



**Hitachi Freedom Storage™
Lightning 9900™ V Series
Performance Monitor User's Guide**

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Source Documents Used in this Revision

- Customer email dated 13 December 2003
- Technical support specialist email dated 21 April 2004

Changes in this Revision

- Reformatted Comments section of Preface
- Added a note on the Export File function (see 2.1 and 4.1)
- Fixed erroneous end dates in example for the Physical Tab of the Performance Monitor Panel (see 4.2.1)
- Fixed erroneous end dates in example for the LDEV Tab of the Performance Monitor Panel (see 4.2.2)

Referenced Documents

- *Hitachi Freedom Storage™ Lightning 9900™ V Series User and Reference Guide* (MK-92RD100)
- *Hitachi Freedom Storage™ Lightning 9900™ V Series Hitachi CruiseControl™ User's Guide* (MK-92RD106)
- *Hitachi Freedom Storage™ Lightning 9900™ V Series Priority Access User's Guide* (MK-92RD117)
- *Hitachi Freedom Storage™ Lightning 9900™ V Series Hitachi Remote Console - Storage Navigator™ User's Guide* (MK-92RD101)
- *Hitachi Freedom Storage™ Lightning 9900™ V Series Hitachi Remote Console Error Codes* (MK-92RD132)
- *Hitachi Freedom Storage™ Lightning 9900™ V Series LUN Manager User's Guide* (MK-92RD105)

Preface

The *Hitachi Freedom Storage™ Lightning 9900™ V Series Performance Monitor User's Guide* (MK-92RD133) describes and provides instructions for using the Performance Monitor software to allow you to obtain usage statistics about the physical hard disk drive, logical volumes, processors, or other resources in your disk subsystem. Performance Monitor also lets you obtain statistics about workloads on disk drives and traffic between hosts and the disk subsystem. This document assumes that:

- the user has a background in data processing and understands direct-access storage device (DASD) subsystems and their basic functions,
- the user is familiar with the Hitachi 9900V subsystem and the 9900V Storage Navigator computer,
- the user has read and understands both the *Hitachi Freedom Storage™ Lightning 9900™ V Series User and Reference Guide* (MK-92RD100) and the *Hitachi Freedom Storage™ Lightning 9900™ V Series Hitachi Remote Console - Storage Navigator™ User's Guide* (MK-92RD101), and
- the user is familiar with the operating system (e.g., Windows®, Solaris®, and Linux®) and web browser software (e.g., Internet Explorer, Netscape®, and Mozilla) on the system hosting the 9900V Storage Navigator and Performance Management remote console software.

Notes:

- The term “9900V” refers to the entire Lightning 9900™ V Series subsystem family, unless otherwise noted. The term “Web Console” refers to “Storage Navigator” unless otherwise noted. The terms “PPC” and “Prioritized Port Control” refer to “Priority Access” unless otherwise noted. For additional information on the 9900V disk array subsystems please refer to the *Hitachi Freedom Storage™ Lightning 9900™ V Series User and Reference Guide* (MK-92RD100) or contact your Hitachi account team. For additional information on the 9900V Storage Navigator computer, please refer to the *Hitachi Freedom Storage™ Lightning 9900™ V Series Hitachi Remote Console - Storage Navigator™ User's Guide* (MK-92RD101) or contact your Hitachi account team.
- The use of Performance Monitor, the Performance Monitor/Storage Navigator software, and all other Hitachi Data Systems products is governed by the terms of your license agreement(s) with Hitachi Data Systems.
- The screens shown in this document were captured on a Windows® system with the Internet Explorer® web browser. The Storage Navigator screens may display differently on other operating systems and browsers. Please refer to the *9900V Remote Console - Storage Navigator User's Guide* for further information on UNIX® operating systems and browsers.
- The 9900 V Series documents sometimes use the term Channel Processor (CHP) to refer to the Client-Host Interface Processor (CHIP).
- The 9900 V Series documents sometimes use the term Disk Processor (DKP) to refer to the Array Control Processor (ACP).

Microcode Level

This document revision applies to 9900V microcode versions 21-09-0x and higher.

Comments

Please send us your comments on this document. Make sure to include the document title, number, and revision. Please refer to specific section(s) and paragraph(s) whenever possible.

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Chapter 1 Performance Management Solution Overview

The Hitachi Freedom Storage™ Lightning 9900™ V Series includes a suite of performance management software products. These products allow you to monitor and tune disk subsystem performance. The performance management suite of software consists of the following:

- **Performance Monitor**
- **CruiseControl™**
- **Priority Access (Prioritized Port Control)**

Performance Monitor lets you obtain usage statistics about the physical hard disk drive, logical volumes, processors, or other resources in your disk subsystem. Performance Monitor also lets you obtain statistics about workloads on disk drives and traffic between hosts and the disk subsystem. The Performance Monitor panel displays a line graph that indicates changes in the usage rates, workloads, or traffic. You can view information in the panel, and analyze trends in disk I/Os and detect peak I/O time. If the system performance is low, you can use information in the panel to detect bottlenecks in the system. For details, see Chapter 2.

CruiseControl™ lets you balance workload among hard disk drives, logical volumes, and processors to remove bottlenecks from your system. If Performance Monitor indicates that a lot of I/O reads and writes are made to certain hard disk drives, you can use CruiseControl™ to distribute workloads to other disk drives. For details, see the *Hitachi Freedom Storage™ Lightning 9900™ V Series Hitachi CruiseControl™ User's Guide (MK-92RD106)*.

Priority Access (Prioritized Port Control) lets you tune the system to provide high-priority hosts with relatively higher throughput. Priority Access can prevent production servers from suffering lowered performance. For details, see the *Hitachi Freedom Storage™ Lightning 9900™ V Series Priority Access User's Guide (MK-92RD117)*.

Figure 1.1 graphically illustrates the Hitachi performance management solution.

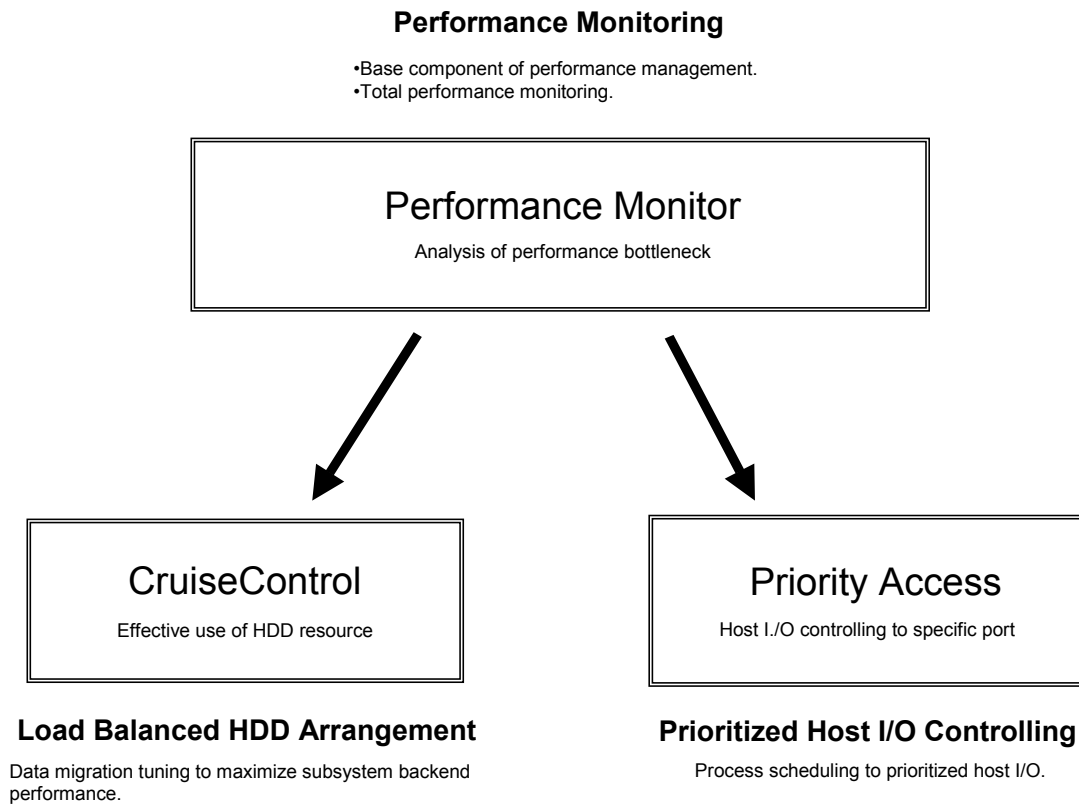


Figure 1.1 Performance Management Solution Components

Using Hitachi Storage Navigator along with Performance Monitor, CruiseControl™, and Priority Access provides a simple and straightforward performance management solution. Figure 1.2 illustrates a somewhat simplified view of the performance management process.

CAUTIONS:

- If Performance Monitor is not enabled, you cannot use CruiseControl™ or Priority Access.
- Performance management operations (Performance Monitor, CruiseControl™, and Priority Access) involve the collection of large amounts of monitoring data. This requires considerable web client computer memory. It is therefore recommended that you exit the Storage Navigator program when not conducting performance management operations, thereby freeing up system memory.

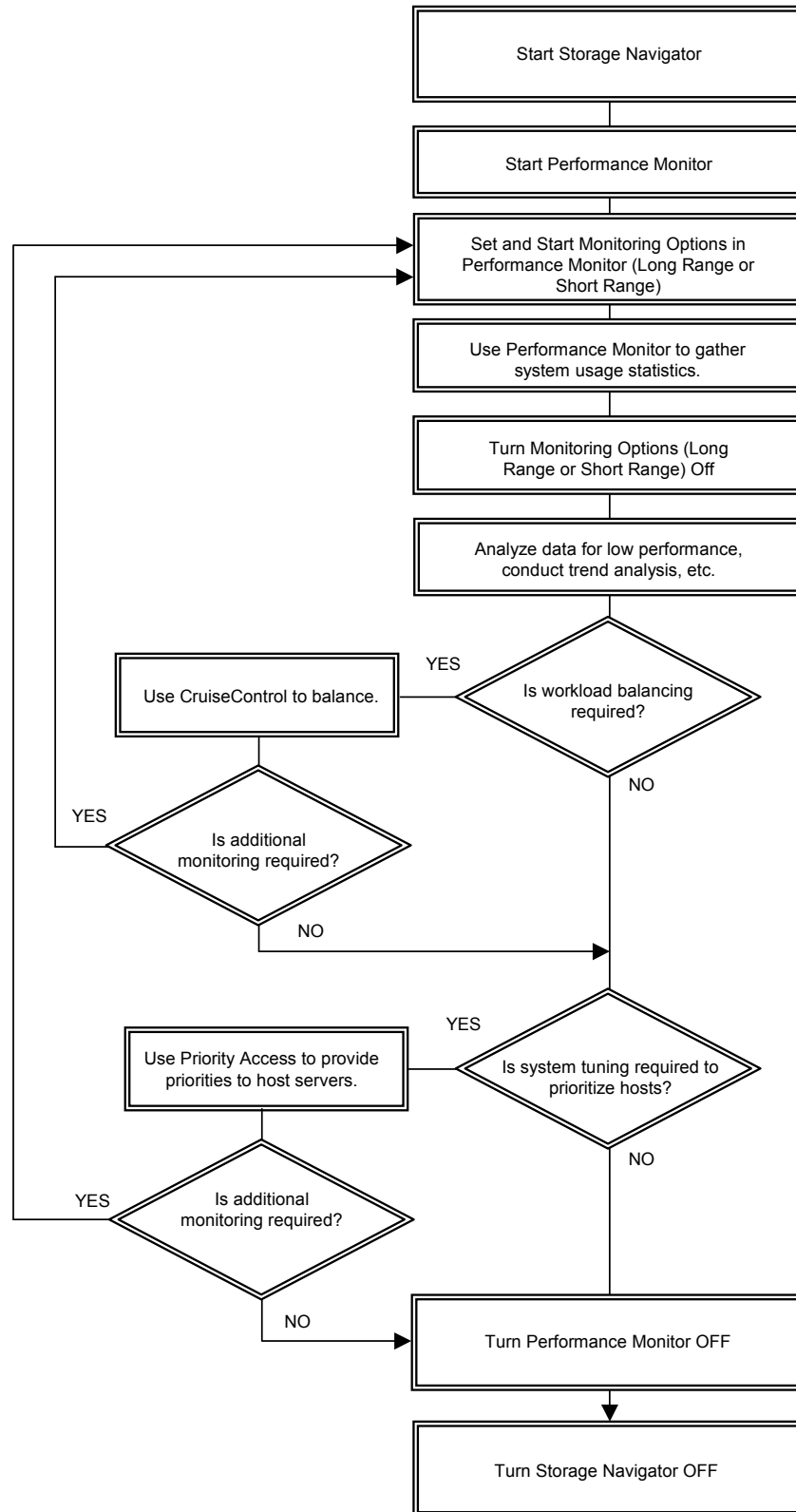


Figure 1.2 Performance Management Process Flow Diagram

Chapter 2 Performance Monitor Overview

Performance Monitor tracks your disk subsystem and lets you obtain statistics about resources in your disk subsystem and statistics about workloads on disks and ports. If your system encounters a problem (for example, if server hosts suffer delayed response times), Performance Monitor may help you detect the cause of the problem.

Note: The Export Tool enables you to save information on the Performance Monitor panel into files. This allows you to use spreadsheet software or database software to analyze the monitoring results. For detailed information about the Export Tool, please see Appendix A.

Note: The Export File function provides the ability to gather subsystem performance monitor data for analysis by the Technical Support centers. Please refer to the *Hitachi Freedom Storage™ Lightning 9900™ V Series Hitachi Remote Console - Storage Navigator™ User's Guide* (MK-92RD101), section 3.11 Exporting Data Using the Export File Function.

2.1 Viewing Usage Statistics about Resources in Your Disk Subsystem

If disk subsystem resources (e.g., hard disk drives) become overloaded, your system might require a lot of time for processing data and, in worst cases, the system might go down. To avoid such a situation, you must monitor utilization of resources and, if necessary, take preventive measures.

Performance Monitor allows you to monitor your disk subsystem and obtain usage statistics about resources such as front-end and back-end processors, hard disk drives, and logical volumes every 15 minutes. The obtained statistics are automatically collected by the SVP (web server) twice a day (once in the morning and once in the afternoon). The Performance Monitor panel allows you to view statistics about the resources and detect the resources on which workloads converge. The Performance Monitor panel displays a line graph that helps you detect the peak time of the resource usage.

WARNING: Statistics collected more than three months previously (i.e., 93 days) are lost from the disk subsystem and are not displayed in the Performance Monitor panel.

If workloads converge on some particular resources, you will need to balance the workloads by installing new hard disk drives or by using CruiseControl™. For details of CruiseControl™, please refer to *Hitachi Freedom Storage™ Lightning 9900™ V Series Hitachi CruiseControl™ User's Guide* (MK-92RD106).

The Performance Monitor panel lets you view the following types of information:

- Parity Group Usage Statistics
- Logical Volumes Usage Statistics
- Client-Host Interface Processor Usage Statistics
- Array Control Processor Usage Statistics
- Disaster Recovery and Regeneration Processor Usage Statistics
- Write Pending Rate
- Access Path Usage Statistics
- Disk Workload Statistics
- Port Traffic Statistics
- LU Path Statistics
- Path Between Host Bus Adapter and Port Statistics

Each is briefly described in the following sections:

2.1.1 Viewing Parity Group Usage Statistics

A *parity group* is a group of hard disk drives (HDDs) that form the basic unit of storage for the 9900V subsystem. All HDDs in a parity group must have the same physical capacity. The 9900V supports both RAID-1 and RAID-5 parity groups. A RAID-1 parity group consists of two pairs of HDDs in a mirrored configuration. A RAID-5 parity group consists of four HDDs.

If the monitor data shows overall high parity group usage, you should consider installing additional HDDs and using CruiseControl™ to migrate the high-usage volumes to the new parity groups. If the monitor data shows that parity group usage is not balanced, you can use CruiseControl™ to migrate volumes from high-usage parity groups to low-usage parity groups.

For details on how to view usage statistics about parity groups, see section 5.2.1.

2.1.2 Viewing Logical Volume Usage Statistics

Performance Monitor displays the average and maximum usage, including sequential and random access, of each logical volume (LDEV) in a parity group. The logical volume usage is the time in use (sequential and random access) of the physical drives of each LDEV, averaged by the number of physical drives in the parity group.

If the monitor data shows overall high logical volume usage, you should consider installing additional hardware (e.g., HDDs, disk adapters (DKAs), cache). If the monitor data shows that volume usage is not balanced, you can use CruiseControl™ to migrate high-usage volumes to higher HDD classes and/or to lower-usage parity groups. The logical volume usage data can also be used to analyze the access characteristics of volumes and determine the appropriate RAID level and/or HDD type for the volumes.

For details on how to view usage statistics about logical volumes, see section 5.2.3.

2.1.3 Viewing Client-Host Interface Processor Usage Statistics

A Client-Host Interface Processor (CHIP), which is contained in a channel adapter (CHA), processes host commands and controls data transfer between hosts and the cache. A channel adapter contains multiple client-host interface processor, which process host commands and control data transfer.

If the monitor data shows overall high CHIP usage, you should consider installing additional CHAs. If the monitor data shows that CHIP usage is not balanced, you should consider moving some devices that are defined on overloaded ports to ports with lower-usage CHIPs to balance front-end usage.

For details on how to view usage statistics about channel adapters and client-host interface processors groups, see section 5.2.4.

2.1.4 Viewing Array Control Processor Usage Statistics

An Array Control Processor (ACP), which is contained in a disk adapter (DKA), controls data transfer between the cache and the disk devices. A disk adapter contains multiple array control processors.

If the monitor data shows overall high ACP usage, you should consider installing additional HDDs and/or Disk Adapters, and then using CruiseControl™ to migrate the high-write-usage volumes (especially sequential writes) to the new parity groups. If the monitor data shows that ACP usage is not balanced, you can use CruiseControl™ to migrate logical volumes from high-usage parity groups to low-usage parity groups.

For details on how to view usage statistics about disk adapters and array control processors, see section 5.2.5.

Note: CruiseControl™ cannot estimate ACP usage. Only use CruiseControl™ migration for obvious cases of high or unbalanced ACP usage. CruiseControl™ migration may not provide any performance improvement for cases in which ACP usage values vary only slightly, or for cases in which overall Disaster Recovery and Regeneration (DRR) usage values are relatively high.

2.1.5 Viewing Disaster Recovery and Regeneration Processor Usage Statistics

A Disaster Recovery and Regeneration Processor (DRR) is a microprocessor (located on the DKAs) which is used to generate parity data for RAID-5 parity groups. The DRR uses “old data + new data + old parity” to generate new parity.

If the monitor data shows overall high DRR usage, this can indicate a high write penalty condition. Please consult your Hitachi representative about high write penalty conditions. If the monitor data shows that DRR usage is not balanced, you should consider relocating volumes using CruiseControl™ to balance DRR usage within the subsystem.

For details on how to view usage statistics on DRRs, see section 5.2.6.

2.1.6 Viewing the Write Pending Rate

The write pending rate indicates the ratio of write-pending data to cache memory capacity. The Performance Monitor panel displays the average and the maximum write pending rate for the specified period of time. The panel also displays a graph that indicates how the write pending rate changes within that period.

For details on how to view the write pending rate, see section 5.2.7.

2.1.7 Viewing Access Path Usage Statistics

An *access path* is a path through which data and commands are transferred within a disk subsystem.

In a disk subsystem, channel adapters (CHAs) control data transfer between hosts and the cache memory. Also, disk adapters control data transfer between the cache memory and disk drives. Data transfer does not occur between channel adapters and disk adapters. Data is transferred via the cache switch (CSW) to the cache memory.

When hosts issue commands, the commands are transferred via channel adapters to the shared memory (SM). Disk adapters check the content of the shared memory.

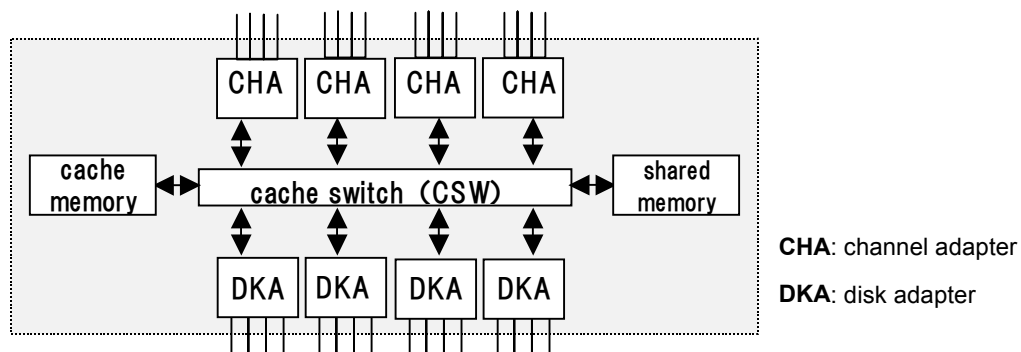


Figure 2.1 Access Paths

Performance Monitor tracks and displays the usage rate for the following access paths.

- Paths between channel adapters and the cache switch
- Paths between disk adapters and the cache switch
- Paths between the cache switch and the cache memory
- Paths between channel adapters and the shared memory
- Paths between disk adapters and the shared memory

For details on how to view usage statistics about access paths, see section 5.2.8.

2.1.8 Viewing Disk Workload Statistics

If a lot of accesses are made to particular disks or data, the system performance might deteriorate. Performance Monitor lets you view statistics about parity groups and logical devices to help you detect bottlenecks in your system. Performance Monitor displays a line graph that indicates changes in access workloads, so that you will be able to detect the peak time of I/O accesses.

Note: You will be unable to view workload statistics that were obtained more than 24 hours previously because such statistics are erased from the disk subsystem.

- I/O rate

The *I/O rate* indicates how many I/Os are made to the disk in one second. If the I/O rate is high, the hosts might consume a lot of time for accessing disks and the response time might be long.

- Transfer rate

The *transfer rate* indicates the size of data transferred to the disk in one second. If the transfer rate is high, the hosts might consume a lot of time for accessing disks and the response time might be long.

- The read hit ratio

For a read I/O, when the requested data is already in cache, the operation is classified as a read hit. For example, if ten read requests have been made from hosts to devices in a time period and the read data was already on the cache memory three times out of ten, the read hit ratio for that time period is 30 percent. A higher read hit ratio implies higher processing speed because fewer data transfers are made between devices and the cache memory.

- The write hit ratio

For a write I/O, when the requested data is already in cache, the operation is classified as a write hit. For example, if ten write requests were made from hosts to devices in a time period and the write data was already on the cache memory three cases out of ten, the write hit ratio for that time period is 30 percent. A higher write hit ratio implies higher processing speed because fewer data transfers are made between devices and the cache memory.

For details on how to view workload statistics about disks, see section 5.3.

2.1.9 Viewing Port Traffic Statistics

Performance Monitor tracks host ports and disk subsystem ports to obtain statistics about I/O rates and transfer rates at these ports. If you analyze these I/O rates and transfer rates, you will be able to find out which host issues a lot of I/O requests to the disk and to find out which host transfers a lot of data to the disk. For details on how to view statistics about traffic at ports, see section 5.4.

Note: Workload statistics are deleted from the disk subsystem after 24 hours. You will not be able to view statistics more than 24 hours old.

2.1.10 Viewing LU Path Traffic Statistics

Performance Monitor tracks LU paths to obtain statistics about I/O rates and transfer rates at these LU paths. If you analyze these I/O rates and transfer rates, you will be able to detect LU paths through which a lot of I/O requests are made to the disk. You will also detect LU paths through which a lot of data are transferred to the disk. For details on how to view workload statistics about LU paths, see section 5.5.

Note: Workload statistics are deleted from the disk subsystem after 24 hours. You will not be able to view statistics more than 24 hours old.

2.1.11 Viewing Host Bus Adapters and Port Path Traffic Statistics

Host bus adapters (HBAs) are adapters contained in hosts. HBAs, which serve as ports on hosts, are connected to ports on the disk subsystem.

If Priority Access is enabled, Performance Monitor lets you view statistics about traffic between HBAs and disk subsystem ports. The traffic statistics reveals the number of I/O requests that have been made from hosts and also reveals the size of data transferred between hosts and disk subsystem ports. For details on how to view traffic statistics about HBAs, see section 5.6.

Note: Traffic statistics are deleted from the disk subsystem after 24 hours. You will not be able to view statistics more than 24 hours old.

2.2 Monitoring the Disk Subsystem

Performance Monitor allows you to monitor disk subsystem resources and disk drives, ports, LU paths and Host Bus Adapters (HBAs).

2.2.1 Monitoring Resources in the Disk Subsystem

Performance Monitor provides the ability to obtain statistics about resources and saves those statistics every 12 hours. By default, Performance Monitor starts saving statistics on 0:00 a.m. and 0:00 p.m. However, you can change the times by using the **From** and **To** controls in the Monitoring Term area (for details, see section 4.2.1).

You can also specify the range of usage statistics saved in the disk subsystem that you are interested in viewing (for details, see section 4.2.1).

To view resource usage statistics that are saved in the disk subsystem, see section 5.1.

2.2.2 Monitoring Disk Drives, Ports, LU Paths and Host Bus Adapters

When monitoring ports, LU paths or host bus adapters, you can view the monitoring results in almost real time (information in the panel will be updated every minute). If you want to view the monitoring results in real time, you must use the **Real Time** option, which is included in the **Monitoring Term** area of the **Performance Monitor panel**.

Note: You cannot view the monitoring results in real time when monitoring disk drives.

If you prefer to view the monitoring results for a specified period of time, you can do that by setting a specific time period.

Note: You will be able to view the monitoring results for the last 24 hours. If more than 24 hours have passed since a monitoring result was obtained, the result is erased from the disk subsystem and you will not be able to view that monitoring result.

Chapter 3 Preparing for Performance Monitor Operations

3.1 System Requirements

To be able to use Performance Monitor, you need:

- the 9900V subsystem installed
- the Performance Monitor software enabled
- a web client computer(s) connected to the 9900V subsystem via LAN (intended for use as a remote console(s))

To use Performance Monitor, you must use the web client computer(s) to log on to the SVP (web server). When you are logged on, the Storage Navigator program, which is a Java™ applet, will be downloaded to the web client computer(s). You will then be able to perform Performance Monitor operations within the Storage Navigator panel.

For details on all of the above, please refer to *Hitachi Freedom Storage™ Lightning 9900™ V Series Remote Console - Storage Navigator™ User's Guide* (MK-92RD101).

3.2 Starting Storage Navigator™ and Configuring Your Web Client Computer

Performance Monitor operations require the Storage Navigator program, which is downloaded to your web client computer. Your web client computer must be connected to the 9900V subsystem via LAN. Browser settings are also required on your web client computer. For details, refer to *Hitachi Freedom Storage™ Lightning 9900™ V Series Remote Console - Storage Navigator™ User's Guide* (MK-92RD101).

Note: When you use Storage Navigator on UNIX® workstations or in other non-Windows® environments, certain additional operating conventions must be followed. For details, refer to the *Hitachi Freedom Storage™ Lightning 9900™ V Series Remote Console - Storage Navigator™ User's Guide* (MK-92RD101).

Note: Performance management operations (Performance Monitor, CruiseControl™, and Priority Access) involve the collection of large amounts of monitoring data. This requires considerable web client computer memory. It is therefore recommended that you exit the Storage Navigator program when not conducting performance management operations, thereby freeing up system memory.

3.3 Starting Performance Monitor

Before starting Performance Monitor, verify Storage Navigator is installed (refer to section 3.1).

To start Performance Monitor:

1. Log onto the Storage Navigator (refer to *Hitachi Freedom Storage™ Lightning 9900™ V Series Remote Console - Storage Navigator™ User's Guide* (MK-92RD101). The Storage Navigator main panel appears (see Figure 3.1).

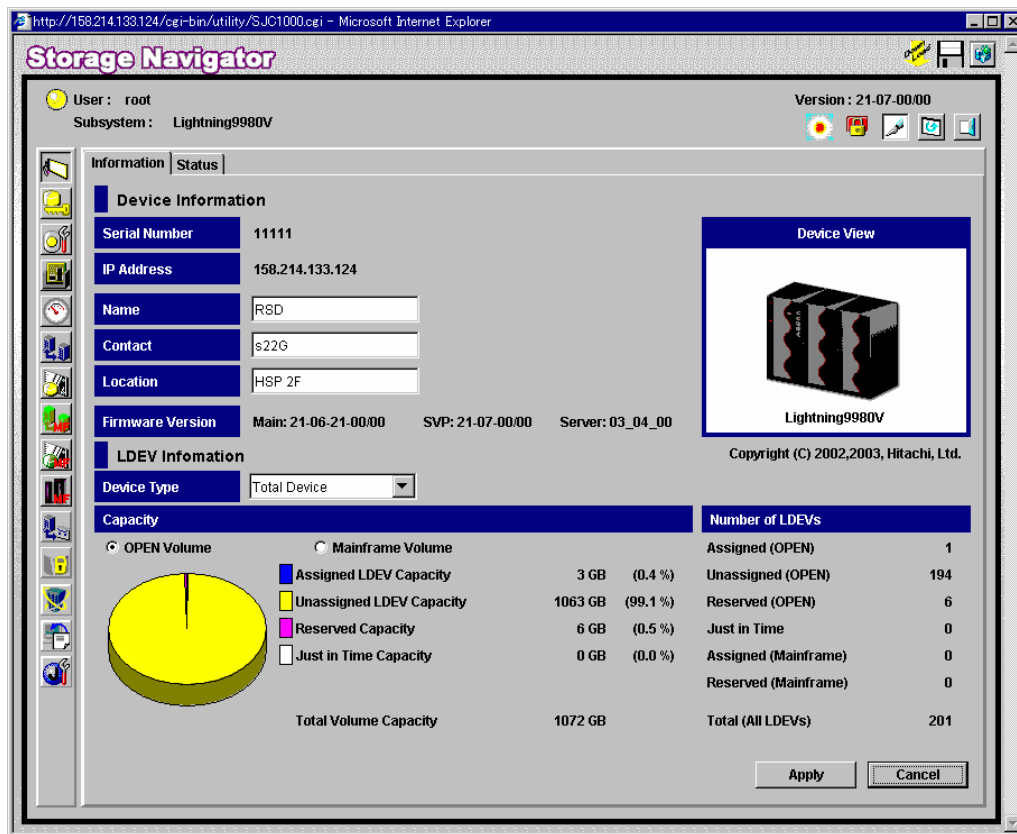


Figure 3.1 Storage Navigator Main Panel

Note: Option buttons are displayed vertically along the left side.

2. In the Storage Navigator main panel, click the **Performance Monitor** (📊) icon.

Performance Monitor starts and the Performance Monitor panel appears as an overlay on the Storage Navigator Main panel (see Figure 3.1). **Note:** Performance Monitor defaults to the Port-LUN tab.

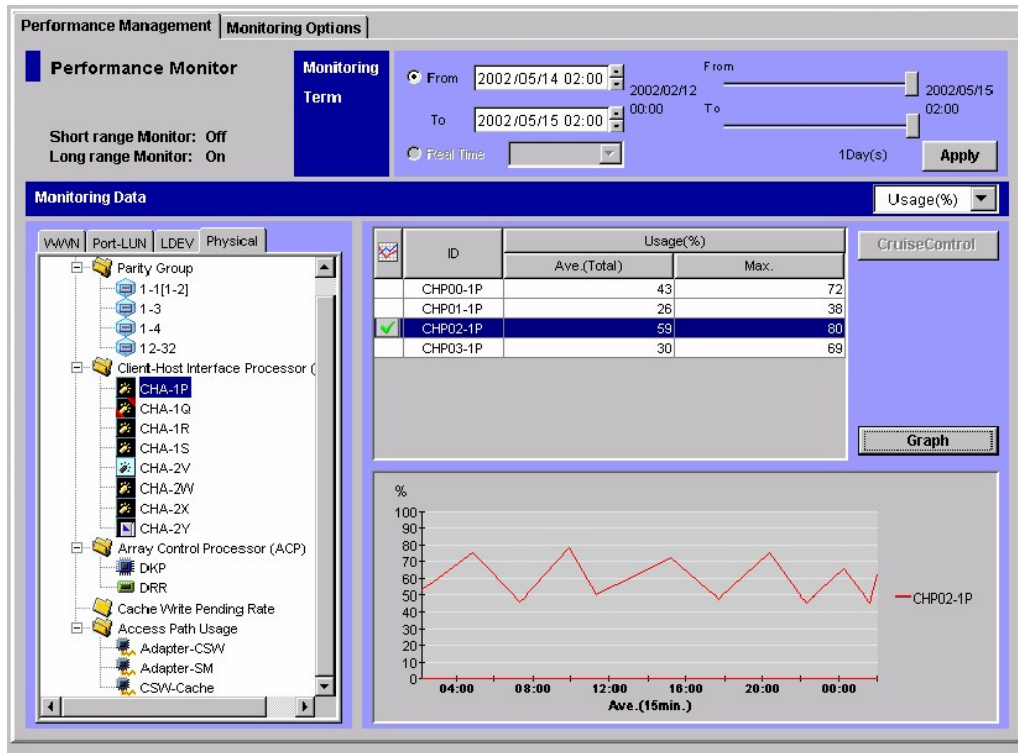


Figure 3.2 Performance Monitor Default Panel

3.4 Switching to Modify Mode

If you are going to implement any changes in Performance Monitor, you must be in modify mode. The subsystem information icons are on the upper right corner of the Storage Navigator main panel, as well as all of the option panels. **Note:** The information might not be displayed correctly when the exclusive lock is effective or SVP (web server) maintenance is in progress or if SNMP operations are being performed.

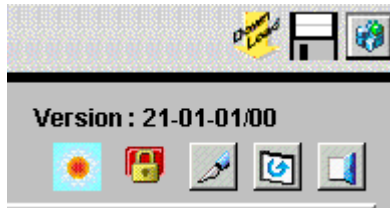


Figure 3.3 Subsystem Information Icons

These icons are described in detail in *Hitachi Freedom Storage™ Lightning 9900™ V Series Remote Console - Storage Navigator (MK-92RD101)*. If you want to change from **View** mode to **Modify** mode and back, two of the icons are important:

- The exclusive lock icons indicate the operation mode of all currently logged-in users. If all users are operating in view mode, the **Unlocked** icon (🔓) is displayed. If a user is operating in the modify mode, the **Locked** icon (🔒) is displayed. **Note:** The display may show as **Locked** (🔒) when the SVP (web server) maintenance is in progress or if SNMP operations are being performed.
- The **Mode-Switching** buttons allow users to switch the operation mode between **View** mode (🔑) and **Modify** mode (🔑). **Note:** Only one user at a time can be in **Modify** mode. Make sure that the subsystem is not locked before attempting to switch to **Modify** mode. If you select the **Mode-Switching** button a confirmation message will display.

To change from **View** mode to **Modify** mode:

1. You must have administrator or write access for the Performance Monitor option. For details on assigning user access, see *Hitachi Freedom Storage™ Lightning 9900™ V Series Remote Console - Storage Navigator (MK-92RD101)*.
2. Verify that the subsystem is unlocked. If all users are operating in view mode, the **Unlocked** icon (🔓) is displayed. If a user is operating in the modify mode, the **Locked** icon (🔒) is displayed, and you will not be able to implement changes (refer to Figure 3.3).
3. Select the **Mode Switching** icon, which should be in **View** mode (🔑). A confirmation message will display. Select **OK** and the **Mode Switching** icon will change from a gray background to a yellow background, to indicate that you are in **Modify** mode (🔑) (refer to Figure 3.3). **Note:** The Unlocked icon changes to Locked.
4. Implement your desired changes, and then select the **Mode Switching** icon (🔑), to change back to **View** mode (🔑). Click **OK** in the confirmation message. **Note:** The Locked icon changes to Unlocked.

3.5 Setting Monitoring Options

Before any data can be collected and statistics generated, monitoring options must be set in Performance Monitor.

To set the monitoring options:

1. From the Performance Monitor panel, click the Monitoring Options tab.

The Monitoring Options panel appears as an overlay on the Storage Navigator main panel (see Figure 3.2). **Note:** Only the overlay is shown here.

2. Set the appropriate monitoring settings as discussed below.

The screenshot shows a software interface with two tabs at the top: "Performance Management" and "Monitoring Options". The "Monitoring Options" tab is selected. Below the tabs, there is a section titled "Monitoring Options". Under this section, there are two main categories: "Long range monitoring SW" and "Short range monitoring SW". For "Long range monitoring SW", the "Current Status" is set to "OFF" (indicated by a selected radio button), and the "Gathering Time" is set to "00" for both "AM" and "PM" (indicated by dropdown menus). For "Short range monitoring SW", the "Current Status" is also set to "OFF" (indicated by a selected radio button). At the bottom right of the panel, there are two buttons: "Apply" and "Reset".

Figure 3.4 Monitoring Options Tab of the Performance Monitor Panel

The Monitoring Options panel allows you make settings to obtain usage rates on disk drives, client-host interface processors and array control processors. The Monitoring Options panel is divided into two functional areas: Long Range Monitoring and Short Range Monitoring.

- **Long Range Monitoring** allows collection of usage rates for disk subsystem resources.
 - **Current Status** specifies whether or not to monitor the disk subsystem. By default, **OFF** is selected.
 - **Gathering Time** specifies when statistics are collected. If **Current Status** is **ON**, statistics are collected at the specified times (once in the morning and once in the afternoon). The default is 0:00 (0:00 a.m. and 0:00 p.m.).

Note: When statistics are collected, a heavy workload is likely to be placed on servers. Therefore, the web client processing might slow down.

Note: Long range monitoring S/W must be **ON** to create automatic migration plans using Hitachi CruiseControl™. For details, refer to *Hitachi Freedom Storage™ Lightning 9900™ V Series Hitachi CruiseControl™ User's Guide (MK-92RD106)*.

- **Short Range Monitoring** allows collection of workload statistics for disks, ports, and LU paths. It defines settings for obtaining statistics on traffic between host bus adapters and disk subsystems ports.
 - **Current Status** specifies whether or not to monitor the disk subsystem. If **ON** is selected, the disk subsystem will be monitored. If **OFF** is selected, the disk subsystem will not be monitored. By default, **OFF** is selected.

CAUTION: If you select **ON** for the **Current Status** option, the option setting automatically changes to **OFF** 24 hours later.

Note: When monitoring data is collected, a heavy workload is likely to be placed on servers. Therefore, the web client processing might slow down.

3.5.1 Starting Long Range Monitoring Software

To start long range monitoring:

1. Under Long range monitoring S/W, select **ON** for the Current Status option.
2. Specify the time when the SVP (web server) collects statistics using the two **Gathering Time** drop-down lists.
3. Click the **Apply** button. Performance Monitor starts monitoring the disk subsystem.

3.5.2 Stopping Long Range Monitoring Software

To stop monitoring the disk subsystem:

1. Select **OFF** for the Current Status option.
2. Click **Apply**.

Note: If you stop monitoring, Performance Monitor stops collecting statistics.

3.5.3 Starting Short Range Monitoring Software

To start short range monitoring:

1. Under Short range monitoring S/W, select **ON** for the Current Status option.
2. Click the **Apply** button. Performance Monitor starts monitoring the disk subsystem.

3.5.4 Stopping Short Range Monitoring Software

To stop monitoring the disk subsystem:

1. Select **OFF** for the Current Status option.
2. Click **Apply**.

Note: If you stop monitoring, Performance Monitor stops collecting statistics.

Chapter 4 Reviewing Performance Monitor Panels

4.1 The Monitoring Options Panel

The Monitoring Options panel is available only after Storage Navigator has been installed (refer to section 3.1) and Performance Monitor has been started (refer to section 3.3). When Performance Monitor starts, the Performance Monitor panel appears (as an overlay on the Storage Navigator main panel) as shown in Figure 4.1.

Note: The Export File function provides the ability to gather subsystem performance monitor data for analysis by the Technical Support centers. Please refer to the *Hitachi Freedom Storage™ Lightning 9900™ V Series Hitachi Remote Console - Storage Navigator™ User's Guide* (MK-92RD101), section 3.11 Exporting Data Using the Export File Function.

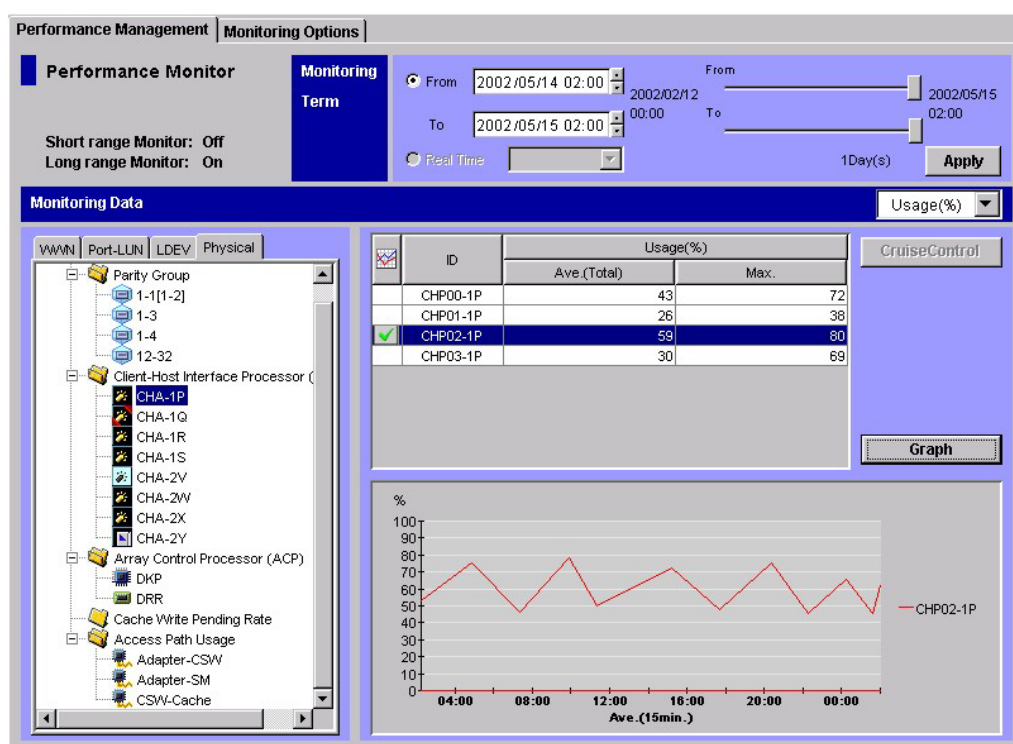


Figure 4.1 Performance Monitor Panel

When you click the Monitoring Options tab, the Monitoring Options panel appears as an overlay on the Storage Navigator main panel as shown in Figure 4.2. **Note:** Only the overlay is shown here.

The screenshot shows a software interface with two tabs at the top: "Performance Management" and "Monitoring Options". The "Monitoring Options" tab is selected. Below the tabs is a section titled "Monitoring Options". Under this section, there are two main categories: "Long range monitoring SW" and "Short range monitoring SW".

Under "Long range monitoring SW", there is a "Current Status:" label followed by two radio buttons: "ON" and "OFF". The "OFF" radio button is selected. Below this is a "Gathering Time:" label followed by two dropdown menus, both showing "00", and the text "AM & PM".

Under "Short range monitoring SW", there is a "Current Status:" label followed by two radio buttons: "ON" and "OFF". The "OFF" radio button is selected.

At the bottom right of the panel, there are two buttons: "Apply" and "Reset".

Figure 4.2 The Monitoring Options Panel of Performance Monitor

The Monitoring Options panel allows you make settings to obtain usage rates on disk drives, client-host interface processors and array control processors. The Monitoring Options panel is divided into two functional areas: Long Range Monitoring and Short Range Monitoring.

- **Long Range Monitoring** allows collection of usage rates for disk subsystem resources.
 - **Current Status** specifies whether or not to monitor the disk subsystem. By default, **OFF** is selected.
 - **Gathering Time** specifies when statistics are collected. If **Current Status** is **ON**, statistics are collected at the specified times (once in the morning and once in the afternoon). The default is 0:00 (0:00 a.m. and 0:00 p.m.).

Note: When statistics are collected, a heavy workload is likely to be placed on servers. Therefore, the web client processing might slow down.

Note: Long range monitoring S/W must be **ON** to create automatic migration plans using Hitachi CruiseControl™. For details, refer to *Hitachi Freedom Storage™ Lightning 9900™ V Series Hitachi CruiseControl™ User's Guide (MK-92RD106)*.

- **Short Range Monitoring** allows collection of workload statistics for disks, ports, and LU paths. It defines settings for obtaining statistics on traffic between host bus adapters and disk subsystems ports.
 - **Current Status** specifies whether or not to monitor the disk subsystem. If **ON** is selected, the disk subsystem will be monitored. If **OFF** is selected, the disk subsystem will not be monitored. By default, **OFF** is selected.

CAUTION: If you select **ON** for the **Current Status** option, the option setting automatically changes to **OFF** 24 hours later.

Note: When monitoring data is collected, a heavy workload is likely to be placed on servers. Therefore, the web client processing might slow down.

- The **Apply** button applies settings in the Monitoring Options panel to the disk subsystem.
- The **Reset** button resets the settings in the Monitoring Options panel.

4.2 The Performance Monitor Panels

The Performance Monitor panel is available only after Storage Navigator has been installed (refer to section 3.1) and Performance Monitor has been started (refer to section 3.3). When Performance Monitor starts, the Performance Monitor panel appears as an overlay on the Storage Navigator main panel (refer to Figure 4.2).

This section describes options, buttons and other components in Performance Monitor panels.

Note: Only the overlay portion of each Performance Monitor panel is depicted. All Storage Navigator main panel Option buttons and Subsystem Information icons are available but not depicted. For details, please refer to the *Hitachi Freedom Storage™ Lightning 9900™ V Series Hitachi Remote Console - Storage Navigator™ User's Guide (MK-92RD101)*.

4.2.1 The Physical Tab of the Performance Monitor Panel

The Performance Monitor panel includes four tabs: WWN, Port-LUN, LDEV, and Physical. The Physical tab, lets you view usage rates for parity groups, logical volumes, client-host interface processors, and array control processors (see Figure 4.3).

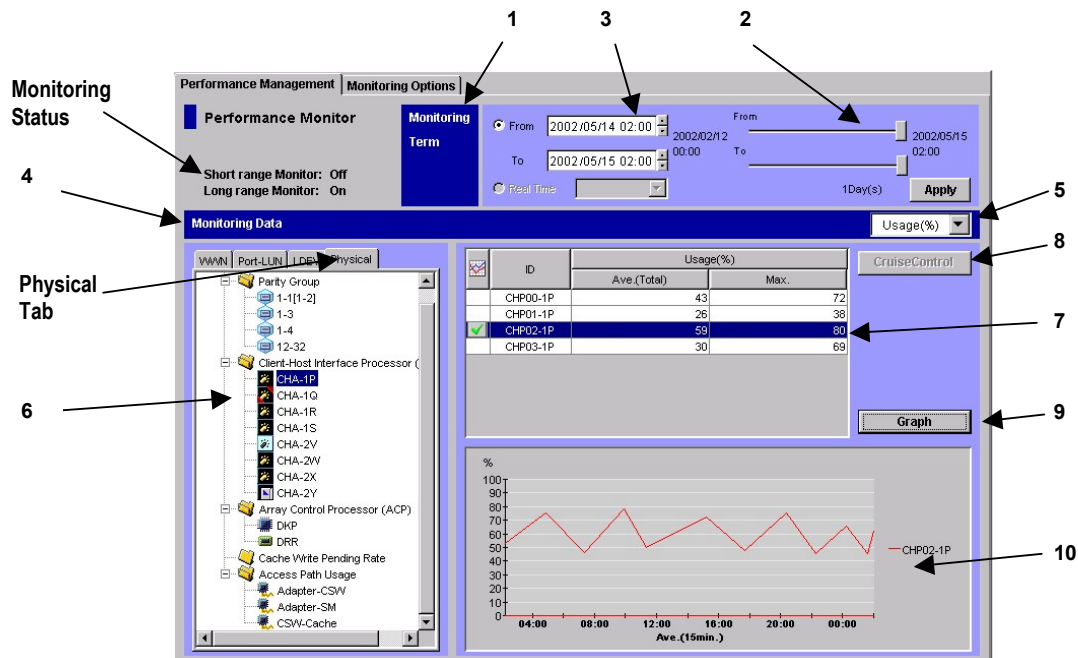


Figure 4.3 Physical Tab

When the **Physical** tab is active, the Performance Monitor panel contains the following items (each is numbered and corresponds to the figure numbering).

- **Monitoring Status:** lets you quickly determine current monitoring mode.
 - When **Long Range Monitor** is **On**, Performance Monitor is monitoring resources in the disk subsystem to obtain usage statistics. When Long Range Monitor is **Off**, Performance Monitor is not monitoring resources in the disk subsystem.
 - When **Short Range Monitor** is **On**, Performance Monitor is monitoring disks, ports, and LU paths to obtain workload statistics. Performance Monitor is also measuring traffic between host bus adapters and ports. When Short Range Monitor is **Off**, Performance Monitor is not monitoring disks, ports, and LU paths. Performance Monitor is not measuring traffic between host bus adapters and ports.

Note: Long range monitoring S/W must be **ON** to create automatic migration plans using Hitachi CruiseControl™. For details, refer to *Hitachi Freedom Storage™ Lightning 9900™ V Series Hitachi CruiseControl™ User's Guide* (MK-92RD106).

- **The Monitoring Term Area ①** - lets you narrow the range of usage statistics that should be displayed in the panel. For example, if you want to view usage statistics within the range of 10:30 February 1 2003 to 22:30 February 28 2003, you set 2003/02/01 10:30 in the **From** box, set 2003/02/28 22:30 in the **To** box, and then click the **Apply** button.

To set a date and time in the **From** and **To** boxes, do either of the following:

- Move the slider ② to the left or to the right.
- In the text box ③, select the number that you want to change. Next, click the upward or downward arrow button.

When you specify dates and time in the **From** and **To** boxes, Performance Monitor calculates the length (in minutes) of the specified period and displays the calculated length.

Notes:

- The **From** and **To** boxes are grayed out if the monitoring data (that is, usage statistics) is not stored in the disk subsystem.
- The **Real Time** option is grayed out when the **Physical** tab is active.

- **The Monitoring Data Area ④** - provides a drop down list, a tree view, a table, and a line graph as follows:

- the drop-down list ⑤ specifies the type of statistics to be displayed in the panel. When the **Physical** tab is active, the drop-down list contains only one entry (i.e., **Usage**).
- The tree view ⑥ lists items such as parity groups and channel adapters (CHAs). The tree view can display the following items:

-  a parity group
-  an ESCON channel adapter or a FICON channel adapter
-  a short-wave Fibre Channel adapter in Standard mode
-  a short-wave Fibre Channel adapter in High Speed mode or in High Speed (2port) mode
-  a long-wave Fibre Channel adapter in Standard mode
-  a long-wave Fibre Channel adapter in High Speed mode or in High Speed (2port) mode
-  a disk processor (DKP)
-  a Disaster Recovery And Regeneration Processor (DRR)
-  an access path

The parity group icon () can represent a single parity group. The parity group icon can also represent two or more parity groups that are concatenated. If two or more parity groups are concatenated, logical volumes can be striped across two or more drives. Therefore, concatenated parity groups provide faster access (particularly, faster sequential access) to data.

For example, if the parity group icon () indicates a single parity group 1-3, the text 1-3 appears on the right of the icon. If the parity group icon indicates two or more parity groups that are connected together, all the connected parity groups appear on the right of the icon. For example, if the parity group 1-3 is connected with the parity group 1-4, the text 1-3[1-4] appears on the right of the parity group icon. (All the parity groups connected with 1-3 are enclosed by square brackets).

Note: Storage Navigator does not allow you to connect two or more parity groups. If you want to use connected parity groups, contact the maintenance personnel.

Note: When the ShadowImage™ or SI390 quick restore operation is being performed, a Storage Navigator panel may display old information (status before the quick restore operation) on logical volume (LDEV) configurations. In this case, wait until the quick restore operation completes, and then select Refresh () to update the Storage Navigator panel.

- The table ⑦ area displays statistics about parity group usage, processor usage, etc. If you select connected parity groups in the tree view, the table displays usage statistics for all the connected parity groups.

If you select the **Array Control Processor (ACP)** folder in the tree view, the table displays a list of disk adapters (see Figure 4.4), so that you are able to confirm whether each disk adapter is located in Cluster-1 or Cluster-2. For example, if the Cluster-1 column displays 0 and the Cluster-2 column displays a hyphen, the disk adapter is located in Cluster-1

Adapter	Cluster-1	Cluster-2
DKA-1B	0	-
DKA-1C	0	-
DKA-1D	0	-
DKA-1E	0	-
DKA-2H	-	0
DKA-2J	-	0
DKA-2K	-	0
DKA-2L	-	0

Figure 4.4 Listed Disk Adapters

For details on the table contents, refer to section 2.2.1.

- The **CruiseControl™** button ⑧ starts the CruiseControl™ option program if CruiseControl™ is enabled. CruiseControl™ lets you optimize disk drive performance. For details, see *Hitachi Freedom Storage™ Lightning 9900™ V Series Hitachi CruiseControl™ User's Guide* (MK-92RD106).
- The **Graph** button ⑨ displays a line graph that illustrates changes in usage statistics. The graph can display up to eight lines simultaneously.
- The line graph ⑩ illustrates changes in usage statistics. The vertical axis indicates the usage rates (in percentage). The horizontal axis indicates dates and/or times. If you select connected parity groups in the tree view, the graph displays changes in usage statistics for all the connected parity groups.

4.2.2 The LDEV Tab of the Performance Monitor Panel

The Performance Monitor panel includes the LDEV tab, which lets you view statistics about disk access performance. For example, the panel displays the *I/O rate* (the number of I/Os per second) and the *transfer rate* (the size of data transferred per second) for parity groups and logical volumes.

For details on how to use this panel, see section 5.3.

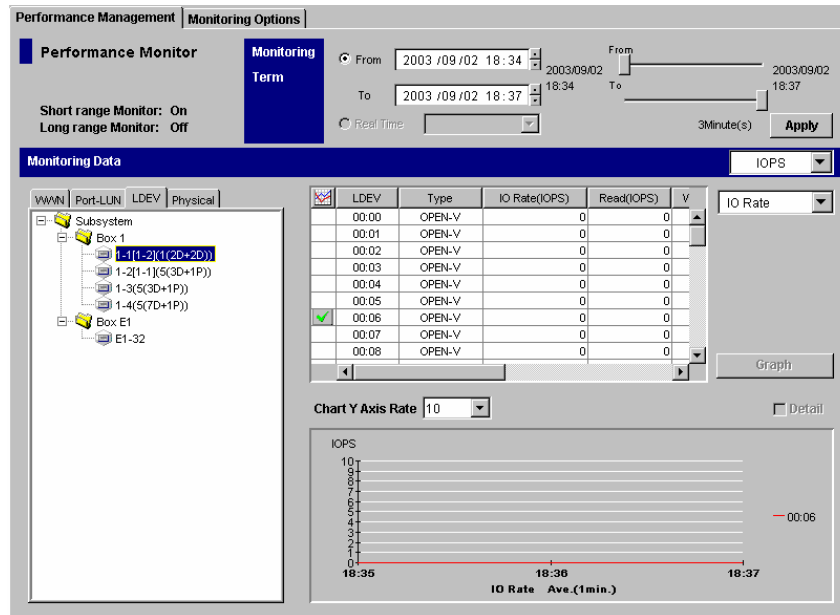


Figure 4.5 The LDEV Tab

When the **LDEV** tab is active, the Performance Monitor panel contains the following items:

- **Monitoring Status:** lets you quickly determine current monitoring mode.
 - When **Long Range Monitor** is **On**, Performance Monitor is monitoring resources in the disk subsystem to obtain usage statistics. When Long Range Monitor is **Off**, Performance Monitor is not monitoring resources in the disk subsystem.
 - When **Short Range Monitor** is **On**, Performance Monitor is monitoring disks, ports, and LU paths to obtain workload statistics. Performance Monitor is also measuring traffic between host bus adapters and ports. When Short Range Monitor is **Off**, Performance Monitor is not monitoring disks, ports, and LU paths. Performance Monitor is not measuring traffic between host bus adapters and ports.

Note: Long range monitoring S/W must be **ON** to create automatic migration plans using Hitachi CruiseControl™. For details, refer to *Hitachi Freedom Storage™ Lightning 9900™ V Series Hitachi CruiseControl™ User's Guide (MK-92RD106)*.

- **The Monitoring Term Area** - lets you narrow the range of usage statistics that should be displayed in the panel. For example, if you want to view usage statistics within the range of 10:30 February 1 2003 to 22:30 February 28 2003, you set 2003 /02/01 10:30 in the **From** box, set 2003 /02/28 22:30 in the **To** box, and then click the **Apply** button.

To set a date and time in the **From** and **To** boxes, do either of the following:

- Move the slider to the left or to the right.
- In the text box, select the number that you want to change. Next, click the upward or downward arrow button.

When you specify dates and time in the **From** and **To** boxes, Performance Monitor calculates the length (in minutes) of the specified period and displays the calculated length.

Notes:

- The **From** and **To** boxes are grayed out if the monitoring data (that is, usage statistics) is not stored in the disk subsystem.
- The **Real Time** option is grayed out when the **LDEV** tab is active.
- **The Monitoring Data Area** - provides a drop down list, tree view, table area, graph button, Chart Y drop down, Detail check box, and line graph as follows:

- The drop-down list lets you specify the type of statistics to be displayed in the panel. To view the I/O rate, select **IOPS** (I/Os per second) from the drop-down list. To view the transfer rate, select **MB/s** (megabytes per second) from the drop-down list.
- The tree view lists parity groups.

Below the **Subsystem** folder appear **Box** folders (for example, **Box 1** and **Box E1**). The number at the end of a **Box** folder name indicates the number at the beginning of parity group ID. For example, if you double click the **Box 1** folder, the tree view displays a list of parity groups whose IDs begin with **1** (for example, **1-1** and **1-2**). When you double-click a parity group, the table on the right lists logical volumes in the parity group.

If a parity group ID starts with the letter "E", logical volumes in the parity group are Hi-Copy volumes. **Note:** The Hi-Copy documentation uses the term "external LU group" to refer to parity groups whose IDs begin with the letter "E".

The parity group icon () can represent a single parity group. The parity group icon can also represent two or more parity groups that are connected together. If two or more parity groups are connected together, logical volumes can be striped across two or more drives. Therefore, connected parity groups provide faster access (particularly, faster sequential access) to data.

For example, if the parity group icon () indicates a single parity group 1-3, the text 1-3 appears on the right of the icon. If the parity group icon indicates two or more parity groups that are connected together, all the connected parity groups appear on the right of the icon. For example, if the parity group 1-3 is connected with the parity group 1-4, the text 1-3[1-4] appears on the right of the parity group icon. (All the parity groups connected with 1-3 are enclosed by square brackets).

Note: Storage Navigator does not allow you to connect two or more parity groups. If you want to use connected parity groups, contact the maintenance personnel.

- The table area displays statistics about disk access performance (for example, I/O rate, transfer rate, read hit ratio, and write hit ratio). For details on the table contents, see section 5.3.

If you select connected parity groups in the tree view, the table displays usage statistics for all the connected parity groups.

- The **Graph** button displays a line graph that illustrates changes in the I/O rate and the transfer rate. The graph can display up to eight lines simultaneously.
- Before clicking the **Graph** button, you should use the drop-down list at the lower-right corner of the table to specify the type of information that will be displayed in the graph. The drop-down list contains the following items:
 - **IO Rate** (The I/O rate. The number of I/O accesses per second.)
 - **Read** (The number of read accesses per second.)
 - **Write** (The number of write accesses per second.)
 - **Read Hit** (Read hit ratio)
 - **Write Hit** (Write hit ratio)
 - **Back Transfer** (Backend transfer. The number of data transfers between the cache memory and the disk)
 - **Trans. Rate** (The transfer rate. The size of data transferred per second)
- The **Chart Y Axis Rate** drop-down list lets you select the highest value of the Y-axis (the vertical axis) of the graph.
- If you select the **Detail** check box, the graph displays detailed statistics as described in Table 4.1. The information in the graph depends on the item selected in the drop-down list on the right of the table.

Table 4.1 Detailed Information Displayed in the Graph

If you select Detail and also select this item in the drop-down list	The graph presents
IO Rate (the number of I/Os per second)	- statistics in sequential access mode - statistics in random access mode - statistics in CFW (cache fast write) mode Note: If the read hit ratio or the write hit ratio is high, random access mode is used for transferring data instead of sequential access mode. For example, random access mode is likely to be used for transferring data to disk areas to which the FlashAccess function is applied.
Read (the number of read accesses per second)	
Write (the number of write accesses per second)	
Read Hit (the read hit ratio)	
Write Hit (the write hit ratio)	
Back Transfer (backend transfer; the number of I/Os between the cache memory and disk drives)	- the number of data transfers from the cache memory to disk drives - the number of data transfers from disk drives to the cache memory in sequential access mode - the number of data transfers from disk drives to the cache memory in random access mode
Trans. Rate (the number of data transfers)	The graph does not display detailed information.

- The line graph illustrates changes in the I/O rate and the transfer rate. The vertical axis indicates the usage rates (in percentage). The horizontal axis indicates dates and/or times.

4.2.3 The Port-LUN Tab of the Performance Monitor Panel

The Performance Monitor panel includes the Port-LUN tab, which lets you view statistics about I/O rates and transfer rates at disk subsystem ports and LU paths.

For details on how to use this panel, see sections 5.4 and 5.5.

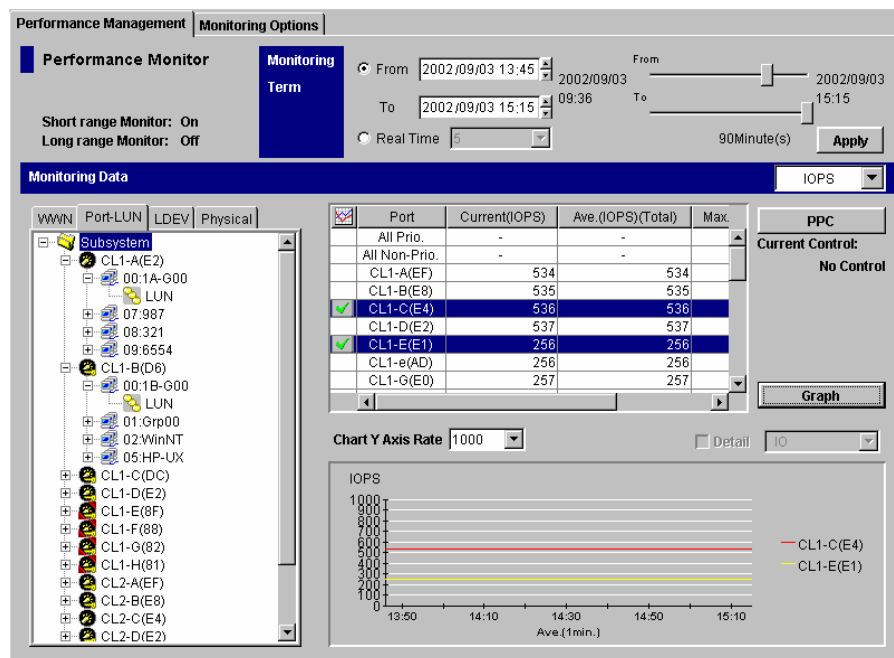


Figure 4.6 The Port-LUN Tab

When the **Port-LUN** tab is active, the Performance Monitor panel contains the following items:

- **Monitoring Status:** lets you quickly determine current monitoring mode.
 - When **Long Range Monitor** is **On**, Performance Monitor is monitoring resources in the disk subsystem to obtain usage statistics. When **Long Range Monitor** is **Off**, Performance Monitor is not monitoring resources in the disk subsystem.
 - When **Short Range Monitor** is **On**, Performance Monitor is monitoring disks, ports, and LU paths to obtain workload statistics. Performance Monitor is also measuring traffic between host bus adapters and ports. When **Short Range Monitor** is **Off**, Performance Monitor is not monitoring disks, ports, and LU paths. Performance Monitor is not measuring traffic between host bus adapters and ports.

Note: Long range monitoring S/W must be **ON** to create automatic migration plans using Hitachi CruiseControl™. For details, refer to *Hitachi Freedom Storage™ Lightning 9900™ V Series Hitachi CruiseControl™ User's Guide* (MK-92RD106).

- **The Monitoring Term Area** - provides **From** and **To** options and **Real Time** options as follows:
 - The **From** and **To** options let you narrow the range of statistics that should be displayed in the panel. For example, if you want to view statistics within the range of 10:30 February 1 2003 to 10:30 February 2 2003, you set 2003 /02/01 10:30 in the **From** box, set 2003 /02/02 10:30 in the **To** box, and then click the **Apply** button.
 - To set a date and time in the **From** and **To** boxes, do either of the following:
 - Move the slider to the left or to the right.
 - In the text box, select the number that you want to change. Next, click the upward or downward arrow button.

When you specify dates and time in the **From** and **To** boxes, Performance Monitor calculates the length (in minutes) of the specified period and displays the calculated length. When calculating the length in minutes, Performance Monitor rounds up the fraction.

Note: The **From** and **To** boxes are grayed out if the monitoring data (that is, obtained statistics) is not stored in the disk subsystem.
 - The **Real Time** option lets you view statistics in real-time mode. The statistics will be updated every minute.

The drop-down list lets you specify the range of data that should be displayed in the graph. For example, if you select **90**, the graph displays statistics for the last 90 minutes.
- **The Monitoring Data Area** - provides a drop down list, tree view, table area, Priority Access (PPC) button, graph button, Chart Y drop down, Detail check box, and line graph as follows:
 - The drop-down list lets you specify the type of statistics to be displayed in the panel. To view I/O rates, select **IOPS** (I/Os per second) from the drop-down list. To view transfer rates, select **MB/s** (megabytes per second) from the drop-down list.
 - The tree view area contains the Subsystem folder. Below the Subsystem folder are ports (such as  and ). When you double-click a port, the Host Storage Domains () that correspond to that port appear. The Host Storage Domain (host group) ID appears on the left of the colon (:). The Host Storage Domain (host group) name appears on the right of the colon. When you double-click a Host Storage Domain (host group), an item named **LUN** () appears. When you select **LUN**, the table area lists LU paths. For details of Host Storage Domains and LU paths, refer to the *Hitachi Freedom Storage™ Lightning 9900™ V Series LUN Manager User's Guide* (MK-92RD105).
 - The table displays statistics (that is, I/O rates or transfer rates). For details on the table contents, see sections 5.4 and 5.5.
 - The Priority Access (PPC) button starts the Priority Access option program if Priority Access is enabled. For details on Priority Access, refer to *Hitachi Freedom Storage™ Lightning 9900™ V Series Priority Access User's Guide* (MK-92RD117).

- If the **Current Control** label displays **Port Control**, the system is controlled by the upper limits and the threshold specified in the **Port** tab of the Priority Access (Prioritized Port Control) panel (refer to Figure 4.1 in the *Hitachi Freedom Storage™ Lightning 9900™ V Series Priority Access User's Guide* (MK-92RD117).

If the **Current Control** label displays **WWN Control**, the system is controlled by the upper limits and the threshold specified in the **WWN** tab of the Priority Access (Prioritized Port Control) panel (refer to Figure 4.2 in the *Hitachi Freedom Storage™ Lightning 9900™ V Series Priority Access User's Guide* (MK-92RD117).

If the **Current Control** label displays **No Control**, system performance is not controlled by Priority Access (Prioritized Port Control).

- The **Graph** button displays a line graph that illustrates changes in the I/O rate or the transfer rate. The graph can display up to eight lines simultaneously.
- The **Chart Y Axis Rate** drop-down list lets you select the highest value of the Y-axis (the vertical axis) of the graph.
- If you select the **Detail** check box, the graph displays information as explained below:

If you select a port in the table, select the **Detail** check box and then select the **Graph** button, the graph displays detailed statistics about workloads on the port selected in the table.

If you select **LUN** (🗄️) in the tree view, select the **Detail** check box and then select the **Graph** button, the graph displays detailed statistics as explained in Table 4.2. The information in the graph depends on the item selected in the drop-down list on the right of the **Detail** check box.

Table 4.2 Detailed Information Displayed in the Graph

If you select Detail and also select this item in the drop-down list	The graph presents
IO Rate (the number of I/Os per second)	- statistics in sequential access mode - statistics in random access mode - statistics in CFW (cache fast write) mode Note: If the read hit ratio or the write hit ratio is high, random access mode is used for transferring data instead of sequential access mode. For example, random access mode is likely to be used for transferring data to disk areas to which the FlashAccess function is applied.
Read (the number of read accesses per second)	
Write (the number of write accesses per second)	
Read Hit (the read hit ratio)	
Write Hit (the write hit ratio)	
Back Transfer (backend transfer; the number of I/Os between the cache memory and disk drives)	- the number of data transfers from the cache memory to disk drives - the number of data transfers from disk drives to the cache memory in sequential access mode - the number of data transfers from disk drives to the cache memory in random access mode
Trans. Rate (the number of data transfers)	The graph does not display detailed information.

- The line graph illustrates changes in the I/O rate or the transfer rate. The vertical axis indicates the I/O rate or the transfer rate. The horizontal axis indicates dates and/or times.

When the graph displays I/O rates or the transfer rates for a port controlled by an upper limit or a threshold, the graph also displays a line that indicates the upper limit or the threshold.

For example, if you select the port CL1-A in the table and then click **Graph**, the graph contents changes as explained in Figure 4.7 below. The figure explains the following facts:

- The workload on the port CL1-A is 200 IO/s at 8:00, and 300 IO/s at 10:00 (see the graph on the left).
- For the period of 7:59 to 8:00, the maximum workload on CL1-A is 300 IO/s. The average workload on CL1-A is 200 IO/s. The minimum workload on CL1-A is 100 IO/s (see the graph on the right).
- For the period of 9:59 to 10:00, the maximum workload on CL1-A is 400 IO/s. The average workload on CL1-A is 300 IO/s. The minimum workload on CL1-A is 200 IO/s (see the graph on the right).
- When **Detail** is deselected, only one line appears in the graph. This line is equivalent to the line Ave. (1 min), which appears when **Detail** is selected.

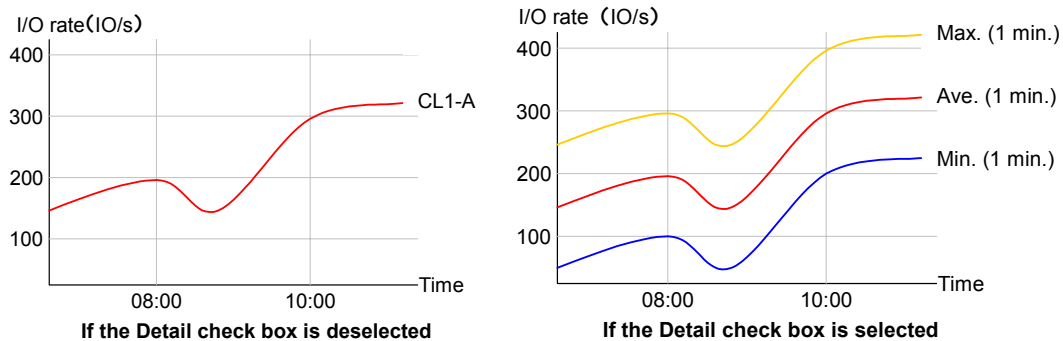


Figure 4.7 Workload Changes on a Port

4.2.4 The WWN Tab of the Performance Monitor Panel

The Performance Monitor panel includes the WWN tab, which lets you view statistics (I/O rates and transfer rates) about traffic between host bus adapters in the hosts and ports on the disk subsystem.

CAUTION: The **WWN** tab is grayed out and cannot be used if Priority Access is not enabled (for details, please refer to *Hitachi Freedom Storage™ Lightning 9900™ V Series Priority Access User's Guide* (MK-92RD117).

Note: A **WWN** (Worldwide Name) is a 16-digit hexadecimal number used as the unique identifier for a host bus adapter. Host bus adapters are contained in hosts and serve as ports for connecting the hosts and the disk subsystem. One WWN represents one host bus adapter.

For details on how to use this panel, see section 5.6.

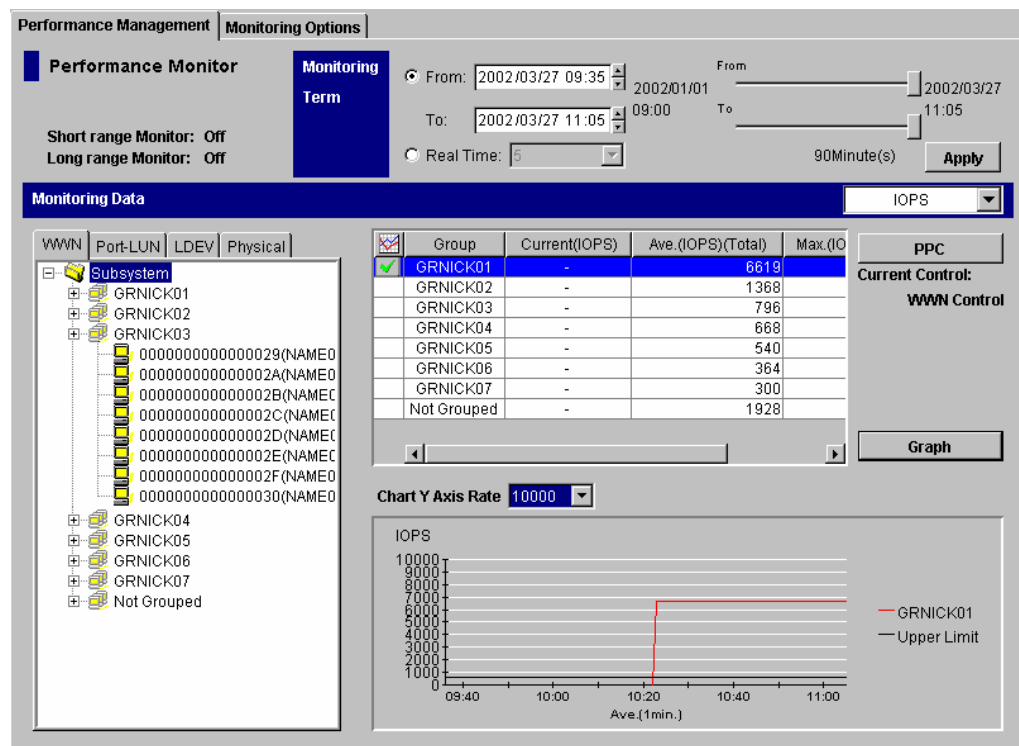


Figure 4.8 The WWN Tab

When the **WWN** tab is active, the Performance Monitor panel contains the following items:

- **Monitoring Status:** lets you quickly determine current monitoring mode.
 - When **Long Range Monitor** is **On**, Performance Monitor is monitoring resources in the disk subsystem to obtain usage statistics. When Long Range Monitor is **Off**, Performance Monitor is not monitoring resources in the disk subsystem.
 - When **Short Range Monitor** is **On**, Performance Monitor is monitoring disks, ports, and LU paths to obtain workload statistics. Performance Monitor is also measuring traffic between host bus adapters and ports. When Short Range Monitor is **Off**, Performance Monitor is not monitoring disks, ports, and LU paths. Performance Monitor is not measuring traffic between host bus adapters and ports.

Note: Long range monitoring S/W must be **ON** to create automatic migration plans using Hitachi CruiseControl™. For details, refer to *Hitachi Freedom Storage™ Lightning 9900™ V Series Hitachi CruiseControl™ User's Guide* (MK-92RD106).

- **The Monitoring Term Area** - provides **From** and **To** options and **Real Time** options as follows:
 - The **From** and **To** options let you narrow the range of statistics that should be displayed in the panel. For example, if you want to view statistics within the range of 10:30 February 1 2003 to 10:30 February 2 2003, you set 2003 /02/01 10:30 in the **From** box, set 2003 /02/02 10:30 in the **To** box, and then click the **Apply** button.

To set a date and time in the **From** and **To** boxes, do either of the following:

- Move the slider to the left or to the right.
- In the text box, select the number that you want to change. Next, click the upward or downward arrow button.

When you specify dates and time in the **From** and **To** boxes, Performance Monitor calculates the length (in minutes) of the specified period and displays the calculated length. When calculating the length in minutes, Performance Monitor rounds up the fraction.

Note: The **From** and **To** boxes are grayed out if the monitoring data (that is, obtained statistics) is not stored in the disk subsystem.

- The **Real Time** option lets you view statistics in real-time mode. The statistics will be updated every minute.

The drop-down list lets you specify the range of data that should be displayed in the graph. For example, if you select **90**, the graph displays statistics for the last 90 minutes.

- The **Monitoring Data** Area - provides a drop down list, tree view, table area, Priority Access (PPC) button, graph button, Chart Y drop down, and line graph as follows:
 - The drop-down list lets you specify the type of statistics to be displayed in the panel. To view I/O rates, select **IOPS** (I/Os per second) from the drop-down list. To view transfer rates, select **100KB/s** (megabytes per second) from the drop-down list.
 - The tree area view contains the Subsystem folder. Below the Subsystem folder are *Priority Access (PPC) groups*, which are groups of multiple *WWNs*. When you double-click a Priority Access (PPC) group (🗂️), the host bus adapters (🖨️) belonging to that Priority Access (PPC) group appear. On the right of the (🖨️) icon appear the *WWN* and the *Priority Access (PPC) name* of the host bus adapter. A *WWN* is a 16-digit hexadecimal number used to identify a host bus adapter. The system administrator assigns a *Priority Access (PPC) name* to each host bus adapter so that the host bus adapter can easily be identified.

If you double-click **Not Grouped** in the tree view, host bus adapters (WWNs) that do not belong to any Priority Access group appear.

Note: If the WWN of a host bus adapter is displayed in red in the tree view, the host bus adapter is connected to two or more ports, but the traffic between the HBA and some of the ports are *not* controlled by Priority Access (Prioritized Port Control). See section 6.1 for how to control the traffic between the HBA and the all the connected ports.

- The table area displays statistics (that is, I/O rates or transfer rates). For details on the table contents, see section 5.6.
- The **Priority Access (PPC)** button starts the Priority Access option program if Priority Access is enabled. For details on Priority Access, refer to *Hitachi Freedom Storage™ Lightning 9900™ V Series Priority Access User's Guide* (MK-92RD117).
- If the **Current Control** label displays **Port Control**, the system is controlled by the upper limits and the threshold specified in the **Port** tab of the Priority Access (Prioritized Port Control) panel (refer to Figure 4.1 in the *Hitachi Freedom Storage™ Lightning 9900™ V Series Priority Access User's Guide* (MK-92RD117)).
If the **Current Control** label displays **WWN Control**, the system is controlled by the upper limits and the threshold specified in the **WWN** tab of the Priority Access (Prioritized Port Control) panel (refer to Figure 4.2 of the *Hitachi Freedom Storage™ Lightning 9900™ V Series Priority Access User's Guide* (MK-92RD117)).
- If the **Current Control** label displays **No Control**, system performance is not controlled by Priority Access (Prioritized Port Control).
- The **Graph** button displays a line graph that illustrates changes in the I/O rate or the transfer rate. The graph can display up to eight lines simultaneously.
- The **Chart Y Axis Rate** drop-down list lets you select the highest value of the Y-axis (the vertical axis) of the graph.
- The line graph illustrates changes in the I/O rate or the transfer rate. The vertical axis indicates the usage rates (in percentage). The horizontal axis indicates dates and/or times.

When the graph displays I/O rates or the transfer rates for a host bus adapter or a Priority Access (PPC) group controlled by an upper limit or a threshold, the graph also displays a line that indicates the upper limit or the threshold.

Chapter 5 Performing Performance Monitor Operations

After you have prepared for Performance Monitor operations as described in Chapter 3, you are ready to start performing monitoring operations that include:

- Monitoring Resources in the Disk Subsystem (see section 5.1)
- Monitoring Disk Drives (see section 5.3)
- Monitoring Ports (see section 5.4)
- Monitoring LU Paths (see section 5.5)
- Monitoring Paths Between Host Bus Adapters and Ports (see section 5.6)

5.1 Notes on Using Performance Monitor

CAUTION: You should obtain monitoring results before powering off the subsystem. If monitoring results are not obtained prior to powering off, some of the monitoring results may not be displayed in the Physical tab. For example, if 4:00 AM and PM is specified in the Gathering Time option in the Monitoring Options panel (see section 4.1) and you turn off the power to the disk subsystem at 5:00 p.m., the Physical tab will not display monitoring results for 4:00 p.m. through 5:00 p.m. of that day. **Note:** The 9900V documentation sometimes uses the term **PS ON**, which refers to turning on the power supply to the disk subsystem, and **PS OFF**, which refers to turning off the power supply to the disk subsystem.

CAUTION: Performance Monitor collects large amounts of monitoring data. This requires considerable web client computer memory. It is therefore recommended that you exit the Storage Navigator program when not using Performance Monitor, thereby freeing up system memory.

CAUTION: If the Physical tab is displayed and the monitoring term exceeds one day (i.e., 24 hours and 0 minute), data in the graph might be subject to a margin of error. To display the graph correctly, ensure that the monitoring term does not exceed one day. In the Physical tab, a maximum of 96 data points are plotted to form a single graph line, and the values of the data points can differ depending on whether the monitoring term exceeds one day.

CAUTION: If the LDEV, Port-LUN, or WWN tab is displayed and the monitoring term exceeds 90 minutes, data in the graph might be subject to a margin of error. To display the graph correctly, ensure that the monitoring term does not exceed 90 minutes. In the LDEV, Port-LUN, or WWN tab, a maximum of 90 data points are plotted to form a single graph line, and the values of the data points can differ depending on whether the monitoring term exceeds 90 minutes.

5.2 Monitoring Resources in the Disk Subsystem

This section describes how to view usage statistics on resources in the disk subsystem.

Notes:

- To be able to view the latest statistics, you must be in the Modify mode of Storage Navigator prior to selecting the Physical tab from the Performance Monitor panel (for details, refer to sections 3.4 and 5.2.9).
- You will be able to view usage statistics that have been obtained for the last three months (i.e., 93 days). You will not be able to view usage statistics that were obtained 94 days ago or earlier because such statistics are erased from the disk subsystem.
- When you are using Performance Monitor, the following message might appear (see Figure 5.1). When this message is displayed, the SVP (web server) is calculating obtained statistics to update information in the panel. This message might disappear as fast as in a couple of seconds, but sometimes in a couple of minutes. For example, this message might remain for a long time if SVP (web server) is forced to perform a lot of processing.

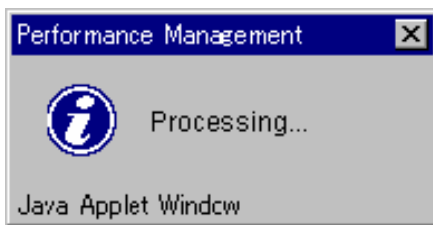


Figure 5.1 The Processing Message

- If you want to view a graph that shows statistics for more than one day (i.e., 24 hours and 0 minute), it is recommended that you ensure the dates in the **From** box and the **To** box (see the Monitoring Term area in Figure 4.1) are different but the times in the two boxes are the same. If **From** and **To** do not contain the same time, data points in the graph might be plotted incorrectly relative to the time axis.
- If you want to view a graph that shows statistics for more than 90 minutes, it is recommended that you should specify a period in increments of 90 minutes in **Monitoring Term** in the Performance Monitor panel (Figure 4.1). If you do not specify the period in increments of 90 minutes, data points in the graph might be plotted in imperfect accordance with the time axis.

5.2.1 Collecting Statistics About Resource Usage

To start monitoring the disk subsystem:

1. In the Performance Monitor panel, click the Monitoring Options tab.
The Monitoring Options panel appears (see Figure 5.2).
2. In **Long range monitoring S/W**, select **ON** for the **Current Status** option.
3. Using the two **Gathering Time** drop-down lists, specify the time when the SVP (web server) collects statistics.
4. Click **Apply**. Performance Monitor starts monitoring the disk subsystem.

Tip: To stop monitoring the disk subsystem, refer to section 3.5.2.

Note: Long range monitoring S/W must be **ON** to create automatic migration plans using Hitachi CruiseControl™. For details, refer to *Hitachi Freedom Storage™ Lightning 9900™ V Series Hitachi CruiseControl™ User's Guide (MK-92RD106)*.

The screenshot shows the 'Performance Management' window with the 'Monitoring Options' tab selected. The 'Monitoring Options' section is active, displaying two main settings: 'Long range monitoring S/W' and 'Short range monitoring S/W'. Under 'Long range monitoring S/W', the 'Current Status' is set to 'OFF' (radio button selected), and the 'Gathering Time' is set to '00' for both hours and minutes, with 'AM & PM' selected. Under 'Short range monitoring S/W', the 'Current Status' is set to 'OFF' (radio button selected). At the bottom right, there are 'Apply' and 'Reset' buttons.

Figure 5.2 Setting Long Range Monitoring in the Monitoring Options Tab

5.2.2 Viewing Usage Statistics About Parity Groups

Performance Monitor tracks parity groups and lets you view the average and the maximum usage rate in a specified period. Performance Monitor also displays a graph that illustrates changes in parity group usage within that period.

Note: You must be monitoring the disk subsystem before usage statistics can be viewed (for details, refer to section 5.2.1).

To view usage statistics about parity groups:

1. Ensure that the Performance Monitor panel is displayed.
2. In the tree view, click the **Physical** tab and select the **Parity Group** folder (see Figure 5.3).

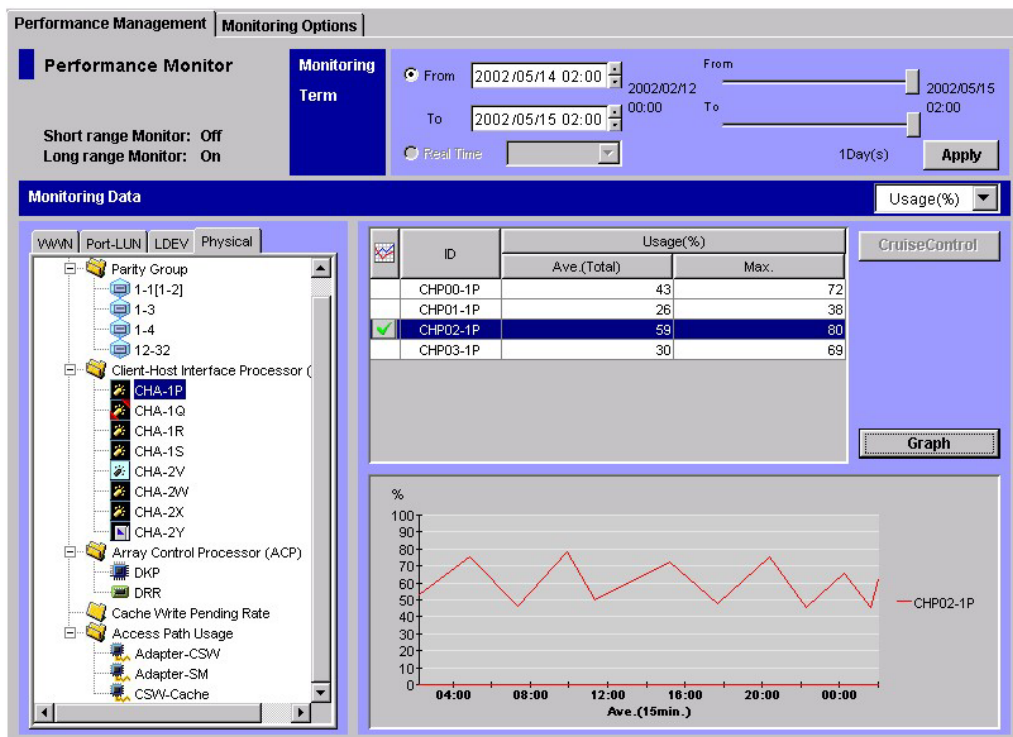


Figure 5.3 The Physical Tab of the Performance Monitor Panel

The table area displays usage statistics about parity groups (see Figure 5.4). The displayed statistics are the average and the maximum usage rates for the period specified in the **From** and **To** boxes.

Notes:

- If you change the date and time in the **From** and **To** boxes and then click the **Apply** button, Performance Monitor recalculates usage rates and updates information in the table. To change the date and time in the **From** and **To** boxes, use the arrow buttons and the sliders (for details, refer to section 4.2.1).
 - If an exclamation mark (!) is displayed before a usage rate, the reported parity group usage rate is likely to be inaccurate, because the configuration has changed (e.g., volumes have been moved by CruiseControl™ or ShadowImage™, or changed by Virtual LVI).
3. To display a graph that illustrates changes in usage rate for parity groups, select the desired parity groups in the table area and then click the **Graph** button (see Figure 5.4)

Note: The length of the monitoring period affects the time period represented by a graduation on the horizontal axis.

	PG			Usage(%)	
		RAID	Drive Type	Ave.(Total)	Max.
	1-3	5(3D+1P)	DKR1B-J047F...	10	81
	1-4	5(7D+1P)	DKR1B-J047F...	10	81
	12-32	1(2D+2D)	DKR1B-J047F...	10	81

Note: It is possible that the usage rate for a parity group is not equal to the sum of the usage rate for each logical volume in that parity group (see section 5.2.3). This is because the Performance Monitor panel rounds off fractions below the decimal point to the nearest whole number when displaying the usage rate for each logical volume.

Figure 5.4 An Example of Parity Group Usage Rates Displayed in the Table

The table displays the following items:

- : When the check mark icon () appears in this column, the graph illustrates changes in usage rate for the parity group.
- **PG:** This column indicates IDs of parity groups.
- **RAID:** This column indicates the RAID level (RAID-5 or RAID-1).
- **Drive Type:** This column indicates types of HDDs (hard disk drives).
- **Usage:**
 - The **Ave. (Total)** column displays the average usage rate in the specified period.
 - The **Max.** column displays the maximum usage rate in the specified period.

5.2.3 Viewing Usage Statistics About Logical Volumes in Parity Groups

Performance Monitor tracks logical volumes in parity groups and lets you view the average and the maximum usage rate in a specified period. Performance Monitor also displays a graph that illustrates changes in logical volume usage within that period.

Note: You must be monitoring the disk subsystem before usage statistics can be viewed (for details, refer to section 5.2.1).

To view usage statistics about logical volumes in a parity group:

1. Ensure that the Performance Monitor panel is displayed.
2. In the tree view, click the **Physical** tab and double-click the **Parity Group** folder (refer to Figure 5.3).

The folder opens. A list of parity groups appears below the folder.

3. Select the desired parity group.

The table area displays usage statistics about logical volumes in the specified parity group (see Figure 5.5). The displayed statistics are the average and the maximum usage rates for the period specified in the **From** and **To** boxes.

Notes:

- If you change the date and time in the **From** and **To** boxes and then click the **Apply** button, Performance Monitor recalculates usage rates and updates information in the table. To change the date and time in the **From** and **To** boxes, use the arrow buttons and the sliders (for details, refer to section 4.2.1).
 - If an exclamation mark (!) is displayed before a usage rate, the reported logical volume usage rate is likely to be inaccurate, because the configuration has changed (e.g., volumes have been moved by CruiseControl™ or ShadowImage™, or changed by Virtual LVI).
4. To display a graph that illustrates changes in usage rate for logical volumes, select the desired logical volumes in the table and then click the **Graph** button.

Note: The length of the monitoring period affects the time period represented by a graduation on the horizontal axis.

	LDEV	Emulation	Usage(%)		Read Rate(%)		Write Rate(%)		Grp.Use[Exp](%)	
			Ave.(Total)	Max.	Rnd.	Seq.	Rnd.	Seq.	Ave.(Total)	Max.
	0:00	OPEN-3	110	120	30	40	50	60	10 -> 70	81 -> 80
	0:01	OPEN-3	15	25	35	45	55	65	10 -> 75	81 -> 85
	0:02	OPEN-3	0	0	0	0	0	0	10 -> 0	81 -> 0
	0:03	OPEN-3	0	0	0	0	0	0	10 -> 0	81 -> 0
	0:04	OPEN-3	0	0	0	0	0	0	10 -> 0	81 -> 0
	0:05	OPEN-3	0	0	0	0	0	0	10 -> 0	81 -> 0
	0:06	OPEN-3	0	0	0	0	0	0	10 -> 0	81 -> 0
	0:07	OPEN-3	0	0	0	0	0	0	10 -> 0	81 -> 0

Note: It is possible that the sum of the usage rate for each logical volume in a parity group is not equal to the usage rate for that parity group (refer to section 5.2.2). This is because the Performance Monitor panel rounds off fractions below the decimal point to the nearest whole number when displaying the usage rate for each logical volume.

Figure 5.5 An Example of Logical Volume Usage Rates Displayed in the Table

The table displays the following items:

- : When the check mark icon () appears in this column, the graph illustrates changes in usage rate for the logical volume.
- **LDEV:** This column indicates logical volumes (LDEVs). The number on the left of the colon is the CU image number. The number on the right of the colon is the LDEV number.
- **Emulation:** This column indicates device emulation types.
- **Usage:**
 - The **Ave. (Total)** column displays the average usage rate in the specified period.
 - The **Max.** column displays the maximum usage rate in the specified period.
- **Read Rate:**
 - The **Rnd.** column indicates random read rates. A random read rate is the ratio of random read requests to read and write requests.
 - The **Seq.** column indicates sequential read rates. A sequential read rate is the ratio of sequential read requests to read and write requests.
- **Write Rate:**
 - The **Rnd.** column indicates random write rates. A random write rate is the ratio of random write requests to read and write requests.
 - The **Seq.** column indicates sequential write rates. A sequential write rate is the ratio of sequential write requests to read and write requests.
- **Grp. Use:** Assumes the volume might be migrated out of the parity group (or uninstalled) and indicates expected (estimated) average and maximum usage rates of the parity group. The **Ave. (Total)** column indicates an estimated change in the average usage rate. The **Max.** column indicates an estimated change in the maximum usage rate. For example, if the **Ave. (Total)** box for the volume 0:01 displays “20 -> 18”, the average usage rate of the parity group that the volume belongs to is 20 percent. If the volume were migrated out of the parity group, the average usage rate of that group is expected to drop to 18 percent.

5.2.4 Viewing Usage Statistics About Client-Host Interface Processors (CHIPs)

Performance Monitor tracks client-host interface processors in each channel adapter and lets you view the average and the maximum usage rate in a specified period. Performance Monitor also displays a graph that illustrates changes in client-host interface processor usage within that period.

Note: You must be monitoring the disk subsystem before usage statistics can be viewed (for details, refer to section 5.2.1).

To view usage statistics about client-host interface processors:

1. Ensure that the Performance Monitor panel is displayed.
2. In the tree view, click the **Physical** tab.
3. In the tree view, do either of the following:
 - If you want to view usage statistics about all the channel processors in your disk subsystem, select the **Client-Host Interface Processor (CHIP)** folder.
 - If you want to view usage statistics about channel processors in a channel adapter, double-click the **Client-Host Interface Processor (CHIP)** folder and then select the desired channel adapter.

The table on the right displays usage statistics about the channel processors (Figure 5.6). The displayed statistics are the average and the maximum usage rates for the period specified in the **From** and **To** boxes.

Note: If you change the date and time in the **From** and **To** boxes and then click the **Apply** button, Performance Monitor recalculates usage rates and updates information in the table. To change the date and time in the **From** and **To** boxes, use the arrow buttons and the sliders (for details, refer to section 4.2.1).

4. To display a graph that illustrates changes in usage rate for client-host interface processors, select the desired client-host interface processors in the table and then click the **Graph** button.

Note: The length of the monitoring period affects the time period represented by a graduation on the horizontal axis.

	ID	Usage(%)	
		Ave.(Total)	Max.
	CHP00-1P	20	82
	CHP01-1P	20	82
	CHP02-1P	20	82
	CHP03-1P	20	82

Figure 5.6 An Example of Client-Host Interface Processors Usage Rates Displayed in the Table

The table displays the following items:

- : When the check mark icon () appears in this column, the graph illustrates changes in usage rate for the client-host interface processor.
- **ID**: This column displays ID numbers for client-host interface processors.
- **Usage**:
 - The **Ave. (Total)** column displays the average usage rate in the specified period.
 - The **Max.** column displays the maximum usage rate in the specified period.

5.2.5 Viewing Usage Statistics About Array Control Processors (ACPs)

Performance Monitor tracks array control processors and lets you view the average and the maximum usage rate in a specified period. Performance Monitor also displays a graph that illustrates changes in array control processor usage within that period.

Note: You must be monitoring the disk subsystem before usage statistics can be viewed (for details, refer to section 5.2.1).

To view usage statistics about array control processors:

1. Ensure that the Performance Monitor panel is displayed.
2. In the tree view, click the **Physical** tab and double-click the **Array Control Processor (ACP)** folder (refer to Figure 5.3).
3. In the tree view, click **DKP** from below the **Array Control Processor (ACP)** folder.

The table area displays usage statistics about array control processors in the disk adapter (Figure 5.7). The displayed statistics are the average and the maximum usage rates for the period specified in the **From** and **To** boxes.

Note: If you change the date and time in the **From** and **To** boxes and then click the **Apply** button, Performance Monitor recalculates usage rates and updates information in the table. To change the date and time in the **From** and **To** boxes, use the arrow buttons and the sliders (for details, refer to section 4.2.1).

4. To display a graph that illustrates changes in usage rate for array control processors, select the desired array control processors in the table and then click the **Graph** button.

Note: The length of the monitoring period affects the time period represented by a graduation on the horizontal axis.

	ID	Usage(%)	
		Ave.(Total)	Max.
	DKP80-1B	30	83
	DKP81-1B	30	83
	DKP82-1B	30	83
	DKP83-1B	30	83
	DKP90-1C	30	83
	DKP91-1C	30	83
	DKP92-1C	30	83
	DKP93-1C	30	83
	DKPA0-1D	30	83

Figure 5.7 An Example of Array Control Processor Usage Rates Displayed in the Table

The table displays the following items:

- : When the check mark icon () appears in this column, the graph illustrates changes in usage rate for the array control processor.
- **ID:** This column displays ID numbers for array control processors.
- **Usage:**
 - The **Ave. (Total)** column displays the average usage rate in the specified period.
 - The **Max.** column displays the maximum usage rate in the specified period.

5.2.6 Viewing Usage Statistics About Disaster Recovery and Regeneration Processors (DRRs)

Performance Monitor tracks DRRs (disaster recovery and regeneration processors) and lets you view the average and the maximum usage rate in a specified period. Performance Monitor also displays a graph that illustrates changes in DRR usage within that period.

Note: You must be monitoring the disk subsystem before usage statistics can be viewed (for details, refer to section 5.2.1).

To view usage statistics about DRRs:

1. Ensure that the Performance Monitor panel is displayed.
2. In the tree view, click the **Physical** tab and double-click the **Array Control Processor (ACP)** folder (refer to Figure 5.3).
A list of disk adapters appears.
3. In the tree view, click **DRR** from below the **Array Control Processor (ACP)** folder.
The table area displays usage statistics about DRRs in the disk adapter (Figure 5.8). The displayed statistics are the average and the maximum usage rates for the period specified in the **From** and **To** boxes.

Note: If you change the date and time in the **From** and **To** boxes and then click the **Apply** button, Performance Monitor recalculates usage rates and updates information in the table. To change the date and time in the **From** and **To** boxes, use the arrow buttons and the sliders (for details, refer to section 4.2.1).

4. To display a graph that illustrates changes in usage rate for DRRs, select the desired DRRs in the table and then click the **Graph** button.

Note: The length of the monitoring period affects the time period represented by a graduation on the horizontal axis.

	ID	Usage(%)	
		Ave.(Total)	Max.
	DRR80-1B	40	84
	DRR81-1B	40	84
	DRR82-1B	40	84
	DRR83-1B	40	84
	DRR90-1C	40	84
	DRR91-1C	40	84
	DRR92-1C	40	84
	DRR93-1C	40	84
	DRRA0-1D	40	84

Figure 5.8 An Example of DRR Usage Rates Displayed in the Table

The table displays the following items:

- : When the check mark icon () appears in this column, the graph illustrates changes in usage rate for the DRR.
- **ID:** This column displays ID numbers for DRRs.
- **Usage:**
 - The **Ave. (Total)** column displays the average usage rate in the specified period.
 - The **Max.** column displays the maximum usage rate in the specified period.

5.2.7 Viewing Write Pending Rates

Performance Monitor lets you view write pending rates. A write pending rate indicates the ratio of write-pending data to the cache memory capacity. Performance Monitor displays the average and the maximum write pending rate in a specified period. Performance Monitor also displays a graph that illustrates changes in write pending rate within that period.

Note: You must be monitoring the disk subsystem before usage statistics can be viewed (for details, refer to section 5.2.1).

To view the write pending rate:

1. Ensure that the Performance Monitor panel is displayed.
2. In the tree view, click the **Physical** tab and select the **Cache Write Pending Rate** folder (refer to Figure 5.3).

The table area displays usage statistics about write pending rates (see Figure 5.9).

- The **Ave. (Total)** column displays the average write pending rate for the period specified in the **From** and **To** boxes.
- The **Moment Max.** column displays the maximum write pending rate for the period specified in the **From** and **To** boxes.

Note: If you change the date and time in the **From** and **To** boxes and then click the **Apply** button, Performance Monitor recalculates usage rates and updates information in the table. To change the date and time in the **From** and **To** boxes, use the arrow buttons and the sliders (for details, refer to section 4.2.1).

3. To display a graph that illustrates changes in the write pending rate, select the write pending rate in the table and then click the **Graph** button.

Note: The length of the monitoring period affects the time period represented by a graduation on the horizontal axis.

	Cache Write Pending Rate(%)	
	Ave.(Total)	Moment Max.
	88	99

Figure 5.9 An Example of Write Pending Rate Displayed in the Table

- : When the check mark icon () appears in this column, the graph illustrates changes in the write pending rate.
- **Cache Write Pending Rate:**
 - The **Ave. (Total)** column displays the average write pending rate for the specified period.
 - The **Moment Max.** column displays the maximum write pending rate for the specified period.

5.2.8 Viewing Usage Statistics About Access Paths

The channel adapters (CHAs) and the disk adapters (DKAs) transfer data to the cache switch (CWS) and the shared memory (SM) when I/O requests are issued from hosts to the disk subsystem. Also, the cache switch transfers data to the cache memory.

Performance Monitor tracks these data transfer paths and lets you view the average and the maximum usage rate for the paths in a specified period. Performance Monitor also displays a graph that illustrates changes in path usage within that period.

Note: You must be monitoring the disk subsystem before usage statistics can be viewed (for details, refer to section 5.2.1).

To view usage statistics about paths:

1. Ensure that the Performance Monitor panel is displayed.
2. In the tree view, click the **Physical** tab and double-click the **Access Path Usage** folder (refer to Figure 5.3).
3. Do either of the following:
 - To check usage statistics about paths between adapters (CHAs and DKAs) and the cache switch, select **Adapter-CSW** from below the **Access Path Usage** folder.
 - To check usage statistics about paths between adapters (CHAs and DKAs) and the shared memory, select **Adapter-SM** from below the **Access Path Usage** folder.
 - To check usage statistics about paths between cache switches and the cache memory, select **CSW-Cache** from below the **Access Path Usage** folder.

The table area displays the average and maximum usage rate for the specified paths (see Figure 5.10). The displayed statistics are the average and the maximum usage rates for the period specified in the **From** and **To** boxes.

Note: If you change the date and time in the **From** and **To** boxes and then click the **Apply** button, Performance Monitor recalculates usage rates and updates information in the table. To change the date and time in the **From** and **To** boxes, use the arrow buttons and the sliders (for details, refer to section 4.2.1).

4. To display a graph that illustrates changes in usage statistics about paths, select the desired paths in the table and then click the **Graph** button.

Note: The length of the monitoring period affects the time period represented by a graduation on the horizontal axis.

Paths between adapters and cache switches:

	Adapter	CSW	Usage(%)	
			Ave.(Total)	Max.
	CHA-1P	CSW-1N	60	86
	CHA-1P	CSW-1A	60	86
	CHA-1Q	CSW-1N	60	86
	CHA-1Q	CSW-1A	60	86
	CHA-1R	CSW-1N	60	86
	CHA-1R	CSW-1A	60	86
	CHA-1S	CSW-1N	60	86
	CHA-1S	CSW-1A	60	86

Paths between adapters and shared memories:

	Adapter	SM	Usage(%)	
			Ave.(Total)	Max.
	CHA-1P	Side-A	50	85
	CHA-1P	Side-B	50	85
	CHA-1Q	Side-A	50	85
	CHA-1Q	Side-B	50	85
	CHA-1R	Side-A	50	85
	CHA-1R	Side-B	50	85
	CHA-1S	Side-A	50	85
	CHA-1S	Side-B	50	85

Paths between cache switches and cache memory:

	CSW	Cache	Usage(%)	
			Ave.(Total)	Max.
	CSW-1N	CACHE-1T	70	87
	CSW-1A	CACHE-1T	70	87
	CSW-2M	CACHE-1T	70	87
	CSW-2Z	CACHE-1T	70	87
	CSW-1N	CACHE-1U	70	87
	CSW-1A	CACHE-1U	70	87
	CSW-2M	CACHE-1U	70	87
	CSW-2Z	CACHE-1U	70	87

Figure 5.10 Examples of Usage Statistics Displayed in the Table

- : When the check mark icon () appears in this column, the graph illustrates changes in the write pending rate.
- **Adapter:** This column indicates adapters.
- **CSW:** This column indicates cache switches.
- **SM:** This column indicates shared memories.
- **Cache:** This column indicates the cache memories.
- **Usage:**
 - The **Ave. (Total)** column displays the average usage rate for the specified period.
 - The **Max.** column displays the maximum usage rate for the specified period.

5.2.9 Updating Usage Statistics

If you want to update usage statistics, you must first switch from View mode to Modify mode (for details, refer to section 3.4).

To update statistics:

1. In the Storage Navigator main menu, switch to **Modify** mode (for details, refer to *Hitachi Freedom Storage™ Lightning 9900™ V Series Hitachi Remote Console - Storage Navigator™ User's Guide* (MK-92RD101)).
2. In the **Performance Monitor** panel, click the **Physical** tab. A message appears asking if you want to obtain the latest information.
3. Click **OK**.

Note: If you want to update statistics in the panel again later, you must quit and then restart **Performance Monitor**.

5.3 Monitoring Disk Drives

The **LDEV** tab of the Performance Monitor panel lets you check workloads on physical disk drives (parity groups) or on logical volumes. The **LDEV** tab displays the *I/O rate* and the *transfer rate*. The *I/O rate* indicates the number of disk I/Os per second. The *transfer rate* indicates the size of data transferred to the disk in one second.

In addition, the **LDEV** tab displays the *read hit ratio* and the *write hit ratio*. For a read I/O, when the requested data is already in cache, the operation is classified as a *read hit*. For a write I/O, when the requested data is already in cache, the operation is classified as a *write hit*.

Note: To monitor disk drives, **Performance Monitor** must be running (refer to section 3.3).

5.3.1 Collecting Statistics About Workloads on Disk Drives

Note: You must be monitoring disk drives before statistics can be viewed.

To start monitoring the disk subsystem:

1. Start Performance Monitor (refer to section 3.3). The Performance Monitor panel appears (see Figure 5.11).
2. Click the Monitoring Options tab. The Monitoring Options panel appears.
3. In **Short range monitoring S/W**, select **ON** for the **Current Status** option.
4. Click **Apply**. Performance Monitor starts monitoring the disk subsystem.

The screenshot shows a software interface with two tabs: "Performance Management" and "Monitoring Options". The "Monitoring Options" tab is active. Below the tab, there is a section titled "Monitoring Options". Under this, there are two main sections: "Long range monitoring S/W" and "Short range monitoring S/W".

In the "Long range monitoring S/W" section, the "Current Status" is set to "OFF" (indicated by a selected radio button). Below it, the "Gathering Time" is set to "00" in a dropdown menu, followed by "AM & PM".

In the "Short range monitoring S/W" section, the "Current Status" is set to "ON" (indicated by a selected radio button).

At the bottom right of the interface, there are two buttons: "Apply" and "Reset".

Figure 5.11 Setting Short Range Monitoring in the Monitoring Options Tab.

Tips: To stop monitoring the disk subsystem, follow the procedure below. If you stop monitoring, Performance Monitor stops collecting statistics.

To stop monitoring the disk subsystem:

1. Start Performance Monitor and click the Monitoring Options tab. The Monitoring Options panel appears (refer to Figure 5.11).
2. In **Short range monitoring S/W**, select **OFF** for the **Current Status** option.
3. Click **Apply**.

5.3.2 Viewing I/O Rates

Performance Monitor tracks disk drives and measures I/O rates (that is, the number of disk I/Os per second).

Note: You must be monitoring disk drives before statistics can be viewed (for details, refer to section 5.3.1).

To view I/O rates:

1. Ensure that the Performance Monitor panel is displayed.
2. Click the **LDEV** tab. The tree view displays a list of parity groups (refer to Figure 4.5).
3. Select **IOPS** from the drop-down list on the right side of the Monitoring Data panel.
4. In the tree view, do either of the following:

- To view the I/O rate for each parity group, select the **Subsystem** folder or a **Box** folder. The table area displays the I/O rate for each parity group (Figure 5.12).

Note: If you select the **Subsystem** folder, the table displays all parity groups. To narrow the number of parity groups to be displayed in the table, select a **Box** folder. For example, if you select the **Box 1** folder, the table displays only the parity groups whose IDs start with "1-".

- To view the I/O rate for each logical volume in a parity group, select the parity group. The table area displays the I/O rate for each logical volume in the selected parity group (Figure 5.12).

The displayed statistics are the average and the maximum I/O rates for the period specified in the **From** and **To** boxes.

Note: If you change the date and time in the **From** and **To** boxes and then click the **Apply** button, Performance Monitor recalculates usage rates and updates information in the table. To change the date and time in the **From** and **To** boxes, use the arrow buttons and the sliders (for details, refer to section 4.2.1).

5. To display a graph to find out how the I/O rate has been changed, take the following steps:
 - a) In the table, select the parity group(s) or the logical volume(s) that you want.
 - b) Use the drop-down list at the right side of the table to select the type of information that you want to view in the graph.
 - c) Click the Graph button.
 - d) A graph appears below the table. The horizontal axis indicates the time.

CAUTION: If the graph does not display changes in the I/O rate (for example, if the line in the graph runs vertically), it is recommended that you change the value in the Chart Y Axis Rate drop-down list. For example, if the largest value in the table is 200 and the value in Chart Y Axis Rate is 100, you should select a value larger than 200 from Chart Y Axis Rate.

- e) To view more detailed information in the graph, use the drop-down list to the right of the table to select the type of information that you want. Next, select the **Detail** check box at the lower right of the table and then click the **Graph** button. The graph contents change as described in Table 4.1.

CAUTION: If more than one parity group or logical volume is selected in the table, you cannot select the Detail check box to view detailed information.

I/O rate for parity groups:

	Group	IO Rate...	Read...	Write...	Read Hit...	Write Hit...	Back Tra...
	1-3	0	0	0	0	0	0
	1-4	0	0	0	0	0	0
	12-32	0	0	0	0	0	0

When the **Subsystem** folder is selected.

	Group	IO Rate...	Read...	Write...	Read Hit...	Write Hit...	Back Tra...
	1-3	0	0	0	0	0	0
	1-4	0	0	0	0	0	0

When the **Box 1** folder is selected.

I/O rate for logical volumes:

	LDEV	Type	IO R...	Read...	Write...	Read H...	Write H...	Ba...
	01:10	OPEN-3	0	0	0	0	0	0
	01:11	OPEN-3	0	0	0	0	0	0
	01:12	OPEN-3	0	0	0	0	0	0
	01:13	OPEN-3	0	0	0	0	0	0
	01:14	OPEN-3	0	0	0	0	0	0

Note: It is possible that the I/O rate for a parity group is not equal to the sum of the I/O rate for each logical volume in that parity group. This is because the Performance Monitor panel omits fractions below the decimal point when displaying the I/O rate for each logical volume.

Figure 5.12 I/O Rates for Disks

The table displays the following:

- : When the check mark icon () appears in this column, the graph displays workload statistics about the parity group or the logical volume.
- **Group:** Indicates the parity group ID. If the ID starts with the letter "E", logical volumes in the parity group are Hi-Copy volumes.
- **LDEV:** Indicates the logical volume ID. If the ID ends with the symbol "#", the logical volume is a Hi-Copy volume.
- **Type:** Indicates the emulation type
- **IO Rate:** Indicates the number of I/O requests to the parity group (or the logical volume) per second.
- **Read:** Indicates the number of read requests to the parity group (or the logical volume) per second.
- **Write:** Indicates the number of write requests to the parity group (or the logical volume) per second. This column appears when **IOPS** is selected in the drop-down list at the upper right of the table.
- **Read Hit:** Indicates the read hit ratio
- **Write Hit:** Indicates the write hit ratio
- **Back Trans.:** Indicates the number of data transfers per second between the parity group (or the logical volume) and the cache memory

5.3.3 Viewing Transfer Rates

Performance Monitor tracks disk drives and measures transfer rates (that is, the size of data transferred in one second).

Note: You must be monitoring disk drives before statistics can be viewed (for details, refer to section 5.3.1).

To view transfer rates:

1. Ensure that the Performance Monitor panel is displayed.
2. Click the **LDEV** tab (Figure 4.5).
The tree view displays a list of parity groups.
3. Select **MB/s** from the drop-down list on the right side of the Monitoring Data panel.

4. In the tree view, do either of the following:

- To view the transfer rate for each parity group, select the **Subsystem** folder or a **Box** folder.

The table area displays the transfer rate for each parity group (Figure 5.13).

Note: If you select the **Subsystem** folder, the table displays all parity groups. To narrow the number of parity groups to be displayed in the table, select a **Box** folder. For example, if you select the **Box 1** folder, the table displays only the parity groups whose IDs start with "1-".

- To view the transfer rate for each logical volume in a parity group, select the parity group.

The table area displays the transfer rate for each logical volume in the selected parity group (Figure 5.13).

The displayed statistics are the average and the maximum transfer rates for the period specified in the **From** and **To** boxes.

Note: If you change the date and time in the **From** and **To** boxes and then click the **Apply** button, Performance Monitor recalculates usage rates and updates information in the table. To change the date and time in the **From** and **To** boxes, use the arrow buttons and the sliders (for details, refer to section 4.2.1).

5. To display a graph to find out how the transfer rate has been changed, take the following steps:

- a) In the table, select the parity group(s) or the logical volume(s) that you want.
- b) Use the drop-down list at the right side of the table to select the type of information that you want to view in the graph.
- c) Click the **Graph** button.
- d) A graph appears below the table. The horizontal axis indicates the time.

CAUTION: If the graph does not display changes in the transfer rate (for example, if the line in the graph runs vertically), it is recommended that you change the value in the **Chart Y Axis Rate** drop-down list. For example, if the largest value in the table is 200 and the value in **Chart Y Axis Rate** is 100, you should select a value larger than 200 from **Chart Y Axis Rate**.

- e) To view more detailed information in the graph, use the drop-down list to the right of the table to select the type of information that you want. Next, select the **Detail** check box at the lower right of the table and then click the **Graph** button. The graph contents change as described in Table 4.1.

CAUTION: If more than one parity group or logical volume is selected in the table, you cannot select the **Detail** check box to view detailed information.

Transfer rate for parity groups:

	Group	Trans.Rate...	Read Hit...	Write Hit...	Back Trans.(count/sec)
☐	1-3	0	0	0	0
☐	1-4	0	0	0	0
☐	12-32	0	0	0	0

When the **Subsystem** folder is selected.

	Group	Trans.Rate...	Read Hit...	Write Hit...	Back Trans.(count/sec)
☐	1-3	0	0	0	0
☐	1-4	0	0	0	0

When the **Box 1** folder is selected.

Transfer rate for logical volumes:

	LDEV	Type	Trans.Rate...	Read Hit...	Write Hit...	Back Trans...
☐	01:10	OPEN-3	0	0	0	0
☐	01:11	OPEN-3	0	0	0	0
☐	01:12	OPEN-3	0	0	0	0
☐	01:13	OPEN-3	0	0	0	0
☐	01:14	OPEN-3	0	0	0	0

Note: It is possible that the transfer rate for a parity group is not equal to the sum of the transfer rate for each logical volume in that parity group. This is because the Performance Monitor panel omits fractions below the decimal point when displaying the transfer rate for each logical volume.

Figure 5.13 Transfer Rates for Disks

The table displays the following:

- : When the check mark icon (☒) appears in this column, the graph displays workload statistics about the parity group or the logical volume.
- **Group:** Indicates the parity group ID. If the ID starts with the letter "E", logical volumes in the parity group are Hi-Copy volumes.
- **LDEV:** Indicates the logical volume ID. If the ID ends with the symbol "#", the logical volume is a Hi-Copy volume.
- **Type:** Indicates the emulation type
- **Trans. Rate:** Indicates the size (in megabytes) of data transferred to the parity group (or the logical volume) per second
- **Read Hit:** Indicates the read hit ratio
- **Write Hit:** Indicates the write hit ratio
- **Back Trans.:** Indicates the number of data transfers per second between the parity group (or the logical volume) and the cache memory

5.4 Monitoring Ports

Performance Monitor tracks ports on the disk subsystem and measures I/O rates (that is, the number of I/Os per second) and transfer rates (that is, the size of data transferred per second).

Note: To monitor ports, Performance Monitor must be running (refer to section 3.3).

5.4.1 Collecting Statistics About Traffic at Ports

Note: You must be monitoring the disk subsystem before statistics can be viewed.

To start monitoring the disk subsystem:

1. Start Performance Monitor (refer to section 3.3).
The Performance Monitor panel appears (refer to Figure 4.1).
2. Click the **Monitoring Options** tab.
The Monitoring Options panel appears (refer to Figure 5.11).
3. In **Short range monitoring S/W**, select **ON** for the **Current Status** option.
4. Click **Apply**. Performance Monitor starts monitoring the disk subsystem.

Tip: To stop monitoring the disk subsystem, follow the procedure below. If you stop monitoring, Performance Monitor stops collecting statistics.

To stop monitoring the disk subsystem:

1. Start Performance Monitor and click the Monitoring Options tab.
The Monitoring Options panel appears (refer to Figure 5.11).
2. In **Short range monitoring S/W**, select **OFF** for the **Current Status** option.
3. Click **Apply**.

5.4.2 Viewing I/O Rates

Performance Monitor tracks ports on the disk subsystem and measures I/O rates (that is, the number of disk I/Os per second).

Note: You must be monitoring the disk subsystem before statistics can be viewed (for details, refer to section 5.4.1).

To view I/O rates:

1. Ensure that the Performance Monitor panel is displayed.

2. Click the **Port-LUN** tab (Figure 4.6).

The tree view displays a list of ports. If you double-click a port icon (for example,  and ) , the Host Storage Domains () corresponding to that port appear.

3. Select **IOPS** from the drop-down list on the right side of the Monitoring Data panel.

4. In the Monitoring Term area, do either of the following:

- To view the I/O rate in real time, you must select the **Real Time** option and then click **Apply**.

Note: If you use the drop-down list to specify a time before clicking **Apply**, the specified time affects the data range for the graph. For example, if you want to view I/O rates for the last ninety minutes, select 90 from the drop-down list.

- To view I/O rates for a certain period of time in the last 24 hours, you must select the **From** option, change the date and time in the **From** and **To** boxes, and then click **Apply**. Use the arrow button and the sliders when you change the date and time in the **From** and **To** boxes (refer to section 4.2.3).

5. In the tree view, select the **Subsystem** folder.

The table area displays I/O rates for the ports on the subsystem (Figure 5.14).

Tips:

- If you select a port (for example,  and ) in the tree view, the table displays I/O rates for all the host bus adapters connected to the selected port (Figure 5.14).
- If you select a Host Storage Domain (host group) () in the tree view, the table displays I/O rates for host bus adapters in the Host Storage Domain (host group) (Figure 5.14).

6. To display a graph to find out how the I/O rate has been changed, take the following steps:

- a) In the table, select one or more ports or host bus adapters (WWNs).
- b) Click the Graph button.

CAUTION: If the graph does not display changes in the I/O rate (for example, if the line in the graph runs vertically), it is recommended that you change the value in the **Chart Y Axis Rate** drop-down list. For example, if the largest value in the table is 200 and the value in **Chart Y Axis Rate** is 100, you should select a value larger than 200 from **Chart Y Axis Rate**.

I/O rate for ports:

	Port	Current(IOPS)	Ave.(IOPS)...	Max...	Attribute
	All Prio.	-	-	-	Prio.
	All Non-Prio.	-	-	-	Non-Prio.
	CL1-A(EF)	534	534	597	Prio.
	CL1-B(E8)	535	535	598	Prio.
	CL1-C(E4)	536	536	599	Non-Prio.
	CL1-D(E2)	537	537	600	Non-Prio.

All Prio. indicates all the prioritized ports.
All Non-Prio. indicates all the non-prioritized ports

I/O rate for host bus adapters connected to a specified port:

	WWN	PPC Name	Curr...	Ave....	Max...	Attribute
	000000000000000003	NAME0003	-	293	293	Non-Prio.
	000000000000000006	NAME0006	-	290	290	Prio.
	000000000000000007	NAME0007	-	289	289	Non-Prio.
	000000000000000004	NAME0004	-	292	292	Prio.
	000000000000000005	NAME0005	-	291	291	Non-Prio.

I/O rates for host bus adapters in a Host Storage Domain (host group)

	WWN	Nickname	Current...	Ave...	Max...	Attribute
	000000000000000003	M1	-	293	293	Non-Prio.
	000000000000000004	M4	-	292	292	Prio.
	000000000000000005	M5	-	291	291	Non-Prio.

Figure 5.14 I/O Rates for Ports

The table displays the following:

- : When the check mark icon () appears in this column, the graph displays changes in workload statistics about the item.
- **Port:** Indicates ports on the disk subsystem
- **WWN:** Indicates WWNs of the host bus adapters
- **Priority Access (PPC) name:** Indicates Priority Access (PPC) names of the host bus adapters. Priority Access allows you to assign a *Priority Access (PPC) name* to each host bus adapter so that you can easily identify each host bus adapters in the Priority Access panels.
- **Nickname:** Indicates the nickname for the host bus adapters. LUN Manager allows you to assign a *nickname* to each host bus adapter so that you can easily identify each host bus adapter in the LUN Manager panels.
- **Current:** Indicates the current I/O rate
- **Ave.:** Indicates the average I/O rate for the specified period
- **Max.:** Indicates the maximum I/O rate for the specified period
- **Attribute:** Indicates the priority of each port. **Prio.** indicates a prioritized port. **Non-Prio.** indicates a non-prioritized port.

5.4.3 Viewing Transfer Rates

Performance Monitor tracks ports on the disk subsystem and measures transfer rates (that is, the size of data transferred in one second).

Note: You must be monitoring the disk subsystem before statistics can be viewed (for details, refer to section 5.4.1).

To view transfer rates:

1. Ensure that the Performance Monitor panel is displayed.
2. Click the **Port-LUN** tab (Figure 4.6).
The tree view displays a list of ports. If you double-click a port icon (for example,  and ) , the Host Storage Domains () corresponding to that port appear.
3. Select **MB/s** from the drop-down list on the right side of the Monitoring Data panel.
4. In the Monitoring Term area, do either of the following:

- To view the transfer rate in real time, you must select the **Real Time** option and then click **Apply**.

Note: If you use the drop-down list to specify a time before clicking **Apply**, the specified time affects the data range for the graph. For example, if you want to view I/O rates for the last ninety minutes, select 90 from the drop-down list.

- To view transfer rates for a certain period of time in the last 24 hours, you must select the **From** option, change the date and time in the **From** and **To** boxes, and then click **Apply**. Use the arrow button and the sliders when you change the date and time in the **From** and **To** boxes (refer to section 4.2.3).

5. In the tree view, select the **Subsystem** folder.

The table area displays transfer rates for the ports on the subsystem.

Tips:

- If you select a port (for example,  and ) in the tree view, the table displays transfer rates for all the host bus adapters connected to the selected port (Figure 5.15).
- If you select a Host Storage Domain (host group) () in the tree view, the table displays transfer rates for host bus adapters in the Host Storage Domain (host group) (Figure 5.15). **Note:** You cannot view information about host bus adapters if the Host Storage Domain (host group) is not registered in LUN Manager.

6. To display a graph to find out how the transfer rate has been changed, take the following steps:

- a) In the table, select one or more ports or host bus adapters (WWNs).
- b) Click the Graph button.

CAUTION: If the graph does not display changes in the transfer rate (for example, if the line in the graph runs vertically), it is recommended that you change the value in the **Chart Y Axis Rate** drop-down list. For example, if the largest value in the table is 200 and the value in **Chart Y Axis Rate** is 100, you should select a value larger than 200 from **Chart Y Axis Rate**.

Transfer rate for ports:

	Port	Current(MB/s)	Ave.(MB/s)...	Max...	Attribute
	All Prio.	-	-	-	Prio.
	All Non-Prio.	-	-	-	Non-Prio.
	CL1-A(EF)	34	34	38	Prio.
	CL1-B(E8)	35	35	39	Prio.
	CL1-C(E4)	36	36	40	Non-Prio.
	CL1-D(E2)	37	37	41	Non-Prio.

All Prio. indicates all the prioritized ports.

All Non-Prio. indicates all the non-prioritized ports

Transfer rate for host bus adapters connected to a specified port:

	WWN	PPC Name	Curr...	Ave...	Max...	Attribute
	0000000000000003	NAME0003	-	294	294	Non-Prio.
	0000000000000006	NAME0006	-	291	291	Prio.
	0000000000000007	NAME0007	-	290	290	Non-Prio.
	0000000000000004	NAME0004	-	293	293	Prio.
	0000000000000005	NAME0005	-	292	292	Non-Prio.

Transfer rates for host bus adapters in a Host Storage Domain (host group)

	WWN	Nickname	Current...	Ave...	Max...	Attribute
	0000000000000003	M1	-	294	294	Non-Prio.
	0000000000000004	M4	-	293	293	Prio.
	0000000000000005	M5	-	292	292	Non-Prio.

Figure 5.15 Transfer Rates for Ports

The table displays the following:

- : When the check mark icon  appears in this column, the graph displays changes in workload statistics about the item.
- **Port:** Indicates ports on the disk subsystem
- **WWN:** Indicates WWNs of the host bus adapters
- **Priority Access (PPC) name:** Indicates Priority Access (PPC) names of the host bus adapters. Priority Access allows you to assign a *Priority Access (PPC) name* to each host bus adapter so that you can easily identify each host bus adapters in the Priority Access panels.
- **Nickname:** Indicates the nickname for the host bus adapters. LUN Manager allows you to assign a *nickname* to each host bus adapter so that you can easily identify each host bus adapter in the LUN Manager panels.
- **Current:** Indicates the current transfer rate
- **Ave.:** Indicates the average transfer rate for the specified period
- **Max.:** Indicates the maximum transfer rate for the specified period
- **Attribute:** Indicates the priority of each port. **Prio.** indicates a prioritized port. **Non-Prio.** indicates a non-prioritized port.

5.4.4 Viewing Detailed Information About the I/O Rate and the Transfer Rate

Note: You must be monitoring the disk subsystem before statistics can be viewed (for details, refer to section 5.4.1).

To view detailed information about the I/O rate or the transfer rate for a port:

1. Select the **Subsystem** folder in the tree view.
2. Select a port from the table.
3. Select the **Detail** check box at the lower right of the table, and then click the **Graph** button. The graph contents change as described in Figure 4.7 earlier in this chapter.

5.5 Monitoring LU Paths

Performance Monitor tracks LU paths and measures I/O rates (that is, the number of I/Os per second) and transfer rates (that is, the size of data transferred per second).

Note: To monitor LU paths, Performance Monitor must be running (refer to section 3.3).

5.5.1 Collecting Statistics About Traffic at LU Paths

To obtain statistics about traffic at LU paths, you must follow the procedure below to start monitoring the disk subsystem.

To start monitoring the disk subsystem:

1. Start Performance Monitor (refer to section 3.3).
The Performance Monitor panel appears.
2. Click the **Monitoring Options** tab.
The Monitoring Options panel appears (refer to Figure 5.11).
3. In **Short range monitoring S/W**, select **ON** for the **Current Status** option.
4. Click **Apply**. Performance Monitor starts monitoring the disk subsystem.

Tip: To stop monitoring the disk subsystem, follow the procedure below. If you stop monitoring, Performance Monitor stops collecting statistics.

To stop monitoring the disk subsystem:

1. Start Performance Monitor and click the Monitoring Options tab. The Monitoring Options panel appears (refer to Figure 5.11).
2. In **Short range monitoring S/W**, select **OFF** for the **Current Status** option.
3. Click **Apply**.

5.5.2 Viewing I/O Rates

Performance Monitor tracks LU paths and measures I/O rates (that is, the number of disk I/Os per second).

Note: You must be monitoring the disk subsystem before statistics can be viewed (for details, refer to section 5.5.1).

To view I/O rates:

1. Ensure that the Performance Monitor panel is displayed.
2. Click the **Port-LUN** tab (refer to Figure 4.6).
The tree view displays a list of ports on the disk subsystem.
3. Select **IOPS** from the drop-down list on the right side of the Monitoring Data panel.
4. In the Monitoring Term area, do either of the following:
 - To view the I/O rate in real time, you must select the **Real Time** option and then click **Apply**.
Note: If you use the drop-down list to specify a time before clicking **Apply**, the specified time affects the data range for the graph. For example, if you want to view I/O rates for the last ninety minutes, select 90 from the drop-down list.
 - To view I/O rates for a certain period of time in the last 24 hours, you must select the **From** option, change the date and time in the **From** and **To** boxes, and then click **Apply**. Use the arrow button and the sliders when you change the date and time in the **From** and **To** boxes (refer to section 4.2.3).
5. In the tree view, double-click a port (for example,  or ) and then select a Host Storage Domain (host group) ().
The **LUN** icon () appears.
6. Select **LUN**.
The table area displays a list of LU paths and I/O rates (see Figure 5.16).

	LUN	CU:LDEV	Type	Paths	Current(IOPS)	Ave...	Max....
	00	00:05	OPEN-3 ...	1	0	0	0
	01	00:06	OPEN-3 ...	1	0	0	0

Figure 5.16 I/O Rates for LU Paths

7. To display a graph to find out how the I/O rate has been changed, take the following steps:

- a) In the table, select one or more LUNs.
- b) Click the Graph button.

CAUTION: If the graph does not display changes in the I/O rate (for example, if the line in the graph runs vertically), it is recommended that you change the value in the **Chart Y Axis Rate** drop-down list. For example, if the largest value in the table is 200 and the value in **Chart Y Axis Rate** is 100, you should select a value larger than 200 from **Chart Y Axis Rate**.

To view more detailed information in the graph, select the **Detail** check box at the lower right of the table and then click the **Graph** button. The graph contents change as described in Table 4.2.

CAUTION: If more than one row is selected in the table, you cannot select the Detail check box.

The table displays the following:

- : When the icon () appears on the left of an item, the graph displays changes in workload statistics about the item.
- **LUN:** Indicates LUNs (logical unit numbers)
- **CU:LDEV:** Indicates IDs of logical volumes. The number of the left of the colon is the CU image number. The number of the right of the colon is the LDEV number. If the ID of a logical volume ends with the symbol "#", the logical volume is a Hi-Copy volume.
- **Type:** Indicates emulation types
- **Paths:** Indicates the number of LU paths (i.e., paths to logical volumes)
- **Current:** Indicates the current I/O rate
- **Ave.:** Indicates the average I/O rate for the specified period
- **Max.:** Indicates the maximum I/O rate for the specified period

5.5.3 Viewing Transfer Rates

Performance Monitor tracks LU paths and measures transfer rates (that is, the amount of data transferred in one second).

Note: You must ensure that statistics have been collected (for details, refer to section 5.5.1).

To view transfer rates:

1. Ensure that the Performance Monitor panel is displayed.
2. Click the Port-LUN tab (Figure 4.5).
The tree view displays a list of ports on the disk subsystem.
3. Select MB/s from the drop-down list on the right side of the panel.
4. In Monitoring Term, do either of the following:
 - If you want to view the transfer rate in real time, you must select the Real Time option and then click Apply.
Note: If you use the drop-down list to specify a time before clicking Apply, the specified time affects the data range for the graph. For example, if you want to view transfer rates for the last ninety minutes, select 90 from the drop-down list.
 - If you want to view transfer rates for a certain period of time in the last 24 hours, you must select the From option, change the date and time in the From and To boxes, and then click Apply. Use the arrow button and the sliders when you change the date and time in the From and To boxes (refer to section 4.2.3).
5. In the tree view, double-click a port (for example,  or ) and then select a Host Storage Domain (host group) ().
The LUN icon () appears
6. Select LUN.

The table on the right displays a list of LU paths and transfer rates (see Figure 5.17).

7. If you want to display a graph to find out how the transfer rate has been changed, take the following steps:
 - a) In the table, select one or more LUNs.
 - b) Click the Graph button.

CAUTION: If the graph does not display changes in the transfer rate (for example, if the line in the graph runs vertically), it is recommended that you change the value in the Chart Y Axis Rate drop-down list. For example, if the largest value in the table is 200 and the value in Chart Y Axis Rate is 100, you should select a value larger than 200 from Chart Y Axis Rate.

8. If you want to view more detailed information in the graph, select the **Detail** check box at the lower right of the table and then click the Graph button. The graph contents change as described in Table 4.2.

CAUTION: If more than one row is selected in the table, you cannot select the Detail check box.

	LUN	CU:LDEV	Type	Paths	Current(MB/s)	Ave...	Max...
	00	00:05	OPEN-3 ...	1	0	0	0
	01	00:06	OPEN-3 ...	1	0	0	0

Figure 5.17 Transfer Rates for LU Paths

The table displays the following:

- : When the icon () appears on the left of an item, the graph displays changes in workload statistics about the item.
- **LUN:** Indicates LUNs (logical unit numbers)
- **CU:LDEV:** Indicates IDs of logical volumes. The number of the left of the colon is the CU image number. The number of the right of the colon is the LDEV number. If the ID of a logical volume ends with the symbol "#", the logical volume is a Hi-Copy volume.
- **Type:** Indicates emulation types
- **Paths:** Indicates the number of LU paths (i.e., paths to logical volumes)
- **Current:** Indicates the current transfer rate
- **Ave.:** Indicates the average transfer rate for the specified period
- **Max.:** Indicates the maximum transfer rate for the specified period

5.6 Monitoring Paths Between Host Bus Adapters and Ports

If Priority Access is enabled, Performance Monitor can be used to monitor paths between host bus adapters (HBAs) in host servers and ports on the disk subsystem. HBAs are contained in host servers and serve as ports for connecting the host servers to the disk subsystem.

Note: To monitor paths between HBAs and ports, Performance Monitor must be running (refer to section 3.3).

5.6.1 Collecting Statistics About Traffic Between HBAs and Ports

CAUTION: To collect statistics about traffic between HBAs and ports, you must perform a Priority Access operation first, then you may proceed with monitoring the disk subsystem (please refer to the Measuring Traffic between Host Bus Adapters and Ports section in *Hitachi Freedom Storage™ Lightning 9900™ V Series Priority Access User's Guide* (MK-92RD117)).

To start monitoring the disk subsystem:

1. Start Performance Monitor (refer to section 3.3).
The Performance Monitor panel appears.
2. Click the **Monitoring Options** tab.
The Monitoring Options panel appears (refer to Figure 5.11).
3. In **Short range monitoring S/W**, select **ON** for the **Current Status** option.
4. Click **Apply**. Performance Monitor starts monitoring the disk subsystem.

Tip: To stop monitoring the disk subsystem, follow the procedure below. If you stop monitoring, Performance Monitor stops collecting statistics.

To stop monitoring the disk subsystem:

1. Start Performance Monitor and click the Monitoring Options tab. The Monitoring Options panel appears (refer to Figure 5.11).
2. In **Short range monitoring S/W**, select **OFF** for the **Current Status** option.
3. Click **Apply**.

5.6.2 Viewing I/O Rates

Performance Monitor tracks traffic between HBAs in the hosts and ports on the disk subsystem, and measures I/O rates (that is, the number of disk I/Os per second).

Note: Statistics must be collected and stored in the disk subsystem before statistics can be viewed (for details, refer to section 5.6.1).

To view I/O rates:

1. Ensure that the Performance Monitor panel is displayed.

2. Click the **WWN** tab (Figure 4.8).

The tree view displays a list of Priority Access groups (). Below Priority Access (PPC) groups appears an item named **Not Grouped**.

- If you double-click a Priority Access group, host bus adapters () in the Priority Access group appear.
- If you double-click **Not Grouped**, host bus adapters () that do not belong to any Priority Access group appear.

3. Select **IOPS** from the drop-down list on the right side of the Monitoring Data panel.

4. In the Monitoring Term area, do either of the following:

- To view the I/O rate in real time, you must select the **Real Time** option and then click **Apply**.

Note: If you use the drop-down list to specify a time before clicking **Apply**, the specified time affects the data range for the graph. For example, if you want to view I/O rates for the last ninety minutes, select 90 from the drop-down list.

- To view I/O rates for a certain period of time in the last 24 hours, you must select the **From** option, change the date and time in the **From** and **To** boxes, and then click **Apply**. Use the arrow button and the sliders when you change the date and time in the **From** and **To** boxes (refer to section 4.2.4).

5. In the tree view, do either of the following:

- To view the I/O rate for host bus adapters in a Priority Access group, select the Priority Access group. The table area displays the I/O rate (Figure 5.18).
- To view the I/O rate for host bus adapters that do not belong to any Priority Access group, select **Not Grouped**. The table area displays the I/O rate (Figure 5.18).

Tips:

- If you select the **Subsystem** folder in the tree view, the table displays the I/O rate at each Priority Access group (Figure 5.18).
- If you select a host bus adapter () in the tree view, the table displays the I/O rate at each port connected to the selected host bus adapter (Figure 5.18).

6. To display a graph to find out how the I/O rate has been changed, take the following steps:
 - a) In the table, select one or more Priority Access groups or WWNs. **Note:** In future versions, the graph can also be displayed when one or more ports are selected in the table.
 - b) Click the Graph button.

CAUTION: If the graph does not display changes in the I/O rate (for example, if the line in the graph runs vertically), it is recommended that you change the value in the **Chart Y Axis Rate** drop-down list. For example, if the largest value in the table is 200 and the value in **Chart Y Axis Rate** is 100, you should select a value larger than 200 from **Chart Y Axis Rate**.

Note: If the WWN of a host bus adapter is displayed in red in the tree view, the host bus adapter is connected to two or more ports, but the traffic between the HBA and some of the ports are *not* controlled by Priority Access (Prioritized Port Control). Refer to section 6.1 for how to control the traffic between the HBA and the all the connected ports.

I/O rate at host bus adapters

(Displayed when a Priority Access group or Not Grouped is selected)

	WWN	PPC Name	Current...	Ave....	Max....	Attribute
	0000000000000041	NAME65	-	71	71	Non-Prio.
	0000000000000042	NAME0066	-	70	70	Non-Prio.
	0000000000000043	NAME0067	-	69	69	Non-Prio.
	0000000000000044	NAME0068	-	68	68	Non-Prio.
	0000000000000045	NAME0069	-	67	67	Non-Prio.
	0000000000000046	NAME0070	-	66	66	Non-Prio.
	0000000000000047	NAME0071	-	65	65	Non-Prio.
	0000000000000048	NAME0072	-	64	64	Non-Prio.

I/O rate at each Priority Access group

(Displayed when the Subsystem folder is selected)

	Group	Current(IOPS)	Ave.(IOPS)(Total)	Max.(IOPS)	Attribute
	GRNICK01	-	7028	7028	Non-Prio.
	GRNICK02	-	924	924	Prio.
	GRNICK03	-	796	796	Non-Prio.
	GRNICK04	-	668	668	Prio.
	GRNICK05	-	540	540	Non-Prio.
	GRNICK06	-	364	364	Prio.
	GRNICK07	-	300	300	Non-Prio.
	Not Grouped	-	3672	3672	-

I/O rate at each port connected to a specified host bus adapter

(Displayed when a host bus adapter is selected)

	Port	Current(IOPS)	Ave.(IOPS)(Total)	Max.(IOPS)	Attribute
	CL1-A	-	-	-	Prio.
	CL1-B	-	-	-	Prio.

Figure 5.18 I/O Rates for Host Bus Adapters

The table displays the following:

- : When the check mark icon () appears in this column, the graph displays changes in workload statistics about the item.
- **Group:** Indicates Priority Access groups
- **Priority Access (PPC) name:** Indicates Priority Access (PPC) names of host bus adapters. Priority Access allows you to assign a *Priority Access (PPC) name* to each host bus adapter so that you can easily identify each host bus adapters in the Priority Access panels.
- **Port:** Indicates ports on the disk subsystem
- **Current:** Indicates the current I/O rate
- **Ave.:** Indicates the average I/O rate for the specified period
- **Max.:** Indicates the maximum I/O rate for the specified period
- **Attribute:** Indicates the priority of each host bus adapter (HBA). **Prio.** indicates a high-priority HBA (a prioritized WWN). **Non-Prio.** indicates a low-priority HBA (a non-prioritized WWN).

5.6.3 Viewing Transfer Rates

Performance Monitor tracks traffic between HBAs in the hosts and ports on the disk subsystem, and measures transfer rates (that is, the size of data transferred in one second).

Note: You must be monitoring the disk subsystem before statistics can be viewed (for details, refer to section 5.6.1).

To view transfer rates:

1. Ensure that the Performance Monitor panel is displayed.
2. Click the **WWN** tab (Figure 4.8).

The tree view displays a list of Priority Access groups (). Below Priority Access groups appears an item named **Not Grouped**.

- If you double-click a Priority Access group, the tree view displays host bus adapters () in the Priority Access group.
 - If you double-click **Not Grouped**, the tree view displays host bus adapters () that do not belong to any Priority Access group.
3. Select **100KB/s** from the drop-down list on the right side of the Monitoring Data panel.

4. In the Monitoring Term area, do either of the following:
 - To view the transfer rate in real time, you must select the **Real Time** option and then click **Apply**.

Note: If you use the drop-down list to specify a time before clicking **Apply**, the specified time affects the data range for the graph. For example, if you want to view transfer rates for the last ninety minutes, select **90** from the drop-down list.
 - To view transfer rates for a certain period of time in the last 24 hours, you must select the **From** option, change the date and time in the **From** and **To** boxes, and then click **Apply**. Use the arrow button and the sliders when you change the date and time in the **From** and **To** boxes (refer to section 4.2.4).
5. In the tree view, do either of the following:
 - To view the transfer rate for host bus adapters in a Priority Access group, select the Priority Access group.

The table area displays the transfer rate (Figure 5.19).
 - To view the transfer rate for host bus adapters that do not belong to any Priority Access group, select **Not Grouped**.

The table area displays the transfer rate (Figure 5.19).

Tips:

 - If you select the **Subsystem** folder in the tree view, the table displays the transfer rate at each Priority Access group (Figure 5.19).
 - If you select a host bus adapter () in the tree view, the table displays the transfer rate at each port connected to the selected host bus adapter (Figure 5.19).
6. To display a graph to find out how the transfer rate has been changed, take the following steps:
 - a) In the table, select one or more Priority Access groups or WWNs. **Note:** In future versions, the graph can also be displayed when one or more ports are selected in the table.
 - b) Click the Graph button.

CAUTION: If the graph does not display changes in the transfer rate (for example, if the line in the graph runs vertically), it is recommended that you change the value in the **Chart Y Axis Rate** drop-down list. For example, if the largest value in the table is 200 and the value in **Chart Y Axis Rate** is 100, you should select a value larger than 200 from **Chart Y Axis Rate**.

Note: If the WWN of a host bus adapter is displayed in red in the tree view, the host bus adapter is connected to two or more ports, however, the traffic between the HBA and some of the ports are *not* controlled by Prioritized Port Control. Refer to section 6.1 for how to control the traffic between the HBA and the all the connected ports.

Transfer rate at host bus adapters

(Displayed when a Priority Access group or Not Grouped is selected)

	WWN	PPC Name	Current...	Ave...	Max...	Attribute
	0000000000000041	NAME65	-	72	72	Non-Prio.
	0000000000000042	NAME0066	-	71	71	Non-Prio.
	0000000000000043	NAME0067	-	70	70	Non-Prio.
	0000000000000044	NAME0068	-	69	69	Non-Prio.
	0000000000000045	NAME0069	-	68	68	Non-Prio.
	0000000000000046	NAME0070	-	67	67	Non-Prio.
	0000000000000047	NAME0071	-	66	66	Non-Prio.
	0000000000000048	NAME0072	-	65	65	Non-Prio.

Transfer rate at each Priority Access group

(Displayed when the Subsystem folder is selected)

	Group	Current...	Ave.(100KB/s)...	Max.(100KB/s)	Attribute
	GRNICK01	-	7174	7174	Non-Prio.
	GRNICK02	-	932	932	Prio.
	GRNICK03	-	804	804	Non-Prio.
	GRNICK04	-	676	676	Prio.
	GRNICK05	-	548	548	Non-Prio.
	GRNICK06	-	371	371	Prio.
	GRNICK07	-	308	308	Non-Prio.
	Not Grouped	-	3702	3702	-

Transfer rate at each port connected to a specified host bus adapter

(Displayed when a host bus adapter is selected)

	Port	Current(100KB/s)	Ave.(100KB/s)...	Max.(100KB/s)	Attribute
	CL1-A	-	-	-	Prio.
	CL1-B	-	-	-	Prio.

Figure 5.19 Transfer Rates for Host Bus Adapters

The table displays the following:

- : When the check mark icon () appears in this column, the graph displays changes in workload statistics about the item.
- **Group:** Indicates Priority Access groups
- **WWN:** Indicates WWNs of host bus adapters
- **Priority Access (PPC) name:** Indicates Priority Access (PPC) names of host bus adapters. Priority Access allows you to assign a *Priority Access (PPC) name* to each host bus adapter so that you can easily identify each host bus adapters in the Priority Access panels.
- **Port:** Indicates ports on the disk subsystem
- **Current:** Indicates the current transfer rate
- **Ave.:** Indicates the average transfer rate for the specified period
- **Max.:** Indicates the maximum transfer rate for the specified period
- **Attribute:** Indicates the priority of each host bus adapter (HBA). **Prio.** indicates a high-priority HBA (a prioritized WWN). **Non-Prio.** indicates a low-priority HBA (a non-prioritized WWN).

5.7 Stopping Monitoring Operations

Use the following procedures when you wish to stop collecting subsystem performance statistics:

Note: Short Range Monitoring will automatically turn off by default after 24 hours.

To stop Long Range Monitoring:

1. From the Monitoring Options tab of Performance Monitor panel, click the Current Status OFF radio button in the Long range monitoring S/W area.
2. Click the **Apply** button.

To stop Short Range Monitoring:

1. From the Monitoring Options tab of Performance Monitor panel, click the Current Status OFF radio button in the Short range monitoring S/W area.
2. Click the **Apply** button.

Note: You must be in **Modify Mode** of Storage Navigator to execute the above operations.

5.8 Exiting Performance Monitor

If you have finished using Performance Monitor to perform various performance management operations (i.e., performance data collection, CruiseControl™ operations and/or Priority Access operations), you should exit Storage Navigator completely.

To exit Storage Navigator,

1. From the Subsystem Information icon toolbar, click the **exit** () icon.
2. The Storage Navigator application shuts down.

Note: Storage Navigator need not be returned to View Mode prior to exiting Performance Monitor or Storage Navigator. However, if you have completed modifications to various Performance Monitor settings, you should exit Storage Navigator to free up system file space.

Note: When exiting CruiseControl™ on UNIX® and other non-Windows® workstations, certain conventions must be followed. For details, refer to *Hitachi Freedom Storage™ Lightning 9900™ V Series Hitachi Remote Console - Storage Navigator™ User's Guide* (MK-92RD101).

Chapter 6 Troubleshooting

This chapter gives troubleshooting information on Performance Monitor. For troubleshooting information on Storage Navigator, please refer to the following documents:

- *9900V Remote Console - Storage Navigator User's Guide (MK-92RD101)*
- *9900V Remote Console - Storage Navigator Error Codes (MP-92RD132)*

6.1 Troubleshooting Performance Monitor

If the WWN of a host bus adapter is displayed in red in the WWN tree view, the host bus adapter is connected to two or more ports, however, the traffic between the HBA and some of the ports is not controlled by Prioritized Port Control. To control the traffic between the HBA and the all the connected ports, take the following steps:

1. Start Prioritized Port Control and ensure that the WWN tab is displayed.
2. In the upper-left tree view, double-click all the ports to which the HBA is connected.
3. Double-click all the Monitor entries and the No-Monitor entries that appear below the specified ports.
4. If you find any occurrence of the HBA below the No-Monitor entries, drag the HBA to Monitor.
5. Ensure that the HBA appears below each of the Monitor entries and click Apply.

6.2 Calling 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. Include the circumstances surrounding the error or failure and the exact content of any error codes and/or messages displayed on the Storage Navigator. 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 A Exporting Monitoring Data to Files

The Export Tool enables you to export monitoring data (i.e., statistics) that can display in the Performance Monitor panel to text files. The Export Tool also enables you to export monitoring data on Hitachi TrueCopy™ or Hitachi TrueCopy - S/390® remote copy operations. If you export monitoring data to text files, you can import the monitoring data into word processor documents. You can also import the monitoring data into spreadsheet or database software to analyze the monitoring data.

Figure A.1 is an example of a text file imported into spreadsheet software:

Transfer rates for LUs (Filename: LU_IOPS.csv)

LU_IOPS.csv					
Serial number : 28528(RAID450)		Indicates that the subsystem serial number is 28528. The word in parentheses is a code that indicates the subsystem type.			
From : 2002/11/25 10:49		Indicates that the data was obtained from 10:49 to 10:52 on Nov. 25, 2002. Sampling rate: 1 indicates that monitoring was performed every minute (at a one-minute interval).			
To : 2002/11/25 10:52					
sampling rate : 1					
No.	time	CL1-B.00(1B-G00).01	CL1-B.00(1B-G00).02	CL1-B.01(WinNT).00	CL1-B.01(WinNT).01
1	2002/11/25 10:49	10	20	30	40
2	2002/11/25 10:50	12	22	30	35
3	2002/11/25 10:51	12	21	29	35
4	2002/11/25 10:52	10	19	32	38
		Indicates monitoring data. If a value is -1, the value indicates that Performance Monitor failed to obtain the data for some reason. For detailed information, refer to the troubleshooting information later in this appendix.			

Notes:

- In this LU_IOPS.csv file, the last two digits of a table column heading (such as **01** and **02**) indicate an LUN. For example, the heading **CL1-B.00(1B-G00).01** indicates the port **CL1-B**, the host storage domain ID **00**, the host storage domain name **1B-G00**, and the LUN **01**.
- If you export monitoring data about concatenated parity groups, the resulting CSV file do not contain column headings for the concatenated parity groups. For example, if you export monitoring data about a concatenated parity group named **1-3[1-4]**, you will be unable to find **1-3[1-4]** in column headings. To locate monitoring data about **1-3[1-4]**, find the **1-3** column or the **1-4** column. Either of these columns contains monitoring data about **1-3[1-4]**.

Figure A.1 An Example of a Text File

Notes:

- When you run the Export Tool, text files are usually compressed in a ZIP-format archive file. To be able to open a text file, you must decompress the ZIP file to extract the text files.
- Text files are in CSV (comma-separated value) format, in which values are delimited by commas. Many spreadsheet applications can be used to open CSV files.
- Do not run multiple instances of the Export Tool simultaneously. If you run multiple instances, the SVP may be overloaded and a timeout error may occur.

A.1 Files to be Exported

The Export Tool enables you to save monitoring data in the Performance Monitor panel into files (see Table A.1 through Table A.8). The Export Tool also enables you to save monitoring data about remote copy operations (see Table A.10). The Export Tool usually compresses monitoring data in ZIP files. When you want to use a text editor or spreadsheet software to view or edit the monitoring data, you usually need to decompress the ZIP files to extract CSV files. However, if you want the Export Tool to save monitoring data in CSV files instead of ZIP files, you can force the Export Tool to do so.

The tables below (Table A.1 through Table A.8) describe ZIP files and CSV files to be saved by the Export Tool.

Table A.1 ZIP Files and CSV Files Containing Statistics About Ports

ZIP File	CSV File	Data Saved in the File
Port_dat.ZIP	Port_IOPS.csv	The number of read and write operations per second.
	Port_MBPS.csv	The size of data transferred per second.

Table A.2 ZIP Files and CSV Files Containing Statistics About Host Bus Adapters Connected to Ports

ZIP File	CSV File	Data Saved in the File
PortWWN_dat.ZIP	PortWWN_xx_IOPS.csv	The I/O rate (that is, the number of read and write operations per second) for HBAs that are connected to a port.
	PortWWN_xx_100KBPS.csv	The size of data transferred per second between a port and the HBAs connected to that port (the unit is 100 KB/sec).

Notes:

- The letters "xx" in CSV filenames indicate a port name. For example, if the filename is PortWWN_1A_IOPS.csv, the file contains the I/O rate for each host bus adapter connected to the CL1-A port.
- If files are exported to a Windows computer, CSV filenames may end with numbers (for example, PortWWN_1A_IOPS-1.csv and PortWWN_1a_IOPS-2.csv).

Table A.3 ZIP Files and CSV Files Containing Statistics About PPC Groups

ZIP File	CSV File	Data Saved in the File
PPCG_dat.ZIP	PPCG_IOPS.csv	The number of read and write operations per second.
	PPCG_100KBPS.csv	The size of data transferred per second.

Table A.4 ZIP and CSV Files Containing Statistics About Host Bus Adapters Belonging to PPC Groups

ZIP File	CSV File	Data Saved in the File
PPCGWWN_dat.ZIP	PPCGWWN_xx_IOPS.csv	The I/O rate (that is, the number of read and write operations per second) for HBAs belonging to a PPC group
	PPCGWWN_xx_100KBPS.csv	The transfer rate for HBAs belonging to a PPC group (The unit is 100 KB/sec)
	PPCGWWN_NotGrouped_IOPS.csv	The I/O rate (that is, the number of read and write operations per second) for HBAs that do not belong to any PPC group
	PPCGWWN_NotGrouped_100KBPS.csv	The transfer rate for HBAs that do not belong to any PPC group (The unit is 100 KB/sec)

Notes:

- The letters "xx" in CSV filenames indicate the name of a PPC group.
- If files are exported to a Windows computer, CSV filenames may end with numbers (for example, PPCGWWN_mygroup_IOPS-1.csv and PPCGWWN_MyGroup_IOPS-2.csv).

Table A.5 ZIP Files and CSV Files Containing Statistics About Parity Groups or External LU Groups

ZIP File	CSV File	Data Saved in the File
PG_dat.ZIP	PG_IOPS.csv	The number of read and write operations per second.
	PG_TransRate.csv	The size of data transferred per second (the unit is MB/sec).
	PG_Read_IOPS.csv	The number of read operations per second.
	PG_Seq_Read_IOPS.csv	The number of sequential read operations per second.
	PG_Rnd_Read_IOPS.csv	The number of random read operations per second.
	PG_CFW_Read_IOPS.csv	The number of read operations in "cache-fast-write" mode per second.
	PG_Write_IOPS.csv	The number of write operations per second.
	PG_Seq_Write_IOPS.csv	The number of sequential write operations per second.
	PG_Rnd_Write_IOPS.csv	The number of random write operations per second.
	PG_CFW_Write_IOPS.csv	The number of write operations in "cache-fast-write" mode per second.
	PG_Read_Hit.csv	The read hit ratio.
	PG_Seq_Read_Hit.csv	The read hit ratio in sequential access mode.
	PG_Rnd_Read_Hit.csv	The read hit ratio in random access mode.
	PG_CFW_Read_Hit.csv	The read hit ratio in "cache-fast-write" mode.
	PG_Write_Hit.csv	The write hit ratio.
	PG_Seq_Write_Hit.csv	The write hit ratio in sequential access mode.
	PG_Rnd_Write_Hit.csv	The write hit ratio in random access mode.
	PG_CFW_Write_Hit.csv	The write hit ratio in "cache-fast-write" mode.
	PG_BackTrans.csv	The number of data transfer operations between cache memories and disk drives (i.e., parity groups or external LU groups) per second.
	PG_C2D_Trans.csv	The number of data transfer operations from cache memories and disk drives (i.e., parity groups or external LU groups).
	PG_D2CS_Trans.csv	The number of data transfer operations from disk drives (i.e., parity groups or external LU groups) to cache memories in sequential access mode.
	PG_D2CR_Trans.csv	The number of data transfer operations from disk drives (i.e., parity groups or external LU groups) to cache memories in random access mode.

Table A.6 ZIP Files and CSV Files Containing Statistics About Logical Volumes in Parity Groups or in External LU Groups

ZIP File	CSV File	Data Saved in the File
LDEV_IOPS.ZIP	LDEV_IOPS_x-y.csv	The number of read and write operations per second.
LDEV_TransRate.ZIP	LDEV_TransRate_x-y.csv	The size of data transferred per second.
LDEV_Read_IOPS.ZIP	LDEV_Read_IOPS_x-y.csv	The number of read operations per second.
LDEV_Seq_Read_IOPS.ZIP	LDEV_Seq_Read_IOPS_x-y.csv	The number of sequential read operations per second.
LDEV_Rnd_Read_IOPS.ZIP	LDEV_Rnd_Read_IOPS_x-y.csv	The number of random read operations per second.
LDEV_CFW_Read_IOPS.ZIP	LDEV_CFW_Read_IOPS_x-y.csv	The number of read operations in "cache-fast-write" mode per second.
LDEV_Write_IOPS.ZIP	LDEV_Write_IOPS_x-y.csv	The number of write operations per second.
LDEV_Seq_Write_IOPS.ZIP	LDEV_Seq_Write_IOPS_x-y.csv	The number of sequential write operations per second.
LDEV_Rnd_Write_IOPS.ZIP	LDEV_Rnd_Write_IOPS_x-y.csv	The number of random write operations per second.
LDEV_CFW_Write_IOPS.ZIP	LDEV_CFW_Write_IOPS_x-y.csv	The number of write operations in "cache-fast-write" mode per second.
LDEV_Read_Hit.ZIP	LDEV_Read_Hit_x-y.csv	The read hit ratio.
LDEV_Seq_Read_Hit.ZIP	LDEV_Seq_Read_Hit_x-y.csv	The read hit ratio in sequential access mode.
LDEV_Rnd_Read_Hit.ZIP	LDEV_Rnd_Read_Hit_x-y.csv	The read hit ratio in random access mode.
LDEV_CFW_Read_Hit.ZIP	LDEV_CFW_Read_Hit_x-y.csv	The read hit ratio in "cache-fast-write" mode.
LDEV_Write_Hit.ZIP	LDEV_Write_Hit_x-y.csv	The write hit ratio.
LDEV_Seq_Write_Hit.ZIP	LDEV_Seq_Write_Hit_x-y.csv	The write hit ratio in sequential access mode.
LDEV_Rnd_Write_Hit.ZIP	LDEV_Rnd_Write_Hit_x-y.csv	The write hit ratio in random access mode.
LDEV_CFW_Write_Hit.ZIP	LDEV_CFW_Write_Hit_x-y.csv	The write hit ratio in "cache-fast-write" mode.
LDEV_BackTrans.ZIP	LDEV_BackTrans_x-y.csv	The number of data transfer operations between cache memories and disk drives (i.e., logical volumes) per second.
LDEV_C2D_Trans.ZIP	LDEV_C2D_Trans_x-y.csv	The number of data transfer operations from cache memories and disk drives (i.e., logical volumes).
LDEV_D2CS_Trans.ZIP	LDEV_D2CS_Trans_x-y.csv	The number of data transfer operations from disk drives (i.e., logical volumes) to cache memories in sequential access mode.
LDEV_D2CR_Trans.ZIP	LDEV_D2CR_Trans_x-y.csv	The number of data transfer operations from disk drives (i.e., logical volumes) to cache memories in random access mode.

Note: The letters "x-y" in CSV filenames indicate a parity group. For example, if the filename is LDEV_IOPS_1-2.csv, the file contains the I/O rate for each logical volume in the parity group 1-2.

Table A.7 ZIP Files and CSV Files Containing Statistics About LU Paths

ZIP File	CSV File	Data Saved in the File
LU_dat.ZIP	LU_IOPS.csv	The number of read and write operations per second.
	LU_TransRate.csv	The size of data transferred per second.
	LU_Seq_Read_IOPS.csv	The number of sequential read operations per second.
	LU_Rnd_Read_IOPS.csv	The number of random read operations per second.
	LU_Seq_Write_IOPS.csv	The number of sequential write operations per second.
	LU_Rnd_Write_IOPS.csv	The number of random write operations per second.
	LU_Seq_Read_Hit.csv	The read hit ratio in sequential access mode.
	LU_Rnd_Read_Hit.csv	The read hit ratio in random access mode.
	LU_Seq_Write_Hit.csv	The write hit ratio in sequential access mode.
	LU_Rnd_Write_Hit.csv	The write hit ratio in random access mode.
	LU_C2D_Trans.csv	The number of data transfer operations from cache memories and disk drives (i.e., LUs).
	LU_D2CS_Trans.csv	The number of data transfer operations from disk drives (i.e., LUs) to cache memories in sequential access mode.
	LU_D2CR_Trans.csv	The number of data transfer operations from disk drives (i.e., LUs) to cache memories in random access mode.

Table A.8 ZIP Files and CSV Files Containing Statistics About Resource Usage Rates and Write Pending Rates

ZIP File	CSV File	Data Saved in the File
Physical_dat.ZIP	PHY_PG.csv	Usage rates for parity groups
	PHY_CHP.csv	Usage rates for channel processors
	PHY_DKP.csv	Usage rates for disk processors
	PHY_DRR.csv	Usage rates for DRRs (data recovery and regeneration processors)
	PHY_MPA_CSW.csv	■ Usage rates for access paths between channel adapters and cache memories ■ Usage rates for access paths between disk adapters and cache memory
	PHY_MPA_SMA.csv	■ Usage rates for access paths between channel adapters and the shared memory ■ Usage rates for access paths between disk adapters and the shared memory
	PHY_CSW_CMA.csv	Usage rates for access paths between cache switches and cache memories
	PHY_Write_Pending_Rate.csv	Write pending rates
	PHY_LDEV_x-y.csv	Usage rates for logical volumes in a parity group Note: The letters "x-y" in CSV filenames is a parity group ID.
PhyPG_dat.ZIP	PHY_PG.csv	Usage rates for parity groups
PhyProc_dat.ZIP	PHY_CHP.csv	Usage rates for channel processors
	PHY_DKP.csv	Usage rates for disk processors
	PHY_DRR.csv	Usage rates for DRRs (data recovery and regeneration processors)
PhyCSW_dat.ZIP	PHY_MPA_CSW.csv	■ Usage rates for access paths between channel adapters and cache memories ■ Usage rates for access paths between disk adapters and cache memories
	PHY_MPA_SMA.csv	■ Usage rates for access paths between channel adapters and the shared memory ■ Usage rates for access paths between disk adapters and the shared memory
	PHY_CSW_CMA.csv	Usage rates for access paths between cache switches and cache memories
	PHY_Write_Pending_Rate.csv	Write pending rates
PhyLDEV_dat.ZIP	PHY_LDEV_x-y.csv	Usage rates for logical volumes in a parity group. Note: The letters "x-y" in CSV filenames is a parity group ID.

Table A.9 ZIP Files and CSV Files Containing Statistics About Remote Copy Operations

ZIP File	CSV File	Data Saved in the File
RemoteCopy_dat.ZIP	RemoteCopy.csv	Usage rate for sidefile cache Average transfer rate (kB/sec) for initial copy remote I/Os. Average transfer rate (kB/sec) for update copy remote I/Os. Average transfer rate (kB/sec) for TrueCopy/TC390 Async update copy remote I/Os.

A.2 Preparing for Using the Export Tool

This section explains how to prepare for using the Export Tool.

A.2.1 Requirements for Using the Export Tool

The following components are required to use the Export Tool:

- A Windows® computer or a UNIX® computer

The Export Tool runs on Windows® computers and UNIX® computers that can run Storage Navigator. If your Windows® or UNIX® computer is unable to run Storage Navigator, your computer is unable to run the Export Tool. For detailed information about computers that can run Storage Navigator, please refer to *9900V Remote Console - Storage Navigator User's Guide (MK-92RD101)*.

- Java™ Runtime Environment (JRE)

To be able to use the Export Tool, you must install Java™ Runtime Environment on your Windows® or UNIX® computer. If your computer runs Storage Navigator, JRE is already installed on your computer and you can install the Export Tool. If your computer does not run Storage Navigator but contains an appropriate version of JRE, you can install the Export Tool on your computer.

Note: The JRE version required for running the Export Tool is the same as the JRE version required for running Storage Navigator. For detailed information about the JRE version required for running Storage Navigator, please refer to *9900V Remote Console - Storage Navigator User's Guide (MK-92RD101)*.

- A user ID exclusively for use with the Export Tool

If you want to use the Export Tool, you must create a user ID that will be used exclusively with the Export Tool. Also, you must ensure that the user ID does *not* have write permission. Do not use any other user ID when you use the Export Tool. If a user ID having write permission is used with the Export Tool, the subsystem configuration might be changed in an unfavorable way by an unidentified user.

Note: However, if you want to use the `set` subcommand (see section A.4.12), you must ensure that the user ID has write permission in either of the following ways:

- If you want to use the **longrange** or **shrotrange** operand with the **set** subcommand, you must ensure that the user ID has write permission for Performance Monitor. To assign write permission for **Performance Monitor** to a user ID, check the Performance Monitor option and then click the **Submit** button in the User Entry panel or in the User List Editor panel of Storage Navigator.

- If you want to use the **remotecopyrange** operand with the **set** subcommand, you must ensure that the user ID has write permission for Hitachi TrueCopy™ (TC) or Hitachi TrueCopy - S/390® (TC390). To assign write permission for TC or TC390 to a user ID, check the **TrueCopy™** or **TrueCopy - S/390(R)** option and then click the **Submit** button in the User Entry panel or in the User List Editor panel of Storage Navigator.

For detailed information about how to create a user ID, please refer to *9900V Remote Console - Storage Navigator User's Guide* (MK-92RD101).

- The Export Tool program

The Export Tool is provided with the Performance Monitor product (installation media). For detailed information about how to install the Export Tool on a Windows® computer, see section A.2.2. For detailed information about how to install the Export Tool on a UNIX® computer, see section A.2.3.

A.2.2 Installing the Export Tool on a Windows® Computer

To install the Export Tool on a Windows® computer:

1. Create a directory on your Windows® computer.
In later steps, you will install the Export Tool on the new directory.
2. Insert the Export Tool installation media into the appropriate drive.
3. Locate the self-extracting file **export.EXE** in the directory **\program\monitor\win_nt** in your CD-ROM disc, and then copy **export.EXE** to the new directory that you created earlier.
4. Double-click **export.EXE** on your computer.

The Export Tool is installed. Also, a new directory named **export** is created.

Notes:

- The **export** directory contains a couple of files, which include **runUNIX.bat**. It is recommended that you delete **runUNIX.bat** because this file is no longer needed.
- The Export Tool program is a Java™ class file and is located in the **export\lib** directory.

A.2.3 Installing the Export Tool on a UNIX® Computer

To install the Export Tool on a UNIX® computer:

1. Create a directory on your UNIX® computer.
In later steps, you will install the Export Tool on the new directory.
2. Mount the Export Tool installation media.
3. Do either of the following:
 - If you are using Solaris™, please locate the archive file export.tar in the directory /program/monitor/solaris in your CD-ROM disc, and then copy export.tar to the new directory that you created earlier.
 - If you are using HP-UX, please locate the archive file export.tar in the directory /program/monitor/HP-UX in your CD-ROM disc, and then copy export.tar to the new directory that you created earlier.
4. Decompress export.tar on your computer.

The Export Tool is installed. Also, a new directory named **export** is created.

Notes:

- The export directory contains a couple of files, which include runWin.bat. It is recommended that you delete runWin.bat because this file is no longer needed.
- The Export Tool program is a Java™ class file and is located in the export/lib directory.

A.3 Using the Export Tool

To be able to export monitoring data, you must prepare a command file and a batch file. This section explains how to prepare a command file and a batch file, and then explains how to run the Export Tool.

- Preparing a command file (see section A.3.1)
- Preparing a batch file (see section A.3.2)
- Running the Export Tool (see section A.3.3)

A.3.1 Preparing a Command File

To be able to run the Export Tool, you must write scripts for exporting monitoring data. When writing scripts, you need to write several subcommands in a *command file*. When you run the Export Tool, the subcommands in the command file execute sequentially, and then the monitoring data are saved in files.

Figure A.2 gives an example of a command file:

```
svpip 158.214.135.57      ; Specifies IP address of SVP
login expusr passwd      ; Logs user into SVP
show                     ; Outputs monitoring term to standard output
group Port               ; Specifies type of data to be exported
group Physical           ; Specifies type of data to be exported
group RemoteCopy         ; Specifies type of data to be exported
shortrange 200310010850:200310010910
                           ; Specifies range of data to be exported
longrange 200309301430:200310011430
                           ; Specifies range of data to be exported
remotecopyrange 200309301430:200310011430
                           ; Specifies range of data to be exported
outpath out              ; Specifies directory in which files will be saved
option compress          ; Specifies whether to compress files
apply                   ; Executes processing for saving monitoring data in files
```

Note: In the above scripts, the semicolon (;) indicates the beginning of a comment. Characters from a semicolon to the end of the line are regarded as a comment.

Figure A.2 An Example of a Command File

The following detail the commands seen in Figure A.2:

- `svpip 158.214.135.57`

This script specifies that you are logging into the SVP whose IP address is 158.214.135.57. You must log into the SVP when using the Export Tool.

The `svpip` subcommand specifies the IP address of the SVP. You must include the `svpip` subcommand in your command file. For detailed information about the `svpip` subcommand, see section A.4.1.

- `login expusr passwd`

This script specifies that you use the user ID **expusr** and the password **passwd** to log into the SVP.

The `login` subcommand logs the specified user into the SVP. You must include the `login` subcommand in your command file. For detailed information about the `login` subcommand, see section A.4.3.

CAUTION: When you write the `login` subcommand in your command file, you must specify a user ID that should be used exclusively for running the Export Tool. See section A.2.1 for reference.

- `show`

The `show` subcommand checks the SVP to find the range of monitoring data that you can export, and then outputs the range to the standard output (for example, the command prompt) and the log file.

The following is an example of information that the `show` subcommand outputs:

Short Range	From: 2003/10/01 01:00 - To: 2003/10/01 15:00
Long Range	From: 2003/09/01 00:00 - To: 2003/10/01 15:00
Remote Copy	From: 2003/09/30 00:00 - To: 2003/10/01 15:00

Short Range indicates the range of monitoring data that you can export from the **LDEV** tab, the **Port-LUN** tab, and the **WWN** tab of Performance Monitor. In the above example, you can export monitoring data within the range of 1:00-15:00 on Oct. 1, 2003.

Long Range indicates the range of monitoring data that you can export from the **Physical** tab of Performance Monitor. In the above example, you can export monitoring data within the range of Sept. 1, 2003, 0:00 through Oct. 1, 2003, 15:00.

Remote Copy indicates the range of monitoring data that you can export from Hitachi TrueCopy™ or Hitachi TrueCopy - S/390®. In the above example, you can export monitoring data within the range of Sep. 30, 2003, 0:00 through Oct. 1, 2003, 15:00.

The use of the `show` subcommand is not mandatory, but it is recommended that you include the `show` subcommand in your command file. If an error occurs when you run the Export Tool, you might be able to find the error by checking the log file for information issued by the `show` subcommand. For detailed information about the `show` subcommand, see section A.4.4.

Note: The **Monitoring Term** area of the Performance Monitor panel displays information that the `show` subcommand outputs to the **Short Range** and **Long Range** (see Figure A.3).

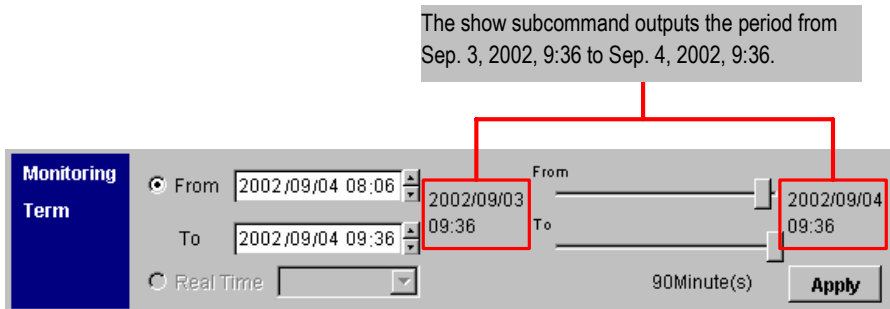


Figure A.3 The Starting Time and the Ending Time for Collecting Monitoring Data (for Short Range and Long Range)

- **group Port, group Physical, and group RemoteCopy**
group Port specifies that the Export Tool should export port statistics (such as I/O rates and transfer rates). group Physical specifies that the Export Tool should export statistics that should be displayed in the Physical tab (for example, usage rates for parity groups and channel adapters). group RemoteCopy specifies that the Export Tool should export statistics about remote copy operations (such as sidefile cache usage).

The group subcommand specifies the type of data that you want to export. For detailed information about the group subcommand, see section A.4.5.

- **shortrange 200310010850:200310010910,**
longrange 200309301430:200310011430, and
remotecopyrange 200309301430:200310011430

The shortrange and longrange subcommands specify the range of data that you want to export. The difference between these subcommands is as follows:

- Use the shortrange subcommand when you want to export monitoring data that should be displayed in the **LDEV** tab, the **Port-LUN** tab, or the **WWN** tab of the Performance Monitor.
- Use the longrange subcommand when you want to export monitoring data that should be displayed in the **Physical** tab of the Performance Monitor.
- Use the remotecopyrange subcommand when you want to export monitoring data on remote copy operations.

The script shortrange 200310010850:200310010910 specifies the period 8:50-9:10 on Oct. 1, 2003. In the above example, the Export Tool exports port statistics within the specified period. For detailed information about the shortrange subcommand, see section A.4.6.

The script longrange 200309301430:200310011430 specifies the period from Sep. 30, 2003, 14:30 to Oct. 1, 2003, 14:30. In the above example, the Export Tool exports usage statistics about resources (such as disk adapters and access paths) within the specified period. For detailed information about the longrange subcommand, see section A.4.7.

The script remotecopyrange 200309301430:200310011430 specifies the period from Sep. 30, 2003, 14:30 to Oct. 1, 2003, 14:30. In the above example, the Export Tool exports statistics about remote copy operations within the specified period. For detailed information about the remotecopyrange subcommand, see section A.4.8.

- **outpath out**

This script specifies that files should be saved in the directory named **out** in the current directory.

The **outpath** subcommand specifies the directory in which files should be saved. For detailed information about the **outpath** subcommand, see section A.4.9.

- **option compress**

This script specifies that the Export Tool should compress monitoring data in ZIP files.

The **option** subcommand specifies whether to save files in ZIP format or in CSV format. For detailed information about the **option** subcommand, see section A.4.10.

- **apply**

The **apply** subcommand saves monitoring data in files. For detailed information about the **apply** command, see section A.4.11.

When you install the Export Tool, the file **command.txt** will be stored in the **export** directory. The **command.txt** file contains sample scripts for your command file. It is recommended that you customize scripts in **command.txt** according to your needs. For detailed information about subcommand syntax, see section A.4.

A.3.2 Preparing a Batch File

To run the Export Tool, you need a batch file. The Export Tool starts and saves monitoring data in files when you execute the batch file.

The installation directory for the Export Tool (that is, the **export** directory) contains two batch files: **runWin.bat** and **runUNIX.bat**. If your computer runs Windows®, use **runWin.bat**. If your computer runs UNIX®, use **runUNIX.bat**.

Figure A.4 illustrates scripts in **runWin.bat** and **runUNIX.bat**. These batch files include a command line that executes a Java™ command. When you execute your batch file, the Java™ command executes subcommands specified in your command file and then saves monitoring data in files.

Batch file for Windows® computers (runWin.bat)

```
java -classpath ".\lib\JSanExport.jar;.\lib\JSanRmiServer.jar" -Dmd.command=command.txt -
Dmd.logpath=log sanproject.getmondat.RJMdMain ↵
pause ↵
```

Batch file for UNIX® computers (runUNIX.bat)

```
#!/bin/sh ↵
java -classpath ".\lib\JSanExport.jar:.\lib\JSanRmiServer.jar" -Dmd.command=command.txt -
Dmd.logpath=log sanproject.getmondat.RJMdMain ↵
```

Note: The "↵" symbol indicates the end of a command line.

Figure A.4 Scripts in Batch Files (**runWin.bat** and **runUNIX.bat**)

If the computer that runs the Export Tool communicates directly with the SVP, you usually do not need to change scripts in **runWin.bat** and **runUNIX.bat**. However, you might need to edit the Java™ command script in your text editor on some occasions, for example:

- if the name of your command file is not **command.txt**
- if you moved your command file to a different directory
- if you do not want to save log files in the "log" directory
- if you want to name log files as you like

If the computer that runs the Export Tool communicates with the SVP via a proxy host, you need to edit the Java™ command script in your text editor. When editing the Java™ command script, you need to specify the host name (or the IP address) and the port number of the proxy host. For example, if the host name is **Jupiter** and the port number is **8080**, the resulting command script is as shown in Figure A.5:

Batch file for Windows® computers (runWin.bat)

```
java -classpath "./lib/JSanExport.jar;./lib/JSanRmiServer.jar" -Dhttp.proxyHost=Jupiter
-Dhttp.proxyPort=8080 -Dmd.command=command.txt -Dmd.logpath=log
sanproject.getmondat.RJMdMain ↵
pause ↵
```

Batch file for UNIX® computers (runUNIX.bat)

```
#!/bin/sh ↵
java -classpath "./lib/JSanExport.jar:./lib/JSanRmiServer.jar" -Dhttp.proxyHost=Jupiter
-Dhttp.proxyPort=8080 -Dmd.command=command.txt -Dmd.logpath=log
sanproject.getmondat.RJMdMain ↵
```

Note: The "↵" symbol indicates the end of a command line.

Figure A.5 Scripts in Batch Files (When Specifying the Host Name of a Proxy Host)

If the IP address of the proxy host is **158.211.122.124** and the port number is **8080**, the resulting command script is as follows:

Batch file for Windows® computers (runWin.bat)

```
java -classpath "./lib/JSanExport.jar;./lib/JSanRmiServer.jar" -Dhttp.proxyHost=158.211.122.124
-Dhttp.proxyPort=8080 -Dmd.command=command.txt -Dmd.logpath=log sanproject.getmondat.RJMdMain ↵
pause ↵
```

Batch file for UNIX® computers (runUNIX.bat)

```
#!/bin/sh ↵
java -classpath "./lib/JSanExport.jar:./lib/JSanRmiServer.jar" -Dhttp.proxyHost=158.211.122.124
-Dhttp.proxyPort=8080 -Dmd.command=command.txt -Dmd.logpath=log sanproject.getmondat.RJMdMain ↵
```

Note: The "↵" symbol indicates the end of a command line.

Figure A.6 Scripts in Batch Files (When Specifying the IP Address of a Proxy Host)

For detailed information about Java™ command syntax, see section A.4.14.

A.3.3 Running the Export Tool

To run the Export Tool and save monitoring data in files, you need to execute your batch file. To execute your batch file, you need to enter the name of the batch file at the command prompt and then press the <Enter> key (see Figure A.7 for reference). If you are using a Windows® computer, you can double-click the batch file to execute the batch file.

```
c:\WINDOWS> c:\export> runWin.bat ← Execute runWin.bat
```

Figure A.7 An Example of Executing a Batch File (on a Windows® Computer)

When the Export Tool starts exporting monitoring data, dots (...) are issued to the standard output (e.g., the command prompt). The dots increment as export processing continues (see Figure A.8). If an internal error occurs, the exclamation mark (!) is issued to the standard output and the Export Tool attempts to restart exporting data. If the export processing restarts, dots reappear and increment until export processing finishes.

```
[ 2] svpip 158.214.135.57      ← Displays the currently-running subcommand
[ 3] login User = expusr, Passwd = [*****] ← Displays the currently-running subcommand
:
:
[ 6] group Port                ← Displays the currently-running subcommand
:
:
[20] apply                    ← Displays the currently-running subcommand
Start gathering port data      ← Indicates that the export processing starts
Target = 16, Total = 16
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
.....!                      ← Indicates that an error occurs during the export processing
.....                      ← Dots appear and increment as the export processing
continues
End gathering port data        ← Indicates that the export processing ends successfully
```

Figure A.8 An Example of Command Prompt Outputs When the Export Tool Runs

When the Export Tool finishes successfully, monitoring data are usually compressed in ZIP-format archive files. If you want to obtain CSV files, you need to decompress ZIP files and extract CSV files out of the ZIP files. If the operating system on your computer does not include a feature for decompressing ZIP files, you need to obtain software for decompressing files.

For a complete list of files to be saved by the Export Tool, see section A.1.

Notes:

- When an internal error occurs during export processing, the exclamation mark (!) appears and then retries export processing. Usually, the Export Tool can retry processing up to three times. If export processing does not finish through three retries, you need to quit the command prompt and then run the Export Tool again. Note, however, that you can change the maximum number of retries by using the `retry` subcommand. For detailed information about the `retry` subcommand, refer to section A.4.2.
- If you specify the `nocompress` operand for the `option` subcommand, the Export Tool saves files in CSV format instead of ZIP format (for detailed information, see section A.4.10). **Note:** When files are saved in CSV format instead of ZIP format, the file saving process could take longer and the resulting files could be larger.
- Files saved by the Export Tool are often very large. The total file size for all the files can be as large as approximately 2 GB. For this reason, the exporting process might take a lot of time (see Table A.10). If you want to export statistics spanning a long period of time, it is recommended that you use the Export Tool more than one time, rather than using the tool only one time to export all the statistics. For example, if you want to export statistics spanning 24 hours, you could run the Export Tool eight times; each time you run the Export Tool, the tool should export statistics spanning three hours.

Table A.10 Estimates of Time Required for Exporting Files

Operand for the Group Subcommand	Estimated Time	Remarks
Port	5 minutes	This estimate assumes that the Export Tool should save statistics about 64 ports within a 24-hour period.
PortWWN	5 minutes	This estimate assumes that the Export Tool should save statistics about 64 ports within a 24-hour period.
PPCG	10 minutes	
LDEV	60 minutes	This estimate assumes: The Export Tool should save statistics about 8,192 logical volumes within a 24-hour period. The Export Tool is used eight times. Each time the Export Tool is used, the tool obtains statistics within a 3-hour period.
LU	60 minutes	This estimate assumes: The Export Tool should save statistics about 12,288 LUs within a 24-hour period. The Export Tool is used eight times. Each time the Export Tool is used, the tool obtains statistics within a 3-hour period.

- Whenever the Export Tool runs, the Export Tool creates a new log file on your computer. Therefore, if you run the Export Tool repeatedly, the size of free space on your computer will be reduced. To secure free space on your computer, it is strongly recommended that you delete log files regularly. For information about the directory containing log files, see section A.4.14.
- For information about how to solve errors with the Export Tool, see section A.5.
- The Export Tool returns a termination code when the Export Tool finishes (see Table A.11).

Table A.11 Termination Codes Returned by Export Tool

Termination Code	Meaning
0	The Export Tool finished successfully.
1	An error occurred when the set subcommand (see section A.4.12) executed, because an attempt to switch to Modify mode failed. Some other user might have been logged on in Modify mode.
2	An error occurred due to some reason unrelated to SVP modes (i.e., View mode and Modify mode)
3	An error occurred due to more than one reason. One of the reasons is that an attempt to switch to Modify mode failed when the set subcommand (see section A.4.12) executed. Some other user might have been logged on in Modify mode.
4	• The user ID does not have write permission for Performance Monitor. • The user ID does not have write permission for Hitachi TrueCopy™ or Hitachi TrueCopy - S/390®.

If you want to use a reference to a termination code in your batch file, do the following:

- To use such a reference in a Windows batch file, write **%errorlevel%** in the batch file.
- To use such a reference in a UNIX Bourne shell script, write **%?** in the shell script.
- To use such a reference in a UNIX C shell script, write **%status** in the shell script.

A reference to a termination code is used in the following example of a Windows batch file. If this batch file executes and the Export Tool returns the termination code 1 or 3, the command prompt displays a message that indicates the set subcommand fails.

```
java -classpath ".\lib\JSanExport.jar;.\lib\JSanRmiServer.jar" -Dmd.command=command.txt
-Dmd.logpath=log sanproject.getmondat.RJMdMain ↵
if %errorlevel%==1 echo THE SET SUBCOMMAND FAILED ↵
if %errorlevel%==3 echo THE SET SUBCOMMAND FAILED ↵
pause ↵
```

Note: The "↵" symbol indicates the end of a command line.

Figure A.9 An Example of a Batch File Including a Reference to Termination Code

A.4 Command Reference

This section explains the syntax of subcommands that you can write in your command file. This section also explains the syntax of the Java™ command that should be used in your batch file.

■ Conventions used in this section:

This section uses the following symbols and typefaces to explain syntax:

△

Indicates a space.

bold

Indicates characters that you must type as they are.

italics

Indicates a type of an operand. You do not need to type characters in italics as they are.

[]

Indicates one or more operands that can be omitted.

If two or more operands are enclosed by this square brackets and are delimited by vertical bars (|), you can select one of the operands. For detailed information, refer to Table A.12.

{ }

Indicates that you must select one operand from the operands enclosed by the braces. Two or more operands are enclosed by the braces and are delimited by vertical bars (|). For detailed information, refer to Table A.12.

...

Indicates that a previously used operand can be repeated. For detailed information, refer to Table A.12.

Table A.12 Syntax Descriptions

Syntax	The Syntax Indicates that You Can Write the Following Script
connect △ <i>ip-address</i>	connect 123.01.22.33
destination △[<i>directory</i>]	■ destination ■ destination c:\temp
compress △[yes no]	■ compress ■ compress yes ■ compress no
answer △{yes no}	■ answer yes ■ answer no
ports △[<i>name</i>][△...]	■ ports ■ ports port-1 ■ ports port-1 port-2

■ **Notes on writing script in the command file**

Note the following when you write script in your command file:

- Ensure that only one subcommand is used in one line.
- Note that empty lines in any command file will be ignored.
- Use a semicolon (;) if you want to insert a comment in your command file. If you enter a semicolon in one line, the remaining characters in that line will be regarded as a comment.

```

//////////
;;;  COMMAND FILE: command.txt  ;;;;
//////////
svpip 158.214.135.57      ; IP address of SVP
login expusr "passwd"    ; Log onto SVP

```

Figure A.10 Examples of Comments

■ **Viewing the on-line Help for subcommands**

You can display the on-line Help to view the syntax of subcommands when you are working at the command prompt. To be able to view the on-line Help, you must use the **help** subcommand of the Export Tool. For detailed information about how to use the **help** subcommand, see section A.4.13.

A.4.1 The svpip Subcommand

A.4.1.1 Syntax

`svpip△{ip-address|host-name}`

A.4.1.2 Description

The `svpip` subcommand

Specifies the IP address or the host name of the SVP.

A.4.1.3 Operands

ip-address

Specifies the IP address of the SVP.

host-name

Specifies the host name of the SVP.

If the host name includes any character that is neither an alphanumeric nor a period, the host name must be enclosed by double quotation marks ("").

A.4.1.4 Example

The following example specifies the IP address of the SVP as 158.214.127.170.

```
svpip 158.214.127.170
```

A.4.2 The retry Subcommand

A.4.2.1 Syntax

`retry△[time=m] △[count=n]`

A.4.2.2 Description

The **retry** subcommand makes settings on retries of export processing.

When an internal error occurs during export processing, the Export Tool stops processing and then retries export processing. By default, the Export Tool can retry processing up to three times, but you can change the maximum number of retries by using the **retry** subcommand.

By default, the interval between one retry and the next retry is two minutes. You can change the interval by using the **retry** subcommand.

The **retry** subcommand must execute before the **login** subcommand executes.

A.4.2.3 Operands

time=*m*

Specifies the interval between retries in minutes.

m is a value within the range of 1 to 59.

If this operand is omitted, the interval between retries is two minutes.

count=*n*

Specifies the maximum number of retries.

If *n* is 0, the number of retries is unlimited.

If this operand is omitted, the maximum number of retries is 3.

A.4.2.4 Example

If the following command file is used, the interval between retries is five minutes and the maximum number of retries is 10.

```
svpip 158.214.135.57
retry time=5 count=10
login expusr passwd
show
group Port
shortrange 200304010850:200304010910
outpath out
option compress
apply
```

A.4.3 The login Subcommand

A.4.3.1 Syntax

`login△userid△password`

A.4.3.2 Description

The **login** subcommand uses a user ID and a password to log the specified user in the SVP.

The **svpip** subcommand must execute before the **login** subcommand executes.

The **login** subcommand fails if monitoring data does not exist in the SVP.

A.4.3.3 Operands

userid

Specifies the user ID for the SVP.

If the user ID includes any non-alphanumeric character, the user ID must be enclosed by double quotation marks ("").

Note: Be sure to specify a user ID that should be used exclusively with the Export Tool. For detailed information, see section A.2.1.

password

Specifies the password of the user.

If the password includes any non-alphanumeric character, the password ID must be enclosed by double quotation marks ("").

A.4.3.4 Example

This example logs the user **expusr** into the SVP whose IP address is 158.214.127.170. The password is **pswd**.

```
svpip 158.214.127.170
login expuser pswd
```

A.4.4 The show Subcommand

A.4.4.1 Syntax

show

A.4.4.2 Description

The show subcommand determines when monitoring data was collected and then outputs the information to the standard output (e.g., to the command prompt). For example, the show command outputs the following information:

Short Range	From: 2003/10/01 01:00 - To: 2003/10/01 15:00
Long Range	From: 2003/09/01 00:00 - To: 2003/10/01 15:00
Remote Copy	From: 2003/09/30 00:00 - To: 2003/10/01 15:00

Short Range indicates when the monitoring data in the LDEV, Port-LUN, and WWN tabs was collected. For example, Short Range indicates when the transfer rates for ports and host bus adapters were collected.

Long Range indicates when the monitoring data in the Physical tab was collected. For example, Long Range indicates when the usage rates for channel adapters and disk adapters were collected.

Remote Copy indicates when the monitoring data on remote copy operations was collected.

From indicates the starting time for collecting monitoring data. To indicates the ending time for collecting monitoring data.

The **login** command must execute before the **show** subcommand executes.

A.4.5 The group Subcommand

A.4.5.1 Syntax

```
group△{Port△[[port-name]:[port-name]][△⋯]|
      PortWWN△[[port-name]:[port-name]][△⋯]|
      PPCG△[[ppc-group-name]:[ppc-group-name]][△⋯]|
      PPCGWWN△[[ppc-group-name]:[ppc-group-name]][△⋯]|
      PG△[[parity-group-id|exg-id]:[parity-group-id|exg-id]][△⋯]|
      LDEV△[[parity-group-id|exg-id]:[parity-group-id|exg-id]][△⋯]|
      LU△[[port-name.host-group-id]:[port-name.host-group-id]][△⋯]|
      Physical|
      PhyPG△[[parity-group-id]:[parity-group-id]][△⋯]|
      PhyProc|
      PhyCSW|
      PhyLDEV△[[parity-group-id]:[parity-group-id]][△⋯]|
      RemoteCopy
}
```

A.4.5.2 Description

The **group** subcommand specifies the type of monitoring data that you want to export. This command uses an operand (such as **Port** and **PortWWN** above) to specify a type of monitoring data.

You can use the **group** subcommand more than one time in a command file. For example, you can write the following script:

```
group PortWWN CL1-A:CL1-B
group PPCG ppcg01:ppcg02
group Physical
```

If an operand is used more than one time in a command file, the last operand takes effect. In the example below, the first **group** subcommand does not take effect, but the second **group** subcommand takes effect:

```
group PortWWN CL1-A:CL1-B
group PortWWN CL2-A:CL2-B
```

Use an operand starting with **Phy** (for example, **Physical** or **PhyPG**) when you want to export data displayed in the Physical tab in the Performance Monitor panel. Use other operands when you want to export data displayed in the LDEV, Port-LUN, and WWN tabs in the Performance Monitor panel.

A.4.5.3 Operands

Port $\Delta[[port-name]:[port-name]][\Delta\cdots]$

Use this operand when you want to export port statistics (refer to Table A.1 in section A.1).

port-name is a port name. The colon (:) indicates a range. For example, CL3-a:CL3-c indicates ports from CL3-a to CL3-c.

Ensure that the port-name value on the left of the colon is smaller than the port-name value on the right of the colon. Note that the smallest port-name value is CL1-A and the largest port-name value is CL4-r. The following formula illustrates which value is smaller than which value:

CL1-A < CL1-B < ... < CL2-A < CL2-B < ... < CL3-a < CL3-b < ... < CL4-a < ... < CL4-r

For example, you can specify Port CL1-C:CL2-A, but you cannot specify Port CL2-A:CL1-C. Also, you can specify Port CL3-a:CL3-c, but you cannot specify Port CL3-c:CL3-a.

PortWWN $\Delta[[port-name]:[port-name]][\Delta\cdots]$

Use this operand when you want to export statistics about host bus adapters (WWNs) connected to ports (refer to Table A.2 in section A.1).

port-name is a port name. The colon (:) indicates a range. For example, CL3-a:CL3-c indicates ports from CL3-a to CL3-c.

Ensure that the port-name value on the left of the colon is smaller than the port-name value on the right of the colon. Note that the smallest port-name value is CL1-A and the largest port-name value is CL4-r. The following formula illustrates which value is smaller than which value:

CL1-A < CL1-B < ... < CL2-A < CL2-B < ... < CL3-a < CL3-b < ... < CL4-a < ... < CL4-r

For example, you can specify PortWWN CL1-C:CL2-A, but you cannot specify PortWWN CL2-A:CL1-C. Also, you can specify PortWWN CL3-a:CL3-c, but you cannot specify PortWWN CL3-c:CL3-a.

PPCG△[[*ppc-group-name*]:[*ppc-group-name*]][△...]

Use this operand when you want to export statistics about PPC groups (refer to Table A.3 in section A.1).

ppc-group-name is the name of a PPC group. If the name includes any non-alphanumeric character, the name must be enclosed by double quotation marks ("").

The colon (:) indicates a range. For example, Grp01:Grp03 indicates a range from Grp01 to Grp03.

Ensure that the *ppc-group-name* value on the left of the colon is smaller than the *ppc-group-name* value on the right of the colon. Note that numerals are smaller than letters and lowercase letters are smaller than uppercase letters. In the following formulae, values are arranged so that smaller values are on the left and larger values are on the right:

- 0 < 1 < 2 < ... < 9 < a < b < ... < z < A < B < ... < Z
- cygnus < raid < Cancer < Pisces < RAID < RAID5

Regardless of whether you specify or omit PPC group names, the resulting CSV file contains statistics about host bus adapters that do not belong to any PPC groups. The resulting CSV file uses the heading named Not Grouped to indicate statistics about these host bus adapters.

PPCGWWN△[[*ppc-group-name*]:[*ppc-group-name*]][△...]

Use this operand when you want to export statistics about host bus adapters (WWNs) belonging to PPC groups (refer to Table A.4).

ppc-group-name is the name of a PPC group. If the name includes any non-alphanumeric character, the name must be enclosed by double quotation marks ("").

The colon (:) indicates a range. For example, Grp01:Grp03 indicates a range from Grp01 to Grp03.

Ensure that the *ppc-group-name* value on the left of the colon is smaller than the *ppc-group-name* value on the right of the colon. Note that numerals are smaller than letters and lowercase letters are smaller than uppercase letters. In the following formulae, values are arranged so that smaller values are on the left and larger values are on the right:

- 0 < 1 < 2 < ... < 9 < a < b < ... < z < A < B < ... < Z
- cygnus < raid < Cancer < Pisces < RAID < RAID5

PG△[[*parity-group-id*|*exg-id*]:[*parity-group-id*|*exg-id*]][△...]

Use this operand when you want to export statistics about parity groups or external LU groups (refer to Table A.5).

parity-group-id is a parity group ID. *exg-id* is the ID of an external LU group. The colon (:) indicates a range. For example, 1 1: 1 5 indicates parity groups 1-1 to 1-5. E1-1:E1-5 indicates external LU groups E1-1 to E1-5.

Ensure that the *parity-group-id* or *exg-id* value on the left of the colon is smaller than the *parity-group-id* value on the right of the colon. For example, you can specify PG 1-1:1-5, but you cannot specify PG 1-5:1-1. Also, you can specify PG 1-5:2-1, but you cannot specify PG 2-1:1-5.

LDEV△[[*parity-group-id*|*exg-id*]:[*parity-group-id*|*exg-id*]][△⋯]

Use this operand when you want to export statistics about logical volumes (refer to Table A.6).

parity-group-id is a parity group ID. *exg-id* is the ID of an external LU group. The colon (:) indicates a range. For example, 1-1: 1-5 indicates parity groups 1-1 to 1-5. E1-1:E1-5 indicates external LU groups E1-1 to E1-5.

Ensure that the *parity-group-id* or *exg-id* value on the left of the colon is smaller than the *parity-group-id* value on the right of the colon. For example, you can specify LDEV 1-1:1-5, but you cannot specify LDEV 1-5:1-1. Also, you can specify LDEV 1-5:2-1, but you cannot specify LDEV 2-1:1-5.

LU△[[*port-name.host-group*]:[*port-name.host-group*]](△⋯)

Use this operand when you want to export statistics about LU paths (refer to Table A.7).

port-name is a port name. *host-group-id* is the ID of a host group (i.e., a host storage domain). The host storage domain (host group) ID must be a hexadecimal numeral.

The colon (:) indicates a range. For example, CL1-C.01:CL1-C.03 indicates the range from the host group #01 of the CL1-C port to the host group #03 of the CL1-C port.

Ensure that the value on the left of the colon is smaller than the value on the right of the colon. Note that the smallest *port-name* value is CL1-A and the largest *port-name* value is CL4-r. The following formula illustrates which *port-name* value is smaller than which *port-name* value:

CL1-A < CL1-B < ... < CL2-A < CL2-B < ... < CL3-a < CL3-b < ... < CL4-a < ... < CL4-r

For example, you can specify LU CL1-C.01:CL2-A.01, but you cannot specify LU CL2-A.01:CL1-C.01. Also, you can specify LU CL1-C.01:CL1-C.03, but you cannot specify LU CL1-C.03:CL1-C.01.

Physical

Use this operand when you want to export all the statistics that can be displayed in the **Physical** tab of the Performance Monitor panel (refer to Table A.8). This operand enables you to export usage rates for resources such as parity groups, adapters, and access paths. This operand also enables you to export write pending rates. When statistics are exported to a ZIP file, the file name will be Physical_dat.ZIP.

PhyPG△[[parity-group-id]:[parity-group-id]][△…]

Use this operand when you want to export statistics about parity group usage rates, which are displayed in the **Physical** tab of the Performance Monitor panel (refer to Table A.8). When statistics are exported to a ZIP file, the file name will be PhyPG_dat.ZIP.

parity-group-id is a parity group ID. The colon (:) indicates a range. For example, 1-1:1-5 indicates parity groups 1-1 to 1-5.

Ensure that the *parity-group-id* value on the left of the colon is smaller than the *parity-group-id* value on the right of the colon. For example, you can specify *PhyPG 1-1:1-5*, but you cannot specify *PhyPG 1-5:1-1*. Also, you can specify *PhyPG 1-5:2-1*, but you cannot specify *PhyPG 2-1:1-5*.

PhyProc

Use this operand when you want to export the following statistics, which are displayed in the Physical tab of the Performance Monitor panel (see Table A.8):

- Usage rates of channel processors
- Usage rates of disk processors
- Usage rates of DRRs (data recovery and regeneration processors)

When statistics are exported to a ZIP file, the file name will be PhyProc_dat.ZIP.

PhyCSW

Use this operand when you want to export the following statistics, which are displayed in the Physical tab of the Performance Monitor panel (see Table A.8):

- Usage rates of access paths between channel adapters and cache memories
- Usage rates of access paths between disk adapters and cache memories
- Usage rates of access paths between channel adapters and the shared memory
- Usage rates of access paths between disk adapters and the shared memory
- Usage rates of access paths between cache switches and cache memories
- Write pending rates

When statistics are exported to a ZIP file, the file name will be PhyCSW_dat.ZIP.

PhyLDEV△[[parity-group-id]:[parity-group-id]][△…]

Use this operand when you want to export statistics about logical volume usage rates, which are displayed in the **Physical** tab of the Performance Monitor panel (refer to Table A.8). When statistics are exported to a ZIP file, the file name will be PhyLDEV_dat.ZIP.

parity-group-id is a parity group ID. The colon (:) indicates a range. For example, 1-1:1-5 indicates parity groups 1-1 to 1-5.

Ensure that the *parity-group-id* value on the left of the colon is smaller than the *parity-group-id* value on the right of the colon. For example, you can specify *PhyLDEV 1-1:1-5*, but you cannot specify *PhyLDEV 1-5:1-1*. Also, you can specify *PhyLDEV 1-5:2-1*, but you cannot specify *PhyLDEV 2-1:1-5*.

RemoteCopy

Use this operand when you want to export statistics about remote copy operations (see Table A.9 in section A.1). When statistics are exported to a ZIP file, the file name will be RemoteCopy_dat.ZIP.

A.4.5.4 Example

The following example exports statistics about host bus adapters and PPC groups. This example also exports statistics in the **Physical** tab of the Performance Monitor panel:

```
group PortWWN  
group PPCG  
group Physical
```

The following example exports statistics about three ports (CL1-A, CL1-B, and CL1-C):

```
group Port CL1-A:CL1-C
```

The following example exports statistics about six ports (CL1-A to CL1-C, and CL2-A to CL2-C):

```
group Port CL1-A:CL1-C CL2-A:CL2-C
```

The following example exports statistics about the parity group 1-3:

```
group PG 1-3:1-3
```

The following example exports statistics about the parity group 1-3 and other parity groups whose ID is larger than 1-3 (for example, 1-4 and 1-5):

```
group PG 1-3:
```

The following example exports statistics about the external LU groups E1-1 to E1-5:

```
group PG E-1:E-5
```

The following example exports statistics about the parity group 1-3 and other parity groups whose ID is smaller than 1-3 (for example, 1-1 and 1-2):

```
group LDEV :1-3
```

The following example exports statistics about LU paths for the host group (host storage domain) ID 01 for the port CL1-A:

```
group LU CL1-A.01:CL1-A.01
```

A.4.6 The shortrange Subcommand

A.4.6.1 Syntax

```
shortrange△[[yyyyMMddhhmm][{+|-}hhmm]:[yyyyMMddhhmm][{+|-}hhmm]]
```

A.4.6.2 Description

The **shortrange** subcommand enables you to specify a period in order to narrow monitoring data that should be saved in files. The Export Tool exports monitoring data within the specified period.

Use the **shortrange** subcommand if the **group** subcommand uses any of the following operands:

- Port
- PortWWN
- PPCG
- PPCGWWN
- PG
- LDEV
- LU

The login subcommand must execute before the shortrange subcommand executes.

A.4.6.3 Operands

The value on the left of the colon (:) specifies the starting time of the period. The value on the right of the colon specifies the ending time of the period.

If no value is specified on the left of the colon, the starting time for collecting monitoring data is assumed. If no value is specified on the right of the colon, the ending time for collecting monitoring data is assumed. The starting and ending times for collecting monitoring data are displayed in the Monitoring Term area in the Performance Monitor panel (see Figure A.11).

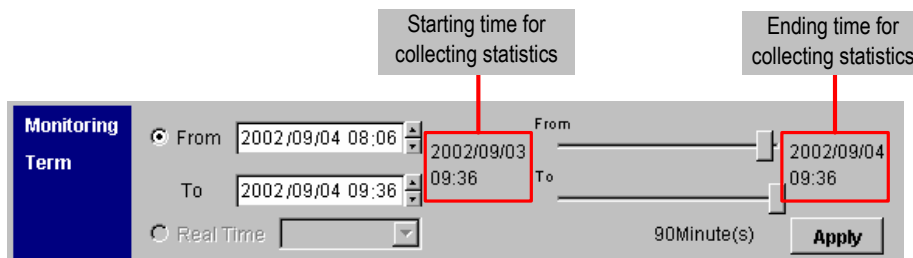


Figure A.11 The Starting Time and the Ending Time for Collecting Monitoring Data

yyyyMMddhhmm

yyyyMMdd indicates the year, the month, and the day. hhmm indicates the hour and the minute.

If yyyyMMddhhmm is omitted on the left of the colon, the starting time for collecting monitoring data is assumed. If yyyyMMddhhmm is omitted on the right of the colon, the ending time for collecting monitoring data is assumed.

+hhmm

Adds time (hhmm) to yyyyMMddhhmm if yyyyMMddhhmm is specified. For example, **200301230000+0130** indicates Jan. 23, 2003. 01:30.

Adds time to the starting time for collecting monitoring data, if yyyyMMddhhmm is omitted.

-hhmm

Subtracts time (hhmm) from yyyyMMddhhmm if yyyyMMddhhmm is specified. For example, **200301230000-0130** indicates Jan. 22, 2003. 22:30.

Subtracts time from the ending time for collecting monitoring data, if yyyyMMddhhmm is omitted.

A.4.6.4 Example

The examples below assume that:

- the starting time for collecting monitoring data is Jan. 1, 2003, 00:00
- the ending time for collecting monitoring data is Jan. 2, 2003, 00:00

shortrange 200301010930:200301011730

The Export Tool saves monitoring data within the range of Jan. 1, 9:30-17:30.

shortrange 200301010930:

The Export Tool saves monitoring data within the range of Jan. 1, 9:30 to Jan. 2, 00:00.

shortrange :200301011730

The Export Tool saves monitoring data within the range of Jan. 1, 0:00-17:30.

shortrange +0001:

The Export Tool saves monitoring data within the range of Jan. 1, 0:01 to Jan. 2, 00:00.

shortrange -0001:

The Export Tool saves monitoring data within the range of Jan. 1, 23:59 to Jan. 2, 00:00.

shortrange :+0001

The Export Tool saves monitoring data within the range of Jan. 1, 0:00-00:01.

shortrange :-0001

The Export Tool saves monitoring data within the range of Jan. 1, 0:00-23:59.

shortrange +0101:-0101

The Export Tool saves monitoring data within the range of Jan. 1, 1:01-22:59.

shortrange 200301010900+0130:200301011700-0130

The Export Tool saves monitoring data within the range of Jan. 1, 10:30-15:30.

shortrange 200301010900-0130:200301011700+0130

The Export Tool saves monitoring data within the range of Jan. 1, 7:30-18:30.

shortrange 200301010900-0130:

The Export Tool saves monitoring data within the range of Jan. 1, 7:30 to Jan. 2, 00:00.

A.4.7 The longrange Subcommand

A.4.7.1 Syntax

`longrange△[[yyyyMMddhhmm][{+|-}ddhhmm]:[yyyyMMddhhmm][{+|-}ddhhmm]]`

A.4.7.2 Description

The **longrange** subcommand enables you to specify a period in order to narrow monitoring data that should be saved in files. The Export Tool exports monitoring data within the specified period.

Use the **longrange** subcommand if the **group** subcommand uses any of the following operands:

- Physical
- PhyPG
- PhyProc
- PhyCSW
- PhyLDEV

The login subcommand must execute before the longrange subcommand executes.

A.4.7.3 Operands

The value on the left of the colon (:) specifies the starting time of the period. The value on the right of the colon specifies the ending time of the period.

If no value is specified on the left of the colon, the starting time for collecting monitoring data is assumed. If no value is specified on the right of the colon, the ending time for collecting monitoring data is assumed. The starting and ending times for collecting monitoring data are displayed in the Monitoring Term area in the Performance Monitor panel (see Figure A.12).

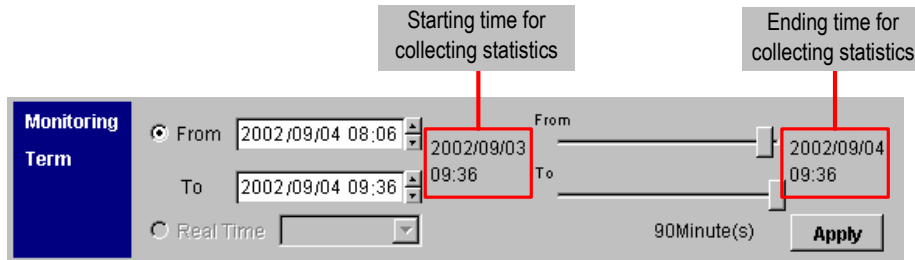


Figure A.12 The Starting Time and the Ending Time for Collecting Monitoring Data

`yyyyMMddhhmm`

`yyyyMMdd` indicates the year, the month, and the day. `hhmm` indicates the hour and the minute.

If `yyyyMMddhhmm` is omitted on the left of the colon, the starting time for collecting monitoring data is assumed. If `yyyyMMddhhmm` is omitted on the right of the colon, the ending time for collecting monitoring data is assumed.

`+ddhhmm`

Adds time (`ddhhmm`) to `yyyyMMddhhmm` if `yyyyMMddhhmm` is specified. For example, **200301120000+010130** indicates Jan. 13, 2003, 01:30.

Adds time to the starting time for collecting monitoring data, if `yyyyMMddhhmm` is omitted.

`-ddhhmm`

Subtracts time (`ddhhmm`) from `yyyyMMddhhmm` if `yyyyMMddhhmm` is specified. For example, **200301120000-010130** indicates Jan. 10, 2003. 22:30.

Subtracts time from the ending time for collecting monitoring data, if `yyyyMMddhhmm` is omitted.

Note: Ensure that *mm* is 00, 15, 30, or 45. If you do not specify *mm* in this way, the value on the left of the colon (:) will be rounded up to one of the four values. Also, the value on the right of the colon will be rounded down to one of the four values. For example, if you specify 200301010013:200301010048, the specified value is regarded as 200301010015:200301010045.

A.4.7.4 Example

The examples below assume that:

- the starting time for collecting monitoring data is Jan. 1, 2003, 00:00
- the ending time for collecting monitoring data is Jan. 2, 2003, 00:00

longrange 200301010930:200301011730

The Export Tool saves monitoring data within the range of Jan. 1, 9:30-17:30.

longrange 200301010930:

The Export Tool saves monitoring data within the range of Jan. 1, 9:30 to Jan. 2, 00:00.

longrange :200301011730

The Export Tool saves monitoring data within the range of Jan. 1, 0:00-17:30.

longrange +000015:

The Export Tool saves monitoring data within the range of Jan. 1, 0:15 to Jan. 2, 00:00.

longrange -000015:

The Export Tool saves monitoring data within the range of Jan. 1, 23:45 to Jan. 2, 00:00.

longrange :+000015

The Export Tool saves monitoring data within the range of Jan. 1, 0:00-00:15.

longrange :-000015

The Export Tool saves monitoring data within the range of Jan. 1, 0:00-23:45.

longrange +000115:-000115

The Export Tool saves monitoring data within the range of Jan. 1, 1:15-22:45.

longrange 200301010900+000130:200301011700-000130

The Export Tool saves monitoring data within the range of Jan. 1, 10:30-15:30.

longrange 200301010900-000130:200301011700+000130

The Export Tool saves monitoring data within the range of Jan. 1, 7:30-18:30.

longrange 200301010900-000130:

The Export Tool saves monitoring data within the range of Jan. 1, 7:30 to Jan. 2, 00:00.

A.4.8 The remotecopyrange Subcommand

A.4.8.1 Syntax

remotecopyrange△[[*yyyyMMddhhmm*][{+|-}*ddhhmm*]:*yyyyMMddhhmm*][{+|-}*ddhhmm*]]

A.4.8.2 Description

Use the **remotecopyrange** subcommand if you want to export statistics about remote copy operations (see Table A.9 in section A.1). The **remotecopyrange** subcommand enables you to specify a period in order to narrow monitoring data that should be saved in files. The Export Tool exports monitoring data within the specified period.

Use the **remotecopyrange** subcommand if the **group** subcommand uses the **RemoteCopy** operand.

The **login** subcommand must execute before the **remotecopyrange** subcommand executes.

A.4.8.3 Operands

The value on the left of the colon (:) specifies the starting time of the period. The value on the right of the colon specifies the ending time of the period.

If no value is specified on the left of the colon, the starting time for collecting monitoring data is assumed. If no value is specified on the right of the colon, the ending time for collecting monitoring data is assumed.

yyyyMMddhhmm

yyyyMMdd indicates the year, the month, and the day. *hhmm* indicates the hour and the minute.

If *yyyyMMddhhmm* is omitted on the left of the colon, the starting time for collecting monitoring data is assumed. If *yyyyMMddhhmm* is omitted on the right of the colon, the ending time for collecting monitoring data is assumed.

+*ddhhmm*

Adds time (*ddhhmm*) to *yyyyMMddhhmm* if *yyyyMMddhhmm* is specified. For example, **200310120000+010130** indicates Oct. 13, 2003. 01:30.

Adds time to the starting time for collecting monitoring data, if *yyyyMMddhhmm* is omitted.

-ddhhmm

Subtracts time (*ddhhmm*) from *yyyyMMddhhmm* if *yyyyMMddhhmm* is specified. For example, **200310120000-010130** indicates Oct. 10, 2003. 22:30.

Subtracts time from the ending time for collecting monitoring data, if *yyyyMMddhhmm* is omitted.

A.4.8.4 Example

The examples below assume that:

- the starting time for collecting monitoring data is Oct. 1, 2003, 00:00,
- the ending time for collecting monitoring data is Oct. 2, 2003, 00:00.

`remotecopyrange 200310010930:200310011730`

The Export Tool saves monitoring data within the range of Oct. 1, 9:30-17:30.

`remotecopyrange 200310010930:`

The Export Tool saves monitoring data within the range of Oct. 1, 9:30 to Oct. 2, 00:00.

`remotecopyrange :200310011730`

The Export Tool saves monitoring data within the range of Oct. 1, 0:00-17:30.

`remotecopyrange +000015:`

The Export Tool saves monitoring data within the range of Oct. 1, 0:15 to Oct. 2, 00:00.

`remotecopyrange -000015:`

The Export Tool saves monitoring data within the range of Oct. 1, 23:45 to Oct. 2, 00:00.

`remotecopyrange :+000015`

The Export Tool saves monitoring data within the range of Oct. 1, 0:00-00:15.

`remotecopyrange :-000015`

The Export Tool saves monitoring data within the range of Oct. 1, 0:00-23:45.

`remotecopyrange +000115:-000115`

The Export Tool saves monitoring data within the range of Oct. 1, 1:15-22:45.

`remotecopyrange 200310010900+000130:200310011700-000130`

The Export Tool saves monitoring data within the range of Oct. 1, 10:30-15:30.

`remotecopyrange 200310010900-000130:200310011700+000130`

The Export Tool saves monitoring data within the range of Oct. 1, 7:30-18:30.

`remotecopyrange 200310010900-000130:`

The Export Tool saves monitoring data within the range of Oct. 1, 7:30 to Oct. 2, 00:00.

A.4.9 The **outpath** Subcommand

A.4.9.1 Syntax

outpath△[*path*]

A.4.9.2 Description

The **outpath** subcommand specifies the directory to which monitoring data will be exported.

A.4.9.3 Operands

path

Specifies the directory in which files will be saved.

If the directory includes any non-alphanumeric character, the directory must be enclosed by double quotation marks ("").

If the specified directory does not exist, this subcommand creates a directory that has the specified name.

If this operand is omitted, the current directory is assumed.

A.4.9.4 Example

The following example saves files in the directory **C:\Project\out** in a Windows® computer:

```
outpath "C:\Project\out"
```

The following example saves files in the **out** directory in the current directory:

```
outpath out
```

A.4.10 The option Subcommand

A.4.10.1 Syntax

`option△[compress|nocompress]△[ask|clear|noclear]`

A.4.10.2 Description

The **option** subcommand specifies the following:

- whether to compress monitoring data in ZIP files.
- whether to overwrite or delete existing files and directories when saving monitoring data in files.

A.4.10.3 Operands

The two operands below specify whether to compress CSV files into ZIP files. If none of these operands is specified, **compress** is assumed:

compress

Compresses data in ZIP files. To extract CSV files out of a ZIP file, you will need to decompress the ZIP file.

nocompress

Does not compress data in ZIP files and saves data in CSV files.

The three operands below specify whether to overwrite or delete an existing file or directory when the Export Tool saves files. If none of these operands is specified, **ask** is assumed:

ask

Displays a message that asks whether to delete existing files or directories.

clear

Deletes existing files and directories and then saves monitoring data in files.

noclear

Overwrites existing files and directories.

A.4.10.4 Example

The following example saves monitoring data in CSV files, not in ZIP files:

```
option nocompress
```

A.4.11 The apply Subcommand

A.4.11.1 Syntax

apply

A.4.11.2 Description

The **apply** subcommand saves monitoring data specified by the **group** subcommand into files.

The **login** subcommand must execute before the **apply** subcommand executes.

The **apply** subcommand does nothing if the **group** subcommand executes.

The settings made by the **group** subcommand will be reset when the **apply** subcommand finishes.

A.4.12 The set Subcommand

A.4.12.1 Syntax

set△[shortrange={on|off}]△[longrange={on|off}]△[remotecopy={m|off}]

A.4.12.2 Description

The **set** subcommand starts or ends monitoring the disk subsystem (i.e., starts or ends collecting performance statistics).

The **login** subcommand must execute before the **set** subcommand executes. If you want to use the **set** subcommand, you must specify the *userid* operand of the **login** subcommand in either of the following ways (see section A.2.1 for reference):

- If you want to use the **shortrange** or **longrange** operand with the **set** subcommand, you must specify a user ID that has write permission for Performance Monitor.
- If you want to use the **remotecopyrange** operand with the **set** subcommand, you must specify a user ID that has write permission for Hitachi TrueCopy™ or Hitachi TrueCopy - S/390®.

Ensure that the **set** subcommand executes after the **login** subcommand executes and immediately before the Export Tool finishes.

If the **set** subcommand is used more than once with the same operand, only the last occurrence of the operand takes effect. For example, if the **set** subcommand is used three times and the **shortrange** operand is used for each of the times, only the last occurrence of the **shortrange** operand will take effect, and the first and second occurrences of the **shortrange** operand will not take effect.

Executing the **set** subcommand generates an error in the following conditions:

- Some other user is being logged onto the SVP in Modify mode.
- Maintenance operations are being performed at the SVP.

If an error occurs, do the following:

- Ensure that all the users who are logged onto the SVP are not in Modify mode. If any user is logged on in Modify mode, ask the user to switch to View mode.
- Wait until maintenance operations finish at the SVP, so that the **set** subcommand can execute.

Note: Your batch files can include script that should execute when an error occurs. For information about writing such a script in your batch file, refer to **Notes** in section A.3.3.

A.4.12.3 Operands

shortrange={on | off}

Use this operand when you want to start or end monitoring disks, ports, LU paths, and host bus adapters. To start monitoring, specify **on**. To end monitoring, specify **off**.

If this operand is omitted, the **set** subcommand does not make settings for starting or ending monitoring disks, ports, LU paths, and host bus adapters.

If the **set** subcommand executes with **shortrange=on** specified, the monitoring starts and will continue for 24 hours. The monitoring will automatically end in 24 hours.

longrange={on | off}

Use this operand when you want to start or end monitoring usage rates for disk subsystem resources. To start monitoring, specify **on**. To end monitoring, specify **off**.

If this operand is omitted, the **set** subcommand does not make settings for starting or ending monitoring usage rates for disk subsystem resources.

remotecopyrange={m | off}

Use this operand when you want to start or end monitoring remote copy operations.

To start monitoring, specify a value within the range of 1 to 546 for *m*. *m* is the sampling time interval in minutes.

To end monitoring, specify **off**.

If this operand is omitted, the **set** subcommand does not make settings for starting or ending monitoring remote copy operations.

A.4.12.4 Example

The following command file starts monitoring disks, ports, LU paths, and host bus adapters. This example also starts monitoring resource usage rates:

```
svpip 158.214.135.57  
login expusr passwd  
set shortrange=on longrange=on
```

The following command file saves port statistics and then ends monitoring ports:

```
svpip 158.214.135.57  
login expusr passwd  
show  
group Port  
shortrange 200304010850:200304010910  
apply  
set shortrange=off
```

The following command file starts monitoring remote copy operations. The sampling time interval is 10 minutes:

```
svpip 158.214.135.57  
login expusr passwd  
set remotecopy=10
```

A.4.13 The help Subcommand

A.4.13.1 Syntax

help

A.4.13.2 Description

The **help** subcommand displays the on-line help for subcommands.

If you want to view the on-line help, it is recommended that you create a batch file and a command file that are exclusively used for displaying the on-line help. For detailed information, see the *Example* below.

A.4.13.3 Example

In this example, a command file (cmdHelp.txt) and a batch file (runHelp.bat) are created in the **C:\export** directory in a Windows® computer:

- Command file (c:\export\cmdHelp.txt):

```
help
```

- Batch file (c:\export\runHelp.bat):

```
java -classpath ".\lib\JSanExport.jar;.\lib\JSanRmiServer.jar" -Dmd.command=cmdHelp.txt  
-Dmd.logpath=log sanproject.getmondat.RJMdMain ↵  
pause ↵
```

Note: The "↵" symbol in this batch file example indicates the end of a command line.

In this example, you must do either of the following to view the on-line Help:

- Double-click runHelp.bat with the mouse
- Go to the c:\export directory at the command prompt, enter runHelp or runHelp.bat and then press the <Enter> key.

A.4.14 The Java™ Command for Exporting Data In Files

A.4.14.1 Syntax

```
java△-classpath△class-path△property-parameters△sanproject.getmondatt.RJMdMain
```

A.4.14.2 Description

This Java™ command starts the Export Tool.

To start the Export Tool, you must write this Java™ command in your batch file and then run the batch file.

A.4.14.3 Operands

class-path

Specifies the path to the class file of the Export Tool

The path must be enclosed in double quotation marks ("").

property-parameters

You can specify the following parameters. You must, at least, specify **-Dmd.command**.

- **-Dhttp.proxyHost**=host-name-of-proxy-host, or

- **-Dhttp.proxyHost**=IP-address-of-proxy-host

Specifies the host name or the IP address of a proxy host. You must specify this parameter if the computer that runs the Export Tool communicates with the SVP via a proxy host.

- **-Dhttp.proxyPort**=port-number-of-proxy-host

Specifies the port number of a proxy host. You must specify this parameter if the computer that runs the Export Tool communicates with the SVP via a proxy host.

- **-Dmd.command**=path-to-command-file

Specifies the path to the command file

- **-Dmd.logpath**=path-to-log-file

Specifies the path to log files. A log file will be created whenever the Export Tool executes.

If this parameter is omitted, log files will be saved in the current directory.

- **-Dmd.logfile=name-of-log-file**

Specifies the name of the log file.

If this parameter is omitted, log files are named **exportMMddHHmmss.log**. *MMddHHmmss* indicates when the Export Tool executed. For example, the log file **export0101091010.log** contains log information about Export Tool execution on Jan. 1, 09:10:10.

A.4.14.4 Example

The following example assumes that the computer running the Export Tool communicates with the SVP via a proxy host. In this example, the host name of the proxy host is Jupiter, and the port name of the proxy host is 8080:

```
java -classpath "./lib/JSanExport.jar;./lib/JSanRmiServer.jar" -Dhttp.proxyHost=Jupiter  
-Dhttp.proxyPort=8080 -Dmd.command=command.txt -Dmd.logpath=log  
sanproject.getmondar.RJMdMain ↵
```

In the following example, a log file named **export.log** will be created in the **log** directory below the current directory when the Export Tool executes:

```
java -classpath "./lib/JSanExport.jar;./lib/JSanRmiServer.jar" -Dmd.command=command.txt  
-Dmd.logfile=export.log -Dmd.logpath=log sanproject.getmondar.RJMdMain ↵
```

Note: The "↵" symbol indicates the end of a command line.

A.5 Troubleshooting the Export Tool

Table A.13 explains possible problems with the Export Tool and probable causes and recommended solutions to the problems.

Table A.13 Troubleshooting the Export Tool

Possible Problems	Probable Causes and Recommended Action
You cannot run the batch file.	- The path to the Java™ Virtual Machine (java.exe) might not be defined in the PATH environment variable. If this is true, you must add that path to the PATH environment variable. For information about how to add a path to the environment variable, please refer to the documentation for your operating system. - An incorrect version of Java™ Runtime Environment (JRE) might be installed on your computer. To check the JRE version, enter the following command at the Windows® command prompt or the UNIX® console window: <pre>java -version</pre> If the version is incorrect, please install the correct version of JRE.
The Export Tool stops and the processing does not continue. The command prompt window was displaying progress of the export processing, but the window stopped displaying progress before the processing stops. The progress information does not seem to be updated anymore.	The command prompt window might be in pause mode. The command prompt window will be in pause mode if you click the command prompt window when the Export Tool is running. To cancel pause mode, you need to activate the command prompt window and then press the <ESC> key. If you do not cancel pause mode, an error will occur. The error message ID will be (1, 4011).
An error occurs and the processing stops.	If the error message ID is (1, 4011), the user is forcibly logged off and the processing stops because the SVP does not respond. Please run the Export Tool again. If the error persists, contact the maintenance personnel. If the error message ID is (2, 5510), probable error causes and solutions are: - An internal processing is being performed in the disk array. Alternatively, another user is changing configurations. Wait for a while and then run the Export Tool again. - Maintenance operations are being performed on the disk array. Wait until the maintenance operations finish and then run the Export Tool again. If the error message ID is none of the above, see Table A.14 below.
The monitoring data in the CSV file includes "-1".	The value "-1" indicates that Performance Monitor failed to obtain monitoring data for some reasons. Probable reasons are: - Performance Monitor attempted to obtain statistics when an operation for rebooting the disk array is in progress. - A heavy workload is imposed on the disk array.

If an error occurs when you run the Export Tool, error messages are issued to the standard output (for example, the command prompt) and the log file. Table A.14 lists the Export Tool messages and recommended actions against errors.

Table A.14 Messages to be Issued by the Export Tool (continues on following pages)

Possible Problems	Probable Causes and Recommended Action
Connection to the server has not been established.	Connection to the server has not been established. Use the login subcommand.
Execution stops.	Execution stops. Please remove errors.
Illegal character: "character"	An illegal character is used. Please use legal characters.
Invalid length: token	The length is invalid. Specify a value that has a correct length.
Invalid range: range	The specified range is invalid. Specify the correct range.
Invalid value: "value"	The specified value is invalid. Specify a correct value.
Login failed	An attempt to log into the SVP failed. Probable causes are: 1. An incorrect operand is used for the svpip subcommand. 2. An incorrect operand is used for the login subcommand. 3. The specified user ID is used by another person, and the person is being logged in. 4. Two users are currently displaying the Performance Monitor panel. 5. Two users are currently executing the Export Tool. Note: If the error cause is 4 or 5 above, do either of the following: ▪ Ask one of the users to display another panel. ▪ Ask one of the users to log off. ▪ Wait for one of the users to quit the Export Tool.
Missing command file	The command file is not specified. Specify the name of the command file correctly.
Missing group name	No operand is specified in the group subcommand. Specify operands for the subcommand.
Missing host name	No host name is specified. Please specify a host name.
Missing output directory	No directory is specified for saving files. Please specify the directory for saving files.
Missing password	The Export Tool cannot find the user ID, which is used to log into the SVP. Specify the password.
Missing svpip	The svpip subcommand is not used. Use the svpip command.
Missing time range	Specify the time range.
Missing user ID	The Export Tool cannot find the user ID, which is used to log into the SVP. Specify the user ID.

Table A.14 Messages to be Issued by the Export Tool (continued)

Possible Problems	Probable Causes and Recommended Action
Out of range: range	The value is outside the range. If the shortrange subcommand or the longrange subcommand is used, specify a value within the range from the monitoring start time to the monitoring end time. If the set subcommand is used with the remotecopy operand, specify a value within the range of 1 to 546.
Permission Denied.(Performance Monitor)	The user ID does not have write permission for Performance Monitor.
Permission Denied.(RemoteCopy)	The user ID does not have write permission for Hitachi TrueCopy™ or Hitachi TrueCopy S/390®.
RMI server error (part-code, error-number)	An error occurs at the RMI server. For detailed information, please refer to 9900V Remote Console - Storage Navigator Error Codes.
Unable to display help message	The Export Tool cannot display the on-line help due to a system error.
Unable to get serial number	The Export Tool cannot obtain the serial number due to a system error.
Unable to get time range for monitoring	The SVP does not contain monitoring data.
Unable to read command file: file	The Export Tool cannot read the command file. Specify the name of the command file correctly.
Unknown host: host	The Export Tool cannot resolve the host name. Please specify the correct host name.
Unsupported command: "command"	The Export Tool does not support the specified command. Please specify a correct command.
Unsupported operand: operand	The specified operand is not supported. Please correct the specified operand.
Unsupported option: option	The specified option is not supported. Please correct the specified option.
Some file exists in path. What do you do? clear(c)/update(u)/stop(p) You selected "action". Is it OK? (y/n)	Files exist in path. ■ If you want to clear the files, press the <c> key. ■ If you want to overwrite the files, press the <u> key. ■ If you want to stop the operation, press the <p> key. When you press a key, a message appears and asks whether to perform the specified action. ■ To perform the specified action, press the <y> key. ■ To cancel the specified action, press the <n> key.

Table A.14 Messages to be Issued by the Export Tool (continued)

Possible Problems	Probable Causes and Recommended Action
Specify the following subcommand before login subcommand: retry	The retry subcommand is written in an incorrect position in the command file. Write the retry subcommand before the login subcommand.
Start gathering group data Target = xxx, Total = yyy End gathering group data	The Export Tool starts collecting data specified by the group subcommand. The number of targets is xxx and the total number is yyy (refer to Note below). The Export Tool ends collecting data. Note: For example, suppose that the disk subsystem contains 100 parity groups and the command file contains the following command line: group PG 1-1:1-2 The Export Tool displays the message "Target=2, Total=100", which means that the group subcommand specifies two parity groups and that the total number of parity groups in the subsystem is 100.
Syntax error: "line"	A syntax error is detected in a command line in your command file. Check the command line for the syntax error and then correct the script. Note that some operands must be enclosed by double quotation marks (""). Please check the command line to find whether double quotation marks are missing.

Acronyms and Abbreviations

ACP	Array Control Processor
CHA	channel adapter
CHIP	client-host interface processor
CHP	channel processor
CSV	comma-separated value format. Also known as comma-delimited format.
CSW	cache switch
CU	control unit (logical control unit)
DASD	direct-access storage device
DKA	disk adapter
DKP	disk processor
DRR	Disaster Recovery and Regeneration Processor
HDD	Hard Disk Drive
LAN	local-area network
LDEV	logical device
LU	logical unit
LUN	logical unit number
RAID	redundant array of independent disks
SM	shared memory
SVP	service processor
TC	Hitachi TrueCopy™
TC390	Hitachi TrueCopy - S/390®
ZIP	A common data compression format.

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