

# **SentinelRAID 2500F**

**SCSI-to-SCSI RAID Controller**



## **Hardware Manual**

Revision: 1.1

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This device is in conformity with the EMC directive.

## **FCC Class B Radio Frequency Interference Statement**

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules (47 CFR, Part 2, Part 15 and CISPR PUB. 22 Class B). These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with this user's guide, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help

This device complies with Part 15 of FCC Rules. Operation is subjected 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:**

A shielded-type power cord is required in order to meet FCC emission limits and also to prevent interference to the

nearby radio and television reception.

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.

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## About This Manual

This manual provides necessary information a system integrator with the knowledge and experience in SCSI, Fibre, and RAID technologies needs to install and/or upgrade the SentinelRAID 2500F controller. This manual is only applicable to this model, which uses 133MHz ASIC and PowerPC750Cxe CPU. For information on firmware configuration, please refer to the *Generic Operation Manual*. For information on the controller's management software, please refer to the *RAIDWatch User's Manual*.

### Products Covered:

Models	Channels
SentinelRAID 2500F	4 Ultra160 as base channels; another 4 Ultra160 by the expansion daughterboard

The manual will be continuously updated to be compatible with the newest product release. This manual (v. 1.1) is fit for the operation with SentinelRAID series of the following hardware and firmware versions:

SentinelRAID 2500F	PCB version: 1.0 or above
	PCB version: 2.6 or above
	PCBA version: 5A or above
Firmware Version:	Revision 3.23 or above

Part no. for this manual: M3250UUh11

Throughout the discussions in this manual, "the controller" will be used to indicate all the variants of the controller series. Unless specified otherwise, different combinations of daughterboard and backplane will not influence the operation and adjustment of controller firmware and hardware components.

## Revision History

5/1/02     version 1.1 initial release

## Standard Package Content

- The RAID controller
- Generic Operation Manual
- This hardware manual
- IFT-9512 serial port combo cable
- IFT-9531 bezel key
- IFT-9011 null modem
- IFT-9537 LAN cable

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### NOTE:

- *The controller series allows flexible combinations of I/O channels by adding a daughterboard. However, the expansion and battery modules are optional and are shipped in separate packages. The installation of these modules should be completed by system integrators.*
  - *The IFT-9515 (term power) cable is included with the daughterboard backplane.*
  - *The IFT-9535 serial cable is necessary for joining two independent controllers in a redundant configuration and should be ordered separately.*
- 
-

# Chapter 1 Overview

## Introduction

Thank you for purchasing the controller. The SentinelRAID series covers the whole range of demands for RAID storage in high availability, high performance, and fault tolerance. The controller is a SCSI-to-SCSI RAID controller designed to provide RAID 0, 1 (0+1), 3, 5, 10, 30, 50, or JBOD RAID storage to any host system equipped with an Ultra160 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.

## Important Features:

### Fault Tolerance:

**Rebuild** - The controller has comprehensive drive failure management that allows automatic reassignment of reserved blocks when a bad sector is encountered during a write. Automatic drive failure management is enhanced by the dedicated or global spare drive(s). The controller automatically disconnects with a failed drive and rebuilds data onto a spare, which in turn replaces the defective drive after the rebuilding process.

A failed drive can also be replaced manually, followed by background rebuilding of data. Hot swapping is supported through automatic disconnection from a failed drive and detection

of a reserved drive. All these failure recovery procedures are transparent to the host system.

**Redundant Controller Operation-** Two controllers can operate in the dual-active mode. The dual-active configuration can sustain single controller failure without interrupting I/O access. Should one controller fail, I/O requests from host can be shifted to the surviving controller almost instantly.

Cached writes are constantly synchronized between controllers and thus allowing the surviving controller to continue the unfinished writes afterwards. During normal operation, both controllers are actively processing data, thus improving the overall data throughput and processing performance.

## **Flexible Configuration:**

**Channel Mode:** All channels are Ultra160 and 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.

Two or more ID/LUN's can be mapped to the same logical drive for redundant host operation. Up to 32 LUN numbers per ID and up to 128 per controller are supported.

## **S.M.A.R.T. Support:**

The controller supports S.M.A.R.T. with enhanced features. When S.M.A.R.T.-related errors are reported by an unstable drive, the controller will respond with pre-configured methods to ensure the integrity of data. System administrators may also use a spare drive to copy the data in a drive suspected of defects and then replace it online (manual clone).

## Expansion:

**Channel Expansion** - The controller supports up to 8 SCSI channels by adding an expansion module (daughterboard).

**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.

## 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 RAID manager, for local or remote management.

## 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 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.

## Functional Features:

Six operating modes for logical drives:

JBOD      Just a Bunch of Drives

Non-RAID Disk Spanning

RAID-0    Disk Striping

RAID-1    Disk Mirroring and Striping (RAID 0+1)

RAID-3 Disk Striping with Dedicated Parity

RAID-5 Multiple Block Striping with Interspersed Parity

Other RAID levels: Logical Volume

RAID 10: a Logical volume with RAID 1 logical drives

RAID 30: a Logical volume with RAID 3 logical drives

RAID 50: a Logical volume with RAID 5 logical drives

NOTE: The controller allows the flexibility of combining logical drives of different RAID levels into single logical volume, making it difficult to name the RAID level used in different combinations.

- Comprehensive failure management including:
  - Automatic bad block reassignment
  - Drive hot swapping
  - Controller hot swapping (in redundant controller configuration)
  - Spare drive operation [supports both Global Spare and Local (Dedicated) Spare]
  - Background rebuilding (rebuild priority selectable)
  - Verify-after-Write supported on normal writes, rebuild writes and/or RAID initialization writes
  - Regenerate parity of logical drives in background
  - Supports S.M.A.R.T. drive functionality with enhanced features
  - Works with any operating system without additional software drivers
- 5.25" drive profile allows easy integration into external subsystem enclosures or directly into the host system's drive bay
- Up to seven drive channels (with optional 4-channel upgrade) for a total of 105 connected drives (SCSI operation)
- Supports up to 15 SCSI ID's per channel or 125 ID's per Fibre loop

- The optional upgrade daughterboards:  
IFT-9284FU3/ 4 Ultra160 SCSI channels

Elongated versions of daughterboard (model names suffixed with "M") are available for OEMs who design custom backplanes.

- Up to 8 logical drives, each with independent RAID modes; up to 32 LUN's per SCSI ID (multiple SCSI ID's per channel are supported)
- Up to 8 partitions per logical drive/logical volume
- Logical drive and logical volume can be assigned a name for ease of identification
- Number of drives for each logical drive: 31 (RAID 3 or 5); 45 (RAID 0 or NRAID); 44 (RAID 1)
- Dynamic mapping of LUN's to logical drives. Two or more LUN's can be mapped to the same logical drive for redundant host operation
- Concurrent/background logical drive initialization
- Performance optimization for either sequential or random I/Os
- Allows multiple drive failure and concurrent multiple drive rebuild of a RAID (0+1) logical drive
- Configuration of individual SCSI target parameters
- Controller and logical drive/logical volume can be assigned a name for ease of identification
- Prior to first disk access, it allows adjustment of delay time during controller initialization to enhance compatibility with slow-initialize drives
- All channels are Ultra160 SCSI (backward compatible to SCSI-1) and can be configured as either a host or drive interface
- Two or more SCSI channels can be simultaneously set as host interface for redundant host operation
- Compatible and will automatically match any SCSI hard disks with SCSI-1, SCSI-2, or (Ultra)-Wide-SCSI (1 or 2) specification
- Full SCSI implementation including Tagged Command Queuing and Multi-Threaded I/O

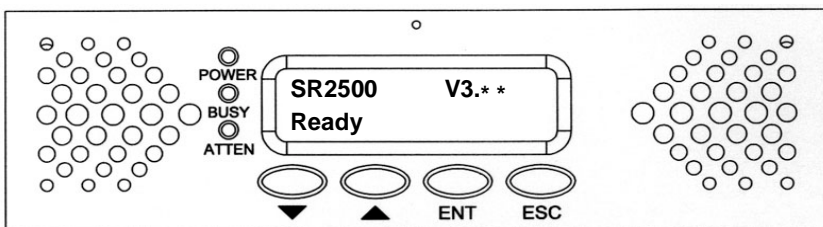
- Uses PowerPC® RISC CPU with all executable firmware downloaded into high-speed SDRAM
- SDRAM DIMM supports ECC function
- Architecturally supports up to 1GB of intelligent Read-ahead/Write-back cache
- Firmware resides in easy-to-update flash memory
- Write-through, write-back, Multi-threaded intelligent predictive read-ahead, optimized sorted grouped writes
- Front panel LCD and push buttons for configuration and message display
- Supports TELNET with PPP protocol for remote administration
- Cross-platform Java-based RAIDWatch manager and RS-232C terminal interface for embedded management utility.
- SAF-TE or S.E.S. support
- ISEMS via I<sup>2</sup>C interface for enclosure management (ISEMS: Infortrend Simple Enclosure Management Service)
- In-band Text RAID Manager provided for configuration through SCSI/Fibre rather than RS-232C
- TCP/IP agents provided for remote administration via RAIDWatch Manager or SNMP trap event monitoring with third-party SNMP software
- Active-to-active Redundant Controller Configuration via SCSI synchronized cache connection
- Controller self-monitoring features: monitors the voltages (+5 and +12), temperature (CPU, ASIC, board) and fan rpm status (front panel fans); the controller may automatically shut down for an extended overheated condition
- Dual power connectors design: to avoid single point of failure on the power connector, also guarantees efficient power source
- Uses 168-pin PC-133 industrial standard SDRAM module. Buffered, unbuffered, ECC, non-ECC, registered, non-registered modules are supported
- Separate-bus architecture increases Sequential I/O performance
- More details about redundant controller configuration will be discussed in Chapter 4.



The controller has been designed with ease of integration and maintenance in mind. The controller already includes all the major operational requirements of a RAID subsystem. The overall features of a complete RAID subsystem will, however, depend on the actual components used and the creativity of the integrator.

# Chapter 2 Hardware Introduction

## 2.1 Locations of the Parts



### LCD Panel:

POWER	Lighted LED indicates power is on.
BUSY	Unlit indicates no activity. Blinking indicates data is being accessed. Lighted LED indicates unprocessed data is still cached in the memory.
ATTEN	Lights when an error message appears or service is required, e.g., when a drive fails and needs to be replaced.
▼ ▲ Buttons	Scroll through available options.
ENT button	Choose or executes an option.
ESC button	Return to previous menu or cancel selection.
2 x 16 LCD	Displays throughput during normal operation, approximately 128Kbytes/sec per division. Displays message for configuration and management.

OEMs may prefer board-only's and the fan detect signals (connected to front panel) should be disabled by jumper switch. Please refer to Appendix D for details.

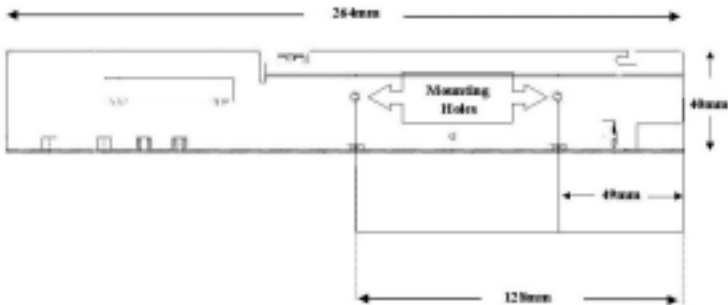
**Status Indicators:**

There are two status LEDs in the front of main circuit board: "Ready" and "Not Ready." Before the controller is successfully initialized or serious errors have been detected, the "Not Ready" will be lit. These indicators can be used in OEM systems where no LCD is applied. Please refer to Appendix D for the locations of these two indicators.

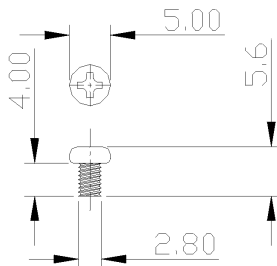
## Mounting Holes:

The controller can be installed into an industrial standard 5.25" half-height canister. To secure the controller within an enclosure chassis, drive screws through the enclosure's mounting rails and into the four mounting holes on the sides of the controller. Screws used for mounting the controller should not extend  $5.6 \pm 0.3$  mm. The keep-out area is 3 mm along the sides of controller board. The part of screws driven into the controller chassis should not extend this limit. Use the same screws for all mounting positions on controller chassis or PCB boards.

Longer screws may cause damage. Use M3 Phillips (flathead) screws for securing the top cover.



Use M3 (2.8mm thread) metric screws, 4mm long.



## **Component List:**

### **Controller Components:**

Single Controller: Controller main circuit board housed in a 5.25" half-height canister with a removable front panel and a controller backplane. The board-only solution is provided for OEMs who design custom backplanes and controller canister.

The daughterboard adds additional I/O channels and the installation of daughterboard and daughterboard backplane should be completed by system integrators.

### **Items Included in the Accessory Kit but not Installed:**

1. **Serial cable** - IFT-9512 (the redundant pair of controllers using cabling connection requires the IFT-9535).
2. **Terminator power cable** - IFT-9515. If the expansion module (daughterboard) is installed, connect this cable between two backplane boards.
3. **Null modem** – signal converter, please refer to Appendix D for more detail.
4. **Ethernet cable** - IFT-9537 (plug to receptacle). 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.
5. **Bezel key** – IFT-9531.

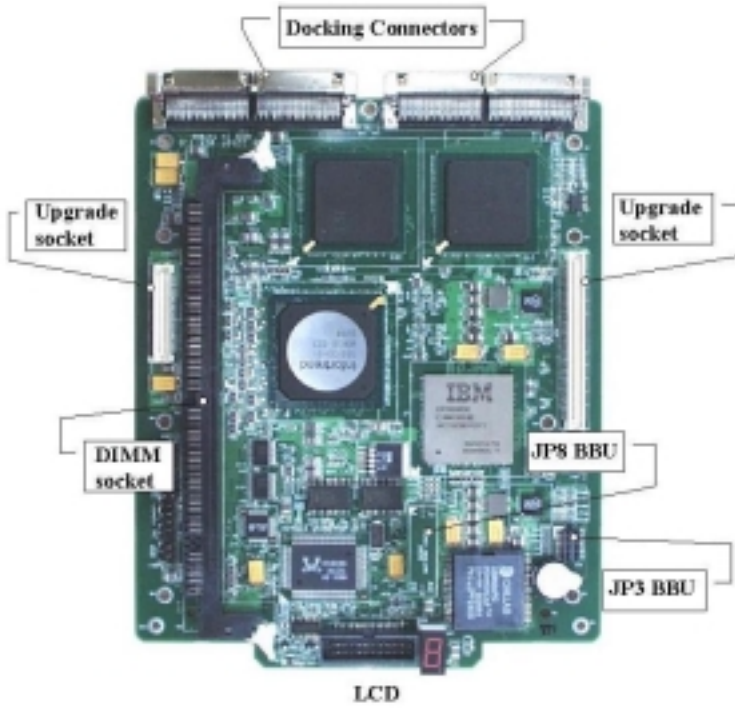
### **Not Included but Necessary:**

1. Cache memory (controller model names suffixed with "D" are shipped with DIMM modules)
2. SCSI cables and SCSI terminators
3. Power cords
4. I<sup>2</sup>C signal compatible cables for enclosure device monitoring

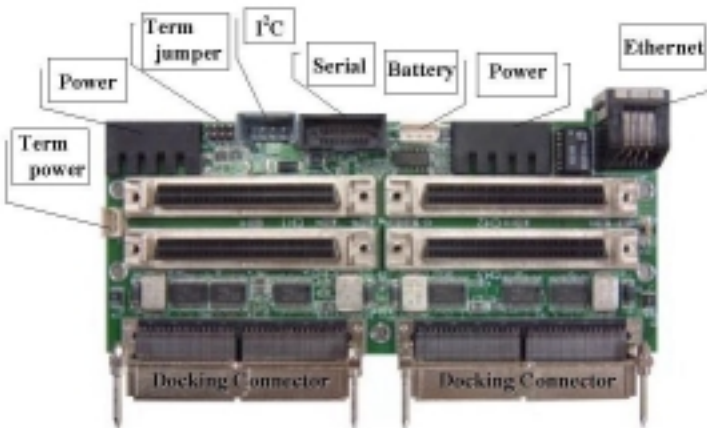
### **Optional**

Battery module

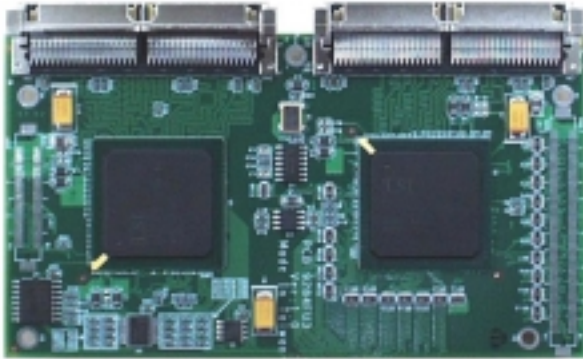
## Controller Main Board:



## Backplane interfaces

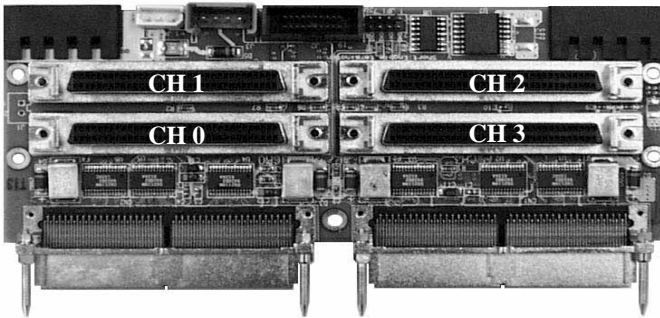


## Daughterboard:



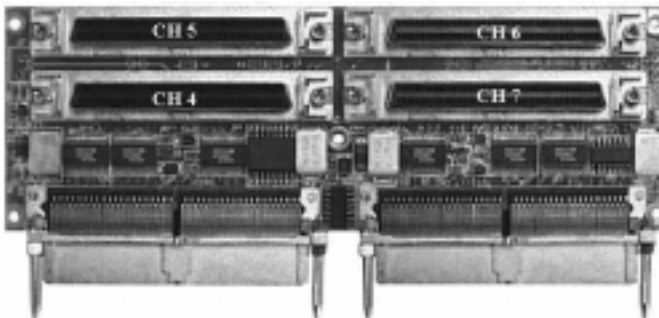
IFT-9284FU3

## Backplane Boards:



IFT-9288FMB4

(Backplane to the SentinelRAID 2500F main board)



IFT-9288FB4

(Backplane to the IFT-9284FU3 daughterboard)

## 2.2 Accessories:

### Battery Module: optional

IFT-9070D (charger circuit board)



IFT-9010D (battery cell pack)



### Cables: included in kit



IFT-9512 (combo-cable for serial ports COM 1 and COM 2)

IFT-9011 (Null Modem)



IFT-9537 (Ethernet Cable)





**Cables not included in kit**

IFT-9535 (serial port combo-cable for redundant controller configuration)



IFT-9538 (battery extension cable)



**Included with daughterboard backplane**

IFT-9515 (terminator power cable)



**Bezel key: included in kit**

IFT-9531 (bezel key)



# Chapter 3 Getting Started

## 3.1 Considerations

### Ventilation

The controller uses a convection-cooled processor; therefore, airflow across the heat-generating chips is required for operation within normal temperature range. Failure to provide an enclosure capable of sufficient airflow will void our warranty. Controller and drives should be operating under 50°C (ambient temperature).

### Static-Free Installation

Static electricity can damage electronic components. Before proceeding with controller unpacking, discharge your body's static electric charge by touching a grounded metal surface and put on a grounded anti-static wrist strap.

- Do not remove controller from the anti-static bag until you are ready to install. Do not lay PCB board or DIMM module on top of the anti-static bag. Only the inside of the bag is anti-static.
- Handle PCB boards by holding their edges and avoid touching the chips and connector pins.
- Avoid carpet, plastic, vinyl, and styrofoam in your work area.
- Make sure all components are room temperature before working with them.
- Properly align interface connectors to avoid bending pins.

## Jumpers and Connectors

Except for setting the terminators, installing Infortrend's line of controllers usually does not require configuring jumpers. If there is any need to disable or change controller features through jumper switches, please refer to the Appendix D for more details.

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### Notice for Unpacking:

*Provide a static free environment to unpack the controller components. The controller board is packed inside an anti-static bag and foaming. Remove the controller carefully and inspect if it is damaged. If the controller appears damaged or any of the items in the packing list is missing, please contact Infortrend for assistance.*

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## Interfaces

Ultra160 SCSI is basically a continuous superset of Ultra2. Except for the doubling data rate, the Ultra160 models operate using the same backplanes, connectors, cables, and other accessories. Although not recommended, mixing Ultra2 and Ultra160 devices will not cause a bus failure. Ultra160 devices will operate at the speed up to 160MB/second and Ultra2 80MB/second.

## 3.2 Assumptions

A RAID system typically consists of a RAID controller, disk drives, and the enclosures or system cabinetries that provide power supply, ventilation, and environmental monitoring services to these components.

RAID controller is the accelerator of I/O performance and provides data protection in a storage subsystem. These functions include the capabilities to provide storage I/O bus performance, to assemble large amount of disk drives into a contiguous whole, to report system events, and many more. The controller, as well as hard drives, should be mounted in a cabinetry provided with adequate power supply and ventilation. The power consumption is listed in Appendix A (A.6).

In spite of the use of different enclosures and cabinetries, the requirements for installing a RAID controller should include the following:

1. A RAID enclosure providing power, proper ventilation, and at least one 5.25" half-height canister for the controller.
2. Disk drives installed in drive enclosure(s); controller(s) and drives may be integrated into one enclosure.
3. Environmental monitoring capabilities on the enclosure(s) through the supported SAF-TE (SCSI), S.E.S. (Fibre), or I<sup>2</sup>C interface.
4. SCSI terminators and SCSI cables that are adequate for Ultra160 SCSI channels.
5. Requirements:

Electrical (base module; please refer to Appendix A for more details)

Input	+5VDC $\pm$ 5% (max. 5.5A; normal 4.0A)
	+12VDC $\pm$ 10% (max. 1.0A when charging battery)

## Environmental

Temperature	5 to 44 °C
Humidity	10-95%, non-condensing
Altitude	Sea level to 10,000 ft

Installation of a controller means the completion of the following:

1. Integration of the RAID controller into the cabinetry.
2. Cabling between the controller and drive bays / drive enclosure(s).
3. Cabling between the RAID system and host computer.
4. Cabling of other interfaces.
5. Installing software utilities, configuring physical drives into RAID, and enabling enclosure devices monitoring.

---

### **WARNING!**

*Constant airflow over the major chips is essential for operation within an acceptable temperature range. The RAID enclosure where the controller is installed must provide sufficient airflow to maintain an internal ambient temperature below 50°C. Failure to utilize a design which keeps the ambient below 50°C will void the controller's warranty.*

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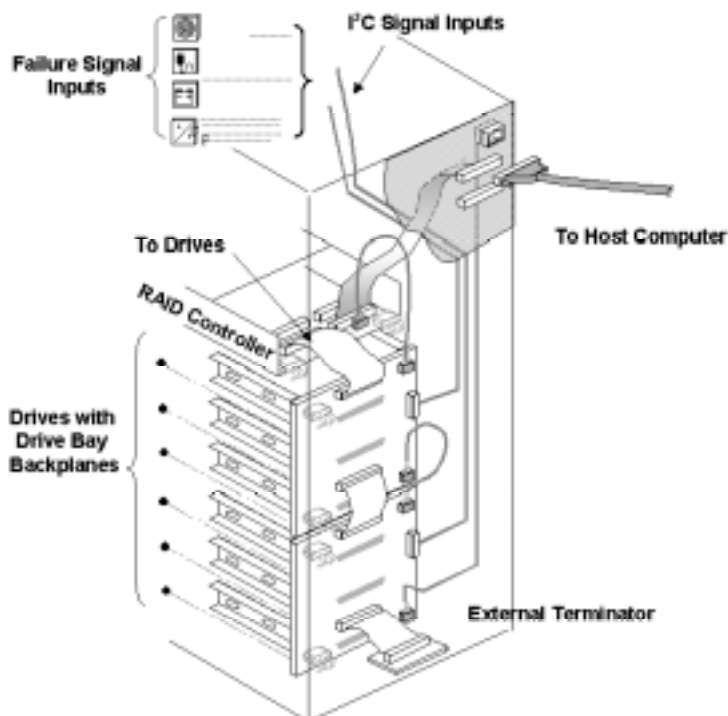
## 3.3 Steps Necessary for Installing the Controller

### *Steps for the Hardware Installation:*

1. Remove the controller carefully from its package; or, if you are upgrading controller components, turn off all power to the host computer and RAID enclosure. If you are installing memory to a new controller, jump to step 3. A minimum DIMM size of 64MB is required.
2. After you turn off the controller power and unplug the power cords, remove the controller from the enclosure cabinet where it is located. Do not connect or disconnect cables when system power is on.
3. Locate and unscrew the fasteners on the sides of controller. Remove the controller top cover.
4. When controller front panel and its top cover are removed, you may continue with installing hardware components.
5. Follow the instructions, Notes, and Warnings in this manual.
6. Install memory to the controller.
7. Check if all the SCSI bus components (cable type, cable length, terminators, and ID setting) you use meet the SCSI conventions.
8. Preparing drives: Please refer to the installation instructions provided by drive manufacturers for information on jumper configuration.
  - Remove or disable terminator on all drives.
  - Enable terminator power from all drives to SCSI bus
  - Set unique ID for each drive.

- Drive enclosures may have ID setting pre-configured through DIP switches on its drive backplanes.
9. Install the controller in the server or enclosure and attach the SCSI/Fibre/serial cables and terminators as needed. If using on-board terminators for SCSI termination, please refer to Chapter 4 to shunt the terminator jumpers properly.
  10. Make sure all cables are correctly attached in accordance with SCSI rules. Make sure the controller is properly installed. Connect the supported interface for environmental monitoring devices. Turn power on after all components are correctly installed.
  11. Install the controller software utilities such as the RAIDWatch manager. Software on the host computer can communicate with the controller either through an Ethernet port or the existing I/O channels (SCSI/Fibre cable). The embedded configuration utility can be accessed through the RS-232 port.
  12. Refer to the Generic Operation Manual to configure and initialize your RAID.

## Connecting Drive Channels and Host Channel(s)



Above is an example of connecting RAID controller to 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 I<sup>2</sup>C interface as displayed in the example. 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:*

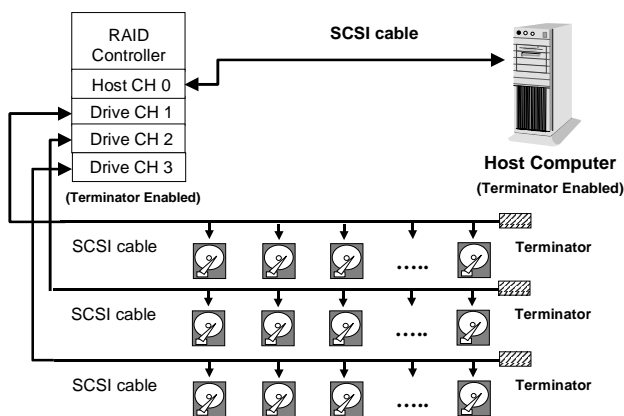
- 1. Refer to the installation documents that came with your drives for information on jumper setting.*
  - 2. Set a unique SCSI ID address on each drive. ID7 should be avoided, which is a default reservation for the controller. In redundant controller mode, each of the two controllers takes an ID on each SCSI bus. The combination can be ID 6 and ID 7 or ID 8 and ID 9.*
-

## 3.4 Sample Topologies

### *Supported Configurations:*

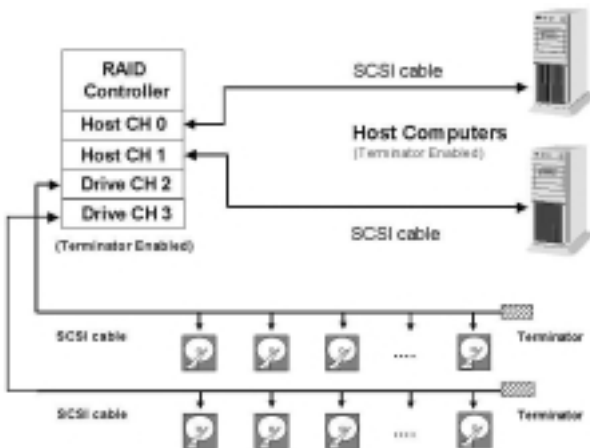
#### Single-Host Configuration

An example is diagrammed:



- The SCSI cable must be shorter than 12 meters using high-quality SCSI cable and terminators.
- Channel 0 is the default for host connection.
- Drives are connected through drive channels 1 to 3 (with the expansion daughterboard, there can be up to 7 drive channels).
- SCSI devices on the same channel have their own unique ID number.
- Both the host and drive SCSI cables are properly terminated.
- The terminator of all the hard drives must be disabled.
- The power supply is attached.
- All operation parameters are properly set.

## Dual-Host Configuration



The multiple-host configuration can 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.

## To Connect the Components:

1. Make sure power is off and the power plug is disconnected.
2. Connect the controller's host channel(s) to the host system's adapter card using an external SCSI cable as recommended by the HBA vendor. Usually it is necessary to connect from the controller to the outside of enclosure.
3. Make sure the host side of the SCSI cable is properly terminated. HBA cards are usually equipped with an auto sensor.
4. Assign a unique SCSI ID for every hard disks that are to be connected on the same SCSI cable; between ID numbers '0' and '6' or '8' and '15.' The controller itself takes SCSI ID '7' on all channels.
5. Connect the other end of the drive-side SCSI cable to one of the remaining channels on the controller.
6. Connect the connectors located at the middle of the drive SCSI cable to the hard drives.
7. Terminate the SCSI cable by installing an external terminator on the last connector. Terminators on all the hard drives must be removed or disabled so that removing a hard drive will not affect channel bus termination.

---

### NOTE:

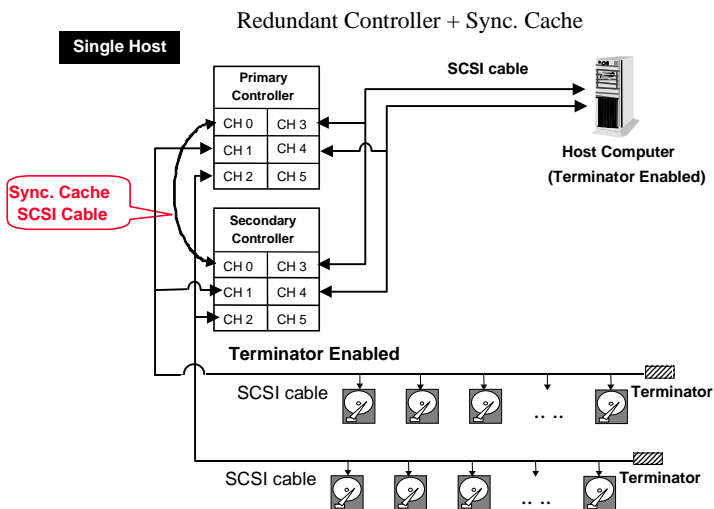
*Channel 0 is the default host interface using ID number '0.' Any channel can be set as the Host interface, and more than one channel can be set as host interface when operating with redundant host or multiple host systems.*

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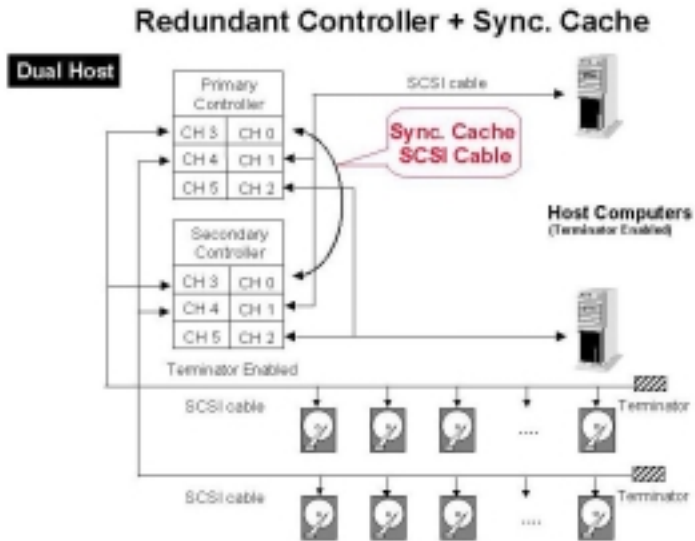
# Single Host (Dual-HBA) Redundant Controller Configuration

The example below shows a redundant controller configuration using two controllers and a dedicated SCSI channel for the synchronized cache communications between. Data cached in memory will be constantly synchronized between controllers to ensure no data inconsistency will occur after a controller failure.

Drive channels are terminated by external terminators. Using two HBAs is for data path redundancy. Host software support is required to distribute I/O traffic between the two adapters; or, in case of HBA failure, direct I/O traffic from one to the other. Also refer to the *Generic Operation Manual* that came with your controller for details on how to setup redundant controllers.



## Dual-Host Redundant Controller Configuration



Channel	Status
0	Synchronized cache communications path
1	Host channel
2	Host channel
3	Drive channel
4	Drive channel

As diagrammed above, a host computer is connected to channel 1 on both controllers, and the other host computer is connected to channel 2 on both controllers. Drives are also connected to the same channel on both controllers. Use a SCSI cable to connect channel 0 on both controllers. Enable the redundant controller function, and the controllers will automatically start negotiating with each other and synchronizing cached data and configuration information after the system reboots.

All other channels can be designated as either host or drive through firmware setting. This means that you can have as many as 6 drive channels or 6 host channels. Multiple-host configuration ensures data access with host clustering deployment and avoid compatibility problem between systems. Each host can be using one or two HBAs. When the

array is shared by two systems, different logical units (logical configurations of drives) can be mapped to different systems to prevent data corruption if the operating systems does not support file locking.

Except channel 0, all channels are configured as drive channels by default. Change channel mode through one of the configuration utilities if you want to configure specific channel as a host data path.

## **3.5 Software Utilities**

### **Requirements for Using the Configuration Utilities:**

There are different ways to configure a RAID system: LCD front panel, firmware embedded configuration utilities, and the Java-based GUI RAID manager.

1. LCD front panel does not require any preparation.
2. Firmware embedded configuration utilities: the RS-232 communication between host computer (or any computer used as a management platform) and RAID controller should first be established.
3. The Java-Based GUI RAID Manager is supported via In-band or Out-of-band connection. The management platform communicates with the controller through the host I/O channel(s) using the In-band SCSI protocol. The Ethernet port can also be used for this purpose. If connected via In-band, host-side parameters should be adjusted before the host computer can see the controller. This is especially the case when users begin storage configuration with the GUI manager.
4. The GUI manager is not provided in kit. Users may acquire the manager from system vendors or download the program from Infortrend's ftp sites.

## 3.5.1 In-Band SCSI

### What is it and why do you need it?

The GUI manager can use SCSI or Fibre cabling and protocols to manage a RAID controller. However, the host computer will not be able to locate the controller unless the controller is defined as a peripheral device or logical units have been mapped to host LUNs through other means of configuration.

### How does it work with the SCSI cable?

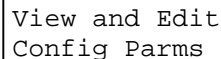
In-band SCSI technology translates the original commands into standard SCSI commands. These SCSI commands are then received by the RAID controller. It can be used to communicate between host management software and controller. The Java-Based GUI RAID Manager can administrate the RAID controller via the existing SCSI or Fibre I/O path. (Note: It is assumed that users of In-band SCSI possess the following: a third-party SCSI adapter and a channel on their Infortrend RAID controller that can be designated as a host channel). Both of these are required for In-band SCSI communication between the host and the RAID controller.

### How Do You Configure the Controller to Use In-Band SCSI?

#### RAID Controller Adjustments

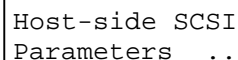
Use the front panel to configure the In-band SCSI settings.

From the Main Menu, press ▼ or ▲ to select "View and Edit Configuration Parameters."



View and Edit  
Config Params

Press [ENT] and use the ▼ or ▲ to select "Host-side SCSI Parameters," then press [ENT] to proceed.



Host-side SCSI  
Parameters ..



You may need to make adjustments in the following four submenu's: Peripheral Device Type, Peripheral Device Qualifier, Device Support for Removable Media, and LUN Application. Different host operating systems require different adjustments. As a general rule, default values should not be changed except the Peripheral Device Type. Find in the table below the proper settings for your host operating system.

**Peripheral Device Type Parameters  
for  
Various Operating Systems:**

<b>Operating System</b>	<b>Peripheral Device Type</b>	<b>Peripheral Device Qualifier</b>	<b>Device Support for Removable Media</b>	<b>LUN Applicability</b>
Windows NT® 4.0	0x1f	Connected	Disabled	All Undefined LUNs
NetWare® 4.x/Windows2000	0x03	Connected	Disabled	All Undefined LUNs
NetWare® 5.x	0x03	Connected	Disabled	All Undefined LUNs
SCO OpenServer 5.0x	0x7f	Connected	either is okay	All Undefined LUNs
SCO UnixWare 2.1x, UnixWare 7	0x03	Connected	either is okay	All Undefined LUNs
Solaris (x86 and SPARC)	0x7f	Connected	either is okay	All Undefined LUNs
Linux	0x03	Connected	Enabled	All Undefined LUNs

## Cross Reference for the Meaning of Peripheral Device Type Settings:

Device Type	Setting
No Device Present	0x7f
Direct-access Device	0
Sequential-access Device	1
Processor Type	3
CD-ROM Device	5
Scanner Device	6
MO Device	7
Storage Array Controller Device	0xC
Unknown Device	0x1f

### Configuration Example: Settings for Windows NT 4.0

The setting for Windows NT 4.0 is provided here as an example. For other operating systems, please refer to the table above.

On the front panel, use ▼ or ▲ to select "Peripheral Device Type Parameters"; and then press [ENT].

```
Periph      Dev
Type Parameters
```

(For this example, we assume that there are currently no peripheral devices.)

```
Device Type -
No Device (0x7f)
```

Press ▼ or ▲ to choose "Unknown Device - 1f".

```
Set Device Type?
Unknown (0x1f)
```

Press [ENT] to confirm the selection. Use the arrow keys to scroll down to Device Qualifier, press ▼ or ▲ to select "Device Qualifier Connected. "

```
Device Qualifier
Connected
```

The default setting is "Connected."  
If your Front Panel reads  
"Disconnected," press **[ENT]** and  
you will be prompted to change to  
"Connected." If your Device  
Qualifier setting reads  
"Connected," press **[ESC]** to return  
to the Host-side SCSI submenu's.

Use the ▼ or ▲ to select "Support  
for Removable Media." The  
default setting is "Disabled." If the  
LCD reads "Enabled," press **[ENT]**  
and you will be prompted to  
accept a change. If the screen  
reads "Disabled," press **[ESC]** to  
return to the Host-side SCSI  
submenu's.

```
SupportRemovable  
Media - Disabled
```

Press ▼ or ▲ to select "LUN  
Application;" and then press  
**[ENT]**. The default setting is "All  
Undefined LUN."

```
LUN Application-  
All Undefine LUN
```

Press **[ENT]** and use ▼ or ▲ to  
select "Undefined LUN-0's."

```
Applies to      ?  
Undefine LUN-0's
```

Press **[ENT]** to accept. The screen  
should display the following  
message.

```
LUN Application-  
Undefine LUN-0's
```

## 3.5.2 Out-of-Band via Ethernet port

Infortrend's Java-based manager, RAIDWatch, can communicate to the controller via the Ethernet port. You may obtain the management software from your system providers or download the program directly from Infortrend's FTP sites.

Follow the steps listed below to manage the controller through the Ethernet port:

1. Connect the Ethernet port to the outside of the enclosure using the included IFT-9537 cable and then to a hub using another Ethernet cable. The receptacle side of the cable can be secured to the back panel of an enclosure.
2. Assign an IP address to the controller (via the LCD keypad or the terminal emulation utility). Also enter appropriate Net Mask and gateway values. Reset the controller for the configuration to take effect.
3. A small sector should be created on each hard drive for storing software modules. You will be able to assign a reserved capacity to drives during the configuration process. Details can be found in your Generic Operation Manual. Wait until the drive formatting process (of the preserved capacity) is completed.

**NOTE:** If you complete the preparation of software modules and accidentally delete or lose a logical drive afterwards, you may use the same drives to create another logical drive. Software modules in the reserved space will remain intact, and RAIDWatch can still access the controller.

4. The controller will take a while formatting a small sector on each drive for the manager program.

5. FTP the RAIDWatch Manager programs (grm.jar and grm.htm) to the IP address designated for the controller. The software help files are optional. You may also FTP the Event Monitor (grem.jar and grem.htm), RAIDWatch's sub-module, to the controller.

**NOTE:** To begin the FTP process, use "root" as user name and enter the controller's password when requested for a password. Press Enter for none.

6. You need to FTP another two files, ".keystore" and ".java.policy" to a specific location under your management station depending on your OS.

The two files are included in the "gui.zip" of the software package.

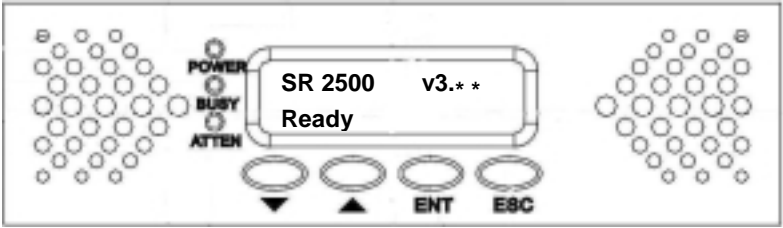
The recommended locations are:

- Windows 95/98:  
user's home directory == "C:\Windows\"
- Windows NT 4.0:  
user's home directory ==  
C:\Winnt\Profiles\USER\_NAME"
- Solaris: (if logon as "root")  
root directory == "/"

7. Two agents are used for the communications between software and the controller. The Primary and Secondary agents are already implemented in controller firmware. Another sub-module, NPC, should be installed and run on a host computer.
8. Controller firmware has a built-in HTTP server. You can now start your browser and access RAIDWatch manager by entering the controller's IP address followed by "grm.htm" as your URL (e.g., 222.212.121.123/grm.htm); or "grem.htm" to start Event Monitor. To access the

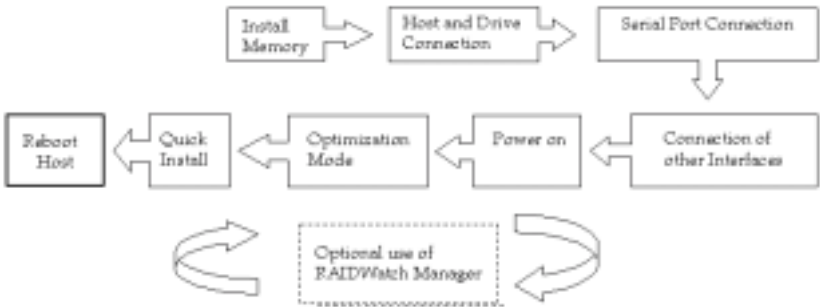
manager program via browser, support for Java applet should be enabled on the management station.

### 3.5.3 Quick Start



**Key:**

- [ESC] = Pressing the Escape key
- [ENT] = Pressing the Enter key
- [▲] = Pressing the Up Arrow key
- [▼] = Pressing the Down Arrow key
- “XXX” = LCD Panel text is in quotes
- XXXX = Variable Info is underlined (i.e. drives/ Megabytes/ RAID level all depend on individual configuration)



#### Quick Installation Flowchart

Quick start will include all the physical drives connected on all drive channels into one logical drive. The logical drive will be automatically mapped to the first available host ID/LUN.

## Optimization for Random or Sequential I/O

Before creating a logical drive, you must decide what your application will be and then choose to optimize the configuration of your controller for “Random I/O” or “Sequential I/O.” The selection can be found in “Main Menu”/“View and Edit Configuration Parameters”/“Caching Parameters.” Reset the controller for the configuration to take effect. Please also refer to chapter 6 and chapter 8 of your *Generic Operation Manual*.

1. After adding memory , power on the controller. The LCD should read, “SR 2500 V3.\*\* NO HOST LUN”
2. [ENT] for two seconds to “Quick Logical Drive Install ↓”
3. [ENT] to see “Set TDRV=8 with LG RAID5+Spare?” TDRV means the total number of drives.
4. Press [▲] or [▼] to select a desired RAID level configuration, see the options below and also refer to the Generic Operation Manual:
  - RAID 5 + Spare
  - RAID 5
  - RAID 3 + Spare
  - RAID 3
  - RAID 1 + Spare
  - RAID 1
  - RAID 0
  - NRAID
5. [ENT] to select an option, for example, “RAID5+Spare”
6. LCD screen will read “Init Parity 24% Please Wait !” The percentage of initialization progress will be shown, front panel BUSY LED and enclosure hard disk busy LED(s) will be lighted. Note that the time it takes to initialize varies by selecting different RAID levels. Drive capacity and drive speed are also parameters of controller performance.
7. Upon completion, LCD will read “LG=0 Initialize Completed.” The logical drive will be automatically mapped to the first available host LUN.
8. [ESC] three times to main screen, “SR 2500 v3.\*\* READY”



---

**NOTE:**

1. *You may need to reboot your Host to “see” or negotiate with the controller. When SCSI negotiation is complete, you will be able to partition and/or format the RAID. Once you have written data to the controller the front panel will no longer display the “READY” text on the second line.*
  2. *An abbreviation of model name will be displayed on LCD. SR is the abbreviation for SentinelRAID. You may setup a controller name to be displayed on LCD for ease of identification in a multi-RAID configuration. Please refer to your Generic Operation Manual for details.*
-

# Chapter 4 Installation

## 4.1 Steps for Installation:

1. Provide a static-free working environment. Turn off and disconnect all power to the host, hard disk drives, enclosure, and other components.
2. Install cache memory. Install DIMM's of the same size to both controllers in a redundant controller configuration.
3. If you are setting up a redundant controller configuration, connect a SCSI cable between channel 0 on both controllers.
4. Install the controller in a canister within server or enclosure and attach the SCSI/Fibre/serial cables and terminators as needed. It is recommended to use the on-board terminators for SCSI bus termination, please refer to section 4.7 to shunt the terminator jumpers properly.
5. Make sure all cables are correctly attached in accordance with SCSI or Fibre specifications. Make sure the controller is properly installed. Turn power on after all components are correctly installed.
6. Install RAIDWatch manager or connect serial port to start terminal emulation. The manager can communicate with the controller via the existing host I/O path or Ethernet port. The requirements for the management software to communicate with the controller are:

1. The controller is configured as a peripheral device. Please refer to the Generic Operation manual for more detail.
2. Logical units have been created (logical configurations of drives) in the storage system and they are mapped to Host ID/LUNs.

If you want to use RAIDWatch to start system configuration, host computer can communicate with the controller through host channels using the in-band SCSI protocol. You may also choose using the front panel keypad or firmware-embedded utility via the RS-232 connection.

7. RAIDWatch can also be started via Ethernet connection. This feature is supported with firmware revision 3.23 or above. Please refer to Chapter 3 "Software Utilities" for more details.
8. Configure and initialize your RAID.

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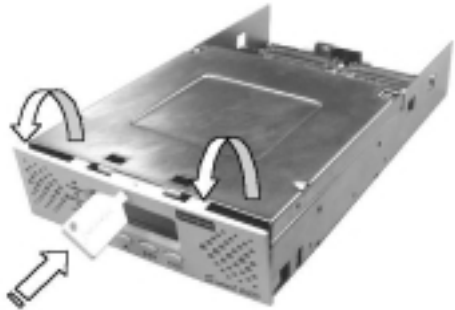
### **WARNING!**

*Before proceeding on controller installation, disconnect the system (an enclosure, for instance) from the electrical outlet before opening the system cabinet. Working with electrical power attached to the system can result in shock and injury.*

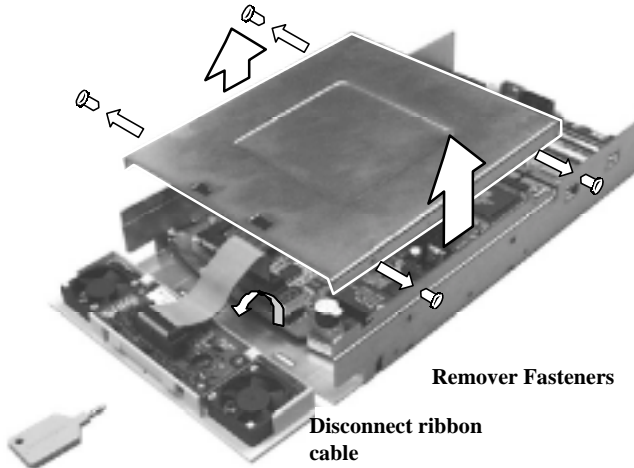
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## 4.2 Removing Controller Top Cover

1. Remove the controller carefully from its package; or, if you are upgrading controller memory, power down the host computer, power down and disconnect all power to your RAID enclosure. If you are installing components to a new controller, jump to step 3.
2. After you turn off the controller and unplug the power cords, remove the controller from the enclosure cabinet or chassis where it is located.
3. Use the included bezel key or a straightened paper clip to remove the front panel. Insert the bezel key into the eject hole in the middle of front panel and lever down slightly to remove the panel from chassis.
4. Disconnect the 34-pin ribbon cable from the front panel module.



Remove the controller's top cover by unscrewing the two fasteners on each side.



### **Removing front panel and controller top cover**

5. If you are confident with reconnecting a controller main board, you may simply remove the main circuit board from chassis. Pay attention to where you are going to put your main board when working on it.
6. When the top cover is removed, you may continue with installing or upgrading controller components.

## 4.3 Installing SDRAM DIMM

---

### CAUTION:

- *Do not remove memory from the anti-static bag until you are ready to install. Do not lay memory on top of the anti-static bag. Only the inside of the bag is anti-static.*
  - *Static electricity can damage electronic components, including SDRAM. Before touching a memory module, discharge your body's static electric charge by touching a grounded surface or wearing a grounded wristband.*
  - *Handle memory cards by holding their edges.*
  - *Avoid touching chips and connector pins.*
  - *Avoid carpet, plastic, vinyl, or styrofoam in your work area.*
  - *Make sure all components are room temperature before working with them.*
- 

### The following are guidelines on using SDRAM:

- ✓ *The controller requires a minimum of 64 Mbytes SDRAM DIMM (with or without parity function) installed in the DIMM socket in order for it to operate. The controller is normally delivered without any SDRAM installed.*
- ✓ *Use 168-pin SDRAM DIMM module. An SDRAM DIMM that meets Intel's PC-133 standard is recommended.*
- ✓ *A DIMM with or without ECC support can be auto-detected by the controller. A DIMM with parity is recommended for security.*
- ✓ *The minimum is 64Mbytes installed, however, greater memory size is recommended. The controller supports DIMM modules with the capacities between 64MB and 1GB.*

---

### **WARNING!**

*Do not attempt to install, remove, or upgrade an SDRAM DIMM on the controller with the battery installed. Damage to controller components will occur.*

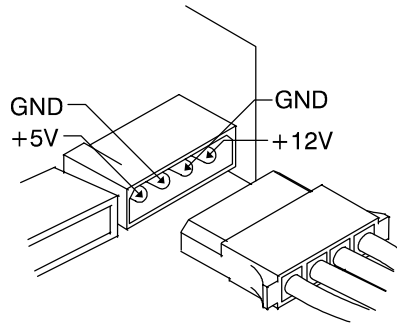
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**To install the SDRAM DIMM:**

1. Before installation, make sure there is no power connected to the controller and anti-ESD methods have been applied. Before installation, you have to remove controller main board from the controller chassis. Please refer to section 4.6 for details on how to remove controller main board.
2. Remove charger board and disconnect battery module before installing or replacing DIMM's. Grab the edges of your charger board and pull carefully to remove it from the respective sockets.
3. Pull the tabs at the ends of the DIMM socket aside.
4. Position the DIMM toward the socket with the notches in the module aligned with the keys on the socket.
5. Insert the module horizontally into the socket. The tabs will hold the DIMM in place.

## 4.4 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 below.

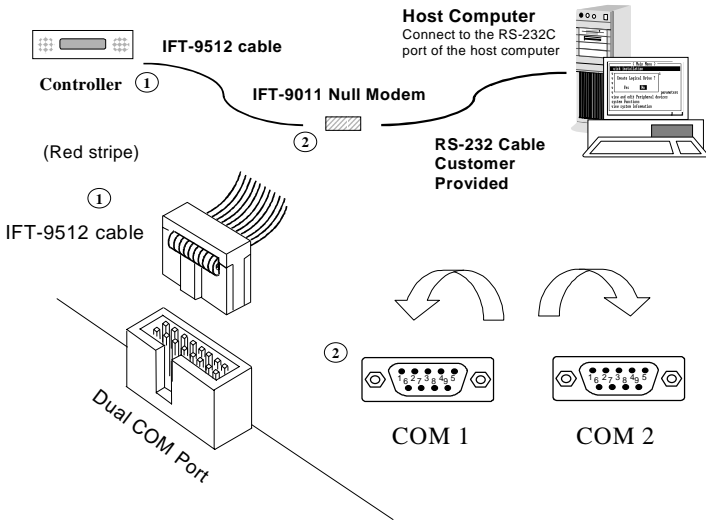




# 4.5 Connecting RS-232C Terminal Emulation

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.

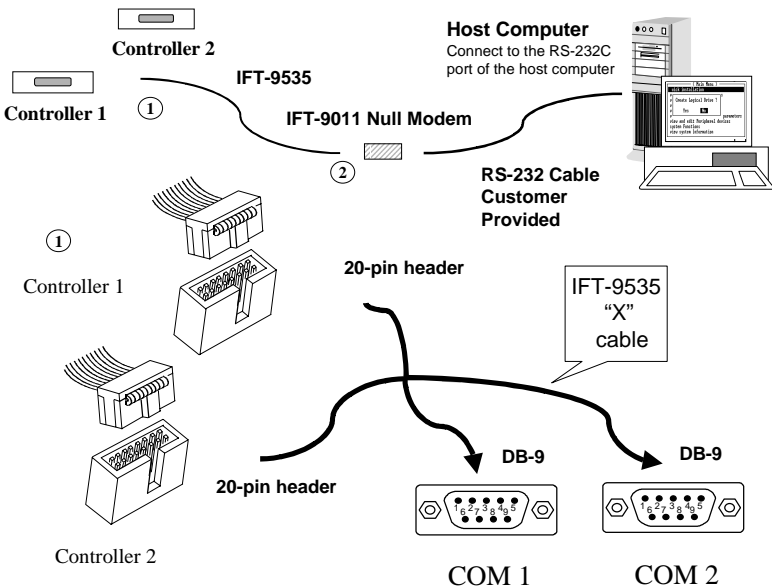
Connect COM 1 to the included Null Modem (IFT-9011) and connect the other end of the Null Modem to the outside of your enclosure or to an external RS-232 cable. COM ports can also be used for connecting to a modem for remote configuration. The COM 2 port can not be used for firmware download.



## In Redundant Mode: IFT-9535 "X" Cable

An "X" shape cable (IFT-9535) can be used to connect the serial ports on two controllers in a redundant configuration to a management platform. If one controller should fail, the existing controller can obtain the signal path to respond to the configuration commands from host computer. The existing controller also needs to notify system administrators of system events.

Whether in normal condition or degraded mode (the surviving controller serving all I/O requests), only the controller designated as the primary responds to user's configuration. However, it is not predictable whether the primary or the secondary controller will fail. The cable connects to both controllers. Should any of the two controllers fail, the existing controller will obtain the signal path and respond as the primary. The cable has two 20-pin male headers and two DB-9 connectors.



## The following are guidelines on using the serial port:

- The serial port's default is set at 38400 baud, 8 bit, 1 stop bit and no parity.
- In most cases, connecting RD, TD, and SG is enough to establish communication with a terminal.
- If you are using a PC as a terminal, any of the VT-100 terminal emulation software will suffice. Microsoft® Windows includes a terminal emulation program with the "HyperTerminal" icon in the Accessories menu.
- When using Hyper Terminal in Windows 2000, due to its mis-interpretation, your arrow keys might not work properly. The following key combinations can be used instead:
  - Ctrl-J = Down arrow
  - Ctrl-K = Up arrow
  - Ctrl-H = Left arrow
  - Ctrl-L = Right arrow

The baud rate can be changed using the front panel. To change the baud rate:

Press **ENT** for two seconds to enter the Main Menu. Press ▼ or ▲ to select "View and Edit Configuration Parameters," then press **ENT**.

```
View and Edit  
Config Params  ↑
```

Select "Communication Parameters," then press **ENT**.

```
Communication  
Parameters ..
```

Select "RS-232C Configuration," then press **ENT**.

```
RS-232C  
Configuration ..
```

Select "COM1 Configuration," then press **ENT**.

```
COM1  
Configuration ..
```

Select "Baud-rate 9600..," then press **ENT**.

```
Baud-rate 9600  
..
```

Press ▼ or ▲ to select the baud rate, then press **ENT** for two seconds to confirm the selected baud rate.

```
Baud-rate 9600
Change to 38400?
```

- The following baud rates are available: 2400, 4800, 9600, 19200 and 38400. Baud rate settings on the controller and the terminal must be identical.

## 4.6 Controller Main Board Removal and Replacement

As a general rule, the controller main board should never be removed. The components on the board can be damaged by improper handling or electrostatic discharge (ESD).

It is only necessary to remove the controller board in the following two conditions:

- a) Redundant controllers are in use and one of the controllers has failed.
- b) Single controller in use and the controller has failed.

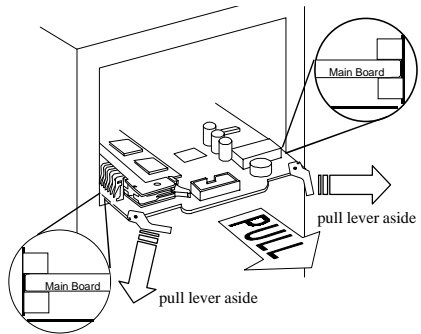
Remove the main circuit board and replace it with a new one.

If the controller main board needs to be removed for any other reason, system vendor should be contacted for assistance.

### 4.6.1 Controller Main Board Removal

1. To prevent damage to components, apply electrostatic protection methods.
2. Power down your RAID system.
3. Use the included bezel key to remove front panel. Insert bezel key into the eject hole located at the top center of the controller front panel and lever down to remove the panel. You must then remove the gray ribbon cable connected between front panel and controller main board.

4. Pull the “eject levers,” located at the front of the controller main board, to the side. Make sure to pull each lever outwards as far as it will go.



5. You may now remove the controller's main board.



## 4.6.2 Controller Main Board Replacement

1. To prevent damage to components by ESD, it is recommended that an anti-static wristband be worn.
2. Gently slide the main board into the enclosure. Make sure the controller board reaches the end of controller chassis and is inserted properly into the metal grooves on each side of the enclosure.
3. Push the eject levers toward the center, moving them inward as shown below. Also make sure the square-shaped notches on eject levers lock onto the edge of the metal groove.



4. Connect LCD ribbon cable between main board and front panel module.
5. Install the front panel module back to its original position by pushing it gently into the front opening of controller chassis. You should be able to hear a “click” sound when the tenons on front panel are accepted by the mortises on controller chassis.

## 4.7 How to Install Daughterboard/ Daughterboard Backplane

1. The expansion module, daughterboard, adds additional SCSI channels to your RAID controller. An interface backplane should also be installed along with the daughterboard. The appropriate combination of daughterboard and interface backplane is listed below:

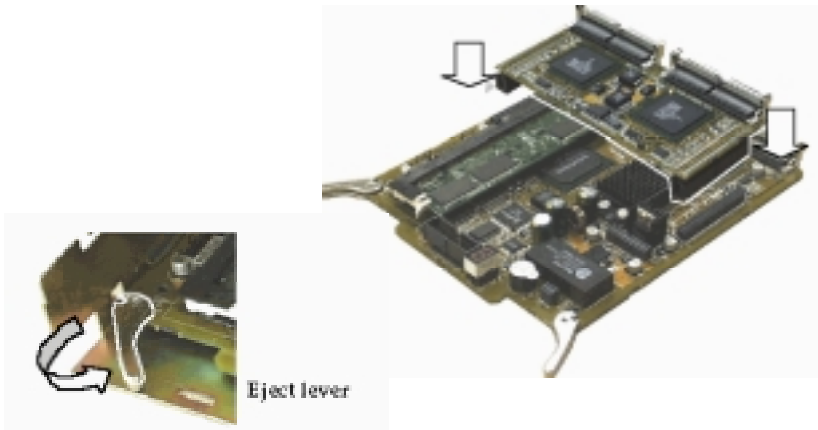
<b>Expansion channels</b>	Ultra160 x 4
<b>Daughterboard:</b>	IFT-9284FU3
<b>Daughterboard Backplane:</b>	IFT-9288FB4

2. Each controller in a redundant controller configuration must have the same number of I/O channels. You must shut down or disconnect I/O cables from the host computer(s) and power down the storage system to proceed with installation.
3. Appropriate anti-static methods should be applied. Also pay attention to the following:
  - *Do not remove components from the anti-static bag until you are ready to install.*
  - *Handle components by holding its edges and avoid touching chips and connector pins.*
  - *Make sure all components are room temperature before working with them.*
  - *Use screws already implemented on the mounting positions or those provided by Infortrend only (M3, 5.6±0.3mm in length). Longer screws may cause damage.*
4. Disconnect power cords from the back of the controller.
5. Remove controller front panel and top cover from controller chassis. Use the included bezel key or a straightened paper clip to remove front panel. Disconnect ribbon cable from the front panel.



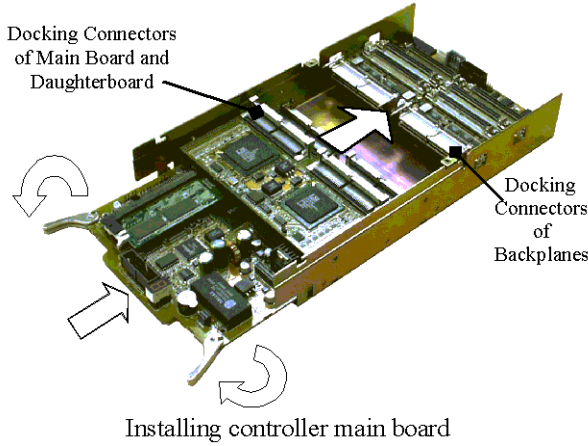
6. Use the eject levers in the front of main board to disconnect docking connectors and remove controller main board.
7. Please note that screws are already fastened to the associated mounting positions. Mount the daughterboard backplane to controller chassis by positioning it to the four mounting positions. Secure the backplane board to controller chassis by fastening the four M3 screws.
8. Locate the daughterboard upgrade sockets (JP1 & JP13 receptacle connectors) on controller main board. Install your daughterboard by orienting and plugging its headers into the upgrade sockets. Secure the daughterboard by installing the included copper spacers through mounting holes on the main board. These four spacers should receive phillips screws driven through holes on the corners of daughterboard.

Position and press down firmly until the daughterboard fits into place. Remember to orient the docking connectors on daughterboard towards the rear side of controller. Secure the board with the phillips screws through the copper spacers. If properly installed, plugs and receptacles should be properly mated between daughterboard and its backplane when the controller is inserted into chassis.



- 9. Gently slide the main board into chassis. Make sure the main board reaches the end of chassis and is inserted properly into the metal grooves on each side of the controller chassis.

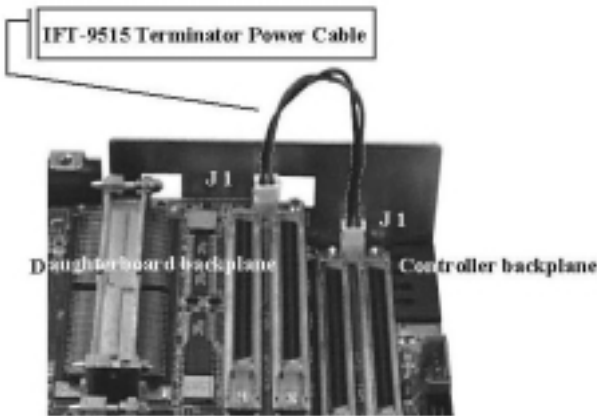
Push the eject levers towards the center, moving them inward as shown below. Also make sure the square-shaped notches on the eject levers lock onto the edge of the metal groove. The "plugs" on daughterboard and main board must be mated to the "receptacles" on controller backplane and daughterboard backplane.



10. Attach J1 on controller backplane to J1 on daughterboard backplane with the **IFT-9515** linking cable. This cable is provided with the daughterboard backplane. The connection between these two headers provides a 5 V power to the terminator circuits on daughterboard backplane.

This connection keeps SCSI buses intact under the condition when the controller fails and has to be removed from a redundant controller system.

Please refer to the diagrams below to locate J1 and the terminator jumpers, JP1.



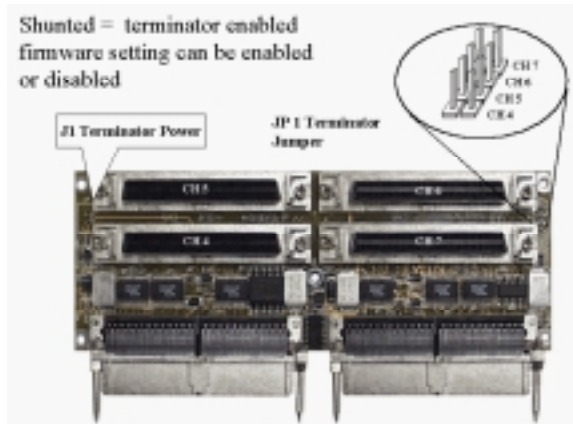
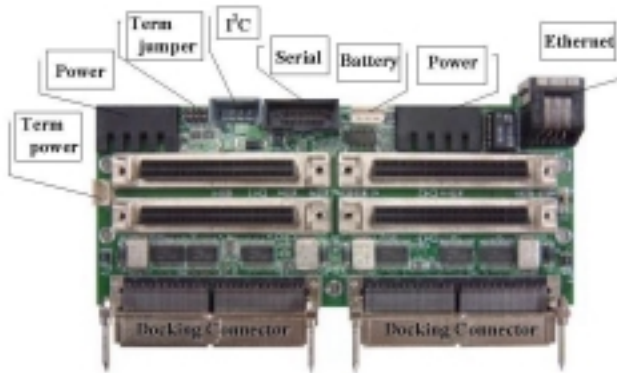
Connecting IFT-9515 terminator power cable

11. **Terminator circuits** are provided on interface backplanes. Configure JP 1 jumpers to force enabled (jumper pins shunted) SCSI termination of the associated channel(s). The on-board terminators can be used in redundant controller configuration as long as they are enabled by jumper setting.

**DO NOT** rely on firmware configuration for controlling SCSI bus termination, because once a controller fails or is removed, firmware control is lost. Shunt the associated jumpers to enable the on-board terminators. On the other

end of a SCSI channel, you can choose to use an external terminator or the terminator on a drive canister backplane.

SCSI buses attached to the interface backplanes will remain unaffected even when one controller fails and the failed controller is swapped out.



Connectors and terminator jumpers on daughterboard backplane

12. Connect the LCD front panel ribbon cable. Install front panel back to the controller chassis. Attach power cords and SCSI/Fibre cables to the connectors of the associated channels. Connect other interfaces to the controller: RS-

232C, I<sup>2</sup>C, etc. If you have removed the controller from an enclosure, follow the instructions provided by system vendor.

13. When finished with hardware installation, you may refer to Infortrend's *Generic Operation Manual* for instructions on how to configure your RAID. If your controller initializes successfully after the installation, you will be able to start "View and Edit SCSI Channel" to see if your newly-added channels have been correctly recognized by your controller.

## 4.8 How to Install/Replace Battery Backup Module

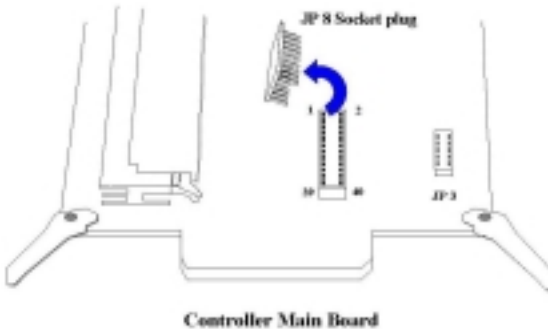
The controller operates using cache memory. However, if the controller operates with write-back caching and power failure occurs, the cache memory may contain buffered data that has not been made permanent on hard disks.

The buffered data is not retrievable when power returns unless a backup power has been provided. The combination of the IFT-9070D and IFT-9010D allows two battery packs to be daisy-chained for longer backup time and can sustain power supply 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.

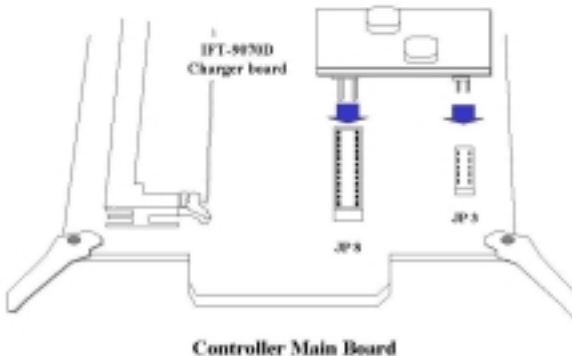
Each battery in the cell pack has a storage capacity of 3A/H when fully charged, and three cells are used for a total of 3.6V source. The charger circuit on IFT-9070D provides a 160mA charge until 1). a time limit of 90 minutes is reached; 2). a temperature limit of 65°C is reached. After fast charging,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

## To Install the IFT-9070D Charger Board and IFT-9010D Battery Cell Pack:

1. Make sure all power to the controller and drives are disconnected. Provide a static-free environment in your working area.
2. Remove controller main board from your enclosure (refer to section 4.5).
3. Locate the battery socket plug (loop-back circuit) that is inserted in JP8 (female pin socket).



4. Keep the socket plug for future use. Pin socket JP8 must be installed with either the socket plug or the charger board (charger circuit).



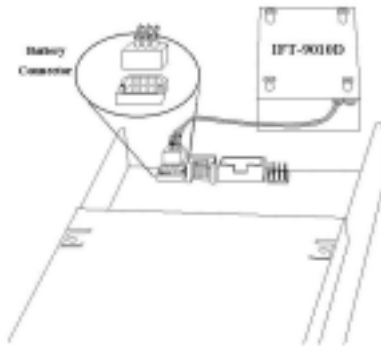
---

## **WARNING!**

*Be careful to properly insert the pins on the IFT-9070D charger board. All of the pins should be seated in the female pin sockets JP8 and JP3. Failure to properly insert the pins may result in serious damage to the controller.*

---

5. Install the IFT-9070D charger board onto the controller main board.
  6. Connect the cell pack to the 4-pin header on controller backplane. Either of the linking cables on the cell pack can be used. The shorter one is usually applied for cascading another cell pack.
1. Connect the cell pack to the 4-pin header (J4) on controller backplane.



Connecting a cell pack using to the 4-pin header on controller backplane

2. Integrators may provide pre-drilled holes in their canister for securing the cell pack using its four mounting positions.
3. Remember to attach the included plastic plug to the unused connector of the cell pack with the precaution that pins of an unused connector may be shorted to enclosure metal parts.



---

## **IMPORTANT!**

*You must install the socket plug back to JP8 once you have removed the IFT-9070D battery charger board. The controller will not work if you fail to do so.*

---

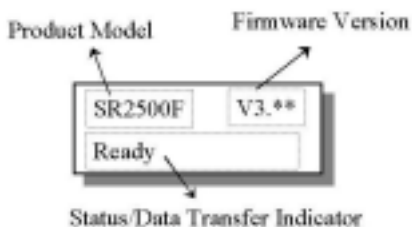
### **Notice for First Installation:**

1. It is possible that the linking cable connected between the IFT-9070D charger board and IFT-9010D cell pack would have a surface contact with components on the controller main board. While routing this cable from one side to the other, please take it into your consideration that some chip surfaces should be avoided. The surface temperature on chips like SCSI/Fibre processors may rise and damage the plastic shielding of a linking cable.
2. 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. The first time charge of battery cells takes about 24 hours to complete. When the installation of 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. Once the controller power is turned off, and there is unwritten data in cache memory, the battery will start discharging.
3. Inspect regularly and replace every **TWO** years; use official battery pack replacement and use with specified RAID controllers only.
4. Be sure to disconnect battery module before replacing the controller's DIMM module.
5. During normal use, an empty cell pack takes about 20 hours to recharge.

6. Disconnect battery module 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:  $>65\%\pm 10\%$ ).

## Power on the Storage Subsystem

1. Power on the RAID system. If the SCSI buses are properly installed and terminated, you should be able to hear the disk drives inside when they are spinning-up. Follow the boot device procedure as provided by the enclosure manufacturer. As a general rule, the RAID system should be powered on first before the host computer, since the RAID system usually takes a while to boot (waiting for the drives to be ready, then for the controller to be ready).
2. Normally all the storage will be used and should be ready before the host computer boots.
3. Wait for the controller LCD to indicate "READY" or "No Host LUN" before the host boots up.
4. Refer to the following diagram on how to read the LCD screen. The front panel LCD should light on. A few messages will appear on the LCD for a short while.



```
SR2500F v3* *  
No Host LUN
```

This screen is accompanied by two “beeps.”

```
Initializing...  
Please Wait...
```

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.

- OR -

```
SR2500F v3* *  
Ready
```

This is a normal message when a logical drive has been created and mapped to a host channel ID/LUN.

5. For other screen messages, please refer to Chapter 5 of the *Generic Operation Manual* that came with your controller.

# Chapter 5 System Information

In addition to reporting the working conditions of enclosure components, the controller is capable of self-monitoring. This chapter will reveal how to access these monitoring functions and the way to adjust the related parameters.

Please note that “remote” devices monitoring is dependent on the enclosure manufacturer’s implementation. The typical remote devices include chips for detecting fan rotation speed, power supply status, and temperature.

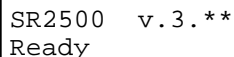
The controller’s status is displayed by the LCD screen and the terminal emulation, or through the RAIDWatch management software.

## 5.1 How to View System Environmental Information

### 5.1.1 Via LCD Push-button Panel

#### View Peripheral Device Status:

If the controller is properly installed, the controller LCD should display the following message:



```
SR2500 v.3.**
Ready
```

The on-screen message should contain model number, firmware version, and the current status of RAID configuration. “Ready” means

at least one logical drive has been mapped to host ID/LUN's. Before system configuration, the LCD will display "No host LUN."

Press **[ENT]** for two seconds to enter the main menu:

Press **▼** or **▲** to select "View and Edit Peripheral Dev," then press **[ENT]**.

```
View and Edit
Peripheral Dev  ↑
```

Press **▼** or **▲** to select "Ctrl Peripheral Device Config.," then press **[ENT]**.

```
Ctrl Peripheral
Device Config..
```

Press **▼** or **▲** to choose "View Ctrl Periph Device Status..."

```
View Ctrl Periph
Device Status..
```

Press **▼** or **▲** to browse through the menu items:

```
Voltage Monitor
..
```

```
Temperature
Monitor ..
```

```
Cooling FAN
Monitor ..
```

Listed below are read-only items that indicate voltage status. Press **▼** or **▲** to browse through the available items.

```
[+3.3v] 3.384V
Operation Normal
```

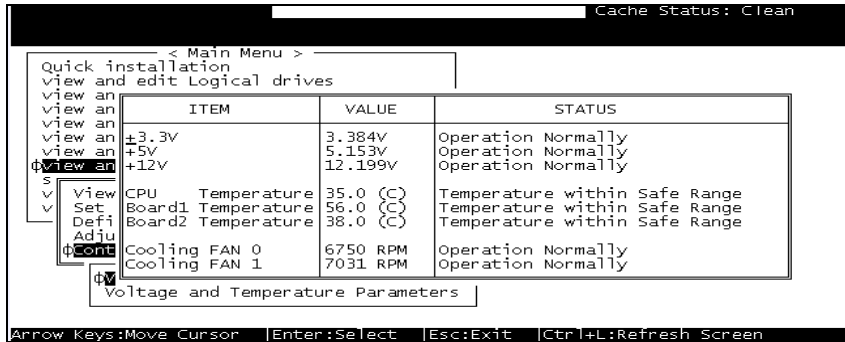
```
[+5v] 5.153V
Operation Normal
```

```
[+12V] 12.199V
Operation Normal
```

Follow the same method to check other aspects of system status. The fan status refers to the two cooling fans in the front panel. The detection of fan status can be disabled by jumper setting. Please refer to the Appendix D for more details.

## 5.1.2 Via Terminal Emulation

Open your PC Terminal Emulation screen. Enter the main menu and select “View and Edit Peripheral Devices.” Use the arrow keys to scroll down and select “Controller Peripheral Device Configuration,” “View Peripheral Device Status,” and then press **[ENTER]**.



The screenshot shows a terminal window with a title bar "Cache Status: Clean". The main content is a menu with options: "Quick installation", "view and edit Logical drives", "view an", "view an", "view an", "view an", "view an", "view an", "View an", "s", "v", "v", "View", "Set", "Defi", "Adju", "Cont", "Voltage and Temperature Parameters". A table is displayed with the following data:

ITEM	VALUE	STATUS
±3.3V	3.384V	Operation Normally
+5V	5.153V	Operation Normally
+12V	12.199V	Operation Normally
CPU Temperature	35.0 (C)	Temperature within Safe Range
Board1 Temperature	56.0 (C)	Temperature within Safe Range
Board2 Temperature	38.0 (C)	Temperature within Safe Range
Cooling FAN 0	6750 RPM	Operation Normally
Cooling FAN 1	7031 RPM	Operation Normally

At the bottom, a legend indicates: "Arrow Keys:Move Cursor |Enter:Select |Esc:Exit |Ctrl+L:Refresh Screen".

The controller operation status will be displayed.

## 5.2 Configuring Threshold Parameters

### 5.2.1 Via LCD Push-button Panel

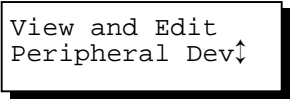
Changing the controller's threshold parameters for system alarm can help different users to modify the tolerance range of the self-monitoring function. Although the upper and lower thresholds can be modified, yet there is a safety limit embedded on both thresholds.

If a value exceeding the safety range is entered, an error message will prompt and the new parameter will be ignored. Under specific circumstances, for example, the controller operates in a system enclosure where the upper limit on ambient temperature is relatively high or low, adjusting the default threshold on temperature can coordinate the controller status monitoring with that of the system.

To increase or decrease the threshold values, follow the steps as described below:

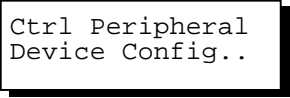
#### Temperature and Voltage Parameters:

Press **[ENT]** for two seconds to enter the main menu. Press **▼** or **▲** to select "View and Edit Peripheral Dev $\updownarrow$ ," then press **[ENT]** to confirm.




View and Edit  
Peripheral Dev $\updownarrow$

Press **▼** or **▲** to select "Ctrl Peripheral Device Config...," then press **[ENT]** to confirm.



Ctrl Peripheral  
Device Config..

Press **▼** or **▲** to select "Temperature and Voltage Parm...," press **[ENT]** to proceed.



Temperature and  
Voltage Parm ..

Here we use the configuration of board temperature thresholds as an example.



Trigger Threshold  
Board Temp Event



Press ▼ or ▲ to select "Trigger Threshold Board Temp Event," then press [ENT].

Press ▼ or ▲ to select the upper or lower threshold.

Upper Board Tem  
Event-Def (80C)

Lower Board Tem  
Event-Def (0C)

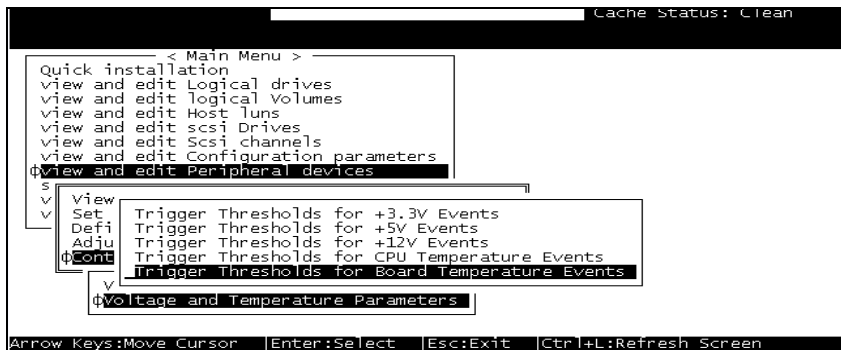
Press [ENT] to start configuration. Use ▼ or ▲ to enter any value within the safety range and press [ENT] to shift to next number, press [ENT] for two seconds to confirm. Any value beyond the safety range will be rejected by controller firmware.

Range 0°C-20°C  
Input : %

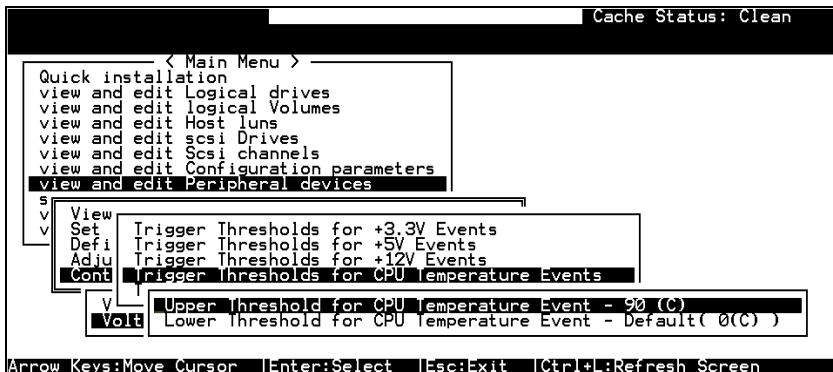
Follow the same method to modify other parameters.

## 5.2.2 Via Terminal Emulation

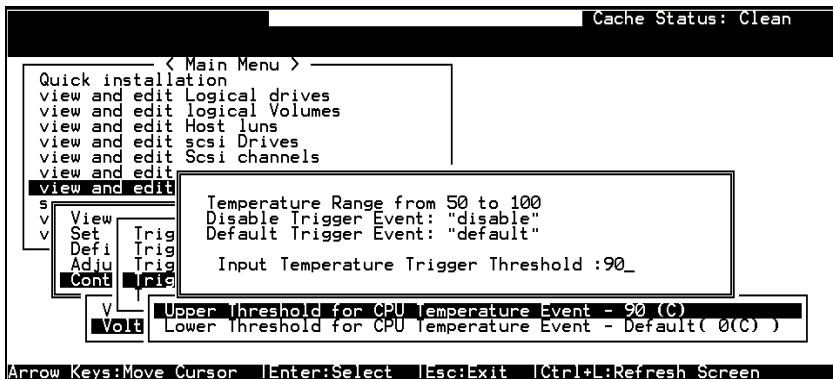
Open your PC Terminal Emulation utility. Enter the main menu and select "View and edit Peripheral devices." Use the arrow keys to scroll down and select "Controller Peripheral Device Configuration," "Voltage and Temperature Parameters," and confirm by pressing [ENTER].



Scroll down and select an item to configure.



Select an item, for instance, “Trigger Thresholds for CPU Temperature Events.” Press [ENTER] and a list of selections will appear. You can change the upper or lower threshold values. Press [ENTER] to confirm.



A configuration window will prompt. Enter any value within the safety range. Value exceeding the safety range will be rejected by controller firmware.



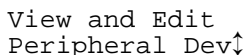
Follow the same method to modify other threshold parameters.

## 5.3 Adjusting LCD Contrast

The controller LCD contrast has been configured in an acceptable range before shipping. To modify LCD contrast:

### 5.3.1 Via LCD front panel:

From the main menu, select “View and Edit Peripheral Dev $\uparrow$ . ” Press  $\blacktriangledown$  or  $\blacktriangle$  to select “Adjust LCD Contrast..,” press [ENT] to proceed.

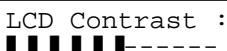


View and Edit  
Peripheral Dev $\uparrow$



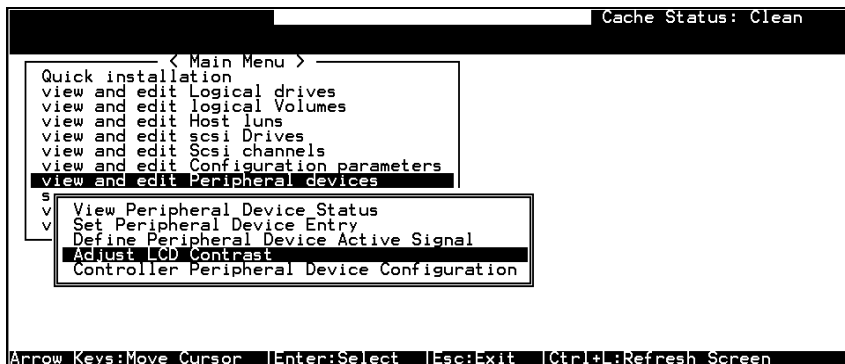
Adjust LCD  
Contrast ..

Press  $\blacktriangledown$  or  $\blacktriangle$  to adjust LCD display contrast. Press [ESC] to confirm.



LCD Contrast :  
██████████- - - - -

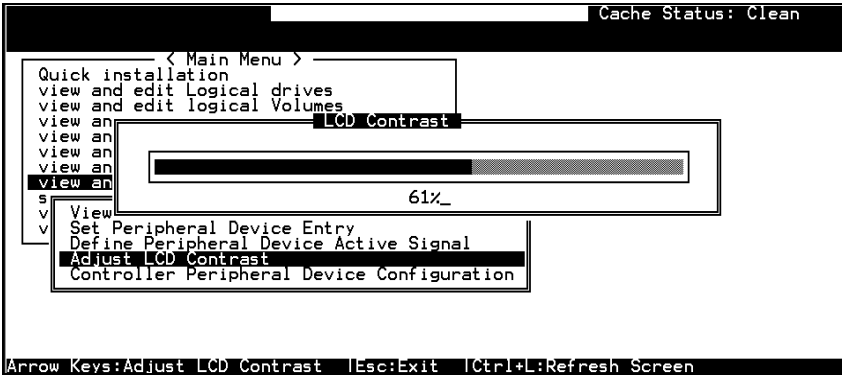
### 5.3.2 Via terminal emulation:



```
Cache Status: Clean
< Main Menu >
Quick installation
view and edit Logical drives
view and edit Logical Volumes
view and edit Host Luns
view and edit scsi Drives
view and edit Sesi channels
view and edit Configuration parameters
view and edit Peripheral devices
s
v
View Peripheral Device Status
Set Peripheral Device Entry
Define Peripheral Device Active Signal
Adjust LCD Contrast
Controller Peripheral Device Configuration
Arrow Keys:Move Cursor |Enter:Select |Esc:Exit |Ctrl+L:Refresh Screen
```

Select “View and Edit Peripheral Devices” from the main menu, press [ENTER] to confirm. Select “Adjust LCD Contrast,” and then press [ENTER].

When prompted by the status bar, use arrow keys to adjust LCD display contrast. Press [ESC] to confirm.



## 5.4 System Functions

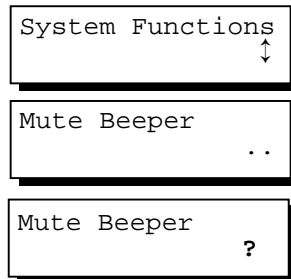
### Mute Beeper

When the controller’s beeper has been activated, choose “Mute beeper,” then press **[ENTER]**. Choose “Yes” and press **[ENTER]** in the next dialog box to turn the beeper off temporarily. The beeper will still be activated on the next event.

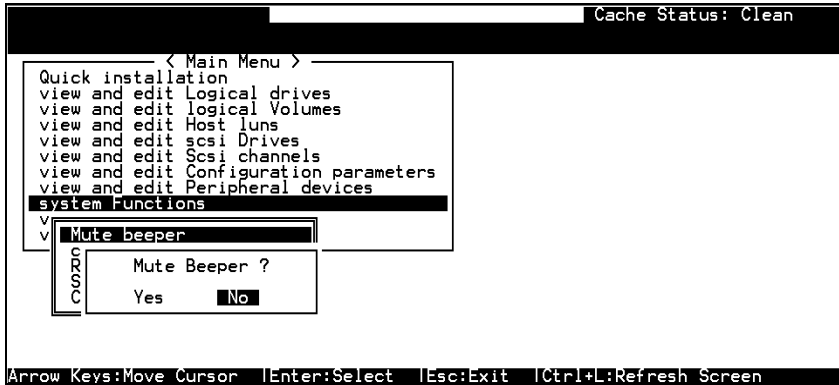
#### 5.4.1 Via LCD front panel:

From the main menu, select “System Functions↑.” Press ▼ or ▲ to select “Mute Beeper...,” press **[ENT]** to proceed.

Press **[ENT]** to confirm.

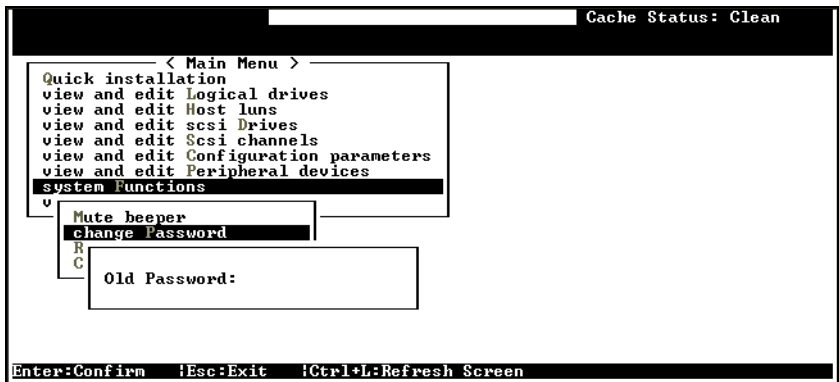


## 5.4.2 Via terminal emulation:



Select “System Functions” from the main menu, press **[ENTER]** to confirm. Select “Mute Beeper,” and then press **[ENTER]**. Choose yes to confirm.

## Change Password



Use the controller’s password to protect the controller from unauthorized entry. Once the controller’s password has been set, regardless of whether the front panel, the RS-232C terminal interface or the GUI RAID Manager is used, the user can only configure and monitor the RAID controller by providing the correct password.

---

## **IMPORTANT!**

- *The controller will verify the password only when entering the Main Menu from the initial screen or making configuration change. Always go back to the initial screen when the controller is going to be left unattended.*
  - *The controller password and controller name are sharing a 16-character space. The maximum characters for the controller password is 15. When the controller name occupied 15 characters, there is only one character left for the controller password and vice versa.*
- 

### **Changing the Password**

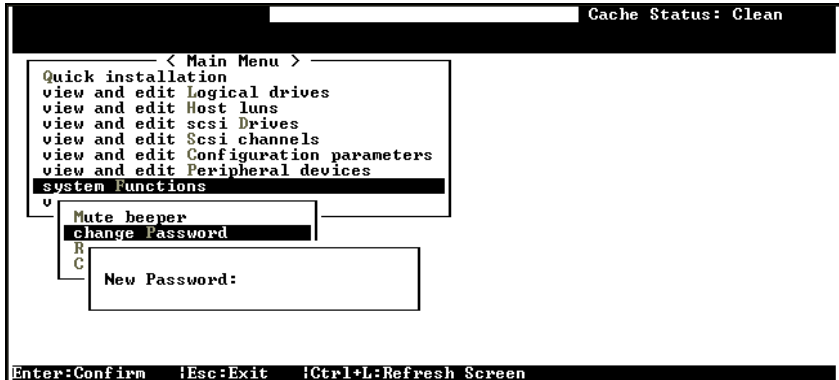
To set or change the controller password, move the cursor bar to “Change Password,” then press **[ENTER]**.

If a password has previously been set, the controller will ask for the old password first. If the password has not yet been set, the controller will directly ask for the new password. The password can not be replaced unless a correct old password is provided.

Key-in the old password, then press **[ENTER]**. If the password is incorrect, it will not allow you to change the password. Instead, it will display the message “Password incorrect!,” then go back to the previous menu.

If the password is incorrect, or there is no preset password, it will ask for the new password.

## Setting a New Password



Enter the desired password in the column, then press **[ENTER]**. The next dialog box will display “Re-Enter Password.” Enter the password again to confirm and press **[ENTER]**.

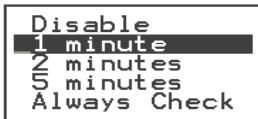
The new password will now become the controller’s password. Providing the correct password is necessary when entering the Main Menu from the Initial screen.

### Disabling the Password

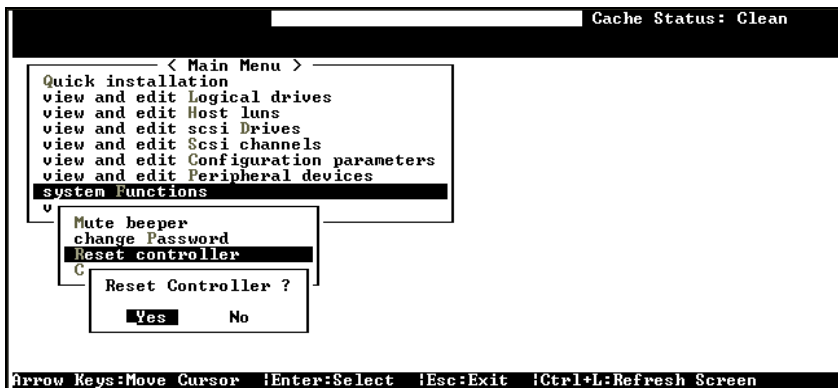
To disable or delete the password, press **[ENTER]** only in the password column that is used for entering a new password. The existing password will be deleted. No password checking will occur when entering the Main Menu from the initial screen.

## Setting the Password Validation Timeout

The time interval setting can be found in the “system function” submenu. Set checking time interval to ”Always check” if the controller is to be left unattended for a long time. Any configuration change will be inaccessible without re-entering the password. If the configuration screen is going to be left unattended for a period of time, settings from 1 minute to 5 minutes are available.



## Reset Controller

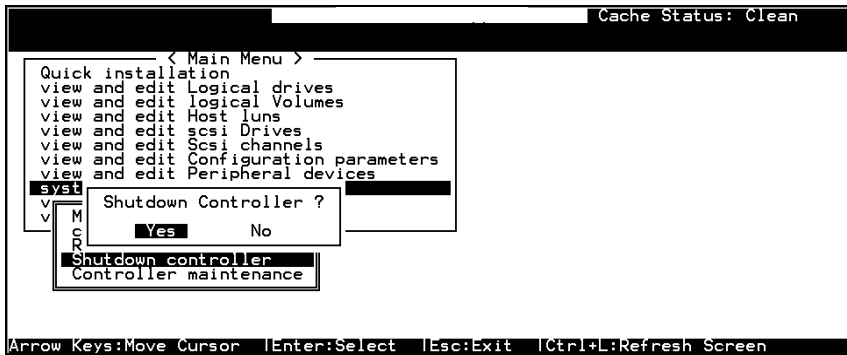


To reset the controller without powering off the system, move the cursor bar to “Reset Controller”, then press [ENTER]. Choose **Yes** in the dialog box that followed, then press [ENTER]. The controller will now reset as well as power-off or re-power-on.



## Shutdown Controller

Before you shutdown a controller, there may be unwritten data in cache. Use this function to flush controller cache memory before shutting down the system.



For downloading firmware functions, please refer to the Appendix C of your *Generic Operation Manual*.

# Appendix A      Hardware Specifications

## A-1 Configuration

Specification	Feature
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	4 on base module Up to 8 (with the expansion daughterboard)
Host interface	Ultra160 SCSI
Host channels	all channels can be configured as host or drive channels
Drive interface	Ultra160 SCSI
Drive channels	Up to 3 or 7 with the expansion daughterboard
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	Yes; main RAIDWatch agents included

memory	
Drive hot swapping	Yes
Controller hot swapping	Yes, via two 160-pin docking connectors (in redundant controller mode)

## A-2 Controller Architecture

Specification	Feature
CPU	PowerPC® 750CXe 600MHz microprocessor
SCSI controllers	LSI 53C1010 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	Ultra160 SCSI: up to 160Mbytes/sec
Real-time clock	For event messages with time record

## A-3 RAID Management

Specification	Feature
Performance monitoring	Yes
Remote control and monitoring	Yes
Event broadcast/alert	Yes (via Java-based RAIDWatch manager and Event Monitor)
Event notification	Yes (via RAIDWatch's sub-module, NPC)
Hardware connection	In-band over SCSI or Fibre, 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

## A-4 Fault Tolerance

Specification	Feature
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 <sup>2</sup> 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 2 <sup>nd</sup> temporary failed drive in a RAID 1, 3 or 5 logical drive	Yes
Salvage the 1 <sup>st</sup> temporary failed drive in a RAID 0 logical drive	Yes
Variable stripe size	<ul style="list-style-type: none"> <li>▪ Optimization for sequential:128KB</li> <li>▪ Optimization for random: 32KB</li> </ul>

## A-5 Software

Specification	Feature
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

## A-6 Controller Specifications

Specification	Feature
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"
Cache memory	At least 64MB, up to 1GB, PC-133 SDRAM DIMM socket x1
Firmware	Resides in 2MB Flash memory
NVRAM	32KB
Operating voltage	

<b>SentinelRAID 2500F</b>				
Main board				
	Normal	Peak	Idle	Power-up
5V	4A	5.5A	3.5A	4.0A
12V	0.2A	0.4A		
When charging battery:				
12V	0.4A	1.0A		
Main board + 9284FU3 (SCSI D/B)				
5V	5A	6.4A		
12V	0.2A	0.4A		
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			
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 12 meters with low-voltage differential			
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, redundant controller features, RS-232C COM-1 and COM-2, battery connector signal,			

	on-board alarm, external LCD module, SAF-TE status inputs, Ethernet port, I <sup>2</sup> C port and drive failure indication interface
--	----------------------------------------------------------------------------------------------------------------------------------------

# Appendix B Hardware Troubleshooting

<u>PROBLEM</u>	<u>CHECK</u>
LCD is off	<ol style="list-style-type: none"> <li>1. Check power connection of controller board and LCD panel.</li> <li>2. Requires minimum of 64MB SDRAM DIMM installed.</li> </ol>
7-segment LED flashes "F"	<ol style="list-style-type: none"> <li>1. DIMM module not installed yet.</li> <li>2. Socket plug (loop-back circuits board) for battery charger connector (JP8) not installed.</li> </ol>
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"> <li>1. Check cable connection</li> <li>2. Check ID numbers (must be unique for each device on the same SCSI channel).</li> <li>3. Make sure that SCSI channels are properly terminated.</li> <li>4. Check the voltage output of the power supply.</li> <li>5. Connect both power connectors</li> </ol>
Initialization failure	<ol style="list-style-type: none"> <li>1. Check ID numbers (must be unique for each device on the same SCSI channel).</li> <li>2. Make sure terminators are properly installed.</li> </ol>



Cannot detect SCSI drive	<ol style="list-style-type: none"> <li>1. Check drive power connection.</li> <li>2. Check drive SCSI cable connection.</li> <li>3. Check ID numbers (must be unique for each device on the same SCSI channel).</li> </ol>
Host can not detect the controller	<ol style="list-style-type: none"> <li>1. Check host-side SCSI cable connection.</li> <li>2. Check SCSI port to LUN assignment.</li> <li>3. Check logical drive's mapping to LUN.</li> <li>4. If there is no logical unit created, the controller must be set as a peripheral device.</li> </ol>
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"> <li>1. SCSI cable length must be within the range of specifications.</li> <li>2. Make sure terminators are properly installed.</li> <li>3. Power supply voltage must be within specifications.</li> <li>4. Check the enclosure's inner temperature.</li> </ol>
When using "Scan New SCSI Drive" and the desired ID is empty, an empty drive entry appears	Remove the empty drive entry

<p>The RS-232C Terminal Interface does not work.</p>	<ol style="list-style-type: none"> <li>1. Check RS-232C cable connection.</li> <li>2. Check if the Baud Rate settings on both ends identical.</li> <li>3. Enable Terminal Emulation.</li> <li>4. Set “Data Routing Direct to Port” in the “ Communication Parameters.”</li> </ol>
<p>When choosing “Configure Modem Port”, the screen is full of “ Comm Buffer Overflow”.</p>	<p>“Terminal Emulation” should be enabled after all modem configurations are completed.</p>
<p>The logical drive states “INVALID”.</p>	<ol style="list-style-type: none"> <li>1. “Optimization for ... I/O,” the logical drive caching parameter is different from the current setting.</li> <li>2. Change “Optimization for ...I/O” to the opposite setting and reset the controller.</li> </ol>
<p>In “View and Edit SCSI Drives” or “View and Edit SCSI Channels”, the speed is only “80Mhz” (Ultra160 machines), not “160Mhz”</p>	<p>“80Mhz” is SCSI sync frequency, not transfer rate.</p>
<p>All settings are too complex to remember.</p>	<ol style="list-style-type: none"> <li>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.</li> <li>2. Save NVRAM to a file or to drives</li> </ol>

<p>Upon replacing the failed controller with a new one during redundant controller connection, nothing appears on the LCD of the new controller.</p>	<ol style="list-style-type: none"> <li>1. Set the new controller as “redundant controller enabled” before connecting to the active controller.</li> <li>2. Connect the new controller to the active controller and choose “Deassert failed controller” on the active controller.</li> <li>3. Refer to “Chapter 12, Redundant Controller of your Generic manual” for more detail.</li> </ol>
<p>Error: Check DRAM Installed?</p>	<p>Check to see if a DIMM module is installed or properly installed. Reinstall a DIMM module will usually solve the problem.</p>
<p>SR2000 v3.** No Host LUN</p>	<p>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.</p>
<p>SR2000 v3.** Ready</p>	<p>This is a normal message when a logical drive has been created and mapped to a host channel ID/LUN.</p>
<p>[Other error messages]</p>	<p>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.</p>

# Appendix C      SCSI/Fibre Cable Specifications

The recommended SCSI cable for an Ultra160 LVD SCSI operating at a transfer rate of 80 or 160 Mbytes/sec. is described below.

<b>Electrical</b>	
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.)

## SCSI Standards, Cable Length and Corresponding Maximum Possible Drive Connections

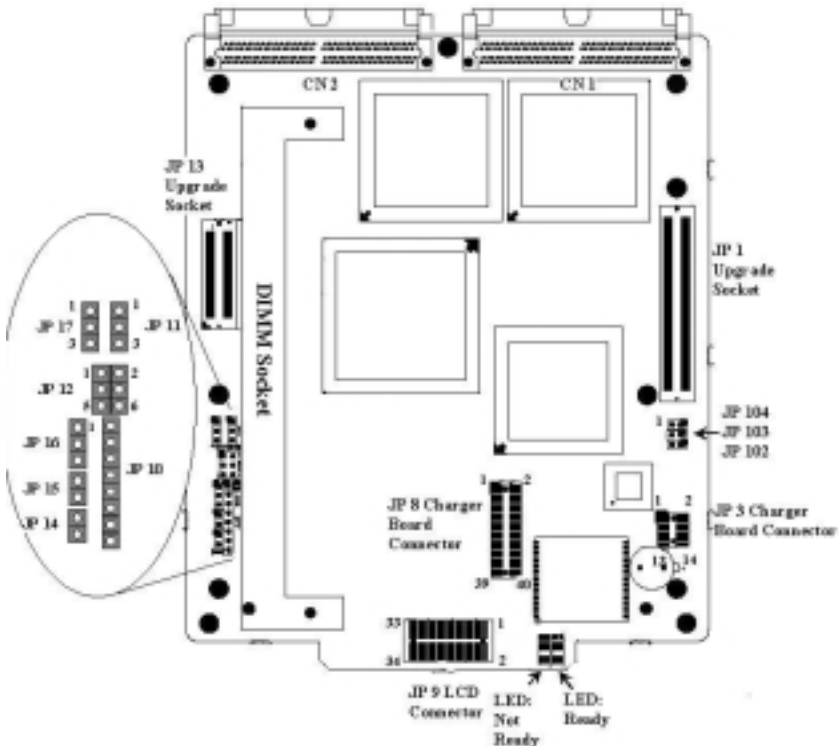
	Single-Ended	Differential	Ultra2	Fibre	Maximum Devices
Ultra2 Wide SCSI	-	-	12 m	-	16
Ultra160 SCSI	-	-	12 m	-	16

## SCSI Bus Width and Maximum Throughput

	Bus Width	SCSI Bus Sync. Frequency	Max. Bus Throughput
Ultra2 Wide SCSI	16-bit	40 MHz	80 MB/Sec
Ultra160	16-bit	80 MHz	160 MB/Sec

# Appendix D Connectors and Jumpers Identification

## D.1 Controller Main Board Interfaces



Connector	Description
<b>JP 1</b>	Daughterboard upgrade socket
<b>JP 2</b>	reserved
<b>JP 3</b>	Charger board (IFT-9070D) connector
<b>JP 8</b>	Charger board (IFT-9070D) connector

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

- **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. When the default is restored, power off and remove the jumper cap.

## JP 12 LED Connector Pinouts

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

## JP1 LCD Pin Header (17 x 2) for 2-line LCD Module

JP1 LCD connector pinouts

Pin	Pin Name	Pin	Pin Name
1	VCC	2	GND
3	LCDLVO	4	LCDSA2
5	LCDRW-	6	BXDCS2
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

### Connector Pin Name Descriptions:

Pinout Description

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

## Charger Board Connectors:

### JP8

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

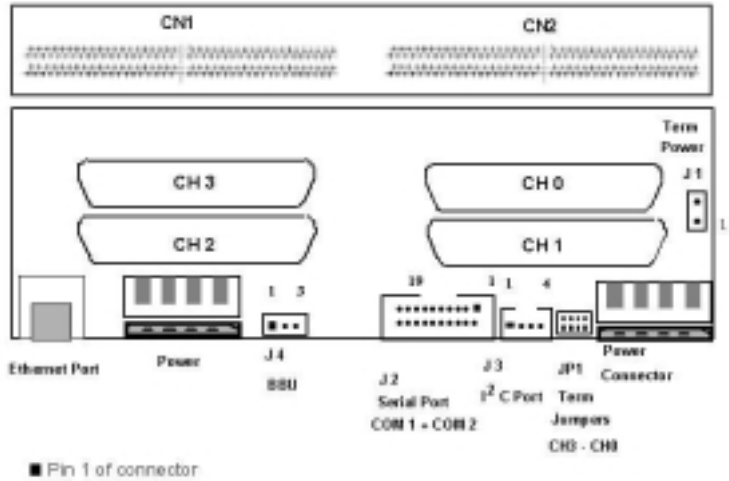
### JP3

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	TRI2CLK	14	GND



## D.2 Controller Backplane

### Controller Backplane Drawing



## Serial Port: COM 1 and COM 2 (J 2)

### Serial Port Pinouts

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

### Serial Port Pin Descriptions:

#### Pinout Descriptions

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)

## I<sup>2</sup>C Port (JP-3)

I<sup>2</sup>C Port Pinouts

Pin	Pin name
1	I <sup>2</sup> CCLK
2	GND
3	VCC
4	I <sup>2</sup> CDATA

## Ethernet Port

RJ-45 Pinouts

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

## I<sup>2</sup>C Connector Pin Name Descriptions:

Pinout Description

Symbol	Type	Description
GND	G	Signal ground
I <sup>2</sup> CCLK	O	I <sup>2</sup> C clock
I <sup>2</sup> CDATA	O	I <sup>2</sup> C data
VCC	P	+5V voltage input

## J 1 SCSI Terminator Power

This 2-pin header provides an auxiliary 5 V 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

## Battery Connector (JP-4)

**Battery Connector Pinout (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

## D.3 Accessories

### IFT- 9011 Null Modem

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

### IFT-9012 RS-232C Extension Cable

Extend the cable length only, no wire swap.
---------------------------------------------

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