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Hitachi Freedom Storage™ Thunder 9500™ V Series

User and Reference Guide

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Document Revision Level

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Document Revision Level

The following source documents were used to produce this User and Reference Guide:

- *DF600 Disk Array Subsystem User's Guide*, Rev. 1st Edition.

Preface

The *Hitachi Freedom Storage™ Thunder 9500™ V Series User and Reference Guide* describes the physical, functional, and operational characteristics of the 9500V subsystem. This document also provides operation instructions, installation details, and configuration planning information for the 9500V subsystem.

This User and Reference Guide assumes that:

- The user has a background in data processing and understands direct-access storage device subsystems and their basic functions,
- The user is familiar with the Hitachi Freedom Storage™ Thunder 9500™ V Series array subsystem,
- The user is familiar with the Windows® 95, Windows® 98, Windows® 2000 or Windows NT® operating systems.

For further information on Hitachi Data Systems products and services, please contact your Hitachi Data Systems account team, or visit the Hitachi Data Systems worldwide web site at http://www.hds.com. For specific information on the supported host systems and platforms for the 9500V, please refer to the user documentation for the product, or contact the vendor's customer support service.

Note: This document uses the term "9500V" to refer to any 9500V subsystem.

COMMENTS

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Contents

List of Figures

List of Tables

Chapter 1 Overview of the Thunder 9500™ V Series Subsystem

The Hitachi Freedom Storage™ Thunder 9500™ V Series subsystem is a high-performance, medium-capacity storage array with added features designed to reduce the possibility of data loss due to the failure of any single component. Disk array installation and setup are simplified using the Resource Manager 9500 program (optionally available). Many parts are replaceable while the disk array is online. Cache memory has a battery backup to preserve cache contents in the event of a power failure. For information regarding model types, see sections 1.2 Rack-Mount Model and 1.3 Floor Model.

This chapter includes the following:

- Overview Features
- Rack-Mount Model
- Floor Model

1.1 Overview Features

The following Hitachi Freedom Storage™ Thunder 9500™ V Series features are discussed in this section:

- Differences Between the Thunder 9200™ and Thunder 9500™ V Series Subsystems
- High Data Availability
- Connectivity
- Enhanced Data Accessibility
- Scalability
- Performance Reporting and Monitoring
- Reliability, Availability, and Serviceability

1.1.1 High Data Availability

The 9500V is designed for high performance and protection of user data. See section 1.2 for additional information on the reliability and availability features of the Hitachi Thunder 9500™ V Series subsystem.

1.1.2 Connectivity

The Hitachi Thunder 9500™ V Series subsystem provides connectivity to most open systems through a standard Fibre Channel interface.

- With the Fibre Channel connection, the 9500V subsystem can transfer data between the host computer and the subsystem at a maximum speed of 200 MB/sec. The subsystem can be located up to 300 meters from the host.

- The 9500V subsystem enables you to construct a system which can connect up to 126 fibre channel devices by using the fibre channel interface and connecting the fibre-channel arbitrated loop (FC-AL) and the fibre channel switch (Fabric).
- When the system is configured to connect multiple hosts, a function is provided which rejects a boot by any host except a specified host. This function can prevent access from an illegal host.

1.1.3 Enhanced Data Accessibility

The 9500V supports command tag queuing, multi-initiator I/O, and most industry-standard middleware products providing host fail-over capability, I/O path fail-over support, and logical volume management. The 9500V also has many features that increase data accessibility and enable continuous user data access.

- FlashAccess 9500V allows a LUN to reside in cache memory for fastest possible access.
- LUNs can be created to suit customer needs using the Resource Manager 9500V.
- LUN Security 9500V allows the 9500V to control host access to LUNs by host Worldwide Name. Up to 128 Worldwide Names per port can be supported.
- Up to 2 GBs (two pair of 512 MB DIMMs) of cache memory can be installed in each controller (or up to 4 GBs per subsystem) to improve I/O performance.
- ShadowImage 9500V enables you to maintain subsystem-internal copies of all user data on the Thunder 9500™ V Series storage subsystem for purposes such as data backup or duplication.

1.1.4 Scalability

The architecture of the 9500V enables the user to scale the subsystem to meet a wide range of capacity and performance requirements.

- You can construct a variety of systems; for example, a system with 14 disk drives can be configured using a single RK/RKS, or a more complex system can be set up using the maximum of 224 disk drives, expanded by connecting up to 14 RKAs to the RK.
- Up to 15 spare disks (for RKS: up to 1) can be set up and mounted in any location. Use the system effectively by mounting each spare disk in a disk drive slot left unused due to system construction.

  Note: Some disk drive slots cannot be used for spare disk. For additional information, contact Hitachi Data Systems Customer Support.
- From the host computer, the subsystem can be used as a single large-scale disk drive or as 512 logical disks (LUs) (maximum).

1.1.5 Performance Reporting and Monitoring

The Resource Manager 9500V program provides the capability to either monitor the disk array in real time or to collect historical data regarding the performance of the disk array.

1.1.6 Reliability, Availability, and Serviceability

The 9500V subsystem is not expected to fail in any way that would interrupt user access to data. The 9500V can sustain single component failures and still continue to provide full access to all stored user data.

Note: While access to user data will not normally be compromised, the failure of any single key component may degrade performance.

The reliability, availability, and serviceability features of the 9500V subsystem include:

- **High-Availability capability**. The 9500V subsystem provides high-availability capability for all critical components. The 9500V uses component and function redundancy to provide high availability for many subsystem components.

  The Controller of the Thunder 9500™ V Series subsystem increases data reliability by adding original 8-byte data assurance codes to data from a host computer by automatically generating them, writing them in the disk drive together with the data, and checking them when reading the data. On the data bus in the controller, the automatic generation of the data assurance codes and the check are executed to enhance data reliability in data distribution/concentration control, peculiar to the disk array.

  Up to 15 spare disks (for RKS: up to 1) can be specified per subsystem; this function monitors the potential disk failure. Before failure occurs, the data copy operation can be automatically performed in the background. The dynamic sparing feature enables the subsystem to replace the spare disk due to redundancy (excluding RAID 0 configuration) and provides high reliability.

- **Redundant power supply systems**. Each 9500V unit has a set of two power supplies. Each power supply can provide power for the entire subsystem in the unlikely event of power supply failure. The power supplies of each set can be connected across power boundaries so that each set can continue to provide power if a power outage occurs. Each unit of the 9500V can sustain the loss of a single power supply and still continue operation.
- **High capacity cache.** The Thunder 9570™ V Series subsystem supports a maximum of 2 Gbs high capacity cache per controller (Thunder 9530V supports a maximum of 1 GB cache per controller). Writing completion can be reported to the host system when data is written to cache.

1.2 Rack-Mount Model

The rack-mount model is composed of a combination of the RK/RKS and RKA mounted on a rack frame. The RK/RKS are capable of mounting up to 14 disk drives; a controller to perform RAID control on the drives is included. The RKA is capable of mounting up to 15 disk drives and controls the drives through a connection with an RK. The RKA is provided with no controller.

Note: Since the RK controls the Thunder 9500™ V Series subsystem, at least one RK must be mounted. For details, consult with the Hitachi, Sales Division.

Note: For additional information about the rack-mount model, refer to the *Hitachi Freedom Storage™ Thunder 9500™ V Series 19-Inch Rack Reference Guide* (MK-92DF654).

1.3 Floor Model

There are two floor model styles:

- Floor (RK+H1H) Model/Floor (RKS+H1H) Model
- Floor (RK+RKA+H2H) Model

The Floor (RK+H1H) Model and Floor (RKS+H1H) Model are capable of mounting up to 14 disk drives and include a controller to perform RAID control on the drives. The Floor (RK+RKA+H2H) model is capable of mounting up to 29 disk drives and includes a controller to perform RAID control on the drives.

Note: For the specifications of the Floor model, refer to Chapter 2 Planning for Installation and Operation.

Chapter 2 Planning for Installation and Operation

This chapter provides information for planning and preparing a site before and during installation of the Hitachi Thunder 9500™ V Series subsystem. Please read this chapter carefully before beginning your installation planning.

If you would like to use any of the 9500V features or products (e.g., LUN Security 9500V, FlashAccess 9500V), please contact your Hitachi Data Systems account team to obtain the appropriate license(s) and software key files.

Note: The general information in this chapter is provided to assist in installation planning and is not intended to be complete. The internal 9500V installation and maintenance documents used by Hitachi Data Systems personnel contain complete specifications. The exact electrical power interfaces and requirements for each site must be determined and verified to meet the applicable local regulations. For further information on site preparation for 9500V installations, contact your Hitachi Data Systems account team or the Hitachi Data Systems Support Center.

This chapter includes the following:

- User Responsibilities
- Safety Precautions
- Dimensions and Weight
- Service Clearance Requirements
- Floor Load Rating
- Internal Logic Specifications
- Cable Requirements
- Environmental Specifications

2.1 User Responsibilities

Before the 9500V subsystem arrives for installation, the user must provide the following items to ensure proper installation and configuration.

- Physical space necessary for proper subsystem function and maintenance activity
- Electrical input power
- Connectors and receptacles
- Air conditioning
- Floor ventilation areas (recommended but not required)
- Cable access holes

2.2 Safety Precautions

When using the 9500V disk array subsystem, follow these cautionary procedures:

- Perform operations in accordance with the instructions or procedures described in this manual.
- Follow the cautionary notes written on labels affixed to the equipment.
- Follow the cautionary notes written in this manual.

It is impossible to describe every hazard that may exist with this equipment. Please be aware of hazards not described in this manual. Work safely.

The following information is included in this section:

- Symbol Marks
- Repair, Modification, and Disassembly
- Precautions for Using the Equipment
- Precautions for Inspection and Cleaning
- Emergency Precautions
- Warning Notices

2.2.1 Symbol Marks

The  symbol followed by the word "CAUTION" in this manual indicates a potential safety hazard. When you see this symbol, observe the safety instructions that follow.

CAUTION

This symbol indicates the existence of a potential hazard which may cause a rather light injury or serious damage to the equipment if the written contents are not observed.

2.2.2 Repair, Modification, and Disassembly

Users must not repair, remodel, or disassemble the equipment. Such actions may cause hazardous conditions for the user and/or the equipment.

2.2.3 Precautions for Using the Equipment

Use special precautions for the following:

- Equipment
- Cables
- Air Vents
- Battery Unit
- Nickel-Hydride Rechargeable Battery Instructions
- Other

2.2.3.1 Equipment

- If you notice unusual heat generation, odors, or smoke emission, shut off the power feed to the equipment and contact the maintenance engineer. Leaving such conditions unattended may result in hazardous physical conditions and equipment failure.
- Avoid physical disruption to the equipment. This may result in hazardous physical conditions and equipment failure.
- Do not place heavy objects on top of the disk array. Avoid using the equipment for any use other than its original purpose; otherwise, an injury or equipment failure may result.

2.2.3.2 Cables

- Avoid obstructing walkways when routing cables.
- Do not allow heavy material to be placed on cables. Do not place cables near any apparatus that generates heat. Do not step on or subject cables or connectors to shearing or pulling forces; the cable jacket can be damaged and can break, resulting in an electric shock, fire, or loss of data.
- Make sure that electrical and signal cables are clean before connecting them. Any dirt on a connector should be removed before inserting the connector into a socket.

2.2.3.3 Air Vents

- Make certain that the air vents are free of obstruction. They should be inspected periodically.
- Do not place metallic material such as paper clips or any combustible material such as paper into or near the air vents. This may result in electric shock or fire.

2.2.3.4 Battery Unit

Observe the following when handling the battery:

- Do not disassemble or tamper with the battery.
- Do not allow the battery to be physically damaged. If the battery is physically damaged, have it replaced as soon as possible.
- Do not connect the two terminals of the battery directly to each other; this will create a short circuit.
- Do not tamper with cable insulation.
- Do not connect the battery to any equipment other than the Thunder 9500™ V Series subsystem.
- Do not expose the battery to high temperatures.
- Use only the specified battery.

2.2.3.5 Nickel-Hydride Rechargeable Battery Instructions

These instructions explain what you must observe when you use a nickel-hydride rechargeable battery (hereafter it is referred to as the **battery**). If you use the battery incorrectly, it can overheat ignite, burst, or explode, damaging and deteriorating its performance/life. Read and follow the instructions below:

⚠ Danger

1. Do not disassemble the case; do not modify it or peel off the label. There are high voltage parts inside: if you attempt any of these actions, this can result in electrical shock or burning.
2. Do not disassemble the battery; this can cause short circuits inside or outside of the battery. If the components are exposed to the air, the battery can overheat, burst or ignite. Disassembling the battery can expose you to alkaline solution, which can be dangerous.
3. Do not cut the output cable. Do not modify the connector. If you attempt any of these actions, an electrical shock or burn can result. A short-circuit may cause abnormal chemical reactions inside the battery which leads to overheating, bursting or ignition.
4. Follow the instructions when you recharge the battery pack. If you recharge it in a way different from specified here, it may cause the following problems: The battery may become charged excessively; excessive current may be produced; or the battery cannot be recharged. As a result, the battery may leak, become overheated, burst, or ignite.
5. Do not use excessive force when you connect the battery pack to the charger or other devices. If you cannot connect it easily, check that the positive and negative positions are correct for the connector. If you connect the battery in reverse, it will be charged incorrectly and abnormal chemical reactions may occur inside. As a result, the battery may become overheated, burst or ignite.
6. Do not connect the battery to a power receptacle. If you apply an excessive amount of voltage to the battery, it may produce excessive current making the battery overheat, burst or ignite.
7. Do not use or leave the battery where the temperature can become high, such as, near a fire or a heating element. High temperatures can damage the battery's separator, which may cause short circuit, making it overheat, burst or ignite.
8. Do not incinerate or heat the battery pack. If you do so, the insulator may melt, the safety fuse/mechanism may be damaged, or the electrolyte may gush out. As a result, the battery can burst, explode or ignite.
9. Do not connect the negative terminal to the positive with metal wire. Do not carry or store the battery with other metal parts. This can cause a short circuit or produce an excessive current which can cause the battery to leak, overheat, burst or ignite.
10. Do not let the battery become wet by soaking it in the water or seawater. If the battery becomes wet, a short circuit can occur and an excessive amount of current can be produced, causing abnormal chemical reactions inside. As a result, the battery may become overheated, burst or ignite.
11. Do not nail or hammer the battery. The battery may be broken or dented and a short circuit may occur inside. As a result, the battery may become overheated, burst or ignite.
12. Do not solder directly to the battery. If you do so, heat will melt the insulator and damage the safety fuse/mechanism. As a result, the battery may leak or may become overheated, burst or ignite.

Warning

13. If you find anything strange or unusual with the battery when you use/carry/store it, remove the battery from the device and stop using it. For example, strange smells, strange colors, or deformation are a sign you must stop using the battery.
14. If it takes longer than the specified time to complete recharging, stop recharging the battery; otherwise, the battery may become overheated, burst or ignite.

If the battery leaks and gets into your eyes, immediately flush your eyes with clean water (tap water) and do not rub your eye. Visit the doctor immediately. If you do not seek any treatment for your eyes, problems may occur later. Because the battery uses highly concentrated alkaline as electrolyte, it can burn; you may lose your sight if it makes contacts your eyes. If the battery's liquid contacts your skin or eyes, you must flush them with plenty of clean water and visit a doctor at once.

2.2.3.6 Other

When a failure occurs in the unit, take action according to the procedures recommended in this manual. If the difficulty does not correspond to the corrective measures documented in this manual, contact the maintenance engineer.

2.2.4 Precautions for Inspection and Cleaning

- If a maintenance activity requires that the unit be powered off, make sure that the power-off sequence described in the manual is performed before proceeding with maintenance.
- Do not work on the unit in a damp or flooded environment.
- Do not obstruct access to the unit with parts or tools.
- When performing the work with the door open, take off metal watches or jewelry to prevent electric shock. If you wear metal-frame glasses, do not touch the equipment.
- Ensure that loose clothing, jewelry, or hair do not become tangled in moving components.
- There are high-voltage parts in the equipment. Observe the cautionary statements in the manual to make sure that high-voltage components are not touched during maintenance. Another person should be on alert to shut off the power feed to the equipment.
- After the power feed to the equipment is shut off, electricity remains in the equipment for a period of time. Therefore, do not touch any components other than those indicated in this manual.
- The equipment can become extremely hot. Do not touch any part other than those indicated in this manual.
- When working with the door open, wear cotton gloves to prevent your hands from touching sharp objects.

2.2.5 Emergency Precautions

Follow these emergency precautions for the following:

- Electric Shock
- Fire

2.2.5.1 Electric Shock

- Do NOT immediately touch the person struck by electricity. You could be the second victim.
- To shut off the electric flow to a victim, disconnect the power feed cable of the equipment. In spite of this action, electricity may not be shut off. Separate the victim from the current source by using a non-conductive material such as dry wooden bar.
- Call an ambulance.
- When the victim has lost consciousness, practice artificial respiration on the victim. To prepare for such a case, learn how to practice artificial respiration.
- When the victim's heart has stopped, give a heart massage. This treatment should only be conducted by a person who has been trained and qualified.

2.2.5.2 Fire

- To shut off the electric flow to the equipment, pull out the power feed cable. This will terminate the power supply.
- If a fire cannot be extinguished when the electric flow has been shut off, use fire-fighting procedures and contact the fire department.

2.2.6 Warning Notices

2.2.6.1 CAUTION Statements

CAUTION statements described in this manual and the pages where they appear are listed below.

Table 2.1 CAUTION Statements

Warning Statement	Corresponding Page
Cooling fans rotate at a high speed. Keep body parts and loose clothing away from the cooling fans.	12
When cleaning, take care not to touch electrically charged parts. Electric shock may result.	12, 13
Do not touch electrically charged components during parts replacement. Electric shock may result.	13

2.2.7 Locations of Warning Labels on the Equipment

Warning labels are pasted on sections of equipment which require special care. Read the messages and observe the warning procedures. They are shown in the following figures:

- Floor Model RK+H1H/Floor Model RKS+H1H
- Floor Model RK+RKA+H2H
- Rack-Mount Model RD/RKS
- Rack-Mount Model RKA
- Additional Battery Unit

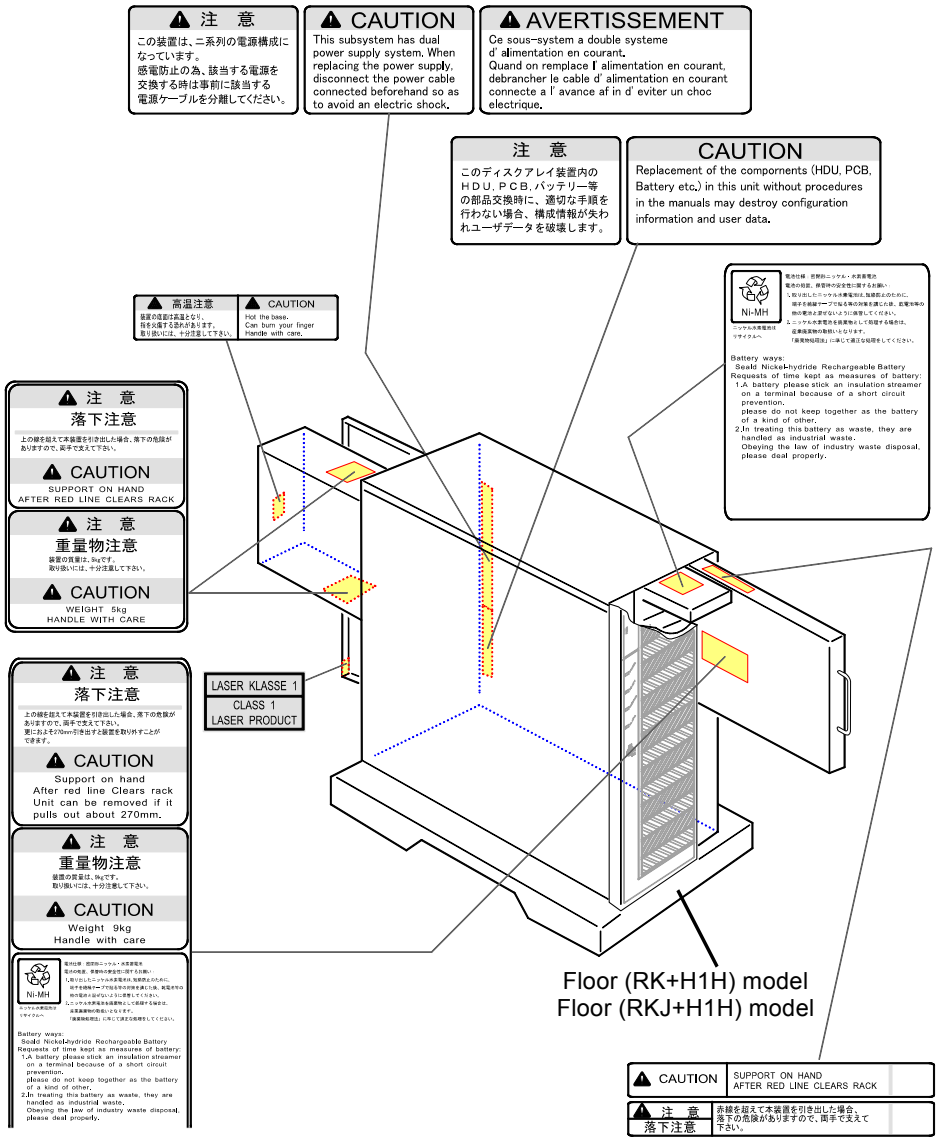


Figure 2.1 Positions and Contents of Labels on Floor Model RK+H1H/Floor Model RKS+H1H

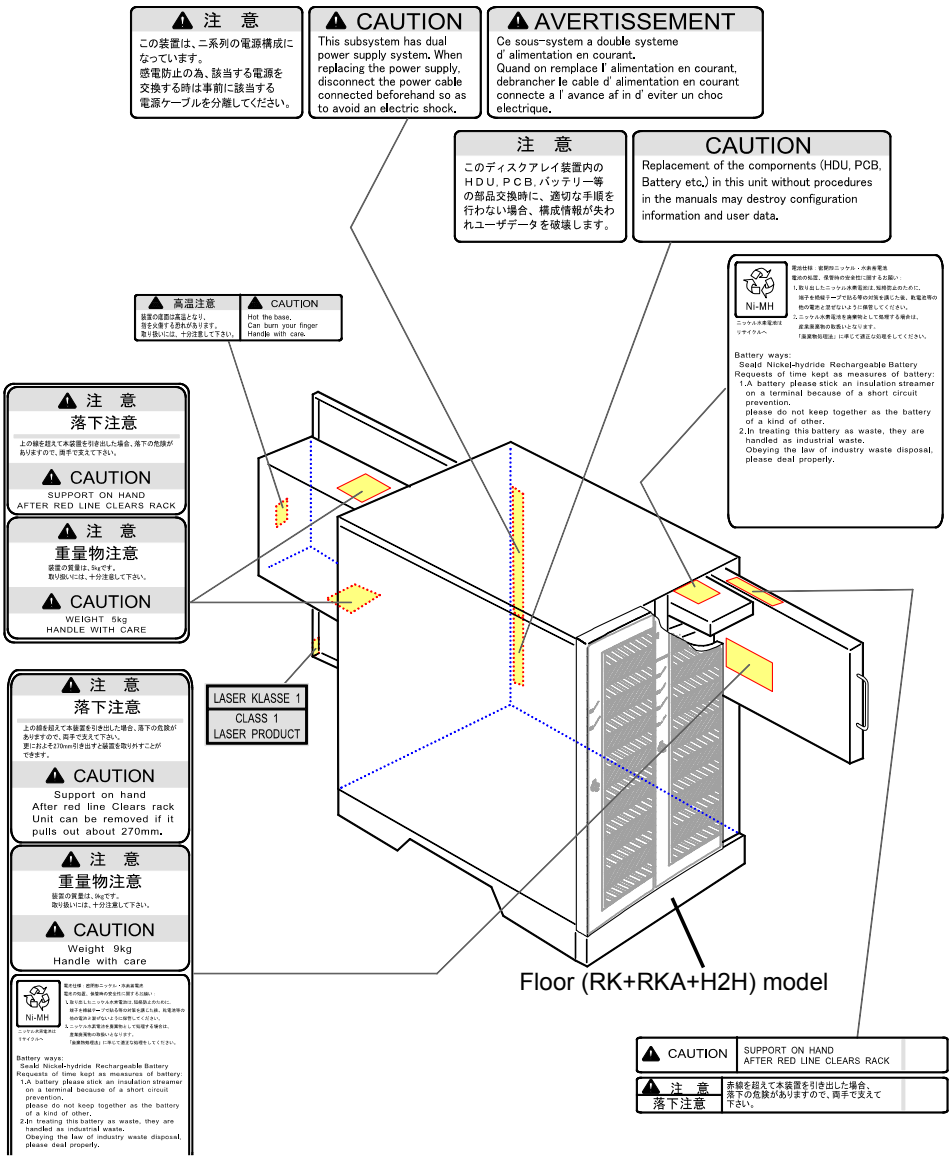


Figure 2.2 Positions and Contents of Labels on Floor Model RK+RKA+H2H

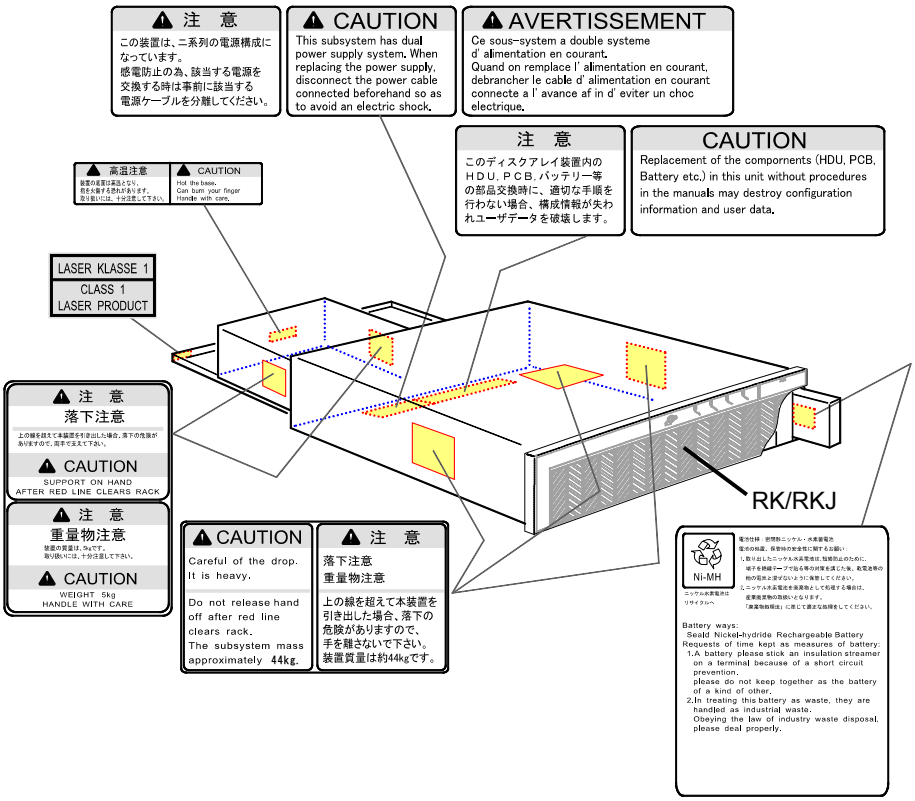


Figure 2.3 Positions and Contents of Labels on Rack-Mount Model RK/RKS

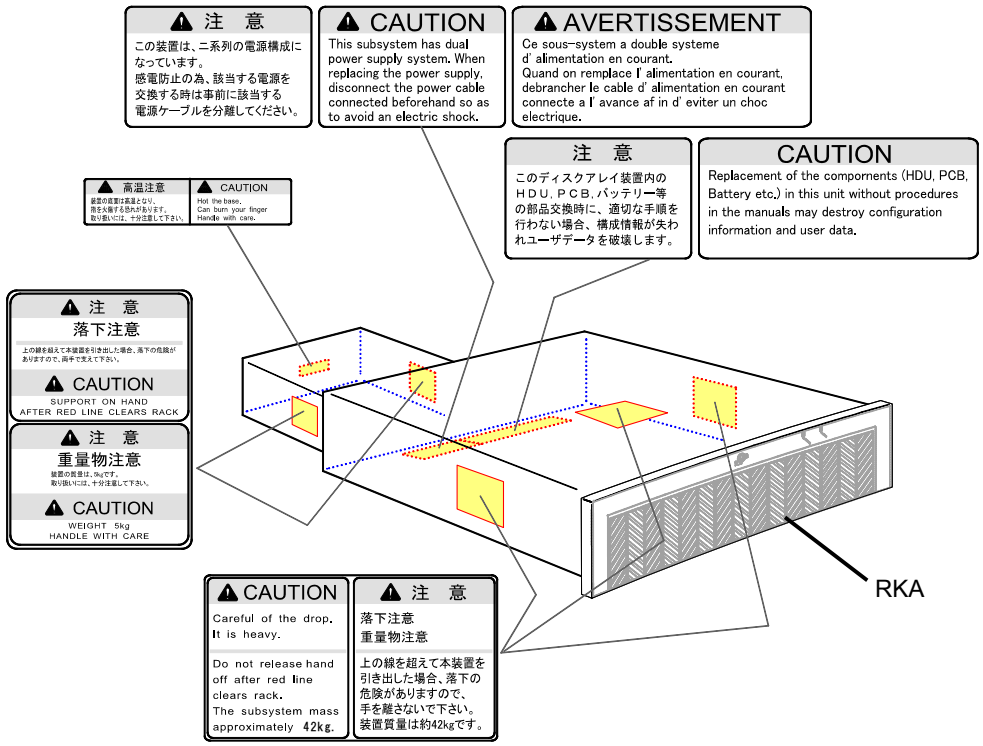


Figure 2.4　Positions and Contents of Labels on Rack-Mount Model RKA

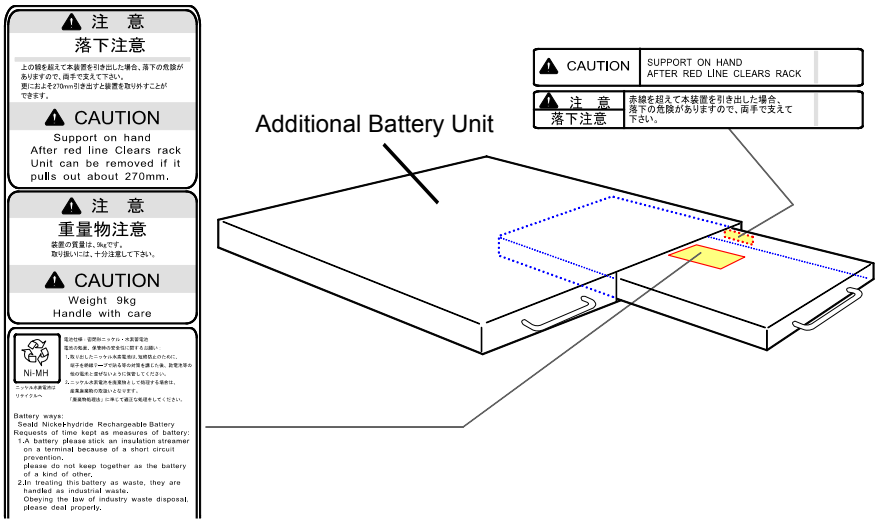


Figure 2.5　Positions and Contents of Labels on the Additional Battery Unit

2.3 General Specifications and Requirements

This section describes the general specifications and requirements for the Thunder 9500™ V Series subsystem. The following are included:

- Dimensions and Weight
- Service Clearance Requirements
- Floor Load Rating
- Internal Logic Specifications
- Cable Requirements

2.3.1 Dimensions and Weight

The following table illustrates the dimensions and weight of the 9500V rack-mount model and the 9500V floor model.

Table 2.2 9500V Dimensions and Weight of the Rack-Mount Model

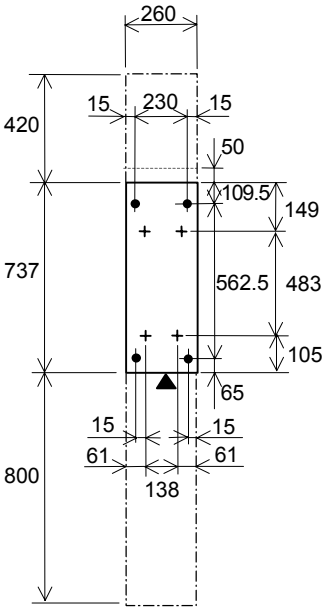
Item / Model		Rack-Mount Model		
		RK	RKS	RKA
Physical Specifications	Chassis size (W×D×H) (mm)	483×656×129		
	Mass (kg)	44 approx		42 approx
	Acoustic noise (dB)	53 approx		
	Required height (EIA unit)	3		

Table 2.3 9500V Dimensions and Weight of the Floor Model

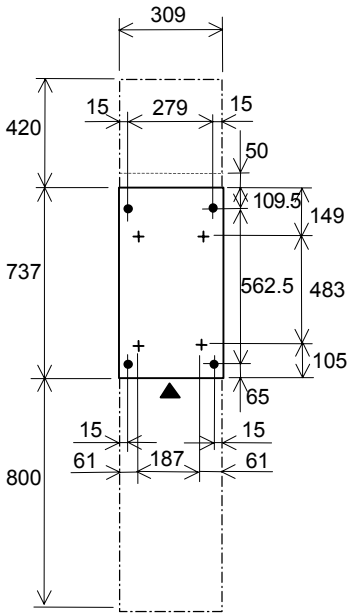
Item / Model		Floor Model	
		Floor (RK+H1H) Model/ Floor (RKS+H1H) Model	Floor (RK+RKA+H2H) Model
Physical Specifications	Chassis size (W×D×H) (mm)	260×737×540	309×737×540
	Mass (kg)	80 approx	125 approx
	Acoustic noise (dB)	53 approx	56 approx

2.3.2 Service Clearance Requirements

The following figure shows the floor area required for installing the equipment. Install the equipment in a place with the area shown in the figure to avoid problems such as inadequate service clearance or insufficient ventilation. All distances in the following figure are stated in millimeters (mm).



Floor (RK+H1H) Model/
Floor (RKJ+H1H) Model



Floor (RK+RKA+H2H) Model

2.3.3 Floor Load Rating

This section includes:

- Floor Load Rating for the 9500V Rack-Mount Model
- Floor Load Rating for the 9500V Floor Model

2.3.3.1 Floor Load Rating for the 9500V Rack-Mount Model

In the maximum configuration, the rack-mount model can be configured with 1 RK and 14 RKAs. The total weight of the subsystem in this configuration is 1,030 kg.

Note: For additional information about the rack-mount model, refer to the *Hitachi Freedom Storage™ Thunder 9500™ V Series 19-Inch Rack Reference Guide* (MK-92DF654).

2.3.3.2 Floor Load Rating for the 9500V Floor Model

The Floor (RK+H1H) Model/Floor (RKS+H1H) Model contains controller boards (up to 2) and disk drives (up to 14). A maximum configuration weighs 80 kg.

The Floor (RK+RKA+H2H) Model contains controller boards (up to 2) and disk drives (up to 29). A maximum configuration weighs 125 kg.

To assure adequate load-bearing capacity, plan for the maximum configuration.

2.3.4 Internal Logic Specifications

The following table lists the internal logic specifications of the 9500V.

Table 2.4 Internal Logic Specification of the 9500V Rack-Mount Model

Item		Specification (Note)
Internal logic specification	Control CPU	Power PC7455 (667 MHz)
	Control OS	VxWorks
	Control memory	Flash memory: 2 Mbytes L2 cache memory: 512 Kbytes SRAM: 64 M bytes
	Data bus performance	Cache access: 2.44 Gbytes/s
	Data assurance method	Data bus: Through-parity Cache memory: ECC (1 bit for correction, 2 bits for detection) Disk drive: Data assurance code

Note: RKA is not included in these specifications.

Note: For additional information about the rack-mount model, refer to the *Hitachi Freedom Storage™ Thunder 9500™ V Series 19-Inch Rack Reference Guide* (MK-92DF654).

2.3.5 Cable Functions

The following table lists the principal functions of the 9500V cable. Fibre channel cables are available from Hitachi Data Systems.

Table 2.5 Principal Functions of 9500V Cables

Cable	Function
Fibre Channel cable	Connect with a host or HBA/Switch.
ENC (ENCLOSURE) cable	Connect between subsystems with 4 loops Fibre Channel (FC_AL).
LAN Cross cable	Connect the PCs for user, monitoring and maintenance.

2.4 Environmental Specifications and Requirements

To maintain optimal Thunder 9500V performance, the 9500V subsystem must be installed in a proper environment. This section discusses the following necessary environmental specifications and requirements:

- Environmental Hazards
- Temperature and Humidity Requirements
- Input Power and Insulation Performance Specifications
- Air Flow Requirements
- Vibration and Shock Tolerances
- Reliability

2.4.1 Environmental Hazards

Do not install the subsystem in the places described below; the life of equipment functioning will be shortened and equipment failures will occur. **Avoid** the following:

- Direct sunlight exposure
- Temperature and humidity variation (for example, near an air conditioner)
- Close proximity to a device that generates electrical noise and motion (for example, air conditioner that is not grounded and washing machine motor)
- Close proximity to an apparatus that generates a strong magnetic field
- Excessive dust
- Frequent vibrations
- An inclined floor

2.4.2 Temperature and Humidity Requirements

Table 2.6 lists the temperature and humidity requirements for the 9500V subsystem.

Table 2.6 Environmental Specifications

Item		Specification
Temperature	In operation (°C)	10 to 40
	In non-operation (°C)	-10 to 50
	In transport/storage (°C)	-30 to 60
	Temperature change rate (°C/h)	10 or less
Humidity	In operation (%)	8 to 80
	In non-operation (%)	8 to 90
	Maximum wet bulb temperature (°C)	29 (non-condensing)
Altitude	In operation (m)	-300 to 3,000
	In non-operation (m)	-300 to 12,000

2.4.3 Input Power and Insulation Performance Specifications

The following tables list the input power and insulation performance specifications for the 9500V rack-mount models and the 9500V floor model.

Table 2.7 Input Power and Insulation Performance Specifications for the Rack-Mount Model

Item \ Model			Rack-Mount Model		
			RK	RKS	RKA
Input power specification	Input voltage (V)		AC 100/200 (100-120/200-240)		
	Frequency (Hz)		50/60 ± 1		
	Number of phases, cabling		Single-phase with protective grounding		
	Steady-state current (A) (See **Note**)		4.4×2/2.2×2		3.2×2/1.6×2
	Breaking current (A)		20.0		15.0
	Required power	Steady state (VA)	880 of less		640 of less
		Starting state (VA)	920 of less		720 of less
Insulation performance	Insulation withstand voltage		AC 1,500 V (10 mA, 1 min)		
	Insulation resistance		DC 500 V, 10 M Ω or more		

Note: This indicates the current consumption in the usual state. When a power supply failure occurs, the power consumption is provided by the single power supply for the subsystem.

Table 2.8 Input Power and Insulation Performance Specifications for the Floor Model

Item			Floor Model	
			Floor (RK+H1H) Model/ Floor (RKS+H1H) Model	Floor (RK+RKA+H2H) Model
Input power specification	Input voltage (V)		AC 100/200 (100-120/200-240)	
	Frequency (Hz)		50/60 ± 1	
	Number of phases, cabling		Single-phase with protective grounding	
	Steady-state current (A)		4.4×2/2.2×2	4.4×2+3.2×2/ 2.2×2+1.6×2
	Breaking current (A)		20.0	15.0/20.0
	Required power	Steady state (VA)	880 of less	1,520 of less
		Starting state (VA)	920 of less	1,640 of less
Insulation performance	Insulation withstand voltage		AC 1,500 V (10 mA, 1 min)	AC 1,500 V (100 mA, 1 min)
	Insulation resistance		DC 500 V, 10 M Ω or more	

2.4.4 Air Flow Requirements

The 9500V subsystem is air-cooled. Air must enter the subsystem through the airflow intakes at the back of each subsystem and must be exhausted out of the front, so it is very important that the air intakes and outlets remain clear.

2.4.5 Vibration and Shock Tolerances

Table 2.9 lists the vibration and shock tolerance data for the 9500V subsystem. The 9500V can tolerate vibration and shock within these limits and continue to perform normally. The user should consider these requirements if installing the 9500V near large generators located on the floor above or below the 9500V subsystem. Generators or any other source of vibration, if not insulated or shock-mounted, can cause excessive vibration that may affect the subsystem.

Table 2.9 Vibration and Shock Tolerances

Item		Specification
Vibration	In operation (m/s^2)	2.5 or less
	In non-operation (m/s^2)	5.0 or less
	In transport (packed) (m/s^2)	5.0 or less
Impact	In operation (m/s^2)	20 or less
	In non-operation (m/s^2)	50 or less
	In transport (packed) (m/s^2)	80 or less
Angle at which the subsystem will turn over (°)		15 or less

2.4.6 Reliability

The reliability of the 9500V is described in the following tables.

Table 2.10 Reliability of the 9500V Rack-Mount Model

Item	Model	Rack-Mount Model		
		RK	RKS	RKA
Reliability	MTBF (Mean Time Between Failure)	MTBF of longer than 50,000 hours is expected.		
	MTBDL (Mean Time Between Data Lost) See Note.	$\frac{(\text{MTBF of the disk drive})^2}{n(n-1)\times\text{Number of RAID group}\times\text{MTTR}}$ MTTR: Mean Time To Repair About 20 million hour or longer		
	Drop in package (JIS Z 0200-1997)	No abnormality must be caused by a free drop of level IV.		
	Radio frequency radiation	Conforms to FCC Class A		
	Instantaneous power failure	10 ms (100% dip)		

Note: n= Number of mounted Disk drives

RAID 5: n(n-1), RAID 0: n2, RAID 1 and RAID 0+1: 1/2

Table 2.11 Reliability of the 9500V Floor Model

Item	Model	Floor Model	
		Floor (RK+H1H) Model/ Floor (RKS+H1H) Model	Floor (RK+RKA+H2H) Model
Reliability	MTBF (Mean Time Between Failure)	MTBF of longer than 50,000 hours is expected.	
	MTBDL (Mean Time Between Data Lost) See Note.	$\frac{(\text{MTBF of the disk drive})^2}{n(n-1)\times\text{Number of RAID group}\times\text{MTTR}}$ MTTR: Mean Time To Repair About 20 million hour or longer	
	Drop in package (JIS Z 0200-1997)	No abnormality must be caused by a free drop of level IV.	No abnormality must be caused by a drop of level IV. (one end is dropped while another end is supported.)
	Radio frequency radiation	Conforms to FCC Class A	
	Instantaneous power failure	10 ms (100% dip)	

Note: n= Number of mounted Disk drives

RAID 5: n(n-1), RAID 0: n2, RAID 1 and RAID 0+1: 1/2

Chapter 3 Powering On/Off Procedure

The disk drive may emit audible mechanical sounds when the disk drive is started (spun up), immediately after the subsystem is powered on and powered off (spun down). However, this does not indicate a problem if the WARNING or ALARM LED of the basic frame is off; you may use the subsystem.

This section describes power on/off procedures for the following:

- 9500V Rack-Mount Model
- 9500V Floor Model

3.1 9500V Rack-Mount Model

The following steps describe power on/off procedures for the 9500V rack-mount model.

Note: For additional information about the rack-mount model, refer to the *Hitachi Freedom Storage™ Thunder 9500™ V Series 19-Inch Rack Reference Guide* (MK-92DF654).

3.1.1 Subsystem Power On

1. Verify that the main switch is turned off.
2. Verify that the AC power unit switch of each power unit is turned off.
3. Verify that the circuit breaker (CB1) is turned off.
4. Turn on the circuit breaker (CB1) of the PDB.
5. Turn on the AC power unit switch of the power unit on RKA. (This procedure is 9570V only.)

   Note: When disk drives are not installed on the additional disk drive unit side, shut off the power to the power unit (RKA).
6. Turn on the AC power unit switch of the power unit on RK/RKS.
7. Turn on the main switch.
8. Make sure that the READY LED (green) lights in a few minutes. If the ALARM LED (red) or WARNING LED (orange) lights, refer to 8.1 Troubleshooting Based on LED Indications.

3.1.2 Subsystem Power Off

1. Turn off the main switch.
2. Verify that the POWER LED (green) on the panel is off.
3. Turn off the AC power unit switch of the power unit.
4. Turn off the circuit breaker (CB1) of the PDB.

3.2 9500V Floor Model

The following steps describe power on/off procedures for the 9500V floor model.

3.2.1 Subsystem Power On

1. Verify that the main switch is turned off.
2. Verify that the AC power unit switch of the power unit is turned off.
3. Turn on the AC power unit switch of the power unit on RKA. (This procedure is 9570V only.)

   Note: When disk drives are not installed on the additional disk drive unit side, shut off the power to the power unit (RKA).
4. Turn on the AC power unit switch of the power unit on RK/RKS.
5. Turn on the main switch.
6. Verify that the READY LED (green) lights in a few minutes. If the ALARM LED (red) or WARNING LED (orange) lights, refer to 8.1 Troubleshooting Based on LED Indications.

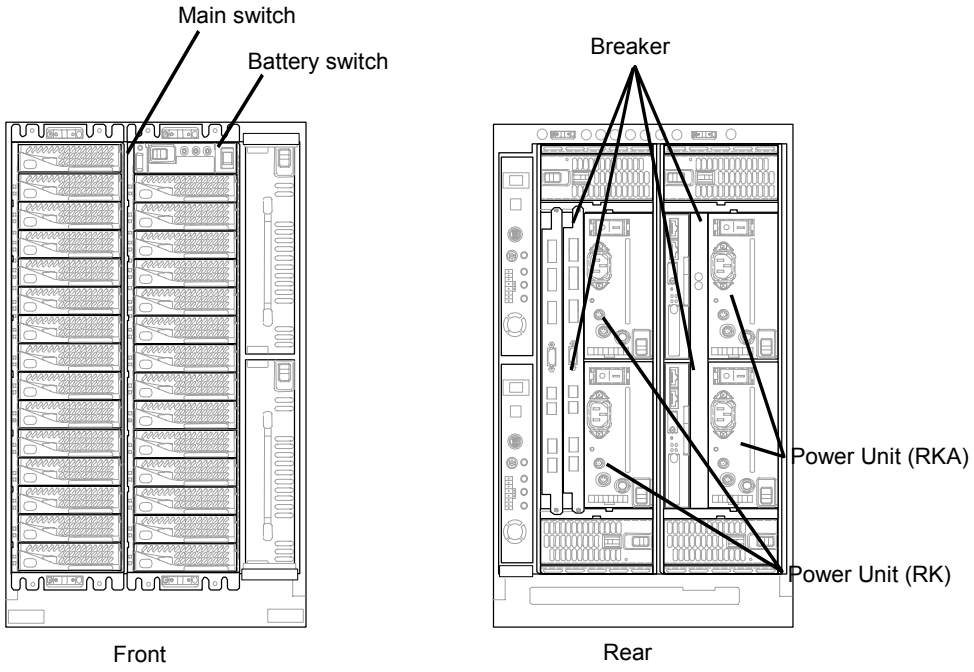


Figure 3.1 Subsystem Power On/Off (Example: Floor [RK+RKA+H2H] Model)

3.2.2 Subsystem Power Off

1. Turn off the main switch.
2. Verify that the POWER LED (green) on the panel is off.
3. Turn off the AC power unit switch of the power unit.

Chapter 4 Subsystem Architecture and Components

This chapter includes the following:

- Configuration Block Diagrams
- Redundant Power Supplies
- Fibre Channel Interface
- Array Frames
- Disk Array Groups
- Service Processor (SVP)
- Components and Optional Parts of the Thunder 9500™ V Series Subsystem
- Component Names, Locations, and Functions
- Periodical Replacement Parts and Parts with Limited Lives

4.1 Configuration Block Diagrams

This section includes block diagrams for the following:

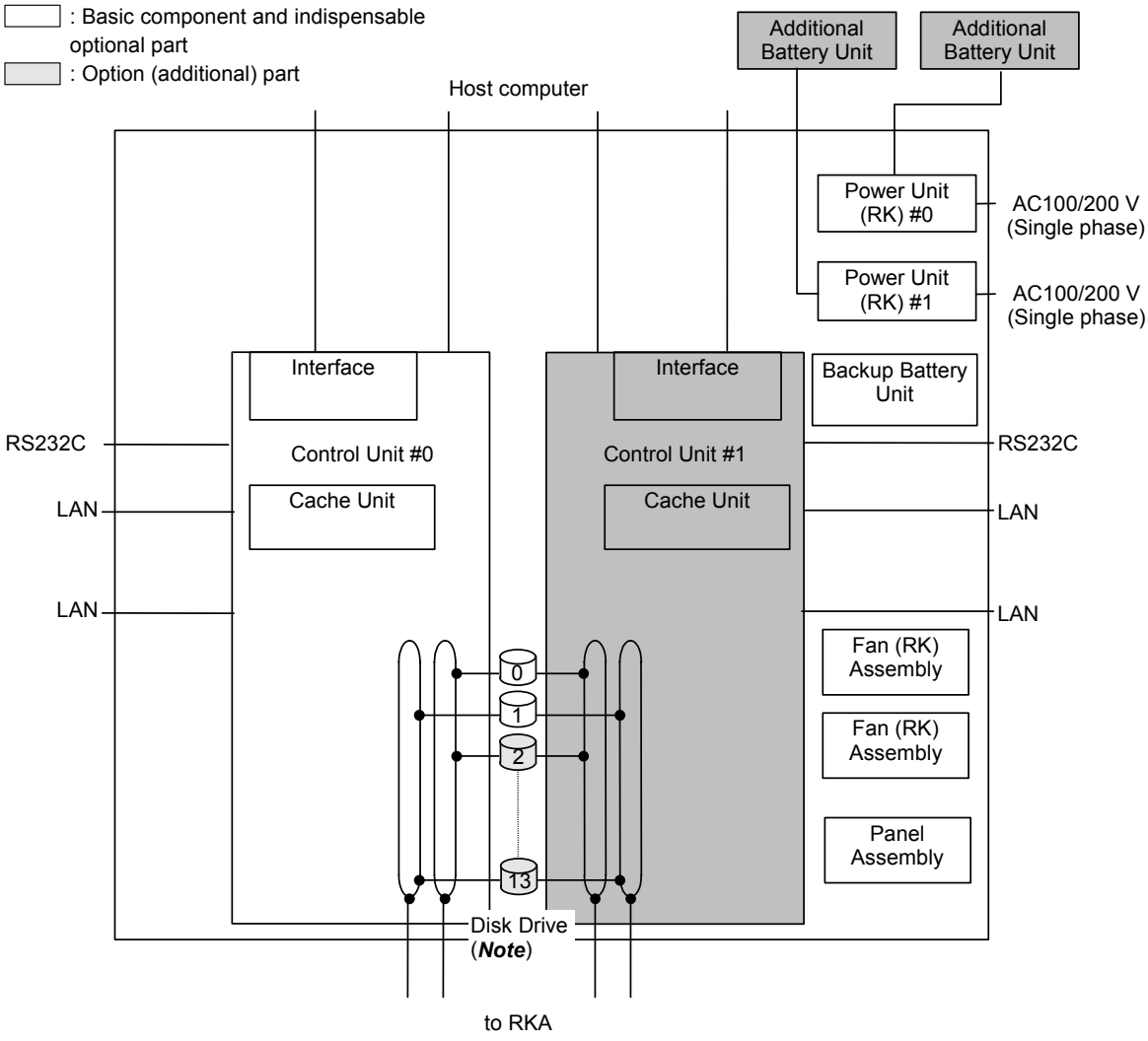
- 9500V Rack-Mount Model
- 9500V Floor Model

4.1.1 9500V Rack-Mount Model

The configuration block diagrams of the RK, RKS, and RKA Rack-Mount models are shown below. The RK/RKS and RKA can mount up to 14, 15 disk drives respectively. (The RK has a controller that can control up to 224 disk drives as RAID.)

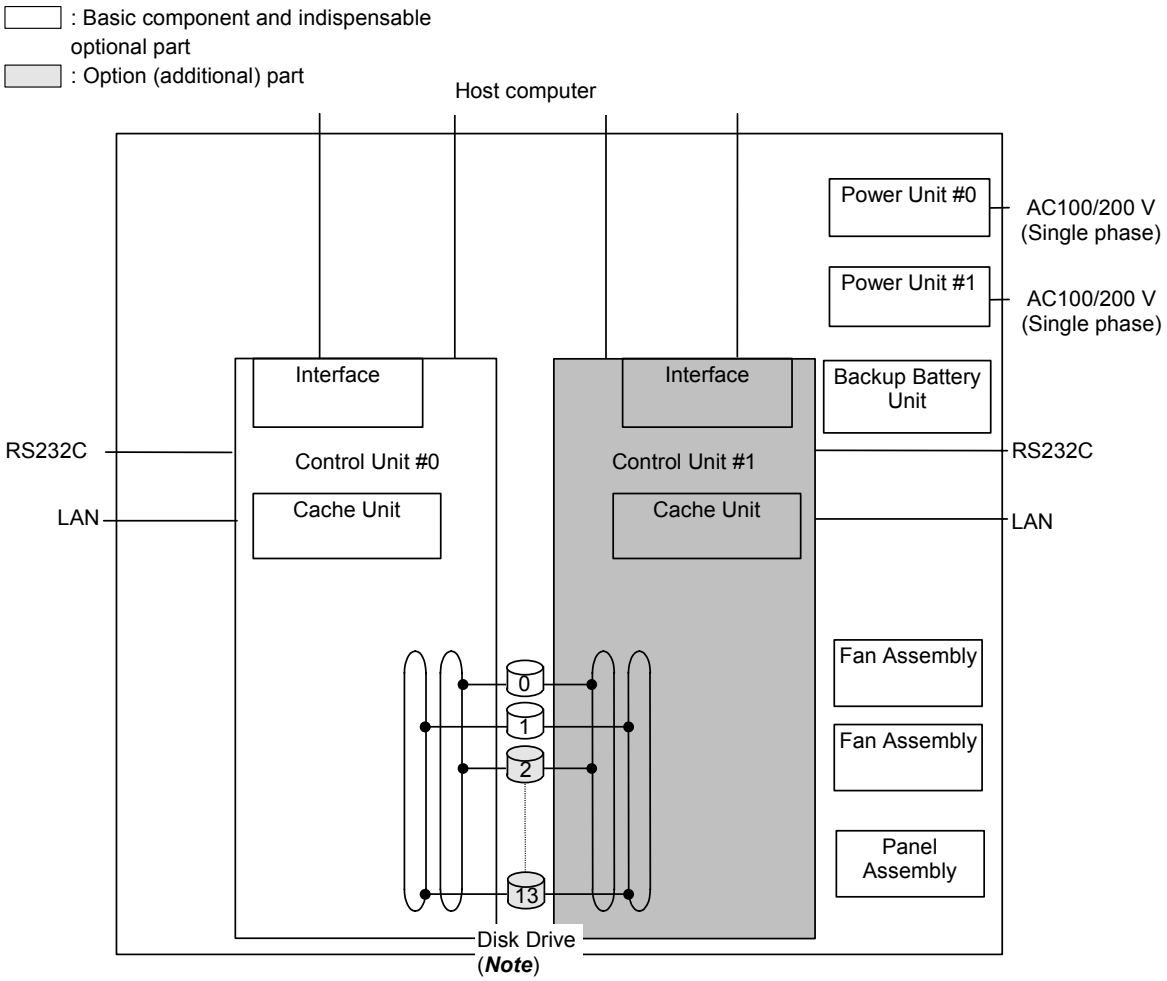
The disk drives can be assigned to data disk(s), parity disk(s) (mirror disk(s)) depending on the RAID level.

Up to 15 spare disks (for RKS: up to 1) can be mounted in any locations within the configuration.



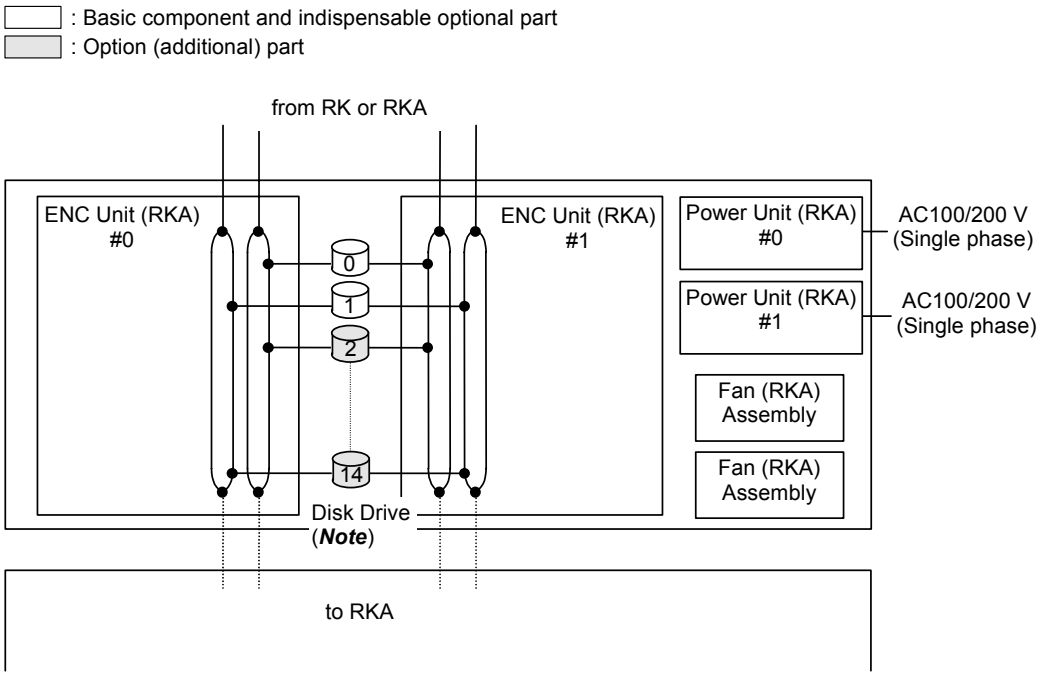
Note: Disk drive: DF-F600-AEH36, DF-F600-AEF72, DF-F600-AEH72

Figure 4.1 RK Unit System Configuration



Note: Disk drive: DF-F600-AEF72

Figure 4.2 RKS Unit System Configuration



Note: Disk drive: DF-F600-AEH36, DF-F600-AEF72, DF-F600-AEH72

Figure 4.3 RKA Unit System Configuration

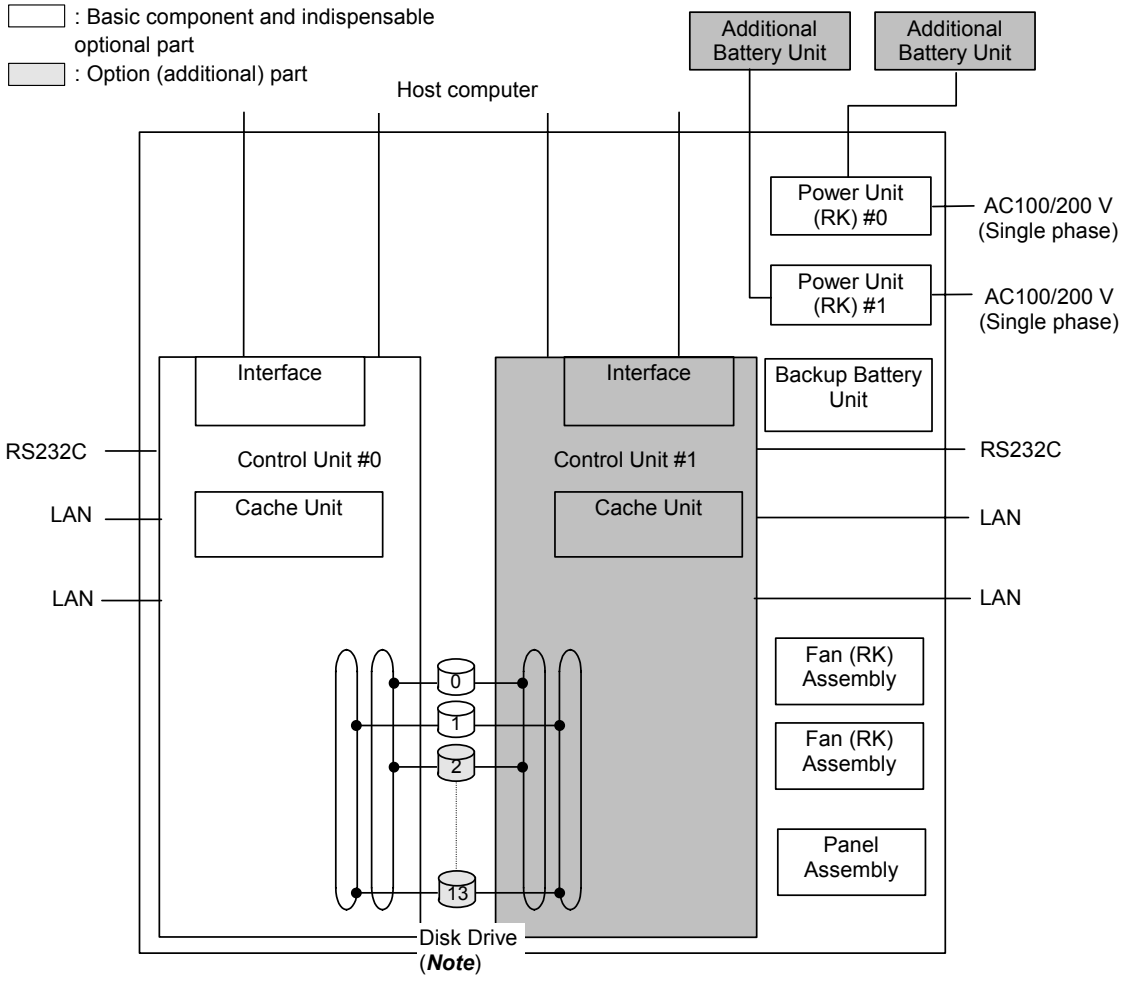
4.1.2 9500V Floor Model

The configuration block diagrams of the Floor (RK+H1H) Model, Floor (RKS+H1H) Model, and Floor (RK+RKA+H2H) Model are shown below.

The Floor (RK+H1H) Model/Floor (RKS+H1H) Model can mount up to 14 disk drives. The Floor (RK+RKA+H2H) Model can mount up to 29 disk drives.

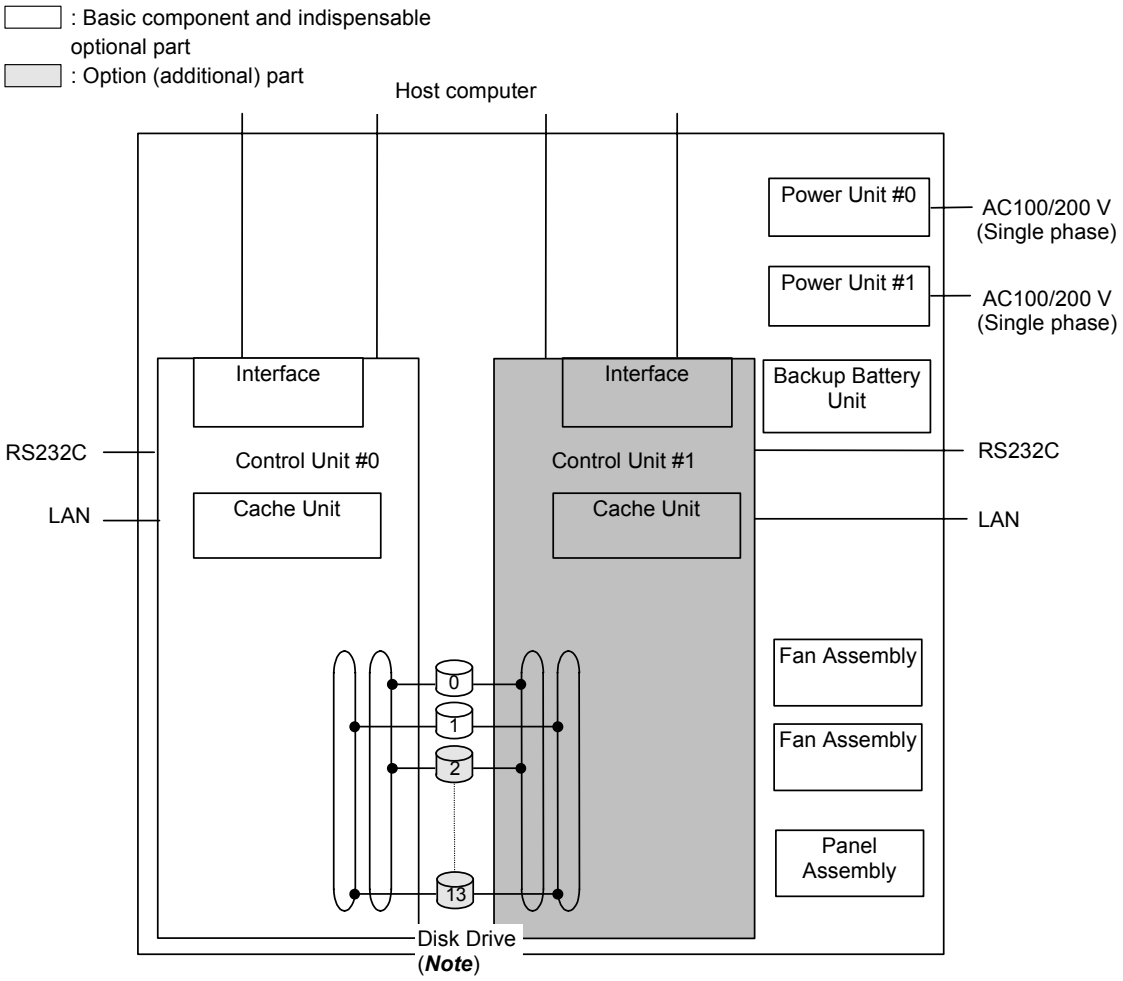
The disk drives can be assigned to data disk(s), parity disk(s) (mirror disk(s)) depending on the RAID level.

Up to 15 spare disks (for Floor [RK+H1H] Model/Floor [RKS+H1H] Model: up to 1)can be mounted in any locations within the configuration.



Note: Disk drive: DF-F600-AEH36, DF-F600-AEF72, DF-F600-AEH72

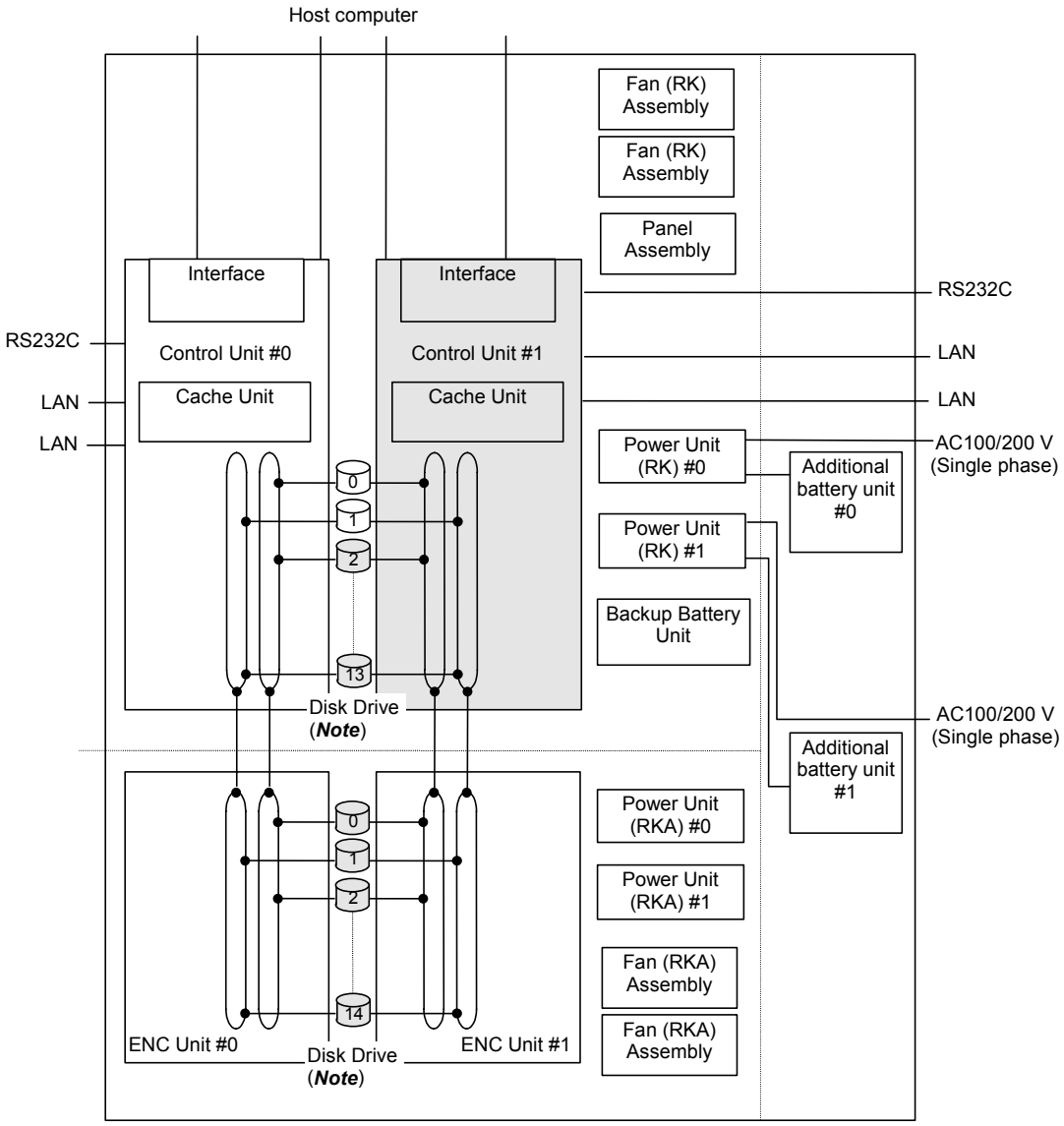
Figure 4.4 Floor (RK+H1H) Model System Configuration



Note: Disk drive: DF-F600-AEF72

Figure 4.5 Floor (RKS+H1H) Model System Configuration

: Basic component and indispensable optional part
: Option (additional) part



Note: Disk drive: DF-F600-AEH36, DF-F600-AEF72, DF-F600-AEH72

Figure 4.6 Floor (RK+RKA+H2H) Model System Configuration

4.2 Redundant Power Supplies

Each 9500V unit is powered by its own set of redundant power supplies, and each power supply is able to provide power for the entire RK/RKS or RKA unit, should it become necessary. Because of this redundancy, the Thunder 9500™ V Series subsystem can sustain the loss of multiple power supplies and still continue operation. To make use of this capability, the two power supplies of each 9500V unit should be connected either to dual power sources or to different power panels, so if there is a power failure on one of the sources, the Thunder 9500™ V Series subsystem can continue full operations using power from the alternate source.

4.3 Fibre Channel Interface

The Thunder 9500™ V Series subsystem supports open system operations. The Thunder 9500™ V Series subsystem supports up to 4 fibre-channel ports. (Thunder 9530V supports up to 2 fibre channel ports.) The 9500V Fibre Channel interface is capable of operating at data transfer speeds of up to 200 MB/sec. The 9500V supports shortwave multimode optical cables. With these shortwave fibre channel cards, the 9500V subsystem can be located up to 300 meters from the open-system host.

4.4 Array Frame

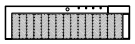
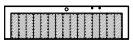
The following array frames are described in this section:

- 9500V Rack-Mount Model
- 9500V Floor Model

4.4.1 9500V Rack-Mount Model

Each RK/RKS or RKA unit contains the physical disk drives, including the disk array groups and the dynamic spare disk drives. Each rack frame has dual AC power plugs, which should be attached to two different power sources or power panels. The 9500V can be configured with 1 RK and up to 11 RKA units for a total of 179 GB disk drives at a maximum of 12.7 Tbytes RAID0 (using the 72 G disk drive).

Table 4.1 Basic Specifications of the Rack-Mount Model

Item	Model		Rack-Mount model	
			1 RK/RKS	1 RKA
Configuration	Configuration		1 RK/RKS	1 RKA
	System appearance			
Disk drive used	Disk drive size (W×D×H) (mm)		101.6×146.1×25.5	
	Data capacity (Gbyte)		36/72 (RKS is 36 Gbyte disk drive cannot be used)	
	Rotational speed (min^{-1})		10,000/15,000 (RKS is 15,000 min^{-1} disk drive cannot be used)	
	Maximum mountable quantity (unit)		14	15
Host interface	Interface type		2 Gbps Fibre Channel Optical (Non-OFC)	-
	Data transfer speed (i.e. maximum speed for transfer to host)		200 M bytes/s (Fibre Channel)	-
	Number of ports	Single controller	Fibre Channel: 2 (RKS is 1 port)	-
		Dual controller	Fibre Channel: 4 (RKS is 2 port)	-
	Transferred block size (bytes)		512	-

Note: For additional information about the rack-mount model, refer to the *Hitachi Freedom Storage™ Thunder 9500™ V Series 19-Inch Rack Reference Guide* (MK-92DF654).

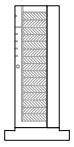
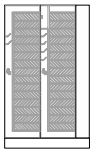
4.4.2 Floor Model

Each floor model contains physical disk drives, including the disk array groups and the dynamic spare disk drives. Additionally, each floor model has dual AC power plugs, which should be attached to two different power sources or power panels.

Floor (RK+H1H) Model/Floor (RKS+H1H) Model can be configured with 14 disk drives at a maximum of 1,001 Gbytes RAID0.

Floor (RK+RKA+H2H) Model can be configured with 29 disk drives at a maximum of 2,075 Gbytes RAID0 (using the 72 G disk drive).

Table 4.2 Basic Specifications of the Floor Model

Item			Model: Floor model	
			Floor (RK+H1H) Model/ Floor (RKS+H1H) Model	Floor (RK+RKA+H2H) Model
Configuration	Configuration		1 RK/RKS+Floor setting kit (DF-F600-H1H)	1 RK+1 RKA+Floor setting kit (DF-F600-H2H)
	System appearance			
Disk drive used	Disk drive size (W×D×H) (mm)		101.6×146.1×25.5	
	Data capacity (Gbyte)		36/72 (Floor (RKS+H1H) Model is 36Gbyte disk drive cannot be used)	
	Rotational speed (min^{-1})		10,000/15,000 (Floor (RKS+H1H) Model is 15,000 min^{-1} disk drive cannot be used)	
	Maximum mountable quantity (unit)		14	29
Host interface	Interface type		2 Gbps Fibre Channel Optical (Non-OFC)	
	Data transfer speed (i.e. maximum speed for transfer to host)		200 M bytes/s (Fibre Channel)	
	Number of ports	Single controller	Fibre Channel: 2 (Floor (RKS+H1H) Model is 1 port)	
		Dual controller	Fibre Channel: 4 (Floor (RKS+H1H) Model is 2 port)	
	Transferred block size (bytes)		512	

4.5 Disk Array Groups

The RAID group is the basic unit of storage capacity for the Thunder 9500™ V Series subsystem. All disk drives in a RAID group must have the same logical capacity. When a RAID group is configured with drives of different capacity, the RAID group is configured by assuming the minimum capacity of the drives.

The 9500V supports several different RAID levels.

Note: Details of the storage capacities, depending on the RAID level and subsystem configuration, are shown in Appendix E List of Storage Capacities Corresponding to RAID Levels and Configurations.

4.6 Service Processor (SVP)

The Thunder 9500™ V Series subsystem is controlled by the service processor (SVP). The SVP is integrated into the controller frame and is accessed through the Resource Manager 9500V program and service utilities. The SVP enables Hitachi Data Systems representatives to configure, maintain, and upgrade the 9500V subsystem.

4.7 Components, Optional Parts, and Accessory Parts of the Thunder 9500™ V Series Subsystem

This section includes the following:

- Components and Essential Optional Parts
- Optional Parts
- Accessory Parts

4.7.1 Components and Essential Optional Parts

Thunder 9500™ V Series subsystem components and essential optional parts are listed in the following table:

Table 4.3 Components and Essential Optional Parts

Name	Model	Components (Note 1)
RK	DF-600-RK	Frame (1), Control unit (including Fibre Channel interface) (1), Panel (1), Backup battery unit (1), Fan assembly (RK) (2), AC cable J2H (2), Power unit (RK) (2) Key (Bezel key: 2, Latch key: 4)
RKS	DF-600-RKS (***Note 2***)	Frame (1), Control unit (including Fibre Channel interface) (1), Panel (1), Backup battery unit (1), Fan assembly (RK) (2), AC cable J2H (2), Power unit (RK) (2) Key (Bezel key: 2, Latch key: 4)

Table 4.3 Components and Essential Optional Parts (Continued)

Classification	Model	Components (*Note1*)
RKA	DF-600-RKA	Frame (1), Fan assembly (RKA) (2), AC cable J2H (2), Power unit (RKA) (2), ENC unit (RKA) (2), ENC cable (4) Key (Bezel key: 2, Latch key: 4)
Floor (RK+H1H) Model	DF-600-RK+ DF-F600-H1H	RK (1), Floor setting kit H1H (1), Frame (1), Control unit (including Fibre Channel interface) (1), Panel (1), Backup battery unit (1), Fan assembly (RK) (2), AC cable J1H (2), Power unit (RK) (2), Key (Bezel key: 2, Latch key: 2)
Floor (RKS+H1H) Model	DF-600-RKS+ DF-F600-H1H	RKS (1), Floor setting kit H1H (1), Frame (1), Control unit (including Fibre Channel interface) (1), Panel (1), Backup battery unit (1), Fan assembly (RK) (2), AC cable J1H (2), Power unit (RK) (2), Key Key (Bezel key: 2, Latch key: 4)
Floor (RK+RKA+H2H) Model	DF-600-RK+ DF-600-RKA+ DF-F600-H2H	RK (1), RKA (1), Floor setting kit H2H (1), Frame (1), Control unit (including Fibre Channel interface) (1), Panel (1), Power unit (RK) (2), Power unit (RKA) (2), Backup battery unit (1), Additional battery unit (2), Fan assembly (RK) (2), Fan assembly (RKA) (2), ENC unit (RKA) (2), ENC cable (4), AC cable J1H (4), Key (Bezel key: 4, Latch key: 10)
Cache memory	DF-F600-C512X2	Cache memory of 1 Gbytes (512 M bytes×2)
	DF-F600-C1GX2 (***Note 3***)	Cache memory of 2 Gbytes (1 Gbytes×2)
Disk drive	DF-F600-AEH36 (***Note 3***)	3.5-type Disk drive (35.4 Gbytes) installed in a canister. (Disk rotational speed: 15,000 min^{-1})
	DF-F600-AEF72	3.5-type Disk drive (71.3 Gbytes) installed in a canister. (Disk rotational speed: 10,000 min^{-1})
Resource Manager	P-002D-J200	Utility which integrates the following products. Media provided : CD-ROM Resource Manager 9500V program SNMP Password Protection LUN Size Expansion (LUSE) FlashAccess Dual Active ID Succession

Note 1: Numbers in parentheses following component names display the quantities of components.

Note 2: DF600-RKS is not the model name for the arrangement. Make the arrangements with the collective model names including this model name; DF600-RSS75, DF600-RSD79 and DF600-RSD7D.

Note 3: This disk drive cannot be used for Thunder 9530V.

4.7.2 Optional Parts

Thunder 9500™ V Series subsystem optional parts are listed in the following table:

Table 4.4 Optional Parts

Classification	Model	Name	Specification
Controller	DF-F600-F1H (9570V)	Controller	For duplicating the system
	DF-F600-F1HS (9370V) (***Note 1***)		
Floor setting kit	DF-F600-H1H	Floor setting kit for RK, RKS	Floor setting kit
	DF-F600-H2H	Floor setting kit for RK+RKA	Floor setting kit (for RK+RKA)
Utility Program	P-002D-J201 (9570V) P-002D-J201S (9530V)	Hitachi ShadowImage	This function makes a copy of a logical unit (volume) within a array unit.
	P-002D-J202 (9570V) P-002D-J202S (9530V)	Hitachi TrueCopy	This function equalizes data of disk array subsystems by always synchronizing their data.
	P-002D-J201U (9570V) P-002D-J202SU (9530V)	Upgrade TrueCopy	This function upgrades the TrueCopy Basic.
	P-002D-J203 (9570V) P-002D-J203S (9530V)	LUN Security	This function inhibits access from a specific host or the specific command.
	P-002D-J204 (9570V) P-002D-J204S (9530V)	LUN Management	Support schedule (2002.12)
	P-002D-J211	Resource Manager 9500V	Resource Manager 9500V program
	P-002D-J212	Password Protection	This function inhibits access to an array unit if the user is not registered.
	P-002D-J213	SNMP	This function makes reports a failure that occurs in a array unit via SNMP.
	P-002D-J214	LUN Size Expansion (LUSE)	This function expands the capacity of a Logical Unit by unifying two internal Logical Units.
	P-002D-J215	FlashAccess	This function makes high-speed access possible from a host by the Logical Unit being resident in the cache memory.

Note 1: DF600-RKS is not the model name for the arrangement; RKS is the 9530V model.

4.7.3 Accessory Parts

The model names and specifications of 9500V accessory parts are listed below.

Table 4.5 Accessory Parts

Classification	Model	Name	Specification
Power Cables	DF-F600-J1H	Power cable	2.5 m, 2-pole power cable with grounding terminal (AC 125V, 13 A)
	DF-F600-J2H	Power cable	2.5 m, 2-pole power cable with grounding terminal (AC 125V, 13 A)
Fibre Channel Interface Cables	JZ-050SL025PC.P	1 G-2 G Fibre I/F Cable	SC-LC Fibre I/F cable for Optical (25 m)
	JZ-050SL050PC.P	1 G-2 G Fibre I/F Cable	SC-LC Fibre I/F cable for Optical (50 m)
	JZ-050SL100PC.P	1 G-2 G Fibre I/F Cable	SC-LC Fibre I/F cable for Optical (100 m)
	JZ-050LL025PC.P	2 G-2 G Fibre I/F Cable	LC-LC Fibre I/F cable for Optical (25 m)
	JZ-050LL050PC.P	2 G-2 G Fibre I/F Cable	LC-LC Fibre I/F cable for Optical (50 m)
	JZ-050LL100PC.P	2 G-2 G Fibre I/F Cable	LC-LC Fibre I/F cable for Optical (100 m)
RS232C Cable	IP0814-1P	RS232C cable	9 pins - 9 pins, 5 m
ENC Cable Assembly	DF-F600-K075B	FC cable assembly	FC cable 75 cm×2
	DF-F600-K15B	FC cable assembly	FC cable 15 m×2

4.8 Component Names, Locations, and Functions

This section includes the following:

- Front Bezel Component Locations and Functions
- RK/RKS and RKA Component Locations
- Switch Locations and Functions
- Connector Locations and Functions
- LED Locations and Functions

4.8.1 Front Bezel Component Locations and Functions

This section illustrates and describes the locations and functions for the front bezel.

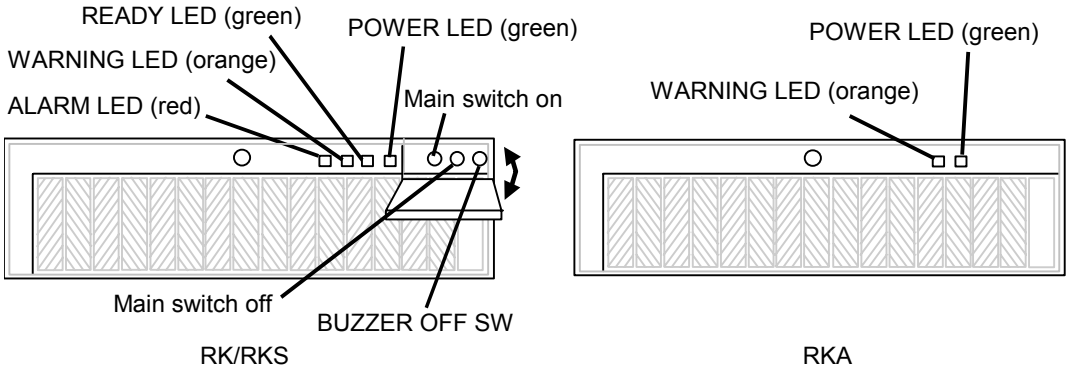


Figure 4.7 Front Bezel Component Locations

Table 4.6 Front Bezel Component Functions

Name	Function
ALARM LED (red)	Indicates that a failure has occurred which makes the subsystem inoperable.
WARNING LED (orange)	Indicates that a failure occurred, but the subsystem is currently operational.
READY LED (green)	Indicates that the subsystem is operational.
POWER LED(green)	Indicates that the power is supplied to the subsystem.
Main switch on	ON: Turns on the power.
Main switch off	OFF: Turns off the power.
BUZZER OFF SW	Press this switch when the buzzer sounds to stop the beep.

4.8.2 RK/RKS and RKA Component Locations

The locations of the RK/RKS and RKA components are shown in the following diagram:

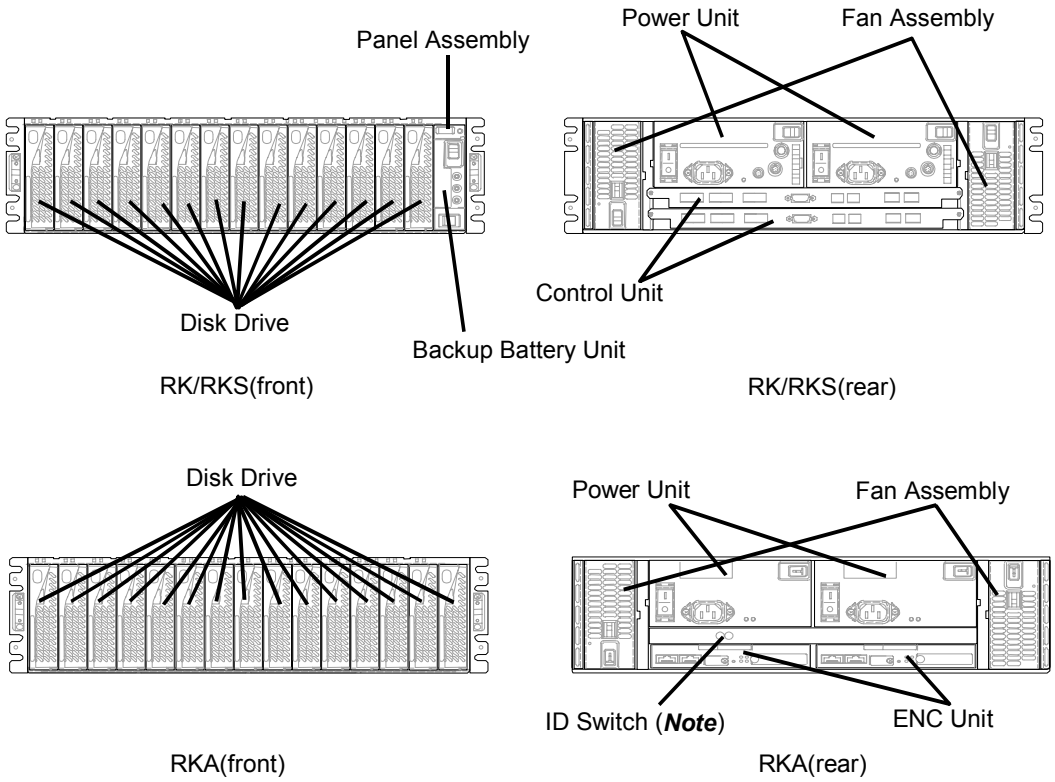


Figure 4.8 RK/RKS and RKA Component Locations

Note: Sets the device ID (1 to 14) of the RKA.

4.8.3 Switch Locations and Functions

This section illustrates and describes the locations and functions for switches in the following hardware components:

- Panel Assembly
- Backup Battery Unit
- Power Unit

4.8.3.1 Panel Assembly

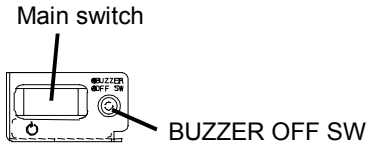


Figure 4.9 Panel Assembly Switch Location

Table 4.7 Panel Assembly Switch Functions

Switch	Function
Main switch	Turns on/off the power.
BUZZER OFF SW	Pressing this switch while the buzzer sounds stops the beep.

4.8.3.2 Backup Battery Unit

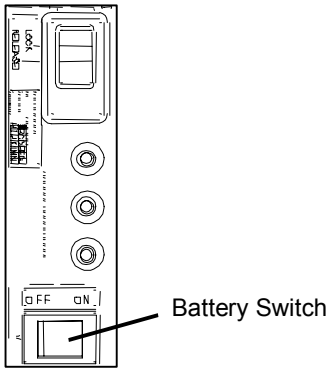


Figure 4.10 Backup Battery Unit Switch Location

Table 4.8 Backup Battery Unit Switch Functions

Switch	Function
Battery Switch	Turns on/off the battery power. When this switch is set to the off, the WARN LED comes on and the buzzer sounds.

4.8.3.3 Power Unit

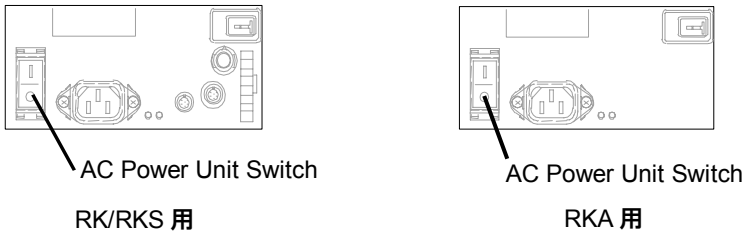


Figure 4.11 Power Unit Switch Locations

Table 4.9 Power Unit Switch Functions

Switch	Function
AC Power Unit Switch	Controls the power applied to the subsystem.

4.8.4 Connector Locations and Functions

This section illustrates and describes the locations and functions for connectors in the following hardware components:

- ENC Unit
- Power Unit
- Control Unit

4.8.4.1 ENC Unit

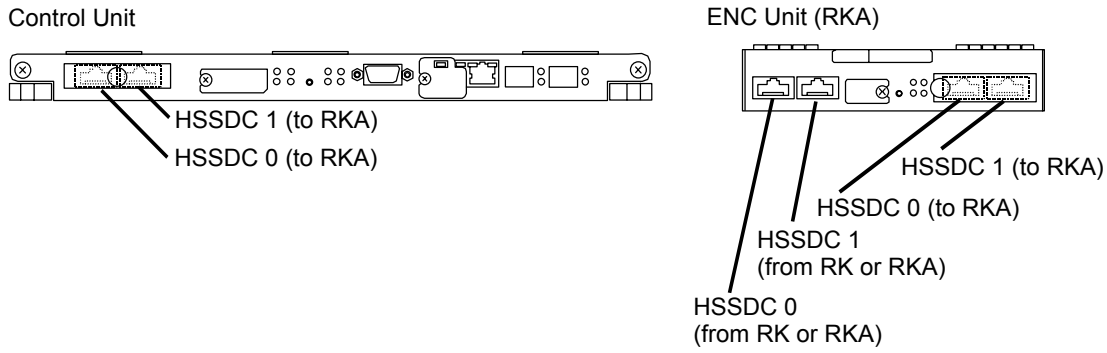


Figure 4.12 Connector Locations for the ENC Unit

Table 4.10 Connector Functions for the ENC Unit

Connector	Function
PATH 0 (***Note***)	RK/RKA connection connector of PC-AL (loop 0 side)
PATH 1 (***Note***)	RK/RKA connection connector of PC-AL (loop 1 side)

Note: These connectors are not supported for Thunder 9530V.

4.8.4.2 Power Unit

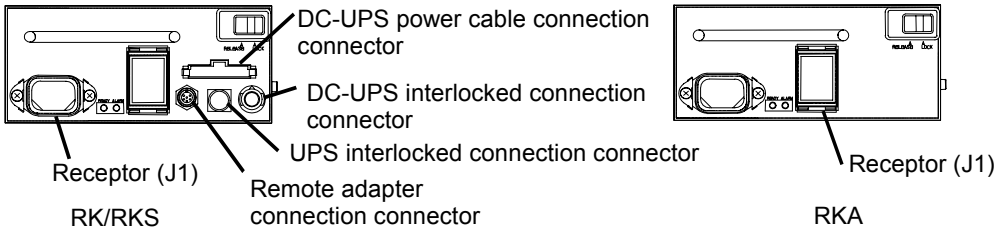


Figure 4.13 Connector Locations for the Power Unit

Table 4.11 Connector Functions for the Power Unit

Connector	Function
Remote adapter connection connector	Used to connect a Remote adapter.
Additional Battery Unit connection connector (for power)	Used to connect the Additional Battery Unit.
Additional Battery Unit connection connector (for signal)	Used to connect the Additional Battery Unit.
UPS interlocked connection connector	Used to connect an UPS for Thunder 9500V.
Receptor (J1)	Power cable receptacle on the unit side.

4.8.4.3 Control Unit

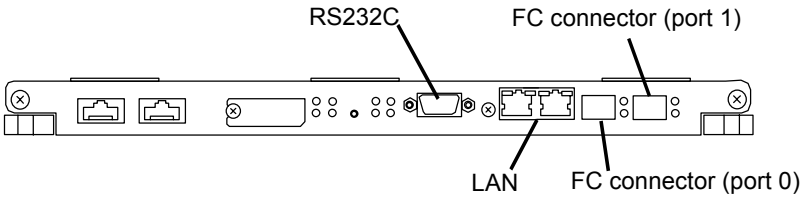


Figure 4.14 Connector Locations for the Control Unit

Table 4.12 Connector Functions for the Control Unit

Connector	Function
RS232C	Connector used to connect an RS232C.
FC connector (***Note***)	Connector for a Fibre channel interface cable.
LAN	Connector used to connect a LAN cable.

Note: The FC connector (port 1) is not supported for Thunder 9530V.

4.8.5 LED Locations and Functions

This section illustrates and describes the locations and functions of LEDs in the following hardware components:

- Disk Drive Display
- Battery Backup Unit
- ENC Unit
- Power Unit
- Fan Assembly
- Control Unit

4.8.5.1 Disk Drive Display

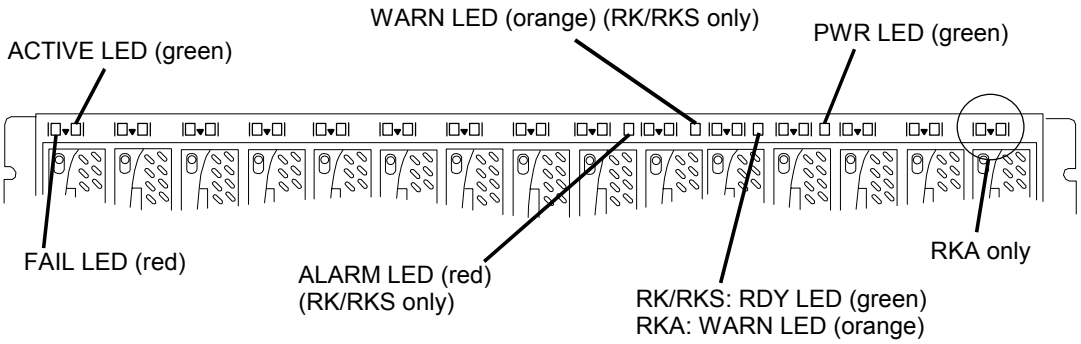


Figure 4.15 LED Locations for the Disk Drive Display

Table 4.13 LED Functions for the Disk Drive Display

Connector	Function
HDD ACTIVE LED (green)	When on or flashing, it indicates that the disk drive is operational.
HDD ALARM LED (red)	When on, it indicates that a failure occurred in the disk drive; the disk drive is inoperable.
ALARM LED (red)	When on, it indicates that a failure occurred in the unit; the unit is inoperable.
READY LED (green)	When on, it indicates that the unit is operable.
WARNING LED (orange)	When on, it indicates that a failure occurred in the unit; the unit is inoperable.
POWER LED (green)	When on, it indicates that electricity is supplied to the unit.

4.8.5.2 Battery Backup Unit

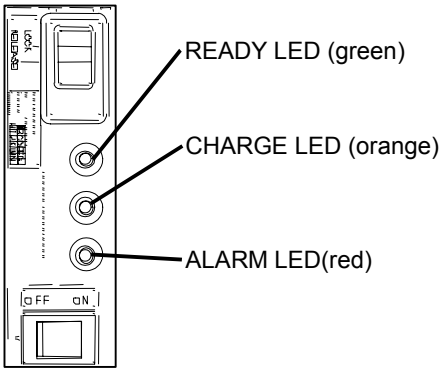


Figure 4.16 LED Locations for the Battery Backup Unit

Table 4.14 LED Functions for the Battery Backup Unit

Connector	Function
READY LED (green)	When on, flashing, or off, it indicates the condition of the battery.
CHARGE LED (orange)	When on or flashing, it indicates the charging status of the battery.
ALARM LED (red)	When on, it indicates that a failure occurs in the battery.

4.8.5.3 ENC Unit

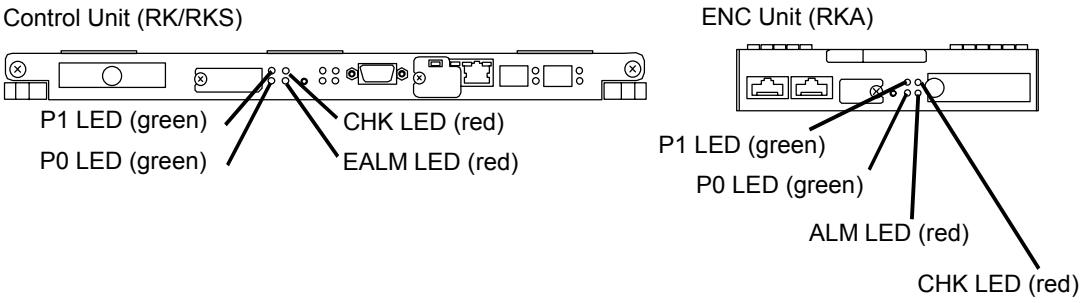


Figure 4.17 LED Locations for the ENC Unit

Table 4.15 LED Functions for the ENC Unit

Connector	Function
P1 LED (green)	When on, it indicates that the link status of FC-AL (loop 1 side) is normal.
P0 LED (green)	When on, it indicates that the link status of FC-AL (loop 0 side) is normal.
EALM LED (red)	When on, it indicates that a failure occurs in the controller (ENC side), so the controller is inoperable.
ALM LED (red)	When on, it indicates that a failure occurs in the ENC Unit, so the ENC Unit is inoperable.
CHK LED (red)	It indicates, according to the number of times the LED flashes, what voltage is abnormal. Once: Logic +5 V voltage is abnormal. Twice: Drive +12 V voltage is abnormal. Three times: Logic +3.3 V voltage is abnormal. Five times: Battery is abnormal. Six times: Voltage on the controller is abnormal. (Reset of the controller is not canceled) Seven times: BS 1.8 V, BS 3.3 V, or BS 12 V voltage is abnormal. The following blinking is fast because ENC microprogram detects CUDG error. Once: SRAM error. Twice: ENC hard error. Three times: Microprogram error in flash memory. Not blinking: Boot section error of ENC microprogram, RAM error, or ENC hard configuration error.

4.8.5.4 Power Unit

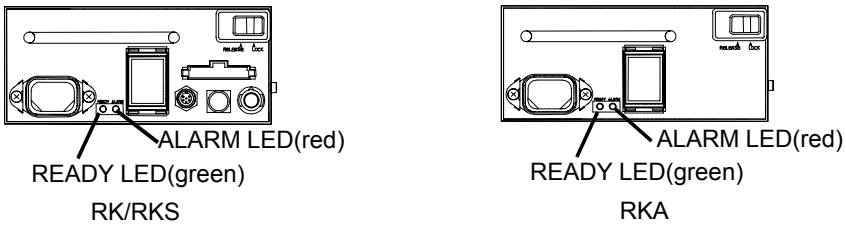


Figure 4.18 LED Locations for the Power Unit

Table 4.16 LED Functions for the Power Unit

Connector	Function
READY LED (green)	When on, it indicates the operating normally.
ALARM LED (red)	When on, it indicates the abnormal or in a stop state.

4.8.5.5 Fan Assembly

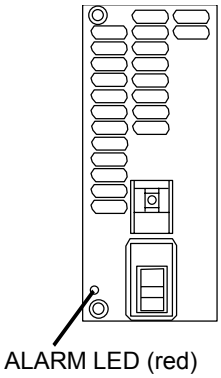


Figure 4.19 LED Locations for the Fan Assembly

Table 4.17 LED Functions for the Fan Assembly

Connector	Function
ALARM LED (red)	When on or off, it indicates the operating status of the fan assembly. on: It is abnormal. off: It is operating normally or in a stop state.

4.8.5.6 Control Unit

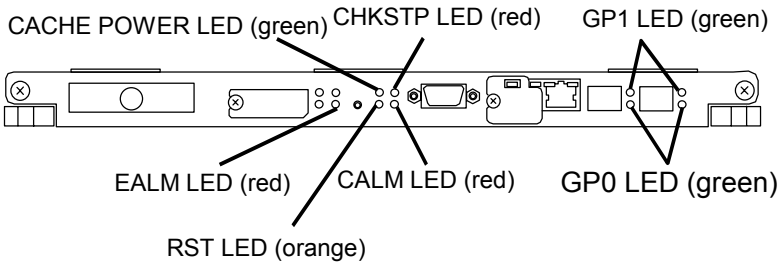


Figure 4.20 LED Locations for the Control Unit

Table 4.18 LED Functions for the Control Unit

Connector	Function
CACHE POWER LED (green)	When on or off, it indicates the status of the cache memory backup operation. on: Backup operation is in execution. off: Backup operation is not in execution.
RST LED (orange)	When on, it indicates that the controller is under resetting.
CALM LED (red)	When on, it indicates that a failure occurs in the controller (CTL side), so the controller is inoperable.
GP0 LED (green)	It indicates the status of the interface installed in the controller as standard.
GP1 LED (green)	It indicates the status of the interface installed in the controller as standard.
CHKSTP LED (red)	When on, it indicates that a failure occured in the controller (CTL side); the controller is inoperable.

4.9 Parts with Limited Lives

In the Thunder 9500™ V Series subsystem, parts with limited lives are used. Part replacement is required to maintain high-quality operation performance.

- Replacement of the designated parts is basically covered by the maintenance service contract. Otherwise, the customer is responsible for purchasing genuine replacement parts periodically and replacing the parts.
- Special maintenance (overhaul) of the subsystem is required to replace parts with limited lives.
- The battery mounted in the subsystem is a periodical replacement part with an indication of the part to be recycled.

Table 4.19 Periodical Replacement Parts and Parts with Limited Lives

Classification	Part name	Life	Treatment
Part with limited life	Battery unit	Two years	Periodical replacement is required. When the maintenance service contract is made, periodical replacement is performed as a part of maintenance service. If not, the periodical replacement must be performed by the user. The genuine parts must be used. Follow the given procedure to dispose of the used battery.
Part with limited life	Disk drive	Five years (***Note 1***)	This part must be replaced through the special maintenance when its life is expires. (After the time limit, possibility of failure occurrence will be higher and it is feared that data may be lost.) Life of the subsystem main body is eight years after the shipping from the factory even though special maintenance is performed.
	Additional battery unit	Five years (***Note 2***)	This part must be replaced through special maintenance when its life is expires. (After the time limit, possibility of failure occurrence will be higher and it is feared that data may be lost.) Life of the subsystem main body is eight years after the shipping from the factory even though special maintenance is performed. Follow the given procedure to dispose of the used battery.

Note 1: The expected useful life of the disk drive varies depending on the environment in which the customer uses it. For details, please consult Hitachi Data Systems Customer Service.

Note 2: The useable period of the battery differs, depending on the environmental location and the quantity of charges and discharges.

Chapter 5 Functional and Operational Characteristics

This chapter includes a description of the following:

- New 9500V Features and Capabilities
- RAID Implementations
- Cache Management
- Logical Units
- Open System Features and Functions
- Data Management Features and Functions
- Copy Solution Features and Functions

5.1 New 9500V Features and Capabilities

The Hitachi Thunder 9500™ V Series subsystem offers the following new or improved features and capabilities, which distinguish the 9500V subsystem from the 9200 subsystem:

- Up to 15 spare disks (for RKS: up to 1) installable
- 512 LUNs maximum/45 RAID groups
- The drive interface supports 2 Gbs fibre channel.
- A maximum of 4 Gbs high capacity cache is supported in the dual configuration (Thunder 9530V: maximum of 2 Gbs cache). This improves the cache percent hit rate.

5.2 RAID Implementations

The Thunder 9500™ V Series subsystem supports RAID0, RAID0+1, RAID1, RAID5 or an intermix.

- RAID 0 group stripes data across all disk drives in the group to attain higher throughput. There is no sparing disk drive function with this configuration.
- RAID 0+1 groups provide data redundancy like RAID 1 by copying all the contents of two disk drives to another pair. Different from RAID 1, data striping is performed for a maximum of 16 sets of two disk drives.
- RAID1 array groups consist of at least two disk drives in a mirrored configuration. Data is mirrored across the groups of two adjacent drives. The stripe consists of two data chunks.
- RAID5 uses from 2 to 5 data disks and has a parity disk performing the data striping.

The RAID specifications are shown in the following tables:

Table 5.1 RAID Specifications of the Rack-Mount Model

Item / Model			Rack-Mount Model		
			RK	RKS	RKA (range for setup)
RAID specifications	RAID level		0/1/5/0+1		-
	RAID configuration (unit of addition)	RAID 0	2D to 14D		2D to 16D
		RAID 1	1D+1M		-
		RAID 5	2D+1P to 13D+1P		2D+1P to 15D+1P
		RAID 0+1	2D+2M to 7D+7M		2D+2M to 8D+8M

Note: For additional information about the rack-mount model, refer to the *Hitachi Freedom Storage™ Thunder 9500™ V Series 19-Inch Rack Reference Guide* (MK-92DF654).

Table 5.2 Table 5.3 RAID Specifications of the Floor Model

Item / Model			Floor Model	
			Floor (RK+H1H) Model/ Floor (RKS+H1H) Model	Floor (RK+RKA+H2H) Model
RAID specifications	RAID level		0/1/5/0+1	
	RAID configuration (unit of addition)	RAID 0	2D to 14D	2D to16D
		RAID 1	1D+1M	
		RAID 5	2D+1P to 13D+1P	2D+1P to 15D+1P
		RAID 0+1	2D+2M to 7D+7M	2D+2M to 8D+8M

5.3 Cache Management

Cache management features include the following:

- Data is stored in cache when reading and writing; it is dynamically managed, depending on the workload read and write I/O characteristics. A high percent cache hit rate is expected, due to transaction processing (data is updated after it is referenced). System throughput is increased by the reduced data writing time.
- Writing completion is reported to the host at the same time the data is written onto the cache; the write operation onto the disk will be asynchronously performed later. The host can perform the next process without waiting for the write operation onto disk.
- The data written onto the cache is saved in the event of an electric power failure due to the nonvolatile cache. The data is assured for 24 hours on the full charge of a standard configuration.
- One specified logical unit on each controller can be resident in cache. High throughput can be realized for the specified logical unit since a 100% cache percent hit rate is expected when reading and writing from the host.

Cache specifications are shown in the following tables:

Table 5.4 Cache Specifications of the Rack-Mount Model

Item / Model		Rack-Mount Model		
		RK	RKS	RKA
Cache specifications	Capacity (M bytes/CTL)	1,024 to 2,048	1,024	-
	Control method	Read LRU/Write after		-
	Battery backup	Provided		-
	Backup duration (h)	24 (When cache of 2,048 M bytes/CTL is installed)	24 (When cache of 1,024 M bytes/CTL is installed)	-

Note: For additional information about the rack-mount model, refer to the *Hitachi Freedom Storage™ Thunder 9500™ V Series 19-Inch Rack Reference Guide* (MK-92DF654).

Table 5.5 Cache Specifications of the Floor Model

Item		Model: Floor Model	
		Floor (RK+H1H) Model/ Floor (RKS+H1H) Model	Floor (RK+RKA+H2H) Model
Cache specifications	Capacity (M bytes/CTL)	1,024 to 2,048 (Floor (RKS+H1H) Model is 1,024)	1,024 to 2,048
	Control method	Read LRU/Write after	
	Battery backup	Provided	
	Backup duration (h)	24 (When cache of 2,048 M bytes/ CTL is installed) (Floor (RKS+H1H) Model is 1,024 M bytes/CTL)	24 (When cache of 2,048 M bytes/ CTL is installed)

5.4 Logical Units (LUs)

The 9500V supports up to 128 LUNs. Each LU is identified by fibre-channel port ID and LUN number.

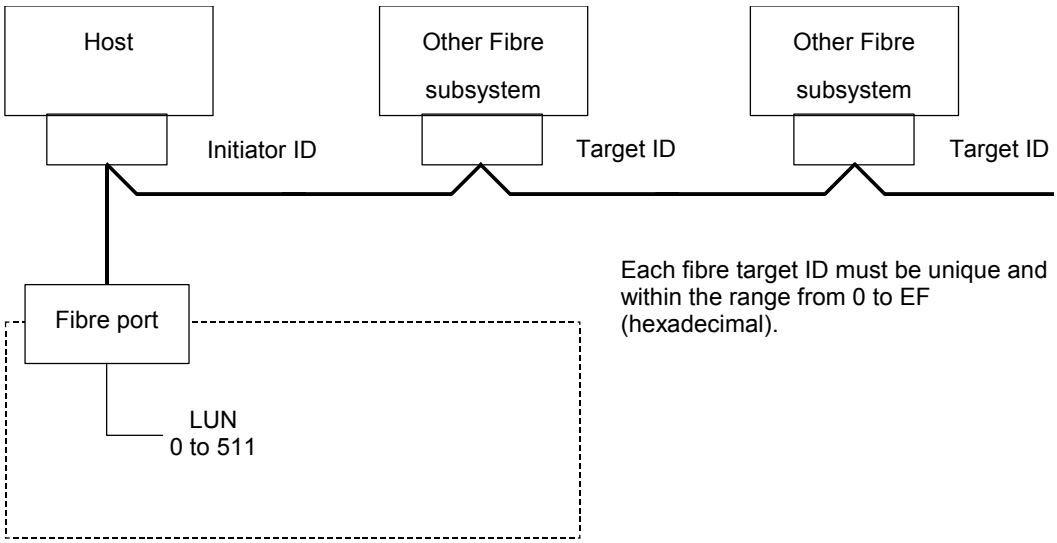


Figure 5.1 Logical Units

5.5 Open Systems Features and Functions

The Thunder 9500™ V Series subsystem offers many features and functions specifically for the open-systems environment. The 9500V subsystem also supports important open-system functions such as fibre-channel arbitrated-loop (FC-AL) and fabric topologies, command tag queuing, multi-initiator I/O, and most industry-standard software and middleware products which provide host fail-over, I/O path fail-over, and logical volume management functions.

5.5.1 Open Systems Middleware

Open-system middleware products provide host fail-over capability, I/O path fail-over support, and logical volume management in the open-systems environment. Middleware is not usually supplied as part of the basic operating system.

5.5.2 LUN Management

Each LUN can be assigned to multiple fibre-channel ports to provide I/O path fail-over with middleware support.

5.6 Data Management Features and Functions

These features include:

- Flash Access
- Fibre Security

5.6.1 FlashAccess

The FlashAccess function ensures that all data in an LU is stored in cache memory. All read/write commands to the LU can be executed by cache hit 100% without accessing the drive. The system throughput is improved when this function is applied to an LU that contains data accessed frequently because no latency period is needed to access the disk drive.

For additional information, refer to the *Hitachi Freedom Storage™ Thunder 9500™ V Series FlashAccess 9500V User's Guide (*MK-92DF612).

5.6.2 Fibre Security

The Fibre Security function prevents data from being destroyed by illegal accesses. Only specified hosts are permitted to access LUNs.

5.7 Copy Solution Features and Functions

The *9500V* subsystem provides features and functions which allow you to maintain remote and subsystem internal copies of all user data on the 9500V storage subsystem for data backup or duplication. These features include:

- Synchronous TrueCopy
- ShadowImage

5.7.1 Synchronous TrueCopy

The Synchronous TrueCopy feature enables you to maintain remote copies of all user data on the Hitachi 9500V storage subsystem for data backup or duplication. The duplicated volumes are created between subsystems that are connected with a Fibre Channel interface.

Synchronous TrueCopy operations are non-disruptive and allow the primary (main) volume of each volume pair to remain online to all hosts for both read and write I/O operations. Once established, Synchronous TrueCopy operations continue unattended to provide synchronous remote data backup. Usability is further enhanced through a resynchronization capability that reduces data duplication requirements and backup time, thereby increasing user productivity.

For additional information, refer to the *Hitachi Freedom Storage™ Thunder 9500™ V Series Synchronous TrueCopy 9500V User's Guide* (MK-92DF608).

5.7.2 ShadowImage

The Hitachi Data Systems ShadowImage 9500V features enable you to maintain subsystem-internal copies of all user data on the 9500V storage subsystem for purposes such as data backup or duplication. The duplicated volumes are created within the same 9500V subsystem as the primary volume.

ShadowImage 9500V operations are non-disruptive and allow the primary (main) volume of each volume pair to remain online to all hosts for both read and write I/O operations. Once established, ShadowImage 9500V operations continue unattended to provide asynchronous internal data backup. Usability is further enhanced through a resynchronization capability that reduces data duplication requirements and backup time, thereby increasing user productivity.

For additional information, refer to the *Hitachi Freedom Storage™ Thunder 9500™ V Series ShadowImage 9500V User's Guide* (MK-92DF607).

Chapter 6 Configuring the Thunder 9500™ V Series Subsystem

This chapter includes the following:

- Overview of Configuration
- Configuring the LAN Interface of the Thunder 9500™ V Series Subsystem
- Configuring the Thunder 9500™ V Series Subsystem
- Registering the Thunder 9500™ V Series Subsystem for Control by Resource Manager 9500V
- Configure the Thunder 9500™ V Series Subsystem for the Desired Application
- General Configuration of the Thunder 9500™ V Series Subsystem
- Starting the Parameter Wizard in Resource Manager 9500V
- Configuring the Basic Parameters for the Thunder 9500™ V Series Subsystem

6.1 Overview of Configuration

This section includes the following information on configuration:

- Open Systems Configuration
- Defining LUNs
- Fibre Channel Interface Addressing
- Alternate Pathing

6.1.1 Open Systems Configuration

The Thunder 9500™ V Series subsystem uses the HP9000 series, SUN Fire series, SUN Enterprise series, RS6000 Family, and each vendor PC (Net Ware 5.0, Linux, Windows NT 4.0, and Windows 2000, Me, XP) as a supported platform. Installation for each open system is required.

6.1.2 Defining LUNs

The Resource Manager 9500V software enables the user to define the LUN mapping for each device and reconfigure the mapping at any time. For further information on Resource Manager 9500V, please refer to the *Hitachi Freedom Storage™ Thunder 9500™ V Series Resource Manager 9500V User's Guide Graphical User Interface (GUI),* MK-92DF605, to use a GUI interface. See the *Hitachi Freedom Storage ™ Thunder 9500 ™ V Series Resource Manager 9500V User's Guide Command Line Interface (CLI),* MK-92DF603, to use the CLI version. You can also contact your Hitachi Data Systems account team.

6.1.3 Fibre Channel Interface Addressing

The 9500V subsystem supports a maximum of 4 fibre-channel ports. (Thunder 9530V supports a maximum of 2 fibre-channel ports.) Each fibre-channel port is assigned a unique target ID number. The 9500V can address up to 512 LUNs per port. The following figure illustrates fibre port-to-LUN addressing.

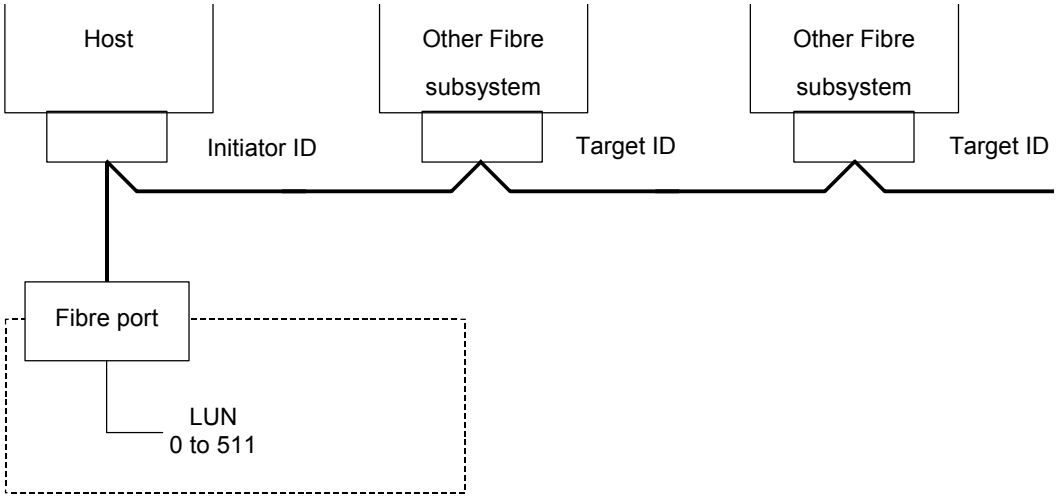


Figure 6.1 Fibre Port-to-LUN Addressing

6.1.4 Alternate Pathing

The user should plan for alternate pathing to ensure the highest data availability. The 9500V provides up to 4 fibre channel ports or to accommodate alternate pathing for host attachment. (Thunder 9530V is 2 fibre channel ports.) The following figure shows a sample of alternate pathing.

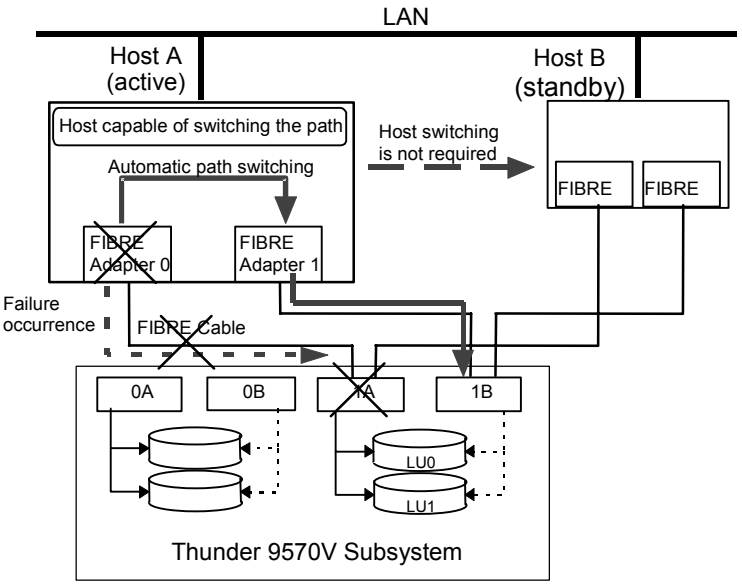


Figure 6.2 Alternate Pathing

6.2 Configuring the LAN Interfaces of the Thunder 9500™ V Series Subsystem

Each controller is shipped with a default IP address of 192.168.0.16 and netmask of 255.255.255.0 (the netmask number may differ). The IP address can be set using the Resource Manager 9500V program.

If the Resource Manager 9500V program is used to configure the IP addresses, also refer to the procedure in 7.8 Changing the Network Parameter.

If you wish to use Resource Manager 9500V to configure the IP addresses, please refer to the *Hitachi Freedom Storage™ Thunder 9500™ V Series Resource Manager 9500V User's Guide Graphical User Interface (GUI),* MK-92DF605, to use a GUI interface. Refer to the *Hitachi Freedom Storage ™ Thunder 9500 ™ V Series Resource Manager 9500V User's Guide Command Line Interface (CLI),* MK-92DF603, to use the CLI version.

Note: Set the IP address after an array subsystem becomes Ready.

6.3 Configuring the Thunder 9500™ V Series Subsystem

The following steps must be performed to configure the disk array:

1. Verify that the subsystem is connected to the LAN.
2. Install Resource Manager 9500V on the system that will be used as the management PC/Server.

   See the *Hitachi Freedom Storage™ Thunder 9500™ V Series Resource Manager 9500V User's Guide Graphical User Interface (GUI),* MK-92DF605, to use a GUI interface. See the *Hitachi Freedom Storage ™ Thunder 9500 ™ V Series Resource Manager 9500V User's Guide Command Line Interface (CLI)*, MK-92DF603, to use the CLI version.

   Refer to the section titled "Installing Resource Manager 9500V" for instructions on how to install the program.
3. Register the disk array for control by Resource Manager 9500V.
4. Set the system parameters using the appropriate installation guide for the desired host platform(s).
5. Reboot the disk array to complete the configuration.

6.4 Registering the Thunder 9500™ V Series Subsystem for Control by Resource Manager 9500V

To operate the array unit from Resource Manager 9500V, register the array unit. You cannot temporarily register a non-existing array unit.

1. On the **Add** menu, click **Register Array Unit** or click **Register Array Unit** button in the tool bar.
2. Input the **registration information** and click the **OK** button.
3. When a registration completion message appears, click the **OK** button.
4. The Main screen is updated and then displayed.

6.5 Configure the Thunder 9500™ V Series Subsystem for the Desired Application

Before configuring the *9500V* make sure that you know the following:

- The required RAID level, based on performance and pricing criteria
- The number and size of LUNs you wish to create
- The controller path you wish to use to access the data on the LUNs
- If there are any special options that need to be set that are specific to the host platform(s) being used. These will be detailed in the Host Installation Manual for the host platform being used.

6.6 General Configuration of the Thunder 9500™ V Series Subsystem

Activating Management mode in Resource Manager 9500V will enable you to do a general configuration of the 9500V subsystem. Before it is possible to configure the 9500V, management mode must be enabled in Resource Manager 9500V. Otherwise, it is only possible to monitor the status of the 9500.

To enable Management mode:

1. On the **Settings** menu, click **Password**.
2. Enter **New Password** and **New Password** (for confirmation) and click the **OK** button. Specify a password of up to 12 alphanumeric characters.
3. On the **File** menu, click **Change Mode** or click **Change Mode** button in the tool bar.
4. When the **password-input** screen appears, input a password and click the **OK** button. **Management Mode** is displayed in **Active Mode**: in the upper part of the Main screen. The Resource Manager 9500V program will operate in **Management Mode**.

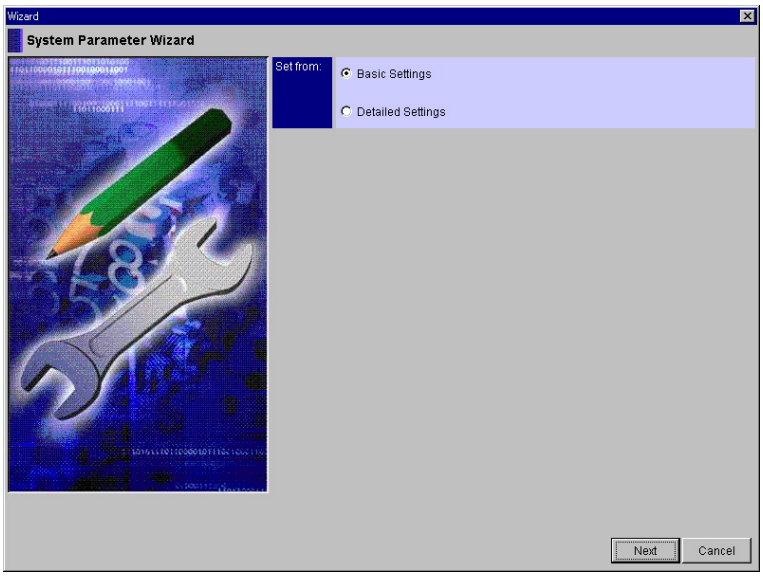
6.7 Starting the Parameter Wizard in Resource Manager 9500V

1. Click the icon of an array unit on the Main screen.
2. Select the **Settings** menu, click **Display Details**. Or, click the **Display Details** button in the tool bar.
3. On the **Settings** menu, select **System Parameter Wizard** or click **System Parameter Wizard** button in the tool bar.

6.8 Configuring the Basic Parameters for the Thunder 9500™ V Series Subsystem

Set the system parameters in the Wizard format.

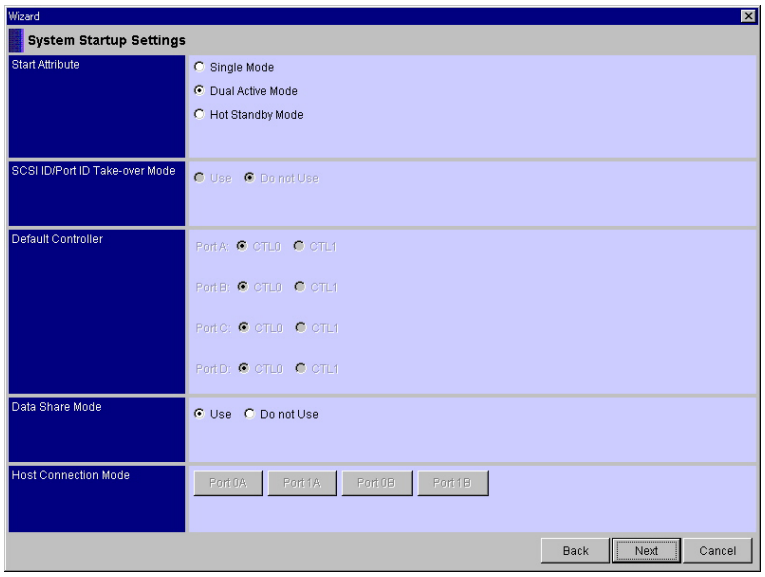
1. On the **Settings** menu, select **System Parameter Wizard** or click **System Parameter Wizard** button in the tool bar.
2. Click the **Basic Settings**. Click the **Next** button.



3. The system parameter window is displayed, starting with **System Startup Settings**. The window displays the items that are currently set. Check the displayed contents on the window and set each displayed item to the desired configuration.

   To perform the next setting, click the **Next** button. When you click the **Back** button, the previous window will appear.

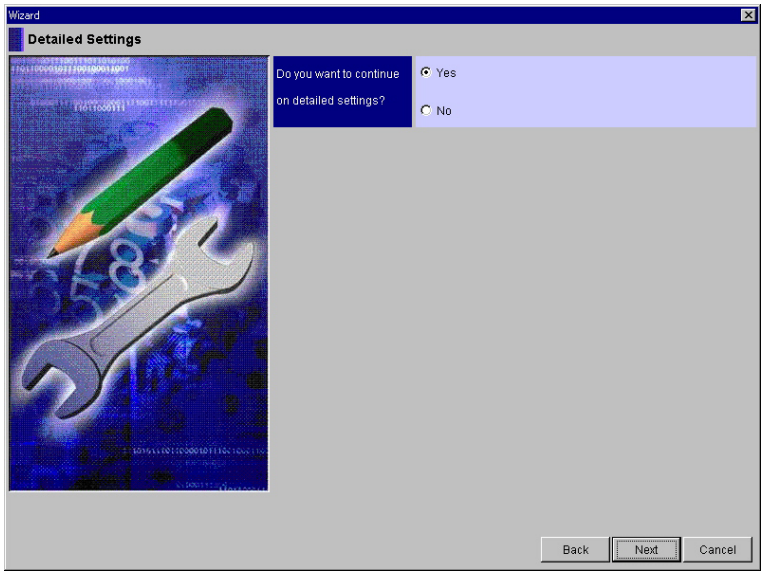
   To stop the setting, click the **Cancel** button.



4. **Common 1**, **Option 1**, and **Option 2** screens are shown. Perform the settings for each item. For options, you can make multiple selections.

5. The window for the **Option 2** setting is the final window. Click the **Next** button, then displayed **Detailed Settings**.

   If you set the **Detailed Settings** items in succession, select **Yes** or select **No**, and then click the **Next** button.



When you select **No**, the **System Parameter Setting Completed** screen will be displayed.

When the setting is completed, restart the array unit; connect it to the host and the Resource Manager 9500V program.

Chapter 7 Configuring Storage on the Thunder 9500™ V Series Subsystem

The process of configuring storage on the 9500V subsystem involves the following sub-processes:

- Software Composition
- Setting Fibre Channel Information
- Determining Space and RAID Level Requirements
- Setting Host Group Information
- Transferring Configurations from One Array to Another
- Storing Configuration Data
- Applying Configuration Data to an Additional Thunder 9500™ V Series Subsystem
- Setting the Subsystem when Using Special Mode

7.1 Software Composition

This section includes the following:

- Microprogram
- System Parameters
- Configuration Information
- SNMP Information
- Storage for Parameters

7.1.1 Microprogram

A microprogram controls basic hardware operations which accompany the execution of given instructions performed by a CPU. The version of the microprogram is controlled by the following numerical format: **xxxx/x**.

The microprogram for fibre channel, **065x/x** (x is optional) is available. However, **/x** may not be included in the microprogram version number or another control system may control the microprograms.

7.1.2 System Parameters

System parameters are necessary to start the subsystem (from turning on the main switch to generation of the READY LED (green). System parameters are stored in flash memory.

7.1.3 Configuration Information

The configuration information is a record of customer data on the subsystem, such as the RAID configuration and LU capacity. The configuration information exists in the disk drive when the main switch is turned off; it is transmitted onto the main memory of the controller when the main switch is turned on. When configuration information is changed, the information on the disk drive is updated simultaneously.

7.1.4 SNMP Information

The SNMP parameter enables the SNMP function to operate effectively. When SNMP information activates the SNMP function, the template contained in the SNMP information (in the SNMP directory on the provided CD-R) is edited and registered in the subsystem.

7.1.5 Storage for Parameters

The storage areas where the parameters on the controller are stored are described in the following table:

Table 7.1 Storage for Parameters

No.	Parameter	Storage	Description
1	Fixed Part Program Flash Program System Parameters	Flash Memory (and backup FD)	The parameters are stored in flash memory. No provision of storage against a power shut off is required for the parameters because flash memory can retain information when power is shut off. Parameters can be backed up to the following: • Fixed part program: Cannot be backed up program • Flash program: Automatically backed up to the system area. • System parameters: Automatically backed up to the disk drive.
2	Microprogram Configuration Information SNMP Information	Disk Drive (System Area)	Generally, information in a RAM is erased when the main switch is turned off. Therefore, the subsystem also stores the parameters used on the RAM on the disk drive. (An area is reserved in the disk drive to store them. This area is called the system area.) The system area is provided on the disk drives #0 to #4 in the RK frame. Therefore, the system area has redundancy for disk drives #0 to #4 in the RK frame.

7.2 Setting Fibre Channel Information

Follow the steps below to set and display fibre channel information:

Note: Back up all data before performing this procedure. (If a mistake in operation is made, user data in the subsystem can be lost.)

1. Turn on the power supply.
2. Start the Resource Manager 9500V program and set the operation mode in the **Maintenance Mode**.
3. Click the icon of an array unit on the Main window and select the **Settings** menu. Click **Display Details** or click the **Display Details** button in the tool bar.
4. On the **Settings** menu, click **Configuration Settings** or click the **Configuration Settings** button in the tool bar.
5. Click the **Fibre Channel** tab.
6. Set a **Port Address**, **Topology Information**, **Transfer Rate**.

   Port Address: Port address is displayed as a hexadecimal number.
   Topology Information: Indicates the topology status.
   Transfer Rate: Indicates the fibre transfer rate.
7. Click the **Apply** button.
8. A confirmation message appears. After verifying that the I/O operation initiated by the host has stopped, click the **OK** button.
9. A message appears, stating that the setting is completed. Click the **OK** button.

7.3 Determining Space and RAID Level Requirements

This process will depend on the customer requirements, however Hitachi Data Systems recommends certain configuration guidelines that will provide good performance and adequate protection of data integrity in most circumstances.

This function can be used in the device ready state (R/W cannot be executed from the host in operation. When a host command is received, Not Ready is reported to the host computer).

This section includes:

- Setting a Spare Disk
- Canceling a Spare Disk Setting
- Setting a RAID Group
- Deleting a RAID Group
- Setting a Logical Unit
- Deleting the Last Logical Unit
- Formatting a Logical Unit
- Change of the Controller in Charge of a Default LU

7.3.1 Setting a Spare Disk

To set a spare disk, follow these steps:

Note: Disk drives that can be set as spare drives do not yet have a defined RAID group; this excludes disk drive #0 to #4 in Unit 0.

1. Turn on the power supply.
2. Start the Resource Manager 9500V program and set the operation mode in the **Maintenance Mode**.
3. Click the icon of an array unit on the Main window, and then select the **Settings** menu. Click **Display Details** or click the **Display Details** button in the tool bar.
4. On the **Settings** menu, select **Configuration Settings** or click **Configuration Settings** button in the tool bar.
5. Click the **Spare Drive** tab.
6. To set up the spare drive, double-click the icon of the disk drive to be setup as a spare drive.
7. The confirmation message for spare drive setup is displayed. Click the **OK** button.

8. A message indicating that the setting is complete is displayed. Click the **OK** button. The icon of the disk drive that is set up is updated and displayed.

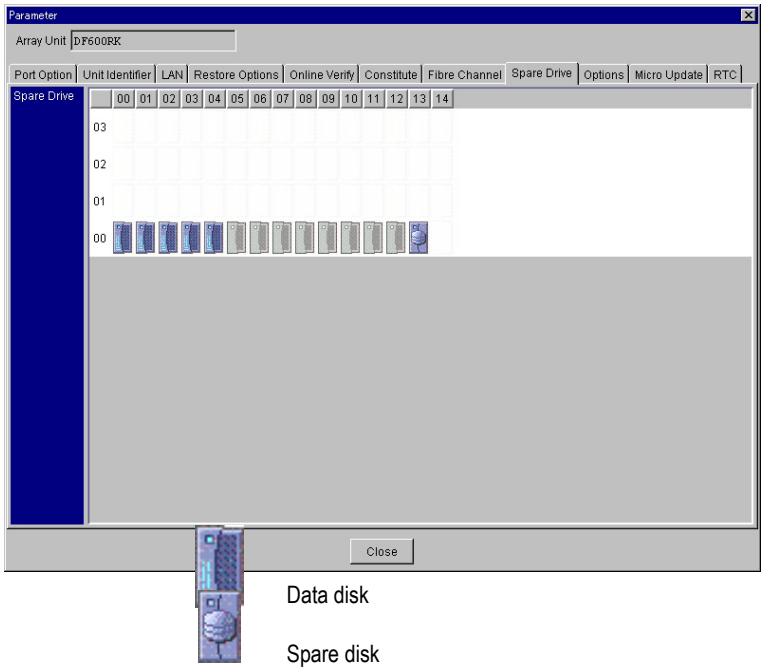


Figure 7.1 Spare Disk Tub Screen

7.3.2 Canceling a Spare Disk Setting

To cancel a spare disk setting, follow these steps:

1. On the **Settings** menu, click **Configuration Settings** or click the **Configuration Settings** button in the tool bar.
2. To cancel the spare drive setup, click the icon of the disk drive to be canceled.
3. The confirmation message for spare drive canceled is displayed. Click the **OK** button.
4. A message is displayed, stating that the setting is complete. Click the **OK** button.

7.3.3 Setting a RAID Group

To set a RAID group, follow these steps:

1. Turn on the power supply.
2. Start the Resource Manager 9500V program and set the operation mode in the **Maintenance Mode**.
3. Click the icon of an array unit on the Main window. Select the **Settings** menu and click **Display Details** or click the **Display Details** button in the tool bar.
4. Click the **Logical Status** tab.
5. Click the top drive of a selected RAID. The drive that is selected is highlighted.

6. Hold down the **shift** key and click the last drive of the RAID group to be created. The drives of the RAID group to be created are enclosed by a **rectangular** box.
7. On the **Settings** menu, select **RAID Group**, and click the **Settings**. Alternatively, click **RAID Group Settings** button in the tool bar.

   This operation can also be completed from the context menu of the **RAID Group** box.
8. Select a RAID level and click the **OK** button.
9. A message appears, stating that the setting is complete. Click the **OK** button. The set RAID group is updated and the window is displayed.

   If the RAID group setting is not successful, delete the affected RAID group and try creating the RAID group again.

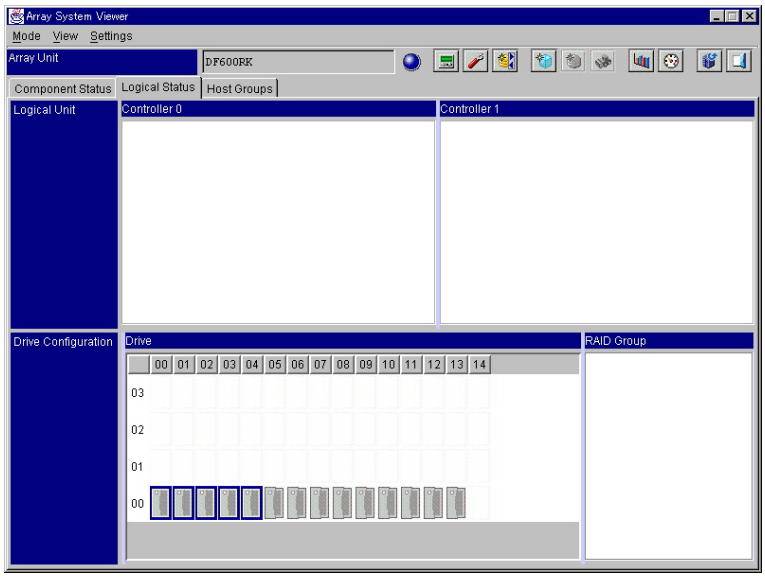


Figure 7.2 Select the Disk Drive

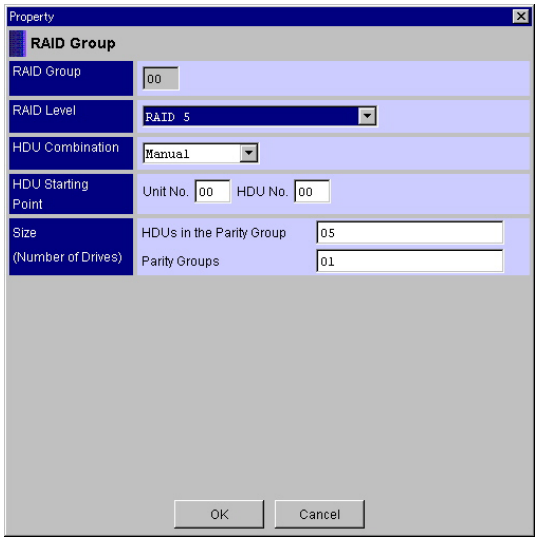


Figure 7.3 Setting the RAID Group Property

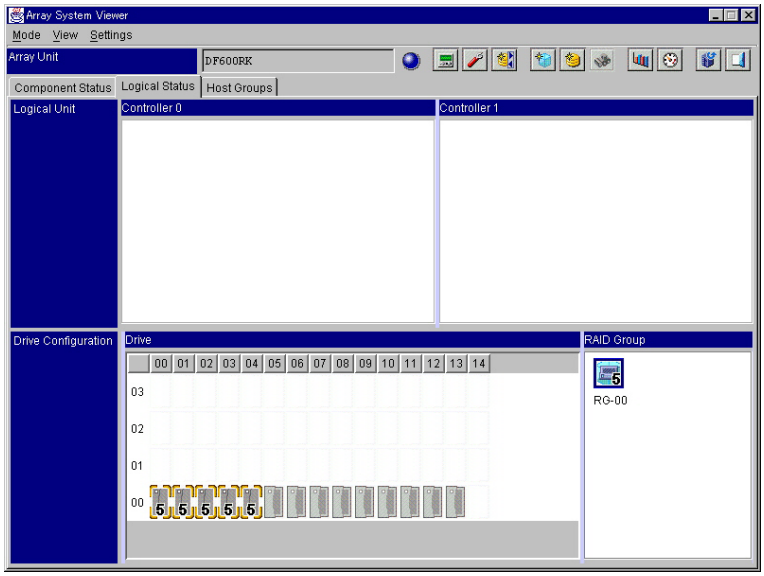


Figure 7.4 Set RAID Group is Updated

7.3.4 Deleting a RAID Group

This section includes the following:

- Deleting All RAID Groups
- Deleting a Specified RAID Group

7.3.4.1 Deleting All RAID Groups

To delete all RAID groups, follow these steps:

Note: All user data on all LUNs will be lost if all RAID groups are deleted. Backup the user data before performing this operation.

The unified LU cannot be unified or split unless the LU unifying function (a priced option) is validated. When a unified LU is defined, the RAID group cannot be deleted. Delete the RAID group after splitting all the unified LUs in the RAID group. For the procedure for splitting a unified LU, refer to the **LU Unifying Function User's Guide**.

1. Click the **Logical Status** tab on the Unit screen.
2. On the **Settings** menu, select **RAID Group** and click the **Delete All**.
3. A message appears, requesting confirmation to delete all RAID groups. Click the **OK** button.

   The deleted RAID group is updated and a window is displayed.

7.3.4.2 Deleting a Specified RAID Group

Note: All user data on all LUNs will be lost if all RAID groups are deleted. Backup the user data before performing this operation.

If the "Unified LU" function has been enabled, make sure that no unified Lus are present in the RAID group to be deleted. It will be impossible to delete a RAID group containing unified Lus until the unified Lus are split.

Delete the RAID group after splitting all the unified LUs in the RAID group. Refer to the **LU Unifying Function User's Guide** for the procedure for splitting a unified LU.

When a logical unit is deleted, user data is erased. Perform the deletion after verifying the number of the logical unit to be deleted and backing up the data.

To delete a specified RAID group, follow these steps:

1. Click the **Logical Status** tab on the Unit screen.
2. Click the icon of a RAID group on the Unit screen. On the **Settings** menu, select **RAID Group** and click **Delete Specified RAID Group**.

3. A message appears, requesting confirmation to delete the specified RAID group. Click the **OK** button.

   The deleted RAID group is updated and the window is displayed.

7.3.5 Setting a Logical Unit

To set a logical unit, follow these steps:

1. Turn on the power supply.
2. Start the Resource Manager 9500V program and set the operation mode in the **Management Mode**.
3. Right-click the icon of an array unit on the Main window. Select the **Settings** menu and click **Display Details** or click the **Display Details** button in the tool bar.
4. Click the **Logical Status** tab on the Unit screen.
5. Click the icon of a logical unit on the Unit screen. On the **Settings** menu, select **Logical Unit** and click the **Settings**. Alternatively, click the **Logical Unit Settings** button in the tool bar.

   This operation can also be completed from the context menu of the **Logical Unit** box.
6. Select a controller in charge in the **Default** box and enter the size in Gigabytes, Megabytes or blocks.
7. A created logical unit number is displayed for the **Logical Unit No.** and the RAID group number in which logical units are defined for the **RAID Group**. Additionally, a logical unit capacity that can be created is displayed.

Note: To specify a size explicitly in figures, select a unit to specify the size from among the **GB**, **MB**, and **Block**. Specify the size to be allocated in decimal number. The subsystem can be divided into a maximum of 512 logical units.

Note: The logical unit number may be set optionally when the logical unit is created. However, logical unit number 0 is assigned to the logical unit created first.

8. After the setting is complete, click the **OK** button.

9. The set logical unit information is updated and the window is displayed.

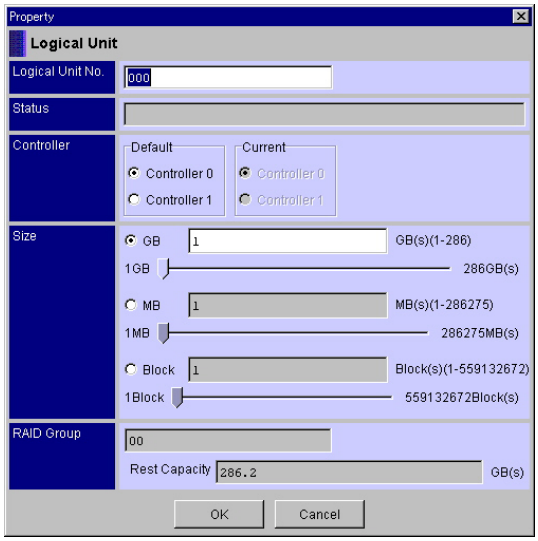


Figure 7.5 Setting the Logical Unit Property

7.3.6 Deleting the Last Logical Unit

To delete the last logical unit, follow these steps:

Note: The last logical unit is the final logical unit, which is unified. Delete the final logical unit after verifying its number.

When any logical unit is deleted, the user data in the logical unit will be lost.

1. Click the **Logical Status** tab on the Unit window.
2. On the Settings menu, select Logical Unit and click Delete Last Defined Logical Unit.
3. A confirmation message is displayed indicating whether or not the last logical units should be deleted.

   Click the **OK** button, and last logical units will be deleted. When any logical unit is deleted, the user data in the logical unit will be lost.

   The logical unit information in which the last logical unit has been deleted is updated and the window is displayed.

7.3.7 Formatting a Logical Unit

There are two methods of formatting a logical unit:

- **Online Format**
  Specified logical units are formatted one by one and the progress of the formatting is displayed.
- **Offline Format**
  If multiple logical units are specified, up to six logical units are formatted concurrently, and the progress of formatting is displayed.

  When the logical units are configured for each drive, the time required for the formatting is reduced by 30 to 50 (%).

To format a logical unit, follow these steps:

Note: When formatting a logical unit with a logical unit capacity less than 100,000 (blocks), formatting may terminate abnormally. When formatting a logical unit with a logical unit capacity of 100,000 (blocks), select **Online Format**.

1. Click the icon of a logical unit on the Unit window. On the **Settings** menu, select **Logical Unit** and click **Online Format** or **Offline Format**.

   When you select multiple logical units, hold down the **Ctrl** key and click the icons of the logical units to format.

2. A confirmation message appears and confirms whether or not the selected logical units may be formatted.

Note: When a specified logical unit is formatted, the user data within the specified logical unit is lost. When incorrectly specifying an logical unit, press the **Cancel** button and redo processing by selecting an logical unit to be reformatted.

3. Click the **OK** button to format the specified logical units.
4. When a message is displayed indicating that the specified logical unit has been formatted, click the **OK** button.

If formatting is terminated abnormally, contact HDS technical support for assistance.

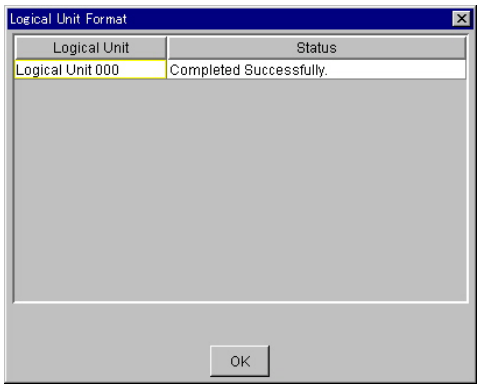


Figure 7.6 Logical Unit Format screen

7.3.8 Change of the Default Controller in Charge of a LU

Note: Change of the controller in charge of a default LU can be used only for the dual active mode configuration of a dual system.

To change the controller in charge of a default LU, follow these steps:

1. Start the Resource Manager 9500V program and set the operation mode in the **Management Mode**.
2. Click the icon of an array unit on the Main window and select the **Settings** menu. Click **Display Details** or click the **Display Details** button in the tool bar.
3. Click the **Logical Status** tab on the Unit screen.
4. Click the logical unit for which you want to change ownership.

   Resource Manager confirms by highlighting a box around the chosen LU.
5. On the **Settings** menu, select **Logical Unit** and select **Change Default Controller**.
   A message appears, requesting confirmation to change the default controller.
6. Click the **OK** button and default controller in charge of a logical unit will be changed.
7. A message appears, indicating that the default controller connected with the logical unit has been changed. A confirmation message requesting a restart is displayed; click the **OK** button when restarting.

   To validate the setup default controller of a logical unit, restart the array unit. The previous setting stays valid until restarting. When a restart is initiated, the array unit is not ready to accept access from the host for duration from initiation until the restarting terminates. After verifying that the host has terminated access, initiate a restart.

Note: It may take time for an array unit to respond, depending on the condition of the array unit. If it does not respond after 5 minutes, check the condition of the array unit.

8. A message indicating that the restart has terminated is displayed. Click the **OK** button.

   When the **OK** button is clicked, the unit window is closed. To perform other operations, select the array unit to be operated on the main window and open the unit window. When not restarting, logical unit information for which the default controller of an logical unit has been changed, is displayed on the window after being updated.

Note: Execution for switching the default controller which controls logical unit changes for the default controller is displayed. When switching is continuously executed twice, the specified controller is changed to the original default controller which controls the logical unit.

7.4 Setting Host Group Information

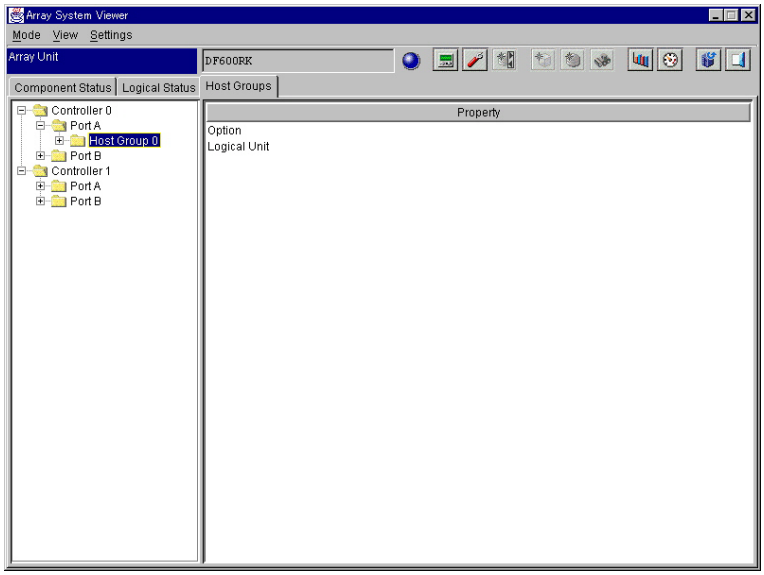
In the 9200, the Host Connection Mode was set for each port, and the port and host to be connected each other were fixed. In the 9500V, the Host Connection Mode, the mapping information of Logical Unit, and LUN security information are set to the group of hosts, not to the host. This enables you to select the host computer to which the subsystem is connected depending on each group of hosts.

For this version, only the Host Group 0 is supported. When only the host group 0 is used, the same functions that can be used in 9200 are available.

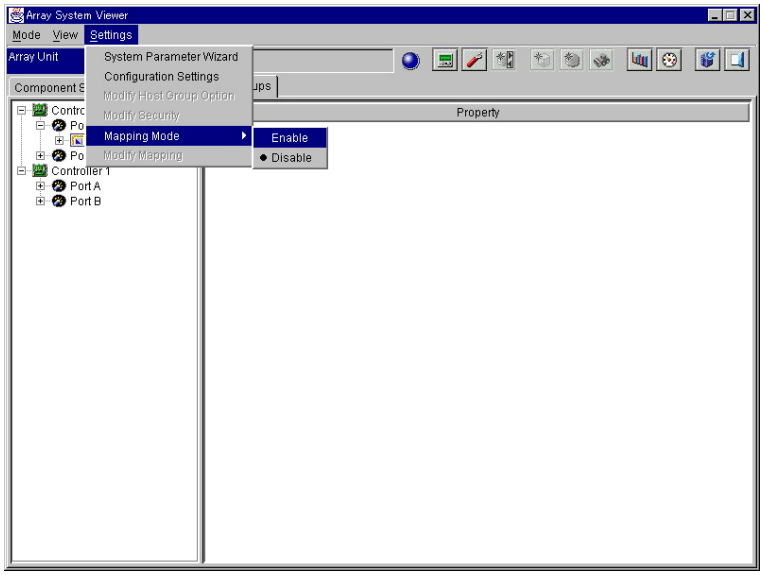
7.4.1 Setting the mapping information

Modify Host Group Option is a function that integrates the Host Connection Mode 1 and 2 on the System Parameter in the 9200.

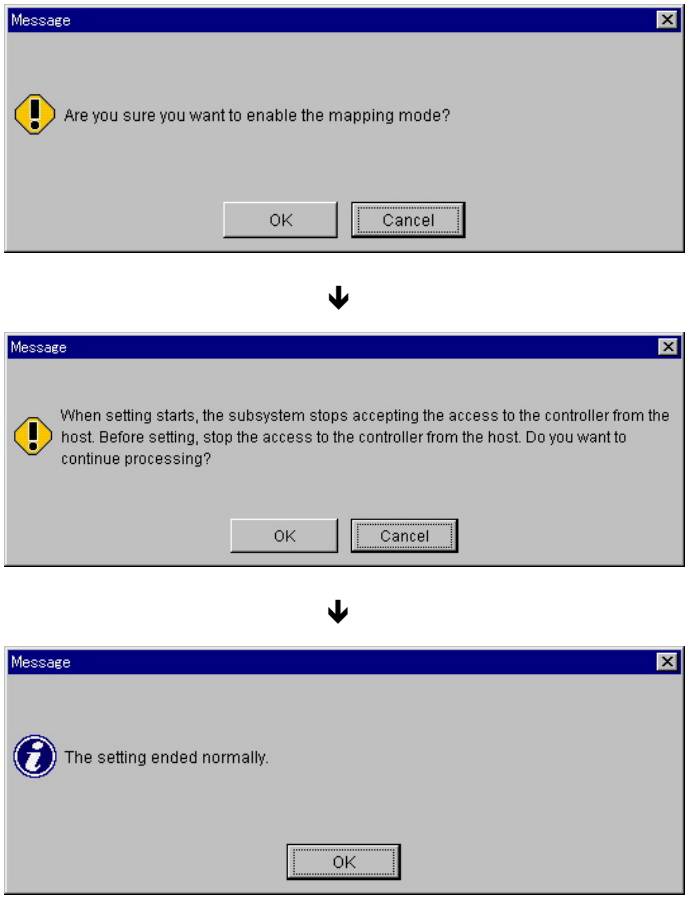
1. On the unit window, click the **Host Groups** tab.
2. On the unit window, double-click the **Controller** to be set for the connection mode with the host. Display the **Host group 0** by double-clicking the **Port**.



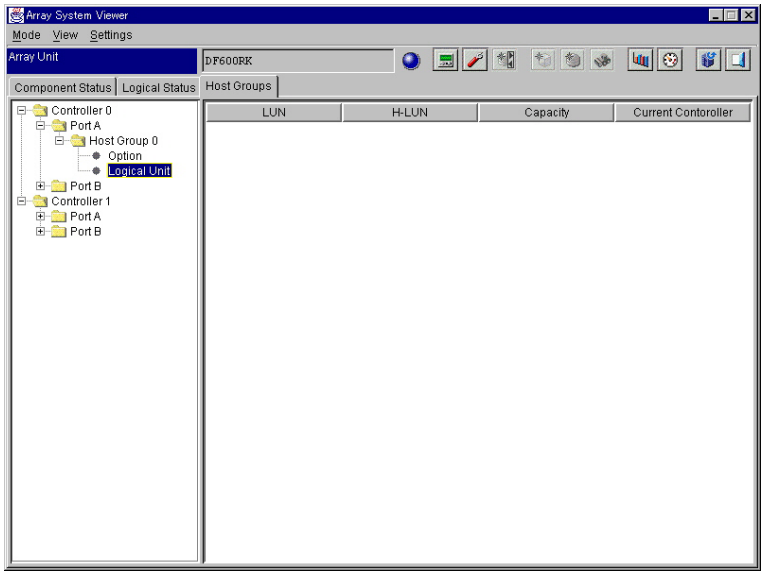
3. On the **Settings** menu, select **Mapping Mode** and click **Enable**.



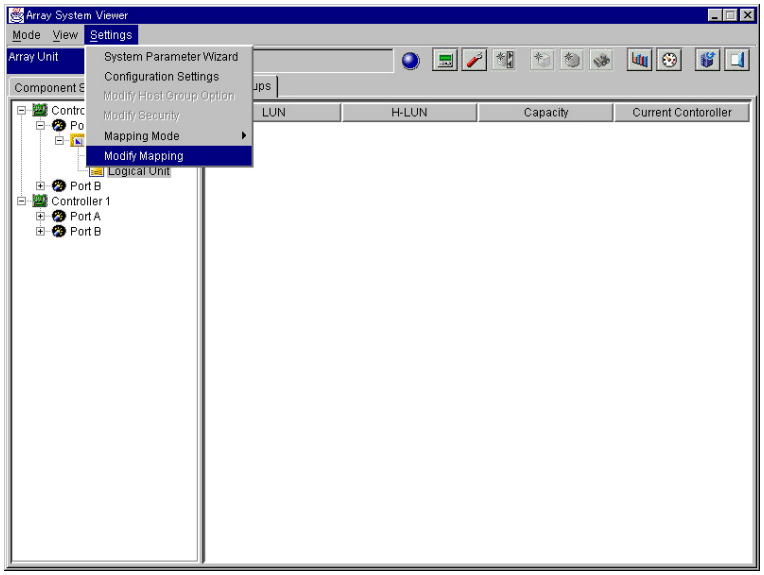
4. A message appears; click the **OK** button.



5. Click the Logical Unit.

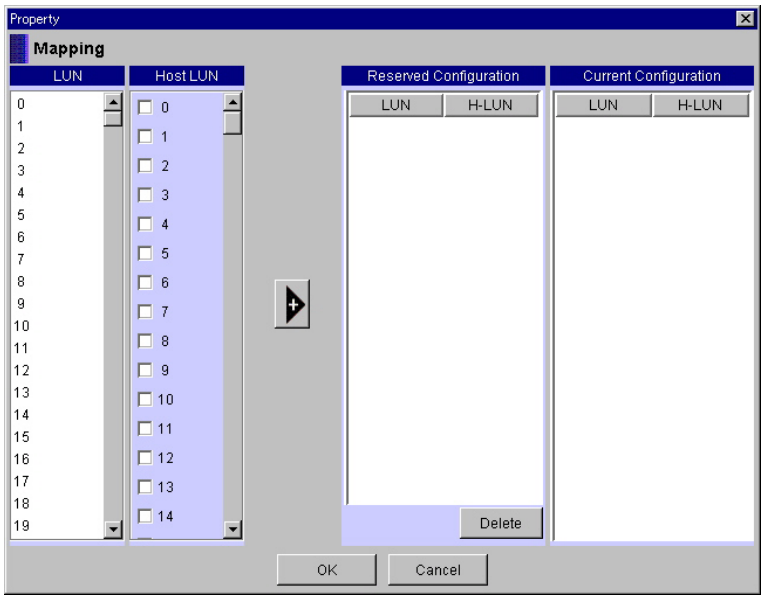


6. On the **Settings** menu, select **Modify Mapping**.

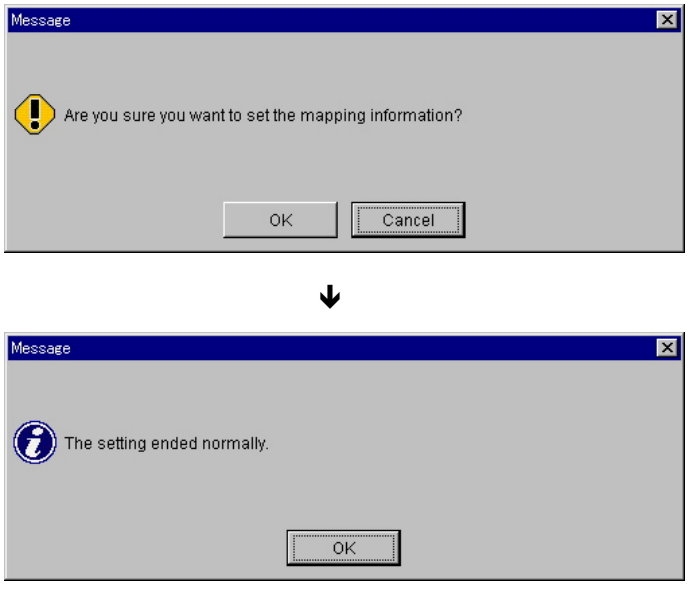


7. Select one **LUN** and one or more **Host LUNs**. Click the  button. The added specification is displayed in the **Reserved Configuration**. For the **Host LUN**, multiple selections can be made.

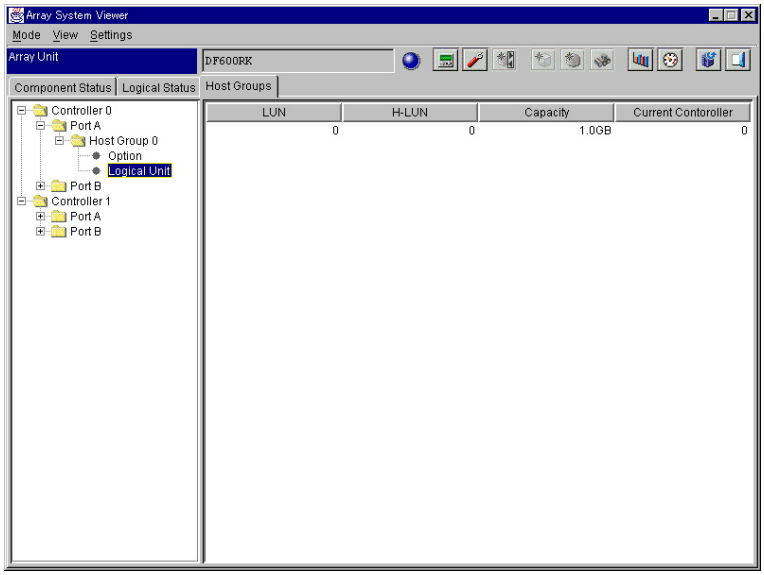
   To delete LUN mapping information, select the line that you want to delete from the **Reserved Configuration**, and click the **Delete** button. The deleted specification disappears from the **Reserved Configuration** display.



8. A message appears; click the **OK** button.



The mapping information is updated and the following window is displayed.



7.5 Transferring Configurations from One Array to Another

Output the configuration information of the array unit in a text file or set configuration using a text file. The configuration information output in a text file includes the status of the system parameters, RAID group/logical unit and the constituent parts of the array unit. The configuration to be set includes the system parameters and RAID group/logical unit. The status of the constituent parts of the array unit cannot be set.

Configuration information is handled with separate text files for the system parameters and for RAID group/logical unit.

Copying configuration information between array units can be executed by outputting a text file of the configuration from an array unit, then using the output text file to set another array unit.

Note: IP addresses will be reset based on file input. The user must edit the text file to include the correct IP addresses in order to transfer a configuration from one unit to another.

Editing a text file to set an array unit can be executed, but it is recommended that this function be used for the configuration of the same array unit. To change the configuration, use individual functions.

7.6 Storing Configuration Data

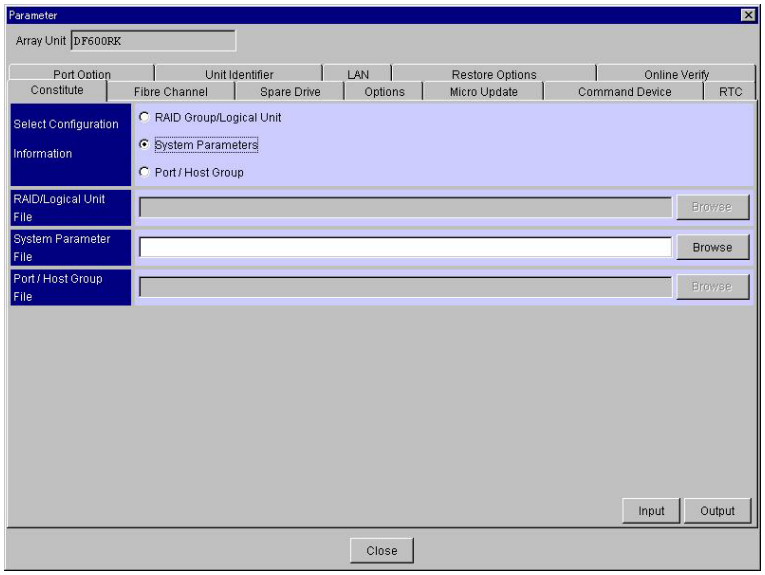
This section includes the following:

- System Parameter Information
- RAID Group/LU Information
- Port/Host Group Information

7.6.1 System Parameter Information

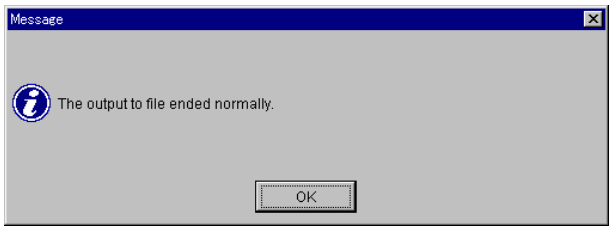
To output the setting of the system parameters for an array unit in text form to a specified file:

1. On the **Settings** menu, select **Configuration Settings** or click **Configuration Settings** button in the tool bar.
2. Click the **Constitute** tab.



3. Check the **System Parameters** in the **Select Configuration Information** box.
4. Click the **Browse** button. Specify the directory and file name to which the configuration file will be output.
5. Click the **Output** button.

6. When a message appears, confirm that the system parameter information is output with the specified file name. Click the **OK** button.

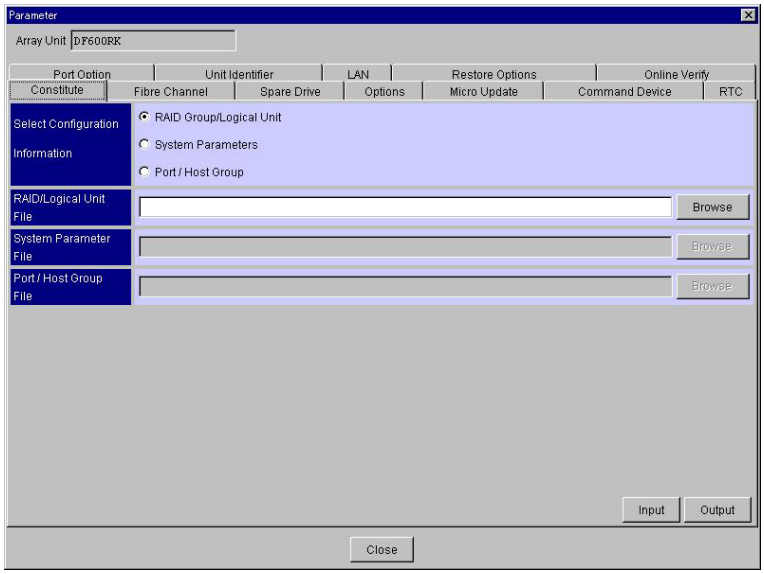


System parameter information is saved in the form of a text file with the specified file name.

7.6.2 RAID Group/LU information

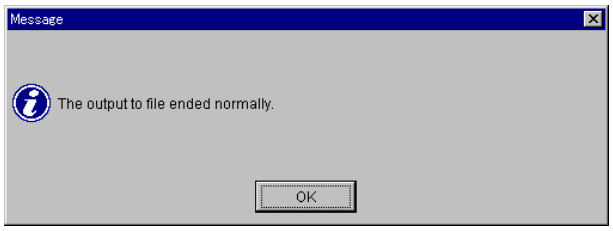
To output the RAID group/logical unit definition information already set in an array unit to a specified file in a text format:

1. On the **Settings** menu, select **Configuration Settings** or click **Configuration Settings** button in the tool bar.
2. Click the **Constitute** tab.



3. Check **RAID Group/Logical Unit** in the **Select Configuration Information** box.
4. Click the **Browse** button, and specify the directory and file name to output the file of the configuration.
5. Click the **Output** button.

6. A message appears, confirming that the system parameter information is output with the specified file name. Click the **OK** button.

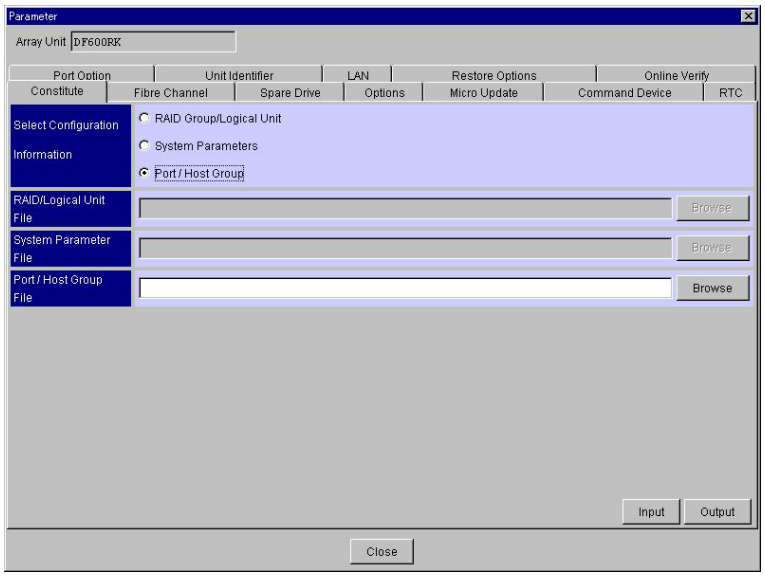


RAID group/LU information is saved in the form of a text file with the specified file name.

7.6.3 Port/Host Group Information

To output Port/Host group definition information previously set in an array unit to a specified file in a text format:

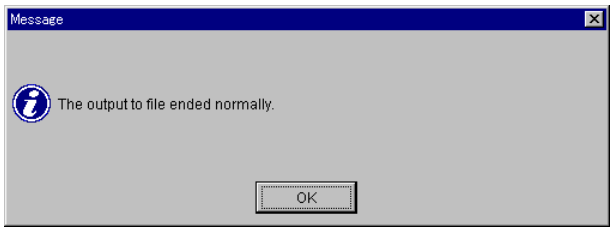
1. On the **Settings** menu, select **Configuration Settings** or click **Configuration Settings** button in the tool bar.
2. Click the **Constitute** tab.
3. Check the **Port/Host Group** in the **Select Configuration Information** box.



4. Click the **Browse** button, and specify the directory and file name to output the file of the configuration.

5. Click the **Output** button.

   A message appears, confirming that the system parameter information is output with the specified file name. Click the **OK** button.



   Port/Host group information is saved in the form of a text file with the specified file name.

7.7 Applying Configuration Data to Another Thunder 9500™ V Series Subsystem

This section includes the following:

- System Parameters
- RAID Group/Logical Unit
- Port/Host Group

7.7.1 System Parameters

Use the modes discussed in this section only when recommended by an Hitachi Data Systems Host or Optional Product installation guide.

Set the system parameters in the array unit with the information described in the file. If you set the system parameters using a file that was output when a priced optional feature is in an unlocked state, the setting may terminate abnormally. To set system parameters, use a file that was output when all priced optional features are in a locked state.

For a dual system, the setting cannot be executed if one of the controllers is detached. Confirm that the array unit is operating normally.

When system parameters are set, the array unit cannot execute commands from the host. The functions of Resource Manager 9500V can no longer work with the exception of the Wizard for setting the system parameters and failure monitoring. After setting, restart the array unit. Confirm that it is operating successfully, then connect to the host and the Resource Manager 9500V management program.

1. Edit the file for which you will set system parameters to set the array unit. This file has a specified format. The format of the file is the same as that of the file output by the array unit. To format a file, refer to the file output in 7.6 Storing Configuration Data.
2. On the **Settings** menu, select **Configuration Settings** or click **Configuration Settings** button in the tool bar.
3. Click the **Constitute** tab.
4. Click the **System Parameter** radio button.
5. Click the **Browse** button, and specify the directory and file name of the file that describes the system parameters edited in 1. The specified file name will be shown in the text box.
6. Click the **Input** button.

Note: To validate the set system parameters, restart the array unit. The previous settings stay valid until restarting. The array unit cannot access the host until the reboot is completed and the system restarts. Therefore, be certain the host has stopped accessing data before beginning the restart process.

7.7.2 RAID Group/Logical unit

Note: Back up all data before performing this procedure. All user data is lost when the logical unit is deleted.

Set the array unit according to the RAID group/logical unit setting information described in a file. If the setup of RAID group/logical unit is configured and completed, all user data previous data will be lost; RAID group/logical unit configuration as specified in the file will be set after deleting the current RAID group/logical unit. If user data is needed, configure the setting after backing up the system.

1. Edit the file for which you will set system parameters to set the array unit. This file has a specified format. The format of the file is the same as that of the file output by the array unit. To format a file, refer to the file output in 7.6 Storing Configuration Data.
2. On the **Settings** menu, select **Configuration Settings** or click **Configuration Settings** button in the tool bar.
3. Click the **Constitute** tab.
4. Click the **RAID Group/Logical Unit** radio button.
5. Click the **Browse** button, and specify the directory and name of the file that describes the RAID group definition and logical unit definition edited in 1. The specified file name will be shown in the text box.
6. Click the **Input** button.

To check the configuration, select the **Logical Status** tab.

7.7.3 Port/Host Group

1. Edit the file for which you will set system parameters to set the array unit. This file has a specified format. The format of the file is the same as that of the file output by the array unit. To format a file, refer to the file output in 7.6 Storing Configuration Data.
2. On the **Settings** menu, select **Configuration Settings** or click **Configuration Settings** button in the tool bar.
3. Click the **Constitute** tab.
4. Click the **Port/Host Group** radio button.
5. Click the **Browse** button, and specify the directory and name of the file that describes the RAID group definition and logical unit definition edited in 1. The specified file name will be shown in the text box.
6. Click the **Input** button.

7.7.4 Setting the Subsystem When Using Special Mode

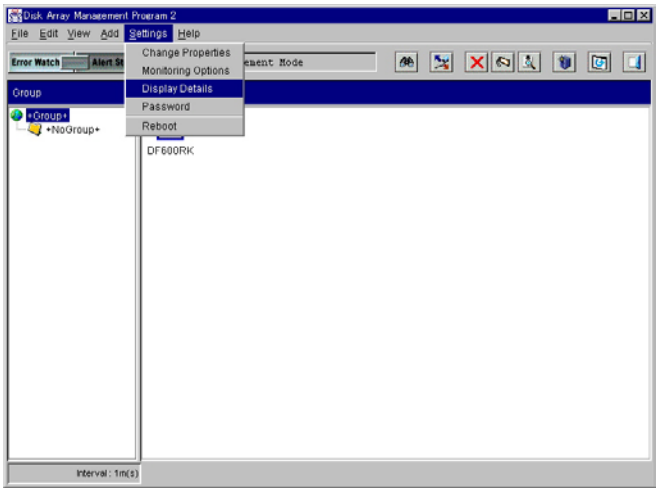
This section includes the following:

- Using Resource Manager 9500V
- Using the I/O Bus Switching Function in the Sequent NUMA-Q Connection
- Using the Subsystem in LU Blockade Mode
- Using the WolfPack Mode
- Using VxVM (Version 2.6, Ver. 2.6.1) on the Host Side
- Using V.VM (Version 3.0.1) on the Host Side
- Making Nine or More LUs Recognized by Using Qlogic HBA on Windows 2000/NT
- Using the Subsystem Connected to Hitachi 3050
- Making LUs, Numbers 8 – 63 when the Subsystem is Connected to the HP Server
- Using the SUN Cluster 3.0
- Using the ftServer
- Using the Synchronous TrueCopy Function
- Using the Microsoft Cluster Server

7.7.5 Using Resource Manager 9500V

To set the subsystem from the Resource Manager 9500V, perform the following steps:

1. Start the Resource Manager 9500V program and set the operation mode in the **Management Mode**. Refer to the *Hitachi Freedom Storage™ Thunder 9500™ V Series Resource Manager 9500V User's Guide Graphical User Interface (GUI),* MK-92DF605.
2. Click the icon of an array unit on the Main window, and then select the **Settings** menu. Click **Display Details** or click the **Display Details** button in the tool bar.



Perform the appropriate operation corresponding to the model to be set.
For detailed operation, see the following table:

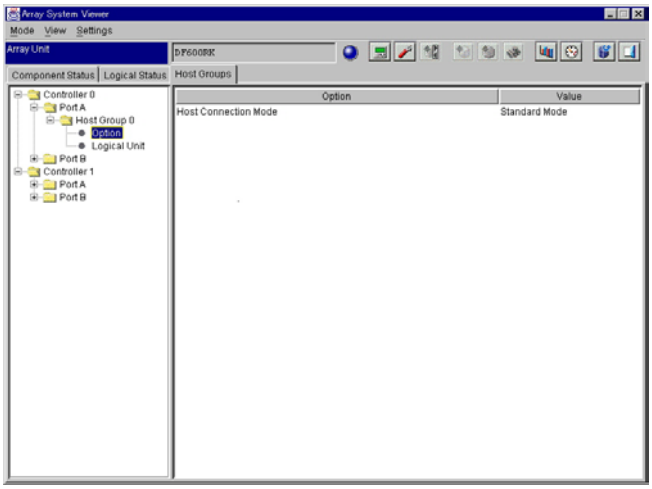
Note: The procedure for changing to special mode is performed when the host group setting is in normal mode.

Table 7.2 Model Operations

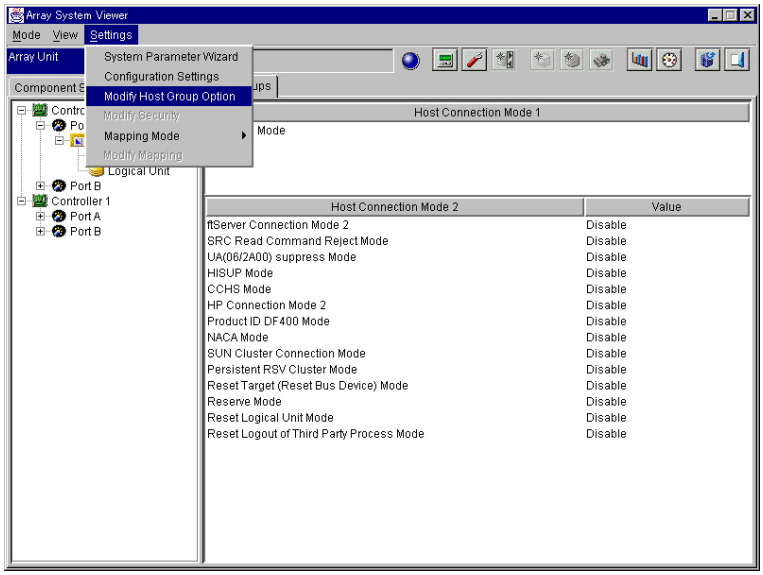
Operations	Page
Using I/O Bus Switching Function in the Sequent NUMA-Q Connection	101
Using the Subsystem in LU Blockade Mode	104
Using the WolfPack Mode	106
Using VxVM (Version 2.6, Ver. 2.6.1) on the Host Side	109
Using V.VM (Version 3.0.1) on the Host Side	110
Making Nine or More LUs Recognized by Using Qlogic HBA or Emulex HBA on Windows 2000	113
Making LUs, Numbers 8 – 63 when the Subsystem is Connected to the HP Server	115
Using the SUN Cluster 3.0	117
Using the ftServer	119
Using the Hitachi SynchronousTrueCopy Function	121
Using the Microsoft Cluster Server	123

7.7.6 Using the I/O Bus Switching Function in Sequent NUMA-Q Connection

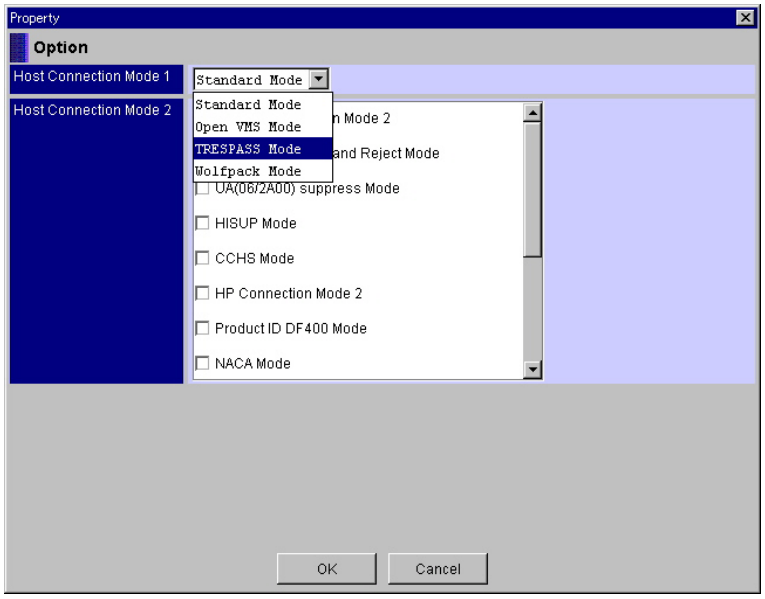
1. On the unit window, double-click the **Controller** to be set for the connection mode with the host. Display **Host group 0** by double-clicking the **Port**.
2. Display the **Option** and **Logical Unit** by double-clicking the **Host group 0**, select the **Option**.



3. On the **Settings** menu, select **Modify Host Group Option**.

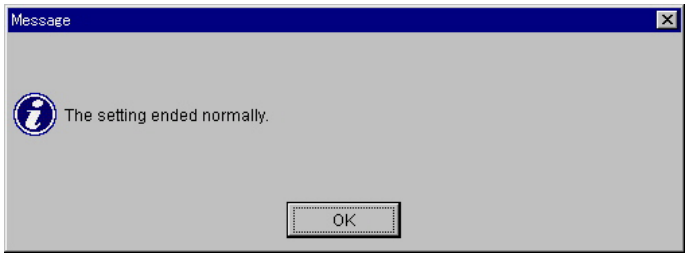


4. Select the **TRESPASS Mode** in **Host Connection Mode 1**. Click the **OK** button.



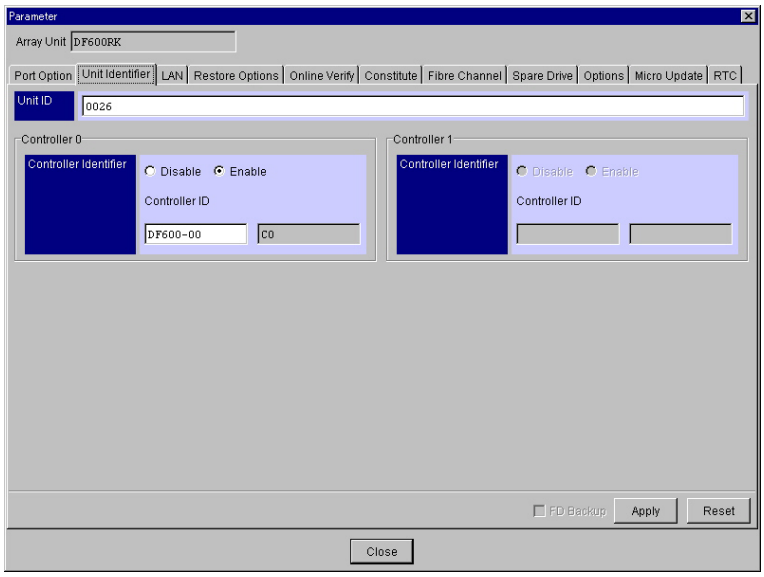
5. A message appears; click the **OK** button.

6. A message appears stating that the setting is complete. Click the **OK** button.



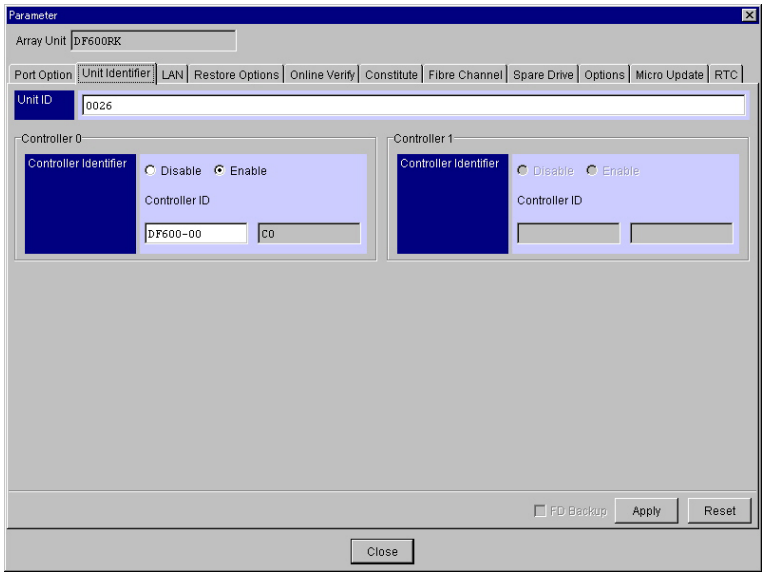
7. On the **Settings** menu, select **Configuration Settings** or click **Configuration Settings** in the tool bar.

8. Click the **Unit Identifier** tab.



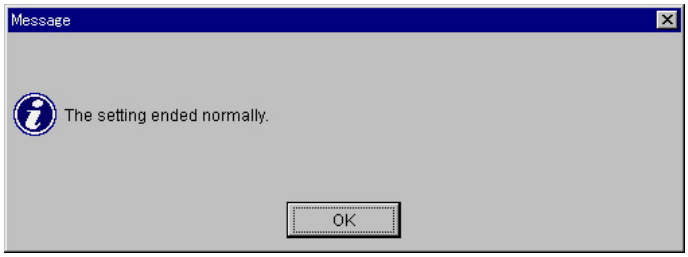
9. After **Controller Option** is displayed, click **Enable** in the **Controller Identifier**. If nothing is input to a **Controller ID**, **DF600-00** (default value) is reported.

   A controller identifier needs to be set for every device. When connecting only one device under control of a host computer, the default value can be used. From the second host computer the controller identifier needs to be changed.



10. Click the **Apply** button.

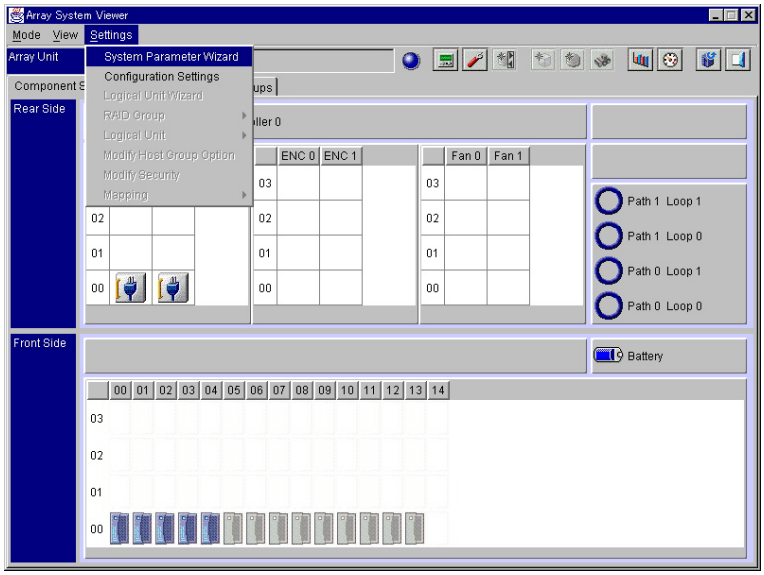
11. A message appears, stating that the setting is complete. Click the **OK** button.



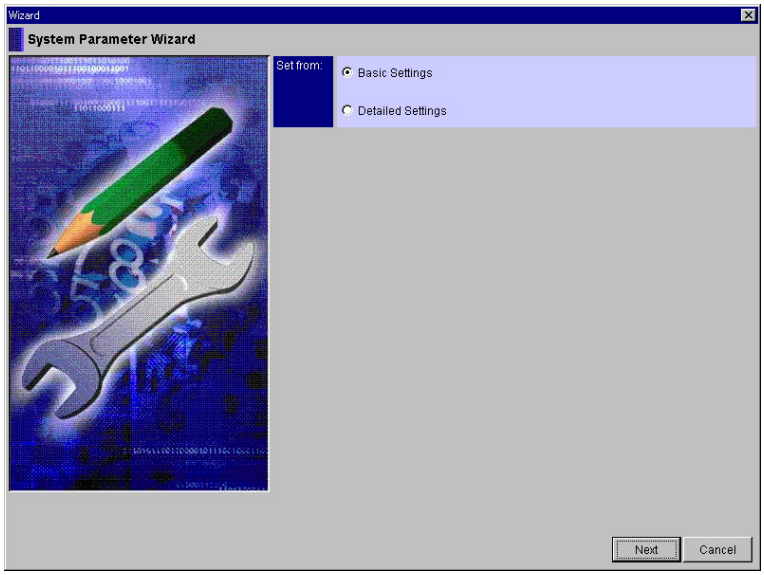
12. Click the **Close** button.

7.7.7 Using the Subsystem in LU Blockade Mode

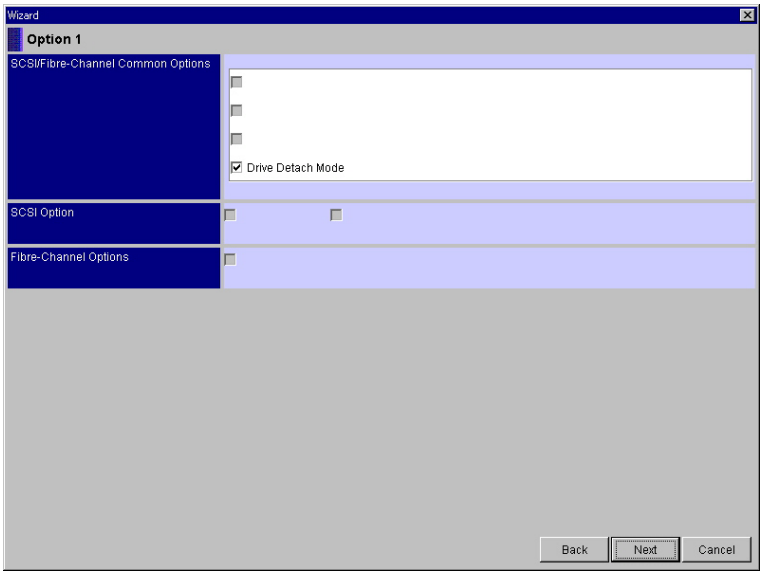
1. On the **Settings** menu, click **System Parameter Wizard** or click the **System Parameter Wizard** in the tool bar.



2. Click the **Basic Settings**, then click the **Next** button.



3. Click the **Next** button until **Option 1** is displayed.
4. After **Option 1** has been displayed, click the **Drive Detach Mode** in the **SCSI/Fibre-Channel Common Options**.

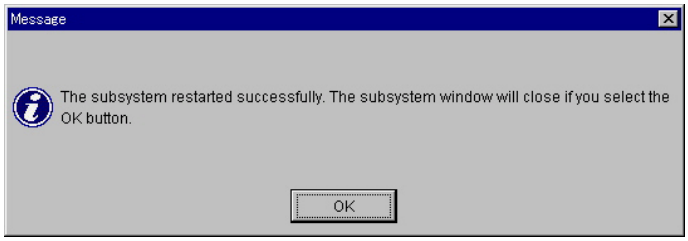


5. Click the **Next** button until **System Parameter Setting Completed** is displayed.
6. Click the **OK** button.

7. When terminated, set the system parameters. The following window is displayed. Click the **OK** button.

8. Click the **OK** button.

9. A message appears, stating that the restart is successful. Click the **OK** button.

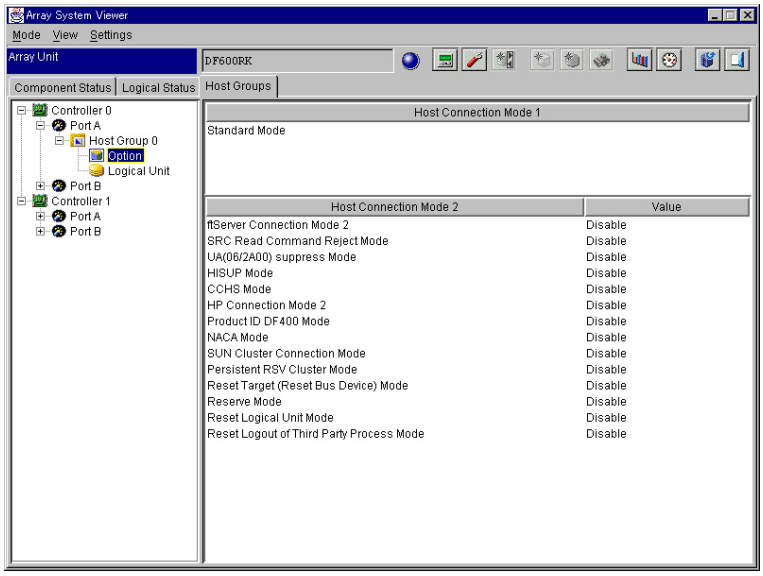


The Unit screen is closed. To perform other operations on the Main screen, select an array unit from the Main screen and open the selected Unit screen.

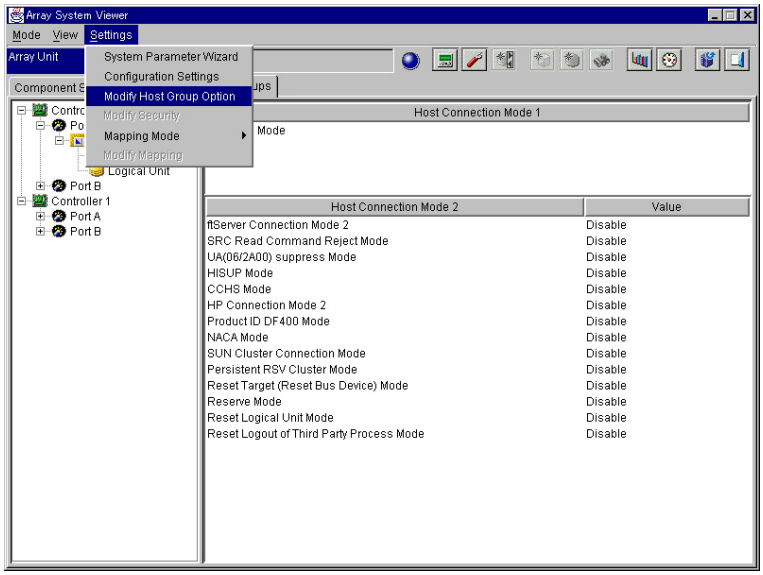
7.7.8 Using in the WolfPack Mode

1. In the unit window, double-click the **Controller** to be set for the connection mode with the host. Display the **Host group 0** by double-clicking the **Port**.

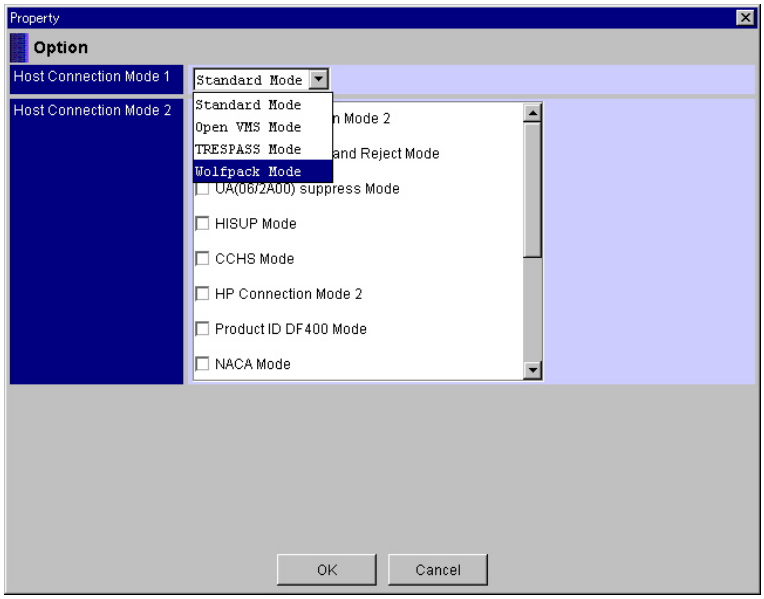
   Display the **Option** and **Logical Unit** by double-clicking the **Host group 0** and select the **Option**.



2. On the **Settings** menu, select **Modify Host Group Option**.

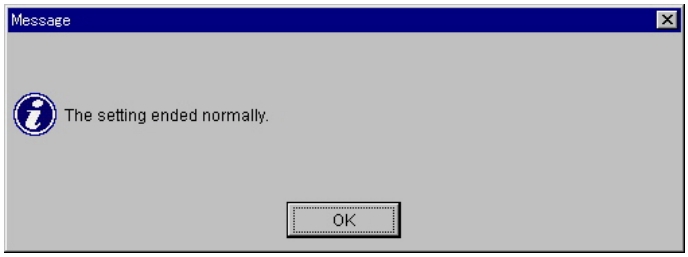


3. Select the **Wolfpack Mode** in the **Host Connection Mode 1**. Click the **OK** button.

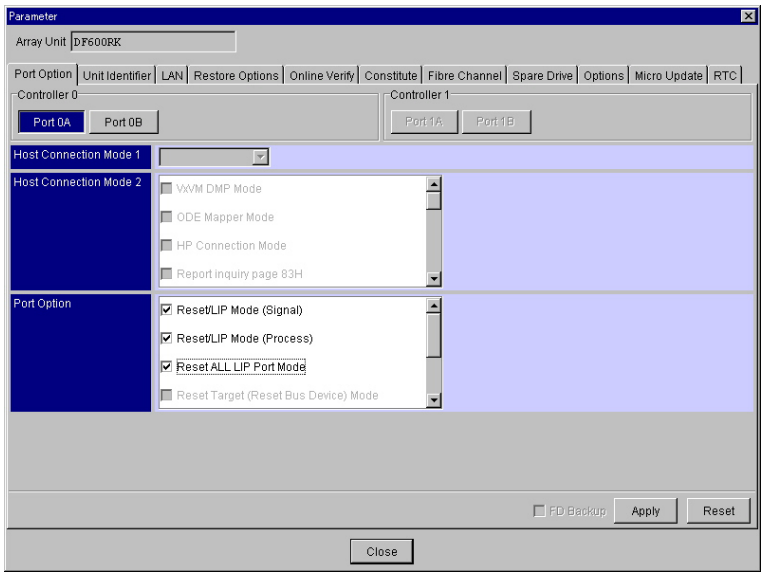


4. A message appears; click the **OK** button.

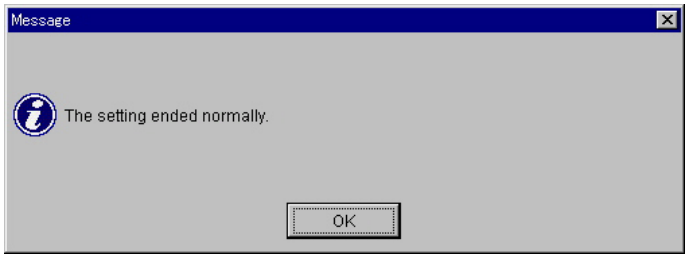
5. A message appears stating that the setting is complete is displayed. Click the **OK** button.



6. On the Settings menu, select **Configuration Settings** or click **Configuration Settings** in the tool bar.
7. Click the **Port Option** tab.
8. Select **Reset ALL LIP Port Mode** of the **Port Option**.



9. Click the **Apply** button.
10. A message appears stating that the setting is complete. Click the **OK** button.

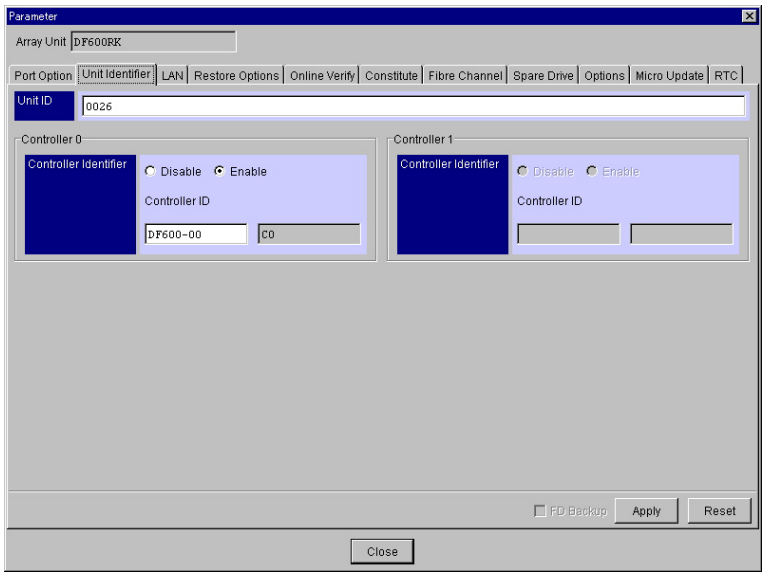


11. Click the **Close** button.

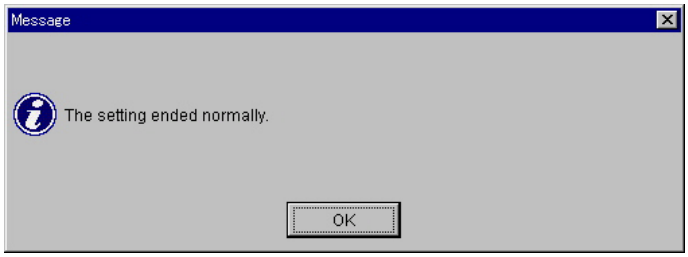
7.7.9 Using VxVM (Ver.2.6, Ver.2.6.1) on the Host Side

1. On the **Settings** menu, select **Configuration Settings** or click **Configuration Settings** in the tool bar.
2. Click the **Unit Identifier** tab.
3. After **Controller Option** is displayed, click **Enable** in the **Controller Identifier**.

   If nothing is input to a **Controller ID**, **DF600-00** (default value) is reported. A controller identifier needs to be set for every device. When connecting only one device under control of a host computer, a default value can be used. From the second host computer, the controller identifier needs to be changed.



4. Click the **Apply** button.
5. A message appears indicating that the setting is complete. Click the **OK** button.

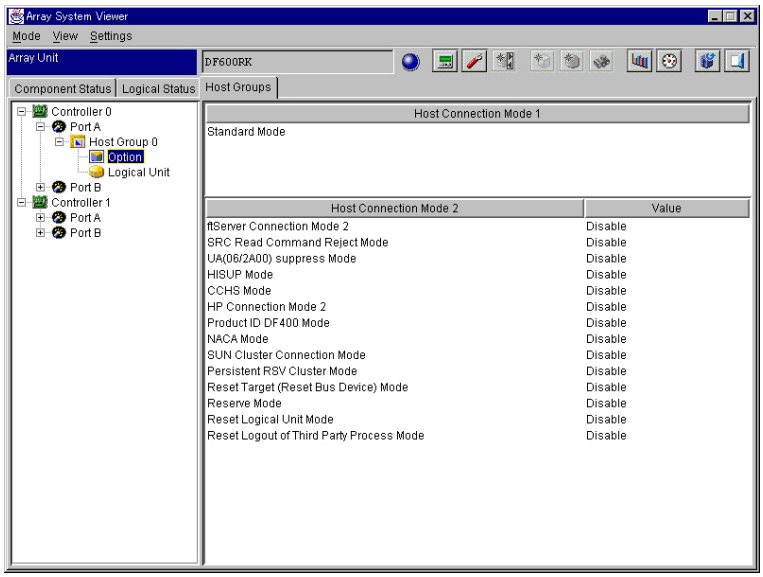


6. Click the **Close** button.

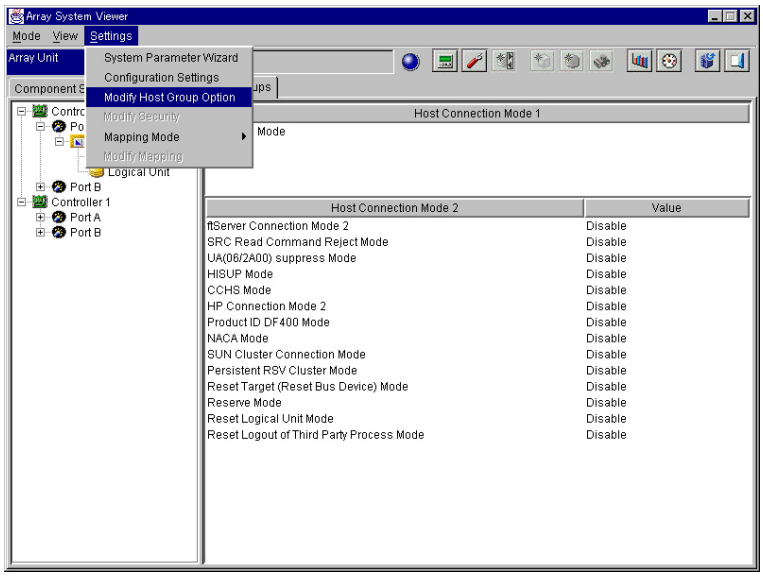
7.7.10 Using VxVM (Ver.3.0.1) on the Host Side

1. On the unit window, double-click the **Controller** to be set for the connection mode with the host, then display **Host group 0** by double-clicking the **Port**.

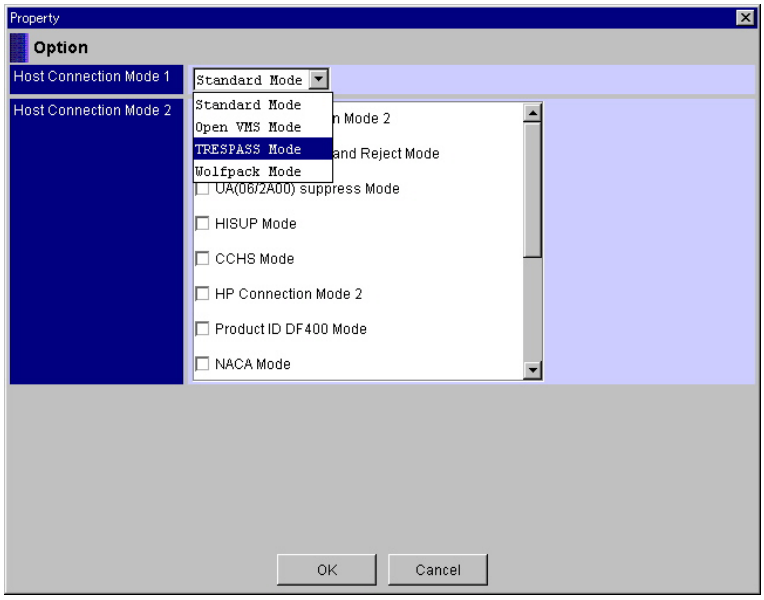
   Display the **Option** and **Logical Unit** by double-clicking **Host group 0** and select the **Option**.



2. On the **Settings** menu, select **Modify Host Group Option**.

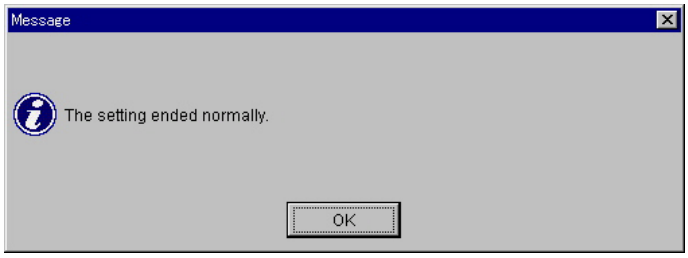


3. Select the **TRESPASS Mode** in the **Host Connection Mode 1**. Click the **OK** button.

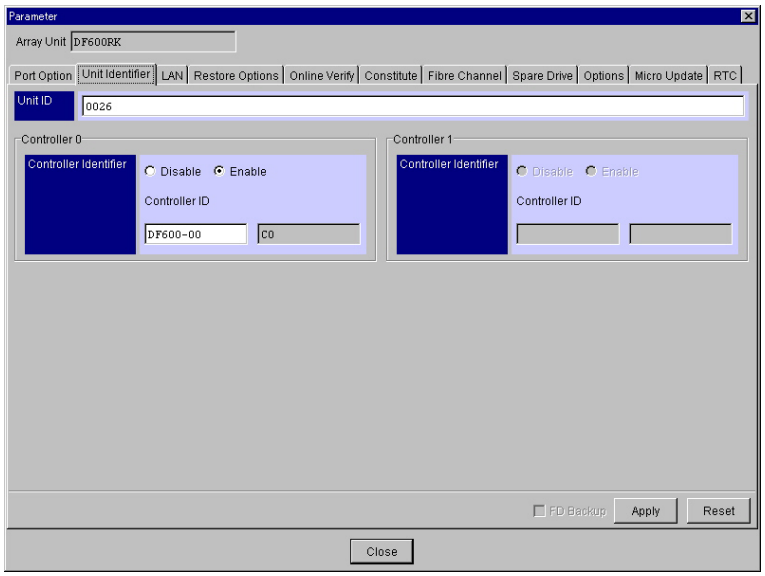


4. A message appears; click the **OK** button.

5. A message appears stating that the setting is complete. Click the **OK** button.



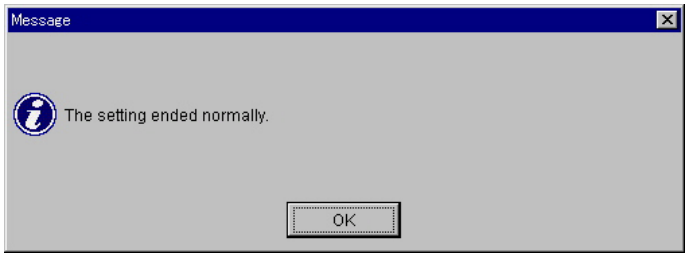
6. On the **Settings** menu, select **Configuration Settings** or click **Configuration Settings** in the tool bar.
7. Click the **Unit Identifier** tab.



8. After the **Controller Option** is displayed, click **Enable** in the **Controller Identifier**.

   If nothing is input to a **Controller ID**, **DF600-00** (default value) is reported.

   A controller identifier needs to be set for every device. When connecting only one device under control of a host computer, a default value can be used. From the second host computer, the controller identifier needs to be changed.
9. Click the **Apply** button.
10. A message appears, stating that the setting is complete. Click the **OK** button.

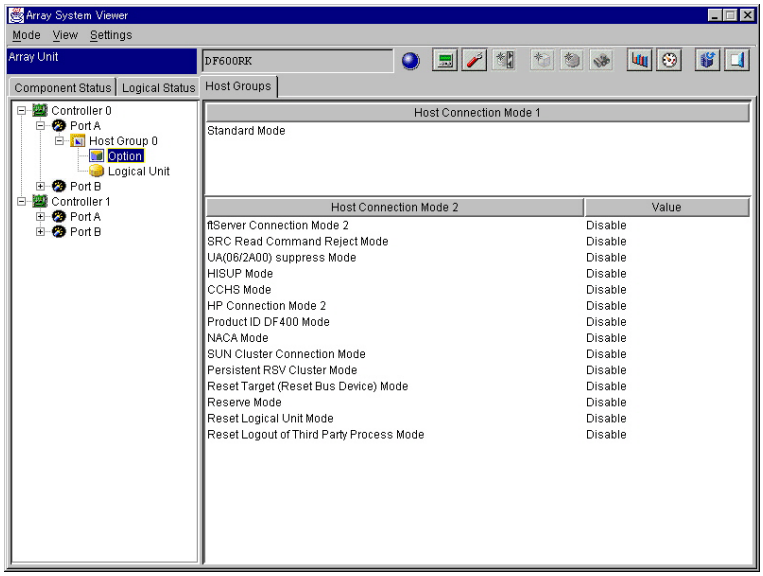


11. Click the **Close** button.

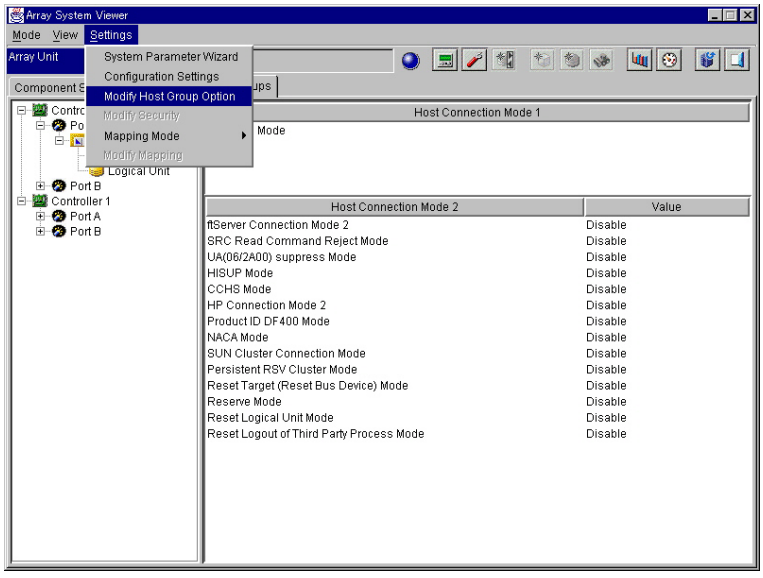
7.7.11 Making Nine or More LUs Recognized by Using Qlogic HBA or Emulex HBA on Windows 2000

1. On the unit window, double-click the **Controller** to be set for the connection mode with the host, then display the **Host group 0** by double-clicking the **Port**.

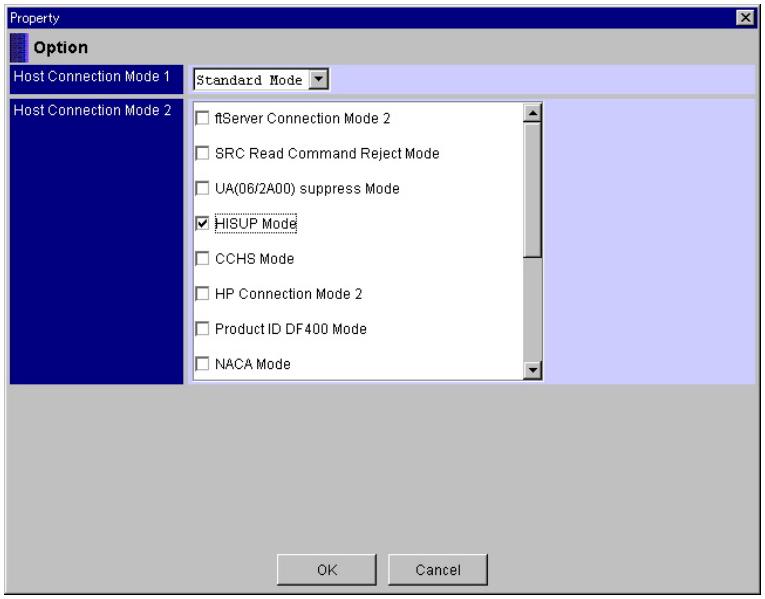
   Display **Option** and **Logical Unit** by double-clicking the **Host group 0** and select the **Option**.



2. On the **Settings** menu, select **Modify Host Group Option**.

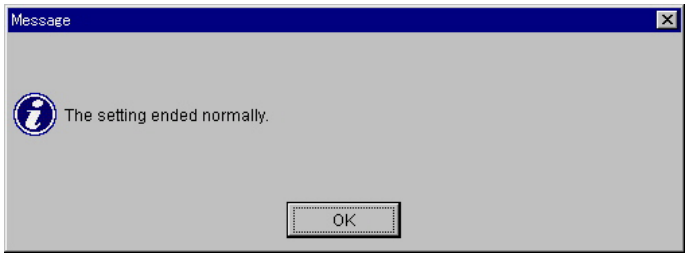


3. Select the **HISUP Mode** in **Host Connection Mode 2**. Click the **OK** button.



4. A message appears; click the **OK** button.

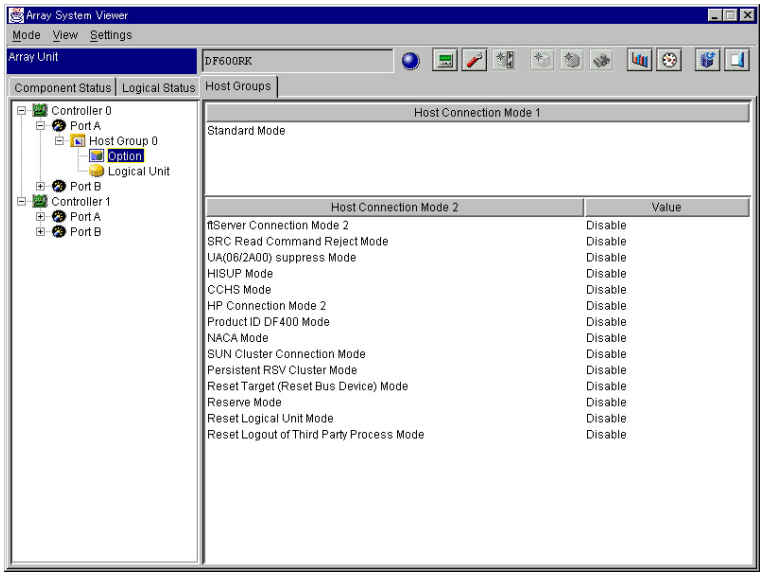
5. A message appears, stating that the setting is complete. Click the **OK** button.



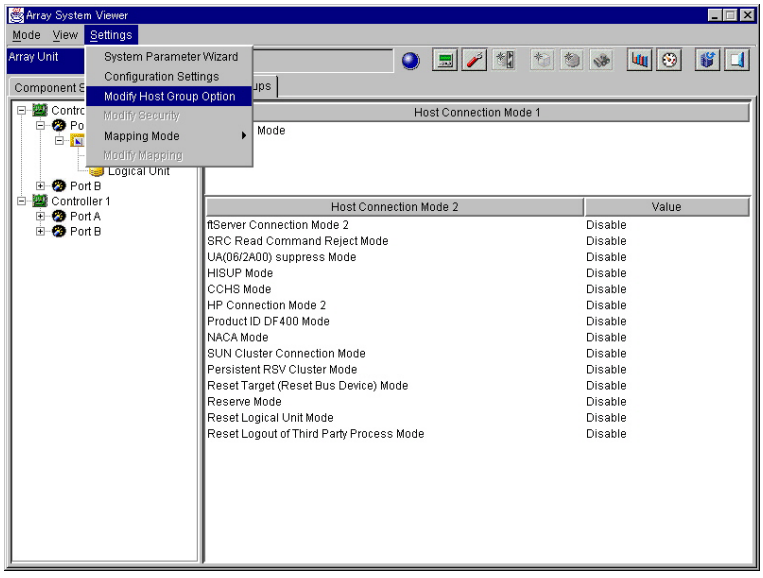
7.7.12 Making LU Numbers 8 to 63, Recognized when the Subsystem is Connected to the HP Server

1. On the unit window, double-click the **Controller** to be set for the connection mode with the host, then display the **Host group 0** by double-clicking the **Port**.

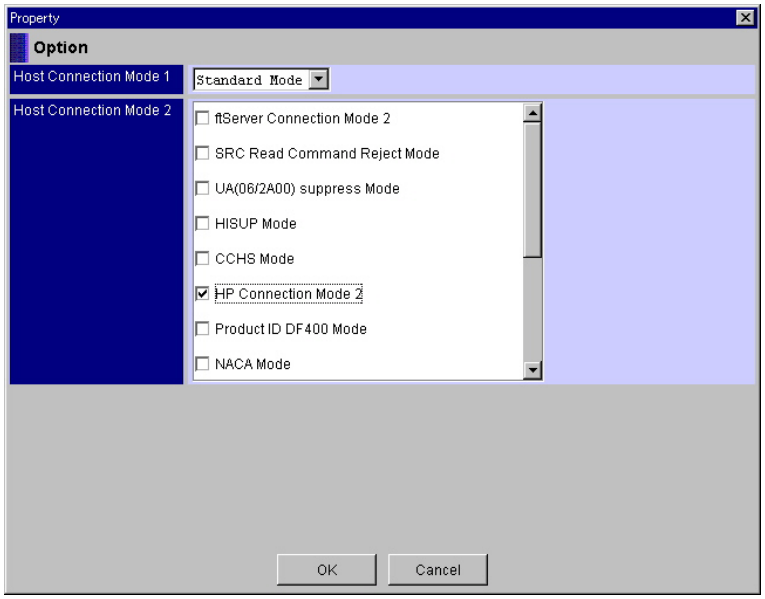
   Display the **Option** and **Logical Unit** by double-clicking **Host group 0** and select the **Option**.



2. On the Settings menu, select **Modify Host Group Option**.

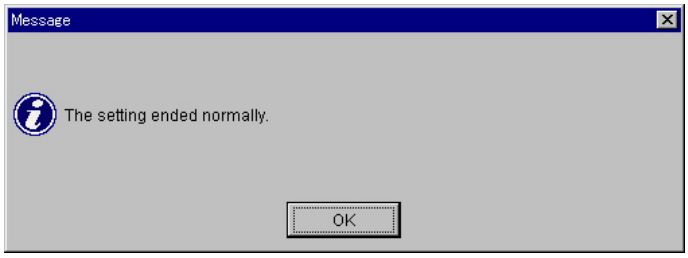


3. Select the **HP Connection Mode 2** in the **Host Connection Mode 2**. Click the **OK** button.



4. A message appears; click the **OK** button.

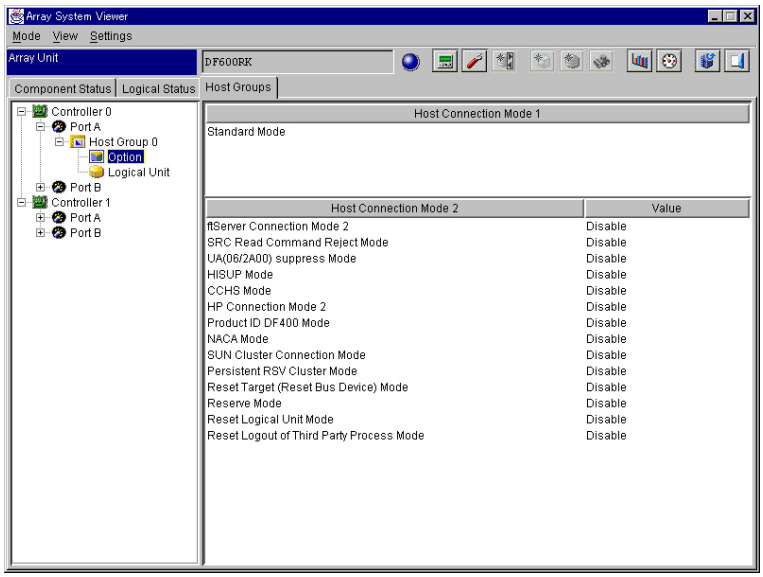
5. A message appears stating that the setting in complete. Click the **OK** button.



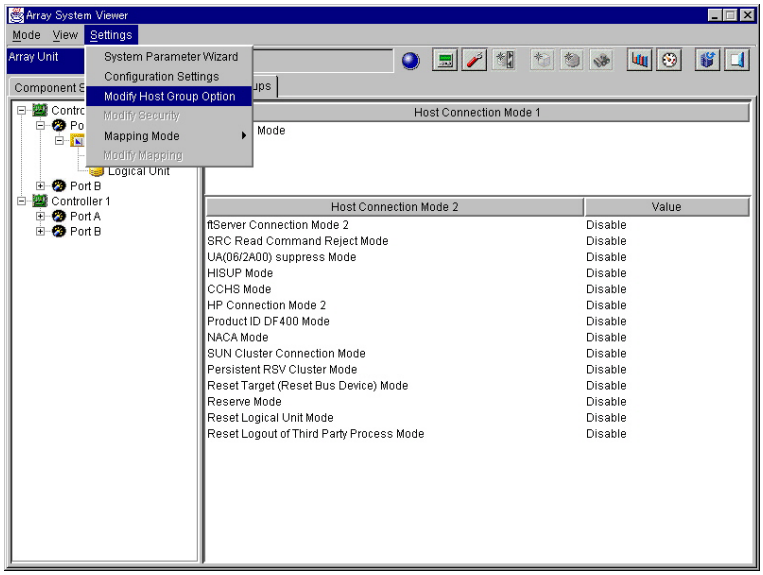
7.7.13 Using SUN Cluster 3.0

1. On the unit window, double-click the **Controller** to be set for the connection mode with the host, then display the **Host group 0** by double-clicking the **Port**.

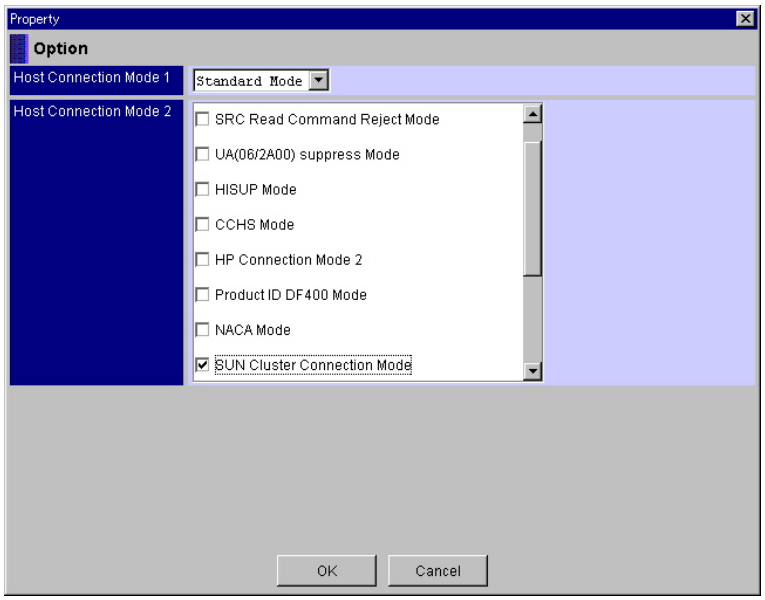
   Display the **Option** and **Logical Unit** by double-clicking the **Host group 0** and select the **Option**.



2. On the **Settings** menu, select **Modify Host Group Option**.

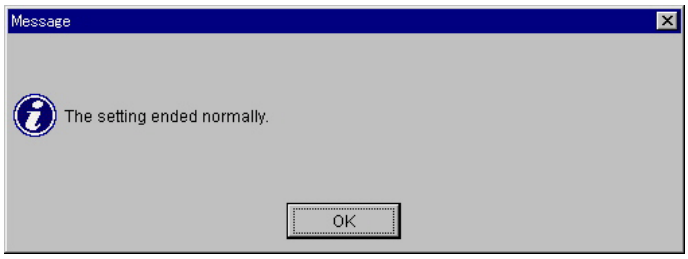


3. Select the **SUN Cluster Connection Mode** in **Host Connection Mode 2**. Click the **OK** button.



4. A message appears; click the **OK** button.

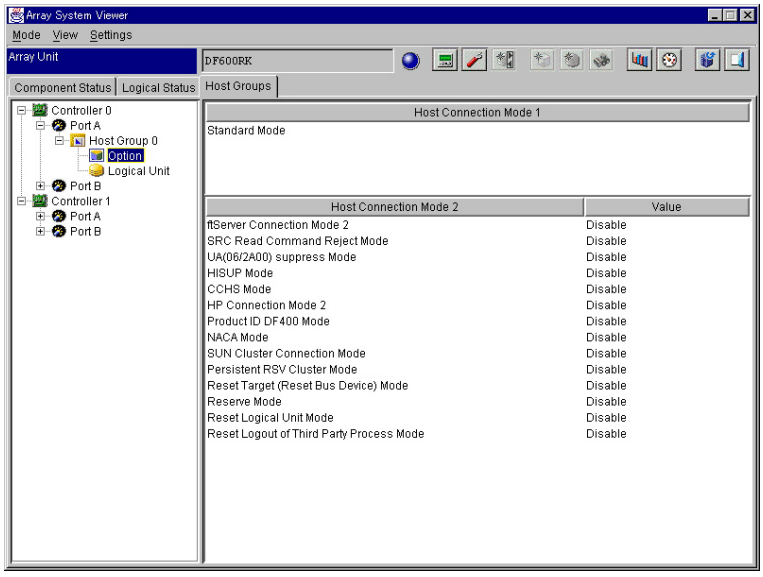
5. A message appears stating that the setting is complete. Click the **OK** button.



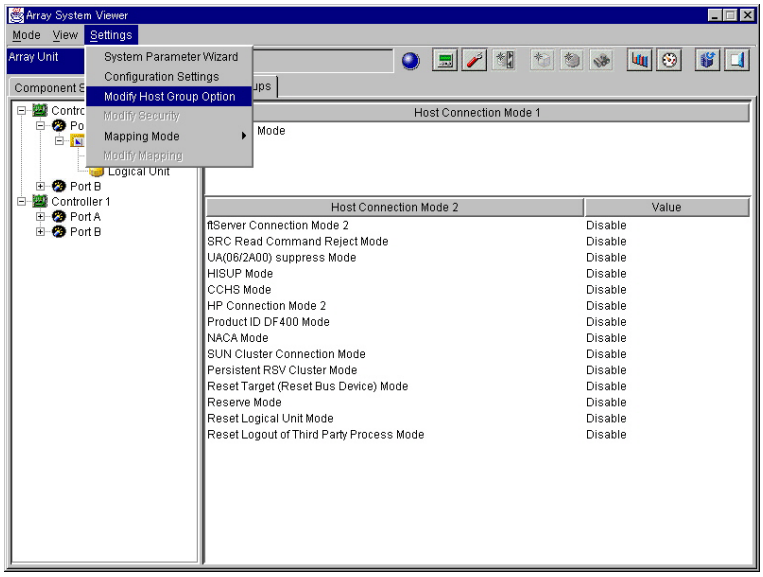
7.7.14 Using the ftServer

1. On the unit window, double-click the **Controller** to be set for the connection mode with the host. Display the **Host group 0** by double-clicking the **Port.**

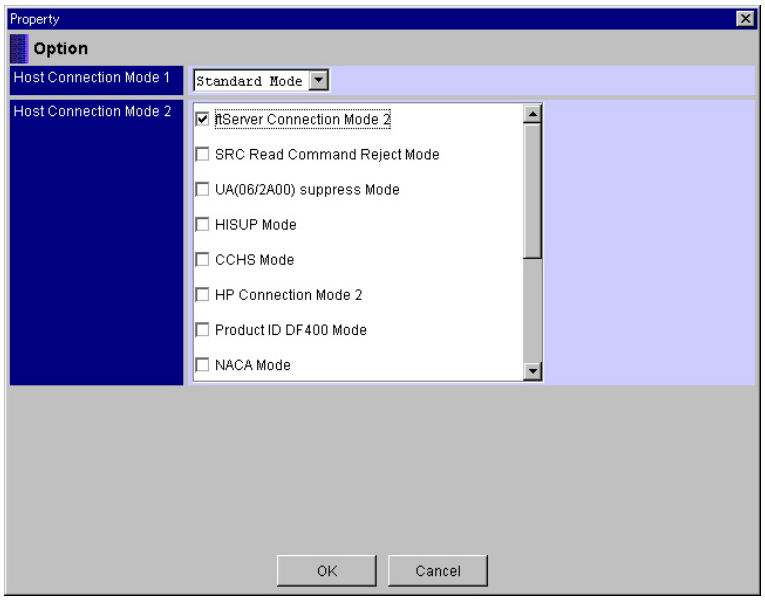
   Display **Option** and **Logical Unit** by double-clicking **Host group 0;** select the **Option**.



2. On the **Settings** menu, select **Modify Host Group Option**.

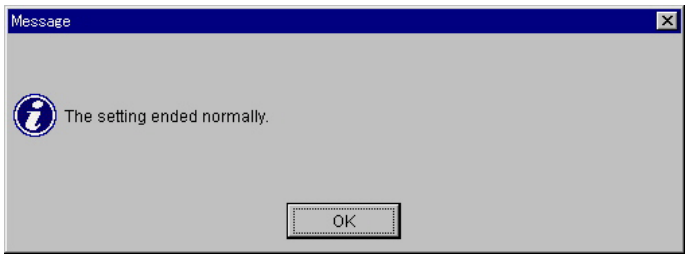


3. Select the **ftServer Connection Mode 2** in the **Host Connection Mode 2**. Click the **OK** button.



4. A message appears; click the **OK** button.

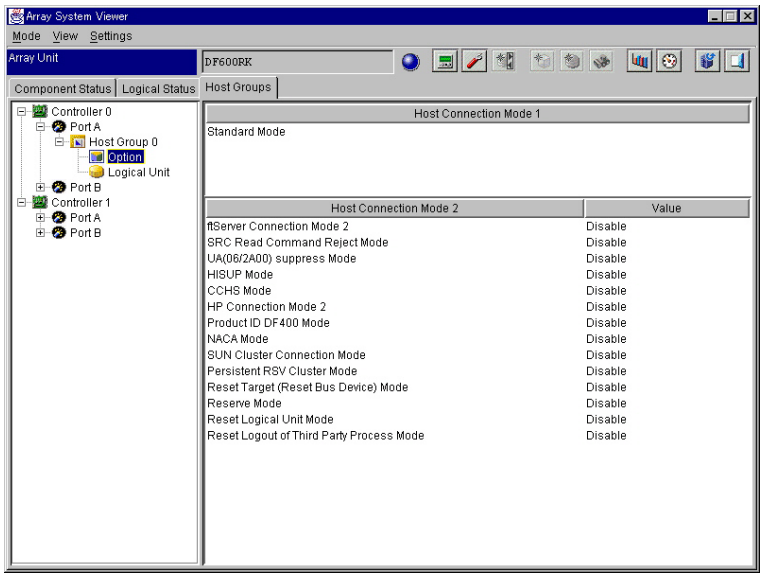
5. A message appears stating that the setting is complete. Click the **OK** button.



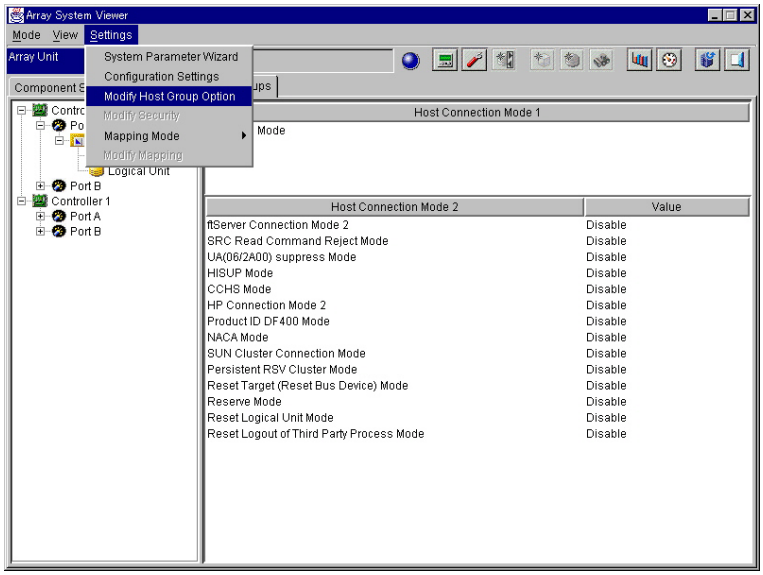
7.7.15 Using Synchronous TrueCopy

1. On the unit window, double-click the **Controller** to be set for the connection mode with the host. Display the **Host group 0** by double-clicking the **Port**.

   Display **Option** and **Logical Unit** by double-clicking the **Host group 0** and selecting **Option**.

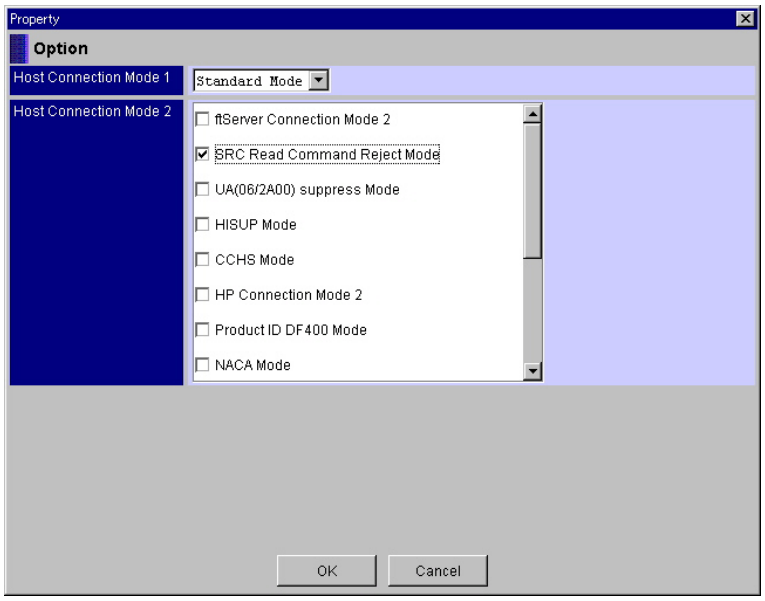


2. On the **Settings** menu, select **Modify Host Group Option**.



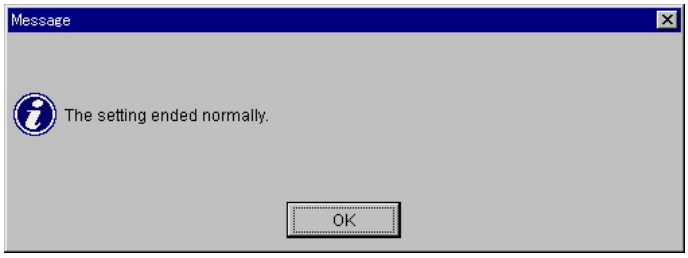
3. If you want to use the subsystem, suppressing read access to the P-VOL when the mode is changed to PSUE, select **SRC Read Command Reject Mode** for the **Host Connection Mode 2**.

   Click the **OK** button.



4. A message appears; click the **OK** button.

5. A message appears, stating that the setting is complete. Click the **OK** button.



7.7.16 Using the Microsoft Cluster Server

When connecting to Microsoft Cluster Server via Fabric Switch, Zoning on Fabric Switch must be set for each HBA as shown below:

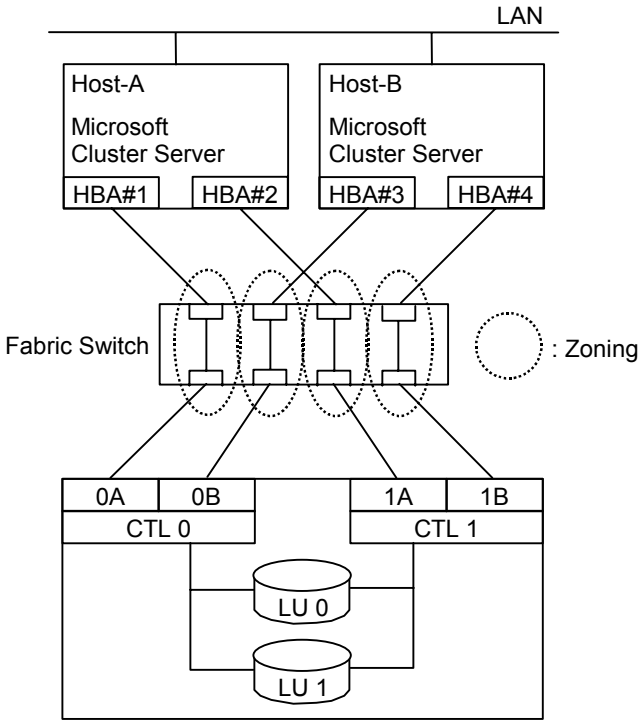


Figure 7.7 Configuration Example (without Port Sharing)

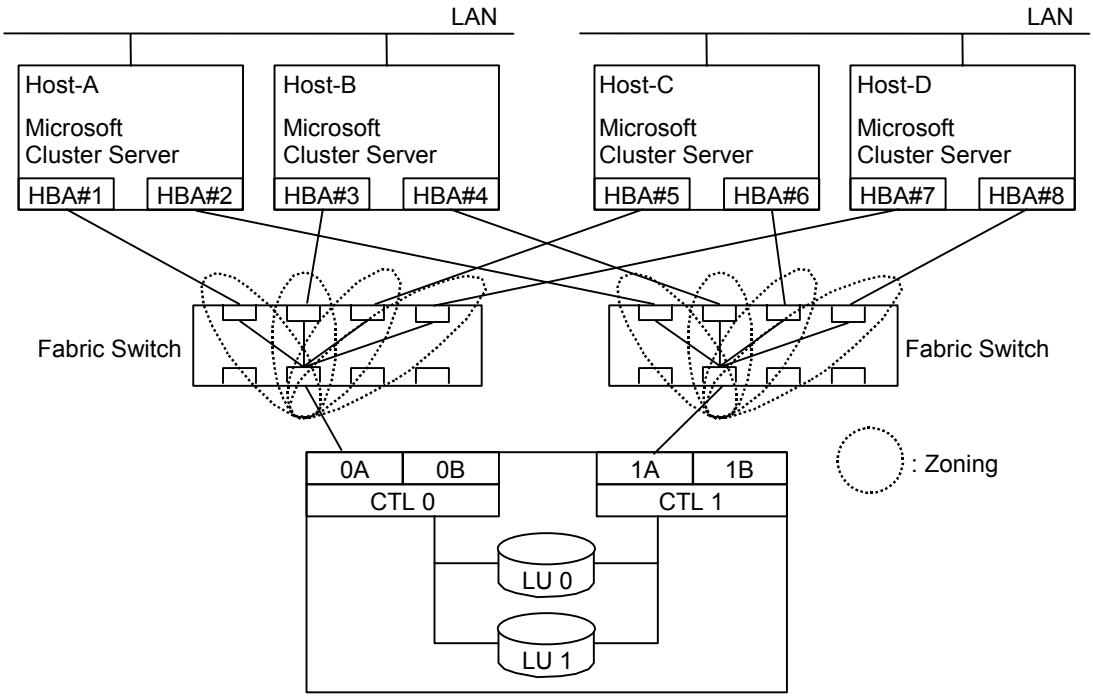
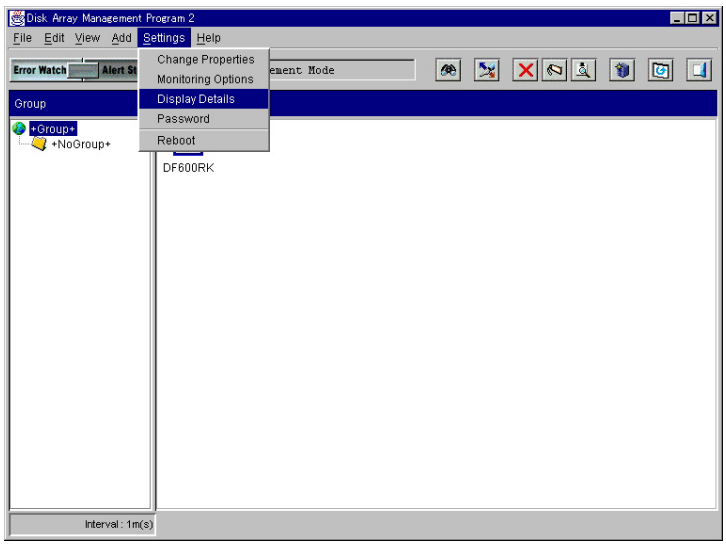


Figure 7.8 Configuration Example (with Port Sharing)

7.8 Changing the Network Parameter

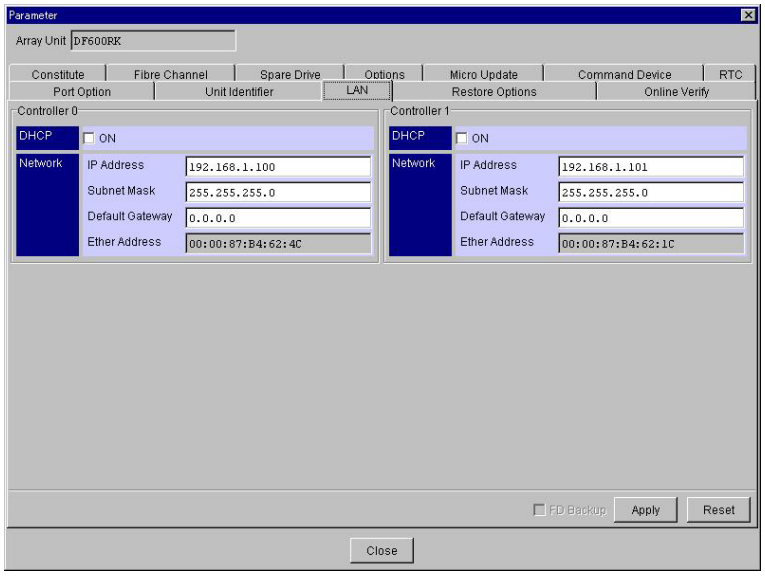
To set a network parameter from the Resource Manager 9500V program, use the following procedure:

1. Turn on the power supply.
2. Start the Resource Manager 9500V program and set the operation mode to Management Mode Refer to the *Hitachi Freedom Storage™ Thunder 9500™ V Series Resource Manager 9500V User's Guide Graphical User Interface (GUI)*, MK-92DF605.
3. Click the icon of an array unit on the Main window, and select the **Settings** menu.
4. Click **Display Details** or click the **Display Details** button in the tool bar.



5. On the **Settings** menu, select **Configuration Settings** or click **Configuration Settings** in the tool bar.

6. Click the **LAN** tab on the Unit screen.



7. Set the Network parameter for the Network.
8. Click the **Apply** button.
9. A message appears, stating that the network parameter has been changed. A confirmation message appears, asking you to verify that you wish to restart. Click the **OK** button to restart.

Note: When a restart is initiated, the array unit is not ready to access data from the host for duration of this process. Therefore, verify that the host has stopped accessing data before initiating a restart.

9. A message appears, stating that the restart has terminated. Click the **OK** button.

   When the **OK** button is clicked, the unit window is closed. To perform other operations, select an array unit on the main window and open the unit window.

Chapter 8 Troubleshooting

The Hitachi Freedom Storage™ Thunder 9500™ V Series subsystem provides high data availability and is not expected to fail in any way that would prevent access to user data.

This section includes the following:

- Troubleshooting Based on LED Indications
- Web Overview
- Web Operational Procedures
- Troubleshooting Using a Web Connection

8.1 Troubleshooting Based on LED Indications

This section includes the following:

- The POWER LED does not Turn On
- The POWER LED is Turned Off
- The READY LED does not Turn On or the READY LED has Turned On Once, then Turned Off
- The ALARM LED has Turned On
- The WARNING LED has Turned On or Blinks

8.1.1 The POWER LED does not Turn On

When the POWER LED does not turn on, follow these steps:

1. Set the AC power unit switch on; set the main switch to on.
2. Has the POWER LED turned on?

   Yes: Go to step 9.
   No: If the power control has been set to **Remote**, power-on the host computer.
3. Has the POWER LED turned on?

   Yes: Go to step 9.
   No: Set the main switch to off; set the AC power unit switch to off.
4. Check the PDB to verify that electricity is supplied to the unit.
5. Verify that the AC cable is correctly connected to the plug socket and the equipment.
6. Set the AC power unit switch to on; set the main switch to on.
7. Has the POWER LED turned on?

   Yes: Go to step 9.
   No: Set the main switch to off; set the AC power unit switch to off.

8. Call your maintenance engineer. Go to step 10.
9. Has the READY LED turned on?

   Yes: Continue to use the equipment as it is.
   No: Verify that the READY LED does not turn on or that the READY LED has turned on once and then turned off.
10. End of the procedure.

8.1.2 The POWER LED has Turned Off

When the POWER LED has turned off, follow these steps:

1. Electricity is received by the equipment?

   Yes: Remove anything that would prohibit electricity from being supplied to the unit and restart the unit. Go to step 7.
   No: Verify that the AC cable is correctly connected to the plug socket, then restart the unit.
2. Set the main switch to off, then set the AC power unit switch to off.
3. After waiting for more than one minute, set the AC power unit switch to on, then set the main switch to on.
4. Has the POWER LED turned on?

   Yes: Go to step 6.
   No: Set the main switch to off, then set the AC power unit switch to off.
5. Call your maintenance engineer.
6. Has the READY LED turned on?

   Yes: Continue to use the equipment as it is.
   No: Refer to READY LED does not turn on or READY LED has turned on once, then turned off.
7. End of procedure.

8.1.3 READY LED does not Turn On or the READY LED has Turned On Once, then Turned Off

If the READY LED does not turn on or the READY LED has turned on once, then turned off, follow these steps:

1. Is the POWER LED on?

   Yes: Go to step 2.
   No: Go to step 4 in **POWER LED does not turn on**.
2. Is the ALARM LED on?

   Yes: Refer to **ALARM LED has turn on**.
   No: Go to step 3.
3. Turn off the main switch.

4. After waiting for more than one minute, set the AC power unit switch to on, then set the main switch to on.
5. Has the READY LED turned on?

   Yes: Continue to use the equipment as it is. Go to step 8.
   No: Go to step 6.
6. Set the main switch to off, then set the AC power unit switch to off.
7. Call your maintenance engineer.
8. End of the procedure.

8.1.4 The Alarm LED has Turned On

When the ALARM LED has turned on, follow these steps:

1. Identify in which components the failure is resident.

Note: Refer to 4.8.5 LED Locations and Functions to identify failed components whose LEDs indicate their respective failures.

2. Set the main switch to off, then set the AC power unit switch to off.
3. Call your maintenance engineer.

8.1.5 The WARNING LED has Turned On or Blinks

When the WARNING LED has turned on or blinks, follow these steps:

1. Does the WARNING LED blink?

   Yes: Call your maintenance engineer. Go to step 5
   No: Go to step 2.
2. Is the READY LED on?

   Yes: Go to step 3.
   No: Refer to: READY LED does not turn on or READY LED has turned on once and then turned off.
3. Identify in which components a failure is resident.

Note: Refer to 4.8.5 LED Locations and Functions to identify failed components whose LEDs indicate their respective failures.

4. Continue to use the equipment and contact the maintenance engineer.
5. End of the procedure.

8.2 Web Overview

This section includes the following:

- Operational Environment
- Characteristics of Network Functions
- Connecting to the Network

8.2.1 Operational Environment

The Web operational environment and the necessary requirements are shown in the following tables.

Table 8.1 Web Operational Environment

No.	Item	Description
1	OS	Microsoft Windows 95/98/2000/Me/XP/NT 4.0, Solaris 2.6/8.0, IRIX 6.4
2	PC	Pentium (Pentium Ⅱ[233 M Hz or more] is recommended), Memory 40 M bytes or more (64 Mbytes or more is recommended or more)
3	WS	Turbo Sparc 170 M Hz, Memory 256 Mbytes or more R10000 195M Hz, Memory 128 Mbytes or more
4	Disk requirement	50 Mbytes

Table 8.2 Web Operational Requirements

No.	Platform	OS	Browser	Ver.	Supported or Not Supported	Microprogram Supported or Not Supported
1	WS	IRIX	Netscape Navigator	4.7	○	X
				4.76	○	X
		Solaris 2.6	Netscape Navigator	4.7	○	X
				4.76	○	X
		Solaris 8.0	Netscape Navigator	4.78	○	X
2	PC	Windows	Internet Explorer	5.0	○	X
				5.5 (***Note 1***)	○	○
				6.0	○	○
			Netscape Navigator	4.7	○	X
				4.73	○	X
				4.74	○	X
				4.75	○	X
				4.76	○	X
				4.78	○	X
				6.2	○	X

Note 1: The Service Pack 1 is included.

8.2.2 Characteristics of Network Functions

This section discusses the following network function characteristics:

- LAN Interface:
  The connector for 10Base-T/100Base-TX is equipped with the controller. 10Base-T/100Base-TX is selected automatically.
- Network Parameter:
  The 9500V has the following network parameters; they can be set or changed by the Web browser or the Resource Manager 9500V, concerning only port 1 (for users) of each controller.

Table 8.3 Network Parameters

Network parameter	Description	Factory Setting Value (*Note 1*)	
		Controller 0	**Controller 1**
		For users port: variable IP	**For user's port: variable IP**
IP Address	The IP Address is changed/set up.	192.168.0.16 (***Note 1***)	192.168.0.16 (***Note 1***)
Subnet Mask	The Subnet Mask is changed/set up.	255.255.255.0	255.255.255.0
Default Gateway	The Default Gateway is changed/set up.	0.0.0.0	0.0.0.0
DHCP (***Note 2***)	Enable/Disable of the DHCP function is set up.	Off	Off

Note 1: Manage the IP Address after the IP Address is changed from the IP Address of factory setting.

Note 2: When the DHCP mode is validated, the IP Address is acquired from the DHCP server.
If the DHCP server is not started up or the DHCP function has been wrongly set, the acquisition of the IP Address will fail and the IP Address of the subsystem will remain **0.0.0.0**. (This is a state in which Disk Array management program 2 or the Web cannot be used via a LAN.)
In this case, you can acquire the IP Address by starting up the DHCP server or by setting the DHCP function correctly when necessary.

8.3 Web Operational Procedures

This section contains the following information:

- Connecting to the Network using a LAN Interface
- Screen Outlines
- Main Screen in Normal Mode
- Status Display of Replaceable Components
- Information Message
- Setting the Buzzer Sound Volume

8.3.1 Connecting to the Network using a LAN Interface

To use a LAN interface, follow these steps:

1. The connector for 10Base-T/100Base-TX is equipped with the controller. 10Base-T/100Base-TX is selected automatically.
2. Connect the LAN cable with the LAN connector shown in the Figure 8.1.

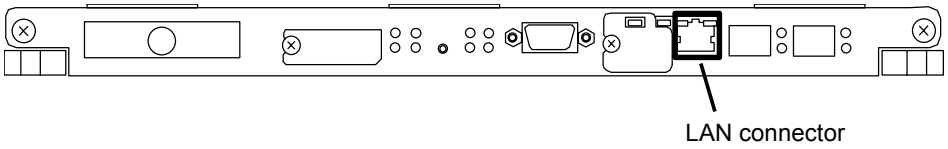


Figure 8.1 LAN Connector Location

Change the IP Address of the controller set up to the Address of the Web browser, to enter Normal Mode. Set the IP Address of the controller connected with the network as a dual system configuration. The status of the devices (both controllers) can be monitored from one controller.

8.3.2 Screen Outlines

If the Normal Mode function is displayed and clicked in the menu screen, the chosen function can be executed. The following figure displays the main screen outline of Normal Mode.

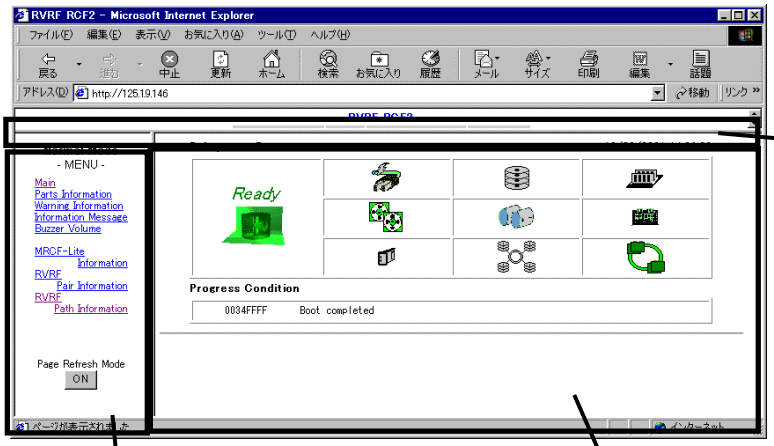


Figure 8.2 Main Screen Outline

This section includes the following:

- Menu Frame
- Main Frame
- Version Frame

8.3.2.1 Menu Frame

The main frame displays the following information:

Main: The main screen of Normal Mode is displayed.

Parts Information: The status of exchange parts is displayed.

Warning Information: Fault information that was detected during device information status is displayed.

Information Message: Fault information, detected during device operation and device information status is displayed.

Simple Trace: A window for collecting the Simple trace is displayed.

CTL Alarm Trace: A window for collecting the CTL Alarm trace is displayed.

Buzzer Volume: The screen where Buzzer Volume is set up is displayed.

Page Refresh Mode: This button sets up an on/off an automatic redisplay function. When clicked, the on/off mode changes.

OFF display: This is not refreshed.
ON display: The screen of the mainframe is refreshed every 5 seconds. The refresh time currently (RTC) is displayed on the right top.

Note: When the PC enters suspension status during operation while the **Page Refresh Mode** is set to **ON**, the Web may not operate correctly after the PC is released from suspension status. When the Web is connected for status monitoring, etc., set the power management of the PC so that the PC does not enter suspension status.

8.3.2.2 Main frame

The main frame displays the following information:

Subsystem Status: The device status and the exchange parts status are displayed.

Progress Condition: The Progress Condition as the device is booting is displayed.

8.3.2.3 Version Frame

The version frame displays the following information:

Web title: The Web title set by a user is displayed. When it is not set, nothing is displayed.

Serial No: The subsystem serial number is displayed.

CTL: The connected controller number is shown.

IP: The connected IP Address of the controller is shown.

Rev: The device version of the microprogram is shown.

8.3.3 Main Screen in Normal Mode

The main screen of normal mode consists of the following:

- Patrol Lamp
- Summary of Exchange Parts Status
- Progress Condition Display
- Page Refresh Button

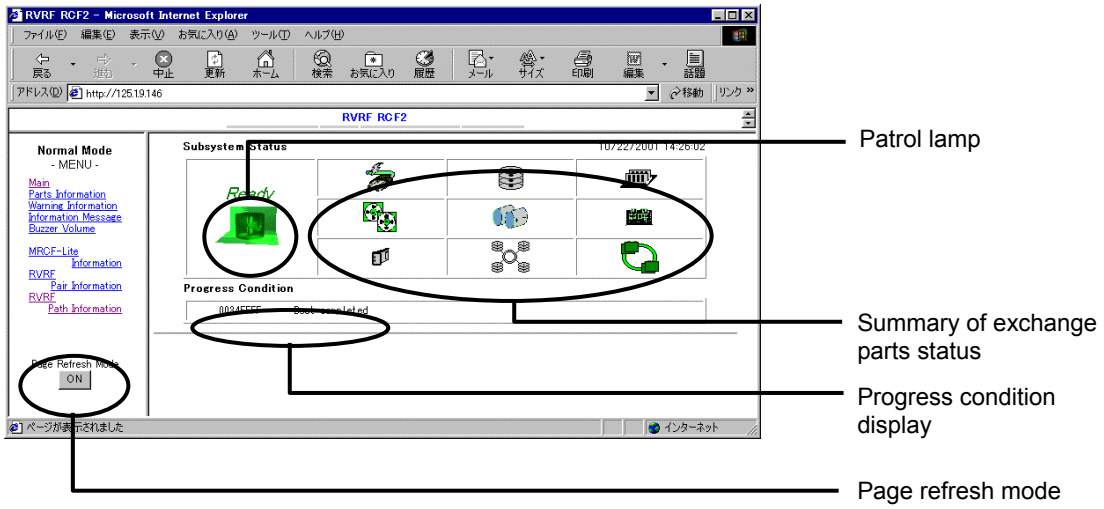


Figure 8.3 Subsystem Condition Display

8.3.3.1 Patrol Lamp

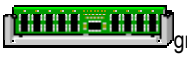
While monitoring the device, the status is displayed.

Image	Status
Booting...	During the start
blue	Normal
yellow	Warning status
red	Alarm status

Figure 8.4 Patrol Lamp Display

8.3.3.2 Summary of Exchange Parts Status

The summary of exchange parts status displays the condition of the exchange parts by changing the color. Detailed information of the specific part is displayed by clicking the part icon.

Parts	Image		
	Normal	Abnormal	
Power Unit	 blue	 red	
Disk Drive	 blue	 red	
Cache Unit	 green	 red	
Fan Assembly	 black	 red	
Backup Battery Unit	 blue	 red	
Control Unit	 green	 red	
ENC Unit	 green	 red	Thunder 9530V: Not displayed.
Fibre Loop	 blue	 red	
Remote Path	 orange	 red	When displayed in the Synchronous TrueCopy function is effective. (**Note**)

Note: A path blockage that occurred while using the Hitachi TrueCopy function (even if the remote subsystem was off) also occurs. The remote subsystem is turned on and automatically recovered when the remote subsystem is Ready. If a path blockage is not recovered (even when Ready), contact Hitachi Customer Service.

Figure 8.5 Exchange Parts Status Display

8.3.3.3 Progress Condition Display

The progress condition, as the device is booting, is displayed in the progress condition display box.

8.3.3.4 Page Refresh Button

This button sets the on/off function of the automatic redisplay function. If clicked, the on/off mode changes.

OFF display: The screen is not refreshed.

ON display: The screen of the mainframe is refreshed every 5 seconds. The refresh time currently (RTC) is displayed on the right top.

8.3.4 Status Display of Replaceable Components

The status display screen of replaceable components displays the status of the Disk Drive, Control Unit, Cache Unit, Fiber Channel Loop, Fan Assembly, Backup Battery Unit, Power Unit, and ENC Unit that are implemented.

This screen is not displayed if the component is not implemented. When the replaceable component has an abnormal status, a red image is displayed.

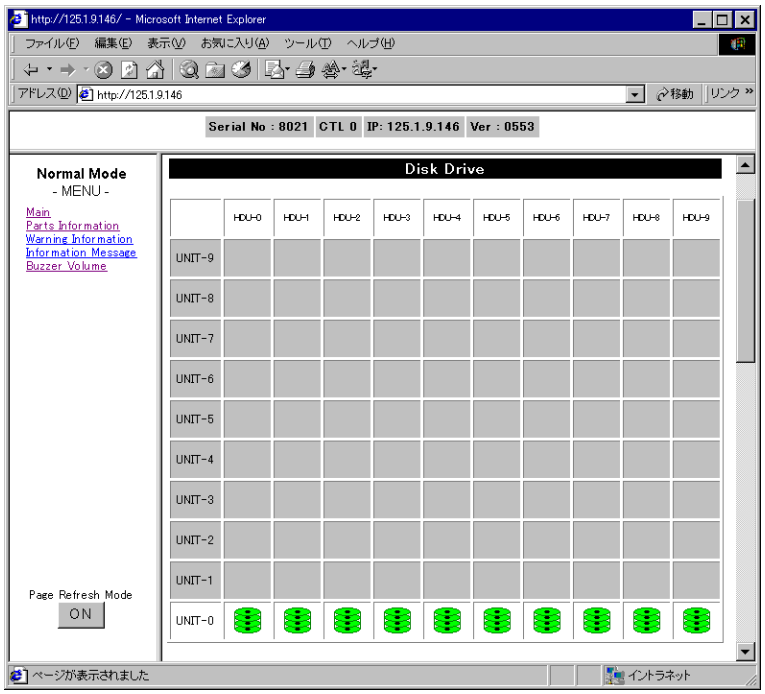


Figure 8.6 Component Status Screen

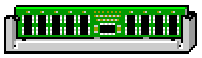
Disk Drive

Image	Status
 blue	Normal
 red	A fault has occurred to the disk drive
 red and black	The disk drive port where the fault occurred is not implementing the disk drive
No display	The disk drive is not implemented (the disk drive where the fault occurred was drawn out)

Control Unit

Image	Status
 green	Normal
 red	Shutdown of the control unit (status where it is not implemented with the setting of the dual system configuration is included)
 yellow	Fault of the battery backup circuit
No display	The fault has not occurred without being implemented with the setting of a single system configuration

Cache Unit

Image	Status
 green	Normal
 red	Fault (status when the unit is not implemented and the extracted fault cache unit is included)

Battery Backup Unit

Image	Status
 blue	Normal
 red	There is a fault or the unit is not implemented

Fan Assembly

Image	Status
 black	Normal
 red	There is a fault or the fan assembly is not implemented (The condition that an AC power supply is not supplied is contained)

Power Unit

Image	Status
 blue	Normal
 red	A fault occurred or the unit is not implemented (The condition that an AC power supply is not supplied is contained)

ENC Unit (Thunder 9530V: Not displayed)

Image	Status
 green	Normal
 red	A fault occurred or the unit is not implemented

Fibre Loop

Image	Status
 blue	Normal
 red	Fault

8.3.5 Information Message

Fault information and status information of the device that detected it during the device operation are displayed.

Fault information and status information after the device completes a boot are displayed in the **Controller 0/1 Common** box.

Fault information and status information as the device is booting are displayed in the box of **Controller 0** and **Controller 1** for every the controller.

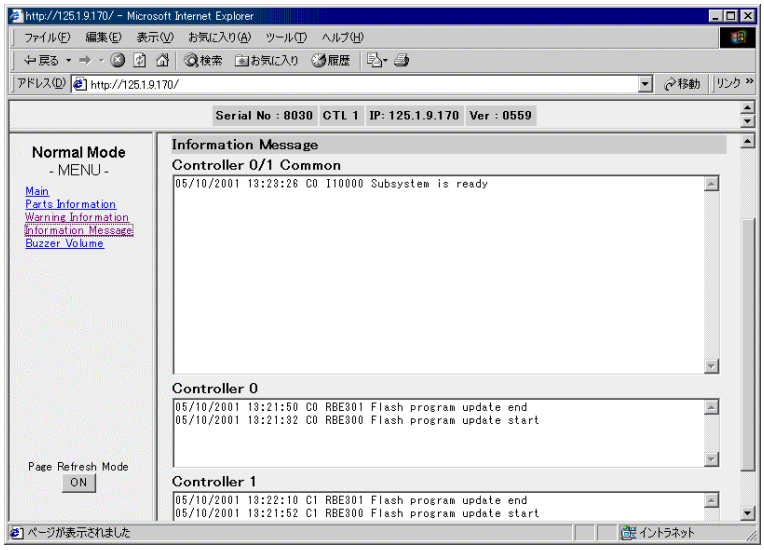


Figure 8.7 Information Message Screen

8.3.6 Setting the Buzzer Sound Volume

Note: Set the buzzer volume for the environment in which I/Os from a host are not issued while the system is maintained or before the host is started up.

The buzzer volume can be adjusted for 5 stages. Click the **Buzzer Volume** of the menu frame to enter into the buzzer volume-setting screen. If the buzzer volume is designated with the radio button and the **OK** button is clicked, the buzzer volume is changed.

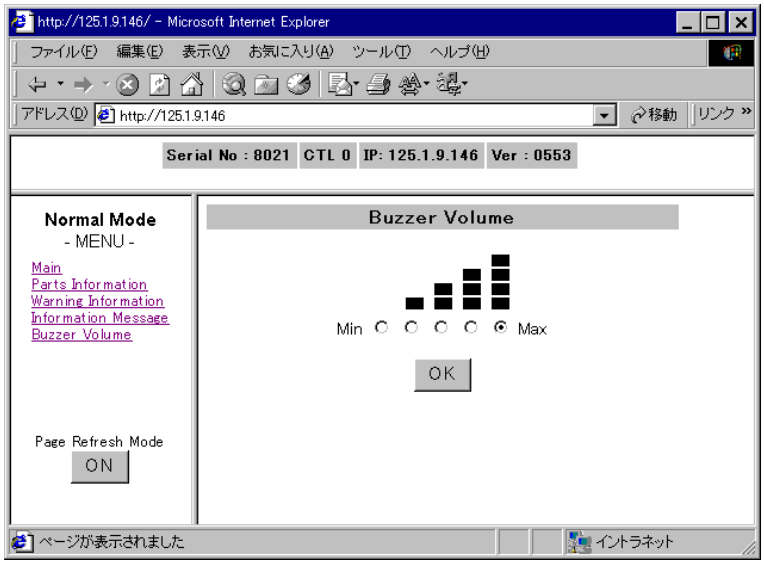


Figure 8.8 Buzzer Volume Screen

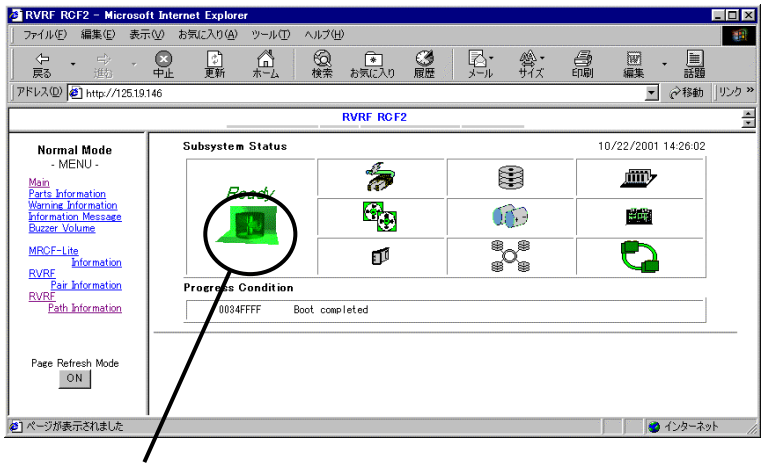
8.4 Troubleshooting Using a Web Connection

This section includes the following:

- Checking Subsystem Status
- Checking the Progress Condition Display
- Checking Component Status
- Checking Log Messages
- Troubleshooting using Messages
- Reading Failure Information

8.4.1 Checking Subsystem Status

Check the position of the failed part of the unit on the main window in the normal mode of the Web.



Subsystem Status

Booting	Ready	Warning	Alarm
Booting... black	Ready blue	Warning yellow	Alarm red

Figure 8.9 Subsystem Status Screen

8.4.2 Checking the Progress Condition Display

If **Booting...** is indicated in the window (the controller is being started up), the progress of the start-up operation can be confirmed according to the following procedure:

1. Turn on the page refresh mode (click the **ON** button).

   The window is updated automatically at 5-second intervals. (If the **OFF** button of the page refresh mode is activated, this operation is not necessary.)

   If the page refresh mode is not activated in the main window, press the **update** button of the browser to update the window.

2. Observe the condition-in-progress within the window.

   If the start-up operation is completed, **Boot completed** is indicated in this part.

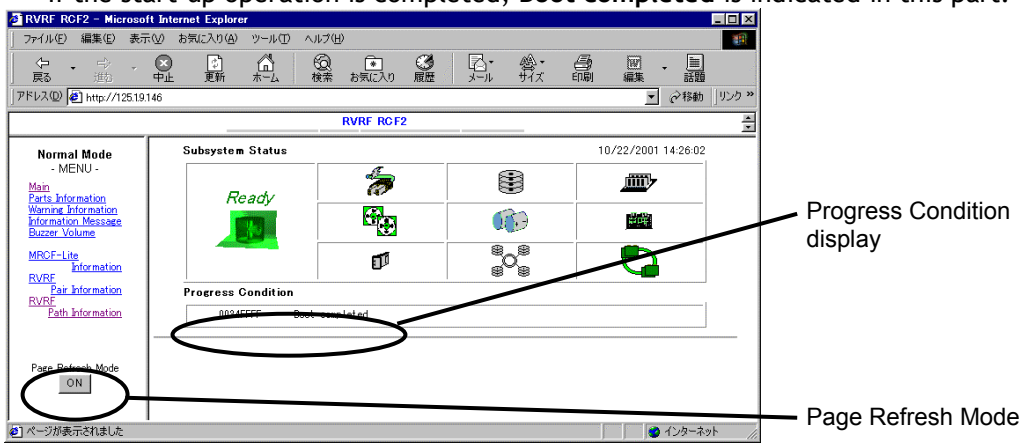


Figure 8.10 Progress Condition Display

8.4.3 Checking Component Status

Click each part of Replace Part Summary in the main window; the following window appears and the state of the part is displayed.

In this example, the selected (clicked) part is at the head of the window. You can also select this window by clicking the **Parts Information** menu in the main window. In this window, you can confirm the state of each part in detail. If a part fails, its corresponding icon turns red.

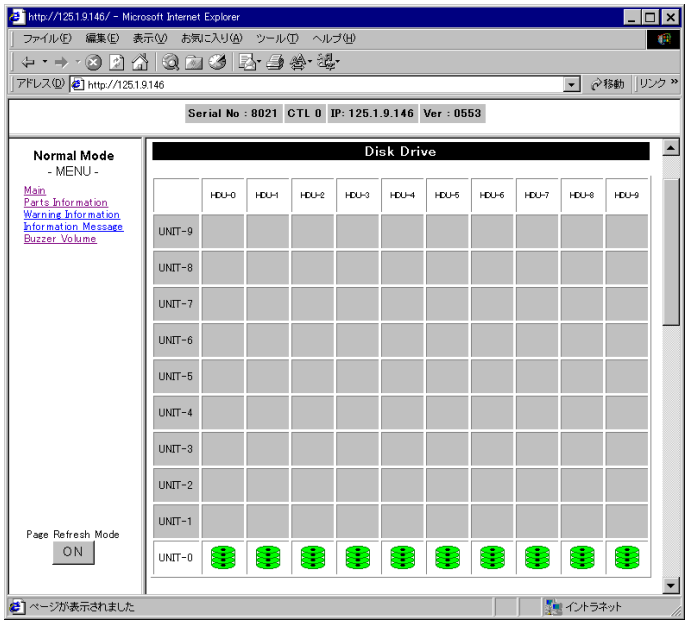


Figure 8.11 Replace Part Summary Screen (HDD)

The following screen is displayed only when the icon of a remote path is clicked. This screen is displayed only when the Synchronous TrueCopy function is effective.

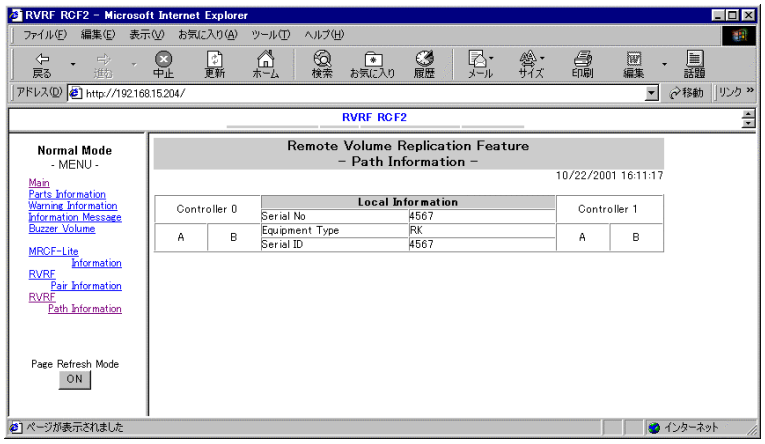


Figure 8.12 Path Information Screen

8.4.4 Checking Log Messages

To check log messages:

1. Click the **Information Message** menu in the main window.

   The Information Message window appears.

2. In the Information Message window, identify the cause of the failure and confirm the recovery measures.

   The information on the detected failures during operation of the unit and the state of the unit are displayed in the above window.

   The information on the failures and the state at the start-up time of the unit is displayed for each Controller in the **Controller 0** and **Controller 1** boxes.

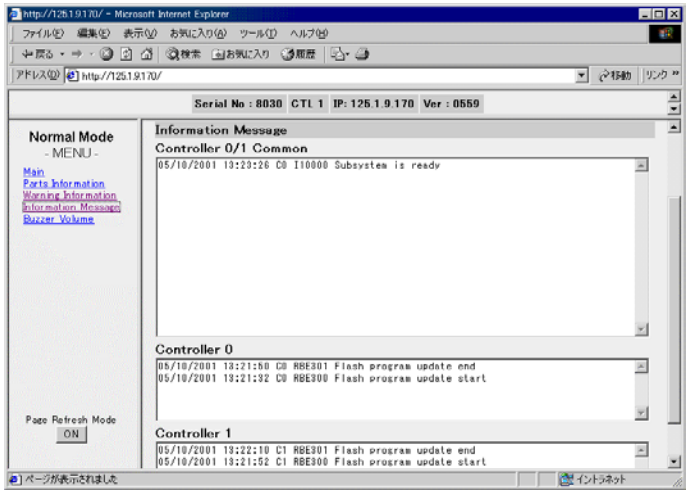


Figure 8.13 Information Message Screen

The contents of each message are shown in the following examples:

- CUDG (Self-test at power-on) Detection Message

  The CUDG detection message is displayed in the **Controller 0** or **Controller 1** box as shown in the following example:

Example:

```
MM/DD/YYY HH:MM:SS Cx   54 ◆◆◆◆◆◆◆◆
MM/DD/YYY HH:MM:SS Cx   50 ◆◆◆◆◆◆◆◆
MM/DD/YYY HH:MM:SS Cx   4C ◆◆◆◆◆◆◆◆
MM/DD/YYY HH:MM:SS Cx   48 ◆◆◆◆◆◆◆◆
MM/DD/YYY HH:MM:SS Cx   44 ◆◆◆◆◆◆◆◆
MM/DD/YYY HH:MM:SS Cx   40 ■■■■■■■■
MM/DD/YYY HH:MM:SS Cx   3C ■■■■■■■■
MM/DD/YYY HH:MM:SS Cx   38 ■■■■■■■■
MM/DD/YYY HH:MM:SS Cx   34 ■■■■■■■■
MM/DD/YYY HH:MM:SS Cx   30 ■■■■■■■■
MM/DD/YYY HH:MM:SS Cx   2C ■■■■■■■■
MM/DD/YYY HH:MM:SS Cx   28 ■■■■■■■■
MM/DD/YYY HH:MM:SS Cx   24 ■■■■■■■■
MM/DD/YYY HH:MM:SS Cx   20 ●●●●●●●●
MM/DD/YYY HH:MM:SS Cx   ○○○○○○○○○○○○
MM/DD/YYY HH:MM:SS Cx   CTLx
```

MM/DD/YYYY: Data of occurrence

HH:MM:SS: Time of occurrence

Cx: # of Controller in which failure is detected

◆◆◆◆◆◆◆◆: PCI Config information

■■■■■■■■: Detailed information

●●●●●●●●: Message code

○○○○○○○○○○○○: Message text (Any number of letters)

CTLx: CUDG executing controller #

- Flash/RAM Micro Detection Message

  The Flash/RAM micro detection message is displayed in the **Controller 0/1 Common**, **Controller 0**, of **Controller 1** box as shown in the following example. The latest one is shown on the top line.

  Note: The date and time the RTC is set in the detection controller is displayed in this message. If the RTC is different from one control to another, the displayed time of occurrence may differ within messages (the message on the upper line is issued prior to the message on the lower line).

In this example, the latest message is also indicated at the top.

Example:

```
MM/DD/YYY HH:MM:SS Cx ●●●●●● ○○○○○○○○○○○○      : ■■■■■■/◆◆◆◆
MM/DD/YYY HH:MM:SS Cx ●●●●●● ○○○○○○○○○○○○      : ■■■■■■/◆◆◆◆
                                    :
                                    :
```

MM/DD/YYYY: Confirmed data

HH:MM:SS: Confirmed times

Cx: Error detected Controller #

●●●●●●: Message code (**Rxxxxx**: Flash detected messages, **Ixxxxx**: Progress messages, **Wxxxxx**: Warning messages, **Hxxxxx**: Failure messages)

○○○○○○○○○○○○: Message text (Any number of letters)

■■■■■■: Recovery measures code

◆◆◆: Collecting failure information code

8.4.5 Troubleshooting Using Messages

The contents of each failure detected during operation are reported by a message. The failures detected during operation and the state of the unit, after the main switch of this unit is turned on, are reported.

The five types of message codes are displayed in the following table:

Table 8.4 Message Code Types

Message code	Measures
018xxxxx	Errors detected by CUDG
Rxxxxx	Flash detected messages
Ixxxxx	Progress messages
Wxxxxx	Warning messages
Hxxxxx	Failure messages

8.4.5.1 Errors Detected by CUDG

When the Errors detected by CUDG are displayed, call your maintenance personnel.

8.4.5.2 Flash Detected Messages

When the following Flash detected messages are displayed, follow the instructions to resolve the problem.

Table 8.5 Flash Detected Messages

Message code	Message Text	Recovery Measures
RA00xx	Microprogram error [FLS]	Restarting the equipment.
RA7000	Microprogram revision mismatch	
RB0000	Upload system error	Check the microprogram you want to install and install it over again.
RB0600	No micro program	Perform the new installation upgrade.
RB0A00	Upload file SUM check error	A sum check error occurred in a read file during a upload. Check the microprogram you want to install and install it over again.
RB0E00	Up grade check NG	The upgrade check of the microprogram failed. (An upgrade version of a microprogram does not conform to the microprogram being upgraded.) Do a new install of the microprogram.
RB3000	File size error	Check the microprogram you wish to install.
RB3100	File open error	
RB3200	File read error	
RB3500	Bad block ID	
RB3600	Bad LBA in START 600 DAT	
RB7000	Program size too large	
RB8000	Old microprogram exists	If the installation can be continued, the RAID group and LU deformation are initialized. (In this case, all the data in the disk drive are deleted. When the data in the disk drive need to be saved, stop the work and perform the update installation.
RB8300	Empty system retry full install	The update installation cannot be executed because a system does not exist in the disk drive. Execute a new installation.
RBA000	Down grade check NG	The present microprogram version cannot be updated to a specified microprogram version. Check the work procedure. Execute a new installation.

When a Flash detected message other than those shown above is displayed, inform maintenance personnel of the message code.

8.4.5.3 Progress Messages

When the following Progress messages are displayed, follow the instructions to resolve the problem.

Table 8.6 Progress Messages

Message Code	Message Text	Recovery Measures
I031xy	Path recovered automatically	The path recovered automatically. (x: Remote DF# (0), y: Path # (0 or 1))
I10000	Subsystem is ready	The unit is ready.
I11000	All raid group initialized	All RAID groups were deleted.
I111xx	RAID group deleted (RG-xx)	All LUs were deleted. (xx: RAID group# (0-14))
I12000	ALL LU initialized	All LUs were deleted. (This is also displayed when the LU#0 is created.)
I12100	LU deleted (LU-xxx)	LUs were deleted. (xxx: LU# (0-511))
I12200	LU format completed (LU-xxx)	LU formatting was completed. (xxx: LU# (0-511))
I12400	LU format start (LU-xxx)	An LU formatting was started. (xxx: LU# (0-511))
I12500	Unified LUs separated (Uni: LU-xxx)	Dissolution of all LU unification (to dissolve unification of all the unified LUs and to split them into internal LUs) was executed. (xxx: LU# (0 to 511) of a unified LU to be split)
I12600	Last LU separated from unified LU (Uni: LU-xxx)	A separation of a final LU of a unified LU (to separate the last one of the internal LUs which have been combined with a unified LU) was executed. (xxx: LU# (0 to 511) of a unified LU to be split)
I12700	LU reappeared (Uni: LU-xxx)	An internal LU(s) was validated again through splitting of all unified LUs or a separation of a final LU. (xxx: An LU# (0 to 511) of an internal LU which has been separated and validated)
I15Axy	Dynamic sparing start (Unit-x, HDU-y) [zzzzzzzzzz]	Dynamic sparing started. (x: Unit ID# (0-14), y: Disk drive# (RK/RKS=0-13, RKA=0-14), z: Detailed code)
I17002	Default LU-CTL change failed [PS OFF]	Set the equipment in the ready state and turn off the power, then turn on the power again
I17003	Default LU-CTL change failed [HOT]	Use the system as it is
I17004	Default LU-CTL change failed [LU]	
I1A00x	Turbo-LU disable (Default CTL-x)	Set the equipment in the ready state and turn off the power, then turn on the power again
I1A30x	Turbo-LU enable (Default CTL-x)	The FlashAccess function was turned on. (x: Default Controller# (0 or 1))
I1B100	Forced parity correction completed	Forced parity recovery processing was finished.

Table 8.6 Progress Messages (Continued)

Message Code	Message Text	Recovery Measures
I1C0xy	Loop diagnostic start (Path-x, Loop-y)	Loop diagnosis was started. (x: Path# (0 or 1), y: Loop# (0 or 1))
I1C1xy	Loop diagnostic end (Path-x, Loop-y)	Loop diagnosis was finished. (x: Path# (0 or 1), y: Loop# (0 or 1))
I61D00	Shutdown warning	Turn off power supply by main switch.

When a Progress message other than those shown above is displayed, inform maintenance personnel of the message code.

8.4.5.4 Warning Messages

When the following Warning messages are displayed, follow the instructions to resolve the problem.

Table 8.7 Warning Messages

Message Code	Message Text	Recovery Measures
W03200	Battery SW off	Turn on the battery unit switch.

When a Warning messages other than those shown above is displayed, inform maintenance personnel of the message code.

8.4.5.5 Failure Messages

When the following Failure messages are displayed, follow the instructions and resolve the problem.

Table 8.8 Failure Messages

Message Code	Message Text	Recovery Measures
H90330	Connection unit excess	The number of connected units exceeded the limit.
HI0201	PS OFF failed [POFNONCLD]	Turn on PS, then off again.
HI0202	PS OFF failed [POFNOJOB]	

When a Failure message other than those shown above is displayed, inform maintenance personnel of the message code.

8.4.6 Reading Failure Information

- The history of the unit, after it is turned on, is displayed in the **Information Message**.
- The **Subsystem is Ready** message displays the time when the unit is ready. Messages sent after the power is turned on until the unit is ready are displayed prior to this message. Messages sent after the unit is ready are displayed after this message.
- Carefully observe the following: **Wxxxxx** (Warning message), **Hxxxxx** (Failure message), and **Rxxxxx** (Flash detection message).
- The following messages are displayed when failures occur and when they are solved. If the recovery message is displayed after a failure occurrence message, the failure has been solved.

Table 8.9 How to Read Failure Information

No.	Description	Failure Detection Messages	Failure Recovery Messages
1	Controller error/ recover	**W0100x**: CTL alarm (CTL-x)	**I0010x**: CTL recovered (CTL-x)
2	error/recovery	**W0D0x0**: Cache alarm (CTL-y, CACHE-z)	**I0020z**: Cache recovered (CACHE-z)
3	Cache memory error/recovery	**W03000**:Battery alarm	**I00300**: Battery recovered
		W03100: Battery removed	
		W03200: Battery SW OFF	
		W03300: Battery thermal alarm	
4	Battery backup board error/recovery	**W0340x**: Battery backup circuit alarm (CTL-x)	**I0040x**: Battery backup circuit recovered (CTL-x)
5	Fan error/recovery	**W04000**: FAN alarm (Unit-x, FAN-y)	**I00500**: FAN recovered (Unit-x, FAN-y)
6	Power supply error/ recovery	**W050xy**: PS alarm (Unit-x, PS-y)	**I006xy**: PS recovered (Unit-x, PS-y)
7	Disk drive error/ recovery	**W060xy**: HDU alarm (Unit-x, HDU-y)	**I007xy**: HDU recovered (Unit-x, HDU-y)
8	Spare disk error/ recovery	**W061xy**: Spare HDU alarm (Unit-x, HDU-y)	**I009xy**: Spare HDU recovered (Unit-x, HDU-y)
9	Loop error/recovery	**W080xy**: Loop alarm (Path-x, Loop-y)	**I00Axy**: Loop recovered (Path-x, Loop-y)
10	ENC board error/ recovery	**W090xy**: ENC alarm (Unit-x, ENC-y)	**I00Bxy**: ENC recovered (Path-x, Loop-y)
11	UPS error/recovery	**W0C000**: UPS alarm (UPS-x)	**I00D00**: UPS recovered (UPS-x)
12	Path error/recovery	**W0F0xy**: Path alarm (Remote-x, Path-y)	**I030xy**: Path recovered by web operation (Remote-x, Path-y)
			I031xy: Path recovered automatically (Remote-x, Path-y)

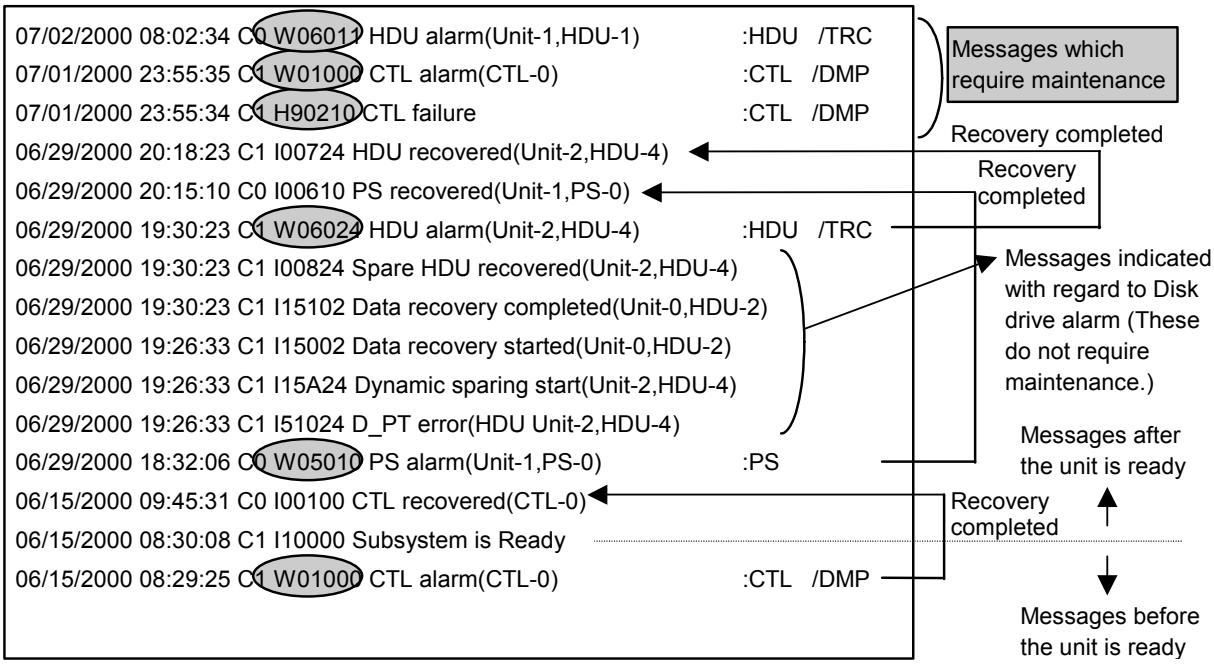


Figure 8.14 Message Analysis Example

Chapter 9 Periodic Maintenance

If the subsystem is not energized for more than one month, the battery may over-discharge and unrecoverable damage may result. The battery must be energized more than 24 hours at least once a month or, alternatively, the subsystem can be stored with the AC Power Unit Switch of the battery turned off. However, when the AC Power Unit Switch is turned off, the battery discharges naturally. In this case, the battery should be charged once every three months for longer than 24 hours because spontaneous discharge occurs.

If the Additional Battery Unit is not energized for more than 3 months, the battery may over-discharge and unrecoverable damage may result. The battery must be energized more than 24 hours at least once every 3 months.

Appendix A Glossary

- Cache backup:
  Because a cache memory uses DRAM, information stored in it is lost when the subsystem power is shut off. To provide against unexpected power failure, the subsystem has an setup to maintain data in the cache memory by batteries.

  Cache backup is a state in which the data is protected by the batteries.
- CTL:
  Controller
- CUDG:
  Control Unit Diagnosis
- Destage:
  Automatically writes data in cache memory, not yet written on the disk drive, on the disk drive when the main switch is turned off.
- DHCP:
  DHCP is an abbreviation for Dynamic Host Configuration Protocol; it is a client/server type protocol according to which a server automatically assigns an IP address when each client has started.
- ECC:
  Error Checking and Correcting
- EIA:
  Electronic Industries Alliance
  EIA standard (1 EIA unit = 44.45 mm)
- FC-AL:
  Fibre Channel Arbitrated Loop
- FC-SW:
  Fibre Channel-Switch Topology
- Fibre channel:
  A set of standards of interfaces that are connected through optical fibre, etc. to achieve high-speed data transfer between devices.
- Fibre Channel HBA:
  Fibre Channel Host bus Adapter
- Fibre Channel HUB:
  An apparatus to connect and relay Fibre Channel cables, each connected to a Fibre Channel device in order to form an arbitrated loop of the Fibre Channel.

- Flash memory:
  ROM that can be electrically erased and reprogrammed. A type of EEPROM (Electrically Erasable and Programmable). It can retain information without electricity and is widely used as an external storage, etc.
- Host computer:
  A computer which manages devices. For the disk array, it is a computer which enables the disk array store data.
- Hot replacement:
  Used to replace an installed part with the subsystem power on. Usually, the major part is duplicated so that when one of the parts fails, the subsystem function is maintained by another part.
- I/F:
  Interface
- IP address:
  IP address is an abbreviation for Internet Protocol Address; it is a numeral string which shows an address of a computer connected to a network.
- LA:
  Logical Address
- LBA:
  Logical Block Address
- LED:
  Light-Emitting Diode
- LRC:
  Longitudinal Redundancy Check
- LSI:
  Large-service Interface
- LU:
  Logical Unit
- LVD:
  Low Voltage Differential

- Microprogram:
  A program that controls the basic hardware operation.
- MTBF:
  Mean Time Between Failure
- Parity disk:
  When configuring RAID 5, one disk drive in a RAID group is designated as the parity disk and the other disk drives are designated as data disks. On the parity disk, parity data calculated from those of data disks is stored. When one of the disk drives in a RAID group fails, the subsystem can still be used and its data will not be damaged, by virtue of the parity data.
- PDB:
  Power Distribution Box
- Rack frame:
  A frame on which electronic equipment is mounted (using rails, etc.). Most rack frames have a width of 19 inches and are called 19-inch rack frames. The height of the equipment to be mounted is regulated by the EIA standard. The rack frame has screw holes to fasten equipment with bolts, etc.
- RAID:
  Redundant Array of Independent (Inexpensive) Disks
  A concept proposed in 1987 by a research group of the University of California, Berkeley. RAID distributes accesses among multiple disk drives, and thereby realizes a storage subsystem with high-speed accessibility, a large capacity, and high reliability.
  The University of California defined six levels of configurations from RAID 0 through RAID 5, and one of the levels is selected based on the trade-off in terms of cost and speed to meet the user's need.
- Remote Maintenance Function (SNMP):
  The SNMP agent support function reports failures to the workstation which monitors the network via the SNMP of the open platform.
- R/W:
  Read/Write
- SNMP:
  SNMP is an abbreviation for Simple Network Management Protocol, and it is one of the network protocols developed to manage a network.

- Spare disk:
  A disk drive which is mounted separately from the disk drives for usual write and read operation; when a failure occurs in a disk drive, data stored in the failed drive is copied to the spare disk drive so that the disk subsystem can continue to be available equivalently to the original subsystem.
- UPS:
  Uninterrupted Power Supply
  A backup power supply which is mounted on the Thunder 9570 unit to prevent shutdown of the unit even when power stoppage or momentary power interruption occurs.
- Write cache:
  When data is written from a host computer onto a disk array subsystem, it is not written directly on the disk drive but written in cache memory. In this way, the disk array subsystem can return a writing completion report promptly. This writing method using cache memory is called write cache.

Appendix B System Parameter Setting List

Table B.1 System Parameter Setting List

	Platforms		HP			SUN								
	HA	Alternate Path	None	Alternate Link	None	None		HPM (***Note 12***)/ HDLM (***Note 13***)	VxVM V2.6/2.6.1		VxVM V3.0.1 or later			
		Fail Over	None		MC/ Service Guard	None	SC (***Note 8***)	VCS (***Note 5***)	None	SC (***Note 8***)	First Watch/ VCS (***Note 5***)	SC (***Note 8***)	None	
	System Parameter													
1	System Startup Attribute	Depends on System Configuration (***Note 1***)												
2	Data Share Mode	Depends on System Configuration (***Note 2***)												
3	Drive Detach mode enable	Disable (Standard setting)												
4	Report status (normal/warning)	Enable (Standard setting)												
5	Turbo LU Warning	Disable (Standard setting)												
6	Operation if the Processor failures Occurs	Reset a Fault (Standard setting)												
7	Command Queuing Mode	On (Standard setting)												
8	Vendor ID	HITACHI (Standard setting)												
9	Product ID	DF600F (Standard setting)										DF400		
10	ROM Microprogram Version	No change is needed												
11	RAM Microprogram Version	No change is needed												
12	RS232C Error Information Outflow Mode	When RS232C is used: On When RS232C is not used: Off (Standard setting)												
13	Write & Verify Executing Mode	On (Standard setting)												
14	DHCP (***Note 9***)	OFF (Standard setting)												
15	IP Address	To be set according to the network setting												
16	Subnet Mask	To be set according to the network setting												
17	Default Gateway	To be set according to the network setting												
	Host Group													
1	Host Connection Mode (Option 2)	Without setting												
2	Host Connection Mode1	Standard Mode										TRESPASS Mode		
3	Host Connection Mode2	HP Connection mode 2 enable (***Note 7***)	(***Note 10***)	SUN Cluster Connection Mode	Persistent RSV Cluster Mode (***Note 11***)	(***Note 10***)	SUN Cluster Connection Mode	Persistent RSV Cluster Mode (***Note 11***)	SUN Cluster Connection Mode	(***Note 10***)				
4	LU Mapping Mode	Depends on System Configuration (***Note 3***)												
	Configuration Information													
1	Reset/LIP Mode (Process)	Reset within the port (Standard setting)												
2	Reset/LIP Mode (Signal)	Reset within the port (Standard setting)												
3	LIP Reset Mode	Target Authentication (Standard setting)												
4	Serial Number	Without setting (***Note 6***)												
5	Controller Identifier	Disable (Standard setting)										Enable		
6	Controller ID	–										DF600-00 (Standard setting (***Note 4***))		

Note 1: Hot Standby mode is used when only one of the two Controllers is normal.

Note 2: Data Share mode is used to prevent performance deterioration which results from LU ownership that is switched when a host computer issues commands frequently to a Controller to which the computer has no ownership, in the normal or regression status (owing to a path or host computer failure).

It is recommended that the subsystem in the Data Share mode be used when LU ownership switching may occur.

Note 3: When the 9500V is connected, the LU not intended to be accessed by the port must be masked by means of LU mapping mode.

Note 4: Make the controller IDs of the CTL-00 and CTL-01 of the 9500V identical. When two or more 9500Vs are connected to the system, set the Controller IDs which are not duplications of each other.

When one of the host computers connected to the 9500V requires a Controller ID, set the Controller identifier to Enabled.

Note 5: Veritas Cluster Server

Note 6: When resetting this item, set it to the last five figures of the 9500V serial number.

Note 7: Set the HP Connection Mode 2 when LUs, whose LU numbers are 8 to 63, are recognized if the subsystem is connected to the HP server.

Note 8: SUN Cluster 3.0

Note 9: When the DHCP mode is validated, the IP Address is acquired from the DHCP server.
If the DHCP server is not started or the DHCP function has been incorrectly set, the acquisition of the IP Address will fail and the IP Address of the subsystem will remain “0.0.0.0”. (When this occurs, the Resource Manager 9500V program or the Web cannot be used via a LAN.) In this case, acquire the IP Address by starting the DHCP server or by setting the DHCP function correctly when necessary.

Note 10: Without setting

Note 11: Set the Persistent RSV Cluster mode when using the "VERITAS Database Edition/Advanced Cluster for Oracle8i".

Note 12: Hitachi Path Manager.

Note 13: Hitachi Dynamic Link Manager

When using HDLM, please note the following:
Data Share Mode: Indispensable selection
Vendor ID: If this text is changed, it cannot be managed by HDLM. Do not change this text.
Serial Number: When multiple storages of same type exist, allocate a different Serial Number for each disk array subsystem.

Table B.1 System Parameter Setting List (Continued)

	Platforms		IBM (AIX)			Sequent
	HA	Alternate Path	None	HPM (***Note 8***)/HDLM (***Note 9***)		MP Driver
		Fail Over	None	HACMP	None	None
	System Parameter					
1	System Startup Attribute		Depends on System Configuration (***Note 1***)			
2	Data Share Mode		Depends on System Configuration (***Note 2***)			
3	Drive Detach mode enable		Disable (Standard setting)			
4	Report status (normal/warning)		Enable (Standard setting)			
5	Turbo LU Warning		Disable (Standard setting)			
6	Operation if the Processor failures Occurs		Reset a Fault (Standard setting)			
7	Command Queuing Mode		On (Standard setting)			
8	Vendor ID		HITACHI (Standard setting)			
9	Product ID		DF600F (Standard setting)			
10	ROM Microprogram Version		No change is needed			
11	RAM Microprogram Version		No change is needed			
12	RS232C Error Information Outflow Mode		When RS232C is used: On When RS232C is not used: Off (Standard setting)			
13	Write & Verify Executing Mode		On (Standard setting)			
14	DHCP (***Note 7***)		OFF (Standard setting)			
15	IP Address		To be set according to the network setting			
16	Subnet Mask		To be set according to the network setting			
17	Default Gateway		To be set according to the network setting			
	Host Group					
1	Host Connection Mode (Option 2)		Without setting			
2	Host Connection Mode1		Standard Mode			TRESPASS Mode
3	Host Connection Mode2		UA(06/2A00) suppress mode enable NACA mode enable (***Note 6***)			Without setting
4	LU Mapping Mode		Depends on System Configuration (***Note 3***)			
	Configuration Information					
1	Reset/LIP Mode (Process)		Reset within the port (Standard setting)			
2	Reset/LIP Mode (Signal)		Reset within the port (Standard setting)			
3	LIP Reset Mode		Target Authentication (Standard setting)			
4	Serial Number		Without setting (***Note 5***)			
5	Controller Identifier		Disable (Standard setting)			Enable
6	Controller ID		–			DF600-00 (Standard setting (***Note 4***))

Note 1: Hot Standby mode is used when only one of the two Controllers is normal.

Note 2: Data Share mode is used to prevent performance deterioration which results from LU ownership that is switched when a host computer issues commands frequently to a Controller to which the computer has no ownership, in the normal or regression status (owing to a path or host computer failure).

It is recommended that the subsystem in the Data Share mode be used when LU ownership switching may occur.

Note 3: When the 9500V is connected, the LU not intended to be accessed by the port must be masked by means of LU mapping mode.

Note 4: Set the controller ID's of the CTL-00 and CTL-01 of the 9500V to be identical. When two or more 9500Vs are connected to the system, set the Controller IDs which are not duplications of each other.

When one of the host computers connected to the 9500V requires a Controller ID, set the Controller identifier to Enabled.

Note 5: When resetting this item, set it to the last five figures of the 9500V serial number.

Note 6: Set the NACA mode when the subsystem is connected to an AIX server where the IBM genuine HBA (FC6227 or later) is installed.

Do not connect a server other than the AIX server where the IBM genuine HBA (FC6227 or later) is installed, to a port of the 9500V for which the NACA mode has been set. (In the Fibre Channel Loop connection or Fabric connection, do not connect the AIX server, in which the IBM genuine HBA (FC6227 or later) is installed, together with another type server, to a port of the 9500V for which the NACA mode has been set.)

Note 7: When the DHCP mode is validated, the IP Address is acquired from the DHCP server.
If the DHCP server is not started or the DHCP function has been incorrectly set, the acquisition of the IP Address will fail and the IP Address of the subsystem will remain "0.0.0.0". (When this occurs, the Resource Manager 9500V program or the Web cannot be used via a LAN.) In this case, acquire the IP Address by starting the DHCP server or by setting the DHCP function correctly when necessary.

Note 8: Hitachi Path Manager

Note 9: Hitachi Dynamic Link Manager
When using HDLM, note the following:
Data Share Mode: Indispensable selection
Vendor ID: If this text is changed, it cannot be managed by HDLM. Do not change this text.
Serial Number: When multiple storages of same type exist, a different Serial Number needs to be allocated for each disk array subsystem.

Table B.1 System Parameter Setting List (Continued)

	Platforms		NT/Windows 2000			Others
	HA	Alternate Path	None	HPM (***Note 6***)/ HDLM7 (***Note 7***)	None	None
		Fail Over	None	MSCS		None
	System Parameter					
1	System Startup Attribute		Depends on System Configuration (***Note 1***)			
2	Data Share Mode		Depends on System Configuration (***Note 2***)			
3	Drive Detach mode enable		Disable (Standard setting)			
4	Report status (normal/warning)		Enable (Standard setting)			
5	Turbo LU Warning		Disable (Standard setting)			
6	Operation if the Processor failures Occurs		Reset a Fault (Standard setting)			
7	Command Queuing Mode		On (Standard setting)			
8	Vendor ID		HITACHI (Standard setting)			
9	Product ID		DF600F (Standard setting)			
10	ROM Microprogram Version		No change is needed			
11	RAM Microprogram Version		No change is needed			
12	RS232C Error Information Outflow Mode		When RS232C is used: On When RS232C is not used: Off (Standard setting)			
13	Write & Verify Executing Mode		On (Standard setting)			
14	DHCP (***Note 5***)		OFF (Standard setting)			
15	IP Address		To be set according to the network setting			
16	Subnet Mask		To be set according to the network setting			
17	Default Gateway		To be set according to the network setting			
	Host Group					
1	Host Connection Mode (Option 2)		Without setting			
2	Host Connection Mode1		Standard Mode		Wolfpack Mode	Standard Mode
3	LU Mapping Mode		Depends on System Configuration (***Note 3***)			
	Configuration Information					
1	Reset/LIP Mode (Process)		Reset within the port (Standard setting)			
2	Reset/LIP Mode (Signal)		Reset within the port (Standard setting)			
3	LIP Reset Mode		Target Authentication (Standard setting)	LIP Port ALL Reset Mode		Target Authentication (Standard setting)
4	Serial Number		Without setting (***Note 4***)			
5	Controller Identifier		Disable (Standard setting)			
6	Controller ID		–			

Note 1: Hot Standby mode is used when only one of the two Controllers is normal.

Note 2: Data Share mode is used to prevent performance deterioration which results from LU ownership that is switched when a host computer issues commands frequently to a Controller to which the computer has no ownership, in the normal or regression status (owing to a path or host computer failure).

It is recommended that the subsystem in the Data Share mode be used when LU ownership switching may occur.

Note 3: When the 9500V is connected, the LU not intended to be accessed by the port must be masked by means of LU mapping mode.

Note 4: When resetting this item, set it to the last five figures of the 9500V serial number.

Note 5: When the DHCP mode is validated, the IP Address is acquired from the DHCP server.
If the DHCP server is not started or the DHCP function has been incorrectly set, the acquisition of the IP Address will fail and the IP Address of the subsystem will remain “0.0.0.0”. (When this occurs, the Resource Manager 9500V program or the Web cannot be used via a LAN.) In this case, acquire the IP Address by starting the DHCP server or by setting the DHCP function correctly when necessary.

Note 6: Hitachi Path Manager

Note 7: Hitachi Dynamic Link Manager
When using HDLM, note the following:
Data Share Mode: Indispensable selection
Vendor ID: If this text is changed, it cannot be managed by HDLM. Do not change this text.
Serial Number: When multiple storages of same type exist, a different Serial Number needs to be allocated for each disk array subsystem.

Appendix C Basic Specifications of the Subsystem

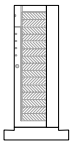
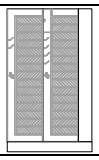
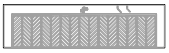
This appendix includes the following:

- Basic Specifications of the 9570V
- Basic Specifications of the 9530

C.1 Basic Specifications of the 9570V

The basic specifications of the 9570V are described in this section.

Table C.1 Basic Specifications of 9570V

Item	Model		Floor Model			Rack-Mount Model
			Floor (RK+H1H) Model	Floor (RK+RKA+ H2H) Model	RK	RKA
Configu-ration	Configuration		-	-	1 RK	1 RKA
	Subsystem appearance					
Disk drive used	Disk drive size (W×D×H) (mm)		101.6×146.1×25.4			
	Data capacity (G byte)		36/72			
	Rotational speed (min^{-1})		10,000/15,000			
	Maximum mountable quantity (unit)		14	29	14	15
Host interface	Interface type		2 G bps Fibre Channel Optical (Non-OFC)			-
	Data transfer speed (i.e. maximum speed for transfer to host)		200 M bytes/s (Fibre Channel)			-
	Number of ports	Single controller	Fibre Channel: 2			-
		Dual controller	Fibre Channel: 4			-
	Transferred block size (bytes)		512			

Note: For additional information about the rack-mount model, refer to the *Hitachi Freedom Storage™ Thunder 9500™ V Series 19-Inch Rack Reference Guide* (MK-92DF654).

Table C.1 Basic Specifications of 9570V (Continued)

Item	Model		Floor Model			Rack-Mount Model
			Floor (RK+H1H) Model	Floor (RK+RKA+ H2H) Model	RK	RKA
RAID specifi-cations (***Note 1***)	RAID level (***Note 2***)		0/1/5/0+1			
	RAID confi-guration (unit of addition)	RIAD 0	2D to 14D	2D to 16D	2D to 14D	-
		RAID 1	1D+1M			-
		RAID 5	2D+1P to 13D+1P	2D+1P to 15D+1P	2D+1P to 13D+1P	-
		RAID 0+1	2D+2M to 7D+7M	2D+2M to 8D+8M	2D+2M to 7D+7M	-
Internal logic specifi-cations	Control CPU		Power PC7455 (667 M Hz)			-
	Control OS		VxWorks			-
	Control memory		Flash memory: 2 Mbytes L2 Cache memory: 512 kbytes SRAM: 64 M bytes			-
	Data bus performance		Cache access 610 Mbytes/s			-
	Data assurance method		Data bus: Through-parity Cache memory: ECC (1 bit for correction, 2 bits for detection) Disk drive: Data assurance code			-
Physical Specifi-cations	Start-up time (min)		Standard: 3 (***Note 8***)			-
	Chassis size (W×D×H) (mm)		260×737×540	309×737×540	483×656×129	483×656×129
	Mass (kg) (***Note 3***)		80 approx.	125 approx.	44 approx.	42 approx.
	Acoustic noise (dB) (***Note 7***)		53 or less	56 or less	53 or less	
	Required height (EIA unit) (***Note 4***)		-		3	
Input power specifi-cations	Input voltage (V)		AC 100/200 (100 to 120/200 to 240)			
	Frequency (Hz)		50/60 ±1			
	Number of phases, cabling		Single-phase with protective grounding			
	Steady-state current (A) (***Note 6***)		4.4×2/2.2×2	4.4×2+3.2×2/ 2.2×2+1.6×2	4.4×2/2.2×2	3.2×2/1.6×2
	Breaking current (A)		20.0	15.0/20.0	20.0	15.0
	Required power	Steady state (VA)	880 or less	1,520 or less	880 or less	640 or less
		Starting state (VA) (***Note 5***)	920 or less	1,640 or less	920 or less	720 or less

Note 1: D: Data disk, P: Parity disk

Note 2: Although the subsystem with a configuration of RAID 5, RAID 1, or RAID 0+1 provides data reliability enhanced by means of redundancy, a possibility remains that user data is lost owing to an unexpected failure of a host computer or hardware/software of the subsystem itself. Therefore, users are requested to back up all data for restoration in case where the original data is lost.

Note 3: Value of maximum configuration (in the case where all the mountable Disk drives and Controller are mounted).

Note 4: Can be mounted on the Hitachi special rack frame (U6). For the mounting, special rails for the rack frame and decoration panel(s) are required separately depending on the number of the mounted subsystem(s).

Note 5: Power requirement in the case of the maximum configuration is shown. When planning facilities such as the uninterrupted power supply (UPS), specify the power factor as 100% for calculation. Value at 100 V/200 V is shown. (Example: 300 W=300 VA)
The actual required power may exceed the value shown in the table when the tolerance is included.

Note 6: For the both systems, plan the facilities for supplying power to the subsystem according to the specifications for the single power supply because when a failure occurs, only the one power supply operates.

Note 7: A noise emitted at the time of start is not included.

Note 8: The start-up time may be longer than three minutes depending on the configuration.

Table C.1 Basic Specifications of 9570V (Continued)

Item	Model	Floor Model			Rack-Mount Model
		Floor (RK+H1H) Model	Floor (RK+RKA+H2H) Model	RK	RKA
Cache specifi-cations	Capacity (Mbytes/CTL)	1,024 to 2,048			-
	Control method	Read LRU/Write after			-
	Battery backup	Provided			-
	Backup duration (h) (***Note 1***)	24 (When cache of 2,048 M bytes/CTL)			-
Mainte-nance specifica-tions/ antifault specifica-tions	Spare disk	Up to fifteen of mounted Disk drives can be set to Spare disks			
	Display function	Status LEDs (POWER, READY, WARNING, and ALARM), LED of maintenance part			
Insulation perfor-mance	Insulation withstand voltage	AC 1,500 V (10 mA、1 min)	AC 1,500 V (100 mA、1 min)	AC 1,500 V (10 mA、1 min)	
	Insulation resistance	DC 500 V、10 M Ω or more			

Note 1: Non-volatility of data in the cache memory is ensured against power trouble such as a sudden power failure. It transfers data in the Cache memory to Disk drives by turning off the power normally, and prevents the battery charge from being wasted.

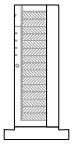
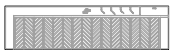
When the subsystem enters the Cache Backup mode, a warning (lighting of the orange LED) informing of a voltage drop of the battery may be issued when the subsystem is started. It shows that the remaining capacity of the battery is not sufficient, and in this state, the subsystem operates disabling the Write Cache function automatically.
When the battery is charged, the warning indication disappears, and the subsystem continues the operation enabling the Write Cache function.
The warning indication disappears within 24 hours at the latest. Even when the warning is being indicated, normal functional operation is assured although the operation is performed in the Write-Through mode and the R/W performance is lowered because the Write Cache function is disabled.

If the subsystem is not energized for more than a month, the over discharging of the battery occurs and it may cause the battery an unrecoverable damage. In this case, the battery must be energized more than 24 hours at least once a month, or store the subsystem with the switch of the battery turned off. Even when the switch is turned off, the battery discharges naturally. Even in this case, however, charge the battery once per three months for longer than 24 hours because spontaneous discharge is done.

C.2 Basic Specifications of the 9530V

The basic specifications of the Thunder 9530V are described in this section.

Table C.2 Basic Specifications of 9530V

Item	Model		Floor Model	Rack-Mount Model
			Floor (RKS+H1H) Model	RKS
Configu-ration	Configuration		-	1 RKS
	Subsystem appearance			
Disk drive used	Disk drive size(W×D×H) (mm)		101.6×146.1×25.4	
	Data capacity (G byte)		72	
	Rotational speed (min^{-1})		10,000	
	Maximum mountable quantity (unit)		14	
Host interface	Interface type		2 Gbps Fibre Channel Optical (Non-OFC)	-
	Data transfer speed (i.e. maximum speed for transfer to host)		200 Mbytes/s (Fibre Channel)	-
	Number of ports	Single controller	Fibre Channel: 1	-
		Dual controller	Fibre Channel: 2	-
	Transferred block size (bytes)		512 bytes	

Note: For additional information about the rack-mount model, refer to the *Hitachi Freedom Storage™ Thunder 9500™ V Series 19-Inch Rack Reference Guide* (MK-92DF654).

Table C.2 Basic Specifications of 9530V (Continued)

Iteml	Model		Floor Model	Rack-Mount Model
			Floor (RKS+H1H) Model	RKS
RAID specifications (***Note 1***)	RAID level (***Note 2***)		0/1/5/0+1	
	RAID configuration (unit of addition)	RAID 0	2D to 14D	
		RAID 1	1D+1M	
		RAID 5	2D+1P to 13D+1P	
		RAID 0+1	2D+2M to 7D+7M	
Internal logic specifications	Control CPU		Power PC7455 (667 MHz)	
	Control OS		VxWorks	
	Control memory		Flash memory: 2 Mbytes L2 Cache memory: 512 kbytes SRAM: 64 M bytes	
	Data bus performance		Cache access 610 M bytes/s	
	Data assurance method		Data bus: Through-parity Cache memory: ECC(1 bit for correction, 2 bits for detection) Disk drive: Data assurance code	
Physical Specifications	Start-up time (min)		Standard 3	
	Chassis size (W×D×H) (mm)		260×737×540	483×656×129
	Mass (kg) (***Note 3***)		80 approx.	44 approx.
	Acoustic noise (dB) (***Note 8***)		53 or less	
	Required height (EIA) (***Note 4***)		-	3
Input power specifications	Input voltage (V)		AC 100/200 (100 to 120/200 to 240)	
	Frequency (Hz)		50/60 ±1	
	Number of phases, cabling		Single-phase with protective grounding	
	Steady-state current 100V/200V (A) (***Note 6***)		4.4×2/2.2×2	
	Breaking current (A)		20.0	
	Required power	Steady state (VA)	880 or less	
		Starting state (VA) (***Note 5***)	920 or less	

Note 1: D: Data disk, P: Parity disk

Note 2: Although the subsystem with a configuration of RAID 5, RAID 1, or RAID 0+1 provides data reliability enhanced by means of redundancy, a possibility remains that user data is lost owing to an unexpected failure of a host computer or hardware/software of the subsystem itself. Therefore, users are requested to back up all data for restoration in case where the original data is lost.

Note 3: Value of maximum configuration (in the case where all the mountable Disk drives and Controller are mounted).

Note 4: Can be mounted on the Hitachi special rack frame (U6). For the mounting, special rails for the rack frame and decoration panel(s) are required separately depending on the number of the mounted subsystem(s).

Note 5: Power requirement in the case of the maximum configuration is shown. When planning facilities such as the uninterrupted power supply (UPS), specify the power factor as 100% for calculation. Value at 100 V/200 V is shown. (Example: 300 W=300 VA)
The actual required power may exceed the value shown in the table when the tolerance is included.

Note 6: For the both systems, plan the facilities for supplying power to the subsystem according to the specifications for the single power supply because when a failure occurs, only the one power supply operates.

Note 7: A noise emitted at the time of start is not included.

Note 8: The start-up time may be longer than three minutes depending on the configuration.

Table C.2 Basic Specifications of 9530V (Continued)

Item	Model	Floor Model	Rack-Mount Model
		Floor (RKS+H1H) Model	RKS
Cache specifications	Capacity (M bytes/CTL)	1,024	
	Control method	Read LRU/Write after	
	Battery backup	Provided	
	Backup duration (h) (***Note 1***)	24 (Cache 1,024 M bytes/CTL)	
Maintenance specifications/ anti-fault specifications	Spare disk	Up to fifteen of mounted Disk drives can be set to Spare disks	
	Display function	Status LEDs (POWER/READY/WARNNING/ALARM) LED of maintenance part	
Insulation performance	Insulation withstand voltage	AC 1,500 V (10 mA to 1 min)	
	Insulation resistance	DC 500 V、10 M Ω or more	

Note 1: Non-volatility of data in the cache memory is ensured against power trouble such as a sudden power failure. It transfers data in the Cache memory to Disk drives by turning off the power normally, and prevents the battery charge from being wasted.

When the subsystem enters the Cache Backup mode, a warning (lighting of the orange LED) informing of a voltage drop of the battery may be issued when the subsystem is started. It shows that the remaining capacity of the battery is not sufficient, and in this state, the subsystem operates disabling the Write Cache function automatically.
When the battery is charged, the warning indication disappears, and the subsystem continues the operation enabling the Write Cache function.
The warning indication disappears within 24 hours at the latest. Even when the warning is being indicated, normal functional operation is assured although the operation is performed in the Write-Through mode and the R/W performance is lowered because the Write Cache function is disabled.

If the subsystem is not energized for more than a month, the over discharging of the battery occurs and it may cause the battery an unrecoverable damage. In this case, the battery must be energized more than 24 hours at least once a month, or store the subsystem with the switch of the battery turned off. Even when the switch is turned off, the battery discharges naturally. Even in this case, however, charge the battery once per three months for longer than 24 hours because spontaneous discharge is done.

Appendix D List of Storage Capacities Corresponding to RAID Levels and Configurations

The upper and lower values in each cell show the number of mounted disk drives and disk capacity respectively. No spare disk is included.

Table D.1 List of Capacities Corresponding to RAID 0 (36 Gbytes)

Disk capacity	35.4 G bytes															
Component unit	RK/RKS		RKA													
Range	1		1	2	3	4	5	6	7	8	9	10	11	12	13	14
Total range of Disk drives	Min.	14 (Max)	29	44	59	74	89	104	119	134	149	164	179	194	209	224 (Max)
2D	2 63.2	14 472.5	28 967.5	44 1533.2	58 2028.2	74 2593.9	88 3088.9	104 3654.6	118 4149.6	134 4715.3	148 5210.3	164 5776.0	178 6271.0	194 6836.7	208 7331.7	224 7897.4
3D	3 94.8	12 401.8	27 932.1	42 1462.5	57 1992.8	72 2523.2	87 3053.5	102 3583.9	117 4114.2	132 4644.6	147 5174.9	162 5705.3	177 6235.7	192 6766.0	207 7296.4	222 7826.7
4D	4 126.4	12 394.2	28 960.0	44 1525.7	56 1950.0	72 2515.7	88 3081.4	104 3647.1	116 4071.4	132 4637.1	148 5202.8	164 5768.5	176 6192.8	192 6758.5	208 7324.2	224 7889.9
5D	5 158.0	10 334.8	25 865.2	40 1395.5	55 1925.9	70 2456.2	85 2986.6	100 3516.9	115 4047.3	130 4577.6	145 5108.0	160 5638.3	175 6168.7	190 6699.1	205 7229.4	220 7759.8
6D	6 189.6	12 401.8	24 826.0	42 1462.5	54 1886.7	72 2523.2	84 2947.5	102 3583.9	114 4008.2	132 4644.6	144 5068.9	162 5705.3	174 6129.6	192 6766.0	204 7190.3	222 7826.7
7D	7 221.2	14 468.7	28 963.7	42 1458.7	56 1953.7	70 2448.7	84 2943.7	98 3438.7	119 4181.2	133 4676.2	147 5171.2	161 5666.2	175 6161.2	189 6656.2	203 7151.2	224 7893.7
8D	8 252.8	8 252.8	24 818.5	40 1384.2	56 1950.0	72 2515.7	88 3081.4	104 3647.1	112 3929.9	128 4495.7	144 5061.4	160 5627.1	176 6192.8	192 6758.5	208 7324.2	224 7889.9
9D	9 284.4	9 284.4	27 920.8	36 1239.1	54 1875.5	72 2511.9	81 2830.1	99 3466.5	117 4103.0	126 4421.2	144 5057.6	162 5694.0	171 6012.3	189 6648.7	207 7285.1	216 7603.3
10D	10 316.0	10 316.0	20 669.6	40 1376.7	50 1730.3	70 2437.4	80 2791.0	100 3498.2	110 3851.7	130 4558.9	140 4912.4	160 5619.6	170 5973.1	190 6680.3	200 7033.9	220 7741.0
11D	11 347.6	11 347.6	22 736.5	44 1514.4	55 1903.3	66 2292.3	88 3070.1	99 3459.0	110 3848.0	132 4625.8	143 5014.7	154 5403.7	176 6181.5	187 6570.5	209 7348.3	220 7737.2
12D	12 379.2	12 379.2	24 803.5	36 1227.8	48 1652.1	72 2500.6	84 2924.9	96 3349.2	108 3773.5	132 4622.1	144 5046.3	156 5470.6	168 5894.9	192 6743.5	204 7167.8	216 7592.1
13D	13 410.8	13 410.8	26 870.5	39 1330.1	52 1789.7	65 2249.4	78 2709.0	104 3628.3	117 4088.0	130 4547.6	143 5007.2	156 5466.9	169 5926.5	182 6386.2	208 7305.4	221 7765.1
14D	14 442.4	14 442.4	28 937.4	42 1432.4	56 1927.4	70 2422.4	84 2917.4	98 3412.4	112 3907.4	126 4402.4	140 4897.4	154 5392.4	168 5887.4	182 6382.4	196 6877.4	224 7867.4
15D	-	-	15 474.0	30 1004.4	45 1534.7	60 2065.1	75 2595.5	90 3125.8	105 3656.2	120 4186.5	135 4716.9	150 5247.2	165 5777.6	180 6307.9	195 6838.3	210 7368.6
16D	-	-	16 505.6	32 1071.3	48 1637.1	64 2202.8	80 2768.5	96 3334.2	112 3899.9	128 4465.6	144 5031.3	160 5597.0	176 6162.8	192 6728.5	208 7294.2	224 7859.9

Table D.2 List of Capacities Corresponding to RAID 1 (36 Gbytes)

Disk capacity	35.4 G bytes															
Component unit	RK/RKS		RKA													
Range	1		1	2	3	4	5	6	7	8	9	10	11	12	13	14
Total range of Disk drives	Min.	14 (Max)	29	44	59	74	89	104	119	134	149	164	179	194	209	224 (Max)
1D+1M	2 31.6	14 236.2	28 483.7	44 766.6	58 1014.1	74 1296.9	88 1544.4	104 1827.3	118 2074.8	134 2357.7	148 2605.2	164 2888.0	178 3135.5	194 3418.4	208 3665.9	224 3948.7

Table D.3 List of Capacities Corresponding to RAID 5 (36 Gbytes)

Disk capacity	35.4 G bytes															
Component unit	RK/RKS		RKA													
Range	1		1	2	3	4	5	6	7	8	9	10	11	12	13	14
Total range of Disk drives	Min.	14 (Max)	29	44	59	74	89	104	119	134	149	164	179	194	209	224 (Max)
2D+1P	3 63.2	12 267.8	27 621.4	42 975.0	57 1328.5	72 1682.1	87 2035.7	102 2389.3	117 2742.8	132 3096.4	147 3450.0	162 3803.5	177 4157.1	192 4510.7	207 4864.2	222 5217.8
3D+1P	4 94.8	12 295.7	28 720.0	44 1144.3	56 1462.5	72 1886.7	88 2311.0	104 2735.3	116 3053.5	132 3477.8	148 3902.1	164 4326.4	176 4644.6	192 5068.9	208 5493.2	224 5917.4
4D+1P	5 126.4	10 267.8	25 692.1	40 1116.4	55 1540.7	70 1965.0	85 2389.3	100 2813.5	115 3237.8	130 3662.1	145 4086.4	160 4510.7	175 4935.0	190 5359.2	205 5783.5	220 6207.8
5D+1P	6 158.0	12 334.8	24 688.4	42 1218.7	54 1572.3	72 2102.6	84 2456.2	102 2986.6	114 3340.1	132 3870.5	144 4224.1	162 4754.4	174 5108.0	192 5638.3	204 5991.9	222 6522.3
6D+1P	7 189.6	14 401.8	28 826.0	42 1250.3	56 1674.6	70 2098.9	84 2523.2	98 2947.5	119 3583.9	133 4008.2	147 4432.5	161 4856.7	175 5281.0	189 5705.3	203 6129.6	224 6766.0
7D+1P	8 221.2	8 221.2	24 716.2	40 1211.2	56 1706.2	72 2201.2	88 2696.2	104 3191.2	112 3438.7	128 3933.7	144 4428.7	160 4923.7	176 5418.7	192 5913.7	208 6408.7	224 6903.7
8D+1P	9 252.8	9 252.8	27 818.5	36 1101.4	54 1667.1	72 2232.8	81 2515.7	99 3081.4	117 3647.1	126 3929.9	144 4495.7	162 5061.4	171 5344.2	189 5909.9	207 6475.6	216 6758.5
9D+1P	10 284.4	10 284.4	20 602.6	40 1239.1	50 1557.3	70 2193.7	80 2511.9	100 3148.3	110 3466.5	130 4103.0	140 4421.2	160 5057.6	170 5375.8	190 6012.3	200 6330.5	220 6966.9
10D+1P	11 316.0	11 316.0	22 669.6	44 1376.7	55 1730.3	66 2083.9	88 2791.0	99 3144.6	110 3498.2	132 4205.3	143 4558.9	154 4912.4	176 5619.6	187 5973.1	209 6680.3	220 7033.9
11D+1P	12 347.6	12 347.6	24 736.5	36 1125.5	48 1514.4	72 2292.3	84 2681.2	96 3070.1	108 3459.0	132 4236.9	144 4625.8	156 5014.7	168 5403.7	192 6181.5	204 6570.5	216 6959.4
12D+1P	13 379.2	13 379.2	26 803.5	39 1227.8	52 1652.1	65 2076.4	78 2500.6	104 3349.2	117 3773.5	130 4197.8	143 4622.1	156 5046.3	169 5470.6	182 5894.9	208 6743.5	221 7167.8
13D+1P	14 410.8	14 410.8	28 870.5	42 1330.1	56 1789.7	70 2249.4	84 2709.0	98 3168.7	112 3628.3	126 4088.0	140 4547.6	154 5007.2	168 5466.9	182 5926.5	196 6386.2	224 7305.4
14D+1P	-	-	15 442.4	30 937.4	45 1432.4	60 1927.4	75 2422.4	90 2917.4	105 3412.4	120 3907.4	135 4402.4	150 4897.4	165 5392.4	180 5887.4	195 6382.4	210 6877.4
15D+1P	-	-	16 474.0	32 1004.4	48 1534.7	64 2065.1	80 2595.5	96 3125.8	112 3656.2	128 4186.5	144 4716.9	160 5247.2	176 5777.6	192 6307.9	208 6838.3	224 7368.6

Table D.4 List of Capacities Corresponding to RAID 0+1 (36 Gbytes)

Disk capacity	35.4 G bytes															
Component unit	RK/RKS		RKA													
Range	1		1	2	3	4	5	6	7	8	9	10	11	12	13	14
Total range of Disk drives	Min.	14 (Max)	29	44	59	74	89	104	119	134	149	164	179	194	209	224 (Max)
2D+2M	4 63.2	12 197.1	28 480.0	44 762.8	56 975.0	72 1257.8	88 1540.7	104 1823.5	116 2035.7	132 2318.5	148 2601.4	164 2884.3	176 3096.4	192 3379.3	208 3662.1	224 3945.0
3D+3M	6 94.8	12 200.9	24 413.0	42 731.2	54 943.4	72 1261.6	84 1473.7	102 1791.9	114 2004.1	132 2322.3	144 2534.4	162 2852.7	174 3064.8	192 3383.0	204 3595.1	222 3913.4
4D+4M	8 126.4	8 126.4	24 409.3	40 692.1	56 975.0	72 1257.8	88 1540.7	104 1823.5	112 1965.0	128 2247.8	144 2530.7	160 2813.5	176 3096.4	192 3379.3	208 3662.1	224 3945.0
5D+5M	10 161.8	10 158.0	20 334.8	40 688.4	50 865.2	70 1218.7	80 1395.5	100 1749.1	110 1925.9	130 2279.4	140 2456.2	160 2809.8	170 2986.6	190 3340.1	200 3516.9	220 3870.5
6D+6M	12 197.1	12 189.6	24 401.8	36 613.9	48 826.0	72 1250.3	84 1462.5	96 1674.6	108 1886.7	132 2311.0	144 2523.2	156 2735.3	168 2947.5	192 3371.7	204 3583.9	216 3796.0
7D+7M	14 232.5	14 221.2	28 468.7	42 716.2	56 963.7	70 1211.2	84 1458.7	98 1706.2	112 1953.7	126 2201.2	140 2448.7	154 2696.2	168 2943.7	182 3191.2	196 3438.7	224 3933.7
8D+8M	-	-	16 252.8	32 535.7	48 818.5	64 1101.4	80 1384.2	96 1667.1	112 1950.0	128 2232.8	144 2515.7	160 2798.5	176 3081.4	192 3364.2	208 3647.1	224 3929.9

Table D.5 List of Capacities Corresponding to RAID 0 (72 Gbytes)

Disk capacity	71.3 G bytes															
Component unit	RK/RKS		RKA													
Range	1		1	2	3	4	5	6	7	8	9	10	11	12	13	14
Total range of Disk drives	Min.	14 (Max)	29	44	59	74	89	104	119	134	149	164	179	194	209	224 (Max)
2D	2 135.1	14 975.8	28 1974.2	44 3115.2	58 4113.5	74 5254.5	88 6252.8	104 7393.8	118 8392.2	134 9533.1	148 10531.5	164 11672.5	178 12670.8	194 13811.8	208 14810.2	224 15951.1
3D	3 202.7	12 833.2	27 1902.9	42 2972.5	57 4042.2	72 5111.9	87 6181.5	102 7251.2	117 8320.9	132 9390.5	147 10460.2	162 11529.9	177 12599.5	192 13669.2	207 14738.8	222 15808.5
4D	4 270.2	12 825.7	28 1966.7	44 3107.6	56 3963.4	72 5104.4	88 6245.3	104 7386.3	116 8242.0	132 9383.0	148 10524.0	164 11665.0	176 12520.7	192 13661.7	208 14802.6	224 15943.6
5D	5 337.8	10 694.3	25 1764.0	40 2833.7	55 3903.3	70 4973.0	85 6042.7	100 7112.3	115 8182.0	130 9251.7	145 10321.3	160 11391.0	175 12460.7	190 13530.3	205 14600.0	220 15669.6
6D	6 405.3	12 833.2	24 1688.9	42 2972.5	54 3828.3	72 5111.9	84 5967.6	102 7251.2	114 8106.9	132 9390.5	144 10246.3	162 11529.9	174 12385.6	192 13669.2	204 14524.9	222 15808.5
7D	7 472.9	14 972.1	28 1970.4	42 2968.8	56 3967.1	70 4965.5	84 5963.8	98 6962.2	119 8459.7	133 9458.1	147 10456.4	161 11454.8	175 12453.1	189 13451.5	203 14449.8	224 15947.4
8D	8 540.4	8 540.4	24 1681.4	40 2822.4	56 3963.4	72 5104.4	88 6245.3	104 7386.3	112 7956.8	128 9097.8	144 10238.7	160 11379.7	176 12520.7	192 13661.7	208 14802.6	224 15943.6
9D	9 608.0	9 608.0	27 1891.6	36 2533.4	54 3817.0	72 5100.6	81 5742.4	99 7026.0	117 8309.6	126 8951.4	144 10235.0	162 11518.6	171 12160.4	189 13444.0	207 14727.6	216 15369.4
10D	10 675.6	10 675.6	20 1388.7	40 2814.9	50 3528.0	70 4954.2	80 5667.3	100 7093.6	110 7806.7	130 9232.9	140 9946.0	160 11372.2	170 12085.3	190 13511.5	200 14224.7	220 15650.9
11D	11 743.1	11 743.1	22 1527.5	44 3096.4	55 3880.8	66 4665.2	88 5234.1	99 7018.5	110 7802.9	132 9371.7	143 10156.2	154 10940.6	176 12509.4	187 13293.9	209 14862.7	220 15647.1
12D	12 810.7	12 810.7	24 1666.4	36 2522.1	48 3377.9	72 5089.3	84 5945.1	96 6800.8	108 7656.5	132 9368.0	144 10223.7	156 11079.5	168 11935.2	192 13646.7	204 14502.4	216 15358.1
13D	13 878.2	13 878.2	26 1805.3	39 2732.3	52 3659.4	65 4586.4	78 5513.4	104 7367.5	117 8294.6	130 9221.6	143 10148.7	156 11075.7	169 12002.7	182 12929.8	208 14783.9	221 15710.9
14D	14 945.8	14 945.8	28 1944.1	42 2942.5	56 3940.8	70 4939.2	84 8937.6	98 6935.9	112 7934.3	126 8932.6	140 9931.0	154 10929.3	168 11927.7	182 12926.0	196 13924.4	224 15921.1
15D	-	-	15 1013.3	30 2083.0	45 3152.7	60 4222.3	75 5292.0	90 6361.7	105 7431.3	120 8501.0	135 9570.7	150 10640.3	165 11710.0	180 12779.7	195 13849.3	210 14919.0
16D	-	-	16 1080.9	32 2221.9	48 3362.8	64 4503.8	80 5644.8	96 6785.8	112 7926.8	128 9067.7	144 10208.7	160 11349.7	176 12490.7	192 13631.6	208 14772.6	224 15913.6

Table D.6 List of Capacities Corresponding to RAID 1 (72 Gbytes)

Disk capacity	71.3 G bytes															
Component unit	RK/RKS		RKA													
Range	1		1	2	3	4	5	6	7	8	9	10	11	12	13	14
Total range of Disk drives	Min.	14 (Max)	29	44	59	74	89	104	119	134	149	164	179	194	209	224 (Max)
1D+1M	2 67.6	14 487.9	28 987.1	44 1557.6	58 2056.8	74 2627.2	88 3126.4	104 3696.9	118 4196.1	134 4766.6	148 5265.7	164 5836.2	178 6335.4	194 6905.9	208 7405.1	224 7975.6

Table D.7 List of Capacities Corresponding to RAID 5 (72 Gbytes)

Disk capacity	71.3 G bytes															
Component unit	RK/RKS		RKA													
Range	1		1	2	3	4	5	6	7	8	9	10	11	12	13	14
Total range of Disk drives	Min.	14 (Max)	29	44	59	74	89	104	119	134	149	164	179	194	209	224 (Max)
2D+1P	3 135.1	12 555.5	27 1268.6	42 1981.7	57 2694.8	72 3407.9	87 4121.0	102 4834.1	117 5547.2	132 6260.3	147 6973.5	162 7686.6	177 8399.7	192 9112.8	207 9825.9	222 10539.0
3D+1P	4 202.7	12 619.3	28 1475.0	44 2330.7	56 2972.5	72 3828.3	88 4684.0	104 5539.7	116 6181.5	132 7037.3	148 7893.0	164 8748.7	176 9390.5	192 10246.3	208 11102.0	224 11957.7
4D+1P	5 270.2	10 555.5	25 1411.2	40 2266.9	55 3122.7	70 3978.4	85 4834.1	100 5689.9	115 6545.6	130 7401.3	145 8257.1	160 9112.8	175 9968.5	190 10824.3	205 11680.0	220 12535.7
5D+1P	6 337.8	12 694.3	24 1407.4	42 2477.1	54 3190.2	72 4259.9	84 4973.0	102 6042.7	114 6755.8	132 7825.4	144 8538.5	162 9608.2	174 10321.3	192 11391.0	204 12104.1	222 13173.8
6D+1P	7 405.3	14 833.2	28 1688.9	42 2544.7	56 3400.4	70 4256.1	84 5111.9	98 5967.6	119 7251.2	133 8106.9	147 8962.7	161 9818.4	175 10674.1	189 11529.9	203 12385.6	224 13669.2
7D+1P	8 472.9	8 472.9	24 1471.2	40 2469.6	56 3468.0	72 4466.3	88 5464.7	104 6463.0	112 6962.2	128 7960.5	144 8958.9	160 9957.3	176 10955.6	192 11954.0	208 12952.3	224 13950.7
8D+1P	9 540.4	9 540.4	27 1681.4	36 2251.9	54 3392.9	72 4533.9	81 5104.4	99 6245.3	117 7386.3	126 7956.8	144 9097.8	162 10238.7	171 10809.2	189 11950.2	207 13091.2	216 13661.7
9D+1P	10 608.0	10 608.0	20 1249.8	40 2533.4	50 3175.2	70 4458.8	80 5100.6	100 6384.2	110 7026.0	130 8309.6	140 8951.4	160 10235.0	170 10876.8	190 12160.4	200 12802.2	220 14085.8
10D+1P	11 675.6	11 675.6	22 1388.7	44 2814.9	55 3528.0	66 4241.1	88 5667.3	99 6380.4	110 7093.6	132 8519.8	143 9232.9	154 9945.0	176 11372.2	187 12085.3	209 13511.5	220 14224.7
11D+1P	12 743.1	12 743.1	24 1527.5	36 2312.0	48 3096.4	72 4665.2	84 5449.6	96 6234.1	108 7018.5	132 8587.3	144 9371.7	156 10156.2	168 10940.6	192 12509.4	204 13293.9	216 14078.3
12D+1P	13 810.7	13 810.7	26 1666.4	39 2522.1	52 3377.9	65 4233.6	78 5089.3	104 6800.8	117 7656.5	130 8512.3	143 9368.0	156 10223.7	169 11079.5	182 11935.2	208 13646.7	221 14502.4
13D+1P	14 878.2	14 878.2	28 1805.3	42 2732.3	56 3659.4	70 4586.4	84 5513.4	98 6440.5	112 7367.5	126 8294.6	140 9221.6	154 10148.7	168 11075.7	182 12002.7	196 12929.8	224 14783.9
14D+1P	-	-	15 945.8	30 1944.1	45 2942.5	60 3940.8	75 4939.2	90 5937.6	105 6935.9	120 7934.3	135 8932.6	150 9931.0	165 10929.3	180 11927.7	195 12926.0	210 13924.4
15D+1P	-	-	16 1013.3	32 2083.0	48 3152.7	64 4222.3	80 5292.0	96 6361.7	112 7431.3	128 8501.0	144 9570.7	160 10640.3	176 11710.0	192 12779.7	208 13849.3	224 14919.0

Table D.8 List of Capacities Corresponding to RAID 0+1 (72 Gbytes)

Disk capacity	71.3 G bytes															
Component unit	RK/RKS		RKA													
Range	1		1	2	3	4	5	6	7	8	9	10	11	12	13	14
Total range of Disk drives	Min.	14 (Max)	29	44	59	74	89	104	119	134	149	164	179	194	209	224 (Max)
2D+2M	4 135.1	12 412.8	28 983.3	44 1553.8	56 1981.7	72 2552.2	88 3122.7	104 3693.2	116 4212.0	132 4691.5	148 5262.0	164 5832.5	176 6260.3	192 6830.8	208 7401.3	224 7971.8
3D+3M	6 202.7	12 416.6	24 844.5	42 1486.3	54 1914.1	72 2555.9	84 2983.8	102 3625.6	114 4053.5	132 4695.3	144 5123.1	162 5764.9	174 6192.8	192 6834.6	204 7262.5	222 7904.3
4D+4M	8 270.2	8 270.2	24 840.7	40 1411.2	56 1981.7	72 2552.2	88 3122.7	104 3693.2	112 3978.4	128 4548.9	144 5119.4	160 5689.9	176 6260.3	192 6830.8	208 7401.3	224 7971.8
5D+5M	10 341.5	10 337.8	20 694.3	40 1407.4	50 1764.0	70 2477.1	80 2833.7	100 3546.8	110 3903.3	130 4616.4	140 4973.0	160 5686.1	170 6042.7	190 6755.8	200 7112.3	220 7825.4
6D+6M	12 512.8	12 405.3	24 833.2	36 1261.1	48 1688.9	72 2544.7	84 2972.5	96 3400.4	108 3828.3	132 4684.0	144 5111.9	156 5539.7	168 5967.6	192 6823.3	204 7251.2	216 7679.1
7D+7M	14 484.2	14 472.9	28 972.1	42 1471.2	56 1970.4	70 2469.6	84 2968.8	98 3468.0	112 3967.1	126 4466.3	140 4965.5	154 5464.7	168 5963.8	182 6463.0	196 6962.2	224 7960.5
8D+8M	-	-	16 540.4	32 1110.9	48 1681.4	64 2251.9	80 2822.4	96 3392.9	112 3963.4	128 4533.9	144 5104.4	160 5674.8	176 6245.3	192 6815.8	208 7386.3	224 7956.8

Appendix E Port Address Mapping Table

Fibre channel physical addresses are converted to target IDs (TIDs) using a conversion table. The following table shows the current limits for TIDs on various operating systems.

Table E.1 Limits for TIDs on Operating Systems

	HP-UX		Solaris		Windows NT (SP4 or later)	
Port	TID	LUN	TID	LUN	TID	LUN
Fibre	0 to 15	0 to 255	0 to 125	0 to 255	0 to 31	0 to 255

AL-PA is an abbreviation for Arbitrated Loop Physical Address and indicates the physical address for Fibre Channel. TID indicates the target ID.

Table E.2 Port Addresses for HP-UX

C0		C1		C2		C3		C4		C5		C6		C7	
ALPA	TID	ALPA	TID	ALPA	TID	ALPA	TID	ALPA	TID	ALPA	TID	ALPA	TID	ALPA	TID
EF	0	CD	0	B2	0	98	0	72	0	55	0	3A	0	25	0
E8	1	CC	1	B1	1	97	1	71	1	54	1	39	1	23	1
E4	2	CB	2	AE	2	90	2	6E	2	53	2	36	2	1F	2
E2	3	CA	3	AD	3	8F	3	6D	3	52	3	35	3	1E	3
E1	4	C9	4	AC	4	88	4	6C	4	51	4	34	4	1D	4
E0	5	C7	5	AB	5	84	5	6B	5	4E	5	33	5	1B	5
DC	6	C6	6	AA	6	82	6	6A	6	4D	6	32	6	18	6
DA	7	C5	7	A9	7	81	7	69	7	4C	7	31	7	17	7
D9	8	C3	8	A7	8	80	8	67	8	4B	8	2E	8	10	8
D6	9	BC	9	A6	9	7C	9	66	9	4A	9	2D	9	0F	9
D5	10	BA	10	A5	10	7A	10	65	10	49	10	2C	10	08	10
D4	11	B9	11	A3	11	79	11	63	11	47	11	2B	11	04	11
D3	12	B6	12	9F	12	76	12	5C	12	46	12	2A	12	02	12
D2	13	B5	13	9E	13	75	13	5A	13	45	13	29	13	01	13
D1	14	B4	14	9D	14	74	14	59	14	43	14	27	14		
CE	15	B3	15	9B	15	73	15	56	15	3C	15	26	15		

Table E.3 Port Addresses for Solaris

C0		C1		C2		C3		C4		C5		C6		C7	
ALPA	TID	ALPA	TID	ALPA	TID	ALPA	TID	ALPA	TID	ALPA	TID	ALPA	TID	ALPA	TID
EF	0	CD	16	B2	32	98	48	72	64	55	80	3A	96	25	112
E8	1	CC	17	B1	33	97	49	71	65	54	81	39	97	23	113
E4	2	CB	18	AE	34	90	50	6E	66	53	82	36	98	1F	114
E2	3	CA	19	AD	35	8F	51	6D	67	52	83	35	99	1E	115
E1	4	C9	20	AC	36	88	52	6C	68	51	84	34	100	1D	116
E0	5	C7	21	AB	37	84	53	6B	69	4E	85	33	101	1B	117
DC	6	C6	22	AA	38	82	54	6A	70	4D	86	32	102	18	118
DA	7	C5	23	A9	39	81	55	69	71	4C	87	31	103	17	119
D9	8	C3	24	A7	40	80	56	67	72	4B	88	2E	104	10	120
D6	9	BC	25	A6	41	7C	57	66	73	4A	89	2D	105	0F	121
D5	10	BA	26	A5	42	7A	58	65	74	49	90	2C	106	08	122
D4	11	B9	27	A3	43	79	59	63	75	47	91	2B	107	04	123
D3	12	B6	28	9F	44	76	60	5C	76	46	92	2A	108	02	124
D2	13	B5	29	9E	45	75	61	5A	77	45	93	29	109	01	125
D1	14	B4	30	9D	46	74	62	59	78	43	94	27	110		
CE	15	B3	31	9B	47	73	63	56	79	3C	95	26	111		

Table E.4 Port Addresses for Windows NT (Fibre Board: Emulex)

C5(Phld5)				C4(Phld4)				C3(Phld3)				C2(Phld2)				C1(Phld1)		
TID	AL PA	TID	AL PA	TID	AL PA	TID	AL PA	TID	AL PA	TID	AL PA	TID	AL PA	TID	AL PA	TID	AL PA	TID
					CC	15			98	15			56	15			27	15
			E4	30	CB	14	B1	30	67	14	72	30	55	14	3C	30	26	14
			E2	29	CA	13	AE	29	90	13	71	29	64	13	3A	29	25	13
			E1	28	C9	12	AD	28	8F	12	6E	28	53	12	39	28	23	12
			E0	27	C7	11	AC	27	88	11	6D	27	52	11	36	27	1F	11
			DC	26	C6	10	AB	26	84	10	6C	26	51	10	35	26	1E	10
			DA	25	C5	9	AA	25	82	9	6B	25	4E	9	34	25	1D	9
			D9	24	C3	8	A9	24	81	8	6A	24	4D	8	33	24	1B	8
			D6	23	BC	7	A7	23	80	7	69	23	4C	7	32	23	18	7
			D5	22	BA	6	A6	22	7C	6	67	22	4B	6	31	22	17	6
			D4	21	B9	5	A5	21	7A	5	66	21	4A	5	2E	21	10	5
			D3	20	B6	4	A3	20	79	4	65	20	49	4	2D	20	0F	4
			D2	19	B5	3	9F	19	76	3	63	19	47	3	2C	19	08	3
			D1	18	B4	2	9E	18	75	2	5C	18	46	2	2B	18	04	2
	EF	1	CE	17	B3	1	9D	17	74	1	5A	17	45	1	2A	17	02	1
	E8	0	CD	16	B2	0	9B	16	73	0	59	16	43	0	29	16	01	0

Table E.5 Port Addresses for Windows NT (Fibre Board: Qlogic)

C0(Phld0)				C1(Phld1)				C2(Phld2)				C3(Phld3)				C4(Phld4)			
AL PA	TID	AL PA	TID	AL PA	TID	AL PA	TID	AL PA	TID	AL PA	TID	AL PA	TID	AL PA	TID	AL PA	TID	AL PA	TID
EF	0	CD	16	B2	0	98	16	72	0	55	16	3A	0	25	16				
E8	1	CC	17	B1	1	67	17	71	1	64	17	39	1	23	17				
E4	2	CB	18	AE	2	90	18	6E	2	53	18	36	2	1F	18				
E2	3	CA	19	AD	3	8F	19	6D	3	52	19	35	3	1E	19				
E1	4	C9	20	AC	4	88	20	6C	4	51	20	34	4	1D	20				
E0	5	C7	21	AB	5	84	21	6B	5	4E	21	33	5	1B	21				
DC	6	C6	22	AA	6	82	22	6A	6	4D	22	32	6	18	22				
DA	7	C5	23	A9	7	81	23	69	7	4C	23	31	7	17	23				
D9	8	C3	24	A7	8	80	24	67	8	4B	24	2E	8	10	24				
D6	9	BC	25	A6	9	7C	25	66	9	4A	25	2D	9	0F	25				
D5	10	BA	26	A5	10	7A	26	65	10	49	26	2C	10	08	26				
D4	11	B9	27	A3	11	79	27	63	11	47	27	2B	11	04	27				
D3	12	B6	28	9F	12	76	28	5C	12	46	28	2A	12	02	28				
D2	13	B5	29	9E	13	75	29	5A	13	45	29	29	13	01	29				
D1	14	B4	30	9D	14	74	30	59	14	43	30	27	14						
CE	15	B3	31	9B	15	73	31	56	15	3C	31	26	15						

Appendix F Host Side Parameter Settings

Table F.1 OS and HBA Supported by 9500V (Fibre Channel)

No	OS	HBA					Note
		Vendor	Model	Bus Type	Driver	BIOS	
1	HP-UX 11i(11.11)	HP	A5158A	PCI	Bundle		
2		HP	A6795A	PCI	Bundle		
3	HP-UX 11.0	HP	A5158A	PCI	Bundle		Support schedule
4		HP	A6685A/A3404A	HSC Bus	Bundle		Support schedule
5	Solaris 2.6/7/8	Sun	X6729A	PCI	Bundle		*1
6		Sun	X6730A	SBus	Bundle		*1 Support schedule
7		Sun	X6799A	PCI	Bundle		*2
8		Sun	X6748A	cPCI	Bundle		*2 Support schedule
9		JNI	FCE-1063	SBus	4.1.1		*3
10		JNI	FCE-6410	PCI	4.1.1		*3
11		JNI	FCE-1473	PCI	5.1.0.HIT.M01		*3
12		JNI	FCE-6460	PCI	5.1.0.HIT.M01		*3
13		JNI	FCI-1063	PCI	Undecided		Support schedule
14		JNI	FC64-1063	Sbus	Undecided		Support schedule
15		FUJITSU	GP7B8FC1	PCI	2.2.1		*3
16		FUJITSU	PW008FC2	PCI	2.2.1		*3
17	AIX 4.3.3/5.1	IBM	FC6227	PCI	FW:3.22A1		
18		IBM	FC6228	PCI	FW:3.82A1		
19	IRIX 6.5	SGI	XT-FC-1PORT	XIO	Bundle	2.1.36	
20		SGI	PCI-FC-1PORT	PCI	Bundle	2.1.36	
21	Windows 2000 AS	Emulex	LP8000	PCI	Port Driver: 2.12a1	3.90a7	
22		Emulex	LP9002	PCI	Port Driver: 2.12a1	3.90a7	
23		Q-logic	QLA2200F	PCI	8.1.5.12	1.76	
24		Q-logic	QLA2310F	PCI	8.1.5.12	1.24	
25	Windows NT4.0 EE	Emulex	LP8000	PCI	Port Driver: 2.12a1	3.90a7	Support schedule
26		Emulex	LP9002	PCI	Port Driver: 2.12a1	3.90a7	Support schedule
27		Q-logic	QLA2200F	PCI	8.1.5.12	1.76	Support schedule
28		Q-logic	QLA2310F	PCI	8.1.5.12	1.76	Support schedule
29	Linux Redhat 7.2	Emulex	LP8000	PCI	4.12c	3.90a7	
30		Emulex	LP9002	PCI	4.12c	3.90a7	
31	Netware 5.1	Emulex	LP8000	PCI	Undecided	Undecided	Support schedule
32		Emulex	LP9002	PCI	Undecided	Undecided	Support schedule
33	Tru64 Unix5.1	Compaq	KGPSA-CA	PCI	1.25a	3.30x2	

*1: If you use a Sun HBA X6729A or X6730A, the following patches must be applied.
In addition, connection via an FC Switching HUB (Fabric Mode) is not allowed.

Solaris 2.6
X6729A: 105356-15 SunOS 5.6: /kernel/drv/ssd and /kernel/drv/sd patch
107280-05 SunStorEdge PCI FC-100 Host Adapter1.0: /kernel/drv/ifp patch

Solaris 2.6
X6730A: 105375-22 SunOS 5.6: sf & socal driver patch
105357-04 SunOS 5.6: /Kernel/drv/ses patch
105356-15 SunOF 5.6: /kernel/drv/ssd and /kernel/drv/sd patch

Solaris 7
X6729A: 107292-07 SunOS 5.7: ifp driver patch

Solaris 7
X6730A: 107469-08 SunOS 5.7: sf & socal drivers patch

Solaris 8
X6730A: 109460-03 SunOS 5.8: socal and sf driver patch

*2: Supported Solaris 8 only
X6799A/X6748
111095-08 fctl/fp/fcp/usoc driver patch
111096-04 fcip driver patch
111097-08 qlc driver patch
111412-08 Sun StorEdge Traffic Manager patch
111413-08 luxadm, liba5k and libg_fc patch
111846-03 cfgadm fp plug-in library patch

*3: Supported Solaris2.6/8 only

Table F.2 FC Switching HUB and FC HUB Supported by 9500V (FC Switching HUB)

No	OS	FC Switching HUB				Note
		Vendor	Model	Mode	Firmware	
1	HP-UX 11i(11.11)	Brocade	Silkworm2800	Fabric/QL	2.6.0c	Fabric: A5158A/A6795A
2		Brocade	Silkworm2010	Fabric/QL	2.6.0c	Fabric: A5158A/A6795A
3		Brocade	Silkworm3800	Fabric/QL	3.0.2d	Fabric: A5158A/A6795A
4	HP-UX 11.0	Brocade	Silkworm2800	Fabric/QL	2.6.0c	Support schedule
5		Brocade	Silkworm2010	Fabric/QL	2.6.0c	Support schedule
6	Solaris 2.6	Brocade	Silkworm2800	Fabric/QL	2.6.0c	JNI/Emulex/FUJITSU
7		Brocade	Silkworm2010	Fabric/QL	2.6.0c	JNI/EmulexFUJITSU
8		Brocade	Silkworm3800	Fabric/QL	3.0.2d	JNI/Emulex
9	Solaris 7	Brocade	Silkworm2800	Fabric/QL	2.6.0c	JNI/EmulexFUJITSU
10		Brocade	Silkworm2010	Fabric/QL	2.6.0c	JNI/EmulexFUJITSU
11	Solaris 8	Brocade	Silkworm2800	Fabric/QL	2.6.0c	JNI/EmulexFUJITSU
12		Brocade	Silkworm2010	Fabric/QL	2.6.0c	JNI/EmulexFUJITSU
13		Brocade	Silkworm3800	Fabric/QL	3.0.2d	JNI/Emulex
14	AIX 4.3.3 /5.1	Brocade	Silkworm2800	Fabric/QL	2.6.0c	
15		Brocade	Silkworm2010	Fabric/QL	2.6.0c	
16		Brocade	Silkworm3800	Fabric/QL	3.0.2d	
17	IRIX 6.5	Brocade	Silkworm2800	Fabric/QL	2.6.0c	
18		Brocade	Silkworm2010	Fabric/QL	2.6.0c	
19	Windows 2000 AS	Brocade	Silkworm2800	Fabric/QL	2.6.0c	
20		Brocade	Silkworm2010	Fabric/QL	2.6.0c	
21		Brocade	Silkworm3800	Fabric/QL	3.0.2d	
22	Windows NT4.0 EE	Brocade	Silkworm2800	Fabric/QL	2.6.0c	
23		Brocade	Silkworm2010	Fabric/QL	2.6.0c	
24		Brocade	Silkworm3800	Fabric/QL	3.0.2d	
25	Linux Redhat 7.2	Brocade	Silkworm2800	Fabric/QL	2.6.0c	
26		Brocade	Silkworm2010	Fabric/QL	2.6.0c	
27		Brocade	Silkworm3800	Fabric/QL	3.0.2d	
28	Tru64 UNIX 5.1	Brocade	Silkworm2800	Fabric/QL	2.6.0c	
29		Brocade	Silkworm2010	Fabric/QL	2.6.0c	

This section describes the parameters information of HBAs that are used by each platform. If you use individual HBAs provided by each vendor, set the parameter values as described below.

If you use a 2 GBps HBA in 1 GBps mode, the set-up values are the same as those for use in 2 G Bps mode.

If a 2 GBps I/F card on the 9500V side is used in 1 GBps mode, the set-up values on the HBA side are also the same.

When connecting a 9500V by using a Host Bus Adapter JNI FC64-1063 (Support schedule), the "/kernel/drv/fcaw.conf" file must be edited and set up as follows; set-up values are described below. Use respective default values for other parameters.

- If connecting a DF600 directly or via an FC HUB: fca-nport = 0
- If connecting a DF600 via an FC Switching HUB: fca-nport = 1

Table F.3 Parameters Extracted from the "/kernel/drv/fcaw.conf" File

No	Parameter	Default	Value	Note
1	scsi-initiator-id	0x7d	Optional	
2	fca_nport	0	0 or 1	Loop = 0, Fabric = 1
3	public_loop	0		
4	target_controllers	126		
5	ip_disable	1		
6	qfull_retry_count	0		
7	qfull_retry_interval	1000		
8	failover	30		
9	failover_extension	0		
10	recovery_attempts	5		
11	class2_enable	0		
12	fca_heartbeat	0		
13	reset_glm	0		
14	timeout_reset_enable	0		
15	busy_retry_delay	500		
16	link_recovery_delay	100		
17	scsi_probe_delay	0		
18	def_hba_binding	"fcaw*"		
19	def_wwpn_binding	"xxxxxxxxxxxxxxx"		
20	def_wwnn_binding	"xxxxxxxxxxxxxxx"		
21	def_port_binding	"$xxxxxx"		
22	fca_verbose	1		

When connecting a 9500V by using a Host Bus Adapter JNI FCI-1063 (Support schedule), the "/kernel/drv/fca-pci.conf" file must be edited and set up as follows; set-up values are described below. Use respective default values for other parameters.

- If connecting a DF600 directly or via an FC HUB: fca-nport = 0
- If connecting a DF600 via an FC Switching HUB: fca-nport = 1

Table F.4 Parameters Extracted from the "/kernel/drv/fca-pci.conf" File

No	Parameter	Default	Value	Note
1	scsi-initiator-id	0x7d	Optional	
2	fca_nport	0	0 or 1	Loop = 0Fabric = 1
3	public_loop	0		
4	target_controllers	126		
5	ip_disable	1		
6	qfull_retry_count	0		
7	qfull_retry_interval	1000		
8	failover	30		
9	failover_extension	0		
10	recovery_attempts	5		
11	class2_enable	0		
12	fca_heartbeat	0		
13	reset_glm	0		
14	timeout_reset_enable	0		
15	busy_retry_delay	500		
16	link_recovery_delay	100		
17	scsi_probe_delay	0		
18	def_hba_binding	"fca-pci*"		
19	def_wwpn_binding	"xxxxxxxxxxxxxxxx"		
20	def_wwnn_binding	"xxxxxxxxxxxxxxxx"		
21	def_port_binding	"$xxxxxx"		

If you are connecting a 9500V by installing a Host Bus Adapter Emulex LP7000E/LP8000/LP9002, using SCSI IP Driver Version 5-2.12a1, Fireware: Ver3.90a7 must be set up and changed as indicated in the following table. The setup values are described below.

Table F.5 Setup Values using Host Bus Adapter Emulex LP7000E/LP8000/LP9002

	Initial Defaults	FC-AL Direct/HUB Recommended value	Fabric Switch Recommended value	Remarks
Link Control Parameters:				
Point to Point			X	*1
Arbitrated Loop	X	X		*1
Link Speed	AUTO	AUTO	AUTO	
Adapter Controls:				
Automatically Map SCSI Devices	X	X	X	
Query name server for all N-Ports	X	X	X	
Allow Multiple paths to SCSI Targets	0	X	X	
Register for State Change	X	X	X	
Use Report LUNs	X	X	X	
Use Name Server after RSCN	X	0	X	*2
Lun Mapping	0	0	0	
Scan in Device ID Order	X	X	X	
Enable Class 2 for SCSI Devices	0	0	0	
Report Unknown SCSI Devices	X	X	X	
Look for Disappearing Devices	0	0	0	
Translate Queue Full to Busy	0	0	0	
Use Bus Reset Status for Retries	0	0	0	
Retry Unit Attention	0	0	0	
Retry PLOGI Open Failures	0	0	0	
LUN Setup Section:				
Maximum Number of LUNs	32	255	255	*3
Maximum Queue Depth	32	128	128	*3
Static Poll Destination Address	BLANK	BLANK	BLANK	
Adapter Timer Settings:				
Link Timer	30	30	30	
Retries	64	64	64	
E_D_TOV	2000	2000	2000	
AL_TOV	15	15	15	
Wait Ready Timer	45	-1	-1	*4
Retry Timer	2000	2000	2000	
R_A_TOV	2	2	2	
ARB_TOV	1000	1000	1000	
Refistry Parameters:				
Quick Fail	0	1	1	*5
NameServer Delay	0	800	800	*5

*1: For the direct or HUB connection with DF600, Arbitrated LOOP is specified. For Switch connection, Point to Point is specified. Direct/HUB= Emulex LightPluse - Arbitrated Loop - Automap SCSI Devices and Switch= Emulex LightPluse - Point to Point - Automap SCSI Devices are recommended.

*2: It is enabled only with the Switch connection. For other cases, leave blank.

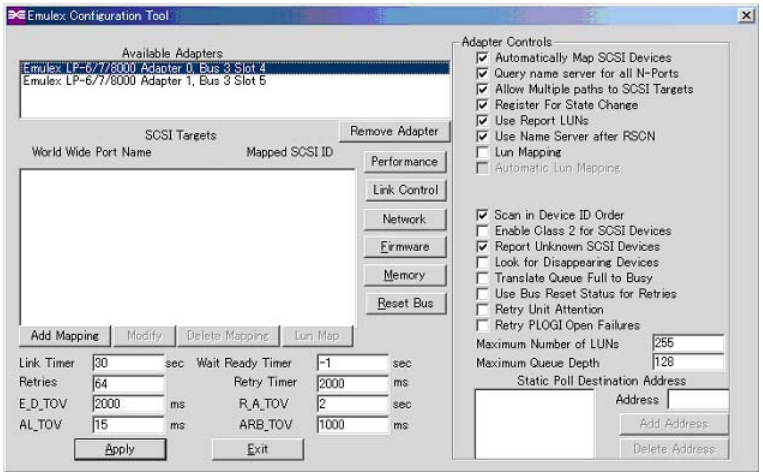
*3: In the examination at Hitachi, it is set at 128 for 4LUs since the multiplicity of 1JOB performed in the examination is set at 32.

*4: By specifying 1, time out monitoring time is handled as “R_A_TOV*2”. For the Switch connection, “R_A_TOV” is supplied from Switch side.

*5: It is set for each port. For details, refer to the following notes on setting the registry of LP800 port driver.

To set the port driver registry of LP8000:

1. In the setting of LP8000 port driver, QuickFail and NameServerDelay should be set using a registry editor.
2. QuickFail and NameServerDelay cannot be set for the setting utility of port driver (elxcfg.exe) since the setting items do not exist.
3. For port driver, never use the miniport driver (lputilnt.exe) setting utility. (Although QuickFail and NameServerDelay exist, do not use them. Use each utility since the directory for reference of miniport driver differs from that of port driver.)
4. After setting the parameter on the GUI window for the HBA driver setting, set the registry. (This necessary because once you have set the registry, the set value returns to the default value by pressing the "Apply" button on the GUI window.)



To set the port driver registry of LP8000:

1. Open the "regedt32".
2. Open the registry is described as follows:

   HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\elxsli2

3. Added the entry is described as follows:

   Name: QuickFail
   Data: 0x1
   Type: REG_DWORD

4. Open the registry is described below.

   (Make all the settings under each BusXSlot. Set the set registries for each HBA since the same number of set registries as that of HBAs exist. The following example displays the setting of BUS2Slot3.)

   HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\elxsli2\Bus2Slot3

5. Added the entry is described as follows:

Name: QuickFail	Name: NameServerDelay
Data: 0x1	Data: 0x320
Type: REG_DWORD	Type: REG_DWORD

6. For each BusXSlotY, repeat 4 to 5.

7. The setting that was changed is enabled by closing the "regedt32", and rebooting the server.

When connecting a 9500V by installing Host Bus Adapter Q-logic QLA2200F using Miniport Driver Version 8.1.5.12, BIOS must be set up and changed using the setup values described below. Use their respective default values for other parameters.

- Frame size = 2048
- Adapter Hard Loop ID = Enable
- Execution Throttle = 256
- Login Retry Count = 30
- Port Down Retry Count = 30
- IOCB Allocation = 512

Table F.6 Parameters Extracted from the BIOS (using Host Bus Adapter Q-logic QLA2200F)

No	Parameter	Default	Value	Note
Host Adapter Settings				
1	Host Adapter BIOS	Disabled	—	
2	Frame Size	1024	2048	
3	Loop Reset Delay	5	—	
4	Adapter Hard Loop ID	Disabled	Enabled	
5	Hard Loop ID	0	Optional	
Advanced Adapter Settings				
6	Execution Throttle	16	256	
7	Fast Command Posting	Enabled	—	
8	>4GByte Addressing	Disabled	Disable or Enable	Microsoft Cluster Server configuration= Enable is mandatory.
9	LUNs Per Target	8	—	
10	Enable LIP Reset	No	No or Yes	Microsoft Cluster Server configuration= Yes is mandatory.
11	Enable LIP Full Login	Yes	—	
12	Enable Target Reset	No	No or Yes	Microsoft Cluster Server configuration= Yes is mandatory.
13	Login Retry Count	8	30	
14	Port Down Retry Count	8	30	
15	Drivers Load RISC Code	Enabled	—	
16	Enable Database Updates	No	—	
17	Disable Database Load	No	—	
18	IOCB Allocation	256	512	
19	Extended Error Logging	Disabled	—	
Extended Firmware Settings				
20	Extended Control Block	Enabled	—	
21	RIO Operation Mode	0	—	
22	Connection Options	3	0 or 1 or 3	Microsoft Cluster Server configuration Loop= 0, Fabric= 1
23	Class 2 Service	Disabled	—	
24	ACK0	Disabled	—	
25	Fibre Channel Tape Support	Disabled	—	
26	Fibre Channel Confirm	Disabled	—	
27	Command Reference Number	Disabled	—	
28	Read Transfer Ready	Disabled	—	
29	Response Timer	0	—	
30	Interrupt Delay Timer	0	—	

Additionally, the Registry options are listed below. Use their respective default values for parameters.

Table F.7 Parameters Extracted from the Registry Options (using Host Bus Adapter Q-logic QLA2200F)

No	Parameter	Default	Value	Note
1	MaximumSGList	REG_DWORD: 0x41	—	
2	NumberOfRequests	0x96	—	
3	FabricSupported	1	—	
4	FabricDeviceCount	64	—	
5	ConfigRequired	0	—	
6	Portname	—	—	
7	FC Tape	—	—	
8	MSCS	2	—	Microsoft Cluster Server configuration= 2 is mandatory.
9	UseSameNN	1	—	
10	TimeOutValue	0x3c	—	

When connecting a 9500V by installing Host Bus Adapter Q-logic QLA2310F using Miniport Driver Version 8.1.5.12, BIOS must be set up and changed using the setup values described below. Use their respective default values for other parameters.

- Frame size = 2048
- Adapter Hard Loop ID = Enable
- Execution Throttle = 256
- Login Retry Count = 30
- Port Down Retry Count = 30
- IOCB Allocation = 512

Table F.8 Parameters Extracted from the BIOS (using Host Bus Adapter Q-logic QLA2310F)

No	Parameter	Default	Value	Note
Host Adapter Settings				
1	Host Adapter BIOS	Disabled	—	
2	Frame Size	2048	2048	
3	Loop Reset Delay	5	—	
4	Adapter Hard Loop ID	Disabled	Enabled	
5	Hard Loop ID	0	Optional	
Advanced Adapter Settings				
6	Execution Throttle	16	256	
7	Fast Command Posting	Disabled	—	
8	> 4GByte Addressing	Disabled	Disable or Enable	Microsoft Cluster Server configuration= Enable is mandatory.
9	LUNs Per Target	8	—	
10	Enable LIP Reset	No	No or Yes	Microsoft Cluster Server configuration= Yes is mandatory.
11	Enable LIP Full Login	Yes	—	
12	Enable Target Reset	No	No or Yes	Microsoft Cluster Server configuration= Yes is mandatory.
13	Login Retry Count	8	30	
14	Port Down Retry Count	8	30	
15	Drivers Load RISC Code	Enabled	—	
16	Enable Database Updates	No	—	
17	Disable Database Load	No	—	
18	IOCB Allocation	256	512	
19	Extended Error Logging	Disabled	—	
Extended Firmware Settings				
20	Extended Control Block	Enabled	—	
21	RIO Operation Mode	0	—	
22	Connection Options	2	0 or 1 or 2	Microsoft Cluster Server configuration Loop = 0, Fabric = 1
23	Class 2 Service	Disabled	—	
24	ACK0	Disabled	—	
25	Fibre Channel Tape Support	Disabled	—	
26	Fibre Channel Confirm	Disabled	—	
27	Command Reference Number	Disabled	—	
28	Read Transfer Ready	Disabled	—	
29	Response Timer	0	—	
30	Interrupt Delay Timer	0	—	
31	Data Rate	0	2	Auto Mode

Additionally, the Registry options are listed below. Use their respective default values for parameters.

Table F.9 Parameters Extracted from the Registry Options (using Host Bus Adapter Q-logic QLA2310F)

No	Parameter	Default	Value	Note
1	MaximumSGList	REG_DWORD: 0x21	—	
2	NumberOfRequests	0x96	—	
3	FabricSupported	—	—	
4	FabricDeviceCount	—	—	
5	ConfigRequired	—	—	
6	Portname	—	—	
7	FC Tape	—	—	
8	MSCS	2	—	Microsoft Cluster Server configuration= 2 is mandatory.
9	UseSameNN	1	—	
10	TimeOutValue	0x3c	—	

When using Windows NT4.0 Enterprise Edition (Support schedule) or connecting a 9500V by installing a Host Bus Adapter Emulex LP7000E/LP8000/LP9002 and using SCSI Miniport Driver Version 4-2.12a1, Fireware Version3.90a7, see Table F.5.

When connecting a 9500V by installing Host Bus Adapter Q-logic QLA2300F using Miniport Driver Version 8.1.5.12, BIOS must be set up and changed using the setup values described below. Use their respective default values for other parameters.

- Frame size = 2048
- Adapter Hard Loop ID = Enable
- Execution Throttle = 256
- Login Retry Count = 30
- Port Down Retry Count = 30
- IOCB Allocation = 512

Table F.10 Parameters Extracted from the BIOS (using Host Bus Adapter Q-logic QLA2300F)

No	Parameter	Default	Value	Note
Host Adapter Settings				
1	Host Adapter BIOS	Disabled	—	
2	Frame Size	2048	2048	
3	Loop Reset Delay	5	—	
4	Adapter Hard Loop ID	Disabled	Enabled	
5	Hard Loop ID	0	Optional	
Advanced Adapter Settings				
6	Execution Throttle	16	256	
7	Fast Command Posting	Disabled	—	
8	>4GByte Addressing	Disabled	Disable or Enable	In the case of MSCS configuration= Enable is mandatory
9	LUNs Per Target	8	—	
10	Enable LIP Reset	No	No or Yes	In the case of MSCS configuration= Yes is mandatory
11	Enable LIP Full Login	Yes	—	
12	Enable Target Reset	No	No or Yes	In the case of MSCS configuration= Yes is mandatory
13	Login Retry Count	8	30	
14	Port Down Retry Count	8	30	
15	Drivers Load RISC Code	Enabled	—	
16	Enable Database Updates	No	—	
17	Disable Database Load	No	—	
18	IOCB Allocation	256	512	
19	Extended Error Logging	Disabled	—	
Extended Firmware Settings				
20	Extended Control Block	Enabled	—	
21	RIO Operation Mode	0	—	
22	Connection Options	2	0 or 1 or 2	In the case of MSCS configuration: Loop= 0, Fabric= 1
23	Class 2 Service	Disabled	—	
24	ACK0	Disabled	—	
25	Fibre Channel Tape Support	Disabled	—	
26	Fibre Channel Confirm	Disabled	—	
27	Command Reference Number	Disabled	—	
28	Read Transfer Ready	Disabled	—	
29	Response Timer	0	—	
30	Interrupt Delay Timer	0	—	
31	Data Rate	0	2	Auto Mode

Additionally, the Registry options are listed below. Use their respective default values for parameters.

- EnableLun0 = 1

Table F.11 Parameters Extracted from the Registry Options (using Host Bus Adapter Q-logic QLA2300F)

No	Parameter	Default	Value	Note
1	MaximumSGList	REG_DWORD:F0x21	—	
2	NumberOfRequests	0x96	—	
3	FabricSupported	—	—	
4	FabricDeviceCount	—	—	
5	ConfigRequired	—	—	
6	LargeLuns	0x01	—	
7	Portname	—	—	
8	FC Tape	—	—	
9	MSCS	2	—	In the case of MSCS configuration= 2 is mandatory.
10	UseSameNN	1	—	
11	EnableLun0	0	1	
12	TimeOutValue	0x3c	—	

When Tru64 UNIX 5.1 is used and you are connecting a 9500V directly or via an FC HUB by using a Host Bus Adapter KGPSA-CA, the Fibre Topology of the Host Bus Adapter must be set to **Loop**.

The following screen is an example of the operation procedure.

Example:

```
P00>> wwidmgr –show adapter                                    :Adapter item No. check
P00>> wwidmgr –set adapter –item[Adapter item No] –topo loop
```

When connecting a 9500V via an FC Switching HUB by using a Host Bus Adapter KGPSA-CA, the Fibre Topology of the Host Bus Adapter must be set to **Loop**.

The following screen is an example of the operation procedure.

Example:

```
P00>> wwidmgr –show adapter                                    :Adapter item No. check
P00>> wwidmgr –set adapter –item[Adapter item No] –topo fabric
```

When using HP-UX, specify the setting of disk cache in the Kernel Parameter to be without cache (default on HP-UX's); default_disk_ir=0.

This setting is required since volatile cache is not supported on the 9500V. The procedure for this operation is as follows:

1. Activate sam.
2. Select Kernel Configuration.
3. Select Configurable Parameters.
4. Confirm or specify as follows: defult_disk_ir=0.

Appendix G Power Cables

This section includes descriptions of the following power cables:

- J1H
- J2H
- J2H5
- J2H10

Table G.1 J1H Power Cable

Cable name	Part No.	Name	Quantity	Model	Applicable safety standard/ rating
DF-F600-J1H	1	Cable	-	PVC code	UL and CSA
Power cable	2	Connector A	1	NEMA Standard 5-15 P	For AC 125 V (13 A)
	3	Connector B	1	EN60320-C13	For standard use

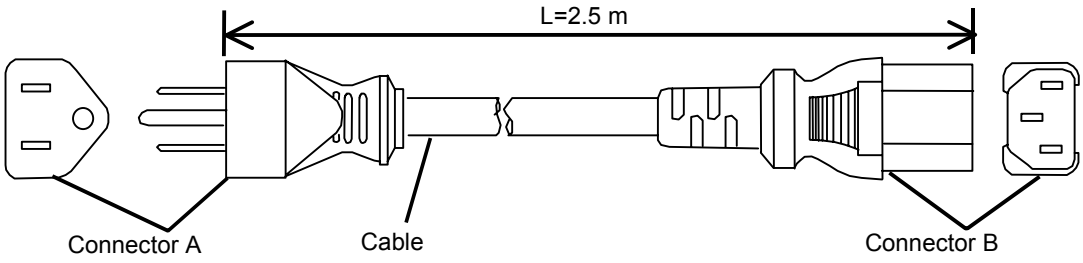


Figure G.1 Port Extender Dimensions

Table G.2 J2H Power Cable

Cable name	Part No.	Name	Quantity	Model	Applicable safety standard/ rating
DF-F600-J2H	1	Cable	-	PVC code	UL and CSA
Power cable	2	Connector A	1	EN60324-C14	For AC 250 V (10 A)
	3	Connector B	1	EN60324-C13	For rack frame

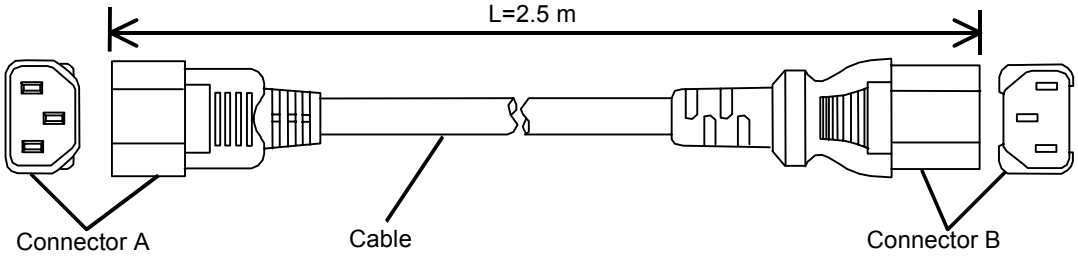


Figure G.2 J2H Power Cable

Table G.3 J2H5 and J2H10 Power Cables

Cable name	Part No.	Name	Quantity	Model	Applicable safety standard/ rating
DF-F600-	1	Cable	-	CENELEC	VDE
J2H5/J2H10	2	Connector A	1	EN60320-C14	For AC 200 V (13 A)
Power cable	3	Connector B	1	EN60320-C13	For rack frame

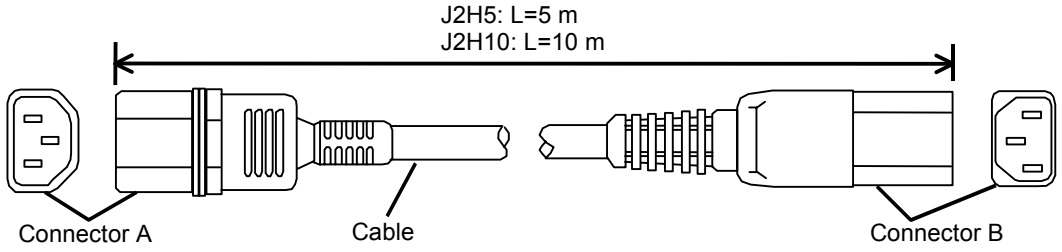


Figure G.3 J2H5 and J2H10 Power Cables