

IBM TotalStorage™ Network Attached Storage 300



User's Reference

Version 1 Release 1

Note

Before using this information and the product it supports, be sure to read the general information in "Appendix A. Notices" on page 95.

First Edition (July 2001)

This edition applies to Version 1, Release 1, of the IBM 5195 TotalStorage Network Attached Storage 300 (Model 325, product number 5195-325) and to all subsequent releases and modifications until otherwise indicated in new editions.

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About this book

This book provides information necessary to configure and administer the IBM 5195 TotalStorage Network Attached Storage 300.

Hereafter, the IBM 5195 TotalStorage Network Attached Storage 300 is referred to as the Model 325.

Who should read this book

This book is for Model 325 administrators.

Frequently used terms

This document contains certain notices that relate to a specific topic. The caution and danger notices also appear in the multilingual Safety Information on the Documentation CD that came with the appliance. Each notice is numbered for easy reference to the corresponding notices in the Safety Information.

The following terms, used within this document or within the Safety Information, have these specific meanings:

| Term | Definition in this document |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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. |
| Drive bay | A receptacle into which you insert a hard drive. 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 appliance resides. |
| Headless | Operating and administering the machine without a keyboard, monitor (display), or mouse directly attached to it. |
| Notes | These notices provide important tips, guidance, or advice. |

Publications

The latest versions of the following product publications are available in softcopy at:
<http://www.ibm.com/storage/support/nas>

Descriptions of the Model 325 publications

The Model 325 library consists of the following publications:

- *Installation Guide*

This book describes hardware physical specifications, electrical specifications, cabling, environmental specifications, and networking specifications for installing the Model 325.

- *User's Reference*

This book describes such operational and administrative activities as:

- Using the configuration utilities
- Administering the Model 325
- Troubleshooting
- Using the Recovery and Supplementary CDs

Hardcopy publications shipped with the Model 325

The following publications are shipped in hardcopy and are also provided in softcopy (PDF) form at:

<http://www.ibm.com/storage/support/nas>

- *IBM 5195 TotalStorage Network Attached Storage 300G Installation Guide, GA27-4275*

- *Release Notes*

This document provides any changes that were not available at the time this book was produced.

Note that the *User's Reference* is provided in softcopy only.

Related publications

The following publications contain additional information about the Model 325:

- *IBM 5195 TotalStorage Network Attached Storage 300 Installation Guide GA27-4275*
- *IBM 5195 TotalStorage Network Attached Storage 300 Service Guide GA27-4277*
- *UM Services User's Guide* (on the Documentation CD that came with the appliance)

Additional information on Universal Manageability Services, Netfinity Director, and Advanced System Management is located on the Documentation CD that came with the appliance

Web sites

The following Web site has additional and up-to-date information about the IBM Model 325:

- <http://www.storage.ibm.com/nas/index.html>

Chapter 1. Introduction

Note: The information in this book applies to both engines of the Model 325.

The IBM 5195 TotalStorage Network Attached Storage 300 (Model 325) is a two-node appliance server. The Model 325 features:

- One Rack 36U (with a Power Distribution Unit)
- Two engines, each with:
 - Dual 933 MHZ processors
 - 1 GB memory
 - Two redundant 270 watt power supplies
 - Fibre-Channel adapter

Communication between the two engines takes place through an integrated 10/100 Mbps Ethernet port on each engine's planar board.

- Two Fibre Channel Hubs
- One fibre RAID storage controller (ten 36.4 GB hot-swappable HDD)
- Optionally:
 - An additional RAID storage controller
 - Maximum of seven storage expansion units, each populated with ten 36.4 GB Hot Swappable HDDs

In addition, the two-node Model 325 provides clustering and failover protection. This highly available design helps protect against appliance failure and increases uptime to provide continuous access to data.

Because the Model 325 is a modular, single-use appliance, it has a specifically defined hardware and software configuration. The preloaded software stack is based on the Windows Powered OS operating system, which is very similar to Microsoft® Windows® 2000 Advanced Server. Included in the operating system is Microsoft Cluster Services, Microsoft Windows Terminal Services, and Windows Services for UNIX.

Preloaded software includes:

- Columbia Data Products Persistent Storage Manager® (PSM)
- IBM FAStT Check (providing diagnostics for the fibre channel)
- IBM (Netfinity)® Director Agent
- IBM Netfinity FAStT Storage Manager for Windows 2000 Version 7.02
- Intel PROSet II (providing diagnostics for the Ethernet adapters)
- Microsoft Windows® 2000 for Network Attached Storage (a graphical user interface [GUI])
- Tivoli® Storage Manager Client

Roadmap for setting up and configuring the Model 325

The following roadmap presents the requirements and instructions required to set up and configure the Model 325. Following these directions and referring to the appropriate sections of this book will help you in this task.

Prerequisites

- A Domain Controller must exist on the network and a login ID must be defined for each node to log on. Each node must join the same domain.
- All Windows shared disks must be defined as basic. Windows 2000 dynamic disks are not supported.
- All shared disks between the two cluster nodes must have the same drive letter.
- All shared storage must be defined as NTFS and be primary partitions
- Compression cannot be enabled on any disk partition
- Each node must have one private and one public adapter

Cluster setup requirements

See “Cluster setup requirements” on page 4.

Configuration and administration tools (“Chapter 2. Configuration and administration tools” on page 7)

The Model 325 is a two-node clustered network-attached storage appliance that has several different methods of configuration depending on your environment.

Determine how you will manage the device. You can manage the Model 325 in “headless” mode or with a keyboard, display, and mouse directly attached to each node. For “headless” management of the Model 325, you can use one of the following tools:

- Terminal Services, for remote configuration and management from another device on the network
- Universal Manageability Services (UMS) for management through a web browser
- Windows 2000 for NAS, a Web-based GUI for those not familiar with the Windows desktop
- IBM Advanced Appliance Configuration Utility (IAACU) for setup and configuring multiple devices or other appliances on a single network

Having determined how you will manage the Model 325, you can begin setup and configuration of the device.

Step 1 - Initial Network Setup (“Chapter 3. Getting started” on page 23)

- Configure both nodes to enable access over the network. First, use DHCP or static addressing to set up one public network connection in each node. If you are running with a keyboard, display, and mouse, set up a public network connection to access the device.
- If you are running in a headless environment, you can use one of the following methods:
 - If DHCP is installed and the IP address requested can be determined, you can use this method for initial setup, but you should change this address to static later in the configuration.

- If you have multiple appliances or cannot determine the DHCP address, you can install the IAACU utility to identify appliances and define IP addresses. The tool will also allow you to set static addresses.
- Complete the steps in “Maintenance (Date and Time)” on page 25 and “Network Setup” on page 25.

Step 2 - Define shared storage and set up partitions (“Chapter 4. Shared storage setup” on page 27)

The Model 325 comes with preconfigured shared storage spanning nine disks. The storage is formatted as an array, at RAID-level 5, consisting of the following LUNs:

- A LUN of 500 MB, for the Quorum drive (drive letter will be G)
- A second LUN, composed of the remaining space (approximately 270 Gbytes) and used as a share drive with one hot spare

If you plan to use this default storage, validate all storage areas and determine that the drive letters are the same on each node.

Otherwise, from one of the two nodes, define all storage arrays using Storage Manager 7 and then setup Windows partitions as defined in “Chapter 4. Shared storage setup” on page 27).

Step 3 - Complete network setup and cluster installation (“Chapter 5. Completing networking and clustering setup” on page 31)

1. Power on either node. As a reference point, this is the first node.
2. First node setup steps:
 - a. Networking setup
See “Networking setup” on page 31. Note the cautionary statement at the beginning of this section.
 - b. Domain setup
See “To join a node to a domain” on page 34.
3. Power down the first node.
4. Power on the other node. As a reference point, this is the joining node.
5. Joining node setup steps:
 - a. Networking setup
See “Networking setup” on page 31.
 - b. Shared storage setup
For the joining node, the only part of this step that you will need to complete is assigning drive letters on the shared storage, making sure that the drive letters are the same as those on the first node.
Also, if you are having trouble with the Fibre Channel connection, you can use the steps in “Testing the fibre-channel host adapter with FASTT Check” on page 77 to diagnose the problem.
 - c. Domain setup
See “To join a node to a domain” on page 34.
 - d. Power down the joining node.
6. Power on the first node and complete “Cluster setup” on page 34.
7. Power on the joining node and complete “Cluster setup” on page 34.

Step 4 - Cluster administration (“Cluster administration” on page 35)

At this point you can add users, file shares, and complete other configuration tasks to improve operations of the Model 325 in a cluster environment.

Step 5 - Additional functions (“Chapter 6. Additional administrative functions” on page 41)

Additional functions are available for backup, persistent images, and adding more storage areas. It is recommended that once you complete the setup and configuration procedures, you use the Persistent Storage Manager Disaster Recovery option (“Disaster Recovery” on page 46) or other method to back up the system configuration in the event of a failure.

Also, **it is imperative to use the system shutdown procedure** described in “Appendix G. Powering off and powering on the Model 325” on page 141 to ensure system integrity.

Cluster setup requirements

Before you configure the Model 325 nodes for clustering function, ensure that the following requirements are met:

Network Requirements

- A unique NetBIOS cluster name
- At least three unique, static IP Addresses for the public network: one for each node (for client access through the PCI NIC adapter) and one for the cluster itself (the administration IP Address)

Table 1 on page 6 shows a summary of the networking information you will need for the public connection.

- Two static IP addresses for the cluster interconnect on a private network or crossover, through the onboard Ethernet adapter. The default IP addresses for the private network adapters are 10.1.1.1 for the first node in the cluster, and 10.1.1.2 for the node that joins the cluster. (The top node in the Model 325 is considered the first node, and the bottom node is considered the joining node.)

Notes:

1. If you are not the system administrator, contact that person for the applicable IP addresses.
2. One additional static IP address will be required for creating each clustered group.
3. Each node in a cluster must join the same domain and be able to access a Primary Domain Controller (PDC) and DNS server, but it is not required that the nodes log into the domain.
4. Each node in the cluster must have at least two network adapters: at least one for the public network and the other for the private interconnect.

Shared Disk Requirements

- All shared disk arrays and devices, including the Quorum Disk, must be physically attached to a shared storage bus
- All shared disks must be configured as **basic** (not dynamic) disks
- All shared disks **must have the same drive letter** on each node
- All partitions on these disks must be formatted with NTFS

- All partitions on these disks must also be Primary Partitions
- Compression must not be enabled

Powering off and powering on the Model 325

The clustering function requires special considerations when you need to power off and power on the Model 325. See “Appendix G. Powering off and powering on the Model 325” on page 141 for details.

Table 1. Networking information worksheet for the public connection

| Cluster component | Information needed |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cluster | <p>Cluster name:</p> <p>IP address:</p> <p>Subnet:</p> |
| First node | <p>Computer name (example: IBM5195–23H1234):</p> <p>IP address:</p> <p>Subnet:</p> <p>Gateway:</p> <p>Preferred DNS:</p> <p>WINS server (optional):</p> |
| Joining node | <p>Computer name:</p> <p>IP address:</p> <p>Subnet:</p> <p>Gateway:</p> <p>Preferred DNS:</p> <p>WINS server (optional):</p> |
| Domain to join | <p>Domain name:</p> |

Chapter 2. Configuration and administration tools

Attention

Changing the preloaded software configuration of this product, including applying or installing unauthorized service packs or updates to preinstalled software, or installing additional software products that are not included in either the preloaded image or on the Supplementary CD, may not be supported and could cause unpredictable results. For updated compatibility information, please see

<http://www.storage.ibm.com/nas/index.html>

To correct problems with a preloaded software component, back up your user and system data. Then use the Recovery CD to restore the preloaded software image.

The Model 325 appliance comes with the following configuration programs that you can use to configure and administer the appliance:

- Terminal Services Client
- IBM Advanced Appliance Configuration Utility (IAACU)
- Universal Manageability Services
- Windows 2000 for Network Attached Storage

This chapter describes these tools in general and then in detail.

There are several ways to setup and administer the Model 325. Table 2 on page 8 suggests which tool you can use for specific functions, but does not list all options or combinations. The administrator training-level or administrator preferences may determine an alternate approach from that suggested in the table.

Table 2. Summary of configuration and administration tools for the Model 325

| Administration Tool | Main functions |
|-------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| IBM Advanced Appliance Configuration Utility | <p>Access a headless Model 325 node, particularly for the initial setup of the network connectivity. (Alternatively, you can attach a keyboard, mouse, display to each node of the Model 325.)</p> <ul style="list-style-type: none"> • Set time and date • Configure initial network connectivity parameters • Access to Windows 2000 for NAS GUI, Terminal Services (NAS Desktop), and Universal Manageability Services |
| Windows 2000 for NAS GUI | <p>Provides ease-of-use administration, but not all the capability of Terminal Services and IBM NAS Administration</p> <ul style="list-style-type: none"> • Configure networking connectivity, private (for clustering) and public LAN connections (must do on each node) • Create and format logical drives • Join domains • Setup access permissions and disk quotas for CIFS, NFS, HTTP, FTP, and NetWare shares (must configure on node where volume is active) • Use Persistent Storage Manager • Use NAS Backup Assistant, or NTBackup and Restore wizard • Learn detailed inventory information about hardware, OS, and so on, using Universal Manageability Services. |
| IBM NAS desktop and IBM NAS Admin program, via a Terminal Services session or a directly-connected keyboard and display | <p>Provides in-depth administration of all aspects of Model 325. Provides all of the Windows 2000 for NAS GUI functions above, plus:</p> <ul style="list-style-type: none"> • RAID configuration via Storage Manager 7 <ul style="list-style-type: none"> – Create RAID arrays and LUNs – Add additional RAID or storage enclosure after initial purchase – Rename storage subsystems • Cluster Administration <ul style="list-style-type: none"> – Setup cluster – Define failover for each volume – Evict a node (force failover of a node) – Cluster resource balancing by assigning preferred node <p>Note: On a clustered node, you must define and authenticate users and user groups with the Windows Domain Controller.</p> <ul style="list-style-type: none"> • Diagnose system problems <ul style="list-style-type: none"> – Check 10/100 or GB Ethernet using PROSet II – Check Fibre Channel card using FastTCheck – Check RAID subsystem using Storage Manager 7 |

Terminal Services Client

The Terminal Services Client, when installed on a workstation that is attached to the same network as the Model 325, enables you to remotely administer the appliance using the Model 325 desktop. If you are familiar with administrative tasks using a Windows desktop, you can use Terminal Services.

See “Terminal Services and the IBM NAS Administration Console” on page 10 for more information.

IBM Advanced Appliance Configuration Utility (IAACU)

The IBM Advanced Appliance Configuration Utility (IAACU) aids in setting up and reconfiguring the network configuration on your appliances. The IAACU agent works with the IAACU Console to automatically detect the presence of appliances on the network.

Once the appliance is detected by the IAACU Console, you can use the IAACU to:

- Set up and manage the appliance's network configuration, including assigning the IP address, default gateway, network mask, and DNS server to be used by the appliance. (See the note in "Network Setup" on page 25, regarding the planar Ethernet adapter.)
- Start Universal Manageability Services on the appliance, enabling you to do more advanced systems-management tasks

See "IBM Advanced Appliance Configuration Utility" on page 11 for more information.

Universal Manageability Services

Universal Manageability Services (UM Services) provides point-to-point remote management of client systems through a Web browser window. You can use UM Services to:

- Learn detailed inventory information about your computers, including operating system, memory, network cards and hardware
- Track your computers with features such as power management, event log, and system monitor capabilities
- Upwardly integrate with Tivoli Enterprise, Tivoli NetView[®], Computer Associates Unicenter, Microsoft SMS, and Intel[®] LANDesk Management Suite

In addition, you can link to Windows 2000 for Network Attached Storage and Terminal Services from UM Services.

See "Universal Manageability Services" on page 18 for more information.

Windows 2000 for Network Attached Storage

For administrators who are not familiar with the Windows operating systems, the Model 325 provides a Web-based GUI, Microsoft Windows 2000 for Network Attached Storage (Windows 2000 for NAS). Using Windows 2000 for NAS, you navigate through various administrative task categories by clicking on the appropriate links or buttons, and then selecting a task from that category.

See "Windows 2000 for Network Attached Storage" on page 21 for more information.

Information about each of these configuration programs follows.

Terminal Services and the IBM NAS Administration Console

If you are familiar with Windows operating systems, you can use Terminal Services. In some cases, you must use Terminal Services to complete administrative tasks.

You can access Terminal Services in two ways:

1. Through the UM Services browser, as described in step 3 on page 19.
2. By using the Terminal Services Client software.

To use Terminal Services Client, complete the following steps to install it on the remote workstation and connect to your Model 325 appliance:

1. Insert the Supplementary CD into the workstation CD-ROM drive.
2. Click **Start** → **Run**.
3. In the **Open** field, type (with quotes)

```
"x:\Terminal Services Client\Disk 1\setup.exe"
```

where *x* is the drive letter assigned to the CD-ROM drive. Then click **OK** to begin the Terminal Services Client Setup program.

4. Accept the defaults in each window that opens or refer to the Microsoft Windows documentation for more instructions. When the Terminal Services Client Setup program is completed, proceed to the next step.
5. Check the workstation network TCP/IP protocol configuration settings.

Connecting to the desktop through Terminal Services

To connect to Terminal Services from your workstation, do the following:

1. Click **Start** → **Programs** → **Terminal Services** → **Terminal Services Client**.
2. In the Server field, select the computer name of the desired Model 325. If the desired Model 325 is not listed, enter the IP address or the computer name of the Model 325. The computer name is predefined as IBM5195-xxxxxxx, where xxxxxx is the serial number located in the lower right corner of the bezel on the front of the appliance. If you have changed the computer name from the predefined value, use that name instead.

For Size, select a size other than full screen in which the Model 325 desktop will appear, then click **Connect** to start the Terminal Services Client session. A user log in window displays.

Log in. Type *Administrator* in the Username field, type *password* in the password field, and then click OK to log in. Once you have logged in, you can begin using Terminal Services Client to configure and manage your Model 325.

Once you have logged into Terminal Services, you can perform administrative tasks on the Model 325, as if your keyboard, mouse, and monitor were directly attached to it. The Model 325 desktop contains a shortcut, titled **IBM NAS Admin**, to a special console, the IBM NAS Administration console.

IBM NAS Administration console

The IBM NAS Administration console contains all of the standard functions that are contained in the standard Computer Management console available on any Windows 2000 desktop, plus the following functions specific to the Model 325:

- Cluster Administration, as described in “Cluster administration” on page 35
- Storage Manager 7, as described in “Chapter 4. Shared storage setup” on page 27
- As described in “Chapter 6. Additional administrative functions” on page 41:
 - Advanced System Management Adapter
 - FAStT Check
 - NAS Backup Assistant
 - Persistent Storage Manager
 - Prose II

IBM Advanced Appliance Configuration Utility

The IBM Advanced Appliance Configuration Utility (IAACU) helps you to set up and reconfigure the network configuration on your Model 325 appliance, as well as other IBM appliances. The IAACU agent, preinstalled on your IBM Model 325 appliance, works with the IAACU Console, a Java™-based application that is installed on a network-attached system. You can use this system as a systems-management console to automatically detect the presence of Model 325 appliances on the network. Once the Model 325 appliance is detected by the IAACU Console, use the IAACU to set up and manage the appliance’s network configuration, including assigning the IP address, default gateway, network mask, and DNS server to be used by the appliance. You can also use the IAACU to start Universal Manageability Services (UM Services) on the appliance, enabling you to perform more advanced systems-management tasks.

For networks that are not currently running DHCP servers, the IAACU is useful for automatically configuring network settings for newly added appliances, such as the Model 325.

However, networks with DHCP servers will also benefit from using the IAACU because it enables you to reserve and assign the appliance IP address in an orderly, automated fashion. Even when you use DHCP and do not reserve an IP address for the appliance, you can still use the IAACU to discover appliances and to start UM Services Web-based systems-management.

Notes:

1. The IAACU configures and reports the TCP/IP settings of the first adapter (excluding the built-in Ethernet controller which is used for the interconnection of the two engines) on each appliance. The “first” adapter is defined by its position: if there is an adapter in slot 2, it is the first adapter; if there is an adapter in slot 3, it is the first adapter.

Be sure to connect the first adapter, according to the previous definition, to the same physical network as your systems-management console. You can do this in one of two ways:

- By manually configuring the network adapter to be on the same subnetwork as the systems-management console.
- By creating a Family that assigns the network adapter to the same subnetwork as the systems-management console. See “Creating a Family” on page 15

page 15 for more details. Note that the values for Min IP address, Max IP address, Subnet Mask, and Default Gateway need to be in the same range that the IAACU is configured.

2. The IAACU must be running to configure newly installed appliances automatically.
3. The system running the IAACU Console automatically maintains a copy of its database (ServerConfiguration.dat) in the Advanced Appliance Configuration Station installation directory. To remove previous configuration data, close the IAACU, delete this file, and then restart the utility. This deletes all previously configured Families. However, the IAACU will automatically discover connected appliances and their network settings.

IAACU Agent

Once you connect the Model 325 to your network, the IAACU agent automatically reports the appliance's serial number and type, the MAC address of its onboard Ethernet controller, and whether DHCP is in use by the appliance. Furthermore, it will report the hostname, primary IP address, subnet mask, primary DNS server address, and primary gateway address if these are configured on the system.

The IAACU agent is preinstalled on your Model 325 appliance.

Note: The IAACU agent periodically broadcasts the appliance IP settings. To prevent the service from broadcasting this data periodically, stop the `iaaconfig` service.

IAACU Console

The IAACU Console is a Java application that you install on one system in your network for use as a systems-management console. For information on how to install the IAACU Console, see "Using the Supplementary CD" on page 94.

Note: The IAACU creates a private database that is specific to the IP subnetwork to which it is attached. Therefore, do not install it on more than one systems-management console residing on the same IP subnetwork.

The IAACU Console enables you to:

- Automatically discover Model 325 appliances, as well as other IBM appliances, that run the IAACU agent and are attached to the same physical subnet as the IAACU Console.

When you start the IAACU Console, it automatically detects all appliances on your physical subnet that are running the IAACU agent.

- Use a GUI-based application to configure the appliance network settings. Use the IAACU to assign network parameters such as IP addresses, DNS and gateway server addresses, subnet masks, and hostnames.
- Group discovered appliances into function-specific Families. Appliances are added to a Family based on the appliance type. Appliances that perform the same function appear in the same Family.
- Start UM Services Web-based systems-management console. Launch UM Services on your appliances and perform advanced systems-management tasks on a selected appliance with a single mouse click.

The IAACU Console is divided into two panes:

- **The Tree View Pane**

The Tree View Pane, located on the left side of the IAACU Console window, presents a list of all discovered Model 325 appliances and includes any Families you have previously defined. The Tree View Pane also includes groups for appliances that do not fit any of the defined Families, that were not configured using the IAACU, or that have IP addresses that conflict with other devices on your network. When you click on any item in the Tree View, information about that item (and any items that are nested below that item in the tree view) displays in the Information Pane.

- **The Information Pane**

The Information Pane, located at the right side of the IAACU Console, displays information about the item that is currently selected in the Tree View Pane. The information that displays in the Information Pane varies depending on the item that is selected. For example, if you select the All Appliances item from the Tree View Pane, the Information Pane displays configuration information (IP settings, hostname, serial number, and so on) about each of the Model 325 appliances that have been discovered by the IAACU Console. However, if you select a Family, the Information Pane displays information about the Family settings for the selected Family.

The IAACU Console also features the following menus:

- **File:** Use the File menu to import or export the IAACU Console configuration data, to scan the network, or to exit the program.
- **Family:** Use the Family menu to add or delete Families, or to move Families up or down in the tree view.
- **Appliance:** Use the Appliance menu to remove a previously discovered appliance from a Family or group, and to add an appliance to the first matching Family in the tree view.
- **Help:** Use the Help menu to display product information.

Discovering Model 325 Appliances

Any Model 325 appliance, or other IBM appliance, that is running and is connected to the same subnet as the system running the IAACU Console is automatically discovered when you start the IAACU Console. Discovered appliances appear in the IAACU Console tree view (in the left pane of the IAACU Console window). Each appliance will appear in two locations in the tree view:

1. Every discovered appliance is listed in the tree view under All Appliances.
2. Each discovered appliance will also appear in one of the following portions of the tree view:

- In a *Family*

If the discovered appliance fits the requirements of a Family, it will automatically appear as part of a Family.

Note: If a discovered appliance fits the requirements of more than one Family, it is automatically added to the first appropriate Family that is listed in the tree view, starting from the top of the tree. For information on how to move appliances between families, see “Using Families and Groups in the Tree View” on page 14.

- In the *Orphaned Appliances* group

If the discovered appliance does not fit a previously configured Family, it is placed in the *Orphaned Appliances* group.

- In the *Orphaned Externally Configured Appliances* group

Appliances that are running the IAACU agent, but that have a network configuration that was not set by the IAACU agent or console, will appear in

the *Orphaned Externally Configured Appliances* group. If an appliance is contained in the Orphaned Externally Configured Appliances group, you can use the Adopt By First Matching Family function to add it to a previously defined Family. For more information, see “Using the Adopt by First Matching Family Function” on page 16.

Using Families and Groups in the Tree View

Families are important elements of the IAACU. They specify the parameters that the IAACU uses to automatically categorize discovered appliances and to configure them with the appropriate network settings. Family rules are defined solely by appliance type or purpose. Each Family can contain only one type of appliance. The only way to automatically apply predetermined network settings to newly installed and discovered appliances is to create and use Families.

Appliances that match the rules criteria for a Family group can be automatically configured to use predefined network settings. A Family can be configured to allow appliances to use DHCP to configure their IP settings, or can be defined to automatically assign IP settings (such as primary gateway and DNS server addresses, assigning an IP address from a specified IP address range, and specifying a subnet mask). Host names for discovered appliances can also be defined so that they are allocated using either a prefix or appliance serial number.

The IAACU is not the only way to configure network settings. For example, network settings can be configured using Terminal Services for Windows or by attaching a keyboard and mouse to the appliance and using Windows Control Panel. If the appliance network settings have been configured by a method other than using the IAACU, the appliance will be discovered by the IAACU and it will be added to an appropriate Family, if one exists. Appliances that have been configured using a method other than the IAACU for which no appropriate family exists will appear in the Orphaned Externally Configured Appliances group.

The Tree View Panel contains the following items:

- **All Appliances**

Every discovered appliance is listed in the tree view under All Appliances.

- **Families**

The Families group in the Tree View Pane shows all Families that have been defined, with appliances that have already been assigned to each Family nested beneath the Family name in the tree view. Families are defined by appliance purpose, so all appliances that appear in a given family are of the same type. If you select a Family from the Tree View Pane, a description of the Family and the rules that are used to define the selected Family display in the Information Pane. If you select an appliance from a Family in the Tree View Pane, the selected appliance network settings display in the Information Pane.

If you are not using DHCP, the IAACU automatically assigns one IP address per appliance, using available addresses within the range defined in the Family rules. When a Family's IP address range has been exhausted, the IAACU automatically searches for other Families that have rules matching the appliance being configured. If a matching Family with an available address is found, the appliance will automatically be assigned to the Family that has available IP addresses. This enables you to define multiple Families, each of which uses a set of non-contiguous IP address ranges.

When an appliance is discovered on the network, the IAACU automatically searches all previously defined Families, starting with the first Family listed in the Families tree view and moving downward. Appliances are automatically added to the first defined Family that matches the appliance purpose. Therefore, the order

in which Families appear is important. To adjust this search order, right-click on a Family and then select **Move Up** or **Move Down** to adjust its position within the Families list.

- **Orphaned Appliances**

Any discovered appliances that have been configured using the IAACU but that do not meet the rules for any existing Family are automatically added to the Orphaned Appliances group.

- **Orphaned Externally Configured Appliances**

Any discovered appliance that has been configured without using the IAACU tool and that does not meet the rules for any existing Family is automatically added to the Orphaned Externally Configured Appliances group. Appliances configured without the IAACU that meet the rules for any existing Family are automatically added to the matching Family. To add an Orphaned Externally configured Appliance to an appropriate Family that was created after the orphaned appliance was discovered, right-click on the orphaned appliance and select **Adopt by First Matching Family**. For more information, see “Using the Adopt by First Matching Family Function” on page 16.

Note: The IAACU will not change manually configured network settings of discovered appliances. If the manually configured IP and Subnet addresses fit an existing Family, the IAACU will place that appliance into that Family, but will not change any other settings (such as Host Name, DNS, or gateway addresses).

- **Conflicting Network Addresses**

Any discovered appliance that has the same IP address as a previously discovered appliance will be listed in the Conflicting Network Addresses group.

Creating a Family: To create a Family:

1. Select **Create Family** from the Family menu.

The IAACU Family Setup window displays.

2. Select the Appliance Family Rules.

The Appliance Family Rules determine what purpose an appliance must serve to be included in the Family. You can select one of the following values:

- IBM TotalStorage NAS Appliances
- IBM xSeries 130 and 135

3. Specify a Family name.

In the Family Name field type the name that will be used for this Family.

4. Specify network resources to be used by members of the Family.

You can use the IAACU to assign network resources for members of this Family, or you can use a DHCP server to assign network resources.

- To use the IAACU to assign network resources, uncheck the **Use DHCP** checkbox and fill in the following fields:

Min IP Address

The lowest IP address in a range of IP addresses that can be assigned to an appliance that is a member of this Family

Max IP Address

The highest IP address in a range of IP addresses that can be assigned to an appliance that is a member of this Family

Subnet Mask

The subnet mask value that will be used by appliances that are members of this Family

Default Gateway

The IP address of the default gateway that will be used by appliances that are members of this Family (optional)

DNS The IP address of the DNS server that will be used by appliances that are members of this Family (optional)

- To use a DHCP server to assign network resources, check the **Use DHCP** checkbox. This will allow a DHCP server on your network to assign an IP address and subnet mask and to specify the default gateway address and address of the DNS server that will be used by appliances that are members of this Family.

5. Select a Host Name Allocation Type.

The Host Name Allocation Type enables you to automatically specify a Host Name that members of this Family will use. You can select one of the following Host Name Allocation Types:

No Allocation

No preconfigured host name format will be assigned to appliances that are members of this family.

Use Serial Number

The Serial Number of the discovered appliance will be used as a host name for the appliance.

Use Prefix Name

A user-specified prefix, along with an incremental number for each appliance, will be used for the host name of each appliance that is a member of this Family. Type the desired prefix in the **Host Name Prefix** field.

6. Click **OK to save this Family.**

Removing Appliances from Families: Use the Remove Appliance function to delete an appliance from the IAACU Console database and view panel. Removing an appliance that is no longer in use allows the IP address that was assigned to the appliance to be allocated to another appliance. You can also remove an appliance from a family and then rescan the network to add it to an appropriate Family that appears higher in the Tree View pane.

To remove an appliance, right-click on the appliance, and then select **Remove Appliance** from the pop-up menu.

- If the IAACU is unable to communicate with the selected appliance (because, for example, it has been removed from the network or has failed), the appliance is removed immediately.
- If the IAACU is able to communicate with the selected appliance, you will be asked to confirm removal of the appliance before the appliance removal task is completed. This helps prevent accidental removal of an active and functional appliance.

Using the Adopt by First Matching Family Function: Use this function to:

- Add an *Orphaned Externally Configured Appliance* to an appropriate Family. Appliances that have been configured without using the IAACU tool and that do not meet the rules for any existing Family are automatically added to the Orphaned Externally Configured Appliances group. If, after the orphaned

appliance is discovered, you create a Family that is appropriate for the orphaned appliance, right-click on the orphaned appliance and select **Adopt by First Matching Family** to move the appliance from the Orphaned Externally Configured Appliances group to the newly created Family.

- Move an appliance from one Family to another appropriate Family that occurs higher in the list of previously defined Families. If there is more than one appropriate Family for a newly discovered appliance, it automatically appears in the first appropriate Family in the list of Families. If you want to move a discovered appliance from one appropriate Family to another appropriate Family:
 1. Right-click on the Family that you want the appliance moved to.
 2. Select **Move Up in List** to move the selected Family up in the list of families. Repeat steps 1 and 2 until the Family that you want to add the appliance to displays above the Family that currently contains the appliance.
 3. Right-click on the appliance that you want to move to another Family and then select **Adopt by First Matching Family**.

Universal Manageability Services

The Universal Manageability Services (UM Services) GUI enhances the local or remote administration, monitoring, and maintenance of IBM systems. UM Services is a lightweight client that resides on each managed computer system. With UM Services, you can use a Web browser and UM Services Web console support to inventory, monitor, and troubleshoot IBM systems on which UM Services is installed.

This “point-to-point” systems-management approach, in which you use a Web browser to connect directly to a remote client system, enhances support and enables you to effectively maintain IBM systems without requiring the installation of additional systems-management software on your administrator console.

In addition to point-to-point systems-management support, UM Services also includes support for UM Services Upward Integration Modules. These modules enable systems-management professionals who use any supported systems-management platform (including Tivoli Enterprise, CA Unicenter TNG Framework, and Microsoft Systems Management Server [SMS]) to integrate portions of UM Services into their systems-management console. Because it was designed to use industry-standard information-gathering technologies and messaging protocols, including Common Information Model (CIM), Desktop Management Interface (DMI), and Simple Network Management Protocol (SNMP), UM Services adds value to any of these supported workgroup or enterprise systems-management platforms.

Complete documentation on how to use UM Services is included on the Documentation CD that came with the appliance.

System requirements

The UM Services client is preinstalled on the Model 325 appliance. However, you must have a Web browser installed on your systems-management console. It is recommended that you set Microsoft Internet Explorer 5.x (or later) as the default browser.

-

Notes:

1. You must install the optional Java Virtual Machine (VM) support to access a client system running UM Services.
2. If you reinstall Internet Explorer after installing UM Services, you must reapply the Microsoft VM update. The UM Services client requires Microsoft VM Build 3165 or later. Download the latest Microsoft VM from:

<http://www.microsoft.com/java>

- Microsoft Management Console (MMC) 1.1 or later

Note: If you install UM Services before you install MMC 1.1 or later, you will not have an icon for Microsoft Management Console in the IBM Universal Manageability Services section of your Start menu.

Starting UM Services

You can use IAACU or Terminal Services Client to configure the network setting remotely, or you can attach a keyboard and mouse to your appliance and configure the Network settings using the Windows Control Panel. Once you have configured the network settings for your appliance, you are ready to use UM Services.

To start UM Services:

1. Start your Web browser and then, in the **Address** or **Location** field of the browser, enter:

http://ip_address:1411

where *ip_address* is the IP address of the Model 325, and then press **Enter**.

Or, type:

http://computer_name:1411

where *computer_name* is the computer name of the Model 325. The computer name is predefined as: IBM5195-xxxxxxx, where xxxxxx is the serial number located in the lower right corner of the bezel on the front of the appliance.

If you have changed the computer name from the predefined value, use that name instead. After you have entered the computer name, press **Enter**.

2. A user log in window displays. Type *Administrator* in the Username field, and type *password* in the Password field. You can leave the Domain field blank. Make sure the "Save this password in your password list" checkbox is not checked, and then click **OK**.

Note: To ensure system security, change the Administrator password from "password" to something else. Once you do, or if you create another user in the Administrator group in the future, use your new username/password combination instead of the default username/password combination.

The first time you connect you may be prompted to install XML and Swing components. Follow the on-screen instructions to install these components and then close and restart Internet Explorer before you proceed.

3. You are now connected to the Model 325 through UM Services. In addition to the standard UM Services functionality, your appliance includes functionality for administering the appliance, available from the Appliances tab in the left pane of the UM Services browser. The default view (in the right pane of the UM Services browser) when you connect to your appliance is Windows 2000 for NAS. The other selectable view in the Appliances tab is Windows 2000 Terminal Services, which displays a Terminal Services Web Connection page.

To start Windows 2000 for NAS, click **Administer this server appliance** in the right pane of the UM Services browser. To connect to the Model 325 and manage it as though you were running Terminal Services Client from your desktop, select **Terminal Services** in the Appliances tab of the UM Services browser, and then follow the instructions for connecting to the Model 325 using Terminal Services described in "Terminal Services and the IBM NAS Administration Console" on page 10.

Launching UM Services from the configuration utility

You can use the IAACU to launch UM Services on your Model 325 appliances.

Note: The selected appliance must be running Universal Manageability (UM) Services as a UM Services client. Also, the systems-management console (the system that is running the IAACU Console) must use a Web browser that is supported for use with UM Services. If you have not used UM Services from this system, you will need to install several plug-ins before proceeding. If you are using an unsupported browser, or if your browser

does not have the necessary plug-ins, you will be notified when you attempt to launch UM Services on the appliance. For more information on UM Services, go to:

<http://www.ibm.com/pc/ww/software/applications/ums/library.html>

To use the IAACU Console to start UM Services on an appliance:

1. Click on the appliance in the IAACU Console Tree View Pane.
When you select the appliance from the tree view, information about the selected appliance displays in the Information Pane. A **Start Web-Based Management** button displays as well.
2. Click **Start Web-Based Management**.
Your default Web browser starts, loading the UM Services browser automatically.
3. Log in to the UM Services browser. Refer to step 2 on page 19 for log in instructions.

For more information on using UM Services to manage your appliances, see the *Universal Manageability Services User's Guide*, included on the Documentation CD that came with the appliance.

Windows 2000 for Network Attached Storage

You can perform the appliance administration tasks with the Windows 2000 for Network Attached Storage GUI. You navigate through various administrative task categories by clicking on the appropriate links on pages or buttons at the top of the page, and then selecting the task from that category.

Online help is available for Windows 2000 for NAS. This online help can be accessed in two ways:

1. By clicking the **Help** button at the top of any Web page. This will display a table of contents which you can navigate to find help for any Windows 2000 for NAS task.
2. By clicking the question mark (?) button at the top of any Web page. This will display context-sensitive help for the task you are currently performing.

While you can perform most administrative tasks using Windows 2000 for NAS, there are some advanced tasks for which you must use Terminal Services Client. See “Terminal Services and the IBM NAS Administration Console” on page 10 for more information.

You can start Windows 2000 for NAS in one of three ways:

1. Through UM Services, as described in step 3 on page 19.
2. From a Web browser, by entering **http://<ip_address>:8099** or **http://<computer_name>:8099** and then logging on to the Model 325.
3. From the Model 325 desktop while using Terminal Services Client and starting a browser.

Chapter 3. Getting started

This chapter gives details to set up the initial communication to the Model 325 to enable setup and configuration. You can choose from several options to accomplish this task. These instructions refer specifically to a base configuration as shipped and do not cover the setup of additional storage units, which can be purchased separately.

Note: You will need to follow these procedures for both nodes.

Methods for setting up your Model 325

The following sections detail how to set up your Model 325. You first need to ensure that the network recognizes the new appliance. The appropriateness of the method you use to do this depends on several conditions:

- If you are operating in a “headless” environment, you can use one of the following methods:
 - If DHCP is installed and the IP address requested can be determined, you can use this method for initial setup, but you should change this address to static later in the configuration. This condition is most appropriate for use of Windows Terminal Services for operation of the Model 325.
If you are using this method, proceed with “Initial setup and configuration” on page 24.
 - If you have multiple appliances or cannot determine the DHCP address, you can install the IAACU utility to identify appliances and define IP addresses. The tool will also allow you to set static addresses.
If you are using this method, proceed with “The IBM Advanced Appliance Configuration Utility”.
- The use of a keyboard, display, and mouse is most appropriate when there is a single or few appliances in the network and you use static setup and definition.
If you are using this method, proceed with “Initial setup and configuration” on page 24.

The IBM Advanced Appliance Configuration Utility

These instructions assume that you have installed and powered on the appliance according to the installation guide procedures. You are now ready to install the IAACU Console application from the Supplementary CD.

Note: The IAACU creates a private database that is specific to the IP subnetwork to which it is attached. Therefore, do not install it on more than one systems management console residing on the same IP subnetwork.

Install the Advanced Appliance Configuration console application from the Supplementary CD onto a Windows NT 4.0 or Windows 2000 workstation that is attached to the same IP subnetwork to which the appliance is attached.

For information on how to install the IAACU Console, see “Using the Supplementary CD” on page 94.

After you have installed the Advanced Appliance Configuration console application, the following steps will take you to the point where you can administer the appliance.

1. Start the Advanced Appliance Configuration console application by clicking its icon.
2. On the left pane of the Advanced Appliance Configuration console, select the appliance you want to administer. Initially, the appliance will be named **IBM5195-serial number**, which is located in the lower right corner of the bezel on the front of the appliance.
3. Click the **Start Web Management** button at the bottom of the right pane of the Advanced Appliance Configuration console to start the Universal Manageability (UM) Services browser. This will open a separate Web browser.

To read more information on the IAACU, see “IAACU Console” on page 12.

Accessing Universal Manageability Services

1. You will be prompted to authenticate with the administrative user name (“Administrator”) and password (initially “password,” but you can change it later; note that the password is case-sensitive, but the user name is not).
If this is the first time you have accessed the UM Services browser (on any appliance) from this workstation, you will also be prompted to install the Swing and XML Java libraries in your Web browser. You can download these libraries from the Model 325 via the network link.
2. The UM Services browser will start. In the left pane, Microsoft Windows 2000 for NAS will be automatically selected, on the Appliance tab. In the right pane, Windows 2000 for NAS will start.
3. Again, you will be prompted to authenticate with administrative user name and password.
4. Click **Administer this server appliance** to bring up the Microsoft Windows 2000 for NAS GUI.

You are now ready to begin administering the appliance. Details for this task are described in “Initial setup and configuration”.

Initial setup and configuration

If you are administering the Model 325 without a keyboard, monitor, and mouse (“headless” mode), there are one of two methods that you can use:

- Terminal Services, which provides full administrative function. (See “Terminal Services and the IBM NAS Administration Console” on page 10.)
- Windows 2000 for Network Attached Storage, which provides a subset of the full administrative function in Terminal Services. (See “Windows 2000 for Network Attached Storage” on page 21.)

Note: The following tasks are described in the context of the Windows 2000 for Network Attached Storage Web-based GUI.

In general, you administer the appliance by adjusting information contained in the following task groups:

- “Maintenance (Date and Time)” on page 25
- “Network Setup” on page 25

Although you can modify multiple appliance and network attributes in each task group, the information given here is the minimum you need to know to administer the appliance and network.

You can find more information on administration elsewhere in this book and in the online help.

Note that the icons for the task groups on the Windows 2000 for NAS GUI are not in the same order as presented here.

You can access these task groups in one of three ways:

1. Click the **Home** tab and then select the task group link.
2. Click the top tab associated with that task group.
3. Click the **Back** button on your browser until you arrive Home and then select the task group link.

Maintenance (Date and Time)

In the Maintenance task group, you will need to change the date and time. To do so, click on **Date and Time** or the green arrow. (Remember that you can also access all of these task groups by clicking on the titled tabs at the top of the page.) The Set Date and Time page displays, allowing you adjust information as necessary.

Network Setup

Note: All appliances have an initial default user name of “administrator” and password of “password.”

In the Network Setup task group, you can change the administrator password. Optionally, you can configure the properties of each network interface that resides on the appliance.

To change the administrator password, click on **Change Administrator Password** or the green arrow. The Change Administrator Password page displays, allowing you to change the password. Note the warning on the page that any information you enter can be viewed by others on the network. To prevent others from seeing your information, set up a secure administration Web site as described in the online help.

To optionally change interface properties such as IP addresses, click on **Interfaces** or the green arrow. The Network Adapters on Server Appliance page displays. You would use this page primarily to change IP addresses from dynamic (DHCP, which is the system default) to static.

Note: During the initial setup, you should configure the non-planar Ethernet adapter only. The Model 325 engine uses the planar (onboard) Ethernet adapter as the interconnect private network for clustering.

If you want to use an Ethernet adapter other than the default Ethernet adapter (in slot 2) as the network interface to be attached to the subnet, then you can change the order of precedence later with the Windows Networking Properties option. The order of precedence for the initial configuration is: PCI slot 2, then PCI slot 3.

Note that you may need to enable some of the Model 325 NIC connections, because the NICs in slots 1, 3, and 4 are set to disabled. During initial setup, the IAACU first looks for a 10/100 adapter in slot 2 (if you ordered it), which is enabled by default. If there is no adapter in slot 2, the IAACU looks for a

Gigabit adapter card in slot 3 (if you ordered it) and it should be enabled. If the Gigabit adapter card is not enabled, right-click the adapter icon to enable it. After the initial setup, you can then enable all other NIC interfaces installed.

You must modify the adapter by completing the **IP** task (to modify IP configurations) and then choosing one or more of the following tasks, as appropriate:

-
- **DNS** (to modify DNS configurations)
- **WINS** (to modify WINS configurations)
- **HOSTS** (to modify host configurations)

Chapter 4. Shared storage setup

This chapter gives the details for setting up and configuring the Model 325 storage.

The Model 325 comes with preconfigured shared storage spanning nine disks. The storage is formatted as an array, at RAID-level 5, consisting of the following LUNs:

- A LUN of 500 MB, for the Quorum drive (drive letter will be G)
- A second LUN, composed of the remaining space (approximately 270 Gbytes) and used as a share drive with one hot spare

You can use this preconfigured storage, or delete it and configure new storage. If the preconfigured storage is agreeable with your requirements, you can proceed with “Chapter 5. Completing networking and clustering setup” on page 31. If you delete it, you will need to complete the steps in this chapter.

Note: If you set up the shared storage with Storage Manager 7, you need to configure the storage on one node only. For the other node (the joining node), the only part of shared storage setup that you will need to complete is assigning drive letters on the shared storage, making sure that the drive letters are the same as those on the first node.

With Storage Manager 7, you can configure and manage the DASD mounted in the IBM 5191 RAID Storage Controller Model 2RU (storage controller) and IBM 5192 Network Attached Storage Storage Unit Model 1RU (storage unit) enclosures.

Storage Manager 7 provides a GUI for managing storage subsystems. It features two main windows:

| | |
|------------------------------|--------------------------------------------------------------------------------------------------|
| Enterprise Management | Use this window to add, remove, and monitor all storage subsystems within the management domain. |
| Subsystem Management | Use this window to manage individual storage subsystem components. |

You manage the storage subsystems through the Fibre Channel I/O path between the engines and the RAID controllers (host-agent method). The Storage Manager 7 software is installed on both engines allowing you to manage the storage subsystems from a Terminal Services session open on either node's engine.

Starting Enterprise Management

The Enterprise Management window is the first window to open when you start the software. Use the Enterprise Management window to:

- Add and discover the storage subsystems you want to manage
- Provide a comprehensive view of all storage subsystems in your management domain
- Perform batch storage subsystem management tasks using the Script Editor

Use the following procedure to start the Enterprise Management window. You will do these steps on one node, and then bring up the other node to validate the input.

1. Select **Start → Programs**.
2. Select **Netfinity Fibre Channel Storage Manager 7 client**. The client software starts, displaying the Enterprise Management window and the Confirm Initial Automatic Discovery window.

Note: The Enterprise Management window can take up to five minutes to open. No wait-cursor (such as an hourglass) is displayed. If you do not want to perform the initial automatic discovery, select **No**.

3. Select **Yes** to begin an initial automatic discovery of hosts and storage subsystems attached to the local subnetwork on which the management station is installed.

The software sends a broadcast message across the local subnetwork where the management station is installed. It discovers host-agent managed storage subsystems if the hosts that provide network management connections to the storage subsystems respond to the broadcast. The software discovers directly managed storage subsystems if the controllers in those storage subsystems respond to the broadcast message.

Note: It can take up to a minute for the Enterprise Management window to refresh after an initial automatic discovery.

If you need to stop the automatic discovery operation, close the Enterprise Management window.

When the initial automatic discovery is complete, you can see all hosts and storage subsystems attached to the local subnetwork.

If you do not see all hosts and storage subsystems, do the following:

- Check the hardware and connections for possible problems (refer to the hardware documentation for specific procedures).
- Refer to the Enterprise Management online Help topic about discovering storage subsystems.

If any device shows a status of Unresponsive, use the software to remove the device from the management domain and then add it again. Refer to the Enterprise Management online Help for instructions on removing and adding devices.

A storage subsystem might be duplicated in the device tree after an automatic discovery, if the storage subsystem is directly managed but is attached to a host with the host-agent software installed and running. In this case, you can remove the duplicate storage management icon from the device tree using the remove device option in the Enterprise Management window.

Continue with “Renaming storage subsystems”.

Renaming storage subsystems

When you start Storage Manager 7 for the first time, the storage subsystems are unnamed. If you want to rename them, you can use the Subsystem Management window to rename each storage subsystem from unnamed to the name you want. Refer to the renaming storage subsystems topic in the Subsystem Management online Help. The Help topic provides detailed instructions for renaming storage subsystems. As a security precaution, it is recommended that you protect the storage subsystems with a password.

Continue with “Starting Subsystem Management”.

Starting Subsystem Management

The Subsystem Management window enables you to manage selected subsystems.

Use the following procedure to open a Subsystem Management window for a selected storage subsystem:

1. In the Enterprise Management window, select a storage subsystem.
2. Select **Tools** ⇒ **Manage Device**. The software displays the Subsystem Management window for the selected storage subsystem. Note: Using the open Subsystem Management window, you can manage only the selected storage subsystem. However, you can open multiple Subsystem Management windows to manage other storage subsystems.
3. Continue with “Renaming storage subsystems”.

Creating arrays and logical drives

To create an array or logical drive, perform the following procedure:

1. Highlight a storage subsystem in the Enterprise Management window and select **Tools** ⇒ **Manage Device** to start a Subsystem Management window for that storage subsystem.
2. Create all of your planned arrays and logical drives on this storage subsystem using the **Configure** ⇒ **Create Array/Logical Drive** option.
3. Repeat the arrays/logical drive configuration for each storage subsystem connected to your cluster.

Note: If you make any other logical drive additions or deletions, you must make them known to the other node in a cluster configuration.

4. Go to “Creating Quorum arrays and LUNs under the Storage Manager 7 application”.

Creating Quorum arrays and LUNs under the Storage Manager 7 application

When you begin this procedure, all drives display in an unconfigured state with one massive size. To begin creating arrays and LUNs, right-click on **Unconfigured Capacity** and select **Create Array**. Your choices will be **Automatic** or **Manual**, depending on your requirements. Automatic-mode chooses drives vertically across different enclosures connected to that particular storage controller, which spreads out the array bandwidth, and can also keep arrays running in case of a total storage unit failure.

In this procedure, it is recommended that all arrays are RAID-5. The first logical drive is configured as the 500 MB Quorum drive. Once the first logical drive is created, create a logical drive with the rest of the space. Create arrays using the rest of the unconfigured capacity until all of the arrays are created and initializing. (This will take place in the background automatically).

During this procedure, you will see System Settings Change notifications that new hardware has been found, and you will be asked whether you want to restart your computer. Do not restart your computer at this point.

Finally, you will also see a System Settings Change message that Windows 2000 has finished installing new devices, and you will be asked whether you want to restart you computer. Again, do not restart your computer at this point. Leave this message in the foreground until the array initialization completes. The drives will initialize for approximately 48 minutes for every 50 GB.

Once the initialization for all arrays completes, restart the system.

Continue with "Format the logical drives".

Format the logical drives

Follow this procedure to format logical drives.

Note: Do **NOT** upgrade any disks to dynamic. Only basic disks are supported for clustering. In addition, all partitions used for clustering must be primary partitions.

1. After rebooting, open **IBM NAS Admin** and select **Disk Management (Local)**, in the **Storage** folder.
2. You will see a Write Signature and Upgrade Disk Wizard pop up on the screen. Click **Cancel**.
3. Right-click on the bottom right, where it says **Disk 1**, and select **Write Signature**.
4. Write Signature to all disks that will be accessed by the NOS (All disks in view).
5. On the Quorum drive:
 - a. Right-click and select **Create Partition** and click **Next**.
 - b. Select **Primary Partition** and click **Next**.
 - c. Select the entire disk size and click **Next**.
 - d. Enter the following properties:
 - File System of *NTFS*
 - Volume Label of *Quorum Disk*
 - e. Click **Finish**.

Do **not** enable disk compression, and select **Finish**.

6. Format all other drives, but do **not** enable compression. Use all space available for each drive for each logical drive assigned by the operating system. Assign a drive letter of *G* for the first drive (the Quorum drive), *H* for the second drive (the first user volume), and so on.

At this point, you have set up shared storage. You can now continue with "Chapter 5. Completing networking and clustering setup" on page 31.

Chapter 5. Completing networking and clustering setup

Note: Before proceeding with the steps in this chapter, configure your shared storage using Storage Manager 7. See “Chapter 4. Shared storage setup” on page 27 for details.

The Model 325 uses Microsoft’s Cluster Server (MSCS) software to provide clustering technology for your storage. Clustering ensures availability of the storage, regardless of individual component failure.

After installing the clustering function, you can use Cluster Administration to set up the failover function. Then, if a node or a node’s component were to fail, the Model 325 detects the failure and begins a failover process in less than 10 seconds, and completes the process within 60 seconds. Failover/Failback includes Active/Active support for the CIFS and NFS protocols.

Active/Active support is available for HTTP and FTP. See the online cluster administration guide for this procedure.

Native NetWare is available on both nodes, but not through clustering services. If either node fails, the shares become unavailable until the node is brought back up.

This chapter gives the details for installing and initially configuring MSCS on the Model 325. Administrative concepts and procedures are provided in the online help and at the following Web sites:

<http://www.microsoft.com/windows2000/library/technologies/cluster/default.asp>

http://www.microsoft.com/ntserver/support/faqs/clustering_faqs.asp

<http://support.microsoft.com/support/kb/articles/Q248/0/25.ASP>

Networking setup

CAUTION:

Before you begin installing cluster services on the first node, make sure that the joining node is powered off. This is required to prevent corruption of data on the shared storage devices. Corruption can occur if both nodes were to try to simultaneously write to the same shared disk that is not yet protected by the clustering software.

Configuring the interconnect (Private) network adapter

Do the following steps on both nodes to configure the interconnect (Private) network adapter. The **Private** connection is the heartbeat interconnect for the cluster.

1. Right-click **My Network Places** and then select **Properties**.
2. Select the network connection that uses the IBM 10/100 Netfinity Fault Tolerant Adapter.
3. Right-click the adapter icon and click **Properties**.
4. Click **Configure**, select the **Advanced** tab, and verify that the following characteristics are set:

| | |
|---------------------|----------------------|
| External PHY | 100 Mbps Full Duplex |
| Full Duplex | UTP - Full Duplex |
| TP Mode | On (Default) |

5. Click **OK**.
6. If prompted to restart the node, select **NO**.
7. In the Properties panel for the IBM 10/100 Netfinity Fault Tolerant Adapter connection, select **Internet Protocol (TCP/IP)** from the components section, and click **Properties**.
8. The default IP address should be 10.1.1.1 for the first node, and 10.1.1.2 for the joining node. If not, it is recommended that you set them to those values.
9. Ensure a Subnet Mask of 255.255.255.0.
10. Click on **Advanced**, and select the **WINS** tab.
11. Select the **Disable NetBIOS over TCP/IP** radio button.
12. Click **OK**.
13. Select **YES** when you are asked if you want to continue using an empty Primary WINS address.
14. Click **OK** on the Internet Protocol (TCP/IP) Properties panel.
15. Click **OK** on the Local Area Connection Properties (Private) panel.
16. Rename the connection to **Private**.

Configuring the public local area connection

Note: While the public network adapter's IP address can be automatically obtained if a DHCP server is available, this is not recommended for cluster nodes. It is strongly recommended that you set static IP addresses for all network adapters in the cluster. If IP addresses are obtained through DHCP, access to cluster nodes could become unavailable if the DHCP server goes down.

Do the following steps on each node to configure each public local area connection.

1. Right-click **My Network Places**, then click **Properties**.
2. Select the desired **Local Area Connection** .
When you do this step, the connection that uses the IBM 10/100 Netfinity Fault Tolerant Adapter is the private connection. The other active connection is the public connection. Use that other active connection for this step and the next step.
3. If desired, click **Rename**, and then type **Public**, and press **Enter**.
When you do these renaming steps for the joining node, ensure that the local area connection name for each physically connected network is identical on each server. See Table 3 on page 33 for an example.
4. Use the networking information in Table 1 on page 6 to enter the networking addresses:
 - Right-click **My Network Places**
 - Click **Properties**
 - Right-click the **Public** icon, then click **Properties**.
 - Select **Internet Protocol (TCP/IP)**
 - Click **Properties**, select **Use the following IP address:**, and enter the addresses for the IP, subnetmask, default gateway, and preferred DNS server.
5. If needed, configure the DNS, WINS, HOSTS, or whichever method you will be using for names resolution. You can view this information by clicking the **Advanced** button on the **Properties** window.
6. Click **OK** on each panel to back up to the Properties window.

Do not place paired adapters on the same IP network, unless you are going to use adapter teaming or adapter load balancing.

Verify network connectivity and names resolution

Verify network connectivity and names resolution after you have installed clustering on the joining node.

To verify that the private and public networks are communicating properly, open an MS-DOS command prompt and type **ping ipaddress** where *ipaddress* is the IP address for the corresponding network adapter in the other node, and press **Enter**.

For example, assume that the IP addresses are set as follows:

Table 3. Example of local area connection names and network adapter IP addresses

| Node | Local area connection name | Network adapter IP address |
|------|-----------------------------|----------------------------|
| 1 | Private Cluster Connection | 10.1.1.1 |
| 1 | Public Cluster Connection 1 | 192.168.1.12 |
| 1 | Public Cluster Connection 2 | 192.168.2.12 |
| 2 | Private Cluster Connection | 10.1.1.2 |
| 2 | Public Cluster Connection 1 | 192.168.1.13 |
| 2 | Public Cluster Connection 2 | 192.168.2.13 |

In this example, you would type **ping 192.168.1.12** and **ping 192.168.2.12** for the first node, and you would type **ping 192.168.1.13** and **ping 192.168.2.13** for the joining node. You can do this from any machine that is physically connected to each node's networks.

In case you need to view the addresses, retrieve them using the **ipconfig** command on each node:

- Click **Start**, click **Run**, type **cmd** in the text box, and click **OK** to bring up an MS-DOS prompt.
- Type **ipconfig /all** and press **Enter**. IP information should display for all network adapters in the machine.

To check or change the Network Binding order

The clustering function requires the following binding order:

- Private
- Public
- Public 1
- Public 2
-
-

The top-most connection is first in the binding order. Typically, this will be the most used network adapter.

To check the binding order and change it:

1. Right-click **My Network Places** and then select **Properties**.
2. Select **Advanced, Advanced Settings**.
3. Reorder the position of the adapters by selecting them, then pressing the **up** or **down** arrow keys, then clicking **OK**.

If you change the binding order, a reboot is not necessary until after you have joined the node to the domain. If prompted to restart, click **No**.

To join a node to a domain

All nodes in the cluster must be members of the same domain and be able to access a Primary Domain Controller (PDC) and a DNS Server.

Also, note that the Administrator in the following procedure must have a valid account on the PDC.

1. Right-click **My Computer**, and click **Properties**.
2. Click **Network Identification**. The System Properties dialog box displays the full computer name and workgroup or domain.
3. Click **Properties** and do these steps to join a domain:
 - a. Select the **Domain** radio button
 - b. Type in the name of your domain and click **OK**.
 - c. When prompted, enter the Administrator user id and password and press **OK**.
4. Close the **System Properties**
5. Take one of the following actions:
 - If this is the first node, power it down and begin setting up the joining node with “Networking setup” on page 31.
 - If this is the joining node, restart it, and proceed with “Cluster setup” .

After the computer restarts, it is recommended that you do not login to the domain. You will see the Windows 2000 Configure Your Server window. Click the **I will configure this server later** radio button, then click the **Next** button. The next window has a checkbox, *Show this screen at startup*. Uncheck the checkbox and click **Finish**.

Cluster setup

At this step, you have completed the cluster installation steps on each node and are ready to set up the cluster. Do the following steps.

Note that the nodes are equivalent in hardware and software. In the following sequence, “first node” and “joining node” refer merely to the sequence in which you set up the nodes, and not to an order of importance.

1. **Power on the first node.**

For simplicity, it is recommended that you start the cluster setup procedure on the first node on which you completed the installation steps. However, at this point, both nodes are equally composed and you could begin the cluster setup on either one.

2. To set up the cluster, open **IBM NAS Admin**, then the **Cluster Tools** folder, and click the **Cluster Setup** icon.
3. You will be asked to verify that you have completed the steps that precede this cluster setup step. If you have, click the **Continue** button.
4. Click the **First Node** button.
5. The Cluster Information panel appears. Enter the data for the following fields (some of this data comes from Table 1 on page 6):
 - Administrator’s ID and password

Note: The ID and password are any valid user ID and password with administrator privileges on the domain.

- Domain name
 - Cluster name
 - Cluster IP address
 - Subnet mask
 - Quorum drive (select from the pulldown)
6. After you have entered the data, click **Continue**.
 7. You will be asked to verify the information. If it is correct, click **Yes** to start the configuration. You will see a message that configuration takes a few minutes.
 8. If you are asked by the Cluster Service Configuration Wizard to select a user account, enter the user name and password for the domain account you want the cluster service to use. If you are not asked, cluster configuration completes.
 9. If you are asked to select a disk on which to store cluster checkpoint and log files, do the following:
 - a. Select the disk on which the Quorum is located (for instance, G, if this is what you specified earlier) and click **Next**.
 - b. The Cluster Information panel displays. Click **Finish**.
If you are not asked, cluster configuration completes.
 10. Cluster configuration completes for the first node.
 11. **Power on the joining node.** (You will join this node to the cluster.)
 12. Do steps 2 on page 34 and 3 on page 34.
 13. Click the **Joining Node** button.
 14. The First Node Information panel appears. Enter the name of the **first** node.
 15. You may be asked to confirm the Administrator name and password. Enter that information and click **Finish**.
 16. You will see a message that configuration takes a few minutes. When configuration completes, the Cluster Administration function starts.

You have now completed cluster setup.

Cluster administration

This section contains procedures to assist you in configuring basic cluster functions. It is assumed that the cluster installation has completed without errors, and both cluster nodes are running.

It is recommended that you review the *Cluster Administration Guide*, located in the IBM NAS Admin in the Cluster Tools folder before continuing with the following steps.

Recommended settings

The following steps are needed to reset the size of the logfile and set the priority and purpose of the private network.

1. Select **Cluster Administration**, located in IBM NAS Admin, in the Cluster Tools folder.
If prompted for a Cluster Name, enter the name of the cluster, and then click **Open**.
2. The cluster name appears in the left panel. Underneath it are the Groups (there is one disk group for each disk that you created on the shared storage),

Resources, Cluster Configuration folders, and the two nodes in the cluster. Under the nodes are the respective active groups, active resources, and network interfaces. These folders allow you to select cluster resources on either node to view or change their properties.

3. Click on the cluster name to see the status of the cluster nodes in the right hand pane. The state of both nodes should be "Up".
4. Right click on the cluster name and select **Properties**. The Properties window has four tabs:
 - **General**
 - **Quorum Disk**
 - **Network Priority**
 - **Security**
5. Select **Quorum Disk**, and change the *Reset quorum log at:* field from 64 KB to 4096 KB.
6. Select **Network Priority** to view all networks acknowledged by the cluster server, then select the private network connection and move it to the top for cluster communication priority by clicking the **Move Up** button.

Doing this provides internal communication to the private network before attempts are made to communicate over any public networks that are installed. Do not make any changes to the communication options for the public network adapters as they should support both network and cluster traffic.
7. Open the properties for the private network and select **Internal cluster communication only (private network)** to ensure that no client traffic will be placed on the private network.
8. Click **Apply**, **OK**, and then **OK**.

Cluster resource balancing

When you configure cluster resources, you should manually balance them on the disk groups to distribute the cluster resource functions between the two nodes. This allows for a more efficient response time for the clients and users accessing these resources.

To set up cluster resource balancing:

1. Select a disk group and bring up its Properties panel by right-clicking it.
2. Click on the **General** tab.
3. Click the **Modify** button to the right of the *Preferred owners:* field.
4. In the Available nodes pane, select a node and click the **arrow** button to move the node to the Preferred Owners pane.

This is accomplished by selecting each disk group, right clicking and selecting Properties. The first tab, General will allow you to set this.

Each disk group has a preferred owner so that, when both nodes are running, all resources contained within each disk group will have a node defined as the owner of those resources. Even though a disk group has a preferred owner, its resources can run on the other node in the cluster following a failover. If you restart a cluster node, those resources that are preferentially owned by the restarted node failback to that node once the cluster service detects that the node is operational, and provided that the defined failover policy allows this to occur. If you have not defined the node as the preferred owner for the resources, then they do not failback to the node.

Failover setup

The failover of resources under a disk group on a node allows users to continue accessing the resources if the node goes down. Individual resources contained in a group cannot be moved to the other node; rather, the group it is contained in is moved. If a disk group contains a large number of resources and any one of those resources fail, then the whole group will failover according to the group's failover policy.

The setup of the failover policies is critical to data availability.

To set up the failover function:

1. Open the Properties panel for the disk group.
2. Select the **Failover** tab to set your Threshold for Disk Group Failure.
For example, if a network name fails, clustering services attempts to failover the group 10 times within 6 hours, but if the resource fails an eleventh time, the resource will remain in a failed state and Administrator action is required to correct the failure.
3. Select the **Failback** tab to allow, or prevent, failback of the disk group to the preferred owner, if defined.

In allowing failback of groups, is a slight delay in the resources moving from one node to the other. The group can also be instructed to allow failback when the preferred node becomes available or to failback during specific off-peak usage hours.

Each resource under each disk group has individual resource properties. The properties range from restart properties, polling intervals to check if resource is operational, to a timeout to return to an online state. The default settings for these properties are selected from average conditions and moderate daily usage.

User creation

The creation of users is performed through normal procedures. Users do not need to be created exclusively for use on the cluster resources. You will need to define properties of the resources for users to access the resources within the domain policies. All user-accessible cluster resources have the same properties as standard Microsoft Windows resources, and should be set up following the same policies.

File share creation (CIFS and NFS)

Note: For HTTP and FTP clustering setup and file sharing, refer to the information at the following URL:

<http://support.microsoft.com/support/kb/articles/Q248/0/25.ASP>

The creation of file shares involves dependencies on a physical disk, a static IP address, and a network name. The various dependencies allow resources that are defined to the same disk group to move as a group. The dependencies also assure necessary access for the given resource.

Physical disk

Is the base resource in which to store user data. It is not dependent on any other resources except for the physical disk that it defines. The disk resource must also have the same drive letters on both nodes so that the definitions of resources that depend on it will not change if the resource is moved to the other node.

Static IP address

Is a virtual address that will bind onto an existing IP address on one of the cluster's public networks. This IP address provides access for clients, and is not dependent on a particular node, rather a subnet that both nodes can access. Because this address is not the physical adapter's permanent address, it can bind and unbind to its paired adapter on the same network on the other node in the cluster. You can create multiple IP addresses through the Cluster Administrator on the same physical network.

Note: Note that the cluster IP Address is not to be used for file shares. That address is reserved to connect to and manage the cluster through the network that it is defined on.

Network name

Provides an alternate computer name for an existing named computer. It is physically dependent on an IP address on one of the public networks. When a disk group contains an IP address resource and a network name, it is a virtual server and provides identity to the group, which is not associated to a specific node and can be failed over to another node in the cluster. Users access the groups using this virtual server.

In the creation of a basic file share that is publicized to the network under a single name, you will need to set it up to be dependent on the physical disk and network name in the same disk group you are creating the file share in. The network name is dependent on the IP address, so do not add that to the dependency list. You can set your share permissions and advanced share resources also.

File share creation example

An example of how to create a clustered file share follows. For this example, assume that you are creating a file share in Disk Group 2.

1. Creating the IP address resource
 - a. Right-click Disk Group 2, and select **New** → **Resource**.
 - b. Enter an IP address name, for example *ipaddr2*, and change the resource type to IP Address.
 - c. Select **Run this resource in a separate Resource Monitor** and click **Next**.
 - d. A list of possible owners displays, and both nodes should remain as assigned. Click **Next**.
 - e. There are no resource dependencies on this panel, so click **Next**.
 - f. Enter your TCP/IP Parameters. This will be the first virtual IP Address. The value in the Network field identifies to the system which network the address is located on. Click **Finish** to create the resource.
 - g. Right-click the resource and bring it online.
2. Creating the network name resource
 - a. Right-click Disk Group 2, and select **New** → **Resource**.
 - b. Enter the virtual server name you want to use, for example, *NN2*, select **Network Name** as the resource type, and click **Next**.
 - c. Both nodes will be possible owners. Click **Next**.
 - d. Add the IP address you created as a resource dependency in Step 1 and click **Next**.
 - e. Enter the virtual server name, *NN2* into the Network Name Parameters field and click **Finish**.
 - f. It takes a few moments to register the virtual server name with your Name Server. After this has completed, bring the resource online.

3. Creating the CIFS or NFS file share resource
 - a. Right-click Disk Group 2, and select **New** → **Resource**.
 - b. Enter a file share name, for example, *FS2*, and select either **File Share** or **NFS Share**.
 - c. Both nodes are possible owners. Click **Next**.
 - d. Add the resource dependencies for the Physical Disk and Network Name that the file share will use and click **Next**.
 - e. Enter the share name of FS2 and the path to the disk in this group, either drive or sub-directory. You can then set:
 - For CIFS shares Properties:
 - User Limit
 - Permissions
 - Advanced File Share
 - For NFS shares Properties
 - Permissions
 - Share
 - f. Click **Finish** and bring the resource online.

You have now completed network and clustering setup.

Chapter 6. Additional administrative functions

This chapter describes the advanced administrative functions that you can do on the Model 325.

The following functions are available:

- “NAS Backup Assistant”, accessed through IBM NAS Admin icon
- “Persistent Images” on page 43, accessed through the Windows 2000 for Network Attached Storage user interface
- “FASTt Check” on page 52, accessed through the IBM NAS Admin icon
- “Advanced System Management Adapter” on page 53
- “Adding a second IBM 5191 RAID Storage Controller Model 2RU” on page 56

NAS Backup Assistant

The NAS Backup Assistant is a preloaded utility that helps you create and schedule backup batch files, and maintain log files. It can be used for backing up either the Model 325 operating system or user data.

You invoke the NAS Backup Assistant by clicking on the **IBM NAS Admin** desktop icon to open the IBM NAS Administration console. Select **Backup and Restore** to expand that tree, then select **IBM NAS Backup Assistant**. Once you have selected this option, a logon prompt appears. You will need to log on as a user who has backup operator privileges (that is, as an Administrator or backup Administrator).

If you want to back up selected folders, you can use NT Backup without the NAS Backup Assistant (which backs up an entire volume). However, if you use NT Backup, it is recommended that you select and back up the copy of the files in a previous persistent image, rather than the original data itself. When selecting the files for the NT Backup operation, you must select the specific folders in the persistent image. If you select the entire group of persistent images, the files in those images will not be selected for backup. For more information about persistent images see “Persistent Images” on page 43.

Because NAS Backup Assistant only creates and launches scripts, and is not a comprehensive backup application, it does not support interactive error messages. To check status of jobs, you must either view the Backup Logs or view the Windows Event Viewer. If a logon prompt does not appear, right-click on the **IBM NAS Backup Assistant** link, and select refresh. Once you log on, the main panel appears.

There are four tabs on the main panel:

Backup Operations

This tab is the main window where you create and schedule backup batch jobs.

There are two backup methods you can select in the Backup Operations window. You can choose a standard NT Backup operation, but this backs up only those files on the drive that are not in use. Therefore, to guarantee a complete backup image using this method, you would need to ensure that no users are accessing files on the drive. Hence, this method is useful only for offline backup.

To do a complete online backup that includes files that are in use, you should choose the Persistent Storage Manager (PSM) Persistent Image backup method. This method creates a persistent image (mapped as an unused drive letter on the system), backs up a copy of that persistent image, and then deletes the original persistent image (drive letter). For more information about persistent images see “Persistent Images” on page 43.

Scheduled Jobs

This tab displays a list of backup batch jobs that you scheduled.

Backup Logs

This tab displays a list of log files for each backup that has run.

Displayed Logs

This tab displays the text contained in the log files that you can select from the **Backup Logs** tab.

All of the options on each tab are described in detail in the online help. To access the online help, click on the **IBM NAS Admin** icon, then expand the Backup and Restore directory, then select **IBM NAS Backup Assistant Help** and log in.

Restoring using the NT Backup panel

To restore backups, use the following procedure:

1. Note the following conditions:
 - If you are restoring a backup that you created using the standard backup method, go to step 2.
 - If you are restoring a backup that you created using Persistent Images in the NAS Backup Assistant, the NT Backup file (*.BKF) was created for the persistent image virtual drive letter instead of the original drive letter. For example, if you selected drive C for backup, a persistent image was created on the next available drive letter in the system, and that drive was backed up instead of drive C. If you do not remember the original drive letter, you can view the backup log files in NAS Backup Assistant. The top section of the log file gives you the original drive letter, and the bottom section gives you the persistent image drive letter. When you have the original drive letter, go to step 2.
2. Click on the **Restore using NT Backup** link in the Backup and Restore section of the IBM NAS Admin console to open the backup GUI.
3. Click **Restore Wizard**, then click **Next**.
4. You are asked what you want to restore. Select the appropriate media that you are restoring from.
5. If you are restoring from tape, expand the backup media pool name, and then double-click on the media (this will normally be named *media created on {date - time}*). This action will read the set list from the tape.

If you are restoring a file, select **Tools** → **Catalog a backup file**, then click **Browse** and find the backup file (.BKF) created for this backup. If you do not know the .BKF file name, refer to the backup log in NAS Backup Assistant. Click **OK**. You will now have a *Media created on {date - time}* listed under file. Click on the plus sign (+) to the left of this media to see the set list. You may be prompted to enter the path to the file you want to catalog; if so, select the same file that you just imported. This will build a set list.
6. Select the files and directories you want to restore by placing a check in the corresponding check box.

7. In the bottom left corner of the window, there is an option called **Restore files to**. Using the pull-down, select **Alternate Location**. In the alternate location window, select the root directory of the original backup drive letter you determined in step 1 on page 42.
8. If desired, select **Tools** from the menu bar at the top of the window, then select **Options** to change restore options. Refer to NT Backup online help (see **Restore files from a file or a tape**) for use of these options.
9. Once you have selected the files or directories for restore, the alternate location, and options, click the **Start Restore** button in the lower right corner.
10. You will now be prompted to confirm that you want to begin the restore. You can click the **Advanced** button to select advanced options (see the NT Backup online help for details), then click **OK** to begin the restore.

Persistent Images

A persistent image is a copy you make of one or more file system volumes at a specific time. The Persistent Images function allows the recovery of a file or volume to the state it was in at the time you created the persistent image. Persistent images are maintained in a way that minimizes the storage required to keep a second (or third or fourth, and so on) copy of the volume. This is done by using a copy-on-write technique that uses, for each volume, an area of pre-allocated storage (the PSM cache file) that keeps only those data blocks which have been written since the time you made a persistent image of the volume.

Persistent Storage Manager (PSM) allows you to create and preserve images of the Model 325 drives. You can take a persistent image immediately or schedule persistent images as one-time events or regularly repeated events. You can access the Persistent Storage Manager tasks in the Disks and Volumes task group within the Windows 2000 for Network Attached Storage user interface, in one of two ways:

- By going to the IBM NAS Admin console on the appliance desktop (via Terminal Services or directly-attached keyboard, monitor, and mouse) and selecting Persistent Storage Manager (this automatically launches the Windows 2000 for Network Attached Storage user interface and brings up the Disks and Volumes page containing the PSM tasks).
- By starting the Windows 2000 for Network Attached Storage user interface directly

Once you create a persistent image, it appears as a directory on the original drive. Access rights and permissions from the original drive are inherited by the persistent image. Persistent images are used in the same way as conventional drives. However, unlike conventional drives, persistent images are records of the content of the original drive at the time you created the persistent image. Persistent images are retained following shutdown and reboot.

There are six PSM tasks in the Disks and Volumes group:

- PSM Setup
- PSM Volume Setup
- Persistent Images
- PSM Schedules
- Volume Restore
- Disaster Recovery

Each of these tasks are described in the following sections. More detailed descriptions and instructions for each of the control panels and topics are contained in the online help.

PSM Setup

On this panel you can configure the following attributes of the persistent image system:

| Attribute: | Default value: |
|-------------------------------------|----------------------------|
| Maximum number of persistent images | No default. Maximum of 250 |
| Inactive period | 5 seconds |
| Inactive period wait timeout | 15 minutes |

PSM Volume Setup

This panel displays statistics for each volume, such as total volume capacity, free space, and cache file size and usage. You can also select any volume and configure volume-specific PSM attributes for that volume, such as:

| Attribute: | Default value: |
|------------------------------------------------|-------------------------------------------|
| Cache-full warning threshold | 80 percent full |
| Cache-full persistent image deletion threshold | 90 percent full |
| Cache size | 15 percent (of the total volume capacity) |

Persistent Images

This panel lists all of the persistent images that exist on all volumes. On this panel you can:

- Create a new persistent image immediately (without scheduling it via the PSM Schedules panel). When you create the persistent image, you can specify properties for the persistent image, including:

Volume(s)

The persistent image can contain a single volume or multiple volumes. To select multiple volumes, hold down the Ctrl key while clicking on the volumes you wish to select. For multi-volume persistent images, a virtual directory containing data for a volume will appear under the persistent image directory in the top level of each volume in the persistent image (the name of the persistent image directory is configured in the PSM Setup panel).

Name

You can name the persistent image. This will be the name of the virtual directory containing the persistent image, underneath the persistent image directory in the top level of the volume (the name of the persistent image directory is configured in the PSM Setup panel).

Read-only or read-write

A persistent image is read-only by default, so no modifications can be made to it. However, you

can set the persistent image to read-write, which permits you to modify it. When a persistent image is written, the modifications made are also persistent (they survive a reboot of the system). Changing a persistent image from read-write to read-only resets the persistent image to its state at the time you took the persistent image, as does selecting **Undo Writes** for a read-write persistent image from the Persistent Images panel.

Retention value

A persistent image can be given a relative retention value or weight. This is important when PSM needs to delete some persistent images for a volume because the cache file for the volume for which the persistent image was taken capacity has reached a certain threshold, as described later in this section. If the volume cache file completely fills, then all persistent images for that volume are deleted regardless of the retention values. By default, a new persistent image is assigned a “Normal” retention value (there are other higher and lower values which can be selected).

- Delete an existing persistent image.
- Modify properties of an existing persistent image, including read-only or read-write, and retention value.

PSM Schedules

Use this panel to schedule persistent images to be taken at specific times (this is independent of the scheduled backup function via NAS Backup Assistant described earlier). Each PSM schedule entry defines a set of persistent images to be taken starting at a specified time and at a specified interval, with each image having the set of properties defined in the entry. This allows you to customize scheduled persistent images on a per-volume basis.

For instance, you could set a persistent image for one volume to occur every hour, and for another volume to occur only once a day. The set of properties you can define are the same properties described in the Persistent Images panel description above; when you define these properties, all persistent images created according to this schedule entry will be given those properties. Once a scheduled persistent image is created, certain properties of that persistent image can be modified via the Persistent Images panel, independently of other persistent images created according to the schedule.

Once a schedule entry is created, it appears in the list of scheduled persistent images. Subsequently you can modify the properties of an existing entry, such as start time, repetition rate, the volume(s), and so on. For a schedule you can name the persistent images based on a pattern you configure; format specifiers (defined on the New Persistent Image Schedule panel under the Persistent image name(s) entry field) allow you to customize variable portions of the name.

Volume Restore

On this panel, you can select an existing persistent image and quickly restore the volume contained in the image back to the state it was in at the time the selected

persistent image was taken. This is useful if you need to recover an entire volume, as opposed to just a few files. The volume restore function is available for the system volume as well as the data volumes.

Disaster Recovery

PSM provides a disaster recovery solution for the system drive. This extends the volume restore function of PSM to provide disaster recovery in the event that the system drive is corrupted to the point where the file system is corrupt, or the operating system is unbootable. Note that while disaster recovery is also supported via the Recovery CD-ROM and backup and restore capability, that is a two-step process. In contrast, the method supported by PSM allows you to restore the system drive from a single image, without having to go through the entire recovery procedure and then additionally having to restore a system drive backup.

Use the Disaster Recovery panel to schedule and create backup images of the system drive, and to create a bootable diskette which will allow you to restore the system drive from a backup image (located on the node's maintenance partition, shared storage drive, or network drive). The remainder of this section provides additional information on how to perform backup and recovery operations for the Model 325.

Note: Restoration of a PSM backup image over the network is not supported for the Gigabit Ethernet Adapter. If you have only Gigabit Ethernet adapters installed, it is recommended that you perform PSM backup of each node to its maintenance partition (D: drive), which would allow you to recover if the system volume is corrupt and/or unbootable. Should the hard disk drive fail completely, you would need to use the Recovery CD as described in "Using the Recovery Enablement Diskette and Recovery CD" on page 91 to restore the node to its original (factory) configuration.

Backing up the system drive

On the Disaster Recovery panel you will find status information for backup operations, both scheduled and immediate, as well as buttons for starting and stopping a backup operation, for configuring backup, and for creating a recovery diskette.

Click the **Modify Settings** button to open the Disaster Recovery Settings page. Modify the settings for backup as you desire. Note that you must not include spaces in the *Backup name* field. When you have modified the settings, click the **OK** button to save the changes.

Note: If you are performing any backups to an external (clustered/shared) storage drive, you must specify as the backup location a name for a share defined on the drive in the Cluster Administrator (*\\network_name\file_share*, where *network_name* is the network name assigned to the drive's disk group in the Cluster Administrator, and *file_share* is the name of a file share resource defined on the drive). This is because the recovery diskette cannot directly access the external storage over fibre channel; it must access the storage via the other node, as a network client, attaching to the clustered file share name. Additionally, you must specify the user name as *domain_name\user_name*, where *domain_name* is the domain name that was used to set up clustering, and *user_name* is either Administrator or another user name with administrative privileges on the node.

On the Disaster Recovery page, click the **Start Backup** button to begin the backup. The backup process will first create a persistent image of the system drive (C:),

named *System Backup*. Then it will create the backup images from that persistent image, and then delete that persistent image once the backup operation is complete.

Creating a recovery diskette

You will now create a bootable recovery diskette which, when used to boot up the node, will use the backup location settings you configured on the Disaster Recovery Settings page to locate the backup image and restore it to the system drive of the node.

1. Insert a blank, formatted diskette in the diskette drive of the node.
2. On the Disaster Recovery page, click **Create Diskette**.
3. Click **OK** on the Create Recovery Diskette page to create the diskette. The diskette drive LED will turn off when the creation is complete. The diskette creation should take no more than two minutes.
4. One of the files that is copied onto the diskette is a utility to make it DOS bootable, called *fixboot.exe*. From a command prompt, either via the desktop of the node itself (with the diskette still in the diskette drive of the node), or on another system with the diskette in its diskette drive, type **a:\fixboot.exe** and answer the prompts.

Note: Once you have run *fixboot.exe* for the diskette, the diskette remains bootable unless you format it again (without specifying an option to make it bootable), so if you later erase files on the diskette you do not need to run *fixboot.exe* again.

5. If both of the following are true:
 - a. On the Disaster Recovery Settings panel, you specified at least one external (clustered/shared) storage drive as a backup location, and
 - b. On the same panel, in the user name field (which you were required to specify as *domain_name\user_name*), you specified as the *user_name* portion a user name that is defined only on the node itself, and not on the domain (specified as the *domain_name* portion),

then you must edit the file, *a:\app\app_sets.bat*, on the recovery diskette. Change the line that starts with *set DOMAIN=* so that nothing follows the equals sign (=).

6. Remove the diskette from the diskette drive (of the node itself, or other system if you used that system to run the *fixboot* utility). You should label the diskette appropriately and keep it in a safe place.

You may create additional copies of the diskette using the above procedure for each new copy. Please note that if you change the backup location or logon settings using the Disaster Recovery Settings page, you will need to rebuild the recovery diskette(s) for that node to reflect the new backup location and/or logon settings for that node.

Static IP addressing

If you do not have a DHCP server on your network, and you must access a backup image that is only accessible via the network (for example, no backup image is located on the maintenance partition [D: drive] of the node to be recovered), then you must configure the recovery diskette so that it will use a static IP address and subnet mask when accessing the network.

On the recovery diskette, edit the file `a:\net_sets.bat`. Near the top of this file are two lines that begin with *rem* (comment lines) that, when you uncomment them, set the `IPAddress` and `SubnetMask` environment variables. Change these lines as follows:

1. Uncomment both lines by removing *rem* from the beginning of both lines.
2. For each line, what follows the equals sign (=) is an IP address expressed as a set of four space-separated numbers (an IP address without the dots [.]). Change the `SubnetMask` value to match the subnet mask your network uses. Change the `IPAddress` value to match the IP address you want to assign to the node, during the recovery operation. Do not insert dots between the numbers (octets) in either value.

As an example, here is how the lines would look for a node using IP address 192.168.1.200, and subnet mask 255.255.255.0:

```
set SubnetMask=255 255 255 0
set IPAddress=192 168 1 200
```

If you later want to reconfigure the recovery diskette to use DHCP to obtain an IP address instead of static IP addressing, you must reinsert *rem* in front of the `SubnetMask` and `IPAddress` lines to disable static IP addressing, as follows (based on the previous example):

```
REM set SubnetMask=255 255 255 0
REM set IPAddress=192 168 1 200
```

Restoring the system drive

If you need to restore the system drive from a backup image created via the PSM Disaster Recovery panel as described above, you must use a recovery diskette created via the Disaster Recovery panel. If you did not create a recovery diskette then you must use the Recovery CD as described in “Using the Recovery Enablement Diskette and Recovery CD” on page 91 to restore the system drive to its original (factory) configuration.

To restore the system drive:

1. Insert the recovery diskette in the diskette drive of the node whose system drive you are restoring, and restart the node.
2. The recovery process begins. The recovery diskette software will locate the first backup image it can find, based on the backup locations specified on the Disaster Recovery Settings panel in Microsoft Windows 2000 for NAS when the diskette was created. Once it has located a backup image it will begin restoring the system drive from the image. During the restore operation the hard-disk drive LED (on the front right of the node’s hard disk drive) will flash green or stay nearly solid green; this indicates write activity to the system volume.

Note: If the hard-disk drive LED stays off for at least 10 minutes since you restarted the node, then there is a problem with the recovery procedure and it will not be able to restore the system volume from a backup image. Should this occur, you will need to use the Recovery CD as described in “Using the Recovery Enablement Diskette and Recovery CD” on page 91.

When the restore operation completes, the hard-disk drive LED will turn off, and a sound will indicate the success or failure of the restore operation. If the restore operation was successful, you will hear three pairs of tones. If the restore operation was unsuccessful, you will hear one long low tone.

If the restore was successful, remove the diskette, and restart the node. The node will come back up in the state it was in at the time you created the backup image used for the recovery operation.

Note: The persistent image that was created on the system drive (named *System Backup*) by the backup process is restored by the restore process as it is preserved in the backup image. It is recommended that you now delete that persistent image as it is no longer needed. On the Persistent Images panel, select the persistent image named *System Backup* on drive C: from the list of persistent images, then click **Delete**, then click **OK** on the Delete Persistent Image panel that appears.

If the restore was unsuccessful, then you must use the Recovery CD as described in “Using the Recovery Enablement Diskette and Recovery CD” on page 91.

Rebuilding the maintenance partition

If this is a new hard drive or if the Maintenance (D:) partition is unusable, you will need to rebuild the Maintenance partition. You do this with the following steps:

Start Disk Management on the node. You can do this in one of two ways:

- Start a Terminal Services session to the node, then click the **IBM NAS Admin** icon, and then from the IBM NAS Administration console that appears, select **Computer Management**, then **Disk Management**.
- Start a Windows 2000 for NAS user interface session to the node, then select **Disks and Volumes**, then select **Disks**, and then provide your Administrator user name and password when prompted.

Once Disk Management has started, do the following:

1. In the Disk Management window, right-click on the unallocated area of Disk 0, and then click **Create Partition**.
2. In the Create Partition wizard, click **Next** and select **Primary Partition**.
3. Click **Next** and select **D:** as the drive letter.
4. Click **Next** and select **FAT32** as the file system and change the drive label to *Maintenance*.
5. Click **Finish** to close the wizard.

The partition will then be formatted. Once formatting is complete, the status of the partition should appear as *Healthy*, and the other properties should appear as: name *Maintenance*, drive letter *D:*, file system *FAT32*, size (approximately) *5.9 GB*.

Granting user access to persistent image files

You can give end-users access to files in the persistent images. For example, this would be helpful to a user who has accidentally corrupted a file and needs to get an uncorrupted copy of that file.

To enable end-user access to persistent image files, go into Terminal Services. For instructions on how to start Terminal Services, see “Terminal Services and the IBM NAS Administration Console” on page 10. Once you are in Terminal Services, click the **My Computer** icon. Next, click the volume on which you want to enable persistent image access. Then, go into the persistent images directory and right-click the mouse on your desired persistent image mount point, select **Sharing**, then specify sharing as desired. If you want to enable the same access to all

persistent images on the volume, you can right-click on the persistent images directory (from the top level of the volume), select **Sharing**, and then specify sharing as desired.

Note: The share settings are maintained in a persistent image. Therefore, granting access to all end-users only permits those users to access files and directories within the persistent image that they would have been able to access originally on the actual drive.

PSM notes

Notes:

1. As mentioned, you can take and keep a maximum of 250 persistent images. These can be taken on local drives, or drives on the external storage that are logically local.

Note that on various panels, such as the New Persistent Image Schedule panel, you will see a field, *Keep the last:* (number of persistent images). The total number of persistent images that you enter in these fields will not override the maximum number of persistent images that you set in the PSM Setup panel. For example, if your maximum number of persistent images is 10, and you enter in numbers in other fields that add up to greater than 10, only 10 persistent images will be taken.

2. You cannot take a persistent image of the maintenance drive (D:). Hence, you will not see it as a choice in either the New Persistent Image Schedule panel or the Create Persistent Image panel. Also, it is highly recommended that you do not take a persistent image of the clustering Quorum disk.
3. PSM stores the cache file for each drive on the drive itself. The first persistent image created on a particular drive will take a significant amount of time because the PSM cache file must be created (pre-allocated) for that drive. The time required for creation depends on the configured size of the cache file (15 percent of the total drive size by default). Creation takes roughly three to four minutes per gigabyte. For example, a 10 GB cache file would take 30 to 40 minutes to create. You should create a persistent image for a drive before scheduling any persistent images for that drive, to build the cache file. You may then delete the persistent image that you just created if you do not need to keep it.

After the creation of the first persistent image on a volume, future persistent images on that volume will complete faster.

4. As mentioned, the default size of the cache file per drive is 15 percent of the total drive capacity. In most cases, that should be sufficient.

However, it is possible that it will not be enough to maintain the number of persistent images you wish to keep concurrently on the drive, given the amount of file-write activity to the drive. PSM will automatically take action to prevent the cache file from overflowing, because if that occurred, PSM would be forced to automatically delete all persistent images on the drive (once it cannot keep track of changes made to the drive, it cannot maintain a valid persistent image).

PSM takes the following actions as the cache file usage approaches a full condition:

- Once the cache file usage exceeds the warning threshold (configured in the PSM Volumes panel for the drive; the default value is 80 percent), PSM generates a warning message to the system event log (viewable via the Windows 2000 Event Viewer in the IBM NAS Admin console), and to the alert log in the Microsoft Windows 2000 for Network Attached Storage user interface. The name of the source for the message will be *psman5*.

Additionally, while the cache file usage is above the warning threshold, PSM prohibits any attempt to create a new persistent image, and logs an error message (to the system log and alert log). The text of the error message that is logged in the system event log (from *psman5*) is “A persistent image could not be created due to error 0xe000102b”.

- Once the cache file usage exceeds the automatic deletion threshold (also configured in the PSM Volumes panel for the drive; the default value is 90 percent), PSM automatically selects a persistent image on the volume and deletes it to reduce the cache file usage. It selects the persistent image with the lowest retention value (as described above in the Persistent Images panel section). If more than one persistent image has the same (lowest) retention value, then the oldest image will be selected for deletion. If this deletion does not reduce the cache file usage below the automatic deletion threshold, then it will continue to select and delete persistent images until the cache file usage is reduced below the automatic deletion threshold. For each deletion, PSM generates an error message to the system event log and to the Windows 2000 for Network Attached Storage alert log indicating that a persistent image was deleted.

You should periodically check the system event log or Windows 2000 for Network Attached Storage alert log to ensure that the cache file usage is not consistently high, forcing existing persistent images to be deleted and preventing new persistent images from being created. If you find that this is the case, you can increase the size of the cache file using the PSM Volumes page, but you will need to delete all persistent images currently on that volume as dynamic cache file resizing is not supported in this release.

5. When a shared volume is failed over from one engine in the Model 325 to the other engine, the persistent images for that volume move over with the volume. The Persistent Images panel on a particular engine will display only those persistent images which are on volumes that the engine owns at a point in time. If persistent images are scheduled for a volume, on a particular engine, a scheduled persistent image is created only as long as that engine owns the volume at the time the scheduled persistent image is to occur.

To ensure that a scheduled persistent image will take place regardless of which engine owns the volume, you must do the following:

- a. Use the PSM Schedules panel to create the schedule on the engine that currently owns the volume.
 - b. Use the Cluster Administrator to move the disk group that contains the volume to the other engine.
 - c. Use the PSM Schedules panel on the other engine to create the same schedule that you created on the original engine, with all of the same parameters (start time, frequency, number to keep, etc.). In the previous step you had to move the volume to the other engine. The reason is that you can only create or edit a schedule for a volume on the engine that currently owns the volume. If an engine does not own the volume, you cannot select the volume when creating a new schedule via the New Persistent Image Schedule panel (under PSM Schedules).
 - d. Use the Cluster Administrator to move the disk group that contains the volume back to the original engine.
6. Volume restore of the system volume (C: drive) of a node requires a reboot of the node. Volume restore of a data volume may require a reboot of the node. You will be notified by the Volume Restore panel whether a reboot is required after a restore operation is initiated.

7. Volume restore is not supported for multiple-volume persistent images in this release. If you attempt to restore a multiple-volume persistent image, an error message will be logged to the system event log on the Model 325, and the restore will not take place. You can restore any persistent image containing a single volume.

Attention: The recovery process invalidates persistent images and leaves them in an inconsistent state. So, if you plan to use the Recovery CD, it is recommended that you first delete all persistent images to ensure a clean reload of the system software. For more information on using the Recovery CD, see “Using the Recovery Enablement Diskette and Recovery CD” on page 91.

FAStT Check

The FAStT Check diagnostic utility allows you to manage and control fibre-channel host bus adapter(s). With FAStT Check, you can:

- Retrieve and display general information about the adapters
- Request and display the real-time statistics of adapters
- Diagnose operations on the adapters and attached devices
- Display the NVRAM parameters of adapters (Note that you cannot change the parameters.)
- Monitor alarms and indications of the adapters

The primary purpose of FAStT Check in the Model 325 is to obtain diagnostic information about the fibre channel connections.

You start FAStT Check by double-clicking the **IBM NAS Admin** icon. Then, under the **NAS Management** icon, double-click **Storage**, then **NAS Utilities**. And finally, you select **FAStT Check**. Once the FAStT Check opens, click **Connect**.

For further details on FAStT Check, see the online help.

“Appendix F. Fast!UTIL options” on page 135 provides detailed configuration information for advanced users who want to customize the configuration of the FAStT Host Adapter board and the connected devices, using Fast!UTIL to make changes.

Advanced System Management Adapter

There are two types of Advanced System Management (ASM) processors¹:

- The ASM processor integrated on the planar board of each engine of the Model 325
- An optional ASM PCI adapter that can connect to up to twelve of the planar ASM processors

The planar ASM adapter provides basic operational status about key engine components, such as its processors, power supplies, fans, and so on.

The optional ASM PCI Adapter allows you to connect via LAN or modem from virtually anywhere for extensive remote management. The ASM PCI Adapter works in conjunction with the ASM processor that is integrated into the base planar board of the Model 325 and an interconnect cable that connects multiple engines to the ASM adapter. Remote connectivity and flexibility with LAN capability is provided by Ethernet connection. The ASM PCI adapter enables more flexible management through a Web browser interface, in addition to ANSI terminal, Telnet, and Netfinity Director.

To use either adapter, and for more information, see “Additional information for the ASM adapters” on page 55.

Table 4 on page 54 provides a summary of the features of the planar ASM processor and the ASM PCI adapter.

Remote status includes information on power supply voltages, voltage-regulator module (VRM) readings, temperatures of system components, system power status, power-on hours, fan status, and system state.

The lightpath diagnostics LED status that is available via ASM includes:

- Power-supply failure
- Insufficient power for power-supply redundancy
- Exceeded power-supply capabilities
- Non-maskable interrupt occurred
- Over heating
- Fan failure
- Memory error
- Microprocessor failure
- PCI-bus error
- VRM failure
- Planar SCSI failure for system disk or internal tape drive (if any)

1. There is a third ASM adapter that might be referred to in some of the documentation that came with your system, but that is not used in the system.

Table 4. Planar ASM processor compared to the ASM PCI adapter

| Feature | Planar ASM processor | ASM PCI adapter |
|-----------------------------------------------|-----------------------------|-----------------------------|
| Location | On planar | Separate PCI adapter option |
| Light path diagnostics | Remotely reports on | Remotely reports on |
| LED status of engine | Remotely reports on | Remotely reports on |
| LED status of HDD in engine | No | No |
| Remote update of system BIOS | Yes | Yes |
| Remote update of ASM BIOS | Yes | Yes |
| Remote power on/off | Yes | Yes |
| Remote POST (including all POST message ids) | Yes | Yes |
| Access to NIC card and fibre-channel status | No | No |
| Remote access to engine VPD and serial number | Yes | Yes |
| Remote access to external fibre RAID or hubs | No | No |
| Multiple login IDs | Yes | Yes |
| Connect to LAN | No | Yes |
| TELNET interface over IP | No | Yes (via LAN connection) |
| Web-browser interface over IP | No | Yes (via LAN connection) |
| Forwarding of SNMP traps | Yes, to the ASM PCI adapter | Yes (via LAN connection) |
| Automated server restart | Yes | Yes |
| Remote Alerts | Yes | Yes |
| Configuration | By DOS utility | By DOS utility |
| Aggregate from other ASM processors | Yes | Yes |

ASM PCI adapter - onboard planar communication on a single machine

You will need to follow one of two methods to enable communication between the ASM PCI adapter and the onboard planar on a single machine:

1. Using a single ASM interconnect cable (with dual RJ-11 plugs)
 - a. Connect one end of the internal ASM interconnect cable to the J-40 connector on the system board.
 - b. Connect the other end (the RJ-11 socket) of the internal ASM interconnect cable to the knockout slot on the back panel of the machine until it locks into place.
 - c. Connect one connector on the ASM interconnect cable to the RJ-11 socket you just installed on the back panel (in step 1b).
 - d. Connect the other connector to the RJ-11 socket on the ASM PCI adapter.
2. Using two ASM interconnect cables (each with a single RJ-11 plug)
 - a. Connect one end of the internal ASM interconnect cable to the J-40 connector on the system board.
 - b. Connect the other end (with the RJ-11 socket) of the internal ASM interconnect cable to the knockout slot on the back panel of the machine until it locks into place.
 - c. Connect the first ASM interconnect cable to the RJ-11 socket you just installed on the back panel (in step 2b).
 - d. Connect the second ASM interconnect cable to the RJ-11 socket on the ASM PCI adapter.
 - e. Connect the two ASM interconnect cables with a single Category 5 Ethernet cable (by plugging one end of the Ethernet cable into the “black box” on the first ASM interconnect cable, and the other end into the “black box” on the second ASM interconnect cable).

Additional information for the ASM adapters

The documentation CD that came with your system contains additional information and software for the planar ASM adapter. To use the planar ASM adapter, complete the following steps:

1. Consult the planar ASM adapter user's manual and the README file that is located on the documentation CD.
2. Run the executable to create a bootable floppy disk. The executable is located in:
C:\IBM\ASMP\UPDATES\32P0083.EXE
3. Boot each node of the Model 325 with floppy disk created in the previous step to configure the planar ASM adapter.

The documentation CD that came with your system contains additional information and software for the ASM PCI adapter. To use the ASM PCI adapter, complete the following steps:

1. Consult the ASM PCI adapter user's manual and the README file that is located on the documentation CD.
2. Run the executable to create a bootable floppy disk. The executable is located in:
C:\IBM\ASMP\UPDATES\24P1874.EXE
3. Boot each node of the Model 325 with floppy disk created in the previous step to configure the planar ASM adapter.

Note: The ASM PCI adapter configuration program is different than the planar ASM adapter configuration program.

Adding a second IBM 5191 RAID Storage Controller Model 2RU

This section gives details to follow when you have added a second RAID controller, and need to add a new logical drive or create an array in the unconfigured storage.

Attention: Before proceeding with these steps, note the special considerations for powering off and powering on the unit as described in “Appendix G. Powering off and powering on the Model 325” on page 141.

To add a second IBM 5191 RAID Storage Controller Model 2RU, you will need to power-off one node, and restart the other node. It is recommended that you do the following procedure during non-peak operation hours.

First, install the RAID storage controller:

1. Attach a keyboard, monitor, and mouse to the node you will power-down first (in Step 4).
2. Mount the RAID storage controller into a rack.
3. Attach Fibre cables and power cables.
4. Power-down one of the nodes. Make sure that you note which node you power-down in this step.
5. Power-on the unit. Wait for all drive lights to become solid green.
6. Restart the node
7. On the node that is powered-on, go into Storage Manager 7, right-click the hostname and select **Rescan**.
8. Once the node finds the device, you will see it under the hostname along with the existing unit.
9. Right-click the new device and select **Manage**.
10. Create your new array(s) and logical drive(s). Do not restart the node until all the arrays have finished initializing.
11. After the array(s) have finished initializing, restart the node.
12. The node will install the new devices, and then you will need to start Disk Management.
13. Create the logical partitions, format, assign drive letters and label disk(s). To do this, use the procedure described in “Format the logical drives” on page 30.
14. Once you finish the above steps, power down the node, and continue with the steps for the other node.

Steps for the other node:

1. Power on the other node.
2. It will find new devices, and you will need to restart the system.
3. Upon restart, start Disk Management.
4. Assign drive letters to the newly found disks and partitions, making sure the drive letters match those on the other node.
5. Open the Cluster Administrator.
6. Create a new disk group under the cluster name.
7. On the new disk group name, right-click and select **New** → **Resource**.
8. Enter the *Disk* and the drive letter you want to assign to this disk group. For example: *Disk M:*.
9. For the Resource Type, select **Physical Disk** and click **Next**.
10. Make sure that both nodes are selected as possible owners and click **Next**.

11. Under **Parameters**, use the drop-down menu to select the new disk drive you want to manage using the Cluster Server and select **Finish**.
12. Bring the resource online.
13. Do steps 6 on page 56 through 12 for additional disk drives, placing new disks into new disk groups.

Finally, power-on the other node, wait for resources to come online, and then you can create additional resources, dependencies, and failover policies.

Chapter 7. Troubleshooting

This chapter provides basic troubleshooting information to help you resolve some common problems that might occur with the Model 325 components. These components are:

- IBM 5187 Network Attached Storage Model 5RZ (engine)
- IBM 3534 Fibre Channel Hub Model 1RU (hub)
- IBM 5191 RAID Storage Controller Model 2RU (storage controller)
- IBM 5192 Network Attached Storage Storage Unit Model 1RU (storage unit)

If you cannot locate and correct the problem using the information in this section, refer to “Appendix B. Getting help, service, and information” on page 97 for more information.

IBM 5187 Network Attached Storage Model 5RZ

This section gives troubleshooting information for the IBM 5187 Network Attached Storage Model 5RZ (engine).

Note: The information in this section needs to be applied to both engines in the Model 325. As an example, when the text reads, “The engine has light-emitting diodes (LEDs) to help you identify problems,” this means that each engine in the Model 325 has LEDs which require your attention.

As another example, the information contained in “Engine troubleshooting charts” on page 66 applies to each of the two engines.

Engine diagnostic tools overview

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

Note: If you need to remove the engines for inspection, do so one at a time: remove an engine, inspect it, and put it back; then remove the other engine, inspect it, and put it back.

- **POST beep codes, error messages, and error logs**

The power-on self-test (POST) generates beep codes and messages to indicate successful test completion or the detection of a problem. See “Power-on self-test” on page 103 for more information.

POST error messages and descriptions are given in “Appendix D. Engine POST messages” on page 103.

- **Diagnostic programs and error messages**

The 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 the Model 325 engine. See “POST diagnostic programs” on page 111 for more information.

- **Light-path diagnostics**

The engine has light-emitting diodes (LEDs) on its system board to help you identify problems. These LEDs are part of the light-path diagnostics that are built into the Model 325 engine. By following the *path of lights*, you can quickly identify the type of system error that occurred. See “Light-path diagnostics” on page 61 for more information.

- **Networking adapter diagnostic tools**
 - **Intel PROSet II**
See “Testing the Ethernet adapters with Intel PROSet II” on page 77.
 - **FAStT Check**
See “Testing the fibre-channel host adapter with FAStT Check” on page 77
- **Troubleshooting charts**
These charts list problem symptoms, along with suggested steps to correct the problems. See “Engine troubleshooting charts” on page 66 for more information.
- **Support**
You can register with the following support site to subscribe to e-mail notification of new technical tips and frequently asked questions, obtain downloads, and join forum discussions:
<http://www.storage.ibm.com/support/nas>

Identifying problems using LEDs

The LEDs are part of the light-path diagnostics built into the Model 325 engine. The LEDs help you identify the type of system error that occurred. See the following sections for more information.

Power-supply LEDs

The ac and dc power LEDs on the power supply provide status information about the power supply.

Table 5 describes the ac and dc power LEDs.

Table 5. Power supply LEDs

| AC power LED | DC power LED | Description and action |
|--------------|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| On | On | The power supply is on and operating correctly. |
| On | Off | <p>There is a dc power problem.</p> <p>Possible causes:</p> <ol style="list-style-type: none"> 1. The power control button on the front of the appliance is in the Off position. Action: Press the power control button to start the appliance. 2. The power supply has failed. Action: Replace the power supply. <p>If the problem persists, have the system serviced.</p> |
| Off | Off | <p>There is an ac power problem.</p> <p>Possible causes:</p> <ol style="list-style-type: none"> 1. There is no ac power to the power supply. Action: Verify that: <ul style="list-style-type: none"> • The power cord is properly connected to the appliance. • The power outlet functions properly. 2. The power supply has failed. Action: Replace the power supply. <p>If the problem persists, have the system serviced.</p> |

Light-path diagnostics

You can use the light-path diagnostics built into the Model 325 engine to identify the type of system error that occurred. Any LEDs that are illuminated remain illuminated during a shutdown as long as the ac power source is good and the power supplies can supply +5V dc current to the Model 325 engine. This feature helps you isolate the problem, if an error causes the Model 325 to shut down. See “Light-path diagnostics”.

Diagnostics panel

Figure 1 shows the LEDs on the diagnostics panel on the system board. See “Light-path diagnostics” for information on identifying problems using these LEDs.

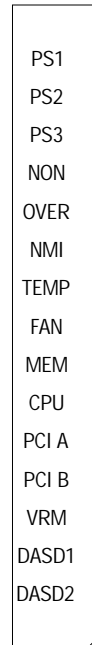


Figure 1. Diagnostics panel LEDs

Light-path diagnostics

Table 6 on page 62 describes the light-path diagnostics LEDs. The system-error LED on the operator information panel is lit when certain system errors occur. Table 6 on page 62 helps determine the cause of the error and the action you should take.

Table 6. Light-path diagnostics

| Lit LED on diagnostics panel | Cause | Action |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| None | The Advanced System Management Processor has failed. | Verify that the Advanced System Management Processor LED on the system board is on. Have the system serviced. |
| PS1 | Power supply 1 has failed. | Replace power supply 1. |
| PS2 | Power supply 2 has failed. | Replace power supply 2. |
| NON | Power supply redundancy has been lost. Note: This LED will not be lit if the engine has only one power supply; however, the power is not redundant with only one power supply installed. | Check the PS1 and PS2 LEDs and replace the indicated power supply. If neither LEDs is lit, you can remove optional devices from the appliance to restore power supply redundancy. |
| OVER | The system has exceeded the power capabilities of the installed power supply. | Remove optional devices from the appliance to reduce the power requirements. |
| NMI | A nonmaskable interrupt occurred. | <ol style="list-style-type: none"> 1. If the PCI A or PCI B LED is on, follow the instructions for that LED. 2. If neither the PCI A or PCI B LED is on, restart the appliance. <p>If the problem persists, have the system serviced.</p> |
| TEMP | The system temperature has exceeded a threshold level. | <ol style="list-style-type: none"> 1. Check to see if a fan has failed. If it has, replace the fan. 2. Make sure the room temperature is within an acceptable range- <ul style="list-style-type: none"> • Appliance on: 10° to 35° C (50.0° to 95.0° F). Altitude: 0 to 914 m (2998.7 ft.) • Appliance on: 10° to 32° C (50.0° to 89.6° F). Altitude: 914 m (2998.7 ft.) to 2133 m (6998.0 ft.) • Appliance off: 10° to 43° C (50.0° to 109.4° F). Maximum altitude: 2133 m (6998.0 ft.) <p>If the problem persists, have the system serviced.</p> |
| FAN | A fan has failed or is operating too slowly. Note: A failing fan can also cause the TEMP LED to be on. | Check the LEDs on the fan assemblies and replace the indicated fan assembly. |
| MEM | A memory error occurred. | <ol style="list-style-type: none"> 1. Check the DIMM failure LEDs on the system board. 2. Replace the DIMM indicated by the lit DIMM failure LED. |

Table 6. Light-path diagnostics (continued)

| Lit LED on diagnostics panel | Cause | Action |
|------------------------------|----------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CPU | One of the microprocessors has failed or a microprocessor is installed in the wrong connector. | <ol style="list-style-type: none"> 1. Check the microprocessor failure LEDs on the system board. 2. If a microprocessor failure LED is lit, make sure that microprocessor is installed correctly and seated correctly. See information on installing a microprocessor in the hardware installation guide that came with the appliance. 3. If the problem persists, replace the microprocessor. <p>If the problem persists, have the system serviced.</p> |
| PCI A | An error occurred on PCI bus A. Either an adapter in PCI slot 1 or 2 or the system board caused the error. | <ol style="list-style-type: none"> 1. Check the error log for additional information. If the error log indicates a problem with the integrated Ethernet controller or the integrated SCSI controller, have your system serviced. 2. If you cannot isolate the failing adapter from the information in the error log, try to determine the failing adapter by removing one adapter at a time from PCI bus A (PCI slots 1 and 2) and restarting the appliance after each adapter is removed. <p>If the problem persists, have the system serviced.</p> |
| PCI B | An error occurred on PCI bus B. Either an adapter in PCI slot 3, 4, or 5 or the system board caused the error. | <ol style="list-style-type: none"> 1. Check the error log for additional information. 2. If you cannot isolate the failing adapter from the information in the error log, try to determine the failing adapter by removing one adapter at a time from PCI bus B (PCI slots 3, 4, and 5) and restarting the appliance after each adapter is removed. <p>If the problem persists, have the system serviced.</p> |
| VRM | One of the VRMs on the system board has failed. | <p>Check the VRM failure LEDs on the system board.</p> <ul style="list-style-type: none"> • If the VRM1 failure LED is on, have the system serviced. • If the VRM2 failure LED is on: <ol style="list-style-type: none"> 1. Turn off the appliance, reseal the VRM, and restart the appliance. 2. If the problem persists, replace the VRM. <p>If the problem still persists, have the system serviced.</p> |

Table 6. Light-path diagnostics (continued)

| Lit LED on diagnostics panel | Cause | Action |
|------------------------------|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DASD1 | SCSI channel A has failed. | <ol style="list-style-type: none"> 1. If an amber LED on a hot-swap hard disk drive is on, replace the hard disk drive. 2. Run the diagnostics programs. Replace any identified failing device. 3. If the error log indicates a temperature problem and the fans are working correctly, have the system serviced. <p>If the problem still persists, have the system serviced.</p> |
| DASD2 | SCSI channel B has failed. | <ol style="list-style-type: none"> 1. If an amber LED on a hot-swap hard disk drive is on, replace the hard disk drive. 2. Run the diagnostics programs. Replace any identified failing device. 3. If the error log indicates a temperature problem and the fans are working correctly, have the system serviced. <p>If the problem still persists, have the system serviced.</p> |

Recovering BIOS

If the BIOS has become corrupted, such as from a power failure during a flash update, you can recover the BIOS using the boot block jumper and a BIOS flash diskette.

Note: You can obtain a BIOS flash diskette from one of the following sources:

- Use the ServerGuide program to make a BIOS flash diskette.
- Download a BIOS flash diskette from the World Wide Web. Go to <http://www.storage.ibm.com/support/nas> and make the selections for the engine.
- Contact your IBM service representative.

The flash memory of the engine 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.

Figure 2 on page 65 shows the location of the boot block jumper on the system board.

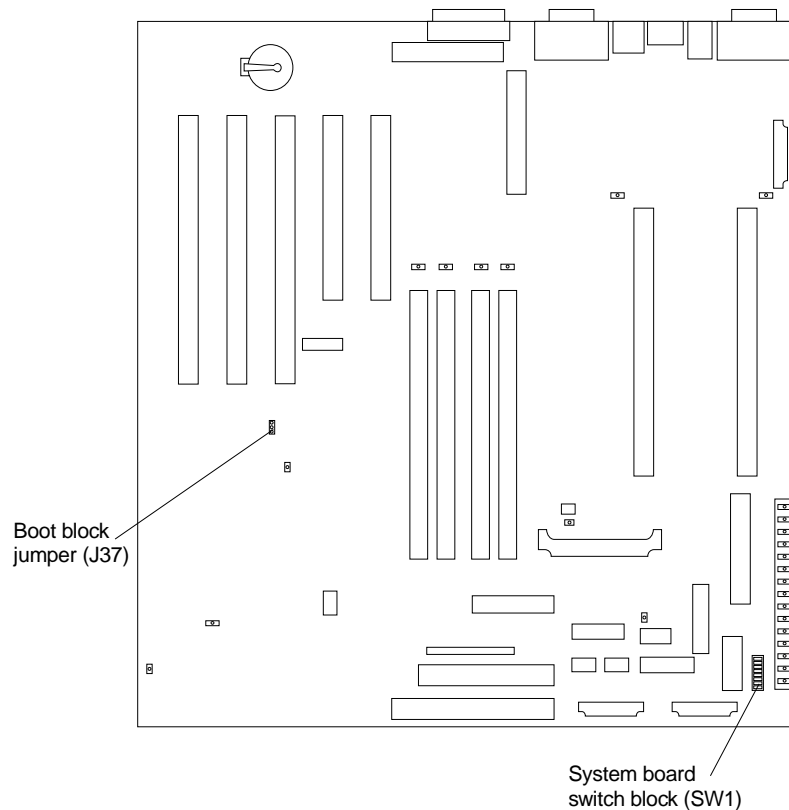


Figure 2. Boot block jumper location

To recover the BIOS:

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

The Recovery Boot screen will appear. 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 the procedure completes, 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. Turn the appliance off.
8. Remove the jumper from the boot-block jumper block or move it to pins 1 and 2 to return to normal startup mode.
9. Restart the appliance. The system should start up normally.

Engine troubleshooting charts

You can use Table 7 to find solutions to problems that have the described symptoms.

If you cannot find the problem in the table, go to “Starting the diagnostic programs” on page 112 to test the Model 325 engine. If you have run the diagnostic test programs or if running the tests does not reveal the problem, call for service.

The symptom appears in the left column of the table. Instructions and probable solutions to the problem are in the right column. If you have just added new software or a new option and the Model 325 engine is not working, do the following before using the troubleshooting charts:

- Remove the software or device that you just added.
- Run the diagnostic tests to determine if the Model 325 engine is running correctly.
- Reinstall the new software or new device.

Table 7. Engine troubleshooting symptoms and actions

| Device | Suggested action |
|----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CD-ROM drive | Verify that: |
| CD-ROM drive is not recognized. | <ol style="list-style-type: none"> 1. The primary IDE channel is enabled in the Configuration/Setup Utility program. 2. All cables and jumpers are installed correctly. 3. The correct device driver is installed for the CD-ROM drive. <p>If the problem remains, call for service.</p> |
| Diskette drive | If there is a diskette in the drive, verify that: |
| Diskette drive in-use light stays on, or the system bypasses the diskette drive. | <ol style="list-style-type: none"> 1. The diskette drive is enabled in the Configuration/Setup Utility program. 2. The diskette is good and not damaged. (Try another diskette if you have one.) 3. The diskette contains the necessary files to start the appliance. 4. Your software program is OK. <p>If the diskette drive in-use light stays on, or the system continues to bypass the diskette drive, call for service.</p> |
| General problems | Call for service. |
| Problems such as broken cover locks or indicator lights not working. | |
| Intermittent problems | Verify that: |
| A problem occurs only occasionally and is difficult to detect. | <ol style="list-style-type: none"> 1. All cables and cords are connected securely to the rear of the appliance and attached options. 2. When the appliance is turned on, air is flowing from the rear of the appliance at the fan grill. If there is no air flow, the fan is not working. This causes the appliance to overheat and shut down. <p>If the items above are correct, call for service.</p> |

Table 7. Engine troubleshooting symptoms and actions (continued)

| Device | Suggested action |
|----------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Memory problems</p> | <p>Verify that:</p> <ol style="list-style-type: none"> 1. The memory modules are seated properly. 2. You have installed the correct type of memory. 3. If you changed the memory, you updated the memory configuration with the Configuration/Setup Utility program. 4. All banks of memory on the DIMMs are enabled. The appliance might have automatically disabled a DIMM bank when it detected a problem or a DIMM bank could have been manually disabled. <p>If the above items are correct, run the memory diagnostic program. The system might have detected a bad memory module and automatically reallocated memory to enable you to continue to operate. If the memory tests fail, call for service or replace the failing DIMM.</p> |
| <p>The amount of memory displayed is less than the amount of memory installed.</p> | |
| <p>Microprocessor problems</p> | <p>The startup (boot) microprocessor is not working properly.</p> <p>Verify that the startup microprocessor is seated properly. If it is, replace the startup microprocessor.</p> <p>If the problem remains, call for service.</p> |
| <p>The appliance emits a continuous tone during POST.</p> | |
| <p>Option problems</p> | <p>Verify that:</p> <ol style="list-style-type: none"> 1. The option is supported by the appliance. Refer to the hardware installation guide that came with this appliance for a list of supported options. 2. You followed the installation instructions that came with the option. 3. The option is installed correctly. 4. You have not loosened any other installed options or cables. 5. You updated the configuration information in the Configuration/Setup Utility program. Whenever memory or an option is changed, you must update the configuration. <p>If the problem remains, call for service.</p> <p>Verify that all of the option hardware and cable connections are secure.</p> <p>If the option comes with its own test instructions, use those instructions to test the option.</p> <p>If the problem remains, call for service.</p> |
| <p>An IBM option that was just installed does not work.</p> | |
| <p>An IBM option that used to work does not work now.</p> | |
| <p>The number of parallel ports displayed is less than the number of parallel ports installed.</p> | |
| <p>Power problems</p> | <p>Verify that:</p> <ol style="list-style-type: none"> 1. The power cables are properly connected to the appliance. 2. The electrical outlet functions properly. 3. The type of memory installed is correct. 4. If you just installed an option, remove it, and restart the appliance. If the appliance now powers on, you might have installed more options than the power supply supports. 5. The LEDs on the power supply are on. <p>If the problem remains, call for service.</p> |
| <p>The appliance does not power on.</p> | |

Table 7. Engine troubleshooting symptoms and actions (continued)

| Device | Suggested action |
|------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Serial port problems</p> <p>The number of serial ports identified by the operating system is less than the number of serial ports installed.</p> | <p>Verify that:</p> <ol style="list-style-type: none"> Each port is assigned a unique address by the Configuration/Setup Utility program and none of the serial ports are disabled. Note: The management C connector is the same as a serial port connector, but it is used only by the integrated Netfinity Advanced System Management Processor, and is not available for use by the operating system. This port does not appear in the Configuration/Setup Utility program menus; it can be configured using Netfinity Manager. The serial-port adapter, if you installed one, is seated properly. <p>If the problem still exists, call for service.</p> |
| <p>Service processor problems</p> <p>Netfinity Service Processor Manager reports a general monitor failure</p> | <p>Disconnect the appliance from all electrical sources, wait for 30 seconds, reconnect the appliance to the electrical sources, and restart the appliance.</p> <p>If a problem remains, call for service.</p> |
| <p>Software problem</p> <p>Suspected software problem.</p> | <p>To determine if problems are caused by the software, verify that:</p> <ol style="list-style-type: none"> The appliance has the minimum memory requirements needed to use the software. For memory requirements, refer to the information that comes with the software. Note: If you have just installed an adapter or memory, you might have a memory address conflict. The software is designed to operate on the appliance. Other software works on the appliance. The software that you are using works on another system. <p>If you received any error messages when using the software program, refer to the information that comes with the software for a description of the messages and solutions to the problem.</p> <p>If the items above are correct and the problem remains, contact your place of purchase.</p> |

Power checkout

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

A general procedure for troubleshooting power problems is as follows:

- Power off the system and disconnect the AC cord(s).
Attention: Note the special considerations when powering off and powering on the Model 325 engine. See "Appendix G. Powering off and powering on the Model 325" on page 141 for details.
- 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.
- Remove adapters and disconnect the cables and power connectors to all internal and external devices until the Model 325 engine is at minimum configuration required for power on.
- Reconnect the AC cord and power on the Model 325 engine. If the engine powers up successfully, replace adapters and devices one at a time until the problem is isolated. If the engine does not power up from minimal configuration, replace FRUs of minimal configuration one at a time until the problem is isolated.

Table 8 lists the power error messages that you might encounter.

Table 8. Power error messages

| Message | Action |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Power supply "X" current share fault (level-critical; excessive current demand on power supply "X") | 1. See "Power checkout" on page 68 |
| Power supply "X" DC good fault (level-critical; power good signal not detected for power supply "X") | 1. Replace power supply "X" |
| Power supply "X" temperature fault | 1. Replace fan "X" |
| Power supply "X" removed | 1. No action required - information only |
| Power supply "X" fan fault (level-critical; fan fault in power supply "X") | 1. Replace power supply "X" |
| Power supply "X" 12V fault (level-critical; overcurrent condition detected) | 1. See "Power checkout" on page 68 |
| Power supply "X" 3.3V fault (level-critical; 3.3V power supply "X" had an error) | 1. See "Power checkout" on page 68 |
| Power supply "X" 5V fault (level-critical; 5V power supply "X" had an error) | 1. See "Power checkout" on page 68 |
| System over recommended "X" current (level-non-critical; system running too much current on that voltage) | 1. See "Power checkout" on page 68 |
| System running non-redundant power (level-non-critical; system does not have redundant power) | 1. Add another power supply 2. Remove options from system 3. System can continue to operate without redundancy protection if 1 and 2 above are not followed. |
| System under recommended voltage for "X" v (level-warning; indicated voltage supply under nominal value; value for "X" can be +12, -12, or +5) | 1. Check connections to power subsystem 2. Replace power supply 3. Replace power backplane |
| System under recommended voltage on 3.3 v (level-warning; 3.3 volt supply under nominal value) | 1. Check connections to power subsystem 2. Replace power supply 3. Replace power backplane |
| System under recommended X current (level-non-critical; system drawing less current than recommended on voltage "X") | 1. See "Power checkout" on page 68 |
| "X" V bus fault (level-critical; overcurrent condition on "X" voltage bus) | 1. Check for short circuit on "X" voltage bus 2. See "Power checkout" on page 68 |
| 12V "X" bus fault (level-critical; overcurrent condition on 12 volt "X" voltage bus) | 1. Check for short circuit on 12 volt "X" voltage bus 2. See "Power checkout" on page 68 |
| 5V fault (level-critical; overcurrent condition on 5 V subsystem) | 1. Check for short circuit on 5 v bus 2. See "Power checkout" on page 68 |
| 240 VA fault (level-critical; overcurrent or overvoltage condition in power subsystem) | 1. See "Power checkout" on page 68 |

Replacing the battery

IBM has designed this product with your safety in mind. The lithium battery must be handled correctly to avoid possible danger. If you replace the battery, you must adhere to the following instructions.

Note: In the U.S., call 1-800-IBM-4333 for information about battery disposal.

If you replace the original lithium battery with a heavy-metal battery or a battery with heavy-metal components, be aware of the following environmental consideration. Batteries and accumulators that contain heavy metals must not be disposed of with normal domestic waste. They will be taken back free of charge by the manufacturer, distributor, or representative, to be recycled or disposed of in a proper manner.

To order replacement batteries, call 1-800-772-2227 within the United States, and 1-800-465-7999 or 1-800-465-6666 within Canada. Outside the U.S. and Canada, call your IBM reseller or IBM marketing representative.

Note: After you replace the battery, you must reconfigure your appliance and reset the system date and time.

CAUTION:



When replacing the lithium battery, use only IBM Part Number 10L6432 or an equivalent type battery recommended by the manufacturer. If your system has a module containing a lithium battery, replace it only with the same module type made by the same manufacturer. The battery contains lithium and can explode if not properly used, handled, or disposed of.

Do not:

- **Throw or immerse into water.**
- **Heat to more than 100 C (212 F)**
- **Repair or disassemble**

Dispose of the battery as required by local ordinances or regulations.

Note: For translations of the safety notice, refer to the multilingual Safety Information on the Documentation CD that came with the appliance.

To replace the battery:

1. Review the information in the section “Before you begin” in the hardware installation guide that came with this appliance, and any special handling and installation instructions supplied with the replacement battery.
2. Turn off the appliance and peripheral devices and disconnect all external cables and power cords; then, remove the appliance cover.
3. Remove the battery:
 - a. Use one finger to lift the battery clip over the battery.
 - b. Use one finger to slightly slide the battery from its socket. The spring mechanism behind the battery will push the battery out toward you as you slide it from the socket.
 - c. Use your thumb and index finger to pull the battery from under the battery clip.

- d. Ensure that the battery clip is touching the base of the battery socket by pressing gently on the clip.

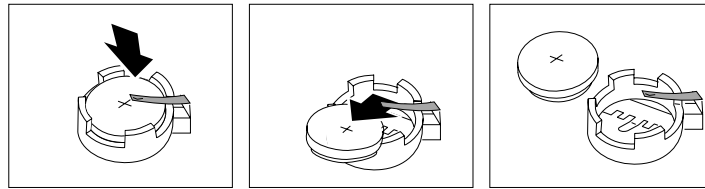


Figure 3. Battery removal

4. Insert the new battery:
 - a. Tilt the battery so that you can insert it into the socket, under the battery clip.
 - b. As you slide it under the battery clip, press the battery down into the socket.

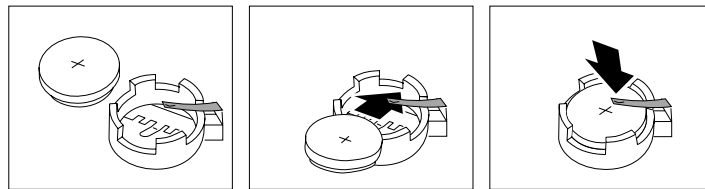


Figure 4. Battery replacement

5. Reinstall the appliance cover and connect the cables.

Note: Wait approximately 20 seconds after you plug the power cord of the engine into an electrical outlet for the Power Control button to become active.

6. Turn the appliance on.
7. Start the Configuration/Setup Utility program and set configuration parameters.
 - Set the system date and time.
 - Set the power-on password.
 - Reconfigure the engine.

Adapter troubleshooting

This section presents information on troubleshooting the following engine adapters:

- Planar Ethernet controller
- 10/100 PCI Ethernet adapter
- Gigabit Ethernet SX adapter

Troubleshooting the planar Ethernet controller

This section provides troubleshooting information for problems that might occur with the 10/100 Mbps planar Ethernet controller.

Network connection problems: If the Ethernet controller cannot connect to the network, check the following:

- Make sure that the cable is installed correctly.

The network cable must be securely attached at all connections. If the cable is attached but the problem persists, try a different cable.

If you set the Ethernet controller to operate at 100 Mbps, you must use Category 5 cabling.

If you directly connect two workstations (without a hub), or if you are not using a hub with X ports, use a crossover cable.

Note: To determine whether a hub has an X port, check the port label. If the label contains an X, the hub has an X port.

- Determine if the hub supports auto-negotiation. If not, try configuring the integrated Ethernet controller manually to match the speed and duplex mode of the hub.
- Check the Ethernet controller lights on the operator information panel.
These lights indicate whether a problem exists with the connector, cable, or hub.
 - The Ethernet Link Status light is On when the Ethernet controller receives a LINK pulse from the hub. If the light is Off, there might be a bad connector or cable, or a problem with the hub.
 - The Ethernet Transmit/Receive Activity light is On when the Ethernet controller sends or receives data over the Ethernet Network. If the Ethernet Transmit/Receive Activity light is Off, make sure that the hub and network are operating and that the correct device drivers are loaded.
- Make sure that you are using the correct device drivers, supplied with the Model 325 engine.
- Check for operating system-specific causes for the problem.
- Make sure that the device drivers on the client and the Model 325 engine are using the same protocol.
- Test the Ethernet controller by running the diagnostic program.

Failover for redundant Ethernet: The 10/100 Ethernet adapter that is built-in (on the planar) of the engine is not redundant-capable. However, the IBM 10/100 Ethernet Server Adapters (NIC adapter) that you install in the PCI card slots are redundant-capable. If you install two NIC adapters and connect them to the same logical segment, you can configure the server to support an Ethernet-adapter failover function.

In failover mode, if the primary Ethernet adapter detects a link failure, all Ethernet traffic associated with it is switched to the redundant (secondary) adapter. This switching occurs without your intervention. When the primary link is restored to an operational state, the Ethernet traffic switches back to the primary Ethernet adapter. The switch back to the primary Ethernet adapter can be automatically or manually controlled, depending on the setup.

Planar Ethernet controller troubleshooting chart: Use Table 9 to find solutions to 10/100 Mbps planar Ethernet controller problems that have definite symptoms.

Table 9. Planar Ethernet controller troubleshooting chart

| Ethernet controller problem | Suggested Action |
|-------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Ethernet Link Status light is not On. | <p>Check the following:</p> <ul style="list-style-type: none"> • Ensure that the hub is powered on. • Check all connections at the Ethernet controller and the hub. • Check the cable. A crossover cable is required unless the hub has an X designation. • Use another port on the hub. • If the hub does not support auto-negotiation, manually configure the Ethernet controller to match the hub. • If you manually configured the duplex mode, ensure that you also manually configure the speed. • Run diagnostics on the LEDs. <p>If the problem remains, go to “Starting the diagnostic programs” on page 112 to run the diagnostic programs.</p> |
| The Ethernet Transmit/Receive Activity light is not On. | <p>Check the following:</p> <p>Note: The Ethernet Transmit/Receive Activity LED is On only when data is sent to or by this Ethernet controller.</p> <ul style="list-style-type: none"> • Ensure that you have loaded the network device drivers. • The network might be idle. Try sending data from this workstation. • Run diagnostics on the LEDs. • The function of this LED can be changed by device driver load parameters. If necessary, remove any LED parameter settings when you load the device drivers. |
| Data errors | <p>Check the following:</p> <ul style="list-style-type: none"> • Ensure that you are using Category 5 cabling when operating the Model 325 engine at 100 Mbps. • Make sure that the cables do not run close to noise-inducing sources like fluorescent lights. |
| The Ethernet controller stopped working when another adapter was added to the Model 325 engine. | <p>Check the following:</p> <ul style="list-style-type: none"> • Ensure that the cable is connected to the Ethernet controller. • Ensure that the PCI system BIOS is current. • Reseat the adapter. • Ensure that the adapter you are testing is supported by the Model 325 engine. <p>Go to “Starting the diagnostic programs” on page 112 to run the diagnostic programs.</p> |
| The Ethernet controller stopped working without apparent cause. | <p>Check the following:</p> <ul style="list-style-type: none"> • Run diagnostics for the Ethernet controller. • Try a different connector on the hub. • Reinstall the device drivers. Refer to your operating-system documentation and to the <i>User’s Reference</i> information. <p>If the problem remains, go to “Starting the diagnostic programs” on page 112 to run the diagnostic programs.</p> |

Troubleshooting the 10/100 PCI Ethernet adapter

You can use Table 10 to find solutions to 10/100 Mbps Ethernet adapter problems that have definite symptoms.

Table 10. 10/100 PCI Ethernet adapter troubleshooting chart

| Ethernet adapter problem | Suggested Action |
|--------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>The adapter cannot connect to the network.</p> | <p>Check the following:</p> <ol style="list-style-type: none"> 1. Ensure that the network cable is installed correctly. The cable must be securely attached at both RJ-45 connections (adapter and hub). The maximum allowable distance from adapter to the hub is 100 m (328 ft.). If the cable is attached and the distance is within acceptable limits but the problem persists, try a different cable. If you are directly connecting two computers without a hub or switch, make sure you are using a crossover cable. 2. Check the LED lights on the adapter. The adapter has two diagnostic LEDs, one on each side of the cable connector. These lights help you to determine whether there is a problem with the connector, cable, switch, or hub. <ul style="list-style-type: none"> ACT/LNK — On <ul style="list-style-type: none"> • Adapter and switch is receiving power and cable connection between them is good ACT/LNK — Off <p>Check the following:</p> <ul style="list-style-type: none"> • Adapter not sending or receiving data • Adapter or switch not receiving power • Cable connection between adapter and switch is faulty • Drivers not configured properly ACT/LNK — Flashing <p>Normal operation. LED flashes when the adapter sends or receives data. The frequency of the flashes varies with the amount of network traffic</p> 100 — On <p>Adapter is operating at 100 Mbps</p> 100 — Off <p>Adapter is operating at 10 Mbps</p> 3. Ensure that you are using the correct drivers. Ensure that you are using the drivers that come with this adapter. Drivers that support previous versions of this adapter do not support this version of the adapter. 4. Ensure that the switch port and the adapter have the same duplex setting. If you configured the adapter for full-duplex, ensure that the switch port is also configured for full-duplex. Setting the wrong duplex mode can degrade performance, cause data loss, or result in lost connections. |
| <p>Diagnostics pass, but the connection fails or errors occur.</p> | <p>Check the following:</p> <ol style="list-style-type: none"> 1. For 100 Mbps: <ul style="list-style-type: none"> • Use Category 5 cabling and ensure that the network cable is securely attached. • Verify the adapter is seated firmly in the slot and connected to a 100BASE-TX hub/switch (not 100BASE-T4). 2. Ensure the duplex mode setting on the adapter matches the setting on the switch |

Table 10. 10/100 PCI Ethernet adapter troubleshooting chart (continued)

| Ethernet adapter problem | Suggested Action |
|---------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The LNK LED is not On. | Check the following: <ol style="list-style-type: none"> 1. Ensure that you loaded the correct network drivers. 2. Check all connections at the adapter and the switch. 3. Try another port on the switch. 4. Ensure that the duplex mode setting on the adapter matches the setting on the switch. 5. Ensure that you have the correct type of cable between the adapter and the hub. 100BASE-TX requires two pairs. Some hubs require a crossover cable while others require a straight-through cable. |
| The ACT LED is not On. | Check the following: <ol style="list-style-type: none"> 1. Ensure that you loaded the correct network drivers. 2. The network might be idle. Try accessing a server. 3. The adapter is not transmitting or receiving data. Try another adapter. 4. Ensure that you are using two-pair cable for TX wiring. |
| Adapter stops working without apparent cause. | Check the following: <ol style="list-style-type: none"> 1. Run the diagnostics. 2. Try reseating the adapter in its slot, or try a different slot if necessary. 3. The network driver files might be corrupt or missing. Remove and then reinstall the drivers. |
| The LNK LED is not On when you connect the power. | Check the following: Ensure that the network cable is securely attached at both ends. |

Troubleshooting the Gigabit Ethernet SX adapter

Use Table 11 on page 76 to find solutions to gigabit Ethernet adapter problems that have definite symptoms.

Table 11. Gigabit Ethernet SX adapter troubleshooting chart

| Gigabit adapter problem | Suggested Action |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No Link or TX/RX Activity | <p>If you cannot link to your switch, check the following:</p> <ol style="list-style-type: none"> Check the following LED lights on the adapter: <ul style="list-style-type: none"> 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 Link is inoperative. <ul style="list-style-type: none"> • Check all connections at the adapter and link partner • Make sure the link partner is set to 1000 Mbps and full-duplex • Ensure the required drivers are loaded PRO — Programmable LED Identifies the adapter by blinking. Use the Identify Adapter push-button in INTEL PROSet II to control blinking. Ensure that the cable is installed correctly. The network cable must be securely attached at all connections. If the cable is attached but the problem persists, try a different cable. |
| Your computer cannot find the Gigabit Ethernet SX adapter | <p>Check the following:</p> <ol style="list-style-type: none"> Verify that the adapter is seated firmly in the slot Try a different Gigabit Ethernet SX adapter |
| Diagnostics pass but the connection fails | <p>Check the following:</p> <p>Ensure the network cable is securely attached</p> |
| Another adapter stopped working after you installed the Gigabit Ethernet SX Adapter | <p>Check the following:</p> <ol style="list-style-type: none"> Verify that the cable is connected to the Gigabit Ethernet SX Adapter and not to another adapter. Check for a resource conflict Ensure both adapters are seated firmly in the slot Check all cables |
| The adapter stopped working without apparent cause | <p>Check the following:</p> <ol style="list-style-type: none"> Try reseating the adapter The network driver files might be damaged or deleted. Reinstall the drivers Try a different Gigabit Ethernet SX Adapter |
| LINK LED is not On | <p>Check the following:</p> <ol style="list-style-type: none"> Ensure that you have loaded the adapter driver Check all connections at the adapter and the buffered repeater or switch Try another port on the buffered repeater or switch Ensure that the buffered repeater or switch port is configured for 1000 Mbps and full-duplex. Try changing the auto-negotiation setting on the link partner, if possible |

Table 11. Gigabit Ethernet SX adapter troubleshooting chart (continued)

| Gigabit adapter problem | Suggested Action |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| RX or TX LED is no On | <p>Check the following:</p> <ol style="list-style-type: none"> 1. Ensure that you have loaded the adapter driver 2. Network might be idle; try logging in from a workstation 3. The adapter is not transmitting or receiving data; try another adapter |

Running adapter diagnostics

This section describes how to test the adapters using the diagnostics tools.

Testing the Ethernet adapters with Intel PROSet II

Each Model 325 engine comes with Intel PROSet II. You can use PROSet to view the following:

- Adapter parameters such as MAC and IP addresses
- Network link status such as speed, duplex mode, and activity
- Device-driver level used for the adapter

You can also use PROSet II to test the 10/100 Ethernet and GB Ethernet PCI adapters for any problems with the adapter hardware, cabling, or network connections. PROSet performs a loopback test on the 10/100 Ethernet and GB Ethernet PCI cards.

To access the PROSet II utility, go into Terminal Services. For instructions on how to invoke Terminal Services, see “Terminal Services and the IBM NAS Administration Console” on page 10. Within Terminal Services do the following steps:

1. Go to the Start menu, select **Settings**, then **Control Panel**.
2. Double-click the INTEL PROSet II icon in the Control Panel to start the INTEL PROSet II utility.
3. In the INTEL PROSet II utility, select the Ethernet adapter you want to test (Gigabit Ethernet PCI adapter or 10/100 Ethernet Adapter).
4. Select the **Diagnostics** tab. A list of available tests is displayed.
5. Select **Run Tests**. You can also select or deselect individual tests with the check boxes. If an error is detected, information about the error is displayed.
6. Repeat Steps 3 through 5 for each Ethernet adapter installed.

For additional information about Intel PROSet, please refer to the online help that accompanies the utility.

Testing the fibre-channel host adapter with FASt Check

Note: Ensure that there is no adapter activity before running the test or data can be lost.

The Model 325 engine also comes with FASt Check for viewing the status of the Fibre Channel connection as well as testing the adapter or cable. To use FASt Check, you should first go into Terminal Services. For instructions on how to invoke Terminal Services, see “Terminal Services and the IBM NAS Administration Console” on page 10.

You access FASt Check by going into the IBM NAS Admin console, selecting **NAS Management** → **Storage** → **NAS Utilities** → **FASt Check**. Then, select **Connect**. A

diagnostic panel displays the following general information related to the Fibre Channel adapter which can be useful if you need to place a support call:

- Node name
- Serial number (in hex)
- Loop ID
- BIOS version
- Firmware version number
- Device driver version number
- PCI slot number

FASTT Check also provides the Model 325 engine's world-wide name (WWN) as detailed in "FASTT Check" on page 52.

To test the Fibre Channel adapter, select the adapter and then click the **Diagnostic** button. FASTT Check can perform fibre loopback and data tests.

For additional information relating to FASTT Check diagnostic functions, refer to the online help accessed from its panels.

Checking the FASTT host-bus adapter's fibre-channel connectivity: In addition to the above diagnostic function, you can use FASTT Check to determine if your physical fibre channel connections are in place by doing the following steps:

1. Once Connected with FASTT as above, select the **QLA2200 Adapter** icon, and verify that you see all Fibre Controllers that you are physically connected to. If you see a red **X** on the QLA2200 Adapter icon, and the icon is yellow, the adapter cannot register with the 3534 Fibre Channel hub. (A green icon means connections are in place.) Check the fibre cable connections, and if the QLA2200 adapter still does not connect, run the adapter and 3534 Fibre Channel hub diagnostics.
2. If the icon is green, click on the plus sign (+) in front of the adapter icon to see the state of the attached Fibre channel storage controllers. The absence of controllers in the display indicates connection problems.

For additional information relating to FASTT Check diagnostic functions, refer to the online help accessed from its panels.

Testing the Advanced System Management adapter

1. Insert the Advance System Management Utility CD-ROM into the CD-ROM drive and restart the Model 325 engine. If the engine does not boot from the CD-ROM, use POST/BIOS setup to configure the CD-ROM drive as a boot device.
2. After the engine boots, the main option menu appears. The main menu contains the following selections:
 - Hardware Status and Information
 - Configuration Settings
 - Update System Management firmware
3. Use the up and down arrow keys to select **Hardware Status and Information** and press **Enter**. The Hardware Status and Information menu contains the list of Advanced System Management devices with the following diagnostic test results:

```

System Management Processor Communication : Passed
-> Built in Self Test Status ..... : Passed
   Boot Sector Code Revision ...      :6, Build ID: RIET62A
   Main Application Code Revision     :4, Build ID: ILET15A

System Management Processor Communication : Passed
-> Built in Self Test Status ..... : Passed
   Boot Sector Code Revision ...      :6, Build ID: WMICT60A
   Main Application Code Revision     :4, Build ID: WMXT57A

```

4. Use the up and down arrow keys to select the device you want to look at in more detail. Press **Enter**. You will see a list of tests and results on the device:

Current System Management Processor Status

```

Current BIST Results:
SRAM Memory Test:                Passed
Serial Port 1 Test :              Passed
Serial Port 2 Test:              Passed
NVRAM Memory Test                Passed
Realtime Clock Test              Passed
Programmable Gate Array Test:    Passed
I2C Interface Test:              Passed
Main Application Checksum:       Passed
Boot Sector Checksum:            Passed

```

Current System Management Adapter Status

```

Current BIST Results:
SRAM Memory Test:                Passed
Serial Port 1 Test :              Passed
Serial Port 2 Test:              Passed
NVRAM Memory Test                Passed
Realtime Clock Test              Passed
Programmable Gate Array Test:    Passed
I2C Interface Test:              Passed
Main Application Checksum:       Passed
Boot Sector Checksum:            Passed
Onboard Ethernet Hardware Test:  Passed
PCI EEPROM Initialization Test:  Passed

```

5. When you are finished viewing this information, press **Esc** to return to the main option menu. Remove the CD then restart the Model 325 engine.

IBM 3534 Fibre Channel Hub Model 1RU

This section gives troubleshooting information for the IBM 3534 Fibre Channel Hub Model 1RU (hub).

Each hub port includes an LED indicator. If a problem has been detected with the port, the LED indicators provide some indication of the type of problem. Faults and problems are displayed with a yellow port indicator. The color and blink speed of each port's LED, as described in Table 12, indicates the status of each port.

Table 12. HUB front panel LED status indicators

| Indicators | Status |
|------------------------------------------|----------------------------------------------------------------------------------------|
| No light showing | No light or signal carrier (no module, no cable) for media interface LEDs. |
| Steady yellow | Receiving light or signal carrier, but attached device not yet online. |
| Slow ¹ yellow | Disabled (result of diagnostics or portDisable command). Blinks every 2 seconds. |
| Fast ² yellow | Error, fault with the port. Blinks every 1/2 second. |
| Steady green | Online (connected with device over cable) |
| Slow green | Online, but segmented (loopback cable or incompatible switch). Blinks every 2 seconds. |
| Fast green | Internal loopback (diagnostic). Blinks every 1/2 second. |
| Flickering green | Online and frames are flowing through the port. |
| Green and yellow | The port is bypassed. |
| Notes: | |
| 1. Slow - blinks at 2 second intervals | |
| 2. Fast - blinks at 1/2 second intervals | |

If a GBIC is not installed, no light shows on the LED. When a GBIC is installed and a cable is connected to a properly functioning fibre channel device, the LED indicator will be steady green. If a slow green blink is observed, it indicates the port is seeing light but cannot make a proper loop connection. This could indicate a possibly defective cable.

When frame traffic is being transferred on a port, the LED flickers fast green, showing the port is active and transferring data.

After the POST diagnostics are run, the hub power-on (ready) LED indicates that the system board diagnostics have completed successfully.

Managed hub diagnostics

The 3534 Managed Hub is designed for maintenance-free operation. When there is a suspected failure, the 3534 Managed Hub has self-diagnostic capabilities to help isolate any equipment or Fibre Channel (FC) loop failures.

The 3534 Managed Hub supports POSTs and diagnostic tests.

Verifying power-on self test (POST)

Table 13 lists the diagnostic tests that automatically run during a POST.

Table 13. Hub POST tests

| Test | Description |
|---------------------|----------------------------------------------------------------------------------------------------------------|
| Memory test | Checks the CPU RAM memory |
| Port register test | Checks the ASIC registers and SRAMs |
| Central memory test | Checks the system board SRAMs |
| CMI Conn test | Checks the CMI bus between ASICs |
| CAM test | Checks the CAM |
| Port loopback test | Checks all of the 3534 Managed Hub's hardware to ensure the frames are transmitted, looped back, and received. |

After the 3534 Managed Hub completes the POST, the indicator returns to a steady state from the blinking states shown during the tests. If a yellow indicator light is displayed, this indicates that the port failed one of the POSTs. If error conditions are encountered, they can be displayed through Telnet after the 3534 Managed Hub completes the POST.

The 3534 Managed Hub ready LED can be used to verify successful POST approximately 2 minutes after power on.

Running diagnostics

The diagnostic tests determine the status of the hub and isolate problems. You run the diagnostic tests with Telnet commands. For more information about running diagnostics, see "Appendix E. Diagnostics for the IBM 3534 Fibre Channel Hub Model 1RU (hub)" on page 121. The following tests are available:

- Hub offline (switchDisable)
- Memory test (ramTest)
- Port register test (portRegTest)
- Central memory test (centralMemoryTest)
- CMI Conn test (cmiTest)
- CAM test (camTest)
- Port loopback test (portLoopbackTest)
- Cross port test (crossPortTest)
- SpinSilk test (spinSilk)
- SRAM data retention test (sramRetentionTest)
- CMem data retention test (cmemRetentionTest)
- Hub online (switchEnable)

Attention: Offline tests are disruptive to hub operations. Do not run these tests unless you are sure that hub operation can be disrupted.

Table 14 shows the offline and online tests.

Table 14. Hub offline and online tests

| Offline tests | Offline and online tests |
|-------------------|--------------------------|
| camTest | crossPortTest |
| centralMemoryTest | ramTest |
| cmiTest | |
| cmemRetentionTest | |
| portLoopbackTest | |
| portRegTest | |
| spinSilk | |
| sramRetentionTest | |

IBM 5191 RAID Storage Controller Model 2RU

This section contains information to help you solve some of the simpler problems that you might have with the IBM 5191 RAID Storage Controller Model 2RU (storage controller). It contains the problem symptoms and error messages along with suggested actions to take to resolve the problem.

Always use the storage-management software to diagnose storage controller problems. You can use Table 15 to find solutions to problems that have definite symptoms.

Table 15. Storage controller troubleshooting

| Problem indicator | Component | Possible cause | Possible solutions |
|-------------------|---------------------------|---------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|
| Amber LED on | Drive CRU | Drive has failed | Replace the drive that has failed. |
| | Fan CRU | Fan failure | Replace the fan that has failed. |
| | RAID controller Fault LED | RAID controller has failed | If the RAID controller Fault LED is on, replace the RAID controller. |
| | Expansion port bypass LED | GBIC port empty | No corrective action is needed if the system is properly configured. |
| | | Fibre Channel cable is not attached to the expansion unit | No corrective action is needed. |
| | | No incoming signal detected | Reattach the GBIC and Fibre Channel cables. Replace input and output GBIC or cables as necessary. |
| Front panel | General system error | Indicates that a Fault LED somewhere on the storage controller has turned on. (Check for amber LEDs on CRUs.) | |

Table 15. Storage controller troubleshooting (continued)

| Problem indicator | Component | Possible cause | Possible solutions |
|-----------------------------------|------------------|------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Amber LED is on and green LED off | Power-supply CRU | Power switch is turned off or ac power failure | Turn on all power-supply power switches. |
| Amber and green LEDs on | Power-supply CRU | Power supply failure | Replace the failed power-supply CRU. |
| All green LEDs off | All CRUs | Subsystem power is off | Check that all storage-controller power cords are plugged in and the power switches are on. If applicable, check that the main circuit breakers for the rack are turned on. |
| | | AC power failure | Check the main circuit breaker and ac outlet. |
| | | Power supply failure | Replace the power supply. |
| | | Midplane failure | Have the storage controller serviced. |
| Amber LED flashing | Drive CRUs | Drive rebuild or identity is in process | No corrective action is needed. |

Table 15. Storage controller troubleshooting (continued)

| Problem indicator | Component | Possible cause | Possible solutions |
|----------------------------|-------------------|--------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| One or more green LEDs off | Power supply CRUs | Power cord unplugged or switches turned off | Make sure that the power cord is plugged in and the power-supply switches are turned on. |
| | All drive CRUs | Midplane failure | Have the midplane replaced (service technician only). |
| | Front panel | Power supply problem | Make sure that the cords are plugged in and power supplies are turned on. |
| | | Hardware failure | If any other LEDs are on, replace the midplane (service technician only). |
| | Battery | Battery failure | Replace the battery. |
| | Cache active | The cache is disabled, the cache has failed, battery failure | Use the storage-management software to enable the cache; replace the RAID controller; replace the battery |
| | Host loop | Host, managed hub, or switch is off or has failed | Check if host managed hub or switch is on. Replace attached devices that have failed. |
| | | Fibre Channel cable has failed | Ensure that the Fibre Channel cables are undamaged and properly connected. |
| | | GBIC has failed | Ensure GBIC is seated properly; replace GBIC |
| | | RAID controller has no power or has failed | Ensure that the unit is powered on. Replace RAID controller |
| | Expansion loop | Drives are improperly installed or not installed | Ensure that the drives are properly installed. |
| | | RAID controller has no power or has failed | Ensure that the unit is powered on. Replace the RAID controller. |
| | | 3542 drive failure | Replace the drive. |
| | | Externally attached expansion port device has failed | Replace the drive; replace the expansion unit GBIC or Fiber Channel cable |

Table 15. Storage controller troubleshooting (continued)

| Problem indicator | Component | Possible cause | Possible solutions |
|---------------------------------------------------------------|-------------------------------|--------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Intermittent or sporadic power loss to the storage controller | Some or all CRUs | Defective ac power source or partially plugged-in power cord | Check the ac power source. Reseat all installed power cables and power supplies. If applicable, check the power components. Replace defective power cords. |
| | | Power supply has failed | Check for a Fault LED on the power supply, and replace the failed CRU. |
| | | Midplane has failed | Have the midplane replaced (service technician only). |
| Unable to access drives | Drives and Fibre Channel loop | Fibre Channel cabling has failed. | Ensure that the Fibre Channel cables are undamaged and properly connected. |
| | | RAID controller has failed | Replace the RAID controller. |
| | | GBIC has failed | Ensure GBIC is seated properly; replace GBIC. |
| Random errors | Subsystem | Midplane has failed | Have the midplane replaced (service technician only). |

IBM 5192 Network Attached Storage Storage Unit Model 1RU

This section contains information to help you solve some of the simpler problems that you might have with the IBM 5192 Network Attached Storage Storage Unit Model 1RU (storage unit).

You can use Table 16 on page 87 to find solutions to problems that have definite symptoms. Refer to your system management software documentation for additional information.

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

Table 16. Storage unit troubleshooting table

| Problem Indicator | Component | Possible Cause | Possible Solutions |
|--------------------------------|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| Amber LED on | Drive CRU | Drive failure | Replace failed drive. |
| | Fan CRU | Fan failure | Replace failed fan. |
| | ESM board Over-temperature LED | Subsystem is overheated | Check fans for faults. Replace failed fan if necessary. |
| | | Environment too hot | Check the ambient temperature around the expansion unit. Cool as necessary. |
| | | Defective LED or hardware failure | If you cannot detect a fan failure or overheating problem, replace the ESM board. |
| | ESM board Fault LED | ESM board failure | Replace ESM board. Refer to your controller documentation for details. |
| | ESM board Bypass LED | GBIC port empty | No corrective action needed if system is properly configured. |
| | | ESM board failure | If the ESM board Fault LED is lit, replace the ESM board. |
| | | No incoming signal detected | Reattach the GBIC and Fibre Channel (FC) cables. Replace input and output GBIC or cables as necessary. |
| | Front panel | General machine fault | Indicates that a Fault LED somewhere on the expansion unit has been turned on. (Check for amber LEDs on CRUs). |
| GBIC transmit fault | | Check that the CRUs are plugged in properly. If no amber LEDs are lit on the CRUs, this indicates a GBIC transmission fault in the expansion unit. Have the failed GBIC replaced (service technician only). | |
| Amber LED on and green LED off | Power supply CRU | Power switch is turned off or ac power failure | Turn on all power supply power switches. |
| Amber and green LEDs on | Power supply CRU | Power supply failure | Replace failed power supply CRU. |

Table 16. Storage unit troubleshooting table (continued)

| Problem Indicator | Component | Possible Cause | Possible Solutions |
|-----------------------------------------------------------|-------------------|--------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| All green LEDs off | All CRUs | Subsystem power is off | Check that all expansion unit power cords are plugged in and the power switches are on. If applicable, check that the main circuit breakers for the rack are turned on. |
| | | ac power failure | Check the main circuit breaker and ac outlet. |
| | | Power supply failure | Replace the power supply. |
| | | Midplane failure | Have the expansion unit serviced. |
| Amber LED flashing | Drive CRUs | Drive rebuild or identity is in process | No corrective action needed. |
| One or more green LEDs off | Power supply CRUs | Power cord unplugged or switches turned off | Make sure the cord is plugged in and the switches are turned on. |
| | All drive CRUs | Midplane failure | Have the midplane replaced (service technician only). |
| | Several CRUs | Hardware failure | Replace the affected CRUs. If this does not correct the problem, have the ESM boards replaced, followed by the midplane (service technician only). |
| | Front panel | Power supply problem | Make sure the cords are plugged in and power supplies are turned on. |
| | | Hardware failure | If any other LEDs are on, replace the midplane (service technician only). |
| Intermittent or sporadic power loss to the expansion unit | Some or all CRUs | Defective ac power source or partially plugged in power cord | Check the ac power source. Reseat all installed power cables and power supplies. If applicable, check the power components (power units, UPS, and so on). Replace defective power cords. |
| | | Power supply failure | Check for a Fault LED on the power supply and replace the failed CRU. |
| | | Midplane failure | Have the midplane replaced (service technician only). |

Table 16. Storage unit troubleshooting table (continued)

| Problem Indicator | Component | Possible Cause | Possible Solutions |
|-------------------------|--------------------|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Unable to access drives | Drives and FC loop | Incorrect ID settings | Ensure that the FC optical cables are undamaged and properly connected. Check the drive ID settings. Note: Change switch position only when the expansion unit is powered off. |
| | | ESM board failure | Have one or both ESM boards replaced. |
| Random errors | Subsystem | Midplane failure | Have the midplane replaced (service technician only). |

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

Chapter 8. Using the Recovery and Supplementary CDs

Attention

Changing the preloaded software configuration of this product, including applying or installing unauthorized service packs or updates to preinstalled software, or installing additional software products that are not included in either the preloaded image or on the Supplementary CD, may not be supported and could cause unpredictable results. For updated compatibility information, please see

<http://www.storage.ibm.com/support/nas>

To correct problems with a preloaded software component, back up your user and system data. Then use the Recovery CD to restore the preloaded software image.

This chapter describes the applications included on the Supplementary and Recovery CDs, and how and when you should use them.

As an alternative to using the Recovery CD, you can use the restore portion of the disaster recovery solution provided by Persistent Storage Manager (PSM) to recover the node, if you have met the requirements (including creating a PSM backup image and PSM recovery diskette). The restore function allows you to restore the node to the state it was in at the time of the PSM backup, in one step, without having to revert back to the original (factory) configuration which would require you to subsequently reconfigure clustering and other components. See "Restoring the system drive" on page 48 to determine whether you have met the requirements. If so, you can use the PSM recovery method. If you have not met the requirements for using the PSM recovery method, or if the PSM recovery fails, then you must use the Recovery CD as described in this chapter.

Using the Recovery Enablement Diskette and Recovery CD

The Recovery CD contains the preload image for your Model 325 and is used to recover the preloaded image on either node of your appliance. You must start the (failed) appliance node using the Recovery Enablement Diskette before you can boot the Recovery CD.

Attention: The Model 325 does not have a monitor, keyboard, or mouse attached to it under normal operating conditions. Because of this, you can not interact with the preload-image restore process using a monitor. Starting the Recovery CD will, without visually prompting the user, automatically destroy all data on the system drive. Use the Recovery Enablement Diskette and Recovery CD only when it is absolutely necessary to restore the preloaded system image.

To recover the preloaded image on a (failed) node, do the following steps. Note that the recovery process invalidates persistent images and leaves them in a state that is inconsistent with their pre-recovery state. So, if you plan to use the Recovery CD, it is recommended that you first delete all persistent images to ensure a clean reload of the system software.

1. On the other (working) node of the Model 325, select Cluster Administration, located in the Cluster Tools folder in the IBM NAS Admin. If prompted for a cluster name, enter the name of the cluster, and then click **Open**.

2. The cluster name appears in the left panel. Underneath it, locate the name of the failed node, right-click on the failed node machine name, and select **Evict Node**. The name of the failed node will be removed from the left pane, and the cluster will now contain only the working node of the Model 325.
3. Insert the Recovery Enablement Diskette into the diskette drive of the failed node and restart the node. When the Recovery Enablement Diskette has completed loading and modifying your node startup sequence, the node will begin a continuous beep. Do not continue with this procedure until the node begins the beep.

Important

The Recovery Enablement Diskette enables the Model 325 to start from the CD-ROM drive. You will not be able to restore the preload image from the Recovery CD without first restarting the appliance using the Recovery Enablement Diskette.

4. Remove the Recovery Enablement Diskette from the diskette drive of the failed node.
5. If you have installed more processor memory on the failed node, you will now need to attach a keyboard and display to the node to step through the menu-driven BIOS configuration program which will appear (as a result of the memory having been installed) during two of the node restarts that will take place.
6. Place the Recovery CD in the CD-ROM drive of the failed node and restart the node.
7. If you have installed more processor memory, the BIOS configuration program will now appear (you should have already attached a keyboard and display in Step 5). Click **Continue** on the first screen, then click **Continue** again, then click **Exit Setup**, and finally, click **Yes, save and exit Setup**.
8. The recovery process will begin automatically and the original manufacturing preload will be restored. After the preload image is restored, the node restarts automatically.
9. If you have installed more processor memory, the BIOS configuration program will now appear a second time (again, you should have already attached a keyboard and display in 5). Click **Continue** on the first screen, then click **Continue** again, then click **Exit Setup**, and finally, click **Yes, save and exit Setup**. You may now detach the keyboard and display from the failed node and allow the recovery process to complete automatically.

Important

- After the node restarts, a series of configuration and system preparation programs that finish configuring the node run automatically. These programs must finish running before you use any included applications (such as the IBM Advanced Appliance Configuration Utility or the Terminal Services Client) to connect to or configure your Model 325. Do not connect to or configure the node for at least 15 minutes after system restart. This notice applies only to the first time the Model 325 node is started after using the Recovery CD.
- Logical Disk 0 will be configured to have a 3GB NTFS boot partition. Any other previously configured logical disk drives, as well as the remainder of Logical Disk 0 (which, on the original hard disk drive of the node, contains the Maintenance partition, but for a replacement hard disk drive would not contain any other partitions), will be left unchanged.

10. Reinstall all software updates you had installed on the failed node since you installed the Model 325 out of the box. Or, if the Recovery CD you used in Step 5 on page 92 is a newer version than the one you received with the Model 325, reinstall only those software updates that are newer than those on the Recovery CD.
11. If you are using the recovery procedure to restore the failed node after replacing the internal hard disk drive, continue with this step. Otherwise, go to Step 8 on page 92. You must now rebuild the Maintenance (D:) partition on the new hard disk drive, as the recovery process only rebuilds the System (C:) partition.

Start Disk Management on the failed node. You can do this in one of two ways:

- Start a Terminal Services session to the node, then click the IBM NAS Admin icon, and then from the IBM NAS Administration console that appears, select Computer Management, then Disk Management.
- Start a Windows 2000 for NAS user interface session to the node, then select Disks and Volumes, then select Disks and Volumes again, and then provide your administrator user name and password when prompted.

Once Disk Management has started, do the following:

- a. In the Disk Management window, right-click on the unallocated area of Disk 0, and then click Create Partition.
- b. In the Create Partition wizard, click Next and select Primary Partition.
- c. Click Next and select D: as the drive letter.
- d. Click Next and select FAT32 as the file system and change the volume label to Maintenance.
- e. Click Finish to close the wizard.

The partition will then be formatted. Once formatting is complete, the status of the partition should appear as *Healthy*, and the other properties should appear as: name **Maintenance**, drive letter **D:**, file system *FAT32*, size (approximately) *5.9 GB*.

12. On the failed (now recovered) node, follow the procedures outlined in 3 (and described in detail in other chapters, for which the outline provides a roadmap) for configuring a joining node. The recovered node will rejoin the cluster which already contains the other (working) node. You will also need to reconfigure any cluster resource balancing you had set up prior to recovery, such that the recovered node will once again be the preferred owner of any resources for

which it had been the preferred owner prior to the recovery. See “Cluster resource balancing” on page 36 for more details on configuring resource balancing.

Using the Supplementary CD

The Supplementary CD contains documentation and copies of key software applications that are preinstalled on your Model 325. Table 17 includes the names of the directories found on the Supplementary CD and a description of the contents of the directory.

Table 17. Supplementary CD directories

| Directory Name | Contents |
|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| IBM Advanced Appliance Configuration | IBM Advanced Appliance Configuration console and agent installation files. The IBM Advanced Appliance Configuration agent is preinstalled as a Windows Powered service on the Model 325. To install the Advanced Appliance Configuration console, run setup.bat from the x:\IBM Advanced Appliance Configuration directory, where x is the drive letter assigned to your CD-ROM drive. |
| DiskImages | Self-extracting diskette images for the Recovery Enablement Diskette (RecovDsk.exe) . To make a diskette, run the executable file and insert HD 1.44 floppy diskette into drive A: when prompted. Be sure to read the readme!.txt file located in this directory for last minute and model specific updates. |
| I386 | Windows Powered installation files. If you add device drivers, OS features, and so on, you may be prompted to insert your Windows Powered CD-ROM. If so, insert the Supplementary CD, and specify path x:\i386 where x is the drive letter assigned to your CD-ROM drive. |
| Services for UNIX 2.0 | SFU 2.0 installation files. If you add features that are not preloaded, you will be prompted for this CD. |
| Terminal Services Client | The stand-alone Win32 Terminal Services Client application. The Model 325 appliance supports Web-based terminal services, so this is an optional installation. To install the Terminal Services Client, run setup.exe from the Disk1 subdirectory. |
| readme.txt | This is a text file that describes the contents of the Supplementary CD. |

Appendix A. Notices

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Appendix B. 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 18 lists some of these pages.

Table 18. IBM Web sites for help, services, and information

| | |
|---------------------------------------------------------------------------------------------|---------------------------|
| http://www.ibm.com | Main IBM home page |
| http://www.ibm.com/storage | IBM Storage home page |
| http://www.ibm.com/storage/support/nas | IBM NAS Support home page |

You might also want to visit the Web pages of other companies for information about other operating systems, software, and accessories. The following are some other Web sites you might find helpful:

<http://www.tivoli.com>
<http://www.cdpi.com>

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 99 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 are required for many service activities. Before you have the computer serviced, be sure to have these components attached to your computer, either directly or through a console switch.

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 Network Attached Server appliance. Also, be sure to read the information in any README files that come with your software.

Your Network Attached Server appliance 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: <http://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 Network Attached Server appliance
- 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.²

Table 19 provides the telephone numbers.

Table 19. 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 |

² Response time will vary depending on the number and complexity of incoming calls.

Table 19. Telephone numbers for warranted help and information (continued)

| | | |
|------------------------|------------------------|----------------|
| 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 |
| 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 C. 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.

Appendix D. Engine POST messages

This appendix identifies and describes POST messages that you might encounter, and gives corrective actions where applicable.

Note: The information in this appendix applies to each engine in the appliance. For example, when the text reads, “When a monitor and keyboard is attached to the appliance,” that means that a monitor and keyboard has been attached to either of the two engines.

Power-on self-test

When you turn on your Model 325, its engine performs a power-on self-test (POST) to check the operation of appliance components and some of the options installed in the appliance.

If POST finishes without detecting any problems, you will hear one long and three short beeps, when a monitor and keyboard are not attached to the appliance. When a monitor and keyboard are attached, you will hear one short beep. Any other series of beeps indicates a problem, and an error message appears on your screen. See “POST beep code descriptions” for more information.

POST beep code descriptions

Beep codes are sounded in a series of beeps. For example, a 1-2-4 beep code sounds like one beep, a pause, two consecutive beeps, another pause, and four more consecutive beeps.

The possible types of beep codes that your appliance might emit include the following:

No beeps

If no beep occurs after your appliance completes POST (that is, after the system POST complete (OK) light on the operator information panel is illuminated), call for service.

Continuous beep

The recovery enablement disk has booted, your startup (boot) microprocessor has failed, or your system board or speaker subsystem might contain a failing component. If the system continues through POST with no errors, call for service. If no video appears, the startup processor has failed; replace the startup processor.

One short beep

When a monitor and keyboard is attached to the appliance, one beep indicates that your appliance successfully completed POST. POST detected no configuration or functional errors. One beep also occurs after your appliance completes POST if you enter an incorrect power-on password.

Two short beeps

POST encountered an error. The Configuration/Setup Utility program will display additional information; follow the instructions that appear on the screen. See “POST error messages” on page 106 for descriptions of the text messages that might appear.

Three short beeps

A system memory error has occurred. This combination occurs only if the video Basic Input/Output System (BIOS) cannot display the error message. Replace the failing memory module.

Repeating short beeps

The system board might contain a failing component, your keyboard might be defective, or a key on the keyboard might be stuck. Ensure that:

1. Nothing is resting on the keyboard and pressing a key.
2. No key is stuck.
3. The keyboard cable is connected correctly to the keyboard and to the correct connector on the appliance.

Running the diagnostic tests can isolate the appliance component that failed, but you must have your system serviced. If the error message remains, call for service.

Note: If you just connected a new mouse or other pointing device, turn off the appliance and disconnect that device. Wait at least 5 seconds; then, turn on the appliance. If the error message goes away, replace the device.

One long and one short beep

POST encountered an error on a video adapter. If you are using the integrated video controller, call for service. If you are using an optional video adapter, replace the failing video adapter.

One long and two short beeps

A video I/O adapter ROM is not readable, or the video subsystem is defective. If you hear this beep combination twice, both the system board and an optional video adapter have failed the test. This beep combination might also indicate that the system board contains a failing component.

One long and three short beeps

This series of beeps has two meanings. The first means that the POST has completed without detecting errors, when a monitor and keyboard is not attached. However, when a monitor is attached, and you hear this series, it means the system-board video subsystem has not detected a monitor connection to the appliance. Ensure that the monitor is connected properly to the appliance. If the problem persists, replace the monitor.

Two long and two short beeps

POST does not support the optional video adapter. This beep combination occurs when you install a video adapter that is incompatible with your appliance. Replace the optional video adapter with one that the appliance supports or use the integrated video controller.

Table 20 on page 105 describes the codes and specifies the action to take.

POST beep codes

Table 20. POST beep codes

| Beep code | Description | Action | |
|-------------|-----------------------------------------------------------|-------------------|---------------------------------------------------------------------------------------------------|
| 1-1-2 | Microprocessor register test has failed. | Call for service. | |
| 1-1-3 | CMOS write/read test has failed. | | |
| 1-1-4 | BIOS ROM checksum has failed. | | |
| 1-2-1 | Programmable Interval Timer test has failed. | | |
| 1-2-2 | DMA initialization has failed. | | |
| 1-2-3 | DMA page register write/read test has failed. | | |
| 1-4-3 | Interrupt vector loading test has failed. | | |
| 2-1-1 | Secondary DMA register test has failed. | | |
| 2-1-2 | Primary DMA register test has failed. | | |
| 2-1-3 | Primary interrupt mask register test has failed. | | |
| 2-1-4 | Secondary interrupt mask register test has failed. | | |
| 2-2-1 | Interrupt vector loading has failed. | | |
| 2-2-2 | Keyboard controller test has failed. | | |
| 2-2-3 | CMOS power failure and checksum checks have failed. | | |
| 2-2-4 | CMOS configuration information validation has failed. | | |
| 2-3-2 | Screen memory test has failed. | | |
| 2-3-3 | Screen retrace tests have failed. | | |
| 2-3-4 | Search for video ROM has failed. | | |
| 2-4-1 | Screen test indicates the screen is operable. | | |
| 3-1-1 | Timer tick interrupt test has failed. | | |
| 3-1-2 | Interval timer channel 2 test has failed. | | |
| 3-1-3 | RAM test has failed above address hex 0FFFF. | | |
| 3-1-4 | Time-of-day clock test has failed. | | |
| 3-2-1 | Serial port test has failed. | | |
| 3-2-2 | Parallel port test has failed. | | |
| 3-2-3 | Math coprocessor test has failed. | | |
| 3-2-4 | Comparison of CMOS memory size against actual has failed. | | |
| 2-3-1 3-3-2 | Screen initialization has failed. I2C bus has failed. | | Turn off the appliance and then restart the appliance. If the problem persists, call for service. |
| 1-2-4 | RAM refresh verification has failed. | | Reseat the memory modules or install a memory module. If the problem persists, call for service. |
| 1-3-1 | First 64 KB RAM test has failed. | | |
| 1-3-2 | First 64 KB RAM parity test has failed. | | |
| 3-3-1 | A memory size mismatch has occurred. | | |
| 3-3-3 | No memory has been detected in the system. | | |

POST error messages

Table 21 provides information about the POST error messages that can appear during startup.

Note that these diagnostic error messages require the attachment of a monitor, keyboard, and mouse (before you power on the system) to enable you to see them.

In the following error messages, X can be any number or letter.

Table 21. POST error messages

| Error Code/Symptom | Action |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| 062 (Three consecutive boot failures using the default configuration.) | <ol style="list-style-type: none"> Run Configuration/Setup Battery System Board Processor |
| 101, 102 (System and processor error) | <ol style="list-style-type: none"> System Board |
| 106 (System and processor error) | <ol style="list-style-type: none"> System Board |
| 111 (Channel check error) | <ol style="list-style-type: none"> Failing 15A adapter Memory DIMM System Board |
| 114 (Adapter read-only memory error) | <ol style="list-style-type: none"> Failing Adapter Run Diagnostics |
| 129 (Internal cache error) | <ol style="list-style-type: none"> Processor |
| 151 (Real time clock error) | <ol style="list-style-type: none"> Run Diagnostics Battery System Board |
| 161 (Real time clock battery error) | <ol style="list-style-type: none"> Run Configuration/Setup Battery System Board |
| 162 (Device Configuration Error) Note: Be sure to load the default settings and any additional desired settings; then, save the configuration. | <ol style="list-style-type: none"> Run Configuration/Setup Battery Failing Device System Board |
| 163 (Real-Time Clock error) | <ol style="list-style-type: none"> Run Configuration/Setup Battery System Board |
| 164 (Memory configuration changed.) | <ol style="list-style-type: none"> Run Configuration/Setup DIMM |
| 175 (Hardware error) | <ol style="list-style-type: none"> System Board |
| 176 (Model 325 cover or cable cover was removed without a key being used) | <ol style="list-style-type: none"> Run Configuration/Setup System Board C2 Security Switch |
| 177, 178 (Security hardware error) | <ol style="list-style-type: none"> Run Configuration/Setup System Board |

Table 21. POST error messages (continued)

| Error Code/Symptom | Action |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 184 (Power-on password corrupted) | <ol style="list-style-type: none"> 1. Run Configuration/Setup 2. System Board |
| 185 (Drive startup sequence information corrupted) | <ol style="list-style-type: none"> 1. Run Configuration/Setup 2. System Board |
| 186 (Security hardware control logic failed) | <ol style="list-style-type: none"> 1. Run Configuration/Setup 2. System Board |
| 187 (VPD serial number not set.) | <ol style="list-style-type: none"> 1. Set serial number in Setup 2. System Board |
| 188 (Bad EEPROM CRC #2) | <ol style="list-style-type: none"> 1. Run Configuration/Setup 2. System Board |
| 189 (An attempt was made to access the server with invalid passwords) | <ol style="list-style-type: none"> 1. Run Configuration/Setup, enter the administrator password |
| 201 (Memory test error.) If the server does not have the latest level of BIOS installed, update the BIOS to the latest level and run the diagnostic program again. | <ol style="list-style-type: none"> 1. DIMM 2. System Board |
| 229 (Cache error) | <ol style="list-style-type: none"> 1. Processor |
| 262 (DRAM parity configuration error) | <ol style="list-style-type: none"> 1. Run configuration /setup 2. Battery 3. System Board |
| 289 (DIMM has been disabled by the user or system.) | <ol style="list-style-type: none"> 1. Run Configuration/Setup, if disabled by user 2. Disabled DIMM, if not disabled by user. |
| 301 (Keyboard or keyboard controller error) | <ol style="list-style-type: none"> 1. Keyboard 2. System Board |
| 303 (Keyboard controller error) | <ol style="list-style-type: none"> 1. System Board |
| 602 (Invalid diskette boot record) | <ol style="list-style-type: none"> 1. Diskette 2. Diskette Drive 3. Cable 4. System Board |
| 604 (Diskette drive error) | <ol style="list-style-type: none"> 1. Run Configuration/Setup and Diagnostics 2. Diskette Drive 3. Drive Cable 4. System Board |
| 605 (Unlock failure) | <ol style="list-style-type: none"> 1. Diskette Drive 2. Drive Cable 3. System Board |
| 662 (Diskette drive configuration error) | <ol style="list-style-type: none"> 1. Run Configuration/Setup and Diagnostics 2. Diskette Drive 3. Drive Cable 4. System Board |

Table 21. POST error messages (continued)

| Error Code/Symptom | Action |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 762 (Coprocessor configuration error) | <ol style="list-style-type: none"> 1. Run configuration setup 2. Battery 3. Processor |
| 962 (Parallel port error) | <ol style="list-style-type: none"> 1. Disconnect external cable on parallel port. 2. Run Configuration/Setup 3. System Board |
| 11XX (System board serial port 1 or 2 error) | <ol style="list-style-type: none"> 1. Disconnect external cable on serial port. 2. Run Configuration/Setup 3. System Board |
| 0001200 (Machine check architecture error) | <ol style="list-style-type: none"> 1. Processor 1 |
| 1301 (I ² C cable to front panel not found) | <ol style="list-style-type: none"> 1. Cable 2. Front Panel 3. Power Switch Assembly 4. System Board |
| 1302 (I ² C cable from system board to power on and reset switches not found) | <ol style="list-style-type: none"> 1. Cable 2. Power Switch Assembly 3. System Board |
| 1303 (I ² C cable from system board to power backplane not found) | <ol style="list-style-type: none"> 1. Cable 2. Power Backplane 3. System Board |
| 1304 (I ² C cable to diagnostic LED board not found) | <ol style="list-style-type: none"> 1. Power Switch Assembly 2. System Board |
| 1600 (The Service Processor is not functioning) Do the following before replacing a FRU: <ol style="list-style-type: none"> 1. Ensure that a jumper is not installed on J45. 2. Remove the ac power to the Model 325, wait 20 seconds; then, reconnect the ac power. Wait 30 seconds; then, power-on the Model 325. | <ol style="list-style-type: none"> 1. System Board |
| 1601 (The Model 325 is able to communicate to the Service Processor, but the Service Processor failed to respond at the start of POST.) Do the following before replacing a FRU: <ol style="list-style-type: none"> 1. Remove the ac power to the Model 325, wait 20 seconds; then, reconnect the ac power. Wait 30 seconds; then, power-on the Model 325. 2. Flash update the Service Processor. | <ol style="list-style-type: none"> 1. System Board |

Table 21. POST error messages (continued)

| Error Code/Symptom | Action |
|---------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1762 (Fixed Disk Configuration error) | <ol style="list-style-type: none"> 1. Fixed Disk Drive 2. Fixed Disk Cables 3. Run Configuration/Setup 4. Fixed Disk Adapter 5. SCSI Backplane 6. System Board |
| 178X (Fixed Disk error) | <ol style="list-style-type: none"> 1. Fixed Disk Cables 2. Run Diagnostics 3. Fixed Disk Adapter 4. Fixed Disk Drive 5. System Board |
| 1800 (No more hardware interrupt available for PCI adapter) | <ol style="list-style-type: none"> 1. Run Configuration/Setup 2. Failing Adapter 3. System Board |
| 1962 (Drive does not contain a valid boot sector) | <ol style="list-style-type: none"> 1. Verify a bootable operating system is installed 2. Run Diagnostics 3. Hard Disk Drive 4. SCSI Backplane 5. Cable 6. System Board |
| 2400 (Video controller test failure) | <ol style="list-style-type: none"> 1. Video Adapter (if installed) 2. System Board |
| 2462 (Video memory configuration error) | <ol style="list-style-type: none"> 1. Video Adapter (if installed) 2. System Board |
| 5962 (IDE CD-ROM configuration error) | <ol style="list-style-type: none"> 1. Run Configuration/Setup 2. CD-ROM Drive 3. CD-ROM Power Cable 4. IDE Cable 5. System Board 6. Battery |
| 8603 (Pointing Device Error) | <ol style="list-style-type: none"> 1. Pointing Device 2. System Board |
| 00019501 (Processor 1 is not functioning - check VRM and processor LEDs) | <ol style="list-style-type: none"> 1. VRM 1, VRM 2 2. Processor 1 3. System Board |
| 00019502 (Processor 2 is not functioning - check VRM and processor LEDs) | <ol style="list-style-type: none"> 1. VRM 2 2. Processor 2 |
| 00019701 (Processor 1 failed) | <ol style="list-style-type: none"> 1. Processor 1 2. System Board |
| 00019702 (Processor 2 failed) | <ol style="list-style-type: none"> 1. Processor 2 2. System Board |

Table 21. POST error messages (continued)

| Error Code/Symptom | Action |
|--------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 00180100 (No room for PCI option ROM) | <ol style="list-style-type: none"> 1. Run Configuration/Setup 2. Failing Adapter 3. System Board |
| 00180200 (No more I/O space available for PCI adapter) | <ol style="list-style-type: none"> 1. Run Configuration/Setup 2. Failing Adapter 3. System Board |
| 00180300 (No more memory (above 1MB for PCI adapter) | <ol style="list-style-type: none"> 1. Run Configuration/Setup 2. Failing Adapter 3. System Board |
| 00180400 (No more memory (below 1MB for PCI adapter) | <ol style="list-style-type: none"> 1. Run Configuration/Setup 2. Move the failing adapter to slot 1 or 2 3. Failing Adapter 4. System Board |
| 00180500 (PCI option ROM checksum error) | <ol style="list-style-type: none"> 1. Remove Failing PCI Card 2. System Board |
| 00180600 (PCI to PCI bridge error) | <ol style="list-style-type: none"> 1. Run Configuration/Setup 2. Move the failing adapter to slot 1 or 2 3. Failing Adapter 4. System Board |
| 00180700, 00180800 (General PCI error) | <ol style="list-style-type: none"> 1. System Board 2. PCI Card |
| 01295085 (ECC checking hardware test error) | <ol style="list-style-type: none"> 1. System Board 2. Processor |
| 01298001 (No update data for processor 1) | <ol style="list-style-type: none"> 1. Ensure all processors are the same stepping level and cache size. 2. Processor 1 |
| 01298002 (No update data for processor 2) | <ol style="list-style-type: none"> 1. Ensure all processors are the same stepping level and cache size. 2. Processor 2 |
| 01298101 (Bad update data for processor 1) | <ol style="list-style-type: none"> 1. Ensure all processors are the same stepping level and cache size. 2. Processor 1 |
| 01298102 (Bad update data for processor 2) | <ol style="list-style-type: none"> 1. Ensure all processors are the same stepping level and cache size. 2. Processor 2 |
| I9990301 (Fixed boot sector error) | <ol style="list-style-type: none"> 1. Hard Drive 2. SCSI Backplane 3. Cable 4. System Board |
| I9990305 (Fixed boot sector error, no operating system installed) | <ol style="list-style-type: none"> 1. Install operating system to hard drive. |

Table 21. POST error messages (continued)

| Error Code/Symptom | Action |
|----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| I9990650 (AC power has been restored) | <ol style="list-style-type: none"> 1. Check cable 2. Check for interruption of power supply 3. Power Cable |

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 Netfinity Advanced System Management Processor.

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

POST diagnostic programs

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 program error messages indicate that a problem exists; they are not intended to be used to identify a failing part. Troubleshooting and servicing of complex problems that are indicated by error messages should be performed by trained service personnel. For a list of error messages and associated actions that you can take, see Table 21 on page 106.

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.

The following sections contain the error codes that might appear in the detailed test log and summary log when running the diagnostic programs.

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. (These codes are for trained service personnel and are described in the *Hardware Maintenance Manual*.)

iii is the three-digit device ID. (These codes are for trained service personnel and are described in the *Hardware Maintenance Manual*.)

date is the date that 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 be one of the following:

Passed

The diagnostic test has completed without any errors.

Failed The diagnostic test has discovered an error.

User Aborted

You stopped the diagnostic test before it is 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 is to be tested is not installed.

Test Specific String

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

Starting the diagnostic programs

To start the diagnostic programs:

1. Ensure you have connected a monitor, keyboard, and mouse to your Model 325.

Notes:

- a. When you *do not* have a monitor, keyboard, and mouse attached and the Model 325 engine passes POST, one long and three short beeps sound.
 - b. When you *have* a monitor, keyboard, and mouse attached and the Model 325 engine passes POST, one beep sounds. If the Model 325 fails POST, a series of beeps sound (see "POST beep code descriptions" on page 103 for more details) and an error message appears on the monitor screen.
2. Power on the Model 325 and watch the screen.
 3. When the message F2 for Diagnostics appears, press **F2**. If a POST error is encountered, a series of beeps sound and an error message appears on the monitor screen.
 4. Type in the appropriate password; then, press **Enter**. If a system error is encountered, the Configuration/Setup screen appears. Press **Esc** to start the Diagnostic program.

Note: To run the diagnostic programs, you must start the Model 325 with the highest level password that is set. That is, if an administrator password is set, you must enter the administrator password, not the power-on password, to run the diagnostic programs.

5. Select either **Extended** or **Basic** from the top of the screen. (*PC-Doctor 2.0* with a copyright statement appears at the bottom of this screen.)
6. When the Diagnostic Programs screen appears, select the test you want to run from the list that appears; then, follow the instructions on the screen.

Notes:

- a. Press **F1** while running the diagnostic programs to obtain Help information. Also press **F1** from within a help screen to obtain online documentation from which you can select different categories. To exit Help and return to where you left off, press **Esc**.
- b. If the Model 325 engine stops during testing and you cannot continue, restart the Model 325 engine and try running the diagnostic programs again.
- c. If you run the diagnostic programs with either no mouse or a USB mouse attached to your Model 325 engine, you will not be able to navigate between test categories using the **Next Cat** and **Prev Cat** buttons. All other functions provided by mouse-selectable buttons are also available using the function keys.
- d. You can test the USB keyboard by using the regular keyboard test. The regular mouse test can test a USB mouse. Also, you can run the USB hub test only if there are no USB devices attached.
- e. You can view Model 325 engine 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 screen.
- f. You cannot use the diagnostics program to test adapters. Use the procedure outlined in "Running adapter diagnostics" on page 77.

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

If the hardware checks out OK but the problem persists during normal Model 325 operations, a software error might be the cause. If you suspect a software problem, refer to the information that comes with the software package.

Viewing the test log

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

Note: If you already are running the diagnostic programs, begin with step 4

To view the test log:

1. Ensure a monitor, keyboard, and mouse is connected to the Model 325.
2. Power on the Model 325 engine and watch the screen.
If the Model 325 engine is on, shut down your operating system and restart the engine.
3. When the message F2 for Diagnostics appears, press **F2**.
If a power-on password or administrator password is set, you will be prompted for it. Type in the appropriate password, then press **Enter**.
4. When the Diagnostic Programs screen appears, select **Utility** from the top of the screen.
5. Select **View Test Log** from the list that appears; then, follow the instructions on the screen.

The system maintains the test-log data while the Model 325 is powered on. When you power off the power to the Model 325, the test log is cleared.

Diagnostic error message tables

Table 22 describes the error messages that might appear when you run the diagnostic programs.

Important: If diagnostic error messages appear that are not listed in Table 22, make sure that your appliance has the latest levels of BIOS, Advanced System Management Processor, and diagnostics microcode.

Table 22. Diagnostic error messages

| Code | Function | Result | Text message | Action |
|------|----------------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 001 | Core system | Failed | Processor board, ECC Test | Call for service. |
| | | | System board | |
| 005 | Video port | | Processor and system boards | |
| 011 | Serial port | | Integrated serial port | |
| 014 | Parallel port | | Integrated parallel port | |
| 015 | USB interface | Aborted | Can not test USB interface while it is in use. Note: If you have a USB keyboard or mouse attached, you cannot run the diagnostic program for the USB interface. | <ol style="list-style-type: none"> 1. Turn off the appliance. 2. Replace the USB keyboard and mouse with a standard keyboard and mouse. 3. Turn on the appliance. 4. Run the diagnostic test again. |
| | | Failed | System board | Call for service. |
| 020 | PCI interface | Failed | System board | Call for service. |
| | | | Tab on PCI Hot Swap slot number <i>n</i> is bad (where <i>n</i> is the number of the failing PCI slot) Note: For normal operation, the Power LED for the hot-plug PCI slot will be on and the Attention Led will be off. | <p>Make sure the tab and latch on hot-plug PCI slot <i>n</i> are closed correctly.</p> <p>If the problem persists, call for service.</p> |
| 030 | SCSI interface | Failed | SCSI adapter in slot <i>n</i> failed register/counter/power test (where <i>n</i> is the slot number of the failing adapter) | <p>Refer to the information provided with the adapter for instructions.</p> <p>If the problem persists, call for service.</p> |
| | | | SCSI controller on system board failed register/counter/power test | Call for service. |
| | | | Logical drive on system board adapter | |
| 075 | Power supply | Failed | Voltage sensed by the system is out of range | Call for service. |

Table 22. Diagnostic error messages (continued)

| Code | Function | Result | Text message | Action |
|------|----------------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 089 | Microprocessor | Failed | Invalid microprocessor in slot xyz or BIOS setup problem (where xyz identifies the microprocessor that is causing the error message) | <ol style="list-style-type: none"> 1. Check the system error log for the related error messages. 2. If your appliance does not have the latest level BIOS installed, update the BIOS. |
| | | | Processor in socket id xyz is installed but not functioning (where xyz identifies the microprocessor that is causing the error message) | |
| | | | Microprocessor in socket id xyz (where xyz identifies the microprocessor that is causing the error message) Note: The microprocessor error LED associated with the microprocessor will be lit. | <ol style="list-style-type: none"> 1. Reseat the microprocessor. 2. If the problem remains, replace the microprocessor. <p>If the problem persists, call for service.</p> |
| | | | Processor in socket id xyz is defective (where xyz identifies the microprocessor that is causing the error message) | <p>Replace the microprocessor.</p> <p>If the problem persists, call for service.</p> |

Table 22. Diagnostic error messages (continued)

| Code | Function | Result | Text message | Action |
|------|-------------------|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 089 | Microprocessor | Failed | Test setup error: Application microprocessor not installed or BIOS setup problem | <ol style="list-style-type: none"> 1. Verify that the Application microprocessor is installed and seated correctly. 2. Check the system error log for related error messages. 3. If your appliance does not have the latest level BIOS installed, update the BIOS. 4. If the problem remains, replace the application microprocessor and run the test again. <p>If the problem persists, call for service.</p> |
| | | | VRM corresponding to Microprocessor in socket xyz is defective (where xyz identifies the microprocessor whose VRM is causing the error message) | <p>Replace the VRM.</p> <p>If the problem remains, call for service.</p> |
| | | | VRM corresponding to Microprocessor in socket id xyz is not installed (where xyz identifies the microprocessor whose VRM is causing the error message) | <p>Install a VRM.</p> <p>If the problem persists, call for service.</p> |
| 165 | Service processor | Failed | Netfinity Advanced System Management Processor on system board | Call for service. |
| 175 | System thermal | Failed | Fan number <i>n</i> (where <i>n</i> is the number of the failing fan) Note: The fan LED on the diagnostic LED panel will be lit. | Replace the indicated fan |
| | | | Temperature sensed on processor board is out of range | If one of the fan LEDs on the diagnostic LED panel is on, replace the indicated fan. If the problem persists, call for service. |
| 180 | Status display | Failed | Diagnostic LED panel | Call for service. |
| | | | Operator information panel | |
| | | | LED on hot-swap SCSI backplane | |
| | | | LED on processor board | |
| | | | LED on system board | |

Table 22. Diagnostic error messages (continued)

| Code | Function | Result | Text message | Action |
|------|---------------|--------|--------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 201 | System memory | Failed | DIMMs in location DIMM <i>n</i> (where <i>n</i> is the number of the socket that contains the failing DIMM) | <ol style="list-style-type: none"> 1. Reseat the failing DIMM. 2. If the problem remains, replace the DIMM. <p>If the problem persists, call for service.</p> |
| | | | Test setup error: Corrupt BIOS in ROM | If your appliance does not have the latest level BIOS installed, update the BIOS to the latest level. |
| | | | Test setup error: Corrupt DMI BIOS, information in BIOS is not as expected | If the problem persists, call for service. |

Table 22. Diagnostic error messages (continued)

| Code | Function | Result | Text message | Action |
|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 202 | System cache | Aborted | Test setup error: BIOS cannot access VPD information | If your appliance does not have the latest level BIOS installed, update the BIOS to the latest level and run the diagnostic program again. If the problem persists, call for service. |
| | | | Test setup error: Corrupt DMI BIOS. Information in BIOS is not as expected | |
| | | | Test setup error: No L2 cache detected on microprocessor socket id xyz or BIOS setup problem (where xyz identifies the microprocessor that is causing the error message) | <ol style="list-style-type: none"> 1. If your appliance does not have the latest level BIOS installed, update the BIOS to the latest level 2. Run the diagnostic program again. 3. If the problem remains, replace the failing processor. If the problem persists, call for service. |
| | | Test setup error: Unknown hardware problem associated with microprocessor in socket id xyz. (where xyz identifies the microprocessor that is causing the error message) | | |
| Failed | Microprocessor in socket ID xyz (where xyz identifies the microprocessor that is causing the error message) Note: The indicated microprocessor LED will be on. | <ol style="list-style-type: none"> 1. Reseat the identified microprocessor. 2. If the problem remains, replace the microprocessor. If the problem persists, call for service. | | |
| Warning | Test setup error: Cache is disabled. Use system setup to enable before retrying the test | Use the Cache Control choice from the Advanced Setup menu to enable the cache. If the problem persists, call for service. | | |
| 206 | Diskette drive | Failed | Internal diskette drive bay | Call for service. |
| 215 | CD-ROM | Aborted | The CD-ROM drive is not present. | Verify that the cables are properly connected to the CD-ROM drive. If the problem persists, call for service. |
| | | Failed | On system board. | Call for service. |
| 217 | Hard disk drive | Failed | BIOS drive number <i>n</i> (where <i>n</i> is the drive bay number) | Call for service. |

Table 22. Diagnostic error messages (continued)

| Code | Function | Result | Text message | Action |
|------|---------------|--------|--------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 301 | Keyboard | Failed | On system board keyboard test failed | <ol style="list-style-type: none"> 1. Verify that the keyboard cable is connected. 2. If the problem remains, replace the keyboard cable. <p>If the problem persists, call for service.</p> |
| 302 | Mouse | Failed | On system board pointing device test failed. | Replace the pointing device. If the problem persists, call for service. |
| 305 | Video monitor | | Any message | Refer to the information that came with the monitor. |
| 405 | Ethernet | Failed | In PCI slot <i>n</i> (where <i>n</i> is the PCI slot number in which the failing Ethernet adapter is installed) | Replace the Ethernet adapter in slot <i>n</i> . If the problem persists, call for service. |
| | | | On system board | Call for service. |

Appendix E. Diagnostics for the IBM 3534 Fibre Channel Hub Model 1RU (hub)

This appendix provides diagnostic information for the hub.

Note: Throughout this section, the term *switch* refers to switches and hubs unless otherwise noted.

General information

The hub is designed for maintenance-free operation. When there is a suspected failure, the hub has self-diagnostic capabilities to aid in isolating any equipment or fabric failures.

The hub supports power-on self-tests (POSTs) and diagnostic tests. The diagnostic tests determine the status of the hub and isolate problems.

Telnet commands are used to determine the status of the hub, error conditions, and hub operating statistics. A Telnet session can be established from the IBM StorWatch SAN Fibre Channel Managed Hub Specialist. The same Telnet commands can also be issued using the service terminal connected to the serial port.

Attention: Many of the diagnostic tests are disruptive to hub operation. Read the information on each diagnostic before beginning a test or procedure.

Isolating a system fault

Various loopback paths are built into the hub hardware for diagnostic purposes. A loopback path test within the hub verifies the proper internal fibre-channel port logic functions and the paths between the interfaces and central memory.

Diagnostics also supports external loops that include the system board and the GBIC module in cross-port configurations. These port-to-port diagnostics allow you to check installed fiber cables and perform port fault isolation.

Removing power

After all data transferring processes external to the hub are completed, removing power from the hub does not disrupt the fabric.

Note: Error messages are stored in random access memory (RAM) and are lost when power is removed from the hub. Access the error message log to view, and note any error messages before removing power from the hub.

Service actions for error messages

See "Error messages" on page 129 for error message descriptions and the appropriate service actions.

Running diagnostics on the hub

There are three methods to access the hub for running diagnostics. All methods involve the use of Telnet commands and differ only in the initial login requirement and the access level given to the user.

Attaching to the serial port while the hub is off

1. If you can attach your service terminal to the hub before turning it on, you are automatically logged on as the administrator ID and can issue all diagnostic commands. You can watch the progress of the POST diagnostics as they are posted to your service terminal.
2. If you can attach this way, attach your service terminal to the serial port on the front of the hub and start a terminal emulation session on your service terminal.
3. Start up the hub by plugging the power cord into an electrical outlet.
4. As the hub executes a POST, you will see the results posted.
5. When the hub has completed POST, you are logged on as administrator. The hub leaves the terminal session open. Press Enter. The hub responds with:
Admin>
6. You can perform any of the diagnostics described in this section by typing the appropriate command. The hub shows the results as the diagnostic progresses.

Attaching to the serial port while the hub is on

1. If the hub is on, you can attach your service terminal, login, and run most diagnostics. However, you need to get an administrator username and password recognized by the hub from the system administrator.
2. After you get an administrator username, stop any Ethernet session active on the Ethernet port.
3. Attach your service terminal to the serial port on the hub. The Ethernet port and the serial port are mutually exclusive.
4. On your service port type:
Login *username* (the username you were given)

The hub responds:
Password:
5. Type in the password you were given. The password does not display as you type it in. The hub responds:
Username>

You can now type any diagnostic command and observe the results as they are logged to your service terminal.

Running diagnostics from a Telnet session on the Ethernet

The easiest way to run diagnostics is through a LAN-attached server that can access the hub Ethernet port.

You need to get an administrator-level username and password from the system administrator, as well as the hub IP address or name.

When you have the IP address, administrator-level username, and password, do the following:

1. Go to the server having LAN access and, in an open window, type:
Telnet *Ipaddress* or *name* (the hub IP address or name you were given by the system administrator)
2. Type the username you were given and press Enter. The hub responds:
Ipaddress password:
3. Type the password you were given. The hub responds:
Username>

You can now run any of the diagnostics and observe the results as the hub displays them in your Telnet session.

Power-on self tests

Table 23 lists the diagnostic tests that are automatically run during POST.

Table 23. Hub POST diagnostic tests

| Test | Brief description |
|---------------------|------------------------------------------------------------------------------------|
| Memory test | Checks CPU RAM memory. |
| Port register test | Checks the ASIC registers and SRAMs. |
| Central memory test | Checks the system board SRAMs. |
| CMI conn test | Checks the CMI bus between ASICs. |
| CAM test | Checks the CAM. |
| Port loopback test | Checks all of the hub hardware: frames are transmitted, looped back, and received. |

POST runs differently depending on the startup method. A power cycle (disconnecting from power and reconnecting to power) is considered a cold start. All other starts from a powered-on state (such as restart or panic) are considered warm starts.

From a cold start condition, executing a POST runs the long version of ramTest. From a warm start condition, executing a POST runs a shorter version of ramTest. The start time with POST varies depending on the startup method.

A hub that is restarted with POST disabled generates the DIAG-POST_SKIPPED error log message.

Diagnostic commands

All commands are case sensitive and must be entered exactly as shown.

These tests are available from the Telnet session or from the service terminal connected to the local serial port. In the following list, the test name is followed by the command used to run the test. "Diagnostic command descriptions" on page 124 provides brief descriptions of the commands.

| | |
|---------------------------------|---------------------|
| Hub offline | (switchDisable) |
| Memory test | (ramTest) |
| Port register test | (portRegTest) |
| Central memory test | (centralMemoryTest) |
| CMI conn test | (cmiTest) |
| CAM test | (camTest) |
| Port loopback test | (portLoopbackTest) |
| Cross port test | (crossPortTest) |
| Spin silk test | (spinSilk) |
| SRAM data retention test | (sramRetentionTest) |
| CMem data retention test | (cmemRetentionTest) |

Hub online (switchEnable)

Simultaneously press **Ctrl+C** and **Enter** to quit, continue, view stats, or log test results. When you press **Ctrl+C** and **Enter**, you receive the message:

Diags: (Q)uit, (C)ontinue, (S)tats, (L)og

- Enter Q to quit the diagnostic test
- Enter C to continue testing
- Enter S to view statistics
- Enter L to save results

See Table 14 on page 82 for a list of the available offline and online tests. See “Error messages” on page 129 for error message descriptions and the appropriate service actions.

Attention: All offline diagnostics are disruptive to hub operations. Before attempting these diagnostic tests or procedures, make sure that the entire hub is available.

Diagnostic command descriptions

camTest Verifies that the SID translation required by QuickLoop and implemented using content addressable memories (CAM) are functioning correctly.

centralMemoryTest

Checks the central memory in each ASIC as follows:

- The built-in self-repair (BISR) circuit in each ASIC chip does not report failure to repair bad cells (bISR test).
- The data cells can be uniquely written and read correctly (data write/read test).
- The data in any one ASIC can be read from any other ASIC (asic-asic test).
- Bad parity can be detected and flagged in the error register and interrupt posted (parity error test).
- Buffer number error can be detected and flagged in the error register and interrupt posted (buffer number error test).
- Chip number error can be detected and flagged in the error register and interrupt posted (chip number error test).

cmemRetentionTest

Verifies that:

- Data written into the SRAMs that make up the central memory are retained
- Data bits do not drop when read after some amount of delay since the write

cmiTest Verifies that control messages can be correctly sent from any ASIC to any ASIC. It also tests that the checksum check is OK.

crossPortTest

Verifies the intended functional operation of the hub. The `crossPortTest` command sends frames from each port's transmitter using the GBIC, the imbedded optics, and the external cable back to another port's receiver. It exercises the entire path of the hub.

The command has two parameters:

- *nFrames* specifies the number of frames to run. If you omit this parameter, the test runs until you press **Enter**.

- *0* or *1* specifies whether a single port looped back to itself is allowed. *0*, the default, does not allow this. *1* does allow this.

A port can be connected to any port in the same hub provided the connection is of the same technology. For example, this means that SWL ports are connected to SWL ports and LWL ports are connected to LWL ports.

Note: All ports on the hub must be connected if GBIC mode is disabled, or else the hub shows an error condition. When running the cross port test, you must set the operating mode value to 0 or 1. Modes 2 and 3 do not send out the extended link parameters (ELP) used to discover switches and hubs. If the ELP is not sent, the hub does not know the port is connected to another port on the same hub and the test fails.

This command behaves differently according to the modes activated as follows:

switchEnable or switchDisable mode

- Online mode

In the online mode, where the hub is enabled prior to executing the test, it only tests ports that are cable-loopbacked to ports in the same hub. Ports connected outside of the hub under test are ignored. To run, the test must find:

- at least one port (if singlePortAlso mode is active)
- two ports (if singlePortAlso mode is not active [default]) cable-loopbacked to each other.

If this criteria is not met, the test displays the following message in the Telnet shell:

```
Need at least 1 port(s) connected to run this test.
```

or

```
Need at least 2 port(s) cross-connected to run this test.
```

- Offline mode

In the offline mode, where the hub is disabled prior to executing the test, it tests and expects that all ports are cable loopbacked to similar ports in the same hub. If one or more ports are found not connected, it aborts the test.

The test determines which port is connected to which port by transmitting frames. As such, if any pair of ports are not properly connected for various reasons (improperly seated GBICs or cables, bad GBICs or cables, or improper connection of SWL to LWL, and so on), the test ends with the following message in the Telnet shell:

```
One or more ports is not active, please double-check fibres on all ports.
```

singlePortAlso mode

The singlePortAlso mode is specified by executing the crossPortTest command with the second argument a value of 1 as follows:

```
sw:admin> crossPortTest 0, 1
```

In this mode, `crossPortTest` allows a port to be cable-loopbacked to itself (port M is connected to port M) in addition to the cross connection supported (port M is connected to port N). This can be used to isolate bad ports.

GBIC mode

Note: Ensure that you reset GBIC mode before returning the hub to normal operation.

The GBIC mode is activated by executing the following command prior to executing the `crossPortTest` command:

```
sw:admin> setGbicMode 1
```

When activated, only ports with a GBIC or imbedded optics present are included in the `crossPortTest` list of ports to test. For example, if GBIC mode is activated:

- Ports 0 - 6 (which have imbedded optics) are always included in the testing
- Port 7 is only included if a GBIC is plugged into Port 7.

The state of the GBIC mode is saved in flash. It stays activated (even after restarts or power on and off cycles) until it is disabled as follows:

```
sw:admin> setGbicMode 0
```

An example mode of operation would be to disable the hub, set the GBIC mode to 1, and execute the `crossPortTest` command with `singlePortAlso` activated. The `crossPortTest` would then limit its testing to:

- All ports with GBIC and embedded optics present
- All ports with GBIC and embedded optics present and properly cable loopbacked
- Allow ports to be connected to itself (single port connections).

Note: If a GBIC is failing severely, such that the `crossPortTest` cannot determine if a GBIC is even installed, that port is not tested, and is not reported as failing. Therefore, it is important to make sure that testing occurs on all the ports that are intended. This can be done by observing the screen messages from the `crossPortTest`.

diagClearError

Clears diagnostic errors detected on a specified port. If you do not include the `port #` parameter, all errors are cleared.

diagDisablePost

Disables POST processing. The start up time without POST processing is approximately 50-55 seconds for warm or cold starts. A hub restarted without POST generates the `DIAG-POST_SKIPPED` error.

Note: IBM recommends that POST processing always be executed to ensure the operational status of the hub during the start up stage.

diagEnablePost

Enables POST processing. The choice remains in effect across power on and off cycles until toggled by the user. The start up time with POST processing is approximately 110-120 seconds for a warm POST and 165:175 seconds for a cold POST. The factory default enables POST processing.

diagShow

Summarizes the diagnostic results since the hub was last started up, including POST results.

The diagShow command also allows you to loop on the command. For example,

```
diagShow 4
```

executes diagShow every 4 seconds, continuously, unless stopped by pressing **Enter**. This may be used to isolate a bad GBIC. A port with a changing LLI_errs value is prefixed by ** in the display.

portLoopbackTest

Verifies the intended functional operation of the hub by sending frames from each port's transmitter back to the same port's receiver through an internal hardware loopback. It tests the hub circuitry up to the serial output of the ASIC.

portRegTest

Checks each register and static memory located on the system board. Registers are set under firmware control and are used to control the hardware route selection and other internal hardware functions.

The loopback point chosen by this command depends on what kind of GBIC module is present. If a GBIC other than an optical SWL or LWL GBIC is present, the test loops back only at the input (rather than the output) of the serial link. Copper and unknown GBIC types fall within this category. On the hub, Ports 0 - 6 are all treated as if a SWL GBIC is present.

If you do not include the *nFrames* parameter (specifying the number of frames) when you issue the command, the loopback test runs continuously until you press **Enter** again. If the test does not find an error, there is no output. You can choose to continue the test, view statistics, or view an error log.

ramTest

Checks CPU RAM memory. This test validates proper memory function.

setGbicMode

Forces crossPortTest or spinSilk to limit its testing to only those ports whose GBICs or imbedded optics are detected present. Entering the command with the *1* parameter enables GBIC mode. Entering the command with the *0* parameter disables GBIC mode.

spinSilk

Verifies the intended functional operation of the hub by sending frames from the transmitter of each port through the GBIC, the imbedded optics and external cable, and back to another port's receiver at the full hardware speed of 1 GB per second. It exercises the entire path of the hub.

Because the CPU is not comparing data on each frame as with the other two frame tests, the DIAG-DATA error is never reported during spinSilk. However, the other error messages defined for crossPortTest and their corresponding probable causes and actions are applicable to spinSilk.

The operation of spinSilk is affected by the state of the GBIC mode. The GBIC mode is activated by executing the following command prior to executing the spinSilk command:

```
sw:admin> setGbicMode 1
```

When activated, only ports with a GBIC or embedded optics present are included in the spinSilk list of ports to test. For example, if GBIC mode is activated, ports 0 - 6, which have imbedded optics, are always included in the testing. Port 7 is only included if a GBIC is plugged into it.

The state of the GBIC mode is saved in flash. It stays activated (even after restarts or power on and off cycles) until it is disabled as follows:

```
sw:admin> setGbicMode 0
```

An example mode of operation would be to disable the hub, set the GBIC mode to 1, and execute the spinSilk command which would limit its testing to:

- All ports with GBIC and embedded optics present.
- All ports with GBIC and embedded optics present properly cable-loopbacked.

Note: When running the spinSilk test, you must set the operating mode value to 0 or 1. Modes 2 and 3 do not send out the ELP used to discover switches and hubs. If the ELP is not sent, the hub does not know the port is connected to another port on the same hub and the test fails. Using operating mode 0 when running spinSilk is preferred.

If you do not include the *nMillions* parameter (the number of frames for the test to execute, in millions of frames), the spinSilk test runs until you press **Enter**.

sramRetentionTest

Verifies that:

- Data written into the ASIC memories are retained
- Data bits do not drop when read after some amount of delay since the write

supportShow Prints the hub information for debugging purposes. supportShow executes the following commands in the order shown:

- version
- tempShow
- psShow
- licenseShow
- diagShow
- errDump
- switchShow
- portFlagsShow
- portErrShow
- mqShow
- portSemShow
- portShow
- portRegShow
- portRouteShow
- fabricShow

- topologyShow
- qlShow
- nsShow
- nsAllShow
- cfgShow
- configShow
- faultShow
- traceShow
- portLogDump

The command is entered with the following parameters:

- *firstPort* specifies the first port of range of ports to dump information. The default, if no operand is specified, is to print the state of port 0. If only firstPort is specified, only the information for firstPort is printed.
- *lastPort* specifies the last port of range of ports to dump information. If firstPort is specified, but lastPort is not specified, it defaults to printing firstPort only for the port-based commands (portShow, portRegShow, portRouteShow).
- *numLog* specifies the number of lines of portLogDump to print: 0 means dump all lines (default); N means dump the last N lines; <0 means skip portLogDump.

Error messages

Action codes and recommended actions

Table 24 shows the action codes and the recommended action for each action code listed in Table 25 on page 130.

Table 24. Hub action codes

| Action number | Recommended action |
|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1, 3, 4 | Replace the hub. |
| 2 | Further diagnostic action required. Failure can be system board, GBIC, embedded optic, or cable. This is typically the result of running a wrap test. The tests should be run again after swapping cables and GBICs to determine cause. It is unlikely that the system board is at fault as most system board failures cause a POST failure. |

Diagnostic error message formats

If any port fails during a diagnostic test, it is marked **BAD** in the status display.

To retest a port that has been marked **BAD**, clear the port and set to OK using the diagClearError (port#) command. This command clears the port status only and does not clear the logs or change the port's condition. The diagClearError (port#) command should only be used during diagnostic procedures to reset a bad port for retest.

Some messages contain the following abbreviations:

- sb: Should be
- er: Bits in error

Note: If you run the portStatsShow command or the diagShow command before running a test, errors may appear as a result of the normal synchronization process. These errors should be addressed if the number of errors found increases when running the portStatsShow command again.

Error message tables

Table 25 shows the diagnostic error messages, their descriptions and probable causes. Each message has an error number (ERR#xxxx) associated with it.

Table 25 shows the system error messages, their descriptions, and probable causes.

Table 25. Hub diagnostic error messages

| Message | Description | Probable cause | Action |
|----------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------|---------------|
| DIAG-BADINT Err#1030, 2030 [centralMemoryTest, cmiTest] | Port received an interrupt when not expecting one. | ASIC failure | 1 |
| DIAG-BUS_TIMEOUT Err#0BoF, 4040F [portRegTest, sramRetentionTest] | ASIC register or ASIC SRAM did not respond to an ASIC data access. | ASIC failure | 1 |
| DIAG-CAMSID Err#223C [camTest] | ASIC failed SID NO translation test. | ASIC failure | 1 |
| DIAG-CLEAR_ERR Err#0001 | Port's diag error flag (OK or BAD) is cleared. | Informational only | None required |
| DIAG-CMBISRF Err#1021 [centralMemoryTest] | ASIC's central memory SRAMs did not complete the BISR within the time-out period. | ASIC failure | 1 |
| DIAG-CMBISRTO Err#1020 [centralMemoryTest] | ASIC's central memory SRAMs did not complete the BISR within the time-out period. | ASIC failure | 1 |
| DIAG-CMERRPTN Err#102B [centralMemoryTest] | Error detected at the wrong port. | ASIC failure | 1 |
| DIAG-CMERRTYPE Err#102A [centralMemoryTest] | Port got the wrong CMEM error type. | ASIC failure | 1 |
| DIAG-CMICKSUM Err#2036 [cmiTest] | CMI message received failed bad checksum test. | ASIC or system board failure | 1 |
| DIAG-CMIDATA Err#2035 [cmiTest] | CMI data received did not match data transmitted. | ASIC or system board failure | 1 |
| DIAG-CMIINVCAP Err#2034 [cmiTest] | Unintended ASIC erroneously got CMI capture flag. | ASIC or system board failure | 1 |
| DIAG-CMINOCAP Err#2033 [cmiTest] | CMI intended receiver ASIC failed to get CMI capture flag. | ASIC or system board failure | 2 |
| DIAG-CMISA1 Err#2032 [cmiTest] | An attempt to send a CMI message from ASIC to ASIC failed. | ASIC failure | 1 |
| DIAG-CMNOBUF Err#1029 [centralMemoryTest] | Port could not get any buffer. | ASIC failure | 1 |

Table 25. Hub diagnostic error messages (continued)

| Message | Description | Probable cause | Action |
|----------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|--------|
| DIAG-DATA Err#266E, 306E [portLoopbackTest, crossPortTest] | Payload received by port did not match payload transmitted. | System board, GBIC module, embedded optic or fiber cable failure | 1 |
| DIAG-ERRSTAT Err#2640-2647, 3040-3047, 3840-3847 [portLoopbackTest, crossPortTest, spinSilk] | Port error statistics counter is non- zero, meaning an error was detected when receiving frames. One of the following status errors occurred: <ul style="list-style-type: none"> • Enc_in - Encoding error, inside frame • CRC_err - Cyclic redundancy check on frame failed • TruncFrm - Truncated frame • FrmTooLong - Frame too long • BadEOF - Bad end of file • Enc_out - Encoding error, outside frame • BadOrdSet - Bad symbol on fiber-optic cable • DiscC3 - Discarded class 3 frames | ASIC, system board, GBIC module, embedded optic or fiber cable failure | 1 |
| DIAG-INIT Err#264F, 304F, 384F [portLoopbackTest, crossPortTest, spinSilk] | Port failed to go active in the loopback mode requested. | ASIC, system board, GBIC module, embedded optic or fiber cable failure | 1 |
| DIAG-INTNIL Err#2031 [cmiTest] | ASIC failed to get a CMI error (interrupt). | ASIC failure | 1 |
| DIAG-INTNOTCLR Err#102C [centralMemoryTest] | The interrupt bit could not be cleared. | ASIC failure | 1 |
| DIAG-LCMEM Err#1027 [centralMemoryTest, cmemRetentionTest] | Data read from the central memory location did not match data previously written into the same location. | ASIC failure | 1 |
| DIAG-LCMEMTX Err#1F27, 1028 [centralMemoryTest] | Central memory transmit path failure: ASIC 1 failed to read ASIC 2 using the transmit path. | System board failure | 1 |
| DIAG-LCMRS Err#1F25, 1025 [centralMemoryTest, cmemRetentionTest] | Central memory read short: M bytes requested but got less than M bytes. | ASIC failure | 1 |
| DIAG-LCMTO Err#1F26, 1026 [centralMemoryTest, cmemRetentionTest] | Central memory timeout: Data transfer initiated did not complete within the timeout period. | ASIC failure | 1 |
| DIAG-MEMNULL Err#0112 [ramTest] | Test failed to malloc. | System board failure | 1 |

Table 25. Hub diagnostic error messages (continued)

| Message | Description | Probable cause | Action |
|-------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|---------------|
| DIAG-MEMSZ Err#0111 [ramTest] | Memory size to be tested is less than or equal to zero. | System board failure | 1 |
| DIAG-MEMORY Err#0110 [ramTest] | Data read from RAM location did not match previously written data into same location. | CPU RAM failure | 1 |
| DIAG-PORTABSENT Err#2670, 3070, 3870 [portLoopbackTest, crossPortTest, spinSilk] | Port is not present. | ASIC or system board failure | 1 |
| DIAG-PORTDIED Err#265F, 305F, 385F [portLoopbackTest, crossPortTest, spinSilk] | Port was in loopback mode and then went inactive. | ASIC, GBIC module, embedded optic or fiber cable failure | 2 |
| DIAG-PORTSTOPPED Err#3874 [spinSilk] | Port is no longer transmitting, as indicated by the number of frames transmitted counter being stuck at N frames. | ASIC, GBIC module, embedded optic or fiber cable failure | 2 |
| DIAG-PORTWRONG Err#3078 [crossPortTest] | Frame erroneously received by port M instead of the intended port N. | ASIC failure | 1 |
| DIAG-POST_SKIPPED Err#0004 [managed hub initialization] | POST is skipped. Its message recommended that POST be executed. | Informational only | None required |
| DIAG-REGERR Err#0B15, 0415 [portRegTest, sramRetentionTest] | Data read from ASIC register or ASIC SRAM did not match data previously written into same location. | ASIC failure | 1 |
| DIAG-REGERR_UNRST Err#0B16, 0416 [portRegTest, sramRetentionTest] | Port failed to unreset. | ASIC failure | 1 |
| DIAG-STATS Err#2660 - 2662, 3060 - 3062 [portLoopbackTest, crossPortTest] | Port counter value did not match the number of frames actually transmitted. Possible counters reporting: <ul style="list-style-type: none"> • FramesTx - number of frames transmitted • FramesRx - number of frames received • Cl3FrmRx - number of class 3 frames received | ASIC, GBIC module, embedded optic or fiber cable failure | 2 |
| DIAG-TIMEOUT Err#266F, 306F, 386F [portLoopbackTest, crossPortTest, centralMemoryTest] | <ul style="list-style-type: none"> • For portLoopbackTest and crossPortTest: port failed to receive frame within time-out period. • For centralMemoryTest: port failed to detect an interrupt within the timeout period. | ASIC, GBIC module, embedded optic or fiber cable failure | 2 |

Table 25. Hub diagnostic error messages (continued)

| Message | Description | Probable cause | Action |
|----------------------------------------------------------------------------------------------|--------------------------------|----------------|--------|
| DIAG-XMIT Err#2271, 2671, 3071, 3871 [portLoopbackTest, crossPortTest, spinSilk, camTest] | Port failed to transmit frame. | ASIC failure | 1 |

Table 26. Hub system error messages

| Message | Description | Probable cause | Action |
|-------------------------------|---------------------------|----------------------|--------|
| TEMP, 4_FAILED, LOG_CRITICAL | Managed hub overheated | Fan failure | 3 |
| TEMP, 5_FAILED, LOG_CRITICAL | | | |
| FANS, 1_FAILED, LOG_WARNING | | | |
| FANS, 2_FAILED, LOG_ERROR | | | |
| FANS, 3_FAILED, LOG_CRITICAL | | | |
| FANS, 4_FAILED, LOG_CRITICAL | | | |
| FANS, 5_FAILED, LOG_CRITICAL | | | |
| FANS, 6_FAILED, LOG_CRITICAL | | | |
| POWER, 1_FAILED, LOG_CRITICAL | Managed hub power failure | Power supply failure | 4 |

Appendix F. Fast!UTIL options

This appendix provides detailed configuration information for advanced users who want to customize the configuration of the FAST Host Adapter and the connected devices. However, customizing the configuration is not recommended, as the adapter was configured specifically for the Model 325.

The board can be configured using Fast!UTIL. Access Fast!UTIL by pressing **Alt + Q** during the adapter BIOS initialization (it may take a few seconds for the Fast!UTIL menu to appear). If you have more than one FAST Host Adapter, Fast!UTIL prompts you to select the adapter you want to configure. After changing the settings, Fast!UTIL restarts your system to load the new parameters.

Attention: If the configuration settings are incorrect, your FAST Host Adapter board might not function properly.

Configuration settings

This is the first selection on the Fast!UTIL Options menu. These settings configure the Fibre Channel (FC) devices and the FAST Host Adapter to which they are attached.

Host adapter settings

From the Configuration Settings menu in Fast!UTIL, select **Host Adapter Settings**. The default settings for the FAST Host Adapter are listed in Table 27 and described in the following paragraphs.

Table 27. Host adapter settings

| Setting | Options | Default |
|----------------------|---------------------|-----------|
| Host Adapter BIOS | Enabled or Disabled | Disabled |
| Frame Size | 512, 1024, 2048 | 2048 |
| Loop Reset Delay | 0-15 seconds | 5 seconds |
| Adapter Hard Loop ID | Enabled or Disabled | Disabled |
| Hard Loop ID | 0-125 | 125 |

Host Adapter BIOS

When this setting is disabled, the ROM BIOS on the FAST Host Adapter is disabled, freeing space in upper memory. This setting must be enabled if you are booting from an FC disk drive attached to the FAST Host Adapter. The default is Disabled.

Frame Size

This setting specifies the maximum frame length supported by the FAST Host Adapter. The default size is 1024. If using F-Port (point-to-point) connections, change this setting to 2048 for maximum performance.

Loop Reset Delay

After resetting the loop, the firmware does not initiate any loop activity for the number of seconds specified in this setting. The default is 5 seconds.

Adapter Hard Loop ID

This setting forces the adapter to attempt to use the ID specified in the Hard Loop ID setting. The default is Disabled.

Hard Loop ID

If the Adapter Hard Loop ID setting is enabled, the adapter attempts to use the ID specified in this setting. The default ID is 0.

Selectable boot settings

Though you can access this option from the Configuration Settings menu, do not change the settings as booting from Fibre Channel is not supported.

Restore default settings

You can access this option from the Configuration Settings menu. It restores the FAST Host Adapter default settings.

Raw NVRAM data

This option displays the adapter's NVRAM contents in hexadecimal format. This is a QLogic troubleshooting tool; you cannot modify the data.

Advanced adapter settings

You can access this option from the Configuration Settings menu. The default settings for the FAST Host Adapter are listed in Table 28 and described in the following paragraphs.

Table 28. Advanced adapter settings

| Setting | Options | Default |
|-------------------------|----------------------------|-------------|
| Execution Throttle | 1-256 | 256 |
| Fast Command Posting | Enabled or Disabled | Enabled |
| >4 GByte Addressing | Enabled or Disabled | Disabled |
| LUNs per Target | 0, 8, 16, 32, 64, 128, 256 | 0 |
| Enable LIP Reset | Yes or No | No |
| Enable LIP Full Login | Yes or No | Yes |
| Enable Target Reset | Yes or No | Yes |
| Login Retry Count | 0-255 | 30 |
| Port Down Retry Count | 0-255 | 30 |
| Drivers Load RISC Code | Enabled or Disabled | Enabled |
| Enable Database Updates | Yes or No | No |
| Disable Database Load | Yes or No | No |
| IOCB Allocation | 1-512 buffers | 256 buffers |
| Extended Error Logging | Enabled or Disabled | Disabled |

Execution Throttle

Specifies the maximum number of commands executing on any one port. When a port's execution throttle is reached, no new commands are executed until the current command finishes executing. The valid options for this setting are 1-256. The default (optimum) is 256.

Fast Command Posting

Decreases command execution time by minimizing the number of interrupts. The default is Enabled.

>4 GByte Addressing.

Enable this option if the system has more than 4 GB of memory available. The default is Disabled.

LUNs per Target

Specifies the number of LUNs per target. Multiple LUN support is typically for redundant array of independent disks (RAID) boxes that use LUNs to map drives. The default is 0.

Enable LIP Reset

Determines the type of loop initialization process (LIP) reset that is used when the operating system initiates a bus reset routine. When this setting is yes, the driver initiates a global LIP reset to clear the target device reservations. When this setting is no, the driver initiates a global LIP reset with full login. The default is No.

Enable LIP Full Login

Instructs the ISP chip to log in to all ports after any LIP. The default is Yes.

Enable Target Reset

Enables the drivers to issue a Target Reset command to all devices on the loop when a SCSI Bus Reset command is issued. The default is Yes.

Login Retry Count

Specifies the number of times the software tries to log in to a device. The default is 30 retries.

Port Down Retry Count

Specifies the number of times the software retries a command to a port returning port down status. The default is 30 retries.

Drivers Load RISC Code

When this setting is enabled, the host adapter uses the RISC firmware that is embedded in the software driver. When this setting is disabled, the software driver loads the RISC firmware found on the system. The default is Enabled.

Note: The driver being loaded must support this setting. If the driver does not support this setting, the result is the same as disabled regardless of the setting. Leaving this option enabled guarantees a certified combination of software driver and RISC firmware.

Enable Database Updates

When enabled, it allows the software to save the loop configuration information in flash memory when the system powers down. The default is No.

Note: This option usually applies to Windows NT and Windows 2000 operating environments.

Disable Database Load

When enabled, the device database is read from the Registry during driver initialization. When disabled, the device database is created dynamically during driver initialization. The default is No.

IOCB Allocation

Specifies the maximum number of buffers from the firmware's buffer pool that are allocated to any one port. The default is 256 buffers.

Extended Error Logging

Provides additional error and debug information to the operating system. When enabled, events are logged into the Windows NT or Windows 2000 Event Viewer. The default is Disabled.

Extended Firmware Settings

You can access this option from the Configuration Settings menu. The default settings for the FAStT Host Adapter are listed in Table 29 and described immediately following the table.

Table 29. Extended firmware settings

| Setting | Options | Default |
|----------------------------|---------------------|----------|
| Extended Control Block | Enabled or Disabled | Enabled |
| RIO Operation Mode | 0, 1, 2, 3, 4 | 0 |
| Connection Options | 0, 1, 2, 3 | 3 |
| Class 2 Service | Enabled or Disabled | Disabled |
| ACK0 | Enabled or Disabled | Disabled |
| Fibre Channel Tape Support | Enabled or Disabled | Disabled |
| Fibre Channel Confirm | Enabled or Disabled | Disabled |
| Command Reference Number | Enabled or Disabled | Disabled |
| Read Transfer Ready | Enabled or Disabled | Disabled |
| Response Timer | 0-255 | 0 |
| Interrupt Delay Timer | 0-255 | 0 |

Extended Control Block

Enables all other extended firmware settings. The default is Enabled.

RIO Operation Mode

Specifies the reduced interrupt operation (RIO) modes, if supported by the software driver. RIO modes allow posting multiple command completions in a single interrupt (see Table 30). The default is 0.

Table 30. RIO operation modes

| Option | Operation mode |
|--------|----------------------------------------------------------|
| 0 | No multiple responses |
| 1 | Multiple responses, 16 bit handles, interrupt host |
| 2 | Multiple responses, 32 bit handles, interrupt host |
| 3 | Multiple responses, 16 bit handles, delay host interrupt |
| 4 | Multiple responses, 32 bit handles, delay host interrupt |

Connection Options

Defines the type of connection (loop or point to point) or connection preference (see Table 31). The default is 3.

Table 31. Connection options

| Option | Type of connection |
|--------|---------------------|
| 0 | Loop only |
| 1 | Point-to-point only |

Table 31. Connection options (continued)

| | |
|---|------------------------------------------|
| 2 | Loop preferred, otherwise point to point |
| 3 | Point-to-point, otherwise loop |

Class 2 Service

Enables Class 2 service parameters to be provided during all automatic logins (loop ports). The default is Disabled.

ACK0 Determines the type of acknowledge (ACK) used. When this setting is enabled, sequence ACK is used. When this setting is disabled, frame ACK is used. The default is Disabled.

Note: The Class 2 Service setting must be enabled to use the ACK0 setting.

Fibre Channel Tape Support

This setting is reserved for Fibre Channel tape support. . The default is Disabled.

Fibre Channel Confirm

This setting is reserved for Fibre Channel tape support. . The default is Disabled.

Command Reference Number

This setting is reserved for Fibre Channel tape support. . The default is Disabled.

Read Transfer Ready

This setting is reserved. The default is Disabled.

Response Timer

Contains the value (in 100-microsecond increments) used by a timer to limit the time waiting accumulating multiple responses. For example, if this field is 8, the time limit is 800 microseconds. The default is 0.

Interrupt Delay Timer

Contains the value (in 100-microsecond increments) used by a timer to set the wait time between accessing (DMA) a set of handles and generating an interrupt. The default is 0.

Scan Fibre Channel Devices

Use this option to scan the FC loop and list all the connected devices by loop ID. Information about each device is listed, for example, vendor name, product name, and revision. This information is useful when configuring your FASTT Host Adapter and attached devices.

Fibre Disk Utility

This option scans the FC loop bus and lists all the connected devices by loop ID. You can select a disk device and perform a low-level format or verify the disk media.

CAUTION:

Performing a low-level format destroys all data on the disk.

Loopback Data Test

This option performs a data test using an FC loop or a loopback connector.

CAUTION:

Performing this test will disrupt data if tested in a FC loop.

Select Host Adapter

Use this setting to select a specific FAStT Host Adapter if you have multiple FAStT Host Adapters in your system.

Appendix G. Powering off and powering on the Model 325

The clustering function requires special considerations when you need to power off and power on the Model 325. This section gives the details for those considerations.

Powering off the Model 325 when clustering is active

1. Make note of the order in which you shut down the nodes.
You shut the nodes down one at a time, and in the powering on procedure you start the nodes in the opposite order in which you powered them off.
2. On the node you want to shut down last (the second node), click **Cluster Administration**, located in IBM NAS Admin, in the Cluster Tools folder. If prompted for a cluster name, enter the name of the cluster, and then click **Open**. Make sure that all resources are in the online state.
3. With all clustered resources in the online state, on the node you want to shut down first (the first node), go to **Start, Shut Down** and select **Shut down** from the drop down menu. Click **OK**.
4. On the second node, in Cluster Administrator, wait for all resources to fail over to that node and return to the online state.
5. Once all resources are in the online state, and the first node has shut down, on the second node go to **Start, Shutdown** and select **Shut down** from the drop down menu. Click **OK**.
6. Once both nodes have shut down, power off each 5191 RAID Storage Controller by pressing the two power switches located on the rear of the unit.
7. Power off all 5192 Network Attached Storage Storage Units and 3534 Managed Hubs.
8. You may power down any network hubs or switches that are used exclusively by the Model 325. If they are used by other network attached devices, do not power these off.
9. You may also power off any Uninterruptible Power Supplies (UPS) that regulate power for the Model 325, provided that no other equipment that you wish to keep powered on is plugged into the same UPS.

Powering on the Model 325 when clustering is active

1. Power on any UPS that you powered off in the powering off procedure, and allow it to return to normal operation.
2. Power on any network hubs or switches that you powered off in the powering off procedure.
3. Power on all 5192 Network Attached Storage Storage Units and 3534 Managed Hubs. Give the 3534 Managed Hubs about three minutes to start up.
4. Power on each 5191 RAID Storage Controller. After about three to four minutes, the storage controllers will have completed their startup routine. You can verify this by making sure that for each drive in the storage controller and for each drive in the storage unit, the status LED (on the top front of the drive) is solid green (not blinking) for at least five seconds.
5. Power on the node that you shut down last in the powering off procedure.
6. Once the node comes up, start Cluster Administrator on that node and make sure that all resources are in an online state or shortly return to that state.

7. If no problems exist and all clustered resources are online, power on the node that you shut down first in the powering off procedure. Each resource for which that node is the preferred owner will fail back to that node and return to an online state.

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