

ServeRAID M5120 SAS/SATA Controller for IBM System x

IBM Redbooks Product Guide

The ServeRAID M5120 SAS/SATA Controller for IBM® System x® is a part of the ServeRAID M Series family, which offers a complete server storage solution consisting of RAID controllers, cache/flash modules, energy packs, and software feature upgrades in an ultra-flexible offerings structure. These products are optimized to deliver performance demanded by the ever-growing I/O requirements of today's enterprises. The M5120 comes as a small form factor PCIe adapter, and it shares a common set of ServeRAID M Series upgrades available for the entire family, simplifying inventory management.

Figure 1 shows the ServeRAID M5120 controller.



Figure 1. ServeRAID M5120 SAS/SATA Controller (with flash module)

Did you know

The ServeRAID M5120 SAS/SATA Controller is optimized for high-performance external data storage with integration of dual-core chip architecture, DDR3 1333 MHz cache memory, and PCIe 3.0 host interface. A portfolio of building blocks allows clients to design around a bottoms-up approach and caters to a wide array of storage requirements. Upgrade features such as support for RAID 6/60, performance optimization, and caching with SSDs no longer require a hardware key. They are implemented through Features-on-Demand (FoD) software licenses.

Part number information

Table 1 provides the ordering part numbers and feature codes.

Table 1. Ordering part numbers and feature codes

Description	Part number	Feature code
Base controller		
ServeRAID M5120 SAS/SATA Controller for IBM System x	81Y4478	A1WX
Cache upgrades and battery kit		
ServeRAID M5100 Series 512MB Cache/RAID 5 Upgrade for IBM System x	81Y4484	A1J3
ServeRAID M5100 Series 512MB Flash/RAID 5 Upgrade for IBM System x	81Y4487	A1J4
ServeRAID M5100 Series 1GB Flash/RAID 5 Upgrade for IBM System x	81Y4559	A1WY
ServeRAID M5100 Series 2GB Flash/RAID 5 Upgrade	47C8670	A4G6
ServeRAID M5100 Series Battery Kit for IBM System x	81Y4508	A22E
Features on Demand (FoD) upgrades		
ServeRAID M5100 Series RAID 6 Upgrade for IBM System x	81Y4546	A1X3
ServeRAID M5100 Series SSD Performance Accelerator for IBM System x	90Y4273	A2MC
ServeRAID M5100 Series SSD Caching Enabler for IBM System x	90Y4318	A2MD

Important: The ServeRAID M5120 SAS/SATA Controller ships standard without a cache. One of the available cache upgrades (81Y4484, 81Y4487, or 81Y4559) is required for the M5120 adapter operations, and it must be purchased together with the controller.

The ServeRAID M5120 option part number includes the following items:

- One ServeRAID M5120 adapter card
- Full-height (3U) bracket
- Low-profile (2U) bracket
- Warranty Flyer
- ServeRAID M Documentation CD
- Important Notices Flyer

The ServeRAID M5100 Series 512MB Cache Upgrade option part number includes the following items:

- Cache module
- Important Notices flyer
- Warranty Flyer
- ServeRAID M Documentation CD

The ServeRAID M5100 Series Battery Kit option part number includes the following items:

- Battery
- Two battery cables (0.5 m and 0.95 m)
- Important Notices Flyer
- Lithium Battery Handling Statement
- Warranty Flyer
- ServeRAID M Documentation CD

ServeRAID M5100 Series 512MB, 1GB, and 2GB Flash Upgrade option part numbers include the following items:

- Cache module
- Flash power module
- Two power module cable
- Important Notices Flyer
- Warranty Flyer
- ServeRAID M Documentation CD

ServeRAID M5100 Series RAID 6 Upgrade, SSD Performance Accelerator, and SSD Caching Enabler option part numbers include the following items:

- M5100 Series upgrade authorization letter
- Feature Activation Instructions

Figure 2 shows the Flash-backed cache module, power module, and power cable.

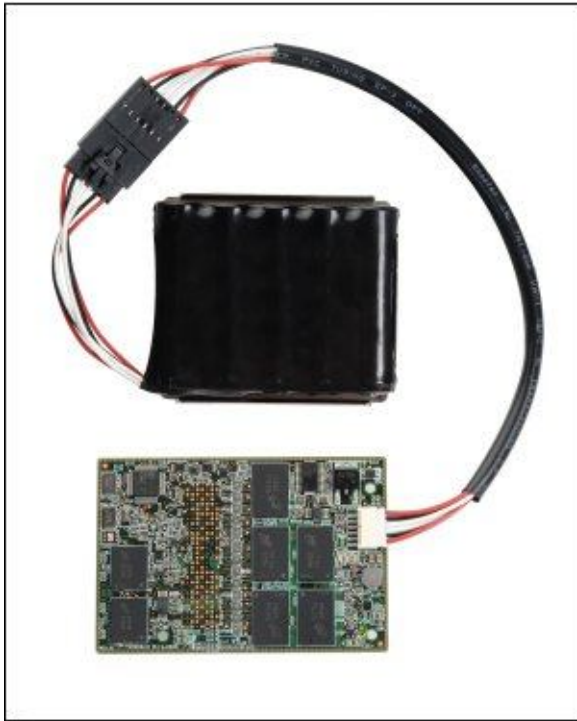


Figure 2. Flash-backed cache module, power module, and power cable

Features

The ServeRAID M5120 SAS/SATA Controller has the following standard 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**

Fast initialization quickly writes zeroes to the first and last sectors of the virtual drive. This allows you to immediately start writing data to the virtual drive while the initialization is running in the background.
- **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 and 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.

- Single controller multipathing (failover) I/O load balancing
The ServeRAID's firmware detects and uses multiple paths from the controllers to the SAS drives that are in enclosures. With redundant paths to the same port of a device, if one path fails, another path can be used to communicate between the controller and the drive. Using multiple paths with load balancing, instead of a single path, can increase reliability through redundancy.
- WebBIOS configuration utility for pre-boot array configuration and management
WebBIOS is a utility built into the ServeRAID controller that allows you to configure drive groups and logical drives before installing or booting the operating system.
- MegaRAID Storage Manager management software
MegaRAID Storage Manager is an easy-to-use advanced RAID management application used across the entire family of ServeRAID M controllers. It allows you to configure, monitor, and maintain drive groups, virtual drives, and advanced features with an intuitive GUI, reducing administrative efforts and simplifying troubleshooting.

The following features are not included in the base shipment and require respective upgrade to be purchased:

- Support for RAID levels 6 and 60 with M5100 Series RAID 6 Upgrade (81Y4546)
- MegaRAID SafeStore support for self-encrypting drive (SED) services
MegaRAID 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. The SafeStore is a part of any RAID 5 upgrade available: 81Y4484, 81Y4487, 81Y4559, or 47C8670.
- MegaRAID flash cache protection
MegaRAID 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, flash cache protection technology transfers the contents of the DRAM cache to NAND flash using power from the flash power module. After the power is restored to the RAID controller, flash protection technology transfers the contents of the NAND flash back to the DRAM, which will eventually be flushed to disk.
- MegaRAID FastPath SSD performance acceleration
MegaRAID FastPath software provides high-performance I/O acceleration for SSD-based virtual drives by exploiting an extremely low latency I/O path to increase the maximum IOPS capability of the controller. This feature boosts performance of applications with highly random data storage access patterns like transactional databases. The feature is activated by enabling M5100 Series Performance Accelerator (90Y4273).

- MegaRAID CacheCade SSD caching for traditional hard drives

MegaRAID CacheCade read/write software is designed to accelerate the performance of hard disk drive (HDD) arrays with only an incremental investment in solid state drive (SSD) technology. The software enables SSDs to be configured as a dedicated pool of controller cache to help maximize I/O performance for transaction-intensive applications like databases and web serving. CacheCade software tracks data storage access patterns and identifies the most frequently accessed data. This hot data is then automatically stored on the solid state storage devices assigned as a dedicated cache pool on a ServeRAID controller with the M5100 Series SSD Caching feature (90Y4318) enabled.

Technical specifications

The ServeRAID M5120 SAS/SATA Controller has the following specifications:

- PCI Low Profile, Half-length - MD2 form factor
- Eight external 6 Gbps SAS/SATA ports
- Two external Mini-SAS connectors (SFF-8088)
- 6 Gbps throughput per port
- 800 MHz dual-core IBM PowerPC® processor with LSI SAS2208 6 Gbps RAID on Chip (ROC) controller
- PCI Express 3.0 x8 host interface
- Support for RAID levels 0, 1, 10 standard, support for RAID 5, 50 and 6, 60 with additional upgrades
- Onboard data cache (DDR3 running at 1333 MHz) required for M5120 operations (does not come standard, must be purchased in addition to M5120) with the choice of:
 - 512 MB with optional battery backup
 - 512 MB, 1 GB, or 2 GB with flash backup (MegaRAID flash cache protection technology)
- Supports SAS, SATA HDDs, and SSDs
- Intermix of SAS and SATA HDDs and SSDs is supported, but the mixing of different drives type in the same array (drive group) is not recommended
- Connects to up to 240 external drives
- Supports connections to EXP2512 and EXP2524 external expansion enclosures
- Optional support for self-encrypting drives (SEDs) with MegaRAID SafeStore
- Optional support for SSD performance acceleration with MegaRAID FastPath and SSD caching with MegaRAID CacheCade
- Supports up to 64 virtual drives, up to 128 drive groups, up to 16 virtual drives per one drive group, and up to 32 physical drives per one drive group
- 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
- MegaRAID Storage Manager management software

Feature upgrade matrix

The ServeRAID M5120 SAS/SATA Controller ships standard without a cache. One of the available cache upgrades listed in the following table is required for the M5120 adapter operations, and it must be purchased together with the controller. Additional functional upgrades optionally are available to expand the capabilities of M5120.

There are two types of upgrades available: hardware (HW) and Feature-on-Demand (FoD). Hardware upgrades contain physical parts (for example, cache module or battery), whereas FoD upgrades are software licenses. The following table lists cache upgrades available and their capabilities and types.

Table 2. ServeRAID M5120 cache upgrades and their features

			Feature	RAID 5, 50	SED	512 MB DDR3 cache	1 GB DDR3 cache	2 GB DDR3 cache	Flash-backed cache
Option description	Part number	Type							
ServeRAID M5100 Series 512MB Cache/RAID 5 Upgrade	81Y4484	HW	Yes	Yes	Yes	No	No	No	No
ServeRAID M5100 Series 512MB Flash/RAID 5 Upgrade	81Y4487	HW	Yes	Yes	Yes	No	No	Yes	Yes
ServeRAID M5100 Series 1GB Flash/RAID 5 Upgrade	81Y4559	HW	Yes	Yes	No	Yes	No	Yes	Yes
ServeRAID M5100 Series 2GB Flash/RAID 5 Upgrade	47C8670	HW	Yes	Yes	No	No	Yes	Yes	Yes

Zero Cache/RAID 5 Upgrade: ServeRAID M5100 Series Zero Cache/RAID 5 Upgrade (81Y4544) is not supported on the M5120 adapter.

The following table shows additional upgrades, their capabilities, types, and compatibility with cache upgrades. In the table below, "Required" means that the cache upgrade listed in the column must be enabled before enabling the additional feature listed in that particular row.

Table 3. ServeRAID M5120 additional upgrades, their features, and compatibility

		Cache upgrades	Option description	512 MB Cache/RAID 5	512 MB Flash/RAID 5	1 GB Flash/RAID 5	2 GB Flash/RAID 5
		Part number	Upgrade type				
Additional feature upgrades	Option description	Part number	Type				
Battery-backed cache	Battery Kit	81Y4508	HW	Required	No support	No support	No support
RAID 6, 60	RAID 6 Upgrade	81Y4546	FoD	Required	Required	Required	Required
FastPath	SSD Performance Accelerator	90Y4273	FoD	Required	Required	Required	Required
CacheCade	SSD Caching Enabler	90Y4318	FoD	Required	Required	Required	Required

Supported servers

The ServeRAID M5120 adapter card is supported on the System x and IBM iDataPlex® servers listed in the following table.

Table 4. System x and iDataPlex compatibility (Part 1)

Part number	Description	x3100 M4 (2582)	x3250 M4 (2583)	x3300 M4 (7382)	x3500 M4 (7383, E5-2600)	x3530 M4 (7160)	x3550 M4 (7914, E5-2600)	x3630 M4 (7158)	x3650 M4 (7915, E5-2600)	x3690 X5 (7147)	x3750 M4 (8722)	x3850 X5 (7143)	dx360 M4 (7912, E5-2600)
81Y4478	ServeRAID M5120 SAS/SATA Controller	N	N	Y	Y	Y	Y	Y	Y	N	Y	N	Y
81Y4544	ServeRAID M5100 Series Zero Cache/RAID 5 Upgrade	N	N	Y	Y	Y	Y	Y	Y	N	Y	N	Y
81Y4484	ServeRAID M5100 Series 512MB Cache/RAID 5 Upgrade	N	N	Y	Y	Y	Y	Y	Y	N	Y	N	Y
81Y4487	ServeRAID M5100 Series 512MB Flash/RAID 5 Upgrade	N	N	Y	Y	Y	Y	Y	Y	N	Y	N	Y
81Y4559	ServeRAID M5100 Series 1GB Flash/RAID 5 Upgrade	N	N	Y	Y	Y	Y	Y	Y	N	Y	N	Y
47C8670	ServeRAID M5100 Series 2GB Flash/RAID 5 Upgrade	N	N	N	N	N	N	N	N	N	Y	N	N
81Y4508	ServeRAID M5100 Series Battery Kit	N	N	Y	Y	Y	Y	Y	Y	N	Y	N	Y
81Y4546	ServeRAID M5100 Series RAID 6 Upgrade	N	N	Y	Y	Y	Y	Y	Y	N	Y	N	Y
90Y4273	ServeRAID M5100 Series SSD Performance Accelerator	N	N	Y	Y	Y	Y	Y	Y	N	Y	N	Y
90Y4318	ServeRAID M5100 Series SSD Caching Enabler	N	N	Y	Y	Y	Y	Y	Y	N	Y	N	Y

Table 4. System x and iDataPlex compatibility (Part 2)

Part number	Description	x3500 M4 (7383, E5-2600 v2)	x3550 M4 (7914, E5-2600 v2)	x3650 M4 (7915, E5-2600 v2)	x3650 M4 HD (5460)	dx360 M4 (7912, E5-2600 v2)	nx360 M4 (5455)
81Y4478	ServeRAID M5120 SAS/SATA Controller	Y	Y	Y	N	Y	N
81Y4544	ServeRAID M5100 Series Zero Cache/RAID 5 Upgrade	Y	Y	Y	N	Y	N
81Y4484	ServeRAID M5100 Series 512MB Cache/RAID 5 Upgrade	Y	Y	Y	N	Y	N
81Y4487	ServeRAID M5100 Series 512MB Flash/RAID 5 Upgrade	Y	Y	Y	N	Y	N
81Y4559	ServeRAID M5100 Series 1GB Flash/RAID 5 Upgrade	Y	Y	Y	N	Y	N
47C8670	ServeRAID M5100 Series 2GB Flash/RAID 5 Upgrade	N	N	N	N	N	N
81Y4508	ServeRAID M5100 Series Battery Kit	Y	Y	Y	N	Y	N
81Y4546	ServeRAID M5100 Series RAID 6 Upgrade	Y	Y	Y	N	Y	N
90Y4273	ServeRAID M5100 Series SSD Performance Accelerator	Y	Y	Y	N	Y	N
90Y4318	ServeRAID M5100 Series SSD Caching Enabler	Y	Y	Y	N	Y	N

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

Supported expansion enclosures and drives

The ServeRAID M5120 SAS/SATA Controller supports connectivity to the IBM System Storage® external expansion enclosures listed in the following table. Up to nine expansion enclosures can be daisy chained per one M5120's external port. For better performance, distribute expansion enclosures evenly across both M5120 ports.

Table 5. IBM System Storage external expansion enclosures

Part number	Description	Maximum quantity supported per one M5120
174712X	IBM System Storage EXP2512 Express	18
174724X	IBM System Storage EXP2524 Express	9

The external SAS cables listed in the following table support connectivity between external expansion enclosures and the ServeRAID M5120 SAS/SATA Controller.

Table 6. External SAS cables for external storage expansion enclosures

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

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

Table 7. Drive options for EXP2512 external expansion enclosures

Part number	Description	Maximum quantity supported per one enclosure
3.5" NL SAS HS 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
46W0975	4TB 7,200 rpm 6Gb SAS NL 3.5" HDD	12
3.5" SAS HS 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 EXP2524 external expansion enclosures.

Table 8. Drive options for EXP2524 external expansion enclosures

Part number	Description	Maximum quantity supported per one enclosure
2.5" NL SAS HS HDDs		
49Y1898	500GB 7,200 rpm 6Gb SAS NL 2.5" HDD	24
81Y9952	1TB 7,200 rpm 6Gb SAS NL 2.5" HDD	24
2.5" SAS HS HDDs		
49Y1896	146GB 15,000 rpm 6Gb SAS 2.5" HDD	24
81Y9944	300GB 15,000 rpm 6Gb SAS 2.5" HDD	24
00W1595	600GB 10,000 rpm 6Gb SAS 2.5" HDD	24
46W0970	900GB 10,000 rpm 6Gb SAS 2.5" HDD	24
46W0980	1.2TB 10,000 rpm 6Gb SAS 2.5" HDD	24
2.5" SAS HS SSDs		
49Y6072	200GB 6Gb SAS 2.5" SSD	24
49Y6077	400GB 6Gb SAS 2.5" SSD	24

Supported operating systems

The ServeRAID M5120 SAS/SATA Controller supports the following operating systems:

- Microsoft Windows Server 2012
- 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
- Red Hat Enterprise Linux 6 Server x64 Edition
- Red Hat Enterprise Linux 6 Server Edition
- Red Hat Enterprise Linux 5 Server with Xen x64 Edition
- Red Hat Enterprise Linux 5 Server x64 Edition
- 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
- SUSE LINUX Enterprise Server 10 for AMD64/EM64T
- VMware vSphere 5.1 (ESXi)
- VMware vSphere 5.0 (ESXi)
- VMware ESX 4.1
- VMware ESXi 4.1

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>

Warranty

The ServeRAID M5120 SAS/SATA Controller carries a 1-year limited warranty. When installed in a supported System x server, the adapter assumes your system's base warranty and any IBM ServicePac® upgrade.

Physical specifications

The ServeRAID M5120 SAS/SATA Controller has the following physical specifications:

Dimensions (approximate):

- Height: 15 mm (0.6 in)
- Width: 69 mm (2.7 in)
- Depth: 168 mm (6.6 in)
- Weight: 77 g (0.2 lb)

Shipping dimensions (approximate):

- Height: 51 mm (2.0 in)
- Width: 143.0 mm (5.6 in)
- Depth: 238 mm (9.4 in)
- Weight: 222 g (0.5 lb)

Operating environment

The ServeRAID M5120 SAS/SATA Controller is supported in the following environment:

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

Agency approvals

The adapter conforms to the following regulations:

- 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-IV

Related publications and links

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/ENUS112-048>
- System x RAID products home page
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://ibm.com/systems/xbc/cog/>

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