TEXAS MEMORY SYSTEMS, INC.

RamSan-210 User's Manual

Version 1.1

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Preface

Document Overview

This document provides operating procedures for the RamSan-210. It covers installation, management, and troubling shooting issues.

Conventions

The following textual conventions are used in this document:

Select	Front panel button descriptions
`Ethernet Setup`	Front panel text (menu items)
`lunconfig`	Management port (serial/telnet) commands and text.

Chapter 1 – Introduction

1.1 Overview

The RamSan-210 is a solid-state disk. The system uses SDRAM (memory) as primary storage. The system is non-volatile because all writes are mirrored to two internal hard disk drives and stored in memory. All reads occur from memory. This architecture provides uncompromised performance and security.

The RamSan-210 is designed to be highly available and fault tolerant. The system is more highly available than RAID or JBOD systems because the primary storage media is SDRAM. There are no moving parts required to store data on SDRAM. Additionally, SDRAM has a very high mean time between failures (as high as several hundred years) according to some studies. The mechanical components in the RamSan-210 are redundant and hot swappable.

The RamSan-210 is a complement to existing disk drives, JBOD or RAID in performance sensitive applications. The RamSan-210 appears as another SCSI disk drive that has been attached to the server. For some applications, the RamSan-210 is the only storage system that will be required. For applications that store terabytes of data, the RamSan-210 will be added to a system that includes RAID or JBOD.

The RamSan-210 can be connected via Fibre Channel to host servers, NAS filers or to storage network switches and hubs. If you have specific questions about compatibility, please see or contact Texas Memory Systems directly.

The RamSan-210 can be used in a variety of applications. If your application is slowed down by hard disk drives, there is a good chance that the RamSan-210 can speed it up.

1.2 System Components

The system components for the RamSan-210 include:

- Main system memory ranging from four gigabytes to thirty-two gigabytes
- Either two or four one gigabit Fibre Channel ports
- Dual, redundant hot-swappable power supplies
- Dual, redundant hot-swappable 10,000 RPM hard drives
- Dual, redundant batteries
- Dual, redundant hot-swappable fans
- Ethernet monitoring port
- Serial monitoring port
- Front panel display for monitoring and configuration
- SNMP based monitoring

1.3 Power Requirements

The RamSan-210 requires 150 watts of power for a fully loaded system. The RamSan-210 includes two power supplies. Only one power supply is needed to run the system. The power supplies are auto-ranging (they will accept either 110 or 220 power).

Each power supply is connected to an internal battery. The batteries provide at least one hour of operation after a power failure. The power supplies and the batteries are linked. In other words, if a power supply is not plugged into the system, its attached battery will not work. If the power supply is broken its attached battery will not work. If the power supply is plugged in and functional, the battery should operate properly. In the event one battery or power supply is disabled, the other functional power supply and battery combination will be able to handle system operation. Power supply temperature can be monitored from the system monitoring software.

If power is lost, the system will operate for a user-defined number of minutes before shutting down. When the system shuts down it will clear the write buffers by writing to the mirrored internal disk drives.

When power is restored, the RamSan-210 will resume normal operations after restoring system memory with the data from the disk drives. The system will also begin recharging the batteries. Battery charge levels can be monitored using the bundled remote monitoring software.

1.4 Non-Volatility

By utilizing internal hard drives and batteries, the RamSan-210 combines the performance of SDRAM storage with the non-volatile nature of hard disk drives. The RamSan-210 is equipped with dual, redundant, hot-swappable hard drives. Each of these drives is able to operate at about 30 MB/sec during operation. RAID-1 is implemented on this drive array to provide a redundant configuration for the non-volatile storage. In order to operate the drives after a power failure occurs, the RamSan-210 contains dual redundant batteries. When fully functional and fully charged, the batteries are able to provide about one hour of operation.

The management control port (MCP) monitors the internal disks and batteries for a failure condition. In such an event, the management card will notify the operator of an error through the front panel display and over the Ethernet.

The RamSan-210 operates in mirrored write mode. All data written to the RamSan-210 system memory is also automatically mirrored to the internal disk drives. An internal cache is used to allow for write bursts to occur without incurring a delay for each write. Since all write operations are synchronous in this mode, there is no need to copy data from memory to disk when a power failure occurs. The system simply waits a user selectable amount of time (default of 5 minutes) before the RamSan-210 is powered off.

While writes are made to both disks and memory, all reads are done directly from memory. Therefore, the RamSan-210 is an excellent solution for applications that are

read intensive. Statistically, most applications have 80% reads and 20% writes. For systems that are write intensive, please contact Texas Memory Systems to discuss configuration alternatives.

The RamSan-210 with two FC32 Fibre Channel controllers should be able to provide very close to 400MB/second of read performance.

The system will automatically conduct all reads and writes from the disk drives in the event of a main memory failure (this type of failure is not expected). This fault tolerant approach is designed into the system in order to provide the ultimate in data availability.

Chapter 2 – Installation

2.1   Electro-Static Discharge Warning

Important:

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. The components used in the RamSan-210 and its interfaces can be damaged by electrostatic discharge.

2.2   Battery Warning

The internal batteries in the RamSan-210 are charged with enough voltage to power a fully loaded system for approximately one hour. However, the batteries may not be fully charged when you install your system. Therefore, be sure your batteries are fully charged before you use the system where there is risk of power failure.

2.3   System Inspection

The RamSan-210 should be shipped complete with a packing list. Make sure you have received all of the components listed.

1. Examine the external chassis for any damage that might have occurred during shipping.
2. Make sure that both power supplies are locked securely in place and that both backup drives have not come loose.
3. Inspect the interface plate for any screws that might have loosen during shipping.
4. Inspect both the front and rear fans to make sure they are locked in place.
5. Inspect the front panel screen for damage.
6. Report any meaningful damage to Texas Memory Systems.

 Figure 1 shows an overhead view of the layout of the RAM-SAN system components.
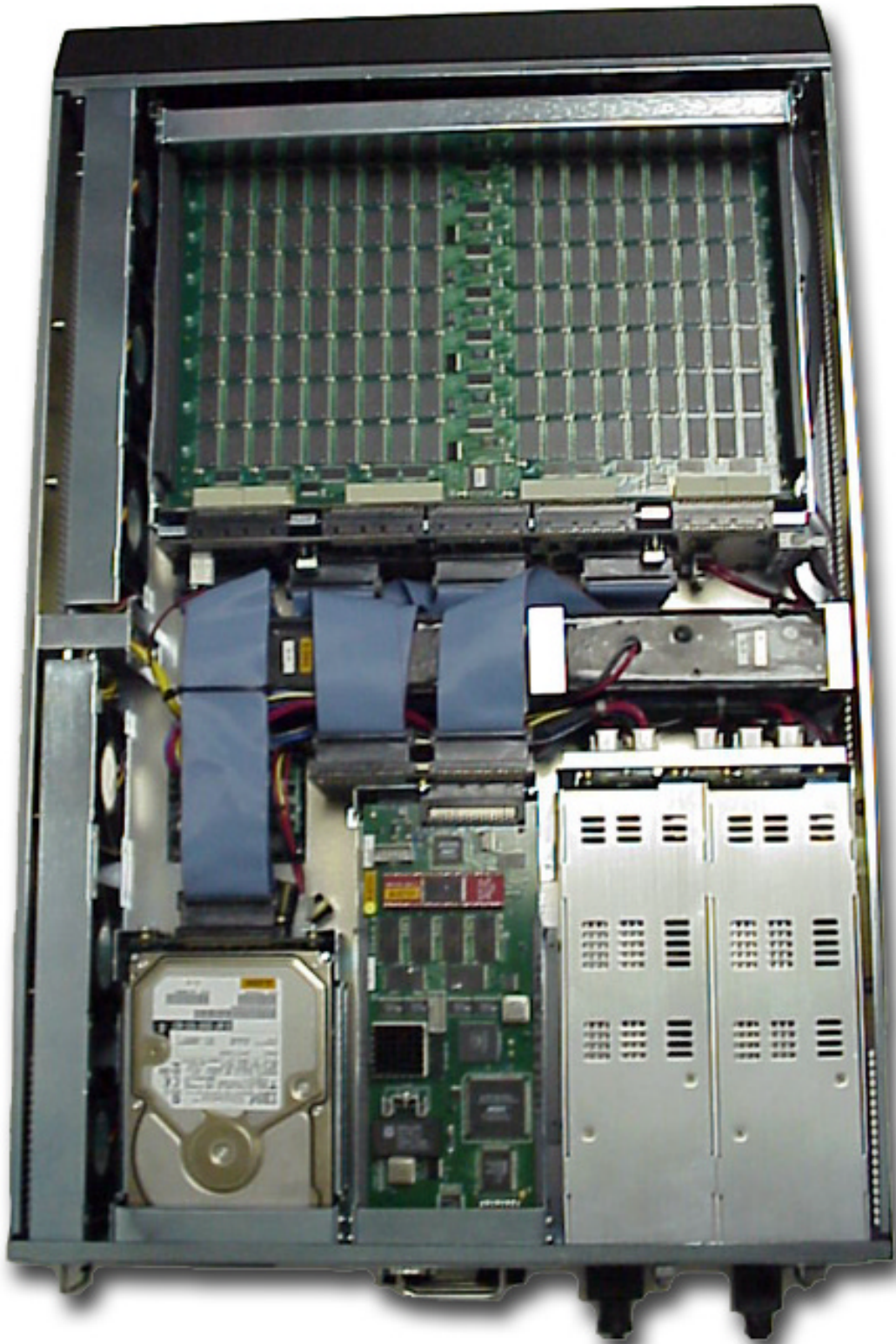
Figure 1 RamSan-210 Layout

2.4   Rack Mounting

The RamSan-210 is a 2U rack-mountable system. The system is shipped with the slides and equipment needed to install it into a standard 19" rack.

2.5   Connecting the Fibre Channel Ports

After you have inspected the system and properly mounted it, connect the Fibre Channel ports on the RamSan-210 to either your server or to a Fibre Channel switch. See for a list of TMS approved SAN hardware.

Controller 1   Controller 2
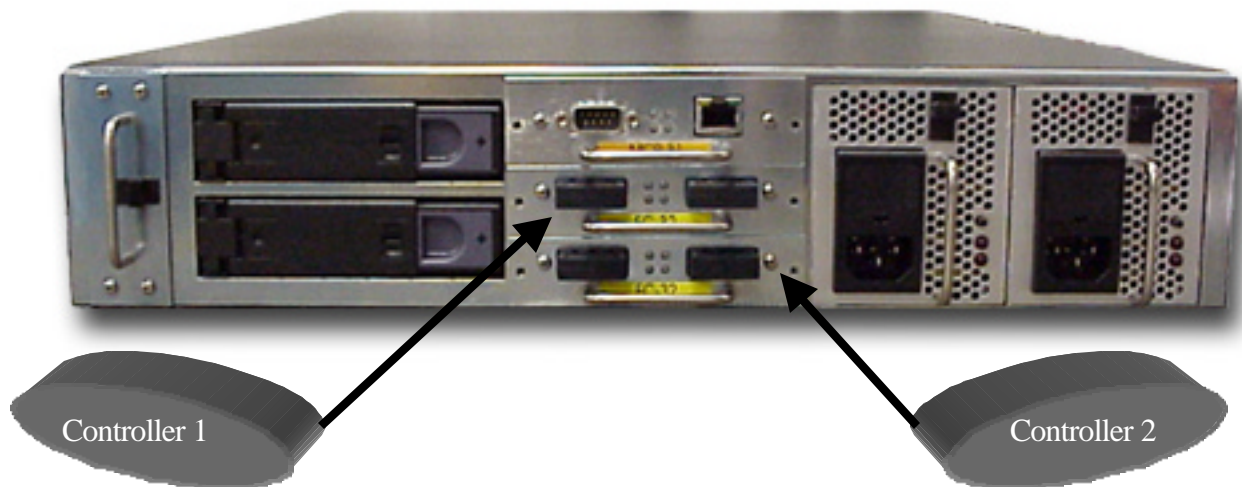
Figure 2-2 RamSan-210 Interface Plate

Your system will be equipped with either one or two FC32 Fibre Channel controllers.

Figure 2- shows the port layout for the RamSan-210. Each controller has two Fibre Channel ports A and B, on the left and right respectfully. These port numbers have no correlation to the port identifiers assigned during port login. They are only used in the management utilities for identification and LUN assignments. The interface plate also has a DB-9 RS-232 serial connection and an RJ-45 Ethernet port. These ports are used for local and remote management of the system. The FC32 ports on the system are capable of connecting to point-to-point, arbitrated loop, and switched fabric topologies.

2.6   Connecting the Power Supplies

The RamSan-210 is equipped with dual redundant hot-swappable power supplies that operate on 110/220 VAC line power. Using the provided AC power cords, connect both power supplies to a source of power.

For normal system operation make sure both power supplies are connected to an external power source. Since the power supplies are redundant, you may remove line power from

one without any interruption in Fibre Channel service. However, if external power is completely lost, all Fibre Channel ports will go into a standby mode after a short user-defined timeout period because the system will power off.

Warning:

Do not remove both power supplies from the system at the same time. This will cause system failure since the internal batteries require that at least 1 power supply be present in the system at all times. If both supplies are physically removed from the chassis, possible data loss may occur.
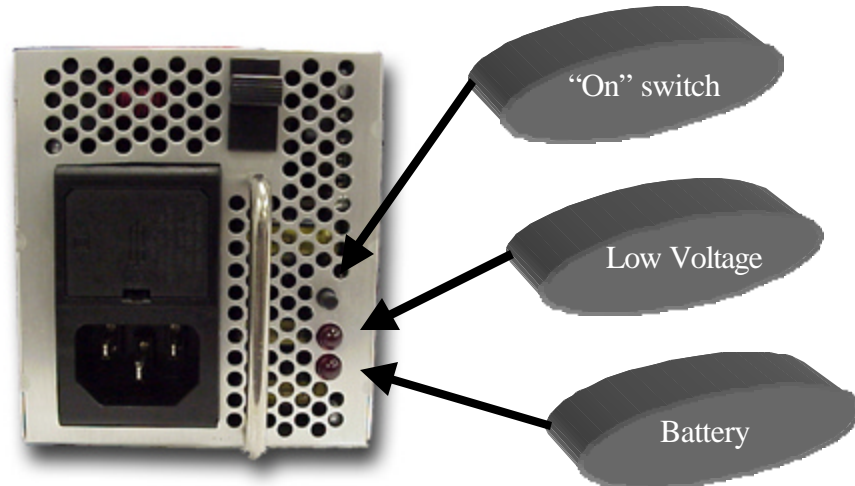
Figure 2-3 RamSan-210 Power Supply Modules

The following buttons and indicators are on the power supply:

- The top button provides a means to activate the power supplies (turn them on) after a user-initiated system shutdown. When a user initiates a shutdown of the system, the power supplies are typically still connected. Therefore, the system cannot use the presence or absence of AC to know whether to operate. In order for the power to come on after a user initiated shut down, the top button must be pressed on either of the power supplies. If power is restored after a power failure or a power cord is reinserted, the system will automatically power on.
- Low Voltage indicator light. The top indicator light shows when the power supply is operating below the voltage necessary to power the entire system. Low voltage indications are a sign that the power supply needs to be monitored and possibly replaced.
- Battery Operation indicator light. The bottom indicator light shows when the system is operating from battery power. The system should only operate from battery power when external AC power has failed.

Warning:

The power supply modules maintain high voltage levels during normal operation. To prevent the risk of electrical shock, remove the power cord and wait 15 seconds before removing a power supply module.

2.7 Turning on the System

The RamSan-210 will automatically power on when power is connected to the system. The only time the system will not automatically power on is when a user has initiated a Manual Shutdown of the system. In the event this has happened, it is necessary to press the top button on either power supply. Please see 2.6 Connecting the Power Supplies.

2.8 System Initialization

The front panel display shows the current state of the boot process. Once the power is connected, the system will turn on automatically and the front panel will begin the power on sequence. The following will happen automatically (this boot sequence can also be monitored externally through the serial port or Ethernet port):

1. After approximately seven seconds, the RamSan-210 will power-up.
2. You should see "`Texas Memory Systems`" appear on the front panel, as well as "`RamSan-210`". Soon after that you will see "`Booting`" and "`Initializing RamSan`".

3. After the firmware has finished booting, the front panel display will indicate "`Bringing Disks Online`". The system disks take approximately 10 seconds each to spin-up.
4. The front panel will indicate "`Restoring`" and show a progress bar and give an estimated time till completion. Administrators may use this to determine how much time before the system is on-line. This information is also available through the telnet remote monitoring software in the status command. This process will take approximately 2 minutes 15 seconds for every 4 gigabytes of memory in the system.

5. Once the system has restored data, the system will display "**`Status Good`**" and show the performance bars for each Fibre Channel port.

The system is now ready for normal operation.

Please see Chapter 7 – Troubleshooting for possible error conditions during start-up.

Please see Chapter 3 – Using the Front Panel for more information on configuring the Ethernet and monitoring system health.

Chapter 3 – Using the Front Panel

3.1   Overview

The front panel for the RamSan-210 allows you to inspect the state of the system, change the method of IP address assignment, and shutdown the system. Four buttons located to the left of the panel are used to make selections. Figure 4.1 is a picture of the front of the system.

Figure 3-2 RamSan-210 Front Panel

The buttons on the front panel serve the following functions:

- *Menu*. The Menu button has two functions:
  - Function 1: On any of the status or performance displays, pressing the "*Menu*" button will launch the RamSan-210 Main Menu.
  - Function 2: Escape function. Pressing "*Menu*" once the menu is open returns the user to the prior screen.
- *Select*. If "*Select*" is pressed when a menu item is on the screen, the system will either: execute that menu option or proceed to the next layer in the menu. This button is disabled if the menu is not selected.
- ⁻. The "⁻" button scrolls up through the menu. The "⁻" is also used cancel certain commands, as indicated on the display. This button is disabled if the menu is not selected.
- ⁻. The " ⁻" button scrolls down through the menu. The " ⁻" is also used confirm certain commands, as indicated on the display. This button is disabled if the menu is not selected.

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3.2 Menu System Layout

The front panel menu system is as follows:

<u>RS-210 Main Menu</u>
- `Ethernet Setup`
    - `Set IP Config`
        - `Static`
            - `IP`
            - `Subnet Mask`
            - `Gateway`
        - `DHCP`
        - `BOOTP`
        - `RARP`
        - `None`
        - `No Change (Exit)`
    - `Restart Network`
    - `Show Current Config`
    - `Exit Menu`
- `Manual Shutdown`
    - `Power off System?`
- `Exit Menu`

3.3 Ethernet Setup

The RamSan-210 uses both a serial port and an Ethernet port to allow you to monitor and configure the system. To access the system's Ethernet port, the RamSan must be assigned an IP address, subnet mask, and possibly a gateway. The IP address may be assigned in one of five ways: Static IP, DHCP, BOOTP, RARP, or No Ethernet.

To setup the Ethernet, use the arrow buttons to cycle through the top-level menu options until "`Ethernet Setup`" is showing on the display. 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: "`Set IP Config`", "`Restart Network`", "`Show Current Config`", and "`Exit Menu`". "`Restart Network`" will shutdown and restart the Ethernet port using the current IP assignment configuration. Selecting "`Show Current Config`" will display a list of the current IP configuration, hostname, IP address, subnet mask, gateway address (if applicable), and hardware Ethernet address. Use the arrow buttons to scroll up and down through the list. Pressing the "*Menu*" button will return to the previous menu, and pressing the "*Select*" button will exit the menu system. To continue setting up the Ethernet configuration, select "`Set IP Config`".

After selecting "`Set IP Config`", you may use the arrow buttons to cycle though "`Static IP`", "`DHCP`", "`BOOTP`", "`RARP`", "`None`", and "`No Change`". Talk to your system 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.

If you are setting up the RamSan-210 with a static IP, you need to have the Ethernet IP, subnet mask, and a gateway address if you need to access the device from a different network. After you have chosen "`Static IP`", "`Ethernet IP`" replaces the top line of the display, and you will be prompted to enter an IP. The "`-`" or " ‾" buttons cycle through the numbers "`0`" through "`9`". To select the value, use the "Select" button. The input prompt will move to the next character position. To back up a space, press the "`-`" and " ‾" button simultaneously. You can press the "*Menu*" button at any time to cancel the Static IP assignment. Repeat this procedure until the 4-byte address has been entered. After you have finished entering the IP, the top line of the front panel will change to "`Subnet Mask`". Using the same procedure as entering the IP address, enter the subnet mask. The final value you must enter is the "`Gateway Address`". If the RamSan-210 is on a private network and this value is not needed, enter the value "`0.0.0.0`" to tell the RamSan-210 to ignore this entry. After entering all three values, you will be prompted to confirm the command with the " ‾" button.

After confirming the new IP assignment mode, the display will indicate "`Shutting Down Network...`" followed by a success or failure message. The display will then indicate "`Saving IP Config...`" followed by a success or failure message. Next, the RamSan-210 will attempt to start the network with the new settings, indicated on the front panel display with "`Restarting Network...`". Upon success, the new IP address is displayed on the front panel for 15 seconds or until any button is pressed. If the network fails to start, check the Ethernet connection and contact your system administrator. If the IP configuration was successfully saved, you may simply select the "`Restart Network`" option from the "`Ethernet Setup`" menu instead of re-selecting the same IP configuration.

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

3.4   Manual Shutdown

The RamSan-210 may be shut down from the front panel. This procedure will safely synchronize all data in RAM to the internal disk drive storage.

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. You will be prompted to confirm that you wish to "`Power Off System`". To cancel the shutdown, use the "`-`" button again to return to the main menu. To proceed with the shutdown, use the " ‾" button to confirm the system power off. The front panel

display will now indicate that the system is powering off. This will typically take between 5 and 15 seconds to complete.

As a reminder, in order to turn the RamSan-210 back on after a manual shutdown it is necessary to press the top button on either power supply.

3.5   System Monitoring

When the menu on the front panel is not in use, it is possible to monitor various aspects of the system. The following information is presented:

- Fibre Channel port bandwidth. The front panel displays the Read and Write performance of each Fibre Channel port. As seen in the picture, the indicator lights correspond to the actual location of the ports on the RamSan-210. The top indicators are for the top Fibre Channel interface board. The bottom indicators are for the bottom Fibre Channel interface board. The left and right indicators map to the left and right sides of the interface boards when you look at them from behind. For each channel, the top half of the graph represents read megabytes per second in 10 megabyte per second increments. The bottom half represents write bandwidth.
- Restore/Backup Progress. During any backup or restore, the front panel will display the operation progress and estimated time remaining until completion.
- Status. The following status levels are possible:
  - "Good". This is normal operation.

  - "*WARN*". This indicates that a System Warning has been detected. Possible warnings include:

    – Front or rear fan trays removed
    – Power supply removed
    – AC Lost at one or both power supplies
    – One or both batteries have been removed
    – Temperature warning
    – One or both disks removed

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o "`*FAIL*`". This indicated that a System Failure has been detected.
Possible failures include:
- – Front or rear fan trays have a failed fan
- – Power supply failed
- – One or both batteries have failed
- – System overheated
- – One or both disks have failed

In the case of either System Warnings or Failures, the front panel display will
alternate between displaying status information and Warning/Failure messages
every 10 seconds.

Chapter 4 The Management Control Port (MCP)

4.1   Connecting to the MCP

The management port on the RamSan-210 allows you to manage, configure, and monitor system behavior. This includes obtaining status information about internal hardware, configuring the LUNs, and obtaining data rates of the system.

You may connect to the management port using either a DB-9 serial cable or an RJ-45 Ethernet cable.

4.1.1   RS232 Serial Port

To connect to the serial port use the DB-9 non-null serial cable supplied with the system. You need to set your terminal program to 9600 baud, 8 data bits, no parity, and 1 stop bit.

4.1.2   Ethernet

In order to use the Ethernet port, you must first configure the IP address for the RAM-SAN. You may configure the IP using the front panel display or from the serial port. For a complete description for configuring the Ethernet using the front panel, please refer to Section 3.3 of this manual. If you are configuring the Ethernet using the serial port refer to Section 4.5.5 of this manual.

4.2   Connecting using a terminal program

To connect to the RamSan-210 using a serial port connection, you must use a dumb terminal or a terminal emulation program such as Windows™ HyperTerminal. Your baud rate should be set to 9600 with 8 data bits, 1 stop bit, no parity, and no flow control.

4.3   Connecting using telnet

Once the Ethernet port on the RamSan-210 has been configured using either the front panel or the serial port, you may remotely monitor the system using a telnet session. Your terminal settings should be set to VT100 mode.

4.4   Logging into the system

The RamSan-210 has two login accounts, "root" and "user". Default passwords for both accounts have been left blank.

4.5   MCP Commands

4.5.1   EXIT

The exit command is used to close a monitor session. The "**QUIT**" command also performs the same action.

4.5.2   HELP

The "**HELP***"* command provides a brief online description of each command that is available. Commands that require parameters are listed with the "**<parameters>**" as options. Commands with optional parameters are listed with the "**[parameters]**" as options.

4.5.3   CONFIGSYS

The system configuration utility allows you to configure various system dependant options. Currently, the only option available is the amount of time the management controller waits after power loss before it initiates an automatic shutdown.

```
       ** Ethernet configuration utility **

 1. Set time to wait after losing power before system shutdown
 Q. Exit

Select:
```

By selecting option "**1**" you may set the power down delay to be between 1 and 15 minutes. The default value is 5 minutes.

4.5.4   FIRMWARE

The "**FIRMWARE**" command shows the firmware revision levels for various components in the RamSan-210. This command is mainly for internal use for tracking firmware revision levels.

4.5.5   IPCONFIG

The Ethernet monitor port is configured using the "**IPCONFIG**" command. The RamSan-210 supports IP assignment through DHCP, BOOTP, RARP, or setting a static IP. This command may only be used from the serial port since it involves changing the network settings. Here is a demonstration of the command:

```
ram-san> ipconfig

        ** Ethernet configuration utility **

     IP assignment mode   = RARP
     Hostname             = ram-san
     Ethernet MAC Address = 00:20:c2:00:08:05
```

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```
              IP Address            = 192.94.231.206
              Netmask               = 255.255.255.0

Select option:

      1. Change IP assignment mode
      2. Change hostname
      S. Save changes, restart the network, and exit
      Q. Cancel (No changes)

   Enter selection:
```

To change the IP assignment mode enter "**1**". This will present the following screen:

```
          ** Ethernet configuration utility **


      Current IP assignment: RARP

Select option:

      1. Select static
      2. Select DHCP
      3. Select BOOTP
      4. Select RARP
      5. Disable Ethernet

   Enter selection:
```

To set the RamSan-210 up with a static IP, type "**1**" and press enter. You will then be prompted for IP address, subnet mask, and gateway address. If your network does not use a gateway, use the gateway address of 0.0.0.0 to disable this feature. The output will look like:

```
      Ethernet IP address [255.255.255.255]: 192.168.0.100
      Ethernet subnet mask [255.255.255.0]: 255.255.255.0
      Ethernet gateway [0.0.0.0]: <enter>
```

All other options set the assignment mode and return you to the main menu immediately. You may cancel from this menu by selecting the same assignment mode as the current IP assignment value.

The option "**2. Change hostname**" from the main menu allows you to change the hostname associated with the RamSan-210.

If you are configuring your system with a static IP address, you will be presented with options 3, 4, and 5 on the main menu. These options allow you to change the IP, subnet and gateway values for the Ethernet.

To exit the IP configuration utility, select "**S**" to save the changes you have made. The network will be reconfigured to use the new Ethernet settings you have chosen. To discard any changes you have made, use the "**Q**" option.

4.5.6   LUNCONFIG

This command is a memory-partitioning tool that allows the administrator to configure system memory into LUNs that may be assigned to specific Fibre Channel ports in the RamSan-210. The LUNs may also be assigned access lists that mask the visibility to specific servers.

4.5.7   MANAGE

The manage command allows the user to enable or disable network management methods. The Manage command also supports configuration of SNMP. When option "**1**" is selected, it toggles the current value. For example, if the current value is disabled, then selecting "**1**" will change the value to "**enabled**".

The following screen displays show the output from the SNMP commands:

```
ram-san> manage

                ** Management configuration utility **

                        Telnet = enabled
                        SNMP   = disabled

Select option:

    1. Disable telnet management
    2. Configure SNMP

    S: Save changes and exit
    Q: Discard changes and exit

  Enter selection:
```

4.5.8   PASSWORD

Since it is possible to access the RamSan-210 remotely through the management port, a password feature has been included for system security. By default, the root and user passwords are left blank. In order to change the password, the current password must be entered first. However, on the console, the password may be overridden without requiring the current password.

The password feature is automatically bypassed when logging in on the serial console. This feature allows a system administrator access to the RamSan-210 if the password is forgotten or lost.

4.5.9   PERFORMANCE

The "**PERFORMANCE**" command may be used to view the bandwidth of each port. The monitor shows the average bandwidth of each port over a period of one second. This performance view shows only DMA activity and does not show other Fibre Channel activity. To stop the output from this command, press "**Q**".

```
ram-san> perf
Press 's' to toggle scroll mode, 'q' to quit.
     -- Controller 1 --                 -- Controller 2 --
A:  Band     I/O  B:  Band     I/O  A:  Band     I/O  B:  Band     I/O
    93.2     345      97.2     370      96.6     359      95.2     350
    96.5     356      97.1     369      97.0     367      92.8     337
```

4.5.10   PORTCONFIG

The "**PORTCONFIG**" command is used to configure the Fibre Channel controllers. After the "**PORTCONFIG**" command is entered, the current configuration is listed and the available options are listed.

4.5.11   POWEROFF

The "**POWEROFF**" command is equivalent to a front panel "Manual Shutdown". This will power off the system. Before powering off the system, all writes will be completed. Note: To resume operation, it is necessary to press the top button on either power supply.

4.5.12   REBOOT

The Reboot command allows a system administrator to reboot the management controller. This command should only be needed under rare circumstances.

4.5.13   RESET

The "**RESET**" command allows the administrator to reset individual ports on the RamSan-210. This command should only be needed under rare circumstances since the Fibre Channel ports handle the appropriate reset protocol. To issue this command, a port number is specified as a parameter to the command.

4.5.14   STATUS

The "**STATUS**" command provides a variety of configuration details for the MCP and the Fibre Channel controllers.

```
ram-san> status

Texas Memory Systems, Inc.
RamSan-210 Monitor
Software Version:  1.0.1
Ethernet address:  00:20:c2:00:08:05
Ethernet IP:       192.94.231.206
Capacity:          4096 Megabytes

System Status: System Idle

FC32 Controller 1 -- Not installed
FC32 Controller 2 - Firmware version: 0.9d
   Channel A: 10:02:00:20:c2:00:08:03    offline
   Channel B: 11:02:00:20:c2:00:08:03    offline
```

Chapter 5– Hot Swap Components

One of the main features of the RamSan-210 is the ability to hot swap many of the system components. The power supplies, fans and disk drives can all be hot swapped; meaning that these components can be removed and replacement components reinserted while the system is running.

5.1   Hot Swapping Power Supplies

The RamSan-210 includes two power supplies. The system only requires one functioning power supply to run. Texas Memory Systems has taken special care to enclose the RamSan-210 power supplies in a protective case in order to minimize the electrical risks for users. It is critical, however, that users follow the following steps when removing and replacing the power supplies:

Warning:

The power supply modules maintain high voltage levels during normal operation. To prevent the risk of electrical shock, remove the power cord and wait 15 seconds before removing a power supply module.

- Disconnect the power cord from the power supply that needs to be replaced.
- Wait 15 seconds.
- Remove the power supply from the RamSan-210 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 supply in the RamSan-210 chassis. Make sure to insert the power supply squarely and press firmly until the power supply is fully inserted into the system.
- The new power supply will begin to operate within a couple of seconds.

Important:

The power supply modules are linked to the batteries. If a power supply module is removed, the battery that feeds it will not provide power to the system. In other words, the batteries only work when attached to a functional power supply. Never simultaneously remove both power supplies while the system is running. The system will cease operation.

Important:

Failed power supplies should be replaced as soon as possible.

5.2   Hot Swapping Disk Drives

The RamSan-210 includes two mirrored hard disk drives. The system can operate with two disks operational, one disk operational or no disks operational. Normal operation mirrors writes to both disk drives.

If a single disk drive fails, the system will continue to write to the available disk drive. At this point, it is desirable to replace the malfunctioning disk with a new disk drive. Once inserted, the system will rebuild the disk by executing a disk-to-disk copy. Overall system write performance will be degraded during the restore, but read operations will continue uninterrupted.

Important:

Do not remove either disk drive during a disk-to-disk copy. Removing either disk drive will destroy data on both disks. This will then require both drives to be removed and replaced for a memory to disk resynchronization.

If both disks fail, the system will perform all operations from memory. This is a volatile state. When functional disks are inserted, the system takes the Fibre Channel interfaces off-line and executes a memory to disk copy.

The following steps should be used to replace bad disk drives:

1. Verify that a disk-to-disk copy is not in progress. If it is in progress, then wait for the disk-to-disk copy to complete.
2. Slide the disk eject latch to the right.
3. Remove the disk by pulling squarely on the handle.
4. Insert new disk squarely into the available slot. Make sure the disk drive is completely inserted into the system and flush with the chassis.

Important:

Failed disk drives should be replaced as soon as possible. You should only use TMS factory certified disk drives for replacement.

Important:

It is not advised to remove disks that are functional. The action should be perfectly safe, unless a disk-to-disk copy is in progress, but will impact system performance as the new disk drive is rebuilt from the mirror.

5.3   Hot Swapping Fans

The fans in the RamSan-210 can be removed and replaced during system operation. There are two blocks of three fans each. The blocks are accessed from different locations. The rear fan block is easily accessed from the rear of the chassis. Removing the front panel from the RamSan-210 provides access the front fan block.

The following steps should be performed to hot swap a fan block:

1. Slide the latch on the fans to the left and simultaneously pull firmly on the fan handle. The unit will slide out from the chassis. Use caution to avoid hitting the spinning fan blades once removed.
2. Firmly insert the new fan block into the RamSan-210 chassis. The fans will begin immediate operation once inserted into the chassis.

Important:

Failed fans should be replaced as soon as possible.

Chapter 6 – Batteries

The RamSan-210 is equipped with two redundant one-hour Lithium Ion batteries. The batteries are designed to support the RamSan's operational modes. Specifically, if external power to the RamSan-210 is lost, the system will continue to function running on the internal batteries.

The batteries in the RamSan-210 are linked to the power supply units. In the event a power supply is removed or broken its attached battery will not work. The batteries are designed to provide power for the system in the event external power is lost, not in case both power supplies fail.

The RamSan-210 can be configured to run on battery power for up to fifteen minutes after external power is lost. The system default is to stay on for five minutes after power fails. Because the RamSan-210 uses a mirrored writes mode, the system only has to stay on for one minute in order to clear the disk buffer and disk cache. The amount of time that the RamSan-210 stays on line can be user defined from one to fifteen minutes. If power is restored within this time period, the system will stay online.

Chapter 7 – Troubleshooting

After the system runs short self-tests on each internal component, the hardware initiates synchronization between disk and memory. To obtain further information about the failing location, the management port must be used.

Contact Information:

Texas Memory System, Inc.
11200 Westheimer Suite #1000
Houston, Texas 77042
713-266-3200

Chapter 8 – Specifications

8.1 Physical Characteristics

Rack Mount Size:	2U (3.5") x 25" deep
Weight:	50 lbs.
Voltage:	110 or 220 VAC
Ventilation:	Side to side airflow
	Rear exhaust for power supplies

8.2 Operating Environment

Temperature:	32-85 °F (0-30 °C)
Max relative humidity:	80%
(non-condensing)	
Max heat dissipation:	512 Btu/hr (150 W)
Power consumption:	100-150 W

8.3 Non-operating Environment

Temperature:	32-150 °F (0-65 °C)
Relative Humidity:	10-90%
(non-condensing)	

8.4 Warranty

1 year FOB
Texas Memory Systems, Inc.
Houston, Texas

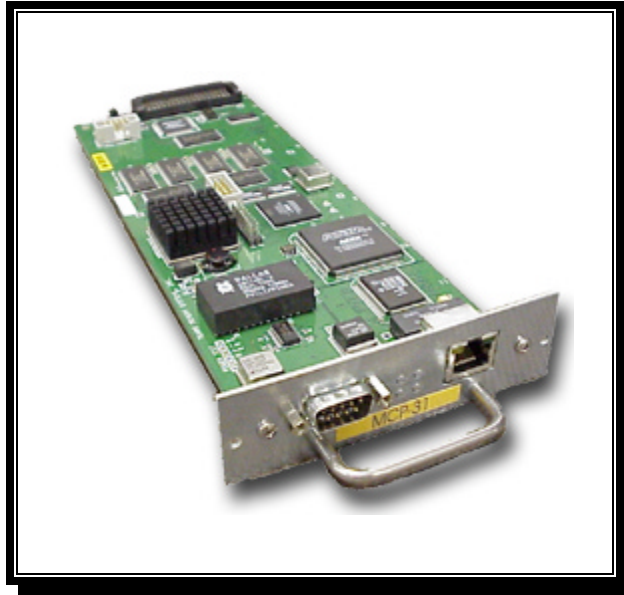# Appendix A – RamSan-210 Replacement Parts

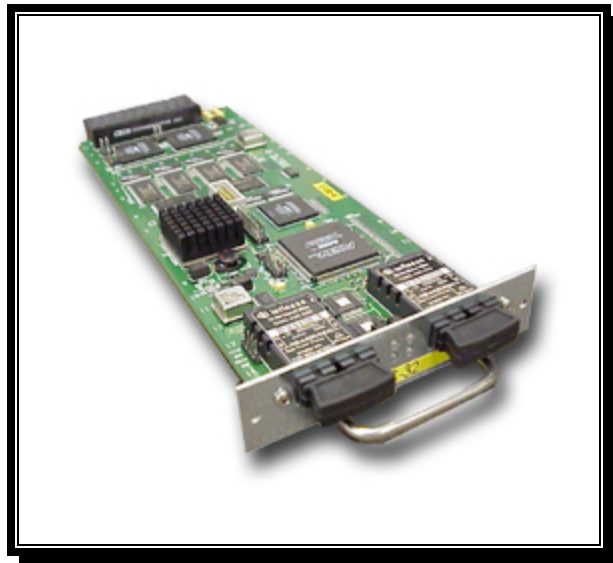**Figure B-1 MCP31 Management Control Processor**

Figure B-2 FC32 Dual channel 1 gigabit Fibre Channel controller
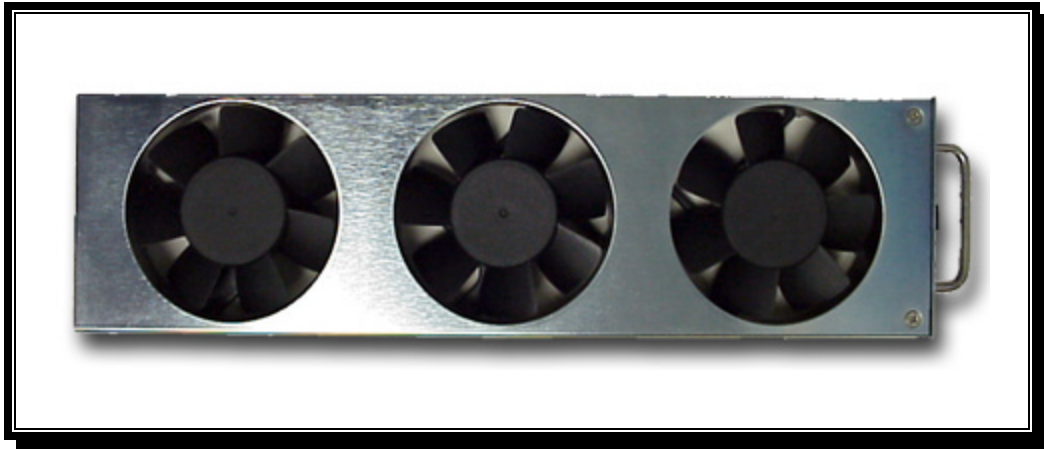
Figure B-3 PWR21 Power Supply Module
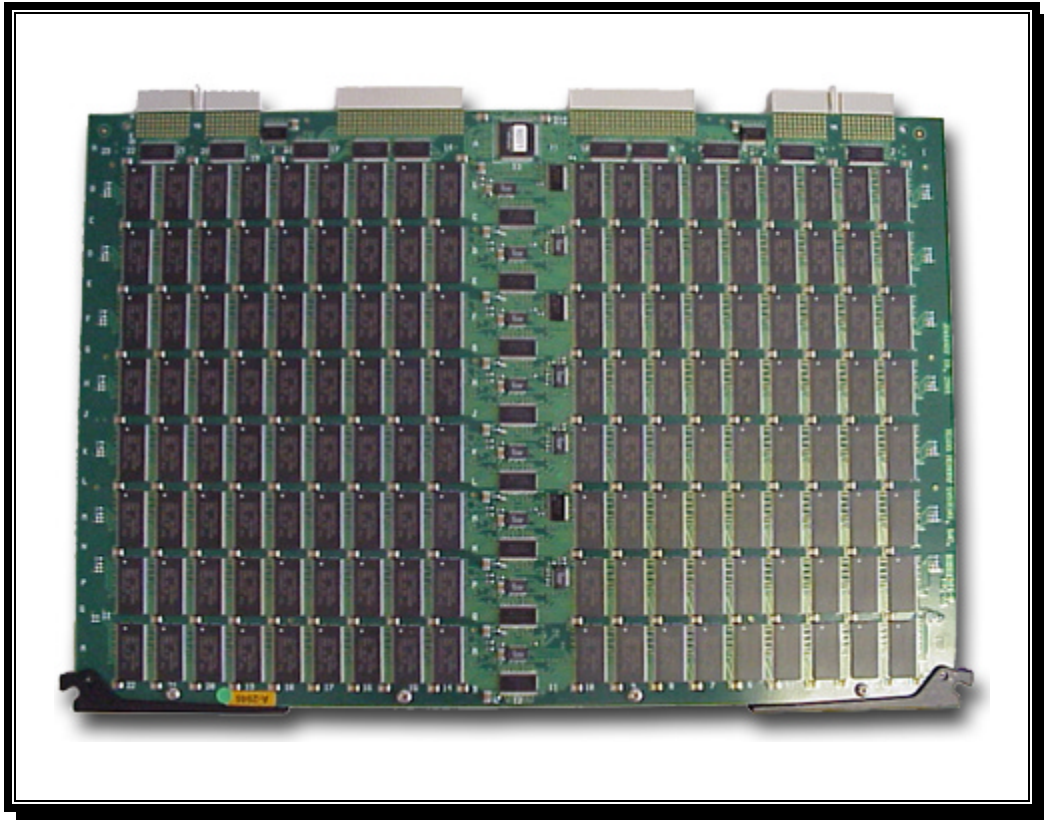

Figure B-4 FAN21 Hot swappable fan tray

Figure B-5 MEMG41 4 Gigabyte memory blade

Figure B-6 TDD21 18 gigabyte replacement hard drive

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