

SentinelRAID® 2700

320MB/sec SCSI-to-SCSI RAID Controller

Installation and Hardware Reference Manual

Revision: 1.2



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FCC (applies in the U.S. and Canada)

This device complies with Part 15 of FCC Rules. Operation of this device is subject to the following two conditions: 1) this device may not cause harmful interference, and 2) this device must accept any interference received, including interference that may cause undesired operation.

Warning:

Use only shielded cables to connect I/O devices to this equipment.

You are cautioned that changes or modifications not expressly approved by the party responsible for compliance could void your authority to operate the equipment.



This device is in conformity with the EMC

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Safety Precautions

Precautions and instructions

- ◆ Prior to powering on the controller, ensure that the correct power range is being used.
- ◆ To handle the controller and its components, use the retention screws, eject levers, and the metal frames/faceplates. Avoid touching PCB boards or connector pins.
- ◆ To comply with safety, emission, or thermal requirements, none of the covers or replaceable modules should be removed. Make sure that during operation, all enclosure modules and covers are securely in place.
- ◆ Be sure that the enclosure into which the controller chassis is to be installed provides sufficient ventilation channels and airflow circulation around the controller.
- ◆ Provide a soft, clean surface to place your controller on before working on it. Servicing on a rough surface may damage the exterior of the chassis.

ESD Precautions

Observe all conventional anti-ESD methods while handling system modules. The use of grounded wrist-strap and an anti-static work pad are recommended. Avoid dust or debris in your work area.

About This Manual

Chapter Descriptions

This Hardware and User's Installation Guide for the SentinelRAID RAID controller is divided into 5 chapters and 5 appendices.

- ◆ ***Chapter 1: SentinelRAID Introduction***

This chapter introduces the SentinelRAID along with all its major components. The locations of active components are described and the brief descriptions of each component are also given. After reading this chapter a user should be familiar with the different active components and their locations on the controller. A brief introduction to controller monitoring and hot-swappable components is also given.

◆ ***Chapter 2: Installation***

This chapter shows users how to correctly install the SentinelRAID controller. Installation pre-requisites, precautions and unpacking instructions are also given.

◆ ***Chapter 3: Controller Monitoring***

This chapter teaches the user how to use LEDs to monitor the status of SentinelRAID. The RAIDWatch® GUI and Firmware is briefly introduced and audible alarms, with activation thresholds are also described.

◆ ***Chapter 4: Controller Connection and Operation***

This chapter teaches users how to connect the controller to a host computer and drives. Different configurations are shown with brief descriptions of each. This chapter also describes both the power on and power off procedure of the SentinelRAID controller.

◆ ***Chapter 5: Controller Maintenance***

This chapter instructs users on how to maintain their controller. The replacement and maintenance of a number of active components including the controller module, the power supply units and the cooling FAN modules are discussed. Replacement of failed battery modules and DIMM modules are also described.

◆ ***Appendix A: SentinelRAID Features***

This appendix describes a few of the many features of the SentinelRAID.

◆ ***Appendix B: SentinelRAID Specifications***

This appendix lists all the technical specifications of the SentinelRAID controller.

◆ ***Appendix C: Troubleshooting***

This appendix describes how to troubleshoot the SentinelRAID controller.

◆ ***Appendix D: Accessories and Spare Parts***

This appendix lists all the part numbers for the different accessories and spare parts that are available for the SentinelRAID.

◆ ***Appendix E: Pinouts***

This appendix shows the different pinouts of the SentinelRAID interfaces.

Who should read this manual?

This manual assumes that its readers are experienced with computer hardware installation and are familiar with storage enclosures.

Related Documentation

- ◆ Generic Operation Manual
- ◆ RAIDWatch User's Manual

Conventions

Naming

From this point on and throughout the rest of this manual the SentinelRAID controllers are referred to as simply the “controller” or the “system” and SentinelRAID is frequently abbreviated as SR.

Important Messages

Important messages appear where mishandling of components is possible or when work orders can be misunderstood. These messages also provide vital information associated with other aspects of system operation. The word “important” is written as “**IMPORTANT**,” both capitalized and bold and is followed by text in italics. The italicized text is the important message.

Warnings

Warnings appear where overlooked details may cause damage to the equipment or result in personal injury. Warnings should be taken seriously. Warnings are easy to recognize. The word “warning” is written as “**WARNING**,” both capitalized and bold and is followed by text in italics. The italicized text is the warning message.

Cautions

Cautionary messages should also be heeded to help you reduce the chance of losing data or damaging the system. Cautions are easy to recognize. The word “caution” is written as “**CAUTION**,” both capitalized and bold and is followed by text in italics. The italicized text is the cautionary message.

Notes

Notes inform the reader of essential but non-critical information. These messages should be read carefully as any directions or instructions contained therein can help you avoid making mistakes. Notes are easy to recognize. The word “note” is written as “**NOTE**,”

both capitalized and bold and is followed by text in italics. The italicized text is the note message.

Steps

Steps describe the sequential tasks in a specific work procedure. Following the steps in their proper order helps guarantee effectiveness and lowers the chance of making mistakes.

Lists

Bulleted Lists: Bulleted lists are statements of non-sequential facts. They can be read in any order. Each statement is preceded by a round black dot “•.”

Numbered Lists: Numbered lists describe sequential steps you should follow in order. Software and Firmware Updates

Software and Firmware Updates

Please contact your system vendor or visit Infortrend’s FTP site (<ftp.infortrend.com.tw>) for the latest software or firmware updates. ***NOTE*** that the firmware version installed on your system should provide the complete functionality listed in the specification sheet/user’s manual. We provide special revisions for various application purposes. Therefore, **DO NOT** upgrade your firmware unless you fully understand what a firmware revision will do.

Problems that occur during the updating process may cause unrecoverable errors and system down time. Always consult technical personnel before proceeding with any firmware upgrade.

Chapter 1

Introduction

1.1. Chapter Overview

This chapter:

1. Introduces the SCSI-to-SCSI SentinelRAID (SR) controllers.
2. Introduces the model variations.
3. Introduces the different components and connectors on the controller and the controller backplane.
4. Introduces the different components and connectors on the daughter board and daughter board backplane.
5. Introduces the different monitoring techniques.

After reading this chapter a user should:

1. Have a good overview the SentinelRAID controller series.
2. Be well acquainted with the different components and connectors and their locations in the controller.
3. Have an idea of the different controller status monitoring techniques that can be used.

1.2. Product Overview

1.2.1 Product Introduction

This hardware manual briefly introduces the SentinelRAID 2700 (SR 2700) 320MB/sec SCSI (SCSI-320) SCSI-to-SCSI RAID controllers shown in the figure in **Figure 1-1**.



Figure 1-1: SentinelRAID SCSI-to-SCSI Controller

The SentinelRAID 2700 has been designed to meet the high availability, high performance, and extreme fault tolerant demands placed on RAID controllers operating in today's extreme storage environments. These SCSI-to-SCSI controllers are designed to provide RAID 0, 1 (0+1), 3, 5, 10, 30, 50, NRAID, or JBOD RAID storage to any host system equipped with a SCSI-320 interface. The controller's operation is completely independent of the host operating system.

All RAID functions are performed by a PowerPC® RISC CPU with high-speed SDRAM's and firmware in flash memory. In effect, it endows the host system with high-speed and fault-tolerant disk storage operation using RAID technology. It is an ideal solution for weaving multiple hard drives into one or more contiguous volumes as well as enhancing availability, integrity, and performance of storage.

1.2.2 Enclosure

The controller enclosure is divided into a front and rear section.

1.2.2.1 Front Side

The front panel of the controller canister consists of an LCD panel that is used to manage the controller and the storage devices to which it is connected. The LCD panel can be removed from the controller using the

bezel key to extract it and disconnecting the ribbon connector that attaches the LCD panel to the controller board.

1.2.2.2 Rear Side

The rear side of the controller chassis provides access to the backplane board that contains the SCSI-320 connectors, power cord sockets, RS-232C serial port, I²C connector and battery connector. The backplane is connected to the controller board via two docking connectors.

1.2.2.3 Mounting Holes

The controller can be installed into an industrial standard 5.25" half-height canister. To secure the controller within an enclosure chassis, screws must be inserted through the enclosure's mounting rails and into the four mounting holes on the sides of the controller.

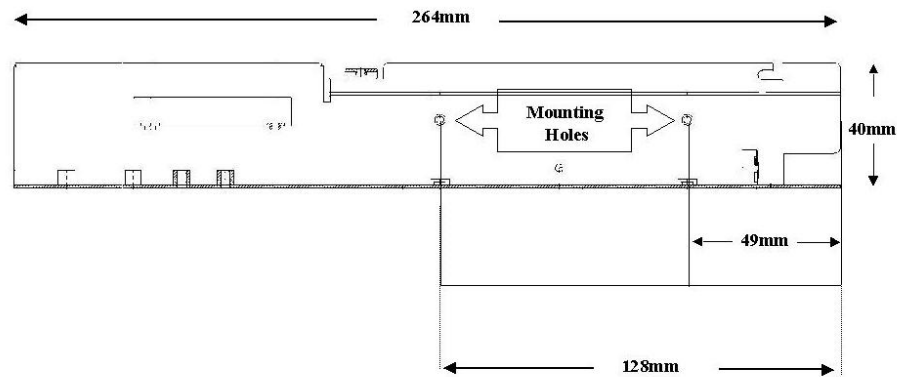


Figure 1-2: Controller Canister Mounting Holes

1.3. Controller Components

1.3.1 LCD Panel

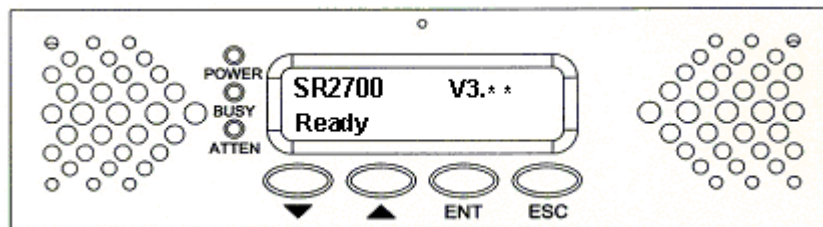


Figure 1-3: LCD Panel

The LCD panel shown in *Figure 1-3* consists of a 16x2 character LCD screen with two navigation buttons (labeled as ▼▲ in *Figure 1-3*), three status indicating LEDs

(**POWER**, **BUSY** and **ATTEN**), an enter button (labeled **ENT**) and an escape button (labeled **ESC**). The LCD front panel provides full access to all RAID configurations and monitoring. After powering up the controller, the initial screen will show the controller model name. A different name may be assigned for the system or different arrays. This will enable easier identification in a topology with numerous arrays.

1.3.2 Controller Board

WARNING:

The controller board is a very sensitive component that can be easily damaged. When working with the controller board make sure that all safety precautions are strictly adhered to. Failure to adhere to these safety instructions can result in the severe damage to the controller board.

The heart of the SentinelRAID 2700 RAID controllers is the SCSI-to-SCSI controller board (see **Figure 1-4**). The controller board on the SentinelRAID 2700 has four channels (CH0, CH1, CH2 and CH3). Two upgrade sockets allow for the installation of a daughter board that facilitates an increase in the available I/O SCSI-320 I/O channels. It should be noted that all the I/O channels can be configured as either host or drive channels.

The controller board also comes with a 68-pin SDRAM DIMM socket that facilitates the installation of a (64MB to 1GB) SDRAM DIMM module. A variety of onboard jumpers facilitate the connection of a variety of accessory components like battery module charger boards. These jumpers and connectors are listed in **Table 1-1**.

Connector Type	Label	Description
Docking Connectors	CN1 and CN2	These two connectors are used to connect the controller board to the controller backplane.
Daughter Board Connectors	JP1 and JP13	These two connectors are used if an expansion daughter board is being installed on the controller module.
Battery Charger Board Connector	JP3 and JP8	These connectors are used to mount the optional battery charger board onto the controller board.
LCD Screen Connector	JP9	Connects the ribbon cable from the LCD panel to the controller board.
LCD Type	JP11	Only used by Infortrend for testing.
LED Signals	JP12	Used for the Power, Busy and Attention LED signals.
Reset	JP14	Used to reset the controller
NMI	JP15	Only used by Infortrend for debugging.
Loopback	JP16	Only used by Infortrend for testing
FAN Select	JP17	Disables/Enables the FAN

Table 1-1: Controller Jumpers and Connectors

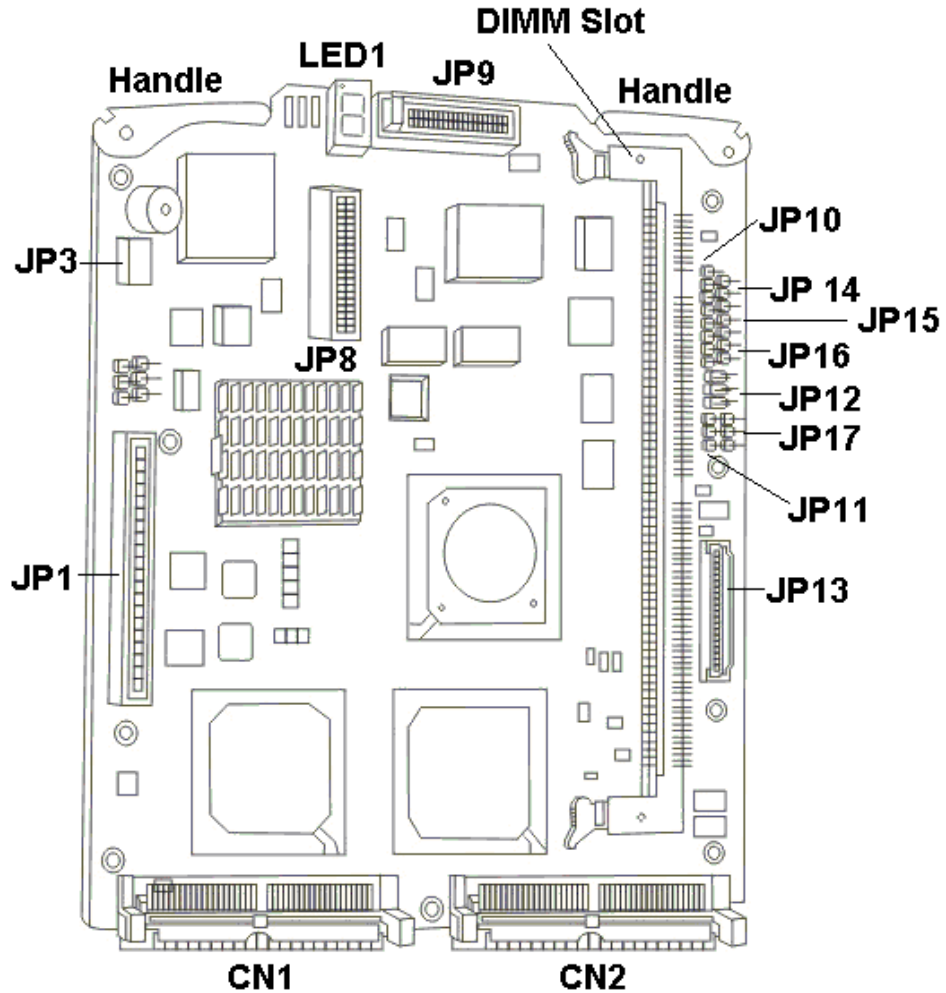


Figure 1-4: Controller Board

1.3.3 Backplane

The backplane (see *Figure 1-5*) is located at the back of the controller enclosure and is connected to the controller board through two docking connectors. The backplane contains all the external interfaces that are used to connect to external devices. These interfaces include the SCSI-320 I/O channel connectors, power cord sockets, RS-232C serial port connector, I²C connector and battery connector. The backplane interfaces are fully described in *Table 1-2*.

Connector Type	Label	Description
Docking Connectors	CN1 and CN2	These two connectors are used to connect the backplane to the controller board.
SCSI-320 Connectors	CH0 , CH1 , CH2 and CH3	68-pin VHDCI connectors that facilitates the connection of the SCSI-320 I/O channels to external devices.
Serial Port Connector	RS-232 (J2)	A 20-pin connector that facilitates serial port communication between the controller and an external device.
I ² C Connector	J3	I ² C supports the monitoring of remote enclosure devices.
Battery Connector	J4	Allows an optional battery backup unit (BBU) to be mounted onto the controller board.
SCSI Terminators	JP2	This 8-pin jumper is used to terminate the different I/O channels.
RJ-45 Ethernet Connector	JP1	This connector provides users with access to LAN and web based management of the controller.
Power Terminator	J1	This 2-pin header provides an auxiliary 5V power to the terminator circuits on daughterboard backplane. If a controller fails or is removed, power to the daughterboard backplane will be discontinued causing SCSI buses (channel 0 to channel 3) to fail.

Table 1-2: Backplane Interfaces

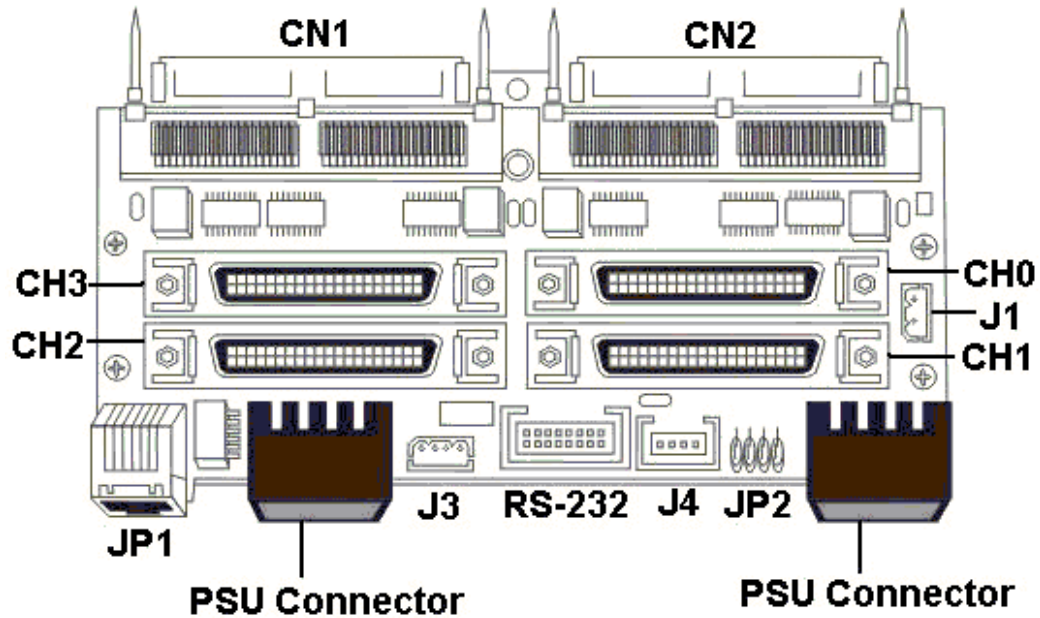


Figure 1-5: Controller Backplane

1.4. Accessory Items

The following items are not installed in the controller but come in the accessory box and can be used with the controller.

1.4.1 Serial cable

The IFT-9512 RS-232C serial cable allows the serial RS-232C serial communications connector on the backplane board (J2) to be connected to a PC hyper-terminal, which enables a RAID array manager to easily manage and configure the storage array to which the controller is connected.

1.4.2 Terminator power cable

If the expansion module (daughterboard) is installed, connect this cable between two backplane boards.

1.4.3 Null modem

The null modem is a signal converter, please refer to Appendix D for more details.

1.4.4 Ethernet cable

The receptacle side is shaped as a DB-9 connector and can be attached to enclosure back panel using the mounting positions of a serial port header to connect to the outside of the enclosure.

1.4.5 Bezel key

The IFT-9531 is used to remove the LCD front panel from the controller canister. The only time the LCD front panel needs to be removed is when the controller board needs to be accessed.

1.5. Separately Purchased Accessory Items

The following items are required to run the controller. These items must be separately purchased and independently installed by the end user.

1.5.1 DIMM Modules

The controllers are able to support PC-133 SDRAM DIMM modules with ECC support and capacities between 64MB and 1GB. DIMM modules must be separately purchased and installed by the end user. The SDRAM DIMM module socket is located on the controller board and can only be accessed by removing the controller board from the enclosure.

NOTE:

Although the hardware is able to support a minimum SDRAM DIMM Module size of 64MB it is recommended that DIMM modules with minimum capacities of 256MB are used.

1.5.2 SCSI cables

SCSI cables are required to connect the VHDCI connectors on the backplane to the SCSI-320 drives and application servers equipped with SCSI-320 host adapters. When purchasing SCSI-320 cables ensure that they are of the highest quality and that a reputable manufacturer has produced them. To ensure optimum controller performance it is necessary to use proper SCSI-320, high quality, durable SCSI cables. Failure to do so will result in downgraded performance. Please contact the controller vendor for a list of compatible cables.

1.5.3 Power cords

Two four pin power cord connectors are located on both the right and left side at the back of the backplane. These connectors facilitate the power supply connection.

1.5.4 I²C signal compatible cables

These cables are required for enclosure device monitoring.

1.6. Optional Items

1.6.1 Battery Backup Unit

The controller operates using cache memory. However, if the controller operates with write-back caching and a power failure occurs, the cache memory may contain buffered data that has not been made permanent on hard disks.

The buffered data is not retrievable when power returns unless backup power has been provided. The combination of the optional, separately purchased IFT-9070D battery charger board (*Figure 1-7*) and IFT-9010D (*Figure 1-6*) allows two battery packs to be daisy-chained for longer backup time and can sustain power supply for longer than 72 hours with single cell pack. The IFT-9519D extension cable can be used to cascade multiple cell packs or to extend the connection between controller and cell pack.

Each battery in the cell pack has a storage capacity of 3A/H when fully charged, and three cells are used for a total of 3.6V source. The charger circuit on IFT-9070D provides a 160mA charge until 1). a time limit of 90 minutes is reached; 2). a temperature limit of 65°C is reached. After fast charging, the charger will shift to a trickle stage until the battery is fully charged.

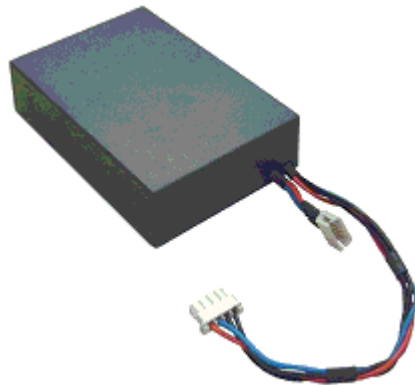


Figure 1-6: BBU Module



Figure 1-7: Battery Charger Board

1.6.2 Daughter Board Expansion

The installation of an optional daughter board with its associated backplane would make either an additional 4 SCSI-320 IO channels available or two 2Gbps Fibre Channel (FC-

2G) channels available. Both daughter boards come with their own backplane which, like the daughter boards themselves, must be independently installed. The two daughter boards and their associated backplanes are listed in *Table 1-3* below:

Daughter Board	Backplane	Channels
IFT-9284U4	IFT-9288FB4	4 x SCSI-320
IFT-9282FF2	IFT-9288FB2F2	2 x FC-2G

Table 1-3: Daughter Boards and Associated Backplanes

The two daughter boards and their available channels are listed in *Table 1-4* below:

	SCSI-320 Channels	FC-2G Channels
SR 2700	4	0
SR 2700 + IFT-9284U4	8	0
SR 2700 + IFT-9282FF2	4	2

Table 1-4: Available Channels

1.7. Environmental Requirements

When installing and running a controller, the following environmental considerations must be taken into account.

1.7.1 Power Supply Requirements

Two power cord connectors facilitate the connection of two, redundant power supply units (PSUs). If redundant PSUs are used, if one PSU should fail the second PSU can continue to supply power to the controller. The power requirements are listed below:

- ◆ **Input Voltage** +5VDC, +12VDC
- ◆ **Power Consumption (5V)**
 - *Full Loading:* 5.5A
 - *Idle:* 3.5A
 - *Power-up:* 4A

When purchasing a PSU, the power requirements, listed above, must be taken into consideration. Please contact the controller vendor for a list of compatible PSUs.

1.7.2 Cooling Requirements

Proper controller cooling is required to ensure that the temperature of critical controller board components does not exceed the operational temperature range. The main components on the controller board that can overheat are:

- ◆ ASIC 133
- ◆ CPU
- ◆ SCSI Chip/s

The temperature of these items cannot exceed 80°C. Of the three items listed, the CPU will heat up the most. To pre-empt overheating of the CPU, a heat sink has been mounted on top of the CPU. The heat sink is separated from the CPU with thermal grease.

It is imperative that users, prior to installing and powering on the controller, ensure that there is sufficient cooling of the controller.

1.8. Controller Monitoring

The controller comes with a number of different monitoring methods that enable users to constantly be updated on the status of the controller and the storage array to which it is connected.

1.8.1 I²C bus

The I²C bus allows for the status monitoring of a number of different devices like power supplies and cooling fans.

1.8.2 LED Indicators

The LCD front panel has three LED status indicators that are used to show that the power is on, when there is activity on the I/O channels and when an error message appears on the LCD screen itself.

1.8.3 Firmware (FW) and RAIDWatch GUI

Firmware:- The firmware is pre-installed software that is used to configure the controller. The FW can be accessed through either the front panel LCD module or a terminal emulation program that is installed on an external computer that is connected to the host.

RAIDWatch:- RAIDWatch is a premier web-based graphics user interface (GUI) that can be installed on a remote computer and accessed via the web.

1.8.4 Audible Alarms

The controllers come with audible alarms that will be triggered when certain active components fail or when certain thresholds are exceeded. If you hear an audible alarm being emitted from the controller it is imperative that you determine and rectify the problem immediately.

WARNING:

Failing to respond when an audible alarm is heard can lead to permanent damage of the controller. If an audible alarm is heard, rectify the problem as soon as possible.

Chapter 2

Installation

2.1. Chapter Overview

CAUTION

Please note that the installation instructions described in this manual should be carefully followed. If they are not carefully followed, the system may be damaged.

This chapter:

1. Discusses installation pre-requisites.
2. Discusses installation safety procedures.
3. The unpacking procedure.
4. Installation/replacement of DIMM modules.
5. Installation of BBU modules, controller modules, hard drives, and drive trays.

After reading this chapter a user should:

1. Be well acquainted with the pre-requisites required for installation.
2. Be well acquainted with the safety procedures.
3. Know how to install all the uninstalled active controller components.

2.2. Installation Pre-requisites

1. **Static Free Installation Environment** – The controller must be installed in a static free environment to minimize the possibility of electrostatic discharge (ESD) damage. (See *Section 2.3.2*).
2. **Component Check** – Before the controller is installed, users should, during the unpacking process, check to see that they have received all the components on the unpacking list. (See *Section 2.5*)
3. **Memory Modules** – Separately purchased modules must be separately purchased and installed. (See *Section 2.7*)
4. **Hard drives** – SCSI-320 hard drives must be purchased separately prior to installation of the controller.
5. **Cabling** – All the SCSI cables that are used to connect the controller to the host and drives must be purchased separately. (See *Section 4.2.1*)

2.3. Safety Precautions

2.3.1 General Considerations

- ◆ **Power Source** - Make sure power source is within the correct power range prior to power on.
- ◆ **Earth** - Always make sure the controller has a safe electrical earth connection via power cords or chassis ground by the rack cabinet.
- ◆ **Ventilation** - Be sure that the rack cabinet into which the controller is to be installed provides sufficient ventilation channels and airflow circulation around the controller.
- ◆ **Working Surface** - Provide a soft, clean surface to place your controller on before working on it. Servicing on a rough surface may damage or scratch the enclosure.

2.3.2 Static-Free Installation

Static electricity can damage the electronic components of the system. Most of the controllers that are returned for repair are the results of improper installation and ESD damage. To prevent ESD damage to any of the components, before touching or handling them follow these precautions:

- ◆ When installing the controller, a user should wear an anti-static wrist band or touch a grounded metal surface to discharge any static electricity from his/her body.

- ◆ Avoid carpets, plastic, vinyl or styrofoam in the work area.
- ◆ Handle any components by holding its edges or metal frame. Avoid touching PCB boards or connector pins.

2.4. Hardware Installation Preparation

2.4.1 Tools or Equipment Needed for Installing the Controller

The only tools necessary are #2 cross-head Phillips and 3/16" slotted screwdrivers.

2.4.2 Planning Before Installation

- ◆ **Module Locations** - Make sure you are aware of the related positions of each plug-in module and interfaces.
- ◆ **I/O path configurations** - The controllers provide a total of two (2) or four (4) SCSI-320 IO channels interfaced through two (2) or four (4) SCSI ports (depending on the model type). The installation of an optional daughter board increases the available SCSI-320 IO channels by four (4). All IO channels can be configured as either host or drive channels.
- ◆ **IO port cabling** - All series models are equipped with 0.8mm VHDCI SCSI connectors. Please contact our technical support for an updated list of host adapters that have been tested and proved compatible with the controller series.
- ◆ **Power supplies** – Two power cord connectors ensure that redundant power supplies can be connected to the controller ensuring that in the event of one power supply failing, the second power supply will continue to supply sufficient power to run the controller.

2.4.3 General Installation Procedure

If the following steps are followed, the installation of the controller should be smooth and efficient. Detailed, illustrated instructions for each step are given in the following sections.

CAUTION

To ensure that the system is correctly installed, please follow the steps outlined below. If these steps are followed the installation will be fast and efficient. If these steps are not followed may hardware may accidentally be installed incorrectly

- Step 1.** **Unpack** – Unpack the controller and make sure that all the components that are meant to come with the controller have indeed arrived. (See *Section 2.5*)

- Step 2.** ***Install the DIMM Module*** – The controller does not come with pre-installed DIMM modules. Separately purchased DIMM modules need to be installed by the end user. (See *Section 0*)

- Step 3.** ***Install optional BBU*** – Install the optional BBU prior to the operation of the controller. (See *Section Step 2*)

- Step 4.** ***Install the optional daughter board*** – If a user requires more than four (SentinelRAID 2700) SCSI-320 channels the optional daughter board with the appropriate expansion channels must be installed.

- Step 5.** ***Rack/Cabinet installation*** – Install the controller into an appropriate cabinet or rack.

- Step 6.** ***Connect the Host*** – Connect the user configured host channels to the host computer.

- Step 7.** ***Connect the Drives*** – Connect the user configured drive channels to the hard drives.

2.5. Unpacking the Controller

NOTE:

A detailed packing list can be found in the *Appendix D* of this manual.

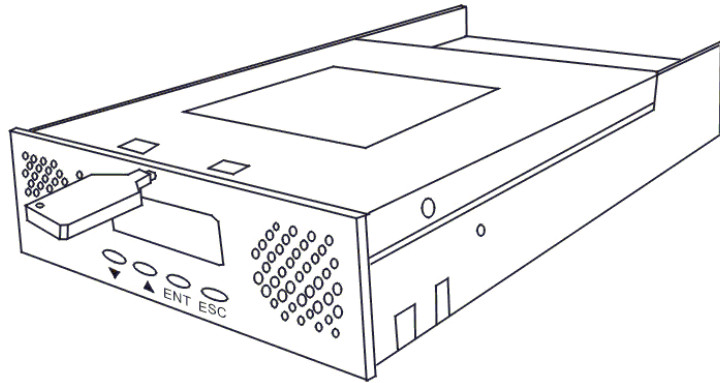
When unpacking the controller, please ensure that all the items that are listed on the unpacking list that came with the controller are present. If any of the items listed on the unpacking list are missing, please contact the controller vendor immediately. A complete unpacking list is given in *Appendix D*.

2.6. Removing and Installing the Controller Board

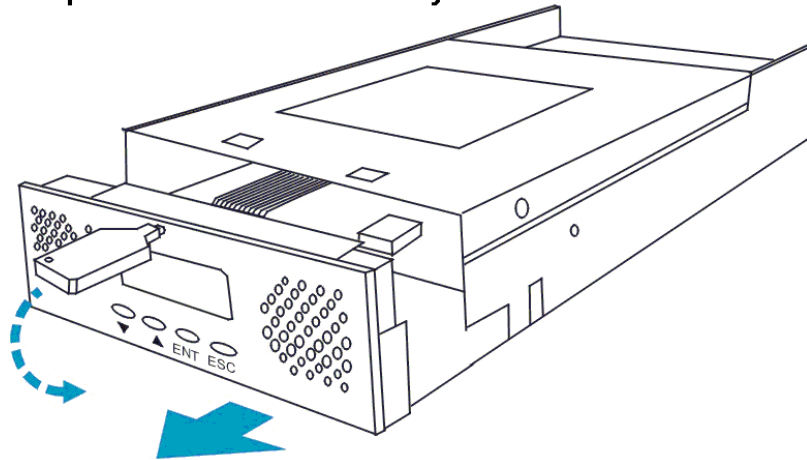
2.6.1 Removing the Controller Board

- Step 1.** ***Disconnect PSU and Drives*** – If PSUs and drives have already been connected to the controller backplane, these items must be disconnected.

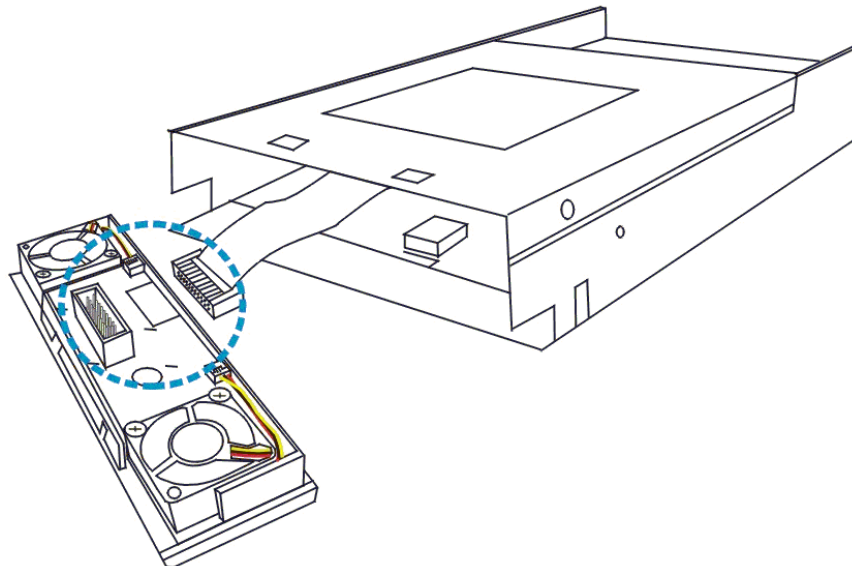
- Step 2.** ***Remove the LCD Front Panel*** – The controller board is located behind the front LCD panel. To remove the panel it is necessary to use the bezel key. Insert the bezel key into the hole above the screen (see *Step 1* in *Figure 2-1*). Once inserted, pull the key in a downward direction (see *Step 2* in *Figure 2-1*). This will draw the LCD front panel out of the controller canister. Once the LCD panel has been completely removed, disconnect the ribbon cable that connects it to the internal connector (see *Step 3* in *Figure 2-1*).



Step 1: Insert the Bezel Key



Step 2: Remove the LCD Panel



Step 3: Remove the ribbon cable

Figure 2-1: Remove the Front LCD Panel

- Step 3.** ***Remove the controller board*** – To remove the controller board from the controller canister, pull the two handles at the front of the board in an outward direction until they are at an angle of 90 degrees to the controller board. The controller board will automatically be dislodged from the docking connectors that join it to the backplane. Gently slide the controller out of the canister and place it on a static free surface. See *Figure 2-2*.

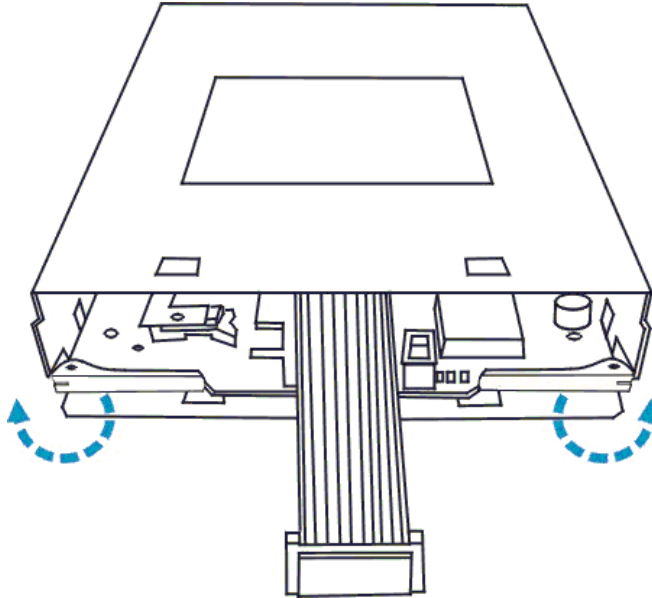


Figure 2-2: Open the Controller Board Handles

2.6.2 Installing the Controller Board

- Step 1.** ***Install the controller board*** – Align the board with the canister’s internal rails. Make sure that the two silver handles are at 90 degrees to the board. Gently slide the board into the canister. Once the board has been inserted into the canister, close the handles by pushing them inwards, towards the board. This will secure the controller in the canister.
- Step 2.** ***Replace the LCD panel*** – After the controller board has been reinstalled into the canister, the front LCD panel must be reinstalled at the front of the canister. Connect the ribbon cable from the controller board to the LCD panel. Next, push the bottom of the LCD panel against the bottom front of the canister. Angle the LCD panel at 45 degrees to the canister. Gently push the LCD panel in an upward direction until it clips into place. BBU Installation

2.7. Memory Module Installation

The controller comes without a DIMM memory module. It is therefore necessary for a separately purchased DIMM module to be installed by the end user.

2.7.1 Selecting the DIMMs

When purchasing the DIMM modules the following factors must be considered:

- ◆ ***SDRAM DIMM modules supported*** – The controllers are able to support SDRAM DIMMs with memory capacities 256MB and 1GB with ECC support.
- ◆ ***Installation Considerations*** – When installing the SDRAM DIMM module, it is necessary to handle the controller board. The controller board is susceptible to damage and must therefore be handled with extreme care. ALL anti-static precautions specified in **Section 2.3.2** must be strictly adhered to.
- ◆ ***Secure Installation*** - When installing the DIMM module, make sure that the DIMM module is firmly in place prior to installing the controller. If the DIMM module is not firmly in place, the controller will not be able to run and will need to be removed and the DIMM module correctly installed.
- ◆ ***Purchasing considerations*** – When purchasing an SDRAM DIMM to install on the controller board, contact the controller vendor.

2.7.2 DIMM Module Installation Procedure

To upgrade a DIMM module into the controller, please follow these steps:

- Step 1.** ***Remove the controller board*** – Before installing the DIMM module, it is necessary to remove the controller board from the controller canister. For further instructions on how to remove the controller board, please refer to **Section 2.6.1**.
- Step 2.** ***Insert the DIMM Module*** – Once the controller board has been removed, install the DIMM module. To do this, first push the white clips on either side of the DIMM module in an outward direction. Next, align the DIMM module with the DIMM slot. Then, gently push the DIMM module into the slot. The white clips should automatically close and secure the DIMM module into the DIMM slot. See **Figure 2-3**.

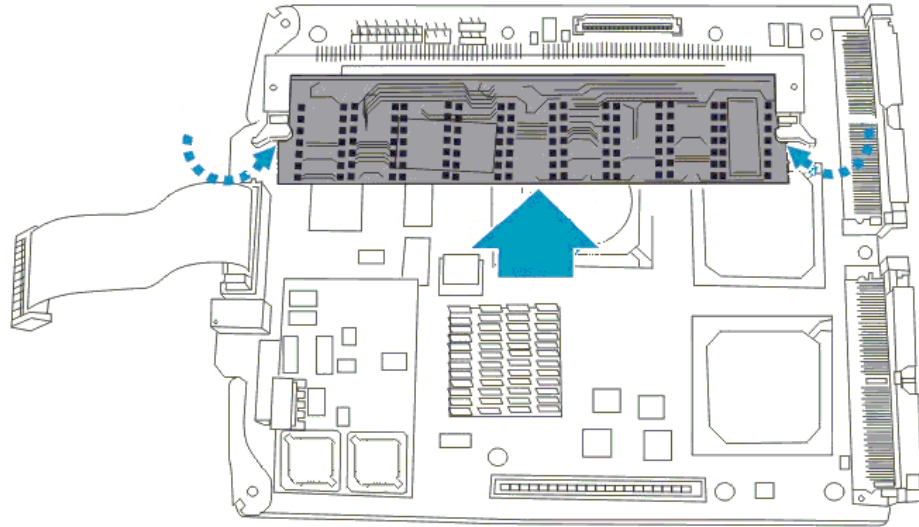


Figure 2-3: Install the DIMM Module

- Step 3.** *Replace the controller board* – Once the DIMM module has been installed on the controller board, the controller board must be reinstalled into the canister. For further instructions on how to reinstall the controller board, please refer to *Section 2.6.2*.

2.8. Battery Backup Unit (BBU) Installation

2.8.1 About first BBU Installation

- ◆ It is possible that the linking cable connected between the IFT-9070D charger board and IFT-9010D cell pack has contact with the components on the surface of the controller main board. While routing this cable from one side to the other, please take it into consideration that some chip surfaces should be avoided. The surface temperature on chips like SCSI processors may rise and damage the plastic shielding of a linking cable.
- ◆ A battery has a tendency to "remember" its capacity. In order to make use of all the capacity of your battery cells allow the battery cell pack to be fully charged when installed for the first time. When charging a battery for the first time, 24 hours is required for the battery to be completely charged. When the installation of the battery module is completed and the controller is powered on, the battery will automatically start charging. Do not power down the controller during the first 24 hours after the BBU has been installed. After installing the BBU, if the controller power is turned off, and there is unwritten data in the cache memory, the battery will start discharging.
- ◆ Inspect the BBU regularly and replace it every **TWO** years; use an official battery pack replacement and only use them with specified RAID controllers.

- ◆ When replacing the controller's DIMM module, be sure to disconnect the BBU.
- ◆ During normal use, an empty cell pack takes about 20 hours to recharge.
- ◆ Disconnect the BBU if there is a long storage period before deployment. Extreme storage condition should be avoided (temperature: $<-20^{\circ}\text{C}$ or $>65^{\circ}\text{C}$, relative humidity: $>65\% \pm 10\%$).

2.8.2 BBU Installation Procedure

- Step 1.** *Remove the controller board* – Before installing the BBU charger board, it is necessary to remove the controller board from the controller canister. For further instructions on how to remove the controller board, please refer to *Section 2.6.1*.
- Step 2.** *Remove the Battery Connector Cap* – The connector that facilitates the connection of the BBU is covered with a connector cap that must be removed. Remove this cap by gently pulling it in an upward direction. Put the cap in a safe place in case it needs to be replaced at a future time. See *Figure 2-4*.

WARNING

The battery cap must be put in a safe place. If the BBU module is removed from the controller board, the controller will not operate unless the BBU cap is reinstalled on the board-to-board connector from which it was removed.

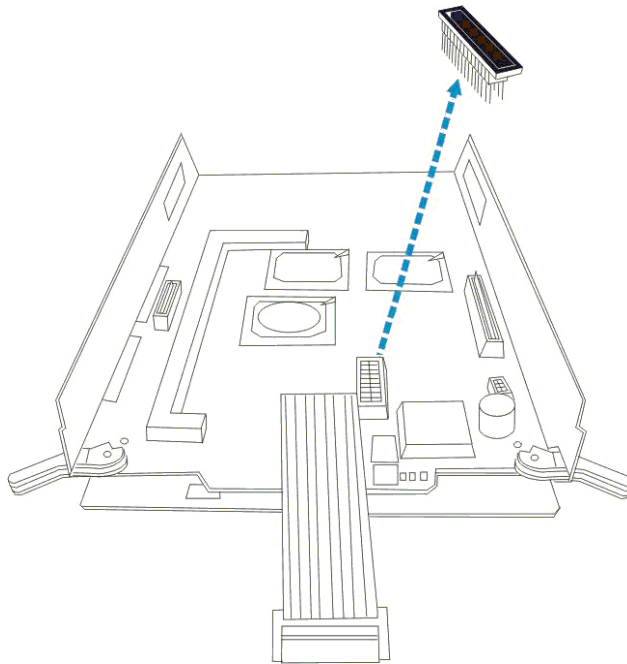


Figure 2-4: Remove the Battery Connector Cap

Step 3. ***Install the Battery Charger Board*** – The battery charger board comes with two board-to-board connectors. Align the appropriate connectors with jumper 7 (JP7) and jumper 2 (JP2) on the controller board. Once these connectors are aligned with the jumpers, gently insert them into the jumpers.

Step 4. ***Connect the BBU cable*** – The BBU cable can be connected to a white, 4-pin header on either the BBU charger board or on the controller board backplane (labeled J4). If the BBU cable is going to be connected to the charger board, the connections should be made now. If the BBU is going to be connected to the connector on the backplane board, the connection can be made now or after the controller board has been reinstalled into the canister.

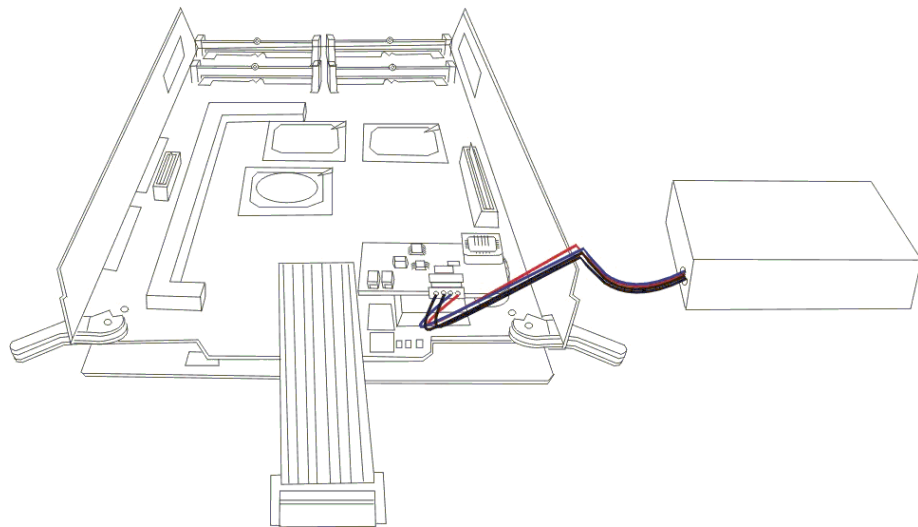


Figure 2-5: Connect the BBU to the BBU Charger Board

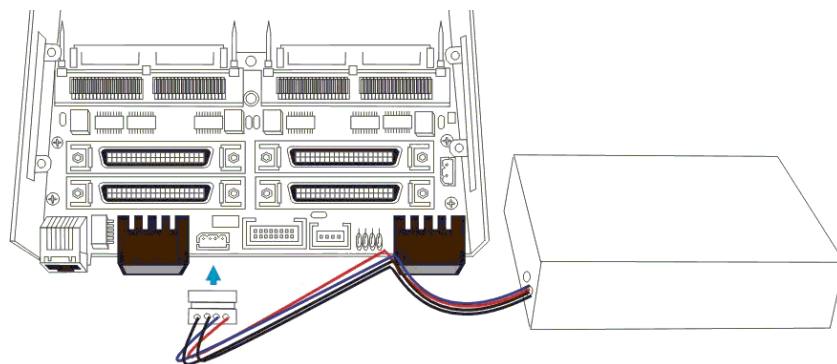


Figure 2-6: Connect the BBU to the Backplane Connector

Step 5. ***Replace the controller board*** – Once the battery charger board has been installed on the controller board, the controller board must be reinstalled into the canister. For further instructions on how to reinstall the controller board, please refer to *Section 2.6.2*.

- Step 6.** ***Attach the BBU to the enclosure*** – Integrators can use the four, pre-drilled mounting holes on the BBU to attach the BBU to a custom designed enclosure.

2.9. Daughter board Installation

2.9.1 About Daughter Board Installation

- ◆ The optional, separately purchased daughter board allows users to add either an additional four SCSI-320 or an additional two FC-2G I/O channels to the controller. Installing the daughter board requires the installation of the daughter board itself along with the associated daughter board backplane.
- ◆ The Daughter Board, like the controller board, is a very sensitive component and must be treated carefully. All anti-static precautions must be strictly adhered to and all the controller safety precautions observed.
- ◆ The installation procedure of both the SCSI-320 (IFT-9284U4) and the FC-2G (IFT-9282FF2) daughter boards and there associated backplanes are the same. Below the installation of the SCSI-320 daughter board and its associated backplane are described.

2.9.2 Daughter Board Installation Procedure

- Step 1.** ***Remove the controller board*** – Before installing the daughter board, it is necessary to remove the controller board from the controller canister. For further instructions on how to remove the controller board, please refer to *Section 2.6.1*.
- Step 2.** ***Install the daughter board backplane*** – The daughter board connects to external interfaces on the daughter board backplane. The daughter board backplane is mounted above the controller board backplane on four small brackets with pre-installed retention screws. Remove these retention screws. Align the retention screw holes on the daughter board backplane with those on the brackets. Reinsert the retention screws ensuring that the daughter board backplane is securely attached to the controller canister. See *Figure 2-7*.

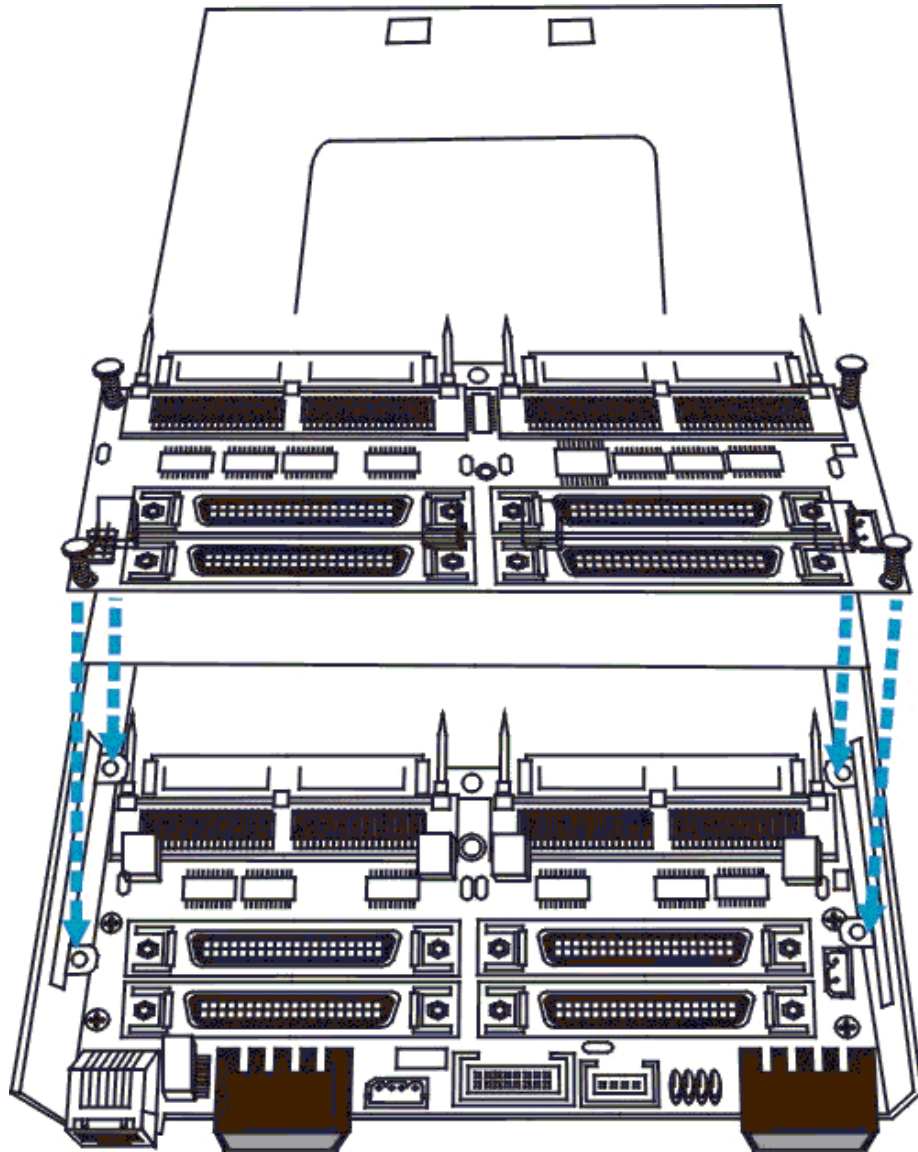


Figure 2-7: Install the daughter board backplane

- Step 3.** *Install the daughter board* – The daughter board is mounted on four pre-installed spacers that are located at the back of the controller board near the docking connector. Place the daughter board onto the docking connector in such a way that the retention screw holes on the daughter board are clearly aligned with the spacers. Insert the four retention screws that came with the daughter board.

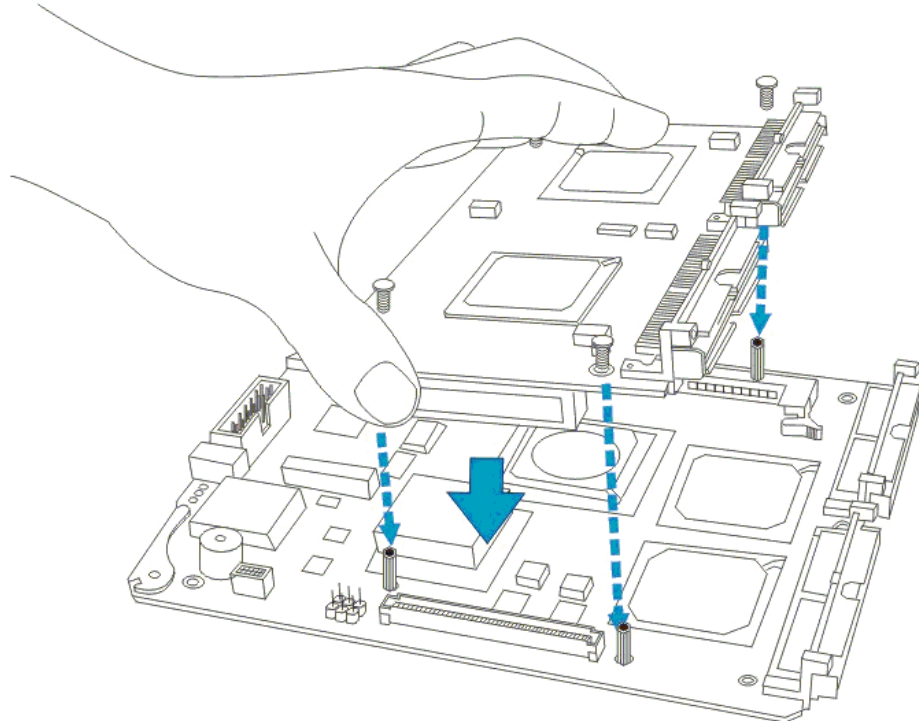


Figure 2-8: Install the Daughter Board

- Step 4.** *Replace the controller board* – Once the daughter board has been installed on the controller board, the controller board must be reinstalled into the canister. For further instructions on how to reinstall the controller board, please refer to *Section 2.6.2*.

Chapter 3

Controller Monitoring

3.1. Chapter Overview

This chapter:

1. Introduces the different monitoring techniques.
2. Gives detailed descriptions and definitions of status indicating LEDs
3. Describes the audible alarm and events that may cause it to trigger.
4. Introduces I²C monitoring.

After reading this chapter a user should:

1. Be well acquainted with the different controller monitoring techniques.
2. Be able to use LEDs to determine the status of different controller components.
3. Know how to react when an audible alarm is heard.

3.2. Controller Monitoring Overview

The controller is equipped with a variety of self-monitoring features that help to keep controller managers informed of the controller operational status. These monitoring features provide vital feedback that help users maintain the operational integrity of the controller. Prompt response to warnings and failure notifications will improve the overall operation and help to ensure the longevity of the controller.

Self-monitoring features include:-

- ◆ **Management Firmware (FW)** – The controller comes with pre-installed FW (version 3.31 or above). The FW can be accessed using either the LCD panel or a PC hyper-terminal. The controller can be connected to a PC hyper-terminal through the RS-232C serial port. Device status information can be obtained from the FW. The FW has been fully described in the *Generic User's Manual* that came with the controller. Please refer to this manual for further details.
- ◆ **RAIDWatch** – RAIDWatch is a fully integrated Java based Graphics User Interface (GUI) (that came with the controller) and can be used to monitor the controller remotely. The powerful *Notification Process Center* (NPC) sub-module can be used to keep user's informed over a variety of communication devices like FAX, pager, e-mail etc. The installation and operation of RAIDWatch has been fully described in the *RAIDWatch User's Manual*. Please refer to this manual for further details.
- ◆ **LEDs** – Device status indicating LEDs are placed on the front panel of the controller. These LEDs are used to inform users of the integrity and status of different controller items. A user should familiarize themselves with these LEDs and be aware of their functions.
- ◆ **Audible Alarm** – An audible alarm is present on the controller board and will be triggered if any of a number of threatening events occur. These events usually jeopardize the functional and operational integrity of the controller board and must be heeded at all times. Events such as a breaching of the temperature threshold will trigger the alarm and if an onsite controller manager is present, the manager should, using either the LCD panel or the PC hyper-terminal, determine the cause of the alarm and take the appropriate corrective measures.
- ◆ **I²C** – The I²C bus

Controller monitoring is a necessary part of controller management. If failure events or other disruptive events are detected and reported, the controller managers must take the appropriate action to rectify the problem. Failure to act in a properly specified manner to a system event (like overheating) can cause severe and permanent damage to the controller.

3.3. Status Indicating LEDs

The front panel LCD panel comes with three status, indicating LEDs. The LEDs on the front panel are marked, from top to bottom “**PWR**”, “**BUSY**” and “**ATTEN**” and are clearly seen in *Figure 3-1* below. The definitions of these LEDs are shown in *Table 3-1*.

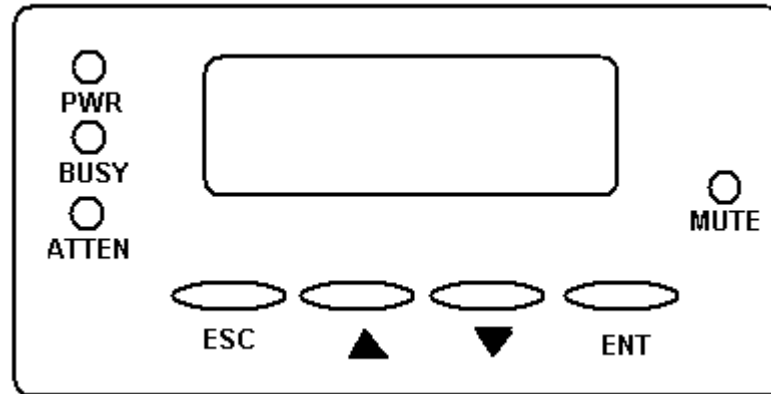


Figure 3-1: LCD Panel LEDs

LED Name	Color	Status
PWR	Blue	ON indicates that the power is being supplied to the controller. OFF indicates that no power is being supplied to the controller.
BUSY	White	ON indicates that there is activity on the host/drive channels. OFF indicates that there is no activity on the host/drive channels.
ATTEN	Red	ON indicates that a component failure/status event has occurred. OFF indicates that the controller and all the controller components are operating correctly.

Table 3-1: LCD Panel definitions

3.4. RAIDWatch Manager

The RAIDWatch Manager enables users to manage and maintain the RAID Controllers using their web browsers. The Ethernet port at the back of each controller module enable users to use a LAN cable to connect to the controller.

NOTE: *The RAIDWatch User's Manual can be found on the CD-ROM that came with the system. To access the RAIDWatch User's Manual please refer to this file.*

3.5. Notification Processing Center (NPC)

The NPC is a powerful module that runs as a background *Disk and Executive Monitor* (DAEMON) independent from RAIDWatch that can, itself, be installed redundantly on different hosts. It is used for event notification over Email, LAN broadcast, and SNMP traps. It helps to prevent blind time and keeps a user constantly informed as to the status of the storage management controller. The NPC functionality can be activated and the instructions are given in the *RAIDWatch User's Manual*.

NOTE: *The RAIDWatch User's Manual can be found on the CD-ROM that came with the system. To access the RAIDWatch User's Manual please refer to this file.*

3.6. Audible Alarm

Different controller environmental and operational parameters (like temperature etc.) have been assigned a range of values between which they can fluctuate. If either the upper or lower thresholds are exceeded, an audible alarm will automatically be triggered. The alarm will also be triggered when an active component of the controller fails. If the controller manager is onsite and is alerted by the alarm, to determine what has triggered the alarm the user will have to read the error message on the LCD screen or on the PC terminal. After determining what has occurred the controller manager must take appropriate actions to rectify the problem.

WARNING:

If an alarm is triggered it is necessary for the user to determine the problem. If the audible alarm is ignored or not taken seriously and the problem is not rectified, permanent damage to the system can result.

3.6.1 Default Threshold Values

Table 3-2 shows the default threshold values for the controller. If any of these values are surpassed the alarm will sound:

<i>Parameter</i>	<i>Upper Threshold</i>	<i>Lower Threshold</i>
+3.3V	+3.6V	+2.9V
+5V	+5.5V	+4.5V
+12V	+13.2V	+10.8V
<i>CPU Temperature</i>	90°C	0°C
<i>Board Temperature</i>	90°C	0°C

Table 3-2: Default Threshold Values

The thresholds in *Table 3-2* are the default threshold values. The user can change these values. To see how to change these values please refer to the *Generic Operation Manual* that came with your system.

3.7. I²C Port (Enclosure Monitoring)

The I²C interface is designed for Infortrend Simple Enclosure Management Service (ISEMS). FW supports monitoring of remote enclosure devices (power, fan rotation speed, temperature, etc.) through SAF-TE, S.E.S, or I²C interface. Via the I²C interface, the controller collects signals from remote sensors and notifies the system administrator if the signals exceed any critical thresholds.

Chapter 4

Controller Connections and Operation

4.1. Chapter Overview

This chapter:

1. Describes how to operate the SentinelRAID controller.
2. Describes how to connect the SentinelRAID controller to external devices.
3. Briefly introduces SentinelRAID controller topologies.
4. Shows how to integrate a SentinelRAID controller into a subsystem.
5. Fully describes the power off and power on procedure.

After reading this chapter a user should:

1. Know how to operate the SentinelRAID controller.
2. Integrate the SentinelRAID controller into a subsystem.
3. Correctly power on and power off the controller.
4. SentinelRAID controller Host Connection and Drive connection

4.2. SentinelRAID Connection

4.2.1 Channel Configuration

All channels can be configured as either host channels or drive channels. Typically, in the SentinelRAID 2700 controller, either one channel is configured as host and three channels configured as drives, or two channels are configured as host and two as drives.

4.2.2 SCSI Cables

Separately purchased SCSI-320 compatible cables, not longer than 12 meters, must be used for host and drive connection. When purchasing SCSI-320 cables ensure that they are of the highest quality and that a reputable manufacturer has produced them. To ensure optimum SentinelRAID controller performance it is necessary to use proper high quality, durable SCSI-320 cables. Failure to do so will result in downgraded performance.

The recommended SCSI cable for an SCSI-320 LVD SCSI operating at a transfer rate of 320 Mbytes/sec is described below.

Electrical	
Impedance	120ΩK10%
Capacitance	15.9 pf / ft @ 1MHz
Propagation Delay	1.59ns / ft nom
DC Resistance	95Ω / 1000 ft @ 20°C
Delay Skew	0.035ns / ft (max.)

Table 4-1: SCSI-320 Cable Electrical Specifications

4.2.3 Host Connection

Channels configured as host can be connected, using an industry standard SCSI-320 cable, to a SCSI-320 host computer.

4.2.4 Drive Connection

Each drive channel can be connected to up to 15 SCSI-320 drives. The maximum amount of drives that can be connected to each controller are shown in the table below:

Model	Host Channels	Drive Channels	Maximum Number of Drives
SR 2700	1	3	45
SR 2700 + IFT- 9284U4	1	7	105

Table 4-2: Maximum Number of Drives

4.2.5 SCSI Termination

It is important that both the host and drive SCSI cables must be properly terminated. If these cables are not properly terminated then signals being transmitted along the SCSI bus may become corrupted. When multiple drives are being connected together (as shown in the topologies below) the SCSI terminators on the individual drives must be disabled.

4.2.6 Unique IDs

SCSI devices connected on the same channel have their own unique ID number. This number enables these individual devices to be recognized by the controller when executing I/O commands from the host computer.

4.3. SentinelRAID 2700 Topologies

4.3.1 Single Host Computer

Single host connection is shown in *Figure 4-1*. The single host computer manages all the logical drives (LDs). In the topology shown in *Figure 4-1* the channels are configured as shown in *Table 4-3*.

Channel	Configured as...
CH0	Host Channel
CH1	Drive Channel
CH2	Drive Channel
CH3	Drive Channel

Table 4-3: SentinelRAID 2700 Single Host Channel Configurations

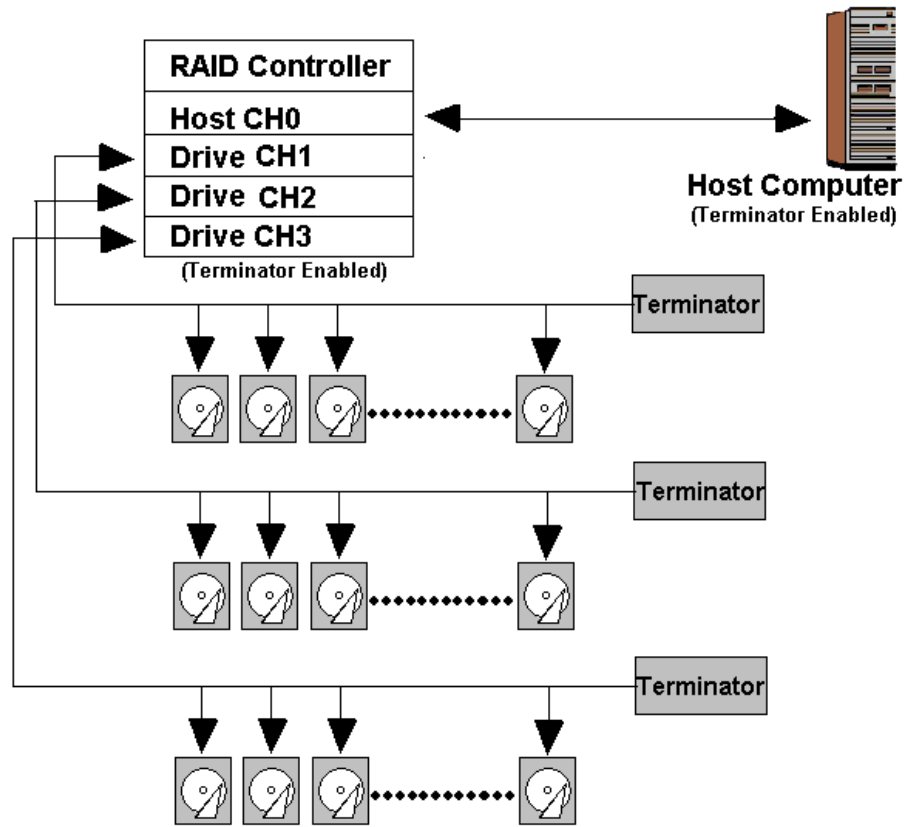


Figure 4-1: Single host Connection

4.3.2 Dual Host Connection

In Figure 4-2 the two channels (CH0 and CH1) are configured as host channels and two channels (CH2 and CH3) are configured as drive channels. The firmware (FW) can be used to create LDs. These LDs must in turn be mapped to the host channel.

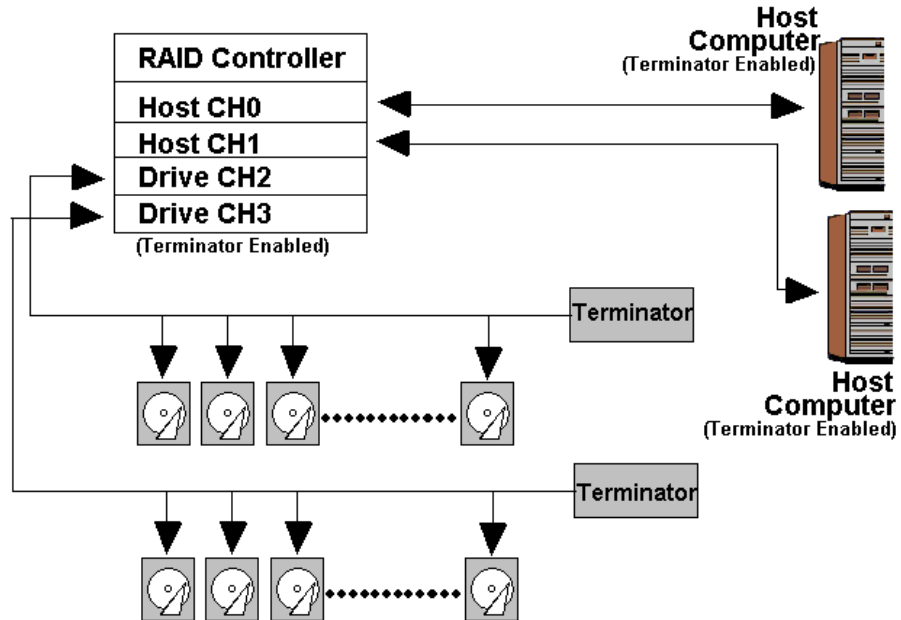


Figure 4-2: Dual host Connection

- ◆ **Creating Redundant Host Paths** – If access to data is a critical requirement, redundant data paths to different LDs or logical volumes (LVs) can be created. This is done by mapping the logical units (LDs or LVs) to both the host channels (i.e. CH0 and CH1 in *Figure 4-1*). This will ensure that if one host computer fails, the second host computer will be able to access the logical unit.

NOTE: To create dual redundant data paths on the host side, it is necessary for third party failover software to be installed on the host computer/s

- ◆ **Physically Isolating one OS system from another** - The multiple-host configuration can also be applied when the array is shared by two or more systems. Using each host channel for a host adapter on different host computers can physically isolate one OS system from another.

This configuration is applied when two systems can not share the same SCSI bus as the access route to storage. Unless some file system "Lock manager" is available, physical drives should be configured into different "logical drives" or "logical volumes," and each logical unit should be mapped to IDs/LUNs on each host channel. In this way, each host computer will be accessing separate logical units.

4.3.3 Expansion

The installation of an optional daughter board can expand the number of available SCSI-320 channels by four. The SentinelRAID 2700 will then, with the addition of the daughter board, have eight (8) SCSI-320 channels available. These expansion channels are connected in the same way as described above. They can all be configured as either host or drive channels.

4.4. Fibre Channel (FC) Considerations

If a FC-2G expansion daughter board (IFT-9282FF2) has been added to the controller, please consider the following.

4.4.1 Cabling

The FC standard allows for optical connections. Optical cables can be used over long distances and have been shown to be more reliable. Due to the extremely high data transfer rates, optical cables are preferred for 2Gbps fibre connectivity. Optical cables are less susceptible to EMI.

Cable Specifications: 62.5/125 μm , multimode 850nm, 200MHz-km, LC to LC cables. IFT-9538 is Infortrend's model name for the optical cables which are 550mm (21.65") in length.

WARNING: *All Cables must be handled with care. They must not be bent; and to prevent interference within a rack system the routing path must be carefully planned.*

4.4.2 FC Lasers

WARNING: *Lasers can cause permanent eye damage, which may result in permanent blindness, and therefore must be treated with respect and used with caution. Never look at lasers without knowing whether they are on or off is **hazardous**.*

◆ *Wavelengths*

The lasers on FC fiber optic cables emit either short wave (SW) beams (770nm – 860nm) or long wave (LW) (1270 nm - 1355 nm) beams.

◆ *Laser Types*

Two type of laser devices can be used in fibre cables: Optical Fibre Control (OFC) and non-OFC lasers. The OFC lasers are high-powered and can be used over long distances.

◆ *Safety features*

OFC lasers, due to their high power output, usually come with a safety mechanism that switches the laser off as soon as it is unplugged. Non-OFC lasers do not (due to their low power) come with these safety features but they can still inflict damage.

4.4.3 SFF Transceivers

The 2Gb FC optical interface is connected from the SFF (small form factor) transceivers on board, via multimode optical cables, and to the LC duplex adapters installed on the back of enclosure. The SFF transceivers convert electric signals to optical signals using laser diodes.

4.4.4 LC Duplex Adapter (IFT-9539: Baycom, LC-Zipcord type)

Adapter brackets included in the kit may be used to secure the adapters to DB-9 holes on enclosure's rear panel. If not, custom-make two openings on the enclosure sheet metal to secure these two adapters.

4.4.5 Fibre Channel Topologies

The FC Standard has been designed to support three separate topologies. They are point-to-point, FC arbitrated loop (FC-AL) and fabric switch topologies.

- ◆ Point-to-Point:

Point-to-point topology is the simplest topology that can be used. It is a direct connection between two fibre channel devices.

- ◆ FC-AL

This is the most common topology currently in use. Fibre channel devices are all connected in a loop. Each device is assigned an arbitrated loop physical address (AL_PA). The FC-AL is able to support 127 devices in a single loop.

- ◆ Fabric

The fabric topology can support up to 2^7 Fibre channel devices. This topology allows many devices to communicate at the same time. To implement this topology a fibre switch is required.

4.5. Controller Integration

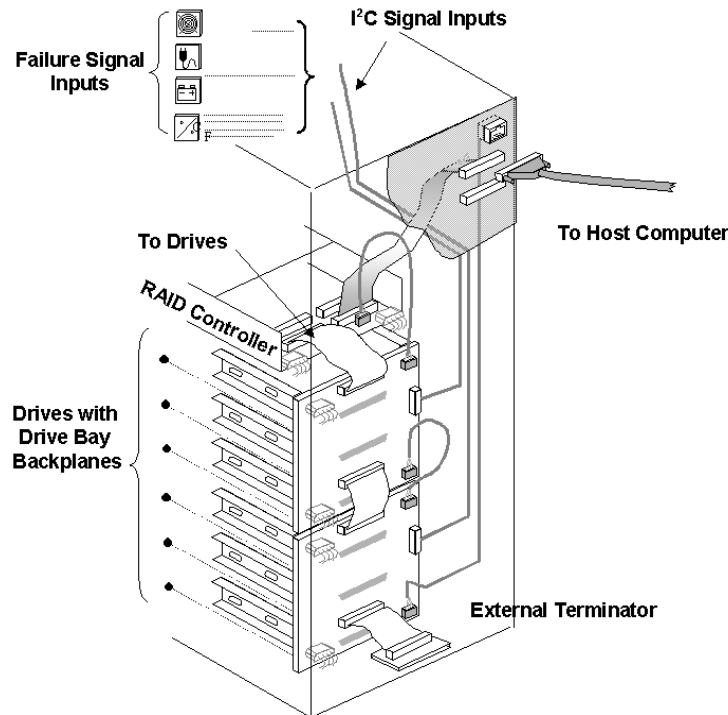


Figure 4-3: Drive channel and Host Channel Connection

Figure 4-3 above is an example of connecting the RAID controller to the drives and the host computer. Since all channels can be configured as host or drive, a variety of host and drive configurations are available. The on-board terminator has been enabled on the controller side of the I/O channels. On the other end of the SCSI cable, an external terminator is applied. Termination on all SCSI drives should be disabled.

Integrators may choose a different interface for the enclosure device management. Connect remote devices (sensors for fan rotation, power supply, temperature, etc., connected through a chip) on a SCSI bus (SAF-TE) or via the I2C interface as displayed in *Figure 4-3*. Controller firmware has embedded utilities to help configuring these devices.

NOTE:

It is recommended to use the embedded terminators on host or drive channels by setting DIP switches, and then install an external terminator on the other end of your SCSI cable. If a drive fails, data traffic will remain unaffected. Also pay attention to the following:

1. Refer to the installation documents that came with your drives for information on jumper setting.
2. Set a unique SCSI ID address on each drive. ID7 should be avoided, which is a default reservation for the controller.

4.6. Other Connections

4.6.1 Power Connection

The power input and connection of the controller is exactly the same as those for hard disk drives. Be sure to connect **both** connectors. The power connection is shown in *Figure 4-4* below.

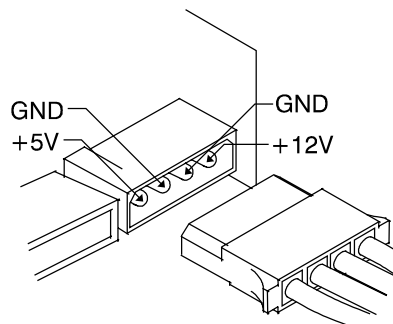


Figure 4-4: PSU Connection

4.6.2 Connecting RS-232C Terminal Emulation

The controller can be configured via a PC running a VT-100 terminal emulation program, or a VT-100 compatible terminal. The provided combo cable (IFT-9512) converts the RS-232 signals from the 20-pin header into the two 9-pin D-Sub male connectors. The pin layout of the 9-pin connectors is similar to that of a PC's serial port and is set as a DTE device. The proper connection of the cable is displayed in the following diagram. The DB-9 connectors of the IFT-9512 cable are marked as "COM 1" and "COM 2." Please use the connector marked as "COM 1" for terminal emulation.

Connect COM 1 to the included Null Modem (IFT-9011) and connect the other end of the Null Modem to the outside of your enclosure or to an external RS-232 cable. COM ports can also be used for connecting to a modem for remote configuration. The COM 2 port can not be used for firmware download.

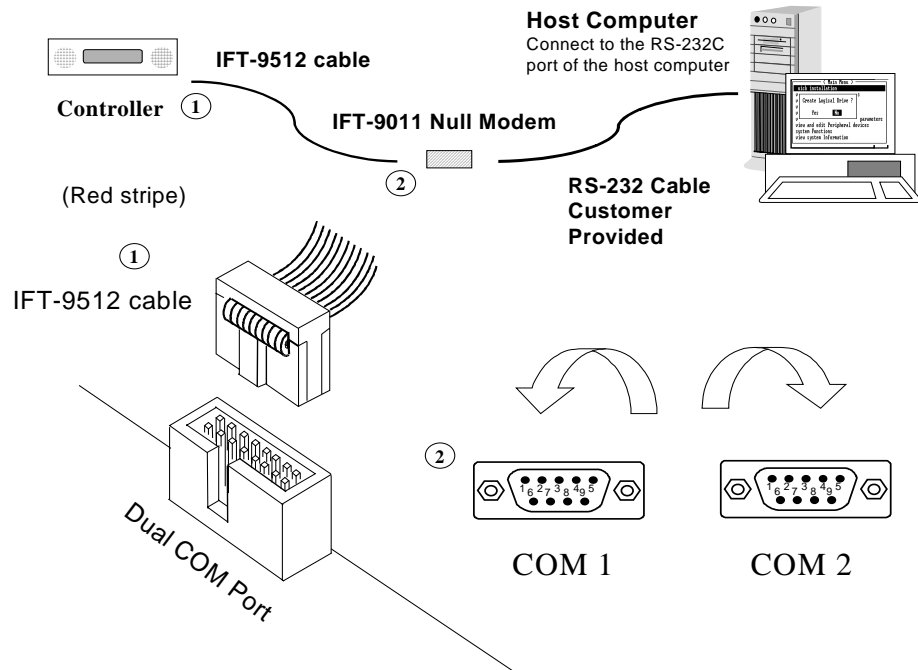


Figure 4-5: RS-232C Connection

4.7. Power On

Once all the components have been installed in the SentinelRAID controller and the host channels have been connected to the host and the drive channels have been connected to the SCSI-320 drives, the controller can be powered on.

4.7.1 Check List

BEFORE powering on the SentinelRAID controller, please check the following:

- Memory Module** – Make sure that a memory module has been correctly installed on the controller board.
- BBU Modules** –If installed, make sure the BBU charger board and the BBU battery pack have been installed correctly.
- Host computers** – Host channels have been connected to the host computers
- Hard Drives** – Hard Drives have been connected to the drive channels.
- Power Module Connection** – The PSU connectors at the back of the controller backplane have been connected to an appropriate PSU.

- **Ambient Temperature** – All the controller components have been acclimated to the surrounding temperature.

4.7.2 Power On Sequence

When powering on the SentinelRAID controller, please follow these steps.

1. Power on hard drives

The SCSI-320 hard drives that have been connected to the SentinelRAID controller should be powered up first. For the hard drive power on procedure, please refer to the documentation that came with the hard drives.

2. Power on the SentinelRAID controller

Once the hard drives have been powered on, the controller must be powered on. To do this turn on the power supplies that have been connected to the PSU connectors at the back of the controller modules.

3. Host Computers

The host computers should be the last devices that are turned on. Please refer to the manual that came with your host computers to see its own power on procedure.

4.7.3 LCD Screen

When Powering On the controller the following messages should appear on the front panel LCD screen. Wait for the front panel LCD to show “**READY**” or “**No Host LUN**” before the host boots up. Refer to *Figure 4-6* on how to read the screens.

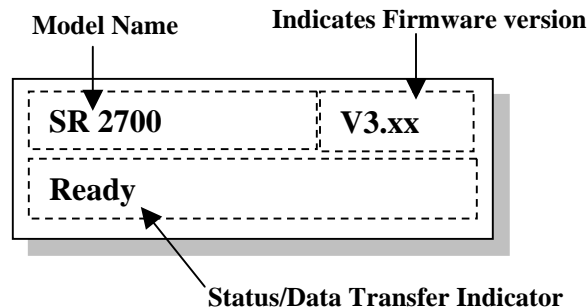
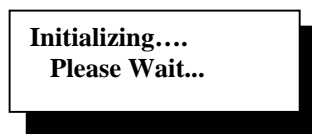
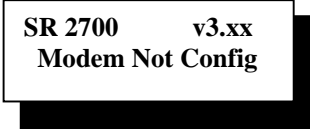


Figure 4-6: The LCD Start-Up Screen

The LCD screen startup sequence is shown and described in the sequence below.



This screen appears when the PSUs are turned on.



SR 2700 v3.xx
Modem Not Config

This screen appears after the initialization process. It clearly shows the model name.



SR 2700 v3.xx
256MB RAM, Wait...



SR 2700 v3.xx
No Host LUN

System is ready. You can now start to configure the controller.

4.8. Power Off Procedure

If you wish to power down the SentinelRAID controller, please follow these steps:

NOTE:

If you wish to power down the SentinelRAID controller, please ensure that no time-consuming processes, like a “logical drive parity” check or a “background scrub,” are running.

1. ***Stop I/O access to the system***

Use the software that is provided on the host computer to stop all I/O accesses to the SentinelRAID controller. Please refer to the user manual that came with your host computer.

2. ***Disconnect the host***

The host must be disconnected from the controller. To do this, disconnect the cables from both the host and the SentinelRAID controller.

3. ***Flush the cache***

Use the “Shutdown Controller” function to flush all cached data. This prepares the controller to be powered down.

4. ***Turn off the power***

Turn off the PSUs that supply power to the SentinelRAID controller. Once the RAID controller has been powered down, other devices that are connected to the controller may be powered down.

Chapter 5

Controller Maintenance

5.1. Chapter Overview

This chapter:

1. Introduces the different SentinelRAID maintenance.
2. Gives detailed descriptions of how to maintain the controller.
3. Describes different maintenance techniques and procedures.

After reading this chapter a user should:

1. Be well equipped to be able to maintain the SentinelRAID controller.
2. Know how to replace different controller components.
3. Know how to correctly maintain the controller.

5.2. Controller Maintenance Overview

5.2.1 About Controller Maintenance

Maintaining the controller in the proper manner will ensure consistent controller performance and reliability. Failure to maintain the controller in the correct way may lead to unreliable or degraded performance. Proper controller maintenance minimizes the chance of system downtime and preserves the working integrity of the system for a longer period of time.

5.2.2 User Serviceable Components

Most of the controller components are user serviceable, i.e. replaceable. A maintenance engineer can replace all the following components if they fail.

- ◆ Controller board
- ◆ Daughter board
- ◆ DIMM module
- ◆ BBU
- ◆ BBU charger board

The LCD panel, controller board backplane and the daughter board backplane very seldom fail it is therefore not necessary to replace them.

5.2.3 Controller Maintenance Considerations

- ◆ Qualified engineers who are familiar with the SentinelRAID controller should be the only ones who carry out maintenance operations on the controller. If a user is not familiar with the SentinelRAID controller and not familiar with RAID appliance maintenance in general, it is strongly advised that they refer SentinelRAID controller maintenance to a suitably qualified maintenance engineer.
- ◆ When maintenance procedures are carried out on the controller, all safety regulations described in *Chapter 2* must be strictly adhered to. Failure to do adhere to these regulations may cause permanent, irreparable damage. It should especially be remembered that the controller board and the daughter board are very sensitive components that can be easily damaged.
- ◆ When replacing any of the controller components, it is necessary to remove the controller board from the controller canister. It is therefore recommended that when maintenance procedures are being carried out, all power to the controller canister is turned off.

- ◆ If essential operation components fail (DIMM module, controller board, daughter board) it is necessary to carry out the maintenance operations as soon as possible.
- ◆ If non-essential operational components fail (BBU modules or BBU charger boards), the power to the controller must be turned off. If no other components have been damaged, the controller can still be used to manage the RAID array. It is therefore necessary to carefully select the time of module replacement as all I/O access to the controller will be shut off for the duration of the maintenance procedure.

5.3. Replacing a Failed Controller Board

5.3.1 About Controller Board Replacement

If a controller board fails it must be replaced. The controller board is the heart of the SentinelRAID controller and should therefore, in the case of failure, be replaced as soon as possible. The controller board will have a DIMM module and may have an optional BBU with an associated BBU charger board and an optional daughter board. If these items are undamaged, they may be reused on the replacement controller board.

5.3.2 Controller Board Replacement Procedure

To replace the controller board, please follow these steps:

Step 1. Remove the controller board from the canister – The complete controller removal procedure has been fully described in Chapter 2. Please refer to *Section 2.6.1* for complete removal instructions.

Step 2. Remove the optional daughter board – If an optional daughter board was installed on the controller module and it is undamaged, it can be reused on the replacement controller board. To remove the daughter board, remove the four retention screws that connect the daughter board to the pre-installed onboard spacers. Once the four retention screws have been removed, gently pull the daughter board in an upward direction disconnecting the board-to-board connectors on the daughter board from those on the controller board. Place the daughter board on a static free surface. See *Section 5.6.2* below.

Step 3. Disconnect the (optional) BBU – If the BBU has been connected to the BBU charger board on the controller board, it must be disconnected. To disconnect the BBU from the BBU charger board, gently pull the four pin connector at the end of the cable out of the four pin connector head on the BBU charger board. See *Section 5.5.2.2* below.

Step 4. Remove the (optional) BBU charger board – If the charger board remains undamaged, it can be reused on the new controller and must therefore be

removed. To remove the BBU charger board, gently pull the charger board in an upward direction disconnecting the board-to-board connectors on the bottom of the BBU charger board from those on the controller board. *Section 5.5.3* below.

Step 5. Remove the DIMM module – If the DIMM module on the failed controller board is undamaged, it can be reused on the replacement board. To remove the DIMM module from the controller module, locate the DIMM slot and push the white clips on either side of the slot in an outward direction. This will automatically eject the DIMM module from the DIMM slot. See *Step 4* in *Section 5.4.2* below.

Step 6. Install the new controller board – Before installing the new controller board the following items must be installed: DIMM module (see *Step 5 Section 5.4.2* below), optional BBU (see *Section 5.5.2.2* below), optional BBU charger board (see *Section 5.5.3* below) and the optional daughter board (see *Section 5.6.2* below). Once these items have all been installed the controller board can be installed. To see how to install the controller board, please refer to *Section 2.6.2*.

5.4. Replacing a Failed DIMM Module

5.4.1 When should a DIMM Module be Replaced?

There are two instances when a DIMM module should be replaced:

◆ **CASE 1: DIMM module Fails**

If a DIMM module fails it must be replaced immediately. Without a DIMM module the controller cannot function and therefore is rendered inoperable. In this instance DIMM module replacement becomes a priority which must be replaced as soon as possible.

◆ **CASE 2: DIMM module with larger capacity required**

If the capacity of the currently installed DIMM module is not sufficient, it should be replaced with a DIMM module that has a larger storage capacity. In this instance it is best to replace the DIMM module during the least busy time as the controller will have to be powered down and removed.

5.4.2 DIMM Module Replacement Procedure

Step 1. Remove the controller board – The DIMM module is located on the controller board. To replace the DIMM module the whole controller board needs to be removed. The complete removal procedure is described in *Chapter 2*. Please refer to *Section 2.6.1*.

Step 2. Remove the optional daughter board – If an optional daughter board has been installed, it should be removed. The DIMM module is located beneath the daughter board and to ensure unobstructed access to the daughter board it should be removed. See *Section 5.6.2* below.

Step 3. Remove the optional BBU charger board – The BBU charger board obstructs the DIMM module when it is extracted. The BBU charger board should therefore be removed. See *Section 5.5.3* below.

Step 4. Remove the old DIMM module – Once the controller board, the optional the optional daughter board and the optional BBU charger board have been removed, the old DIMM module can be removed. To remove the DIMM module from the controller module, locate the DIMM slot and push the white clips on either side of the slot in an outward direction. This will automatically eject the DIMM module from the DIMM slot. See *Figure 0-1*.

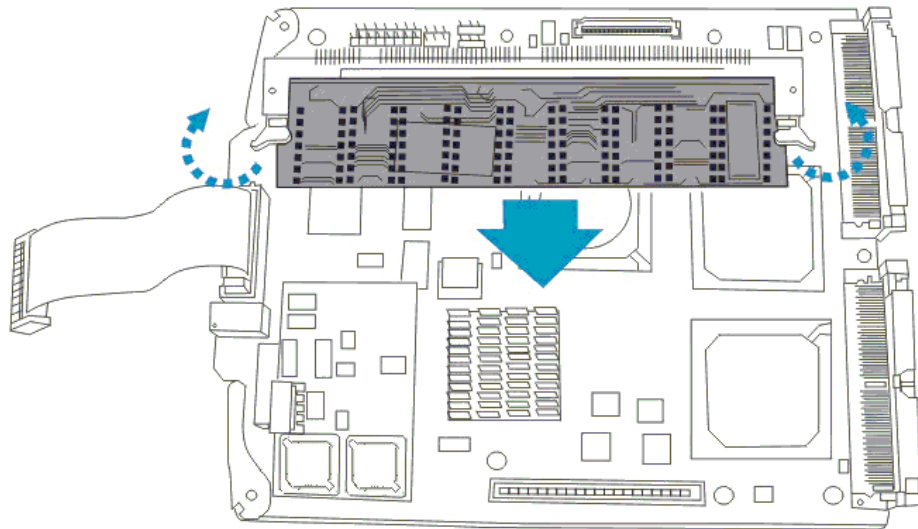


Figure 0-1: Remove DIMM Module

Step 5. Insert the new DIMM module – Once the old DIMM module has been removed the replacement DIMM module can be installed. To install the replacement DIMM module align it with the DIMM slot. Next, gently push the new DIMM module into the DIMM socket. The white clips on either side of the DIMM socket will automatically close and lock the new DIMM module into place. See *Figure 0-2*.

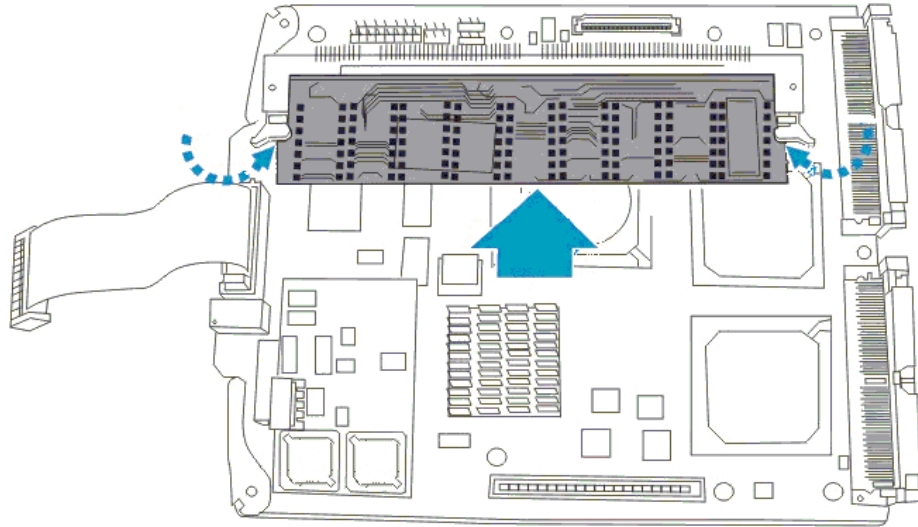


Figure 0-2: Install DIMM Module

Step 6. Reinstall the optional BBU charger board – Once the new DIMM module has been installed, if an optional BBU charger board was removed it can now be reinstalled onto the controller board. *Section 5.5.3* below.

Step 7. Reinstall the optional daughter board – Once the optional BBU charger board has been reinstalled, if an optional daughter board was previously installed on the controller board, it too can be reinstalled. See *Section 5.6.2* below.

Step 8. Reinstall the controller board – Once the DIMM module has been installed and the (optional) BBU charger board and (optional) daughter board have all been reinstalled, reinstall the controller board.

5.5. Replacing a Failed (optional) BBU Module

5.5.1 About BBU Maintenance

Maintaining the BBU requires that two items be maintained:

- ◆ **BBU Battery Pack**

The BBU battery pack contains the cells that provide power to the memory cache during a power outage. The battery pack is connected to the battery charger board or the connector on the controller board backplane through a cable connector. It is recommended by our engineers that the BBU battery pack is replaced every two years.

- ◆ **BBU Charger Board**

The BBU charger board is installed on the controller board. The charger board keeps the battery pack charged so that, during a power outage, the BBU will be able to support the cache memory.

If either of these components fail, they will have to be replaced.

5.5.2 BBU Battery Pack Replacement

5.5.2.1 Case 1: BBU Battery pack Connected to the Controller Board Backplane Connector

If the BBU battery pack is connected to the connector on the controller board backplane, the cable that is connected to the backplane connector must be removed and the connector on the replacement battery pack connected. See *Figure 0-3*.

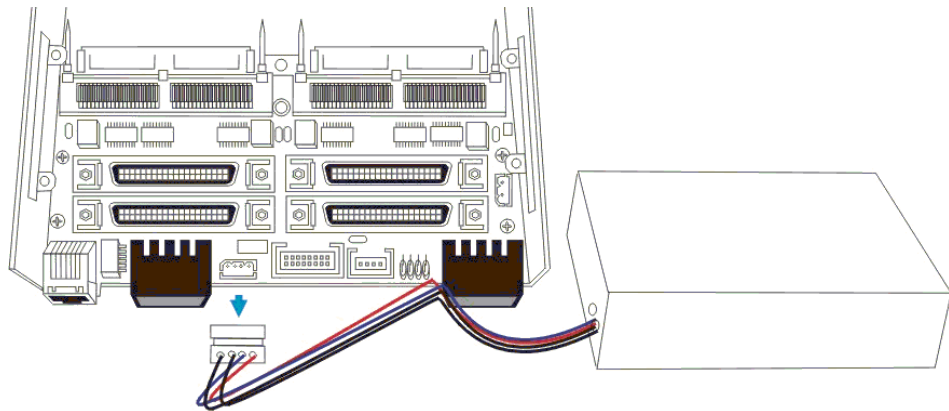


Figure 0-3: Disconnect the BBU Connector from the Backplane.

5.5.2.2 Case 2: BBU Battery Pack Connected to the Charger Board Connector on the Controller Board.

If the BBU battery pack is connected to the connector on the BBU charger board, please follow these instructions:

Step 1. Remove the controller board – The BBU charger board is located on the controller board. To disconnect the BBU battery pack from the charger board the whole controller board needs to be removed. The complete removal procedure is described in *Chapter 2*. Please refer to *Section 2.6.1*.

Step 2. Disconnect the BBU Battery Pack Connector – Once the controller board has been removed, disconnect the failed BBU pack from the charger board connector. See *Figure 0-4*.

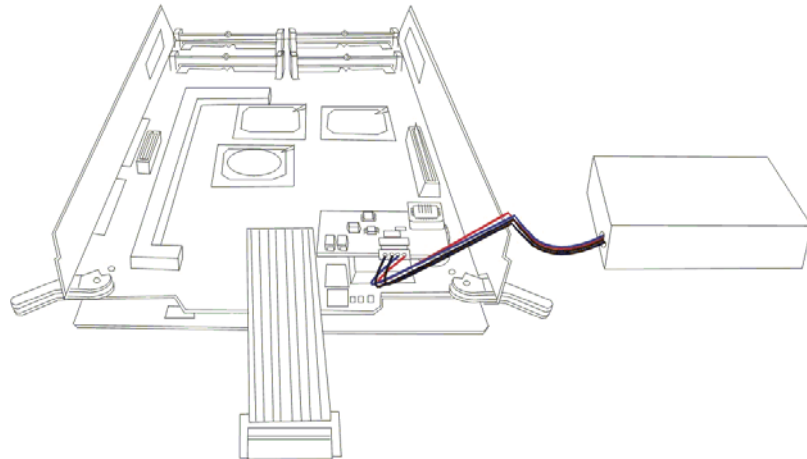


Figure 0-4: Disconnect the BBU Connector from the Charger Board

Step 3. *Connect the new BBU Battery Pack* – Connect the replacement BBU battery pack to the BBU charger board.

Step 4. *Reinstall the controller board* – Once the new BBU battery pack has been connected to the BBU charger board reinstall the controller board.

5.5.3 BBU Charger Board Replacement

To replace the BBU charger board please follow these instructions

Step 1. *Remove the controller board from the canister* – The complete controller removal procedure has been fully described in Chapter 2. Please refer to *Section 2.6.1* for complete removal instructions.

Step 2. *Disconnect the BBU battery pack* – If the BBU battery pack has been connected to the battery charger board, it should be disconnected. See *Section 5.5.2.2* above.

Step 3. *Remove the BBU charger board* – Locate the BBU charger board and gently pull it in an upward direction.

Step 4. *Install the new charger board* – Once the old charger board has been removed from the controller board, the new BBU charger board can be installed on the controller board. Complete installation instructions have been described in *Chapter 2*. Please refer to *Section 2.8*.

Step 5. *Connect the BBU Battery Pack* – Connect the BBU battery pack to the charger board onboard connector. See *Section 5.5.2.2* above.

Step 6. *Reinstall the controller board* – Once the BBU charger board has been installed and connected to the BBU battery pack, reinstall the controller board.

5.6. Daughter Board Maintenance

5.6.1 About Daughter Board Maintenance

The daughter board is an optional item that is used to expand the number of SCSI-320 channels that are available. The daughter board is installed on the controller board that is connected to its own backplane, which is mounted on the controller board backplane. A daughter board can be damaged by, among other things, over heating and static electricity.

5.6.2 Replacing a Daughter Board

To replace a daughter board please follow these steps:

Step 1. *Remove the controller board from the canister* – The complete controller removal procedure has been fully described in Chapter 2. Please refer to *Section 2.6.1* for complete removal instructions.

Step 2. *Remove the retention screws* – The daughter board is secured to the controller board with four retention screws that pass through spacers that are mounted on the controller board. These four retention screws must be removed.

Step 3. *Remove the daughter board* – The daughter board is connected to the controller board through two board-to-board connectors. To disconnect the failed daughter board from the controller board gently lift it in an upward direction.

Step 4. *Install the new daughter board* – Install the replacement daughter board. Correctly align the board-to-board connectors on the daughter board with those on the controller. Place the daughter board onto the controller board and push down gently ensuring that the board-to-board connectors are properly connected. Use the previously removed retention screws to secure the daughter board to the controller board.

Step 5. *Reinstall the controller board* – Once the new daughter board has been properly installed the controller board can be reinstalled.

Appendix A

SentinelRAID Features

A.1. Appendix Overview

This Appendix:

1. Introduces the flexible configuration options of the SentinelRAID controller.
2. Introduces some of the SentinelRAID controller features.
3. Describes some of the fault tolerant features
4. Describes the mechanical features.

After reading this Appendix a user should:

1. Have an overview of the configuration flexibility of the SentinelRAID controllers.
2. Be acquainted with rich variety of features available to the SentinelRAID controllers.

A.2. Overview

The SentinelRAID controller comes with many different features. Some of these features enhance the performance of the controller, other features add configuration flexibility and other features simplify the installation, maintenance and upgrade procedures of the controller. This section highlights some of the features of the SentinelRAID controller.

A.3. Controller Features

A.3.1 SCSI-320 I/O Channels

All the I/O channels on both controllers are SCSI-320 compatible. All these channels can be connected to SCSI-320 host computers and SCSI-320 drives with data transmission rates of up to 320MB/sec.

A.3.2 Flexible Configuration

All the SCSI-320 I/O channels can be configured as host or drive. Eight logical drives can be created from physical drives and eight logical volumes can be created each from one or several logical drives. Users may then divide storage capacity by partitioning each of the logical units into 8 portions. A total of 64 partitions can be created. Various RAID levels can be applied to different logical units with the support of dedicated or global spare drives.

A.3.3 Expansion

- ◆ **Channel Expansion** - The SentinelRAID 2700 controller supports up to 8 SCSI-320 channels by adding an expansion module (daughter board).
- ◆ **Capacity Expansion** - Logical drive capacity can be expanded either by adding a new drive or copying and then replacing the original members with drives of larger capacity.

A.3.4 User-friendly Configuration Utilities

There are multiple choices with the interfaces or management programs for configuring the RAID system. Administrators may choose one or more from the LCD front panel, firmware-embedded configuration utility, and the Java-based GUI RAIDWatch manager, for local or remote management.

A.3.5 Controller Architecture

The controller is developed from Infortrend's PowerPC-500133 ASIC architecture, a third generation 64-bit controller design that efficiently eliminates internal bottlenecks. The controller's high performance derives from a state-of-the-art PowerPC[®] 750CXe RISC microprocessor, which provides a 64-bit 133MHz path to SDRAM. The 500133 ASIC integrates SDRAM control, CPU peripheral, dual 64-bit PCI buses, and hardware XOR functions. The ASIC provides 133MHz operating frequency for CPU and DRAM interfaces, and 66MHz for PCI interfaces. Two 64-bit 66MHz PCI buses can operate independently to maximize the performance.

A.4. Fault Tolerance

A.4.1 Global and Dedicated Spares

Both Global and Dedicated (Local) spares are supported. The controller(s) will automatically disconnect from a failed drive and start to rebuild data on the spare drive. The spare drive will then replace the failed drive.

A.4.2 Hot-Swapping of Drives

A failed drive can be exchanged without turning off the system or interrupting the operation of the system. Once the failed drive is replaced the data will be rebuilt in the background. Hot-swapping is supported through the automatic disconnection from a failed drive and the detection of a reserve drive. All these failure recovery procedures are completely transparent to the host.

A.4.3 S.M.A.R.T. Support

S.M.A.R.T (Self Monitoring Analysis and Reporting Technology) is supported with configurable reaction schemes. Users may select different reaction schemes for immediate prevention against S.M.A.R.T. detected errors. Available options include: detect only, clone and replace, and perpetual clone. A drive showing symptoms of defects (for example, reports of media errors or low rotation speed) can be cloned to an active spare upon the discovery of errors.

A.4.4 Other Fault Tolerant Features

Other comprehensive failure management features on the SentinelRAID controllers include:

- Automatic Bad Block Assignment
- Background rebuilding

- Verify-after-Write is supported on normal writes, rebuild writes and/or RAID initialization writes.
- Regeneration of parity of logical drives in the background.

A.5. Functional Features

A.5.1 RAID Levels Supported

The following RAID Levels are supported: RAID 0, 1(0+1), 3, 5, 10, 30, 50, NRAID and JBOD.

A.5.2 Controller Chassis

The 5.25" profile of the controller chassis enables it to be easily integrated into an external subsystem enclosure or directly into an application server drive bay.

Appendix B

Hardware Specifications

B.1. Appendix Overview

This Appendix provides:

1. Controller Configuration
2. Controller Architecture
3. RAID Management Specifications
4. Fault Tolerance Management
5. Software
6. Technical Specifications

After reading this Appendix a user should:

1. Be acquainted with the controller specifications.

B.2. Configuration

Specifications	Features
RAID levels	0, 1(0+1), 3, 5, 10, 30, 50, JBOD, and non-RAID disk spanning
Host O/S compatibility	Host O/S independent
SCSI channels	2 or 4 on base module 6 or 8 (with the expansion daughter board)
Host interface	SCSI-320
Host channels	all channels can be configured as host or drive channels
Drive interface	SCSI-320
Drive channels	Up to 3 or 7 with the expansion daughter board
Maximum number of SCSI drives	Up to 105 (on 7 drive channels)
Cache memory size	At least 64MB, up to 1GB architecturally supported, PC-133 SDRAM DIMM socket x1 with ECC support
Cache mode	Write-through or write-back
Logical drives	Up to 8
Partitions	Up to 8 per logical drive or logical volume, total of 64
Number of LUN's	Up to 32 per SCSI ID; 128 per controller
Multiple SCSI ID's per host channel	Yes
Firmware on Flash memory	Yes
Drive hot swapping	Yes

Table B-1: Controller Configuration

B.3. Controller Architecture

Specifications	Features
CPU	PowerPC® 750CXe 600MHz microprocessor
SCSI controllers	LSI 53C1030T SCSI controller
DIMM slot	One 168-pin DIMM module
PC-133 support	Yes
ASIC	Infotrend 64-bit chipset
Flash ROM	16Mbit (2 MB)
NVRAM	32KB
Hardware XOR	Yes
Channel termination	On-board LVD active termination, configurable via backplane DIP switch
I/O channel bandwidth	SCSI-320: up to 320Mbytes/sec
Real-time clock	For event messages with time record

Table B-2: Controller Architecture

B.4. RAID Management

Specifications	Features
Performance monitoring	Yes
Remote control and monitoring	Yes
Event broadcast/alert	Yes (via Java-based RAIDWatch manager and its sub-module, Configuration Client)
Event notification	Yes (via RAIDWatch's sub-module, Configuration Client and NPC)
Hardware connection	In-band over SCSI or Fibre, out-of-band via Ethernet or RS-232C
Configuration on Disk	Configuration data stored on disks for logical drive assemblies to exist after controller replacement
Failure indicator	Via alarm, LCD panel, RAIDWatch manager, or terminal emulation

Table B-3: RAID Management

B.5. Fault Tolerance

Specifications	Features
Drive S.M.A.R.T. support	Yes (with user-configurable detect only, clone and replace, and perpetual clone functions)
Battery back-up option	Yes
SAF-TE support	Yes
S.E.S. support	Yes
ISEMS (Infotrend Simple Enclosure Management Service) via I ² C interface	Yes
Automatic drive failure detection	Yes
Automatic rebuild on spare drives	Yes
Regenerate logical drive parity	Yes
Bad block reassignment	Yes
Automatic rebuild upon failed drive replacement	Yes
Manual clone of suspected failed drive	Yes
Concurrent rebuild on multiple drives in a RAID (0+1) logical drive	Yes
Salvage the 2nd temporarily failed drive in a RAID 1, 3 or 5 logical drive	Yes
Salvage the 1st temporarily failed drive in a RAID 0 logical drive	Yes
Variable stripe sizes	Optimization for sequential: 128KB Optimization for random: 32KB

Table B-4: Fault Tolerance

B.6. Software

Specifications	Features
In-band Text RAID Manager	Yes (all major platforms)
RAIDWatch Manager	Yes (for any platform that supports Java 2.0 or for Java Applet running via web browser)
LAN/WAN support via SNMP	Yes

Table B-5: Available Software

B.7. Technical Specifications

B.7.1 Physical Dimensions

Specifications	Sizes
Controller size (in frame)	10.39 x 5.74 x 1.60 (L x W x H) inches
main board size (without backplane)	6.88 x 5.62 inches
Main board height with daughterboard	1.30"

Table B-6: Controller Physical Dimensions

B.7.2 Operating voltage

SentinelRAID 2700

Main board	5V	12V
Normal	4.0A	0.2
Peak	5.5A	0.4
Idle	3.5A	–
Power-Up	4.0A	–

Table B-7: Main Board Operating Voltage

Main board (when charging Battery)	12V
Normal	0.4A
Peak	1.0A

Table B-8: Main Board Operating Voltage When Charging Battery

Main board and daughter board	5V	12V
Normal	5.0A	0.2A
Peak	6.4A	0.4

Table B-9: Main Board with Daughter Board Operating Voltage

B.7.3 Environmental Specifications

Specifications	Features
Operating temperature	4 to 44°C
Operating ambient temperature within enclosure	<50°C
Relative humidity	10 to 95%, non-condensing
Operating altitude	Sea level to 10,000 ft
MTBF	Greater than 500,000 hours

Table B-10: Environmental Specifications

B.7.4 Controller Specifications

Specifications	Features
Cache memory	At least 64MB, up to 1GB, PC-133 SDRAM DIMM socket x1
Firmware	Resides in 2MB Flash memory
NVRAM	32KB
Devices per channel	SCSI: up to 15 SCSI devices
Supported device types	Synchronous or asynchronous
RAID levels supported	0, 1(0+1), 3, 5, 10, 30, 50, JBOD and non-RAID disk spanning
SCSI connectors	68-pin high-density connectors (x 4) on base module
SCSI cables	Up to 15 meters with low-voltage differential; may vary with cabling conditions
Serial port	20-pin box header for COM1 & COM2
Ethernet port	10/100M
LCD panel	Yes
LED and push-button interface	Yes
Board connectors	160-pin male docking connectors (x 2) on main board (I-PEX model number T80043-160T): connects main board to main board backplane, integrating SCSI/Fibre channels, RS-232C COM-1 and COM-2, battery connector signals, on-board alarm, external LCD panel, SAF-TE status inputs, Ethernet port, I ² C port and drive failure indication interface

Table B-11: Controller Specifications

Appendix C

Hardware Troubleshooting

C.1. Appendix Overview

This Appendix provides:

1. A list of possible problems that may occur during the installation and operation of the SentinelRAID 2700 controllers.
2. An overview on how to troubleshoot any difficulties that may arise during the operation and installation of the SentinelRAID 2700 controllers.

After reading this Appendix a user should:

1. Be able to determine what may be interrupting the operation of a controller.
2. Be able to correct a non-fatal disruption to the controller.

C.2. Problems

◆ **LCD is off**

1. Check power connection of controller board and LCD panel.
2. Requires minimum of 128MB SDRAM DIMM installed.

◆ **7-segment LED flashes "F"**

3. DIMM module not installed yet.
4. Socket plug (loop-back circuits board) for battery charger connector (JP8) not installed.

7-segment LED flashes "F"	<ol style="list-style-type: none"> 1. DIMM module not installed yet. 2. Socket plug (loop-back circuits board) for battery charger connector (JP8) not installed.
SCSI channel failure detected upon start-up (SCSI cables connected) Message on LCD: <div style="border: 1px solid black; padding: 2px; width: fit-content;"> SCSI CHLs fail CHL=x, x, x </div>	<ol style="list-style-type: none"> 1. Check cable connection 2. Check ID numbers (must be unique for each device on the same SCSI channel). 3. Make sure that SCSI channels are properly terminated. 4. Check the voltage output of the power supply. 5. Connect both power connectors
Initialization failure	<ol style="list-style-type: none"> 1. Check ID numbers (must be unique for each device on the same SCSI channel). 2. Make sure terminators are properly installed.
Cannot detect SCSI drive	<ol style="list-style-type: none"> 1. Check drive power connection. 2. Check drive SCSI cable connection. 3. Check ID numbers (must be unique for each device on the same SCSI channel).
Host can not detect the controller	<ol style="list-style-type: none"> 1. Check host-side SCSI cable connection. 2. Check SCSI port to LUN assignment. 3. Check logical drive's mapping to LUN. 4. If there are no configured logical units, the controller must be set as a peripheral device.
Parity error detected	SDRAM DIMM should be replaced.
Logical drive failure detected during boot-up	Check proper installation or connection of drives (use the "View and Edit SCSI drives" function to help locating the problem).

System is not stable after running for a period of time.	<ol style="list-style-type: none"> 1. SCSI cable length must be within the range of specifications. 2. Make sure terminators are properly installed. 3. Power supply voltage must be within specifications. 4. Check the enclosure's inner temperature.
When using "Scan New SCSI Drive" and the desired ID is empty, an empty drive entry appears	Remove the empty drive entry
The RS-232C Terminal Interface does not work.	<ol style="list-style-type: none"> 1. Check RS-232C cable connection. 2. Check if the baud rate settings on both ends identical. 3. Enable Terminal Emulation. 4. Set "Data Routing Direct to Port" in the "Communication Parameters."
When choosing "Configure Modem Port", the screen is full of "Comm Buffer Overflow".	"Terminal Emulation" should be enabled after all modem configurations are completed.
The logical drive states "INVALID".	<ol style="list-style-type: none"> 1. "Optimization for ... I/O," the logical drive caching parameter is different from the current setting. 2. Change "Optimization for ...I/O" to the opposite setting and reset the controller.
In "View and Edit SCSI Drives" or "View and Edit SCSI Channels", the speed is only "80Mhz" (SCSI-320 machines), not "320Mhz"	"80Mhz" is SCSI sync frequency, not transfer rate.
All settings are too complex to remember.	<ol style="list-style-type: none"> 1. After system installation is complete, write down all the settings and related information using Chapter 11 of your "Generic Operation Manual" for future reference. You may also save your configuration data as a retrievable file (using TextRAID manager) or save it to disks. 2. Save NVRAM to a file or to drives

<pre>Error: Check DRAM Installed?</pre>	Check to see if a DIMM module is installed or properly installed. Reinstall a DIMM module will usually solve the problem.
<pre>SR2700 v3.** No Host LUN</pre>	This is a normal message if no logical drive has been created or no logical drive has been mapped to a host channel ID/LUN.
<pre>SR2700 v3.** Ready</pre>	This is a normal message when a logical drive has been created and mapped to a host channel ID/LUN.
<pre>[Other error messages]</pre>	Please contact your system vendor for assistance with any other error messages. You may also refer to Appendix D of your "Generic Operation Manual" to learn more about error messages.

Appendix D

Spare Parts and Accessories

1. Appendix Overview

This Appendix lists:

1. Spare parts
2. Accessories

After reading this Appendix a user should:

1. Be familiar with the spare parts that are available.
2. Be familiar with the accessory items that are available.

2. Spare Parts

The following table lists the available spare parts for the SentinelRAID 2700 external controllers.

Spare Part	Part Number	Description
Main controller board backplane	IFT-9288FMB4	SentinelRAID 2700 main controller board backplane
Daughter board	IFT-9284U4	Expansion board with four additional SCSI-320 channels
Daughter board backplane	IFT-9288FB4	IFT-9284U4 backplane
Daughter board	IFT-9282FF2	Expansion board with two FC-2G channels
Daughter board backplane	IFT-9288FB2F2	IFT-9282FF2 backplane

Table D-1: SentinelRAID 2700 Spare Parts

3. Accessories

The following table lists the available accessories for the SentinelRAID 2700 external controllers.

Accessory	Part Number	Description
Battery charger	IFT-9070D	Mounted on the controller board and is used to charge the batteries
Battery cell pack	IFT-9010D	The battery cell pack.
Battery expansion cable	IFT-9515D	Allows extension of the connection line between the controller and a battery cell pack.
Null modem	IFT-9011	Pins swapped. Facilitates serial connection between the controller and a PC running a terminal program.
Bezel key	IFT-9531	Used for the removal of the front bezel.
COM 1 + COM2 combo cable	IFT-9512	Serial port cable.
FC-2G optical cable	IFT-9538	Used for optical fiber connection.
LC duplex adapter	IFT-9539	An adapter mounted on the enclosure to simplify FC connectivity.
Ethernet cable	IFT-9537	Connects the controller to the local network for local/remote management over TCP/IP.

Table D-2: SentinelRAID 2700 Accessories

Appendix E

Connectors and Jumpers Identification

E.1.1 Appendix Overview

This Appendix lists:

1. Description of the controller main board interfaces
2. Controller Jumper and Connector pinouts
3. Description of Controller Backplane Interfaces
4. Controller backplane jumper and connector pinouts

After reading this Appendix a user should:

1. Be able to determine the different interfaces on the main controller board and the controller board backplane.
2. Be able to determine the pinouts on the external interfaces of the controller and the pinouts of the board-to-board connectors.

E.1.2 Controller Main Board Interfaces

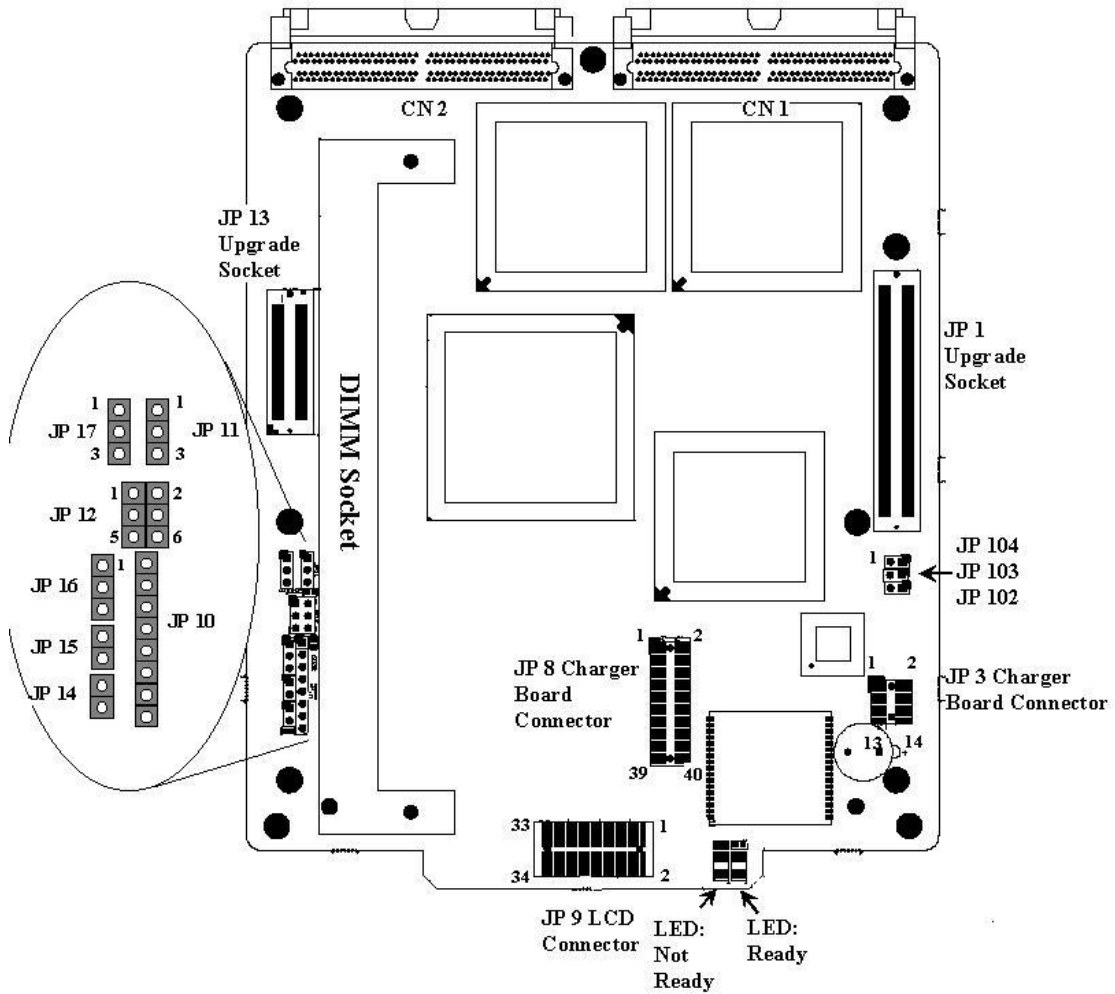


Figure E-1: Locations of Jumpers and Connectors

E.2. Controller Main Board Interface Description

Connector	Description
JP 1	Daughterboard upgrade socket
JP 2	reserved
JP 3	Charger board (IFT-9070D) connector
JP 8	Charger board (IFT-9070D) connector
JP 9	LCD connector
JP 10	GAL - for program download
JP 11	LCD type selection (4-line: 1-2 shorted; 2-line: 2-3 shorted)
JP 12	LED connector
JP 13	Daughterboard upgrade socket
JP 14	Reset
JP 15	NMI - non mask interrupt (Enable: shorted)
JP 16	Loop back test (enable: 2-3 shorted, normal: 1-2 shorted)
JP 17	Front panel fan status detect (disable: 1-2 shorted)
JP 102	LED connector: Ready
JP 103	LED connector: Not Ready
JP 104	Restore Default – short to engage
CN1	Main board to backplane connector
CN2	Main board to backplane connector

Table 0-1: Jumpers and Connectors

- ◆ **NOTE:** JP 104 can be connected to an on/off switch or manually shorted when necessary to restore firmware default. Power off the controller and shunt the pins by a jumper cap. Power on the controller to restore defaults. When the defaults have been restored, power off and remove the jumper cap.

E.3. Controller Jumper and Connector Pinouts

E.3.1 JP12 LED Connector Pinouts

Pin	Pin name	Pin	Pin name
1	Power	4	GND
2	GND	5	Atten
3	Busy	6	GND

Table 0-2: JP12 Pinouts

E.3.2 JP1 LCD Pin Header (17 x 2) for 2-line LCD Module

Pin	Pin Name	Pin	Pin Name
1	VCC	2	GND
3	LCDLVO	4	LCDSA2
5	LCDRW-	6	BXDSC2
7	LCD0	8	LCD1
9	LCD2	10	LCD3
11	LCD4	12	LCD5
13	LCD6	14	LCD7
15	GND	16	N/C
17	N/C	18	UPPUSH
19	ESCPUSH	20	DOWNPUSH
21	ENTPUSH	22	BUSYLED
23	V12V	24	ATTENLED
25	POWERLED	26	N/C
27	FAN2	28	V12V
29	N/C	30	Fan1
31	GND	32	VCC
33	N/C	34	N/C

Table 0-3: JP1 Pinouts

E.3.3 Connector Pin Name and Pinout Descriptions

Symbol	Type	Description
LCD(0-7)	I/O	Common pins in "LCD" mode: 8 LCD data lines
LCDLVO	O	LCD contrast voltage
LCDRW-	O	LCD read/write
GND	G	Signal ground
POWERLED	O	Front panel LED:"POWER"
BUSYLED	O	Front panel LED:"BUSY"
ATTENLED	O	Front panel LED:"ATTEN"
ESCPUSH	I	Front panel <Escape> button
ENTPUSH	I	Front panel <Enter> button
UPPUSH	I	Front panel up-arrow button
DOWNPUSH	I	Front panel down-arrow button
VCC	P	+5V voltage input
Fan 1 & 2	I	Detect Fan RPM
LCDDI-	O	LCD read/write
LCDEN	O	LCD Enable
12V to 5V	P	+5V voltage input
V12V	P	+12V voltage input
N/C		No connection

Table 0-4: Connector Pin Name and Pinout Descriptions

E.3.4 Charger Board JP8 Pinouts

Pin	Pin name	Pin	Pin name
1	BCS1-	21	Key blocked
2	+12V	22	+5V
3	GND	23	GND
4	+12V	24	+5V
5	GND	25	CPURST
6	+3.3V	26	VBAT_N
7	BRAS-	27	RAM3V
8	+3.3V	28	VBAT_N
9	BCAS-	29	RAM3V
10	+3.3V	30	Key blocked
11	BCKE0	31	RAM3V
12	+3.3V	32	GND
13	BWE-	33	RAM3V
14	+3.3V	34	GND
15	BCS0-	35	RAM3V
16	GND	36	TURN_ON_384
17	VBAT_P	37	VBAT_THM
18	+5V	38	DB_EN
19	VBAT_P	39	BATCLK
20	+5V	40	Key blocked

Table 0-5: BBU Charger Board JP8 Pinouts

E.3.5 Charger Board JP3 Pinouts

Pin	Pin name	Pin	Pin name
1	GND	8	N/C
2	SOFT_ON	9	BAT_FAIL
3	TRI2CDATA	10	VBDETECT
4	SHDN_BAT	11	IS_SHDN
5	VBAT	12	746 SHDN
6	T_ON_BAT	13	VBAT_SEN
7	TRI2CCLK	14	GND

Table 0-6: BBU Charger Board JP3 Pinouts

E.4. Controller Backplane

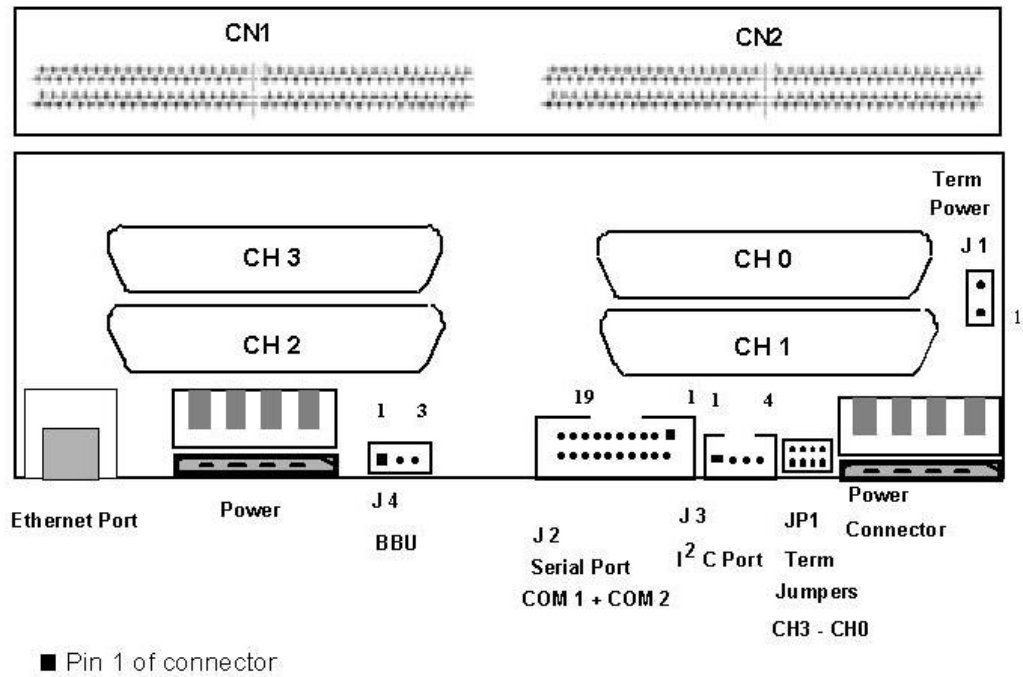


Figure 0-2: Controller Backplane Connectors and Interfaces

E.5. Controller Jumper and Connector Pinouts

E.5.1 Serial Port: COM 1 and COM 2 (J 2)

Pin	Pin name	Pin	Pin name
1	DCD1	11	DCD2
2	RSR1	12	DSR2
3	RXD1	13	RXD2
4	RTS1	14	RTS2
5	TXD1	15	TXD2
6	CTS1	16	CTS2
7	DTR1	17	DTR2
8	RI1	18	RI_RST
9	GND	19	GND
10	N/C	20	N/C

Table 0-7: Serial Port Pinouts

Symbol	Type	Description
CTS1	I	Clear to send (COM1)
DCD1	I	Data carrier detect (COM1)
DSR1	I	Data set ready (COM1)
DTR1	O	Data terminal ready (COM1)
GND	G	Signal ground
N/C	/	No connection
RI1	I	Ring indicator for COM1
RTS1	O	Request to send (COM1)
RXD1	I	Receive data (COM1)
TXD1	O	Transmit data (COM1)
GND	G	Signal ground
CTS2	I	Clear to send (COM2)
DCD2	I	Data carrier detect (COM2)
DSR2	I	Data set ready (COM2)
DTR2	O	Data terminal ready (COM2)
RTS2	O	Request to send (COM2)
RXD2	I	Receive data (COM2)
TXD2	O	Transmit data (COM2)
RI_RST	/	Redundant Controller Reset (reserved)

Table 0-8: Serial Port Pinout Description

E.5.2 I²C Port (JP-3)

Pin	Pin name
1	I ² CCLK
2	GND
3	VCC
4	I ² CDATA

Table 0-9: I²C Port Pinouts

Symbol	Type	Description
GND	G	Signal ground
I2CCLK	O	I ² C clock
I2CDATA	O	I ² C data
VCC	P	+5V voltage input

Table 0-10: I²C Connector Pin Name Description

E.5.3 Ethernet Port

Pin	Pin name	Pin	Pin name
1	TXM+	5	N2
2	TXM-	6	RXM-
3	RXM+	7	N1
4	N2	8	N1

Table 0-11: RJ-45 Ethernet Port Pinouts

E.5.4 J1 SCSI Terminator Power

This 2-pin header provides an auxiliary 5V power to the terminator circuits on daughterboard backplane. In the situation when a controller fails or is removed, power to the daughterboard backplane will be discontinued causing SCSI buses (channel 4 to channel 7) to fail. This is especially important in redundant controller configuration when every I/O channels are connected to both controllers. Power can be maintained through the failed controller's backplane even when the failed controller is removed. To prevent bus failure, connect J 1 on controller backplane to J 1 on daughterboard backplane using the IFT-9515 linking cable.

Pin	Pin name
1	VCC
2	GND

Table 0-12: RJ-45 Ethernet Port Pinouts

E.5.5 Battery Connector (JP-4)

Battery Connector Pinouts (JP-4)

Pin	Pin name	Type	Description
1	VBAT_P	I	Battery +
2	VBAT_THM	I	Battery thermal
3	VBAT_SEN	I	Battery -
4	GND		Presence detect

Table 0-13: Battery Connector Pinouts

E.6. Accessories

E.6.1 IFT- 9011 Null Modem

Swap pin-2 and pin-3
Swap pin-4 and pin-6
Swap pin-7 and pin-8

E.6.2 IFT-9012 RS-232C Extension Cable

Extend the cable length only, no wire swap.

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