

## ServeRAID M5016 SAS/SATA Controller

### IBM System x at-a-glance guide

The ServeRAID M5016 SAS/SATA Controller offers an enterprise grade RAID solution for internal HDDs and integrates popular 6 Gbps SAS technology into an organization's storage infrastructure. In addition, M5016 comes with Flash-Backed cache offload, allowing clients to have extended-life cached data protection in their storage subsystem in the event of an unexpected power outage.

Figure 1 shows the ServeRAID M5016 controller.

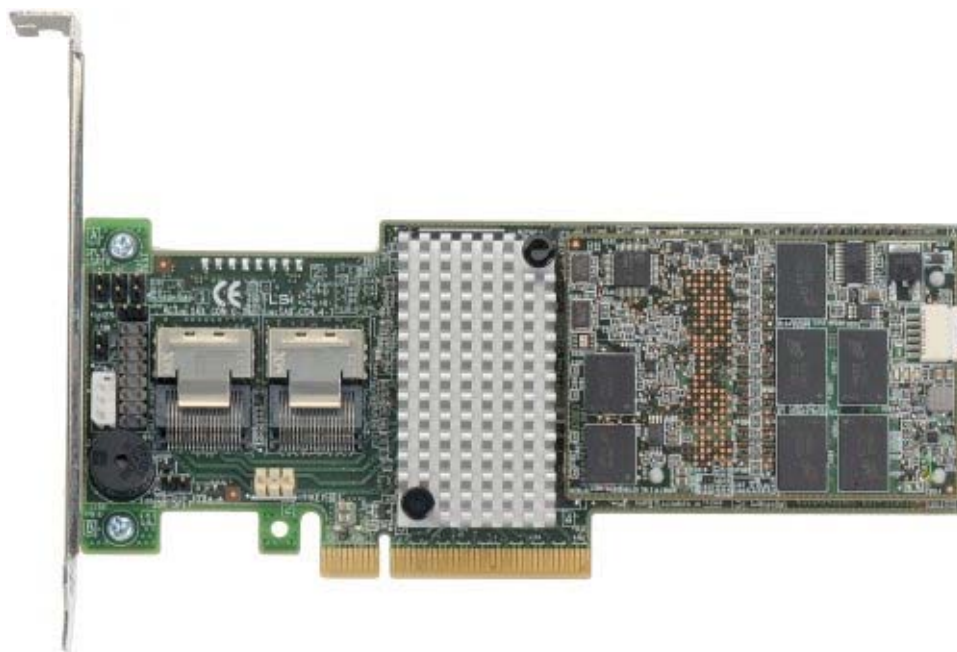


Figure 1. ServeRAID M5016 SAS/SATA Controller (with flash module)

### Did you know

The ServeRAID M5016 SAS/SATA Controller uses 1 GB of Flash-Backed cache with super-capacitor technology, eliminating the need for consumable batteries. In addition, it supports RAID 6 and 60, and self-encrypting drives as a standard feature. The purchase of additional feature keys is not required.

## Part number information

Table 1 provides the ordering part number and feature code.

Table 1. Ordering part number and feature code

Description	Part number	Feature code
ServeRAID M5016 SAS/SATA Controller for IBM System x	90Y4304	A2NF

The ServeRAID M5016 option part number includes the following items:

- One ServeRAID M5016 adapter card
- Full-height (3U) bracket
- Low-profile (2U) bracket
- Cache module
- Power module
- Two power module cables
- Cable clip
- Quick installation guide
- Warranty flyer
- Documentation CD
- Important notices flyer

Figure 2 shows ServeRAID M5016 adapter with cache and power modules and power cables.

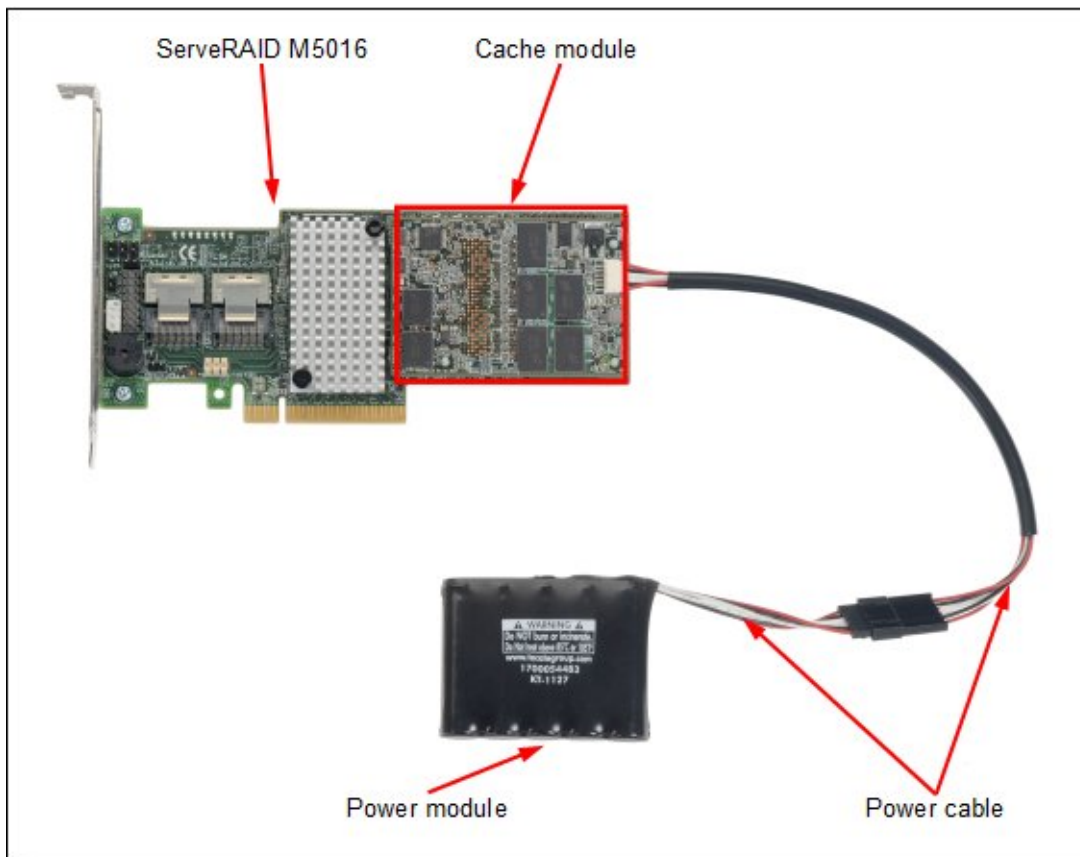


Figure 2. ServeRAID M5016 adapter with cache and power modules and power cables

## Specifications

The ServeRAID M5016 adapter card has the following specifications:

- Eight internal 6 Gbps SAS/SATA ports
- Two Mini-SAS internal connectors (SFF-8087)
- 6 Gbps throughput per port
- 800 MHz dual-core PowerPC® processor with LSI SAS2208 6 Gbps RAID on Chip (ROC) controller
- PCI Express x8 Gen 2 host interface
- 1 GB of onboard data cache (DDR3 running at 1333 MHz)
- CacheVault technology to protect data in cache in case of critical power or server failure
- Supports RAID levels 0, 1, 5, 6, 10, 50, and 60
- Connects to up to 128 SAS or SATA drives
- Intermix of SAS and SATA drives are supported, but the mixing of SAS and SATA drives in the same RAID array is not supported
- Supports up to 64 logical volumes
- Supports LUN sizes up to 64 TB
- Configurable stripe size up to 1 MB
- Compliant with Disk Data Format (DDF) configuration on disk (COD)
- S.M.A.R.T. support

## Features

The ServeRAID M5016 SAS/SATA Controller has the following features:

- Auto-resume on array rebuild or array reconstruction after loss of system power  
Auto-resume uses non-volatile NVRAM to save rebuild progress during a host reboot or power failure to automatically resume from the last checkpoint. Auto-resume ensures that data integrity is maintained through the process. The card supports a number of features that are able to be implemented without rebooting the server. Applications such as email and web server benefit from avoiding downtime during transition.
- Online Capacity Expansion  
Online Capacity Expansion (OCE) allows the capacity of a virtual disk to be expanded by adding new physical disks or making use of unused space on existing disks, without requiring a reboot.
- Online RAID Level Migration  
Online RAID Level Migration (also known as logical drive migration) provides the ability to migrate a virtual disk from any RAID level to any other RAID level without requiring a reboot. System availability and application functionality remain unaffected.

- Fast initialization for quick array setup

- Consistency check for background data integrity

Consistency check verifies that all stripes in a virtual disk with a redundant RAID level are consistent. The consistency check will mirror data when an inconsistent stripe is detected for a RAID 1 and recreate the parity from the peer disks in the case of a RAID 5 or RAID 6. Consistency checks can be scheduled to take place periodically.

- Extensive online configuration options: Advanced monitoring and event notification

Management tools provide convenience for configuration of logical volumes and alerting when errors have occurred or are about to occur.

- Patrol read for media scanning and repairing

Patrol read is a background sentry service designed to proactively discover and correct media defects (bad sectors) that arise normally as a disk drive ages. The service issues a series of verify commands, and if a bad block is discovered, the card's firmware uses RAID algorithms to recreate the missing data and remap the sector to a good sector. The task is interruptible based on controller activity and host operations. The firmware also provides an interface where the patrol read task can be initiated, set up for continuous operation, and terminated from a management application. Patrol read can be activated by manual command or automatically.

- Global and dedicated Hot Spare with Revertible Hot Spare support

A hot spare rebuilds data from all virtual disks within the disk group in which it is configured. ServeRAID provides the ability to define a physical disk as a hot spare to replace a failed drive. Hot spares can be configured as either global or dedicated. A global hot spare allows any physical drive to be designated as a hot spare. A dedicated hot spare allows the user to assign a hot spare drive to a particular array of the same drive type.

- Support for RAID levels 6 and 60 and self-encrypting drives as a standard feature (no additional feature keys required)

- LSI SafeStore support for self-encrypting drive services

LSI SafeStore encryption services offer instant secure erase and local key management for self-encrypting drives. This technology represents a significant step forward in securing data on a disk drive from any unauthorized access or modification resulting from theft, loss, or repurposing of drives. Instant secure erase permanently removes data when repurposing or decommissioning SEDs. SafeStore local key management provides the necessary management and protection of SEDs using a simple pass phrase, security key identifier, and security key file that can be set and applied to all SEDs assigned to a ServeRAID adapter. This removes the complexity of managing each SED's unique encryption key, and essentially relieves the administrator of most of the daily tasks of securing data.

- CacheVault flash cache protection

LSI CacheVault flash cache protection uses NAND flash memory powered by a supercapacitor to protect data stored in the controller cache. This module eliminates the need for a lithium-ion battery commonly used to protect DRAM cache memory on PCI RAID controllers. To avoid the possibility of data loss or corruption during a power or server failure, CacheVault technology transfers the contents of the DRAM cache to NAND flash (CacheVault flash module - CVFM) using power from the CacheVault power module (CVPM). After the power is restored to the M5016 RAID controller, CacheVault technology transfers the contents of the NAND flash back to the DRAM, which will eventually be flushed to disk.

## Supported servers

The ServeRAID M5016 adapter card is supported on the IBM® System x® servers listed in Table 2.

Table 2. Supported System x servers (part 1)

Adapter	x3100 M3	x3100 M4	x3200 M2	x3200 M3	x3250 M2	x3250 M3	x3250 M4	x3400 M2	x3400 M3	x3500 M2	x3500 M3	x3550 M2
ServeRAID M5016 SAS/SATA Controller	N	N	N	N	N	N	N	N	N	N	N	N

Table 2. Supported System x servers (part 2)

Adapter	x3550 M3	x3620 M3	x3630 M3	x3650 M2	x3650 M3	x3690 X5	x3755 M3	x3850 M2	x3950 M2	x3850 X5	dx360 M2	dx360 M3
ServeRAID M5016 SAS/SATA Controller	Y	N	N	N	Y	N	N	N	N	N	N	N

See IBM ServerProven® for the latest information about the System x servers that support each adapter:  
<http://ibm.com/servers/eserver/serverproven/compat/us/>

## Supported disk drives

The ServeRAID M5016 SAS/SATA controller supports the disk drives that are supported on the servers listed in Table 2. The maximum number of drives that can be connected to the RAID controller is limited by the number of internal drive bays for a supported server. These drives and the servers that they are supported with are listed in the following tables.

Table 3. Supported hot-swap NL SAS drives

Part number	Product description	x3100 M3	x3100 M4	x3200 M3	x3250 M3	x3250 M4	x3400 M2	x3400 M3	x3500 M2	x3500 M3	x3550 M2	x3550 M3	x3620 M3	x3650 M2	x3650 M3	x3850 X5
42D0777	IBM 1TB 7.2K 6Gbps NL SAS 3.5" HS HDD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
42D0767	IBM 2TB 7.2K 6Gbps NL SAS 3.5" HS HDD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
81Y9758	IBM 3TB 7.2K 6Gbps NL SAS 3.5" HS HDD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
42D0692*	IBM 500GB 7200 6Gbps NL SAS 2.5" SFF HS HDD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
42D0707	IBM 500GB 7.2K 6Gbps NL SAS 2.5" SFF Slim-HS HDD	N	N	N	N	N	N	N	N	N	N	Y	N	N	Y	N
81Y9690	IBM 1TB 7.2K 6Gbps NL SAS 2.5" SFF HS HDD	N	N	N	N	N	N	N	N	N	N	Y	N	N	Y	N

\* Note: Withdrawn, not available for ordering.

Table 4. Supported hot-swap SAS drives

Part number	Product description	x3100 M3	x3100 M4	x3200 M3	x3250 M3	x3250 M4	x3400 M2	x3400 M3	x3500 M2	x3500 M3	x3550 M2	x3550 M3	x3620 M3	x3650 M2	x3650 M3	x3850 X5
40K1043*	73GB 15K Hot-Swap SAS	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
40K1044*	146GB 15K 3.5" Hot-Swap SAS	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
43W7524*	146GB 15K 3.5" SAS Hot-Swap HDD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
43X0802*	300GB 15K 3.5" Hot-Swap SAS	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
44W2234	IBM 300GB 15K 6Gbps SAS 3.5-inch Hot-Swap HDD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
42D0519*	IBM 450GB 15K SAS 3.5" HS HDD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
44W2239	IBM 450GB 15K 6Gbps SAS 3.5" Hot-Swap HDD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
44W2244	IBM 600GB 15K 6Gbps SAS 3.5" Hot-Swap HDD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
42D0672	IBM 73GB 15K 6Gbps SAS 2.5" SFF Slim-HS HDD	N	N	N	N	N	N	N	N	N	N	Y	N	N	Y	N
43W7545*	IBM 73GB 15K SAS 2.5" SFF Slim-HS HDD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
43X0837*	IBM Server 73GB SAS 15K 2.5" SFF HS	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
42D0632	IBM 146GB 10K 6Gbps SAS 2.5" SFF Slim-HS HDD	N	N	N	N	N	N	N	N	N	N	Y	N	N	Y	N
42D0652	IBM 146GB 15K 6Gbps SAS 2.5" SFF HS HDD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
42D0677	IBM 146GB 15K 6Gbps SAS 2.5" SFF Slim-HS HDD	N	N	N	N	N	N	N	N	N	N	Y	N	N	Y	N
43W7536*	IBM 146GB 10K SAS 2.5" SFF Slim-HS HDD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
43X0824*	IBM Server 146GB SAS 10K 2.5" SFF HS	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
44W2294	IBM 146GB 15K 6Gbps SAS 2.5" SFF Slim-HS SED	N	N	N	N	N	N	N	N	N	N	Y	N	N	Y	N
42D0612	IBM 300GB 10K 6Gbps SAS 2.5" SFF HS HDD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
42D0637	IBM 300GB 10K 6Gbps SAS 2.5" SFF Slim-HS HDD	N	N	N	N	N	N	N	N	N	N	Y	N	N	Y	N
44W2264	IBM 300GB 10K 6Gbps SAS 2.5" SFF Slim-HS SED	N	N	N	N	N	N	N	N	N	N	Y	N	N	Y	N
81Y9670	IBM 300GB 15K 6Gbps SAS 2.5" SFF HS HDD	N	N	N	N	N	N	N	N	N	N	Y	N	N	Y	N
49Y2003	IBM 600GB 10K 6Gbps SAS 2.5" SFF HS HDD	N	N	N	N	N	N	N	N	N	N	Y	N	N	Y	N
81Y9650	IBM 900GB 10K 6Gbps SAS 2.5" HS HDD	N	N	N	N	N	N	N	N	N	N	Y	N	N	Y	N

\* Note: Withdrawn, not available for ordering.

Table 5. Supported hot-swap SATA drives

Part number	Product description	x3100 M3	x3100 M4	x3200 M3	x3250 M3	x3250 M4	x3400 M2	x3400 M3	x3500 M2	x3500 M3	x3550 M2	x3550 M3	x3620 M3	x3650 M2	x3650 M3	x3850 X5
39M4526*	250GB 7200 RPM 3.5" Hot-Swap SATA II	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
43W7754	IBM 250GB 7.2K SATA 3.5" Hot-Swap HDD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
43W7576*	750GB Hot-Swap SATA II	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
43W7626	IBM Server 1TB 7200 SATA 3.5" HS	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
42D0782	IBM 2TB 7200 NL SATA 3.5" HS HDD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
81Y9774	IBM 3TB 7.2K 6Gbps NL SATA 3.5" HS HDD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
42D0747*	IBM 160GB 7200 NL SATA 2.5" SFF Slim-HS HDD	N	N	N	N	N	N	N	N	N	N	Y	N	N	Y	N
42D0752*	IBM 500GB 7200 NL SATA 2.5" SFF Slim-HS HDD	N	N	N	N	N	N	N	N	N	N	Y	N	N	Y	N
81Y9722	IBM 250GB 7.2K 6Gbps NL SATA 2.5" SFF HS HDD	N	N	N	N	N	N	N	N	N	N	Y	N	N	Y	N
81Y9726	IBM 500GB 7.2K 6Gbps NL SATA 2.5" SFF HS HDD	N	N	N	N	N	N	N	N	N	N	Y	N	N	Y	N
81Y9730	IBM 1TB 7.2K 6Gbps NL SATA 2.5" SFF HS HDD	N	N	N	N	N	N	N	N	N	N	Y	N	N	Y	N

\* Note: Withdrawn, not available for ordering.

Table 6. Supported Simple Swap SATA drives

Part number	Product description	x3100 M3	x3100 M4	x3200 M3	x3250 M3	x3250 M4	x3400 M2	x3400 M3	x3500 M2	x3500 M3	x3550 M2	x3550 M3	x3620 M3	x3650 M2	x3650 M3	x3850 X5
39M4508*	250GB 7200 RPM 3.5" Simple-Swap SATA II	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
43W7594*	250GB 7200-rpm Simple-swap SATA HDD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
43W7750	IBM 250GB 7.2K SATA 3.5" Simple-Swap HDD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
39M4514	500GB 3.5" Simple-Swap SATA II	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
43W7572*	750GB 3.5" Simple-Swap SATA II	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
42D0787	IBM 2TB 7200 NL SATA 3.5" SS HDD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
81Y9778	IBM 3TB 7.2K 6Gbps NL SATA 3.5" SS HDD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N

\* Note: Withdrawn, not available for ordering.

Table 7. Supported solid state drives

Part number	Product description	x3100 M3	x3100 M4	x3200 M3	x3250 M3	x3250 M4	x3400 M2	x3400 M3	x3500 M2	x3500 M3	x3550 M2	x3550 M3	x3620 M3	x3650 M2	x3650 M3	x3850 X5
43W7618*	IBM 31.4GB 2.5" Solid State Drive	N	N	N	N	N	N	N	N	N	N	Y	N	N	Y	N
43W7648*	IBM 31.4 GB SATA 2.5" SFF Slim-HS SSD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
41Y8264*	IBM 31.4 GB SATA 2.5" SFF Slim-HS SSD V2	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
43W7698*	IBM 50GB SATA 3.5" HS High IOPS SSD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
43W7714	IBM 50GB SATA 2.5" SFF Slim-HS High IOPS SSD	N	N	N	N	N	N	N	N	N	N	Y	N	N	Y	N
43W7722	IBM 50GB SATA 2.5" SFF HS High IOPS SSD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
43W7706	IBM 50GB SATA 2.5" SFF NHS High IOPS SSD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
43W7718	IBM 200GB SATA 2.5" MLC HS SSD	N	N	N	N	N	N	N	N	N	N	Y	N	N	Y	N
43W7742	IBM 200GB SATA 2.5" MLC SS SSD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N

\* Note: Withdrawn, not available for ordering.

## Warranty

There is a 1-year limited warranty. When installed on a System x server, these cards assume your system's base warranty and any IBM ServicePac® upgrade.

## Physical specifications

The ServeRAID M5016 SAS/SATA controller has the following physical specifications:

- Height: 69 mm (2.7 in)
- Width: 167 mm (6.6 in)
- Depth: 13 mm (5.0 in)
- Weight: 90 g (0.2 lb)

These are the shipping dimensions:

- Height: 238.3 mm (9.4 in)
- Width: 143.0 mm (5.6 in)
- Depth: 50.8 mm (2.0 in)
- Weight: 222 g (0.5 lb)

## Operating environment

The ServeRAID M5016 SAS/SATA controller is supported in the following environment:

- Temperature:
  - At 0 - 914 m (0 - 3,000 ft): 10 - 35 °C (50 - 95 °F)
  - At 914 - 2133 m (3,000 - 7,000 ft): 10 - 32 °C (50 - 90 °F)
- Relative humidity: 20 - 80% (non-condensing)
- Maximum altitude: 2,133 m ( 7,000 ft)

## Agency approvals

- EN55022
- EN55024
- EN60950 / CE
- EN 61000-3-2
- EN 61000-3-3
- IEC 950 CB Scheme
- FCC Part 15 Class A, and Class B
- UL 1950
- CSA C22.2 950-95
- VCCI
- NZ AS3548 / C-tick
- RRL for MIC (KCC)
- BSMI
- UL 94-/V

## Supported operating systems

The ServeRAID M5016 SAS/SATA Controller supports the following operating systems:

- 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 Storage Server 2003/2003 R2, Standard Edition
- Microsoft Windows Storage Server 2003/2003 R2, Enterprise Edition x64
- Microsoft Windows Storage Server 2003/2003 R2, Standard Edition x64
- Microsoft Windows Storage Server 2003/2003 R2, Workgroup Edition x64
- 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 Small Business Server 2003/2003 R2 Premium Edition
- Microsoft Windows Small Business Server 2003/2003 R2 Standard Edition

- Red Hat Enterprise Linux 4 AS for x86
- Red Hat Enterprise Linux 4 AS for AMD64/EM64T
- Red Hat Enterprise Linux 4 ES for x86
- Red Hat Enterprise Linux 4 ES for AMD64/EM64T
- 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
- 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 4.1
- VMware ESXi 4.1
- VMware vSphere 5.0

See the IBM ServerProven website for the latest information about the specific versions and service packs supported: <http://ibm.com/servers/eserver/serverproven/compat/us/>. Click **System x servers**, then **Disk controllers** to see the support matrix. Click the check mark that is associated with the System x server in question to see the details of the operating system support.

## Related publications

For more information see the following documents:

- IBM US Announcement Letter:  
<http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS111-215>
- System x RAID products home page:  
[http://www.ibm.com/systems/storage/product/systemx/scsi\\_raid.html](http://www.ibm.com/systems/storage/product/systemx/scsi_raid.html)
- IBM ServeRAID software matrix:  
<http://www.ibm.com/support/docview.wss?uid=psg1SERV-RAID>
- IBM System x Configuration and Options Guide:  
<http://www.ibm.com/support/docview.wss?uid=psg1SCOD-3ZVQ5W>

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