TEXAS MEMORY SYSTEMS, INC.

RamSan-500

User's Manual

RamSan-500

Version 1.2

Revision History

The following table describes revisions to this document:

Version	Comments	Date
1.0	Initial release	9/14/2007

Table of Contents

Chapter 1 – Introduction

1.1 Overview

The RamSan-500 is the World's Fastest Flash-based storage system. The basic unit contains nine RAID-protected Flash storage modules accessible from the front, with a combined usable capacity of either 1 or 2-Terabytes and a data bandwidth of 2 GB/sec. A single RamSan-500 fits in 4U of rack space. Multiple RamSan-500 units scale capacity, bandwidth, and IOPS.

1.1.1 High Performance Solid–State Storage

Unlike other mass storage products, the RamSan-500 is not based on mechanical rotating disk technology, but instead on high performance memory technology. While each of the nine Flash storage modules may look like a disk, there are no moving parts and it operates with a much faster protocol, reducing access time and increasing the data transfer rate. This is achieved with the use of better connectors (rugged, more data pins) and a simple transfer protocol.

While the capacity and throughput of the RamSan-500 is impressive, the key to the system's power resides in its I/O structure. The RamSan-500 can be configured with 2-8 Fibre Channel (FC) ports. Internally, it can handle the bandwidth and supply the IOPS needed for emerging storage applications.

1.1.2 Easy Installation and Configuration

The RamSan-500 is easy to install on a Fibre Channel SAN or directly attached to a server. Most common parameters, including the management Ethernet port, can be set from the front panel. The RamSan-500 also has monitoring and configuration capabilities through a Web browser.

1.2 System Components

The system components for the RamSan-500 include:

- ✓ 9 Flash modules with 1 or 2 Terabytes of data storage capacity
- ✓ 16-64 GB DDR Cache
- ✓ 4 dual-ported 4G-bit Fibre Channel Controllers
- ✓ Hot-swappable redundant power supplies
- ✓ Easily replaceable fans
- ✓ Front panel display for monitoring and configuration
- ✓ Java-based monitoring

1.3 Power

The RamSan-500 includes two hot-swappable power modules that are auto-ranging (they accept either 110 or 220 VAC power).

1.4 Reliability

The RamSan-500 is designed to offer superior reliability to other solid-state disks and RAID devices. Its standard features include Chipkill™-protected RAM, hot-swap modular Flash memory, hot-swap power supplies, failover ports, and SNMP compatibility. The nine-unit RAID design ensures data integrity even in the event of the complete failure of a single Flash module. In order to reduce the probability of a Flash module failure, the unit incorporates multiple error-correcting methods.

1.5 System Management

Basic management operations, including manual shutdown and alerts, are available from the front panel screen. Full monitoring and configuration capabilities are available over any browser via a password protected Java applet. The RamSan-500 also offers Telnet management capabilities and is fully SNMP compatible.

Chapter 2 – Reviewing your shipment

2.1 Unpacking

2.1.1 System Inspection

TMS ships the RamSan-500 with a packing list. Ensure that you have received all of the components listed.

1) Examine the external chassis for any damage that might have occurred during shipping.
2) Examine the Flash modules to ensure that they were not damaged during shipping.
3) Inspect the interface plate for any screws that might have loosened during shipping.
4) Inspect the front panel display for damage.
5) Report any meaningful damage to Texas Memory Systems.

2.2 System Overview

All nine Flash storage modules can be quickly accessed from the front of the RamSan-500. Each module has an interlocking system with the look and feel of a typical disk drive. The Flash module can be removed while system power is on, once the module has been selected to go off-line (indicated when both module LEDs are off). Additionally, all nine Flash modules can be removed and reinstalled into another RamSan-500 unit.

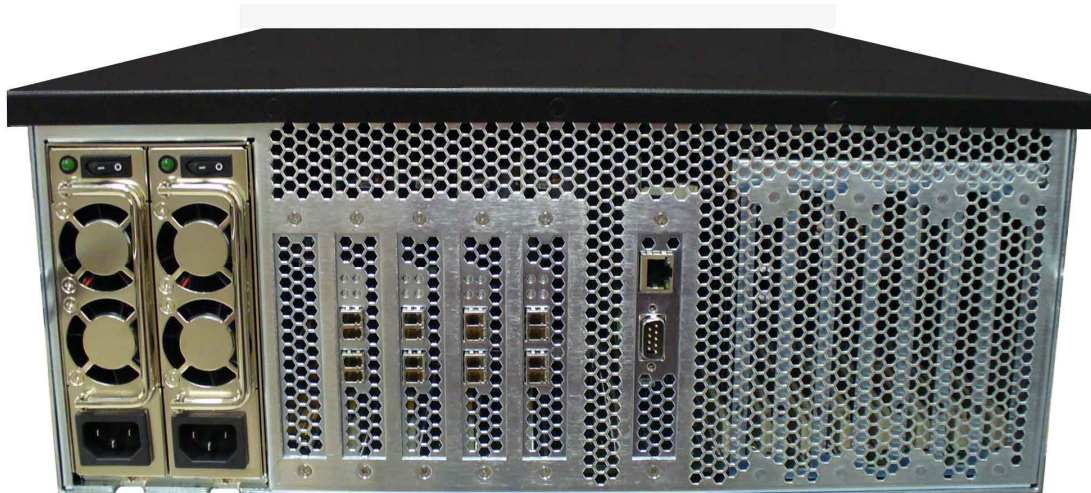**Figure 1 – RamSan-500 Front**

Figure 2 – RamSan-500 Back

2.2.1 Rack mounting

The RamSan-500 solid-state disk (SSD) system is a 4U rack-mountable system. TMS ships the system with the slides and equipment needed to install it into a standard 19" rack.

Chapter 3 – Connections

3.1 Installing a Host Bus Adaptor in the Host System

Host Bus Adapters (HBAs) provide an interface from the server's PCI bus to Fibre Channel attached devices. HBAs are available from a variety of vendors. Before purchasing an HBA, ensure that it provides a driver for the Operating System (OS) version that you are using.

Before installing the HBA, consult your server's documentation to determine which one of its PCI slots is on the fastest and least congested PCI bus (see *Section 3.1.3*, below, for details). Next, power down your server and place the HBA in this slot. Power on your server and follow the instructions provided with the HBA to install the driver. It is generally a good idea to check the HBA provider's Web site to obtain the latest drivers and firmware for the HBA. Updated drivers may include new features, improved performance, and minor bug fixes.

TROUBLESHOOTING TIP:

IF YOU ENCOUNTER ANY PROBLEMS WITH THE HBA, THE FIRST STEP IN THE DEBUGGING PROCESS IS VERIFYING THAT YOU ARE USING THE LATEST DRIVER AND FIRMWARE.

The speed of the server and network interface ultimately limit the RamSan-500's capabilities. A few different components can affect the maximum performance of the RamSan-500, including FC interfaces, Host Bus Adapters, PCI buses, and server CPU resources.

3.1.1 Fibre Channel Interface

Currently, the RamSan supports two Fibre Channel communication speeds: 2- and 4-gigabit. Accounting for encoding and overhead, these transfer rates allow data to be transmitted to the RamSan-500 at a half duplex rate of ~200 MB/s and ~400 MB/s, for 2- and 4-gigabit, respectively. Fibre Channel interfaces have separate read and write connections that allow a maximum data rate of twice the half-duplex rate. To sustain the maximum full duplex rate, the data usage pattern of the system must be 50% read and 50% write (due to the individual half duplex limits). To find the maximum for other data usage patterns, use the following formula (4-gigabit HBA):

(Smaller usage percentage / Larger) x 400MB/s + 400MB/s

For example, to calculate a data usage pattern with 66% reads and 33% writes:

(33 / 66) x 400 + 400 = 600 MB/s

Many applications require storage bandwidth that exceeds what a single FC connection can provide. To accommodate this situation, we provide up to 8 FC ports per RamSan-500, each of which can supply the bandwidth described above. Using multiple Fibre Channel

connections requires one of the following solutions: multi-pathing software to a single LUN, using software to stripe across multiple LUNs, accessing multiple LUNs on the RamSan-500 concurrently, or connecting multiple servers to the system.

3.1.2 Host Bus Adapter

You can modify some HBA settings to increase performance. For information specific to your HBA, consult the HBA documentation. Note that many settings are intended to increase the performance of slow storage devices and will not be applicable to RamSans. It is always advisable to check the frame size. The amount of overhead for each Fibre Channel frame is fixed, so larger frames have lower overhead. Set the frame size to the maximum setting, generally 2048 bytes.

3.1.3 PCI Bus

High bandwidth HBA traffic can quickly inundate slower PCI buses. Once a PCI bus reaches its limit, you can do very little to improve performance. Many servers, however, provide different PCI buses with different speeds, and placing the HBA on a different PCI bus can improve performance. TMS recommends giving each 4-gigabit 2 port HBA at least an entire PCIX bus or a PCI Express (PCIe) slot.

3.1.4 CPU

At a certain point, CPU performance can limit data transfer rates. Determine whether the server's CPU resources are the limiting factor in performance while benchmarking the RamSan-500 as a raw physical device. Otherwise, an improperly tuned file system or application can make the CPU appear to be the limiting factor when it is not. Perform raw device testing after setting up any multi-pathing.

There are a few ways to decrease CPU usage without increasing CPU resources. Certain data usage patterns can be very CPU intensive and fully utilize the CPU. These usually involve small transfer sizes. When possible, increasing the average transfer size decreases CPU usage and offers better performance. Another way to decrease CPU usage is by enabling interrupt coalescing. Interrupt coalescing is an HBA dependent feature that offers a method to trade latency for CPU usage. This feature delays calling the HBA transfer interrupt until several transfers are ready. In general, TMS does not recommend enabling Interrupt Coalescing, because most RamSan applications benefit from low latency. For more information, consult your HBA documentation.

3.2 Connecting the Fibre Channel Ports

Connect the Fibre Channel ports on the RamSan-500 to your server or to a Fibre Channel switch.
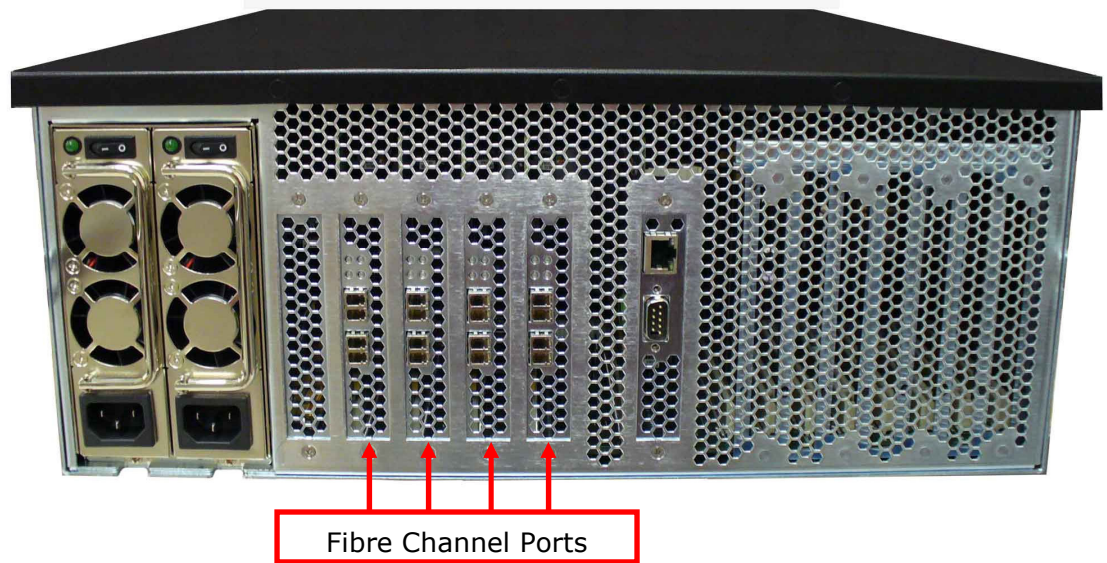
Fibre Channel Ports

Figure 3– Fibre Channel Port Locations

Figure 3– Fibre Channel Port Locations shows the port layout for the RamSan-500. Each controller has two or four Fibre Channel ports: A and B, on the top and bottom respectively. The FC-77 ports on the system are capable of connecting to point-to-point, arbitrated loop, and switched fabric topologies at either 4-Gigabit or 2-Gigabit speeds.

3.3 Connecting to a Network

Your RamSan-500 includes a Gigabit Ethernet port for remote management over a network. You use this connection to configure the storage and management features.
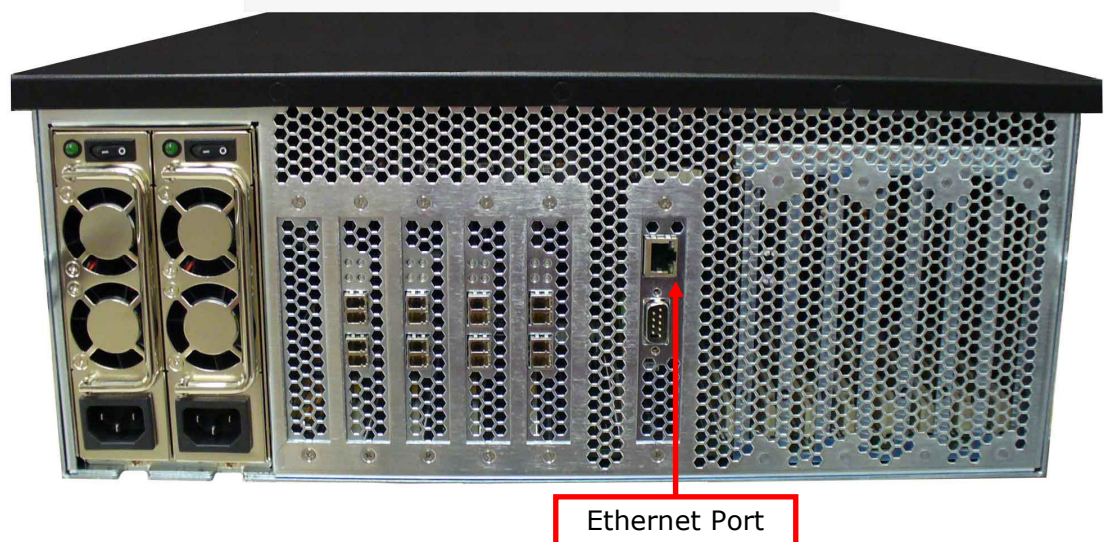

Ethernet Port

Figure 4 – Gigabit Ethernet Port Location

3.4 Connecting Power to the System

A fully loaded RamSan-500 requires approximately 250 watts of power. It contains redundant power supplies that are hot-swappable. Using the AC power cords provided, connect each power module to a power source. Install the socket outlet in an easily accessible location near the equipment.
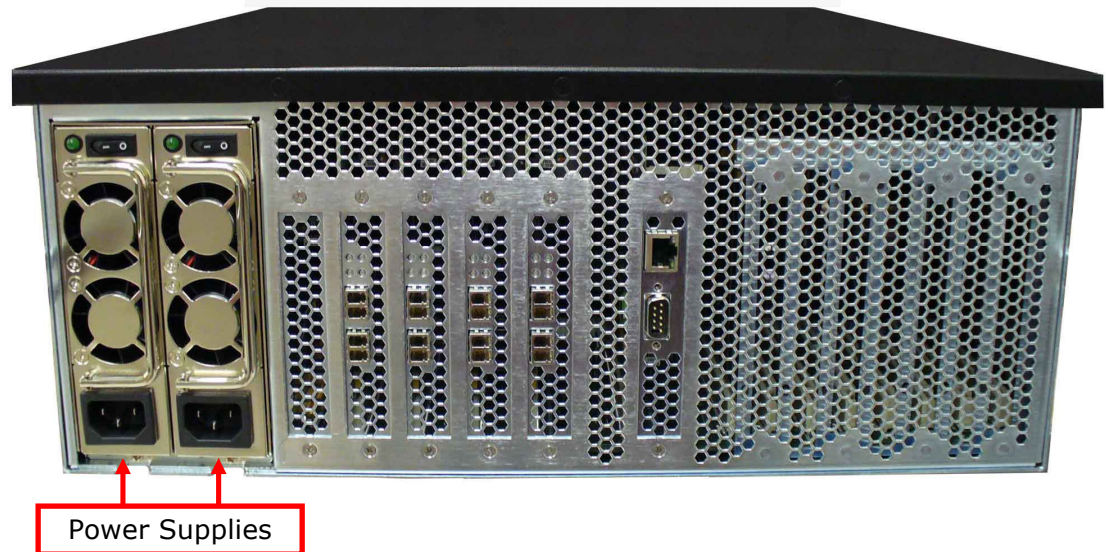

Power Supplies

Figure 5 – RamSan-500 Power Supply

The power supply includes the following button and indicators:

3.4.1 Power Switches

Each power module has an individual on/off switch and power indicator light.

WARNING:
A HARD-SHUTDOWN WILL CAUSE DATA LOSS AND SHOULD ONLY BE USED WHEN YOU ARE UNABLE TO PERFORM A MANUAL SHUTDOWN AND BACK UP ALL DATA TO THE FLASH MODULES OR EXTERNAL STORAGE.

3.4.2 AC Voltage Indicator Light

When the power supply is connected to AC power and is operating properly, the indicator light attached to each power supply is green. If the green light is not on, either the power supply is disconnected from an AC power source or the power supply has failed. Check the power cable to determine if power has been lost to the supply or the module has failed. The front panel display or Web monitor may provide additional information regarding the problem.

Chapter 4 – Getting Started

This chapter will guide you through setting up your RamSan-500. It is important to accomplish the following tasks to make your system usable:

- Use the front panel display to set up the network (*Section 4.5*)
- Get the Web monitor operational (*Section 4.7*)
- Use the Web monitor to set the date and time (*Section 4.8*)
- Use the Web monitor to configure advanced network settings (*Section 4.9*)
- Use the Web monitor to configure security (*Section 4.10*)

Other sections explore the configuration tools and should be read to familiarize you with the system.

4.1 Turning on the System

Separate power cables should be connected to each of the two RamSan-500 power modules. The 3-prong AC inlet lies at the bottom of each power module. To power on the system, both power modules should be switched on. Though the RamSan-500 will operate when only one power supply is switched on, this is not recommended. After a user-initiated shutdown, switch both power modules off, then switch both modules on again to bring the system back on-line.

4.2 System Initialization

The front panel display shows the boot process' current state. Once the power is connected, the system turns on automatically and the front panel display begins the power-on sequence. The following happens automatically:

- ☐ Once AC power is connected, the RamSan will power-up and the front panel displays "**System Status: GOOD**" and shows the performance bars for each Fibre Channel port. The numbers represent the Fibre Channel Controllers. If a controller is not installed, the number and corresponding performance will not display. The top bars represent port A and the bottom bars represent port B.

```
System Status:    GOOD
1        2        3        4
```

The system is now ready for normal operation.

4.3 Front Panel Display Basics

The front panel display provides a quick and easy way to view the RamSan-500's status. It displays the current progress of Flash module synchronization and shows system warnings and failures.

The RamSan-500's front panel allows you to:

➢ Inspect the state of the system
➢ Select a Flash module to power off
➢ Change the method of IP address assignment
➢ Reboot/Shutdown the system.

Four buttons located to the left of the display are used to make selections:

Menu: This button has two functions. On any of the status or performance displays, pressing this button launches the RamSan Main Menu. It is also used as an escape function. Once the menu is open, pressing it returns the user to the prior screen.

Select: When a menu item is on the display, pressing this button will either execute that menu option or proceed to the next layer in the menu. If the menu is not selected, this button is disabled.

↑: This button scrolls up through the menu. It is also used to cancel certain commands, as indicated on the display. If the menu is not selected, this button is disabled.

↓: This button scrolls down through the menu. It is also used to confirm certain commands, as indicated on the display. If the menu is not selected, this button is disabled.

You can scan through the first level of options on the RamSan by pressing the **Menu key**.

⬜ Selecting "**System Info**" displays information about your RamSan-500.

```
Main Menu
▶ System Info
```

⬜ Selecting "**System Log**" allows you to clear your system log. See *Section 4.15.2* for more information.

```
Main Menu
▶ System Log
```

⬜ Selecting "**Network Config**" allows you to connect your RanSan-500 to your network. See *Section 4.9* for more information.

```
Main Menu
▶ Network Config
```

☐ Selecting "**Flash Module**" allows you to select a module to identify mode or for power off.

```
Main Menu
▶ Flash Module
```

☐ Selecting "**Active Monitor Mode**" changes the default front panel display to show port activity across both display lines. This makes it easier to view from a distance. This option becomes "**Remove Monitor Mode**" once it has been set.

```
Main Menu
▶ Active/Remove Monitor Mode
```

☐ Selecting "**LED Config**" gives you a variety of options for controlling the LEDs on the upper left-hand side of the front of the RamSan-500.

```
Main Menu
▶ LED Config
```

☐ Selecting "**Display Logo**" displays the TMS logo on the front panel display. This option becomes "**Disable Logo**" once it has been set.

```
Main Menu
▶ Display/Disable Logo
```

☐ Selecting "**Manual Restart**" reboots your RamSan-500. See *Section 4.4.2* for more information.

```
Main Menu
▶ Manual Restart
```

☐ Selecting "**Manual Shutdown**" turns off your RamSan-500. See *Section 4.4.1* for more information.

```
Main Menu
▶ Manual Shutdown
```

4.4 Controlling System Power with the Front Panel Display

The RamSan-500 has features that allow the administrator to safely power down the system. Before powering down the system, un-mount the drives from your OS. Do not turn off the system by unplugging the power cords.
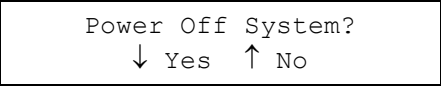
4.4.1 Manual Shutdown

The administrator can shut down the RamSan-500 manually from the front panel display. This procedure safely synchronizes all data in the RAM cache to the internal Flash module storage.

In order to turn the RamSan-500 back on after a manual shutdown, switch off both power modules and then switch both back on.

□ To shut down the system using the front panel, use the arrow buttons to cycle through the top-level menu to select "**Manual Shutdown**". Use the **Select** button to select this menu item.

```
Main Menu
▶ Manual Shutdown
```

□ The display prompts you to confirm that you wish to "**Power Off System**". To cancel the shutdown, use the ↑ button to return to the main menu. To proceed with the shutdown, use the ↓ button to confirm the system power off.

```
     Power Off System?
     ↓ Yes   ↑ No
```

□ Now, the front panel display indicates that the system is powering off. When the system is ready, it will automatically shut off.

```
Powering Off         60%
■■■■■■■■■■■
```
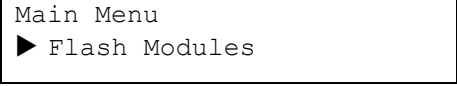
4.4.2 Flash Modules

You may need to remove one or more of the Flash modules for various reasons. This can be done with the RamSan-500 system power on or off. However, if the RamSan power is on, the particular Flash module selected for removal must always be powered off prior to removal.

WARNING

REMOVING A FLASH MODULE WHILE IT IS POWERED ON MAY CAUSE IRREVERSIBLE DAMAGE TO THE MODULE.

Prior to powering off a module you may wish to verify the physical location of a module. This can be accomplished with the "Identify Module" feature from the front panel.

□ To Identify a particular module, use the arrow buttons to cycle through the top-level menu to select "**Flash Modules**". Use the Select button to select this menu item.

```
Main Menu
▶ Flash Modules
```

□ To choose a particular Flash module to Identify, scroll through the Flash Module sub-

```
Flash Modules
▶ Identify Module
```
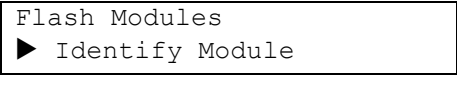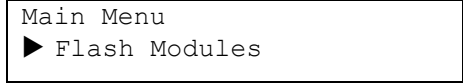
menu and choose the "Identify Module" option.

☐ Next, scroll down the Identify Module sub-menu to choose the module that you wish to Identify. After a Module is selected it Status Indicator LED will slowly blink Orange for four second and then return to its previous state.

```
Identify Module
▶ Module 1
```
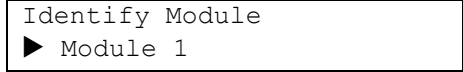
Once the appropriate module has been identified it may be powered off from the front panel.

☐ To power off a particular module, use the arrow buttons to cycle through the top-level menu to select "**Flash Modules**". Use the Select button to select this menu item.

```
Main Menu
▶ Flash Modules
```

☐ To choose a particular Flash module to power off, scroll through the Flash Module sub-menu and choose the "Power Off Module" option.

```
Flash Modules
▶ Power off Module
```
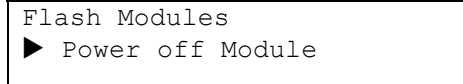
☐ Next, scroll down the Power Off Module sub-menu to choose the module that you wish to power off.

```
Power Off Module
▶ Module 1
```
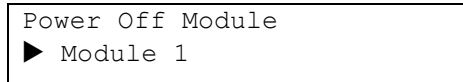
☐ The display prompts you to confirm that you wish to power off the module. To cancel the module power off, use the ↑ button to return to the main menu. To proceed with the module power off, use the ↓ button to confirm.

```
Power Off Module 1?
↓ Yes   ↑ No
```
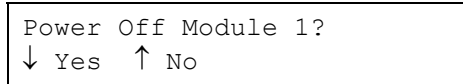
☐ You can then exit from the Flash Module sub-menu and remove the chosen module.

```
Flash Module Menu
▶ Exit
```
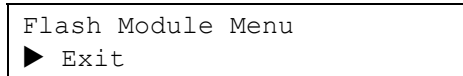
### 4.4.3 Manual Restart

The administrator can reboot the RamSan manually from the front panel display. This procedure safely synchronizes all data in RAM to the internal Flash module storage, powers off for around 5 seconds, and then powers back on.

☐ To shut down the system using the front panel, use the arrow buttons to cycle through the top-level menu to select "**Manual Restart**". Use the **Select** button to select this menu item.

```
Main Menu
▶ Manual Restart
```

☐ The display prompts you to confirm that you wish to "**Restart System**". To cancel the shutdown, use the ↑ button to return to the main menu. To proceed with the shutdown, use the ↓ button to confirm the system power off.

```
         Restart System?
         ↓ Yes   ↑ No
```
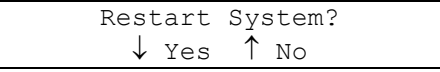
☐ Now, the front panel display indicates that the system is powering off. When the system is ready, it will automatically shut off. In approximately 5 seconds time, the system will turn back on.

```
Powering Off        90%
■■■■■■■■■■■■■■■■■■
```

4.4.4 Automatic Shutdown

In the event that the system senses a high system temperature, power out of range, or a variety of other dangerous environmental conditions, the system will automatically initiate the shutdown procedure.

4.5 Network Configuration with the Front Panel Display

The RamSan-500 allows system monitoring and configuration through the installed Ethernet module. To access the system's Ethernet port you will need to provide the system with an IP address, subnet mask, and possibly a gateway address. The administrator may assign the IP address in one of three ways: Static IP, DHCP, or No Ethernet. The default factory setting is DHCP.

For any questions regarding IP assignment values, please consult your network administrator.

To set up the network via the front panel, use the arrow buttons to cycle through the top-level menu options until the display shows **"Network Config"**. Use the **Select** button to choose this option and continue with the configuration. You may now use the arrow buttons to scroll through the following menu options:

    ☐   Displays a list of the current IP configuration, hostname, IP address, subnet mask, gateway address (if applicable), and hardware Ethernet address.

```
Network Config
▶ Show Current Config
```

    ☐   To continue setting up the Ethernet configuration.

```
Network Config
▶ Set IP Config
```

    ☐   Shuts down and restarts the Ethernet port using the current IP assignment configuration.

```
Network Config
▶ Restart Network
```

    ☐   Exits the setup menu.

```
Network Config
▶ Exit Menu
```

Use the arrow buttons to scroll up and down through the list. To continue setting up the Ethernet configuration, select "**Set IP Config**".

After selecting "**Set IP Config**", you may use the arrow buttons to cycle through:

    ☐   Enables you to set a static IP address for the RamSan.

```
Set IP Config
▶ Static
```

    ☐   Sets the IP configuration to DHCP

```
Set IP Config
▶ DHCP
```

    ☐   Disables Ethernet

```
Set IP Config
▶ None
```

    ☐   Returns to the Main Menu without making any changes

```
Set IP Config
▶ No change (exit)
```

Talk to your network administrator for the proper IP assignment type. Use the **Select** button to select the desired method of IP assignment. If you did not choose **"Static IP"** you are asked to confirm the selection with the ↓ button.

To configure the RamSan with a static IP, the system requires the IP address, subnet mask, and possibly a gateway address.

□ After you have chosen "**Static IP**", the display prompts you to enter an address. Use the ↑ and ↓ buttons to move the cursor. Hit **Select** to pick a number. And then use the ↑ and ↓ buttons to cycle through the numbers **0** through **9**. To save the changed value, press the **Select** button. To revert to the previous value, press the **Menu** button.

```
Ethernet IP address:
▶ 192.000.000.000
```

□ After you have finished entering the IP address, scroll the cursor off the end – this brings up the "**Network Subnet Mask**" screen. Using the same procedure as entering the IP address, enter the subnet mask.

```
Network Subnet Mask:
▶ 255.255.255.000
```

□ The final value you must enter is the "**Ethernet Gateway**". If the RamSan is on a private network and this value is not needed, enter the value "**000.000.000.000**" to tell the RamSan to ignore this entry.

```
Ethernet gateway:
▶ 192.168.111.001
```

□ The next screen commits the changes and automatically restarts the network.

```
Assign Static IP?
↓ Yes   ↑ No
```

□ You should witness the network restarting.

```
Restarting
Network...    Done
```

□ The final screen displays the assigned IP address

```
New IP Address:
192.168.111.101
```

The RamSan-500 comes from the factory using DHCP as its IP address method. To configure your DHCP server you may need to know the RamSan's hardware MAC address. Follow the instructions below to get the MAC address and to set up your system to use DHCP:

□ From the "**Network Config**" sub-menu select the "**Show Current Config**" option.

```
Network Config:
▶ Show Current Config
```

□ Use the ↓ button to scroll to the bottom of the screen. This will display 6 octets of the hardware
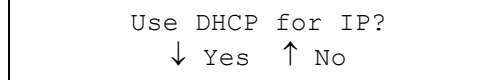
```
↑ Hardware Address:
■ a2:78:90:f7:01:88
```

MAC address. Use this value to configure your DHCP server.

☐ Re-enter the "**Network Config"** menu, then "**Set IP Config**" menu and select "**DHCP**".
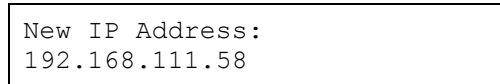
```
Set IP Config
▶ DHCP
```

☐ The next screen commits the changes and automatically restarts the network.

```
       Use DHCP for IP?
        ↓ Yes  ↑ No
```

☐ You should witness the network restarting.

```
Restarting
Network...   Done
```

☐ The final screen displays the IP address assigned by the DHCP server.

```
New IP Address:
192.168.111.58
```

If the network fails to start, check the Ethernet connection and contact your system administrator. If the system successfully saved the IP configuration, you may simply select the "**Restart Network**" option from the "**Ethernet Setup**" menu instead of re-selecting the same IP configuration.

4.6 Additional System Management Options

4.6.1 Connecting using a Terminal Program

To connect to the RamSan-500 using a serial port connection, use a dumb terminal or a terminal emulation program such as Windows™ HyperTerminal. Set your baud rate to 9600 with 8 data bits, 1 stop bit, no parity, and no flow control. Connect to the serial port using a DB-9 non-null serial cable.

4.6.2 Connecting using Telnet

Once the administrator configures the Ethernet port on the RamSan-500 using either the front panel or the serial port, you may remotely monitor the system using a Telnet session. Set your terminal settings to VT100 mode.

To learn more about managing the RamSan-500 using the serial port or Telnet connections, see the *RamSan Command Line Interface Manual* available from Texas Memory Systems.

4.6.3 Connecting using SNMP

RamSans support the Simple Network Management Protocol (SNMP), which is the dominant network management protocol. The industry has accepted this protocol due to its relative simplicity. SNMP standards provide a framework for the definition of management information along with a protocol for the exchange of that information. The RamSan-500 is compatible with SNMP V2c.

The SNMP model contains "managers" and "agents." A manager is a software module responsible for managing the configuration on behalf of the network management application end users. Agents are devices, such as the RamSan, which are responsible for maintaining local management information and delivering that information to a manager via SNMP. Both the manager (via polling) and the agent (via a trap) can initiate management information exchanges.

Managers can access statistical information from the RamSan through its management information base (MIB). For more information on how to use the SNMP management capability, please see the *RamSan SNMP Guide* available from Texas Memory Systems.

4.6.4 Connecting using the Web Monitor

The RamSan-500 is equipped with a browser-enabled tool to facilitate system monitoring, management, and configuration. This Java-based monitoring application is the most popular and convenient RamSan management tool and will be introduced and discussed in greater detail below. Texas Memory Systems also provides an extensive Web monitor users manual called the *RamSan Web Interface Guide*.
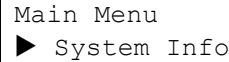
4.7 Web Monitor Basics

The RamSan-500 comes with a powerful Web-based management tool. It is important to learn how to use this tool, as it will make upkeep and maintenance of the system simple.

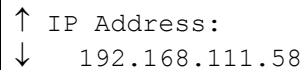### 4.7.1 Acquiring the System IP Address

To use the Web monitor, you must connect to it over your network. You will need to acquire the RamSan-500's IP address – which can be accomplished from the front panel display.

☐ Press the **Menu** button to display the "**Main Menu**". Use the ↓ and ↑ buttons to find the "**System Info**" option. Tap the **Select** key.

```
Main Menu
▶  System Info
```

☐ Use the ↓ button to scroll until you see the "IP Address" line and the line below it. Take note of the IP address.

```
↑ IP Address:
↓    192.168.111.58
```

4.7.2 Accessing the Web Monitor

Accessing the Web monitor can be done from any Web browser that supports Sun Java v1.5 or later. You can download the Sun Java plug-in for Microsoft Internet Explorer for Windows and for both Linux and Windows versions of Firefox. To get the latest Sun Java plug-in, go to http://www.sunjava.com/.

The following figures refer to "**myRamSan**" instead of an IP address, since "**myRamSan**" was assigned the IP address 192.168.111.58 from our name server. You do not need to use a name server to access the Web monitor. You can instead type the IP address in directly.
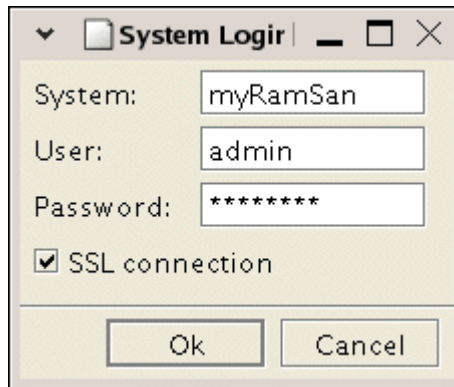
Figure 6 – Web Monitor Login Screen

Using a standard Web browser with the Sun Java plugin, set the address to your IP address. It will take a moment to download the Java program (10 or 15 seconds) and then the window displayed in *Figure 6* will appear. The RamSan ships with the **admin** user defined

User: **admin**
Password: **password**

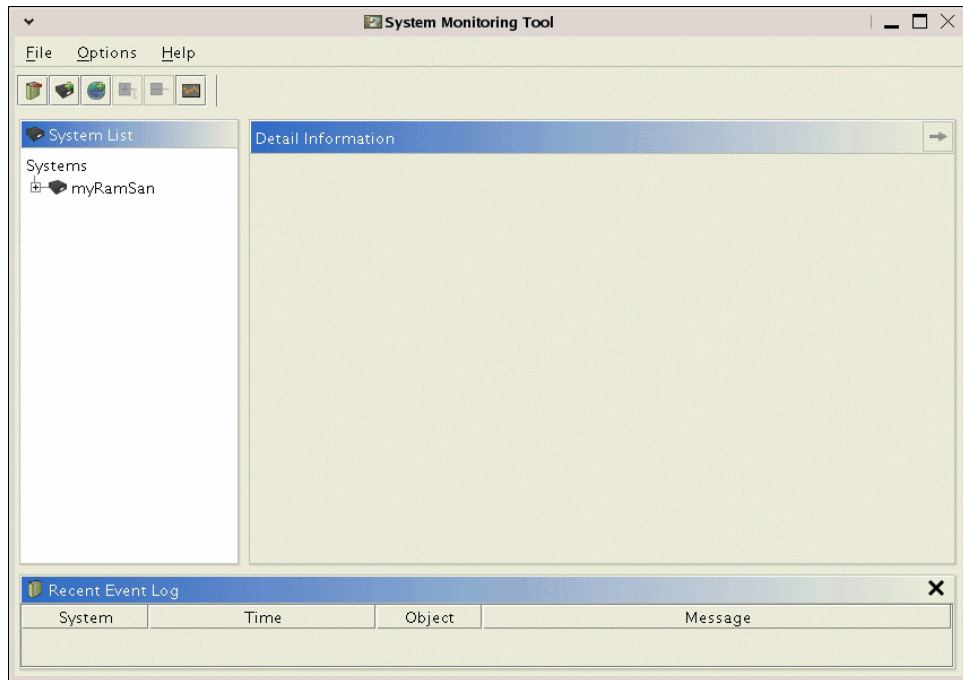After you log in, the window shown in *Figure 7* will appear.

Figure 7 – Web Monitor Opening Screen

From here select the RamSan icon. When selected it shows a variety of information about the system.
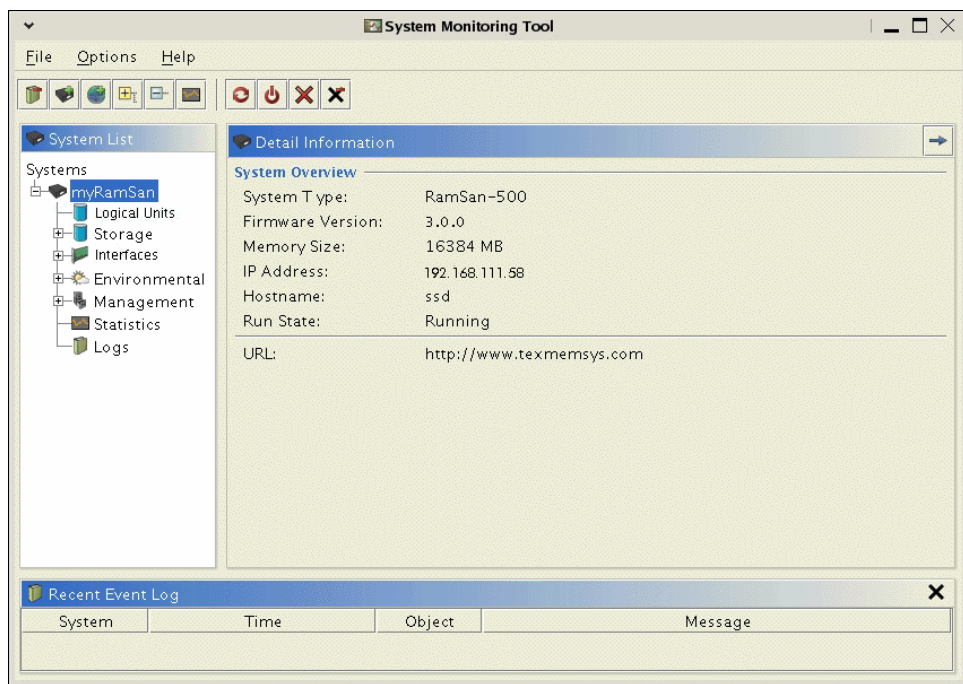

Figure 8 – Web Monitor Information

A great deal of information is available in this monitor: firmware versions, system event warnings, environmental information, and system statistics.

4.8 Date and time setup with the Web monitor

When you acquire the system, it is important to verify that the date and time are correct. If they are incorrect, you can use the Web monitor to change them.

From the Web monitor, expand the "**Management**" tab under the "**System List**". This will expose three sub-options. Highlight "**Date/Time**," it will display the current date and time as well as the amount of time the system has been up. Please see *Figure 9* for a screenshot.
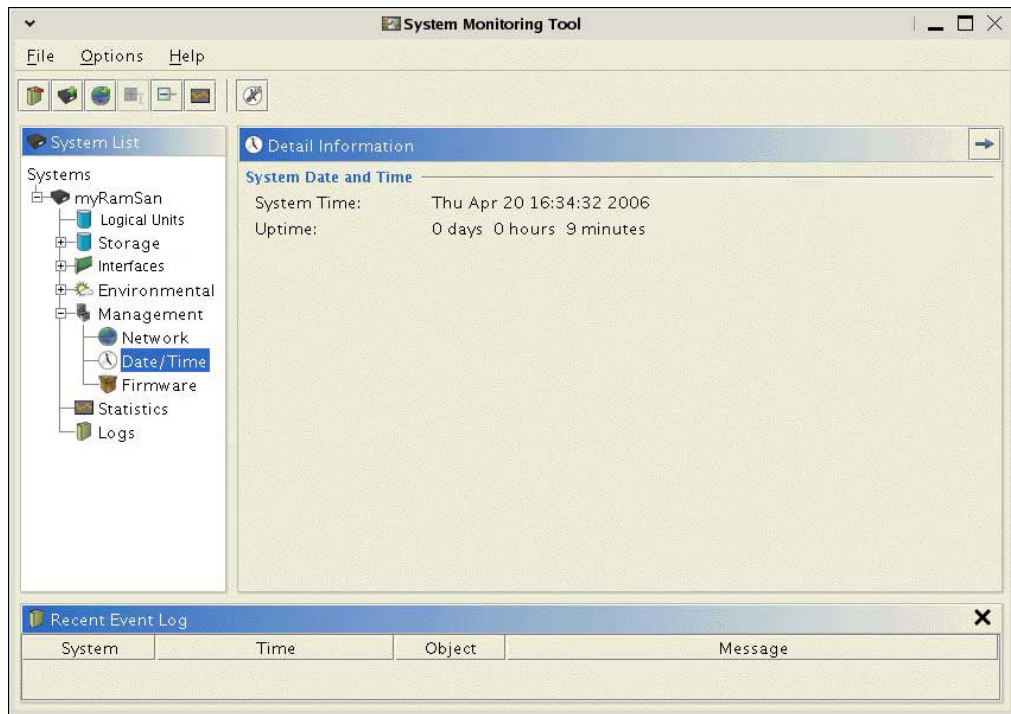

Figure 9 – Web Monitor Date and Time Management

If the date and time are incorrect you can set the time and date manually. Either right-mouse click and select "**Set date/time...**" or left-mouse click the clock/wrench icon in the button bar – both methods bring up the calendar window (*Figure 10*).
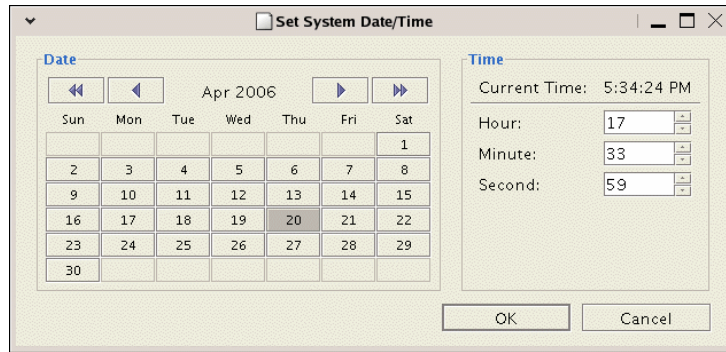
Figure 10 – Web Monitor Calendar

By configuring the calendar, you will set the date and time of the RamSan-500. Additionally, the RamSan-500 supports NTP (Network Time Protocol).

4.9 Network Configuration with the Web Monitor

You should have already set up the basic network options via the front panel if you followed the instructions in *Section 4.5 – Network Configuration with the Front Panel Display*. The Web monitor allows you to change those options as well.

From the Web monitor, expand the "**Management**" tab under the "**System List**". This will expose three sub-options. Highlight "**Network**"; it will display the current network settings.
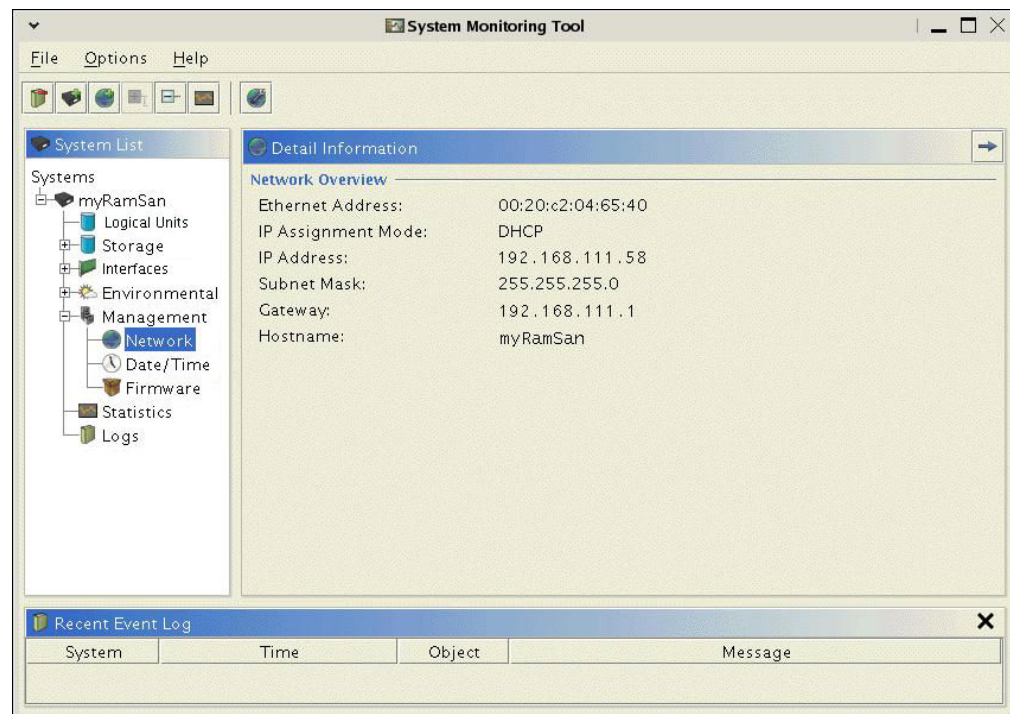

Figure 11 – Web Monitor Network Management

To modify the network configuration, right-mouse click and select "**Network config...**" or left-mouse click the globe/wrench icon in the button bar. Both methods bring up the network configuration window.
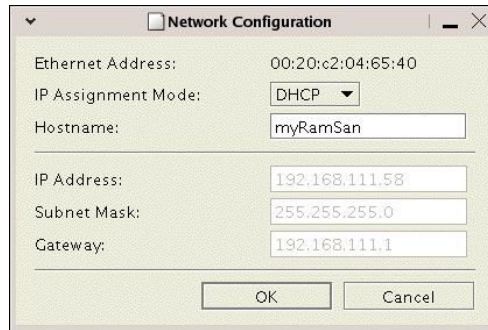

Figure 12 – Web Monitor Network Configuration

You can manipulate the network settings and then select "**OK**". The settings will be saved and the system's network will be restarted. You should see several system messages displayed in the "**Recent Event Log**" panel of the Web monitor confirming your settings.

4.10 Managing security with the Web Monitor

4.10.1 Default Accounts

The RamSan-500 ships with a high-privileged user as well as a low-privileged user. The high-privileged user is:

User: **admin**
Password: **password**

The high-privileged user is allowed to change RamSan configurations. The low-privileged user is:

User: **user**
Password: **password**

The low-privileged user can view statistics, logs, and other information, but cannot change any RamSan-500 settings.

4.10.2 Changing Passwords

You should configure the security on the RamSan to suite your needs. At a minimum, you should change the high-privileged user password to prevent accidental mishaps.

To configure users using the Web monitor, right-mouse click the "**Management**" tab under the "**Systems List**". This will expose four menu options – left-mouse click "**Add/Remove Users**". Alternatively, you may just right click the head/wrench icon in the button bar while the "**Management**" item is highlighted. Please see *Figure 13* for a screenshot.
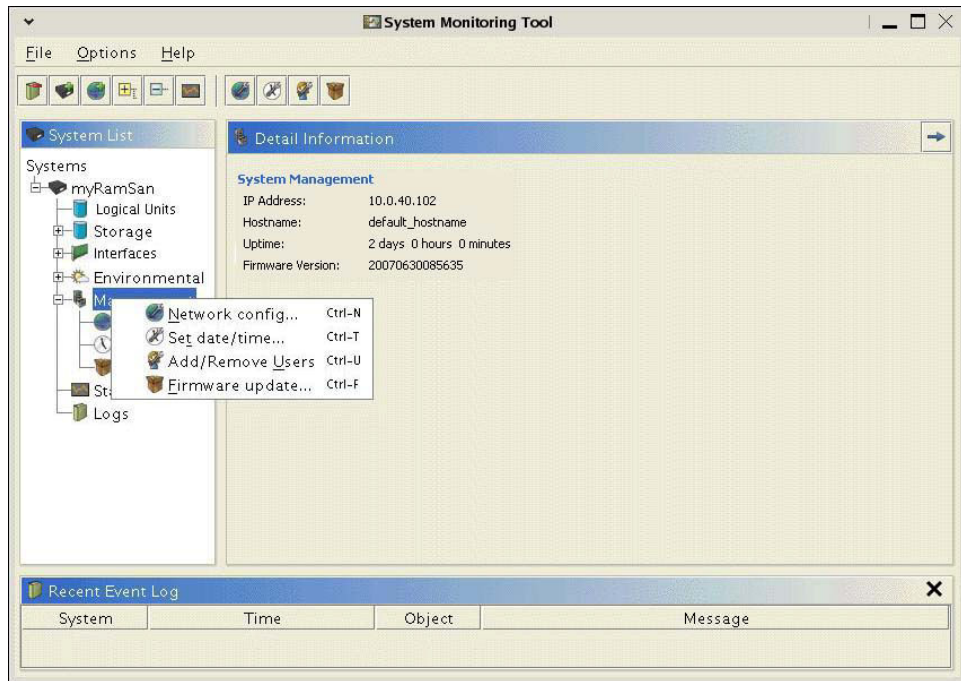
Figure 13 – Web Monitor Management Options

A user management table window pops up and displays all current users in the system. By default, there are only two users, please see *Figure 14* for a screenshot.
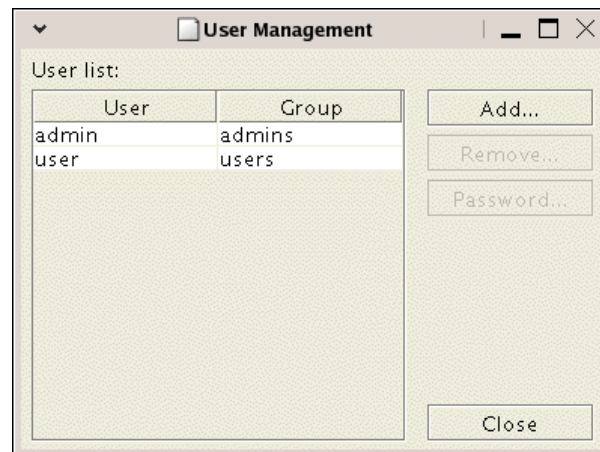

Figure 14 – Web Monitor User Management

Please change the password to your high-privileged user account (named "**admin**") by selecting the user and left-clicking the "**Password...**" button. This will pop up the "**Change User**" window shown in *Figure 15*.
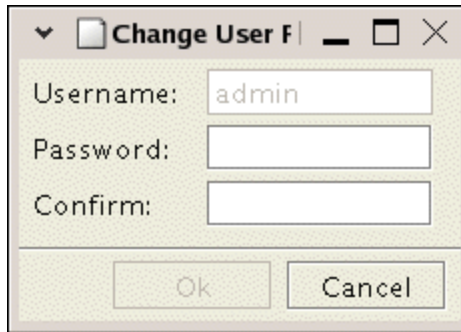
Figure 15 – Web Monitor Change User

Type in the new password and confirm it. Hit the "**OK**" button when finished.

4.10.3 Adding Users

You can add new users by selecting the "**Add...**" button in the "**User Management**" window. Doing so will bring up the "**Add User**" window shown in *Figure 16*.
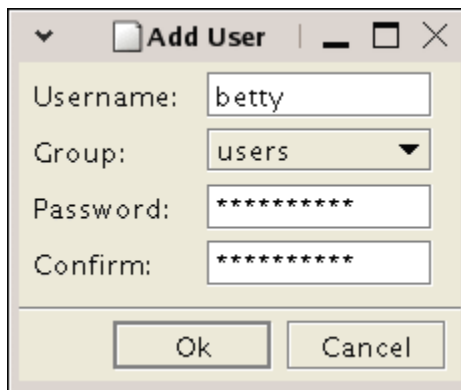

Figure 16 – Web Monitor Add User

You can add high-privileged users by assigning the new user to the "**admins**" group. You can give the new user low-privileges by assigning them to the "**users**" group.

4.11 Basic LUN Creation

The most common management activity on the RamSan is LUN provisioning. This section will go over the basic LUN provisioning activities (creating a LUN and linking it to a port), for more in-depth configuration details please consult the RamSan Web Interface Guide.

4.11.1 Creating a LUN

You can create a LUN from the "**Logical Units**" tree node by right-clicking and selecting "**Create**" or by clicking on the "**Create**" button after highlighting "**Logical Units**". This is shown in *Figure 17.*
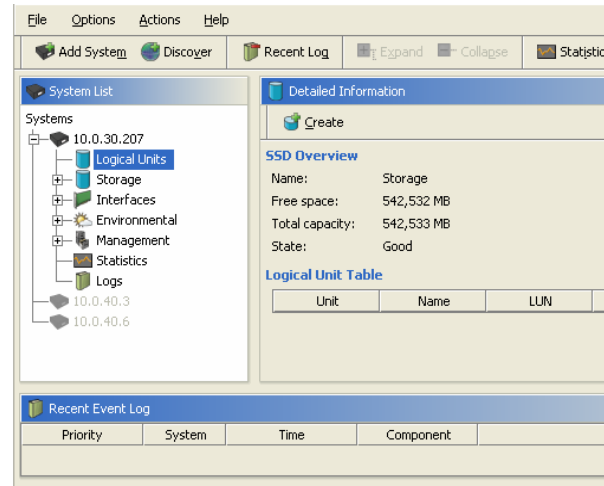
Figure 17 – Web monitor Logical Unit

A wizard will open to guide you through the Logical Unit creation process. After reading the overview, click the "**Next**" button to set the Logical Unit Parameters. The parameters window is shown in *Figure 18*.
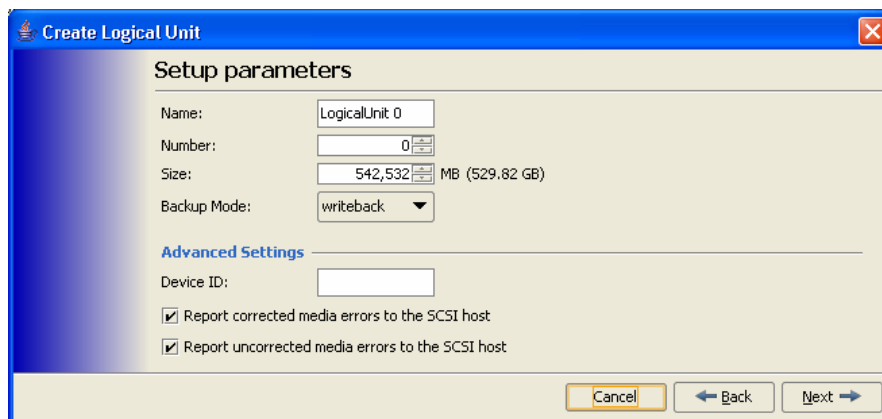
Figure 18 - Web Monitor Logical Unit Parameters

The parameters available for the Logical Unit are:

- Name – This is a user defined name for the LUN to make it easily identifiable.

- Number – This is the Logical Unit Number (LUN) that is presented to the host.

- Size – This is the size of the Logical Unit in Megabytes.

- Backup mode – This affects the cache operation for the Logical unit. There are two modes available:

    o Writeback – Cache incoming writes in the battery protected cache and synchronize the writes to Flash as a background process.

o Writethrough – Force all of the writes to be written to Flash before acknowledging the write as complete.

- Device ID – This is an OpenVMS specific identifier.

- Report corrected media errors to the SCSI host – This controls whether any internal corrected errors are reported over the SCSI layer to the host. By default it is enabled. For most environments this should be set.

- Report uncorrected media errors to the SCSI host – This controls whether any internal uncorrected errors are reported over the SCSI layer to the host. By default it is enabled.

After setting the appropriate values click "**Next**". A final window will confirm the values. After clicking "**Next**" again, the Logical unit will be created. For the Logical Unit to be used, an access policy needs to be defined.

4.11.2 Adding an Access Policy to a LUN

The Web Management Interface provides the ability to create access lists for individual Fibre Channel ports. This allows the administrator to specify which worldwide port names (HBAs) are allowed to communicate with each partition. To make partitioned LUNs accessible to connected servers, the next step is to link the LUNs to the RamSan's Fibre Channel ports. The "**Logical Unit Overview**" is shown in *Figure 19*, note that the Logical Unit is in a warning state notifying the administrator that a Logical Unit was created and has not been presented to any hosts.

Figure 19 - Web Monitor Logical Unit with No Access Policy

Click the "**Access**" button on the "**Logical Unit Overview**" screen to start the access policy wizard. The first step of the access policy wizard will provide an overview of the process. After reading the overview, click the "**Next**" button to continue to the "**Access Policy Table**" for the Logical Unit, shown in *Figure 20*.
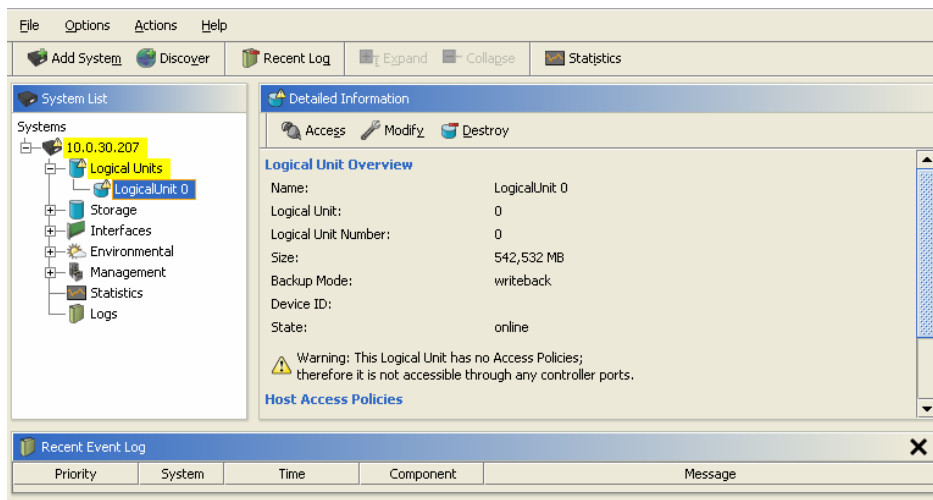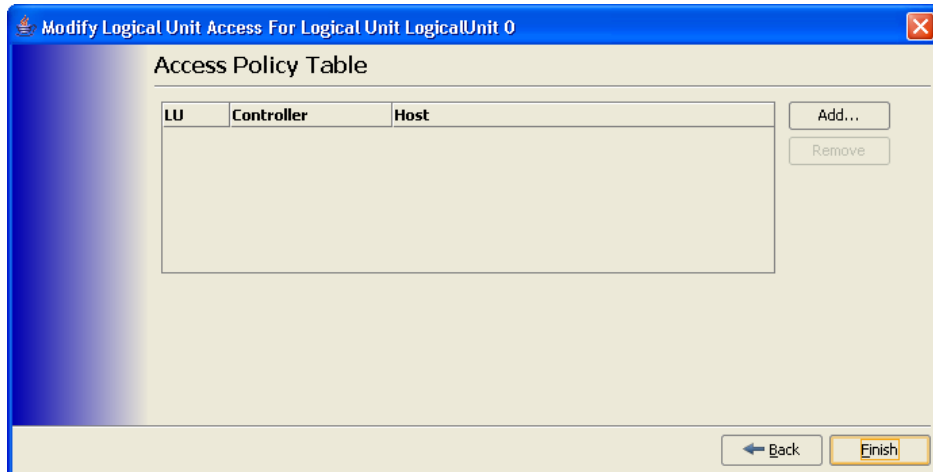
Figure 20 - Web Monitor Access Policy Table

To create and access policy, click the "**Add**" button. This opens a window that allows you to define the parameters of the access policy, shown in *Figure 21*.
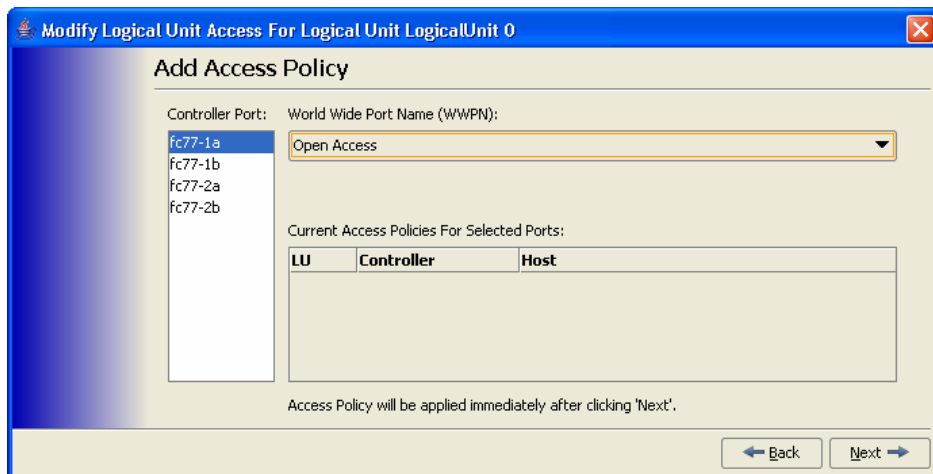
Figure 21 - Web Monitor Add Access Policy

To create an access policy, present the Logical unit to a host, then select a "**Controller Port**" on the RamSan. Next, select a "**World Wide Port Name (WWPN)**" from the drop down box, this box will include any hosts HBA WWPN that are presented to the RamSan port, as well as an "**Open Access**". If a particular HBA WWPN is selected then the LUN will only be presented to that HBA (it will be masked to it). If "**Open Access**" is selected then the LUN will be presented to all HBAs that are connected to that port. Lastly, click the "**Next**" button to create the access policy.

4.12 Configuring the RamSan−500 Cache

The RamSan-500 contains a large RAM cache to buffer write operations and keep the back and Flash busy with parallel operation. The cache details and configuration can be viewed by selecting the "**Cache**" item from under the "**Storage**" node of the system tree. The cache "**Detailed Information**" is shown in *Figure 22*.
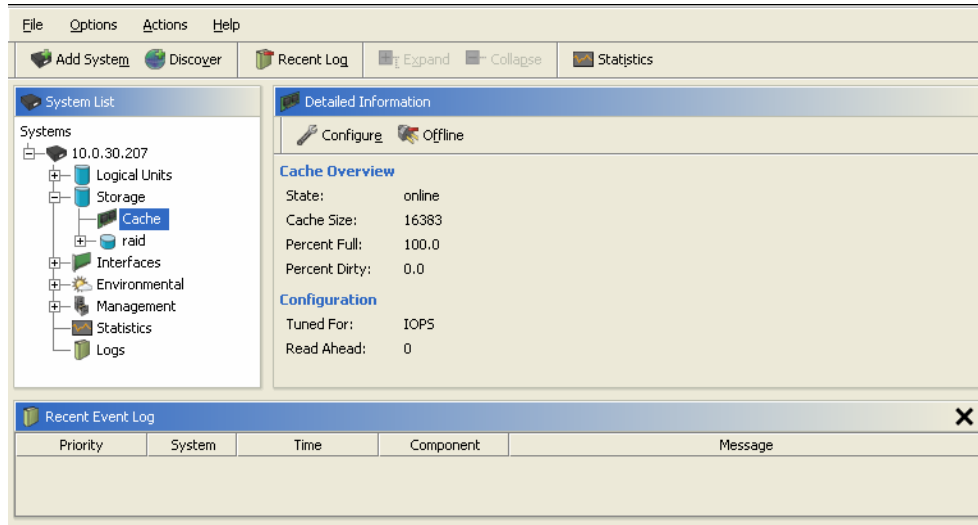

Figure 22 - Web Monitor Cache Detailed Information

The detailed information includes information about the cache and its current configuration. To modify the configuration of the cache, click the "**Configure**" button. This will open the "**Cache Configuration**" wizard, shown in *Figure 23*.
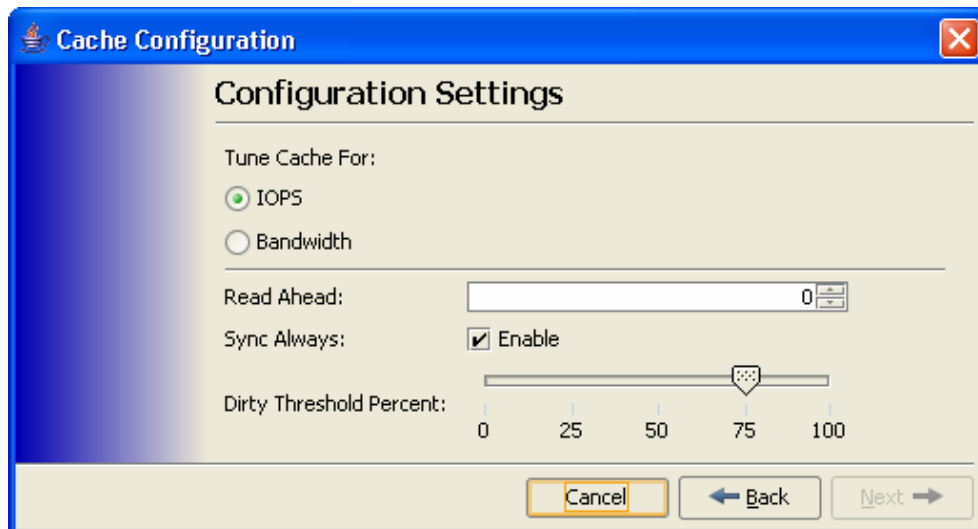

Figure 23 - Web Monitor Cache Configuration

There are four different configuration options, Tuning, Read Ahead, Sync Always, and Dirty Threshold Percent. There are several options for each of these parameters that affect the behavior of the Cache:

- Tune Cache For – This parameter controls the cache line size and how the Cache works with the back end Flash Array. The two options are:

    - IOPS – Use a smaller cache line size and send smaller accesses to the RAID controller. This setting is recommended for storage workloads that tend to us 64KB or smaller accesses (most database workloads).

    - Bandwidth – Use a larger cache line size and send large accesses to the RAID that access multiple Flash modules in parallel. This setting is recommended for data acquisition or for a small number of users that need high bandwidth (some data warehouse workloads).

- Read Ahead – The read ahead setting controls whether the cache attempts to read additional data ahead of the location of a read. This can help improve performance in a highly sequential read environment, but wastes cache space under a random workload. The higher the setting the more read ahead is attempted.

- Sync Always – This parameter controls whether the cache will always attempt to sync to the back end Flash. When the box is checked, this feature is enabled.

- Dirty Threshold Percent – This parameter controls how much of the cache can be used for storing dirty data (data that has been written to Flash but has not yet been written to disk) before the system gives syncing the dirty data to Flash a higher priority.

4.13 Viewing the Logs with the Web Monitor

Perhaps the most important part of the Web monitor is the system event log. This log keeps track of all events that occurred within the system. If you are having trouble with your system, be sure to open the system event log and check this information.
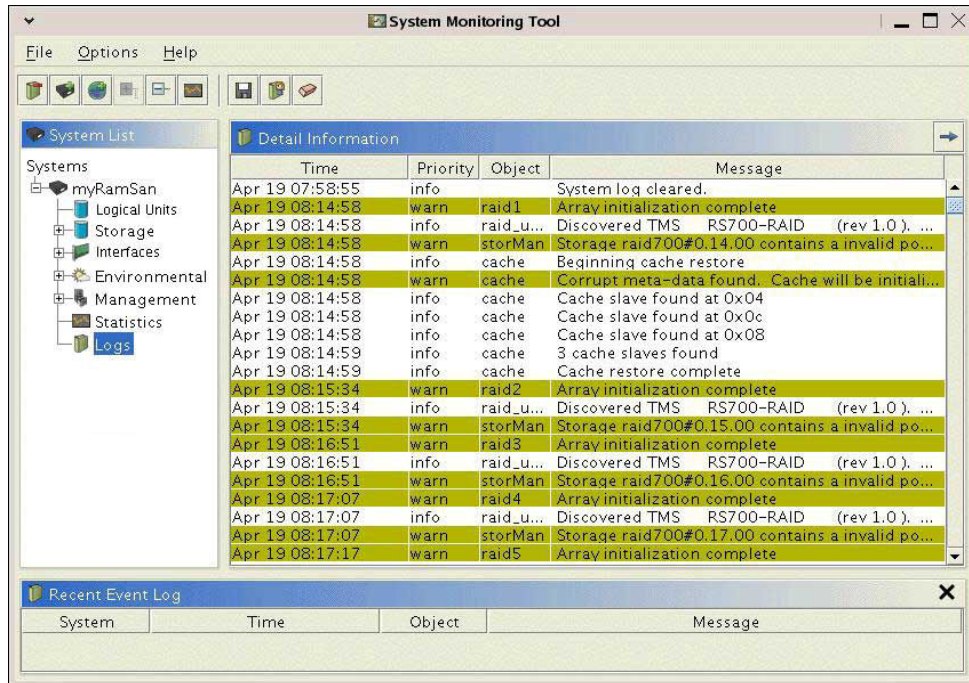
Figure 24 – Web Monitor Logs

The log events displayed in *Figure 24 – Web Monitor Logs* are not indicative of a shipped system.

Sometimes it is valuable to save the RamSan logs made available from the Web monitor. To save the system event log, right mouse click the "**Logs**" item in the "**System List**", then select "**Save Log…**" Or you can just left-click on the Flash icon under the menu bar in the button bar while the "**Logs**" item is highlighted. See *Figure 25 – Web Monitor Log Options* for a screen shot of the right-mouse click menu.

A second log is accessible via the Web monitor, called the System Report. It contains information about the system configuration, firmware version, environment, and a range of other information, including a copy of the system event log. A System Report should always be on-hand when diagnosing problems with Texas Memory System's customer support.

To access the System Report from the Web monitor, right-mouse click the "**Logs**" item in the "**System List**" and select "**System Report…**"
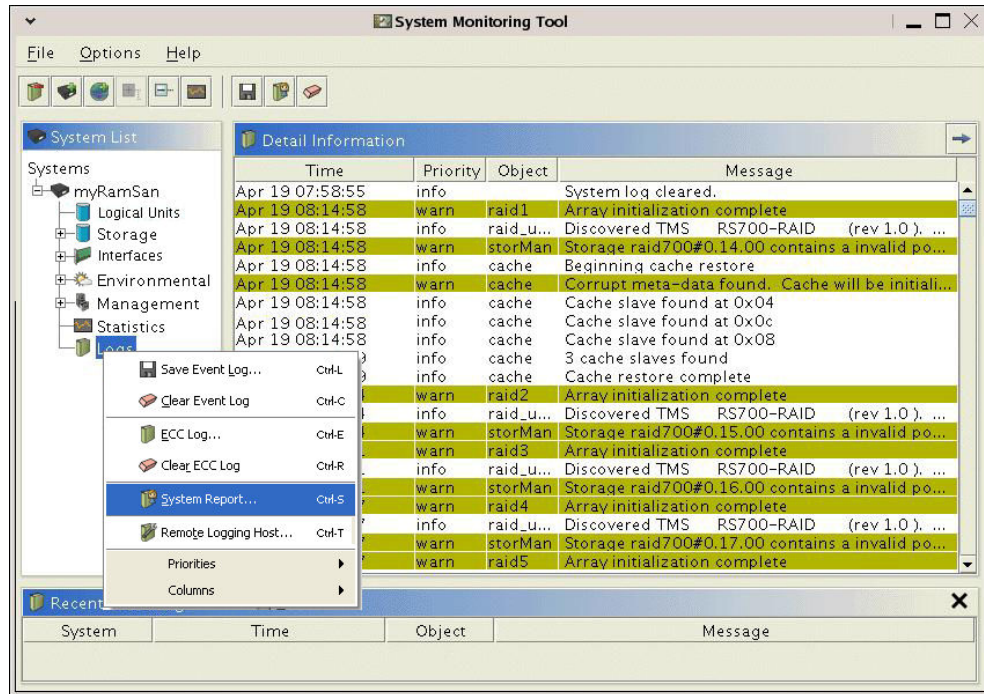
Figure 25 – Web Monitor Log Options

Once you select the "**System Report...**" option, a new window will appear and download the support log from the RamSan. It will take 10 to 20 seconds to complete. You can then hit the "**Save**" button in the lower right to save the support log to a file.
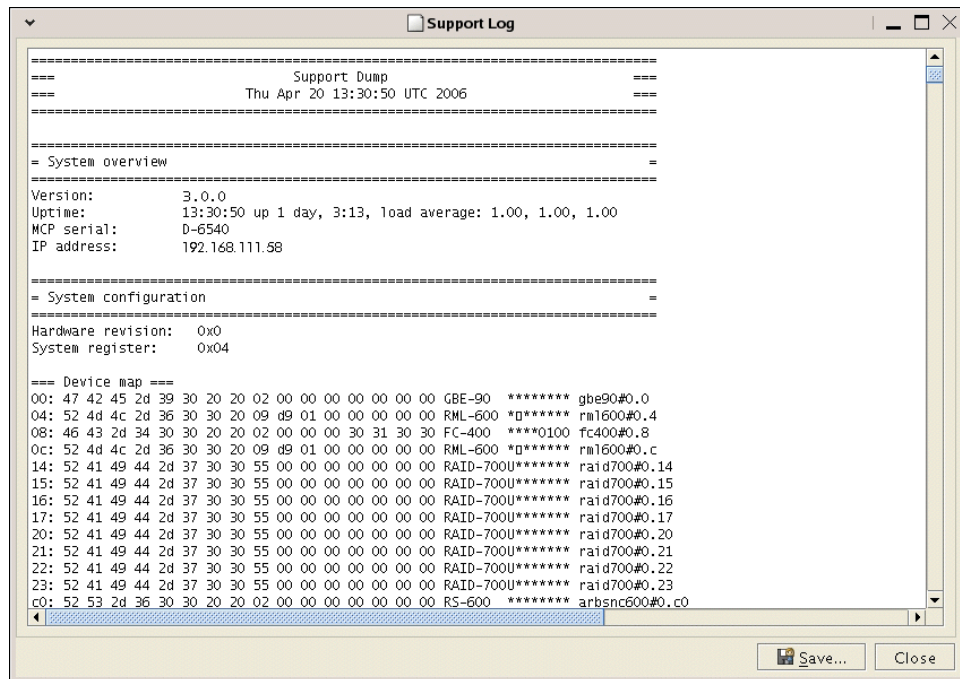
Figure 26 – Web Monitor System Report

4.14 Upgrading the System with the Web Monitor

It is easy to upgrade your RamSan using the Web monitor if you have a patch file. Patch files should be formatted "**rs500-<version>.patch**".

From the Web monitor, expand the "**Management**" tab under the "**Systems List**". This will expose three sub-options. Highlight "**Firmware**" – it will display the current RamSan-500 firmware version.
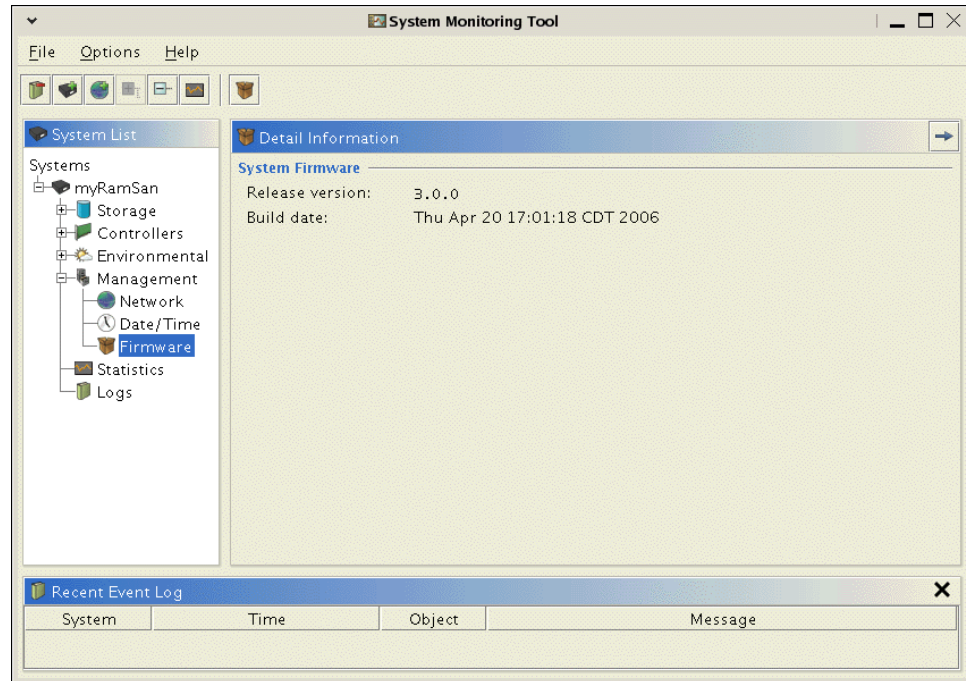
Figure 27 – Web Monitor Firmware Management

To update the firmware either right-mouse click and select "**Firmware update...**" or left-mouse click the open box icon in the button bar. Both methods bring up the patch file selector window.

WARNING
PATCHING THE RAMSAN-500 IS A DELICATE PROCESS. IF THE PATCH IS INTERRUPTED, THE SYSTEM CAN BECOME UNUSABLE AND MAY HAVE TO BE SENT BACK TO THE FACTORY FOR REPAIR. IF YOUR SYSTEM'S PATCH IS INTERRUPTED, IMMEDIATELY CALL TEXAS MEMORY SYSTEMS (*SECTION 4.15.1*). DEPENDING UPON THE STATE OF THE SYSTEM, IT MAY BE REPAIRABLE.

Figure 28 – Web Monitor Patch Selection

Either type in the path and file name of the patch or use the "**Select...**" button to browse for the file. When the file is selected, left-click the "**Start**" button. The firmware upgrade may take up to five minutes to complete. While the system is patching, a variety of messages will display in the "**Recent Event Log**" panel in the Web monitor. When the patch has completed, select the "**Done**" button. You will need to reboot your RamSan-500 for the patch to take effect.

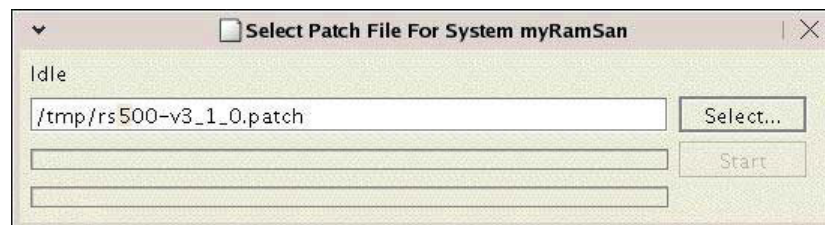Selecting your RamSan from the "**System List**" will produce four buttons on the button bar (See *Figure 8 – Web Monitor Information* for a screenshot). You can reboot the system by either right-mouse clicking it and selecting the "**Reboot...**" option or left-mouse click the arrowed circle icon in the button bar. Confirm that you wish to reboot the system. The system will shutdown for 5 seconds and then power back on. The Web monitor will reconnect to the RamSan-500 when it comes up.

4.15 If the System has a Problem

The RamSan-500 is a complex system with many redundant features to safeguard your data; however, components can fail. The RamSan-500 has many ways to inform the user about what is happening inside the system.

The easiest way to detect if something has gone wrong is to monitor the front panel display. The normal display will show a line at the top that tells you if the system is "**Good**". If the system has detected an error or if something has gone wrong, the front panel display will report the error in a concise manner.

The system event log made available via the Web monitor will provide more detailed information. Please see *Section 4.7* for more information on how to access the log.

All errors persist; that is, they are permanently logged until the problem has been solved and the log has been cleared.

4.15.1 Contacting Texas Memory Systems

Contact Texas Memory Systems for additional support. Before contacting Texas Memory Systems, please save a copy of the support log to send to tech support.

Texas Memory Systems, Inc.
10777 Westheimer, Suite 600
Houston, TX 77042
Phone: (713) 278-6200
Fax: (713) 266-0332
Email: support@texmemsys.com

4.15.2 Clearing the System Event Log

Once a problem has been diagnosed, it is important to clear the errors from the log. That way, future logs are not confused with old, fixed errors.

Follow the information in *Section 4.8* to get to the "**Logs**" item in the Web monitor "**System List**". To clear the system event log, right-mouse click the "**Logs**" item and select "**Clear Logs**" – alternatively, left-mouse click the eraser icon in the button bar. This will clear the system event log.

Chapter 5 – System Maintenance

Texas Memory Systems designed the RamSan-500 to be easily maintainable. You can update firmware from the Java interface and easily maintain the system components. You can hot swap the power supplies and Flash modules, which means that you can remove and replace these components while the system is running.

ELECTRO-STATIC DISCHARGE WARNING
PLEASE TAKE FULL E.S.D. PRECAUTIONS IF IT IS NECESSARY AT ANY TIME TO COME INTO CONTACT WITH ANY CIRCUIT BOARDS, COMPONENTS, OR CONNECTORS. ELECTROSTATIC DISCHARGE CAN DAMAGE THE COMPONENTS USED IN THE RAMSAN AND ITS INTERFACES.

Prior to performing maintenance on the RamSan-500 please contact Texas Memory Systems for detailed maintenance instructions.

5.1 Contacting Texas Memory Systems

Contact Texas Memory Systems for additional support. Before contacting Texas Memory Systems, please save a copy of the support log to send to tech support.

> Texas Memory Systems, Inc.
> 10777 Westheimer, Suite 600
> Houston, TX 77042
> Phone: (713) 278-6200
> Fax: (713) 266-0332
> Email: support@texmemsys.com

5.2 Power Supplies

The RamSan-500 includes two power modules. The system requires one functioning power module to run. Please consult *Section 3.4 – Connecting Power to the System*, above for more information.

Figure 29 - Back of RamSan-500, Power Supply Location

If the RamSan power supplies fail, they can be replaced while the power remains on to the system. There are three ways to detect a bad power supply. The easiest way is to examine the AC voltage LED. (See Figure 5 – RamSan-500 Power Supply.) If it is illuminated the power supply is running.

Texas Memory Systems has taken special care to enclose the RamSan-500 power modules in a protective case to minimize the electrical risks for users; however, it is critical for users to follow the following steps when removing and replacing the power modules:

✓ Switch the power module off and disconnect the power cord.
✓ Wait 15 seconds.
✓ Remove the power module that needs to be replaced from the RamSan-500 chassis by pressing the release switch and pulling squarely on the power supply handle. **DO NOT REACH INSIDE THE PROTECTIVE ENCLOSURE AFTER REMOVING THE POWER SUPPLY**.
✓ Insert the replacement power module in the RamSan-500 chassis. Make sure the power supply is properly oriented to mate with the connectors, then insert the power module squarely and press firmly until the power supply is fully inserted into the system.
✓ Reconnect power to the new power module and switch it on.
✓ The new power module begins to operate when AC is connected and the power switch is turned on.

WARNING
REPLACE FAILED POWER MODULES AS SOON AS POSSIBLE.

5.3 Flash Modules

The RamSan-500 comes with 9 Flash modules in a RAID 5 configuration. This section will go over various failure conditions and what must be done to correct them.

The Flash modules in the RamSan-500 are designed and manufactured by Texas Memory Systems. They incorporate proprietary technology to interface with the RamSan backplane and cannot by used outside of the RamSan-500. Internal to the modules, multiple proprietary error corrections technologies are used to make a single module extremely robust and capable of smoothly handling multiple failures of the internal Flash media. With this technology a module should last at least 3 years, even under a continuous write load. If the IO load is a mix of reads and writes Flash modules can last even longer.

Internal to each module there may be 1 or 2 regions (depending on the ordered capacity) for Flash storage. These regions are largely independent of one another and are each given their own status indicator LED on the front of the Flash module as illustrated in the figure below.

Flash Status
Indicator LEDs

Figure 30 - Flash Module

The LEDs can be used to determine the state of the module based on the following:

Steady Green	Power, status good
Blinking Green	Activity, status good
Orange	RAID Rebuilding, Degraded, Disabling
Blinking Orange	User initiated identification of module (See Section 4.4.2)
Red	Fail

OFF   No Power, zone not present

Because each Flash zone is independent of the other, the status of each zone may differ.

WARNING
REMOVING A FLASH MODULE WHILE IT IS POWERED ON MAY CAUSE IRREVERSIBLE DAMAGE TO THE MODULE. ONLY REMOVE A FLASH MODULE IF BOTH STATUS INDICATOR LEDS ARE OFF.

5.3.1 Flash Module Failure

In addition to the error correct features built into the Flash module, the Flash modules are protected from a complete Flash module failure by a RAID configuration. If only a single module fails in a RAID, all data in the array will be preserved. You should replace the bad Flash module right away. If the system detects a bad Flash module, it will note the bad module by illuminating the red LED on the front of the module.

- The front panel display will register a warning stating that one or more modules have been degraded. A degraded module functions correctly, but a degraded array cannot tolerate another Flash module failure without data loss.

```
System Status: WARN
Errors: Flash Module
Degraded
```

You can also get information about the state of the Flash modules from the Web monitor.
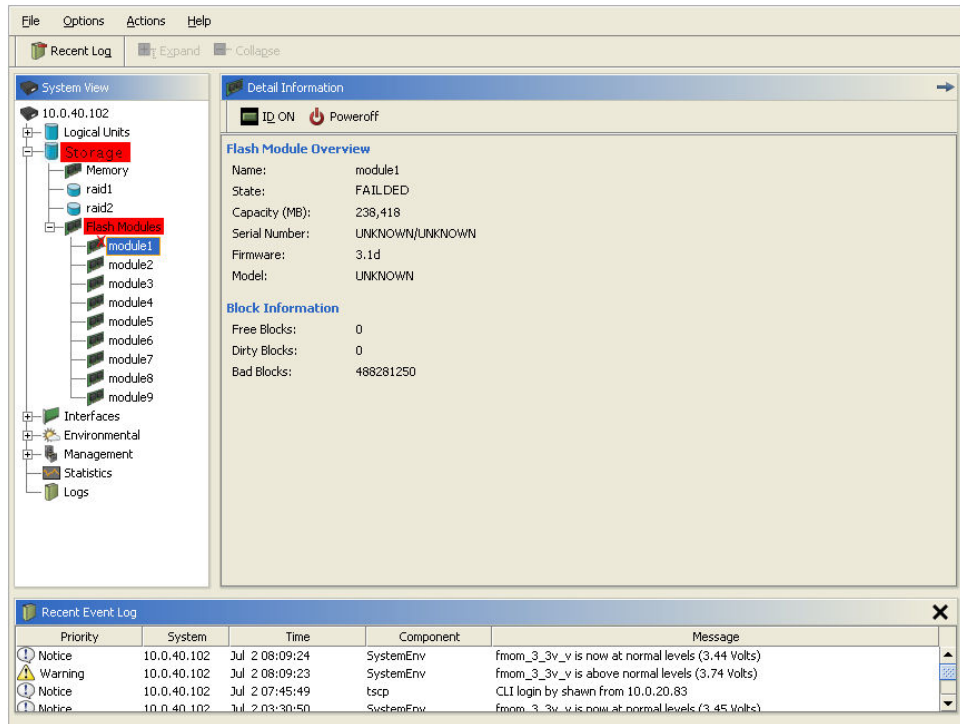
Figure 31 – Web Monitor Flash Module Failure Detection

Figure 31 shows the Web monitor detecting a single bad Flash module. In this case, the module has been physically removed from the system so the Web monitor is reporting it missing. The module icons in the "**System List**" show a warning icon on all suspect components. Both "**raid2**" and "**Flash 2**" have been noted with warning icons (yellow triangled explanation points).

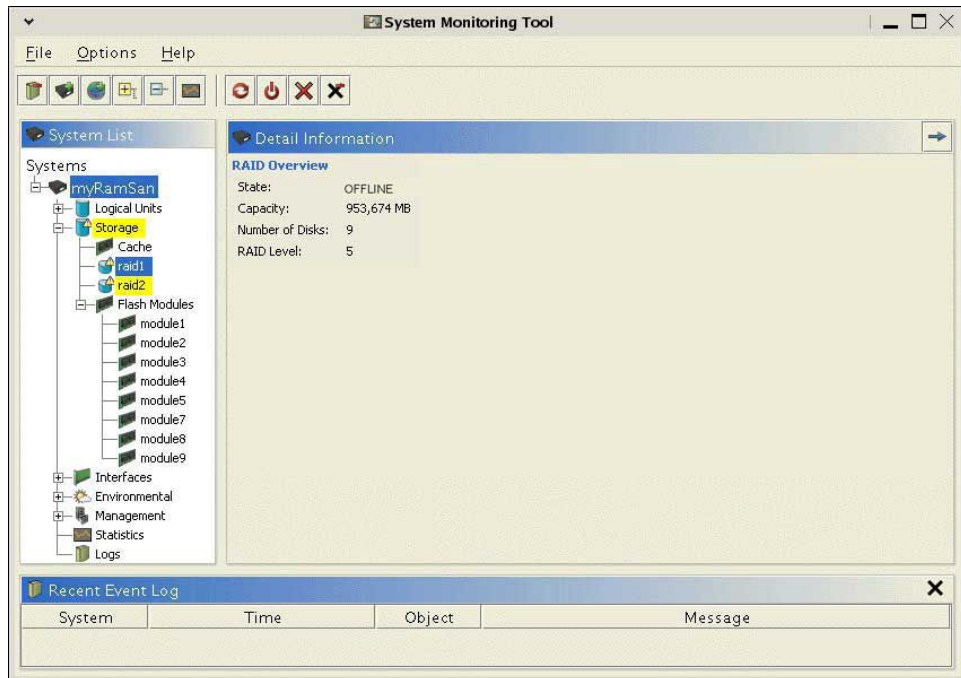| WARNING |
| --- |
| REPLACE FAILED FLASH MODULES AS SOON AS POSSIBLE. IF A SECOND FLASH MODULE FAILS IN THE SAME RAID, ALL DATA WILL BE LOST IN THE SYSTEM. |

Figure 32 – Web Monitor RAID Degraded Detection

WARNING
MAKE CERTAIN THAT FLASH MODULES ARE POWERED OFF BEFORE REMOVING.

The Web monitor reports higher-level information about a RAID that has a missing or bad Flash module. *Figure 32* above shows the RAID information generated by removing the same Flash drive as shown in *Figure 31*. In this case, the removed module causes the RAID to be degraded, meaning the RAID cannot tolerate another Flash module error without data loss – but the RAID is still usable.
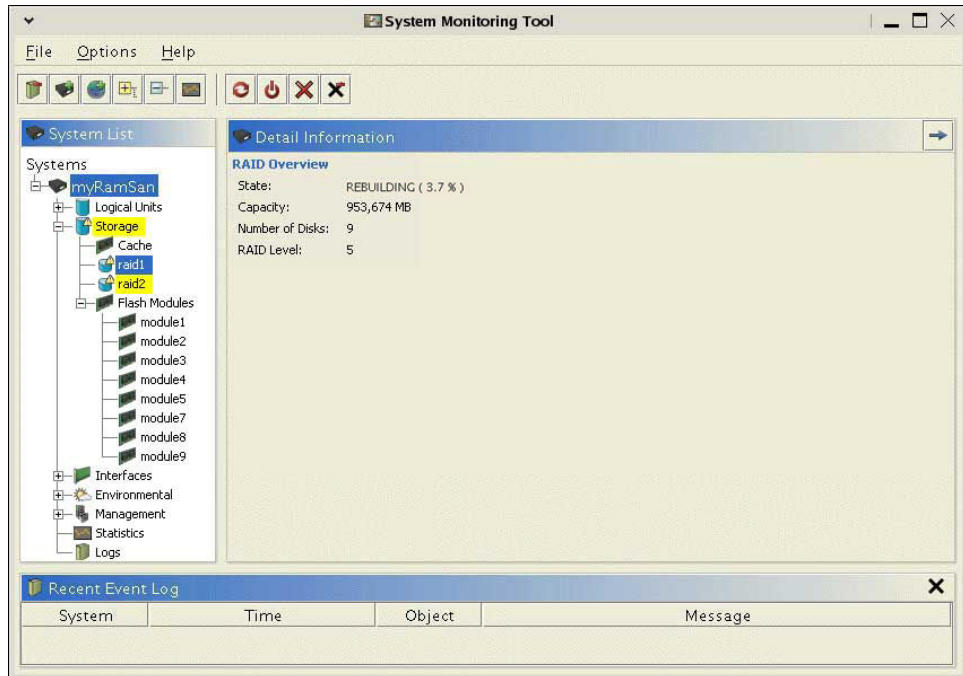
Figure 33 – Web Monitor RAID Rebuild Status

If a Flash module fails and it is replaced with a new module, the RAID must be rebuilt. The RAID is usable while rebuilding, but performance is limited.

WARNING
IT IS RECOMMENDED THAT THE RAMSAN REMAIN UNUSED WHILE ANY RAID IS BEING REBUILT IF HIGH PERFORMANCE IS CRITICAL. REBUILDING RAID ARRAYS GREATLY IMPACTS SYSTEM THROUGHPUT.

You can use the Web monitor to examine the status of the rebuilding process. Please view *Figure 33* above for a screen shot of RAID rebuild status. A RAID rebuild should take about 30 minutes to complete.

5.3.2 RAID Failure

It is unlikely but possible for multiple Flash modules to fail in a single RAID. If it happens, the system will turn the RAID offline.

☐ The front panel display will show a system failure. The system should not be exercised while in a failed state.

```
System Status: FAIL
Errors: Flash Array
Offline
```

If a RAID is put offline, all Flash modules in that array will have their front LED illuminated red.
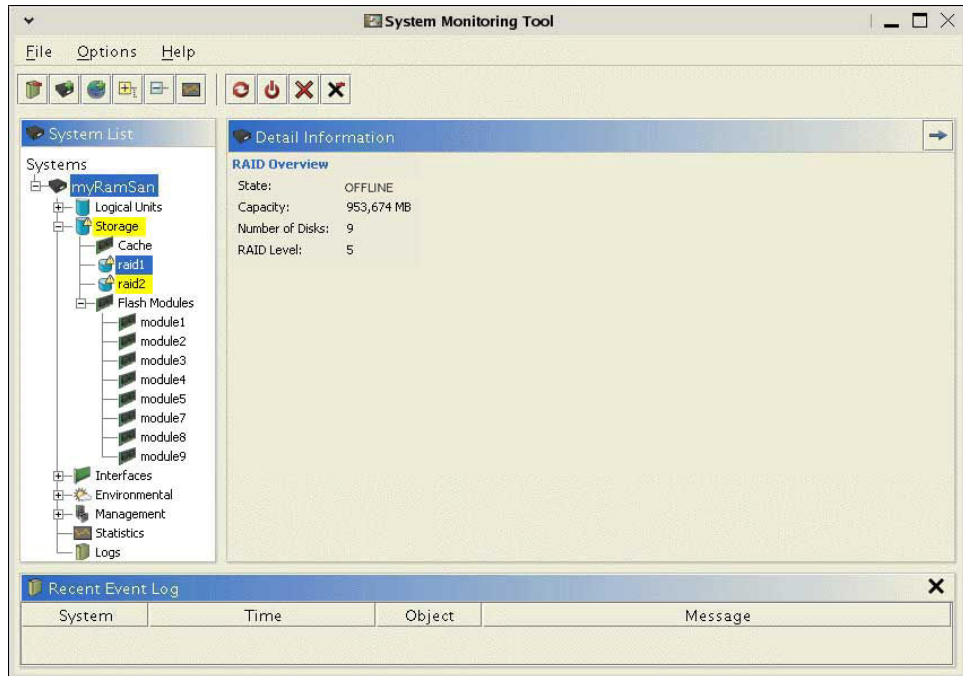
Figure 34 – Web Monitor RAID Offline

You can access the Web monitor for more specific information on which RAID is offline. An example screenshot is shown in *Figure 34*.

If the RAID has multiple module failures, it will be taken offline. There will be a good chance your RAID will lose its data. Please contact Texas Memory Systems to diagnose and repair your system (see *Section 4.15.1 – Contacting Texas Memory Systems*).

Once the RAID has been repaired (probably by replacing failed Flash modules), it will have to be re-initialized.

WARNING

RE-INITIALIZING THE RAID WILL DESTROY ALL DATA ON THAT PARTICULAR RAID.

Right-mouse click on the offline RAID icon shown in the Web monitor and select "**Initialize**" to start the process, or you could just left-mouse click the green plus sign in the button bar. It will take roughly 20 minutes to finalize the initialization. The RAID will not be usable while it is being initialized.

5.4 Fans

The system has two fan trays, one behind the Flash modules containing eight smaller fans, and one in front of the RAM boards containing four larger fans. These fans cool components in the system. Internal sensors report the fan spin speed. If the fan-spin speed falls out of specification, warnings are reported. If they degrade and are unusable, errors are reported.

☐ If a fan degrades in performance, the front panel display will show the fan's speed. In this situation, the fan is still working, but it is not efficient. The error line displayed to the right scrolls across the bottom display row.

```
System Status: WARN
Errors: cage 1 fan 1 speed
is below normal levels
(6122.82 RPM)
```

☐ If a fan completely stops working an error is reported on the front panel display. The error line displayed to the right scrolls across the bottom display row.

```
System Status: FAIL
Errors: cage 1 fan 1 speed
is critically low (0.00
RPM)
```

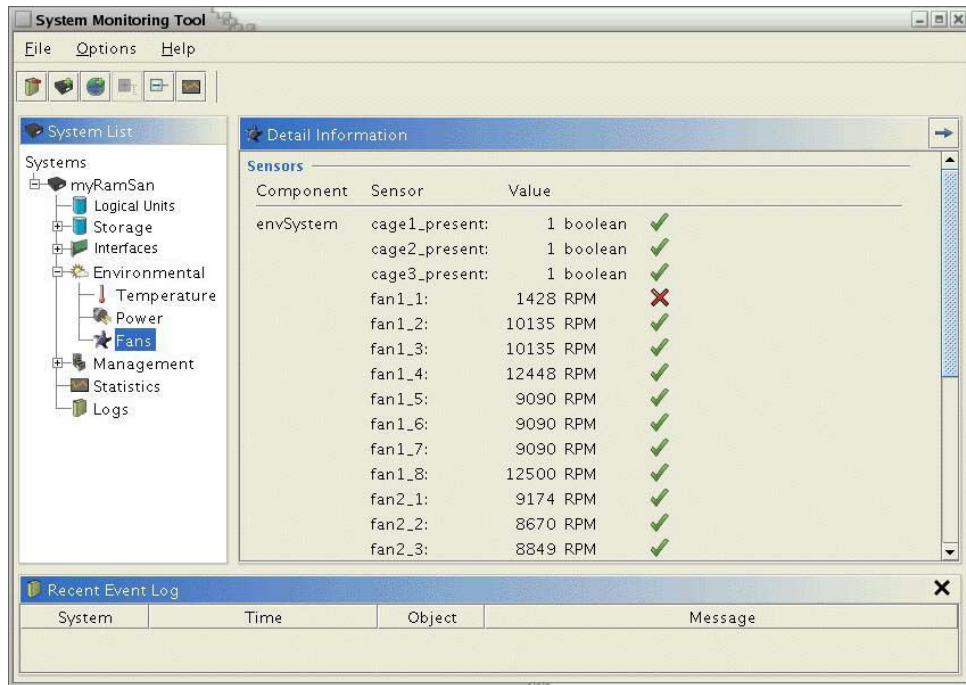| **WARNING** |
|---|
| FIX OR REPLACE FAILED FANS AS SOON AS POSSIBLE. IF TOO MANY FANS FAIL THE SYSTEM TEMPERATURES MAY RISE PAST AN ACCEPTABLE RANGE. IF THIS HAPPENS, THE SYSTEM MAY TURN OFF TO PREVENT COMPONENT DAMAGE. |

Figure 35 – Web Monitor Fan Failure Detection

You can use the Web monitor to detect more specific information on failing or failed fans. Once your system is displayed in the Web monitor, select "**Environmental**"/"**Fans**". This will display a list of all fans. Please see *Figure 35* for a fan failure example.

To fix a fan, determine which fan from which cage has failed – either from the front panel display or from the Web monitor. Then turn off your system and remove the lid.
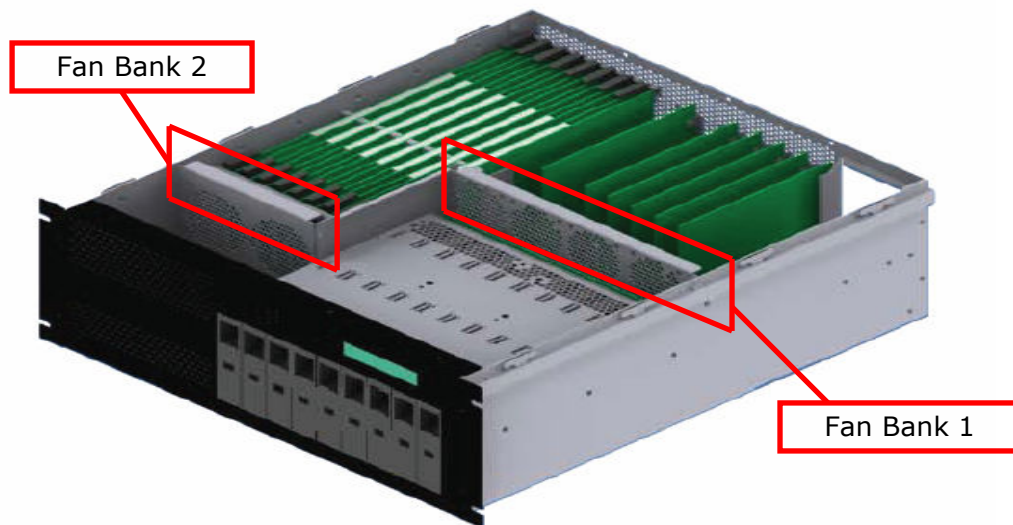
Figure 36 – Top of an Open RamSan-500, Locations of the Fan Cages

Please consult *Figure 36* above to determine where each fan cage is in the chassis. Fans 1 through 8 are in Fan Bank 1, and fans 9 through 12 are in Fan Bank 2.

Once you have extracted the fan cage, find the failed fan. There is a good chance that hair or dust has collected on the fan and all it needs is to be cleaned. Blowing compressed air into the axle of the fan can clear obstruction or debris. If the fan cannot be cleaned or repaired, the entire cage must be replaced.

5.5 Batteries

The system has two batteries; both are located directly in front of Fan bank 2. These batteries are redundant and will power the entire system - in the event of an external power failure – long enough to copy all of the data in the RAM cache to the Flash storage. Internal sensors report on the battery voltage level and a monthly test ensures that the current supplied from batteries will be able to power the system. If the battery voltage is out of specification or the monthly battery test fails, warnings are reported. If they degrade and are unusable, errors are reported. The batteries are redundant so the cache is not at risk in the event of a power failure, however, replacing the failed battery quickly is recommended. The batters in the RamSan-500 will last on average for 2-3 years.

Free Manuals Download Website

http://myh66.com

http://usermanuals.us

http://www.somanuals.com

http://www.4manuals.cc

http://www.manual-lib.com

http://www.404manual.com

http://www.luxmanual.com

http://aubethermostatmanual.com

Golf course search by state

http://golfingnear.com

Email search by domain

http://emailbydomain.com

Auto manuals search

http://auto.somanuals.com

TV manuals search

http://tv.somanuals.com