ServeRAID Adapter Quick Reference for System x Servers

Reference Information

Whether you are protecting your storage network, enterprise databases, or application network, the ServeRAID family of SAS/SATA Controllers and Host Bus Adapters delivers benefits to fit your requirements. 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)
12 Gbps SAS	N2215 N2225 N2226	ServeRAID M1215	ServeRAID M5225-2GB ServeRAID M5210 ServeRAID M5210e
6 Gbps SAS	N2125 N2115 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
3 Gbps SAS		ServeRAID BR10il v2	
3 Gbps SATA		ServeRAID C105 ServeRAID C100	

ServeRAID M5225-2GB SAS/SATA Controller

The ServeRAID M5225-2GB SAS/SATA Controller 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 M5225-2GB is a small form factor PCIe RAID adapter for external storage, and it shares a common set of ServeRAID M Series Features on Demand (FoD) upgrades available for the entire family.

Figure 1. ServeRAID M5225-2GB SAS/SATA Controller

Table 2. Ordering part numbers and feature codes

Description	Part number	Feature code
Base controller		
ServeRAID M5225-2GB SAS/SATA Controller	00AE938	A5ND
Features on Demand (FoD) upgrades*		
ServeRAID M5200 Series RAID 6 Upgrade-FoD	47C8706	A3Z5
ServeRAID M5200 Series Performance Accelerator-FoD	47C8710	A3Z7
ServeRAID M5200 Series SSD Caching Enabler-FoD	47C8712	A3Z8

* One FoD upgrade for the M5200 Series controllers activates the feature on all M5200 Series controllers installed in a server.

ServeRAID M5225-2GB specifications

The ServeRAID M5225-2GB SAS/SATA Controller has the following specifications:

- LSI SAS3108 12 Gbps RAID on Chip (ROC) controller with the 1.2 GHz dual-core processor
- PCI Low Profile, Half-length - MD2 form factor
- Eight external 12 Gbps SAS/SATA ports (support for 12, 6, or 3 Gbps SAS speeds and 6 or 3 Gbps SATA speeds). Up to 12 Gbps throughput per port.
- Two external x4 mini-SAS HD connectors (SFF-8644)
- PCI Express 3.0 x8 host interface
- Support for RAID levels 0, 1, 10, 5, and 50 standard; support for RAID 6, 60 with the additional upgrade
- 2 GB of onboard data cache (DDR3 running at 1866 MHz) with flash backup (MegaRAID flash cache protection technology)

- Supports SAS and 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 216 external drives
- Support for self-encrypting drives (SEDs) with MegaRAID SafeStore as a standard feature
- Optional support for SSD performance acceleration with MegaRAID FastPath and SSD caching with MegaRAID CacheCade
- Support for up to 64 virtual disks, up to 128 arrays, up to 16 virtual disks per array, and up to 32 physical drives per array.
- Support for logical drive sizes greater than 2 TB.
- Configurable stripe size from 64 KB 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 M5225-2GB SAS/SATA Controller Product Guide*
  http://lenovopress.com/tips1258
- ServeRAID M5225 support
  http://ibm.com/support/entry/portal/search_results?q=M5225

ServeRAID M5210 and M5210e SAS/SATA Controllers

The ServeRAID M5210 and M5210e SAS/SATA controllers are part of the ServeRAID M Series family that 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. M5210 comes as a small form factor PCIe adapter, and M5210e comes integrated with the System x3650 M4 HD and x3750 M4 (8752) servers. They also share a common set of upgrades, simplifying inventory management.

Figure 2. ServeRAID M5210 SAS/SATA Controller (with an optional cache installed)

Table 3. Ordering part numbers and feature codes

Description	Part number	Feature code
Base controller		
ServeRAID M5210e SAS/SATA Controller	Onboard	Onboard
ServeRAID M5210 SAS/SATA Controller	46C9110	A3YZ
Cache upgrades		
ServeRAID M5200 Series 1GB Cache/RAID 5 Upgrade	47C8656	A3Z0
ServeRAID M5200 Series 1GB Flash/RAID 5 Upgrade	47C8660	A3Z1
ServeRAID M5200 Series 2GB Flash/RAID 5 Upgrade	47C8664	A3Z2
ServeRAID M5200 Series 4GB Flash/RAID 5 Upgrade	47C8668	A3Z3
Features on Demand upgrades		
ServeRAID M5200 Series Zero Cache/RAID 5 Upgrade-FoD	47C8708	A3Z6
ServeRAID M5200 Series RAID 6 Upgrade-FoD	47C8706	A3Z5
ServeRAID M5200 Series Performance Accelerator-FoD	47C8710	A3Z7
ServeRAID M5200 Series SSD Caching Enabler-FoD	47C8712	A3Z8

ServeRAID M5210 and M5210e specifications

The ServeRAID M5210 and M5210e SAS/SATA controllers have the following specifications:

- LSI SAS3108 12 Gbps RAID on Chip (ROC) controller.
- PCI low profile, half-length - MD2 form factor (M5210) or onboard chip (M5210e).
- Eight internal 12 Gbps SAS/SATA ports (support for 12, 6, or 3 Gbps SAS speeds and 6 or 3 Gbps SATA speeds). Up to 12 Gbps throughput per port.
- Two internal x4 HD Mini-SAS connectors (SFF-8643).
- PCI Express 3.0 x8 host interface.

- Support for RAID 0, 1, and 10 standard; support for RAID 5, 50, 6, and 60 with optional upgrades.
- Optional onboard data cache (DDR3 running at 1866 MHz) with the choice of the following backup:
  - 1 GB (no battery backup)
  - 1 GB, 2 GB, or 4 GB with flash backup
- 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 is not supported.
- 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.
- Support for up to 64 virtual disks, up to 128 arrays, up to 16 virtual disks per array, and up to 32 physical drives per array.
- Support for logical drive sizes greater than 2 TB.
- Support for Integrated MegaRAID (iMR) mode (no cache memory upgrades installed) or MegaRAID (MR) mode (requires 1 GB or 2 GB cache memory upgrade).
  - iMR mode supports (no cache memory upgrades installed) the following features:
    - RAID 0, 1, and 10, and, optionally, 5 and 50
    - Fixed stripe unit size of 64 KB
    - Self-encrypting drives with optional Zero Cache/RAID 5 upgrade
    - Both RAID and JBOD (pass-thru mode with system drives) configurations
      - Up to 16 drives are supported in a RAID configuration.
      - Up to 63 drives are supported in a JBOD configuration. (JBOD drives can be used as bootable drives.)
  - MR mode supports (1 GB or 2 GB cache memory upgrade required):
    - RAID 0, 1, 10, 5, and 50 and, optionally, 6 and 60 (Non-RAID is not supported.)
    - Configurable stripe unit size from 64 KB up to 1 MB
    - Self-encrypting drives
    - Optional SSD performance features (FastPath and CacheCade)
- 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 M5210 support
  http://ibm.com/support/entry/portal/search_results?q=M5210

Feature upgrade matrix for M5200 Series

The following table shows feature upgrade matrix for ServeRAID M5200 Series SAS/SATA controllers.

Table 4. Feature upgrade matrix for ServeRAID M5200 Series SAS/SATA controllers

Feature			RAID Controller
Description	**Part number**	**Type**	M5210 M5210e
Zero Cache RAID 5 and SED Upgrades			
ServeRAID M5200 Series Zero Cache/RAID 5 Upgrade	47C8708	FoD	Yes
Cache, RAID 5 and SED Upgrades with no backup			
ServeRAID M5200 Series 1GB Cache/RAID 5 Upgrade	47C8656	HW	Yes
Cache, RAID 5 and SED Upgrades with flash backup			
ServeRAID M5200 Series 1GB Flash/RAID 5 Upgrade	47C8660	HW	Yes
ServeRAID M5200 Series 2GB Flash/RAID 5 Upgrade	47C8664	HW	Yes
ServeRAID M5200 Series 4GB Flash/RAID 5 Upgrade	47C8668	HW	Yes
Advanced Upgrades*			
ServeRAID M5200 Series RAID 6 Upgrade	47C8706	FoD	Yes
ServeRAID M5200 Series SSD Performance Accelerator	47C8710	FoD	Yes
ServeRAID M5200 Series SSD Caching Enabler	47C8712	FoD	Yes

* Advanced Upgrade requires cache upgrade

ServeRAID M1215 SAS/SATA Controller

The ServeRAID M1215 SAS/SATA Controller is a part of the ServeRAID M Series family that 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. The M1215 offers a low-cost internal RAID 0/1/10 solution that can be upgraded to a cacheless RAID 5 with a Features on Demand (FoD) license upgrade. The M1215 provides two internal mini-SAS HD connectors with eight lanes of 12 Gbps SAS and eight lanes of PCIe 3.0 to facilitate high data transfer rates.

Figure 3. ServeRAID M1215 SAS/SATA Controller

Table 5. Ordering part numbers and feature codes

Description	Part number	Feature code
ServeRAID M1215 SAS/SATA Controller	46C9114	A45W
ServeRAID M1200 Series Zero Cache/RAID 5 Upgrade-FoD	00AE930	A5H5

The ServeRAID M1215 SAS/SATA Controller provides support for RAID 0, 1, and 10 as standard, ready to use or "out-of-the-box" capabilities. An optional feature upgrade is available to expand standard capabilities with RAID 5, 50 and self-encrypting drives. This Features on Demand (FoD) upgrade is a software license.

ServeRAID M1215 specifications

The ServeRAID M1215 SAS/SATA Controller has the following specifications:

- LSI SAS3008 12 Gbps RAID on Chip (ROC) controller
- PCI Low Profile, Half-length - MD2 form factor
- Eight internal 12 Gbps SAS/SATA ports
- Two internal mini-SAS HD connectors (SFF-8643)
- Supports 12, 6, and 3 Gbps SAS and 6 and 3 Gbps SATA data transfer rates
- Up to 12 Gbps throughput per port
- PCI Express 3.0 x8 host interface
- Support both RAID and JBOD (pass-thru mode with system drives) configurations
  - Up to 32 drives, including hot spares, are supported in a RAID configuration.
  - Up to 64 drives are supported in a JBOD (non-RAID) configuration.
- 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 supported.

- Optional support for self-encrypting drives (SEDs) with MegaRAID SafeStore
- Support for up to 32 virtual drives, up to 32 drive groups, up to 16 virtual drives per one drive group, and up to 32 physical drives per one drive group
- Support for virtual drive sizes greater than 2 TB
- Fixed stripe size of 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:

- 6 Gb and 12 Gb MPT2SAS Controller documentation
  http://ibm.com/support/entry/portal/docdisplay?lndocid=MIGR-5088601
- M1215 support and downloads
  http://ibm.com/support/entry/portal/search_results?q=M1215

ServeRAID M5120 SAS/SATA Controller

The ServeRAID M5120 SAS/SATA Controller is a part of the 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 4. ServeRAID M5120 SAS/SATA Controller (with flash module)

Table 6. ServeRAID M5120 ordering part numbers and feature codes

Description	Part number	Feature code
ServeRAID M5120 SAS/SATA Controller	81Y4478	A1WX
ServeRAID M5100 Series 512MB Cache/RAID 5 Upgrade	81Y4484	A1J3
ServeRAID M5100 Series 512MB Flash/RAID 5 Upgrade	81Y4487	A1J4
ServeRAID M5100 Series 1GB Flash/RAID 5 Upgrade	81Y4559	A1WY
ServeRAID M5100 Series 2GB Flash/RAID 5 Upgrade	47C8670	A4G6
ServeRAID M5100 Series Battery Kit	81Y4508	A22E
ServeRAID M5100 Series RAID 6 Upgrade	81Y4546	A1X3
ServeRAID M5100 Series SSD Performance Accelerator	90Y4273	A2MC
ServeRAID M5100 Series SSD Caching Enabler	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, 1 GB, or 2 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 216 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

Resources

For more information, see the following documents:

- *ServeRAID M5120 SAS/SATA Controller Product Guide*
  http://lenovopress.com/tips0858
- *ServeRAID M5120 SAS/SATA Controller Installation Guide*
  http://www.ibm.com/support

ServeRAID M5110 and M5110e SAS/SATA Controllers

The ServeRAID M5110 and M5110e SAS/SATA controllers are part of the ServeRAID M Series family. While M5110 comes as a small form factor PCIe adapter, M5110e comes integrated with the System x3650 M4 and x3750 M4 (8722) servers. 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 5. ServeRAID M5110 SAS/SATA Controller (with flash module)

Table 7. ServeRAID M5110 and M5110e part numbers and feature codes

Description	Part number	Feature code
ServeRAID M5110e SAS/SATA Controller	Onboard	Onboard
ServeRAID M5110 SAS/SATA Controller	81Y4481	A347
ServeRAID M5100 Series Zero Cache/RAID 5 Upgrade	81Y4544	A1X2
ServeRAID M5100 Series 512MB Cache/RAID 5 Upgrade	81Y4484	A1J3
ServeRAID M5100 Series 512MB Flash/RAID 5 Upgrade	81Y4487	A1J4
ServeRAID M5100 Series 1GB Flash/RAID 5 Upgrade	81Y4559	A1WY
ServeRAID M5100 Series 2GB Flash/RAID 5 Upgrade	47C8670	A4G6
ServeRAID M5100 Series Battery Kit	81Y4508	A22E
ServeRAID M5100 Series RAID 6 Upgrade	81Y4546	A1X3
ServeRAID M5100 Series SSD Performance Accelerator	90Y4273	A2MC
ServeRAID M5100 Series SSD Caching Enabler	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 Product Guide*
  http://lenovopress.com/tips0857
- ServeRAID M5110 SAS/SATA Controller Installation Guide
  http://www.ibm.com/support

ServeRAID M1115 SAS/SATA Controller

The ServeRAID M1115 SAS/SATA Controller is a part of the 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 6. ServeRAID M1115 SAS/SATA Controller

Table 8. ServeRAID M1115 ordering part numbers and feature codes

Description	Part number	Feature code
ServeRAID M1115 SAS/SATA Controller	81Y4448	A1MZ
ServeRAID M1100 Series Zero Cache/RAID 5 Upgrade	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 Product Guide*
  http://lenovopress.com/tips0856
- *ServeRAID M1115 SAS/SATA Controller Installation Guide*
  http://www.ibm.com/support

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

Feature			RAID Controller		
Description	Part number	Type	M1115	M5110 M5110e	M5120*
Zero Cache RAID 5 and SED Upgrades					
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
Cache, RAID 5 and SED Upgrades with optional battery backup					
ServeRAID M5100 Series 512MB Cache/RAID 5 Upgrade	81Y4484	HW	No	Yes	Yes
ServeRAID M5100 Series Battery Kit	81Y4508	HW	No	Yes	Yes
Cache, RAID 5 and SED Upgrades with flash backup					
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
ServeRAID M5100 Series 2GB Flash/RAID 5 Upgrade	47C8670	HW	No	Yes	Yes
Advanced Upgrades**					
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

ServeRAID H1110 SAS/SATA Controller

The ServeRAID H1110 SAS/SATA Controller 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.
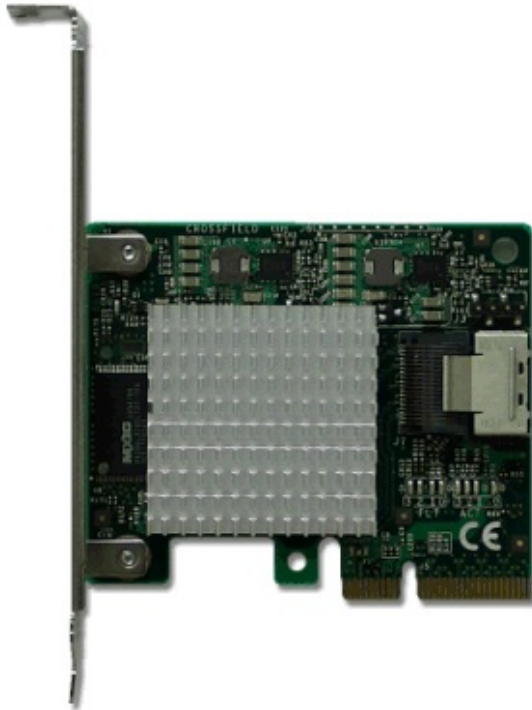

Figure 7. ServeRAID H1110 SAS/SATA Controller

Table 10. ServeRAID H1110 ordering part number and feature code

Description	Part number	Feature code
ServeRAID H1110 SAS/SATA Controller	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 Product Guide*
  http://lenovopress.com/tips0831
- 6 Gigabit MPT2SAS Controller Documentation
  http://www.ibm.com/support/entry/portal/docdisplay?lndocid=MIGR-5088601

ServeRAID M5025 SAS/SATA Controller

The ServeRAID M5025 SAS/SATA Controller 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.
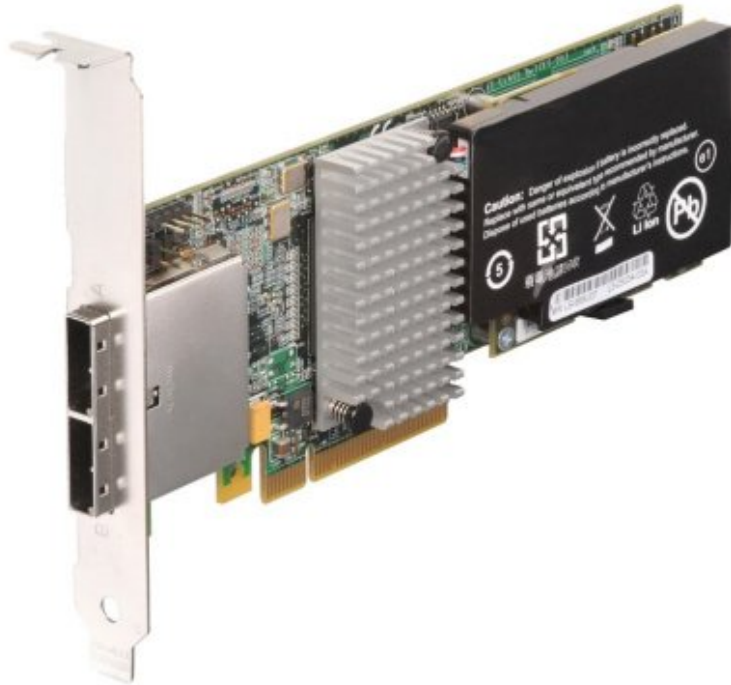

Figure 8. ServeRAID M5025 SAS/SATA Controller

Table 11. 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)

Resources

For more information, see the following documents:

- *ServeRAID M5025 SAS/SATA Controller Product Guide*
  http://lenovopress.com/tips0739

- *ServeRAID M5025 SAS/SATA Controller Installation Guide*
  http://www.ibm.com/support

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.
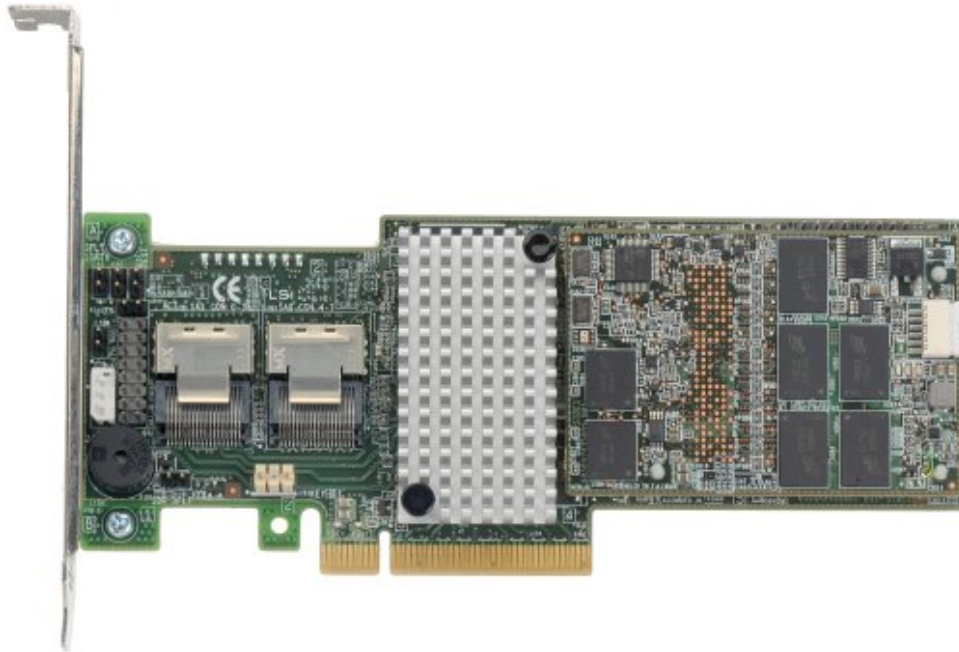
Figure 9. ServeRAID M5016 SAS/SATA Controller (with flash module)

Table 12. ServeRAID M5016 ordering part number and feature code

Description	Part number	Feature code
ServeRAID M5016 SAS/SATA Controller	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 Product Guide*
  http://lenovopress.com/tips0847

- ServeRAID M5016 Documentation
  http://www.ibm.com/support/entry/portal/docdisplay?lndocid=MIGR-5089105

ServeRAID M5015 SAS/SATA Controller

The ServeRAID M5015 SAS/SATA Controller 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.
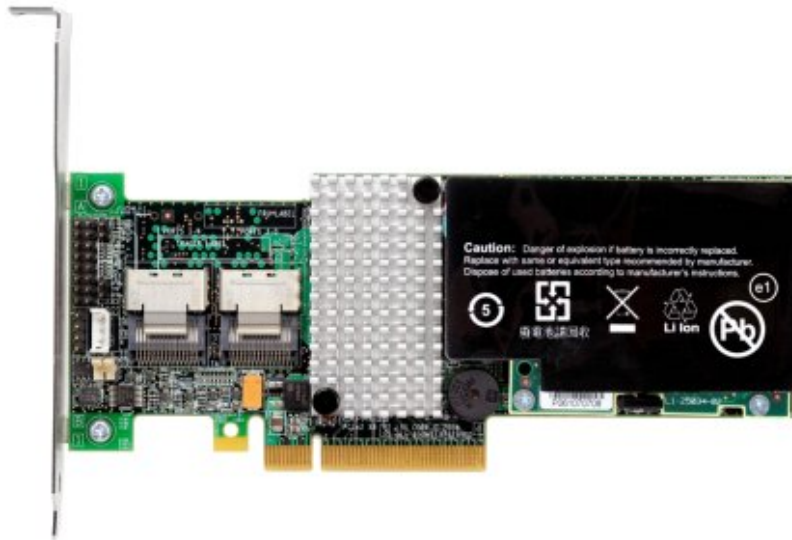
Figure 10. ServeRAID M5015 SAS/SATA Controller with the battery backup unit attached

Table 13. 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)
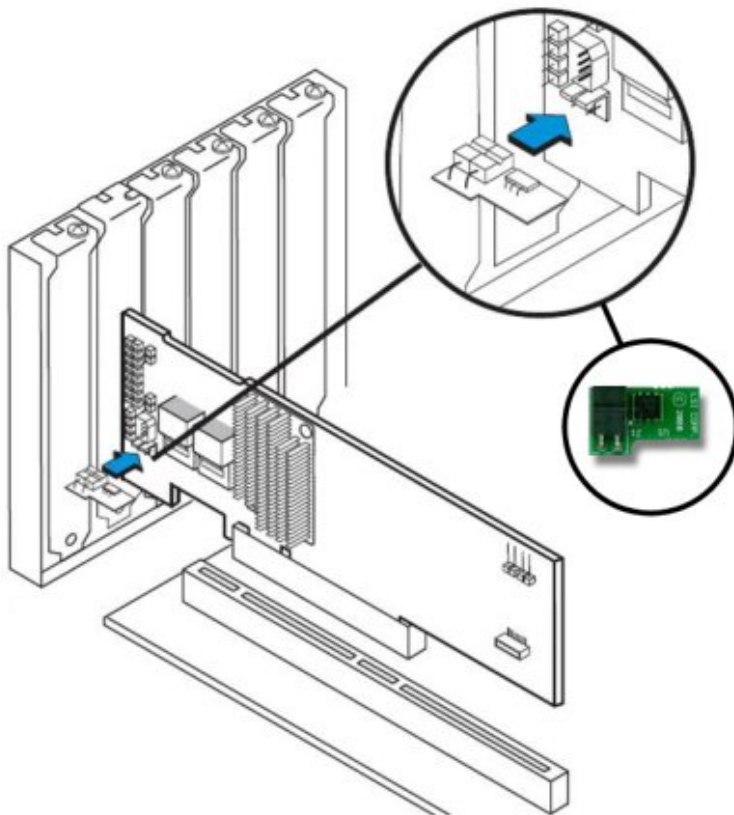

Figure 11. ServeRAID M5000 Series Advanced Feature Key attached to the ServeRAID M5015 Controller

Resources

For more information, see the following documents:

- *ServeRAID M5015 and M5014 SAS/SATA Controllers Product Guide*
  http://lenovopress.com/tips0738
- *ServeRAID M5015 and M5014 User's Guide*
  http://www.ibm.com/support/entry/portal/docdisplay?lndocid=MIGR-5083652

ServeRAID M5014 SAS/SATA Controller

The ServeRAID M5014 SAS/SATA Controller 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.
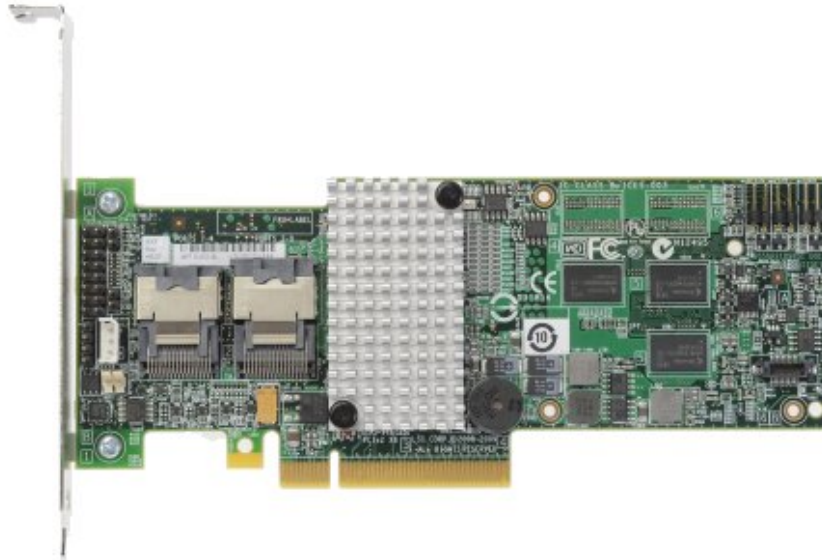
Figure 12. ServeRAID M5014 SAS/SATA Controller

Table 14. 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 Product Guide*
  http://lenovopress.com/tips0738
- *ServeRAID M5015 and M5014 User's Guide*
  http://www.ibm.com/support/entry/portal/docdisplay?lndocid=MIGR-5083652

ServeRAID M1015 SAS/SATA Controller

The ServeRAID M1015 SAS/SATA Controller 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 13. ServeRAID M1015 SAS/SATA Controller

Table 15. 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)
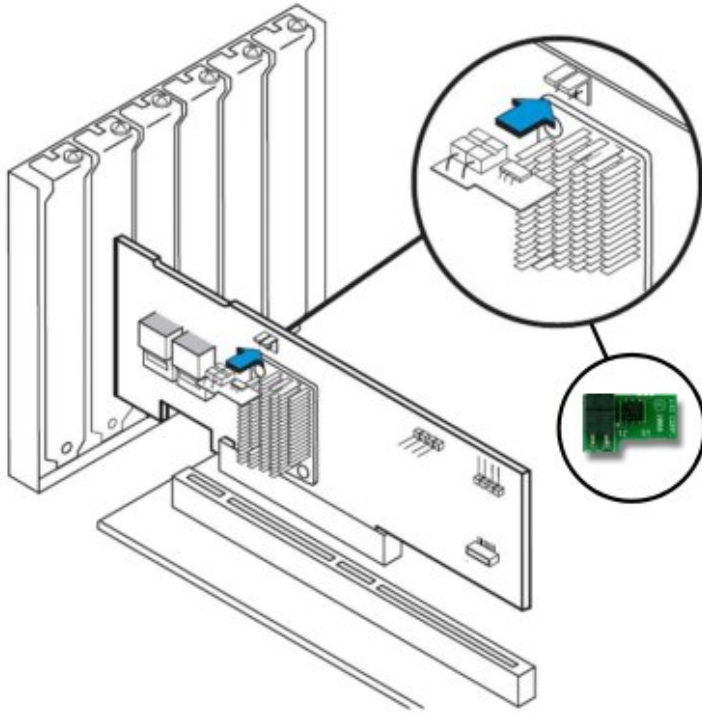
Figure 14. ServeRAID M1000 Series Advanced Feature Key attached to the ServeRAID M1015 controller just above the heat sink

Resources

For more information, see the following documents:

- *ServeRAID M1015 SAS/SATA Controller Product Guide*
  http://lenovopress.com/tips0740

- *ServeRAID M1015 User's Guide*
  http://www.ibm.com/support/entry/portal/docdisplay?lndocid=MIGR-5083720

- ServeRAID software and drivers
  http://www.ibm.com/support/entry/portal/docdisplay?lndocid=SERV-RAID

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 15. ServeRAID-BR10il SAS/SATA Controller v2 (BR10il v2)

Table 16. 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/entry/portal/docdisplay?lndocid=MIGR-65666

ServeRAID C100 and C105

The 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.
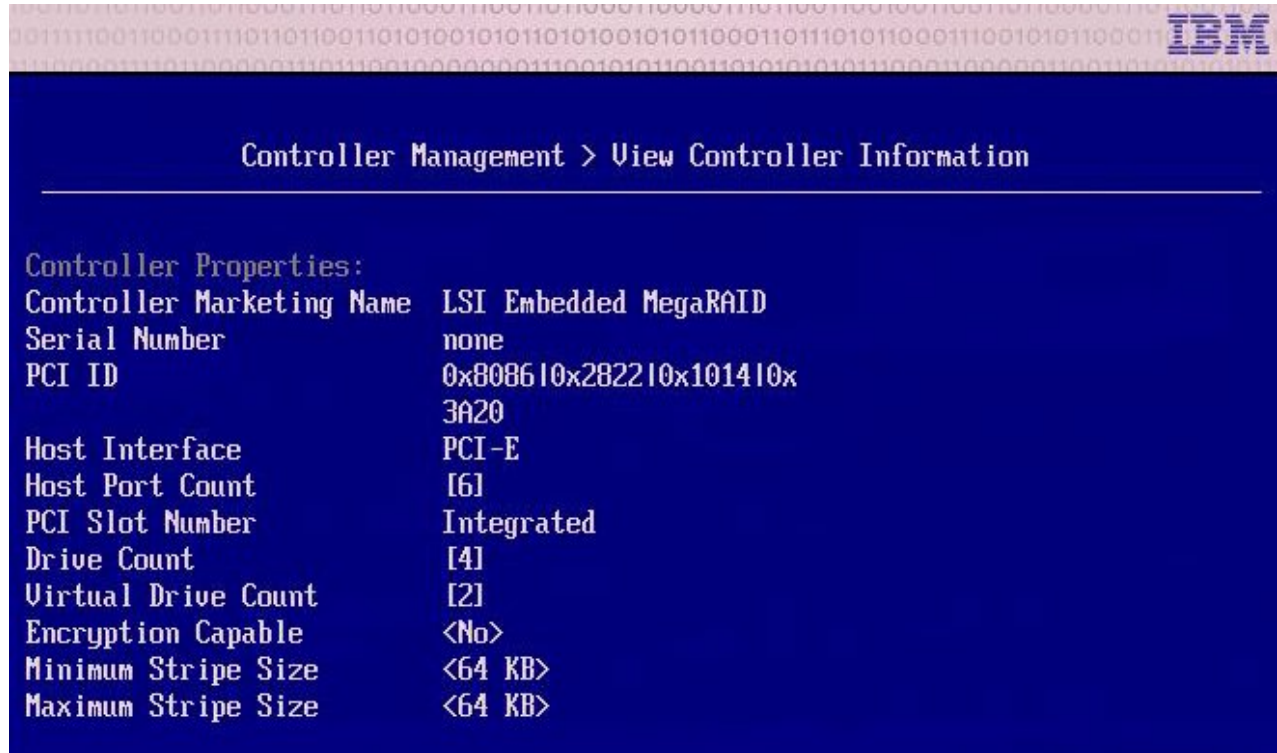
Figure 16. ServeRAID C100/C105 configuration utility: Controller information

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 17. Ordering part numbers and feature codes

Description	Part number	Feature code
ServeRAID C100	Onboard	Onboard
ServeRAID C105	Onboard	Onboard
ServeRAID C100 Series RAID 5 Upgrade-FoD*	81Y4406	A17U
8-Pack ServeRAID C105 Controller Enabler**	90Y4349	A2V7

* An FoD upgrade for ServeRAID C100 that enables support for RAID 5.
** An FoD upgrade for ServeRAID C105 that enables support for up to eight SATA HDDs.

ServeRAID C100 and C105 specifications

The following table lists specifications for the ServeRAID C100 and C105 controllers.

Table 18. ServeRAID C100 and C105 specifications

Specification	C100 (System x M4 servers)	C100 (System x M5 servers)	C100 (nx460 M4)	C105 (System x M4 servers)	C105 (Blade servers)
Interface type	SATA	SATA	SATA	SATA	SATA
Number of ports	Up to 6*	Up to 6*	4	Up to 8**	2
Port speed	3 Gbps	6 Gbps	2x 3 Gbps, 2x 6 Gbps	3 Gbps	3 Gbps
Number of physical drives supported#	Up to 4	Up to 4	Up to 4	Up to 8**	2
Number of virtual drives supported	Up to 8	Up to 8	Up to 8	Up to 8	Up to 8
Virtual drive size support	> 2 TB	> 2 TB	> 2 TB	> 2 TB	> 2 TB
Stripe unit size	64 KB fixed	64 KB fixed	64 KB fixed	64 KB fixed	64 KB fixed
RAID levels	0, 1, 10	0, 1, 10, 5†	0, 1, 10	0, 1, 10	0, 1, 10
SAS HDD support	No	No	No	No	No
SATA HDD support	Yes	Yes	Yes	Yes	Yes
SAS SSD support	No	No	No	No	No
SATA SSD support	No	No	Yes	No	No
Simple-swap support	Yes	Yes	Yes	Yes	No
Hot-swap support	No	No	No	Yes	Yes
Optical drive support	Yes	Yes	No	No	No
Tape drive support	Yes	Yes	No	No	No
Internal connector type	Up to six 7-pin L-shape SATA	Up to six 7-pin L-shape SATA	1x Mini-SAS	2x Mini-SAS (SFF-8087) x4	2x Drive connectors
Supported servers	x3100 M4, x3250 M4	x3250 M5	nx460 M4	x3300 M4, x3530 M4, x3630 M4	HS23E, x220

* Up to four ports are used to connect hard drives, and up to two ports are used to connect optical or tape drives (server dependent).
** Eight HDD support requires optional 8-pack Enabler Features on Demand (FoD) upgrade, 90Y4349.
# The maximum number of physical drives supported depends on the server model.
† RAID 5 support requires optional C100 Series RAID 5 FoD upgrade, 81Y4406.

Resources

For more information, see the following documents:

- *ServeRAID C100 and C105 Product Guide*
  http://lenovopress.com/tips0855

- *User's Guide for ServeRAID C100*
  http://www.ibm.com/support/entry/portal/docdisplay?lndocid=MIGR-5089055

N2225 and N2226 SAS/SATA HBAs

The N2225 and N2226 SAS/SATA HBAs are low-cost, high-performance host bus adapters for high-performance connectivity between System x servers and external storage enclosures (JBODs), tapes, and RAID storage systems. The N2225 provides two x4 external mini-SAS HD connectors with eight lanes of 12 Gbps SAS. The N2226 provides four x4 external mini-SAS HD connectors with 16 lanes of 12 Gbps SAS.

Figure 17. N2225 (left) and N2226 (right) SAS/SATA HBAs

Table 19. Ordering part numbers and feature codes

Description	Part number	Feature code
N2225 SAS/SATA HBA	00AE912	A5M0
N2226 SAS/SATA HBA	00AE916	A5M1

N2225 and N2226 SAS/SATA HBAs specifications

The N2225 and N2226 SAS/SATA HBAs have the following features and specifications:

- LSI SAS3008 12 Gbps I/O controller
- PCIe low profile (N2225) or full height (N2226), half-length form factor
- PCI Express 3.0 x8 host interface
- Eight (N2225) or 16 (N2226) external 12 Gbps SAS/SATA ports
- Supports 12, 6, and 3 Gbps SAS and 6 and 3 Gbps SATA data transfer rates
- Up to 12 Gbps throughput per port
- Two (N2225) or four (N2226) external x4 mini-SAS HD connectors (SFF-8644)
- Supports connectivity to the external storage systems, tapes, and JBOD expansion units
- High-performance IOPS LSI Fusion-MPT architecture
- Advanced power management support
- Support for SSP, SMP, STP, and SATA protocols
- Support for narrow and wide ports
- End-to-End CRC with Advanced Error Reporting
- T-10 Protection Model for early detection of and recovery from data corruption
- Spread Spectrum Clocking for EMI reductions

Resources

For more information, see the following documents:

- N2225 support and downloads
  http://ibm.com/support/entry/portal/search_results?q=N2225
- N2226 support and downloads
  http://ibm.com/support/entry/portal/search_results?q=N2226

N2215 SAS/SATA HBA

The N2215 SAS/SATA HBAis an ideal solution for System x servers that require high-speed internal storage connectivity. This eight-port host bus adapter supports direct attachment to SAS and SATA internal HDDs and SSDs. With a low-profile form-factor design, the N2215 SAS/SATA HBA offers two x4 internal mini-SAS HD connectors.

Figure 18. N2215 SAS/SATA HBA

Table 20. Ordering part numbers and feature codes

Description	Part number	Feature code
N2215 SAS/SATA HBA	47C8675	A3YY

N2215 SAS/SATA HBA specifications

The N2215 SAS/SATA HBA has the following features and specifications:

- LSI SAS3008 12 Gbps controller
- PCI low profile, half-length - MD2 form factor
- PCI Express 3.0 x8 host interface
- Eight internal 12 Gbps SAS/SATA ports (support for 12, 6, or 3 Gbps SAS speeds and 6 or 3 Gbps SATA speeds)
- Up to 12 Gbps throughput per port
- Two internal x4 HD Mini-SAS connectors (SFF-8643)
- Non-RAID (JBOD mode) support for SAS and SATA HDDs and SSDs (RAID not supported)
- Optimized for SSD performance
- High-performance IOPS LSI Fusion-MPT architecture
- Advanced power management support
- Support for SSP, SMP, STP, and SATA protocols
- End-to-End CRC with Advanced Error Reporting
- T-10 Protection Model for early detection of and recovery from data corruption
- Spread Spectrum Clocking for EMI reductions

Resources

For more information, see the following documents:

- 6 Gb and 12 Gb MPT2SAS Controller documentation
http://ibm.com/support/entry/portal/docdisplay?lndocid=MIGR-5088601
- N2215 support and downloads
http://ibm.com/support/entry/portal/search_results?q=N2215

N2125 SAS/SATA HBA

The N2125 SAS/SATA HBA is a low-cost, high-performance 8-port host bus adapter for high-performance connectivity between System x servers and external storage enclosures (JBODs), tapes, and RAID storage systems. With a low-profile form-factor design, the N2125 SAS/SATA HBA offers two x4 external mini-SAS connectors.

Figure 19. N2125 SAS/SATA HBA

Table 21. Ordering part numbers and feature codes

Description	Part number	Feature code
N2125 SAS/SATA HBA	46C9010	A3MV

N2125 SAS/SATA HBA specifications

The N2125 SAS/SATA HBA has the following features and specifications:

- LSI SAS2308 6 Gbps I/O controller
- PCIe low profile, half-length form factor
- PCI Express 3.0 x8 host interface
- Eight external 6 Gbps SAS/SATA ports (support for 6, 3, or 1.5 Gbps speeds)
- Up to 6 Gbps throughput per port
- Two external x4 mini-SAS connectors (SFF-8088)
- Supports connectivity to the external storage systems
- High-performance IOPS LSI Fusion-MPT architecture
- Advanced power management support
- Support for SSP, SMP, STP, and SATA protocols
- End-to-End CRC with Advanced Error Reporting
- T-10 Protection Model for early detection of and recovery from data corruption
- Spread Spectrum Clocking for EMI reductions

Resources

- 6 Gb and 12 Gb MPT2SAS Controller documentation
  http://ibm.com/support/entry/portal/docdisplay?lndocid=MIGR-5088601
- N2125 support and downloads
  http://ibm.com/support/entry/portal/search_results?q=N2125

N2115 SAS/SATA HBA

The N2115 SAS/SATA HBA is an ideal solution for System x servers that require high-speed internal storage connectivity. This eight-port host bus adapter supports direct attachment to SAS and SATA internal HDDs and SSDs. With a low-profile form-factor design, the N2115 SAS/SATA HBA offers two x4 internal mini-SAS connectors.
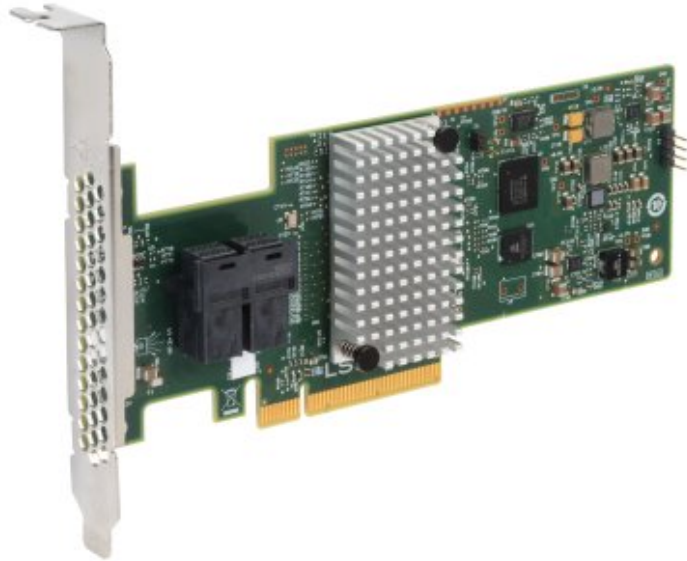

Figure 20. N2115 SAS/SATA HBA

Table 22. Ordering part numbers and feature codes

Description	Part number	Feature code
N2115 SAS/SATA HBA	46C8988	A3MW

N2115 SAS/SATA HBA specifications

The N2115 SAS/SATA HBA has the following features and specifications:

- LSI SAS2308 6 Gbps I/O controller
- PCI low profile, half-length - MD2 form factor
- PCI Express 3.0 x8 host interface
- Eight internal 6 Gbps SAS/SATA ports (support for 6, 3, or 1.5 Gbps speeds)
- Up to 6 Gbps throughput per port
- Two internal x4 Mini-SAS connectors (SFF-8087)
- Non-RAID (JBOD mode) support for SAS and SATA HDDs and SSDs (RAID not supported)
- Optimized for SSD performance
- High-performance IOPS LSI Fusion-MPT architecture
- Advanced power management support
- Support for SSP, SMP, STP, and SATA protocols
- End-to-End CRC with Advanced Error Reporting
- T-10 Protection Model for early detection of and recovery from data corruption
- Spread Spectrum Clocking for EMI reductions

Resources

For more information, see the following documents:

- 6 Gb and 12 Gb MPT2SAS Controller documentation
  http://ibm.com/support/entry/portal/docdisplay?lndocid=MIGR-5088601
- N2115 support and downloads
  http://ibm.com/support/entry/portal/search_results?q=N2115

6Gb SAS HBA

The 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 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 21. 6Gb SAS Host Bus Adapter with the PCIe slot bracket removed

Table 23. 6Gb SAS Host Bus Adapter part number and feature code

Description	Part number	Feature code
6 Gb SAS Host Bus Adapter	46M0907	3875

6Gb SAS HBA specifications

The 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 *6Gb SAS HBA Product Guide* : http://lenovopress.com/tips0776

Note: The adapter does not support internal disk drives.

Resources

For more information, see the following documents:

- *6Gb SAS HBA Product Guide*
  http://lenovopress.com/tips0776

6Gb Performance Optimized HBA

The 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 22. 6Gb Performance Optimized HBA

Table 24. 6Gb Performance Optimized HBA part number and feature code

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

* Formerly known as the IBM 6Gb SSD Host Bus Adapter

See the *6Gb Performance Optimized HBA Product Guide* for a list of supported drives:
http://lenovopress.com/tips0744

6Gb Performance Optimized HBA specifications

The 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:

- *6Gb Performance Optimized HBA Product Guide*
  http://lenovopress.com/tips0744

ServeRAID M5115 SAS/SATA Controller

The ServeRAID M5115 SAS/SATA Controller is a high-performance offering for 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 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 25. Ordering part numbers and feature codes

Description	Part number	System x feature code
ServeRAID M5115 SAS/SATA Controller for Flex System	90Y4390	A2XW
Hardware enablement kits - Flex System x240 Compute Node		
ServeRAID M5100 Series Enablement Kit for Flex System x240	90Y4342	A2XX
ServeRAID M5100 Series Flex System Flash Kit for x240	90Y4341	A2XY
ServeRAID M5100 Series SSD Expansion Kit for Flex System x240	90Y4391	A2XZ
Hardware enablement kits - Flex System x220 Compute Node		
ServeRAID M5100 Series Enablement Kit for Flex System x220	90Y4424	A35L
ServeRAID M5100 Series Flex System Flash Kit for x220	90Y4425	A35M
ServeRAID M5100 Series SSD Expansion Kit for Flex System x220	90Y4426	A35N
Feature on demand licenses (for both x240 and x220)		
ServeRAID M5100 Series RAID 6 Upgrade for Flex System	90Y4410	A2Y1
ServeRAID M5100 Series Performance Upgrade for Flex System	90Y4412	A2Y2
ServeRAID M5100 Series SSD Caching Enabler for 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 26. Supported upgrade features

Part number	Description
90Y4410	ServeRAID M5100 Series RAID 6 Upgrade for Flex System
90Y4412	ServeRAID M5100 Series Performance Accelerator for Flex System (MegaRAID FastPath)
90Y4447	ServeRAID M5100 Series SSD Caching Enabler for 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 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 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 Flex System Product Guide*
  http://lenovopress.com/tips0884

- *ServeRAID M5115 SAS/SATA Controller Installation and User Guide*
  http://www.ibm.com/support

ServeRAID H1135 SAS/SATA Controller

The 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 ServeRAID H1135 controller in a Flex System x220 compute node or a BladeCenter® HS23E blade server.

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

Table 27. Ordering part numbers and feature codes

Description	Part number	System x feature code
ServeRAID H1135 Controller for 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 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?lndocid=MIGR-5088601

Supported servers

The following table lists supported System x servers.

Table 28. Supported System x servers (Part 1)

Server	M5025	M5016	M5015	M5014	M1015	BR10il v2	N2226	N2225	N2125	6Gb SAS	6Gb SSD
x3100 M4	Y	N	Y	Y	Y	Y	N	N	N	Y	Y
x3100 M5	N	N	N	N	N	N	N	N	Y	Y	N
x3200 M2	N	N	N	N	N	N	N	N	N	Y	N
x3200 M3	Y	N	Y	Y	Y	Y	N	N	N	Y	N
x3250 M2	N	N	N	N	N	N	N	N	N	Y	N
x3250 M3	Y	N	Y	Y	Y	Y	N	N	N	Y	N
x3250 M4	Y	N	Y	Y	Y	Y	N	N	N	Y	Y
x3250 M5	N	N	N	N	N	N	N	Y	Y	N	N
x3300 M4	N	N	N	N	N	N	N	N	N	Y	Y
x3400 M2	Y	N	Y	Y	Y	Y	N	N	N	Y	N
x3400 M3	Y	N	Y	Y	Y	Y	N	N	N	Y	N
x3500 M2	Y	N	Y	Y	Y	N	N	N	N	Y	N
x3500 M3	Y	N	Y	Y	Y	N	N	N	Y	Y	N
x3500 M4	N	N	N	N	N	N	Y*	Y*	Y	Y	Y
x3530 M4	N	N	N	N	N	N	N	Y*	N	Y	Y
x3550 M2	Y	N	Y	Y	Y	N	N	N	N	Y	Y
x3550 M3	Y	Y	Y	Y	Y	Y	N	N	N	Y	Y
x3550 M4	N	N	N	N	N	N	N	Y*	Y	Y	Y
x3550 M5	N	N	N	N	N	N	Y	Y	N	N	N
x3620 M3	N	N	Y	Y	Y	Y	N	N	N	Y	N
x3630 M3	N	N	Y	Y	Y	N	N	N	N	Y	N
x3630 M4	N	N	N	N	N	N	Y*	Y*	Y	Y	Y
x3650 M2	Y	N	Y	Y	Y	N	N	N	N	Y	Y
x3650 M3	Y	Y	Y	Y	Y	Y	N	N	N	Y	Y
x3650 M4	N	N	N	N	N	N	Y*	Y*	Y	Y	Y
x3650 M4 BD	N	N	N	N	N	N	Y	Y	Y	N	N
x3650 M4 HD	N	N	N	N	N	N	Y	Y	N	N	N
x3650 M5	N	N	N	N	N	N	Y	Y	N	N	N
x3690 X5	Y	Y**	Y	Y	Y	N	N	N	N	Y	Y
x3750 M4 (8722)	N	N	N	N	N	N	N	N	Y	Y	Y
x3750 M4 (8752)	N	N	N	N	N	N	N	N	Y	N	N
x3755 M3	N	N	Y	Y	Y	N	N	N	N	Y	N
x3850 M2/x3950 M2	N	N	N	N	N	N	N	N	N	Y	Y
x3850 X5/x3950 X5	Y	Y**	Y	Y	Y	N	N	N	Y	Y	Y
x3850 X6/x3950 X6	N	N	N	N	N	N	N	Y	Y	N	N

* Supported with Intel Xeon v2 processors.
** Supported with Intel Xeon E7 family-based eX5 servers, requires optional M5016 Battery Tray (88Y5874).

Table 28. Supported System x servers (Part 2)

Server	M5225-2GB	M5210	M5210e	M1215	M5120	M5110	M5110e	M1115	H1110	C105	C100	N2215	N2115
x3100 M4	N	N	N	N	N	N	N	N	Y	N	Y	N	N
x3100 M5	N	N	N	N	Y	Y	N	Y	Y	N	Y	N	Y
x3200 M2	N	N	N	N	N	N	N	N	N	N	N	N	N
x3200 M3	N	N	N	N	N	N	N	N	Y	N	N	N	N
x3250 M2	N	N	N	N	N	N	N	N	N	N	N	N	N
x3250 M3	N	N	N	N	N	N	N	N	Y	N	N	N	N
x3250 M4	N	N	N	N	N	N	N	N	Y	N	Y	N	N
x3250 M5	N	N	N	N	Y	Y	N	Y	Y	N	Y	N	Y
x3300 M4	N	N	N	N	Y	Y	N	Y	Y	Y	N	N	N
x3400 M2	N	N	N	N	N	N	N	N	N	N	N	N	N
x3400 M3	N	N	N	N	N	N	N	N	Y	N	N	N	N
x3500 M2	N	N	N	N	N	N	N	N	N	N	N	N	N
x3500 M3	N	N	N	N	N	N	N	N	Y	N	N	N	N
x3500 M4	N	Y	N	Y	Y	Y	N	Y	N	N	N	Y	Y
x3530 M4	N	N	N	N	Y	Y	N	Y	Y	Y	N	N	N
x3550 M2	N	N	N	N	N	N	N	N	N	N	N	N	N
x3550 M3	N	N	N	N	N	N	N	N	Y	N	N	N	N
x3550 M4	N	Y	N	Y	Y	Y	N	Y	N	N	N	Y	Y
x3550 M5	Y	Y	N	Y	N	N	N	N	N	N	N	Y	N
x3620 M3	N	N	N	N	N	N	N	N	Y	N	N	N	N
x3630 M3	N	N	N	N	N	N	N	N	N	N	N	N	N
x3630 M4	N	N	N	N	Y	Y	N	Y	Y	Y	N	N	Y
x3650 M2	N	N	N	N	N	N	N	N	N	N	N	N	N
x3650 M3	N	N	N	N	N	N	N	N	Y	N	N	N	N
x3650 M4	N	Y	N	N	Y	Y	Y	N	N	N	N	Y	Y
x3650 M4 BD	N	Y	N	Y	Y	Y	N	Y	Y	N	N	Y	Y
x3650 M4 HD	N	Y	Y	N	N	N	N	N	Y	N	N	Y	N
x3650 M5	Y	Y	N	Y	N	N	N	N	N	N	N	Y	N
x3690 X5	N	N	N	N	N	N	N	N	N	N	N	N	Y
x3750 M4 (8722)	N	N	N	N	Y	Y	Y	Y	Y	N	N	N	Y
x3750 M4 (8752)	N	Y	Y	Y	Y	N	N	N	N	N	N	Y	N
x3755 M3	N	N	N	N	N	N	N	N	N	N	N	N	N
x3850 M2/x3950 M2	N	N	N	N	N	N	N	N	N	N	N	N	N
x3850 X5/x3950 X5	N	N	N	N	N	N	N	N	N	N	N	N	Y
x3850 X6/x3950 X6	N	Y	N	N	Y	N	N	N	N	N	N	Y	N

The following table lists supported iDataPlex and NeXtScale servers.

Table 29. Supported iDataPlex and NeXtScale servers (Part 1)

Server	M5025	M5016	M5015	M5014	M1015	B5015	BR10il v2	N2226	N2225	N2125	6Gb SAS	6Gb SSD
dx320	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
dx360	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
dx360 M3	N	N	Y	N	Y	N	N	N	N	N	Y	N
dx360 M4	N	N	N	N	N	N	Y	N	N	N	Y	Y
nx360 M4	N	N	N	N	N	N	N	Y	Y	Y	N	N
nx360 M5	N	N	N	N	N	N	N	N	N	N	N	N

Table 29. Supported iDataPlex and NeXtScale servers (Part 2)

Server	M5225-2GB	M5210	M5210e	M1215	M5120	M5110	M5110e	M1115	H1110	C105	C100	N2215	N2115
dx320	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
dx360	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
dx360 M3	N	N	N	N	N	N	N	N	Y	N	N	N	N
dx360 M4	N	Y	N	N	Y	N	N	Y	Y	N	N	N	N
nx360 M4	N	N	N	N	Y	Y	N	Y	Y	N	Y	N	Y
nx360 M5	N	Y	N	Y	N	N	N	N	N	N	N	Y	N

The following table lists supported BladeCenter servers.

Table 30. Supported BladeCenter servers

Server	M5115	H1135	C105
HS12 (8028)	N	N	N
HS22 (7870)	N	N	N
HS22V (7871)	N	N	N
HS23 (7875)	N	N	N
HS23E (8038)	N	Y	Y
HX5 (7872)	N	N	N
HX5 (7873)	N	N	N

The following table lists supported Flex System servers.

Table 31. Supported Flex System servers

Server	M5115	H1135	C105	C100
x220	Y	Y	Y	N
x222	N	N	N	Y
x240	Y	N	N	N
x240 M5	N	N	N	N
x440	Y	N	N	N
x280/x480/x880 X6	N	N	N	N

Feature comparison

The following tables compare features of the storage controllers.

Table 32. Feature comparison: Controllers for System x, iDataPlex, and NeXtScale servers (Part 1)

Feature	M5025	M5016	M5015	M5014	M1015	BR10il v2	N2226	N2225	N2125	6Gb SAS	6Gb SSD
Port interface	SAS	SAS	SAS	SAS	SAS	SAS	SAS	SAS	SAS	SAS	SAS
Port speed, Gbps	6	6	6	6	6	3	12	12	6	6	6
Number of ports	8	8	8	8	8	4	16	8	8	8	8
PCIe spec	2.0	2.0	2.0	2.0	2.0	1.0	3.0	3.0	3.0	2.0	2.0
PCIe lanes	x8	x8	x8	x8	x8	x4	x8	x8	x8	x8	x8
Int. connectors	0	2	2	2	2	1	0	0	0	4	2
Ext. connectors	2	0	0	0	0	0	4	2	2	1	0
SAS controller	LSI SAS 2108	LSI SAS 2208	LSI SAS 2108	LSI SAS 2108	LSI SAS 2008	LSI SAS 1064	LSI SAS 3008	LSI SAS 3008	LSI SAS 2308	LSI SAS 2008	LSI SAS 2008
Cache (MB)#	512	1024	512	256	None	None	None	None	None	None	None
Battery backup	Y	N	Y	Opt	N	N	N	N	N	N	N
Flash backup	N	Y	N	N	N	N	N	N	N	N	N
Data encryption	Opt	Y	Opt	Opt	Opt	N	N	N	N	N	N
Max stripe size (KB) (F=fixed)	1024	1024	1024	1024	64	64-F	N/A	N/A	N/A	N/A	N/A
Mixing SAS & SATA‡	Y	Y	Y	Y	Y	Y	N/A	N/A	N/A	N/A	N/A
SSD support	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y
Tape support	N	N	N	N	N	N	N	N	N	Y	N
Max volumes	64	64	64	64	16	2	N/A	N/A	N/A	N/A	N/A
Max volume size	64TB	64TB	64TB	64TB	64TB	Y	N/A	N/A	N/A	N/A	N/A
UEFI support	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Patrol read (data scrubbing)	Y	Y	Y	Y	Y	Y	N/A	N/A	N/A	N/A	N/A
Consistency check	Y	Y	Y	Y	Y		N/A	N/A	N/A	N/A	N/A
Online RAID Level Migration†	Y	Y	Y	Y	Y		N/A	N/A	N/A	N/A	N/A
Online Capacity Expansion	Y	Y	Y	Y	Y		N/A	N/A	N/A	N/A	N/A
AutoSync (auto-rebuild)	Y	Y	Y	Y	Y	Y	N/A	N/A	N/A	N/A	N/A
Copyback§	Y	Y	Y	Y	N	N	N/A	N/A	N/A	N/A	N/A
FastPath	Opt	N	Opt	Opt	N	N	N/A	N/A	N/A	N/A	N/A
CacheCade	Opt	N	Opt	Opt	N	N	N/A	N/A	N/A	N/A	N/A
RAID-0	Y	Y	Y	Y	Y	Y	N/A	N/A	N/A	N/A	N/A
RAID-1	Y	Y	Y	Y	Y	Y	N/A	N/A	N/A	N/A	N/A
RAID-1E	N	N	N	N	N	Y	N/A	N/A	N/A	N/A	N/A
RAID-5	Y	Y	Y	Y	Opt	N	N/A	N/A	N/A	N/A	N/A
RAID-6	Opt	Y	Opt	Opt	N	N	N/A	N/A	N/A	N/A	N/A
RAID-10	Y	Y	Y	Y	Y	N	N/A	N/A	N/A	N/A	N/A
RAID-50	Y	Y	Y	Y	Opt	N	N/A	N/A	N/A	N/A	N/A
RAID-60	Opt	Y	Opt	Opt	N	N	N/A	N/A	N/A	N/A	N/A

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 32. Feature comparison: Controllers for System x, iDataPlex, and NeXtScale servers (Part 2)

Feature	M5225-2GB	M5210/M5210e	M1215	M5120	M5110/M5110e	M1115	H1110	C105	C100	N2215	N2115
Port interface	SAS	SAS	SAS	SAS	SAS	SAS	SAS	SATA	SATA	SAS	SAS
Port speed, Gbps	12	12	12	6	6	6	6	3	3	12	6
Number of ports	8	8	8	8	8	8	4	8	Up to 6	8	8
PCIe spec	3.0	3.0	3.0	3.0	3.0	2.0	2.0	N/A	N/A	3.0	3.0
PCIe lanes	x8	x8	x8	x8	x8	x8	x4	N/A	N/A	x8	x8
Int. connectors	0	2	2	0	2	2	2	2	Up to 6	2	2
Ext. connectors	2	0	0	2	0	0	0	0	0	0	0
SAS controller	LSI SAS 3108	LSI SAS 3108	LSI SAS 3008	LSI SAS 2208	LSI SAS 2208	LSI SAS 2008	LSI SAS 2004	None	None	LSI SAS 3008	LSI SAS 2308
Cache (MB)#	2 GB	Opt	N	Opt	Opt	N	N	N	N	N	N
Battery backup	N	N	N	Opt	Opt	N	N	N	N	N	N
Flash backup	Yes	Opt	N	Opt	Opt	N	N	N	N	N	N
Data encryption	Yes	Opt	Opt	Opt	Opt	Opt	N	N	N	N	N
Max stripe size (KB) (F=fixed)	1024	1024	64-F	1024	1024	64-F	64-F	64-F	64-F	N/A	N/A
Mixing SAS & SATA‡	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y
SSD support	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y
Tape support	N	N	N	N	N	N	N	N	Y	N	N
Max volumes	64	64	32	64	64	16	2	8	8	N/A	N/A
Max volume size	64TB	64TB	>2TB	64TB	64TB	64TB	16TB	>2TB	>2TB	N/A	N/A
UEFI support	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Patrol read (data scrubbing)	Y	Y	Y	Y	Y	Y	N	N	N	N/A	N/A
Consistency check	Y	Y	Y	Y	Y	Y	Y	Y	Y	N/A	N/A
Online RAID Level Migration†	Y	Y	Y	Y	Y	Y	N	N	N	N/A	N/A
Online Capacity Expansion	Y	Y	Y	Y	Y	Y	Y	N	N	N/A	N/A
AutoSync (auto-rebuild)	Y	Y	Y	Y	Y	Y	Y	Y	Y	N/A	N/A
Copyback§	Y	Y	Y	Y	Y	Y	N	N	N	N/A	N/A
FastPath	Opt	Opt	N	Opt	Opt	N	N	N	N	N/A	N/A
CacheCade	Opt	Opt	N	Opt	Opt	N	N	N	N	N/A	N/A
RAID-0	Y	Y	Y	Y	Y	Y	Y	Y	Y	N/A	N/A
RAID-1	Y	Y	Y	Y	Y	Y	Y	Y	Y	N/A	N/A
RAID-1E	N	N	N	N	N	N	Y	N	N	N/A	N/A
RAID-5	Y	Opt	Opt	Opt	Opt	Opt	N	N	N	N/A	N/A

Feature	M5225-2GB	M5210/M5210e	M1215	M5120	M5110/M5110e	M1115	H1110	C105	C100	N2215	N2115
RAID-6	Opt	Opt	N	Opt	Opt	N	N	N	N	N/A	N/A
RAID-10	Y	Y	Y	Y	Y	Y	Y	Y	Y	N/A	N/A
RAID-50	Y	Opt	Opt	Opt	Opt	Opt	N	N	N	N/A	N/A
RAID-60	Opt	Opt	N	Opt	Opt	N	N	N	N	N/A	N/A

\# 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 33. Feature comparison: ServeRAID controllers for BladeCenter and Flex System servers

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

Opt=optional
‡ Requires that the server also supports the mixing of SAS & SATA drives.
* The ServeRAID-MR10ie (CIOv) 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.

Related product families

Product families related to this document are the following:

- RAID Adapters

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