Global Array Manager 2 Client Software v2.10

Installation Guide and User Manual

Part Number 771980-D01

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About This Manual

This installation guide covers the steps involved to install and use the client component of Mylex Corporation's Global Array Manager 2, Version 2.10.

For information on defining and setting RAID (Redundant Array of Independent Disks) levels and the configuration of the array as a DOS boot device, consult the ***Disk Array Controller Configuration Utilities v4.7 Installation Guide and User Manual***, included with your Mylex controller.

Notice for Users of Global Array Manager 2 Client on Digital Prioris Servers

The Mylex Global Array Manager 2 Client has been customized for integration with Digital's ServerWorks Manager. If you are installing GAM2 Client from diskettes, follow the instructions contained within Chapter 2 of this manual. If installing GAM2 Client from ServerWorks Manager, the following changes apply:

- The documentation for GAM2 Client in Chapter 2 refers to use of the installation floppies. In this kit, images of the floppies are located on the CD-ROM in \Mylex\Client\Disk1 and \Mylex\Client\Disk2.
- When told to install by running a:\setup.exe, you should substitute e:\Mylex\Client\Disk1\setup.exe (substituting your CD-ROM drive letter for "e" if different). You will not be prompted for the second floppy in this case.

Conventions

Throughout the manual, the following conventions are used to describe user interaction with the product:

bold	The user must enter the bold text exactly as shown
↵	Press the Enter key, or
Enter	Press the key labeled “Enter” (or “Delete”, etc.)
File, Run	Select the Run option from the pull-down menu activated when the File menu pad is selected

☞ **Note**

Supplementary information that can have an effect on system performance

⚠ ***Caution***

Notification that a proscribed action has the *potential* to adversely affect equipment operation, system performance, or data integrity

STOP **WARNING**

Notification that a proscribed action will *definitely* result in equipment damage, data loss, or personal injury

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Chapter 1
Introduction

Figure 1-1. Global Array Manager 2 Client

Overview

Global Array Manager 2 Client software v2.10 (GAM2 Client 2.10) is used in order to:

- Monitor, manage, maintain, and *configure* Mylex Disk Array Controllers (DAC960 controllers) and the physical and logical drives that are connected to these controllers
- Monitor and manage Mylex SCSI Host Bus Adapters and the physical devices that are connected to these adapters

Global Array Manager 2 has two components – the Global Array Manager 2 Server component (available separately), and the Global Array Manager 2 Client component described in some detail in this guide. Each component handles specific tasks based upon the selected function.

Configuration Functions

In DAC960 (RAID) subsystems only, configuration functions are easily performed using RAID Assist™, an intuitive, wizard-like utility in the Global Array Manager 2 Client component that simplifies the process of setting up or reconfiguring a disk array. Just answer a few brief questions, and RAID Assist automatically does the rest. Use Manual Configuration for more control over drive group setup or individual configuration parameters.

Monitoring Functions

The Global Array Manager 2 Server component collects and disseminates information on disk array or HBA subsystem status and resource utilization. The Global Array Manager 2 Client component organizes this information through an intuitive graphical display. Errors and events are recorded in a log, and if the problem is serious enough to warrant immediate attention, operators can be alerted via popup windows, pagers, fax, or email if so desired.

Maintenance Functions

The Global Array Manager 2 Client manages or performs maintenance on individual disk arrays and drives (with the appropriate authentication), again by means of the graphical user interface. This includes removing physical devices from operation in a functioning disk array (also known as “killing” or off-lining a drive), rebuilding drives, selecting hot spares, and initiating a check of consistency (or parity) information on arrays that are configured to support redundancy. The Global Array Manager 2 Server executes the management instructions specified by the Global Array Manager 2 Client.

What's New In GAM2 Version 2.10?

Global Array Manager 2 Version 2.10 contains new features, enhancements, and modifications not available in Global Array Manager Version 2.00:

Support for MORE™. Version 2.10 adds a new level of configuration by including support for Mylex Online RAID Expansion (MORE) technology. This allows capacity expansion of an existing array by restriping the array's data across both existing and additional array drives.

User Interface Revisions. Redesign of the user interface has occurred in many GAM2 Client v2.10 screens. Such aspects as menus, the toolbar, layout and contents of the Global Array Manager, Global Status View, Log Information Viewer, Statistics View, and Controller View windows, *RAID Assist*™, and several other changes enhance the usability of GAM2 Client.

Support for Mylex SCSI Host Bus Adapters. Version 2.10 supports monitoring and limited configuration of Mylex SCSI Host Bus Adapters (SCSI HBA) and the physical devices connected to them.

RAIDBUILD (in GAM2 Server v2.10). Version 2.10 of GAM2 Server adds a new run-time utility called RAIDBUILD, used for scheduling consistency checks, device scans, rebuilds, etc. Details are discussed in the DAC960 Software Kit v1.06 Installation Guide and User Manual.

Redesigned and Enhanced *RAID Assist*™. Version 2.10 has completely restructured and enhanced the RAID Assist configuration wizard. A "one step" Automatic Configuration option has been added to the existing Assisted Configuration and Manual Configuration options. All array and logical drive configuration activities are now performed from within RAID Assist. Under each type of configuration (Automatic, Assisted, Manual), you may now choose to create a new configuration, add a logical drive, or expand an array. Manual Configuration also includes an Edit Configuration option. Assisted Configuration in Version 2.10 now includes wizards for adding a logical drive AND expanding an array in addition to setting up a new configuration. In short, RAID Assist in GAM2 Client v2.10 is more flexible and more intuitive.

Requirements

Because Global Array Manager 2 is a *client/server* application, the GAM2 Server software component must be installed in one or more file servers in order for the GAM2 Client software component to work properly. Requirements for the GAM2 Client component are as follows:

Client Hardware and Software

- PC-compatible computer with an 80486 (or higher) class processor and at least 4 MB of system memory
- Network interface card connected to a functioning network
- 3 1/2-inch floppy disk drive (or CD-ROM drive if installing from the CD-ROM)
- Fixed disk with at least 4 MB available free space
- Mouse or other pointing device
- Appropriate network drivers for the installed network interface card
- For proper client component connectivity, installed and functioning GAM2 Server software component *on the server*, under any of the supported operating systems (such as: NetWare, Windows NT, SCO UNIX)
- For client component installation and operation, Microsoft Windows NT 3.51 or 4.x, or Microsoft Windows 95 installed on a local hard disk
- TCP stack installed.

Optional

- Modem or Fax/Modem (Hayes compatible)
- MAPI-compliant messaging client (e.g., Microsoft Mail)

Refer to the documentation that accompanied your server and to the Windows documentation for more information on hardware and operating system requirements.

Chapter 2
Installation

Installation Overview

Installation of the Global Array Manager 2 Client component requires one of the following operating systems:

- Windows NT 3.51 or 4.x
- Windows 95

This chapter assumes that the network administrator for this site will be performing these installation procedures.

For Windows NT, it is recommended that the GAM2 Server component be installed before the Client component.

> ☞ **Note**
>
> The installation procedure requires a user with administrator access rights.

Notice for Users of Global Array Manager 2 Client on Digital Prioris Servers

The Mylex Global Array Manager 2 Client has been customized for integration with Digital's ServerWorks Manager. If you are installing GAM2 Client from diskettes, follow the instructions in this chapter. If installing GAM2 Client from ServerWorks Manager, the following changes apply:

- The documentation for GAM2 Client in this chapter refers to use of the installation floppies. In this kit, images of the floppies are located on the CD-ROM in \Mylex\Client\Disk1 and \Mylex\Client\Disk2.
- When told to install by running a:\setup.exe, you should substitute e:\Mylex\Client\Disk1\setup.exe (substituting your CD-ROM drive letter for "e" if different). You will not be prompted for the second floppy in this case.

Global Array Manager 2 Client Component Installation

Disk File List

Global Array Manager 2 Client software is shipped on two diskettes. The contents of these diskettes are:

Disk 1

```
_INST32I.EX_                GAMCLNT.1
_ISDEL.EXE                  SETUP.EXE
_SETUP.DLL                  SETUP.INI
_SETUP.LIB                  SETUP.INS
DISK1.ID                    SETUP.PKG
```

Disk 2

```
DISK2.ID                    GAMCLNT.2
```

Installation

Install the Global Array Manager 2 Client from within your version of Windows NT 3.51, Windows NT 4.x, or Windows 95.

> ⚠ ***Caution***
>
> Files for the client are decompressed by the installation procedure. Copying the files directly to a hard disk will NOT result in a successful installation.

1. Make sure TCP/IP is installed and functioning properly.
2. Insert Global Array Manager 2 Client installation Disk 1 into your 3.5-inch floppy diskette drive.
3. From the Windows NT 3.51 Program Manager, select **File**, **Run** (or click the **Start** button and select **Run** for Windows 95 and Windows NT 4.x). The Run dialog box appears (Figure 2-1).

Figure 2-1. Starting the Installation Program

Note

Screens in this section are taken from a Windows 95 installation. If you are running Windows NT 3.51 your screens may look different, but the Global Array Manager 2 Client installation is the same.

4. Enter the following command line if necessary: **A:\SETUP** ↵

   GAM2 Client Setup loads the installation wizard (Figure 2-2):

Figure 2-2. Loading the Installation Wizard

5. After a few moments, the Welcome dialog box appears (Figure 2-3). Click Next to proceed with the installation, or click Cancel to end the installation procedure and return to Windows.

Figure 2-3. Welcome Dialog Box

6. You are prompted to identify this copy of the program (Figure 2-4).

Figure 2-4. Personalize Global Array Manager 2

7. To continue, enter your name and, optionally, the name of your company in the appropriate text fields. Click Next to proceed.

> ☞ **Note**
>
> The Name field must be filled in order for you to be able to continue.

8. The installation program allows you to verify the information you entered (Figure 2-5). To continue, click Yes. To change the information, click No, enter the desired information, then click Next to return to the dialog box shown below:

Figure 2-5. User Verification Dialog Box

9. In the Destination Directory area in Figure 2-6, the suggested directory path for installation of GAM2 Client reads:

   `C:\Program Files\Mylex\GAM Client\`

   - To select a different destination directory, click Browse and navigate to the directory you wish to select, or
   - To proceed with the installation, click Next.

Figure 2-6. Destination Path for Global Array Manager 2

10. During installation, files are decompressed and copied from installation Disk 1 to the destination directory (Figure 2-7).

Figure 2-7. Installation Progress Display for Disk 1

To cancel the installation/file copy process, click Cancel.

11. Setup will request that you to insert Global Array Manager 2 Client installation Disk 2 when appropriate (Figure 2-8):

Figure 2-8. Insert Installation Disk 2

12. The Installation Progress Display (as was shown in Figure 2-7) continues until it registers 100% (Figure 2-9):

Figure 2-9. Installation Complete

Shortly thereafter the following display appears (Figure 2-10):

Figure 2-10. View ReadMe File or Run GAM2

- To view changes and updates to the program or installation guide, check only the box which reads “Yes, I want to view the ReadMe file now,” then click Finish.
- To run Global Array Manager 2 right away without viewing changes and updates to the program or installation guide, check only the box which reads “Yes, I want to run Global Array Manager now,” then click Finish.
- To do both of the above (view the file, then run GAM2), check both boxes, then click Finish.
- To finish installation without viewing the ReadMe file or starting GAM2 right away, uncheck both boxes and click Finish.

13. If you chose to view the ReadMe file (README.TXT), the Notepad accessory will open and the README.TXT file will be presented.

.

Figure 2-11. GAM2 Client Readme.txt File in Notepad

Read the contents of this file for the most up-to-date information about Global Array Manager 2 Client. Much of this information may not appear in this installation guide, as sometimes last-minute modifications to the software are done after completion of the guide. You may also wish to print the contents of this file.

14. Close the Notepad accessory after reading and/or printing.
    - If earlier you chose to run GAM2 Client upon completion of installation, GAM2 Client will open.
    - If you did not choose to run the Client software right away, exit to Windows.

This concludes Global Array Manager 2 Client component installation.

Chapter 3
Startup & Navigation

Starting Global Array Manager 2

Server Component

> ☞ **Note**
>
> Installation and startup of the Global Array Manager 2 Server component 2.10 is covered in a separate document. Software diskettes for GAM2 Server are also provided separately.

Refer to the appropriate sections in the above-mentioned manual for instructions on starting the Global Array Manager 2 Server component under any of the following network operating systems:

- NetWare 3.1x, 4.xx
- Windows NT 3.51, 4.x
- OS/2 Warp 3.x, 4.x
- SCO UNIX ODT 3.x
- SCO OpenServer 5.x
- UnixWare 2.x

Client Component

> ☞ **Note**
>
> Install and run the GAM2 Server component *before* you attempt to run the GAM2 Client component.

Under Windows NT 3.51/4.x or Windows 95, you are ready to start up the Global Array Manager 2 Client once you have installed the client on your workstation (see the previous chapter).

- Start the GAM2 Client software by double-clicking the Global Array Manager icon. If at least one server group and file server have been defined, the opening screen appears. If not, the Define Server Groups dialog box appears.

Note

After starting the Global Array Manager 2 Client, minimize the utility to an icon and let it run in the background at all times, unless you're doing a configuration or setting up a maintenance process. If Global Array Manager 2 detects a logical drive in a critical state, or a physical drive failing, it prompts you with windows describing the location and nature of the problem. Maximize the utility to display more detailed information.

In order for event notification to occur the Global Array Manager 2 Server and Client must be running at all times.

Navigating Global Array Manager 2 Client

Button Controls

Dialog boxes throughout the Global Array Manager 2 Client have a series of control buttons. Some examples of these include:

OK	Click this button to apply the settings made in the dialog box.
Cancel	Click this button to cancel the settings made in the dialog box.
Yes	Click this button to confirm the action identified in the dialog box.
No	Click this button to cancel the action identified in the dialog box.
Close	Click this button to close the active dialog box.
Apply	Click this button to apply your configuration changes.

Components of the Opening Screen

Upon startup (with defined servers), Global Array Manager 2 Client displays the opening screen, consisting of the Global Array Manager window, the Global Status View window and the Log Information Viewer (Figure 3-1).

Figure 3-1. Opening Screen

Components of the Global Array Manager Window

The major components of the Global Array Manager window (Figure 3-1) are described below:

1. Item **#1** is the GAM2 Client *menubar*. There are five menus with several selections each. The contents of the menus and the functionality of several of the most important selections will be described throughout this guide.

2. Item **#2** is the GAM2 Client *toolbar*. There are eight toolbar icons representing eight of the most useful functions available in GAM2 Client. The identity of each toolbar icon and an explanation of the purpose of each will be described in later sections.

3. Item **#3** is the GAM2 Client *server selection box*. When selected, the box displays the names of each file server group that is in contact with the current client workstation. Each group may consist of multiple servers. You may select a specific file server group to view, or select "All Servers" if you want to view all the servers that are in contact with this workstation.
4. Item **#4** is the GAM2 Client *controller selection box*. When selected, the box displays the controller ID (C-0, C-1, etc.) and controller type (BT-052, DAC960PG, etc.) of each Mylex SCSI HBA and PCI/SCSI RAID Controller connected to the currently-selected server (see below).

Components of the Global Status View Window

The major components of the Global Status View window (Figure 3-1) are described below:

1. Item **#5** is an icon that represents a currently *unselected file server* running the GAM2 Server component. The icon identifies:
   - the IP address or name of the server (e.g. 192.192.192.1, Srv1, etc.)
   - the network operating system running on the server (e.g. NW = NetWare)
   - the operational status of the server (green = functioning, yellow = critical, red 'X' = down or nonfunctional)
   - the number of DAC (PCI/SCSI RAID) controllers and/or SCSI HBA controllers connected on the server, with a controller operational status light (green = functioning, yellow = critical, red 'X' = down or nonfunctional)
2. Item **#6** is an icon that represents the *currently-selected file server* running the GAM2 Server component. The icon identifies:
   - the IP address of the server (e.g. 192.192.200.5)
   - the network operating system running on the server (e.g. SCO = SCO UNIX ODT or SCO OpenServer)

- the operational status of the server (green = functioning, yellow = critical, red ‘X’ = down or nonfunctional)
- the number of DAC (PCI/SCSI RAID) controllers and/or SCSI HBA controllers connected on the server, with a controller operational status light (green = functioning, yellow = critical, red ‘X’ = down or nonfunctional)

Components of the Log Information Viewer

1. Item **#7** in Figure 3-1 is the GAM2 Client *Log Information Viewer*. Each line in the Log Information Viewer identifies a single *event* (error, status, warning, etc.) which was noted during monitoring by a file server running GAM2 Server, and was transmitted by that server to this client workstation. Relevant details accompany the event:

   - **Event Icon**. Displays whether the event is informational, cautionary, a warning, etc.
   - **User ID/Severity**. The severity of this event and the user identification number assigned
   - **Source**. The IP address or name of the file server that is the sender (source) of this event
   - **Source Time**. Day of the week, month, day of the month, time of day, and year at the source file server’s location when this event occurred
   - **Data**. Relevant channel/target activity and other data pertaining to why this event posted
   - **Description**. Text of the message describing what occurred
   - **Sequence**. Number representing where this event fell in a sequence of possibly related events
   - **Local Time**. Month, day, year at the *local client workstation’s location* when this event arrived.

Menubar and Menus

GAM2 Client contains a menubar (Figure 3-2) in the Global Array Manager window:

Figure 3-2. Menu Bar

File Menu

Figure 3-3. File Menu

Global Array Manager 2 Client's File menu (Figure 3-3) contains the following options:

- **Open Configuration (Ctrl+O)**: Opens a saved configuration file for a controller.
- **Save Configuration (Ctrl+S)**: Saves a configuration file to a new filename, disk, and/or directory.
- **Clear Configuration**: Removes configuration information for the selected controller.

  ⚠ ***Caution***

  Although there are confirmation checkpoints and warnings following selection of this option, remember that all existing configuration and file data (on all drives connected to the controller) will be deleted

- **Exit (Ctrl+Q)**: Exits the Global Array Manager 2 Client.

Views Menu

Figure 3-4. Views Menu

Global Array Manager 2 Client's Views menu (Figure 3-4) contains the following options:

- **Global Status View**: Toggles the Global Status View window. The Global Status View window opens by default when Global Array Manager 2 Client starts.
- **Controller View**: Toggles the Controller View window showing channel/SCSI ID/target information and physical device/logical drive configurations for the controller selected in the controller selection box (Global Array Manager window).
- **Statistics View**: Toggles the Statistics View window display for the controller selected in the controller selection box (Global Array Manager window). Tabs in the Statistics View window include Controller Statistics, Drive Statistics, and system usage History**.**
- **Log Information Viewer**: Toggles the Log Information Viewer, a window showing a log of recent system error and status event messages. The Log Information Viewer opens by default when Global Array Manager 2 Client starts.

- **Initialize Status**: Displays the progress (percent complete) of an ongoing initialization of one or more drives.
- **Rebuild Status**: Displays the progress (percent complete) of an ongoing device rebuild.
- **Consistency Check Status**: Displays the progress (percent complete) of an ongoing logical drive consistency check.
- **Expand Capacity Status**: Displays the progress (percent complete) of an ongoing data restriping process across the target RAID group.

  ⚠ ***Caution***

  Once the Expand Array (Expand Capacity) process has begun, you should not attempt to interrupt that process before completion. Data loss will result. You may, however, monitor the progress by choosing the Expand Capacity Status option.

- **Error Table**: Displays a table of bad block and “request sense” data generated as a result of finding areas of damage or data unavailability on a storage device. Data for all storage devices on the selected controller are presented in the same tables.

Administration Menu

Figure 3-5. Administration Menu

Global Array Manager 2 Client's Administration menu (Figure 3-5) contains the following options:

- **Sign On**: Enables use of Global Array Manager's configuration and administration functions to "Administrators" ("gamroot" + password). Enables only monitoring functions to "Users."
- **Define Server Groups**: Sets up server groups and individual server names or IP addresses within each group.
- **Select Current Server Group (Ctrl+G)**: Displays the current contents of the server selection box located in the Global Array Manager window. Functions in the same way as directly selecting the server selection box.
- **Select Current Controller (Ctrl+C)**: Displays the current contents of the controller selection box located in the Global Array Manager window. Functions in the same way as directly selecting the controller selection box.

- **RAID Assist**: Mylex's built-in RAID Controller configuration utility. Facilitates configuration tasks using either one-step "automatic" configuration, a configuration "wizard" assistant, or an manual (advanced-level) configuration option allowing more control over configuration parameters.
- **Initialize Logical Drives**: Offers the ability to initialize logical drives at a time of your choice, NOT just immediately following a new configuration. If it's inconvenient to follow a configuration immediately with a logical drive initialization, you can decline the initialization and use this menu item to start the process at a later time.
- **Display Controller Information**: Displays key information about the currently-selected controller (DAC controller or SCSI HBA), such as model, firmware version, BIOS version, controller number, IRQ, cache size (DAC controller only), and so on. The Controller Information screen is read only.
- **Controller Options**: (Advanced users only). Sets various parameters for the selected DAC controller or SCSI HBA (such as read ahead flag, rebuild rate, controller channel, etc.). Unlike Controller Information, user definable controller parameters are modified in Controller Options.
- **Intelligent BBU**: *(Only enabled if the selected controller is a DAC960PG with the Intelligent Battery Backup Unit installed)* Displays a dialog box from which you can do the following:
  - Monitor the power remaining in the Intelligent BBU
  - Request reconditioning of the Intelligent BBU

  The Intelligent BBU's features and functionality are described in detail elsewhere. GAM2 simply offers a way of keeping up-to-date as to the condition and charge in the battery so that, in the case of a power outage, the user need not worry that the Intelligent BBU will totally discharge.
- **Scan Devices**: Scans for new devices that have recently been added and are not currently identified within Global Array Manager 2.

> ☞ **Note**
>
> Each time you add or remove physical devices from the controller, select Scan Devices to allow Global Array Manager 2 to update the device list.

- **Settings**: Opens a tabbed dialog box in which you can specify the Alert/Alarm, Communication, and Event Editor settings that you desire. Examples of such settings include type of alarm, such as pager, fax, email, etc., modem baud rate, COM port, stop bits, data bits, parity, event severity level, event message editing, and so on.

Window Menu

Figure 3-6. Window Menu

Global Array Manager 2 Client's Window menu (Figure 3-6) is a standard feature of Windows 95 and Windows NT. It is implemented as such in Global Array Manager 2 Client.

Help Menu

Figure 3-7. Help Menu

Global Array Manager 2 Client's Help menu (Figure 3-7) identifies the on-line help options available within the Global Array Manager:

- **Contents**: Displays a list of available Global Array Manager help topics.
- **About Global Array Manager**: Displays the Windows standard "About" box**.**

Toolbar and Toolbar Icons

GAM2 Client contains a toolbar (Figure 3-8) in the Global Array Manager window:

Figure 3-8. Toolbar

Each toolbar button corresponds to a function available from the menu bar:

RAID Assist: Brings up the Raid Assist dialog box for DAC (RAID) configuration.

Scan Devices: Scans for new devices recently added and not currently identified within GAM2.

Display Controller Information: Displays key information about the currently-selected DAC or HBA controller.

Statistics View: Toggles the Statistics View window for the currently-selected DAC or HBA controller.

Error Table: Displays a table of bad block and “request sense” data.

Sign On: Enables GAM2’s configuration and administration functions to Administrators and monitoring functions to “Users.”

Settings: Opens a dialog box for specifying the Alert/Alarm, Communication, and Event Editor settings that you desire.

Help: Displays GAM2 Client’s on-line help contents page.

Exiting Global Array Manager 2

Exiting GAM2 Client

Exit Global Array Manager 2 Client as shown in Figure 3-9:

Figure 3-9. Select “Exit”

☛ **Note**

We recommend leaving the Global Array Manager 2 Client running as long as there are servers you wish to monitor or configure. If you do exit, you will be unable to receive events from GAM2 Server and you will not be informed of errors or status unless you restart GAM2 Client and reconnect to the server(s).

Exiting GAM2 Server

Some operating systems (such as NetWare) allow you to “unload” the GAM2 Server component while the file server remains running. Other operating systems may require you to “down” the file server in order to exit from or remove the GAM Server component.

> ⚠ ***Caution***
>
> Be aware that downing a file server may result in data loss if I/Os are in progress along the network. Exit the GAM Server component only if necessary.

For More Information...

This concludes the Startup & Navigation chapter. For additional information on Global Array Manager 2 options and functionality, refer to other chapters in this installation guide, AND to the context-sensitive online help file available from the Help menu, by pressing **F1**, or by right-mouse-clicking an item on which you require help.

Chapter 4
Configuration

Introduction

Global Array Manager 2 Client configuration activities involve the following:

- Setting up server groups and servers
- Setting or modifying user preferences such as alarms, alerts, event message editing, and communications parameters
- Setting or modifying controller options to suit your application needs
- Creating, modifying, or deleting Mylex RAID Controller

Before You Begin...

Be sure that you have successfully completed the following tasks before attempting any configuration activities:

1. Install and start up the Server component of the Global Array Manager 2 utility for your particular server platform(s).
2. Install and start up the Client component of GAM2 under Windows 95 or Windows NT 3.51/4.x. See “Global Array Manager 2 Client Component Installation” on page 2-2, and “Starting Global Array Manager 2” on page 3-1

Signing On to a Server

Security Access Levels

The ability to perform certain actions within the Global Array Manager 2 Client depends on your security access level.

There are three levels of security access, Guest (no sign-on), User, and Administrator.

Guest

By attaching to a file server through the Global Array Manager 2 Client, a user is automatically assigned Guest (no sign-on) status. Guest users can monitor Global status and the Log Information Viewer. They cannot make changes to any parameters or configurations.

User

A User has ordinary system privileges. A User signs on with his or her username and a password that has been assigned by the Administrator of that server. A User can alter parameters of anything that is not controller or drive related, and also monitor the status of any selected controller and RAID subsystem, but has no administrative capability. The User cannot set up or modify configurations, kill drives, rebuild drives, or change their on-line status. In essence, Users can “look”, but they can’t “touch.”

Administrator

Individuals with Administrator security access have the capabilities of Guests and Users plus the ability to manipulate controllers and RAID subsystems. These additional abilities include configuration, drive kill, drive rebuild, and drive state changes. An Administrator initially signs on as “gamroot” and secures his or her access with a password.

Under Windows NT, the Global Array Manager 2 uses security features built into Windows NT.

Signing On

To gain access capabilities beyond Guest level, you must sign on to a server. If you double-click a server from the Global Status View window when you are not already signed on, then click on any option that requires Administrator rights, the Sign On dialog box appears automatically (Figure 4-1).

Figure 4-1. Sign On Dialog Box

Open Sign On at any time as shown in Figure 4-2

Figure 4-2. Select "Sign On"

Do the following:

1. Type the password previously enabled on the server that corresponds with username "gamroot."

   This should provide Administrator access privileges.

2. Click the Sign-On button.

Setting Up Server Groups and Servers

Adding a Server Group to the Server Group List

Open Define Server Groups as shown in Figure 4-3

Figure 4-3. Select "Define Server Groups"

Figure 4-4. Define Server Groups Dialog Box

In the Define Server Groups dialog box (Figure 4-4), do the following:

1. Click the Add button under the Server Groups section of the dialog box.
2. In the Adding Item dialog box, enter a name for the server group that you are adding

3. Click OK. The Define Server Groups dialog box will reappear with the newly-defined server group added.

Adding a Server to the Servers List

With the Define Server Groups dialog box still open (Figure 4-4), do the following:

1. Click the Add button under the Servers section of the dialog box.
2. In the Adding Item dialog box, enter the name or IP address of the server that you are adding.
3. Click OK. The Define Server Groups dialog box will reappear with the newly-defined server added.
4. To add more servers to the group, repeat steps 5 through 7.
5. Click OK in the Define Server Groups dialog box when you are finished.

After adding servers, Global Array Manager 2 returns to the Global Status window.

☛ **Note**

Select “All Servers” to see all servers in the Global Status view.

Setting and Modifying User Preferences

Open Settings as shown in Figure 4-5

Figure 4-5. Select "Settings"

Alert Preferences

Figure 4-6. Settings Dialog Box: Alert Preferences

In the Settings dialog box, under the Alert Preferences tab (Figure 4-6), you have the option to do any of the following:

Event Log

- Append events to your current log file, or
- Replace the log file (overwrite it)
- Rename the log file
- Enable or disable the event logging function

Enable Global Alerts for Severity Level(s)

- For each type of alarm (Email, Pager, Fax, Launch Application, and Alarm Sound) check the box(es) corresponding to the event severity level(s) for which you would like to enable this type of alarm globally.

  For example, in Figure 4-6, all Level 0 and Level 1 messages/events will result in an alarm sound locally, and email, page (Level 0 only), and fax to those individuals identified in Alarm Setup.

  Events are numbered from 0 for most severe to 4 for least severe, and can be edited by the user.
- Click the Reset button within Alarm sound should you need to reset or turn off the alarm.

Finish by doing one of the following:

- Click OK to accept the global alert settings and exit the Settings dialog box, or

  Click Cancel to leave original settings unchanged, or

  Click another Settings tab to set additional user preferences.

Alarm Setup

Figure 4-7. Settings Dialog Box: Alarm Setup

In the Settings dialog box, under the Alarm Setup tab (Figure 4-7), you have the option to do any of the following:

Pager

- Enter the phone number of someone who will receive a page.
- Add or remove phone numbers by clicking the More button.
- Enter the modem setup string, or keep the default.
- If the recipient of the page has a text pager, check the Text Pager box.
- Enter a prefix, suffix, or delay interval by clicking the Advanced button.

Fax

- Enter the fax phone number of someone who will receive a fax.
- Add or remove fax phone numbers by clicking the More button.
- Enter a fax header, if desired.
- Select the installed fax software from the Fax Software list.

Email

- Enter the email address of someone who will receive an email.
- Add or remove email addresses by clicking the More button.

Launch Application

- Enter the name of an application to launch should certain events or messages require it.
- If you don't remember the name or path of the application, click the Browse button.

Finish by doing one of the following:

- Click OK to accept the alarm settings and exit the Settings dialog box, or

  Click Cancel to leave original settings unchanged, or

  Click another Settings tab to set additional user preferences.

Communication

Figure 4-8. Settings Dialog Box: Communication

In the Settings dialog box, under the Communication tab (Figure 4-8), you have the option to do any of the following:

Baud Rate

- Select the baud rate appropriate to your communication hardware.

Port

- Select the COM port at which your communication hardware resides.

Parity

- Select the type of parity for communication sessions: None, Even, Odd, Mark, Space.

Stop Bits

- Select the number of stop bits required for communication sessions: 1, 1.5, 2.

Data Bits

- Select the number of data bits required for communication sessions: 4, 5, 6, 7, 8.

Finish by doing one of the following:

- Click OK to accept the communication settings and exit the Settings dialog box, or

  Click Cancel to leave original settings unchanged, or

  Click another Settings tab to set additional user preferences.

Event Editor

Figure 4-9. Settings Dialog Box: Event Editor

In the Settings dialog box, under the Event Editor tab (Figure 4-9), you have the option to do any of the following:

GAM ID / User ID/ Severity / Default

- Select a GAM (event) ID to edit from the GAM ID list box.
- Enter your own number for this event in the User ID list box, or keep the default (equal to the GAM ID number).
- Enter your own event severity level in the Severity list box, or keep the default (set by Mylex).
- Click the Default button to return all settings for this particular event to their Mylex defaults.

Alarm for the Event

- When all Global boxes are checked, you are seeing the alarms that will activate when this particular event occurs (these are based on the settings in Alert Preferences). Check or uncheck specific boxes if you wish to override these defaults and change the alarms for this event.

Event Message Text

- Enter new text for this event, or keep the default text (set by Mylex).

Default All

- Click the Default All button to reset all events of all severity levels back to their Mylex defaults.

Finish by doing one of the following:

- Click OK to accept the event settings and exit the Settings dialog box, or

  Click Cancel to leave original settings unchanged, or

  Click another Settings tab to set additional user preferences.

Setting and Modifying Controller Options

Open Controller Options as shown in Figure 4-10

Figure 4-10. Select "Controller Options"

DAC960 Controllers (RAID)

Figure 4-11. Controller Options Dialog Box For DAC960

In the Controller Options dialog box (Figure 4-11), you have the option to do any of the following:

- Enable (by checking) or disable (by unchecking) any of the Global Parameters. *For descriptions of these options, refer to the context-sensitive online help provided in GAM2 Client.*
- Change the default Rebuild Rate to less than 50.

  A rate of 50 devotes the maximum allowable resources to a drive rebuild or array expansion, allowing the Rebuild or Expand to proceed at its fastest. Lowering the number devotes more resources to I/Os and consequently slows the Rebuild or Expand.
- Change the Startup Parameter “Spin-up” if you do not want the controller to initiate drive spin-up.
- Change any of the SCSI Parameters as needed, such as channel for this controller, transfer rate, or tag queuing. *For descriptions of these options, refer to the context-sensitive online help provided in GAM2 Client.*

Click the OK button to accept the changes, or the Cancel button to delete them.

Mylex SCSI Host Bus Adapters

Figure 4-12. Controller Options Dialog Box For SCSI HBA

In the Controller Options dialog box (Figure 4-12), you have the option to do any of the following:

- Enable (by checking) or disable (by unchecking) wide negotiation and/ or disconnect under SCSI Device Parameters. *For descriptions of these options, refer to the context-sensitive online help provided in GAM2 Client.*
- Change the SCSI ID of this HBA.
- Change the Startup Parameter “Spin-up” option.
- Change the transfer rate *For a description of this option, refer to the context-sensitive online help provided in GAM2 Client.*

Click the OK button to accept the changes, or the Cancel button to delete them.

Running RAID Assist

RAID Assist is the Global Array Manager 2 Client’s “wizard” for the setup and configuration of new logical drives and disk arrays.

In its simplest form, RAID Assist provides an *Auto Configuration* option which immediately configures all available drives into an optimal, RAID 5 configuration. Raid Assist’s *Assisted Configuration* sets up a new array according to predefined parameters, and asks the user questions to gather the key information necessary to build the array.

If configuration needs go beyond what Auto or Assisted Configuration offers, the *Manual Configuration* option allows additional control over logical drive setup parameters.

Entering RAID Assist

Open RAID Assist as shown in Figure 4-13

Figure 4-13. Select "RAID Assist"

Figure 4-14. RAID Assist "Welcome" Dialog Box

In the RAID Assist "Welcome" dialog box (Figure 4-14), do one of the following:

- Click the *Automatic Configuration* button if you want to provide only minimal input and allow RAID Assist to set up an optimal configuration automatically, or
- Click the *Assisted Configuration* button if you want RAID Assist to lead you step-by-step through the configuration steps, or
- Click the *Manual Configuration* button if you want full control over your configuration setup, or
- Click Cancel if you want to exit RAID Assist without any changes.

Automatic Configuration

Automatic Configuration provides three options:

- **New Configuration**. Sets up a new configuration on the controller, deleting the previous configuration and data (if any).
- **Add Logical Drive**. Sets up additional arrays (logical drives) leaving the existing array(s) intact. At least one array must be configured on this controller, and unconfigured drive space must remain.
- **Expand Array**. Restripes data in your array across additional, unconfigured drives to expand the capacity of the array.

Open New Configuration (for example), as shown in Figure 4-15

Figure 4-15. Select "New Configuration"

Figure 4-16. Automatic Configuration->New Configuration->Finish

The Finish screen appears (Figure 4-16). Do the following:

1. Examine the Configuration Summary for details about the configuration that RAID Assist will set up.
2. If you want to start over, click the Back or Cancel button, OR

   If you want to make some changes to the configuration before it is applied to the controller, click the Details button. You will be taken to an equivalent of the Manual Configuration dialog box with tabs. In that box you can change what you want and click Apply, OR

   If you accept the configuration as presented, click the Apply button to apply the new configuration to the controller.

☞ Note

In Automatic Configuration, Add Logical Drive and Expand Array function very similarly to the New Configuration option. In each case RAID Assist prepares an optimal configuration without user input based on characteristics of the available devices.

Assisted Configuration

Assisted Configuration provides three options:

- **New Configuration**. Sets up a new configuration on the controller, deleting the previous configuration and data (if any).
- **Add Logical Drive**. Sets up additional arrays (logical drives) leaving the existing array(s) intact. At least one array must be configured on this controller, and unconfigured drive space must remain.
- **Expand Array**. Restripes data in your array across additional, unconfigured drives to expand the capacity of the array.

Open New Configuration (for example), as shown in Figure 4-17

Figure 4-17. Select "New Configuration"

Figure 4-18. Assisted Configuration

Assisted Configuration walks you step by step through a new configuration (Figure 4-18). Each “tab” in the Assisted Configuration dialog box collects information about an important aspect of the configuration you wish to set up. During this process, you provide answers to several questions.

Fault Tolerance Tab

1. Do you want Fault Tolerance? [Yes/No]
2. Do you want a Hot Spare? [Yes/No]

RAID Level Tab (If Fault Tolerance Was Yes)

3. Choose between:
   - Parity error correction (RAID 5, RAID 3), or
   - Fully redundant drives (RAID 1, RAID 6)

RAID Level Tab (If Fault Tolerance Was No)

4. Choose between:
   - Striping (RAID 0), or
   - Stand-alone drive (JBOD)

Logical Drives Tab

5. How many logical drives do you want to create? [1 - 32]
6. How much capacity do you want to use? [default=100% available space, or equivalent in MB]
7. Do you want to initialize logical drives? [Yes/No]

   This is done after the configuration has been applied.

Optimization Tab

8. Choose between:
   - write cache enabled (write back), or
   - write cache disabled (write through)
9. Select Stripe Size (valid options are in the list)
10. Select Cache line size: [see below]

    Valid cache line size values depend on the stripe size setting and are listed appropriately once you've selected a stripe size.

Figure 4-19. Assisted Configuration->New Configuration->Finish

The Finish screen appears (Figure 4-19). Do the following:

1. Examine the Configuration Summary for details about the configuration that RAID Assist will set up.
2. If you want to start over, click the Welcome tab or Cancel button, OR

   If you want to change your answers to any of the questions you were asked, click the appropriate tab to return to that screen, OR

   If you want to make other changes to the configuration before it is applied to the controller, click the Details button. You will be taken to an equivalent of the Manual Configuration dialog box with tabs. In that box you can change what you want and click Apply, OR

   If you accept the configuration as presented, click the Apply button to apply the new configuration to the controller.

Note

In Assisted Configuration, Add Logical Drive and Expand Array function very similarly to the New Configuration option. In each case RAID Assist leads you step-by-step through the relevant questions for the task.

Manual Configuration

Manual Configuration provides four options:

- **Edit Configuration**. Displays the current configuration (disk arrays and logical drives), and allows you to make any changes that you require.
- **New Configuration**. Sets up a new configuration on the controller, deleting the previous configuration and data (if any).
- **Add Logical Drive**. Sets up additional arrays (logical drives) leaving the existing array(s) intact. At least one array must be configured on this controller, and unconfigured drive space must remain.
- **Expand Array**. Restripes data in your array across additional, unconfigured drives to expand the capacity of the array.

Open New Configuration (for example), as shown in Figure 4-20:

Figure 4-20. Select "New Configuration"

Figure 4-21. Manual Configuration - Disk Arrays

The Disk Arrays tab in Manual Configuration is where you begin to configure your unused disk drives (lower left, Figure 4-21). Each disk array is represented by one line in the Disk Arrays area of the screen (upper left, Figure 4-21). Logical drives (if any have already been configured) appear on the right side.

Do the following:

1. Select an unused drive and drag it to the Disk Array A0 section. The drive will be part of a disk array referred to as “A0.”
2. Select other unused drives and drag them to Disk Array A0, OR click the Add Array button to create a row for Disk Array A1 (then A2, A3, etc.), then drag unused drives to A1 if you so desire.
3. If you want to manually configure a hot spare, click an unused drive, then click the Make Hot Spare button.
4. If you want to start over, click the Clear All button and start again.

5. Once you've assembled the disk array groups, you may
   - Apply the configuration without configuring any logical drives, or
   - Go to the Logical Drives tab to configure logical drives.

   Click the Apply button to save your configuration without setting up any logical drives, OR

   Click the Logical Drives tab to continue on to logical drive setup (Figure 4-22):

Figure 4-22. Manual Configuration - Logical Drives

The Logical Drives tab in Manual Configuration is where you configure your disk arrays into logical drives. Your first logical drive will set the stripe size and cache line size for *all* logical drives on this controller.

Do the following:

1. Select a RAID level for your first logical drive. Supported RAID levels are RAID 0, RAID 1, RAID 3, RAID 5, RAID 0+1 (Mylex RAID 6), and stand-alone drive (Mylex RAID 7, or JBOD). Only RAID levels compatible with the current configuration will be available in the list.
2. Enter the amount of available logical or physical capacity for this logical drive. If your total configuration will have only one logical drive which uses all available capacity, the default sizes should not be

changed. If you intend to create additional logical drives now or later, enter a smaller number to reserve the desired amount of capacity.

3. Check the Write Cache box if you want this logical drive to use Write Back caching. This improves performance but puts data at risk. You should have a battery backup unit or uninterruptable power supply if selecting this feature.
4. Check the Init Drive box if you want this logical drive to be initialized at the conclusion of the configuration. It is recommended that you check this option.
5. If this is your first logical drive, select a stripe size. This setting will apply to all logical drives on this controller.
6. If this is your first logical drive, select a cache line size. Available settings will depend on the selected stripe size.
7. Click the Add Drive button to register your new logical drive.

   Click Apply to save the configuration if you are finished setting up logical drives, OR

   Repeat the process above to set up additional logical drives, then click Apply when you’re done.

An example of a completed Manual configuration is shown in Figure 4-23:

Figure 4-23. Sample Manual Configuration Just Before "Apply"

Note

In Manual Configuration, Add Logical Drive and Expand Array function very similarly to what was shown above. In each of these two cases, however, RAID Assist shows you the disk arrays and logical drives and allows you to add to the configuration without risking existing data.

Chapter 5
Monitoring

Introduction

Global Array Manager 2 Client monitoring activities involve the following:

- Monitoring events (messages) sent by various servers to the client workstation
- Monitoring controller activity; reviewing controller configuration and other information
- Reviewing physical device and logical drive information
- Monitoring the performance of drives and controllers; reviewing historical performance data

Before You Begin...

Be sure that you have successfully completed the following tasks before attempting any monitoring activities:

1. Install and start up the Server component of the Global Array Manager 2 utility for your particular server platform(s).
2. Install and start up the Client component of GAM2 under Windows 95 or Windows NT 3.51/4.x. See “Global Array Manager 2 Client Component Installation” on page 2-2, and “Starting Global Array Manager 2” on page 3-1

Event Monitoring

Global Array Manager 2 Server monitors activity and performance of all devices and controllers attached to the particular server. When an identified activity occurs which results in an “event” (whether severe, such as a hard disk failure, or informational, such as assignment of a drive to hot spare status), the event is sent to selected workstations running GAM2 Client.

GAM2 Client displays events in the Log Information Viewer. An “event” can be any of the following:

- Server attach and detach (Guest, User, and Administrator).
- Error or warning condition in a RAID subsystem (such as a power, fan, or drive failure).
- Any administrative activity (taking a drive off-line, killing or rebuilding a drive).

> ☞ **Note**
>
> It is recommended that the Global Array Manager 2 Client be kept active continuously as a minimized Windows application.

Opening the Log Information Viewer

The Log Information Viewer is opened when Global Array Manager 2 Client is started and one or more controllers are detected as connected to the server(s). The viewer displays the contents of GAM2CL.LOG, an ASCII text file. This file contains a chronological log of all the events that occur while this session of the Global Array Manager 2 Client is executing.

Should you need to open the Log Information Viewer manually, do so as shown in Figure 5-1:

Figure 5-1. Select "Log Information Viewer"

Figure 5-2. Log Information Viewer

The Log Information Viewer (Figure 5-2), displays the following information about events:

- **Event Icon**. Displays whether the event is informational, cautionary, a warning, etc.
- **User ID/Severity**. The severity of this event and the user identification number assigned
- **Source**. The IP address or name of the file server that is the sender (source) of this event message
- **Source Time**. Day of the week, month, day of the month, time of day, and year at the source file server's location when this event occurred

- **Data**. Relevant channel/target activity and other data pertaining to why this event posted
- **Description**. Text of the message describing what occurred
- **Sequence**. Number representing where this event fell in a sequence of possibly related events
- **Local Time**. Month, day, year at the *local client workstation's location* when this event arrived.

Controller Monitoring

After a client and server connection is made through sign-on, the GAM2 Client opens a window for each RAID controller, Mylex SCSI HBA, and their drives operating in that file server. These controller windows are the Global Array Manager 2 Client's Controller View.

Opening the Controller View

Open the Controller View by double-clicking any server icon in the Global Status View, or as shown in Figure 5-3:

Figure 5-3. Select "Controller View"

Figure 5-4. Controller View Window

The Controller View window (Figure 5-4), displays the following information about the controller currently selected in the *controller selection box* (Global Array Manager window):

- The number of channels on this controller, each channel depicted as a tower
- The physical devices present on each channel, specifying the target ID, capacity of the device, device type, and device status
- The logical drives configured on the controller, specifying the logical unit number (LUN), capacity of the logical drive, configured RAID level, and logical drive status

Displaying Controller Information

Open Display Controller Information as shown in Figure 5-5:

Figure 5-5. Select "Display Controller Information"

Figure 5-6. Controller Information

Controller Information (Figure 5-6), displays the following information about the controller currently selected in the *controller selection box* (Global Array Manager window):

- The controller model and the sequential number of this controller (1 = C-1, 2 = C-2, etc.)
- The firmware and BIOS versions residing on the controller

- The cache size and EEPROM size
- The bus and slot numbers
- The IRQ setting for this controller
- Presence or absence of an Intelligent Battery Backup Unit (IBBU), only available at this time for DAC960PG controllers
- The channel where this controller is installed, and the total number of channels on this controller
- The number of SCSI devices installed, and the maximum number of SCSI devices that this controller can hold
- The number of logical drives configured on this controller, and the maximum number of logical drives that can be configured

Click the Controller Options button to view a dialog box of user-definable controller parameters (see “Setting and Modifying Controller Options” on page 4-13).

Physical Device and Logical Drive Monitoring

Displaying Device Information

The Controller View window details which *physical* devices are associated with each controller channel. Each stack of drives represents the physical drives connected to a single SCSI channel on the controller.

Display information about a particular physical device by double-clicking the physical device icon.

Figure 5-7. Device Information for a RAID Controller

Figure 5-8. Device Information for a Disk Drive

Device Information (Figure 5-7, Figure 5-8) displays the following about the currently-selected physical device:

Device Inquiry Data: RAID Controller

- The vendor or source of the controller
- The controller's product identification (such as DAC960PG)
- The revision level of the hardware

- Whether the following parameters are set to Yes or No: WBus32, WBus16, Synch, Linked, Soft Reset, Command Queuing

Device Inquiry Data: Disk Drive

- The vendor or source of the drive
- The drive's product identification (such as XP32150)
- The revision level of the hardware
- Whether the following parameters are set to Yes or No: WBus32, WBus16, Synch, Linked, Soft Reset, Command Queuing

Device Information: Disk Drive

- The channel and target (SCSI) ID at which this drive resides
- The physical capacity of this device in MB
- The current status of this device (On-line, etc.)

Device Errors: Disk Drive

- The number of soft, hard, parity, and miscellaneous errors registered

In a disk drive Device Information dialog box...

Click the Reset Errors button to return all error tallies to 0.

If the disk drive's status is dead, the Rebuild button may be available so that you can initiate a physical device rebuild.

If the physical device is unconfigured, the Make Hot Spare button may be available to set this device as a hot spare.

Make Online and Make Offline buttons should be used with great caution. Refer to the online help file, or call Mylex for support on these options.

In any Device Information dialog box...

Click the Close button to dismiss the dialog box.

Displaying Logical Drive Information

The icons on the right side of the Controller View window represent the *logical drives* (also known as logical units or system drives) created by the controller out of the available physical drives.

Display information about a particular logical drive by double-clicking the logical drive icon.

Figure 5-9. Logical Drive Information for a RAID Controller

Logical Drive Information (Figure 5-9) displays the following about the currently-selected logical drive:

- The logical drive number
- The operational status of the logical drive
- The logical and physical size of the logical drive
- The RAID level at which the logical drive is configured
- Whether write back cache is enabled or disabled
- The stripe size and cache line size in use by the logical drive
- Whether the logical drive's configuration is optimized for speed, optimized for capacity, and fault tolerant [Yes/No]
- Out of the total amount of capacity configured on the controller, the

amount of capacity held by this logical drive (shown in a bar graph)

If write back cache is disabled, click the Enable Write Cache button to enable the cache.

If write back cache is enabled, click the Disable Write Cache button to disable the cache (and use write through caching).

If the Consistency Check button is enabled, you may manually run a consistency check on this logical drive (as discussed in the next chapter).

Click the Close button to dismiss the dialog box.

Performance Monitoring

Open the Statistics View as shown in Figure 5-10:

Figure 5-10. Select "Statistics View"

Controller Statistics

Figure 5-11. Statistics View Window: Controller Statistics

The Controller Statistics tab of the Statistics View window (Figure 5-11) displays logical drive I/O activity, throughput, and cache hits, as well as physical drive I/O activity and throughput.

Click the Reset Max button to reset the scale to a setting more appropriate for the amount of drive activity.

Click Close to dismiss the Statistics View window, or

Click another Statistics View tab to monitor other performance data.

Drive Statistics

Figure 5-12. Statistics View Window: Drive Statistics

The Drive Statistics tab of the Statistics View window (Figure 5-12) displays cache hits on logical drives (%), and I/O activity on logical drives, physical drives, and channels.

Additional statistics can be displayed in various combinations by clicking the Select Statistics button.

Click the Select Drives button to select the drives whose performance you wish to monitor.

Click the Reset Max button to reset the scale to a setting more appropriate for the amount of drive activity.

Click Close to dismiss the Statistics View window, or

Click another Statistics View tab to monitor other performance data.

History

Figure 5-13. Statistics View Window: History

The History tab of the Statistics View window (Figure 5-13) displays a view over time of I/O reads and writes, KB reads and writes, and cache hits for logical and physical drives. Maximum, minimum, last, and average values are provided.

Statistics can be displayed in various combinations by checking and unchecking the boxes beside each statistic.

Enter a time in seconds into the Time Scale Unit box which will set how frequently polling of devices is to take place.

Click the Clear button to reset the History view.

Click the Pause button to freeze the statistics at a single point in time to allow greater scrutiny.

Click the Open File button to select a file containing a previously-saved performance history.

Click the Save File button to save the current performance history to a file that can later be opened and reviewed with Open File.

Click Close to dismiss the Statistics View window, or

Click another Statistics View tab to monitor other performance data.

Settings

Figure 5-14. Statistics View Window: Settings

The Settings tab of the Statistics View window (Figure 5-14) acts as a user preferences screen dedicated solely to History data display preferences. It displays the following information which can be changed by the user:

History Graph Lines

Displays the statistic and the line type that represents it on the graph, and allows modification of the line color and thickness.

To change the color of a line:

1. Select a statistic and line in the box whose color you wish to change.
2. Click the Color button and select a new color for this statistic's line.
3. Click OK to accept the change, or Cancel to leave the color unchanged.

To change the width of a line:

1. Select a statistic and line in the box whose width you wish to change.
2. Select a new line width in the Width box for this statistic's line (options are Thin, Medium, and Thick).

Sample Period

- Enter a value (in seconds) in the Sample Period box indicating how often Global Array Manager 2 should collect data to display.

History Time Scale Unit

- Enter a value in hours and/or minutes and/or seconds in the appropriate box, indicating the time units to display in the History graph.

Click the Apply button to record all changes you carried out under the Settings tab.

Click Close to dismiss the Statistics View window, or

Click another Statistics View tab to monitor other performance data.

Process Status Monitoring

Initialization Status

If logical drives are currently being initialized, open the Initialize Status box as shown in Figure 5-15 to monitor the progress of or cancel the process:

Figure 5-15. Select "Initialize Status"

Figure 5-16. Initialization Status Box

The Initialize Status box (Figure 5-16) displays the progress of one or more logical drive initializations.

To cancel ALL drive initializations at the same time...

- Click the Select All button, which selects all drives for cancellation, then click Cancel to stop all the initializations.

To cancel individual drive initializations...

- Check the box(es) of the drive(s) to cancel, then click Cancel to stop only those initializations.

If all drives are selected for cancellation and you wish to reverse that...

- Click the Clear All button, which deselects all drives for cancellation.

Click Close to dismiss the Initialize Status box at any time.

Rebuild Status

If a rebuild process is currently underway, open the Rebuild Status box as shown in Figure 5-17 to monitor the progress of or cancel the process:

Figure 5-17. Select "Rebuild Status"

Figure 5-18. Rebuild Status Box

The Rebuild Status box (Figure 5-18) displays the progress of a physical drive rebuild.

Click Cancel to stop the rebuild. You may need to check the Views menu to see if Rebuild Status is still enabled. If so, you may need to cancel other rebuilds as well.

Click Close to dismiss the Rebuild Status box at any time.

Consistency Check Status

If a consistency check process is currently underway, open the Consistency Check Status box as shown in Figure 5-19 to monitor the progress of or cancel the process:

Figure 5-19. Select "Consistency Check Status"

Figure 5-20. Consistency Check Status Box

The Consistency Check Status box (Figure 5-20) displays the progress of a logical drive consistency check.

Click Cancel to stop the consistency check. You may need to check the Views menu to see if Consistency Check Status is still enabled. If so, you may need to cancel other consistency checks as well.

Click Close to dismiss the Consistency Check Status box at any time.

Expand Capacity Status

If an expand array (also called “expand capacity”) process is currently underway, open the Expand Capacity Status box as shown in Figure 5-21 to monitor the progress of this process:

Figure 5-21. Select “Expand Capacity Status”

Figure 5-22. Expand Capacity Status Box

The Expand Capacity Status box (Figure 5-22) displays the progress of a disk array capacity expansion.

WARNING

You should not attempt to cancel an Expand Array (Expand Capacity) process; data loss will result.

Click Close to dismiss the Expand Capacity Status box at any time.

Chapter 6
Maintenance Processes

Introduction

Global Array Manager 2 Client maintenance processes include the following two activities which you may need to perform from time to time on arrays that use redundancy and/or fault tolerance:

- Running a consistency check on a logical drive to examine (and optionally restore) consistency (parity). Encountered errors may be written to the Error Table.
- Running a data rebuild on a physical drive that replaces a drive that went dead or offline.

Before You Begin...

Be sure that you have successfully completed the following tasks before attempting any maintenance processes:

1. Install and start up the Server component of the Global Array Manager 2 utility for your particular server platform(s).
2. Install and start up the Client component of GAM2 under Windows 95 or Windows NT 3.51/4.x. See “Global Array Manager 2 Client Component Installation” on page 2-2, and “Starting Global Array Manager 2” on page 3-1

Running a Logical Drive Consistency Check

From time to time it is prudent to run a consistency check on each of your fault tolerant logical drives. This check scans the logical drive to determine whether consistency data has become corrupted and needs to be restored. If you have reason to believe that logical drive consistency data is corrupted, or if you wish to run a consistency check for maintenance reasons, perform the following procedure:

1. Double-click a logical drive in Controller View (right side of a Controller View window).
2. Click the Consistency Check button in the Logical Drive Information dialog box to begin.

A message is displayed asking if you would like consistency to be restored in the event of errors (Figure 6-1):

Figure 6-1. Restore Consistency If Errors Are Found?

3. Click Yes to restore consistency during the process.

   ⚠ ***Caution***

   If consistency data is badly corrupted on a logical drive, attempting to restore consistency may result in corrupted real data. Use the Yes option with caution.

   Click No if you just want to carry out the consistency check. There is no risk of data loss. Errors will still be reported to the Error Table but no attempt will be made to correct them.

Consistency Check runs and the Consistency Check Status box appears (see the previous chapter). Close the box and continue or leave the box open until Consistency Check has completed.

Running a Device Rebuild

If a single device in a fault tolerant system fails, the system is spared data loss by virtue of the striping with parity present across the logical drive (RAID 3, RAID 5) or the total redundancy of data (RAID 1, RAID 0+1). The failed drive needs to be replaced, and the failed drive's data must be rebuilt on a new drive to restore the system to fault tolerance once again.

The device rebuild function performs this task. A failed drive's data can be rebuilt to:

- The original drive if this drive happens to be still functional
- A hot spare (standby) drive present for just this purpose, or
- A drive inserted in place of the failed drive.

If you need to carry out a device rebuild, perform the following procedure:

1. Reinsert the removed drive that caused the failure (if it is still a good drive), or replace the failed drive with a new drive of equal or greater capacity.
2. Double-click the relevant physical device in the Controller View window.
3. Click the Rebuild button in the Device Information dialog box to begin.

Rebuild runs and the Rebuild Status box appears (see the previous chapter). Close the box and continue or leave the box open until Rebuild has completed.

When rebuild has completed, the selected physical device AND the logical drive(s) of which it is a part are returned to operational status. If you cancel rebuild, the device returns to its offline (dead) status (red X). You must complete a future rebuild to return the device to operational status.

Appendix A
Error Codes

Overview

Global Array Manager 2 classifies the events it records into five severity levels described in the following table.

Table A-1. Severity Level Priorities and Descriptions

Severity	Type	Description
0	Critical	Controller failure.
1	Serious	The failure of a major component within the array enclosure. For example, a power supply, fan or physical drive.
2	Error	A consistency check fails, or a rebuild on a drive stopped because of errors.
3	Warning	Global Array Manager 2 has failed to kill a drive, or failed to start a rebuild.
4	Informational	Messages such as sign-ons and system startups. When a consistency check or a rebuild has finished, for example, or a physical drive has been put on standby.

Critical (Level 0)

388 Controller is dead. System is disconnecting from this controller

391 Controller is gone. System is disconnecting from this controller.

Serious (Level 1)

12 A hard disk has failed.

134 A logical drive has been made offline.

256 Fan failure.

258 Fan failure.

272 Power supply failure.

274 Power supply failure.

288 Over temperature. Temperature is above 70 degrees Celsius.

291 Over temperature.

Errors (Level 2)

9 Rebuild stopped with error.

10 Rebuild stopped with error. New device failed.

11 Rebuild stopped because logical drive failed.

18 Expand Capacity Stopped with error.

131 Consistency check on logical drive error.

132 Consistency check on logical drive failed.

135 A logical drive is critical.

141 Rebuild stopped with error.

142 Rebuild stopped with error. New device failed.

143 Rebuild stopped because logical drive failed.

147 Logical drive initialization failed.

152 Expand Capacity stopped with error.

385 Write back error.

Warnings (Level 3)

3 Hard drive error found.

4 Hard drive PFA condition found, this drive may fail soon.

386 Internal log structures getting full, PLEASE SHUTDOWN AND RESET THE SYSTEM IN THE NEAR FUTURE.

389 Controller has been reset.

393 Battery Power Low.

Information (Level 4)

1	A hard disk in array changed status.
2	A hard disk been added as hot spare.
5	An automatic rebuild has started.
6	A manual rebuild has started.
7	Rebuild is over.
8	Rebuild is cancelled.
13	A new physical device has been found.
14	A physical device has been removed.
15	A previously configured device is now available.
16	Expand Capacity Started.
17	Expand Capacity Completed.
128	A Consistency check is started.
129	Consistency check is finished.
130	Consistency check is cancelled.
133	No Message.
136	A logical drive has been placed online.
137	An automatic rebuild has started on logical drive.
138	A manual rebuild has started on logical drive.
139	Rebuild on logical drive is over.
140	Rebuild on logical drive is cancelled.
144	Logical drive initialization started.
145	Logical drive initialization done.
146	Logical drive initialization cancelled.
148	A new logical drive has been created.
149	A logical drive has been deleted.
150	Expand Capacity Started.
151	Expand Capacity Completed.
257	Fan has been restored.

259	No Message.
273	Power supply has been restored.
275	No Message.
290	Normal temperature has been restored.
292	No Message.
384	GAM Server Software Started Successfully.
390	Controller is found.
392	Battery Backup Unit Present.
394	Battery Power OK.

Glossary

BBU

See “Battery Backup Unit” .

Bad Block Table (or Bad Data Table)

There are two bad-block tables that the controller automatically maintains: The Rebuild Bad Block Table stores information on bad blocks encountered during a rebuild or consistency check process. The Write-Back Bad Block Table stores information on all irrecoverable write-back errors that occur. GAM2 provides an Error Table in which you can see Bad Block Data and Request Sense Data.

Battery Backup Unit

A Battery Backup Unit (DBBU960) is an add-on module that provides power to a DAC960P Series Controller cache memory in the event of a power failure (except for the DAC960PG; see “Intelligent Battery Backup Unit” .) The battery backup module monitors the write back cache on the controller, and provides power to the cache if it contains data not yet written to the drives when power is lost.

Cache

Controller memory used to speed up data transfer to and from a disk.

Cache Flush

Refers to an operation where all unwritten blocks in a Write-Back Cache are written to the target disk. This operation is necessary before powering down the system.

Cache Line Size

The Cache Line Size function, available in Controller Options or Manual Configuration, is set in conjunction with stripe size and represents the size of the data “chunk” that will be read or written at one time. The cache line size should be based on the stripe size you selected.

Channel

Refers to one SCSI bus on a DAC960 Series controller. Each DAC960 provides at least one channel, and additional channels with optional upgrades.

Consistency Check

Refers to a process where the integrity of redundant data is verified. For example, a consistency check of a mirrored drive will make sure that the data on both drives of the mirrored pair is exactly the same. For RAID Level 5 redundancy, a consistency “connect” is a function that allows a target SCSI device (typically a disk drive that received a request to perform a relatively long I/O operation) to release the SCSI bus so that the controller can send commands to other devices. When the operation is complete and the SCSI bus is needed by the disconnected target again, it is “reconnected.”

Disk Failure Detection

The controller automatically detects SCSI disk failures. A monitoring process running on the controller checks, among other things, elapsed time on all commands issued to disks. A time-out causes the disk to be “reset” and the command to be retried. If the command times out again, the disk could be “killed” (taken “offline”) by the controller (its state changed to “dead”). DAC960 Series controllers also monitor SCSI bus parity errors and other potential problems. Any disk with too many errors will also be ‘killed’.

Disk Media Error Management

DAC960 Series controllers transparently manage SCSI disk media errors. Disks are programmed to report errors, even ECC-recoverable errors.

When a disk reports a media error during a read, the controller reads the data from the mirror (RAID 1 or 0+1), or computes the data from the other blocks

(RAID 3, RAID 5), and writes the data back to the disk that encountered the error. If the write fails (media error on write), the controller issues a “reassign” command to the disk, and then writes the data to a new location. Since the problem has been resolved, no error is reported to the system.

When a disk reports a media error during a write, the controller issues a “reassign” command to the disk, and writes the data out to a new location on the disk.

Drive Groups (or Drive Packs)

A drive group is a group of individual disk drives (preferably identical) that are logically tied to each other and are addressed as a single unit. In some cases this may be called a drive “pack” when referring to just the physical devices. Up to eight (8) drives can be configured together as one drive group.

All the physical devices in a drive group should have the same size, otherwise each of the disks in the group will effectively have the capacity of the smallest member. The total size of the drive group will be the size of the smallest disk in the group multiplied by the number of disks in the group. For example, if you have 4 disks of 400MB each, and 1 disk of 200MB in a pack, the effective capacity available for use is only 1000MB (4*200), not 1800MB

Error Table

See “Bad Block Table (or Bad Data Table)”.

Hot Replacement of Disks (“Hot Swap”)

The design of the DAC960 Series controllers allows for the replacement of failed hard disk drives without interruption of system service. In the event of a SCSI drive failure on a properly configured system (where the data redundancy features of the controller are used), system service continues without interruption. A message is generated by the system to alert the system operator.

When a replacement drive becomes available, the system operator can remove the failed disk drive, install a new disk drive, and instruct the controller to “rebuild” the data on the new drive, all without interrupting system operations.

Once the rebuild is complete, the controller will be brought back into a fault tolerant state.

IBBU

See “Intelligent Battery Backup Unit” .

Intelligent Battery Backup Unit

The Intelligent Battery Backup Unit (IBBU) is an add-on module that provides power to a DAC960PG PCI to Ultra-SCSI RAID Controller cache memory in the event of a power failure. The battery backup module monitors the write back cache on the DAC960PG, and provides power to the cache if it contains data not yet written to the drives when power is lost.

The DAC960PG controller, with the IBBU installed, together occupy only one PCI slot on the host backplane.

Logical Drive States

The state of a logical (system) drive can be either ONLINE, CRITICAL, or OFFLINE. Notice that the same term “online” is used for both physical and logical drives.

Online: A Logical Drive is in an “online” state if...

All of its participating SCSI drives are “online.”

Critical: A Logical Drive is in a “critical” state if...

It has been configured at RAID level 1, 3, 5, or 0+1; and

One (and only one) of its SCSI drives is not “online.”

A logical drive is considered “critical” because any failure of another of its SCSI drives may result in a loss of data.

> ☞ **Note**
>
> I/O operation can only be performed with logical drives that are online or critical.

Offline: A Logical Drive is in an “offline” state if...

No data can be read from it or written to it.

System commands issued to offline logical drives are returned with an error status: no operations can be performed on offline logical drives. A logical drive can be “offline” under one of two situations described below:

- It is configured with a redundant RAID level (1, 3, 5, or 0+1), and two or more of its SCSI drives are not “online”; or
- It is configured at RAID level 0, JBOD, or in a spanned set, and one or more of its SCSI drives are not “online.”

Logical Drives

A logical drive is equivalent to a “system” drive. Logical drives are presented to the operating system as available disk drives, each with a capacity specified by the DAC960 Series controller.

Mirroring

Refers to the 100% duplication of data on one disk drive to another disk drive. Each disk will be the mirror image of the other.

Pack

See “Drive Groups (or Drive Packs)” .

Parity

See “Rotated XOR Redundancy” .

RAID

RAID stands for Redundant Array of Independent Disks. The DAC960 Series controllers implement this technology to connect up to 7 SCSI devices simultaneously on each channel for firmware versions below 3.0, and up to 15 SCSI devices per channel for firmware 3.0 and above. Several different forms of RAID implementation have been defined. Each form is usually referred to as a “RAID level.” All the RAID levels supported by DAC960 Series controllers are shown below.

The appropriate RAID level for a system is selected by the system manager or integrator. This decision will be based on which of the following are to be emphasized:

Disk Capacity

Data Availability (redundancy or fault tolerance)

Disk Performance

RAID Levels

The disk array controllers monitored by GAM2 support four RAID Advisory Board-approved RAID levels (RAID 0, RAID 1, RAID 3, RAID 5) and two special RAID levels (RAID 0+1, and JBOD).

Level 0. Block “striping” across multiple drives is provided, yielding higher performance than is possible with individual drives. This level does not provide any redundancy.

Level 1. Drives are paired and mirrored. All data is 100% duplicated on a drive of equivalent size.

Level 3. Data is “striped” across several physical drives. Maintains parity information which can be used for data recovery.

Level 5. Data is “striped” across several physical drives. For data redundancy, drives are encoded with rotated XOR redundancy.

Level 0+1. Combines RAID 0 striping and RAID 1 mirroring. This level provides redundancy through mirroring. (Mylex RAID 6)

JBOD. Sometimes referred to as “Just a Bunch of Drives.” Each drive is operated independently like a normal disk drive, or drives may be spanned and seen as a single drive. This level does not provide data redundancy. (Mylex RAID 7)

> ☞ **Note**
>
> The host operating system drivers and software utilities remain unchanged regardless of the level of RAID installed. The controller makes the physical configuration and RAID level implementation transparent to the host operating system.

Replacement Table

A replacement table contains information regarding which SCSI devices have been replaced by others through standby replacement.

Rotated XOR Redundancy

This term (also known as “parity” or “consistency data”) refers to a method of providing complete data redundancy while requiring only a fraction of the storage capacity of mirroring. In a system configured under RAID 3 or RAID 5 (which require at least three SCSI drives), all data and parity blocks are divided between the drives in such a way that if any single drive is removed (or fails), the data on it can be reconstructed using the data on the remaining drives. (XOR refers to the Boolean “Exclusive-OR” operator.) In any RAID 3 or RAID 5 array, the capacity allocated to redundancy is the equivalent of one drive.

SCSI Drive

A disk drive equipped with a SCSI interface (sometimes referred to as a SCSI Disk). Each disk drive will be assigned a SCSI address (or SCSI ID), which is a number from 0 to 7 (0 to 15 under Wide or Ultra SCSI). The SCSI address uniquely identifies the drive on the SCSI bus or channel.

SCSI Drive States

Refers to a SCSI drive's current operational status. At any given time, a SCSI drive can be in one of five states: READY, ONLINE, STANDBY, DEAD, or REBUILD.

The controller stores the state of the attached SCSI drives in its non-volatile memory. This information is retained even after power-off. Hence, if a SCSI disk is labeled DEAD in one session, it will stay in the DEAD state until a change is made either by using a system level utility or after a rebuild. Each of the states is described below:

Ready: A SCSI disk drive is in a "ready" state if it...

Is powered on; and

Is available to be configured during the current session but remains unconfigured.

Online: A SCSI disk drive is in an "online" state if it...

Is powered on; and

Has been defined as a member of a drive group; and

Is operating properly.

Standby: A SCSI disk drive is in a "standby" state if it...

Is powered on; and

Is able to operate properly; and

Was NOT defined as part of any drive group.

Dead: A SCSI disk drive is in a "dead" state if it...

Is not present; or

If it is present but not powered on; or

If it failed to operate properly and was 'killed' by the controller.

When the controller detects a failure on a disk, it "kills" that disk by changing its state to "dead." A SCSI drive in a dead state does not participate in any I/O activity. No commands are issued to dead drives.

Rebuild: A SCSI disk drive is in a “rebuild” state...

While it is in the process of being rebuilt. During this process, data is regenerated and written to the disk drive. This state is also referred to as ‘Write-Only’ (WRO).

Session

Refers to the period of time between any two consecutive system shutdowns. System shutdown may be either a power off/on, or a hardware reset.

Standard Disk Drive

This term refers to a hard disk drive with SCSI, IDE, or other interface, that is attached to the host system through a standard disk controller.

Standby Replacement of Disks (“Hot Spare”)

The “Standby Replacement” (or “Hot Spare”) is one of the most important features the controller provides to achieve automatic, non-stop service with a high degree of fault-tolerance. The rebuild operation will be carried out by the controller automatically when a SCSI disk drive fails and both of the following conditions are true:

- A “standby” SCSI disk drive of identical size is found attached to the same controller;
- All of the system drives that are dependent on the failed disk are redundant system drives, e.g., RAID 1, RAID 3, RAID 5, RAID 0+1.

> ☞ **Note**
>
> The automatic rebuild will only happen on the SAME DAC960 controller, never across DAC960 controllers.

A “Hot Spare” disk can be created in one of two ways:

1. When configuring in GAM2 Client, all disks attached to the controller that are NOT configured into any disk array will be automatically labeled as hot spare drives.

2. A disk drive may also be added (attached at a later time) to a running system and labeled as a hot spare by using the “DAC960 Software Kit” (see appropriate chapters for DAC960 utilities for a particular operating system).

During the automatic rebuild process, system activity continues as normal. System performance may degrade slightly during the rebuild process.

To use the automatic rebuild feature, you should always maintain a hot spare SCSI drive in your system. When a drive fails, the hot spare will automatically replace the failed drive and the data will be rebuilt. The system administrator can disconnect and remove the bad drive and replace it with a new drive. The administrator can then make this new drive a hot spare.

The standby replacement table has a limit of 8 automatic replacements in any session (from power-on/reset to the next power-off/reset). When the limit of 8 is reached and a disk failure occurs, the standby replacement will occur but will not be recorded in the replacement table.

Stripe Order

The order in which SCSI disk drives appear within a drive group. This order must be maintained, and is critical to the controller’s ability to ‘Rebuild’ failed drives.

Stripe Size

The stripe size is defined as the size, in kilobytes (1024 bytes) of a single I/O operation. A stripe of data (data residing in actual physical disk sectors, which are logically ordered first to last) is divided over all disks in the drive group.

Stripe Width

The number of striped SCSI drives within a drive group.

Striping

Refers to the storing of a sequential block of incoming data across multiple SCSI drives in a group. For example, if there are 3 SCSI drives in a group, the data will be separated into blocks and block 1 of the data will be stored on SCSI drive 1, block 2 on SCSI drive 2, block 3 on SCSI drive 3, block 4 on SCSI drive 1, block 5 on SCSI drive 2 and so on. This storage method increases the disk system throughput by ensuring a balanced load among all drives.

System Drives

See “Logical Drives”.

Target ID

A target ID is the SCSI ID of a device attached to a DAC960 Series controller. Under firmware versions below 2.6, each SCSI channel can have up to 7 attached SCSI devices (target ID from 0 to 6). Under firmware versions at or above 2.6, each SCSI channel can have up to 15 attached SCSI devices (target ID from 0 to 6, and 8 to 15).

Write Back Cache

Refers to a caching strategy whereby write operations result in a completion signal being sent to the host operating system as soon as the cache (not the disk drive) receives the data to be written. The target SCSI drive will receive the data at a more appropriate time, in order to increase controller performance. An optional cache battery backup or an Uninterruptable Power Supply (UPS) can be used to protect against data loss as a result of a power failure or system crash.

Write Through Cache

Refers to a caching strategy whereby data is written to the SCSI drive before a completion status is returned to the host operating system. This caching strategy is considered more secure, since a power failure will be less likely to cause loss of data. However, a write through cache results in a slightly lower performance.

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