



## IBM ServeRAID Adapter Quick Reference

The ServeRAID M Series family 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 the performance that is demanded by the ever-growing I/O requirements of today's enterprises. With data transfer rates of up to 6 Gbps per port and PCI Express 3.0 host interface, the ServeRAID family bring users new features and improved performance, while continuing to support all the benefits of the previous generation.

**Looking for older adapters?** You can find reference information for older ServeRAID controllers, all the way back to the 1996-vintage ServeRAID I adapter, in the *ServeRAID Adapter Quick Reference - Archive* available at <http://www.redbooks.ibm.com/abstracts/tips0784.html>.

This document provides a summary of the features and specifications of each of the ServeRAID controllers and SAS HBAs that we currently offer for sale.

### Introduction

Whether you are protecting your storage network, enterprise databases, or application network, the IBM® System x® ServeRAID family of SAS/SATA Controllers and Host Bus Adapters delivers benefits to fit your requirements. IBM offers the choice of integrated single-port or dual-port RAID controllers. Combining these controllers with internal disk drives or external storage expansion unit increases storage capabilities.

Table 1. Adapter positioning

	Host Bus Adapters	Basic RAID (emphasis on cost)	Enterprise RAID (emphasis on performance)
<b>6 Gbps SAS</b>	IBM 6Gb Performance Optimized HBA IBM 6Gb SAS HBA	ServeRAID M1115 ServeRAID H1135 ServeRAID H1110 ServeRAID M1015	ServeRAID M5120 ServeRAID M5115 ServeRAID M5110 ServeRAID M5110e ServeRAID M5025 ServeRAID M5016 ServeRAID M5015 ServeRAID M5014 ServeRAID B5015 SSD
<b>3 Gbps SAS</b>		ServeRAID BR10il v2	ServeRAID MR10ie (CIOv)
<b>3 Gbps SATA</b>		ServeRAID C105 ServeRAID C100	

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## ServeRAID M5120 SAS/SATA Controller

The ServeRAID M5120 SAS/SATA Controller is a part of the IBM ServeRAID M Series family. 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. This 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.



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

Table 2. ServeRAID M5120 ordering part numbers and feature codes

Description	Part number	Feature code
ServeRAID M5120 SAS/SATA Controller for IBM System x	81Y4478	A1WX
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 Battery Kit for IBM System x	81Y4508	A22E
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

## ServeRAID M5120 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 or 1 GB with flash backup (MegaRAID CacheVault 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 Pro 2.0
- 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

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 3. 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

## Resources

For more information, see the following documents:

- *ServeRAID M5120 SAS/SATA Controller for IBM System x Product Guide*  
<http://www.redbooks.ibm.com/abstracts/tips0858.html>
- *ServeRAID M5120 SAS/SATA Controller Installation Guide*  
<http://www.ibm.com/support>
- IBM US Announcement Letter for ServeRAID M5120  
<http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS112-048>

## ServeRAID M5110 and M5110e SAS/SATA Controllers

The ServeRAID M5110 and M5110e SAS/SATA controllers are part of the IBM ServeRAID M Series family. While M5110 comes as a small form factor PCIe adapter, M5110e comes integrated with the IBM System x3650 M4 server. These controllers are optimized for high-performance, internal data storage with integration of the dual-core chip architecture, DDR3 1333 MHz cache memory, and PCIe 3.0 host interface. 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).



Figure 2. ServeRAID M5110 SAS/SATA Controller (with flash module)

Table 4. ServeRAID M5110 and M5110e part numbers and feature codes

Description	Part number	Feature code
ServeRAID M5110e SAS/SATA Controller for IBM System x	Onboard	Onboard
ServeRAID M5110 SAS/SATA Controller for IBM System x	81Y4481	A347
ServeRAID M5100 Series Zero Cache/RAID 5 Upgrade for IBM System x	81Y4544	A1X2
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 Battery Kit for IBM System x	81Y4508	A22E
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

## ServeRAID M5110 and M5110e specifications

The ServeRAID M5110 and M5110e SAS/SATA controllers have the following specifications:

- PCI Low Profile, Half-length - MD2 form factor (M5110) or onboard chip (M5110e)
- Eight internal 6 Gbps SAS/SATA ports
- Two internal Mini-SAS connectors (SFF-8087)
- 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 optional upgrades
- Optional onboard data cache (DDR3 running at 1333 MHz) with the choice of:
  - 512 MB with optional battery backup
  - 512 MB or 1 GB with flash backup (MegaRAID CacheVault technology)
- Support for SAS and SATA HDDs and SSDs
- Support for intermixing SAS and SATA HDDs and SSDs; mixing different types of drives in the same array (drive group) not recommended
- Connections to up to 32 internal drives, depending on the server model
- 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 Pro 2.0
- Support for 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
- Support for logical unit number (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

## Resources

For more information, see the following documents:

- *ServeRAID M5110 and M5110e SAS/SATA Controllers for IBM System x Product Guide*  
<http://www.redbooks.ibm.com/abstracts/tips0857.html>
- ServeRAID M5110 SAS/SATA Controller Installation Guide  
<http://www.ibm.com/support>
- IBM US Announcement Letter for ServeRAID M5110 and M5110e  
<http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS112-048>

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## ServeRAID M1115 SAS/SATA Controller

The ServeRAID M1115 SAS/SATA Controller is a part of the IBM ServeRAID M Series family. The M1115 comes as a small form factor PCIe adapter, and it offers a low-cost RAID 0/1/10 solution that can be upgraded to a cacheless RAID 5 with a Features-on-Demand license upgrade. With increased demand for performance and advanced features, the M1115 provides a seamless migration path to the full-featured RAID controllers, such as the ServeRAID M5110. The information about existing arrays can be recognized and imported into the new controller without requiring any reconfiguration.



Figure 3. ServeRAID M1115 SAS/SATA Controller

Table 5. ServeRAID M1115 ordering part numbers and feature codes

Description	Part number	Feature code
ServeRAID M1115 SAS/SATA Controller for IBM System x	81Y4448	A1MZ
ServeRAID M1100 Series Zero Cache/RAID 5 Upgrade for IBM System x	81Y4542	A1X1

## ServeRAID M1115 specifications

The ServeRAID M1115 SAS/SATA Controller has the following specifications:

- PCI Low Profile, Half-length - MD2 form factor
- Eight internal 6 Gbps SAS/SATA ports
- Two internal Mini-SAS connectors (SFF-8087)
- 6 Gbps throughput per port
- 533 MHz IBM PowerPC processor with LSI SAS2008 6 Gbps RAID on Chip (ROC) controller
- PCI Express 2.0 x8 host interface
- Support for RAID levels 0, 1, and 10 standard; support for RAID 5, 50 with optional upgrade
- Zero Controller Cache, no battery/flash backup
- Support for SAS and SATA hard disk drives (HDDs) and solid-state drives (SSDs)
- Support for simple swap and hot swap drives
- Support for intermixing SAS and SATA HDDs and SSDs. Mixing different types of drives in the same array (drive group) not recommended
- Connection to up to 32 internal drives, depending on the server model (Up to 16 physical drives, including hot spares, can be used in RAID configurations. The drives beyond the limit of 16 are used as stand-alone HDDs in a non-RAID environment.)
- Optional support for self-encrypting drives (SEDs) with MegaRAID SafeStore
- Support for up to 16 virtual drives, up to 16 drive groups, up to 16 virtual drives per one drive group, and up to 16 physical drives per one drive group
- Support for virtual drive sizes up to 64 TB
- Configurable stripe size up to 64 KB
- Compliant with Disk Data Format (DDF) configuration on disk (COD)
- S.M.A.R.T. support
- MegaRAID Storage Manager management software

## Resources

For more information, see the following documents:

- *ServeRAID M1115 SAS/SATA Controller for IBM System x Product Guide*  
<http://www.redbooks.ibm.com/abstracts/tips0856.html>
- *ServeRAID M1115 SAS/SATA Controller Installation Guide*  
<http://www.ibm.com/support>
- IBM US Announcement Letter for ServeRAID M1115  
<http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS112-048>



## Feature upgrade matrix for M1100 and M5100 series

The following table shows feature upgrade matrix for ServeRAID M1100 and M5100 series SAS/SATA controllers.

Table 6. Feature upgrade matrix for ServeRAID M1100 and M5100 series SAS/SATA controllers

Feature			RAID Controller		
Description	Part number	Type	M1115	M5110 M5110e	M5120*
<b>Zero Cache RAID 5 and SED Upgrades</b>					
ServeRAID M1100 Series Zero Cache/RAID 5 Upgrade	81Y4542	FoD	Yes	No	No
ServeRAID M5100 Series Zero Cache/RAID 5 Upgrade	81Y4544	FoD	No	Yes	No
<b>Cache, RAID 5 and SED Upgrades with optional battery backup</b>					
ServeRAID M5100 Series 512MB Cache/RAID 5 Upgrade	81Y4484	HW	No	Yes	Yes
ServeRAID M5100 Series Battery Kit	81Y4508	HW	No	Yes	Yes
<b>Cache, RAID 5 and SED Upgrades with flash backup</b>					
ServeRAID M5100 Series 512MB Flash/RAID 5 Upgrade	81Y4487	HW	No	Yes	Yes
ServeRAID M5100 Series 1GB Flash/RAID 5 Upgrade	81Y4559	HW	No	Yes	Yes
<b>Advanced Upgrades**</b>					
ServeRAID M5100 Series RAID 6 Upgrade	81Y4546	FoD	No	Yes	Yes
ServeRAID M5100 Series SSD Performance Accelerator	90Y4273	FoD	No	Yes	Yes
ServeRAID M5100 Series SSD Caching Enabler	90Y4318	FoD	No	Yes	Yes

\* M5120 requires cache upgrade

\*\* Advanced Upgrade requires cache upgrade

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## ServeRAID H1110 SAS/SATA Controller

The ServeRAID H1110 SAS/SATA Controller for IBM System x offers a low-cost enterprise-grade RAID solution for internal HDDs and integrates popular SAS technology into an organization's storage infrastructure. Ideal for supporting four HDDs in a space-constrained server configuration, the ServeRAID H1110 comes in a standard PCIe form factor, enabling it to support a wide array of servers. It features a PCI Express x4 Gen 2 host interface, MD0 form factor, and robust hardware RAID processing engine based on the LSI SAS2004 RAID on Chip (ROC) controller.

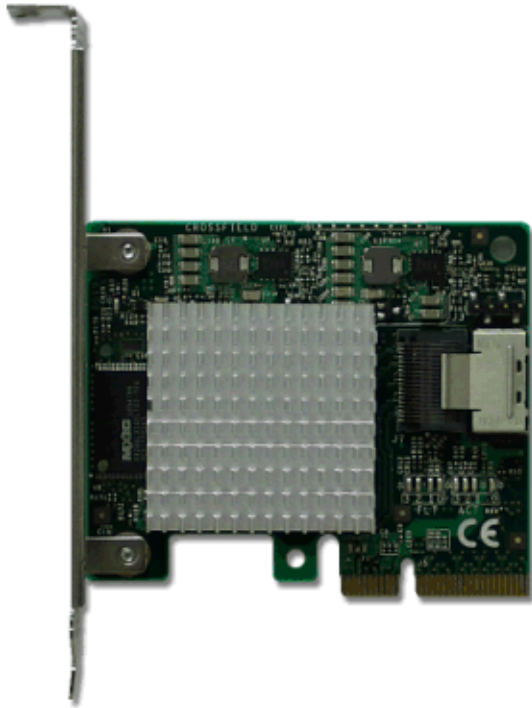


Figure 4. ServeRAID H1110 SAS/SATA Controller for IBM System x

Table 7. ServeRAID H1110 ordering part number and feature code

Description	Part number	Feature code
ServeRAID H1110 SAS/SATA Controller for IBM System x	81Y4492	A1XL

## ServeRAID H1110 specifications

The ServeRAID H1110 adapter has the following specifications:

- Four internal 6 Gbps SAS/SATA ports
- One x4 mini-SAS internal connector (SFF-8087)
- 6 Gbps throughput per port
- Based on LSI SAS2004 6 Gbps RAID on Chip (ROC) controller
- x4 PCI Express 2.0 host interface
- Supports RAID 0, 1, 1E, and 10
- Connects to up to four SAS or SATA drives
- SAS and SATA drives are supported, but the mixing of SAS and SATA in the same integrated volume is not supported
- Supports simple-swap SATA and hot-swap SAS and SATA drives
- Supports up to two integrated volumes
- Supports up to two global hot-spare drives
- Supports drive sizes greater than 2 TB for RAID 0, 1E, and 10 (not RAID 1)
- Fixed stripe size of 64 KB
- Compliant with Disk Data Format (DDF)
- S.M.A.R.T. support

## Resources

For more information, see the following documents:

- *ServeRAID H1110 SAS/SATA Controller for IBM System x Product Guide*  
<http://www.redbooks.ibm.com/abstracts/tips0831.html>
- IBM 6 Gigabit MPT2SAS Controller Documentation - IBM System x  
<http://www.ibm.com/support/entry/portal/docdisplay?Indocid=MIGR-5088601>
- IBM US Announcement Letter for ServeRAID H1110  
<http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS111-126>

## ServeRAID M5025 SAS/SATA Controller

The ServeRAID M5025 SAS/SATA Controller for IBM System x is the next-generation 6 Gbps SAS 2.0 external RAID controller. This adapter has two external mini-SAS connectors that can control up to 240 devices and supports global and dedicated hot-spare drives. The ServeRAID M5025 controller delivers a full 6 Gbps SAS 2.0 RAID solution with the performance advantages of an extended cache and a standard battery backup unit. With the attachment of the ServeRAID M5000 Advanced Feature Key, the ServeRAID M5025 offers the option of RAID 6, RAID 60, and SED Encryption Key Management.



Figure 5. ServeRAID M5025 SAS/SATA Controller

Table 8. ServeRAID M5025 part numbers and feature codes

Description	Part number	Feature code
ServeRAID M5025 SAS/SATA Controller	46M0830	0094
ServeRAID M5000 Series Advanced Feature Key (RAID 6, 60; SED support)*	46M0930	5106
IBM 3m SAS Cable (for connectivity to external SAS enclosures)	39R6531	3707
IBM 1m SAS Cable (for connectivity to external SAS enclosures)	39R6529	3708
ServeRAID M5000 Series Performance Accelerator Key (FastPath; CacheCade; RAID 6, 60; SED support)*	81Y4426	A10C

\* Note: The Advanced Feature Key and Performance Accelerator Key cannot be used at the same time. Only one key can be installed onto the RAID controller.

## ServeRAID M5025 specifications

The ServeRAID M5025 adapter card has the following specifications:

- Eight external 6 Gbps SAS 2.0 ports implemented through two four-lane (x4) connectors
- Two mini-SAS external connectors (SFF-8088)
- 6 Gbps throughput per SAS port
- 800 MHz PowerPC processor with LSI SAS2108 6 Gbps RAID on Chip (ROC) controller
- PCI Express 2.0 x8 host interface
- 512 MB onboard data cache (DDR2 running at 800 MHz)
- Intelligent lithium polymer battery backup unit standard with up to 48 hours of data retention
- Supports RAID levels 0, 1, 5, 10, and 50 (RAID 6 and 60 support with the optional M5000 Advanced Feature Key)
- Connects to:
  - Up to 240 SAS or SATA drives
  - Up to 9 daisy-chained enclosures per port
- SAS and SATA drives are supported, but the mixing of SAS and SATA 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 1024 KB
- Compliant with Disk Data Format (DDF) configuration on disk (COD)
- S.M.A.R.T. support
- Supports the optional M5000 Advanced Feature Key, which enables the following features:
  - RAID levels 6 and 60
  - LSI SafeStore: Support for self-encrypting drive services, such as instant secure erase and local key management (which requires the use of self-encrypting drives)

The key difference between the ServeRAID M5025 and M5015 RAID controllers is that the M5025 has two external SAS 2.0 x4 connectors and the M5015 has two internal SAS 2.0 x4 connectors.

The ServeRAID M5025 Controller supports connectivity to the external SAS expansion enclosures that are listed in the following table.

Table 9. Supported expansion enclosures

Expansion Enclosure	Part number	Maximum number of enclosures*
IBM System Storage EXP3000	172701X / 39R6464	18
IBM System Storage EXP2512 Express	174712X	18
IBM System Storage EXP2524 Express	174724X	9

\* This refers the maximum number of enclosures supported connected to one ServeRAID M5025

## Resources

For more information, see the following documents:

- *ServeRAID M5025 SAS/SATA Controller for IBM System x Product Guide*  
<http://www.redbooks.ibm.com/abstracts/tips0739.html>
- *ServeRAID M5025 SAS/SATA Controller Installation Guide*  
<http://www.ibm.com/support>
- ServeRAID software and drivers  
<http://www.ibm.com/support/docview.wss?uid=psg1SERV-RAID>
- IBM US Announcement Letter for the ServeRAID M5025  
<http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS110-172>
- IBM US Announcement Letter for the M5000 Series Advanced Feature Key  
<http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS109-739>
- IBM 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)

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## ServeRAID M5016 SAS/SATA Controller

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. This 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.

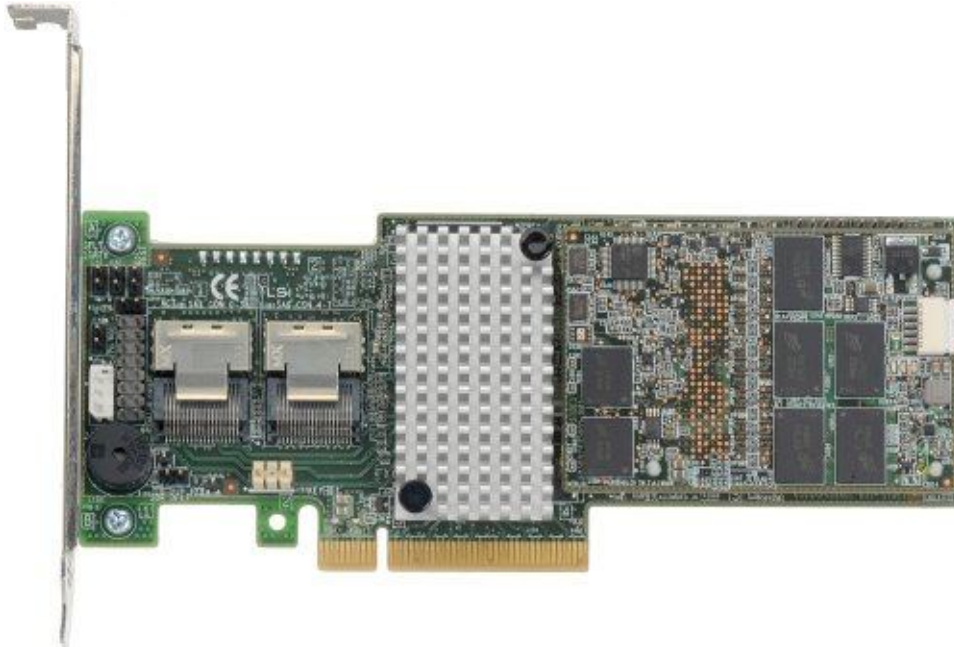


Figure 6. ServeRAID M5016 SAS/SATA Controller (with flash module)

Table 10. ServeRAID M5016 ordering part number and feature code

Description	Part number	Feature code
ServeRAID M5016 SAS/SATA Controller for IBM System x	90Y4304	A2NF
ServeRAID M5016 Battery Tray	88Y5874	A39V

## ServeRAID M5016 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

## Resources

For more information, see the following documents:

- *ServeRAID M5016 SAS/SATA Controller for IBM System x Product Guide*  
<http://www.redbooks.ibm.com/abstracts/tips0847.html>
- ServeRAID M5016 Documentation  
<http://www.ibm.com/support/entry/portal/docdisplay?Indocid=MIGR-5089105>
- IBM US Announcement Letter for ServeRAID M5016  
<http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS111-215>
- IBM US Announcement Letter for ServeRAID M5016 Battery Tray  
<http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS112-132>



## ServeRAID M5015 SAS/SATA Controller

The ServeRAID M5015 SAS/SATA Controller for IBM System x is the next-generation 6 Gbps SAS 2.0 RAID controllers. The adapter has two internal mini-SAS connectors that can control up to 32 devices and supports global and dedicated hot-spare drives.

The ServeRAID M5015 controller delivers a full RAID 6 Gbps SAS 2.0 solution with 512 MB of cache and a standard battery backup unit (standard when ordering the option part number). With the attachment of the ServeRAID M5000 Advanced Feature Key, the ServeRAID M5015 offers the option of RAID 6, RAID 60, and SED Encryption Key management.



Figure 7. IBM ServeRAID M5015 SAS/SATA Controller with the battery backup unit attached

Table 11. ServeRAID M5015 SAS/SATA Controller part numbers and feature codes

Description	Part number	Feature code
ServeRAID M5015 SAS/SATA Controller	46M0829 (with battery)	0093 (optional battery)
ServeRAID M5000 Series Advanced Feature Key (RAID 6, 60; SED support)*	46M0930	5106
ServeRAID M5000 Series Battery Kit	46M0917	5744
ServeRAID M5000 Series Battery Remote Mount Cable	68Y7396	5862
ServeRAID M5000 Series Performance Accelerator Key (FastPath; CacheCade; RAID 6, 60; SED support)*	81Y4426	A10C

\* Note: The Advanced Feature Key and Performance Accelerator Key cannot be used at the same time. Only one key can be installed onto the RAID controller.

Included components:

- The ServeRAID M5015 option part number 46M0829 includes the M5000 battery; however, the feature code 0093 does not contain the battery. Order feature code 5744 if you want to include the battery in the server configuration.
- The ServeRAID M5000 Series Battery Kit option part number includes a battery but does not include the remote mount cable.
- The ServeRAID M5000 Series Battery Remote Mount Cable is a 24-inch cable and enables the battery to be installed separately from the adapter. The cable is only required for certain systems.

### **ServeRAID M5015 specifications**

The ServeRAID M5015 and ServeRAID M5014 adapter cards have the following specifications:

- Eight internal 6 Gbps SAS/SATA ports
- Two Mini-SAS internal connectors (SFF-8087)
- 6 Gbps throughput per port
- 800 MHz PowerPC processor with LSI SAS2108 6 Gbps RAID on Chip (ROC) controller
- x8 PCI Express 2.0 host interface
- 512 MB onboard data cache (DDR2 running at 800 MHz)
- Standard intelligent Li-Ion-based battery backup unit with up to 48 hours of data retention (Note that when ordering the adapter using feature code 0093, the battery is not included and must be added using feature code 5744)
- Supports RAID levels 0, 1, 5, 10, and 50 (RAID 6 and 60 support with the optional M5000 Advanced Feature Key)
- Connects to up to 32 SAS or SATA drives
- SAS and SATA drives are supported, but the mixing of SAS and SATA 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 1024 KB
- Compliant with Disk Data Format (DDF) configuration on disk (COD)
- S.M.A.R.T. support
- Supports the optional M5000 Advanced Feature Key, which enables the following features:
  - RAID levels 6 and 60
  - LSI SafeStore: Support for self-encrypting drive (SED) services, such as instant secure erase and local key management (which requires the use of self-encrypting drives)

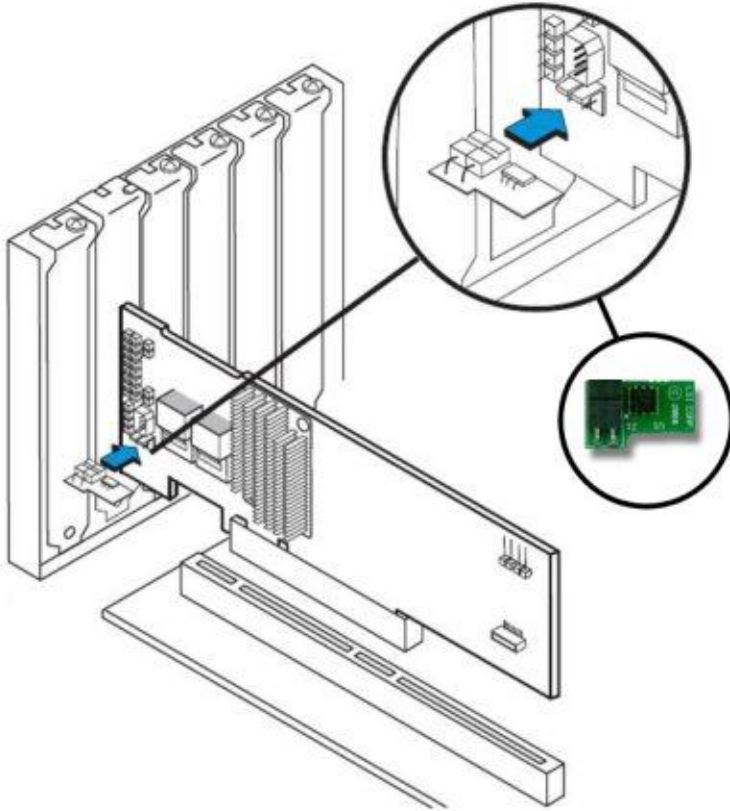


Figure 8. ServeRAID M5000 Series Advanced Feature Key attached to the ServeRAID M5015 Controller

## Resources

For more information, see the following documents:

- *ServeRAID M5015 and M5014 SAS/SATA Controllers for IBM System x Product Guide*  
<http://www.redbooks.ibm.com/abstracts/tips0738.html>
- *ServeRAID M5015 and M5014 User's Guide*  
<http://www.ibm.com/support/docview.wss?uid=psg1MIGR-5083652>
- ServeRAID software and drivers  
<http://www.ibm.com/support/docview.wss?uid=psg1SERV-RAID>
- IBM US Announcement Letter for the M5015 and M5014 Controllers  
<http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS109-416>
- IBM US Announcement Letter for the M5000 Series Advanced Feature Key  
<http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS109-739>
- IBM US Announcement Letter for the M5000 Series Battery Remote Mount Cable  
<http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS110-013>
- IBM 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)

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## ServeRAID M5014 SAS/SATA Controller

The ServeRAID M5014 SAS/SATA Controller for IBM System x is a 6 Gbps SAS 2.0 RAID controller. The adapter has two internal mini-SAS connectors to control up to 32 devices and support global and dedicated hot-spare drives.

The ServeRAID M5014 controller delivers a full RAID 6 Gbps SAS 2.0 solution with 256 MB of cache and an optional battery. With the attachment of the ServeRAID M5000 Advanced Feature Key, the ServeRAID M5014 offers the option of RAID 6, RAID 60, and SED Encryption Key management.



Figure 9. IBM ServeRAID M5014 SAS/SATA Controller

Table 12. ServeRAID M5014 Controller part numbers and feature codes

Description	Part number	Feature code
ServeRAID M5014 SAS/SATA Controller (optional battery)	46M0916	3877
ServeRAID M5000 Series Advanced Feature Key (RAID 6, 60; SED support)*	46M0930	5106
ServeRAID M5000 Series Battery Kit	46M0917	5744
ServeRAID M5000 Series Battery Remote Mount Cable	68Y7396	5862
ServeRAID M5000 Series Performance Accelerator Key (FastPath; CacheCade; RAID 6, 60; SED support)*	81Y4426	A10C

\* Note: The Advanced Feature Key and Performance Accelerator Key cannot be used at the same time. Only one key can be installed onto the RAID controller.

Included components:

- The ServeRAID M5000 Series Battery Kit option part number includes a battery but does not include the remote mount cable.
- The ServeRAID M5000 Series Battery Remote Mount Cable is a 24-inch cable and enables the battery to be installed separately from the adapter. The cable is only required for certain systems.

## ServeRAID M5014 specifications

The ServeRAID M5014 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 PowerPC processor with LSI SAS2108 6 Gbps RAID on Chip (ROC) controller
- x8 PCI Express 2.0 host interface
- 256 MB onboard data cache (DDR2 running at 800 MHz)
- Optional intelligent Li-Ion-based battery backup unit with up to 48 hours of data retention
- Supports RAID levels 0, 1, 5, 10, and 50 (RAID 6 and 60 support with the optional M5000 Advanced Feature Key)
- Connects to up to 32 SAS or SATA drives
- SAS and SATA drives are supported, but the mixing of SAS and SATA 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 1024 KB
- Compliant with Disk Data Format (DDF) configuration on disk (COD)
- S.M.A.R.T. support
- Supports the optional M5000 Advanced Feature Key which enables the following features:
  - RAID levels 6 and 60
  - LSI SafeStore: Support for self-encrypting drive (SED) services, such as instant secure erase and local key management (which requires the use of self-encrypting drives)

## Resources

For more information, see the following documents:

- *ServeRAID M5015 and M5014 SAS/SATA Controllers for IBM System x Product Guide*  
<http://www.redbooks.ibm.com/abstracts/tips0738.html>
- *ServeRAID M5015 and M5014 User's Guide*  
<http://www.ibm.com/support/docview.wss?uid=psg1MIGR-5083652>
- ServeRAID software and drivers  
<http://www.ibm.com/support/docview.wss?uid=psg1SERV-RAID>
- IBM US Announcement Letter for the M5015 and M5014 Controllers  
<http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS109-416>
- IBM US Announcement Letter for the M5000 Series Advanced Feature Key  
<http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS109-739>
- IBM US Announcement Letter for the M5000 Series Battery Remote Mount Cable  
<http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS110-013>
- IBM 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)

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## ServeRAID M1015 SAS/SATA Controller

The ServeRAID M1015 SAS/SATA Controller for IBM System x is an entry-level 6 Gbps SAS 2.0 PCI Express 2.0 RAID controller. The adapter has two internal mini-SAS connectors to drive up to 32 devices and supports the same base RAID 0, 1, and 10 feature set and drivers as the M5000 series controllers.

With the attachment of the ServeRAID M1000 Advanced Feature Key, the ServeRAID M1015 offers the option of RAID 5 and SED Encryption Key management, while still being sensitive to administrator cost concerns in an entry-level RAID environment. This RAID controller provides connectivity to internal direct-attach or expander-attached hard disk, solid-state, or self-encrypting drives.



Figure 10. ServeRAID M1015 SAS/SATA Controller

Table 13. ServeRAID M1015 SAS/SATA Controller part numbers and feature codes

Description	Part number	Feature code
ServeRAID M1015 SAS/SATA Controller	46M0831	0095
ServeRAID M1000 Series Advanced Feature Key (RAID 5, 50; SED support)	46M0832	9749

### ServeRAID M1015 Specifications

The ServeRAID M1015 SAS/SATA Controller has the following specifications:

- Eight internal 6 Gbps SAS/SATA ports
- Supports SAS and SATA drives (but not in the same RAID volume)
- Two Mini-SAS internal connectors (SFF-8087)
- 6 Gbps throughput per port
- LSI SAS2008 6 Gbps RAID on Chip (ROC) controller
- x8 PCI Express 2.0 host interface
- Supports RAID levels 0, 1, 10 (RAID levels 5 and 50 with optional ServeRAID M1000 Series Advanced Feature Key)

- Connects to up to 32 SAS or SATA drives
- Supports up to 16 logical volumes
- Supports LUN sizes up to 64 TB
- Configurable stripe size up to 64 KB
- Compliant with Disk Data Format (DDF) configuration on disk (COD)
- S.M.A.R.T. support
- Maximum stripe size: 64 KB (fixed)
- Supports the optional M1000 Advanced Feature Key which enables the following features:
  - RAID levels 5 and 50
  - LSI SafeStore: Support for self-encrypting drive (SED) services, such as instant secure erase and local key management (which requires the use of self-encrypting drives)

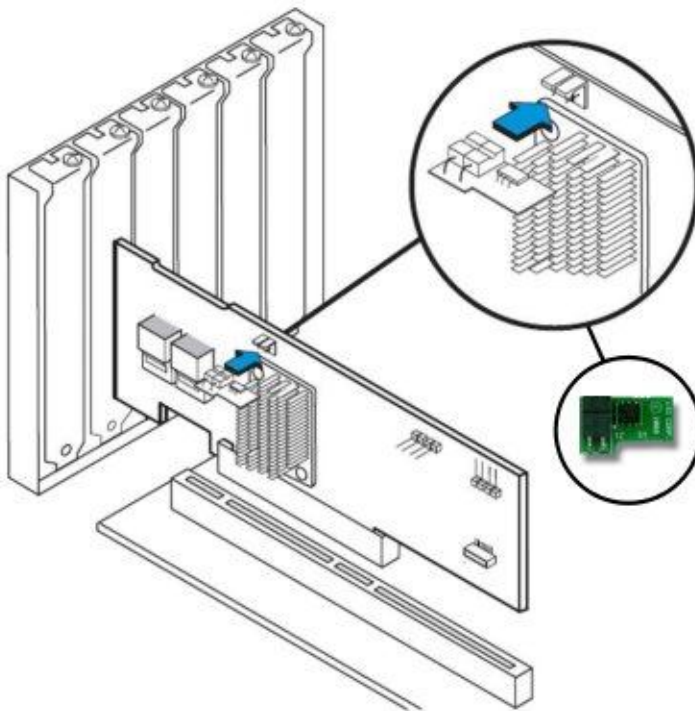


Figure 11. ServeRAID M1000 Series Advanced Feature Key attached to the ServeRAID M1015 controller just above the heat sink

## Resources

For more information, see the following documents:

- *ServeRAID M1015 SAS/SATA Controller for IBM System x Product Guide*  
<http://www.redbooks.ibm.com/abstracts/tips0740.html>
- *ServeRAID M1015 User's Guide*  
<http://www.ibm.com/support/docview.wss?uid=psg1MIGR-5083720>
- ServeRAID software and drivers  
<http://www.ibm.com/support/docview.wss?uid=psg1SERV-RAID>
- IBM US Announcement Letter  
<http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS109-739>
- IBM 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)



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## ServeRAID B5015 SSD Controller

Today's business-critical servers require more protection, performance, and manageability than ever. An enterprise-grade RAID solution needs to provide the greatest level of data protection, the highest performance, and easy-to-use management tools. The ServeRAID B5015 SSD Controller combines the PM8013 maxSAS RAID-on-Chip (RoC) controller and the RAID stack from PMC-Sierra to accommodate the most rigorous server environments and to support high-performing SSDs.



Figure 12. ServeRAID B5015 SSD Controller

Table 14. ServeRAID B5015 SSD Controller part numbers and feature codes

Description	Part number	Feature code
ServeRAID B5015 SSD Controller	46M0969	3889

## ServeRAID B5015 specifications

The ServeRAID B5015 SSD Controller has the following specifications:

- RAID 1 and 5 support
- Hot-spare support with automatic rebuild capability
- Background data scrubbing
- 6 Gbps per SAS port
- PCI Express 2.0 x8 host interface
- PCI MD2 low profile form factor
- Two x4 internal (SFF-8087) connectors
- SAS controller: PMC-Sierra PM8013 maxSAS 6 Gbps SAS RoC controller
- Up to 8 disk drives per RAID adapter
- Performance optimized for SSDs
- Three multi-threading MIPS processing cores
- High performance contention-free architecture
- Up to four ServeRAID B5015 adapters supported in a system
- Maximum stripe size: 1024 KB
- Support for up to 4 arrays/logical volumes

## Resources

For more information, see the following documents:

- *ServeRAID B5015 SSD Controller for IBM System x Product Guide*  
<http://www.redbooks.ibm.com/abstracts/tips0763.html>
- ServeRAID B5015 Installation Guide (download the unpack the ISO file)  
<http://www.ibm.com/support/docview.wss?uid=psg1MIGR-5085047>
- ServeRAID B5015 drivers, maxRAID software, and utilities  
<http://www.ibm.com/support/docview.wss?uid=psg1MIGR-5085047>
- IBM US Announcement Letter  
<http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS110-113>

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## ServeRAID BR10il SAS/SATA Controller v2

The ServeRAID-BR10il SAS/SATA Controller v2 (BR10il v2) offers a low-cost, enterprise-grade RAID solution for internal HDDs and integrates SAS technology into an organization's storage infrastructure. This controller supports RAID levels 0, 1, and 1E.

Intended specifically for the small to medium business (SMB) market, as well as departments of a large enterprise (LE), the solution is ideal for supporting server and workgroup applications where high levels of sustained read and write operations are required.



Figure 13. ServeRAID-BR10il SAS/SATA Controller v2 (BR10il v2)

Table 15. ServeRAID-BR10il SAS/SATA Controller v2 (BR10il v2) part number and feature code

Description	Part number	Feature code
ServeRAID BR10il SAS/SATA Controller v2	49Y4731	9742

### ServeRAID BR10il v2 specifications

The ServeRAID BR10il v2 has the following specifications:

- Form factor: Rectangular card with mini-PCIe connector
- One internal x4 SFF-8087 connectors
- PCI Express 2.0 x4 host interface
- SAS Controller: LSI 1064e
- 3 Gbps per port data transfer rate
- Supports SAS 3 Gbps and SATA 2
- Cache: None
- Maximum stripe size: 64 KB (fixed)
- RAID levels: RAID 0, 1, 1E
- Max number of disks without a SAS expander: 4
- Max number of disks with a SAS expander (where supported): 63
- Max number of disks per logical volume: 14
- Max number of logical volumes: 2

## Resources

For more information, see the following documents:

- ServeRAID BR10 software and drivers  
<http://www.ibm.com/support/docview.wss?uid=psg1MIGR-65666>
- IBM US Announcement Letter  
<http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS109-589>

## ServeRAID C100 and C105

The IBM ServeRAID C100 and ServeRAID C105 are integrated SATA controllers with software RAID capabilities. They are a cost-effective way to provide reliability, performance, and fault-tolerant disk subsystem management to help safeguard your valuable data and enhance availability.

The following figure shows a screenshot from the configuration utility for ServeRAID C100/C105 that displays information about the controller.

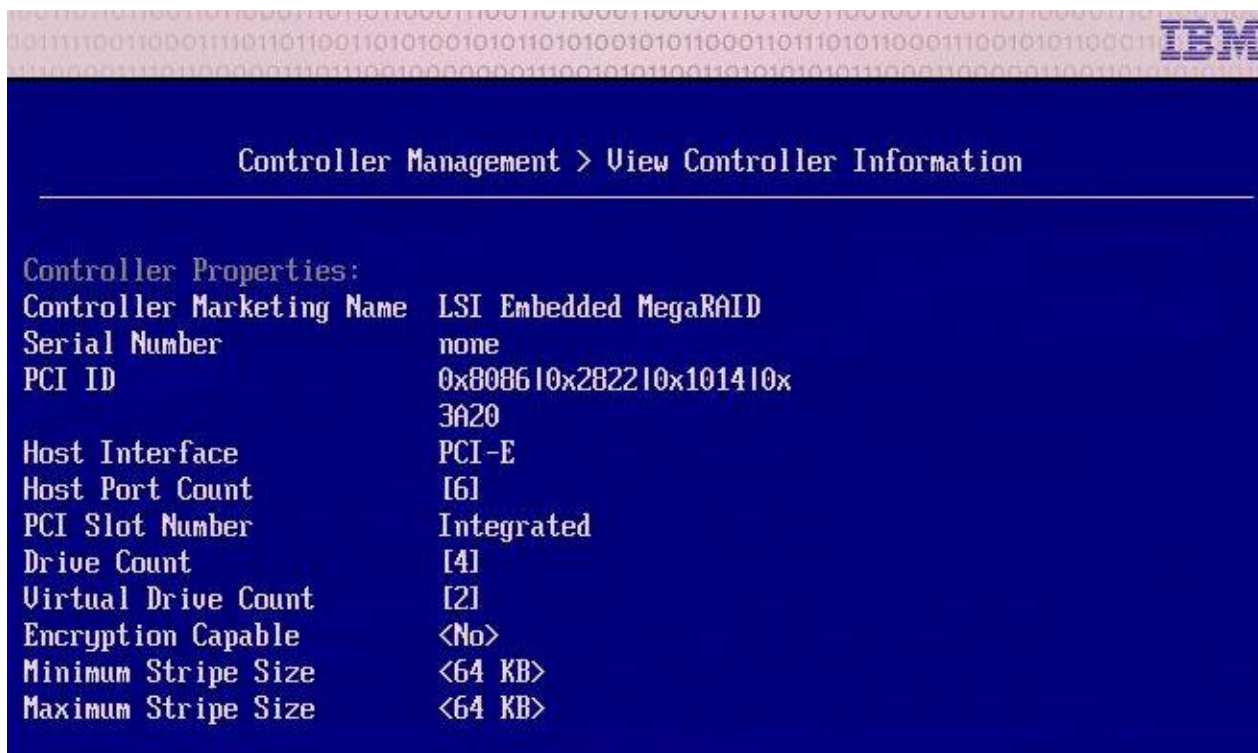


Figure 14. ServeRAID C100/C105 configuration utility: Controller information

The ServeRAID C100 and C105 are integrated SATA controllers that come standard with supported servers and cannot be ordered separately. The following table provides the ordering part numbers and feature codes for the additional options.

Table 16. Ordering part numbers and feature codes

Description	Part number	Feature code
ServeRAID C100 for IBM System x	Onboard	Onboard
ServeRAID C105 for IBM System x	Onboard	Onboard
8-pack SATA Enabler for IBM System x*	90Y4349	A2V7

\* An FoD upgrade for ServeRAID C105 that enables support for up to eight SATA HDDs.

## ServeRAID C100 and C105 specifications

The ServeRAID C100 and C105 have the following features and specifications:

- Onboard SATA controller with software RAID capabilities
- RAID levels 0, 1, and 10 support
- Support for up to eight virtual drives
- Support for virtual drive sizes greater than 2 TB
- Fixed stripe unit size of 64 KB
- Support for MegaRAID Storage Manager management software
- ServeRAID C100 features:
  - Six internal SATA ports with up to 3 Gbps throughput per port
  - Six internal 7-pin L-shape onboard SATA connectors
  - Support for SATA simple-swap hard drives (solid state drives and hot-swap drives are not supported)
  - Support for SATA CD/DVD-ROM
  - SATA tape support to allow backups to SATA tape devices
  - Connection to up to four internal drives, depending on the server model
- ServeRAID C105 features:
  - Eight internal SATA ports with up to 3 Gbps throughput per port
  - Two internal Mini-SAS (SFF-8087) x4 onboard connectors
  - Support for SATA simple-swap and SATA hot-swap hard drives (solid state drives and SAS hard drives are not supported)
  - Support for up to eight internal drives (up to four standard, with an additional four with optional 8-pack enabler FoD upgrade, 90Y4349)

## Resources

For more information, see the following documents:

- *ServeRAID C100 and C105 for IBM System x Product Guide*  
<http://www.redbooks.ibm.com/abstracts/tips0855.html>
- *User's Guide for ServeRAID C100*  
<http://www.ibm.com/support/entry/portal/docdisplay?Indocid=MIGR-5089055>
- 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>

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## IBM 6Gb SAS HBA

The IBM 6Gb SAS HBA is an economical storage enabler to attach RAID-capable external storage enclosures and provide 3 Gbps or 6 Gbps tape storage connectivity for data archiving applications to achieve a higher level of performance.

The PCIe small form-factor IBM 6Gb SAS HBA is based on the LSI SAS2008 controller and can handle medium to large capacity server storage applications by connecting an 8-lane PCI Express adapter with one external x4 SFF-8088 connector and four internal SATA connectors.



Figure 15. IBM 6Gb SAS Host Bus Adapter with the PCIe slot bracket removed

Table 17. IBM 6Gb SAS Host Bus Adapter part number and feature code

Description	Part number	Feature code
IBM 6 Gb SAS Host Bus Adapter for System x	46M0907	3875

### IBM 6Gb SAS HBA specifications

The IBM 6Gb SAS Host Bus Adapter has the following specifications:

- One external SAS x4 connector (SFF-8088)
- Four internal SATA x1 connectors (SFF-8087)
- PCI Express x8 2.0 host interface
- SAS Controller: LSI SAS2008
- 6 Gbps per port data transfer rate
- MD2 small form factor
- High performance I/O Processor: PowerPC 440 at 533 MHz
- UEFI support
- RAID levels: None (uses RAID as provided by external disk enclosures)
- Maximum endpoint devices: 512
- Power consumption: 13.5 W

For a list of supported tape drives and external disk enclosures, see the *IBM 6Gb SAS HBA Product Guide*:

<http://www.redbooks.ibm.com/abstracts/tips0776.html>

**Note:** The adapter does not support internal disk drives.

## Resources

For more information, see the following documents:

- *IBM 6Gb SAS HBA for IBM System x Product Guide*  
<http://www.redbooks.ibm.com/abstracts/tips0776.html>
- IBM 6Gb SAS HBA drivers and utilities  
<http://www.ibm.com/support/docview.wss?uid=psg1MIGR-5084922>
- IBM US Announcement Letter  
<http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS110-013>



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## IBM 6Gb Performance Optimized HBA

The IBM 6Gb Performance Optimized HBA is an ideal host bus adapter to connect to high-performance solid state drives. With a PCI Express 2.0 x8 interface, two SAS x4 SFF-8087 connectors, and a high performance PowerPC I/O processor, this HBA can support the bandwidth that solid state drives can generate.



Figure 16. IBM 6Gb Performance Optimized HBA

Table 18. IBM 6Gb Performance Optimized HBA part number and feature code

Description	Part number	Feature code
IBM 6Gb Performance Optimized HBA*	46M0912	3876

\* Formerly known as the IBM 6Gb SSD Host Bus Adapter for IBM System x

See the *IBM 6Gb Performance Optimized HBA Product Guide* for a list of supported drives:

<http://www.redbooks.ibm.com/abstracts/tips0744.html>

### IBM 6Gb Performance Optimized HBA specifications

The IBM 6Gb Performance Optimized HBA has the following specifications:

- Two internal mini-SAS x4 connectors (SFF-8087)
- PCI Express x8 2.0 host interface
- SAS Controller: LSI SAS2008
- 6 Gbps per port data transfer rate
- MD2 small form factor
- High performance I/O Processor: PowerPC 440 at 533 MHz
- uEFI support
- RAID levels: None
- Maximum endpoint devices: 256
- Power consumption: 13.5 W

## Resources

For more information, see the following documents:

- *IBM 6Gb Performance Optimized HBA for IBM System x Product Guide*  
<http://www.redbooks.ibm.com/abstracts/tips0744.html>
- IBM 6Gb Performance Optimized HBA drivers and utilities  
<http://www.ibm.com/support/docview.wss?uid=psg1MIGR-5084922>
- IBM US Announcement Letter  
<http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS110-013>

## ServeRAID M5115 SAS/SATA Controller

The ServeRAID M5115 SAS/SATA Controller is a high-performance offering for IBM Flex System™ compute nodes. It enables a high-performance RAID solution composed of combinations of SAS or SATA drives or high-throughput solid-state drives (SSDs). The offering is designed around a base RAID adapter with a set of upgrades that are rich with features, designed to minimize parts-on-the-floor, optimized for storage performance, and consistent with existing industry-leading ServeRAID products.

The ServeRAID M5115 SAS/SATA Controller for IBM Flex System is capable of delivering several focused solutions depending on business needs, offering two-drive HDD connectivity or support for up to eight 1.8-inch SSDs or combinations of HDDs and SSDs. Software upgrades include SSD performance features or an extra layer of redundancy with RAID 6. These solutions are realized by pairing M5115 with one or more available hardware kits and Feature-on-Demand license upgrades.

The following table provides the ordering part numbers and feature codes.

Table 19. Ordering part numbers and feature codes

Description	Part number	System x feature code
ServeRAID M5115 SAS/SATA Controller for IBM Flex System	90Y4390	A2XW
<b>Hardware enablement kits - IBM Flex System x240 Compute Node</b>		
ServeRAID M5100 Series Enablement Kit for IBM Flex System x240	90Y4342	A2XX
ServeRAID M5100 Series IBM Flex System Flash Kit for x240	90Y4341	A2XY
ServeRAID M5100 Series SSD Expansion Kit for IBM Flex System x240	90Y4391	A2XZ
<b>Hardware enablement kits - IBM Flex System x220 Compute Node</b>		
ServeRAID M5100 Series Enablement Kit for IBM Flex System x220	90Y4424	A35L
ServeRAID M5100 Series IBM Flex System Flash Kit for x220	90Y4425	A35M
ServeRAID M5100 Series SSD Expansion Kit for IBM Flex System x220	90Y4426	A35N
<b>Feature on demand licenses (for both x240 and x220)</b>		
ServeRAID M5100 Series RAID 6 Upgrade for IBM Flex System	90Y4410	A2Y1
ServeRAID M5100 Series Performance Upgrade for IBM Flex System	90Y4412	A2Y2
ServeRAID M5100 Series SSD Caching Enabler for IBM Flex System	90Y4447	A36G

## ServeRAID M5115 specifications

The ServeRAID M5115 has the following specifications:

- Eight internal 6 Gbps SAS/SATA ports
- PCI Express 3.0 x8 host interface
- 6 Gbps throughput per port
- 800 MHz dual-core IBM PowerPC processor with LSI SAS2208 6 Gbps RAID on Chip (ROC) controller
- Support for RAID levels 0, 1, 10, 5, 50 standard; support for RAID 6 and 60 with optional upgrade using 90Y4411
- Optional onboard 1 GB data cache (DDR3 running at 1333 MHz) with optional flash backup (MegaRAID CacheVault technology) as part of the Enablement Kit 90Y4342
- Support for SAS and SATA HDDs and SSDs
- Support for intermixing SAS and SATA HDDs and SSDs; mixing different types of drives in the same array (drive group) is not recommended
- Support for self-encrypting drives (SEDs) with MegaRAID SafeStore
- Optional support for SSD performance acceleration with MegaRAID FastPath and SSD caching with MegaRAID CacheCade Pro 2.0 (90Y4447)
- Support for 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
- Support for logical unit number (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

Optional add-ons to the ServeRAID M5115 controller are RAID 6 support, SSD performance accelerator, and SSD caching enabler. The feature upgrades are as listed in the following table. These are all Feature on Demand (FoD) license upgrades.

Table 20. Supported upgrade features

Part number	Description
90Y4410	ServeRAID M5100 Series RAID 6 Upgrade for IBM Flex System
90Y4412	ServeRAID M5100 Series Performance Accelerator for IBM Flex System (MegaRAID FastPath)
90Y4447	ServeRAID M5100 Series SSD Caching Enabler for IBM Flex System (MegaRAID CacheCade Pro 2.0)

These features are described as follows:

- RAID 6 Upgrade (90Y4410)  
Adds support for RAID 6 and RAID 60. This is a Feature on Demand license.
- Performance Accelerator (90Y4412)  
The Performance Accelerator for IBM Flex System (implemented using the LSI MegaRAID FastPath software) provides high-performance I/O acceleration for SSD-based virtual drives by using an extremely low-latency I/O path to increase the maximum I/O per second (IOPS) capability of the controller. This feature boosts the performance of applications with a highly random data storage access pattern, such as transactional databases. Part number 90Y4412 is a Feature on Demand license.
- SSD Caching Enabler for traditional hard drives (90Y4447)  
The SSD Caching Enabler for IBM Flex System (implemented using the LSI MegaRAID CacheCade Pro 2.0) is designed to accelerate the performance of hard disk drive (HDD) arrays with only an incremental investment in solid-state drive (SSD) technology. The feature enables the SSDs to be configured as a dedicated cache to help maximize the I/O performance for transaction-intensive applications, such as databases and web serving. The feature tracks data storage access patterns and identifies the most frequently accessed data. The hot data is then automatically stored on the SSDs that are assigned as a dedicated cache pool on the ServeRAID controller. Part number 90Y4447 is a Feature on Demand license. This feature requires at least one SSD drive be installed.

## Resources

For more information, see the following documents:

- *ServeRAID M5115 SAS/SATA Controller for IBM Flex System Product Guide*  
<http://www.redbooks.ibm.com/abstracts/tips0884.html>
- *ServeRAID M5115 SAS/SATA Controller Installation and User Guide*  
<http://www.ibm.com/support>
- 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/entry/portal/docdisplay?Indocid=SERV-RAID>
- IBM US Announcement Letter  
<http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS112-079>

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## ServeRAID H1135 SAS/SATA Controller

The IBM ServeRAID H1135 controller enables you to use RAID technology to manage hard disk drive configurations and integrate Serial Attached SCSI (SAS) technology into your storage infrastructure. You can install the optional IBM ServeRAID H1135 controller in an IBM Flex System x220 compute node or an IBM BladeCenter® HS23E blade server.

The following table provides the ordering part numbers and feature codes.

Table 21. Ordering part numbers and feature codes

Description	Part number	System x feature code
ServeRAID H1135 Controller for IBM Flex System and BladeCenter	90Y4750	A1XJ

### ServeRAID H1135 specifications

The ServeRAID H1135 Controller has the following specifications:

- Based on the LSI SAS2004 6 Gbps SAS 4-port controller
- Up to 6 Gbps throughput per port
- CIOv form factor
- PCIe 2.0 x4 host interface
- Two SAS ports routed internally to the two hot-swap drive bays
- Two SAS ports routed externally to the chassis I/O bays 3 and 4
- Support for SAS/SATA HDD and SSD drives
- Support for RAID 0, 1, 1E, and 10, and non-RAID
- Support for up to two RAID volumes
- Support for up to 10 drives in one RAID volume
- Support up to 14 volume drives, including up to two hot-spare drives
- Support for virtual drive sizes greater than 2 TB
- Fixed stripe size of 64 KB
- S.M.A.R.T. support
- Support for MegaRAID Storage Manager management software
- Supports connectivity to the EXP3000, EXP2512, and EXP2524 storage expansion enclosures
- Supports connectivity to the BladeCenter S disk storage modules (via SAS Connectivity Modules or SAS RAID Controller Modules), tape drives, and external storage systems
- Supports operations as a RAID controller for the internal drives and as an HBA for the external storage at the same time

## Resources

For more information, see the following documents:

- *ServeRAID H1135 SAS/SATA Controller Installation and User Guide*  
<http://www.ibm.com/support/entry/portal/docdisplay?Indocid=MIGR-5088601>
- 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/entry/portal/docdisplay?Indocid=SERV-RAID>
- IBM US Announcement Letter  
<http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS112-083>

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## ServeRAID MR10ie (CIOv) SAS/SATA Controller

The ServeRAID-MR10ie Controller is a high-performance PCIe RAID Controller expansion card for BladeCenter for on-board and external Direct Attached Storage RAID 0, 1, 10, 5, 50, 6, and 60. This expansion card form factor (CIOv) with battery backed memory cache, utilizes an LSI 1078 controller for support with up to 26 disk drives. Option includes battery backup module (BBU) that installs in blade server DIMM socket.

The following table provides the ordering part numbers and feature codes.

Table 22. Ordering part numbers and feature codes

Description	Part number	System x feature code
ServeRAID MR10ie (CIOv) Controller for IBM BladeCenter (includes battery)	46C7167	0070
Battery for ServeRAID-MR10ie (CIOv) Controller	46M0800	5741

### ServeRAID MR10ie (CIOv) specifications

The ServeRAID MR10ie (CIOv) Controller has the following specifications:

- Two SAS ports routed internally to the two hot-swap drive bays
- 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
- Supports connectivity to the BladeCenter S disk storage modules (via SAS Connectivity Modules) and tape drives
- Supports connectivity to the EXP3000, EXP2512 and EXP2524 storage expansion enclosures

### Resources

For more information, see the following documents:

- *ServeRAID MR10ie SAS/SATA Controller Installation and User Guide*  
<http://www.ibm.com/support/entry/portal/docdisplay?Indocid=MIGR-5078830>
- 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/entry/portal/docdisplay?Indocid=SERV-RAID>
- IBM US Announcement Letter  
<http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS108-761>



## Supported servers

The following tables list supported IBM System x, iDataPlex, BladeCenter and Flex System servers.

Table 23. Supported IBM System x servers

Server	M5120	M5110	M5110e	M1115	H1110	C105	C100	M5025	M5016	M5015	M5014	M1015	B5015	BR10ii v2	6Gb SAS	6Gb SSD
x3100 M4	N	N	N	N	Y	N	Y	Y	N	Y	Y	Y	N	Y	Y	Y
x3200 M2	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N
x3200 M3	N	N	N	N	Y	N	N	Y	N	Y	Y	Y	N	Y	Y	N
x3250 M2	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N
x3250 M3	N	N	N	N	Y	N	N	Y	N	Y	Y	Y	N	Y	Y	N
x3250 M4	N	N	N	N	Y	N	Y	Y	N	Y	Y	Y	N	Y	Y	Y
x3350	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N
x3400	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N
x3400 M2	N	N	N	N	N	N	N	Y	N	Y	Y	Y	N	Y	Y	N
x3400 M3	N	N	N	N	Y	N	N	Y	N	Y	Y	Y	N	Y	Y	N
x3500	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N
x3500 M2	N	N	N	N	N	N	N	Y	N	Y	Y	Y	N	N	Y	N
x3500 M3	N	N	N	N	Y	N	N	Y	N	Y	Y	Y	N	N	Y	N
x3500 M4	Y	Y	N	Y	N	N	N	N	N	N	N	N	N	N	Y	N
x3530 M4	Y	Y	N	Y	Y	Y	N	N	N	N	N	N	N	N	Y	Y
x3550	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N
x3550 M2	N	N	N	N	N	N	N	Y	N	Y	Y	Y	Y	N	Y	Y
x3550 M3	N	N	N	N	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
x3550 M4	Y	Y	N	Y	N	N	N	N	N	N	N	N	N	N	Y	Y
x3620 M3	N	N	N	N	Y	N	N	N	N	Y	Y	Y	N	Y	Y	N
x3630 M3	N	N	N	N	N	N	N	N	N	Y	Y	Y	N	N	Y	N
x3630 M4	Y	Y	N	Y	Y	Y	N	N	N	N	N	N	N	N	Y	Y
x3650	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N
x3650 M2	N	N	N	N	N	N	N	Y	N	Y	Y	Y	Y	N	Y	Y
x3650 M3	N	N	N	N	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
x3650 M4	Y	N	Y	N	N	N	N	N	N	N	N	N	N	N	Y	N
x3690 X5	N	N	N	N	N	N	N	Y	Y*	Y	Y	Y	N	N	Y	Y
x3750 M4	Y	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	Y	Y
x3755 M3	N	N	N	N	N	N	N	N	N	Y	Y	Y	N	N	Y	N
x3850 M2	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y
x3950 M2	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y
x3850 X5	N	N	N	N	N	N	N	Y	Y*	Y	Y	Y	Y	N	Y	Y
x3950 X5	N	N	N	N	N	N	N	Y	Y*	Y	Y	Y	Y	N	Y	Y

\* Supported for Intel Xeon processor E7 family-based eX5 servers, requires optional ServeRAID M5016 Battery Tray (part number 88Y5874).

Table 24. Supported IBM iDataPlex servers

Server	M5120	M5110	M5110e	M1115	H1110	C105	C100	M5025	M5016	M5015	M5014	M1015	B5015	BR10ii v2	6Gb SAS	6Gb SSD
dx320	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
dx340	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
dx360	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
dx360 M2	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
dx360 M3	N	N	N	N	Y	N	N	N	N	Y	N	Y	N	N	Y	N
dx360 M4	N	N	N	Y	Y	N	N	N	N	N	N	N	N	Y	Y	N

Table 25. Supported IBM BladeCenter servers

Server	M5115	H1135	C105	MR10ie
HS12 (8028)	N	N	N	Y
HS22 (7870)	N	N	N	Y
HS22V (7871)	N	N	N	Y
HS23 (7875)	N	N	N	N
HS23E (8038)	N	Y	Y	N
HX5 (7872)	N	N	N	N
HX5 (7873)	N	N	N	N
PS700/PS701/PS702 (8406)	N	N	N	N
PS703/PS704 (7891)	N	N	N	N

Table 26. Supported IBM Flex System servers

Server	M5115	H1135	C105	MR10ie
x220	Y	Y	Y	N
x240	Y	N	N	N
p24L	N	N	N	N
p260	N	N	N	N
p460	N	N	N	N

See the IBM ServerProven Web site for the latest information about the adapters supported by each System x server model: <http://ibm.com/servers/eserver/serverproven/compat/us/>.

## Feature comparison

The following tables compare features of the ServeRAID controllers.

Table 27. Feature comparison: ServeRAID controllers for System x and iDataPlex servers

Feature	M5120	M5110	M5110e	M1115	H1110	C105	C100	M5025	M5016	M5015	M5014	M1015	B5015	BR10iil v2	6Gb SAS	6Gb SSD
Port interface	SAS	SAS	SAS	SAS	SAS	SATA	SATA	SAS	SAS	SAS	SAS	SAS	SAS	SAS	SAS	SAS
Port speed, Gbps	6	6	6	6	6	3	3	6	6	6	6	6	6	3	6	6
Number of ports	8	8	8	8	4	8	8	8	8	8	8	8	8	4	8	8
PCIe spec	3.0	3.0	3.0	2.0	2.0	N/A	N/A	2.0	2.0	2.0	2.0	2.0	2.0	1.0	2.0	2.0
PCIe lanes	x8	x8	x8	x8	x4	N/A	N/A	x8	x8	x8	x8	x8	x8	x4	x8	x8
Int. connectors	0	2	2	2	2	2	6	0	2	2	2	2	2	1	4	2
Ext. connectors	2	0	0	0	0	0	0	2	0	0	0	0	0	0	1	0
SAS controller	LSI SAS 2208	LSI SAS 2208	LSI SAS 2208	LSI SAS 2008	LSI SAS 2004	None	None	LSI SAS 2108	LSI SAS 2208	LSI SAS 2108	LSI SAS 2108	LSI SAS 2008	PMC 8013	LSI SAS 1064	LSI SAS 2008	LSI SAS 2008
Cache (MB)#	Opt	Opt	Opt	None	None	None	None	512	1024	512	256	None	None	None	None	None
Battery backup	Opt	Opt	Opt	N	N	N	N	Y	N	Y	Opt	N	N	N	N	N
Flash backup	Opt	Opt	Opt	N	N	N	N	N	Y	N	N	N	N	N	N	N
Data encryption	Opt	Opt	Opt	Opt	N	N	N	Opt	Y	Opt	Opt	Opt	N	N	N	N
Max stripe size (KB) (F=fixed)	1024	1024	1024	64	64-F	64-F	64-F	1024	1024	1024	1024	64	1024	64-F	N/A	N/A
Mixing SAS & SATA‡	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	N/A			
SSD support	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	N	Y
Tape support	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	Y	N
Max volumes	64	64	64	16	2	8	8	64	64	64	64	16	4	2	N/A	N/A
Max volume size	64TB	64TB	64TB	64TB	16TB	>2TB	>2TB	64TB	64TB	64TB	64TB	64TB			N/A	N/A
UEFI support	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Patrol read (data scrubbing)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N/A	N/A
Consistency check	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y				
Online RAID Level Migration†	Y	Y	Y	Y	N	N	N	Y	Y	Y	Y	Y			N/A	N/A
Online Capacity Expansion	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y			N/A	N/A
AutoSync (auto-rebuild)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N/A	N/A
Copyback§	Y	Y	Y	Y	N	N	N	Y	Y	Y	Y	N	N	N	N	N
FastPath	Opt	Opt	Opt	N	N	N	N	Opt	N	Opt	Opt	N	N	N		
CacheCade	Opt	Opt	Opt	N	N	N	N	Opt	N	Opt	Opt	N	N	N		
RAID-0	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N	N
RAID-1	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N
RAID-1E	N	N	N	N	Y	N	N	N	N	N	N	N	N	Y	N	N
RAID-5	Opt	Opt	Opt	Opt	N	N	N	Y	Y	Y	Y	Opt	Y	N	N	N
RAID-6	Opt	Opt	Opt	Opt	N	N	N	Opt	Y	Opt	Opt	N	N	N	N	N
RAID-10	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N
RAID-50	Opt	Opt	Opt	Opt	N	N	N	Y	Y	Y	Y	Opt	N	N	N	N
RAID-60	Opt	Opt	Opt	Opt	N	N	N	Opt	Y	Opt	Opt	N	N	N	N	N

# Opt=optional

‡ Requires that the server also supports the mixing of SAS & SATA drives.

† Online RAID Level Migration (RLM) is also known as Logical Drive Migration (LDM).

§ Copyback is also known as Revertible Hot Spare.

Table 28. Feature comparison: ServeRAID controllers for BladeCenter and Flex System servers

Feature	M5115	H1135	C105	MR10ie
Port interface	SAS	SAS	SATA	SAS
Port speed, Gbps	6	6	3	3
Number of ports	8	4	8	8
PCIe spec	3.0	2.0	N/A	1.0
PCIe lanes	x8	x4	N/A	x4
Int. connectors	2	0	2	2
Ext. connectors	0	0	0	0
SAS controller	LSI SAS 2208	LSI SAS 2004	None	LSI SAS 1078
Cache (MB)#	Opt	None	None	256
Battery backup	N	N	N	Y
Flash backup	Opt	N	N	N
Data encryption	Opt	N	N	N
Max stripe size (KB) (F=fixed)	1024	64-F	64-F	1024
Mixing SAS & SATA‡	Y	Y	N	Y*
SSD support	Y	Y	N	Y*
Tape support	N	N	N	Y
Max volumes	64	2	8	64
Max volume size	64TB	>2TB	>2TB	>2TB
UEFI support	Y	Y	Y	Y
Patrol read (data scrubbing)	Y	Y	Y	Y
Consistency check	Y	Y	Y	Y
Online RAID Level Migration†	Y	N	N	Y
Online Capacity Expansion	Y	Y	N	Y
AutoSync (auto-rebuild)	Y	Y	Y	Y
Copyback§	Y	N	N	N
FastPath	Opt	N	N	N
CacheCade	Opt	N	N	N
RAID-0	Y	Y	Y	Y
RAID-1	Y	Y	Y	Y
RAID-1E	N	Y	N	N
RAID-5	Y	N	N	Y
RAID-6	Opt	N	N	Y
RAID-10	Y	Y	Y	Y
RAID-50	Y	N	N	Y
RAID-60	Opt	N	N	Y

# Opt=optional

‡ Requires that the server also supports the mixing of SAS & SATA drives.

\* The ServeRAID-MR10ie (C10v) Controller does not support the use of SATA or SSD drives on the blade.

† Online RAID Level Migration (RLM) is also known as Logical Drive Migration (LDM).

§ Copyback is also known as Revertible Hot Spare.

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