

SentinelRAID 150

Ultra160-to-Ultra160 SCSI RAID Controller

Hardware Manual

Revision: 1.1



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About This Manual

This manual provides the necessary information a system administrator with knowledge in SCSI and RAID technologies needs to install and/or upgrade the SentinelRAID 150 RAID controller. For information on the configuration and use of the controller, please refer to the ***Generic Operation Manual***.

The manual will be continuously updated to be compatible with the newest releases of product versions. This manual (v. 1.1) is fit for the operation with SentinelRAID 150 of the following hardware and firmware versions:

PCB Version: 1.0 or above

PCBA Version: 1A or above

Firmware Version: 3.12 or above

Part no. for this manual: M3252UPH12

Related Publications

Other manuals that may be necessary during controller installation include:

- Management Software: RAIDWatch User's Guide (the Java-based GUI RAID Manager)
- Other manuals for SCSI drives, host system, enclosure, and other components

Revision History

10/22/'00 initial release 1.1

RMA Policy

Please visit our websites

(www.infortrend.com/www.infortrend.com.tw) for details on our RMA policy.

Standard Package Content

- SentinelRAID 150 RAID controller
- A CD title for drivers and utilities
- Generic operation manual
- This hardware manual
- IFT-9016 serial cable
- IFT-9011 null modem
- IFT-9531 bezel key

The battery backup module (IFT-9070C + IFT-9010C) is an optional item.

Overview

Introduction

Thank you for purchasing the SentinelRAID 150. The controller is an Ultra160-to-Ultra160 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 is completely independent of the host system's operating system. All RAID functions are performed by an IBM 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 several hard disks into one contiguous volume and providing availability, integrity, and performance to storage.

Important Features:

Fault Tolerance: 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 supported with dedicated or global spare drive. Controller automatically disconnects with a failed drive and rebuilds data onto a spare drive, 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 of a failed drive and detection of a reserved drive. All these failure recovery procedures are transparent to the host system.

Flexible Configuration: All channels are Ultra160 and can be configured as host or drive. Physical drives can be configured into 8 logical drives and 8 logical volumes can be created from one or several logical drives. Users may divide the storage capacity by partitioning each of the logical units into 8 portions. Variable RAID levels can be applied to different logical units with the support of dedicated spare drives. Two or more LUN's can be

mapped to the same logical drive for redundant host operation. Host LUN mapping allows a variable combination of each host channel ID with up to 32 LUNs.

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

Expansion: The controller supports up to 8 Ultra160 channels by adding an expansion daughterboard.

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

Other Important 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 operating modes with logical volumes:
 - RAID 10: Logical volume with RAID 1 logical drives spanning
 - RAID 30: Logical volume with RAID 3 logical drives spanning
 - RAID 50: Logical volume with RAID 5 logical drives spanning
- ⇒ Comprehensive failure management including:
 - Automatic bad block reassignment
 - Drive hot swapping
 - Spare drive operation (supports both Global Spare and Dedicated/Local Spare)
 - Background and concurrent 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

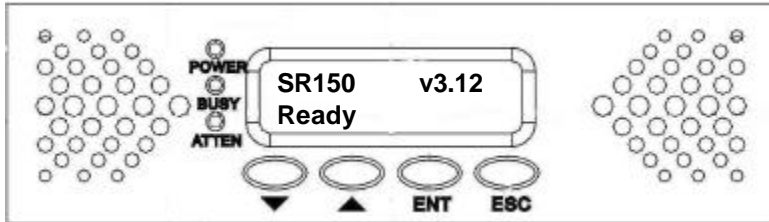
- Supports S.M.A.R.T. drive functionality
- ⇒ Works with any operating system without additional software drivers
- ⇒ 5.25" drive profile allows easy integration into external subsystem enclosures or directly into the host system's drive bay
- ⇒ Up to seven drive channels for a total of 105 connected drives (SCSI operation)
- ⇒ Supports up to 15 SCSI ID's per channel
- ⇒ Up to 8 partitions per logical drive; a total of 64 partitions are supported
- ⇒ Controller, 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)
- ⇒ Concurrent and background logical drive initialization
- ⇒ Performance optimization for either sequential or random I/O
- ⇒ Allows multiple drive failure and concurrent multiple drive rebuild of a RAID (0+1) logical drive
- ⇒ Configuration of individual SCSI target parameters
- ⇒ Prior to first disk access, it allows adjustment of delay time during controller initialization to enhance compatibility with slow-initial drives
- ⇒ Two or more SCSI channels can be simultaneously set as host interface for redundant host system 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
- ⇒ SDRAM DIMM supports ECC function
- ⇒ Up to 1GB of intelligent Read-ahead/Write-back cache
- ⇒ Write-through, write-back, Multi-threaded intelligent predictive read-ahead, optimized sorted grouped writes
- ⇒ Supports TELNET with PPP protocol for remote administration
- ⇒ Cross-platform and Java-based RAIDWatch GUI manager; RS-232C terminal interface for RAID management
- ⇒ SAF-TE support

- ⇒ Supports ISEMS via PC interface for enclosure management (ISEMS: Infortrend Simple Enclosure Management Service)
- ⇒ In-band TextRAID Manager provided for configuration through SCSI cable rather than RS-232C
- ⇒ TCP/IP agents provided for remote administration via RAIDWatch manager or SNMP trap event monitoring with third-party SNMP software
- ⇒ Controller self-monitoring features: monitors the voltages (+5 and +12), temperature (CPU, ASIC, board), and fan rotation speed status (front panel fans)
- ⇒ Dual power connector design: to avoid single point of failure on the power connector and also guarantees a more efficient power source

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.

Hardware Introduction

2.1 Locations of the Parts



Front View

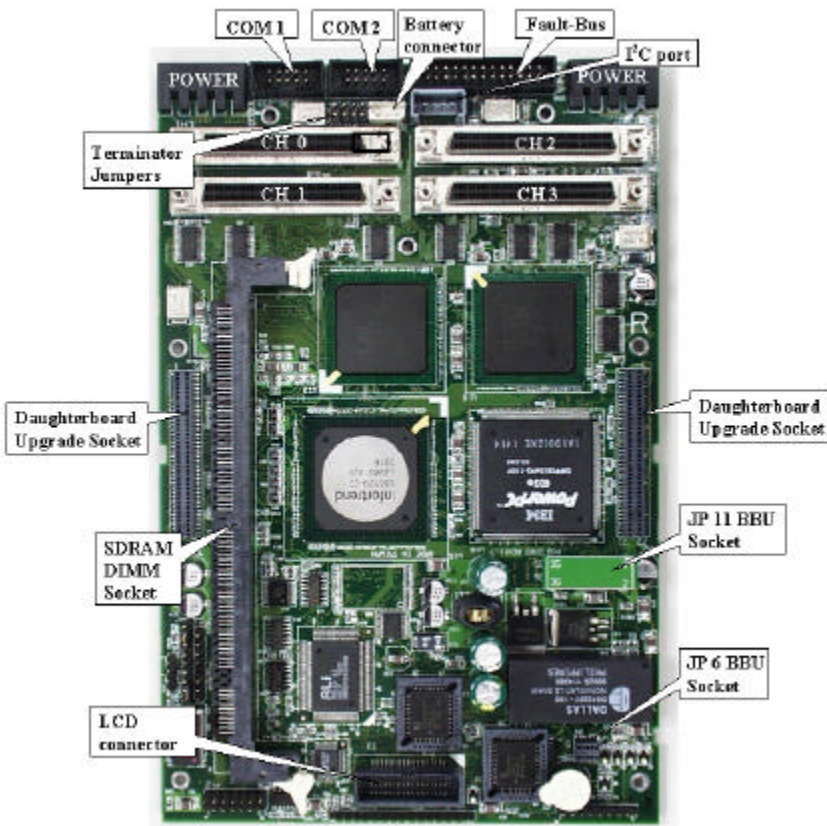
2.1.1 LCD Panel

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 execute 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.

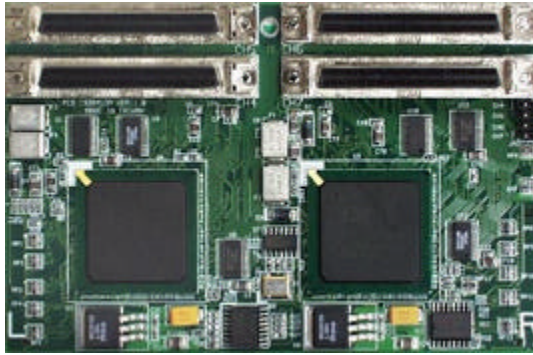
2.1.2 Mounting Holes:

The controller can be installed into any industry 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 eight mounting holes on the sides of the controller. Screws driven into the controller chassis should not extend $5.15/\pm 0.3$ mm. Longer screws may cause electric shorting inside the controller. Use M3 screws for controller top cover.

2.1.3 The Controller Main Board



2.1.4 Optional Daughterboard

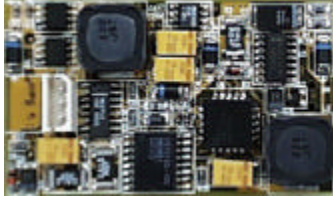


IFT-9284U3A
(4 Ultra160 channels)

2.1.5 Accessories

Battery Module: optional

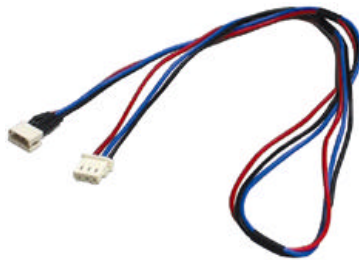
Optional battery backup module



IFT-9070C
(Battery backup daughterboard - charger circuit)



IFT-9010C
(Battery cell pack)



IFT-9519
(Extension Cable for connecting and cascading battery cell packs)

Cables and accessories: included in kit



IFT-9016
(cable for Serial COM 1 and COM 2)



IFT-9011
(Null Modem)



IFT-9531
(Bezel Key)

Getting Started

3.1 Considerations

Ventilation

Infortrend RAID controllers use a convection-cooled processor; however, airflow across the heat-generating chips is required for operation within the normal temperature range. Failure to provide an enclosure capable of sufficient airflow across controller board may void our warranty. Controller and drives should be operating at an ambient temperature under 50°C. The voltage safety tolerance is listed in Appendix A (A.6).

Static-Free Installation

Static electricity can damage electronic components. Most of the RMA's Infortrend receives are the results of improper installation and ESD damage. Before proceeding with controller unpacking, discharge your body's static electric charge by touching a grounded surface and put on a grounded anti-static wrist strap. For example, if the system unit is connected to a grounded outlet you can touch any part of the system's unpainted metal chassis.

- Do not remove controller from the anti-static bag until you are ready to install. Do not lay PCB board on top of the anti-static bag. Only the inside of the bag is anti-static.
- Handle PCB boards by holding their edges.
- 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.

Jumpers and Connectors

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 Appendix D.

Notice for Unpacking:

Provide a static free environment to unpack before installing 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 listed in the packing list is missing, please contact Infortrend for assistance.

3.2 Assumptions

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

RAID controller is the accelerator of storage I/O functions in a storage system. These functions include the capabilities to provide storage I/O bus performance, to assemble large amount of disk drives into a contiguous whole, and many more. The controller, as well as all the hard drives, should be mounted in a cabinetry and provided with power supply and ventilation.

In spite of the fact that the configuration of a storage system may be totally different using different kinds of drive enclosures and cabinetries with the controller, 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
2. Disk drives installed in drive enclosure(s); the controller may be accomodated with drives in the same enclosure

3. Environmental monitoring capabilities on the enclosure(s) through the supported SAF-TE, I²C port, or Fault-bus interface.
4. External terminators and SCSI cables that are adequate for Ultra160 SCSI channels
5. Environmental Requirements:

Electrical

Input	+5VDC \pm 5% (max. 7.0A; normal 6.0A)
	+12VDC \pm 10% (max. 100mA)

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 RAID controller into the cabinetry
2. Cabling between controller and drives/drive enclosure(s)
3. Cabling between controller unit and host computer
4. Cabling of other interfaces
5. Installing software utilities and configuring physical drives into RAID

3.3 Steps Necessary for Installing the Controller

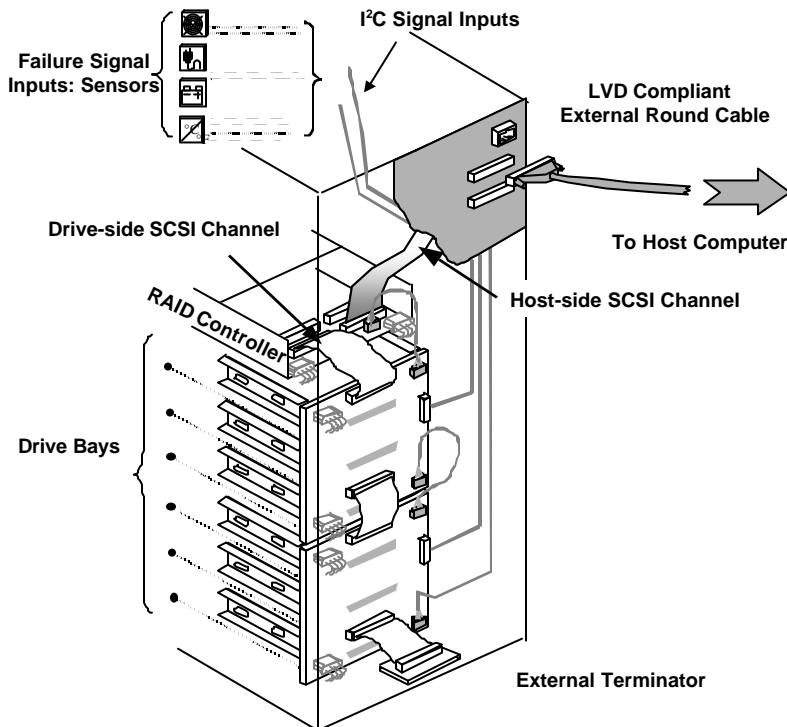
Steps for the Hardware Installation:

1. Unpack the controller carefully from its package; or, if you are upgrading controller components, turn off all power to the server and RAID enclosure. If you are installing memory to a new controller, jump to step 3. A minimum of 32MB is required.
2. After you turn off the controller power and unplug the power cords, remove the controller from the enclosure cabinet or chassis where it is located. Do not connect or disconnect cables when system power is on.
3. Locate and unscrew the four fasteners on the sides of controller. Remove the controller top cover.
4. When controller front panel and 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 controller. Make sure that battery module is disconnected before installing or upgrading DIMM module.
7. Check if all the SCSI bus components (cable type, cable length, terminators, and ID setting) you use meet the SCSI convention.
8. Preparing drives: Please refer to the installation instructions provided by drive manufacturers for information on jumper configuration.
 - Remove terminator 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 on its drive backplanes.
9. Install the controller in the server/enclosure and attach the SCSI/serial cables and terminators as needed. If using on-board terminators for SCSI termination, please refer to the following chapter 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. Fault-bus and I²C cables should be provided with the

enclosure. Turn power on after all components are correctly installed.

- 11.** Install the controller software utilities or RAIDWatch manager. Software on the host can communicate with the controller either through RS-232 serial port or SCSI cable.
- 12.** 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/drive configuration is available. The on-board terminator has been enabled on the drive side SCSI channel. On the other end of the SCSI cable, an external terminator is applied. Termination on all the SCSI drives should be disabled. The enclosure environmental management service may be built on different interfaces. Connection to the remote devices (fans rotation speed detector, power supply status, temperature sensors, etc.) may be using SAF-TE, Fault-bus, or the I²C interface as displayed in the example.

NOTE:

It is recommended to force enabled the terminator circuits on host/drive channels and to 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:

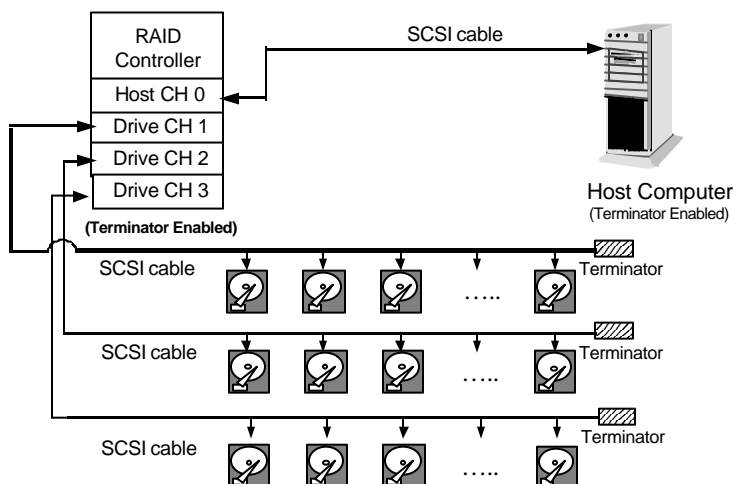
- 1. Refer to the installation documents that came with your drive enclosure for information on jumper configuration.*
 - 2. Disable SCSI termination on all drives.*
 - 3. Enable termination power from the drive to the SCSI bus.*
 - 4. Set a unique SCSI ID address on each drive. ID7 should be avoided, which is a default reservation for the controller itself.*
 - 5. Install your drives into the enclosure following the related documents provided with your enclosure.*
-
-

3.4 Sample Topologies

Supported Configurations:

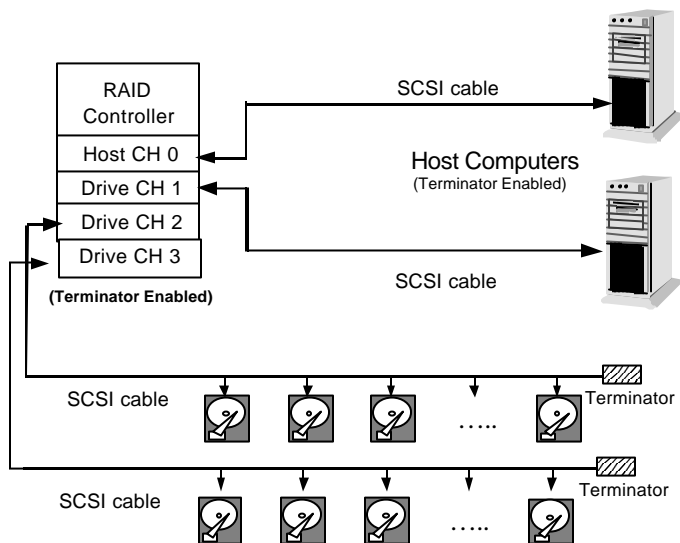
Single-Host Configuration

An example of the operational setup is shown below:



- The SCSI cable must be shorter than 12 meters using high-quality SCSI cable and terminators.
- Channel 0 is usually connected to the Host system.
- Drives are connected to 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 is applied when the array is shared by two or more systems. Using each host channel for a host adapter physically isolates one from another. This configuration is especially useful when two systems are not allowed to be sharing the same SCSI bus. Unless some file system "Locks" is available, the capacity of storage should be divided into different logical drives or logical volumes, and each logical unit should be mapped to different host channel.

To Connect the Components:

1. Make sure power is off or the power connector is disconnected.
2. Connect channel 0 of the controller to the Host system's SCSI port using a LVD compatible external SCSI cable as recommended by the HBA vendor. Usually it is necessary to connect from the controller to the outside of RAID enclosure. Use cables recommended by HBA vendor.
3. Make sure the host side of the SCSI cable is properly terminated.

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' and '8' and '15.' The default ID of the controller's channel 0 is '7.'
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 of the channels can also be set as the Host interface. More than one channel can be set as the Host interface when operating with redundant Host or multiple Host systems.

3.5 Software Utilities

Requirements for Using the Configuration Utilities:

There are different ways to configure a RAID system: through the use of LCD front panel, firmware embedded configuration utilities, Text-Based Manager, 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 and controller should be established.
3. Text-Based Manager: communicates through the host-controller SCSI connection using the In-Band SCSI protocol or RS-232 connection. Host-side parameters should be adjusted before the host computer can see the controller. You may find the program in the CD that came with your controller.
4. Java-Based GUI RAID Manager: communicates through the host-controller SCSI connection using the In-Band SCSI protocol. Host-side parameters should be adjusted before the host computer can see the controller. This is especially the case when users start configuring a RAID with the GUI manager from the beginning.

3.5.1 In-Band SCSI

What is it and why do you need it?

Management software (TextRAID manager and GUI manager) can use SCSI cabling and protocols to manage a RAID controller. However, a host computer can only "see" a RAID controller only when certain number of disk drives have been configured into logical units and mapped to host ID/LUN combinations. The other way for a host to see a RAID controller is to configure the controller as a peripheral device.

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 sent to and

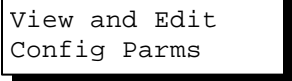
received from the SCSI RAID controller. It can be used to communicate between host and controller. The Java-Based GUI RAID Manager can administrate the RAID controller via SCSI connection. (Note: It is assumed that users of In-band SCSI possess the following: a third-party SCSI adapter and a channel 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

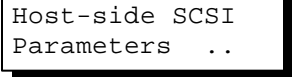
Use the front panel to configure the In-band SCSI settings.

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 will 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. Find in the table below the proper settings for your host operating system.

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

Operating System	Peripheral Device Type	Peripheral Device Qualifier	Device Support for Removable Media	LUN Applicability
Windows NT® 4.0	0x1f	Connected	disabled	All Undefined LUNs
NetWare® 4.x/Windows2000	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 Undefined LUN
```

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

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

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

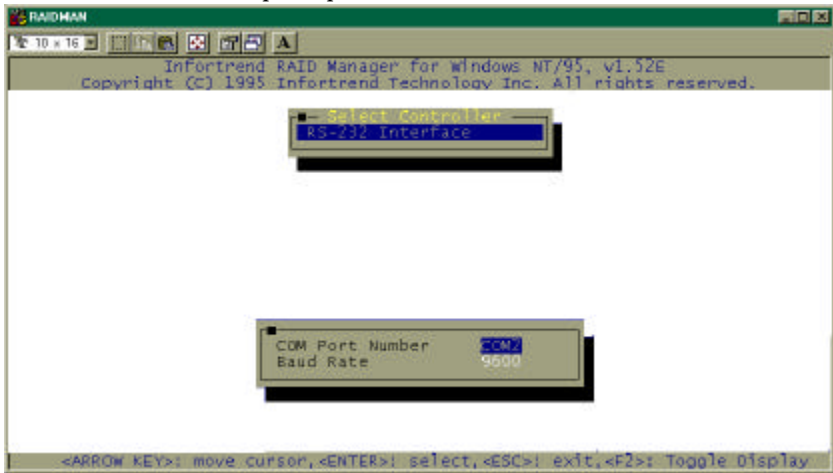
LUN Application-
Undefine LUN-0's

The RAID controller adjustments necessary to use In-band SCSI have been completed.

3.5.2 Using TextRAID Manager

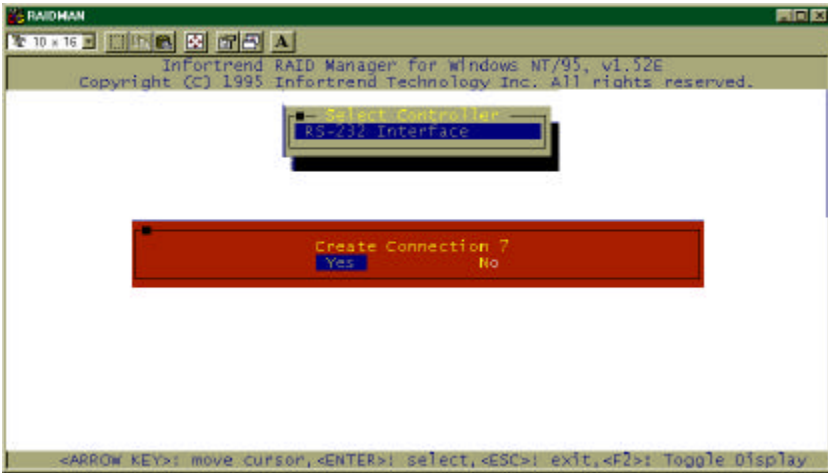
Connection — Using RS-232C

To configure your RAID through the TextRAID Manager, use an RS-232 cable to connect your host computer to the controller. Insert the "Drivers and Utilities" CD provided by Infortrend into your CD-ROM drive. Locate and execute the TextRAID manager program <drive letter of CD-ROM drive>:\3102\RaidUtils\WIN95\Raidman.exe. The initial screen will prompt.



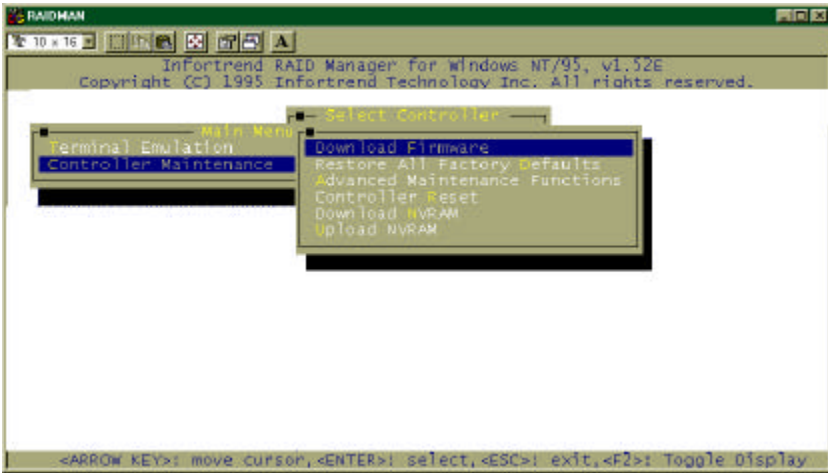
Change the COM port number to where you have connected the RS-232C serial and set the baud rate identical to the baud rate setting of your controller. You may also refer to the *Generic Operation Manual* for more details.

When finished with configuring the COM port and baud rate, press **[Esc]** to proceed.



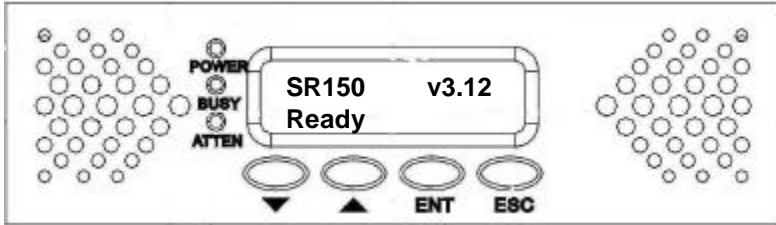
Choose **Yes** to establish the connection between host and controller.

Select “Controller Maintenance” or “Terminal Emulation” and press **[ENTER]** to proceed.



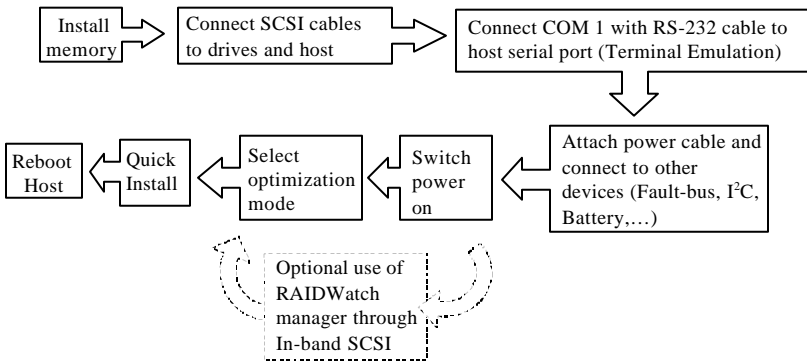
Now you can configure your RAID by the TextRAID manager. The terminal emulation operation will be discussed in the *Generic Operation manual*.

3.6 Quick Installation



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

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, “SR150 V3.12 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 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, “SR150 v3.12 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. SR150 stands for the SentinelRAID 150. You may setup a controller name to be displayed on LCD. Please refer to your Generic Operation Manual for details.*
-
-

Hardware Installation

4.1 Removing Controller Top Cover

1. Unpack the controller carefully from its package; or, if you are upgrading controller memory, turn off all power to the server or RAID enclosure. If you are installing memory to a new controller, jump to step 3.
2. After you turn off the controller power and unplug the power cords, remove the controller from the enclosure cabinet or chassis where it is located.
3. Locate and unscrew the four fasteners on the sides of controller. Remove the controller top cover.
4. With controller front panel and top cover removed, you may continue with installing or upgrading hardware components.

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.

4.2 Installing/Upgrading SDRAM DIMM's

The following are guidelines on using SDRAMs:

- Use 168-pin SDRAM DIMM module (buffered/unbuffered DIMM are supported). SDRAM DIMM that meets PC-100 standard is recommended.
- A DIMM with or without parity can be auto-detected by the controller. A DIMM with parity is recommended for security.
- The minimum SDRAM required is 32Mbytes installed in a DIMM socket, however, greater memory size is recommended.

The controller supports between 32MB and up to 1GB (architectually) SDRAM DIMM modules.

CAUTION:

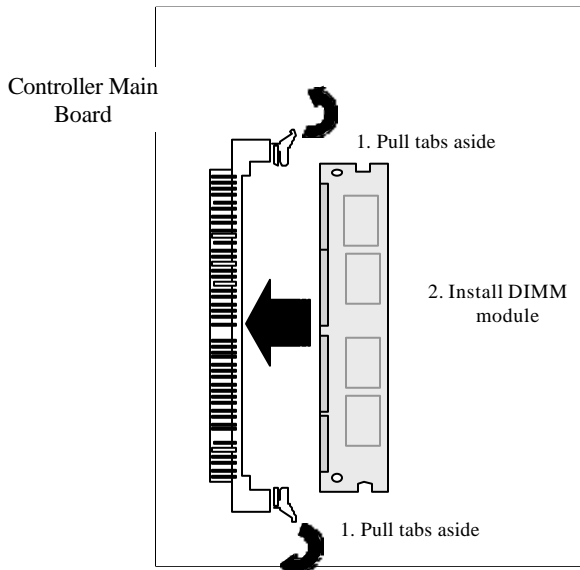
Anti-static methods should be applied before installation takes place. Before touching the memory module, discharge your body's static electric charge by touching a grounded surface. For example, if the system unit is connected to a grounded outlet you can touch any part of the system's unpainted metal chassis.

- *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.*
 - *Handle memory cards by holding its edges.*
 - *Avoid touching the chips and connector pins.*
 - *Avoid carpet, plastic, vinyl, styrofoam in your work area.*
 - *Make sure all components are room temperature before working with them.*
-
-

How to Install/Upgrade SDRAM DIMM's

To install the SDRAM DIMM:

1. Before installation, make sure that there is no power connected to the controller and ESD (Electrical Static Discharge) protective measures have been applied. Before installation, you have to remove chassis top cover. Please refer to section 4.1 for details on removing controller top cover.
2. Remove daughterboard and battery module before installing or replacing DIMM's.
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.



IMPORTANT:

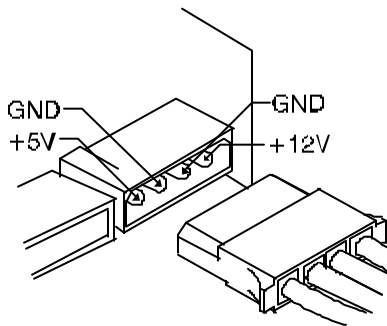
The SentinelRAID 150 controller requires a minimum of 32 Mbytes SDRAM DIMM (with or without parity function) installed in the DIMM socket in order for it to operate.

WARNING:

Do not attempt to install, remove, or upgrade a SDRAM DIMM on the SentinelRAID 150 with the battery installed. Damage to the controller components will occur.

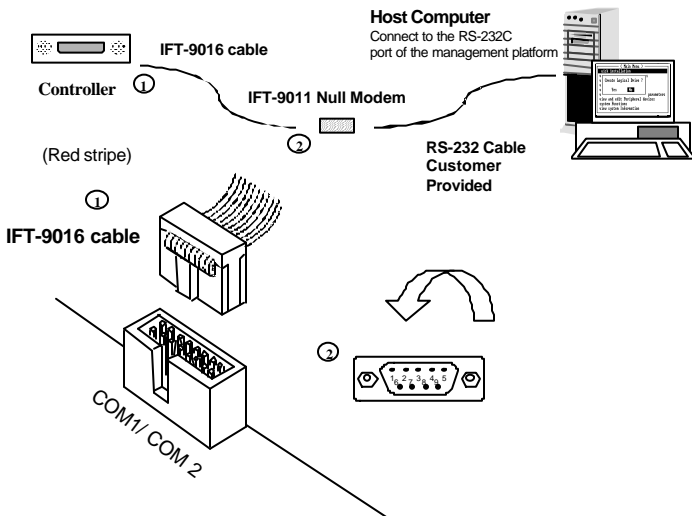
4.3 Power Connection

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.



4.4 How to Connect RS-232C Terminal Emulation

The SentinelRAID 150 controller can be configured via a PC running a VT-100 terminal emulation program, or a VT-100 compatible terminal. The provided RS-232 cable (IFT-9016) receives the RS-232 signals from the 10-pin header on the controller and ends with a 9-pin D-Sub male connector. The pin layout of the 9-pin D-Sub male connectors is similar to that of a PC's serial port and is set as a DTE device. The proper connection of the cable and pin layout is displayed in the diagram below. 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 1 and COM 2 can also be used for a direct connection to a modem. Dial-out modem operation for remote management is supported.



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.
- On the Hyper Terminal of Windows 2000, due to its mis-interpretation, the arrow keys might not work properly. The following key combination can be used instead:

Ctrl-J = Down arrow

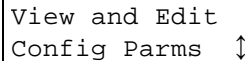
Ctrl-K = Up arrow

Ctrl-H = Left arrow

Ctrl-I = Right arrow

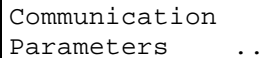
The baud rate can be changed using the front panel. To change the baud rate:

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



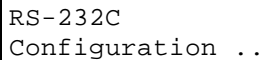
```
View and Edit
Config Parm's ↓
```

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



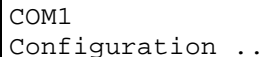
```
Communication
Parameters ..
```

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



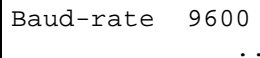
```
RS-232C
Configuration ..
```

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



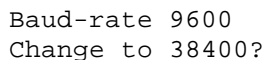
```
COM1
Configuration ..
```

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?
```

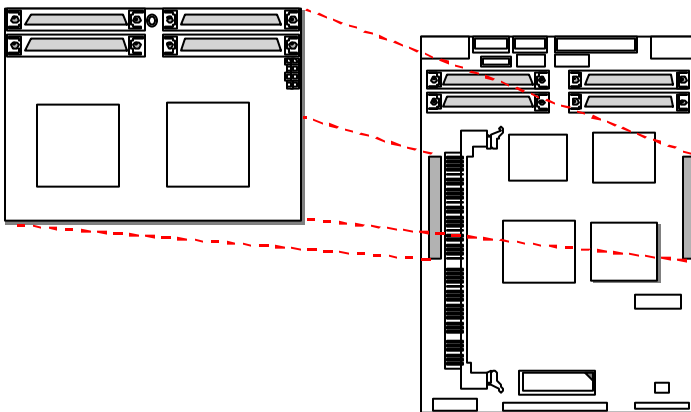

- The following baud rates are available: 2400, 4800, 9600, 19200 and 38400. Baud rate settings on the controller and on the terminal must be identical and the selection for terminal emulation must be "enabled."

4.5 Daughterboard Upgrade

The expansion daughterboard, IFT-9284U3A, adds another four Ultra160 channels.

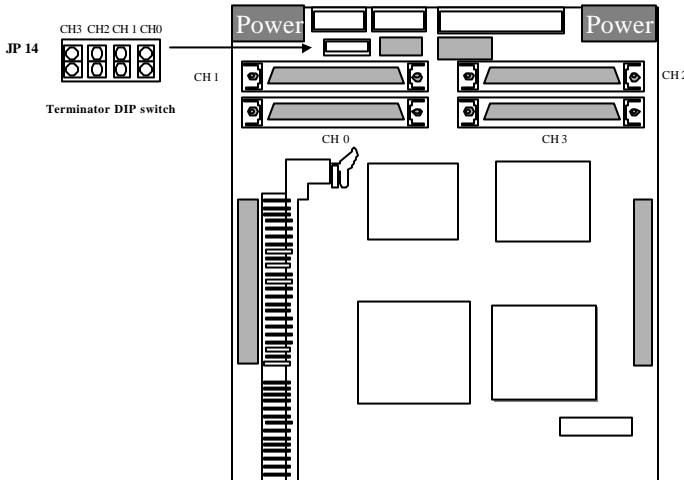
Daughterboard Upgrade

Additional 4 SCSI Channels



To install the daughterboard, power down the system and remove the top cover from controller chassis. Attach the daughterboard to the SentinelRAID 150 main board by securing the connection with the upgrade sockets. Be sure to orient the connector side of daughterboard to the connector side of the controller.

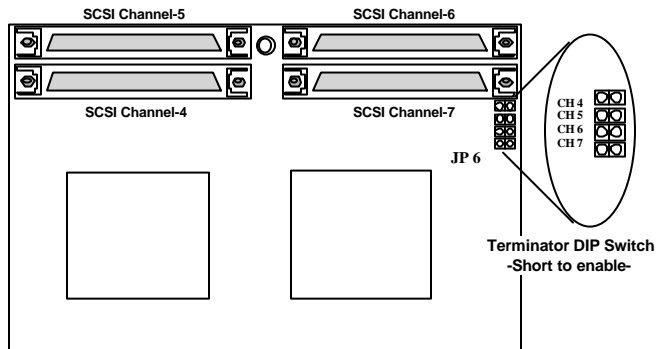
4.6 How to Enable/Disable On-Board Terminators



Terminator Jumpers on Controller Main Board

1. The controller has SCSI terminators implemented with each channel. To enable the SCSI termination on the associated SCSI channels:
 - You may choose to shunt the terminator jumpers (JP 14) on controller main board as displayed in the diagram above.
 - OR -
 - You may also configure (either using front panel or terminal emulation) the associated channel as "terminator enabled" or "terminator disabled." When the terminator jumpers are shunted, the associated SCSI channels will be terminated on the controller side no matter firmware setting is terminator "enabled" or "disabled." Remember to terminate the other end of the SCSI cable with an external terminator and to disable terminators on all SCSI drives.
2. To disable SCSI termination on the associated SCSI channels:

- Leave the terminator jumpers of the associated channels open. The firmware setting of the associated SCSI channels must also be configured as "terminator disabled." Configure SCSI termination in "Main Menu"/View and Edit SCSI Channels/"SCSI Terminator."
3. Follow the same method to configure the termination jumpers of SCSI channels 4 to 7 on the expansion daughterboard.



Terminator Jumpers on Controller Daughterboard

4.7 How to Install/Replace Battery Backup Module

The SentinelRAID 150 controller operates with cache memory. However, if the controller is configured as write-back cache enabled and a power failure occurs, the cache memory may contain buffered data that has not been written to the hard drives. This buffered data is not retrievable when power returns unless a backup power is provided. The combination of the IFT-9070C and IFT-9010C allows two battery packs to be daisy-chained for longer backup time and can sustain power supply to memory for more than 72 hours.

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-9070C provides a 160mA charge until: 1). a time limit of 90 minutes is reached; 2). a temperature limit of 60°C is reached. After the fast charging, the charger will shift to a trickle stage until the charge is full.

IFT-9070C is a daughterboard that is plugged into the main board. The IFT-9010C is a battery cell pack that connects to the battery connector located on the main board.

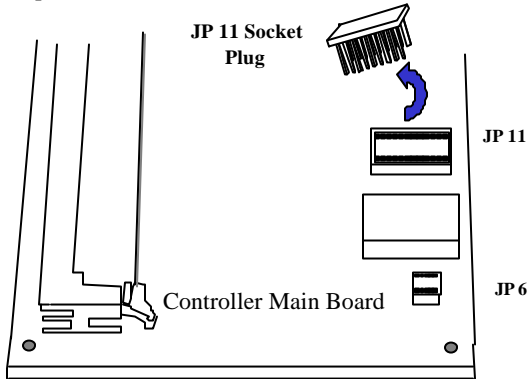
WARNING:

Do not attempt to install, remove, or upgrade a SDRAM DIMM on the SentinelRAID 150 with the battery installed. Damage to the controller components will occur.

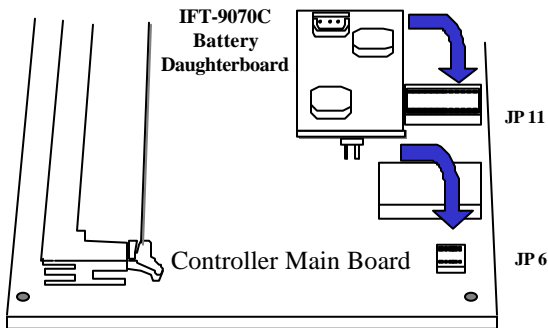
To install the IFT-9070C battery backup daughterboard and the IFT-9010C battery pack:

1. Make sure all power connections to the controller and drives are turned off. Provide a static-free environment in your work area.
2. Remove the controller from the enclosure or remove the controller top cover.

3. Locate the BBU socket plug that is inserted in the female pin socket JP 11 (please refer to the main board diagram in Chapter 2).



4. Remove the socket plug that is on JP 11 (keep the socket plug in a safe place for future use). Pin socket JP 11 must be installed with either the socket plug or the battery backup daughterboard.



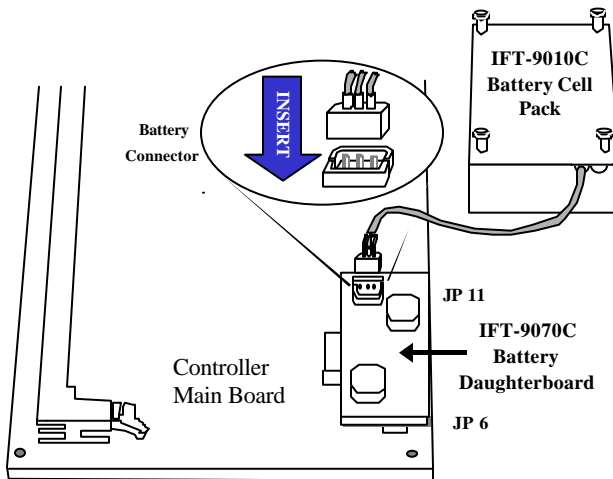
5. Now install the IFT-9070C battery backup daughterboard onto the controller main board.
6. There are two alternatives for installing the IFT-9070C battery daughterboard and the IFT-9010C cell pack:
 - The first is, install the IFT-9070C to controller main board and connect IFT-9010C to the 3-pin battery connector (J 2) on controller main board.

- The second is, install the IFT-9070C to controller main board and connect IFT-9010C directly to the battery cable connector on the daughterboard.

IMPORTANT:

Be careful to properly insert the pins on the IFT-9070C daughterboard. All of the pins should be seated in the female pin sockets JP11 and JP6. Failure to properly insert the pins may result in serious damage.

7. Connect the IFT-9010C cell pack to the battery connector located on the controller main board (J 2); or, if there is enough room in controller canister, connect the IFT-9010C cell pack directly to IFT-9070C daughterboard as shown below.

**Connecting battery cell pack to daughterboard**

8. You may use the four mounting screws to secure the cell pack on the pre-drilled mounting holes within RAID enclosure. Either of the linking cables on IFT-9010C can be used. The shorter cable is usually used for cascading with another cell pack.

NOTE:

You must install the socket plug back to JP 11 once you have removed the IFT-9070C battery backup daughterboard. The controller will not work if you fail to do so. Also, pin 1 of the socket plug must be installed to pin 1 of the JP 11.

Notice for the first installation:

1. It is possible that the linking cable connected between IFT-9070C daughterboard and IFT-9010C cell pack would have a surface contact with components on the controller main board. While routing the linking 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 the SCSI/Fibre processors may possibly damage the plastic shielding of battery linking cable.
2. Battery has a tendency to memorize its charge 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 complete and the controller is powered on, the battery will automatically start charging. Do not turn off the controller power during the first 24 hours. Once the controller power is turned off, and there is unwritten data in cache memory, the battery will start to supply power to refresh memory.
3. Inspect regularly and replace every two years; use official battery pack replacement and use with specified RAID controllers only.
4. During normal use, an empty IFT-9010C takes about 20 hours to recharge.
5. It is a must to disconnect battery module before replacing DIMM module.
6. Disconnect battery module if there is a long storage period before deployment. Extreme storage condition should be avoided (<-20°C or >40°C, >65% ± 10%).

4.8 Connecting Host Channels to Host Computers

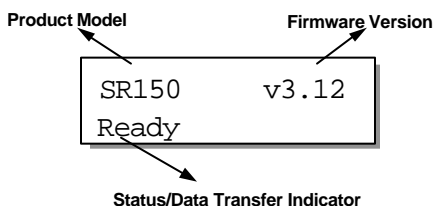
1. Locate the host channel SCSI connector on your RAID subsystem. A RAID subsystem is an enclosure that not only contains multiple disk drives but also is an assembly of power supply, cables, cooling fans, and environmental monitoring modules. Please refer to the documents provided with your RAID enclosure for detailed information.
2. Locate and connect to the SCSI connector on your host computer.

Note on Connecting to Host Bus Adapter:

- The synchronous clock or speed setting of HBA should be configured at its top-speed and “Wide” enabled.
- Any single-ended device on an Ultra160 SCSI bus should be removed. A single-ended device on an Ultra160 LVD bus will force the entire bus to adopt single-ended mode. The maximum transfer rate will be limited as Ultra-Wide, instead of Ultra160.
- An external round cable should be a LVD type cable recommended by HBA vendor.
- Connect one end of the external SCSI cable to the connector on the subsystem and the other end of the cable to the connector on the host computer. The cable length and termination should follow the SCSI specification. For information about SCSI cable lengths and requirement for cabling, please refer to Appendix C.

Powering on the storage system

1. Power on the RAID system. If the SCSI buses are properly 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. 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.



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

This screen is accompanied by two "beeps."

```
SR150      v3.12  
No Host LUN
```

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 -

```
SR150      v3.12  
Ready
```

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

System Information

The working condition of a controller may easily be affected by different factors: system over heating, unstable voltage, and hardware failure. In addition to the overall environmental conditions within the enclosure, the controller is capable of self-monitoring. The SentinelRAID 150 continuously monitors different aspects of its working condition and automatically issue event message once an error occurs. Whenever the controller detects unstable or out-of-the-normal-range situations, a notification message will be sent to warn the system administrator.

There are different ways to notify a system administrator: on-board alarm, LCD display alert message, alert message on terminal emulation; and, if the Java-based GUI RAID manager is installed, a notification message can be sent remotely via email, pager, fax, or broadcast over LAN.

In this chapter, the discussion on controller environmental monitoring will focus on the access to this controller-embedded function through LCD display and terminal emulation. For more information on GUI RAID manager, please refer to the RAIDWatch's user manual.

The other remote devices status monitoring within the RAID enclosure (cooling fans, power supply, temperature status, etc.) requires the implementations of enclosure manufacturer.

5.1 How to View System Environmental Information

5.1.1 Via LCD Push-button Panel

Viewing Peripheral Device Status:

If the controller is properly installed, your LCD should be displaying the message as follows:

```
SR150    v.3.12
Ready
```

The on-screen message should contain controller model number, firmware version, and current status of RAID configuration. “Ready” means there is at least one logical drive or any RAID configuration unit mapped to host LUN’s. If you have not configured your RAID system, LCD will be displaying “No host LUN.”

Press **[ENT]** for two seconds, no matter you have configured your RAID or not, 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 scroll down the following options:

```
Voltage Monitor
..
```

```
Temperature
Monitor ..
```

```
Cooling FAN
Monitor ..
```

Select either one of them by pressing **[ENT]**. For instance, choose “Voltage Monitor” and browse through the various voltage and temperature statuses:

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

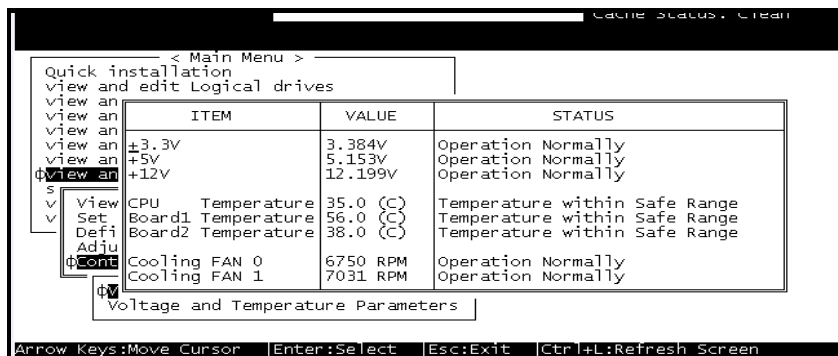
```
[+5v]    5.153V
Operation Normal
```

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

Follow the same method to browse through the statuses. The Fan status refers to the two cooling fans installed on the front panel of the controller.

5.1.2 Via Terminal Emulation

Open your PC Terminal Emulation screen. Get into 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 current controller operation status will be displayed and defined as normal or out of the normal range.

5.2 Configuring Threshold Parameters for Controller Environmental Monitoring

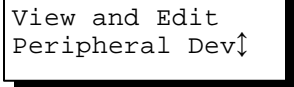
5.2.1 Via LCD Push-button Panel

Changing controller's threshold parameters for the system error events can help different users to modify the tolerance range of the controller's self-monitoring function. A system administrator can decide to what extent the controller will be operating without sending error message. Event messages will only appear when the controller detects the out-of-the-range conditions. Although the upper and lower thresholds can be modified, yet there is still a safety limit embedded in firmware on both. If the user enter a value that exceeds the safety limit, an error message will prompt and the new parameter will be canceled. Under specific circumstances, for example, locations where the operating temperature is relatively high or low, pulling up or down the default threshold parameters on temperature can stop the controller from sending error messages.

To increase or decrease the upper and lower thresholds, follow the steps as described below:

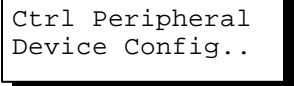
Temperature and Voltage Parameters:

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



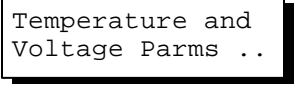
View and Edit
Peripheral Dev↑

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



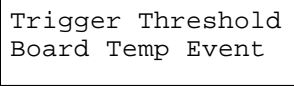
Ctrl Peripheral
Device Config..

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



Temperature and
Voltage Parms ..

Here we use the configuration of board temperature thresholds for an example. Press **▼** or **▲** to select "Trigger Threshold Board Temp Event," then press **[ENT]**.



Trigger Threshold
Board Temp Event

Press ▼ or ▲ to select 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 another 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 temperature or voltage parameters.

5.2.2 Via Terminal Emulation

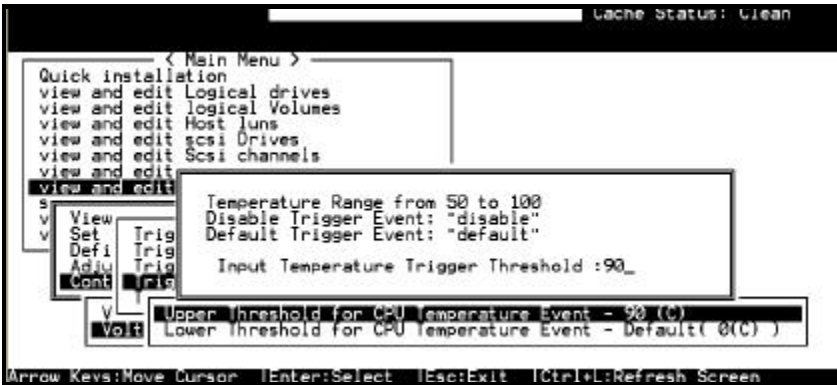
Open your PC Terminal Emulation screen. Get into the main menu and select “View and Edit Peripheral Devices.” Use the arrow keys to scroll down and select “Controller Peripheral Device Configuration,” “Voltage and Temperature Parameters,” and confirm by pressing [ENTER].



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 choose to change the upper or lower threshold values. Press **[ENTER]** to confirm.



A configuration window will prompt. Enter any value within the safety range. Any value exceeding the safety level 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:

Via LCD front panel:

From the main menu, select “View and Edit Peripheral Dev↑.” Press ▼ or ▲ to select “Adjust LCD Contrast..” then press **[ENT]** to proceed.

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

```
Adjust LCD  
Contrast ..
```

Press ▼ or ▲ to adjust LCD display contrast. Press **[ESC]** to confirm and leave.

```
LCD Contrast :  
■■■■■■|-----
```

Via terminal emulation:



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 the **[ESC]** key to confirm and leave.



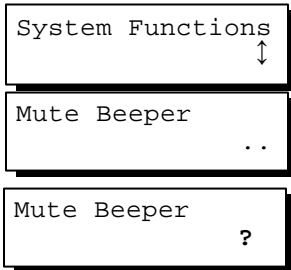
5.4 System Functions

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 until the next event.

Via LCD front panel:

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



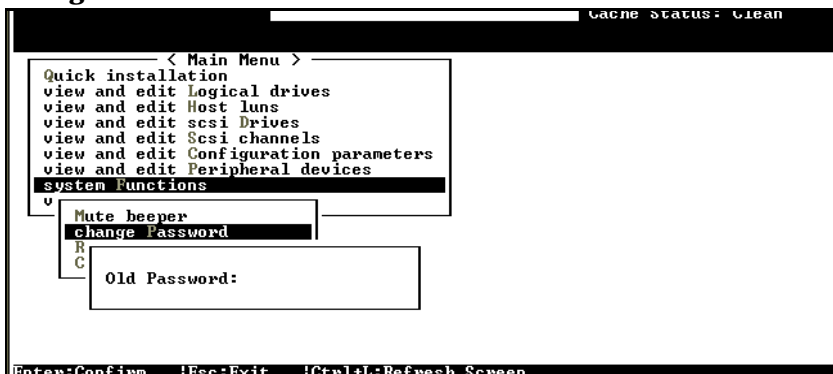
Press **[ENT]** to confirm.

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

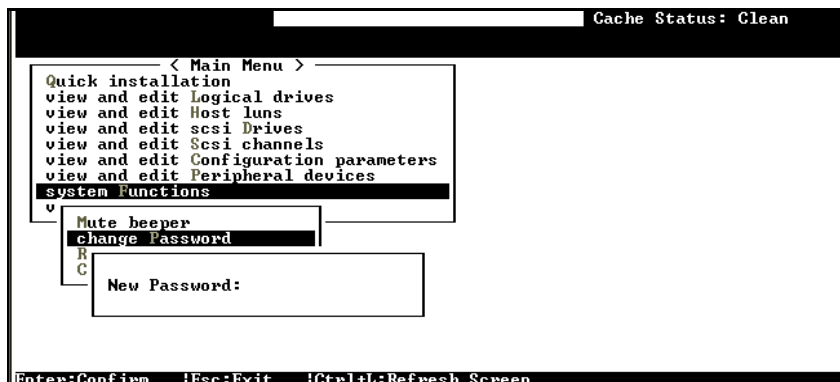
To set or change the controller password, move the cursor bar to "Change Password", then press **[ENTER]**.

If a password has previously been set, the controller will ask for the old password first. 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, firmware will not allow you to change the password.

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

Setting a New Password



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

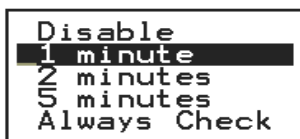
The new password will now become the controller’s password. Providing the correct password is necessary when entering the Main Menu from the Initial screen.

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 or making configuration change.

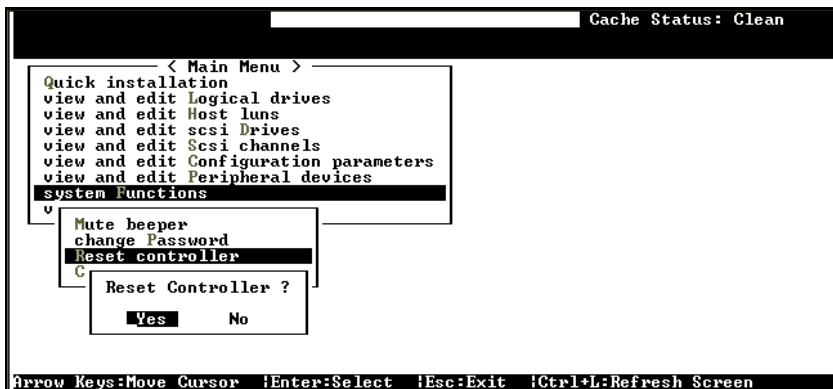
Setting Password Validation Timeout

The time interval setting can be found in the “system function” submenu. Setting check time interval to “Always check” will disable any configuration change without re-entering password. If the configuration screen is going to be left unattended for a period of time,



settings from 1 minute to 5 minutes are also available.

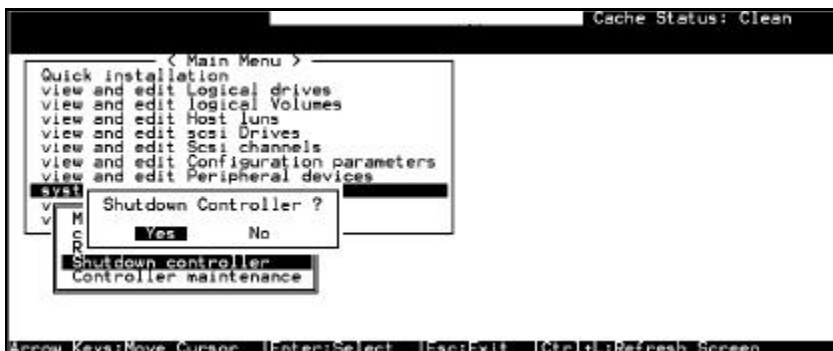
Reset Controller



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 follows, then press **[ENTER]**. The controller will now reset as well as power-off or re-power-on.

Shutdown Controller

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



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

Controller Hardware Specifications

A.1 Configuration

Specification	Feature
RAID levels	0, 1(0+1), 3, 5, 10, 30, 50, JBOD, non-RAID disk spanning, and spanning multiple logical drives in a logical volume
Host O/S compatibility	Host O/S independent
SCSI channels	4 on base module
Host interface	Ultra160 SCSI (base module)
Host channels	all channels can be configured as host or drive
Drive interface	Ultra160 SCSI (base module)
Drive channels	Up to 3 (7 with expansion daughterboard)
Maximum number of SCSI drives	Up to 45 (with 3 drive channels)
Cache memory size	32MB to 1GB, 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/volume, total of 64
Number of LUN's	Up to 32 per SCSI ID
Multiple SCSI ID's per host channel	Yes
Firmware on Flash memory	Yes
Drive hot swapping	Yes

A.2 Controller Architecture

Specification	Feature
CPU	PowerPC® 603e microprocessor
SCSI controllers	SYM 53C1010-33 SCSI controller
DIMM slot	one 168-pin DIMM module
ASIC	Infotrend 64-bit chipset
Flash RAM	16Mbit (4 MB)
NVRAM	32KB
Hardware XOR	Yes
Channel termination	LVD active termination, configurable via DIP switch
I/O channel bandwidth	Ultra160 SCSI: up to 160 Mbytes/sec

A.3 RAID Management

Specification	Feature
SNMP agent support	Yes [Windows NT 3.5/4.x, Windows 2000, Windows NT 4.0 for DEC Alpha, Novell NetWare 3.1x/4.x/5.x, SCO UnixWare 2.1x/7, SCO OpenServer 5.0x, Sun Solaris 2.5.x/2.6/2.7/2.8 (x86 and SPARC), Linux]
Performance monitoring	Yes
Remote control and monitoring	Yes
Event broadcast/alert	Yes (via RAIDWatch Manager or the direct connection to a modem); SNMP trap supported
Hardware connection	In-band SCSI , In-band Fibre or RS-232C
Failure indicator	Via buzzer, front 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
ISEMS (Infotrend Simple Enclosure Management Service) via I ² C interface	Yes
Automatic drive failure detection	Yes
Automatic rebuild on spare drives	Yes
Regenerate logical drive parity	Yes
Bad block reassignment	Yes
Automatic rebuild upon failed drive replacement	Yes
Concurrent rebuild on multiple drives in a RAID (0+1) logical drive	Yes
Salvage the 2 nd temporary failed drive in a RAID 1, 3 or 5 logical drive	Yes
Salvage the 1 st temporary failed drive in a RAID 0 logical drive	Yes

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)	9.5" x 5.75" x 1.60" (L x W x H)
Main board size	8.37" x 5.51" inches
Main board height with daughterboard	1.19"
CPU	PowerPC® 603e microprocessor
Cache memory	32MB to 1GB, SDRAM DIMM socket x1 with ECC support
Firmware	2MB Flash memory
NVRAM	32KB
Operating voltage	+5VDC \pm 5% (max. 7.0A; normal 6.0A) +12VDC \pm 10% (max. 100mA)
Operating temperature	4 to 44°C
Relative humidity	10 to 96%, non-condensing
Operating altitude	Sea level to 10,000 ft
MTBF	Greater than 500,000 hours
Devices per channel	SCSI: up to 15 wide 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)
SCSI cables	Up to 12 meters with low-voltage differential
Serial port	10-pin box headers for COM1 & COM2
LCD panel	Yes
LED and push-button interface	Yes

Appendix B

Hardware Troubleshooting

We provide a list of the common problems you may encounter during or after installation.

<u>PROBLEM</u>	<u>CHECK</u>
LCD is off	Check power connections of the board and LCD panel. Requires minimum of 32 MB SDRAM DIMM installed.
SCSI channel failure detected upon start-up (SCSI cables connected) Message on LCD: <code>SCSI CHLs fail CHL=x, x, x</code>	Check ID numbers (must be unique for each device on the same SCSI channel). Make sure that all SCSI channels are properly terminated. Check the voltage output of the power supply.
Initialization failure	Check ID numbers (must be unique for each device on the same SCSI channel). Make sure terminators are properly installed.
Cannot detect SCSI drive	Check drive power connections. Check drive SCSI cable connections. Check ID numbers (must be unique for each device on the same SCSI channel).
Host can not detect SentinelRAID 150	Check host SCSI cable connections. Check SCSI port to LUN assignment. Check logical drive mapping to LUN.
Parity error detected	SDRAM DIMM should be replaced.

Logical drive failure detected during boot-up	Check proper installation or connection of the drives (use the "View SCSI drives" and "flash drives" functions to help locate the problem).
System is not stable after running for a period of time.	SCSI cable length must be within the range of specifications. Make sure terminators are proper installed. Power supply voltage must be within specification. Check the enclosure's inner temperature.
The RS-232C Terminal Interface does not work.	<ol style="list-style-type: none"> 1. Check RS-232C cable connections. 2. Check if the Baud Rate setting on both ends identical. 3. Enable Terminal Emulation. Set Data Routing Direct to Port. Check if Null Modem is attached
When choosing "Configure Modem Port", the screen is full of "Comm Buffer Overflow".	"Terminal Emulation" should be enabled after all modem configurations are completed.
The logical drive states "INVALID".	"Optimization for ... I/O", when creating the logical drive in Cache Parameter, is different from the current setting. Change "Optimization for ...I/O" to the opposite setting and reset the controller.
In "View and Edit SCSI Drives" or "View and Edit SCSI Channels", the speed is only "80Mhz", not "160Mhz"	"80Mhz" is SCSI sync frequency, not transfer rate.

<p>All settings are too complex to remember.</p>	<p>After the system installation is complete, write down all the settings and related information in Chapter 11 of your “Generic Operation Manual” for future reference. Configuration data can also be saved as file using Text-based manager.</p>
<p>Upon replacing the failed controller with a new one during Redundant controller connection, nothing appears on the LCD of the new controller.</p>	<p>Set the new controller as “redundant controller enabled” before connecting to the active controller. Connect the new controller to the active controller and choose “Deassert failed controller” on the active controller. Refer to “Chapter 12 Redundant Controller” in your Generic Operation Manual for more details.</p>
<pre>C=* I= * Gross Signal Error:</pre>	<p>Channel * ID * Gross Signal Error Drive-side SCSI phase/signal abnormality detected. Check cabling and SCSI bus termination and drive canister connections.</p>
<pre>High +5V Voltage Detected (****)</pre>	<p>High/Low +5V/+12V Voltage Detected (<i>current_voltage</i>) The current voltage source is higher/lower than the preset voltage threshold. Check the power supply, voltage threshold settings and contact the support of your RAID system supplier.</p>
<pre>Error: Check DRAM Installed?</pre>	<p>Check to see if a DIMM module is installed or properly installed.</p>
<pre>SR150 v3.12 No Host LUN</pre>	<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>SR150 v3.12 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 dealer for assistance with any other error messages.</p>

SCSI Cable Specifications

The recommended SCSI cable for an Ultra2 Wide SCSI operating at a transfer rate of 80 Mbytes/sec. is described below.

Electrical	
Impedance	120 ± 10%Ω
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.)

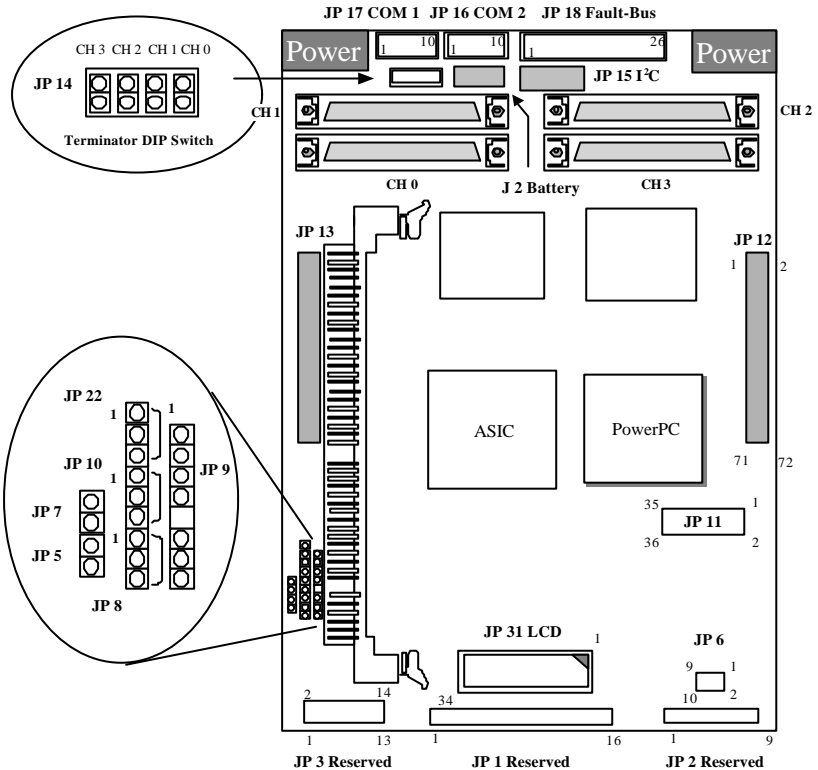
SCSI Standards, Cable Length and Corresponding Maximum Possible Drive Connections

	Single-Ended	Differential	Ultra2	Fibre	Maximum Devices
SCSI-1	6 m	25 m	-	-	8
SCSI-2	3 m	25 m	-	-	8
Wide SCSI-2	3 m	25 m	-	-	16
Ultra SCSI-2	1.5 m	25 m	-	-	8
Ultra SCSI-2	3m	-	-	-	4
Ultra Wide SCSI-2	-	25 m	-	-	16
Ultra Wide SCSI-2	1.5 m	-	-	-	8
Ultra Wide SCSI-2	3 m	-	-	-	4
Ultra2 Wide SCSI	-	-	12 m	-	16
Ultra160	-	-	12 m	-	16

SCSI Bus Width and Maximum Throughput

	Bus Width	SCSI Bus Sync. Frequency	Max. Bus Throughput
SCSI-1	8-bit	Asynchronous	5 MB/Sec
(Fast) SCSI-2	8-bit	10 MHz	10 MB/Sec
(Fast) Wide SCSI-2	16-bit	10 MHz	20 MB/Sec
Ultra SCSI-2	8-bit	20 MHz	20 MB/Sec
Ultra Wide SCSI-2	16-bit	20 MHz	40 MB/Sec
Ultra2 Wide SCSI	16-bit	40 MHz	80 MB/Sec
Ultra160	16-bit	80 MHz	160 MB/Sec

General Identification and Pin Assignments



Connector	Description
J 2	Battery cell pack connector
JP 1	4-line LCD (reserved)
JP 2	Keypad (reserved)
JP 3	2-line LCD (reserved)
JP 5	NMI – non mask interrupt (Enabled: shorted)
JP 6	Battery daughterboard connector 2x5 pin header
JP 7	Reset (Enabled: 1-2 shorted)
JP 8	Loop-back test (Enabled: 2-3 shorted; normal: 1-2 shorted)

JP 9	GAL
JP 10	LCD type selection (4-line: 1-2 shorted; 2-line: 2-3 shorted)
JP 11	Battery daughterboard connector 36-pin header; with a socket plug when not installed with daughterboard
JP 12	Daughterboard upgrade socket
JP 13	Daughterboard upgrade socket
JP 14	Terminator DIP switch jumpers channel 0 to channel 3 : (Force Enabled: short)
JP 15	I ² C port
JP 16	COM 2
JP 17	COM 1
JP 18	Fault-Bus
JP 22	Fan panel fan status detect (disable: 1-2 shorted; enabled: open)
JP 31	LCD connector

JP 16 RS-232C Port

Pin	Descriptions	Pin	Descriptions
1	DCD1	6	DSR1
2	RXD1	7	RST1
3	TXD1	8	CTS1
4	DTR1	9	RT1
5	GND	10	N/C

JP 17 RS-232C Port

Pin	Descriptions	Pin	Descriptions
1	DCD2	6	DSR2
2	RXD2	7	RTS2
3	TXD2	8	CTS2
4	DTR2	9	RS232 RESET
5	GND	10	N/C

I²C Port

I²C Port Pinouts

Pin	Pin name
1	I ² CCLK
2	GND
3	VCC
4	I ² C DATA

I²C Connector Pin Name Descriptions:

Pinout Description

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

Battery Connector

Battery Connector Pinouts (JP-4)

Pin	Pin name
1	VBAT_P
2	VBAT_THM
3	VBAT_N

Battery Connector Description:

Battery Connector Pinout Description

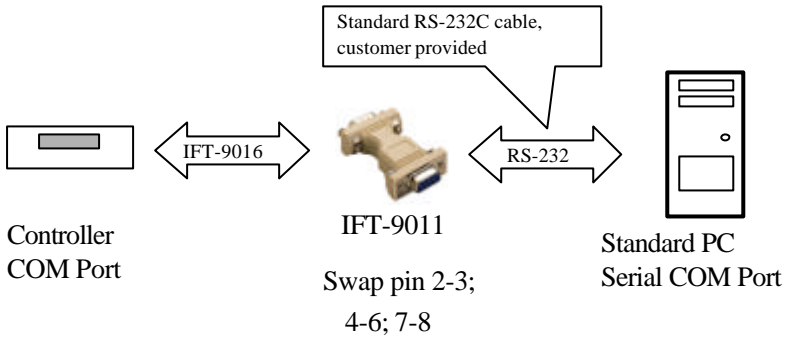
Symbol	Type	Description
VBAT_N	I	Battery -
VBAT_P	I	Battery +
VBAT_THM	I	Battery thermal

JP 18 Fault-Bus Plus Port

Pin	Descriptions	Pin	Descriptions
1	Slot 1	2	Slot 5
3	Slot 2	4	Slot 6
5	Slot 3	6	Slot 7
7	Slot 4	8	FBUS_RST
9	GND	10	GND
11	Slot 8	12	Slot 12
13	Slot 9	14	Slot 13
15	Slot 10	16	Slot 14
17	Slot 11	18	N/C
19	GND	20	GND
21	UPSOUT#	22	N/C
23	POWER#	24	TEMP#
25	UPSIN#	26	FAN#

TTL Device Parameters

Symbol	Parameter	Rating	Unit
V_{IN}	Input voltage	-0.5 to +7.0	V
I_{IN}	Input current	-30 to +5	mA
V_{OUT}	Voltage applied to output in High output state	-0.5 to + V_{CC}	V
I_{OUT}	Current applied to output in Low output state	40	mA



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 (not included in kit)

Extend the cable length only, no wire swap.

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