

ServeRAID-8 Series



Best Practices and Maintenance Information

ServeRAID-8 Series



Best Practices and Maintenance Information

Note: Before using this information and the product it supports, read the general information in “Notices,” on page 45.

Second Edition (September 2011)

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Chapter 1. ServeRAID-8 series best practices and maintenance information

This document provides best practices and maintenance information for the IBM® ServeRAID-8 series controllers.

Notices and statements in this 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.

Obtaining ServeRAID updates

For updated versions of the ServeRAID software, go to <http://www-304.ibm.com/systems/support/supportsite.wss/docdisplay?Indocid=SERV-RAID&brandind=5000008> or complete the following steps.

Note: Changes are made periodically to the IBM Web site. Procedures for locating firmware and documentation 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. Under **Popular links**, click **Software and device drivers**.
4. Under **Related downloads**, click **ServeRAID** to display the matrix of downloadable ServeRAID files.

Note: If you download ServeRAID software, you must download and install all ServeRAID software at the same time to make sure that all levels of the software are compatible. The ServeRAID software includes the following types of software:

- BIOS and firmware code
- Device drivers
- ServeRAID Manager program
- Command-line programs

If you do not have access to the World Wide Web, contact your place of purchase, your IBM reseller, or your IBM marketing representative for updated CDs.

Initializing previously used good hard disk drives

A previously used good hard disk drive is defined in this document as a drive that was previously a member of an array that was attached to a ServeRAID-8 series controller. The drive is being reused within a new RAID configuration. Before you can add a previously used good hard disk drive to a new array, either as a replacement drive or to expand an array, you must first initialize the drive to remove existing configuration information. Existing configuration information can cause the ServeRAID controller to behave differently than expected and, in some rare cases, can result in data loss.

You can initialize a hard disk drive by using the Array Configuration Utility (ACU) (accessible by pressing Ctrl+A when you are prompted at system startup), the IBM ServeRAID Support CD version 8 or 9, or the ServeRAID Manager program (from within the operating system), or by using the **arconf task** command.

For more information, see the following RETAIN tips.

A rebuild does not start after replacing a defunct drive - IBM ServeRAID

<http://www-304.ibm.com/systems/support/supportsite.wss/docdisplay?brandind=5000008&indocid=MIGR-5074510>
(Type 5074510 in the **Search** field at <http://www.ibm.com>.)

Lost configuration when drive added - ServeRAID 8k, 8k-I

<http://www-304.ibm.com/systems/support/supportsite.wss/docdisplay?brandind=5000008&indocid=MIGR-5073723>
(Type 5073723 in the **Search** field at <http://www.ibm.com>.)

Synchronizing logical drives after upgrading firmware from build 8263 or earlier

ServeRAID firmware builds 7777 through 8263 use a legacy method to track bad-stripe unit errors. Starting with firmware build 8264 and later, the process to manage bad-stripe units is improved with a bad-stripe table. The firmware upgrade process does not import existing bad-stripe information from the old method to the new, and the legacy method is perceived by the new code as disk errors when the affected stripe units are read. In most cases, these types of errors are corrected automatically without any user intervention. However, in rare cases, if a large number of these errors are reported by a single drive, the drive might be marked Defunct prematurely.

To avoid this situation, start a synchronization on each logical drive. The synchronization process scrubs the physical drives, corrects the errors as they are detected, and when applicable, creates an equally equivalent bad-stripe table entry. Note that the ServeRAID-8 series controllers are designed to correct or self-heal bad-stripe table entries when the next successful write occurs to that stripe unit.

You can start synchronizations by using the IBM ServeRAID Support CD, the ServeRAID Manager installable application (from within the operating system), or the **arconf task** command.

Note: The ServeRAID-8 series controllers can run multiple synchronizations, at the expense of an incremental performance decrease. You can modify the priority of synchronizations from high to low by using the ServeRAID Manager application or by using the **arconf setpriority** command to help balance incoming user workload to synchronization workload.

Upgrading to ServeRAID Manager 9.0 within Microsoft Windows

ServeRAID Manager 9.0 changed a fundamental method that is used to manage attached storage. In earlier versions 8.00 to 8.40 two components are always needed to communicate with the storage subsystem. These two components are the operating-system ARCSAS device driver and the AACMGT.SYS filter driver. With the ServeRAID Manager 9.0 application, only the latest version of the operating-system device driver is needed, because the AACMGT filter driver functions are added to the new device drivers.

On a new installation of ServeRAID Manager 9.0, the filter driver is not installed, and a restart is not required; however, the management function works only if the latest ARCSAS driver, which is version 5.2.0.12913, is installed. If an earlier version of the driver is installed, the ServeRAID Manager application reports a driver update is required message.

If you are upgrading an existing installation of ServeRAID Manager 8.x to version 9.0, the upgrade installation preserves the existing AACMGT filter driver. The new software uses the existing filter driver to obtain the storage-management data as needed. This is the only way that ServeRAID Manager 9.0 can manage a system with an earlier version of the device driver. If the device driver is ever upgraded to version 5.2.0.12913, ServeRAID Manager 9.0 uses the native storage-management functions of the new driver.

If it is necessary to upgrade an existing installation of an earlier version of ServeRAID Manager 8.x, you must first upgrade to ServeRAID Manager 8.40 and then upgrade to 9.0 to incorporate the broadest support for the ServeRAID 8-series controllers and the fixes in the later code.

For more information, see the following RETAIN tip.

ServeRAID Manager reports “SAS driver update required”

<http://www-304.ibm.com/systems/support/supportsite.wss/docdisplay?brandind=5000008&Indocid=MIGR-5073797>

(Type 5073797 in the **Search** field at <http://www.ibm.com>.)

Synchronization options when you create a new array and the impact on performance

When you create a new redundant array, three methods are available to synchronize the data on the new array: QuickInit, AutoSync, and Clear. The initial synchronization on a new array creates the redundant stripe units that are used to recover the array if a disk has failed.

The QuickInit option has the least impact on system performance because the synchronization is done as new write operations are made to the array; however, the array becomes available to you immediately. The array shows a status of Impacted until the synchronization is completed. During idle time, the array slowly synchronizes in the background. QuickInit might take days to several weeks to be

completed and change the array status to Optimal. You can make the new array Optimal faster by synchronizing the logical drive.

The AutoSync option has minimal impact on performance because an active synchronization is started after the array is created. The new array immediately becomes available; however, the synchronization defaults to a high priority. When the synchronization task is set to High, the task can take as much as 33% of the controller resources. After the array is created, you can modify the priority from High to Medium to Low by using the IBM ServeRAID Support CD, the ServeRAID Manager application, or the **arcconf setpriority** command. Modifying the priority to low reduces the resources that are used by the synchronization to about 16% but increases the time that it takes to be completed. The array becomes Optimal after the synchronization is completed.

Use the Clear option to perform an immediate and exclusive synchronization on the new array. The synchronization might take several hours to finish; the array is unavailable until the synchronization is completed. When the synchronization is completed, the array is Optimal, and the new logical drive becomes available.

For more information, see the following RETAIN tip.

Rebuild and sync priorities on ServeRAID-8x controllers

<http://www-304.ibm.com/systems/support/supportsite.wss/docdisplay?brandind=5000008&Indocid=MIGR-5070858>
(Type 5070858 in the **Search** field at <http://www.ibm.com>.)

Physical drive write-cache policies changed with firmware build 15407 and later

With ServeRAID firmware build 15407 and later, managing hard disk drive write-cache policies on the ServeRAID-8 series controllers is improved to make this a global controller setting so that all hard disk drives that are attached to the subsystem conform to a common write-cache policy. You can set the write-cache policy differently for SAS and SATA drives.

You can set the hard disk drives write-cache setting to either write-through (disabled or Off) or write-back (enabled or On). In earlier firmware versions, the hard disk drive write-cache policy is changed on an individual device basis. Different devices can have different cache states.

The cache policy changes offer four new options: SAS = On or Off and SATA = On or Off. The controller default is SAS = Off and SATA = On. When you upgrade the firmware to build 15407 and later from a version earlier than 15407, the controller applies the default settings to the storage devices.

Avoid using more than one cache mode. The new firmware options help to make sure that all drives conform to a common write-cache configuration. The write-cache mode of a hard disk drive supports one of two general policies on a RAID controller. When you disable (Off) the write-cache, the RAID controller firmware can protect the uncommitted write operations at the logical drive level, which prevents the loss of data if there is an unexpected power outage. When the write-cache setting is enabled (On), there is a moderate performance gain at the risk of losing data if there is an unexpected power loss. With earlier versions of firmware, it is possible to configure multiple write-cache modes on array member devices, which undermines both policies.

Attention: Data loss can occur when the write-cache policy is enabled on the physical drives, because the ServeRAID controller cannot manage write operations that are owned by the individual hard disk drive and are not committed to the drive media. The battery-backed memory cache on the ServeRAID controller can protect the write operation only at a logical drive level. Therefore, set the hard disk drive write-cache policy to Off or Disabled. Turning the write-cache policy Off on all drives ensures the lowest risk to data loss if there is an unexpected power outage.

You can modify the write-cache policy settings from the Controller Configuration section, which you can access by pressing Ctrl+A, and which is available from the IBM ServeRAID Support CD, the ServeRAID Manager application, and the **arcconf setcache** command.

Note: The IBM default hard disk drive write-cache state for SAS drives is Disabled or Off. For SATA drives, the IBM default hard disk drive write-cache policy is Enabled or On.

For more information, see the following RETAIN tip.

ServeRAID changes hard drive write-cache mode unexpectedly

<http://www-304.ibm.com/systems/support/supportsite.wss/docdisplay?brandind=5000008&Indocid=MIGR-5070673>
(Type 5070673 in the **Search** field at <http://www.ibm.com>.)

Defunct hard disk drives might return to normal operation after a system restart

A hard disk drive that is marked Defunct during normal operation on a ServeRAID-8 series controller is treated as a replaced drive when the host server is restarted. *Defunct* is a physical-drive state in which the ServeRAID controller cannot communicate correctly with the drive.

Visual indicators, such as the amber LEDs, are also reset and turn off.

During a server restart process, the ServeRAID-8 series controller executes normal startup sequences for each drive that is attached to the system, assuming that each drive is good. If a drive that is marked Defunct spins up, the controller takes user-defined actions as if it were replaced in the system. If a drive that is marked Defunct does not spin up, the disk might remain in a Defunct state, or appear missing from the controller scan or in the ServeRAID Manager program. In this situation, the amber LED that is lit still turns off.

If a hard disk drive returns to normal operation, the drive might not be bad. The ServeRAID controller marks a drive Defunct if any component in the subsystem prevents normal communication to the drive. This includes issues with the hard disk drive firmware, cables, backplanes, drive connectors, and tray interposers. The ServeRAID controller cannot determine which component has contributed to the offline drive.

A strong indicator that the drive might be good is that the hard disk drive does return to normal operation after a system restart. If this occurs, perform a subsystem health check to make sure that all known issues are avoided by applying known fixes. For more information, see “Periodic ServeRAID maintenance updates and evaluation” on page 9.

For more information, see the following RETAIN tip.

Hard Disk Drives rebuild after going defunct and a system restart

<http://www-304.ibm.com/systems/support/supportsite.wss/docdisplay?brandind=5000008&Indocid=MIGR-5072365>
(Type 5072365 in the **Search** field at <http://www.ibm.com>.)

The Automatic Failover feature and how it affects replaced drives

The Automatic Failover feature of the Adaptec RAID Configuration Utility controls the rebuilding of a logical drive when a defunct drive is replaced. *Defunct* is a physical-drive state in which the ServeRAID controller cannot communicate correctly with the drive.

When Automatic Failover is enabled (the default setting), the ServeRAID controller automatically starts a rebuild operation when a hard disk drive is installed to replace a defunct drive and no other hot-spare options are defined. Hot spares always have priority over the Automatic Failover feature.

When Automatic Failover is disabled and a new (never used) hard disk drive is installed to replace a defunct drive, the new drive status becomes Ready. Then, you must manually configure the drive for operation. The drive can be used in a new array or defined as a hot spare. If an array is critical and the drive is defined as a hot spare, a rebuild operation starts for the drive, if its size qualifies the drive as a replacement disk.

Attention: When Automatic Failover is disabled, do not replace a defunct hard disk drive with a hard disk drive that has existing ServeRAID configuration information (metadata). The ServeRAID controller tries to use the existing information on the drive to recover the array. The newly installed drive might appear as part of an incomplete array, or, if the drive is a simple volume or one part of a mirror, the array might come online. If the newly installed drive is part of a mirror, it might come online in a Critical state. In some cases, this causes unpredictable behavior and data corruption.

Important: If Automatic Failover is disabled, before you install a hard disk drive that has existing ServeRAID configuration information, you must first initialize the drive to remove the existing configuration information. For more information, see “Initializing previously used good hard disk drives” on page 2.

To change the Automatic Failover feature setting, press Ctrl+A when you are prompted at system startup. From the **Adaptec RAID Configuration Utility** menu, select **SerialSelect Utility**; then, select **Controller Configuration**. You can also use the **arconf failover** command to change the Automatic Failover feature setting, if you are using firmware version build 15407 or later.

Performance is degraded with multiple ongoing background tasks

The ServeRAID-8 series controllers are designed to run multiple background tasks at the same time. Background tasks are rebuilds, synchronizations, and copy back operations. There can be a significant performance impact, to the point of making the controller unusable, if too many operations are started and you do not balance the total number of tasks and the priority of those tasks.

Synchronizing spanned arrays is one of the main sources of an unexpected high impact to performance. Spanned arrays are made up of multiple subarrays or legs. When you start a synchronization on a logical drive, it actually starts one synchronization per leg. If a RAID 10 is made up of eight subarrays, synchronizing the logical drive results in a synchronization of each leg, or eight synchronizations.

An active synchronization defaults to a high priority, which takes as much as 33% of the controller resources. Adjusting the priority to low reduces the resources that are used by the synchronization to approximately 16% but increases the time it takes to be completed.

If two synchronizations are active with a high priority, over 50% of the controller resources are used by these operations. The controller firmware moderately throttles synchronization operations; however, the high priority setting remains aggressive. Additional background tasks will continue to reduce resources that are available to user workload without manual intervention.

Considering the number of drives and array spans within a ServeRAID configuration, you can manage tasks by controlling the total number of background tasks that are running concurrently and by lowering the priority of the operations.

On systems that are servicing clients in a business capacity, do not run more than two background tasks concurrently, and lower the task priority to free resources for business workloads. You can stop synchronization tasks, if necessary, and restart them after other operations are completed.

The tools that are available from a graphical interface to modify tasks are on the IBM ServeRAID Support CD (you must start to the CD) and the operating-system-installable version of the ServeRAID Manager application. From the command line, you can use the **arconf task** command to start and stop operations, and you can use the **arconf setpriority** command to change the priority.

Note: Firmware builds 11849 and earlier do not preserve modifications that you make to task priorities between system resets. After a system reset is completed, the tasks switch to high priority. Firmware builds 15407 and later preserve the modifications that you make to task priorities before a system reset.

For more information, see the following RETAIN tip.

Rebuild and sync priorities on ServeRAID-8 series SAS controllers

<http://www-304.ibm.com/systems/support/supportsite.wss/docdisplay?brandind=5000008&Indocid=MIGR-5070858>
(Type 5070858 in the **Search** field at <http://www.ibm.com>.)

Replacing and rebuilding a drive in a PFA state

IBM SAS and SATA hard disk drives support Predictive Failure Analysis (PFA) or SMART alerts. This specification is designed into the hard disk drives to internally monitor and diagnose a likely failure within the near future. If a disk issues a PFA event, the ServeRAID controller captures and forwards the event locally to the ServeRAID Management console and agent. ServeRAID Manager Agent software supports industry-standard Simple Network Management Protocol (SNMP) for alert automation. If a PFA alert occurs on an IBM hard disk drive, the hard disk drive is eligible for replacement under the warranty terms and conditions.

Depending on whether the RAID configuration is redundant, recovering an array when a member hard disk drive has an active PFA alert requires different actions. Make sure that there is a recent backup of the data before you proceed.

If the affected array is a redundant logical drive (RAID 1, 1E, 5, 6, 5EE, 10, 1E0, 50, or 60), the controller protects and keeps the data available to you while the logical drive is critical. The following procedure provides the steps to replace the PFA drive and to regenerate the Critical logical drive back to an online or Okay state. If a qualified hot-spare drive is configured, ServeRAID automatically uses the hot-spare drive to regenerate logical drives to an Optimal state.

If the affected array is a nonredundant logical drive (a simple volume, RAID 0, or RAID 00), all data on the logical drive is lost when the disk eventually fails. To recover the logical drive, you must delete the nonredundant array and recreate it; then, you can restore the data from a recent backup.

To replace a PFA drive, complete the following steps:

1. Make sure that you back up the data.
2. Identify the slot location of the PFA drive. (Use the ServeRAID Manager application, the IBM ServeRAID Support CD, or the **arconf identify** command.)
3. Mark the drive Defunct and wait for the amber LED to light. (Use the ServeRAID Manager application, the IBM ServeRAID Support CD, or the **arconf setstate** command.)
4. Without removing the drive completely, gently remove the physical drive from the connector, using the handle of the tray.
5. Wait 45 seconds to allow the hard disk drive motor to completely stop spinning.
6. Remove the defunct drive from the slot and insert the replacement hard disk drive.
7. For redundant arrays, go to step 8. For nonredundant arrays, recreate the array and restore the data from a recent backup.
8. Observe the drive for normal device startup behavior and LED activity. Within approximately one minute, the ServeRAID controller and the ServeRAID Manager application detect the hot-swap event. Depending on the configuration, the following actions occurs:
 - The replacement hard disk drive spins up.
 - The green drive activity LED begins flashing and might eventually turn off or flash rapidly, depending on the configuration.
 - If no hot-spare drive is defined, ServeRAID Manager automatically initiates a rebuild operation to the replacement disk (the green LED flashes rapidly and the amber LED flashes).
 - If a hot-spare drive is defined and copy back is enabled, ServeRAID Manager automatically performs a rebuild operation back to the replaced drive, after the hot-spare drive rebuild operation is completed.
 - The steady amber drive LED turns off after a transition to a Hot-Spare, Ready, or Online state is completed. Otherwise, the amber LED is flashing during a rebuild or copy back operation
9. Observe the drive for normal device startup behavior and LED activity:
 - The replacement hard disk drive spins up.
 - The activity LED (green drive LED) begins flashing and might eventually turn off or flash rapidly, depending on the configuration.

- The solid amber drive LED turns off after a transition to a Hot-Spare, Ready, or Online state is complete. Otherwise, it flashes during a rebuild or copy back operation.

Note: You can see the drive state transitions in real time by using ServeRAID Manager.

(Optional) You can use these same instructions for an offline hard disk drive replacement by starting to the IBM ServeRAID Support CD.

PHY settings and AMSU updates

The term *PHY* equates to the port or channel on SAS and SATA controllers and devices. PHY ports on a SAS controller have settings that tune the signal for correct communication across the channel. SAS devices use one group of settings, and SATA devices use another. Each device type uses separate values and can be optimized individually.

The tool that is used to program these settings is the Adaptec Manufacturing SAS Update (AMSU) utility. PHY settings are not firmware updates. Over time, IBM has made improvements to the signal quality through continued testing and as new devices are released. AMSU updates can improve communication to disk devices but is not necessary in all situations.

In most situations, the original PHY settings operate normally; however, in some cases, updating to the latest AMSU settings is necessary. The symptoms that are generated by previous levels of PHY settings often have multiple origins; therefore, it is very important to apply all other updates and fixes before you consider the AMSU updates.

The following symptoms are observed in IBM lab testing:

- A server experiences repeated hard disk drive failures in the same slot location.
- A drive intermittently becomes missing from the configuration.
- The ServeRAID Manager RaidEvtA.log file indicates sense data 0b/4b/04 “informational” events.

Apply the following fixes before you update the AMSU settings:

- Apply the latest ServeRAID-8k or ServeRAID-8k-I firmware and device drivers.
- Apply the latest hard disk drive firmware.
- Apply the latest backplane update (if one is available for the system).
- Review and apply host system updates that are applicable.

If the symptoms continue, obtain the current AMSU update package and apply the updates. For more information about a complete ServeRAID maintenance review, see “Periodic ServeRAID maintenance updates and evaluation.”

Periodic ServeRAID maintenance updates and evaluation

On a periodic basis, the server and the ServeRAID subsystem require maintenance and service to remain optimal. To help avoid known issues before they might affect the server, complete the following steps:

1. Make sure that you back up the data.
2. Update the ServeRAID device driver.

3. Update the ServeRAID controller firmware. If this results in a failed flash update or a blinkLED event, run a zero-mode flash update to recover the controller.
4. Update the ServeRAID Manager application, monitoring agents, or IBM Systems Director components, as applicable.
5. Update the command-line tools.
6. Update the hard disk drive firmware.
7. Update the backplane firmware, as applicable to the system.
8. For external SAS/SATA storage, update the firmware of any attached IBM System Storage® EXP3000.
9. Evaluate the host system updates that are available and make sure that the current microcode is installed. (Sometimes these updates can dramatically improve ServeRAID runtime operations.)
10. Make sure that Data Scrubbing is enabled.
11. Make sure that Automatic Failover is enabled.
12. Run a synchronization on each logical drive (lower the task priority as needed to minimize the production impact).
13. Evaluate the current AMSU settings for the servers that are listed in Table 1.

Note: You can check the AMSU settings by using the following **arccconf getlogs** command:

```
arccconf getlogs n uart > filename.txt
```

Search this log for the following string:

```
mfg connector name=
```

The string is followed by a value for the AMSU settings, for example:

```
mfg connector name=j1sprucewood-v2
```

Table 1. AMSU settings for servers

Server	AMSU version	Release date	Changes
IBM System x3500	J1SPRUCEWOOD-V3	August 2008	Improved SATA PHY settings
	J1SPRUCEWOOD-V2	July 2007	Improved SAS PHY settings
	J1SPRUCEWOOD	Original	Original version
IBM System x3550	J1DEFIANT-V3	August 2008	Improved SATA PHY settings
	J1DEFIANT-V2	May 2008	Improved SATA PHY settings
	J1RIGDE LITE-V4	July 2007	Improved SAS PHY settings
	J1SPRUCEWOOD	Original	Original version
IBM System x3650	J1VALIANT-V2	July 2007	Improved SAS PHY settings
	J1SPRUCEWOOD	Original	Original version
IBM System x3655	VJ1THUNDER-V2	July 2007	Improved SAS PHY settings
	J1SPRUCEWOOD	Original	Original version

14. (Optional) Evaluate whether the Copy Back option is necessary in the configuration and set it accordingly.
15. (Optional) Inspect the SAS cables for the correct connection to the backplanes and system boards.
16. (Optional) Review the configuration and evaluate the need to define a hot-spare drive.
17. (Optional) Run the operating-system level “file system” health check tools.
18. (Optional) Run the native application-based data integrity tools to make sure that the data is good.
19. Note the date and time of completion.
20. Observe and evaluate the ServeRAID logs to verify the correct operation.

Note: A healthy log contains informational events but minimal warning and critical events. Repeated warning or critical events after a complete health check might require additional troubleshooting.

Zero-mode flash update overview

A zero-mode flash update is a recovery procedure for ServeRAID controllers that you can perform when a flash update fails or otherwise appears to have corrupted firmware. Some of the following symptoms might appear if a ServeRAID controller flash update has failed:

- The ServeRAID controller is not seen during POST after a recent flash update.
- The flash update program returns an error code or failed message.
- The system loses power during a flash update.
- A kernel panic event is displayed during the ServeRAID controller POST.
- A blinkLED message is displayed during the ServeRAID controller POST.

The following sections contain information about zero-mode flash updates for the following controllers:

- ServeRAID-8i
- ServeRAID-8s
- ServeRAID-8k and 8k-l in the following systems:
 - IBM BladeCenter Storage Expansion Unit 3
 - System x3500 server
 - System x3550 server
 - System x3650 server

Zero-mode flash for ServeRAID-8i (optional controller)

To perform a zero-mode flash update for a ServeRAID-8i SAS PCI-X Controller, complete the following steps:

1. Obtain a 2-pin jumper connector.
2. Download and create the ServeRAID-8i flash diskettes from the IBM ServeRAID Support CD version 9.0 (containing build 15407 or later) or download the individual diskettes (two total) from the ServeRAID Software Matrix Web site; go to <http://www-304.ibm.com/systems/support/supportsite.wss/docdisplay?Indocid=SERV-RAID&brandind=5000008> or complete the following steps.

Note: Changes are made periodically to the IBM Web site. Procedures for locating firmware and documentation might vary slightly from what is described in this document.

- a. Go to <http://www.ibm.com/systems/support/>.
- b. Under **Product support**, click **System x**.
- c. Under **Popular links**, click **Software and device drivers**.
- d. Under **Related downloads**, click **ServeRAID** to display the matrix of downloadable ServeRAID files.

Detailed instructions for building these diskettes are provided in the readme file.

3. Turn off the server and remove the cover.
4. Determine whether the flash jumper is accessible. If it is not, remove the ServeRAID-8i controller.
5. Locate the flash jumper, which is labeled on the top of the controller as shown in Figure 1.

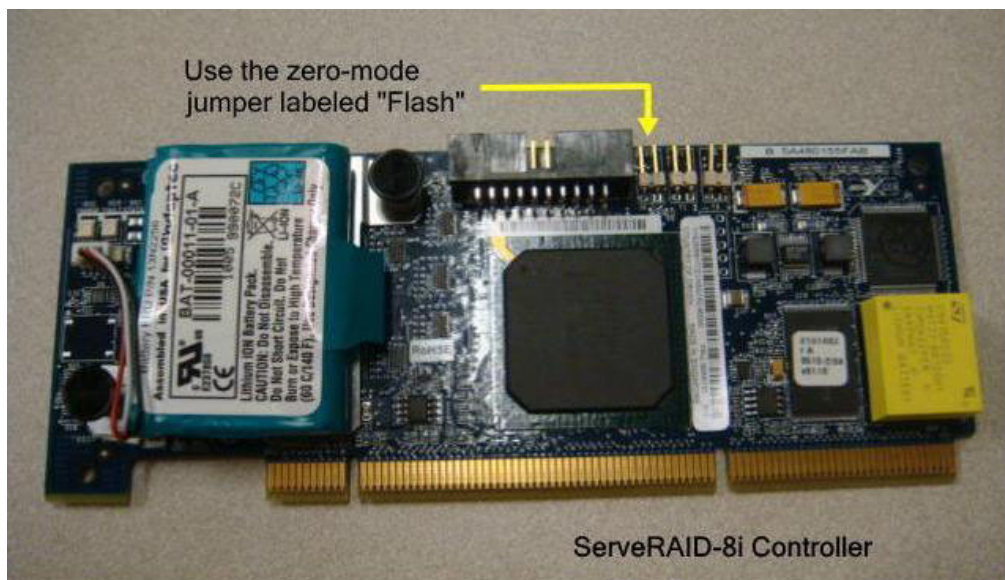


Figure 1. ServeRAID-8i zero-mode flash jumper

6. Install the jumper connector across the two pins that are shown in Figure 1.
7. If you removed the controller in step 4, reinstall it.
8. Insert the ServeRAID-8i firmware disk 1 into the diskette drive.
9. Turn on the server and observe the server POST process. If the zero-mode jumper is installed correctly, the ServeRAID-8i controller does not display a POST banner.
10. As the server starts to diskette 1, the following message is displayed:
This program will update the firmware on all IBM ServeRAID-8i controllers in the system. Do you want to continue. [Y,N]?
11. Type y to respond to the prompt, and then follow the instructions on the screen to complete the flash update.
12. After the flash update is completed, turn off the server.
13. Remove the zero-mode jumper from the flash pins (if necessary, remove and reinstall the ServeRAID-8i controller).

14. Replace the server cover.
15. Turn on the server and observe the server POST process for correct operation.

Zero-mode flash for ServeRAID-8s (optional controller)

To perform a zero-mode flash update for a ServeRAID-8s SAS/SATA PCI-e Controller, complete the following steps:

1. Obtain a 2-pin jumper connector.
2. Download and create the ServeRAID-8s flash diskettes from the IBM ServeRAID Support CD version 9.0 (containing build 15407 or later) or download the individual diskettes (two total) from the ServeRAID Matrix Web site; go to <http://www-304.ibm.com/systems/support/supportsite.wss/docdisplay?Indocid=SERV-RAID&brandind=5000008> or complete the following steps.

Note: Changes are made periodically to the IBM Web site. Procedures for locating firmware and documentation might vary slightly from what is described in this document.

- a. Go to <http://www.ibm.com/systems/support/>.
- b. Under **Product support**, click **System x**.
- c. Under **Popular links**, click **Software and device drivers**.
- d. Under **Related downloads**, click **ServeRAID** to display the matrix of downloadable ServeRAID files.

Detailed instructions for building these diskettes are provided in the readme file.

3. Turn off the server and remove the cover.
4. Determine whether the flash jumper is accessible. If it is not, remove the ServeRAID-8s controller.
5. Locate the flash jumper, which is labeled on the upper right hand corner of the controller as shown in Figure 2.

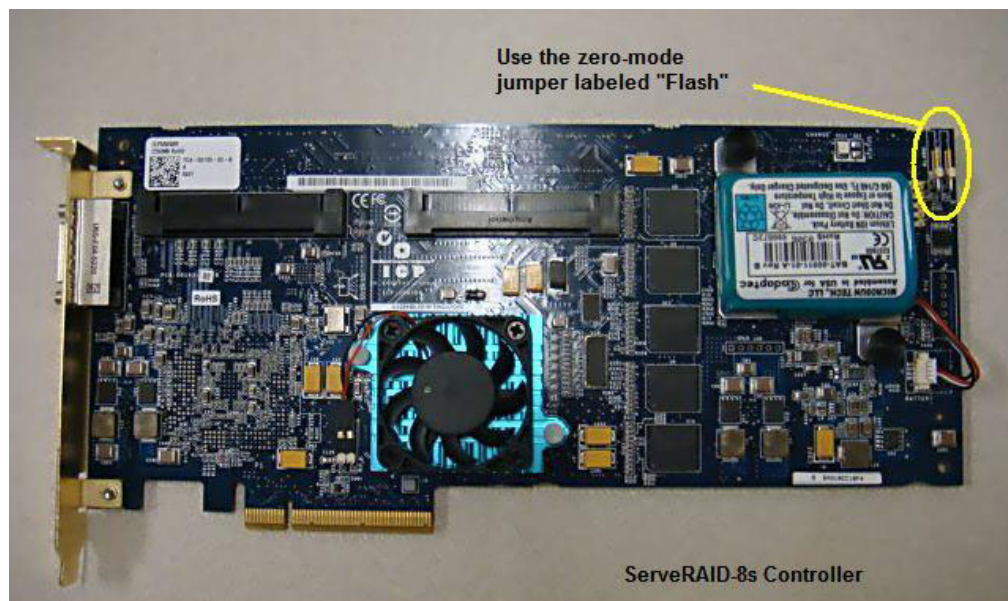


Figure 2. ServeRAID-8s zero-mode flash jumper

6. Install the jumper connector across the two pins that are shown in Figure 2 on page 13.
7. If you removed the controller in step 4 on page 13, reinstall it.
8. Insert the ServeRAID-8s firmware disk 1 into the diskette drive.
9. Turn on the server and observe the server POST process. If the zero-mode jumper is installed correctly, the ServeRAID-8s controller does not display a POST banner.
10. As the server starts to diskette 1, the following message is displayed:
This program will update the firmware on all IBM ServeRAID-8s controllers in the system. Do you want to continue. [Y,N]?
11. Type y to respond to the prompt, and then follow the instructions on the screen to complete the flash update.
12. After the flash update is completed, turn off the server.
13. Remove the zero-mode jumper from the flash pins (if necessary, remove and reinstall the ServeRAID-8s controller).
14. Replace the server cover.
15. Turn on the server and observe the server POST process for correct operation.

Zero-mode flash for ServeRAID-8k and ServeRAID-8k-I (BladeCenter Storage Expansion Unit 3)

Use the instructions in this section for the following hardware:

- BladeCenter Storage and I/O Expansion Blade, part number 39R7563, FRU 40K1739
- ServeRAID-8k SAS Controller, part number 25R8064
- ServeRAID-8k-I SAS Controller, part number 39R8729

To perform a zero-mode flash update, complete the following steps:

1. Obtain a 2-pin jumper connector.
2. Download and create the ServeRAID-8k flash diskettes from the IBM ServeRAID Support CD version 9.0 (containing build 15407 or later) or download the individual diskettes (two total) from the ServeRAID Matrix Web site; go to <http://www-304.ibm.com/systems/support/supportsite.wss/docdisplay?Indocid=SERV-RAID&brandind=5000008> or complete the following steps.

Note: Changes are made periodically to the IBM Web site. Procedures for locating firmware and documentation might vary slightly from what is described in this document.

- a. Go to <http://www.ibm.com/systems/support/>.
- b. Under **Product support**, click **System x**.
- c. Under **Popular links**, click **Software and device drivers**.
- d. Under **Related downloads**, click **ServeRAID** to display the matrix of downloadable ServeRAID files.

Detailed instructions for building these diskettes are provided in the readme file.

3. Shut down the operating system and turn off the blade server; then, remove the combined blade server and storage expansion unit from the BladeCenter unit (see the documentation that comes with the blade server for more information).

4. Carefully lay the combined unit on a flat, static-protective surface, with the cover side up.
5. Remove the cover from the storage expansion unit.
6. Locate the 2-pin jumper at JP1 on the system board, near the right side of the ServeRAID-8k DIMM connector, as shown in Figure 3.

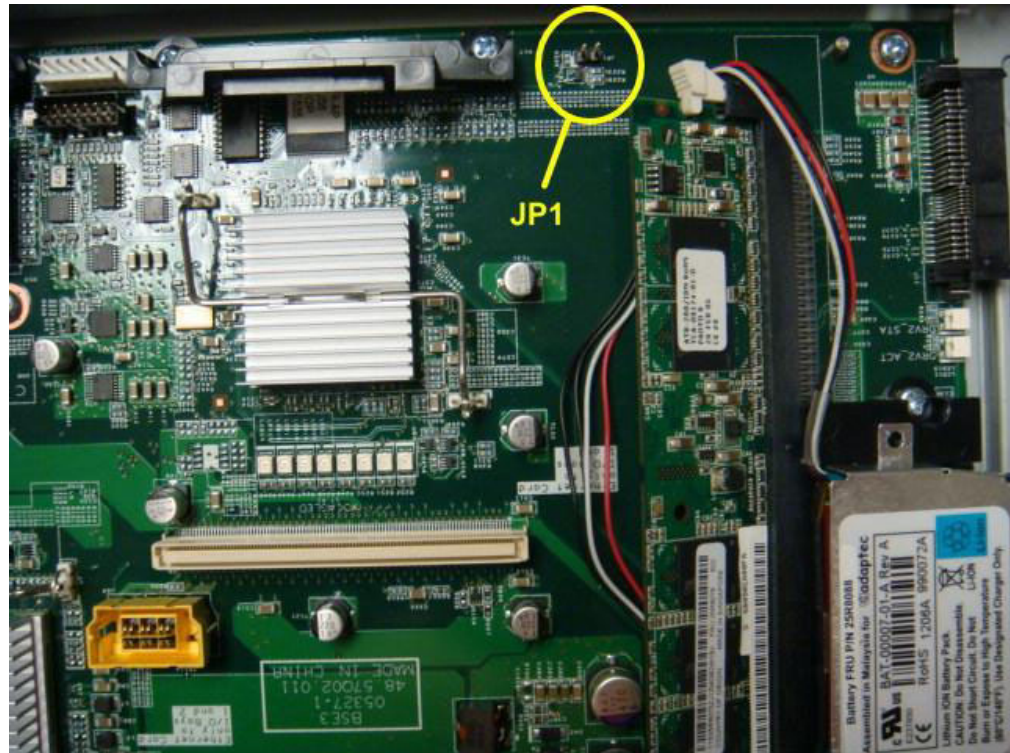


Figure 3. ServeRAID-8k and ServeRAID-8k-l zero-mode flash jumper (BladeCenter Storage Expansion Unit 3)

7. Install the jumper connector across the two pins that are shown in Figure 3.
8. Replace the cover on the storage expansion unit and reinsert the blade server into the BladeCenter unit.
9. Switch control for the monitor and media bay to the blade server.
10. Insert the ServeRAID-8k firmware disk 1 into the diskette drive.
11. Turn on the blade server and observe the system POST process. If the zero-mode jumper is installed correctly, the ServeRAID-8k controller does not display a POST banner.
12. As the system starts to diskette 1, the following message is displayed:
This program will update the firmware on all IBM ServeRAID-8k controllers in the system. Do you want to continue. [Y,N]?
13. Type y to respond to the prompt, and then follow the instructions on the screen to complete the flash update.
14. After the flash update is completed, turn off the blade server.
15. Remove the combined blade server and storage expansion unit from the BladeCenter unit.
16. Remove the cover on the storage expansion unit and remove the 2-pin jumper connector from JP1 (see Figure 3).

17. Replace the cover on the storage expansion unit and reinsert the combined blade server and storage expansion unit in the BladeCenter unit.
18. Turn on the blade server and observe the system POST process for correct operation.

Note: In some storage expansion units, a “power good” timing issue results in a memory initialization error for the ServeRAID-8k subsystem. This error results in the fatal kernel panic 0x5A. The timing issue was first corrected in ServeRAID firmware version v5.2-0 build 11835.

Zero-mode flash for ServeRAID-8k and ServeRAID-8k-I (System x3650)

Use the instructions in this section for the following hardware:

- IBM System x3650 server
- ServeRAID-8k SAS Controller, part number 25R8064
- ServeRAID-8k-I SAS Controller, part number 39R8729

To perform a zero-mode flash update, complete the following steps:

1. Obtain a 2-pin jumper connector.
2. Obtain a USB diskette drive.
3. Download and create the ServeRAID-8k flash diskettes from the IBM ServeRAID Support CD version 9.0 (containing build 15407 or later) or download the individual diskettes (two total) from the ServeRAID Matrix Web site; go to <http://www-304.ibm.com/systems/support/supportsite.wss/docdisplay?Indocid=SERV-RAID&brandind=5000008> or complete the following steps.

Note: Changes are made periodically to the IBM Web site. Procedures for locating firmware and documentation might vary slightly from what is described in this document.

- a. Go to <http://www.ibm.com/systems/support/>.
- b. Under **Product support**, click **System x**.
- c. Under **Popular links**, click **Software and device drivers**.
- d. Under **Related downloads**, click **ServeRAID** to display the matrix of downloadable ServeRAID files.

Detailed instructions for building these diskettes are provided in the readme file.

4. Turn off the System x3650 server and remove the cover.

5. Locate the 2-pin jumper at J89 on the system board at the back of the server, next to the power supply (see Figure 4).



Figure 4. ServeRAID-8k and ServeRAID-8k-l zero-mode flash jumper (System x3650)

6. Install the jumper connector across the two pins that are shown in Figure 4.
7. Connect the USB diskette drive to the front panel of the server.
8. Insert the ServeRAID-8k firmware disk 1 into the diskette drive.
9. Turn on the server and observe the server POST process. If the zero-mode jumper is installed correctly, the ServeRAID-8k or ServeRAID-8k-l controller does not display a POST banner.
10. As the server starts to diskette 1, the following message is displayed:
This program will update the firmware on all IBM ServeRAID-8k controllers in the system. Do you want to continue. [Y,N]?
11. Type y to respond to the prompt, and then follow the instructions on the screen to complete the flash update.
12. After the flash update is completed, turn off the server.
13. Disconnect the USB diskette drive.
14. Remove the 2-pin jumper connector from J89.
15. Replace the server cover.
16. Turn on the server and observe the server POST process for correct operation.

Zero-mode flash for ServeRAID-8k and ServeRAID-8k-I (System x3550)

Use the instructions in this section for the following hardware:

- IBM System x3550 server
- ServeRAID-8k SAS Controller, part number 25R8064
- ServeRAID-8k-I SAS Controller, part number 39R8729

To perform a zero-mode flash update, complete the following steps:

1. Obtain a 2-pin jumper connector.
2. Obtain a USB diskette drive.
3. Download and create the ServeRAID-8k flash diskettes from the IBM ServeRAID Support CD version 9.0 (containing build 15407 or later) or download the individual diskettes (two total) from the ServeRAID Matrix Web site; go to <http://www-304.ibm.com/systems/support/supportsite.wss/docdisplay?Indocid=SERV-RAID&brandind=5000008> or complete the following steps.

Note: Changes are made periodically to the IBM Web site. Procedures for locating firmware and documentation might vary slightly from what is described in this document.

- a. Go to <http://www.ibm.com/systems/support/>.
- b. Under **Product support**, click **System x**.
- c. Under **Popular links**, click **Software and device drivers**.
- d. Under **Related downloads**, click **ServeRAID** to display the matrix of downloadable ServeRAID files.

Detailed instructions for building these diskettes are provided in the readme file.

4. Turn off the System x3550 server and remove the cover.

5. Locate the 2-pin jumper at J63 on the system board, at the edge of the ServeRAID-8k or ServeRAID-8k-l connector (see Figure 5).



Figure 5. ServeRAID-8k and ServeRAID-8k-l zero-mode flash jumper (System x3550)

6. Install the jumper connector across the two pins that are shown in Figure 5.
7. Connect the USB diskette drive to the front panel of the server.
8. Insert the ServeRAID-8k firmware disk 1 into the diskette drive.
9. Turn on the server and observe the server POST process. If the zero-mode jumper is installed correctly, the ServeRAID-8k or ServeRAID-8k-l controller does not display a POST banner.
10. As the server starts to diskette 1, the following message is displayed:
This program will update the firmware on all IBM ServeRAID-8k controllers in the system. Do you want to continue. [Y,N]?
11. Type y to respond to the prompt, and then follow the instructions on the screen to complete the flash update.
12. After the flash update is completed, turn off the server.
13. Disconnect the USB diskette drive.
14. Remove the 2-pin jumper connector from J63.
15. Replace the server cover.
16. Turn on the server and observe the server POST process for correct operation.

Zero-mode flash for ServeRAID-8k and ServeRAID-8k-I (System x3500)

Use the instructions in this section for the following hardware:

- IBM System x3500 server
- ServeRAID-8k SAS Controller, part number 25R8064
- ServeRAID-8k-I SAS Controller, part number 39R8729

To perform a zero-mode flash update, complete the following steps:

1. Obtain a USB diskette drive.
2. Download and create the ServeRAID-8k flash diskettes from the IBM ServeRAID Support CD version 9.0 (containing build 15407 or later) or download the individual diskettes (two total) from the ServeRAID Matrix Web site; go to <http://www-304.ibm.com/systems/support/supportsite.wss/docdisplay?Indocid=SERV-RAID&brandind=5000008> or complete the following steps.

Note: Changes are made periodically to the IBM Web site. Procedures for locating firmware and documentation might vary slightly from what is described in this document.

- a. Go to <http://www.ibm.com/systems/support/>.
- b. Under **Product support**, click **System x**.
- c. Under **Popular links**, click **Software and device drivers**.
- d. Under **Related downloads**, click **ServeRAID** to display the matrix of downloadable ServeRAID files.

Detailed instructions for building these diskettes are provided in the readme file.

3. Turn off the System x3500 server and remove the cover.

4. Locate the 3-pin jumper at JP9 on the system board at the back right corner from the front of the server (see Figure 6).

Note: The JP9 location is not labeled on the system board.

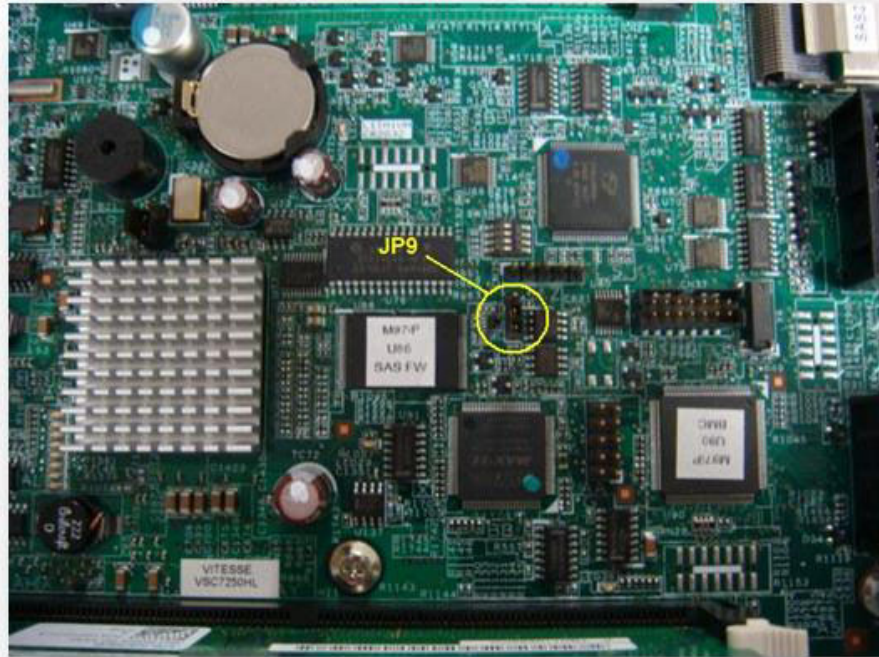


Figure 6. ServeRAID-8k and ServeRAID-8k-l zero-mode flash jumper (JP9) (System x3500)

5. Move the jumper from pins 1 and 2 to pins 2 and 3 to enable the zero-mode flash (see Figure 7).

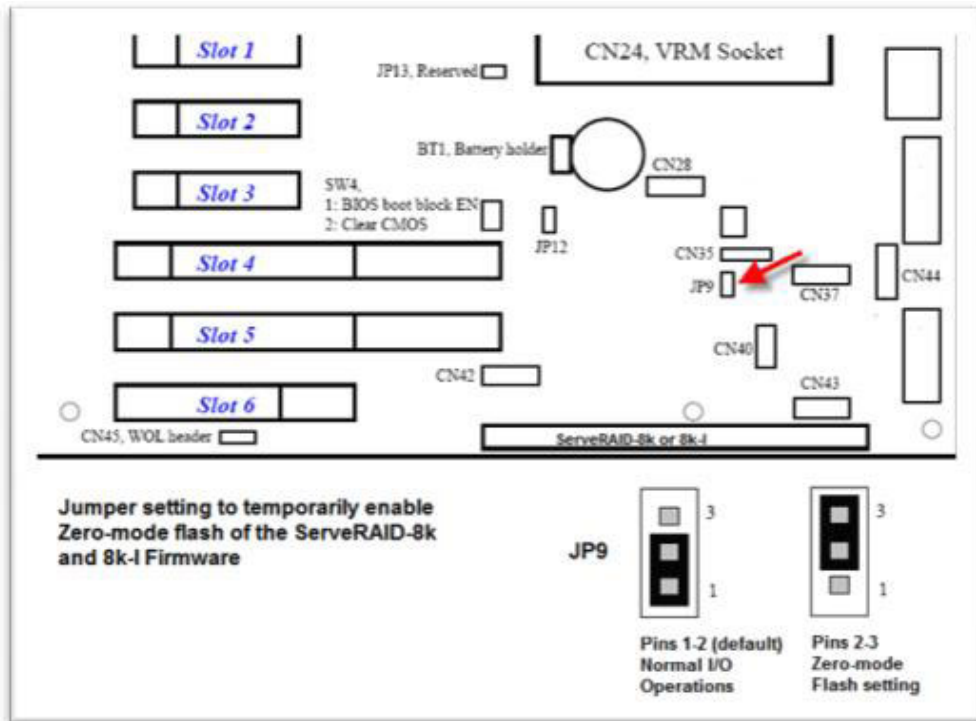


Figure 7. JP9 jumper pins 1 and 2 and 2 and 3

6. Connect the USB diskette drive to the front panel of the server.
7. Insert the ServeRAID-8k firmware disk 1 into the diskette drive.
8. Turn on the server and observe the server POST process. If the zero-mode jumper is installed correctly, the ServeRAID-8k or ServeRAID-8k-I controller does not display a POST banner.
9. As the server starts to diskette 1, the following message is displayed:
This program will update the firmware on all IBM ServeRAID-8k controllers in the system. Do you want to continue. [Y,N]?
10. Type y to respond to the prompt, and then follow the instructions on the screen to complete the flash update.
11. After the flash update is completed, turn off the server.
12. Disconnect the USB diskette drive.
13. Move the jumper from pins 2 and 3 back to the default pins 1 and 2 to enable normal I/O mode.
14. Replace the server cover.
15. Turn on the server and observe the server POST process for correct operation.

The ServeRAID-8k and ServeRAID-8k-I RAID enabler modules have a very low failure rate

The ServeRAID-8k and ServeRAID-8k-I are basically RAID enabler modules and not RAID controllers. The actual RAID controller is integrated on the system board of the server, near where the enabler module is connected. The ServeRAID-8k-I comes standard in systems and enables only RAID 0, RAID 1, and RAID 10 but has no memory cache. Upgrading to the ServeRAID-8k enables all RAID levels that are supported by the integrated controller in the system and provides the transportable battery backup (TBBU) memory cache of 256 MB. The ServeRAID-8k has a battery connection and PIC code, which manages the battery charging circuit.

The ServeRAID-8k and ServeRAID-8k-I are modified memory modules and have a very low failure rate, although they seem to be the most identified component when there are problems. These modules are just one small part of the controller subsystem and do not typically change the behavior of the controller when they are replaced, except as specifically outlined in an IBM RETAIN tip.

If a RAID issue occurs, be sure to perform the following problem determination tasks before any warranty actions:

1. Check the cable connections on the backplanes and system boards.
2. Perform any required ServeRAID BIOS, firmware, and device-driver updates.
3. Perform any hard disk drive firmware updates.
4. Perform a zero-mode flash update if a blinkLED error or a kernel panic occurs.
5. Review any RETAIN tips for known issues and solutions (some known issues are in the following list).
6. Evaluate whether an AMSU update might apply to the system and perform the update, if needed.

For more information, see the following RETAIN tips.

Controller kernel error code (57) posts intermittently

<https://www-304.ibm.com/systems/support/supportsite.wss/docdisplay?Indocid=MIGR-5073936&brandind=5000008>
(Type 5073936 in the **Search** field at <http://www.ibm.com>.)

Stalls or unexpectedly reboots with 8k and SATA drives

<https://www-304.ibm.com/systems/support/supportsite.wss/docdisplay?Indocid=MIGR-5071075&brandind=5000008>
(Type 5071075 in the **Search** field at <http://www.ibm.com>.)

TBBU in recovery mode message after flashing ServeRAID code

<https://www-304.ibm.com/systems/support/supportsite.wss/docdisplay?Indocid=MIGR-5076156&brandind=5000008>
(Type 5076156 in the **Search** field at <http://www.ibm.com>.)

Potential data corruption issue with ServeRAID controllers

<https://www-304.ibm.com/systems/support/supportsite.wss/docdisplay?Indocid=MIGR-5075192&brandind=5000008>
(Type 5075192 in the **Search** field at <http://www.ibm.com>.)

Correct mounting of the ServeRAID-8k RAID enabler battery

Mount the ServeRAID-8k battery to the system chassis. If the battery is mounted to the ServeRAID-8k RAID enabler card, the weight of the battery on such a small component, combined with runtime vibration and heat, can damage the enabler card, which results in an offline array and possibly loss of data.

Figure 8 shows the correct battery mounting.



Figure 8. Correct battery mounting of a ServeRAID-8k battery

Physical drives are online, but the logical drive is offline

In rare catastrophic failures, the controller might not be able to recover the logical drive. The failure results in the symptom where the physical drives appear online while the logical drives remain offline and inaccessible. This is caused by two nearly simultaneous failures within the subsystem. When the first drive goes offline, the controller begins writing a new age count and deadmap value to the metadata of the surviving member drives of the array. Unfortunately, if the second drive fails almost simultaneously, the controller immediately stops all metadata updates, and in this special case, the controller completes only partial updates to the surviving member drives. When the controller restarts, it reads two sets of metadata. The first set has a newer age count, and the second has an older age count. The controller does not know which metadata to trust, so it keeps the array offline.

The Force Online option has some limitations. Ideally, the Force Online option forces the age count to the next common number and sets the deadmap value to 0. This does not mean that the data is good if the force online is successful. The following criteria must be true for the Force Online option to work:

- The logical volume is offline.
- All the members (physical disks) of the array are present.

- The physical disks operate normally throughout the process.
- The array does not have an active background task (rebuild, copy back, or initialize).
- The array is not a RAID 10 or RAID 60.

This type of catastrophic failure is typically a symptom of other problems. There must be two or more almost simultaneous failures (usually within milliseconds) for the controller to fail in this way, and these problems are difficult to debug. Usually, there is an obvious failure, but the secondary issue is often much more difficult to detect. The best opportunity to get good data so that you can understand this dynamic is to capture UART logs as soon as technically possible after the failure.

You can collect UART logs by typing the following CLI command:

```
arconf getlogs n uart > filename.txt
```

Valid RAID 5EE state transitions after a disk fails

RAID 5EE has some unique characteristics. This RAID level uses a distributed hot-spare technique that populates free space throughout the array. If a disk fails, the controller compacts the missing data into the free space of the surviving drives. This activity creates a new substate of the logical drive, called *compacting*. These substates identify the stages of the ServeRAID controllers as they recover from a defunct drive. The RAID 5EE valid state transitions for single-disk failures are listed in the following table.

Table 2. RAID 5EE valid state transitions for single-disk failures

Logical drive state	RAID 5EE state	Description
Okay	Expanded	<ul style="list-style-type: none"> • Normal and Optimal
Critical	Compacting	<ul style="list-style-type: none"> • A single drive is defunct. • The array is actively compacting to free space. • The array is degraded in performance. • The array is not redundant at this time.
Critical	Compacted	<ul style="list-style-type: none"> • A single drive is defunct. • The array has compacted to the free space. • The array is not degraded in performance. • The array is redundant.
Critical	Expanding	<ul style="list-style-type: none"> • The defunct drive was replaced. • The array is expanding to its original configuration. • The array is degraded in performance. • The array is redundant.

At the time that a RAID 5EE state becomes Critical, the array should start compacting shortly thereafter. Drives do not rebuild in a RAID 5EE until the array has finished compacting, even if the drive is replaced before the compacting is completed.

If the array does not start compacting automatically, the controller might report the array as a Critical array with a substate as Expanded. Unfortunately, this combination of states is not valid. Typically, an array in this condition remains

accessible; however, there are no known methods for forcing the array to start compacting or to force a rebuild operation. If these rare circumstances occur and result in this type of invalid array, complete the following steps:

1. Back up the data on the array.
2. Delete the array.
3. Initialize the hard disk drives that were used in the previous array.
4. Create a new array, using the same drives.
5. Format the new logical drive.
6. Restore the data.

System hang issues with ServeRAID-8i on enterprise servers

ServeRAID firmware builds 11835 to 11844 introduced performance improvements. The new code level inadvertently exposed a weakness in early revisions of the Complex Programmable Logic Device (CPLD) microcode in some systems (identified in the following list). Upgrade the CPLD code on the following servers before you apply ServeRAID firmware version 11844 or later:

- System x3800, type 8865, any model
- System x3800, type 8866, any model
- System x3850, type 8863, any model
- System x3850, type 8864, any model
- System x3950 E, type 8874, any model
- System x3950 E, type 8879, any model
- System x3950, type 8872, any model
- System x3950, type 8878, any model
- xSeries 260, type 8865, any model
- xSeries 366, type 8863, any model
- xSeries 460, type 8872, any model
- xSeries MXE-460, type 8874, any model

For more information, see the following RETAIN tips.

System restarts or hangs: ServeRAID logical drive, array offline

<https://www-304.ibm.com/systems/support/supportsite.wss/docdisplay?Indocid=MIGR-5070598&brandind=5000008>
(Type 5070598 in the **Search** field at <http://www.ibm.com>.)

Intermittent system hangs with ServeRAID-8i

<https://www-304.ibm.com/systems/support/supportsite.wss/docdisplay?Indocid=MIGR-63269&brandind=5000008>
(Type 50763269 in the **Search** field at <http://www.ibm.com>.)

After upgrading firmware, the server crashes every 8-10 days

Upgrading servers that are running ServeRAID Firmware build 92xx to build 118xx might be exposed to an issue that results in an unexpected system reset approximately every 8-10 days.

For more information, see the following RETAIN tip.

Server crashes every 8-10 days with ServeRAID 8 controllers

<https://www-304.ibm.com/systems/support/supportsite.wss/docdisplay?Indocid=MIGR-5073003&brandind=5000008>
(Type 5073003 in the **Search** field at <http://www.ibm.com>.)

Evaluating hard disk drive problems

Hard disk drives are designed to tolerate some types of errors and recover from them. The implementation of the error recovery varies from drive vendor to drive vendor; however, they must conform to various disk standards that are common in the industry. Aside from a catastrophic failure, most hard disk drives can recover or retry operations that have failed. An example of a recoverable disk error is a drive medium error in which the data on the substrate of the disk becomes unreadable. There are many reasons for this happening, and most modern hard disk drives have extra known-good sectors that are used internally to spare out a bad sector with a good sector. New bad sectors are added to an internal “grown defect” list.

If a drive spares out a bad sector, the data that is stored on that sector might or might not survive; however, the ServeRAID controller firmware verifies or rewrites good data as errors are detected. This and other types of disk issues are often resolved with background data scrubbing operations.

The hard disk drive firmware controls the error recovery process of the drive. Sometimes, error recovery is improved over the life of the drive, and sometimes, older firmware can cause premature disk failures. This information is listed in the change history of the hard disk drive firmware updates. If a drive is marked Defunct by the ServeRAID controller and does not have the latest firmware, the drive might not be irrevocably bad. The drive might have been marked Defunct because of firmware error recovery issues, not because something is physically wrong with the disk.

There are several methods that you can use to evaluate whether a disk is good or bad. You can use some methods while the system is online, and other methods require the system to be taken offline. For details about the tools and syntax for commands, see the *IBM ServeRAID User Reference Guide* (SRAID.PDF) on the IBM Web site. If a drive cannot complete these tests or fails, replace the drive according to your warranty terms and conditions.

Table 3. ServeRAID hard disk drive maintenance and recovery methods and tools

Action	Method and tool used	Operation state of the system	Confidence to fix
Controller-based low-level format for a single drive	<p>This action erases all data on the selected drive and reconditions the disk to a healthy state. This format performs read and write operations to the drive and is a good option to test and recover a drive that is marked Defunct.</p> <ol style="list-style-type: none">1. Turn on the system and press Ctrl+A when you are prompted to access the Adaptec RAID Configuration Utility (ARC).2. From the ARC menu, select Disk Utilities.3. Select the hard disk drive.4. Select Format Disk. <p>Attention: Be sure to select the correct disk to format. Formatting the wrong disk can result in data loss.</p>	Server is offline.	Very high; replace the hard disk drive if it fails.

Table 3. ServeRAID hard disk drive maintenance and recovery methods and tools (continued)

Action	Method and tool used	Operation state of the system	Confidence to fix
Controller-based media test for a single drive	<p>This option is a read-only test, except when disk errors are detected and corrected. The controller prompts you to repair any errors that are found. If all errors are corrected, the drive is considered healthy. Generally, this action is a thorough and nondestructive test, but unrecoverable errors might cause data loss.</p> <ol style="list-style-type: none"> 1. Turn on the system and press Ctrl+A when you are prompted to access the Adaptec RAID Configuration Utility (ARC). 2. From the ARC menu, select Disk Utilities. 3. Select the hard disk drive. 4. Select Verify Disk Media. 	Server is offline.	High; replace the hard disk drive if it fails.
CLI tool-based low-level format for a single drive	<p>The target drive must be in a Ready state for you to take this action within an operating system because it erases all data on the selected drive. The disk is reconditioned to a healthy state. This operation performs read and write operations to the drive and is a good option for testing and recovering a drive that is marked Defunct.</p> <pre>arcconf task start n device ID_number clear</pre>	Within the operating system	High; replace the hard disk drive if it fails.
CLI tool-based media test for a single drive	<p>The target drive must be in a Ready state for you to take this action within an operating system. This option is a read-only test except when disk errors are detected and corrected. The controller prompts you to repair any errors that are found. If no errors occur or all errors are corrected, the drive is considered healthy. Unrecoverable errors might cause data loss.</p> <pre>arcconf task start n device ID_number verify</pre>	Within the operating system	High; replace the hard disk drive if it fails.
Update hard disk drive firmware	<p>This action updates the firmware on the drives; however, the results vary depending on the updates that are stated in the change history. Hard disk drive firmware updates are downloadable from the IBM Web site.</p> <p>Firmware updates can be applied to drives that are already marked Defunct. In some cases, this might correct issues with the drive, and the drive can be returned to service.</p>	Server is offline.	Varies according to the change history
Begin a manual logical drive synchronization	<p>If an array is <i>not</i> critical, you can verify the drive media by using a logical drive synchronization. This is effectively the same thing as a controller-based Verify Disk Media test for all the drives in the array, but it can correct unrecoverable media errors. This can be done while the logical drive is online and in operation and is a good option for routine preventive maintenance. There will be some performance degradation, depending on the priority that is set. You can start synchronizations by using the following tools:</p> <ul style="list-style-type: none"> • IBM ServeRAID Support CD • ServeRAID Manager application (in the operating system) • Typing the following command: <pre>arcconf task start n logicaldrive logical_drive_number synchronization</pre> <p>Notes:</p> <ol style="list-style-type: none"> 1. To retrieve the logical drive number, use the arcconf getconfig command. 2. If multiple logical drives are associated with the same array of disks, you must perform a synchronization on each logical drive. 	Within the operating system	High

Table 3. ServeRAID hard disk drive maintenance and recovery methods and tools (continued)

Action	Method and tool used	Operation state of the system	Confidence to fix
Rebuilding a defunct drive	<p>If a drive is marked Defunct and is known to be good or is recently updated, you can return the disk to service by starting a rebuild operation to the drive. The disk is not tested but is actively monitored by the controller for errors as normal operation.</p> <ul style="list-style-type: none"> • The drive can be initialized and then inserted as a replacement disk. • Insert the drive and designate the disk as a hot-spare drive. A critical drive automatically starts a rebuild operation if the size requirement is met. 	Within the operating system	Moderate
Initializing a drive	<p>Initializing a drive removes any existing configuration information but does not test the drive itself. Initialization writes to a small section of the drive, so a drive must be healthy enough to complete the write operations. Initializing a drive is not a thorough diagnostic test of the health of a hard disk drive; however, it does indicate that the drive is functional.</p> <p>If the drive fails initialization, check the connections and retry. If the drive does not complete initialization, replace it. This process irrevocably removes array and logical drive information from the disk. You can initialize drives by using the following tools:</p> <ul style="list-style-type: none"> • The Array Configuration Utility (ACU) (Turn on the system and press Ctrl+A when you are prompted to access the Adaptec RAID Configuration Utility (ARC). From the ARC menu, select Array Configuration Utility.) • IBM ServeRAID Support CD • ServeRAID Manager application (in the OS) • Typing the following command: <pre>arconf task start n device ID_number initialize</pre> 	Server is Offline or within the operating system	Low

Any drive that undergoes a reconditioning by a low-level format or Verify Disk Media should be observed for normal operation for a period of time. In large environments, this might be difficult to implement. A practical method is to flag each reconditioned drive with a small label or colored sticker. If the drive continues to have problems, it is easy to tell that the disk has already undergone the reconditioning process and updates. This way, if a follow-up service call is necessary, the service technician and administrators can determine the actions that are needed to solve the problem.

Logical drive states and descriptions

The following table provides descriptions of logical drive states.

Table 4. Logical drive state descriptions

Logical drive state	Description
Clearing	Clearing is usually automatic when you create a logical drive. Clearing a logical drive erases the first 1024 sectors on the drive and prevents access to any data previously stored on the drive. Note: Data cannot be read or written to a drive while it is undergoing a “clear” process.
Critical	A RAID level-1, level-1E, level-5, level-5EE, level-10, or level-50 logical drive that contains a defunct physical drive is in a Critical state. A RAID level-6 or level-60 logical drive that contains two defunct physical drives is also in a Critical state. A Critical state logical drive is accessible, despite a physical drive failure. Note: For more information if the logical drive is in a Critical state, see the section “Rebuilding a Defunct Drive” in the <i>IBM ServeRAID User's Reference</i> on the IBM <i>ServeRAID Support CD</i> .
Critical Migrating	A logical drive in a Critical state that is undergoing a logical-drive migration (LDM).
Degraded	RAID level-6 and RAID level-60 moves to a Degraded state if one drive is defunct.
Degraded Migrating	(For RAID level-6 and RAID level-60 only) A logical drive in a Degraded state that is undergoing a logical-drive migration (LDM).
Impacted	For RAID level-1, level-1E, level-5, level-6, level-5EE, level-10, level-50, and level-60, if the drive fails during initialization or you stop the initialization process before it is complete, the drive enters an Impacted state. This means that the striping/synchronization process has not completed and you need to resynchronize. This situation can occur in the following two cases: <ul style="list-style-type: none"> • When you create a container, during the automatic background synchronization • When you perform a data scrubbing (with background synchronization)
Migrating	The logical drive is undergoing a logical-drive migration; that is, a change in RAID levels, a change in logical-drive size, or a change in logical drive stripe size.

Table 4. Logical drive state descriptions (continued)

Logical drive state	Description
Offline	<p>The logical drive is in an Offline state and is not accessible. This state occurs when one of the following scenarios is true:</p> <ul style="list-style-type: none"> • One or more physical drives in a RAID level-0 logical drive are defunct. • Two or more physical drives in a RAID level-1, level-1E, or level-5 logical drive are defunct. • Three or more drives in a RAID level-5EE logical drive or RAID level-6 logical drive are defunct. • One or more drives in a RAID level-5EE logical drive fail while a compaction is in progress. If the drive fails after the RAID level-5EE logical drive is in a Compacted state, the array becomes Critical. <p>Note: For more information if any of the preceding scenarios is true, see the section “Rebuilding a Defunct Drive” in the <i>IBM ServeRAID User's Reference</i> on the <i>IBM ServeRAID Support CD</i>.</p>
Okay	<p>The logical drive is working correctly. It is in a good, functional state.</p>
Okay Revived	<p>The logical drive has recovered to a Okay Revived state. This state occurs when a logical drive is brought from an Offline state to an Okay state by using a force online operation. If no drives are removed, the logical drive remains in an Okay Revived state until the array is deleted.</p>
Offline Revived	<p>The logical drive changes state from an Okay Revived, Critical (revived), or Degraded (revived) state to an Offline Revived state because of one or more drive failures.</p>
Degraded (revived)	<p>The logical drive has recovered to a Degraded (revived) state in RAID 6, based on the following scenarios:</p> <ul style="list-style-type: none"> • When a force online operation is performed on an Offline state logical drive that has one defunct physical drive in its configuration. • One of the physical disks is marked defunct from an Okay (revived) state configuration.

Table 4. Logical drive state descriptions (continued)

Logical drive state	Description
Critical (revived)	<p>The logical drive has recovered to a Critical Revived state. This state occurs during the following scenarios.</p> <p>Redundant RAID Level RAID 5,1,1E,10,50</p> <ul style="list-style-type: none"> • When a force online operation is performed on an Offline state logical drive that has one defunct physical drive in its configuration. • One of the physical disks is marked Defunct from an Okay (revived) state configuration. <p>Redundant RAID Level RAID 5EE</p> <ul style="list-style-type: none"> • When a force online operation is performed on an Offline state logical drive that has two defunct physical drives in its configuration, provided that the compaction operation is completed after the first drive failure. • Two physical disks are marked Defunct from an Okay (revived) state configuration. <p>Redundant RAID Level RAID 6</p> <ul style="list-style-type: none"> • One of the physical disks is marked Defunct from a Degraded (revived) state configuration. • Two physical disks are marked Defunct from an Okay (revived) state configuration.

Using the force online feature

Force online is a feature of ServeRAID Manager, through the Adaptec BIOS Settings, which is the standalone version of ServeRAID Manager for operating systems. The force online feature is a part of the Adaptec RAID Controller Configuration (ARCCONF) command-line tool.

The force online option is used to change an array in the Offline state to the Revived state. Recovering from an Offline logical drive state requires the minimum number of the drives that was configured in the array. The Revived states differentiate on force online arrays. This feature is compatible with earlier versions of ServeRAID-8 series controllers.

Note: Background operations are allowed on revived arrays. After recovery, make sure that the data is backed up and the arrays are deleted.

Consider the following guidelines before using the force online option:

- Do not use this feature on arrays that are meant for production purposes.
- Data consistency is not guaranteed.
- No background operations are allowed for the logical drives in the revived state (for example, Rebuilding, Clear, or Synchronize).
- Arrays in the Okay Revived and Critical Revived states can be selected as bootable arrays.
- Offline logical drives cannot be selected as bootable arrays.
- Hot spare assignment is not allowed for arrays in the Revived state.
- The operating system might not boot correctly from an Offline Revived array.

To view the minimum number of drives required for recovering the data by using the force online option, see the table on page 116 in the *IBM ServeRAID Use's Guide*. In the table, the N refers to the number of physical drives removed from an Okay revived logical drive array.

Recover Data option

You can use the Recover Data option to create an array without building or initializing it. This feature enables you to reconfigure a set of drives for which the data is thought to be good so that the data can be recovered, if there is no other avenue for recovery.

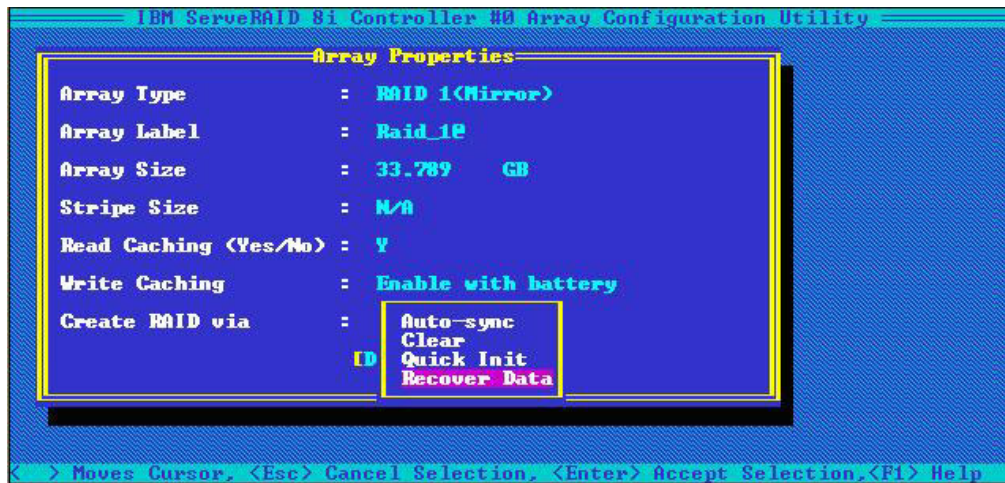
You can create the arrays by using the BIOS, ServeRAID Manager (SRM) GUI, or the Adaptec RAID Controller Configuration (ARCCONF) Recover Data option.

BIOS

To create an array by using the BIOS, complete the following steps:

1. Turn on the server and when you are prompted, press Ctrl+A to enter the Adaptec BIOS Utility.
2. Select **Array Configuration Utility** and then select **Create Array**. The Array Properties window opens.
3. Select the physical drives that are members of the previous configuration.
4. Select the previous RAID level.
5. Enter the previous stripe size.
6. Select the previous Cache Policy.
7. In the **Create RAID via** field, select **Recover Data**.

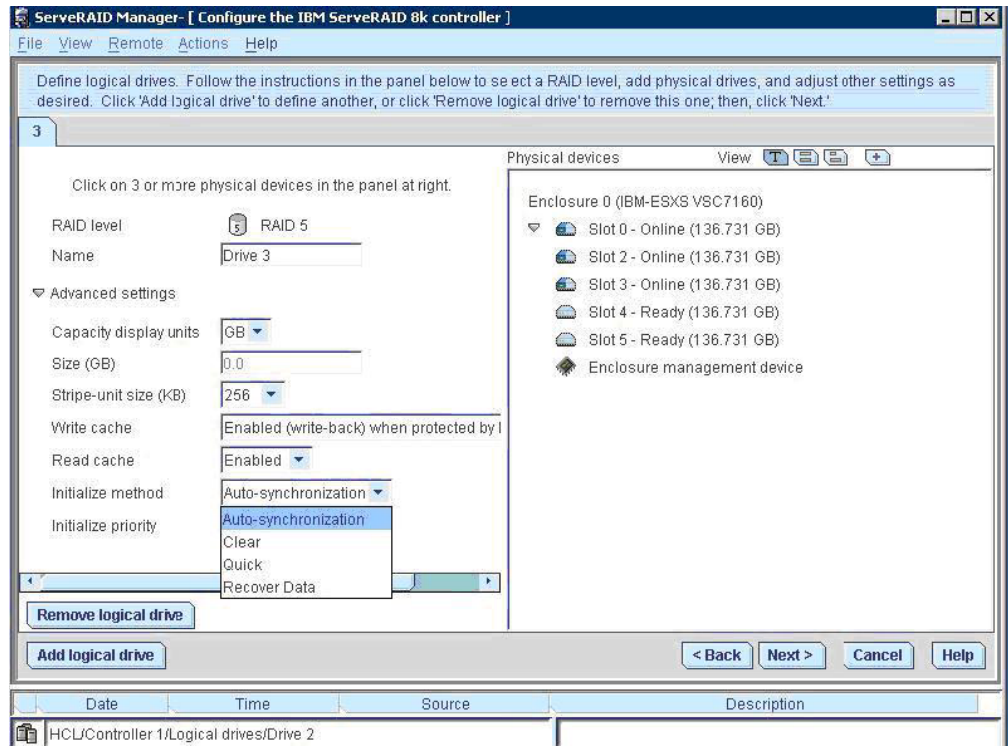
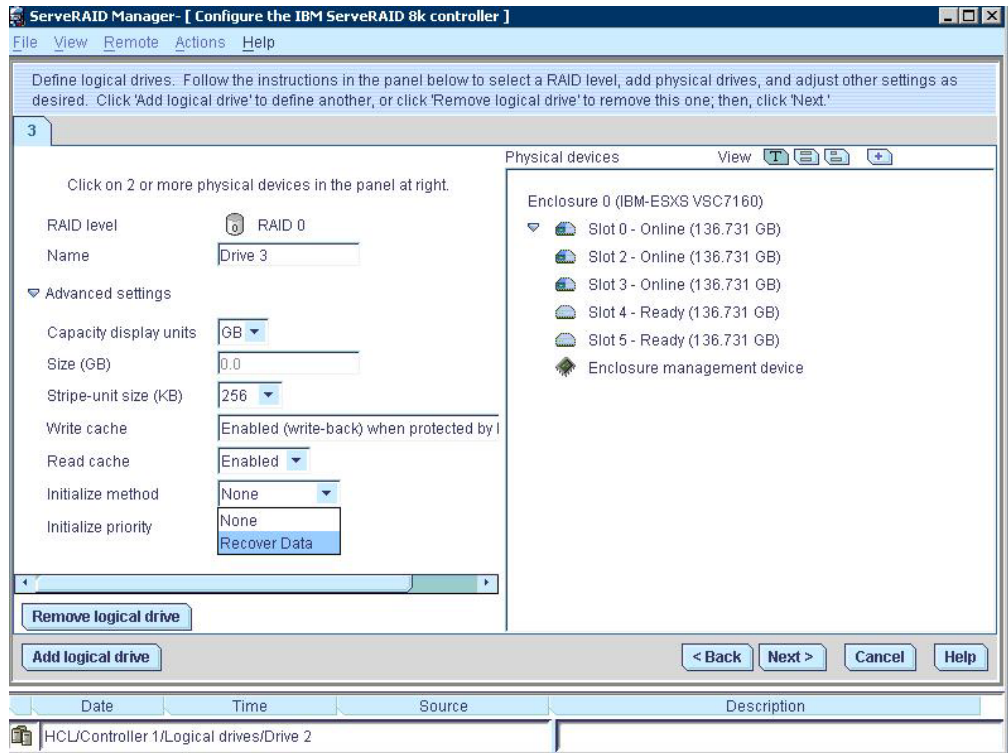
8. The Array Created through Recover Data option message is displayed after the array is created.



SRM GUI

To create an array by using the SRM GUI, complete the following steps:

1. Turn on the server and when you are prompted, press Ctrl+A to enter the Adaptec BIOS Utility.
2. Select **Array Configuration Utility** and then select **Create Array**. The Array Properties window opens.
3. Select the physical drives that are members of the previous configuration.
4. Select the previous RAID level.
5. Enter the previous stripe size.
6. Select the previous cache policy.
7. In the **Initialization method** field, select **Recover Data**.
8. The Array Created through Recover Data option message is displayed after the array is created.



Force-online operation

Sometimes the logical drives might go to an Offline state even if all the hard drives are working correctly. In such cases, if you know that the data on that logical array is in a working state, you can force the array to an Online or Critical state (depending upon the earlier state of the array). This feature helps recover the data by forcing the logical drive from Offline to Online or Critical state. Use the force-online option only as a last attempt to recover data. Do not use such an array for production purposes.

You can force an Offline array to Online / Critical Revived by using the BIOS, ServeRAID Manager (SRM) GUI, or the Adaptec RAID Controller Configuration (ARCCONF) Force-Online operation option.

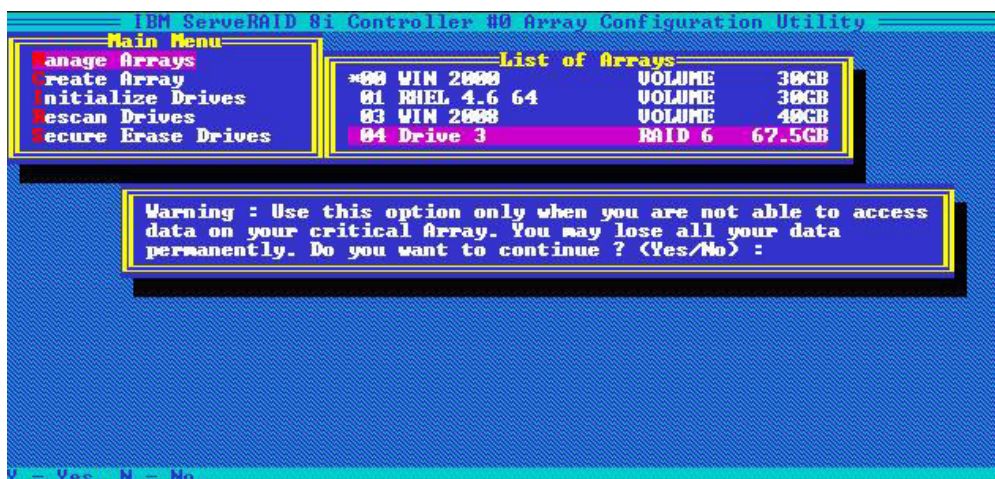
BIOS

To force an Offline array to Online / Critical Revived by using the BIOS, complete the following steps:

1. Select **Manage Containers** in the Array configuration utility.
2. Use the Up and Down keys to navigate to an Offline array.
3. Press Ctrl+R to perform a force online operation on that logical array.
4. Press Y to continue the force online operation.

The Success in Force On-Line Process message is displayed after the array is created.

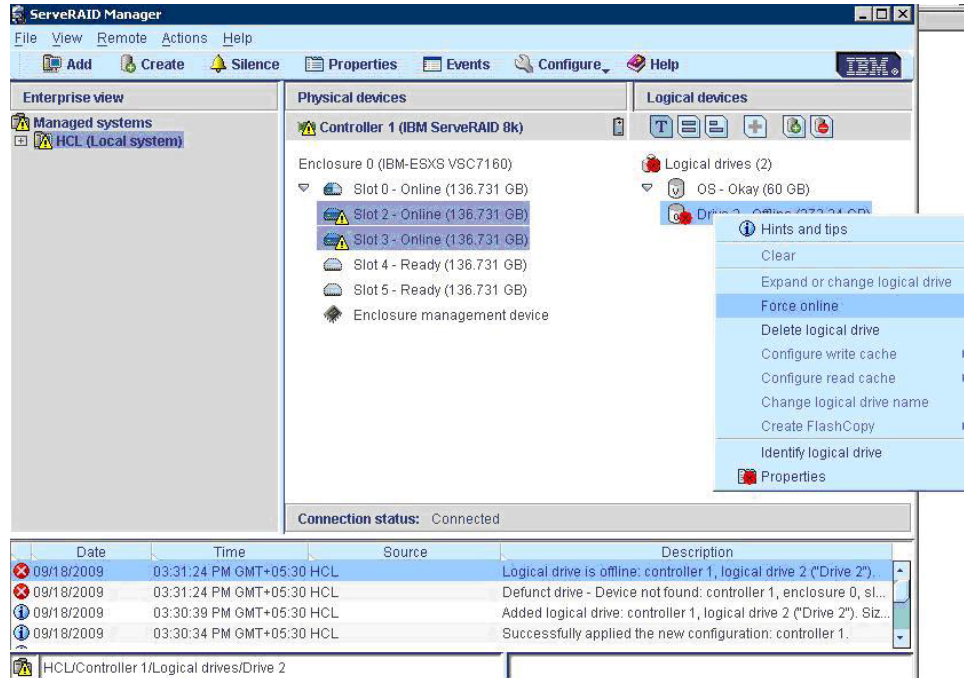
The Failure in Force On-Line Process message is displayed if the array is not created.



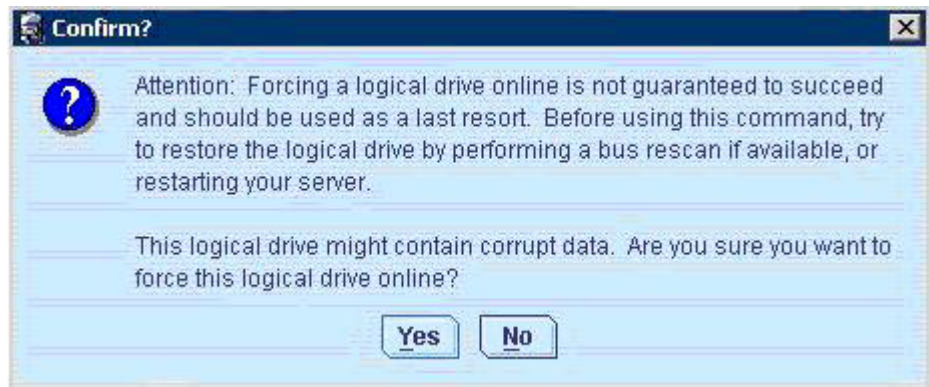
SRM GUI

To force an Offline array to Online / Critical Revived by using the SRM GUI, complete the following steps:

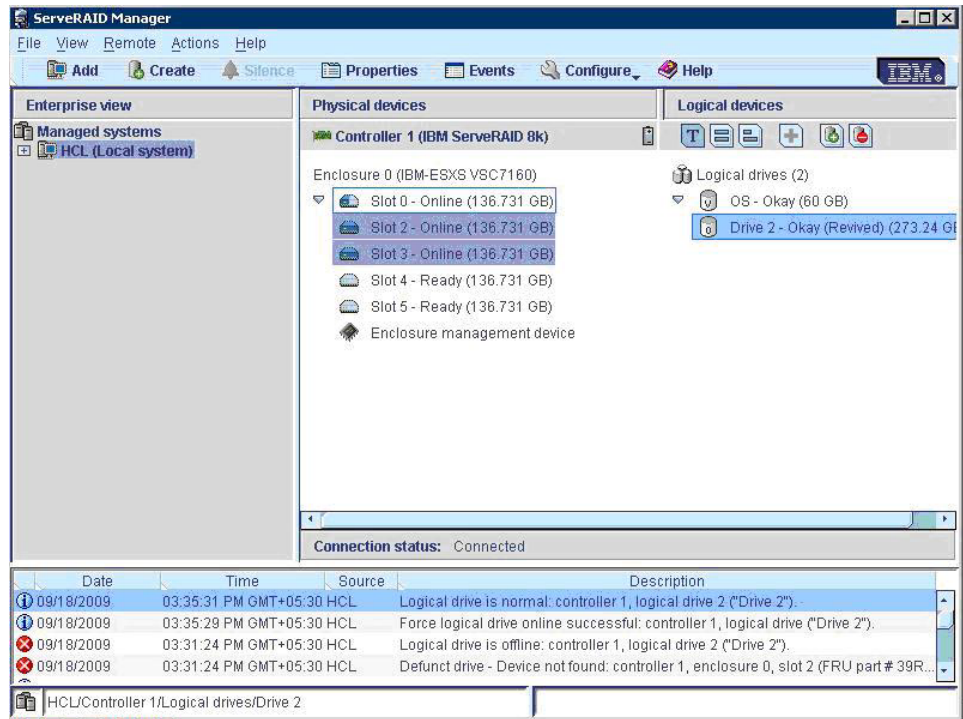
1. Right click an Offline logical drive.
2. Select **Force online**.



3. A warning message is displayed, as shown in the following illustration.



- If the force online operation is successful, the logical drive state changes to Okay (Revived) or Critical (Revived) depending on the number of Ready physical drives, and a successful event is displayed in the SRM event viewer.



Arccconf

To force a logical drive online by using the Arccconf, complete the following steps:

- To set the state of a logical drive to Online, use the following command:
`setstate controller_number logicaldrive logical_drive_number online [noprompt]`
- You are prompted with the following warning message before the force-online operation is performed:

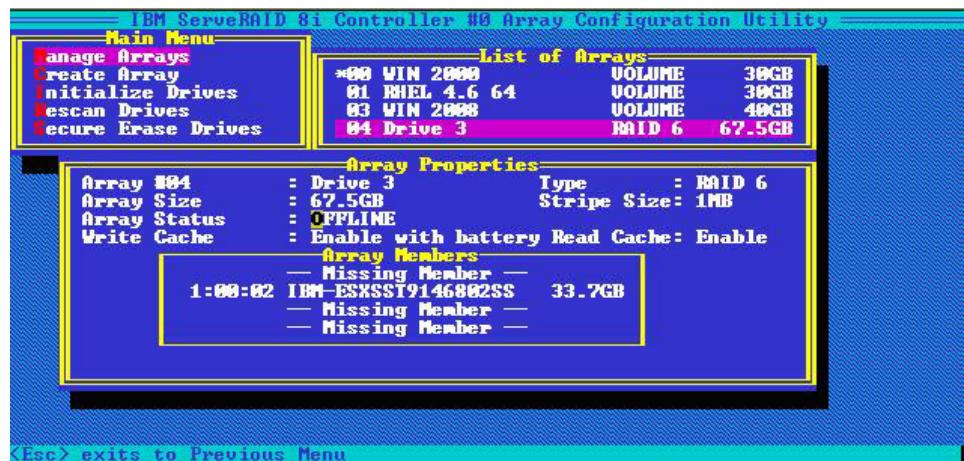
WARNING: Forcing a logical drive online is not guaranteed to succeed and should be used as a last resort.
 Before using this command, try to restore the logical drive by performing a bus rescan if available, or restarting your server.

This logical drive might contain corrupt data.
 Are you sure you want to force this logical drive online?
 Press y, then ENTER to continue or press ENTER to abort:

Displaying an Offline array

To view an Offline array from the Adaptec BIOS Utility, complete the following steps

1. Turn on the server and when you are prompted, press Ctrl+A to enter the Adaptec BIOS Utility.
2. Select **Array Configuration Utility** and then select **Manage Array**.
3. Use the Up and Down keys to navigate to an Offline array.
4. Press Enter. The array status is displayed as Offline, Offline Revived, or Critical Revived.

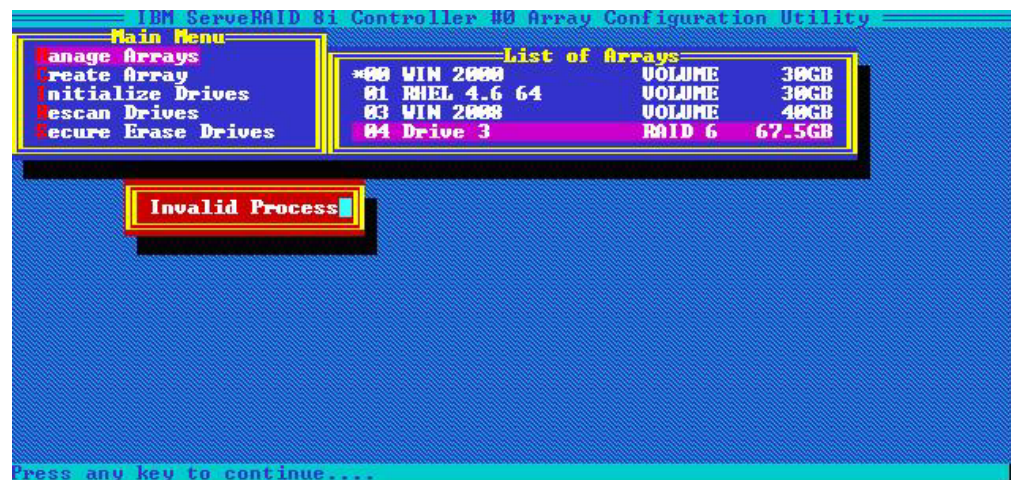


Invalid process

In the Adaptec BIOS Utility or in the IBM ServeRAID Manager application, if you select an option that is not valid, an Invalid Process error message is displayed. For example, in the Adaptec BIOS Utility, if you select **Manage Array**, and then select an Offline array, a menu is displayed that enables you to select which array you want to be the bootable array. If you select an Offline array, an Invalid Process error message is displayed because you cannot boot from an Offline array.

BIOS

If you set an Offline drive as a bootable device, an Invalid Process error message is displayed.



SRM GUI

In the SRM GUI, if a force online operation fails, an error window stating the reason for the failure is displayed in SRM, and an event is logged to the event viewer.

Arcconf

If a force online operation fails, the arcconf command exits and an applicable error message is displayed.

Displaying an Offline array in POST

After powering on or restarting the server, as the Adaptec BIOS information is displayed and power-on self-test (POST) is completed, the array name and status are displayed, as shown in the following illustration.

```
Adaptec RAID BIOS V5.2-0 [Build 40005]                                CP: 4B
(c) 1998-2007 Adaptec, Inc. All Rights Reserved.

  Press <Ctrl><A> for IBM ServeRAID Configuration Utility?

Booting the Controller Kernel.....Controller started

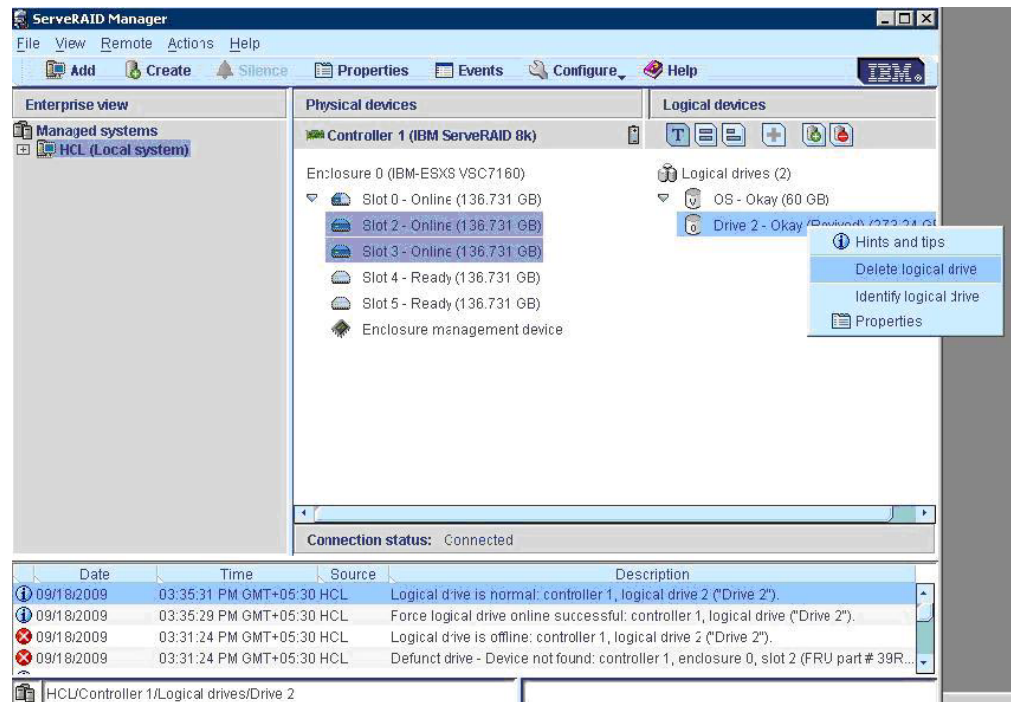
Controller #00: IBM ServeRAID 8i at PCI Slot:00, Bus:01, Dev:02, Func:00
Waiting for Controller to Start...Controller started
Controller monitor V5.2-0[40005], Controller kernel V5.2-0[40005]
Controller POST operation successful
Controller Memory Size: 256 MB
One or more drives are moved to different SAS Phys.
Following Arrays have missing required members and cannot be configured:
Array#2-RAID-6

Press <Enter> to accept the current configuration
Press <Ctrl-A> to enter IBM ServeRAID Configuration Utility
Press <Ctrl-H> to Pause Configuration Messages
(Default is <Enter> if no valid key pressed in 30 seconds)
<Enter> Pressed. The current Configuration is accepted.
Array#4 - RAID-6      67.57 GB Offline / Offline Revived

BIOSrInstallednSuccessfully?B      Okay
```

Revived array operations

You can perform only certain operations on Revived logical drives. For example, in the following illustration showing the IBM ServeRAID Manager application, you can select only **Delete logical drive** or **Identify logical drive**.



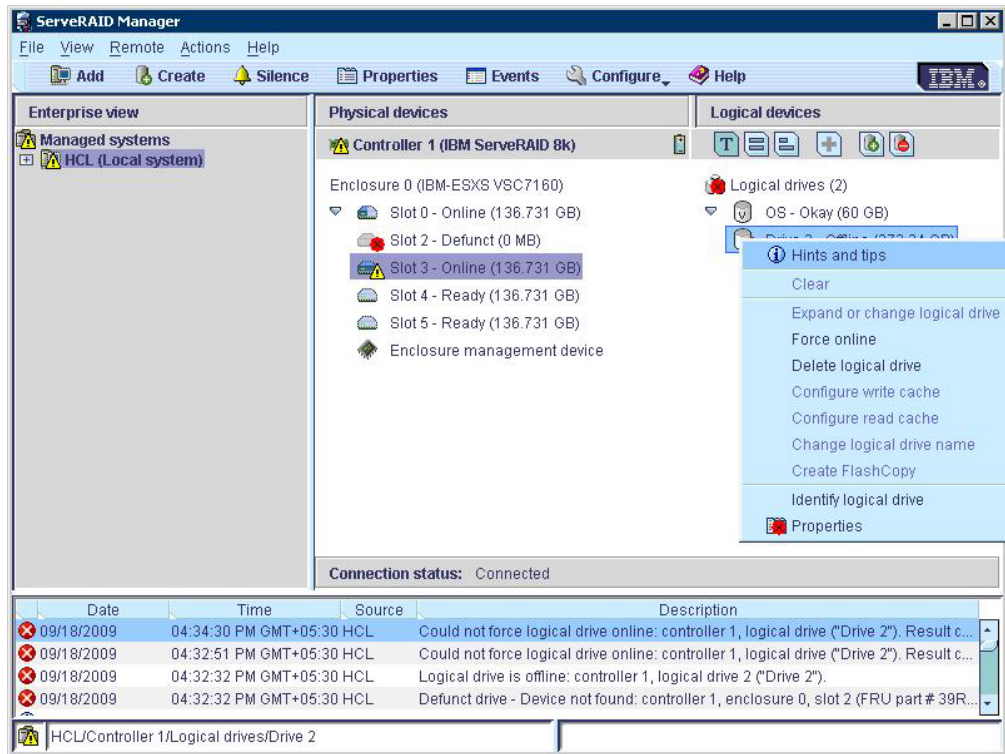
Arccconf

Only a delete logical drive operation can be performed on a Revived logical drive. If you perform any other operation on the Revived drive, other than a delete logical drive, Arccconf displays the following error message:

Requested operation cannot be initiated on a Revived logical drive.

Offline array operations

You can perform only certain operations on Revived logical drives. For example, in the following illustration showing the IBM ServeRAID Manager application, you can select only **Force online**, **Delete logical drive** or **Identify logical drive**.



Arcconf

Only a delete logical drive or force online operation can be performed on an Offline drive. If you perform any other operation on an Offline drive, other than a delete logical drive or force online, Arcconf displays the following error message:

Requested operation cannot be initiated on an OFFLINE logical drive.

Chapter 2. 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.

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Getting help and information from the World Wide Web

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IBM Taiwan product service contact information:
IBM Taiwan Corporation
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Important notes

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

CD drive speeds list the variable read rate. Actual speeds vary and are often less than the maximum possible.

When referring to processor storage, real and virtual storage, or channel volume, KB stands for approximately 1000 bytes, MB stands for approximately 1 000 000 bytes, and GB stands for approximately 1 000 000 000 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 may vary depending on operating environments.

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Part Number: 46M1375

Printed in USA

(1P) P/N: 46M1375

