Areas Covered

Before Reading This Manual	This section explains the notes for your safety and conventions used in this manual.
Chapter 1 Overview (Features / Note)	Explains the overview of the disk array and features of the SCSI array controller.
Chapter 2 How to Use WebBIOS	Explains WebBIOS setup procedures. WebBIOS is a basic utility to set up and manage the onboard SCSI array controller. Read this chapter carefully before using WebBIOS.
Chapter 3 Installing Global Array Manager (GAM)	Explains how to install Global Array Manager (GAM) to use a SCSI array controller in a Windows Server 2003, Windows 2000 Server, or Linux environment.
Chapter 4 How to Use GAM	GAM is a basic utility to manage the disk array. Read this chapter carefully before use.
Chapter 5 Replacing a Hard Disk	Explains maintenance related issues, such as hard disk replacement.
Appendix	Explains RAID level and list of GAM error codes.

Before Reading This Manual

Remarks

■ Symbols

Symbols used in this manual have the following meanings.

IMPORTANT	These sections explain prohibited actions and points to note when using this device. Make sure to read these sections.
POINT	These sections explain information needed to operate the hardware and software properly. Make sure to read these sections.
→	This mark indicates reference pages or manuals.

■ Key Descriptions / Operations

Keys are represented throughout this manual in the following manner.
E.g.: [Ctrl] key, [Enter] key, [→] key, etc.
The following indicate pressing several keys at once:
E.g.: [Ctrl] + [F3] key, [Shift] + [↑] key, etc.

■ Entering Commands (Keys)

Command entries are displayed in the following way.

```
diskcopy  a:  a:
          ↑   ↑
```

- In the areas of the "↑" mark, press the [Space] key once.
- When using Windows or DOS OS, commands are not case sensitive.
- CD-ROM drive names are shown as [CD-ROM drive]. Enter your drive name according to your environment.
  [CD-ROM drive]:\setup.exe

■ Screen Shots and Figures

Screen shots and figures are used as visual aids throughout this manual. Windows, screens, and file names may vary depending on the OS, software, or configuration of the server used. Figures in this manual may not show cables that are actually connected for convenience of explanation.

■ Consecutive Operations

Consecutive operations are described by connecting them with arrows (→).

Example: Procedure of clicking the [Start] button, pointing to [Programs], and clicking [Accessories]

↓

Click [Start] → [Programs] → [Accessories].

■ Product Names

The following expressions and abbreviations are used throughout this manual.

table: Abbreviations of Product Names

Product name	Expressions and abbreviations		
PRIMERGY RX600 S2	This server or the server		
Microsoft® Windows Server™ 2003, Standard Edition	Windows Server 2003, Standard Edition	Windows Server 2003	Windows
Microsoft® Windows Server™ 2003, Enterprise Edition	Windows Server 2003, Enterprise Edition		
Microsoft® Windows Server™ 2003, Standard x64 Edition	Windows Server 2003 x64		
Microsoft® Windows Server™ 2003, Enterprise x64 Edition			
Microsoft® Windows® 2000 Server	Windows 2000 Server		
Microsoft® Windows® 2000 Advanced Server	Windows 2000 Advanced Server		
Red Hat Enterprise Linux AS (v.3 for x86)	Linux		
Red Hat Enterprise Linux AS (v.4 for x86)			
Red Hat Enterprise Linux AS (v.4 for EM64T)			

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Chapter 1

Overview (Features / Note)

This chapter explains the overview of the disk array and features of the SCSI array controller.

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1.1 Overview

Explains the overview of the disk array and features of the SCSI array controller.

1.1.1 Onboard SCSI Array Controller

The following shows the SCSI array controller(MegaRAID SCSI 320-2E)explained in this manual.

table: Performance of MegaRAID SCSI 320-2E

Items	Contents
Number of SCSI channels	2
Battery	Available
Cache size	256MB
OS	Windows Server 2003 / Windows 2000 / Linux

POINT

- Battery for cache memory backup.
- Installation of TCP/IP and ServerView are required on all OSes, also please apply the latest Service Pack to each OS.
- For the supported Linux distribution, refer to the latest system configuration chart.

1.1.2 Disk Array

A disk array or Redundant Array of Independent Disks (RAID) is a system that can improve performance and reliability compared to a single hard disk, by using a disk controller and multiple hard disks. Access to each hard disk is controlled by the disk controller, but different control methods are used depending on the RAID level settings. It is also possible to give the disk redundancy so that the system can be operated continuously without losing data even when one hard disk fails.

1.1.3 RAID Level

There are several types of RAID level, each of which has different characteristics. The RAID level supported by the onboard SCSI array controller of this server is 1, 5, and 10. Depending on the RAID level, the number of available hard disks, available capacity and applicability of redundancy are different. The following briefly summarizes the characteristics of the supported RAID levels.

table: Features of RAID Level

RAID Level	Number of hard disks	Available capacity	Redundancy
RAID 1	2	Capacity of 1 hard disk	Applied
RAID 5	3 ～ 5	Capacity of 1 hard disk × (Number of hard disks -1)	Applied
RAID 10	4	Capacity of 1 hard disk × (Number of hard disks /2)	Applied

POINT

- Regardless of the applicability of redundancy, data backup should be performed as frequently as possible just in case.
- It is recommended to specify a redundant RAID level (RAID 1, RAID 5 or RAID 10) during normal use. With 4 or more hard disks, specify RAID 5 when priority is placed on capacity, or specify RAID 10 when priority is placed on performance.
- For details of supported RAID levels, refer to "A RAID Level" (→pg.122).

1.1.4 Physical Pack and Logical Drive

■ Physical Pack

A physical pack is a group of physical hard disks that compose a disk array. It is not recognized by the OS.

IMPORTANT

- A physical pack can consist of 2 to 5 hard disks.
- For hard disks in the same physical pack, use hard disks of the same model (with the same capacity and speed) as a rule.
- Maximum capacity of one physical pack should not exceed 2TB.

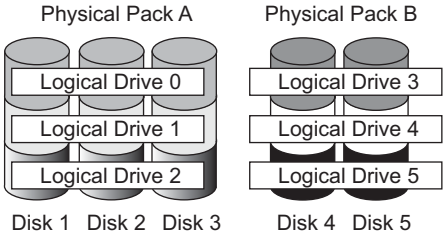
■ Logical Drive

A logical drive is a logical hard disk space existing in a physical pack. It is recognized in the same manner as a single hard disk by the OS. The RAID level is specified respectively for each logical drive.

IMPORTANT

- Do not set logical drives of different RAID levels in the same physical pack.
- Maximum capacity of one logical drive is 2TB.
- When creating RAID 10, do not create multiple logical drives in the same physical pack.
- Up to 8 logical drives can be set.

In the following example, 2 physical packs (Physical Packs A and B) are created using 5 hard disks, and on those packs, 6 logical drives are created. It is recognized by the OS as if 6 hard disks are connected.



In this case, use hard disks of the same capacity and speed for Disks 1 - 3 (Disks 4 - 5). Logical Drives 0 - 2 and Logical Drives 3 - 5 must be set to the same RAID level respectively.

Logical drive has 3 types of status as follows:

- Online
  Indicates that the logical drive is operating properly.

- Critical
  Indicates that the redundant logical drive (RAID 1, RAID 5 or RAID 10) is operating without redundancy due to a failure of 1 hard disk. In this case, replace the failed hard disk as immediately as possible and perform the procedure to recover the status to "Online" (rebuild). For details, refer to "1.1.7 Rebuild" (→pg.14).
- Offline
  Indicates that the logical drive is not operating. This status occurs when 2 or more hard disks in a physical pack fail. In this case, data in the logical drive will be lost.

In the case shown in the figure above, if Disk 1 in Physical Pack A fails for instance, the status of all Logical Drives 0 - 2 becomes "Critical". If another disk (e.g. Disk 2 or 3) fails in addition, the status of all Logical Drives 0 - 2 becomes "Offline". In this case, Logical Drives 3 - 5 of Physical Pack B remain in "Online" status.

1.1.5 Write Mode

Write Mode or Write Cache is the mode for writing to cache memory. There are 2 modes of Write Mode: Write Through and Write Back. The following explains these modes.

■ Write Through

In this mode, when an instruction to write data is issued from the system to a logical drive, completion of writing instruction is reported to the system after data write to hard disk is completed.

■ Write Back

In this mode, when an instruction to write data is issued from the system to a logical drive, completion of writing instruction is reported to the system at the same time as data is written to cache memory, and data write to hard disk is performed later. Therefore, higher writing processing performance can be obtained than Write Through, but risk of data loss becomes higher. This is because data that is not written to hard disk may remain in cache memory after completion of writing instruction.

1.1.6 Initializing a Logical Drive

To use a logical drive in the optimum status, the logical drive needs to be initialized. There are 2 methods to initialize a logical drive as described below.

■ Initialization by WebBIOS

In this method, "0 (zero)" is written in all areas of logical drive to initialize before using the drive. This requires a certain amount of time because writing operations are performed for all areas of all hard disks. Execution time of initialization by WebBIOS per 1GB is as shown in the following table. For example, capacity of a RAID 5 logical drive consisting of 3 units of 73GB hard disks is 146GB (= 73GB × (3 - 1)), which requires approximately 22 minutes (= approx. 9 sec./ GB × 146GB) to execute initialization. However, the time may differ from the table depending on the configuration and hard disk type. Use the table only as a guide.

table: Estimated time of initialization by WebBIOS per 1GB

RAID level	Number of hard disks	Execution time per 1GB
RAID 1	2 units	18 sec./GB
RAID 5	3 units	9 sec./GB
	5 units	3 sec./GB
RAID 10	4 units	11 sec./GB

■ Background Initialization

In this method, initialization of logical drive is performed in parallel with normal I/O access operations from the host. If initialization by WebBIOS is not executed, background initialization is automatically executed. This can save time for initialization by WebBIOS, but the following points must be noted.

IMPORTANT

- During background initialization, access to the hard disk may occur regardless of normal I/O access.
- When executing background initialization using a hard disk that may include data such as partition information because of its previous use in another system, low level format of the hard disk on the other system is required prior to physical connection (addition).

POINT

- Background initialization starts automatically when the SCSI array controller checks redundant logical drives (RAID 1/RAID 5/RAID 10) and detects a drive that is not initialized. The SCSI array controller checks uninitialized logical drives every 5 minutes.
- If the server is reset or turned off before completion of background initialization, background initialization operations are stopped.
  At the next restart, background initialization resumes from the block where the process stopped.
- Before completion of background initialization, I/O processing performance may be less sufficient compared to the logical drives that have been initialized.
- During background initialization operations, the access LED of the hard disks that compose the target logical drive remains on.

When no normal I/O access is performed, execution time of background initialization per 1GB is as shown in the following table. For example, capacity of a RAID 5 logical drive consisting of 3 units of 73GB hard disks is 146GB (= 73GB × (3 - 1)), which requires approximately 278 minutes (= 1.9 min./GB × 146GB) to execute background initialization. However, if initialization is executed in parallel with normal I/O access, longer time may be required. In addition, the time may differ from the table depending on the configuration and hard disk type. Use the table only as a guide.

table: Estimated time of background initialization per 1GB

RAID level	Number of hard disks	Execution time per 1GB
RAID 1	2 units	2.9 min./GB
RAID 5	3 units	1.9 min./GB
	5 units	1.2 min./GB
RAID 10	4 units	2.8 min./GB

1.1.7 Rebuild

Even when 1 hard disk in a physical pack fails, if a logical drive in the physical pack has redundancy (RAID 1, RAID 5 or RAID 10), the logical drive continues to operate in "Critical" status. However, if another hard disk in the same physical pack fails in addition, the status of the logical drive becomes "Offline". Rebuild is the operation to recover a logical drive in "Critical" status to "Online" status. There are 2 methods of rebuild as described below.

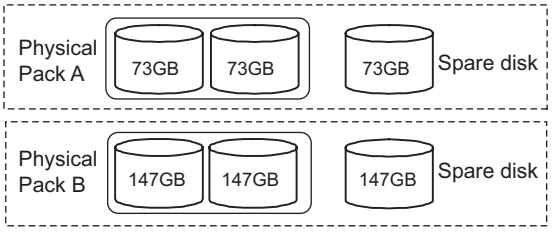
■ Hot Spare (Standby) Rebuild

Hot Spare (Standby) Rebuild is rebuild performed automatically by having a spare hard disk installed in advance. Hot Spare Rebuild is performed prior to replacement of a failed hard disk. The spare hard disk prepared in advance is called a spare (standby) disk. The rebuild that is performed automatically prior to replacement of the failed hard disk by having a spare hard disk installed in advance is called Hot Spare (Standby) Rebuild. When a hard disk failure occurs, rebuild is immediately performed on the spare hard disk, which minimizes the time in "Critical" status. This will improve system safety. The new hard disk replaced with the failed hard disk is used as a spare disk. For how to replace hard disks, refer to "5.1 Replacing a Hard Disk" (→pg.114).

● Pay attention to the spare disk

This is required to perform a Hot Spare Rebuild. A spare disk is used as a substitute for a failed hard disk. Pay attention to the following points.

- For the spare disk, use a hard disk of the same capacity and speed as the hard disk connected in the physical pack.
- If a spare disk is set when multiple physical packs that use different hard disks exist, at least 1 spare disk of the same capacity and speed must be set for each physical pack.



■ Manual Rebuild

Manual Rebuild is rebuild performed by replacing a failed hard disk with a new hard disk. When no spare disk is prepared, the disk array needs to be repaired through Manual Rebuild. Until replacement of hard disks and rebuild completion, the logical drive continues to operate in "Critical" status. For how to replace hard disks, refer to "5.1 Replacing a Hard Disk" (→pg.114).

When no normal I/O access is performed, execution time of rebuild per 1GB is as shown in the following table. For example, capacity of a RAID 5 logical drive consisting of 3 units of 73GB hard disks is 146GB (= 73GB × (3 - 1)), which requires approximately 219 minutes (= approx. 1.5 min./ GB × 146GB) to execute rebuild. However, if rebuild is executed in parallel with normal I/O access, longer time may be required. In addition, the time may differ from the table depending on the configuration and hard disk type. Use the table only as a guide.

table: Estimated time of manual rebuild per 1GB

RAID level	Number of hard disks	Execution time per 1GB	
		Rebuild Rate=50	Rebuild Rate=100
RAID 1	2 units	3.0 min./GB	0.4 min./GB
RAID 5	3 units	1.5 min./GB	0.3 min./GB
	5 units	0.4 min./GB	0.2 min./GB
RAID 10	4 units	1.5 min./GB	0.3 min./GB

POINT

- The default of [Rebuild Rate] is "50%".
  To reduce the time required for rebuild operation, change the [Rebuild Rate] to "100%". However, if I/O load becomes high in 100% setting, set back the value to "50%".
  After the rebuild operation is completed in 100%, restore the value to the default, "50%". [Rebuild Rate] can be set from [Adapter Properties] of WebBIOS or from "4.4.2 Setting and Changing Controller Options" (→pg.81) of GAM.
- If restart or shutdown is executed during the rebuild, rebuild resumes at the next launch starting from the position where the process stopped.

1.1.8 Expand Capacity

Expand Capacity is a function to expand capacity of physical packs by adding hard disks without destroying existing data. The following figure shows an example of adding 2 hard disks to Physical Pack A consisting of 3 hard disks. Re-striping is performed for 5 hard disks without destroying the data in the logical drive, and the amount of capacity of the additional hard disks is added to the logical drive.

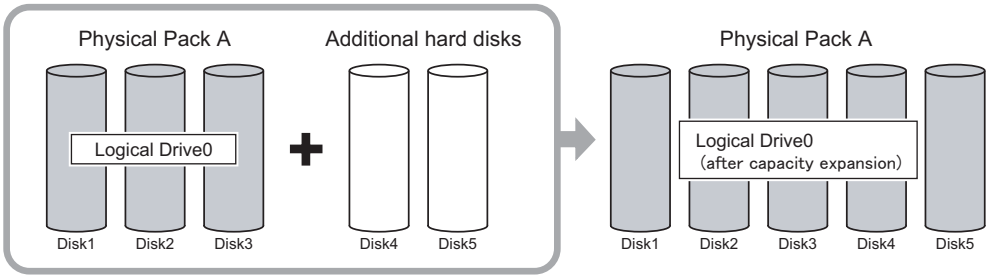


table: About the RAID level after expand capacity

Current RAID level	RAID level after capacity expansion (When hard disk is added: RAID Migration (with addition))
RAID 1	RAID 5
RAID 5	RAID 5
RAID 10	Disabled

IMPORTANT

- Expand Capacity can be used only on Windows Server 2003 / Windows 2000 Server. When using Linux, do not perform capacity expansion.
- Capacity of a RAID 10 logical drive cannot be expanded.
- When multiple logical drives are defined in a physical pack, capacity cannot be expanded.

When no normal I/O access is performed, execution time of capacity expansion per 1GB is as shown in the following table (when 1 hard disk is added and when 3 hard disks are added). For example, capacity of a RAID 5 logical drive consisting of 3 units of 73GB hard disks is 146GB (= 73GB × (3 - 1)), which requires 584 minutes (= 4.0 min./ GB × 146GB) to execute capacity expansion by adding 1 hard disk. However, if capacity expansion is performed in parallel with normal I/O access, longer time may be required. In addition, the time may differ from the table depending on the configuration, hard disk type and the number of added hard disks. Use the table only as a guide.

table: Estimated time of capacity expansion per 1GB

RAID level before expansion	Number of hard disks	RAID level after expansion	Execution time per 1GB	
			When 1 unit is added	When 3 units are added
RAID 1	2 units	RAID 5	6.0 min./GB	3.3 min./GB
RAID 5	3 units	RAID 5	4.0 min./GB	2.9 min./GB
	5 units	RAID 5	2.1 min./GB	1.9 min./GB

POINT

- Only capacity of logical drives is expanded by Expand Capacity. Capacity of partitions is not expanded.

1.1.9 Consistency Check

Consistency Check is a function to check consistency between data on redundant logical drives (RAID 1, RAID 5 or RAID 10) and mirrored data or parity data, or in other words, to check reliability of the data. In addition to a data reliability check, Consistency Check also automatically corrects media errors of hard disks (not consistency errors).

When no normal I/O access is performed, execution time of consistency check per 1GB is as shown in the following table. For example, capacity of a RAID 5 logical drive consisting of 3 units of 73GB hard disks is 146GB (= 73GB × (3 - 1)), which requires approximately 278 minutes (= approx. 1.9 min./ GB × 146GB) to execute a consistency check. However, if a consistency check is executed in parallel with normal I/O access, longer time may be required. In addition, the time may differ from the table depending on the configuration and hard disk type. Use the table only as a guide.

table: Execution time of consistency check per 1GB

RAID level	Number of hard disks	Execution time per 1GB
RAID 1	2 units	2.9 min./GB
RAID 5	3 units	1.9 min./GB
	5 units	1.2 min./GB
RAID 10	4 units	2.8 min./GB

IMPORTANT

- During normal use, execution of consistency check is not required because Patrol Read is performed periodically. Execute consistency check when proper shutdown processing is not performed, which may cause data inconsistency.

POINT

- Whether to automatically correct errors detected by consistency check or not can be set with parameters. During normal use, it is recommended to set the parameter to automatically correct the errors. For setting procedures on WebBIOS, refer to "2.3.2 Viewing/Changing Array Controller Properties" (→pg.27). For setting procedures on GAM, refer to "4.7.1 Consistency Check" (→pg.111).

1.1.10 Patrol Read

Patrol Read is a function to detect/correct media errors of hard disks in advance. With RAID 1/RAID 5/ RAID 10, media errors of hard disks are corrected.

With RAID 1/RAID 5/RAID 10, periodical execution of Patrol Read can reduce data loss at rebuild due to media errors.

The Patrol Read function is set to be automatically executed every 168 hours (a week). Patrol Read is executed when no normal I/O access is performed, causing no impact on performance.

POINT

- Media errors are recovered also during normal I/O access. However, if the errors are recovered beforehand with Patrol Read, overhead at recovery during normal I/O access can be eliminated.
- While executing Patrol Read, the access LED of the target hard disk (1 unit) remains on.

Chapter 2

How to Use WebBIOS

This chapter explains WebBIOS setup procedures. WebBIOS is a basic utility to set up and manage the onboard SCSI array controller. Read this chapter carefully before using WebBIOS.

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2.1 Starting Up WebBIOS

This section explains how to start up WebBIOS. Start of WebBIOS can be instructed from the BIOS at system startup, regardless of whether the OS has been installed or not on the computer to be used.

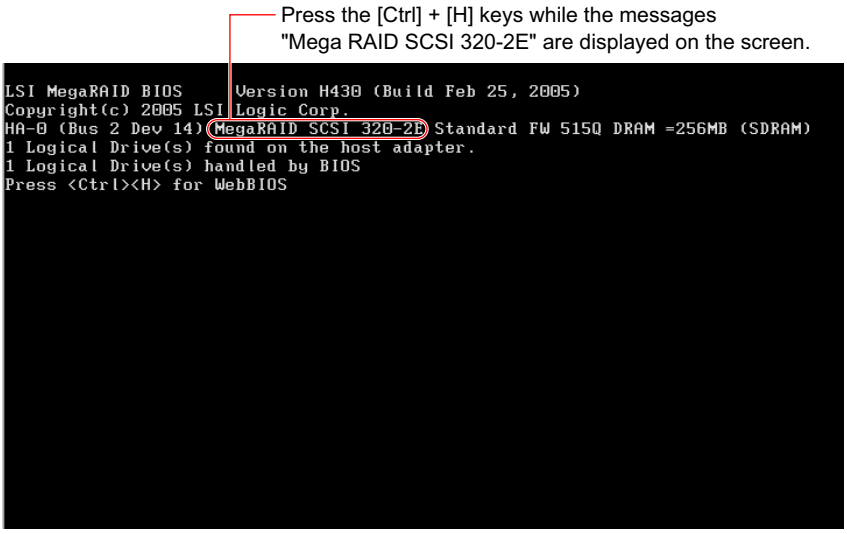
IMPORTANT

- To use the WebBIOS, the mouse needs to be connected. Before starting the WebBIOS, make sure the mouse is connected. Also, to make available the mouse, press the [Ctrl] and [H] key in the onboard SCSI RAID controller POST screen which is displayed as "Mega RAID SCSI 320-2E" on starting up the WebBIOS.
  Even if you install the SCSI RAID (PG-142E3) and press the [Ctrl] and [H] key in the PG-142E3 POST screen, mouse is not available. Restart the system.

2.1.1 How to Start Up WebBIOS

Perform the following procedure to start up WebBIOS.

1 Turn on the server, and press the [Ctrl] + [H] keys while the following messages are displayed on the screen.



POINT

- Press the [Ctrl] + [H] keys while the message "Press <CTRL><H> for WebBIOS" is displayed in the last line on the screen.
- If the following error message is displayed during POST, the message "Press <CTRL><H> for WebBIOS" is not displayed. The system is automatically restarted when POST completes and configuration information of the hard disk is restored. Do not use WebBIOS.

```
Configuration of NVRAM and drives mismatch.
Press any key to enter the Configuration Utility.
```

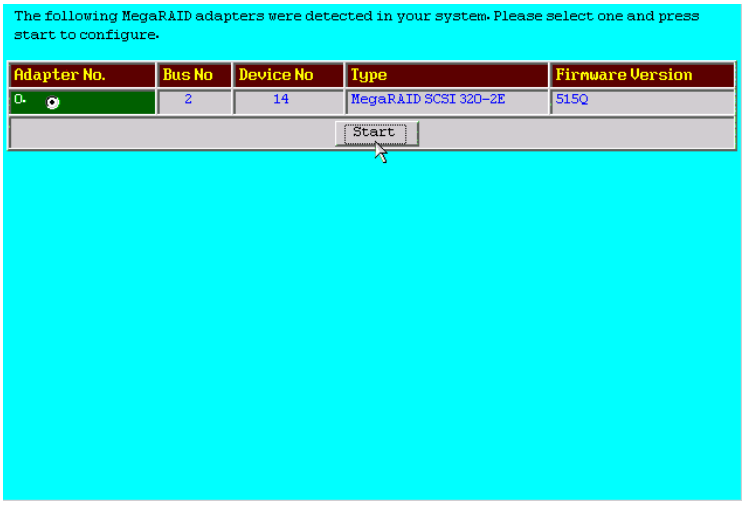
- If the following error message is displayed during POST phase, stop the operation and contact an office listed in the "Contact Information" of the "Start Guide".

```
Unresolved configuration mismatch between
disk(s)and NVRAM on the adapter
```

The following message appears and WebBIOS starts up after system BIOS operations complete.

```
WebBIOS will be executed after POST is over
```

When WebBIOS starts, the [Adapter Selection] window of WebBIOS appears. If any other array card is mounted at the same time, multiple SCSI array controllers are displayed.

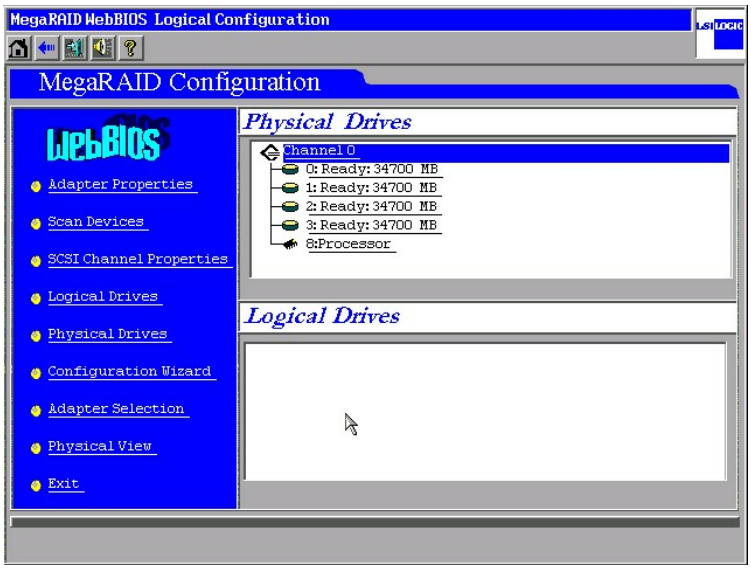


POINT

- For the onboard SCSI array controller, [Type] in the window shown above is displayed as "MegaRAID SCSI 320-2E".

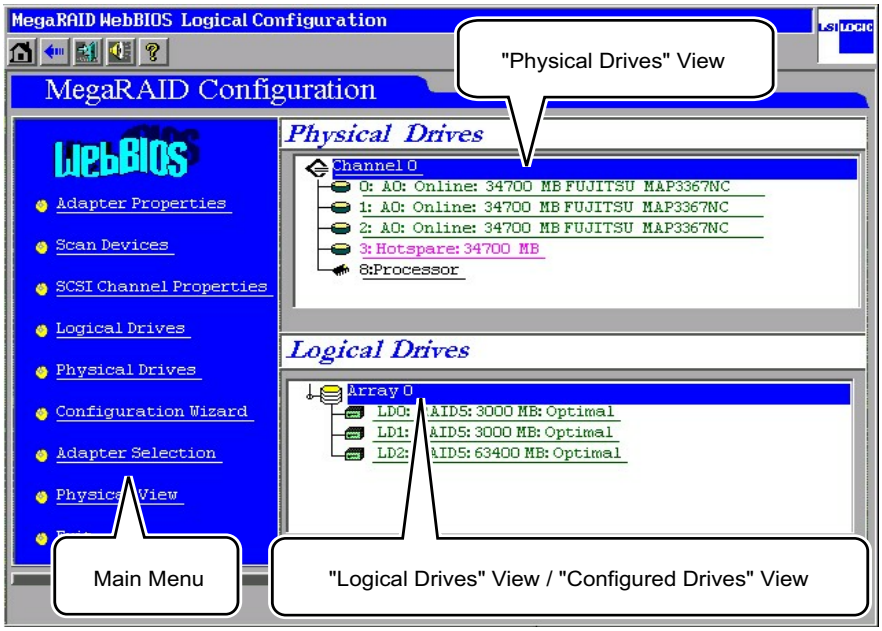
2 Select the SCSI array controller to be accessed, and click [Start].

The main window appears.



2.2 WebBIOS Window Layout

Start WebBIOS and select a SCSI array controller (when multiple SCSI array controllers are installed). The main menu of WebBIOS will appear.
The main menu of WebBIOS consists of 3 areas.



2.2.1 Main Menu

This is the main menu of WebBIOS.

table: Main menu of WebBIOS

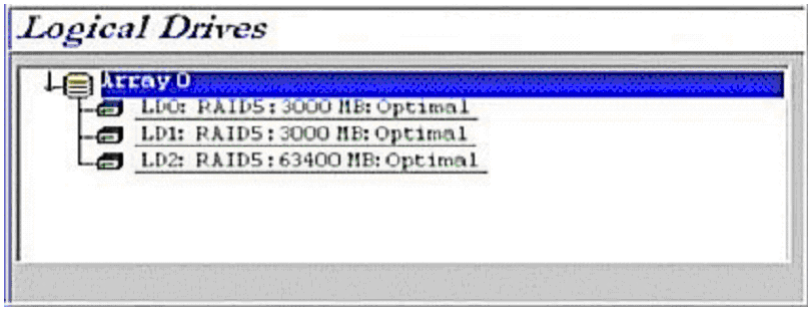
Menu	Description
Adapter Properties	Allows you to view/change the properties settings of the array controller.
Scan Devices	Redetects the hard disks connected.
SCSI Channel Properties	Configures the [SCSI Channel] properties.
Logical Drives	This function is not supported. Do not use this function.
Physical Drives	This function is not supported. Do not use this function.
Configuration Wizard	Creates and adds/deletes RAID configurations.
Adapter Selection	Switches array controllers.
Physical View	Displays the [Configured Drives] view.
Logical View	Displays the [Logical Drives] view.
Exit	Exits WebBIOS.

2.2.2 [Physical Drives] View

Displays all channels of SCSI array controllers and hard disks connected to each channel. Also displays the status of each hard disk.

2.2.3 [Logical Drives] View/[Configured Drives] View

The [Logical Drives] view displays the relationship between a physical pack (Array) and logical drives. This also displays the RAID level, capacity and status of logical drives.



The [Configured Drives] view displays the relationship between a physical pack and the hard disks that compose the physical pack. This also displays the status and capacity of hard disks.

POINT

- The [Logical Drives] view and the [Configured Drives] view can be switched by selecting [Logical View] or [Physical View] from the main menu.
- With RAID 10, the first logical drive is displayed as "RAID 1". Other logical drives are displayed as "(Contd)".

2.3 Array Controller Properties Setting

Array controller settings can be checked using WebBIOS. Before creating an array configuration, make sure to check the array controller settings.

2.3.1 SCSI Array Controller Properties Default Settings

The properties of the SCSI array controller need to be configured as follows. However, [Rebuild Rate] and [ChkConst Restore] can be changed.

table: SCSI Array Controller Properties Default Settings

Properties	Parameter	Default setting
Adapter Properties	Battery Backup	Present (Fixed value)
	RAM Size	256MB (Fixed value)
	Cluster Mode	Disabled
	Initiator ID	7
	Rebuild Rate	50
	Flex RAID Power Fail	Enabled
	Alarm Control	Disabled
	Adapter BIOS	Enabled
	Set Factory Defaults	No
	ChkConst Restore	Enabled
	Force Boot Option	On
	Bios Stops on Error	Off
	BIOS Echoes Messages	On
	Bios Config Auto Selection	DISK
	Spin up Parameters	2 per 6 sec
	Fast Initialization	Disabled
	PCI Delay Trans	Enabled
	Auto Rebuild	Enabled
	Class Emulation Mode	Mass Storage
	Temporary RAID Offline	Enabled
SCSI Channel Properties (both for Channel 0/Channel 1)	Termination	Enabled
	SCSI Capabilities	U320

■ Property Details

The meaning of each parameter of Adapter Properties is shown in the table below.

table: meaning of each parameter of Adapter Properties

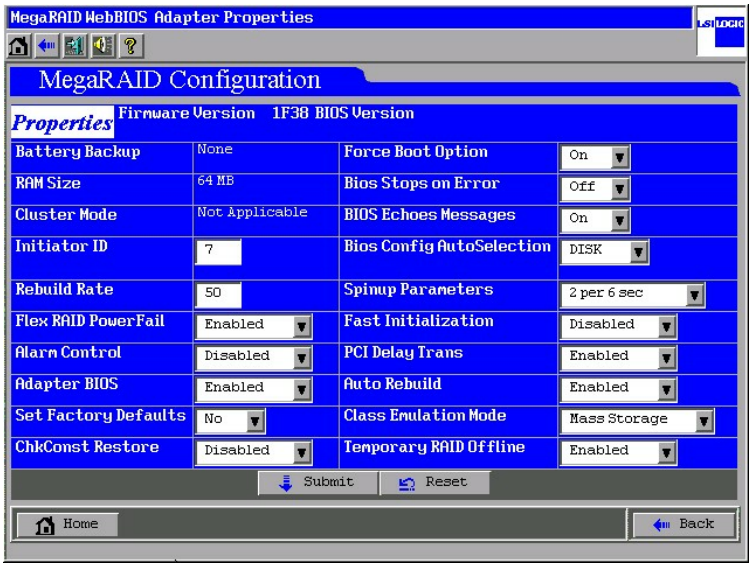
Parameter	Meaning
Battery Backup	Specifies whether a battery is installed or not. In this product, "Present" is fixed values.
RAM Size	Specifies the memory size of RAM for cache. In this product, "256MB" is fixed values.
Cluster Mode	This parameter is not supported. Do not change this.
Initiator ID	Specifies the SCSI ID of the initiator. For this product, set this parameter to "7".
Rebuild Rate	Specifies the priority of rebuilding. The default value is 50. If it is changed to 100, rebuild time can be reduced.
Flex RAID Power Fail	Specifies whether continued operation of capacity expansion is enabled/disabled after power off. For this product, set this parameter to "Enabled".
Alarm Control	Controls the speaker for alarm on the card of this product. For this product, set this parameter to "Disabled".
Adapter BIOS	Specifies whether BootBIOS in the card is enabled/disabled. The default value is "Enabled".
Set Factory Defaults	This parameter is used to restore when settings buying it. Do not use this during normal use.
ChkConst Restore	Specifies whether automatic correction of errors detected by consistency check is performed or not. When set to "Disabled", detected errors are not corrected automatically.
Force Boot Option	Continues the startup process without waiting for key entry when startup is available.
Bios Stops on Error	Stops in POST when a problem is detected in configuration information during startup.
BIOS Echoes Messages	Specifies whether POST messages are displayed on screen or not. When set to "Disabled", the message "press [Ctrl] [H]" is not displayed during POST of MegaRAID. Although the message is not displayed, pressing [Ctrl] and [H] allows entry to WebBIOS.
Bios Config Auto Selection	Specifies the source to read array configuration information. For this product, set this parameter to "DISK".
Spin up Parameters	Specifies the number of hard disk drives that start rotating at the same time and the parameter of rotation start between hard disk drives in sequence. For this product, set this parameter to "2per6sec".
Fast Initialization	This parameter is not supported. For this product, set this parameter to "Disabled".
PCI Delay Trans	Specifies whether PCI delayed transfer is enabled/disabled. For this product, set this parameter to "Enabled".
Auto Rebuild	Specifies whether rebuild is performed automatically or not after detecting a failed hard disk drive and installing a new hard disk drive.
Class Emulation Mode	Only "Mass storage class" is supported. Set this parameter to "Mass Storage".
Temporary RAID Offline	Specifies whether the function to handle a failed hard disk drive used for an array in "Critical" status temporarily as "Online" is enabled/disabled. The default value is "Enabled".
Termination	Specifies whether termination of the SCSI array controller is enabled/disabled. For this product, set this parameter to "Enabled".
SCSI Capabilities	Specifies the SCSI transfer capability of the SCSI array controller. For this product, set this parameter to "U320".

2.3.2 Viewing/Changing Array Controller Properties

Perform the following procedure to check properties of the SCSI array controller.

1. Select the array controller to set from the [Adapter Selection] window, and click [Start].

2. Click [Adapter Properties]. The [Properties] window of the SCSI array controller appears.
   Check and change the settings for each option, referring to the table in "2.3.1 SCSI Array Controller Properties Default Settings" (→pg.25).



3. Check that the settings are properly configured, and click [Submit].
   The properties are committed with the settings currently displayed.

POINT

- Click [Home] to return to the main menu.

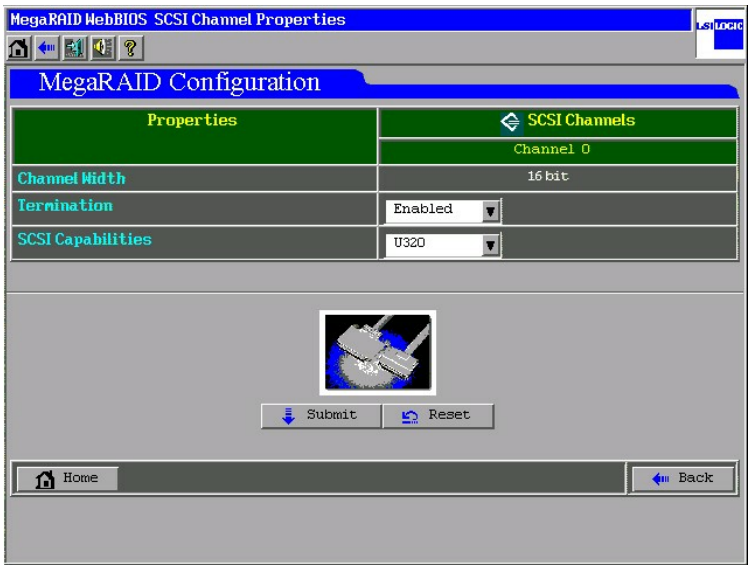
2.3.3 How to View/Change SCSI Channel Properties

Perform the following procedure to check the SCSI Channel properties. Configure the setting for each channel (Channel 0/Channel 1).

1. Select the array controller to set from the [Adapter Selection] window, and click [Start].
   The main menu of WebBIOS appears.

2 Click [SCSI Channel Properties].

The [Properties] window appears. Check and change the settings for each option, referring to the table in "2.3.1 SCSI Array Controller Properties Default Settings" (→pg.25).



3 Check that the settings are properly configured, and click [Submit].

The properties are committed with the settings currently displayed.

POINT

- Click [Home] to return to the main menu.

2.4 Creating a Disk Array Configuration

This section explains how to create a disk array configuration.

2.4.1 Overview of creating a disk array configuration

An overview of procedures for creating a disk array configuration is as follows.

- Selecting creation of a new configuration or addition of configuration to the current configuration
- Creating a physical pack
- Selecting the RAID level
- Setting the Write mode
- Setting capacity of the logical drive
- Setting a spare disk

When using RAID 10, note the following points.

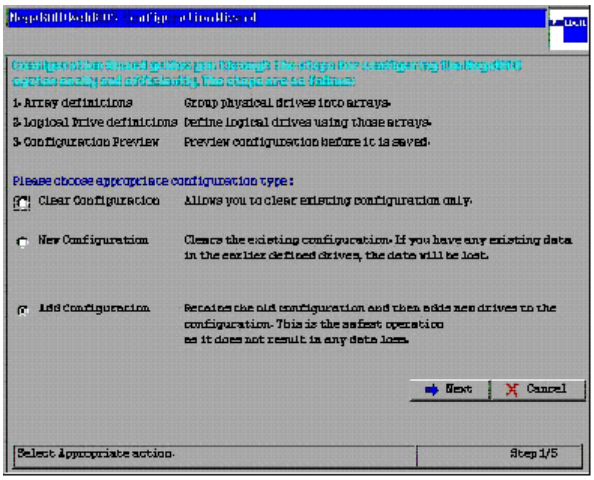
- RAID 10 logical drives cannot be created using GAM. Create them using WebBIOS.
- For RAID 10 logical drives, capacity expansion and RAID level conversion are not available.
- In a physical pack of RAID 10, multiple logical drives cannot be defined.
- Do not create a physical pack for RAID 1/RAID 5 at the same time as creating RAID 10.

2.4.2 How to Create a Disk Array Configuration

Perform the following procedure to set a disk array configuration.

1 Click [Configuration Wizard] from the main menu.

The [Configuration Wizard] window appears.



2 Select [New Configuration] when creating a new disk array configuration, or [Add Configuration] when adding a logical drive to the current disk array configuration. Then click [Next].

IMPORTANT

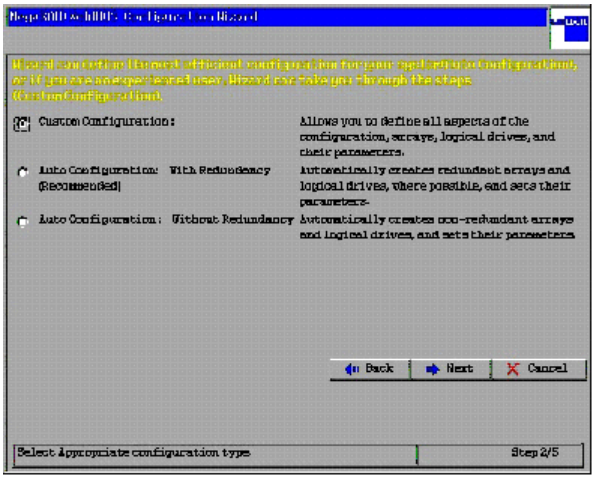
- If [New Configuration] is used when a disk array configuration already exists, the current configuration is deleted. Note that data in the disk array is also deleted.

POINT

- To add a new logical drive while keeping the existing logical drive, use [Add Configuration].
- If [New Configuration] is selected when a RAID configuration already exists, the warning message as shown below is displayed. If you want to delete the existing configuration, click [Yes] to proceed.

```
This is a Destructive Operation!
Original configuration and data will be lost.
Select YES, if desired so.
```

3 Select [Custom Configuration] and click [Next].



IMPORTANT

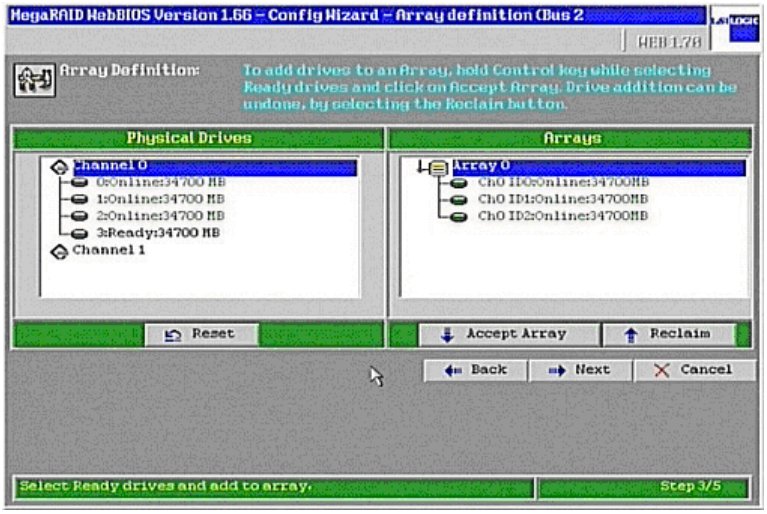
- [Auto Configuration With Redundancy] and [Auto Configuration Without Redundancy] are not supported. Do not select these.

4 Create a physical pack.

The following procedures are executed.

1. The hard disk that wants to be added to physical pack is selected while pushing the [Ctrl] key from the "Physical Drives" area.
   At this time, the hard disk that can be selected is displayed as "Ready".
2. Click [Accept Array].
   The physical pack is committed and displayed in the [Arrays] area.

Repeat the above-mentioned procedure and set a required number of physical packs.



IMPORTANT

- When creating RAID 10, do not create a physical pack for RAID 1/RAID 5 at the same time. At this point, define only the physical pack to be used for RAID 10, and define the RAID 10 logical drive according to this procedure. Then define RAID 1/RAID 5 using [Configuration Wizard] → [Add Configuration] again.
- Press the [Ctrl] key only when clicking the mouse. While moving the mouse cursor, release the [Ctrl] key.
- For hard disks in a physical pack, use hard disks of the same model (with the same capacity and speed) as a rule.

POINT

- Hard disks that are already incorporated in a physical pack are displayed as "Online" in green letters.
- If a wrong physical pack is set, click [Back] and perform the procedure from Step 3 again.

The number of hard disks to be used for the disk array is determined depending on the RAID level applied to the logical drive. Refer to the table below.

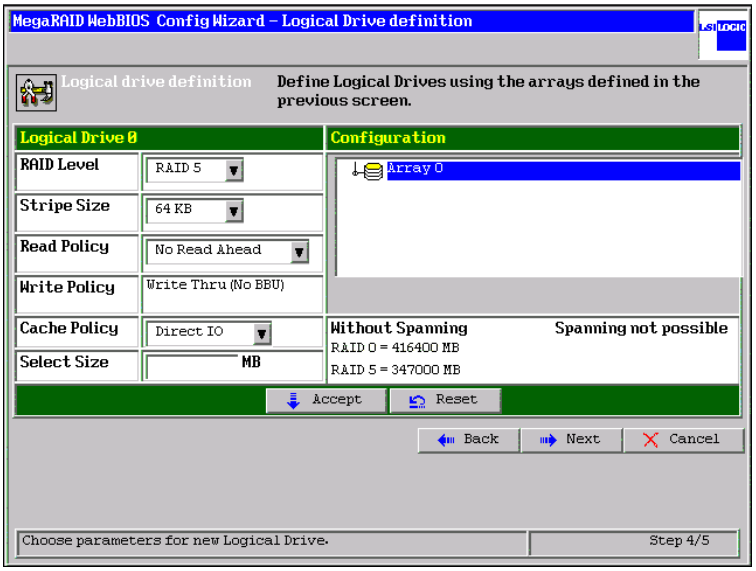
table: The number of hard disks to be used for the disk array

RAID level	Number of hard disks
RAID1	2 units
RAID5	3 units or more
RAID10	4 units * 2 or more physical packs consisting of 2 units are required.

5 When defining of the physical pack is completed, click [Next].

The [Logical drive definition] window appears. Creates the logical drive from the physical pack with the smallest number.

(For example, if the [Configuration] area has physical packs named "Array0" and "Array1," defining the logical drive starts from the physical pack "Array0.")



6 Select [RAID Level] to set for the logical drive.

POINT

- Do not create logical drives of different RAID levels in a single physical pack.
- Do not create logical drives of different RAID levels in a single physical pack.
  Set [RAID Level] to RAID 1 when creating RAID 10 logical drives. This requires 2 or more unused consecutive physical packs consisting of 2 hard disks.

7 Set [Stripe Size], [Read Policy] and [Cache Policy] as follows:

table: Set value

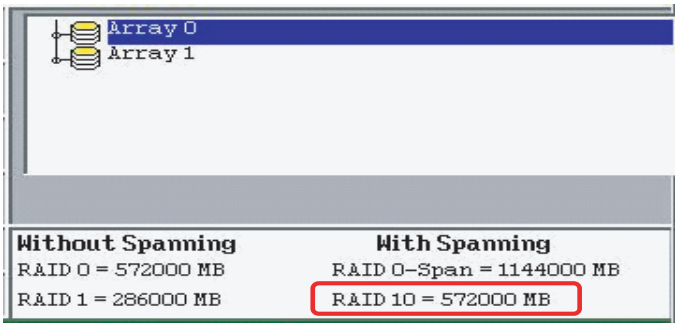
Items	Set value
Stripe Size	64KB
Read Policy	No Read Ahead
Cache Policy	Direct IO

8 In [Select Size], enter capacity of the logical drive to be created in units of MB.

The maximum value of capacity that can be entered here is: the value displayed in [Without Spanning] in case of RAID 1/RAID 5, and the value displayed in [With Spanning] in case of RAID 10. When creating multiple logical drives in a physical pack, specify a value of the maximum capacity or less so as to leave space for logical drives to be defined later.

POINT

- When creating a RAID 10 logical drive, the maximum value (the value displayed in [RAID 10 size] below [With Spanning]) must be set to [Select Size] and multiple RAID 10 logical drives cannot be created in a physical pack.

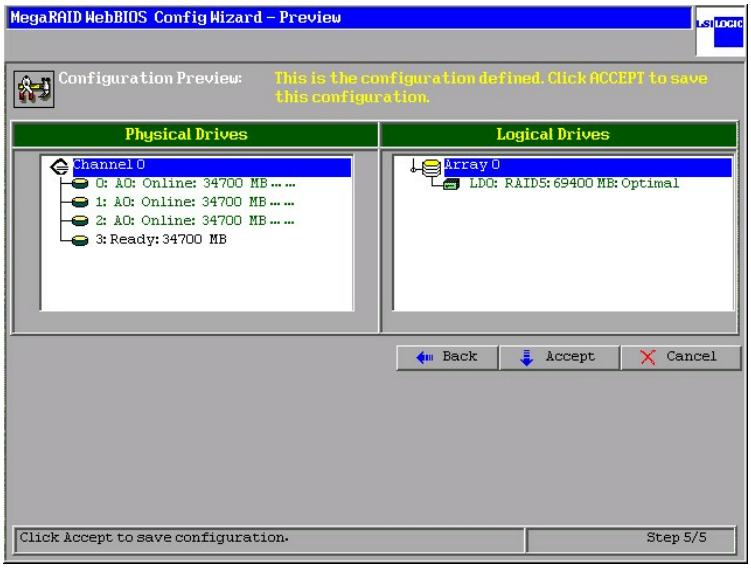


Enter this value when creating RAID10

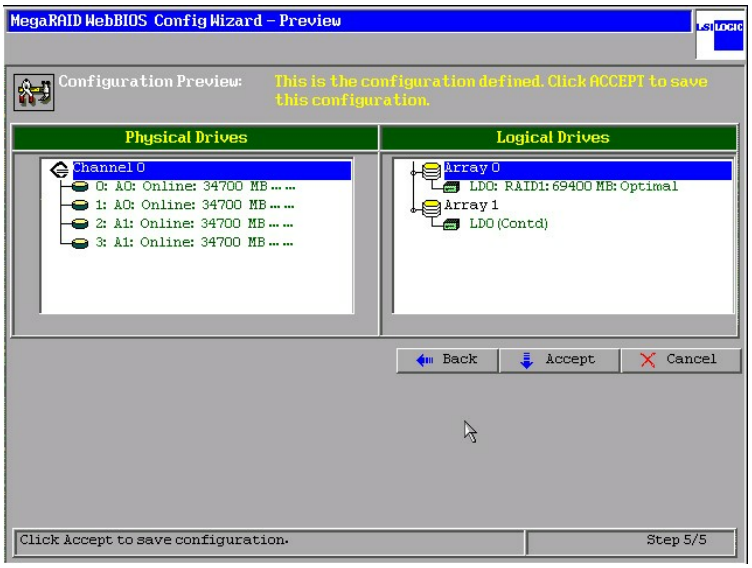
9 Add the logical drive.

Click [Accept]. The logical drive is added under the physical pack in the [Configuration] area. If capacity to set other logical drives remains or if there is a physical drive for which no logical drive is set, the [Logical drive definition] window appears again. Return to Step 5, and define logical drives until no free space remains in the physical pack. When there is no more free space in the physical pack, the [Configuration Preview] window appears.

- Example of the window in case of RAID 1/RAID 5



• Example of the window in case of RAID 10



POINT

- The first logical drive of the logical drives included in RAID 10 is displayed as "RAID 1". Other logical drives in RAID 10 are displayed as "(Contd)". All logical drives are displayed with the same number, indicating that one logical drive consists of multiple logical drives.

10 Check the [Physical Drives] area and the [Logical Drives] area.

If no mistakes are found, click [Accept] to write the content that has been set. When the message "Save this Configuration?" appears, click [Yes]. The message "Want to Initialize the New Logical Drives?" appears.

11 Click [No] to perform background initialization, or click [Yes] to perform foreground initialization.

POINT

- It is not necessary to perform initialization at this point, because background initialization is supported.

If foreground initialization is performed by clicking [Yes], the array controller cannot be operated until the initialization completes.

12 Click [Home] to return to the main menu.

2.5 Setting/Releasing a Spare Disk

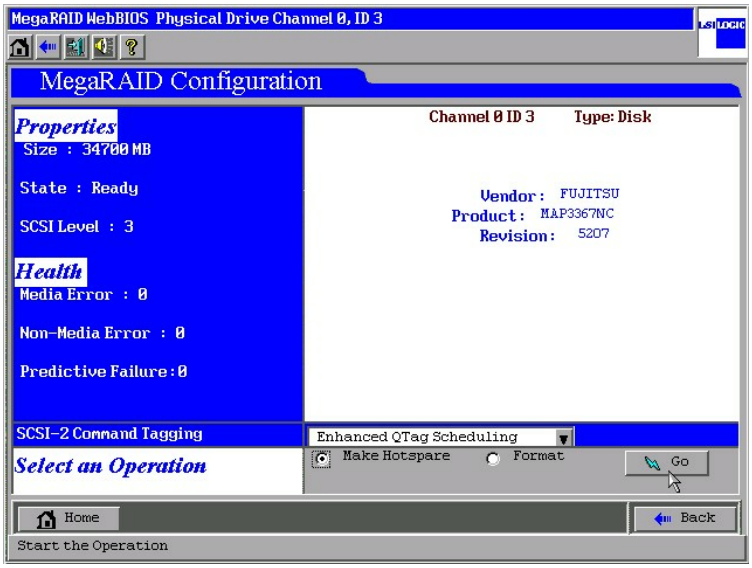
This section explains how to set a hard disk in Ready state as a spare disk and how to release an existing spare disk.

2.5.1 Setting a Spare Disk

Set a hard disk in Ready state as a spare disk according to the following procedure.

1. Click the hard disk in Ready state to be set as a spare disk from the [Physical Drives] area in the main menu.

2. Select [Make Hotspare] from [Select an Operation] displayed at the bottom of the window, and click [Go].
   Check that [State] becomes "Hotspare".



3. Click [Home] to return to the main menu.

2.5.2 Releasing a Spare Disk

A hard disk in Hotspare state can be restored to the Ready state according to the following procedure.

1. Click the hard disk in Hotspare state to be restored to the Ready state from the [Physical Drives] area in the main menu.
   Check that [State] displayed in [Properties] is "Hotspare".
2. Select [Offline] from [Select an Operation] displayed at the bottom of the window, and click [Go].
   Check that [State] becomes "Ready".
3. Click [Home] to return to the main menu.

2.6 Deleting a Physical Pack

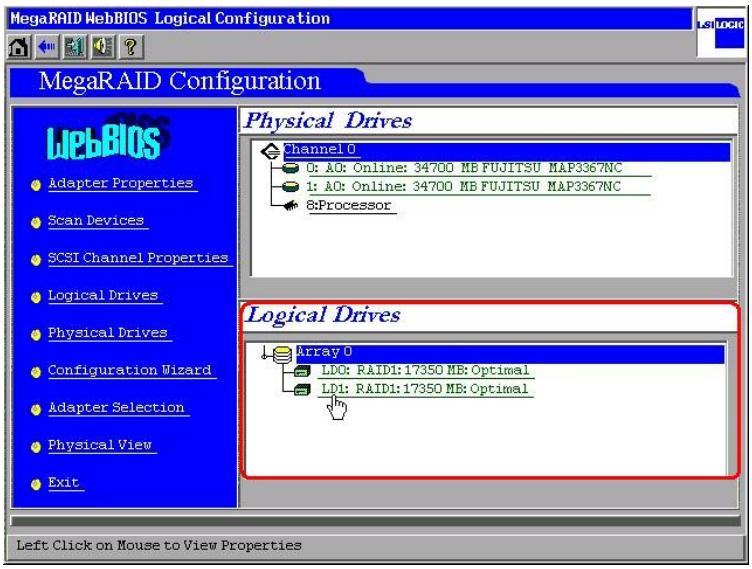
Deleting all of the logical drives that configure the physical pack can restore the hard disks that compose the physical pack to the Ready state.
To delete a logical drive using WebBIOS, perform the following procedure.

POINT

- Only the logical drive with the largest ID can be deleted.

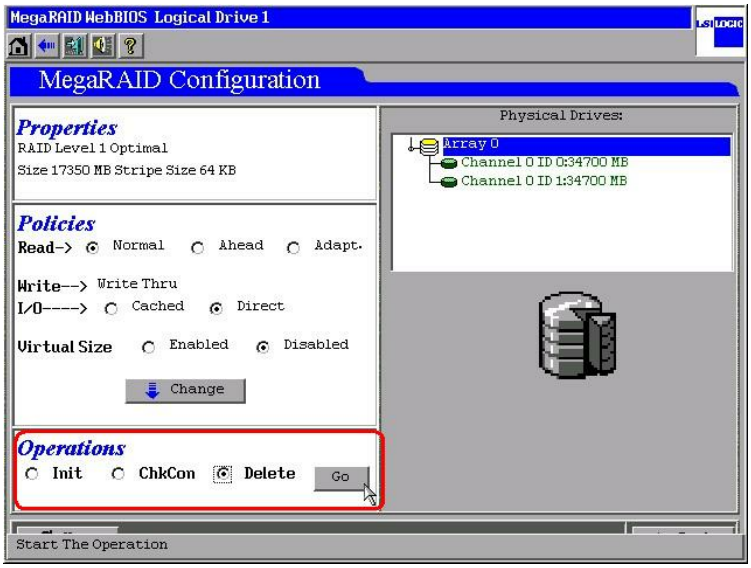
1 Display the [Logical Drives] view from the main menu.

If [Configured Drives] is displayed in the lower right area of the window, click [Logical View] in the main menu to display the [Logical Drives] view.



2 Click the logical drive displayed at the bottom of the [Logical Drives] view.

3 Select [Delete] from the [Operations] area in the lower left of the window, and click [Go].



4 If no mistakes are found, click [Yes].

2.7 Deleting Disk Array Configuration Information

To delete the entire current disk array configuration, use the [Clear Configuration] function of [Configuration Wizard]. After the disk array configuration is deleted, data currently contained in the hard disk cannot be accessed any more. Allocation information in the disk array is completely deleted, and all hard disks are restored to the Ready state.

IMPORTANT

- Do not use this function during normal use.
- If this function is used, the current settings on the array controller are deleted and data on all hard disks connected to the array controller is also deleted. When using this option, make appropriate plans and proceed carefully.

1. Click [Adapter Selection] from the main menu and select the array controller whose disk array configuration is to be deleted.
   When no other array controllers are installed, it is not necessary to select array controllers.

2. Click [Configuration Wizard] from the main menu.

3. Select [Clear Configuration] and click [Next].
   When the following warning message appears, click [Yes].

```
This is Destructive Operation!
Original configuration and data will be lost.
Select Yes, if desired so.
```

4. When the [Configuration Preview] window appears, click the [Accept] button.
   When the message "Save this Configuration?" appears, click [Yes]. Allocation of all logical drives is deleted, and the state of all hard disks connected to the array controller becomes Ready.

2.8 Initializing a Logical Drive

This section explains how to initialize a logical drive using WebBIOS.
Disk arrays can usually be used immediately after disk array configuration is set, because background initialization is supported.

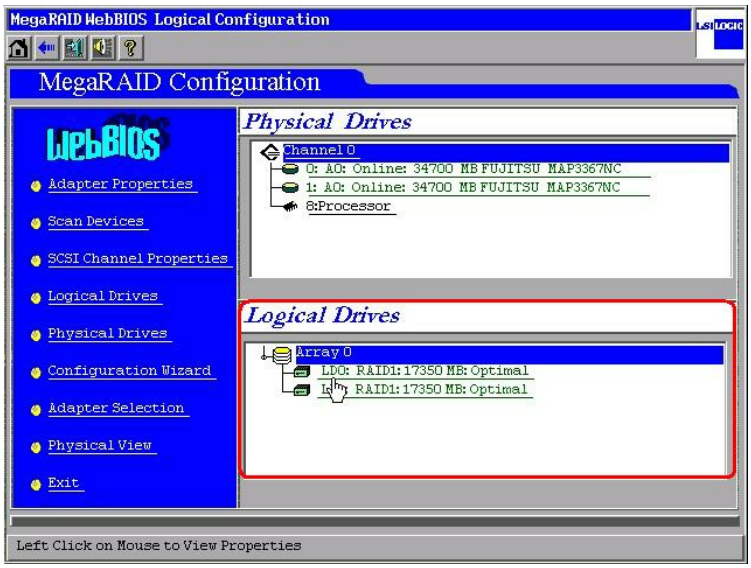
IMPORTANT

- Note that initialization of a logical drive will delete the data in the target logical drive.

POINT

- It is not necessary to perform initialization using this function after creating a logical drive, because background initialization is supported.
- While background initialization is being executed, this function cannot be used.

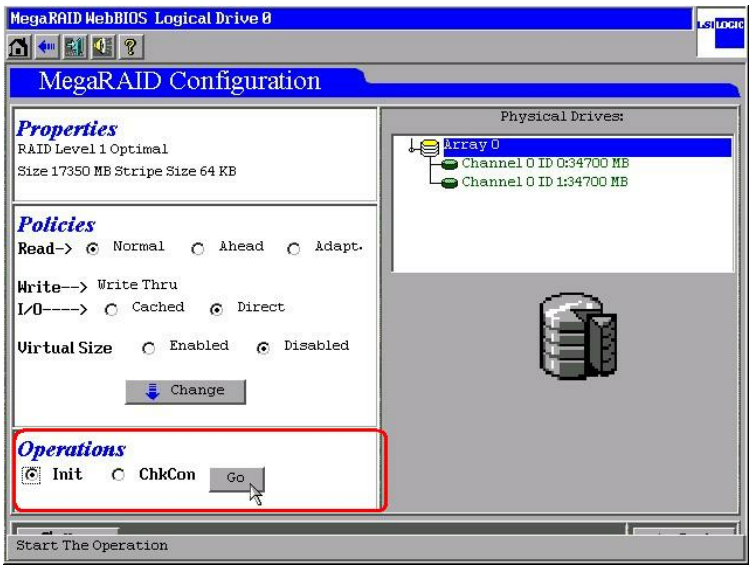
1 Display the [Logical Drives] view in the main menu (lower right of the window).
If [Configured Drives] is displayed in the lower right area of the window, click [Logical View] in the main menu to display the [Logical Drives] view.



2 Click the logical drive to be initialized from the [Logical Drives] view.

3 Select [Init] in [Operations] and click [Go].

[Initialization Progress] appears and initialization of the logical drive will start.



4 Click [Home] to return to the main menu.

POINT

- If [Initialization Progress] displayed at the bottom of the main menu is clicked, progress of initialization can be checked. While an initialization process is in progress, the [Progress] bar appears and the progress can be checked.

2.9 Consistency Check of Logical Drive Data

Consistency Check of the logical drive is a function to check reliability of the data. check the consistency between data on redundant logical drives and mirrored data or parity data.

IMPORTANT

- Note that consistency checks can be performed on logical drives with redundancy such as Optimal RAID 1/RAID 5/RAID 10 logical drives. Consistency checks cannot be performed on logical drives without redundancy such as Degraded and Offline logical drives.
- In addition to the function to check consistency, Consistency Check also automatically corrects media errors of hard disks (physical errors that can be recovered, not data consistency errors).

To execute a data consistency check of a logical drive using WebBIOS, perform the following procedure.

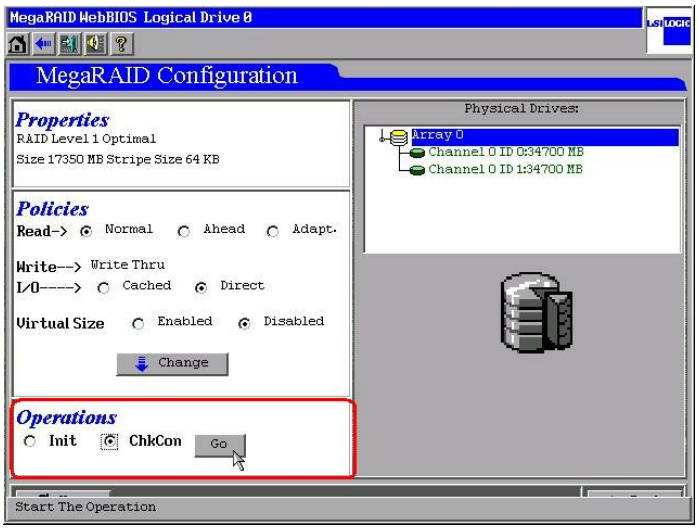
1 Display the [Logical Drives] view from the main menu.

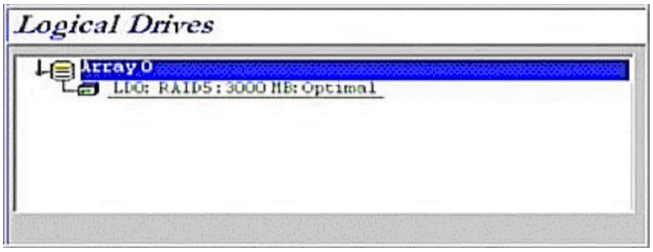
If [Configuration Drives] is displayed in the lower right area of the window, click [Logical View] in the main menu to display the [Logical Drives] view.

2 Click the logical drive to check consistency from the [Logical Drives] view.

3 Select [ChkCon] from [Operations] in the lower left of the window, and click [Go].

Consistency check starts and the progress is displayed.





4 When consistency check completes, click [Home].

The main menu appears again. In the [Logical Drives] view, the result of the consistency check is displayed. If consistency check completes successfully, "Optimal" is displayed. If an error is found during consistency check, "CC ERROR" is displayed.

POINT

- If an error is detected in data consistency, take the following action:
  - If an error is detected during the consistency check performed for maintenance while the OS is running normally, the above will not pose a problem.
    When [ChkConst Restore] is set to "Enabled", the error is automatically corrected.
    When [ChkConst Restore] is set to "Disabled", perform the following procedure to correct parity or mirrored data:
    1. Click [Adapter Properties] from the main menu.
       The adapter properties window appears.
    2. Change [ChkConst Restore] to "Enabled" and click [Submit].
    3. Click [Home].
       The main menu appears again.
    4. According to "2.9 Consistency Check of Logical Drive Data" (→pg.42), execute consistency check again.
    5. If data is not corrected in consistency check, select [Adaptor Properties] from the main menu, and change [ChkConst Restore] to "Disabled", then click [Submit].
  - If an error is detected by consistency check performed after using the "Online" function of WebBIOS, or the [Make Drive Online] or the [Restore Configuration] function of GAM (none of which should not be used in a normal situation), data on the target logical drive is not reliable. In this case, it is required to initialize the logical drive and reinstall reliable data.

2.10 Expanding Capacity of a Logical Drive

With WebBIOS, capacity expansion and RAID level change can be performed for existing RAID 1/RAID 5 logical drives.
To perform capacity expansion and RAID level conversion, the following conditions must be satisfied:

- Only one logical drive must be defined in the physical pack.
- The number of hard disks that compose the target physical pack/logical drive must not exceed 5 after capacity expansion (RAID level conversion).
- The RAID level of the target logical drive must be 1, or 5. (Capacity expansion (RAID level conversion) is not possible for RAID 10.) The OS must be Windows Server 2003 or Windows 2000 Server. (Capacity expansion is not possible for Linux.)

To expand capacity, perform the following procedure.

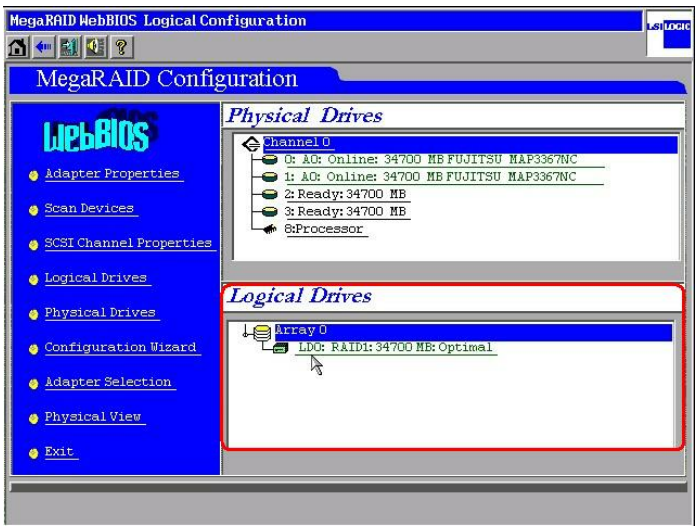
1 To prepare for unexpected problems, perform data backup.

2 Perform consistency check onto the logical drive whose capacity is to be expanded.
Confirm that the check completes successfully.

IMPORTANT

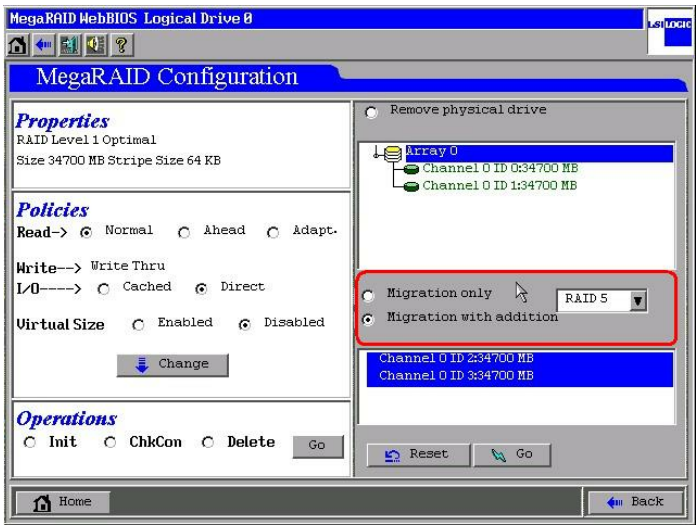
- If it does not complete successfully, do not expand capacity of the logical drive.

3 Display the [Logical Drives] view in the main menu (lower right of the window).
If [Configured Drives] is displayed in the lower right area of the window, click [Logical View] in the main menu to display the [Logical Drives] view.



4 Click the logical drive whose capacity is to be expanded from the [Logical Drives] window.

The following window appears. To expand capacity by adding a new hard disk, select [RAID Migration (with addition)] in the right side of the window. To expand capacity without adding a new hard disk, select [RAID Migration only].



IMPORTANT

- Do not select [Remove physical drive].

5 Select the RAID level to be set after capacity expansion from the box in the center of the right side of the window.

Select RAID5 to add the hard disk and enhance capacity when an existing logical drive is composed of RAID1. If the drive has been already composed of RAID5, you do not need to change the RAID level.

IMPORTANT

- Please do not select RAID0 in this product for the unsupport. Though "RAID0" is displayed when the select the RAID level after capacity expansion.

6 In the lower right area of the window, a list of unused hard disks is displayed.

If [RAID Migration (with addition)] is selected, select a hard disk to be added to expand capacity.

POINT

- Multiple hard disks can be selected at a time with holding down the [Ctrl] key.
- Press the [Ctrl] key only when clicking the mouse. While moving the mouse cursor, release the [Ctrl] key.

7 Click [Go] in the lower right of the window.

[Reconstruction Progress] appears and a capacity expansion process will start. Wait until the process is completed.

POINT

- If the message "Unacceptable Reconstruction parameter" is displayed, the combination of the RAID level after capacity expansion and the added hard disk may be inappropriate. Configure the proper settings, referring to the table in Step 5.
- If the message "Failed to start operation on Logical Drive" is displayed, a background task may be under execution. Perform capacity expansion after background task operations complete.

IMPORTANT

- While capacity expansion is in progress, do not turn off, reset or restart the server. Doing so may cause loss of data on the target logical drive.
- If the server is turned off during the capacity expansion process, access to the hard disk resumes automatically after the server restart. In this case, wait until the access lamp on the hard disk turned off, ensure that no access is made to the hard disk, create an array configuration again and then restore the data backed up before the task.
- If the RAID level of the logical drive after expansion is RAID 5, background initialization will be performed after capacity expansion completes.

2.11 Viewing Each Status

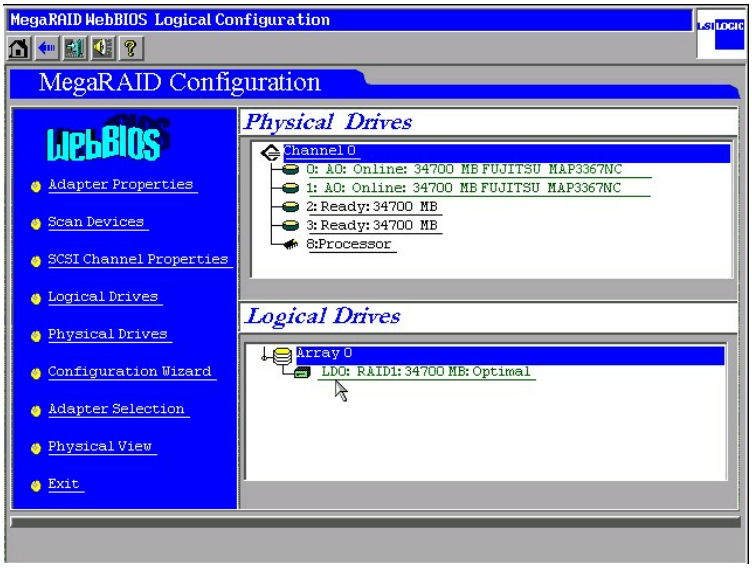
This section explains how to view the status of logical drives and hard disks using WebBIOS.

2.11.1 Viewing the Logical Drive Status

To view the logical drive status using WebBIOS, perform the following procedure.

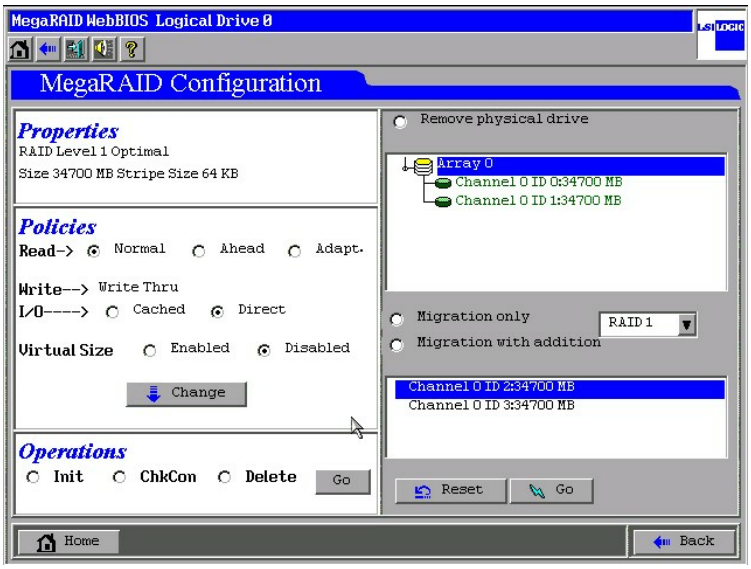
1 Display the [Logical Drives] view from the main menu.

If [Configured Drives] is displayed in the lower right area of the window, click [Logical View] in the main menu to display the [Logical Drives] view.



2 Click the logical drive to be viewed from the [Logical Drives] area.

The status and the settings of the selected logical drive are displayed.



The following information is displayed in the [Properties] area.

- RAID level
- Logical drive status
- Logical drive size
- Stripe size

The logical drive status is as follows:

table: The logical drive status

Status	Description
Optimal	Online (normal)
Degraded	Status without redundancy
Offline	Offline (failed)

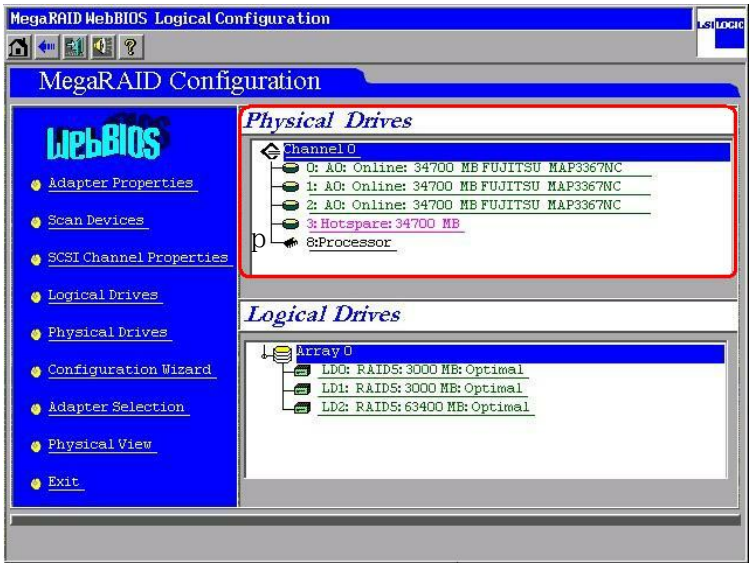
The current logical drive settings are displayed in the [Policies] area.

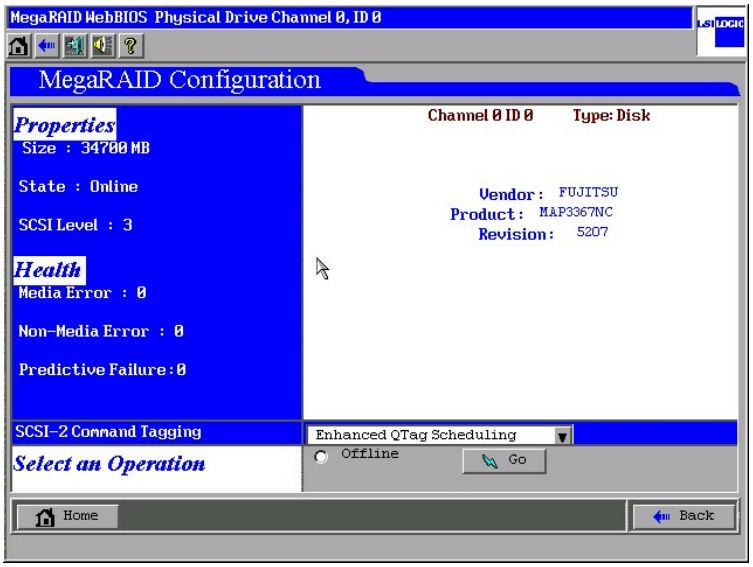
IMPORTANT

- The following 3 options displayed in the [Policies] area must be fixed to the values as shown below without change:
  Read → Normal
  I/O → Direct
  Virtual Size → Disabled

2.11.2 Viewing the Hard Disk Status

To view the hard disk status using WebBIOS, click the hard disk to be viewed from the [Physical Drives] area in the main menu.





The following information is displayed in the [Properties] area.

- Size: Hard disk capacity
- State: Hard disk status
- SCSI Level: SCSI standard

The hard disk status is as follows.

table: The hard disk status

状態	説明
Online	Online (normal)
Failed	Offline (failed)
Rebuild	Rebuild in progress
Ready	Unused (available)
Hotspare	Spare disk
Format	Formatting

The number of errors is displayed under [Health].

- Media Error: The number of media errors
- Non-Media Error: The number of other errors
- Predictive Failure: The number of predictive failures

IMPORTANT

- [SCSI-2 Command Tagging] must be fixed to "Enhanced QTag Scheduling" without change.
- Without instructions by our maintenance engineer, do not use the "Offline" function for a hard disk in "Online" state.
- Without instructions by our maintenance engineer, do not use the "Online" function for a hard disk in "Failed" state. Doing so may cause data loss.

2.12 Formatting a Hard Disk

This section explains how to perform a low level format on a hard disk using WebBIOS.
When reusing a hard disk that has been used for another system, format the hard disk according to the following procedure.

IMPORTANT

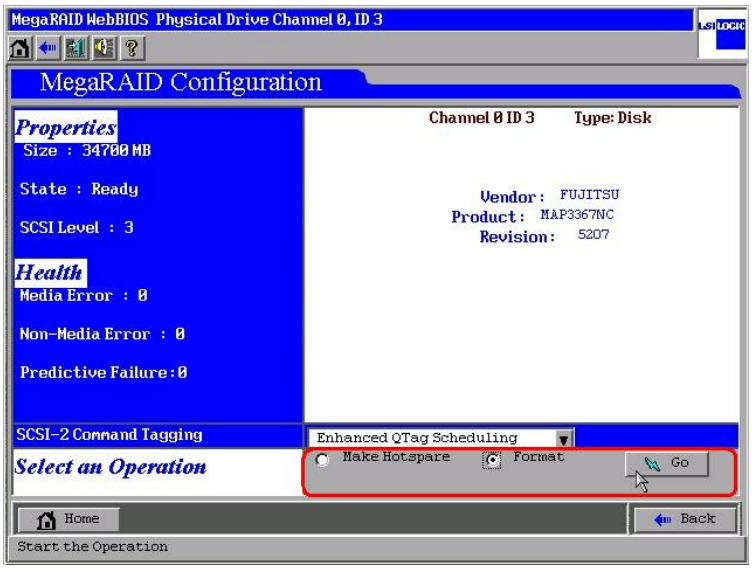
- When a hard disk is formatted, data on it is all deleted.
- Do not turn off or restart the server during formatting.

POINT

- Formatting of a hard disk can be executed only for hard disks in Ready state.
- Formatting of a hard disk takes time. Once started, it cannot be aborted. Perform it when you have enough time.
- Multiple hard disks cannot be formatted simultaneously.

1 From the [Physical Drives] area in the main menu, click the hard disk in Ready state to be formatted.

2 Select [Format] and click [Go].



3 Low level formatting of the hard disk starts.
Wait until the format is completed.

2.13 Checking a Background Task in Progress

With WebBIOS, the status of a task currently running in the background can be checked. This enables progress check of logical drive initialization, consistency check, rebuild, etc.

While a task is being executed in the background, the task in progress is displayed at the bottom of the main menu. Clicking buttons of each task enables progress check of the task being executed in the background. The following tasks can be checked.

- Consistency check (Check Consistency Progress)
- Rebuild (Rebuild Progress)
- Initialization (Initialization Progress)
- Background initialization (Background Initialization Progress)
- Capacity expansion (Reconstruction Progress)

IMPORTANT

- Do not cancel background tasks in progress during normal use.
- The options such as Initialize/Check Consistency/Properties/Set Boot Drive displayed in the right side of the window showing the progress of each task are not supported. Do not use these functions.

POINT

- If the button of the background task in progress is not displayed, it will be displayed by executing [Scan Devices] from the main menu.

2.14 Exiting WebBIOS

To exit WebBIOS, perform the following procedure.

1. Display the main menu.
2. Click [Exit].
3. When the message "Exit Application" appears, select [Yes].
4. When the message "Please Reboot your System" appears, the server can be turned off.
5. Press the [Ctrl] + [Alt] + [Delete] keys to restart the server.

Chapter 3

Installing Global Array Manager (GAM)

This chapter explains how to install Global Array Manager (GAM) to use a SCSI array controller in a Windows Server 2003, Windows 2000 Server, or Linux environment.

3.1 Overview / Product Requirements 56
3.2 Installing GAM 58
3.3 Using GAM in a Linux Environment 65
3.4 Using GAM in a Multiple Server Environment 66

3.1 Overview / Product Requirements

This section explains Global Array Manager (hereafter referred to as GAM).

3.1.1 GAM Overview

Global Array Manager (GAM) is an application that allows you to manage a disk array system connected to a SCSI array controller (RAID controller).
The functions of GAM are accomplished by the interaction of GAM Client with GAM Server.

- Monitoring function
  GAM Server collects information about the status and resource usage of disk arrays and notices them.
- Management function
  GAM Client provides fault management, highly reliable messaging process, and excellent OS support. GAM Client also manages maintenance of each disk array and hard disk and provides an intuitive GUI.

IMPORTANT

- To ensure stable operation of PRIMERGY, install the GAM when using the onboard SCSI RAID.
  The hard disk status cannot be monitored with the system operates when GAM is not installed. For instance, the system down and the loss of data are caused due to leaving one hard disk breakdowns. Install the GAM to detect malfunction at the stage where one hard disk breaks down.

3.1.2 Requirements for OS Drivers

The SCSI array controller setting must be configured in advance. When configuring the setting, refer to "Chapter 2 How to Use WebBIOS" (→pg.19).
Make sure to complete the disk array setting as a preparation before installing the drivers and utilities as described below.
Drivers and GAM must be installed with administrator privileges on each OS.

3.1.3 Requirements for GAM

An appropriate server environment is required for using GAM Server and GAM Client properly. Use hardware and software that meet the following conditions to create an environment best suited for use:

- OS: Windows Server 2003, Windows 2000 Server, Linux
- Hard disk free space: 20MB or more
- TCP/IP, SNMP service, and ServerView must be installed

IMPORTANT

- Apply the latest Service Pack to each OS.
- Make sure to install the specified drivers and GAM.

POINT

- Disk arrays are monitored by OS event logs that are noticed by ServerView. Because events that are noticed from GAM (source: gamevlog) are not supported, ignore the events recorded by "gamevlog". If any logs for a SCSI array controller are noticed by ServerView before or after the event, view the logs. For the list of logs noticed by ServerView, refer to "Appendix B List of GAM Error Codes" (→pg.125).

3.2 Installing GAM

This section explains how to install GAM. GAM must be installed for your safety.

IMPORTANT

- GAM cannot be overwrite-installed. Make sure to uninstall the existing GAM before reinstalling GAM.
- Depending on your system configuration, the SNMP service may be stopped after installing or uninstalling GAM. Restart the OS after installing or uninstalling GAM.
- During GAM installation, you may be prompted to enter appropriate information. In such cases, follow the window instructions to proceed.

3.2.1 How to Install GAM

Perform the following procedure to install GAM.

POINT

- To record events occurring to the OS event logs, install ServerView and configure the event logging settings. For details, refer to "ServerView User Guide".

1 Log on with administrator privileges.

2 Before installing GAM, complete the following preparation:

- Check that TCP/IP is installed and working properly.
- Check that ServerView is installed and working properly.
- Insert the ServerStart CD-ROM into the CD-ROM drive.
- Exit all applications.

IMPORTANT

- Exit all applications before starting installation. Especially, if you install GAM while Event Viewer or Computer Management is running, the installation may fail.

3 Click [Start] → [Run...]. Enter the following path and click [OK].

[CD-ROM drive name] :\PROGRAMS\GENERAL\LSI\GAM\install.bat

The Global Array Manager Setup wizard starts up.

4 In the [Welcome] window, click [Next].

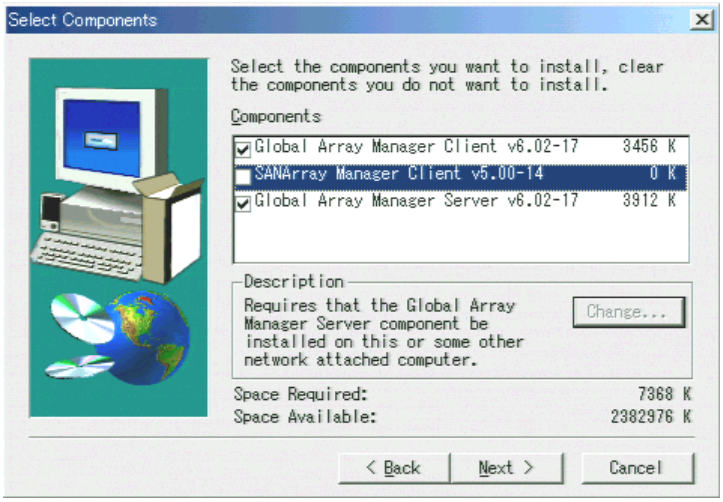
The [Software License Agreement] window appears.

5 Click [Yes].

The [Select Components] window appears.

Make sure the boxes next to [Global Array Manager Server] and [Global Array Manager Client] are checked.

Uncheck [SANArray Manager Client].

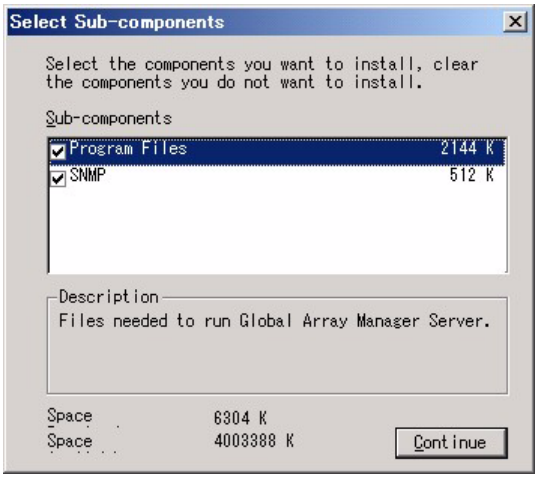


IMPORTANT

- Do not install SANArray Manager Client because it is not supported.

6 Select [Global Array Manager Server] and click [Change].

The [Select Sub-components] window appears.



Make sure [Program Files] and [SNMP] are checked. If any items other than [Program Files] and [SNMP] are displayed, uncheck them.

7 Click [Continue] after confirmation.

The [Select Components] window appears again.

8 Click [Next].

The [Choose Destination Location] window appears.

POINT

- When GAM Server has already been installed, a message will appear to confirm the overwrite. Click [OK] to proceed.

9 Click [Next].

The installation location for GAM is displayed.

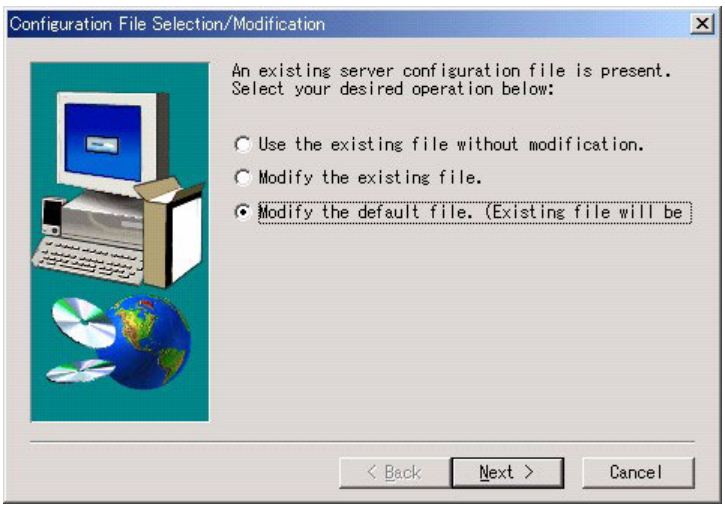
POINT

- When GAM Client has already been installed, a message will appear to confirm the overwrite. Click [OK] to proceed.

10 Confirm the installation location and click [Next].

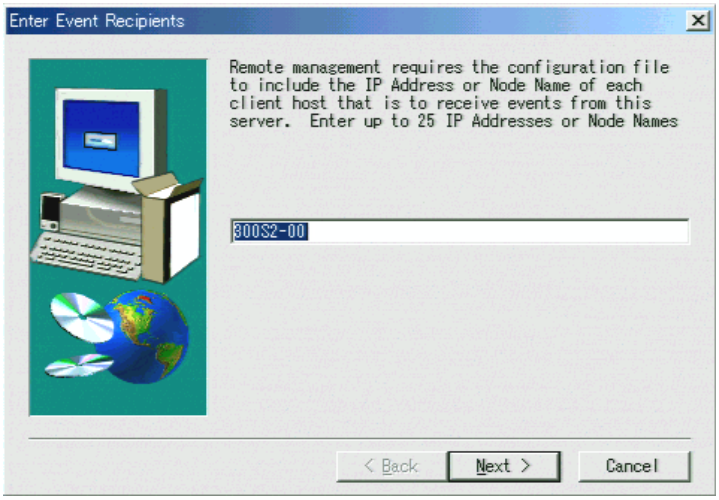
File copying starts.

If the following window appears, GAM has already been installed. Cancel this procedure and install GAM again after uninstalling.



11 Specify the client receiving events from GAM Server.

In the text box, enter the computer name on which GAM Client is being installed and click [Next].



「The [Server Event Logging] window appears.

POINT

- If the IP address or computer name of Client is changed after GAM Server was installed, events cannot be noticed correctly. In this case, GAM Server needs to be uninstalled first and then installed again. (If the IP address is automatically obtained from the DHCP server, the IP address may be changed depending on the timing of powering on/off or restarting the system.)
- To specify multiple clients receiving events, enter the computer names or IP addresses of servers, each separated by space. It is possible to specify up to 25 clients receiving events at a time.
  Make sure [Enable event logging on the server machine] is checked and click [Next].

12 Make sure [Enable event logging on the server machine] is checked and click [Next].

IMPORTANT

- This option must be enabled.

13 When the full pathname of the configuration file appears, click [OK].

The [Setup Complete] window appears.

14 Click [Finish] to exit the GAM installation wizard.

15 Restart the system.

16 Create the user account "gamroot" for GAM administrator privileges and a user account for GAM user privileges (e.g. gamuser) as a Windows user account.
Assign the user account "gamroot" to the Administrators group.

POINT

- Create each user account as an OS user account.
- When creating the account for GAM administrator privileges, uncheck the following checkbox:
  • [User must change password at next logon]
  Also, check the following checkbox:
  • [Password never expires]
  If not making the above settings, you may not be able to log on to GAM.

3.2.2 Local Logon Setting on a Domain Controller

If Windows Server 2003 or Windows 2000 Server is used as a domain controller, it is necessary to set the local logon rights to the user account with which you log on to GAM.
Configure the setting according to the following procedure.

POINT

- Attempting to log on to GAM with a user account that does not have the local logon rights will fail even if the user name and password are entered correctly.

1 Click [Start] → [Programs] → [Administrative Tools] → [Domain Controller Security Policy].
The [Domain Controller Security Policy] window appears.

2 Double-click [Security Settings].

3 Double-click [Local Policies].

4 Double-click [User Rights Assignment].

5 Double-click [Log on locally].
The [Security Policy Setting] window appears.

6 Click [Add].

7 Click [Browse].

8 Select the user account with which is to be logged on to GAM and click [Add].

9 Click [OK].

10 Click [OK].
The [Add User or Group] window closes.

11 Click [OK].

The [Security Policy Setting] window closes.

12 Open [Command Prompt] and run the following command.

- For Windows Server 2003

```
C:\>gpupdate
```

- For Windows 2000 Server

```
C:\>secedit /refreshpolicy MACHINE_POLICY
```

3.2.3 How to Uninstall GAM

Perform the following procedure to uninstall GAM.

IMPORTANT

- Do not uninstall GAM Server/GAM Client during normal use.

■ Uninstalling GAM Client

1 Log on as Administrator.

2 Exit all programs before starting uninstallation.

If uninstalling GAM while Event Viewer or Computer Management is running, the uninstallation will fail. Make sure to exit all programs.

3 Double-click [Add or Remove Applications] or [Add or Remove Programs].

4 Select [Mylex Global Array Manager Client v.n.nn-nn] from the application list and click [Change/Remove].

The message "Are you sure you want to completely remove 'Mylex Global Array Manager Client vn.nn-nn' and all of its components?" appears.

5 Click [Yes].

Uninstallation process starts.

6 When the uninstallation completes, click [OK].

■ Uninstalling GAM Server

1 Log on as Administrator.

2 Exit all programs before starting uninstallation.

If uninstalling GAM while Event Viewer or Computer Management is running, the uninstallation will fail. Make sure to exit all programs.

3 Click [Start] → [Settings] → [Control Panel] → [Add or Remove Applications].

4 Select [Mylex Global Array Manager Server v.n.nn-nn] from the application list and click [Change/Remove].

The message "Are you sure you want to completely remove 'Mylex Global Array Manager Server vn.nn-nn' and all of its components?" appears.

5 Click [Yes].

Uninstallation process starts.

6 When the uninstallation completes, click [OK].

7 Restart the system.

3.3 Using GAM in a Linux Environment

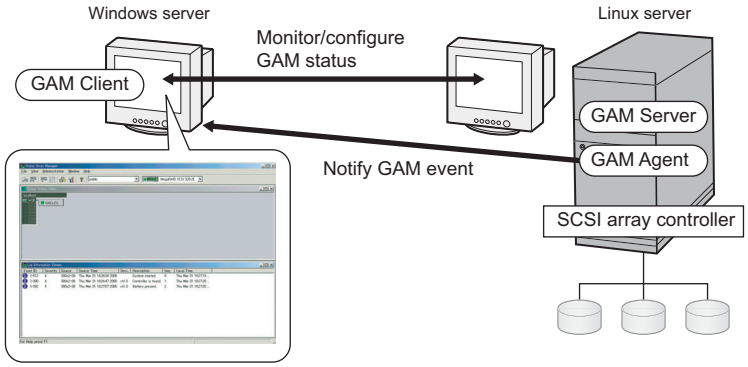
To use GAM in a Linux environment, it is necessary to install device drivers and GAM.

When using Linux on the server which has not bundled the Linux service, refer to the Fujitsu PRIMERGY website (http://primergy.fujitsu.com).

POINT

- When GAM on a Linux server is monitored from GAM Client, GAM Client can only be installed on servers or computers running Windows. Make considerations when creating system configuration since GAM Client cannot be installed on a server running Linux.

The following figure shows a system configuration in which GAM Client on a Windows server manages a Linux server.



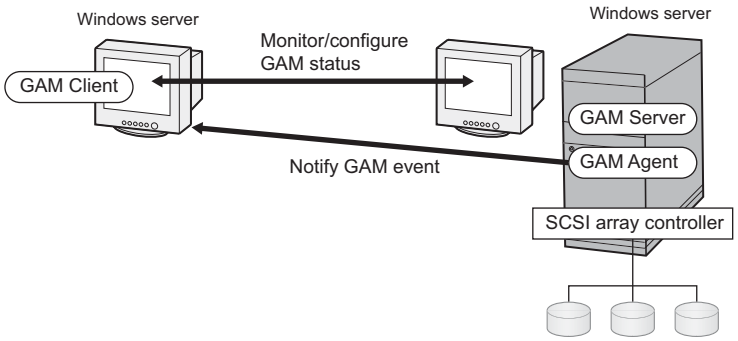
POINT

- The following GAM Server and GAM Agent modules must be installed on the Linux server.
  - gam-server-6.02-22.i386.rpm (GAM Server)
  - gam-agent-6.02-22.i386.rpm (GAM Agent)

  In addition, it is necessary to edit the configuration file to set the GAM event recipient and enable storing event logs after the installation. For more details, refer to "Installation Guide" about Linux using the above URL.
- If there is a firewall in the environment, it is necessary to configure network settings, such as disabling blocking of the port used by the GAM protocol.

3.4 Using GAM in a Multiple Server Environment

The following figure shows a system configuration in which GAM Client on the other Windows server manages GAM Server.



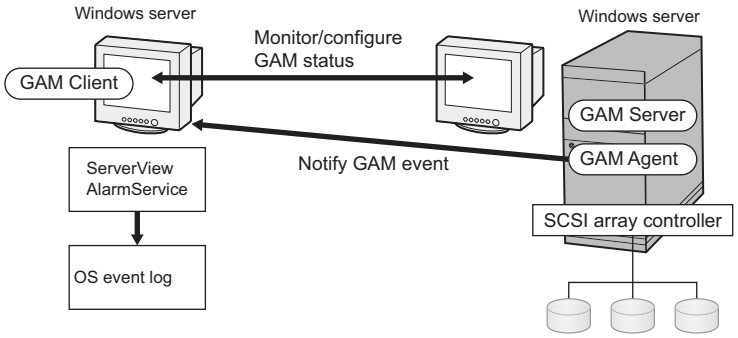
POINT

- It is necessary to configure the server receiving GAM events during GAM installation. For more details, refer to Step 12 in "3.2.1 How to Install GAM" (→pg.58).
- If there is a firewall in the environment, it is necessary to configure network settings, such as disabling blocking of the port used by the GAM protocol.

3.4.1 Interaction between ServerView and AlarmService

The following figures show the interaction between AlarmService of ServerView and GAM Client on the other Windows server manages GAM Server.

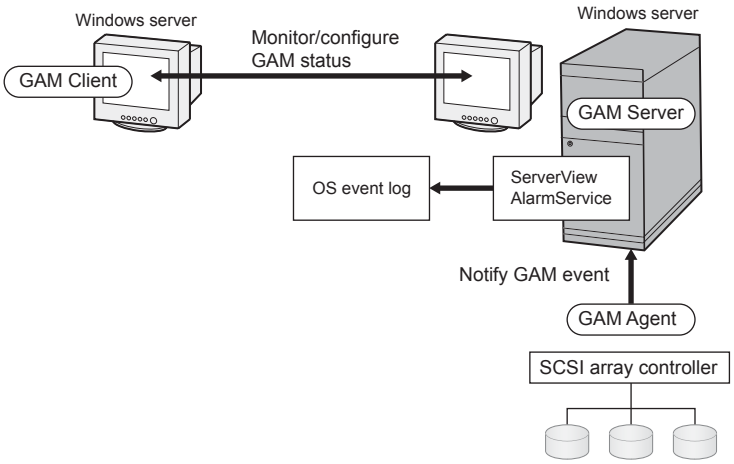
■ When Storing OS Event Logs on GAM Client



POINT

- ServerView must be installed on GAM Client.
- The OS event logs related to GAM events are stored on GAM Client.

■ When Storing OS Event Logs on GAM Server



POINT

- ServerView must be installed on GAM Server.
- The OS event logs related to GAM events are stored on GAM Server.

Chapter 4

How to Use GAM

4

GAM is a basic utility to manage the disk array.
Read this chapter carefully before use.

4.1 Overview of GAM 70
4.2 Starting and Exiting GAM 71
4.3 Window Layout 73
4.4 Settings 80
4.5 Creating and Operating a RAID Configuration 84
4.6 Viewing Information 99
4.7 Maintenance Functions 111

4.1 Overview of GAM

GAM is used for monitoring, management, maintenance and configuration of the array controller, as well as hard disks and logical drives connected to it.

4.1.1 About the access privileges to GAM

It is necessary to log on (sign on) to GAM to use GAM functions: user authentication is made using the user accounts registered in the OS. Note that available functions vary depending on the user account used to log on (sign on). There are three access privileges as shown below:

■ Guest

When using GAM with Guest privileges, it is not necessary to log on (sign on). With Guest privileges, only the RAID status and occurring events can be checked. It is not possible to set or change parameters.

■ User

This is mainly used to monitor the status of controllers and hard disks/logical drives. To use User privileges, log on (sign on) with any of the user names and passwords registered in the OS. With User privileges, in addition to using the functions made available with Guest privileges, several parameters can be changed. It is also possible to view the detailed status of the controller and RAID subsystem selected. Note that it is not possible to perform management such as changing a RAID configuration, rebuilding drives, and changing parameters related to controllers and drivers.

POINT

- RAID configuration and data cannot be destroyed with User privileges. If GAM is used only for purposes such as monitoring the RAID system or checking the status, it is recommended that using User privileges.

■ Administrator

This is used for management, maintenance and configuration of controllers and hard disks/logical drives. To use Administrator privileges, log on (sign on) with "gamroot". In addition to the monitoring functions made available with Guest or User privileges, it is possible to use all other functions including creating/changing a RAID configuration, rebuilding drives, checking the consistency of logical drives, and changing the drive status.

IMPORTANT

- When using GAM with Administrator privileges, depending on the operation, you may lose data in the SCSI array controller. Read this Chapter and utilize GAM very carefully.
- If GAM information cannot be monitored from ServerView, there is a possibility that the network settings are not proper. In this case, check the network settings again.

4.2 Starting and Exiting GAM

This section explains how to start and exit GAM.

4.2.1 Starting

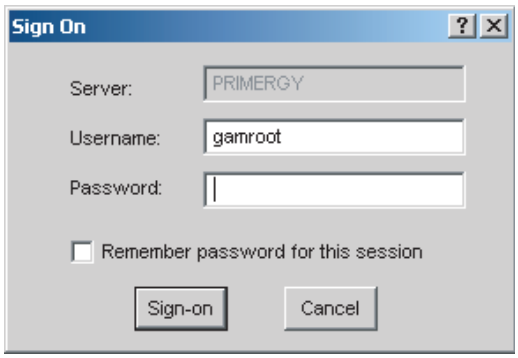
To start GAM, click [Start] → [Programs] (or [All Programs] on Windows Server 2003) → and [Mylex Global Array Manager Client].
If a server group or server is already defined, [Global Status View] appears.

POINT

- This is the case when using Guest privileges. To use User or Administrator privileges, it is necessary to sign on.
- If GAM is started for the first time after its installation, the [Define Server Groups] window appears. Refer to "4.4.1 Server Group and Server Settings" (→pg.80) to make the settings.

4.2.2 Sign On (Log On)

In GAM, user authentication is performed to limit availability of functions according to uses. It is necessary to sign on to GAM to obtain access privileges User or higher. When double-clicking the server icon in the [Global Status View] window, or when performing operations requiring Administrator privileges, the following [Sign On] window is automatically displayed.



POINT

- It is also possible to open the [Sign On] window by selecting [Sign On] from the [Administration] menu.
- If GAM Client and GAM Server are installed on different servers (for the Linux system, etc.), enter the password configured on GAM Server.

■ Procedure to sign on

Perform the following procedure to sign on.

1. Enter a user name.
   - When signing on with User privileges
     Enter any user name in [Username].
   - When signing on with Administrator privileges
     Enter "gamroot" in [Username].
2. Enter a password in [Password].
3. If [Remember password for this session] is checked, uncheck it.

   POINT
   - Note that if this option is checked, you can automatically sign on to different servers. To avoid accessing servers automatically, it is recommended to keep this option unchecked.
4. Click [Sign-on].

   POINT
   - If Windows is used as a domain controller, it is necessary to set the local logon rights to the user account used to sign on to GAM. If the local logon rights are not set, it is not possible to sign on to GAM. Refer to "Chapter 3 Installing Global Array Manager (GAM)" (→pg.55).
   - In GAM, availability of functions is limited according to access privileges. For access privileges, refer to "4.1.1 About the access privileges to GAM" (→pg.70).

4.2.3 Exiting

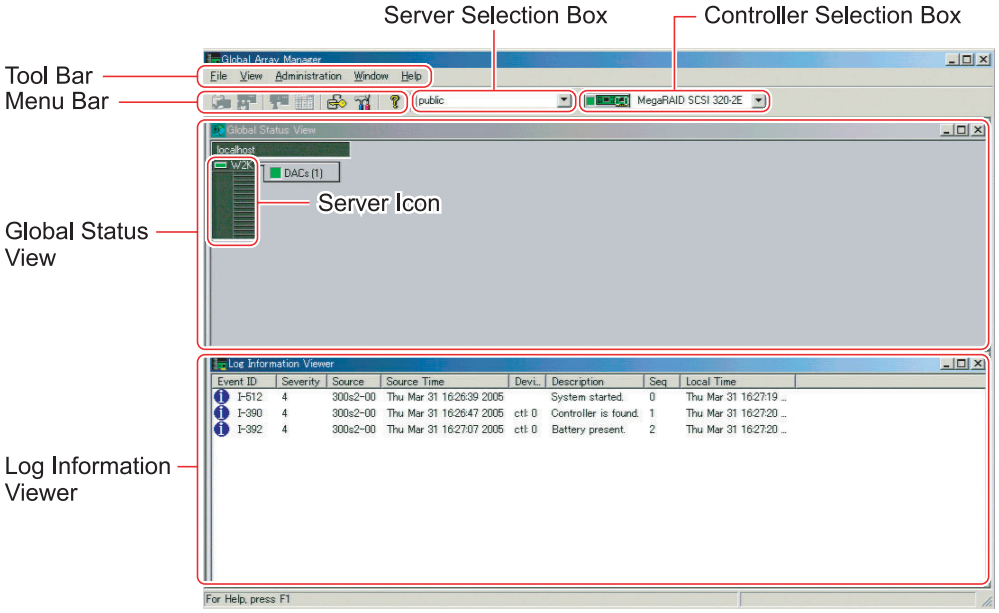
To exit GAM, click [Exit] from [File] in the GAM menu bar.

4.3 Window Layout

The following provides a description of windows, buttons, and menu items displayed when using GAM.

4.3.1 Startup Window Layout/Functions

When GAM is started, a window consisting of [Global Status View] and [Log Information Viewer] will appear.



■ Menu Bar

Allows you to perform GAM functions.

■ Tool Bar

Collection of buttons for frequently used functions on GAM.

■ Server Selection Box

Clicking ▼ displays a box listing the names of the server groups connected to the current client workstation.

■ Global Status View

Displays servers in the currently selected server group.

■ Controller Selection Box

Clicking ▼ displays the onboard SCSI array controller that connects to the currently selected server, or the controller ID and type (e.g. MegaRAID SCSI 320-2E) of the SCSI array card.

■ Server Icon

Displays the server status. The following information is available:

- IP address (e.g. 10.1.19.100) or server name (e.g. ide40)
- Operating system running on the server (e.g. W2K3=Windows Server 2003, W2K=Windows 2000 Server)
- Server status (Green=normal, Yellow=critical, Red=failure or malfunction)
- Number and status of SCSI array controllers connected to the server (Green=normal, Yellow=critical, Red=failure or malfunction)

■ Log Information Viewer

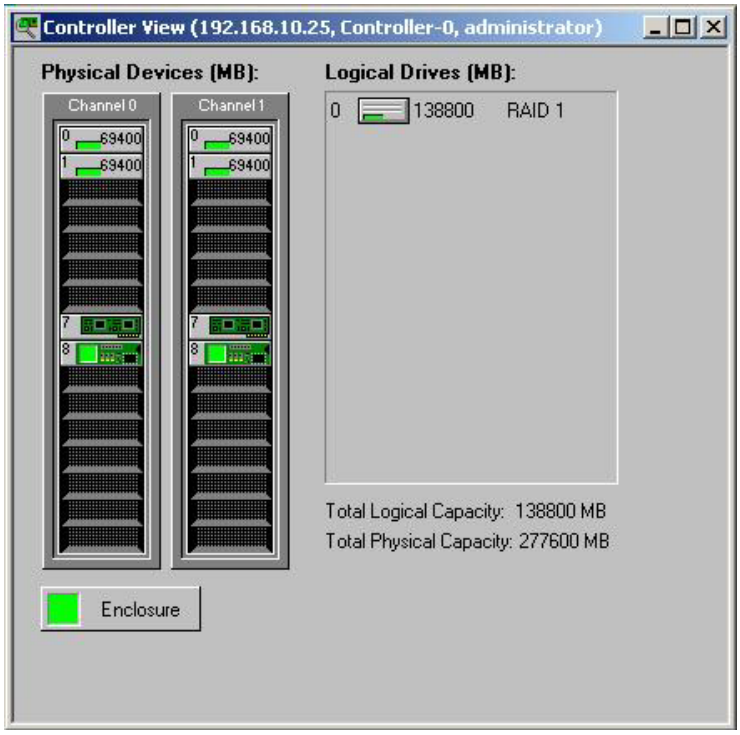
Displays an event that occurred.

table: Log Information Viewer

Event	Details
Event ID	Displays the level of an event to be reported using an icon that signifies information, caution, warning, or others. Displays simultaneously the ID assigned to the event being reported.
Severity	Priority level of the event.
Source	IP address or name of the server that sent the event.
Source Time	Time when the event occurred.
Device Address	Other data regarding the channels linked, operations in question, and reason why this event was sent.
Description	Description of the event.
Sequence(Seq)	Sequence number of the event.
Local Time	Time when the event occurrence was signaled to GAM Client.

4.3.2 [Controller View] Window Layout/Functions

Displaying the [Controller View] window enables you to monitor the status of hard disks/logical drives. To display the [Controller View] window, select [Controller View] from the [View] menu. If the [Sign On] window opens, sign on according to "4.2.2 Sign On (Log On)" (→pg.71).
The following window appears.



The [Controller View] window displays information shown below regarding the controller currently selected in the [Controller Selection] box.

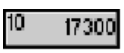
● Number of controller channels

Each channel is displayed as the tower on the left.

Hard disk

Displays the target ID, device capacity, device type and device status. The following shows the hard disk status:

table: Hard disk status icon

Icon	Color	Status
	Green	Normal (OnLine)
	Red	Failure (Dead)
	Yellow	Rebuild in progress (Rebuilding)
	Green + white	Spare drive (Hot Spare)
	Yellow	Failure expected (Critical) State of PFA Count not 0
	Not applied	Unused and available (Unconfigured)

Logical drive

Displays the logical drive number and capacity, RAID level set, and logical drive status. The following shows the logical drive status:

table: Logical drive status icon

Icon	Color	Status
	Green	Normal (OnLine)
	Yellow	Operating without redundancy (Critical)
	Red	Cannot be used (OffLine)
	Green	Checking consistency

Enclosure

This function is not supported.

Double-clicking the icon of each hard disk/logical drive enables you to display more detailed information. For more details, refer to "4.6 Viewing Information" (→pg.99).

4.3.3 Menu Layout/Functions

The following explains the function of each menu item.

■ [File] Menu

table: [File] Menu

Menu	Function
Open Configuration	Reads the disk array settings saved in the disk in advance and reflects these to the currently selected controller. For more details, refer to "4.5.8 Saving, Restoring and Deleting RAID Configuration Information" (→pg.97).
Save Configuration	Saves the current RAID configuration in a file. For more details, refer to "4.5.8 Saving, Restoring and Deleting RAID Configuration Information" (→pg.97).
Clear Configuration	Clears all the RAID configurations of the currently selected SCSI array controller. For more details, refer to "4.5.8 Saving, Restoring and Deleting RAID Configuration Information" (→pg.97).

POINT

- It is necessary to open [Controller View] to use the above menus.

IMPORTANT

- If [Open Configuration] or [Clear Configuration] is executed, all the existing array configurations and data on the logical drives will be deleted. Do not perform the above operations unless directed by your maintenance engineer.

■ [View] Menu

table: [View] Menu

Menu	Function
Global Status View	Displays the [Global Status View] window. By default, [Global Status View] is configured to open at the time of GAM startup.
Controller View	Displays the [Controller View] window. This window displays information of each device, or displays the status of hard disks or logical drives connected to the controller selected in the controller selection box.
Log Information Viewer	Displays the [Log Information Viewer] window. This window displays events or errors that occurred in the SCSI array controller. [Log Information Viewer] opens automatically when GAM Client starts up.
Foreground Initialize Status	Displays progress of on-going foreground initialization of a logical drive. This is selectable only while foreground initialization is in progress.
Background Initialize Status	Displays progress of the on-going background initialization of a logical drive. This is selectable only while background initialization is in progress.
Rebuild Status	Displays progress of the on-going rebuild. This is selectable only while a rebuild is in progress.
Consistency Check Status	Displays progress of the on-going consistency check. This is selectable only while consistency check is in progress.

table: [View] Menu

Menu	Function
Expand Capacity Status	Displays progress of the on-going capacity expansion process. This is selectable only while a capacity expansion process is in progress. **Note:** ▸ Do not restart or shut down the system while a capacity expansion process is in progress. Doing so may cause data loss.
Patrol Read Status	Displays the Patrol Read progress. Also, allows you to start or stop Patrol Read.
Error Table	Displays the sense data. A list of sense data on the hard disks connected to the selected SCSI array controller will be displayed.

■ [Administration] Menu

table: [Administration] Menu

Menu	Function
Sign On	Allows you to log on when using GAM's monitoring and setting functions. If signing on with a user account registered on the server, it is possible to use the monitoring function (available with User privileges). Signing on with "gamroot" enables you to use the GAM's setting and management functions (available with Administrator privileges).
Define Server Groups	Sets a server group and the name or IP address of each server in the group.
Select Current Server Group	Selects a server group. Functions in the same manner as when the [Server Selection] box is directly operated. **Note:** ▸ Make sure to select a server group that was registered using [Define Server Group].
Select Current Controller	Selects a controller to be managed. Functions in the same manner as when the [Controller Selection] box is directly operated.
RAID Assist	Sets a disk array configuration. This function enables you to define physical packs and logical drives. **Note:** ▸ Automatic Configuration and Assisted Configuration are not supported. Therefore, make sure to use Manual Configuration.
Initialize Logical Drives	Initializes a logical drive. **Note:** ▸ When a logical drive is initialized, data on it will be deleted.
Controller Information	Displays major information of the currently selected SCSI array controller.
Enclosure Information	Displays the information of SES and SAF-TE Enclosure Management. **Note:** ▸ The Enclosure Information function is not supported. Hard disk cabinets cannot be monitored using this function.
Controller Options	Sets parameters of the selected SCSI array controller.
Physical Device Options	Not supported. Do not use this function.
Intelligent BBU	Not supported. Do not use this function.
Scan Devices	Redetects the hard disks connected.
Advanced Functions	Provides other functions. Selecting this opens the submenu.

table: [Administration] Menu

Menu	Function
Flash Utility	Not supported. Do not use this function.
Settings	Not supported. Do not use this function.
Alarm Sound	Not supported. Do not use this function.
Consistency Check with Restoration	Specifies whether data should be corrected or not during a consistency check. If set to Enable, data will be corrected in the event it lacks consistency.

4.3.4 Tool Bar Icons

Tool bar icons at the top of the [Global Array Manager] window enable you to start up frequently used functions.

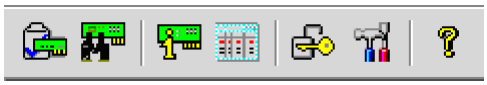


table: Tool bar Icons

Icon	Function
	Displays the [RAID Assist] window and starts creating a RAID configuration. Functions in the same manner as when [RAID Assist] is selected from the [Administration] menu.
	Rescans the devices. Functions in the same manner as when [Scan Devices] is executed from the [Administration] menu.
	Displays controller information. Functions in the same manner as when [Controller Information] is selected from the [Administration] menu.
	Displays sense data. Functions in the same manner as when [Error Table] is selected from the [View] menu.
	Displays the [Sign On] window. Functions in the same manner as when [Sign On] is selected from the [Administration] menu.
	This function is not supported.
	Displays Help.

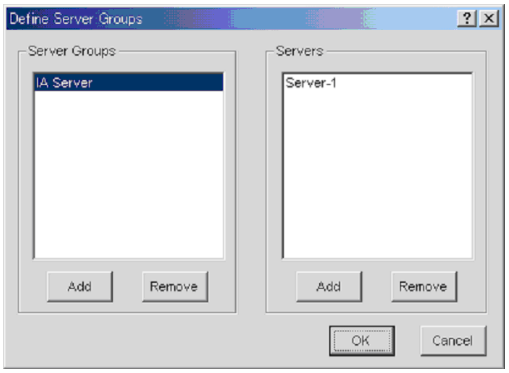
4.4 Settings

This section explains how to set parameters.
The following setting items are available:

- Server group and server settings
- Controller option settings

4.4.1 Server Group and Server Settings

The server group setting window automatically displays when GAM Client is started for the first time. Perform the following procedure to add a server group and servers. It is also possible to set a server group by selecting [Define Server Groups] from the [Administration] menu.



1 Click [Add] button in the [Server Groups] area.

2 Enter any name for the server group to be added using the [Adding Item] window.

3 Click [OK].
The added server group name is displayed in the [Server Groups] area.

4 Select the server group added and click [Add] button in the [Servers] area.

5 Enter the computer name of the server you want to monitor using the [Adding Item] window.

6 Click [OK].
The entered server name will be added in the [Server] area.

7 Click [OK] to close the [Define Server Groups] window.
Check that the registered server appears in [Global Status View].

4.4.2 Setting and Changing Controller Options

It is possible to check and change SCSI array controller options from [Controller Options] in the [Administration] menu. The properties of the SCSI array controller need to be configured as follows. However, [Rate] for [Enable Automatic Rebuild Management] can be changed.

table: Properties of the SCSI array controller

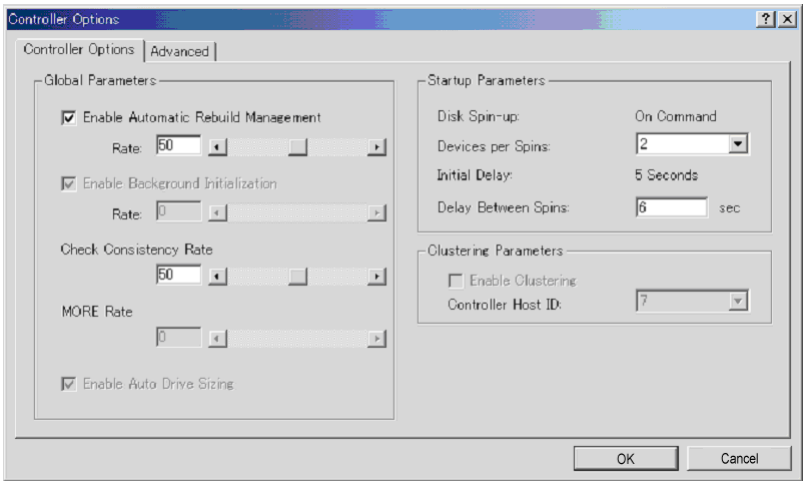
Option type	Parameter	Setting
Global Parameters	Enable Automatic Rebuild Management	Enable
	Rate	50
	Enable Background Initialization	Enable (Fixed)
	Rate	0 (Fixed)
	Check Consistency Rate	50
	MORE Rate	0 (Fixed)
	Enable Auto Drive Sizing	Enable (Fixed)
Startup Parameters	Disk Spin-up	On Command (Fixed)
	Devices Per Spins	2
	Initial Delay	5 (Fixed)
	Delay Between Spins	6
Clustering Parameters	Enable Clustering	Disable (Fixed)
	Controller Host ID	7 (Fixed)
Advanced	Temporarily Offline RAID Array	Enabled
	Device Health Monitoring(S.M.A.R.T/I.E.C)	Enabled
	Polling Interval	5
	Patrol Read	Enabled
	Delay between Iterations	168

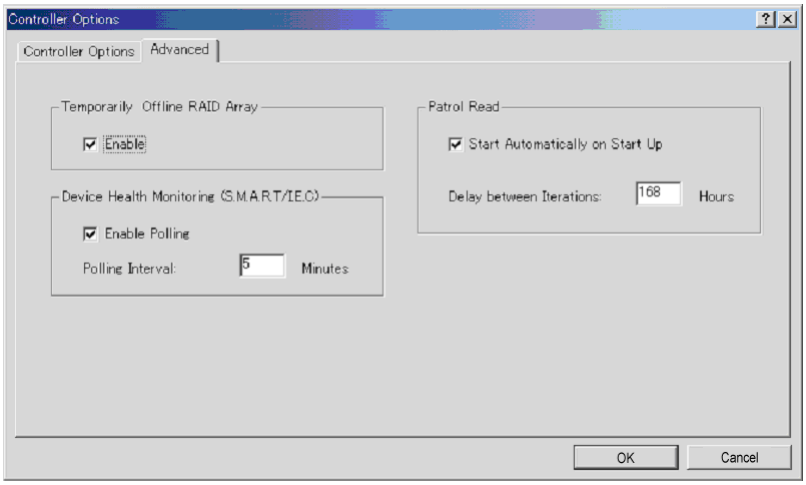
IMPORTANT

- If settings are made improperly, correct operation may not be ensured. Make sure to check the settings.
- If you temporarily change Rebuild Rate or Consistency Check Rate at the time of hard disk replacement or consistency check, make sure to restore its value after finishing the task.
- For Background Initialization and Check Consistency, their rates cannot be specified independently. Because operation is ensured by synchronizing the above rates with the setting for Automatic Rebuild Management, make sure to change the rate set for Automatic Rebuild Management when specifying the rates for Background Initialization and Check Consistency.

4.4.3 Controller Options Window Layout/Functions

Open the [Controller Options] window from the [Administration] menu (→pg.78).





■ Global Parameters

- Enable Automatic Rebuild Management
  Working with SAF-TE Disk Array Enclosure, detects a failed hard disk and automatically executes the rebuild process after a new hard disk is installed. Sets the priority of rebuilding using [Rate]. Increasing the value performs the rebuild at a higher speed. Decreasing the value performs the rebuild at a lower speed.
- Enable Background Initialization
  Enables the background initialization function. This function is constantly enabled. This setting cannot be changed.
- Check Consistency Rate
  Sets the priority of a consistency check. Increasing the value in [Rate] performs consistency check at a higher speed. Decreasing the value performs consistency check at a lower speed.

- MORE Rate
  Not supported.
- Enable Auto Drive Sizing
  Automatically adjusts the size displayed for the hard disk capacity. This function is constantly enabled. This option cannot be changed.

■ Start up Parameters

- Disk Spin-up
  Sets how the hard disks start rotating. Fixed to "On Command".
- Devices per Spins
  Sets the number of hard disks that start rotating at the same time. The smaller the number, the lighter the loads on the power supply.
- Initial Delay
  Fixed to 5 seconds. Cannot be changed.
- Delay Between Spins
  Specifies the cycle of rotation start between hard disks that rotate in sequence.

■ Clustering Parameters (Specifying Clustering-related Parameters)

Not supported.

■ Advanced Options

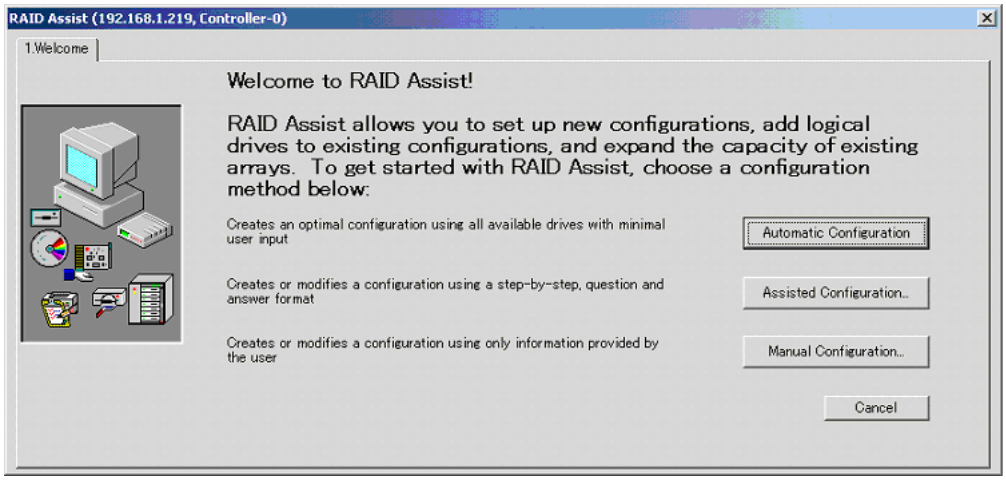
- Temporarily Offline RAID Array
  Of hard disks composing the array, if multiple hard disks become "Offline", treats the second or later hard disks that become Offline as "temporarily Offline", changes their status to "Online" at the time of the next system startup, and sets the status of the array to "Critical".
- Device Health Monitoring (S.M.A.R.T/I.E.C)
  Enables the hard disk failure prediction function. Specifies a polling interval for S.M.A.R.T detection at [Polling Interval].
- Patrol Read
  If [Start Automatically on Start Up] is enabled, the Patrol Read function is automatically executed when the system starts up. Specifies an interval of Patrol Read execution at [Delay between Iterations]. The value is set by specifying a multiple of 4 between 0 and 1016.

4.5 Creating and Operating a RAID Configuration

To create a new physical pack or logical drive in GAM, use the RAID Assist function. Using RAID Assist, it is possible to create or add an array configuration, expand the capacity and set the hot spare.

4.5.1 Overview of RAID Assist

It is possible to start RAID Assist by selecting [RAID Assist] from the [Administration] menu. The following window appears.



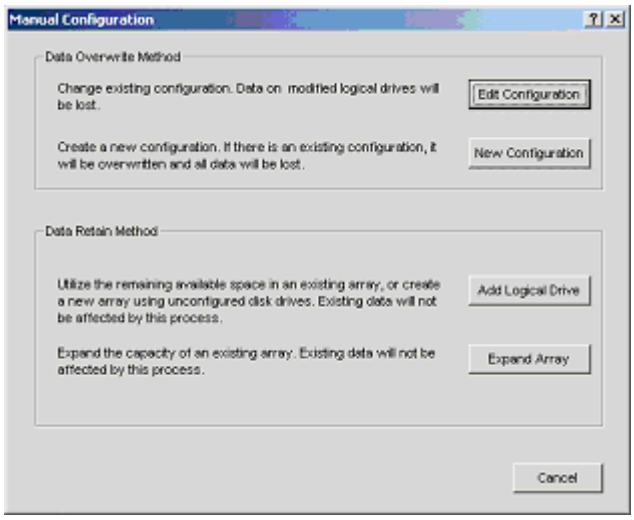
To start setting the array configuration, click [Manual Configuration].

IMPORTANT

- If the background task is running, you cannot use the RAID Assist function. However, if the background initialization is running, you can use RAID Assist by canceling it.
  Perform the following procedure to cancel the background initialization.
  1. Click [Background Initialization status] from the [View] window.
  2. Click [Select All] and then click [Cancel].

  Because the background initialization canceled using the above procedure will resume automatically, select the [RAID Assist] menu before it resumes.
- When executing RAID Assist, depending on operations, the existing array configuration information or file data may be deleted. Read this chapter carefully before use.
- Automatic Configuration and Assisted Configuration are not supported.
  Do not use these functions. Use Manual Configuration to create a RAID configuration.
- RAID 10 logical drives cannot be created using GAM. Use WebBIOS to create RAID 10 logical drives.

The following window appears.



The buttons are used in the following situations.

■ Edit Configuration

Used for setting/releasing a hot spare disk or for deleting a logical drive.

IMPORTANT

- Do not use Edit Configuration for purposes other than to delete a logical drive or to set/release a hot spare.
- When a logical drive is deleted, the data inside is also deleted. Thus, full planning is absolutely required before using this function.

■ New Configuration

Deletes the old array configuration and data (if any) and applies a new array configuration to the SCSI array controller. This function is used when no array configuration exists on the SCSI array controller, or when a new array configuration is created after deleting the existing array configuration completely.

IMPORTANT

- Executing New Configuration deletes the existing configuration information. Use this function very carefully since it will delete all the existing logical drives and data inside.

■ Add Logical Drive

Used for setting up an additional logical drive while keeping the existing array configuration as is. It is necessary that one or more logical drives are set for the selected SCSI array controller, and that free space remains in the physical pack or hard disks that are unused (Unconfigured).

■ Expand Array

To expand the logical drive's capacity, adds an unused (Unconfigured) hard disk to an existing physical pack and reconfigure data in the drive. The data in the logical drive to be expanded will not be destroyed.

4.5.2 Creating a New RAID Configuration (New Configuration)

To newly create an array configuration or to create a new array configuration after deleting the existing array configuration completely, perform the following procedure.
The following shows a procedure for executing New Configuration.

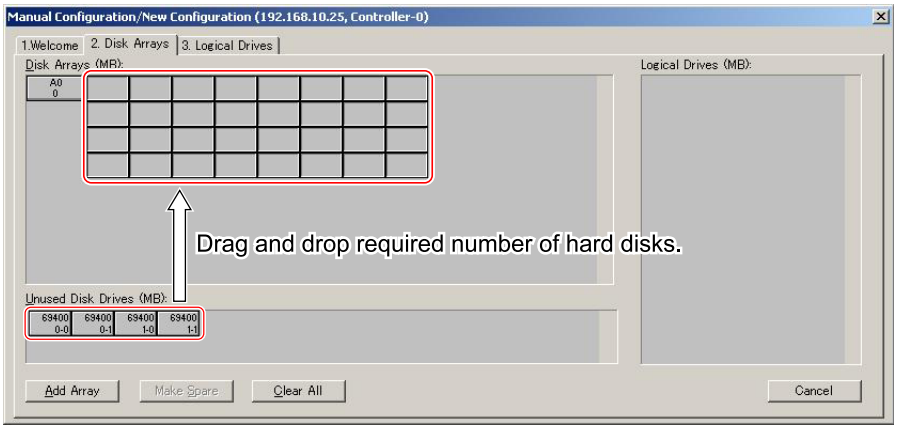
1 Start [RAID Assist] from the [Administration] menu.

→"4.5.1 Overview of RAID Assist" (pg.84)

2 Click [Manual Configuration].

3 Click [New Configuration].

The following window appears. At this point, create a physical pack.
The physical pack is displayed in the [Disk Arrays] area at the top left of the window.



A list of unused hard disks is displayed in the [Unused Disk Drives] area at the bottom left of the window. Select an unused hard disk from the above list and drag and drop it to the [Disk Array A0] area. The hard disk dragged and dropped will become part of the physical pack A0. A maximum of 5 hard disks can be added to one physical pack.

POINT

- When you select unused hard disks, selecting while holding down the [Ctrl] key enables selection of multiple hard disks at a time.

In addition, drag and drop hard disks from the [Disk Arrays] area into the [Unused Disk Drives] area to delete them from a physical pack.
Click [Clear All] if you want to make a physical pack setting from the beginning.

IMPORTANT

- At this point, do not use the [Add Array]. When multiple physical packs are created, use [Add Logical Drive] after completing this procedure and make an addition.
- Use hard disks of the same capacity and type in one physical pack. If a mixture of different hard disks are connected, check in advance according to "4.6.3 Viewing Hard Disk Information" (→pg.103).

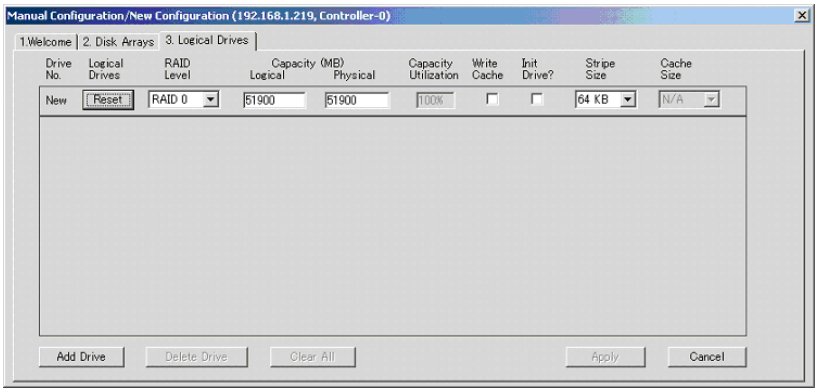
4 When a spare disk is set, click [Make Spare] with the unused hard disk selected.

The unused hard disk icon will be changed to a spare disk icon. To release a spare disk, select the spare disk to be released and then click [Remove Spare].

IMPORTANT

- Do not drag and drop a hard disk whose status was set as a spare disk into the physical pack area.
- Use a spare disk of the same capacity and type as hard disks in the physical pack.
- If a spare disk is set when multiple physical packs that use different hard disks exist, a spare disk must be set for each type of hard disks.

5 Click the [Logical Drives] tab after creating the physical pack, and start setting up a logical drive.



6 Select a RAID level to set for the logical drive.

Click ▼ of [RAID Level] and then select the RAID level to set for the logical drive from the list displayed.

IMPORTANT

- RAID 10 logical drives cannot be created using GAM. Use WebBIOS to create RAID 10 logical drives.

7 Enter the capacity of a logical drive to be created in [Capacity-Logical] or the physical capacity to be used in [Capacity-Physical].

If only one logical drive is created in the disk array, or if the last logical drive in the physical pack is created, do not change the default size. If creating multiple logical drives, enter a value smaller than the entire capacity to leave the required capacity.

IMPORTANT

- The capacity of a logical drive may be adjusted to match the block size.

POINT

- It is recommended not to create multiple logical drives in a single physical pack.
  If multiple logical drives are created in a single physical pack, it is not possible to expand the capacity later using the [Expand Capacity] function.

8 To initialize a logical drive that is created after creating the configuration, check the [Init Drive] checkbox.

POINT

- Even if this option is not checked, the background initialization will be performed automatically.

9 Select [64KB] for the Stripe Size.

IMPORTANT

- [Stripe Size] must be set to [64KB].

10 Click [Add Drive] to register the new logical drive.

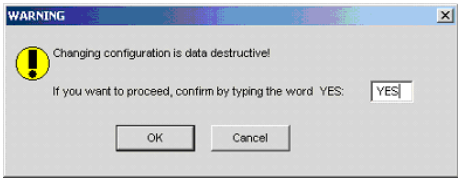
11 To create multiple logical drives in a single physical pack, repeat Steps 6 through 10 respectively.

IMPORTANT

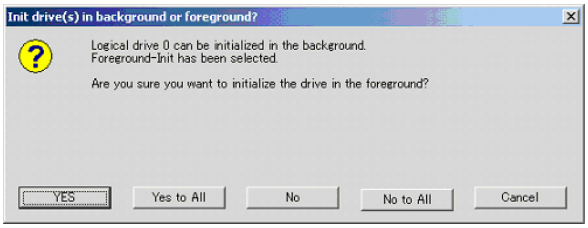
- Do not set logical drives of different RAID levels in a single physical pack.
- Do not leave free space in the physical pack. (Do not change the capacity of the last created logical drive in Step 7. In addition, check that "0" appears in the [Capacity] fields for both Logical and Physical after the last logical drive has been added.)
- Do not check the [Write Cache] checkbox.

12 After completing setup of all the logical drives, click [Apply] to enable the configuration.

13 A final confirmation window appears. Enter "YES" and click [OK].



If a logical drive exists whose [Init Drive] has been checked in Step 8, the following window displayed.

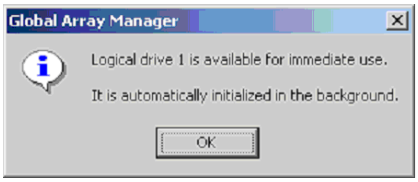


Click [YES] to perform foreground initialization, or click [No] to perform background initialization.

POINT

- This window appears asking whether the redundant logical drive with [Init Drive] checked should be initialized in the foreground or background.
  This window does not appear for logical drives with [Init Drive] not checked.

14 If a drive to be initialized in the background exists, the following window appears indicating that the drive is ready. Then click [OK].



15 The [Physical Drive Options] window automatically appears. Click [Cancel].

If there is a drive for which foreground initialization is specified, the [Initialize Status] window is displayed and the foreground initialization starts.

IMPORTANT

- The logical drive for which foreground initialization is specified cannot be used until the initialization is completed.

4.5.3 Adding a Logical Drive to the Existing RAID Configuration (Add Logical Drive)

The following explains procedures for adding a new logical drive to the existing RAID configuration. To add a new logical drive, it is necessary to have either an unused drive or free space in the existing physical pack.

The following shows procedures for executing Add Logical Drive.

1 Start [RAID Assist] from the [Administration] menu.

2 Click [Manual Configuration].

3 Click [Add Logical Drive].

The [Disk Arrays] tab window appears.

POINT

- If free space remains in the physical pack already defined, the [Logical Drives] tab window appears. In this case, refer to "4.5.2 Creating a New RAID Configuration (New Configuration)" (→pg.86) for defining logical drives.

4 Click [Add Array] to configure a new physical pack.

An empty physical pack is additionally displayed in the [Disk Arrays] field.

5 Select an unused drive from the [Unused Disk Drives/Global Hot Spares] field, and drag it to the empty physical pack added.

The drive dragged will become part of the physical pack. A maximum of 5 drives can be added to one disk array.

IMPORTANT

- Do not add multiple disk arrays at a time. If an additional disk array is created, complete this procedure, apply the configuration and execute Add Logical Drive again.
- Use hard disks of the same capacity and type in one physical pack. If a mixture of different hard disks are connected, check in advance according to "4.6.3 Viewing Hard Disk Information" (→pg.103).

6 When a spare disk is set, click [Make Spare] with the unused hard disk selected.

The unused hard disk icon will be changed to a spare disk icon. To release a spare disk, select the spare disk to be released and then click [Remove Spare].

POINT

- Please advance to the following procedure (procedure 7) after clicking [Make Spare] or [Remove Spare] without fail only even when the spare disk is set.
  A set content is not reflected as long as the content of procedure 7 is not executed.

IMPORTANT

- Do not drag and drop a hard disk whose status was set as a spare disk into the physical pack area.
- Use a spare disk of the same capacity and type as hard disks in the physical pack.
- If a spare disk is set when multiple physical packs that use different hard disks exist, a spare disk must be set for each type of hard disk.

7 Click the [Logical Drives] tab after configuring the physical pack and spare disk, and start setting up a logical drive.

After this, refer to Steps 6 and later in "4.5.2 Creating a New RAID Configuration (New Configuration)" (→pg.86) for defining logical drives.

4.5.4 Expanding Capacity of a Logical Drive (Expand Array)

The capacity of a logical drive can be expanded by adding a new hard disk at a later time to the existing physical pack. To expand the capacity of a logical drive, the target logical drive needs to satisfy the following conditions:

- Only one logical drive must be defined in the physical pack.
- The number of hard disks that compose the target physical pack/logical drive must not exceed 5 after capacity expansion.
- The RAID level of the target logical drive must be 1, or 5. (Capacity expansion is not possible for RAID 10.)
- The OS must be Windows 2000 Server or Windows Server 2003.

1 To prepare for unexpected problems, perform data backup.

2 Perform consistency check onto the logical drive whose capacity is to be expanded.

Confirm that the check completes successfully.

IMPORTANT

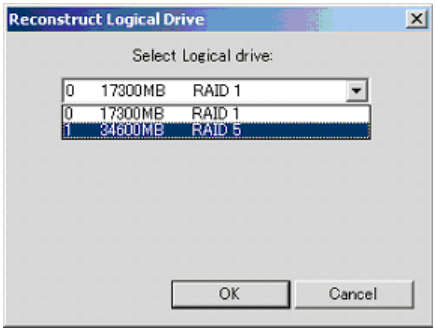
- If it does not complete successfully, do not perform capacity expansion.

3 Start [RAID Assist] from the [Administration] menu.

4 Click [Manual Configuration].

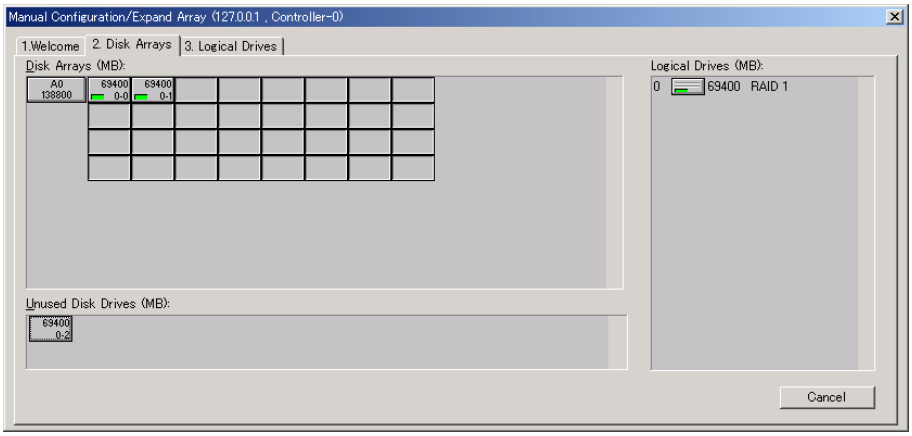
5 Click [Expand Array].

The following window appears. Select a logical drive to be expanded.



6 Click [OK].

The [Disk Arrays] tab window appears.



7 Select an unused hard disk from the [Unused Disk Drives] area and drag and drop it to the physical pack displayed at the top left of the window.

You can add hard disks until the total number of hard disks in the physical pack reaches 5.

IMPORTANT

- Keep the number of hard disks in the physical pack 5 or less.
- Use additional hard disks of the same capacity and type as the hard disks in the physical pack. If a mixture of different hard disks are connected, check in advance according to "4.6.3 Viewing Hard Disk Information" (→pg.103).

8 Click the [Logical Drives] tab after adding a hard disk to the physical pack.

9 Select [RAID Level].

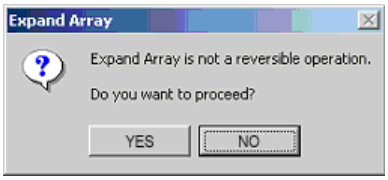
After the expansion, the RAID level of the logical drive will be converted to the RAID level selected here. RAID 5 can be selected.

IMPORTANT

- Do not change Stripe Size.
- RAID 0 is not supported. Please do not select RAID 0.

10 Click [Apply].

When the following confirmation window appears, click [YES].



11 A final confirmation window appears.

Enter "YES" and click [OK].

A window showing the progress of capacity expansion appears and the expansion process starts. Wait until the process is completed.

IMPORTANT

- While capacity expansion is in progress, do not turn off, reset or restart the server. Doing so may cause loss of data on the target logical drive.
- If the server is turned off during the capacity expansion process, access to the hard disk resumes automatically after the server restart. In this case, wait until the access lamp on the hard disk turned off, ensure that no access is made to the hard disk, create an array configuration again and then restore the data backed up before the task.
- If the RAID level of the logical drive after expansion is RAID 5, background initialization will be performed after capacity expansion completes.

4.5.5 Deleting an Existing Logical Drive (Edit Configuration)

The following explains procedures for deleting a logical drive using Edit Configuration.

IMPORTANT

- Do not use Edit Configuration for operations other than deleting a logical drive or setting/releasing a spare disk. When a physical pack or logical drive is created, use New Configuration or Add Logical Drive.
- Make sure to back up data before you delete a logical drive.

1 To prepare for unexpected problems, perform data backup.

2 Start [RAID Assist] from the [Administration] menu.

3 Click [Manual Configuration].

4 Click [Edit Configuration].

The [Disk Arrays] tab window appears. Click the [Logical Drives] tab.

IMPORTANT

- Do not change the physical pack configuration in the [Disk Arrays] window. If the physical pack configuration is changed, all the existing logical drives will be deleted. Should the physical pack configuration be accidentally changed, click [Cancel] and start the procedure again.

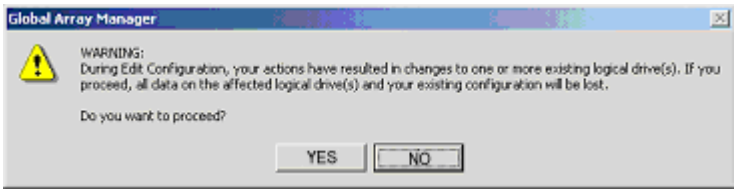
A list of the currently defined logical drives appears. When [Delete Drive] is clicked, logical drives will be deleted in ascending order from the last in the list.

IMPORTANT

- Note that clicking [Clear All] deletes all logical drives. Should the wrong logical drive be deleted, click [Cancel] and start again from the beginning.

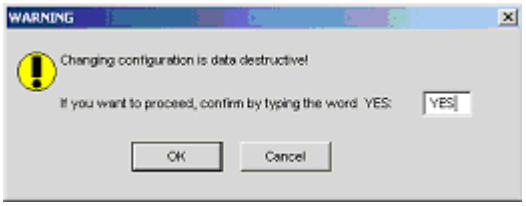
5 When completing deletion of logical drives from the list, recheck if the wrong drive has been deleted. If not, click [Apply].

The following warning message appears.



6 Click [YES].

7 A final confirmation message appears. Enter "YES" and click [OK].



8 Click [Cancel] when the [Physical Device Options] window appears.

IMPORTANT

- Should the wrong logical drive be deleted, create an array configuration again and then restore the data backed up before the task.
- If all logical drives in a physical pack are deleted, the physical pack will be automatically deleted, and the hard disks that composed the physical pack will become unused.

4.5.6 Setting and Releasing a Spare Disk (Edit Configuration)

This section explains how to set and release a spare disk.

IMPORTANT

- Do not use Edit Configuration for operations other than deleting a logical drive or setting/releasing a spare disk. When a physical pack or logical drive is created, use New Configuration or Add Logical Drive.

1 Start [RAID Assist] from the [Administration] menu.

2 Click [Manual Configuration].

3 Click [Edit Configuration].

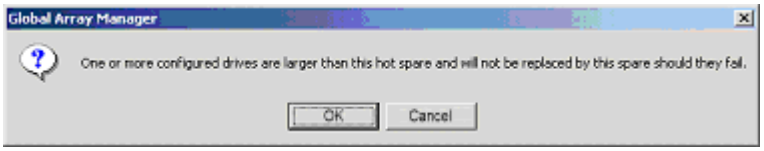
The [Disk Arrays] tab window appears.

4 Click [Make Spare] with the unused hard disk selected in the [Unused Disk Drives] area.

The unused hard disk icon will be changed to a spare disk icon. To release a spare disk, select its icon and then click [Remove Spare].

POINT

- If a physical pack exists that consists of hard disks with capacity larger than that of a hard disk to set as a spare, the following message appears when [Make Spare] is clicked. Click [OK].



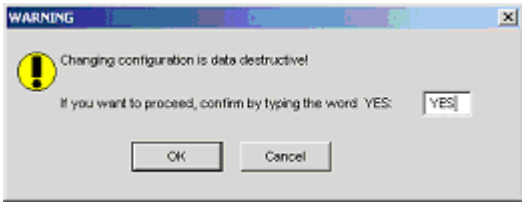
IMPORTANT

- Do not drag and drop the icon of a spare disk or unused hard disk into the physical pack area.
- Use a spare disk of the same capacity and type as hard disks in the physical pack.
- If a spare disk is set when multiple physical packs that use different hard disks exist, a spare disk must be set for each type of hard disks.

5 After configuring the spare disk, ensure that the existing logical drives displayed on the right have not been changed.
If not, click the [Logical Drives] tab.

6 Click [Apply].

7 When a confirmation window appears, enter "YES" and click [OK].



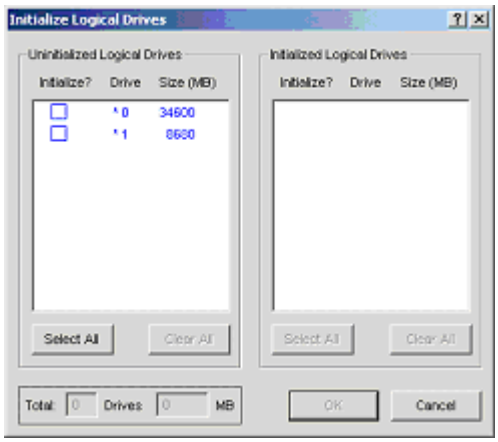
4.5.7 Initializing a Logical Drive (Data Deletion)

This section explains how to initialize a logical drive in the foreground. Initializing a logical drive in the foreground enables you to delete data in the logical drive.

POINT

- The background initialization function is supported. Therefore, after the array has been configured, it is not necessary to perform initialization using this function.

When [Initialize Logical Drives] is selected from the [Administration] menu, the following window appears.



In this window, it is possible to initialize a logical drive in the foreground (data deletion). It is also possible to check logical drives both not initialized and already initialized.
A list of uninitialized logical drives is displayed in the [Uninitialized Logical Drives] area (on the left of the window). A list of already-initialized logical drives is displayed in the [Initialized Logical Drives] area (on the right of the window).

IMPORTANT

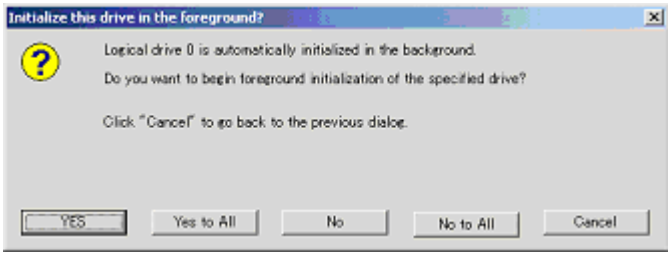
- Because background initialization is supported, there is a possibility that data is already written even if the logical drive is displayed in the [Uninitialized Logical Drives] area. Initialization using this function must be performed carefully because it will delete all the data in the logical drive.

■ Procedure to initialize a logical drive

To initialize a logical drive in the foreground, perform the following procedure.

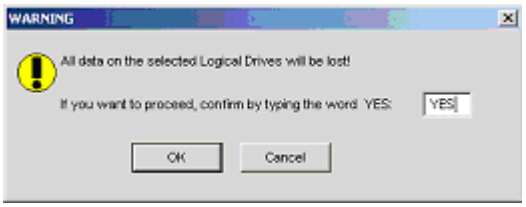
1 Select a logical drive to be initialized and check the [Initialize?] checkbox.
To cancel all that you have selected, click [Clear All].

2 Ensure that the right logical drives are selected and click [OK].
The following window appears.



3 Click [Yes to All].
A final confirmation window appears.

4 To start initialization, enter "YES" and click [OK].



The [Initialize Status] window appears and foreground initialization starts. Wait until the initialization is completed.

IMPORTANT

- Do not use logical drives until the initialization completes. Doing so may cause data loss.

4.5.8 Saving, Restoring and Deleting RAID Configuration Information

RAID configuration information refers to the information created when the disk array is configured such as physical pack or logical drive capacity, RAID levels, and which physical pack the hard disks belong to. By saving the RAID configuration information to a file, it is possible to restore the current RAID configuration should unexpected problems occur.

POINT

- From the file in which RAID configuration information was saved, only the information about the RAID configuration can be restored. The data written to a logical drive cannot be restored.

■ Saving RAID Configuration Information

The current RAID configuration information can be saved to a floppy disk or hard disk.

1. Select [Save Configuration] from the [File] menu.
2. Enter a file name and click [Save].
   The current RAID configuration information is saved in the file.

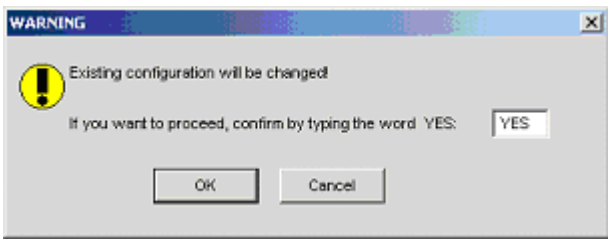
■ Restoring RAID Configuration Information

To restore the RAID configuration information saved to a floppy disk or hard disk, perform the following procedure.

IMPORTANT

- Do not restore RAID configuration information unless directed by your maintenance engineer. If RAID configuration information is restored, all data on the existing logical drives will be lost.

1. Select [Open Configuration] from the [File] menu.
2. Select the RAID configuration information file you want to restore and click [Open].
   The following warning window appears.
   To write the RAID configuration information contained in the file over the existing configuration information, enter "YES" and click [OK]. Click [Cancel] to cancel the operation.



■ Deleting RAID Configuration Information

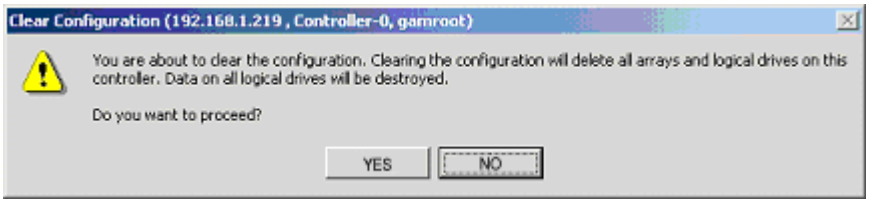
The following explains how to delete RAID configuration information.

IMPORTANT

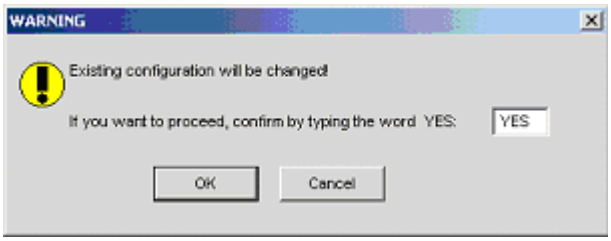
- Do not delete RAID configuration information unless directed by your maintenance engineer. All data on the logical drives will be lost by this operation.

1 Select [Clear Configuration] from the [File] menu.

When the following confirmation window appears, click [YES].
If you want to stop deleting the RAID configuration information, click [NO].



When [YES] is clicked, a final confirmation window appears. Enter "YES" and click [OK].
If you want to exit without deleting the existing RAID configuration information, click [Cancel].



4.6 Viewing Information

The following information can be viewed using GAM.

- Information of an event or error that occurred
- Array configuration or controller information
- Hard disk information
- Logical drive information
- Request Sense Data information
- Information of a task running in the background

4.6.1 Event

GAM monitors the behaviors of all hard disks and controllers connected to the server. If a behavior that should be treated as an event (a serious event such as hard disk failure or an event related to spare disk allocation) is found, that event is noticed to GAM.
Events such as errors, information, or management tasks in the RAID system are displayed in [Log Information Viewer].

POINT

- To write the incidence of an event or error into event logs of the operating system, it is necessary to install ServerView. Refer to "User's Guide" in the PRIMERGY Documents & Tools CD provided with the server to install and configure ServerView.
- The GAM Server records detailed information on occurred events in the file "GAMEVLOG.LOG". This file may be used when investigation is necessary.
  The path where "GAMEVLOG.LOG" is stored is as follows, depending on the OS:
  - Windows Server 2003 / Windows 2000 Server:
    [%SystemRoot%¥System32¥Gamserv¥GAMEVLOG.LOG]
  - Windows Server 2003 x64:
    [%SystemRoot%¥Syswow64¥Gamserv¥GAMEVLOG.LOG]
  - Linux:
    [/var/log/gamevlog.log]
- While GAM Client is running, if the IP address of the server to be monitored is changed or the LAN connection is disconnected, the "Lost connection to server, or server is down" message will be recorded every 10 minutes.
- If the IP address or computer name of Client is changed after GAM Server was installed, events cannot be noticed correctly. In this case, it is necessary to uninstall GAM Server first and then install it again. (If the IP address is automatically obtained from the DHCP server, the IP address may be changed depending on the timing of powering on/off or restarting the system.)

■ Log Information Viewer

[Log Information Viewer] opens automatically when a SCSI array controller is detected at the time of GAM Client startup.

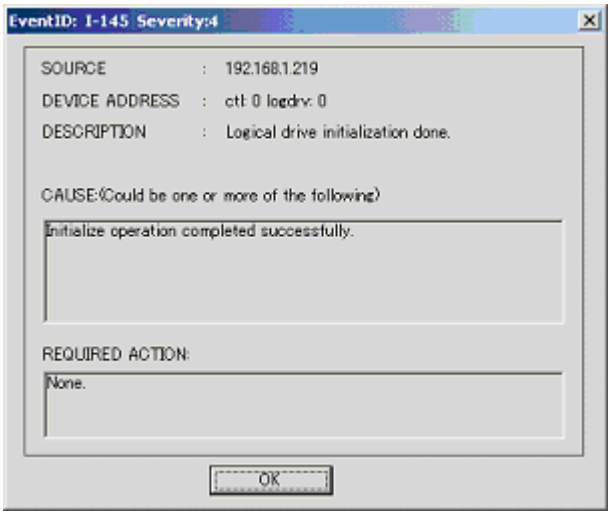
POINT

- Event histories displayed in [Log Information Viewer] are stored in the GAM2CL.LOG file.

When [Log Information Viewer] is opened manually, select [Log Information Viewer] from the [View] menu. For the meaning of each item displayed in [Log Information Viewer], refer to "4.3.1 Startup Window Layout/Functions" (→pg.73).

■ Displaying Detailed Information of Each Event

When detailed information of an event displayed in [Log Information Viewer] is needed, display the [Event ID] window.
Double-click the event displayed in [Log Information Viewer] to display the [Event ID] window.



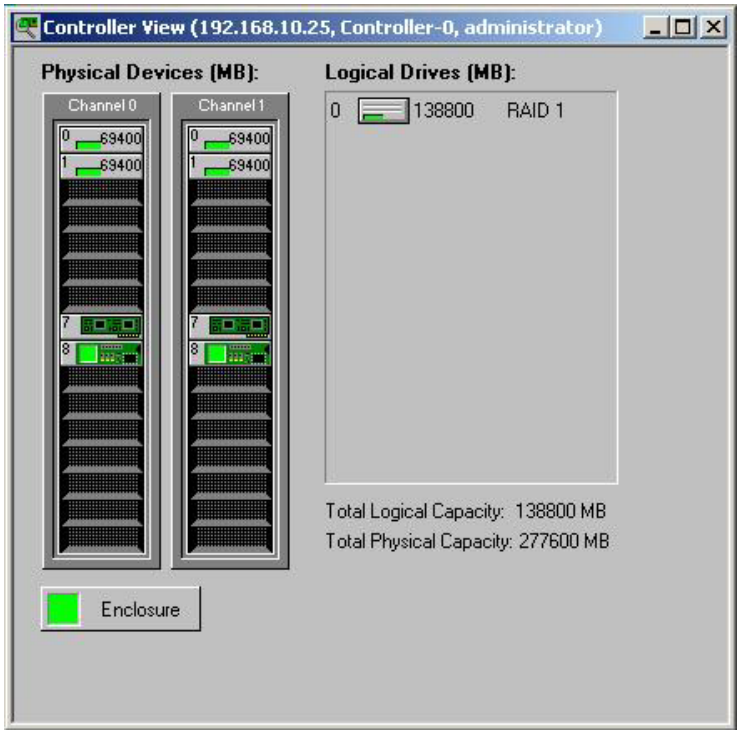
Detailed information on the selected event is displayed.
Click [OK] to close the [Event ID] window.

4.6.2 RAID Controller

The [Controller View] window enables you to view the status of the RAID controller and hard disks or logical drives connected.

■ Starting Controller View

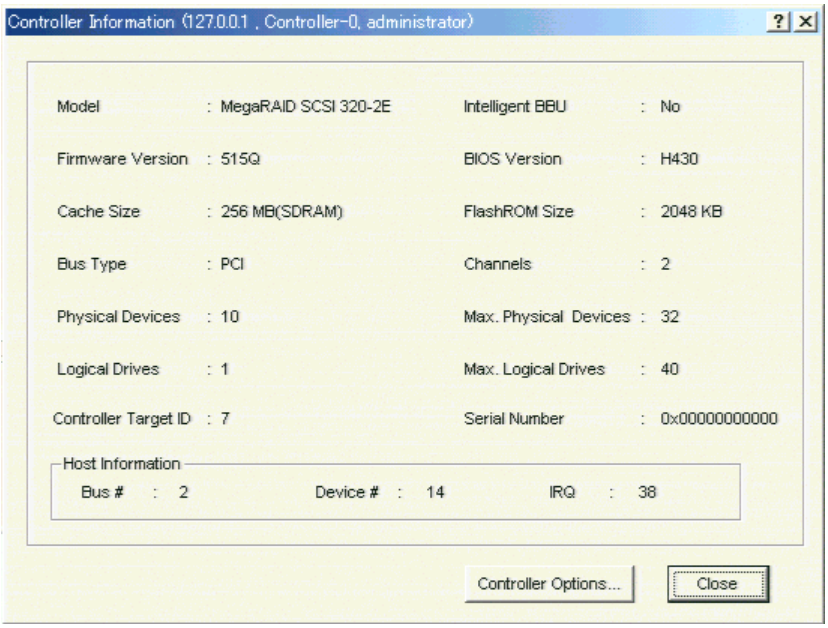
Double-click the server icon in [Global Status View] to start [Controller View]. If you have not signed on to the server, the [Sign On] window appears. Sign on to the server using this window.



For details on icons in the [Controller View] window, refer to "4.3.2 [Controller View] Window Layout/ Functions" (→pg.75).

■ Displaying RAID Controller Detailed Information

Click [Controller Information] from the [Administration] menu ("[Administration] Menu"→pg.78). The [Controller Information] window appears. You can set controller options by clicking [Controller Options].



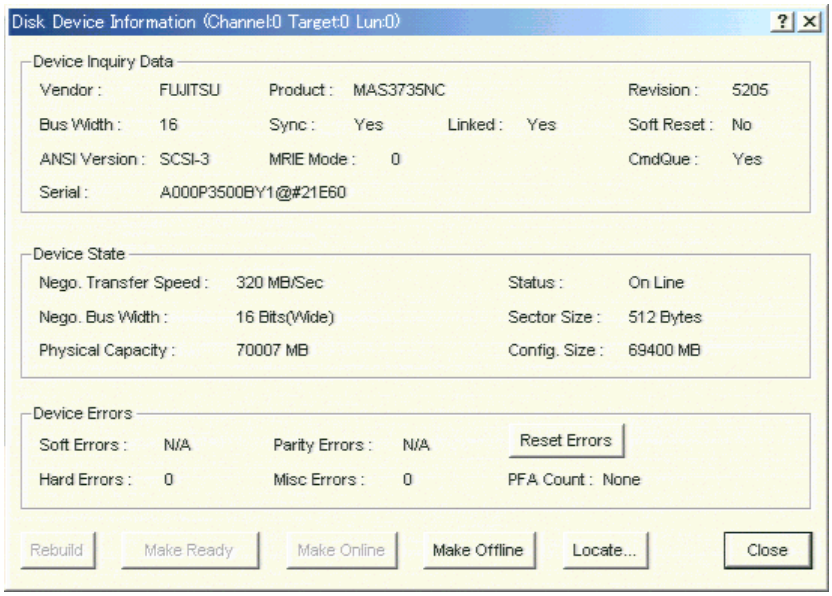
Click [Close] to close the [Controller Information] window.

POINT

- The controller type of an SCSI array controller is displayed in the Model field. For the onboard array controller, it is displayed as MegaRAID SCSI 320-2E, and for PG-142E3, it is displayed as MegaRAID SCSI 320-2.
- The Serial Number field is not supported.

4.6.3 Viewing Hard Disk Information

The [Controller View] window displays details of hard disks connected to channels of the controller.
Each drive column indicates the hard disks connected to one controller channel each.
Double-clicking a hard disk icon enables you to display the information of a specific hard disk.



The following information is displayed.

- Hard disk channel and target ID
  These information is displayed on the title bar.
- Vendor
  Hard disk vendor.
- Product
  Hard disk part number.
- Revision
  Version of firmware on the hard disk.
- Bus Width
  SCSI bus width.
- Synch / Soft Reset / Linked / Command Queuing
- ANSI Version
  ANSI version supported.
- Serial
  Disk drive's serial number.

- Nego. Transfer Speed / Nego. Bus Width
  Current transfer speed (MB/second) and current transfer bus width.

  POINT
  - The transfer speed may become slower if an error temporarily occurs in the hard disk. Normally, if the status of the hard disk is not dead, this phenomenon does not pose any problem to operation. However, if the performance is very low, the transfer speed is reconfigured by restarting the system.

- Physical Capacity
  Physical capacity of the hard disk.
- Config. size
  Hard disk capacity available when connected.
- Sector size
  Sector size.
- Status
  Current status of the hard disk.
  The hard disk status is as follows:

  table: The status of the hard disk

Status	Meaning
OnLine	Online (normal)
Dead	Dead (failed)
Dead (absent)	Dead (Drive not found)
Rebuilding	Rebuild in progress
Unconfigured	Unused and available
Hot Spare	Spare disk
Critical	State of failure being expected (PFA Count)

- Hard Errors / Misc Errors / PFA Count
  Number of errors.
  Errors is as follows:
  - Hard Errors : Media errors
  - Misc Errors : Errors other than media errors
  - PFA Count : Failure expected

  POINT
  - Soft Error / Parity Error display is not supported.
  - If PFA Count is Found, refer to "5.2 Preventive Replacement Procedure of a Hard Disk" (→pg.117) to replace the hard disk.
  - In the case of Hard Errors and Misc Errors, because the hard disk is restored using the recovery function, there is no problem in continuing with the operation. If errors occur frequently, please contact an your maintenance engineer.

  The following operations can be performed using buttons.
- Rebuild button
  When the hard disk status is "Dead", [Rebuild] is enabled, so that you can specify rebuilding of the hard disk (→"4.7.2 Rebuild" (pg.112)).

- Make Ready button
  This button is enabled for hard disks with "Hot spare" status Using the [Make Ready] button makes the hard disk "Unconfigured".

  IMPORTANT
  - Do not use "Make Ready" except in special cases, such as when you are instructed to do so by your maintenance engineer.

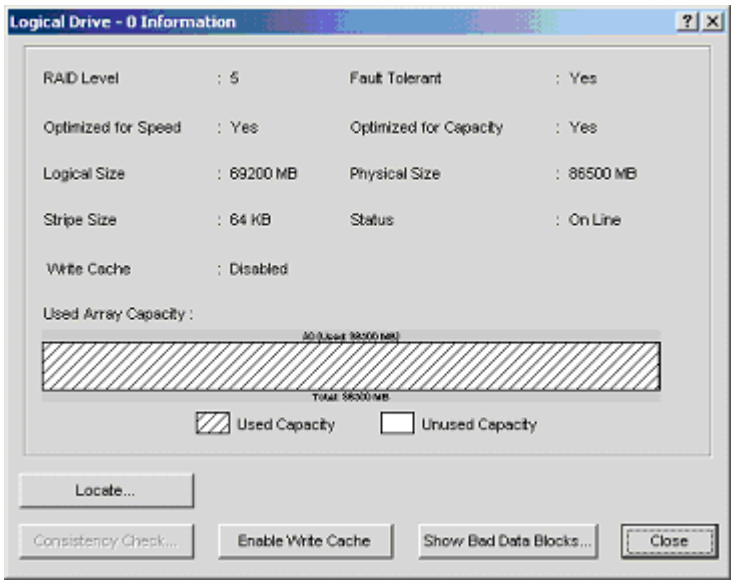
- Make Online/Make Offline button
  Forcibly changes the status of a hard disk to "Online" or "Offline".

  IMPORTANT
  - Do not use [Make Online] or [Make Offline] unless directed by your maintenance engineer. Use only the rebuild operation especially when changing hard disks status from "Offline" status to the "Online" status. Data reliability may be lost by this operation.

- Locate button
  Blinks the access lamp on the hard disk and notifies the hard disk position.

4.6.4 Displaying Logical Drive Information

Defined logical drives are displayed at the right of the [Controller View] window, each icon representing one logical drive (also called Logical Unit or System Drive).
To display information of a specific logical drive, double-click a logical drive icon in the [Controller View] window.



The following information is displayed.

- Logical Drive
  Logical drive number (displayed on the title bar of the window).

- RAID Level / Fault Tolerant
  RAID level and applicability of redundancy.
- Optimized for Speed / Optimized for Capacity
  Whether the speed set, capacity, or redundancy is optimized.
- Logical Size / Physical Size
  Logical and physical sizes of the logical drive.
- Stripe Size / Cache Line Size
  Stripe size the logical drive uses.
- Write Cache
  Write back cache setting.
- Status
  Current logical drive's operation status.
  The meaning of each status is as follows:

table: Logical drive's operation status.

Status	Meaning
OnLine	Online (normal)
Critical	Operating without redundancy
OffLine	Offline (failed)

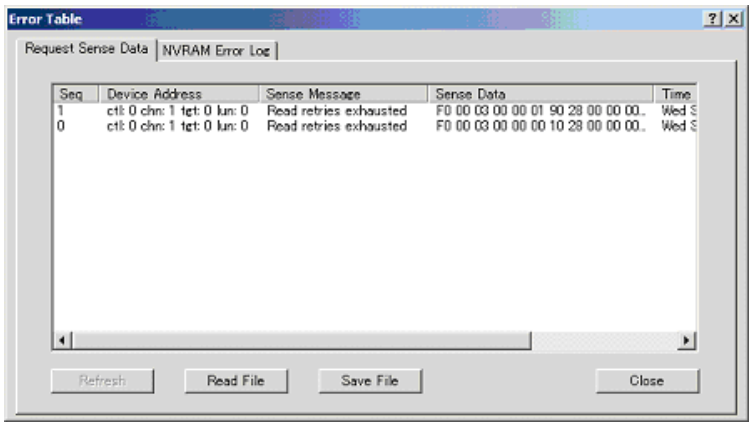
- Used Array Capacity
  Of the physical pack capacity, the capacity occupied by the current logical drive.
  The following operations can be performed using buttons.
  - Locate button
    Blinks the access lamps on all the hard disks that compose the logical drive and notifies the hard disk positions.
  - Consistency Check button
    If [Consistency Check] is enabled, it is possible manually to perform a consistency check on the logical drive. For details on consistency check, refer to "4.7.1 Consistency Check" (→pg.111).
- Enable Write Cache / Disable Write Cache
  Not supported.
- Show Bad Data Blocks
  Not supported.

POINT

- On GAM, a RAID 10 logical drive is displayed as RAID 1. For a RAID 10 logical drive, two or more physical packs are displayed in the Used Array Capacity graph.

4.6.5 Displaying Request Sense Data / NVRAM Error Log

To display hard disk sense information, select [Error Table] from the [View] menu.
The following window appears.

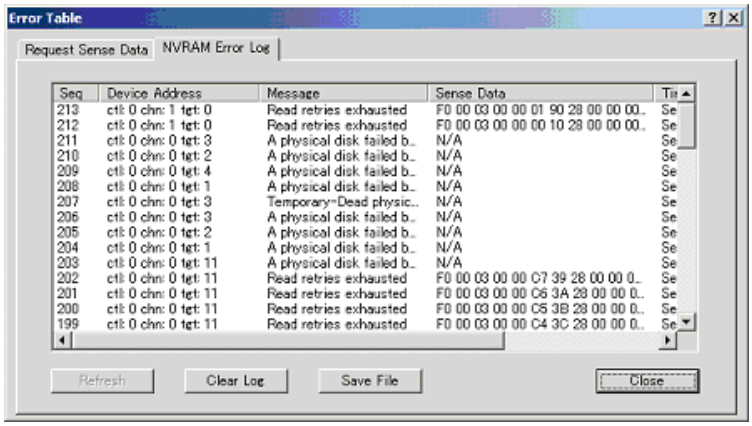


It is possible to save sense information to a file by clicking [Save File].

POINT

- Request Sense Data is data used for problem investigation.
- When the system is restarted, Request Sense Data is cleared.

Click the [NVRAM Error Log] tab to display NVRAM logs.



It is possible to save NVRAM logs to a file by clicking [Save File].

IMPORTANT

- Do not click the [Clear Log] button. Doing so deletes logs.

POINT

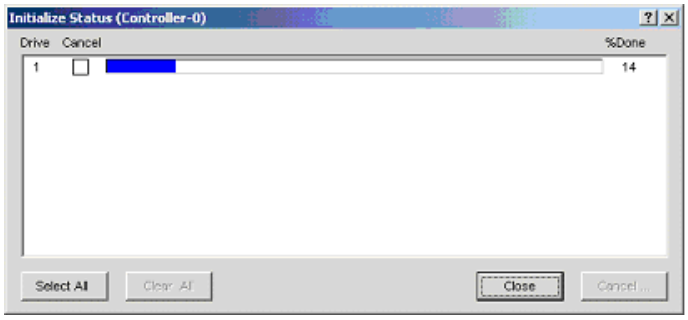
- NVRAM Error Log is data used for problem investigation.

4.6.6 Checking the Progress of a Background Task

Background tasks include processes such as initialization, rebuild, consistency check and capacity expansion. GAM enables you to check the progress of these tasks in graph form.

■ Foreground/Background Initialize Status

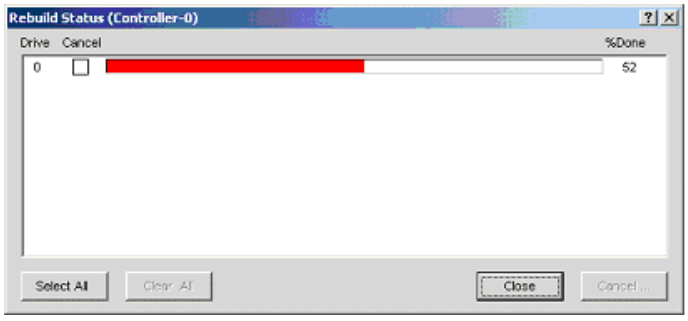
When the initialization of a logical drive is in progress, select [Foreground Initialize Status] or [Background Initialize Status] from the [View] menu to check its progress.



It is possible to cancel the initialization of the target logical drive with checking the [Cancel] checkbox of each logical drive and clicking [Cancel].
Click [Close] to close the [Initialize Status] window.

■ Rebuild Status

When a rebuild is in progress, it is possible to check its progress by selecting [Rebuild Status] from the [View] menu.



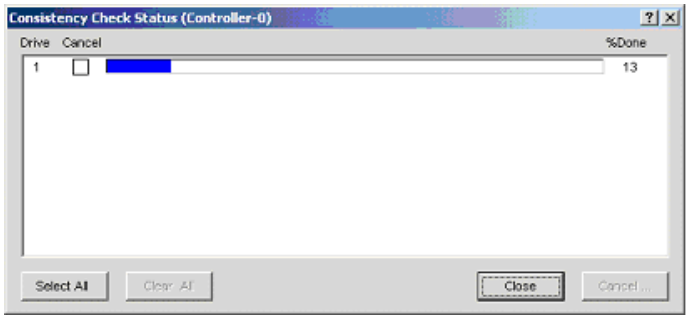
Click [Close] to close the [Rebuild Status] window.

IMPORTANT

- Do not cancel the rebuild.

■ Consistency Check Status

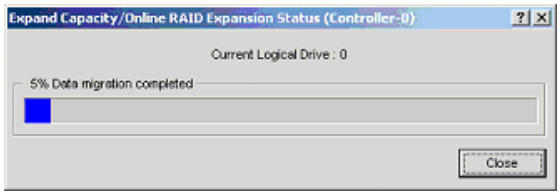
When consistency check is in progress, it is possible to check its progress by selecting [Consistency Check Status] from the [View] menu.



Click [Close] to close the [Consistency Check Status] window.

■ Expand Capacity Status

When capacity expansion is in progress, it is possible to check its progress by selecting [Expand Capacity Status] from the [View] menu.



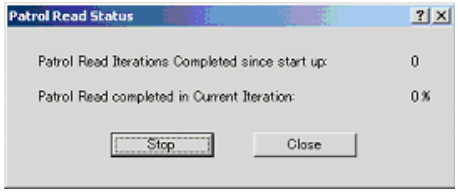
Click [Close] to close the [Expand Capacity Status] window.

IMPORTANT

- Do not restart or shut down the system while a capacity expansion process is in progress. Doing so will cause data loss.

■ Patrol Read Status

It is possible to check the progress of Patrol Read by selecting [Patrol Read Status] from the [View] menu.



- Patrol Read Iterations Completed since start up:
  Number of times Patrol Read has completed since system startup.
- Patrol Read completed in Current Iteration:
  Progress of the on-going Patrol Read.

POINT

- Click [Start] to force Patrol Read start.
- Click [Stop] to abort the currently running Patrol Read.
- Click [Close] to close the [Patrol Read Status] window.

4.7 Maintenance Functions

The following are the functions that can be executed from GAM at the time of maintenance.

- Logical drive consistency (parity) check (Consistency Check)
- Rebuilding Dead or Offline hard disks (Rebuild)

4.7.1 Consistency Check

Consistency Check is a function to check consistency between data on redundant logical drives and mirrored data or parity data, in other words, to check reliability of the data.

POINT

- Note that consistency checks can be performed on logical drives with redundancy such as Online RAID 1, RAID 5, and RAID 10 logical drives. Consistency checks cannot be performed on logical drives without redundancy such as Critical and Offline logical drives.
- In addition to a data integrity check, Consistency Check also automatically corrects media errors of hard disks (not consistency errors). Normally, media errors are periodically corrected by Patrol Read.

To check consistency, perform the following procedure.

1 Double-click the icon of a logical drive to be performed a consistency check from the [Controller View] window.

2 Click [Consistency Check] in the [Logical Drive Information] window to start.

- When the consistency check completes successfully, the following log appears in [Log Information Viewer]:

```
I-129  Consistency check is finished.
```

- If an error is found during the consistency check, the following log is displayed:

```
I-127  Consistency check is finished with errors.
```

POINT

- If an error is detected in data consistency, take the following action:
  - If an error is detected during the consistency check performed for maintenance while the OS is running normally, the above will not pose a problem.
    When [Consistency Check with Restoration] is set to "Enable", the error is automatically corrected.
    When it is set to "Disable", perform the following procedure to correct parity or mirrored data.
    1. Select [Consistency Check with Restoration] from the [Administration] menu and click [Enable].
    2. Perform a consistency check following the above procedure.
    3. If data is not corrected in the consistency check, select [Consistency Check with Restoration] from the [Administration] menu and click [Disable].
  - If an error is detected by consistency check performed after using [Make Drive Online] or [Restore Configuration] (neither of which should not be used in a normal situation), data on the target logical drive is not reliable. In this case, it is necessary to initialize the logical drive again and reinstall reliable data.

4.7.2 Rebuild

If a failed hard disk is replaced offline, it is necessary to execute a rebuild manually. To execute a rebuild manually, perform the following procedure.

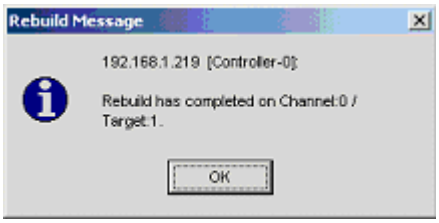
IMPORTANT

- For normal hard disk replacement and rebuild operations, follow the procedure in "Chapter 5 Replacing a Hard Disk" (→pg.113).

1 Double-click the offline hard disk (marked with X in red) in the [Controller View] window.

2 Click [Rebuild] when the [Disk Device Information] window appears.

The [Rebuild Status] window appears and a rebuild starts.
When the rebuild completes, the following window appears. The hard disk becomes online and the related logical drives are restored to a state of redundancy (online).



3 Click [OK].

Chapter 5

Replacing a Hard Disk

This chapter explains maintenance related issues, such as hard disk replacement.

5.1 Replacing a Hard Disk 114
5.2 Preventive Replacement Procedure of a Hard Disk 117

5.1 Replacing a Hard Disk

If a hard disk fails, it must be replaced with a new hard disk as soon as possible. The following explains the procedure for replacing a hard disk. The explanation includes the method for replacing it during system operation, and that for performing the same using WebBIOS.

IMPORTANT

- For replacement, use a hard disk of the same model (with the same capacity and speed) as the disk that has failed as a rule.
- When connecting a hard disk that was previously used in the disk array configuration to a general SCSI adapter, perform a low level format on the hard disk connected to the SCSI adapter in advance.
- While the server is turned on, do not remove any hard disks except for when replacing a failed hard disk. (Only the hard disks in Offline or Unconfigured state can be removed while the server is on.)

5.1.1 Replacing a Hard Disk during System Operation

You can replace a failed hard disk without turning off the system.

1 Check the channel and ID of the failed hard disk using Disk Drive Information of GAM.

For more details, refer to "4.6.3 Viewing Hard Disk Information" (→pg.103)

If any hard disk is being rebuilt, wait until the process completes. After its completion, check the failed hard disk using Disk Drive Information.

2 Locate the failed hard disk using its ID and channel checked by GAM.

Also, make sure that the Hard disk failure LED corresponding to the failed hard disk is lit.

3 Pull out the plastic lever 90 degrees towards you, and also pull out the failed hard disk unit 1 to 3cm to disconnect it from the SCSI bus.

Do not pull out the hard disk unit completely from the server at this point.

4 Wait 1 minute or more.

Please wait until the rotation of the motor in the hard disk unit stops.

5 Pull out the failed hard disk from the hard disk bay.

6 Install a new hard disk in the hard disk bay where the failed hard disk was previously installed.

7 Check the following.

The confirmation procedure differs depending on whether any spare disk had been set before the hard disk failure.

If any spare disk had been set

A short while after installing a new hard disk, it automatically becomes a spare disk, and the Hard disk failure LED corresponding to the hard disk turns off.

Make sure that the status of the replaced hard disk has changed to "Hot Spare" from "Dead" using Disk Device Information of GAM.

If no spare disk had been set

A short while after installing a new hard disk, rebuilding is started automatically on the installed hard disk. When rebuilding is started, the Hard disk failure LED corresponding to the hard disk that was lit starts to blink, and turns off after rebuilding is completed.

After its completion, make sure that the status of the replaced hard disk has changed to "OnLine" from "Dead" using Disk Device Information of GAM.

POINT

- If restart or shutdown is executed during the rebuild, rebuild resumes at the next launch starting from the position where the process stopped.

5.1.2 Replacing a Hard Disk Using WebBIOS

1 Check the channel and ID of the failed hard disk using [Physical Devices] of WebBIOS.

For more details, refer to "2.11.2 Viewing the Hard Disk Status" (→pg.49).

2 Locate the failed hard disk using its ID and channel checked by WebBIOS.

3 Make sure that the Hard disk failure LED corresponding to the failed hard disk is lit.

4 Pull out the plastic lever 90 degrees towards you, and also pull out the failed hard disk unit 1 to 3cm to disconnect it from the SCSI bus.

Do not pull out the hard disk unit completely from the server at this point.

5 Wait 1 minute or more.

Please wait until the rotation of the motor in the hard disk unit stops.

6 Pull out the failed hard disk from the hard disk bay.

7 Install a new hard disk in the hard disk bay where the failed hard disk was previously installed.

8 Check the following.

The confirmation procedure differs depending on whether any spare disk had been set before the hard disk failure.

If any spare disk had been set

A short while after installing a new hard disk, it automatically becomes a spare disk, and the Hard disk failure LED corresponding to the hard disk turns off.

Make sure that the status of the replaced hard disk has changed to "Hot Spare" from "Dead" using Disk Device Information of WebBIOS.

If no spare disk had been set

A short while after installing a new hard disk, rebuilding is started automatically on the installed hard disk. When rebuilding is started, the Hard disk failure LED corresponding to the hard disk that was lit starts to blink, and turns off after rebuilding is completed.

After its completion, make sure that the status of the replaced hard disk has changed to "OnLine" from "Dead" using Disk Device Information of WebBIOS.

5.2 Preventive Replacement Procedure of a Hard Disk

When the failure prediction function of the hard disk (PFA Count) reports the Critical status of a hard disk, it may fail at a future date. If the Critical status is reported, perform preventive replacement of the hard disk.

IMPORTANT

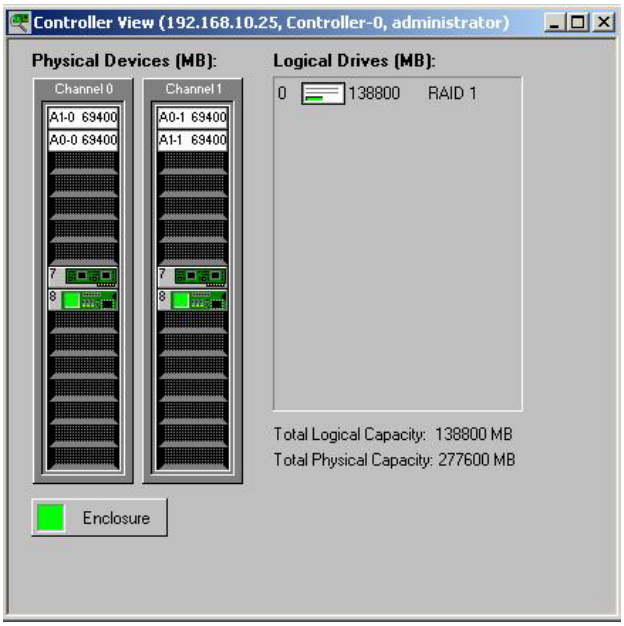
- For preventive replacement, use a hard disk of the same model (with the same capacity and speed) as the likely-to-fail disk as a rule.

5.2.1 Checking Applicability of Redundancy

Perform the following procedure to check whether the array system including the hard disk targeted for preventive replacement is redundant.

1 Right-click and select the logical drive icon displayed in the [Logical Drives] field in the [Controller View] window of GAM.

The icons of the hard disks composing the logical drive appear in white.



POINT

- Right-clicking the logical drive icon again returns the display to its original status.

2 Check all the hard disks included in each logical drive.

3 Determine which logical drive uses the hard disk targeted for preventive replacement.

4 Check the RAID level of the logical drive.

5.2.2 Preventive Replacement Procedure of a Hard Disk

If the server supports the onboard SCSI array controller, it is possible to replace a hard disk without turning off the server.

IMPORTANT

- It is recommended to back up data before executing preventive replacement of a hard disk.
- When two or more hard disks are expected to fail, perform preventive replacement of one disk at a time.
- In the case of only RAID 0, restore data from backup data after creating array of RAID 0.

1 Check the channel and ID of the hard disk indicated as likely to fail (Critical) by using Disk Drive Information of GAM.

For more details, refer to "4.6.3 Viewing Hard Disk Information" (→pg.103).

The hard disk that has received a failure prediction warning is displayed with the following icon.

If any other failed hard disk exists at this point, replace it following the procedures described in "5.1 Replacing a Hard Disk" (→pg.114). Also, if any hard disk is being rebuilt, wait until the process completes. After its completion, check the hard disk indicated as likely to fail (S.M.A.R.T.) by using Disk Drive Information.

2 Double-click the icon of the likely-to-fail hard disk by GAM to confirm that its "Status" indicates "Critical".

3 Press the [Make Offline] button. When the [WARNING] window appears, enter "YES" and press the [OK] button.

POINT

- If any hot spare disks are set, rebuilding is started automatically. Wait until rebuilding is completed.

4 Make sure that the Hard disk failure LED corresponding to the likely-to-fail hard disk is lit.

5 Confirm that the following log is displayed in Log Information Viewer of GAM.

Event ID : S-12
Description : A physical disk has failed.

6 Pull out the plastic lever 90 degrees towards you, and also pull out the likely-to-fail hard disk unit 1 to 3cm to disconnect it from the SCSI bus.

POINT

- Do not pull out the hard disk unit completely from the server at this point.

7 Wait 1 minute or more.

Please wait until the rotation of the motor in the hard disk unit stops.

8 Pull out the likely-to-fail hard disk from the hard disk bay.

9 Install a new hard disk in the hard disk bay where the likely-to-fail hard disk was previously installed.

10 Check the following.

The confirmation procedure differs depending on whether any spare disk had been set before the hard disk failure.

If any spare disk had been set

A short while after installing a new hard disk, it automatically becomes a spare disk, and the Hard disk failure LED corresponding to the hard disk turns off.

Make sure that the status of the replaced hard disk has changed to "Hot Spare" using Disk Device Information of GAM.

If no spare disk had been set

A short while after installing a new hard disk, rebuilding is started automatically on the installed hard disk. When rebuilding is started, the Hard disk failure LED corresponding to the hard disk that was lit starts to blink, and turns off after rebuilding is completed.

After its completion, make sure that the status of the replaced hard disk has changed to "OnLine" using Disk Device Information of GAM.

Appendix

This chapter explains RAID level and list of GAM error codes.

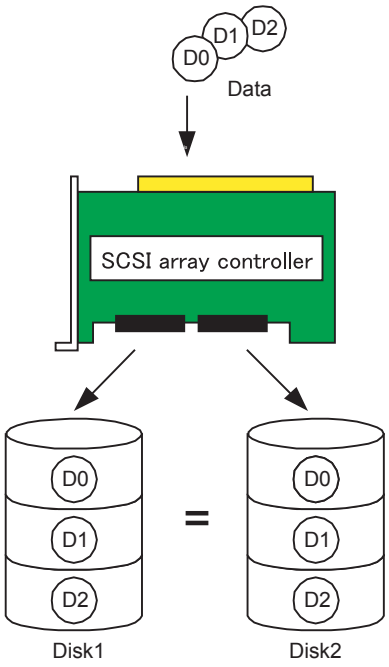
A RAID Level 122
B List of GAM Error Codes 125

A RAID Level

Explains the RAID level as follows.

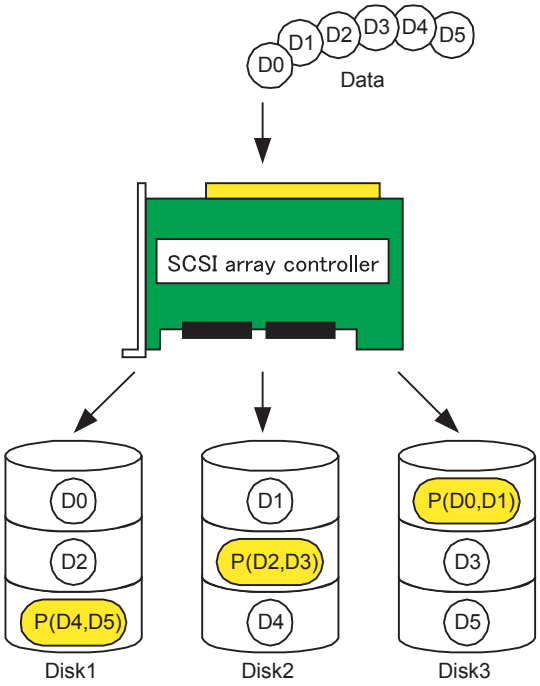
A.1 RAID 1 (Mirroring)

The process of redundantly writing the same data to another hard disk is known as "mirroring". Thanks to this, even if one of the hard disks fails, the system can continue its operation with the data on the other hard disk. RAID 1 is set only when using two hard disks. Data redundancy of RAID 1 by mirroring enhances the high reliability of the server, but the available capacity is that of one hard disk.



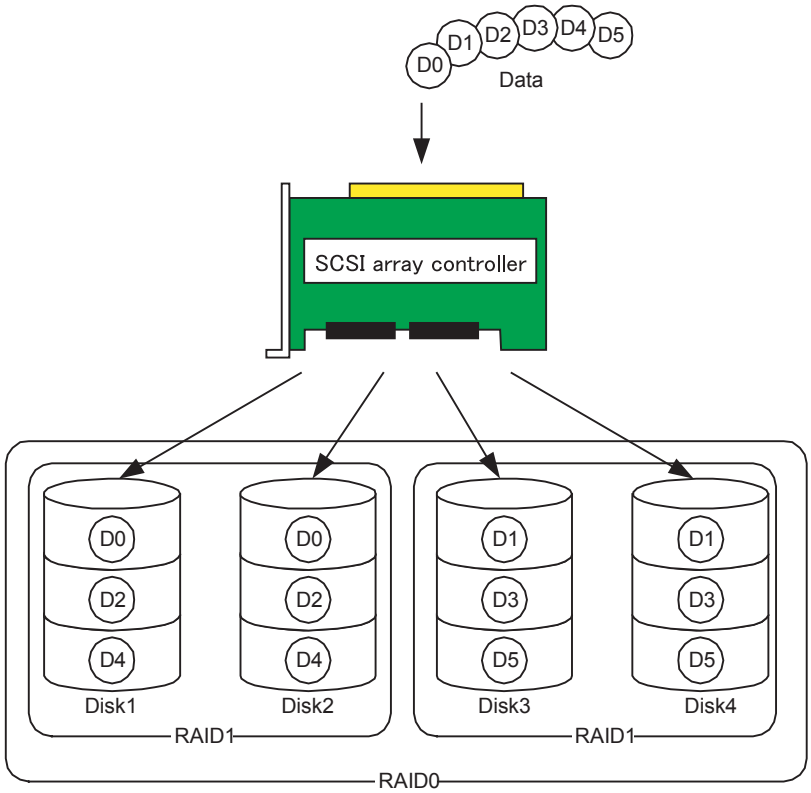
A.2 RAID 5 (Striping + Parity)

In addition to striping (the process distributing data across multiple hard disks), RAID 5 creates parity data for redundancy. Parity data is derived via an algorithm from the original data. For example, when writing six blocks of data (D0 - D5) with three hard disks, each data block and the calculated parity data P (DX, DY) are distributed across the hard disks (see below figure). Because redundancy is achieved by the parity data, a hard disk worth of capacity is used for the parity data.



A.3 RAID 10 (Mirroring + Striping)

In addition to striping (the process distributing data across multiple hard disks), RAID 10 mirrors the data for redundancy. For example, when writing six blocks of data (D0 - D5) with three hard disks, each data block and redundant data are distributed across the hard disks (see below figure). Reliability is enhanced by writing the data across three hard disks, and redundancy is achieved with the redundant data. Although only half of the capacity of all hard disks is available, it is better performance than RAID 5.



B List of GAM Error Codes

By installing ServerView, errors that occur can be logged to Event Viewer. The following is a list of logs written to the application log of Windows Event Viewer as events of the "Fujitsu ServerView Service" source. The device address is logged at the beginning of the event log (part within [ ]). The device address indicates where the event occurred.

table: Meaning of event log's character strings

character strings	Meaning
clt:	Controller ID
chn:	Channel
tgt:	Target ID of the physical device
logdrv:	Logical drive number

IMPORTANT

- Unless ServerView is installed, event logging to Event Viewer will not occur. Refer to "User's Guide" in the PRIMERGY Documents & Tools CD provided with the server to install and configure ServerView.

The number within the brackets of the GAM ID is displayed in hexadecimal.

table: List of event log

GAM ID	Severity	Description	Details	Corrective action
1 (0x01)	Info/1	A physical disk has been placed online.	A hard disk is now in Online state. The following are possible causes: • Rebuilding completed. • It was embedded into the configuration. • Make Online was executed.	None.
2 (0x02)	Info/1	Physical disk added as hot spare.	A hard disk was set as a hot spare.	None.
3 (0x03)	Warning/2	Physical disk error found.	• A bad sector was found on the media. • A mechanical failure of the device. The host device detected an invalid sequence.	Because the controller is implementing a recovery, no action is required as long as the corresponding disk is Online. However, if this occurs frequently, it is recommended to replace the disk as a precautionary measure.
4 (0x04)	Warning/2	Physical disk PFA condition found; this disk may fail soon.	A failure was predicted for the hard disk.	Refer to "5.2 Preventive Replacement Procedure of a Hard Disk" (→pg.117).

table: List of event log

GAM ID	Severity	Description	Details	Corrective action
5 (0x05)	Info/1	An automatic rebuild has started.	Rebuild started.	If there is a dead hot spare hard disk, replace it with a new hard disk.
6 (0x06)	Info/1	A rebuild has started.	Rebuild started via a command.	None.
7 (0x07)	Info/1	Rebuild is over.	Rebuild completed successfully.	None.
8 (0x08)	Warning/2	Rebuild is cancelled.	Rebuild was canceled.	Re-execute the rebuild.
9 (0x09)	Error/3	Rebuild stopped with error.	Rebuild terminated abnormally.	Check the logs surrounding the process and perform necessary actions.
10 (0x0a)	Error/3	Rebuild stopped with error. New device failed.	Rebuild terminated abnormally due to a bad hard disk for the rebuild.	Replace the hard disk again and re-execute the rebuild process.
11 (0x0b)	Error/3	Rebuild stopped because logical drive failed.	The source disk of the rebuild failed.	Contact an office listed in the "Contact Information" of "Start Guide".
12 (0x0c)	Error/3	Physical disk has failed.	A hard disk failed.	Replace the Dead hard disk and rebuild.
13 (0x0d)	Info/1	A new physical disk has been found.	A new hard disk was detected. This is logged in the following situations: • A hard disk was added. • The controller was powered on. • A controller was added. • The system was rebooted.	None.
14 (0x0e)	Info/1	A physical disk has been removed.	A hard disk was removed.	None.
15 (0x0f)	Info/1	A previously configured disk is now available.	A hard disk is now in Unconfigured state.	None.
16 (0x10)	Info/1	Expand Capacity Started.	The capacity expansion process started.	None.
17 (0x11)	Info/1	Expand Capacity Completed.	The capacity expansion process completed.	None.
18 (0x12)	Error/3	Expand Capacity Stopped with error.	Multiple hard disks failed and the capacity expansion process terminated abnormally.	Recreate the array configuration and restore the data from backup.
19 (0x13)	Warning/2	SCSI command timeout on hard device.	A command timeout was detected.	Because the firmware is implementing a recovery, there is no problem as long as there are no Dead hard disks.

table: List of event log

GAM ID	Severity	Description	Details	Corrective action
20 (0x14)	Error/3	SCSI command abort on hard disk.	• The user aborted the command. • The firmware aborted the command to recover from an error. • A device aborted the command.	Because the firmware is implementing a recovery, there is no problem as long as there are no Dead hard disks.
21 (0x15)	Warning/2	SCSI command retried on hard disk.	• The command timed out. • A bus reset occurred. • A device reset occurred.	Because the firmware is implementing a recovery, there is no problem as long as there are no Dead hard disks.
22 (0x16)	Warning/2	Parity error found.	A parity error was detected.	If the error occurs frequently, replace the SCSI cable or SCSI BP.
23 (0x17)	Warning/2	Soft error found.	An error was detected in a hard disk, but it was resolved.	No action is required. If this frequently occurs, replace the hard disk as a precautionary measure.
24 (0x18)	Warning/2	Misc error found.	• A hard disk reported an error. • The Read/Write command timed out. • A hard disk is busy.	No action is required. If this frequently occurs, replace the hard disk as a precautionary measure.
25 (0x19)	Info/1	SCSI device reset.	The firmware issued a reset for recovery.	No action is required. If this message occurs frequently, check the logs surrounding the process and perform necessary actions.
28 (0x1c)	Error/3	Request Sense Data available.	A hard disk reported sense information.	Because the controller is implementing a recovery, no action is required as long as the corresponding disk is Online.
29 (0x1d)	Info/1	Initialization started.	The hard disk format started.	Wait until the format is completed.
30 (0x1e)	Info/1	Initialization completed.	The hard disk format completed.	None.
31 (0x1f)	Warning/2	Initialization failed.	The hard disk format failed.	Replace the hard disk.
32 (0x20)	Error/3	Initialization canceled.	The hard disk format was canceled.	Format the disk again.
33 ～ 41 (0x21) ～ (0x29)	Error/3	A physical disk failed because...	A hard disk failed.	Replace the hard disk and perform the rebuild process.
42 (0x2a)	Error/3	A physical disk set to failed state by host.	Make Offline was executed.	Replace the hard disk and perform the rebuild process.
43 ～ 49 (0x2b) ～ (0x31)	Error/3	A physical disk failed because...	A hard disk failed.	Replace the hard disk and perform the rebuild process.

table: List of event log

GAM ID	Severity	Description	Details	Corrective action
57 (0x39)	Error/3	Physical drive missing on startup.	No hard disk was detected during startup.	Replace the hard disk and perform the rebuild process.
58 (0x3a)	Warning/2	Rebuild startup failed due to lower disk capacity.	Insufficient hard disk space to perform the rebuild.	Replace the hard disk with a disk of the same model (with the same capacity and speed) as the other disks, and then perform the rebuild process.
60 (0x3c)	Error/3	Temporary-Dead physical drive is automatically made online.	Due to a temporary error, the disk is now in Temporary-Dead state.	Contact an office listed in the "Contact Information" of "Start Guide".
61 (0x3d)	Info/1	A standby rebuild has started.	Standby rebuild started.	None.
62 (0x3e)	Info/1	Hot spare replaced with a smaller capacity drive.	A hot spare with a smaller capacity was set.	Replace the hard disk with a disk of the same model (with the same capacity and speed) as the previous disk.
65 (0x41)	Warning/2	A logical disk has come online.	A logical drive came online.	None.
86 (0x56)	Info/1	Rebuild resumed.	Rebuild restarted.	None.
89 (0x59)	Info/1	Physical disk transfer speed changed.	The transfer speed of the hard disk changed.	Check the status of the array and implement necessary steps.

127 (0x7f)	Info/1	Consistency check is finished with errors	Errors were detected by the consistency check.	• If errors are found in the consistency check after Make Drive Online or Restore Configuration is performed, the data is no longer reliable. Initialize the logical drive with the error and reinstall the data.
				• If the OS is running normally, restore the parity or mirrored data.
				  • For GAM: Go to [Administration], set [Consistency Check with Restoration] to "Enabled", and execute the consistency check.
				  • For WebBIOS: Go to [Adapter Properties], set [ChkConst Restore] to "Enabled", and execute the consistency check.

128 (0x80)	Info/1	Consistency check is started.	Consistency check started.	None.
129 (0x81)	Info/1	Consistency check is finished.	Consistency check completed successfully.	None.
130 (0x82)	Warning/2	Consistency check is cancelled.	Consistency check was canceled.	If necessary, run the consistency check again.

table: List of event log

GAM ID	Severity	Description	Details	Corrective action
131 (0x83)	Error/3	Consistency check on logical drive error.	An error was detected in the data consistency.	• If errors are found in the consistency check after Make Drive Online or Restore Configuration is performed, the data is no longer reliable. Initialize the logical drive with the error and reinstall the data. • If the OS is running normally, restore the parity or mirrored data. • For GAM: Go to [Administration], set [Consistency Check with Restoration] to "Enabled", and execute the consistency check. • For WebBIOS: Go to [Adapter Properties], set [ChkConst Restore] to "Enabled", and execute the consistency check.
132 (0x84)	Error/3	Consistency check on logical drive failed.	The consistency check terminated abnormally due to a bad logical drive.	Check the status of the array and implement necessary steps.
133 (0x85)	Error/3	Consistency check failed due to physical device failure.	The consistency check terminated abnormally due to a bad hard disk.	Check the status of the array and implement necessary steps.
134 (0x86)	Error/3	Logical drive has been made offline.	Due to multiple hard disk failures, the logical drive is now in Offline state.	The logical drive(s) cannot continue running in this state. Recreate the array configuration and restore the data from backup.
135 (0x87)	Error/3	Logical drive is critical.	Due to one of the hard disks failing, the logical drive is now in Critical state.	Replace the Dead hard disk and rebuild.
136 (0x88)	Info/1	Logical drive has been placed online.	• Rebuild completed. • The user executed Make Online. • A new configuration was added.	None.
137 (0x89)	Info/1	An automatic rebuild has started on logical drive.	Rebuild started.	None.
138 (0x8a)	Info/1	A manual rebuild has started on logical drive.	Rebuild started.	None.
139 (0x8b)	Info/1	Rebuild on logical drive is over.	Rebuild completed.	None.
140 (0x8c)	Warning/2	Rebuild on logical drive is cancelled.	Rebuild was canceled.	Re-execute the rebuild.
141 (0x8d)	Error/3	Rebuild stopped with error.	Rebuild terminated abnormally.	Check the logs surrounding the process and perform necessary actions.

table: List of event log

GAM ID	Severity	Description	Details	Corrective action
142 (0x8e)	Error/3	Rebuild stopped with error. New device failed.	Rebuild terminated abnormally due to a bad hard disk for the rebuild.	Replace the hard disk again and re-execute the rebuild process.
143 (0x8f)	Error/3	Rebuild stopped because logical drive failed.	The source disk of the rebuild failed.	Contact an office listed in the "Contact Information" of "Start Guide".
144 (0x90)	Info/1	Logical drive initialization started.	The initialization of a logical drive started.	None.
145 (0x91)	Info/1	Logical drive initialization done.	The initialization of the logical drive completed.	None.
146 (0x92)	Warning/2	Logical drive initialization cancelled.	The initialization of the logical drive was canceled.	Re-execute the initialization process.
147 (0x93)	Error/3	Logical drive initialization failed.	The initialization terminated abnormally.	Replace the hard disk and perform the rebuild process.
148 (0x94)	Info/1	A logical drive has been found.	• A new configuration was added. • The capacity expansion process completed. • A new controller was added. • The system was rebooted.	None.
149 (0x95)	Info/1	A logical drive has been deleted.	A logical drive was deleted.	None.
150 (0x96)	Info/1	Expand Capacity Started.	The capacity expansion process started.	None.
151 (0x97)	Info/1	Expand Capacity Completed.	The capacity expansion process completed.	None.
152 (0x98)	Error/3	Expand Capacity stopped with error.	The capacity expansion process terminated abnormally due to multiple hard disks failed.	The logical drive(s) cannot continue running in this state. Recreate the array configuration and restore the data from backup.
153 (0x99)	Error/3	Bad Blocks found.	A bad block was detected during the consistency check, rebuild, or capacity expansion process.	• During consistency check/ capacity expansion process: The bad block will be repaired, so there is no problem. • During rebuild: If a corrupted file is found, restore it from the backup.
154 (0x9a)	Info/1	System drive size changed.	• The capacity of the logical drive changed. • Additional capacity was added by the capacity expansion process.	None.
155 (0x9b)	Info/1	System drive type changed.	A new configuration was added with the completion of the capacity expansion process.	None.

table: List of event log

GAM ID	Severity	Description	Details	Corrective action
156 (0x9c)	Error/3	Bad data blocks found. Possible data loss.	Bad blocks were found in multiple hard disks in the same location.	If a corrupted file is found, restore it from the backup.
158 (0x9e)	Error/3	Attempt to read data from block that is marked in Bad Data Table.	Attempted to read data logged in the BDT table.	If a corrupted file is found, restore it from the backup.
159 (0x9f)	Error/3	Data for Disk Block has been lost due to Logical Drive problem.	Due to a problem with the logical drive, cache data could not be written to the hard disk.	Check the logs surrounding the process and perform necessary actions.
160 (0xa0)	Error/3	Temporary-Offline RAID5/RAID3 array is available to the user again.	Due to an error detected in multiple hard disks, the Temporary-Offline function was executed and the logical drive was restored temporarily to a Critical status.	It may soon revert to an Offline state; therefore, Contact an office listed in the "Contact Information" of "Start Guide" as soon as possible.
161 (0xa1)	Error/3	Temporary-Offline RAID0+1/RAID1/ RAID0/JBOD array is available to the user again.		
162 (0xa2)	Info/1	A standby rebuild has started on a logical drive.	Standby rebuild started.	If there is a Dead hard disk, replace it.
176 (0xb0)	Info/1	Logical drive background initialization started.	BGI started.	None.
177 (0xb1)	Info/1	Logical drive background initialization stopped.	The user or firmware stopped BGI.	None.
178 (0xb2)	Info/1	Logical drive background initialization paused.	BGI was paused for operations with higher priority.	None.
179 (0xb3)	Info/1	Logical drive background initialization restarted.	BGI resumed after a pause.	None.
180 (0xb4)	Error/3	Logical drive background initialization failed.	BGI terminated abnormally.	Check the logs surrounding the process and perform necessary actions.
181 (0xb5)	Info/1	Logical drive background initialization completed.	BGI completed.	None.

table: List of event log

GAM ID	Severity	Description	Details	Corrective action
183 (0xb7)	Warning/2	Inconsistent data found during consistency check.	Data errors were detected during the consistency check.	• If errors are found in the consistency check after Make Drive Online or Restore Configuration is performed, the data is no longer reliable. Initialize the logical drive with the error and reinstall the data. • If the OS is running normally, restore the parity or mirrored data. • For GAM: Go to [Administration], set [Consistency Check with Restoration] to "Enable," and execute the consistency check. • For WebBIOS: Go to [Adapter Properties], set [ChkConst Restore] to "Enabled," and execute the consistency check.
256 (0x100)	Error/3	Fan failure.	A fan failure was detected.	After checking ServerView, replace the cabinet fan connected to the array controller.
257 (0x101)	Info/1	Fan has been restored.	The fan was restored.	None.
258 (0x102)	Error/3	Fan failure.	A fan failure was detected.	After checking ServerView, replace the cabinet fan connected to the array controller.
259 (0x103)	Info/1	Storage cabinet fan is not present.	No fan was detected.	None.
272 (0x110)	Error/3	Power supply failure.	A power supply failed.	After checking ServerView, replace the cabinet PSU connected to the array controller.
273 (0x111)	Info/1	Power supply has been restored.	The PSU was restored.	None.
274 (0x112)	Error/3	Power supply failure.	A power supply failed.	After checking ServerView, replace the cabinet PSU connected to the array controller.
275 (0x113)	Info/1	Storage cabinet power supply is not present.	No PSU was detected.	None.
288 (0x120)	Error/3	Over temperature. Temperature is above 70 degrees Celsius.	Abnormal temperature was detected.	Check the fan with ServerView and check the ambient temperature. In the event of a fan failure, replace the fan. If the above does not resolve the issue, adjust the ambient temperature.
289 (0x121)	Warning/2	Temperature is above 50 degrees Celsius.	Abnormal temperature was detected.	Check the fan with ServerView and check the ambient temperature. In the event of a fan failure, replace the fan. If the above does not resolve the issue, adjust the ambient temperature.

table: List of event log

GAM ID	Severity	Description	Details	Corrective action
290 (0x122)	Info/1	Normal temperature has been restored.	The temperature is now normal.	None.
291 (0x123)	Error/3	Over temperature.	Abnormal temperature was detected.	Check the fan with ServerView and check the ambient temperature. In the event of a fan failure, replace the fan. If the above does not resolve the issue, adjust the ambient temperature.
292 (0x124)	Info/1	Storage cabinet temperature sensor is not present.	No temperature sensor was detected.	None.
306 (0x132)	Info/1	Storage Works enclosure reported normal state.	The cabinet was restored to a normal state.	None.
320 (0x140)	Error/3	Fan failure.	A fan failure was detected.	After checking ServerView, replace the cabinet fan connected to the array controller.
321 (0x141)	Info/1	Fan has been restored.	The fan was restored.	None.
322 (0x142)	Info/1	Fan is not present.	No fan was detected.	None.
323 (0x143)	Error/3	Power supply failure.	A power supply failed.	After checking ServerView, replace the cabinet PSU connected to the array controller.
324 (0x144)	Info/1	Power supply has been restored.	The PSU was restored.	None.
325 (0x145)	Info/1	Power supply is not present.	No PSU was detected.	None.
326 (0x146)	Error/3	Temperature is over safe limit. Failure imminent.	Abnormal temperature was detected.	Check the fan with ServerView and check the ambient temperature. In the event of a fan failure, replace the fan. If the above does not resolve the issue, adjust the ambient temperature.
327 (0x147)	Warning/2	Temperature is above working limit.	Abnormal temperature was detected.	Check the fan with ServerView and check the ambient temperature. In the event of a fan failure, replace the fan. If the above does not resolve the issue, adjust the ambient temperature.
328 (0x148)	Info/1	Normal temperature has been restored.	The temperature is now normal.	None.
329 (0x149)	Info/1	Temperature sensor is not present.	No temperature sensor was detected.	None.
330 (0x14a)	Warning/2	Enclosure access critical.	An error occurred in the access to the enclosure.	Replace the SCSI BP or SCSI cable.

table: List of event log

GAM ID	Severity	Description	Details	Corrective action
331 (0x14b)	Info/1	Enclosure access has been restored.	Enclosure access was restored.	None.
332 (0x14c)	Error/3	Enclosure access is offline.	Could not access the enclosure.	Replace the SCSI BP or SCSI cable.
384 (0x180)	Info/1	Array management server software started successfully.	GAM Server started successfully.	None.
385 (0x181)	Error/3	Write back error	Failed to write cache.	Check the logs surrounding the process and perform necessary actions.
386 (0x182)	Warning/2	Internal log structures getting full, PLEASE SHUTDOWN AND RESET THE SYSTEM IN THE NEAR FUTURE.	Due to many configuration changes, the configuration change table is full.	After successfully shutting down, turn off and then turn on the server. If the same log is not deleted, replace the controller.
388 (0x184)	Error/3	Controller is dead. System is disconnecting from this controller.	The controller failed.	Replace the array controller.
389 (0x185)	Warning/2	Controller has been reset.	The controller received a reset command.	Because the firmware is implementing a recovery, there is no problem as long as there are no Dead hard disks.
390 (0x186)	Info/1	Controller is found.	• A new controller was detected. • GAM Server restarted. • The system was rebooted.	None.
391 (0x187)	Error/3	Controller is gone. System is disconnecting from this controller.	• Power supplied to the controller was cut off. • The controller was removed from the system.	Check to see whether the array controller is correctly installed to the server. If the above does not resolve the issue, replace the following: • Array controller • Motherboard
392 (0x188)	Info/1	BBU Present.	A battery module was detected.	None.
393 (0x189)	Warning/2	BBU Power Low.	The battery charge level is under the warning threshold.	No action is required if this occurred during installation or prolonged power off. In other cases, replace the battery.
394 (0x18a)	Info/1	BBU Power OK.	The battery is fully charged. (The charge level is above the set threshold.)	None.

table: List of event log

GAM ID	Severity	Description	Details	Corrective action
395 (0x18b)	Error/3	Controller is gone. System is disconnecting from this controller.	• Power supplied to the controller was cut off. • The controller was removed from the system.	Check to see whether the array controller is correctly installed to the server. If the above does not resolve the issue, replace the following: • Array controller • Motherboard
396 (0x18c)	Info/1	Controller powered on.	A new controller was installed.	None.
397 (0x18d)	Info/1	Controller is online.	A controller came online.	None.
398 (0x18e)	Error/3	Controller is gone. System is disconnecting from this controller.	• Power supplied to the controller was cut off. • The controller was removed from the system.	Check to see whether the array controller is correctly installed to the server. If the above does not resolve the issue, replace the following: • Array controller • Motherboard
403 (0x193)	Error/3	Installation aborted.	The configuration changed while the system was offline.	Shut down the server and check the hard disk connections. Check to see whether the appropriate hard disks are installed, and remove inappropriate hard disks. (For example, a hard disk for another system was installed by accident.) If the above does not resolve the issue, recreate the array configuration and restore the backup data.
405 (0x195)	Warning/2	BBU removed.	The battery was removed.	Check the connection of the battery. If the above does not resolve the issue, replace the array controller.
414 (0x19e)	Warning/2	Soft ECC error Corrected.	An ECC error was detected in the memory.	Replace the array controller.
415 (0x19f)	Warning/2	Hard ECC error Corrected.	An ECC error was detected in the memory.	Replace the array controller.
418 (0x1a2)	Error/3	BBU out of service.	BBU cannot supply power to the cache.	Replace the array controller.
427 (0x1ab)	Error/3	Mirror Race recovery failed.	Multiple hard disks failed.	Contact an office listed in the "Contact Information" of "Start Guide".
428 (0x1ac)	Error/3	Mirror Race on critical drive.	The logical drive went critical.	Replace the hard disk and perform the rebuild process.

table: List of event log

GAM ID	Severity	Description	Details	Corrective action
431 (0x1af)	Error/3	Controller improperly shutdown! Data may have been lost.	The consistency of the logical drive was lost due to an invalid shutdown process.	Restore the parity or mirrored data. • For GAM: Go to the [Administration] menu, set [Consistency Check with Restoration] to "Enabled", and execute the consistency check. After the process is completed, "Disabled" the above setting. • For WebBIOS: Go to [Adapter Properties], set [ChkConst Restore] to "Enabled", and execute the consistency check. After the process is completed, "Disabled" the above setting.
442 (0x1ba)	Info/1	Patrol Read iteration completed.	Patrol Read completed.	None.
512 (0x200)	Info/1	System started.-	The server or GAM Server started.	None.
514 (0x202)	Info/1	User logged in.-	The user logged in to the server.	None.
515 (0x203)	Info/1	User logged out.-	The user logged out of the server.	None.
516 (0x204)	Info/1	Server alive.	• Reconnected to the server. • The server rebooted.	None.
517 (0x205)	Error/3	Lost connection to server, or server is down.	• The network connection to the server was lost. • The server shut down.	Check the network. Check that the server is running.
640 (0x280)	Warning/2	Channel Failed.	The channel failed.	Replace the SCSI BP or SCSI cable. If the issue is not resolved, replace the array controller.
641 (0x281)	Warning/2	Channel Online.	The channel was restored.	None.
800 (0x320)	Warning/2	New Configuration Received.	A new configuration was set.	None.
801 (0x321)	Warning/2	Configuration Cleared.	The array configuration was cleared.	None.
802 (0x322)	Warning/2	Configuration Invalid.	The array configuration information is invalid.	Check to see whether the hard disk is connected properly. If the above does not resolve the issue, recreate the array and recover the backup data.
803 (0x323)	Warning/2	Configuration On Disk Access Error.	The array configuration information could not be read from the hard disk.	Recreate the array and recover the backup data.

table: List of event log

GAM ID	Severity	Description	Details	Corrective action
805 (0x325)	Warning/2	Configuration On Disk Import Failed.	The array configuration information could not be imported.	Check to see whether the hard disk is connected properly. If the above does not resolve the issue, recreate the array and recover the backup data.
896 (0x380)	Error/3	Internal Controller is in the hung state.	The controller hung.	Replace the array controller.
912 (0x390)	Error/3	Internal Controller has encountered i960 processor specific error.	An error in the controller was detected.	Replace the array controller.
928 (0x3a0)	Error/3	Internal Controller has encountered Strong-ARM processor specific error.	An error in the controller was detected.	Replace the array controller.
-1	Error/3	Unknown Error.	An unknown error was detected.	Check the logs surrounding the process and perform necessary actions. Unless the hard disk is dead, no action is required, because the firmware is implementing a recovery.

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