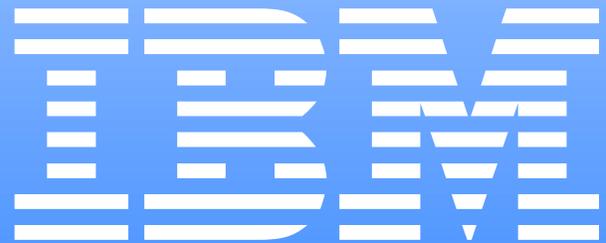


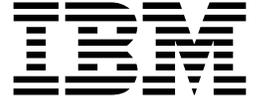
IBM® FAStT MSJ



User's Guide



IBM® FAStT MSJ



User's Guide

Note:

Before using this information and the product it supports, be sure to read the general information in Appendix B, "Notices," on page 63.

First Edition (August 2001)

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Chapter 1. Introduction to FASTt MSJ

This chapter introduces the IBM Fibre Array Storage Technology Management Suite Java (FASTt MSJ) and includes information on what is contained in this document, background information on Storage Area Network (SAN) environments, and an overview of the functions of FASTt MSJ.

About this document

This document contains the latest information available regarding FASTt MSJ, IBM's cross-platform SAN management solution. This guide is intended for trained service personnel who are familiar with IBM SAN products and are proficient with Linux, Microsoft® Windows®, and NetWare operating system administration.

Use this document to:

- Understand the SAN environment
- Get an overview of FASTt MSJ
- View FASTt MSJ system requirements
- Install and start FASTt MSJ
- Explore the features and functions of FASTt MSJ

Note: Read the file README.TXT first. The README file is located in the IBM FASTt MSJ folder of the installation CD, or refer to <http://www.ibm.com/pc/support> for the latest installation and user information about FASTt MSJ.

The SAN environment

Storage Area Network (SAN) is a high-speed subnetwork of shared storage devices. In a typical SAN environment, a system might be equipped with multiple host bus adapters (HBAs) that control devices on a local loop or on a fabric (a fabric is the network of Fibre Channel hubs, switches, and gateways connecting storage devices such as disk arrays, optical disks or tape libraries, and servers on a many-to-many basis).

In a SAN, a single device can be monitored and controlled by more than one HBA. An example of this type of configuration is dual-path devices used in a primary/failover setup.

The following are the common basic SAN configurations:

- Basic storage partitioning
- Cluster and non-cluster shared storage pool
- SAN with partitioned storage
- High-capacity storage configuration
- Multiple clusters in a switched fabric environment
- Direct attach multiple cluster configuration

In a switched or clustering configuration, more than one system can access the same device; this type of configuration enables storage sharing. In this scenario, a system might access certain logical unit numbers (LUNs) on a device while other systems control other LUNs on the same device.

Because a SAN has scalable storage capacity, you can add new devices dynamically. After you add these new devices, they need to be configured. Furthermore, a SAN can change not only through the addition of new devices, but also through the replacement of current devices on the network.

In such a complicated environment where there might be hot-swapping of SAN components, some manual configuration is required to achieve proper installation and functionality.

Overview of the IBM FAST Management Suite Java

FAST MSJ assists you in configuring a SAN environment. This application is specifically designed for IBM FAST Fibre Channel HBAs in a SAN environment.

A complete SAN is comprised of HBA components, storage devices, and host systems, and FAST MSJ.

FAST MSJ is a network-capable application that can connect to and configure remote systems. The networking capability of FAST MSJ enables centralized management and configuration of the entire SAN.

You can use IBM FAST MSJ to manage and control one or more IBM FAST Host Bus adapters that are installed on local or remote computers. You use IBM FAST MSJ, in conjunction with problem determination procedures (PDPs), on new or existing installations to assist in diagnosing Fibre Channel (FC) subsystem problems (in adapters, controllers, and devices that are attached to the FC fabric or loop).

With FAST MSJ you can also configure devices in your system using the following three types of operations:

Disable (unconfigure) a device on a host bus adapter

When a device is set as unconfigured by the utility, it is not recognized by the HBA and is inaccessible to that HBA on that system.

Enable a device

This operation adds a device and makes it accessible to the HBA on that system.

Designate a path as an alternate or preferred path

When a device is accessible from more than one adapter in the same system, you can assign one path as the preferred path and the other path as the alternate path. If the preferred path fails, the system switches to the alternate path to ensure that data transfer is not interrupted.

Note: The diagnostic functions of FAST MSJ are available for all supported operating systems. The configuration functions are available only for the Linux operating systems. IBM FAST Storage Manager provides management capability for Microsoft Windows and NetWare-based platforms.

Chapter 2. FAStT MSJ system requirements

The FAStT MSJ application consists of two components:

- FAStT MSJ client interface
- Host agent

Each of these components has different system requirements depending on the operating system that they run on.

FAStT MSJ client interface

FAStT MSJ is written in Java and should run on any platform that has a compatible Java VM installed. The minimum system requirements for FAStT MSJ to run on all platforms are:

- A video card capable of 256 colors
- At least 64 MB of physical RAM (128 MB is preferred. Running with less memory might cause disk swapping, which has a negative effect on performance.)
- 30 MB of free disk space is required for installation

Platform-specific requirements for the FAStT MSJ client interface are as follows:

- Linux x86
 - RedHat Linux 7.1 (preferred configuration)
 - PII 233MHz (preferred minimum)
- Microsoft Windows 2000/Windows NT
 - Pentium III processor 450 MHz or greater
- Novell NetWare
 - Pentium III processor 450 MHz or greater

Note: If multiple Network Interface Cards (NICs) are present in the system, the FAStT MSJ client will broadcast to the first IP address subnet based on the binding order. Therefore, ensure that the NIC for the local subnet is first in the binding order. If this is not done, the diagnostics might not run properly and remote connection might not occur. See the Readme file in the release package for more information.

Host agent

Host agents are platform-specific applications that reside on a host with IBM HBAs attached. The minimum system requirements for an agent to run on all platforms are:

- An IBM FAStT MSJ-supported driver (see release.txt in the release package for a list of supported device driver versions for each platform)
- At least 8 MB of physical RAM
- 2 MB of free disk space is required for installation

Platform-specific requirements for the FAStT MSJ host agents are as follows:

- Linux x86—Agent runs as a daemon
- Microsoft Windows NT[®] or Windows 2000—Agent runs as an NT service
- Novell NetWare installation prerequisites

Be sure you have the following items before installing the QLremote NetWare Agent:

- NetWare Client software (from Novell) on the Windows NT/2000 client
- NWLink IPX/SPX-compatible transport or TCP/IP transport network protocols
 - Note:** The TCP/IP transport must be loaded to communicate with the FAST MSJ agent.
- NWLink NetBios
- Drive letter mapped to the root of the SYS volume of the NetWare server. By default, the NetWare Client maps to sys\system or sys\public; however, you must set the root of SYS volume by assigning a drive letter to sys:\.
 - Note:** You must be logged on as an administrator to map server drive letters.
- On the NetWare Server—NetWare 5.1 server with service pack 2 or later

Chapter 3. Installing and getting started

This chapter contains procedures for installing FAStT MSJ and for using the application.

Installing and uninstalling FAStT MSJ

This section discusses the following:

- Initial installation options
- Installing FAStT MSJ
- Uninstalling FAStT MSJ

Initial installation options

FAStT MSJ supports stand-alone and network configurations. Install the software appropriate for your configuration. See Table 1 for details.

Note: The same version of FAStT MSJ must be installed on all systems.

Table 1. Configuration option installation requirements.

Configuration	Software Requirements
Stand-alone system: This system monitors host bus adapters locally.	FAStT MSJ GUI Plus one of the following: <ul style="list-style-type: none">• FAStT MSJ NT/2000 agent• FAStT MSJ Linux agent
Networked system: This system monitors host bus adapters locally and monitors remote systems on the network. Host agents are required for remote connection (see "Host agent system" following).	FAStT MSJ GUI Plus one of the following: <ul style="list-style-type: none">• FAStT MSJ NT/2000 agent• FAStT MSJ Linux agent
Client system: This system monitors host bus adapters only on remote systems on the network.	FAStT MSJ GUI Host agents (see requirements for host agent system)
Host agent system: The host bus adapters on this system are remotely monitored only from other systems on the network.	One of the following: <ul style="list-style-type: none">• FAStT MSJ NT4/2000 agent• FAStT MSJ NetWare 5.x agent• FAStT MSJ Linux agent

Installing FAStT MSJ

The FAStT MSJ installer is a self-extracting program that installs the FAStT MSJ application and related software.

Notes:

1. If you have a previous version of FAStT MSJ installed, uninstall the previous version of FAStT MSJ before installing FAStT MSJ.
2. You cannot install the FAStT MSJ agent directly on a NetWare server; you must install the agent on a system connected to the NetWare server. The Netware server must have a drive mapped to a Windows 2000 or Windows NT system.

Perform the following steps to install FAST MSJ on the system or the NetWare server:

1. Access the FAST MSJ installer by doing one of the following:
 - If installing FAST MSJ from a CD, click the **IBM FAST MSJ** folder on the CD.
 - If installing FAST MSJ from the IBM Web site, go to the page from which you can download FAST MSJ (this URL is listed in the README file).
2. From the CD folder or the folder in which you saved the FAST MSJ installer, select the appropriate install file by doing one of the following:
 - For Windows 2000/Windows NT and NetWare, double-click the FASTTMSJ_install.exe file.
Note: For NetWare, save to the system drive mapped to the NetWare server.
 - For Red Hat Linux, do the following:
 - a. Open a shell.
 - b. Change to the directory that contains the FAST MSJ installer that you downloaded in Step 1.
 - c. At the prompt, type `sh ./FASTTMSJ_install.bin`, where `install` is the FAST MSJ installer file.

InstallAnywhere prepares to install FAST MSJ. The Installation Introduction window is displayed.
3. Click **Next**. The Choose Product Features window is displayed. The window differs, depending on whether you are installing on a Windows 2000/Windows NT, or Red Hat Linux system. See Figure 1 for a sample window.



Figure 1. Choose Product Features window (sample)

4. Do one of the following to install the software appropriate to your configuration:
 - For Windows 2000/Windows NT systems, click one of the following preconfigured installation sets, then click **Next**.
 - Click **GUI and NT Agent** if this Windows 2000/Windows NT system will monitor host bus adapters on this system and remote systems on the network.

- Click **GUI** if the system will monitor host bus adapters only on remote systems on the network.
 - Click **NT Agent** if the host bus adapters on this Windows 2000/Windows NT system will be remotely monitored only from other systems on the network.
 - Click **NetWare 5.x Agent** if the host bus adapters on this NetWare 5.x system will be remotely monitored only from other systems on the network.
 - For Red Hat Linux systems, click one of the following preconfigured installation sets, then click **Next**.
 - Click **GUI** if the system will monitor host bus adapters only on remote systems on the network.
 - Click **Linux Agent** if the host bus adapters on this Red Hat Linux system will be remotely monitored only from other systems on the network.
 - Click **GUI and Linux Agent** if this Red Hat Linux system will monitor host bus adapters on this system and on remote systems on the network.
 - For other configuration installation sets, click **Customize** to create a customized installation set. The Choose Product Components window is displayed. The window differs depending on whether you are installing on a Windows 2000/Windows NT or Red Hat Linux system.

Perform the following steps to create a custom installation set:

 - a. In the **Feature Set** list-box, click **Custom Set**.
 - b. Select from the following components:
 - For a Windows 2000/Windows NT system:
 - **GUI**
 - **NT Agent**
 - **NetWare 5.x Agent**
 - **Help**
 - For a Red Hat Linux system:
 - **GUI**
 - **Linux Agent**
 - **Help**
 - c. Click **Next**. The Important Information window is displayed.
5. Read the information, then click **Next**.
- Note:** Information in the README file supplied with the installation package takes precedence over the information in the Important Information window.
- The Choose Install Folder window is displayed.
6. Do one of the following:
- Note:** For NetWare, click the drive mapped to the NetWare server.
- To select the default destination location displayed in the window, click **Next**.
The default location for a Windows 2000/Windows NT system is C:\Program Files\IBM FAST Management Suite\ .
The default location for a Red Hat Linux system is /root/IBM_FAST_MSJ.
 - To select a location other than the default, click **Choose**, click the desired location, and click **Next**.

- To reselect the default location after selecting a different location, click **Restore Default Folder**, and click **Next**
7. If you are installing on a Windows platform, the **Select Shortcut Profile** location window is displayed. Do one of the following:
 - a. To select the all users profile to install the application program group and shortcuts, select the **All Users Profile** radio button, and click **Next**.
 - b. To select the current users profile to install the application program group and shortcuts, select the **Current Users Profile** radio button, and click **Next**.
 8. If you are installing on a NetWare system, the Novell NetWare Disk Selection window is displayed (see Figure 2).

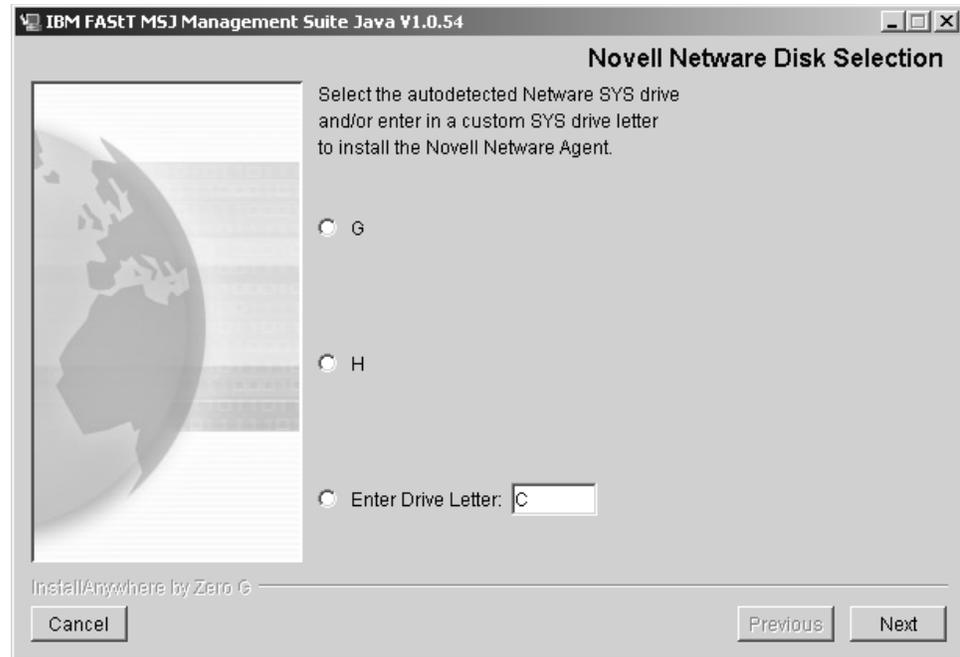


Figure 2. Novell NetWare Disk Selection window

- A list of the autodetected, mapped NetWare drives on the subnet is displayed in the following format: *drive, server name, server IP address*.
- a. Click the drives on which to install the NetWare agent. Each drive must be a NetWare drive mapped on the Windows 2000 or Windows NT system. You can select drives by clicking one or more autodetected drives from the list or by typing the drive letter corresponding to the drive you want to use.
 - b. Click **Next**. The Installing Components window is displayed. Subsequent screens inform you that the installation is progressing. When installation is complete, the Install Complete window is displayed.
9. Click **Done**.
 10. Customize the FASt MSJ application and set your security parameters. See “Security” on page 15 for details.

Uninstalling FASt MSJ

You must exit the FASt MSJ application before uninstalling FASt MSJ. Make sure you uninstall the NetWare agent from the Windows 2000 or Windows NT drive mapped to the Novell NetWare server when installing FASt MSJ.

Perform the following steps to uninstall FASt MSJ:

1. Start the FAST MSJ Uninstaller:
 - From a Windows 2000/Windows NT system, click **Start -> Programs -> IBM FAST MSJ -> FAST MSJ Uninstaller**.
 - From a Red Hat Linux system:
 - a. Change to the directory where you installed FAST MSJ. For example, type:

```
cd /usr
```
 - b. Type the following to run the InstallAnywhere Uninstaller:

```
./FAST_MSJ_Uninstaller
```

The InstallAnywhere Uninstaller window is displayed with IBM FAST Management Suite Java Vx.x.xx as the program to be uninstalled.
2. Click **Uninstall**. The InstallAnywhere Uninstaller - Component List window lists the components to be uninstalled. A message displays informing you that the uninstaller is waiting 30 seconds for the agent to shut down. Wait while the uninstaller removes the components. The InstallAnywhere Uninstaller - Uninstall Complete window informs you that the uninstall is complete.
3. Click **Quit**.
4. If any items are not successfully uninstalled, repeat the uninstallation instructions to remove them.
5. Restart the system.

Getting started

FAST MSJ enables you to customize the GUI and agent. After you install FAST MSJ and set your initial parameters, these components activate each time you start the application.

Starting FAST MSJ

This section describes how to start FAST MSJ on a Windows system and a Linux system.

Windows 2000/Windows NT system

On a Windows 2000/Windows NT system, double-click the **FAST MSJ** icon on your desktop if you selected to create the icon during installation (see Figure 3), or click **Start -> Programs-> IBM FAST MSJ -> FAST MSJ**.



Figure 3. FAST MSJ Icon

The FAST MSJ main window opens.

Red Hat Linux system

On a Red Hat Linux system, perform the following steps to start the FAST MSJ:

1. Ensure that you are in a graphical user environment.
2. Open a command terminal.

3. Change to the usr directory in which the IBM FASTt MSJ application is installed by typing `cd /usr`.
4. Type `./FASTt_MSJ`. The FASTt MSJ main window opens.

FASTt MSJ main window

The IBM Management Suite Java-HBA View window (hereafter referred to as the FASTt MSJ main window) is displayed after you start FASTt MSJ. See Figure 4.

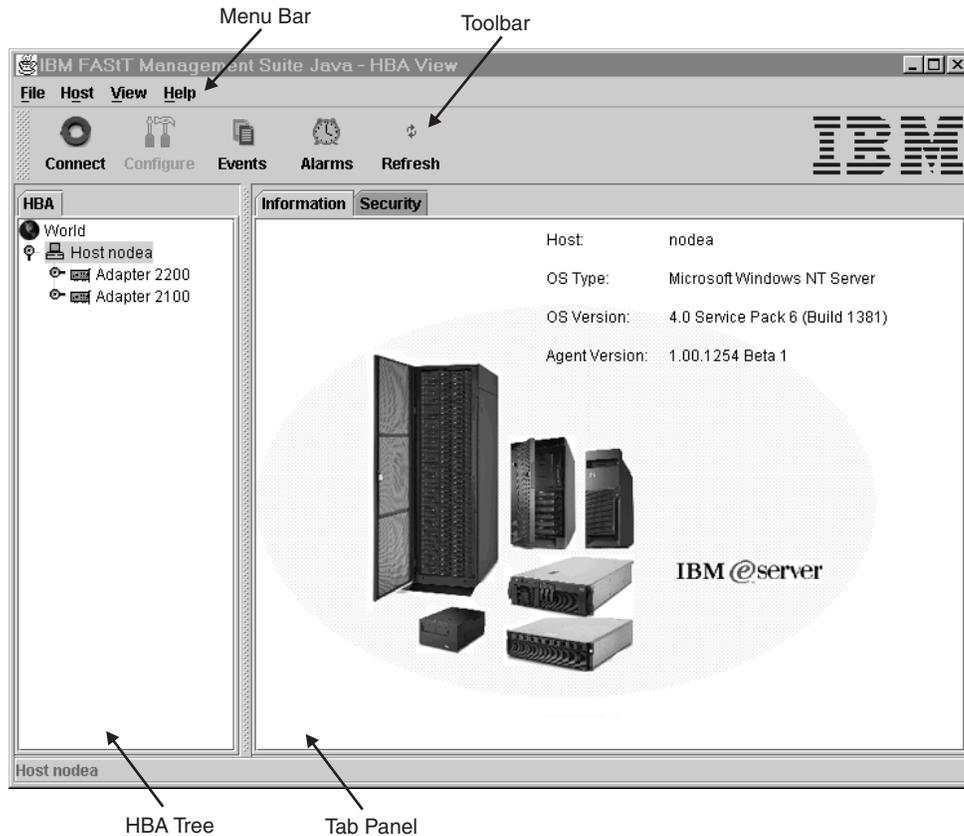


Figure 4. FASTt MSJ main window

The window consists of the following sections:

- Menu bar
- Toolbar
- HBA tree panel
- Tab panel

Chapter 4. Basic features overview

This chapter lists FAStT MSJ features and contains general information needed to run FAStT MSJ on any supported platform. Topics include:

- Features
- Options
- Connecting to hosts
- Disconnecting from hosts
- Polling interval
- Security
- Help menu

Features

FAStT MSJ enables you to do the following:

- Set FAStT MSJ options
- Connect to hosts
- Disconnect from a host
- View extensive event and alarm log information
- Use host-to-host SAN Configuration Policies
- Configure port devices
- Use LUN Level configuration
- Watch real-time to see when failovers occur with the Failover Watcher
- Control host-side agent operations, including setting the host agent polling interval
- Review host adapter information, including:
 - General information
 - Statistics
 - Information on attached devices
 - Attached device link status
- Perform adapter functions, including:
 - Configure adapter NVRAM settings
 - Execute Fibre Diagnostics (Read/Write Loopback tests)
 - Perform flash updates on an adapter
 - Perform NVRAM updates on an adapter
- Manage configurations
 - Save configurations for off-line policy checks and SAN integrity
 - Load configurations from file if host is off-line for policy checks and SAN integrity
- Confirm security

Options

To configure FASTT MSJ, click **View** -> **Options**. The options window opens.

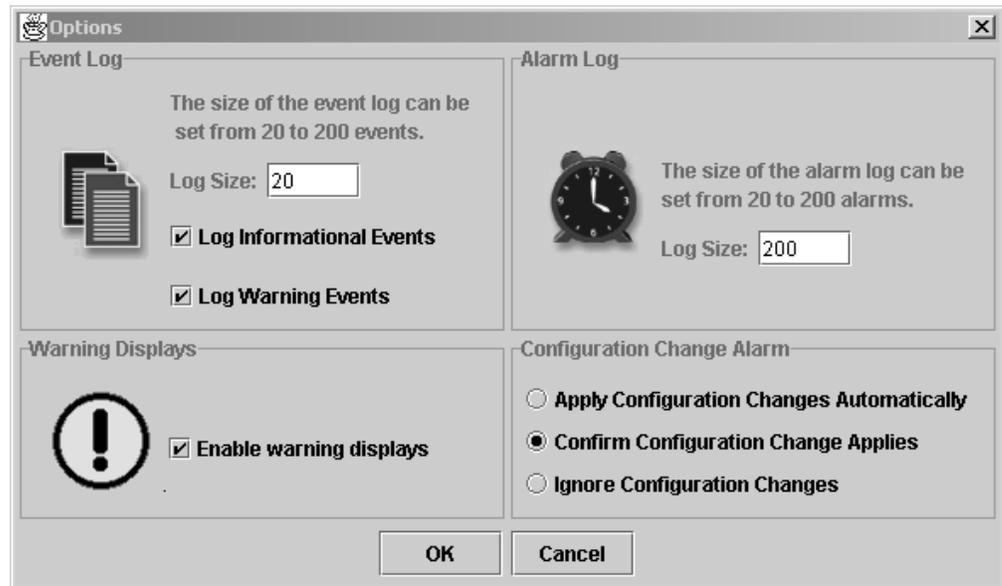


Figure 5. Options window

The Options window has four sections and two buttons:

- Event Log
- Alarm Log
- Warning Displays
- Configuration Change Alarm
- OK (save changes) and Cancel (changes are not saved) buttons

The option window functions are described in the following sections.

Event log

Event log information includes communication and file system errors. FASTT MSJ stores the event entries in the events.txt file. You can log informational and warning events.

You can set the maximum size of the event log to be in the range of 20 to 200 event entries; the default is 20 events. When the maximum size of the event log is exceeded, old entries are automatically deleted to provide space for new entries. The following are example event log entries:

```
Fri Dec 08 17:10:47 PST 2000, 4, RPC request 23 for Host 10.3.1.152 failed., 2
```

```
Fri Dec 08 17:10:47 PST 2000, 4, Retrying RPC request 23 for Host 10.3.1.152., 2
```

Fri Dec 08 17:11:32 PST 2000, 4, RPC request 23 for Host 10.3.1.152 failed., 2

Alarm log

When FASTT MSJ communicates with a host, FASTT MSJ continually receives notification messages from the host indicating changes directly or indirectly made on adapters. Messages regarding status, configuration, and NVRAM changes are logged. FASTT MSJ stores these alarm messages in the alarms.txt file.

You can set the maximum size of the alarm log to be in the range of 20 to 200 event entries; the default is 200 entries. When the maximum size of the alarm log is exceeded, old entries are automatically deleted to provide space for new entries. Following are example alarm log entries:

Mon Dec 04 15:28:03 PST 2000, carlhpc, 2-2100, 0, Status Change: LIP Detected., 1

Mon Dec 04 15:28:04 PST 2000, carlhpc, 3-12160, 0, Status Change: Request Transfer Error., 1

Mon Dec 04 15:28:33 PST 2000, carlhpc, 0-2200, 0, Status Change: System Error., 2

Warning displays

FASTT MSJ displays additional warning dialogs throughout the application. By default, the Warning Displays option is enabled. To disable the display of warning dialogs, clear the **Enable warning displays** check box on the Options window.

Configuration change alarm

FASTT MSJ tries to keep the devices and the LUNs that the adapter displays current. During cable disconnects, hotplug of devices, or device removal, configuration change alarms are generated to keep the GUI current. You can control the way FASTT MSJ handles configuration change alarms with the Configuration Change Alarm option. You can choose from the following options:

- Apply Configuration Changes Automatically
When a configuration change alarm is detected by the GUI, the application disconnects the host and reconnects to get the new configuration automatically.
- Confirm Configuration Change Applies (default setting)
When a configuration change alarm is detected by the GUI, the application displays a window that the user clicks **Yes** or **No** to refresh the configuration for the specified host. See Figure 6.

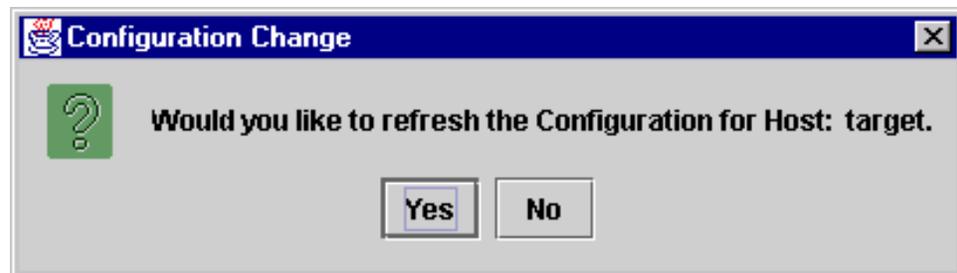


Figure 6. Configuration Change window

- Ignore Configuration Changes

With this setting, a configuration change alarm detected by the GUI is ignored. For the configuration to be updated, a manual disconnect and connect of the host must be performed.

Note: You can refresh the configuration by selecting the desired host and clicking the **Refresh** button on the toolbar or by right-clicking the desired host and clicking **Refresh** on the pop-up menu.

Connecting to hosts

There are two ways to connect to hosts in a network:

- Manually
- Automatically with the Broadcast function

For multi-homed or multiple IP hosts, FASTT MSJ tries to ensure that a specified host is not loaded twice into the recognized host tree. If a particular host has multiple interfaces (NICs), each with its own IP address, and proper name-resolution-services are prepared, the host will not be loaded twice into the tree. Problems can occur when one or more IPs are not registered with a host.

The blinking heart indicator (blue pulsating heart icon) indicates that the connection between the client and remote agent is active for this test (see Figure 7).

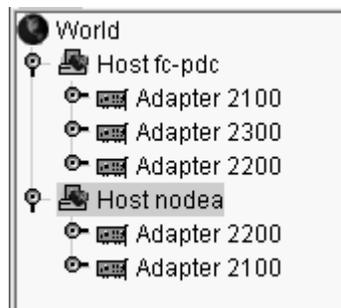


Figure 7. HBA tree with Heartbeat indicator

Manual Connection

Perform the following steps to manually connect to a host.

1. From the FASTT MSJ main window click the **Connect** button, or click **Connect** from the **Host** menu.

The Connect to Host window is displayed.

2. Type in the host name, or select the host you want to connect to from the drop-down list. You can use the computer's IP address or its host name. If the computer you want to connect to is the computer on which FASTT MSJ is running, select **localhost** from the drop-down list. To delete all user-entered host names from the drop-down list, click **Clear**.

3. After you have selected or typed the host's name, click **Connect** to initiate the connection.

If the connection attempt fails, an error message is displayed that indicates the failure and potential causes. If the connection is successfully established, the host's name and its adapters are shown on the HBA tree.

Click **Cancel** to stop the connection process and return to the main window.

Broadcast connections

FAST MSJ can auto-connect to all hosts running an agent in a network. For auto-connect to function properly, ensure that the **Broadcast** setting is enabled. To enable auto-connect, select the **Auto Connect** check box from the **Host** menu. To disable auto-connect, clear the **Auto Connect** check box.

Note: If multiple NICs (Network Interface Cards) are present in the system, the FAST MSJ client will broadcast to the first IP address subnet based on the binding order. Therefore, ensure that the NIC for the local subnet is first in the binding order. If this is not done, the diagnostics might not run properly and remote connection might not occur. See the Readme file in the release package for more information.

Disconnecting from a host

Perform the following steps to disconnect from a host:

1. From the FAST MSJ main window HBA tree, click the host that you want to disconnect from.
2. Click **Host -> Disconnect**.

When a host is disconnected, its entry in the HBA tree is removed.

Polling interval

You can set polling intervals on a per-host basis to retrieve information. The polling interval setting can be in the range from 1 second to 3600 seconds (one hour). Perform the following steps to set the polling interval:

1. Click the host in the HBA tree in the FAST MSJ main window.
2. Click **Host -> Polling**. The Polling Settings - target window is displayed.
3. Type the new polling interval and click **OK**.

Security

FAST MSJ protects everything written to the adapter or adapter configuration with an agent-side password. You can set the host agent password from any host that can run the FAST MSJ GUI and connect to the host agent.

When a configuration change is requested, the Security Check window is displayed to validate the application-access password. Type the application-access password for confirmation.

To change the host agent password, select a host by clicking it in the HBA tree. The Information/Security tab panels are displayed. Click the Security tab to display the Security panel.

Figure 8. Security panel

The security panel is divided into two sections: Host Access and Application Access.

Host access

The Host Access section verifies that the host user login and password has administrator or root privileges before an application access is attempted. The login and password values are the same as those used to access the computer.

Login A host user account with administrator or root-level rights.

Password

The password for the host user account.

Application access

The Application Access section enables you to change the FAST MSJ host agent password. To change the password, type information into the following fields:

Old password

The current application-access password for the host. The original default password is **config**. Change it immediately to a new password.

New password

The new application-access password for the host.

Verify Password

The new application-access password for host verification.

The Help menu

From the FAST MSJ **Help** menu, you can specify the location of the browser to launch when help is requested by a user. You can also view FAST MSJ version information.

The **Help** menu contains the following items:

- **Set Browser Location**

Click this item to display the Browser Location window (see Figure 9). Type the file path of the browser that FAStT MSJ will launch when a user requests help, or click **Browse** to find the file location.

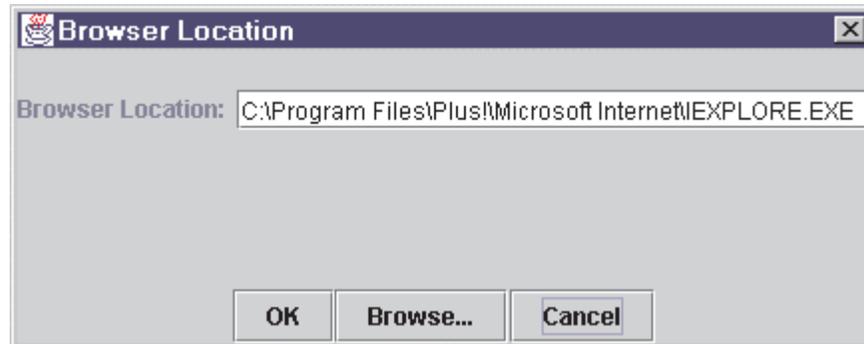


Figure 9. Browser Location window

- **Browse Contents**

Click this item to access FAStT MSJ help.

- **About**

Click this item to view information about FAStT MSJ, including the current FAStT MSJ version number.

Chapter 5. Diagnostics and utilities

The diagnostic and utility features of FAS*t*T MSJ enable you to do the following:

- View event and alarm log information
- Review host adapter information
 - View general information
 - View statistics
 - View information on attached devices
 - View attached device link status
 - Configure adapter NVRAM settings
- Perform adapter functions, including:
 - Configure adapter NVRAM settings
 - Perform NVRAM updates on an adapter
 - Perform flash updates on an adapter
 - Execute Fibre Diagnostics (Read/Write Loopback tests)
- Manage configurations
 - Save configurations for off-line policy checks and SAN integrity
 - Load configurations from file if host is off-line for policy checks and SAN integrity

Viewing logs

FAS*t*T MSJ records an extensive set of information to the event and alarm logs. The logs are saved as text files (alarms.txt and events.txt) in the folder where FAS*t*T MSJ is installed. FAS*t*T MSJ can parse and view these logs in a window. To view these logs, click **Event Log** or **Alarm Log** from the **View** menu, or click the appropriate button on the button bar.

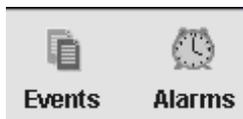


Figure 10. Events and Alarms buttons

Viewing the event log

The event log window displays events relating to FAS*t*T MSJ application operations (see Figure 11 on page 20). New events are displayed in the window as they occur. There are three types of time-stamped event messages:

-  Informative - an informative or general information event
-  Warning - a non-critical application event
-  Error - a critical application event

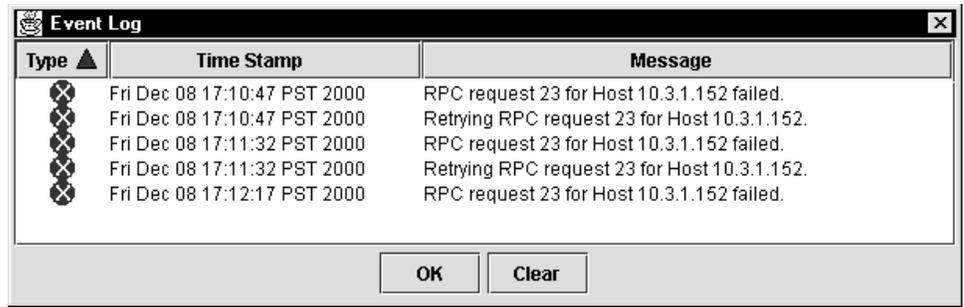


Figure 11. Event Log window

Click **OK** to close the **Event Log** window. Click **Clear** to purge all event entries from the log.

Sorting

To sort a column in ascending or descending order, right-click the column header, and click the desired sorting method.

Details

To view an individual event entry, double-click on the entry; a separate event details window is displayed. See Figure 12. You can navigate individual entries by clicking **Next** or **Previous**.

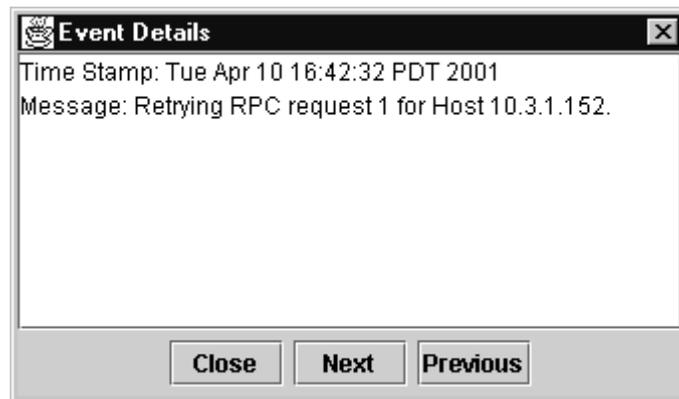


Figure 12. Event Details window

Viewing alarm log

The alarm log window displays events that occurred on hosts connected to FAST MSJ (see Figure 13 on page 21). New alarms are displayed in the window as they occur. Alarm entries have the following properties:

- Time Stamp — The date and time of the logged alarm
- Host Name — The agent host that sent the alarm
- Adapter ID — The host adapter the alarm occurred on
- Application — The type of device that sent the alarm
- Description — The description of the alarm

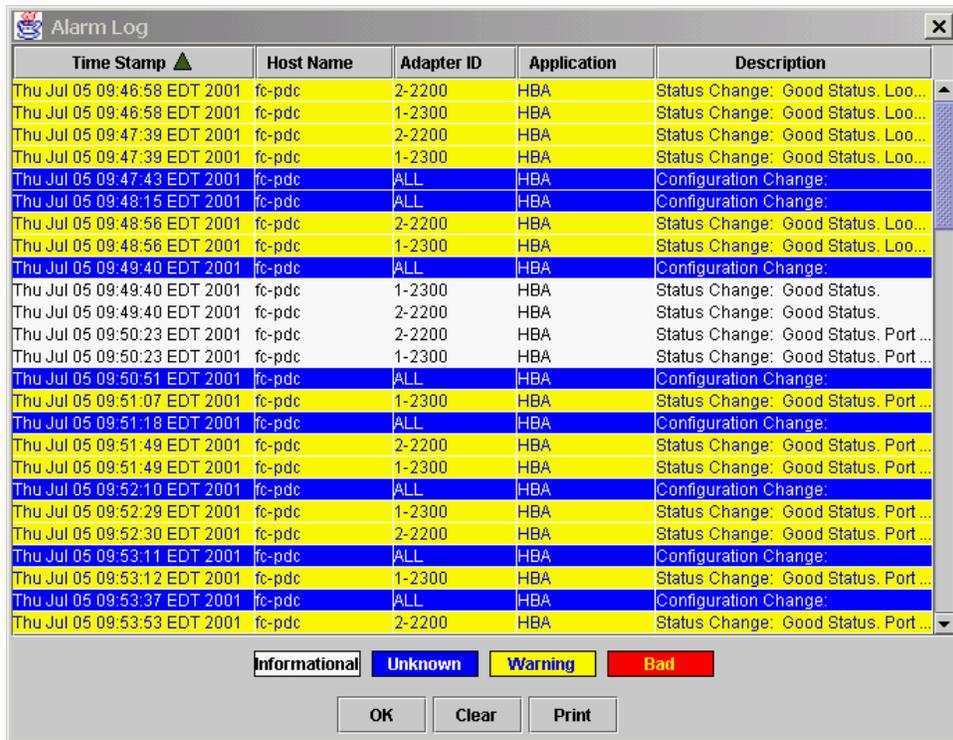


Figure 13. Alarm log window

Click **OK** to close the Alarm Log window. Click **Clear** to purge all alarm entries from the alarm log.

Sorting

To sort a column in ascending or descending order, right-click the column header, and click the desired sorting method.

Colors

When the GUI receives an alarm with a status color other than white (informational), the adapter in the HBA tree with the most severe status blinks until you view the alarm. The following types of alarms are associated with each color:

- Informational: Rows in the table are color coded white.
- Unknown: Rows in the table are color coded blue.
- Warning: Rows in the table are color coded yellow.
- Bad: Rows in the table are color coded red.
- Loop Down: Adapter in the HBA tree is color coded yellow with a red X (see Figure 14).



Figure 14. Loop Down alarm in HBA tree

Details

To view an individual alarm entry, double-click the entry; the Alarm Details window is displayed. See Figure 15. You can navigate individual entries by clicking **Next** and **Previous**.



Figure 15. Alarm Details window

Viewing adapter information

To view adapter information, click the adapter in the HBA tree. The Information panel displays general information about the selected adapter (see Figure 16).

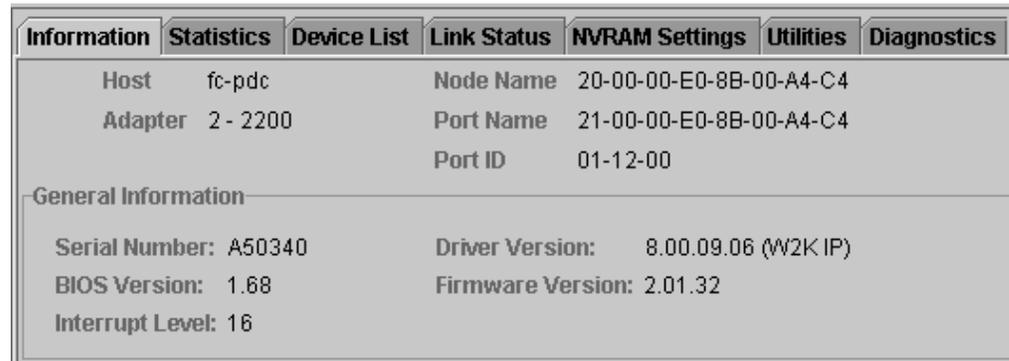


Figure 16. Information panel

The Information panel displays the following information:

- Host: The name of the host
- Adapter: The ID of the adapter
- Node Name: The node name of the adapter (WWN)
- Port Name: The port name of the adapter
- Port ID: The port ID of the adapter (the AL-PA if in arbitrated loop environment)
- Serial Number: The serial number (in hex) of the adapter
- BIOS Version: BIOS version of the adapter
- Interrupt Level: The interrupt level the adapter is assigned to
- Driver Version: The version number of the adapter device driver
- Firmware Version: The version number of the adapter firmware

Viewing adapter statistics

The Statistics panel displays statistical information about the selected adapter (see Figure 17).

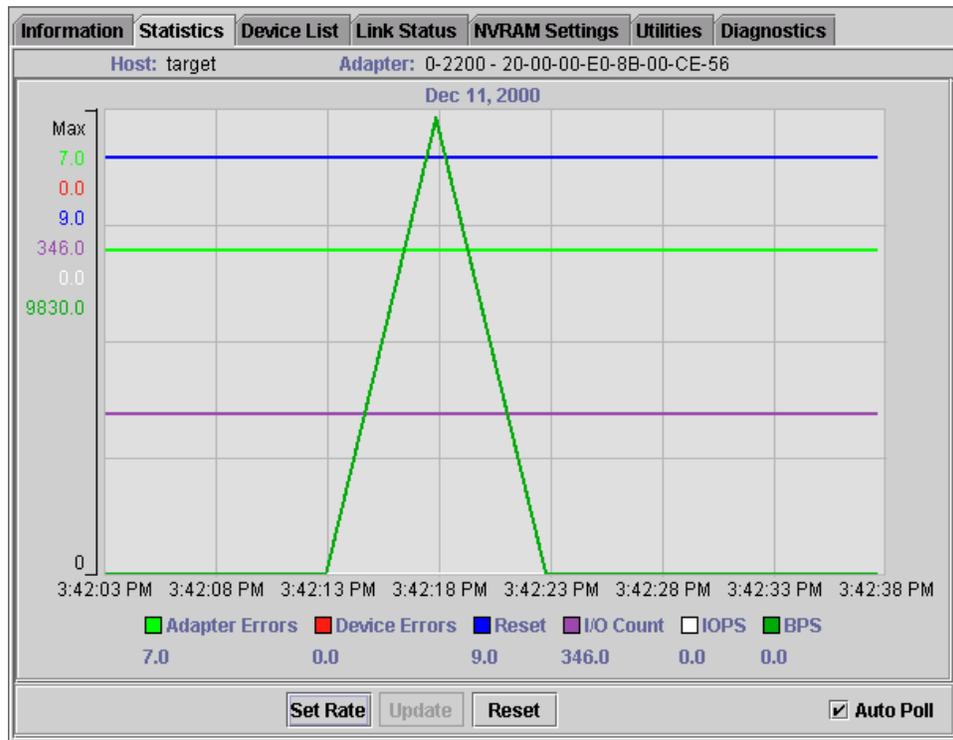


Figure 17. Statistics panel

The Statistical panel displays the following information:

- **Adapter Errors:** The number of adapter errors reported by the adapter device driver.
- **Device Errors:** The number of device errors reported by the adapter device driver.
- **Reset:** The number of LIP resets reported by the adapter device driver.
- **I/O Count:** The total number of I/Os reported by the adapter device driver.
- **IOPS (I/O per second):** The current number of I/Os per second.
- **BPS (bytes per second):** The current number of bytes per second processed by the adapter.

Use the buttons and check box at the bottom of the Statistics panel to control sampling:

- **Auto Poll**
Select this check box to use automatic sampling mode. To use manual mode, clear the check box. If the check box is selected, use **Set Rate** to define the sampling rate.
- **Set Rate**
Click **Set Rate** to set the polling interval at which the GUI retrieves statistics from the host. The valid range is 5 to 30 seconds.
- **Update**
Click the **Update** button to retrieve statistics from the host.

- **Reset**

Click the **Reset** button to reset all statistics to the initial value of 0.

Device list

The Device List panel displays the following information about the devices attached to an adapter connected to a host:

- Host: The name of the host
- Adapter: The ID of the adapter
- Node Name: The node name of the adapter (WWN)
- Port Name: The port name of the adapter
- Path: The path number
- Target: The device ID
- Loop ID: The loop ID of the adapter when operating in loop mode
- Port ID: The port ID of the adapter (the AL-PA if in arbitrated loop environment)
- Vendor ID: ID of the device manufacturer
- Product ID: ID of the device
- Product Revision: Device revision level

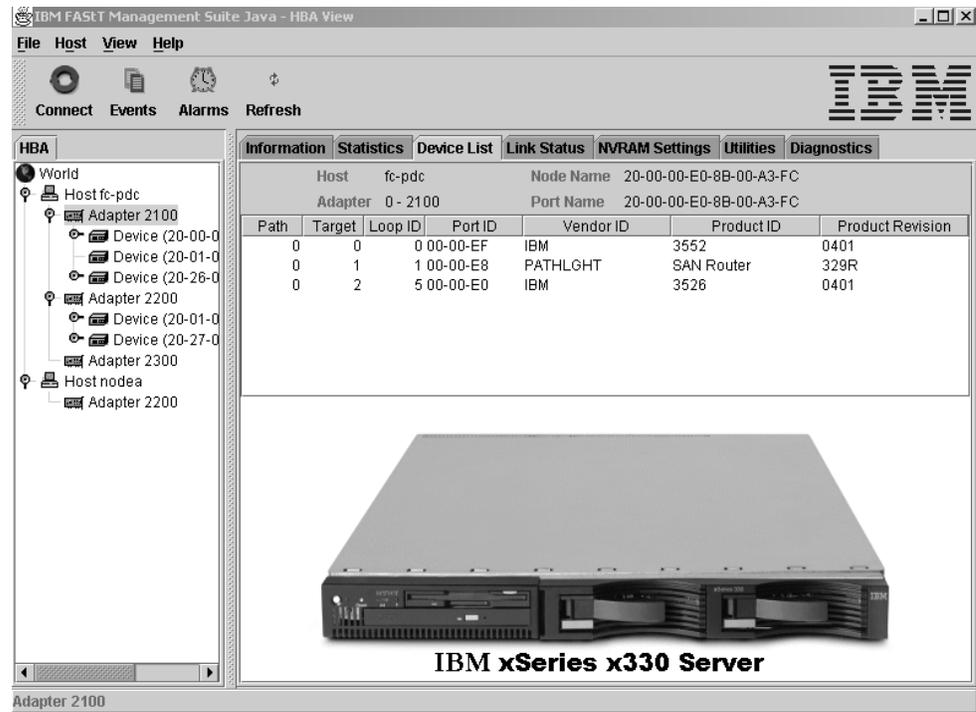


Figure 18. Device List panel

Link Status

The Link Status panel displays link information for the devices attached to an adapter connected to a host.

Information	Statistics	Device List	Link Status	NVRAM Settings	Utilities	Diagnostics
Host	target	Node Name	20-00-00-E0-8B-01-BF-CA			
Adapter	0 - 2200	Port Name	21-00-00-E0-8B-01-BF-CA			
	Port Name	Link Failure	Sync Loss	Signal Loss	Invalid CRC	
	Adapter (21-00-00-E0-8B-01-BF-CA)	0	9	9	0	
	Device (21-00-00-20-37-04-D2-0C)	0	7168	0	0	
	Device (21-00-00-20-37-08-03-6B)	0	0	0	0	
	Device (21-00-00-20-37-08-10-28)	15	138637	0	0	
<input type="button" value="Refresh Current"/> <input type="button" value="Refresh Total"/> <input type="button" value="Reset Current"/>						

Figure 19. Link Status panel

The Link Status table in the panel displays the latest adapter link status from the device driver and the status for the adapter and all attached targets.

The first column of the link status table is the World Wide Unique Port Name of the adapter and the attached devices.

The remaining columns display the following diagnostics information about the adapter and devices (see Table 2).

Table 2. Link status table.

Diagnostic information	Definition
Link Failure	A loss of word synchronization for more than 100 msec or loss of signal.
Sync Loss	Four invalid transmission words out of eight (FC-PH rules) cause loss of synchronization (synch). Only transitions from in sync to out of sync are counted. Three valid ordered sets in a row are required to reestablish word sync.
Signal Loss	The receiver is not detecting a valid input signal.
Invalid CRC	The number of Cyclic Redundancy Check (CRC) errors that were detected by the device.

Use the buttons at the bottom of the panel for the following:

- Refresh Current**
 Click this button to query the adapter for updated device link statistics since the last refresh.
- Refresh Total**
 Click this button to query the adapter for cumulative updated device link statistics.
- Reset Current**
 Click this button to initialize link statistics.

Displaying device information

You can view general device information (see “Viewing general device information” on page 26) or a LUN list (see “Viewing the LUN List” on page 26).

Viewing general device information

To view general information about a device, click the device in the FASTT MSJ main window HBA tree. The Information panel for the device is displayed. See Figure 20.

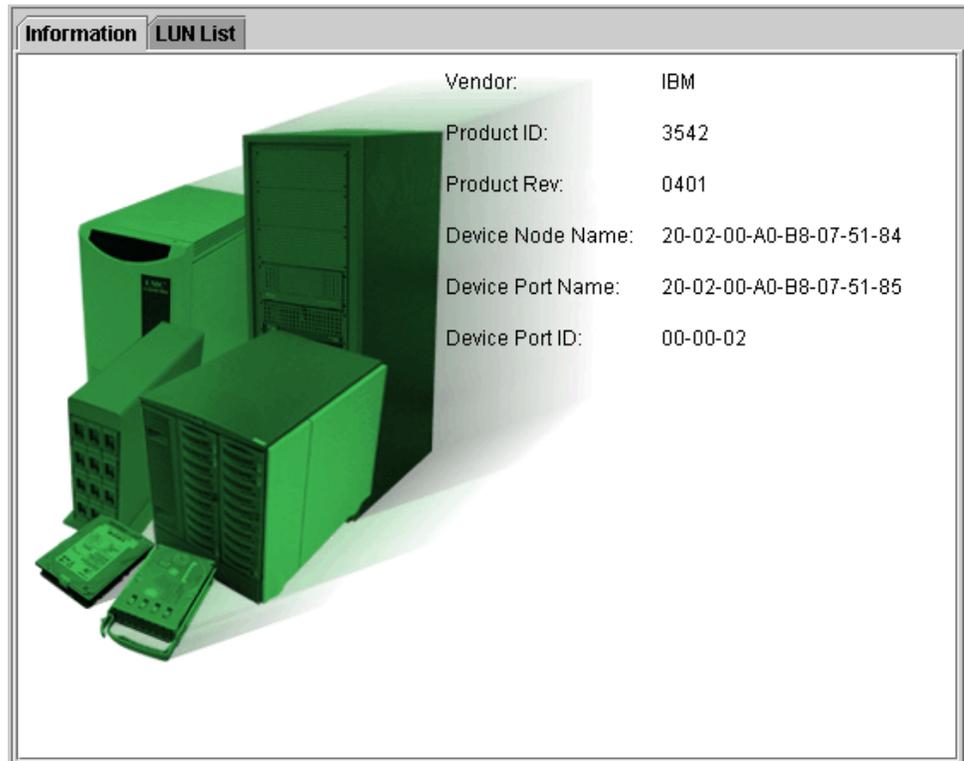


Figure 20. Device Information panel

The Information panel displays the following information:

- Vendor: Device manufacturer
- Product ID: Product ID of the device
- Product Rev: Device revision level
- Device Node Name: World wide node name of the device
- Device Port Name: World wide port name of the selected device port
- Device Port ID: Port ID of the selected device port

Viewing the LUN List

To display information about LUNs, click the device in the FASTT MSJ main window HBA tree; then, click the **LUN List** tab. The LUN List window is displayed. See Figure 21 on page 27.

Information		LUN List				
Device Vendor:	IBM	Device Product ID:	3552	Device Product Rev:	0401	
Device Node Name:	20-26-00-A0-B8-06-61-98					
Device Port Name:	20-27-00-A0-B8-06-61-99					
Device Port ID:	01-13-00					
LUN	Vendor	Product ID	Product Rev	World Wide Unique LUN...	Size	Disk Number
0	IBM	3552	0401	60-0A-0B-80-00-06-61-98	103.93 GB	0
31	IBM	Universal X...	0401	60-0A-0B-80-00-06-61-98	0 MB	N/A

Figure 21. LUN List panel

The identifying information is displayed:

- Device Vendor: The device manufacturer
- Device Product ID: The product ID of the device
- Device Product Rev: The device revision level
- Device Node Name: The World wide node name of the device
- Device Port Name: The World wide port name of the selected device port
- Device Port ID: Port ID of the selected device port

The LUN list information is displayed:

- LUN: The LUN number
- Vendor: The manufacturer of the LUN
- Product ID: The product ID of the LUN
- Product Rev: The product revision level of the LUN
- World Wide Unique LUN Name: The World wide name of the LUN
- Size: The capacity of the LUN
- Disk Number: The disk number of the LUN

Displaying LUN information

To view general information about a LUN, click the LUN in the FASTT MSJ main window HBA tree; then, click the **Information** tab. The **Information** window for the LUN is displayed. See Figure 22 on page 28.

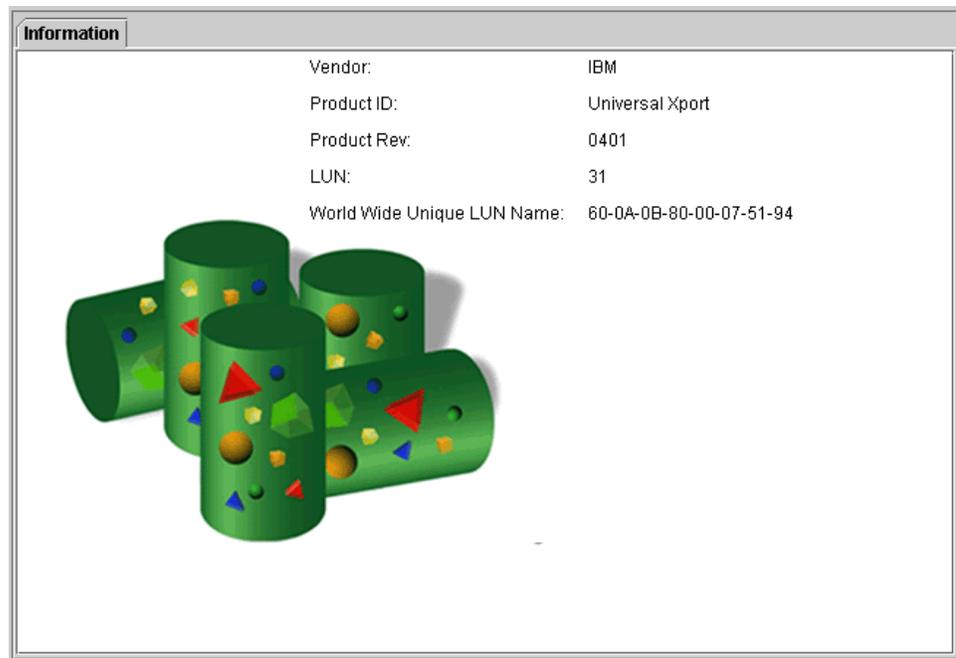


Figure 22. LUN Information panel

The LUN Information panel displays the following information:

- Vendor: Manufacturer of the LUN
- Product ID: Product ID of the LUN
- Product Rev: Revision level of the LUN
- LUN: LUN number
- World Wide Unique LUN Name: World wide name of the LUN

NVRAM settings

The NVRAM Settings panel displays parameters that are saved in the adapter's Non-Volatile RAM (NVRAM).

Note: The NVRAM parameters are preset at the factory. Do not alter them unless an IBM technical-support representative instructs you to do so. Adapter operation might be adversely affected if you enter the wrong parameters.

The NVRAM settings panel controls settings are divided into three categories: Host NVRAM Settings, Advanced NVRAM Settings, and Extended NVRAM Settings. You can access sections by clicking an option in the **Select NVRAM** drop-down list. The following sections define the NVRAM parameters and do not necessarily reflect the IBM default values.

Host NVRAM settings

When you click **Host NVRAM Settings** in the **Select NVRAM section** list box, the following information is displayed:

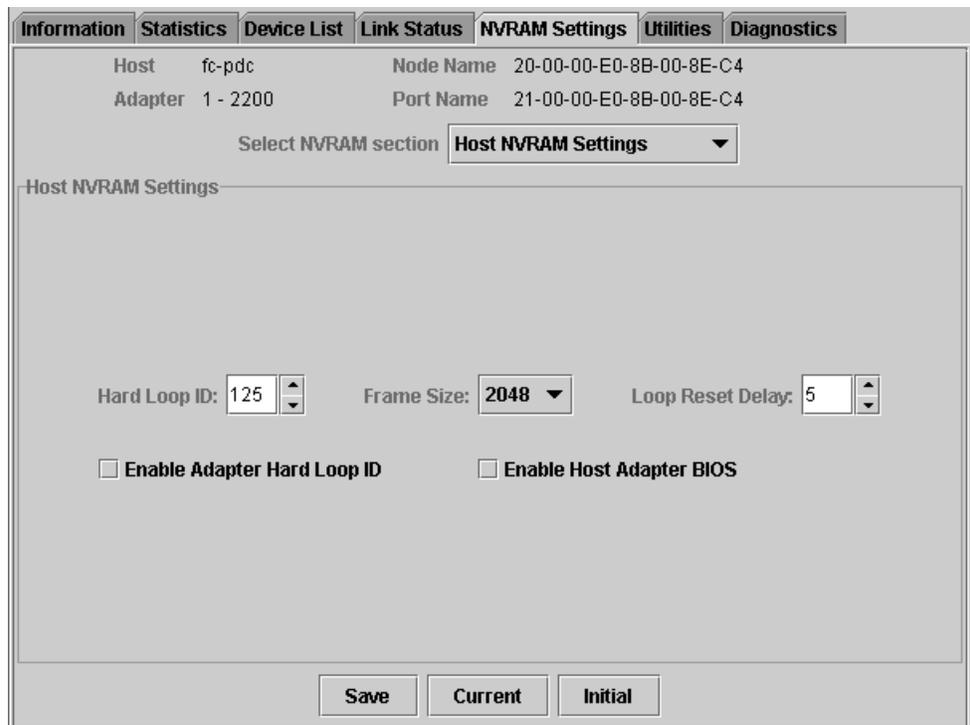


Figure 23. NVRAM Settings panel - Host NVRAM Settings

The following parameters are available in the Host NVRAM Settings section:

Hard Loop ID

ID used by the adapter when the **Enable Adapter Hard Loop ID** setting is enabled.

Frame Size

Specifies the maximum frame length supported by the adapter. The valid frame sizes are: 512, 1024, and 2048.

Loop Reset Delay

After resetting the loop, the firmware refrains from initiating any loop activity for the number of seconds specified in this setting. The valid delay is 0 to 60 seconds.

Enable Adapter Hard Loop ID

If this setting is enabled, the adapter uses the ID specified in the **Hard Loop ID** setting.

Enable Host Adapter BIOS

When this setting is disabled, the ROM BIOS on the host bus adapter is disabled, freeing space in the system's upper memory. Do not disable this setting if you are booting from a Fibre Channel disk drive attached to the adapter.

The **Initial** button restores all parameters to the settings used when the system was initially started. The **Current** button restores the updated settings modified by FAST MSJ. The **Save** button saves the updated NVRAM settings.

Advanced NVRAM settings

When you click **Advanced NVRAM Settings** in the **Select NVRAM section** list box, the following information is displayed:

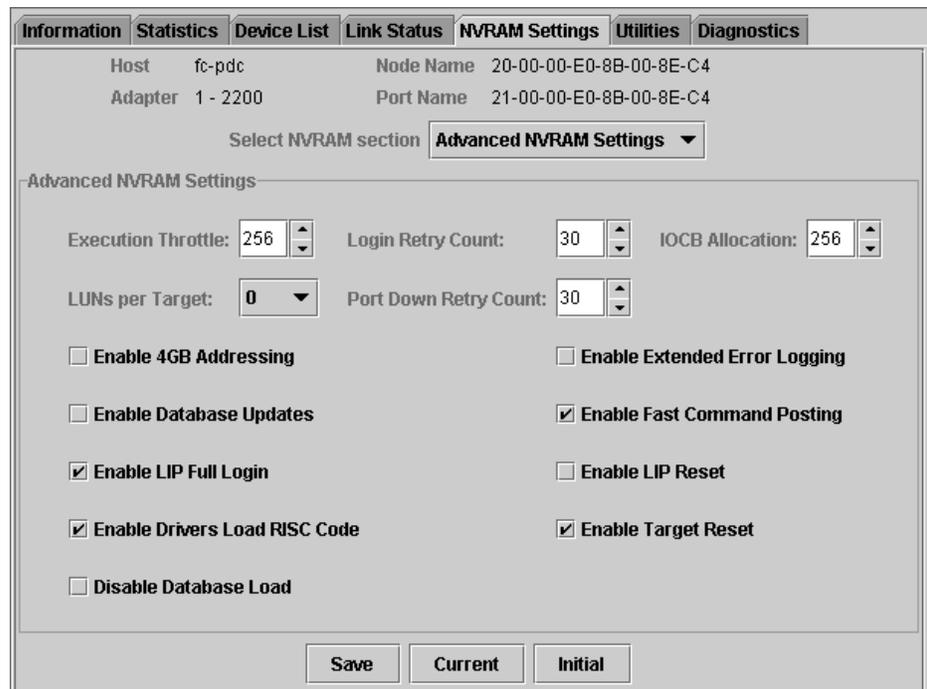


Figure 24. NVRAM Settings panel - Advanced NVRAM Settings

The following parameters are available in the Advanced NVRAM Settings section:

Execution Throttle

Specifies the maximum number of commands executing on any one port. When a port execution throttle is reached, no new commands are executed until the current command finishes executing. The valid values for this setting are in the range 1 to 256.

Login Retry Count

Specifies the number of retries the adapter uses during a login. This count can be a value in the range 0 to 255.

IOCB Allocation

Specifies the maximum number of buffers from the firmware buffer pool to be allocated to any one port. Valid range is 1 to 512.

LUNs per Target

Specifies the number of LUNs per target. Multiple LUN support is typical for Redundant Array of Independent Disk (RAID) boxes that use LUNs to map drives. The valid values for this setting are 0, 8, 16, 32, 64, 128, and 256. If you do not need multiple LUN support, set **LUNs per Target** to 0.

Port Down Retry Count

Specifies the number of times the adapter software retries a command to a port returning port down status. Valid range is 0 to 255.

Enable 4GB Addressing

When enabled, the adapter is notified if the system has more than 4 gigabytes of memory.

Enable Database Updates

When enabled, the adapter device driver saves loop configuration information in the flash (EEPROM) when the system is powered down.

Enable LIP Full Login

When this setting is enabled, the adapter logs in to all ports after a loop initialization process (LIP).

Enable Drivers Load RISC Code

When this setting is enabled, the host adapter uses the RISC firmware that is embedded in the adapter device driver. If this setting is disabled, the adapter device driver loads the latest version of RISC firmware found on the system.

Note: The device driver being loaded must support this setting. If the device driver does not support this setting, the result is the same as disabled regardless of the setting. Leaving this option enabled ensures support of the software device driver and RISC firmware.

Disable Database Load

When enabled, the device database is read from the Registry during device driver initialization. When disabled, the device database is created dynamically during device driver initialization. The default value is cleared (Disable Database Load is not enabled).

Note: This option usually applies to Windows NT and Windows 2000 operating environments.

Enable Extended Error Logging

This setting provides additional error and debugging information to the operating system.

Enable Fast Command Posting

When this setting is enabled, command execution time is decreased by minimizing the number of interrupts.

Enable LIP Reset

This setting determines the type of LIP reset that is used when the operating system initiates a bus reset routine. When this setting is enabled, the adapter device driver initiates a global LIP reset to clear the target drive reservations. When this setting is disabled, the device driver initiates a global LIP reset with full login.

Enable Target Reset

When this setting is enabled, the adapter device driver issues a target reset to all devices on the loop during a SCSI bus reset function call.

Extended NVRAM settings

When you click **Extended NVRAM Settings** in the **Select NVRAM section** list box, the following information is displayed:

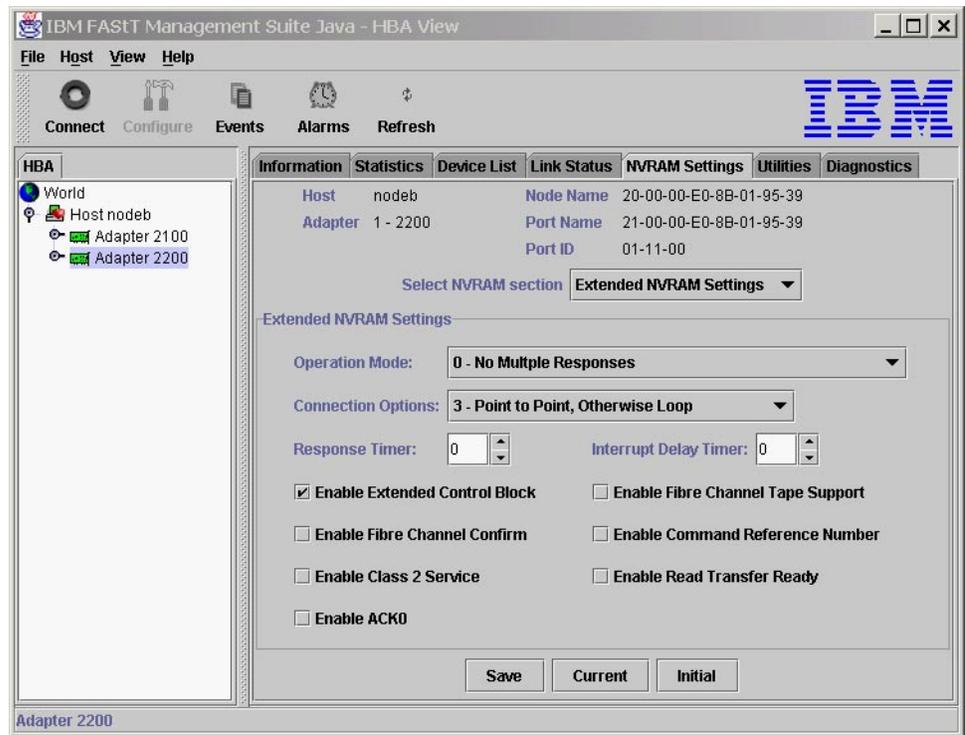


Figure 25. NVRAM Settings panel - Extended NVRAM Settings

The following parameters are available in the Extended NVRAM Settings section:

Operation mode

Specifies the reduced interrupt operation (RIO) modes (see Table 3). RIO modes enable posting multiple command completions in a single interrupt.

Table 3. Reduced interrupt operation modes.

Bit	Description
0	RIO is disabled; enable fast posting by setting the Fast Posting option.
1	Combine multiple responses, 16-bit handles, interrupt the host. The handles are reported by asynchronous event codes 8031h-8035h or the RIO Type 2 IOCB.
2	Combine multiple responses, 32-bit handles, interrupt the host. The handles are reported by asynchronous event code 8020h or 8042h or the RIO Type 1 IOCB.
3	Combine multiple responses, 16-bit handles, delay the host interrupt. The handles are reported by the RIO Type 2 IOCB
4	Combine multiple responses, 32-bit handles, delay the host interrupt. The handles are reported by the RIO Type 1 IOCB.

Connection Options

Defines the type of connection (loop or point-to-point) or connection preference during startup (see Table 4 on page 33).

Table 4. Connection type and preference.

Bit	Description
0	Loop only
1	Point-to-point only
2	Loop preferred, otherwise point-to-point
3	Point-to-point preferred, otherwise loop

Response Timer

Sets the time limit (in 100-microsecond increments) for accumulating multiple responses. For example, if this field is 8, the time limit is 800 microseconds.

Interrupt Delay Timer

Sets the time to wait (in 100-microsecond increments) between accessing a set of handles and generating an interrupt. (An interrupt is not generated when the host updates the queue out-pointer during this period.) For example, if this field is set to 4, then 400 microseconds pass between the DMA operation and the interrupt.

Enable Extended Control Block

This setting enables all extended NVRAM settings. The default is enabled.

Enable Fibre Channel Confirm

This setting is reserved for Fibre Channel tape support.

Enable Class 2 Service

Select this check box to provide class 2 service parameters during all automatic logins (loop ports). Clear the check box if you do not want to provide class 2 service parameters during automatic logins.

Enable ACK0

Select this check box to use ACK0 when class 2 service parameters are used. Clear this check box to use ACK1.

Enable Fibre Channel Tape Support

Select this check box to enable the firmware to provide Fibre Channel tape support.

Enable Command Reference Number

This setting is reserved. The default is disabled.

Enable Read Transfer Ready

Select this check box to enable the read transfer ready option (XFR-RDY). The firmware also sends an XPR-RDY IU before transferring read data as a SCSI target.

Utilities

Within the Utilities panel you can perform adapter-level configurations on a host-connected adapter.

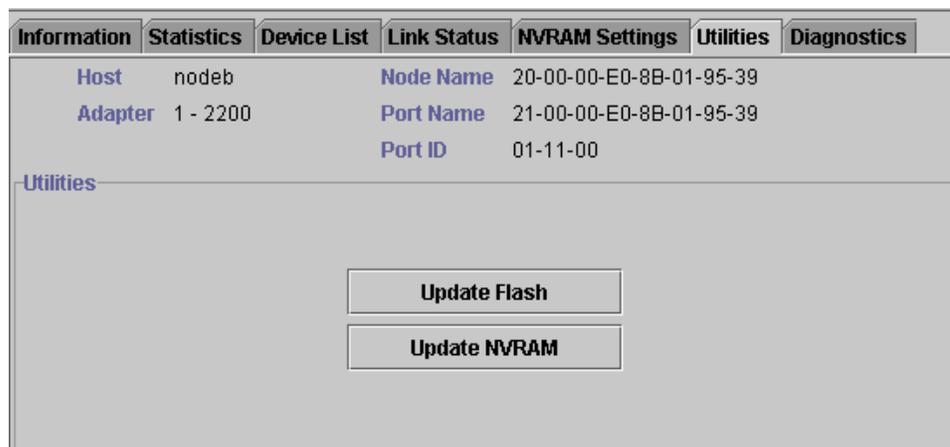


Figure 26. Utilities panel

Update flash

When you click this button (and the adapter accepts the update), the application prompts for the file name that contains the new flash BIOS. You can obtain this file from the IBM Web site or service personnel. The file name ends with .BIN (for example, QL22ROM.BIN).

After you enter a valid flash file, click **OK** to proceed with the update, or click **Cancel** to abort.

When you click **OK**, FAST MSJ verifies the file name and format of the new file. If the file is valid, the application compares the version of the file with the adapter flash version. If the adapter version is the same or newer than the file flash version, the application asks if you still want to update the flash.

If the update fails, an error message is displayed.

Update NVRAM

When you click this button (and the adapter accepts the update), the application prompts for the file name that contains the new NVRAM. You can obtain this file from the IBM Web site or service personnel. The file name ends with .DAT (for example, NVRM22.DAT).

After you enter a valid NVRAM file, click **OK** to proceed with the update, or click **Cancel** to abort.

When you click **OK**, FAST MSJ verifies the contents of the new file.

If the update fails, an error message is displayed.

Diagnostics

You can perform the loopback and read/write buffer tests using the Diagnostics panel (see Figure 27 on page 35).

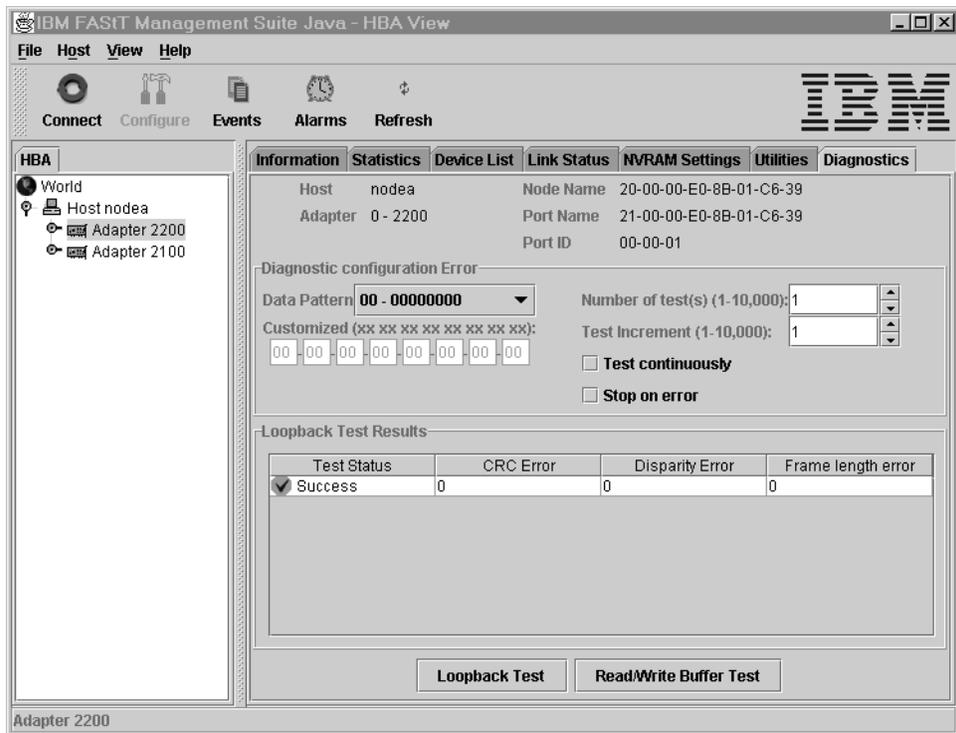


Figure 27. Diagnostics panel

The loopback test is internal to the adapter. The test evaluates the Fibre Channel loop stability and error rate. The test transmits and receives (loopback) the specified data and checks for frame CRC, disparity, and length errors.

The read/write buffer test sends data through the SCSI Write Buffer command to a target device, reads the data back through the SCSI Read Buffer command, and compares the data for errors. The test also compares the link status of the device before and after the read/write buffer test. If errors occur, the test indicates a broken or unreliable link between the adapter and the device.

The Diagnostics panel has three main parts:

- Identifying Information

This part of the panel displays information about the adapter being tested. This information includes:

- Host
- Adapter
- Node Name
- Port Name
- Port ID

- Diagnostic Configuration Error

This part of the panel contains the following testing options:

Data Pattern

Sets the test pattern. You can click a data pattern in the list or specify a customized pattern.

To specify a customized pattern, click **Customized** in the list and type the data pattern in hex format (0x00 - 0xFF) into the boxes under **Customized**.

When you select the random pattern from the list, a new random 8-byte pattern is sent to the devices, the adapter, or both (depending on whether you select the loopback or read/write buffer test).

Number of test(s)

Sets the number of tests you want to run. You can run the test for a certain number of times (up to 10,000) or continuously. You can also set the number of test increments per test up to 10,000.

Test continuously

Select this check box to test continuously.

Test Increment

The Test Increment value determines the number of times a test will be run against a particular device (read/write buffer test). For example if the value is set to 10, the Read/Write buffer test will be run 10 times against that device before moving to the next device in the Device List. The Number of tests parameter determines the total number of tests that will be run.

If you select **Test continuously**, the Test Increment value is set to 125 as the default value. You can increase this value to up to 10,000. While the test is running, a test progress dialogue window is displayed. You can cancel the test at any time by clicking the **Stop** button in this window. FAStT MSJ waits until the Test Increment value is reached before stopping. Thus, a large Test Increment value will delay the stop action. The delay is dependent on the number of devices being tested.

Stop on error

Select this check box if you want continuous testing to discontinue when an error is encountered.

- **Loopback Test Results**

The Loopback Test Results section displays the results of a test. The first column shows whether the test passed or failed. The remaining columns display error counters.

For a loopback test, the test result includes the following information: Test Status, CRC Error, Disparity Error, and Frame Length Error.

For a Read/Write Buffer Test, the test result shows the following information: Loop ID/Status, Data Mismatch, Link Failure, Sync Loss, Signal Loss, and Invalid CRC.

Some devices do not support Read/Write Buffer commands. FAStT MSJ displays the result for these devices as Information (blue) with the R/W buffer not supported message in the Data Mismatch column. The test results are sorted in the following order:

1. Errors
2. Information
3. Success

Notes:

1. The Netfinity® Fibre Channel Host Bus Adapter (QLA2100) does not support loopback mode. Use only the read/write test for this type of adapter.
2. A wrap connector and coupler (refer to the README file for the part number) is available to assist in isolating loop problems. When running the loopback test, you can plug the wrap connector directly into the FAStT host bus adapter to verify whether the adapter is functional. You can then move the wrap connector to other points in the loop (for example, ends of cables, hubs, and so on) to isolate the point of failure.

3. If the read/write buffer test returns the message The Adapter has no devices attached, make sure that the HBA is connected to the devices, and click **Refresh** to refresh the host database. If the adapter detects devices, they will appear in the HBA tree of the selected host.

Running the diagnostic tests

After you have chosen the loopback and read/write buffer test parameters as described in “Diagnostics” on page 34, click **Loopback Test** or **Read/Write Buffer Test** to run the loopback or read/write buffer test. If displaying warnings is enabled, the following warning window is displayed.

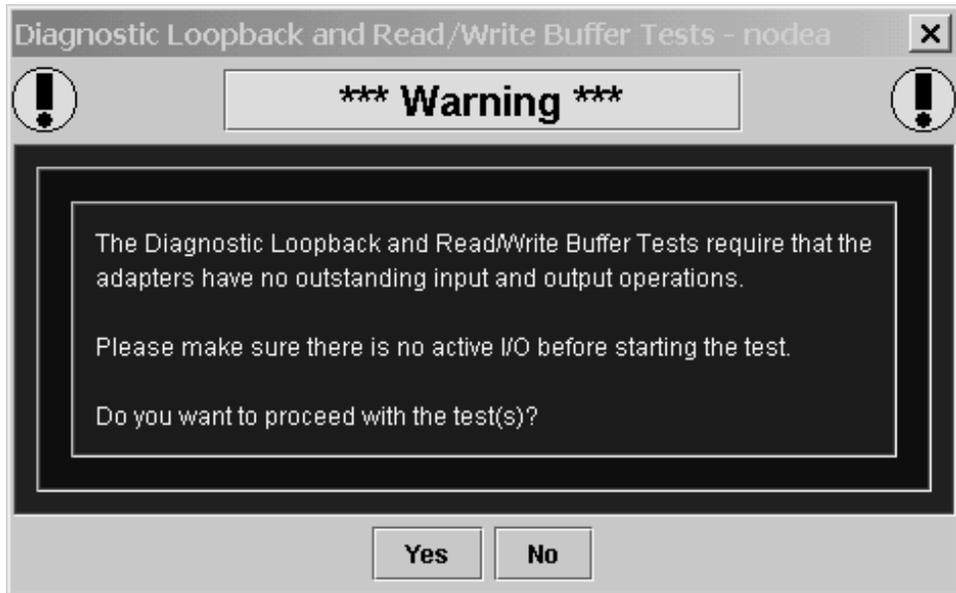


Figure 28. Diagnostic Loopback and Read/Write Buffer Tests Warning

Click **Yes** if there are no I/Os active and you want to proceed with the test, or click **No** to cancel the diagnostic test.

Note: To disable the warning message, click **View -> Options**, and clear the **Enable Warning Messages Displays** check box.

If you selected the **Test continuously** check box or a large value for number of tests or test increments, the Test Progress Dialogue window is displayed (see Figure 29). Click **Stop** to cancel the test.

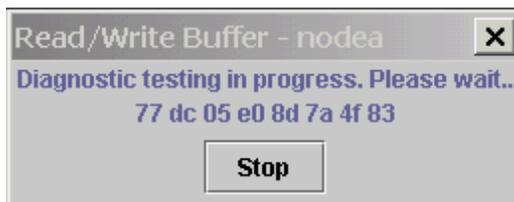


Figure 29. Test Progress Dialogue window

Diagnostic test results

The Test Result section of the Diagnostics panel displays the results of a test (see Figure 30 on page 38 and Figure 31 on page 39). Descriptions of the Loopback Test Results and Read/Write Test Results sections follow.

Loopback test results

The Loopback Test Results section provides the following information:

- Tests Status—whether the test passed or failed. The possible values are:
 - Success—The test passed.
 - Error—CRC, disparity, or frame length errors occurred.
 - Failed—An error occurred when attempting to issue a command.
 - Loop down—The loop is down.
- CRC Error—Number of CRC errors
- Disparity Error—Number of disparity errors
- Frame Length Errors—Number of frame length errors

The Test Status column in Figure 30 shows that the loopback test failed.

The screenshot shows a diagnostic utility window with several tabs: Information, Statistics, Device List, Link Status, NVRAM Settings, Utilities, and Diagnostics. The 'Information' tab is active, displaying host and adapter details. Below this is the 'Test Configuration' section, which includes a 'Data Pattern' dropdown set to '00 - 00000000', a 'Number of test(s)' field set to 1, and a 'Test Increment' field set to 1. There are also checkboxes for 'Test continuously' and 'Stop on error', both of which are unchecked. The 'Loopback Test Results' section contains a table with the following data:

Test Status	CRC Error	Disparity Error	Frame length error
Failed	1	0	0

At the bottom of the window, there are two buttons: 'Loopback Test' and 'Read/Write Buffer Test'.

Figure 30. Loopback Test Results section

Read/Write Buffer Test Results

The Read/Write Buffer Test Results section provides the following information:

- Loop ID—The loop ID of the adapter when operating in loop mode.
- Status—Whether the test passed or failed. The possible values:
 - Success—The test passed.
 - Error—A data miscompare or link status firmware error occurred.
 - Failed—A link status error, SCSI write buffer error, or SCSI read buffer error occurred.
 - Unknown—The target was not present.
 - Unsupported—The device does not support this test.
- Data Miscompare—Type of data miscompare. The possible values:

- 0 (no data miscompares)
- Get link status failed
- Read buffer failed
- Reserve unit failed
- Release unit failed
- R/W buffer not supported
- Write buffer failed
- Link Failure—Number of link failures
- Sync Loss—Number of sync loss errors
- Signal Loss—Number of signal loss errors
- Invalid CRC—Number of CRCs that were not valid

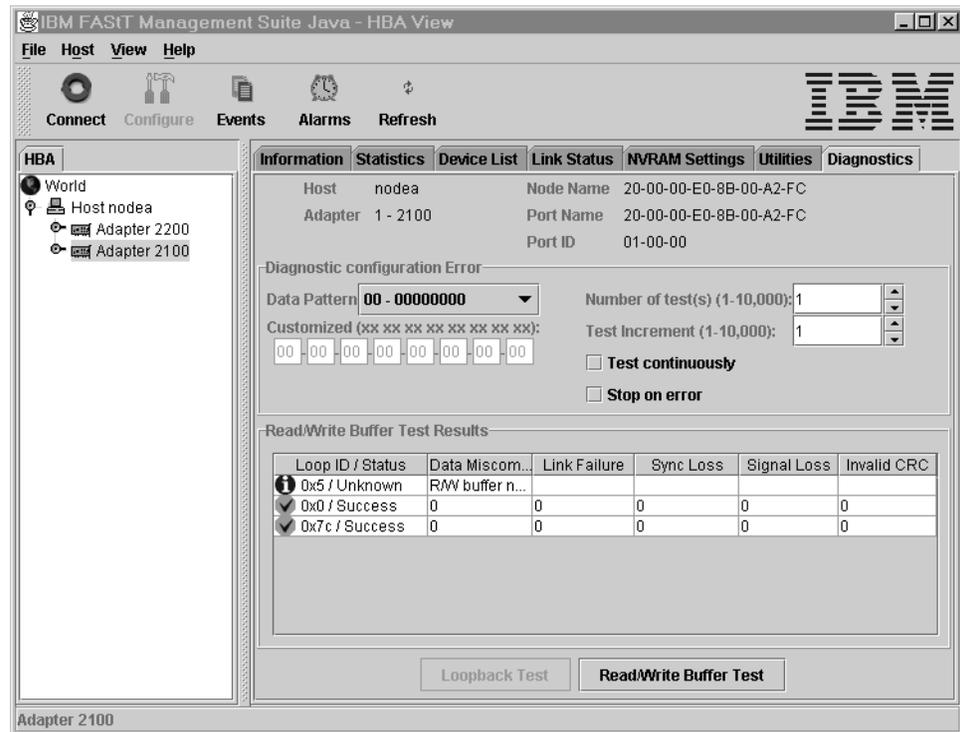


Figure 31. Read/Write Buffer Test Results section

Saving a configuration to a file

You can save a virtual image of a host that has been configured and might no longer be connected to the network by saving the host configuration to a file. To load the configuration of the host that has been saved, you must first configure and save the host information to a file.

To save the host configuration, click **File -> Save Configuration to File** in the Host Adapter Configuration window.

You are alerted with the following information:

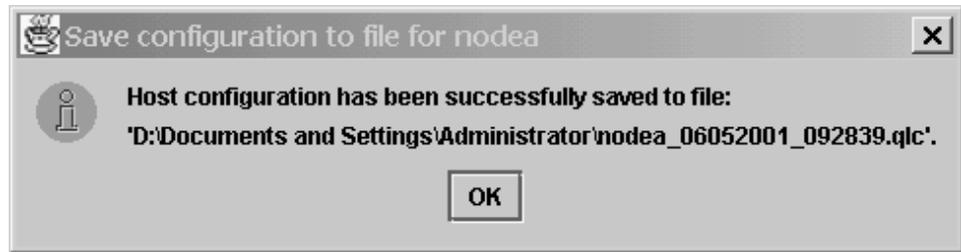


Figure 32. Save Configuration Alert window

After the .qlc file has been saved, the user can load it.

Loading a configuration from a file

After you have saved the host configuration to a file, you can load the configuration. Loading from a file enables you to load a virtual image of a host that has been previously configured and that is no longer connected to the network.

To load a configured file from FAST MSJ, perform the following steps:

1. Click **Host -> Load from File** in the Host Adapter Configuration window.
2. In the Open window, click the file you want to load, then click **Open**.

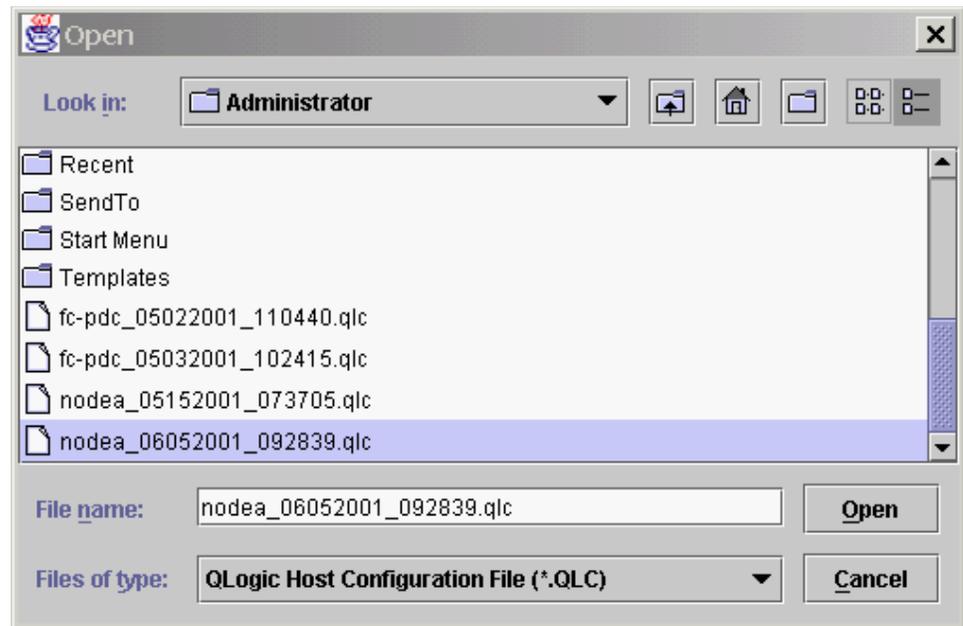


Figure 33. Load Configuration File window

After you have loaded the file, the adapters under the newly loaded host will appear in blue in the HBA. Blue adapters indicate that the host was loaded from a file rather than a live host.

Opening a group

Opening the group from a file enables the user to reload all the host information that was previously saved by the Save Group operation. FAStT MSJ will then connect the host and identify any discrepancies between the saved configuration and the newly discovered one.

To open a host configuration, click **File -> Open Group** in the host adapter configuration window. Select the desired .hst file from the Open window. After the file has been opened, the newly loaded host will be connected and displayed in the HBA tree panel.

Saving a group

Saving a Host Group to a file enables the user to save the HBA tree for that host including the device list and configuration settings. This feature also allows a system administrator to create Host files to selectively connect a number of hosts in the same SAN.

To save a host configuration to FAStT MSJ, the host adapter must be configured. Click **File -> Save Group** in the host adapter configuration window.

Once the 'Save Group' sub-menu item is selected the Save window is displayed. Select a file name (for example. Host NodeA.HST) and click **Enter**.

Chapter 6. SAN port configuration

This chapter describes the port configuration function of FASTT MSJ and includes the following information:

- Configuring Fibre Channel devices
- Configuring LUNs for a device
- Viewing adapter, device, and path information
- Editing persistent configuration data
- Saving and retrieving the host configuration to view from a file
- Using the failover watcher

Note: All of these configuration functions are available for only Linux operating systems.

Configuring Fibre Channel devices

Perform the following steps to configure Fibre Channel devices.

1. Do one of the following from the FASTT MSJ main menu.
 - In the HBA tree, click the host or an adapter connected to the host. Click **Configure** on the toolbar.
 - Right-click the host or adapter in the HBA tree. From the pop-up menu, click **Configure**. If FASTT MSJ detects an erroneous port configuration, the following message is displayed (see Figure 34). Click **OK** to continue.

Note: You will see this message prior to configuring the ports for the first time.

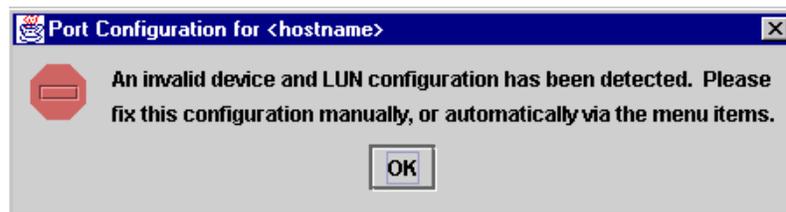


Figure 34. Port Configuration for Host Name message

Erroneous port configurations include:

- A device with contradictory visible paths. Only one path can be visible at a time.
- A LUN with contradictory (both disabled and enabled) paths. A configuration is valid when all paths are either enabled or disabled.
- More than one preferred path in the system. Only one path can be preferred at a time.

The Fibre Channel Port Configuration window is displayed (see Figure 35 on page 44).

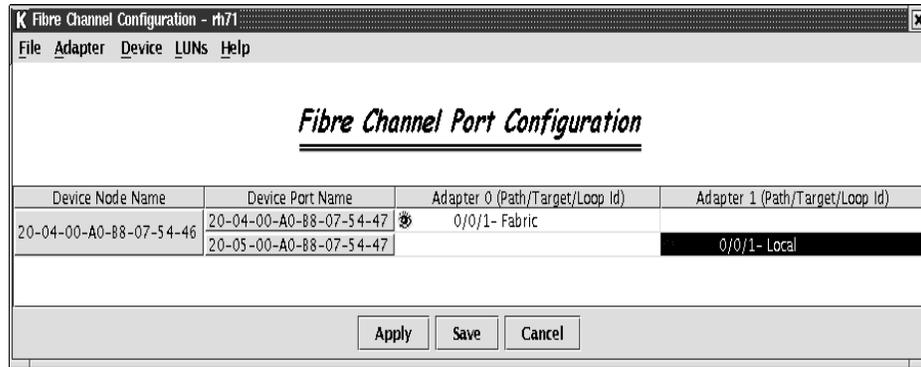


Figure 35. Fibre Channel Port Configuration window

The host name is displayed in the title bar. The window displays the adapters and devices in the computer. The following information is displayed.

- Device Node Name: World wide device node name
- Device Port Name: World wide device port name
- Adapter n (Path/Target/Loop ID): The adapter cell in the table represents a path (the device is visible to the adapter)

Adapter cell information consists of the following:

- Path: Path number
- Target: Device ID
- Loop ID: Complement of the arbitrated loop_physical address (AL_PA)

The adapter cells are color-coded to represent path information, as follows:

- White with open eye icon: The path is visible to the operating system.



- Black with no icon: The path is hidden from the operating system.



- Gray with stop icon: The device is unconfigured.



- White with no icon: There is no path present.



2. Select the following, as appropriate, from the Fibre Channel Port Configuration window menu.

- Modify the devices, LUNs, and paths:
 - Editing persistent configuration data (see “Editing persistent configuration data” on page 55)
 - Separating and combining separated device ports (see “Separating and combining separated device ports” on page 46)
 - Auto configuring device paths (see “Automatically configuring device paths” on page 46)

- Configuring LUNs for a device (see “Configuring LUNs for a device” on page 48)
 - Enabling and disabling LUNs (see “Enabling and disabling all LUNs” on page 47)
 - Load balancing LUN paths on this host (see “Load balancing LUN paths on this host” on page 47)
 - Setting device path visibility (see “Setting device path visibility” on page 47)
 - View information:
 - Adapter information (see “Viewing adapter information” on page 52)
 - Device information (see “Viewing device information” on page 53)
 - Help information. Click **Help** -> **Browse Contents**. The help text for the Fibre Channel Port Configuration window is displayed.
3. The modified configuration set up by FASTT MSJ can be applied to the live system for dynamic updates, or can be saved to the system persistent configuration file. When you save the configuration, the adapter device driver retrieves the data from the persistent configuration file at the next system startup and configures the system accordingly.

Do one of the following:

- Click **Apply** to apply the new configuration. The new configuration is saved to the persistent configuration file; it will be used the next time the system is restarted. The new configuration remains in memory and is displayed after the apply operation completes. If configuration is successful, the following message is displayed (see Figure 36). Click **OK**.

Note: For Linux operating systems, the applied configuration is only effective after the device driver is unloaded and subsequently reloaded with modprobe.

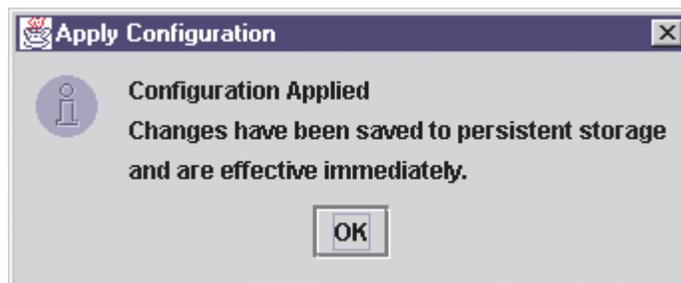


Figure 36. Apply Configuration message

- Click **Save** to save the new configuration. The new configuration is saved to the persistent configuration file; it will be used the next time the system is started. The current configuration remains in memory and is redisplayed after the save operation completes.

One of the following messages is displayed:

- If the save was successful, the following message is displayed (see Figure 37 on page 46). Click **OK**.



Figure 37. Save Configuration message

- If the save failed, the **Save Configuration Failed** message is displayed. The failure is usually caused by communication problems between the GUI and agent. Click **OK**.
 - Click **Cancel** on the Fibre Channel Port Configuration window (see Figure 35 on page 44) if you do not want to save the configuration changes.
- Note:** For Linux operating systems, the saved configuration is effective after the device driver is reloaded. Restarting is not required.

Separating and combining separated device ports

Failover and currently active paths are usually configured based on the device (as represented by the device node name). This method allows for adapter level and port failover. You can, however, separate a device into two devices based on a port (by device port name), where each device has a subset of paths. This allows only for adapter level failover.

Forcing separate devices

Perform the following steps to divide a device with two ports into two distinct devices based on the port. Click **Edit -> Force Separate Devices**, or right-click the device node name and click **Force Separate Devices**.

Combining separated devices

Perform the following steps to combine two devices with the same device node name (separated based on their port name) back into one device based on the device node name:

1. Click the device node name in the Fibre Channel Port Configuration window.
2. Click **Edit -> Combine Separated Devices**, or right-click the **Device Node Name** and click **Combine Separated Devices**.

Automatically configuring device paths

The **Auto Configure** option configures all device paths for the selected host to the default values. The default path for each device is the first available path as visible, with the other paths hidden. This option prompts for the automatic configuration of LUNs associated with these devices.

Perform the following steps to configure the device paths, and optionally the LUN paths, on this host to default values.

1. From the Fibre Channel Port Configuration window, click **Tools -> Auto Configure**. The system prompts whether you also want to use default LUN configurations.
2. Click **Yes** to change the current LUN configurations to the default values. Click **No** to keep the current LUN configuration settings.

Enabling and disabling all LUNs

Perform the following steps to configure all LUNs attached to devices on this host as enabled or disabled.

1. From the Fibre Channel Port Configuration window, click **Tools** -> **Enable LUNs**.
2. Do one of the following:
 - Click **Enable All** to configure all LUNs as enabled.
 - Click **Disable All** to configure all LUNs as disabled.
 - Click **Inverse State** to enable currently disabled LUNs and disable currently enabled LUNs.

Load balancing LUN paths on this host

The **Load Balance** option configures all LUN paths on this host to use system resources most efficiently. The LUNs are staggered between the adapters for load distribution. You can configure all LUNs or only LUNs that are enabled.

Perform the following steps to configure LUNs on this host:

1. From the Fibre Channel Port Configuration window, click **Tools** -> **Load Balance**.
2. Do one of the following:
 - Click **Enabled LUNs Only** to configure only enabled LUNs for load balancing across the paths within this device. When you click this option for a device with no enabled LUNs, the following message is displayed. Click **OK**.



Figure 38. Enabled-LUNs Configuration for <hostname> window

- Click **All LUNs** to configure all LUNs for load balancing across the paths within this device.

Setting device path visibility

Perform the following steps to set device path visibility to the operating system.

Note: There must be one visible path for the operating system to see the device.

1. In the Fibre Channel Port Configuration window, right-click the cell in the Adapter column that contains the adapter name.
2. From the pop-up menu, click one of the following options:
 - Click **Set Visible** to set this path as visible to the operating system during the start process.
 - Click **Set Hidden** to set this path as not visible to the operating system during the start process but used in failover conditions.
 - Click **Set Unconfigured** to set this path as not visible to the operating system. The path is not used in failover conditions. If setting the path has caused the LUNs associated with this device to have an invalid configuration, an error message is displayed (see Figure 39 on page 48).

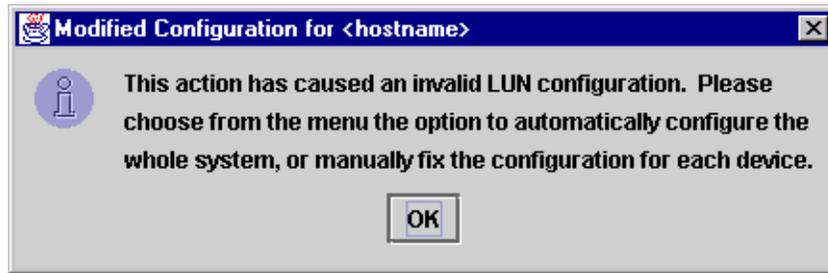


Figure 39. Modified Configuration for <hostname> window

This problem is usually the result of changing the configuration state of a device. You must modify the LUN configuration for this device before you can save or apply the configuration.

Configuring LUNs for a device

Perform the following steps to configure individual LUNs for a selected device:

1. In the Fibre Channel Port Configuration window, right-click the cell in the Device Node Name or Device Port Name column that contains the device name.
2. From the pop-up menu, click **Configure LUNs**.
 - If FAST MSJ detects an erroneous LUN configuration, the following message is displayed (see Figure 40). Click **OK** to continue.



Figure 40. Detected Invalid LUN Configuration for <hostname> window

Erroneous LUN configurations include:

- A LUN with both enabled and disabled paths. All paths must be either enabled or disabled.
- Too many preferred paths in the system. Only one path can be preferred at a time.
- If FAST MSJ detects an erroneous SAN cloud configuration, the following message is displayed (see Figure 41).



Figure 41. Detected Invalid SAN Cloud for <hostname> window

Change this configuration before continuing; FASTT MSJ cannot manage erroneous SAN configurations. Click **OK** to continue.

The LUN Configuration window for the device is displayed (see Figure 42).

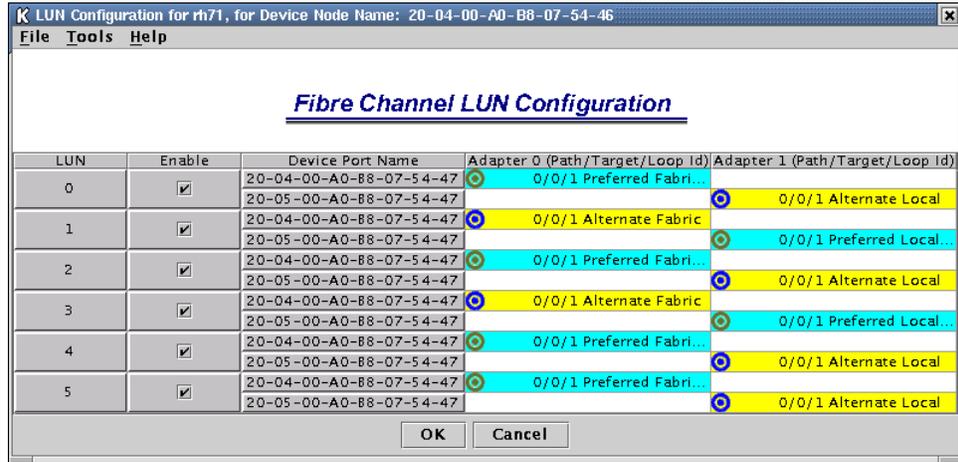


Figure 42. LUN Configuration window

The title displays the host name and world wide device node name. The table displays the following information:

- LUN: LUN number
- Enable: Whether the LUN is enabled
- Device Port Name: World wide device port name
- Adapter n (Path/Target/Loop ID): The adapter cell in the table represents a path (the device is visible to the adapter)

Adapter cell information consists of the following:

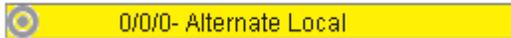
- Path: Path number
- Target: Device ID
- Loop ID: Loop IDs are 7-bit values that represent the 127 valid AL_PA addresses.
- Path type: Preferred or Alternate, and Current

The adapter cells are color-coded to represent path information, as follows:

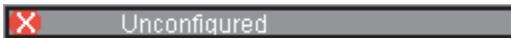
- Cyan with green bull's-eye: The preferred path to the LUN.



- Yellow with blue bull's-eye: An alternate path to the LUN.



- Gray with Stop icon: This is an unconfigured device.



- White with no icon: There is no path present.



3. Click the following, as appropriate, from the LUN Configuration window menu:

- Modify the LUNs and paths for this device:
 - Auto configuring LUN paths (see “Automatically configuring LUN paths” on page 51)
 - Load balancing LUN paths on this device (see “Load balancing LUN paths on this device” on page 51)
 - Configuring a LUN path using the default (see “Configuring a LUN path using the default” on page 51)
 - Enabling and disabling all LUNs (see “Enabling and disabling all LUNs” on page 47)
 - Enabling and disabling individual LUNs (see “Enabling and disabling individual LUNs” on page 52)
 - Setting LUN path failover (see “Setting LUN path failover” on page 52)
 - View information:
 - Adapter information (see “Viewing adapter information” on page 52)
 - Device information (see “Viewing device information” on page 53)
 - Path information (see “Viewing path information” on page 54)
 - Help information. Click **Help** -> **Browse Contents**. The help text for the LUN Configuration window is displayed.
4. Click **OK** to save the changes until you exit the Fibre Channel Port Configuration window; then, review the configuration changes (see Step 3 on page 49). If FASTT MSJ detects an erroneous LUN configuration while saving the configuration, the Auto LUN Configuration at Exit for <hostname> window is displayed (see Figure 43).

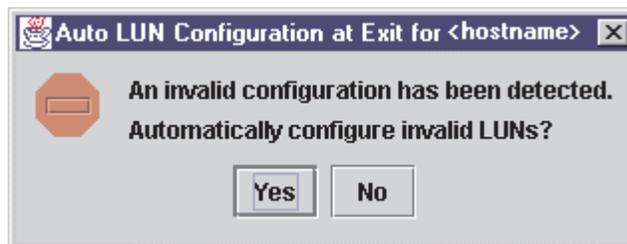


Figure 43. Auto LUN Configuration at Exit for <hostname> window

Do one of the following:

- Click **Yes** if you want the software to configure the invalid LUNs with the default paths. The following confirmation message is displayed (see Figure 44). Click **OK**.

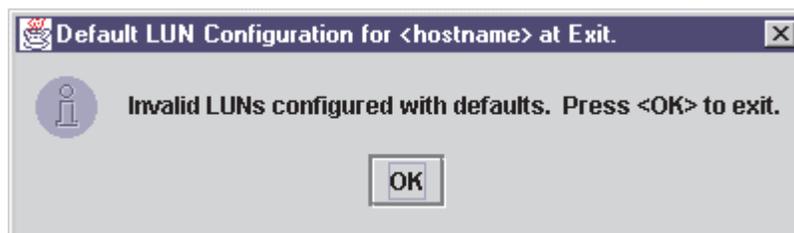


Figure 44. Default LUN Configuration for <hostname> at Exit window

- Click **No** if you do not want to configure the invalid LUNs. The configuration changes you made are not saved.
- Click **Cancel** if you do not want to apply the configuration changes.

Automatically configuring LUN paths

The **Auto Configure** option configures all LUN paths for the selected device to the default values. The default path for each LUN is the first available preferred path, with the other paths as alternates.

From the LUN Configuration window **Tools** menu, click **Auto Configure** to configure the LUN paths on this device to the default values.

Load balancing LUN paths on this device

The **Load Balance** option configures all LUN paths on this device to use system resources most efficiently. The LUNs are staggered between the devices to provide load distribution. You can configure all LUNs or only LUNs that are enabled.

Perform the following steps to configure the LUNs on this device:

1. From the LUN Configuration window **Tools** menu, click **Load Balance**.
2. Do one of the following:
 - Click **Enabled LUNs Only** to configure only those LUNs enabled for load balancing across the paths within this device. If you clicked this option for a device with no enabled LUNs, the following message is displayed. Click **OK**.



Figure 45. Enabled-LUNs Configuration for <hostname> window

- Click **All LUNs** to configure all LUNs for load balancing across the paths within this device.

Configuring a LUN path using the default

Perform the following steps to configure a LUN paths to the default values for LUN failover, with the first configured path as preferred and all other paths as alternate.

Note: This option is available only if the LUN is enabled and there are at least two available paths.

1. For the LUN you want to configure, right-click in the LUN, Enable, or Device Port Name column.
2. From the pop-up menu, click **Configure Path Using Default**.

Enabling and disabling all LUNs

Perform the following steps to configure all LUNs attached to this device as either enabled or disabled.

1. In the LUN Configuration window, right-click the **Enable** heading.
2. From the pop-up menu, click one of the following:
 - **Enable All LUNs** to configure all LUNs as enabled
 - **Disable All LUNs** to configure all LUNs as disabled
 - **Inverse State** to enable currently disabled LUNs and disable currently enabled LUNs

Enabling and disabling individual LUNs

To configure a specific LUN as enabled or disabled, in the LUN Configuration window Enable column do one of the following:

- Select the **Enable** check box to configure the LUN as enabled.
- Clear the **Enable** check box to configure the LUN as disabled.

Setting LUN path failover

Perform the following steps to set a LUN path as the preferred or alternate path in a failover condition. You can also click the preferred or alternate path as the currently active path.

Perform the following steps to set LUN path failover:

1. In the LUN Configuration window, right-click the cell for the device in the Adapter n column
2. From the pop-up menu, click one of the available options.
 - Click **Set LUN to Preferred** to set the alternate path as the preferred path in a failover condition.
 - Click **Set LUN to Alternate** to set the preferred path as the alternate path in a failover condition.
 - Click **Set Path to Current** to set this preferred or alternate path as the currently active path.

Notes:

1. You can set the path of an enabled LUN only. A LUN path can be set as either preferred or alternate (but not as unconfigured) if the device path is configured as hidden or visible.
2. You can use the failover watcher to view the failover settings for a selected host and set the preferred or alternate LUN path as the currently active path (see “Using the failover watcher” on page 57).

Viewing adapter, device, and path information

You can view adapter, device, and path information in the Fibre Channel Port Configuration and LUN Configuration windows. In the LUN Configuration window, you can also view LUN information. See Chapter 5, “Diagnostics and utilities,” on page 19 for information about viewing host, adapter, device, and LUN information from the tab panel.

Viewing adapter information

Perform the following steps in the Fibre Channel Port Configuration and LUN Configuration windows to view adapter information.

1. Right-click the Adapter n column heading to display information about a specific adapter. The Adapter Information window is displayed (see Figure 46 on page 53).

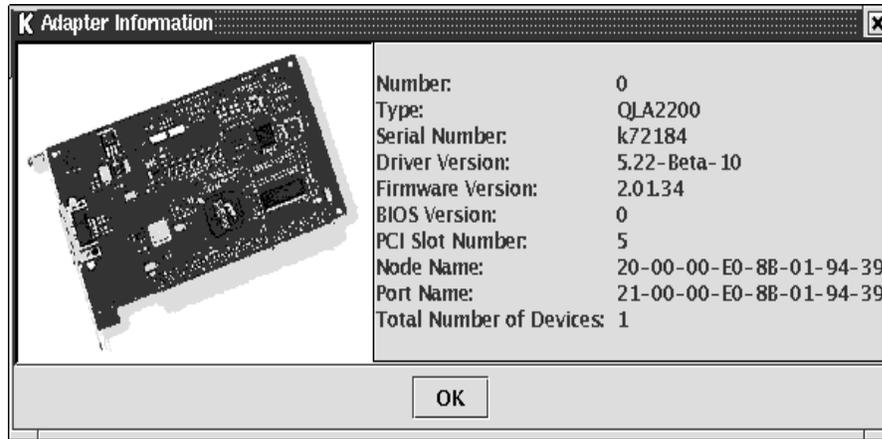


Figure 46. Adapter Information window

The following information is displayed:

- Number: Adapter number
- Type: Type of board. 2200 indicates a QLA22xx
- Serial Number: Serial number of the adapter
- Driver Version: Version of the adapter driver on the host that controls the adapter
- Firmware Version: Version of the adapter firmware on the host that controls the adapter
- BIOS Version: BIOS version on the adapter
- PCI Slot Number: PCI slot number assigned by the host
- Node Name: World wide adapter node name
- Port Name: World wide adapter port name
- Total Number of Devices: Number of devices attached to the adapter

2. Click **OK** to close the Adapter Information window.

Viewing device information

Perform the following steps in the Fibre Channel Port Configuration and LUN Configuration windows to view device information.

1. To display information for a device node, do one of the following:
 - In the Fibre Channel Port Configuration window, right-click a cell in either the Device Node Name or Device Port Name column.
 - In the LUN Configuration window, right-click a cell in the LUN, Enable, or Device Port Name column.

The Device Information window is displayed (see Figure 47 on page 54).



Figure 47. Device Information window

The following information is displayed:

- Product Identification: Product ID of the device
 - Product Vendor: Device manufacturer
 - Product Revision: Device revision level
 - Path: Path number
 - Target: Device number
 - LUN: The first LUN attached to the device
 - Loop ID: Loop IDs are 7-bit values that represent the 127 valid AL_PA addresses.
 - Port ID: Port ID of the selected device's port
 - Node Name: Click World wide node name of the device
 - Port Name: World wide port name of the selected device's port
- Note:** If the Device Node Name was selected, all the device's port names are displayed.
- Number of LUN(s): Number of LUNs attached to the device

2. Click **OK** to close the Device Information window.

Viewing path information

Perform the following steps to view path information in the LUN Configuration window.

1. Right-click the cell for the device in the Adapter n column. The Path Information window is displayed for the path (see Figure 48 on page 55).

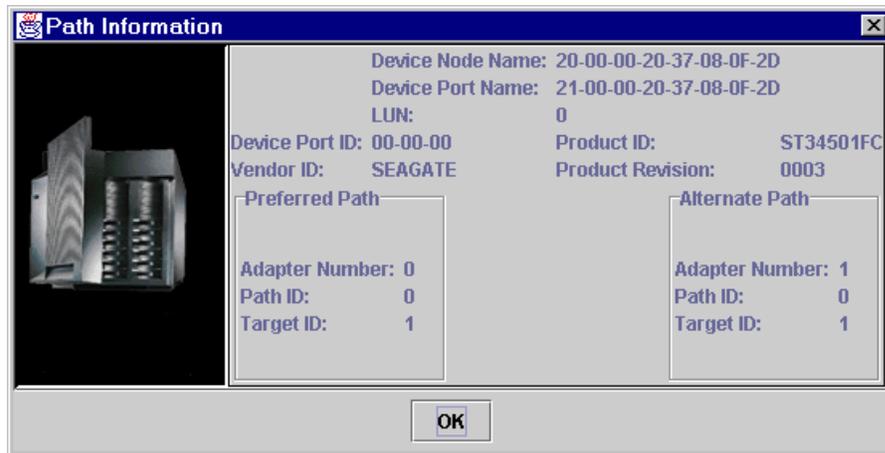


Figure 48. Path Information window

The following information is displayed:

- Device Node Name: World wide node name of the device
 - Device Port Name: World wide port name of the selected device's port
 - LUN: LUN number
 - Device Port ID: Port ID of the selected device's port
 - Vendor ID: Device manufacturer
 - Product ID: Product ID of the device
 - Product Revision: Device revision level
 - For the Preferred Path and Alternate Path sections:
 - Adapter Number: Number of the adapter
 - Path ID: Path number
 - Target ID: Device ID
2. Click **OK** to close the Path Information window.

Editing persistent configuration data

When you select **Persistent Configuration Data**, the current configuration data is displayed if a configuration exists. You can do the following:

- Click **Adapter Persistent Configuration** to delete the persistent configuration data for an adapter and its devices and LUNs (see "Deleting adapter persistent configuration data").
- Click **Device Persistent Configuration** to delete the persistent configuration data for a device and its LUNs (see "Deleting device persistent configuration data" on page 56).

Deleting adapter persistent configuration data

Perform the following steps to delete the persistent configuration data for an adapter, its devices, and LUNs.

1. Do one of the following:

- From the FAST MSJ main window, right-click the host or adapter in the HBA tree. In the resulting pop-up menu, click **Adapter Persistent Configuration Data**.
- From the Fibre Channel Port Configuration window **Adapter** menu, click **Adapter Persistent Configuration Data**.

The Fibre Persistent Configuration Editor window is displayed (see Figure 49).

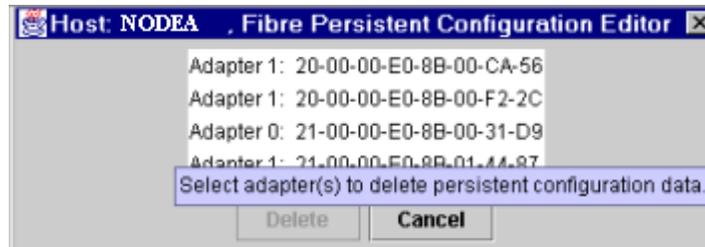


Figure 49. Fibre Persistent Configuration Editor window

For each adapter connected to the host, the current persistent configuration editor lists the adapter number and its world wide port name.

2. Do one of the following to delete one or more entries:
 - Click the adapter entries that you want to delete.
 - Click **Delete** to remove the entries.

The Security Check window is displayed. Enter the password, and click **OK**.

Note: Changes made to the persistent configuration are final. If you do not want the changes, reconfigure the host (see “Configuring Fibre Channel devices” on page 43).

Deleting device persistent configuration data

Perform the following steps to delete the persistent configuration data for a device and its LUNs.

1. Do one of the following.
 - From the FAST MSJ main window, right-click the device or LUN in the HBA tree. In the resulting pop-up menu, click **Device Persistent Configuration Data**.
 - From the Fibre Channel Port Configuration window, click **Device -> Device Persistent Configuration Data**.

The Device Persistent Configuration Editor window is displayed.

For each device connected to the adapter, the current persistent configuration editor displays the device number and its world wide port name.

2. Do the following to delete one or more entries:
 - a. Click the device entries that you want to delete.
 - b. Click **Delete** to remove the entries. The Security Check window is displayed.
 - c. Type the password and click **OK**.

Note: Changes made to the persistent configuration are final. If you do not want the changes, reconfigure the host (see “Configuring Fibre Channel devices” on page 43).

Saving and printing the host configuration file

You can save the host configuration file and then view a virtual image of the host. The file name includes the host name, date saved, and time saved. See “Saving a configuration to a file” on page 39 for details.

Printing the configuration to a file

Perform the following steps to print a device and LUN configuration.

1. From the FASTT MSJ main window, do one of the following:
 - a. In the HBA tree, click the host (or adapter connected to the host).
 - b. Do one of the following:
 - Click **Configure** on the toolbar.
 - Right-click the host (or adapter) in the HBA tree. From the resulting pop-up menu, click **Configure**.

The Fibre Channel Port Configuration window is displayed.

2. Click **File -> Print**.
3. Select the printer and print the configuration.

Using the failover watcher

The failover watcher enables you to view the failover settings for a selected host and set a preferred or alternate LUN path as the currently active path.

Note: See “Setting LUN path failover” on page 52 for more information.

Perform the following steps to view or modify the failover information.

1. In the FASTT MSJ main window HBA tree, click the host for which you want to view failover information.
2. Do one of the following:
 - Click **Host -> Current Path**.
 - Right-click the host in the HBA tree. From the pop-up menu, click **Current Path**. The HBA ViewFailover window is displayed (see Figure 50 on page 58).

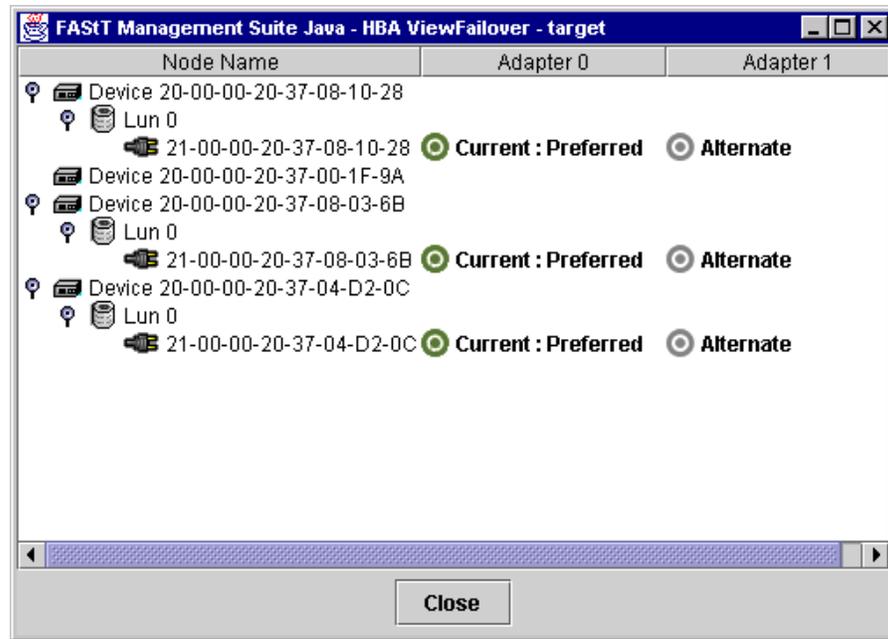


Figure 50. HBA ViewFailover window

The identifying information is displayed:

- **Host**

The title displays the host name.

The failover information is displayed:

- **Node Name**

Listing of the devices and LUNs.

- Devices

World wide device port name of the devices.

- LUNs

LUNs are listed under the devices to which they are connected. Includes the LUN number and world wide LUN port name.

- **Adapters**

Lists the adapters connected to the host and specifies their path status:

- Preferred

- Alternate

Path status:

- Green bull's-eye and **Current**: currently active

- Gray bull's-eye: not active

- Red bull's-eye: preferred path that is not active

3. To set the path of a device as currently active, do the following:

- a. Right-click the path status in the Adapter column.

- b. In the pop-up menu, click **Set Current**. The bull's-eye changes to green and the word *Current* is displayed.

Appendix A. Getting information, help, and service

If you need help, service, or technical assistance or just want more information about IBM products, you will find a wide variety of sources available from IBM to assist you. This section contains information about where to go for additional information about IBM and IBM products, what to do if you experience a problem with your computer, and whom to call for service should it be necessary.

Getting information

Information about your IBM software is available in the documentation. That documentation includes online books, README files, and help files. In addition, information about IBM products is available on the World Wide Web and through the IBM Automated Fax System.

Using the World Wide Web

On the World Wide Web, the IBM Web site has up-to-date information about IBM products and support. The address for the IBM Personal Computing home page is <http://www.ibm.com/pc/>.

You can find support information for your IBM products at <http://www.ibm.com/pc/support/>.

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You also can order publications through the IBM Publications Ordering System at <http://www.elink.ibm.com/public/applications/publications/cgibin/pbi.cgi>.

Getting information by fax

If you have a touch-tone telephone and access to a fax machine, in the U.S. and Canada, you can receive, by fax, marketing and technical information on many topics, including hardware, operating systems, and local area networks (LANs).

You can call the IBM Automated Fax System 24 hours a day, 7 days a week. Follow the recorded instructions, and the requested information will be sent to your fax machine. In the U.S. and Canada, to access the IBM Automated Fax System, call 1-800-426-3395.

Getting help and service

If you have a problem with your server product you will find a wide variety of sources available to help you.

Using the documentation

Many problems can be solved without outside assistance. If you experience a problem with your product, the first place to start is the troubleshooting information in your IBM documentation. If you suspect a software problem, see the documentation, including README files and online help, that comes with the operating system or application program.

Calling for service

If you have tried to correct the problem yourself and still need help, during the warranty period, you can get help and information by telephone through the IBM Help-Center®. 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 selected Engineering Changes (ECs) available that apply to your hardware.

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- Replacement or use of non-IBM parts or nonwarranted IBM parts. 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 warranty terms. Be sure to retain your proof of purchase to obtain warranty service.

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.

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

In addition, you are eligible for IBM Start Up Support for 90 days after installation. This service provides assistance for:

- Setting up your network operating system
- Installing and configuring interface adapters
- Installing and configuring network adapters

Please have the following information ready when you call:

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

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Belgium - French	Belgique	02-210 9800

Country		Telephone number
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Italy	Italia	02-482 9202
Luxembourg	Luxembourg	298-977 5063
Netherlands	Nederland	020-514 5770
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Spain	España	91-662 49 16
Sweden	Sverige	08-477 4420
Switzerland	Schweiz/Suisse/Svizzera	058-333 0900
United Kingdom	United Kingdom	01475-555 055
U.S.A. and Puerto Rico	U.S.A. and Puerto Rico	1-800-772-2227

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

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