ServeRAID M controllers

Problem Determination and Service Guide

ServeRAID M controllers

Problem Determination and Service Guide

Note: Before using this information and the product it supports, read the general information in Appendix B, “Notices,” on page 75.

Third Edition (March 2012)

© Copyright IBM Corporation 2010, 2012.
US Government Users Restricted Rights – Use, duplication or disclosure restricted by GSA ADP Schedule Contract with IBM Corp.

Contents

© Copyright IBM Corp. 2010, 2012

Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الآمنية

Antes de instalar este produto, leia as Informações de Segurança.

在安装本产品之前，请仔细阅读 Safety Information (安全信息)。

安裝本產品之前，請先閱讀「安全資訊」。

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

Ennen kuin asennat tämän tuotteen, lue turvaohjeet kohdasta Safety Information.

Avant d'installer ce produit, lisez les consignes de sécurité.

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

Πριν εγκαταστήσετε το προϊόν αυτό, διαβάστε τις πληροφορίες ασφάλειας (safety information).

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

A termék telepítése előtt olvassa el a Biztonsági előírásokat!

Prima di installare questo prodotto, leggere le Informazioni sulla Sicurezza.

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

Пред да се инсталира овој продукт, прочитајте информацијата за безбедност.

Les sikkerhetsinformasjonen (Safety Information) før du installerer dette produktet.

Przed zainstalowaniem tego produktu, należy zapoznać się z książką "Informacje dotyczące bezpieczeństwa" (Safety Information).

Antes de instalar este produto, leia as Informações sobre Segurança.

Перед установкой продукта прочтите инструкции по технике безопасности.

Pred inštaláciou tohto zariadenia si pečítaje Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

Antes de instalar este producto, lea la información de seguridad.

Läs säkerhetsinformationen innan du installerar den här produkten.

© Copyright IBM Corp. 2010, 2012

Guidelines for trained service technicians

This section contains information for trained service technicians.

Inspecting for unsafe conditions

Use the information in this section to help you identify potentially unsafe conditions in an IBM product that you are working on. Each IBM product, as it was designed and manufactured, has required safety items to protect users and service technicians from injury. The information in this section addresses only those items. Use good judgment to identify potential unsafe conditions that might be caused by non-IBM alterations or attachment of non-IBM features or optional devices that are not addressed in this section. If you identify an unsafe condition, you must determine how serious the hazard is and whether you must correct the problem before you work on the product.

Consider the following conditions and the safety hazards that they present:

- Electrical hazards, especially primary power. Primary voltage on the frame can cause serious or fatal electrical shock.
- Explosive hazards, such as a damaged CRT face or a bulging capacitor.
- Mechanical hazards, such as loose or missing hardware.

To inspect the product for potential unsafe conditions, complete the following steps:

1. Make sure that the power is off and the power cord is disconnected.
2. Make sure that the exterior cover is not damaged, loose, or broken, and observe any sharp edges.
3. Check the power cord:
   - Make sure that the third-wire ground connector is in good condition. Use a meter to measure third-wire ground continuity for 0.1 ohm or less between the external ground pin and the frame ground.
   - Make sure that the power cord is the correct type.
   - Make sure that the insulation is not frayed or worn.
4. Remove the cover.
5. Check for any obvious non-IBM alterations. Use good judgment as to the safety of any non-IBM alterations.
6. Check inside the server for any obvious unsafe conditions, such as metal filings, contamination, water or other liquid, or signs of fire or smoke damage.
7. Check for worn, frayed, or pinched cables.
8. Make sure that the power-supply cover fasteners (screws or rivets) have not been removed or tampered with.

Guidelines for servicing electrical equipment

Observe the following guidelines when you service electrical equipment:

- Check the area for electrical hazards such as moist floors, nongrounded power extension cords, and missing safety grounds.
- Use only approved tools and test equipment. Some hand tools have handles that are covered with a soft material that does not provide insulation from live electrical currents.
- Regularly inspect and maintain your electrical hand tools for safe operational condition. Do not use worn or broken tools or testers.

- Do not touch the reflective surface of a dental mirror to a live electrical circuit. The surface is conductive and can cause personal injury or equipment damage if it touches a live electrical circuit.
- Some rubber floor mats contain small conductive fibers to decrease electrostatic discharge. Do not use this type of mat to protect yourself from electrical shock.
- Do not work alone under hazardous conditions or near equipment that has hazardous voltages.
- Locate the emergency power-off (EPO) switch, disconnecting switch, or electrical outlet so that you can turn off the power quickly in the event of an electrical accident.
- Disconnect all power before you perform a mechanical inspection, work near power supplies, or remove or install main units.
- Before you work on the equipment, disconnect the power cord. If you cannot disconnect the power cord, have the customer power-off the wall box that supplies power to the equipment and lock the wall box in the off position.
- Never assume that power has been disconnected from a circuit. Check it to make sure that it has been disconnected.
- If you have to work on equipment that has exposed electrical circuits, observe the following precautions:
  - Make sure that another person who is familiar with the power-off controls is near you and is available to turn off the power if necessary.
  - When you are working with powered-on electrical equipment, use only one hand. Keep the other hand in your pocket or behind your back to avoid creating a complete circuit that could cause an electrical shock.
  - When you use a tester, set the controls correctly and use the approved probe leads and accessories for that tester.
  - Stand on a suitable rubber mat to insulate you from grounds such as metal floor strips and equipment frames.
- Use extreme care when you measure high voltages.
- To ensure proper grounding of components such as power supplies, pumps, blowers, fans, and motor generators, do not service these components outside of their normal operating locations.
- If an electrical accident occurs, use caution, turn off the power, and send another person to get medical aid.

Safety statements

Important:

Each caution and danger statement in this document is labeled with a number. This number is used to cross reference an English-language caution or danger statement with translated versions of the caution or danger statement in the *Safety Information* document.

For example, if a caution statement is labeled “Statement 1,” translations for that caution statement are in the *Safety Information* document under “Statement 1.”

Be sure to read all caution and danger statements in this document before you perform the procedures. Read any additional safety information that comes with the server or optional device before you install the device.

Attention: Use No. 26 AWG or larger UL-listed or CSA certified telecommunication line cord.

Statement 1:

DANGER

Electrical current from power, telephone, and communication cables is hazardous.

To avoid a shock hazard:

- **Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.**
- **Connect all power cords to a properly wired and grounded electrical outlet.**
- **Connect to properly wired outlets any equipment that will be attached to this product.**
- **When possible, use one hand only to connect or disconnect signal cables.**
- **Never turn on any equipment when there is evidence of fire, water, or structural damage.**
- **Disconnect the attached power cords, telecommunications systems, networks, and modems before you open the device covers, unless instructed otherwise in the installation and configuration procedures.**
- **Connect and disconnect cables as described in the following table when installing, moving, or opening covers on this product or attached devices.**

To Connect:	**To Disconnect:**
1. Turn everything OFF.	1. Turn everything OFF.
2. First, attach all cables to devices.	2. First, remove power cords from outlet.
3. Attach signal cables to connectors.	3. Remove signal cables from connectors.
4. Attach power cords to outlet.	4. Remove all cables from devices.
5. Turn device ON.	

Statement 28:

CAUTION:
The battery is a lithium ion battery. To avoid possible explosion, do not burn the battery. Exchange it only with the IBM-approved part. Recycle or discard the battery as instructed by local regulations. In the United States, IBM® has a process for collection of this battery. For information, call 1-800-426-4333. Have the IBM part number for the battery unit available when you call.

Chapter 1. Introduction

This *Problem Determination and Service Guide* provides guidance for troubleshooting ServeRAID controllers.

Overview

The following ServeRAID controllers are supported by this document:

- ServeRAID-M1015
- ServeRAID-M5000
- ServeRAID-M5014
- ServeRAID-M5015
- ServeRAID-M5016
- ServeRAID-M5025
- ServeRAID M5110
- ServeRAID M1115
- ServeRAID M5120
- ServeRAID-MR10i
- ServeRAID-MR10ie
- ServeRAID-MR10il
- ServeRAID-MR10is
- ServeRAID-MR10k
- ServeRAID-MR10M

The following software is supported by this document:

- *ServeRAID M Support CD*
- MegaRAID Storage Manager
- ServeRAID M controller firmware updates
- Device drivers
- Command-line utilities

Related documentation

The following documents are in Portable Document Format (PDF) and provide instructions for installing the IBM ServeRAID M controller hardware. Unless specified otherwise, you can download the documents at http://www.ibm.com/support/entry/portal/docdisplay?lndocid=MIGR-5073015.

- *Quick Installation Guide*

  This document provides the instructions for installing the IBM ServeRAID-M controller hardware.

- *User's Guide*

  This document provides instructions for using the IBM ServeRAID-M controller hardware.

- *Device Driver Installation and User's Guide*

  This document provides information about the operating system device drivers that are applicable for each IBM ServeRAID M controller.

© Copyright IBM Corp. 2010, 2012

- *Software User's Guide*

  This document provides instructions for using the new Human Interface Infrastructure (HII) tools in UEFI, the MegaRAID Web BIOS Configuration Utility, and MegaRAID Storage Manager software applications. You can download this document at http://www.ibm.com/support/entry/portal/docdisplay?lndocid=MIGR-5086126.

IBM publishes updates for known issues on a regular basis. For a problem that is not covered by the documentation that comes with the ServeRAID controller or in this *Problem Determination and Service Guide*, go to http://www.ibm.com/supportportal/.

Notices and statements in this document

The caution and danger statements in this document are also in the multilingual *Safety Information* document, which is on the *Documentation* CD. Each statement is numbered for reference to the corresponding statement in your language in the *Safety Information* document.

The following notices and statements are used in this document:

- **Note:** These notices provide important tips, guidance, or advice.
- **Important:** These notices provide information or advice that might help you avoid inconvenient or problem situations.
- **Attention:** These notices indicate potential damage to programs, devices, or data. An attention notice is placed just before the instruction or situation in which damage might occur.
- **Caution:** These statements indicate situations that can be potentially hazardous to you. A caution statement is placed just before the description of a potentially hazardous procedure step or situation.
- **Danger:** These statements indicate situations that can be potentially lethal or extremely hazardous to you. A danger statement is placed just before the description of a potentially lethal or extremely hazardous procedure step or situation.

Installation guidelines

Before you remove or replace a component, read the following information:

- Read the safety information that begins on page v, the guidelines in “Working inside the server with the power on” on page 4, and “Handling static-sensitive devices” on page 4. This information will help you work safely.
- When you install your new server, take the opportunity to download and apply the most recent firmware updates.

  Important: Some cluster solutions require specific code levels or coordinated code updates. If the device is part of a cluster solution, verify that the latest level of code is supported for the cluster solution before you update the code. This step will help to ensure that any known issues are addressed and that your server is ready to function at maximum levels of performance. To download firmware updates for your server, complete the following steps:

  1. Go to http://www.ibm.com/systems/support/.
  2. Under **Product support**, click **System x**.
  3. In the **IBM Support Portal**, select your server model and operating system, and then click **Submit**.
  4. In the **Choose Your Page** section, select **Downloads** and click **Continue**.

5. On the **Downloads** page, under the **Downloads and Fixes** section, select **View System (Type) downloads**.
6. If applicable, click **Continue** at the **Welcome to Fix Central** window.
7. On the **Fix Central** window, select the correct 4-digit model type under **Product** and click **Continue**.

For additional information about tools for updating, managing, and deploying firmware, see the System x and xSeries Tools Center at http://publib.boulder.ibm.com/infocenter/toolsctr/v1r0/index.jsp.

- Before you install optional hardware, make sure that the server is working correctly. Start the server, and make sure that the operating system starts, if an operating system is installed, or that a 19990305 error code is displayed, indicating that an operating system was not found but the server is otherwise working correctly. If the server is not working correctly, see Chapter 3, “Problem determination procedures,” on page 11 for diagnostic information.
- Observe good housekeeping in the area where you are working. Place removed covers and other parts in a safe place.
- If you must start the server while the cover is removed, make sure that no one is near the server and that no tools or other objects have been left inside the server.
- Do not attempt to lift an object that you think is too heavy for you. If you have to lift a heavy object, observe the following precautions:
  - Make sure that you can stand safely without slipping.
  - Distribute the weight of the object equally between your feet.
  - Use a slow lifting force. Never move suddenly or twist when you lift a heavy object.
  - To avoid straining the muscles in your back, lift by standing or by pushing up with your leg muscles.
- Make sure that you have an adequate number of properly grounded electrical outlets for the server, monitor, and other devices.
- Back up all important data before you make changes to disk drives.
- Have a small flat-blade screwdriver available.
- To view the error LEDs on the system board and internal components, leave the server connected to power.
- You do not have to turn off the server to install or replace hot-swap fans, redundant hot-swap ac power supplies, or hot-plug Universal Serial Bus (USB) devices. However, you must turn off the server before you perform any steps that involve removing or installing adapter cables or non-hot-swap optional devices or components.
- Blue on a component indicates touch points, where you can grip the component to remove it from or install it in the server, open or close a latch, and so on.
- Orange on a component or an orange label on or near a component indicates that the component can be hot-swapped, which means that if the server and operating system support hot-swap capability, you can remove or install the component while the server is running. (Orange can also indicate touch points on hot-swap components.) See the instructions for removing or installing a specific hot-swap component for any additional procedures that you might have to perform before you remove or install the component.
- When you are finished working on the server, reinstall all safety shields, guards, labels, and ground wires.
- For a list of supported optional-devices for the server, see http://www.ibm.com/servers/eserver/serverproven/compat/us/.

System reliability guidelines

To help ensure proper cooling and system reliability, make sure that:

- Each of the drive bays has a drive or a filler panel and electromagnetic compatibility (EMC) shield installed in it.
- If the server has redundant power, each of the power-supply bays has a power supply installed in it.
- There is adequate space around the server to allow the server cooling system to work properly. Leave approximately 50 mm (2.0 in.) of open space around the front and rear of the server. Do not place objects in front of the fans. For proper cooling and airflow, replace the server cover before turning on the server. Operating the server for extended periods of time (more than 30 minutes) with the server cover removed might damage server components.
- You have followed the cabling instructions that come with optional adapters.
- You have replaced a failed fan within 48 hours.
- You have replaced a hot-swap fan within 30 seconds of removal.
- You do not operate the server without the air baffles installed. Operating the server without the air baffles might cause the microprocessor to overheat.

Working inside the server with the power on

Attention: Static electricity that is released to internal server components when the server is powered-on might cause the server to halt, which might result in the loss of data. To avoid this potential problem, always use an electrostatic-discharge wrist strap or other grounding system when you work inside the server with the power on.

The server supports hot-plug, hot-add, and hot-swap devices and is designed to operate safely while it is turned on and the cover is removed. Follow these guidelines when you work inside a server that is turned on:

- Avoid wearing loose-fitting clothing on your forearms. Button long-sleeved shirts before working inside the server; do not wear cuff links while you are working inside the server.
- Do not allow your necktie or scarf to hang inside the server.
- Remove jewelry, such as bracelets, necklaces, rings, and loose-fitting wrist watches.
- Remove items from your shirt pocket, such as pens and pencils, that could fall into the server as you lean over it.
- Avoid dropping any metallic objects, such as paper clips, hairpins, and screws, into the server.

Handling static-sensitive devices

Attention: Static electricity can damage the server and other electronic devices. To avoid damage, keep static-sensitive devices in their static-protective packages until you are ready to install them.

To reduce the possibility of damage from electrostatic discharge, observe the following precautions:

- Limit your movement. Movement can cause static electricity to build up around you.

- The use of a grounding system is recommended. For example, wear an electrostatic-discharge wrist strap, if one is available. Always use an electrostatic-discharge wrist strap or other grounding system when you work inside the server with the power on.
- Handle the device carefully, holding it by its edges or its frame.
- Do not touch solder joints, pins, or exposed circuitry.
- Do not leave the device where others can handle and damage it.
- While the device is still in its static-protective package, touch it to an unpainted metal surface on the outside of the server for at least 2 seconds. This drains static electricity from the package and from your body.
- Remove the device from its package and install it directly into the server without setting down the device. If it is necessary to set down the device, put it back into its static-protective package. Do not place the device on the server cover or on a metal surface.
- Take additional care when handling devices during cold weather. Heating reduces indoor humidity and increases static electricity.

Returning a device or component

If you are instructed to return a device or component, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Chapter 2. Start here

You can solve many problems without outside assistance by following the troubleshooting procedures in this *Problem Determination and Service Guide* and on the IBM website. This document describes the troubleshooting procedures and explanations of event messages and error codes. The documentation that comes with your operating system and software also contains troubleshooting information.

Before you contact IBM or an approved warranty service provider, follow these procedures in the order in which they are presented to diagnose a problem with the server or the ServeRAID controller:

1. **Determine what has changed.**

   A ServeRAID M controller issue can occur when changes are introduced into an operational server. If there is a clear cause and effect to a change, back out the change until a workaround or a fix is available. If the recent change status is unknown, determine whether any of the following items were added, removed, replaced, or updated before the problem occurred:

   - System Unified Extensible Firmware Interface (UEFI) or basic input/output system (BIOS) code update
   - ServeRAID M controller BIOS or firmware update
   - ServeRAID M controller device driver update
   - Other hardware components added
   - Other software or device driver update
   - Any software configuration changes

   Note: IBM does not support updating to previous versions of ServeRAID M BIOS and firmware packages.

2. **Collect data.**

   Thorough data collection is necessary for effectively diagnosing hardware and software problems. The following clues are used to determine the best approach to solving specific problems:

   Document event messages, error codes, and system-board LEDs.

   - Check the system-events logs for hardware faults within the integrated management module (IMM), baseboard management controller (BMC), or Remote Supervisor Adapter (RSA) logs, as applicable to the specific server.
   - Check for operating-system event messages.
   - Check MegaRAID Storage Manager for event messages.
   - Document the light path diagnostics LEDs and the LEDs for the attached disk drives.
   - Observe the server for POST messages as the server starts.
   - Observe and record any suspect controller or hard disk drive behavior.

3. **Programmatically collect system data by using IBM Dynamic System Analysis (DSA).**

   If a server can boot to the operating system, Dynamic System Analysis (DSA) can programmatically collect important system and configuration information that you can use to diagnose the problem.

   Run DSA to collect information about the hardware, firmware, software, and operating system. Have this information available when you contact IBM or an approved warranty service provider. For more information about running DSA,

© Copyright IBM Corp. 2010, 2012

see the *IBM Dynamic System Analysis Installation and User's Guide*, which is available on the DSA download web page.

If you have to download the latest version of DSA, go to http://www.ibm.com/systems/support/supportsite.wss/docdisplay?brandind=5000008&lndocid=SERV-DSA.

4. **Follow the problem-resolution procedures.**

   The following four problem-resolution procedures are presented in the order in which they are most likely to solve your problem. Follow these procedures in the order in which they are presented:

   a. **Apply software updates.**

      IBM incorporates all known fixes into the latest release of software and firmware for the ServeRAID M controllers. Most known issues are corrected by updates to the software and device drivers for the hardware components. This is the first step in eliminating known issues that might be causing problems.

      Server software can also affect the behavior of the ServeRAID M controllers. You must update the server with the latest versions of available software to eliminate known issues. All systems and ServeRAID M software updates include “change history” documentation that describes the changes, fixes, or improvements that are made to the software. A change history file has a .chg extension. This file is a plain text downloadable document that is available at the same location where the updated software is downloaded.

      Important: Software and device driver updates are best applied to correct behavioral problems within the subsystem or to improve stability. If the server or ServeRAID M subsystem is in an Offline or Failed state, it is best not to attempt any updates to the software until the system and configuration are stabilized. After a system experiences a failure, it is usually best to bring the system into an operational state and then apply the software updates.

      All ServeRAID M software, drivers, and firmware updates can be downloaded from the IBM support matrix - SAS/SATA II matrix at http://www.ibm.com/support/entry/portal/docdisplay?lndocid=MIGR-5073015.

      The following other important software updates are available at the Fix Central software download section:

      - Hard disk drive firmware updates
      - Enclosure unit updates
      - System software updates

      After you apply software updates, observer the ServeRAID M controller for correct operation. See the next section if the problem is not solved.

b. **Controller hardware checkout procedure.**

Review the ServeRAID M hardware and software configuration for correct installation.

Safety: Power off the server before you follow these checkout procedures.

- ServeRAID M controller
  - Reseat the controller in the PCIe slot
  - Align and secure the chassis brackets in the slot correctly. This is very important if you are installing the controller on a riser-card assembly before you install it in the server.
  - Review the server documentation to make sure that the expansion-slot restrictions are observed. A system might limit the use of some slots because of thermal issues, fit restrictions, or interference with other internal components.
- SAS/SATA cables
  - Reseat any SAS/SATA cable connections. Each connection must latch and click into place from the controller to the backplane.
  - In simple-swap configurations, the SAS/SATA cables might be attached directly to the drive or to a simple-swap connector at the back of a drive cage that is connected to the system board.
  - Make sure that each cable has the correct bend radius. Exceeding the bend radius as outlined in the server documentation can add stress to the components.
  - Make sure that the SAS/SATA cables are not overstretched, nicked, or damaged.
- Internal power cables
  - Backplane power cables are keyed to ensure that they attached correctly to the server and the disk drive backplane. Most power cables latch with a plastic connector. Reseat the backplane power cables.
  - In a simple-swap configuration, the power cables are connected directly to a drive, or the simple-swap connector at the back of the drive cage is attached directly to the power supply.
- I2C

  The I2C cable is connected from the hot-swap backplane to the system board. This cable controls the amber LEDs for the hard disk drives and the out-of-band alert notifications. Reseat the I2C cables.
- Backplanes

  Make sure that the backplanes are seated correctly by using the information in the server documentation. An incorrectly seated or aligned backplane can cause hard disk drive related problems because of a bad connection to a disk drive. Inspect the seating of the backplane and reseat as needed.
- Hard disk drives (including solid state drives)
  - Reseat the hot-swap drives against the backplane to make sure that they are installed correctly.
  - A simple-swap server might require removal of the front bezel to gain access to the hard disks drives to reseat them.
- Controller-mounted batteries
  - Batteries that are mounted on the controller come disconnected in the packaging, and you must connect the battery at the time of installation.

- Battery connections are keyed to ensure that they are mounted in the correct orientation.
- New batteries might trigger battery errors the first few times they are powered on, depending on the level of discharge of the battery. Allow new batteries to charge for at least 30 minutes within a server before they change to an operational state. Batteries might require up to 6 hours to fully charge.

• Remote batteries

  To meet airflow and cooling requirements, mount remote batteries according to the server documentation.

c. **Symptom-based problem determination**

- Go to “Hard disk drive LED-to-action” on page 11.
- Go to “POST messages-to-action” on page 14.
- Go to “Event messages-to-actions” on page 29.
- Go to “Symptoms-to-actions” on page 60.
- Go to “System events-to-actions index” on page 62.
- Check for updated troubleshooting procedures and RETAIN tips.

d. **RETAIN tips**

Troubleshooting procedures and RETAIN tips document known problems and suggested solutions. To search for troubleshooting procedures and RETAIN tips, complete the following steps.

Note: Changes are made periodically to the IBM Web site. The actual procedure might vary slightly from what is described in this document.

1) Go to http://www.ibm.com/systems/support/.
2) Under **Product support**, click **System x**.
3) From the **Product family** list, select the server.
4) Under **Choose your page**, click **Troubleshooting**.
5) Under **Problem Resolution** select the troubleshooting procedure or RETAIN tip that applies to your problem.

e. **Check for and replace defective hardware.**

- Replace hardware determined to be defective using the problem determination procedures.
- See Chapter 6, “Parts listing,” on page 71 for more details.

Chapter 3. Problem determination procedures

Problem determination procedures have several starting points, depending on the indicator that alerts you to a problem within the subsystem. The troubleshooting paths are as follows:

- Light path diagnostics LEDs-to-actions
- POST messages-to-actions
- Event messages-to-actions
- Symptom-to-actions
- System events-to-actions

If you cannot diagnose and correct a problem by using the information in this chapter, see Appendix A, “Getting help and technical assistance,” on page 73 for more information.

Hard disk drive LED-to-action

Light path diagnostics LEDs on the front panel of the server indicate symptoms within the entire system; however, this *Problem Determination and Service Guide* is focusing only on the LEDs that are relative to the storage subsystem. The front panel display and bezel LEDs are used to solve hard disk drive problems.

If the hard disk drive status LED is lit, it means that an out-of-band alert for the RAID controller was posted to the system-event logs. These messages are helpful for remote administration and alert automation; however, when you are troubleshooting hard drive issues from the front of the system, use the following table to review the LED behaviors and take the applicable actions.

Table 1. Hard disk drive LED-to-action

Symptom	Action
A hard disk drive has failed, and the associated amber hard disk drive status LED is steady.	1. Replace the failed hard disk drive that has an amber LED that is lit. (For more information, see “Removing a hot-swap hard disk drive” on page 63 and “Installing a hot-swap hard disk drive” on page 64.) 2. Observe the drive LEDs for normal operation, as described in “Installing a hot-swap hard disk drive” on page 64. The amber LED turns off, and the green activity LED flashes while the hard disk drive is accessed by the controller.

© Copyright IBM Corp. 2010, 2012

Table 1. Hard disk drive LED-to-action (continued)

Symptom	Action
An installed hard disk drive is not recognized.	1. Is the hard disk drive amber LED lit or off? • If the LED is lit, it indicates a drive fault. • If the LED is off, the drive is working correctly. 2. If the amber LED is lit, remove the drive from the bay, wait 45 seconds, and reinsert the drive, making sure that the tray latches correctly to the system chassis. (For more information, see “Installing a hot-swap hard disk drive” on page 64.) 3. Observe the associated green hard disk drive activity LED and the amber status LED: • If the green activity LED is flashing and the amber status LED is not lit, the drive is recognized by the controller and is working correctly. Run Dynamic System Analysis (DSA) to determine whether the drive is detected. • If the green activity LED is flashing and the amber status LED is flashing slowly, the drive is recognized by the controller and is rebuilding. • If neither LED is lit or flashing when the drive is inserted, the hard disk drive backplane might not have the correct power (go to step 4). • If the green activity LED is flashing and the amber status LED is lit, replace the drive. If the activity of the LEDs remains the same, go to step 4. If the activity of the LEDs changes, return to step 1. 4. Make sure that the hard disk drive backplane is correctly seated. When it is correctly seated, the drive assemblies correctly connect to the backplane without bowing or causing movement of the backplane. 5. Move the hard disk drives to different bays to determine whether the drive or the backplane is not functioning. 6. Reseat the backplane power cable and repeat steps 1 through 3. 7. Reseat the backplane signal cable and repeat steps 1 through 3. 8. Suspect the backplane signal cable or the backplane: a. Replace the affected backplane signal cable. b. Replace the affected backplane. c. If installed, replace the SAS expander card. 9. Run the DSA tests for the SAS controller and hard disk drives: • If the controller passes the test but the drives are not recognized, replace the backplane signal cable and run the tests again. • Replace the backplane. • If the controller fails the test, disconnect the backplane signal cable from the controller and run the tests again. • If the controller fails the test, replace the controller. 10. If the problems cannot be corrected with these steps, contact IBM support.
Multiple hard disk drives fail.	Make sure that the hard disk drive, SAS RAID controller, and server device drivers and firmware are at the latest level. **Important:** Some cluster solutions require specific code levels or coordinated code updates. If the device is part of a cluster solution, verify that the latest level of code is supported for the cluster solution before you update the code.

Table 1. Hard disk drive LED-to-action (continued)

Symptom	Action
Multiple hard disk drives are offline.	1. To identify the cause of the problem, collect the storage subsystem logs by using DSA before taking any corrective actions. 2. Check for outside influences that might have contributed to multiple drives offline, for example, unexpected loss of power, system hang conditions, or other server-related problems that might be noted in the service processor logs. Take any necessary corrective actions noted in the server documentation. 3. Review the storage subsystem logs for indications about problems within the storage subsystem, such as backplane or cable problems. If the problem is obvious, for example, a controller failure or all disks on the same backplane are offline, review the hardware checkout procedure and use DSA diagnostics as described in previous sections of this table. 4. The controller will attempt to automatically reconfigure and recover offline drives the next time the server is started. • Follow the hardware checkout procedure, but try not to modify the controller configuration by using tools until an automatic recovery is attempted first. • The controller maintains its last known good configuration and attempts to sort out changes during the system boot, and it recovers a good configuration with the physical hard disk drives that are available. • After a catastrophic failure, the controller might see an offline RAID-volume as a foreign disk that can be imported. (For more information about importing logical volumes, see the ServeRAID-M user guide.) 5. Contact IBM support to review the logs and determine the corrective actions.
A replacement hard disk drive does not rebuild.	1. Make sure that the hard disk drive is recognized by the controller (the green hard disk drive activity LED is flashing). Compare the bezel location to the Preboot GUI utility or the Storage Manager Application (SMA), or use the CLI command to determine the current state of the device. You might have to configure the device before you use. 2. If the Automatic Rebuild feature is disabled, the replacement drive will not rebuild. You must configure the replaced drive as a spare. 3. The disk group/virtual drive (DG/VD) might have been protected by a hot spare and rebuilt to an alternative device. Check the configuration and determine whether the DG/VD is still degraded or whether another device is rebuilding. 4. Evaluate the hard disk drive LEDs by using the instructions in “A hard disk drive is not detected after installation” in this table.

Table 1. Hard disk drive LED-to-action (continued)

Symptom	Action
An amber hard disk drive status LED does not accurately represent the actual state of the associated drive.	1. If the amber hard disk drive LED and the RAID controller software do not indicate the same status for the drive, complete the following steps: a. Turn off the server. b. Reseat the SAS controller. c. Reseat the SAS cables. d. Reseat the power cable connections to the backplane. e. Reseat the SAS expander cables, if any are present. f. Reseat the I2C cable from the backplane to the server. g. Reseat the hard disk drive. h. Turn on the server and observe the activity of the hard disk drive LEDs for normal operation. i. Move the drive to another bay, if possible, to see whether the symptom stays with the drive. 2. If the problem remains: • Replace the I2C cables. • Replace the backplane. 3. If the problems cannot be corrected with these steps, contact IBM support.

POST messages-to-action

ServeRAID M POST messages are displayed after server power-on but before the operating system is loaded. POST messages do not appear during runtime operations, because they usually describe unexpected events that are detected between the previous shutdown and the most recent power on. Note all POST messages and follow the suggested actions.

IBM System x servers use two types of system initialization code: older servers use standard BIOS, and newer servers use UEFI. See your server documentation to determine which system initialization code is used. These two environments have different ServeRAID M behaviors during the POST process.

In BIOS-based IBM servers, ServeRAID M displays a POST banner. While the POST banner is displayed, new event messages are displayed to notify you of events or pauses for events that require user interaction.

IBM UEFI-based servers require an operating system that is UEFI supported to take full advantage of the new specification. Most IBM UEFI-based servers support a legacy mode that emulates the standard BIOS for backward compatibility to legacy operating systems that are not UEFI supported. When UEFI detects an operating system that is not UEFI supported, ServeRAID M controllers display a POST banner. If a native UEFI-supported operating system is installed, ServeRAID M might not display a post banner during normal operation; however, critical POST event messages are displayed.

Table 2. POST event messages

Event ID	**BOOT_MSG_8033X_ATU_ISSUE**
Message	Your controller's IO processor has a fault that can potentially cause data corruption. Your controller needs replacement. Please contact your system support. To continue please press 'Y' to acknowledge.
Controller response	Waits indefinitely for user input.
Suggested actions	Contact IBM support.
Event ID	**BOOT_MSG_BAD_MFC_SASADDRESS**
Message	Invalid SAS Address present in MFC data. Please program valid SAS Address.
Controller response	Waits 10 seconds and then continues to boot.
Suggested actions	The controller requires a valid SAS address for correct operation. This might not indicate bad hardware; however, the programmed SAS address is lost. Contact IBM support.
Event ID	**BOOT_MSG_SBR_SASADDRESS**
Message	Invalid SAS Address present in SBR. Please contact your system support. Press any key to continue with Default SAS Address.
Controller response	Waits indefinitely for user input.
Suggested actions	The controller requires a valid SAS address for correct operation. This might not indicate bad hardware; however, the programmed SAS address was lost and should recover, using the default SAS address during the next reboot of the server. If the controller continues to present this message, contact IBM support for additional assistance.

Table 2. POST event messages (continued)

Event ID	**BOOT_MSG_BBU_BAD**
Message	The battery is currently discharged or disconnected. Verify the connection and allow 30 minutes for charging. If the battery is properly connected and it has not returned to operational state after 30 minutes of charging then contact technical support for additional assistance.
Controller response	Waits 10 seconds for user input and then continues to boot.
Suggested actions	Power off the server, inspect the battery connections, and allow the battery to charge for 30 minutes. If the battery is good, the controller returns to an operational state; otherwise, contact IBM support for additional assistance.
Event ID	**BOOT_MSG_BBU_MSG_DISABLE**
Message	The battery hardware is missing or malfunctioning, or the battery is unplugged, or the battery could be fully discharged. If you continue to boot the system, the battery-backed cache will not function. If battery is connected and has been allowed to charge for 30 minutes and this message continues to appear, then contact technical support for assistance. Press 'D' to disable this warning (if your controller does not have a battery).
Controller response	Waits 10 seconds for user input and then continues to boot. The message is not disabled unless you press D.
Suggested actions	Check the battery connections and allow the battery to charge for 30 minutes. If the battery is good, the controller returns to an operational state; otherwise, contact IBM support for additional assistance.
Event ID	**BOOT_MSG_BBU_MSG_DISABLE_PERC**
Message	The battery is currently discharged or disconnected. VDs configured in write-back mode will run in write-through mode to protect your data and will return to write-back policy when the battery is operational. If VDs have not returned to write-back mode after 30 minutes of charging then contact technical support for additional assistance. The following VDs are affected: %s. Press any key to continue.
Controller response	Waits 10 seconds for user input and then continues to boot.
Suggested actions	Check the battery connections and allow the battery to charge for 30 minutes. If the battery is good, the controller returns to an operational state; otherwise, contact IBM support for additional assistance.
Event ID	**BOOT_MSG_CACHE_DISCARD**
Message	Memory/battery problems were detected. The adapter has recovered, but cached data was lost. Press any key to continue, or 'C' to load the configuration utility.
Controller response	Waits 5 seconds for user input and then continues to boot.
Suggested actions	The RAID controller recovered from a memory or battery issue but was unable to write pending data to the disks before the cache was lost. If this is expected, use the configuration utility to make any necessary adjustments; otherwise, try to determine the reason for this event. The cause of a memory or battery issue might be available from other logs or events at or near the time of the failure. Evaluate the contents of the virtual drives to determine what data was lost, and restore the data from backup, if necessary. Contact IBM support if additional assistance is needed.
Event ID	**BOOT_MSG_CACHE_DISCARD_WARNING**

Table 2. POST event messages (continued)

Message	Cache data was lost due to an unexpected power-off or reboot during a write operation, but the adapter has recovered. This could be due to memory problems, bad battery, or you may not have a battery installed. Press any key to continue or 'C' to load the configuration utility.
Controller response	Waits indefinitely for user input.
Suggested actions	The RAID controller recovered from a memory or battery issue but was unable to write pending data to the disks before the cache was lost. If this is expected, use the configuration utility to make any necessary adjustments; otherwise, try to determine the reason for this event. The cause of a memory or battery issue might be available from other logs or events at or near the time of the failure. Evaluate the contents of the virtual drives to determine what data was lost, and restore the data from backup, if necessary. Contact IBM support if additional assistance is needed.
Event ID	**BOOT_MSG_CACHE_DISCARD_WARNING_PERC**
Message	Cache data was lost, but the controller has recovered. This could be due to the fact that your controller had protected cache after an unexpected power loss and your system was without power longer than the battery backup time. Press any key to continue or 'C' to load the configuration utility.
Controller response	Waits indefinitely for user input.
Suggested actions	The RAID controller recovered from a memory or battery issue but was unable to write pending data to the disks before the cache was lost. If this is expected, use the configuration utility to make any necessary adjustments; otherwise, try to determine the reason for this event. The cause of a memory or battery issue might be available from other logs or events at or near the time of the failure. Evaluate the contents of the virtual drives to determine what data was lost, and restore the data from backup, if necessary. Contact IBM support if additional assistance is needed.
Event ID	**BOOT_MSG_CACHE_FLUSH_NOT_POSSIBLE**
Message	The cache contains dirty data, but some VDs are missing or will go offline, so the cached data can not be written to disk. If this is an unexpected error, then please power off your system and check your cables to ensure all disks are present. If you continue, the data in cache will be permanently discarded. Press 'X' to acknowledge and permanently destroy the cached data.
Controller response	Waits indefinitely for user input.
Suggested actions	If this is expected or intentional, press X to permanently discard the cached data; otherwise, power off the server and make sure that the cable and drive configuration is correct before you proceed. For more information, see “Controller hardware checkout procedure” on page 9. If the message remains, contact IBM support for additional assistance.
Event ID	**BOOT_MSG_CACHE_VERSION**
Message	Memory/battery problems were detected. The adapter has recovered, but cached data was lost. Press any key to continue, or 'C' to load the configuration utility.
Controller response	Wait 5 seconds for user input and then continues to boot.
Suggested actions	The RAID controller recovered from a memory or battery issue but was unable to write pending data to the disks before the cache was lost. If this is expected, use the configuration utility to make any necessary adjustments; otherwise, try to determine the reason for this event. The cause of a memory or battery issue might be available from other logs or events at or near the time of the failure. Evaluate the contents of the virtual drives to determine what data was lost, and restore the data from backup, if necessary. Contact IBM support if additional assistance is needed.

Table 2. POST event messages (continued)

Event ID	**BOOT_MSG_CFG_CMD_LOST**
Message	The most recent configuration command could not be committed and must be retried. Press any key to continue, or 'C' to load the configuration utility.
Controller response	Waits indefinitely for user input.
Suggested actions	Power off the server and make sure that the cable and drive configuration is correct. For more information, see “Controller hardware checkout procedure” on page 9. After you complete the hardware checkout procedure, try again to configure the controller and disks. If the message remains, contact IBM support for additional assistance.
Event ID	**BOOT_MSG_CONFIG_CHANGE_WARNING**
Message	Entering the configuration utility in this state will result in drive configuration changes. Press 'Y' to continue loading the configuration utility or please power off your system and check your cables to ensure all disks are present and reboot.
Controller response	Waits indefinitely for user input.
Suggested actions	If this is expected or intentional, press Y to commit the programmatic changes that the controller detects; otherwise, power off the server and make sure that the cable and drive configurations are correct. For more information, see “Controller hardware checkout procedure” on page 9. After you complete the hardware checkout procedure, power on the server and observe it for normal operation. If the message remains, contact IBM support for additional assistance.
Event ID	**BOOT_MSG_CONFIG_MISSING**
Message	All of the disks from your previous configuration are gone. If this is an unexpected message, then please power off your system and check your cables to ensure all disks are present. Press any key to continue, or 'C' to load the configuration utility.
Controller response	Waits indefinitely for user input.
Suggested actions	If this is expected or intentional, press C to start the configuration utility; otherwise, power off the server and make sure that the cable and drive configurations are correct. For more information, see “Controller hardware checkout procedure” on page 9. After you complete the hardware checkout procedure, power on the server and observe it for normal operation. If the message remains, contact IBM support for additional assistance.
Event ID	**BOOT_MSG_CTRL_DOWNGRADE_DETECTED**
Message	An upgrade key was present on a previous power cycle, but it is not connected. This can result in inaccessible data unless it is addressed. Please re-attach the upgrade key and reboot.
Controller response	Waits indefinitely for user input. The server must be restarted.
Suggested actions	A ServeRAID upgrade was installed on the previous boot but has been removed from the server. This is likely a user-induced issue. The data on the hard disk drives might be inaccessible or unrecoverable unless the upgrade is reinstalled. For more information about how to correctly install the upgrade, see the server documentation. If this is intentional, it might be possible to clear the drives permanently and destroy the data so that you can configure the server for another use.

Table 2. POST event messages (continued)

Event ID	**BOOT_MSG_CTRL_LOCK_KEY_INVALID**
Message	There was a drive security key error. All secure drives will be marked as foreign. Press any key to continue, or 'C' to load the configuration utility.
Controller response	Waits indefinitely for user input.
Suggested actions	This event is specific to the ServeRAID-MR10is controller and indicates that an invalid security key was handled by one or more drives. As a security precaution, all secure drives are being marked as foreign to protect the data. For more information about key management, see the “Data Encryption” section in the ServeRAID-MR10is *User's Guide*.
Event ID	**BOOT_MSG_CTRL_SECRET_KEY_FIRST**
Message	Drive security is enabled on this controller and a pass phrase is required. Please enter the pass phrase.
Controller response	Waits indefinitely for the user's pass phrase.
Suggested actions	This event is specific to the ServeRAID-MR10is controller. A valid user pass phrase is required in the current configuration. See your system administrator to obtain the pass phrase. For more information about secure controller management procedures, see the “Data Encryption” section in the ServeRAID-MR10is *User's Guide*.
Event ID	**BOOT_MSG_CTRL_SECRET_KEY_RETRY**
Message	Invalid pass phrase. Please enter the pass phrase.
Controller response	Waits indefinitely for the user's pass phrase.
Suggested actions	This event is specific to the ServeRAID-MR10is controller. A valid user pass phrase is required in the current configuration. See your system administrator to obtain the pass phrase. For more information about secure controller management procedures, see the “Data Encryption” section in the ServeRAID-MR10is *User's Guide*.
Event ID	**BOOT_MSG_DDF_FOREIGN_FOUND**
Message	Foreign configuration(s) found on adapter. Press any key to continue or 'C' load the configuration utility, or 'F' to import foreign configuration(s) and continue.
Controller response	Waits 10 seconds for user input and then imports the foreign configuration if there is no user input.
Suggested actions	A foreign configuration was detected on the controller. The user has 10 seconds to press C or F. Press C to start the configuration utility and stop the automatic import of the foreign configuration, or press F to immediately start the import. After the 10 seconds has expired, the controller automatically attempts to import the foreign configuration.
Event ID	**BOOT_MSG_DDF_IMPORT**
Message	Previous configuration cleared or missing. Importing configuration created on %02d/%02d %2d:%02d. Press any key to continue, or 'C' to load the configuration utility.
Controller response	Waits 10 seconds for user input and then imports the foreign configuration if there is no user input.
Suggested actions	The controller reports that a previously good configuration is missing (as if the drive were removed) and a foreign configuration is now detected on the controller. The user has 10 seconds to press C to start the configuration utility and stop the automatic import of the foreign configuration. After the 10 seconds has expired, the controller automatically attempts to import the foreign configuration.

Table 2. POST event messages (continued)

Event ID	**BOOT_MSG_DDF_MFC_INCOMPATIBLE**
Message	The native configuration is no longer supported by the current controller settings. Please ensure that correct controller or ibutton is being used. If you continue the configuration will be marked foreign and part of it may be imported if possible. Press any key to continue.
Controller response	Waits 5 seconds for user input and then continues to boot. During the boot process, the controller attempts to programmatically resolve the configuration issues, if possible.
Suggested actions	The controller detects one or more possible changes within the subsystem that affect the use of the existing configuration. The controller might have changed, and the new controller might have a previous version of firmware. Changes between levels of code and controller types might introduce incompatibilities to the configuration information that is stored on the disk devices. The controller attempts to resolve these issues, but this might not be successful. You can allow it to try to resolve the issues, or you can start the configuration utility and make any necessary adjustments.
Event ID	**BOOT_MSG_DISCOVERY_ERROR**
Message	A discovery error has occurred, please power cycle the system and all the enclosures attached to this system.
Controller response	Waits indefinitely. Requires the server to be restarted.
Suggested actions	A serious discovery error occurred while the controller was probing attached devices. This is a logical issue and does not necessarily indicate a hardware problem. Power cycling the host server and the attached enclosure units resets and clears the problem in most circumstances. If the error remains, inspect the cable connections and make sure that the enclosure units are attached correctly. If this error occurs in a new installation, test the controller with a smaller configuration to isolate the problem. Add components back one at a time until the error occurs. In an existing configuration, you might have to swap a known good environmental services module within each enclosure unit chain to isolate the fault.
Event ID	**BOOT_MSG_DUAL_BAT_PRSNT**
Message	Two BBUs are connected to the adapter. This is not a supported configuration. Battery and caching operations are disabled. Remove one BBU and reboot to restore battery and caching operations. If dirty cache is lost in this boot that could have been because of dual battery presence.
Controller response	Waits 10 seconds and then continues to boot with adjusted settings according to the displayed message.
Suggested actions	Examine the battery configuration according to the *User's Guide* for the affected controller. Correct any issues that are observed.

Table 2. POST event messages (continued)

Event ID	**BOOT_MSG_EMBEDDED_MULTIBIT_ECC_ERROR**
Message	Multibit ECC errors were detected on the RAID controller. If you continue, data corruption can occur. Please contact technical support to resolve this issue. Press 'X' to continue or else power off the system, replace the controller and reboot.
Controller response	Waits indefinitely for user input.
Suggested actions	This event is a strong indicator that the controller has failed and requires service. The error indicates that there is a potential for data loss, not that data loss has occurred. Replace the controller before you continue, and inspect the data for data loss. It might be necessary to restore lost data from a recent backup. Contact IBM support for additional assistance.
Event ID	**BOOT_MSG_EMBEDDED_SINGLE_BIT_ECC_ERROR**
Message	Single-bit ECC errors were detected on the RAID controller. Please contact technical support to resolve this issue. Press 'X' to continue or else power off the system, replace the controller and reboot.
Controller response	Waits indefinitely for user input.
Suggested actions	This event is a strong indicator that the controller has failed and requires service. The error indicates that there is a potential for data loss, not that data loss has occurred. Replace the controller before you continue, and inspect the data for data loss. It might be necessary to restore lost data from a recent backup. Contact IBM support for additional assistance.
Event ID	**BOOT_MSG_EMBEDDED_SINGLE_BIT_OVERFLOW_ECC_ERROR**
Message	Single-bit overflow ECC errors were detected on the RAID controller. If you continue, data corruption can occur. Please contact technical support to resolve this issue. Press 'X' to continue or else power off the system, replace the controller and reboot.
Controller response	Waits indefinitely for user input.
Suggested actions	This event is a strong indicator that the controller has failed and requires service. The error indicates that there is a potential for data loss, not that data loss has occurred. Replace the controller before you continue, and inspect the data for data loss. It might be necessary to restore lost data from a recent backup. Contact IBM support for additional assistance.
Event ID	**BOOT_MSG_ENCL_COUNT_PER_PORT_EXCEEDED**
Message	There are *%d* enclosures connected to connector *%s*, but only maximum of *%d* enclosures can be connected to a single SAS connector. Remove the extra enclosures and then restart your system.
Controller response	Waits indefinitely. Requires the server to be restarted.
Suggested actions	This event indicates that too many enclosure units are chained together on the same port. For the correct installation procedures and requirements, see the enclosure unit documentation. The total number of enclosure units must not exceed the number in the event message for this controller.
Event ID	**BOOT_MSG_ENCL_VIOLATION_MODE**
Message	Attached Enclosure doesn't support in controller's Direct mapping mode. Please contact your system support. System has halted due to unsupported configuration.
Controller response	Waits indefinitely. Requires the server to be restarted.

Table 2. POST event messages (continued)

Suggested actions	This event indicates a serious configuration issue. Before you contact IBM support, review the IBM System x ServerProven matrix to verify that the server supports the ServeRAID M controller and enclosure unit. If both devices are supported and this error occurs, contact IBM support for assistance.
Event ID	**BOOT_MSG_EXPANDER_VIOLATION_FORCE_REBOOT**
Message	Expander Detected in controller with Direct mapping mode Reconfiguring automatically to persistent mapping mode. Automatic reboot would happen in 10 seconds.
Controller response	Waits 10 seconds and then automatically warm boots.
Suggested actions	The controller detected and corrected a configuration issue with an attached expander. The change requires a server restart, which occurs automatically. No additional action is required.
Event ID	**BOOT_MSG_FIRMWARE_ALPHA**
Message	This firmware is an ALPHA version - It has not completed all validations. The validation stamp is: %s
Controller response	Waits 1 second and then continues to boot.
Suggested actions	This is a notification that the controller is operating with alpha code that might not be fully featured or tested. This software must not be used in a production environment. To download the latest supported version of software from the ServeRAID software matrix, go to http://www-947.ibm.com/systems/support/supportsite.wss/docdisplay?lndocid=SERV-RAID&brandind=5000008.
Event ID	**BOOT_MSG_FIRMWARE_BETA**
Message	This firmware is BETA version - It has not completed all validations. The validation stamp is: %s
Controller response	Waits 1 second and then continues to boot.
Suggested actions	This is a notification that the controller is operating with beta code that might not be fully featured or tested. This software must not be used in a production environment. To download the latest supported version of software from the ServeRAID software matrix, go to http://www-947.ibm.com/systems/support/supportsite.wss/docdisplay?lndocid=SERV-RAID&brandind=5000008.
Event ID	**BOOT_MSG_FIRMWARE_TEST**
Message	This firmware is a TEST version - It has not completed any validation.
Controller response	Waits 1 second and then continues to boot.
Suggested actions	This is a notification that the controller is operating with a test version of firmware that might not be fully featured or tested. This software must not be used in a production environment. To download the latest supported version of software from the ServeRAID software matrix, go to http://www-947.ibm.com/systems/support/supportsite.wss/docdisplay?lndocid=SERV-RAID&brandind=5000008.
Event ID	**BOOT_MSG_HBA_MULTIBIT_ECC_ERROR**
Message	Multibit ECC errors were detected on the RAID controller. The DIMM on the controller needs replacement. Please contact technical support to resolve this issue. If you continue, data corruption can occur. Press 'X' to continue or else power off the system and replace the DIMM module and reboot. If you have replaced the DIMM press 'X' to continue.

Table 2. POST event messages (continued)

Controller response	Waits indefinitely for user input.
Suggested actions	This event is a strong indicator that the controller has failed and requires service. The error indicates that there is a potential for data loss, not that data loss has occurred. Replace the controller before you continue, and inspect the data for data loss. You might have to restore lost data from a recent backup. Contact IBM support for additional assistance.
Event ID	**BOOT_MSG_HBA_SINGLE_BIT_ECC_ERROR**
Message	Single-bit ECC errors were detected during the previous boot of the RAID controller. The DIMM on the controller needs replacement. Please contact technical support to resolve this issue. Press 'X' to continue or else power off the system and replace the DIMM module and reboot. If you have replaced the DIMM press 'X' to continue.
Controller response	Waits indefinitely for user input.
Suggested actions	This event is a strong indicator that the controller has failed and requires service. The error indicates that there is a potential for data loss, not that data loss has occurred. Replace the controller before you continue, and inspect the data for data loss. You might have to restore lost data from a recent backup. Contact IBM support for additional assistance.
Event ID	**BOOT_MSG_HBA_SINGLE_BIT_OVERFLOW_ECC_ERROR**
Message	Single-bit overflow ECC errors were detected during the previous boot of the RAID controller. The DIMM on the controller needs replacement. Please contact technical support to resolve this issue. If you continue, data corruption can occur. Press 'X' to continue or else power off the system and replace the DIMM module and reboot. If you have replaced the DIMM press 'X' to continue.
Controller response	Waits indefinitely for user input.
Suggested actions	This event is a strong indicator that the controller has failed and requires service. The error indicates that there is a potential for data loss, not that data loss has occurred. Replace the controller before you continue, and inspect the data for data loss. You might have to restore lost data from a recent backup. Contact IBM support for additional assistance.
Event ID	**BOOT_MSG_INCOMPATIBLE_SECONDARY_IBUTTON**
Message	Please insert the correct iButton and restart the system. Press any key to continue but OEM specific features will not be upgraded!
Controller response	Waits indefinitely for user input.
Suggested actions	This event indicates that the wrong upgrade was installed on the controller. Some controllers support advanced functions when an enabler memory cache DIMM is installed. In this case, the wrong enabler DIMM was installed for the controller. For the correct part and installation guidelines, see the ServeRAID M documentation. The controller does allow you to continue to boot by pressing any key without enabling the advanced features and options.
Event ID	**BOOT_MSG_IR_MR_MIGRATION_FAILED**
Message	IR to MR Migration failed. Press any key to continue with MR defined NVDATA values.
Controller response	Waits indefinitely for user input.

Table 2. POST event messages (continued)

Suggested actions	A ServeRAID M controller was attempting to migrate an existing configuration from an IR controller but failed. The configuration information that the controller uses during normal operation has a high probability of being in an invalid state because of an incomplete migration. This might cause the data to be permanently inaccessible.
Event ID	**BOOT_MSG_KEY_EKMS_FAILURE**
Message	Unable to communicate to EKMS. If you continue, there will be a drive security key error and all secure configurations will be marked as foreign. Please check connection with the EKMS, reboot the machine to retry the EKMS or press any key to continue.
Controller response	Waits indefinitely for user input.
Suggested actions	This event is specific to the ServeRAID-MR10is controller and indicates that the controller cannot communicate with the external key management server (EKMS). As a security precaution, all secure drives are being marked as foreign to protect the data. For more information about key management and the EKMS, see the “Data Encryption” section in the ServeRAID-MR10is *User's Guide*.
Event ID	**BOOT_MSG_KEY_MISSING_REBOOT_OR_CONTINUE**
Message	Invalid pass phrase. If you continue, there will be a drive security key error and all secure configurations will be marked as foreign. Reboot the machine to retry the pass phrase or press any key to continue.
Controller response	Waits indefinitely for user input.
Suggested actions	This event is specific to the ServeRAID-MR10is controller. A valid user pass phrase is required in the current configuration. See your system administrator to obtain the pass phrase. For more information about secure controller management procedures, see the “Data Encryption” section in the ServeRAID-MR10is *User's Guide*.
Event ID	**BOOT_MSG_LDS_CACHE_PINNED**
Message	There are offline or missing virtual drives with preserved cache. Please check the cables and ensure that all drives are present. Press any key to continue, or 'C' to load the configuration utility.
Controller response	Waits indefinitely for user input.
Suggested actions	The controller detects offline or missing physical disks that cause unavailable virtual drives that were previously attached with uncommitted writes in the memory cache. If this is expected or intentional, start the configuration utility and make any necessary adjustments. Otherwise, power off the server and make sure that the cable and drive configuration is correct. For more information, see “Controller hardware checkout procedure” on page 9. After you complete the hardware checkout procedure, power on the server and observe it for normal operation. If the drives are returned to an operational state, the preserved writes should commit the changes from the memory cache. If the message remains, contact IBM support for additional assistance.
Event ID	**BOOT_MSG_LDS_CACHE_PINNED_HALT**
Message	There are offline or missing virtual drives with preserved cache. Please check the cables and ensure that all drives are present. Press any key to enter the configuration utility.
Controller response	Waits indefinitely for user input.

Table 2. POST event messages (continued)

Suggested actions	The controller detects offline or missing physical disks that cause unavailable virtual drives that were previously attached with uncommitted writes in the memory cache. If this is expected or intentional, start the configuration utility and make any necessary adjustments. Otherwise, power off the server and make sure that the cable and drive configuration is correct. For more information, see “Controller hardware checkout procedure” on page 9. After you complete the hardware checkout procedure, power on the server and observe it for normal operation. If the drives are returned to an operational state, the preserved writes should commit the changes from the memory cache. If the message remains, contact IBM support for additional assistance.
Event ID	**BOOT_MSG_LDS_MISSING**
Message	The following VDs are missing: %s. If you proceed (or load the configuration utility), these VDs will be removed from your configuration. If you wish to use them at a later time, they will have to be imported. If you believe these VDs should be present, please power off your system and check your cables to ensure all disks are present. Press any key to continue, or 'C' to load the configuration utility.
Controller response	Waits indefinitely for user input.
Suggested actions	If this is expected or intentional, press C to start the configuration utility; otherwise, power off the server and make sure that the cable and drive configuration is correct. For more information, see “Controller hardware checkout procedure” on page 9. After you complete the hardware checkout procedure, power on the server and observe it for normal operation.
Event ID	**BOOT_MSG_LDS_OFFLINE**
Message	The following VDs have missing disks: %s If you proceed (or load the configuration utility), these VDs will be marked OFFLINE and will be inaccessible. Please check your cables and ensure all disks are present. Press any key to continue, or 'C' to load the configuration utility.
Controller response	Waits indefinitely for user input.
Suggested actions	If this is expected or intentional, press C to start the configuration utility; otherwise, power off the server and make sure that the cable and drive configuration is correct. For more information, see “Controller hardware checkout procedure” on page 9. After you complete the hardware checkout procedure, power on the server and observe it for normal operation.
Event ID	**BOOT_MSG_LDS_WILL_RUN_WRITE_THRU**
Message	Your VDs that are configured for write-back are temporarily running in write-through mode. This is caused by the battery being charged, missing or bad. Please allow the battery to charge for 24 hours before evaluating the battery for replacement. The following VDs are affected: %s. Press any key to continue.
Controller response	Waits 5 seconds for user input and then continues to boot.

Table 2. POST event messages (continued)

Suggested actions	The RAID controller has one of several possible problems with the battery: the battery might have to be charged, it might be missing, or it might be bad. If the virtual drive (VD) was previously configured to run in write-back, the controller programmatically switches to write-through to protect pending write operations from waiting in the memory cache, which can expose the subsystem to data loss if an unexpected power failure occurs. This usually has some impact on performance while the temporary change is in effect. From a service perspective, inspect the battery and connections for correct installation. Good batteries return to write-back after approximately 30 minutes of charging. For more information, see the ServeRAID M controller *User's Guide*.
Event ID	**BOOT_MSG_LDS_WILL_RUN_WRITE_THRU_PERC**
Message	The battery is currently discharged or disconnected. VDs configured in write-back mode will run in write-through mode to protect your data and will return to write-back policy when the battery is operational. If VDs have not returned to write-back mode after 30 minutes of charging then contact technical support for additional assistance. The following VDs are affected: %s. Press any key to continue.
Controller response	Waits 5 seconds for user input and then continues to boot.
Suggested actions	The RAID controller has one of several possible problems with the battery: the battery might have to be charged, it might be missing, or it might be bad. If the virtual drive (VD) was previously configured to run in write-back, the controller programmatically switches to write-through to protect pending write operations from waiting in the memory cache, which can expose the subsystem to data loss if an unexpected power failure occurs. This usually has some impact on performance while the temporary change is in effect. From a service perspective, inspect the battery and connections for correct installation. Good batteries return to write-back after approximately 30 minutes of charging. For more information, see the ServeRAID M controller *User's Guide*.
Event ID	**BOOT_MSG_MAX_DISKS_EXCEEDED**
Message	Number of disks exceeded the maximum supported count of %d disks. Please remove the extra drives and reboot system to avoid losing data Press 'Y' to continue with extra drives.
Controller response	Waits indefinitely for user input.
Suggested actions	The controller detects more drives than are supported. There is a potential to lose data from the drives that the controller cannot use because of this limitation. Power off the server and reduce the number of attached drives to a supported configuration. If there is a good configuration on the controller and the error occurs after you attach additional drives, remove the most recently added drives first. Reducing the total number of drives returns the controller to normal operation.
Event ID	**BOOT_MSG_MAX_DISKS_EXCEEDED_PER_QUAD**
Message	Number of devices exceeded the maximum limit of devices per quad. Please remove the extra drives and reboot system to avoid losing data System has halted due to unsupported configuration.
Controller response	Waits indefinitely. Requires the server to be restarted.
Suggested actions	The controller detects more drives than are supported. There is a potential to lose data from the drives that the controller cannot use because of this limitation. Power off the server and reduce the number of attached drives to a supported configuration. If there is a good configuration on the controller and the error occurs after you attach additional drives, remove the most recently added drives first. Reducing the total number of drives returns the controller to normal operation.

Table 2. POST event messages (continued)

Event ID	**BOOT_MSG_MEMORY_INVALID**
Message	Invalid memory configuration detected. Please contact your system support. System has halted.
Controller response	Waits indefinitely. Requires the server to be restarted.
Suggested actions	This indicates a problem with the system memory configuration. Power off the server and see the server documentation for information about the correct memory installation and configuration.
Event ID	**BOOT_MSG_NVDATA_IMAGE_MISSING**
Message	Firmware did not find valid NVDATA image. Please program valid NVDATA image and restart your system. Press any key to continue.
Controller response	Waits indefinitely for user input. The server must be restarted.
Suggested actions	The controller firmware is missing or corrupt. Attempt to update the firmware by using the **megacli** command in the LSI MegaCLI tool, or if this is the primary boot controller, use the IBM UpdateXpress System Pack Installer bootable update environment. If the update fails, replace the controller. Contact IBM support for additional assistance.
Event ID	**BOOT_MSG_PDS_MISSING**
Message	Some configured disks have been removed from your system, or are no longer accessible. Please check your cables and also ensure all disks are present. Press any key to continue, or 'C' to load the configuration utility.
Controller response	Waits indefinitely for user input.
Suggested actions	If this is expected or intentional, press C to start the configuration utility; otherwise, power off the server and make sure that the cable and drive configuration is correct. For more information, see “Controller hardware checkout procedure” on page 9. After you complete the hardware checkout procedure, power on the server and observe it for normal operation.
Event ID	**BOOT_MSG_REKEY_TO_EKMS_FAILURE**
Message	Unable to Rekey security to EKMS as not able to communicate to EKMS. If you continue, the drive security will remain to existing security mode. Please check connection with the EKMS, reboot the machine to retry the EKMS or press any key to continue.
Controller response	Waits indefinitely for user input.
Suggested actions	This event is specific to the ServeRAID-MR10is controller and indicates that the controller cannot communicate with the external key management server (EKMS). For more information about key management and the EKMS, see the “Data Encryption” section in the ServeRAID-MR10is *User's Guide*.
Event ID	**BOOT_MSG_REPOSITORY_MISSING**
Message	Snapshot Repository VDs %s have been removed from your system, or are no longer accessible. Please check your cables and ensure all disks are present. If you continue to boot the system, the snapshot related data will be lost. Press any key to continue, or 'C' to load the configuration utility.
Controller response	Waits indefinitely for user input.

Table 2. POST event messages (continued)

Suggested actions	The controller detects offline or missing physical disks that are causing previously attached virtual disks to be unavailable. If this is expected or intentional, start the configuration utility and make any necessary adjustments. Otherwise, power off the server and make sure that the cable and drive configuration is correct. For more information, see “Controller hardware checkout procedure” on page 9. After you complete the hardware checkout procedure, power on the server and observe it for normal operation. If the drives are returned to an operational state, the snapshot-related data will be written.
Event ID	**BOOT_MSG_ROLLBACK_ACTIVE**
Message	A snapshot rollback is in progress on VDs %s, controller cannot boot till the rollback operation completes. Press any key to enter the configuration utility.
Controller response	Waits indefinitely for user input.
Suggested actions	A rollback operation is in progress and cannot be interrupted without data loss. Allow the operation to be completed. If the disks are not showing normal activity throughout the operation for a long period of time, the rollback might have stalled. You might have to start the configuration utility and restart the rollback operation.
Event ID	**BOOT_MSG_ROLLBACK_ACTIVE_REPOSITORY_MISSING**
Message	The Following VDs: %s have Rollback active and corresponding Repository missing. If you continue to boot the system or enter the configuration utility, these VDs will become unusable. Press any key to Continue.
Controller response	Waits indefinitely for user input.
Suggested actions	A rollback operation is in progress and cannot be interrupted without data loss. Allow the operation to be completed. If the disks are not showing normal activity throughout the operation for a long period of time, the rollback might have stalled. You might have to start the configuration utility and restart the rollback operation.
Event ID	**BOOT_MSG_SAS_NOT_SUPPORTED**
Message	SAS drives were detected, but this controller does not support SAS drives. Please remove the SAS drives then restart your system. Press any key to continue, or 'C' to load the configuration utility.
Controller response	Waits indefinitely for user input.
Suggested actions	The controller is configured to support only SATA devices, and SAS devices have been detected. Remove the SAS devices and restart the server.
Event ID	**BOOT_MSG_SAS_SATA_MIXING_VIOLATION**
Message	An enclosure was found that contains both SAS and SATA drives, but this controller does not allow mixed drive types in a single enclosure. Please correct the problem then restart your system. Press any key to continue, or 'C' to load the configuration utility.
Controller response	Waits indefinitely for user input.
Suggested actions	The controller is configured to support only SAS or SATA devices in an enclosure unit; however, both drive types are detected. Power off the server and then make any necessary adjustments to the hard disk drive types in the enclosure unit by removing one of the drive types.
Event ID	**BOOT_MSG_SAS_TOPOLOGY_ERROR**

Table 2. POST event messages (continued)

Message	Invalid SAS topology detected. Please check your cable configurations, repair the problem, and restart your system.
Controller response	Waits indefinitely. Requires the server to be restarted.
Suggested actions	An invalid SAS topology typically indicates a problem with cabling. Review the cabling guidelines for the controller and the enclosure units in the documentation that comes with the devices. Inspect all cable connections to make sure that they are attached correctly. If this occurs in a new installation, test the controller with a smaller configuration to isolate the problem. Add components back one at a time until the error occurs. In an existing configuration, you might have to swap a known working backplane between iPass connections. For external enclosure units, use a known working environmental services module within each enclosure unit chain to isolate the fault.
Event ID	**BOOT_MSG_SATA_NOT_SUPPORTED**
Message	SATA drives were detected, but this controller does not support SATA drives. Please remove the SATA drives then restart your system. Press any key to continue, or 'C' to load the configuration utility.
Controller response	Waits indefinitely for user input.
Suggested actions	The controller is configured to support only SAS devices, and SATA devices have been detected. Remove the SATA devices and restart the server.

Event messages-to-actions

Event messages are found in the MegaRAID Storage Manager application. Events that are logged into an operating-system event log typically have a correlating MegaRAID Storage Manager event log entry. This section lists the MegaRAID Storage Manager events that might appear in the event log.

MegaRAID Storage Manager software monitors the activity and performance of all controllers in the server and the devices that are attached to them. When an event occurs, such as the start of an initialization, an event message is displayed in the log at the bottom of the MegaRAID Storage Manager window.

Each message in the event log has an event type that indicates the severity of the event, as shown in Table 3 on page 30.

Some **Suggested Actions** might state that a procedural, environmental, or physical problem within the subsystem might have caused the event. These suggest that the trigger event might have limited predictability on the part of the controller and often times requires user intervention to determine the cause.

Procedural conditions describe user actions or script automation that cannot be predicted by the controller. This includes procedures, for example, a user removing an operational drive, modifying the hardware while powered off, using a command to change the logical configuration, and changing the server configuration with an unexpected result to the ServeRAID M subsystems. Other procedural conditions can include the following:

- Powering off a server incorrectly.
- Operating a server for an extended period of time with known issues resolved in the latest versions of ServeRAID M software including BIOS, firmware, drivers, and utilities.

- Operating a server for an extended period of time while a logical drive is in a critical state.
- Cached data is lost after a battery fully discharges.
- Incorrect installation of the ServeRAID M components, drives, or replacement components.
- Failure to follow recommended guidelines for a UPS installation and redundant power connections designed to prevent exposure to an unexpected power off condition.

Physical conditions is a category for unpredictable hardware issues outside of the ServeRAID M controller. Some components of the subsystem have some intelligence and others do not. Backplanes, expanders, and drives can typically provide some logged events, messages, or warnings to help identify the source of the problem. Other dependencies, for example, the power subsystem and cables are not so easily detected if they introduce problems. Physical issues might be the result of a failing component within the IBM server or another component in the ServeRAID M subsystem, for example, drives, backplanes, expander backplanes, loose or intermittent cables, power, or I2C interfaces. Other problem physical conditions can include:

- Two or more problems with hard disk drives simultaneously
- Subsystem component failures, for example, backplanes failing or failing components in the data path, including cables, tray interposers, or drives.
- Hard system hang conditions
- Any unexpected power loss, power fluctuations, brown-outs, and UPS failures
- System non-maskable interrupt (NMI) conditions
- CPU and memory errors

Environmental events are caused by the hardware operating outside expected environmental conditions. This can sometimes create unpredictable situations. For example, if a hard disk drive begins to overheat over an extended period of time, the drive might fail, causing a RAID volume to become critical. The actual cause of the problem might be a fan problem in the server, or a procedural problem, for example, operating the server with the cover removed or not seated correctly. There are many interdependencies in a server. A thermal condition is the most common problem with regard to environmental conditions affecting a ServeRAID M controller. See the server and controller user guides to review the supported environmental operating conditions.

Table 3. MegaRAID Storage Manager event types and descriptions

Event type	Description
Information	Informational message. No user action is necessary.
Warning	Some component might be close to a failure point.
Critical	A component has failed, but the server has not lost data.
Fatal	A component has failed, and data loss has occurred or will occur.

All of the MegaRAID Storage Manager event messages are listed in the following table. Each event description includes one or more placeholders for specific values that are determined when the event is generated. For example, in message 0x0001 in Table 4 on page 31, the value *%s* is replaced by the firmware version, which is read from the firmware when the event is generated.

Table 4. MegaRAID Storage Manager event messages-to-action

Number	Type	Event description	Suggested actions
0x0001	Information	MegaRAID firmware version *%s*	
0x0002	Fatal	Unable to recover cache data from TBBU	(TBBU is transportable battery backup cache.) If a controller failure occurs, the memory cache can be moved to a new controller, and the data in the cache can be preserved. If this message is displayed, the data in the cache was lost. This is a data loss event but not necessarily a hardware problem. See other events to determine whether the battery failed or the battery was left in a powered off state beyond the battery capacity to preserve the data.
0x0003	Information	Cache data recovered from TBBU successfully	
0x0004	Information	Configuration cleared	
0x0005	Warning	Cluster down; communication with peer lost	Clustering is not supported by IBM
0x0006	Information	Virtual drive *%s* ownership changed from *%02x* to *%02x*	
0x0007	Information	Alarm disabled by user	
0x0008	Information	Alarm enabled by user	
0x0009	Information	Background initialization rate changed to *%d%%*	
0x000a	Fatal	Controller cache discarded due to memory/battery problems	The message is probably the result of a bad battery. 1. Replace the battery. 2. Replace the controller.
0x000b	Fatal	Unable to recover cache data due to configuration mismatch	The cache might not be recoverable if the drives are in a different configuration than they were in the last time the controller started. This might occur if the transportable battery backup cache (TBBU) is moved to a new controller that contains a different configuration. Reconfigure the disk groups and virtual disks drives.
0x000c	Information	Cache data recovered successfully	
0x000d	Fatal	Controller cache discarded due to firmware version incompatibility	The cache write operations are firmware sensitive and might not be compatible with different versions of code. Return the controller to the previously used firmware version and retry. Update the adapter and enclosure unit firmware.
0x000e	Information	Consistency check rate change to *%d%%*	
0x000f	Fatal	Fatal firmware error: *%s*	The firmware error *%s* states which device had the error. This is expected to be a controller event. 1. Update the adapter and enclosure unit firmware. 2. Replace the device.
0x0010	Information	Factory defaults restored	

Table 4. MegaRAID Storage Manager event messages-to-action (continued)

Number	Type	Event description	Suggested actions
0x0011	Information	Flash downloaded image corrupt	
0x0012	Caution	Flash erase error	Update the adapter and enclosure unit firmware.
0x0013	Caution	Flash timeout during erase	Update the adapter and enclosure unit firmware.
0x0014	Caution	Flash error	Update the adapter and enclosure unit firmware.
0x0015	Information	Flashing image: *%s*	
0x0016	Information	Flash of new firmware images complete	
0x0017	Caution	Flash programming error	Update the adapter and enclosure unit firmware.
0x0018	Caution	Flash timeout during programming	Update the adapter and enclosure unit firmware.
0x0019	Caution	Flash chip type unknown	Update the adapter and enclosure unit firmware.
0x001a	Caution	Flash command set unknown	Update the adapter and enclosure unit firmware.
0x001b	Caution	Flash verify failure	Update the adapter and enclosure unit firmware.
0x001c	Information	Flush rate changed to *%d* seconds	
0x001d	Information	Hibernate command received from host	
0x001e	Information	Event log cleared	
0x001f	Information	Event log wrapped	
0x0020	Fatal	Multi-bit ECC error: ECAR=*%x*, ELOG=*%x*, (*%s*)	A multi-bit ECC error refers to the memory cache on the controller. Replace the controller.
0x0021	Warning	Single-bit ECC error: ECAR=*%x*, ELOG=*%x*, (*%s*)	A single-bit ECC error refers to the memory on the controller; however, the ECC recovered from the error. Replace the controller if the event repeats on a regular basis. By design, the controller memory can recover from a singe-bit error.
0x0022	Fatal	Not enough controller memory	Replace the controller.
0x0023	Information	Patrol Read complete	
0x0024	Information	Patrol Read paused	
0x0025	Information	Patrol Read Rate changed to *%d%%*	
0x0026	Information	Patrol Read resumed	
0x0027	Information	Patrol Read started	
0x0028	Information	Rebuild rate changed to *%d%%*	
0x0029	Information	Reconstruction rate changed to *%d%%*	
0x002a	Information	Shutdown command received from host	
0x002b	Information	Test event: *%s*	

Table 4. MegaRAID Storage Manager event messages-to-action (continued)

Number	Type	Event description	Suggested actions
0x002c	Information	Time established as *%s*; (*%d* seconds since power on)	
0x002d	Information	User entered firmware debugger	
0x002e	Warning	Background Initialization aborted on *%s*	Investigate other events to determine the cause of this event. A procedural, environmental, or physical problem within the subsystem might have caused this event. This is usually a symptom of another problem.
0x002f	Warning	Background Initialization corrected medium error (*%s* at *%lx*)	By design, the controller and, usually, the hard disk drive correct medium errors. No data is lost with a redundant virtual disk, but there might be a small exposure to data loss in a RAID-0 configuration when the physical medium error is corrected but the data that was stored at the location was not recovered. The controller automatically corrects this exposure within redundant virtual disks.
0x0030	Information	Background Initialization completed on *%s*	
0x0031	Fatal	Background initialization completed with uncorrectable errors on *%s*	Replace hard disk drive *%s*.
0x0032	Fatal	Background initialization detected uncorrectable double medium errors (*%s* at *%lx* on *%s*)	If the events are targeted to the same hard disk drive, replace the drive. If the events point to two or more drives, investigate other events to determine the cause of this event. A procedural, environmental, or physical problem within the subsystem might have caused this event. This might be a symptom of another problem. 1. Evaluate previous events to determine trending problems with physical devices. 2. If trending problems span multiple devices, check and reseat cable and device connections. 3. If trending problems are isolated to one device, replace that device. 4. Manually begin a consistency check and allow that process to be completed. 5. Evaluate the actions and conditions that exhibited the problem, or observe for normal behavior.

Table 4. MegaRAID Storage Manager event messages-to-action (continued)

Number	Type	Event description	Suggested actions
0x0033	Caution	Background Initialization failed on *%s*	If the events are targeted to the same hard disk drive, replace the drive. If the events point to two or more drives, investigate other events to determine the cause of this event. A procedural, environmental, or physical problem within the subsystem might have caused this event. This might be a symptom of another problem. 1. Evaluate previous events to determine trending problems with physical devices. 2. If trending problems span multiple devices, check and reseat cable and device connections. 3. If trending problems are isolated to one device, replace that device. 4. Manually begin a consistency check and allow that process to be completed. 5. Evaluate the actions and conditions that exhibited the problem, or observe for normal behavior.
0x0034	Progress	Background initialization progress on *%s* is *%s*	
0x0035	Information	Background initialization started on *%s*	
0x0036	Information	Policy change on *%s* from *%s* to *%s*	
0x0038	Warning	Consistency Check aborted on *%s*	A consistency check automatically aborts if the disk group or virtual disk becomes critical or offline for some other reason, or if a user modifies an existing virtual disk. Evaluate the server for these types of changes.
0x0039	Warning	Consistency Check corrected medium error (*%s* at *%lx*)	By design, the controller and, usually, the hard disk drive correct medium errors. No data is lost with a redundant virtual disk, but there might be a small exposure to data loss in a RAID-0 configuration when the physical medium error is corrected but the data that was stored at the location was not recovered. The controller automatically corrects this exposure within redundant virtual disks.
0x003a	Information	Consistency Check done on *%s*	
0x003b	Information	Consistency Check done with corrections on *%s*	

Table 4. MegaRAID Storage Manager event messages-to-action (continued)

Number	Type	Event description	Suggested actions
0x003c	Fatal	Consistency Check detected uncorrectable double medium errors (%s at %lx on %s)	If the events are targeted to the same hard disk drive, replace the drive. If the events point to two or more drives, investigate other events to determine the cause of this event. A procedural, environmental, or physical problem within the subsystem might cause this event. This might be a symptom of another problem. 1. Evaluate previous events to determine trending problems with physical devices. 2. If trending problems span multiple devices, check and reseat cable and device connections. 3. If trending problems are isolated to one device, replace that device. 4. Run a new consistency check and evaluate whether it is completed correctly. .
0x003d	Caution	Consistency Check failed on *%s*	If the events are targeted to the same hard disk drive, replace the drive. If the events point to two or more drives, investigate other events to determine the cause of this event. A procedural, environmental, or physical problem within the subsystem might cause this event. This might be a symptom of another problem. 1. Evaluate previous events to determine trending problems with physical devices. 2. If trending problems span multiple devices, check and reseat cable and device connections. 3. If trending problems are isolated to one device, replace that device. 4. Run a new consistency check and evaluate whether it is completed correctly.
0x003e	Fatal	Consistency Check completed with uncorrectable data on *%s*	Investigate other events to determine the cause of this event. A procedural, environmental, or physical problem within the subsystem might cause this event. This is typically a symptom of another problem. Data has been lost, so the order of recovery is as follows: 1. Determine the cause of the failure by evaluating other event entries. 2. Take the applicable corrective action for the failure mode. 3. Determine what data was lost. 4. Recover the hardware (re-create logical drives if necessary). 5. Restore data.

Table 4. MegaRAID Storage Manager event messages-to-action (continued)

Number	Type	Event description	Suggested actions
0x003f	Warning	Consistency Check found inconsistent parity on *%s* at strip *%lx*	Inconsistencies on a logical drive do not always cause data loss, but they can lead to data loss over an extended period of time. Investigate other events to determine the cause of this event. A procedural, environmental, or physical problem within the subsystem might cause this event. This is typically a symptom of another problem. 1. This event might occur if patrol read is disabled for long periods of time. Enable patrol read. 2. Evaluate previous events to determine trending problems with physical devices. 3. If trending problems span multiple devices, check and reseat cable and device connections. 4. If trending problems are isolated to one device, replace that device. 5. Run a new consistency check and evaluate whether it is completed correctly.
0x0040	Warning	Consistency Check inconsistency logging disabled on *%s* (too many inconsistencies)	Inconsistencies on a logical drive do not always cause data loss, but they can lead to data loss over an extended period of time. Investigate other events to determine the cause of this event. A procedural, environmental, or physical problem within the subsystem might cause this event. This is typically a symptom of another problem. 1. This event might occur if patrol read is disabled for long periods of time. Enable patrol read. 2. Evaluate previous events to determine trending problems with physical devices. 3. If trending problems span multiple devices, check and reseat cable and device connections. 4. If trending problems are isolated to one device, replace that device. 5. Run a new consistency check and evaluate whether it is completed correctly.
0x0041	Progress	Consistency Check progress on *%s* is %s	
0x0042	Information	Consistency Check started on *%s*	
0x0043	Warning	Initialization aborted on *%s*	This might be the result of an action by firmware or the result of user actions. Evaluate the previous procedures that were used to start and stop the initialization of a new or existing virtual disk. An initialization action is automatically stopped if the array becomes critical or offline or if a user interrupts this process.

Table 4. MegaRAID Storage Manager event messages-to-action (continued)

Number	Type	Event description	Suggested actions
0x0044	Caution	Initialization failed on *%s*	This might be the result of an action by firmware or the result of user actions. Evaluate previous procedures that were used to start and stop the initialization of a new or existing virtual disk. An initialization action is automatically stopped if the array becomes critical or offline, or if a user interrupts this process.
0x0045	Progress	Initialization progress on *%s* is *%s*	
0x0046	Information	Fast initialization started on *%s*	
0x0047	Information	Full initialization started on *%s*	
0x0048	Information	Initialization complete on *%s*	
0x0049	Information	LD Properties updated to *%s* (from *%s*)	
0x004a	Information	Reconstruction complete on *%s*	
0x004b	Fatal	Reconstruction of *%s* stopped due to unrecoverable errors	A rebuild stopped abnormally. An environmental, procedural, or physical device problem within the subsystem caused this event. Investigate other logged events to determine the cause of the problem. **Important:** Replacing a hard disk drive other than the drive that is rebuilding can result in data loss. If drive errors occur on a RAID volume that is in a Critical or Rebuilding state, data loss might occur. After any corrective actions are taken, make sure that the data is correct. 1. Evaluate previous events to determine trending problems with physical devices. 2. If trending problems span multiple devices, check and reseat cable and device connections. 3. If trending problems are isolated to one device, replace that device. 4. Manually begin a new rebuild and allow that process to be completed. 5. Evaluate the actions and conditions that exhibited the problem, or observe for normal behavior.

Table 4. MegaRAID Storage Manager event messages-to-action (continued)

Number	Type	Event description	Suggested actions
0x004c	Fatal	Reconstruct detected uncorrectable double medium errors (*%s* at *%lx* on *%s* at *%lx*)	The rebuild process detected multiple error conditions within the disk group, and some data might be lost or inaccessible. This error halts the rebuild operation and identifies the drives that are reporting the errors. Investigate other logged events to determine trending errors on the identified drives and replace drives as necessary. **Important:** Replacing a hard disk drive other than the drive that is rebuilding can result in data loss. If drive errors occur on a RAID volume that is in a Critical or Rebuilding state, data loss might occur. After any corrective actions are taken, make sure that the data is correct. 1. Evaluate previous events to determine trending problems with physical devices. 2. If trending problems span multiple devices, check and reseat cable and device connections. 3. If trending problems are isolated to one or several devices, replace the devices. 4. Determine whether data was lost. 5. Recover the hardware (re-create logical drives if necessary). 6. Restore data, if necessary. 7. Evaluate the actions and conditions that exhibited the problem, or observe for normal behavior.
0x004d	Progress	Reconstruction progress on *%s* is *%s*	
0x004e	Information	Reconstruction resumed on *%s*	

Table 4. MegaRAID Storage Manager event messages-to-action (continued)

Number	Type	Event description	Suggested actions
0x004f	Fatal	Reconstruction resume of *%s* failed due to configuration mismatch	The configuration might have changed after a rebuild operation was started and before it was completed. This can be the result of an action by firmware or the result of some user intervention. Evaluate the previous procedures that were used to start and stop the consistency check. Investigate previous related logged events to determine the cause of this event. A critical RAID volume or a volume that is building is not redundant and is susceptible to other problems if a secondary failure occurs. Spanned volumes can survive a single disk failure in each sub-volume. A rebuild operation is automatically stopped if another drive fails or goes offline for some other reason, or if a user interrupts this process. If the user made physical changes to the subsystem while the server was powered off, the controller might not be able to resume a rebuild operation from a previous runtime session.
0x0050	Information	Reconstructing started on *%s*	
0x0051	Information	State change on *%s* from *%s* to *%s*	
0x0052	Information	Drive Clear aborted on *%s*	
0x0053	Caution	Drive Clear failed	The physical drive could not initialize or clear its data structures. This might be a communication problem with the disk drive, or there is a low probability that the drive might be defective. 1. Evaluate previous events to determine trending problems with physical devices. 2. If trending problems span multiple devices, check and reseat cable and device connections. 3. Move the drive to a different drive bay location, if another drive bay is available. 4. Update the hard disk drive firmware. 5. Run Dynamic System Analysis on the hard disk drive to determine its status. 6. If the hard disk drive fails the diagnostic test or trending problems are isolated to one device, replace that device. 7. Try again to clear the drive, and evaluate whether this was completed correctly.
0x0054	Progress	Drive Clear progress on *%s* is *%s*	
0x0055	Information	Drive Clear started on *%s*	
0x0056	Information	Drive Clear completed on *%s*	

Table 4. MegaRAID Storage Manager event messages-to-action (continued)

Number	Type	Event description	Suggested actions
0x0057	Warning	Error on *%s* (Error *%02x*)	The indicated drive has errors. Monitor the drive and consider replacing it if the error count is excessive.
0x0058	Information	Format complete on *%s*	
0x0059	Information	Format started on *%s*	
0x005a	Caution	Hot Spare SMART polling failed	The controller polled the identified device for SMART events, and the polling operation failed. This might be a communication problem with the disk drive, or there is a low probability that the drive might be defective. 1. Evaluate previous events to determine trending problems with physical devices. 2. If trending problems span multiple devices, check and reseat cable and device connections. 3. Move the drive to a different drive bay location, if another drive bay is available. 4. Update the hard disk drive firmware. 5. Run Dynamic System Analysis on the hard disk drive to determine its status. 6. If the hard disk drive fails the diagnostic test or trending problems are isolated to one device, replace that device. 7. Try again to clear the drive, and evaluate whether this was completed correctly.
0x005b	Information	Drive inserted: *%s*	
0x005c	Warning	Drive *%s* is not supported	
0x005d	Warning	Patrol Read corrected medium error on *%s* at *%lx*	
0x005e	Progress	Patrol Read progress on *%s* is *%s*	
0x005f	Fatal	Patrol Read found an uncorrectable medium error on *%s* at *%lx*	The controller background patrol read operation found a media error on the identified drive, and the medium error cannot be corrected. This event usually causes the drive to be marked as failed. 1. Update the hard disk drive firmware. 2. Manually begin a consistency check and evaluate the drive for normal operation. 3. If the problems remain, replace the drive at *%s*.
0x0060	Caution	Predictive failure: CDB: *%s*	The drive has reached its internal error threshold and has sent a SMART alert (Predictive Failure Analysis alert) to the controller. The hard disk drive remains operational until it is marked as failed; however, the drive is predicted to fail soon. Replace the drive.

Table 4. MegaRAID Storage Manager event messages-to-action (continued)

Number	Type	Event description	Suggested actions
0x0061	Fatal	Patrol Read puncturing bad block on *%s* at *%lx*	The technique of “puncturing bad block” is an earlier method of managing bad blocks and is used only with older firmware versions. Upgrade the firmware as soon as possible. Run a consistency check to convert the bad block management into the current method, which is managed with a “bad block table.” Puncturing bad blocks is not supported on storage devices that are larger than 72 GB.
0x0062	Information	Rebuild aborted by user on *%s*	
0x0063	Information	Rebuild complete on *%s*	
0x0064	Information	Rebuild complete on *%s*	
0x0065	Caution	Rebuild failed on *%s* due to source drive error	The rebuild failed because of errors in the redundant data. In a critical mirror (RAID-1, 10) the source of the error is the online disk member. The drive at *%s* is the drive that is rebuilding, which is usually an operational disk. Make sure that there is a recent backup of the data, and try the rebuild operation again. If the rebuild operation continues to fail, you might have to recreate the disk group or virtual disks. There are usually other errors in the event logs that identify the source disk with an unrecoverable error. **Note:** This error might indicate some data loss because the error occurs while the disk group or virtual disk is critical and nonredundant. 1. Update the hard disk drive firmware. 2. Manually begin a new rebuild operation and evaluate the drive for normal operation. 3. If the problem remains, replace the source drive.
0x0066	Caution	Rebuild failed on *%s* due to target drive error	The rebuild operation failed because of errors on the rebuilding hard disk drive. Replace the drive at *%s*.
0x0067	Progress	Rebuild progress on *%s* is *%s*	
0x0068	Information	Rebuild resumed on *%s*	
0x0069	Information	Rebuild started on *%s*	
0x006a	Information	Rebuild automatically started on *%s*	
0x006b	Caution	Rebuild stopped on *%s* due to loss of cluster ownership	IBM does not support clustering.
0x006c	Fatal	Reassign write operation failed on *%s* at *%lx*	Replace hard disk drive *%s*.
0x006d	Fatal	Unrecoverable medium error during rebuild on *%s* at *%lx*	Replace hard disk drive *%s*.
0x006e	Information	Corrected medium error during recovery on *%s* at *%lx*	
0x006f	Fatal	Unrecoverable medium error during recovery on *%s* at *%lx*	Replace hard disk drive *%s*.
0x0070	Information	Drive removed: *%s*	

Table 4. MegaRAID Storage Manager event messages-to-action (continued)

Number	Type	Event description	Suggested actions
0x0071	Warning	Unexpected sense: *%s*, CDB*%s*, Sense: *%s*	As commands are sent to the hard disk drives, the controller expects applicable responses. When this error occurs, the controller received an unexpected response to a command. In a very busy server, this might occur infrequently without any significant problems; however, repeated events might indicate some level of incompatibility. 1. Update the hard disk drive firmware. 2. Update the controller firmware and device drivers. 3. Reboot the server (the reset might clear the problem).
0x0072	Information	State change on *%s* from *%s* to *%s*	
0x0073	Information	State change by user on *%s* from *%s* to *%s*	
0x0074	Warning	Redundant path to *%s* is broken	There is a communication problem within the SAS/SATA subsystem. The controller can no longer communicate with the *%s* device. 1. If this is a new installation, see the documentation for correct cabling instructions. 2. Check cables for damage, and reseat each cable. 3. If the problem remains, replace the applicable cables within the identified connections. 4. Replace the backplane. **Note:** Swap cables to identify the bad component through the process of elimination as needed.
0x0075	Information	Redundant path to *%s* restored	
0x0076	Information	Dedicated Hot Spare Drive *%s* no longer useful due to deleted drive group	
0x0077	Caution	SAS topology error: Loop detected	There is a communication problem within the SAS/SATA subsystem. The controller can no longer communicate with the *%s* device. 1. If this is a new installation, see the documentation for the correct cabling instructions. 2. Check cables for damage, and reseat each cable. 3. If the problem remains, replace the applicable cables within the identified connections. 4. Replace the backplane. **Note:** Swap cables to identify the bad component through the process of elimination as needed.

Table 4. MegaRAID Storage Manager event messages-to-action (continued)

Number	Type	Event description	Suggested actions
0x0078	Caution	SAS topology error: Unaddressable device	There is a communication problem within the SAS/SATA subsystem. The controller cannot address the *%s* device. 1. If this is a new installation, see the documentation for the correct cabling instructions. 2. Check cables for damage, and reseat each cable. 3. If the problem remains, replace the applicable cables within the identified connections. 4. Replace the backplane. **Note:** Swap cables to identify the bad component through the process of elimination as needed.
0x0079	Caution	SAS topology error: Multiple ports to the same SAS address	There is a communication problem within the SAS/SATA subsystem. The controller detected multiple ports to the same SAS address. 1. If this is a new installation, see the documentation for the correct cabling instructions. 2. Check cables for damage, and reseat each cable. 3. If the problem remains, replace the applicable cables within the identified connections. 4. Replace the backplane. **Note:** Swap cables to identify the bad component through the process of elimination as needed.
0x007a	Caution	SAS topology error: Expander error	There is a communication problem within the SAS/SATA subsystem. The controller detected a problem with the expander on the backplane. 1. If this is a new installation, see the documentation for the correct cabling instructions. 2. Check cables for damage, and reseat each cable. 3. Update the backplane firmware (if an update is available). 4. Replace the backplane.

Table 4. MegaRAID Storage Manager event messages-to-action (continued)

Number	Type	Event description	Suggested actions
0x007b	Caution	SAS topology error: SMP timeout	There is a communication problem within the SAS/SATA subsystem. The controller detected problems with SMP commands timing out. 1. If this is a new installation, see the documentation for the correct cabling instructions. 2. Check cables for damage, and reseat each cable. 3. If the problem remains, replace the applicable cables within the identified connections. 4. Replace the backplane. **Note:** Swap cables to identify the bad component through the process of elimination as needed.
0x007c	Caution	SAS topology error: Out of route entries	There is a communication problem within the SAS/SATA subsystem. The controller can no longer communicate with the devices. 1. If this is a new installation, see the documentation for the correct cabling instructions. 2. Check cables for damage, and reseat each cable. 3. If the problem remains, replace the applicable cables within the identified connections. 4. Replace the backplane. **Note:** Swap cables to identify the bad component through the process of elimination as needed.
0x007d	Caution	SAS topology error: Index not found	There is a communication problem within the SAS/SATA subsystem. The controller cannot locate a valid index of devices. 1. If this is a new installation, see the documentation for the correct cabling instructions. 2. Check cables for damage, and reseat each cable. 3. If the problem remains, replace the applicable cables within the identified connections. 4. Replace the backplane. **Note:** Swap cables to identify the bad component through the process of elimination as needed.

Table 4. MegaRAID Storage Manager event messages-to-action (continued)

Number	Type	Event description	Suggested actions
0x007e	Caution	SAS topology error: SMP function failed	There is a communication problem within the SAS/SATA subsystem. The controller detected problems with the SMP operations. 1. If this is a new installation, see the documentation for the correct cabling instructions. 2. Check cables for damage, and reseat each cable. 3. If the problem remains, replace the applicable cables within the identified connections. 4. Replace the backplane. **Note:** Swap cables to identify the bad component through the process of elimination as needed.
0x007f	Caution	SAS topology error: SMP CRC error	There is a communication problem within the SAS/SATA subsystem. The controller detected CRC errors in the SMP communication. 1. If this is a new installation, see the documentation for the correct cabling instructions. 2. Check cables for damage, and reseat each cable. 3. If the problem remains, replace the applicable cables within the identified connections. 4. Replace the backplane. **Note:** Swap cables to identify the bad component through the process of elimination as needed.
0x0080	Caution	SAS topology error: Multiple subtractive	There is a communication problem within the SAS/SATA subsystem. The controller detected multiple subtractive issues, which indicates that there are problems with the external enclosure unit cabling or the cables that chain the external enclosure units together. 1. If this is a new installation, see the documentation for the correct cabling instructions. 2. Check cables for damage, and reseat each cable. 3. If the problem remains, replace the applicable cables within the identified connections. 4. Update the backplane or enclosure unit firmware (if a newer version is available). 5. Replace the backplane. **Note:** Swap cables to identify the bad component through the process of elimination as needed.

Table 4. MegaRAID Storage Manager event messages-to-action (continued)

Number	Type	Event description	Suggested actions
0x0081	Caution	SAS topology error: Table to table	There is a communication problem within the SAS/SATA subsystem. The controller detected table-to-table issues, which usually indicates that there are problems with the external enclosure unit cabling or the cables that chain the external enclosure units together. 1. If this is a new installation, see the documentation for the correct cabling instructions. 2. Check cables for damage, and reseat each cable. 3. If the problem remains, replace the applicable cables within the identified connections. 4. Update the backplane or enclosure unit firmware (if a newer version is available). 5. Replace the backplane. **Note:** Swap cables to identify the bad component through the process of elimination as needed.
0x0082	Caution	SAS topology error: Multiple paths	There is a communication problem within the SAS/SATA subsystem. The controller detected multiple path issues, which usually indicates that there are problems with the external enclosure unit cabling or the cables that chain the external enclosure unit together. 1. If this is a new installation, see the documentation for the correct cabling instructions. 2. Check cables for damage, and reseat each cable. 3. If the problem remains, replace the applicable cables within the identified connections. 4. Replace the backplane. **Note:** Swap cables to identify the bad component through the process of elimination as needed.

Table 4. MegaRAID Storage Manager event messages-to-action (continued)

Number	Type	Event description	Suggested actions
0x0083	Fatal	Unable to access device *%s*	There is a communication problem within the SAS/SATA subsystem. The controller cannot access the device *%s*. 1. If this is a new installation, see the documentation for the correct cabling instructions. 2. Check cables for damage, and reseat each cable. 3. If the problem remains, replace the applicable cables within the identified connections. 4. Move device *%s* to a different slot (if available). 5. Replace the backplane. **Note:** Swap cables to identify the bad component through the process of elimination as needed.
0x0084	Information	Dedicated Hot Spare created on *%s* (*%s*)	
0x0085	Information	Dedicated Hot Spare *%s* disabled	
0x0086	Caution	Dedicated Hot Spare *%s* no longer useful for all drive groups	Check the size of the spare and then review the configuration to determine whether any active drive members are larger than the spare. If so, this event is correctly notifying you that a larger dedicated spare is required to protect the disk groups and virtual drives.
0x0087	Information	Global Hot Spare created on *%s* (*%s*)	
0x0088	Information	Global Hot Spare *%s* disabled	
0x0089	Caution	Global Hot Spare does not cover all drive groups	Check the size of the spare and then review the configuration to determine whether any active drive members are larger than the spare. If so, this event is correctly notifying you that a larger global spare is required to protect the disk groups and virtual drives.
0x008a	Information	Created *%s*}	
0x008b	Information	Deleted *%s*}	
0x008c	Information	Marking LD *%s* inconsistent due to active writes at shutdown	
0x008d	Information	Battery Present	
0x008e	Warning	Battery Not Present	Check the battery and the connection to the adapter. Install the battery if it was removed.
0x008f	Information	New Battery Detected	
0x0090	Information	Battery has been replaced	
0x0091	Caution	Battery temperature is high	Check the ambient temperature of the server. Make sure that the environmental configuration, temperatures, and airflow are correct for the server and rack.

Table 4. MegaRAID Storage Manager event messages-to-action (continued)

Number	Type	Event description	Suggested actions
0x0092	Warning	Battery voltage low	1. Begin a battery calibration and allow it to be completed. 2. Observe for battery events and normal operation. 3. If the problem remains, replace the battery.
0x0093	Information	Battery started charging	
0x0094	Information	Battery is discharging	
0x0095	Information	Battery temperature is normal	
0x0096	Fatal	Battery needs to be replaced, SOH Bad	Replace the battery.
0x0097	Information	Battery relearn started	
0x0098	Information	Battery relearn in progress	
0x0099	Information	Battery relearn completed	
0x009a	Caution	Battery relearn timed out	1. Reseat the battery connections. 2. Begin a battery calibration and allow it to be completed. 3. Observe for battery events and normal operation. 4. If the problem remains, update the controller firmware (if a new version is available) and retry. 5. If the problem remains, replace the battery and try again. 6. If the problem remains, replace the controller.
0x009b	Information	Battery relearn pending: Battery is under charge	
0x009c	Information	Battery relearn postponed	
0x009d	Information	Battery relearn will start in 4 days	
0x009e	Information	Battery relearn will start in 2 day	
0x009f	Information	Battery relearn will start in 1 day	
0x00a0	Information	Battery relearn will start in 5 hours	
0x00a1	Information	Battery removed	
0x00a2	Information	Current capacity of the battery is below threshold	
0x00a3	Information	Current capacity of the battery is above threshold	
0x00a4	Information	Enclosure (SES) discovered on *%s*	
0x00a5	Information	Enclosure (SAFTE) discovered on *%s*	

Table 4. MegaRAID Storage Manager event messages-to-action (continued)

Number	Type	Event description	Suggested actions
0x00a6	Caution	Enclosure %s communication lost	There is a communication problem within the SAS/SATA subsystem. The controller lost communication with the backplane or external storage enclosure. 1. If this is a new installation, see the documentation for the correct cabling instructions. 2. Check cables for damage, and reseat each cable. 3. If the problem remains, replace the applicable cables within the identified connections. 4. For an internal enclosure unit, replace the backplane. 5. For an external enclosure unit, see the enclosure unit documentation for more information. **Note:** Swap cables to identify the bad component through the process of elimination as needed.
0x00a7	Information	Enclosure *%s* communication restored	
0x00a8	Caution	Enclosure *%s* fan *%d* failed	1. Check the enclosure unit fan for correct operation. 2. See the enclosure unit documentation for more information.
0x00a9	Information	Enclosure *%s* fan *%d* inserted	1. Check the enclosure unit fan for correct operation. 2. See the enclosure unit documentation for more information.
0x00aa	Caution	Enclosure *%s* fan *%d* removed	1. Check the enclosure unit fan for correct operation. 2. See the enclosure unit documentation for more information.
0x00ab	Caution	Enclosure *%s* power supply *%d* failed	1. Check the enclosure unit power supply for correct operation. 2. See the enclosure unit documentation for more information.
0x00ac	Information	Enclosure *%s* power supply *%d* inserted	
0x00ad	Caution	Enclosure *%s* power supply *%d* removed	1. Check the enclosure unit power supply for correct operation. 2. See the enclosure unit documentation for more information.
0x00ae	Caution	Enclosure *%s* SIM *%d* failed	See the enclosure unit documentation for more information.
0x00af	Information	Enclosure *%s* SIM *%d* inserted	

Table 4. MegaRAID Storage Manager event messages-to-action (continued)

Number	Type	Event description	Suggested actions
0x00b0	Caution	Enclosure *%s* SIM *%d* removed	See the enclosure unit documentation for more information.
0x00b1	Warning	Enclosure *%s* temperature sensor *%d* below Warning threshold	Check the ambient temperature of the server. Make sure that the environmental configuration, temperatures, and airflow are correct for the server and rack.
0x00b2	Caution	Enclosure *%s* temperature sensor *%d* below error threshold	Check the ambient temperature of the server. Make sure that the environmental configuration, temperatures, and airflow are correct for the server and rack.
0x00b3	Warning	Enclosure *%s* temperature sensor *%d* above Warning threshold	Check the ambient temperature of the server. Make sure that the environmental configuration, temperatures, and airflow are correct for the server and rack.
0x00b4	Caution	Enclosure *%s* temperature sensor *%d* above error threshold	Check the ambient temperature of the server. Make sure that the environmental configuration, temperatures, and airflow are correct for the server and rack.
0x00b5	Caution	Enclosure %s shutdown	This might be an expected event if the enclosure unit was intentionally shut down. Otherwise, check the enclosure unit power and cables. See the enclosure unit documentation for more information.
0x00b6	Warning	Enclosure unit *%s* is not supported; too many enclosure units are connected to a port	There is a communication problem within the enclosure unit subsystem. The controller detected too many enclosure units connected to a port. This usually indicates problems with external enclosure unit cabling or the cables that chain the external enclosure units together. See the enclosure unit documentation for more information.
0x00b7	Caution	Enclosure unit *%s* firmware mismatch	Update the controller and enclosure unit firmware until they operate together correctly.
0x00b8	Warning	Enclosure *%s* sensor *%d* bad	A sensor cannot report its status or has failed. If it has failed, some information might be missing from the management of the unit. See the enclosure unit documentation to determine which part should be serviced.
0x00b9	Caution	Enclosure *%s* phy *%d* bad	PHY is the physical port connector. Check the cable from the adapter to the enclosure unit. Check the enclosure unit power. Examine the enclosure unit LEDs.
0x00ba	Caution	Enclosure *%s* is unstable	1. Check the enclosure unit LEDs for correct operation. 2. See the enclosure unit documentation for more information.
0x00bb	Caution	Enclosure *%s* hardware error	1. Check the enclosure unit LEDs for correct operation. 2. See the enclosure unit documentation for more information.

Table 4. MegaRAID Storage Manager event messages-to-action (continued)

Number	Type	Event description	Suggested actions
0x00bc	Caution	Enclosure *%s* not responding	1. Check the enclosure unit LEDs for correct operation. 2. See the enclosure unit documentation for more information.
0x00bd	Information	SAS/SATA mixing not supported in enclosure; Drive *%s* disabled	
0x00be	Information	Enclosure (SES) hotplug on *%s* was detected, but is not supported	
0x00bf	Information	Clustering enabled	IBM does not support clustering.
0x00c0	Information	Clustering disabled	IBM does not support clustering.
0x00c1	Information	Drive too small to be used for auto-rebuild on *%s*	
0x00c2	Information	BBU enabled; changing WT virtual drives to WB	
0x00c3	Warning	BBU disabled; changing WB virtual drives to WT	If the battery charge is low, the logical drive shifts into WT mode while the battery charges. This is working as designed.
0x00c4	Warning	Bad block table on drive *%s* is 80% full	This event causes the *%s* hard disk drive to be marked as failed. Replace the drive at *%s*.
0x00c5	Fatal	Bad block table on drive *%s* is full; unable to log block *%lx*	This event causes the *%s* hard disk drive to be marked as failed. Replace the drive at *%s*.
0x00c6	Information	Consistency Check Aborted due to ownership loss on *%s*	
0x00c7	Information	Background Initialization (BGI) Aborted Due to Ownership Loss on *%s*	
0x00c8	Caution	Battery/charger problems detected; SOH Bad	1. Reseat the battery connections. 2. Begin a battery calibration and allow it to be completed. 3. Observe for battery events and normal operation. 4. If the problem remains, update the controller firmware (if a new version is available) and try again. 5. If the problem remains, replace the battery and try again. 6. If the problem remains, replace the controller.
0x00c9	Warning	Single-bit ECC error: ECAR=*%x*, ELOG=*%x*, (*%s*); Warning threshold exceeded	A single-bit ECC memory error threshold was exceeded. The controller is alerting you that the memory on the controller will probably fail soon. Replace the controller. **Note:** At this time there is no data loss.

Table 4. MegaRAID Storage Manager event messages-to-action (continued)

Number	Type	Event description	Suggested actions
0x00ca	Caution	Single-bit ECC error: ECAR=*%x*, ELOG=*%x*, (*%s*); critical threshold exceeded	A single-bit ECC memory error threshold was exceeded, and the number of errors is excessive. The controller is alerting you that the memory on the controller is failing rapidly. Shut down the server and replace the controller as soon as possible. **Note:** At this time there is no data loss.
0x00cb	Caution	Single-bit ECC error: ECAR=*%x*, ELOG=*%x*, (*%s*); further reporting disabled	A single-bit ECC memory error threshold was exceeded, and any new events are not logged. The controller is alerting you that the memory on the controller is not trustworthy. Shut down the server and replace the controller as soon as possible. **Note:** Additional single-bit ECC errors might cause bad data, and these errors are not reported.
0x00cc	Caution	Enclosure *%s* Power supply *%d* switched off	1. Check the enclosure unit power supply for correct operation. 2. See the enclosure unit documentation for more information.
0x00cd	Information	Enclosure *%s* Power supply *%d* switched on	
0x00ce	Caution	Enclosure *%s* Power supply *%d* cable removed	1. Check the enclosure unit power supply cabling. 2. See the enclosure unit documentation for more information.
0x00cf	Information	Enclosure *%s* Power supply *%d* cable removed	
0x00d0	Information	Enclosure *%s* Power supply *%d* cable inserted	
0x00d1	Information	BBU Retention test was initiated on previous boot	
0x00d2	Information	BBU Retention test passed	
0x00d3	Caution	BBU Retention test failed!	Replace the battery.
0x00d4	Information	NVRAM Retention test was initiated on previous boot	
0x00d5	Information	NVRAM Retention test passed	
0x00d6	Caution	NVRAM Retention test failed!	Replace the controller.
0x00d7	Information	*%s* test completed *%d* passes successfully	
0x00d8	Caution	*%s* test FAILED on *%d* pass.	1. Check the cables and connections. 2. Reseat the *%s* device. 3. If this is a new configuation, check the device by swapping it to a new slot position and determine whether the problem is the device, backplane, or cable. 4. Observe the server for normal operation. 5. If the problem remains, replace the *%s* device.

Table 4. MegaRAID Storage Manager event messages-to-action (continued)

Number	Type	Event description	Suggested actions
0x00d9	Information	Self check diagnostics completed	
0x00da	Information	Foreign Configuration Detected	
0x00db	Information	Foreign Configuration Imported	
0x00dc	Information	Foreign Configuration Cleared	
0x00dd	Warning	NVRAM is corrupt; reinitializing	Allow the controller enough time to try to correct the problem programmatically. If the controller is stopped or is unable to recover, power off and disconnect the hard disk drives from the controller. Power on the server and start the WebBIOS. Clear the controller configuration (reset to defaults). If the controller stabilizes, reattach the drives and allow the RAID configuration to import the existing configuration. If the controller does not stabilize, update the firmware on the controller.
0x00de	Warning	NVRAM mismatch occurred	Allow the controller enough time to try to correct the problem programmatically. If the controller is stopped or is unable to recover, power off and disconnect the hard disk drives from the controller. Power-on the server and start the WebBIOS. Clear the controller configuration (reset to defaults). If the controller stabilizes, reattach the drives and allow the RAID configuration to import the existing configuration. If the controller does not stabilize, update the firmware on the controller.
0x00df	Warning	SAS wide port *%d* lost link on PHY *%d*	The controller lost a wide port link. A wide port link in this configuration usually means that a 4-channel connection to an expander-based backplane or enclosure unit was downgraded from 4 active channels to 3 active channels. The controller will take a channel down when too many errors occur on the link and will often reset the channel and restore the link programmatically. This is normal operation; however, repeating events might indicate a systemic problem within that connection.
0x00e0	Information	SAS wide port *%d* restored link on PHY *%d*	
0x00e1	Warning	SAS port *%d*, PHY *%d* has exceeded the allowed error rate	
0x00e2	Warning	Bad block reassigned on *%s* at *%lx* to %lx	
0x00e3	Information	Controller Hot Plug detected	
0x00e4	Warning	Enclosure *%s* temperature sensor *%d* differential detected	An enclosure unit is reporting a temperature threshold event.
0x00e5	Information	Drive test cannot start. No qualifying drives found	
0x00e6	Information	Time duration provided by host is not sufficient for self check	

Table 4. MegaRAID Storage Manager event messages-to-action (continued)

Number	Type	Event description	Suggested actions
0x00e7	Information	Marked Missing for *%s* on drive group *%d* row *%d*	
0x00e8	Information	Replaced Missing as *%s* on drive group *%d* row *%d*	
0x00e9	Information	Enclosure *%s* Temperature *%d* returned to normal	
0x00ea	Information	Enclosure *%s* Firmware download in progress	
0x00eb	Warning	Enclosure *%s* Firmware download failed	The controller is reporting from the enclosure unit that the recent firmware update failed. Review the firmware update procedure for the enclosure unit and try the firmware update again.
0x00ec	Warning	*%s* is not a certified drive	The controller is reporting that an uncertified drive is detected at a specific location. If the drive is newly inserted in the controller, remove the drive and check for any specific drive requirements or labeling that is defined for this solution.
0x00ed	Information	Dirty cache data discarded by user	
0x00ee	Information	Drives missing from configuration at boot	
0x00ef	Information	Virtual drives (VDs) missing drives and will go offline at boot: *%s*	
0x00f0	Information	VDs missing at boot: *%s*	
0x00f1	Information	Previous configuration completely missing at boot	
0x00f2	Information	Battery charge complete	
0x00f3	Information	Enclosure *%s* fan *%d* speed changed	
0x0128	Information	Cache discarded on offline virtual drive. When a VD with cached data goes offline or missing during runtime, the cache for the VD is discarded. Because the VD is offline, the cache cannot be saved.	
0x0129	Information	Copyback cannot be started as PD %s is too small for src PD %s	
0x012a	Information	Copyback cannot be started on PD %s from PD %s, as SAS/SATA is not supported in an array	
0x012b	Information	Microcode update started on PD %s	
0x012c	Information	Microcode update completed on PD %s	
0x012d	Warning	Microcode update timeout on PD %s	
0x012e	Warning	Microcode update failed on PD %s	
0x012f	Information	Controller properties changed	
0x0130	Information	Patrol Read properties changed	

Table 4. MegaRAID Storage Manager event messages-to-action (continued)

Number	Type	Event description	Suggested actions
0x0131	Information	CC Schedule properties changed	
0x0132	Information	Battery properties changed	
0x0133	Warning	Periodic Battery Relearn is pending. Please initiate manual learn cycle as Automatic learn is not enabled.	
0x0134	Information	Drive security key created	
0x0135	Information	Drive security key backed up	
0x0136	Information	Drive security key from escrow, verified	
0x0137	Information	Drive security key changed	
0x0138	Warning	Drive security key, re-key operation failed	
0x0139	Warning	Drive security key is invalid	
0x013a	Information	Drive security key destroyed	
0x013b	Warning	Drive security key from escrow is invalid	
0x013c	Information	VD %s is now secured	
0x013d	Warning	VD %s is partially secured	
0x013e	Information	PD %s security activated	
0x013f	Information	PD %s security disabled	
0x0140	Information	PD %s is reprovisioned	
0x0141	Information	PD %s security key changed	
0x0142	Fatal	Security subsystem problems detected for PD %s	
0x0143	Fatal	Controller cache pinned for missing or offline VD %s	
0x0144	Fatal	Controller cache pinned for missing or offline VDs: %s	
0x0145	Information	Controller cache discarded by user for VDs: %s	
0x0146	Information	Controller cache destaged for VD %s	
0x0147	Warning	Consistency Check started on an inconsistent VD %s	
0x0148	Warning	Drive security key failure, cannot access secured configuration	
0x0149	Warning	Drive security pass phrase from user is invalid	
0x014a	Warning	Detected error with the remote battery connector cable	
0x014b	Information	Power state change on PD %s from %s to %s	
0x014c	Information	Enclosure %s element (SES code 0x%x) status changed	

Table 4. MegaRAID Storage Manager event messages-to-action (continued)

Number	Type	Event description	Suggested actions
0x014d	Information	PD %s rebuild not possible as HDD/SSD mix is not supported in a drive group	
0x014e	Information	Copyback cannot be started on PD %s from %s, as HDD/SSD mix is not supported in a drive group	
0x014f	Information	VD bad block table on %s is cleared	
0x0150	Caution	SAS topology error: 0x%lxs	
0x0151	Information	VD cluster of medium errors corrected for %s at %lx (on %s at %lx)	
0x0152	Information	Controller requests a host bus rescan	
0x0153	Information	Controller repurposed and factory defaults restored	
0x0154	Information	Drive security key binding updated	
0x0155	Information	Drive security is in EKM mode	
0x0156	Warning	Drive security failed to communicate with EKMS	
0x0157	Information	%s needs key to be %s %s	
0x0158	Warning	%s secure failed	
0x0159	Critical	Controller encountered a fatal error and was reset	
0x015a	Information	Snapshots enabled on %s (Repository %s)	
0x015b	Information	Snapshots disabled on %s (Repository %s) by the user	
0x015c	Critical	Snapshots disabled on %s (Repository %s), due to a fatal error	
0x015d	Information	Snapshot created on %s at %s	
0x015e	Information	Snapshot deleted on %s at %s	
0x015f	Information	View created at %s to a snapshot at %s for %s	
0x0160	Information	View at %s is deleted, to snapshot at %s for %s	
0x0161	Information	Snapshot rollback started on %s from snapshot at %s	
0x0162	Fatal	Snapshot rollback on %s internally aborted for snapshot at %s	
0x0163	Information	Snapshot rollback on %s completed for snapshot at %s	
0x0164	Information	Snapshot rollback progress for snapshot at %s, on %s is %s	
0x0165	Warning	Snapshot space for %s in snapshot repository %s, is 80%% full	

Table 4. MegaRAID Storage Manager event messages-to-action (continued)

Number	Type	Event description	Suggested actions
0x0166	Critical	Snapshot space for %s in snapshot repository %s, is full	
0x0167	Warning	View at %s to snapshot at %s, is 80%% full on snapshot repository %s	
0x0168	Critical	View at %s to snapshot at %s, is full on snapshot repository %s	
0x0169	Critical	Snapshot repository lost for %s	
0x016a	Warning	Snaphot repository restored for %s	
0x016b	Critical	Snapshot encountered an unexpected internal error: 0x%lx	
0x016c	Information	Auto Snapshot enabled on %s (snapshot repository %s)	
0x016d	Information	Auto Snapshot disabled on %s (snapshot repository %s)	
0x016e	Critical	Configuration command could not be committed to disk, please retry	
0x016f	Information	COD on %s updated as it was stale	
0x0170	Warning	Power state change failed on %s (from %s to %s)	
0x0171	Warning	%s is not available	
0x0172	Information	%s is available	
0x0173	Information	%s is used for CacheCade with capacity 0x%lx logical blocks	
0x0174	Information	%s is using CacheCade %s	
0x0175	Information	%s is no longer using CacheCade %s	
0x0176	Critical	Snapshot deleted due to resource constraints for %s in snapshot repository %s	
0x0177	Warning	Auto Snapshot failed for %s in snapshot repository %s	
0x0178	Warning	Controller reset on-board expander	
0x0179	Warning	CacheCade (%s) capacity changed and is now 0x%lx logical blocks	
0x017a	Warning	Battery cannot initiate transparent learn cycles	
0x017b	Information	Premium feature %s key was applied for - %s	
0x017c	Information	Snapshot schedule properties changed on %s	
0x017d	Information	Snapshot scheduled action is due on %s	
0x017e	Information	Performance Metrics: collection command 0x%lx	
0x017f	Information	Premium feature %s key was transferred - %s	

Table 4. MegaRAID Storage Manager event messages-to-action (continued)

Number	Type	Event description	Suggested actions
0x0180	Information	Premium feature serial number %s	
0x0181	Warning	Premium feature serial number mismatched. Key-vault serial num - %s	
0x0182	Warning	Battery cannot support data retention for more than %d hours. Please replace the battery.	
0x0183	Information	%s power policy changed to %s (from %s)	
0x0184	Warning	%s cannot transition to max power savings	
0x0185	Information	Host driver is loaded and operational	
0x0186	Information	%s mirror broken	
0x0187	Information	%s mirror joined	
0x0188	Warning	%s link %d failure in wide port	
0x0189	Information	%s link %d restored in wide port	
0x018a	Information	Memory module FRU is %s	
0x018b	Warning	Cache-vault power pack is sub-optimal. Please replace the pack.	
0x018c	Warning	Foreign configuration auto-import did not import any drives	
0x018d	Warning	Cache-vault microcode update required	
0x018e	Warning	CacheCade (%s) capacity exceeds maximum allowed size, extra capacity is not used	
0x018f	Warning	LD (%s) protection information lost	
0x0190	Information	Diagnostics passed for %s	
0x0191	Critical	Diagnostics failed for %s	
0x0192	Information	Server Power capability Diagnostic Test Started	
0x0193	Information	Drive Cache settings enabled during rebuild for %s	
0x0194	Information	Drive Cache settings restored after rebuild for %s	
0x0195	Information	Drive %s commissioned as Emergency spare	
0x0196	Warning	Reminder: Potential non-optimal configuration due to drive %s commissioned as emergency spare	
0x0197	Information	Consistency Check suspended on %s	
0x0198	Information	Consistency Check resumed on %s	
0x0199	Information	Background Initialization suspended on %s	

Table 4. MegaRAID Storage Manager event messages-to-action (continued)

Number	Type	Event description	Suggested actions
0x019a	Information	Background Initialization resumed on %	
0x019b	Information	Reconstruction suspended on %s	
0x019c	Information	Rebuild suspended on %	
0x019d	Information	Copyback suspended on %s	
0x019e	Information	Reminder: Consistency Check suspended on %	
0x019f	Information	Reminder: Background Initialization suspended on %s	
0x01a0	Information	Reminder: Reconstruction suspended on %s	
0x01a1	Information	Reminder: Rebuild suspended on %s	
0x01a2	Information	Reminder: Copyback suspended on %s	
0x01a3	Information	Reminder: Patrol Read suspended	
0x01a4	Information	Erase aborted on %s	
0x01a5	Critical	Erase failed on %s (Error %02x)	
0x01a6	Progress	Erase progress on %s is %s	
0x01a7	Information	Erase started on %s	
0x01a8	Information	Erase completed on %s	
0x01a9	Information	Erase aborted on %s	
0x01aa	Critical	Erase failed on %s	
0x01ab	Progress	Erase progress on %s is %s	
0x01ac	Information	Erase started on %s	
0x01ad	Information	Erase complete on %s	
0x01ae	Warning	Potential leakage during erase on %s	
0x01af	Warning	Battery charging was suspended due to high battery temperature	
0x01b0	Information	NVCache firmware update was successful	
0x01b1	Warning	NVCache firmware update failed	
0x01b2	Fatal	%s access blocked as cached data in CacheCade is unavailable	
0x01b3	Information	CacheCade disassociate started on %s	
0x01b4	Information	CacheCade disassociate completed on %s	
0x01b5	Critical	CacheCade disassociate failed on %s	
0x01b6	Progress	CacheCade disassociate progress on %s is %s	
0x01b7	Information	CacheCade disassociate aborted by user on %s	

Table 4. MegaRAID Storage Manager event messages-to-action (continued)

Number	Type	Event description	Suggested actions
0x01b8	Information	Link speed changed on SAS port %d and PHY %d	
0x01b9	Warning	Advanced Software Options was deactivated for - %s	
0x01ba	Information	%s is now accessible	
0x01bb	Information	%s is using CacheCade	
0x01bc	Information	%s is no longer using CacheCade	
0x01bd	Information	Patrol Read aborted on %s	

Symptoms-to-actions

This section lists common symptoms and suggested actions to take.

The ServeRAID M controller is not seen during POST, or the WebBIOS is not accessible

Applicability:

- The server is BIOS-based, and the ServeRAID M controller does not display a POST banner.
- The WebBIOS configurator (Ctrl + H) is inaccessible or does not start.
- The server is UEFI-based, and the WebBIOS configurator in “Applications and Settings” is inaccessible or does not start.

Possible causes:

- The keyboard or mouse is faulty.
- There is a problem with UEFI, BIOS, or a device driver.
- PCI ROM execution is disabled in the setup utility.
- There is no power to the PCIe slot. Check the light path diagnostics panel (NMI/SMI).
- The ServeRAID M controller is malfunctioning.
- There are bad storage disk drives.
- The controller or riser card is not correctly seated in the PCI slot.
- There is a problem with the system board.

Problem determination procedure:

1. Reseat the keyboard and mouse connections. If a KVM is used, test a local keyboard and mouse to make sure that you can interact with the server.
2. Check the server light path diagnostics panel for possible issues.
3. Restart the server, and start the BIOS or UEFI setup utility by pressing F1.
4. From the setup utility, check the following settings to make sure that the PCI slot is configured correctly:
   a. For ServeRAID-MR10k, make sure that the planar SAS is enabled before you install the enabler DIMM.
   b. Check the advanced PCI settings to enable PCI ROM execution for the slot.
   c. Check and enable Rehook Int 19h in the **Start Options**.

5. If the controller is not detected correctly, power off the server, remove all disk drives from the backplane, and power on the server. If the controller is still not detected correctly, go to the next step.
6. Power off the server and open the server cover.
7. Disconnect all SAS cables (including external SAS cables).
8. Disconnect the remote battery.
9. Remove the ServeRAID M controller, or in the case of a ServeRAID-MR10k, reseat the enabler DIMM.
10. Inspect the PCI slot and controller for damage.
11. Make sure that the controller is in a supported PCI slot.
12. Inspect the SAS cables for damage, overstretching, nicks, or an excessive bend radius.
13. Reseat the ServeRAID M controller (do not attach SAS cables or battery).
14. Make sure that any PCI hot-plug latches are correctly seated.
15. Power on the server.

    If these setting changes do not correct the problem, load the default settings to try to correct the problem.
16. Observe for system power good indicators. (For more information, see the *Problem Determination and Service Guide* that comes with the server.)
17. Observe for correct LED activity on the ServeRAID M controller. Not all controllers have LEDs. For more information, see the *Quick Installation Guide* for each controller.
18. If the server is now able to detect the ServeRAID M controller, power off the server and attach the missing SAS/SATA cables and remote battery one at a time while you try the tests again each time.
19. Reseat the battery (if applicable) and power on the server.

    Note: If you get a battery error message, you might have a faulty battery.

Other considerations:

With only one controller and one PCI slot, it is difficult to determine which component is at fault. Additional hardware, another available PCI slot, or another test server greatly increases your ability to isolate the fault. For example, you can test whether other adapters work in the suspect PCI slot and whether the controller works correctly in another PCI slot or server.

One or more ServeRAID M controllers are inaccessible when multiple storage controllers are installed

Applicability:

- Two or more ServeRAID M controllers are installed.
- Additional non-ServeRAID adapters are installed in the server.
- The server does not boot correctly after another controller is installed.
- The server generates an 1801 POST error after a new controller is installed.

Possible causes:

- The new controller takes a higher position in the PCI scan order and becomes the primary boot controller.
- No option ROM memory space is available for additional adapters.

Problem determination procedure:

1. If the controller was recently added and caused the boot failure, remove the new controller to confirm that the original configuration continues to work. If it does, the cause of the problem is probably the scan order of the PCI buses in the server. In some servers, you can change the scan order by using the BIOS or UEFI setup utility, and in other servers, the scan order is fixed. In a server with a fixed PCI scan order, a good work-around is to swap the slot locations of the controllers in the server to make sure that the boot controller takes the highest priority slot location.
2. Only the boot ServeRAID M controller requires the BIOS to be enabled. Usually you can disable other SAS storage controllers without affecting their operational status. Use the advanced PCI settings to enable or disable PCI ROM execution for the slot. This also frees up option ROM space for other adapters.
3. For multiple ServeRAID M controllers to operate correctly within the same server, both controllers must have the same BIOS and firmware to reduce the probability of incompatibilities. Make sure that both controllers are operating with the same software.
4. For the secondary controller, make sure that the attached drives do not contain a bootable virtual disk from another configuration. If the data is not needed, clear the configuration from the added drives by using WebBIOS.

System events-to-actions index

System events originate from the server and are logged in the service processor in the server. Service processors vary from server to server, depending on the current technology and generation of the hardware. System events can significantly impact the operational status of the ServeRAID M controller or provide clues to resolving complex issues. Generally, the following list of event types can indicate a wide impact to the server and in some cases can help to isolate a hardware problem from a software or firmware problem:

- PCI events
- Memory events
- Processor events

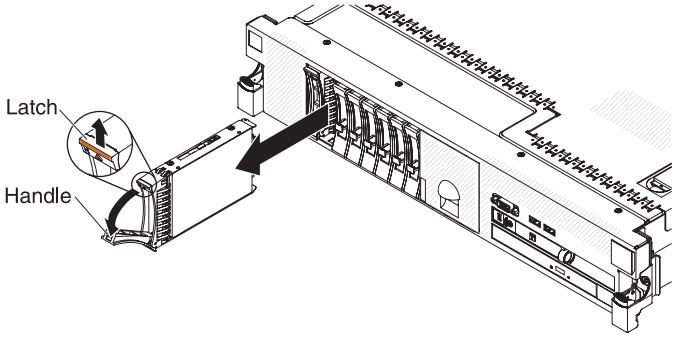
For details about troubleshooting, see the *Problem Determination and Service Guide* for the server and review the information about system-event logs and service processors, such as the integrated management module (IMM), baseboard management controller (BMC), and Remote Supervisor Adapter.

Chapter 4. Recovery procedures

Note: The illustrations in this document might differ from your hardware.

This section describes how to perform recovery procedures.

Removing a hot-swap hard disk drive



Attention: To maintain proper system cooling, do not operate the server for more than 10 minutes without either a drive or a filler panel installed in each bay.

To remove a hard disk drive from a hot-swap bay, complete the following steps:

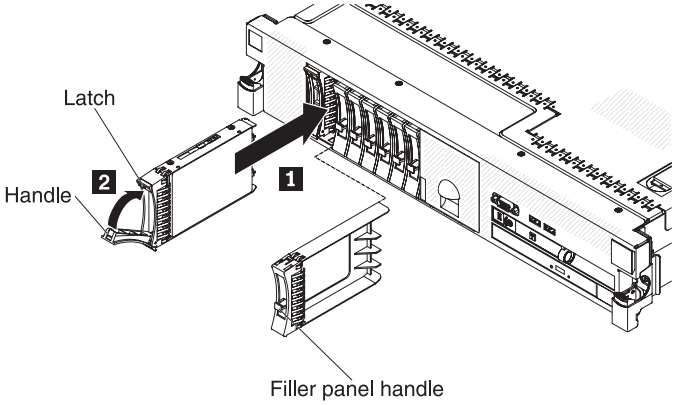
1. Read the safety information that begins on page v, “Handling static-sensitive devices” on page 4, and “Installation guidelines” on page 2.
2. Press up on the release latch at the top of the drive front.
3. Rotate the handle on the drive downward to the open position.
4. Pull the hot-swap drive assembly out of the bay approximately 25 mm (1 inch). Wait approximately 45 seconds while the drive spins down before you remove the drive assembly completely from the bay.
5. If you are instructed to return the hot-swap drive, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

© Copyright IBM Corp. 2010, 2012

Installing a hot-swap hard disk drive

Locate the documentation that comes with the hard disk drive and follow those instructions in addition to the instructions in this section.

For information about the type of hard disk drive that the server supports and other information that you must consider when you install a hard disk drive, see the *Installation and User's Guide* on the IBM *Documentation* CD.



To install a drive in a hot-swap bay, complete the following steps.

Attention: To maintain proper system cooling, do not operate the server for more than 10 minutes without either a drive or a filler panel installed in each bay.

1. Orient the drive as shown in the illustration.
2. Make sure that the tray handle is open.
3. Align the drive assembly with the guide rails in the bay.
4. Gently push the drive assembly into the bay until the drive stops.
5. Push the tray handle to the closed (locked) position.
6. If the server is turned on, check the hard disk drive status LED to verify that the hard disk drive is operating correctly.

Hard disk drive behavior after installation

After you install or replace a hard disk drive, you might observe the following behavior:

- A newly installed hard disk drive takes approximately 60 seconds before it is ready for operation. During that time, the disk spins up and the LEDs might flash; however, when the drive is finished spinning up, the amber LED remains off during normal operation. The green activity LED flashes while the disk is accessed by the controller.
- If you are replacing a failed drive, the amber LED that was previously lit turns off after approximately 60 seconds, and the green LED flashes while it is accessed by the controller. Depending on the RAID configuration, replaced drives might start rebuilding. If this occurs, the amber LED flashes slowly during the rebuild process and heavy green LED activity is normal. If the amber LED remains lit, see Table 1 on page 11.

Note: You might have to reconfigure the disk arrays after you install hard disk drives. For more information, see the RAID controller documentation.

Chapter 5. Battery maintenance

New ServeRAID M controllers and new batteries that are added or replaced on a controller require some initial maintenance. When the batteries are packaged for shipping, they are only partially charged, according to the optimal specifications of the battery manufacturing process. Depending on the length of time between packaging and installation into an IBM server, the battery might lose some or most of its charge. All batteries require a period of time for charging before they are ready to protect the ServeRAID subsystem from an unexpected power loss. The typical maintenance routine is as follows:

- Allow at least 6 hours of charging time in normal operating conditions for the battery to become fully charged.
- After the battery is fully charged, calibrate the battery at a convenient time.

The ServeRAID M controllers are capable of providing an accurate gauge of the battery properties throughout the battery life cycle. As part of maintaining a high degree of accuracy, the controller must periodically calibrate the battery. The suggested calibration period is approximately once every three months. This learning period enables the controller to programmatically gauge the behavior of the battery charging time, rate of discharge, and power capacity. Battery properties change over time depending on many factors, including temperature, usage, charges, and discharges. These factors are important in ensuring that a battery remains optimal when it is needed to protect the ServeRAID subsystem if an unexpected power loss occurs.

ServeRAID batteries are considered consumable items in the United States. Customers are responsible for obtaining a consumable part and replacing it. IBM Service cannot replace consumable parts without an invoice or bill. An IBM ServeRAID battery can be ordered as a customer replaceable unit (CRU), using one of the following methods:

By telephone in the US: (877) 719-0841, option 1 (parts order)

On the web: http://www.ibm.com/shop/americas/content/home/store_IBMPublicUSA/en_US/parts/parts_main.html

Consumable parts are not covered by the IBM Statement of Limited Warranty or maintenance agreements.

BBU modes for iBBU08 and iBBU09 batteries

When the ServeRAID M controller has an iBBU08 or iBBU09 battery installed, three user-configurable settings for the battery backup (BBU) mode are available within the Battery Properties. The mode of operation determines the retention time of any data protected during an unexpected power failure and the learn cycle configuration, which as a result can improve the service life of the battery as defined below:

Mode of Operation:

1 12 hours retention with a transparent learn cycle and best service life.

2 24 hours retention with transparent learn cycle and a balanced service life.

4 (Default) 48 hours retention with a non-transparent learn cycle and a moderate service life.

© Copyright IBM Corp. 2010, 2012

When modes 1 or 2 are configured, learn cycles become transparent, meaning that no further configuration is necessary to define or schedule learn cycles. A transparent learn cycle calibrates the battery in the background while the controller remains in write-back cache mode, if so configured. RAID volumes do not change to write-through cache mode during the learn cycles.

By default, mode 4 is selected and features the longest retention time; however, learn cycles require more resources to calibrate. To maintain optimal data protection, the controller will change the cache mode to write-through during the calibration cycle.

Battery frequently asked questions (FAQs)

Below are the most frequently asked questions about the behavior of a battery backup unit (BBU) configured with an IBM ServeRAID MR10x SAS/SATA controller on supported IBM System x servers:

1. What causes the battery “relative state of charge” to not reach 100% charge completion?
2. Why is the battery “remaining capacity” not the same as “full capacity?”
3. How long does it take to finish a battery relearn cycle after a ServeRAID M controller has initiated this action?
4. Why does the IBM ServeRAID M controller write cache remain disabled while a battery learn cycle is in process?
5. Why does the IBM ServeRAID M controller cache mode default to write-through mode while a battery learn cycle is disabled?

The BBU is composed of lithium-ion and an electronic control circuitry. The unique nature of the Li-Ion battery is that its life span is dependent upon aging (shelf life). From the time of manufacturing, regardless of whether it was charged or the number of charge/discharge cycles, the battery declines slowly and predictably in capacity. This means that an older battery does not last as long as a new battery solely due to its age. This is the main reason why the relative state of charge of the BBU is not going to be equal to the absolute state of charge, because by design batteries are consumable goods and degrade over time.

Do not disable the learn cycle of the BBU because it shortens the service life of the battery to one-third (approximately eight months) of its original useful life of two years. This is why it is so important to keep the learn cycle turned on to prolong the life of the battery. The learn cycle can take up to 12 hours to complete, during which write-cache mode defaults to write-through mode. There might be some slight performance impact of the controller while in this process. For more information about the battery learn cycle, see the controller User's Guide.

After the BBU is completely charged, the controller automatically changes the write-cache mode back to write-back when configured to do so. The write-back cache mode can be manually changed by using the MegaRAID Storage Manager (MSM) application or the Command Line Interface (CLI) tool.

When the ServeRAID M battery learn cycle is disabled, after a period of time, the controller enables a safety mechanism to prevent data loss. The controller also sets its cache mode to write-through mode, even if the battery is fully charged.

It is not uncommon for the relative state of charge of the BBU to not reach 100%. Relative state of charge is an indication of the full charge capacity percentage in relation to the design capacity. Multiple battery learn cycles can move this state up or down.

For more information about ServeRAID batteries, see RETAIN tip H001648 (MIGR-5072280) at http://www.ibm.com/support/entry/portal/docdisplay?lndocid=MIGR-5072280.

Note: For the best performance, replace the battery after 1 year of service.

Known battery issues

System issues thermal warnings with multiple ServeRAID controllers:

A server that has multiple ServeRAID MR10M or MR10i controllers might see battery thermal warnings. These messages are logged in the server baseboard management controller (BMC) log. A remote battery cover and shelf is available for the affected systems.

For the IBM System x3650 and IBM System x3655, order FRU 46C4183. For the IBM System x3350 and IBM System x3550, part number 44W4896, remote battery cover, is available. These parts are not CRUs and must be installed by service personnel.

The remote battery shelves and covers enable the placement of the ServeRAID batteries closer to the server fans, enabling better cooling and improved airflow.

For more information, see RETAIN Tip H194157.

ServeRAID M or MegaRAID storage controller battery does not appear in POST:

A battery might appear missing at POST because the battery or charging circuit is not functioning correctly. Check the management software or use the CLI tools to determine the status of the battery. If a battery message is displayed in POST or within the management software, indicating that the battery has failed or is dead, replace the battery.

The ServeRAID battery is a consumable item. For the best performance, replace the battery after 1 year of service. The battery can be purchased in the United States at http://www.ibm.com/shop/americas/content/home/store_IBMPublicUSA/en_US/parts/parts_main.html or call IBM parts help at (877) 719-0841 and press option 1 for a parts order. For a list of battery part numbers, see Chapter 6, “Parts listing,” on page 71.

After replacing the battery, a new battery requires two hours to reach a usable state of charge.

For more information, see RETAIN Tip H196374 (MIGR-5083004) at http://www.ibm.com/support/entry/portal/docdisplay?lndocid=MIGR-5083004.

ServeRAID-MR10M and MR10i controllers are transitioning from NiMH to Li-Ion batteries:

ServeRAID-MR10M and ServeRAID-MR10i controllers are transitioning from NiHM to Li-Ion batteries and charging technologies. If the battery technology changes, the charging unit must also be updated.

For the latest information about battery transitions for specific ServeRAID M controllers, see RETAIN Tip H19142 (MIGR-5077853) at http://www.ibm.com/support/entry/portal/docdisplay?lndocid=MIGR-5077853.

A new battery requires two hours to reach a usable state of charge.

ServeRAID M controllers with flash-backed cache

ServeRAID M controllers with cache-to-flash technology do not have batteries; however, they provide the same protection against unexpected power-loss situations. These controllers use high performance capacitors to power the flash-backed cache feature that offloads unsaved write operations to nonvolatile flash storage on the controller. A battery powered controller protects and maintains power to the volatile cache memory on the controller for up to a few days[1] under normal conditions. With flash-backed cache, the data stored in the flash is retained for months[2] without power.

There are some important difference in the behavior of flash-backed cache compared to controllers with batteries.

For controllers with batteries, an unexpected power loss event triggers the battery to maintain power[3] to the volatile cache memory on the controller until power is restored. With cache-to-flash, the power in the charged capacitors is used to read uncommitted writes from the volatile cache memory then saves them to the nonvolatile flash storage. The cache-offload process can take about 25 seconds.

After power is restored to the server, flash-backup cache controllers must reverse the process, by moving the data stored in the backup flash to the cache memory. This cache-reload process also takes about 25 seconds and increases the startup time of the server slightly during this process. The typical time to recharge the flash-backup unit is from 2 to 3 minutes and the controller operates in write-through cache mode until it is charged. These units do require learn cycles, which are predefined, automated, and run in less than a minute. You can manually adjust these cycles by using controller software utilities.

For alerts, warnings, and messages, a flash-backed cache controller responds with the same battery messages used by controllers with batteries. From a service perspective, the flash-backed cache and remote capacitor unit are considered to be effectively a “battery;” therefore, applicable battery messages apply.

1. Review the controller documentation for battery retention attributes supported by the specific controller.
2. Flash data retention depends on many factors beyond the scope of this document; however, statements here fit common expected server retention scenarios.
3. Review the controller documentation for battery retention attributes supported by the specific controller.

Chapter 6. Parts listing

This section provides the replaceable components that are available for ServeRAID M controllers.

Replaceable components for ServeRAID M controllers are of two types:

- **Tier 1 customer replaceable unit (CRU):** Replacement of Tier 1 CRUs is your responsibility. If IBM installs a Tier 1 CRU at your request, you will be charged for the installation.
- **Consumable part:** Purchase and replacement of consumable parts (components, such as batteries and printer cartridges, that have depletable life) is the customer's responsibility. If IBM acquires or installs a consumable part at the customer's request, the customer is charged for the service.

For information about the terms of the warranty, see the *Warranty Information* document and that comes with the controller. For information about getting service and assistance, see Appendix A, “Getting help and technical assistance,” on page 73.

Table 5. Tier 1 customer replaceable units

Part number	Description
43W4297	ServeRAID-MR10i SAS/SATA PCIe controller
43W4304	ServeRAID-MR10i battery carrier
44E8776	ServeRAID-MR10il SAS/SATA PCIe controller
46C4171	Cable
44E8696	ServeRAID-MR10is SAS/SATA PCIe controller
44E8763	Battery carrier with remote intelligent Battery Backup Unit (iBBU) cable
41Y3884	SAS cable
43W4282	ServeRAID-MR10k SAS/SATA PCIe controller
43W4341	ServeRAID-MR10M SAS/SATA PCIe controller
43W4343	ServeRAID-MR10M battery carrier
46M0832	ServeRAID M1000 Series Advanced Feature Key
46M0861	ServeRAID M1015 SAS/SATA controller
46M0918	ServeRAID M5014 SAS/SATA controller
46M0851	ServeRAID M5015 SAS/SATA controller
46M0830	ServeRAID M5025 SAS/SATA controller

© Copyright IBM Corp. 2010, 2012

Table 5. Tier 1 customer replaceable units (continued)

Part number	Description
46M0930	ServeRAID M5000 Series Advanced Feature Key
46C8974	ServeRAID M5016 for IBM System x (Feature code A2NF)
81Y4482	ServeRAID M5110 SAS/SATA Controller for IBM System x
81Y4449	ServeRAID M1115 SAS/SATA Controller for IBM System x
81Y4479	ServeRAID M5120 SAS/SATA Controller for IBM System x
81Y4485	ServeRAID M5100 Series 512 MB Cache/RAID 5 Upgrade
81Y4488	ServeRAID M5100 Series 512 MB Flash/RAID 5 Upgrade
81Y4580	ServeRAID M5100 Series 1 GB Flash/RAID 5 Upgrade
81Y4491	ServeRAID M5100 Series Battery Kit for IBM System x

Consumable parts are not covered by the IBM Statement of Limited Warranty. The following consumable parts are available for purchase from the retail store.

Table 6. Consumable parts

Part number	Description
43W4301	ServeRAID-MR10i NiMH controller battery
43W4342	ServeRAID MR10i Li-Ion controller battery ServeRAID MR10is controller battery ServeRAID-MR10M controller battery ServeRAID M5015 controller battery
90Y9406	ServeRAID MR10ie controller battery
43W4283	ServeRAID-MR10k controller battery
46M0917	ServeRAID M5000 series battery kit
81Y4579	ServeRAID M5100 Series Flash Power Module

Order an IBM ServeRAID battery as a customer replaceable unit (CRU) by using one of the following methods:

By telephone in the US: (877) 719-0841, option 1 (parts order)

On the web at http://www.ibm.com/shop/americas/content/home/store_IBMPublicUSA/en_US/parts/parts_main.html.

Appendix A. Getting help and technical assistance

If you need help, service, or technical assistance or just want more information about IBM products, you will find a wide variety of sources available from IBM to assist you. This section contains information about where to go for additional information about IBM and IBM products, what to do if you experience a problem with your system, and whom to call for service, if it is necessary.

Before you call

Before you call, make sure that you have taken these steps to try to solve the problem yourself:

- Check all cables to make sure that they are connected.
- Check the power switches to make sure that the system and any optional devices are turned on.
- Use the troubleshooting information in your system documentation, and use the diagnostic tools that come with your system. Information about diagnostic tools is in the *Problem Determination and Service Guide* on the IBM *Documentation* CD that comes with your system.
- Go to the IBM support website at http://www.ibm.com/supportportal/ to check for technical information, hints, tips, and new device drivers or to submit a request for information.

You can solve many problems without outside assistance by following the troubleshooting procedures that IBM provides in the online help or in the documentation that is provided with your IBM product. The documentation that comes with IBM systems also describes the diagnostic tests that you can perform. Most systems, operating systems, and programs come with documentation that contains troubleshooting procedures and explanations of error messages and error codes. If you suspect a software problem, see the documentation for the operating system or program.

Using the documentation

Information about your IBM system and preinstalled software, if any, or optional device is available in the documentation that comes with the product. That documentation can include printed documents, online documents, readme files, and help files. See the troubleshooting information in your system documentation for instructions for using the diagnostic programs. The troubleshooting information or the diagnostic programs might tell you that you need additional or updated device drivers or other software. IBM maintains pages on the World Wide Web where you can get the latest technical information and download device drivers and updates. To access these pages, go to http://www.ibm.com/supportportal/ and follow the instructions. Also, some documents are available through the IBM Publications Center at http://www.ibm.com/shop/publications/order/.

Getting help and information from the World Wide Web

On the World Wide Web, the IBM website has up-to-date information about IBM systems, optional devices, services, and support. The address for IBM System x® and xSeries® information is http://www.ibm.com/systems/x/. The address for IBM BladeCenter® information is http://www.ibm.com/systems/bladecenter/. The address for IBM IntelliStation® information is http://www.ibm.com/systems/intellistation/.

© Copyright IBM Corp. 2010, 2012

You can find service information for IBM systems and optional devices at http://www.ibm.com/supportportal/.

Software service and support

Through IBM Support Line, you can get telephone assistance, for a fee, with usage, configuration, and software problems with System x and xSeries servers, BladeCenter products, IntelliStation workstations, and appliances. For information about which products are supported by Support Line in your country or region, see http://www.ibm.com/services/supline/products/.

For more information about Support Line and other IBM services, see http://www.ibm.com/services/, or see http://www.ibm.com/planetwide/ for support telephone numbers. In the U.S. and Canada, call 1-800-IBM-SERV (1-800-426-7378).

Hardware service and support

You can receive hardware service through your IBM reseller or IBM Services. To locate a reseller authorized by IBM to provide warranty service, go to http://www.ibm.com/partnerworld/ and click **Find Business Partners** on the right side of the page. For IBM support telephone numbers, see http://www.ibm.com/planetwide/. In the U.S. and Canada, call 1-800-IBM-SERV (1-800-426-7378).

In the U.S. and Canada, hardware service and support is available 24 hours a day, 7 days a week. In the U.K., these services are available Monday through Friday, from 9 a.m. to 6 p.m.

IBM Taiwan product service

台灣 IBM 產品服務聯絡方式：
台灣國際商業機器股份有限公司
台北市松仁路 7 號 3 樓
電話：0800-016-888

IBM Taiwan product service contact information:
IBM Taiwan Corporation
3F, No 7, Song Ren Rd.
Taipei, Taiwan
Telephone: 0800-016-888

Appendix B. Notices

This information was developed for products and services offered in the U.S.A.

IBM may not offer the products, services, or features discussed in this document in other countries. Consult your local IBM representative for information on the products and services currently available in your area. Any reference to an IBM product, program, or service is not intended to state or imply that only that IBM product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any IBM intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any non-IBM product, program, or service.

IBM may have patents or pending patent applications covering subject matter described in this document. The furnishing of this document does not give you any license to these patents. You can send license inquiries, in writing, to:

IBM Director of Licensing
IBM Corporation
North Castle Drive
Armonk, NY 10504-1785
U.S.A.

INTERNATIONAL BUSINESS MACHINES CORPORATION PROVIDES THIS PUBLICATION “AS IS” WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some states do not allow disclaimer of express or implied warranties in certain transactions, therefore, this statement may not apply to you.

This information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. IBM may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

Any references in this information to non-IBM websites are provided for convenience only and do not in any manner serve as an endorsement of those websites. The materials at those websites are not part of the materials for this IBM product, and use of those websites is at your own risk.

IBM may use or distribute any of the information you supply in any way it believes appropriate without incurring any obligation to you.

Trademarks

IBM, the IBM logo, and ibm.com are trademarks of International Business Machines Corp., registered in many jurisdictions worldwide. Other product and service names might be trademarks of IBM or other companies. A current list of IBM trademarks is available on the web at “Copyright and trademark information” at http://www.ibm.com/legal/copytrade.shtml.

Adobe and PostScript are either registered trademarks or trademarks of Adobe Systems Incorporated in the United States and/or other countries.

© Copyright IBM Corp. 2010, 2012

Cell Broadband Engine is a trademark of Sony Computer Entertainment, Inc., in the United States, other countries, or both and is used under license therefrom.

Intel, Intel Xeon, Itanium, and Pentium are trademarks or registered trademarks of Intel Corporation or its subsidiaries in the United States and other countries.

Java and all Java-based trademarks and logos are trademarks or registered trademarks of Oracle and/or its affiliates.

Linux is a registered trademark of Linus Torvalds in the United States, other countries, or both.

Microsoft, Windows, and Windows NT are trademarks of Microsoft Corporation in the United States, other countries, or both.

UNIX is a registered trademark of The Open Group in the United States and other countries.

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 1024 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.

IBM makes no representation or warranties regarding non-IBM products and services that are ServerProven®, including but not limited to the implied warranties of merchantability and fitness for a particular purpose. These products are offered and warranted solely by third parties.

IBM makes no representations or warranties with respect to non-IBM products. Support (if any) for the non-IBM products is provided by the third party, not IBM.

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

Index

© Copyright IBM Corp. 2010, 2012

S

T

U

W

Part Number: 81Y1021

Printed in USA

(1P) P/N: 81Y1021