Areas Covered

Before Reading This Manual

This section explains the notes for your safety and conventions used in this manual.

Chapter 1 Overview

This chapter explains an overview of the disk array configurable with the onboard SCSI array controller.

Chapter 2 Installing Global Array Manager (GAM)

This chapter explains how to install Global Array Manager (GAM) .

Chapter 3 How to Use GAM

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

Chapter 4 Replacing a Hard Disk

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

Appendix

This appendix explains the list of GAM error codes.

Before Reading This Manual

Remarks

■ Symbols

Symbols used in this manual have the following meanings.

重要	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].

■ Trademarks

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Chapter 1

Overview

This chapter explains an overview of the disk array configurable with the onboard SCSI controller.

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1.1 Disk Array Configuration

A disk array or RAID (Redundant Array of Independent Disks) is a system using a disk controller and multiple hard disk units that achieves better performance and higher reliability than just a single hard disk unit.
The disk controller controls the access to each hard disk unit. Thanks to its redundancy feature, the system can keep operating without loss of data, even if a failure should occur with one of the hard disk units.

1.1.1 RAID Level

Among the several RAID levels, the onboard SCSI array controller of this server supports only RAID1. In RAID1, the maximum number of hard disk units, the available total capacity, and the redundancy feature are defined as follows:

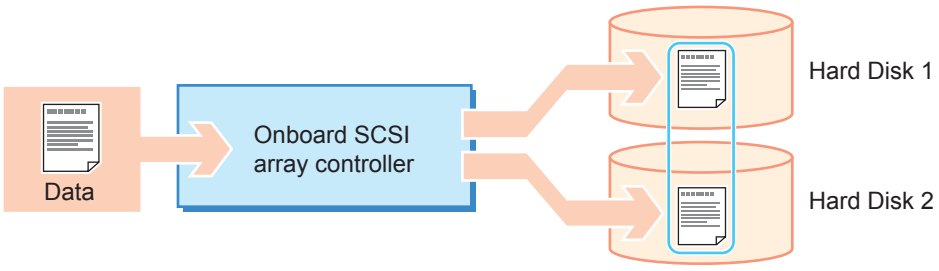
- Maximum number of hard disk units: 2
- Available total capacity: Capacity of one hard disk unit
- Redundancy feature: Yes

POINT

- To prepare for unexpected problems, back up the data frequently.
- Even for a system that can contain three or more hard disk units, only two hard disk units can be used in RAID1.

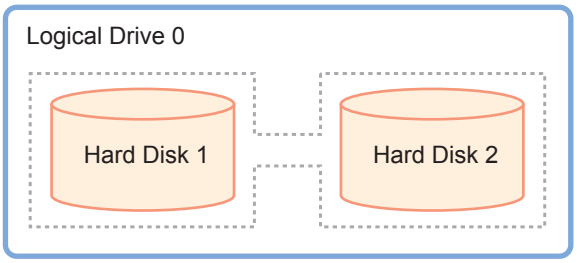
■ RAID1 - Mirroring

Mirroring is a function in which identical data is written in two hard disk units in duplicate. With this function, even if one hard disk unit should fail, the system can keep operating using the other hard disk unit. RAID1 provides high reliability by utilizing the redundancy feature of mirroring and the actual available capacity is equal to the capacity of one hard disk unit.



1.1.2 Logical Drive

A logical drive is a virtual drive consisting of multiple hard disk units.
The OS recognizes it as if it were a single hard disk drive. The RAID level needs to be configured for each logical drive.
The onboard SCSI array controller of this server supports only one logical drive.
In the figure below, the RAID1 disk array consists of two hard disk units. The OS recognizes the array as if one hard disk unit was connected.



As for the status of the logical drive, "Online" represents the normal state, "Critical" means a state where one hard disk unit has a failure and the redundancy feature is inactive, and "Offline" means a state where both of hard disk units have failures and the logical drive is inactive.

■ Initialization of a Logical Drive

When you have just created a logical drive, the data in the two hard disk units may not be identical. You need to make the data in the two hard disk units identical by initializing the logical drive.
This server's onboard SCSI array controller executes "Rebuild" for the logical drive initialization, automatically when creating a logical drive.

POINT

- During the initialization, the hard disk failure LEDs blink on the front of the initialized hard disk units during the OS operation. Also, when ServerView is installed, the System ID LED light up on the front and the back of the server. After the initialization is completed, these LEDs turn off automatically.
- When resetting the server or turning off the power before the initialization is completed, the initialization is halted. Upon restarting the server, the initialization resumes from the block where it was interrupted, so that the initialization continues over the reset and the power-off.
- To confirm the initialization status, select [Logical drive info] from [Controller View] in the GAM Utility. If [Online] is displayed in [Status], the initialization is completed. If [Critical] is displayed, the initialization is still in progress. For more details, refer to "3.5.4 Displaying Logical Drive Information" (→pg.44).

● Notes on Initialization of Logical Drives

Before the initialization is completed, the logical drive may not achieve sufficient I/O performance compared to an initialized drive. There are no problems with accessing to the hard disk drive, but the access speed will be slower. At the maximum, the speed is degraded to about 54%. From the array configuration until the initialization is complete, the array is in the non-redundancy state. Therefore, do not start the system operation or store valuable data before the array construction is finished.
The estimated time required for the initialization is as follows. If the initialization does not finish in over twice the estimated time, contact an office listed in the "Contact Information" of "Start Guide".

table: Estimated time required for the initialization

Capacity of the hard disk unit	Estimated time required for the initialization (w/o ordinary I/O)
73GB	Approx. 6.5 hrs
147GB	Approx. 13 hrs
300GB	Approx. 26 hrs

IMPORTANT

- The estimated time above is the total time during OS operation and does not include the power-off period in between. If ordinary I/O occurs during the initialization, it may take longer.
  The time may vary depending on the configuration and the model of the hard disk units. Use the estimated time only as a reference.
- After the initialization is completed, the RAID1 logical drive maintains its redundancy.

● Time Required for Completing "Rebuild"

Without ordinary I/O, the execution time for "Rebuild" is approximately 5.2 min/GB. For example, when a RAID1 logical drive is configured with two 146.8GB hard disk units, the "Rebuild" execution takes about 763 minutes (≒ 5.2 min/GB x 146.8GB, i.e. approx. 13 hrs). When ordinary I/O occurs during "Rebuild", it may take longer. The time may vary depending on the configuration and the model of the hard disk units. Use the estimated time only as a reference.

1.1.3 Media Verification

Media verification is a function that detects and corrects media errors in hard disk units in advance. This server's onboard SCSI array controller always performs media verification when the logical drive is in the Online state.
If there is a media error in a hard disk unit other than the failed hard disk unit during "Rebuild", data cannot be recovered after "Rebuild". Media verification reduces the risk of data loss at "Rebuild", by correcting media errors in advance.

1.1.4 Hard Disk Failure Prediction Function (S.M.A.R.T.)

The hard disk has a S.M.A.R.T. function. With this function, the hard disk predicts a failure and gives you prior warning when there is a high possibility of a failure.
The hard disk works normally even when the S.M.A.R.T. is issued. However, early replacement of the hard disk is recommended to avoid a future failure. For information on how to replace the hard disk, refer to "4.3 Preventive Replacement Procedure of a Hard Disk" (→pg.52).
The onboard SCSI array controller of this server issues S.M.A.R.T. and it can be checked on any of the following.

- System event log (GAM ID=4)
- GAM Utility

1.2 Notes on Array Configuration and Operation

This section explains how to configure an array with the onboard SCSI array controller and notes on the array operation.

1.2.1 Array Configuration

Before installing the OS in the server, configure an array with the SCSI Setup Utility. For details, refer to "Chapter 8 Configuring Hardware and Utilities" in the "User's Guide". Also, after the OS installation, install GAM (Global Array Manager) which is the RAID Management Tools. For details on how to install GAM, refer to "2.2.1 How to Install GAM" (→pg.17).

1.2.2 Hard Disk Units to Be Used

Check the following notes on hard disk units in advance.

- Before configuring an array, make sure that two hard disk units of the same model (with the same capacity and the same rotation speed) are installed.
- Hard disk units that have been used before may have unwanted partition information or array configuration information. Using such units without taking the proper measures may cause unexpected problems. If you connect any hard disk units with usage history to this server, format them at low level on another system in advance.
- In the state with the power supply of the server, do not remove the hard disk unit except when you replace the failed hard disk (you can only remove the hard disk with the Dead status when the power of the server is on).

1.2.3 Notes on RAID1 Operation

When operating in RAID1 array configuration, the system always writes the same data in two hard disk units, using the redundancy feature. Even if one hard disk unit has a failure (i.e. the "Critical" state), operation is maintained.
However, when two hard disks have failed, the system does not start and data is lost.
If the logical drive falls into the "Critical" state, replace the failed hard disk unit and execute "Rebuild" to restore the "Online" state as soon as possible.

POINT

Rebuild

- "Rebuild" is a process in which data are copied from the functioning hard disk unit to the replaced hard disk unit, in order to restore the data redundancy. When executing "Rebuild", the logical drive in the "Critical" state turns back to the "Online" state.
  For details on how to replace the hard disk unit, refer to "4.2 Replacing a Hard Disk" (→pg.51).

■ When a Hard Disk Failure Is Detected at Startup

If a hard disk failure is detected when starting the system, the following error message is displayed at the POST screen and the startup pauses.

```
Warning!: The array is degraded.  Press [Ctrl] [A] to continue after
insert Floppy Disk.
```

In this case, confirm the state of the hard disk by using an attached "Onboard RAID Utility". For details on how to confirm it, refer to "9.2.3 Software Troubleshooting" in "User's Guide".

Chapter 2

Installing Global Array Manager (GAM)

This chapter explains how to install Global Array Manager (GAM) .

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2.1 Overview / Product Requirements

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

2.1.1 GAM Overview

GAM is an application that allows you to manage a disk array system connected to a SCSI array 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 array controller. 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.

2.1.2 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.
- Configure network settings properly. If the network settings are not proper, it may not be possible to monitor the array status by ServerView, or events may not be noticed.

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 A List of GAM Error Codes" (→pg.56).

2.2 Installing GAM

This section explains how to install GAM.

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.
- During GAM installation, if the error "Could not stop Snmp service. Installation will not continue." occurs and the installation cannot be completed, reinstall GAM. If the same error occurs again, stop the SNMP service and reinstall GAM.
- The following message may pop up when the system is restarted immediately after installing/ uninstalling GAM if Service Pack 1 for Windows Server 2003 is applied.

  ```
  This program was terminated by Windows for the security of the computer.
      Name:     SNMP Service
  ```

  This does not pose any problem to operation. Click [Close Message] to close the message.
- For Windows Server 2003 or Windows 2000 Server, if you install GAM right after the OS startup, an error may occur when stopping the SNMP service and the following error information may be logged in the OS event log. This does not happen when installing GAM more than five minutes after the OS startup.

  ```
  Type : Error
  Source : Service Control Manager
  Description: The SNMP Service service terminated unexpectedly.
  ```

  Since there are no operation problems with this OS event log, continue the installation procedure and reboot the system after the installation.

2.2.1 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's 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.
- 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 Insert the SCSI Array Controller Document & Tool CD V6.0L10 and click [Start] → [Run...]. Enter the following path and click [OK].

[CD-ROM drive] :\RAIDTOOL\GAM\Windows\install.bat

The Global Array Manager Setup wizard starts up.

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

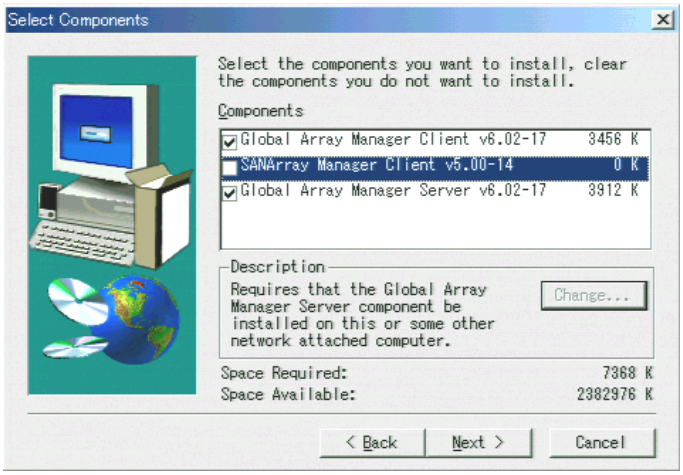
The [Software License Agreement] window appears.

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].

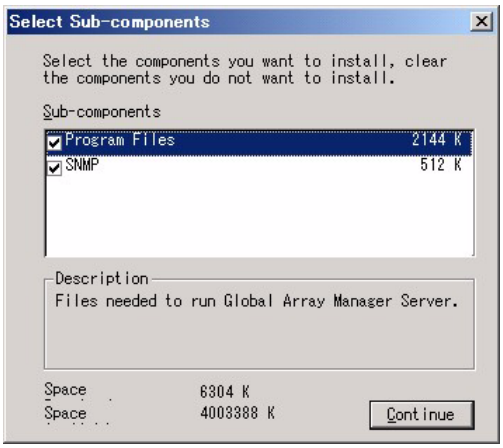


IMPORTANT

- 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 [Cancel] to stop installation. Check the message that will appear after stopping installation and perform the operation of step 15 and 16. Uninstall the existing GAM, restart the system and reinstall GAM.

9 Click [Next].

The installation location for GAM is displayed.

POINT

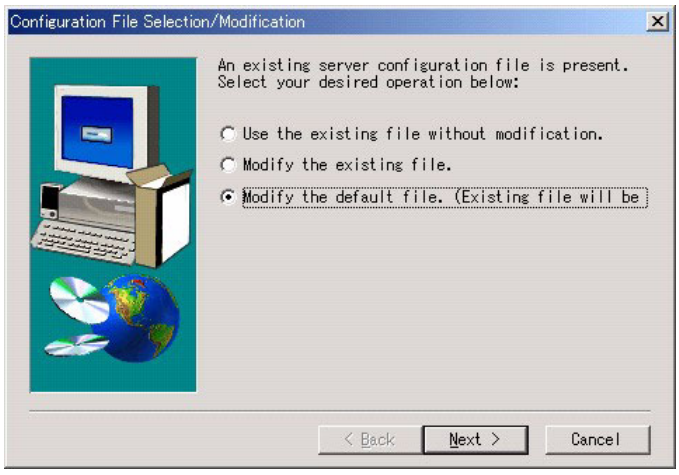
- When GAM Client has already been installed, a message will appear to confirm the overwrite. Click [Cancel] to stop installation. Check the message that will appear after stopping installation and perform the operation of step 15 and 16. Uninstall the existing GAM, restart the system and reinstall GAM.

10 Confirm the installation location and click [Next].

File copying starts.

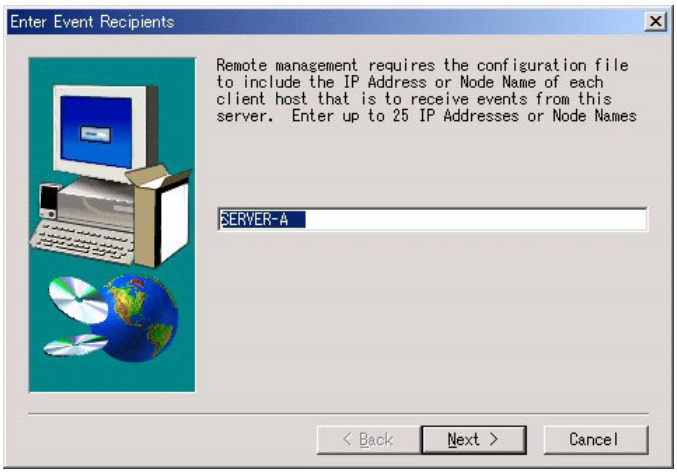
POINT

- 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 GAM Client and GAM Server are installed on the same computer, enter the name of the server.
- 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.

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 Press the [Enter] key if the message appears on the command prompt to indicate that the setup has started.

16 Press the [Enter] key if the message appears on the command prompt to indicate that the installation has been completed.
The command prompt is closed.

17 Restart the system.

18 Create the user account "gamroot" for GAM administrator privileges and a user account for GAM user privileges (e.g. gamuser) as Windows user accounts.
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 "User must change password at next logon".
  Also, check the "Password never expires".
  If not making the above settings, you may not be able to log on to GAM.

2.2.2 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
```

2.2.3 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 with administrator privileges.

POINT

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

2 Click [Start] → [Settings] → [Control Panel].

3 Start [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 with administrator privileges.

POINT

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

2 Click [Start] → [Settings] → [Control Panel].

3 Start [Add or Remove Applications] or [Add or Remove Programs].

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.

2.3 Using GAM in a Linux Environment

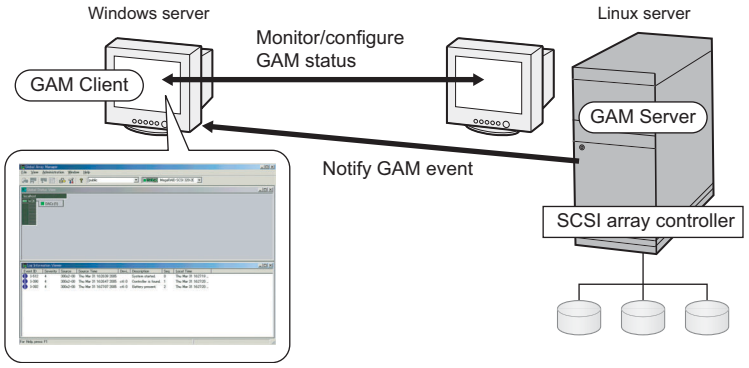
To use GAM in a Linux environment, it is necessary to install device drivers and GAM.

For using Linux, when setting up the server again from the beginning, install the device drivers and GAM, referring to the release notes supplied with the server.
If using Linux on another type of server, visit the PRIMERGY page on the Fujitsu website (http://primergy.fujitsu.com/) and refer to information about Linux.

POINT

- When GAM on a Linux server is monitored from GAM Client, GAM Client can only be installed on servers or computers running Windows 2003 / Windows 2000 / Windows XP. 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.



IMPORTANT

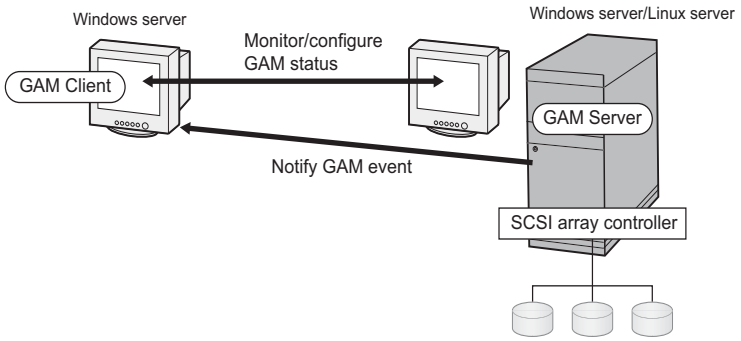
- Rebuild will not start automatically after the replacement from a failed hard disk drive to a new drive. You must send a Rebuild command from GAM Client to execute Rebuild after hot swapping of a failed hard disk drive. If you do not perform this action, Rebuild will not start and the array will stay as Critical status accordingly.

POINT

- 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. GAM uses TCP port 157 and 158 for transmission.

2.4 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.



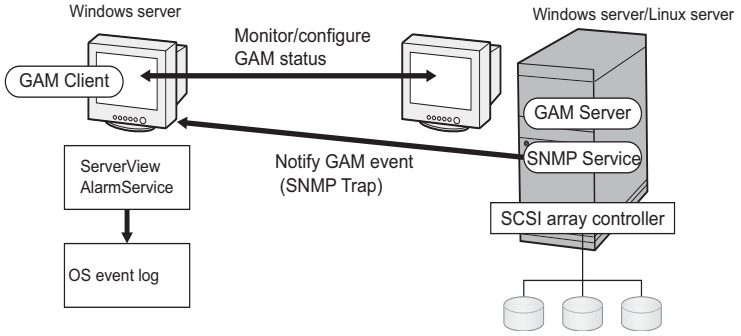
POINT

- It is necessary to configure the server receiving GAM events during GAM installation. For more details, refer to Step 11 in "2.2.1 How to Install GAM" (→pg.17).
- 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. GAM uses TCP port 157 and 158 for transmission.

2.4.1 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.

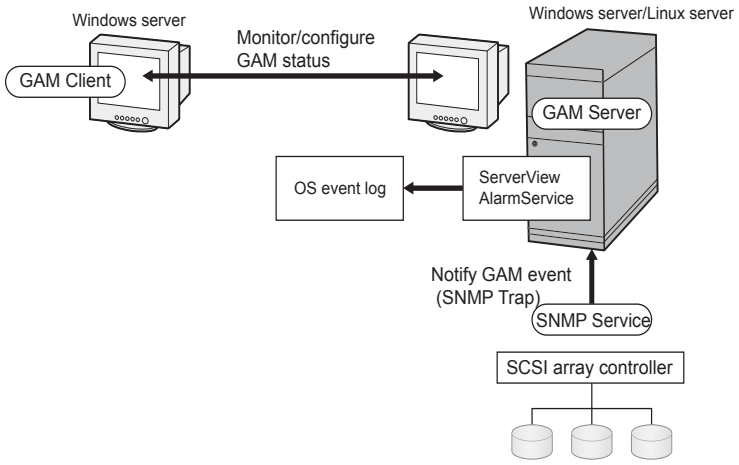
■ When Storing OS Event Logs on GAM Client



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 3

How to Use GAM

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

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3.1 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.

3.1.1 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 cannot be configured 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 rebuilding 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.

3.2 Starting and Exiting GAM

This section explains how to start and exit GAM.

3.2.1 Starting

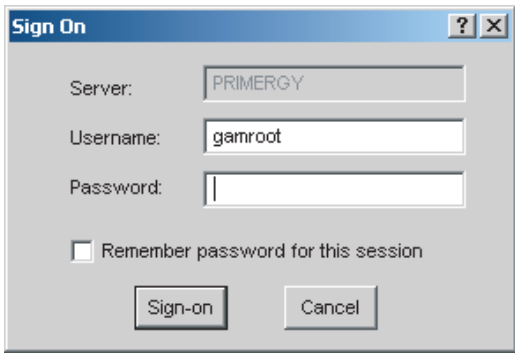
To start GAM, click [Start] → [Programs] (or [All Programs] on Windows Server 2003) and [Mylex Global Array Manager Client] in this order.
If a server group or server is already defined, [Global Status View] appears.

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 "3.4 Server Group and Server Settings" (→pg.37) to make the settings.

3.2.2 Log On (Sign 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].

If [Remember password for this session] is checked, uncheck it.

POINT

- Note that if this option is checked, you will automatically sign on to different servers. To avoid accessing servers automatically, it is recommended to keep this option unchecked.

3 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 2 Installing Global Array Manager (GAM)" (→pg.15).
- In GAM, availability of functions is limited according to access privileges. For access privileges, refer to "3.1.1 About the access privileges to GAM" (→pg.28).

3.2.3 Exiting

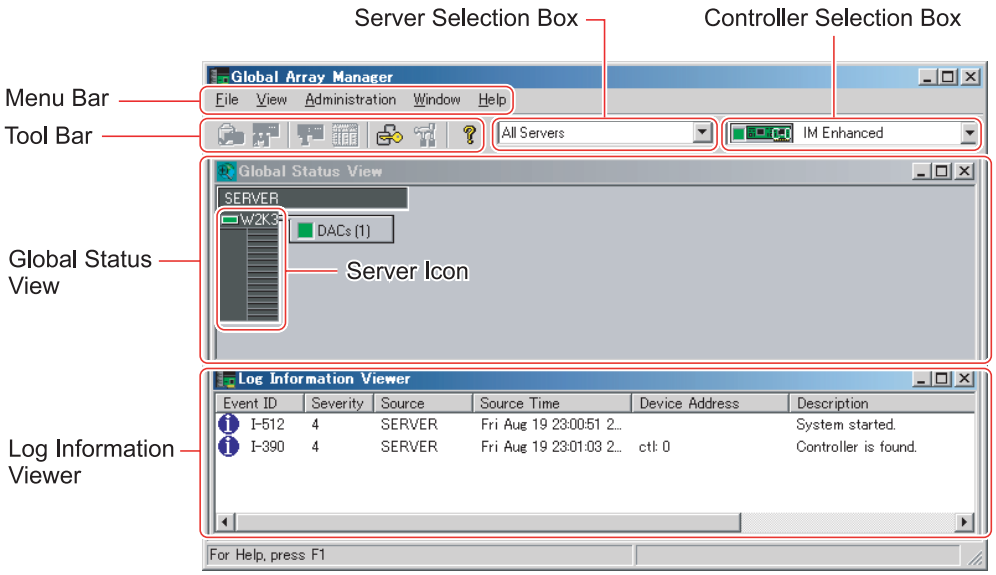
To exit GAM, click [Exit] from [File] in the GAM menu bar.

3.3 Window Layout

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

3.3.1 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

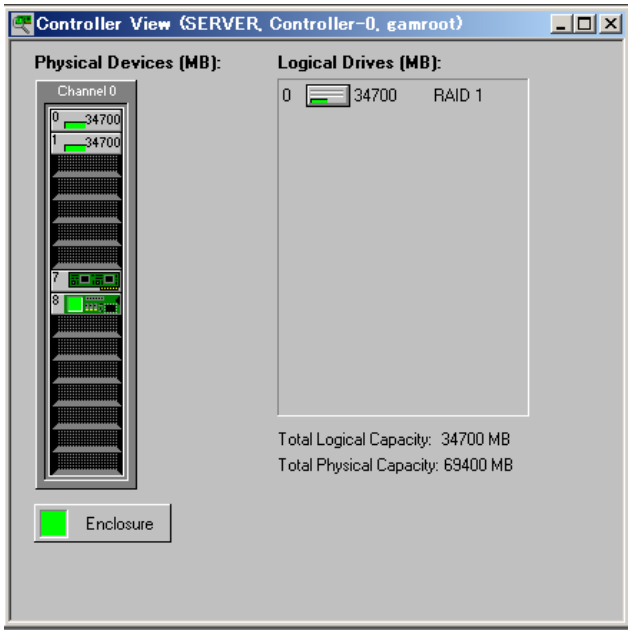
Displays an event that occurred.

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.

3.3.2 [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 "3.2.2 Log On (Sign On)" (→pg.29).
The following window appears.



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

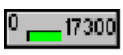
● Number of controller channels

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)
	Yellow	Failure expected (Critical)

● 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)

● Enclosure

This function is not supported.

Double-clicking the icon of each hard disk/logical drive enables you to see more detailed information. For more details, refer to "3.5 Viewing Information" (→pg.38).

3.3.3 Menu Layout/Functions

The following explains the function of each menu item.

■ [File] Menu

table: [File] Menu

Menu	Function
Clear Configuration	Clears all the RAID configurations of the currently selected SCSI array controller. This onboard SCSI array controller does not support this function.

■ [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.
Rebuild Status	Displays progress of the on-going rebuild. This is selectable only while a rebuild is in progress.
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 here are the same as those of the [Server Selection] box. **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 here are the same as those of the [Controller Selection] box.
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.
Scan Devices	Redetects the hard disks connected.
Settings	Not supported. Do not use this function.

3.3.4 Tool Bar Icons

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

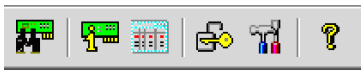
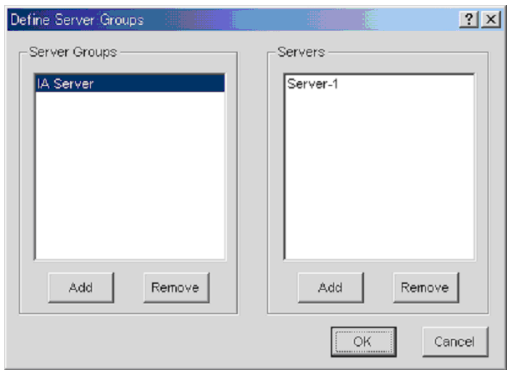


table: Tool Bar Icons

Icon	Function
	Rescans the devices.
	Displays controller information.
	Displays sense data.
	Displays the [Sign On] window.
	This function is not supported.
	Displays Help.

3.4 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] in the [Server Groups] area.
The [Adding Item] window appears.

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] in the [Servers] area.
The [Adding Item] window appears.

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].

3.5 Viewing Information

The following information can be viewed using GAM.

- Information of an event or error that occurred: Refer to "A List of GAM Error Codes" (→pg.56)
- Array configuration or controller information: Refer to "3.5.2 RAID Controller" (→pg.40)
- Hard disk information: Refer to "3.5.3 Displaying Hard Disk Information" (→pg.42)
- Logical drive information: Refer to "3.5.4 Displaying Logical Drive Information" (→pg.44)
- Request Sense Data information: Refer to "3.5.5 Displaying Request Sense Data" (→pg.45)
- Information of Rebuild progress: Refer to "3.5.6 Checking the Progress of a Rebuild" (→pg.46)

3.5.1 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 Document & Tool 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. The path may differ depending on the installation environment.
  - Windows Server 2003 / Windows 2000 Server:
    [C:\WINDOWS\System32\GAMSERV\gamelog.log]
  - Windows Server 2003 x64:
    [C:\WINDOWS\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

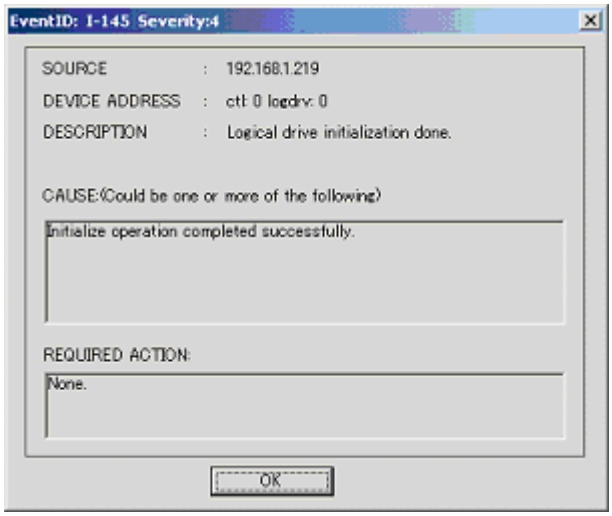
- Event histories displayed in [Log Information Viewer] are stored in the GAM2CL.LOG file.

To open [Log Information Viewer] manually, select [Log Information Viewer] from the [View] menu. For the meaning of each item displayed in [Log Information Viewer], refer to "3.3.1 Startup Window Layout/Functions" (→pg.31).

■ 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.

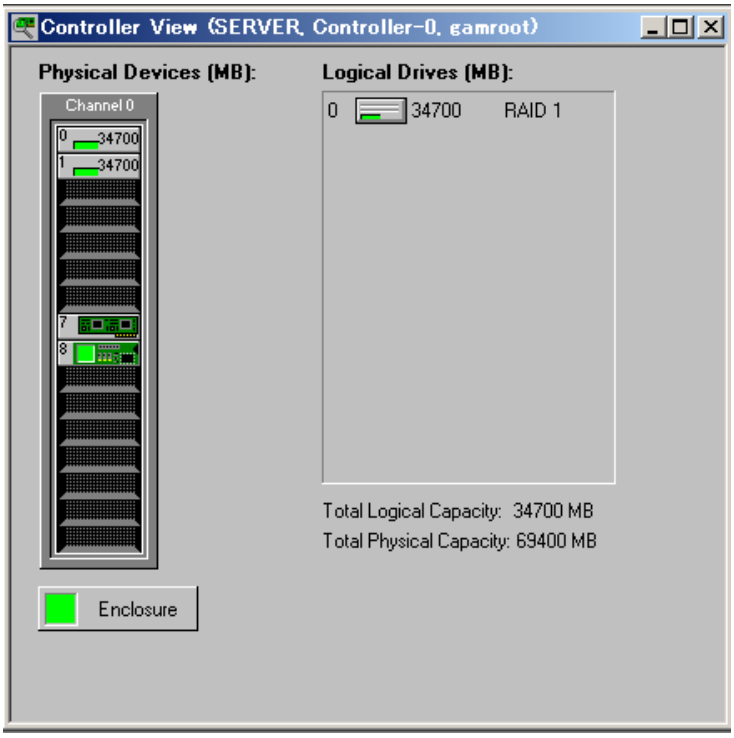
Click [OK] to close the [Event ID] window.

3.5.2 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.

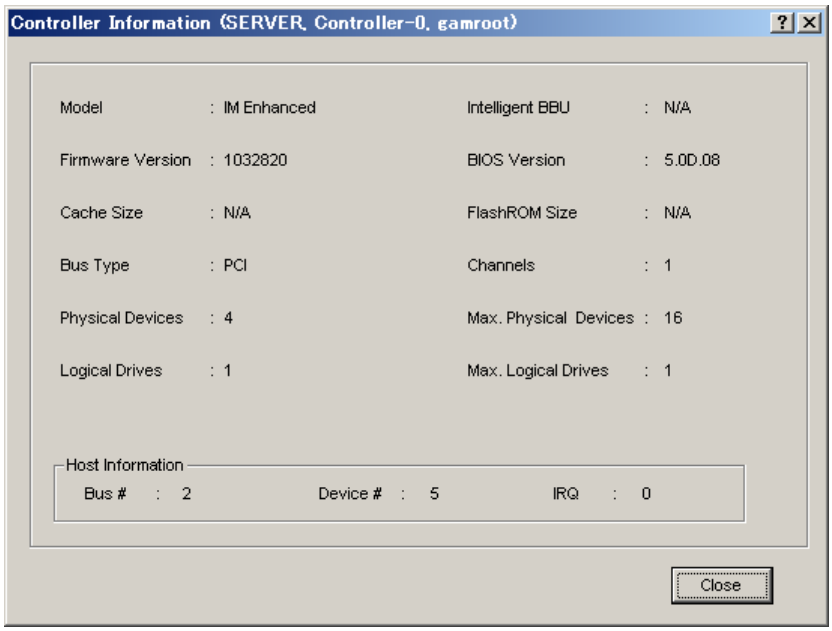


For details on icons in the [Controller View] window, refer to "3.3.2 [Controller View] Window Layout/ Functions" (→pg.33).

■ Displaying RAID Controller Detailed Information

Click [Controller Information] from the [Administration] menu ("[Administration] Menu"→pg.35).

The [Controller Information] window appears. You can set controller options by clicking [Controller Options].



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

POINT

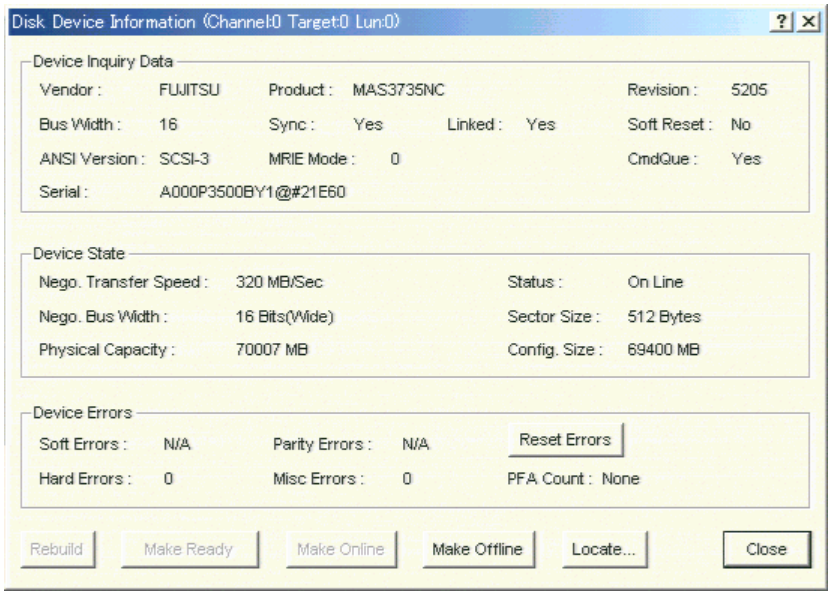
- Displayed Bus#, Dev#, and IRQ are not supported. These displayed values may differ from their actual values. To find out the correct bus number, device number and IRQ, check them using Device Manager, etc.

3.5.3 Displaying 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 see the information of a specific hard disk.

POINT

- Channel and target ID of the hard disk are displayed in the title bar.



● Displayed information

The following information is displayed.

- Vendor
  Hard disk vendor.
- Product
  Hard disk model name.
- Revision
  Version of firmware on the hard disk.
- Bus Width
  SCSI bus width.
- 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, restart the system to reconfugure the transfer speed.

- Physical Capacity
  Physical capacity of the hard disk.
- Sector Size
  Sector size.
- Config. Size
  Available hard disk capacity when connected.
- 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 is not found)
Rebuilding	Rebuild in progress
Critical	State of failure being expected (PFA Count)

- Device Errors
  The kind of the error is displayed. In this server, only PFA Count (failure prediction) is supported.
  If PFA Count is found, refer to "4.3 Preventive Replacement Procedure of a Hard Disk" (→pg.52) to replace the hard disk.

● Function buttons

The following operations can be performed using buttons.

- Make Offline button
  Forcibly changes the status of a hard disk to "Dead".

  IMPORTANT

  - Perform the rebuild operation especially when changing hard disks status from the "Offline" to the "Online". Data may be lost by performing [Make Offline] operation.

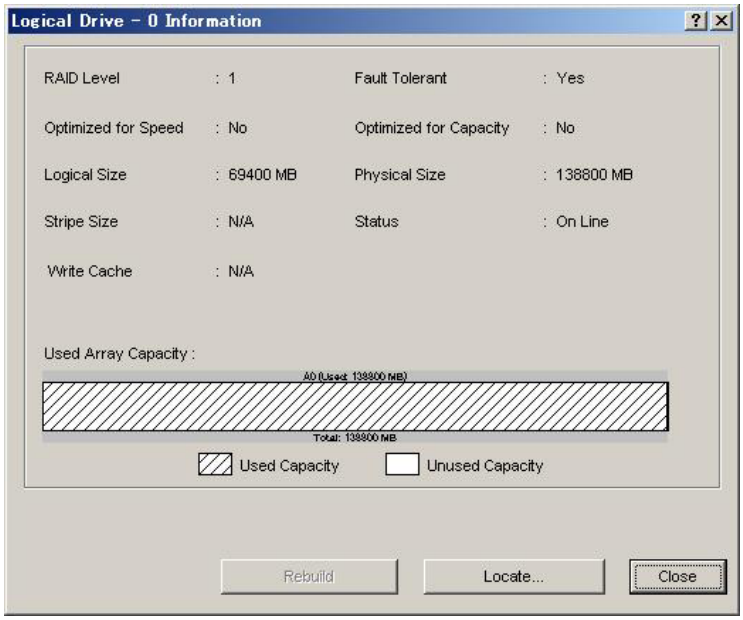
- Locate button
  Blinks the access lamp on the hard disk and notifies the hard disk position.

3.5.4 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.

POINT

- Logical drive number are displayed in the title bar.



● Displayed information

The following information is displayed.

- 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
  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

- Used Array Capacity
  Of the physical pack capacity, the capacity occupied by the current logical drive.

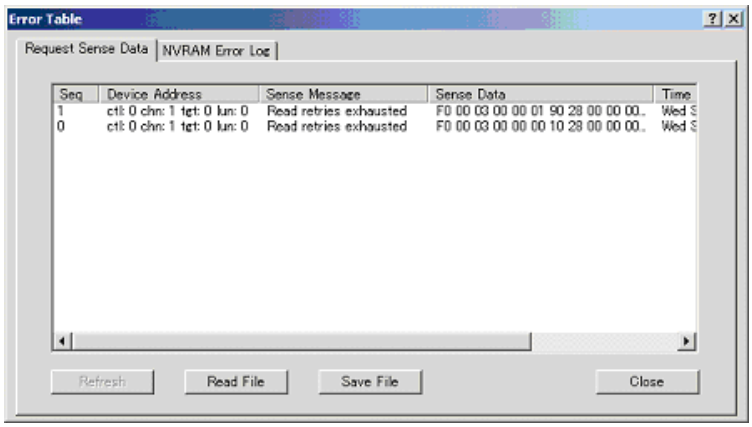
● Function buttons

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.
- Rebuild button
  When logical drive status is "Critical", [Rebuild] button is enabled, and you can rebuild of logical drive. Refer to "3.6.1 Rebuild" (→pg.47).

3.5.5 Displaying Request Sense Data

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

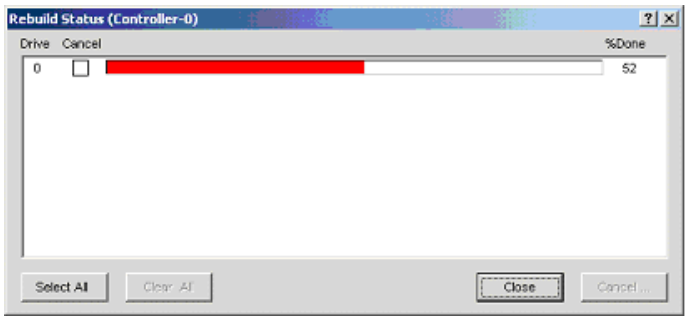
- Request Sense Data is data used for problem investigation.
- When the system is restarted, Request Sense Data is cleared.

3.5.6 Checking the Progress of a Rebuild

Using GAM, you can check the progress of a rebuild in graph from.

■ 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.

3.6 Maintenance Functions

Rebuild can be executed for a logical drive that status is "Critical".

3.6.1 Rebuild

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

IMPORTANT

- For hard disk replacement and rebuild operations, follow the procedure in "Chapter 4 Replacing a Hard Disk" (→pg.49).

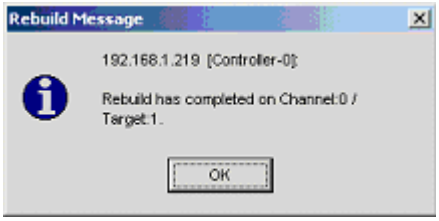
1 Double-click the Critical logical drive ( ) in the [Controller View] window.

The [Logical Drive Information] window appears.

2 Click [Rebuild].

The [Rebuild Status] window appears and a rebuild starts.

Click [OK] if the following window appears after completion of rebuild operation. The window may not appear depending on the environment.



The hard disk becomes online and the logical drives are restored to a state of redundancy (online).

3 Click [OK].

Chapter 4

Replacing a Hard Disk

4

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

4.1 Confirming the Hard Disk 50
4.2 Replacing a Hard Disk 51
4.3 Preventive Replacement Procedure of a Hard Disk 52

4.1 Confirming the Hard Disk

Before replacing the hard disk, check the channel and ID of the failed hard disk.

1 Start and log on to the GAM.

Refer to "3.2 Starting and Exiting GAM" (→pg.29).

2 Select [Controller View] from the [View] menu.

The Controller View window (→pg.33) appears.

3 Check the hard disk status icon.

When the hard disk has failure, the [Failure] status icon is displayed.
When a failure prediction is issued, the [Critical] status icon is displayed.
For information on the icon, refer to "● Hard disk" (→pg.33).

IMPORTANT

- If any hard disk is being rebuilt, wait until the process completes. After its completion, check the hard disk.

4 Double-click the hard disk icon to check the details.

When a failure prediction(S.M.A.R.T.) is issued, [PFA Count] in the [Device Errors] field is displayed as [Found].

5 When exists of failure or failure predicted hard disk, replace the hard disk as follows:

When failure hard disk exists.

Replace the hard disk, referring to "4.2 Replacing a Hard Disk" (→pg.51).

When failure predicted hard disk exists.

Replace the hard disk, referring to "4.3 Preventive Replacement Procedure of a Hard Disk" (→pg.52).

IMPORTANT

If one hard disk has a failure, the other has a failure prediction

- Replace the failed hard disk first, and perform the rebuild process. Confirm the hard disk again after its completion. If a failure prediction hard disk is still displayed, execute preventive replacement of hard disk.
  If failure prediction hard disk was replaced before replacing the failed one, rebuild cannot be performed and redundancy is not functioned. Also, data may be lost.

4.2 Replacing a Hard Disk

If a hard disk fails, it must be replaced with a new hard disk as soon as possible. Replace a failed hard disk without turning off the server.

IMPORTANT

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

1 Check the channel and ID of the failed hard disk using GAM.
Refer to "4.1 Confirming the Hard Disk" (→pg.50)

2 Check 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.

POINT

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

4 Wait 1 minute or more 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 Double-click the Critical logical drive () in the [Controller View] window of GAM.
The [Logical Drive Information] window appears.

8 Click [Rebuild].
Rebuild starts. When rebuilding is started, the Hard disk failure LED of the replaced 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 logical drive has changed from "Critical" to "OnLine" using [Logical Drive 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.
- The rebuild may not start even if [Rebuild] is clicked. In this case, perform [Scan Device] that can be selected from the [Administration] menu, and perform the rebuild process again.

4.3 Preventive Replacement Procedure of a Hard Disk

When the failure prediction function of the hard disk 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.
Replace a failed hard disk without turning off the server.

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.
- It is recommended to back up data before executing preventive replacement of a hard disk.
- When both hard disks are expected to fail, perform preventive replacement of one disk at a time.

1 Check the channel and ID of the likely-to-fail hard disk using GAM.
Refer to "4.1 Confirming the Hard Disk" (→pg.50)

2 Confirm that the status of the other hard disk is [OnLine].

IMPORTANT

- When the hard disk fails (the status is [Dead]), replace the failed hard disk first, and perform the rebuild process. Confirm the hard disk again after its completion. If a failure prediction hard disk is still displayed, execute preventive replacement of hard disk.
  If failure prediction hard disk was replaced before replacing the failed one, rebuild cannot be performed and redundancy is not functioned. Also, data may be lost.

3 Double-click the icon of the likely-to-fail hard disk by [Controller View] window.
Confirm that the "Status" in [Device State] indicates "Critical".

4 Click [Make Offline]. When the [WARNING] window appears, enter "YES" and click [OK].

5 Check the Hard disk failure LED corresponding to the likely-to-fail hard disk is lit.

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

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

7 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.

8 Wait 1 minute or more until the rotation of the motor in the hard disk unit stops.

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

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

11 Start GAM, and double-click the Critical logical drive () in the [Controller View] window of GAM.

The [Logical Drive Information] window appears.

12 Click [Rebuild].

Rebuild starts. When rebuilding is started, the Fault LED of the replaced 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 logical drive has changed from "Critical" to "OnLine" using [Logical Drive 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.
- The rebuild may not start even if [Rebuild] is clicked. In this case, perform [Scan Device] that can be selected from the [Administration] menu, and perform the rebuild process again.

Appendix

This chapter explains the list of GAM error codes.

A List of GAM Error Codes 56

A 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 Document & Tool CD provided with the server to install and configure ServerView.

The correspondence of Severity in GAM events (SNMP TRAP), Severity in Gam2cl logs, and the event log type is shown in the table below.

table: The event log types and explanations

Severity	Description	Severity in Gam2cl.log	OS event log type	
CRITICAL	Severe error	1		Error
MAJOR	Error	2		Error
MINOR	Warning	3		Warning
INFORMATIONAL	Information (No action required)	4		Information

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	A physical disk has been placed online.	The hard disk entered the state of online by having completed rebuild.	None.
3 (0x03)	Warning	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	Physical disk PFA condition found; this disk may fail soon.	A failure was predicted for the hard disk.	Refer to "4.3 Preventive Replacement Procedure of a Hard Disk" (→pg.52).
5 (0x05)	Info	An automatic rebuild has started.	Rebuild started.	None.
6 (0x06)	Info	A rebuild has started.	Rebuild started via a command.	None.
7 (0x07)	Info	Rebuild is over.	Rebuild completed successfully.	None.
8 (0x08)	Warning	Rebuild is cancelled.	Rebuild was cancelled.	Re-execute the rebuild.
9 (0x09)	Error	Rebuild stopped with error.	Rebuild terminated abnormally.	Check the logs surrounding the process and perform necessary actions.
10 (0x0a)	Error	Rebuild stopped with error. New device failed.	Rebuild terminated abnormally due to a bad hard disk for the rebuild.	Replace the hard disk and perform the rebuild process.
11 (0x0b)	Error	Rebuild stopped because logical drive failed.	The source disk of the rebuild failed.	After backing up the data, replace the "Rebuild" source disk unit, reconfigure the array, and restart the system installation.
12 (0x0c)	Error	Physical disk has failed.	A hard disk failed.	Replace the hard disk of "Dead" and perform the rebuild process.
13 (0x0d)	Info	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	A physical disk has been removed.	A hard disk was removed.	None.
15 (0x0f)	Info	A previously configured disk is now available.	A hard disk was removed form array configuration.	None.

table: List of event log

GAM ID	Severity	Description	Details	Corrective action
19 (0x13)	Warning	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.
20 (0x14)	Error	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	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	Parity error found.	A parity error was detected.	If one hard disk unit has a failure, replace the hard disk and perform the rebuild process. If both of the two hard disk units fail, replace the "Rebuild" source disk unit, configure the array, and restart the system installation. If errors still occur frequently, the SCSI cable or the SCSI BP must be replaced. Contact an office listed in the "Contact Information" of "Start Guide".
23 (0x17)	Warning	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	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	SCSI device reset.	The firmware issued a reset for recovery.	No action is required. If this frequently occurs, check the logs surrounding the process and perform necessary actions.
28 (0x1c)	Error	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. For GAM Client, displayed message is replaced with sense information.
33 to 39 (0x21) to (0x27)	Error	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
40 (0x28)	Error	A physical disk failed because of the system reset.	A SCSI bus error or hard disk failure occured.	When the hard disk is failed, replace the hard disk. When the hard disk is not failed but errors still occur frequently, replace the SCSI cable or the SCSI BP. When only this error is logged and no other hard disk errors occur, the noise recovery process will recover the error and no action is required.
41 (0x29)	Error	A physical disk failed because of busy status or parity error.	A hard disk failed.	Replace the hard disk and perform the rebuild process.
42 (0x2a)	Error	A physical disk set to failed state by host.	Make Offline was executed.	Replace the hard disk and perform the rebuild process.
43 to 49 (0x2b) to (0x31)	Error	A physical disk failed because...	A hard disk failed.	Replace the hard disk and perform the rebuild process.
50 (0x32)	Error	Physical device status changed to offline.	The status of the hard disk became "Dead".	When the hard disk is failed, replace the hard disk and perform the rebuild process.
52 (0x34)	Error	Physical device status changed to rebuild.	The status of the hard disk became "Rebuilding".	None.
53 (0x35)	Error	Physical device ID did not match.	Hard disk ID is not matched.	None.
54 (0x36)	Error	Physical device failed to start.	The hard disk failed to start.	When the hard disk is failed, replace the hard disk and perform the rebuild process.
57 (0x39)	Error	Physical drive missing on startup.	No hard disk was detected during startup.	Replace the hard disk and perform the rebuild process.
58 (0x3a)	Warning	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 perform the rebuild process.
68 (0x44)	Info	Physical disk type is not approved by vendor.	The not supported hard disk is installed.	When you confirm that the installed hard disk unit is the proper model and the error still occurs, the baseboard must be replaced. Contact an office listed in the "Contact Information" of "Start Guide".
71 (0x47)	Error	Mirror Race recovery failed for logical drive.	It has failed in the writing processing of light buffer.	When the hard disk is failed, replace the hard disk. If the message still appears after the replacement, the baseboard must be replaced. Contact an office listed in the "Contact Information" of "Start Guide".

table: List of event log

GAM ID	Severity	Description	Details	Corrective action
72 (0x48)	Error	Controller parameters checksum verification failed -- restored default.	The mistake was found in the checksum of the controller parameters.	Check and correct the configuration using the SCSI Setup Utility.
73 (0x49)	Info	Online controller firmware upgrade has started.	Online controller firmware upgrade has started.	None.
74 (0x4a)	Info	Online firmware upgrade has completed successfully.	Online firmware upgrade has completed successfully.	None.
75 (0x51)	Warning	Online firmware upgrade has failed.	Online firmware upgrade has failed.	Re-execute online controller firmware upgrade. If the error still occurs, the baseboard must be replaced. Contact an office listed in the "Contact Information" of "Start Guide".
80 (0x4b)	Warning	Firmware entered unexpected state at run-time.	Firmware entered unexpected state at run-time.	The firmware may have crashed. The baseboard must be replaced. Contact an office listed in the "Contact Information" of "Start Guide".
81 (0x50)	Info	Rebuild stopped on controller failure.	Rebuild stopped due to controller's abnormality.	The baseboard must be replaced. Contact an office listed in the "Contact Information" of "Start Guide". Perform the rebuild process after replaced the baseboard.
86 (0x56)	Info	Rebuild resumed.	Rebuild restarted.	None.
89 (0x59)	Info	Physical disk transfer speed changed.	The transfer speed of the hard disk changed.	Check the status of the array and implement necessary steps.
126 (0x7e)	-	Firmware corrected the ‘Read’ error.	The media error was corrected.	None.
135 (0x87)	Error	Logical drive is critical.	Due to one of the hard disks failing, the logical drive is now in Critical state.	Replace failed hard disk and perform the rebuild process.
136 (0x88)	Info	Logical drive has been placed online.	• Rebuild completed. • The user executed Make Online. • A new configuration was added.	None.
137 (0x89)	Info	An automatic rebuild has started on logical drive.	Rebuild started.	None.
138 (0x8a)	Info	A manual rebuild has started on logical drive.	Rebuild started.	None.

table: List of event log

GAM ID	Severity	Description	Details	Corrective action
139 (0x8b)	Info	Rebuild on logical drive is over.	Rebuild completed.	None.
140 (0x8c)	Warning	Rebuild on logical drive is cancelled.	Rebuild was cancelled.	Re-execute the rebuild.
141 (0x8d)	Error	Rebuild stopped with error.	Rebuild terminated abnormally.	Check the logs surrounding the process and perform necessary actions.
142 (0x8e)	Error	Rebuild stopped with error. New device failed.	Rebuild terminated abnormally due to a bad hard disk for the rebuild.	Replace the hard disk and perform the rebuild process.
143 (0x8f)	Error	Rebuild stopped because logical drive failed.	The source disk of the rebuild failed.	After backing up the data, replace the "Rebuild" source disk unit, reconfigure the array, and restart the system installation.
144 (0x90)	Info	Logical drive initialization started.	The initialization of a logical drive started.	None.
145 (0x91)	Info	Logical drive initialization done.	The initialization of the logical drive completed.	None.
146 (0x92)	Warning	Logical drive initialization cancelled.	The initialization of the logical drive was cancelled.	Re-execute the initialization process.
147 (0x93)	Error	Logical drive initialization failed.	The initialization terminated abnormally.	Replace the hard disk and perform the rebuild process.
148 (0x94)	Info	A logical drive has been found.	A logical drive was newly detected by restarting the system.	None.
149 (0x95)	Info	A logical drive has been deleted.	A logical drive was deleted.	None.
153 (0x99)	Error	Bad Blocks found.	A bad block was detected during the rebuild process.	If a corrupted file is found, restore it from the backup.
156 (0x9c)	Error	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.
157 (0x9d)	Warning	Logical drive LUN mapping has been written to config.	Logical drive LUN mapping has been written to config.	None.
158 (0x9e)	Error	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	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.
384 (0x180)	Info	Array management server software started successfully.	GAM Server started successfully.	None.

table: List of event log

GAM ID	Severity	Description	Details	Corrective action
386 (0x182)	Warning	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.	Shut down the system properly, power off the server and turn it back on. If the error still occurs, the baseboard must be replaced. Contact an office listed in the "Contact Information" of "Start Guide".
388 (0x184)	Error	Controller is dead. System is disconnecting from this controller.	The SCSI array controller failed.	The baseboard must be replaced. Contact an office listed in the "Contact Information" of "Start Guide".
389 (0x185)	Warning	Controller has been reset.	The SCSI array 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	Controller is found.	• A new SCSI array controller was detected. • GAM Server restarted. • The system was rebooted.	None.
391 (0x187) 395 (0x18b)	Error	Controller is gone. System is disconnecting from this controller.	The response from the SCSI array controller was lost.	The baseboard must be replaced. Contact an office listed in the "Contact Information" of "Start Guide".
396 (0x18c)	Info	Controller powered on.	A SCSI array controller was powered on.	None.
397 (0x18d)	Info	Controller is online.	A SCSI array controller came online.	None.
398 (0x18e)	Error	Controller is gone. System is disconnecting from this controller.	The response from the SCSI array controller was lost.	The baseboard must be replaced. Contact an office listed in the "Contact Information" of "Start Guide".
403 (0x193)	Error	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, reconfigure the array and restore the backup data.
404 (0x194)	Error	Controller firmware mismatch.	SCSI array controller firmware mismatch.	The baseboard must be replaced. Contact an office listed in the "Contact Information" of "Start Guide".
406 (0x196)	Error	WARM BOOT failed.	It failed in WARM Boot.	Check the log and identify the malfunction.

table: List of event log

GAM ID	Severity	Description	Details	Corrective action
411 (0x19B)	Warning	Controller entered Conservative Cache Mode.	SCSI array controller entered Conservative Cache Mode.	None.
412 (0x19c)	Warning	Controller entered Normal Cache Mode.	SCSI array controller entered Normal Cache Mode.	None.
413 (0x19d)	Warning	Controller Device Start Complete.	The controller device started.	None.
425 (0x1a9)	Error	Controller Boot ROM Image needs to be reloaded.	Controller Boot ROM Image needs to be reloaded.	The baseboard must be replaced. Contact an office listed in the "Contact Information" of "Start Guide".
426 (0x1aa)	Error	Controller is using default non-unique world-wide name.	SCSI array controller is using default non-unique world-wide name.	None.
427 (0x1ab)	Error	Mirror Race recovery failed.	Multiple hard disks failed.	Replace failed hard disk, reconfigure the array, and restart the system installation.
428 (0x1ac)	Error	Mirror Race on critical drive.	The logical drive went critical.	Replace the hard disk and perform the rebuild process.
512 (0x200)	Info	System started.-	The server or GAM Server started.	None.
514 (0x202)	Info	User logged in.-	The user logged in to the server.	None.
515 (0x203)	Info	User logged out.-	The user logged out of the server.	None.
516 (0x204)	Info	Server alive.	• Reconnected to the server. • The server rebooted.	None.
517 (0x205)	Error	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.
518 (0x206)	Info	Automatic reboot count has changed.	Automatic reboot count has changed.	None.
640 (0x280)	Warning	Channel Failed.	The channel failed.	Replace the SCSI BP, SCSI cable or base board. Contact an office listed in the "Contact Information" of "Start Guide".
641 (0x281)	Warning	Channel Online.	The channel was restored.	None.
700 (0x2bc)	Warning	Event Log Empty.	The content of Event Log became blank.	None.
701 (0x2bd)	Warning	Event Log Entries Lost.	Event Log Entries were lost.	None.
800 (0x320)	Warning	New Configuration Received.	A new configuration was set.	None.

table: List of event log

GAM ID	Severity	Description	Details	Corrective action
801 (0x321)	Warning	Configuration Cleared.	The array configuration was cleared.	None.
802 (0x322)	Warning	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, reconfigure the array and recover the backup data.
803 (0x323)	Warning	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.
805 (0x325)	Warning	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, reconfigure the array and recover the backup data.
806 (0x326)	Info	A Debug Dump exists on this system.	A Debug Dump exists on this system.	None.
807 (0x327)	Info	A Debug Dump exists on this system.		
808 (0x328)	Info	No valid Configuration On Disk (COD) found.	No valid Configuration On Disk (COD) found.	Turn off the server and check whether the hard disk unit is connected correctly. If the error still occurs, reconfigure the array and restore the data.
896 (0x380)	Error	Internal Controller is in the hung state.	The SCSI array controller hung.	The baseboard must be replaced. Contact an office listed in the "Contact Information" of "Start Guide".
928 (0x3a0)	Error	Internal Controller has encountered Strong-ARM processor specific error.	An error in the SCSI array controller was detected.	The baseboard must be replaced. Contact an office listed in the "Contact Information" of "Start Guide".
944 (0x3b0)	Error	Internal Controller Backend Hardware Error.		
-1	Error	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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