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IBM BladeCenter HS22 Technical Introduction

The IBM® BladeCenter® HS22 is a two-socket blade server running the latest Intel® Xeon processors. It is ideal for infrastructure, virtualization and enterprise business applications and is compatible with all IBM BladeCenter chassis.

This paper is a comprehensive technical introduction to the IBM BladeCenter HS22.

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Introduction

The HS22 supports up to two Intel Xeon® Processor 5500 series dual-core or quad-core processors, 12 DIMMs modules, two hot-swap drives, two PCI Express connectors, and one internal USB connector. The HS22 is shown in Figure 1.

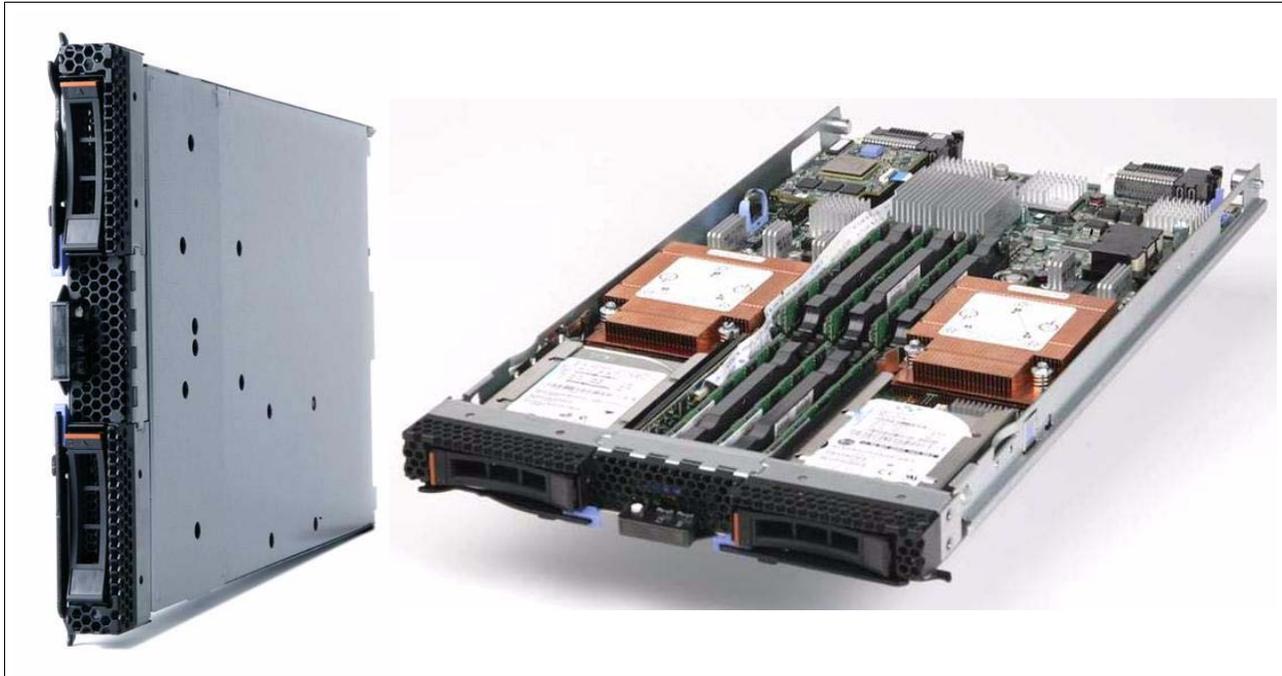


Figure 1 The HS22 type 7870

The features of the HS22 are listed in Table 1 on page 2.

Table 1 Features of the HS22 type 7870

Feature	
Processor options	Intel Xeon 5500 Processor Series quad-core processors Intel Xeon 5500 Processor Series dual-core processors
Number of processors (std/max)	1 / 2
Memory Speed	800 MHz, 1033 MHz or 1333 MHz (dependant on processor model)
Cache	4 MB or 8 MB (shared between cores)
Memory	12 DIMM slots / 96 GB maximum using 8 GB DIMMs
Memory Type	DDR 3 ECC Very Low Profile (VLP) Registered DIMM
Hot Swap Disk Drives (std/max)	0 / 2 (SAS, SATA or SSD)
Maximum internal storage	Optional: Up to two 2.5" hot-swap SAS or SATA HDDs Optional: Up to two 2.5" hot-swap solid state drives
Network	Two ports, One Broadcom BCM5709S dual-port Gigabit Ethernet controller, TOE
I/O upgrade	Two PCI Express connectors (CFFh and CIOv form factors)

The components on the system board of the HS22 are shows in Figure 2.

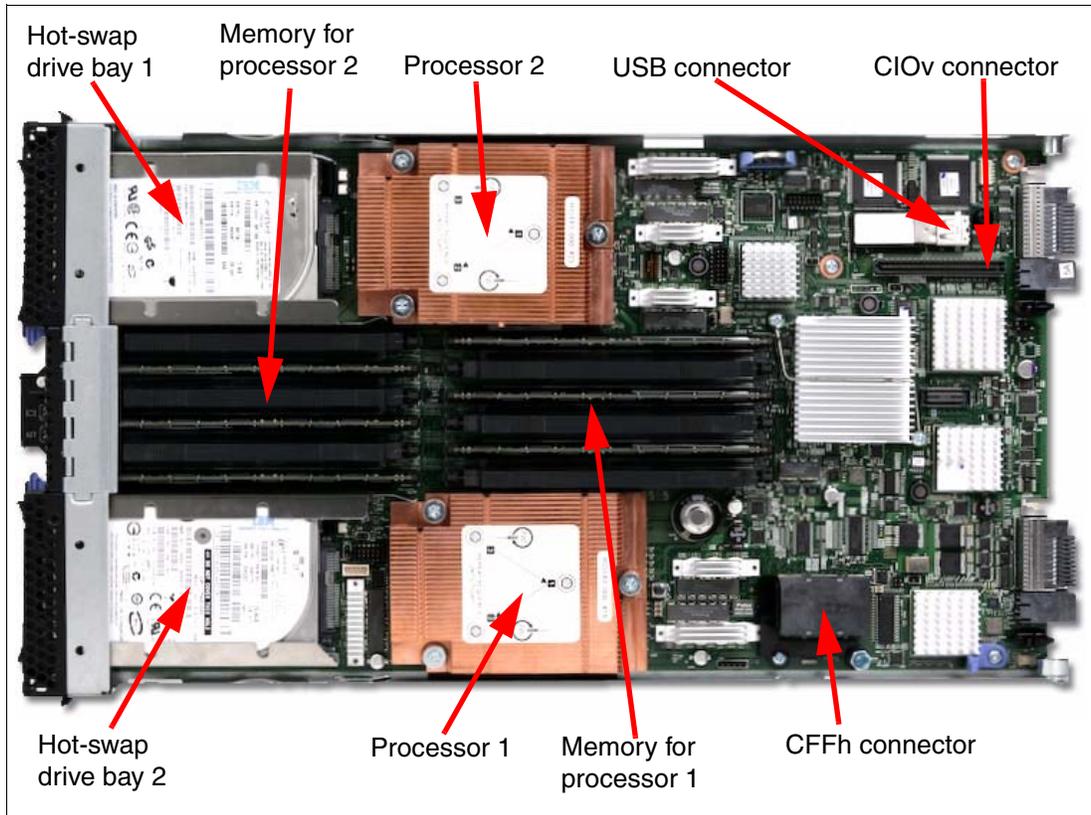


Figure 2 Layout of the HS22 system board

Model information

The models of the HS22 are shown in Table 2.

Table 2 Models of the HS22 type 7870

Server models ^a	Processor model	Clock speed	Number of processors (std/max)	Number of cores	Shared cache size	Maximum memory speed	Memory (std / max ^b)
7870 - D2x	Intel Xeon E5502	1.86 GHz	1 / 2	2	4 MB	800 MHz	2x 1 GB / 96 GB
7870 - CCx ^c	Intel Xeon E5504	2.00 GHz	1 / 2	4	4 MB	800 MHz	2x 1 GB / 96 GB
7870 - A2x	Intel Xeon E5504	2.00 GHz	1 / 2	4	4 MB	800 MHz	2x 1 GB / 96 GB
7870 - L2x ^d	Intel Xeon L5520	2.26 GHz	1 / 2	4	8 MB	1066 MHz	2x 2 GB / 96 GB
7870 - B3x	Intel Xeon E5530	2.40 GHz	1 / 2	4	8 MB	1066 MHz	2x 2 GB / 96 GB
7870 - B4x	Intel Xeon E5540	2.53 GHz	1 / 2	4	8 MB	1066 MHz	2x 2 GB / 96 GB
7870 - C3x	Intel Xeon X5560	2.80 GHz	1 / 2	4	8 MB	1333 MHz	2x 2 GB / 96 GB
7870 - C4x	Intel Xeon X5570	2.93 GHz	1 / 2	4	8 MB	1333 MHz	2x 2 GB / 96 GB

a. Model numbers provided are worldwide generally available variant (GAV) model numbers which are not orderable as listed and need to be modified by country. The U.S. GAV model numbers use the following nomenclature: xxU. For example, the U.S. orderable part number for 7870-A2x is 7870-A2U. See the product-specific Official IBM announcement letter for other country-specific GAV model numbers.

- b. Maximum system memory capacity of 96GB is based on using 12 x 8GB memory DIMMs
- c. The HS22 7870-CCx model includes a Broadcom 2-Port 10Gbit CFFh I/O Expansion card
- d. Designated as a low power processor model

Processor

The HS22 type 7870 features the new powerful Xeon 5500 series processor. With the Xeon 5500 series processors, Intel has moved the memory controller into the processor and no longer has to rely on a front-side bus architecture to access memory. The memory is now directly connected to the processor.

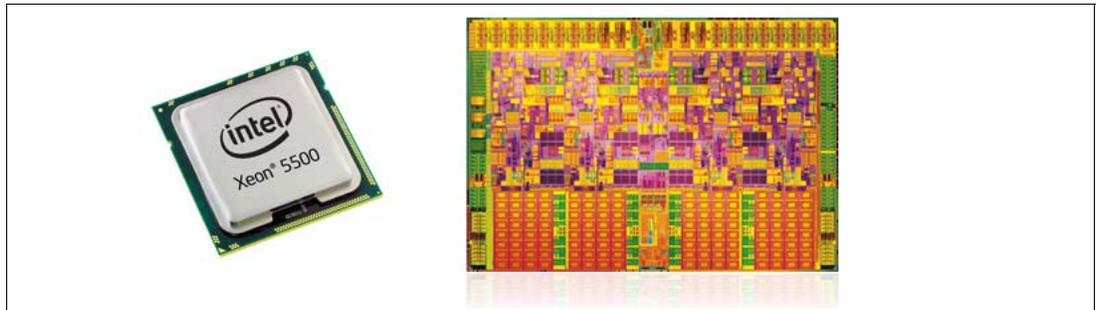


Figure 3 The Intel Xeon 5500 series processor (left) and the Xeon 5500 processor die

The two Xeon 5500 processors in the HS22 are connected through a serial coherency link called QuickPath Interconnect (QPI) as shown in Figure 4 on page 4. The QPI link is capable of up to 6.4 Giga-transfers per second (GTps), depending on the processor model. The *Tylersburg* I/O hub chip is also connected to each processor via another QPI link.

Figure 4 shows the major component of the HS22 system.

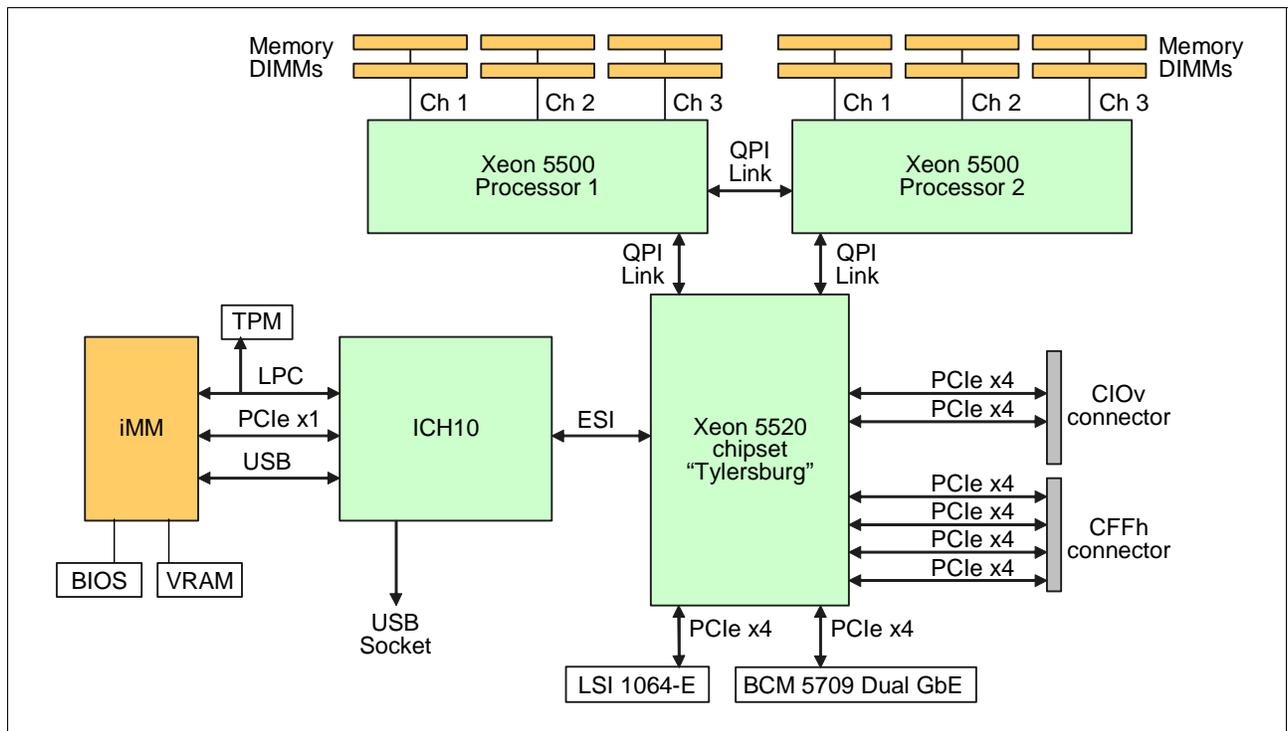


Figure 4 HS22 processor board block diagram

The blade server HS22 type 7870 supports either:

- ▶ Up to two Intel Xeon Processor 5500 Series (Nehalem-EP) quad-core processors
- ▶ Up to two Intel Xeon Processor 5500 Series (Nehalem-EP) dual-core processors

In a two-socket configuration, both processors must be identical.

The Intel Xeon 5500 series processors are available in various clock speeds and have standard and low power offerings. The processors support the following Intel technologies:

- ▶ QuickPath Technology
- ▶ Intel Turbo Boost Technology
- ▶ Intel Hyper-Threading Technology
- ▶ Intel Virtualization Technology
- ▶ Intelligent Power Capability
- ▶ Intel 64 Technology

Table 3 lists the different processor models available for the HS22.

Table 3 Intel Xeon 5500 Series processor features

Processor number	Processor frequency	Turbo	HT	L3 cache	Cores	Power	QPI Link speed ^a	Max DDR3 memory speed
Performance (X)								
Xeon X5570	2.93 GHz	Yes	Yes	8 MB	4	95 W	6.4 GT/s	1333 MHz
Xeon X5560	2.80 GHz	Yes	Yes	8 MB	4	95 W	6.4 GT/s	1333 MHz
Xeon X5550	2.66 GHz	Yes	Yes	8 MB	4	95 W	6.4 GT/s	1333 MHz
Mainstream (E)								
Xeon E5540	2.53 GHz	Yes	Yes	8 MB	4	80 W	5.86 GT/s	1066 MHz
Xeon E5530	2.40 GHz	Yes	Yes	8 MB	4	80 W	5.86 GT/s	1066 MHz
Xeon E5520	2.26 GHz	Yes	Yes	8 MB	4	80 W	5.86 GT/s	1066 MHz
Xeon E5506	2.13 GHz	No	No	4 MB	4	80 W	4.8 GT/s	800 MHz
Xeon E5504	2.00 GHz	No	No	4 MB	4	80 W	4.8 GT/s	800 MHz
Xeon E5502	1.86 GHz	No	No	4 MB	2	80 W	4.8 GT/s	800 MHz
Power-optimized (L)								
Xeon L5520	2.26 GHz	Yes	Yes	8 MB	4	60 W	5.86 GT/s	1066 MHz

a. GT/s = giga transfers per second

The Xeon 5500 series of processors have a number of new features as described in the following sections.

Nehalem architecture

Intel's latest-generation microarchitecture represents the next step in faster, multi-core technology that intelligently maximizes performance to match your workload. It is designed to take advantage of Intel's 45nm high-k metal gate silicon technology. The architecture uses parallel processing enabled by an integrated memory controller and Intel QuickPath Technology providing high-speed interconnects between independent processing cores.

QuickPath Technology

Intel QuickPath Technology is a platform architecture that provides high-speed (up to 25.6 GBps), point-to-point connections between processors, and between processors and the I/O hub. Each processor has its own dedicated memory that it accesses directly through an Integrated Memory Controller. In cases where a processor needs to access the dedicated memory of another processor, it can do so through a high-speed QuickPath Interconnect (QPI) that links all the processors.

Intel Turbo Boost Technology

Turbo Boost Technology dynamically turns off unused processor cores and increases the clock speed of the cores in use. It will increase the frequency in steps of 133MHz (to a maximum of three steps or 400 MHz) as long as the processors predetermined thermal and electrical requirements are still met.

For example, with three cores active, a 2.26 GHz processor can run the cores at 2.4 GHz. With only one or two cores active, the same processor can run those cores at 2.53 GHz. Similarly, a 2.93 GHz processor can run at 3.06 GHz or even 3.33 GHz. When the cores are needed again, they are dynamically turned back on and the processor frequency is adjusted accordingly. This feature can be enabled or disabled in the UEFI BIOS.

For more information on Intel Turbo Boost Technology, refer to the following URL.

<http://www.intel.com/technology/turboboost/>

Intel Hyper-Threading Technology

Boosts performance for parallel, multi-threaded applications. Intel Hyper-Threading Technology enables simultaneous multi-threading within each processor core, up to two threads per core or eight threads per quad-core processor. Hyperthreading reduces computational latency, making optimal use of every clock cycle. This feature can be enabled or disabled in the UEFI BIOS.

Intelligent Power Capability

Intelligent Power Capability powers individual processor elements on and off as needed, to reduce power draw.

Intel Virtualization Technology

Improvements to Intel Virtualization Technology (Intel VT-x) provides hardware-assisted page-table management, allowing the guest operating system more direct access to the hardware and reducing compute-intensive software translation from the VMM. Intel VT-x also includes Intel VT FlexMigration and Intel VT Flex-Priority, which are capabilities for flexible workload migration and performance optimization across the full range of 32-bit and 64-bit operating environments.

For more information on Intel Virtualization Technology, refer to the following URL.

<http://www.intel.com/technology/virtualization/technology.htm>

Table 4 lists the processor options for the HS22.

Table 4 List of processors for the HS22 type 7870

Description	Part number	Feature code	Supported model
Intel Xeon X5570 QC 2.93 GHz 8 MB Cache 1333 MHz	44T1887	1033	C4x
Intel Xeon X5560 QC 2.66 GHz 8 MB Cache 1333 MHz	44T1886	1032	C3x

Description	Part number	Feature code	Supported model
Intel Xeon X5550 QC 2.66 GHz 8 MB Cache 1333 MHz	44T1885	1031	CTO
Intel Xeon E5540 QC 2.53 GHz 8 MB Cache 1066 MHz	44T1884	1030	B4x
Intel Xeon E5530 QC 2.40 GHz 8 MB Cache 1066 MHz	44T1883	1029	B3x
Intel Xeon E5520 QC 2.26 GHz 8 MB Cache 1066 MHz	44T1736	1028	CTO
Intel Xeon L5520 QC 2.26 GHz 8 MB Cache 1066 MHz	46M0697	7793	L2x
Intel Xeon E5506 QC 2.13 GHz 4 MB Cache 800 MHz	43W5987	1027	CTO
Intel Xeon E5504 QC 2.00 GHz 4 MB Cache 800 MHz	44T1712	1026	A2x, CCx
Intel Xeon E5502 DC 1.86 GHz 4 MB Cache 800 MHz	43W5986	5369	D2x

For more information on the Intel Xeon 5500 series processor refer to the following URL.

http://www.intel.com/p/en_US/products/server/processor/xeon5000

Memory

The HS22 has six DIMM sockets per processor, supporting up to 96 GB of memory when using 8 GB DIMM modules and with both processors installed. The HS22 uses registered Double Data Rate-3 (DDR-3) VLP (very-low-profile) DIMMs and provides ECC and advanced Chipkill memory protection.

Unlike previous generations of Intel Xeon processors, the Xeon 5500 series processors have an integrated memory controller. The HS22 has 12 memory DIMM sockets in total as shown in Figure 5 on page 7. The memory DIMMs connects directly to one of the processors. With one processor installed only six DIMM modules can be accessed. To access memory in the other six DIMM connectors requires that the second processor be installed.

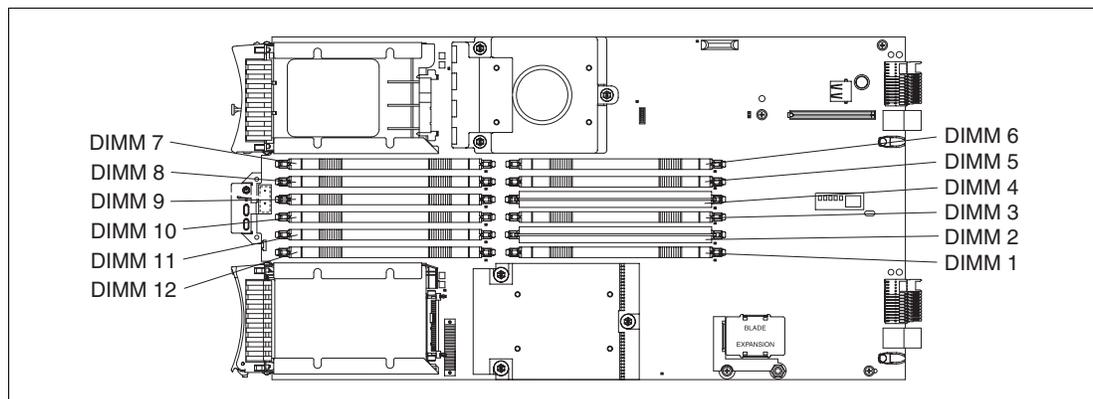


Figure 5 DIMM layout on the HS22 system board

Table 5 shows which memory DIMM connectors are connected to each processor.

Table 5 Memory Channel Configuration

Processor	Memory channel	DIMM connector
1	Channel 0	DIMM connector 1 and 2
	Channel 1	DIMM connector 5 and 6
	Channel 2	DIMM connector 3 and 4
2	Channel 3	DIMM connector 7 and 8
	Channel 4	DIMM connector 11 and 12
	Channel 5	DIMM connector 9 and 10

Table 6 lists the memory options for the HS22.

Table 6 List of memory modules for the HS22 type 7870

Part Number	Feature Code	Description	Rank	Max memory speed
44T1485	1072	1 GB (1x 1GB) Single Rank PC3-10600 CL9 ECC DDR3-1333 VLP Low Power RDIMM	Single	1333 MHz
44T1487	1073	2 GB (1x 2GB) Single Rank PC3-10600 CL9 ECC DDR3-1333 VLP RDIMM	Single	1333 MHz
44T1486	1916	2 GB (1x 2GB) Dual Rank PC3-10600 CL9 ECC DDR3-1333 VLP Low Power RDIMM	Dual	1333 MHz
44T1488	1074	4 GB (1x 4GB) Dual Rank PC3-10600 CL9 ECC DDR3-1333 VLP RDIMM	Dual	1333 MHz
44T1579 ^a	1911	8 GB (1x 8GB) Dual Rank PC3-8500 CL7 ECC DDR3-1066 VLP RDIMM	Dual	1066 MHz

a. The 8 GB Dual Rank DIMM (44T1579) has a maximum memory speed of 1066 MHz

Memory Modes

The HS22 type 7870 supports two different memory modes. These modes can be selected in the UEFI BIOS setup.

Independent channel mode

Independent channel mode gives a maximum of 48 GB of usable memory with one CPU installed, and 96 GB of usable memory with 2 CPUs installed (using 8 GB DIMMs). The DIMMs can be installed without matching sizes. Independent channel mode is the most appropriate memory mode for most HS22 configurations.

Note: If the ServeRAID MR10ie is installed, the battery is installed in DIMM slot 7. Therefore DIMM slot 7 cannot be used for memory. This will limit the total amount of memory that can be installed.

Memory mirroring

Memory mirroring works much like disk mirroring and provides high server availability in the event of a memory DIMM failure. The total memory is divided into two channels, the third channel is unused. Data is written concurrently to both channels. With mirroring enabled only one-third of total memory is available for use as two DIMM slots are the primary channel, two DIMM slots are the backup channel and two DIMM slots are not used. Due to the double

writes to memory, performance is affected. See Figure 6 for the HS22 memory mirroring layout.

If a DIMM fails in one of the DIMMs in the primary channel, it is instantly disabled and the mirrored (backup) memory in the other channel becomes active (primary) until the failing DIMM is replaced. Mirroring is handled at the hardware level and no operating system support is required.

Note: If the ServeRAID MR10ie is installed, the battery is installed in DIMM slot 7. Therefore DIMM slot 7 cannot be used for mirroring. This will limit the amount of memory available when using memory mirroring.

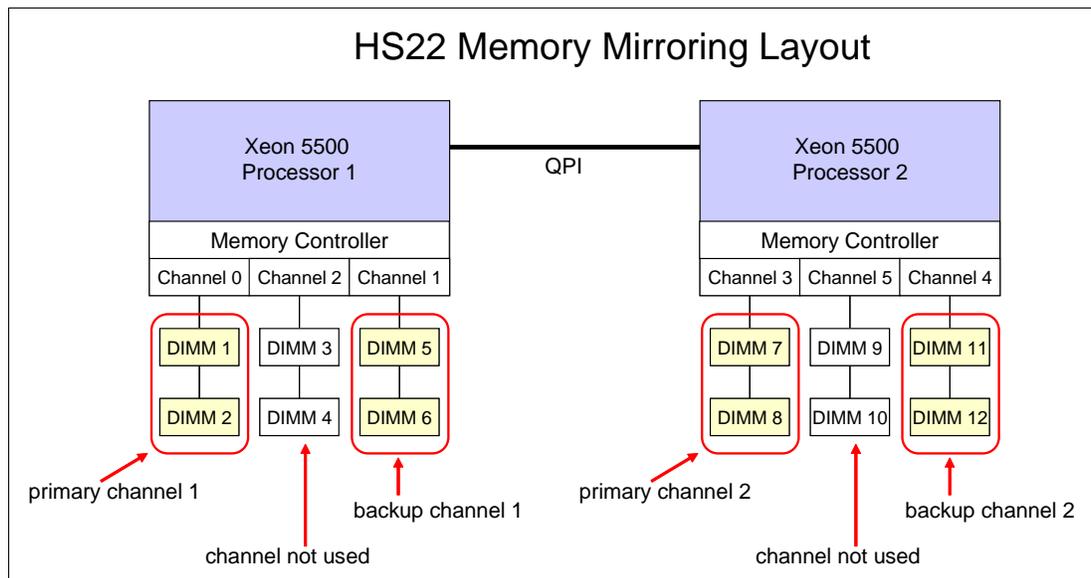


Figure 6 The HS22 type 7870 memory mirroring layout

Factors that affect memory performance

Memory configuration can be critical in the HS22 and there are several things to consider to achieve optimal memory subsystem performance.

The memory controller in the HS22 is integrated into the Intel Xeon 5500 processor. In the HS22, each processor has three memory channels, with two DIMM sockets per channel. The HS22 will boot with one memory DIMM installed and most models of HS22 come standard with two memory DIMMs, however the recommended memory configuration is to balance the memory across all the memory channels on each processor to utilize the available memory bandwidth. This means the recommended memory configuration is:

- ▶ Three or six memory DIMMs in a single processor server
- ▶ Six or 12 memory DIMMs in a dual processor server

The more memory DIMMs per channel, the slower the memory will run. A Xeon X5570 processor with a total of 12 GB, using one 4 GB DIMM module per memory channel, will run the memory channels at 1333 MHz. The same Xeon X5570 processor with a total of 12 GB, using two 2 GB DIMM modules per memory channel, will run the memory channels at 1066 MHz.

All of the memory channels will clock to the frequency of the slowest channel. So if one channel has a slower memory DIMM module or if one channel is configured with two DIMM

modules while the other channels have one DIMM each, then all memory channels will run at the slower speed.

Not all of the models of the Intel Xeon 5500 series processor support the maximum memory clock speed of 1333 MHz. Some models support a maximum clock speed of up to 1066 MHz and some models support a maximum clock speed of up to 800 MHz. Refer to Table 3 on page 5 for the maximum memory speed supported for a particular model of Intel Xeon 5500 series processor. The 8 GB Dual Rank DIMM (part number 44T1579) has a maximum memory speed of 1066 MHz. See Table 6 on page 8 for the maximum speed supported by each DIMM.

Dual rank DIMMs offer better interleaving and hence better performance than single rank DIMMs. Currently, two of the available memory options are dual rank and operate at up to 1333 MHz:

- ▶ 4 GB memory DIMM, part number 44T1488
- ▶ 2 GB memory DIMM, part number 44T1486

Refer to Table 6 on page 8 for memory DIMMs supported in the HS22.

For best memory performance:

- ▶ Choose a Xeon processor model that can support the highest required maximum memory speed. Some Xeon processor models will only run memory at 800 MHz as shown in the right-most column in Table 3 on page 5.
- ▶ Always populate both processors with equal amounts of memory to ensure a balanced system.
- ▶ Always populate all 3 memory channels on each processor with equal memory capacity.
- ▶ Ensure an even number of ranks are populated per channel.
- ▶ Use dual-rank DIMMs when possible.
- ▶ Disable Memory Mirroring mode.

Mindset change: Memory in Intel servers has historically been installed in pairs (due to interleaving requirements). It was common to see servers configured with 2GB, 4GB, 8GB, 16GB or 32GB of memory installed. With the Xeon 5500 series processors, it is recommended to install memory in triplets for optimal performance. You should therefore configure the HS22 (and other servers with Xeon 5500 processors) with 6GB, 12GB, 24GB or 48GB of memory.

Standard on-board features

The HS22 blade server has the following standard on-board features.

UEFI

The HS22 use an integrated Unified Extensible Firmware Interface (UEFI) next-generation BIOS.

New capabilities include:

- ▶ Human readable event logs – no more beep codes
- ▶ Complete setup solution by allowing adapter configuration function to be moved into UEFI
- ▶ Complete out-of-band coverage by Advance Settings Utility to simplify remote setup

To use all of the features that UEFI offers requires a UEFI aware operating system and adapters. UEFI is fully backwards compatible with legacy BIOS.

For more information about UEFI, see the IBM whitepaper, *Transitioning to UEFI and IMM*, available from:

<http://www.ibm.com/support/docview.wss?uid=psg1MIGR-5079769>

Onboard network adapters

The HS22 includes a dual-port Gigabit Ethernet controller with the following specifications:

- ▶ Broadcom BCM5709S Gigabit Ethernet controller
- ▶ Supports TOE (TCP Offload Engine)
- ▶ Supports failover and load balancing for better throughput and system availability
- ▶ Supports highly secure remote power management using IPMI 2.0
- ▶ Supports Wake on LAN® and PXE (Preboot Execution Environment)
- ▶ Support for IPv4 and IPv6

Integrated systems management processor

The HS22 type 7870 blade server includes an Integrated Management Module (IMM) to monitor server availability, perform Predictive Failure Analysis, etc., and trigger IBM Systems Director alerts. The IMM performs the functions of the Baseboard Management Controller (BMC) of earlier blade servers, and adds the features of the Remote Supervisor Adapter found in System x servers, as well as remote control and remote media. A separate card, like the cKVM card, is no longer required for these functions (the cKVM card is not supported on the HS22).

For more information about the IMM, see the IBM whitepaper, *Transitioning to UEFI and IMM*, available from:

<http://www.ibm.com/support/docview.wss?uid=psg1MIGR-5079769>

Video controller

The Video subsystem in the HS22 is a component of the Integrated Management Module (IMM) and is based on the Matrox G200eV video core with 8 MB of video memory. Table 7 lists the supported video resolutions.

Table 7 Supported video resolutions

Resolution	Maximum refresh
640 x 480	85 Hz
800 x 600	85 Hz
1024 x 768	75 Hz

Trusted Platform Module (TPM)

Trusted computing is an industry initiative that provides a combination of secure software and secure hardware to create a trusted platform. It is a specification that increases network security by building unique hardware IDs into computing devices.

The HS22 implements TPM Version 1.2 support.

The trusted platform module (TPM) in the HS22 is one of the three layers of the trusted computing initiative as shown in Table 8.

Table 8 Trusted computing layers

Layer	Implementation
Level 1: Tamper-proof hardware, used to generate trustable keys	Trusted Platform Module
Level 2: Trustable platform	UEFI or BIOS Intel processor
Level 3: Trustable execution	Operating system Drivers

Local storage

The HS22 blade server features an onboard LSI Logic 53C1064E SAS controller with two hot swap drives bay accessible from the front of the blade server. The LSI Logic 53C1064E SAS controller provides RAID 0 or RAID 1 capability and supports up to two internal hot swap SAS or SATA HDDs or two internal hot swap solid-state drives. An optional ServeRAID MR10ie is available that provides battery backed write cache for internal and external disk drives.



Figure 7 The HS22 showing the front hot swap disk drive bays

ServeRAID-MR10ie

The optional ServeRAID-MR10ie, part number 46C7167 is a SAS RAID controller for the HS22. It is installed in the CIOv expansion socket. It provides RAID support with battery-backed cache for onboard and external disk drives. With the ServeRAID-MR10ie, you can connect to BladeCenter S storage or the external System Storage EXP3000 disk enclosure.

Key features of the ServeRAID-MR10ie controller are:

- ▶ Provides 256 MB of ECC DDR-2 battery-backed cache
- ▶ Utilizes an LSI 1078 controller
- ▶ Supports up to 26 disk drives
- ▶ Support for onboard and external disk drives
- ▶ Includes battery backup module
- ▶ Supports RAID levels 0, 1, 10, 5, 50, 6 and 60
- ▶ Support for SAS disks
- ▶ Support for OS Boot over SAS

Note: The ServeRAID-MR10ie does not support the use of SATA or SSD drives on the HS22 blade server.

The ServeRAID-MR10ie option ships with a battery backup unit, in the form of a DIMM (which is installed in DIMM socket 7). IBM recommends that you replace the battery unit annually. The replacement battery unit is part number 46M0800.

For customers in countries with configure-to-order capability, the ServeRAID-MR10ie is available with and without the battery. Relevant part numbers and feature codes are shown in Table 9.

Table 9 Part numbers and feature codes

Description	Part number	Feature code
ServeRAID-MR10ie (CIOv) Controller with battery	46C7167	0070
ServeRAID-MR10ie (CIOv) Controller without battery	Not available	0071
Replacement battery	46M0800	Not available

Note: If the ServeRAID MR10ie is installed, the battery is installed in DIMM slot 7. Therefore DIMM slot 7 cannot be used for memory. This will limit the total amount of memory that will be able to be installed.

Local SAS or SATA disk drives

The HS22 type 7870 has support for up to two hot-swap SFF SAS or SATA hard disk drives. These two hot-swap hard disk drives are accessible from the front of the blade server without removing the blade server from the BladeCenter chassis. See Table 10 for a list of supported SAS and SATA HDDs.

Table 10 Supported SAS and SATA HDDs

Part Number	Feature Code	Description
SAS hard disk drives		
43W7535	1048	IBM 73 GB 10K SAS 2.5" SFF Slim-HS HDD
43W7536	1049	IBM 146 GB 10K SAS 2.5" SFF Slim-HS HDD
43W7545	1050	IBM 73 GB 15K SAS 2.5" SFF Slim-HS HDD
42D0632	5537	IBM 146GB 10K 6Gbps SAS 2.5" SFF Slim-HS HDD
42D0637	5599	IBM 300GB 10K 6Gbps SAS 2.5" SFF Slim-HS HDD
42D0672	5522	IBM 73GB 15K 6Gbps SAS 2.5" SFF Slim-HS HDD
42D0677	5536	IBM 146GB 15K 6Gbps SAS 2.5" SFF Slim-HS HDD
SATA hard disk drives		
43W7670	5595	300GB 10K SATA 2.5" Slim-HS HDD

Solid state drives

Solid state drives (SSD) are a relatively new technology in the server world. SSDs are more reliable than spinning hard disk drives and they consume much less power (approx 0.5W vs.

11 W for a standard SAS drive). Target Applications for SSDs include, video surveillance, transaction based DB and other applications that have high performance but moderate space requirements. See Table 11 for a list of supported SSDs.

Table 11 Supported Solid State Drives (SSD)

Part Number	Feature Code	Description
43W7648	1051	IBM 31.4 GB SATA 2.5" SFF Slim-HS SSD

Integrated virtualization

The HS22 offers an IBM 2GB standard USB Flash Drive option preloaded with VMware ESXi 3.5 Update 4. This is an embedded version of VMware ESX. It is fully contained on the flash drive, without requiring any disk space. The IBM USB Memory Key for VMware Hypervisor plugs into the USB port at the rear of the HS22 motherboard as shown in Figure 8 on page 14.

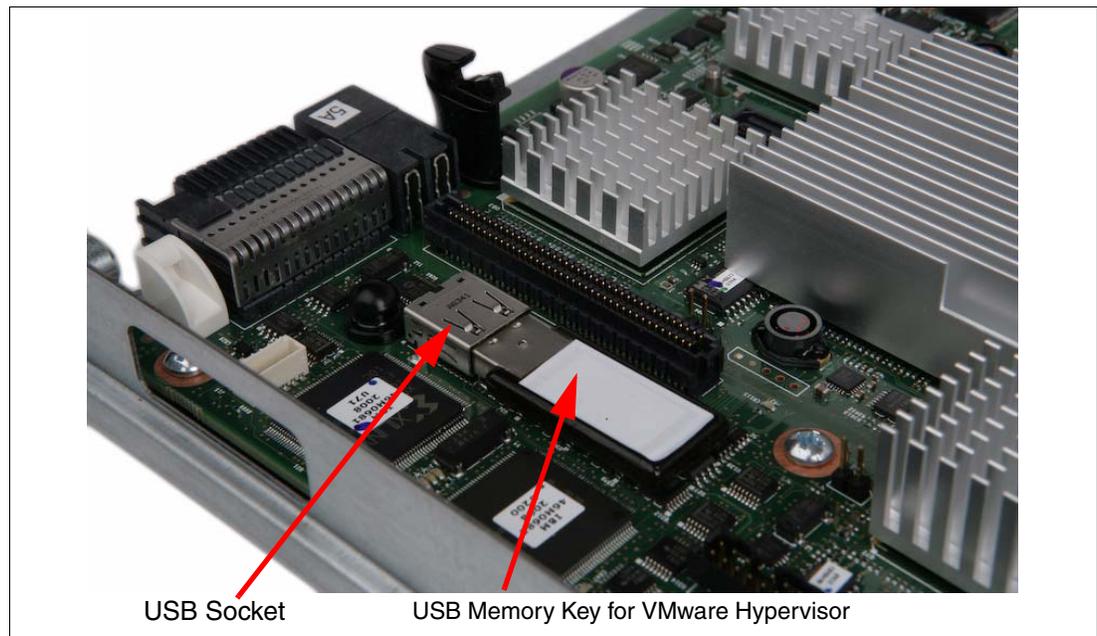


Figure 8 The rear of the HS22 motherboard showing the position of the USB port with the embedded hypervisor memory key installed.

Table 12 IBM USB Memory Key for VMware Hypervisor

Part Number	Feature Code	Description
41Y8269	1774	IBM USB Memory Key for VMware Hypervisor

For a complete description of the features and capabilities of VMware ESX Server, visit;
<http://www.vmware.com/products/vi/esx/>

I/O expansion

The HS22 type 7870 is able to connect to a wide variety of networks and fabrics by installing the appropriate I/O expansion card. Supported networks and fabrics include 1Gb and 10Gb Ethernet, 4Gb and 8Gb Fibre channel, Serial Attached SCSI (SAS) and Infiniband. A HS22 blade server with an I/O expansion card installed, requires that it is installed in a BladeCenter chassis with switch modules (or pass-thru) that are compatible with the I/O expansion card.

The HS22 type 7870 blade server supports two formats of I/O expansion cards, the new CIOv format and the CFFh format.

CIOv

The CIOv I/O expansion connector provides I/O connections to modules located in bays 3 and 4 of a supported BladeCenter chassis. The CIOv slot is a second generation PCI Express 2.0 x8 slot. A maximum of one CIOv I/O expansion card is supported per single-wide blade server. A CIOv I/O expansion card can be installed on a blade server at the same time as a CFFh I/O expansion card is installed. For a list of CIOv expansion cards that are supported in the HS22 type 7870, see Table 13.

Table 13 Supported CIOv Expansion Cards for the HS22 server

Part number	Feature code	Description
44W4475	1039	Ethernet Expansion Card (CIOv)
46M6065	3594	QLogic 4Gb Fibre Channel Expansion Card (CIOv)
43W4068	1041	SAS Connectivity Card (CIOv)
46C7167	0070 / 0071 ^a	ServeRAID-MR10ie (CIOv) Controller
46M6140	3598	Emulex 8Gb Fibre Channel Expansion Card (CIOv)
44X1945	1462	QLogic 8Gb Fibre Channel Expansion Card (CIOv)

a. Feature code 0070 is for the ServeRAID-MR10ie *with* the external battery; 0071 is the feature code for the ServeRAID-MR10ie *without* the battery

See IBM ServerProven for the latest information on the expansion cards supported by the HS22:

<http://ibm.com/servers/eserver/serverproven/compat/us/>

CIOv expansion cards are installed in the CIOv slot in supported servers, such as the HS22, as shown in Figure 9 on page 16.

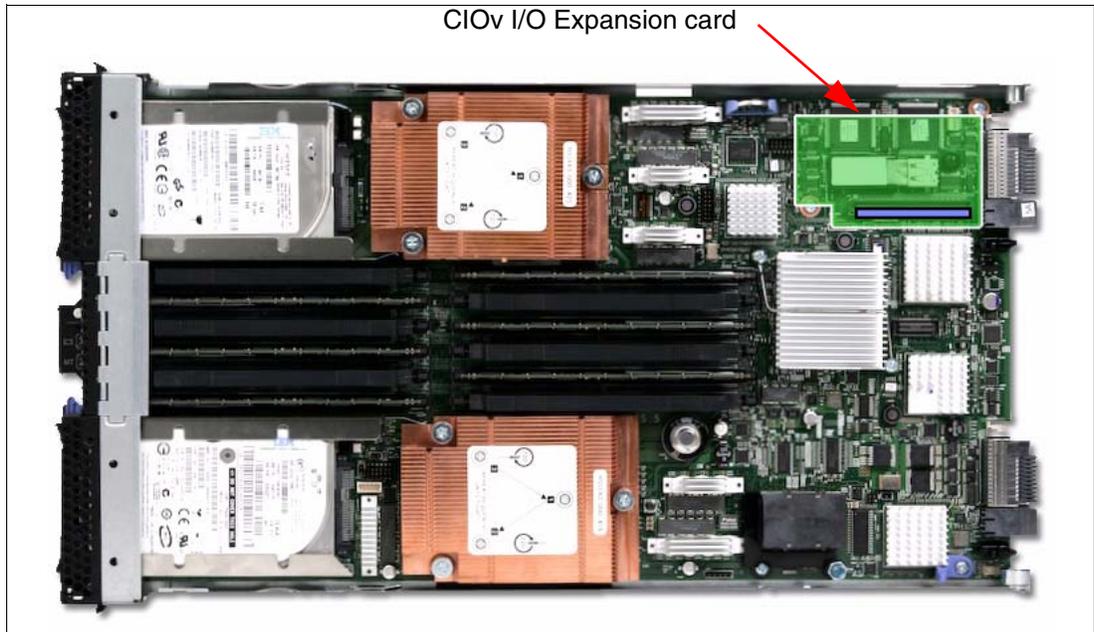


Figure 9 The HS22 type 7870 showing the CIOv I/O Expansion card position

The CIOv Expansion Cards require that a supported I/O module is installed in bay 3 and bay 4 of the chassis that the cards and servers are installed in. The supported I/O modules are:

- ▶ Any IBM, BNT or Cisco Ethernet Switch Module (standard form-factor switch module)
- ▶ Optical Pass-thru Module
- ▶ Copper Pass-thru Module
- ▶ Intelligent Copper Pass-thru Module

CFFh

The CFFh I/O expansion connector provides I/O connections to high speed switch modules located in bays 7, 8, 9 and 10 of a BladeCenter H or BladeCenter HT chassis or to switch bay 2 in a BladeCenter S chassis. The CFFh slot is a second generation PCI Express x16 (PCIe 2.0 x16) slot. A maximum of one CFFh I/O expansion card is supported per blade server. A CFFh I/O expansion card can be installed on a blade server at the same time as a CIOv I/O expansion card is installed. For a list of CFFh expansion cards that are supported in the HS22 type 7870, see Table 14.

Table 14 Supported CFFh Expansion Cards for the HS22 type 7870 server

Part number	Feature code	Description
43W4420	1036	Voltaire 4X InfiniBand DDR Expansion Card (CFFh)
43W4423	1038	4X InfiniBand DDR Expansion Card (CFFh)
44W4466	5489	Broadcom 10Gb 2-port Ethernet Exp Card (CFFh)
44W4465	1076	Broadcom 10Gb 4-port Ethernet Exp Card (CFFh)
44W4479	1077	2/4 Port Ethernet Expansion Card (CFFh)
44X1940	1078	QLogic Ethernet and 8Gb Fibre Channel Exp Card (CFFh)
42C1830	3592	QLogic 2-port 10Gb Converged Network Adapter (CFFh)

See IBM ServerProven for the latest information on the expansion cards supported by the HS22:

<http://ibm.com/servers/eserver/serverproven/compat/us/>

CFFh expansion cards are installed in the CFFh slot in supported servers, such as the HS22, as shown in Figure 10.

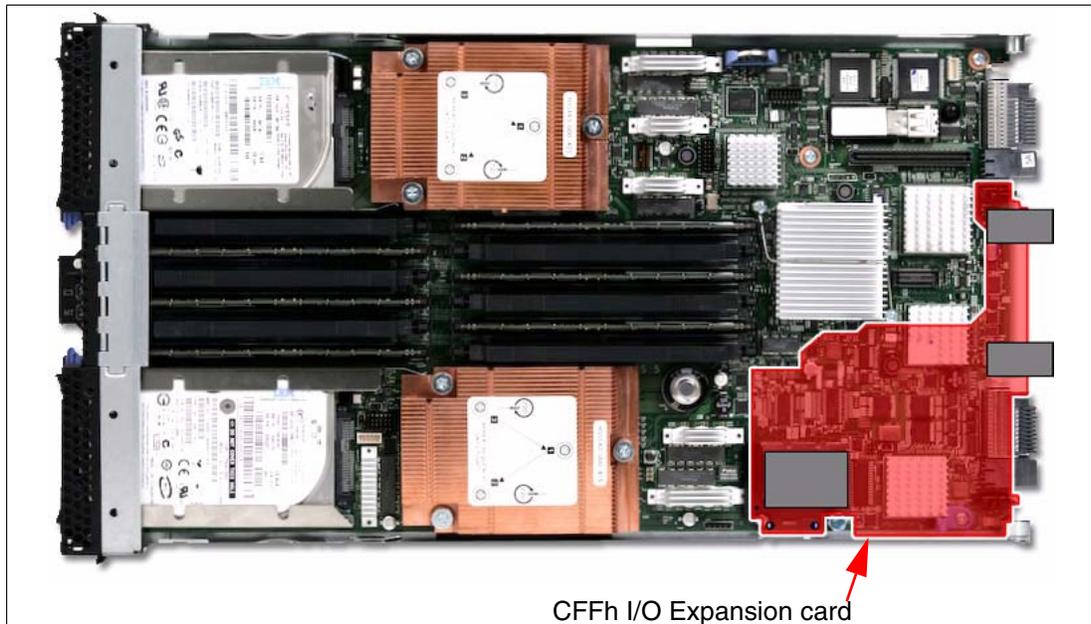


Figure 10 The HS22 type 7870 showing the CFFh I/O Expansion card position

The CFFh I/O Expansion Card requires that a supported high speed I/O module is installed in bay 7, bay 8, bay 9 and/or bay 10 of the BladeCenter H or BladeCenter HT chassis. Examples of the types of modules supported in the high speed I/O module bays are the InfiniBand Pass-Thru Module and the BNT 10G Ethernet Switch Module.

A Multi-switch Interconnect Module can be used in the high speed switch module bays of the BladeCenter H (MSIM) or BladeCenter HT (MSIM-HT) to allow connectivity to standard switch modules.

In a BladeCenter S chassis, the CFFh I/O Expansion Card requires a supported switch module in bay 2. When used in a BladeCenter S chassis, a maximum of two ports are routed from the CFFh I/O Expansion Card to the switch module in bay 2.

See the *IBM BladeCenter Interoperability Guide* for the latest information on the switch modules that are supported with each CFFh I/O expansion card:

<http://www.ibm.com/support/docview.wss?uid=psg1MIGR-5073016>

Product publications

The following publications are relevant for more information:

- ▶ IBM US Announcement Letter for the IBM BladeCenter HS22

<http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS109-101>

- ▶ IBM US Announcement Letter for ServeRAID MR10ie support on the HS22
<http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS109-285>
- ▶ *IBM BladeCenter HS22 Installation and User's Guide*
<http://www.ibm.com/support/docview.wss?uid=psg1MIGR-5079689>
- ▶ *IBM BladeCenter HS22 Problem Determination and Service Guide*
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- ▶ *Integrated Management Module User's Guide*
<http://www.ibm.com/support/docview.wss?uid=psg1MIGR-5079770>

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This document REDP-4538-00 was created or updated on June 3, 2009.

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