

## IBM BladeCenter HS22

### IBM Redbooks Product Guide

The IBM BladeCenter HS22 is a two-socket blade server running Intel Xeon processors. It is ideal for mainstream business applications including as a virtualization engine, and is compatible with the IBM BladeCenter H, E, S, and HT chassis. The HS22 supports up to two Intel Xeon 5500 or 5600 series multi-core processors, 12 DIMMs modules, two hot-swap drives, two PCI Express connectors, and one internal USB connector for embedded virtualization.

The HS22 is shown in Figure 1.

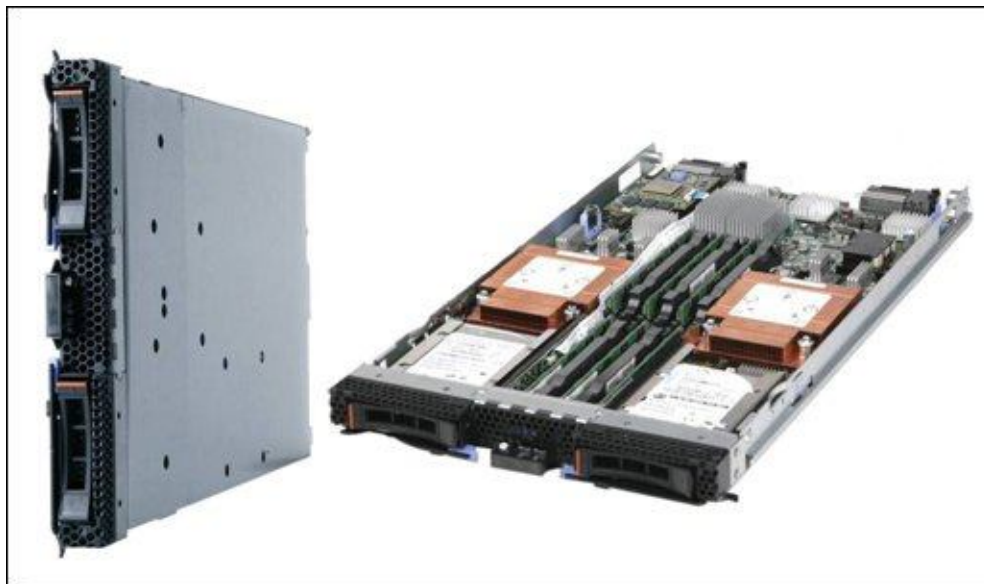


Figure 1. IBM BladeCenter HS22

### Did you know?

IBM BladeCenter HS22 delivered leadership two-processor, single-node result for SPECjEnterprise2010 – 2,752.06 Enterprise jAppServer Operations Per Second (SPECjEnterprise2010 EjOPS). This score was achieved using the IBM BladeCenter HS22 as the application server running IBM WebSphere Application Server V7 as the middle tier and the IBM System x3850 X5 as the database server running IBM DB2 9.7 Enterprise Server. With this SPECjEnterprise2010 result, IBM demonstrates its ability to provide both software and hardware for an optimal solution in the middle tier and in the back-end database layer, and also to deliver a robust solution for clients' complex workloads.

## Locations of key components and connectors

Figure 2 shows the inside of the server indicating key components.

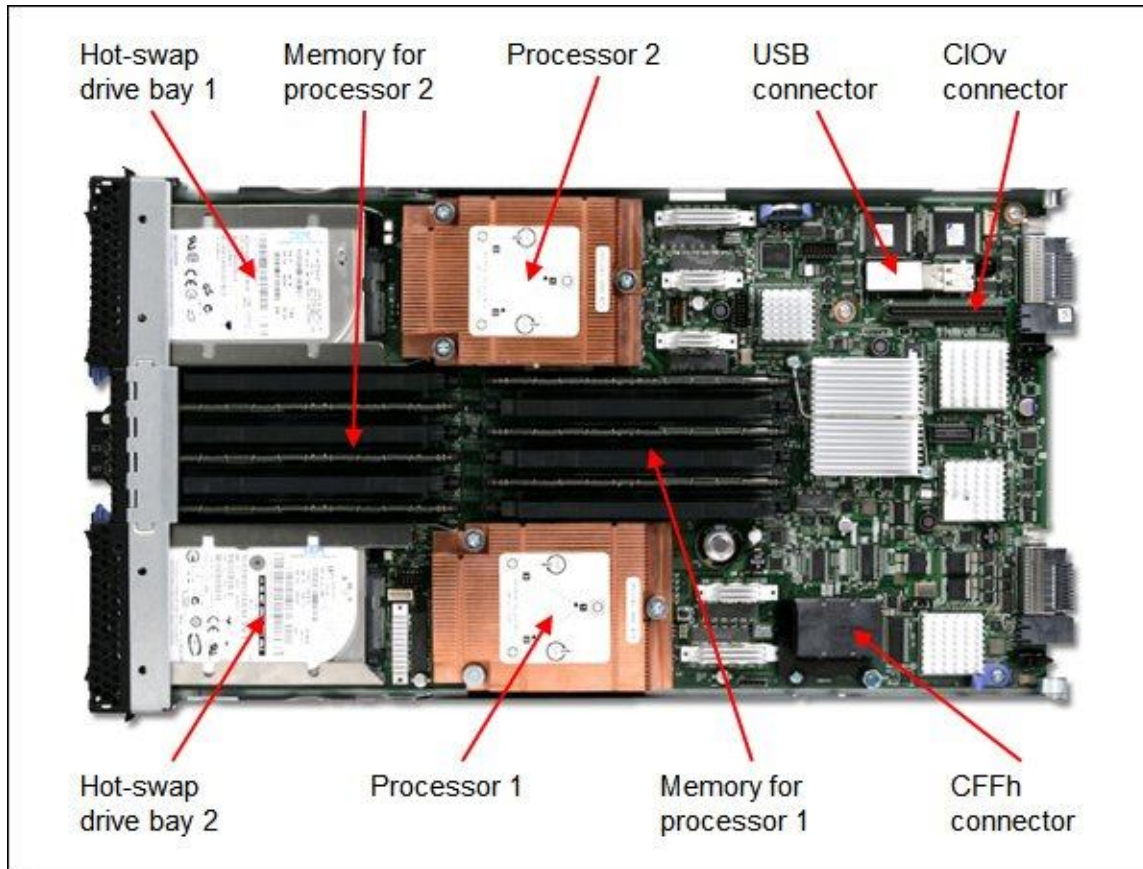


Figure 2. IBM BladeCenter HS22

The IBM BladeCenter HS22 includes the following items:

- Documentation CD
- Environmental Notices CD
- Statement of Limited Warranty
- Important Notices
- Technical Note Flyer

## Standard specifications

The following table lists the standard specifications.

Table 1. Standard specifications

Components	Specification
Form factor	Single-wide (30 mm)
Processor model	Intel Xeon 5600 series processors, up to 3.6 GHz Intel Xeon 5500 series processors, up to 2.80 GHz
Number of processors	1 standard / 2 maximum
L3 cache	Up to 12 MB L3 cache
Chipset	Intel 5520 chipset
Memory DIMM sockets	12x DDR-3 VLP DIMM slots
Maximum memory	Models with Intel Xeon 5600 series processors: 192 GB using 16GB DIMMs Models with Intel Xeon 5500 series processors: 96 GB using 8GB DIMMs
Expansion slots	One CIOv slot: 2 ports One CFFh slot: 4 ports
Disk controller	LSI Logic 1064E SAS 3 Gbps controller, supports RAID-0 & RAID-1 Optional ServeRAID MR10ie with battery-backed write cache for internal and external disk drives
Disk bays (total/hot-swap)	Two hot-swap 2.5-inch SFF bays supporting SAS HDDs or solid-state drives
Maximum internal storage	Up to 2 TB total internal storage (using 1TB NL SAS or NL SATA drives)
Network interface	2x 1Gb Ethernet using a Broadcom BCM5709S onboard NIC; supports TOE, failover and load balancing, Wake on LAN, PXE boot Some models also include a 2-port 10Gb controller installed in the CFFh slot (Emulex 10 GbE Virtual Fabric Adapter Advanced II or QLogic 2-port 10 Gb Converged Network Adapter, depending on the model)
Hot-swap components	Internal storage bays
Systems management	Unified Extensible Firmware Interface (UEFI), IBM Integrated Management Module (IMM), Predictive Failure Analysis, optional embedded hypervisor for virtualization, IBM Systems Director Active Energy Manager, light path diagnostics, IBM Systems Director and IBM ServerGuide
Video	Matrox G200eV video core with 16 MB of video memory
Security	Trusted Platform Module (TPM), Power-on password, administrator password, unattended boot, selectable boot, unattended start mode
Operating systems supported	Microsoft Windows, Red Hat Enterprise Linux, SUSE Linux Enterprise, VMware, Oracle Solaris
Limited warranty	Three-year customer replaceable unit and on-site and off-site limited warranty

## Standard models

The following table lists the standard models.

Table 2. Standard models

Model	Processor** (2 max)	Memory	Standard Ethernet†	Storage controller	Bays (used/max)	Disk drives	Slots (used/max)
Models with Intel Xeon 5500 Series Processors: 4-core and 2-core							
7870-M2x*	1x Xeon L5518 4C 2.13GHz 8MB 1066MHz 60w	2x 2GB	2x 1Gb	SAS RAID	0 / 2	Open	0 / 2
Models with Intel Xeon 5600 Series Processors: 4-core							
7870-A5x*	1x Xeon E5603 4C 1.60GHz 4MB 1066MHz 80w	1x 4GB	2x 1Gb	SAS RAID	0 / 2	Open	0 / 2
7870-A7x*	1x Xeon E5607 4C 2.26GHz 8MB 1066MHz 80w	1x 4GB	2x 1Gb	SAS RAID	0 / 2	Open	0 / 2
7870-G2x	1x Xeon E5620 4C 2.40GHz 12MB 1066MHz 80w	3x 2GB	2x 1Gb	SAS RAID	0 / 2	Open	0 / 2
7870-B5x*	1x Xeon X5647 4C 2.93GHz 12MB 1066MHz 130w	3x 4GB	2x 1Gb	SAS RAID	0 / 2	Open	0 / 2
7870-C5x*	1x Xeon X5672 4C 3.20GHz 12MB 1333MHz 95w	3x 4GB	2x 1Gb	SAS RAID	0 / 2	Open	0 / 2
7870-C7x*	1x Xeon X5687 4C 3.60GHz 12MB 1333MHz 130w	3x 4GB	2x 1Gb	SAS RAID	0 / 2	Open	0 / 2
Models with Intel Xeon 5600 Series Processors: 6-core							
7870-N2x*	1x Xeon L5640 6C 2.26GHz 12MB 1333MHz 60w	3x 2GB	2x 1Gb	SAS RAID	0 / 2	Open	0 / 2
7870-B6x*	1x Xeon E5649 6C 2.53GHz 12MB 1333MHz 80w	3x 4GB	2x 1Gb	SAS RAID	0 / 2	Open	0 / 2
7870-D4x*	1x Xeon E5649 6C 2.53GHz 12MB 1333MHz 80w	3x 4GB	2x 1Gb + 2x 10Gb	SAS RAID	0 / 2	Open	1 / 2
7870-H2x*	1x Xeon X5650 6C 2.66GHz 12MB 1333MHz 95w	3x 2GB	2x 1Gb	SAS RAID	0 / 2	Open	0 / 2
7870-C6x*	1x Xeon X5675 6C 3.06GHz 12MB 1333MHz 95w	3x 4GB	2x 1Gb	SAS RAID	0 / 2	Open	0 / 2
7870-C8x*	1x Xeon X5690 6C 3.46GHz 12MB 1333MHz 130w	3x 4GB	2x 1Gb	SAS RAID	0 / 2	Open	0 / 2
7870-91x*	2x Xeon E5645 6C 2.40GHz 12MB 1333MHz 80w	6x 8GB	2x 1Gb + 2x 10Gb	SAS RAID	0 / 2	Open	1 / 2
7870-92x*	2x Xeon E5645 6C 2.40GHz 12MB 1333MHz 80w	6x 8GB	2x 1Gb + 2x 10Gb	SAS RAID	0 / 2	Open	1 / 2

\* Withdrawn from marketing

\*\* Processor detail: standard quantity, model, cores, core speed, L3 cache, memory speed, power

† All models contain an onboard 2-port Gigabit Ethernet controller. Model D4x includes an Emulex 10 GbE Virtual Fabric Adapter Advanced II (CFFh). Model 91x and D4x include an Emulex 10 GbE Virtual Fabric Adapter Advanced II (CFFh). Model 92x includes an QLogic 2-port 10 Gb Converged Network Adapter (CFFh).

See the Standard specifications section for information about standard features of the server.

## Chassis support

The HS22 is supported in the various BladeCenter chassis as listed in the following table.

Table 4. Chassis support

Description	BC-E (8677)	BC-T	BC-S (8886)	BC-H (8852)	BC-HT AC (8750)	BC-HT DC (8740)
HS22 with 130W processors	No	No	Some limits*	Some limits*	Some limits*	Some limits*
HS22 with up to 95W processors	Some limits*	No	Full	Full	Full	Full

\* See Table 5 for details

The number of HS22 servers supported in each chassis depends on the thermal design power of the processors used in the servers, as shown in Table 5. The table uses the following conventions:

- A green cell means the chassis can be filled with HS22 blade servers up to the maximum number of blade bays in the chassis (for example, 14 blades in the BladeCenter H).
- A yellow cell means that the maximum number of HS22 blades that the chassis can hold is fewer than the total available blade bays (for example, 12 in a BladeCenter H). Other bays in the chassis *may* or *may not* be occupied by servers other than HS22 and HS22V depending on the combination and some bays must remain empty. Consult the BladeCenter Interoperability Guide for specifics: <http://ibm.com/support/entry/portal/docdisplay?Indocid=MIGR-5073016>

**Note:** The HS22 is not supported in the BladeCenter E with power supplies smaller than 2000 W.

Table 5. Chassis support (detailed)

CPU TDP*	Maximum number of HS22 servers supported in each chassis									
	BC-E with AMM (8677) (14 bays)		BC-S (8886) (6 bays)	BC-H (models other than 4Tx) (14 bays)				BC-H (-4Tx) (14 bays)	BC-HT AC (8750) (12 bays)	BC-HT DC (8740) (12 bays)
	2000 W power supplies	2320 W power supplies		2900W supplies		2980W supplies**				
			Standard blowers	Enhanced blowers†	Standard blowers	Enhanced blowers†	Enhanced blowers†			
130W	None‡	None‡	5	None‡	12	None‡	14	14	10	10
95W	6	14	6	14	14	14	14	14	12	12
80W	12	14	6	14	14	14	14	14	12	12
60W	13	14	6	14	14	14	14	14	12	12
40W	14	14	6	14	14	14	14	14	12	12

\* Thermal Design Power

\*\* IBM BladeCenter H 2980W AC Power Modules, 68Y6601 (standard in 4Tx, optional with all other BC-H chassis models)

† IBM BladeCenter H Enhanced Cooling Modules, 68Y6650 (standard in 4Tx, optional with all other BC-H chassis models)

‡ Not supported

## Processor options

The HS22 supports the processor options listed in the following table. The server supports one or two processors. The table also shows which server models have each processor standard. If no corresponding *where used* model for a particular processor is listed, then this processor is available only through Configure to Order (CTO).

Table 6. Processor options (Part 1)

Part number	Intel Xeon processor description	Models where used
Intel Xeon 5600 Series Processors: 4-core		
81Y9323	Xeon E5603 4C 1.60GHz 4MB 1066MHz 80w	A5x
81Y9324	Xeon E5606 4C 2.13GHz 8MB 1066MHz 80w	-
81Y9325	Xeon E5607 4C 2.26GHz 8MB 1066MHz 80w	A7x
59Y5705	Xeon E5620 4C 2.40GHz 12MB 1066MHz 80w	G2x
59Y5707	Xeon E5630 4C 2.53GHz 12MB 1066MHz 80w	-
59Y5708	Xeon E5640 4C 2.66GHz 12MB 1066MHz 80w	G4x, GCx
49Y5184	Xeon L5609 4C 1.86GHz 12MB 1066MHz 40w	-
59Y5704	Xeon L5630 4C 2.13GHz 12MB 1066MHz 40w	-
81Y9326	Xeon X5647 4C 2.93GHz 12MB 1066MHz 130w	B5x
59Y5712	Xeon X5667 4C 3.06GHz 12MB 1333MHz 95w	H5x
81Y9328	Xeon X5672 4C 3.20GHz 12MB 1333MHz 95w	C5x
59Y5714	Xeon X5677 4C 3.46GHz 12MB 1333MHz 130w	F3x
81Y9330	Xeon X5687 4C 3.60GHz 12MB 1333MHz 130w	C7x
Intel Xeon 5600 Series Processors: 6-core		
68Y8125	Xeon E5645 6C 2.40GHz 12MB 1333MHz 80w	91x, 92x
81Y9327	Xeon E5649 6C 2.53GHz 12MB 1333MHz 80w	B6x, D4x
68Y8124	Xeon L5638 6C 2.0GHz 12MB 1333MHz 60w	-
59Y5706	Xeon L5640 6C 2.26GHz 12M 1333MHz 60w	N2x
59Y5709	Xeon X5650 6C 2.66GHz 12M 1333MHz 95w	H2x, HAx
59Y5710	Xeon X5660 6C 2.80GHz 12MB 1333MHz 95w	-
59Y5711	Xeon X5670 6C 2.93GHz 12MB 1333MHz 95w	H4x
81Y9329	Xeon X5675 6C 3.06GHz 12MB 1333MHz 95w	C6x
59Y5713	Xeon X5680 6C 3.33GHz 12MB 1333MHz 130w	F2x
81Y9331	Xeon X5690 6C 3.46GHz 12MB 1333MHz 130w	C8x

Table 6. Processor options (Part 2)

Part number	Intel Xeon processor description	Models where used
Intel Xeon 5500 Series Processors: 2-core		
43W5986	Xeon E5502 2C 1.86GHz 4MB Cache 800MHz	
Intel Xeon 5500 Series Processors: 4-core		
44T1712	Xeon E5504 4C 2.00GHz 4MB 800MHz	-
43W5987	Xeon E5506 4C 2.13GHz 4MB 800MHz	-
59Y5695	Xeon E5507 4C 2.26GHz 4M 800MHz 80w	A4x
44T1736	Xeon E5520 4C 2.26GHz 8MB 1066MHz	-
44T1883	Xeon E5530 4C 2.40GHz 8MB 1066MHz	-
44T1884	Xeon E5540 4C 2.53GHz 8MB 1066MHz	-
44T1885	Xeon X5550 4C 2.66GHz 8MB 1333MHz	-
44T1886	Xeon X5560 4C 2.80GHz 8MB 1333MHz	-
44T1887	Xeon X5570 4C 2.93GHz 8MB 1333MHz	C4x
49Y5052	Xeon L5518 4C 2.13GHz 8MB 1066MHz 60W	M2x

## Memory options

IBM DDR3 memory is compatibility tested and tuned for optimal System x performance and throughput. IBM memory specifications are integrated into the light path diagnostics for immediate system performance feedback and optimum system uptime. From a service and support standpoint, IBM memory automatically assumes the IBM system warranty, and IBM provides service and support worldwide.

The HS22 has six DIMM sockets per processor (12 DIMMs in total) and uses Double Data Rate-3 (DDR-3) very-low-profile (VLP) registered DIMMs. Servers with Intel Xeon 5600 series processors support 16GB DIMMs meaning a total of up to 192 GB of RAM is supported. Servers with Intel Xeon 5500 series processors support 8GB DIMMs meaning a total of up to 96 GB of RAM is supported. The memory DIMMs connects directly to one of the processors. With one processor installed, only six DIMMs can be accessed. To access memory in the other six DIMM connectors, the second processor must be installed.

The following two tables list memory options available for HS22 server: one of 5500 series processors and one for 5600 series processors. DIMMs can be installed one at a time, but for performance reasons, install them in sets of three (one for each of the three memory channels).

Table 7. Memory options for servers with Xeon 5500 series processors

Part number	Feature code	Description	Models where used
49Y1427	8928	1 GB (1x 1 GB, 1Rx8, 1.5 V) PC3-10600 CL9 ECC DDR3 1333 MHz	-
49Y1428	8929	2 GB (1x 2 GB, 2Rx8, 1.5 V) PC3-10600 CL9 ECC DDR3 1333 MHz	-
49Y1429	8930	2 GB (1x 2 GB, 1Rx4, 1.5 V) PC3-10600 CL9 ECC DDR3 1333 MHz	-
44T1594	A0YV	2 GB (1x 2 GB, 1Rx8, 1.5 V) PC3-10600 CL9 ECC DDR3 1333 MHz	-
46C0560	A0WX	2 GB (1x 2 GB, 1Rx8, 1.35 V) PC3L-10600 CL9 ECC DDR3 1333 MHz	-
49Y1430	8931	4 GB (1x 4 GB, 2Rx4, 1.5 V) PC3-10600 CL9 ECC DDR3 1333 MHz	-
44T1596	1908	4 GB (1x 4 GB, 2Rx8, 1.5 V) PC3-10600 CL9 ECC DDR3 1333 MHz	-
46C0563	A0WY	4 GB (1x 4 GB, 1Rx4, 1.35 V) PC3L-10600 CL9 ECC DDR3 1333 MHz	-
46C0564	A0WZ	4 GB (1x 4 GB, 2Rx8, 1.35 V) PC3L-10600 CL9 ECC DDR3 1333 MHz	-
49Y1431	8932	8 GB (1x 8 GB, 2Rx4, 1.5 V) PC3-10600 CL9 ECC DDR3 1333 MHz	-



Table 8. Memory options for servers with Xeon 5600 series processors

Part number	Feature code	Description	Models where used
Standard DIMMs (1.5 V)			
49Y1427	8928	1GB (1x 1GB, 1Rx8, 1.5V) PC3-10600 CL9 ECC DDR3 1333	-
49Y1428	8929	2GB (1x 2GB, 2Rx8, 1.5V) PC3-10600 CL9 ECC DDR3 1333	F2x, F3x, G2x, G4x, GCx, H2x, H4x, H5x, HAx, N2x
49Y1429	8930	2GB (1x 2GB, 1Rx4, 1.5V) PC3-10600 CL9 ECC DDR3 1333	-
44T1594	A0YV	2GB (1x 2GB, 1Rx8, 1.5V) PC3-10600 CL9 ECC DDR3 1333	-
49Y1430	8931	4GB (1x 4GB, 2Rx4, 1.5V) PC3-10600 CL9 ECC DDR3 1333	-
49Y1431	8932	8GB (1x 8GB, 2Rx4, 1.5V) PC3-10600 CL9 ECC DDR3 1333	-
Low Power DIMMs (1.35 V)			
46C0560	A0WX	2GB (1x 2GB, 1Rx8, 1.35V) PC3L-10600 CL9 ECC DDR3 1333	-
46C0563	A0WY	4GB (1x 4GB, 1Rx4, 1.35V) PC3L-10600 CL9 ECC DDR3 1333	A5x, A7x, B5x, B6x, C5x, C6x, C7x, C8x
46C0564	A0WZ	4GB (1x 4GB, 2Rx8, 1.35V) PC3L-10600 CL9 ECC DDR3 1333	-
46C0568	8644	8GB (1x 8GB, 2Rx4, 1.35V) PC3-10600 CL9 ECC DDR3 1333	-
46C0599	2422	16GB (1x16 GB, 2Rx4, 1.35V) PC3L-10600 CL9 ECC DDR3 1333	-

Note that although the maximum speed at which the memory channel runs on the HS22 is 1333 MHz, this depends on a combination of three items:

- Processor memory speed: The processor has a maximum memory speed of 1333, 1066, or 800 MHz depending on the processor model. Only the X (Advanced) range of Xeon 5500 and 5600 series processors supports a maximum memory channel speed of 1333 MHz. See the processor options (Table 5) for the maximum memory speed.
- Memory DIMM: Most but not all DIMMs listed in the previous tables support running at 1333 MHz. Some only run at 1066 MHz. This is noted in the description of the DIMM.
- Number of DIMMs installed: The HS22 implements memory so that 2 DIMMs are on each of the three memory channels of the processor. If only 1 DIMM is installed to each channel (that is, 3 DIMMs per processor) then the DIMMs can operate at the lower of the DIMM rated speed and processor memory channel rated speed, up to 1333 MHz. However at 2 DIMMs per channel (6 DIMMs per processor), memory can only operate at 1333 MHz if Xeon 5600 X (Advanced) range of processors (models X56nn) are installed. All other processors (all 5500, L56nn, and E56nn) cannot drive the memory channel at 1333 MHz if there are 2 DIMMs per channel.

In summary, to ensure DIMMs operate at 1333 MHz, select a Xeon X56nn processor and use DIMMs that are rated at 1333 MHz. All DIMMs in the preceding table support running at 2 DIMMs per channel at 1333 MHz.

The following memory protection technologies are supported:

- ECC
- ChipKill
- Memory Mirroring
- Memory Sparing

## Internal disk storage options

The HS22 blade server features an onboard LSI Logic 53C1064E 3 Gbps 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. The following table lists the hard drive options that are available for internal storage.

Table 9. Disk drive options for internal disk storage (Part 1)

Part number	Feature code	Description	Maximum supported
<b>10K SAS drives</b>			
00AD075	A48S	IBM 1.2TB 10K 6Gbps SAS 2.5" G2HS HDD	2
81Y9650	A282	IBM 900GB 10K 6Gbps SAS 2.5" SFF HS HDD	2
49Y2003	5433	IBM 600GB 10K 6Gbps SAS 2.5" SFF Slim-HS HDD	2
90Y8872	A2XD	IBM 600GB 10K 6Gbps SAS 2.5" SFF G2HS HDD	2
42D0637	5599	IBM 300GB 10K 6Gbps SAS 2.5" SFF Slim-HS HDD	2
90Y8877	A2XC	IBM 300GB 10K 6Gbps SAS 2.5" SFF G2HS HDD	2
<b>15K SAS drives</b>			
81Y9670	A283	IBM 300GB 15K 6Gbps SAS 2.5" SFF HS HDD	2
42D0677	5536	IBM 146GB 15K 6Gbps SAS 2.5" SFF Slim-HS HDD	2
90Y8926	A2XB	IBM 146GB 15K 6Gbps SAS 2.5" SFF G2HS HDD	2
<b>Self-encrypting drives (SEDs)</b>			
00AD085	A48T	IBM 1.2TB 10K 6Gbps SAS 2.5" G2HS SED	2
81Y9662	A3EG	IBM 900GB 10K 6Gbps SAS 2.5" SFF G2HS SED	2
90Y8908	A3EF	IBM 600GB 10K 6Gbps SAS 2.5" SFF G2HS SED	2
90Y8913	A2XF	IBM 300GB 10K 6Gbps SAS 2.5" SFF G2HS SED	2
<b>NL SAS drives</b>			
81Y9690	A1P3	IBM 1TB 7.2K 6Gbps NL SAS 2.5" SFF HS HDD	2
42D0707	5409	IBM 500GB 7200 6Gbps NL SAS 2.5" SFF Slim-HS HDD	2
90Y8953	A2XE	IBM 500GB 7.2K 6Gbps NL SAS 2.5" SFF G2HS HDD	2

Table 9. Disk drive options for internal disk storage (Part 2)

Part number	Feature code	Description	Maximum supported
<b>NL SATA drives</b>			
81Y9730	A1AV	IBM 1TB 7.2K 6Gbps NL SATA 2.5" SFF HS HDD	2
81Y9726	A1NZ	IBM 500GB 7.2K 6Gbps NL SATA 2.5" SFF HS HDD	2
42D0752	5407	IBM 500GB 7200 NL SATA 2.5" SFF Slim-HS HDD	2
81Y9722	A1NX	IBM 250GB 7.2K 6Gbps NL SATA 2.5" SFF HS HDD	2
<b>SAS-SSD Hybrid Drive</b>			
00AD102	A4G7	IBM 600GB 10K 6Gbps SAS 2.5" G2HS Hybrid	2
<b>Enterprise SSDs</b>			
49Y6129	A3EW	IBM 200GB SAS 2.5" MLC HS Enterprise SSD	2
49Y6134	A3EY	IBM 400GB SAS 2.5" MLC HS Enterprise SSD	2
49Y6139	A3F0	IBM 800GB SAS 2.5" MLC HS Enterprise SSD	2
00W1125	A3HR	IBM 100GB SATA 2.5" MLC HS Enterprise SSD	2
43W7718	A2FN	IBM 200GB SATA 2.5" MLC HS SSD	2
<b>Enterprise Value SSDs</b>			
49Y5839	A3AS	IBM 64GB SATA 2.5" MLC HS Enterprise Value SSD	2
49Y5844	A3AU	IBM 512GB SATA 2.5" MLC HS Enterprise Value SSD	2
90Y8643	A2U3	IBM 256GB SATA 2.5" MLC HS Enterprise Value SSD	2
90Y8648	A2U4	IBM 128GB SATA 2.5" MLC HS Enterprise Value SSD	2

## Internal backup units

The server does not support an internal tape drive option.

## Optical drives

The server does not support an optical drive option, however it does interface to the optical drive installed in the BladeCenter chassis media tray if one is installed there.

## I/O expansion options

The HS22 server offers the following PCI Express 2.0 slots, neither of which is hot-swap.

- CIOv expansion slot
- CFFh expansion slot

The CIOv I/O expansion connector provides I/O connections through the midplane of the chassis to modules located in bays 3 and 4 of a supported BladeCenter chassis. It is a PCIe 2.0 x8 slot.

The CFFh I/O expansion connector provides I/O connections to high-speed switch modules that are 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 PCIe x16 slot.

The HS22 optionally supports the IBM BladeCenter PCIe Gen 2 Expansion Blade. The expansion blade provides the capability to attach selected PCI Express cards to the HS22. This capability is ideal for many applications that require special telecommunications network interfaces or hardware acceleration using a PCI Express card.

The expansion blade provides one full height and full length PCI Express slot and one full height and half length PCI Express slot with a maximum power usage of 75 watts for each slot. It integrates PCI Express card support capability into the BladeCenter architecture. Up to four expansion blades can be attached to an HS22. Each expansion blade occupies a bay in the BladeCenter chassis.

The server also supports IBM BladeCenter PCI Express I/O Expansion Unit (PCI Express Gen 1). A maximum of one unit can be attached to a single blade.

Table 10. Expansion blades

Part number	Feature code	Description	Maximum supported
46M6730	9295	IBM BladeCenter PCI Express Gen 2 Expansion Blade	4
68Y7484	A247	IBM BladeCenter PCI Express Gen 2 Expansion Blade II	4
43W4391	4339	IBM BladeCenter PCI Express I/O Expansion Unit	1
46M6771	A25F	IBM BladeCenter GPU Expansion Blade with NVIDIA Tesla M2075	3
46M6772	A10R	IBM BladeCenter GPU Expansion Blade with NVIDIA Tesla M2070Q	3
46M6740	5090	IBM BladeCenter GPU Expansion Blade with NVIDIA Tesla M2070 (CTO Only)	3
68Y7478	A245	IBM BladeCenter GPU Expansion Blade II with NVIDIA Tesla M2075	3
68Y7479	A246	IBM BladeCenter GPU Expansion Blade II with NVIDIA Tesla M2070Q	3

For more information, see the following IBM Redbooks Product Guide publications:

- *IBM BladeCenter PCI Express Gen 2 Expansion Blade and PCI Express Gen 2 Expansion Blade II* at: <http://www.redbooks.ibm.com/abstracts/tips0783.html?Open>
- *IBM BladeCenter GPU Expansion Blade and GPU Expansion Blade II* at: <http://www.redbooks.ibm.com/abstracts/tips0798.html?Open>

## Network adapters

The HS22 offers two integrated Gigabit Ethernet ports, based on the Broadcom BCM5709S controller.

- Failover, adapter fault tolerance
- PXE 2.0 Boot Agent
- Wake on LAN
- Load balancing or teaming

The following table lists additional supported network adapters.

Table 11. Network adapters

Part number	Feature code	Description	Slots supported
<b>10 Gb Ethernet</b>			
46M6164	0098	Broadcom 10Gb Gen2 4-port Ethernet Exp Cd (CFFh)	CFFh
81Y3133	A1QR	Broadcom 2-port 10Gb Virtual Fabric Adapter for IBM BladeCenter	CFFh
81Y1650	5437	Brocade 2 port 10GbE Converged Network Adapter for IBM BladeCenter	CFFh
00Y3264	A3NW	Emulex 10GbE Virtual Fabric Adapter Advanced II - IBM BladeCenter	CFFh
90Y3566	A1XH	Emulex 10GbE Virtual Fabric Adapter Advanced II - IBM BladeCenter	CFFh
49Y4265	2436	Emulex 10GbE Virtual Fabric Advanced Upgrade for IBM BladeCenter	(license)
00Y3266	A3NV	Emulex 10GbE Virtual Fabric Adapter II - IBM BladeCenter	CFFh
90Y3550	A1XG	Emulex 10GbE Virtual Fabric Adapter II - IBM BladeCenter	CFFh
42C1810	3593	Intel 10Gb 2-port Ethernet Expansion Card (CFFh) for IBM BladeCenter	CFFh
90Y3570	A1NW	Mellanox 2-port 10Gb Enet Expansion Card (CFFh) - IBM BladeCenter	CFFh
00Y3280	A3JB	QLogic 2-port 10Gb CNA (CFFh) for IBM BladeCenter	CFFh
42C1830	3592	QLogic 2-pt 10Gb Converged Network Adapter(CFFh)	CFFh
00Y3270	A3JC	QLogic Enet and 8Gb FC Exp Card (CFFh) for IBM BladeCenter	CFFh
44X1940	5485	QLogic Eth and 8Gb Fibre Channel Exp Card (CFFh)	CFFh
<b>1 Gb Ethernet</b>			
44W4479	5476	2/4 Port Ethernet Expansion Card (CFFh) for IBM BladeCenter	CFFh
44W4475	5477	Ethernet Expansion Card (CIOv) for IBM BladeCenter	CIOv
<b>InfiniBand</b>			
46M6001	0056	2-port 40Gb Infiniband Expansion Card (CFFh) for IBM BladeCenter	CFFh
43W4423	2991	4X InfiniBand DDR Expansion Card (CFFh) for IBM BladeCenter	CFFh
43W4420	2993	Voltaire 4X InfiniBand DDR Expansion Card (CFFh)	CFFh

For more information, see the list of IBM Redbooks Product Guides in the Ethernet adapters category:  
<http://www.redbooks.ibm.com/portals/BladeCenter?Open&page=pg&cat=ethadapters>

## Storage host bus adapters

The following table lists storage HBAs supported by HS22 server.

Table 12. Storage adapters

Part number	Feature code	Description	Slots supported
Combination Ethernet and Fibre Channel			
44X1940	5485	QLogic Eth and 8Gb Fibre Channel Exp Card (CFFh)	CFFh
Fibre Channel			
46M6140	3598	Emulex 8Gb Fibre Channel Expansion Card (CIOv) for IBM BladeCenter	CIOv
46M6065	3594	QLogic 4Gb Fibre Channel Expansion Card (CIOv) for IBM BladeCenter	CIOv
44X1945	1462	QLogic 8Gb Fibre Channel Expansion Card (CIOv) for IBM BladeCenter	CIOv
SAS			
46C7167	5490	ServeRAID-MR10ie (CIOv) Controller for IBM BladeCenter	CIOv
43W4068	1593	SAS Connectivity Card (CIOv)	CIOv

For more information, see the list of IBM Redbooks Product Guides in the Fibre Channel adapters category:

<http://www.redbooks.ibm.com/portals/BladeCenter?Open&page=pg&cat=fcadapters>

## PCIe SSD adapters

The HS22 server supports the High IOPS SSD adapters listed in the following table. The adapters must be installed in an IBM BladeCenter PCI Express I/O Expansion Unit (PEU3e), part number 43W4391.

Table 13. SSD adapters

Part number	Feature code	Description	Slots supported	Max quantity
46M0877	0096	IBM 160GB High IOPS SS Class SSD PCIe Adapter	PCI Express I/O Expansion Unit	2
46M0898	0097	IBM 320GB High IOPS MS Class SSD PCIe Adapter	PCI Express I/O Expansion Unit	2

For information about this adapter, see the IBM Redbooks Product Guide *IBM High IOPS SSD PCIe Adapters*: <http://www.redbooks.ibm.com/abstracts/tips0729.html?Open>

## Power supplies

Server power is derived from the power supplies installed in the BladeCenter chassis. There are no server options regarding power supplies.

## Integrated virtualization

The server supports VMware ESXi installed on a USB memory key. The key is installed in a USB socket inside the server. The following table lists the virtualization options.

Table 14. Virtualization options

Part number	Feature code	Description	Maximum supported
41Y8298	A2G0	IBM Blank USB Memory Key for VMware ESXi Downloads	1
41Y8278	1776	IBM USB Memory Key for VMware ESXi 4	1
41Y8296	A1NP	IBM USB Memory Key for VMware ESXi 4.1 Update 1	1
41Y8283	1749	IBM USB Memory Key for VMware ESXi 3.5 Update 5	1
41Y8287	3033	IBM USB Memory Key for VMware ESXi 4.1	1
41Y8311	A2R3	IBM USB Memory Key for VMware ESXi 5.1	1
41Y8300	A2VC	IBM USB Memory Key for VMware ESXi 5.0	1
41Y8307	A383	IBM USB Memory Key for VMware ESXi 5.0 Update 1	1

## Remote management

The server contains an IBM Integrated Management Module (IMM), which interfaces with the advanced management module in the BladeCenter chassis. The combination of these two provides advanced service-processor control, monitoring, and an alerting function. If an environmental condition exceeds a threshold or if a system component fails, LEDs on the system board are lit to help you diagnose the problem, records the error in the event log, and alerts you to the problem. A virtual presence capability is also available for remote server management capabilities.

Remote server management is provided through industry-standard interfaces:

- Intelligent Platform Management Interface (IPMI) Version 2.0
- Simple Network Management Protocol (SNMP) Version 3
- Common Information Model (CIM)
- Web browser

The server also supports virtual media and remote control features, which provide the following functions:

- Remotely viewing video with graphics resolutions up to 1600x1200 at 75 Hz, regardless of the system state
- Remotely accessing the server using the keyboard and mouse from a remote client
- Mapping the CD or DVD drive, diskette drive, and USB flash drive on a remote client, and mapping ISO and diskette image files as virtual drives that are available for use by the server
- Uploading a diskette image to the IMM memory and mapping it to the server as a virtual drive
- Capture blue-screen errors

## Supported operating systems

The server supports the following operating systems:

- Microsoft Windows Compute Cluster Server 2003
- Microsoft Windows Essential Business Server 2008 Premium Edition
- Microsoft Windows Essential Business Server 2008 Standard Edition
- Microsoft Windows HPC Server 2008
- Microsoft Windows Server 2003 Compute Cluster Edition
- Microsoft Windows Server 2003, Ent. Ed. w/Microsoft Cluster Service (MSCS)
- Microsoft Windows Server 2003, Ent. Ed.(64 bit) w/Microsoft Cluster Service (MSCS)
- Microsoft Windows Server 2003, Web Edition
- Microsoft Windows Server 2003/2003 R2, Datacenter Edition
- Microsoft Windows Server 2003/2003 R2, Datacenter x64 Edition
- Microsoft Windows Server 2003/2003 R2, Enterprise Edition
- Microsoft Windows Server 2003/2003 R2, Enterprise x64 Edition
- Microsoft Windows Server 2003/2003 R2, Standard Edition
- Microsoft Windows Server 2003/2003 R2, Standard x64 Edition
- Microsoft Windows Server 2008 HPC Edition
- Microsoft Windows Server 2008 R2
- Microsoft Windows Server 2008, Datacenter x64 Edition
- Microsoft Windows Server 2008, Datacenter x86 Edition
- Microsoft Windows Server 2008, Enterprise x64 Edition
- Microsoft Windows Server 2008, Enterprise x86 Edition
- Microsoft Windows Server 2008, Standard x64 Edition
- Microsoft Windows Server 2008, Standard x86 Edition
- Microsoft Windows Server 2008, Web x64 Edition
- Microsoft Windows Server 2008, Web x86 Edition
- Microsoft Windows Server 2012
- Microsoft Windows Small Business Server 2003/2003 R2 Premium Edition
- Microsoft Windows Small Business Server 2003/2003 R2 Standard Edition
- Microsoft Windows Small Business Server 2008 Premium Edition
- Microsoft Windows Small Business Server 2008 Standard Edition
- Red Hat Enterprise Linux 4 AS for AMD64/EM64T
- Red Hat Enterprise Linux 4 AS for x86
- Red Hat Enterprise Linux 4 ES for AMD64/EM64T
- Red Hat Enterprise Linux 4 ES for x86
- Red Hat Enterprise Linux 4 WS/HPC for AMD64/EM64T
- Red Hat Enterprise Linux 4 WS/HPC for x86
- Red Hat Enterprise Linux 5 Server Edition
- Red Hat Enterprise Linux 5 Server Edition with Xen
- Red Hat Enterprise Linux 5 Server with Xen x64 Edition
- Red Hat Enterprise Linux 5 Server x64 Edition
- Red Hat Enterprise Linux 6 Server Edition
- Red Hat Enterprise Linux 6 Server x64 Edition
- Red Hat Enterprise MRG 1.0 Realtime (x64)
- Red Hat Enterprise MRG 2.0 Realtime (x64)
- Solaris 10 Operating System
- SUSE LINUX Enterprise Real Time 10 AMD64/EM64T
- SUSE LINUX Enterprise Real Time 11 AMD64/EM64T
- SUSE LINUX Enterprise Server 10 for AMD64/EM64T
- SUSE LINUX Enterprise Server 10 for x86
- SUSE LINUX Enterprise Server 10 with Xen for AMD64/EM64T
- SUSE LINUX Enterprise Server 10 with Xen for x86
- SUSE LINUX Enterprise Server 11 for AMD64/EM64T
- SUSE LINUX Enterprise Server 11 for x86
- SUSE LINUX Enterprise Server 11 with Xen for AMD64/EM64T



- VMware ESX 3.5
- VMware ESX 4.0
- VMware ESX 4.1
- VMware ESXi 3.5
- VMware ESXi 4.0
- VMware ESXi 4.1
- VMware vSphere 5.0 (ESXi)
- VMware vSphere 5.1 (ESXi)

See the IBM ServerProven website for the latest information about the specific versions and service levels supported and any other prerequisites:

<http://www.ibm.com/systems/info/x86servers/serverproven/compat/us/nos/matrix.shtml>

## Physical specifications

Dimensions:

- Height: 245 mm (9.7 in)
- Depth: 446 mm (17.6 in)
- Width: 58 mm (2.28 in)

Maximum weight: 5.4 kg (12 lb) (depending on the configuration when options are added)

## Warranty options

The BladeCenter HS22 has a three-year on-site warranty with 9x5 next business day terms. IBM offers the warranty service upgrades through IBM ServicePac, discussed in this section. The IBM ServicePac is a series of prepackaged warranty maintenance upgrades and post-warranty maintenance agreements with a well-defined scope of services, including service hours, response time, term of service, and service agreement terms and conditions.

IBM ServicePac offerings are country-specific, that is, each country might have its own service types, service levels, response times, and terms and conditions. Not all covered types of ServicePac might be available in a particular country. For more information about IBM ServicePac offerings available in your country visit the IBM ServicePac Product Selector at <https://www-304.ibm.com/sales/gss/download/spst/servicepac>.

The following table explains warranty service definitions in more detail.

Table 15. Warranty service definitions

Term	Description
IBM on-site repair (IOR)	A service technician will come to the server's location for equipment repair.
24x7x2 hour	A service technician is scheduled to arrive at your customer's location within two hours after remote problem determination is completed. We provide 24-hour service, every day, including IBM holidays.
24x7x4 hour	A service technician is scheduled to arrive at your customer's location within four hours after remote problem determination is completed. We provide 24-hour service, every day, including IBM holidays.
9x5x4 hour	A service technician is scheduled to arrive at your customer's location within four business hours after remote problem determination is completed. We provide service from 8:00 a.m. to 5:00 p.m. in the customer's local time zone, Monday through Friday, excluding IBM holidays. If after 1:00 p.m. it is determined that on-site service is required, the customer can expect the service technician to arrive the morning of the following business day. For noncritical service requests, a service technician will arrive by the end of the following business day.
9x5 next business day	A service technician is scheduled to arrive at your customer's location on the business day after we receive your call, following remote problem determination. We provide service from 8:00 a.m. to 5:00 p.m. in the customer's local time zone, Monday through Friday, excluding IBM holidays.

In general, the types of IBM ServicePac are as follows:

- Warranty and maintenance service upgrades
  - One, two, three, four, or five years of 9x5 or 24x7 service coverage
  - On-site repair from next business day to four or two hours
  - One or two years of warranty extension
- Remote technical support services
  - One or three years with 24x7 coverage (severity 1) or 9x5 next business day for all severities
  - Installation and startup support for System x servers
  - Remote technical support for System x servers
  - Software support - Support Line
    - Microsoft or Linux software
    - VMware
    - IBM Systems Director

## Regulatory compliance

The server conforms to the following international standards:

- Australia and New Zealand C-Tick Mark, Class A
- CE Mark (EN55022:1998 Class A, EN60950, EN55024:1998, EN61000-3-2 and EN61000-3-3)
- CISPR 22, Class A
- CSA C22.2 No.60950 Safety of Information Technology Equipment 60950
- Canada ICES-003, issue 3, Class A
- China GB 9254-1998, GB17625.1-1998, GB17625.2-1999
- FCC - Verified to comply with Part 15 of the FCC Rules, Class A
- IEC-60950 (CB Certificate and CB Test Report)
- Japan VCCI, Class A
- Korea MIC
- NOM-019 Seguridad de Equipo de Procesamiento de Datos within 30 days of planned availability
- TUV-GS (EN60950/ISO 9241-3/ISO 9241-8)
- Taiwan BSMI CNS13438, Class A
- UL 60950 Safety of Information Technology Equipment

## External disk storage expansion

The HS22 supports attachments to external storage expansion enclosures such as the EXP3000 series, using the ServeRAID-MR10ie Controller installed in the CIOv slot of the blade server. The HS22 can also be attached to supported external storage systems, as described in the next section.

The external disk storage expansion enclosures listed in the following table are supported with the HS22.

Table 16. External storage expansion enclosures

Part number	Description	Maximum quantity supported per blade
172701X	IBM System Storage® EXP3000	1
174712X	IBM System Storage EXP2512 Express	1
174724X	IBM System Storage EXP2524 Express	1

SAS Connectivity Modules (one or two) must be installed into chassis to support external disk storage expansion. SAS Connectivity Module is listed in the following table.

Table 17. SAS Connectivity Modules

Part number	Description	Maximum quantity supported per one chassis
39Y9195	SAS Connectivity Module	2

The RAID controller listed in the following table is supported with external expansion enclosures.

Table 18. RAID controllers for external storage expansion enclosures

Part number	Description	Maximum quantity supported
46C7167	ServeRAID-MR10ie (CIOv) Controller with battery	1

**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.

The ServeRAID MR10ie Controller has the following specifications:

- Two SAS ports routed internally to the chassis I/O bays 3 and 4
- Supports RAID levels 0, 1, 5, 6, 10, 50, and 60
- Provides 256 MB of ECC DDR-2 battery-backed cache
- 3 Gbps throughput per port
- PCI Express 1.0 x4 host interface
- Based on the LSI 1078 controller
- Supports up to 26 disk drives.
- Support for on-board and external disk drives
- Supports connectivity to the EXP3000 storage expansion enclosures

The following table lists the drives supported by EXP3000 external expansion enclosure.

Table 19. Hard drive options for external expansion enclosures

Part number	Description	Maximum quantity supported per enclosure
EXP3000 Hot-Swap SATA 3.5" Hard Drives		
49Y1940	IBM 2 TB 7200 Dual Port SATA 3.5" HS HDD	12
EXP3000 Hot-Swap SAS 3.5" Hard Drives		
44W2234	IBM 300 GB 15K 6 Gbps SAS 3.5" Hot-Swap HDD	12
44W2239	IBM 450 GB 15K 6 Gbps SAS 3.5" Hot-Swap HDD	12
44W2244	IBM 600 GB 15K 6 Gbps SAS 3.5" Hot-Swap HDD	12

The following table lists the drives supported by EXP2512 external expansion enclosures.

Table 20. Drive options for the EXP2512 external expansion enclosures

Part number	Description	Maximum quantity supported per one enclosure
NL SAS 3.5-inch HDDs		
49Y1903	1TB 7,200 rpm 6Gb SAS NL 3.5" HDD	12
49Y1902	2TB 7,200 rpm 6Gb SAS NL 3.5" HDD	12
90Y8720	3TB 7,200 rpm 6Gb SAS NL 3.5" HDD	12
SAS 3.5-inch HDDs		
49Y1899	300GB 15,000 rpm 6Gb SAS 3.5" HDD	12
49Y1900	450GB 15,000 rpm 6Gb SAS 3.5" HDD	12
49Y1901	600GB 15,000 rpm 6Gb SAS 3.5" HDD	12

The following table lists the hard disk drives supported by the EXP2524 external expansion enclosures.

Table 21. Drive options for the EXP2524 external expansion enclosures

Part number	Description	Maximum quantity supported per one enclosure*
<b>NL SAS 2.5-inch HDDs</b>		
49Y1898	500GB 7,200 rpm 6Gb SAS NL 2.5" HDD	12
81Y9952	1TB 7,200 rpm 6Gb SAS NL 2.5" HDD	12
<b>SAS 2.5-inch HDDs</b>		
49Y1896	146GB 15,000 rpm 6Gb SAS 2.5" HDD	12
49Y1895	300GB 10,000 rpm 6Gb SAS 2.5" HDD	12
81Y9944	300GB 15,000 rpm 6Gb SAS 2.5" HDD	12
81Y9596	600GB 10,000 rpm 6Gb SAS 2.5" HDD	12
81Y9948	900GB 10,000 rpm 6Gb SAS 2.5" HDD	12
<b>SAS 2.5-inch SSDs</b>		
81Y9956	200GB 2.5" SAS SSD	12
81Y9960	400GB 2.5" SAS SSD	12

\* Note: Although the maximum number of drives supported by EXP2524 is 24, the ServeRAID H1135 Controller supports up to 14 drives in a RAID configuration, including up to two hot-spare drives. The blade server hosts two internal drives, therefore limiting the number of drives in one EXP2524 to 12.

The external SAS cables listed in the following table are supported with external expansion enclosures and connected to SAS Connectivity Modules.

Table 22. External SAS cables for external storage expansion enclosures

Part number	Description	Maximum quantity supported per enclosure
39R6531	IBM 3 m SAS Cable	1
39R6529	IBM 1 m SAS Cable	1

## External disk storage systems

The following table lists the external storage systems that are supported by server and that can be ordered through the System x sales channel. The server might support other IBM disk systems that are not listed in this table. For further information, refer to the IBM System Storage® Interoperability Center at:

<http://www.ibm.com/systems/support/storage/ssic>

Table 23. External storage expansion

Part number	Description	Maximum quantity supported per one blade server
17226xx	IBM System Storage DS4300 Midrange Disk Systems (all models)	1
17429xx	IBM System Storage DS4500 Midrange Disk System (all models)	1
17241xx	IBM System Storage DS4100 Midrange Disk System (all models)	1
17421xx	IBM System Storage DS4400 Midrange Disk System (all models)	1
181880C	IBM System Storage DCS3700	1
18147Vx	IBM System Storage DS4200 Midrange Disk System (all models)	1
18147xx	IBM System Storage DS4700 Midrange Disk System (all models)	1
18158xx	IBM System Storage DS4800 Midrange Disk System (all models)	1
1814-20A	IBM System Storage DS5020 Midrange Disk System	1
181851x	IBM System Storage DS5100 Midrange Disk System (all models)	1
181853x	IBM System Storage DS5300 Midrange Disk System (all models)	1

For more information, see the list of IBM Redbooks Product Guides in the System Storage category:  
<http://www.redbooks.ibm.com/portals/systemx?Open&page=pg&cat=externalstorage>

## External backup units

The server supports the external backup options listed in the following table. The server may support other IBM tape backup systems that are not listed in this table. For further information, refer to the IBM System Storage Interoperability Center: <http://www.ibm.com/systems/support/storage/ssic>

Table 24. External backup options (part 1)

Part number	Description
External tape expansion enclosures for internal tape drives	
87651UX	1U Tape Drive Enclosure
87651NX	1U Tape Drive Enclosure (with Nema 5-15P LineCord)
Tape enclosure adapters (with cables)	
44E8869	USB Enclosure Adapter Kit
40K2599	SAS Enclosure Adapter Kit
Internal backup drives supported by external tape enclosures	
46C5399	IBM DDS Generation 5 USB Tape Drive
39M5636	IBM DDS Generation 6 USB Tape Drive
43W8478	IBM Half High LTO Gen 3 SAS Tape Drive
44E8895	IBM Half High LTO Gen 4 SAS Tape Drive
49Y9898	IBM Half High LTO Gen 5 Internal SAS Tape Drive

Table 24. External tape options (part 2)

Part number	Description
External backup units*	
362550X	IBM RDX Removable Hard Disk Storage System - External USB 500 GB Bundle
3628L3X	IBM Half High LTO Gen 3 External SAS Tape Drive (with US line cord)
3628L4X	IBM Half High LTO Gen 4 External SAS Tape Drive (with US line cord)
3628L5X	IBM Half High LTO Gen 5 External SAS Tape Drive (with US line cord)
3628N3X	IBM Half High LTO Gen 3 External SAS Tape Drive (without line cord)
3628N4X	IBM Half High LTO Gen 4 External SAS Tape Drive (without line cord)
3628N5X	IBM Half High LTO Gen 5 External SAS Tape Drive (without line cord)
3580S3V	System Storage TS2230 Tape Drive Express Model H3V
3580S4V	System Storage TS2240 Tape Drive Express Model H4V
3580S5E	System Storage TS2250 Tape Drive Express Model H5S
3580S5X	System Storage TS2350 Tape Drive Express Model S53
3572S4R	TS2900 Tape Library with LTO4 HH SAS drive and rack mount kit
3572S5R	TS2900 Tape Library with LTO5 HH SAS drive and rack mount kit
35732UL	TS3100 Tape Library Model L2U Driveless
35734UL	TS3200 Tape Library Model L4U Driveless
46X2682†	LTO Ultrium 5 Fibre Channel Drive
46X2683†	LTO Ultrium 5 SAS Drive Sled
46X2684†	LTO Ultrium 5 Half High Fibre Drive Sled
46X2685†	LTO Ultrium 5 Half High SAS Drive Sled
46X6912†	LTO Ultrium 4 Half High Fibre Channel Drive Sled
46X7117†	LTO Ultrium 4 Half High SAS DriveV2 Sled
46X7122†	LTO Ultrium 3 Half High SAS DriveV2 Sled

\* Note: The external tape drives listed can be ordered through the System x sales channel. The server might support other IBM tape drives that are not listed in this table. For further information, refer to IBM System Storage Interoperability Center .

† Note: These part numbers are the tape drives options for 35732UL and 35734UL.

For more information, see the list of IBM Redbooks Product Guides in the Backup units category:

<http://www.redbooks.ibm.com/portals/systemx?Open&page=pg&cat=tape>



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## Related publications and links

For more information, see the following resources:

- IBM BladeCenter HS22 product page  
<http://ibm.com/systems/bladecenter/hardware/servers/hs22>
- IBM BladeCenter Information Center  
<http://publib.boulder.ibm.com/infocenter/bladectr/documentation>
- IBM BladeCenter HS22 Installation and User's Guide  
<http://ibm.com/support/entry/portal/docdisplay?Indocid=MIGR-5079689>
- IBM BladeCenter HS22 Problem Determination and Service Guide  
<http://ibm.com/support/entry/portal/docdisplay?Indocid=MIGR-5079687>
- ServerProven hardware compatibility page for the HS22  
<http://ibm.com/systems/info/x86servers/serverproven/compat/us/blade/7870.html>
- ServerProven compatibility page for operating system support  
<http://ibm.com/systems/info/x86servers/serverproven/compat/us/nos/ematrix.shtml>
- BladeCenter Interoperability Guide  
<http://www.ibm.com/support/docview.wss?uid=psg1MIGR-5073016>
- IBM Redbooks Product Guides for IBM BladeCenter servers and options  
<http://www.redbooks.ibm.com/Redbooks.nsf/portals/BladeCenter?Open&page=pgbycat>
- Configuration and Option Guide  
<http://www.ibm.com/systems/xbc/cog/>
- xRef - IBM System x Reference Sheets  
<http://www.redbooks.ibm.com/xref>
- IBM System x Support Portal  
<http://ibm.com/support/entry/portal/>  
[http://ibm.com/support/entry/portal/Downloads/Hardware/Systems/BladeCenter/BladeCenter\\_HS22](http://ibm.com/support/entry/portal/Downloads/Hardware/Systems/BladeCenter/BladeCenter_HS22)

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