



USER'S GUIDE

ServeRAID MegaCLI

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Preface

This document explains how to use the MegaRAID® Command Tool (CT), which is a command line interface (CLI) application for Serial-attached SCSI (SAS)/SATA controllers. This application, known as MegaCLI, is used to configure, monitor, and maintain ServeRAID-M® SAS/SATA controllers and the storage-related devices connected to the controllers.

Organization

This document has the following chapters and appendixes:

- [Chapter 1, “MegaRAID Command Tool,”](#) describes how to use the MegaCLI utility to manage storage configurations and devices, and display information about them.
- [Appendix A, “Examples of MegaCLI Commands,”](#) documents examples of MegaCLI commands for specific actions used to manage storage configurations and devices, and display information about them.
- [Appendix B, “MegaCLI Error Messages,”](#) documents the codes and the descriptions for the error messages for the MegaCLI Configuration Utility.
- [Appendix C, “SNMP Extension Agent Trap Definitions,”](#) documents the trap definitions that an SNMP-based management application uses to send information about system events.
- [Appendix D, “Glossary of Terms and Abbreviations,”](#) contains definitions of storage-related terms.
- [Appendix E, “Notices,”](#) contains information about the warranty, patents, license inquiries, and trademarks.

Notices and Statements in This Document

The following notices and statements are used in this document:

Note: Notes contain supplementary information that can have an effect on system performance.

Attention: Attention notices identify actions that might adversely affect equipment operation, system performance, or data integrity.

Related Publications

ServeRAID-M Device Driver Installation User's Guide

This document explains how to install the ServeRAID-M device driver for your operating system. The information in this document is independent of the back-end bus and applies to the Short Product Names.

ServeRAID-M Software User's Guide

This document explains how to use the MegaRAID Storage Manager and WebBIOS utilities to configure, monitor, and maintain the Short Product Names and the storage-related devices connected to them.

Safety Information

This document contains translated caution and danger statements. Each caution and danger statement that appears in the documentation has a number that you can use to locate the corresponding statement in your language in the *Safety Information* document.

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Chapter 1

MegaRAID Command Tool

This chapter describes the tasks, command line conventions, abbreviations, and commands you can use in the MegaRAID[®] Command Tool (CT). This application, also known as MegaCLI, is a command line interface (CLI) application. The MegaCLI utility is used to configure, monitor, and maintain ServeRAID-M[®] SAS/SATA controllers and the storage-related devices connected to them.

Note: The CT supports only the ServeRAID controller. It supports SAS, SATA II, and SATA III, but it does not support other types of ServeRAID controllers, such as U320, SATA I, or IDE.

This chapter has the following sections:

- [Section 1.1, “Product Overview”](#)
- [Section 1.2, “Command Line Abbreviations and Conventions”](#)
- [Section 1.3, “Installing the MegaCLI Utility”](#)
- [Section 1.4, “CacheCade Options”](#)
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- [Section 1.16, “SAS Topology”](#)
- [Section 1.17, “Miscellaneous Options”](#)

1.1 Product Overview

The MegaRAID Command Tool (CT) is a command line interface (CLI) application for Serial-attached SCSI (SAS)/SATA controllers. This application, known as MegaCLI, is used to configure, monitor, and maintain ServeRAID-M SAS/SATA controllers and the storage-related devices connected to them.

You can use the MegaCLI configuration utility to perform the following tasks:

- Configure ServeRAID SAS/SATA controllers and attached devices
- Display information about virtual drives and the drives for the controller and other storage components
- Display ongoing progress for operations on the drives and virtual drives
- Change properties for the virtual drives and the drives for the controller and other storage components
- Set, retrieve, and verify controller default settings
- Change the firmware on the controllers
- Monitor the RAID storage systems
- Support RAID levels 0, 1, 5, 6, 10, 50, and 60 (depending on the RAID controller)
- Create and use scripts with the scriptable CLI tool
- Configure the drive into groups and virtual drives on the controller
- Display the configuration information for the controller, drives, and virtual drives
- Change the virtual drive properties on the controller
- Change the drive properties on the controller
- Display the controller properties

- Load a configuration to the controller from a file
- Save the controller configuration to a file
- Start or stop a rebuild, consistency check (CC), or initialization operation
- Enable or disable a background initialization (BGI)
- Stop or display an ongoing background initialization
- Start or display a reconstruction
- Start or stop the patrol read operation
- Set and retrieve the patrol read related settings
- Flash new firmware on the SAS RAID controller
- Read and program NVRAM and flash memory directly into DOS
- Display the relevant messages on the console and/or in the log file
- Display the controller data using one command
- Exit with predefined success or failure exit codes
- Scan, preview, and import foreign configurations
- Set the predefined environment variables, such as the number of controllers and virtual drives
- Display the firmware event logs
- Display help for how to use the command line options
- Enable or disable snapshots (for the Recovery advanced software feature)
- Create and delete the snapshots and the views of a virtual drive
- Roll back the virtual drive to an older snapshot
- Display the snapshot properties
- Create a CacheCade virtual drive to use as secondary cache
- Display the battery backup unit properties
- Display the enclosure properties
- Display and set the connector mode on supported controllers

The following sections describe the command line options in the MegaCLI Configuration Utility you can use to perform these functions.

Important: The MegaCLI error messages are listed in [Appendix B](#).

1.2 Command Line Abbreviations and Conventions

This section explains the abbreviations and the conventions used with MegaCLI commands.

1.2.1 Abbreviations Used in the Command Line

[Table 1.1](#) lists the abbreviations for the virtual drive parameters used in the following sections.

Table 1.1 Command Line Abbreviations

Abbreviation	Description
WB	WriteBack write policy
WT	WriteThrough write policy
ADRA	Adaptive Read Ahead read policy
RA	Read Ahead read policy
NORA	Normal Read policy (No read ahead)
DIO	Direct I/O cache policy
CIO	Cached I/O cache policy

1.2.2 Conventions

For some options, you can specify multiple values. For example, you can enter commands for a single controller (-aN), multiple controllers (-a0,1,2) or work on all present controllers (-aALL). These values are denoted as - aN| -a0,1,2| -aALL in this document and specify that you can enter commands for one controller, multiple controllers, or all controllers.

Note : All options in the MegaRAID Command Tool are position-dependent, unless otherwise specified.

[Table 1.2](#) describes the conventions used in the options.

Table 1.2 Conventions

Convention	Description
	Specifies “or,” meaning you can choose between options.
-aN	N specifies the controller number for the command.
-a0,1,2	Specifies the command is for controllers 0, 1, and 2. You can select two or more controllers in this manner.
-aALL	Specifies the command is for all controllers.
-Lx	x specifies the virtual drive number for the command.
-L0,1,2	Specifies the command is for virtual drives 0, 1, and 2. You can select two or more virtual drives in this manner.
-Lall	Specifies the command is for all virtual drives.
[E:S0,E1,S1,...]	Specifies when one or more physical devices need(s) to be specified in the command line. Each [E:S] pair specifies one physical device where E means device ID of the enclosure in which a drive resides, and S means the slot number of the enclosure. In the case of a physical device directly connected to the SAS port on the controller, with no enclosure involved, the format of [:S] can be used where S means the port number on the controller. For devices attached through the backplane, the firmware provides an enclosure device ID, and MegaCLI expects the user input in the format of [E:S]. In the following sections, only the format, [E:S], is used in the command descriptions, although both formats are valid.
[]	Indicates that the parameter is optional except when it is used to specify physical devices. For example, [WT] means the write policy (WriteThrough) is optional. If you enter WT at the command line, the application will use WriteThrough write policy for the virtual drive. Otherwise, it uses the default value for the parameter.
{ }	Indicates that the parameters are grouped and must be given at the same time.
-Force	Specifies that the MegaCLI utility does not ask you for confirmation before it performs this command. You might lose data using this option with some commands.

You can specify the `-Silent` command line option for all possible functions of the MegaCLI Configuration Utility. If you enter this option at the command line, no messages appear on the screen.

1.3 Installing the MegaCLI Utility

This section documents the procedures for installing the MegaCLI utility on systems running the following operating systems (OS):

- Microsoft® Windows® operating system
- Linux® operating system

1.3.1 Requirements for MegaCLI Operation under Microsoft Windows Operating Systems

For the Microsoft Windows 2008® OS and later Microsoft Windows operating systems, MegaCLI application does not function if the User Account Control (UAC) settings are turned on. Make sure that the UAC settings are turned off before you start the MegaCLI application.

To turn the User Account Control (UAC) settings on or off, select Control Panel and go to User Accounts section.

1.3.2 Requirements for MegaCLI Operation under the Linux Operating System

For MegaCLI to operate under the Linux operating system, install the libraries described in this section. MegaCLI does not work without these libraries. The file `<Lib_Utils-1.xx-xx.noarch.rpm>` is packaged in the MegaCLI zip file.

To install the file `<Lib_Utils-1.xx-xx.noarch.rpm>`, perform the following steps:

1. Unzip the MegaCLI package.
2. To install the `Lib_Utils` RPM, run this command:

```
rpm -ivh <Lib_Utils-1.xx-xx.noarch.rpm>
```
3. To install the MegaCLI RPM, run this command:

```
rpm -ivh <MegaCli-x.xx-x.noarch.rpm>
```
4. To upgrade the MegaCLI RPM, run this command

```
rpm -Uvh <MegaCli-x.xx-x.noarch.rpm>
```
5. Run MegaCLI with administrator privileges.

1.4 CacheCade Options

Use the commands in this section to create CacheCade drives and delete them.

MegaRAID CacheCade improves application performance by expanding the MegaRAID read-caching capacity. The CacheCade feature uses high-performing CacheCade logical drive as a secondary tier of cache to provide faster reads and to maximize transactional I/O performance.

Using a CacheCade logical drive as controller cache allows for very large data sets to be present in cache, delivering performance up to 50 times greater than regular cache in read-intensive applications, such as online transaction processing (OLTP), and file and Web server workloads. The solution is designed to accelerate the IO performance of HDD-based drive groups while only requiring a small investment in CacheCade software technology.

To support full-throughput for multiple direct-attached CacheCade software, this feature reduces IO-processing overhead in the SAS/SATA controllers. CacheCade offers performance equivalent to flash-based controllers and better performance for RAID 5 and RAID 6 when compared to Fusion I/O.

1.4.1 Create a Solid State Drive Cache Drive to Use as Secondary Cache

Use the command in [Table 1.3](#) to create a cache drive using CacheCade software. You can use that cache drive as secondary cache. CacheCade drives have much greater capacity than HDDs.

Table 1.3 Create a Solid State Cache Drive to Use as Secondary Cache

Convention	<code>MegaCli -CfgCacheCadeAdd -Physdrv[E0:S0,...] {-Name LdNamestring} -aN -a0,1,2 -aALL</code>
Description	This command is used to create CacheCade software that you can use as secondary cache. <code>-Physdrv[E0:S0,...]</code>: Specifies the physical drive enclosure and the slots to use to construct a drive group. <code>-Name LdNamestring</code>: This name is the name given to the CacheCade software cache drive.

1.4.2 Delete a Solid State Drive Cache Drive

Use the command in [Table 1.4](#) to delete a CacheCade drive or multiple CacheCade drives on the selected controller or controllers.

Table 1.4 Delete Solid State Cache Drive(s)

Convention	<code>MegaCli -CfgCacheCadeDel -LX -L0,2,5... -LALL -aN -a0,1,2 -aALL</code>
Description	Deletes the specified CacheCade drive or drives on the selected controller or controllers. You can delete multiple CacheCade drives or all of them.

1.5 Controller Property-Related Options

You can use the commands in this section to set or display properties related to the controller(s), such as the logical drive parameters and factory defaults.

1.5.1 Display Controller Information

Use the command in [Table 1.5](#) to display parameters for the selected controller(s).

Table 1.5 Controller Information

Convention	<code>MegaCli -AdpAllinfo -aN -a0,1,2 -aALL</code>
Description	Displays information about the controller, including cluster state, BIOS, alarm, firmware version, BIOS version, battery charge counter value, rebuild rate, bus number/device number, present RAM, memory size, serial number of the board, and SAS address.

1.5.2 Display Number of Controllers Supported

Use the command in [Table 1.6](#) to display the number of controllers supported on the system.

Table 1.6 Number of Controllers Supported

Convention	<code>MegaCli -AdpCount</code>
Description	Displays the number of controllers supported on the system and returns the number to the operating system.

1.5.3 Enable or Disable Automatic Rebuild

Use the command in [Table 1.7](#) to turn automatic rebuild on or off for the selected controller(s). If you have configured hot spares and enabled automatic rebuild, the RAID controller automatically tries to use them to rebuild failed drives. Automatic rebuild also controls whether a rebuild starts when a drive that was part of the drive group is reinserted.

Table 1.7 Enable or Disable Automatic Rebuild

Convention	<code>MegaCli -AdpAutoRbld -Enbl -Dsbl -Dsply -aN -a0,1,2 -aALL</code>
Description	Enables or disables automatic rebuild on the selected controller(s). The <code>-Dsply</code> option shows the status of the automatic rebuild state.

1.5.4 Flush Controller Cache

Use the command in [Table 1.8](#) to flush the controller cache on the selected controller(s). This option sends the contents of cache memory to the logical drive(s). If the ServerRAID system must be powered down rapidly, you must flush the contents of the cache memory to preserve data integrity.

Table 1.8 Cache Flush on Selected Controller

Convention	<code>MegaCli -AdpCacheFlush -aN -a0,1,2 -aALL</code>
Description	Flushes the controller cache on the selected controller(s).

1.5.5 Set Controller Properties

This command sets the properties on the selected controller(s). For example, for `{RebuildRate -val}`, you can enter a percentage between 0 percent and 100 percent as the value for the rebuild rate. (The rebuild rate is the percentage of the compute cycles dedicated to rebuilding failed drives.) At 0 percent, the rebuild is done only if the system is not doing anything else. At 100 percent, the rebuild has a higher priority than any other system activity.

Note: The default rebuild rate of 30 percent and the default patrol read rate of 30 percent are recommended.

Use the command in [Table 1.9](#) to display the list of properties you can set for the controller(s).

Table 1.9 Set Controller Properties

Convention	MegaCLI -AdpSetProp {RebuildRate -val} {PatrolReadRate -val} {BgiRate -val} {CCRate -val} {ReconRate -val} {CoercionMode -val} {EnblSSDPatrolRead -val} {-PrCorrectUncfgdAreas -val} -aN -a0,1,2 -aALL
Description	Sets the properties on the selected controller(s). The possible settings are: -RebuildRate – Rebuild rate. Values: 0 to 100. -PatrolReadRate – Patrol read rate. Values: 0 to 100. -BgiRate – Background initialization rate. Values: 0 to 100. -CCRate – Consistency check rate. Values: 0 to 100. -ReconRate – Reconstruction rate. Values: 0 to 100. -CoercionMode – Drive capacity Coercion mode. Values: 0 - None, 1 - 128 MB, 2 - 1 GB. 1. The coercion type can be set only when there is no configuration present on the adapter. -EnblSSDPatrolRead – Enable the patrol read operation (media scan) on a SSD. -PrCorrectUncfgdAreas – Informs the firmware whether the media errors found during the patrol read can be corrected or not. This bit is enabled for software RAID.

1.5.6 Display Specified Controller Properties

Use the command in [Table 1.10](#) to display specified properties for the selected controller(s).

Table 1.10 Display Specified Controller Properties

Convention	MegaCLI -AdpGetProp RebuildRate PatrolReadRate BgiRate CCRate ReconRate CoercionMode -aN PrCorrectUncfgdAreas EnblSSDPatrolRead -a0,1,2 -aALL
Description	Displays the properties on the selected controller(s). - RebuildRate – Rebuild rate. Values: 0 to 100. - PatrolReadRate – Patrol read rate. Values: 0 to 100. - BgiRate – Background initialization rate. Values: 0 to 100. - CCRate – Consistency check rate. Values: 0 to 100. - ReconRate – Reconstruction rate. Values: 0 to 100. - CoercionMode – Drive capacity Coercion mode. Values: 0 - None, 1 - 128 MB, 2 - 1 GB. 1. The coercion type can be set only when there is no configuration present on the adapter. - PrCorrectUncfgdAreas – Informs the firmware whether the media errors found during the patrol read can be corrected or not. This bit is enabled for software RAID. - EnblSSDPatrolRead – Enable the patrol read operation (media scan) on a SSD.

1.5.7 Set Factory Defaults

Use the command in [Table 1.11](#) to set the factory defaults on the selected controller(s).

Table 1.11 Set Factory Defaults

Convention	MegaCli -AdpFacDefSet -aN -a0,1,2 -aALL
Description	Sets the factory defaults on the selected controller(s). You cannot set the factory defaults if the controller already has a configuration defined on it.

1.5.8 Set SAS Address

Use the command in [Table 1.12](#) to set the SAS address on the selected controller(s).

Table 1.12 Set SAS Address on Controller

Convention	MegaCli -AdpSetSASA str[0-64] -aN
Description	Sets the controllers SAS address. This string must be a 64-digit hexadecimal number.

1.5.9 Set Time and Date on Controller

Use the command in [Table 1.13](#) to set the time and date on the selected controller(s).

Table 1.13 Set Time and Date on Controller

Convention	MegaCli -AdpSetTime yyyyymmdd HH:mm:ss -aN -a0,1,2 -aALL
Description	Sets the time and date on the controller. This command uses a 24-hour format. For example, 7 p.m. displays as 19:00:00. The order of date and time is reversible.

1.5.10 Display Time and Date on Controller

Use the command in [Table 1.14](#) to display the time and date on the selected controller(s).

Table 1.14 Display Time and Date on Controller

Convention	MegaCli -AdpGetTime -aN
Description	Displays the time and date on the controller. This command uses a 24-hour format. For example, 7 p.m. would display as 19:00:00.

1.6 Patrol Read-Related Controller Properties

You can use the commands in this section to select the settings for Patrol Read. A Patrol Read scans the system for possible drive errors that could lead to drive failure, then takes action to correct the errors. The goal is to protect data integrity by detecting drive failure before the failure can damage data. The corrective actions depend on the logical drive configuration and the type of errors. Patrol Read affects performance; the more iterations there are, the greater the impact.

1.6.1 Set Patrol Read Options

Use the command in [Table 1.15](#) on the selected controller(s) to set the Patrol Read options.

Table 1.15 Set Patrol Read Options

Convention	<code>MegaCli -AdpPR -Dsbl EnblAuto EnblMan Start Stop Info SSDPatrolReadEnbl SSDPatrolReadDsbl {-SetStartTime yyyyymmdd hh} maxConcurrentPD -aN -a0,1,2 -aALL</code>
Description	Sets Patrol Read options on a single controller, multiple controllers, or all controllers: -Dsbl: Disables Patrol Read for the selected controller(s). -EnblAuto: Enables Patrol Read automatically for the selected controller(s). This means Patrol Read will start automatically after the controller initialization is complete. -EnblMan: Enables Patrol Read manually for the selected controller(s). This means that Patrol Read does not start automatically; it has to be started manually by selecting the Start command. -Start: Starts Patrol Read for the selected controller(s). -Stop: Stops Patrol Read for the selected controller(s). -Info: Displays the following Patrol Read information for the selected controller(s): • Patrol Read operation mode • Patrol Read execution delay value • Patrol Read status SSDPatrolReadEnbl: Enable the patrol read operation (media scan) on a SSD. SSDPatrolReadDsbl: Disable the patrol read operation (media scan) on a SSD. SetStartTime yyyyymmdd hh: Set the start time for the patrol read in year/month/day format. maxConcurrentPD: Sets the maximum number of concurrent drives that patrol read runs on.

1.6.2 Set Patrol Read Delay Interval

Use the command in [Table 1.16](#) on the selected controller(s) to set the time between Patrol Read iterations.

Table 1.16 Set Patrol Read Delay Interval

Convention	MegaCli -AdpPRSetDelay -Val -aN -a0,1,2 -aALL
Description	Sets the time between Patrol Read iterations on a single controller, multiple controllers, or all controllers: -Val: Sets delay time between Patrol Read iterations. The value is time of delay in hours. A value of zero means no delay and an immediate restart.

1.7 BIOS-Related Properties

You can use the commands in this section to select the settings for BIOS-related options.

1.7.1 Set or Display Bootable Virtual Drive ID

Use the command in [Table 1.17](#) to set or display the ID of the bootable virtual drive.

Note: This option does not write a boot sector to the virtual drive. The operating system will not load if the boot sector is incorrect.

Table 1.17 Bootable Virtual Drive ID

Convention	MegaCli -AdpBootDrive {-Set -Lx -physdrv[E0:S0]}} -Get -aN -a0,1,2 -aALL
Description	Sets or displays the bootable virtual drive ID: -Set: Sets the virtual drive as bootable so that during the next reboot, the BIOS will look for a boot sector in the specified virtual drive. Identifies the physical drive in the virtual drive, by enclosure and slot, to use to boot from. -Get: Displays the bootable virtual drive ID.

1.7.2 Select BIOS Status Options

Use the command in [Table 1.18](#) to set the options for the BIOS status.

Table 1.18 Options for BIOS Status

Convention	MegaCli -AdpBIOS -Enbl -Dsbl -Dsply SOE BE -aN -a0,1,2 -aALL
-------------------	---

Table 1.18 Options for BIOS Status (Cont.)

Description	Sets BIOS options. The following are the settings you can select on a single controller, multiple controllers, or all controllers: -Enbl, -Dsbl, -Dsply: Enables, disables or displays the BIOS status on selected controller(s). -SOE: Stops on BIOS errors during POST for selected controller(s). When set to -SOE, the BIOS stops in case of a problem with the configuration. This gives you the option to enter the configuration utility to resolve the problem. This is available only when you enable the BIOS status. -BE: Bypasses BIOS errors during POST. This is available only when you enable the BIOS status.
--------------------	---

1.8 Battery Backup Unit-Related Properties

You can use the commands in this section to select the settings for BBU-related options.

1.8.1 Display BBU Information

Use the command in [Table 1.19](#) to display complete information about the BBU for the selected controller(s).

Table 1.19 Display BBU Information

Convention	MegaCli -AdpBbuCmd -aN -a0,1,2 -aALL
Description	Displays complete information about the BBU, such as status, capacity information, design information, and properties.

1.8.2 Display BBU Status Information

Use the command in [Table 1.20](#) to display complete information about the status of the BBU, such as temperature and voltage, for the selected controller(s).

Table 1.20 Display BBU Status Information

Convention	MegaCli -AdpBbuCmd -GetBbuStatus -aN -a0,1,2 -aALL
-------------------	--

Table 1.20 Display BBU Status Information (Cont.)

Description	Displays complete information about the BBU status, such as the temperature and voltage. The information displays in the following formats: BBU Status for Controller: xx Battery Type: XXXXXX(string) Voltage: xx mV Current: xx mA Temperature: xx C° Firmware Status: xx Battery state: xx Gas Gauge Status: Fully Discharged: Yes/No Fully Charged: Yes/No Discharging: Yes/No Initialized: Yes/No Remaining Time Alarm: Yes/No Remaining Capacity Alarm: Yes/No Discharge Terminated: Yes/No Over Temperature: Yes/No Charging Terminated: Yes/No Over Charged: Yes/No Additional status information displays differently for iBBU™ and BBU. For iBBU: Relative State of Charge: xx Charger System State: xx Charger System Ctrl: xx Charging Current: xx mA Absolute State of Charge: xx% Max Error: xx% For BBU: Relative State of Charge: xx Charger Status: xx Remaining Capacity: xx mAh Full Charge Capacity: mAh isSOHGood: Yes/No
--------------------	---

1.8.3 Display BBU Capacity

Use the command in [Table 1.21](#) to display the BBU capacity for the selected controller(s).

Table 1.21 Display BBU Capacity Information

Convention	<code>MegaCli -AdpBbuCmd -GetBbuCapacityInfo -aN -a0,1,2 -aALL</code>
-------------------	---

Table 1.21 Display BBU Capacity Information (Cont.)

Description	Displays BBU capacity information. The information displays in the following format: BBU Capacity Info for Adapter: x Relative State of Charge: xx% Absolute State of Charge: xx% Remaining Capacity: xx mAh Full Charge Capacity: xx mAh Run Time to Empty: xxx Min Average Time to Empty: xxx Min Average Time to Full: xxx Min Cycle Count: xx Max Error: xx%
--------------------	--

1.8.4 Display BBU Design Parameters

Use the command in [Table 1.22](#) to display BBU design parameters for the selected controller(s).

Table 1.22 Display BBU Design Parameters

Convention	MegaCli -AdpBbuCmd -GetBbuDesignInfo -aN -a0,1,2 -aALL
Description	Displays information about the BBU design parameters. The information displays in the following formats: BBU Design Info for Adapter: x Date of Manufacture: mm/dd, yyyy Design Capacity: xxx mAh Design Voltage: mV Serial Number: 0xhhhh Pack Stat Configuration: 0xhhhh Manufacture Name: XXXXXX(String) Device Name: XXXXXX(String) Device Chemistry: XXXXXX(String)

1.8.5 Display Current BBU Properties

Use the command in [Table 1.23](#) to display the current BBU properties for the selected controller(s).

Table 1.23 Display Current BBU Properties

Convention	MegaCli -AdpBbuCmd -GetBbuProperties -aN -a0,1,2 -aALL
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Table 1.23 Display Current BBU Properties (Cont.)

Description	Displays current properties of the BBU. The information displays in the following formats: BBU Properties for Adapter: x Auto Learn Period: xxx Sec Next Learn Time: xxxx Sec Learn Delay Interval: xx Hours Auto-Learn Mode: Warn via Event/Disabled/Enabled
--------------------	--

1.8.6 Start BBU Learning Cycle

Use the command in [Table 1.24](#) to start the BBU learning cycle on the selected controller(s). A learning cycle is a battery calibration operation performed by the controller periodically (approximately every three months) to determine the condition of the battery.

Table 1.24 Start BBU Learning Cycle

Convention	MegaCli -AdpBbuCmd -BbuLearn -aN -a0,1,2 -aALL
Description	Starts the learning cycle on the BBU. No parameter is needed for this option.

1.8.7 Place Battery in Low-Power Storage Mode

Use the command in [Table 1.25](#) to place the battery into Low-Power Storage mode on the selected controller(s). This saves battery power consumption.

Table 1.25 Place Battery in Low-Power Storage Mode

Convention	MegaCli -AdpBbuCmd -BbuMfgSleep -aN -a0,1,2 -aALL
Description	Places the battery in Low-Power Storage mode. The battery automatically exits this state after 5 seconds.

1.8.8 Set BBU Properties

Use the command in [Table 1.26](#) to set the BBU properties on the selected controller(s) after reading from the file.

Table 1.26 Set BBU Properties

Convention	MegaCli -AdpBbuCmd -SetBbuProperties -f<fileName> -aN -a0,1,2 -aALL
-------------------	---

Table 1.26 Set BBU Properties (Cont.)

Description	Sets the BBU properties on the selected controller(s) after reading from the file. The information displays in the following formats: <pre> autoLearnPeriod=1800Sec nextLearnTime=12345678Sec Seconds past 1/1/2000 learnDelayInterval=24hours Not greater than 7 days autoLearnMode=0 – Enabled, 1 - Disabled, 2 – WarnViaEvent. bbuMode=1 – 12 hours cache data retention at 45 °C, 5 year Service Life, 3 – 24 hours cache data retention at 45 °C, 3 year Service Life, 4 – 48 hours cache data retention at 45 °C, 3 year Service Life. </pre> 1. NOTE: You can change only two of these parameters, learnDelayInterval and autoLearnMode.
--------------------	---

1.9 Options for Displaying Logs Kept at Firmware Level

Use the commands in this section to select the display settings for the event log and BBU terminal log, which are kept at the firmware level.

1.9.1 Event Log Management

Use the command in [Table 1.27](#) to manage the event entries in the event log for the selected controller(s).

Table 1.27 Event Log Management

Convention	<pre> MegaCli -AdpEventLog -GetEventlogInfo -GetEvents {-info -warning -critical -fatal} GetSinceShutdown {-info -warning -critical -fatal} GetSinceReboot {-info -warning -critical -fatal} IncludeDeleted {-info -warning -critical -fatal} {GetLatest <number> {-info -warning -critical -fatal} } -f <filename> Clear -aN -a0,1,2 -aALL </pre>
-------------------	--

Table 1.27 Event Log Management (Cont.)

Description	Manages event log entries. The RAID driver maintains a volatile circular list of 100 events, which is deleted at reboot. You can select the following settings on a single controller, multiple controllers, or all controllers: -GetEventLogInfo: Displays overall event information such as total number of events, newest sequence number, oldest sequence number, shutdown sequence number, reboot sequence number, and clear sequence number. -GetEvents: Gets event log entry details. The information shown consists of total number of entries available at firmware side since the last clear and details of each entries of the error log. Start_entry specifies the initial event log entry when displaying the log. -GetSinceShutdown: Displays all of the events since last controller shutdown. -GetSinceReboot: Displays all of the events since last controller reboot. -IncludeDeleted: Displays all events, including deleted events. -GetLatest: Displays the latest number of events, if any exist. The event data will be writtent to the file in reverse order. -Clear: Clears the event log for the selected controller(s).
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1.9.2 Set BBU Terminal Logging

Use the command in [Table 1.28](#) to set the BBU terminal logging for the selected controller(s).

Table 1.28 Set BBU Terminal Logging

Convention	MegaCli -FwTermLog -Bbuoff -BbuoffTemp -Bbuon -BbuGet -Dsply -Clear -aN -a0,1,2 -aALL
Description	Sets BBU terminal logging options. The following are the settings you can select on a single controller, multiple controllers, or all controllers: -Bbuoff: Turns off the BBU for firmware terminal logging. To turn off the BBU for logging, you have to shut down your system or turn off the power to the system after you run the command. -BbuoffTemp: Temporarily turns off the BBU for TTY (firmware terminal) logging. The battery will be turned on at the next reboot. -Bbuon: Turns on the BBU for TTY (firmware terminal) logging. -BbuGet: Displays the current BBU settings for TTY logging. -Dsply: Displays the TTY log (firmware terminal log) entries with details on the given controllers. The information shown consists of the total number of entries available at a firmware side. -Clear: Clears the TTY log.

1.10 Configuration-Related Options

Use the commands in this section to perform actions on the configurations. You can specify the drives by using the Enclosure ID:Slot ID for SAS controllers. This condition assumes that all drives are connected to the controller through an enclosure. If the drives are not connected to an enclosure, it is assumed that they are connected to Enclosure 0. In this case there is no slot, so you can use the pdlist command to get the slot equivalent number. (This condition applies to all commands that use the Enclosure ID:Slot ID format.) MegaCLI expects the input in [:S] format for directly attached devices.

In the following options, [E0:S0, E1:S1] specifies the enclosure ID and slot ID for the drive.

1.10.1 Create a RAID Drive Group from All Unconfigured Good Drives

Use the command in [Table 1.30](#) to create one RAID drive group out of all of the unconfigured good drives, and a hot spare, if desired. This command is for RAID levels 0, 5, 6, 10, 50, or 60. All free drives are used to create a new drive group and, if desired, one hot spare drive. If it is not possible to use all of the free drives, the command will abort with a related error level. If there are drives of different capacities, the largest drive is used to make the hot spare.

Note: A virtual drive cannot have both SAS drives and SATA drives. If the remaining free drives are SAS and SATA, a drive group cannot be created. The command aborts with a related error level.

Note: Firmware supports only 32 drives per drive group; if there are more than 32 unconfigured good drives, MegaCLI cannot configure any of the drives, and the command aborts.

Table 1.29 Create a Drive Group from All of the Unconfigured Drives

Convention	MegaCli -CfgLDAdd -RX[E0:S0,E1:S1,...] [WT WB] [NORA RA ADRA] [Direct Cached] [CachedBadBBU NoCachedBadBBU] [-szXXX [-szYYY ...]] [-strpszM] [-Hsp[E0:S0,...]] [-AfterLdX] -Force [FDE CtrlBased]
-------------------	---

Table 1.29 Create a Drive Group from All of the Unconfigured Drives (Cont.)

Description	Creates one RAID drive group out of all of the unconfigured good drives, and a hot spare, if desired. This is for RAID levels 0, 5, 6, 10, 50, or 60. All free drives are used to create a new drive group and, if desired, one hot spare drive. -Rx [E0:S0,...]: Specifies the RAID level and the drive enclosure/slot numbers used to construct a drive group. 1. The ServeRAID M1015 SAS/SATA controller does not support the cache policies. These policies include access policy, read policy, write policy, IO policy, and drive cache. -WT (Write through), WB (Write back): Selects write policy. -NORA (No read ahead), RA (Read ahead), ADRA (Adaptive read ahead): Selects read policy. -Direct, -Cached: Selects cache policy. -CachedBadBBU NoCachedBadBBU: Specifies whether to use write cache when the BBU is bad. Hsp: Specifies drive to make the hot spare with. -Force: Specifies that drive coercion is used to make the capacity of the drives compatible. Drive coercion is a tool for forcing drives of varying capacities to the same capacity so they can be used in a drive group. [FDE CtrlBased]: Specifies whether to use disk-based encryption (sefl-encrypting disks) or controller-based encryption. 1. NOTE: Previously -szXXX expressed capacity in Mbytes but now you can enter the capacity in your choice of units. For example, to create a virtual drive of 10 Gbytes, enter the size as sz10GB. If you do not enter a unit, by default it is considered as Mbytes.
--------------------	--

1.10.2 Add RAID 0, 1, 5, or 6 Configuration

Use the command in [Table 1.30](#) to add a RAID level 0, 1, 5, or 6 configuration to the existing configuration on the selected controller. For RAID levels 10, 50, or 60, see [Section 1.10.3, “Add RAID 10, 50, or 60 Configuration.”](#)

Table 1.30 Add RAID 0, 1, 5, or 6 Configuration

Convention	<pre>MegaCli -CfgLdAdd -R0 -R1 -R5 -R6 [E0:S0,E1:S1,...] [WT WB] [NORA RA ADRA] [Direct Cached] [CachedBadBBU NoCachedBadBBU] [- szXXXXXXXX [-szYYYYYYY [...]] [-strpszM] [-Hsp [E5:S5,...]] [- afterLdX] -aN</pre>
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Table 1.30 Add RAID 0, 1, 5, or 6 Configuration (Cont.)

Description	Adds a RAID level 0, 1, 5, or 6 configuration to a specified controller. Even if no configuration is present, you have the option to write the configuration to the controller. Note that RAID 1 supports up to 32 drives in a single span of 16 drive groups. RAID 1 requires an even number of drives, as data from one drive is mirrored to the other drive in each RAID 1 drive group. -Rx[E0:S0, ...]: Specifies the RAID level and the drive enclosure/slot numbers to construct a drive group. 1. The ServeRAID M1015 SAS/SATA controller does not support the cache policies. These policies include access policy, read policy, write policy, IO policy, and drive cache. -WT (Write through), WB (Write back): Selects write policy. -NORA (No read ahead), RA (Read ahead), ADRA (Adaptive read ahead): Selects read policy. -Cached, -Direct: Selects cache policy. [{CachedBadBBU NoCachedBadBBU}]: Specifies whether to use write cache when the BBU is bad. -szXXXXXXXX: Specifies the capacity for the virtual drive, where XXXX is a decimal number of Mbytes. However, the actual capacity of the virtual drive can be smaller, because the driver requires the number of blocks from the drives in each virtual drive to be aligned to the stripe size. If multiple size options are specified, CT configures the virtual drives in the order of the options entered in the command line. The configuration of a particular virtual drive will fail if the remaining capacity of the drive group is too small to configure the virtual drive with the specified capacity. This option can also be used to create a configuration on the free space available in the drive group. -strpszM: Specifies the stripe size, where the stripe size values are 8, 16, 32, 64, 128, 256, 512, or 1024 KBytes. Hsp[E5:S5, ...]: Creates hot spares when you create the configuration. The new hot spares will be dedicated to the virtual drive used in creating the configuration. This option does not allow you to create global hot spares. To create global hot spares, you must use the -PdHsp command with proper subcommands. You can also use this option to create a configuration on the free space available in the virtual drive. You can specify which free slot should be used by specifying the -AfterLdX: This command is optional. By default, the application uses the first free slot available in the virtual drive. This option is valid only if the virtual drive is already used for configuration.
--------------------	--

1.10.3 Add RAID 10, 50, or 60 Configuration

Use the command in [Table 1.31](#) to add a RAID 10, 50, or 60 configuration to the existing configuration on the selected controller. For RAID levels 0, 1, 5, or 6, see [Section 1.10.2, “Add RAID 0, 1, 5, or 6 Configuration.”](#)

Table 1.31 Add RAID 10, 50, or 60 Configuration

Convention	<code>MegaCli -CfgSpanAdd -R10 -R50 -R60 -Array0 [E0:S0,E1:S1,...] - Array1 [E0:S0,E1:S1,...] [...] [WT WB] [NORA RA ADRA] [Direct Cached] [CachedBadBBU NoCachedBadBBU] [-szXXXXXXXX [-szYYYYYYY [...]]] [-strpszM] [-afterLdX] [FDE CtrlBased] -aN -a0,1,2 -aALL</code>
Description	Creates a RAID level 10, 50, or 60 (spanned) configuration from the specified drive groups. Even if no configuration is present, you must use this option to write the configuration to the controller. Note that RAID 10 supports up to eight spans with a maximum of 32 drives in each span. (There are factors, such as the type of controller, that limit the number of drives you can use.) RAID 10 requires an even number of drives, as data from one drive is mirrored to the other drive in each RAID 1 drive group. You can have an even or odd number of spans. Multiple drive groups are specified using the <code>-ArrayX[E0:S0,...]</code> option. (Note that X starts from 0, not 1.) All of the drive groups must have the same number of drives. At least two drive groups must be provided. The order of options {WT WB} {NORA RA ADRA} {Direct Cached} is flexible. The size option, <code>-szXXXXXXXX</code>, can be accepted to allow slicing in the spanned drive groups if the controller supports this feature. The <code>[-afterLdX]</code> option is accepted if the size option is accepted. CT exits and does not create a configuration if the size or the afterLd option is specified but the controller does not support slicing in the spanned drive groups. 1. NOTE: Previously <code>-szXXX</code> expressed capacity in Mbytes but now you can enter the capacity in your choice of units. For example, to create a virtual drive of 10 Gbytes, enter the size as <code>sz10GB</code>. If you do not enter a unit, by default it is considered as Mbytes.

1.10.4 Display the Existing Configuration

Use the command in [Table 1.32](#) to display the virtual drive and physical disk drive information for the configuration on the selected adapter(s). This command also provides information about the remaining unconfigured space.

Table 1.32 Display the Existing Configuration

Convention	<code>MegaCli -CfgDsply -aN -a0,1,2 -aALL</code>
Description	Displays the existing storage configuration on the selected controller(s), which includes the virtual drive and component physical drive related details.

1.10.5 Clear the Existing Configuration

Use the command in [Table 1.33](#) to clear the existing configuration on the selected controller(s).

Table 1.33 Clear the Existing Configuration

Convention	<code>MegaCli -CfgClr -aN -a0,1,2 -aALL</code>
Description	Clears the existing storage configuration.

1.10.6 Save the Controller Configuration

Use the command in [Table 1.34](#) to save the configuration for the selected controller(s) to the given filename.

Table 1.34 Save Configuration on the Controller

Convention	<code>MegaCli -CfgSave -f FileName -aN</code>
Description	Saves the configuration for the selected controller or controllers to the given filename. The command also stores the controller properties structure in the file.

1.10.7 Restore the Configuration Data from File

Use the command in [Table 1.35](#) to read the configuration from the file and load it on the selected controller(s). You can restore the read/write properties and the RAID configuration using hot spares.

Table 1.35 Restore Configuration Data from File

Convention	<code>MegaCli -CfgRestore -f FileName -aN</code>
Description	Reads the configuration from the file and loads it on the controller. MegaCLI can store or restore all read and write controller properties, all read and write properties for virtual drives, and the RAID configuration including hot spares. Note the following: • MegaCLI does not validate the setup when restoring the RAID configuration. • The <code>-CfgSave</code> option stores the configuration data and controller properties in the file. Configuration data has only the device ID and sequence number information of the drives used in the configuration. The <code>CfgRestore</code> option will fail if the same device IDs of the drives are not present.

1.10.8 Manage Foreign Configuration Information

Use the command in [Table 1.36](#) to manage configurations from other controllers, called *foreign configurations*, for the selected controller(s). You can scan, preview, import, and clear foreign configurations.

Note: The actual status of virtual drives and drives can differ from the information displayed in the `-Scan` option. IBM suggests that you run `-Preview` before you import a foreign configuration.

Table 1.36 Manage Foreign Configuration Information

Convention	<code>MegaCli -CfgForeign -Scan [-SecurityKey sssssssssss] -Dsply [x] [-SecurityKey sssssssssss] -Preview [x] [-SecurityKey sssssssssss] -Import [x] [-SecurityKey sssssssssss] -Clear [x] [-SecurityKey sssssssssss] -aN -a0,1,2 -aALL</code>
Description	Manages foreign configurations. The options for this command are: <code>-Scan</code>: Scans and displays available foreign configurations. <code>-SecurityKey</code>: This is a key based on a user-provided string. The controller uses the security key to lock and unlock access to the secure user data. This key is encrypted into the security key blob and stored on the controller. If the security key is unavailable, user data is irretrievably lost. You must be careful to never lose the security key. <code>-Preview</code>: Provides a preview of the imported foreign configuration. The foreign configuration ID (FID) is optional. <code>-Dsply</code>: Displays the foreign configuration. <code>-Import</code>: Imports the foreign configuration. The FID is optional. <code>-Clear [FID]</code>: Clears the foreign configuration. The FID is optional.

1.10.9 Delete Specified Virtual Drive(s)

Use the command in [Table 1.37](#) to delete one, multiple, or all virtual drives on the selected controller(s).

Table 1.37 Delete Specified Virtual Drives

Convention	<code>MegaCli -CfgLDDel -Lx -L0,1,2 -Lall -aN -a0,1,2 -aALL</code>
Description	Deletes the specified virtual drive(s) on the selected controller(s). You can delete one virtual drive, multiple virtual drives, or all of the selected virtual drives on selected controller(s).

1.10.10 Display the Free Space

Use the command in [Table 1.38](#) to display the free space that is available to use for configuration on the selected controller(s).

Table 1.38 Display Free Space

Convention	MegaCli -CfgFreeSpaceInfo -aN -a0,1,2 -aALL
Description	Displays all of the free space available for configuration on the selected controller(s). The information displayed includes the number of drive groups, the number of spans in each drive group, the number of free space slots in each drive group, the start block, and the size (in both blocks and Mbytes) of each free space slot.

1.11 Self-Encrypting Disk Options

Use the commands in this section to manage the Self-Encrypting Disk (SED) feature. This feature offers the ability to encrypt data on disks and use disk-based key management to provide data security. With the SED feature, data is encrypted by the drives. You can designate which data to encrypt at the individual virtual drive (VD) level.

This solution provides data protection in the event of theft or loss of physical drives. With self-encrypting disks, if you remove a drive from its storage system or the server it is housed in, the data on that drive is encrypted and useless to anyone who attempts to access without the the appropriate security authorization.

Any encryption solution requires management of the encryption keys. The SED feature provides a way to manage these keys. You can change the encryption key for all ServerRAID controllers that are connected to SED drives. All SED drives, whether locked or unlocked, always have an encryption key. This key is set by the drive and is always active. When the drive is unlocked, the data to host from the drive (on reads) and from the host to the drive cache (on writes) is always provided. However, when resting on the drive platters, the data is always encrypted by the drive.

In the following options, [E0:S0, E1:S1] specifies the enclosure ID and slot ID for the drive.

1.11.1 Use Instant Secure Erase on a Physical Drive

Use the command in [Table 1.39](#) to perform an Instant Secure Erase of data on a physical drive. The Instant Secure Erase feature lets you erase data on SED drives.

Table 1.39 Use Instant Secure Erase on a Physical Drive

Convention	<code>MegaCli -PDInstantSecureErase -PhysDrv[E0:S0,E1:S1,...] [-Force] -aN -a0,1,2 -aALL</code>
Description	Erases the data on a specified drive or drives. -PDInstantSecureErase: Use the Instant Secure Erase feature to erase data on a drive or drives. -PhysDrv[E0:S0,...]: Specifies the drive(s) that you want to perform the Instant Secure Erase on. -Force: Specifies that the MegaCLI utility does not ask you for confirmation before it performs this command (you might lose data using this option with some commands). 1. NOTE: Previously -szXXX expressed capacity in Mbytes but now you can enter the capacity in your choice of units. For example, to create a virtual drive of 10 Gbytes, enter the size as sz10GB. If you do not enter a unit, by default it is considered as Mbytes.

1.11.2 Secure Data on a Virtual Drive

Use the command in [Table 1.40](#) to secure data on a virtual drive.

Table 1.40 Secure Data on a Virtual Drive

Convention	<code>MegaCli -LDMakeSecure -Lx -L0,1,2,... -Lall -aN -a0,1,2 -aALL</code>
Description	Secures data on a specified virtual drive or drives.

1.11.3 Destroy the Security Key

Use the command in [Table 1.41](#) to destroy the security key.

Table 1.41 Destroy the Security Key

Convention	<code>MegaCli -DestroySecurityKey [-Force] -aN</code>
Description	Destroys the security key. The controller uses the security key to lock and unlock access to the secure user data. This key is encrypted into the security key blob and stored on the controller. Re-provisioning disables the security system of a device. For a controller, it involves destroying the security key. For SED drives, when the drive lock key is deleted, the drive is unlocked and any user data on the drive is securely deleted.

1.11.4 Create a Security Key

Use the command in [Table 1.42](#) to create a security key.

Table 1.42 Create a Security Key

Convention	<code>MegaCli -CreateSecurityKey -SecurityKey ssssssssss [-Passphrase ssssssssss] [-KeyID kkkkkkkkkkk] -aN</code>
Description	Creates a security key based on a user-provided string. The controller uses the security key to lock and unlock access to the secure user data. This key is encrypted into the security key blob and stored on the controller. If the security key is unavailable, user data is irretrievably lost. You must take all precautions to never lose the security key. <code>-CreateSecurityKey</code>: Creates the security key. <code>-SecurityKey ssssssssss</code>: Enters the new security key. The security key is case-sensitive. It must be between eight and thirty-two characters and contain at least one number, one lowercase letter, one uppercase letter, and one non-alphanumeric character (e.g. < > @ +). The space character is not permitted. <code>[-Passphrase ssssssssss]</code>: Enters the new passphrase. The pass phrase is case-sensitive. It must be between eight and thirty-two characters and contain at least one number, one lowercase letter, one uppercase letter, and one non-alphanumeric character (e.g. < > @ +). The space character is not permitted.

1.11.5 Change the Security Key

Use the command in [Table 1.43](#) to change the security key.

Table 1.43 Change the Security Key

Convention	<code>MegaCli -ChangeSecurityKey -OldSecurityKey ssssssssss -SecurityKey ssssssssss [-Passphrase ssssssssss] [-KeyID kkkkkkkkkkk] -aN</code>
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Table 1.43 Change the Security Key

Description	Changes a security key. <code>-ChangeSecurityKey</code>: Changes the security key. <code>-OldSecurityKey ssssssssss</code>: Enters the old security key. The security key is case-sensitive. It must be between eight and thirty-two characters and contain at least one number, one lowercase letter, one uppercase letter, and one non-alphanumeric character (e.g. < > @ +). The space character is not permitted. <code>-SecurityKey ssssssssss</code>: Enters the new security key. The security key is case-sensitive. It must be between eight and thirty-two characters and contain at least one number, one lowercase letter, one uppercase letter, and one non-alphanumeric character (e.g. < > @ +). The space character is not permitted. <code>[-Passphrase ssssssssss]</code>: Enters the new passphrase. The pass phrase is case-sensitive. It must be between eight and thirty-two characters and contain at least one number, one lowercase letter, one uppercase letter, and one non-alphanumeric character (e.g. < > @ +). The space character is not permitted. <code>[-KeyID kkkkkkkkkkkk]</code>: Enters the security key ID. The key ID displays when you have to enter a security key. If you have multiple security keys, the security key ID helps you determine which security key to enter.
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1.11.6 Get the Security Key ID

Use the command in [Table 1.44](#) to display the security key ID.

Table 1.44 Get the Security Key ID

Convention	<code>MegaCli -GetKeyID [-PhysDrv [E0:S0]] -aN</code>
Description	<code>-GetKeyID</code> : Displays the security key ID.

1.11.7 Set the Security Key ID

Use the command in [Table 1.39](#) to set the security key ID.

Table 1.45 Set the Security Key ID

Convention	<code>MegaCli -SetKeyID -KeyID kkkkkkkkkkkk -aN</code>
Description	<code>-SetKeyID</code>: Set the security key ID. <code>-KeyID kkkkkkkkkkkk</code>: Enters the security key ID. The key ID displays when you have to enter a security key. If you have multiple security keys, the security key ID helps you determine which security key to enter.

1.11.8 Verify the Security Key

Use the command in [Table 1.39](#) to verify the security key.

Table 1.46 Verify the Security Key

Convention	<code>MegaCli -VerifySecurityKey -SecurityKey sssssssssss -aN</code>
Description	Verifies that the security key is the correct one for the self-encrypted disk. -VerifySecurityKey: Verifies the security key. -SecurityKey sssssssssss: Enters the new security key. The security key is case-sensitive. It must be between eight and thirty-two characters and contain at least one number, one lowercase letter, one uppercase letter, and one non-alphanumeric character (e.g. < > @ +). The space character is not permitted.

1.12 Virtual Drive-Related Options

You can use the commands in this section to select settings for the virtual drives and perform actions on them.

1.12.1 Display Virtual Drive Information

Use the command in [Table 1.47](#) to display virtual drive information for the selected controller(s).

Table 1.47 Display Virtual Drive Information

Convention	<code>MegaCli -LDInfo -Lx -L0,1,2 -Lall -aN -a0,1,2 -aALL</code>
Description	Displays information about the virtual drive(s) on the selected controller(s). This information includes the name, RAID level, RAID level qualifier, capacity in megabytes, state, stripe size, number of drives, span depth, cache policy, access policy, and ongoing activity progress, if any, including initialization, background initialization, consistency check, and reconstruction.

1.12.2 Change the Virtual Drive Cache and Access Parameters

Use the command in [Table 1.48](#) to change the cache policy and access policy for the virtual drive(s) on the selected controller(s).

Note: The ServeRAID M1015 SAS/SATA controller does not support the cache policies. These policies include access policy, read policy, write policy, IO policy, and drive cache.

Table 1.48 Change Virtual Drive Cache and Access Parameters

Convention	MegaCli -LDSetProp WT WB [-Immediate] RA NORA ADRA -Cached Direct CachedBadBBU NoCachedBadBBU -RW RO Blocked {-Name nameString} -EnDskCache DisDskCache -Lx -L0,1,2 -Lall -aN -a0,1,2 -aALL
Description	Allows you to change the following virtual drive parameters: -WT (Write through), WB (Write back): Selects write policy. -NORA (No read ahead), RA (Read ahead), ADRA (Adaptive read ahead): Selects read policy. -Cached, -Direct: Selects cache policy. -CachedBadBBU NoCachedBadBBU: Specifies whether to use write cache when the BBU is bad. -RW, -RO, Blocked: Selects access policy. -EnDskCache: Enables drive cache. -DisDskCache: Disables drive cache.

1.12.3 Display the Virtual Drive Cache and Access Parameters

Use the command in [Table 1.49](#) to display cache and access parameters for the virtual drive(s) on the selected controller(s).

Note: The ServeRAID M1015 SAS/SATA controller does not support the cache policies. These policies include access policy, read policy, write policy, IO policy, and drive cache.

Table 1.49 Display Virtual Drive Cache and Access Parameters

Convention	MegaCli -LDGetProp -Cache -Access -Name -DskCache -Lx -L0,1,2 -Lall -aN -a0,1,2 -aALL
Description	Displays the cache and access policies of the virtual drive(s): -Cache: -Cached, Direct: Displays cache policy. -Access: -RW, -RO, Blocked: Displays access policy. -DskCache: Displays drive cache policy.

1.12.4 Manage Virtual Drives Initialization

Use the command in [Table 1.50](#) to manage initialization of the virtual drive(s) on the selected controller(s).

Table 1.50 Manage Virtual Drive Initialization

Convention	MegaCli -LDInit {-Start [Fast Full]} -Abort -ShowProg -ProgDsply -Lx -L0,1,2 -Lall -aN -a0,1,2 -aALL
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Table 1.50 Manage Virtual Drive Initialization (Cont.)

Description	Allows you to select the following actions for virtual drive initialization: -Start: Starts the initialization (writing 0s) on the virtual drive(s) and displays the progress (this is optional). The fast initialization option initializes the first and last 8 Mbyte areas on the virtual drive. The full option allows you to initialize the entire virtual drive. -Abort: Aborts the ongoing initialization on the virtual drive(s). -ShowProg: Displays the snapshot of the ongoing initialization, if any. -ProgDsply: Displays the progress of the ongoing initialization until at least one initialization completes or you press a key.
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1.12.5 Manage a Consistency Check

Use the command in [Table 1.51](#) to manage a data consistency check (CC) on the virtual drives for the selected controller(s).

Table 1.51 Manage Consistency Check

Convention	MegaCli -LDCC -Start -Abort -ShowProg -ProgDsply -Lx -L0,1,2 -Lall -aN -a0,1,2 -aALL
Description	Allows you to select the following actions for a data CC: -Start: Starts a CC on the virtual drive(s), then displays the progress (optional) and time remaining. -Abort: Aborts an ongoing CC on the virtual drive(s). -ShowProg: Displays a snapshot of an ongoing CC. -ProgDsply: Displays ongoing CC progress. The progress displays until at least one CC is completed or a key is pressed.

1.12.6 Manage a Background Initialization

Use the command in [Table 1.52](#) to enable, disable, or suspend background initialization (BGI), as well as display initialization progress on the selected controller(s).

Table 1.52 Manage Background Initialization

Convention	MegaCli -LDBI -Start -Stop -ShowProg -ProgDsply -PhysDrv [E0:S0,E1:S1...] -Lx -L0,1,2 -Lall -aN -a0,1,2 -aALL
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Table 1.52 Manage Background Initialization (Cont.)

Description	Manages background initialization options. The following are the background initialization settings you can select on a single controller, multiple controllers, or all controllers: -Start: Starts initialization on the selected drive(s). -Stop: Stops an ongoing initialization on the selected drive(s). -ShowProg: Displays the current progress percentage and time remaining for the initialization. This option is useful for running the application through scripts. -ProgDsply: Displays the ongoing clear progress. The routine continues to display the initialization progress until all background initialization processes complete or you press a key to exit. -Physdrv[E0:S0,...]: Specifies the physical drive enclosure and the slots for the drives.
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1.12.7 Perform a Virtual Drive Reconstruction

Use the command in [Table 1.53](#) to perform a reconstruction of the virtual drive(s) on the selected controller(s).

Table 1.53 Virtual Drive Reconstruction

Convention	<code>MegaCli -LDRecon {-Start -Rx [Add Rmv PhysDrv[E0:S0,E1:S1,...]] } -ShowProg -ProgDsply -Lx -aN</code>
Description	Controls and manages virtual drive reconstruction. The following are the virtual drive reconstruction settings you can select on a single controller: -Start: Starts a reconstruction of the selected virtual drive to a new RAID level. -Rx: Changes the RAID level of the virtual drive when you start reconstruction. You might need to add or remove a drive to make this possible. -Start -Add PhysDrv[E0:S0,E1:S1,...]: Adds listed drives to the virtual drive and starts reconstruction on the selected virtual drive. -Start -Rmv PhysDrv[E0:S0,E1:S1,...]: Removes one drive from the existing virtual drives and starts a reconstruction. -ShowProg: Displays a snapshot of the ongoing reconstruction process. -ProgDsply: Allows you to view the ongoing reconstruction. The routine continues to display progress until at least one reconstruction is completed or a key is pressed.

1.12.8 Display Information about Virtual Drives and Drives

Use the command in [Table 1.54](#) to display information about the virtual drives and drives for the selected controller(s), such as the number of virtual drives, RAID level, and drive capacity.

Table 1.54 Display Virtual Drive and Drive Information

Convention	<code>MegaCli -LDPDInfo -aN -a0,1,2 -aALL</code>
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Table 1.54 Display Virtual Drive and Drive Information (Cont.)

Description	Displays information about the present virtual drive(s) and drive(s) on the selected controller(s). Displays information including the number of virtual drives, the RAID level of the virtual drives, and drive capacity information, which includes raw capacity, coerced capacity, uncoerced capacity, and the SAS address.
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1.12.9 Display the Number of Virtual Drives

Use the command in [Table 1.55](#) to display the number of virtual drives attached to the controller.

Table 1.55 Display Number of Virtual Drives

Convention	MegaCli -LDGetNum -aN -a0,1,2 -aALL
Description	Displays the number of virtual drives attached to the controller. The return value is the number of virtual drives.

1.13 Drive-Related Options

You can use the commands in this section to select settings for the drives and perform actions on them.

1.13.1 Display Drive Information

Use the command in [Table 1.56](#) to display information about the drives on the selected controller(s).

Table 1.56 Display Drive Information

Convention	MegaCli -PDInfo -PhysDrv [E0:S0,E1:S1 . . .] -aN -a0,1,2 -aALL
Description	Provides information about the drives connected to the enclosure and controller slot. This includes information such as the enclosure number, slot number, device ID, sequence number, drive type, capacity (if a drive), foreign state, firmware state, and inquiry data. For SAS devices, this includes additional information such as the SAS address of the drive. For SAS expanders, this includes additional information such as the number of devices connected to the expander. -Physdrv [E0:S0,E1:S1 . . .]: Specifies the physical drive enclosure and the slots for the drives.

1.13.2 Set the Drive State to Online

Use the command in [Table 1.57](#) to set the state of a drive to *Online*. In an online state, the drive is working normally and is a part of a configured virtual drive.

Table 1.57 Set Drive State to Online

Convention	MegaCli -PDOnline -PhysDrv[E0:S0,E1:S1...] -aN -a0,1,2 -aALL
Description	Changes the drive state to <i>Online</i> . -Physdrv[E0:S0,E1:S1...]: Specifies the physical drive enclosure and the slots for the drives.

1.13.3 Set the Drive State to Offline

Use the command in [Table 1.58](#) to set the state of a drive to *Offline*. In the offline state, the virtual drive is not available to the RAID controller.

Table 1.58 Set Drive State to Offline

Convention	MegaCli -PDOffline -PhysDrv[E0:S0,E1:S1...] -aN -a0,1,2 -aALL
Description	Changes the drive state to <i>Offline</i> . -Physdrv[E0:S0,E1:S1...]: Specifies the physical drive enclosure and the slots for the drives.

1.13.4 Change the Drive State to Unconfigured Good

Use the command in [Table 1.59](#) to change the state of a drive from *Unconfigured-Bad* to *Unconfigured-Good*.

Table 1.59 Change Drive State to Unconfigured Good

Convention	MegaCli -PDMakeGood -PhysDrv[E0:S0,E1:S1...] [-Force] -aN -a0,1,2 -aALL
Description	Changes the drive state to <i>Unconfigured Good</i> . -Physdrv[E0:S0,E1:S1...]: Specifies the physical drive enclosure and the slots for the drives. Force: Force the drive to the <i>Unconfigured Good</i> state.

1.13.5 Change Drive State

Use the command in [Table 1.60](#) to change the drive state, as it relates to hot spares, and to associate the drive to an enclosure and virtual drive for the selected controller(s).

Table 1.60 Change Drive State

Convention	<code>MegaCli -PDHSP {-Set [{-Dedicated -ArrayN -Array0,1...}] [-EnclAffinity] [-nonRevertible]} -Rmv -PhysDrv [E0:S0,E1:S1,...] -aN -a0,1,2 -aALL</code>
Description	Changes the drive state (as it relates to hot spares) and associates the drive to an enclosure and virtual drive on a single controller, multiple controllers, or all controllers: -Set: Changes the drive state to dedicated hot spare for the enclosure. -Array0: Dedicates the hot spare to a specific drive group number N. -EnclAffinity: Associates the hot spare to a selected enclosure. -Rmv: Changes the drive state to ready (removes the hot spare). -Physdrv[E0:S0,...]: Specifies the physical drive enclosure and the slots for the drives. You can get the list of arrays by using the CLI command "CfgDsply". In the results of the CfgDsply command, the number associated with "DISK GROUPS" is the array number.

1.13.6 Change an Unconfigured Good Drive to JBOD

Use the command in [Table 1.61](#) to change the state of an unconfigured good drive to JBOD (Just a Bunch of Disks). A new drive in JBOD drive state is exposed to the host operating system as a stand-alone drive. Drives in JBOD drive state are not part of the RAID configuration. The operating system can install and run anything on JBOD drives.

Table 1.61 Change an Unconfigured Good Drive to JBOD

Convention	<code>MegaCli -PDMakeJBOD -PhysDrv [E0:S0] -aN</code>
Description	Change the state of an unconfigured good drive to JBOD.

1.13.7 Manage a Drive Initialization

Use the command in [Table 1.62](#) to manage a drive initialization on the selected controller(s).

Table 1.62 Drive Initialization

Convention	<code>MegaCli -PDClear -Start -Stop -ShowProg -ProgDsply -PhysDrv [E0:S0,E1:S1...] -aN -a0,1,2 -aALL</code>
Description	Manages initialization or displays initialization progress on a single controller, multiple controllers, or all controllers: -Start: Starts initialization on the selected drive(s). -Stop: Stops an ongoing initialization on the selected drive(s). -ShowProg: Displays the current progress percentage and time remaining for the initialization. This option is useful for running the application through scripts. -ProgDsply: Displays the ongoing clear progress. The routine continues to display the initialization progress until at least one initialization is completed or a key is pressed. -Physdrv[E0:S0,...]: Specifies the physical drive enclosure and the slots for the drives.

1.13.8 Rebuild a Drive

Use the command in [Table 1.63](#) to start or stop a rebuild on a drive and display the rebuild progress. When a drive in a RAID drive group fails, you can rebuild the drive by recreating the data that was stored on the drive before it failed.

Table 1.63 Rebuild a Drive

Convention	<code>MegaCli -PDRbld -Start -Stop -ShowProg -ProgDsply -PhysDrv [E0:S0,E1:S1...] -aN -a0,1,2 -aALL</code>
Description	Manages a drive rebuild or displays the rebuild progress on a single controller, multiple controllers, or all controllers. Note that the drive must meet the capacity requirements before it can be rebuilt, and it must be part of a drive group: -Start: Starts a rebuild on the selected drive(s) and displays the rebuild progress (optional). -Stop: Stops an ongoing rebuild on the selected drive(s). -ShowProg: Displays the current progress percentage and time remaining for the rebuild. This option is useful for running the application through scripts. -ProgDsply: Displays the ongoing rebuild progress. This routine displays the rebuild progress until at least one initialization is completed or a key is pressed. -Physdrv[E0:S0,...]: Specifies the physical drive enclosure and the slots for the drives.

1.13.9 Locate the Drive(s) and Activate LED

Use the command in [Table 1.64](#) to locate the drive(s) for the selected controller(s) and activate the drive activity LED.

Table 1.64 Locate Drive and Activate LED

Convention	MegaCli -PDLocate -PhysDrv [E0:S0,E1:S1...] -aN -a0,1,2 -aALL
Description	Locates the drive(s) for the selected controller(s) and activates the drive activity LED. -Physdrv[E0:S0,...]: Specifies the physical drive enclosure and the slots for the drives.

1.13.10 Mark the Configured Drive as Missing

Use the command in [Table 1.65](#) to mark the configured drive as missing for the selected controller(s).

Table 1.65 Mark Configured Drive as Missing

Convention	MegaCli -PDMarkMissing -PhysDrv [E0:S0,E1:S1...] -aN -a0,1,2 -aALL
Description	Marks the configured drive as missing for the selected controller(s). -Physdrv[E0:S0,...]: Specifies the physical drive enclosure and the slots for the drives.

1.13.11 Display the Drives in Missing Status

Use the command in [Table 1.65](#) to mark the configured drive as missing for the selected controller(s)

Table 1.66 Display Drives in Missing Status

Convention	MegaCli -PDGetMissing -aN -a0,1,2 -aALL												
Description	Displays the drive(s) in missing status. The format is: <table><tr><td>No</td><td>Row</td><td>Column</td><td>SizeExpected(MB)</td></tr><tr><td>0</td><td>x</td><td>y</td><td>zzzzzzzz</td></tr><tr><td colspan="4">...</td></tr></table> Where x is the index to the drive groups, y is the index to the drive in that drive group, and zzzzzz is the minimum capacity of the drive that can be used as a replacement.	No	Row	Column	SizeExpected(MB)	0	x	y	zzzzzzzz	...			
No	Row	Column	SizeExpected(MB)										
0	x	y	zzzzzzzz										
...													

1.13.12 Replace the Configured Drives and Start an Automatic Rebuild

Use the command in [Table 1.67](#) to replace configured drive(s) and start an automatic rebuild of the drive for the selected controller(s).

Table 1.67 Replace Configured Drive(s) and Start Automatic Rebuild

Convention	<code>MegaCli -PDReplaceMissing -PhysDrv[E0:S0,E1:S1...] -ArrayX -RowY -aN</code>
Description	Replaces the configured drives that are identified as missing and then starts an automatic rebuild.

1.13.13 Prepare Unconfigured Drives for Removal

Use the command in [Table 1.68](#) to prepare the unconfigured drive(s) for removal from the selected controller(s).

Table 1.68 Prepare Unconfigured Drive(s) for Removal

Convention	<code>MegaCli -PDPrpRmv [-Undo] - PhysDrv[E0:S0,E1:S1...] -aN -a0,1,2 -aALL</code>
Description	Prepares unconfigured drive(s) for removal. The firmware will spin down this drive. The drive state is set to <i>unaffiliated</i> , which marks it as offline even though it is not a part of configuration. The <code>-Undo</code> option undoes this operation. If you select undo, the firmware marks this drive as <i>unconfigured good</i> .

1.13.14 Display Total Number of Drives

Use the command in [Table 1.69](#) to display the total number of drives attached to an controller. Drives can be attached directly or through enclosures.

Table 1.69 Display Number of Drives Attached to a Controller

Convention	<code>MegaCli -PDGetNum -aN -a0,1,2 -aALL</code>
Description	Displays the total number of drives attached to an controller. Drives can be attached directly or through enclosures. The return value is the number of drives.

1.13.15 Display List of Physical Devices

Use the command in [Table 1.70](#) to display a list of the physical devices connected to the selected controller or controllers.

Table 1.70 Display List of Physical Devices Attached to Controller(s)

Convention	<code>MegaCli -PDList -aN -a0,1.. -aAll</code>
Description	Displays information about all drives and other devices connected to the selected controller(s). This includes information such as the drive type, capacity (if a drive), serial number, and firmware version of the device. For SAS devices, this includes additional information such as the SAS address of the device. For SAS expanders, this includes additional information such as the number of drives connected to the expander.

1.13.16 Download Firmware to the Physical Devices

Use the command in [Table 1.71](#) to download firmware to the physical devices connected to the selected controller(s).

Table 1.71 Download Firmware to the Physical Devices

Convention	<code>MegaCli -PdFwDownload - -PhysDrv [E0:S0,E1:S1....] --f <filename> -aN -a0,1,2 -aAll</code>
Description	Flashes the firmware with the file specified at the command line. Firmware files used to flash the physical drive can be of any format. The CLI utility assumes that you provide a valid firmware image and flashes the same. The physical device has to do error checking. Firmware files in .dlp format can be flashed with the DOS version of the command tool only.

1.14 Enclosure-Related Options

The commands in this section are used for enclosures.

Use the command in [Table 1.72](#) to display enclosure information for selected controller(s).

Table 1.72 Display Enclosure Information

Convention	<code>MegaCli -EncInfo -aN -a0,1,2 -aALL</code>
Description	Displays information about the enclosure for the selected controller(s).

1.15 Flashing the Firmware

The options in this section describe the functionality of the existing flash application. The firmware flash options do not require input from the user.

1.15.1 Flash the Firmware with the ROM File

Use the command in [Table 1.73](#) to flash the firmware with the ROM file specified at the command line for the selected controller(s).

Table 1.73 Flash Firmware with ROM File

Convention	<code>MegaCli -AdpFwFlash -f filename [-NoSigChk] [-NoVerChk] -aN -a0,1,2 -aALL</code>
Description	Flashes the firmware with the ROM file specified at the command line. The <code>-NoSigChk</code> option forces the application to flash the firmware even if the check word on the file does not match the required check word for the controller. This option flashes the firmware only if the existing firmware version on the controller is lower than the version on the ROM image. If you specify <code>-NoVerChk</code>, also, the application flashes the controller firmware without checking the version of the firmware image. The version check applies only to the firmware (APP.ROM) version. This command also supports the “Mode 0” flash functionality. For Mode 0 flash, the controller number is not valid. There are two possible methods: • Select which controller to flash after the controllers are detected. • Flash the firmware on all present controllers. XML output data is generated by this option.

1.15.2 Flash the Firmware in Mode 0 with the ROM File

Use the command in [Table 1.74](#) to flash the firmware in Mode 0 with the ROM file specified at the command line for the selected controller(s). This option is for DOS only.

Table 1.74 Flash Firmware in Mode 0 with ROM File

Convention	<code>MegaCli -AdpM0Flash -f filename</code>
Description	Flashes the firmware in Mode 0 with the ROM file listed on the command line. This option supports the Mode 0 flash functionality. For Mode 0 flash, the controller number is not valid. The method to handle this is to flash the firmware on all present controllers which are compatible with the image.

1.16 SAS Topology

The commands in this section are used to display SAS topology.

Use the command in [Table 1.75](#) to display the PHY connection information for physical PHY M on the selected controller(s). Each PHY can form one side of the physical link in a connection with a PHY on a different device. The physical link contains four wires that form two differential signal pairs. One differential pair transmits signals, and the other differential pair receives signals. Both differential pairs operate simultaneously and allow concurrent data transmission in both the receive and the transmit directions. PHYs are contained within ports.

A port can contain a single PHY or can contain multiple PHYs. A narrow port contains a single PHY, and a wide port contains multiple PHYs.

Table 1.75 Display PHY Connection Information

Convention	<code>MegaCli -PHYInfo -phyM -aN -a0,1,2 -aALL</code>
Description	Displays PHY connection information for physical PHY M on the controller(s).

1.17 Miscellaneous Options

The commands in this section are used to display various information.

1.17.1 Display the MegaCLI Version

Use the command in [Table 1.76](#) to display the version number of the MegaCLI utility.

Table 1.76 Display MegaCLI Version

Convention	<code>MegaCli -v</code>
Description	Displays the firmware versions and the other code levels installed on the controller, the MegaCLI version, the version of the device driver, the version of the UEFI device driver, the firmware versions for the attached physical device, and the enclosure in a list as location information, model string, and firmware version.

1.17.2 Display Help for MegaCLI

Use the command in [Table 1.77](#) to display help information for the MegaCLI utility.

Table 1.77 Display Help for MegaCLI

Convention	<code>MegaCli -h -Help ?</code>
Description	Displays help for the MegaCLI utility.

1.17.3 Display Summary Information

Use the command in [Table 1.77](#) to display a summary of information about the system, controller, drive, virtual drive, and enclosure.

Table 1.78 Display Help for MegaCLI

Convention	<code>MegaCli -ShowSummary [-f filename] -aN</code>
Description	Displays a summary of the system information, the controller information, the drive information, the virtual drive information, and the enclosure information.

Appendix A

Examples of MegaCLI Commands

This appendix provides examples of the MegaCLI commands as they are used in specific situations. The table in each section displays the desired action, the command that you enter, and the description of the properties for each command.

For details about the additional parameters available for these commands, see [Chapter 1, “MegaRAID Command Tool”](#).

A.1 Clear the Existing Configuration on All Controllers

Use the command in [Table A.1](#) to clear the existing configuration on all of the controllers in the system.

Table A.1 Clear Existing Configurations on All Controllers

To clear the configuration on all controllers in the system: <code>MegaCli -CfgClr -aALL</code>
Clears the existing configuration on all of the controllers in the system. <code>-aALL</code> signifies all of the controllers in the system.

A.2 Display Controller Properties on Controller #0

Use the command in [Table A.2](#) to display the properties for controller #0.

Table A.2 Display Controller Properties for Controller #0

Checking the controller information on controller #0: <code>MegaCli -AdpAllinfo -a0</code>
Displays information about controller #0, including cluster state, BIOS, alarm, firmware version, BIOS version, battery charge counter value, rebuild rate, bus number/device number, present RAM, memory size, serial number of the board, and SAS address. <code>-a0</code> signifies controller #0 in the system.

A.3 Disable MaintainPD Failed History on Controller #0

Use the command in [Table A.3](#) to disable the maintainPD failed history feature on controller #0. This feature allows you to maintain the history of a failed drive.

Table A.3 Disable MaintainPD Failed History on Controller #0

Disable maintainPD Failed history on controller #0: MegaCli -AdpSetProp {MaintainPdFailHistoryEnbl -0} -a0
Disables the MaintainPdFailHistoryEnbl command on controller #0. MaintainPdFailHistoryEnbl: Enable maintenance of the history of a failed drive. Values: 0- Disabled, 1- Enabled. -a0 signifies controller #0 in the system.

A.4 Display Current BBU Properties for Controller #0

Use the command in [Table A.4](#) to display the current properties of the battery backup unit (BBU) used with controller #0.

Table A.4 Display Current BBU Properties for Controller #0

View information about the battery iBBU on controller #0: MegaCli -AdpBbuCmd -GetBbuProperties -a0
Displays current properties of the BBU connected to controller #0. The information displays in the following formats: BBU Properties for Controller: x Auto Learn Period: xxx Sec Next Learn Time: xxxx Sec Learn Delay Interval: xx Hours Auto-Learn Mode: Warn via Event/Disabled/Enabled -a0 signifies controller #0 in the system.

A.5 Display BBU Capacity for Controller #0

Use the command in [Table A.5](#) to display the battery backup unit (BBU) capacity for controller #0.

Table A.5 Display BBU Capacity Information for Controller #0

View battery capacity information on controller #0
`MegaCli -AdpBbuCmd -GetBbuCapacityInfo -a0`

Displays BBU capacity information for the BBU connected to controller #0.

The information displays in the following format:

BBU Capacity Info for Controller: x

Relative State of Charge: xx%

Absolute State of Charge: xx%

Remaining Capacity: xx mAh

Full Charge Capacity: xx mAh

Run Time to Empty: xxx Min

Average Time to Empty: xxx Min

Average Time to Full: xxx Min

Cycle Count: xx

Max Error: xx%

-a0 signifies controller #0 in the system.

A.6 Display List of Physical Devices for Controller #1

Use the command in [Table A.6](#) to display a list of the physical devices connected to controller #1.

Table A.6 Display List of Physical Devices Attached to Controller #1

View information about physical drives on controller #1: `MegaCli -PDList -a1`

Displays information about all drives and other devices connected to the controller #0. This information includes the drive type, capacity (if a drive), serial number, and firmware version of the device. For SAS devices, this includes additional information such as the SAS address of the device.

-a1 signifies controller #1 in the system.

A.7 Change the Drive State of an Unconfigured Good Drive on Controller #0 to JBOD

Use the command in [Table A.7](#) to change the state of an *Unconfigured-Good* drive connected to controller #0 to JBOD (Just a Bunch of Disks).

A new drive in JBOD drive state is exposed to the host operating system as a stand-alone drive. Drives in JBOD drive state are not part of the RAID configuration. The operating system can install and run anything on JBOD drives.

Table A.7 Change Drive State of Unconfigured Good Drive on Controller #0 to JBOD

Change an unconfigured good drive to JBOD on controller #0: Megacli -PDMakeJBOD -PhysDrv[62:3] -a0
Changes the drive state of the <i>Unconfigured Good</i> drive on controller #0 to JBOD. -PhysDrv [62:3] signifies drive enclosure number #62 and the drive in slot number #3. -a0 signifies controller #0 in the system.

A.8 Change the Drive State of a JBOD Drive on Controller #0 to Unconfigured Good

Use the command in [Table A.8](#) to change the state of a JBOD (Just a Bunch of Disks) drive connected to controller #0 from *Unconfigured-Bad* to *Unconfigured-Good*.

Automatic rebuilds always occur when the drive slot status changes, for example, when you insert a drive or remove a drive, so that a commissioned hot spare can be used. However, a new drive in JBOD drive state cannot perform an automatic rebuild. To start an automatic rebuild on the new JBOD drive, you have to change the drive state from JBOD to *Unconfigured-Good*. (Rebuilds start only on *Unconfigured-Good* drives.)

Table A.8 Change Drive State of JBOD Drive on Controller #0 to Unconfigured Good

Change a JBOD drive to unconfigured good on controller #0: MegaCli -PDMakeGood -PhysDrv[62:3] -Force -a0

Table A.8 Change Drive State of JBOD Drive on Controller #0 to Unconfigured Good

Changes the drive state of the JBOD drive on controller #0 to *Unconfigured Good*.

-PhysDrv [62:3] signifies drive enclosure number #62 and the drive in slot number #3.
-a0 signifies controller #0 in the system.

A.9 Create a RAID 5 Array Using 3 Drives on Controller #0

Use the command in [Table A.9](#) to create one RAID 5 array out of 3 unconfigured drives on controller #0. The drives are in slots #5, 6, and 7, respectively, in drive enclosure #252.

Note: A virtual drive cannot have both SAS drives and SATA drives. If the remaining free drives are SAS and SATA, a drive group cannot be created. The command aborts with a related error level.

Note: Firmware supports only 32 drives per drive group; if there are more than 32 unconfigured good drives, MegaCLI cannot configure any of the drives, and the command aborts.

Table A.9 Create a RAID 5 Array from 3 Drives in Slots #5, 6, and 7 in Enclosure #252

Create a RAID 5 array using 3 drives in slots 5,6, and 7 on controller #0:

MegaCli -CfgLdAdd -r5 [252:5,252:6,252:7] -a0

Creates one RAID 5 array using 3 unconfigured good drives on controller #0.

-R5 specifies RAID level 5.

[252:5,252:6,252:7] identifies drive enclosure #252 and the drives in slot numbers 5, 6, and 7 that are used to construct the array.

-a0 signifies controller #0 in the system.

1. The ServerRAID M1015 SAS/SATA controller does not support the cache policies. These policies include access policy, read policy, write policy, IO policy, and drive cache.
-

A.10 Create a RAID 1 Array Using 2 Drives on Controller #0

Use the command in [Table A.10](#) to create a RAID 1 array on controller #0 using 2 drives, and enable the write back cache option and the cache on bad BBU option. The drives are in slots #2 and 3 in drive enclosure #62.

For information about creating RAID level 0, 1, 5, or 6 arrays, see [Section 1.10.2, “Add RAID 0, 1, 5, or 6 Configuration.”](#)

Table A.10 Create a RAID 1 Array Using 2 Drives on Controller #0

Create a RAID 1 array using 2 drives in slots 2 and 3 setting write back cache on and Cache on bad BBU on controller #0:

MegaCLI -CfgLdAdd -R1[62:2, 62,3] WB CacheBadBBU -a0

Creates a RAID 1 configuration using 2 drives on controller #0 and enables the write back cache option and the cache on bad BBU option.

Note that RAID 1 supports up to 32 drives in a single span of 16 drive groups. RAID 1 requires an even number of drives, as data from one drive is mirrored to the other drive in each RAID 1 drive group.

-R1[62:2, 62,3]: Specifies RAID level 1, drive enclosure #62, and drives in slot #2 and #3 that are used to create the RAID array.

1. The ServeRAID M1015 SAS/SATA controller does not support the cache policies. These policies include access policy, read policy, write policy, IO policy, and drive cache.

-WB: Selects write back as the Write policy.

-CachedBadBBU: Indicates to use write cache when the BBU is bad.

-a0 signifies controller #0 in the system.

A.11 Create RAID 10 Array Using 4 Drives on Controller #1

Use the command in [Table A.11](#) to create a RAID 10 configuration using 4 drives in 2 arrays on controller #1.

For more information about creating RAID level 10, 50, or 60 arrays, see [Section 1.10.3, “Add RAID 10, 50, or 60 Configuration.”](#)

Table A.11 Add RAID 10 Configuration

Create RAID 10 drive using drives in slots 0 to 3 on controller #1: MegaCli -CfgSpanAdd -r10 -Array0[62:0,62:1] -Array1[62:2,62:3] -a1
Creates a RAID level 10 (spanned) configuration from the specified drive groups. Even if no configuration is present, you must use this option to write the configuration to the controller.
Note that RAID 10 supports up to eight spans with a maximum of 32 drives in each span. (There are factors, such as the type of controller, that limit the number of drives you can use.) RAID 10 requires an even number of drives, as data from one drive is mirrored to the other drive in each RAID 1 drive group. You can have an even or odd number of spans.
Multiple drive groups are specified using the -ArrayX[E0:S0, . . .] option. (Note that X starts from 0, not 1.) All of the drive groups must have the same number of drives. At least two drive groups must be provided.
-r10 indicates the RAID level.
-Array0[62:0,62:1] specifies array number #0, drive enclosure #62, and drives in slot numbers #0 and #1 that are used to create the RAID array.
-Array1[62:2,62:3] specifies array number #1, drive enclosure #62, and drives in slot numbers #2 and #3 that are used to create the RAID array.
-a1 signifies controller #1 in the system.

A.12 Delete Virtual Drive #1 on Controller #0

Use the command in [Table A.12](#) to force virtual drive #1 on controller #0 to be deleted.

Table A.12 Delete Virtual Drive #1 on Controller #0

Delete Logical Drive #1 on controller #0 by force: Megacli -CfgLdDel -L1 -Force -a0
Forces virtual drive #1 on the controller #1 to be deleted.
-L1 indicates the virtual drive number.
-Force indicates that the virtual drive deletion is being forced.
-a0 signifies controller #0 in the system.

A.13 Set the Drive in Slot #6 Offline on Controller #3

Use the command in [Table A.13](#) to set the state of the drive in slot #6 on controller #3 to *Offline*.

In the offline state, the virtual drive is not available to the controller.

Table A.13 Set Drive State to Offline

Set the drive in slot 6 offline on controller #3: MegaCli -PDOffline -PhysDrv [252:6] -a3
Changes the drive state for the drive in slot #6 on controller #3 to <i>Offline</i> . -PhysDrv [252:6] signifies enclosure #252 and the drive in slot #6. -a3 signifies controller #3 in the system.

A.14 Set the Drive State for Drive in Slot #2 to Online on Controller #0

Use the command in [Table A.14](#) to set the state of the drive in slot #2 on controller #0 to *Online*.

In an online state, the drive is working normally, and it is a part of a configured virtual drive.

Table A.14 Set Drive State to Online

Set state to online for the drive in slot 2 on controller #0: MegaCli -PDOnline -PhysDrv [255:2] -a0
Changes the drive state for the drive in slot #2 on controller #0 to <i>Online</i> . -PhysDrv [255:2] signifies enclosure #255 and the drive in slot #2. -a0 signifies controller #0 in the system.

A.15 Mark the Configured Drive in Slot #2 as Missing on Controller #0

Use the command in [Table A.15](#) to mark the configured drive in slot #2 on controller #0 as missing.

Table A.15 Mark Configured Drive as Missing

MegaCli -PDMarkMissing -PhysDrv [6:2] -a0
Marks the configured drive in slot #2 in enclosure #6 as missing for controller #0. -PhysDrv [6:2] signifies enclosure #6 and the drive in slot #2. -a0 signifies controller #0 in the system.

Appendix B

MegaCLI Error Messages

This appendix documents the codes and descriptions for the error messages for the MegaCLI Configuration Utility.

The following table lists the MegaCLI error message numbers and descriptions.

Table B.1 MegaCLI Error Message Numbers and Descriptions

Number	Description
0x00	Command completed successfully
0x01	Invalid command
0x02	DCMD opcode is invalid
0x03	Input parameters are invalid
0x04	Invalid sequence number
0x05	Abort isn't possible for the requested command
0x06	Application 'host' code not found
0x07	Application already in use - try later
0x08	Application not initialized
0x09	Given array index is invalid
0x0a	Unable to add missing drive to array, as row has no empty slots
0x0b	Some of the CFG resources conflict with each other or the current config
0x0c	Invalid device ID / select-timeout
0x0d	Drive is too small for requested operation

Number	Description
0x0e	Flash memory allocation failed
0x0f	Flash download already in progress
0x10	Flash operation failed
0x11	Flash image was bad
0x12	Downloaded flash image is incomplete
0x13	Flash OPEN was not done
0x14	Flash sequence is not active
0x15	Flush command failed
0x16	Specified application doesn't have host-resident code
0x17	LD operation not possible - CC is in progress
0x18	LD initialization in progress
0x19	LBA is out of range
0x1a	Maximum LDs are already configured
0x1b	LD is not OPTIMAL
0x1c	LD Rebuild is in progress
0x1d	LD is undergoing reconstruction
0x1e	LD RAID level is wrong for requested operation
0x1f	Too many spares assigned
0x20	Scratch memory not available - try command again later
0x21	Error writing MFC data to SEEPROM
0x22	Required HW is missing (i.e. Alarm or BBU)
0x23	Item not found
0x24	LD drives are not within an enclosure
0x25	PD CLEAR operation is in progress
0x26	Unable to use SATA (SAS) drive to replace SAS(SATA)
0x27	Patrol Read is disabled

Number	Description
0x28	Given row index is invalid
0x2d	SCSI command done, but non-GOOD status was received-see mf.hdr.extStatus for SCSI_STATUS
0x2e	IO request for MFI_CMD_OP_PD_SCSI failed - see ext-Status for DM error
0x2f	Matches SCSI RESERVATION_CONFLICT
0x30	One or more of the flush operations failed
0x31	Firmware real-time currently not set
0x32	Command issues while firmware in wrong state (i.e., GET RECON when op not active)
0x33	LD is not OFFLINE - IO not possible
0x34	Peer controller rejected request (possibly due to resource conflict)
0x35	Unable to inform peer of communication changes (retry might be appropriate)
0x36	LD reservation already in progress
0x37	I2C errors were detected
0x38	PCI errors occurred during XOR/DMA operation
0x39	Diagnostics failed - see event log for details
0x3a	Unable to process command as boot messages are pending
0x3b	Returned in case if foreign configurations are incomplete
0x3d	Returned in case if a command is tried on unsupported hardware
0x3e	CC scheduling is disabled
0x3f	PD CopyBack operation is in progress
0x40	Selected more than one PD per array
0x41	Microcode update operation failed
0x42	Unable to process command as drive security feature is not enabled

Number	Description
0x43	Controller already has a lock key
0x44	Lock key cannot be backed-up
0x45	Lock key backup cannot be verified
0x46	Lock key from backup failed verification
0x47	Rekey operation not allowed, unless controller already has a lock key
0x48	Lock key is not valid, cannot authenticate
0x49	Lock key from escrow cannot be used
0x4a	Lock key backup (pass-phrase) is required
0x4b	Secure LD exist
0x4c	LD secure operation is not allowed
0x4d	Reprovisioning is not allowed
0x4e	Drive security type (FDE or non-FDE) is not appropriate for requested operation
0x4f	LD encryption type is not supported
0x50	Cannot mix FDE and non-FDE drives in same array
0x51	Cannot mix secure and unsecured LD in same array
0x52	Secret key not allowed
0x53	Physical device errors were detected
0x54	Controller has LD cache pinned
0x55	Requested operation is already in progress
0x56	Another power state set operation is in progress
0x57	Power state of device is not correct

Number	Description
0x58	No PD is available for patrol read
0x59	Controller reset is required
0x5a	No EKM boot agent detected
0x5b	No space on the snapshot repository VD
0x5c	For consistency SET PiTs, some PiT creations might fail and some succeed
0xFF	Invalid status - used for polling command completion

Appendix C

SNMP Extension Agent

Trap Definitions

This appendix describes the trap definitions that an SNMP-based management application uses to send information about system events.

An SNMP-based management application (also known as an SNMP manager) can monitor and manage devices through SNMP extension agents. The MegaRAID SNMP subagent reports the information about the RAID controller, virtual drives, physical devices, enclosures, and other items per SNMP request. The MegaRAID SNMP agent supports a set of traps for any state change in the controller and its attached devices. The traps that depend on the notification from the firmware.

There are no traps specific to Logical Unit Numbers (LUNs) as the MegaRAID firmware does not allow online removal or addition of LUNs. Hence, there is no notification from the firmware.

This guide contains the following sections:

- [Section C.1, “SNMP Traps for RAID Controllers”](#)
- [Section C.2, “SNMP Traps for Virtual Drives”](#)
- [Section C.3, “SNMP Traps for Physical Drives”](#)

C.1 SNMP Traps for RAID Controllers

The following table lists the supported SNMP traps and their definitions for events related to the RAID controllers.

Table C.1 Supported SNMP Traps and Definitions for RAID Controllers

Trap Number	Trap Definition
8001	Alarm has been enabled by user for Adapter %d
8002	Background Initialization Rate changed to %d for Adapter %d
8003	Controller %d cache discarded due to memory/battery problems
8004	Unable to recover Cache Data due to configuration mismatch for Adapter %d
8005	Cache Data Recovered for Adapter %d
8006	Controller Cache Discarded due to Firmware version incompatibility for Adapter %d
8007	Consistency Check Rate changed to %d for Adapter %d
8008	Flash download image corrupted for Adapter %d
8009	Flash erase error for Adapter %d
8010	Flash Timeout during Erase for Adapter %d
8011	General Flash Error occurred for Adapter %d
8012	Flashing Image %s for Adapter %d
8013	Flash of Firmware Image complete for Adapter %d
8014	Flash programming error for Adapter %d
8015	Flash timeout during programming for Adapter %d
8016	Event log cleared for Adapter %d
8017	Event log wrapped for Adapter %d
8018	Patrol Read complete for Adapter %d
8019	Patrol Read paused for Adapter %d

Trap Number	Trap Definition
8020	Patrol Read resumed for Adapter %d
8021	Patrol Read started for Adapter %d
8022	Shutdown command received for Adapter %d
8023	Hibernate command received for Adapter %d
8024	Fatal error received for Adapter %d
8025	Rebuild Rate changed to %d for Adapter %d
8026	Patrol Read Rate changed to %d for Adapter %d
8027	Alarm disabled by user for Adapter %d
8028	Configuration cleared for Adapter %d
8029	Reconstruction Rate changed to %d for Adapter %d
8030	Factory defaults restored for Adapter %d
8031	Battery Present for Adapter %d
8032	Battery not Present for Adapter %d
8033	New Battery Detected for Adapter %d
8034	Battery has been replaced for Adapter %d
8035	Battery Temperature is high for Adapter %d
8036	Battery voltage low for Adapter %d
8036	Battery started charging for Adapter %d
8037	Battery started charging for Adapter %d
8038	Battery is discharging for Adapter %d
8039	Battery temperature is normal for Adapter %d
8040	Battery needs replacement for Adapter %d
8041	Battery Relearn started for Adapter %d
8042	Battery Relearn in progress for Adapter %d
8043	Battery Relearn completed for Adapter %d
8044	Battery Relearn timed out for Adapter %d

Trap Number	Trap Definition
8045	Battery Relearn pending; Battery is under charge for Adapter %d
8046	Battery Relearn postponed for Adapter %d
8047	Battery removed for Adapter %d
8048	Current capacity of the battery is below threshold for Adapter %d
8049	Current capacity of the battery is above threshold for Adapter %d
8050	Bbu FRU changed for Adapter %d
8051	Revision Identifier changed for Adapter %d
8052	Drive security key created for Adapter %d
8053	Drive security key backed up for Adapter %d
8054	Drive security key from escrow, verified for Adapter %d
8055	Drive security key changed for Adapter %d
8056	Drive security key, re-key operation failed for Adapter %d
8057	Drive security key is invalid for Adapter %d
8058	Drive security key destroyed for Adapter %d
8059	Drive security key from escrow is invalid for Adapter %d
8060	Drive security key failure, cannot access secured configuration for Adapter %d

C.2 SNMP Traps for Virtual Drives

The following table lists the supported SNMP traps and their definitions for events related to the virtual drives.

Table C.2 Supported SNMP Traps and Definitions for VDs

Trap Number	Trap Definition
8101	BGI aborted on Adapter -%d VD Target -%d
8102	BGI completed on Adapter -%d VD Target -%d
8103	BGI completed with uncorrectable errors on Adapter -%d VD Target -%d
8104	BGI failed on Adapter -%d VD Target -%d
8105	BGI started on Adapter -%d VD Target -%d
8107	CC started on Adapter -%d VD Target -%d
8108	CC completed on Adapter -%d VD Target -%d
8109	CC failed on Adapter -%d VD Target -%d
8110	CC aborted on Adapter -%d VD Target -%d
8111	CC completed with correction on Adapter -%d VD Target -%d
8112	Initialization aborted on Adapter -%d VD Target -%d
8113	Initialization failed on Adapter -%d VD Target -%d
8114	Initialization completed on Adapter -%d VD Target -%d
8115	Fast Initialization started on Adapter -%d VD Target -%d
8116	Full Initialization started on Adapter -%d VD Target -%d
8117	Reconstruction started on Adapter -%d VD Target -%d
8118	Reconstruction completed on Adapter -%d VD Target -%d
8119	Reconstruction resumed on Adapter -%d VD Target -%d
8120	Reconstruction stopped on Adapter -%d VD Target -%d
8121	VD state changed on Adapter -%d VD Target -%d from %d to %d
8122	A new VD created on Adapter -%d VD Target -%d

C.3 SNMP Traps for Physical Drives

The following table lists the supported SNMP traps and their definitions for events related to the physical drives.

Table C.3 Supported SNMP Traps and Definitions for PDs

Trap Number	Trap Definition
8201	Physical Drive Clear aborted on Adapter -%d Dev -%d Enc -%d Slot-%d
8202	Physical Drive Clear failed on Adapter -%d Dev -%d Enc -%d Slot -%d
8203	Physical Drive Clear started on Adapter -%d Dev -%d Enc -%d Slot -%d
8204	Physical Drive Clear completed on Adapter -%d Dev -%d Enc -%d Slot -%d
8205	Error occurred on Adapter -%d Dev -%d Enc -%d Slot -%d
8206	Physical Drive Format started on Adapter -%d Dev -%d Enc -%d Slot -%d
8207	Physical Drive Format completed on Adapter -%d Dev -%d Enc -%d Slot -%d
8208	PD inserted on Adapter -%d Dev -%d Enc -%d Slot -%d
8209	Rebuild aborted on Adapter -%d Dev -%d Enc -%d Slot -%d
8210	Rebuild completed on Adapter -%d Dev -%d Enc -%d Slot -%d
8211	Rebuild failed(bad source) on Adapter -%d Dev -%d Enc -%d Slot -%d
8212	Rebuild failed(bad target) on Adapter -%d Dev -%d Enc -%d Slot -%d
8213	Rebuild started on Adapter -%d Dev -%d Enc -%d Slot -%d
8214	Rebuild resumed on Adapter -%d Dev -%d Enc -%d Slot -%d
8215	Rebuild started(auto) on Adapter -%d Dev -%d Enc -%d Slot -%d

Table C.3 Supported SNMP Traps and Definitions for PDs

Trap Number	Trap Definition
8216	Physical Drive removed on Adapter -%d Dev -%d Enc -%d Slot -%d
8217	PD state changed on Adapter -%d Dev -%d Enc -%d Slot -%d from %d to %d
8218	Redundant Path For Physical Drive Broken on Adapter -%d Dev -%d Enc -%d Slot -%d EncDevId -%d pdSAS -%s
8219	Redundant Path Restored For Physical Drive on Adapter -%d Dev -%d Enc -%d Slot -%d EncDevId -%d pdSAS -%s
8220	Redundant Encl Modul Inserted on Adapter -%d Dev -%d Enc -%d Slot -%d EncDevId -%d pdSAS -%s pdpath -%d
8221	Redundant Encl Modul Removed on Adapter -%d Dev -%d Enc -%d Slot -%d EncDevId -%d pdSAS -%s pdpath -%d
8222	FRU changed on Adapter -%d Dev -%d Enc -%d Slot -%d EncDevId -%d pdFRU -%s
8223	PD security activated on Adapter -%d Dev -%d Enc -%d Slot -%d
8224	PD security disabled on Adapter -%d Dev -%d Enc -%d Slot -%d
8225	PD is reprovisioned on Adapter -%d Dev -%d Enc -%d Slot -%d
8226	PD security key changed on Adapter -%d Dev -%d Enc -%d Slot -%d
8227	Security subsystem problems detected on Adapter -%d Dev -%d Enc -%d Slot -%d
8228	Power State Change on Adapter -%d Dev -%d Enc -%d Slot -%d NewPowerState -%d
8229	PD Not Supported on Adapter -%d Dev -%d Enc -%d Slot -%d
8230	PD Not Certified on Adapter -%d Dev -%d Enc -%d Slot -%d

Appendix D

Glossary of Terms and Abbreviations

active termination	The electrical connection required at each end of the SCSI bus, composed of active voltage regulation and a set of termination resistors.
array	An array of drives combines the storage space on the drives into a single segment of storage space. A hot spare drive does not actively participate in an array.
BIOS	Acronym for Basic Input/Output System. Software that provides basic read/write capability. Usually kept as firmware (ROM-based). The system BIOS on the mainboard of a computer boots and controls the system. The BIOS on your host adapter acts as an extension of the system BIOS.
configuration	Refers to the way a computer is set up, the combined hardware components (computer, monitor, keyboard, and peripheral devices) that make up a computer system, or the software settings that allow the hardware components to communicate with each other.
device driver	A program that allows a microprocessor (through the operating system) to direct the operation of a peripheral device.
domain validation	Domain Validation is a software procedure in which a host queries a device to determine its ability to communicate at the negotiated data rate.
EEPROM	Acronym for Electrically Erasable Programmable Read-Only Memory. It is a memory chip that typically stores configuration information, as it provides stable storage for long periods without electricity and can be reprogrammed. Refer to NVRAM.
external SAS device	A SAS device installed outside the computer cabinet. These devices are connected using specific types of shielded cables.
Fusion-MPT architecture	Fusion-MPT (Message Passing Technology) architecture consists of several main elements: Fusion-MPT firmware, the Fibre Channel and SCSI hardware, and the operating system level drivers that support

these architectures. Fusion-MPT architecture offers a single binary, operating system driver that supports both Fibre Channel and SCSI devices.

host	The computer system in which a storage adapter is installed. It uses the storage adapter to transfer information to and from devices attached to the SCSI bus.
host adapter board	A circuit board or integrated circuit that provides a device connection to the computer system.
hot spare	An idle, powered on, standby drive ready for immediate use in case of disk failure. It does not contain any user data. A hot spare can be dedicated to a single redundant array or it can be part of the global hot-spare pool for all arrays managed by the controller. When a disk fails, the controller firmware automatically replaces and rebuilds the data from the failed drive to the hot spare. Data can be rebuilt only from virtual disks with redundancy (RAID levels 1, 5, 10, and 50, but not RAID level 0), and the hot spare must have sufficient capacity.
internal SAS device	A SAS device installed inside the computer cabinet. These devices are connected by using a shielded cable.
main memory	The part of a computer's memory which is directly accessible by the CPU (usually synonymous with RAM).
NVRAM	Acronym for Nonvolatile Random Access Memory. An EEPROM (Electrically Erasable Read-Only Memory chip) that stores configuration information. Refer to EEPROM.
PCI	Acronym for Peripheral Component Interconnect. A high-performance, local bus specification that allows the connection of devices directly to computer memory. The PCI Local Bus allows transparent upgrades from 32-bit data path at 33 MHz to 64-bit data path at 33 MHz, and from 32-bit data path at 66 MHz to 64-bit data path at 66 MHz.
PCI Express	Acronym for Peripheral Component Interconnect Express. A high-performance, local bus specification that allows the connection of devices directly to computer memory. PCI Express is a two-way, serial connection that transfers data on two pairs of point-to-point data lines. PCI Express goes beyond the PCI specification in that it is intended as

a unifying I/O architecture for various systems: desktops, workstations, mobile, server, communications, and embedded devices.

peripheral devices

A piece of hardware (such as a video monitor, drive, printer, or CD-ROM) used with a computer and under the control of the computer. SCSI peripherals are controlled through a ServeRAID SAS/SATA controller (host adapter).

PHY

The interface required to transmit and receive data packets transferred across the serial bus.

Each PHY can form one side of the physical link in a connection with a PHY on a different SATA device. The physical link contains four wires that form two differential signal pairs. One differential pair transmits signals, while the other differential pair receives signals. Both differential pairs operate simultaneously and allow concurrent data transmission in both the receive and the transmit directions.

RAID

Acronym for Redundant Array of Independent Disks (originally Redundant Array of Inexpensive Disks). An array of multiple independent physical disks managed together to yield higher reliability and/or performance exceeding that of a single physical disk. The RAID array appears to the controller as a single storage unit. I/O is expedited because several disks can be accessed simultaneously. Redundant RAID levels (RAID levels 1, 5, 6, 10, 50, and 60) provide data protection.

RAID levels

A set of techniques applied to disk groups to deliver higher data availability, and/or performance characteristics to host environments. Each virtual disk must have a RAID level assigned to it.

SAS

Acronym for Serial Attached SCSI. A serial, point-to-point, enterprise-level device interface that leverages the proven SCSI protocol set. The SAS interface provides improved performance, simplified cabling, smaller connections, lower pin count, and lower power requirements when compared to parallel SCSI. The SAS controller leverages a common electrical and physical connection interface that is compatible with Serial ATA.

ServeRAID SAS/SATA controllers support the SAS protocol as described in the *Serial Attached SCSI Standard, version 2.0*. The controller also supports the Serial ATA III (SATA III) protocol defined by the *Serial ATA Specification, Version 3.0*. SATA III is an extension to SATA 2.0.

SAS device	Any device that conforms to the SAS standard and is attached to the SAS bus by a SAS cable. This includes SAS storage adapters (host adapters) and SAS peripherals.
SATA	Acronym for Serial Advanced Technology Attachment. A physical storage interface standard, SATA is a serial link that provides point-to-point connections between devices. The thinner serial cables allow for better airflow within the system and permit smaller chassis designs.
SMP	Acronym for Serial Management Protocol. SMP enables communicates topology management information directly with an attached SAS expander device. Each PHY on the controller can function as an SMP initiator.
SSD	Acronym for Solid State Devices. A Solid State Device uses solid-state memory to store data. They have no moving parts and are faster and more reliable than hard disk drives (HDDs).
SSP	Acronym for Serial SCSI Protocol. SSP enables communication with other SAS devices. Each PHY on the SAS controller can function as an SSP initiator or SSP target.
STP	Acronym for Serial Tunneling Protocol. STP enables communication with a SATA III device through an attached expander. Each PHY on the SAS controller can function as an STP initiator.
stripe size	The total disk space consumed by a stripe not including a parity disk. For example, consider a stripe that contains 64 Kbytes of disk space and has 16 Kbytes of data residing on each disk in the stripe. In this case, the stripe size is 64 Kbytes and the stripe element size is 16 Kbytes. The stripe depth is four (four physical disks in the stripe). You can specify stripe sizes of 8 Kbytes, 16 Kbytes, 32 Kbytes, 64 Kbytes, or 128 Kbytes for each virtual disk. A larger stripe size produces improved read performance, especially if most of the reads are sequential. For mostly random reads, select a smaller stripe size.
striping	Disk striping writes data across two or more disks. Each stripe spans two or more disks but consumes only a portion of each disk. Each disk, therefore, may have several stripes. The amount of space consumed by a stripe is the same on each disk included in the stripe. The portion of a stripe that resides on a single disk is a stripe element. Striping by itself does not provide data redundancy; striping in combination with parity provides data redundancy.

Appendix E Notices

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E.2 Important Notes

Processor speed indicates the internal clock speed of the microprocessor; other factors also affect application performance.

CD or DVD drive speed is the variable read rate. Actual speeds vary and are often less than the possible maximum.

When referring to processor storage, real and virtual storage, or channel volume, KB stands for 1,024 bytes, MB stands for 1,048,576 bytes, and GB stands for 1,073,741,824 bytes.

When referring to hard disk drive capacity or communications volume, MB stands for 1,000,000 bytes, and GB stands for 1,000,000,000 bytes. Total user-accessible capacity can vary depending on operating environments.

Maximum internal hard disk drive capacities assume the replacement of any standard hard disk drives and population of all hard disk drive bays with the largest currently supported drives that are available from IBM.

Maximum memory might require replacement of the standard memory with an optional memory module.

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Some software might differ from its retail version (if available) and might not include user manuals or all program functionality.

E.3 Particulate contamination

Attention: Airborne particulates (including metal flakes or particles) and reactive gases acting alone or in combination with other environmental factors such as humidity or temperature might pose a risk to the device that is described in this document. Risks that are posed by the presence of excessive particulate levels or concentrations of harmful gases include damage that might cause the device to malfunction or cease functioning altogether. This specification sets forth limits for particulates and gases that are intended to avoid such damage. The limits must not be viewed or used as definitive limits, because numerous other factors, such as temperature or moisture content of the air, can influence the impact of particulates or environmental corrosives and gaseous contaminant transfer. In the absence of specific limits that are set forth in this document, you must implement practices that maintain particulate and gas levels that are consistent with the protection of human health and safety. If IBM determines that the levels of particulates or gases in your environment have caused damage to the device, IBM may condition provision of repair or replacement of devices or parts on implementation of appropriate remedial measures to mitigate such environmental contamination. Implementation of such remedial measures is a customer responsibility.

Table 5. Limits for particulates and gases

Contaminant	Limits
Particulate	• The room air must be continuously filtered with 40% atmospheric dust spot efficiency (MERV 9) according to ASHRAE Standard 52.2¹. • Air that enters a data center must be filtered to 99.97% efficiency or greater, using high-efficiency particulate air (HEPA) filters that meet MIL-STD-282. • The deliquescent relative humidity of the particulate contamination must be more than 60%². • The room must be free of conductive contamination such as zinc whiskers.
Gaseous	• Copper: Class G1 as per ANSI/ISA 71.04-1985³ • Silver: Corrosion rate of less than 300 Å in 30 days

¹ ASHRAE 52.2-2008 - *Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size*. Atlanta: American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

² The deliquescent relative humidity of particulate contamination is the relative humidity at which the dust absorbs enough water to become wet and promote ionic conduction.

³ ANSI/ISA-71.04-1985. *Environmental conditions for process measurement and control systems: Airborne contaminants*. Instrument Society of America, Research Triangle Park, North Carolina, U.S.A.

E.4 Documentation format

The publications for this product are in Adobe Portable Document Format (PDF) and should be compliant with accessibility standards. If you experience difficulties when you use the PDF files and want to request a web-based format or accessible PDF document for a publication, direct your mail to the following address:

- *Information Development*
- *IBM Corporation*
- *205/A015*
- *3039 E. Cornwallis Road*
- *P.O. Box 12195*
- *Research Triangle Park, North Carolina 27709-2195*
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In the request, be sure to include the publication part number and title.

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E.5 Telecommunication regulatory statement

This product is not intended to be connected directly or indirectly by any means whatsoever to interfaces of public telecommunications networks, nor is it intended to be used in a public services network.

E.6 Electronic emission notices

When you attach a monitor to the equipment, you must use the designated monitor cable and any interference suppression devices that are supplied with the monitor.

Federal Communications Commission (FCC) statement

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. IBM is not responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Industry Canada Class A emission compliance statement

This Class A digital apparatus complies with Canadian ICES-003.

Avis de conformité à la réglementation d'Industrie Canada

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

Australia and New Zealand Class A statement

Attention: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

European Union EMC Directive conformance statement

This product is in conformity with the protection requirements of EU Council Directive 2004/108/EC on the approximation of the laws of the Member States relating to electromagnetic compatibility. IBM cannot accept responsibility for any failure to satisfy the protection requirements resulting from a nonrecommended modification of the product, including the fitting of non-IBM option cards.

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Responsible manufacturer:

International Business Machines Corp.
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Armonk, New York 10504
914-499-1900

European Community contact:

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IBM-Allee 1, 71137 Ehningen, Germany
Telephone: +49 7032 15-2937
E-mail: tjahn@de.ibm.com

Germany Class A statement

Deutschsprachiger EU Hinweis:

Hinweis für Geräte der Klasse A EU-Richtlinie zur Elektromagnetischen Verträglichkeit

Dieses Produkt entspricht den Schutzanforderungen der EU-Richtlinie 2004/108/EG zur Angleichung der Rechtsvorschriften über die elektromagnetische Verträglichkeit in den EU-Mitgliedsstaaten und hält die Grenzwerte der EN 55022 Klasse A ein.

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Zulassungsbescheinigung laut dem Deutschen Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG) (bzw. der EMC EG Richtlinie 2004/108/EG) für Geräte der Klasse A

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Verantwortlich für die Einhaltung der EMV Vorschriften ist der Hersteller:

International Business Machines Corp.
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Der verantwortliche Ansprechpartner des Herstellers in der EU ist:

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Technical Regulations, Department M456
IBM-Allee 1, 71137 Ehningen, Germany
Telephone: +49 7032 15-2937
E-mail: tjahn@de.ibm.com

Generelle Informationen:

Das Gerät erfüllt die Schutzanforderungen nach EN 55024 und EN 55022 Klasse A.

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VCCI-A

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中华人民共和国“A类”警告声明

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