

IBM TotalStorage™ IP Storage 200i



Administrator's Guide

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Administrator's Guide

NOTE

Before using this information and the product it supports, read the general information in "Appendix B. Notices" on page 57.

First Edition (June 2001)

This edition applies to the IBM TotalStorage IP Storage 200i and to all subsequent releases and modifications until otherwise indicated in new editions.

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About this guide

This guide provides information necessary to configure and administer the software for the IBM TotalStorage™ IP Storage 200i.

Who should read this guide

This guide is intended for IBM IP Storage software administrators.

Frequently used terms

The following list of terms, used within this document, have these specific meanings:

Term	Definition in this document
Drive bay	A receptacle into which you insert a hard disk drive in an appliance. The bays could be physically located in a separate rack from the appliance.
Engine	The processor that responds to requests for data from clients. This is where the operating software for the IBM IP Storage appliance resides.
Storage unit	Hardware that contains one or more drive bays, power supplies, and a network interface.
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.
Caution	These notices indicate situations that can be potentially hazardous to you. A caution notice is placed just before descriptions of potentially hazardous procedure steps or situations.
Danger	These notices indicate situations that can be potentially lethal or extremely hazardous to you. A danger notice is placed just before descriptions of potentially lethal or extremely hazardous procedure steps or situations.

Publications

Hardcopy publications shipped with the IBM IP Storage

The following publications are shipped in hardcopy. They are also provided in softcopy on the Publications and Code CD that came with your appliance and at www.ibm.com/storage/support/nas.

- *IBM TotalStorage IP Storage 200i Installation Guide, GA27-4273*
This publication provides detailed procedures for setting up and cabling components of the IBM IP Storage and for performing initial configuration.
- *Release Notes*
This document provides any changes that were not available at the time this publication was produced.
- *IBM TotalStorage IP Storage 200i Quick Start Instructions*
This document provides a brief list of procedures for setting up, cabling, and configuring the IBM IP Storage.

Softcopy publications

The following publications support the IBM IP Storage appliance. They are available in softcopy on the Publications and Code CD that came with your appliance and at www.ibm.com/storage/support/nas.

- *IBM TotalStorage IP Storage 200i Administrator's Guide, GA27-4274*
This publication describes instructions for configuring, maintaining, recovering, and troubleshooting the appliance.
- *IBM TotalStorage IP Storage 200i Service Guide, GY27-0403*
This publication describes instructions for troubleshooting, recovering, and servicing the IBM IP Storage appliance.
- *IBM TotalStorage IP Storage 200i Storage Unit Installation Guide, GA27-4265*
This publication provides instructions for installing, replacing, and troubleshooting components in the Model EXP (storage unit).
- *IBM TotalStorage 5Ux24D Tower-to-Rack Kit Installation Guide, GA27-4267*
This publication describes how to convert the Model 100 into a rack-mountable unit.
- *IBM TotalStorage Gigabit Ethernet Copper Adapter Quick Installation Guide, GA27-4266*
This publication describes how to quickly install the Gigabit Ethernet Copper Adapter.
- *Netfinity Gigabit Ethernet SX Adapter User's Guide*
This publication describes how to quickly install the Gigabit Ethernet SX Adapter.

Accessibility

The softcopy version of this guide and the other related publications are all accessibility-enabled for the IBM Home Page Reader.

Web site

You can obtain complete parts information, FAQs, technical hints and tips, the latest level of technical publications and release notes, and downloadable files (including iSCSI client and the latest system image) from:

www.ibm.com/storage/support/nas

Chapter 1. Quick start

This guide assumes that the hardware has been set up successfully using the *IBM TotalStorage IP Storage 200i Installation Guide* and you have set the initial IP address.

Prerequisites

The IBM TotalStorage IP Storage 200i requires a web browser to access the Administrative Console. The supported web browsers are the Microsoft® Internet Explorer 5.x (and later) and Netscape 4.5 (and later) running on Windows 98, Windows Millennium, Windows NT, and Windows 2000. An Internet connection is recommended.

Note: The IBM IP Storage requires a direct connection from the browser, not through a proxy server. If a proxy server is used for the Internet, the IBM IP Storage must be excluded.

The Administrative Console requires the following plug-ins, which are available online at www.sun.com:

- Java™ Swing 2
- Sun Java Plug-in 1.3

Note: The Sun Java Plug-in 1.3 is a product of Sun Microsystems, Inc. IBM does not distribute, support or maintain the Sun Java Plug-in 1.3 and your use of this product is subject to license terms and conditions imposed by Sun Microsystems, Inc. Contact Sun Microsystems, Inc. directly if you have any questions about this product.

Code updates are installed from a local FTP server. This FTP server must support anonymous FTP.

Getting started

The IBM IP Storage is configured and managed through the Web-based Administrative Console. You can access this console through a Web browser, either Netscape or Internet Explorer. An Internet connection from the Administrative Console to the Internet is recommended. If you have an Internet connection, the browser must connect to the Internet directly rather than through a proxy server. Because the appliance is *headless*, configuration must be completed from another machine, known as the *management workstation*.

Before the IBM IP Storage can be fully functional as an iSCSI server, you must complete a set of required configuration tasks using the Administrative Console. Refer to the initial configuration section in the *IBM TotalStorage IP Storage 200i Installation Guide* for instructions.

Accessing the Administrative Console

You can access the Administrative Console from any supported Web browser by performing the following steps:

1. Point your browser to the appliance at:

http://hostname:1959/IBM200i

where *hostname* is the host name or IP address of the appliance.

2. Type your user ID in the **User Name** field. The default user ID is “administrator.” Note that the user ID is case sensitive.
3. Type your password in the **Password** field. The default password for the administrator user ID is “password.” Note that the password is case sensitive.
4. Click **OK**.

Introducing the Administrative Console

The Administrative Console is a Web-based management tool that aids you in setting up and reconfiguring an IBM IP Storage appliance. The Administrative Console is divided into three frames: the Toolbar, Navigator, and Workspace.

Toolbar

The toolbar is located at the top of the page. It contains the following buttons:

Logoff

Logs you off of the Administrative Console.

Help

Displays help for elements on the current page.

Navigator

The Navigator is located on the left side of the page. It contains a navigation tree that allows you to make your way through the configuration pages. This tree is made up of the following items:

Network

Enables you to set IP addresses and configure the domain and SNMP.

Storage

Enables you to manage logical drives, virtual disks, and user access.

System

Enables you to identify the appliance, set the date and time, create administrators, manage code and configuration files, control locks on the Administrative Console, and reset the appliance.

Logs

Enables you to view various log reports.

Workspace

Displays the frames that require input from the administrator. Although some frames include buttons that are specific to the task you are performing, these main buttons are included on each frame within the workspace:

Apply Activates the changes that you want to make.



Reloads the Web page and resets field values.

Chapter 2. System configuration

This chapter describes how to configure the IBM IP Storage.

Administration

You can define and manage administrators using the Administrative Console. The edit and browse modes are especially useful when you have multiple administrators accessing the system and making changes. As the names indicate, browse mode only allows viewing, while the edit mode enables the user to make changes in the system. You can initiate the edit mode by taking control of any system locks. See “Control locks” for additional information about locks.

Viewing the list of administrators

To view the list of administrators that are defined in the system using the Administrative Console, click **System** → **Administrators**.

Adding an administrator

To add an administrator using the Administrative Console:

1. Click **System** → **Administrators**.
2. Click **Add** to add a new administrator.
3. Type the user name of the administrator in the **Administrator** field.
4. Type the password in the **Password** field.
5. Type the password again in the **Verify password** field.
6. Click **Apply**.

Changing an administrator's password

To change an administrator's password using the Administrative Console:

1. Click **System** → **Administrators**.
2. Select the radio button to the left of the administrator's user ID.
3. Click **Edit** to edit the administrator configuration.
4. Type the new password in the **Password** field.
5. Type the new password again in the **Confirm password** field.
6. Click **Apply**.

Removing an administrator

To remove an administrator using the Administrative Console:

1. Click **System** → **Administrators**.
2. Select the radio button to the left of the administrator's user ID.
3. Click **Remove** to delete the administrator.

Control locks

Administrators can lock access to certain system configuration elements so that only one person is assigned editing ability to those specific elements. After one administrator takes control of locks, others only see the system in browse mode and are unable to make changes (that is, no action buttons will appear). Other administrators can make changes by taking control themselves.

The person who takes control of the system does not have to release it. Any other administrator with system access can take control and lock the system out to others. Locks simply enable multiple administrators to better coordinate system configuration changes.

Notes:

1. Every time you close the browser and reopen, you lose control of locks. To make additional system configuration changes, you will need to take control of locks each time you open the browser.
2. Before taking control of locks, be sure that no other administrator has changes pending. Taking control before these changes have been activated will result in the changes not taking effect. Other administrators are not warned when control of is taken.
3. If you have control of certain elements and you close your browser without first logging off, you still have control of those elements.

To control locks on the Administrative Console:

1. Click **System** → **Control locks**.
2. Click **Take Control**.

System settings

Viewing the model and serial number

To view the model and serial number of the IBM IP Storage using the Administrative Console, click **System** → **Settings**.

Setting the date and time

To set the date and time using the Administrative Console:

1. Click **System** → **Date and time** to display the current date and time settings.
2. Type or select the month in the **Month** field.
3. Type or select the day in the **Day** field.
4. Type the year in the **Year** field.
5. Type or select the hour in the **Hours** field.
6. Type the minutes in the **Minutes** field.
7. Type the seconds in the **Seconds** field.
8. Click **Apply**.

Configuring network settings

To configure the network settings, including the domain, gateway, and domain name server (DNS), using the Administrative Console:

1. Click **Network** → **Settings**.
2. Type the IP address of each DNS server in the **Name Server x** fields. You can define up to three DNS servers.
3. Type the domain name in the **Domain** field.
4. Type the IP address of the gateway in the **Gateway** field.
5. Select the **Rip listen enabled** check box to enable RIP or clear the check box to disable it.
6. Click **Apply**.
7. Restart the appliance (see “Restarting the appliance” on page 7).

Restarting the appliance

To shut down and restart the appliance using the Administrative Console:

1. Click **System** → **Reset**.
2. Click **Restart**.
3. Click **OK**.
4. Wait several minutes.
5. Click **Reconnect** to reconnect to the Administrative Console.

Note: If you receive an error message, you attempted to reconnect to the Administrative Console before the appliance finished restarting. Close the browser, and wait a few more minutes before restarting the browser and connecting to the Administrative Console.

Shutting down the appliance

To shut down and restart the appliance using the Administrative Console:

1. Click **System** → **Reset**.
2. Click **Shut down**.
3. Click **OK**.

Note: When you shut down the appliance, you lose your connection to the Administrative Console through your Web browser.

RAID

The redundant array of independent disks (RAID) configuration allows you to dynamically manage the logical drives. A *logical drive* is a unit of virtual storage that is made available to the network. Logical drives consist of multiple physical disks combined using RAID level 0, 1, 1E, 5 or 5E technology. A physical disk cannot hold any user data unless it belongs to a logical drive.

The IBM IP Storage Model 200 supports up to 48 physical disks in a fully configured system. The minimum number of logical drives is one, and the maximum number is eight. (If any logical drive has a RAID configuration of 5E, then the maximum number of logical drives is seven.) Each logical drive can have a maximum of 16 physical disks, although a maximum of eight is recommended.

The Model 100 supports up to 6 physical disks.

The following types of disks are shown:

Physical disks

A disk that has not been assigned as a hot-spare, standby hot-spare, or to a logical drive.

Hot-spare disks

A disk that is not part of a logical drive but can be mapped to a logical drive if one of the logical drive's disks goes offline. The logical drive runs in a degraded, or exposed, condition until all data on the new disk is regenerated.

A hot-spare disk can also be defined as a *standby hot-spare* disk. A standby hot-spare can be mapped to a logical drive if no suitable hot-spare disk is available.

Except for RAID 0, a single disk failure can be recovered by replacing the failed disk. No configuration changes are necessary. If a hot-spare disk is available, it is automatically used to replace the failed disk. Data is automatically rebuilt for the hot-spare disk. If a hot-spare disk is not available, data is rebuilt when the failed disk is replaced with a new disk.

Logical drives

A disk that has been assigned to a logical drive. These disks are displayed under the logical drive in the RAID Configuration tree.

The RAID panel is divided into two subpanels: the RAID Configuration tree containing a graphical representation of the RAID controller, logical drives, and physical disks in the system and the Properties table that shows the information about the selected component.

Refreshing the configuration

The RAID configuration panel is refreshed each time the panel is opened and after each task. It is not automatically updated after a given period of time. It is recommended that you refresh this panel after an extended period of time.

To refresh the RAID configuration displayed on the Administrative Console:

1. Click **Storage** → **RAID**.

Note: Displaying this pane for the first time may take several minutes, depending on your network-connection speed.

2. Click **Controller 1** to highlight it.
3. Right-click **Controller 1**.
4. Click **Refresh the configuration** from the pop-up menu.

Scanning for physical disks

When you add or remove disks, you must update the RAID configuration by scanning the appliance for current physical disks.

Note: Physical disks that are part of a logical drive must not be disrupted by removal or replacement. Adding, removing, and replacing physical disks must be restricted to free disks.

To scan the appliance for new and removed disks in the Ready state using the Administrative Console:

1. Click **Storage** → **RAID**.

Note: Displaying this pane for the first time may take several minutes, depending on your network-connection speed.

2. Click **Controller 1** to highlight it.
3. Right-click **Controller 1**.
4. Click **Scan for ready disks** from the pop-up menu.
5. Click **Scan** to scan for disks. When scanning is complete, the dialog box reports the number of new and removed disks found.
6. Click **Close**. The dialog box closes, and any new disks are moved to the **Physical disks** folder in the RAID Configuration tree.

Creating a logical drive

You can create a maximum of eight logical drives on one appliance.

To create a logical drive using the Administrative Console:

1. Click **Storage** → **RAID**.

Note: Displaying this pane for the first time may take several minutes, depending on your network-connection speed.

2. Click **Controller 1** to highlight it.
3. Right-click **Controller 1**.
4. Click **Add logical drive** from the pop-up menu.
5. Select the RAID level from the **RAID level** drop-down list. You can choose one of the following levels:

RAID 0

Stripes the data across all physical disks in the logical drive. This level offers substantial speed enhancements, but provides no data redundancy. It provides the largest capacity of the RAID levels because no room is taken for redundant data or data-parity storage.

RAID level 0 requires a minimum of one physical disk, and supports a maximum of 16 physical disks. If you have a logical drive that contains only one physical disk, you can assign only RAID level 0 to that logical drive.

This level is recommended for data stores primarily used for sequential data operations where data stores require no redundancy (for example, program-file repositories and daily backups).

RAID 1

Provides data redundancy using disk mirroring. The first half of a stripe is the original data; the second half of a stripe is a mirror (copy) of the data that is written to another disk in the RAID level 1 logical drive. If one physical disk fails, the ServeRAID™ controller switches read and write requests to the remaining functional disk in the RAID level 1 logical drive.

RAID level 1 requires two physical disks. If you have three or more physical disks in the logical drive, you cannot select RAID level 1. You can, however, select RAID level 1 Enhanced (RAID level 1E).

This level is recommended for high-performance and write-intensive random-access applications (for example, database applications).

RAID 1E

Combines mirroring with data striping. This RAID level stripes data and copies the data across all of the disks in the logical drive. If one of the physical disks fails, the ServeRAID controller switches read and write requests to the remaining functional drives in the RAID level 1E logical drive.

RAID level 1E requires a minimum of three physical disks and supports a maximum of 16.

RAID 5

Stripes data and parity across all physical disks in the logical drive. The capacity of the logical drive is reduced by one physical disk, for data-parity storage.

RAID level 5 requires a minimum of three physical disks and supports a maximum of 16.

RAID 5E

Is the same as RAID level 5 with a built-in hot-spare disk. Like RAID level 5, RAID level 5E stripes data and parity across all physical disks in the logical drive. The capacity of the logical drive is reduced by two physical disks: one for data-parity storage and one for hot-spare. This RAID level is more efficient than RAID level 5 (three physical disks) with an idle hot-spare. This spare cannot be shared with the other logical drives.

RAID level 5 requires a minimum of four physical disks and supports a maximum of 16. You can have a maximum of seven RAID level 5E logical drives.

6. Select the write-cache method from the Write cache method drop-down list. You can choose one of the following values:
 - **write back**
 - **write through**
7. Add physical disks to the logical drive:
 - a. Select one or more physical disks that you want to add to the logical drive from the **Available disks** list.
 - b. Click >>> to add the selected disks to the **Selected Disks** list.

The size of the logical drive displayed below the **Selected Disks** list is calculated each time you move a disk from either list.

Note: Depending on your choice of RAID levels, there might be restrictions on the number of physical disks that can be used to create the logical drive. The Administrative Console warns you of invalid assignments. You can assign a maximum of 16 physical disks to one logical drive.

8. Remove a physical disk from the selected list.
 - a. Select one or more physical disks you want to remove from the **Selected Disks** list.
 - b. Click <<< to move the selected disks back to the **Available disks** list.
9. Click **Add**. The new logical drive appears in the RAID Configuration tree with the assigned disks nested beneath it.

Removing a logical drive

Note: If virtual logical units (VLUNs) are assigned on the selected logical drive, you are not able to remove the logical drive. All VLUNs must be removed before a logical drive can be deleted (see “Removing all virtual logical units from a logical drive” on page 13).

To remove a logical drive using the Administrative Console:

1. Click **Storage** → **RAID**.

Note: Displaying the RAID panel for the first time may take several minutes, depending on your network-connection speed.

2. Click the logical drive you want to delete.
3. Right-click the logical drive.

4. Click **Remove drive** from the pop-up menu.
5. Click **Remove** to delete the selected logical drive. The logical drive is deleted and the disks previously associated with the logical drive are moved under **Physical disks** in the RAID Configuration tree.

Resizing a logical drive

You can increase the size of a logical drive by adding new physical disks to it. Note that you cannot change the RAID level of an existing logical drive.

Attention: Modifying the size of a logical drive can take several hours to complete. You cannot perform many RAID-controller tasks (such as adding and removing a logical drive) during an expansion operation. These tasks are disabled until the expansion is completed.

To add physical disks to or remove physical disks from a logical drive using the Administrative Console:

1. Click **Storage** → **RAID**.

Note: Displaying the RAID panel for the first time may take several minutes, depending on your network-connection speed.

2. Click the logical drive you want to expand.
3. Right-click the logical drive.
4. Click **Expand drive** from the pop-up menu.
5. Add physical disks to the logical drive:
 - a. Select one to three physical disks that you want to add to the logical drive from the **Available disks** list. You can add up to three new physical disks to an existing logical drive.
 - b. Click >>> to add the selected disks to the **Expanded drive** list.

The size of the logical drive displayed below the **Expanded Disks** list is calculated each time you move a disk from either list.

6. Remove a physical disk from the **Expanded drive** list:
 - a. Select one or more physical disks you want to remove from the **Expanded drive** list.
 - b. Click <<< to move the selected disks back to the **Available disks** list.
7. Click **Expand** to expand the selected logical drive.
8. Wait for the expansion operation to complete. A progress bar appears below the RAID configuration tree to indicate the progress of the operation.

Defining a disk as hot-spare

To create a hot-spare disk using the Administrative Console:

1. Click **Storage** → **RAID**.

Note: Displaying the RAID panel for the first time may take several minutes, depending on your network-connection speed.

2. Click the physical or standby hot-spare disk you want to define as hot spare.
3. Right-click on the disk.
4. Click **Create hot-spare** from the pop-up menu. The selected disk is moved to the **Hot-spares** folder in the **RAID Configuration** tree, and its state shown in the **Properties** table is changed to "Hot-Spare (HSP)."

Defining a disk as standby hot-spare

To create a standby hot-spare disk using the Administrative Console:

1. Click **Storage** → **RAID**.

Note: Displaying the RAID panel for the first time may take several minutes, depending on your network-connection speed.

2. Click the physical or hot-spare disk you want to define as hot spare.
3. Right-click the disk.
4. Click **Create standby hot-spare** from the pop-up menu. The selected disk is moved to the **Hot-spares** folder in the **RAID Configuration** tree, and its state shown in the **Properties** table is changed to “Standby Hot-Spare (SHS).”

Freeing a hot-spare or standby hot-spare disk

To make a hot-spare or standby hot-spare disk available using the Administrative Console:

1. Click **Storage** → **RAID**.

Note: Displaying the RAID panel for the first time may take several minutes, depending on your network-connection speed.

2. Click the hot-spare or standby hot-spare disk you want to free.

Note: You can determine whether the disk is a hot-spare disk or a standby hot-spare disk viewing the state shown in the **Properties** table.

3. Right-click the disk.
4. Click **Remove hot-spare** or **Remove standby hot-spare** from the pop-up menu. The selected disk is moved under **Physical disks** in the **RAID Configuration** tree, and its state shown in the **Properties** table is changed to “Ready (RDY).”

Virtualization

Virtualization allows you to subdivide each logical drive into one or more virtual disks, known as *virtual logical units* (VLUNs). These VLUNs can then be allocated for use by other computers in the network. These computers are known as *iSCSI clients*.

The Virtualization panel is divided into two subpanels: the **VLUNs** tree containing a list of all logical drives and VLUNs and the table that shows information about the selected item.

Adding a virtual logical unit

Each IBM IP Storage appliance can manage a maximum of 256 VLUNs. Each VLUN is created in increments of 1 GB.

Attention: After you create a VLUN, it cannot be resized or removed individually.

To create a VLUN in a logical drive using the Administrative Console:

1. Click **Storage** → **Virtualization**.
2. Click the logical drive to which you want to add a VLUN. The amount of available space is shown next to the logical drive in the **VLUNs** tree.
3. Click **Add VLUN**.

4. Type the size, in gigabytes, of the VLUN in the **VLUN Size** field.
5. Type the number of VLUNs to create in the **# of VLUNs** field.
6. Click **Add**. The new VLUNs appear in the **VLUNs** tree.
7. Click **Apply**.

Removing all virtual logical units from a logical drive

All VLUNs in the logical drive must be unassigned before performing this task.

Note: You cannot remove VLUNs if an iSCSI client that is assigned to at least one VLUN in the logical drive is currently logged on.

Attention: All data is lost when you remove VLUNs from the logical drive.

To remove *all* VLUNs in a logical drive using the Administrative Console:

1. Click **Storage** → **Virtualization**.
2. Click the logical drive from which you want to remove all VLUNs.
3. Click **Remove VLUNs**.
4. Click **Remove** to verify the removal of all VLUNs from this logical drive. The VLUNs are removed from the **VLUNs** tree.
5. Click **Apply**.
6. If the iSCSI client is logged on, you are asked whether to force the iSCSI client to be disconnected. Click **Yes** to disconnect the iSCSI client.

Assigning an iSCSI client to a virtual logical unit

A VLUN is not accessible until you assign an iSCSI client to it. The user associated with that iSCSI client can then map to the VLUN as a network drive. The IBM IP Storage appliance supports a maximum of 1024 assignments. There is no limit to the number of assignments for each VLUN.

Note: A maximum of 16 clients can be logged on to the Model 100 at one time. A maximum of 32 clients can be logged on to the Model 200 at one time.

Unless the iSCSI client's operating system or applications support file sharing, only one iSCSI client should be assigned to a VLUN.

The maximum number of VLUNs that you can assign to a single iSCSI client is:

Windows 2000	254
Windows NT	8
Linux	16

The iSCSI client is identified by a unique ID (for example, the iSCSI client's host name). The ID is an ASCII string of up to 64 characters. The string can contain alphanumeric characters, periods (.), hyphens (-), and underscores (_). After you identify an ID, it appears in the drop-down list for the client IDs.

Each iSCSI client is limited to a single ID. If multiple VLUNs are assigned to a single iSCSI client, the same client ID must be used to access the VLUNs.

Setting a password is optional. If you specify a password for the iSCSI client, the iSCSI client is identified by both the ID and password. If the password field is left blank, only the client ID is verified. Only one password can be assigned to each iSCSI client ID. The password can be up to 16 characters. The string can contain alphanumeric characters, periods (.), hyphens (-), and underscores (_).

An *iSCSI client logical-unit number* (iLUN) is a unique number that is assigned automatically to each VLUN. The iLUN for a single client starts at 0 and increments sequentially. You can override this assignment; however, when a client is unassigned from a VLUN, the assignment of client logical-unit number for the remaining VLUNs is not changed.

Attention: Unassigning an iSCSI client from a VLUN might create problems on the iSCSI client because most operating systems expect the iLUNs to appear sequentially. Reassignment of iLUNs might also cause problems if the iSCSI client's operating system has certain signatures on the logical units. It is recommended that you evaluate and remedy the ramifications of unassigning an iSCSI client from a VLUN.

Note: Each iSCSI client must have an iLUN 0.

To assign an iSCSI client to a VLUN using the Administrative Console:

1. Click **Storage** → **Virtualization**.
2. Click the VLUN to which you want to assign an iSCSI client.
3. Click **Assign client**.
4. Type a user name in the **Login ID** field or select an existing name from the drop-down list.
5. Type the same password in the **Password** and **Password Confirm** fields.

Note: If the user name already exists, you cannot edit these fields.

6. Click **OK** to assign an iSCSI client to the VLUN. The user name appears under the VLUN in the **VLUNs** tree.
7. Click **Apply**.

Unassigning an iSCSI client from a virtual logical unit

You can unassign an iSCSI client from a VLUN if it is not being used currently by the iSCSI client. All data is cleared, and the VLUN can be assigned to another iSCSI client.

Note: You cannot unassign an iSCSI client that is currently logged on.

To unassign an iSCSI client from a VLUN using the Administrative Console:

1. Click **Storage** → **Virtualization**.
2. Click the iSCSI client you want to remove.
3. Click **Unassign client**.
4. Click **Unassign** to verify that you want to unassign the iSCSI client.
5. Click **Apply**.
6. If the iSCSI client is logged on, you are asked whether to force the iSCSI client to be disconnected. Click **Yes** to disconnect the iSCSI client.

Data ports

Data ports are used for storage traffic and configuration purposes. The ports are automatically enabled when first powered on by the ARPFind function as part of the hardware installation process. Once the Administrative Console is up and running and a single port is configured, all other ports will default to the disabled state.

To modify the configuration of a data port using the Administrative Console:

1. Click **Network** → **Data ports** to view a list of ports.
2. Select the port that you want to configure.
3. Click **Edit** to view the port settings.
4. Type the IP address of the port in the **IP Address** field.
Attention: The data port and control port must be in different subnets.
5. Type the subnet mask of the port in the **Netmask** field.
6. Type the host name of the machine in the **Host name** field.
7. Click **Apply**.
8. Click **Advanced**.
9. Type the maximum transmission unit in the **MTU** field.
10. Type the medium access control (MAC) address in the **MAC address** field.
11. Click the flow control from the **Flow control** drop-down list. You can select one of the following values:
 - **Disabled** (default)
 - **Enabled**
 - **Transmit only**
 - **Receive only**
12. Click **Apply**.
13. Restart the appliance (see “Restarting the appliance” on page 7).

Control port

The control port (also known as the Service Ethernet or backplane) is used only for service purposes. No storage traffic occurs over the control port. The control port is provided as an alternative in the event that you cannot access the configuration through the data port. It is recommended that you use the data port for configuring the IBM IP Storage.

To modify the network configuration of the control port using the Administrative Console:

1. Click **Network** → **Control port**.
2. Type the IP address of the control port in the **Control port 1 IP address** field.
Attention: The data port and control port must be in different subnets.
3. Click **Apply**.
4. Restart the appliance (see “Restarting the appliance” on page 7).

SNMP

Simple Network Management Protocol (SNMP) is a set of network-management protocols used to manage authentication of data messages. It defines the data-message structure and protocols for exchanging data messages.

SNMP community

An access-control mechanism supported by SNMPv1 that allows management workstations within a range of IP addresses to access the IBM IP Storage. You can define an IP address and subnet mask of 0.0.0.0 if you want to allow any IP address to access the community.

SNMP user

An access-control mechanism supported by SNMPv3 that requires a user name and a password for authentication. The user receives SNMP messages.

SNMP traps

Asynchronous data messages sent through SNMP are known as *traps*. Traps signal the occurrence of some event in the appliance.

IBM IP Storage supports these portions of the management information base (MIBs) for SNMP:

- MIB II (RFC1213)
- DPI MIB (RFC1592b)
- SNMP Framework MIB (RFC2571)
- SNMP MDP MIB (RFC2572)
- SNMP Target MIB (RFC2573)
- SNMP View-based ACM MIB (RFC2575)
- Ethernet MIB (RFC2665)
- MIB II Extensions (RFC2863)

For more information about these MIBs, refer to www.faqs.org.rfcs/

Enabling or disabling SNMP

To enable or disable SNMP using the Administrative Console:

1. Click **Network** → **SNMP** → **Enable/Disable**.
2. Select the **Enable SNMP** check box to enable SNMP or clear the check box to disable SNMP.
3. Click **Apply**.
4. Restart the appliance (see “Restarting the appliance” on page 7).

SNMP communities

If your management workstation supports SNMPv1, you can define SNMP communities for authentication purposes.

Viewing the list of SNMP communities

To view the list of defined SNMP communities using the Administrative Console, click **Network** → **SNMP** → **Community**. The following information is displayed for each SNMP community:

SNMP community name	The name of the SNMP community
IP Address	The IP address of the management workstation
Subnet mask	The subnet mask of the management workstation

Adding an SNMP community

To add an SNMP community using the Administrative Console:

1. Click **Network** → **SNMP** → **Community**.
2. Click **Add**.
3. Type the name of the community in the **Community name** field.
4. In the **IP address** field, type the range of IP addresses that can be used for this community. You can define an IP address and subnet mask of 0.0.0.0 if you want to allow any IP address to access the community.
5. In the **Mask** field, type the subnet mask that can be logically associated with the address of the incoming SNMP message.
6. Select the **Read** check box to give the community read access.
7. Select the **Write** check box to give the community read-write access.
8. Select the **Trap** check box to allow this community to receive notification of traps (asynchronous events). You must also define an SNMP trap associated with this community name. If you want to turn off traps temporarily, you can clear the **Trap** check box. If you want to remove traps completely, you must turn off traps and remove the record of the community.
9. Click **Apply** to create the SNMP community.

Modifying an SNMP community

To edit an SNMP community using the Administrative Console:

1. Click **Network** → **SNMP** → **Community**.
2. Select the check box to the left of the SNMP community that you want to edit. To select all of the SNMP communities listed, select the check box at the top of the list.
3. Click **Edit** to view the SNMP community configuration.
4. Modify the appropriate fields.
5. Click **Apply** to save the changes.

Removing an SNMP community

To remove an SNMP community using the Administrative Console:

1. Click **Network** → **SNMP** → **Community**.
2. Select one or more check boxes to the left of the SNMP communities that you want to remove.
3. Click **Remove** to remove the SNMP communities.
4. Click **OK** to confirm the deletion.

SNMP users

You can create SNMP users if the management workstation supports SNMPv3.

Viewing the list of SNMP users

To view the list of SNMP users from the Administrative Console, click **Network** → **SNMP** → **User**.

Adding an SNMP user

To add an SNMP user using the Administrative Console:

1. Click **Network** → **SNMP** → **User**.
2. Click **Add**.
3. Type the ID of the user in the **User name** field.
4. Select an authentication protocol from the **Authentication protocol** drop-down list. The protocol that you select must be supported by the management workstation. You can select one of the following values:
 - **None**
 - **MD5**
 - **SHA**
5. You can select a privacy protocol only if you define an authentication protocol. Privacy must be defined at both the management workstation and the appliance. Select the privacy protocol from the **Privacy protocol** drop-down list. The privacy protocol must be supported by the management workstation. You can select one of the following values:
 - **None**
 - **DES**
6. Type a password for the user in the **Password** field.
7. Select the **Localized key** or **Nonlocalized key** radio button to indicate whether you want to use the key at only one appliance or at multiple appliances. If the key is generated locally, you can communicate only with a single appliance. Localized keys are more secure than nonlocalized keys, but the level of security must be supported by the management workstation. If you select **Nonlocalized key**, the key can be used by multiple appliances.
8. Select the **Read** check box to give the user read access.
9. Select the **Write** check box to give the user read-write access.
10. Select the **Trap** check box if you want this user to receive traps. You must also define an SNMP trap associated with this user.
11. Select **Apply** to add the SNMP user.

Modifying an SNMP user profile

To edit an SNMP user profile using the Administrative Console:

1. Click **Network** → **SNMP** → **User**.
2. Select the check box to the left of the SNMP user that you want to edit.
3. Click **Edit** to view the SNMP user profile.
4. Modify the appropriate fields.
5. Click **Apply** to save the changes.

Removing an SNMP user

To remove an SNMP user using the Administrative Console:

1. Click **Network** → **SNMP** → **User**.
2. Select one or more check boxes to the left of the SNMP users you want to remove.
3. Click **Remove** to remove the selected SNMP users.
4. Click **OK** to confirm the deletion.

SNMP traps

Asynchronous data messages sent through SNMP are known as *traps*. Traps signal the occurrence of some event in the appliance. If you select the **Traps** check box when you are creating an SNMP user or community, you must create a corresponding trap for the user or community to receive notifications of traps.

Viewing the list of SNMP traps

To view the list of SNMP traps using the Administrative Console, click **Network** → **SNMP** → **Traps**.

Adding an SNMP trap

To define an SNMP trap using the Administrative Console:

1. Click **Network** → **SNMP** → **Traps**.
2. Click **Add**.
3. Type a name for the trap in the **Target address name** field.
4. Type the IP address of the management workstation in the **Target address** field.
5. Type the port number of the management workstation in the **Port** field.
6. Select the level of SNMP that is supported by the management workstation:
 - **SNMPv1**
 - **SNMPv3**
7. Associate the trap with a user or community. Select an SNMP user if the management workstation supports SNMPv3 or an SNMP community if the management workstation supports SNMPv1 from the **Security information** drop-down list.
8. Click **Apply** to add the SNMP trap.

Modifying an SNMP trap

To modify an SNMP trap using the Administrative Console:

1. Click **Network** → **SNMP** → **Traps**.
2. Select the check box to the left of the SNMP trap that you want to modify.
3. Click **Edit** to view the SNMP trap configuration.
4. Modify the appropriate fields.
5. Click **Apply** to save the changes.

Removing an SNMP trap

To remove an SNMP trap using the Administrative Console:

1. Click **Network** → **SNMP** → **Traps**.
2. Select one or more check boxes to the left of the SNMP traps that you want to remove.
3. Click **Remove** to remove the SNMP traps. To remove a trap completely, you must also turn off the **Trap** check box in the SNMP user or community definition.
4. Click **OK** to confirm the deletion.

Chapter 3. System maintenance

This chapter describes how to maintain the IBM IP Storage.

Logs

The Administrative Console maintains several log files that you can use to troubleshoot problems with the appliance. To view the logs, click **Reports**, and then click the report you want to view. To navigate within the logs, you can specify a line number in the **GoTo** field, or use the arrow buttons. The following reports are available:

System message
HTTP access log
HTTP error log
iSCSI logs

iSCSI logs

The iSCSI logs contains IBM IP Storage specific messages. You can filter the iSCSI log by log type and error level.

To view the iSCSI log:

1. Click **Logs** → **iSCSI logs**.
2. Click the type of log records you want to view from the log drop-down list. You can display one of the following types:
 - iSCSI messages**
 - RAID messages**
 - RAID event messages**
 - Messages by date**
3. Click the error level from the error level drop down list. You can choose one of the following levels:

Level 0	Error messages
Level 1	Informational messages
Level 2	Debug minimal
Level 3	Debug medium
Level 4	Debug all
4. Click **Display log**.

Code

Two complete copies of code are maintained on the system IDE disk. Each copy is referred to as a *bank*. This banking mechanism enables you to update the code on the appliance without interrupting service. One bank contains the active code. The other bank contains either:

- Nothing, if the code in the bank has been erased.
- A down-level version of the active code. This enables you to return to this level of code if the active version does not meet expectations.
- A newly downloaded version of the code that enables you to prepare for a code upgrade to the appliance.

Currently, code upgrades are delivered as full copies of the system image. To activate a code upgrade, you must reboot the appliance.

Viewing code details

To view information about the code on each bank from the Administrative Console, click **System** → **Code** → **Describe**. The following information is provided for each bank:

Bank	One of two complete software images that are maintained on the system. They are named banks A and B.
Status	The status of the code in each bank. Status can be one of the following: Active The bank is currently active. Avail The code in the bank is not in use. Corrupt The code in the bank is corrupt. None The bank contains no code. Pending The code in the bank has been set to be the active code when the appliance is rebooted.
Product ID	The product identification number of the code installed.
Version	The version number of the code installed.
Release	The release number of the code installed.
Mod	The modification number of the code installed.
PTF	The program temporary fix level of the code installed.
Feature	The feature number of the code installed.
RPQ	The request for price quotation of the code installed (a customer-specific build number).
Date	The date and time when this code image was built
Build	The build name, number and description of the code installed.
Builder	The build environment of the code installed.

Copying code

You can copy code from bank A to bank B or from bank B to bank A, depending on which bank you select to copy to.

To copy code from the Administrative Console:

1. Click **System** → **Code** → **Copy**.
2. Select the radio button to the left of the available bank to which you want to copy the code.
3. Click **Apply**.

Erasing code

To erase code from a bank from the Administrative Console:

1. Click **System** → **Code** → **Erase**.
2. Select the radio button to the left of the available bank from which you want to erase the code.
3. Click **Apply**.

Getting the code

The system image is retrieved from an external server through FTP. The external server must support anonymous FTP.

To get the system image and copy it to a bank from the Administrative Console:

1. Download the system image to a temporary directory from www.ibm.com/storage/support/nas.
2. Copy the system image to an anonymous FTP server.
3. Click **System** → **Code** → **Get**.
4. Type the IP address of the machine where the code resides in the **Remote server IP address** field.
5. Type the name of the file that you want to retrieve in the **Remote server file name** field.
6. Select the radio button to the left of the bank to which you want to copy the code.

Note: You cannot select an active or pending bank.
7. Click **Apply**.

Setting the active code bank

To set the code bank to be used as the active bank from the Administrative Console:

1. Click **System** → **Code** → **Set**.
2. Select the radio button to the left of the available bank whose code you want to set as active.
3. Click **Apply**.
4. Restart the appliance to activate the code in the specified bank (see “Restarting the appliance” on page 7).

Configuration files

It is a good idea to back up the appliance configuration files each time you make changes using the Administrative Console. The backed-up configuration can be restored if the configuration becomes corrupted or if inadvertent changes are made.

The configuration file is backed up to an external server through FTP. The external server must support anonymous FTP.

Note: System configuration contains the host name and IP address and, therefore, is specific to an IBM IP Storage appliance. The configuration is also keyed to the system-level code. Older configuration files might not work on newer code levels.

Backing up the configuration file

To back up the configuration file from the Administrative Console:

1. Click **System** → **Configuration** → **Backup**.
2. Type the IP address of the remote server in the **Server IP address** field.
3. Type the name and path of the backup configuration file in the **Remote path and file name** field.
4. Click **Apply** to back up the configuration file.

Restoring the configuration file

To restore the configuration file from the Administrative Console:

1. Click **System** → **Configuration** → **Restore**.
2. Type the IP address of the remote server in the **Server IP address** field.
3. Type the name and path of the backup configuration file in the **Remote path and file name** field.
4. Click **Apply** to restore the configuration from the backup configuration file.

Chapter 4. Recovery

Recovery procedures are provided in case an appliance engine loses its code banks either completely or in part (for example, a disk failure or a logical-partition corruption occurs). The appliance code system image is obtained by booting the appliance with the Recovery Boot diskette. This allows the Recovery CD to boot and start the restore procedure. The Recovery CD is supplied with the appliance. The Recovery Boot diskette is available at www.ibm.com/storage/support/nas.

Recovering the IBM IP Storage

The Recovery CD (in conjunction with the Recovery Boot diskette) enables you to load the system image from an FTP server. Before attempting to recover the appliance, verify the following requirements:

- A serial console or equivalent device must be attached to serial port A of the appliance using a null-modem cable.
- The appliance must be attached to a working Ethernet network through the Service Ethernet port on the system board.
- The appliance must be connected to a working FTP server on the same Ethernet network as the Service Ethernet port that contains the application code image and supports anonymous FTP attached to the same network.
- You must have the Recovery Boot diskette. You can download the diskette image from www.ibm.com/storage/support/nas.

To recover the appliance code image using the Recovery CD and Recovery Boot diskette:

1. Configure the serial console using the following communications settings:

19200 baud
8 data bits
No parity
1 stop bit

2. Verify that the appliance has the latest BIOS level.

Note: To obtain the most recent version, go to www.ibm.com/storage/support/nas.

3. Verify that the system image is available from the FTP server.

Note: To obtain the most recent version, go to www.ibm.com/storage/support/nas.

4. Place the Recovery CD in the IBM IP Storage CD-ROM drive. You might have to temporarily switch on the appliance to do this.
5. Place the Recovery Boot diskette in the diskette drive. The Recovery CD formats the IDE drive.

Note: You can download the recovery diskette from www.ibm.com/storage/support/nas.

6. You will see the message:

Careful: Continue in /dev/hda setup?

Type **y** and press **Enter**.

7. Wait for formatting to complete and the Service and Recovery Console prompt (svc>) to appear.
8. Enter ? to display a list of possible options available from the Service and Recovery Console prompt.
9. Ensure that the IP address of the Service Ethernet resides in the same network as the FTP server that contains the system image to be reloaded. You can do this in one of two ways:
 - Set up the FTP server so it resides in the default network that includes the Service Ethernet's default IP address (192.9.200.1). Then, skip to step 11.
 - Or, change the Service Ethernet's default IP address (192.9.200.1) to match one that resides in the network that the FTP server operates in. Then, continue with step 10.
10. Type **enet** and then press **Enter**. Follow the onscreen instructions. This allows you to change the default Service Ethernet IP address so it matches the network IP address where the FTP server resides. Then, enter **reboot** and follow the onscreen prompts. When the svc> prompt returns, continue with step 11.
11. Load the image from the FTP server by typing **ftp** and pressing **Enter**. When prompted, type the following responses and press **Enter** after each:

```
get
load
FTP_server_address
image_file
a
```

where *FTP_server_address* is the IP address of the FTP server and *image_file* is the path and file name of the system image.

Status messages indicate the system image is loading into bank A.

12. When loading is complete, set bank A as the bank to load after a reboot by typing **set** and pressing **Enter**. When prompted, type the following response and press **Enter** after each:

```
a
```
13. Remove the Recovery CD and diskette.
14. Type **reboot** and press **Enter** to reboot the appliance.

Recovering the BIOS

If the BIOS becomes corrupted (for example, from a power failure during a flash update), you can recover the BIOS using a BIOS flash diskette.

Note: You can download a BIOS flash diskette from www.ibm.com/storage/support/nas.

The flash memory of the IBM IP Storage contains a protected area that cannot be overwritten. The recovery boot block is a section of code in this protected area that enables the appliance to start up and to read a flash diskette. The flash utility recovers the system BIOS from the BIOS recovery files on the diskette.

To recover the BIOS:

1. Switch OFF the appliance and peripheral devices, and disconnect all external cables and power cords; then, remove the cover.
2. Locate the boot block jumper (J37) on the system board.
3. Place a jumper on pins 1 and 2 to enable BIOS recovery mode.
4. Insert the BIOS flash diskette into the diskette drive.
5. Switch ON the appliance.

The Recovery Boot panel appears. A progress report, Loading data from diskette *xx%*, is displayed. When programming is underway, a further progress report, Programming block *n of 7 yy%*, is displayed. When recovery is complete, the following message is displayed:

Recovery complete, remove the diskette and return boot block switch to the off position before rebooting.

6. Remove the flash diskette from the diskette drive.
7. Switch OFF the appliance.
8. Remove the jumper on the boot-block jumper block, or move the jumper to pins 2 and 3 to return to normal startup mode.
9. Switch ON the appliance. The system should start up normally.

Appendix A. Troubleshooting

This chapter provides basic troubleshooting information to help you resolve some common problems that might occur with your appliance.

Appliance controls and indicators

Figure 1, Figure 2 on page 30, Figure 3 on page 31, and Figure 4 on page 32 illustrate the various controls and indicators on the appliance models.

Note: The Model 100 is also known as the tower model. The Model 200 is also known as the rack model.

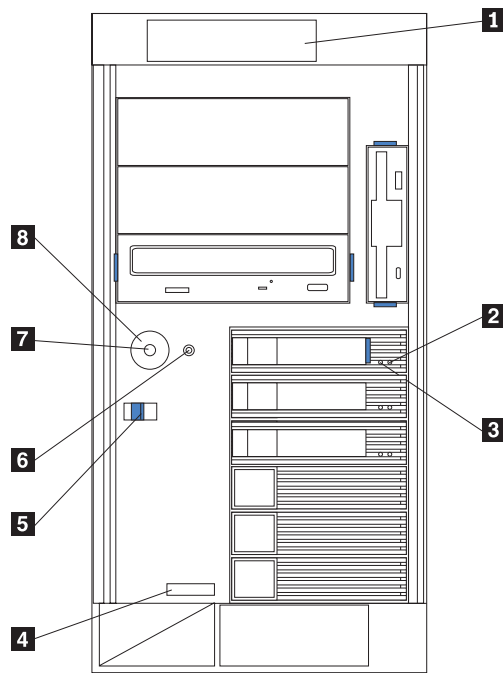


Figure 1. Model 100 front view

- 1** Operator Information panel
- 2** Hard Drive Status LED
- 3** Hard Drive Activity LED
- 4** Serial Number
- 5** Cover Release Latch
- 6** Reset Button
- 7** Power Control Button
- 8** Power Control Button Shield (if installed)

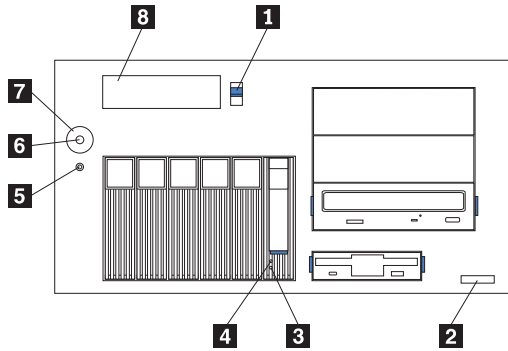


Figure 2. Model 200 front view

- 1** Cover-release latch
- 2** Serial Number
- 3** Hard Drive Status LED
- 4** Hard Drive Activity LED
- 5** Reset Button
- 6** Power Control Button
- 7** Power Control Button Shield (if installed)
- 8** Operator Information panel

Reset Button Press this button to reset the appliance and run the power-on self test (POST).

Attention: Press this button only when the appliance is hung. Pressing this button when the appliance is booting up or operating may make the appliance non-operational or corrupt the drives.

Operator Information panel

The LEDs on this panel give status information for your appliance. See “Operator information panel” on page 33 for more information.

Hard Drive Status LED

Each of the hot-swap drives has a Hard Drive Status LED. When this amber LED is on continuously, the drive has failed. When the LED flashes slowly (one flash per second), the drive is being rebuilt. When the LED flashes rapidly (three flashes per second), the controller is identifying the drive.

Hard Drive Activity LED

Each of the hot-swap drives has a Hard Drive Activity LED. When this green LED is flashing, the controller is accessing the drive.

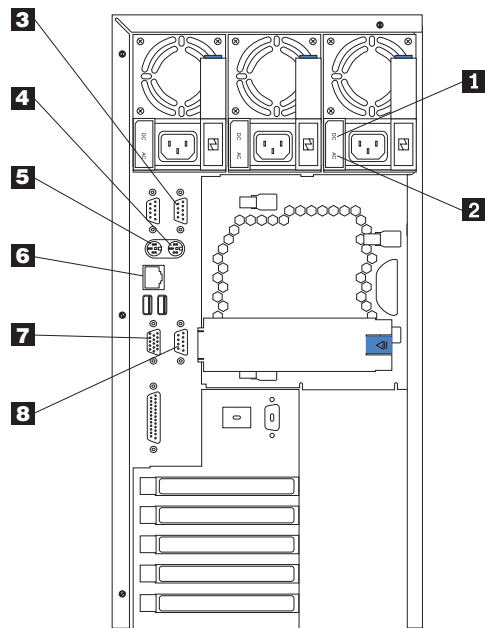


Figure 3. Model 100 rear view

- 1** AC Power LED
This LED provides status information about the power supply. During normal operation, both the AC and DC Power LEDs are on.
- 2** DC Power LED
This LED provides status information about the power supply. During normal operation, both the AC and DC Power LEDs are on.
- 3** Serial Port A
- 4** Mouse
- 5** Keyboard
- 6** Service Ethernet port
- 7** Video
- 8** Management

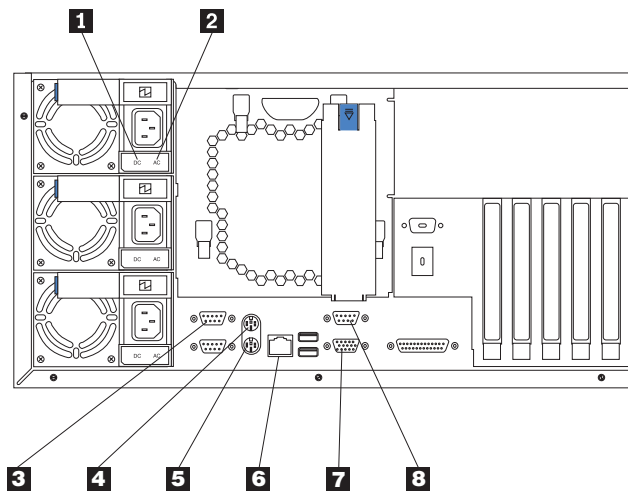


Figure 4. Model 200 rear view

- 1** AC Power LED
This LED provides status information about the power supply. During normal operation, both the AC and DC Power LEDs are on.
- 2** DC Power LED
This LED provides status information about the power supply. During normal operation, both the AC and DC Power LEDs are on.
- 3** Serial Port A
- 4** Mouse
- 5** Keyboard
- 6** Service Ethernet port
- 7** Video
- 8** Management

Operator information panel

The operator information panel on the front of the appliance contains status LEDs.

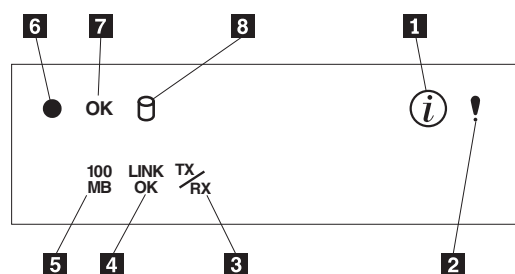


Figure 5. Operator information panel

- 1** Information LED
- 2** System Error LED
- 3** Service Ethernet Transmit/Receive Activity (TX/RX) LED
- 4** Service Ethernet Link Status (LINK OK) LED
- 5** Service Ethernet Speed (100 MB) LED
- 6** Power-on LED
- 7** POST Complete (OK) LED
- 8** SCSI Hard Drive In-use LED

Information LED

This amber LED is on when the information log contains information about certain conditions in your appliance that might affect performance. For example, the LED is on if your appliance does not have redundant power. An LED on the diagnostic panel on the system board will also be on.

System Error LED

This amber LED is on when a system error occurs. An LED on the diagnostic panel on the system board will also be on to further isolate the error.

Service Ethernet Transmit/Receive Activity LED

This green LED is on when there is transmit or receive activity to or from the appliance on the Service Ethernet port.

Service Ethernet Link Status LED

This green LED is on when there is an active connection on the Service Ethernet port.

Service Ethernet Speed LED

This green LED is on when the Service Ethernet LAN speed is 100 Mbps.

Power-on LED

This green LED is on when system power is present in the appliance. When this LED flashes, the appliance is in standby mode (the system power supply is turned off and ac power is present). If this LED is not on, the power cord is not connected, the power supply has failed, or this LED has failed.

POST Complete LED

This green LED is on when the appliance completes the POST without any errors.

SCSI Hard Drive In-use LED

This green LED is on when there is activity on a hard drive. With this appliance, the LED remains on constantly because the on-board SCSI port is disabled.

Basic Troubleshooting

Use this basic troubleshooting information as a starting point in detecting problem components. Begin with step 1 in “Basic system checkout” and proceed as directed.

Note: For more detailed troubleshooting information, refer to specific troubleshooting sections in this chapter.

Basic system checkout

1. Is the Power-on LED on or blinking? If yes, go to step 3. If no, go to step 2.
2. Are the power cords plugged in and attached to a good power supply? If yes, go to step 4.
3. Is the Power-on LED blinking? If yes, go to step 9. If no, go to step 10.
4. Is the System Error LED on? If yes, go to step 5. If no, go to step 6.
5. Open the box and use the diagnostics panel to determine which power supply to replace.
6. Is the system fan on? If yes, go to step 7. If no, go to step 8.
7. Replace the external LED card.
8. See your IBM service representative to troubleshoot power problems.
9. Press the Power button. Then, go to step 9.
10. Is the POST Complete (OK) LED on? If yes, go to step 12. If no, go to step 11.
11. Connect the keyboard and monitor.
12. Connect the keyboard and monitor. Then, reboot the appliance. If the message Uncompressing Linux... OK, booting the kernel appears, go to step 14. If the message does not appear, go to step 13.
13. Reboot the appliance and follow the steps in “Starting the diagnostic programs” on page 38 to perform a check of the system IDE drive that contains the system code load. If the IDE drive is bad, go to step 16. If the IDE drive is good, go to step 15 to obtain a new system image.
14. Follow the steps in “Verifying the network connection is good.”
15. Use the Recovery CD. (See “Recovering the IBM IP Storage” on page 25 for information on using the Recovery CD.)
16. Replace the IDE drive. Then, go to step 15.

Verifying the network connection is good

1. Do you have access to the Administrative Console from the IP-connected management console? If yes, go to step 3. If no, go to step 2.
2. Are you able to ping the appliance's IP address from the IP-connected management console? If yes, go to step 5. If no, go to step 4.
3. Check the LEDs on the Operator Information panel and act appropriately.
4. Is the Link LED on? If yes, go to step 7. If no, go to step 6.
5. Press **Reset** and allow the appliance to reboot. Then, return to step 1.
6. Check the network cabling and connections. Is the problem solved? If yes, verify step 1 and continue system operation. If no, go to step 7.
7. Connect a keyboard and monitor. Run the Gigabit Ethernet diagnostics diskette (see "Using the diagnostics diskette" on page 42).

Note: The diagnostics diskette is available at www.ibm.com/storage/support/nas.

Diagnostic tools overview

The following tools are available to help you identify and resolve hardware-related problems:

- POST beep codes, error messages, and error logs
- Light-path diagnostics
- Diagnostic programs and error messages

POST beep codes, error messages, and error logs

Note: You will need to connect a keyboard and monitor to your appliance in order to see error messages.

When you switch on the appliance, it performs a series of tests to check the operation of appliance components and some of the options installed in the appliance. This series of tests is called the power-on self-test (POST).

If POST finishes without detecting any problems, a single beep sounds and the POST Complete (OK) LED on the operator information panel is on.

If POST detects a problem, more than one beep sounds and an error message appears on your screen.

Note: A single problem might cause several error messages. When this occurs, work to correct the cause of the first error message. After you correct the cause of the first error message, the other error messages usually will not occur the next time you run the test.

Event/error logs

Note: You will need to connect a keyboard and monitor to your appliance in order to see the event/error logs.

The POST error log contains the three most-recent error codes and messages that the system generated during POST. The System Event/Error Log contains all error messages issued during POST and all system status messages from the Advanced System Management Processor.

To view the contents of the error logs, start the Configuration/Setup Utility program and then select **Event/Error Logs** from the main menu.

Light-path diagnostics

If the System Error LED on the operator information panel is on, one or more LEDs inside the appliance or on the power supplies will be on. Use the light-path diagnostics to identify the type of error that occurred.

You can use the light-path diagnostics built into your appliance to quickly identify the type of system error that occurred. Your appliance is designed so that any LEDs that are illuminated remain that way when the appliance shuts down, provided that the ac power source is good and the power supplies can supply +5V dc to the appliance. This feature helps you isolate the problem if an error causes the appliance to shut down.

AC and DC Power LEDs

The AC and DC Power LEDs on the power supply provide status information about the power supply.

Diagnostics panel

Figure 6 shows the LEDs on the diagnostics panel on the system board.

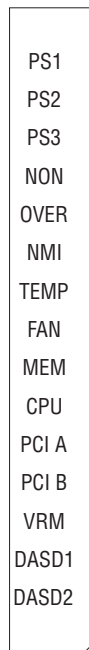


Figure 6. Diagnostics panel

Diagnostics programs and error messages

Note: You will need to connect a keyboard and monitor to your appliance in order to see error messages.

The appliance diagnostic programs are stored in upgradable read-only memory (ROM) on the system board. These programs are the primary method of testing the major components of your appliance.

Diagnostic error messages indicate that a problem exists; they are not intended for use in identifying a failing part.

Sometimes the first error to occur causes additional errors. In this case, the appliance displays more than one error message. Always follow the suggested action instructions for the *first* error message that appears.

Error code format

The error code format is as follows:

fff-ttt-iii-date-cc-text message

where:

fff is the three-digit function code that indicates the function being tested when the error occurred. For example, function code 089 is for the microprocessor.

ttt is the three-digit failure code that indicates the exact test failure that was encountered.

iii is the three-digit device ID.

date is the date when the diagnostic test was run and the error recorded.

cc is the check digit that is used to verify the validity of the information.

text message

is the diagnostic message that indicates the reason for the problem.

Text messages

The diagnostic text message format is as follows:

Function Name: Result (test-specific string)

where:

Function Name

is the name of the function being tested when the error occurred. This corresponds to the function code (*fff*) given in the previous list.

Result can have one of the following values:

Passed: The diagnostic test completed without any errors.

Failed: The diagnostic test discovered an error.

User Aborted: You stopped the diagnostic test before it was complete.

Not Applicable: You specified a diagnostic test for a device that is not present.

Aborted: The test could not proceed because of the system configuration.

Warning: A possible problem was reported during the diagnostic test, such as when a device that was to be tested was not installed.

Test-specific string

is additional information that you can use to analyze the problem.

Starting the diagnostic programs

Press **F1** while running the diagnostic programs to obtain Help information. You also can press **F1** from within a help panel to obtain online documentation from which you can select different categories. To exit Help and return to where you left off, press **Esc**.

To start the diagnostic programs:

1. Switch ON the appliance.
2. When the message F2 for Diagnostics appears, press **F2**.
3. Select either **Extended** or **Basic** from the top of the panel.
4. When the Diagnostic Programs panel appears, select the test you want to run from the list that appears; then, follow the instructions on the panel.

Notes:

- a. If the appliance stops during testing and you cannot continue, restart the appliance and try running the diagnostic programs again.
- b. You can view appliance configuration information (such as system configuration, memory contents, interrupt request [IRQ] use, direct memory access [DMA] use, device drivers, and so on) by selecting **Hardware Info** from the top of the panel.

When the tests have completed, you can view the Test Log by selecting **Utility** from the top of the panel.

If the hardware checks out OK, but the problem persists during normal appliance operations, a code error might be the cause. If you suspect a code problem, refer to the information that comes with the appliance code image load.

Viewing the test log

The test log does not contain any information until after the diagnostic program has run.

Note: If you are already running the diagnostic program, begin with step 3.

To view the test log:

1. Switch ON the appliance.

Note: If the appliance is already on but does not display the system diagnostics window, then shut down the appliance and restart the appliance in diagnostic mode.

2. When the message F2 for Diagnostics appears, press **F2**.

If an administrator password is set, the appliance prompts you for it. Type in the appropriate password; then, press **Enter**.

3. When the Diagnostic Programs panel appears, select **Utility** from the top of the panel.
4. Select **View Test Log** from the list that appears; then, follow the instructions on the panel.

The system maintains the test-log data while the appliance is powered on. When you switch off the appliance, the test log is cleared.

Gigabit Ethernet adapters

This section describes how to troubleshoot the Gigabit Ethernet Adapter and use the diagnostics diskette.

Note: The diagnostics diskette is available at www.ibm.com/storage/support/nas.

Troubleshooting the Gigabit Ethernet adapter

See Table 2 on page 41 and Table 1 for information on the Gigabit Ethernet adapter LEDs.

Note: See Figure 7 for the location of the Gigabit Ethernet Copper Adapter LEDs described in Table 1.

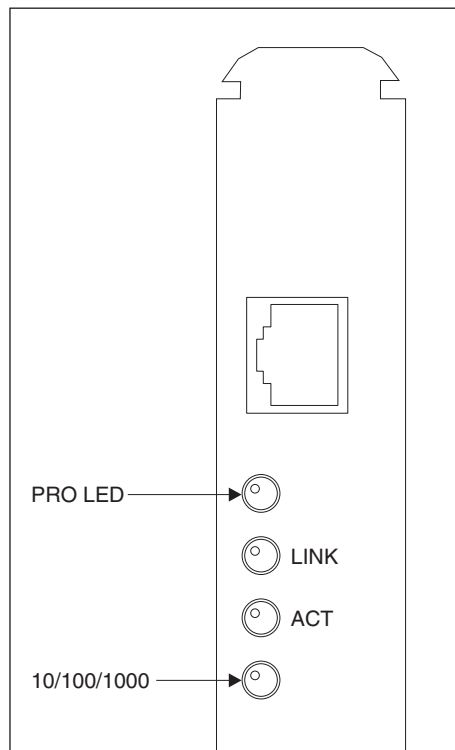


Figure 7. LEDs on the Gigabit Ethernet Copper Adapter

Table 1. LEDs on the Gigabit Ethernet Copper Adapter

LED	Meaning
PRO LED	Identifies the adapter by blinking.
LINK on	Indicates the adapter is connected to a valid link partner and is receiving pulses.
Blinking ACT LED	The adapter is sending/receiving data.
10/100/1000	Amber = 1000 Mbps Green = 100 Mbps Off = 10 Mbps

Note: See Figure 8 for the location of the Gigabit Ethernet SX Adapter LEDs described in Table 2.

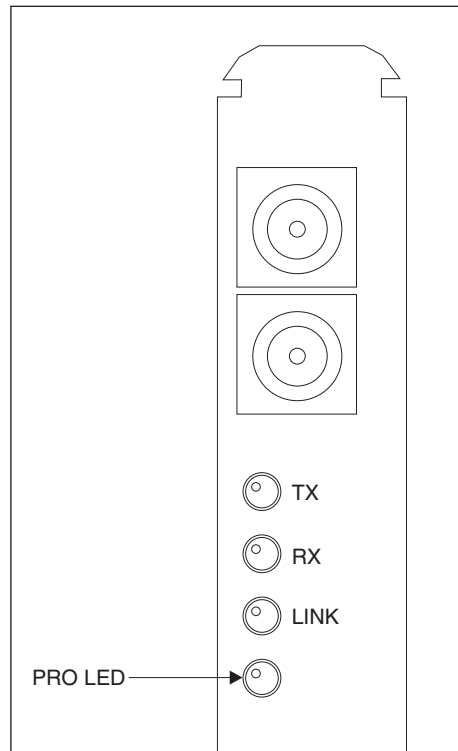


Figure 8. LEDs on the Gigabit Ethernet SX Adapter

Table 2. LEDs on the Gigabit Ethernet SX Adapter

LED	Meaning
PRO LED	Identifies the adapter by blinking.
TX on	The adapter is sending data.
RX on	The adapter is receiving data.
Link on	The adapter is connected to a valid link partner and is receiving link pulses.
Link off	Check all connections at the adapter and link partner. Make sure the link partner is set to 1000 Mbps and full duplex and the drive is loaded.

See Table 3 for information on troubleshooting the Ethernet adapter.

Table 3. Troubleshooting the Ethernet Adapters

Symptom	Suggested Actions
The computer cannot find the adapter.	<ul style="list-style-type: none"> • Ensure that the adapter is firmly seated in the slot. • Try a different PCI busmaster slot.
Diagnostic pass but the connection fails.	<ul style="list-style-type: none"> • Ensure that the network cable is securely attached.
The adapter stopped working for no apparent reason.	<ul style="list-style-type: none"> • Reseat the adapter. • Reinstall the operating system using the Recovery CD.

Table 3. Troubleshooting the Ethernet Adapters (continued)

Symptom	Suggested Actions
The Link LED does not appear.	<ul style="list-style-type: none"> • Check all connections at the adapter and the buffered repeater or switch. • Ensure that the operating system is operational. • Use a different port on the buffered repeater or switch. • Ensure that the buffered repeater or switch port is configured for 1000 Mbps and full duplex.
RX or TX LED or ACT LED does not appear	<ul style="list-style-type: none"> • Try a different adapter. • Ensure that the operating system is operational. • Log in from a workstation (the network may be idle).

Using the diagnostics diskette

Note: The diagnostics diskette is available at www.ibm.com/storage/support/nas.

You can use the diagnostics diskette to detect problems with the appliance's Gigabit Ethernet Adapter. This diskette can be used to test both Gigabit Ethernet Copper Adapters and Gigabit Ethernet SX Adapters. To use this diskette:

1. Connect a monitor and keyboard to the appliance.

Note: The monitor and keyboard are not supplied with the appliance and must be obtained separately.

2. Place the diagnostics diskette into the floppy drive slot and switch the appliance on.
3. At boot up, a selection panel appears. This selection panel allows you to choose either the Ethernet card or ServeRAID card. Choose which device you would like to test.
4. Press **Enter** at the main diagnostics panel. The diagnostics diskette will then search the appliance to ensure an adapter is installed.
5. If the proper adapter is detected, a selection panel will appear.
6. Select **Test the Adapter**. (If you wish to test the adapter without having a network connection, choose that option from the Main panel; then, return back to the Main panel to **Test the Adapter**.)
7. Upon successful completion of the test, exit the diagnostics program by following the onscreen prompts.

Note: If a faulty adapter is found, replace the adapter and rerun the diagnostics to ensure the new adapter is operating correctly.

8. After exiting the program, remove the diskette and press **Ctrl+Alt+Delete** to reboot the appliance.

ServeRAID controllers

This section provides basic troubleshooting information for the ServeRAID controllers. It also provides instructions on using the diagnostics diskette.

Note: The diagnostics diskette is available at www.ibm.com/storage/support/nas.

Troubleshooting the ServeRAID controllers

Figure 9 shows the ServeRAID-4H controller. Figure 10 on page 44 shows the ServeRAID-4L controller.

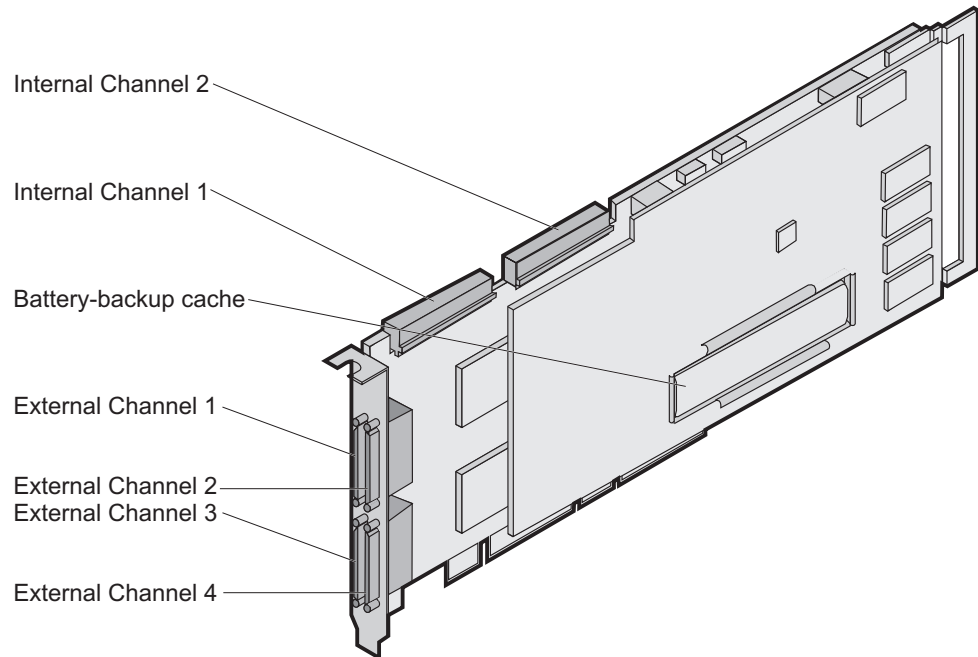


Figure 9. The ServeRAID-4H controller

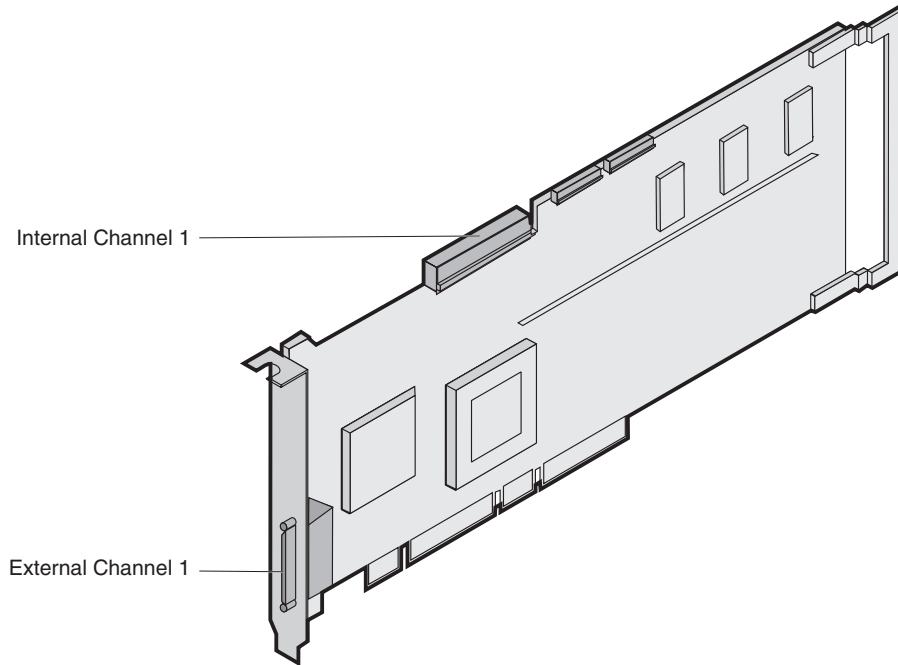


Figure 10. The ServeRAID-4L controller

ServeRAID controller messages

Note: You must connect a keyboard and monitor to the appliance to see the controller messages.

This section lists the ServeRAID messages that might appear during system startup. The ServeRAID controllers provide a Device Event Log that collects statistics on the number and types of events that occur on a selected physical drive. After correcting a problem with the disk array, clear the log so that you can identify any subsequent errors quickly.

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

Following are messages associated with the ServeRAID subsystem in alphabetical order.

Table 4. ServeRAID controller messages

Message	Explanation	Action
A new drive was installed.	When the ServeRAID controller detects a new drive that is not part of the current configuration, the following message appears: x new Ready drives found where x is the number of Ready drives found.	This is an information message. No action is required.
Auto rearrange.	Auto rearrange is enabled or disabled.	This is an information message. No action is required.

Table 4. ServeRAID controller messages (continued)

Message	Explanation	Action
Battery-backup cache not responding.	BIOS code detected a bad or failed battery-backup cache.	Press F9 to remove the battery-backup cache from the configuration, or press F10 to exit without change.
Battery-backup cache replacement.	The ServeRAID controller detects that the battery-backup cache is defective.	Press F8 if you replaced the battery-backup cache, or press F10 if you have not replaced the battery-backup cache.
Configured drives are missing.	<p>When the ServeRAID controller detects that a previously configured drive is missing, the following message appears:</p> <p>x Online drives not responding where x is the number of drives not responding.</p> <p>Example of a possible message: Online Drive on Channel 3 SCSI ID 3 is not responding.</p>	<p>Press one of the following keys:</p> <p>F2 Detailed description. Press this key for a detailed description of the problem.</p> <p>F4 Retry. Press this key after correcting a problem. For example, press F4 after you switch on the external storage enclosure that contains the physical drive.</p> <p>F5 Change the configuration and set the drives to defunct. Press this key to accept the new state that the ServeRAID controller will assign to the drive. For example, the ServeRAID controller will assign the drive a state of defunct or empty. 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 controller will assign the drive a state of defunct, 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.</p> <p>Note: A physical 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"> 1. All cables are connected properly to the backplane and to the physical 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 multiple drives fail in separate arrays (one physical drive per array), then replace each of the defunct physical drives. <p>After you perform these steps, if the physical drive does not function properly, replace the drive.</p> <p>F10 Continue starting without changing the configuration. Press this key to continue without change to the configuration.</p>

Table 4. ServeRAID controller messages (continued)

Message	Explanation	Action
<p>Configured drives are not in the configured location.</p>	<p>When the ServeRAID controller detects that a previously configured drive is present, but the drive is in a new location, the following message appears:</p> <p>x Online drive has been rearranged where x is the number of drives that have been rearranged.</p> <p>For example:</p> <p>Online Drive on Channel 3 SCSI ID 4 moved to Channel 3 SCSI ID 3.</p>	<p>Press one of the following keys:</p> <p>F2 Detailed description. Press this key for a detailed description of the problem.</p> <p>F4 Retry. Press this key after correcting a problem. For example, press F4 after you move the physical drive to its previously assigned location.</p> <p>F5 Change the configuration and set the drive to defunct. Press this key to accept the new state that the ServeRAID controller assigns to the drive. For example, the ServeRAID controller will assign the drive a state of defunct or empty.</p> <p>Note: A physical 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"> 1. All cables are connected properly to the backplane and to the physical 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 multiple drives fail in separate arrays (one physical drive per array), then replace each of the defunct physical drives. <p>After you perform these steps, if the physical drive does not function properly, replace the drive.</p> <p>F5 Change the configuration and accept the rearrangement. Press this key to change 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 controller will update the configuration.</p> <p>F10 Continue startup without changing the configuration. Press this key to continue without change to the configuration.</p>
<p>Controller is not responding to commands. No logical drives are installed.</p>	<p>The ServeRAID controller is not operational.</p>	<p>Service the appliance.</p>

Table 4. ServeRAID controller messages (continued)

Message	Explanation	Action
<p>New controller installed in a configured server or drives are imported.</p>	<p>When the ServeRAID controller detects that the identifiers of the drives do not match the controller configuration information, the following message appears: x Online drive(s) found with mismatch configuration</p>	<p>Press one of the following keys:</p> <p>F2 Detailed description. Press this key for a detailed description of the problem, such as the example messages above.</p> <p>F4 Retry. Press this key after correcting the problem. For example, press F4 after you move the physical drive to its previously assigned location, or after you install the original physical drives back in the server.</p> <p>F5 Change the configuration and set the drive to defunct. Press this key to accept the new state that the ServeRAID controller will assign to the drive. For example, the ServeRAID controller will assign the drive a state of defunct or empty.</p> <p>Note: A physical 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"> 1. All cables are connected properly to the backplane or system board, and to the physical 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 multiple drives fail in separate arrays (one physical drive per array), then replace each of the defunct physical drives. <p>After you perform these steps, if the physical drive does not function properly, replace the drive.</p> <p>F7 Import configuration information from drive. Press this key to restart the server. Press this key to import the configuration information from the drive and to update the configuration information for the ServeRAID controller. This choice is useful when you replace the ServeRAID controller in an existing ServeRAID subsystem.</p> <p>You also might press F7 if you replace a whole set of drives with drives that were configured in another server with a ServeRAID controller.</p> <p>Note: When you install drives in a server that has no logical drives defined, the F7 choice will not appear. The ServeRAID controller does not contain any logical drives in its factory configuration. Therefore, F7 will not appear. In this case, do the following:</p> <ol style="list-style-type: none"> 1. Restart the server and press Ctrl+I to enter the Mini-Configuration program. Follow the onscreen prompts. 2. Select Advanced Functions. 3. Select Copy the Configuration from Drives to the Controller and follow the instructions on the screen.
<p>Recoverable configuration error.</p>	<p>The configuration data stored in NVRAM does not match the configuration data stored in the EEPROM.</p>	<ol style="list-style-type: none"> 1. Press Ctrl+I to access the ServeRAID Mini-Configuration menu. Follow the onscreen prompts. 2. Select Advanced Functions from the Main Menu. 3. Then, select Copy the Configuration from Drives to the Controller. Follow the onscreen prompts.

Table 4. ServeRAID controller messages (continued)

Message	Explanation	Action
Unrecoverable configuration error.	The configuration data stored in NVRAM does not match the configuration data stored in the EEPROM.	<ol style="list-style-type: none"> 1. Press Ctrl+I to access the ServeRAID Mini-Configuration menu. Follow the onscreen prompts. 2. Select Advanced Functions from the Main Menu. 3. Then, select Restore to the Factory Default Settings. Follow the onscreen prompts. <p>Note: Restoring to factory default settings sets all online drives in array to ready. You must import the configuration from the drives or diskette. Otherwise, you must create a new array, install the operating system, and restore data from backup.</p>
WARNING: <i>n</i> logical drives are critical; <i>n</i> logical drives are offline.	One or more physical drives have failed.	Replace the defunct drives as soon as possible to prevent data loss.
Your server has an error due to a Blocked Logical Drive.	One or more logical drives are blocked. A blocked logical drive cannot be accessed.	Press F4 to unblock the logical drive, or press F5 to continue without unblocking.

ServeRAID ISPR, BCS, and ECS POST error codes

This section describes the ISPR, BCS, and ECS POST error codes. See Table 5 for ISPR codes and Table 6 on page 49 for BCS and ECS codes.

Note:

1. When the ServeRAID controller requires your input, a list of function keys will appear below the message.
2. Where *sid* or *ch* appears in these messages, *sid* is the SCSI ID for the device, and *ch* is the channel to which the device is attached.
3. Where *m* or *n* appears in these messages, a number will appear in the actual message.

Table 5 contains information on ISPR codes.

Table 5. ISPR (Interrupt Status Port Register) codes

Code	Explanation	Action
1xxx to 7xxx	The POST detected an internal error.	Correct any problems.
2601 to 260B	The POST detected an error with the ServeRAID subsystem.	Correct any problems.
2610	The POST detected an error with the ServeRAID controller hardware.	Correct any problems.
2620	The POST detected that a ServeRAID configuration or hard disk error occurred.	View the existing device and configuration information for your ServeRAID subsystem. Correct any problems.
8xxx to Bxxx	The POST detected an error with the SCSI interface.	Verify that the SCSI cables are correctly connected and the SCSI termination is set properly for each installed SCSI device. Correct any problems.

Table 6 contains BCS and ECS codes.

Table 6. BCS and ECS codes

BCS	ECS	Explanation and possible recovery action
Code not in table	Code not in table	Explanation: The ServeRAID controller is not functioning properly. Action: Correct any problems.
00	01	Explanation: Invalid flash configuration. Action: Run the ServeRAID BIOS configuration diskette and follow the onscreen prompts. If no instructions appear or if the problem persists, correct any problems.
00	02	Explanation: Invalid flash and NVRAM configuration. Action: Run the ServeRAID BIOS configuration diskette and follow the onscreen prompts. If no instructions appear or if the problem persists, correct any problems.
00	03	Explanation: Invalid flash and NVRAM configuration. Action: Run the ServeRAID BIOS configuration diskette and follow the onscreen prompts. If no instructions appear or if the problem persists, correct any problems.
01	08	Explanation: No configuration was found in drives, or Online/Rebuild drives are not responding. Action: Press F4, F5, F7, or F10 .
01	18	Explanation: No configuration was found in drives, or Online/rebuild and Hot-Spare/Standby Hot-Spare drives are not responding. Action: Press F4, F5, F7, or F10 .
01	28	Explanation: No configuration was found in drives, or Online/Rebuild and Ready/Standby drives are not responding. Action: Press F4, F5, F7, or F10 .
01	38	Explanation: No configuration was found in drives, or Online/Rebuild, Hot-Spare/Standby Hot-Spare drives are not responding. Action: Press F4, F5, F7, or F10 .
01	48	Explanation: No configuration was found in drives, or Online/Rebuild drives are not responding and unidentified drives were found. Action: Press F4, F5, F7, or F10 .
01	58	Explanation: No configuration was found in drives, or Online/Rebuild and Hot-Spare/Standby Hot-Spare drive are not responding and unidentified drives were found. Action: Press F4, F5, F7, or F10 .
01	68	Explanation: No configuration was found in drives, or Online/Rebuild and Ready/Standby drives are not responding and unidentified drives were found. Action: Press F4, F5, F7, or F10 .
01	78	Explanation: 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. Action: Press F4, F5, F7, or F10 .
03	88	Explanation: A drive was imported from another server and it has valid configuration, and Online/Rebuild drives are not responding. Action: Press F4, F5, F7, or F10 .

Table 6. BCS and ECS codes (continued)

BCS	ECS	Explanation and possible recovery action
03	98	<p>Explanation: A drive was imported from another server and it has valid configuration, and Online/Rebuild and Hot Spare/Standby Hot-Spare drives are not responding.</p> <p>Action: Press F4, F5, F7, or F10.</p>
03	A8	<p>Explanation: A drive was imported from another server and it has valid configuration, and Online/Rebuild and Ready/Standby drives are not responding.</p> <p>Action: Press F4, F5, F7, or F10.</p>
03	B8	<p>Explanation: A drive was imported from another server and it has valid configuration, and Online/Rebuild, Hot-Spare/Standby Hot-Spare, and Ready/Standby drives are not responding.</p> <p>Action: Press F4, F5, F7, or F10.</p>
03	C8	<p>Explanation: A drive was imported from another server and it has valid configuration, and Online/Rebuild drives are not responding and unidentified drives were found.</p> <p>Action: Press F4, F5, F7, or F10.</p>
03	D8	<p>Explanation: A drive was imported from another server and it has valid configuration, and Online/Rebuild and Hot-Spare/Standby Hot-Spare drives are not responding and unidentified drives were found.</p> <p>Action: Press F4, F5, F7, or F10.</p>
03	E8	<p>Explanation: A drive was imported from another server and it has valid configuration, and Online/Rebuild and Ready/Standby drives are not responding and unidentified drives were found.</p> <p>Action: Press F4, F5, F7, or F10.</p>
03	F8	<p>Explanation: A drive was imported from another server 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.</p> <p>Action: Press F4, F5, F7, or F10.</p>
07	00	<p>Explanation: The specified drive is not responding.</p> <p>Action:</p> <ol style="list-style-type: none"> 1. If the specified physical drive is in an external enclosure, check to make sure the enclosure is powered on. If the enclosure is not powered on, switch on the power and press F4 to retry. 2. Run the ServeRAID BIOS configuration diskette. 3. Replace the failed physical drive.
07	08	<p>Explanation: The specified drives are not responding.</p> <p>Action: To correct the problem:</p> <ol style="list-style-type: none"> 1. If the specified physical drives are in an external enclosure, check to make sure the enclosure is powered on. 2. If the enclosure is not powered on, switch on the power and press F4 to retry. 3. Run the ServeRAID BIOS configuration diskette. 4. Replace the failed physical drives.
07	0C	<p>Explanation: Online/Rebuild drives are not responding, and a drive was found at the incorrect SCSI ID.</p> <p>Action: Press F4, F5, F6, or F10.</p>

Table 6. BCS and ECS codes (continued)

BCS	ECS	Explanation and possible recovery action
07	18	Explanation: Online/Rebuild and Hot-Spare/Standby Hot-Spare drives are not responding. Action: Press F4, F5, or F10.
07	1C	Explanation: Online/Rebuild and Hot Spare/Standby Hot-Spare drives are not responding, and a drive was found at the incorrect SCSI ID. Action: Press F4, F5, F6, or F10.
07	28	Explanation: Online/Rebuild and Ready/Standby drives are not responding. Action: Press F4, F5, or F10.
07	2C	Explanation: Online/Rebuild and Ready/Standby drives are not responding, and a drive was found at the incorrect SCSI ID. Action: Press F4, F5, F6, or F10.
07	38	Explanation: Online/Rebuild, Ready/Standby, and Hot-Spare/Standby Hot-Spare drives are not responding. Action: Press F4, F5, or F10.
07	3C	Explanation: Online/Rebuild, Ready/Standby, and Hot-Spare/Standby Hot-Spare drives are not responding, and a drive was found at the incorrect SCSI ID. Action: Press F4, F5, F6, or F10.
07	48	Explanation: Online/Rebuild drives are not responding, and unidentified drives were found. Action: Press F4, F5, or F10.
07	4C	Explanation: Online/Rebuild drives are not responding, and a drive was found at the incorrect SCSI ID, and unidentified drives were found. Action: Press F4, F5, F6, or F10.
07	58	Explanation: Online/Rebuild and Hot Spare/Standby Hot-Spare drives are not responding, and unidentified drives were found. Action: Press F4, F5, or F10.
07	5C	Explanation: 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. Action: Press F4, F5, F6, or F10.
07	68	Explanation: Online/Rebuild and Ready/Standby drives are not responding, and unidentified drives were found. Action: Press F4, F5, or F10.
07	6C	Explanation: Online/Rebuild and Ready/Standby drives are not responding, a drive was found at the incorrect SCSI ID, and unidentified drives were found. Action: Press F4, F5, F6, or F10.
07	78	Explanation: Online/Rebuild, Ready/Standby, and Hot-Spare/Standby Hot-Spare drives are not responding, and unidentified drives were found. Action: Press F4, F5, or F10.

Table 6. BCS and ECS codes (continued)

BCS	ECS	Explanation and possible recovery action
07	7C	Explanation: 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. Action: Press F4 , F5 , F6 , or F10 .
09	00	Explanation: No error occurred. Action: No action is required.
09	10	Explanation: Hot-Spare/Standby Hot-Spare drives are not responding. Action: Press F4 , F5 , or F10 .
09	20	Explanation: Ready/Standby drives are not responding. Action: Press F4 , F5 , or F10 .
09	30	Explanation: Hot-Spare/Standby Hot-Spare and Ready/Standby drives are not responding. Action: Press F4 , F5 , or F10 .
0F	00	Explanation: No error occurred. Action: No action is required.
0F	10	Explanation: Hot-Spare/Standby Hot-Spare drives are not responding. Action: Press F4 , F5 , or F10 .
0F	20	Explanation: Ready/Standby drives are not responding. Action: Press F4 , F5 , or F10 .
0F	30	Explanation: Hot-Spare/Standby Hot-Spare and Ready/Standby drives are not responding. Action: Press F4 , F5 , or F10 .

Using the diagnostics diskette

Note: The diagnostics diskette is available at www.ibm.com/storage/support/nas.

You can use the diagnostics diskette to detect problems with the appliance's ServeRAID adapter. To use this diskette:

1. Connect a monitor and keyboard to the appliance (not supplied).
2. Place the diagnostics diskette into the diskette drive slot and switch the appliance on.
3. At boot up, a selection panel appears. This selection panel allows you to choose either the Ethernet card or ServeRAID card. Choose which device you would like to test.
4. When prompted, type **y** and press **Enter** to start the card diagnostics.
5. Upon successful completion of the test, ensure that the displayed message shows the test completed successfully.
6. Remove the diskette and press **Ctrl+Alt+Delete** to reboot the appliance.

Note: If a faulty adapter is found, replace the adapter and rerun the diagnostics to ensure that the new adapter is operating correctly.

Troubleshooting the storage unit (Model EXP)

Use Table 7 to find solutions for storage unit problems with definite symptoms.

Table 7. Model EXP problems and suggested actions

Problem indicator	Component	Possible cause	Suggested Actions
Amber LED is on	Hard drive	Drive failure	Replace the failed drive. Refer to <i>IBM TotalStorage IP Storage 200i Storage Unit Installation Guide</i> .
	ESM board	Board failure	Replace failed board. Refer to <i>IBM TotalStorage IP Storage 200i Storage Unit Installation Guide</i> .
	Front panel	General machine fault; a Fault LED somewhere on the storage unit has been switched on	Check for amber LEDs. Refer to <i>IBM TotalStorage IP Storage 200i Storage Unit Installation Guide</i> .
Amber LED is on and green LED is off	Power supply	Power is switched off	Switch on all power supplies. See <i>IBM TotalStorage IP Storage 200i Storage Unit Installation Guide</i> .
Amber and green LEDs are on	Power supply	Power supply failure	Replace the failed power supply. See <i>IBM TotalStorage IP Storage 200i Storage Unit Installation Guide</i> .
All green LEDs are off		The storage unit is switched off	Check that all storage unit power cables are plugged in and the power is on. If applicable, check that the main circuit breakers for the rack are switched on. If the external switch 1 is set to Off, the SCSI controller must be cabled to the storage unit and switched on.
		AC power failure	Check the main circuit breaker and ac outlet.
		Power supply failed	Replace the power supply. See <i>IBM TotalStorage IP Storage 200i Storage Unit Installation Guide</i> .
		Midplane failure	Service the storage unit.
Amber LED is flashing	Hard drive	Drive rebuild or identity is in process	No corrective action is needed.
	Power supply	Fan failure	Replace the power supply.
Amber LED is on and green DC power LED is off	Power supply	Power supply failure	If the power switch is ON, replace the power supply. See <i>IBM TotalStorage IP Storage 200i Storage Unit Installation Guide</i> .
Amber LED is on and green AC Power LED is off	Power supply	No ac power to power supply. Check the ac power cord (cable) or breaker	If ac power is good at the source, replace the power cord. If the power supply has failed, replace the power supply. See <i>IBM TotalStorage IP Storage 200i Storage Unit Installation Guide</i> .
Green LED is on	Drive ID=6	Cluster configuration	If the storage unit is not currently cluster configured, power cycle it to reenable ID=6.

Table 7. Model EXP problems and suggested actions (continued)

Problem indicator	Component	Possible cause	Suggested Actions
One or more green LEDs are off	One or two drives	No activity to the drives	No action is required.
	All drives or those on one bus	No activity to the drives	No action is required.
		Damaged or loose SCSI cables	Check SCSI-bus cables and connections.
		ESM board failure	Use RAID management code to check the SCSI-bus status. Replace the ESM board. See <i>IBM TotalStorage IP Storage 200i Storage Unit Installation Guide</i> .
		Midplane failure	Service the storage unit.
	Front panel	Power supply	Make sure the cables are plugged in and power supplies are switched on.
		Hardware failure	If any other LEDs are on, service the storage unit.
Intermittent or sporadic power loss to the storage unit		Defective ac power source or partially plugged power cable	Check the ac power source. Resecure all installed power cables and power supplies. If applicable, check the power components (power units, UPS, and so on). Replace defective power cables.
		Power supply failure	Check for a fault LED on the power supply and replace the failed power supply.
		Midplane failure	Service the storage unit.
Unable to access drives on one or both SCSI buses	Drives and SCSI bus	Incorrect SCSI ID settings.	Make sure SCSI cables are undamaged and properly connected. Check the drive SCSI ID settings. Ensure that option switches 1 and 3 (inside the switch card) are set to the appropriate positions. Attention: Change switch positions only when your host server and storage unit are switched off.
		ESM board failure	Service the storage unit.
	Bridge card	Bridge card failure	All high address or all low address hard-disk drive failed; check the bridge card and replace it if necessary.
Random errors	Subsystem	Midplane failure	Service the storage unit.

Note: If you cannot find the problem in the troubleshooting table, test the entire system. See your appliance documentation for more detailed information on testing and diagnostic tools.

If you already have run the server test program, or if running the test does not reveal the problem, have the system serviced.

Power checkout

Power problems can be difficult to troubleshoot. For example, a short circuit can exist anywhere on any of the power distribution buses. Usually, a short circuit will cause the power subsystem to shut down because of an overcurrent condition.

A general procedure for troubleshooting power problems is as follows:

1. Switch OFF the system and disconnect the ac cords.
2. Check for loose cables in the power subsystem. Also check for short circuits; for example, if there is a loose screw causing a short circuit on a circuit board.
3. Remove adapters and disconnect the cables and power connectors to all internal and external devices until the system is at the minimum configuration required for power-on.
4. Reconnect the ac cord and switch ON the system. If the system starts successfully, replace adapters and devices one at a time until the problem is isolated. If the system does not start from minimal configuration, replace parts of the minimal configuration one at a time until the problem is isolated.

To use this method it is important to know the minimum configuration required for a system to start.

Temperature checkout

Proper cooling of the system is important for proper operation and system reliability. For a typical appliance, you should make sure that:

- Each of the drive bays has either a drive or a filler panel installed.
- Each of the power supply bays has a power supply installed.
- The top cover is in place during normal operation.
- There is at least 50 mm (2 in.) of ventilated space at the sides of the appliance and 100 mm (4 in.) at the rear of the appliance.
- The top cover is removed for no longer than 30 minutes while the appliance is operating.
- The processor housing cover covering the processor and memory area is removed for no longer than 10 minutes while the appliance is operating.
- A removed hot-swap drive is replaced within 2 minutes of removal.
- Cables for optional adapters are routed according to the instructions provided with the adapters (ensure that cables are not restricting air flow).
- The fans are operating correctly and the air flow is good.
- A failed fan is replaced within 48 hours.

In addition, ensure that the environmental specifications for the system are met.

Troubleshooting the IDE drive

This section describes symptoms and diagnostics. .

Symptoms

The following symptoms may indicate a problem with your IDE drive:

- You can no longer ping the appliance from the management workstation.
- The system appears to be hung.

Running IDE diagnostics

Follow these steps to run IDE diagnostics:

1. Connect a monitor and keyboard to the appliance.
2. Start the appliance.
3. Press **F2** for System Diagnostics. Wait until it boots. A window stating F2 has been pressed. Booting to Diagnostics appears.
4. After completing the diagnostics boot, the main PC-Doctor window appears.
5. Select **Extended** from the top of the window; then, press **Enter**.
6. Scroll down to the **Fixed Disk** option; then, press **Enter**.
7. The IDE drive containing the code is on Drive 0. The six tests under Drive 0 are the only options that should be selected.

Note: Use the spacebar and arrow keys to deselect the other options.

8. Press **Ctrl+Enter** to run the selected tests.

Note: This may take up to ten minutes.

9. If the tests under the Disk 0 menu show an operational IDE drive, the status is passed. If the tests were not successful, go to step 11.
10. Press **Esc**; then, select **Quit** and press **Enter**. A prompt appears asking if you want to reboot. Enter **y** to reboot the appliance.
11. If the non-hot-swap (IDE) drive failed, replace it .
12. Download a new system image from www.ibm.com/storage/support/nas and install the new image on the network's FTP server.
13. Run the Recovery CD (see "Recovering the IBM IP Storage" on page 25).

Administrative Console

This section describes various error conditions that might occur when using the Administrative Console.

Table 8. Administrative Console error message

Error message	Recommended actions
An error occurred while communicating with the iSCSI Appliance.	If you specify a proxy server in your configuration, you must include your intranet network in the proxy server bypass list.

Appendix B. Notices

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Appendix C. Getting help, service, and information

If you need help, service, technical assistance, or just want more information about IBM products, you will find a wide variety of sources available from IBM to assist you.

IBM maintains pages on the World Wide Web where you can get information about IBM products and services and find the latest technical information.

Table 9 lists some of these pages.

Table 9. IBM Web sites for help, services, and information

www.ibm.com	Main IBM home page
www.ibm.com/storage	IBM Storage home page
www.ibm.com/storage/support/nas	IBM NAS Support home page

Services available and telephone numbers listed are subject to change without notice.

Service support

With the original purchase of an IBM hardware product, you have access to extensive support coverage. During the IBM hardware product warranty period, you may call the IBM Support Center (1-800-426-7378 in the U.S.) for hardware product assistance covered under the terms of the IBM hardware warranty. See “Getting help by telephone” on page 60 for Support Center telephone numbers in other countries.

The following services are available during the warranty period:

- Problem determination - Trained personnel are available to assist you with determining if you have a hardware problem and deciding what action is necessary to fix the problem.
- IBM hardware repair - If the problem is determined to be caused by IBM hardware under warranty, trained service personnel are available to provide the applicable level of service.
- Engineering change management - Occasionally, there might be changes that are required after a product has been sold. IBM or your reseller, if authorized by IBM, will make Engineering Changes (ECs) available that apply to your hardware.

Be sure to retain your proof of purchase to obtain warranty service.

Please have the following information ready when you call:

- Machine Type and Model
- Serial numbers of your IBM hardware products
- Description of the problem
- Exact wording of any error messages
- Hardware and software configuration information

If possible, be at your computer when you call.

A compatible monitor, keyboard, and mouse may be required for some service activities.

The following items are not covered:

- Replacement or use of non-IBM parts or nonwarranted IBM parts

Note: All warranted parts contain a 7-character identification in the format IBM FRU XXXXXXX.

- Identification of software problem sources
- Configuration of BIOS as part of an installation or upgrade
- Changes, modifications, or upgrades to device drivers
- Installation and maintenance of network operating systems (NOS)
- Installation and maintenance of application programs

Refer to your IBM hardware warranty for a full explanation of IBM's warranty terms.

Before you call for service

Many computer problems can be solved without outside assistance, by using the online help or by looking in the online or printed documentation that comes with your IBM IP Storage. Also, be sure to read the information in any README files that come with your software.

Your IBM IP Storage comes with documentation that contains troubleshooting procedures and explanations of error messages. The documentation that comes with your appliance also contains information about the diagnostic tests you can perform.

If you receive a POST error code or beep code when you turn on your Network Attached Server appliance, refer to the POST error-message charts in your hardware documentation. If you do not receive a POST error code or beep code, but suspect a hardware problem, refer to the troubleshooting information in your hardware documentation or run the diagnostic tests.

If you suspect a software problem, consult the documentation (including any README files) for the operating system or application program.

Getting customer support and service

Purchasing an IBM Network Attached Storage appliance entitles you to standard help and support during the warranty period. If you need additional support and services, a wide variety of extended services are available for purchase that address almost any need.

Getting help online: www.ibm.com/storage/support/nas

Here you can visit a support page that is specific to your hardware, complete with FAQs, parts information, technical hints and tips, technical publications, and downloadable files, if applicable.

Getting help by telephone

During the warranty period, you can get help and information by telephone through the IBM Support Center. Expert technical-support representatives are available to assist you with questions you might have on the following:

- Setting up your Network Attached Storage appliance
- Arranging for service

- Arranging for overnight shipment of customer-replaceable parts

In addition, if you purchased a Network Attached Storage appliance, you are eligible for IBM up and running support for 90 days after installation. This service provides assistance for:

- Setting up your IBM IP Storage
- Limited configuration assistance

Please have the following information ready when you call:

- Machine Type and Model
- Serial numbers of your appliance and other components, or your proof of purchase
- Description of the problem
- Exact wording of any error messages
- Hardware and software configuration information for your system

If possible, be at your computer when you call.

In the U.S. and Canada, these services are available 24 hours a day, 7 days a week. In the U.K., these services are available Monday through Friday, from 9:00 a.m. to 6:00 p.m.¹

Table 10 provides the telephone numbers.

Table 10. Telephone numbers for warranted help and information

Country		Number
Austria	Österreich	1-546 585 075
Belgium - Dutch	Belgie	02-717-2504
Belgium - French	Belgique	02-717-2503
Canada	Canada	1-800-565-3344
Denmark	Danmark	03-525-6905
Finland	Suomi	9-22-931805
France	France	01-69-32-40-03
Germany	Deutschland	069-6654-9003
Ireland	Ireland	01-815-9207
Italy	Italia	02-4827-5003
Luxembourg	Luxembourg	298-977-5060
Netherlands	Nederland	020-504-0531
Norway	Norge	2-305-3203
Portugal	Portugal	01-791-5147
Spain	España	091-662-4270
Sweden	Sverige	08-632-0063
Switzerland - German	Schweiz	01-212-1810
Switzerland - French	Suisse	022-310-0418
Switzerland - Italian	Svizzera	091-971-0523
United Kingdom	United Kingdom	01475-555555

¹ Response time will vary depending on the number and complexity of incoming calls.

Table 10. Telephone numbers for warranted help and information (continued)

U.S.A. and Puerto Rico	U.S.A. and Puerto Rico	1-800-426-7378
------------------------	------------------------	----------------

In all other countries, contact your IBM reseller or IBM marketing representative.

Appendix D. Purchasing additional services

During and after the warranty period, you can purchase additional services, such as support for IBM and non-IBM hardware, operating systems, and application programs; network setup and configuration; upgraded or extended hardware repair services; and custom installations. Service availability and name might vary by country.

Warranty and repair services

You can upgrade your standard hardware warranty service or extend the service beyond the warranty period.

Warranty upgrades in the U.S. include:

- On-site service to premium on-site service

If your warranty provides for on-site service, you can upgrade to premium on-site service (4-hour average on-site response, 24 hours a day, 7 days a week).

You also can extend your warranty. Warranty and Repair Services offers a variety of post-warranty maintenance options. Availability of the services varies by product.

For more information about warranty upgrades and extensions:

- In the U.S., call 1-800-426-4343.
- In Canada, call 1-800-465-7999.
- In all other countries, contact your IBM reseller or IBM marketing representative.

Glossary

D

data port. Ethernet ports used for storage-traffic and configuration purposes.

domain name server. In the Internet suite of protocols, the distributed database system used to map domain names to IP addresses.

DNS. See domain name server.

F

free disk. A physical disk that is not assigned as a hot-spare, standby hot-spare, or to a logical drive.

FTP. file transfer protocol.

H

hot-spare disk. A physical disk that is automatically mapped to a logical drive if one of the logical drive's disks goes offline.

I

IDE. integrated development environment.

iLUN. iSCSI client logical-unit number.

iSCSI. A technology that allows the SCSI transport protocol over an IP network by connecting clients (initiators) and servers to storage.

iSCSI client. A device that creates and sends SCSI commands to the target IBM IP Storage appliance.

iSCSI client logical-unit number (iLUN). A unique number that is assigned to each VLUN. The iLUN for a single client starts at zero and increments sequentially.

L

logical drive. A unit of virtual storage that is made available to the network through VLUNs and iLUNs. It is made up of one or more physical disks that are combined using RAID 0, 1, 1E, 5, or 5E technology.

M

MAC. medium access control

management information base (MIB).

management workstation. A workstation that is connected to the appliance through the network. This machine is used to manage and configure the appliance using the Administrative Console.

MIB. management information base

R

RAID. Redundant array of independent disks.

S

SCSI. See small computer system interface.

small computer system interface (SCSI). A standard hardware interface that enables a variety of peripheral devices to communicate with one another.

standby hot-spare disk. A physical disk that is automatically mapped to a logical drive when no suitable hot-spare disk is available.

T

target. A collection of logical units that are directly addressable on the network. The target corresponds to the server in a client-server model.

V

VLUN. See virtual logical unit.

virtual logical unit (VLUN). A subset of a logical drive.

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