HITACHI
DATA SYSTEMS

Hitachi Freedom Storage™ Lightning 9900™ LUN Manager User's Guide

LUN Manager, LU Size Expansion, and Zone Allocation Manager™ (LUN Security)

Notice of Export Controls

Export of technical data contained in this document may require an export license from the United States government and/or the government of Japan. Contact the Hitachi Data Systems Legal Department for any export compliance questions.

Document Revision Level

Revision	Date	Description
MK-90RD006-0	July, 2000	Initial Release
MK-90RD006-1	November, 2000	Revision 1, supersedes and replaces MK-90RD006-0

Source Document Revision Level

The following source documents were used to produce this document:

- ECN TW-90RD035 (Technical Writing ECN).
- ECN TW-90RD036 (Technical Writing ECN).
- ECN TW-90RD037 (Technical Writing ECN).
- ECN TW-90RD038 (Technical Writing ECN).
- ECN TW-90RD039 (Technical Writing ECN).
- ECN TW-90RD040 (Technical Writing ECN).

Preface

This user's guide provides instructions for installing and using LUN Manager, LU Size Expansion (LUSE) and LUN Security (Zone Allocation Manager) on the Lightning 9900™ Remote Console PC. Please read this manual carefully to understand how to use these products, and maintain a copy that is accessible from your Remote Console PC for reference purposes.

This user's guide assumes that:

- the user has a background in data processing and understands RAID storage subsystems and their basic functions,
- the user is familiar with the Hitachi Freedom Storage™ 9900 array subsystem,
- the user is familiar with the Hitachi Freedom Storage™ 9900 Remote Console, and
- the user is familiar with the Windows 95®, Windows 98®, or Windows NT® operating systems.

For further information on the Lightning 9900™ subsystem, please refer to the *Hitachi Freedom Storage™ Lightning 9900™ User and Reference Guide* (MK-90RD008). For further information on the Hitachi Freedom 9900 Remote Console, please refer to the *Hitachi Freedom Storage™ Lightning 9900™ Remote Console User's Guide* (MK-90RD003). You may also contact your Hitachi Data Systems account team or refer to the Hitachi Data Systems worldwide web site (http://www.hds.com) for additional information on the 9900 subsystem and its features and functions.

Note: In this document the term "9900" refers to the entire Hitachi Freedom Storage™ Lightning 9900™ subsystem family, unless otherwise noted.

Contents

List of Figures

List of Tables

Chapter 1 Overview

1.1 Overview of LUN Manager

The LUN Manager feature of the Lightning 9900™ subsystem enables you to define the SCSI-to-LUN paths for the 9900 subsystem using the 9900 Remote Console PC. Each logical unit (LU) can be mapped for access from multiple ports, providing alternate paths for nonstop data availability. In addition, LUN Manager allows you to reconfigure the SCSI paths at any time to accommodate system configuration changes and/or optimize subsystem performance.

LUN Manager enables you to set and define the port modes and set the fibre topology (point to point, FC-AL or fabric). The 9900 subsystem only supports fibre channel ports. The 9900 can be configured with up to 32 fibre ports, each of which can support up to 256 LUNs, thereby allowing up to 8192 fibre attached LUNs. For further information on fibre device addressing and LU configurations, please refer to the *Hitachi Freedom Storage™ Lightning 9900™ User and Reference Guide* (BO-90RD008).

The 9900 fibre channels also support a high-performance mode, which increases throughput by doubling the number of channel processors (CHPs) from 2 to 4 and the fibre optic processors (FOPs) from 1 to 2 per fibre interface. In high-performance mode, half of the fibre interfaces on the channel card are disabled, which allows the remaining interfaces to use the processors from the disabled channels. Each channel PCB can be configured for either high-performance or standard mode, using the LUN Manager software. If you need to use all of the interfaces on a channel card, all of the channel PCBs on that card must be configured for standard mode. For further information on high-performance mode, see section 0.

Note: Some LUN Manager operations may compromise data integrity. Please verify that you are performing the proper operation on the proper devices.

Note: The list of supported volumes in the following table is current as of the publication date of this document. Certain features may be made available later. Contact your Hitachi Data Systems account team for more information.

Table 1.1 LUN Manager Supported Volumes

S/390® Volumes	Open-System Volumes
3390-3A/B/C	OPEN-3
3380-KA/B/C	OPEN-9
	OPEN-K
	OPEN-8
	OPEN-E
	OPEN-L (*note 1)
	OPEN-M (*note 1)

Note 1: OPEN-L and OPEN-M are applicable to Windows 2000 only.

1.2 Overview of LUSE (LU Size Expansion)

The LUSE (LU Size Expansion) feature allows you to create virtual LUs that are larger than standard OPEN-x LUs, by expanding the size of a selected LU up to 36 times its normal size. The maximum size depends on the type of configuration. For example, you can expand an OPEN-9 LU to a maximum size of 265 GB (7.3 GB × 36). This capability enables open-system hosts to access the data on the entire 9900 subsystem using fewer logical units. LUSE allows host operating systems that have restrictions on the number of LUNs per interface to access larger amounts of data.

Warning: LUSE is a destructive process. Before you expand an LU, be sure to back up your data.

1.3 Overview of LUN Security (Zone Allocation Manager)

The Zone Allocation Manager feature of the 9900 subsystem allows you to restrict LU accessibility to an open-systems host using open-systems host's World Wide Name (WWN). You can set an LU to communicate only with one or more specified WWNs, allowing you to limit access to that LU to specified open-system host(s). This feature prevents other open-systems hosts from either seeing the secured LU or accessing the data contained on it. The LUN Security software for the 9900 Remote Console PC enables you to configure Zone Allocation Manager operations on the 9900 subsystem.

Note: LUN Security is not available for S/390® volumes. If you want to secure S/390® volumes, please refer to *Hitachi Freedom Storage™ Lightning™ 9900 LDEV Security User's Manual* (MK-90RD036).

LUN Security can be activated on any installed fibre channel port, and can be turned on or off at the port level. If you do not want to use LUN Security on a particular port you can disable the feature, so that the LU will not be restricted to a particular host or group of hosts. If you enable LUN Security on a specific port, that port will be restricted to a particular host or group of hosts. You can assign a WWN to as many ports as you want and you can assign more than one WWN to each port. You can also change the WWN access for any port without disrupting the settings of that port.

Because up to 256 WWNs can access each port and those same 256 WWNs may go to additional ports in the same subsystem, the LUN Security software allows you to create LU and WWN groups, so you can more easily manage your 9900 storage subsystem. An LU group allows you to assign specified LUs to a single group name. A WWN group allows you to assign up to 128 WWNs to a single group. A WWN group gives every host in the specified WWN group access to the specified LU or group of LUs.

Caution: LUN Security also allows you to set the security parameters while you are online, but be very careful if you choose to do so. If any of the LUN Security parameters are incorrect, the operation could be disruptive to the open-system host's I/O activity. Always verify the LUN Security parameters before entering them.

Chapter 2 Preparing for LUN Manager, LUSE, and LUN Security Operations

2.1 Enabling Options on the Remote Console PC and the SVP

The 9900 Remote Console options can only be enabled by remote console PC users with administrator access privileges. For LUN Manager, LUSE, and LUN Security, the expiration of a temporary license key will have the following effects:

- No new configuration settings may be performed.
- The configuration settings that were made before the temporary license key expired remain in effect and cannot be deleted.
- Non-configuration settings that were made before the temporary license key expired can be deleted.

This section describes the following tasks:

- Enabling the LUN Manager option (see section 2.1.1)
- Enabling LUSE or LUN Security (see section 2.1.2)
- Disabling an option (see section 2.1.3)

Once an option is enabled, modify access to that option is then available to administrators and to users with custom access privileges for that option. Users without either administrator access or custom access privileges for a particular option have view (read-only) access to that option.

The RMCMAIN Option Product panel (see Figure 2.1) displays the RMCMAIN options and their current installation status (**Install** or **Not install**). To access the RMCMAIN Option Product panel, select the **Option…** button on the Remote Console Main panel.

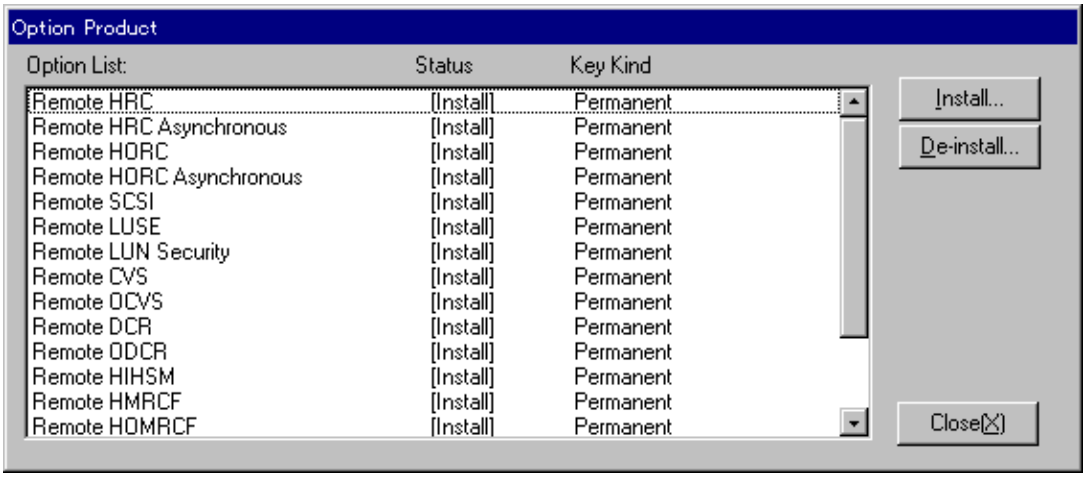

Figure 2.1 RMCMAIN Option Product Panel

The RMCMAIN Option Product panel has the following features:

- The **Option List** displays the available RMCMAIN options.
- The **Status** list shows the current status of each option (**Install** or **Not Install**).
- The **Key Kind** list shows the license type (**Temporary**, **Permanent**, or **Emergency**).
- The **Install…** button opens the Input Key Code panel (see Figure 2.3), which will prompt you for a password to complete the installation process.
- The **De-install…** button allows you to deinstall the selected option.
- The **Close** button closes the Option Product panel.

The DKCMAIN Option Product panel (see Figure 2.2) displays the DKCMAIN options and their current installation status (**Install** or **Not install**). To access the DKCMAIN Option Product panel, select the **Controller…** button on the Remote Console Main panel, select the first subsystem on which you want to enable the option on the Connection Control panel (see Figure 2.5), and then select the **Install…** button.

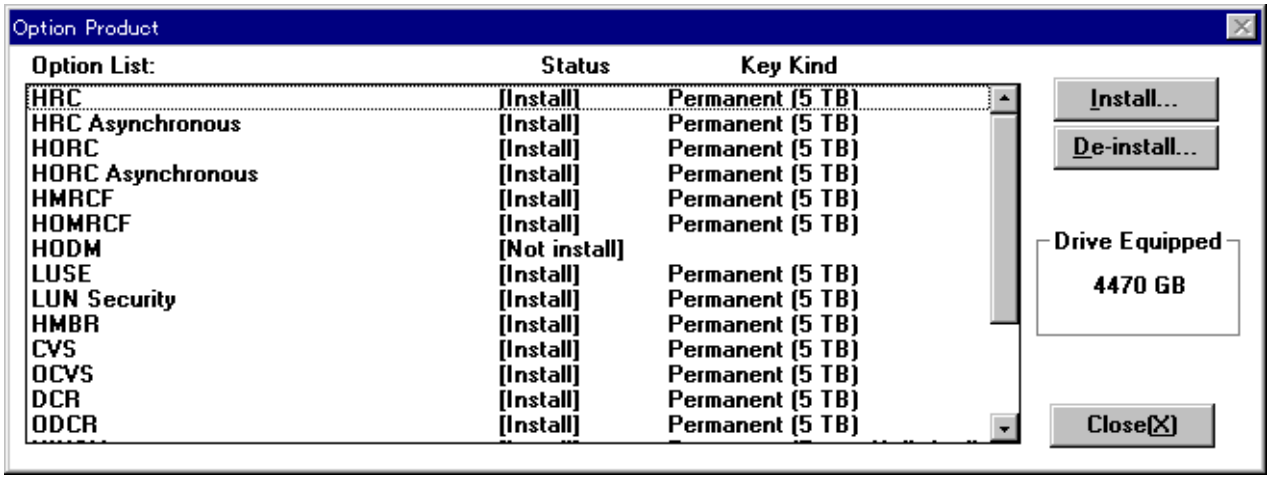

Figure 2.2 DKCMAIN Option Product Panel

The DKCMAIN Option Product panel has the following features:

- The **Option List** displays the available DKCMAIN options.
- The **Status** list shows the current status of each option (**Install** or **Not Install**).
- The **Key Kind** list displays the license type (**Temporary**, **Permanent**, or **Emergency**) and the maximum capacity of the PDEVs (physical devices) that the user is licensed to use. (***Note:*** If **[Free]** is displayed in the **Key Kind** list, this indicates that the capacity can be up to the amount shown in **Drive Equipped** box.)
- The **Install…** button allows you to install the selected option.
- The **De-install…** button deinstalls the selected option.
- The **Drive Equipped** box shows the maximum capacity of the current subsystem.
- The **Close** button closes the Option Product panel.

2.1.1 Enabling LUN Manager

The LUN Manager option must be enabled before you can enable either the LU Size Expansion or LUN Security (Zone Allocation Manager) options. Because LUN Manager comes pre-installed on each subsystem, you only need to enable it on the Remote Console PC.

To enable LUN Manager:

1. Log in as an administrator.
2. On the Remote Console Main panel, select **Option…** to open the RMCMAIN Option Product panel (refer to Figure 2.1). This panel shows the current installation status of the RMCMAIN options.
3. To enable LUN Manager, select **Remote SCSI**, and then select the **Install…** button. The Input Key Code panel (see Figure 2.3) opens. Enter the license key (password) in the **Key Code** text box, and then select **OK**.
4. If the password is approved, the Program Product Confirmation panel (see Figure 2.4) opens. This panel shows the program product model name (e.g., **Remote SCSI**), type of key (e.g., **Permanent**), and effective term (e.g., **Free**).
5. Verify that the information displayed on the Program Product Confirmation panel is correct, and then select **Install**.
6. When this option is enabled, the RMCMAIN Option Product panel opens and the displayed status of the LUN Manager option changes from **Not install** to **Install**.
7. Select **Close** to return to the Remote Console Main panel.

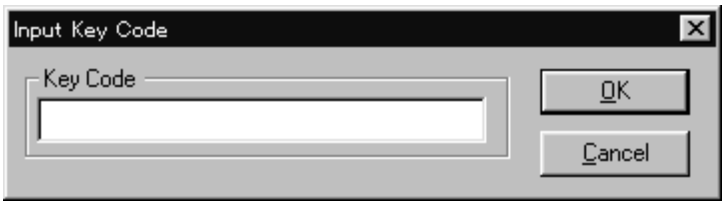

Figure 2.3 Input Key Code Panel

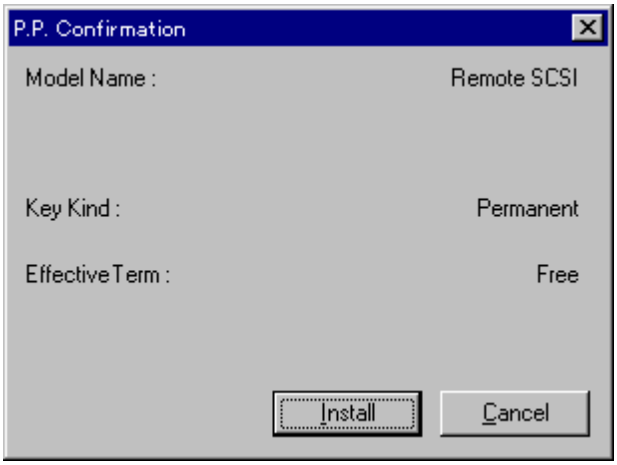

Figure 2.4 Program Product Confirmation Panel

2.1.2 Enabling LUSE and LUN Security

LUSE and LUN Security are enabled both on the remote console PC and on each subsystem.

1. Log in as administrator.
2. On the Remote Console Main panel, select Option… to open the RMCMAIN Option Product panel (refer to Figure 2.1). This panel shows the current installation status of the RMCMAIN options.
3. To enable an option, select that option and then select the Install… button.
4. The Input Key Code panel (see Figure 2.3) opens. Enter the license key (password) in the Key Code text box, and then select OK.
5. If the password is approved, the Program Product Confirmation panel (see Figure 2.4) opens. This panel shows the program product model name (e.g., Remote LUSE), type of key (e.g., Permanent), effective term (e.g., Free). After confirming the content of the Program Product Confirmation panel, select Install.
6. When this option installation is complete, the RMCMAIN Option Product panel reopens and the displayed status of the selected option changes from Not install to Install.
7. To enable another option, select that option, and then select the Install… button. Repeat steps 4 through 5 to complete this part of the option installation.
8. Select Close to return to the Remote Console Main panel.
9. On the Remote Console Main panel, select Controller… to open the Connection Control panel (refer to Figure 2.5).

10. On the Connection Control panel, select the first subsystem on which you want to enable these options, and then select the Install… button to open the DKCMAIN Option Product panel (refer to Figure 2.2).
11. Select the appropriate option, and then select the Install… button.
12. The Input Key Code panel (refer to Figure 2.3) opens. Enter the license key (password) in the Key Code text box, and then select OK.
13. If the password is approved, the Program Product Confirmation panel (refer to Figure 2.4) reopens. This panel shows the program product model name (e.g., LUSE), key kind (e.g., Permanent), and effective term (e.g., Free).
14. To enable another option on this subsystem, repeat steps 9 through 13.
15. To enable options on another 9900 subsystem, repeat steps 10 through 15.
16. When you are finished enabling options on the 9900 subsystems, select Close to return to the Remote Console Main panel.

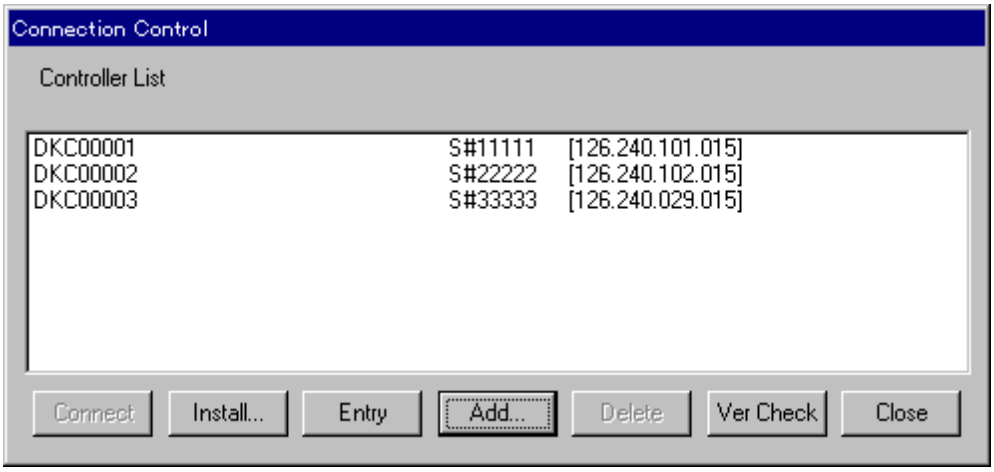

Figure 2.5 Connection Control Panel

2.1.3 Disabling an Option

To deinstall an RMCMAIN option on the Remote Console PC:

1. Log in as administrator.
2. On the Remote Console Main panel, select **Option…** to open the RMCMAIN Option Product panel (refer to Figure 2.1).
3. Select the desired option, then select **Deinstall…**.
4. The displayed status of the selected option changes from **Install** to **Not install**, and the option is no longer installed on the Remote Console PC.
5. To deinstall another option, repeat steps 3 and 4. Select **Close** to return to the Remote Console Main panel.

To deinstall a DKCMAIN option on the SVP:

1. Log in as administrator.
2. On the Remote Console Main panel, select **Controller…** to open the Connection Control panel (see Figure 2.5).
3. On the Connection Control panel, select the subsystem on which you want to disable an option, and then select the **Install…** to open the DKCMAIN Option Product panel (refer to Figure 2.2).
4. Select the desired option, and then select **De-install…**. The displayed status of the selected option changes from **Install** to **Not install**.
5. Select **Close** to exit the DKCMAIN Option Product panel. You are returned to the Connection Control panel.
6. To disable options on another 9900 subsystem, repeat steps 3 through 5. If you are finished, select **Close** to return to the Remote Console Main panel.

2.2 Connecting to a Subsystem

The Connection Control panel (refer to Figure 2.5) displays the registered 9900 subsystems and allows you to connect to a 9900 subsystem. To access the connect function, open the Connection Control panel by selecting the **Connect…** button on the Remote Console Main panel. The connect function is available to all users.

Note: A 9900 controller can only connect to one Remote Console PC at a time.

To connect to a 9900 controller:

1. On the Remote Console Main panel, select **Connect…** to open the Connection Control panel (refer to Figure 2.5).
2. Select the desired controller in the **Controller List** box. Select the **Connect** button.
3. When the Remote Console PC connects to the selected controller, the Option Select panel opens to provide access to the installed 9900 Remote Console options (refer to Figure 2.6).
4. To disconnect from the connected controller, exit the Option Select panel by selecting the **Close** button.

2.3 Launching LUN Manager (SCSI Path)

The Option Select panel (see Figure 2.6) opens automatically when the 9900 Remote Console connects to a selected controller, and provides access to the installed 9900 Remote Console features.

Figure 2.6 Option Select Panel

To launch LUN Manager, select **SCSI PATH**. You may also use the **Execute** menu, which displays the installed options and allows you to select and start SCSI Path. (The option buttons and the **Execute** menu commands perform exactly the same functions.) Once LUN Manager/SCSI Path is launched, you may select either LUSE or LUN Security.

To exit the Option Select panel, select the **File** menu, then select **Close**. The Remote Console PC automatically disconnects from the connected controller, and you are returned to the Remote Console Main panel.

Chapter 3 LUN Manager/SCSI Path Operations

3.1 Initiating LUN Manager/SCSI Path Operations

LUN Manager/SCSI path operations on the 9900 Remote Console PC enable you to add and delete SCSI-to-LUN paths, in order to configure the LUN mapping for each 9900 device. With the appropriate middleware support, each LU can be mapped from multiple TIDs to provide alternate path takeover and/or load balancing capabilities.

LUN Manager/SCSI path operations can be performed by users with administrator or custom access privileges for this option. ***Note:*** Your Hitachi Data Systems representative can also configure the SCSI paths, host modes, expanded LUs and fibre options using the SVP. Contact your Hitachi Data Systems account team for further information on this and other services.

The following sections have specific instructions for LUN Manager operations:

- To perform Fibre-Channel mapping and addressing, see section 3.2
- To add SCSI paths online, see section 3.3
- To add SCSI paths offline, see section 3.3.2.
- To delete SCSI paths, see section 3.3.4.

To begin any of the LUN Manager/SCSI path operations:

1. Log in to the 9900 RMCMAIN software, and verify that the **Remote SCSI** option is installed. If not, install the **Remote SCSI** option as described in section 2.1.1.
2. Connect to the desired 9900 subsystem (refer to section 2.1). The Option Select panel opens (refer to Figure 2.6).
3. On the Option Select panel, select **SCSI PATH** to open the SCSI PATH panel (see Figure 3.3). This is the starting point for all LUN Manager/SCSI path operations.
4. The **Mode** menu on the SCSI PATH panel has three options:
   a) **Off Line Mode** allows you to define SCSI paths while they are offline to the host.
   b) **On Line Mode** allows you to define SCSI paths while they are online to the host.
   c) **View Mode** allows you to view the current SCSI path configuration (the default mode).

3.2 Fibre Channel Mapping and Addressing

To assign a fibre address to an LDEV you must set the port address, the SCSI ID and the logical unit number. To enable high availability configurations, the LUN Manager software can define several paths to the same LDEV.

Figure 3.1 illustrates fibre channel mapping.

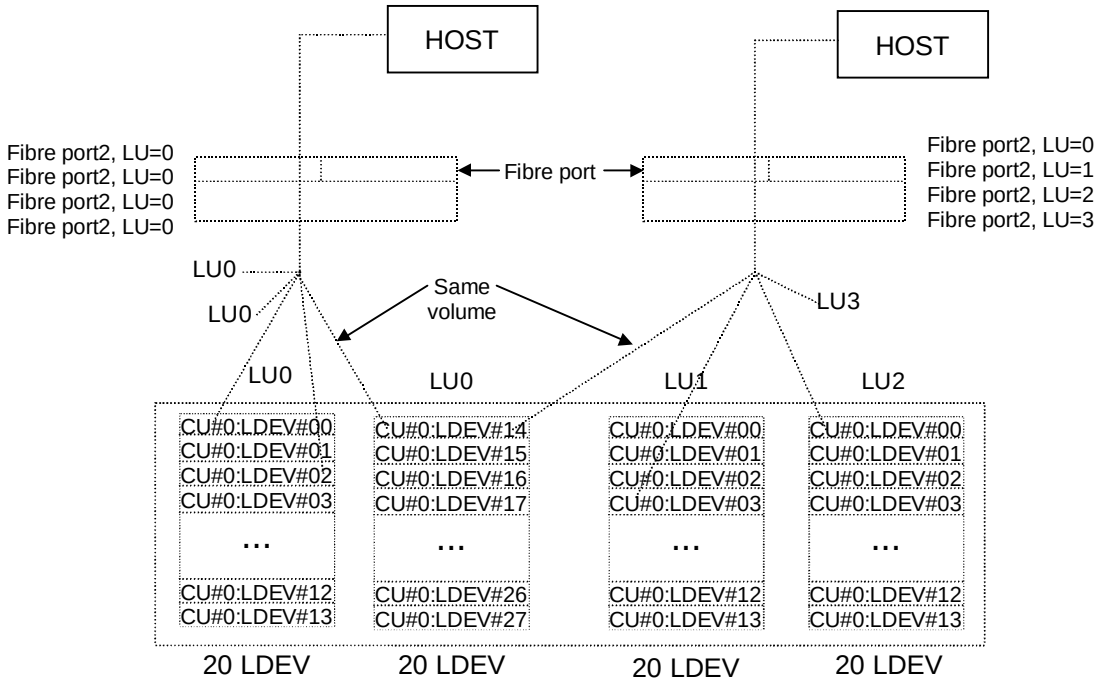

Figure 3.1 Fibre Channel Mapping

Each Fibre port is assigned a Target ID (01-EF), and can be configured with up to 256 LUNs (0-FF). To access an LU in the 9900, the host first selects a fibre path using the host fibre channel ID, then selects the 9900 interface using the Target ID, and then selects the device using the LU number (LUN).

Figure 3.2 illustrates a fibre-channel addressing configuration.

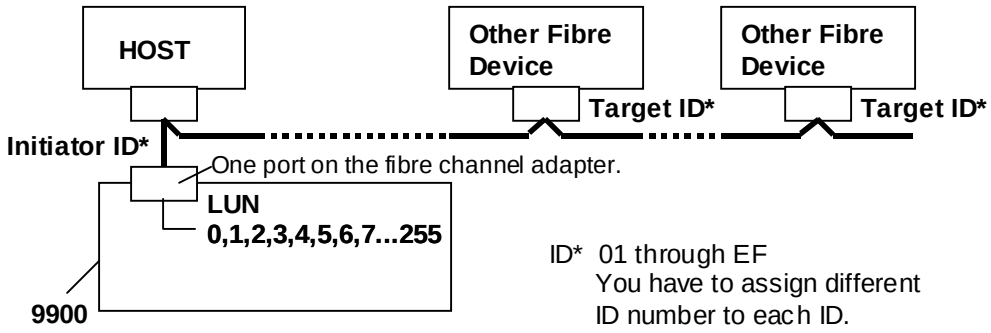

Figure 3.2 Fibre Channel Addressing Configuration

3.3 Adding and Deleting SCSI Paths

3.3.1 Parameters for Online SCSI Path Definition

The **Define Online** option allows the user to add and delete LUs under existing target IDs. There are some general parameters for online SCSI path definition, as follows: In addition, there are some platform-specific requirements for online SCSI path definition, as follow:

- Once you have added path(s) online, you cannot delete them online.
- Once you have deleted path(s) online, you cannot re-add them online.
- If you add path(s) to a port with no assigned path, you can change the host mode, fibre address, and/or fibre topology for that port.
- If you add path(s) to a volume with no assigned path, you can set the command device to that volume.
- If you delete all path(s) to a volume, you can delete (or release) the command device to that volume.

Caution: The online definition feature may only be used for those fibre ports that already have defined SCSI paths.

In addition, there are some platform-specific requirements for online SCSI path definition, as follows:

- Online SCSI path definition is not supported in Compaq Tru-64®, DYNIX/ptx®, Red Hat® Linux® Netware®, Sequent® or VxVM-DMP®.
- Windows NT® and Windows 2000® require a reboot before LUs added online are recognized.
- For HP-UX®, LUN = 0 should not be deleted under the existing target ID.
- Certain operating systems require host operations before the LUs added under the online option are recognized by that operating system.
- You may need to perform several operations on the open-system host in order to recognize the newly added LUs. Certain platforms may not support online SCSI path definition. Please refer to the user documentation for the particular operating system.

3.3.2 The SCSI Path Panels

3.3.2.1 The SCSI PATH Panel (SCSI PATH Tab)

The SCSI PATH panel has three tabs: SCSI PATH (detailed in this chapter), LU Expansion Define (see Chapter 4), and LUN Security (see Chapter 5). All references in this chapter are to the SCSI PATH tab of the SCSI PATH panel. ***Note:*** the panel displays the same information, whether in **Off Line Mode, On Line Mode,** or **View Mode**.

The SCSI PATH tab of the SCSI PATH panel (see Figure 3.3) displays the SCSI path information for the connected subsystem and provides access to all SCSI path functions. This panel opens at the beginning of LUN Manager operations, and you are returned there at the end of these operations so you can view and confirm your requested changes.

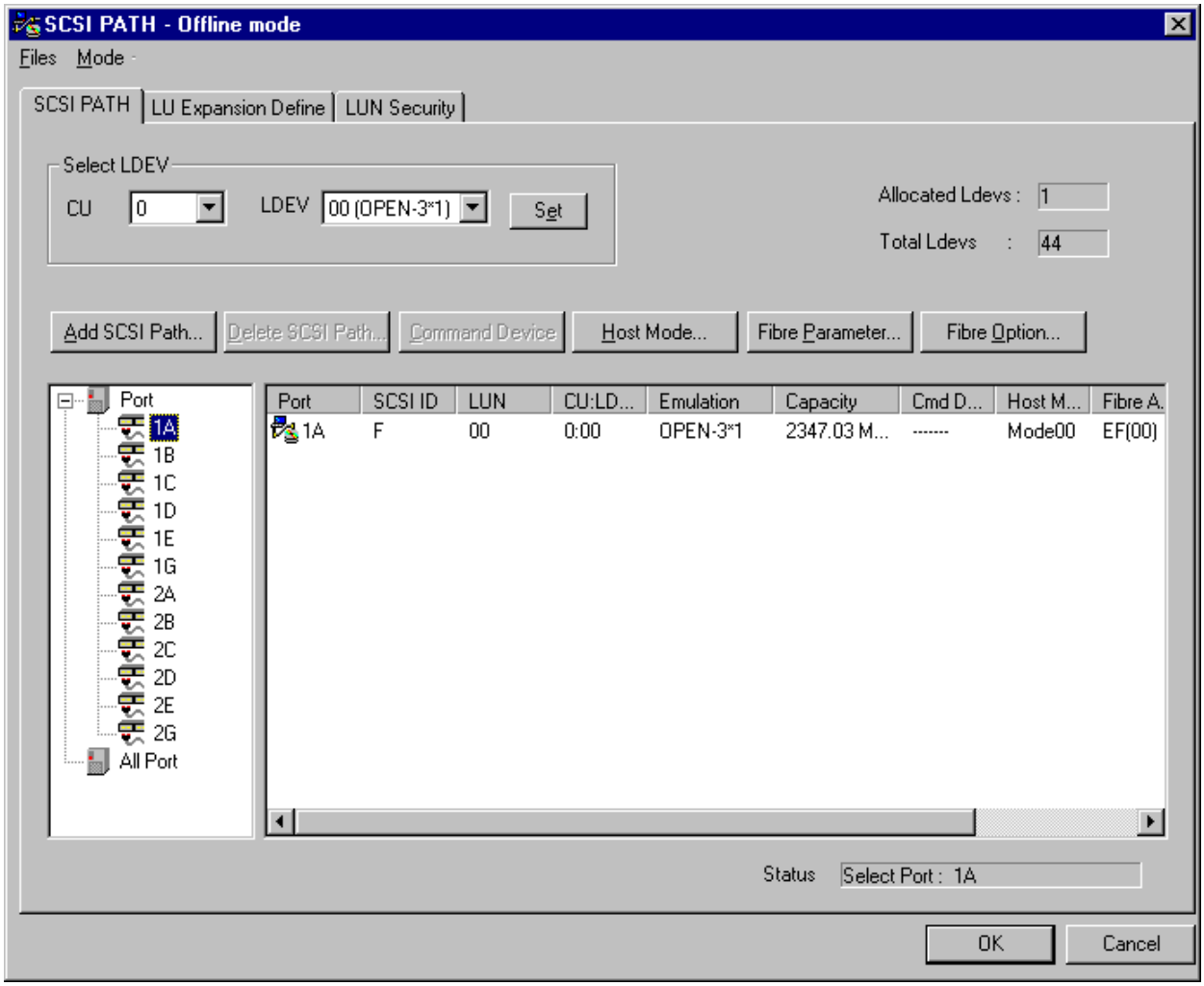

Figure 3.3 SCSI PATH Panel (SCSI PATH tab)

The SCSI PATH tab of the SCSI PATH panel has the following features:

- The **Files** menu includes the **OK** and **Cancel** commands. These commands are equivalent to the **OK** and **Cancel** buttons.
- The **Mode** menu includes the following three modes ***Note:*** all three modes present the same view of the panel.
  - **Off Line Mode** allows you to define SCSI paths while they are offline to the host.
  - **On Line Mode** allows you to define SCSI paths while they are online to the host.
  - **View Mode** allows you to view the current SCSI path configuration (the default mode).
- The outline list box (to the left) displays the connected ports. When you select a port (e.g., 1N Fibre), the path information of the selected port is displayed in the List View on the right. The **All Port** selection (at the bottom of the outline) will cause the path information for all of the ports to be displayed in the detailed list box (see next bullet). The information is sorted in numerical order by CU:LDEV.
- The detailed list box (to the right) displays the path information for the selected port, including **Port**, **SCSI ID**, **LU Number**, **CU:LDEV**, **Emulation type**, **Capacity**, **Command Device**, **Host Mode**, **Fibre Address**, **Fabric**, and **Connection**. If **All Port** is selected in the outline list box (see preceding bullet), the information for all of the ports will be displayed.
- The **Select LDEV box** allows you to specify a particular CU, which will display the LDEVs within that CU in the list view box (to the left). You can then select a particular LDEV to display the path information for that device in the detailed list box. To display the specified path, select the **Set** button.
- The **Add SCSI Path…** button opens the Set SCSI Path Parameter -Fibre Channel panel (see Figure 3.4) to allow you to add SCSI paths.
- The **Delete SCSI Path…** button opens the Delete SCSI Path panel (see Figure 3.5) to allow you to delete selected SCSI paths.
- The **Command Device** button is a toggle switch that allows you to select the command device volumes that you want to use for 9900 Command Control Interface operations (see *Hitachi Freedom Storage™ Lightning 9900™ Command Control Interface User and Reference Guide* MK-90RD011).
- The **Host Mode…** button opens the Set Host Mode panel (see Figure 3.6), which allows you to set the host mode for one or more ports.
- The **Fibre Parameter…** button opens the Fibre Parameter panel (see Figure 3.7), which allows you to specify the port address, loop ID, fabric setting, and type of connection.
- The **Fibre Option...** button opens the Fibre PCB Mode panel (see Figure 3.8), which allows you to specify the Fibre PCB Mode (Standard or High Speed) for each PCB.
- The **OK** button completes the SCSI Path settings.
- The **Cancel** button cancels the SCSI Path settings.

3.3.2.2 The Set SCSI Path Parameter-Fibre Channel Panel

To open the Set SCSI Path Parameter-Fibre Channel panel, select the desired port in the outline list box of the SCSI PATH panel and click the **Add SCSI Path…** button.

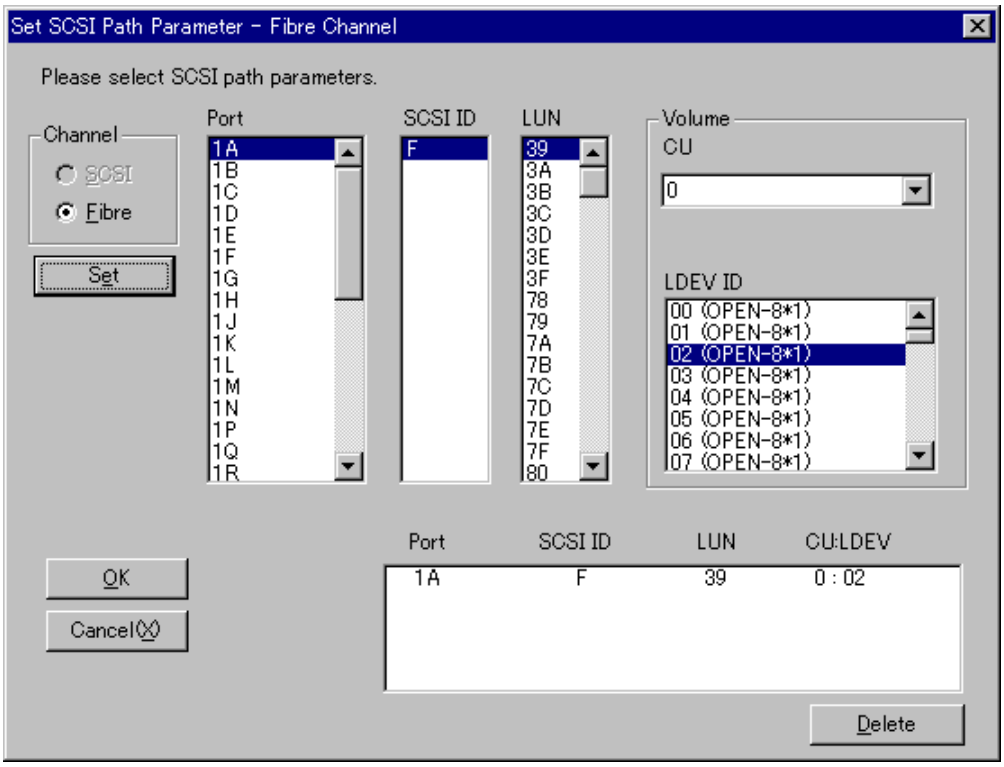

Figure 3.4 Set SCSI Path Parameter-Fibre Channel Panel

The Set SCSI Path Parameter-Fibre Channel panel has the following features:

- The **Channel** box displays **Fibre** as the desired port type. ***Note:*** the SCSI option is not available on the Lightning 9900™, so that button is grayed out.
- The **Port** list box displays all fibre ports. ***Note:*** The port selected in the previous SCSI PATH panel is highlighted. When **All Port** is selected, CL1-A is highlighted. You can select a different port simply by clicking on that port. You can select more than one port by using either the **Shift** key or the **Ctrl** key).
- **SCSI ID** list box displays **F** to indicate fibre.
- The **LUN** list box displays the available LUN IDs (00 - FF). You can select more than one of the LUNs by using either the **Shift** key or the **Ctrl** key.
- The **CU** box allows you to select a particular CU.
- The **LDEV ID** list box shows the LDEVs in the selected CU.
- The **Set...** button adds the selected SCSI path in the **SCSI Path** list box on the Set SCSI Path panel. If you specify an invalid SCSI path, an error message is displayed and the setting is discarded.
- The **SCSI Path** list box displays the information (**Port**, **SCSI ID**, **LUN**, and **Volume**) of the new SCSI paths to be added. ***Note:*** Even though they are displayed, the selected SCSI path(s) are added until you select the **OK** button at the end of the procedure (below).
- The **Delete** button deletes the selected SCSI path from the SCSI Path list box. You can use this button if you want to cancel or correct the SCSI paths you added in the SCSI Path list box.
- The **OK** button applies the settings (adds the SCSI paths), and returns you to SCSI PATH panel, which is updated to display your requested changes.
- The **Close** button returns you to the SCSI PATH panel.

3.3.2.3 The Delete SCSI Path Panel

To open the Delete SCSI Path panel, select the desired port in the outline list box of the SCSI PATH panel, then select one or more SCSI path(s) in the detailed list box, and then select the **Delete SCSI Path…** button.

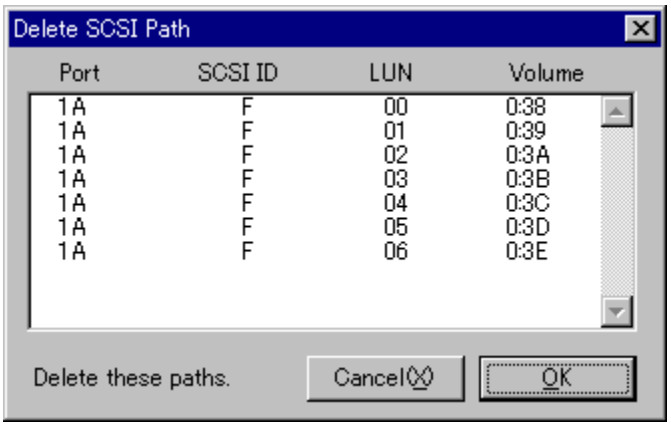

Figure 3.5 Delete SCSI Path Panel

- The **Delete SCSI Path** list box displays the SCSI paths that were selected.
- The **Cancel** button cancels your request to delete the specified paths and returns you to the SCSI PATH panel.
- The **OK** button enters your request to delete the specified paths and returns you to the SCSI PATH panel, which is updated to show your requested changes.

3.3.3 Adding SCSI Paths

To add one or more new SCSI paths:

1. On the SCSI PATH panel (refer to Figure 3.3), under the **Mode** menu select either **On Line Mode** or **Off Line Mode**. (***Note***: if you are adding SCSI paths online, see the additional information in section 3.3.1).
2. On the SCSI PATH panel, review which LDEV paths have already been assigned. A single plus sign (**+**) next to an LDEV ID (listed under the volume attribute) indicates that there is more than one SCSI path to that LDEV. The note **for Cmd.** next to an LDEV ID indicates that that volume is being used as a command device and is not available for SCSI path definition.
3. Select the desired port, and select **Add SCSI Path…** to open the Set SCSI Path Parameter panel (see Figure 3.4).
4. On the Set SCSI Path Parameter panel, select the desired port(s), target ID(s), and LUN(s), along with the corresponding CU and LDEV ID(s). To calculate the number of LDEV IDs that you will need, multiply the number of selected ports, the number of selected SCSI TIDs, and the number of selected LUNs. For example, if you select one port, four SCSI TIDs, and two LUs, you must select eight LDEV IDs ($1 \times 4 \times 2 = 8$).
   a) To sequentially set multiple LDEV IDs, select the first LDEV ID and LUN Manager will assign the remaining paths sequentially, or select the number of LDEV IDs you want to assign.
   b) To randomly set multiple LDEV IDs, select the LDEV IDs, and the random selection will be assigned numerically. For example, if you select LDEV IDs 07, 00, 0F, 01, and 0A, the LDEVs will be assigned in the following order: 00, 01, 07, 0A, and 0F.
5. Select **Set**. The SCSI paths to be added are displayed in the **SCSI Path** list box on the Set SCSI Path Parameter panel.
6. Verify the information presented in the **SCSI Path** list box is correct. Either select **OK** to save the new SCSI path information, or select **Cancel**.
7. The new SCSI paths will be added when you select **OK** to close the Set SCSI Path Parameter panel. (If you are using the LUN Security feature the new SCSI paths will not be added until you have configured the LUN Security parameters. See Chapter 5 for LUN Security information.)

3.3.4 Deleting SCSI Paths

You cannot delete the paths online. You must delete the paths offline, using either the LUN Manager software or the open-system host.

To delete one or more existing SCSI paths:

1. On the SCSI PATH panel (refer to Figure 3.3) under the **Mode** menu, select **Off Line Mode**.
2. Select the **SCSI PATH** tab on the SCSI PATH panel, select the desired port in the outline list box, and then select the SCSI path(s) that you want to delete in the detailed list box.
3. Select **Delete SCSI Path…** to open the Delete SCSI Path panel (see Figure 3.5). The Delete SCSI path panel displays the selected SCSI path(s) to be deleted.
4. Verify that the information presented on the Delete SCSI Path panel is correct. Select **OK** to enter your request to delete the specified paths, or select **Cancel** to cancel your request and return to the SCSI PATH panel.

Note: The specified paths are not actually deleted until you exit SCSI path operations by selecting **OK** on the SCSI PATH panel. If you are using the LUN Security function the paths will not be deleted until you have exited the LUN Security feature. (See Chapter 5 for LUN Security information).

3.4 Setting Host and Port Modes

3.4.1 Host Modes for Fibre Ports

The 9900 LUN Manager feature allows you to set the host mode for each port on the 9900 subsystem. The standard mode for all platforms is 00. If you are using middleware (e.g. I/O path failover), Table 3.1 describes the available host modes.

Note: The configuration guide for each specific platform contains a port address table for that platform. Contact your Hitachi Data Systems account team for more information.

Table 3.1 Host Modes for Fibre Ports

Fibre Channel	Description
00	Standard mode (Red Hat® Linux®, Compaq Tru64®, SGI Irix®)
04	Sequent®
08	HP-UX®
09	Solaris®
0A	NetWare®
0C	PC server host (Windows NT®, Windows 2000®)
0D	IO TRACE mode
0F	AIX® host mode

Caution: Before changing the host mode of a port, Hitachi Data Systems recommends that you first back up the data on that port. The set host mode operation should not be destructive, but data integrity cannot be guaranteed without a backup.

3.4.2 The Set Host Mode Panel

To open the Set Host Mode panel, select the desired port from the detailed list box on the SCSI PATH panel, then select the **Host Mode...** button.

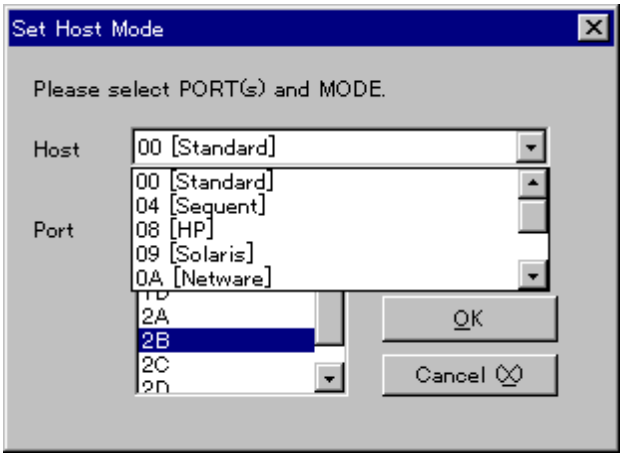

Figure 3.6 Set Host Mode Panel

The Set Host Mode panel has the following features:

- The **Host** pull down selection box allows you to specify the host mode to be assigned to the desired port (see Table 3.1).
- The **Port** list box (partially obscured by the host drop-down box) displays the available ports to which you can assign the selected mode. ***Note:*** The port selected in the previous SCSI PATH panel is focused in reverse video. When **All Port** is selected, CL1-A is focused.
- The **OK** button enters your request to set the host modes as indicated and returns you to the SCSI PATH panel (refer to Figure 3.3), which is updated to show the requested changes. (The **OK** button is disabled if you either did not make any changes, or if there are ports that are not yet defined.
- The **Cancel** button cancels any changes you made on the Set Host Mode panel and returns the SCSI PATH panel.

3.4.3 Setting the Host Mode

To set the host mode for a 9900 port:

1. On the SCSI PATH panel, under the **Mode** menu select **Off Line Mode** (refer to Figure 3.3).
2. Select the **SCSI PATH** tab, and select the desired port and the **Host Mode...** button on the SCSI PATH panel. The Set Host Mode panel opens (see Figure 3.6) and displays both the selected port and all other available ports in the **Port** list box.
3. On the Set Host Mode panel, select the desired fibre port(s) in the **Port** box, select the desired host mode in the **Host** box, and then click the **OK** button. If the settings are incorrect, click the **Cancel** button.
4. The SCSI PATH panel now displays the new host mode settings. To implement the new host mode settings select **OK,** which will close the SCSI PATH panel and implement the changes. To cancel the new host mode settings, select **Cancel** to close the SCSI PATH panel without making any changes.

3.5 Fibre Channel Configuration

3.5.1 The Fibre Configuration Panels

3.5.1.1 The Fibre Parameter Panel

To open the Fibre Parameter panel (see Figure 3.7), select the desired port from the outline list box of the SCSI PATH panel, then click the **Fibre Parameter...** button.

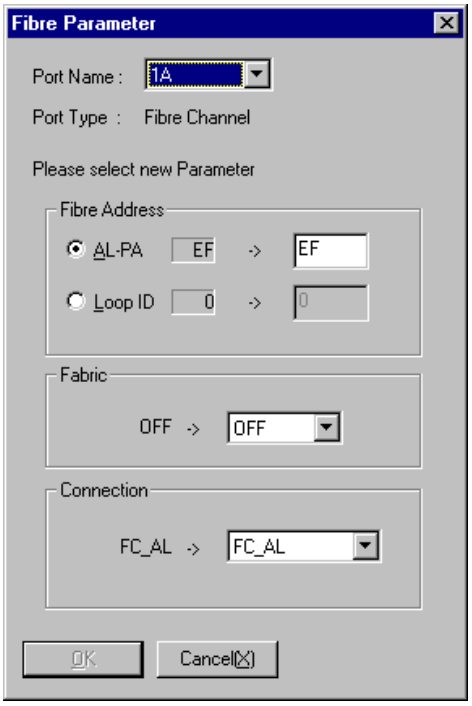

Figure 3.7 Fibre Parameter Panel

The Fibre Parameter panel has the following features:

- The **Port Name** pull down list box displays the selected port and all other available port addresses.
- The **Fibre Address** box allows the following options:
  - The **AL-PA** button allows you to change the port address. The text box on the left shows the current port address. You can enter the new port address in the text box on the right.
  - The **Loop ID** button allows you to change the loop ID. The text box on the left shows the current loop ID. You can enter the new loop ID in the text box on the right.
- The **Fabric** box allows you choose whether the Fabric setting is **On** or **Off**.
- The **Connection** box allows you to choose **FC-AL** or **Point to Point** connections.
- The **OK** button registers any changes that were made and closes the Fibre Parameter panel.
- The **Cancel** button returns you to the SCSI PATH panel without making any changes.

3.5.1.2 The Fibre PCB Mode Panel

To open the Fibre PCB Mode panel (see Figure 3.8), select the **Fibre Option...** button on the SCSI PATH panel. This allows you to set the fibre PCB mode (**Standard** or **High Speed**) for each channel adapter (CHA) PCB. See section 3.5.5 for instructions of setting the fibre PCB mode, and section 3.5.6 for restrictions on using high-speed mode.

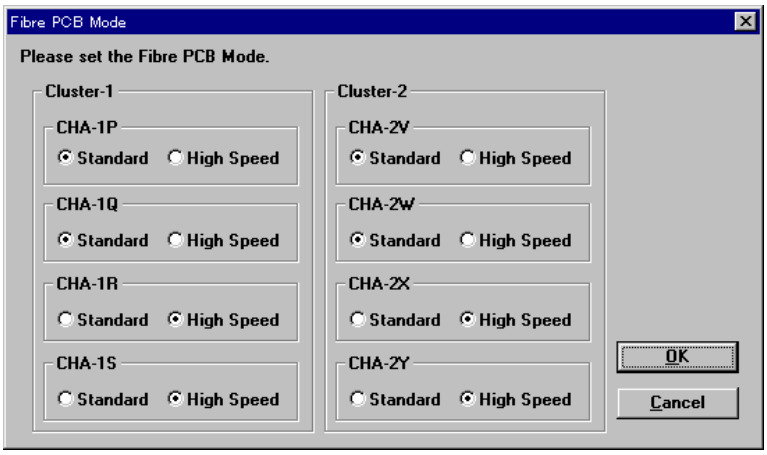

Figure 3.8 Fibre PCB Mode Panel

The Fibre PCB Mode panel has the following features:

- The **Standard** button is the default setting. In standard mode all ports of the specified PCB are enabled (e.g., CH A, CH B, CH C and CH D are used to transfer data.) If any of the ports on a PCB in standard mode are not used, their respective processors remain bound to those ports. This allows the user to attach cables and then use the ports without re-configuring the PCB.
- The **High Speed** button enables high speed mode, in which half of the ports are disabled, and their respective CHA and FOP processors become available for use by the remaining ports on the PCB. This doubles the number of processors allocated to the remaining ports, thereby increasing their performance. In four-port PCBs, the top two ports are used to transfer data (ports A, B, E, F, J, K, N, and P), and the bottom two ports are disabled (ports C, D, G, H, L, M, Q, and R). In two-port PCBs, the top port is used to transfer data (ports A, E, J, and N), and the bottom port is disabled (ports C, G, L, and Q). See section 3.5.6 for restrictions on using high speed mode.
- The **OK** button implements the requested mode changes.
- The **Cancel** button cancels any changes.

3.5.2 Fibre Channel Topology

Fibre channel provides three different topologies for connecting devices: point to point, arbitrated loop (AL or FC-AL), and fabric (see Figure 3.9), as follows:

- Point-to-point: The simplest fibre topology connects two devices directly together.
- Arbitrated loop: Shared interface that can connect up to 126 devices (AL-ports) together. The 100 MB/sec bandwidth is shared among the devices connected to each other.
- Fabric: Utilizes a switch to connect a large number of devices (up to 16 million) together. Each device will have the full bandwidth of 100 MB/sec.

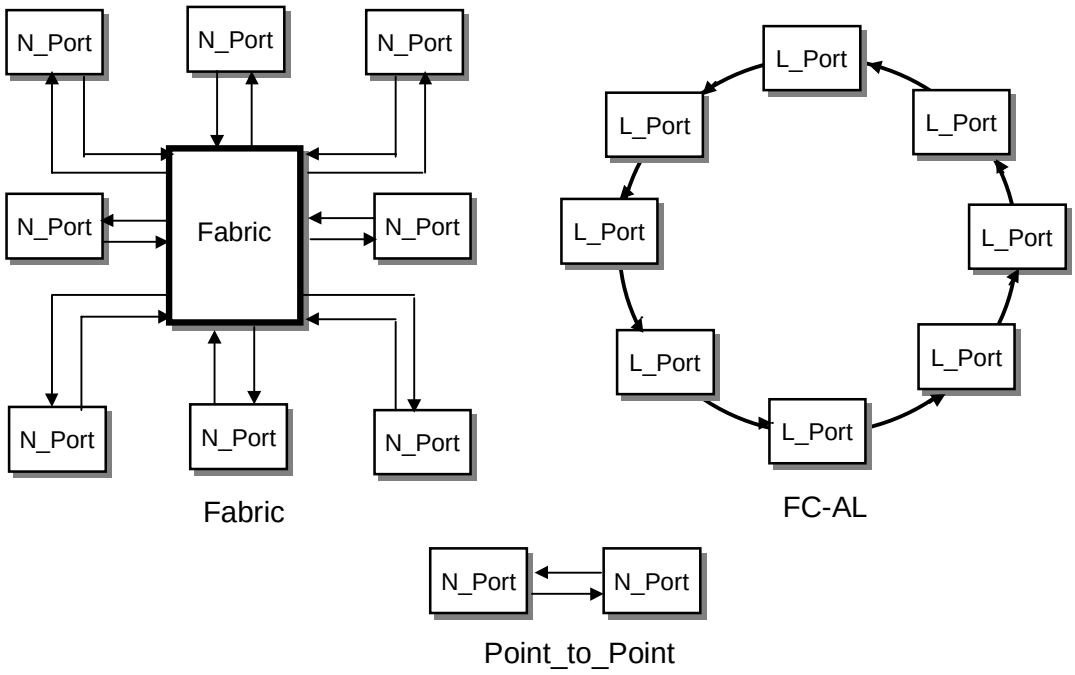

Figure 3.9 Fibre Channel Connections

The first implementation of fibre-channel capabilities for the 9900 subsystem will use an arbitrated loop configuration. The 9900 can be configured with a maximum of 32 fibre-channel ports. The channel PCBs can be either 2-port or 4-port cards.

3.5.3 Fibre Channel Port Addressing

To set a fibre channel port address:

1. On the SCSI PATH panel (refer to Figure 3.3), select the desired port and click the **Fibre Parameter...** button to open the Fibre Parameter panel. ***Note:*** The **Fibre Parameter...** button is enabled only when one or more fibre channel adapters are installed on the 9900.
2. On the Fibre Parameter panel, verify that the desired port is displayed in the **Port Name** pull down list box. ***Note:*** Fibre ports with unassigned addresses are listed with an address of EF.
3. In the **Fibre Address** box, select either **AL_PA** or **Loop ID**, enter the desired address in the corresponding box, and click **OK**. Table 3.2 lists the available port addresses and loop IDs.
4. The SCSI PATH panel, which is updated to show the requested changes, now opens again. To change another address, repeat steps 1 through 3.
5. The SCSI PATH panel now displays the new fibre port addresses. To implement the fibre port addresses, select **OK** to close the SCSI PATH panel.

Table 3.2 Available Fibre Channel Port Addresses

Port Address	Loop ID	Port Address	Loop ID	Port Address	Loop ID	Port Address	Loop ID	Port Address	Loop ID
EF	0	B4	30	76	60	49	90	10	120
E8	1	B3	31	75	61	47	91	0F	121
E4	2	B2	32	74	62	46	92	08	122
E2	3	B1	33	73	63	45	93	04	123
E1	4	AE	34	72	64	43	94	02	124
E0	5	AD	35	71	65	3C	95	01	125
DC	6	AC	36	6E	66	3A	96		
DA	7	AB	37	6D	67	39	97		
D9	8	AA	38	6C	68	36	98		
D6	9	A9	39	6B	69	35	99		
D5	10	A7	40	6A	70	34	100		
D4	11	A6	41	69	71	33	101		
D3	12	A5	42	67	72	32	102		
D2	13	A3	43	66	73	31	103		
D1	14	9F	44	65	74	2E	104		
CE	15	9E	45	63	75	2D	105		
CD	16	9D	46	5C	76	2C	106		
CC	17	9B	47	5A	77	2B	107		
CB	18	98	48	59	78	2A	108		
CA	19	97	49	56	79	29	109		
C9	20	90	50	55	80	27	110		
C7	21	8F	51	54	81	26	111		
C6	22	88	52	53	82	25	112		
C5	23	84	53	52	83	23	113		
C3	24	82	54	51	84	1F	114		
BC	25	81	55	4E	85	1E	115		
BA	26	80	56	4D	86	1D	116		
B9	27	7C	57	4C	87	1B	117		
B6	28	7A	58	4B	88	18	118		
B5	29	79	59	4A	89	17	119		

3.5.4 Setting the Fibre Channel Topology

To set the fibre channel topology:

1. On the SCSI PATH panel (refer to Figure 3.3) select the desired port and click the **Fibre Parameter...** button to open the Fibre Parameter panel (refer to Figure 3.7).
2. On the Fibre Parameter panel verify that the fibre port that you want to change is displayed in the **Port Name** pull down list.
3. In the **Fabric** box, select either **On** or **Off**. In the **Connection** box select either **FC-AL** or **Point to Point**.
4. Click **OK** to register the changes and return to the SCSI PATH panel, which is updated to show the requested changes. Click **Cancel** if you do not want to make topology changes and return to the SCSI PATH panel.
5. To change the topology of another port, repeat steps 1 through 4.
6. On the SCSI PATH panel click **OK** to complete the Topology changes.

3.5.5 Setting the Fibre PCB Mode

To set the fibre PCB mode:

1. On the SCSI PATH panel (refer to Figure 3.3), select the **Fibre Option...** button to open the Fibre PCB panel.(see Figure 3.8)
2. On the Fibre PCB Mode panel, select the **Standard** or **High Speed** mode in the corresponding **CHA-*XX*** boxes of the PCBs and click **OK**.
3. To exit the panel without making changes click **Cancel**.
4. The message "**Changing Fibre PCB Mode**..." will be displayed during the mode change. The settings will be complete when the message disappears.

3.5.6 Using High Speed (Performance) Mode

High-speed mode has the following parameters and restrictions:

- I/Os for an enabled port are transferred via two different channels and processed. It will look as if two targets (FOP) are connected to a single port.
- Half of the ports on the PCB are disabled.
- To maximize the performance, you must balance the access frequency of the two processors by evenly distributing access I/Os between the processors.
- You cannot switch the mode from **Standard** to **High Speed** if any of the following conditions exist:
  - The LUN settings for first and second port are duplicated.
  - The loop ID (FC-AL) settings for the first and second port are duplicated.
  - The host mode settings for the first and second port are duplicated.
  - The topology settings for first and second port are different.
- You cannot change the performance mode while you are online to the hosts. You will need to reboot the hosts after changing the mode.
- When the performance mode is changed, the hosts will identify the existing devices as new devices, because of the change of the device numbers.

Table 3.3 Port Display Format

	8GS/8GL Fibre (Standard)	4GS/4GL Fibre (Standard)	High-performance Mode
CL1-A	1A	1A	1A (1A-1st)
CL1-B	1B	(*note 1)	1B (1B-1st) (*note 2)
CL1-C	1C	1C	1C (1A-2nd)
CL1-D	1D	(*note 1)	1D (1B-2nd) (*note 2)
CL1-E	1E	1E	1E (1E-1st)
CL1-F	1F	(*note 1)	1F (1F-1st (*note 2)
CL1-G	1G	1G	1G (1E-2nd)
CL1-H	1H	(*note 1)	1H (1F-2nd) (*note 2)
CL1-J	1J	1J	1J (1J-1st)
CL1-K	1K	(*note 1)	1K (1K-1st) (*note 2)
CL1-L	1L	1L	1L (1J-2nd)
CL1-M	1M	(*note 1)	1M (1K-2nd) (*note 2)
CL1-N	1N	1N	1N (1N-1st)
CL1-P	1P	(*note 1)	1P (1P-1st) (*note 2)
CL1-Q	1Q	1Q	1Q (1N-2nd)
CL1-R	1R	(*note 1)	1R (1P-2nd) (*note 2)
CL2-A	2A	2A	2A (2A-1st)
CL2-B	2B	(*note 1)	2B (2B-1st) (*note 2)
CL2-C	2C	2C	2C (2A-2nd)
CL2-D	2D	(*note 1)	2D (2B-2nd) (*note 2)
CL2-E	2E	2E	2E (2E-1st)
CL2-F	2F	(*note 1)	2F (2F-1st) (*note 2)
CL2-G	2G	2G	2G (2E-2nd)
CL2-H	2H	(*note 1)	2H (2F-2nd) (*note 2)
CL2-J	2J	2J	2J (2J-1st)
CL2-K	2K	(*note 1)	2K (2K-1st) (*note 2)
CL2-L	2L	2L	2L (2J-2nd)
CL2-M	2M	(*note 1)	2M (2K-2nd) (*note 2)
CL2-N	2N	2N	2N (2N-1st)
CL2-P	2P	(*note 1)	2P (2P-1st) (*note 2)
CL2-Q	2Q	2Q	2Q (2N-2nd)
CL2-R	2R	(*note 1)	2R (2P-2nd) (*note 2)

*Note 1: this port is not available
*Note 2: this port is not available for 4GS/4GL PCB

Chapter 4 LUSE (LU Size Expansion)

4.1 Overview of LUSE Operations

LUSE operations are used for the following types of tasks:

- Creating new expanded LUs (LUSEs) from two or more available LDEVs (see section 4.3).
- Releasing expanded LUs (LUSEs) to individual LUs (see section 4.5).
- Changing the size of a LUSE (see section 4.6).
- Allowing hosts that can only use a limited amount of LUNs per fibre interface to have access to larger amounts of data using expanded LUs.

The following are guidelines for LU Size Expansion:

- A maximum of 256 expanded LUs can be configured on the same port.
- The LDEVs that will become members of the LUSE must not have SCSI paths assigned. These are known as free (or available) LDEVs.
- To make an LDEV free, it must have its SCSI paths deleted, which requires that it be offline (unmounted from all hosts). (Refer to section 3.3.4).
- Combining non-sequential LDEVs into a LUSE is supported, provided they are on the same CU.
- Combining customized volumes into a LUSE is supported, provided they are the same size.
- Combining customized volumes and normal volumes into the same LUSE is not supported.
- Combining RAID 1 and RAID 5 into the same LUSE is not supported.
- Combining emulation types (OPEN-3, OPEN-8, OPEN-9, OPEN-E, OPEN-K, OPEN-L, or OPEN-M) into the same LUSE is not supported. ***Note:*** OPEN-L and OPEN-M are applicable to Windows 2000® only.
- Factors which are relevant to recommended LUSE size include the following:

  -Some operating systems may experience slow disk access times with large logical units, if they contain too many high usage files.

  -The size of a LUSE can affect the amount of time required to perform backups.

Note: The queue depth for open systems can vary, depending on the type of platform. Please contact your Hitachi Data Systems Customer Support Center for assistance.

Warning: Creating and releasing expanded LUs is a destructive process. Be sure to back up your data before proceeding.

Table 4.1 LU Size Expansion Specifications

Parameter	OPEN-3	OPEN-8	OPEN-9	OPEN-E	OPEN-K	OPEN-L (*note 1)	OPEN-M (*note 1)
Capacity of LUs	2.4 GB	7.3 GB	7.3 GB	14.5 GB	1.8 GB	36.4 GB	47.1 GB
Possible number of expanded LUs	2 - 36 LUs	2 - 36 LUs	2 - 36 LUs	2 - 36 LUs	2 - 36 LUs	2 - 36 LUs	2 - 36 LUs
Capacity of expanded LUs	4.8 GB - 88.6 GB	14.6 GB - 264.4 GB	14.7 GB - 265.8 GB	29.1 GB - 524.4 GB	3.7 GB - 67.7 GB	72.9 GB - 1312.2 GB	94.3 GB - 1698.6 GB
Product Name	OPEN-3n (n = # of LUs in the expanded LU)	OPEN-8n (n = # of LUs in the expanded LU)	OPEN-9n (n = # of LUs in the expanded LU)	OPEN-En (n = # of LUs in the expanded LU)	OPEN-Kn (n = # of LUs in the expanded LU)	OPEN-Ln (n = # of LUs in the expanded LU)	OPEN-Mn (n = # of LUs in the expanded LU)

Note 1: OPEN-L and OPEN-M are applicable to Windows 2000® only.

Table 4.2 CVS LU Size Expansion Specifications

Parameter	OPEN-3	OPEN-8	OPEN-9	OPEN-E	OPEN-K
Capacity of LUs	35 MB - 2.4 GB	35 MB - 7.3 GB	35 MB - 7.3 GB	35 MB - 14.5 GB	35 MB - 1.8 GB
Possible number of connected LUs	2 - 36 LUs	2 - 36 LUs	2 - 36 LUs	2 - 36 LUs	2 - 36 LUs
Capacity of expanded LUs	70 MB - 84.2 GB	70 MB - 250.2 GB	70 MB - 252.6 GB	70 MB - 524.4 GB	70 MB - 64.1 GB
Product Name	OPEN-3n - CVS (n = # of LUs in the expanded LU)	OPEN-8n - CVS (n = # of LUs in the expanded LU)	OPEN-9n - CVS (n = # of LUs in the expanded LU)	OPEN-En - CVS (n = # of LUs in the expanded LU)	OPEN-Kn -CVS (n = # of LUs in the expanded LU)

Note: The CVS option is not applicable to OPEN-L and OPEN-M.

4.2 The LU Size Expansion Panels

4.2.1 Accessing the LU Size Expansion Panels

To begin any of the LUSE operations:

1. Log in to the 9900 RMCMAIN software, and verify that the Remote SCSI option is installed. If not, install the Remote SCSI option as described in section 2.1.1.
2. Connect to the desired 9900 subsystem (refer to section 2.1). The Option Select panel opens (refer to Figure 2.6).
3. On the Option Select panel, select SCSI PATH to open the SCSI PATH panel (see Figure 3.3). This is the starting point for all LUSE operations.

4.2.2 The SCSI PATH Panel (LU Expansion Define Tab)

The SCSI PATH panel has three tabs: SCSI PATH (refer to Chapter 3), LU Expansion Define (detailed in this chapter), and LUN Security (see Chapter 5). All references in this chapter are to the LU Expansion Define tab of the SCSI PATH panel. ***Note:*** the panel displays the same information, whether in **Off Line Mode, On Line Mode,** or **View Mode**.

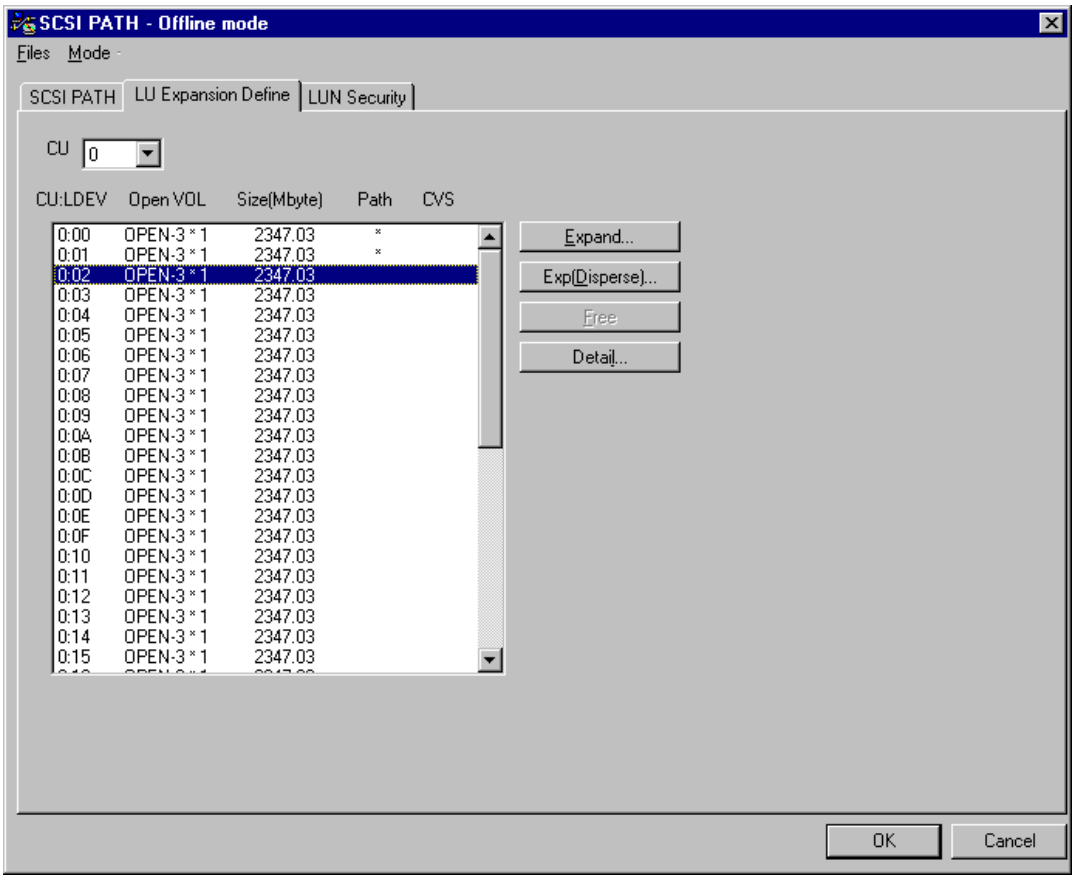

Figure 4.1 SCSI PATH Panel, LU Expansion Define Tab

The LU Expansion Define tab of the SCSI PATH panel has the following features:

- The **Files** menu includes the **OK** and **Cancel** commands. These commands are equivalent to the **OK** and **Cancel** buttons.
- The **Mode** menu includes the following three modes. ***Note:*** all three modes present the same view of the panel.
  - **Off Line Mode** allows you to expand LUs while they are offline to the 9900.
  - **On Line Mode** allows you to expand LUs while they are online to the 9900.
  - **View Mode** allows you to view the current LU configuration (the default mode)
- The **CU** drop down box allows you to select the control unit.
- The list box displays the LDEVs (including expanded volumes) in the selected CU by the following criteria:

  - CU:LDEV displays the Control Unit number and LDEV ID

  -**Open VOL** displays the LU type, (e.g. **OPEN-3**)

  -**Size(Mbyte)** displays the size of the LDEV or LUSE

  -**Path** displays an asterisk (*) if at least one SCSI path is set for this LDEV or LUSE (refer to section 3.3.4).

  -**CVS** displays an asterisk (*) if this is a customized volume.
- The **Expand...** button opens the LU Expansion panel (see Figure 4.2), which allows you to set the expanded size of the LU.
- The **Exp (Disperse)...** button opens the LU Expansion (Disperse) panel (see Figure 4.3), allowing you to combine dispersed LUs.
- The **Free** button will release a previously expanded LU.
- The **Detail...** button opens the Open Vol Detail panel (see Figure 4.4)

4.2.3 The LU Expansion Panel

The LU Expansion panel (see Figure 4.2) is accessed by selecting the **Expand...** button on the SCSI PATH panel.

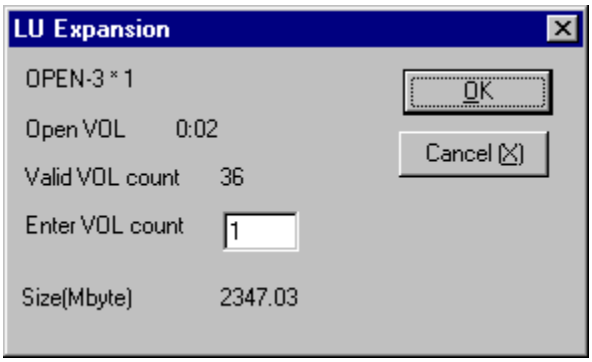

Figure 4.2 LU Expansion Panel

The LU Expansion panel has the following features:

- Volume type (e.g. **Open 3*1 Open VOL**)
- The control unit and LDEV number (e.g. **0:08**)
- The number of connectable LDEVs (displayed as **Valid VOL count**).
- The **Enter VOL count** box allows you to enter the number of volumes to be connected (the size of the volume is displayed in MB).
- The **OK** button returns you to the LU Expansion Define panel

4.2.4 The LU Expansion (Disperse) panel

To open the LU Expansion (Disperse) panel (see Figure 4.3) select the **Exp(Disperse)...** button on the SCSI PATH panel.

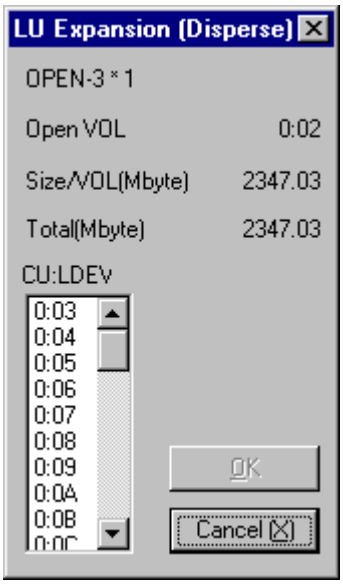

Figure 4.3 LU Expansion (Disperse) Panel

The LU Expansion (Disperse) panel has the following features:

- Volume type (e.g. **Open 3*1 Open VOL**)
- The control unit and LDEV number (e.g. **0:08**)
- The size of the LU is displayed as **Size/VOL(Mbyte)**
- The total size of the selected LUs and LUSE volume is displayed as **Total(Mbyte)**
- The **CU:LDEV** list box displays the LUs that are available to be combined, and allows you to select which LUs are to be combined into a LUSE volume.
- The **OK** button confirms your choice and returns you to the LU Expansion Define panel.
- The **Cancel** button cancels your selection and returns you to the LU Expansion Define panel.

4.2.5 The Open VOL Detail Panel

To open the Open VOL Detail panel, select the **Detail...** button on the SCSI PATH panel.

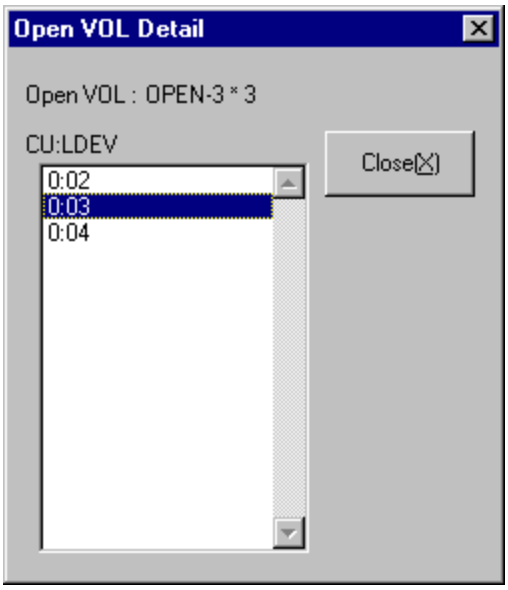

Figure 4.4 Open VOL Detail Panel.

The Open VOL Detail panel displays the settings that you have selected, as follows:

- Volume type of the LDEVs that are to be combined (e.g. **Open 3*4**)
- The CU:LDEV list box displays the CU and LDEV ID of the volumes that are to be combined.
- The **Close** button returns you to the LU Expansion Define panel

4.3 Creating Expanded LUs

WARNING: LU size expansion is a destructive operation. Before you expand an LU, be sure both that you back up your data, and that the required space is available. For example, to expand an LU by five, verify that the next five LUs in sequential order are available for use in the new expanded LU. (LUs in the same control unit do not need to be in sequential order.)
Note: The **LUSE** option is only available when OPEN volumes are selected. OPEN-L and OPEN-M are applicable to Windows 2000 only.

To configure an expanded LU:

1. Select the **LU Expansion Define** tab on the SCSI PATH panel (refer to Figure 3.3) to open the LU Expansion Define panel (refer to Figure 4.1). ***Note:*** The **LUSE** option is only available when OPEN volumes are selected.
2. On the LU Expansion Define panel, use the **CU** drop down list to select a control unit. In the **CU:LDEV** list box, select the first LU in the series of LUs you want to expand, and then click **Expand...** to open the LU Expansion panel (refer to Figure 4.2).

   Note: All available LUs are displayed as **OPEN-x*1** indicating that only one LU is present. Volumes that have already been expanded are displayed as **OPEN-x*n**, where n is the number of LUs present. For example if the volume is displayed as **OPEN-3*16**, there are 16 LUs in that OPEN-3 expanded LU. LUs with an asterisk (*) in either the **Path** or **CVS** columns are not available for size expansion.
3. On the LU Expansion panel (refer to Figure 4.2), enter the desired size of the expanded LU in the **Enter VOL count** box. Click **OK** to expand the LU.
4. The LU Expansion Define panel now opens again to display the newly expanded LU. To expand another LU repeat steps 1 through 3. To return to the SCSI PATH panel, select the **SCSI PATH** tab.
5. The SCSI PATH panel now displays the new expanded LUs. To register the expanded LUs, select **OK**. To cancel the expanded LUs, select **Cancel** to close the SCSI PATH panel.

4.4 Expanding Dispersed LUs

WARNING: LU size expansion is a destructive operation. Before you expand an LU, verify that the required LU space is available. For example, to expand an LU by five, verify that the next five LUs in sequential order are available for use in the new expanded LU. (LUs on the same control unit do not need to be in sequential order.) The five LUs that are connected to make the expanded LU are erased.

To configure an expanded LU:

1. Select the **LU Expansion Define** tab on the SCSI PATH panel to open the LU Expansion Define panel (refer to Figure 4.1).
2. On the LU Expansion Define panel, use the **CU** drop-down list to select the desired control unit In the **CU:LDEV** list box, select the first LU in the series of LUs you want to expand, and then click **Exp (Disperse)...** to open the LU Expansion (Disperse) panel (refer to Figure 4.3).

   Note: All available LUs are displayed as **OPEN-x*1** indicating that only one LU is present. Existing LUSE volumes are displayed as **OPEN-x*n** (n indicates the number of LUs in the LUSE volume). See section 4.6 for instructions on changing the size of a LUSE volume.

   Note: LUs with an asterisk (*) in the **Path** column are not available for size expansion. Only LUs with no SCSI paths assigned can be candidates for LUSE. If these LUs must be used, their SCSI paths must be deleted.
3. On the LU Expansion (Disperse) panel select the LUs to be expanded from the list. The **OK** button is now enabled.
4. Double-check both the number of combined LUs, and the ID of the first LU. If they are correct, select **OK**, which returns you to the LU Expansion Define panel.
5. Select the first LU in the expansion list. The **Detail...** button is now enabled. Select the **Detail...** button to open the Open Vol Detail panel (refer to). Confirm the settings, and then select **Close** to return to the LU Expansion Define panel.
6. On the LU Expansion Define panel, select the **SCSI PATH** tab to return to the SCSI PATH panel. The newly configured expanded LU should be displayed as **OPEN-x*n**, where n is the number of LUs present. Select **OK** to implement the change.
7. To verify the new size-expanded LU, close the SCSI PATH panel, and then re-open the panel in view mode (View Configuration).

4.5 Releasing an Expanded LU

WARNING: Releasing an expanded LU is a destructive operation. Before you release an LU, be sure that you back up your data. When the expanded LU is released the data is erased.

To release an expanded LU:

1. Select the **LU Expansion Define** tab on the SCSI PATH panel (refer to Figure 3.3) to open the LU Expansion Define panel (refer to Figure 4.1).
2. On the LU Expansion Define panel, use the **CU** drop-down list to select the control unit. In the list box select the LUSE volume that you want to release (you can only select one at a time), and click **Free**.

   Note: LUSE volumes are displayed as **OPEN-x*n**, where n is the number of LUs present. For example if the volume is displayed as **OPEN-3*16**, there are 16 LUs in that OPEN-3 expanded LU. If there is an asterisk (*) displayed in the **Path** column, it indicates that there is at least one SCSI path to the LUSE volume. All SCSI paths must be deleted before LUSE operations can be performed.
3. The LU Expansion Define panel now opens again to display the newly released LUs. To release another expanded LU, repeat steps (1) and (2). To return to the SCSI PATH panel, select the **SCSI PATH** tab.
4. The SCSI PATH panel now displays the newly released LUs. To register the released LUs, select **OK**. To cancel the released LUs, select **Cancel** to close the SCSI PATH panel.

4.6 Changing the Size of an Expanded LU

If you have an expanded LU that you wish to make larger or smaller, you must first delete all SCSI paths to that volume (refer to section 3.3.4), release the expanded LU (refer to section 4.5) and then create a new expanded LU which includes the desired number of LUs (refer to section 4.3).

Caution: LUSE is a destructive process: during the creation and release of expanded LUs, all data is erased, so be sure to back up your data before proceeding.

Chapter 5 LUN Security

5.1 Finding the World Wide Name (WWN)

The World Wide Name is a unique identifier for a particular open-system host, consisting of a 64 bit physical address (the IEEE 48-bit format with 12-bit extension and 4-bit prefix). The WWN is essential in defining the LUN Security parameters, because it is the key that either allows or denies an open-system host's access to a specified LU or group of LUs.

After you have installed and configured the subsystem, you must obtain the WWN from each open-system host that want to use for LUN Security. Hitachi Data Systems supports different fibre channel adapters for different open-systems platforms. Sections 5.1.1 through 5.1.4 describe how to find the WWN for specific open-systems hosts. Please read the following instructions carefully to ensure that the correct adapter is installed on the correct open-systems platform.

Note: Connecting two or more servers of different platforms to the same 9900 subsystem via the switch or HUB is not allowed, because the 9900 subsystem cannot distinguish between the types of the connected servers.

Platform-specific instructions for finding the World Wide Name are found in the following sections:

- HP-UX® is discussed in section 5.1.1.
- Windows NT® and Windows 2000® are discussed in section 5.1.2
- Sun Solaris® is discussed in section 5.1.3.
- AIX®, SGI Irix® and Sequent® are discussed in section 5.1.4.

5.1.1 HP-UX®

Hitachi Data Systems currently supports the HP fibre channel adapter in an HP-UX® environment. Hitachi Data Systems plans to support future releases of HP fibre channel adapters. This document will be updated as needed to cover the adapter specific information. For further information on fibre channel adapter support, or if you are using a fibre channel adapter other than HP, please contact the Hitachi Data Systems technical support center for instructions on finding the WWN.

To find the WWN in an HP-UX® environment (see Figure 5.1):

1. Verify that the fibre adapters and the fibre channel device drivers are installed.
2. Log in to the HP-UX® host with root access.
3. At the command line prompt enter **/usr/sbin/ioscan -fnC lan** to list the attached fibre channel devices and their device file names. Record the fibre channel device file name (for example, **/dev/fcms0)**.
4. Use the **fcmsutil** command along with the fibre channel device name to list the WWN for that fibre channel device. For example, to list the WWN for the device with the device file name **/dev/fcms0**, enter **/opt/fcms/bin/fcmsutil /dev/fcms0**. *Note:* When the A5158 fibre channel adapter is used, at the command line prompt enter **/usr/sbin/ioscan -fnC fc** for the device name.
5. Record the fibre channel device file name (for example, /**dev/td0**). *Note:* When the A5158 fibre channel adapter is used, you would list the WWN for the device with the device file name **/dev/td0** (for example), as **/opt/fcms/bin/fcmsutil /dev/td0**.
6. Record the WWN and repeat the above steps for each fibre channel device that you want to use for LUN Security.

```
# /usr/sbin/ioscan -fnC lan                                    ← Enter the ioscan command.
Class     I  H/W Path  Driver      S/W State   H/W Type     Description
===================================================================
lan       0  8/0.5     fcT1_cntl   CLAIMED     INTERFACE    HP Fibre Channel Mass Storage Cntl
                       /dev/fcms0
                        ↖  ↖  ↖      Device file name.
lan       4  8/4.5     fcT1_cntl   CLAIMED     INTERFACE    HP Fibre Channel Mass Storage Cntl
                       /dev/fcms4
                        ↖  ↖  ↖      Device file name.
lan       5  8/8.5     fcT1_cntl   CLAIMED     INTERFACE    HP Fibre Channel Mass Storage Cntl
                       /dev/fcms5
                        ↖  ↖  ↖      Device file name.
lan       6  8/12.5    fcT1_cntl   CLAIMED     INTERFACE    HP Fibre Channel Mass Storage Cntl
                       /dev/fcms6
                        ↖  ↖  ↖      Device file name.
lan       1  10/8/1/0  btlan4      CLAIMED     INTERFACE    PCI(10110009) -- Built-in #1
lan       2  10/8/2/0  btlan4      CLAIMED     INTERFACE    PCI(10110009) -- Built-in #2
lan       3  10/12/6   lan2        CLAIMED     INTERFACE    Built-in LAN
                       /dev/diag/lan3  /dev/ether3     /dev/lan3
# # fcmsutil /dev/fcms0       ← Enter the fcmsutil command.
                  Local N_Port_ID is = 0x000001
         N_Port Node World Wide Name = 0x10000060B0C08294
         N_Port Port World Wide Name = 0x10000060B0C08294      ← Record the WWN.
                           Topology = IN_LOOP
                              Speed = 1062500000 (bps)
                         HPA of card = 0xFFB40000
                         EIM of card = 0xFFFA000D
                        Driver state = READY
              Number of EDB's in use = 0
              Number of OIB's in use = 0
  Number of Active Outbound Exchanges = 1
     Number of Active Login Sessions = 2
#
```

Figure 5.1 HP-UX® World Wide Name

5.1.2 Windows NT® or Windows 2000®

Hitachi Data Systems currently supports the Emulex fibre channel adapter in a Windows NT® environment, and will support other adapters in the future. For further information on fibre channel adapter support, or if you are using a fibre channel adapter other than Emulex, please contact the Hitachi Data Systems technical support center for instructions on finding the WWN.

Note: Before you begin, you will need to determine whether you have installed the Emulex Port driver or the Emulex Mini-port driver, because the instructions for each type are different.

To find the WWN in a Windows NT® environment with an **Emulex Mini-Port Driver**:

1. Verify that the fibre adapters and the fibre channel device drivers are installed.
2. Log in to the Windows NT® host with administrator access.
3. Go to the **LightPulse™** Utility to open the LightPulse™ Utility/NT® panel (see Figure 5.2). If you do not have a shortcut to the LightPulse™ Utility:
   a) Go to the **Start** menu, and select **Find** and choose the **Files and Folders** option. The Find panel will open.
   b) On the Find panel in the **Named** field box enter **lputilnt.exe**.
   In the **Look in** list box choose the hard drive that contains the Emulex mini-port driver.
   c) Choose **Find Now** to search for the LightPulse™ Utility. ***Note:*** If you cannot find the LightPulse™ Utility, contact Emulex technical support.
   d) Select **lputilnt.exe** from the **Find: Files named** list box then press **Enter**. The LightPulse™ Utility/NT® panel opens.
4. On the LightPulse™ Utility/NT® panel, the installed adapter(s) is/are displayed in list box on the left of the panel. Verify that the installed adapter(s) is/are displayed.
5. On the LightPulse™ Utility/NT® panel, in the **Category** list box, choose the **Configuration Data** option, and in the **Region** list box choose the **16 World-Wide Name** option. The WWN of the selected adapter is displayed in the list box on the right of the panel.

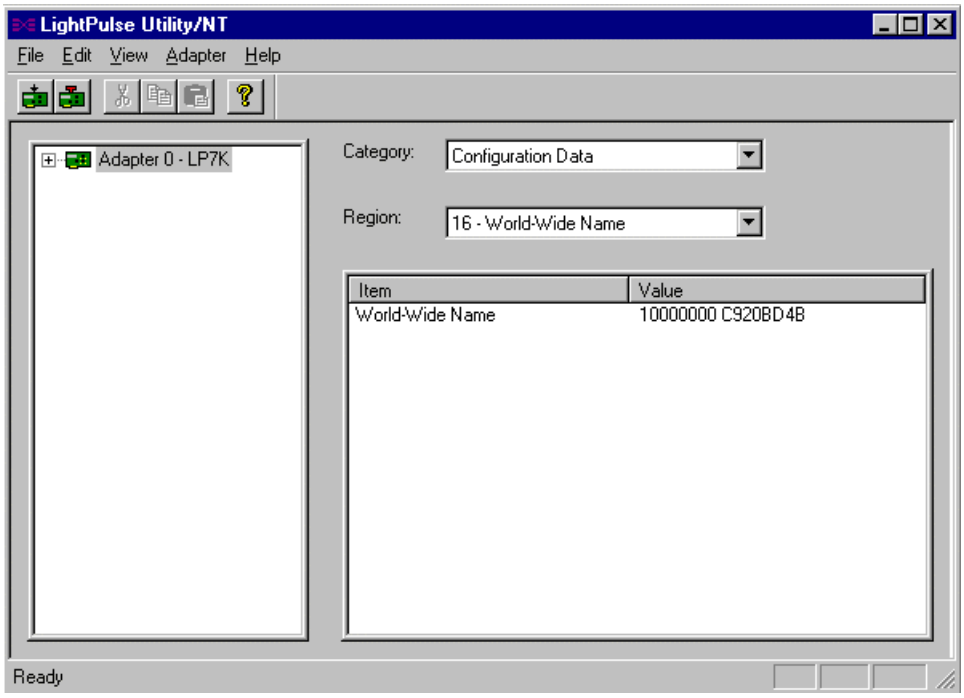

Figure 5.2 LightPulse™ Utility NT® Panel

To find the WWN in a Windows NT® environment with a **regular Emulex™ Port Driver**:

1. Verify that the fibre adapters and the fibre channel device drivers are installed, then log in to the Windows NT® host with administrator access.
2. Check to see if the DOS diagnostic tool **lp6dutil** is already on your hard drive.
   a) Go to the **Start** menu, select **Find**, and choose the **Files and Folders** option. The Find panel will open. Enter **lp6dutil.exe** in the **Find** box.
   b) In the **Look in** list box choose your hard disk drive.
   c) Choose **Find Now** to search for the LightPulse™ Utility. If the **lp6dutil** is found continue to step 5.
3. To download the **lp6dutil** utility from the Emulex web site:
   a) Go to www.emulex.com and select the following string of choices: **support**, **documentation and software**, **LightPulse fibre channel adapters**, **fibre channel adapter** (select the fibre channel adapter you are using), **firmware and diagnostics**.
   b) Download the **download software package** to your hard disk drive, and follow the instructions listed in step (3) to locate the **lp6dutil** executable.
4. Create a DOS boot disk and copy the lp6dutil to the DOS boot disk. Reboot the NT® system with the newly created DOS boot disk in the floppy drive so the system boots off the DOS disk.
5. At the command line prompt enter **lp6dutil.exe**. The diagnostic tool will run a preliminary test of the host adapter and then the tool will confirm that the adapters are ready and functional. Press **Enter** to start the diagnostic tool.
6. The **lp6dutil Main** Menu will open. Select **Show host adapter information**. The **Show Host Adapter** Menu opens.
7. Select option 4: **Display Configuration Data**. The **Display Configuration Data** Menu will open.
8. On the **Display Configuration Data** Menu, choose the number of the node that you want the WWN for. For example if you have one adapter installed on node A, select option **1 - Node Configuration A**.
9. The node configuration option will display the parameters of the selected node. To obtain the WWN combine the N_Port Name[0] and the N_Port Name[1] (see Figure 5.3).

```
Finished reading NV parameters for Host Adapter 1
N_Port Name[0] = 0x10000000                N_Port Name[1] = 0xC92006C3
Node Name[0] = 0x10000000                  Node Name[1] = 0xC92006c3
Preferred DID = 0x00000000                 Hard AL_PA = 0x0
```

Figure 5.3 Windows NT® World Wide Name

5.1.3 Sun Solaris®

Hitachi Data Systems currently supports the JNI fibre channel adapter in a Sun Solaris® environment. This document will be updated as needed to cover future adapter specific information, as those adapters are supported. For further information on fibre channel adapter support, or if you are using a fibre channel adapter other than JNI, please contact the Hitachi Data Systems technical support center for instructions for finding the WWN.

To find the WWN in a Sun Solaris® environment:

1. Verify that the fibre adapters and the fibre channel device drivers are installed.
2. Login to the Sun Solaris® host with root access.
3. Enter **dmesg |grep Fibre** to list the installed fibre channel device(s) and their WWN(s) (see Figure 5.4).
4. Verify that the fibre channel adapter(s) listed are correct, and record the listed WWN(s).

```
# dmesg |grep Fibre                                    ← Enter the dmesg command.
:
fcaw1: JNI Fibre Channel Adapter model FCW
fcaw1: Fibre Channel WWN: 200000e0694011a4             ← Record the WWN.
fcaw2: JNI Fibre Channel Adapter model FCW
fcaw2: Fibre Channel WWN: 200000e06940121e             ← Record the WWN.

#
```

Figure 5.4 Sun Solaris® World Wide Name

5.1.4 AIX®, SGI Irix® or Sequent®

To find the WWN in an AIX®, SGI Irix® or Sequent® environment, use the fibre switch that is connected to the host. The method of finding the WWN of the connected server on each port using the fibre switch depends on the type of switch. For instructions on finding the WWN, refer to the manual of the corresponding switch.

5.2 The LUN Security Panels

After you have installed and configured the subsystem, and recorded the WWN for the open-system host(s) you want to use, you are ready to begin LUN Security operations.

WARNING: If you choose to set the LUN Security parameters while you are online to the 9900 please exercise extreme caution. If any of the LUN Security parameters are incorrect the operation could be disruptive to the open-systems host I/O activity. Before entering the LUN Security parameters, be sure to verify that they are correct.

WARNING: If you are using the LUN Manager software and you have defined LUs or set LU mapping options, you must select the **OK** button on the SCSI PATH panel *whether or not* you wish to enable the LUN Security feature for any newly defined LUs. Unless you select **OK**, your LU definition and LU mapping options will not be implemented

5.2.1 The SCSI PATH Panel (LUN Security Tab)

The SCSI PATH panel has three tabs: SCSI PATH (refer to Chapter 3), LU Expansion Define (refer to Chapter 4), and LUN Security (detailed in this chapter). All references in this chapter are to the LUN Security tab of the SCSI PATH panel. ***Note:*** the panel displays the same information, whether in **Off Line Mode, On Line Mode,** or **View Mode**.

The LUN Security tab of the SCSI PATH panel (see Figure 5.5) allows you to set and define LU groups, define WWN groups, set ports to be secured and set the security level for specified ports.

To open the SCSI PATH panel:

1. Connect to the desired subsystem, and select the **SCSI Path** option on the Option Select panel, then open the SCSI PATH panel (see Figure 3.3). (Refer to sections 2.1 and 2.3 if you need instructions on this process.).
2. Select the **Mode** menu, and then select either **Off Line Mode** to define the LUN Security parameters while I/O activity is suspended, or **On Line Mode** to define the LUN Security parameters while I/O activity continues. The **View Mode** option provides read-only access to the LU configuration information.
3. On the SCSI PATH panel, select the **LUN Security** tab (see Figure 5.5).

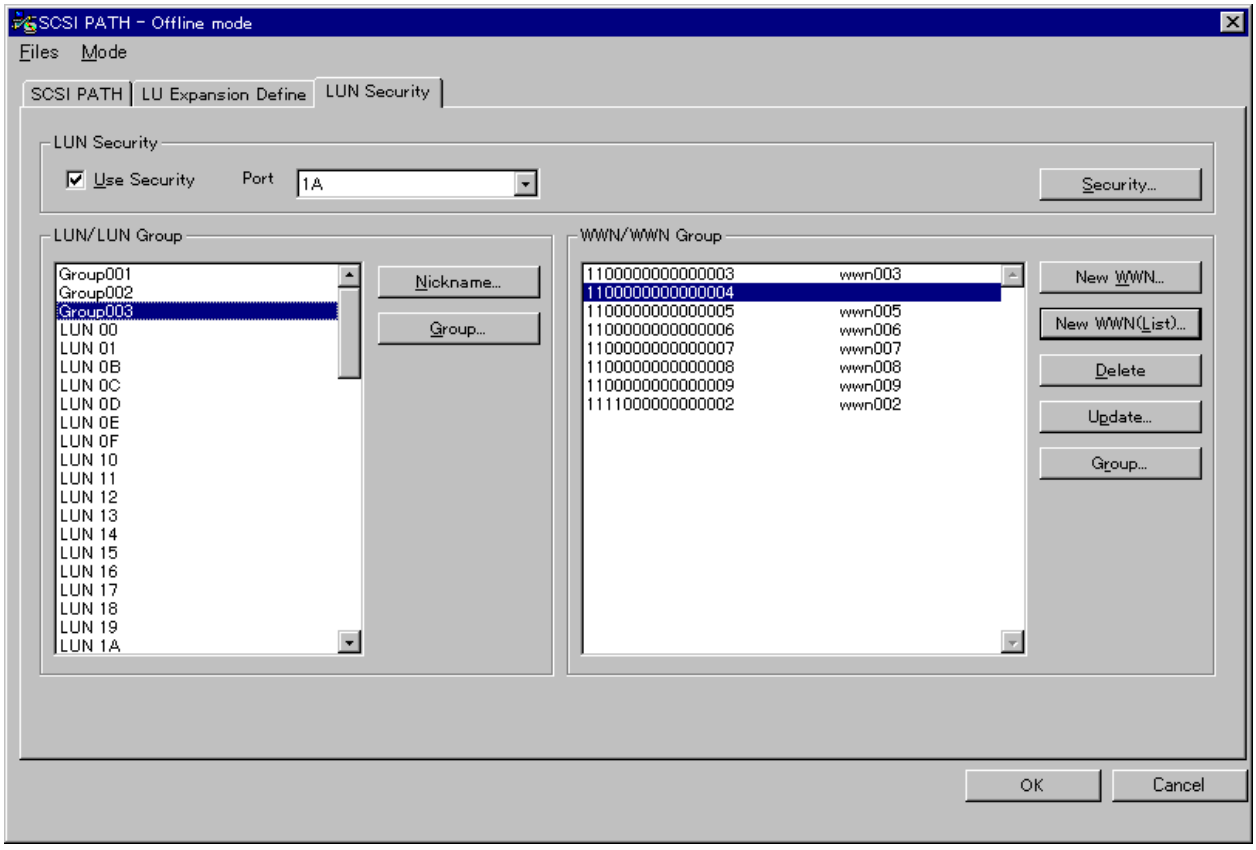

Figure 5.5 SCSI PATH Panel, LUN Security Tab

The LUN Security tab of the SCSI PATH panel has the following features:

- The **Files** menu includes the **OK** and **Cancel** commands. These commands are equivalent to the **OK** and **Cancel** buttons.
- The **Mode** menu includes the following three modes ***Note:*** all three modes present the same view of the panel.
  - **Off Line Mode** allows you to define LUN Security parameters while offline to the host.
  - **On Line Mode** allows you to define LUN Security parameters while they are offline to the host.
  - **View Mode** allows you to view the current LU configuration (the default mode).
- The **LUN Security** box allows you to check the **Use Security** box and specify a particular port, so that you can either have LUN Security enabled or disables for that port.

  -The **Security...** button allows you to set the security options for a particular LUN or LUN Group.
- The **LUN/LUN Group** list box displays the LUNs and LUN groups that are defined on the specified port. The buttons next to that box are as follows:

  -The **Nickname...** button allows you to set or change the nickname of a LUN or LUN group (maximum eight characters).

  -The **Group...** button allows you to define a LUN group name and set or change the LUNs assigned to a LUN group that is displayed in the LUN/LUN Group list box.
- The **WWN/WWN Group** list box displays the nicknames of defined World Wide names. The buttons next to that list box are as follows:

  -The **New WWN...** button allows you to define and set a WWN value and a WWN nickname.

  -The **New WWN(List)...** button opens the WWN List panel (see Figure 5.11), and on the WWN List panel, you can select a WWN value from the WWN list and register the WWN selected.

  -The **Delete** button allows you to delete a WWN from the WWN/WWN Group list box.

  -The **Update...** button allows you to change the security parameters of a defined WWN.

  -The **Group...** button allows you to define a WWN group name and set or change the WWNs assigned to a defined WWN group.
- The **OK** button completes the LUN Security settings.
- The **Cancel** button exits LUN Security without making changes to the subsystem.

5.2.2 The LUN Group Panel

To open the LUN Group panel, select the **Group…** button on the SCSI PATH panel. Once you have set the LUN Security parameters you can change the LUN or WWN group assignments, the WWN definition, and the LUN or WWN nickname.

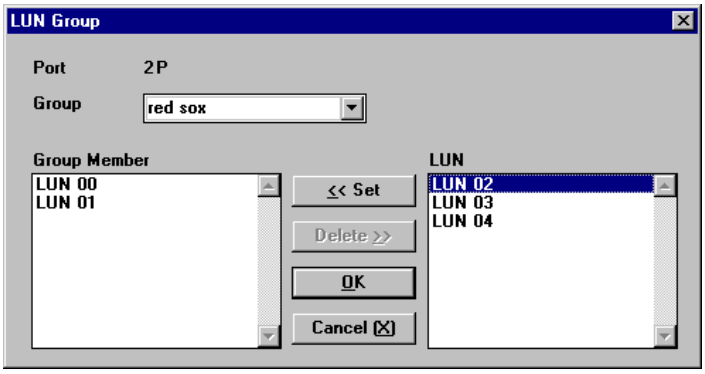

Figure 5.6 LUN Group Panel

The LUN Group Panel has the following features:

- The **Port** listing shows the port selected for this LUN Group.
- The **Group** drop-down box allows you to either specify a name for this group or select an existing group.
- The **Group Member** list box shows the LUNs that have been selected for this LUN group.
- The **LUN** list box shows the LUNs that are available to be selected for this LUN group.
- The **<<Set** button allows you to add a LU that is selected in the **LUN** list box to the **Group Member** list box.
- The **Delete>>** button allows you to delete a selected LUN from the **Group Member** list box.
- The **OK** button confirms your choices and returns you to the SCSI PATH panel.
- The **Cancel** button cancels your choices and returns you to the SCSI PATH panel.

5.2.3 The WWN Panel

To open the WWN panel, select **New WWN** on the SCSI PATH panel.

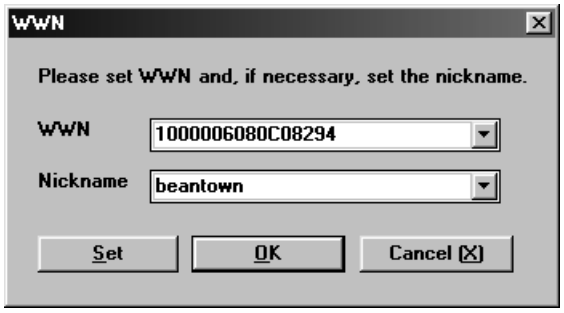

Figure 5.7 WWN Panel

The WWN panel has the following features:

- The **WWN** drop down box allows you to specify or select a World Wide Name.
- The **Nickname** drop down box allows you to specify or select a nickname for this WWN.
- The **Set** button registers the information for each WWN and/or nickname.
- The **OK** button confirms your choices and returns you to the SCSI PATH panel.
- The **Cancel** button cancels your choices and returns you to the SCSI PATH panel.

5.2.4 The WWN Group Panel.

To open the WWN Group panel, select the **Group…** button on the SCSI PATH panel.

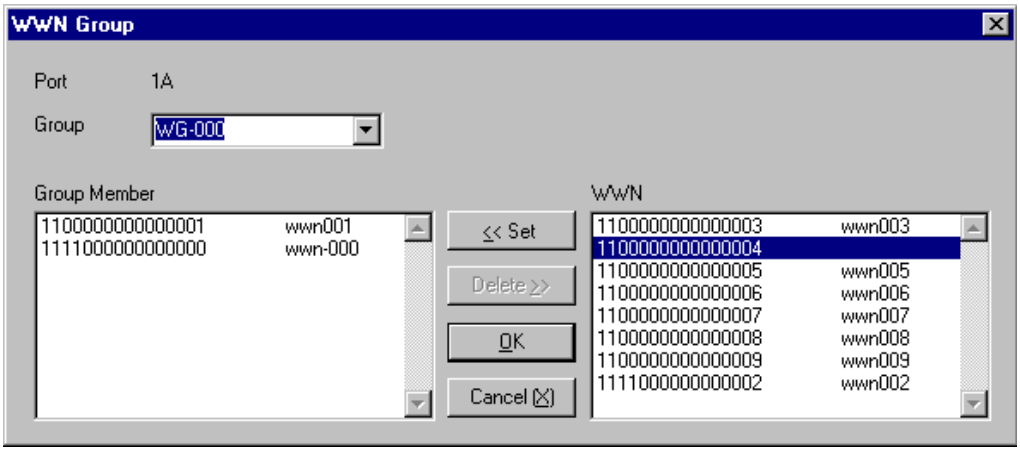

Figure 5.8 WWN Group Panel

The WWN Group panel has the following features:

- The **Port** listing shows the port selected for this WWN Group.
- The **Group** drop-down box allows you to either specify a name for this WWN group or select an existing group.
- The **Group Member** list box shows the WWNs that have been selected for this WWN group.
- The **WWN** list box shows the WWNs that are available to be selected for this WWN group.
- The **<<Set** button allows you to add a WWN that is selected in the **WWN** list box to the **Group Member** list box.
- The **Delete>>** button allows you to delete a selected WWN from the **Group Member** list box.
- The **OK** button confirms your choices and returns you to the SCSI PATH panel.
- The **Cancel** button cancels your choices and returns you to the SCSI PATH panel.

5.2.5 The Security Panel

To open the Security panel, select the **Security…** button on the SCSI PATH panel.

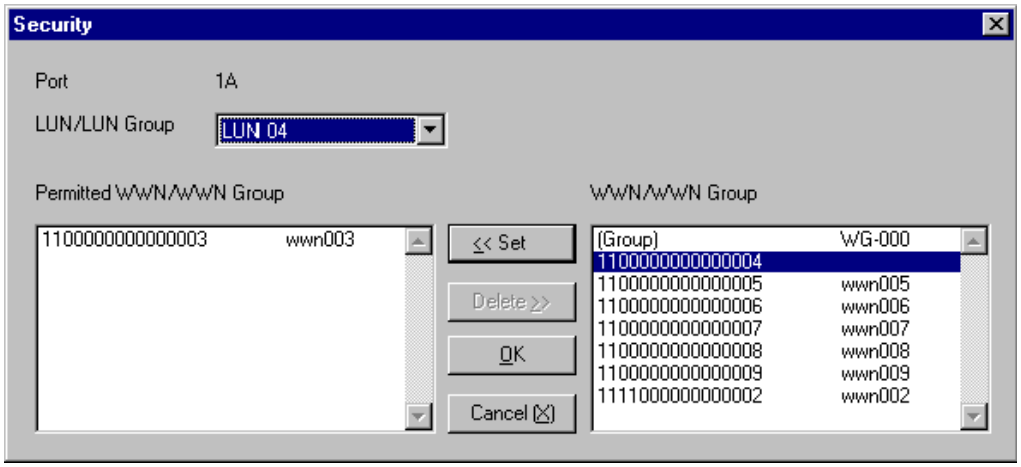

Figure 5.9 Security Panel

The Security panel has the following features:

- The **Port** listing shows the port for this WWN or WWN Group.
- The **LUN/LUN Group** drop-down box allows you to select either the LUN or the LUN group that you wish to secure.
- The **Permitted WWN/WWN Group** list box shows the WWNs and WWN Groups that are allowed access to the specified LUN or LUN Group.
- The **WWN/WWN Group** list box shows the WWNs and WWN Groups that can be selected and added to the **Permitted WWN/WWN Group** list box.
- The **<<Set** button allows you to add a WWN or WWN Group that is selected in the **WWN/WWN Group** list box to the **Permitted WWN/WWN Group** list box.
- The **Delete>>** button allows you to delete a selected WWN or WWN Group from the **Permitted WWN/WWN Group** list box.
- The **OK** button confirms your choices and returns you to the SCSI PATH panel.
- The **Cancel** button cancels your choices and returns you to the SCSI PATH panel.

5.2.6 The LUN Group Nickname Panel

To open the LUN Group Nickname panel:

1. Select the **LUN Security** box on the SCSI PATH panel.
2. Select the desired port from the **Port** list box.
3. Select the **Use Security** box.
4. Select the LUN Group name from the **LUN/LUN Group** list box.
5. Select the LUN Group nickname that you want to change.
6. Select **Nickname...** to open the LUN Group Nickname panel.

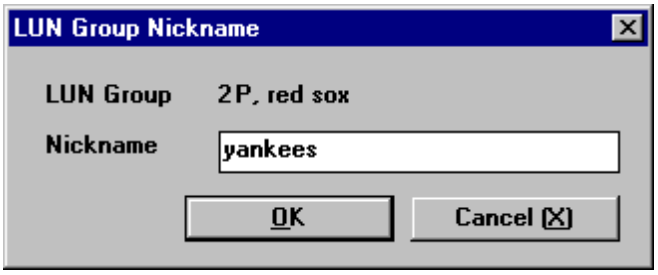

Figure 5.10 LUN Group Nickname Panel

The LUN Group Nickname panel has the following features:

- The name and current nickname (if any) of the **LUN Group** is displayed at the top of the panel.
- The **Nickname** field allows you to enter a different nickname for this LUN Group.
- The **OK** button confirms your choice and returns you to the SCSI PATH panel.
- The **Cancel** button cancels your choice and returns you to the SCSI PATH panel.

5.2.7 The WWN List Panel

The WWN List panel is accessed as follows:

1. On the LUN Security Main panel, select the desired port from the **Port** list box in the **LUN Security** box.
2. Select the **Use Security** box.
3. In the **WWN/WWN Group** box, select the **New WWN(List)...** button to open the WWN List panel.

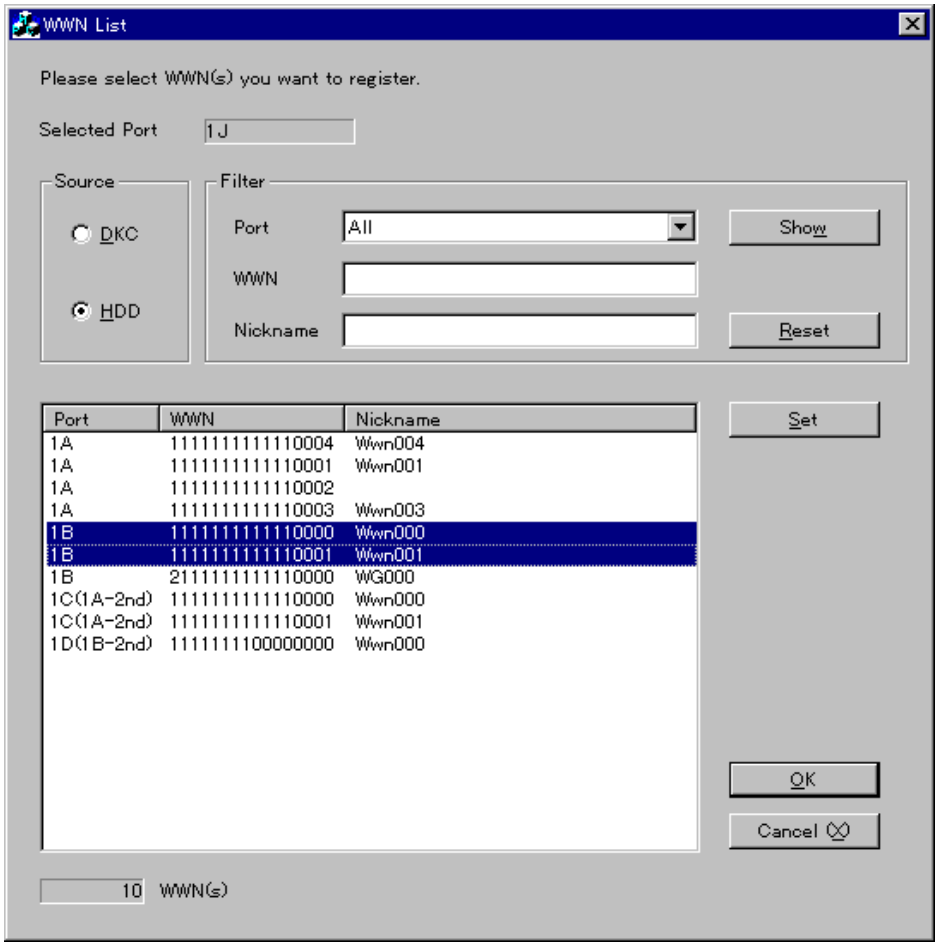

Figure 5.11 WWN List Panel

The WWN List panel has the following features:

- The **Selected Port** box displays a port selected on the LUN Security Main panel. You can register WWNs for this port from the WWN List panel.
- The **Source** box allows you to select an option for displaying WWNs, as follows:
  - **DKC** displays a list of WWNs identified by the 9900 subsystem. If the 9900 cannot identify the WWNs, the information from the hard disk drive of the Remote Console PC is used to display a list of WWNs.
  - **HDD** displays a list of WWNs obtained from the configuration information in the hard disk drive of the Remote Console PC.
- The **Filter** box allows you to filter WWNs of the selected port(s) in the WWN list.
  - The **Port** selection box allows you to select port(s) whose WWNs to be filtered. You can either select **All** to filter WWNs of all equipped devices, or select the desired port to filter WWNs of that port.
  - The **WWN** text box allows you to enter a WWN (up to 16 characters). You can also use a wildcard ('*').

    Note: Entering `1111****0000` is the same as entering `1111****0000****`. If you omit a WWN, `****************` is assumed, and no filtering by WWN takes place.
  - The **Nickname** text box allows you to enter a nickname (up to 8 characters). You can also use a wildcard ('*').

    Note: Entering `wwn**1` is the same as entering `wwn**1**`. If you omit a nickname, `********` is assumed, and no filtering by nickname takes place.
- The **Show** button starts filtering the WWNs as specified in the **Filter** box.
- The **Reset** button resets the settings in the **Filter** box to the default.
- The **WWN** list box displays the port, WWN, and nickname of the filtered WWNs. You can select more than one WWN to be registered.
- The **Set** button registers the selected WWNs to the selected port (in **Selected Port**). The **Set** button is available only when you select one or more WWNs in the **WWN** list box.
- The **OK** button applies the settings and returns you to the LUN Security Main panel.
- The **Cancel** button returns you to the LUN Security Main panel without applying the settings.
- The box below the **WWN** list displays the number of WWNs displayed in the **WWN** list.

5.2.8 The Update WWN/WWN Group Panel

To access the Update WWN/WWN Group panel, from the **LUN Security** box on the SCSI PATH panel, select the desired port from the **Port** list box, and select the **Use Security** box. Select **Update...** to open the Update WWN/WWN Group panel

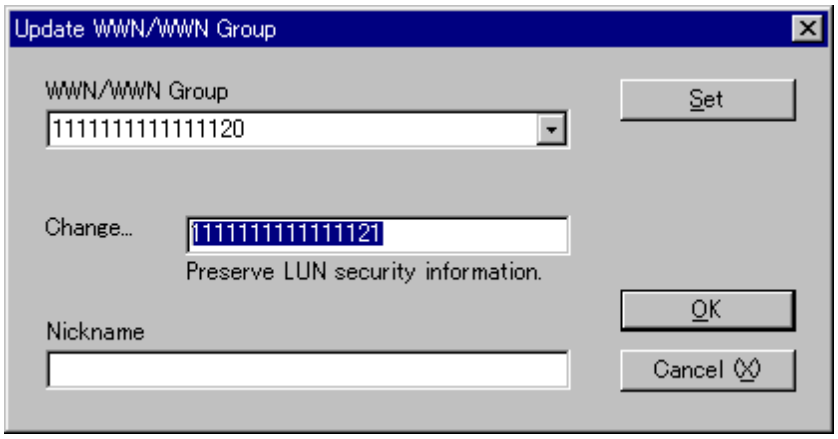

Figure 5.12 Update WWN/WWN Group Panel

The Update WWN/WWN Group panel has the following features:

- The **WWN/WWN Group** drop-down box displays the current WWN (and nickname, if specified).
- The **Change…** box displays current LUN Security information (WWN), and allows you to enter a new value if you want to change the WWN.
- The **Nickname** box displays the current LUN Group nickname, and allows you to enter a new nickname if you want to change the nickname.
- The **Set** button registers your changes in the WWN/WWN Group drop-down box. ***Note:*** When you select the **Set** button, a confirmation panel will appear. To change the WWN or nickname, select **Yes** on the confirmation panel, then select the **OK** button.
- The **OK** button has different functions, depending on which buttons were previously selected.
  - If you have previously selected the **Set** button, the **OK** button implements your changes and returns you to the SCSI PATH (**LUN Security** tab) panel.
  - If you have not previously selected the **Set** button, the **OK** button closes the Update WWN/WWN Group panel without implementing your changes.
- The **Cancel** button cancels any changes that you specified with the **Set** button, and returns you to the SCSI PATH (**LUN Security** tab) panel.

5.3 LUN Security Operations

5.3.1 Defining LUN Security Parameters

After you have obtained the WWN and connected to the 9900 subsystem using the Remote Console PC, you can set the LUN Security parameters for any defined fibre channel port.

To define the LUN Security parameters:

1. On the SCSI PATH panel (refer to Figure 5.5), in the **LUN Security** box, from the **Port** list, select the fibre channel port that you want to secure, and select the **Use Security** box.
2. Verify that the LUNs defined on the specified port appear in the **LUN/LUN Group** list box. If the defined LUNs are not displayed in the LUN/LUN Group list box, use the **Cancel** button to exit the LUN Security function and verify that the LUNs were properly defined using the LUN Manager software (refer to Chapter 3).
3. If you want to create a LUN group, select **Group...** in the LUN/LUN Group box, and the LUN Group panel opens. If you do not want to set a LUN group continue to step (4).
   a) On the LUN Group panel (see Figure 5.6) define a group name in the **Group** list box.
   b) In the **LUN** list box select the LUNs you want to assign to the specified group, and select **<< Set**. The newly assigned LUNs are now display in the Group Member list box. If you make a mistake while selecting LUNs, select the unwanted LUN in the **Group Member** list box and select **Delete >>** to move the LUN out of the defined group. The newly unassigned LUN is displayed in the LUN list box.
   c) After assigning the desired LUNs, select **OK**, and the SCSI PATH panel opens again.
4. Choose **New WWN...** to open the WWN panel.
5. On the WWN panel (see Figure 5.7) enter the WWN in the **WWN** box, and enter the desired **nickname** (maximum eight characters) in the **Nickname** list box.
6. After you have entered the WWN select **Set** to register the information. Repeats steps (5) and (6) until you have entered the desired WWNs. Select **OK** to return to the SCSI PATH panel.
7. If you want to register the WWNs already registered to another port, or if you want to register WWNs identified by the 9900 subsystem, select the desired port, select the **Use Security** box, and then select the **New WWN(List)...** button to open the WWN List panel.

Instructions continue on the following page.

8. On the WWN List panel (see Figure 5.11), WWNs already registered to another port or WWNs identified by the 9900 subsystem are displayed. Select the desired WWN(s) you want to register to the port selected in the LUN Security Main panel.
9. After you have selected the desired WWN(s), select the **Set** button to register the information. Select the **OK** button to return to the LUN Security Main panel on the SCSI PATH panel. Repeat steps (7) through (9) until you have registered the desired WWNs.
10. If you want to create a WWN group, select **Group...** in the **WWN/WWN Group** list box, and the WWN Group panel opens. If you do not want to set a WWN group, continue to step (8).
    a) On the WWN Group panel (see Figure 5.8) define a group name in the **Group** list box.
    b) In the **WWN** list box select the **WWNs** you want to assign to the specified group, and select **<< Set**. The newly assigned WWNs are now display in the Group Member list box. If you make a mistake while selecting WWNs, select the unwanted **WWN** in the **Group Member** list box and select **Delete >>** to move the WWN out of the defined group. The newly unassigned WWN is displayed in the WWN list box.
    c) After assigning the desired WWNs, select **OK**, and the SCSI PATH panel opens again.
11. After you have defined the WWN(s) and defined any desired WWN or LUN groups, select **Security...** to open the Security panel.
12. On the Security panel (see Figure 5.9), from the **LUN/LUN Group** list box, select the **LUN** or **LUN group** you want to secure.
13. In the **WWN/WWN Group** list box, select the WWN or WWN Group to which you want to grant access for the selected group and select **<<Set**.
14. If you make a mistake while selecting a WWN or WWN Group, select the unwanted **WWN** or **WWN Group** in the **Permitted WWN/WWN Group** list box and select **Delete >>** to remove the WWN or WWN Group from the permitted WWN/WWN Group list box. The newly unassigned WWN or WWN Group is displayed in the WWN list box. When you have completed the LUN Security definition on the Security panel, select **OK** to return to the LUN Security panel.
15. Repeat the preceding steps for each fibre channel port that you want to secure. When you have finished securing the desired ports, select **OK** to register the configuration changes with the 9900 subsystem. If you do not want to register the configuration changes with the 9900 subsystem, select **Cancel** to exit the LUN Security software.

5.3.2 Securing or Releasing a Port

The **LUN Security** box on the SCSI PATH panel allows you to either set a port for LUN Security or remove a port from LUN Security.

5.3.2.1 To make a port secure:

1. Define the security parameters for that port, as described in Section 5.3.
2. In the SCSI PATH panel, select the desired port from the **Port** list box, and select the **Use Security** box.
3. Select **OK** to register this configuration change to the 9900 subsystem, or select **Cancel** to exit the LUN Security software without making changes.

5.3.2.2 To release a port from LUN Security:

1. On the SCSI PATH panel, select the desired port from the **Port** list box.
2. De-select the **Use Security** box.

   Note: This will not erase the LUN Security setting for that LUN. The LUN Security software will hold the assigned setting for a LUN until either that LUN is deinstalled, its port is de-installed, or the settings are manually erased from within the LUN Security software.

5.3.3 Changing the Security Parameters

The **Security...** button on the SCSI PATH panel allows you to change the security setting for defined LUNs on a specified port.

To change the security parameters:

1. In the LUN Security box on the SCSI PATH panel (refer to Figure 5.5), select the desired port from the **Port** list box, and then select **Security...** to open the Security panel.
2. On the Security panel (refer to Figure 5.9), select the desired LUN or LUN Group from the **LUN/LUN Group** list box.
3. To grant permission to communicate with the selected LUN to one or more WWN(s) or WWN Group(s):
   a) Select the WWN(s) or WWN Group(s) you want to add to the **permitted WWN/WWN Group** list and select **<< Set**.
   b) If you make a mistake while selecting a WWN or WWN Group, select the unwanted WWN or WWN Group in the **Permitted WWN/WWN Group** list box and select **Delete >>** to remove the WWN or WWN Group from the Permitted WWN/WWN Group list box.
   c) The newly assigned WWN or WWN Group is displayed in the WWN list box.
4. To delete a previously granted permission for one or more WWN(s) or WWN Group(s) to communicate with the selected LUN:
   a) Select the WWN(s) or WWN Group(s) you want to delete from **the permitted WWN/WWN Group** list and select **Delete >>** to remove the WWN or WWN Group from the Permitted WWN/WWN Group list box.
   b) The newly unassigned WWN or WWN Group is displayed in the WWN list box.
   c) If you make a mistake while selecting a WWN or WWN Group, select the desired WWN or WWN Group in the **WWN/WWN Group** list box and select **<< Set** to return the WWN or WWN Group to the Permitted WWN/WWN Group list box. After you have made the desired changes to the defined LUNs, select **OK** to exit the Security panel. The SCSI PATH panel re-opens.
5. On the SCSI PATH panel, select **OK** register the changes you have made with the 9900 subsystem. ***Note:*** Any changes you make will not be effective until they are registered.

5.3.4 Changing LUN or LUN Group Parameters

The **LUN/LUN Group** box on the SCSI PATH panel (refer to Figure 5.5) allows you to set or change the LUN security parameters for a specified port.

5.3.4.1 To change the LUN group definition:

1. In the LUN Security box on the SCSI PATH panel select the desired port from the **Port** list box, and select the **Use Security** box (if it is not already selected).
2. In the **LUN/LUN Group** box select **Group...** to open the LUN Group panel.
3. On the LUN Group panel (refer to Figure 5.6), select the desired group name from the **Group** list box, or enter a new group name in the **Group** list box.
4. To add a LUN to the selected group:
   a) In the **LUN** list box select the LUNs you want to assign to the specified group, and select **<< Set**. The newly assigned LUNs are now displayed in the **Group Member** list box.
   b) If you make a mistake while selecting LUNs, select the unwanted LUN in the **Group Member** list box and select **Delete >>** to move that LUN out of the defined group.
5. To delete a LUN from the selected group:
   a) In the **Group Member** list box select the LUN(s) you want to delete from the specified group, and select **Delete >>**. The newly unassigned LUNs are now displayed in the **LUN** list box.
   b) If you make a mistake while selecting LUNs, select the desired LUN in the **LUN** list box and select **<< Set** to move that LUN to the defined group.
6. After you have made the desired changes to the defined LUN Group(s), select **OK** to exit the LUN Group panel.

5.3.4.2 To change the LUN group nickname

1. In the SCSI PATH panel, select the desired port from the **Port** list box, and select the **Use Security** box (if not already selected).
2. In the **LUN/LUN Group** list box select the LUN Group name you want to change and select **Nickname...** to open the LUN Group Nickname panel.
3. On the LUN Group Nickname panel (see Figure 5.10), the **port name** and the currently assigned **LUN group name** are displayed as the LUN Group information. Verify that you have chosen the correct port and the correct group name.
4. In the **Nickname** field box, enter the new nickname for the LUN group (maximum eight characters), and either select **OK** to make the nickname changes or select **Cancel** to exit without changing the nickname.

5.3.5 Changing WWN or WWN Group Parameters

The SCSI PATH panel (refer to Figure 5.5) allows you to set or change the WWN or WWN Group parameters for a specified port.

5.3.5.1 To Enter a New WWN:

1. In the **LUN Security** box on the SCSI PATH panel select the desired port from the **Port** list box, and select the **Use Security** box.
2. In the **WWN/WWN Group** box, choose **New WWN...** to open the WWN panel (refer to Figure 5.7).
3. On the WWN panel enter the WWN in the **WWN** box, and enter the desired nickname (maximum eight characters) in the **Nickname** list box.
4. After you have entered the WWN and Nickname select **Set** to register the information. Repeats steps (3) and (4) until you have entered all of the desired WWNs. Select **OK** to return to the SCSI PATH panel. The newly defined WWN(s) are now listed in the **WWN/WWN Group** list box of the SCSI PATH panel.

To Delete a WWN:

1. In the **LUN Security** box on the SCSI PATH panel (refer to Figure 5.5) select the desired port from the **Port** list box, and select the **Use Security** box.
2. In the **WWN/WWN Group** list box select the unwanted WWN and select **Delete**. A warning message (see Figure 5.13) will ask you to confirm that you want to delete the WWN and its security information. Select **Yes** to delete the name or **No** to exit without deleting the name.

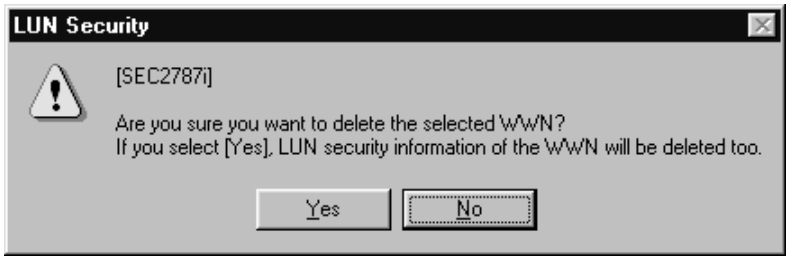

Figure 5.13 Delete WWN Warning Message

5.3.5.2 To Update the WWN Parameters

1. In the **LUN Security** box on the SCSI PATH panel, select the desired port from the **Port** list box, and select the **Use Security** box.
2. Select **Update...** to open the Update WWN/WWN Group panel (refer to Figure 5.12).
3. On the Update WWN/WWN Group panel, the **WWN/WWN Group**, **WWN nickname** and **port** are listed. Verify that the correct port has been selected.
4. To change the WWN or the WWN Group nickname:
   a) From the **WWN/WWN Group** list box select the WWN and/or the WWN Group nickname that you want to change.
   b) In the **Change...** field box enter the new data and select **Set**.
   c) A warning box will open and ask if you want to change the settings. If you are sure you want to make the changes select **Yes**. If you do not want to make the entered changes select **No** to cancel the operation.
   d) Select **OK** to implement your changes. ***Note:*** your changes will not be implemented unless you have previously selected the **Set** button.
   e) If you don't want to change the WWN or the WWN Group nickname that you have previously indicated, select **Cancel** to quit the Update WWN/WWN Group panel without saving the changes.

5.3.5.3 To Change the WWN Group Definition:

1. In the **LUN Security** box on the SCSI PATH panel select the desired port from the **Port** list box, and select the **Use Security** box.
2. In the **WWN/WWN Group** box select **Group...** to open the WWN Group panel.
3. On the WWN Group panel (refer to Figure 5.8) from the **Group** list box, select the WWN group that you want to change.

5.3.5.4 To Add a WWN to the Selected Group:

1. In the **WWN** list box select the WWNs you want to assign to the specified group, and select **<< Set**. The newly assigned WWNs are now display in the Group Member list box.
2. If you make a mistake while selecting WWNs, select the unwanted WWN in the **Group Member** list box and select **Delete** >> to move the WWN out of the defined group.

5.3.5.5 To Delete a WWN from the Selected Group:

1. In the **Group Member** list box select the WWN(s) you want to delete from the specified group, and select **Delete** >>. The newly unassigned WWNs are now display in the WWN list box.
2. If you make a mistake while selecting WWNs, select the desired WWN in the **WWN** list box and select **<< Set** to move the WWN to the defined group.
3. After you have made the desired changes to the defined WWN Group(s), select **OK** to exit the WWN Group panel, completing the operation or select **Cancel** to exit the WWN Group panel without making any changes to the WWN groups.

Chapter 6 Troubleshooting

6.1 Troubleshooting

The Hitachi Freedom Storage™ 9900 subsystem provides continuous data availability and is not expected to fail in any way that would interrupt access to user data. For troubleshooting information on the 9900 subsystem, please refer to the *Hitachi Freedom Storage™ 9900 User and Reference Guide* (MK-RD008). For further information on the Hitachi Freedom 9900 Remote Console, please refer to the *Hitachi Freedom Storage™ 9900 Remote Console User's Guide* (MK-90RD003) or *Hitachi Freedom Storage™ 9900 Remote Console Error Codes* (MK-90RD029).

The user is responsible for the operation and normal maintenance of the Remote Console PC. Here are some guidelines for troubleshooting the Remote Console PC:

- **Check the cabling and the LAN.** Verify that both the computer and LAN cabling are firmly attached, and that the LAN is operating properly.
- **Reboot the PC**. Close any programs that are not responding. If necessary, reboot the PC and restart the Remote Console program. (If possible, first close all open programs before rebooting.) ***WARNING:*** The R-SIMs reported by the 9900 subsystems cannot be logged on the Remote Console PC when the PC is powered off. Reconnect to the same disk controller and verify the status of the data.
- **Check for any Error Codes.** Table 6.1 describes some general error conditions, along with the recommended resolution for each item. If you are unable to resolve an error condition, please call the Hitachi Data Systems Technical Support Center (see section 6.2).

Table 6.1 Troubleshooting

Error Condition	Recommended Action
Error message displayed during RMCMAIN installation.	If the error message **Setup file error for Windows x.xx (ee = y)** appears, verify that the correct version of Windows is installed. If **ee = 2** is displayed, verify that the installation diskette is not write-protected and is inserted in the floppy disk drive properly. Restart the setup program. If the error message **File I/O Error** appears, verify that the installation diskette is not write-protected and is inserted in the floppy disk drive properly, and restart the setup program. If the error message **Resource Error (Err=xxxx)** or **Internal Error (Err=xxxx)** appears, reboot the Remote Console PC, and restart the setup program.
RMCMAIN will not add or connect with a subsystem.	Verify that the S/N is correct. If not, delete the subsystem, and then add the subsystem again using the correct S/N. If RMCMAIN still cannot connect, check the settings on the Windows network control panel, and use PING to test the LAN connection If RMCMAIN still cannot connect, exit RMCMAIN, restart the PC, start RMCMAIN, and try again. If RMCMAIN still cannot connect, reinstall the RMCMAIN software. If the problem persists, call the Hitachi Data Systems Support Center.
The Remote Console PC experiences an error.	Exit RMCMAIN, close all other applications, and then restart the PC. If the problem persists, verify that the PC's operating system and LAN hardware and software are properly configured, and reinstall the RMCMAIN software. The user is responsible for maintaining the Remote Console PC.
Any problem with a 9900 subsystem.	Open the R-SIM panel, and sort the R-SIMs by name to view the R-SIMs by subsystem. If there are any serious- or acute-level R-SIMs, call the Hitachi Data Systems Support Center. Also, please refer to the *Hitachi Freedom Storage™ 9900 User and Reference Guide* (MK-RD008) for troubleshooting information on the 9900.

6.2 Contacting the Hitachi Data Systems Technical Support Center

If you need to call the Hitachi Data Systems Technical Support Center, be sure to provide as much information about the problem as possible, including the circumstances surrounding the error or failure, the exact content of any messages displayed on the Remote Console PC, and the severity levels and reference codes of the R-SIMs on the R-SIM panel.

The worldwide Hitachi Data Systems Technical Support Centers are:

- Hitachi Data Systems North America/Latin America
  San Diego, California, USA
  1-800-348-4357
- Hitachi Data Systems Europe
  Contact Hitachi Data Systems Local Support
- Hitachi Data Systems Asia Pacific
  North Ryde, Australia
  011-61-2-9325-3300

Appendix: Glossary, Acronyms, and Abbreviations

Cache extents	Areas used for FlashAccess (also known as Dynamic Cache Residency)
CU	control unit
Custom access	A feature that allows a non-administrator to be assigned update access to one or more of the restricted Remote Console functions.
CV	custom-sized volume, also called customized volume
CVS	custom volume size (also called Virtual LVI or Virtual LUN). This function divides a logical volume into two or more smaller volumes, called custom-sized volumes.
DASD	direct access storage device
DCR	dynamic cache residence (also called FlashAccess)
DKCMAIN	disk controller main
ESCON®	Enterprise System Connection
FD	floppy disk
FD Copy	floppy disk copy. This function downloads the 9900 Remote Console configuration information onto a floppy diskette or a hard disk drive, and is generally used for troubleshooting purposes.
FlashAccess	dynamic cache residency, or DCR.
GB	gigabyte(s)
HIHSM	Hitachi Internal Hierarchical Storage Manager
HMBR	Hitachi Multiplatform Backup/Restore
HMRCF	Hitachi Multi-RAID Coupling Feature (also called ShadowImage)
HODM	Hitachi Online Data Migration
HORC	Hitachi Remote Copy (open).
HOMRCF	Hitachi Open Multi-RAID Coupling Feature (also called ShadowImage)
HRC	Hitachi Remote Copy – Synchronous. This feature must be installed before you can install either HORC or HRCA.
HRCA	Hitachi Remote Copy - Asynchronous
kB	kilobyte(s)
LAN	local-area network
LBA	logical block address
LDEV	logical device
LU	logical unit
LUN	logical unit number
LUN Manager	remote console software option, also called Remote SCSI. This option must be installed before you can install either LUSE or LUN Security.
LUSE	Logical Unit Size Expansion
LVI	logical volume image (also called device emulation)
MB	megabyte(s)
MIB	message information block

Parity group	a set of hard disk drives that have the same capacity and are treated as one group. A parity group contains both user data and parity information, which allows the user data to be accessed in the event that one or more of the drives within the group are not available.
Remote SCSI	A Remote Console software option, also called LUN Manager
RMC	Remote Console PC
RMCMAIN	Remote console main
R-SIM	remote service information message (generated by the 9900 when it detects an error or service requirement).
SCSI	small computer system interface
ShadowImage	Hitachi Multi-RAID Coupling Feature (HMRCF) and/or Hitachi Open Multi-RAID Coupling Feature (HOMRCF)
SIM	service information message (generated by a disk controller when it detects an error or service requirement).
SNMP	simple network management protocol (part of the TCP/IP protocol suite)
SSID	storage subsystem ID. The 9900 is configured with one SSID for each 64 devices, and up to four SSIDs for each CU image.
SVP	service processor (PC component of the 9900)
TCP/IP	transmission control protocol/internet protocol
TID	target ID
Trap	An SNMP agent initiates trap operations when R-SIMs occur, in order to send the R-SIMs to the SNMP manager (see Figure 4.1). An SNMP agent can be configured to deliver traps to more than one SNMP manager.
UCB	unit control block
VLUN	Virtual LUN (also called custom volume size, CVS)
VLVI	Virtual LVI (also called custom volume size, CVS)
Volser	volume serial number (mainframe volume identifier, not related to the LDEV ID)
WWN	World Wide Name, which is a unique identifier for a particular open-system host, consisting of a 64-bit physical address (the IEEE 48-bit format with 12-bit extension and 4-bit prefix).
WWN Group	A WWN group gives every host in the specified WWN group access to a specified LU or group of LUs. This is part of the LUN Security feature.

Index

M

O

P

R

S

T

U

W