and Software Maintenance agreement contract numbers, if applicable
 - Machine type number (IBM 4-digit machine identifier)
 - Model number
 - Serial number
 - Current system UEFI and firmware levels
 - Other pertinent information such as error messages and logs
- Go to http://www.ibm.com/support/entry/portal/Open_service_request to submit an Electronic Service Request. Submitting an Electronic Service Request will start the process of determining a solution to your problem by making the pertinent information available to IBM Support quickly and efficiently. IBM service technicians can start working on your solution as soon as you have completed and submitted an Electronic Service Request.

You can solve many problems without outside assistance by following the troubleshooting procedures that IBM provides in the online help or in the documentation that is provided with your IBM product. The documentation that comes with IBM systems also describes the diagnostic tests that you can perform. Most systems, operating systems, and programs come with documentation that contains troubleshooting procedures and explanations of error messages and error codes. If you suspect a software problem, see the documentation for the operating system or program.

Using the documentation

Information about your IBM system and preinstalled software, if any, or optional device is available in the documentation that comes with the product. That documentation can include printed documents, online documents, readme files, and help files.

See the troubleshooting information in your system documentation for instructions for using the diagnostic programs. The troubleshooting information or the diagnostic programs might tell you that you need additional or updated device drivers or other software. IBM maintains pages on the World Wide Web where you can get the latest technical information and download device drivers and updates. To access these pages, go to <http://www.ibm.com/supportportal>.

Getting help and information from the World Wide Web

Up-to-date information about IBM products and support is available on the World Wide Web.

On the World Wide Web, up-to-date information about IBM systems, optional devices, services, and support is available at <http://www.ibm.com/supportportal>. IBM System x information is at <http://www.ibm.com/systems/x>. IBM BladeCenter information is at <http://www.ibm.com/systems/bladecenter>. IBM IntelliStation information is at <http://www.ibm.com/systems/intellistation>.

How to send DSA data to IBM

Use the IBM Enhanced Customer Data Repository to send diagnostic data to IBM.

Before you send diagnostic data to IBM, read the terms of use at <http://www.ibm.com/de/support/ecurep/terms.html>.

You can use any of the following methods to send diagnostic data to IBM:

- **Standard upload:** http://www.ibm.com/de/support/ecurep/send_http.html
- **Standard upload with the system serial number:** http://www.ecurep.ibm.com/app/upload_hw
- **Secure upload:** http://www.ibm.com/de/support/ecurep/send_http.html#secure
- **Secure upload with the system serial number:** https://www.ecurep.ibm.com/app/upload_hw

Creating a personalized support web page

You can create a personalized support web page by identifying IBM products that are of interest to you.

To create a personalized support web page, go to <http://www.ibm.com/support/mynotifications>. From this personalized page, you can subscribe to weekly email notifications about new technical documents, search for information and downloads, and access various administrative services.

Software service and support

Through IBM Support Line, you can get telephone assistance, for a fee, with usage, configuration, and software problems with your IBM products.

For information about which products are supported by Support Line in your country or region, see <http://www.ibm.com/services/supline/products>.

For more information about Support Line and other IBM services, see <http://www.ibm.com/services> or see <http://www.ibm.com/planetwide> for support telephone numbers. In the U.S. and Canada, call 1-800-IBM-SERV (1-800-426-7378).

Hardware service and support

You can receive hardware service through your IBM reseller or IBM Services.

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In the U.S. and Canada, hardware service and support is available 24 hours a day, 7 days a week. In the U.K., these services are available Monday through Friday, from 9 a.m. to 6 p.m.

IBM Taiwan product service

Use this information to contact IBM Taiwan product service.

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

IBM Taiwan product service contact information:

IBM Taiwan Corporation
3F, No 7, Song Ren Rd.
Taipei, Taiwan
Telephone: 0800-016-888

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Processor speed indicates the internal clock speed of the microprocessor; other factors also affect application performance.

CD or DVD drive speed is the variable read rate. Actual speeds vary and are often less than the possible maximum.

When referring to processor storage, real and virtual storage, or channel volume, KB stands for 1024 bytes, MB stands for 1,048,576 bytes, and GB stands for 1,073,741,824 bytes.

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Maximum internal hard disk drive capacities assume the replacement of any standard hard disk drives and population of all hard disk drive bays with the largest currently supported drives that are available from IBM.

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Each solid-state memory cell has an intrinsic, finite number of write cycles that the cell can incur. Therefore, a solid-state device has a maximum number of write cycles that it can be subjected to, expressed as total bytes written (TBW). A device that has exceeded this limit might fail to respond to system-generated commands or might be incapable of being written to. IBM is not responsible for replacement of a device that has exceeded its maximum guaranteed number of program/erase cycles, as documented in the Official Published Specifications for the device.

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Attention: Airborne particulates (including metal flakes or particles) and reactive gases acting alone or in combination with other environmental factors such as humidity or temperature might pose a risk to the device that is described in this document.

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

Table 15. Limits for particulates and gases

Contaminant	Limits
Particulate	<ul style="list-style-type: none"> The room air must be continuously filtered with 40% atmospheric dust spot efficiency (MERV 9) according to ASHRAE Standard 52.2¹. Air that enters a data center must be filtered to 99.97% efficiency or greater, using high-efficiency particulate air (HEPA) filters that meet MIL-STD-282. The deliquescent relative humidity of the particulate contamination must be more than 60%². The room must be free of conductive contamination such as zinc whiskers.
Gaseous	<ul style="list-style-type: none"> Copper: Class G1 as per ANSI/ISA 71.04-1985³ Silver: Corrosion rate of less than 300 Å in 30 days
<p>¹ ASHRAE 52.2-2008 - <i>Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size</i>. Atlanta: American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.</p> <p>² The deliquescent relative humidity of particulate contamination is the relative humidity at which the dust absorbs enough water to become wet and promote ionic conduction.</p> <p>³ ANSI/ISA-71.04-1985. <i>Environmental conditions for process measurement and control systems: Airborne contaminants</i>. Instrument Society of America, Research Triangle Park, North Carolina, U.S.A.</p>	

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International Business Machines Corp.
New Orchard Road
Armonk, New York 10504
914-499-1900

European Community contact:

IBM Deutschland GmbH
Technical Regulations, Department M372
IBM-Allee 1, 71139 Ehningen, Germany
Telephone: +49 7032 15 2941
Email: lugi@de.ibm.com

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Technical Regulations, Abteilung M372
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