SOFTWARE GUIDE

VT-100

imageRAID® SCSI Series RAID Storage System

STORAGE BY FUJITSU
SOFTWARE GUIDE

VT-100

imageRAID® SCSI Series RAID Storage System
Fujitsu Europe Limited

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</tbody>
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Preface

About this Manual

Welcome

Congratulations on the purchase of your new imageRAID™ SCSI Series Storage Systems from Fujitsu Europe Limited. This guide provides operational and reference information when using a VT-100 terminal to configure and manage the imageRAID Controllers (JSS122).

This software guide is designed for use with a target audience that has experience as system administrators who are familiar with the principles and conventions of Small Computer System Interface (SCSI) and Redundant Array of Independent Disk (RAID) technology, you will find step-by-step procedures to perform each of the functions of the Disk Array Administrator software onboard the controllers and the enclosure monitoring system.
About this Manual

Customer Care

You will find warranty, customer service and technical support on the Fujitsu web site. Refer to http://www.fel.fujitsu.com/home/help.

Product Identification

Cross-Reference Product Identification

<table>
<thead>
<tr>
<th>Storage Enclosure</th>
<th>Number of Controllers</th>
<th>Model of Controller</th>
</tr>
</thead>
<tbody>
<tr>
<td>IRS-JBOD</td>
<td>0</td>
<td>JBOD (4000S)</td>
</tr>
<tr>
<td>IRS-1U160xx-xx</td>
<td>1</td>
<td>imageRAID Controller (JSS122) (4110S/4120S)</td>
</tr>
<tr>
<td>IRS-2U160xx-xx</td>
<td>2</td>
<td>imageRAID Controller (JSS122) (4110S/4120S)</td>
</tr>
</tbody>
</table>
Chapter 1

Accessing the Disk Array Administrator

This VT-100 interface provides access to the Disk Array Administrator software which enables you to control and manage the imageRAID controllers in your imageRAID SCSI Storage System. You can

- Create and manage disk arrays (see “Creating and Managing Arrays and Partitions” on page 9).
- Monitor system status (see “Monitoring System Status” on page 51).
- Manage drive spares (see “Managing Spares” on page 63).
- Configure the controller (see “Configuring the Controller” on page 71).
- Manage disk drives and enclosures (see “Managing Disk Drives and Storage Enclosures” on page 105).
- Monitoring POST/Boot Sequence (see “Boot and POST Screen” on page 3).

NOTE: For dual controller storage systems, access to each imageRAID Controller is provided through independent controller service ports.
Chapter 1 - Accessing the Disk Array Administrator

Using the VT-100 Terminal

Access to the controller's firmware based program is accomplished via a VT-100 terminal or terminal emulation program from your host connected directly through the RS-232 serial port connections on the rear panel of the storage enclosure.

You must use a standard null-modem cable to connect the imageRAID SCSI Series Storage System RS-232 ports to the terminal.

Configure your host system or terminal RS-232 port to use the following settings:

<table>
<thead>
<tr>
<th>Setting</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terminal Emulation</td>
<td>VT-100 or ANSI (for color support)</td>
</tr>
<tr>
<td>Font</td>
<td>Terminal</td>
</tr>
<tr>
<td>Translations</td>
<td>None</td>
</tr>
<tr>
<td>Columns</td>
<td>80</td>
</tr>
</tbody>
</table>

Set the communications parameters for the terminal program as follows:

<table>
<thead>
<tr>
<th>Setting</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baud Rate</td>
<td>115,200</td>
</tr>
<tr>
<td>Data Bits</td>
<td>8</td>
</tr>
<tr>
<td>Stop Bits</td>
<td>1</td>
</tr>
<tr>
<td>Parity</td>
<td>None</td>
</tr>
<tr>
<td>Flow Control</td>
<td>None</td>
</tr>
<tr>
<td>Connector</td>
<td>COM1 (typically)</td>
</tr>
</tbody>
</table>

To access the RAID controllers:

1. From the computer or terminal connected to the enclosure, start your terminal emulation software.

   Be sure that your terminal emulation software is set to use the correct COM port on your computer. See Terminal Emulator and COM Port Problems in chapter 7 for more details on how it can auto-detect the baud rate.
The initial Boot and POST screens are displayed.

2 Following the Boot and POST screens the System Menu is displayed.

3 You can now perform all of the functions described in the following chapters. All steps start from the System Menu.

If an event has occurred, you will see a message about the problem. This message will also be stored in the event log.
Navigating the Disk Array Administrator Software

You can navigate the Disk Array Administrator menu system using your keypad. The table below describes the primary navigation and selection methods.

<table>
<thead>
<tr>
<th>To</th>
<th>Do this</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select the main menu.</td>
<td>Press the ↑ or ↓ keys and press Enter, or, Press the letter that is a different color (or highlighted) in a menu item (hot key).</td>
</tr>
<tr>
<td>Return to the previous menu or screen without saving your changes.</td>
<td>Press ESC, CTRL-Z, or the ← key.</td>
</tr>
<tr>
<td>Scroll through the available choices for a setting.</td>
<td>Press the ↑ or ↓ keys.</td>
</tr>
</tbody>
</table>

**NOTE:** After four minutes of inactivity, the Disk Array Administrator software returns to the initial screen.

Changing the Screen Display

After you have accessed the Disk Array Administrator software, you can change the screen display using a combination of keystrokes, which is also shown on the System Menu. The table below list the keystrokes required to change various screen displays.

<table>
<thead>
<tr>
<th>Select</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ctrl-A</td>
<td>Toggles between ANSI and VT-100 character sets (use VT-100 for legacy systems).</td>
</tr>
<tr>
<td>Ctrl-B</td>
<td>Toggles between black and white, and color screens.</td>
</tr>
<tr>
<td>Ctrl-E</td>
<td>Toggles between the event log, hardware information, and configuration information.</td>
</tr>
<tr>
<td>Ctrl-H</td>
<td>Toggles between the Help screen and list of shortcut keys.</td>
</tr>
<tr>
<td>Ctrl-R</td>
<td>Refreshes the screen.</td>
</tr>
<tr>
<td>Ctrl-Z, ESC, or the ← key.</td>
<td>Escapes or quits the menu.</td>
</tr>
</tbody>
</table>
Menu System

System Menu
- Array Menu
  - Array Status
  - Drive Status
  - Abort Initialization
  - Verify Function
  - Expand Function
  - Add Spare
  - Delete Spare
  - Change Array name
  - Trust Array
  - * Switch Array Owner
- Partition Menu
  - Add a Partition
  - Delete a Partition
- Pool Spare Menu
  - Display Pool Spare
  - Add Pool Spare
  - Delete Pool Spare
- All Partitions Menu
- Configuration Menu
- Utilities Menu
- Event Log Menu
- * Other Controller Menu
- Shutdown/Restart

Array Menu
- Array Status
- Drive Status
- Abort Initialization
- Verify Function
- Expand Function
- Add Spare
- Delete Spare
- Change Array name
- Trust Array
- * Switch Array Owner
- Partition Menu
- Add a Partition
- Delete a Partition

Add an Array
- Enter Array Name
- Single Partition
- Enter LUN
- Select RAID Type
- Number of Drives
- Select Drives
- Chunk Size
- Number of Spares

Partition Menu
- Partition Status
- Partition Statistics
- Expand Partition
- Change LUN
- Change Partition Name
- Delete This Partition

Verify Function
- Start Verify
- View Verify Status
- Abort Verify

Expand Function
- Start Expand
- View Expand Status

* Applicable only with dual controllers.
Chapter 1 - Accessing the Disk Array Administrator

Menu System (continued)

- System Menu
  - Array Menu
    - Add an Array
    - Delete an Array
    - Pool Spare Menu
    - Display Drives
  - All Partitions Menu
  - Configuration Menu
  - Utilities Menu
  - Event Log Menu
  - * Other Controller Menu
  - Shutdown/Restart

- Configuration Menu
  - Set Date/Time
  - Host Configuration
    - Channel 0 or 1
    - Enable/Disable
    - Target ID
    - Controller LUN
    - * Reset on Failover
  - Channel Configuration
    - Channel
    - Bus Speed
    - Disable Domain Validation
    - Initiator ID
  - SEP Configuration
    - SEP Settings
    - SEP LUN
  - Disk Configuration
    - Write-Back Cache
    - SMART
  - Drive Utilities Menu
    - Blink Drive LED
    - Clear Metadata
    - Down Drive
    - Test Unit Ready
    - Display Drive Cache
  - Option Configuration
    - Operating Mode
    - Cache Lock
    - Battery
    - Trust Array
    - Dynamic Spare Configuration
    - Enclosure Features

- Utilities Menu
  - Rescan
  - Hot Swap Pause
  - Hardware Information
  - LUN Information
  - Drive Utilities Menu
  - Overall Statistics

- Utilities Menu
  - * Other Controller Menu
    - Other Information
    - Kill Other
    - Unkill Other
    - Shutdown Other
    - Shutdown Both

- * Applicable only with dual controllers.

Menu Chart 2 of 2
Chapter 1 - Accessing the Disk Array Administrator

Updating the SAF-TE Disk I/O Firmware

The following describes the procedures to upload new SAF-TE firmware for the SAF-TE Disk I/O card.

1. Ensure that the storage system is properly powered down.
2. Connect one end of a null-modem RS-232 cable to the SAF-TE port and the other end to the host system’s serial communication port.
   
   Set your host system communication protocol to 9,600 Baud, 8 Data bits, 1 Stop bit, No parity, and Flow control off.
3. Power on the enclosure and at the host system terminal program press <Control-E>.
4. Using the pull-down menu selection choose Send File and choose the Xmodem protocol.
5. Use the browse button to locate the firmware file and click Send.
6. After the firmware upload is complete you will see the new firmware version displayed on the screen.
Chapter 1 - Accessing the Disk Array Administrator
Chapter 2

Creating and Managing Arrays and Partitions

Using a VT-100 terminal, you can create and manage disk arrays and partitions. You can perform the following array-related functions:

- Create arrays
- Manage arrays
- Manage partitions

Creating Arrays

You can create an array at anytime. The table below describes the drive requirements for each RAID level.

<table>
<thead>
<tr>
<th>RAID Level</th>
<th>Minimum No. of Drives</th>
<th>Maximum No. of Drives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>0</td>
<td>2</td>
<td>16</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>16</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>16</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
<td>16</td>
</tr>
<tr>
<td>50</td>
<td>6</td>
<td>24</td>
</tr>
<tr>
<td>1 (Mirrored)</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>10 (Mirrored)</td>
<td>4</td>
<td>16</td>
</tr>
</tbody>
</table>
NOTE: Before you create more than one array, you must be sure that your host operating system supports multiple Logical Unit Numbers (LUNs). Most operating systems do, or have an option you can enable to support multiple LUNs. If your operating system does not support multiple LUNs, the host will only be able to see one array at LUN 0.

Before you create an array, you must decide whether you want to partition the array. You can create an array one of two ways:

- As a single-partition array – an array that stores all data in a single partition and is accessed by a single LUN.
- As a multiple-partition array – an array that can have one or more partitions, with each partition assigned its own LUN.

For more information about partitions, see “Understanding Partitions” on page 38.

NOTE: If you have a single controller system (StandAlone), be sure to select the installed controller, otherwise you will get a controller missing status. The controller installed in the left bay is Controller 1 and the controller installed in the right bay is Controller 2.

Creating a Single-Partition Array

You can create an array that has just one partition. Once you create a single-partition array, you can add more partitions. Single-partition arrays work well in environments that need one large, fault-tolerant storage space for data on one server. An example is a large database accessed by users on a single server that is used only for that application.

To create a single-partition array

1. From the System Menu, select **Add an Array** and press **Enter**.

   The Enter Array Name screen displays.
Chapter 2 - Creating and Managing Arrays and Partitions

2 Enter a name for the array and press Enter.

You can use up to 20 characters. You can include any characters in the name, including spaces. If you do not want to name the array, you can just press Enter. You can add or change the name later.

The system asks if you want to create one partition now for the entire array.

3 Select Yes to create a single-partition array and press Enter.

If you want to create a multiple-partition array, “Creating a Multiple Partition Array” on page 16.

The LUN screen displays.

4 Select the LUN for the array and press Enter.

The LUN that is displayed is the suggested default LUN assignment. Use the Up and Down Arrow buttons to locate your selection. You may choose from 0-63.

NOTE: Most UNIX, Linux, and Macintosh operating systems require that the controller LUN is a higher value than all array LUNs. Before creating your first array, change the controller LUN to a higher value if you are not using AdminStor (AdminStor requires the controller LUN be set to 0) to manage the arrays. This allows your first array to be seen at LUN 0. Refer to “Setting Host LUN IDs” on page 49.

The system warns you about the LUN for Unix and Macintosh OS, as above, the first time you create an array. Press Enter and the system asks if you want to be warned again. Select No to avoid receiving this warning again, or select Yes to be warned the next time you create an array.
The RAID Type screen is displayed.

5 Select the array type (RAID 0, RAID 3, RAID 4, RAID 5, RAID 50, VOLUME (a single drive similar to just a bunch of disks [JBOD] except that it includes metadata), or MIRRORED) and press Enter.

NOTE: A RAID 10 array is created when there are more than two drives (four drives minimum) in a mirrored array.

If you selected RAID 50 as the array type, the Select RAID 50 Array Size screen displays (shown on the following page) with all possible configurations for the array and drive combinations. Select the configuration you want, press Enter.

If you selected any array type other than RAID 50, the Number of Drives screen displays.
Enter the number of drives (excluding spares) you want in the array and press *Enter*.

The Select Drives screen displays (shown below). If you are using Active-Active/Active-Passive mode, the list includes all available drives, that is, drives that are not members of an array and are not assigned as a dedicated or pool spare, on both controllers. This includes the following information for each drive:

- Channel
- SCSI ID
- Drive capacity
- Drive manufacturer
- Drive model number
- Drive firmware revision

Select the drives you want to use for in the array and press *Enter*.

You select a drive by highlighting it and pressing Enter. Each selected drive turns gray in the list. After you press *Enter* a second time for the number of drives you have selected, the system automatically goes to the next screen.

To skip a drive, use the ↑ or ↓ keys.

If the array is mirrored, RAID 3, RAID 4, RAID 5, or RAID 50 and you have one or more drives left, the Number of Spares screen displays.

If the Number of Spares screen displays, enter the number of spares you want to add and press *Enter.*
Chapter 2 - Creating and Managing Arrays and Partitions

This creates dedicated spares that can only be used by this array. A dedicated spare drive will not be available for any other use. For more information about spares, “Managing Spares” on page 63.

If you do not want a spare, enter 0. The Select Drives screen displays.

9 If the Select Drives screen displays, select the drive you want to use as a dedicated spare and press Enter.

Only available drives, that is, drives that are not members of an array and are not assigned as dedicated or pool spares, display. You can delete a dedicated spare from the array at any time. For more information, see “Deleting a Dedicated Spare” on page 65.

You select a drive by highlighting it and pressing Enter. Each selected drive turns gray in the drive list. After you press Enter on the last drive for the total number of drives you specified, the system automatically moves to the next screen.

To skip a drive, use the use the ↑ or ↓ keys.

If the array you are creating is a RAID 3, RAID 4, RAID 5, or RAID 50, the Chunk Size screen displays.

10 If the Chunk Size screen displays, select the chunk size and press Enter.

The chunk size is the amount of contiguous data that is written to an array member before moving to the next member of the array. To determine the appropriate chunk size, refer to your operating system documentation. For example, the default chunk size for Windows NT and many other operating systems is 64 KB. If you are using the array for a database with very small records, you may want to use a smaller chunk size.
Creating a Single-Partition Array

If the array you are creating is a RAID 3, RAID 4, RAID 5, RAID 10, or RAID 50, the Array Init Options screen displays. The current option has an * next to it.

11 Select the option you want and press Enter.

   Offline Initialization – Using this option means you must wait for the array initialization process to finish before using the array. It uses zero method to create the array, which is faster than the verify method.

   Online Initialization – Using this option lets you begin using the array immediately after creating it, while the array initialization process runs. It uses the verify method to create the array, which takes longer than the zero method.

The system confirms that you want to create the array.

12 Select Yes and press Enter.

A message notifies you that the array is being created and shows the progress of the initialization process. The array initialization process takes from several minutes to more than an hour depending on the array type (volume, RAID 0, and RAID 1 are the fastest), array size, drive speed, and other processes running on the controller.

You can press ESC to return to the Disk Array Administrator menus and perform other functions. To check the progress of the array initialization, select Array menu from the System Menu. The status of the initialization displays the list of arrays.

If you find that you need to change the disks or some other array configuration, you can stop the array initialization process. See “Stopping the Array Initialization Process” on page 27.

NOTE: Most operating systems, such as Windows NT 4.0, require you to reboot the host system to see the new array. Other operating systems might have similar features.
Creating a Multiple Partition Array

You can create an array that is set up for more than one partition.

NOTE: Once you create a multiple-partition array, you must create at least one partition before you can use the array. See “Creating a Partition” on page 21.

Multiple-partition arrays work well when you have very large disk drives and you want to make the most efficient use of disk space for fault tolerance (parity and spares). For more information, see “Understanding Partitions” on page 38.

To create a multiple-partition array

1. From the System Menu, select Add an Array and press Enter.

   The Enter Array Name screen displays.

   Enter Array Name Screen

2. Enter a name for the array and press Enter.

   You can use up to 20 characters. You can include any characters in the name, including spaces. If you do not want to name the array, you can just press Enter. You can add or change the name later.

   The system asks if you want to create one partition now for the entire array.

3. Select No to create a multiple-partition array and press Enter.

   If you want to create a single-partition array, see “Creating a Single-Partition Array” on page 10.

   The RAID Type screen is displayed.
Chapter 2 - Creating and Managing Arrays and Partitions

Creating a Multiple Partition Array

1. Select the array type (RAID 0, RAID 3, RAID 4, RAID 5, RAID 50, VOLUME (a single drive similar to just a bunch of disks [JBOD] except that it includes metadata), or MIRRORED) and press Enter.

NOTE: A RAID 10 array is created when there are more than two drives (four drives minimum) in a mirrored array.

If you selected RAID 50 as the array type, the Select RAID 50 Array Size screen displays (shown on the following page) with all possible configurations for the array and drive combinations. Select the configuration you want, press Enter.

If you selected any array type other than RAID 50, the Number of Drives screen displays.
5 Enter the number of drives (excluding spares) you want in the array and press Enter.

The Select Drives screen displays (shown below). If you are using Active-Active/Active-Passive mode, the list includes all available drives, that is, drives that are not members of an array and are not assigned as a dedicated or pool spare, on both controllers. This includes the following information for each drive:

- Channel
- SCSI ID
- Drive capacity
- Drive manufacturer
- Drive model number
- Drive firmware revision

Select Drives Screen

6 Select the drives you want to use for in the array and press Enter.

You select a drive by highlighting it and pressing Enter. Each selected drive turns gray in the list. After you press Enter a second time for the number of drives you have selected, the system automatically goes to the next screen.

To skip a drive, use the ↑ or ↓ keys.

If the array is mirrored, RAID 3, RAID 4, RAID 5, or RAID 50 and you have one or more drives left, the Number of Spares screen displays.

7 If the Number of Spares screen displays, enter the number of spares you want to add and press Enter.
This creates dedicated spares that can only be used by this array. A dedicated spare drive will not be available for any other use. For more information about spares, “Managing Spares” on page 63.

If you do not want a spare, enter 0. The Select Drives screen displays.

8 If the Select Drives screen displays, select the drive you want to use as a dedicated spare and press Enter.

Only available drives, that is, drives that are not members of an array and are not assigned as dedicated or pool spares, display. You can delete a dedicated spare from the array at any time. For more information, see “Deleting a Dedicated Spare” on page 65.

You select a drive by highlighting it and pressing Enter. Each selected drive turns gray in the drive list. After you press Enter on the last drive for the total number of drives you specified, the system automatically moves to the next screen.

To skip a drive, use the use the ↑ or ↓ keys.

If the array you are creating is a RAID 3, RAID 4, RAID 5, or RAID 50, the Chunk Size screen displays.

9 If the Chunk Size screen displays, select the chunk size and press Enter.

The chunk size is the amount of contiguous data that is written to an array member before moving to the next member of the array. To determine the appropriate chunk size, refer to your operating system documentation. For example, the default chunk size for Windows NT and many other operating systems is 64 KB. If you are using the array for a database with very small records, you may want to use a smaller chunk size.
Chapter 2 - Creating and Managing Arrays and Partitions

If the array you are creating is a RAID 3, RAID 4, RAID 5, RAID 10, or RAID 50, the Array Init Options screen displays. The current option has an * next to it.

10 Select the option you want and press Enter.

Offline Initialization – Using this option means you must wait for the array initialization process to finish before using the array. It uses the zero method to create the array, which is faster than the verify method.

Online Initialization – Using this option lets you begin using the array immediately after creating it, while the array initialization process runs. It uses the verify method to create the array, which takes longer than the zero method.

The system confirms that you want to create the array.

11 Select Yes and press Enter.

A message notifies you that the array is being created and show the progress of the initialization process. The array initialization process takes from several minutes to more than an hour depending on the array type (volume, RAID 0, and RAID 1 are the fastest), array size, drive speed, and other processes running on the controller.

You can press ESC to return to the Disk Array Administrator menus and perform other functions. To check the progress of the array initialization, select Array menu from the System Menu. The status of the initialization displays the list of arrays.

12 Create at least one partition before using the array. See “Creating a Partition” on page 21.

If you find that you need to change the disks or some other array configuration, you can stop the array initialization process. See “Stopping the Array Initialization Process” on page 27.

13 Reboot your host system.

NOTE: Most operating systems, such as Windows NT 4.0, require you to reboot the host system to see the new array. Other operating systems might have similar features.
Managing Arrays

The Disk Array Administrator software lets you manage your arrays in a variety of ways. You can
- Add a partition
- View array and drive status
- Stop the initialization process
- Verify an array
- Reconstruct an array
- Expand array capacity
- Change the array name
- Change array ownership
- Trust an array
- Delete an array

Creating a Partition

If you created a multiple-partition array, you must create at least one partition on the array before you can use the array. You can create partitions on a multiple-partition array until you use all of the available free space. For more information about partitions, see “Understanding Partitions” on page 38.

To add a partition

1. From the System Menu, select Array Menu and press Enter.
   The Select Array screen displays with a list of existing arrays.
2. Select the multiple-partition array you want and press Enter.
   The Array Menu screen displays.
3. Select Add a Partition and press Enter.
   The Select Free Partition screen displays with a list of free partitions. A free partition is free space that has not yet been partitioned or space that had a partition that was deleted.
Select Free Partition Screen

4 Select the free partition you want to use.

The Partition Size screen displays.

Partition Size Screen

5 Enter the size you want to make the partition and press Enter.

The Partition Name screen displays.

Partition Name Screen
Chapter 2 - Creating and Managing Arrays and Partitions

6 Enter a name for the partition and press Enter.
You can enter up to 20 characters (A-Z and 0-9). You can include any characters in the name, including spaces. If you do not want to name the partition, you can just press Enter. You can add or change the name later.

The LUN screen is displayed.

![LUN Screen](image)

7 Select the LUN for the partition and press Enter.
The LUN that is displayed is the suggested default LUN assignment. Use the Up and Down Arrow buttons to locate your selection. You may choose from 0-63.

**NOTE:** Most UNIX, Linux, and Macintosh operating systems require that the controller LUN is a higher value than all array LUNs. Before creating your first array, change the controller LUN to a higher value if you are not using Administor (Administor requires the controller LUN be set to 0) to manage the arrays. This allows your first array to be seen at LUN 0. Refer to “Setting Host LUN IDs” on page 49.

The system warns you about the LUN for Unix and Macintosh OS, as above, the first time you create a partition. Press Enter and the system asks if you want to be warned again. Select No to avoid receiving this warning again, otherwise select Yes to be warned the next time you create a partition.

The system confirms that you want to make the change.

8 Select Yes and press Enter.

9 Reboot your host system.

**NOTE:** Most operating systems, such as Windows NT 4.0, require you to reboot the host system to see the new array. Other operating systems might have similar features.
Chapter 2 - Creating and Managing Arrays and Partitions

Viewing Array and Drive Status Information

Array and drive status information is available in several ways

- View array status
- View drive status

Viewing Array Status

You can view the status of an array, including the following information

- State – Online, Offline, Critical, or Fault-tolerant.
- Serial number – Unique number the controller assigns to each array.
- Name – Is the name you give to the array.
- RAID level – Array type (0, 3, 4, 5, 50, Volume, or Mirrored). The term “mirrored” is used for both RAID 1 and RAID 10 arrays.
- Number of drives – Number of drives in the array when fault-tolerant. For example, if you create a three-drive RAID 5 array and lose one drive, the number will still display 3.
- Number of drives per sub-array – For RAID 50 only; number of drives in each underlying RAID 5 array.
- Number of spare drives – Number of spare drives dedicated to this array.
- Size – Is the size of the entire array.
- Chunk size – Array’s chunk size.
- Date created – Date the array was created.
- Utility – Is the utility running (None, Verify, Reconstruct, Expand, or Initialize).
- Number of partitions – Number of partitions created on the array.
- Free partition total – Amount of free space (no partition) on the array.
To view the status of an array

1. From the System Menu, select *Array Menu* and press *Enter*.

   The Select Array screen displays with a list of existing arrays.

   ![Select Array Screen](image)

   **Select Array Screen**

2. Select the array you want and press *Enter*.

   The Array Menu screen is displayed.

   ![Array Menu Screen](image)

   **Array Menu Screen**

3. Select Array Status and press *Enter*.

   The status screen is displayed showing the status of the array you selected.
Chapter 2 - Creating and Managing Arrays and Partitions

Viewing Drive Status

You can view the status of the drives in an array, including the following information:

- Drive number – The drive’s sequential position in the controller’s drive list.
- Drive status – Whether the drive is up or down.
- Channel number – Back-end disk bus number.
- Target ID
- Size – Is the size of the drive in MB.
- Status – If part of an array, this displays the array name and member number. If a spare, this displays the type of spare. If unused, this displays Available. If the drive was part of an array that no longer exists, this displays Leftover.

NOTE: If a drive has failed or malfunctioned, it may not be listed.

To view drive status:

1. From the System Menu, select Array Menu and press Enter.
   
The Select Array screen displays with a list of existing arrays.

2. Select the array you want and press Enter.
   
The Array Menu screen is displayed.

3. Select Drive Status and press Enter.
Chapter 2 - Creating and Managing Arrays and Partitions

The Drive Status screen displays showing the drives that are members of the array and that are assigned as dedicated spares.

Drive Status Screen

Use the ↑ or ↓ keys to scroll through the drives. These are the drives that are currently members of the array.

4 Press ESC to return to the Array Menu.

Stopping the Array Initialization Process

If you find that you need to change the disks or some other array configuration, you can stop the array initialization process.

After you stop the process, the array is marked as offline and cannot be used.

NOTE: You must delete the array before you can use the drives in another array.

To stop the array initialization process

1 From the System Menu, select Array Menu and press Enter.

The Select Array screen displays with a list of existing arrays.

2 Select the array you want and press Enter.

The Array Menu screen displays.

3 Select Abort Initialization and press Enter.

The system confirms that you want to stop the initialization process.

4 Select Yes and press Enter.
Chapter 2 - Creating and Managing Arrays and Partitions

Verifying an Array

The Verify function allows you to verify the data on the specified array (RAID 3, RAID 4, RAID 5, RAID 50, and mirrored arrays only)

- RAID 3, RAID 4, RAID 5, and RAID 50 – Verifies all parity blocks in the selected array and corrects any bad parity.
- Mirrored – Compares the primary and secondary drives. If a mismatch occurs, the primary is copied to the secondary.

You may want to verify an array when you suspect there is a problem.

To verify an array

1. From the System Menu, select Array Menu and press Enter.
   
   The Select Array screen displays with a list of existing arrays.

2. Select the array you want and press Enter.
   
   The Array Menu screen displays.

   
   The Verify Menu screen is displayed.

4. Select Start Verify and press Enter.

   Verification begins and the percentage of verification completed displays. You can continue to use the array during verification.
Chapter 2 - Creating and Managing Arrays and Partitions

Viewing Verification Status

To return to the Verification Menu, press ESC.

To check the progress of the array verification, you can use the verification status described below or select Array Menu from the System Menu. The status of the verification displays in the list of arrays.

Viewing Verification Status

You can view the status of the verification process while it is running.

To view verification status

1. From the System Menu, select Array Menu and press Enter.
   
   The Select Array screen displays with a list of existing arrays.

2. Select the array you want and press Enter.
   
   The Array Menu screen displays.

   
   The Verify Menu screen displays.

4. Select View Verify Status and press Enter.
   
   The Verify Status screen displays.

5. Press ESC to return to the Verify menu.
Stopping the Verification

You can stop the verification process. Normally, you want to let the verification finish, although stopping it does not cause any damage to your data. You may want to stop the verification if you want to improve performance of the controller for another application.

To stop the verification process

1. From the System Menu, select Array Menu and press Enter.
   The Select Array screen displays with a list of existing arrays.
2. Select the array you want and press Enter.
   The Array Menu screen displays.
   The Verify Menu screen is displayed.
   The system confirms that you want to stop the verification process.
5. Select Yes and press Enter.

Reconstructing an Array

The controller automatically reconstructs redundant arrays (RAID 3, RAID 4, RAID 5, RAID 50, and mirrored) if an array becomes critical and a properly sized spare drive is available. An array becomes critical when one or more member drives fail.

If a reconstruct does not start automatically, it means that no valid spares are available. To start a reconstruct, replace the failed drive, and add it as a spare (see “Adding a Dedicated Spare” on page 64 and “Enabling Dynamic Spares” on page 66) or as a pool spare (see “Adding a Spare to the Spare Pool” on page 68). Remember that any “pool spares” added might be used by any critical array, not necessarily the array you want.
Expanding Array Capacity

You can expand array capacity without stopping I/O activity, so you can continue using the array while the expansion process runs. *You can only expand one array at a time.*

**NOTE:** Expanding an array here does not change the size of the host operating system partitions that reside on the array, because our controller is working at the block level not the file system level of the operating system. To use the new space, you must create a new partition using the newly added space or use a third-party application specific to the operating system to change the partition size.

How you create a new partition or resize an existing one depends upon the operating system. Most operating systems cannot resize an existing partition. Refer to your operating system documentation.

The number of drives you can add to an array depends upon the RAID level as shown in the table below. You also cannot exceed the maximum number of drives for each RAID level. See “Creating Arrays” on page 9.

**NOTE:** When expanding a RAID 50 array, you must choose the exact number of drives in the RAID 5 array that comprise the RAID 50 array. Example if your RAID 5 array contains three (3) drives, you must choose a total of three (3) drives to perform the expansion. Choosing a different number of drives, greater or lesser, will cause the expansion operation to fail.

<table>
<thead>
<tr>
<th>RAID Level</th>
<th>Number of Drives You Can Add</th>
<th>Maximum Number of Drives</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAID 0</td>
<td>1 to 4 at a time up to the maximum.</td>
<td>16</td>
</tr>
<tr>
<td>RAID 1 (mirrored)</td>
<td>Cannot expand</td>
<td>N/A</td>
</tr>
<tr>
<td>Volume</td>
<td>Cannot expand</td>
<td>N/A</td>
</tr>
<tr>
<td>RAID 10</td>
<td>2 or 4 at a time up to the maximum.</td>
<td>16</td>
</tr>
<tr>
<td>RAID 3, 4, or 5</td>
<td>1 to 4 at a time up to the maximum.</td>
<td>16</td>
</tr>
<tr>
<td>RAID 50</td>
<td>All RAID 5 arrays must contain the same number of drives. You must choose the exact number of drives in the RAID 5 array to perform the expansion. Choosing a number of drives different from the RAID 5 array will cause the expansion to fail.</td>
<td>32</td>
</tr>
</tbody>
</table>
Chapter 2 - Creating and Managing Arrays and Partitions

If you are expanding a multiple-partition array, you add free space at the end of the array. For more information about partitions, see “Understanding Partitions” on page 38.

NOTE: Once you start expanding array capacity, you cannot stop it. The expand function may take an hour or more to complete, depending on the array type, array size, drive speed, and other processes running on the controller.

To expand an array

1. From the System Menu, select Array Menu and press Enter.
   The Select Array screen displays with a list of existing arrays.

2. Select the array you want and press Enter.
   The Array Menu screen displays.

   The Expand Menu screen is displayed.

4. Select Start Expand and press Enter.
   The Number of Drives screen is displayed.

5. Enter the number of drives you want to add and press Enter.
   The Select Drives screen is displayed.
Chapter 2 - Creating and Managing Arrays and Partitions

Expanding Array Capacity

6 Select the drives you want to add from the list of available drives and press Enter.

Only available drives are displayed, that is, drives that are not members of an array and are not assigned as dedicated or pool spares.

You select a drive by displaying it and pressing Enter. Each selected drive turns gray in the drive list. After you press the Enter button for the number of drives you entered previously, the system automatically begins the expansion. To skip a drive, use the ↑ or ↓ keys.

Expansion begins and the percentage completed displays. To return to the Array Menu, press ESC. To check the progress of the expansion, you can use the Expand Status described below or select Array Menu from the System Menu. The status of the expansion displays in the list of arrays.
Chapter 2 - Creating and Managing Arrays and Partitions

Viewing Expand Status

You can view the status of the expansion process while it is running.

To view expand status

1. From the System Menu, select Array Menu and press Enter.
   The Select Array screen displays with a list of existing arrays.
2. Select the array you want and press Enter.
   The Array Menu screen displays.
   The Expand Menu screen is displayed.
4. Select View Expand Status and press Enter.
   The Expand Status screen is displayed.
5. Press ESC to return to the Expand menu.

Changing an Array Name

You can change the name of the array. This does not affect the target ID or LUN values of the array. The controller does not allow you to change an array name when a utility is running.

To change the array name

1. From the System Menu, select Array Menu and press Enter.
   The Select Array screen displays with a list of existing arrays.
2. Select the array you want and press Enter.
   The Array Menu screen displays.
3. Select Change Array Name and press Enter.
   The Enter New Name screen is displayed.
4. Enter the name you want to use and press the Enter button.
   You can enter up to 20 characters (A-Z and 0-9). You can include any characters in the name, including spaces.
   The system confirms that you want to make the change.
5. Select Yes and press Enter.
Chapter 2 - Creating and Managing Arrays and Partitions

Changing Array Ownership

If you are using Active-Active mode, you can change the ownership of any array between the controllers.

You might want to change ownership if you plan to replace or repair one controller. Changing ownership allows you to continue using an array without interruption and makes the array visible on the controller you change it to. You can no longer see the array on the original controller that owned the array.

**NOTE:** When you change the ownership of an array, the LUNs assigned to the array’s partitions become invalid. After changing ownership, you must assign a new LUN to each array partition.

**To change array ownership**

1. From the System Menu, select *Array Menu* and press *Enter*. The Select Array screen displays with a list of existing arrays.
2. Select the array you want and press *Enter*. The Array Menu screen displays.
3. Select *Switch Array Owner* and press *Enter*. The system confirms that you want to make the change.
4. Select *Yes* and press *Enter*.
5. Assign a new LUN to each array partition.

**Trust an Array**

You can use the Trust Array function to bring an array back online by re-synchronizing the time and date stamp and any other metadata on a bad disk. This makes the disk an active member of the array again. You might need to do this when

- One or more disks of an array start up more slowly or were powered on after the rest of the disks in the array. This causes the date and time stamps to differ, which the controller interprets as a problem with the “late” disks. In this case, the array will function normally after using Trust Array.
An array is offline because a drive is failing, you have no data backup, and you want to try to recover the data from the array. In this case, the Trust Array function may work, but only as long as the failing drive continues to operate.

Before you can use this function, you must enable it in the Option Configuration menu.

**CAUTION:** The Trust Array feature can cause unstable operation and data loss if used improperly. This feature is intended for disaster recovery.

**To trust an array**

1. From the System Menu, select *Configuration Menu* and press *Enter*.
   
   The Configuration Menu screen displays.

2. Select *Option Configuration* and press *Enter*.
   
   The Option Configuration Menu is displayed.

3. Select *Enable Trust Array* and press *Enter*.
   
   The Enable Trust Array screen is displayed.

4. Select *Enable* and press *Enter*.
   
   The option is only enabled until you use it. After you trust an array, the option reverts back to being disabled.

5. Press *ESC* twice to return to the System Menu.

6. Select *Array Menu* and press *Enter*.
   
   The Select Array screen displays with a list of existing arrays.

7. Select the array you want and press *Enter*.
   
   The Array Menu screen is displayed.

8. Select *Trust Array* and press *Enter*.
   
   The system confirms that you want to trust the array.

9. Select *Yes* and press *Enter*.
   
   The array will be back online.

**NOTE:** If the array does not come back online, it may be that too many members are offline or the array may have additional failures on the bus or enclosure that Trust Array cannot fix.
Deleting an Array

You can delete an array when you no longer need the array or you need the drives for another use.

**CAUTION:** Deleting an array deletes all partitions and data contained in the array; however, before reusing the drives, you should perform a low-level format on each drive.

**NOTE:** You cannot delete an array while any utility (Initialize, Verify, Expand, or Reconstruct) is running on the array. You must stop the utility, if allowed, or let it finish before you can delete the array.

To delete an array

1. From the System Menu, select **Delete an Array** and press **Enter**.
   The Select Array screen displays.

   ![Select Array Screen]

   **Select Array Screen**

2. Select the array you want to delete and press **Enter**.
   The system asks you to confirm the deletion.

3. Select **Yes** and press **Enter**.
Chapter 2 - Creating and Managing Arrays and Partitions

Managing Partitions

The Disk Array Administrator software lets you manage partitions in a variety of ways. You can
- View partition status information
- Add a partition
- Expand a partition
- Change a partition name
- Change a partition LUN
- Delete a partition

Understanding Partitions

When you create an array, you can choose to make the array all one partition or set up the array for multiple partitions. Using multiple partitions lets you create one very large array making efficient use of your disk drives. For example, you could create one very large RAID 5 array and assign one dedicated spare to the array. This minimizes the amount of disk space allocated to parity and spares compared to the space required if you created five or six smaller RAID 5 arrays.

Once you set up an array for multiple partitions, you must create each partition by setting the partition size and assigning the partition a LUN. You can also give each partition a name. We recommend assigning names that indicate how the partition will be used. For example, if the first partition will be used to store your customer database, give it a name like cust database.

When you first create an array set up for multiple partitions, all of the space on the array is designated as free space.

When you create a partition, you set how large you want the partition to be in MB.
Chapter 2 - Creating and Managing Arrays and Partitions

The onboard software will assign each partition a unique serial number and sequence number. It assigns sequence numbers in the order the partitions are created, so the first partition on an array is number 1, the second is 2, and so on. Once you create one or more partitions on an array, you can create additional partitions in the remaining free space or you can expand a partition with some limitations.

You can only expand a partition into contiguous, following, free space.

After you partition all of the free space, you can expand the size of a partition only by deleting a partition that immediately follows (has a higher number than) the one you want to expand.

| Partition 1 | Partition 2 | Partition 3 | Partition 4 | Partition 5 |

CAUTION: If you delete a partition, you also delete all data stored in the partition. Be sure that you back up all data before deleting a partition.

When you expand an array, you add free space at the end of the array. For more information about expanding an array, see “Expanding Array Capacity” on page 31.

| Partition 1 | Partition 2 | Partition 3 | Partition 4 | Partition 5 | Free Space |

After expanding an array, you can either add a partition or expand the last partition to use the new free space. You can also delete one or more partitions and expand a partition into the space.

Viewing Partition Status Information

You can perform three functions related to partition status information:

- View partition status
- View partition statistics
- Reset partition statistics
Chapter 2 - Creating and Managing Arrays and Partitions

Viewing Partition Status

You can view the status of a partition, including the following information:

- **Array State** – Online, Offline, Critical, or Fault-tolerant.
- **Array type** – RAID level (0, 3, 4, 5, 50, Volume, or Mirrored). The term “mirrored” is used for both RAID 1 and RAID 10 arrays.
- **Array drives** – Number of drives in the array when fault-tolerant. For example, if you create a three-drive RAID 5 array and lose one drive, the number will still display 3.
- **Name** – Is the name you give to the partition.
- **Serial number** – Unique number the controller assigns to each partition.
- **Target ID/LUN** – Target ID and LUN presented to the host system.
- **Partition size** – Is the size of the partition (expressed in MB).
- **Percentage of total array** – The percentage of the total array that this partition represents.
- **Write-back caching** – Status of the write-back cache (enabled or disabled) for this array.

**To view the status of a partition**

1. Display the partition menu. Do this in one of two ways:

<table>
<thead>
<tr>
<th>From the Array Menu</th>
<th>From the All Partitions Menu</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  From the System Menu, select Array Menu and press Enter. The Select Array screen displays with a list of existing arrays.</td>
<td>1  From the System Menu, select All Partitions Menu and press Enter. The Select Partition or Free Area screen displays with a list of existing partitions and free space.</td>
</tr>
<tr>
<td>2  Select the array you want and press Enter. The Array Menu screen displays.</td>
<td>2  Select the partition you want and press Enter. The Partition Menu screen displays.</td>
</tr>
<tr>
<td>3  Select Partition Menu and press Enter. The Select Partition screen displays with a list of existing partitions for the current array.</td>
<td></td>
</tr>
<tr>
<td>4  Select the partition you want and press Enter. The Partition Menu screen displays.</td>
<td></td>
</tr>
</tbody>
</table>
Chapter 2 - Creating and Managing Arrays and Partitions

Partition Menu Screen

2 Select **Partition Status** and press **Enter**.

The Status screen displays showing the status of the partition you selected.

Status Screen

3 Press **ESC** to return to the Partition Menu.

Viewing Partition Statistics

You can view the current partition statistics. The following statistics are available:

- **Read** – Total number of host read requests directed to the partition
- **Write** – Total number of host write requests directed to the partition
- **SecRd** – Total number of sectors read from the partition
- **SecWt** – Total number of sectors written to the partition
Chapter 2 - Creating and Managing Arrays and Partitions

- Queue Depth – Current number of commands from the host that are queued up
- I/O Size – Last host I/O block size request in 512-byte sectors

Similar statistics are also available on an aggregate basis for all partition LUNs. For more information, see “Displaying Overall Statistics” on page 59.

To view the partition statistics

1. Display the partition menu. Do this in one of two ways

<table>
<thead>
<tr>
<th>From the Array Menu</th>
<th>From the All Partitions Menu</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 From the System Menu, select Array Menu and press Enter.</td>
<td>1 From the System Menu, select All Partitions Menu and press Enter.</td>
</tr>
<tr>
<td>The Select Array screen displays with a list of existing arrays.</td>
<td>The Select Partition or Free Area screen displays with a list of existing partitions and free space.</td>
</tr>
<tr>
<td>2 Select the array you want and press Enter.</td>
<td>2 Select the partition you want and press Enter.</td>
</tr>
<tr>
<td>The Array Menu screen displays.</td>
<td>The Partition Menu screen displays.</td>
</tr>
<tr>
<td>3 Select Partition Menu and press Enter.</td>
<td></td>
</tr>
<tr>
<td>The Select Partition screen displays with a list of existing partitions for the current array.</td>
<td></td>
</tr>
<tr>
<td>4 Select the partition you want and press Enter.</td>
<td></td>
</tr>
<tr>
<td>The Partition Menu screen displays.</td>
<td></td>
</tr>
</tbody>
</table>


The statistics menu screen is displayed.
3 Select View Statistics and press Enter.

The Statistics screen displays showing the statistics of the partition you selected.

![Statistics Screen]

4 Press ESC to return to the Statistics menu.

Resetting Partition Statistics

You can reset the following partition statistics

- Read
- Write
- SecRd
- SecWt
- I/O Size

**NOTE:** Resetting statistics here also resets the statistics for this partition that are included in the aggregate statistics. See “Displaying Overall Statistics” on page 59.

You may want to reset the statistics if you are monitoring performance or doing benchmark testing. You may also want to reset statistics when you change how you are using the partition.

**NOTE:** You cannot reset the queue depth value. It always reflects the current I/O queue depth.
Chapter 2 - Creating and Managing Arrays and Partitions

**To reset partition statistics**

1. Display the partition menu. Do this in one of two ways

```
<table>
<thead>
<tr>
<th>From the Array Menu</th>
<th>From the All Partitions Menu</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 From the System Menu, select Array Menu and press Enter.</td>
<td>1 From the System Menu, select All Partitions Menu and press Enter.</td>
</tr>
<tr>
<td>The Select Array screen displays with a list of existing arrays.</td>
<td>The Select Partition or Free Area screen displays with a list of existing partitions and free space.</td>
</tr>
<tr>
<td>2 Select the array you want and press Enter.</td>
<td>2 Select the partition you want and press Enter.</td>
</tr>
<tr>
<td>The Array Menu screen displays.</td>
<td>The Partition Menu screen displays.</td>
</tr>
<tr>
<td>3 Select Partition Menu and press Enter.</td>
<td></td>
</tr>
<tr>
<td>The Select Partition screen displays with a list of existing partitions for the current array.</td>
<td></td>
</tr>
<tr>
<td>4 Select the partition you want and press Enter.</td>
<td></td>
</tr>
<tr>
<td>The Partition Menu screen displays.</td>
<td></td>
</tr>
</tbody>
</table>
```

2. Select *Partition Statistics* and press *Enter*.

   The Statistics Menu screen is displayed.

3. Select *Reset Statistics* and press *Enter*.

   The system confirms that you want to make the change.

4. Select *Yes* and press *Enter*.

   The system confirms that the statistics have been cleared and returns to the Statistics Menu screen.
Expanding a Partition

You can expand an existing partition, with some limitations. You can only expand a partition into contiguous, following, free space. For more information about partitions, see “Understanding Partitions” on page 38.

To expand a partition

1. Display the partition menu. Do this in one of two ways

<table>
<thead>
<tr>
<th>From the Array Menu</th>
<th>From the All Partitions Menu</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 From the System Menu, select Array Menu and press Enter. The Select Array screen displays with a list of existing arrays.</td>
<td>1 From the System Menu, select All Partitions Menu and press Enter. The Select Partition or Free Area screen displays with a list of existing partitions and free space.</td>
</tr>
<tr>
<td>2 Select the array you want and press Enter. The Array Menu screen displays.</td>
<td>2 Select the partition you want and press Enter. The Partition Menu screen displays.</td>
</tr>
<tr>
<td>3 Select Partition Menu and press Enter. The Select Partition screen displays with a list of existing partitions for the current array.</td>
<td></td>
</tr>
<tr>
<td>4 Select the partition you want and press Enter. The Partition Menu screen displays.</td>
<td></td>
</tr>
</tbody>
</table>

2. Select Expand Partition and press Enter.

   The Expand Partition screen is displayed.

Expand Partition Screen
Changing a Partition Name

You can change the name of a partition. This does not affect the target ID or LUN values of the partition. The controller does not allow you to change a partition name when a utility is running.

To change a partition name

1. Display the partition menu. Do this in one of two ways

<table>
<thead>
<tr>
<th>From the Array Menu</th>
<th>From the All Partitions Menu</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. From the System Menu, select Array Menu and press Enter.</td>
<td>1. From the System Menu, select All Partitions Menu and press Enter.</td>
</tr>
<tr>
<td>The Select Array screen displays with a list of existing arrays.</td>
<td>The Select Partition or Free Area screen displays with a list of existing partitions and free space.</td>
</tr>
<tr>
<td>2. Select the array you want and press Enter.</td>
<td>2. Select the partition you want and press Enter.</td>
</tr>
<tr>
<td>The Array Menu screen displays.</td>
<td>The Partition Menu screen displays.</td>
</tr>
<tr>
<td>The Select Partition screen displays with a list of existing partitions for the current array.</td>
<td></td>
</tr>
<tr>
<td>4. Select the partition you want and press Enter.</td>
<td></td>
</tr>
<tr>
<td>The Partition Menu screen displays.</td>
<td></td>
</tr>
</tbody>
</table>

2. Select Change Partition Name and press Enter.

The Enter New Name screen displays.

3. Enter the name you want to use and press the Enter button.

You can enter up to 20 characters (A-Z and 0-9). You can include any characters in the name, including spaces.

The system confirms that you want to make the change.

4. Select Yes and press Enter.
Changing a Partition LUN

You can change the LUN assigned to a partition, as it appears under the controller’s target ID from the host system’s point of view. The change takes place immediately, however, you may need to reboot the host system to see the partition at the new LUN.

NOTE: You cannot change the partition’s LUN to one that is already in use. If you want to use a LUN that is already in use, you must first reassign the LUN in use.

For more information about LUNs and your controller, see “Understanding LUNs and Viewing LUN Information” on page 76.

To change a partition LUN

1. Display the partition menu. Do this in one of two ways

<table>
<thead>
<tr>
<th>From the Array Menu</th>
<th>From the All Partitions Menu</th>
</tr>
</thead>
<tbody>
<tr>
<td>From the System Menu, select Array Menu and press Enter.</td>
<td>From the System Menu, select All Partitions Menu and press Enter.</td>
</tr>
<tr>
<td>The Select Array screen displays with a list of existing arrays.</td>
<td>The Select Partition or Free Area screen displays with a list of existing partitions and free space.</td>
</tr>
<tr>
<td>Select the array you want and press Enter.</td>
<td>Select the partition you want and press Enter.</td>
</tr>
<tr>
<td>The Array Menu screen displays.</td>
<td>The Partition Menu screen displays.</td>
</tr>
<tr>
<td>Select Partition Menu and press Enter.</td>
<td></td>
</tr>
<tr>
<td>The Select Partition screen displays with a list of existing partitions for the current array.</td>
<td></td>
</tr>
<tr>
<td>Select the partition you want and press Enter.</td>
<td></td>
</tr>
<tr>
<td>The Partition Menu screen displays.</td>
<td></td>
</tr>
</tbody>
</table>

2. Select Change LUN and press Enter.
   The New LUN screen displays.

3. Enter the LUN you want to use and press Enter.
   The system confirms that you want to make the change.

4. Select Yes and press Enter.
Deleting a Partition

You can delete a partition when you no longer need it and you want to use the space for another purpose.

**CAUTION:** Deleting a partition deletes all data contained in the partition.

**NOTE:** You cannot delete a partition while any utility (Initialize, Verify, Expand, or Reconstruct) is running on the array. You must stop the utility, if allowed, or let it finish before you can delete the partition.

**To delete a partition**

1. Display the partition menu. Do this in one of two ways

<table>
<thead>
<tr>
<th>From the Array Menu</th>
<th>From the All Partitions Menu</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 From the System Menu, select Array Menu and press Enter. The Select Array screen displays with a list of existing arrays.</td>
<td>1 From the System Menu, select All Partitions Menu and press Enter. The Select Partition or Free Area screen displays with a list of existing partitions and free space.</td>
</tr>
<tr>
<td>2 Select the array you want and press Enter. The Array Menu screen displays.</td>
<td>2 Select the partition you want and press Enter. The Partition Menu screen displays.</td>
</tr>
<tr>
<td>3 Select Partition Menu and press Enter. The Select Partition screen displays with a list of existing partitions for the current array.</td>
<td></td>
</tr>
<tr>
<td>4 Select the partition you want and press Enter. The Partition Menu screen displays.</td>
<td></td>
</tr>
</tbody>
</table>

2. Select *Delete This Partition* and press Enter.

The system asks you to confirm the deletion.

3. Select *Yes* and press Enter.

**NOTE:** The Delete Partition option is also available from the Array Menu.
Setting Host LUN IDs

1. From the System Menu, select *Configuration Menu* and press Enter.
2. Use the ↑ or ↓ keys and select *Host Configuration* and press Enter.
   The Host Configuration screen appears displaying the host target controller information.
3. Use the ↑ or ↓ keys and change the ID to “0” and press Enter.
4. You will be prompted to reset the first out “FO.” Accept the default choice “N” and select “Y” to reset the controller and accept the change.
Chapter 2 - Creating and Managing Arrays and Partitions
Chapter 3

Monitoring System Status

You should monitor your imageRAID SCSI Series Storage System enclosure regularly to ensure that the controller, disks, arrays, and enclosure components are working properly. The Disk Array Administrator software lets you monitor the status in several ways:

- Event Log Display
- Controller Hardware Information
- Array Status Display
- Disk Status Display
- Power On Self-Test (Post) and Boot Sequence
- Overall Statistics Display

Enclosure Component Monitoring

The front bezel LEDs provide component monitoring, as well as the component monitoring provided through the AdminiStor Storage Management software.
Chapter 3 - Monitoring System Status

Controller Monitoring

Displaying the Event Log

The controller’s event log contains important information about the status of the controller, disks, and arrays. You should check it regularly to monitor the status of your system. For more information about specific warning and error events, see “Warning and Error Events” on page 126.

Below is a list of some of the key warning and failure events included in the log during operation:

- Disk detected error
- Disk channel error
- Battery failure
- Drive down
- Power up
- Array critical
- Array offline
- Temperature warning
- Temperature failure (this leads to a shutdown which is also logged)
- Voltage warning
- Voltage failure (this leads to a shutdown which is also logged)

The event log stores the most recent 400 events. Events are numbered sequentially from 001 to 999. The numbering wraps back to 001 after reaching 999.

NOTE: If you are having a problem with the controller or an array, check the event log before calling technical support. Event messages may let you resolve the problem without the need to make a technical support call.

You can view the event information three ways:

- Most recent event
- One event at a time, most recent event first
- Full screen of events at a time

You can also capture the event log to a file. See “Capturing the Event Log File” on page 55.
Chapter 3 - Monitoring System Status

Viewing One Event at a Time

You can view controller-related events one at a time. The events display in reverse chronological order, that is, the most recent event is first.

If an event displays several parameters, you can see all of them when you view the log one event at a time. When you view a whole screen of events, some parameters may be truncated.

To display one event at a time

1. From the System Menu, select Event Log Menu and press Enter.
   The Event Log Menu screen is displayed.

2. Select View Event Log and press Enter.
   The event log screen displays the last event that occurred.

---

To display one event at a time

1. From the System Menu, select Event Log Menu and press Enter.
   The Event Log Menu screen is displayed.

2. Select View Event Log and press Enter.
   The event log screen displays the last event that occurred.
Chapter 3 - Monitoring System Status

3 Press ↑ to see the previous event.
   You can continue to view earlier events by pressing the ↑ key.

4 Press ESC to return to the Event Log Menu.

Viewing a Whole Screen of Events

You can also view events from the log file a whole screen at a time. This lets you quickly review all recent events. The events display in chronological order, that is, the most recent event is last.

When you view a whole screen of events, some parameters may be truncated. If an event displays several parameters, you can see all of them when you view the log one event at a time.

To view a whole screen of events

1 From anywhere in the Disk Array Administrator software, press CTRL-E.

   The first screen of events from the event log displays.

   Event Log Display Screen

   2 Press "U" to page up or "D" to page down in the log.

   3 Keep pressing CTRL-E to page through the other information screens and return to the menu.
Capturing the Event Log File

You can also capture the entire event log, which saves it to a file on your hard drive. This is useful if you want to print the log or attach it to an e-mail message.

The steps below use HyperTerminal as the terminal emulator software. If you use a different terminal emulator, your procedure may be different.

To capture the event log file

1. With HyperTerminal up and running.
2. Press CTRL-E until the event log displays.
3. From the Transfer menu in HyperTerminal, select Capture Text. The Capture Text window is displayed.
4. Enter the path and file name you want to use to store the log file contents.
5. Click Start.
6. Press “P” on the keyboard to begin the transfer.
7. From the Transfer menu in HyperTerminal, select Capture Text. The Capture Text window is displayed.
8. Click Stop.
Displaying Hardware and Configuration Information

You can display the controller’s hardware and configuration information. This is where you can see what version of the firmware you have. Technical support personnel may request this information.

You can display the hardware and configuration information two ways:
- Hardware information only
- Hardware and configuration information

The table below lists the configuration information that is available.

<table>
<thead>
<tr>
<th>Group</th>
<th>Field</th>
<th>What displays</th>
<th>Field</th>
<th>What displays</th>
</tr>
</thead>
<tbody>
<tr>
<td>HOST 0</td>
<td>Active Port or Passive Port</td>
<td>Status of the port based on the operating mode.</td>
<td>SE/LVD</td>
<td>1 Gb/s or 2 Gb/s.</td>
</tr>
<tr>
<td>HOST 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Target ID</td>
<td>SCSI ID of controller.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHAN 0</td>
<td>Initiator ID</td>
<td>SCSI ID of controller on channel 0.</td>
<td>Ultra/U2</td>
<td>Hardware runs as Ultra2.</td>
</tr>
<tr>
<td>CHAN 1</td>
<td>Initiator ID</td>
<td>SCSI ID of controller on channel 1 as set in the software.</td>
<td>Ultra/U2</td>
<td>Hardware runs as Ultra2.</td>
</tr>
<tr>
<td>CHAN 2</td>
<td>Initiator ID</td>
<td>SCSI ID of controller on channel 2 as set in the software.</td>
<td>Ultra/U2</td>
<td>Hardware runs as Ultra2.</td>
</tr>
<tr>
<td>CONTROLLER</td>
<td>Backoff</td>
<td>1% is default and recommended value.</td>
<td>Utility Pri</td>
<td>HIGH, MED, or LOW utility priority as set in the software.</td>
</tr>
<tr>
<td></td>
<td>Bus Speed**</td>
<td>160, 80, or 40 MB/sec.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Domain Validation**</td>
<td>Enabled or Disabled as set in the software.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Alarm Mute</td>
<td>ON or OFF as set in the software.</td>
<td>Battery</td>
<td>ENABLED or DISABLED as set in the software.</td>
</tr>
<tr>
<td></td>
<td>Cache Lock</td>
<td>ON or OFF as set in the software.</td>
<td>Dyn. Spare</td>
<td>ON or OFF.</td>
</tr>
<tr>
<td></td>
<td>CAPI Version</td>
<td>Version of the Configuration Application Programming Interface.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Chapter 3 - Monitoring System Status

Displaying Hardware and Configuration Information

To display hardware information only

1. From the System Menu, select Utilities Menu and press Enter. The Utilities Menu screen is displayed.

Utilities Menu Screen

2. Select Hardware Information and press Enter. The Hardware Information screen is displayed.

Hardware Information Screen

3. Press ESC to return to the Utilities Menu.
To display hardware and configuration information

1. From anywhere in the Disk Array Administrator software, press **CTRL-E**.
   The first screen of events from the event log displays.

2. Press **CNTRL-E** again.
   The HW Info screen displays.

3. Press **CNTRL-E** again.
   You can press **ESC** to return to the previous screen.
   The CFG Info screen displays.

4. Press **CNTRL-E** or **ESC** to return to where you started from.
Displaying Overall Statistics

You can display two types of aggregate statistics for all partition LUNs

- General statistics (Similar statistics are also available for individual partition LUNs. For more information, see “Viewing Partition Status Information” on page 39.)
  - I/O operations per second (IOPS)
  - Bandwidth (Expressed in millions of bytes per second, a higher bandwidth allows fast transmission or the transmission of many signals at once.)
  - Number of read operations
  - Number of write operations
  - Total sectors (512 bytes) read
  - Total sectors written
  - Total current command queue depth across all LUNs

- Host read/write histogram that shows how many host reads and writes fell into a particular size range. The I/O ranges are based on powers of two
  - 1 Sector
  - 2-3 Sectors
  - 4-7 Sectors
  - 8-15 Sectors
  - 16-31 Sectors
  - 32-63 Sectors
  - 64-127 Sectors
  - 128-255 Sectors
  - 256-511 Sectors
  - 512-1023 Sectors
  - 1024-2047 Sectors
  - 2048 (and larger) Sectors

This information may be helpful in interpreting performance based on individual system configurations and operating systems. The information displayed here can be useful to profile applications and their usage of the partition and what type of RAID level is applicable to your needs.
Chapter 3 - Monitoring System Status

To access the general array statistics

1. From the System Menu, select Utilities Menu and press Enter.
   The Utilities Menu screen displays.

2. Select Overall Statistics and press Enter.
   The Overall Statistics screen is displayed.

   **Overall Statistics Screen**

   The View Statistics screen is displayed.

   **View Statistics Screen**

4. Press ESC to return to the Overall Statistics screen.
Chapter 3 - Monitoring System Status

To access the read/write histogram

1. From the System Menu, select Utilities Menu and press Enter.

   The Utilities Menu screen displays.

2. Select Overall Statistics and press Enter.

   The Overall Statistics screen is displayed.


   The View R/W Histogram screen is displayed.

   View R/W Histogram Screen

4. Press ESC to return to the Overall Statistics screen.
Chapter 3 - Monitoring System Status

Resetting Overall Statistics

You can also reset all of the overall statistics back to zero. You may want to reset the statistics if you are monitoring performance or doing benchmark testing.

NOTE: Resetting statistics here also resets the statistics for each individual partition. See “Resetting Partition Statistics” on page 43.

To reset overall statistics

1. From the System Menu, select Utilities Menu and press Enter.
   The Utilities Menu screen displays.
2. Select Overall Statistics and press Enter.
   The Overall Statistics screen displays.
3. Select Reset All Statistics and press Enter.
   The system confirms that you want to make the change.
4. Select Yes and press Enter.
   The system confirms that the statistics have been cleared and returns to the Overall Statistics screen.
Managing Spares

The RAID controllers automatically reconstruct redundant (fault-tolerant) arrays (RAID 3, RAID 4, RAID 5, RAID 10, RAID 50, and mirrored) if an array becomes critical and a properly sized spare drive is available. An array becomes critical when one or more member drives fails.

You can set up two types of spare drives

- Dedicated – Available drive that is assigned to a specific array.
- Pool – Available drive that is assigned to the pool, which can provide a spare for any failed drive in any redundant array. In Active-Active mode, pool spares are available to both controllers. If a drive in an array on either controller fails, the controller can use a pool spare to reconstruct the array.

In addition, if you enable the Dynamic Spares option and a drive fails, you can replace the drive and the controller will rescan the bus, find the new disk drive, and automatically start reconstruction of the array.

The controller looks for a dedicated spare first. If it does not find a properly sized dedicated spare, it looks for a pool spare.

If a reconstruct does not start automatically, it means that no valid spares are available. To start a reconstruct, you must

1. Replace the failed drive, if no other drive (hot spare) is available.
2. Add the new drive or another available drive as a dedicated spare to the array or as a pool spare.

Remember that any pool spares added might be used by any critical array, not necessarily the array you want.
Managing Dedicated Spares

Dedicated spares are unused disk drives that you assign as a spare to a specific array. The disk must be as large as the smallest member of the array. You cannot use a dedicated spare drive in an array or as a pool spare.

Although using a dedicated spare is the most secure way to provide spares for your arrays, it is also expensive to keep an idle drive assigned to each array. An alternative method is to assign one or more idle drives to the spare pool. See “Managing the Spare Pool” on page 68.

Adding a Dedicated Spare

You assign dedicated spare drives to a specific array. If a member drive in the array fails, the controller uses a dedicated spare drive to automatically reconstruct the array. You can add dedicated spare drives to mirrored (RAID 1 and RAID 10) and parity (RAID 3, RAID 4, RAID 5, and RAID 50) arrays when you create the array or afterward. You can assign up to four dedicated spare drives to an array.

For more information about assigning spares when you create an array, see “Creating Arrays” on page 9.

**NOTE:** A spare cannot be added that does not have enough capacity to replace the smallest member in the array.

**To add a dedicated spare**

1. From the System Menu, select Array Menu and press *Enter*.
   The Select Array screen will appear, displaying a list of existing arrays.
2. Select the array you want and press *Enter*.
   The Array Menu screen displays.
3. Select *Add Spare* and press *Enter*.
   **NOTE:** If a drive was a member of an array and was removed from the array, you cannot use it as a spare until you clear the drive’s metadata. For more information, see “Clearing Metadata from a Drive” on page 108.
4. Select the drive you want to add as a spare and press *Enter*.
   The system confirms the change.
5. Select *Yes* and press *Enter*. 
Deleting a Dedicated Spare

You can delete a dedicated spare drive from an array at any time.

To delete a dedicated spare drive

1. From the System Menu, select Array Menu and press Enter.
   The Select Array screen will appear, displaying a list of existing arrays.
2. Select the array you want and press Enter.
   The Array Menu screen displays.
4. Select the spare drive you want to delete by use the ↑ or ↓ keys to select and pressing the Enter.
   The system confirms the deletion.
5. Select Yes and pressing Enter to delete the spare.
   The drive is now available for use in an array or as a spare.
Enabling Dynamic Spares

The Dynamic Spares option lets you use all of your disk drives in redundant arrays, without assigning one as a spare. For example, if you enable Dynamic Spares and a drive fails, you can replace the drive and the controller will rescan the bus, find the new disk drive, and automatically start reconstruction of the array. The controller automatically finds the new drive and reconstructs the array.

With Dynamic Spares enabled, if you have spares or available drives, the controller first looks for a dedicated or spare pool drive for the reconstruction. If none is found, it uses an available drive, which the controller automatically assigns as a spare and starts reconstruction.

You must make sure that the new or available drive has enough capacity to replace the smallest member in the array and does not contain metadata (see “Clearing Metadata from a Drive” on page 108).

In a dual controller configuration (Active-Active or Active Passive mode), a change to either controller's setting is immediately sent to the other controller.

**NOTE:** Performance in systems without a SAF-TE Enclosure Processor (SEP) will decrease if an array becomes critical with this option enabled and there are no available drives to start a reconstruct. To minimize the performance impact, increase the rescan rate as described in the steps below.

To enable dynamic spares

1. From the System Menu, select the *Configuration Menu* and press *Enter*.

   The Configuration Menu screen is displayed.

2. Select *Option Configuration* and press *Enter*.

   The Option Configuration screen is displayed.

3. Select *Dynamic Spare* and press *Enter*.

   The Dynamic Spare Config screen is displayed. The current setting is marked with an ^ next to it.
Chapter 4 - Managing Spares

Dynamic Spare - Rescan Rate Screen

The Rescan Rate screen is displayed.

4 Enter the rescan rate in minutes.

This tells the controller how often it should look for an available drive by rescanning the bus. Remember that rescanning the bus frequently can affect performance. If you have a SEP, the dynamic spare configuration will not rescan the bus. The SEP will detect the new drive and tell the controller to rescan; the rescan rate you set here will not affect the system.

The system confirms the change.

5 Select Yes and press Enter.
Chapter 4 - Managing Spares

Managing the Spare Pool

The spare pool lets you have one or more disk drives available for the reconstruction of redundant arrays (mirrored [RAID 1 and RAID 10] and parity [RAID 3, RAID 4, RAID 5, and RAID 50]). Once you assign a drive to the spare pool, it is not available for use as an array member or as a dedicated spare.

In Active-Active/Active-Passive mode, pool spares are available to both controllers. If a drive in an array on either controller fails, the controller can use a pool spare to reconstruct the array.

If a pool spare is too small (smaller than an individual member in an array), the controller cannot use it.

Adding a Spare to the Spare Pool

You can add up to eight drives to the spare pool to reconstruct any critical array on the controller. After an array has started using a pool spare, other critical arrays are prevented from using it. For a pool spare to be used, it must be at least as large as the minimum drive size in the array.

To add a pool spare

1. From the System Menu, select the Pool Spare Menu and press Enter.

   The Pool Spare Menu screen is displayed.

2. Select Add Pool Spare and press Enter.
The Select Drives screen is displayed.

Select Drives Screen

3 Select each spare drive you want to add and press Enter.
4 Press ESC to return to the previous menu.

Deleting a Spare from the Spare Pool

You can delete a spare from the spare pool at any time.

To delete a spare from the spare pool

To add a pool spare

1 From the System Menu, select the Pool Spare Menu and press Enter.
   The Pool Spare Menu screen is displayed.
2 Select Delete Pool Spare and press Enter.
   The Delete Pool Spare screen displays, listing the drives assigned to spare pool.
3 Select the pool spare you want to delete and press Enter.
4 Press ESC to return to the previous menu.
Displaying the Spare Pool

You can display a list of all of the pool spares.

To display the spare pool

1. From the System Menu, select the Pool Spare Menu and press Enter.
   The Pool Spare Menu screen is displayed.

2. Select Display Pool Spares and press Enter.
   The Display Pool Spare screen displays listing all disk drives assigned to the spare pool.

3. Press ESC to return to the Pool Spare Menu.
Chapter 5

Configuring the Controller

The Disk Array Administrator software lets you configure settings and perform a variety of functions on the imageRAID controller(s). You can

- Reboot the controller
- Change the date and time
- Configure the host channels
- Configure the SCSI channels
- Configuring the operating mode
- Change the sample rate
- Change the alarm mute setting
- Lock the cache setting
- Configure the battery
- Change the utility priority
- Rescan all channels
- Pause I/O
- Restore the default settings
- Upgrade the firmware
Chapter 5 - Configuring the Controller

Rebooting the Controller

CAUTION: Only use this method to reboot the controller when using a Stand-alone (single controller) systems. For Active-Active/Active-Passive (dual controllers) refer to “Shutdown Both Controllers” on page 87.

You may need to shut down and restart the controller after making certain configuration changes and when you move it or make hardware changes. We strongly recommend that you shut down the controller gracefully and do not just turn off the power. A normal shutdown ensures that the write-back cache has been flushed to the disk.

CAUTION: Anyone accessing an array when you shut down the controller will lose access and will lose data.

To shut down and restart the controller
1. From the System Menu, select Shutdown/Restart and press Enter.
   The system confirms that you want to shut down.
2. Select Yes and press Enter.
   The system confirms that it has shut down.
3. Press Enter to reboot.
   The system performs its self-test. When you see the Disk Array Administrator initial screen, the controller is ready. See “Accessing the Disk Array Administrator” on page 1.

Changing the Date and Time

You can change the controller’s date and time. In a dual controller configuration (Active-Active or Active-Passive mode), changes to either controller’s settings are immediately sent to the other controller.

To set the controller’s date
1. From the System Menu, select Configuration Menu and press Enter.
   The Configuration Menu screen displays.
2. Select Set Date/Time and press Enter.
The Set Date/Time screen displays.

3 Select *Set Date* and press *Enter*.

The Set Date screen is displayed.

4 Enter the date you want and press *Enter*.

Enter the date in the following format MM/DD/YYYY.

The system confirms that you want to make the change.

5 Select *Yes* and press *Enter* to make the changes.

The system confirms that the changes are made.

6 Press *ESC* to return to the Configuration Menu.
Chapter 5 - Configuring the Controller

To set the controller’s time

1. From the System Menu, select Configuration Menu and press Enter.
   The Configuration Menu screen displays.

2. Select Set Date/Time and press Enter.
   The Set Date/Time screen is displayed.

3. Select Set Time and press Enter.
   The Set Time screen is displayed.

4. Enter the time you want and press Enter.
   Enter the time using a 24-hour clock in the following format hhmmss.
   The system confirms that you want to make the change.

5. Select Yes and press Enter to make the changes.
   The system confirms that the changes are made.

6. Press ESC to return to the Configuration Menu.
Configuring the Host Channels

You can configure several settings for each host channel independently. The settings that are available vary based on the mode you are using. The table below lists the host channel settings, when they are available, and what they do.

<table>
<thead>
<tr>
<th>Host Channel Setting</th>
<th>Modes Available</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable/ Disable</td>
<td>Stand-Alone</td>
<td>You should not disable the host channel when in Single Port mode. In Dual Port mode, you can disable a channel when you plan to shut down the host on that channel.</td>
</tr>
<tr>
<td></td>
<td>Single Port</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Stand-Alone</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dual Port</td>
<td></td>
</tr>
<tr>
<td>Target ID</td>
<td>All modes</td>
<td>SCSI target ID – You may need to change the host channel's SCSI target ID when you have existing devices at ID 1, the controller's default, or when you are adding more than one controller to a system. You can set the target ID to any number between 0 and 15.</td>
</tr>
<tr>
<td>Controller LUN</td>
<td>All</td>
<td>The controller has just one LUN that you can change when you configure the host channels. If you are using AdminStor, you must set the value to zero (0). You can set the LUN to any number between 0 and 63.</td>
</tr>
<tr>
<td>(For more information about LUNs, see “Understanding LUNs and Viewing LUN Information” on page 76.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reset on Failover</td>
<td>Active-Active</td>
<td>Turn this option on (select Yes) if you find that failover takes a long time. This option tells the controller to reset the SCSI bus after a failover and speeds failover in some situations.</td>
</tr>
</tbody>
</table>

To configure the host channels

1. From the System Menu, select Configuration Menu and press Enter.
   
The Configuration Menu screen is displayed.

2. Select Host Configuration and press Enter.
   
   If the controller is in Stand-Alone Dual Port mode, the Channel screen is displayed. Select the channel you want to configure and press Enter.
   
   The screens that displays next depends on the mode you are using. See “Host Channels Settings” on page 75 for information about each setting.

3. Select the setting you want from each screen and press Enter.
   
   The system confirms that you want to make the change.

4. Select Yes and press Enter to make the changes.
Chapter 5 - Configuring the Controller

Understanding LUNs and Viewing LUN Information

The imageRAID controller supports up to sixty-four (64) SCSI Logical Unit Numbers (LUNs) that are numbered zero through sixty-three. There are three different types of LUNs controller, SEP (SCSI Enclosure Processor), and partition. You can view information about each LUN.

The three LUNs have the following characteristics

- Controller LUN – If you are using AdminiStor to configure the controller over a host channel via SCSI protocol extensions, you must set the controller LUN to zero (0). Otherwise you may set the value between 0 and 63.

  **NOTE:** Most UNIX, Linux, and Macintosh OS operating systems require that the controller LUN is a higher value than all array LUNs. Before creating your first array, change the controller LUN to a higher value if you are not using AdminiStor (AdminiStor requires the controller LUN be set to 0) to manage the arrays. This allows your first array to be seen at LUN 0. Refer to “Setting Host LUN IDs” on page 49.

- SEP LUNs – Allow access to SEPs. A SEP LUN may be set to a value of 0-63 or None.

- Partition LUNs – Allow access to partitions on the controller. Partition LUNs may be set to any numeric value from 0 - 63. For information about changing the partition LUN, see “Changing a Partition Name” on page 46.
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Viewing LUN Information

You can view information for each existing LUN.

To view LUN information

1. From the System Menu, select Utilities Menu and press Enter.

   The Utilities Menu screen is displayed.

2. Select LUN Information and press Enter.

   The LUN Information screen is displayed.

3. Press ESC to return to the Utilities Menu screen.
Configuring the SCSI Disk Channels

You can change three channel configuration options for each SCSI Disk channel:

- **Bus speed** – This is the maximum speed the controller will attempt to negotiate. In a dual controller configuration (Active-Active or Active-Passive mode), a change to either controller’s setting is immediately sent to the other controller.
  - 160 MB/sec - this is the default setting. (DT clocking)
  - 80 MB/sec (ST clocking)
  - 40 MB/sec (ST clocking)

**NOTE:** If you have drives that are not Ultra160 capable and you experience disk channel problems, you should set the bus speed to 80 MB/sec. Not all drives can handle the Ultra160 bus speed negotiation.

- **SCSI ID assigned to each channel (initiator ID)** – The controller assigns each of its SCSI channels one of the SCSI IDs (initiator IDs), leaving 15 SCSI IDs available for devices. You can change the SCSI ID assigned to each channel. You may need to do this if the default ID, 7, conflicts with a SEP ID. You can set the ID to any number between 0 and 15.

**NOTE:** In Active-Active/Active-Passive mode, you cannot change the Initiator ID.

**NOTE:** It is not recommended to change the Initiator ID.

- **Domain validation** – You can enable or disable this function that checks for disk channel hardware and cable problems to ensure that you can run at Ultra160 speed. Some drives do not support this function and return false problems. You should disable the function in those situations. In a dual controller configuration (Active-Active or Active-Passive mode), a change to either controller’s setting is immediately sent to the other controller.

To configure the SCSI disk channels:

1. From the System Menu, select *Configuration Menu* and press *Enter*.
   
   The Configuration Menu screen is displayed.

2. Select *Channel Configuration* and press *Enter*.
The Channel Configuration screen is displayed.

Channel Configuration Screen

3 Select the channel you want and press Enter.

The Bus Speed screen is displayed. The current setting is marked with an * next to it.

Bus Speed Screen

4 Select the bus speed setting you want and press Enter.

The Disable Domain Validation screen is displayed.
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5 Select to disable or enable Domain Validation and press Enter.

If you are not in Active-Active/Active-Passive mode, the Initiator ID screen is displayed showing the current Initiator ID.

6 Select the Initiator ID you want to use and press Enter.

In Active-Active mode, you cannot change the Initiator ID. The system confirms that you want to make the change.

7 Select Yes and press Enter to make the changes.

The system confirms that the changes are made.

8 Press ESC to return to the Configuration Menu.
Working with the Operating Modes

Your controller can operate in several different modes: Stand-Alone (Single Port or Dual Port), Active-Active (Single Port or Dual Port), and Active-Passive Dual Port. In the stand-alone mode, the controller operates autonomously. In the Active-Active/Active-Passive modes, two controllers operate as a pair. If one controller fails, the other can take over the failed controller’s work.

Understanding the Active-Active Configuration

Below are the terms associated with Active-Active/Active-Passive configurations:

- **Controller 1** – One controller is designated as Controller 1 and the other controller is designated as Controller 2 (occasionally they are referred to as Controller A and Controller B respectively). Controller identity is determined by enclosure hardware. The controller’s identity displays continuously at the bottom of the Disk Array Administrator screens.

- **Failback** – The act of returning ownership of controller resources from a surviving controller to a previously failed (but now active) controller. The resources include disk arrays, cache data, and host ID information.

- **Failover** – The act of temporarily transferring ownership of controller resources from a failed controller to a surviving controller. The resources include disk arrays, cache data, and host ID information.

- **Kill** – One controller can kill the other controller by resetting it and taking it offline.

- **Other** – The opposite controller from the one currently being used (that is, not the local controller).

- **Ownership** – In an Active-Active/Active-Passive configuration, each active controller may have ownership of the following resources: arrays, dedicated spares, and the global spare pool. When a controller fails, the other controller assumes temporary ownership of its resources.

- **Unkill** – When a surviving controller removes the reset from the other controller, it unkills it. The other controller will reboot and attempt to come online.

To run two controllers in Active-Active/Active-Passive mode, the following must be true:

- You must have two controllers installed in a proper configuration.
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- Both controllers must be loaded with compatible firmware levels. The system automatically detects firmware incompatibilities and halts the boot of the second controller.
- The operating mode of each controller must be set to the same mode. See “Changing the Operating Mode” on page 83.
- Host channel 0 of each controller must be set to a different ID only if you are using a single host interface. If you are using two host connections, then each controller’s host channel 0 can have the same ID.

Active-Active/Active-Passive Operation Scenarios

You should understand how the controllers act in different Active-Active/Active-Passive scenarios.

- Dual Boot – When both controllers boot at the same time, they exchange information related to their current configuration and the ownership of resources. The time and date of the slave controller (Controller 2) is synchronized with that of the master controller (Controller 1).
- Add Array – When a controller adds an array, that controller is owner of the array, as well as any dedicated spare drives. Arrays and dedicated spares are not visible to the other controller when both controllers are online.
- Delete Array – A controller may only delete arrays that it owns.
- Pool Spare Configuration – Pool spares are only visible to the controller that allocates them when both controllers are online. This means that an Active-Active system must have two spare drives available in order for each controller to have at least one pool spare.
- Failover – When a failover occurs, the surviving controller will display “FAILED OVER” on the Disk Array Administrator, in the area between the board temperature and the date. At this point, the arrays, dedicated spares, and pool spares of the failed controller now belong to the surviving controller. Resources from the failed controller are tagged with (FO).
- Failback – When a failback occurs, the controller coming online regains control of its arrays, dedicated spares, and pool spares from the other controller.
Changing the Operating Mode

You can change the controller's operating mode. In a dual controller configuration (Active-Active or Active-Passive mode), a change to either controller's setting is immediately sent to the other controller, unless you change to a Stand-Alone mode.

**CAUTION:** When using any dual port mode, the host operating system and drivers must support dual port accesses. If the host system does not support dual port access, do not configure the controller in dual port mode, because the operating system may believe that a single LUN is really two independent arrays, resulting in possible data corruption.

<table>
<thead>
<tr>
<th>Host Channel Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stand-Alone Single Port</td>
<td>This option allows the controller to operate as one of two controllers in an Active-Active pair. Active-Active mode allows two controllers to cooperate in system operation in a fault-tolerant manner. If one controller fails while in Active-Active mode, the other controller assumes its activities, allowing host access to continue.</td>
</tr>
<tr>
<td>Active-Active Single Port</td>
<td>This option allows both controllers to operate independently and as in an active-active pair. Active-Active modes allow two controllers to cooperate in system operation in a fault-tolerant manner. If one controller fails while in Active-Active mode, the other controller assumes its activities, allowing host access to continue. When both controllers are online, each controller presents its LUNs on only one port.</td>
</tr>
<tr>
<td>Active-Passive Dual Port</td>
<td>This option allows you to use just one controller with the second controller acting only as a backup in case of a failure of the controller in use. When you change to this mode on one controller, you must reboot both controllers at the same time. After rebooting, both controllers will automatically be in Active-Passive Dual Port mode.</td>
</tr>
</tbody>
</table>

**NOTE:** If you select Stand-Alone Single Port mode, SCSI channel 3 will not be available if it has been disabled in the Flash Utility. See “Disabling SCSI Channel 3” on page 89. Disabling SCSI channel 3 forces the controller into Stand-Alone Single Port mode.

**To change the operating mode**

1. From the System Menu, select *Configuration Menu* and press *Enter*. 
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The Configuration Menu screen will appear.

2 Select Option Configuration and press Enter.

The Option Configuration screen is displayed.

3 Scroll down and select Operating Mode and press Enter.

The Operating Mode screen is displayed.

4 Select the option you want and press Enter.

The system confirms that you want to make the change.

5 Select Yes and press Enter to make the changes.

The system confirms that the changes are made.

6 Press ESC to return to the Option Configuration Menu.

NOTE: You must reboot the controller for the changes to take effect. See “Rebooting the Controller” on page 72.
Managing the Other Controller

If you are using Active-Active/Active-Passive mode, you can do the following:
- Display information about the other controller
- Shut down the other controller
- Shut down both controllers
- Change array owner
- Kill the other controller
- Unkill the other controller

You can also change the ownership of an array between controllers. See “Changing an Array Name” on page 34.

Displaying Information about the Other Controller

You can display information about the other controller. If the other controller is up, the information accurately reflects the other controller’s information. If the other controller is down, the information reflects that last known state of the other controller. If the other controller never communicated with the local controller since this controller was booted, most fields will list Unknown or something similar.

To display information about the other controller

1. From the System Menu, select Other Controller Menu and press Enter.

The Other Controller Menu screen will appear.

![Other Controller Menu Screen](image-url)
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NOTE: The Other Controller Menu is only available if the system is configured to run in Active-Active/Active-Passive mode.

2 Select Other Information and press Enter.

The Other Information screen is displayed.

3 Press ESC to return to the Other Controller Menu.

Shutdown Other

You can gracefully shut down the other controller. Use this option in preparation for power down or replacement of the other controller. You should always use the Shutdown Other option in preference to the Kill Other option.

To shut down the other controller

1 From the System Menu, select Other Controller Menu and press Enter.

   NOTE: The Other Controller Menu is only available if the system is configured to run in Active-Active/Active-Passive mode.

   The Other Controller Menu screen is displayed.

2 Select Shutdown Other and press Enter.

   The system confirms that you want to make the change.

3 Select Yes and press Enter to make the changes.

   The other controller shuts down gracefully.
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4 Press ESC to return to the Other Controller Menu.

Shutdown Both Controllers

You can simultaneously and gracefully shut down both controllers. Use this in preparation for a power down of both systems or replacement of both controllers.

To shut down both controllers

1 From the System Menu, select Other Controller Menu and press Enter.

   NOTE: The Other Controller Menu is only available if the system is configured to run in Active-Active/Active-Passive mode.

   The Other Controller Menu screen is displayed.

2 Select Shutdown Both and press Enter.

   The system confirms that you want to make the change.

3 Select Yes and press Enter to make the changes.

   The other controller shuts down gracefully.

4 Press ESC to return to the Other Controller Menu.

Killing the Other Controller

You can force (non gracefully) the other controller offline causing the local controller to assume control of its arrays.

CAUTION: You should only use the The Kill Other option as a last resort to regain control of the other controller. Use of “Kill Other” may disrupt host I/O activity. If the other controller needs to be taken offline, you should either try a local shutdown or use the “Shutdown Other” option first.

To kill the other controller

1 From the System Menu, select Other Controller Menu and press Enter.

   NOTE: The Other Controller Menu is only available if the system is configured to run in Active-Active/Active-Passive mode.

   The Other Controller Menu screen is displayed.
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2. Select *Kill Other* and press *Enter*.
   The system confirms that you want to make the change.

3. Select *Yes* and press *Enter* to make the changes.
   The other controller shuts down gracefully.

4. Press *ESC* to return to the Other Controller Menu.

Unkilling the Other Controller

You can bring the other controller back online by allowing it to complete booting. This option is primarily used to allow a controller that was previously killed (either due to errors or manual action) to come back online.

**NOTE:** If the other controller was unplugged, then plugged back in or replaced by a different controller, the survivor will automatically unkill the other.

To unkill the other controller

1. From the System Menu, select *Other Controller Menu* and press *Enter*.
   
   **NOTE:** The Other Controller Menu is only available if the system is configured to run in Active-Active/Active-Passive mode.

   The Other Controller Menu screen is displayed.

2. Select *Unkill Other* and press *Enter*.
   The system confirms that you want to make the change.

3. Select *Yes* and press *Enter* to make the changes.
   The other controller shuts down gracefully.

4. Press *ESC* to return to the Other Controller Menu.
Disabling SCSI Channel 3

You can disable SCSI Channel 3 from the Flash Utility.

NOTE: Because disabling SCSI channel 3 may affect the configuration of nonvolatile memory, SCSI channel 3 cannot be disabled if host data is present. Do a graceful shutdown of the controller to flush out host data, or select Clear Battery Back Up from the Flash Utility menu, which will clear the host data.

Disabling SCSI channel 3, on the imageRAID controller (JSS122), results in only one available host channel, meaning that the controller can only be run in Stand-Alone Single Port mode. The primary intent of this option is to provide a SCSI channel configuration (one host channel and two disk channels).

NOTE: You should not disable SCSI Channel 3, on the imageRAID controller (JSS122), if you are using Active-Active Single Port, Active-Passive Dual Port, or Stand-Alone Dual Port modes. The controller will not boot if you use this option in either of these modes. You must change your operating mode before disabling SCSI Channel 3.

To enable SCSI channel 3 after disabling it, repeat the steps below. The Utility Menu item 7 will read Enable SCSI Channel 3.

To disable SCSI channel 3

1. From the System Menu, select Shutdown/Restart and press Enter.

   NOTE: The Other Controller Menu is only available if the system is configured to run in Active-Active/Active-Passive mode.

   The system confirms that you want to shut down.

2. Select Yes and press Enter to make the changes.

   The system confirms that it has shut down.

3. Press Enter to reboot.

4. While the controller reboots, hold down the spacebar on your keyboard.

   The Flash Utility screen is displayed.
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Flashing Utility

Press 6 for the Utility Menu.

The Utility Menu screen displays.

6 Press 8 for Disable SCSI Channel 3.

7 Press q to return to the main menu.

8 Press 5 to start the controller.
Changing the Sample Rate

You can set how often the controller samples data when updating status screens (disk and array). The default is one second.

To change the sample rate
1. From the System Menu, select Configuration Menu and press Enter.
   The Configuration Menu screen is displayed.
2. Select New Sample Rate and press Enter.
   The New Sample Rate screen is displayed.
3. Select a new sample rate and press Enter.
4. Press ESC to return to the previous menu.

Changing the Alarm Mute Setting

You can enable or disable the audible alarm that sounds when the controller becomes too hot, detects low or high voltage, or an array becomes critical or offline. Changing the mute setting lets you turn off the alarm when it is sounding. You should turn it back on after resolving the problem.

The alarm sounds for temperature or voltage conditions (events). Warning events are generated when the temperature or voltage enters the warning range. Shutdown events are generated when the temperature or voltage enters the shutdown range. After reaching the shutdown range, the controller will not function. You must resolve the problem and reboot the controller. If the problem is not resolved, it will shut down again.

Alarm conditions trigger an event message that displays in the Disk Array Administrator software window, OCP, and in the event log. See “Displaying the Event Log” on page 52.

If a dual controller configuration (Active-Active or Active-Passive mode), a change to either controller’s setting is immediately sent to the other controller.
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The table below shows the temperature and voltage thresholds for each alarm and what to do to resolve the problem.

<table>
<thead>
<tr>
<th>Alarm threshold</th>
<th>What to do when the alarm sounds</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU temp – 0˚C to 5˚C and 65˚C to 70˚C Shutdown – 0˚C and 70˚C &lt; 0˚C and &gt; 70˚C</td>
<td>Check the Disk Array Administrator software to confirm what the alarm means. See “Accessing the Disk Array Administrator” on page 1. Check the ambient temperature and lower it, if needed. Ambient temperature should be less than 45˚C.</td>
</tr>
<tr>
<td>Onboard temperature</td>
<td>Same as above for the CPU temperature.</td>
</tr>
<tr>
<td>Warning – 0˚C to 5˚C and 45˚C to 50˚C Shutdown – 0˚C and 50˚C &lt; 0˚C and 50˚C</td>
<td></td>
</tr>
<tr>
<td>VCC voltage</td>
<td>Check the Disk Array Administrator software to confirm what the alarm means. See “Accessing the Disk Array Administrator” on page 1. If it is a warning alarm, let the controller continue to operate. If it is a shutdown alarm, turn off the power to the controller and send it for service.</td>
</tr>
<tr>
<td>Warning – 5V -3.5% and +6.5% Shutdown – 5V -6.5% and +10%</td>
<td></td>
</tr>
<tr>
<td>12V voltage</td>
<td>Same as above for the VCC voltage.</td>
</tr>
<tr>
<td>Warning – 12V -8% and +8% Shutdown – 12V -10% and +10%</td>
<td></td>
</tr>
</tbody>
</table>

To enable or disable the alarm

1. From the System Menu, select Configuration Menu and press Enter.
   The Configuration Menu screen is displayed.
2. Select Alarm Mute and press Enter.
   The Alarm Mute screen is displayed. The current setting is marked with an * next to it.
3. Select the option you want and press Enter.
4. Press ESC to return to the previous menu.
Locking the Cache Setting

You can prevent host systems from using SCSI mode select commands to change the controller's write-back cache setting. Some operating systems disable write cache. If cache lock is enabled, the host cannot modify the cache setting. The default setting is disabled.

This option is useful in some environments where the host system disables the controller's write-back cache, resulting in degraded performance. If a dual controller configuration (Active-Active or Active-Passive mode), a change to either controller's setting is immediately sent to the other controller.

To lock the cache setting

1. From the System Menu, select Configuration Menu and press Enter.
   The Configuration Menu screen is displayed.

2. Select Option Configuration and press Enter.
   The Option Configuration screen is displayed.

   The Cache Lock screen is displayed.
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Cache Lock Screen

4  Select the option you want and press Enter.

5  Press ESC to return to the previous menu.

Configuring the Battery

You can configure two settings related to the battery

- You can enable or disable the battery. It is enabled by default.
- You can set the battery age or disable the battery life monitor.

Enabling and Disabling the Battery

If you are not using a battery in your controller, the controller will sound an alarm. To eliminate the alarm, you can disable the battery. The default setting is battery enabled.

NOTE: You should only disable the battery if you are running the controller with an uninterruptable power supply (UPS), so that you will not lose power to the controller.

If you disable the battery, the controller will not give any warnings, nor will it disable the write-back cache.

If you change this setting, you must reboot the controller for the change to take effect.
To change the battery setting

1  From the System Menu, select Configuration Menu and press Enter.
   The Configuration Menu screen is displayed.
2  Select Option Configuration and press Enter.
   The Option Configuration screen is displayed.
3  Select Battery and press Enter.
   The Battery screen is displayed.
4  Select the option you want and press Enter.
5  Press ESC to return to the previous menu.

Changing the Battery Age and Disabling the Battery Life Monitor

Your controller monitors the life of your battery and creates an event when the battery nears the end of its life. Controller batteries typically last about three years. The event reminding you to replace the battery occurs after about 35 months of use. The event displays each time you reboot the controller until you replace the battery and reset the battery age.

CAUTION: Replace the battery only with the same or equivalent type recommended by the manufacture. Dispose of used batteries in accordance with the manufacturer's instructions.
When you replace the battery, you must reset the battery age, using the Flash Utility as described below, for the battery life monitor to work properly.

You can also set the battery age. You might want to use this option if you install a battery from another controller and want to reset the battery reminder to display at the right time. An option to disable the battery life monitor is also available.

**CAUTION:** Disabling the battery life monitor is not recommended. Battery failure during normal operation disables write-back cache, and leaves the system exposed to data corruption in the event of power loss.

*To change the battery age or disable the battery life monitor*

1. From the System Menu, select **Shutdown/Restart** and press **Enter**.

   The system confirms that you want to shut down.

2. Select **Yes** and press **Enter** to make the changes.

   The system confirms that it has shut down.

3. Press **Enter** to reboot.

4. While the controller reboots, hold down the spacebar on your keyboard.

   The Flash Utility screen is displayed.

5. Press 6 for the Utility Menu.

   The Utility Menu screen is displayed.

   ![Utility Menu Screen](image)

   **Utility Menu Screen**

6. Press 4 for Battery Life Monitor.

   The Battery Life Monitor Menu screen is displayed.
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Battery Life Monitor Screen

7 Press the letter of the option you want.

- A. New Battery Installed – Use this option when you install a new battery to reset the battery age to zero. The system confirms that you want to install a new battery and resets the battery age. Press y and Enter to make the change.
- B. Set Battery Age – Use this option when you install a battery from another controller to reset the age to a specific age (in months). The system prompts you to enter the age of the current battery in months. Enter the number of months and press Enter. The system confirms the new age. Press Y and Enter to make the change.
- C. Disable Battery Life Monitor – Use this option to completely disable the Battery Life Monitor function. We do not recommend using this option.

8 Press q to return to the Utility Menu.

9 Press x to reboot the controller.
Chapter 5 - Configuring the Controller

Changing the Utility Priority

You can change the priority at which all utilities (Verify, Reconstruct, Expand, Initialize, etc.) run when there are active I/O operations competing for the controller’s CPU. The choices are

- High (default)
- Medium
- Low

For example, select High if your highest priority is to get the array back to a fully fault-tolerant state. This causes heavy I/O with the host to be slower than normal. Select Low priority if streaming data without interruption, such as for a Web server, is more important than data redundancy. This allows the Reconstruct or other utility to run at a slower rate with minimal effects on host I/O.

To change utility priority

1. From the System Menu, select Configuration Menu and press Enter.
   The Configuration Menu screen is displayed.
2. Select Utility Priority and press Enter.
   The Utility Priority screen is displayed. The current setting is marked with an * next to it.
3. Select the option you want and press Enter.
4. Press ESC to return to the previous menu.
Rescanning All Channels

You can tell the controller to scan all disk channels for new or removed disk drives. You can use this option when you install or remove drives. The rescan temporarily pauses all I/O processes and then resumes normal operation.

The controller will perform a rescan automatically for you. It will detect removed drives almost immediately; however, installed drives will be detected after a three-minute delay. This delay is to allow the new drives to spin-up.

**NOTE:** If you are installing a new drive, wait for drive to spin up before rescanning the channels. This avoids unnecessary delays during the rescan that can cause the operating system to time-out.

**To rescan all channels**

1. From the System Menu, select **Utilities Menu** and press **Enter**.
   
The Utilities Menu screen is displayed.

2. Select Rescan and press **Enter**.

3. Press **ESC** to return to the previous menu.
Pausing I/O

The Hot Swap Pause option suspends activity on all device channels, thereby ensuring data integrity on the connected drives and arrays.

**CAUTION:** Pausing I/O halts active I/O to the host.

*To pause I/O*

1. From the System Menu, select *Utilities Menu* and press *Enter*.
   
The Utilities Menu screen is displayed.
2. Select *Hot Swap Pause* and press *Enter*.
   
The Bus Paused screen is displayed.

**Bus Paused Screen**

**CAUTION:** *Do not* stay in the Hot Swap Pause mode for too long; otherwise, an operating system time-out may occur (the time varies according to the operating system). For example, in Windows NT, the default limitation during I/O activity is 10 seconds.

3. When you have replaced the drive, resume SCSI bus activity by pressing *ESC*. 
Restoring Default Settings

You can restore all of the controller’s default settings. You may want to do this if the controller is not working properly and you cannot determine why. This lets you then change the settings that are critical to your configuration.

**NOTE:** Restoring defaults does not change any LUN zoning you have set up. The zoning information is stored on the array as metadata and is retained.

**To restore the default settings**

1. From the System Menu, select *Configuration Menu* and press *Enter*.
   
   The Configuration Menu screen is displayed.

2. Select *Restore Defaults* and press *Enter*.
   
   The Restore Defaults screen is displayed.
   
   The system confirms that you want to make the change.

3. Select *Yes* and press *Enter* to make the changes.
   
   The system confirms that the changes are made.

4. Press *ESC* to return to the previous menu.
Chapter 5 - Configuring the Controller

Upgrading Firmware

You use the Flash Utility to download new firmware (.fla file) for your controller. The Flash Utility is resident in the embedded firmware of the controller.

You access the Flash Utility using a computer with VT-100/ANSI terminal emulator software, such as HyperTerminal, connected to the controller through the serial RS-232 interface. The controller auto-detects the baud rate when you hold down the space bar on the computer while powering on the controller. Valid baud rates are 9,600, 19,200, 38,400, 57,600 and 115,200. The default baud rate is 115,200 and is recommended to expedite the download process.

If your controller is set to Active-Active/Active-Passive mode, see “Upgrading Firmware in an Active-Active/Active-Passive System” on page 104.

To upgrade the controller’s firmware

1. Call technical support for information about downloading the firmware update.
2. Access the Operator Control Panel.
   See “Accessing the Disk Array Administrator” on page 1.
3. From the System Menu, select Shutdown/Restart and press Enter.
   CAUTION: Only use this method to reboot the controller when using a Stand-alone (single controller) systems. For Active-Active/Active-Passive (dual controllers) refer to “Shutdown Both Controllers” on page 87.
   The system confirms that you want to shut down.
4. Select Yes and press Enter to make the changes.
   The system confirms that it has shut down.
5. Press Enter to reboot the controller.
6. When the controller prompts with, “<Hold Down Spacebar For Loader Menu>,” immediately hold down the space bar on your VT-100 terminal keyboard until the Flash Utility menu appears.
Chapter 5 - Configuring the Controller

Upgrading Firmware

Flash Utility
Local Memory Test Passed.
Configuration OK.
FLASH LOADER v5.012 - Oct 10 1999 16:40:31
Select Protocol
1. FIRST BINARY
2. UBRM17
3. XMODEM
4. Run diagnostics
5. Run bridge
6. Utility Menu
X. Reboot

The Flash Utility screen is displayed.

7. Press the number on your keyboard that corresponds to the protocol you want to use to transfer the firmware upgrade file from your computer to the controller.

   We recommend using the XMODEM protocol. The system shows that it is ready to use XMODEM.

8. Using your terminal emulator software, send the .fla file using XMODEM.

   Using HyperTerminal, select Transfer | Send File, navigate to where the firmware update file is located, select it, and click Open. Select the same Protocol from the drop-down list that you selected from the Flash Utility screen. Click Send.

   The file transfers. The system displays messages showing that it is flashing the code and rebooting the controller.

   **CAUTION:** Do not interrupt the power when transferring the new firmware.
Chapter 5 - Configuring the Controller

Upgrading Firmware in an Active-Active/Active-Passive System

You need to follow a slightly different procedure if you are upgrading firmware for a controller that is in Active-Active/Active-Passive mode.

To upgrade firmware for an Active-Active/Active-Passive configuration

1. Shut down the controller to be reloaded by selecting Shutdown/Restart from its System Menu (or Shutdown Other from the opposite controller).
2. When the controller prompts with, “Press <Enter> to reboot the controller,” press the Enter button.
3. When the controller prompts with, “<Hold Down Spacebar For Loader Menu>,” immediately hold down the space bar on your VT-100 terminal keyboard until the Flash Utility menu appears.
4. Download the firmware. See “Upgrading Firmware” on page 102.
   Once the firmware download is complete, the controller will reboot and go online.
5. Follow the same procedure to load code into the other controller.

NOTE: When a single controller is shut down in Active-Active/Active-Passive mode, you cannot download new firmware using the AdminiStor host channel interface, because the host channel has failed over to the surviving controller. You can still download new firmware to the shutdown controller using the RS-232 interface.
Chapter 6

Managing Disk Drives and Storage Enclosures

The Disk Array Administrator software lets you control a variety of functions related to disk drives and imageRAID SCSI Series enclosures.

- For drives, you can
  - Display drive information
  - Clear metadata from a drive
  - Enable/disable write-back cache
  - Display disk cache status
  - Enable/disable changes to SMART
  - Blink a drive LED
  - Take down a drive
  - Test a drive

- For IRS-JBOD enclosures, you can
  - Change the SEP LUN
  - Change additional SEP settings
Managing Disk Drives

The Disk Array Administrator software lets you control a variety of functions related to disk drives.

Displaying Drive Information

You can display two types of information about disk drives

- A list of all drives connected to the controller
- The status of all drives in an array

Displaying All Drives

You can display a list of all drives connected to the controller. The information includes

- Channel
- SCSI target ID
- Size
- Manufacturer
- Model number
- Drive firmware revision

If any of the drives are members of an array, the following information may also display

- Utility running – Expand, Verify, etc.
- Array number – The array’s sequential position in the controller’s array list
- Member number – The drive’s sequential position in the array

Drives that are not members of any array are listed as Available. Drives that contain leftover metadata from a previous array are listed as Leftover. This situation can arise if drives are pulled and reinserted. To clear leftover metadata, use the Clear Metadata function. See “Clearing Metadata from a Drive” on page 108.
Chapter 6 - Managing Disk Drives and Storage Enclosures

To display all drives

1. From the System Menu, select Display Drives and press Enter.

The Display Drives screen displays.

2. Press ESC to return to the System Menu.

Viewing Drive Status

You can view the status of the drives in an array, including the following information:

- Drive number – The drive’s sequential position in the controller’s drive list
- Drive status – Whether the drive is up or down
- Channel number – Back-end disk bus number
- Target ID
- Size – Is the size of the drive in MB
- Status – If a member of an array, this displays the array name and member number. If a spare, this displays the type of spare. If unused, this displays Available. If the drive was part of an array that no longer exists, this displays Leftover.

**NOTE:** If a drive has failed or malfunctioned, it may not be listed.

To view drive status

1. From the System Menu, select Array Menu and press Enter.

The Select Array screen displays with a list of existing arrays.
2. Select the array you want and press Enter.

   The Array Menu screen is displayed.

3. Select Drive Status and press Enter.

   The Drive Status screen displays showing the drives that are members of the array and that are assigned as spares.

4. Press ESC to return to the Array Menu.

Clearing Metadata from a Drive

All of the member drives in an array contain metadata in the first sectors of the drive. The controller uses the metadata to identify array members after restarting or changing controllers.

You can clear the metadata from a drive if you have a drive that was previously a member of an array. Drives in this state display Leftover in the Display Drives screen. After you clear the metadata, you can use the drive in an array or as a spare.

**To clear metadata from a drive**

1. From the System Menu, select Utilities Menu and press Enter.

   The Utilities Menu screen is displayed.
2 Select Drive Utilities Menu and press Enter.
   The Drive Utilities Menu screen is displayed.

3 Select Clear Metadata and press Enter.
   The Select Drive screen is displayed showing drives that are not array members.

4 Select the drive you want and press Enter.
   You can now use this drive in an array or as a spare.

Enabling and Disabling Write-back Cache

You can control the write-back cache setting for all of your disk drives at once. Changes take effect after the next rescan or reboot.

This can be set to ENABLE, DISABLE, or DON'T MODIFY (which means the controller should not change any drive’s write-back cache settings). The default setting is DON'T MODIFY.

Typically, if your drives are part of an array, you do not want to turn on write-back cache on the drives. The controller is already using write-back cache to improve performance. Turning on write-back cache on the disk drive may improve performance in some cases, depending on the type of array and how you are using it.

Any disk drives with write-back cache enabled should be connected to an uninterruptable power supply (UPS) in case of power failure. If the drives are not on a UPS and power is lost during disk writes, the array will lose any data in the disk's write-back cache.

CAUTION: We recommend that you disable disk write-back cache. Some drives delete their write-back cache if they encounter an internal error, resulting in lost data.

To change the write-back cache setting

1 From the System Menu, select Configuration Menu and press Enter.
   The Configuration Menu screen is displayed.

2 Select Disk Configuration and press Enter.
Chapter 6 - Managing Disk Drives and Storage Enclosures

The Disk Configuration screen is displayed.

3 Select Write-back Cache and press Enter.

The Write-back Cache screen is displayed.

4 Select the option you want and press Enter.

5 Reboot or rescan to have your changes take effect.

See “Rebooting the Controller” on page 72 or “Rescanning All Channels” on page 99.
Displaying Disk Cache Status

You can display the cache status of each disk drive. Any disk drives with write-back cache enabled should be connected to a UPS in case of power failure. If the drives are not on a UPS and power is lost during disk writes, the array will lose any data in the disk’s write-back cache.

To display disk cache status

1. From the System Menu, select Utilities Menu and press Enter.
   
   The Utilities Menu screen is displayed.

2. Select Drive Utilities Menu and press Enter.
   
   The Drive Utilities Menu screen is displayed.

   
   The Select Drives screen is displayed.

4. Select a drive and press Enter.
   
   The cache status screen is displayed showing the status of the read and write cache.
Enabling and Disabling SMART Changes

You can enable or disable the ability to change the Self-Monitoring, Analysis and Reporting Technology (SMART) settings for all drives connected to the controller. This can be set to ENABLE, DISABLE, or DON'T MODIFY (which means the controller should not change any drive's SMART settings). The default setting is DON'T MODIFY.

On most drives, SMART is disabled by default by the manufacturer. You may want to enable it if you want disk drives to be able to recover from errors on their own.

In a dual controller configuration (Active-Active or Active-Passive), a change to either controller's setting is immediately sent to the other controller.

To enable or disable SMART changes

1. From the System Menu, select Configuration Menu and press Enter. The Configuration Menu screen is displayed.
2. Select Disk Configuration and press Enter. The Disk Configuration screen is displayed.
3. Select SMART and press Enter. The SMART screen is displayed.

5. Press ESC to return to the Drive Utilities Menu.
Chapter 6 - Managing Disk Drives and Storage Enclosures

Blinking a Drive LED

You can blink the Activity LED on a specific drive in the storage system enclosure. The drive continues blinking its LED until you do one of the following:

- Press ESC before a time out occurs.
- Repeat the blink LED command, which toggles the command off.

To blink a drive

1. From the System Menu, select Utilities Menu and press Enter.
   The Utilities Menu screen is displayed.
2. Select Drive Utilities Menu and press Enter.
   The Drive Utilities Menu screen is displayed.
3. Select Blink Drive LED and press Enter.
   The Select Drive screen is displayed.
4. Select the drive you want and press Enter.
5. Locate the drive in the enclosure. Its’ Activity LED will be flashing.
6. Press ESC to stop blinking the LED.
Taking Down a Drive

CAUTION: This function is only for testing arrays and should not be used in normal operation.

The Down Drive function sets the status of a drive in a fault-tolerant array to down. This forces the controller to remove it from the array and marks the array as critical. At this point, you will be unable to down any additional drives in the array.

To make the drive display again, you must use Rescan. See “Rescanning All Channels” on page 99. After you rescan, you must clear the metadata from the drive before you can use it in an array or as a spare. See “Clearing Metadata from a Drive” on page 108.

To take down a drive

1. From the System Menu, select Utilities Menu and press Enter.
   The Utilities Menu screen is displayed.
2. Select Drive Utilities Menu and press Enter.
   The Drive Utilities Menu screen is displayed.
3. Select Down Drive and press Enter.
   The Select Drive screen is displayed showing drives that are array members.
4. Select the drive you want and press Enter.
   The system confirms that you want to make the change.
5. Select Yes and press Enter to make the change.

Testing a Drive

This function issues a Test Unit Ready (TUR) command to the selected disk. This just tells you that the drive can respond, but it still may not be functioning properly.

To test a drive

1. From the System Menu, select Utilities Menu and press Enter.
   The Utilities Menu screen is displayed.
2 Select *Drive Utilities Menu* and press *Enter*.
   The Drive Utilities Menu screen is displayed.
3 Select *Test Unit Ready* and press *Enter*.
   The Select Drive screen is displayed.
4 Select the drive you want and press *Enter*.
   If the TUR was successful, TUR STATUS OK displays.
   If the TUR was not successful, a failure message displays.
5 Press *ESC* to return to the Drive Utilities Menu.
Managing the Disk Enclosures

A SAF-TE Environmental Processor (SEP) is a SCSI device from which the controller can inquire about environmental conditions such as temperature, power supply and fan status, and the presence or absence of disk drives. The controller can also tell the SEP about RAID activities such as drive rebuilds and failed disk drives.

SAF-TE configuration settings are automatically enabled. No changes are required to the default configuration settings to support SAF-TE.

You can control the following functions for SEP enclosures

- Change the SEP LUN
- Change additional SEP settings: Polling interval, Temperature sensor status, Slot update status, and Enclosure update status

Changing the SEP LUN

SEP LUNs allow access to SEPs. A SEP LUN may be set to a value of 0 - 63, or NONE. NONE means that the SEP cannot be accessed via a LUN. You may want to change the SEP LUN if it conflicts with the LUN of another device.

To change the SEP LUN

1. From the System Menu, select Configuration Menu and press Enter.
   
   The Configuration Menu screen is displayed.

2. Select SEP Configuration and press Enter.

   The SEP Configuration screen is displayed.
Chapter 6 - Managing Disk Drives and Storage Enclosures

3. Select SEP LUNs and press Enter.

The SEP LUNs screen is displayed.

![SEP LUNs Screen](image)

4. Select the LUN of the SEP you want and press Enter.

The SEP LUN screen is displayed.

![SEP LUN Screen](image)

5. Select the option or number you want to use.

<table>
<thead>
<tr>
<th>To</th>
<th>Do this</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not assign the SEP a LUN</td>
<td>• Select NONE and press Enter.</td>
</tr>
<tr>
<td>Keep the same LUN for the SEP at all times</td>
<td>• Select the (LUN) you want to use and press Enter.</td>
</tr>
<tr>
<td></td>
<td>• This can be any number from 0 to 63 that is not already in use.</td>
</tr>
</tbody>
</table>
Changing the Additional SEP Settings

You can change four additional SEP settings

- **Polling interval** – This is the interval, in seconds, that the controller polls the SEPs for status changes. The default setting is 5 seconds.

- **Temperature sensor status** – This controls whether the controller’s onboard temperature sensor provides temperature information to the host along with the enclosure’s temperature detected by the SEP. The default setting is OFF, which means that neither the controller nor the enclosure is providing temperature information to the host.

- **Slot update status (Slot Flags)** – This controls whether the controller sends commands to the SEP to update the status of each enclosure slot. The default setting is ON, which means that the controller requests status updates from the enclosure.

- **Update status (Global Flags)** – This controls whether the controller sends commands to the SEP to update the overall status of the enclosure. The default setting is OFF, which means that the controller does not request status updates from the enclosure.

To change the SEP settings

1. From the System Menu, select *Configuration Menu* and press *Enter*.
   
The Configuration Menu screen is displayed.

2. Select *SEP Configuration* and press *Enter*.
   
The SEP Configuration screen is displayed.

3. Select *SEP Settings* and press *Enter*.
   
The Poll Rate screen is displayed.
Chapter 6 - Managing Disk Drives and Storage Enclosures

Changing the Additional SEP Settings

Poll Rate Screen

4. Enter the poll rate you want, in seconds, and press Enter.

The Temperature screen is displayed.

Temperature Screen

5. Select the option you want and press Enter.

The Slot Flags screen is displayed.

Slot Flags Screen
Chapter 6 - Managing Disk Drives and Storage Enclosures

6 Select whether you want the SEP to send slot status updates to the controller and press Enter.

The Global Flags screen is displayed.

![Global Flags Screen](image)

7 Select whether you want the SEP to send enclosure status updates to the controller and press Enter.

The system confirms that you want to make the changes.

8 Select Yes and press Enter to make the changes.
Chapter 7

Troubleshooting

This chapter provides typical solutions for problems you may encounter while using the imageRAID SCSI Series Storage Systems in conjunction with the Disk Array Administrator software.

Terminal Emulator and COM Port Problems

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Reason</th>
<th>Solution</th>
</tr>
</thead>
</table>
| Screen continuously puts out garbage characters. | The likely cause of this problem is a baud rate mismatch between the terminal emulator and the controller. The default baud rate is 115,200. Follow these steps if you set your terminal emulator to this rate and still get garbage characters. | 1. If you are able, shut down the controller. See “Rebooting the Controller” on page 72. If you are unable to shut down the controller, continue with step 2.  
2. Turn off the power to the enclosure containing the controller.  
3. Press the spacebar of your terminal emulator.  
4. Turn on the power while continuing to press the spacebar. This will allow the controller to auto-detect the baud rate setting.  
5. When the Flash Utility appears, select option 5 to continue to boot the controller. |
### Chapter 7 - Troubleshooting

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Reason</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screen continuously puts out garbage characters. (continued)</td>
<td>Note: Some terminal emulators do not immediately change to the new baud rate settings, and you have to exit and restart the emulator to use the new settings.</td>
<td></td>
</tr>
<tr>
<td>Nothing is displayed on the terminal emulator screen.</td>
<td>The probable cause of this problem is a bad RS-232 cable connection or swapped transmit/receive lines.</td>
<td>If the cable is properly connected on both ends, try another null modem cable, perhaps one that is known good.</td>
</tr>
<tr>
<td>Screen is updated, but will not respond to keystrokes.</td>
<td>Improper setting.</td>
<td>Disable hardware flow control on the terminal or terminal emulator. The controller supports XON/XOFF flow control and works properly in most cases with no flow control.</td>
</tr>
<tr>
<td>Screen looks correct, but clock is not being updated.</td>
<td>Enclosure not powered on.</td>
<td>Check to ensure that the enclosure is still powered on.</td>
</tr>
<tr>
<td>Screen is updated and menus appear correctly, but boxes around menus look incorrect.</td>
<td>Terminal program compatibility issues.</td>
<td>Try a different font in your terminal emulator program, such as Terminal. If you cannot find a font that looks correct, set ASCII Display to Yes in the Display options item of the Configuration Menu.</td>
</tr>
</tbody>
</table>
Array Problems

Problem: Array is much smaller than it should be.

The backoff percent may be set higher than 1%, which is causing the array to be much smaller than the full size of its member disks.

NOTE: We strongly recommend that you leave the backoff percent at 1%.

The setting backs off or reduces the capacity of the array by the given percentage. The backoff percentage helps when you assign spares by compensating for the minor capacity differences that occur between vendors. For example, two 18 GB drives from two different vendors may differ in capacity by 100 MB. With a backoff of 0%, you would not be able to replace an array member’s slightly larger 18 GB drive with a smaller 18 GB drive. If you intend to only use identical drives from the same vendor, then you can use a backoff of 0%.

The default setting is 1% backoff. This default allows you to easily work with drives that have the same nominal capacity, but different actual capacities. The backoff percentage affects all arrays created on the controller after you set the percentage.

If the drives in an array are not equal in size, the array capacity in a RAID 5 array is based on the smallest member’s capacity. The backoff percentage is then backed off the capacity from that amount.

In a dual controller configuration (Active-Active or Active-Passive mode), a change to either controller’s setting is immediately sent to the other controller.

To change the backoff percentage:

1. From the System Menu, select Configuration Menu and press Enter.
   
The Configuration Menu displays.

2. Select Backoff Percent and press Enter.
   
The Backoff Percent screen displays.

3. Enter the backoff percent you want to use and press Enter.
   
Enter the percentage as three digits using the following format 00.0%. The default is 01.0%.
Chapter 7 - Troubleshooting

Host SCSI Channel Problems

<table>
<thead>
<tr>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>The host SCSI BIOS scan displays “Device name not available.”</td>
<td>The controller is properly connected, but no arrays have been created. Use the Disk Array Administrator software to create an array and reboot the host system.</td>
</tr>
<tr>
<td>The host SCSI BIOS scan hangs.</td>
<td>Check that termination is set correctly in the Configuration Menu and the drive enclosures. Check that the device ID set in the Disk Array Administrator does not conflict with any other devices on the host SCSI channel. If you have a long SCSI data cable, try a different or shorter cable.</td>
</tr>
<tr>
<td>Only one array is displayed during host SCSI BIOS scan.</td>
<td>Check to ensure that LUN support is enabled. Most SCSI host adapters, such as the AHA-2940U2W, ship with LUN support disabled by default. Use Display Array Status to check the LUN assignment for each array. If LUN 0 is not assigned to an array, or some other LUN numbers are skipped, use the Change LUN Assignment option for each array until you have LUN numbers starting at 0 with no LUNs skipped. You must reboot the host system to recognize the new LUN assignment.</td>
</tr>
<tr>
<td>All arrays are displayed during host SCSI BIOS scan, but only one array is seen by the operating system.</td>
<td>SCSI drivers for some operating systems require a parameter switch to enable LUN support. Check the driver documentation for your host SCSI channel. You may also need to compact the LUN mapping.</td>
</tr>
</tbody>
</table>

Problems During Bootup

The following sections describe problems you might encounter during Power On Self-Test (POST) or during bootup sequence and explains how to resolve those problems. POST shows problems related to the processor, logic, and memory.

<table>
<thead>
<tr>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Controller failed the onboard memory test.</td>
<td>When this failure occurs, it means the internal CPU memory failed. Replace the controller to correct the problem.</td>
</tr>
<tr>
<td>System hangs at Loading Bridge during BFLU Loader Menu.</td>
<td>Reflash the firmware to ensure you are using the latest version. See “Upgrading Firmware.” If you cannot update the firmware or if the updated firmware does not correct the problem, replace the controller.</td>
</tr>
</tbody>
</table>
# Chapter 7 - Troubleshooting

## Problems During Bootup

<table>
<thead>
<tr>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>One of the POST diagnostic tests failed.</td>
<td>Contact technical support or your service provider.</td>
</tr>
</tbody>
</table>
| The system hangs at CT_srv starting. | Follow these steps to resolve the problem  
1. Verify that there are no SCSI address conflicts.  
2. Check the enclosure(s) to make sure everything is properly connected.  
3. If the enclosure(s) and the drive work properly, replace the controller. |
| The system hangs during a drive scan. | Follow these steps to resolve the problem  
1. Check the enclosure(s) to make sure everything is properly connected.  
2. Remove and replace the drive that failed the scan.  
3. If the enclosure(s) and the drive work properly, replace the controller. |
| An Active-Active controller pair hangs during boot up drive scan (typically after displaying CT_Init on the RS-232 display). | Verify that all SCSI channels are connected, cabled, and terminated properly. Verify that the controllers are set to their default configuration (Active-Active Dual Port mode). |
| An Active-Active controller pair hangs the host system during normal operation or after failing over. | Verify that all SCSI channels are connected, cabled, and terminated properly. |
| An Active-Active controller pair always fails over after booting up. | Verify that the controller that is failed/killed is set to its default configuration (Active-Active Dual Port mode). Verify the same SDRAM DIMM sizes are in both controllers. Active-Active controllers require the same SDRAM DIMM size. |
| One controller of an Active-Active controller pair displays the following message when booting “Other Controller is attempting to reset this controller.” | This message displays on fail-back if the failed controller has not been replaced. The message continues to display whenever you boot the working controller and change its configuration. To eliminate the message, replace the failed controller. |
Chapter 7 - Troubleshooting

Controller Problems

<table>
<thead>
<tr>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>The controller's STATUS LED does not turn on.</td>
<td>Check the RS-232 interface for power-on initialization and diagnostics errors. Check the Disk Array Administrator for outstanding events. Replace the controller.</td>
</tr>
<tr>
<td>The controller's STATUS LED is on, but there is no RS-232 display.</td>
<td>Check that the RS-232 cable is the correct type (straight-through). Check that the terminal emulation utility on the computer system is properly configured.</td>
</tr>
<tr>
<td>The controller reports a SDRAM memory error.</td>
<td>Check that the SDRAM DIMM is fully seated in the connector and the latches are fully engaged into the DIMM notches. Check with nStor to ensure that the memory is from the approved vendor list.</td>
</tr>
<tr>
<td>The controller reports a Battery error.</td>
<td>Verify that the correct NiMH battery pack.</td>
</tr>
</tbody>
</table>

Warning and Error Events

There are a number of conditions that trigger warning or error events, activate the alarm, and may affect the state of the STATUS and FAULT LEDs. The alarm or buzzer sounds mainly when the Disk Array Administrator software displays a warning or error event.

The alarm will silence when you acknowledged the event by pressing the alarm reset button, or by pressing the VT-100 terminal \textit{ESC} key. The events in these categories are listed below.

Warnings

Warning events let you know that something related to the controller or an array has a problem. You should correct the problem as soon as possible. The table below defines each warning event and recommends the action you should take.
### Warnings

<table>
<thead>
<tr>
<th>Event</th>
<th>Definition</th>
<th>Recommended Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>BATT FAIL INFO</td>
<td>A warning condition in the battery pack and/or charging interface has been detected.</td>
<td>Replace the controller. Refer to “Replacing a Controller” in the enclosure’s user’s guide.</td>
</tr>
<tr>
<td>REPLACE BATTERY</td>
<td>The battery is approaching its 3-year life span.</td>
<td>Replace the controller. Refer to “Replacing a Controller” in the enclosure’s user’s guide.</td>
</tr>
<tr>
<td>ARRAY CRITICAL</td>
<td>One or more drives were downed and the array is online, but is no longer fault tolerant.</td>
<td>Add a spare to the array or the spare pool. Then replace the bad drives. See “Adding a Dedicated Spare” on page 64 or “Adding a Spare to the Spare Pool” on page 68.</td>
</tr>
<tr>
<td>DRIVE DOWN</td>
<td>An error occurred with the drive and it was downed, removing it from the active array.</td>
<td>Add a spare to the array or the spare pool. Then replace the bad drive. See “Adding a Dedicated Spare” on page 64 or “Adding a Spare to the Spare Pool” on page 68.</td>
</tr>
<tr>
<td>SPARE UNSABLE</td>
<td>The drive still contains metadata that must be cleared.</td>
<td>Clear the metadata from the spare drive. See “Clearing Metadata from a Drive” on page 108.</td>
</tr>
<tr>
<td>SMART EVENT</td>
<td>A disk drive informational exceptions page control (IEPC) predictive failure message was received. No actions by the controller are taken on the drive for these events.</td>
<td>Run diagnostics available from your operating system on the affected drive. Replace the drive, if necessary.</td>
</tr>
<tr>
<td>ARRAY OFFLINE</td>
<td>More than one drive in a RAID 0 or volume set went down bringing the array to an offline state. This array is no longer accessible by the host.</td>
<td>Replace the bad drive and restore the data from backup.</td>
</tr>
<tr>
<td>VOL/TMP WARN</td>
<td>The analog-to-digital converter monitored a temperature and/or voltage in the warning range.</td>
<td>Check that the controller’s fan is running. Check that the ambient temperature is not too warm. See “Technical Information” in the enclosure’s user’s guide.</td>
</tr>
<tr>
<td>UNWRITABLE CACHE</td>
<td>The SDRAM cache has battery backed-up data, and the arrays assigned to this data are not present.</td>
<td>Either determine which drives are missing and reinstall them, or select Yes when asked if you want to discard this data.</td>
</tr>
<tr>
<td>SDRAM CORR ECC</td>
<td>A correctable single-bit SDRAM ECC error occurred.</td>
<td>If this error occurs frequently, replace the memory.</td>
</tr>
</tbody>
</table>
Chapter 7 - Troubleshooting

Errors

Error events let you know that something related the enclosure, controller, or disk drives has failed and requires immediate attention. The table below defines each error event and recommends the action you should take.

<table>
<thead>
<tr>
<th>Event</th>
<th>Definition</th>
<th>Recommended Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>VOLT/TEMP FAIL</td>
<td>The analog-to-digital convertor monitored a temperature and/or voltage in the failure range.</td>
<td>Check that the imageRAID Controller enclosure fans are running. Check that the ambient temperature is not too warm. See “Technical Information” in the enclosure's user's guide.</td>
</tr>
<tr>
<td>ENCLOSURE FAIL</td>
<td>Enclosure specific general purpose I/O triggered a failure condition.</td>
<td>Check the status of the enclosure.</td>
</tr>
<tr>
<td>BATTERY FAILED</td>
<td>A failure in the battery pack and/or charging interface has been detected.</td>
<td>Replace the imageRAID controller.</td>
</tr>
<tr>
<td>DISK CHAN FAILED</td>
<td>An error has occurred in communicating on the disk channel.</td>
<td>Check the cables on the channel.</td>
</tr>
<tr>
<td>SDRAM UNCORR ECC</td>
<td>A noncorrectable multiple-bit SDRAM ECC error occurred.</td>
<td>Reseat the memory. If the problem continues, replace the memory.</td>
</tr>
</tbody>
</table>
Disk Errors

If a disk detects an error, it reports the error, which is recorded in the event log. The following is an example of a disk-detected error.

**Disk-Detected Error Example**

Using the information in the Sense Key and ASC tables, you can see that this is a medium error, unrecovered read error – recommended reassignment.

<table>
<thead>
<tr>
<th>Sense Key</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0h</td>
<td>No sense</td>
</tr>
<tr>
<td>1h</td>
<td>Recovered error</td>
</tr>
<tr>
<td>2h</td>
<td>Not ready</td>
</tr>
<tr>
<td>3h</td>
<td>Medium error</td>
</tr>
<tr>
<td>4h</td>
<td>Hardware error</td>
</tr>
<tr>
<td>5h</td>
<td>Illegal request</td>
</tr>
<tr>
<td>6h</td>
<td>Unit attention</td>
</tr>
<tr>
<td>7h</td>
<td>Data protect</td>
</tr>
<tr>
<td>8h</td>
<td>Blank check</td>
</tr>
<tr>
<td>9h</td>
<td>Vendor-specific</td>
</tr>
<tr>
<td>Ah</td>
<td>Copy aborted</td>
</tr>
<tr>
<td>Bh</td>
<td>Aborted command</td>
</tr>
<tr>
<td>Bh</td>
<td>Aborted command</td>
</tr>
<tr>
<td>Ch</td>
<td>Obsolete</td>
</tr>
<tr>
<td>Dh</td>
<td>Volumes overflow</td>
</tr>
<tr>
<td>Eh</td>
<td>Miscompare</td>
</tr>
<tr>
<td>Fh</td>
<td>Reserved</td>
</tr>
</tbody>
</table>
## ASC and ASCQ Descriptions

<table>
<thead>
<tr>
<th>ASC</th>
<th>ASCQ</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0C</td>
<td>02</td>
<td>Write error - auto-deallocation failed.</td>
</tr>
<tr>
<td>0C</td>
<td>03</td>
<td>Write error - recommend reassignment.</td>
</tr>
<tr>
<td>11</td>
<td>00</td>
<td>Unrecovered read error.</td>
</tr>
<tr>
<td>11</td>
<td>01</td>
<td>Read retries exhausted.</td>
</tr>
<tr>
<td>11</td>
<td>02</td>
<td>Error too long to correct.</td>
</tr>
<tr>
<td>11</td>
<td>03</td>
<td>Multiple read errors.</td>
</tr>
<tr>
<td>11</td>
<td>04</td>
<td>Unrecovered read error - auto-deallocation failed.</td>
</tr>
<tr>
<td>11</td>
<td>0B</td>
<td>Unrecovered read error - recommend reassignment.</td>
</tr>
<tr>
<td>11</td>
<td>0C</td>
<td>Unrecovered read error - recommend rewrite data.</td>
</tr>
<tr>
<td>47</td>
<td>00</td>
<td>SCSI parity error.</td>
</tr>
<tr>
<td>48</td>
<td>00</td>
<td>Initiator-detected error message received.</td>
</tr>
</tbody>
</table>
Disk Channel Errors

Disk channel errors are similar to disk-detected errors, except they are detected by the controller, instead of the disk drive. Some disk channel errors are displayed as text strings, others are displayed as hexadecimal values.

The illustration below shows a disk channel error displaying the hexadecimal codes. Most disk channel errors are informational because the controller issues retries to correct any problem. Errors that cannot be corrected with retries will result in another critical event describing the affected disk array (if any).

<table>
<thead>
<tr>
<th>Error Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>04</td>
<td>Data overrun or underrun occurred while getting sense data.</td>
</tr>
<tr>
<td>05</td>
<td>Request for sense data failed.</td>
</tr>
<tr>
<td>20</td>
<td>Selection time-out occurred (displayed as Sel Timeout).</td>
</tr>
<tr>
<td>21</td>
<td>Controller detected an unrecoverable protocol error on the part of the target.</td>
</tr>
<tr>
<td>22</td>
<td>Unexpected bus-free condition occurred (displayed as Unex Bsfree).</td>
</tr>
<tr>
<td>25</td>
<td>Parity error on data was received from a target displayed as Parity Err).</td>
</tr>
<tr>
<td>24</td>
<td>Data overrun or underrun has been detected (displayed as Data OvUnRn).</td>
</tr>
<tr>
<td>30</td>
<td>Target reported busy status (displayed as Device Busy).</td>
</tr>
<tr>
<td>31</td>
<td>Target reported queue full status (displayed as Queue Full).</td>
</tr>
<tr>
<td>32</td>
<td>Target has been reserved by another initiator.</td>
</tr>
<tr>
<td>40</td>
<td>Controller aborted an I/O request to this target because it timed out (displayed as I/O Timeout).</td>
</tr>
</tbody>
</table>
Using the Loader Diagnostics Menu

If you have any diagnostic errors, contact technical support or your service provider.

Using the Loader Utility Menu

If you have any diagnostic errors, contact technical support or your service provider.

Disk Channel Error Codes

<table>
<thead>
<tr>
<th>Error Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>41</td>
<td>I/O request was aborted because of a channel reset.</td>
</tr>
<tr>
<td>42</td>
<td>I/O request was aborted because of controller’s decision to reset the channel.</td>
</tr>
<tr>
<td>43</td>
<td>I/O request was aborted because of third-party channel reset (displayed as Abort 3PRST).</td>
</tr>
<tr>
<td>44</td>
<td>Controller decided to abort I/O request for reasons other than bus or target reset.</td>
</tr>
<tr>
<td>45</td>
<td>I/O request was aborted because of target reset requested by controller.</td>
</tr>
<tr>
<td>46</td>
<td>Target did not get response properly to abort sequence.</td>
</tr>
<tr>
<td>4B</td>
<td>I/O aborted due to operating mode change (such as LVD to SE or SE to LVD) (displayed as Abort MdChg).</td>
</tr>
<tr>
<td>50</td>
<td>Disk channel hardware failure (displayed as DskChn Fail). This may be the result of bad termination or cabling.</td>
</tr>
</tbody>
</table>
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