TPM 1.0 Installation Instructions and User's Guide for TP9100

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About This Guide

This guide provides information on preparing, installing, configuring, and using the Total Performance Manager (TPM) application for the TP9100 external RAID subsystem.

Audience

This guide is intended for system administrators. Use this guide to:

- Gain a basic understanding of the TPM software.
- Learn how to install, configure, and run the TPM software in Linux, IRIX, and Windows environments.
- Learn about hardware and software requirements.
- Learn how to use the GUI to operate the TPM software.

Structure of this Guide

This guide contains the following chapters:

- Chapter 1, “Introduction” — Introduces the TPM software and provides information about features and packaging.
- Chapter 2, “Installing, Configuring, and Running TPM on IRIX, Linux, and Windows” — Describes the host prerequisites and how to install and configure the TPM software.
- Chapter 3, “Using TPM” — Describes how to use the various GUI menus to configure and control the RAID subsystem.
- Appendix A, “TPMWatch Event Monitor and Logger” — Describes how to configure and operate TPMWatch, a support program designed to poll RAID subsystems and report their health to an output file.
- Appendix B, “Error Codes” — Describes the error codes associated with the TPM software.

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Introduction

Product Overview

The Total Performance Manager (TPM) application is an HTML-based GUI RAID client-server application manager. It provides a user-friendly graphical user interface (GUI) for configuring and monitoring external RAID disk subsystems that use several families of RAID controller engines. TPM consists of two programs that run natively on an IRIX, Windows, or Linux system that is physically attached to a RAID storage subsystem. All communication is through the Fibre Channel (FC) controller, so that no RS-232 interface is required. The application incorporates an embedded Web server to provide the user interface to a user-supplied Web browser.

Note: TPM supports only external RAID controllers. It does not support internal RAID controllers, such as the Mylex AcceleRAID cards used in some SGI computing platforms.

Once the TPM service routine is running on a host server, it may be interfaced to any modern Web browser that supports HTML level 3 or higher. This includes Microsoft's Internet Explorer 4.x and above, and Netscape Navigator 3.x and above. The browser client does not have to be located on the computer running the TPM service routine. The browser also does not have to be running locally. If TPM is running on a computer with Internet access, the browser can communicate with TPM through a dial-up connection (provided there is no firewall blockage).

To communicate with the TPM service, enter the URL on which the TPM is listening. By default, TPM starts on port 2002. Therefore, if your host server is configured for IP address 192.168.1.99, set your web browser to the following URL:

```
http://192.168.1.99:2002
```

Features

TPM is designed to support the TP9100 external RAID subsystem. The TPM application provides the following functions:

- Configuration: Adds, deletes, and modifies LUNs, topologies, and device status.
- Administration: Configures controllers, administers LUNs, and takes controllers online and offline.
- Reporting: Presents statistical data and subsystem status.
- Maintenance Procedures, such as RAID controller and drive firmware downloads.

Software Packaging

The software is packaged differently for IRIX/Linux than for Windows. The following sections describe both.

IRIX/Linux Software Packaging

For IRIX and Linux, the TPM software is distributed on a CD-ROM that contains the files shown in Table 1-1. The files must be located in the `$DAM_HOME` directory tree. By convention, `$DAM_HOME` is set to `/opt/dam`, and this manual uses `$DAM_HOME` and `/opt/dam` interchangeably.

Table 1-1 Files in the Distribution (IRIX and Linux)

Files	Description
`cgi-bin/oemparts.txt`	Cross-reference file for spoofing make and model of subsystem.
`cgi-bin/oemtail.html`	HTML segment that appears at the bottom of most Web pages.
`tpm`	TPM service routine.
`dameventlog`	Log file (automatically created if not found).

Table 1-1 (continued) Files in the Distribution (IRIX and Linux)

Files	Description
`damioscan`	Script or executable that discovers SCSI/Fibre Channel devices and LUNs.
`tpmwatch`	Executable file that monitors subystem health.
`images/`	Directory of image files displayed on various Web pages.
`images/oemlogo.gif`	The logo that is displayed on main screen.
`images/wallpaper.gif`	The background image displayed on most Web pages.
`database/`	Directory of files that store inquiry, log, and sense codes.
`passwd.txt`	The username and password file that is validated during logon.
`/tmp`	The directory where TPM places several small temporary files during program execution.

Windows Software Packaging

By convention, $DAM_HOME is set to the current working directory (for example, "C:\Program Files\SGI\SGI TP1900 Array Manager"). The distribution files must be located in the current working directory.

Table 1-2 Files in the Distribution (Windows)

Files	Description
`aspi32.exe`	This upgrades a machine that currently has ADAPTEC ASPI level 4.57 to 4.60
`aspichk.exe`	This displays the current level of ADAPTEC ASPI drivers installed on the machine.
`aspiinst.exe`	This installs ADAPTEC ASPI level 4.57 onto the machine.
`cgi-bin\oemparts.txt`	Cross-reference file for spoofing make and model of subsystem.

Table 1-2 (continued) Files in the Distribution (Windows)

Files	Description
`cgi-bin\oemtail.html`	HTML segment that appears at the bottom of most Web pages.
`cygwin1.dll`	A pseudo UNIX environment for Windows. This DLL provides a translation layer between the UNIX environment and the Windows environment.
`database\`	Directory files that store inquiry, log, and sense codes.
`dmail.exe`	This executable provides the mailing function and is called from within the tpmwatch executable.
`images\oemlogo.gif`	The logo that is displayed on the main screen.
`images\wallpaper.gif`	The background image displayed on most Web pages.
`passwd.txt`	The username and password file that is validated during logon.
`See32.dll`	This is a support dll for the email program.
`sh.exe`	This executable is part of the CYGWIN environment and allows usage of shell commands using the 'C' system command
`tpm.exe`	TPM service routine.
`tpmwatch.exe`	Executable file that monitors subsystem health.

Installing, Configuring, and Running TPM on IRIX, Linux, and Windows

This chapter explains how to install and configure the TPM application on all operating systems. You may install TPM with other active users on the system if you wish. The entire process takes little time and no reboot is required.

Host Prerequisites

The host server where the TPM application is installed must have the following prerequisites:

- TCP/IP access. This access must exist between the host system and the machine with the Web browser. This can be over any medium, including Ethernet, token ring, ATM, or dial-up SLIP/PPP.
- A specific IP port or socket number.The software must communicate with a specific IP port or socket number. If there is a firewall or router, ensure the administrator does not restrict traffic over that socket (normally, the socket used is 2002).
- A compatible Web browser. HTML-compatible Web browsers with JavaScript support, such as Microsoft's Internet Explorer (IE) version 4.0 or 5.0, and Netscape's 4.x browsers have been tested. The browser can execute on any machine. The operating system of the client machine is not important.
- Your fibre channel host adapter and drivers must be properly configured.
- Operating System. TPM supports the following operating system versions:
  - IRIX 6.5.7 or later
  - Windows NT 4.0 with Service Pack 5 or later

Note: ASPI driver version 4.57 or later must be installed in order to use TPM software.

- Windows 2000 Advanced Server with Service Pack 1 or later.

Note: ASPI driver version 4.60 or later must be installed in order to use TPM software

- Linux RedHat 6.2 with ProPack 1.3 or later

Installing the Software

This section describes how to install and uninstall the TPM software on the IRIX, Linux, and Windows platforms.

Note: Prior to removing or upgrading the software, Tpm and TPMWatch must first be terminated.

Installing TPM on IRIX Platforms

1. Log in as root.
2. Insert the TPM CD-ROM into the CD-ROM drive.

Note: If the CD-ROM does not mount, refer to the appropriate IRIX Operating System Manual for instructions.

3. Type the following command to launch the IRIX software installation tool (inst) to install the software image:

   ```
   inst -f /CDROM/irix/dist/sgi_tpm
   ```

4. To specify the package, type:

   ```
   list
   ```

5. To install the software, type:

   ```
   install
   ```

6. At the Install subsystem prompt, type:

   ```
   sgi_tpm
   ```

7. To complete the installation, type:

   ```
   go
   ```

8. Type the following command to exit the install program:

   ```
   quit
   ```

   The exit operation is automatically performed.

9. Type the following command to unmount the CD:

   ```
   umount /CDROM
   ```

10. Remove the CD from the CD-ROM drive.

Uninstalling TPM on IRIX Platforms

1. Log in as root.
2. Type the following command to launch the IRIX `versions -remove`, to remove TPM software:

   ```
   versions remove sgi_tpm
   ```

Installing TPM on Linux (RedHat 6.2 with SGI ProPack 1.4[1]) Platforms

1. Log in as root.
2. Insert the TPM CD-ROM into the CD-ROM drive.
3. Type the following command to mount the CD:

   ```
   mount /dev/cdrom /mnt/cdrom
   ```

4. Type the following command to launch Red Hat Package Manager (rpm), which installs the TPM software:

   ```
   rpm -iv /mnt/cdrom/linux/rpm/sgi_tpm.rpm
   ```

5. To unmount the CD, type the following command:

   ```
   umount /mnt/cdrom
   ```

---

[1] At the time of this writing, SGI ProPack 1.4 needs a patch to operate properly. SGI ProPack 1.3 works properly with drive firmware 6.14; however, drive downloads to update firmware do not work.

6. Remove the CD from the CD-ROM drive.
7. Make sure of the following:
   a. All SCSI adapters are loaded.
   b. The qlogicfc module is removed.
   c. The qlogic2100 module is loaded.
   d. The SCSI generic module is loaded.

Uninstalling TPM on Linux (RedHat 6.2 w/ProPack 1.4[2]) Platforms

1. Log in as root.
2. Type the following Red Hat Package Manager (rpm) command to uninstall the TPM software:

```
rpm -ev sgi_tpm
```

[2] At the time of this writing, SGI ProPack 1.4 needs a patch to operate properly. SGI ProPack 1.3 works properly with drive firmware 6.14; however, drive downloads to update firmware do not work.

Installing TPM on Windows NT 4.0 and Windows 2000 Advance Server Platforms

1. Log in as administrator.
2. Insert the TPM software CD-ROM into the CD-ROM drive and go to step 3 for Windows 2000 installations or step 5 for Windows NT installations.
3. For Windows 2000 installations, you must manually install the ASPI 4.57 drivers. Type the following:

   ```
   X:\WINDOWS\ASPIINST.EXE
   ```

   where X: corresponds to the drive letter of your CD-ROM drive. Alternately, navigate to the \WINDOWS folder on the CD-ROM and double click `ASPIINST.EXE`.

   The dialog box shown in Figure 2-3 on page 10 appears.
4. Proceed to step 7.

Note: For Windows 2000 users, ASPI drivers must be manually installed prior to the installation of SGI TP9100 Array Manager software. The SGI TP9100 Array Manager software installation will not complete until ASPI drivers are installed. If you start this installation and the ASPI drivers are not installed, the severe warning dialog box shown in Figure 2-1 appears. If this happens, click OK in the dialog box and go back to step 3.

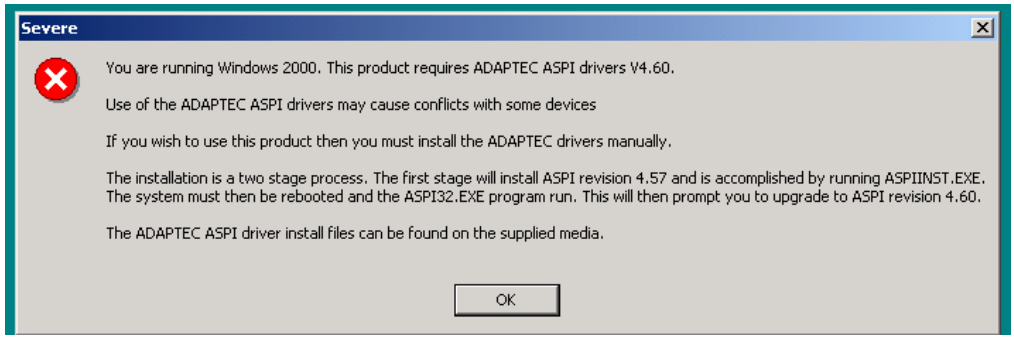


Figure 2-1 Windows 2000 Installation Severe Warning Dialog Box

5. For Windows NT installations, select Start –>Run and type the following in the Run dialog box:

```
X:\WINDOWS\SETUP.EXE
```

where X: corresponds to the drive letter of your CD-ROM drive, OR if you prefer, navigate to the \WINDOWS folder on the CD-ROM and double click SETUP.EXE.

If your platform does not have ASPI drivers, the dialog box shown in Figure 2-2 appears. Otherwise, the dialog box shown in Figure 2-9 on page 14 appears, where you may continue with the installation procedure.

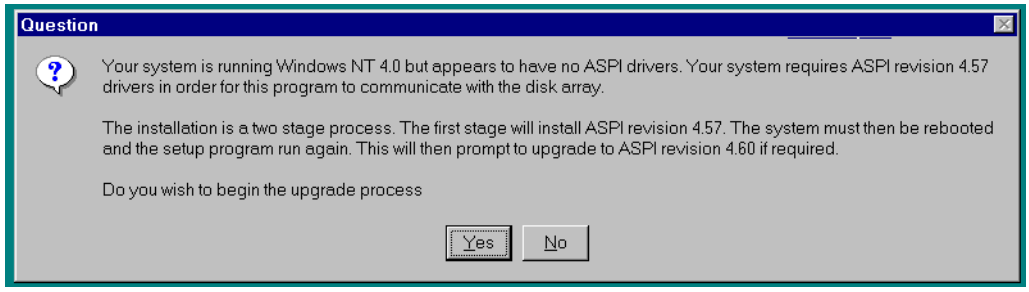


Figure 2-2 ASPI 4.57 Drivers Upgrade Dialog Box

6. Click **Yes** to proceed with the upgrade.

   The dialog box shown in Figure 2-3 appears.

Figure 2-3 Upgrade Confirmation Dialog Box

7. Click **Yes**.

   The ASPI 4.57 upgrade Wizard dialog box appears, as shown in Figure 2-4.

Figure 2-4 ASPI 4.57 Upgrade Wizard

8. Click **Upgrade**.

   The 4.57 upgrade installs, as shown in Figure 2-5.

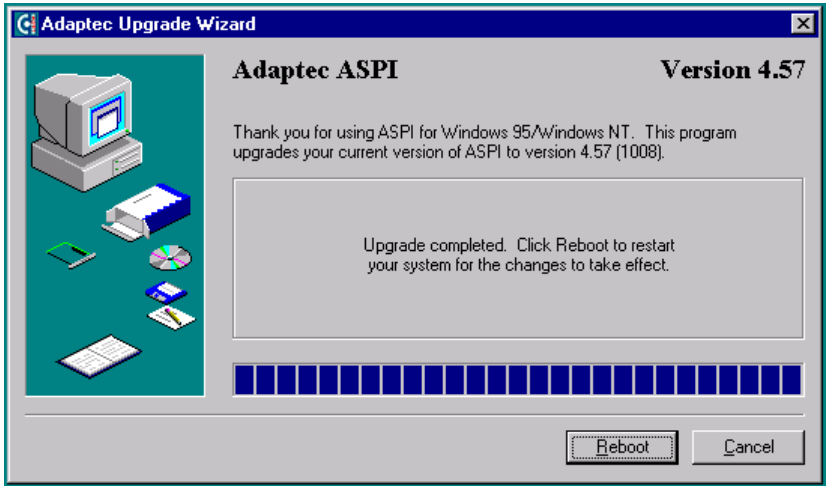


Figure 2-5 ASPI 4.57 Upgrade Wizard Progress

9. Click **Reboot**.
10. Allow the system to reboot, then start the TPM installation process again, as outlined in the following steps.
11. Log in as administrator.
12. Insert the TPM software CD-ROM into the CD-ROM drive and go to step 13 for Windows 2000 installations or step 14 for Windows NT installations.
13. If you are installing the software on a Windows 2000 machine, you must manually install the ASPI 4.60 drivers. Type the following command:

    `X:\WINDOWS\ASPI32.EXE`

    where X: corresponds to the drive letter of your CD-ROM drive. Alternately, navigate to the \WINDOWS folder on the CD-ROM and double click `ASPI32.EXE`.

    The dialog box shown in Figure 2-7 appears. Proceed to step 19.
14. If you are installing the software on a Windows NT machine, select Start –>Run and type the following in the Run dialog box:

    `X:\WINDOWS\SETUP.EXE`

    where X: corresponds to the drive letter of your CD-ROM drive, OR if you prefer, navigate to the \WINDOWS folder on the CD-ROM and double click SETUP.EXE.
15. If you are installing the software on a Windows NT machine, the dialog box shown in Figure 2-6 appears.

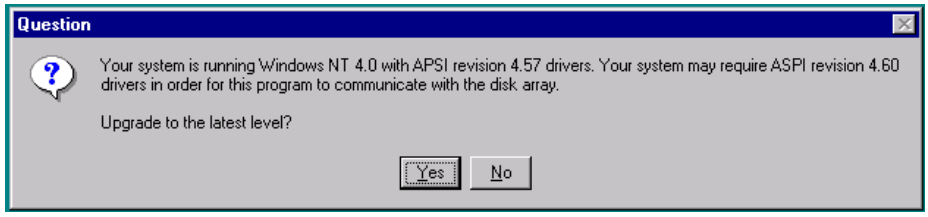


Figure 2-6 Windows NT ASPI 4.60 Drivers Upgrade Dialog Box

16. If you wish to upgrade to ASPI 4.60, you may do so by clicking **Yes**, but it is not required for Windows NT. If you choose to upgrade, a reboot will be required.

    If you clicked **Yes**, the dialog box shown in Figure 2-7 appears.
17. Proceed to step 19.

If you clicked **No**, the TPM InstallShield Wizard appears, as shown in Figure 2-9 on page 14

18. proceed to step 26.

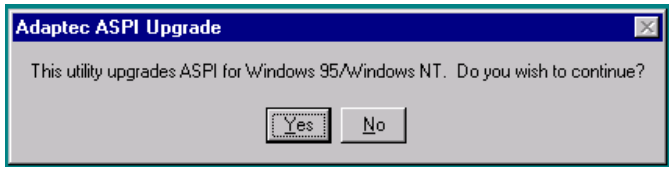


Figure 2-7 Upgrade Confirmation Dialog Box

19. Click **Yes**.

    The Upgrade Wizard dialog box appears for ASPI 4.60 (a dialog box similar to that of Figure 2-4 on page 11).

20. Click **Upgrade**.

    The 4.60 upgrade installs, as shown in Figure 2-8.

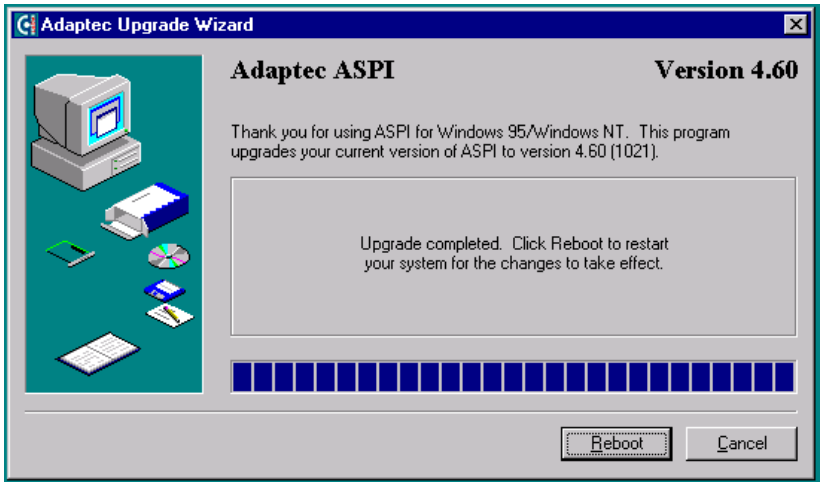


Figure 2-8 ASPI 4.60 Upgrade Wizard Progress

21. Click **Reboot**.

22. Allow the system to reboot, then start the TPM installation process again, as outlined in the following steps.
23. Log in as administrator.
24. Insert the TPM software CD-ROM into the CD-ROM drive.
25. Select Start –>Run and type the following in the Run dialog box:

    `X:\WINDOWS\SETUP.EXE`

    where X: corresponds to the drive letter of your CD-ROM drive, OR if you prefer, navigate to the \WINDOWS folder on the CD-ROM and double click SETUP.EXE.

    The TPM InstallShield Wizard dialog box appears, as shown in Figure 2-9.

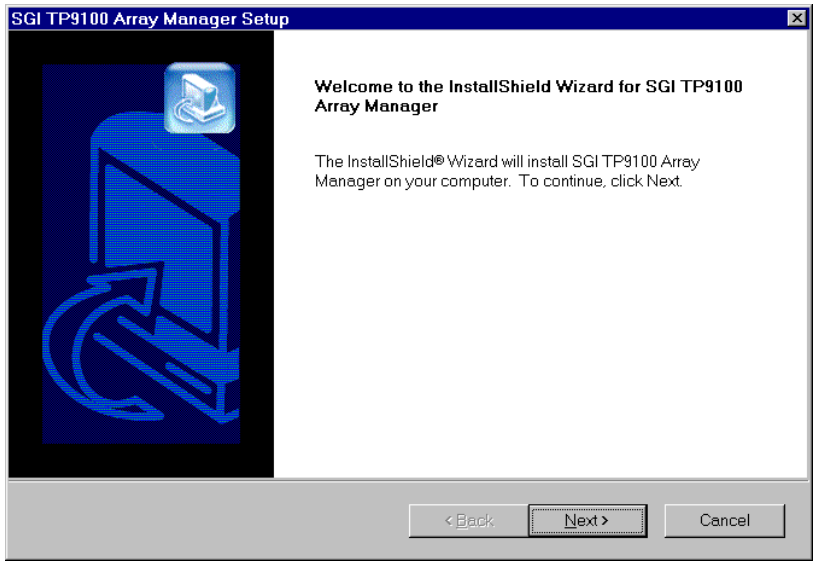


Figure 2-9 TPM InstallShield Wizard

26. Click **Next**.

    The License Agreement dialog box appears, as shown in Figure 2-10.

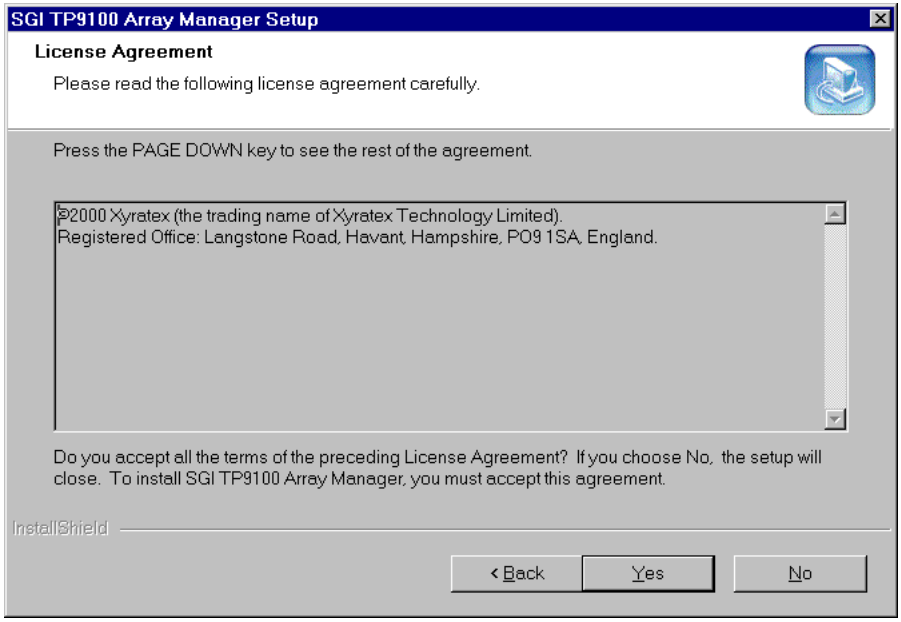


Figure 2-10 License Agreement Dialog Box

27. Click **Yes**.

    The Choose Destination Location dialog box appears, as shown in Figure 2-11.

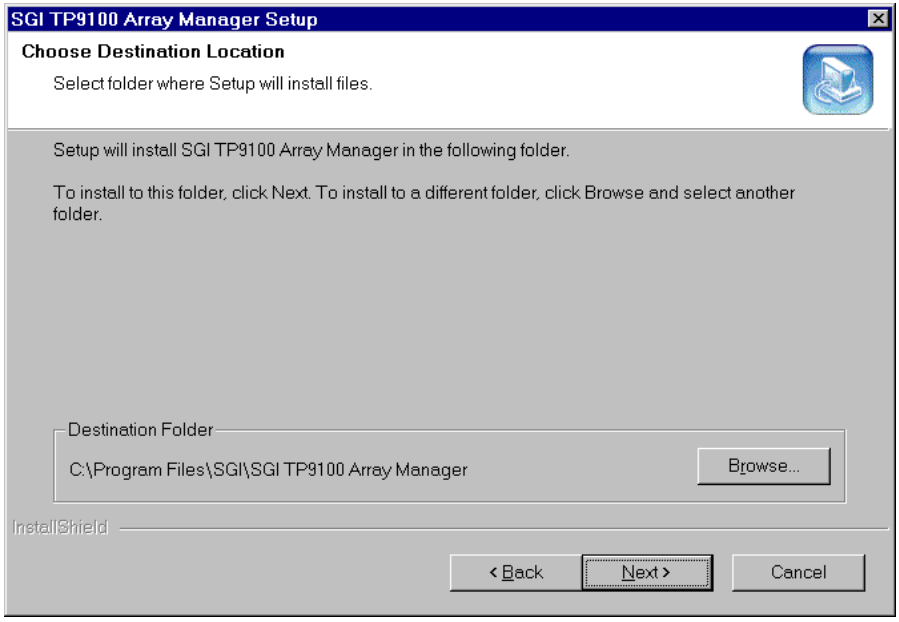


Figure 2-11 Choose Destination Dialog Box

28. You can accept the file installation default destination folder (C:\Program Files\SGI\SGI TP9100 Array Manager) or click **Browse...** to select a file installation different destination folder.
29. When you have selected a destination folder, click **Next**.

    The Select Program Folder dialog box appears, as shown in Figure 2-12.

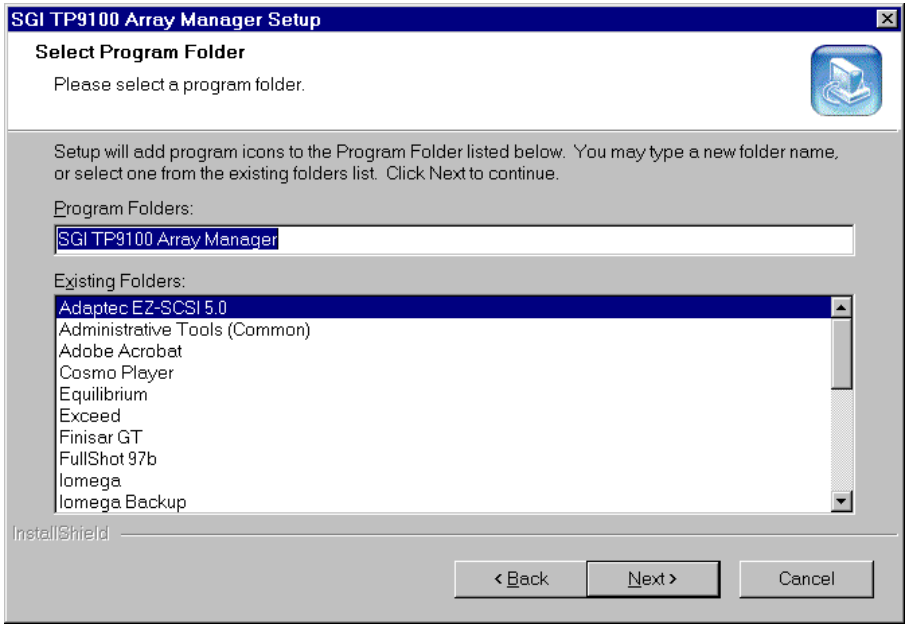


Figure 2-12 Select Program Folder Dialog Box

30. Select the program folder for storing program icons and click **Next**.

    The Installation Complete dialog box appears, as shown in Figure 2-13.

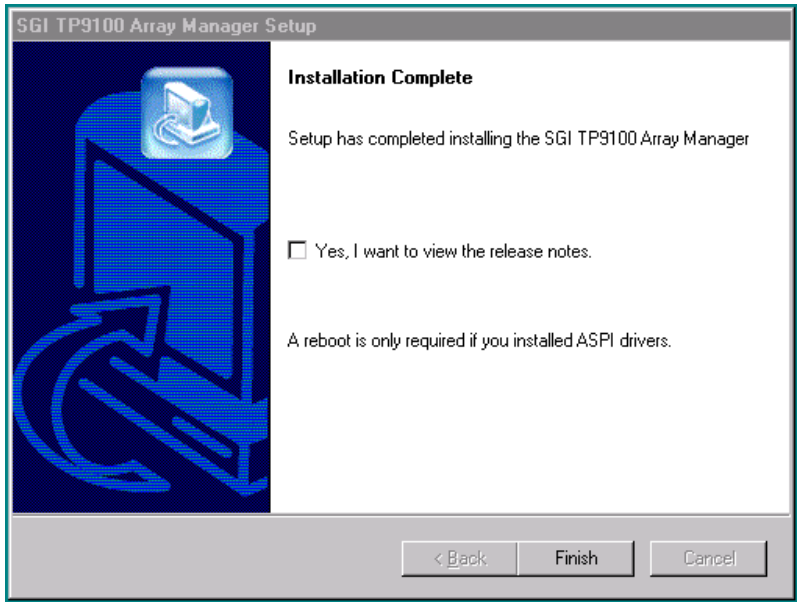


Figure 2-13 License Agreement Dialog Box

31. Click **Finish** to complete the installation.

Uninstalling TPM on Windows NT 4.0 Platforms

To perform the uninstall, follow the procedure listed here.

1. Go to Start –> Settings –> Control Panel and double-click **Add/Remove Programs**.
2. In the list that appears, select the SGI TP9100 Array Manager software entry and click **Add/Remove**.
3. Click **Yes** in the Confirm File Deletion dialog box.

   A dialog box appears that indicates that the SGI TP9100 Array Manager software has been successfully uninstalled from your machine.
4. Click **OK.**

   The TPM software is removed.
5. Click **OK** on the Add/Remove Programs Properties dialog box to close it.
6. Go to Start –> Settings –> Command Prompt.

   A DOS window appears.
7. Use the DOS **del** command as shown to delete the ASPI driver files:

   ```
   del [drive:]\WINNT\System32\WNASPI32.dll
   del [drive:]\WINNT\System32\DRIVERS\ASPI32.sys
   del [drive:]\WINNT\System\WOWPOST.exe
   del [drive:]\WINNT\System\WINASPI.dll
   ```

   where `[drive:]` is the letter of the boot drive where the files are located.

Note: If you are uncomfortable with DOS line commands, go to Start –> Find –> Files (or Folders) and search for the above ASPI driver files and delete them using the Find Files window.

Uninstalling TPM on Windows 2000 Advanced Server Platforms

To perform the uninstall, follow the procedure listed here.

1. Go to Start –> Settings –> Control Panel and double-click **Add/Remove Programs**.
2. In the list that appears, select the SGI TP9100 Array Manager software entry and click **Change/Remove**.
3. Click **Yes in the Confirm File Deletion** dialog box**.**

   A dialog box appears that indicates that the SGI TP9100 Array Manager software has been successfully uninstalled from your machine.
4. Click **OK.**

   The TPM software is removed.
5. Click **Close** on the Add/Remove Programs Properties dialog box to close it.
6. Close the Control Panel window.
7. Go to Start –> Settings –> Command Prompt.

   A DOS window appears.
8. Use the DOS **del** command as shown to delete the following ASPI driver files:

   ```
   del [drive:]\WINNT\System32\WNASPI32.dll
   del [drive:]\WINNT\System32\DRIVERS\ASPI32.sys
   del [drive:]\WINNT\System\WOWPOST.exe
   del [drive:]\WINNT\System\WINASPI.dll
   ```

   where `[drive:]` is the letter of the boot drive where the files are located.

Note: If you are uncomfortable with DOS line commands, go to Start –> Find –> Files (or Folders) and search for the above ASPI driver files and delete them using the Find Files window.

Configuring Usernames and Passwords

TPM's security mechanism is simple. Just edit the `passwd.txt` file, and make changes as necessary (only the system administrator should have access rights to this file). Each line serves as new username and password combination. The username and password are separated with a single colon (username:password). The colon character is not allowed in either the username or password, everything is case-sensitive, and the username, password, or both fields can be blank.

Invoking TPM

Setting the Environment Variable for IRIX and Linux:

To set the environment variable, follow these steps:

1. Log on as root (or have root access).
2. For csh, or tcsh SHELL, type:

   ```
   setenv DAM_HOME /opt/dam
   ```

3. For sh, bash, or ksh SHELL, type:

   ```
   DAM_HOME=/opt/dam
   export DAM_HOME
   ```

Starting SGI TP9100 Array Manager for IRIX and Linux

Note: Only users with root permissions are allowed to run TPM.

To start TPM, enter the following command:

```
/opt/dam/tpm [-D][-W port_number]
```

where `port_number` is the IP socket/port number required to access the program. This not only hides `TPM` from standard Web surfers, but also prevents it from interfering with a system that happens to function as a Web server. Because normal Web traffic uses

TCP/IP port number 80, the TPM server is invisible to client browsers unless the browsers are instructed to use a specific port.

By default, TPM interacts with port number 2002. If that port is busy, the program just initializes the service at the next available port number. It is also recommend that you run the service routine in the background to avoid tying up a terminal session. To do this, enter the following command:

```
# /opt/dam/tpm &
```

The flag `-D` can be added to display debug information on the terminal. Only do this if so instructed.

Note: When enabled, debug mode may cause the application to run more slowly.

Starting SGI TP9100 Array Manager for Windows

To start TPM, use one of the following methods:

- Start –> Programs –> SGI TP9100 Array Manager, or
- Double-click the SGI TP9100 Array Manager icon on the desktop.

To turn on debug mode, right-click the SGI TP9100 Array Manager icon on the desktop and click Properties.

On the resulting dialog box, add -D to the end of the entry in the Target text box (after the right-hand quote mark).

Note: When enabled, debug mode may cause the application to run more slowly.

Setting Up the Browser

Now that TPM has been invoked, you must set up a browser to run the TPM GUI.

Assume, for example, that the TCP/IP number of your host is 192.200.200.7, and it's name is `server1.sgi.com`. To interact with the TPM software, set the address (URL) of your browser to one of the following:

- `http://server1.sgi.com:2002`, or
- `http://192.200.200.7:2002`

If you have another server running the TPM application, and the IP name/number combination is 192.200.200.10, `server2.sgi.com`, and you started the program with `tpm -W 1234`, then you may access the software from either another PC, or an additional browser window, with:

- `http://server2.sgi.com:1234`, or
- `http://192.200.200.10:1234`

Logon Screen

After you invoke TPM, the logon screen appears in the browser window, as shown in Figure 2-14.

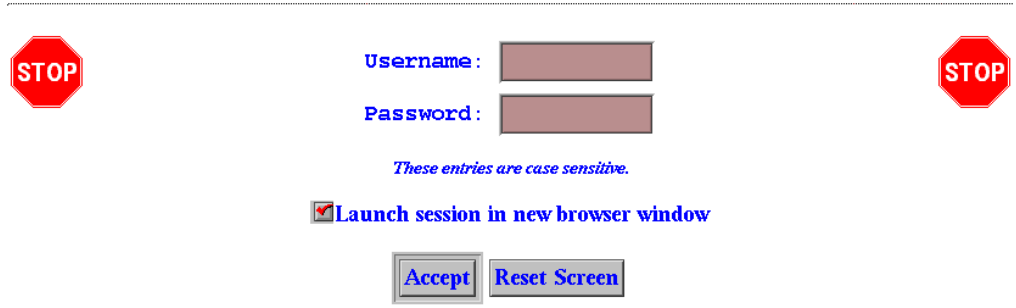


Figure 2-14 Logon Screen

Follow these steps to log on:

1. Enter your username.
2. Enter your password.
3. Click **Accept**.

   The username and password entered are validated against the file `$DAM_HOME/passwd.txt`. If the username and passwords match the file contents, the main window screen appears (see Figure 3-1 on page 28). Otherwise, the logon dialog box is redisplayed. TPM does not support multiple concurrent users. If another user (or specifically, another browser session, from any IP number) invokes TPM by setting their browser to the appropriate URL), TPM logs off the original user.

Note: You should consider the port number as a password. Unless a user knows the port number, they cannot access TPM, and will not be given the chance to attempt a log in.

If you do not have networking installed, you can still access the GUI by using Netscape or Internet Explorer. Just set the browser to `http://localhost:2002`, or the appropriate port number.

Additional Considerations

Below is a list of additional considerations.

- Firewall administrators may block traffic on undefined port numbers such as 2002. Please talk with your security administrator to make sure you agree on what ports are acceptable for running TPM.
- Once the TPM job ends, it typically takes a minute or so for the port to automatically free up on your operating system. That means if you start another session of TPM before the port is free, you will see a message saying your default port is busy, and it will use the next available one.
- TPM is not designed to be a multi-user program. Only one Web browser at a time should attempt to interact with it.
- If you have an enterprise with multiple hosts and subsystems, you can open multiple windows as necessary with your browser to interact with an unlimited number of subsystems concurrently.
- Each record must be a fixed length (16 + 18 + 1) bytes long. The last byte is the new line character which will be added by your text editor. Do not edit this file on a PC. Be careful when FTP'ing, as well.

Using TPM

This chapter explains how to use TPM to configure and monitor your external RAID disk subsystems.

Note: The GUI screens vary according to the firmware (6.14 or 7.01) installed on the RAID controller. Where the screens are different, both are presented and explained.

Main Menu

After you successfully log on to TPM, the main menu is presented (see Figure 3-1).

Note: In many of the menus and screens shown in this document and presented by the software, additional information in the menu or screen is shown that may not appear in the body of the document. Be sure to read all information in each menu or screen before taking action on a particular menu.

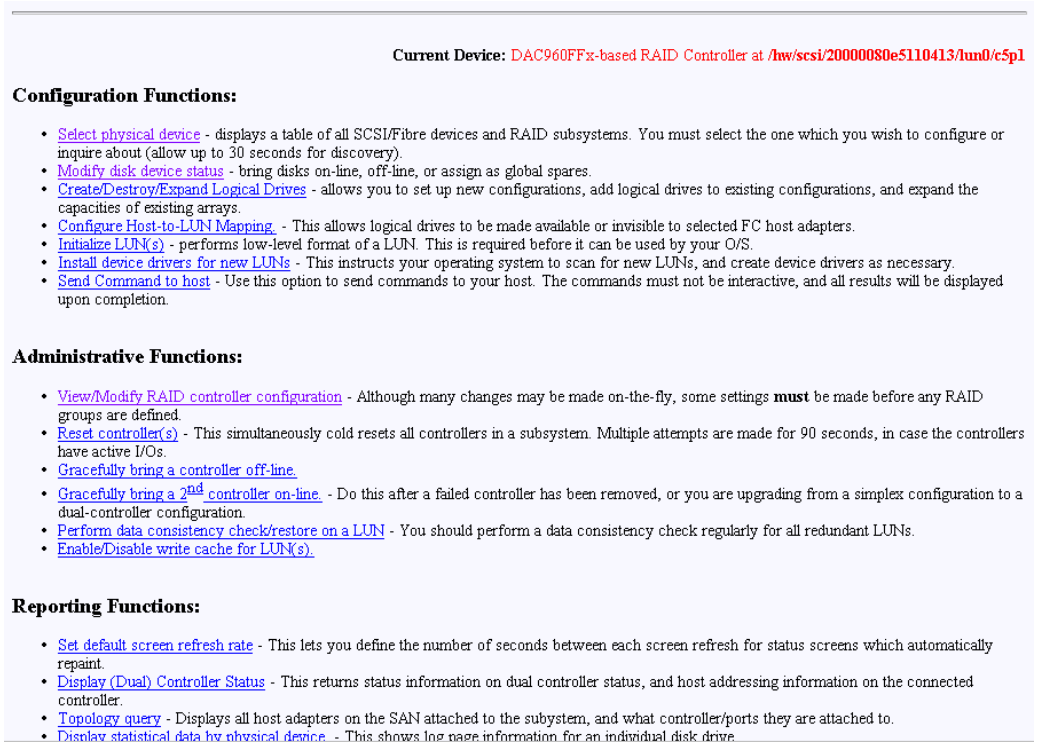


Figure 3-1 Main Menu

Figure 3-1 shows a portion of the main menu window that appears once you log on. The main menu windows are different for 6.14 and 7.01 firmware. The differences will be explained as each menu item is explained in subsequent sections of this chapter.

It is a good idea to disable the browser menu buttons when you run TPM because the BACK, RELOAD (Netscape Navigator), and REFRESH (Internet Explorer) buttons do not work with TPM. In fact, using these buttons may put the TPM application in an undesired state. Instead, use the buttons and links that TPM presents at the bottom of each screen.

The main menu window has the following principal areas, with the associated explanations on the indicated pages:

Configuration Functions

The Configuration Function menu has the following selections, with the associated explanations on the indicated pages:

Select Physical Device (Configuration Function Menu)

To view a table of all devices and RAID subsystems, click the **Select physical devices** link under **Configuration Functions** in the main menu. The dialog box shown in Figure 3-2 appears.

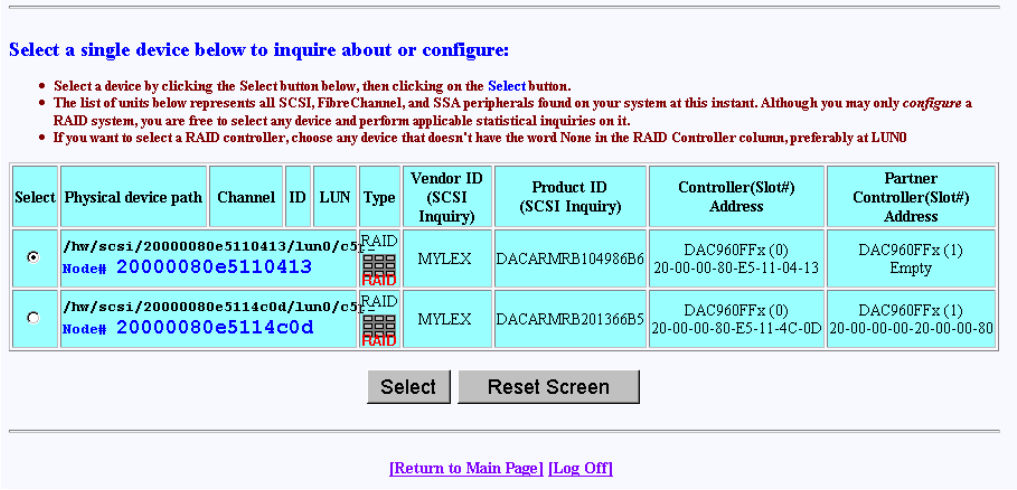


Figure 3-2 Select Physical Device Dialog Box

By activating the desired checkbox under the Select column and clicking the **Select** button, you can select which RAID subsystem you wish to configure or monitor. You make your selection by choosing the physical device path associated with any ID/LUN combination displayed.

If you are running in a dual-controller configuration (in redundant mode), make sure to select controller 0 (C0). An example of this is DAC960FFx(0).

Note: All configuration and monitor operations must be through controller 0.

Operation

It is important for the administrator to know how physical device selection works, because it can serve as a good general debugging tool in the event that your computer does not “see” a specific LUN. The algorithm is the same, regardless of the operating system. In summary, TPM executes the following steps:

1. Creates a list of all SCSI and FC device drivers.
2. Issues a standard SCSI inquiry command to report the drive Vendor ID and Product ID fields. If the inquiry fails, TPM assumes the device driver is no good, and skips to the next driver in the list.
3. Issues the vendor-specific Inquiry command to determine if the device is a logical drive within a RAID subsystem. If so, it issues additional commands to report which controller and World Wide Name (WWN) is associated with that LUN.
4. Builds the record and reports what it has discovered if either the Vendor or Product fields are non-blank.

What to Do if a Device is Missing

If a device does not display, it is probably because the device driver is either missing or incorrect. This happens quite frequently, depending on what OS you have, and what you did to create drivers in the first place. Assuming your FC host adapter is properly installed and operational, and you have exclusive access to your host server, choose from the following:

- If running IRIX, issue the `scsiha -p bus#` command (see scsiha(lm)), followed by the `ioconfig -f /hw` command (see ioconfig (lm)).
- If running Linux, try removing and installing the device driver. If you have the Qlogic device driver, the command is `/sbin/rmmod qla2100; /sbin/insmod qla2100`). If that doesn't work, you must reboot.
- If running Windows, you must reboot.

Caution: If the Qlogic device driver is in use when you attempt to remove it (for example, an outstanding command is in progress), the host server might crash (the Linux OS will hang). Therefore, you should make sure that all applications that are using the Qlogic device driver have been terminated first before you remove and reinstall the device driver.

Note: Use the qla2100 driver for SGI ProPack1.3. Use qla2x00 for SGI ProPack1.4 and later.

If all of the above remedies fail, a device might be masked because the controller is doing it intentionally. This occurs if the Affinity, LUN, or SAN mapping is used to make one or more LUNs invisible to a particular host adapter or controller. If you can, go to the main TPM menu (see Figure 3-1) and use the **Configure Host-to-LUN Mapping** selection under Configuration Functions to see if that is the problem. Otherwise, you may have to contact your SGI customer support representative to resolve the problem.

Field Definitions

The definition of each field in the **Select Physical Device** dialog box is given in Table 3-1.

Table 3-1 Select Physical Device Field Definitions

Field	Definition
Select	Selects which RAID subsystem you wish to configure or monitor.
Physical Device Path	In the case of Linux, the physical device path is the pass-through device driver name (`/dev/sgx`) for that particular device. Otherwise, it is the raw driver.
Controller, Channel, ID, LUN	These are additional fields reported by the OS that help identify the device driver.
Type	TPM reports all TP9100 RAID devices.
Vendor ID (SCSI Inquiry), Product ID (SCSI Inquiry)	**The Vendor ID and Product ID** parameters are returned by a standard SCSI Inquiry. You may wish to note some interesting information reported by LUNs. The first field typically starts with DAC. The second field describes the type and size of RAID LUN you have. For example, the selected LUN at `/hw/scsi/sc34d0l0` (first row of Figure 3-2) points to a 17,464 MB RAID-3 disk. The digits before the "**B**" indicate number of MB, and the character after the "**B**" indicates the type of RAID. RAID types of 0,1,3, and 5 indicate RAID-0, RAID-1, RAID-3, and RAID-5, respectively. A RAID type of 6 indicates RAID 0+1, and a RAID type of 7 indicates JBOD.
Controller (Slots) Address	This parameter shows the model of the controller, followed by the slot number in the subsystem in parentheses, followed by the unique MAC address for that controller, which assigned by the controller manufacturer.

Note: All of the LUNs in Figure 3-2 appear twice, once for each controller. That is because the host is attached to both controllers, and the RAID subsystem is configured to map each LUN to both controllers. If you change the mapping, or don't have a dual-controller configuration, then your results will be different.

Modify Disk Device Status (Configuration Function Menu)

To view or change the status of the drives, select **Modify Disk Device Status** under the **Configuration Function** menu. The dialog box shown in Figure 3-3 (for firmware 6.14) or Figure 3-4 (for firmware 7.01) appears.

Figure 3-3 Modify Disk Device Status Dialog Box (for 6.14 Firmware)

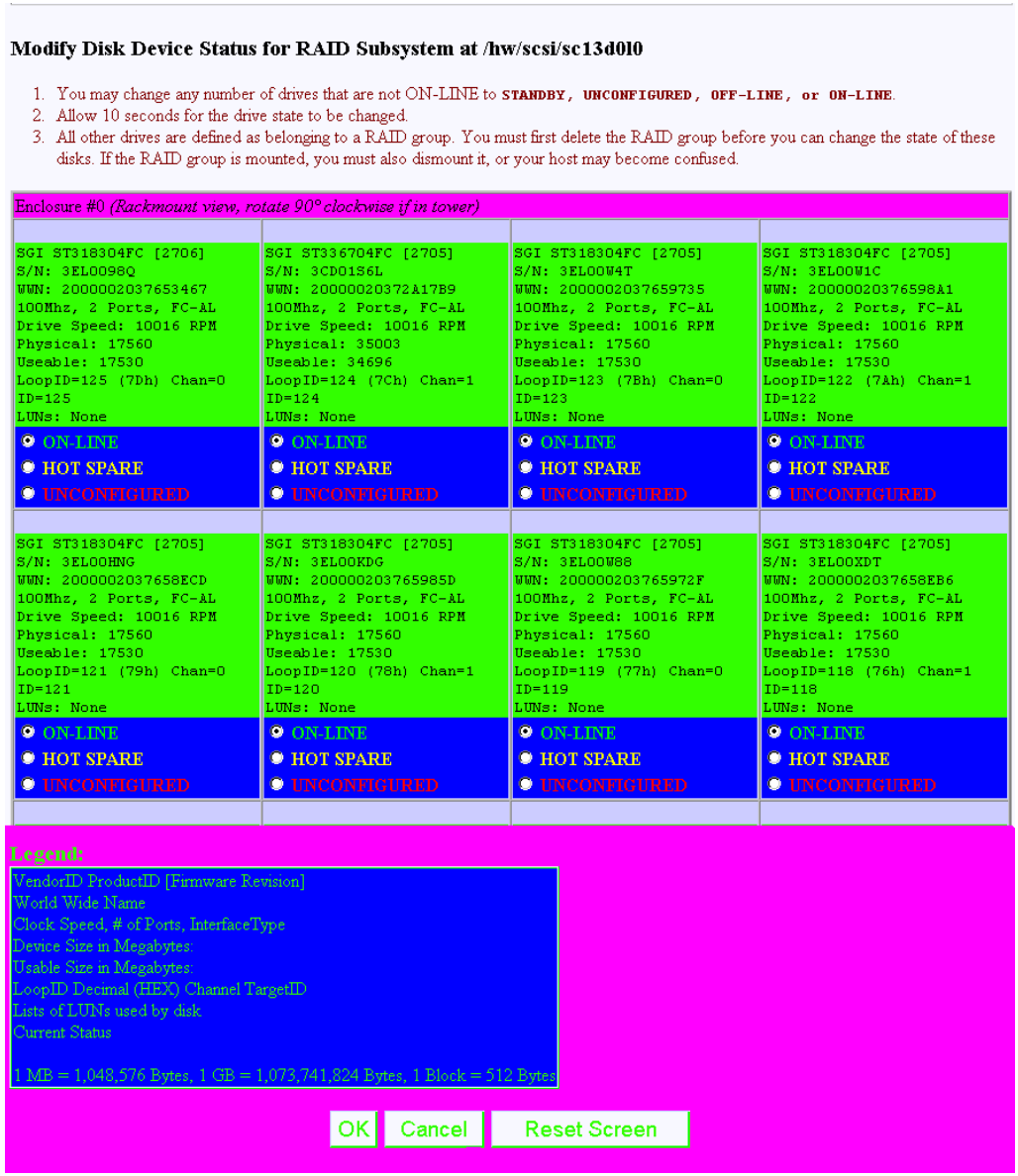


Figure 3-4 Modify Disk Device Status Dialog Box (for 7.01 Firmware)

The Status dialog box for controllers with 7.01 firmware has the following additional information not displayed for the controllers with 6.14 firmware:

- Drive Speed (in RPM)
- WWN (worldwide name)

The **Modify Disk Device Status** dialog box allows you not only quickly view status of the drives, but also to define hot spares. Each drive in Figure 3-3 or Figure 3-4 maps to the same physical row and column of the disk drive chassis. If you are also using expansion enclosures, additional drive matrices are displayed for each chassis attached to the RAID enclosure.

Operation

Click on a button (or buttons) to change the drive state, then click **OK** at the bottom of the screen to activate the changes. You would typically use the buttons as follows:

- Click **ON-LINE** to put a drive into the online state.
- Click **HOT SPARE** to turn one or more drives into hot spares.
- Click **UNCONFIGURED** to change the state of a drive from online to dead (a dead drive acts as though it is not even plugged in).

Changes are effective immediately, and no reboot is required. It is safe to perform these changes at any time (providing you are not taking a mounted LUN offline by marking its drives as **UNCONFIGURED**, of course).

When you click **OK** after having made your selections, you are returned to the main menu. If you click **Reset Screen**, all radio buttons that you have changed are set back to their previous states.

Field Definitions

The definition of each field in the Modify Disk Device Status dialog box is given in Table 3-2.

Table 3-2 Modify Disk Device Status Field Definitions

Field	Definition
Make/Model/ [Firmware]	This field returns the SCSI vendor ID, product ID, and firmware revision for each drive. For proper operation, it is strongly recommended that each drive in a LUN have the same make, model, and firmware release.
Serial Number	The drive serial number
Worldwide Name (7.01 firmware only)	A 64-bit identifier assigned to a particular drive. It is used to distinguish one drive from another. The WWN may be used for network management purposes or whenever drive identification is needed.
Clock Speed	The clock speed in MHz of the device. This is not very interesting now, but when 200 Mhz and 400 MHz fibre channel drives become supported, it will become quite important.
Number of Ports	The number of ports used by each disk. The number should normally be 2 for FC and 1 for SCSI.
Interface	The drive controller interface. FC-AL = Fibre Channel Arbitrated Loop.
Drive Speed (7.01 firmware only)	The spindle speed in RPM of the hard disk drive
Physical	The physical number of blocks and MB on the disk. 1 MB = 1024 * 1024 bytes, and one block = 512 bytes.
Usable	The usable number of blocks and MB on the disk. These numbers are always less than the physical numbers because the RAID controller allocates a portion of disk space for it's Configuration On Disk (COD).
LoopID	A unique hexadecimal number for a particular disk drive. The LoopID is basically the equivalent of a SCSI ID.
Channel/TargetID	The channel number and target ID for a drive. GAM uses this extensively to identify individual disks.
List of LUNS	A list of the logical drives that are using some or all of the space on a disk drive.
Status	The Status area is color-coded. In addition to HOT SPARE and ON-LINE, it is possible that the drive could be in another state, such as UNCONFIGURED.

Finally, TPM does not care to which state you change a drive, so use common sense. If the **Modify Disk Device Status** screen shows that a drive is used within a LUN, and you change the drive from ON-LINE to some other state, data loss could result.

Create/Destroy/Expand Logical Drives (Configuration Function Menu)

To set up new drive configurations or to add, delete, or expand drives in an existing configuration, select **Create/Destroy/Expand Logical Drives** under the **Configuration Function** menu. The dialog box shown in Figure 3-5 appears.

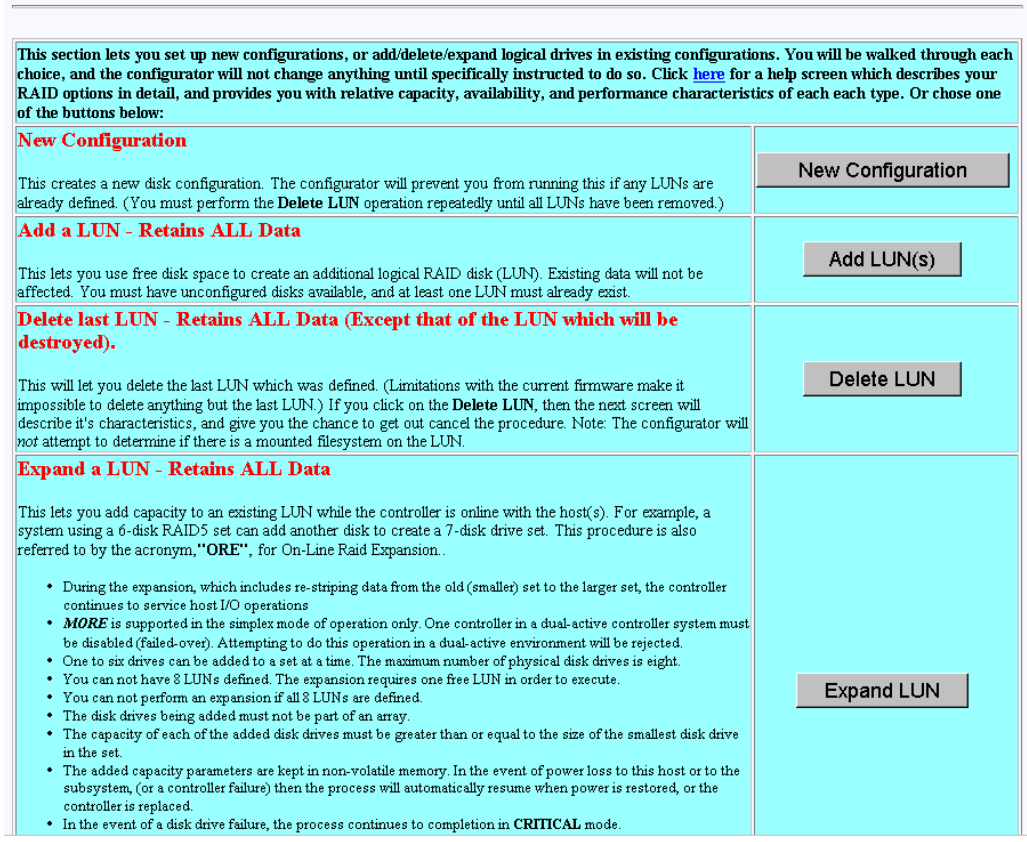


Figure 3-5 Create/Destroy/Expand Logical Drives Dialog Box

The **Create/Destroy/Expand Logical Drives** dialog box contains the following buttons:

- New Configuration: allows you to create a new disk configuration. If LUNs have already been defined, they must be deleted.

- Add LUN(s): allows you to use free disk space to create one or more additional LUN(s).
- Delete LUN: allows you to delete the last LUN that was defined.
- Expand LUN: allows you to add capacity to an existing LUN.

Note: At the top of the screen is a link marked **Click here**. Clicking this link opens a window that provides detailed information on each type of RAID, along with performance characteristics and data reliability considerations. If one has not had factory training on the controllers, this information will probably be quite useful.

The following sections explain how to use these buttons in more detail.

New Configuration

When you click **New Configuration**, the screen appears as shown in Figure 3-6.

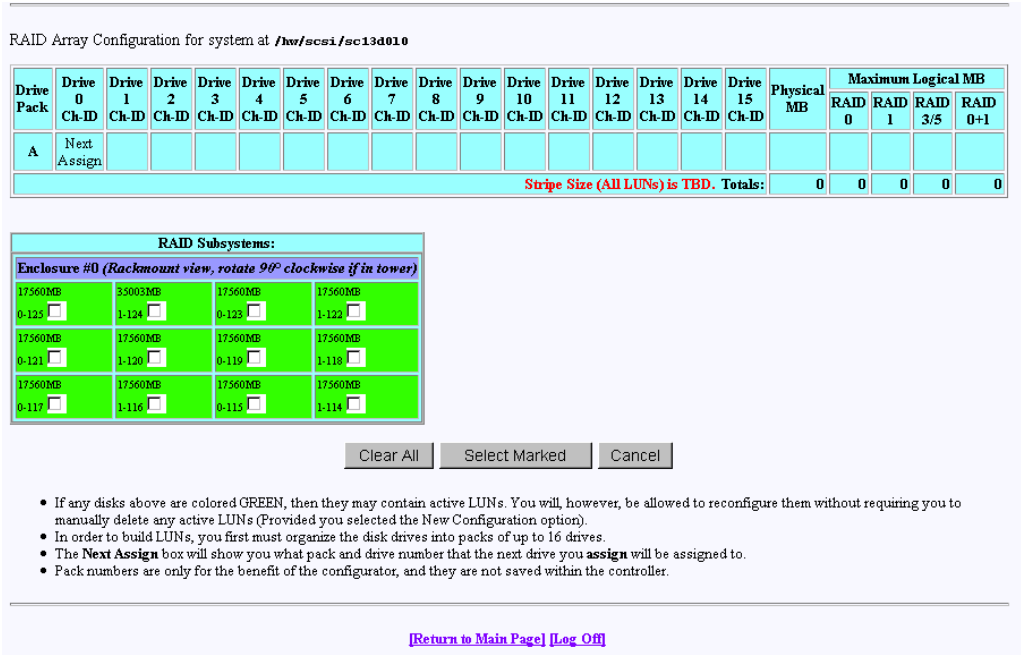


Figure 3-6 New Configuration Screen

You may create a new LUN configuration if presently there are no configured LUNs in your array. Drive packs can be combined to form large LUNs of up to 32 disk drives with 6.14 controller firmware, up to 60 disk drives with 7.01 controller firmware, or can be split into multiple LUNs, or a combination of both. TPM uses packs to group drives together for easier configuration.

Creating Drive Packs

The primary rules for creating packs are listed below. More details on how to do this are found in subsequent sections of this document.

- The maximum number of packs that can be combined into a LUN is four for controllers with 6.14 firmware.

- The maximum number of packs that can be combined into a LUN is 16 for controllers with 7.01 firmware.
- 1 to 8 disk drives can be combined into a pack for controllers with 6.14 firmware.
- 1 to 16 disk drives can be combined into a pack for controllers with 7.01 firmware.
- The number of drives in a pack determines the possible RAID levels.
- If spanning packs into a LUN, all packs must have the same number of disks.
- Any drive of any size may be used in a pack, but the amount of usable storage will be computed as the smallest disk times the number of drives in the pack.

Creating and Defining New LUNs

Follow this procedure to create and define new LUNs. More details on how to do this are found starting in Figure 3-7 on page 42 of this manual.

1. Activate the desired checkboxes in the **RAID Subsystems** area of the screen shown in Figure 3-6 and click **Select Marked** to group the desired drives into a pack.

   The packs exist only for configuration purposes, and are used to group drives together for easier configuration.

2. To continue assigning drives into packs, repeat step 1 until all desired drives are assigned into packs.
3. After at least one pack has been created, you can use the **Select Previous Pack** button to reconfigure a previously configured pack.
4. After you have finished creating the desired drive packs, use the **Define LUNs** button to create a LUN using up to four of the drive packs (for 6.14 firmware), or up to 16 of the drive packs (for 7.01 firmware) you just created. You may use up to four drive packs (32 drives maximum) with 6.14 controller firmware or up 16 drive packs maximum (60 drives maximum) with 7.01 firmware.
5. Select the drive pack(s) that you want to define as the new LUN and click **Configure New**.
6. Select the desired RAID level for the LUN you are creating and click **Apply**.
7. To continue building LUNs that incorporate drives in other packs, click **Select Pack(s)** and repeat the process of defining LUNs and their corresponding RAID levels and usable MB.
8. Update the RAID controller with the new LUN information.

The next sections explain how to execute these steps.

Group the First Set of Drives into a Pack

To group the first set of drives into a pack, follow these directions:

1. Activate the desired checkboxes in the RAID Subsystems area of the dialog box (see Figure 3-6) and click **Select Marked** to move drives from the map shown in the RAID Subsystems area of the screen into Pack A.

   The top area of the screen contains a table that shows the drives assigned to drive pack A. **Next Assign** now appears in a new row to indicate that drives can now be selected and assigned to drive pack B through a similar process.

   As you assign drives to the pack, the screen changes to the example shown in Figure 3-7 (6.14 firmware) or Figure 3-8 (7.01 firmware).

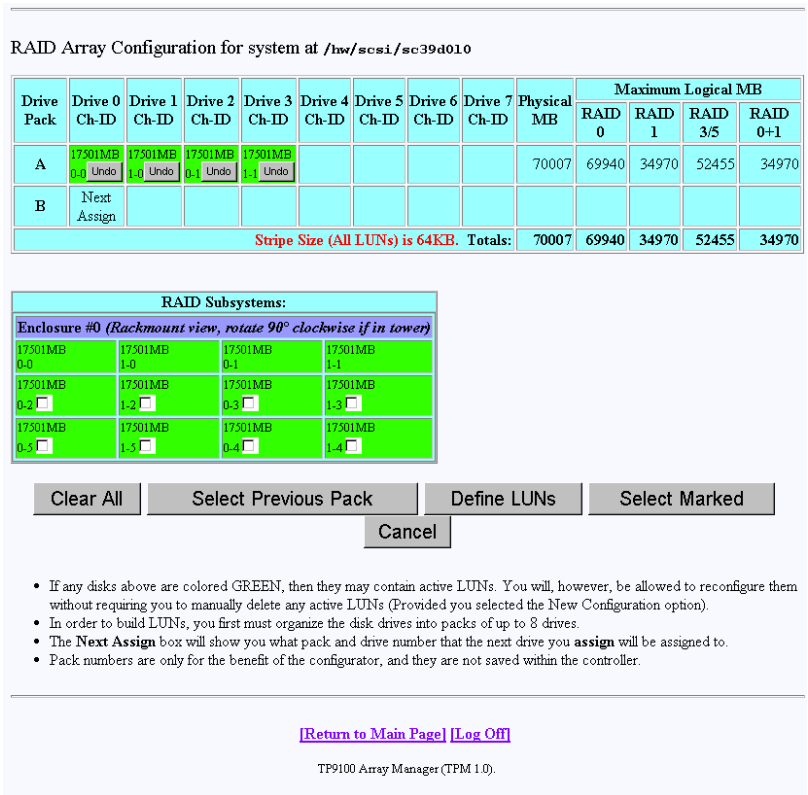


Figure 3-7 Drives Assigned Into Pack A (6.14 Firmware)

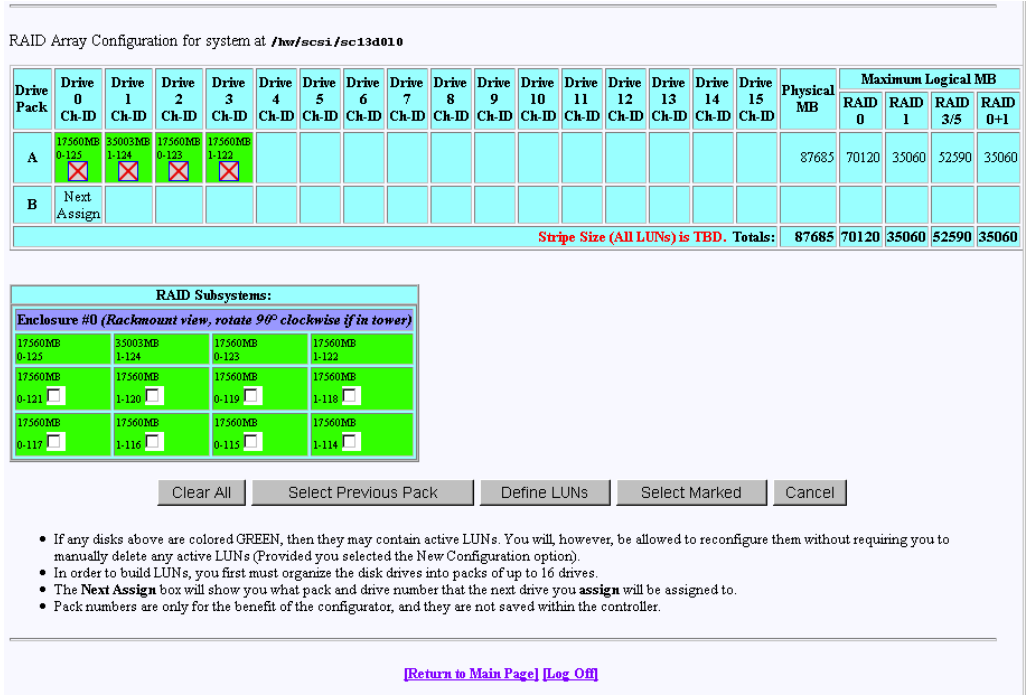


Figure 3-8 Drives Assigned Into Pack A (7.01 Firmware)

Figure 3-7 and Figure 3-8 show that four drives have been assigned into drive pack A, which could become a RAID set. Every time a set of drives is assigned, the table cell labeled **Next Assign** moves to the next row down, where a new drive pack can be created.

2. To remove a drive from a pack, click the undo box (for 7.01 firmware) or click the **Undo** button Undo (for 6.14 firmware), and the remaining drives in the pack shift to the left, while the removed drive reappears with a cleared checkbox in the RAID Subsystem table. Use the **Select Previous Pack** button to reconfigure the drive arrangement in an earlier drive pack.

   Nothing is saved for several more screens, and you may cancel at any time by pressing the **Cancel** button. Use the **Clear All** button to deassign all drives from the drive packs.

Note: You do not have to allocate all the drives to packs (or LUNs). If you choose not to configure certain drives, they may be used at any time when you click **Add LUN(s)** or **Expand LUN** (see Figure 3-5), if the characteristics of the LUN qualify for expansion.

Group the Remaining Drives Into Packs

To create remaining drive packs, continue activating drive checkboxes in the RAID Subsystem area of the dialog box and using the **Select Next Pack** button as necessary until the drives are grouped as desired into separate drive packs.

Note: Refer to "New Configuration" on page 40 for rules on drive pack configuration.

When you are finished, the screen looks similar to the one pictured in Figure 3-9 (6.14 firmware) or Figure 3-10 (7.01 firmware). In both cases, the drives have been grouped into three separate drive packs.

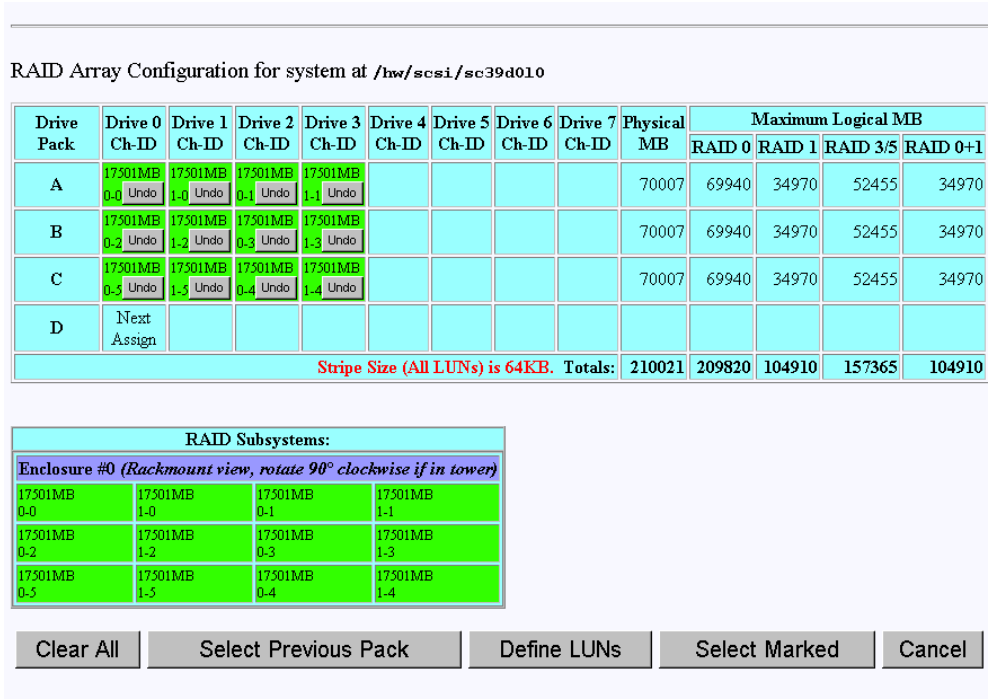
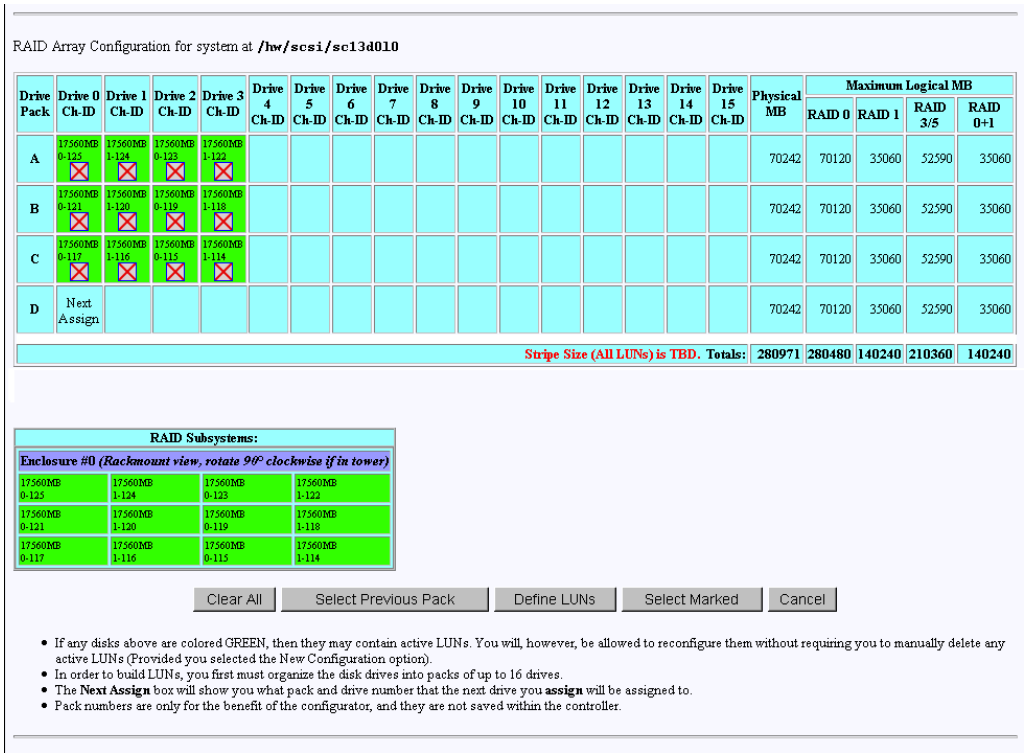


Figure 3-9 All Drive Packs Created (6.14 Firmware)



RAID Array Configuration for system at **/hw/scsi/sc13d010**

Drive Pack	Drive 0 Ch-ID	Drive 1 Ch-ID	Drive 2 Ch-ID	Drive 3 Ch-ID	Drive 4 Ch-ID	Drive 5 Ch-ID	Drive 6 Ch-ID	Drive 7 Ch-ID	Drive 8 Ch-ID	Drive 9 Ch-ID	Drive 10 Ch-ID	Drive 11 Ch-ID	Drive 12 Ch-ID	Drive 13 Ch-ID	Drive 14 Ch-ID	Drive 15 Ch-ID	Physical MB	Maximum Logical MB			
																		RAID 0	RAID 1	RAID 3/5	RAID 0+1
A	17560MB 0-125	17560MB 1-124	17560MB 0-123	17560MB 1-122													70242	70120	35060	52590	35060
B	17560MB 0-121	17560MB 1-120	17560MB 0-119	17560MB 1-118													70242	70120	35060	52590	35060
C	17560MB 0-117	17560MB 1-116	17560MB 0-115	17560MB 1-114													70242	70120	35060	52590	35060
D	Next Assign																70242	70120	35060	52590	35060
Stripe Size (All LUNs) is TBD. Totals:																	280971	280480	140240	210360	140240

RAID Subsystems:

Enclosure #0 *(Rackmount view, rotate 90° clockwise if in tower)*

17560MB 0-125	17560MB 1-124	17560MB 0-123	17560MB 1-122
17560MB 0-121	17560MB 1-120	17560MB 0-119	17560MB 1-118
17560MB 0-117	17560MB 1-116	17560MB 0-115	17560MB 1-114

Clear All | Select Previous Pack | Define LUNs | Select Marked | Cancel

- If any disks above are colored GREEN, then they may contain active LUNs. You will, however, be allowed to reconfigure them without requiring you to manually delete any active LUNs (Provided you selected the New Configuration option).
- In order to build LUNs, you first must organize the disk drives into packs of up to 16 drives.
- The **Next Assign** box will show you what pack and drive number that the next drive you **assign** will be assigned to.
- Pack numbers are only for the benefit of the configurator, and they are not saved within the controller.

Figure 3-10 All Drive Packs Created (7.01 Firmware)

Defining a LUN Using the Drive Packs

To define a LUN, follow these steps:

1. Click **Define LUNs**.

   The screen shown in Figure 3-11 appears.

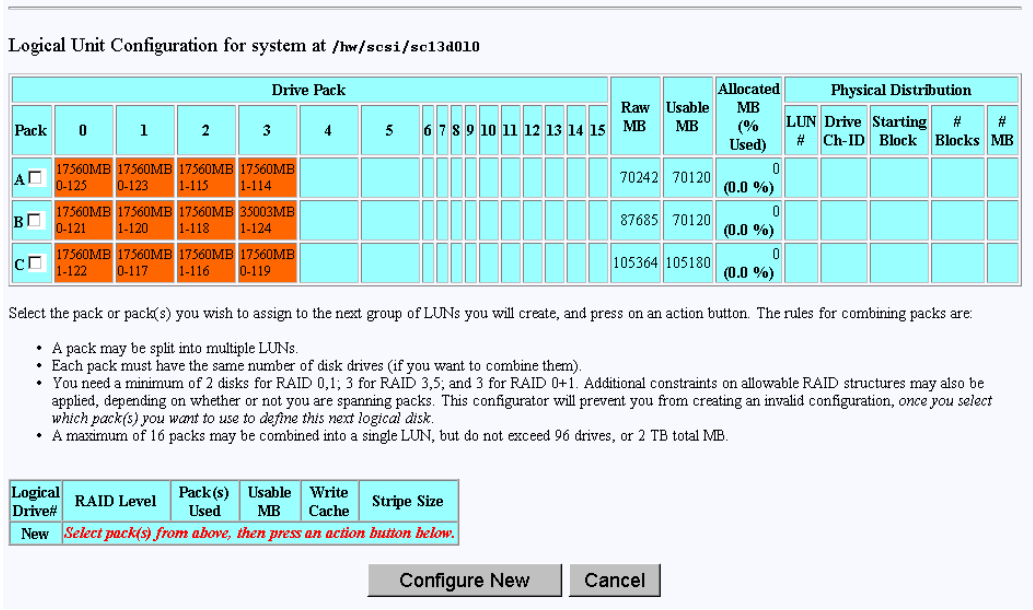
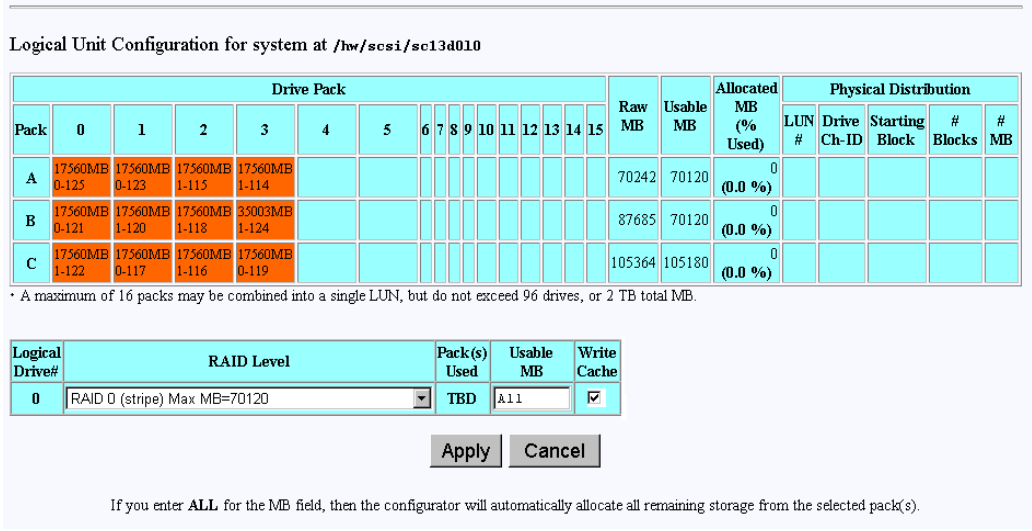


Figure 3-11 Select Drive Packs to Include in LUN

2. Check the boxes at the left (A, B, or C) to select one or more packs to combine into a LUN.
3. To create a LUN from drive pack A, for example, activate the **A** box and click **Configure New** at the bottom of the screen.

   The screen in Figure 3-13 (6.14 firmware) or Figure 3-14 (7.01 firmware) appears.

Note: For controllers with 6.14 firmware, you must go to the **View/Modify RAID Controller Configuration** dialog box (see Figure 3-41 on page 80) and select the stripe size before defining the LUN.



Logical Unit Configuration for system at /hw/scsi/sc13d010

Drive Pack																Raw MB	Usable MB	Allocated MB (% Used)	Physical Distribution				
Pack	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15				LUN #	Drive Ch-ID	Starting Block	# Blocks	# MB
A	17560MB 0-125	17560MB 0-123	17560MB 1-115	17560MB 1-114													70242	70120	0 (0.0 %)					
B	17560MB 0-121	17560MB 1-120	17560MB 1-118	35003MB 1-124													87685	70120	0 (0.0 %)					
C	17560MB 1-122	17560MB 0-117	17560MB 1-116	17560MB 0-119													105364	105180	0 (0.0 %)					

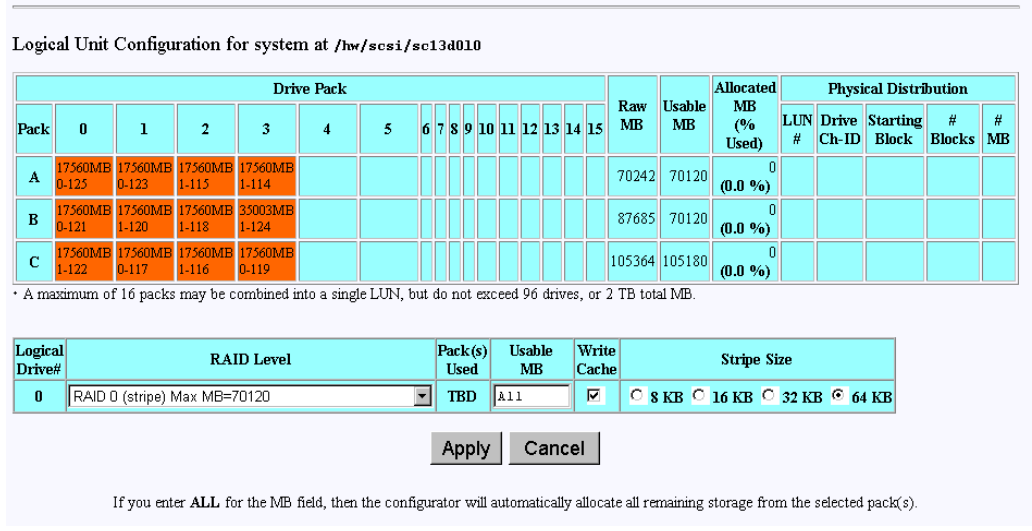
• A maximum of 16 packs may be combined into a single LUN, but do not exceed 96 drives, or 2 TB total MB.

Logical Drive#	RAID Level	Pack(s) Used	Usable MB	Write Cache
0	RAID 0 (stripe) Max MB=70120	TBD	All	☑

Apply Cancel

If you enter **ALL** for the MB field, then the configurator will automatically allocate all remaining storage from the selected pack(s).

Figure 3-12 LUN is Being Defined (6.14 Firmware)



Logical Unit Configuration for system at /hw/scsi/sc13d010

Drive Pack																Raw MB	Usable MB	Allocated MB (% Used)	Physical Distribution				
Pack	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15				LUN #	Drive Ch-ID	Starting Block	# Blocks	# MB
A	17560MB 0-125	17560MB 0-123	17560MB 1-115	17560MB 1-114													70242	70120	0 (0.0 %)					
B	17560MB 0-121	17560MB 1-120	17560MB 1-118	35003MB 1-124													87685	70120	0 (0.0 %)					
C	17560MB 1-122	17560MB 0-117	17560MB 1-116	17560MB 0-119													105364	105180	0 (0.0 %)					

• A maximum of 16 packs may be combined into a single LUN, but do not exceed 96 drives, or 2 TB total MB.

Logical Drive#	RAID Level	Pack(s) Used	Usable MB	Write Cache	Stripe Size
0	RAID 0 (stripe) Max MB=70120	TBD	All	☑	○ 8 KB ○ 16 KB ○ 32 KB ◉ 64 KB

Apply Cancel

If you enter **ALL** for the MB field, then the configurator will automatically allocate all remaining storage from the selected pack(s).

Figure 3-13 LUN is Being Defined (7.01 Firmware)

These dialog boxes show that a Logical Drive #0 (LUN 0) is being created that allows you to select the RAID level and usable MB.

4. Select the desired RAID level from the drop-down box shown and fill in the usable MB you require.
5. If you do not want all remaining storage in the pack to be assigned to the LUN, then cycle between entering the amount of storage you want to use, and the type of RAID you want to assign to it.

   You are free to mix and match as required; however, TPM prevents you from defining a LUN that is either too large or too small.
6. In this example, leave **All** in the **Usable MB** field, and click **Apply** to actually create the LUN.

   The screen shown in Figure 3-14 appears.

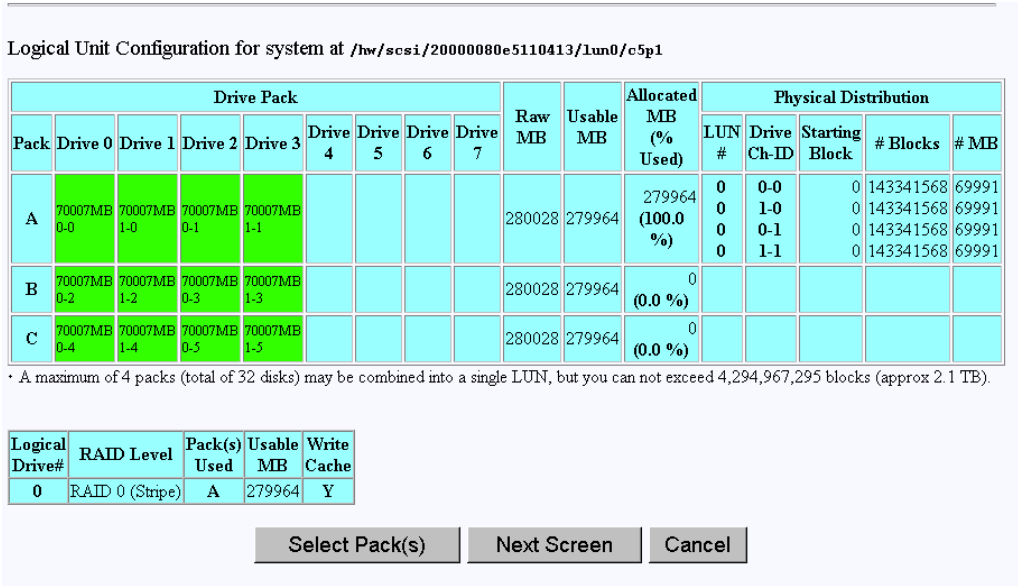
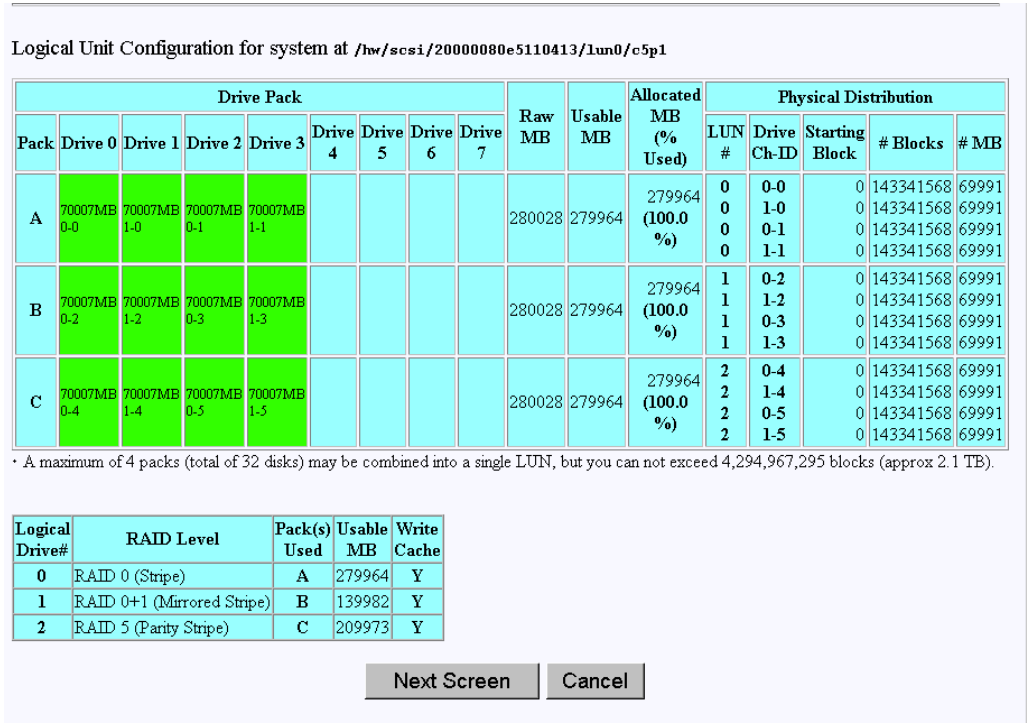


Figure 3-14 LUN is Defined

The right-hand side of the table shows how the LUN is physically arranged on each disk drive.

7. To continue building LUNs that incorporate drives in other packs, click **Select Pack(s)** and repeat the process of defining LUNs and their corresponding RAID levels and usable MB.

   Figure 3-15 (6.14 firmware) or Figure 3-15 (7.01 firmware) shows how the screen appears after using all the drive packs to define three separate LUNS.



Logical Unit Configuration for system at /hw/scsi/20000080e5110413/lun0/c5p1

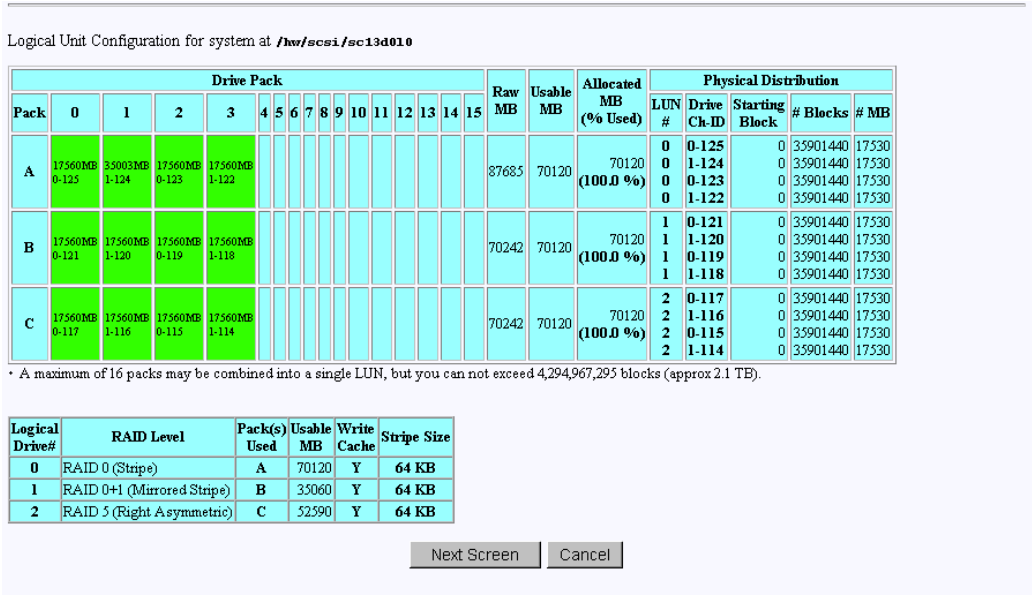
Drive Pack									Raw MB	Usable MB	Allocated MB (% Used)	Physical Distribution				
Pack	Drive 0	Drive 1	Drive 2	Drive 3	Drive 4	Drive 5	Drive 6	Drive 7				LUN #	Drive Ch-ID	Starting Block	# Blocks	# MB
A	70007MB 0-0	70007MB 1-0	70007MB 0-1	70007MB 1-1					280028	279964	279964 (100.0 %)	0	0-0	0	143341568	69991
												0	1-0	0	143341568	69991
												0	0-1	0	143341568	69991
												0	1-1	0	143341568	69991
B	70007MB 0-2	70007MB 1-2	70007MB 0-3	70007MB 1-3					280028	279964	279964 (100.0 %)	1	0-2	0	143341568	69991
												1	1-2	0	143341568	69991
												1	0-3	0	143341568	69991
												1	1-3	0	143341568	69991
C	70007MB 0-4	70007MB 1-4	70007MB 0-5	70007MB 1-5					280028	279964	279964 (100.0 %)	2	0-4	0	143341568	69991
												2	1-4	0	143341568	69991
												2	0-5	0	143341568	69991
												2	1-5	0	143341568	69991

• A maximum of 4 packs (total of 32 disks) may be combined into a single LUN, but you can not exceed 4,294,967,295 blocks (approx 2.1 TB).

Logical Drive#	RAID Level	Pack(s) Used	Usable MB	Write Cache
0	RAID 0 (Stripe)	A	279964	Y
1	RAID 0+1 (Mirrored Stripe)	B	139982	Y
2	RAID 5 (Parity Stripe)	C	209973	Y

Next Screen Cancel

Figure 3-15 All LUNs Defined (6.14 Firmware)



Logical Unit Configuration for system at **/hw/scsi/sc13d010**

Drive Pack																Raw MB	Usable MB	Allocated MB (% Used)	Physical Distribution				
Pack	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15				LUN #	Drive Ch-ID	Starting Block	# Blocks	# MB
A	17560MB 0-125	35003MB 1-124	17560MB 0-123	17560MB 1-122													87685	70120	70120 (100.0 %)	0	0-125	0	35901440	17530
																				0	1-124	0	35901440	17530
																				0	0-123	0	35901440	17530
																				0	1-122	0	35901440	17530
B	17560MB 0-121	17560MB 1-120	17560MB 0-119	17560MB 1-118													70242	70120	70120 (100.0 %)	1	0-121	0	35901440	17530
																				1	1-120	0	35901440	17530
																				1	0-119	0	35901440	17530
																				1	1-118	0	35901440	17530
C	17560MB 0-117	17560MB 1-116	17560MB 0-115	17560MB 1-114													70242	70120	70120 (100.0 %)	2	0-117	0	35901440	17530
																				2	1-116	0	35901440	17530
																				2	0-115	0	35901440	17530
																				2	1-114	0	35901440	17530

• A maximum of 16 packs may be combined into a single LUN, but you can not exceed 4,294,967,295 blocks (approx 2.1 TB).

Logical Drive#	RAID Level	Pack(s) Used	Usable MB	Write Cache	Stripe Size
0	RAID 0 (Stripe)	A	70120	Y	64 KB
1	RAID 0+1 (Mirrored Stripe)	B	35060	Y	64 KB
2	RAID 5 (Right Asymmetric)	C	52590	Y	64 KB

Next Screen Cancel

Figure 3-16 All LUNs Defined (7.01 Firmware)

At this point, all the LUNs have been defined. Next, the RAID controller must be updated with the new configuration.

Updating the RAID Controller

To update the RAID controller with the new LUN configuration, follow these steps:

1. Press the **Next Screen** button.

   The warning screen shown Figure 3-17 appears.

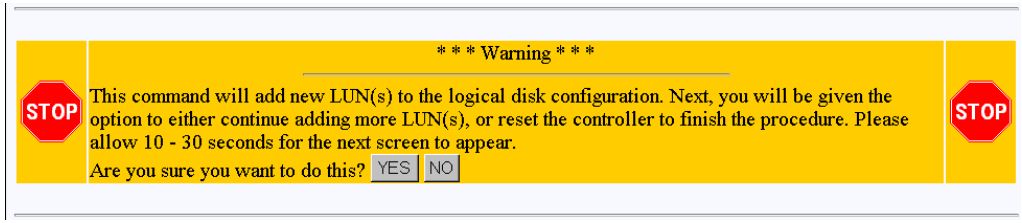


Figure 3-17 Updating the RAID Controller Warning Screen

2. Click **YES** to save the LUN configuration; otherwise click **NO**.

   If all goes well, the screen shown in Figure 3-18 appears, indicating that the new LUN(s) are online.

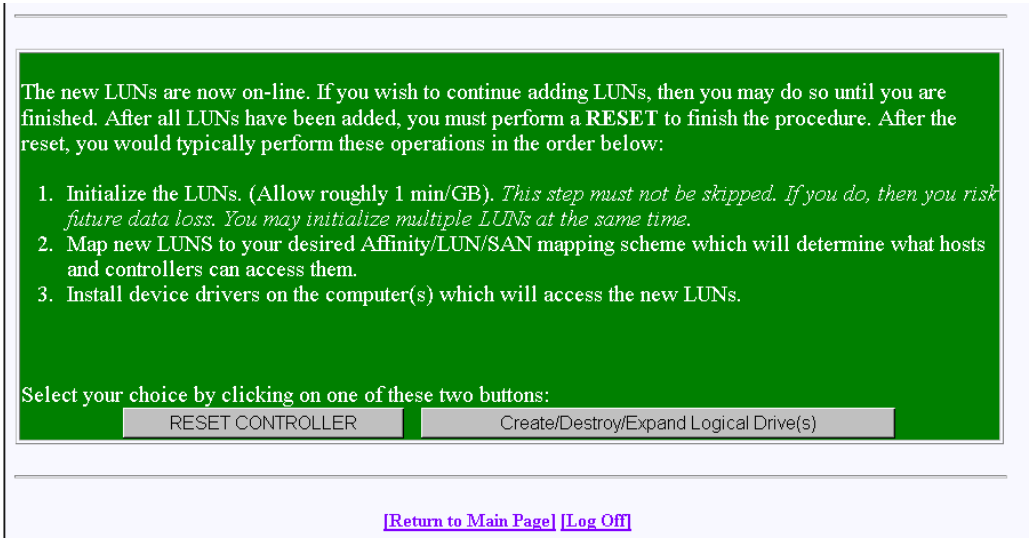


Figure 3-18 LUN Online Screen

3. Press the **Create/Destroy/Expand Logical Drive(s)** button if you want to add more LUNs or reconfigure existing LUNs.
4. Press **Reset Controller** after all LUNs have been added and properly configured.

   The screen shown in Figure 3-19 appears.

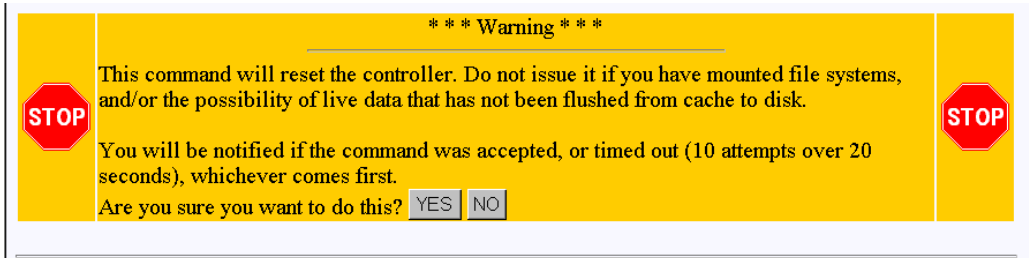


Figure 3-19 Warning Screen

A reset is required, and is not optional. The reason that TPM even asks you about initiating a reset is to give you the chance to make sure your host(s) are ready for a reset.

Note: If you are adding a new LUN to an existing configuration, you should unmount any LUNs before resetting. This is especially important if there is a possibility that the host will attempt to issue any I/Os to the LUNs before the controller(s) finish rebooting.

---

5. Click **YES**.

   The window shown in Figure 3-20 appears.

The controller is resetting, and should complete within 90 seconds. A daughter window will shortly pop-up which will report the status of the reset, and it will tell you when the subsystem is back on-line. Do not destroy *this* window, rather close the daughter window when the reset has completed. Do not minimize the window until it is painted with status information. It may take up to 60 seconds for status information to appear.

Figure 3-20 Controller Resetting Information Screen

Next, the two Reset Status Information windows appear, as shown in Figure 3-21 and Figure 3-22.

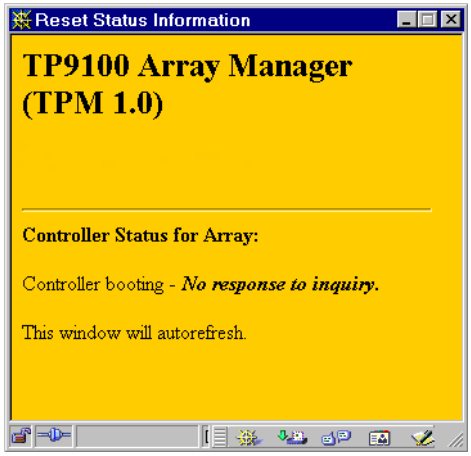


Figure 3-21 Controller Resetting Status Screen (1 of 2)

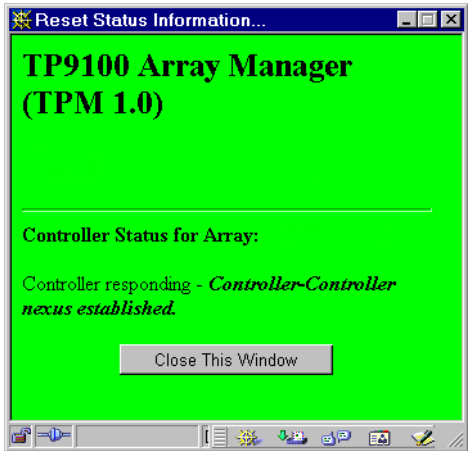


Figure 3-22 Controller Resetting Status Screen (2 of 2)

6. Click **Close This Window** on the dialog box shown in Figure 3-22.

After the controller(s) are reset, you must return to the main menu and do the following:

1. Install the device driver for the new LUN (see "Installing Device Drivers for New LUNS (Configuration Function Menu)" on page 76).
2. Initialize the LUNs (see "Initialize LUN(s) (Configuration Function Menu)" on page 65).

Add LUN(s)

Back at the main menu, click select **Create/Destroy/Expand Logical Drives** under the **Configuration Function** menu. The screen shown in Figure 3-23 appears.

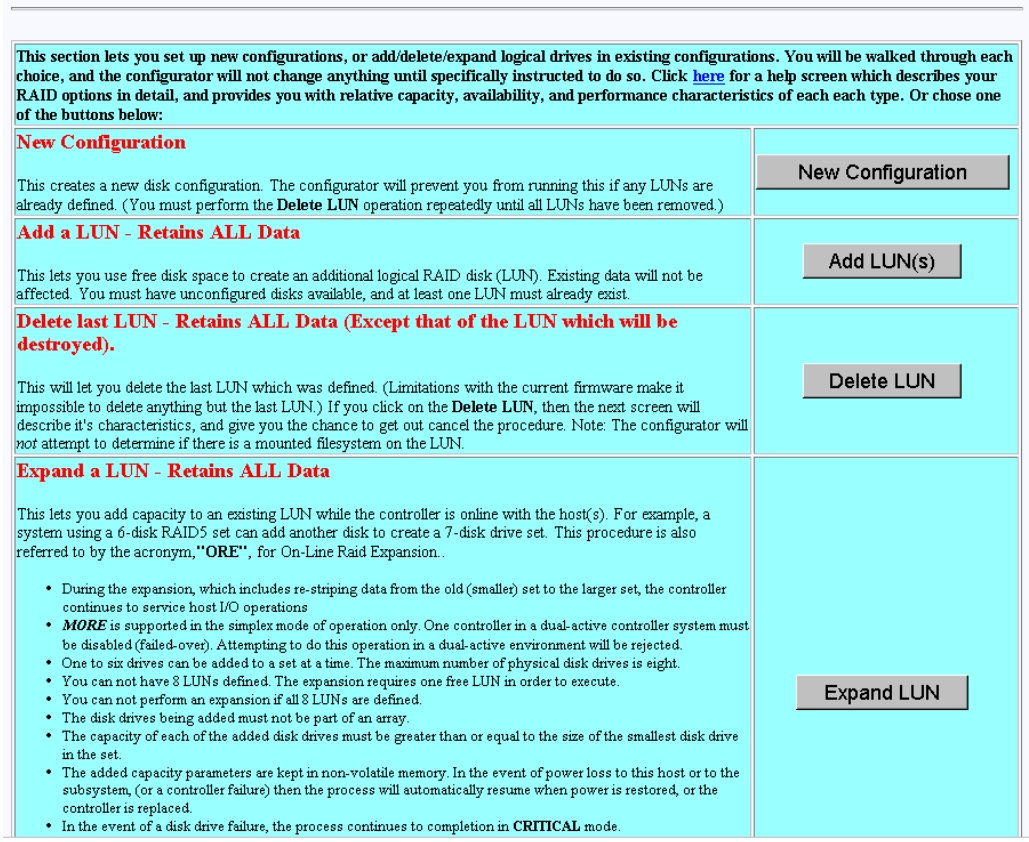


Figure 3-23 Create/Destroy/Expand Logical Drives Screen

To add one or more LUNs, follow these directions:

1. Click **Add LUN(s)**.

   A screen similar to the one in Figure 3-24 on page 57 appears.

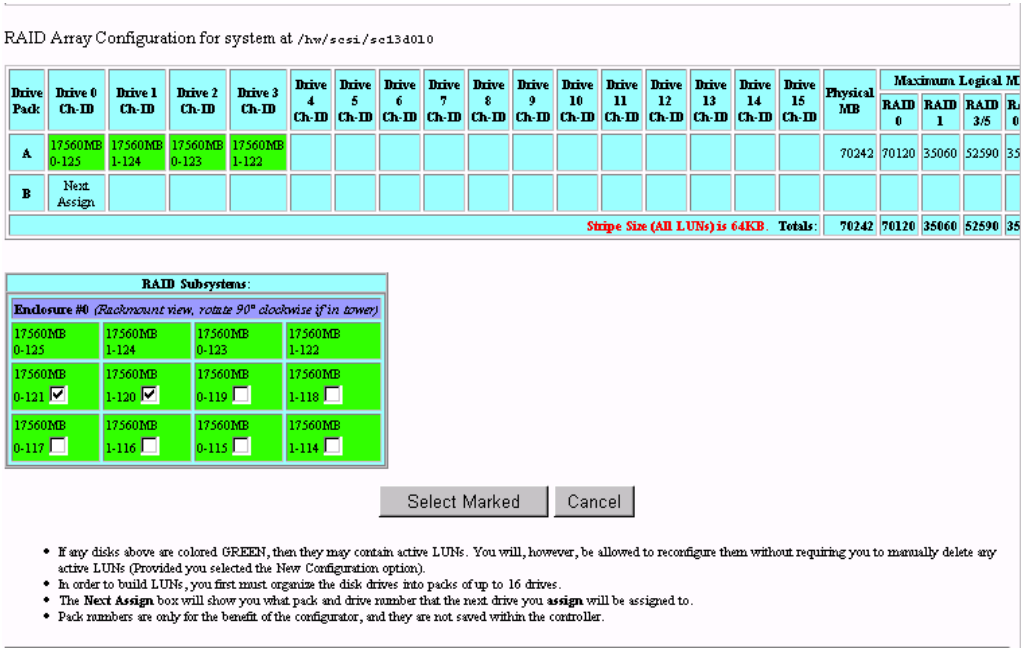


Figure 3-24 Add LUN(s) Screen

To add a LUN to an existing configuration, at least one LUN must already exist. In addition, unconfigured disks must be available with enough disk space to create an additional LUN.

2. Follow essentially the same procedures as before listed under "New Configuration" on page 40.

   The procedure that is followed and the screens that appear are similar to adding a new configuration to an unconfigured controller. The differences are as follows:

   - All previously defined LUNs and packs (which are actually used in LUNs) are displayed when selecting drives for packs. The allocated drives, however, do not have an empty checkbox in them (only unused disks have an empty checkbox).
   - You may not add a drive to an existing pack. To do this, you must use the **Expand LUN** button (see Figure 3-23) to perform an **online R**AID **e**xpansion procedure.

- Although you can fill out the screens, you must not attempt to save the configuration using the **Next Screen** button while users are online, because a controller reset is required.

3. When you have finished defining the new LUN, click **Next Screen**.

   The warning screen shown in Figure 3-25 appears.

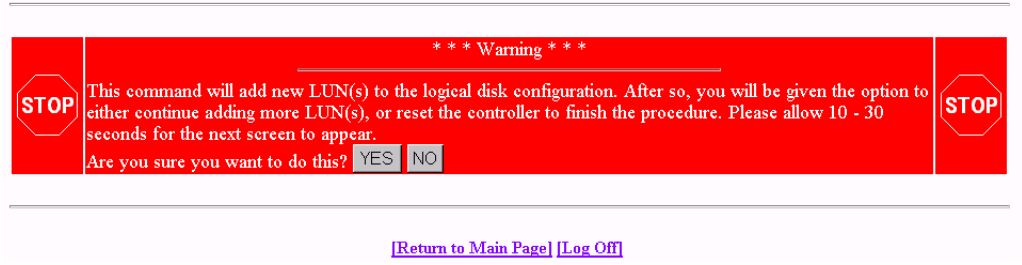


Figure 3-25 Add LUN(s) Warning Screen

4. Click **YES** to add the LUN, or **NO** to cancel and go back to the main menu.

   If you select **YES**, the confirmation screen in Figure 3-26 appears after a brief waiting period.

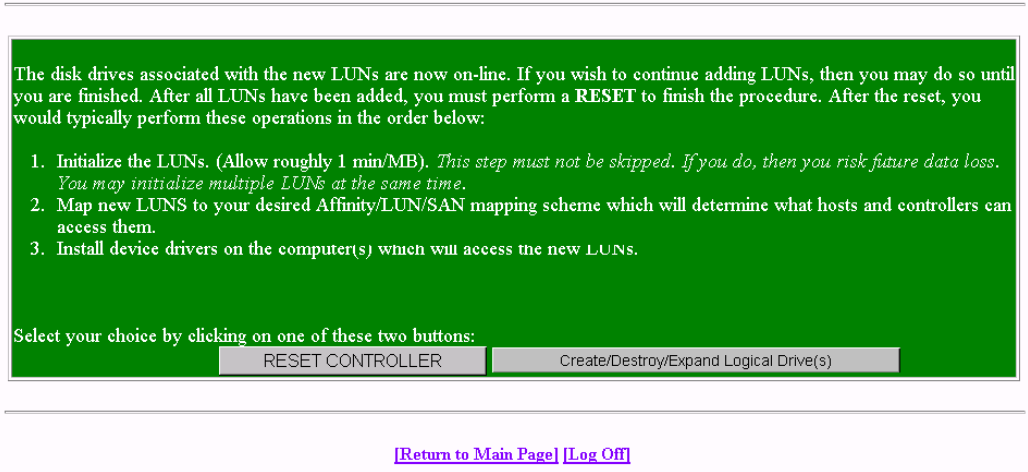


Figure 3-26 Add LUN(s) Confirmation Screen

5. Click **RESET CONTROLLER** if no more LUNs are to be added, or **Create/Destroy/Expand Logical Drives** if you need to add more LUNs.

   If you select **Create/Destroy/Expand Logical Drives, you are returned to** the dialog box of Figure 3-23 on page 56.

Delete LUN

Use the **Delete LUN** button on the **Create/Destroy/Expand Logical Drives** screen (see Figure 3-23) to delete a LUN.

To delete a LUN, follow these directions:

1. Click **Delete LUN**.

   The warning screen shown in Figure 3-27 on page 60 is displayed. This screen shows the size and characteristics of the last LUN that was created.

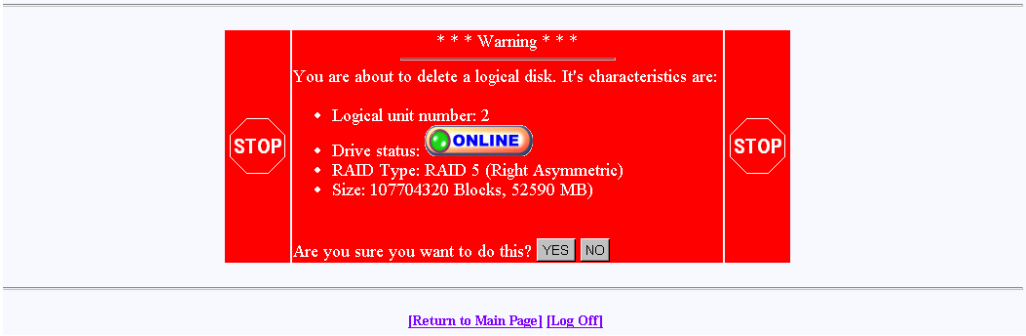


Figure 3-27 Delete LUN Warning Screen

2. Click **YES** to delete the LUN immediately.
3. Click **NO** to return to the main menu.

If you delete the LUN, a controller reboot is required. However, if you are going to be deleting multiple LUNs (for example, you may be entering a completely new configuration) the reboot can be skipped until all of the LUNs have been deleted. Don't delete a LUN with a mounted file system on it. This may lock up the server, or at the very least cripple it.

Warning: Make sure that you do not delete the LUN associated with the device driver you selected to talk to the RAID subsystem. If you do, TPM will not be able to communicate with the RAID controller until you choose another device driver from the Select Physical Device screen (see Figure 3-2 on page 30).

Expand LUN

RAID expansion allows capacity to be added to an existing RAID set while the controller is online. No resets are required, and I/Os to other LUNs will be serviced (a little slower). The following rules and conditions must be met to expand a LUN:

1. The most important rule is that you must be using a file manager such as Veritas' Volume Manager. These file managers allow you to actually use an expanded LUN. If you wish to attempt an on-line expansion, and your environment is not properly configured, the request will fail, and you will receive an appropriate error message.
2. During the expansion, which includes re-striping data from the old (smaller) set to the larger set, the controller continues to service host I/O operation.
3. LUN expansion allows you to add capacity to an existing LUN while the controller is online with the host(s). For example, a system using a 6-disk RAID5 set can add another disk to create a 7-disk drive set. This procedure is also referred to by the acronym MORE.

   MORE is supported in the simplex mode of operation only. One controller in a dual-active controller system must be disabled (failed over). Attempting to do this operation in a dual-active environment will be rejected.
4. One to six drives can be added to a set at a time. The maximum number of physical disk drives is eight with 6.14 controller firmware, or 16 with 7.01 firmware.
5. You can not have eight LUNs defined with 6.14 controller firmware or 32 LUNs defined with 7.01 controller firmware. The expansion requires one free LUN in order to execute.
6. You cannot perform an expansion if all eight LUNs are defined with 6.14 controller firmware or all 32 LUNs defined with 7.01 controller firmware.
7. The disk drives being added must be in STANDBY, and must not be part of an array.
8. The capacity of each of the added disk drives must be greater than or equal to the size of the smallest disk drive in the set.
9. The added capacity parameters are kept in non-volatile memory. In the event of power loss to this host or to the subsystem, (or a controller failure) the process automatically resumes when power is restored, or the controller is replaced.
10. In the event of a disk drive failure, the process continues to completion in CRITICAL mode.
11. MORE, Initialize, Rebuild, and Consistency Check are mutually exclusive operations. Only one process may run at a time.

12. No configuration update commands will be accepted during the expansion.
13. Write-back cache is disabled during the expansion.
14. The LUN must be online.

To expand a LUN, follow these steps:

1. Click **Expand LUN** in the **Create/Destroy/Expand Logical Drives screen (see** Figure 3-28**)**.

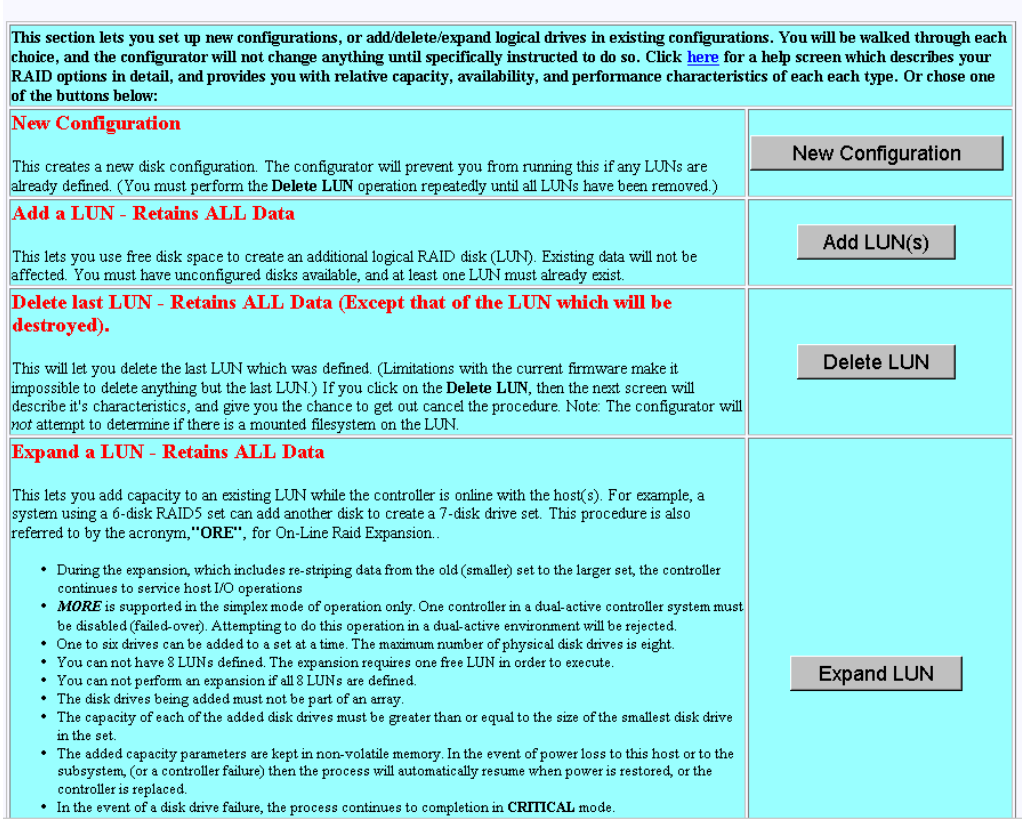


Figure 3-28 Create/Destroy/Expand Logical Drives Screen

A screen similar to that shown in Figure 3-29 appears.

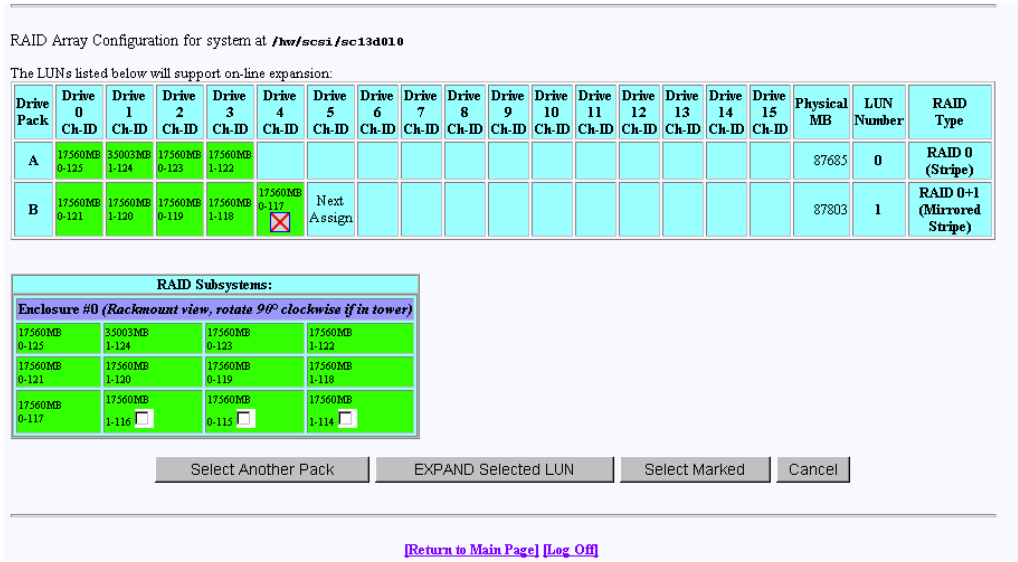


Figure 3-29 Expand LUN Screen

Note: In the screen shown in Figure 3-29, one disk drive has just been added to drive pack A, leaving three unused disk drives that can still be used to expand a LUN.

The drives shown in green are in an online state, which means they are configured into LUNs which happen to be online.

2. When there are drives shown in the RAID Subsystems Map area of the screen with an empty checkbox visible, the drives are unused and can be assigned to expand a LUN. Click the **Select Another Pack** button until the cell labeled **Next Assign** is in the desired drive pack that is being expanded. Then activate the desired checkboxes and click **Select Marked** to add the drive(s) to the pack.

   When you expand the LUN, the drive pack to which the drive has just been added will still be assigned to the LUN, but will have more capacity, thus expanding the LUN.

Note: If a LUN does not qualify for expansion, it will not be displayed.

---

3. When you have finished adding drives to a particular pack, use the **Select Another Pack** button to select and expand another pack, or click **EXPAND Selected LUN** button to finish the LUN expansion process.

   If you click **EXPAND Selected LUN, the** warning message shown in Figure 3-30 appears:

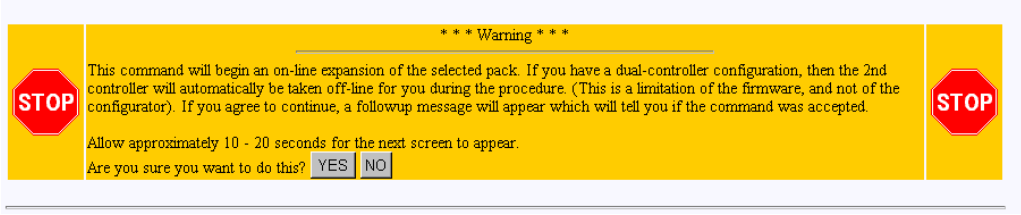


Figure 3-30 Warning Message

4. Click **YES** to begin the LUN expansion, or **NO** to cancel and return to the main menu.

Initialize LUN(s) (Configuration Function Menu)

The LUNs must be initialized before the operating system can use them. The TPM application automatically selects uninitialized LUNs for you and displays their status (**INITIALIZED**, **UNINITIALIZED**, or **INITIALIZING).**

To initialize one or more LUNs, follow these steps:

1. Click **Initialize LUNs** on the main menu.

   The screen shown in Figure 3-31 appears.

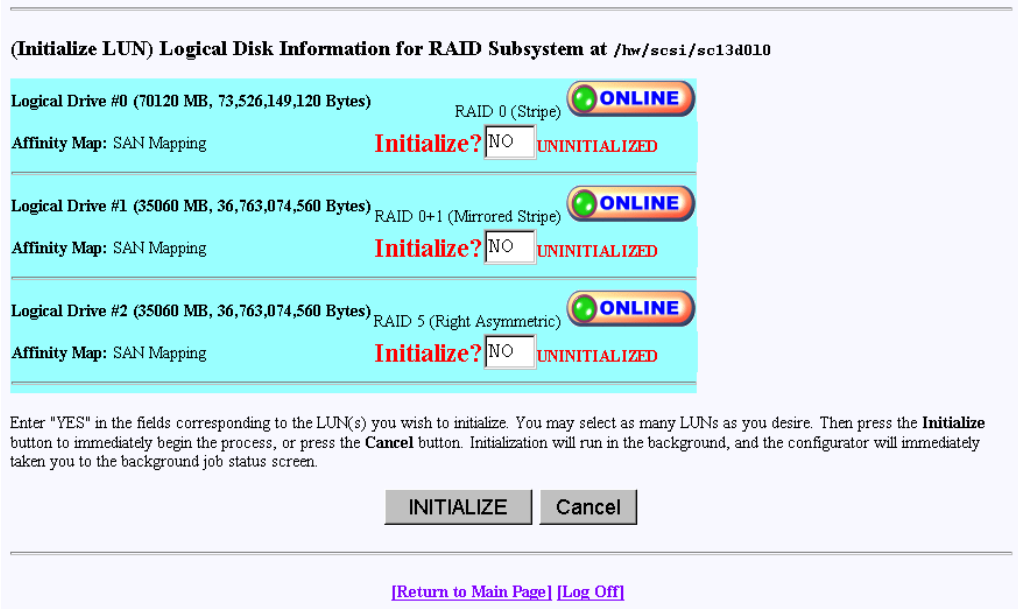


Figure 3-31 Initialize LUN

As shown in Figure 3-31, several LUNs are shown as **UNINITIALIZED**.

2. Type **YES** in the boxes corresponding to the devices to initialize, and click **Initialize** at the bottom of the screen.

   The initialization confirmation screen shown in Figure 3-32 appears.

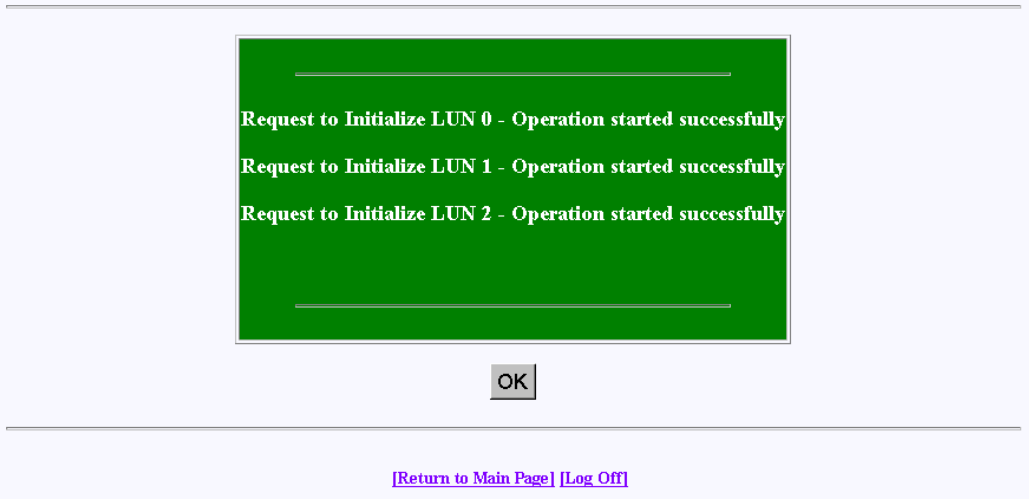
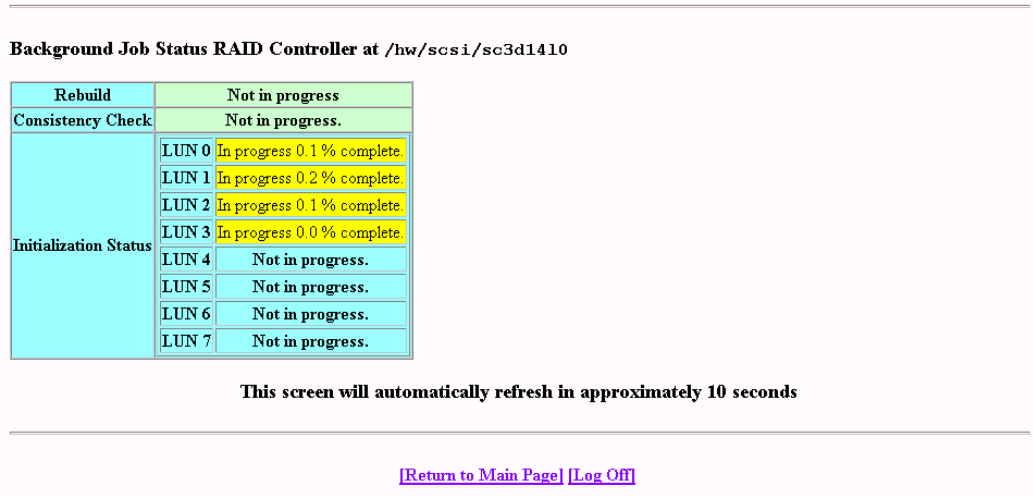


Figure 3-32 Initialization Confirmation

3. To continue with the initialization of the LUNs shown on the screen, click **OK**.

   A status screen similar to the one shown in Figure 3-34 (for controller 6.14 firmware) or in Figure 3-34 (for controller 7.01 firmware) displays how the procedure is progressing, and updates every 10 seconds.



Background Job Status RAID Controller at `/hw/scsi/sc3d1410`

Rebuild	Not in progress	
Consistency Check	Not in progress.	
Initialization Status	LUN 0	In progress 0.1 % complete.
	LUN 1	In progress 0.2 % complete.
	LUN 2	In progress 0.1 % complete.
	LUN 3	In progress 0.0 % complete.
	LUN 4	Not in progress.
	LUN 5	Not in progress.
	LUN 6	Not in progress.
	LUN 7	Not in progress.

This screen will automatically refresh in approximately 10 seconds

[Return to Main Page] [Log Off]

Figure 3-33 Initialization Progress (6.14 Firmware)

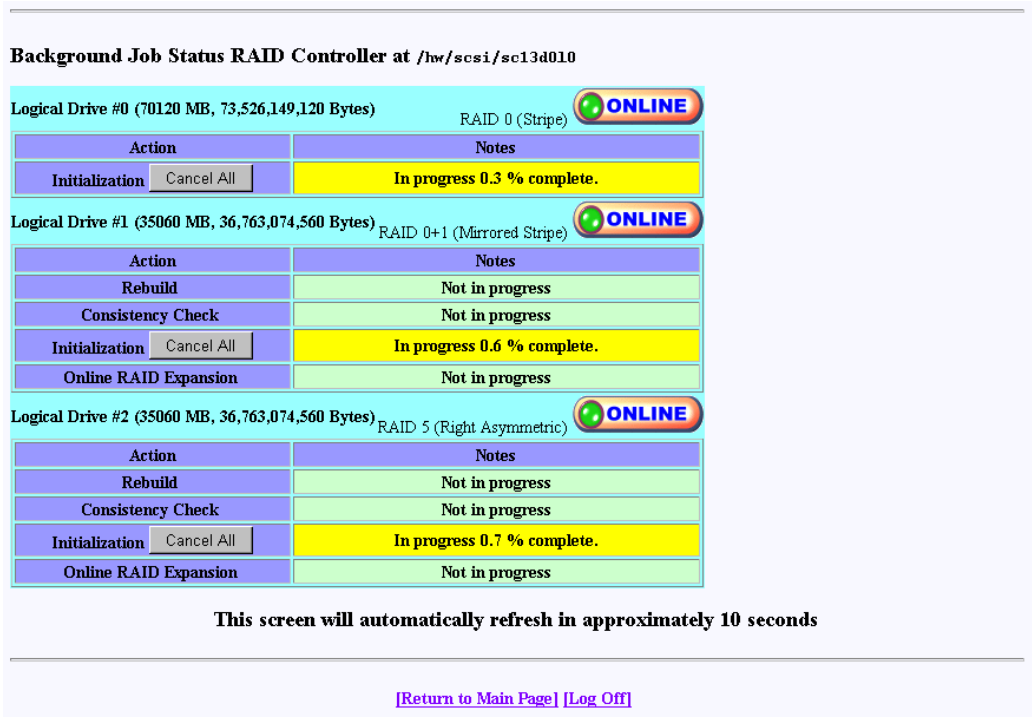


Figure 3-34 Initialization Progress (7.01 Firmware)

The initialization procedure can be done at any time, and the controller(s) will service I/Os for other LUNs while this is in process. There is also a configurable parameter in the controller configuration that allows you to adjust how much controller CPU time to allow for background operations such as this.

Configure Host-to-LUN Mapping (Configuration Function Menu)

The **Configure Host -to-LUN** item on the **Configuration Functions** portion of the main menu (see Figure 3-1 on page 28) allows logical drives to be made available or invisible to selected Fibre Channel host adapters.

RAID controllers offer several drive mapping techniques and configuration modes for many different environments. These configuration modes define which hosts see the logical disks, and the effects of a hardware failure. When you select **Configure Host to LUN Mapping** from the main menu, the dialog box shown in Figure 3-35 (6.14 firmware) or in Figure 3-37 (7.01 firmware) appears.

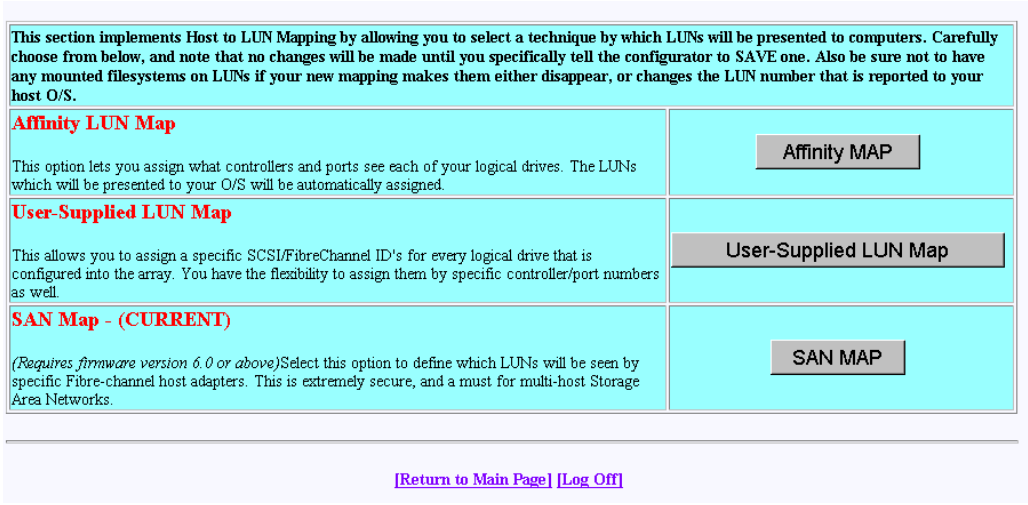


Figure 3-35 Configure Host to LUN Mapping (6.14 Firmware)

The mapping strategy currently used by the controller is indicated with (CURRENT). In the example of Figure 3-35, the SAN Map is the current mapping strategy.

Note: SAN MAP is the only mapping strategy supported by the TP9100 RAID system.

Click **SAN MAP** to make any modifications to the mapping strategy. No changes are made until you complete the subsequent dialog boxes.

Heed these important warnings:

Warning: **A reset is required if you change the mapping type (for example, from SAN to Affinity), or the topology type within SAN mapping. You can, however, set things up and postpone the reset until you have some downtime available.**

Warning: **If you make a change to the mapping, be sure to consider how the new mapping might affect device drivers on attached systems. Depending on what you are changing, you might make the controller invisible to TPM. You also might make one of your host device drivers now point to the wrong LUN, which could result in data loss if the LUN is in use. In other words, TPM will not stand in your way if you do something to configure the system in an undesirable manner.**

Warning: **Only the most experienced administrators should make changes in an on-line environment.**

SAN Mapping

The Storage Area Network (SAN) Mapping feature, also known as Host-to-LUN Mapping feature, restricts host access to logical drives. Each drive is granted only to a single host or group of hosts, providing limited security control of data in an environment where multiple hosts are connected to the controller.

This feature is available only on controllers with a fibre channel host interface running on firmware version 6.0 or greater.

The SAN mapping feature is intended for use in configurations in which multiple host computers attach to one or more controllers. This is also referred to as a SAN configuration. The host computers are attached to the controller(s) through a fibre channel arbitrated loop, FC hub, or FC switch. An example of fibre channel arbitrated loop configuration is shown in Figure 3-36.

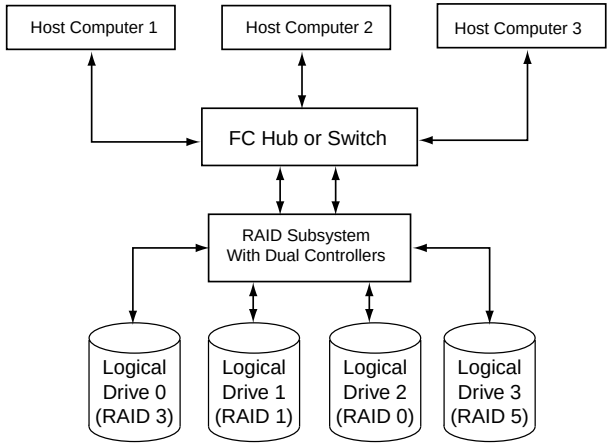


Figure 3-36 Storage Area Network

Without host to LUN mapping, each host computer (1 through 3) has complete access to all four system drives. When a host system boots, operating systems such as Windows NT attempt to mount all of these system drives. As a result, any data on the array can be accessed by the Windows NT system. In some cases, Windows NT automatically writes an identifying signature to these storage areas. This results in data corruption if another one of the host systems has stored data there.

If IRIX or Linux computers are involved, then an automatic mount might not occur, but you still have a security risk, and the possibility that a user with root privilege will mount one of these disks, or attempt to create a file system on one of these disks.

By utilizing SAN mapping, however, each logical drive can be configured to be visible to a single host computer only. If you are using a volume mapping tool such as Veritas' Volume Manager, or Tivoli's (previously Mercury's) SANergy product, then you can safely concurrently mount file systems on these LUNs to any number of these three hosts.

The controller uses the World Wide Name (WWN) to uniquely identify host computers that have logged in to the controller. A list of valid hosts and their corresponding WWNs, is provided to external configurators in order to configure the mapping.

After logical drives are configured, the controller maintains a table of WWNs for each one. This table defines the hosts that are granted access to each system drive and the controller port and the LUN number. The controller uses the table of WWNs to determine access to a specific system drive. If a host sends a new command to the controller, the controller validates the WWN, LUN, and controller port prior to servicing the command. If the WWN, LUN, and port information are valid for the system drive, the requested command is completed normally. If the WWN, LUN, and port combination are not valid for the system drive, the command is completed with SCSI Check Condition status, with the sense key set to Illegal Request (05h) and the sense code set to Logical Unit Not Supported (25h).

There are three exceptions to the response to commands when the WWN, LUN, and port combination are not valid:

1. If the request is an **Inquiry** command, the controller returns the Inquiry data with the peripheral qualifier set to indicate that the target is capable of supporting the specified device type on this LUN, but no device is currently connected to that LUN.
2. If the request is a Report LUNs command, and the addressed LUN is 0, the controller completes the command normally, reporting only the LUNs accessible by the host requesting the command.
3. If the request comes from TPM, however, the command is processed normally by the controller. This allows a controller that is not configured to be reconfigured to operate correctly with the attached hosts.

Supported SAN Mapping Topologies

The model of controller you use dictates what SAN Mapping topologies are supported. This manual covers all three possibilities (Inactive Port, MultiPort, and Multi-TID). Only one type of SAN topology can be active, and any changes to a topology requires a reboot for it to become effective. The topologies are:

- Inactive Port—in this topology, Controller0/Port0 and Controller1/Port1 are active. During failover, the inactive port on the partner takes over for the active port on the failed controller.
- MultiPort—in this topology, all ports are active. This topology does *not* provide transparent failover or failback and requires an alternate path driver to the host.
- Multi-TID—in this topology, all ports are active. This topology provides transparent failover and failback, but should not be used in conjunction with an alternate path driver.

This manual is not designed to be a tutorial on the strengths, weaknesses, and required external hardware configuration to use for each topology for the various operating systems. The documentation here merely covers how to configure each of them.

To display the SAN Logical Drive Map for controllers with 6.14 firmware, click the SAN Map button on the Configure Host to LUN Mapping screen (see Figure 3-35 on page 69). The screen shown in Figure 3-37 appears.

Note: For controllers with 7.01 firmware, the SAN Logical Drive Map appears when the **Configure Host -to-LUN** item on the **Configuration Functions** portion of the main menu **(**see Figure 3-1 on page 28) is selected.

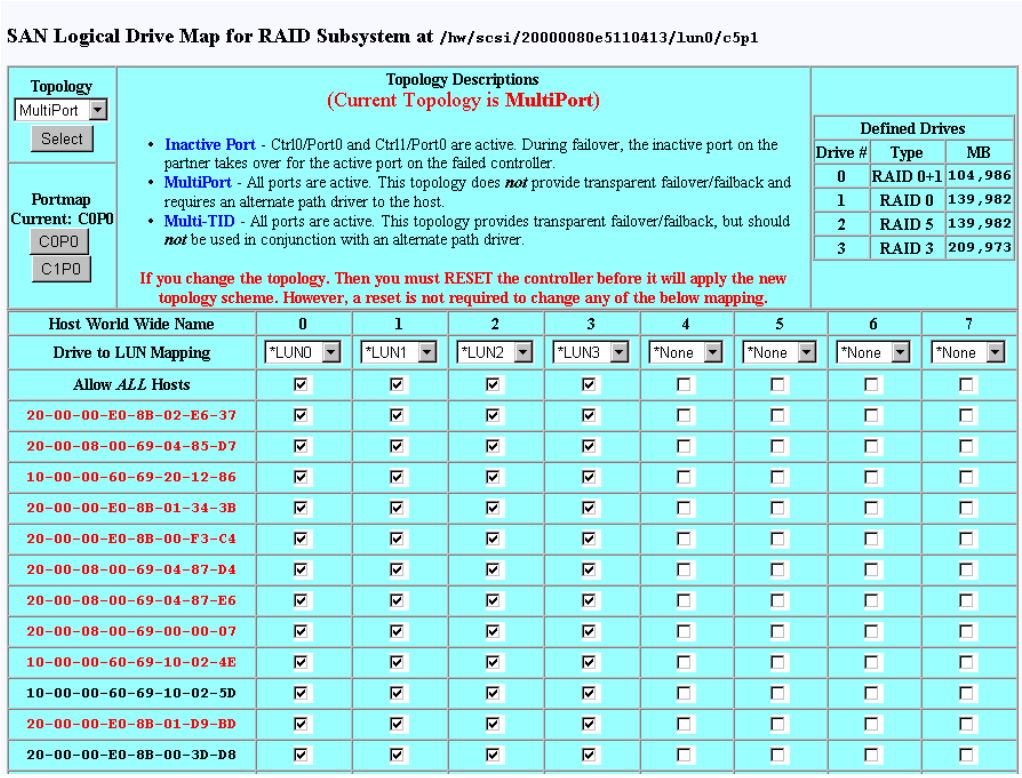


Figure 3-37 SAN Mapping

Regardless of the topology, the bottom portion of the screen shown in Figure 3-37 will be the same. Administrators must first choose the topology that best matches the SAN environment, then configure the mapping. To change the topology, click the **Topology** drop down box, then press the **Select** button. The screen is then changed to contain the appropriate values for the selected topology and controller/port combination.

Note: Your subsystem will probably have multiple controllers and ports. If this is the case, use the buttons in the **Portmap** area of the screen to configure the map for each of them (the topology type is the same for all ports).

After all the changes have been made, click **APPLY** at the bottom of the screen.

The warnings given earlier in this section are repeated here:

Warning: **A reset is required if you change the mapping type (for example, from SAN to Affinity), or the topology type within SAN mapping. You can, however, set things up and postpone the reset until you have some downtime available.**

Warning: **If you make a change to the mapping, be sure to consider how the new mapping might affect device drivers on attached systems. Depending on what you are changing, you might make the controller invisible to TPM. You also might make the device drivers now point to the wrong LUN, which could result in data loss if the LUN is in use. In other words, TPM will not stand in your way if you do something to configure the system in an undesirable manner.**

Warning: **Only the most experienced administrators should make changes in an on-line environment.**

Installing Device Drivers for New LUNS (Configuration Function Menu)

Selecting this item on the main menu (see “Main Menu” on page 27) instructs TPM to tell the host computer to scan for new devices and update device drivers. To initiate this process, click **Install device drivers for new LUNS** on the main menu. The warning screen shown in Figure 3-38 appears.

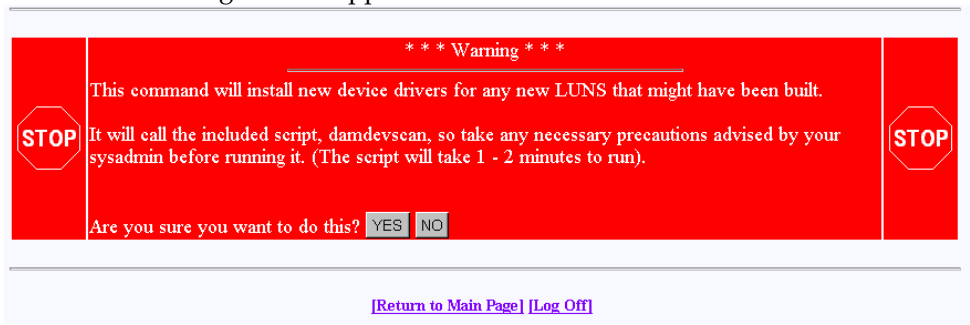


Figure 3-38 Install New Device Drivers Warning Screen

If you are running in a live environment with mounted LUNs, you need to be careful about executing this feature. For example, if you changed SAN mapping so logical drive #3 is mapped to LUN 0 instead of LUN 4, then you will make file systems disappear, and confuse your device drivers. This should be expected, of course. As stated earlier, TPM is not going to prevent you from doing something that would be detrimental to the system configuration.

Also, if you have cross-linked or improperly defined device drivers, running this function corrects the problem, but it also properly redefines drivers. This could also have an effect on mounted devices. Below are some operating system-specific comments:

- Linux: RedHat 6.2 does not support scanning for new devices. A reboot is recommended. However, if you manually remove your FC device driver, then re-install it, new devices are discovered. This saves you the trouble of rebooting, but the technique obviously can’t be used if other LUNs are active and mounted. After unloading the FC driver module, perform a reload. You can select new LUNs, which calls the `$DAM_HOME/damdevscan` shell script.
- IRIX: TPM calls the `$DAM_HOME/damdevscan` shell script.

  If the new LUNs haven't been discovered, a system reboot may be required in order to have the host recognize the new devices.
- Windows: A reboot is required after creating LUNs.

Send Command to Host (Configuration Function Menu)

Use this function to spawn a command line to the IRIX/Linux host that you are communicating with.

Note: The Windows OS does not support **Send Command to Host**. Therefore, it does not appear on the main menu.

When the program terminates, the resulting page is returned. In addition, any error messages going to **stderr** appear at the top of the result window. The output buffer is truncated to the first 95 KB worth of data.

This command is typically used to perform mounts, but TPM doesn't care what you do. Remember also that the command will be run as root, so please view the caveats above. To run the command, click **Send Command To Host** on the main menu. The screen shown in Figure 3-39 appears.

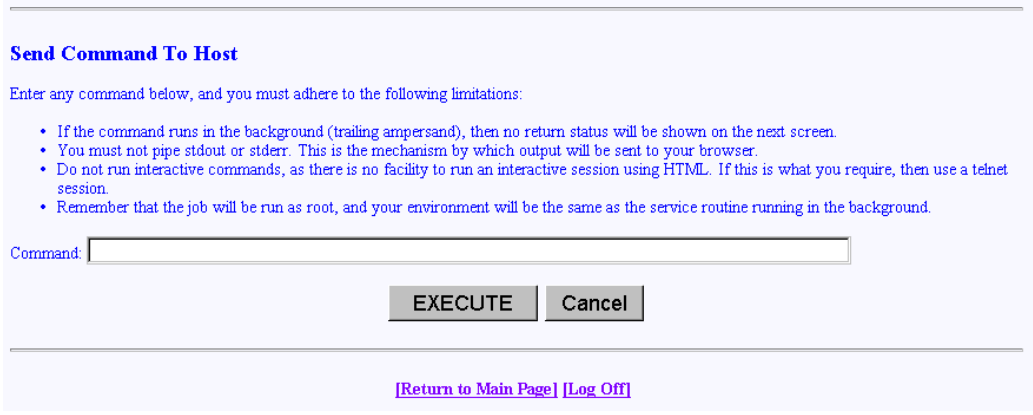


Figure 3-39 Send Command to Host

Note: Use only non-interactive commands (those that do not require a user response).

Type the appropriate command, then click **EXECUTE**.

Administrative Functions

The Administrative Functions menu is located on the main screen and is shown in Figure 3-40.

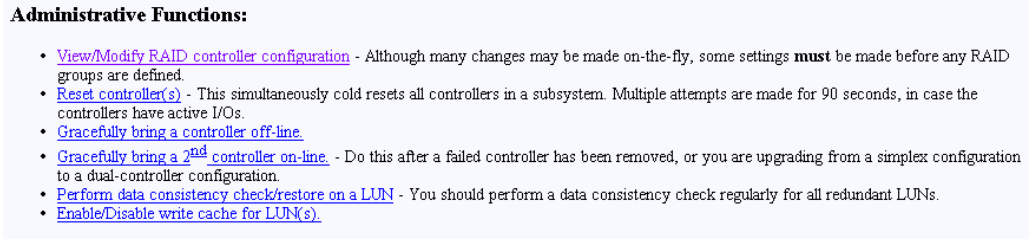


Figure 3-40 Administrative Functions Menu

This menu has the following selections, with the associated explanations on the indicated pages:

- “View/Modify RAID Controller Configuration” on page 79
- “Reset Controller(s)” on page 85
- “Gracefully Bring a Controller Off Line” on page 86
- “Gracefully Bring a 2nd Controller On Line” on page 87
- “Perform Data Consistency Check/Restore LUN” on page 88
- “Enable/Disable Write Cache for LUN(s)” on page 91

View/Modify RAID Controller Configuration

This menu selection lets you make changes to your controller. The most important thing to know is that changes labeled **On-the-fly** are immediate. Those marked **Reset** require a controller reset to become effective. The two choices labeled **New Config** can only be made when there are no defined LUNs, as they are data-destructive. When you click **View/Modify RAID controller configuration**, the dialog boxes appear as shown in Figure 3-41 and Figure 3-42 (for controllers with 6.14 firmware), and as shown in Figure 3-43 and Figure 3-44 (for controllers with 7.01 firmware). A partial dialog box is shown in each figure.

DAC960FFx Controller Configuration (Firmware Type: 5 Rev 6.14 Build #0) 128 MB Cache, Max #LUNs=8

Current	Value	Category	Description
☐	**Auto Rebuild Management**	**On-the-fly**	If enabled, it detects the replacement of a failed drive and performs an automatic rebuild once it has spun up, provided it is installed into a redundant array (RAID 1, RAID 3, RAID 5, RAID 0+1). If this feature is disabled, the administrator must issue the rebuild command manually through this configurator.
☐	**Operational Fault Management**	**Reset**	Allows the controller to take autonomous actions when a failure occurs. This monitors and reports drive failures, background activity completion status, enclosure events, etc. This should remain enabled during normal controller operation. ***(This is also known as SES, or SCSI Enclosure Services)***
16 KB	**Stripe Size**	**New Config**	This is the stripe size used by the controller to allocate cache lines in memory and data striping on disk. The value must **not** change once you have created LUNs as data loss **will** result. Also, certain firmware revisions won't even accept the command if any LUNs exist.
☑	**Read Ahead**	**Reset**	The controller extends commands to the corresponding *stripe unit* size. The controller reads data from disk in chunks of one stripe-unit size. Given an 8KB stripe size, a 2KB read, for example, results in 8KB read being issued to the drive. The remaining 6KB of data stays in the cache.
☐	**Super Read Ahead**	**Reset**	The controller extends the read-ahead algorithm by always reading an extra cache line on a read request, and reading a further cache line when a cache hit occurs on a pre-fetched cache line. This is primarily useful for applications with a high degree of sequential-ness.
☐	**Reassign limited to 1 sector**	**Reset**	If enabled, reassigns will be restricted to only one block, the failing block. If this is disabled al reassigns will be for the entire current I/O, some possibly large number of blocks, not all of them failing. The single block reassign is further limited to recovered errors and medium errors.
☐	**True Verify**	**Reset**	When enabled, and if the host enables verify on an I/O operation, and data is transferred, a true verify with data comparison is performed. When disabled, no data comparision is made.
☐	**Disk Write Through Verify**	**Reset**	During error handling, this turns on Force Unit Acces for reads and writes.
☐	**RAID-5 Algorithm Control**	**New Config**	If disabled, the algorithm is right asymmetric, if enabled, left asymmetric. (It is doubtful you will ever see a performance difference, regardless of the setting).
5	**Rebuild/Check Consistancy Rate Default**	**On-the-fly**	This value times 2 approximates the percentage of available rebuild cycles to be used when rebuilding a RAID group, or checking consistancy. CPU utilization is always shared with data traffic. Range 0-50. Therefore, a value of 50 devotes the maximum allowable resources to a drive rebuild or expansion, allowing it to proceed at its fastest. A lower number provides more resources to service other IOs.
64	**Disk Queue Limit**	**On-the-fly**	Sets the maximum allowed queue depth for tagged commands to each attached drive. This is further limited to the drive's own tag limit when that limit is reached. Do not change this value unless specificically directed to do so (The valid range is 1-230.
☑	**Queuing - Coalescing Optimization**	**On-the-fly**	If enabled, this will join the data from adjacent I/Os into a single I/O to improve performance.
☐	**Enable On queue full give BUSY**	**Reset**	Any time a command is received and the controller detects a queue full condition, it will normally return Queue Full status. If enabled, a queue full status will return a **BUSY** status, if disabled, it will return **QUEUE FULL**. This is intended to help hosts that are confused by QUEUE FULL.
☑	**Failover Node Name Retention**	**Reset**	If enabled, each controller shares its node name with its partner controller and those names are used through all phases of failover and failback. If disabled, each controller still shares its node name with its partner controller, and those names are still used through all phases of a failover, **BUT** when a failback occurs the replacement controller uses its own node name. Not having this feature enabled will have serious ramifications if the controllers are connected to a host that uses node names to locate the LUNs.
☑	**SAF-TE Data for UPS Support**	**On-the-fly**	If checked, then ups monitoring is disabled.
24	**Max Number of Active Commands**	**Reset**	Sets the maximum number of simultaneous commands. Range is (64-244).
☑	**Enable DEBUG Port**	**Reset**	If checked, then debug output will go to the serial port. This is for Engineering and Diagnostic purposes only, and will result in a performance loss if enabled. If not checked, then the port will be in SLP (no jumper) or VT100 mode (jumper - Standard Mode).

Figure 3-41 View/Modify Controller Configuration (partial for 6.14 Firmware)

☐	**Enable Vendor Unique TUR**	**Reset**	If checked, a Test Unit Ready command sent from the host to an off-line LUN will return a hard error status (4/00/00). If clear, then it will return a not ready status (2/04/03).
☑	**Disable Check Condition for Invalid LUN**	**Reset**	If checked, the inquiry command will return data with the peripheral qualifier field set to 1 or 0x20 for the byte meaning peripheral not connected. If clear, the inquiry will fail with check condition of illegal request (sense=5/25/00).
☐	**Disable Pause when Not Ready**	**Reset**	Normally, when controller is starting up, certain commands encounter a brief pause. If this field is checked, the pause is disabled, otherwise, it is enabled.
☐	**Disable BUSY status on failback**	**Reset**	During failback, the survivor controller normally returns BUSY to new commands received from the host during the cache flush operation. If checked, requests are ignored. If unchecked, BUSY status is returned. This feature is intended to help hosts that are confused by a BUSY.
19200	**Serial Port BAUD Rate**	**Reset**	The baud rate of the serial port when in VT100 or Debug modes.
☑	**Force Simplex Mode**	**Reset**	This is provided to allow duplex firmware to serve in a simplex environment, and makes duplex firmware skip some of the active-active operations. If you check this field in a duplex environment, then one of the controllers will go into reset.
☐	**Conservative Cache Mode**	**On-the-fly**	This provides an extra degree of data safety when operating in failed over condition. This turns off write cache while the failed over condition persists. Checking this field enables conservative cache mode.
☐	**Simplex Disable Reset**	**Reset**	For simplex-only. If checked, prevents a controller from asserting the reset signal to the partner controller.
2048 Bytes	**Fibre Channel Frame Control**	**Reset**	Provided to allow adjustment of the FC chip's frame size. Unless you are almost always doing very small block I/O, then you would want this set to **2048**.
512 Bytes	**PCI Latency Control**	**Reset**	Provided to allow adjustment of the FC chip's use of the internal bus. It controls the amount of data each FC processor chip can burst across the primary bus before relinquishing bus ownership to the next device. This takes effect only when all internal FC bus ports are active and arbitrating. Ordinarily you should leave this set to the factory default value of **512**. If you are in a high throughput environment, then you *may* see a slight performance advantage if you change the value to **2048**.
☑	**Enable Hard Loop IDs**	**Reset**	This allows you to force the hard loop ID's for every controller and port. The fields below are used to assign them. Do not enable this feature unless you set appropriate values for your controllers. Changes will not go into effect until you issue a reset or recyle power to the array.
Ctrl0 Port0 10 Ctrl1 Port0 0	**Hard Loop IDs for each controller and port**	**Reset**	Allows option of using the same loop IDs all the time. Some fibre HBAs require non-default settings here. Contact your supplier for details. The valid range is 0-125 (0 - 0x7d). Enter a decimal number. ***Do not adjust these numbers unless instructed to do so by your vendor's technical support team.***
☑	**Smart Large Host Transfers**	**On-the-fly**	If checked, large transfers will coalesce into fewer I/Os, which means fewer disconnects on large transfers. This only takes effect for transfers larger than the stripe size. If enabled, you will have a slightly higher throughput, at a possible cost of some IOPs.
Automatic	**Spin-Up Settings**	**On-the-fly**	2 # of Devices to spin up at a time. Ignored for "On Power" mode. 6 # of seconds to delay. For "Automatic", time between disk spin-up cycles. For "On Power", time before issuing start-up commands. For "On Command", time between disk spin-up cycles. 0 # of seconds between subsequent spin-ups. Only applicable to "On Power"

Notes:

1. Settings characterized as Reset require that the controllers be reset before the new settings are invoked.
2. Settings characterized as On-the-fly may be made at any time, and will become effective immediately.
3. Settings characterized as New Config must be made during initial configuration, before any LUNs are created. **They will result in data loss of existing RAID groups.**

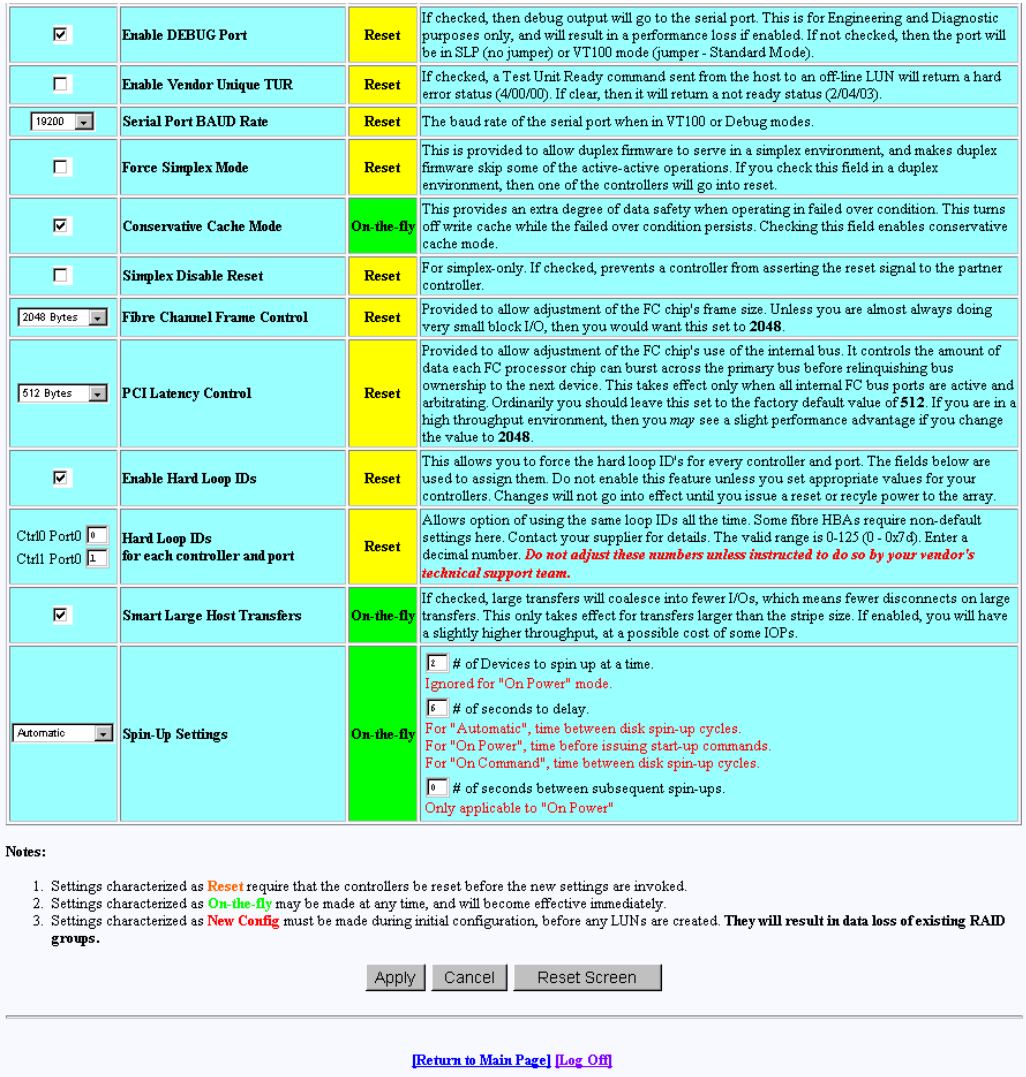
Apply Cancel Reset Screen

Figure 3-42 View/Modify Controller Configuration (partial for 6.14 Firmware)

DAC960FFx Controller Configuration (Firmware Type 7 Rev 7.01 Build #0) 128 MB Cache, Max #LUNs=32

Current	Value	Category	Description
☑	**Auto Rebuild Management**	**On-the-fly**	If enabled, it detects the replacement of a failed drive and performs an automatic rebuild once it has spun up, provided it is installed into a redundant array (RAID 1, RAID 3, RAID 5, RAID 0+1). If this feature is disabled, the administrator must issue the rebuild command manually through this configurator.
☑	**Operational Fault Management**	**Reset**	Allows the controller to take autonomous actions when a failure occurs. This monitors and reports drive failures, background activity completion status, enclosure events, etc. This should remain enabled during normal controller operation. ***(This is also known as SES, or SCSI Enclosure Services)***
☑	**Auto Failback**	**Reset**	Allows the surviving controller to automatically sense and place an inserted replacement controller back in service.
☑	**Read Ahead**	**Reset**	The controller extends commands to the corresponding *stripe unit* size. The controller reads data from disk in chunks of one stripe-unit size. Given an 8KB stripe size, a 2KB read, for example, results in 8KB read being issued to the drive. The remaining 6KB of data stays in the cache.
☐	**Super Read Ahead**	**Reset**	The controller extends the read-ahead algorithm by always reading an extra cache line on a read request, and reading a further cache line when a cache hit occurs on a pre-fetched cache line. This is primarily useful for applications with a high degree of sequential-ness.
☑	**Reassign limited to 1 sector**	**Reset**	If enabled, reassigns will be restricted to only one block, the failing block. If this is disabled al reassigns will be for the entire current I/O, some possibly large number of blocks, not all of them failing. The single block reassign is further limited to recovered errors and medium errors.
☐	**True Verify**	**Reset**	When enabled, and if the host enables verify on an I/O operation, and data is transferred, a true verify with data comparison is performed. When disabled, no data comparision is made.
☐	**Disk Write Through Verify**	**Reset**	During error handling, this turns on Force Unit Access for reads and writes.
5	**Rebuild/Check Consistancy Rate Default**	**On-the-fly**	This value times 2 approximates the percentage of available rebuild cycles to be used when rebuilding a RAID group, or checking consistancy. CPU utilization is always shared with data traffic. Range 0-50. Therefore, a value of 50 devotes the maximum allowable resources to a drive rebuild or expansion, allowing it to proceed at its fastest. A lower number provides more resources to service other IOs.
24	**Max Number of Active Commands**	**Reset**	Sets the maximum number of simultaneous commands. Range is (64-244).
☑	**Queuing - Coalescing Optimization**	**On-the-fly**	If enabled, this will join the data from adjacent I/Os into a single I/O to improve performance.
☐	**Enable On queue full give BUSY**	**Reset**	Any time a command is received and the controller detects a queue full condition, it will normally return Queue Full status. If enabled, a queue full status will return a **BUSY** status, if disabled, it will return **QUEUE FULL**. This is intended to help hosts that are confused by QUEUE FULL.
☐	**Failover Node Name Retention**	**Reset**	If enabled, each controller shares its node name with its partner controller and those names are used through all phases of failover and failback. If disabled, each controller still shares its node name with its partner controller, and those names are still used through all phases of a failover, **BUT** when a failback occurs the replacement controller uses its own node name. Not having this feature enabled will have serious ramifications if the controllers are connected to a host that uses node names to locate the LUNs.
☐	**SAF-TE Data for UPS Support**	**On-the-fly**	If checked, then ups monitoring is disabled.
☐	**Disable Check Condition for Invalid LUN**	**Reset**	If checked, the inquiry command will return data with the peripheral qualifier field set to 1 or 0x20 for the byte meaning peripheral not connected. If clear, the inquiry will fail with check condition of illegal request (sense=5/25/00).
☑	**Disable Pause when Not Ready**	**Reset**	Normally, when controller is starting up, certain commands encounter a brief pause. If this field is checked, the pause is disabled, otherwise, it is enabled.
☑	**Disable BUSY status on failback**	**Reset**	During failback, the survivor controller normally returns BUSY to new commands received from the host during the cache flush operation. If checked, requests are ignored. If unchecked, BUSY status is returned. This feature is intended to help hosts that are confused by a BUSY.

Figure 3-43 View/Modify Controller Configuration (partial for 7.01 Firmware)



☑	**Enable DEBUG Port**	**Reset**	If checked, then debug output will go to the serial port. This is for Engineering and Diagnostic purposes only, and will result in a performance loss if enabled. If not checked, then the port will be in SLP (no jumper) or VT100 mode (jumper - Standard Mode).
☐	**Enable Vendor Unique TUR**	**Reset**	If checked, a Test Unit Ready command sent from the host to an off-line LUN will return a hard error status (4/00/00). If clear, then it will return a not ready status (2/04/03).
19200	**Serial Port BAUD Rate**	**Reset**	The baud rate of the serial port when in VT100 or Debug modes.
☐	**Force Simplex Mode**	**Reset**	This is provided to allow duplex firmware to serve in a simplex environment, and makes duplex firmware skip some of the active-active operations. If you check this field in a duplex environment, then one of the controllers will go into reset.
☑	**Conservative Cache Mode**	**On-the-fly**	This provides an extra degree of data safety when operating in failed over condition. This turns off write cache while the failed over condition persists. Checking this field enables conservative cache mode.
☐	**Simplex Disable Reset**	**Reset**	For simplex-only. If checked, prevents a controller from asserting the reset signal to the partner controller.
2048 Bytes	**Fibre Channel Frame Control**	**Reset**	Provided to allow adjustment of the FC chip's frame size. Unless you are almost always doing very small block I/O, then you would want this set to **2048**.
512 Bytes	**PCI Latency Control**	**Reset**	Provided to allow adjustment of the FC chip's use of the internal bus. It controls the amount of data each FC processor chip can burst across the primary bus before relinquishing bus ownership to the next device. This takes effect only when all internal FC bus ports are active and arbitrating. Ordinarily you should leave this set to the factory default value of **512**. If you are in a high throughput environment, then you *may* see a slight performance advantage if you change the value to **2048**.
☑	**Enable Hard Loop IDs**	**Reset**	This allows you to force the hard loop ID's for every controller and port. The fields below are used to assign them. Do not enable this feature unless you set appropriate values for your controllers. Changes will not go into effect until you issue a reset or recyle power to the array.
Ctrl0 Port0 0 Ctrl1 Port0 1	**Hard Loop IDs for each controller and port**	**Reset**	Allows option of using the same loop IDs all the time. Some fibre HBAs require non-default settings here. Contact your supplier for details. The valid range is 0-125 (0 - 0x7d). Enter a decimal number. ***Do not adjust these numbers unless instructed to do so by your vendor's technical support team.***
☑	**Smart Large Host Transfers**	**On-the-fly**	If checked, large transfers will coalesce into fewer I/Os, which means fewer disconnects on large transfers. This only takes effect for transfers larger than the stripe size. If enabled, you will have a slightly higher throughput, at a possible cost of some IOPs.
Automatic	**Spin-Up Settings**	**On-the-fly**	2 # of Devices to spin up at a time. Ignored for "On Power" mode. 6 # of seconds to delay. For "Automatic", time between disk spin-up cycles. For "On Power", time before issuing start-up commands. For "On Command", time between disk spin-up cycles. 0 # of seconds between subsequent spin-ups. Only applicable to "On Power"

Notes:

1. Settings characterized as Reset require that the controllers be reset before the new settings are invoked.
2. Settings characterized as On-the-fly may be made at any time, and will become effective immediately.
3. Settings characterized as New Config must be made during initial configuration, before any LUNs are created. **They will result in data loss of existing RAID groups.**

Apply Cancel Reset Screen

[Return to Main Page] [Log Off]

Figure 3-44 View/Modify Controller Configuration (partial for 7.01 Firmware)

The following selections appear on the 6.14 firmware dialog box that do not appear on the 7.01 dialog box:

- Stripe Size. In controllers with 7.01 firmware, the stripe size is selected when the LUN is being defined (see Figure 3-13 on page 48). When controllers with 6.14 firmware are used, the stripe size must be defined using the **View/Modify Controller** dialog box before the LUN is defined.
- Disk Queue Limit (not viewable or changeable with controllers that have 7.01 firmware).

The Auto Failback selection appears for 7.01 firmware only. It is not viewable or changeable with controllers that have 6.14 firmware.

Make as many changes as you desire on the screen, then click the **Apply** button, which saves the new configuration on all controllers, as well as the COD area on your RAID subsystem's disk drives. The **Reset Screen** button changes the settings to the default values (the ones appearing when the screen was first selected).

Reset Controller(s)

When the Reset Controller(s) menu selection is made, the screen shown in Figure 3-45 appears.

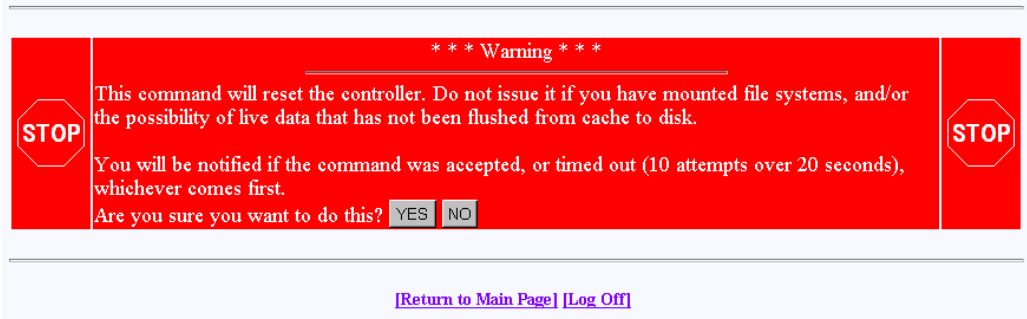


Figure 3-45 Reset Controllers Warning Screen

Click **YES** if you wish to reset your controller. If the system is a dual-controller configuration, clicking **YES** resets both controllers. Otherwise, click **NO** or the **[Return to Main Page]** link.

If you are not running Linux, you will see the screens shown in Figure 3-46 and Figure 3-47. These screens indicate when the controllers are back on-line. Click the close button (X) or press the **Close This Window** button after the controllers have reset.

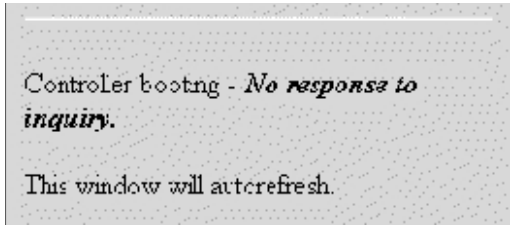


Figure 3-46 Controller Booting Window

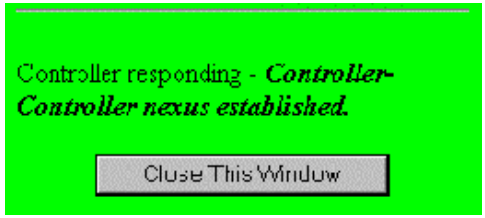


Figure 3-47 Controller Responding Window

As a protective measure, if the controllers are busy servicing I/Os, the Reset command will not be accepted.

Gracefully Bring a Controller Off Line

When the **Gracefully Bring a Controller Off Line** menu selection is made, the screen shown in Figure 3-48 appears.

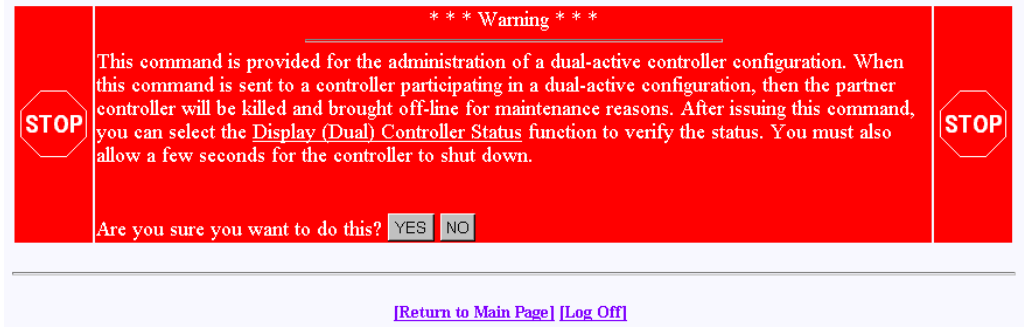


Figure 3-48 Warning Screen

Click **YES** button to initiate a controller failover. This is typically done for disaster recovery testing. You could also do the testing by physically removing a controller, but this lets you accomplish the same thing without touching the disk array.

Gracefully Bring a 2nd Controller On Line

When the **Gracefully Bring a 2nd Controller On Line** menu selection is made, the screen shown in Figure 3-49 appears.

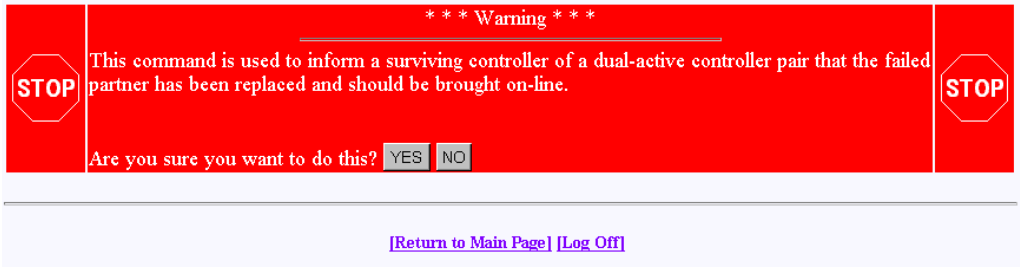


Figure 3-49 Warning Screen

When a failed controller is replaced, the system either automatically detects the replacement (if configured for automatic failback), or is informed of the replacement by issuing this command. The following steps outline the failback process executed by the surviving controller:

1. A replacement controller is detected.
2. The surviving controller releases its partner from reset.
3. Once the replacement controller completes initialization and is ready to resume I/O requests, the surviving controller quiesces both ports by responding with BUSY status to new I/O requests.
4. The surviving controller disables the failover port or secondary ID.
5. The surviving controller enables its primary ports.
6. The replacement controller enables its primary ports.
7. Both controllers disable conservative cache (if enabled) for write-back system drives and resume normal dual-active controller operation.

Click **YES** to force the failback.

Note: A replacement controller is held reset if a consistency check is in progress.

Perform Data Consistency Check/Restore LUN

When the **Perform Data Consistency Check/Restore LUN** menu selection is made, the screen shown in Figure 3-50 appears.

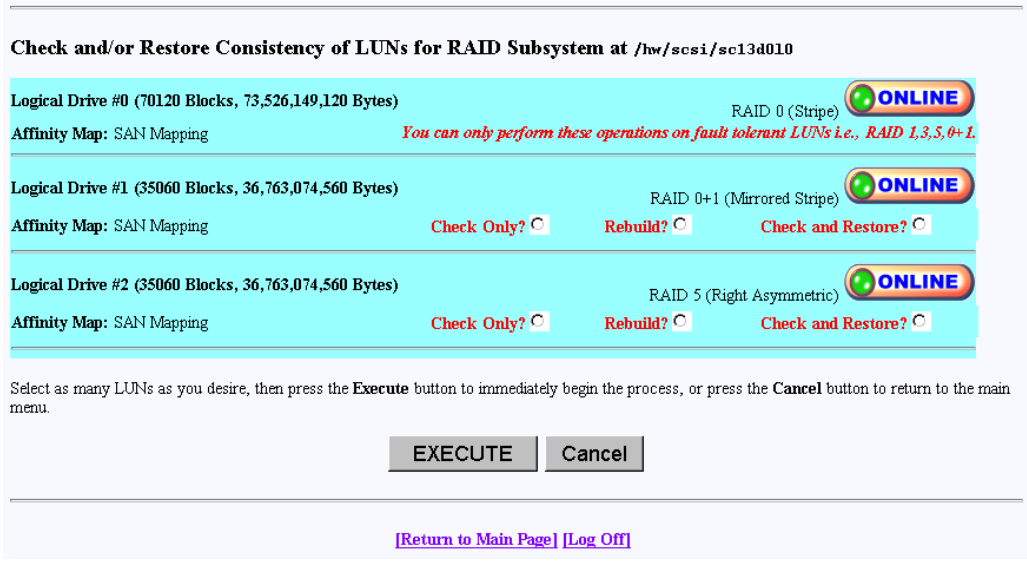


Figure 3-50 Data Consistency Check/Restore

Use this screen to initiate a check and/or repair on a logical drive. To execute this process, the logical drive must be configured for high-availability RAID.

There are several reasons why the check or restore could be denied, and TPM reports the reasons if the request is rejected. The most common reasons are that there is no on-line spare disk to be used to repair the LUN, or more than one rebuild at a time is being attempted.

If you click **EXECUTE** to begin execute any of the check or restore actions, the dialog box of Figure 3-51 appears, indicating that the process has started.

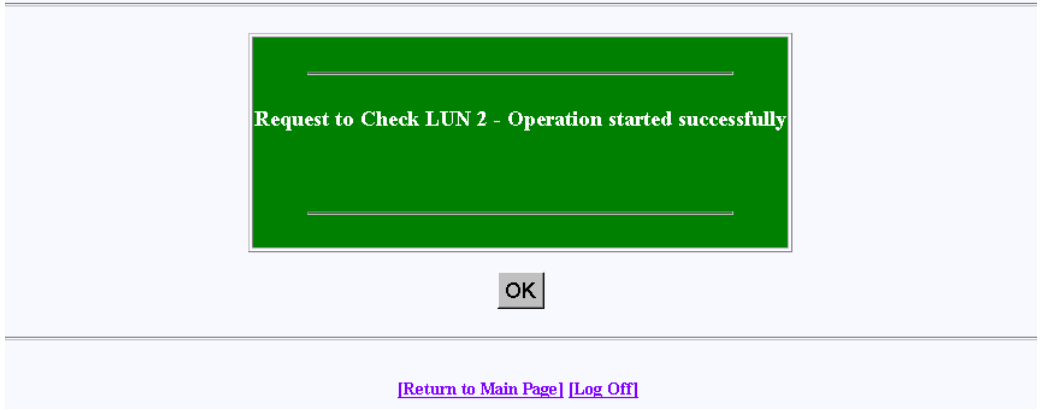


Figure 3-51 Operation Started Dialog Box

Click **OK** to proceed.

The window shown in Figure 3-53 (for 6.14 firmware) or Figure 3-53 (for 7.01 firmware) shows the progress a few minutes after initiating a Check and Restore for Logical Drive #0, and 15 minutes after starting a LUN Initialization (format).

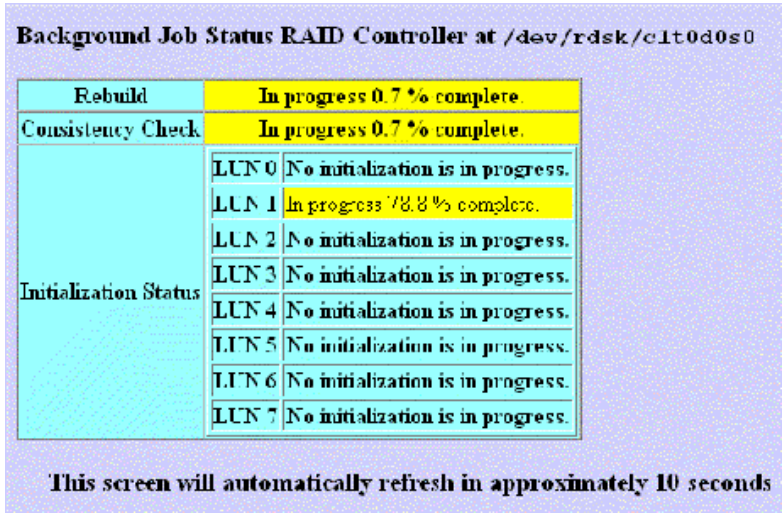


Figure 3-52 Background Status Screen (6.14 Firmware)

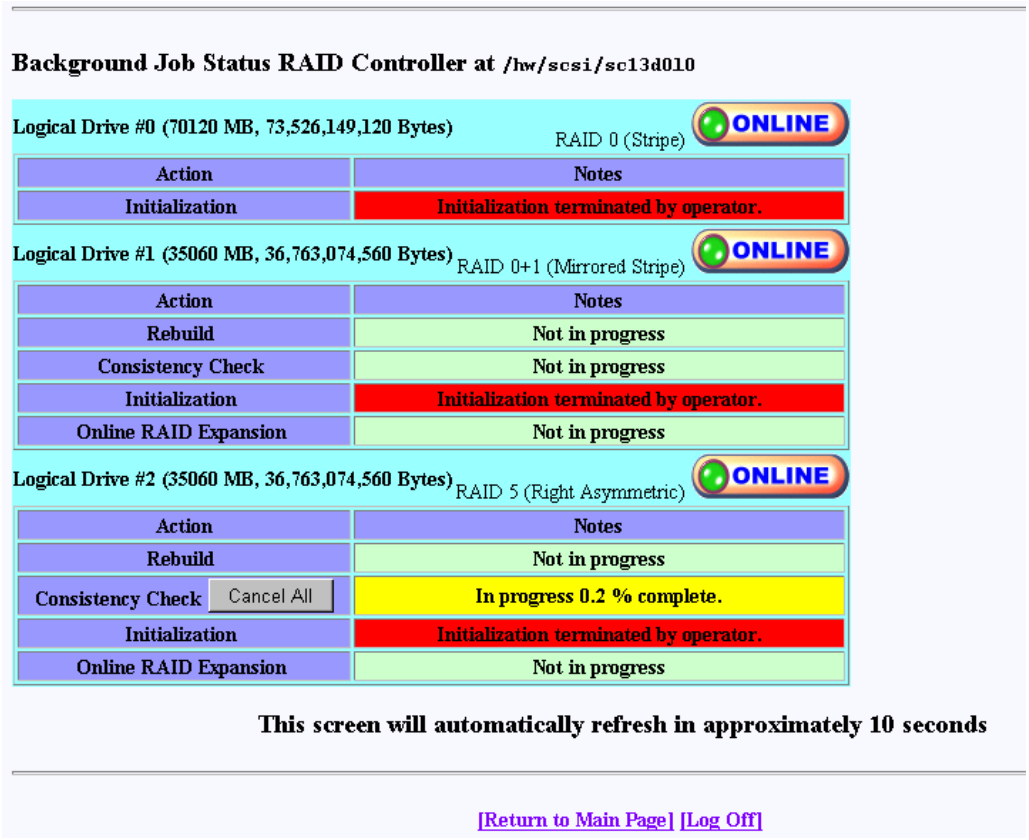


Figure 3-53 Background Status Screen (7.01 Firmware)

Enable/Disable Write Cache for LUN(s)

When the **Enable/Disable Write Cache for LUN(s)** menu selection is made, the dialog box shown in Figure 3-54 appears.

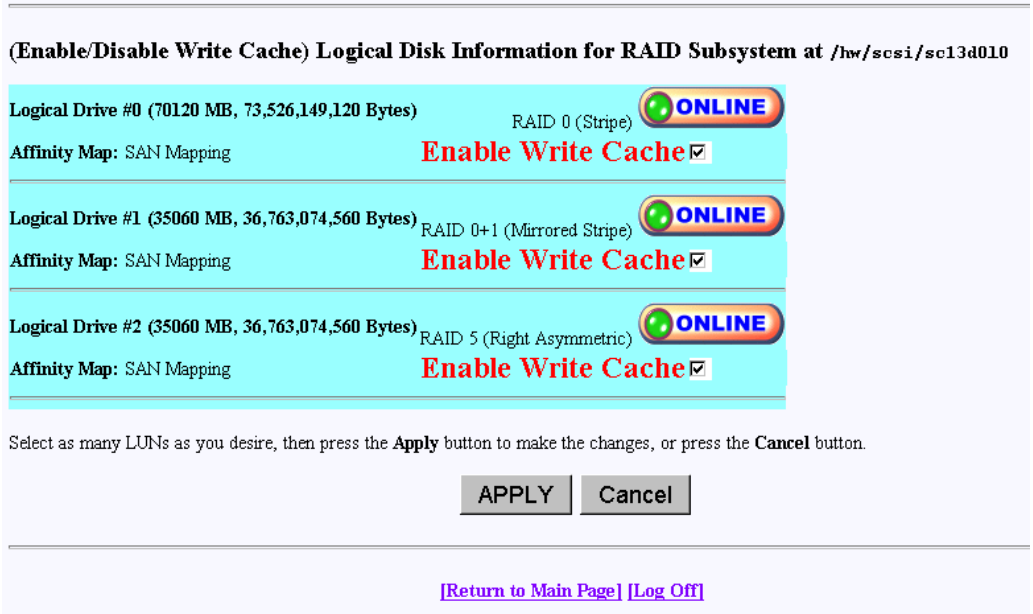


Figure 3-54 Enable Write Cache For LUN(s)

Select the LUNs where you want the cache enabled or disabled and click **Apply** at the bottom of the screen.

Reporting Functions

The Reporting Functions menu is located on the main screen and is shown in Figure 3-55 for 6.14 controller firmware and in Figure 3-56 for 7.01 controller firmware.

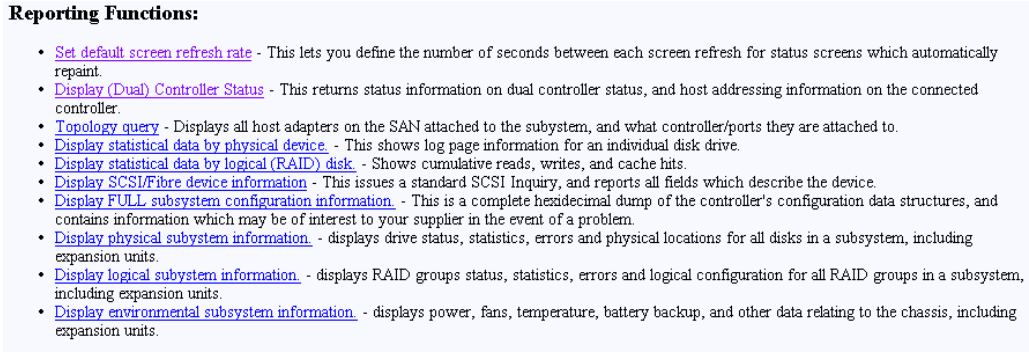


Figure 3-55 Reporting Functions Menu (for 6.14 Firmware)

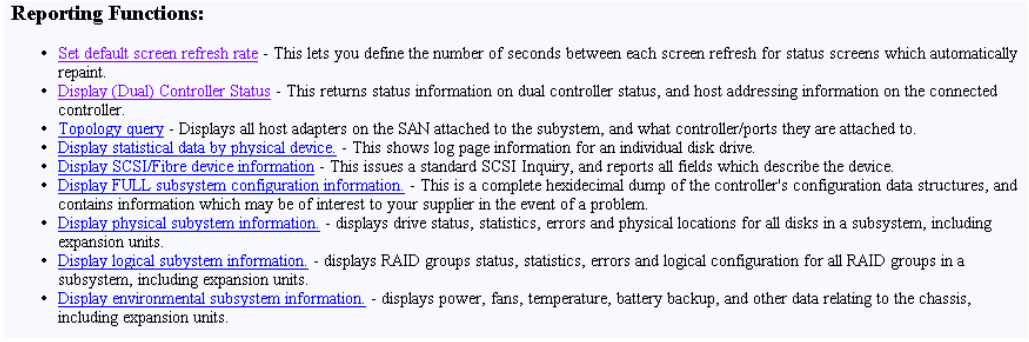


Figure 3-56 Reporting Functions Menu (for 7.01 Firmware)

The Reporting Functions menu has the following selections, with the associated explanations on the indicated pages:

- "Set Default Screen Refresh Rate" on page 93
- "Display (Dual) Controller Status" on page 94
- "Topology Query" on page 95
- "Display Statistical Data by Physical Device" on page 96

Set Default Screen Refresh Rate

When the **Set Default Screen Refresh Rate** menu selection is made, the screen shown in Figure 3-57 appears.

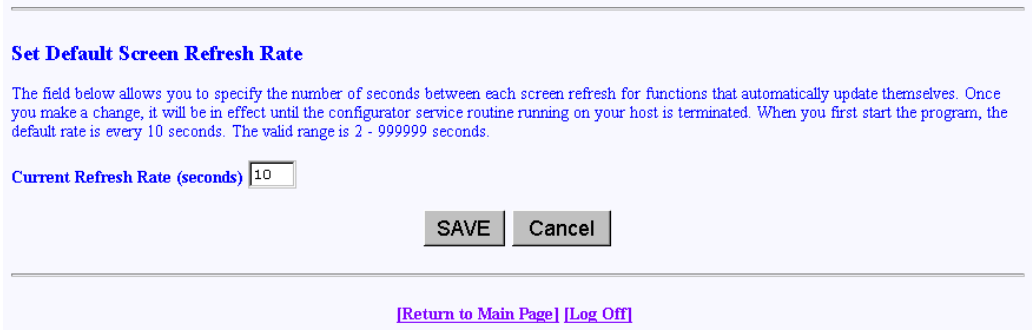


Figure 3-57 Default Screen Refresh Rate

Enter the desired screen refresh rate in seconds and click **SAVE**.

Display (Dual) Controller Status

When the **Display (Dual) Controller Status** menu selection is made, the screen shown in Figure 3-58 appears.

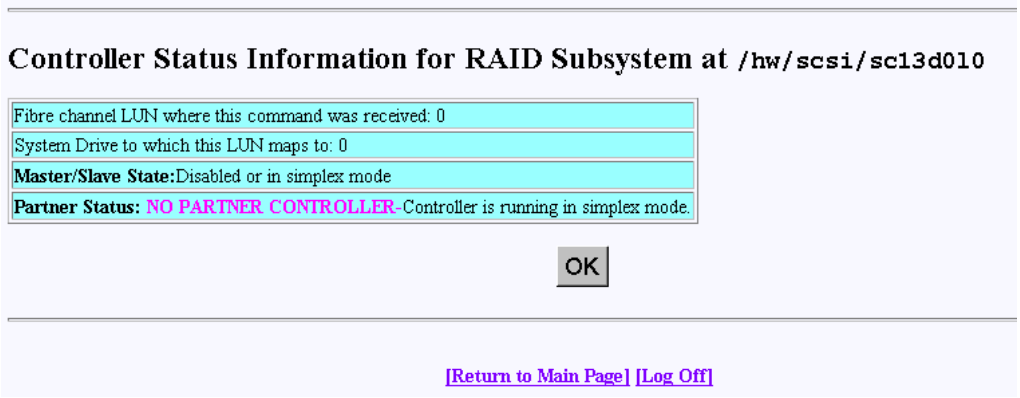


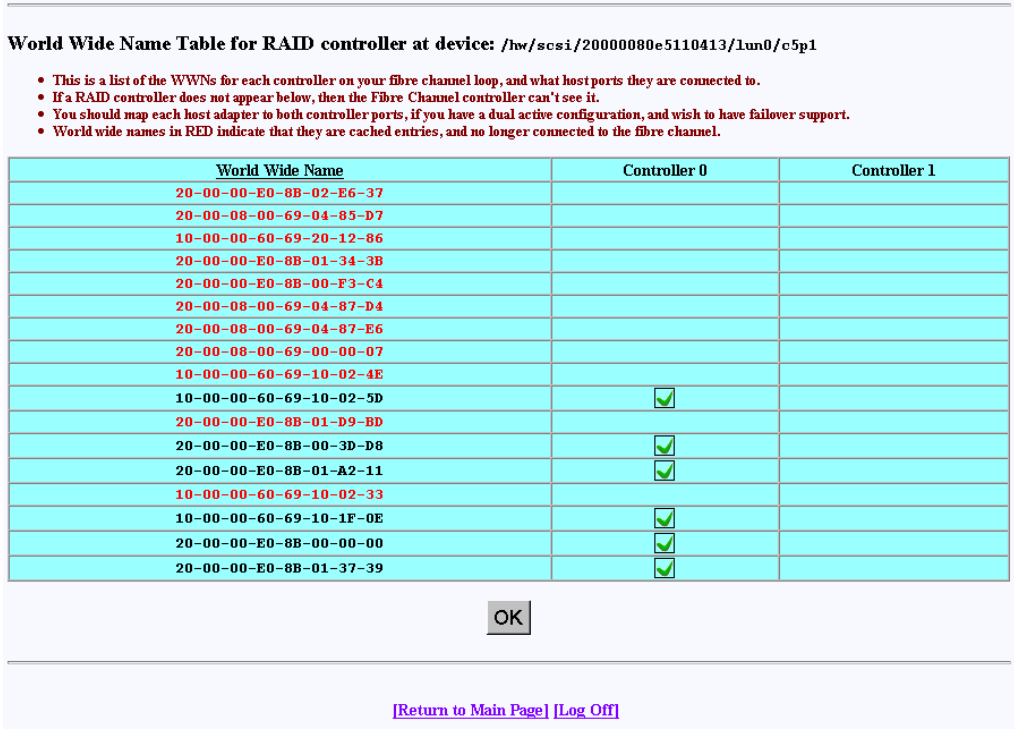
Figure 3-58 Controller Status Information

This Screen displays information about the controller(s) and whether or not they are working together. There are nearly 100 different error or warning messages that can be returned, and this could be quite useful in the event you have a controller failure.

You should also periodically check this screen during normal operations to make sure that all is well. In some cases you may have a controller failure which does NOT result in an audible or visual alarm.

Topology Query

When the **Topology Query** menu selection is made, the screen shown in Figure 3-59 appears.



World Wide Name Table for RAID controller at device: /hw/scsi/20000080e5110413/lun0/c5p1

- This is a list of the WWNs for each controller on your fibre channel loop, and what host ports they are connected to.
- If a RAID controller does not appear below, then the Fibre Channel controller can't see it.
- You should map each host adapter to both controller ports, if you have a dual active configuration, and wish to have failover support.
- World wide names in RED indicate that they are cached entries, and no longer connected to the fibre channel.

World Wide Name	Controller 0	Controller 1
20-00-00-E0-8B-02-E6-37		
20-00-08-00-69-04-85-D7		
10-00-00-60-69-20-12-86		
20-00-00-E0-8B-01-34-3B		
20-00-00-E0-8B-00-F3-C4		
20-00-08-00-69-04-87-D4		
20-00-08-00-69-04-87-E6		
20-00-08-00-69-00-00-07		
10-00-00-60-69-10-02-4E		
10-00-00-60-69-10-02-5D	☑	
20-00-00-E0-8B-01-D9-BD		
20-00-00-E0-8B-00-3D-D8	☑	
20-00-00-E0-8B-01-A2-11	☑	
10-00-00-60-69-10-02-33		
10-00-00-60-69-10-1F-0E	☑	
20-00-00-E0-8B-00-00-00	☑	
20-00-00-E0-8B-01-37-39	☑	

OK

[Return to Main Page] [Log Off]

Figure 3-59 Topology Query

This screen displays a list of Fibre Channel host adapters that are (or were) attached to the RAID controller. Use this screen to view limited topology information.

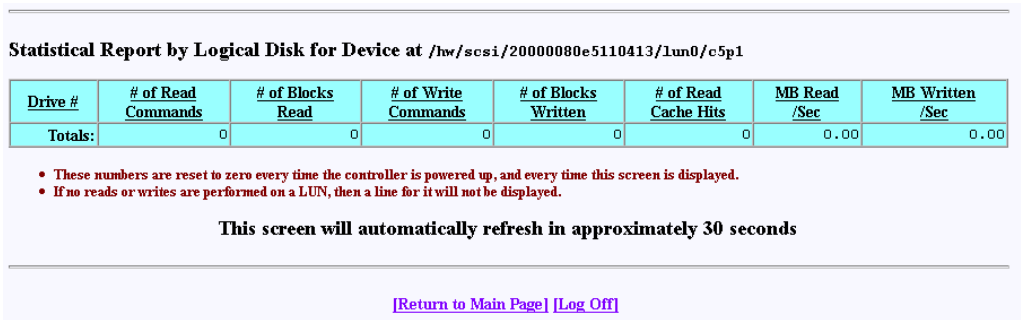
Note: This is a **read-only** display. No parameters can be changed.

Display Statistical Data by Physical Device

Note: This function is not supported by the TP9100 RAID system. It is only for JBOD environments.

Display Statistical Data by Logical (RAID) Disk (6.14 Firmware Only)

When the **Display Statistical Data by Logical RAID Disk** menu selection is made, the screen shown in Figure 3-60 appears.



Statistical Report by Logical Disk for Device at `/hw/scsi/20000080e5110413/lun0/c5p1`

Drive #	# of Read Commands	# of Blocks Read	# of Write Commands	# of Blocks Written	# of Read Cache Hits	MB Read /Sec	MB Written /Sec
Totals:	0	0	0	0	0	0.00	0.00

- These numbers are reset to zero every time the controller is powered up, and every time this screen is displayed.
- If no reads or writes are performed on a LUN, then a line for it will not be displayed.

This screen will automatically refresh in approximately 30 seconds

[Return to Main Page] [Log Off]

Figure 3-60 Statistical Data for Logical Devices (for 6.14 Firmware)

This screen displays cumulative reads and writes for all logical drives since the last polling period. If no I/Os occurred, nothing is displayed. In the screen above, drives number 0 through 3 were just initialized, and no other operations were done during that time.

All numbers reset every time the screen is brought up. Use this screen to view the actual number of I/O operations that get serviced by each LUN during the 10-second polling period.

Display SCSI/Fibre Device Information

When the **Display SCSI/Fibre Device Information** menu selection is made, the screen shown in Figure 3-61 appears.

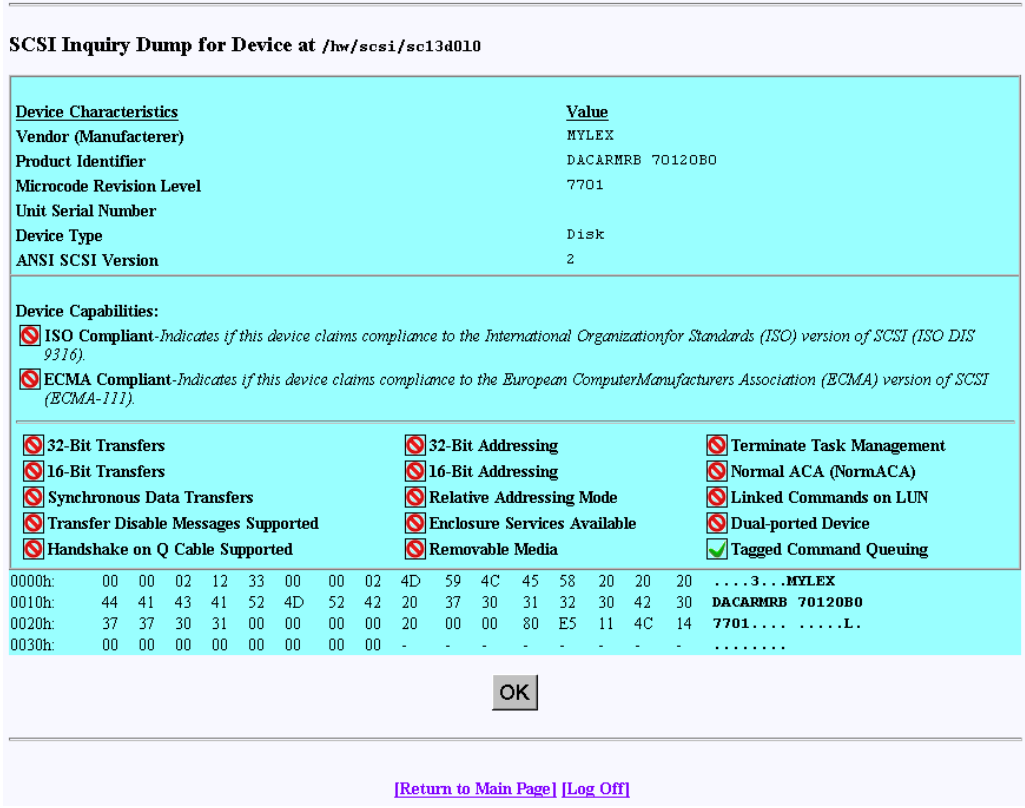


Figure 3-61 Display SCSI/Fibre Device Information

The screen shows what the standard SCSI inquiry returns for a device or LUN. Use it for diagnostic reasons, or to help analyze any SCSI or Fibre Channel device attached to your computer.

Display FULL Subsystem Configuration Information

When the **Display FULL Subsystem Configuration Information** menu selection is made, the screen shown in Figure 3-62 appears.

Hexidecimal Diagnostic Dump for Subsystem on device /hw/scsi/20000080e5110413/lun0/c5p1:

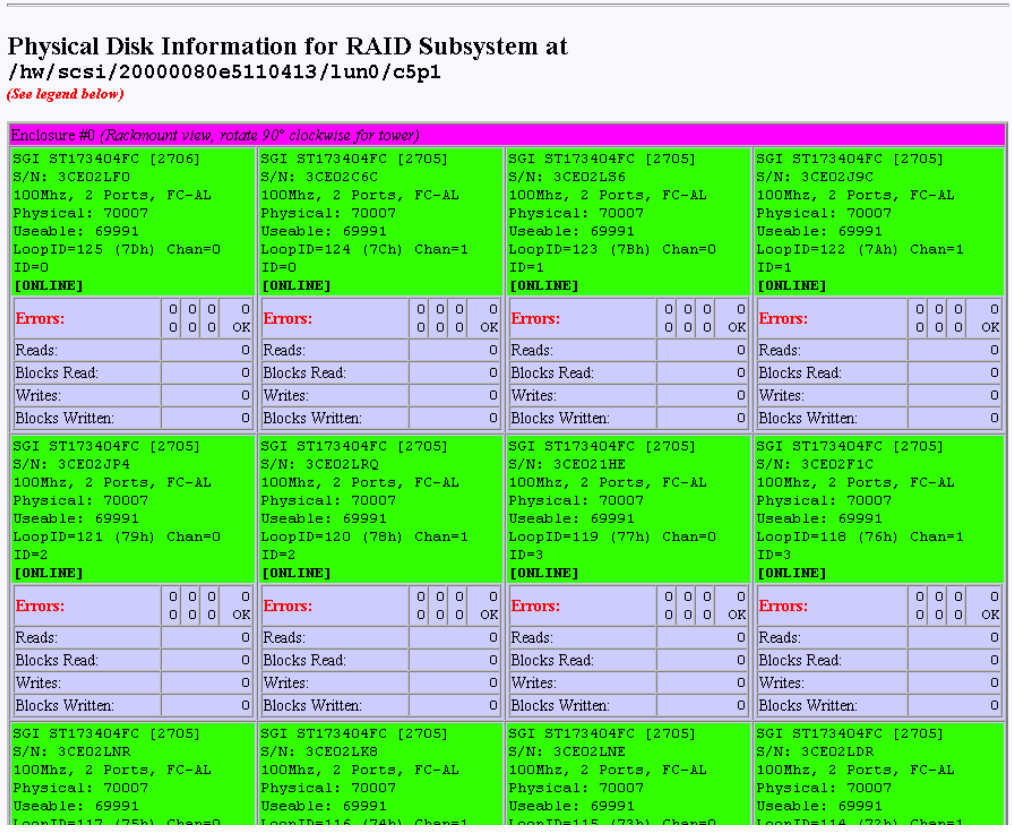
0000h:	00	00	00	53	34	12	00	00	04	00	00	20	03	86	03	00	...S4..... ....
0010h:	01	00	00	00	00	00	00	00	00	00	00	00	00	38	8B	08	.....8..
0020h:	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
0030h:	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
0040h:	00	00	00	00	01	00	00	00	00	01	00	00	00	00	00	00	.....
0050h:	00	38	8B	08	00	00	00	00	00	00	00	00	00	00	00	00	.8.....
0060h:	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
0070h:	00	00	00	00	00	00	00	00	01	00	00	00	01	01	00	00	.....
0080h:	00	00	00	00	00	38	8B	08	00	00	00	00	00	00	00	00	.....8.....
0090h:	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
00A0h:	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
00B0h:	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
00C0h:	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
00D0h:	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
00E0h:	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
00F0h:	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
0100h:	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
0110h:	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
0120h:	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
0130h:	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
0140h:	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
0150h:	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
0160h:	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
0170h:	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
0180h:	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....

Figure 3-62 Subsystem Configuration Information (partial screen)

This screen contains a portion of the 4,660 byte-long hexadecimal dump of the controller configuration file. This would be of interest to the technical support group in the event of a problem, or would prove helpful to verify that several subsystem configurations have properly been cloned.

Display Physical Subsystem Information

When the **Display Physical Subsystem Information** menu selection is made, the screen shown in Figure 3-63 and Figure 3-64 appear (for controllers with 6.14 firmware). Figure 3-65 and Figure 3-66 appear for controllers with 7.01 firmware.

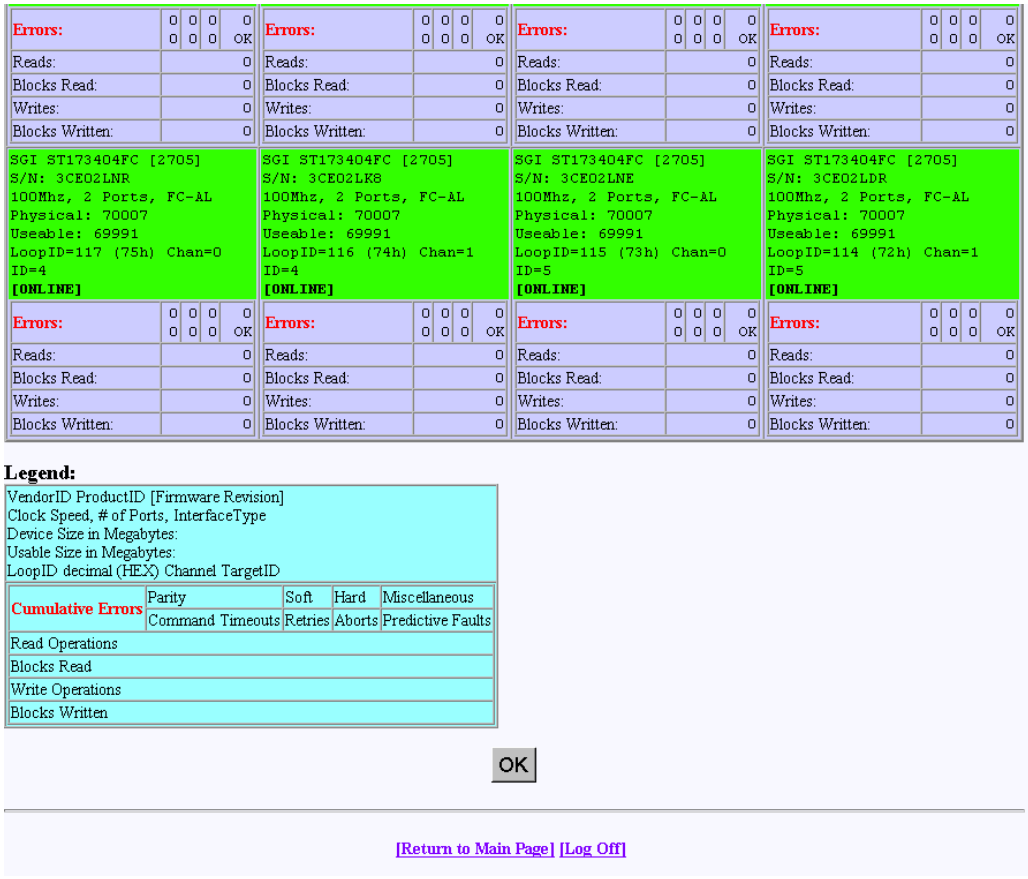


Physical Disk Information for RAID Subsystem at
/hw/scsi/20000080e5110413/lun0/c5p1
(See legend below)

Enclosure #0 *(Rackmount view, rotate 90° clockwise for tower)*

SGI ST173404FC [2706] S/N: 3CE02LFO 100Mhz, 2 Ports, FC-AL Physical: 70007 Useable: 69991 LoopID=125 (7Dh) Chan=0 ID=0 **[ONLINE]**	SGI ST173404FC [2705] S/N: 3CE02C6C 100Mhz, 2 Ports, FC-AL Physical: 70007 Useable: 69991 LoopID=124 (7Ch) Chan=1 ID=0 **[ONLINE]**	SGI ST173404FC [2705] S/N: 3CE02LS6 100Mhz, 2 Ports, FC-AL Physical: 70007 Useable: 69991 LoopID=123 (7Bh) Chan=0 ID=1 **[ONLINE]**	SGI ST173404FC [2705] S/N: 3CE02J9C 100Mhz, 2 Ports, FC-AL Physical: 70007 Useable: 69991 LoopID=122 (7Ah) Chan=1 ID=1 **[ONLINE]**
Errors: 0 0 0 0 0 0 0 0 OK	Errors: 0 0 0 0 0 0 0 0 OK	Errors: 0 0 0 0 0 0 0 0 OK	Errors: 0 0 0 0 0 0 0 0 OK
Reads: 0	Reads: 0	Reads: 0	Reads: 0
Blocks Read: 0	Blocks Read: 0	Blocks Read: 0	Blocks Read: 0
Writes: 0	Writes: 0	Writes: 0	Writes: 0
Blocks Written: 0	Blocks Written: 0	Blocks Written: 0	Blocks Written: 0
SGI ST173404FC [2705] S/N: 3CE02JP4 100Mhz, 2 Ports, FC-AL Physical: 70007 Useable: 69991 LoopID=121 (79h) Chan=0 ID=2 **[ONLINE]**	SGI ST173404FC [2705] S/N: 3CE02LRQ 100Mhz, 2 Ports, FC-AL Physical: 70007 Useable: 69991 LoopID=120 (78h) Chan=1 ID=2 **[ONLINE]**	SGI ST173404FC [2705] S/N: 3CE021HE 100Mhz, 2 Ports, FC-AL Physical: 70007 Useable: 69991 LoopID=119 (77h) Chan=0 ID=3 **[ONLINE]**	SGI ST173404FC [2705] S/N: 3CE02F1C 100Mhz, 2 Ports, FC-AL Physical: 70007 Useable: 69991 LoopID=118 (76h) Chan=1 ID=3 **[ONLINE]**
Errors: 0 0 0 0 0 0 0 0 OK	Errors: 0 0 0 0 0 0 0 0 OK	Errors: 0 0 0 0 0 0 0 0 OK	Errors: 0 0 0 0 0 0 0 0 OK
Reads: 0	Reads: 0	Reads: 0	Reads: 0
Blocks Read: 0	Blocks Read: 0	Blocks Read: 0	Blocks Read: 0
Writes: 0	Writes: 0	Writes: 0	Writes: 0
Blocks Written: 0	Blocks Written: 0	Blocks Written: 0	Blocks Written: 0
SGI ST173404FC [2705] S/N: 3CE02LNR 100Mhz, 2 Ports, FC-AL Physical: 70007 Useable: 69991	SGI ST173404FC [2705] S/N: 3CE02LK8 100Mhz, 2 Ports, FC-AL Physical: 70007 Useable: 69991	SGI ST173404FC [2705] S/N: 3CE02LNE 100Mhz, 2 Ports, FC-AL Physical: 70007 Useable: 69991	SGI ST173404FC [2705] S/N: 3CE02LDR 100Mhz, 2 Ports, FC-AL Physical: 70007 Useable: 69991

Figure 3-63 Physical Subsystem Information (partial for 6.14 Firmware)



Errors:	0 0 0 0 0 0 0 0 OK	Errors:	0 0 0 0 0 0 0 0 OK	Errors:	0 0 0 0 0 0 0 0 OK	Errors:	0 0 0 0 0 0 0 0 OK
Reads:	0	Reads:	0	Reads:	0	Reads:	0
Blocks Read:	0	Blocks Read:	0	Blocks Read:	0	Blocks Read:	0
Writes:	0	Writes:	0	Writes:	0	Writes:	0
Blocks Written:	0	Blocks Written:	0	Blocks Written:	0	Blocks Written:	0
SGI ST173404FC [2705] S/N: 3CE02LNR 100Mhz, 2 Ports, FC-AL Physical: 70007 Useable: 69991 LoopID=117 (75h) Chan=0 ID=4 [ONLINE]		SGI ST173404FC [2705] S/N: 3CE02LK8 100Mhz, 2 Ports, FC-AL Physical: 70007 Useable: 69991 LoopID=116 (74h) Chan=1 ID=4 [ONLINE]		SGI ST173404FC [2705] S/N: 3CE02LNE 100Mhz, 2 Ports, FC-AL Physical: 70007 Useable: 69991 LoopID=115 (73h) Chan=0 ID=5 [ONLINE]		SGI ST173404FC [2705] S/N: 3CE02LDR 100Mhz, 2 Ports, FC-AL Physical: 70007 Useable: 69991 LoopID=114 (72h) Chan=1 ID=5 [ONLINE]	
Errors:	0 0 0 0 0 0 0 0 OK	Errors:	0 0 0 0 0 0 0 0 OK	Errors:	0 0 0 0 0 0 0 0 OK	Errors:	0 0 0 0 0 0 0 0 OK
Reads:	0	Reads:	0	Reads:	0	Reads:	0
Blocks Read:	0	Blocks Read:	0	Blocks Read:	0	Blocks Read:	0
Writes:	0	Writes:	0	Writes:	0	Writes:	0
Blocks Written:	0	Blocks Written:	0	Blocks Written:	0	Blocks Written:	0

Legend:

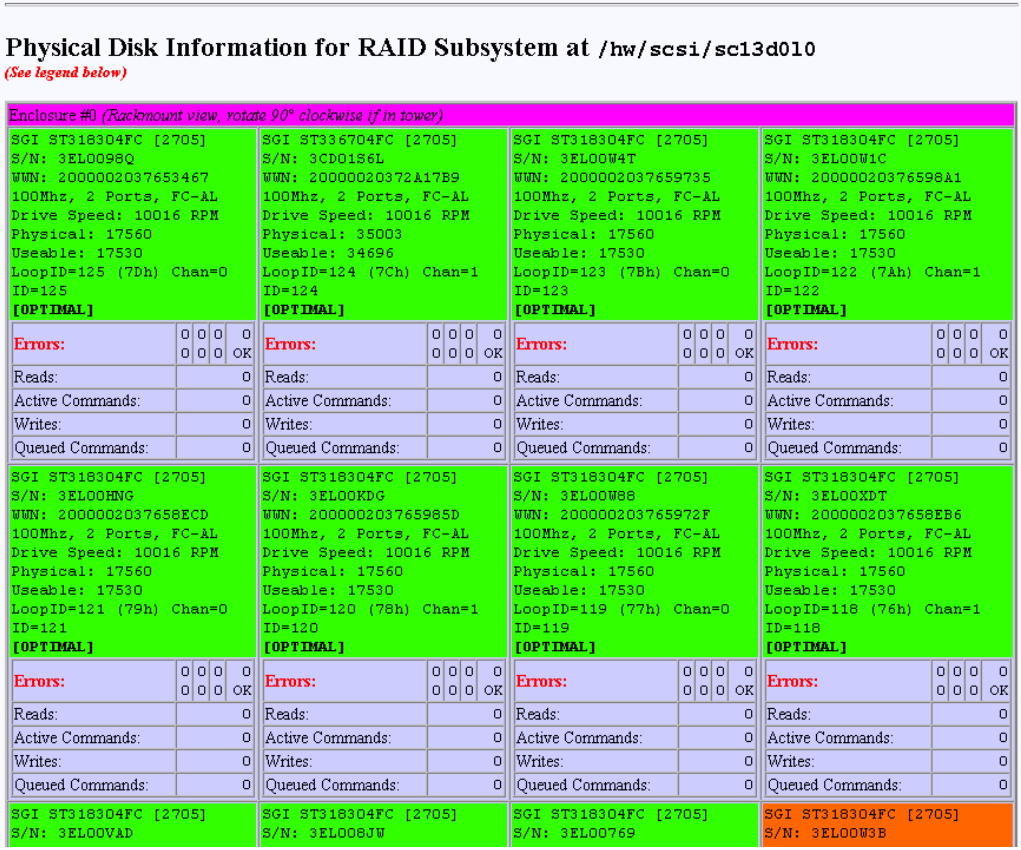
VendorID ProductID [Firmware Revision]
Clock Speed, # of Ports, InterfaceType
Device Size in Megabytes:
Usable Size in Megabytes:
LoopID decimal (HEX) Channel TargetID

Cumulative Errors	Parity	Soft	Hard	Miscellaneous
	Command Timeouts	Retries	Aborts	Predictive Faults
Read Operations				
Blocks Read				
Write Operations				
Blocks Written				

OK

[Return to Main Page] [Log Off]

Figure 3-64 Physical Subsystem Information (partial for 6.14 Firmware)



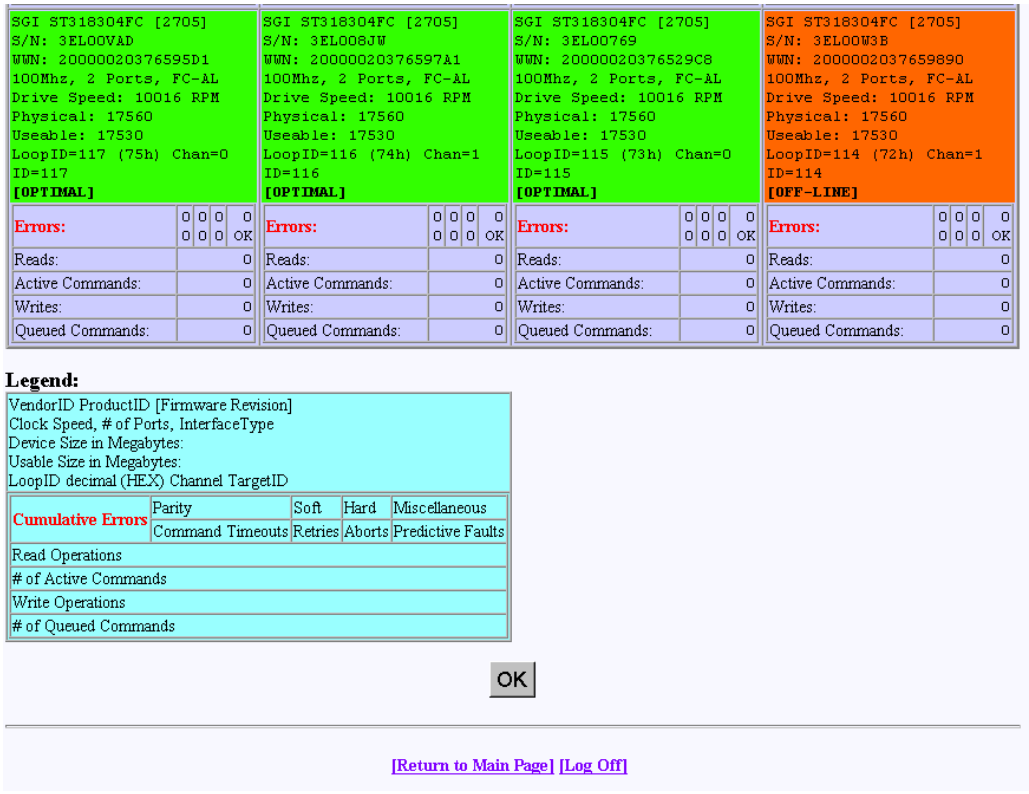
Physical Disk Information for RAID Subsystem at /hw/scsi/sc13d010

(See legend below)

Enclosure #0 *(Rackmount view, rotate 90° clockwise if in tower)*

SGI ST318304FC [2705] S/N: 3EL0098Q WWN: 2000002037653467 100Mhz, 2 Ports, FC-AL Drive Speed: 10016 RPM Physical: 17560 Useable: 17530 LoopID=125 (7Dh) Chan=0 ID=125 **[OPTIMAL]**	SGI ST336704FC [2705] S/N: 3CD01S6L WWN: 20000020372A17B9 100Mhz, 2 Ports, FC-AL Drive Speed: 10016 RPM Physical: 35003 Useable: 34696 LoopID=124 (7Ch) Chan=1 ID=124 **[OPTIMAL]**	SGI ST318304FC [2705] S/N: 3EL00W4T WWN: 2000002037659735 100Mhz, 2 Ports, FC-AL Drive Speed: 10016 RPM Physical: 17560 Useable: 17530 LoopID=123 (7Bh) Chan=0 ID=123 **[OPTIMAL]**	SGI ST318304FC [2705] S/N: 3EL00W1C WWN: 20000020376598A1 100Mhz, 2 Ports, FC-AL Drive Speed: 10016 RPM Physical: 17560 Useable: 17530 LoopID=122 (7Ah) Chan=1 ID=122 **[OPTIMAL]**
Errors: 0 0 0 0 0 0 0 0 OK	Errors: 0 0 0 0 0 0 0 0 OK	Errors: 0 0 0 0 0 0 0 0 OK	Errors: 0 0 0 0 0 0 0 0 OK
Reads: 0	Reads: 0	Reads: 0	Reads: 0
Active Commands: 0	Active Commands: 0	Active Commands: 0	Active Commands: 0
Writes: 0	Writes: 0	Writes: 0	Writes: 0
Queued Commands: 0	Queued Commands: 0	Queued Commands: 0	Queued Commands: 0
SGI ST318304FC [2705] S/N: 3EL00HNG WWN: 2000002037658ECD 100Mhz, 2 Ports, FC-AL Drive Speed: 10016 RPM Physical: 17560 Useable: 17530 LoopID=121 (79h) Chan=0 ID=121 **[OPTIMAL]**	SGI ST318304FC [2705] S/N: 3EL00KDG WWN: 2000002037659850 100Mhz, 2 Ports, FC-AL Drive Speed: 10016 RPM Physical: 17560 Useable: 17530 LoopID=120 (78h) Chan=1 ID=120 **[OPTIMAL]**	SGI ST318304FC [2705] S/N: 3EL00W88 WWN: 2000002037659720 100Mhz, 2 Ports, FC-AL Drive Speed: 10016 RPM Physical: 17560 Useable: 17530 LoopID=119 (77h) Chan=0 ID=119 **[OPTIMAL]**	SGI ST318304FC [2705] S/N: 3EL00XDT WWN: 2000002037658EB6 100Mhz, 2 Ports, FC-AL Drive Speed: 10016 RPM Physical: 17560 Useable: 17530 LoopID=118 (76h) Chan=1 ID=118 **[OPTIMAL]**
Errors: 0 0 0 0 0 0 0 0 OK	Errors: 0 0 0 0 0 0 0 0 OK	Errors: 0 0 0 0 0 0 0 0 OK	Errors: 0 0 0 0 0 0 0 0 OK
Reads: 0	Reads: 0	Reads: 0	Reads: 0
Active Commands: 0	Active Commands: 0	Active Commands: 0	Active Commands: 0
Writes: 0	Writes: 0	Writes: 0	Writes: 0
Queued Commands: 0	Queued Commands: 0	Queued Commands: 0	Queued Commands: 0
SGI ST318304FC [2705] S/N: 3EL00VAD	SGI ST318304FC [2705] S/N: 3EL008JW	SGI ST318304FC [2705] S/N: 3EL00769	SGI ST318304FC [2705] S/N: 3EL00W3B

Figure 3-65 Physical Subsystem Information (partial for 7.01 Firmware)



SGI ST318304FC [2705]
S/N: 3EL00VAD
WWN: 20000020376595D1
100Mhz, 2 Ports, FC-AL
Drive Speed: 10016 RPM
Physical: 17560
Useable: 17530
LoopID=117 (75h) Chan=0
ID=117
[OPTIMAL]

Errors:	0 0 0 0 0 0 0 OK
Reads:	0
Active Commands:	0
Writes:	0
Queued Commands:	0

SGI ST318304FC [2705]
S/N: 3EL008JW
WWN: 20000020376597A1
100Mhz, 2 Ports, FC-AL
Drive Speed: 10016 RPM
Physical: 17560
Useable: 17530
LoopID=116 (74h) Chan=1
ID=116
[OPTIMAL]

Errors:	0 0 0 0 0 0 0 OK
Reads:	0
Active Commands:	0
Writes:	0
Queued Commands:	0

SGI ST318304FC [2705]
S/N: 3EL00769
WWN: 20000020376529C8
100Mhz, 2 Ports, FC-AL
Drive Speed: 10016 RPM
Physical: 17560
Useable: 17530
LoopID=115 (73h) Chan=0
ID=115
[OPTIMAL]

Errors:	0 0 0 0 0 0 0 OK
Reads:	0
Active Commands:	0
Writes:	0
Queued Commands:	0

SGI ST318304FC [2705]
S/N: 3EL00W3B
WWN: 2000002037659890
100Mhz, 2 Ports, FC-AL
Drive Speed: 10016 RPM
Physical: 17560
Useable: 17530
LoopID=114 (72h) Chan=1
ID=114
[OFF-LINE]

Errors:	0 0 0 0 0 0 0 OK
Reads:	0
Active Commands:	0
Writes:	0
Queued Commands:	0

Legend:

VendorID ProductID [Firmware Revision]
Clock Speed, # of Ports, InterfaceType
Device Size in Megabytes:
Usable Size in Megabytes:
LoopID decimal (HEX) Channel TargetID

Cumulative Errors	Parity	Soft	Hard	Miscellaneous
	Command Timeouts	Retries	Aborts	Predictive Faults
Read Operations				
# of Active Commands				
Write Operations				
# of Queued Commands				

OK

[Return to Main Page] [Log Off]

Figure 3-66 Physical Subsystem Information (partial for 7.01 Firmware)

The 7.01 controller firmware returns WWN and Drive Speed information, which are not returned by controllers with 6.14 firmware.

These screens shows statistical data, drive status, and errors for all drives in all subsystems. It also correctly displays the enclosure number, row, and column of each disk drive. All numbers are cumulative, starting from zero when the subsystem is powered on. Under normal operation you should rarely see any errors.

Display Logical Subsystem Information

When the **Display Logical Subsystem Information** menu selection is made, the windows shown in Figure 3-67 (for controllers with 6.14 firmware) and Figure 3-68 (for controllers with 7.01 firmware) appear.

Logical Disk Information for RAID Subsystem at `/hw/scsi/20000080e5110413/lun0/c5p1`

Logical Drive #0 (104986 MB 110,086,324,224 Usable Bytes)	RAID 0+1 (Mirrored Stripe) [Write Cache Enabled, Stripe=16KB] ONLINE
Affinity Map: SAN Mapping	

Drive#	Span	Physical Enclosure	Physical Row	Physical Column	Channel	ID	Starting Block #	Span Size In blocks
0	0	0	0	0	0	0	0	143341568
1	0	0	0	2	0	1	0	143341568
2	0	0	0	3	1	1	0	143341568

Logical Drive #1 (139982 MB 146,781,765,632 Usable Bytes)	RAID 0 (Stripe) [Write Cache Enabled, Stripe=16KB] ONLINE
Affinity Map: SAN Mapping	

Drive#	Span	Physical Enclosure	Physical Row	Physical Column	Channel	ID	Starting Block #	Span Size In blocks
0	0	0	1	1	1	2	0	143341568
1	0	0	1	2	0	3	0	143341568

Logical Drive #2 (139982 MB 146,781,765,632 Usable Bytes)	RAID 5 (Parity Stripe) [Write Cache Enabled, Stripe=16KB] ONLINE
Affinity Map: SAN Mapping	

Drive#	Span	Physical Enclosure	Physical Row	Physical Column	Channel	ID	Starting Block #	Span Size In blocks
0	0	0	1	0	0	2	0	143341568
1	0	0	2	1	1	4	0	143341568
2	0	0	2	2	0	5	0	143341568

Figure 3-67 Logical Subsystem Information (partial for 6.14 Firmware)

Logical Disk Information for RAID Subsystem at `/hw/scsi/sc13d010`

Logical Drive #0 (70120 MB 73,526,149,120 Usable Bytes)	RAID 0 (Stripe) [Write Cache Enabled, Stripe=64KB] ONLINE
Affinity Map: SAN Mapping	
Background Tasks: No backround jobs active	

Drive#	Span	Physical Enclosure	Physical Row	Physical Column	Channel	ID	Starting Block #	Span Size In blocks
0	0	0	0	0	0	125	0	35901440
1	0	0	0	1	1	124	0	35901440
2	0	0	0	2	0	123	0	35901440
3	0	0	0	3	1	122	0	35901440

Logical Drive #1 (35060 MB 36,763,074,560 Usable Bytes)	RAID 0+1 (Mirrored Stripe) [Write Cache Enabled, Stripe=64KB] ONLINE
Affinity Map: SAN Mapping	
Background Tasks: No backround jobs active	

Drive#	Span	Physical Enclosure	Physical Row	Physical Column	Channel	ID	Starting Block #	Span Size In blocks
0	0	0	1	0	0	121	0	35901440
1	0	0	1	1	1	120	0	35901440
2	0	0	1	2	0	119	0	35901440
3	0	0	1	3	1	118	0	35901440

Figure 3-68 Logical Subsystem Information (partial for 7.01 Firmware)

The 7.01 controller firmware returns a Background Task status line, which is not returned by controllers with 6.14 firmware.

The screen shows all configured LUNs, their status, mapping information, and how they are laid out. If one of the drives were removed, you would see the **ONLINE** indicator change to **CRITICAL**. If you were to view the screen shown in “Display Physical Subsystem Information” on page 99 under this condition, you would see the disk being rebuilt only if an action was taken (for example, if a disk had failed and was replaced). In that case, a rebuild operation should be in progress. If this wasn’t a test, the information in that screen would show that the drive is either off-line or the slot is empty, depending on how damaged the disk drive is.

Display Environmental Subsystem Information

When the **Display Environmental Subsystem Information** menu selection is made, the screen shown in Figure 3-69 (for controllers with 6.14 firmware) and Figure 3-70 (for controllers with 7.01 firmware) appears.

Battery Backup Status	Value
Current power in hours (minutes)	30.1 (1805)
Maximum power in hours (minutes)	30.1 (1805)
Power threshold in hours (minutes)	24.1 (1444)
Charge level (per cent)	100
Hardware Version	1
Battery Type	NiCAD
Status	• No reconditioning cycle since power on. • Reconditioning cycle needed.

FAN #	Status	Speed	Enclosure ID (Switch Setting)
0 (RHS from rear)	Operational	Low	0
1 (LHS from rear)	Operational	Low	0
2	Not Present	N/A	0

Power Supply #	Status	Enclosure ID (Switch Setting)
0 (RHS from rear)	Operational	0
1 (LHS from rear)	Operational	0
2	Not Present	0

Temperature Sensor #	Status	OverTemp Warning	Current Temp Celsius/(F)	Enclosure ID (Switch Setting)
0	Operational	Normal	30 (86)	0

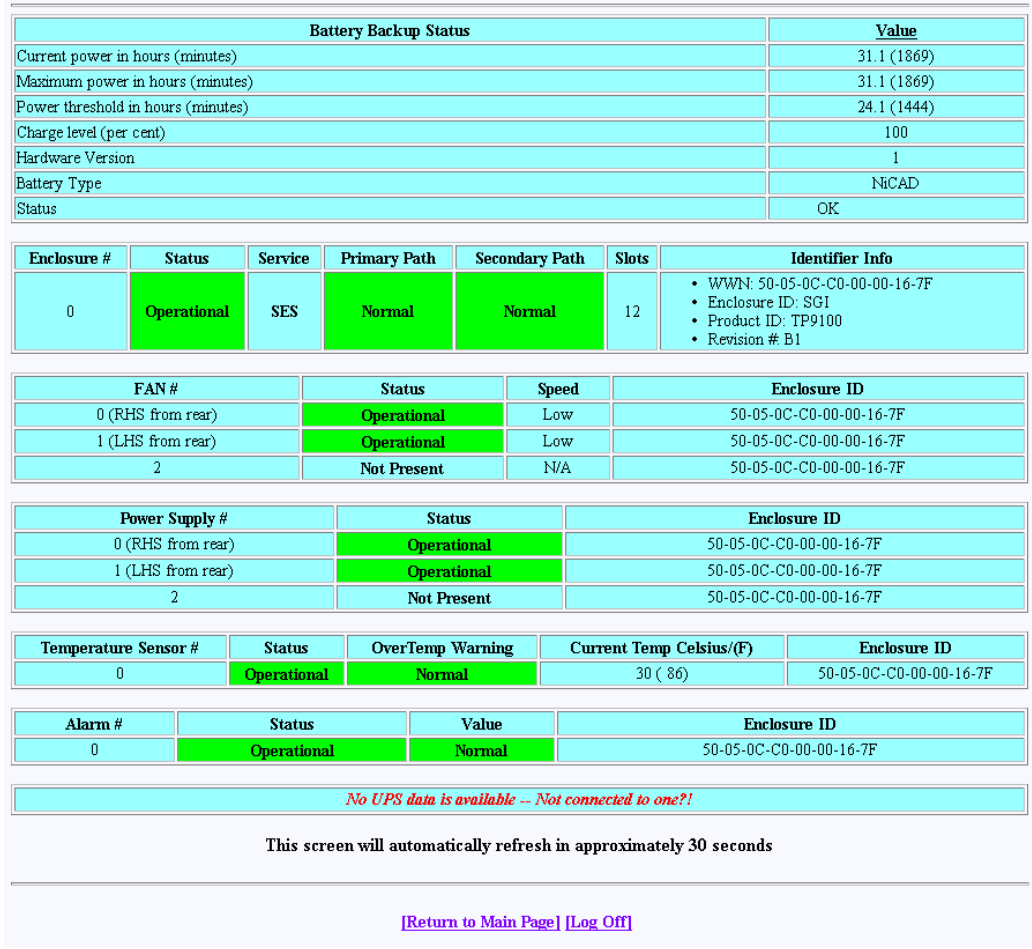
Alarm #	Status	Value	Enclosure ID (Switch Setting)
0	Operational	Normal	0

No UPS data is available -- Not connected to one?!

Enclosure #	Status	Service	Primary Path	Secondary Path	Slots	Identifier Info
0	Operational	SES	Normal	Normal	12	• WWN: 50-05-0C-C0-00-00-16-7F • Enclosure ID: SGI • Product ID: TP9100 • Revision #: B1

This screen will automatically refresh in approximately 10 seconds

Figure 3-69 Display Environmental Subsystem Information (6.14 Firmware)



Battery Backup Status	Value
Current power in hours (minutes)	31.1 (1869)
Maximum power in hours (minutes)	31.1 (1869)
Power threshold in hours (minutes)	24.1 (1444)
Charge level (per cent)	100
Hardware Version	1
Battery Type	NiCAD
Status	OK

Enclosure #	Status	Service	Primary Path	Secondary Path	Slots	Identifier Info
0	Operational	SES	Normal	Normal	12	• WWN: 50-05-0C-C0-00-00-16-7F • Enclosure ID: SGI • Product ID: TP9100 • Revision # B1

FAN #	Status	Speed	Enclosure ID
0 (RHS from rear)	Operational	Low	50-05-0C-C0-00-00-16-7F
1 (LHS from rear)	Operational	Low	50-05-0C-C0-00-00-16-7F
2	Not Present	N/A	50-05-0C-C0-00-00-16-7F

Power Supply #	Status	Enclosure ID
0 (RHS from rear)	Operational	50-05-0C-C0-00-00-16-7F
1 (LHS from rear)	Operational	50-05-0C-C0-00-00-16-7F
2	Not Present	50-05-0C-C0-00-00-16-7F

Temperature Sensor #	Status	OverTemp Warning	Current Temp Celsius/(F)	Enclosure ID
0	Operational	Normal	30 (86)	50-05-0C-C0-00-00-16-7F

Alarm #	Status	Value	Enclosure ID
0	Operational	Normal	50-05-0C-C0-00-00-16-7F

No UPS data is available -- Not connected to one?!

This screen will automatically refresh in approximately 30 seconds

[Return to Main Page] [Log Off]

Figure 3-70 Display Environmental Subsystem Information (7.01 Firmware)

The two windows for the different controller firmware versions contain the same information, but arranged differently. The windows display status information results of polling the enclosure (and all expansion enclosures) every 10 seconds.

Note: If expansion enclosures are attached, all of the same information would be reported for them as well, only with a different **Enclosure ID**.

Miscellaneous Functions

The Miscellaneous Functions menu is located on the main screen and is shown in Figure 3-71.

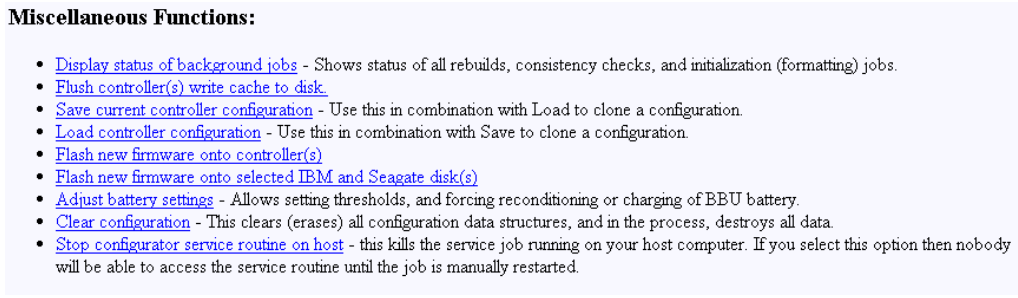


Figure 3-71 Miscellaneous Functions Menu (for 6.14 Firmware)

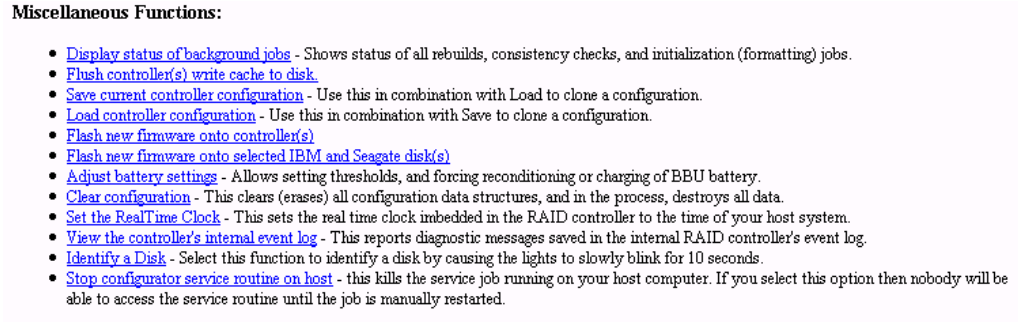


Figure 3-72 Miscellaneous Functions Menu (for 7.01 Firmware)

The Reporting Functions menu has the following selections, with the associated explanations on the indicated pages:

- "Display Status of Background Jobs" on page 108
- "Flush Controller(s) Write Cache to Disk" on page 110
- "Save Current Controller Configuration" on page 111
- "Load Controller Configuration" on page 112
- "Flash New Firmware Onto Controller(s)" on page 113

Display Status of Background Jobs

When the **Display Status of Background Jobs** menu selection is made, the windows appear as shown in Figure 3-73 (for 6.14 firmware) and Figure 3-73 (for 7.01 firmware) appear.

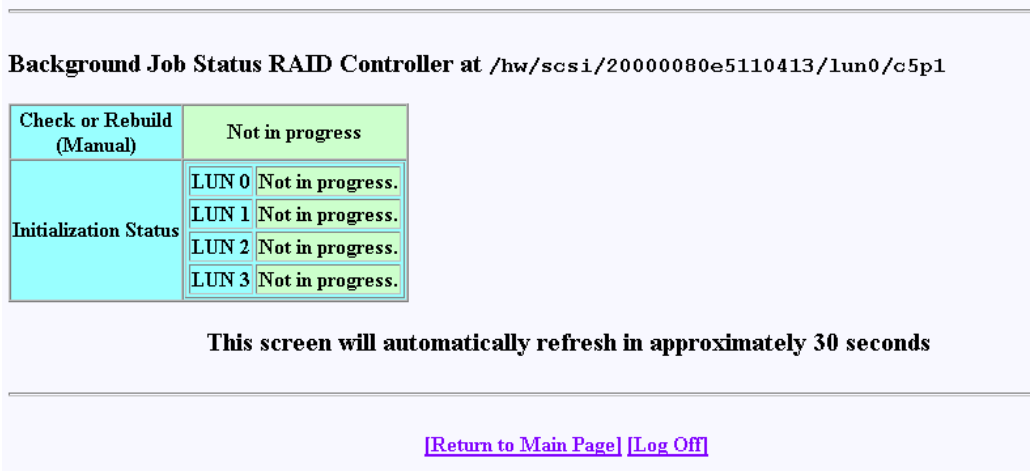
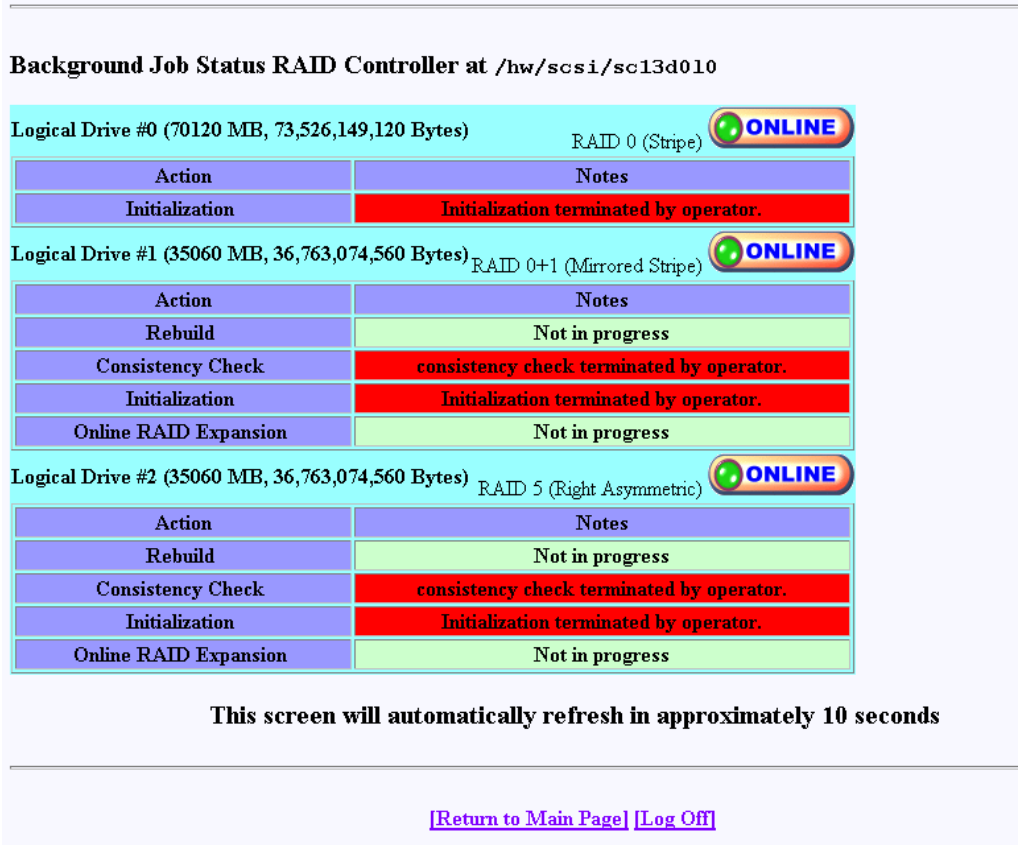


Figure 3-73 Display Status of Background Jobs (6.14 Firmware)



Background Job Status RAID Controller at `/hw/scsi/sc13d010`

Logical Drive #0 (70120 MB, 73,526,149,120 Bytes) RAID 0 (Stripe) ONLINE

Action	Notes
Initialization	Initialization terminated by operator.

Logical Drive #1 (35060 MB, 36,763,074,560 Bytes) RAID 0+1 (Mirrored Stripe) ONLINE

Action	Notes
Rebuild	Not in progress
Consistency Check	consistency check terminated by operator.
Initialization	Initialization terminated by operator.
Online RAID Expansion	Not in progress

Logical Drive #2 (35060 MB, 36,763,074,560 Bytes) RAID 5 (Right Asymmetric) ONLINE

Action	Notes
Rebuild	Not in progress
Consistency Check	consistency check terminated by operator.
Initialization	Initialization terminated by operator.
Online RAID Expansion	Not in progress

This screen will automatically refresh in approximately 10 seconds

[Return to Main Page] [Log Off]

Figure 3-74 Display Status of Background Jobs (7.01 Firmware)

These windows show you how initialization, rebuilds, or checks are progressing. The browser title bar (not shown in Figure 3-74) displays the date and time of the last poll. Press the **[Return to Main Page]** link to exit.

Flush Controller(s) Write Cache to Disk

When the **Flush Controller(s) Write Cache to Disk** menu selection is made, the screen shown in Figure 3-75 appears.

Figure 3-75 Cache Flush Warning

Click **YES** to force a cache flush. You would ordinarily perform this after all LUNs are unmounted, and before a power down. If you were to do a cache flush on mounted file systems that are servicing write requests, there would be a small risk that this request would never complete. However, it would be pointless to flush the cache in this situation, as the cache would instantly be dirty after the controller receives the next write command. If the cache flush is successful, the window shown in Figure 3-75 appears.

Figure 3-76 Cache Flush Successful

Save Current Controller Configuration

When the **Save Current Controller Configuration** menu selection is made, the screen shown in Figure 3-77 appears.

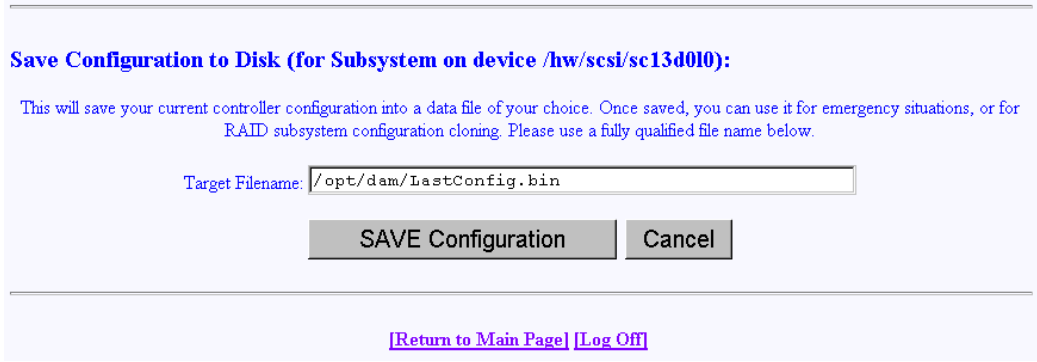


Figure 3-77 Save Current Controller Configuration

To save the current controller configuration to a file, type the name of the file in the area provided on the screen and click **SAVE Configuration**. The file is saved locally on the server that launched TPM, not the client machine running the Web browser. The file may be used later to restore or clone a RAID configuration.

Load Controller Configuration

When the **Load Controller Configuration** menu selection is made, the screen shown in Figure 3-78 appears.

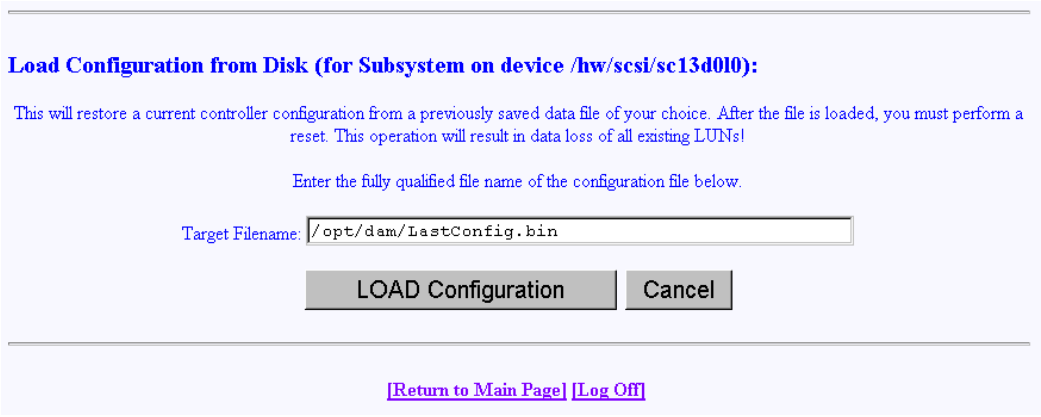


Figure 3-78 Load Controller Configuration

This screen allows you to load the controller configuration file into another RAID array. You can use this feature to clone a RAID configuration. To clone a configuration this way, the two RAID subsystems must be exactly the same, including the disk drives.

The file is or loaded from the sever that launched TPM, not the client machine running the Web browser.

Flash New Firmware Onto Controller(s)

When the **Flash New Firmware Onto Controller(s)** menu selection is made, the screen shown in Figure 3-79 appears.

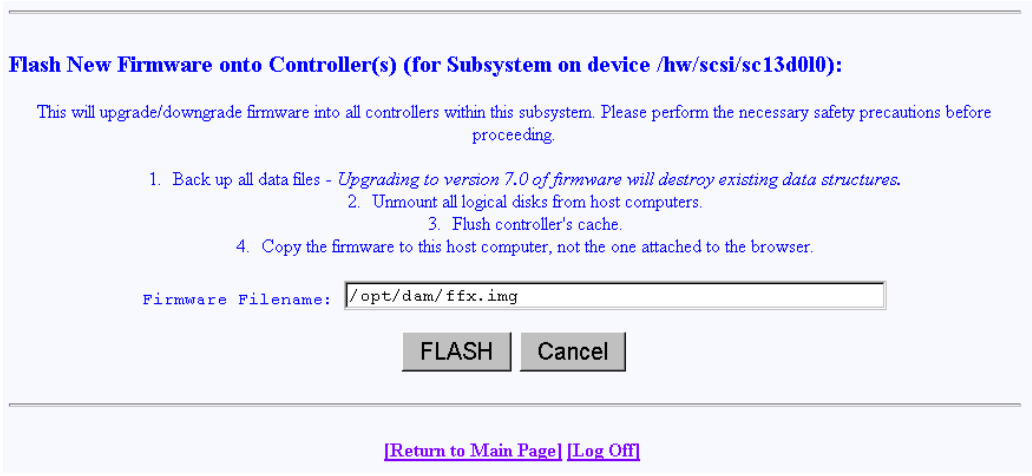


Figure 3-79 Flashing New Firmware

Warning: If you attempt to flash new firmware to the disk drive or controller while background jobs are running (the drive is transferring data), drive operation could become unpredictable and the drive may even become inoperable. In this event, drive data recovery may have to be performed by a professional data recovery lab.

After you enter the filename of the image, click **FLASH**. TPM then verifies the image size and type for your subsystem. If verification fails, a report is made.

Flashing the firmware takes a few seconds, following which TPM immediately jumps to the **Reset Controller** screen. Allow the reset to proceed.

Be sure you are aware of all the information that you need before upgrading (or downgrading) to certain firmware revisions.

Flash New Firmware onto Selected IBM and Seagate Disk(s)

When the **Flash New Firmware Onto Selected IBM and Seagate Disk(s)** menu selection is made, the screen shown in Figure 3-80 appears (provided that the Operational Fault Management and Auto Rebuild Management functions on the View/Modify RAID Controller Configuration dialog box are not disabled—see Figure 3-43 on page 82). If the functions are already disabled when you click the **Flash New Firmware Onto Selected IBM and Seagate Disk(s)** menu selection, the dialog box shown in Figure 3-81 appears.

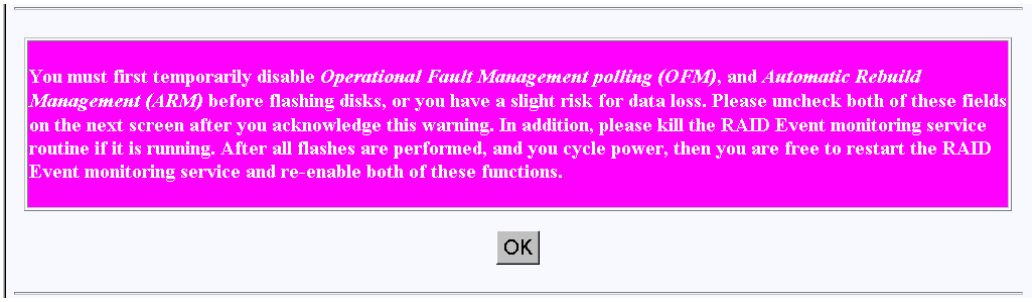


Figure 3-80 Flash New Firmware Onto Selected IBM and Seagate Disk(s)

Warning: The TPMWatch application must be terminated prior to updating disk drive firmware. Failure to do so may cause one or more disk drives to become inoperable.

Warning: If you attempt to flash new firmware to the disk drive or controller while background jobs are running (the drive is transferring data), drive operation could become unpredictable and the drive may even become inoperable. In this event, drive data recovery may have to be performed by a professional data recovery lab.

When you click **OK**, the View/Modify RAID Controller Configuration dialog box appears (see Figure 3-43 on page 82). Make sure you disable the Operational Fault Management and Auto Rebuild Management functions on this dialog box, then click **Apply**. You are returned to the main TPM menu.

Go to the Administrative Functions menu and click **Reset Controllers** (see Figure 3-45 on page 85). After the reset is complete, click the **Flash New Firmware Onto Selected IBM and Seagate Disk(s)** menu selection.

The dialog box shown in Figure 3-81 appears.

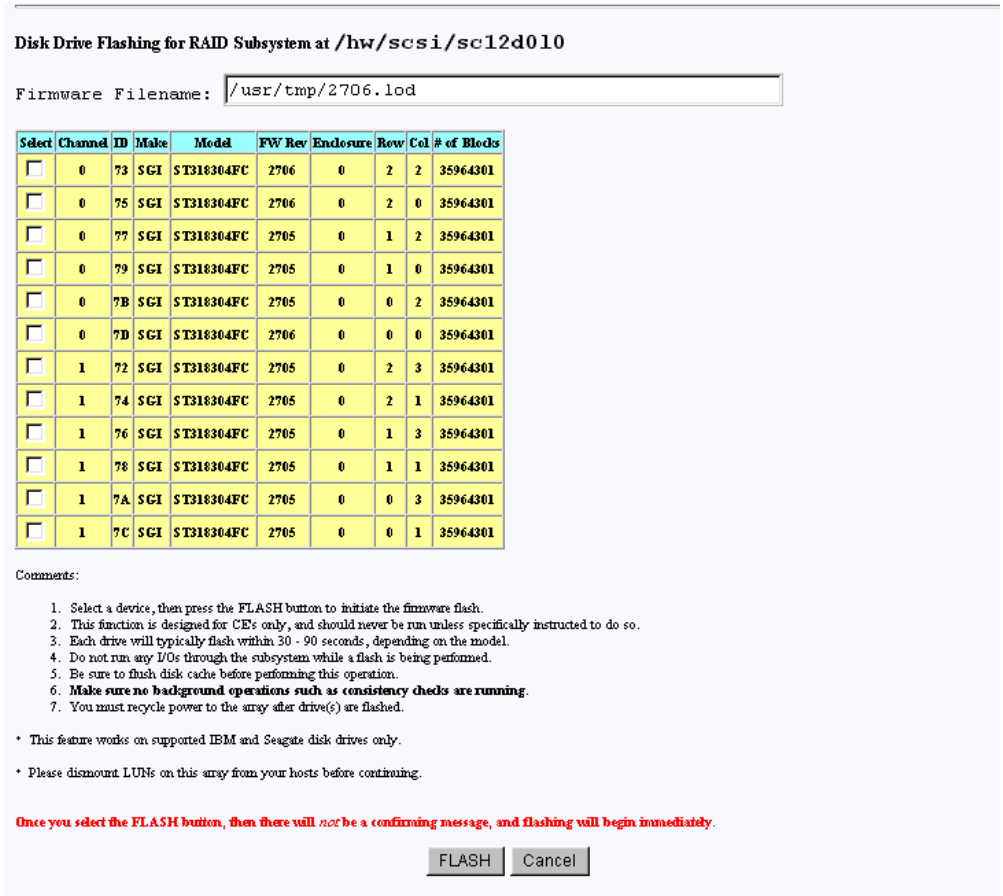


Figure 3-81 Flash New Firmware Dialog Box

Read all the instructions on the dialog box, select one or more devices to flash, then click **FLASH** to flash the firmware. When the process is complete, the screen shown in Figure 3-82 appears.

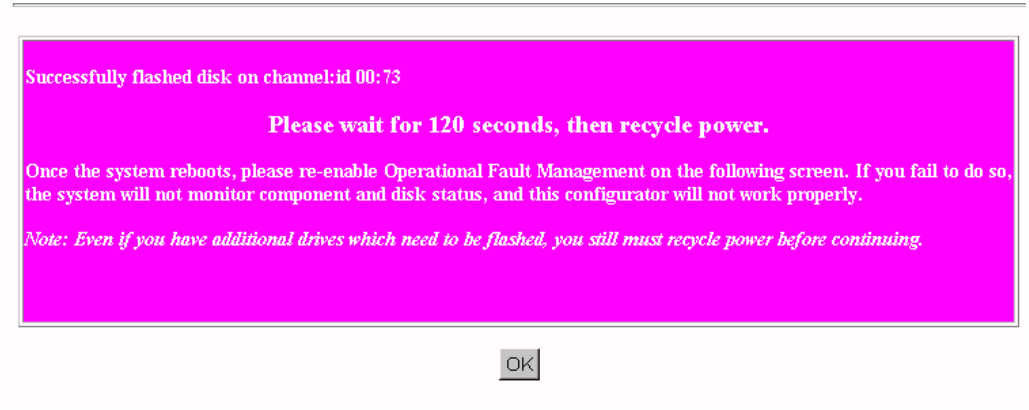


Figure 3-82 Flash New Firmware Complete Box

Wait 120 seconds, as the screen instructs, then cycle the power. After power up and reboot are complete, enable the Operational Fault Management and Auto Rebuild Management functions on the View/Modify RAID Controller Configuration dialog box.

Adjust Battery Settings

When the **Adjust Battery Settings** menu selection is made, the screen shown in Figure 3-83 appears.

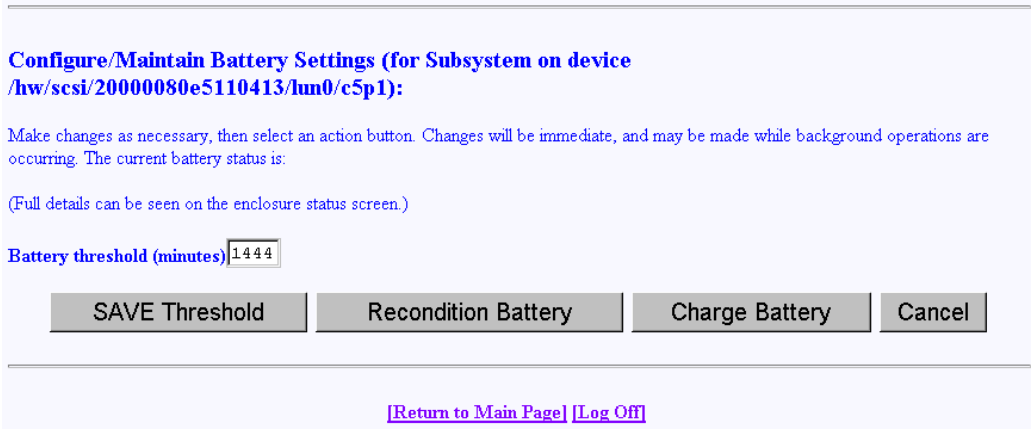


Figure 3-83 Adjust Battery Settings

When the remaining battery power (in minutes) falls below the Battery Threshold (minutes) value entered, a low battery power alarm is triggered and is displayed in the Battery Backup Status portion of the Display Environmental Subsystem Information window (see Figure 3-69 on page 105 and Figure 3-70 on page 106).

The buttons at the bottom of the screen operate as follows:

- Save Threshold: saves the battery threshold value entered in the text box.

Note: The specified threshold value entered must not exceed the battery's maximum power value in minutes.

- Recondition Battery: conditions the battery so that it can achieve maximum life. Conditioning involves fully discharging the battery, then recharging it.

Note: While the battery is being reconditioned, the system cache operates in the conservative cache mode (write-through) for the duration of the reconditioning process.

- Charge Battery: initiates a battery charge cycle.

Clear Configuration

When the **Clear Configuration** menu selection is made, the screen shown in Figure 3-84 appears.

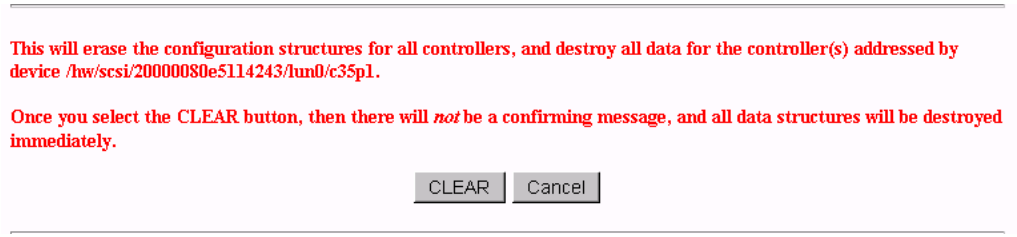


Figure 3-84 Clear Configuration

Warning: Read the information in the screen before you take any action.

To erase the configuration structures, click **CLEAR**.

The confirmation message shown in Figure 3-85 appears.

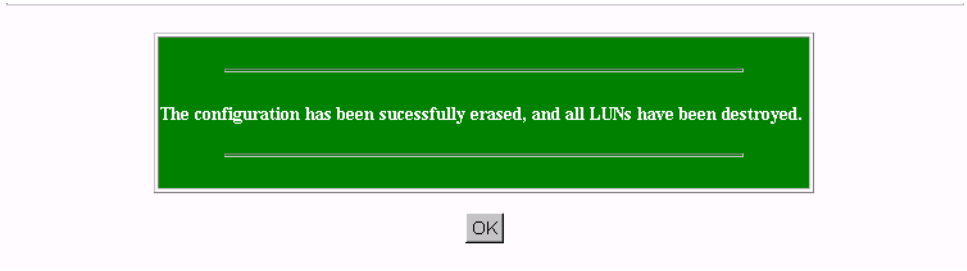


Figure 3-85 Clear Configuration

Set Real Time Clock (7.01 Firmware Only)

When the **Set Real Time Clock** menu selection is made, the dialog box shown in Figure 3-86 appears.

Figure 3-86 Set Real Time Clock

Click **SET CLOCK** to synchronize the controller clock with the host computer.

The confirmation screen shown in Figure 3-87 appears.

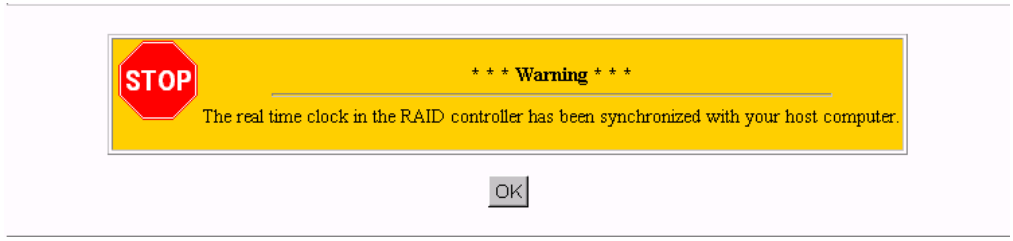
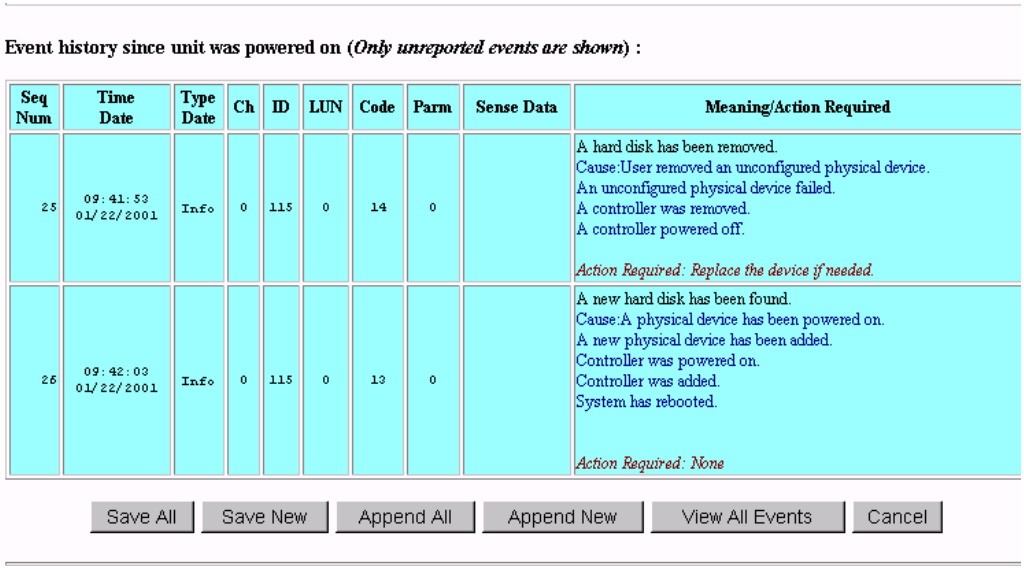


Figure 3-87 Set Real Time Clock Confirmation Dialog Box.

View the Controller's Internal Event Log (7.01 Firmware Only)

When the **View the Controller's Internal Event Log** menu selection is made, the dialog box shown in Figure 3-88 appears.



Event history since unit was powered on (*Only unreported events are shown*) :

Seq Num	Time Date	Type Date	Ch	ID	LUN	Code	Parm	Sense Data	Meaning/Action Required
25	09:41:53 01/22/2001	Info	0	115	0	14	0		A hard disk has been removed. Cause:User removed an unconfigured physical device. An unconfigured physical device failed. A controller was removed. A controller powered off. *Action Required: Replace the device if needed.*
26	09:42:03 01/22/2001	Info	0	115	0	13	0		A new hard disk has been found. Cause:A physical device has been powered on. A new physical device has been added. Controller was powered on. Controller was added. System has rebooted. *Action Required: None*

Save All | Save New | Append All | Append New | View All Events | Cancel

Figure 3-88 View Controller's Internal Event Log

Each time you bring up this dialog box, it displays the events that occurred since the last time the dialog box was brought up.

The buttons at the bottom of the dialog box provide these functions:

- Save All: saves all events to a raw data text file named `eventhistory.log.`
- Save New: saves the new events to a raw data text file named `eventhistory.log.`

Note: A Save New operation overwrites the current `eventhistory.log` file. If you do not want to overwrite it, it must be renamed before you perform the operation.

- Append All: appends all events to the raw data text file named `eventhistory.log` file.

- Append New: appends new events to the raw data text file named `eventhistory.log` file.
- View All Events: displays all events, including old and new events.

Note: If you are running gamevent on the system, this button must be used to see all log events, because gamevent is continually emptying the event log.

Identify a Disk (7.01 Firmware Only)

For the **Identify a Disk** menu selection to work properly, Operational Fault Management (OFM) must be enabled. This is accomplished by enabling the Operational Fault Management function in the View/Modify RAID Controller Configuration dialog box (see Figure 3-43 on page 82). Also, at least one of the SES disk drives must be present and operational (see Figure 3-89 and Figure 3-90).

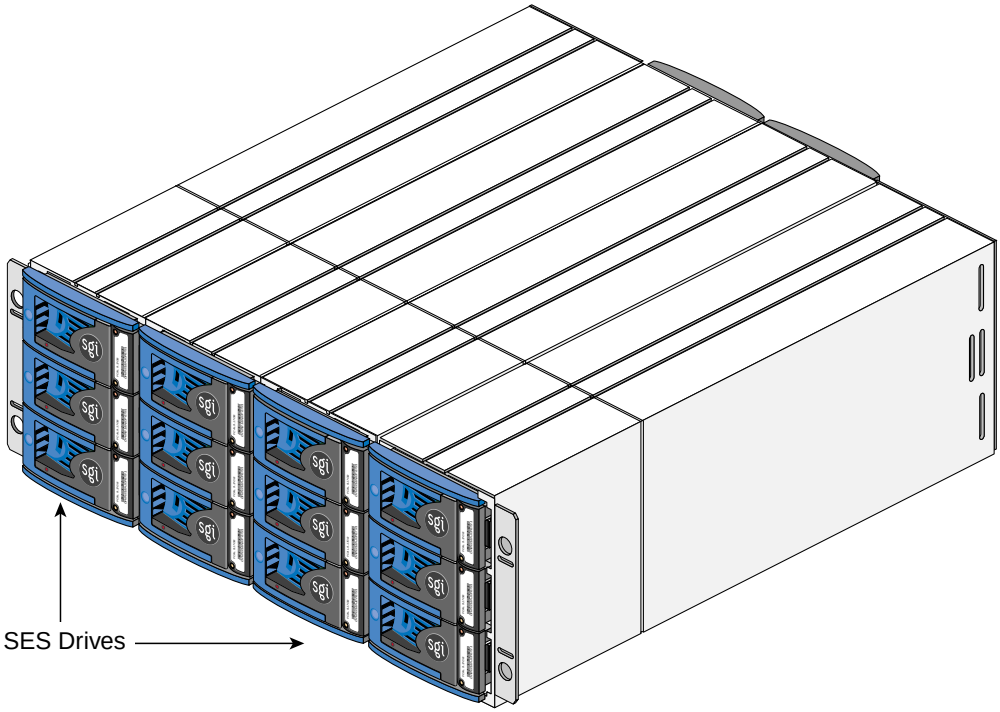


Figure 3-89 SES Drive Locations (Rackmount Configuration)

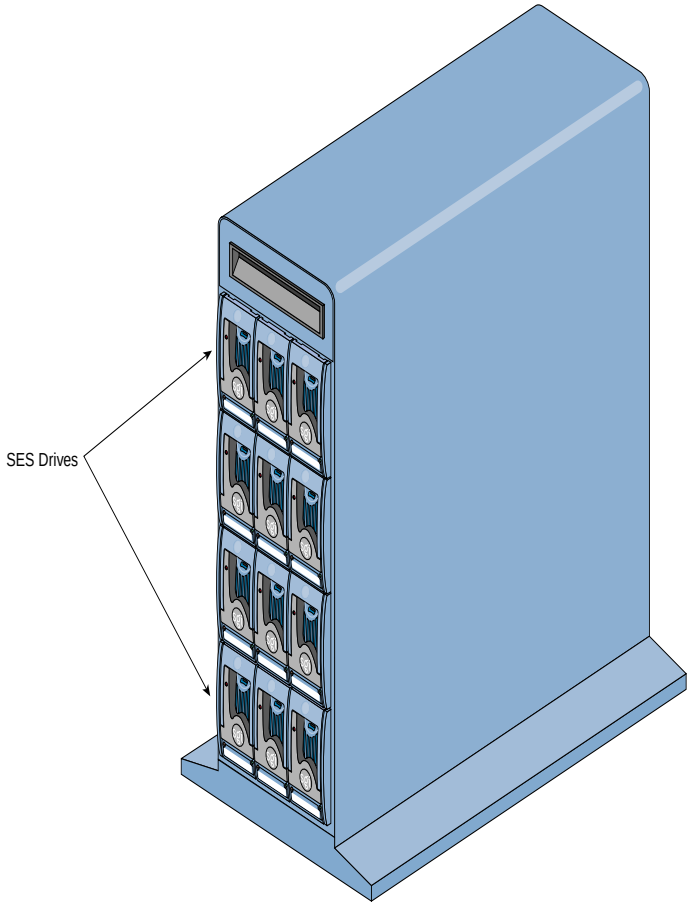
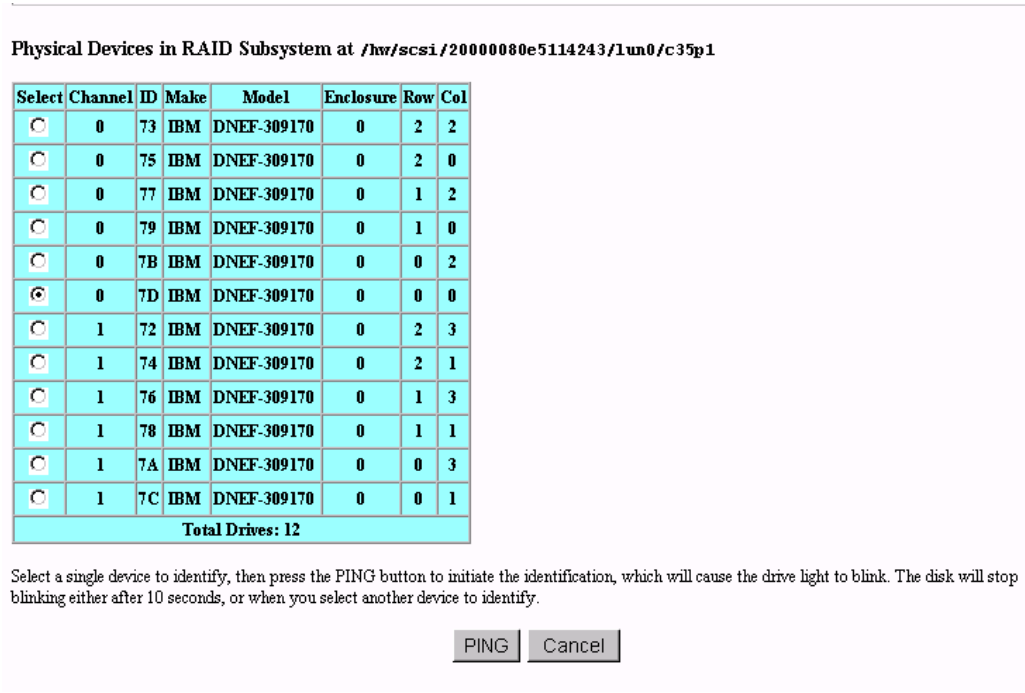


Figure 3-90 SES Drive Locations (Tower Configuration)

When the **Identify a Disk** menu selection is made, the dialog box shown in Figure 3-91 appears.



Physical Devices in RAID Subsystem at /hw/scsi/20000080e5114243/lun0/c35p1

Select	Channel	ID	Make	Model	Enclosure	Row	Col
○	0	73	IBM	DNEF-309170	0	2	2
○	0	75	IBM	DNEF-309170	0	2	0
○	0	77	IBM	DNEF-309170	0	1	2
○	0	79	IBM	DNEF-309170	0	1	0
○	0	7B	IBM	DNEF-309170	0	0	2
◉	0	7D	IBM	DNEF-309170	0	0	0
○	1	72	IBM	DNEF-309170	0	2	3
○	1	74	IBM	DNEF-309170	0	2	1
○	1	76	IBM	DNEF-309170	0	1	3
○	1	78	IBM	DNEF-309170	0	1	1
○	1	7A	IBM	DNEF-309170	0	0	3
○	1	7C	IBM	DNEF-309170	0	0	1
Total Drives: 12							

Select a single device to identify, then press the PING button to initiate the identification, which will cause the drive light to blink. The disk will stop blinking either after 10 seconds, or when you select another device to identify.

PING Cancel

Figure 3-91 Identify a Disk

Click PING to identify a selected drive.

Stop Configurator Service Routine on Host

When the **Stop Configurator Service Routine on Host** menu selection is made, the screen shown in Figure 3-92 appears.

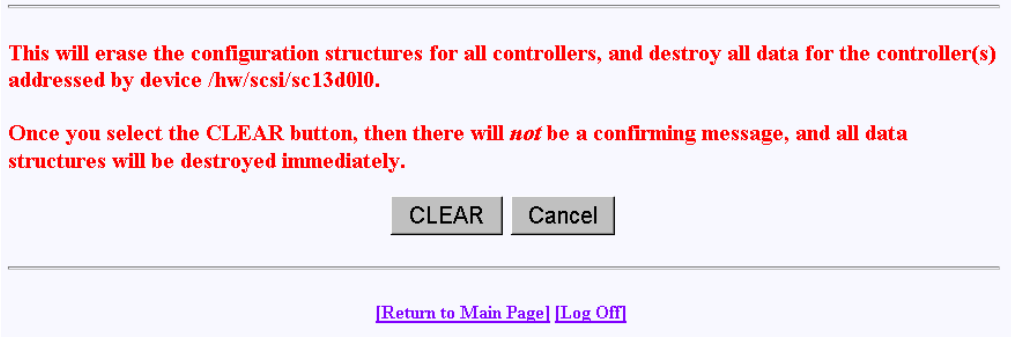


Figure 3-92 Stop Service Screen

This screen provides an emergency shutdown routine for TPM. After you click **CLEAR**, the TPM service routine is immediately shut down. You are not prompted with an "Are-You-Sure Message." Once the service routine as been killed, no commands can be issued, and anyone with a Web browser receives the standard error message indicating the host is not found.

TPMWatch Event Monitor and Logger

TPMWatch is a support program designed to poll RAID subsystems and report their health to an output file. The file can then be used by a user-supplied program or shell script to provide notification in the event a component fails or goes offline. The program works by issuing commands to the controller to report status information for all LUNS, disk drives, and enclosure components (fans, power supplies, batteries, and so on).

To minimize performance impact, provide the greatest amount of flexibility to incorporate TPMWatch in external routines, the program is designed with the following considerations:

- **U**ser-defined polling period (in seconds).
- Generates only 11 I/Os.
- User supplies the status file name upon invocation.
- User supplies the optional history file name upon invocation.
- The status file is pure ASCII text, so the result can easily be interpreted by a shell script.

Running TPMWatch From Linux and IRIX

To run TPMWatch, make sure the `$DAM_HOME` environment variable is set, and you invoke the program from root. The syntax is:

```
tpmwatch [-P Freq][-d][-H HistFile][-T LogFile]-S StatusFile
-D DeviceFile[-M Addresses][-L]
```

Where:

`-P Freq:` Frequency in seconds between each poll.

`-d:` turns on status debugging features by sending information to `stderr.`

`-H HistoryFile:` Optional history file, which is appended to the last status information record. Do not supply this parameter if you do not wish to create a history file.

`-T LogFile:` Sends error text to a user-specified file.

`-S StatusFile:` The health of the subsystem (see record layout in Table A-1).

`-D DeviceFile:` Device to check (for example, `/hw/scsi/sc37d0l0`). This is the raw or pass-through driver attached to any LUN on the subsystem. It doesn't make any difference which LUN you pick. Furthermore, the program still operates correctly if the LUN that it is nailed to goes offline or is even removed.

`-M Addresses:` E-mail addresses used for sending alarm messages.

Note: When specifying more than one e-mail address, the entire list of e-mail addresses must be enclosed in double-quotes ("). For example, -M "user1@domain user2@domain...".

`-L:` Send events to system log file.

An example syntax is:

```
/opt/dam/tpmwatch -D /hw/scsi/sc37d0l0 -P 10 -L &
```

Note: A minimum of two parameters must be specified, one of which must be DeviceFile. If only the DeviceFile parameter is specified, TPMWATCH will not start, and the syntax usage message will be reported.

Running TPMWatch From Windows

To run TPMWatch from Windows, you must be at the directory where the executable resides. The syntax is:

```
tpmwatch [-P Freq][-d][-H HistFile][-T LogFile]-S StatusFile
-D DeviceFile[-E SMPT -M Addresses][-L]
```

Where:

`-P Freq:` Frequency in seconds between each poll.

`-d:` turns on status debugging features by sending information to `stderr.`

`-H HistoryFile:` Optional history file, which is appended to the last status information record. Do not supply this parameter if you do not wish to create a history file.

`-T LogFile:` Sends error text to a user-specified file.

`-S StatusFile:` The health of the subsystem (see record layout in Table A-1).

`-D DeviceFile:` Device to check (for example, `/hw/scsi/sc37d0l0`). This is the raw or pass-through driver attached to any LUN on the subsystem. It doesn't make any difference which LUN you pick. Furthermore, the program still operates correctly if the LUN that it is nailed to goes offline or is even removed.

`-E SMPT:`Mail server address (name of mail server, for example, mail.xyz.com).

`-M Addresses:` E-mail addresses used for sending alarm messages. For example:

"`<user_name@xyz>`" (quotes and angle brackets are required)

`-L:` Send events to system log file.

To invoke TPMWATCH, bring up a DOS window, change directories to the location where TPMWATCH is installed, and type the command to start TPMWATCH. An example is:

```
tpmwatch -D /dev/h2i00l00 -P 10 -L
```

Note: A minimum of two parameters must be specified, one of which must be DeviceFile. If only the DeviceFile parameter is specified, TPMWATCH will not start, and the syntax usage message will be reported.

Table A-1 Record Layout

Byte #	Size	Description
0	8	Polling date in YYYYMMDD format.
8	6	Polling time in HHMMSS format (24-hour clock).
14	1	Subsystem summary status. Set to + if all is OK, - otherwise.
15	1	Fan Status: + if All On-Line, otherwise a single digit representing number of failed fans.
16	1	PSU Status: + if All On-Line, otherwise a single digit representing number of failed power supply units.
17	1	Temperature status. + if within specifications, - if over-temperature warning (or temperature sensor failed).
18	1	+ if UPS found and on-line, - if found and off-line, blank if no UPS.
19	1	- if battery is currently discharging, + otherwise.
20	1	+ if no further enclosure alarms, - otherwise (this tests all ESS pages for any alarm state and detects such things as a FC path failure).
21	2	Master/Slave controller status (see Table A-2).
23	4	Partner State (see Table A-3).
27	32 x 1	Status of each possible System Drive (LUN): + If On-line - If Off-line (and defined) C if Critical (and defined) ? if in unknown state

Table A-1 (continued) Record Layout

Byte #	Size	Description
		Blank if no none defined
59	8 X 16 X 1	Status of each Physical Device Disk[Channel][ID] (0:0, 0:1 .. 7:15)
		+ If On-line
		D if drive is DEAD
		R if drive is Rebuilding
		S if drive is in Stand By state
		? if drive in unknown state
		Blank if empty slot
187	1	New line character 0Ah.

Master/Slave Controller Status Table

Table A-2 Master/Slave Controller Status Table

Value	Meaning
00	Slave disabled, or simplex.
Master States During Redundancy	
10	Initial state during dual-active boot.
11	Default master got first ping.
12	Master in negotiation.
13	Negotiation done; waiting for ping.
14	Negotiation done; received ping.
15	CC nexus established.

Table A-2 (continued) Master/Slave Controller Status Table

Value	Meaning
16	Insufficient memory.
17	Waiting for debounce ping.
18	Waiting for replacement notification.
Failed Slave States	
20	Slave failed.
21	Slave controller is ejected.
22	Slave controller removal is detected.
23	Slave controller is inserted.
24	Command slave controller is inserted.
25	Command slave controller to pause.
26	Paused slave ready to resume.
27	Paused slave controller failed.

Table A-2 (continued) Master/Slave Controller Status Table

Value	Meaning
States During Redundancy	
40	Default slave is slave.
41	Slave entered monitoring mode.
Failed Master States	
80	Master failed.
81	Master controller is ejected.
82	Master controller removal detected.
83	Master controller is inserted.
84	Command master controller insert.
85	Relinquish control.

Partner Status Table

Table A-3 Partner Status Table

Value	Partner State	Notes
0000	No Partner	Controller running in simplex mode.
0100	Booting	From power-up.
0101	Booting	Partner is replacement controller.
0200	Active	Controller-Controller nexus.
0201	Active	Partner is survivor.
0300	Failed	Ping time-out.
0301	Failed	Negotiation - get chunk failure.

Table A-3 (continued) Partner Status Table

Value	Partner State	Notes
0302	Failed	Negotiation - SCSI communication failed or wrong cables, or firmware versions/builds are different.
0303	Failed	Negotiation - host ID mismatch.
0304	Failed	Negotiation - SLIP/DIFFL/FBR mismatch.
0305	Failed	Negotiation - disk channels available mismatch.
0306	Failed	Negotiation - host channels available mismatch.
0307	Failed	Negotiation - firmware version mismatch.
0308	Failed	Negotiation - firmware type mismatch.
0309	Failed	Negotiation - memory size mismatch.
030a	Failed	Negotiation - memory read of partner failed.
030b	Failed	Negotiation - MS_INTNEG command to partner failed.
030c	Failed	Kill Partner command received.
030d	Failed	Partner failed during failback TID handover.
030e	Failed	Partner didn't enter nexus after negotiation complete.
030f	Failed	Partner failed for unknown reason.
0310	Failed	Failed Write Back Synchronization Failed on Channel 0.
0311	Failed	Failed Write Back Synchronization Failed on Channel 1.
0312	Failed	Failed Write Back Synchronization Failed on Channel 2.
0313	Failed	Failed Write Back Synchronization Failed on Channel 3.
0314	Failed	Failed Write Back Synchronization Failed on Channel 4.
0315	Failed	Failed Write Back Synchronization Failed on Channel 5.
0316	Failed	Negotiation - firmware build mismatch.
0317	Failed	Negotiation - device channel cables are crossed.

Table A-3 (continued) Partner Status Table

Value	Partner State	Notes
0320	Failed	Hot pull of partner detected while nexus active.
0321	Failed	Partner absent at boot.
0322	Failed	Power failed before failover finished.
0323	Failed	Power failed before relinquish finished.
0341	Failed	Controller-controller locking had unrecoverable SCSI error.
0400	Removed	Partner is removed.
0500	Inserted	Partner is inserted.

Error Codes

Table B-1 lists error codes associated with the direct commands (MDACIOCTL). These codes can be reported when using TPM and are provided as reference information.

Table B-1 Error Codes

Key	ASC	ASQ	Description
05	24	00	Illegal field in SCSI CDB.
09	00	02	Bounds error.
09	80	50	Parity error detected. Internal firmware error.
09	81	00	Last check had a good completion.
09	81	01	Drive is write-protected.
09	81	02	Specified device not present. Invalid enclosure ID specified.
09	81	03	Host block count is zero.
09	81	04	Unimplemented opcode from host.
09	81	05	Invalid system drive number specified.
09	81	06	if (CommandCode == MDACIOCTL_MORE), a rebuild or check is already in progress. Else controller is busy.
09	81	09	Invalid parameter (reserved bytes) in CDB.
09	81	0B	Enclosure device not ready.
09	81	0C	Initialization is in progress.
09	81	0D	Consistency check is in progress.
09	81	0F	Command issued to C1 in a duplex system. OFM is disabled.
09	81	10	Check consistency or expansion is in progress.
09	81	11	Maximum allowable number of system drives is already defined.
09	81	12	System drive to migrate is in CRITICAL mode.
09	81	13	System drive to migrate is not in ONLINE mode.
09	81	14	Controllers are in dual-active mode for Simplex MORE.
09	81	15	Failover still in progress.

Table B-1 (continued) Error Codes

Key	ASC	ASQ	Description
09	81	16	Migrate command issued to system drive with more than one span.
09	81	17	Disk drive to add is already part of a system drive.
09	81	18	Disk drive to add is not in STANDBY (Hot Spare) mode.
09	81	19	Multiple system drives defined on PDs to enlarge.
09	81	1A	Invalid parameter in data list.
09	81	1B	The rebuild/migrate rate is improperly set to 0xff (255).
09	81	1C	A drive in system drive to expand is also in other system drive with more than one span.
09	81	1D	The drive to add is too small.
09	81	1E	Cannot get temporary memory.
09	81	1F	COD write to disk failed.
09	81	20	Controller not ready.
09	81	21	Controller not ready - waiting for start unit.
09	81	22	Controller not ready - can't get ready.
09	81	23	Controller not ready - command didn't complete.
09	81	24	No more devices to report.
09	81	25	More than 32 enclosures attached, cannot return data.
09	81	26	Insufficient buffer space to return all data. Allocation length too small in CDB.
09	81	27	Specified request not supported. Invalid page code requested.
09	81	28	Device scan in progress for new direct command.
09	81	29	Invalid RAID type.
09	81	2A	Specified device not found.
09	81	2B	Maximum # of COD groups (64) already used.
09	81	30	Invalid range for Config2 parameter.

Table B-1 (continued) Error Codes

Key	ASC	ASQ	Description
09	81	31	A Config2 parameter can not be changed at this time.
09	81	40	Program image failed do to invalid image file.
09	81	41	Program image failed do to EEPROM write failure.
09	81	42	Program image failed do to EEPROM read/compare failure.
09	81	50	Device specified in UDD not previously defined.
09	81	51	Maximum number of physical drives reached.
09	81	52	More than 32 SDs configured.
09	81	53	Requested data larger than allocation length.
0	9	81	54 invalid COD group ID.
09	81	55	Reserved field used or invalid value in field.
09	81	56	New RDN already in use.
09	81	57	Specified transfer size too small.
09	81	58	Top level only can be deleted.
09	81	59	Last defined device only can be deleted.
09	81	5A	Physical device already specified.
09	81	5B	Specified physical device is not configured.
09	81	5C	Cannot change RAID type.
09	81	5D	Cannot change stripe size.
09	81	5E	Cannot change device number.
09	81	5F	Physical device no available.
09	81	60	No groups present.
09	81	61	Bad number of drives to add.
09	81	62	User sent IDD (spanned LUN).
09	81	63	PDD must be configured prior to MORE request.

Table B-1 (continued) Error Codes

Key	ASC	ASQ	Description
09	81	64	Start LBA must be 0.
09	81	65	Entire PDD must be used.
09	81	66	SDD sent with MORE has bad field(s); illegal state change for logical device.
09	81	67	No SES device present (Operational Fault Management MUST be enabled for this command to work).
09	81	68	Invalid SAN map.
09	81	69	Skipped an XLDD number.
09	81	6A	Drive exists but is unconfigured.
09	81	6B	Invalid stripe size in configuration.