



IBM Netfinity

**ServeRAID User's Guide**





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## About This Section

This section provides the information needed to configure an IBM ServeRAID controller. This section also contains instructions for installing and using the ServeRAID utility programs.

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## How This Section Is Organized

Chapter 1, "Getting Started," contains an installation overview and general information about RAID technology.

Chapter 2, "Using the Configuration Programs," explains how to use the IBM ServeRAID Configuration Program and the IBM ServeRAID Mini-Configuration Program. You can refer to the information in this chapter when configuring one or more devices attached to a ServeRAID adapter or controller.

Chapter 3, "Installing Device Drivers and Utility Programs," contains the instructions needed to install the ServeRAID device drivers and programs provided on the CDs that came with your server.

Chapter 4, "Starting and Using the Utility Programs," contains instructions for starting and using the ServeRAID Administration and Monitoring, IPSEND, and IPSMON programs. You can use these operating-system specific programs to maintain and monitor your ServeRAID subsystem.

Chapter 5, "Solving ServeRAID Problems," describes the ServeRAID POST error codes and startup messages. This chapter also includes some basic information about rebuilding a defunct drive.

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## Notices Used in This Section

This section contains notices to highlight information as follows:

- **Notes:**

These notices provide important tips, guidance, or advice.

- **Attention:**

These notices indicate possible damage to programs, devices, or data. An attention notice is placed just *before* the instruction or situation in which damage could occur.





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# Chapter 1. Getting Started

This section provides the information needed to configure an IBM ServeRAID controller. These high-performance, redundant array of independent disk (RAID) controllers are ideally suited for data-storage environments that require superior performance, flexibility, and reliable data storage.

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## Installation Overview

This section contains reference, configuration, and administration information for the IBM ServeRAID controller. The information that you will need to configure your IBM ServeRAID subsystem depends on the type of ServeRAID controller you are using and your familiarity with RAID technology.

A typical configuration of an IBM ServeRAID subsystem consists of the following steps:

**1** Learn about RAID technology.

The “Understanding RAID Technology” section in this chapter contains general information about RAID technology. If you already are familiar with the IBM implementation of RAID technology, you might want to start your installation with step 2.

**2** Use the ServeRAID Configuration Programs to configure your disk arrays.

Chapter 2, “Using the Configuration Programs” explains how to use the IBM ServeRAID Configuration Program and the IBM ServeRAID Mini-Configuration Program. You can refer to the information in this chapter or the online information in the configuration program when configuring one or more devices attached to a ServeRAID adapter or controller.

**Attention:**

The default setting for the stripe-unit size is 8 KB<sup>1</sup>. If you want to use a different setting, be sure to change the stripe-unit size before you store data in the logical drives. After you store data in the drives, you cannot change the stripe-unit size without destroying data in the logical drives. (See “Interleave Depth and Stripe-Unit Size” on page 3 and page 23 for more information.)

**3** Install your operating system, ServeRAID device drivers, and ServeRAID utility programs.

You can skip this step if you are installing multiple ServeRAID adapters and you already installed your operating system and the most current versions of the ServeRAID device drivers and utility programs.

See the information provided with your operating system and Chapter 3, “Installing Device Drivers and Utility Programs” on page 31 for instructions.

After you install the device drivers and utility programs, refer to Chapter 4, “Starting and Using the Utility Programs” on page 57.

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<sup>1</sup> KB equals approximately 1000 bytes.

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## Understanding RAID Technology

RAID is the technology of grouping several hard disk drives in a computer into an *array* that you can define as one or more logical drives. Each *logical* drive appears to the operating system as a single drive. This grouping technique greatly enhances logical-drive capacity and performance beyond the physical limitations of a single hard disk drive.

When you group multiple physical hard disk drives into a logical drive, the ServeRAID controller can transfer data in parallel from the multiple drives in the array. This parallel transfer yields data-transfer rates that are many times higher than with nonarrayed drives. This increased speed makes the system better able to meet the *throughput* (the amount of work in a given amount of time) or productivity needs of the multiple-user network environment.

The ability to respond to multiple data requests provides not only an impressive increase in throughput, but also a decrease in response time. The combination of parallel transfers and simultaneous responses to multiple requests allows disk arrays to provide a high level of performance in network environments.

## Interleave Depth and Stripe-Unit Size

With RAID technology, data is *striped* across an array of hard disk drives. This data-distribution scheme complements the way the operating system requests data.

The granularity at which data from one file is stored on one drive of the array before subsequent data is stored on the next drive of the array is called the *interleave depth*.

You can control the interleave depth and maximize the performance of your ServeRAID controller by setting a stripe-unit size that is close to the size of the system I/O requests. You can set the stripe-unit size to 8 KB, 16 KB, 32 KB, or 64 KB. For example, performance in transaction-based environments, which typically involve large blocks of data, might be optimal when the stripe-unit size is set to 32 KB or 64 KB; however, performance in file and print environments, which typically involve multiple small blocks of data, might be optimal when the stripe-unit size is set to 8 KB or 16 KB.

The collection, in logical order of these stripe units, from the first drive of the array to the last drive of the array, is called a *stripe*. (See page 23 for more information.)

## Supported RAID Levels

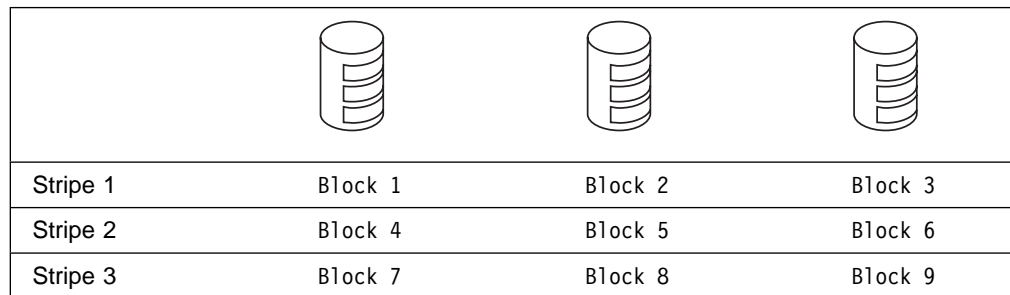
Disk arrays are used to improve performance and reliability. The amount of improvement depends on the application programs that you run on the server and the RAID levels that you assign to the logical drives.

The ServeRAID adapters and controllers support RAID level-0, RAID level-1, Enhanced RAID level-1, and RAID level-5.

## RAID Level-0

RAID level-0 stripes the data across all the drives in the array. This offers substantial speed enhancement, but provides for no data redundancy. RAID level-0 provides the largest capacity of the RAID levels offered, because no room is taken up for redundant data or data-parity storage.

The following illustration shows data arranged in an array of three hard disk drives defined as one RAID level-0 logical drive. Notice that the data is striped across all the drives in the array, but no copies of the data or parity information is stored.



A hard disk failure within the array results in loss of data in the logical drive assigned RAID level-0, but *only in that logical drive*. If you have logical drives assigned RAID level-1 or level-5 in the same array, they will not lose data.

**Note:** The ServeRAID controller automatically assigns RAID level-0 to all logical drives in an array containing only one hard disk drive.

When you replace a failed drive, the ServeRAID controller can rebuild all the RAID level-1 and RAID level-5 logical drives automatically onto the replacement hard disk drive. However, any data stored in a failed RAID level-0 logical drive is lost.

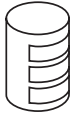
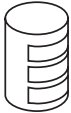
Though the risk of data loss is present, you might want to assign RAID level-0 to one of the logical drives to take advantage of the speed offered with this RAID level. You could use this logical drive to enter data that you back up each day and for which safety is not of primary importance, that is, data that you can re-create easily. You also might want to use a RAID level-0 logical drive when the work you are doing requires maximum capacity.

## RAID Level-1

RAID level-1 provides 100% data redundancy and requires two hard disk drives. With RAID level-1, the first half of a stripe is the original data; the second half of a stripe is a *mirror* (copy) of the data, but written to another drive.

Because the data is mirrored, the capacity of the logical drive when assigned RAID level-1 is 50% of the physical capacity of the two hard disk drives in the array.

The following illustration shows data arranged in an array of two hard disk drives defined as one RAID level-1 logical drive. Notice that the data on Drive B is a mirror copy of the data on Drive A.

	Drive A		Drive B
			
Data Stripe 1	Block 1	Mirror Stripe 1	Block 1
Data Stripe 2	Block 2	Mirror Stripe 2	Block 2
Data Stripe 3	Block 3	Mirror Stripe 3	Block 3

If one of the hard disk drives fails, the ServeRAID controller switches read and write requests to the remaining functional drive in the array.

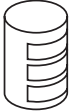


### Enhanced RAID Level-1

When you group more than two physical drives into an array and you select RAID level-1, the ServeRAID controller automatically assigns the IBM Enhanced RAID level-1 to the array.

The Enhanced RAID level-1 combines mirroring with data striping. This RAID level stripes data and copies of the data across all the drives in the array. As with the standard RAID level-1, the data is mirrored, and the capacity of the logical drive is 50% of the physical capacity of the grouping of hard disk drives in the array.

The Enhanced RAID level-1 requires a minimum of three drives and, depending upon the stripe-unit size, supports a maximum of eight or 16 drives.

The following illustration shows data arranged in an array with three hard disk drives. The logical drive is assigned the Enhanced RAID level-1. Notice that the first stripe is the data stripe and the second stripe is the mirror (copy) of the first data stripe, but shifted one drive.

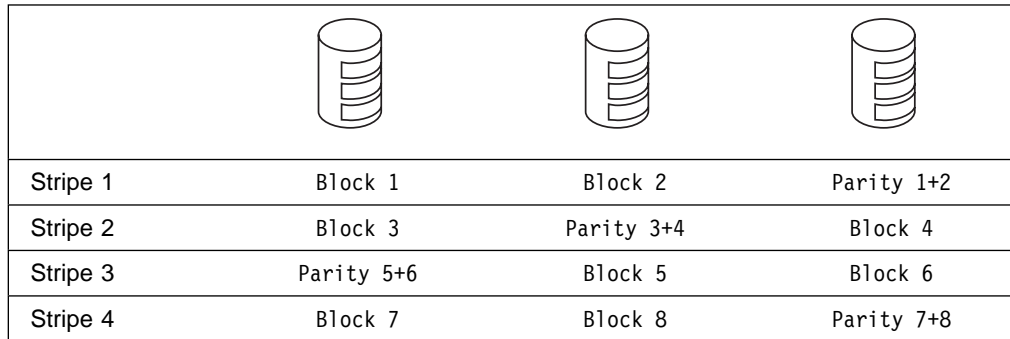
			
Data Stripe 1	Block 1	Block 2	Block 3
Mirror Stripe 1	Block 3	Block 1	Block 2
Data Stripe 2	Block 4	Block 5	Block 6
Mirror Stripe 2	Block 6	Block 4	Block 5

### RAID Level-5

RAID level-5 requires a minimum of three hard disk drives. This RAID level stripes data and parity across all drives in the array. When an array is assigned RAID level-5, the capacity of the logical drive is reduced by one drive (for data-parity storage).

RAID level-5 is generally the most desirable choice, because it offers both data protection and increased throughput. RAID level-5 gives you higher capacity than RAID level-1, but RAID level-1 offers better performance.

The following illustration shows data arranged in an array with three hard disk drives. The logical drive is assigned RAID level-5. Notice that the storage of the data parity also is striped, and it shifts from drive to drive.



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## Chapter 2. Using the Configuration Programs

This chapter provides instructions for using the IBM ServeRAID Configuration and Mini-Configuration Programs. You can use the information in this chapter and the online information in the configuration programs when configuring one or more devices attached to a ServeRAID adapter or controller.

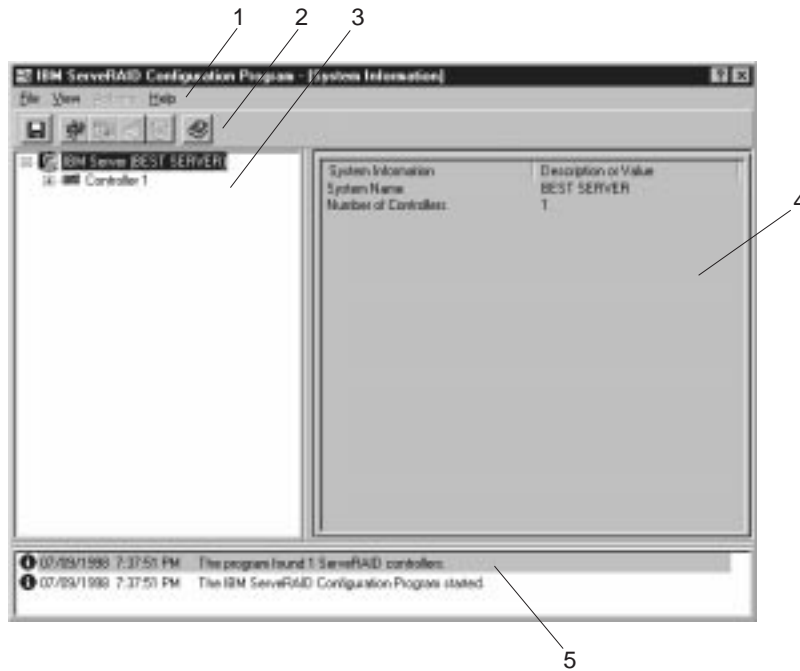
You must use the IBM ServeRAID Configuration Program to configure your disk arrays *before* you install an operating system or store data on the hard disk drives attached to the ServeRAID adapter or controller.

### This chapter contains

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## Using the ServeRAID Configuration Program

The graphical interface in the ServeRAID Configuration Program makes it easy for you to create, delete, change, or view your ServeRAID configuration. Before you begin, review the following illustration to become familiar with the layout of the configuration program screens.



Descriptions of the numbered areas are as follows:

- 1. Menu Bar** Provides standard File, View, Actions, and Help pull-down menus. See "Using the Menu Bar" on page 21 for more information.
- 2. Tool Bar** Provides quick-path icons for common tasks. The icons from left to right are Save the Configuration Event Log, Configure the ServeRAID Controller, Configure for Clustering, Scan for New or Removed Ready Drives, Create an Array, and Help. See "Using the Tool Bar" on page 20 for more information.
- 3. Main Tree** Provides an expandable tree view of your ServeRAID subsystem. You will perform most of your ServeRAID configuration and maintenance tasks by first selecting the ServeRAID controller, array, logical drive, hot-spare drive, or physical drive objects from this Main Tree.
- 4. Main Panel** Provides specific device information or configuration instructions. When the configuration program is in the Information mode and you select an object from the Main Tree, detailed information about the object appears in this panel. When the configuration program is in the Configuration mode, the instructions needed to configure your ServeRAID subsystem appear in this panel.



- 5. Event Viewer** Provides advisory and progressive-status information and messages during the ServeRAID configuration process. Each message appears with a time stamp, a date stamp, and an icon that classifies the severity of the event. Attention messages identify potential data-loss situations, and Fatal messages inform you when a failure has occurred.

## Starting the Configuration Program

The ServeRAID Configuration Program runs in two modes: the *Configuration* mode and the *Information* mode.

In the Configuration mode, you can create or delete disk arrays, create or delete logical drives, and define your hot-spare drives. When this mode is active, only a limited set of functions is available from the Menu and Tool Bars. See “Using the Configuration Mode” on page 11 for more information.

In the Information mode, you can view the existing device and configuration information for your ServeRAID subsystem. When this mode is active, you can use the functions available from the Menu and Tool Bars to customize settings for your ServeRAID controllers. See “Using the Information Mode” on page 14 for more information.

The ServeRAID Configuration Program is provided on the *IBM ServeRAID Configuration CD* packaged with the ServeRAID adapter, and it also is provided on the ServerGuide CD (*CD 1*) that comes with some IBM server models.

### Notes:

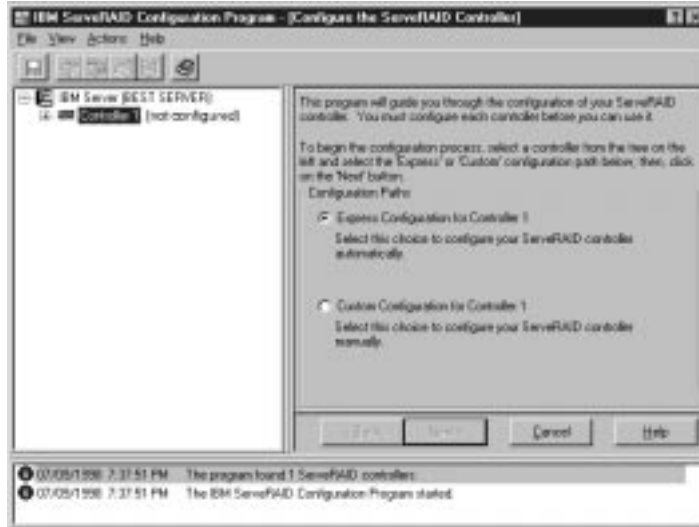
1. If you are configuring a ServeRAID controller on a system board, see the installation instructions and CDs provided with your server for information about starting the configuration programs for the server.
2. To gain access to the ServeRAID Configuration or Mini-Configuration programs, you must restart the server.

To start the configuration program:

1. Insert the *IBM ServeRAID Configuration CD* (or the ServerGuide *CD 1*) into the CD-ROM drive; then, turn on the server.

One of the following screens will appear:


- If the configuration program detects unconfigured ServeRAID controllers, the program starts in the Configuration mode and a screen similar to the following appears.



Click on the **Cancel** button to switch from the Configuration mode to the Information mode.

- If the configuration program detects that all ServeRAID controllers in the server are configured, the program starts in the Information mode and a screen similar to the following appears.



Click on the  icon on the Tool Bar to switch from the Information mode to the Configuration mode.

2. Continue with one of the following:

- "Using the Configuration Mode" on page 11
- "Using the Information Mode" on page 14

## Using the Configuration Mode

You can use the Configuration mode to create up to eight independent disk arrays for each ServeRAID controller. The Configuration mode provides two configuration paths: *Express Configuration* and *Custom Configuration*.

### Learning about Express Configuration

Express Configuration provides a quick and easy path for you to automatically configure your ServeRAID controller. This choice creates the most efficient ServeRAID configuration based on the number and capacity of the Ready drives available in your system. If four or more Ready drives of the same capacity are available, this choice also will define a *hot-spare drive* for the ServeRAID adapter or controller. A hot-spare drive is a physical drive that is defined for automatic use when a similar drive fails.

The Express Configuration choice groups up to 16 Ready drives of the same capacity into one disk array and defines one logical drive for each array. This choice defines the size of the logical drive, based on the amount of free space available, and it assigns the highest RAID level possible, based on the number of physical drives available.

For example, if your server contains one 1024 MB Ready drive, two 2150 MB Ready drives, and four 4300 MB Ready drives, Express Configuration will create three arrays and one hot-spare drive as follows:

**Array A:** The total capacity of this array is 1024 MB (1 x 1024 MB) and it contains one 1024 MB RAID level-0 logical drive.

**Array B:** The total capacity of this array is 4300 MB (2 x 2150 MB) and it contains one 2150 MB RAID level-1 logical drive.

**Array C:** The total capacity of this array is 12900 MB (3 x 4300 MB) and it contains one 8600 MB RAID level-5 logical drive.

**Hot Spare:** Express Configuration defines one of the four 4300 MB drives as a hot-spare drive, as follows:

- When there are four or more Ready drives of the same capacity, Express Configuration groups three of the drives into one array (as in Array C) and defines one of the drives as a hot spare.
- A hot-spare drive must be of equal or greater capacity than the drive that it is intended to replace. In this configuration, the 4300 MB drive can replace any failed drives in Array B or Array C.

### Using Express Configuration

To use the Express Configuration path:

1. Click on the ServeRAID controller that you want to configure in the Main Tree.
2. Click on the **Express Configuration** radio button.
3. Click on the **Next** button.
4. Review the information that appears on the Configuration Summary screen.

**Notes:**

- a. Some operating systems have size limitations for logical drives. Before you save the configuration, you might want to verify that the size of the logical drive is appropriate for your operating system. See your operating-system documentation for more detailed information.
  - b. To change the configuration, click on a **Modify** icon button.
5. Click on the **Apply** button to accept and save the configuration.
  6. If you have not already done so, install your operating system. See the server documentation or the documentation provided with your operating system for more information.

After you install your operating system, see Chapter 3, “Installing Device Drivers and Utility Programs” on page 31 (or see the installation instructions provided with your server) for information about installing the ServeRAID device drivers and utility programs.

**Learning about Custom Configuration**

The Custom Configuration path allows you to manually configure your ServeRAID subsystem. Using this path, you can select the drives that you want to include in each array, define the number and size of the logical drives for each array, and select the drives that you want to use as hot spares.

Before you select the Custom Configuration path, consider the following:

- If you are not familiar with the IBM implementation of RAID technology, you might want to review the information provided in “Understanding RAID Technology” on page 3 before you begin.
- Each ServeRAID controller supports a maximum of eight arrays.
- Each ServeRAID controller supports a maximum of eight logical drives.

When you create an array, you group hard disk drives into one storage area. You can define this storage area as a single *logical* drive, or you can subdivide it into several logical drives. Each logical drive appears to the operating system as a single physical hard disk drive.

If you have only one array, you can define it as a single logical drive, or you can divide it into several logical drives. Typically, the first logical drive defined on the first ServeRAID adapter or controller found by the basic input/output system (BIOS) during startup will be your startup (boot) drive.

If you have two or more arrays, each array can be one logical drive, or you can divide each array into multiple logical drives, as long as the total number of logical drives for all of the arrays does not exceed eight.

**Note:** Independent of the RAID logical drives, most operating systems allow you to partition the logical drives further.

- The optimal way to create arrays is to use hard disk drives that have the same capacity.

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<sup>2</sup> When referring to hard-disk-drive capacity, GB means approximately 1 000 000 000 bytes; total user-accessible capacity may vary depending on operating environment.

Hard disk drive capacities influence the way you create arrays. Drives in an array can be of different capacities (1 GB<sup>2</sup>, or 2 GB, for example), but RAID controllers treat them as if they all have the capacity of the *smallest* disk drive.

For example, if you group three 1 GB drives and one 2 GB drive into an array, the total capacity of the array is 1 GB times 4, or 4 GB, not the 5 GB physically available. Similarly, if you group three 2 GB drives and one 1 GB drive into an array, the total capacity of that array is 4 GB, not the 7 GB physically available.

- A hot-spare drive is a disk drive that is defined for automatic use in the event of a drive failure. The hot-spare drive must be of equal or greater capacity than the drive that it is intended to replace. If a physical drive fails and it is part of a RAID level-1 or RAID level-5 logical drive, the ServeRAID controller automatically starts to rebuild the data on the hot-spare drive.
- You can include a maximum of 16 physical drives in an array when the stripe-unit size is set to 8KB (the default setting) or 16KB, and you can include a maximum of 8 physical drives in an array when the stripe-unit size is set to 32KB or 64KB. (See “Interleave Depth and Stripe-Unit Size” on page 3 and page 23 for more information.)

## Using Custom Configuration

To use the Custom Configuration path:

1. Click on the ServeRAID controller that you want to configure in the Main Tree.
2. Click on the **Custom Configuration** radio button.
3. Click on the **Next** button.
4. Using the right mouse button, click on the drive or SCSI Channel icons in the Main Tree to select the drives that you want to add to your arrays, delete from your arrays, or define as hot-spare drives; then, select a choice from the pop-up list.

or

Drag the drive or SCSI Channel icon from the Main Tree and drop it on the Array or Hot-Spare Drive icon in the Main Panel on the right. If you change your mind, you can drag the icons back to the Main Tree to remove them from the configuration.

5. After you select the data drives for your arrays and define your hot-spare drives, click on the **Next** button.

If you change your mind, you can:

- Remove a specific drive from a newly defined array or delete an entire newly defined array. To do this, click on the **Back** button, use the right mouse button to click on the specific drive or Array icon in the Main Panel on the right, and then select **Remove from New Array** or **Delete New Array**.
  - Remove a specific hot-spare drive or all newly defined hot-spare drives. To do this, click on the **Back** button, use the right mouse button to click on the Hot-Spare Drive icon in the Main Panel on the right, and then select **Remove New Hot-Spare Drive** or **Remove All New Hot-Spare Drives**.
6. Select a RAID level for the logical drive from the RAID pull-down menu in the Main Panel. (See “Supported RAID Levels” on page 3 for descriptions of the supported levels.)

7. Move the sliding bar in the Main Panel from right to left to allot data and parity space for the logical drive.

**Notes:**

- a. You can define from one to eight logical drives.
  - b. Some operating systems have size limitations for logical drives. Before you save the configuration, you might want to verify that the size of the logical drive is appropriate for your operating system. See your operating-system documentation for more detailed information.
  - c. Typically, the first logical drive defined on the first ServeRAID adapter or controller found by system BIOS during startup will be your startup (boot) drive.
8. If free space is available and you want to define another logical drive, click on the **Add Logical Drive** button in the Main Panel.
  9. Repeat steps 6, 7, and 8 for each logical drive that you want to define; then, continue with step 10.
  10. Click on the **Next** button.
  11. Review the information that appears on the Configuration Summary screen.  
**Note:** To change the configuration, click on a **Modify** icon button.
  12. Click on the **Apply** button to accept and save the configuration.
  13. If you have not already done so, install your operating system. See the server documentation or the documentation provided with your operating system for more information.

After you install your operating system, see Chapter 3, “Installing Device Drivers and Utility Programs” on page 31 (or the installation instructions provided with your server) for information about installing the ServeRAID device drivers and utility programs.

## Using the Information Mode

You can use the Information mode to view the configuration information for the server, ServeRAID controllers, arrays, logical drives, hot-spare drives, and physical drives that make up your ServeRAID subsystem. You also can use this mode to change some of the ServeRAID controller settings.

### Viewing the Device and Configuration Information

To view the current settings:

1. Click on the plus (+) box next to the object in the Main Tree to expand that portion of the tree.
2. Click on the icon for the server, ServeRAID controller, array, logical drive, hot-spare drive, or physical drive to view its current settings.

Detailed information about the selected device will appear in the Main Panel on the right. The following pages provide descriptions of the device information that might appear.

## System Information Panel

When you select the server from the Main Tree, the following information appears in the Main Panel on the right:

- **System Name** shows the name you assigned to the server.
- **Number of Controllers** shows the total number of ServeRAID adapters and controllers found in the server.

## ServeRAID Controller Information Panel

When you select a ServeRAID controller from the Main Tree, the following information appears in the Main Panel on the right:

- **Controller Type** shows the type of ServeRAID controller, such as ServeRAID II, ServeRAID-3H, or ServeRAID-3L.
- **BIOS Version** shows the level of basic input/output system code currently installed for the ServeRAID controller.
- **Firmware Version** shows the level of microcode currently installed for the ServeRAID controller.
- **Physical Slot** shows the actual physical slot location for the ServeRAID controller; for example, PCI slot 4.
- **Battery Backup Write Cache** provides information about the optional battery-backup cache device. Statements such as Installed, Not Installed, Defective, or Replace Battery might appear for this feature.
- **Read-Ahead Cache Mode** shows the current setting, Enabled or Disabled, for the read-ahead cache mode. (See page 23 for more information.)
- **Stripe-Unit Size** shows the current setting of 8 KB, 16 KB, 32 KB, or 64 KB for the stripe-unit size. (See “Interleave Depth and Stripe-Unit Size” on page 3 and page 23 for more information.)
- **Rebuild Rate** shows the current setting (High, Medium, or Low) for the rebuild rate. (See page 23 for more information.)
- **Hot-Swap Rebuild** shows the current setting, Enabled or Disabled, for the hot-swap rebuild feature. This feature is set to Enabled when the level of ServeRAID firmware in use supports this feature.
- **Data Scrubbing** shows the current setting, Enabled or Disabled, for the data-scrubbing feature. This feature is set to Enabled when the level of ServeRAID firmware in use supports this feature. The data-scrubbing feature continuously reads all sectors of RAID level-1 and RAID level-5 logical drives “in the background” while your system is running. If a defective sector is found, it is automatically repaired. With this feature Enabled, you no longer need to synchronize RAID level-1 and RAID level-5 logical drives on a weekly basis.
- **Auto-Synchronization** shows the setting for this feature. The auto-synchronization feature always appears as Enabled when the level of ServeRAID firmware in use supports this feature. (See page 25 for more information.)
- **Clustering** shows the current setting, Enabled or Disabled, for this feature.
- **ServeRAID Controller Host ID** appears only when the controller is part of a shared-disk cluster.

- **Cluster Partner Host ID** appears only when the ServeRAID controller is configured for use in a shared-disk cluster.
- **Number of Arrays** shows the total number of arrays (1 to 8) defined for this ServeRAID controller.
- **Number of Logical Drives** shows the total number of logical drives (1 to 8) defined for this ServeRAID controller.
- **Number of Hot-Spare Drives** shows the total number of hot-spare drives defined for this ServeRAID controller.

### Array Information Panel

When you select the Arrays icon from the Main Tree, general information about all configured arrays (such as size, free space, and number of logical drives in each array) appears in the Main Panel on the right.

When you select a specific array from the Main Tree, the following information appears in the Main Panel on the right:

- **Array Letter** shows the letter (A through H) assigned to the array.
- **Array Size in MB** shows the total size, in MB, of the array.
- **Free Space in MB** shows the amount of free space available in the array.
- **Number of Logical Drives** shows the number of logical drives (1 to 8) defined for the array.
- **Number of Physical Drives** shows the number of physical drives grouped in the array.

### Logical Drive Information Panel

When you select a logical drive from the Main Tree, the following information appears in the Main Panel on the right:

- **Logical Drive Number** shows the number (1 to 8) assigned to the logical drive.
- **Array Letter** shows the letter (A through H) assigned to the array in which the logical drive resides.
- **Drive State** shows the current state of the logical drive. See “Logical Drive State Descriptions” on page 18 for descriptions of the states that might appear in this field.
- **RAID Level** shows the RAID level (0, 1, or 5) assigned to the logical drive.
- **Data Space in MB** shows the amount of space in the logical drive defined for data storage.
- **Parity Space in MB** shows the amount of space in the logical drive allocated for parity storage.
- **Date Created** shows the date that you created the logical drive.
- **Write-Cache Mode** shows the current setting, write through or write back, for the logical drive.
- **Battery Backup Write Cache** shows the current setting, Enabled or Disabled, for the battery backup cache device. When the battery backup cache device is installed, write cache is set to the write-back mode.



- **Merge-Group Number** appears if the ServeRAID controller is part of a cluster. The valid settings in the Shared state are 1 through 8. Valid settings in the Non-Shared state are 201 through 215.
- **Merge-Group State** shows the current setting, Shared or Non-Shared, for this parameter.

### Hot-Spare Drive Information Panel

When you select the Hot-Spare Drives icon from the Main Tree, information about the total number of functional hot-spare and standby hot-spare drives defined for the ServeRAID controller appears in the Main Panel on the right.

When you select a specific hot-spare drive from the Main Tree, the following information appears in the Main Panel on the right:

- **SCSI ID** shows the SCSI ID assigned to the drive.
- **Channel** shows the SCSI channel to which the hot-spare drive is attached.
- **Drive Type** shows the type of physical drive. For a hot spare, this will always appear as Hard Disk Drive.
- **Size in MB** shows the total capacity of the hard disk drive in MB.
- **Drive State** shows the drive state. For a hot spare, this will always appear as Hot Spare.
- **Vendor** shows characters that represent the drive manufacturer.
- **Product or Model Number** shows characters that represent the product or model number for the drive.
- **Serial Number** shows the serial number for the drive.
- **Drive Firmware Level** shows the current level of microcode in use for the drive.
- **PFA Error** indicates the status, Yes or No, for predictive-failure alerts. Yes indicates that PFA errors were detected and that you should plan to replace the device. No indicates that PFA errors were not found.

### Physical Drive Information Panel

When you select the Physical Drives icon from the Main Tree, information about the total number of drives connected to each channel of the ServeRAID adapter or controller appears in the Main Panel on the right.

When you select a specific physical drive from the Main Tree, the following information appears in the Main Panel on the right:

- **SCSI ID** shows the SCSI ID assigned to the drive.
- **Channel** shows the SCSI channel to which the physical drive is attached.
- **Drive Type** shows the type of physical drive (Hard Disk, CD-ROM, Tape, Enclosure, Removable-Media, or Unknown) selected.
- **Size in MB** shows the total capacity of the drive, in MB, if the drive is a hard disk. No value will appear if the physical drive is a CD-ROM or Tape drive.
- **Drive State** shows the current state of the physical drive. See “Physical Drive State Descriptions” on page 19 for descriptions of the states that might appear in this field.

- **Array Letter** shows the letter (A through H) assigned to the array in which the physical drive resides, if the physical drive is part of an array.
- **Vendor** shows characters that represent the drive manufacturer.
- **Product or Model Number** shows characters that represent the product or model number for the drive.
- **Serial Number** shows the serial number for the drive.
- **Drive Firmware Level** shows the current level of microcode in use for the drive.
- **PFA Error** indicates the status, Yes or No, for predictive-failure alerts. Yes indicates that PFA errors were detected and that you should plan to replace the device. No indicates that PFA errors were not found.

### Channel Information Panel

When you select a SCSI Channel icon from the Main Tree, the following information appears in the Main Panel on the right:

- **Number of Drives** shows the number of physical drives currently attached to the SCSI channel.
- **SCSI Initiator ID** shows the initiator ID for the SCSI channel.
- **SCSI Transfer Speed** shows the current SCSI transfer setting (Optimal, Ultra2 SCSI, UltraSCSI, Fast SCSI 2, or SCSI 2) for the entire channel. See page 26 for more information.

### Drive States

This section provides descriptions of the logical and physical drive states.

**Logical Drive State Descriptions:** The following table provides descriptions of the valid logical drive states.

Drive State	Meaning
Blocked	During a rebuild operation, the ServeRAID controller sets the state of any RAID level-0 logical drives associated with a failed array to the Blocked state; then, it reconstructs the data that was stored in RAID level-1 and RAID level-5 logical drives.  After the Rebuild operation completes, you can unblock the RAID level-0 logical drives, and access them once again. However, the logical drive might contain damaged data. You must either re-create, install, or restore the data from the most recent backup disk or tape to the RAID level-0 logical drive.
Critical Migrating	A logical drive in the critical state that is undergoing a logical drive migration (LDM).
Critical System	The ServeRAID controller uses this reserved state during a logical drive migration (LDM).

Drive State	Meaning
Critical	<p>A RAID level-1 or level-5 logical drive that contains a defunct physical drive is in the critical state. A critical logical drive is accessible, despite a physical drive failure.</p> <p><b>Attention:</b> If the state of the logical drive is critical, replace and rebuild the defunct drive as soon as possible to prevent the loss of data. If a second drive fails before the first rebuild completes, you might lose valuable data. See “Rebuilding a Defunct Drive” on page 99 for more information.</p>
Migrating	The logical drive is undergoing a logical drive migration; that is, a change in RAID levels, a change in logical drive size, or an increase in free space.
Offline	The logical drive is offline and not accessible. This state occurs if one or more physical drives in a RAID level-0 logical drive is defunct. This state also occurs when two or more physical drives in a RAID level-1 or level-5 logical drive are defunct.
Okay	The logical drive is okay. It is in a good, functional state.
System	The ServeRAID controller uses this reserved state during logical drive migration (LDM).

If the state of the logical drive is critical you must replace and rebuild the defunct drive. See “Rebuilding a Defunct Drive” on page 99 for more information.

**Physical Drive State Descriptions:** The following table provides descriptions of the valid physical drive states.

Drive State	Meaning
Defunct	<p>A physical hard disk drive in the Online, Hot-Spare, or Rebuild state has become defunct. It does not respond to commands, which means that the ServeRAID controller cannot communicate properly with the drive.</p> <p>A hard disk drive in the Defunct state does not necessarily mean that you need to replace the drive. Before you replace the drive, ensure that:</p> <ol style="list-style-type: none"> <li>1. All cables are connected properly to the server backplane and to the hard disk drive. Also, check to ensure that all cables inside the server are connected properly.</li> <li>2. The hot-swap drive trays are seated properly in the drive bay.</li> <li>3. The termination for each device on the SCSI channel is set properly.</li> <li>4. Each device on the SCSI channel has its own, unique SCSI ID.</li> </ol> <p>If the hard disk drive still does not function after you perform these steps, replace the drive.</p>
Empty	No device is present in the bay.
Hot Spare	A Hot-Spare drive is a hard disk drive that is defined for automatic use when a similar drive fails.

Drive State	Meaning
Online	The drive is Online. It is functioning properly and is part of an array.
Rebuilding	The drive is being rebuilt. For more information on rebuilding a drive, refer to “Rebuilding a Defunct Drive” on page 99.
Ready	The ServeRAID controller recognizes a Ready drive as being available for definition.
Standby	A Standby drive is a hard disk drive that the ServeRAID controller has spun down.
Standby Hot Spare	A Standby Hot Spare is a Hot-Spare drive that the ServeRAID controller has spun down. If an Online drive becomes Defunct and no suitable Hot-Spare drive is available, a Standby Hot-Spare drive of the appropriate size automatically spins up, and enters the Rebuild state.

## Changing the ServeRAID Configuration Settings

To change the settings:

1. Click on the plus (+) box next to the object in the Main Tree to expand the tree.
2. Click on the icon in the Main Tree for the ServeRAID controller, array, logical drive, hot-spare drive, or physical drive that you want to change.
3. Click on **Actions** in the File Menu; then, make a selection from the pull-down menu.

or

Using the right mouse button, click on the object in the Main Tree; then, make a selection from the pop-up list.

See “Using the Menu Bar” on page 21 for descriptions of the choices available from the Actions pull-down menu.

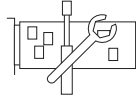
## Using the Tool Bar

Descriptions of the quick-path icons provided on the Tool Bar are as follows:



**Save the Configuration Event Log:** This icon appears in the Information mode. When you select this icon, a pop-up window appears and lets you specify a file name and path for the ServeRAID Configuration Event Log.

**Note:** This feature currently is not supported on IBM Netfinity 3000, 3500, 5000, and 5500 servers; however, IBM intends to support this feature on these server models in the near future. The updated BIOS code needed to support this feature will be made available on the World Wide Web. (See page 32 for the instructions needed to access the IBM support page.)

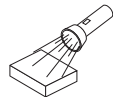


**Configure the ServeRAID Controller:** This icon appears in the Information mode. When you select this icon, the configuration program switches from the Information mode to the Configuration mode. A message will appear at the bottom of the Main Panel if no Ready drives are available for the selected ServeRAID controller. If this occurs, you can click on the Cancel button to return to the Information mode or select another ServeRAID controller.



**Configure for Clustering:** This icon appears in the Information mode. You can select this icon to define the ServeRAID controller for use in a dual-node, high-availability, shared-disk cluster environment. Detailed instructions for using the clustering features are provided in the *IBM Netfinity High-Availability Cluster Solution Installation and User's Guide*. You can obtain a copy of this manual at the following address on the World Wide Web:

<http://www.pc.ibm.com/netfinity/clustering>



**Scan for New or Removed Ready Drives:** This icon appears in the Information mode. When you select a ServeRAID controller from the Main Tree and click on this icon, the configuration program will scan the individual channel, or all channels, on the controller for new or removed Ready drives. Use this feature whenever you physically change the configuration of your ServeRAID subsystem, for example, when you physically install or remove one or more SCSI drives.



**Create an Array:** This icon appears in the Information mode if you select a controller from the Main Tree and that controller has Ready drives available.



**Help:** This icon appears in both the Information and Configuration modes. Select this icon to access the online ServeRAID Help facility. Task-oriented Help is available from many of the pop-up windows that appear during the configuration process; and, you also can obtain context-sensitive Help by selecting an item and then pressing the **F1** key.

## Using the Menu Bar

Descriptions of the choices available from the Menu Bar are as follows:

**File** The File pull-down menu contains the following choices in the Information mode:

- **Save Configuration Event Log:** Select this choice to save configuration event information (such as the start time and completion time for a rebuild operation) to a file.
- **Clear Configuration Event Log:** Select this choice to erase the event information stored in the Configuration Event Log.
- **Exit:** Select this choice to exit from the ServeRAID Configuration Program.

**View** The View pull-down menu contains the following choices in both the Information and Configuration modes:

- **Small Icons:** This is the default setting. When you select this

choice, small icons appear in the Main Tree on the left and the Main Panel on the right.

- **Large Icons:** Select this choice to display large icons in the Main Tree on the left and the Main Panel on the right.
- **Options:** Select this choice to change the Initialization and Synchronization mode, as follows:
  - **Basic:** This is the default setting. When this mode is Enabled, the configuration program automatically initializes each new logical drive and prevents access to the manual initialization and synchronization functions. This choice also forces the synchronization of all new RAID level-5 logical drives attached to older ServeRAID adapter or controller models that do not support the auto-synchronization feature.
  - **Advanced:** When Enabled, this choice lets you select to automatically initialize new logical drives and force the synchronization of all new RAID level-5 logical drives before exiting the ServeRAID Configuration Program.

**Attention:**

If you disable Automatic Initialization, the ServeRAID Configuration Program will not initialize each logical drive (by writing zeros to the first 1024 sectors of the logical drive) when it is created. You still must initialize all newly defined logical drives before storing data. If you disable the synchronization feature and the level of firmware being used by the ServeRAID adapter or controller does not support the auto-synchronization feature, you still must synchronize all RAID level-5 logical drives before storing data.

**Actions** All choices available from the Actions pull-down menu also are available from the pop-up lists that appear when you use the right mouse button and click on the object in the Main Tree.

The following choices appear on the Actions pull-down menu when you select a ServeRAID controller from the Main Tree:

- **Configure the ServeRAID Controller:** This choice is available in the Information mode only. It appears on the pull-down menu when there are Ready drives and logical-drive slots still available for the ServeRAID controller.
- **Configure for Clustering:** This choice is available in the Information mode only. You can select this choice to define the ServeRAID controller for use in a high-availability, shared-disk cluster environment. Detailed instructions for using the clustering features are provided in the *IBM Netfinity High-Availability Cluster Solution Installation and User's Guide*. You can obtain a copy of this manual at the following address on the World Wide Web:  
<http://www.pc.ibm.com/netfinity/clustering>
- **Initialize the Controller Configuration:** This choice is available in both the Configuration and Information modes. Select this choice to delete the ServeRAID controller configuration.

**Attention:**

After you initialize the controller configuration, you will not have access to any data stored on the logical drives attached to the selected ServeRAID adapter or controller.

This choice deletes the existing configuration information, sets all functional hard disk drives attached to the controller to the Ready state, and deletes all logical drives defined for the controller.

This choice *does not* change any of the ServeRAID adapter or controller settings (such as the stripe-unit size, rebuild rate, and so on) from their current or customized values.

- **Copy the Configuration from the Drives to the Controller:** This choice is available in the Information mode only; it copies the configuration information stored on the hard disk drives to the ServeRAID controller. This function is useful when you import previously configured drives from another system, or when you replace the ServeRAID adapter or controller.
- **Disable or Enable Read-Ahead Cache Mode:** These choices are available in the Information mode only. When read-ahead cache is set to Enabled (default setting), the ServeRAID controller transfers data from a disk to its local cache in increments equal to the stripe-unit size. This provides excellent overall performance when workloads are steady and sequential. However, if the workload is random or the system I/O requests are smaller than the stripe-unit size, reading ahead to the end of the stripe might degrade performance. When read-ahead cache is set to Disabled, the ServeRAID controller transfers data from a disk to local cache in increments equal to the system I/O request size, without reading ahead to the end of the stripe.
- **Change the Rebuild Rate:** This choice is available in the Information mode only. You can select this choice to set the priority for Rebuild operations to High (default), Medium, or Low.
  - When the rebuild rate is set to High, the rebuild I/O request gets high priority in the execution order.
  - When the rebuild request is set from High to Medium in a heavily loaded system, it can increase the rebuild time, but provide better system performance.
  - When the rebuild request is set from High or Medium to Low in a moderate to heavily loaded system, it can increase the disk rebuild time, but provide better system performance.
- **Change the Stripe-Unit Size:** This choice is available in the Information mode only.

**Attention:**

After you configure an array and store data on the logical drives, you cannot change the stripe-unit size without destroying data in the logical drives.

The stripe-unit size is the amount of data written on a given disk before writing on the next disk. To maximize the overall performance, choose a size that is close to the size of the system I/O request. You can set the stripe-unit size to 8 KB, 16 KB, 32 KB, or 64 KB. When the stripe-unit size is 8 KB (the default setting) or 16

KB, the maximum number of physical drives supported in an array is 16. When the stripe-unit size is 32 KB or 64 KB, the maximum number of physical drives supported in an array is eight. (See “Interleave Depth and Stripe-Unit Size” on page 3 for more information.)

- **Scan for New or Removed Ready Drives:** This choice is available in the Information mode only. When you select this choice, the configuration program scans all channels on the ServeRAID controller for new or removed Ready drives.

The following choices appear on the Actions pull-down menu when you select the Arrays icon or a specific array icon from the Main Tree:

- **Create an Array:** This choice appears in the Information mode if you select the Arrays icon and Ready drives are available. When you select this choice, the configuration program switches from the Information mode to the Configuration mode.
- **Delete All Arrays:** This choice is available in the Information mode only. It appears on the Actions pull-down menu if you select the Arrays icon from the Main Tree and arrays are defined for the controller.
- **Delete Array:** This choice is available in the Information mode only. It appears on the Actions pull-down menu when you select a specific array icon from the Main Tree.

The following choices appear on the Actions pull-down menu when you select the Logical Drives icon or a specific logical drive icon from the Main Tree:

- **Create a Logical Drive in Array:** This choice appears on the Actions pull-down menu in the Information mode if you select the Logical Drives icon and free space is available in one or more arrays.
- **Change Write-Cache Mode to Write Through or Write Back:** These choices are available in the Information mode when you select a specific logical drive icon from the Main Tree.

When this feature is set to the write-through mode, the completion status of a write command is sent *after* the data is written to the hard disk drive. Under certain workloads, you can improve performance by changing this setting to the write-back mode, where the completion status of a write command is sent *after* the data is copied to cache memory, but *before* the data is actually written to the storage device.

**Attention:**

1. You might lose data if a power outage occurs while using the write-back mode without a battery-backup cache device.
  2. If you do not have a battery-backup cache installed and Enabled and you set this feature to the write-back mode, wait at least 10 seconds after your last operation before you turn off your system. Failure to follow this practice can result in lost data.
- **Synchronize:** This choice is available in the Information mode when you select a logical drive from the Main Tree and the following conditions are both true:



- The ServeRAID adapter or controller does not support the auto-synchronization feature.
- You previously selected Options from the View pull-down menu and disabled the “Synchronize all new RAID level-5 logical drives” setting.

Synchronizing a logical drive verifies that the data redundancy for the logical drive is correct. You must synchronize all RAID level-5 logical drives before storing data. (See page 15 for more information.)

- **Initialize:** This choice is available in the Information mode when you select a logical drive from the Main Tree and you previously selected Options from the View pull-down menu and disabled the “Automatically initialize new logical drives” setting.
- **Unblock the Logical Drive:** This choice appears in the Information mode when you select a specific logical drive that is in the Blocked state. You can select this choice to change the Drive Access setting for the RAID level-0 logical drive from Blocked to Unblocked. During a rebuild operation, the ServeRAID controller sets the state of any RAID level-0 logical drives associated with a failed array to the Blocked state.

After the Rebuild operation completes, you can unblock the RAID level-0 logical drives, and access them once again. However, the logical drive might contain damaged data. You must either re-create, install, or restore the data from the most recent backup disk or tape to the RAID level-0 logical drive.

The following choice appears on the Actions pull-down menu when you select a hot-spare drive from the Main Tree:

- **Remove from Hot-Spare State:** This choice is available in the Information mode only. Select this choice to remove a hot-spare drive from the configuration and set the drive state back to Ready.

The following choices appear on the Actions pull-down menu when you select a physical drive, a physical drive icon, or a SCSI channel icon from the Main Tree:

- **Set Drive State to Hot Spare:** This choice is available in the Information mode only. It appears when the physical drive that you select from the Main Tree is in the Ready state. You can select this choice to add the drive to the configuration and to change its state from Ready to Hot Spare.
- **Set Drive State to Online:** This choice appears in the Information mode, and you can use it to change the state of a drive from Defunct to Online.

**Attention:**

You might lose data by setting a Defunct physical drive that is part of an array to Online.

- **Replace Drive and Rebuild:** This choice is available in the Information mode only. Select this choice when you want to physically remove a defunct drive from the system and install a good drive in its place.

- **Change the SCSI Transfer Speed:** This choice is available in the Information mode only. It appears when you select a SCSI Channel icon. You can select this choice to change the transfer speed from its default value of Optimal. When the transfer speed is set to Optimal, the ServeRAID adapter or controller determines the best transfer speed, based on the types of SCSI drives and storage enclosures in use. Choices available are Ultra2 SCSI, UltraSCSI, Fast SCSI 2, and SCSI 2.
  - **Remove Defunct Drive:** This choice appears in the Information mode only. After you physically remove a drive, select this choice to delete the drive information from the configuration.
  - **Replace Defunct Drive:** This choice appears in the Information mode only. Select this choice to physically replace a defunct disk drive.
- Note:** Always replace a defunct drive with a drive of equal or greater capacity.
- **Scan for New or Removed Ready Drives:** This choice is available in the Information mode only. When you select this choice, the configuration program scans the individual channel or all channels on the ServeRAID controller for new or removed Ready drives.

**Help** The following choices are available from the Help pull-down menu:

- **Contents:** Select this choice to access the online Help facility. This choice is available in both the Information and Configuration modes. Task-oriented Help is available from many of the pop-up windows that appear during the configuration process; and, you also can obtain context-sensitive Help by selecting an item and then pressing the **F1** key.
- **About:** Select this choice to view the version number and copyright information for the ServeRAID Configuration Program. This choice is available in both the Information and Configuration modes.

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## Using the ServeRAID Mini-Configuration Program

The ServeRAID Mini-Configuration Program is a quick way to display the current settings for the ServeRAID adapter or controller. You also can use this program to perform a limited set of the configuration functions without using the *ServeRAID Configuration CD*.

To access the Mini-Configuration program:

1. Turn on the server. If the server already is turned on, press **Ctrl+Alt+Del**.
2. When the ServeRAID Mini-Configuration prompt appears, press **Ctrl+i**.
3. If your system contains more than one ServeRAID adapter or controller, a selection screen will appear. To continue:
  - a. Use the Up Arrow (↑) or Down Arrow (↓) key to select an adapter or controller.
  - b. Press **Enter**.

If your system contains only one ServeRAID adapter or controller, or after you select a ServeRAID adapter or controller, the Main Menu appears.

Descriptions of the choices available from the Main Menu of the Mini-Configuration program are as follows:

- **View Controller Status** shows the current status of the ServeRAID adapter or controller. (See “Viewing the Controller Status” for more information.)
  - **View Configuration** shows the current configuration information for the ServeRAID adapter or controller. (See “Viewing the Configuration” on page 28 for more information.)
  - **Advanced Functions** lets you initialize the configuration, import configuration from drives, configure BIOS settings, and view the controller and PCI information. (See “Using the Advanced Configuration Functions” on page 28 for more information.)
4. Use the Up Arrow (↑) or Down Arrow (↓) key to highlight your choice; then, press **Enter**.
  5. Follow the instructions that appear on the screen.
  6. Click on **Exit** to leave the Main Menu.

## Viewing the Controller Status

When you select View Controller Status from the Main Menu, the following information appears on the screen:

- **Unattended** shows the current On/Off state of the Unattended mode.
  - When set to Off, you can choose the recovery method when there is a ServeRAID adapter or controller startup error.
  - When set to On, the ServeRAID adapter or controller chooses the recovery method when a startup error occurs.
- **Read Ahead** shows the current On/Off state of the Read Ahead Cache mode.
- **BootCD** shows the current On/Off state of the Bootable CD-ROM function. (Refer to “Setting the Bootable CD-ROM Feature” on page 29.)
- **CompMode** shows the current BIOS compatibility mode. **On** indicates 8 GB Extended; **Off** indicates 2 GB Limited.
- **Clustered** shows the current On/Off state for clustering.
- **NVRBB** shows the current state of the battery-backup cache option. The default value is Enabled.
- **Boot Blk** shows the version number of the bootable microcode loaded for the ServeRAID adapter or controller.
- **Code Blk** shows the current version number of the firmware loaded for the ServeRAID adapter or controller.
- **Rebuild Rate** shows the current speed setting for rebuilds: High, Medium, or Low.
- **Number of Defunct Drives** shows the current number of Defunct physical drives.
- **Number of Offline Drives** shows the current number of Offline logical drives.
- **Number of Critical Drives** shows the current number of Critical logical drives.

- **Config. Updates** shows the number of times that the configuration has been changed since it has been initialized. When you initialize the configuration, the Config. Update resets to zero.
- **Flash Pgms** shows the current number of times that the Flash EEPROM has been written.
- **Locked, Bad Stripe, or Blocked Drive** identifies the logical drives that are affected.
  - **Bad Stripe Drives** indicates the area of a logical drive that is inaccessible.
  - **Locked Stripe Drives** is a reserved field.
  - **Blocked Drives** indicates the logical drives that are blocked. You must unblock a blocked drive before you can use it. See “Logical Drive State Descriptions” on page 18 for more information.

## Viewing the Configuration

You can select View Configuration from the Main Menu to view the number of each logical drive, and to view the size, RAID level, state, stripe-unit size, write policy, read-ahead status, and creation date for each logical drive.

## Using the Advanced Configuration Functions

You can select the Advanced Functions choice to reset the ServeRAID adapter or controller, initialize the configuration, import the configuration information from the drives, configure BIOS settings, and view the adapter, controller, or PCI information.

When you select the Advanced Functions choice from the Main Menu, the following choices appear on the screen.

### Attention:

Be careful when making selections from this menu. If you change the configuration, you might lose data.

- **Initialize Configuration** lets you reset the configuration. You will not have access to any data stored on the logical drives attached to the selected ServeRAID adapter or controller.
 

This choice deletes the existing configuration information, sets all functional hard disk drives attached to the controller to the Ready state, and deletes all logical drives defined for the controller.

This choice *does not* change any of the ServeRAID adapter or controller settings (such as the stripe-unit size, rebuild rate, and so on) from their current or customized values.
- **Import Configuration from Drive** reads the most common configuration from the drives in the system and copies it to the ServeRAID adapter or controller NVRAM and EEPROM module.
- **Configure BIOS Settings** lets you modify the BIOS settings, such as the Bootable CD-ROM and INT13 Extensions settings, for the ServeRAID adapter or controller. (See “Setting the Bootable CD-ROM Feature” on page 29 for more information.)

### Notes:

1. The Multiple Controller mode has two settings: Erase and Shrink. When this parameter is set to Erase, redundant copies of the ServeRAID BIOS are erased. When this parameter is set to Shrink, the extra copies of the ServeRAID BIOS are removed from memory, but stored for future use. When you have multiple ServeRAID adapters and controllers installed, you need only one active copy of ServeRAID BIOS. However, to ensure that you will have a copy of the ServeRAID BIOS available if your active copy becomes defective or unavailable, leave the Multiple Controller parameter set to Shrink.
  2. Only one adapter or controller in the system can support the INT13 extensions.
- **View Controller and PCI Information** shows the ServeRAID adapter or controller hardware and PCI register information.
  - **Exit** lets you exit the Mini-Configuration program.

### Setting the Bootable CD-ROM Feature

When you attach a CD-ROM drive to the ServeRAID adapter or controller and set the Bootable CD-ROM feature to Yes, the ServeRAID adapter or controller will attempt to start a CD that has a bootable startup partition, if no other adapter or controller in the system is currently using INT13 extensions. Only one adapter or controller in the system can support the INT13 extensions.

To enable the Bootable CD-ROM feature:

1. Select **Advanced Functions** from the Main Menu of the Mini-Configuration program.
2. Select **Configure BIOS Settings** from the Advanced Functions menu.
3. Use the Up Arrow (↑) and Down Arrow (↓) keys to highlight **BIOS Support for Bootable CD-ROM**; then, press **Enter** to change No to Yes.  
**Note:** This also changes No to Yes next to **Display Boot CD-ROM Menu** and **BIOS Support for INT13 Extensions**.
4. Ensure that the screen has Yes next to **BIOS Support for Reading Partition Tables**. If not, use the Up Arrow (↑) and Down Arrow (↓) keys to highlight **BIOS Support for Reading Partition Tables**; then, press **Enter** to change No to Yes.  
**Note:** You must perform this next step to save the new settings.
5. Highlight **Save Configuration to the ServeRAID Controller**; then, press **Enter**. The program displays a Configuration Saved message, and then returns you to the Main Menu of the Mini-Configuration program.
6. Press **Ctrl+Alt+Del** to restart the system.



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## Chapter 3. Installing Device Drivers and Utility Programs

This chapter provides information about the device drivers and utility programs available for the IBM ServeRAID adapters and controllers.

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## IBM ServeRAID Utility Programs

This section contains information about the device drivers and utility programs available for the ServeRAID adapters and controllers.

### Obtaining ServeRAID Updates

IBM periodically makes updated versions of the ServeRAID device drivers and utility programs available from the IBM Support page on the World Wide Web. In addition to the updated device drivers and utility programs, there are also two ServeRAID command-line programs, IPSSSEND and IPSMON, available from the World Wide Web. These programs are both on the *IBM ServeRAID Command Line Programs Diskette*.

You can download the most current versions of the ServeRAID device drivers and utility programs or a copy of the *IBM ServeRAID Command Line Programs Diskette* from the following address on the World Wide Web:

<http://www.pc.ibm.com/support>

From the IBM Support page:

1. Select **IBM Server Support**; then, select **Server Options** from the Family menu.
2. Select **Downloadable Files**; then, select **ServeRAID**.

---

## Administration and Monitoring Program

The IBM ServeRAID Administration and Monitoring Program monitors your ServeRAID adapters and controllers while your network operating system is up and running.

This section provides information about the IBM ServeRAID Administration and Monitoring Program files for the ServeRAID adapters and controllers. You can use these files with the Windows NT, Windows 95, OS/2, Novell NetWare, SCO OpenServer, and SCO UnixWare operating systems.

### Programs for Windows NT and Windows 95

The ServeRAID program files available for Windows NT consist of the ServeRAID Administration and Monitoring Program, device drivers, background-server components, and the IPSSSEND and IPSMON command-line programs. (See "IPSSSEND and IPSMON Programs" on page 52 for more information.)

The IBM ServeRAID Administration and Monitoring Program for Microsoft Windows NT or Windows 95 is called the WIN32-Based program. This program provides a graphical interface that enables you to monitor ServeRAID configuration changes being performed on your server while your server is fully operational. You can create an array, delete an array, create a logical drive, change the RAID level, dynamically increase the logical drive size, rebuild an array, and perform other basic ServeRAID configuration functions.

You can run the WIN32-Based program in the stand-alone mode *only* on a Windows NT server. Or, you can run the WIN32-Based program remotely on a Windows NT or Windows 95 client and access the client from a server that has



TCP/IP, a background-server component (see “Background-Server Components” on page 33), and one of the following operating systems installed:

- Microsoft Windows NT
- IBM OS/2 Warp Server and OS/2 LAN Server
- Novell NetWare 3.12 and 4.1X
- SCO UnixWare 7.0
- SCO OpenServer 5.0.X

## Background-Server Components

The background-server components are operating-system specific program files that enable servers running Windows NT, OS/2, NetWare, OpenServer, or UnixWare to act as the TCP/IP interface for a remote client that has the WIN32-Based program installed. These files install automatically when you use the instructions in this chapter to install the ServeRAID operating-system specific device drivers.

### Notes:

1. Only one remote session at a time can access ServeRAID adapters and controllers using the background-server component.
2. It is possible to run multiple background-server components with each component using a different TCP/IP port; however, to avoid damage to your data, you must restrict your administration activities to one remote client and use the other remote clients for monitoring purposes only.

## Programs for OS/2 and NetWare

The ServeRAID program files available for the OS/2 and NetWare operating systems consist of the Administration and Monitoring program, device drivers, background-server components, and the IPSSSEND and IPSSMON command-line programs. (See “IPSSSEND and IPSSMON Programs” on page 52 for more information.)

The Administration and Monitoring Program files for OS/2 and NetWare run only on the system containing a ServeRAID adapter or controller (stand-alone mode). These ServeRAID programs provide a limited subset of the functions provided in the WIN32-Based program, and they install automatically when you use the instructions in this chapter to install the ServeRAID device driver for OS/2 or NetWare.

A good way to use these operating-system specific programs is to run the OS/2 or NetWare versions of the Administration and Monitoring Program files locally on the server, while using the WIN32-Based program on a remote Windows NT or Windows 95 client. This method enables you to take advantage of the more advanced administration and monitoring functions provided in the WIN32-Based program.

## Programs for OpenServer and UnixWare

The ServeRAID program files available for OpenServer and UnixWare consist of device drivers, background-server components, and the IPSSSEND and IPSSMON command-line programs. (See “IPSSSEND and IPSSMON Programs” on page 52 for more information.)

The background-server components for SCO operating systems install automatically when you use the instructions in this chapter to install the ServeRAID OpenServer or UnixWare device drivers.

To use the ServeRAID Administration and Monitoring Program with a SCO operating system, you must first install the WIN32-Based program on a Windows NT or Windows 95 client. Then, attach the Windows NT or Windows 95 client to the same network as the OpenServer or UnixWare system that contains the ServeRAID adapter or controller. You must perform all administration functions from the remote WIN32-Based client.

---

## Installing the ServeRAID WIN32-Based Program

This section provides instructions for installing the ServeRAID WIN32-Based program.

Before you begin the installation.

- Be sure that your ServeRAID adapter or controller is physically installed, properly cabled, and configured.
- Be sure that your network operating system is installed and functional.
- If your network operating system is Windows NT, you can use the ServeRAID WIN32-Based program remotely in the client/server mode or locally in stand-alone mode.
- The ServeRAID adapters and controllers do not support Windows 95. However, you can run the WIN32-Based program remotely on a Windows 95 client attached to a remote server running the OS/2, NetWare, Windows NT, UnixWare, or OpenServer operating system. Use the instructions in this section to install the WIN32-Based program on the Windows 95 client.
- If your network operating system is OS/2, NetWare, OpenServer, or UnixWare, you must run the ServeRAID WIN32-Based program remotely, in the client/server mode.

Other requirements for this environment include:

- A Windows NT or Windows 95 client running the IBM ServeRAID WIN32-Based program  
Use the instructions in this section to install the WIN32-Based program.
- A network adapter with proper cabling for access to the remote systems
- The TCP/IP networking protocol installed on both the local and remote systems
- The ServeRAID device driver and background-server component installed on the remote system

Refer to “Installing ServeRAID Device Drivers” on page 35 for more information.

If you are using Windows NT, use the installation instructions and ServerGuide CDs provided with your server to install the Administration and Monitoring program. If you want to install the program on a remote Windows 95 client, use the ServerGuide Diskette Factory to create an *IBM ServeRAID Administration and*

*Monitoring Diskette*; then, use the instructions in this section to install the Administration and Monitoring program.

To install the ServeRAID WIN32-Based program:

1. Turn on the system and allow Windows NT or Windows 95 to start.
2. Insert the *IBM ServeRAID Administration and Monitoring Diskette* into the diskette drive.
3. Click on **Start**, click on **Run**; then, type the following:  
a:\setup  
**Note:** The *a* represents the letter assignment for the diskette drive.
4. Press **Enter**; then, follow the instructions that appear on the screen to complete the installation.

Refer to Chapter 4, "Starting and Using the Utility Programs" on page 57 for more information about the WIN32-Based program.

---

## Installing ServeRAID Device Drivers

This section provides the instructions for installing the device drivers for Windows NT, NetWare, OS/2, OpenServer, and UnixWare. The OS/2 and NetWare Administration and Monitoring Program files and background-server components install automatically when you use the instructions in this section to install the ServeRAID device drivers for OS/2 and NetWare. The Windows NT, UnixWare, and OpenServer background-server components install automatically when you use the instructions in this chapter to install the ServeRAID device drivers for Windows NT, UnixWare, and OpenServer.

<b>When using:</b>	<b>Go to:</b>
Windows NT	"Installing Device Drivers for Windows NT"
NetWare	"Installing Device Drivers for NetWare" on page 36
OS/2	"Installing Device Drivers for OS/2" on page 40
OpenServer	"Installing Device Drivers for OpenServer" on page 43
UnixWare	"Installing Device Drivers for UnixWare" on page 46

## Installing Device Drivers for Windows NT

This section provides two sets of instructions for installing the ServeRAID device driver: one that you can use during the initial Windows NT installation and one that you can use if Windows NT already is installed.

The background-server components for Windows NT 3.5X and Windows NT 4.0 install automatically when you use the instructions in this chapter to install the ServeRAID device drivers.

### Installing the Files while Installing Windows NT

To install the ServeRAID files while installing Windows NT:

1. Use the ServerGuide Diskette Factory to create an *IBM ServeRAID Device Driver Diskette*.
2. Insert the Windows NT boot diskette into the diskette drive or insert the bootable Windows NT CD into the CD-ROM drive; then, restart the server.

3. When the message Setup is inspecting your computer's hardware configuration... appears, press the **F6** key.
4. After loading some files, Windows NT displays a screen that allows you to manually specify an adapter. When this screen appears, press **S** to specify additional devices.
5. When prompted in the next window, select **Other** from the list.
6. When prompted to insert the Manufacturer-supplied-hardware support disk, insert the *IBM ServeRAID Device Driver Diskette* into the diskette drive; then, press **Enter**.
7. Select **IBM ServeRAID Adapter**; then, press **Enter**. A message similar to the following will appear. Setup is loading files (IBM ServeRAID Adapter)....
8. When prompted, press **Enter** to continue.
9. Use the instructions provided in the Windows NT manual to complete the normal installation process.
10. After you complete the installation, be sure to apply the latest Service Pack.

### Installing the Files after Installing Windows NT

To install the ServeRAID files after Installing Windows NT:

1. Use the ServerGuide Diskette Factory to create an *IBM ServeRAID Device Driver Diskette*.
2. Insert the *IBM ServeRAID Device Driver Diskette* into the diskette drive.
3. From the Windows NT Start Menu, select **Settings**; then, select **Control Panel**.
4. Select **SCSI Adapter**; then, click on the **Drivers** tab.
5. Click on **Add**; then, click on **Have Disk**.
6. In the **Copy manufacturer's files from** field, type:  
a:\nt
7. Click on **OK**; then in the next dialog box, click on **OK** again.
8. When a message appears asking if you want to use the currently installed device driver or if you want to install a new one, click on **New**.
9. When prompted to enter the full path to the IBM ServeRAID files, type:  
a:\nt
10. Click on **Continue**; then after the device driver installs, restart the system.

### Installing Device Drivers for NetWare

This section provides instructions for installing the ServeRAID device drivers while installing NetWare 3.12 or 4.1X, and instructions for installing the ServeRAID device drivers if NetWare 3.12 or 4.1X already is installed.

The Administration and Monitoring Program files and the background-server components for NetWare install automatically when you use the instructions in this chapter to install the ServeRAID device drivers for NetWare.

## Installing the Files while Installing NetWare 3.12

The ServeRAID device driver for NetWare, IPSRAID.HAM, is in the NetWare directory on the *IBM ServeRAID Device Driver Diskette*. You can use the INSTALL.BAT file, which is also in the NetWare directory on the diskette, to copy all required files to your server directory. The INSTALL.BAT file will modify the STARTUP.NCF file so that it will load the required NetWare modules.

Use the instructions provided in the NetWare 3.12 manual along with the following instructions to install the ServeRAID device driver, background-server component, and Administration and Monitoring Program files while installing NetWare, Version 3.12.

1. Use the ServerGuide Diskette Factory to create an *IBM ServeRAID Device Driver Diskette*.

2. After you create the diskette, type the following at the command prompt to manually create the directory for NetWare:

```
md server.312
```

**Note:** The *SERVER.312* is the default NetWare 3.12 directory. If you are using a different path, be sure to specify the same path throughout the entire NetWare installation process.

3. Press **Enter**.
4. Change to the *SERVER.312* directory on your hard disk; then, insert the *IBM ServeRAID Device Driver Diskette* into the diskette drive.
5. At the operating-system prompt, type:

```
a:
```

**Note:** The *a* represents the drive assignment for the diskette drive that contains the ServeRAID diskette.

6. Press **Enter**. Then, type:

```
cd netware
```

7. Press **Enter**. Then, type:

```
install
```

8. Press **Enter**. Then, follow the instructions that appear on the screen to complete the ServeRAID device driver and program installation.

## Installing the Files after Installing NetWare 3.12

The ServeRAID device driver for NetWare, IPSRAID.HAM, is in the NetWare directory on the *IBM ServeRAID Device Driver Diskette*. You can use the INSTALL.BAT file, which is also in the NetWare directory on the diskette, to copy all of the required files to your server directory. The INSTALL.BAT file will modify the STARTUP.NCF file so that it will load the required NetWare modules.

Use the instructions provided in the NetWare 3.12 manual along with the following instructions to install the ServeRAID device driver, background-server component, and Administration and Monitoring Program files after installing NetWare, Version 3.12.

1. Use the ServerGuide Diskette Factory to create an *IBM ServeRAID Device Driver Diskette*.
2. Insert the *IBM ServeRAID Device Driver Diskette* into the diskette drive.

3. Go to the default NetWare 3.12 directory. To do this, type:  

```
cd\server.312
```

**Note:** The *SERVER.312* is the default NetWare 3.12 directory. If you are using a different path, be sure to specify the same path throughout the installation process.
4. Press **Enter**; then, from the operating-system prompt in the SERVER.312 directory, type:  

```
a:
```

**Note:** The *a* represents the drive assignment for the diskette drive that contains the ServeRAID diskette.
5. Press **Enter**. Then, type:  

```
cd netware
```
6. Press **Enter**. Then, type:  

```
install
```
7. Press **Enter**. Then, follow the instructions that appear on the screen to complete the ServeRAID device driver and program installation.

### Installing the Files while Installing NetWare 4.1X

Use the instructions provided in the NetWare 4.1X manual along with the following instructions to install the ServeRAID device driver, background-server component, and Administration and Monitoring Program files while installing NetWare, Version 4.1X.

1. Use the ServerGuide Diskette Factory to create an *IBM ServeRAID Device Driver Diskette*.
2. Use the instructions provided in the NetWare manual to begin the installation.
3. When the Choose the Server Drivers - Disk Driver prompt appears during the install process, insert the *IBM ServeRAID Device Driver Diskette* into the diskette drive.
4. Select **Select additional or modify selected Disk/LAN drivers**.
5. If IPSRAID appears, select **Deselect a selected driver**.
6. Select **Select an additional driver**; then, press the **Ins** (Insert) key to add an unlisted new device driver.
7. Press **F3** to specify a path; then, type:  

```
a:\netware
```

**Note:** The *a* represents the drive assignment for the diskette drive that contains the ServeRAID diskette.
8. Select **IPSRAID.HAM** from the list of device drivers that appears in the window; then, press **Enter**.  

**Note:** The IPSRAID.HAM and support files will be copied to the system volume.
9. Select **OK** to overwrite the existing files.
10. Follow the instructions in the NetWare manual to complete the installation.

## Installing the Files after Installing NetWare 4.1X

1. Use the ServerGuide Diskette Factory to create an *IBM ServeRAID Device Driver Diskette*.
  2. From the system console, start the NetWare installation utility program by typing:  
`load install`
  3. Press **Enter**.
  4. Insert the *IBM ServeRAID Device Driver Diskette* into the diskette drive.
  5. Select **Driver options** from the Installation Options list.
  6. Select **Configure disk and storage** from the Driver Options pop-up window.
  7. Select **Select an additional driver** from the Additional Drivers Actions pop-up window.
  8. When the next screen appears, press the **Ins** key to install an unlisted driver.
  9. When the next screen appears, press the **F3** key to specify a different path.
  10. In the **Specify a directory path** field, type:  
`a:\netware`
  11. When prompted to select a driver to install, select **IPSRAID.HAM**.
  12. Select **Yes** when prompted to copy the IPSRAID.HAM driver.
  13. When the prompt appears to specify the server boot path, type:  
`c:\nwserver`
- Notes:**
- a. This instruction assumes that you installed NetWare in its default directory. If you did not install NetWare in the NWSERVER directory on drive C, modify step 13 accordingly.
  - b. If any of the files you are installing already exist on the server, NetWare will prompt you to save the older files. Although it is not necessary to save the older files, it usually is a good idea.
14. After the installation program copies all files, you can edit parameters (such as the ServeRAID slot number) from the Driver IPSRAID Parameter Actions screen.
  15. After you edit the parameters, select **Save Parameters and load driver** to load the ServeRAID device driver.
  16. Press **Esc** to exit the installation screens.
- Note:** If you want NetWare to load the ServeRAID device driver automatically during startup, you must add the appropriate LOAD command (for example, `load ipsraid.ham slot=1`) to the NetWare startup command file (usually `C:\NWSERVER\STARTUP.NCF`).

## Installing Device Drivers for OS/2

This section provides two sets of instructions for installing the ServeRAID device driver: one that you can use during the initial OS/2 installation and one that you can use if OS/2 already is installed.

The ServeRAID Administration and Monitoring Program files and background-server component for OS/2 install automatically when you use the instructions in this chapter to install the ServeRAID device driver for OS/2.

### Installing the Files while Installing OS/2

You can use the following instructions to install the ServeRAID device driver and Administration and Monitoring Program files while installing OS/2 Warp Server.

**Note:** If you install these files on a logical drive that has its write policy set to the write-back mode, wait at least 10 seconds after being prompted to press **Ctrl+Alt+Del** before you actually press the keys. Waiting 10 seconds or longer gives the ServeRAID adapter or controller the time needed to flush all dirty-cache pages out to the hard disk.

To install the ServeRAID files while installing OS/2:

1. Use the ServerGuide Diskette Factory to create an *IBM ServeRAID Device Driver Diskette*.
2. Make a copy of the *OS/2 Warp Diskette 1* and label it *Copy of OS/2 Diskette 1*.
3. Copy the IPSRAID.ADD file from the OS2 directory on the *IBM ServeRAID Device Driver Diskette* to the *Copy of OS/2 Diskette 1*.

If there is not enough space, delete files not needed in your installation (such as proprietary CD-ROM or SCSI device drivers). Make sure you remove all entries referring to any device drivers you delete from the CONFIG.SYS file.

4. Edit the CONFIG.SYS file on the *Copy of OS/2 Diskette 1* to add the following lines:

```
BASEDEV=IPSRAID.ADD  
SET COPYFROMFLOPPY=1
```

5. Install OS/2, but when prompted to insert diskette 1, use the updated *Copy of OS/2 Diskette 1*.
6. After you complete the OS/2 installation, insert the *IBM ServeRAID Device Driver Diskette*.
7. From an OS/2 window, type:

a:

**Note:** The *a* represents the drive assignment for the diskette drive that contains the ServeRAID diskette.

8. Press **Enter**. Then, type:  
ddinstal
9. Press **Enter**.

The OS/2 Device Driver Installation window will appear and prompt you for the source and destination drives. The source directory shows where to insert the *IBM ServeRAID Device Driver Diskette*. The destination directory shows where the program will copy the device driver files.



10. Click on **Install**.
  - The program copies the following ServeRAID device driver and program files to the OS/2 subdirectory on your hard disk: IPSRAID.ADD, IPSADM.EXE, and IPSRADM.EXE.
  - The program copies the ServeRAID IPSRADM.HLP Help file to the \OS2\HELP directory.
11. Edit the CONFIG.SYS file and verify that there is only one copy of the line BASEDEV=IPSRAID.ADD.

**Notes:**

- a. If you have more than one ServeRAID or SCSI adapter in your system, make sure that the BASEDEV statement for the adapter controlling the startup (boot) device appears before the BASEDEV statements for other ServeRAID or SCSI adapters in the CONFIG.SYS file.
  - b. After you install any service packs, check the path for the IPSRAID.ADD device driver and verify that the correct device driver is installed.
12. Restart the server.

### **Installing the Files after Installing OS/2**

You can use the following instructions to install the ServeRAID device driver and Administration and Monitoring Program files after installing OS/2 Warp Server.

To install the ServeRAID files after installing OS/2:

1. Use the ServerGuide Diskette Factory to create an *IBM ServeRAID Device Driver Diskette*.
2. After you complete the OS/2 installation, insert the *IBM ServeRAID Device Driver Diskette*.
3. From an OS/2 window, type:

a:

**Notes:**

- a. The *a* represents the drive assignment for the diskette drive that contains the ServeRAID diskette.
  - b. If you install these files on a logical drive that has its write policy set to the write-back mode, wait at least 10 seconds after being prompted to press **Ctrl+Alt+Del** before you actually press the keys. Waiting 10 seconds or longer gives the ServeRAID adapter or controller the time needed to flush all dirty-cache pages out to the hard disk.
4. Press **Enter**. Then, type:  
`ddinstal`
  5. Press **Enter**.

The OS/2 Device Driver Installation window will appear and prompt you for the source and destination drives. The source directory shows where to insert the *IBM ServeRAID Device Driver Diskette*. The destination directory shows where the program will copy the device driver files.
  6. Click on **Install**.

- The program copies the following ServeRAID device driver statement to your CONFIG.SYS file: BASEDEV=IPSRAID.ADD
  - The program copies the following ServeRAID device driver and program files to the OS/2 subdirectory on your hard disk: IPSRAID.ADD, IPSADM.EXE, and IPSRADM.EXE
  - The program copies the following ServeRAID Help file to the \OS2\HELP directory: IPSRADM.HLP
7. Edit the CONFIG.SYS file and verify that there is only one copy of the line BASEDEV=IPSRAID.ADD.

**Notes:**

- a. If you have more than one ServeRAID or SCSI adapter in your system, make sure that the BASEDEV statement for the adapter controlling the startup (boot) device appears before the BASEDEV statements for other ServeRAID or SCSI adapters in the CONFIG.SYS file.
  - b. After you install any service packs, check the path for the IPSRAID.ADD device driver and verify that the correct device driver is installed.
8. Restart the server.

## Starting the Administration and Monitoring Program

To start the ServeRAID Administration and Monitoring Program for OS/2:

1. Go to the OS/2 subdirectory on the hard disk drive; then, type:

```
ipsradm /f=d:\path\logfile
```

**Notes:**

- a. Make sure that the path you type exists. The program will not create a path.
  - b. *Logfile* is where the program will log messages.
  - c. If you omit the */f* parameter, the program will create the *IPSRADM.LOG* default file in the OS2 subdirectory to log the program messages.
2. Press **Enter**.
3. Use the following steps if you want to define IPSRADM to OS/2:
- a. Open the Templates Folder on the OS/2 Desktop.
  - b. Drag a program template onto the Desktop. A Program Settings window will appear.
  - c. At the Program page in the **Path and File Name** field, type:
 

```
c:\os2\ipsradm.exe
```
  - d. In the **Parameters** field, type:
 

```
/f=d:\path\logfile
```
  - e. At the General Tab in the **Title** field, type:
 

```
ServeRAID
```

## Installing Device Drivers for OpenServer

To use the ServeRAID Administration and Monitoring Program with SCO, you must first install the WIN32-Based version of the Administration and Monitoring Program on a Windows NT or Windows 95 client. Then, attach the Windows NT or Windows 95 client to the same network as the OpenServer systems that contain the ServeRAID adapters or controllers. Finally, you must install the ServeRAID device driver and background-server component for OpenServer.

The background-server component for OpenServer installs automatically when you use the instructions in this chapter to install the ServeRAID OpenServer device driver. This component enables the OpenServer system to act as the TCP/IP interface for the remote WIN32-Based Program. (See "Programs for Windows NT and Windows 95" on page 32 for more information.)

### Installing the Files for OpenServer

Before you begin the installation, review the following information:

- You must install logical drives as Bus Number 0 when using the MKDEV program, regardless of the channel that the physical drives are on.
- You must install nondisk devices, such as CD-ROM and tape drives, as Bus Numbers 1, 2, or 3 relative to the channel to which they are attached. External Channel 1 connector is Bus Number 1, external Channel 2 connector is Bus Number 2, and internal Channel 3 connector is Bus Number 3.

To configure the default nondisk devices during the initial installation:

1. Redefine the default tape drive in the initial bootstring. For example, to install the IPSRAID BTLD and redefine the tape drive, go to the B00T prompt and type:

```
link Stp=ips(0, 1, 2, 0)
```

The numbers in parentheses represent the Host Adapter Number, the Bus Number, the SCSI ID, and the LUN respectively.

2. When prompted for the location of the installation CD, change the Bus Number and SCSI ID, as required.

**Adding BTLD at Boot Time:** To install the ServeRAID device driver for OpenServer, Version 5.0.X:

1. Use the ServerGuide Diskette Factory to create an *IBM ServeRAID Device Drivers for SCO Operating Systems Diskette*.

2. At the B00T prompt, type:

```
link
```

3. Press **Enter**; then, when asked for the name of the package to load, type:

```
ipsraid
```

4. Press **Enter**.

5. After the kernel loads but before it runs, link prompts you to insert the *IBM ServeRAID Device Drivers for SCO Operating Systems Diskette*.

While the installation program copies the files, one or both of the following messages might appear:

### Messages:

- a. Extracting BTL D distribution for ipsraid... /etc/uadmin getdev b  
ips: No such device (error 19)
- b. dynamic linker: dlvr\_audit: Cannot open /dev/zero for file  
/lib/libprot.so.1

You can ignore Message A, no action is required. But if Message B appears, you must press **Enter** when prompted to continue the installation.

6. Keep the *IBM ServeRAID Device Drivers for SCO Operating Systems Diskette* readily available. You will need it to configure the device driver into the link kit.

For additional information about adding a BTL D at boot time, refer to “Using Boot-Time Loadable Drivers” in the *SCO OpenServer Handbook*.

### Adding BTL D after the Initial Installation

1. Use the ServerGuide Diskette Factory to create an *IBM ServeRAID Device Drivers for SCO Operating Systems Diskette*.
2. Start the server in system maintenance mode, and log in as *root*.
3. Type:  
`installpkg`
4. Press **Enter**; then, select the diskette drive in which you will insert your installation diskette.
5. Insert the *IBM ServeRAID Device Drivers for SCO Operating Systems Diskette*, when prompted.
6. When prompted for the name of the package, type:  
`ipsraid`
7. Press **Enter**; then, relink the kernel (as described in “Relinking the kernel” in the *SCO OpenServer Handbook*) by entering the following commands:  
`cd /etc/conf/cf.d`  
`./link_unix`
8. After the kernel rebuilds, the following message appears:  
  
The UNIX kernel has been rebuilt. Do you want this kernel to boot by default?  
  
To continue, enter: `y`  
  
The system backs up the old kernel by moving `/UNIX` to `/UNIX.OLD`.
9. When the system asks for the kernel environment to be rebuilt, enter: `y`  
  
The system will respond with a successful message.
10. Use *shutdown* to bring down the system; then, restart the system.

### Using an IDE CD-ROM Drive to Install OpenServer Files

This section contains instructions for installing files for OpenServer 5.0.0, OpenServer 5.0.2, and OpenServer 5.0.4 when using an IDE CD-ROM Drive.

## Installing the Files for OpenServer 5.0.0

To install files for OpenServer 5.0.0 using an IDE CD-ROM drive:

1. Type the following at the B00T prompt:  
`restart ahslink="ATAPI ipsraid" Srom=wd(0,0,0,0)`
2. Insert the ATAPI BTLD diskette when prompted; then, press **r** to replace the *wd* driver.

The fields for the ATAPI CDROM are:

`Srom=wd(c,d,l,b)` where:

- c = primary (0) or secondary (1) IDE/EIDE controller
- d = master (0) or slave (1) device
- l = LUN of device (always 0 with ATAPI or *wd* driver)
- b = BUS of device (always 0 with ATAPI or *wd* driver)

## Installing the Files for OpenServer 5.0.2 and 5.0.4

To install files for OpenServer Versions 5.0.2 or 5.0.4 using an IDE CD-ROM drive:

1. Type the following at the B00T prompt:  
`restart link=ipsraid Srom=wd(0,0,0,0)`

**Note:** The ATAPI BTLD (which includes the *wd* driver) is included in OpenServer 5.0.2 and 5.0.4.

The fields for the ATAPI CDROM are:

`Srom=wd(c,d,l,b)` where:

- c = primary (0) or secondary (1) IDE/EIDE controller
- d = master (0) or slave (1) device
- l = LUN of device (always 0 with ATAPI or "*wd*" driver)
- b = BUS of device (always 0 with ATAPI or "*wd*" driver)

2. Let the system start normally until it comes to the select Media options.
  - If you are using OpenServer 5.0.2, go to step 3.
  - If you are using OpenServer 5.0.4, go to step 4.
3. To install with OpenServer 5.0.2:
  - a. Select Adapter type as **WD**.
  - b. Select Media Type as **SCSI CDROM**.
  - c. Select ID, BUS and LUN as **0**.
  - d. Go to step 5.
4. To install with OpenServer 5.0.4:
  - a. Select Media Type as **IDE CDROM Drive**.
  - b. Select **Primary Adapter** and **Master Device**.
  - c. Go to step 5.
5. You have completed the installation.

## Installing Device Drivers for UnixWare

The instructions for installing the ServeRAID files when using UnixWare depend on the number of IDE and SCSI disk-storage adapters and controllers installed in the system. If all of the direct-access-storage devices (DASD) in the system are attached to a single disk-storage adapter or controller (such as the ServeRAID adapter or controller), you can skip the instructions in this section and go directly to “Installing the Files while Installing UnixWare” on page 49 or “Installing the Files after Installing UnixWare” on page 49.

If you are attaching devices to multiple disk-storage adapters or controllers (including IDE and SCSI controllers integrated on the system board), use the following instructions.

- If you are installing UnixWare on a drive attached to a ServeRAID adapter or controller, follow the instructions in “Installing UnixWare on a ServeRAID Drive.”
- If you are installing UnixWare on a drive attached to a non-ServeRAID adapter or controller and you intend to store only data on the drives attached to your ServeRAID adapters and controllers, follow the instructions in “Installing UnixWare on a Non-ServeRAID Drive” on page 47.

**Installing UnixWare on a ServeRAID Drive:** Use the following instructions if you are using multiple disk-storage adapters or controllers and you are installing UnixWare on a drive attached to a ServeRAID adapter or controller.

**Note:** If you are not using multiple disk-storage adapters and controllers, go to “Installing the Files while Installing UnixWare” on page 49.

1. Install all ServeRAID adapters that you intend to use in your system.
2. Using the ServeRAID Configuration Program, create all of your arrays and define all of your logical drives.
3. Make a list of all of the ServeRAID adapters and controllers, including the order and slot number, installed in the system. To do this:
  - a. Turn on the server.
  - b. When the ServeRAID Mini-Configuration prompt appears, press **Ctrl+i**. When a system contains more than one ServeRAID adapter or controller, a selection screen appears.
  - c. The menu lists the ServeRAID adapters and controllers in order. Select the first ServeRAID adapter or controller from the menu.
  - d. Select **Advanced Functions** from the Main Menu.
  - e. Select **View Controller and PCI Information** from the Advanced Functions menu.
  - f. Record the slot number for the ServeRAID adapter or controller; then, press **Esc** three times to return to the controller selection screen.
  - g. Repeat step 3c through step 3f until you record the slot number for each ServeRAID adapter or controller that appears on the selection screen.
4. Turn off the system; then, remove all ServeRAID adapters and controllers except the first one on your list.

**Note:** If one of the ServeRAID controllers that you need to remove is on the system board, you must do one of the following:

- If the CD-ROM drive that you are using to install your operating system is attached to the integrated ServeRAID controller, disconnect or remove all disk drives attached to the integrated controller.
  - If only disk drives are attached to the integrated controller, disconnect the SCSI cable from the ServeRAID connector on the system board. See the label inside the server cover for the location of the ServeRAID connector.
5. Remove all other non-ServeRAID IDE and SCSI disk-storage adapters and controllers.

**Note:** If one of the disk-storage controllers that you need to remove is on the system board, you must do one of the following:

- If the CD-ROM drive that you are using to install your operating system is attached to the integrated disk-storage controller, disconnect or remove all disk drives attached to the integrated controller.
  - If only disk drives are attached to the integrated controller, disconnect the cable for the integrated controller from the IDE or SCSI connector on the system board. See the label inside the server cover for the location of the IDE or SCSI controller connector.
6. Follow the instructions in “Installing the Files while Installing UnixWare” on page 49; then, return here and continue with step 7.
  7. Power down the system.
  8. Install any non-ServeRAID disk-storage adapters or controllers in the server; then, attach the drives to the disk-storage adapters and controllers.
  9. Install the second ServeRAID adapter or controller from the list you created in step 3f on page 46; then, attach the drives to the ServeRAID adapter or controller.
  10. Turn on the system and allow UnixWare to discover the new disk-storage adapters and controllers.
  11. Power down the system.
  12. Repeat steps 9, 10, and 11 until all ServeRAID adapters, ServeRAID controllers, and drives are installed.
  13. You can now partition and format the logical drives attached to the additional ServeRAID adapters and controllers. See the information provided with UnixWare for more instructions.

**Installing UnixWare on a Non-ServeRAID Drive:** Use the instructions in this section if you are using multiple disk-storage adapters or controllers, you are installing UnixWare on a drive attached to a non-ServeRAID adapter or controller, and you intend to store only data on the drives attached to your ServeRAID adapters and controllers.

1. Install all ServeRAID adapters that you intend to use in your system.
2. Using the ServeRAID Configuration Program, create all of your arrays and define all of your logical drives.

3. Make a list of all of the ServeRAID adapters and controllers, including the order and slot number, installed in the system. To do this:
  - a. Turn on the server.
  - b. When the ServeRAID Mini-Configuration prompt appears, press **Ctrl+i**. When a system contains more than one ServeRAID adapter or controller, a selection screen appears.
  - c. The menu lists the ServeRAID adapters and controllers in order. Select the first ServeRAID adapter or controller from the menu.
  - d. Select **Advanced Functions** from the Main Menu.
  - e. Select **View Controller and PCI Information** from the Advanced Functions menu.
  - f. Record the slot number for the ServeRAID adapter or controller; then, press **Esc** three times to return to the controller selection screen.
  - g. Repeat step 3c through step 3f until you record the slot number for each ServeRAID adapter or controller that appears on the selection screen.
4. Turn off the system; then, remove all ServeRAID, IDE, and SCSI disk-storage adapters and controllers except the one attached to the drive where you intend to install UnixWare.

**Note:** If one of the disk-storage or ServeRAID controllers that you need to remove is on the system board, do one of the following:

  - If the CD-ROM drive that you are using to install your operating system is attached to the integrated controller, disconnect or remove all disk drives attached to the integrated controller.
  - If only disk drives are attached to the integrated controller, disconnect the SCSI or IDE cable for the integrated controller from the connector on the system board. See the label inside the server cover for the location of the SCSI and IDE cable connectors.
5. Follow the instructions in “Installing the Files while Installing UnixWare” on page 49; then, return here and continue with step 6.
6. Power down the system.
7. Install any non-ServeRAID disk-storage adapters or controllers in the server; then, attach the drives to the disk-storage adapters and controllers.
8. Install the first ServeRAID adapter or controller from the list you created in step 3f; then, attach the drives to the ServeRAID adapter or controller.
9. Turn on the system and allow UnixWare to discover the new disk-storage adapters and controllers.
10. Power down the system.
11. Repeat steps 8, 9, and 10 until all ServeRAID adapters, ServeRAID controllers, and drives are installed.
12. You can now partition and format the logical drives attached to the ServeRAID adapters and controllers. See the information provided with UnixWare for more instructions.



## Installing the Files while Installing UnixWare

To install the ServeRAID files while installing UnixWare 7.0:

1. Use the ServerGuide Diskette Factory to create an *IBM ServeRAID Device Drivers for SCO Operating Systems Diskette*.
2. Use the instructions provided with UnixWare to begin the installation.
3. When a message appears asking if you want to install any HBA diskettes, insert the *IBM ServeRAID Device Drivers for SCO Operating Systems Diskette*; then, select **Install HBA diskette**.
4. Use the instructions provided in the UnixWare manual to complete the normal installation process.

## Installing the Files after Installing UnixWare

Use the following instructions to install the ServeRAID files after you install UnixWare, or use these instructions to update a previously installed ServeRAID file with a newer version. You can use the UnixWare Pkgadd or the UnixWare SCOAdmin utility program to install the files.

### ***Installing an HBA Diskette File Using Pkgadd***

1. Use the ServerGuide Diskette Factory to create an *IBM ServeRAID Device Drivers for SCO Operating Systems Diskette*.
2. Insert the *IBM ServeRAID Device Drivers for SCO Operating Systems Diskette* into the diskette drive.
3. Type:  

```
pkgadd -d/ dev/dsk/f0t
```
4. Press **Enter**
5. When the message Insert diskette into Floppy Drive 1 appears, press **Enter**.
6. When the message Installation of IBM ServeRAID SCSI IHV HBA (ips) was successful appears, type:  

```
q
```
7. Press **Enter**; then after the device driver installs, restart the system.

### ***Installing an HBA Diskette File Using SCOAdmin***

1. Use the ServerGuide Diskette Factory to create an *IBM ServeRAID Device Drivers for SCO Operating Systems Diskette*.
2. Insert the *IBM ServeRAID Device Drivers for SCO Operating Systems Diskette* into the diskette drive.
3. Start the SCOAdmin utility program.
4. Select **Software\_Management**.
5. Select **Application Installer**.
6. Select **Disk\_A** from the Install From tab.
7. Click on the **Update View** button.
8. When the icon labeled **ips** appears in the window, click on **Install**.
9. After the device driver installs, restart the system.

## Starting the Background-Server Components

To start the background-server components:

- If you are using OS/2 or Windows, double-click on the IPSRAID ADMIN-MONITOR icon on the desktop.
- If you are using OpenServer or UnixWare:
  1. Make sure you are logged on as root.
    - a. If you are not, type:

```
su
```
    - b. When prompted, enter the root password.
  2. Start the background-server component (daemon) running in the background. To do this, type:

```
ipsadm &
```
  3. Press **Enter**.
- If you are using Novell NetWare:
  1. Load the remote component. To do this, type:

```
load ipsadm.nlm
```
  2. Press **Enter**

### Notes:

- a. To load the NetWare Administration program with NetWare SFT III installed, load IPSADM.NLM in the mirrored server engine. The ServeRAID adapters and controllers in the primary and backup servers will appear to the Administration and Monitoring Program as if they were in one server.
- b. When a rebuild, synchronization, or logical-drive migration is in process, you cannot stop the IPSADM.NLM module by pressing the Esc key. To stop the module during one of these operations, you must unload the IPSADM.NLM module.

## Using the Background-Server Components

This section provides information about background-server component command-line parameters and logging messages.

### Using the Command-Line Parameters

To use the command-line parameters provided in the background-server components, issue the IPSADM command in the following format:

IPSADM *parameter 1 parameter 2* and so on...

Valid command-line parameters for the background-server components are as follows:

- |                  |   |
|------------------|---|
| <b>-?</b>        | The <b>-?</b> command displays the help for the valid parameters.   |
| <b>-p:number</b> | The <b>-p:number</b> command specifies the port number that the server will check for client connections.<br><br>The port number is a parameter used in TCP/IP to distinguish |

among different services on a single server. The default for the server utility programs is port number 1087. You can use this parameter to change the port number if another service on the system is using 1087.

- s:filename** The `-s:filename` command specifies the name of the file that contains security information. For more about security information, see "Background-Server Component Security."
- f** The `-f` command specifies to log messages to the default file, IPSADM.LOG.
- f:filename** The `-f:filename` command lets you specify the name of a file in which to log messages.
- d** The `-d` command disables the logging of messages to the standard output, which is usually the screen.

### Logging Messages

Messages generated by the ServeRAID adapter or controller consist of startup information, connecting and disconnecting clients, and error messages.

When using the `-f`, `-f:filename` and `-d` parameters, you can specify how you want the ServeRAID messages handled. The default is to log messages to the standard output, which is usually the screen. However, you can have these messages logged to other output devices, such as a printer or a text file.

The following information provides examples of different formats for using the IPSADM command and the results.

Command	Results
<b>IPSADM</b>	Logs messages to the standard output and not to a file.
<b>IPSADM -f</b>	Logs messages to the standard output and to the IPSADM.LOG file.
<b>IPSADM -f:NEWFILE.LOG</b>	Logs messages to the standard output and to the file that you defined: NEWFILE.LOG.
<b>IPSADM -d</b>	Disables the logging of messages.
<b>IPSADM -f -d</b>	Logs messages to the IPSADM.LOG file; however, messages are not logged to the standard output.

### Background-Server Component Security

Security information is maintained in an optional text file on the server. The file stores unencrypted user names and unencrypted passwords; therefore, the file must be kept in a secure directory.

When user names and passwords are entered into the Administration and Monitoring Program (the client), they are encrypted for delivery to the server. The server decrypts the user names and passwords to verify proper access to the ServeRAID adapter or controller. If the verification is successful, the adapter or controller accepts commands from the client. If no security file is present in the default directory, or the directory specified by the `-s` parameter, security is disabled. The server component then accepts commands from any client connection.

The security file contains one user name and password combination per line. The strings are separated by a colon (:) and each string has a maximum of eight characters.

### **Background-Server Component Name Resolution**

The server component relies on name resolution to determine the host name from the client that is trying to connect. When a client is trying to access a remote server, the server tries to look up the name of the client connecting. The method used to look up the name is determined by the configuration of the server. Some possible methods for this are Domain Name Servers (DNS) or HOSTS files. With certain configurations, some timing delays might occur due to misconfiguration or inability to access the DNS. If problems persist, check your network configuration.

---

## **IPSSSEND and IPSMON Programs**

IPSSSEND and IPSMON are advanced command-line programs that you can use to manage your ServeRAID adapters and controllers. These utility programs are provided on the *IBM ServeRAID Command Line Programs Diskette*. This ServeRAID diskette is available from the ServerGuide Diskette Factory or from the following address on the World Wide Web:

<http://www.pc.ibm.com/support>

See page 32 for the instructions needed to access the IBM support page.

You can use the IPSSSEND program to view the configuration of a ServeRAID adapter or controller, rebuild a defunct drive, initialize logical drives, synchronize logical drives, and perform other functions.

You can use the IPSMON program to monitor a ServeRAID adapter or controller for defunct drives, predictive failure analysis (PFA) warnings, rebuild operations, synchronizations, and logical-drive migrations. This program can log a message to the monitor, to a file, or to both the monitor and a file whenever activities occur.

You can use the IPSSSEND and IPSMON programs with the following operating systems:

- IBM OS/2 Warp Server and OS/2 LAN Server
- Novell NetWare 3.12 and 4.1X
- Microsoft Windows NT
- SCO OpenServer 5.0.X
- SCO UnixWare 7.0

You also can use the IPSSSEND program with DOS, but DOS requires the ASPI Manager.

## **Installing IPSSSEND and IPSMON for OS/2, Windows NT, or NetWare**

To install these programs for OS/2, Windows NT, or NetWare:

1. After you create an *IBM ServeRAID Command Line Programs Diskette* using Diskette Factory or by downloading the image from the IBM Support Page on the World Wide Web, start the server.
2. After the operating system loads, insert the *IBM ServeRAID Command Line Programs Diskette* into the diskette drive.

3. If you are using NetWare, go to step 5 on page 53. If you are using Windows NT or OS/2, create an IPSADM directory on your hard disk drive. To do this, go to the operating system command prompt and type:

```
md c:\ipsadm
```

**Notes:**

- a. The *c* represents the drive where OS/2 or Windows NT is installed.
  - b. If you installed the Administration and Monitoring Program files, you already created this directory.
4. Press **Enter**.
  5. Copy the IPSSSEND.EXE file to your hard disk drive by typing one of the following at the command prompt:

- For OS/2, type:

```
copy a:\os2\ipssend.exe c:\ipsadm
```

- For Windows NT, type:

```
copy a:\nt\ipssend.exe c:\ipsadm
```

- For NetWare, type:

```
copy a:\netware\ipssend.nlm c:\nwserver
```

**Notes:**

- a. The *a* represents the drive assignment for the diskette drive that contains the ServeRAID diskette.
  - b. The *c* represents the drive where OS/2, Windows NT, or NetWare is installed.
  - c. These instructions assume that you installed NetWare in the NWSERVER directory.
6. Press **Enter**; then, copy the IPSPMON.EXE file to your hard disk drive by typing one of the following at the command prompt:

- For OS/2, type:

```
copy a:\os2\ipsmon.exe c:\ipsadm
```

- For Windows NT, type:

```
copy a:\nt\ipsmon.exe c:\ipsadm
```

- For NetWare, type:

```
copy a:\netware\ipsmon.nlm c:\nwserver
```

**Notes:**

- a. The *a* represents the drive assignment for the diskette drive that contains the ServeRAID diskette.
  - b. The *c* represents the drive where OS/2, Windows NT, or NetWare is installed.
  - c. These instructions assume that you installed NetWare in the NWSERVER directory.
7. Press **Enter**; then, refer to Chapter 4, "Starting and Using the Utility Programs" on page 57 for information to start and use the IPSSSEND and IPSPMON programs.

## Installing IPSSEND and IPSMON for OpenServer

To install these programs for OpenServer 5.0.X:

1. Insert the *IBM ServeRAID Command Line Programs Diskette* into the diskette drive.
2. Copy the program files from the *IBM ServeRAID Command Line Programs Diskette* by typing the following:  

```
doscp -r a:/openserv/ipssend /usr/bin/ipssend
```
3. Press **Enter**; then, type:  

```
doscp -r a:/openserv/ipsmon /usr/bin/ipsmon
```
4. Press **Enter**; then, change the access permissions by typing the following:  

```
chmod 700 /usr/bin/ipssend
```
5. Press **Enter**; then, type:  

```
chmod 700 /usr/bin/ipsmon
```
6. Press **Enter**; then, refer to Chapter 4, "Starting and Using the Utility Programs" on page 57 for information to start and use the IPSSEND and IPSMON programs.

## Installing IPSSEND and IPSMON for UnixWare

To install these programs for UnixWare 7.0:

1. Insert the *IBM ServeRAID Command Line Programs Diskette* into the diskette drive.
2. Copy the program files from the *IBM ServeRAID Command Line Programs Diskette* by typing the following:  

```
doscp -r a:/unixware/ipssend /usr/bin/ipssend
```
3. Press **Enter**; then, type:  

```
doscp -r a:/unixware/ipsmon /usr/bin/ipsmon
```
4. Press **Enter**; then, change the access permissions by typing the following:  

```
chmod 700 /usr/bin/ipssend
```
5. Press **Enter**; then, type:  

```
chmod 700 /usr/bin/ipsmon
```
6. Press **Enter**; then, refer to Chapter 4, "Starting and Using the Utility Programs" on page 57 for information to start and use the IPSSEND and IPSMON programs.

## Installing IPSSEND for DOS

To install IPSSEND for DOS:

1. Create a startable diskette. To do this, insert a blank diskette in diskette drive A; then, type:  

```
format a: /s
```
2. Press **Enter**.
3. Copy the ASPI device driver from the DOS directory on the *IBM ServeRAID Device Driver Diskette* to the startable diskette.

4. Copy the IPSEND.EXE file from the DOS directory on the *IBM ServeRAID Command Line Programs Diskette* to the startable diskette.
5. Leaving the startable diskette in the diskette drive, restart the system; then, refer to Chapter 4, "Starting and Using the Utility Programs" on page 57 for information to start and use the IPSEND and IPSMON programs.





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## Chapter 4. Starting and Using the Utility Programs

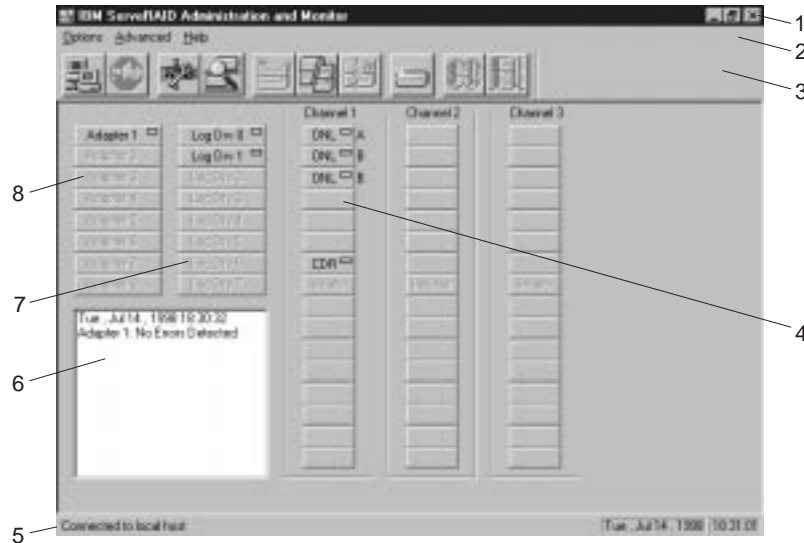
This chapter provides the information needed to start and use the ServeRAID Administration and Monitoring Program, IPSSSEND program, and IPSMON program.

**This chapter contains:**

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Using the Administration and Monitoring Program . . . . .	59
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## Starting the Administration and Monitoring Program

Before you start the ServeRAID WIN32-Based Administration and Monitoring Program, review the following illustration to become familiar with the layout of its Main screen.



Descriptions of the numbered areas are as follows:

- |                              |   |
|------------------------------|---|
| <b>1. Title Bar</b>          | Displays the title of the application, along with the minimize icon, the maximize icon, and the close icon.   |
| <b>2. Menu Bar</b>           | Displays the pull-down menus for all supported functions.   |
| <b>3. Tool Bar</b>           | Displays the icons for the commonly used functions.   |
| <b>4. Device Area</b>        | Displays the state of each device connected to the physical channels of the ServeRAID adapter or controller, and if applicable, its array identifier. |
| <b>5. Status Bar</b>         | Displays help for the area where the cursor is currently pointing. Also displays the date and time.   |
| <b>6. Status Window</b>      | Displays messages regarding the operational status of each adapter or controller.   |
| <b>7. Logical Drive Area</b> | Displays the number of logical drives created and the status of the logical drive.  |
| <b>8. Adapter Area</b>       | Displays the number and status of the installed ServeRAID adapters and controllers  |

To start the WIN32-Based Administration and Monitoring Program:

1. Do one of the following:
  - Double-click on the IBM ServeRAID Administration icon
  - or
  - Select **IBM ServeRAID Administration** from the Start menu.
2. The Administration and Monitoring Program starts in stand-alone mode. After this program loads, you can access the ServeRAID adapters and controllers.

When the Main window appears:

- If you are running the program in the stand-alone mode and you have ServeRAID adapters or controllers installed in your system, the current settings of the installed adapters or controllers will appear on the screen.
  - If you are running the program from a client with no ServeRAID adapters or controllers, a message will appear stating that no ServeRAID adapters or controllers are installed in your system.
3. To access the server that contains the ServeRAID adapters or controllers, select **Network Settings** from the Options menu.
  4. When the window appears prompting for Stand-alone or Client/Server, click on the **Client/Server** button.
  5. In the edit box, type in the host name of the server that you want to access.

or

Select the host name from the pull-down list; then, click on **Connect**.

**Note:** If security is enabled on the server, you must enter a valid user name and password.

---

## Using the Administration and Monitoring Program

You can use the Administration and Monitoring Program to monitor your ServeRAID adapters and controllers, view the ServeRAID configuration and associated devices, rebuild an array, create a logical drive, create an array, delete an array, dynamically increase the logical-drive size, change RAID levels, and much more.

### Using the Options Pull-Down Menu

The following choices are available from the Options pull-down menu on the Main Screen of the Administration and Monitoring Program:

- Network Settings
- General Options
- Alert Options


#### Network Settings

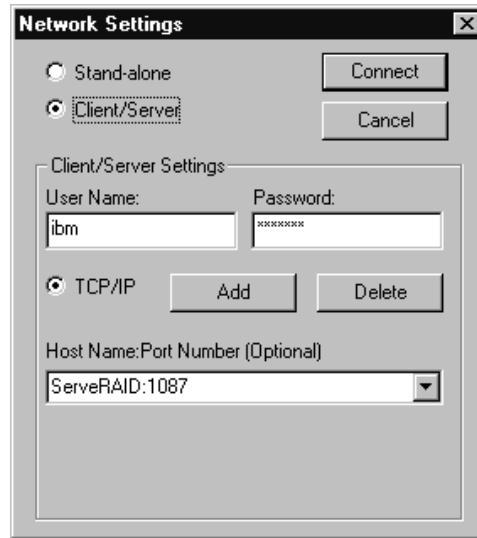
If you want to monitor the ServeRAID adapters and controllers across a network, you must switch to client/server mode.



You can use the Network Settings dialog box to select and connect to servers in your network that contain IBM ServeRAID adapters or controllers.

To select and connect to a server:

1. Click on the  icon on the Tool Bar or select **Network Settings** from the **Options** pull-down menu. A screen similar to the following appears.

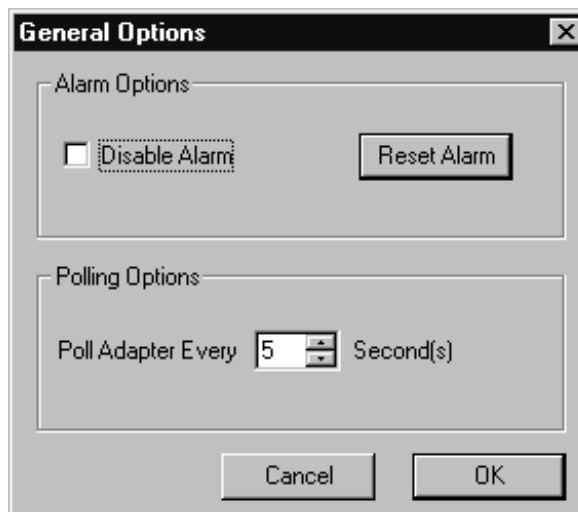


2. Click on the **Client/Server** radio button.
3. If security is enabled on the server to which you are connecting, type in your **User Name** and **Password** as defined by the security file on the server to which you are connecting. (Refer to “Background-Server Component Security” on page 51 for information on the security file).
4. Type in either the **Host Name** or the TCP/IP **Address** of the system, or select it from the pull-down list.
 

**Note:** If your server was started on any port other than the default (1087), after the Host Name or TCP/IP Address that you just entered, type in a colon and the correct port number for your configuration (for example: ServeRAID:1088).
5. Click on **Connect** to initiate a connection with the remote system.

## General Options

When you select General Options from the Options pull-down menu, a screen similar to the following appears.



You can use this screen to:

- Enable or Disable the alarm

- Reset the alarm
- Set the polling options

**Enabling or Disabling the Alarm:** The alarm alerts you to a failure in the system. It sounds if any of the following conditions occur:


- A DDD hard disk drive is found.
- A Predictive Failure Analysis (PFA) error occurs.
- A ServeRAID adapter or controller is not responding.

To enable or disable the alarm, click on the box for **Disable Alarm** on the **General Options** screen. Placing a check in the check box disables the alarm; removing the check enables the alarm.

### **Resetting the Alarm:**



Resetting the alarm turns off the alarm for the current failure without disabling the feature.

To reset the alarm, you can either click on the  icon or click on **Reset Alarm** on the General Options screen.

**Polling Options:** The ServeRAID adapter or controller will *poll*, or check, your server at a specified time interval for any changes that may have occurred in the server.

You can choose how often the adapter or controller polls the server by specifying a time interval on the options menu, from five to 60 seconds. The default time interval setting is five seconds.

The program will poll for the following events:

- Rebuild started
- Rebuild completed
- Synchronization started
- Synchronization completed
- Migration started
- Migration completed
- PFA error detected
- Dead drive detected
- Adapter or controller is not responding to commands

### **Alert Options**

The Netfinity Manage alerts allow system administrators who are using the IBM Netfinity Manager Program to configure the ServeRAID Administration and Monitoring Program to notify the Netfinity Alert Manager of various activities occurring on the server.

To configure the settings for the Netfinity Manager alerts:

1. Open the Options pull-down menu.
2. Click on **Alert Options**.
3. Click on **Netfinity Alerts**. A screen similar to the following appears.



**Note:** The default setting for the Netfinity Manager alerts is disabled.

4. To enable all Netfinity Manager alerts, click on the check box next to Enable Netfinity Alerts.
5. To disable any of the Netfinity Manager alerts:
  - a. Ensure there is a check in the check box next to Enable Netfinity Alerts.
  - b. Click on the check box next to the specific alert or alerts you want disabled.
6. To test the Netfinity Manager integration, click on the **Send Test Alert** button. This will send a Netfinity Manager alert to the Alert Manager with a test message.

When you enable Netfinity Manager Alerts, the ServeRAID adapter or controller will relay the following three types of messages to the Netfinity Alert Manager:

- a. Information
  - Rebuild started
  - Rebuild completed
  - Synchronization started
  - Synchronization completed
  - Migration started
  - Migration completed
- b. Warning
  - PFA error detected
- c. Critical
  - Dead drive detected
  - Adapter or controller is not responding to commands

By knowing what these types of messages are, you can configure the Netfinity Manager program with instructions for monitoring the server configuration and the appropriate action to take if an alert is given. For example, you could set the Netfinity Manager program to dial a specified phone number, should a defunct drive be detected on any server across the network. See the documentation provided with Netfinity Manager for more information.

## Using the Administration Functions

This section provides information about using the following ServeRAID administration functions:

- Array administration
- Logical drive administration
- Logical drive migration administration
- Physical drive administration
- Adapter administration

### Array Administration


This section provides information about creating and deleting disk arrays.

#### Creating Disk Arrays:



You can use disk arrays to improve security, performance, and reliability.

To create a disk array:

1. Click on the  icon on the Tool Bar or select **Manage Disk Arrays** from the Advanced pull-down menu; then, select **Create Disk Array**. A screen similar to the following appears.



2. Select one or more Ready (RDY) drives for the new disk array from the Main screen of the Administration and Monitoring Program.

To select a RDY drive, click the desired RDY button from the device area. A disk array identifier appears beside each RDY drive added to the disk array.

If you change your mind about a selected drive, select the button again to remove the selected drive from the disk array.

3. Click on **OK** to define a logical drive for the new array. A screen similar to the following appears.



4. Select the appropriate RAID level from the pull-down list.

**Note:** The number of hard disk drives in the array determines the RAID levels available for the array.

- If the array contains one hard disk drive, you can select only RAID level-0 for the logical drive.
- If the array contains two hard disk drives, you can select RAID level-0 or RAID level-1 for the logical drive.
- If the array contains three or more hard disk drives, you can select RAID level-0, RAID level-1, or RAID level-5 for the logical drive.

5. Enter the **Requested Space** in the entry field.

The ServeRAID program uses the maximum available space for the selected RAID level to calculate the default value that it assigns.

**Note:** The actual logical drive size might be slightly different from what you type in the **Requested Space** field. The RAID level and the number of hard disk drives determine the size of the logical drive. For example, a disk array consisting of three, 1 GB hard disk drives with a requested RAID level-0 logical drive of 1000 MB will actually contain only 999 MB because the data is striped across all three drives, with 333 MB on each drive.

6. Click on **OK** to create the disk array.


### **Deleting Disk Arrays:**

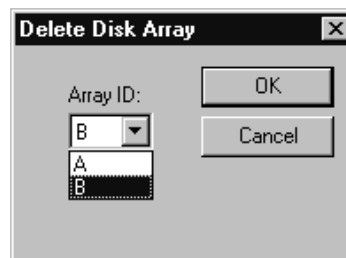


Deleting a disk array deletes all logical drives that are defined in that disk array. All data and programs on the logical drives in the disk array will be lost during this procedure.

To delete a disk array:



1. Click on the  on the Tool Bar or select **Manage Disk Arrays** from the Advanced pull-down menu; then, select **Delete Disk Array**. A screen similar to the following appears.



2. Select the desired disk array ID from the pull-down list.

#### **Attention:**

Before proceeding, ensure that you have backed up any data and programs that you want to save.

3. Click on **OK** to delete the disk array.

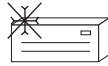
**Note:** For some operating systems, deleting a disk array and its associated logical drives might change the drive-letter assignments of the remaining drives when you restart the system.



## Logical Drive Administration


This section provides the information needed to create logical drives, initialize and synchronizing logical drives, or access blocked logical drives.

### Creating Logical Drives:



Each ServeRAID adapter or controller supports a maximum of 8 logical drives. Depending upon the stripe-unit size being used, you can combine a maximum of 8 or 16 physical drives into each logical drive.

To create a logical drive:

1. Click on the  icon on the Tool Bar or select **Manage Logical Drive** from the Advanced pull-down menu; then, select **Create Logical Drive**. A screen similar to the following appears.



2. Select the desired disk array ID from the pull-down list.
3. Select the appropriate RAID level from the pull-down list.

**Note:** The number of hard disk drives in the array determines the RAID levels available for the array.

- If the array contains one hard disk drive, you can select only RAID level-0 for the logical drive.
- If the array contains two hard disk drives, you can select RAID level-0 or RAID level-1 for the logical drive.
- If the array contains three or more hard disk drives, you can select RAID level-0, RAID level-1, or RAID level-5 for the logical drive.

4. Enter the **Requested Space** in the entry field.

The ServeRAID program uses the maximum available space for the selected RAID level to calculate the default value that it assigns.

**Note:** The actual logical drive size may be slightly different from what you type in the **Requested Space** field. The RAID level and the number of hard disk drives determine the size of the logical drive. For example, a disk array consisting of three, 1 GB hard disk drives with a requested RAID level-0 logical drive of 1000 MB will actually contain only 999 MB because the data is striped across all three drives, with 333 MB on each drive.

5. Click on **OK** to create the logical drive.

**Notes:**

1. If you plan to use the Logical Drive Migration (LDM) feature, *do not* define more than seven logical drives. The LDM feature requires one free logical drive to perform the migration. Refer to “Logical Drive Migration Administration” on page 67 for more information.
2. If you plan to use the Change RAID Level function of the LDM feature, you must assign the same RAID level to all logical drives within a single disk array. Refer to “Change RAID Levels” on page 67 for more information.

**Initializing Logical Drives:** Initializing a logical drive erases the first 1024 sectors on the drive and prevents access to any data previously stored on the drive.

To initialize a logical drive:

1. Select the desired logical drive from the Main screen of the Administration and Monitoring Program.
2. Click on **Initialize** to initialize the drive.
3. If you have initialized a RAID level-5 drive, you must synchronize to ensure data integrity. Go to “Synchronizing Logical Drives.”

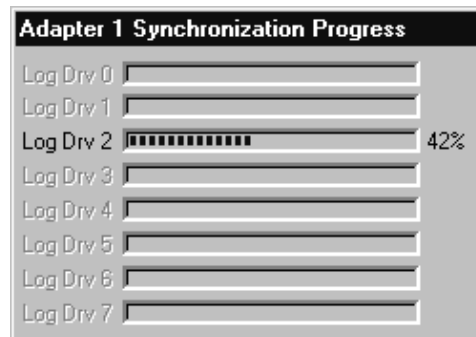
**Synchronizing Logical Drives:** The purpose of synchronizing logical drives is to compute and write the parity data on the selected drives.

If the type of ServeRAID adapter or controller you are using does not support the auto-synchronization and data-scrubbing features, manually synchronize your RAID level-1 and RAID level-5 logical drives weekly. This does not alter data on the drive.

Synchronizing a logical drive verifies that the data redundancy for the logical drive is correct.

To synchronize a logical drive:

1. Select the desired logical drive from the Main screen of the Administration and Monitoring Program.
2. Click on **Synchronize** to synchronize the drive.
3. The synchronization begins automatically and reports progress information on the screen.



**Note:** Only one synchronization command can be active at a time.

**Unblocking Logical Drives:** When the ServeRAID adapter or controller performs a Rebuild operation on an array, it reconstructs the data that was stored in RAID level-1 and RAID level-5 logical drives. However, the ServeRAID adapter or controller cannot reconstruct the data that was stored in any RAID level-0 logical drives in that array. The data in the RAID level-0 logical drives is blocked when the ServeRAID adapter or controller detects that the array is valid, but the data might be damaged.

After the Rebuild operation completes, you can unblock the RAID level-0 logical drives and access them once again. But remember, the logical drive might contain damaged data. You must either re-create, install, or restore the data from the most recent backup disk or tape.

To unblock a blocked drive:

1. Select the blocked logical drive from the Main screen of the Administration and Monitoring Program.
2. Click on **Unblock** to unblock the drive.
3. Initialize all unblocked logical drives before using them. See “Initializing Logical Drives” on page 66.
4. Restore the data to the drive from your most recent backup disk or tape.

## Logical Drive Migration Administration

The logical drive migration (LDM) feature dynamically changes the current logical drive structure. You can use this procedure to change the RAID level, increase the free space in a disk array, or change the size of a logical drive.

To use the LDM feature, you must have at least two logical drives available: one free (FRE) logical drive and one source logical drive that is in the okay (OKY) state. During the LDM procedure, the ServeRAID adapter or controller changes the state of the FRE logical drive to SYS; then, temporarily uses the SYS drive to perform the migration. When the migration procedure completes, the ServeRAID adapter or controller changes the state of the SYS drive back to FRE.

### **Change RAID Levels:**



You can change (migrate) the RAID levels of currently defined logical drives. To use the Change RAID Level feature, all of the logical drives within the array must be the same RAID level.


The ServeRAID adapters and controllers support changing RAID levels as follows:

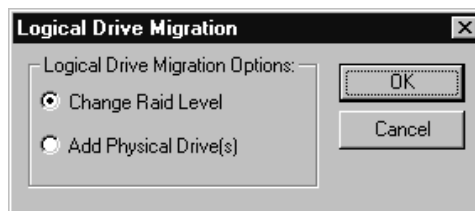
- Change two-drive RAID level-0 to RAID level-5 by adding one hard disk drive
- Change two-drive RAID level-1 to RAID level-5 by adding one hard disk drive
- Change from RAID level-5 to RAID level-0 by removing one hard disk drive

To change the RAID level of an existing disk array:

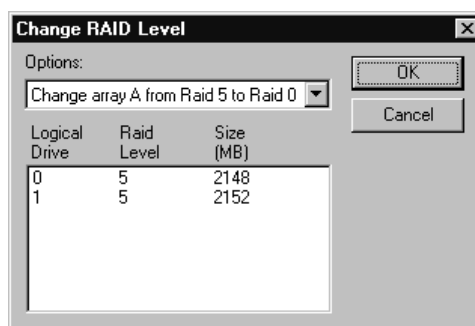
**Note:** If you are migrating to RAID level-0, the last drive defined in the array becomes RDY.



1. Click on the  icon on the Tool Bar or select **Manage Disk Arrays** from the Advanced pull-down menu; then, select **Logical Drive Migration**. A screen similar to the following appears.



2. Select **Change RAID Level**.
3. Click on **OK**.



4. Select a migrating option from the pull-down list.
 

**Note:** The affected logical drives appear, based on the migrating option you select.
5. Click on **OK** to proceed.
6. Click on **OK** to verify the operation.
7. Select a Ready (RDY) drive to add to the array, if you are migrating to RAID level-5.

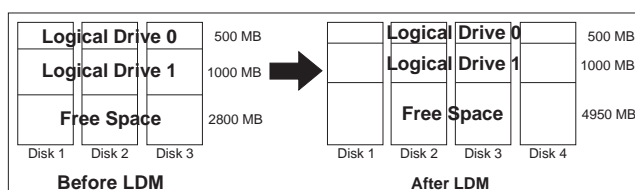
#### **Adding a Physical Drive:**



You can expand currently defined arrays by adding one to three new hard disk drives.

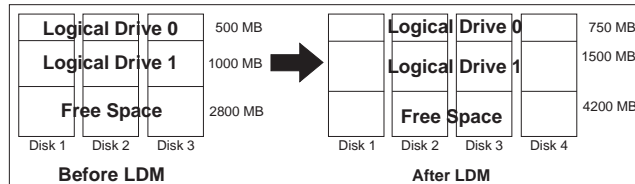
The ServeRAID adapters and controllers support adding new space to a disk array in the following scenarios:

- You can increase the free space in a disk array without changing the size of the logical drives. This is useful when you need to add logical drives to your existing disk arrays. Refer to the following illustration.



For example, an existing disk array uses three, 2150 MB hard disk drives that are configured as two RAID level-5 logical drives (one 500 MB and 1000 MB) and 2800 MB of free space. If you use the logical drive migration procedure and add a 2150 MB hard disk drive to increase the amount of free space, the end result will be two RAID level-5 logical drives (one 500 MB and one 1000 MB) and with 4950 MB of free space.

- You can increase the size of all the logical drives proportionally in a disk array. This is useful when you want to increase the size of the currently defined logical drives. Refer to the following illustration.

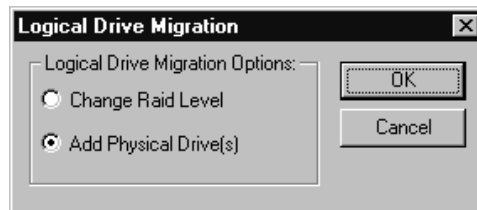


For example, an array uses three 2150 MB hard disk drives that are configured as two RAID level-5 logical drives (one 500 MB and 1000 MB) and 2800 MB of free space. If you use the logical drive migration procedure and add a 2150 MB hard disk drive to proportionally increase the size of the disk array, the end result will be two RAID level-5 logical drives (one 750 MB and 1500 MB) and 4200 MB of free space.

To add a physical device:



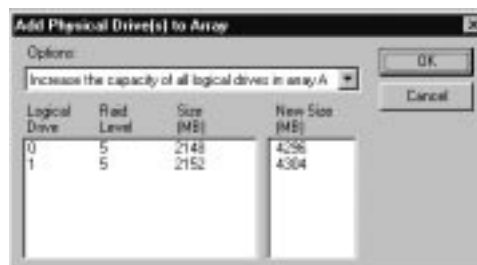
1. Click on the icon on the Tool Bar or select **Manage Disk Arrays** from the Advanced pull-down menu; then, select **Logical Drive Migration**. A screen similar to the following appears.



2. Select **Add Physical Drive(s)**.

A prompt appears requesting that you select from 1 to 3 Ready (RDY) drives to add to the existing array.

3. Click on the appropriate RDY drives on the Main screen. An **X** appears beside the selected drives.
4. When you are finished selecting drives, click on **OK**.



5. Select one of the available expansion options from the pull-down list.  
The screen will show a list of the affected logical drives with their new sizes.
6. Click on **OK**.

## Physical Device Administration

This section provides the information needed to set device states and rebuild devices.

**Setting Physical Device States:** The following table shows the valid device states and valid alternative states.

Device State	Alternative States
EMP	RDY SBY
SBY	RDY EMP HSP SHS
DHS	EMP HSP SHS
SHS	HSP DHS
DDD	ONL RBL
RDY	EMP HSP SHS SBY
HSP	RDY SHS DHS
ONL	DDD
RBL	DDD ONL

To set or change the physical device state:

1. Select the device from the Main screen of the Administration and Monitoring Program.
2. Click on the radio button that indicates the desired state.  
**Note:** If you set a DDD drive to ONL without performing a Rebuild (RBL) operation and that drive is part of a critical (CRT) logical drive, your system might lose data.
3. Click on **Set Device State**.

**Rebuilding a Device:** When a hard disk drive goes defunct (DDD), a Rebuild operation is required to reconstruct the data for the device in its respective disk array. The ServeRAID adapters and controllers can reconstruct RAID level-1 and RAID level-5 logical drives, but they cannot reconstruct data stored in RAID level-0 logical drives. To prevent data integrity problems, the ServeRAID adapters and controllers set the RAID level-0 logical drives to *Blocked* during a Rebuild operation. After the Rebuild operation completes, you can unblock the RAID level-0 logical drives, and access them once again. But remember, the logical drive might contain damaged data. (Refer to “Unblocking Logical Drives” on page 67 for more information.)

To perform a Rebuild operation:

1. Click on the DDD device on the Main screen of the Administration and Monitoring Program.
2. Click on **Rebuild Device**.
3. Select a RDY drive to use to reconstruct the data, or click on **OK** to use the same drive slot and SCSI ID if you have physically replaced the defunct drive.

4. The reconstruction begins automatically and reports progress information on the screen.

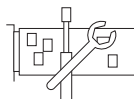
**Notes:**

1. The ServeRAID adapter or controller can perform only one Rebuild operation at a time.
2. If the array contains a critical (CRT) logical drive, the Rebuild operation changes the hard disk drive state from DDD to RBL. After the Rebuild operation completes, the hard disk drive state changes from RBL to ONL. (If you rebuild to a RDY drive, the DDD drive is removed from the disk array and becomes a defunct hot-spare (DHS).)
3. The hard disk drive being rebuilt must be the same size or larger than the failed drive.
4. If a hot-spare (HSP) drive is available, a Rebuild operation will start automatically.
5. If multiple hot-spare (HSP) drives are available, the ServeRAID adapter or controller searches all the drives on each channel for a hot-spare drive of the appropriate size. The first appropriate hot-spare drive found enters the Rebuild (RBL) state.

### Adapter Administration

This section provides instructions for copying the drive configuration to the ServeRAID adapter or controller, copying the ServeRAID adapter or controller configuration to the drives, initializing the adapter or controller configuration, and scanning for new drives.


#### *Copying the Drive Configuration to the Adapter:*

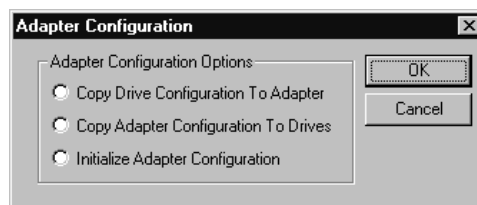


You can copy the configuration stored on the hard disk drives to the ServeRAID adapter or controller.

This operation is useful when drives are imported from other systems.

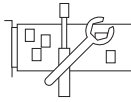
To copy the configuration:

1. Click on the  icon on the Tool Bar or select **Adapter Configuration** from the Advanced pull-down menu. A screen similar to the following appears.




2. Select **Copy Drive Configuration to Adapter**.
3. Click on **OK**.

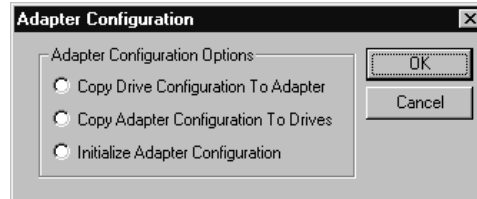
### **Copying the Adapter Configuration to the Drives:**



You can copy the configuration stored for the ServeRAID adapter or controller to all configured hard disk drives.

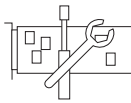
To copy the configuration:

1. Click on the  icon on the Tool Bar or select **Adapter Configuration** from the Advanced pull-down menu. A screen similar to the following appears.



2. Select **Copy Adapter Configuration to Drives**.
3. Click on **OK**.


### **Initializing the Adapter:**

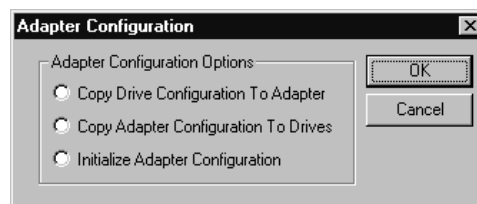


Initializing the adapter or controller configuration clears all the logical drives and resets all the functional hard disk drives to the Ready (RDY) state.

This operation is useful when you want to start over and create a new configuration.

To initialize the adapter or controller:

1. Click on the  icon on the Tool Bar or select **Adapter Configuration** from the Advanced pull-down menu. A screen similar to the following appears.



2. Select **Initialize Adapter Configuration**.

#### **Attention:**

After you initialize the configuration, you will not have access to any data stored on the logical drives attached to the selected ServeRAID adapter or controller.

This choice deletes the existing configuration information, sets all functional hard disk drives attached to the controller to the Ready state, and deletes all logical drives defined for the controller.

This choice *does not* change any of the ServeRAID adapter or controller settings (such as the stripe-unit size, rebuild rate, and so on) from their current or customized values.



3. Click on **OK**.

**Scanning for New Drives:** You can scan for new devices attached to the ServeRAID adapter or controller.

To scan for new drives, click on the  icon on the Tool Bar or select **Scan For New Drives** from the Advanced pull-down menu.

## Using the Monitoring Functions

This section contains instructions for using the Administration and Monitoring Program to monitor the ServeRAID adapter and controller status information, event logs, logical drive information, and physical device information.

### Monitoring the Adapter Status Information

A green or red light on the screen indicates the currently active adapter button. (Green indicates that the ServeRAID adapter or controller is responding and red indicates that it is not responding.) If there is more than one ServeRAID adapter or controller in the system, click once on the appropriate adapter or controller to make it active.

You can then monitor the status by clicking on the active adapter button on the Main screen of the Administration and Monitoring Program.

**Note:** You might need to use the scroll bar and scroll down to see all of the items that appear on this screen.

Descriptions of the information that appears on the screen are as follows:

<b>Adapter Number</b>	The active adapter or controller (1 to 8).
<b>Number of Logical Drives</b>	The number of defined logical drives (0 to 8).
<b>Unattended Mode</b>	<b>Off</b> - The user chooses the recovery method when there is a ServeRAID startup error. <b>On</b> - The adapter or controller chooses the recovery method when there is a ServeRAID startup error.
<b>Code Block Version</b>	The current version number of the firmware loaded on the adapter or controller.
<b>Boot Block Version</b>	The current version number of the bootable microcode loaded on the adapter or controller.
<b>Concurrent Commands</b>	The maximum number of concurrent commands supported.
<b>Maximum Devices Supported</b>	The maximum number of devices supported.
<b>Flash Program Count</b>	The current number of times the flash EEPROM has been written.
<b>Defunct Disk Count</b>	The current number of defunct hard disk drives.
<b>Rebuild Rate</b>	The current setting (Low, Medium, or High) of the rebuild rate.

<b>Hot-Swap Rebuild</b>	The current state (Enabled or Disabled) of the hot-swap rebuild feature.
<b>Offline Logical Drive Count</b>	The current number of offline logical drives.
<b>Configuration Update Count</b>	The number of times that the ServeRAID configuration has been updated.
<b>NVRAM Battery Backup Device</b>	The current state of the battery-backup cache (installed, not installed, or defective).

## Monitoring the Device Event Logs

The ServeRAID adapters and controllers store information concerning various events in the event logs. There are four types of event logs: a device event log, a hard event log, a soft event log, and a configuration event log. (See Chapter 2, “Using the Configuration Programs” on page 7 for information about the configuration event log.)

To view the hard, soft, or device event logs:

1. Click on the **adapter** on the Main screen of the Administration and Monitoring Program.
2. Select an event log button from the bottom of the screen.

The Device Event Log contains event counters for each attached physical device, as follows:

- Parity Event - The ServeRAID adapter or controller detected a parity event while transferring data on the SCSI bus. A large number of parity events might indicate a problem with the SCSI cable, connectors, or terminators on the SCSI channel.
- Soft Event - These events are detected by the SCSI device and reported to the ServeRAID adapter or controller through the SCSI Check Condition status.
- Predictive Failure Analysis (PFA) - The device has signaled the adapter or controller that it might fail in the near future.
- Hard Event - These events are detected by the ServeRAID adapter or controller. The most likely cause of a hard event is a problem with the SCSI cabling, termination, or adapter seating. If one of these is not the problem, have the system serviced.
- Misc Event - These miscellaneous events are detected by the ServeRAID adapter or controller. These events do not include parity, soft, PFA, or hard events. The most likely cause of a miscellaneous event is a cable, termination, or connector problem.

**Note:** Under normal operating conditions, the event logs will contain entries that are not errors.

## Monitoring the Logical Drive Information

You can monitor the logical drive information by clicking on the desired logical drive button on the Main screen of the Administration and Monitoring Program.

Descriptions of the information that appears on the Logical Drive Information screen are as follows:

**Logical Drive Number**      The number of the logical drive.

<b>Blocked</b>	<b>No</b> - The logical drive is accessible. <b>Yes</b> - The logical drive is not accessible.
<b>Part of Array</b>	The identifier of the logical drive disk array (A, B, C, D, E, F, G, H).
<b>Part of Merge Group</b>	The identifier of the logical drive merge group (1 through 254).
<b>Date Created</b>	The date the logical drive was created.
<b>State</b>	The current state (see “Logical Drive State Descriptions” on page 18 for more information).
<b>Size</b>	The size in megabytes.
<b>RAID Level</b>	RAID level (0, 1, or 5).
<b>Write Policy</b>	<b>WT</b> - Write-through. <b>WB</b> - Write-back.
<b>NVRAM Battery Backup</b>	<b>Enable</b> - The battery-backup cache is On. <b>Disable</b> - The battery-backup cache is Off.
<b>Read Ahead</b>	<b>Off</b> - Disk Read-Ahead is inactive. <b>On</b> - Disk Read-Ahead is active.
<b>Stripe-Unit Size</b>	The size of each stripe unit per hard disk (8, 16, 32, 64).
<b>Number of Chunks</b>	The number of hard disk drives that make up the logical drive.
<b>Stripe Order</b>	The channel and SCSI ID of the physical drives that make up the logical drive.

### Monitoring the Physical Device Information

You can monitor the physical device information by clicking on the desired device button on the Main screen of the Administration and Monitoring Program.

Descriptions of the fields that might appear on the Device Management screen are as follows.

**Note:** The number of fields that appear on the Device Management screen depend on the physical device selected.

<b>Channel</b>	The channel to which the device is connected (1, 2, or 3).
<b>SCSI ID</b>	The SCSI ID (0 to 15).
<b>Vendor</b>	The manufacturer of the physical device.
<b>Serial Number</b>	The manufacturer identifier.
<b>Size</b>	The size in megabytes.
<b>State</b>	The current state (see “Physical Drive State Descriptions” on page 19 and “Logical Drive State Descriptions” on page 18 more information).
<b>Soft Event</b>	The number of soft events reported from the device event log.
<b>Hard Event</b>	The number of hard events reported from the device event log.

<b>Misc Event</b>	The number of miscellaneous events reported from the device event log.
<b>Parity Event</b>	The number of parity events reported from the device event log.
<b>PFA Event</b>	<b>Yes</b> - device indicates predictive failure analysis event. <b>No</b> - device does not indicate predictive failure analysis error.

---

## Starting the IPSSSEND Program

You can run the IPSSSEND program from the operating system command line.

To start the IPSSSEND program:

- If you are using OS/2 or Windows NT:
  1. Type:
 

```
c:\ipsadm\ipssend
```
  2. Press **Enter**.
 

**Note:** The *c* represents the drive where OS/2 or Windows NT is installed.
- If you are using NetWare:
  1. From the console, type:
 

```
load ipssend
```
  2. Press **Enter**.
- If you are using DOS:
  1. Insert the bootable IPSSSEND diskette that you created into diskette drive A; then, type:
 

```
a:\ipssend
```
  2. Press **Enter**.
- If you are using OpenServer or UnixWare:
  1. Type:
 

```
/usr/bin/ipssend
```
  2. Press **Enter**.

---

## Using the IPSSSEND Program

When you run the IPSSSEND program with no command-line parameters, a list of available functions and their specific parameters appears. All functions require a minimum set of parameters to run the command. If you run the IPSSSEND program with a specific function but without its required parameters, specific help for that function will appear on the monitor.

There are four basic types of IPSSSEND commands:

- Server roll-out commands
- Error-recovery commands
- Problem-isolation and debug commands
- RAID configuration commands

## Server Roll-Out Commands

The IPSSSEND server roll-out commands include the following:

### BACKUP

Use the BACKUP command to save a ServeRAID adapter or controller configuration to a diskette or to a hard disk drive. The ServeRAID adapter or controller configuration must be valid.

Supported operating systems: Windows NT, OS/2, NetWare, DOS, OpenServer, and UnixWare.

Command:

IPSSSEND BACKUP *Controller Filename Oparm*

Replace:

- *Controller* with the ServeRAID controller number (1 to 8)
- *Filename* with the path and file name where the configuration is to be written
- *Oparm* with the optional parameter, NOPROMPT, to override the user prompt

### COPYLD

Use the COPYLD command to copy a source logical drive to a target logical drive. The size of the target logical drive must be greater than or equal to the size of the source logical drive.

Supported operating system: DOS

Command:

IPSSSEND COPYLD *Controller Source Target Oparm*

Replace:

- *Controller* with the ServeRAID controller number (1 to 8)
- *Source* with the source logical drive number
- *Target* with the target logical drive number
- *Oparm* with the optional parameter, NOPROMPT, to override the user prompt

### RESTORE

Use the RESTORE command to load a configuration from a file stored on a diskette or a hard disk drive. The configuration must be a valid configuration file from the BACKUP option on the *IBM ServeRAID DOS Configuration Utility Program Diskette* or IPSSSEND. This operation overwrites the existing configuration information stored for the ServeRAID adapter or controller.

Supported operating systems: Windows NT, OS/2, NetWare, OpenServer, UnixWare, and DOS

Command:

IPSSSEND RESTORE *Controller Filename Oparm*

Replace:

- *Controller* with the ServeRAID controller number (1 to 8)
- *Filename* with the path and file name where the configuration is to be written
- *Oparm* with the optional parameter, NOPROMPT, to override the user prompt

### INIT

Use the INIT command to initialize the first 0.5 MB of a logical drive. This process will erase the partition tables on the drive, and all data on the logical drive will be lost.

Supported operating systems: Windows NT, OS/2, NetWare, OpenServer, UnixWare, and DOS

Command:

IPSEND INIT *Controller DriveNum Oparm*

Replace:

- *Controller* with the ServeRAID controller number (1 to 8)
- *DriveNum* with the logical drive number (0 to 7)
- *Oparm* with the optional parameter, NOPROMPT, to override the user prompt

## **INITSYNC**

Use the INITSYNC command to initialize and synchronize a logical drive at the same time. This command works only on RAID level-1 and level-5 logical drives. The command will erase the entire logical drive, and all data on the logical drive will be lost.

Supported operating systems: Windows NT, OS/2, NetWare, OpenServer, UnixWare, and DOS

Command:

IPSEND INITSYNC *Controller DriveNum Oparm*

Replace:

- *Controller* with the ServeRAID controller number (1 to 8)
- *DriveNum* with the logical drive number (0 to 7)
- *Oparm* with the optional parameter, NOPROMPT, to override the user prompt

## **SYNCH**

Use the SYNCH command to synchronize the parity information on redundant logical drives. If the parity information is inconsistent, the IPSEND program will repair it automatically.

Supported operating systems: Windows NT, OS/2, NetWare, OpenServer, UnixWare, and DOS

Command:

IPSEND SYNCH *Controller Scope DriveNum*

Replace:

- *Controller* with the ServeRAID controller number (1 to 8)
- *Scope* with Drive for a single logical drive
- *DriveNum* with the logical drive number (0 to 7)

## **Error-Recovery Commands**

The IPSEND error-recovery commands include the following:

**GETSTATUS** Use the GETSTATUS command to display the current logical-drive status for the most recent rebuild, synchronization, or logical-drive migration. The status includes such information as the remaining size of the logical drive, the percentage completed for the function in process, or information about the most recently completed logical-drive function.

Supported operating systems: Windows NT, OS/2, NetWare, OpenServer, UnixWare, and DOS

Command:

IPSEND GETSTATUS *Controller*

Replace:

*Controller* with the ServeRAID controller number (1 to 8)

**REBUILD**

Use the REBUILD command to rebuild a designated disk drive. This command is valid for disk arrays that contain one or more logical drives that are in the critical (CRT) state. Progress is indicated during the rebuild operation, but you can also use the GETSTATUS command to obtain progress information about the rebuild.

Supported operating systems: Windows NT, OS/2, NetWare, OpenServer, UnixWare, and DOS

Command:

IPSEND REBUILD *Controller DCh DSID NCh NSID*

Replace:

- *Controller* with the ServeRAID controller number (1 to 8)
- *DCh* with the channel number for the Defunct drive (1 to 3)
- *DSID* with the SCSI ID for the Defunct Drive (0 to 15)
- *NCh* with the channel number for the New Drive (1 to 3)
- *NSID* with the SCSI ID for the New Drive (0 to 15)

**SETSTATE**

Use the SETSTATE command to change the state of a physical device from its current state to a new state.

**Attention:**

You must be very careful when you use this command. For example, you might lose data if you reset a Defunct (DDD) device to Online (ONL) without first performing a Rebuild operation.

Supported operating systems: Windows NT, OS/2, NetWare, OpenServer, UnixWare, and DOS

Command:

IPSEND SETSTATE *Controller Channel SID NState*

Replace:

- *Controller* with the ServeRAID controller number (1 to 8)
- *Channel* with the channel number for the drive (1 to 3)
- *SID* with the SCSI ID for the drive (0 to 15)
- *NState* with the new state for the drive. Valid states are: EMP for Empty, RDY for Ready, HSP for Hot Spare, SHS for Standby Hot Spare, DDD for Defunct Disk Drive, DHS for Defunct Hot Spare, RBL for Rebuild, SBY for Standby, and ONL for Online. (See "Setting Physical Device States" on page 70 for more information.)

**UNBLOCK**

Use the UNBLOCK command to gain access to a blocked logical drive. RAID level-0 logical drives become blocked if they are in an array that contains RAID level-1 or level-5 logical drives and the array is being rebuilt. Because the RAID level-0 logical drives cannot be rebuilt, the data stored on the RAID level-0 logical drives is damaged and should not be accessed. After you issue the UNBLOCK command, you must re-create or restore the data previously stored on the RAID level-0 logical drives.

Supported operating systems: Windows NT, OS/2, NetWare, OpenServer, UnixWare, and DOS

Command:

IPSEND UNBLOCK *Controller DriveNum*

Replace:

- *Controller* with the ServeRAID controller number (1 to 8)
- *DriveNum* with the logical drive number (0 to 7)

## Problem-Isolation and Debug Commands

The IPSEND problem-isolation and debug commands include the following:

### **CERTIFY**

Use the CERTIFY command to verify the media of a hard disk drive. If the program finds a media error, it reassigns the sectors. A summary of reassignments and PFA errors appears upon completion of the verification.

Supported operating system: DOS

Command:

IPSEND CERTIFY *Controller Channel SID*

Replace:

- *Controller* with the ServeRAID controller number (1 to 8)
- *Channel* with the channel number for the device (1, 2, or 3)
- *SID* with the SCSI ID for the device (0 to 15)

### **ERASEEVENT**

Use the ERASEEVENT command to clear all logged entries in the designated event log. See GETEVENT help for information about the contents of the Device Event Log and the Adapter Soft and Hard Event Logs.

Supported operating systems: Windows NT, O/S2, Netware, OpenServer, UnixWare, and DOS

Command:

IPSEND ERASEEVENT *Controller Options*

Replace:

- *Controller* with the ServeRAID controller number (1 to 8)
- *Options* with one of the following:
  - DEVICE for the Device Event Log
  - SOFT for the ServeRAID adapter or controller Soft Event Log
  - HARD for the ServeRAID adapter or controller Hard Event Log

### **FMSTATUS**

Use the FMSTATUS command to display the progress of a format operation currently processing.

Supported operating system: DOS

Command:

IPSEND FMSTATUS *Controller Channel SID*

Replace:

- *Controller* with the ServeRAID controller number (1 to 8)
- *Channel* with the channel number for the device (1, 2, or 3)



- *SID* with the SCSI ID for the device (0 to 15)

## FORMAT

Use the FORMAT command to perform a low-level format of a hard disk drive.

### Attention:

When you issue this command, all data on the drive will be lost.

Supported operating system: DOS

Command:

IPSSEND FORMAT *Controller Channel SID*

### Replace:

- *Controller* with the ServeRAID controller number (1 to 8)
- *Channel* with the channel number for the device (1, 2, or 3)
- *SID* with the SCSI ID for the device (0 to 15)

## GETEVENT

Use the GETEVENT command to display information about various unexpected events. IBM uses the Soft and Hard Event Logs for development and debugging purposes only. The Device Event Log contains event counters for each attached physical device. These counters include:

- **Parity:** An unexpected event while transferring data on the SCSI bus. This usually indicates a problem with the SCSI cable, connectors, or terminators.
- **Soft:** A SCSI device detected a *check condition* event.
- **Hard:** The SCSI controller detected an unexpected event. The controller is the most likely cause.
- **Misc:** The ServeRAID adapter or controller detected an event that was most likely caused by the device.

The Device Event Log also provides predictive failure analysis (PFA) alerts, which indicate that the device has signaled the ServeRAID adapter or controller that it might fail in the near future.

Supported Operating Systems: Windows NT, OS/2, NetWare, OpenServer, UnixWare, and DOS

Command:

IPSSEND GETEVENT *Controller Options*

### Replace:

- *Controller* with the ServeRAID controller number (1 to 8)
- *Options* with one of the following: DEVICE for Device Event Log, SOFT for the ServeRAID adapter or controller Soft Event Log, or HARD for the ServeRAID adapter or controller Hard Event Log.

## SELFTEST

The SELFTEST command is used to direct an adapter or a device to perform its self-test.

Supported operating systems: DOS

Command:

IPSSEND SELFTEST *Controller Options*

### Replace:

- *Controller* with the ServeRAID controller number (1 to 8)
- *Options* with AD for the ServeRAID adapter or controller self-test or PD Channel SID for the Device self-test.

**Note:** *Channel* represents the drive channel and *SID* represents the SCSI ID for the device.

**STARTDELY** Use the STARTDELY command to set the number of drives in a group to start up simultaneously and to set the delay in seconds between the startup of these groups of drives.

Supported operating systems: DOS

Command:

IPSSEND STARTDELY *Controller Options*

Replace:

- *Controller* with the ServeRAID controller number (1 to 8)
- *Options* with a question mark (?) to display concurrent drive startup count: Drive Count (1 to 16) and Delay Time (3 to 15 seconds).

## RAID Configuration Commands

The IPSSEND RAID configuration commands include the following:

**DRIVEVER** Use the DRIVEVER command to display the vendor ID, microcode version, and serial number of a SCSI device. The IPSSEND program retrieves this information directly from the device.

Supported operating systems: Windows NT, OS/2, NetWare, OpenServer, UnixWare, and DOS

Command:

IPSSEND DRIVEVER *Controller Channel SID*

Replace:

- *Controller* with the ServeRAID controller number (1 to 8)
- *Channel* with the channel number for the device (1, 2, or 3)
- *SID* with the SCSI ID for the device (0 to 15)

**GETCONFIG** Use the GETCONFIG command to display the ServeRAID adapter or controller configuration information. This includes information about the firmware version; initiator ID and rebuild rate; logical drive status, RAID level, and size; and physical device type, SCSI ID, and PFA error.

Supported operating systems: Windows NT, OS/2, NetWare, OpenServer, UnixWare, and DOS

Command:

IPSSEND GETCONFIG *Controller Options*

Replace:

- *Controller* with the ServeRAID controller number (1 to 8)
- *Options* with one of the following: AD for adapter or controller information, LD for logical drive information, PD for physical device information, AL (default) for all information.

- HSREBUILD** Use the HSREBUILD command to set the ServeRAID adapter or controller hot-swap rebuild feature on. Use a question mark (?) to display the current status of the hot-swap rebuild feature.
- Supported operating systems: Windows NT, OS/2, NetWare, OpenServer, UnixWare, and DOS
- Command:  
IPSEND HSREBUILD *Controller Options*
- Replace:
- *Controller* with the ServeRAID controller number (1 to 8)
  - *Options* with ON to enable the hot-swap rebuild feature, or ? to display the status of the hot-swap rebuild feature.

---

## Starting the IPSMON Program

You can run the IPSMON program from the operating system command line.

To start the IPSMON program:

- If you are using OS/2 or Windows NT:
  1. Type:  
`c:\ipsadm\ipsmon`
  2. Press **Enter**.  
**Note:** The *c* represents the drive where OS/2 or Windows NT is installed.
- If you are using Novell NetWare:
  1. From the console, type:  
`load ipsmon`
  2. Press **Enter**.
- If you are using SCO OpenServer or UnixWare:
  1. Type:  
`/usr/bin/ipsmon`
  2. Press **Enter**.

---

## Using the IPSMON Program

When you start this monitoring program, it immediately begins polling all ServeRAID adapters and controllers for specific conditions. If a condition being monitored is found, this program logs a message to the monitor, to a file, or to both the monitor and a file.

The IPSMON program uses command-line parameters to determine where to log the messages. If you need help, you can type the `IPSMON -?` command for a list of valid parameters.

If you start this program without any command-line parameters, the IPSMON program will log the messages to the IPSMON.LOG file, and the messages will not appear on the monitor.

The valid parameters for IPSMON are:

- **-f:filename**

Use the -f parameter to specify the name of the file in which to record messages. The default file name is IPSMON.LOG.

- **-s**

Use the -s parameter to display messages on the standard output (usually the monitor).

- **-?**

Use the -? parameter to obtain a current list of valid parameters.

After you start the IPSMON program, the program will continuously poll the ServeRAID adapters and controllers until you take one of the following actions:

- If you are using Windows NT or OS/2, press **Ctrl+C**.
- If you are using NetWare, type: `unload ipsmon` at the system console.
- If you are using OpenServer or UnixWare, press the **Del** key to cancel the program.

During operation, the program will log various messages. Each message will contain an alert code and a location specifier.

- The alert code begins with the message type and number. For example, INF, WRN, or CRT, followed by the message number.
- After the alert code comes the location specifier:
  - A** specifies the adapter or controller number
  - SID** specifies the SCSI ID (if required)
  - C** specifies the channel number (if required)

For example, a message of CRTxxx:A2C3SID04 signifies that a Critical condition (CRTxxx) was found on Adapter 2 (A2), Channel 3 (C3), SCSI ID 4 (SID04).

The IPSMON program can log the following messages, based on the required condition.

**Information Messages:**

<Date and Time> INF000:A1C-SID-- no errors detected  
<Date and Time> INF001:A1C-SID-- rebuild started  
<Date and Time> INF002:A1C-SID-- rebuild completed  
<Date and Time> INF003:A1C-SID-- synchronization started  
<Date and Time> INF004:A1C-SID-- synchronization completed  
<Date and Time> INF005:A1C-SID-- migration started  
<Date and Time> INF006:A1C-SID-- migration completed

**Warning Messages:**

<Date and Time> WRN001:A2C3SID12 PFA Error detected

**Critical Messages:**

<Date and Time> CRT001:A3C2SID04 dead drive detected  
<Date and Time> CRT002:A1C-SID-- not responding to commands



---

## Chapter 5. Solving ServeRAID Problems

This chapter describes the ServeRAID text and numeric messages that might appear during startup. This chapter also includes some basic information about rebuilding a defunct drive.

In addition to the information provided in this chapter, you might want to use the ServeRAID IPSSSEND program to help isolate ServeRAID problems. See “Using the IPSSSEND Program” on page 76 and “Problem-Isolation and Debug Commands” on page 80 for information about using the IPSSSEND program.

**This chapter contains:**

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---

## ServeRAID Adapter and Controller Messages

This section lists the ServeRAID messages that might appear during system startup.

The ServeRAID adapters and controllers provide a Device Event Log that collects statistics on the number and types of events that occur on a selected hard disk drive. After correcting a problem with the disk array, clear the log so that you can identify any subsequent errors quickly. For information about clearing the event log, see “ERASEEVENT” on page 80.

All hard disk drives contain unique identifiers, such as the drive serial number and manufacturer. During configuration, the ServeRAID adapter or controller stores this information.

## ServeRAID Startup Messages

During power-on self-test (POST), the ServeRAID adapter or controller compares the stored configuration information to the configuration that is actually present. If a discrepancy exists, one or more status messages appear after POST completes, but before the operating system loads.

### Notes:

1. When the ServeRAID adapter or controller requires your input, a list of function keys will appear below the message.
2. Where the “Action” information tells you to start the IBM ServeRAID configuration program, insert the *IBM ServeRAID Configuration CD* into the CD-ROM drive; then, restart the server. The action column also provides general information about the message.
3. Where *SID* and *ch* appear in these messages, *SID* shows the SCSI ID for the device and *ch* shows the channel to which the device is attached.
4. Where *m* or *n* appears in these messages, a number will appear in the actual message.

This following pages list, in alphabetical order, messages associated with the ServeRAID subsystem.

---

### A new drive was installed.

**Explanation:** When the ServeRAID adapter or controller detects a new drive that is not part of the current configuration, the following message appears:

Following new drives found (old state: new state: ch: SID)

**Action:** This is an information message. No action is required.

---

### Auto rearrange.

**Explanation:** Auto rearrange is enabled or disabled.

**Action:** This is an information message. No action is required.



---

**Configured drives are missing.**

**Explanation:** When the ServeRAID adapter or controller detects that a previously configured drive is missing, the following message appears:

Following drives not responding (old state: new state: ch: SID)

Where: **old state** is the configured state of the drive.

**new state** is the state that the ServeRAID adapter or controller will assign to the drive.

**ch** is the channel where the drive was located previously.

**SID** is the SCSI ID for where the drive was located previously.

Examples of the possible state changes include:

Online to Defunct	(ONL: DDD x: y)
Ready to Empty	(RDY: EMP x: y)
Standby to Empty	(SBY: EMP x: y)
Rebuild to Defunct	(RBL: DDD x: y)
Hot Spare to Defunct	(HSP: DHS x: y)
Standby Hot Spare to Defunct	(SHS: DHS x: y)

**Action:** Press one of the following keys:

**F4** Retry. Press this key after correcting a problem. For example, press F4 after you turn on the external storage enclosure that contains the hard disk drive.

**F5** Accept. Press this key to accept the new state that the ServeRAID adapter or controller will assign to the drive. For example, the ServeRAID adapter or controller will assign the drive a state of defunct (DDD) or empty (EMP).

You can also press F5 when you must remove a drive, RAID level-1 and RAID level-5 logical drives are present, and performance in a degraded mode is acceptable. The ServeRAID adapter or controller will assign the drive a state of defunct (DDD), but the server can complete startup. However, the array will remain in Critical mode and the potential for data loss will exist until you replace and rebuild the defunct drive. To prevent the loss of data, replace and rebuild the defunct drive in a timely manner.

**Note:** A hard disk drive in the DDD state does not necessarily mean that you need to replace the drive. Before you replace the drive, ensure that:

1. All cables are connected properly to the backplane and to the hard disk drive. Also, ensure that all cables inside the server are connected properly.
2. The hot-swap drive trays are seated properly in the drive bay.
3. If you have not already attempted to rebuild the drive, try rebuilding it. See "Rebuilding a Defunct Drive" on page 99 for more information.

After you perform these steps, if the hard disk drive does not function properly, replace the drive.

**F10** Continue. Press this key to continue without change to the configuration.

---

**Configured drives are not in the configured location.**

**Explanation:** This message will be preceded by the previous messages and the **F5** key choice because configured drives were not found in the configured location. When the ServeRAID adapter or controller detects that a previously configured drive is present, but the drive is in a new location, the following message appears:

Following drives found in new location (old ch: old SID: > new ch: new SID)

Where: **old ch** is the channel that matches the existing drive configuration information.

**old SID** is the SCSI ID that matches the existing drive configuration information.

**new ch** is the channel where the drive is now located.

**new SID** is the SCSI ID where the drive is now located.

For example:

(1 :5 > 1: 14)

In this example, the message indicates that the drive from Channel 1, SCSI ID 5 is now located at Channel 1, SCSI ID 14. The drive might have been physically moved to the new drive bay.

**Action:** Press one of the following keys:

- F4** Retry. Press this key after correcting a problem. For example, press F4 after you move the hard disk drive to its previously assigned location.
- F5** Accept. Press this key to accept the new state that the ServeRAID adapter or controller will assign to the drive. For example, the ServeRAID adapter or controller will assign the drive a state of defunct (DDD) or empty.

**Note:** A hard disk drive in the DDD state does not necessarily mean that you need to replace the drive. Before you replace the drive, ensure that:

1. All cables are connected properly to the backplane and to the hard disk drive. Also, ensure that all cables inside the server are connected properly.
2. The hot-swap drive trays are seated properly in the drive bay.
3. If you have not already attempted to rebuild the drive, try rebuilding it. See "Rebuilding a Defunct Drive" on page 99 for more information.

After you perform these steps, if the hard disk drive does not function properly, replace the drive.

- F6** Modify. Press this key to modify the configuration to match the current drive location.

You might remove the hot-swap drives from the server for security or maintenance reasons. If you replace the drives but install them in different drive bays, you can press **F6** to accept the new locations, and the ServeRAID adapter or controller will update the configuration.

---

**Controller is not responding to commands. No logical drives are installed.**

**Explanation:** The ServeRAID adapter or controller is not operational.

**Action:** Have the system serviced.

---

**Error: Cannot disable this adapter BIOS.**

**Explanation:** The ServeRAID adapter or controller was unable to prevent an extra copy of its BIOS code from being stored on the server. This condition occurs when the server contains multiple ServeRAID adapters or controllers.

**Action:** This is an information message. No action is required.

---

**Following drives not responding** (old state: new state ch: SID)

**Explanation:** One or more drives did not respond to the ServeRAID adapter or controller. For example, the ServeRAID adapter or controller detected a new drive at an unconfigured SCSI ID, and the drive is not part of the current configuration. This might also occur if the ServeRAID adapter or controller detected that a configured drive is missing.

**Action:** Select **F5** to accept the new state that the ServeRAID adapter or controller will assign to the drive. For example, the ServeRAID adapter or controller will assign the drive a state of defunct (DDD) or empty (EMP).

A hard disk drive in the defunct state does not necessarily mean that you need to replace the drive. Before you replace the drive, ensure that:

1. All cables are connected properly to the backplane or system board, and to the hard disk drive. Also, ensure that all cables inside the server are connected properly.
2. The hot-swap drive trays are seated properly in the drive bay.
3. If you have not already attempted to rebuild the drive, try rebuilding it. See “Rebuilding a Defunct Drive” on page 99 for more information.

After you perform these steps, if the hard disk drive does not function properly, replace the drive.

For more information, see “Configured drives are missing.” on page 88.

---

**Following drives found in new location** (old ch: old SID > new ch: new SID)

**Explanation:** POST found that the location of one or more drives does not match the stored configuration information.

**Action:** For more information, see “Configured drives are not in the configured location.” on page 89.

---

**Following new drives found** (old state: new state ch: SID)

**Explanation:** One or more drives were found at an unconfigured SCSI ID. For each drive listed, a new state of Ready (RDY) appears.

**Action:** This is an information message. No action is required.

---

**Installation stopped.**

**Explanation:** The server cannot access the ServeRAID adapter or controller.

**Action:** This is a follow-on message to a preceding message. Follow the “Action” instructions for the preceding message to resolve the problem.

---

**n logical drives are installed.**

**Explanation:** *n* represents the number of defined logical drives.

**Action:** This is an information message. No action is required.

---

**New adapter installed in a configured server or drives are imported**

**Explanation:** This message might be preceded by the previous two messages and the **F5** and **F6** key choices because the drives were not found in the configured location. When the ServeRAID adapter or controller detects that the identifiers of the drives do not match the adapter configuration information, the following message appears:

Following new drives found: (host id: old ch: old SID: new ch: new SID)

Where: **host id** identifies the System Name where the ServeRAID adapter or controller resides.

**old ch** is the channel that matches the drive configuration information.

**old SID** is the SCSI ID that matches the drive configuration information.

**new ch** is the channel where the drive is now located.

**new SID** is the SCSI ID where the drive is now located.

For example, when drives are imported from a server with the System Name of *My Machine*: (My Machine: 1:6 > 1:10)

In this example, the message indicates that the drive from Channel 1, SCSI ID 6 is now located at Channel 1, SCSI ID 10. The drive might have been physically moved to a new drive bay.

**Action:** Press one of the following keys:

**F4** Retry. Press this key after correcting the problem. For example, press F4 after you move the hard disk drive to its previously assigned location, or after you install the original hard disk drives back in the server.

**F5** Accept. Press this key to accept the new state that the ServeRAID adapter or controller will assign to the drive. For example, the ServeRAID adapter or controller will assign the drive a state of defunct (DDD) or empty (EMP).

**Note:** A hard disk drive in the defunct state does not necessarily mean that you need to replace the drive. Before you replace the drive, ensure that:

1. All cables are connected properly to the backplane or system board, and to the hard disk drive. Also, ensure that all cables inside the server are connected properly.
2. The hot-swap drive trays are seated properly in the drive bay.
3. If you have not already attempted to rebuild the drive, try rebuilding it. See “Rebuilding a Defunct Drive” on page 99 for more information.

After you perform these steps, if the hard disk drive does not function properly, replace the drive.

**F6** Modify. This choice is not always active. Press this key to modify the configuration to match the current drive location.

You might remove the hot-swap drives from the server for security or maintenance reasons. If you replace the drives but install them in different drive bays, you can press **F6** to accept the new locations, and the ServeRAID adapter or controller will update the configuration.

**F7** Import. Press this key to import the configuration information from the drive and to update the configuration information for the ServeRAID adapter or controller. This choice is useful when you replace the ServeRAID adapter or controller in an existing ServeRAID subsystem.

You also might press F7 if you replace a whole set of drives with drives that were configured in another server with a ServeRAID adapter or controller.

**Note:** When you install drives in a server that has no logical drives defined, the F7 choice will not appear. The ServeRAID adapter or controller does not contain any logical drives in its factory configuration. Therefore, F7 will not appear. In this case, do the following:

1. Restart the server and press **Ctrl+I** to enter the Mini-Configuration program (see “Using the ServeRAID Mini-Configuration Program” on page 26).
2. Select **Advanced Functions**.
3. Select **Import Configuration from Drives to Adapter** and follow the instructions on the screen.

---

### **NVRAM Cache Controller Not Responding**

**Explanation:** BIOS code detected a bad or failed NVRAM.

**Action:** Press **F9** to remove the NVRAM cache controller from the configuration, or press **F10** to exit without change.

---

### **NVRAM Cache Controller Replacement**

**Explanation:** The ServeRAID controller detects that the NVRAM cache controller is defective.

**Action:** Press **F8** if you replaced the NVRAM cache controller, or press **F10** if you have not replaced the NVRAM cache controller.

---

**Recoverable configuration error**

**Explanation:** The configuration data stored in NVRAM does not match the configuration data stored in the EEPROM.

**Action:**

1. Press **Ctrl+Alt+Del** to restart the system.
2. Start the ServeRAID Mini-Configuration Program. (See “Using the ServeRAID Mini-Configuration Program” on page 26 for instructions.)
3. Select **Advanced Functions** from the Main Menu; then, select **Import Configuration from Drive(s)**. (See “Using the Advanced Configuration Functions” on page 28 for more information.)

---

**WARNING: *n* logical drives are critical; *n* logical drives are offline.**

**Explanation:** One or more hard disk drives have failed.

**Action:** Replace the defunct drives as soon as possible to prevent data loss.

---

**Your server has an error due to a Blocked Logical Drive.**

**Explanation:** One or more logical drives are in a blocked state. A blocked logical drive cannot be accessed. See “Logical Drive State Descriptions” on page 18 for additional information.

**Action:** Press **F4** to unblock the logical drive, or press **F5** to continue without unblocking.

## ServeRAID POST Messages

The following numeric POST messages appear in hexadecimal format.

---

**1xxx to 7xxx**

**Explanation:** The POST detected an internal error.

**Action:** Have the system serviced.

---

**2601 to 260B**

**Explanation:** The POST detected an error with the ServeRAID subsystem.

**Action:** Have the system serviced.

---

**2610**

**Explanation:** The POST detected an error with the ServeRAID adapter or controller hardware.

**Action:** Have the system serviced.

---

**2620**

**Explanation:** The POST detected that a ServeRAID configuration or hard disk error occurred.

**Action:** Start the *IBM ServeRAID Configuration CD* and view the existing device and configuration information for your ServeRAID subsystem. If you can not locate and correct the configuration problem or the failing device, or if the problem persists, have the system serviced.

---

**8xxx to Bxxx**

**Explanation:** The POST detected an error with the SCSI interface.

**Action:** Verify that the SCSI cables are correctly connected, and the SCSI termination is set properly for each installed SCSI device.

If you can not locate and correct the SCSI problem, or if the problem persists, have the system serviced.

## ServeRAID ISPR, BCS, and ECS Codes

Once the ServeRAID POST completes, register information appears on the screen in hexadecimal format, as follows:

Hardware: ISPR=aaaa BCS=bb ECS=cc

ISPR displays the four digit Interrupt Status Report Register code, BCS displays the Basic Configuration Status Register code, and ECS displays the Extended Configuration Status Register code.

If no errors occur:

**ISPR (aaaa)** = EF10

**BCS (bb)** = 0F or 09

**ECS (cc)** = 00

If an error occurs, refer to: "ISPR (Interrupt Status Port Register) Codes" for the ISPR error codes and "Basic and Extended Configuration Status Codes" on page 95 for the BCS and ECS error codes.

### ISPR (Interrupt Status Port Register) Codes

---

#### 1xxx

**Explanation:** A flash checksum error occurred.

**Action:** Have the system serviced.

---

#### 2xxx

**Explanation:** A code DRAM error occurred.

**Action:** Have the system serviced.

---

#### 3xxx

**Explanation:** A NVRAM error occurred.

**Action:** Have the system serviced.

---

#### 4xxx

**Explanation:** A timer/cache memory controller error occurred.

**Action:** Have the system serviced.

---

#### 5xxx

**Explanation:** A cache memory controller error occurred.

**Action:** Have the system serviced.

---

**6xxx**

**Explanation:** A cache DRAM error occurred.

**Action:** Have the system serviced.

---

**7xxx**

**Explanation:** A host/local PCI bus interface error occurred.

**Action:** Have the system serviced.

---

**8xxx**

**Explanation:** A SCSI I/O port error occurred.

**Action:** Have the system serviced.

---

**9xxx**

**Explanation:** A SCSI termination error occurred.

**Action:** Check cable connections and device termination. If the problem persists, have the system serviced.

---

**Axxx**

**Explanation:** A SCSI I/O port error occurred.

**Action:** Have the system serviced.

---

**Bxxx**

**Explanation:** A SCSI bus interface error occurred.

**Action:** Have the system serviced.

---

## Basic and Extended Configuration Status Codes

---

BCS	ECS	Explanation and Possible Recovery Action
<b>Code not in table</b>	<b>Code not in table</b>	<b>Explanation:</b> The ServeRAID adapter or controller is not functioning properly. <b>Action:</b> Have the system serviced.
<b>00</b>	<b>01</b>	<b>Explanation:</b> Invalid flash configuration. <b>Action:</b> Start the <i>IBM ServeRAID Configuration CD</i> and follow the instructions that appear on the screen.  If no instructions appear or if the problem persists, have the system serviced.
<b>00</b>	<b>02</b>	<b>Explanation:</b> Invalid NVRAM configuration. <b>Action:</b> Start the <i>IBM ServeRAID Configuration CD</i> and follow the instructions that appear on the screen.  If no instructions appear or if the problem persists, have the system serviced.
<b>00</b>	<b>03</b>	<b>Explanation:</b> Invalid flash and NVRAM configuration. <b>Action:</b> Start the <i>IBM ServeRAID Configuration CD</i> and follow the instructions that appear on the screen.  If no instructions appear or if the problem persists, have the system serviced.

---

BCS	ECS	Explanation and Possible Recovery Action
01	08	<b>Explanation:</b> No configuration was found in drives or Online/Rebuild drives are not responding. <b>Action:</b> Press F4, F5, F7, or F10.
01	18	<b>Explanation:</b> No configuration was found in drives; or, Online/Rebuild and Hot-Spare/Standby Hot-Spare drives are not responding. <b>Action:</b> Press F4, F5, F7, or F10.
01	28	<b>Explanation:</b> No configuration was found in drives; or, Online/Rebuild and Ready/Standby drives are not responding. <b>Action:</b> Press F4, F5, F7, or F10.
01	38	<b>Explanation:</b> No configuration was found in drives; or, Online/Rebuild, Hot-Spare/Standby Hot-Spare, and Ready/Standby drives are not responding. <b>Action:</b> Press F4, F5, F7, or F10.
01	48	<b>Explanation:</b> No configuration was found in drives; or, Online/Rebuild drives are not responding and unidentified drives were found. <b>Action:</b> Press F4, F5, F7, or F10.
01	58	<b>Explanation:</b> No configuration was found in drives; or, Online/Rebuild and Hot-Spare/Standby Hot-Spare drives are not responding and unidentified drives were found. <b>Action:</b> Press F4, F5, F7, or F10.
01	68	<b>Explanation:</b> No configuration was found in drives; or, Online/Rebuild and Ready/Standby drives are not responding and unidentified drives were found. <b>Action:</b> Press F4, F5, F7, or F10.
01	78	<b>Explanation:</b> No configuration was found in drives; or, Online/Rebuild, Hot-Spare/Standby Hot-Spare, and Ready/Standby drives are not responding and unidentified drives were found. <b>Action:</b> Press F4, F5, F7, or F10.
03	88	<b>Explanation:</b> A drive was imported from another system and it has valid configuration; and, Online/Rebuild drives are not responding. <b>Action:</b> Press F4, F5, F7, or F10.
03	98	<b>Explanation:</b> A drive was imported from another system and it has valid configuration; and, Online/Rebuild and Hot Spare/Standby Hot-Spare drives are not responding. <b>Action:</b> Press F4, F5, F7, or F10.
03	A8	<b>Explanation:</b> A drive was imported from another system and it has valid configuration; and, Online/Rebuild and Ready/Standby drives are not responding. <b>Action:</b> Press F4, F5, F7, or F10.
03	B8	<b>Explanation:</b> A drive was imported from another system and it has valid configuration; and, Online/Rebuild, Hot-Spare/Standby Hot-Spare, and Ready/Standby drives are not responding. <b>Action:</b> Press F4, F5, F7, or F10.



BCS	ECS	Explanation and Possible Recovery Action
03	C8	<b>Explanation:</b> A drive was imported from another system and it has valid configuration; and, Online/Rebuild drives are not responding and unidentified drives were found. <b>Action:</b> Press F4, F5, F7, or F10.
03	D8	<b>Explanation:</b> A drive was imported from another system and it has valid configuration; and, Online/Rebuild and Hot-Spare/Standby Hot-Spare drives are not responding and unidentified drives were found. <b>Action:</b> Press F4, F5, F7, or F10.
03	E8	<b>Explanation:</b> A drive was imported from another system and it has valid configuration; and, Online/Rebuild and Ready/Standby drives are not responding and unidentified drives were found. <b>Action:</b> Press F4, F5, F7, or F10.
03	F8	<b>Explanation:</b> A drive was imported from another system and it has valid configuration; and, Online/Rebuild, Hot-Spare/Standby Hot-Spare, and Ready/Standby drives are not responding and unidentified drives were found. <b>Action:</b> Press F4, F5, F7, or F10.
07	08	<b>Explanation:</b> Online/Rebuild drives are not responding. <b>Action:</b> Press F4, F5, or F10.
07	0C	<b>Explanation:</b> Online/Rebuild drives are not responding and a drive was found at the incorrect SCSI ID. <b>Action:</b> Press F4, F5, F6, or F10.
07	18	<b>Explanation:</b> Online/Rebuild and Hot-Spare/Standby Hot-Spare drives are not responding. <b>Action:</b> Press F4, F5, or F10.
07	1C	<b>Explanation:</b> Online/Rebuild and Hot Spare/Standby Hot-Spare drives are not responding and a drive was found at the incorrect SCSI ID. <b>Action:</b> Press F4, F5, F6, or F10.
07	28	<b>Explanation:</b> Online/Rebuild and Ready/Standby drives are not responding. <b>Action:</b> Press F4, F5, or F10.
07	2C	<b>Explanation:</b> Online/Rebuild and Ready/Standby drives are not responding; and, a drive was found at the incorrect SCSI ID. <b>Action:</b> Press F4, F5, F6, or F10.
07	38	<b>Explanation:</b> Online/Rebuild, Ready/Standby, and Hot-Spare/Standby Hot-Spare drives are not responding. <b>Action:</b> Press F4, F5, or F10.
07	3C	<b>Explanation:</b> Online/Rebuild, Ready/Standby, and Hot-Spare/Standby Hot-Spare drives are not responding; and, a drive was found at the incorrect SCSI ID. <b>Action:</b> Press F4, F5, F6, or F10.
07	48	<b>Explanation:</b> Online/Rebuild drives are not responding and unidentified drives were found. <b>Action:</b> Press F4, F5, or F10.

<b>BCS</b>	<b>ECS</b>	<b>Explanation and Possible Recovery Action</b>
07	4C	<b>Explanation:</b> Online/Rebuild drives are not responding, a drive was found at the incorrect SCSI ID, and unidentified drives were found. <b>Action:</b> Press F4, F5, F6, or F10.
07	58	<b>Explanation:</b> Online/Rebuild and Hot Spare/Standby Hot-Spare drives are not responding; and, unidentified drives were found. <b>Action:</b> Press F4, F5, or F10.
07	5C	<b>Explanation:</b> Online/Rebuild and Hot Spare/Standby Hot-Spare drives are not responding, a drive was found at the incorrect SCSI ID, and unidentified drives were found. <b>Action:</b> Press F4, F5, F6, or F10.
07	68	<b>Explanation:</b> Online/Rebuild and Ready/Standby drives are not responding; and, unidentified drives were found. <b>Action:</b> Press F4, F5, or F10.
07	6C	<b>Explanation:</b> Online/Rebuild and Ready/Standby drives are not responding, a drive was found at the incorrect SCSI ID, and unidentified drives were found. <b>Action:</b> Press F4, F5, F6, or F10.
07	78	<b>Explanation:</b> Online/Rebuild, Ready/Standby, and Hot-Spare/Standby Hot-Spare drives are not responding; and, unidentified drives were found. <b>Action:</b> Press F4, F5, or F10.
07	7C	<b>Explanation:</b> Online/Rebuild, Ready/Standby, and Hot-Spare/Standby Hot-Spare drives are not responding, a drive was found at the incorrect SCSI ID, and unidentified drives were found. <b>Action:</b> Press F4, F5, F6, or F10.
09	00	<b>Explanation:</b> No error occurred. <b>Action:</b> No action is required.
09	10	<b>Explanation:</b> Hot-Spare/Standby Hot-Spare drives are not responding. <b>Action:</b> Press F4, F5, or F10.
09	20	<b>Explanation:</b> Ready/Standby drives are not responding. <b>Action:</b> Press F4, F5, or F10.
09	30	<b>Explanation:</b> Hot-Spare/Standby Hot-Spare and Ready/Standby drives are not responding. <b>Action:</b> Press F4, F5, or F10.
0F	00	<b>Explanation:</b> No error occurred. <b>Action:</b> No action is required.
0F	10	<b>Explanation:</b> Hot-Spare/Standby Hot-Spare drives are not responding. <b>Action:</b> Press F4, F5, or F10.
0F	20	<b>Explanation:</b> Ready/Standby drives are not responding. <b>Action:</b> Press F4, F5, or F10.
0F	30	<b>Explanation:</b> Hot-Spare/Standby Hot-Spare and Ready/Standby drives are not responding. <b>Action:</b> Press F4, F5, or F10.

---

## Rebuilding a Defunct Drive

When a hard disk drive goes defunct (DDD), a Rebuild operation is required to reconstruct the data for the device in its respective disk array. The ServeRAID adapters and controllers can reconstruct RAID level-1 and RAID level-5 logical drives, but they cannot reconstruct data stored in RAID level-0 logical drives.

To prevent data integrity problems, the ServeRAID adapters and controllers set the RAID level-0 logical drives to *Blocked* during a Rebuild operation. After the Rebuild operation completes, you can unblock the RAID level-0 logical drives, and access them once again. But remember, the logical drive might contain damaged data. (Refer to “Unblocking Logical Drives” on page 67 for more information.)

Before you rebuild a drive, review the following guidelines and general information.

### Guidelines for the Rebuild Operation

- The replacement hard disk drive must have a capacity equal to or greater than the failed drive.
- If the hard disk drive being rebuilt is part of a RAID level-0 logical drive, the RAID level-0 drive is blocked.
  - You must unblock any RAID level-0 logical drives at the end of the rebuild operation.
  - If you use the Administration and Monitoring program to initiate the rebuild operation, you can unblock the blocked RAID level-0 drive when the rebuild operation completes. (See “Unblocking Logical Drives” on page 67 for more information.)
- Data in a logical drive with RAID level-0 is lost during the rebuild operation. If you backed up your data before the drive failed, you can restore the data to the new drive.

### General Information about the Rebuild Operation

A physical hard disk drive can enter the rebuild state if:

- You physically replace a defunct drive that is part of the critical logical drive.

When you physically replace a defunct drive in a critical logical drive, the ServeRAID adapter or controller rebuilds the data on the new physical drive *before* it changes the logical drive state back to Okay.
- The ServeRAID adapter or controller adds a hot-spare or a standby hot-spare drive to the array and changes its state from Hot-Spare or Standby Hot-Spare to Rebuilding.

## Automatically Rebuilding the Defunct Drive

The ServeRAID adapter or controller will rebuild a defunct drive automatically when all of the following conditions exist:

- The physical drive that failed is part of a RAID level-1 or RAID level-5 logical drive.
- A hot-spare or standby hot-spare drive with a capacity equal to or greater than the capacity of the defunct drive is available the moment the drive fails.
  - When multiple hot-spare drives are available, the ServeRAID adapter or controller searches for a hot-spare drive of the appropriate size. The smallest drive that meets this requirement enters the Rebuild state.
  - If no hot-spare or standby hot-spare drives are available, the rebuild operation will start the moment you replace the defective drive.
    - Note:** If you physically replace the drive and the new drive does not appear in the Physical Drives branch of the Main Tree, you must scan for new or removed Ready drives.
- No rebuild, synchronization, or logical-drive migration operation is in process.

---

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