

CR8e



User's Guide



nStor Corporation, Inc.

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3rd Edition

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CAUTION: Drives and controller/adaptor cards described in this manual should only be installed in UL-listed and CSA certified computers that give specific instructions on the installation and removal of accessory cards (refer to your computer installation manual for proper instructions).

ATTENTION: Les lecteurs et cartes contrôleurs décrits ici ne doivent être montés que sur des ordinateurs homologués (UL et CSA) et livrés avec des manuels contenant les instructions d'installation et de retrait des accessoires. Reportez-vous au manuel d'installation de votre ordinateur.

NOTE: Only drives supplied by nStor Corporation are approved for use in this product. Use of other drives could affect the safety and/or radio frequency interference characteristics of the product.

Regulatory Information

FCC 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. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio or television communications. However, there is no guarantee that the 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 to an outlet on a circuit other than that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

nStor Corporation, Inc. is not responsible for any interference caused by unauthorized modifications to this equipment. It is the user's responsibility to correct such interference. You are also warned, that any changes to this certified device will void your legal right to operate it.

CAUTION: Drives and controller/adaptor cards described in this manual should only be installed in UL-listed and CSA certified computers that give specific instructions on the installation and removal of accessory cards (refer to your computer installation manual for proper instructions).

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Compliance Information Statement

We,

nStor Corporation, Inc.

450 Technology Park

Lake Mary, Florida 32746

(407) 829-3500

declare under our sole responsibility that the product,

Type of Equipment: Disk Array Enclosure

Model Number: CR8e

to which this declaration relates is in conformity with the Title 47 of the US Code of Federal Regulations, Part 15 covering Class B personal computers and peripherals.

Operation is subject to the following two conditions:

- 1 This device may not cause harmful interference, and
- 2 This device must accept any interference received, including interference that may cause undesired operation.

Power Cord Selection

- This subsystem is intended for indoor use only.
- This subsystem is intended to be plugged into a 6A branch circuit in Europe.
- To select the proper power cord:

For 110 Volt Operation – Use a UL Listed/CSA Labeled cord set consisting of a minimum 18 AWG, type SVT or SJT three conductor cord, terminating in a molded connector body having an IEC CEE-22 female configuration on one end and a molded-on parallel blade grounding type attachment plug rated 15A, 125V configuration (5 - 15P) at the other end.

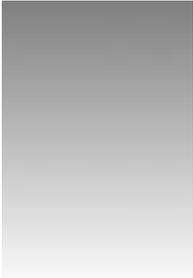
For 230 Volt Operation (North America) – Use a UL Listed/CSA Labeled cord set consisting of a minimum 18 AWG, type SVT or SJT three conductor cord, terminating in a molded connector body having an IEC CEE-22 female configuration on one end and a molded-on tandem blade grounding type attachment plug rated 15A, 250V configuration (6 - 15P) at the other end.

For 230 Volt Operation (Europe) – Use a cord set marked “HAR”, consisting of a H05VV-F cord that has a minimum 0.75 square mm diameter conductors provided with an IEC 320 receptacle and a male plug for the country of installation rated 6A, 250V.

NOTE: The subsystem automatically selects the proper settings for the input voltage. Therefore, no additional adjustments are necessary to connect the unit to any input voltage within the range marked on the drive.

- Das Laufwerk sollte nicht im Freien verwendet werden.
- In Europa, sollte das Laufwerk an einen 6A-Stromkreis angeschlossen werden.
- Zur Wahl des korrekten Netzkabels beachten Sie bitte folgendes:

230V-Betrieb (Europa) – Verwenden Sie Netzkabel der Bezeichnung “HAR” die H05VV-F-Kabel und einen Leitungsdurchmesser von mindestens 0,75 mm² aufweisen. Verwenden Sie eine IEC 320-Buchse und einen für das Installationsland passenden Stecker, der auf 6A und 250V gesichert ist.

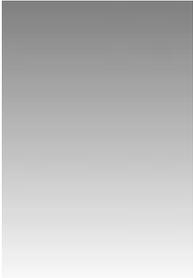


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Preface

Welcome

Congratulations on the purchase of your new CR8e from nStor Corporation. The nStor CR8e provides a superior fault-tolerant network storage solution in a subsystem-based SAF-TE compliant RAID enclosure.

The CR8e is an eight drive enclosure designed to support Ultra Wide SCSI (Fast-20) and Fast Wide SCSI protocols. The Ultra Wide SCSI (Fast-20) support maintains SCSI bus data transfer rates up to 40 Mbytes/sec. The subsystem supports both host system based RAID controllers, as well as an option for an onboard Ultra SCSI-to-SCSI RAID controller.

The CR8e also provides an upgrade path to Ultra2 Low Voltage Differential (LVD) SCSI technology and easily connects to the network attach storage module to maintain its total cost of ownership.

The intelligent enclosure is compliant with SAF-TE version 1.0, an industry standard, non-proprietary means to automatically integrate with peripheral packaging that supports status signals, hot swapping drives and enclosure monitoring. Combined with the enterprise-wide storage management software from nStor, additional levels of fault tolerance can be maintained.

Features

The following are major features of the nStor CR8e disk array subsystem:

RAID Level Support	RAID levels 0, 1, 3, 5, 10 (1 + 0), 30, and 50.
Configuration	Deskside tower-based subsystem or rack-mount subsystem.
Drive Support	Up to eight 3.5-inch, half-height form factor, hot swappable high performance 7,200 and 10,000 RPM Ultra SCSI disk drives using SCA-II technology (4.2, 9.1, or 18.2 gigabyte capacities).
Interface	Ultra SCSI (Fast 20)/SCSI.
Scalable Capacities	Drive capacities are expandable to 145 GB using 18 GB disk drives and further expansion through daisy-chaining of multiple cabinets.
Hot Swap Power Supplies	Dual hot swap power supplies expandable to three, all with current sharing circuitry.
Cooling	Dual high capacity hot swap cooling fans.
Notifications	LEDs and audible alarms provide failure notifications.
Front Panel	A password protected Operator Control Panel (OCP) for administration control and monitoring functions.
SCSI-to-SCSI Support	Provides on-board Ultra SCSI-to-Ultra SCSI RAID processing via the Ultra S2S RAID Controller.
Termination	Automatic SCSI-bus termination.
Locking Door	A key-locking front door.
SAF-TE	SAF-TE v1.0 compliant enclosure.
Cluster-Ready	Cluster-ready subsystem.
Storage Management Solution	Enterprise-wide managing and monitoring using AdminiStor Manager and AdminiStor Agent software.

Where to Find Answers

When you have questions about your nStor products there are several places you can look to find answers. Refer to the following:

- In this guide** This user's guide provides detailed information for installing and using the CR8e disk array subsystem. The manual assumes that the reader is already familiar with the operating system environments where the CR8e will be installed.
- Resource Guide** Use this manual to locate telephone numbers for customer service and technical support, technical support email address, instructions to obtain an RMA number, and conditions of the limited warranty.
- AdminiStor Manager User's Guide** Use this manual to install and use the nStor Java-based management and monitoring software.
- AdminiStor Agent User's Guide** Use one of these manuals to install and use the nStor SNMP-based network RAID subsystem management software.
- On the software diskettes** Review the README files for last minute information about the release of the software products.
- Via email** You may email questions and comments to support@nstor.com.

Registering Your Product

Registering your product allows nStor to continue providing the highest quality technical support while keeping you informed about product developments.

To register your product, complete and fax the Plan Registration/Upgrade Form found in the Product Registration kit.

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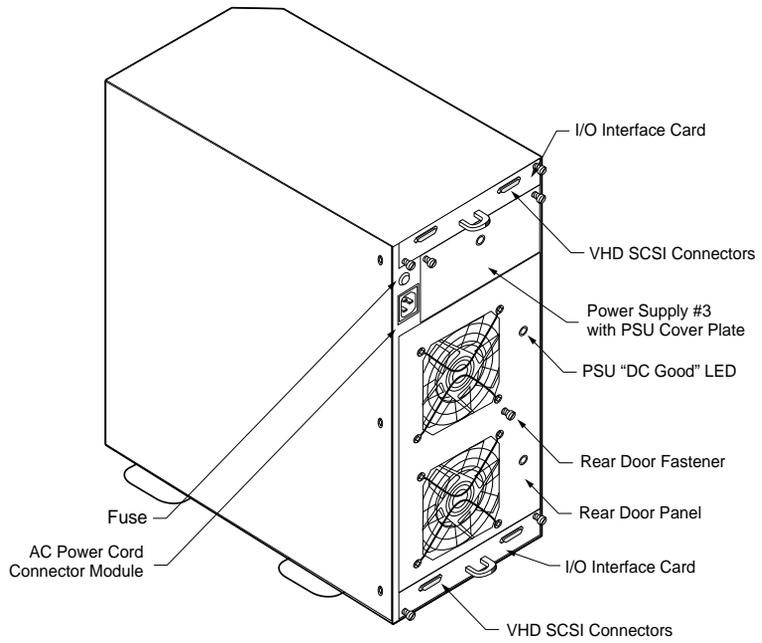
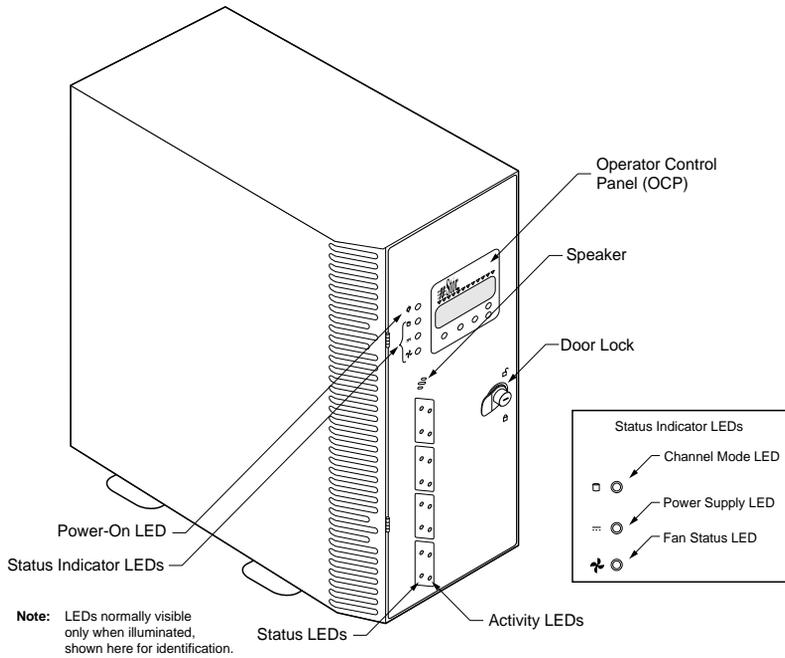
Getting Started

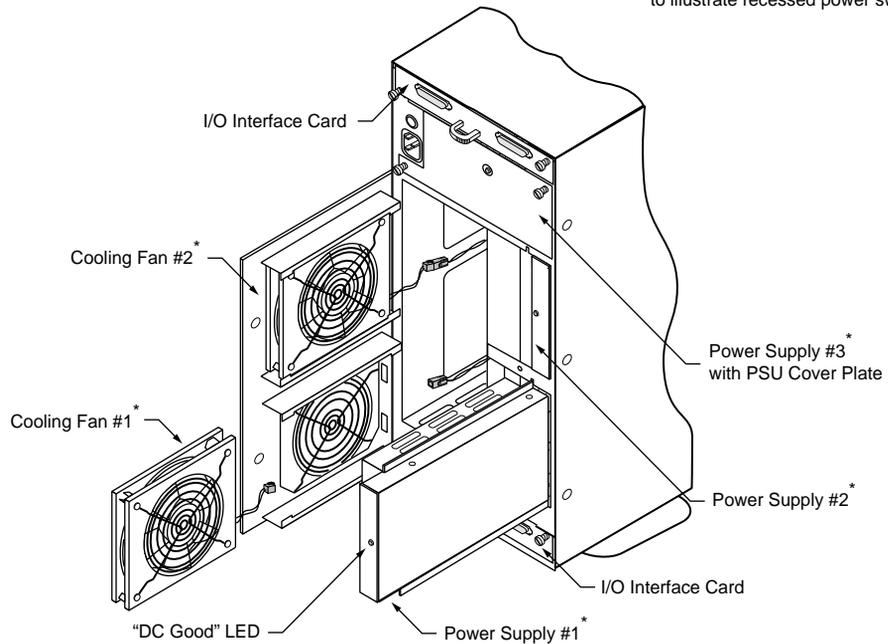
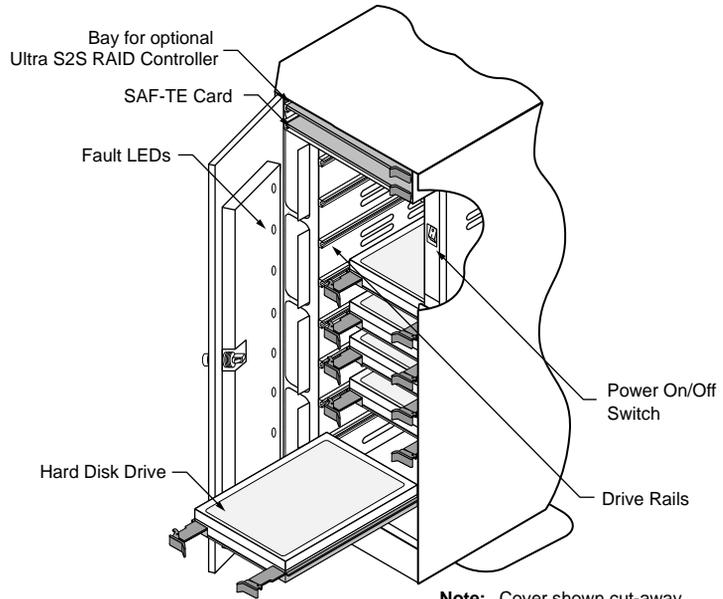
In this chapter we will provide a description of the components, and the control and onboard monitoring systems found in the CR8e enclosure.

On the next two pages are illustrations that depicts the location of featured components of the CR8e. Familiarize yourself with the subsystem's components and their descriptions prior to beginning the installation and using the CR8e.

Following the Components section, a Control and Monitoring section describes the subsystem's LEDs provides an explanation of the manner in which the CR8e presents normal and abnormal conditions. The Operator Control Panel (OCP) section describes in the general the features of the LCD panel and an illustration pictorially describes items found on the display. In chapter 3 a more detailed functional description of each OCP menu option is provided.

CR8e Subsystem at a Glance





** Power supplies and cooling fans must be replaced by qualified service personnel only.*

Components

This section provides a descriptive overview of each of the major components that comprise the CR8e subsystem.

Hot Swap Disk Drives

The CR8e uses either 4.2 gigabyte, 9.1 gigabyte, or 18.2 gigabyte high performance, 3.5-inch form factor hot swap disk drives. The drives are designed to operate on the Small Computer System Interface (SCSI) and are Ultra SCSI as well as SCSI-2 command compatible.

Each drive has an 80-pin Wide Single Connector Attachment (SCA-II) interface, designed to allow the drive to be inserted directly into the backplane thus making it possible to “hot swap” the drive without shutting down the subsystem.

The drive mounting design uses a rail system with built-in connectors which allows for easy installation with minimal force. Latching clips ensure that the drive is secured once it is installed.

Hot Swap Cooling Fans

CAUTION: Cooling fans must be replaced by qualified service personnel only.

The cooling system consists of two high-performance fans fitted to the rear panel. These fans draw air from a high pressure plenum, across the drives and electronics of the system and exhaust out through the rear door panel.

The fan speed is thermally controlled to provide reduced operating noise levels. In the event of a fan failure or the cabinet temperature approaches the threshold limit, the remaining fan will switch to maximum operating speed.

Cabinet temperature is measured within the drive bay area between drive slots 2 and 3, and slots 7 and 8. The fan's speed and alarm are keyed to the higher of the two temperatures. The SAF-TE processor monitors the performance of each of the fans via tach pulses which track the speed (RPM) of each fan impeller.

The fans can be replaced during normal operation without having to power down the CR8e. In the event of a fan failure, the Fan Status LED will illuminate amber and an alarm will sound.

If an error occurs, access the Operator Control Panel to determine the cause and locate the failed component. For more information, see *Operator Control Panel* on page 40. The fans are identified on the rear door panel using a placard for “FAN 1” and “FAN 2.” For more information on changing a cooling fan, see *Replacing the Cooling Fans* on page 60.

Hot Swap Power Supplies

CAUTION: Power supplies must be replaced by qualified service personnel only.

Up to three 150 watt hot swap power supplies are incorporated as part of a fault-tolerant design (N+ 1 power system). Each power supply unit (PSU) has current share circuitry which balances the load between the installed power supplies. In the event of a power supply failure, the load is transferred to the remaining power supplies without interruption to the CR8e’s normal operation.

If a failure occurs, the Power Supply Status LED will illuminate amber and an alarm will sound. The user can identify the failed component by accessing the OCP and viewing the “Hardware Status.” The PSU “DC Good” LED will not be illuminated on the failed power supply. For more information, see *Replacing a Power Supply* on page 58.

Power Switch

The power switch is located inside the locking front door and controls AC power to all of the power supplies. This positioning of the switch deters unauthorized users from powering down the CR8e provided the door is locked. The switch is recessed to prevent inadvertent activation during service activities.

The switch is labeled with a “I” for the ON condition and “O” for the OFF condition and is illuminated when the power is on for easy identification. Depending on the orientation of the subsystem (i.e., in the rack configuration) the “I” label will appear as a “—” and should be interpreted as the ON condition.

Door Lock

The front door has an integral lock that also serves as a door handle. In addition, the door lock provides security to deter unauthorized access to the disk drives and SAF-TE card. Two keys are provided with the system.

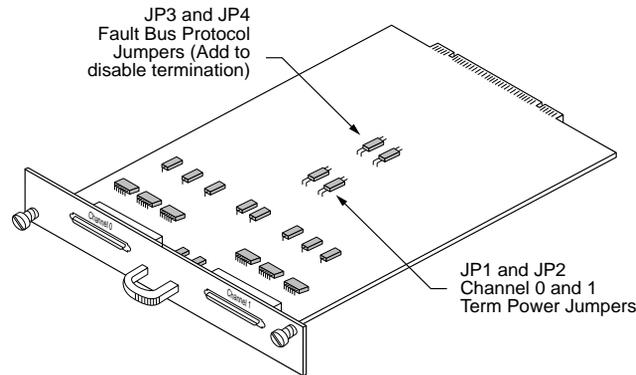
To unlock the door, insert the key and turn it in a counterclockwise direction. To lock the door, turn the key in a clockwise direction.

I/O Interface Card

The I/O Interface card provides the connection from the subsystem's bus to the host adapter. Located on the I/O Interface card are two 68-pin very high density (VHD) SCSI connectors. The connectors are labeled Channel 0 and Channel 1.

The I/O Interface card incorporates built-in automatic SCSI termination. When a data cable is plugged in, the system automatically senses the connection and provides the required SCSI termination.

Two sets of jumpers are provided on the card. One set of jumpers (JP1 and JP2) routes Term Power in the event that the host controller does not provide it. The default setting is the unjumpered condition (jumper offset on one pin only).



The next set of jumpers, JP3 and JP4, addresses termination protocol for a specific set of controllers that use the DEC Fault Bus. If you are using a DEC system where the controller uses this protocol, you will need to jumper locations (jumper on both pins) JP3 and JP4 for each channel that has an external SCSI cable connected. This will disable termination at that point.

If you are using a standard host adapter that provides Term Power, no change is required and SCSI bus termination will occur automatically.

Power Cord Connector and Fuse

The power cord connector supplies the AC power to the CR8e through a power cord connected to a conventional three-hole grounded outlet or power strip. A 250V 10 amp fuse is provided to protect the system from any electrical fault.

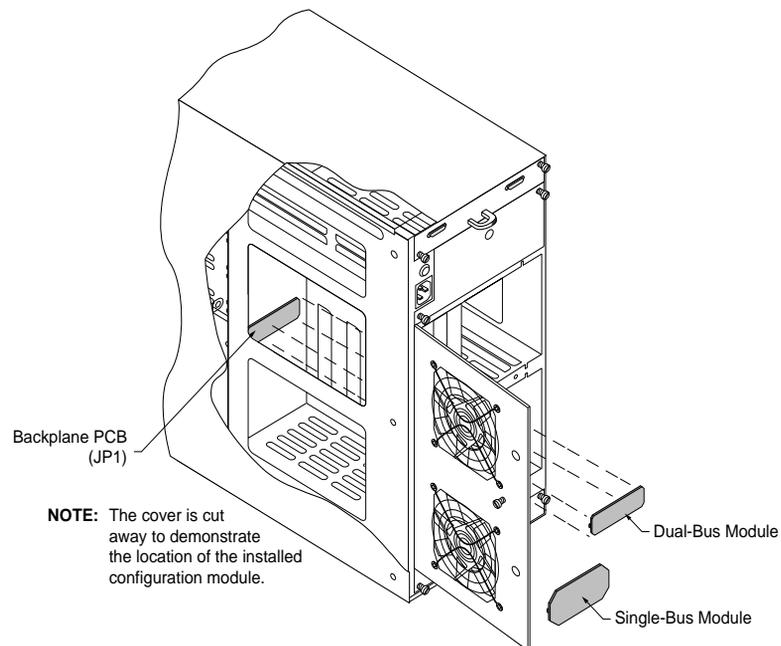
Configuration Modules

CAUTION: Configuration modules must be installed or replaced by qualified service personnel only.

The CR8e's SCSI bus design provides either of two bus configurations which is determined by the configuration module installed. The Dual-Bus module provides a split bus configuration where the enclosure's top four drive slots and the lower four drive slots are on two independent SCSI buses. The Single-Bus module connects both SCSI buses together tying all drive slots to one SCSI bus.

The Single-Bus module is larger in physical size than the Dual-Bus module and is easily identified by its description silkscreened on the module card. It is installed on the backplane printed circuit board, at location JP1, and is accessed from the rear door panel.

The connector is keyed and the module will only install in one direction. For illustration purposes, the tower system is used to depict the location of the modules.



Controlling and Monitoring

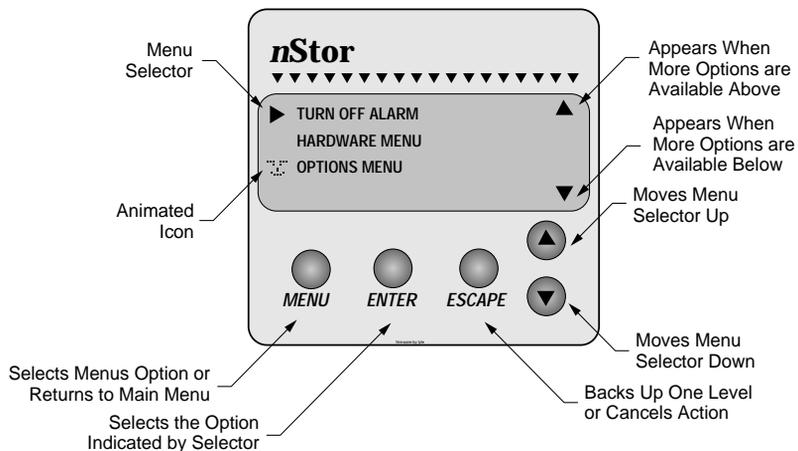
An integral part of the CR8e is its control and monitor capabilities. The subsystem enclosure contains a series of redundant alert notifications in the form of LEDs, alarms, and an LCD Operator Control Panel. Each of these components are discussed in the following topics.

Operator Control Panel

The Operator Control Panel (OCP) provides control and monitoring capabilities through an LCD panel located on the front door of the CR8e. The disk drives, power supplies, fans, and processor can be monitored for their status by using the menu driven OCP interface. Also the user can maintain control of the subsystem components by providing the capability to change to the disk drive SCSI IDs and SAF-TE processor ID, and making changes to the temperature threshold for the thermal monitoring system.

Other menu functions provide for viewing subsystem component status, silencing the audible alarm, establishing a password to protect the subsystem OCP access, establishing intra-cabinet communications (master/slave), and reading firmware information.

The OCP uses a four line by twenty character LCD display. There are five function keys that define the menu driven interface.



An animated icon will appear on the display after 30 seconds of no OCP input activity and provides an “at-a-glance” look at system status. When a “happy” animated face appears, all systems are indicating a nominal state. When the animated face changes to a “sad” face, the system indicates that a problem has been detected and requires attention.

The “power system” status will display the total power available per drive slot in redundant and non-redundant mode. A maximum supported value of 30 watts per drive bay is available in either mode. Also the user can view individual power supply status and configurations.

The OCP displays information on each cooling fan’s speed. Each fan’s speed (RPM) is controlled via the internal cabinet thermal monitoring system, referenced from a user-established temperature threshold. Cabinet temperature is measured within the drive bay area between drive slots 2 and 3, and between slots 7 and 8. By sensing cabinet temperature in these locations, the system provides the most sensitive measurement for maximum protection. The temperature is displayed in both Celsius and Fahrenheit. The SAF-TE processor monitors the performance of each fan via tach pulses which track the speed (RPM) of each fan impeller.

LEDs

Power-On LED

The Power-On LED signifies that the CR8e system has power applied.

Status Indicator LEDs

There are three Status Indicator LEDs to assist the user in determining the current state of the CR8e subsystem. The following subsections describe each LED.

Channel Mode

The Channel Mode LED indicates the status of the subsystem array by changes in its color and state. Steady green indicates normal array activities.

When the LED changes to amber (flashing or steady) it indicates abnormal activities. For more information see *LED Descriptions* on page 39.

Power Supply Status

The Power Supply Status LED indicates the condition of the power supplies. The LED will illuminate steady green when all the power supplies are functioning normally and will change to amber if one of the power supplies should fail. The LED will also switch to amber if the power system is in a non-redundant state. A failed component can be identified via the Operator Control Panel and the lack of an illuminated “DC Good” LED located on each power supply unit.

Fan Status

The Fan Status LED indicates the condition of the cooling fans by changes in its color. The LED will illuminate green when all of the fans are functioning normally and will change to amber if any of the fans fail.

When a failed component is present, use the Operator Control Panel to identify the failed fan. The fans are identified on the rear door panel via placarded markings. For more information see *Hardware Menu* on page 42.

Status LEDs

There are eight Status LEDs located in windows on the front panel (for the rack-mount system they are the lower set of LEDs and for the tower-based system they will be the set on the left hand side).

These LEDs, in conjunction with an approved RAID controller, will indicate the status of a specific disk drive by their state (flashing or steady) and/or color (amber or green).

For more information on interpreting these indications, see *LED Descriptions* on page 39.

Activity LEDs

There are eight Activity LEDs located in windows on the front panel (for the rack-mount system they are the upper set of LEDs and for the tower-based system they will be the set on the right hand side). These LEDs will flash indicating a specific drive is being accessed, either as reads or writes.

Alarm Speaker

An audible alarm will sound when any component's condition changes to an abnormal state. The Status Indicator LEDs conditions (color and/or state) will provide a general area of failure, and the failed component can then be identified using the Operator Control Panel.

To silence the alarm, access the control panel and select "Turn Off Alarm." For more information see *Main Menu* on page 42.

Fault LEDs

When a disk drive is installed in a drive slot, it has a corresponding Drive Fault LED that will illuminate to aide in identifying a failed or problem disk drive. These LEDs are located on the inside front door panel and are aligned with their respective drive slot. If the LED is illuminated (amber), the condition indicates a failed or problem drive found in that drive slot.

SAF-TE Card

The SAF-TE card contains the control and monitoring electronics for the subsystem cabinet. It provides the central data link between the enclosure and the host system.

Located in the tower-based systems' top bay (the rack-mount systems' far left bay) are two card slots. The SAF-TE card is installed in the lower (furthest right) of the two slots. The upper slot (furthest left slot) is not used.

SAF-TE

The CR8e is designed to be compliant with version 1.0 of the SAF-TE (SCSI Accessed Fault-Tolerant Enclosure) specification. Under this specification, the enclosure is implemented as an assignable SCSI target ID. This allows standardized alert detection and status reporting using the SCSI bus as the underlying transport mechanism.

Disk drives, power supplies, cooling fans and temperature are continually monitored and these conditions are then reported over the SCSI bus to the host system.

When used in conjunction with the AdminiStor Storage Management software, the CR8e can alert the user or LAN administrator of conditions requiring their attention. These alert notifications can be made via network broadcast or electronic pages, in addition to the LEDs and Operator Control Panel alerts found on the CR8e subsystem. This allows the administrator to receive remote notification of conditions that require corrective action to prevent data loss.

2

Installation

Setup

The installation of your nStor CR8e disk array subsystem is essentially a three-step process: the subsystem is setup and its components installed, the cabling is completed based on the supported configurations, and the array is then configured.

This chapter is divided into two sections: Setup and Cabling Configuration. The Setup section provides the instructions for assembling the rack-mount subsystem, and installing the hardware components (controllers, disk drives, power supplies, etc.) for both rack-mount and desktide tower-based subsystems.

The Cabling Configuration section contains samples of cabling schemes and configurations. If your desired configuration is not shown in the samples, refer to the example most similar and follow the cabling topology scheme expanding the configuration example to fit your needs while conforming to the specific SCSI specification.

The CR8e is designed with an open architecture that allows for many possible combinations of cabling schemes. Because of these possible combinations, we will provide a sampling of configurations in this chapter.

Additional configurations are available through the use of nStor's Ultra Extender or Differential Converter Feature cards. Refer to the *nStor Feature Card User's Guide* for information specific to each card and configuration. When configuring the array, refer to the user's guide provided with your RAID controller.

System Requirements

The nStor CR8e disk subsystem is based on an open architecture design and can be connected to any host-based SCSI system. Refer to your adapter/controller and host system user's manuals for information about the system requirements for the host system where the controller will be installed.

Guidelines

Before installation, you will need to consider the following:

- When referencing a component on the rear panel it is assumed the user is facing the rear panel and when referencing the front panel components the assumption is that the user is facing the front panel.
- Interior temperature of the rack cabinet should be maintained at ambient temperatures but must not exceed 117°F (47°C) during normal operation.
- Remove each piece from the shipping carton, leaving the disk drives in their anti-static protective packaging until you are ready to install them.
- Save the packing materials in case you need to ship the CR8e.
- Secure all cable connectors using the thumb screws (finger tight only).
- When connecting the data cable VHD connectors, be sure to exercise caution that the connector is inserted carefully and correctly. Otherwise it is very likely to bend the pins inside the connector.

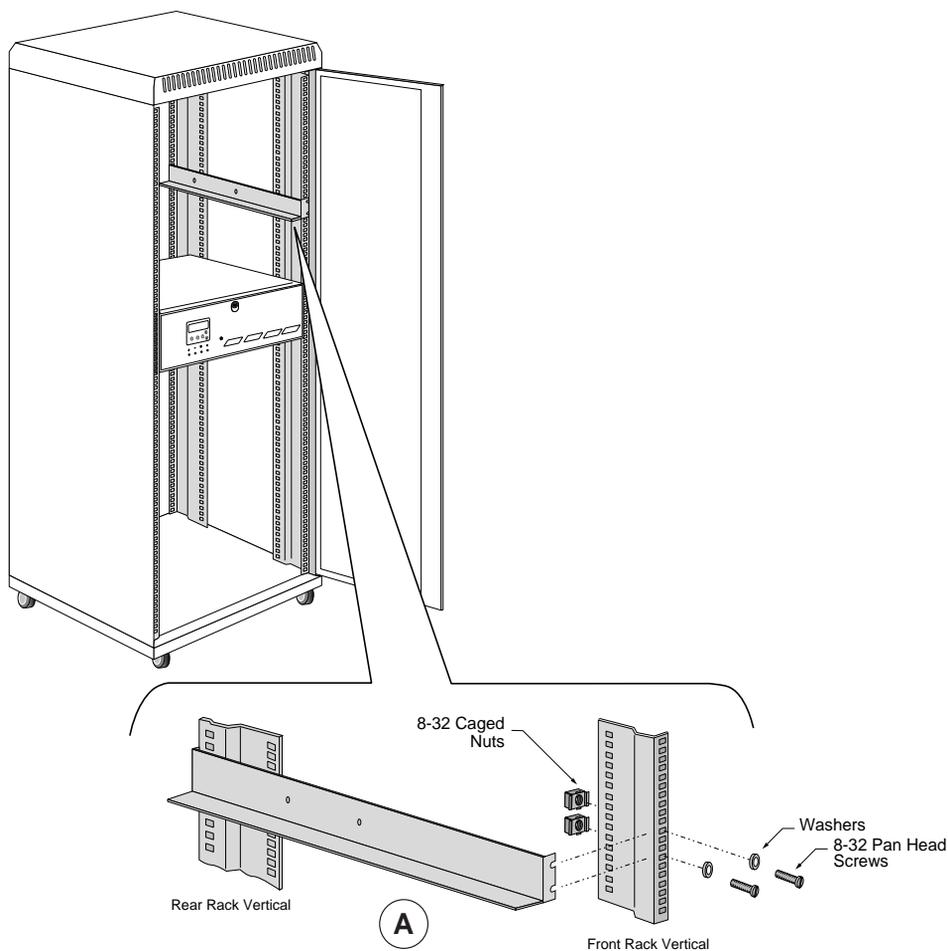
Rack-Mount Subsystem Assembly

You can install the CR8e into any standard IAE 19" rack cabinet.

CAUTION: Ensure that the location of the CR8e does not create an unstable condition when installed in the rack cabinet enclosure.

NOTE: Mount the subsystem into the rack enclosure before installing the disk drives. This will reduce the weight required to support during installation.

- 1 Select an appropriate location in your rack cabinet for the CR8e. If you are installing multiple systems, review the cabling configuration section later in this chapter for your cable scheme to determine the optimum locations.



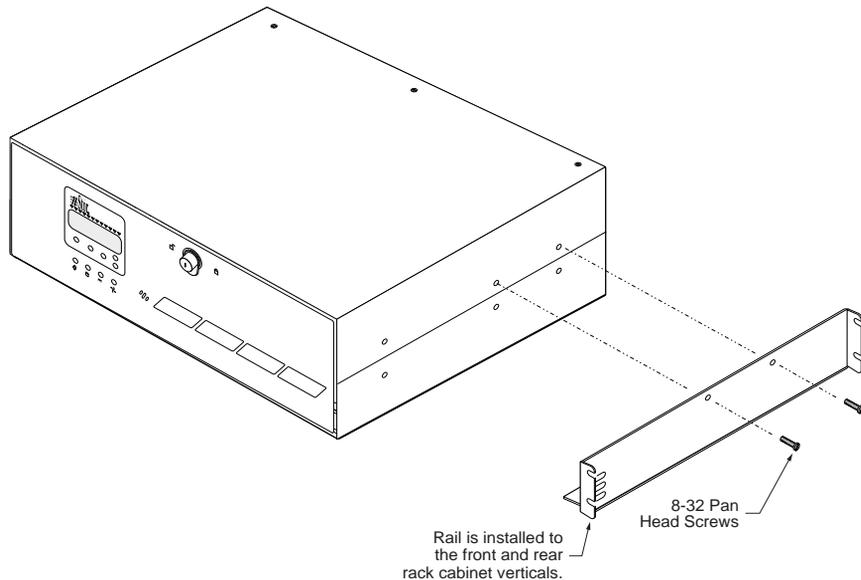
- 2 To aid in support bracket installation, remove the rack cabinet side panels.
- 3 Locate the two support brackets. Mount the two brackets to the rack cabinet verticals using the four screws, four washers, and four caged nuts provided for each bracket. Refer to detail "A" in the illustration on the previous page.

NOTE: The caged nuts are secured into the rack cabinet vertical slots by inserting one side of the nut into the slot and squeezing while pressing the opposite side in until it snaps into place.

- 4 Remove the two (2) upper enclosure case screws as depicted below on the right side of the subsystem cabinet.

NOTE: The enclosure is attached to the support bracket only on the right side.

- 5 Slide the subsystem cabinet into the cabinet with the subsystem riding on top of the support brackets.
- 6 Align the two upper case screw holes with those provided in the support bracket on the right side.



- 7 Secure the subsystem cabinet to the right hand rail using the two (2) screws previously removed.
- 8 Continue with the component installation on the next page.

Component Installation

CAUTION: Disk drives and printed circuit board components are sensitive to electrostatic discharge. To prevent operating failure or damage, observe the following: Establish a ground for yourself by using the wrist grounding strap, or by touching the metal chassis prior to handling or installing the drives or printed circuit board components.

- 1** Down your server or power off your computer system in preparation for installing the host adapter (if applicable).
- 2** Install the adapter into your host computer. For specific instructions, refer to your host system's manual and the host adapter's user guide.

CAUTION: Exercise care when handling any hard disk drive. Do not drop, jar, or bump the disk drives.

- 3** Install the disk drives. Remove one of the disk drives from its anti-static protective packaging.
- 4** Holding the drive by its edges, locate the Drive Latching Clips and pull out on the latches to unlock them.

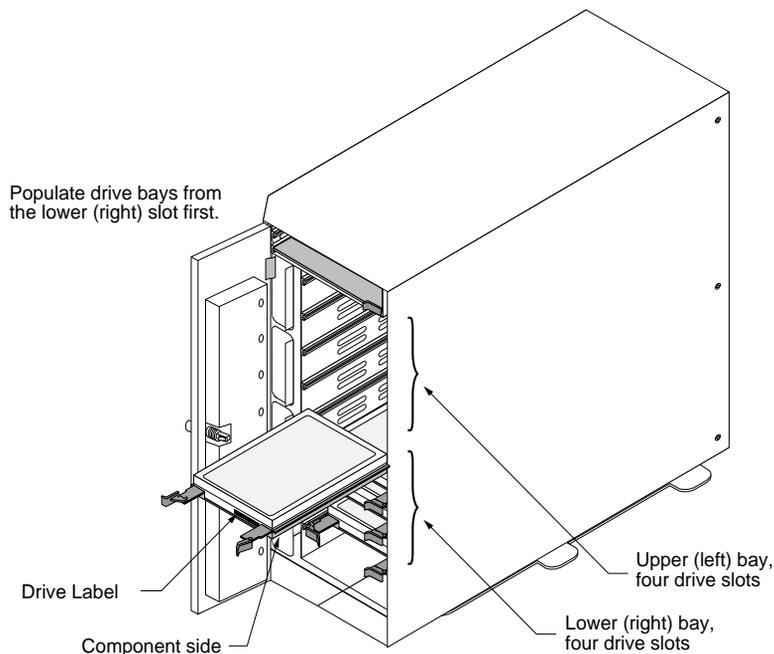
The Drive Latching Clips are placed in the locked position for shipping purposes.

- 5** Insert the disk drive into the drive bay by aligning its rails into the drive bay slots, component side toward the right on rack-mount systems or component side down on tower-based systems.

Dual-Bus module - The drive slots are split into two buses: one bus connects the left or upper four drive slots and the other bus connects the right or lower four drive slots.

Depending on to which bus the drives will be configured, begin populating the drives starting with the far right slot or lowest slot for that bus.

Single-Bus module - The Single-Bus module connects all eight drive slots to one bus. Begin populating the drive with the far right or lowest drive slot and work to your left or up.



- 6** Fully seat the drive by applying pressure with your thumb to the front of the drive.
- 7** Press the Drive Latching Clips until they “snap” into place. The drive is now locked into position.
- 8** Install the remaining drives repeating steps 3 through 7, until all the drives have been installed, as desired.

NOTE: Verify that the power switch on the CR8e is in the OFF position (O).

- 9** Connect one end of the power cord to the power connector on the rear panel and the other end to a three-hole grounded outlet or power strip. A UPS is recommended.
- 10** Refer to the “Cabling Configuration” on page 20 to complete the data cable connections if you are using the AM RAID Controller card. If you are using the Ultra S2S RAID Controller, refer to the *nStor Ultra S2S RAID Controller and PC Utilities User’s Guide* for information about cabling configurations.

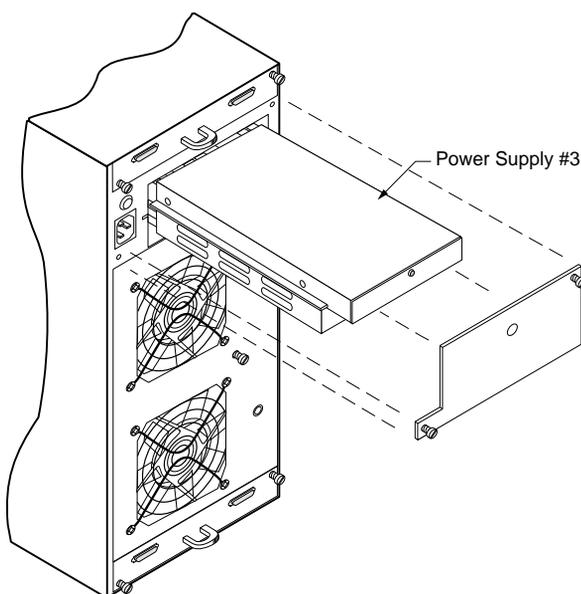
Installing the Third Power Supply

If you will be installing five (5) or more disk drives you will be required to install the third power supply.

CAUTION: Power supply installation is to be performed by qualified service personnel only. There is no need to power off the CR8e or the computer system. The power supplies are hot swappable.

- 1 Loosen the two screws on the Power Supply #3 cover plate using a flat-blade screwdriver and remove the cover plate.
- 2 Remove the power supply from its shipping package.
- 3 Install the third power supply by sliding the PSU into the cabinet until it reaches its locked position. Orient the supply as indicated in the illustration.

NOTE: Use care when inserting the power supply into its fully seated position. Do not use a strong force to seat the PSU into its mating connector.



- 4 Remove the blanking plug for the LED on the cover plate.
- 5 Re-install the cover plate. Secure the cover plate with the two screws using a flat-blade screwdriver securing the power supply.

Cabling Configuration

The Ultra Wide SCSI mode provides enhanced performances with data transfers up to 40 MBs per second (20 MHz), while the Fast Wide SCSI mode will provide transfers up to 20 MBs per second (10 MHz).

The cabling configuration section is divided into two subsections, Ultra Wide SCSI and Fast Wide SCSI. These two sections provide the recommended cable configurations when operating the CR8e in a specific mode.

The CR8e supports the American National Standard Ultra SCSI (Fast-20) parallel interface standards, referred to as Ultra Wide SCSI. This standard is backward compatible with Fast SCSI (SCSI-2 with the Wide option), also referred to as Fast Wide SCSI. This standard defines the mechanical, electrical, and timing requirements. In compliance with these interface standards, certain limitations apply when considering the configuration, lengths of cabling, and termination. The configuration samples and cables provided with the subsystem meet the requirements of the specifications. Modifications to any of these variables can have less than desirable results when operating any SCSI device.

General

Cables

Cable length is a critical consideration when configuring the subsystems. There are different limitations for Ultra Wide SCSI and Fast Wide SCSI.

When calculating the total length of your cabling, the internal subsystem length of cables and printed circuit board traces (known as the internal cable length) must be subtracted from your total cable length. The CR8e internal cable length is 36 inches.

For Ultra Wide SCSI, the total SCSI cable length is 3 meters (118 inches) with four drives and 1.5 meters (59 inches) with eight drives. After subtracting the internal length of 36 inches the remaining cable length is 82 inches or approximately 6.83 feet (2.08 meters) for four drives and 23 inches or approximately 1.9 feet (.58 meters) for eight drives.

For Fast Wide SCSI, the total SCSI cable length is 6 meters (236 inches) with four drives and 3 meters (118 inches) with eight drives. After subtracting the internal length of 36 inches the remaining cable length is 200 inches or approximately 16.66 feet (5.08 meters) for four drives or approximately 6.83 feet (2.08 meters) for eight drives.

Because of the enhancements in the CR8e, its possible to extend beyond the limits set forth in the specification. However, a symptom from exceeding this cable limit is a SCSI bus lockup or “freeze.” If you experience a similar problem and are aware of a cabling limit issue, reducing the length of cabling and returning the total length to within the specified limit should resolve any problems.

If you have a cabling issue and require more information, contact nStor Technical Support for further assistance. *Data loss is possible under conditions of SCSI bus lockup.*

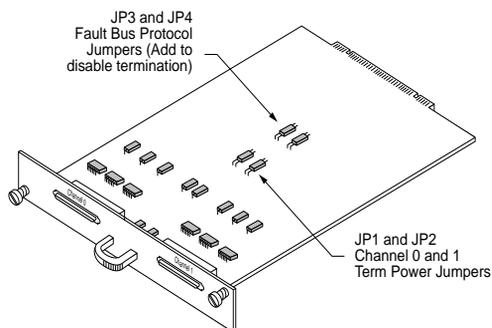
NOTE: Shielded data cables, such as those provided with the subsystem, must be used to prevent radio frequency interference. It is recommended that you use the cables provided by nStor. These cables have been tested and meet stringent guidelines set forth by SCSI-3 ANSI specifications.

Termination

Termination is required at both ends of the SCSI bus. There are two sets of jumpers on the I/O Interface card. One set of jumpers (JP1 and JP2) routes “Term Power” in the event that the host controller is not providing it. The default setting is the unjumpered condition (jumper offset on one pin only). The second set of jumpers addresses a specific set of controllers that use the DEC Fault Bus protocol. If your controller uses this protocol, you will need to jumper (jumper on both pins) at location JP3 and JP4 on the backplane for the indicated channel that will be used. A jumper at either of these locations will disable termination at that point on the SCSI bus.

If you are using a controller that provides Term Power, no change is required and SCSI bus termination will occur automatically.

Most RAID controllers provide termination for one end of the SCSI bus, while the I/O Interface card provide final termination at the other end of the bus.



Ultra Wide SCSI Mode

Several possible configurations exist for the CR8e in Ultra Wide SCSI mode. However this manual will discuss the two possible configurations using the I/O Interface card in Ultra Wide SCSI mode: dual-bus module in a single enclosure and single-bus module in a single enclosure. Refer to the *nStor Feature Card User's Guide* for additional configurations when using the Ultra Extender or Differential Converter card.

When configuring a dual-bus enclosure subsystem with an AM RAID Controller, one channel on the controller connects to Channel #0 on the I/O Interface card and the other channel on the controller connects to Channel #1 on the I/O Interface card – each channel addresses either the upper (right) or lower (left) bank of drives. When configuring the single-bus enclosure with an AM RAID Controller, one channel on the controller connects to the right or upper channel (Channel #1) connector on the I/O Interface card and addresses both banks of drives.

From the front, the drives slots are divided into two banks. The left or upper four front drive slots, which are connected to “Channel 1” on the I/O Interface card, and the right or lower four front drive slots are connected to “Channel 0” on the I/O Interface card.

Dual-Bus Enclosure

With this configuration you will have a total storage capacity of up to 145 GB (using 18 GB disk drives) per subsystem enclosure.

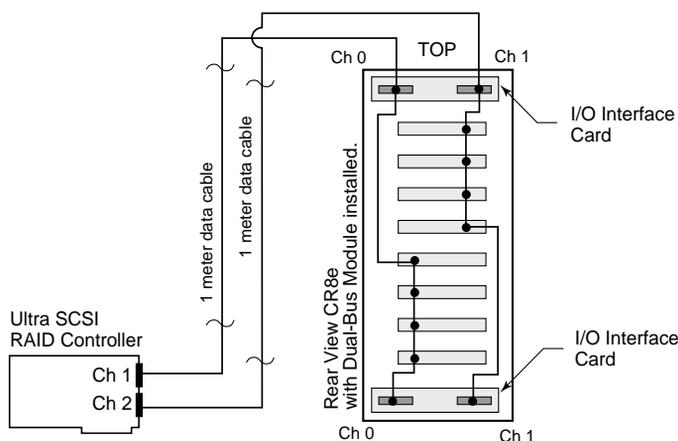
The SCSI IDs of the drives are set by the SAF-TE card defaults to IDs 0, 1, 2, and 4, from the front beginning with the drive located on the right or lower slot of each bank. The SCSI IDs can be manually changed from the OCP, if required. Both banks of drives will normally use the same sequence of SCSI ID numbers when the Dual-Bus module is installed.

NOTE: SCSI ID 3 is reserved for the SAF-TE card processor.

CAUTION: Ensure that the power switch is in the OFF (O) position for both the host system and the CR8e subsystem before connecting any cables.

- 1 Connect one end of a one meter data cable to the Channel #1 connector on the AM RAID Controller.

- 2 Connect the other end of the data cable to the Channel #0 SCSI connector on the right side or upper I/O Interface card.
- 3 If required, connect one end of the second one meter data cable to the Channel #2 connector on the AM RAID Controller.
- 4 Connect the other end of the second data cable to the Channel #1 SCSI connector on the right side or upper I/O Interface card.



NOTE: SCSI termination is automatic and requires no user configuration. Refer to “Termination” on page 21 for information on systems using DEC Fault bus protocol.

- 5 Turn on the power to the CR8e. After the power-on self-test has completed, Status and Channel Mode LEDs will be solid green.
- 6 Access the Options menu on the Operator Control Panel and choose the SAFTE CHAIN ID selection. Choose the “None” selection, refer to “SAFTE CHAIN ID” on page 50.
- 7 After setting the cabinet identifications you must power cycle the subsystem. Observe normal power cycling precautions by waiting a minimum of five (5) seconds before adding power again.

This will reset the SCSI IDs to a default setting that prevents a SCSI ID conflict under normal conditions.

- 8 Power up your computer system and run the configuration program.

This completes the hardware installation.

Single-Bus Enclosure

With the Single-Bus module installed, all of the disk drives in the CR8e enclosure are on the same SCSI bus. With this configuration you will have a total storage capacity of up to 145 GB (using 18 GB disk drives) per subsystem enclosure and have access to the drives independently or as a single large array.

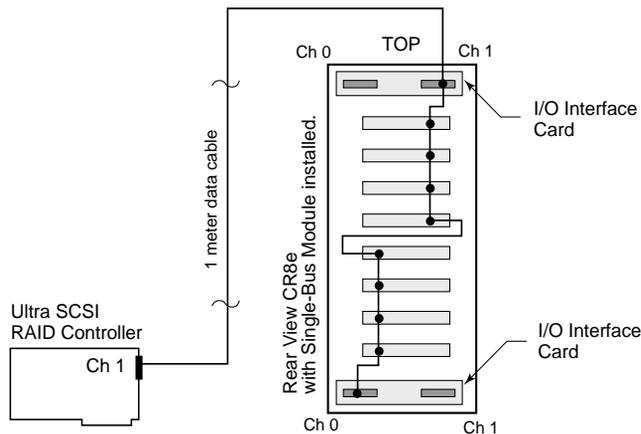
The SCSI IDs of the drives are set by SAF-TE card defaults to IDs 0 through 9, and are assigned sequentially beginning with the lowest or far right drive.

NOTE: SCSI ID 3 is reserved for the SAF-TE card processor and ID 7 reserved for the RAID controller.

CAUTION: Ensure that the power switch is in the OFF (O) position for both the host system and the CR8e subsystem before connecting any cables.

- 1 Connect one end of a one meter data cable to the Channel #1 connector on the AM RAID Controller.
- 2 Connect the other end of the data cable to the Channel #1 SCSI connector on the upper or right side I/O Interface card.

NOTE: The Channel #1 connector located on the upper or right side I/O Interface card is the active connector when the Single-Bus module is installed.



NOTE: SCSI termination is automatic and requires no user configuration. Refer to “Termination” on page 21 for information on systems using DEC Fault bus protocol.

- 3 Turn on the power to the CR8e. After the power-on self-test has completed, Status and Channel Mode LEDs will be solid green.
- 4 Access the Options menu on the Operator Control Panel and choose the SAFTE CHAIN ID selection. Choose the “None” selection, refer to “SAFTE CHAIN ID” on page 50.
- 5 After setting the cabinet identifications you must power cycle the subsystem. Observe normal power cycling precautions by waiting a minimum of five (5) seconds before adding power again.

This will reset the SCSI IDs to a default setting that prevents a SCSI ID conflict under normal conditions.

- 6 Power up your computer system and run the configuration program.

This completes the hardware installation.

NOTE: For additional configuration options using Ultra Wide SCSI, refer to the *nStor Feature Card User's Guide*.

Fast Wide SCSI Mode

Several possible configurations exist for the CR8e in the Fast Wide SCSI mode: dual-bus with one or two enclosures, single-bus with one or two enclosures, and one dual-bus enclosure with two single-bus enclosures connected.

When configuring a dual-bus enclosure subsystem with an AM RAID Controller, one channel on the controller connects to Channel #0 on the I/O Interface card and the other channel on the controller connects to Channel #1 on the I/O Interface card – each channel addresses either the upper (right) or lower (left) bank of drives. When configuring the single-bus enclosure with an AM RAID Controller, one channel on the controller connects to the right or upper channel (Channel #1) connector on the I/O Interface card and addresses both banks of drives.

From the front, the drives slots are divided into two banks. The left or upper four front drive slots, which are connected to “Channel 1” on the I/O Interface card, and the right or lower four front drive slots are connected to “Channel 0” on the I/O Interface card.

Single Dual-Bus Enclosure

With the Single-Bus module is installed, all of the disk drives in the CR8e enclosure are on the same SCSI bus. With this configuration you will have a total storage capacity of up to 145 GB (using 18 GB disk drives) per subsystem enclosure and have access to the drives independently or as a single large array.

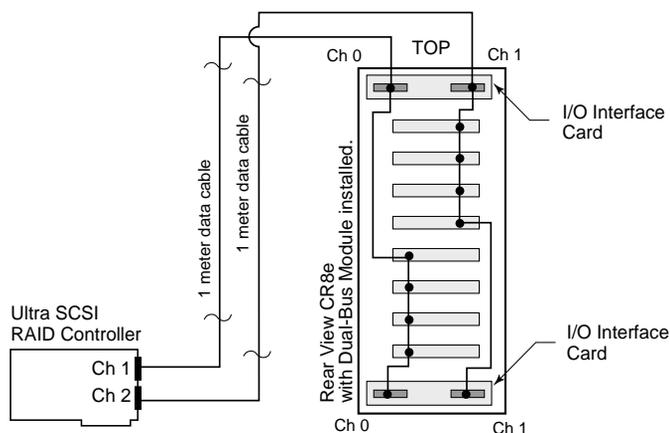
The SCSI IDs of the drives are set by the SAF-TE card defaults to IDs 0, 1, 2, and 4, from the front beginning with the drive located on the right or lower slot of each bank. The SCSI IDs can be manually changed from the OCP, if required. Both banks of drives will normally use the same sequence of SCSI ID numbers when the Dual-Bus module is installed.

NOTE: SCSI ID 3 is reserved for the SAF-TE card processor.

CAUTION: Ensure that the power switch is in the OFF (O) position for both the host system and the CR8e subsystem before connecting any cables.

- 1 Connect one end of a one meter data cable to the Channel #1 connector on the AM RAID Controller.

- 2 Connect the other end of the first data cable to the Channel #0 SCSI connector on the right side or upper I/O Interface card.
- 3 If required, connect one end of the second one meter data cable to the Channel #2 connector on the AM RAID Controller.
- 4 Connect the other end of the second data cable to the Channel #1 SCSI connector on the right side or upper I/O Interface card.



NOTE: SCSI termination is automatic and requires no user configuration. Refer to “Termination” on page 21 for information on systems using DEC Fault bus protocol.

- 5 Turn on the power to the CR8e. After the power-on self-test has completed, Status and Channel Mode LEDs will be solid green.
- 6 Access the Options menu on the Operator Control Panel and choose the SAFTE CHAIN ID selection. Choose the “None” selection, refer to “SAFTE CHAIN ID” on page 50.
- 7 After setting the cabinet identifications you must power cycle the subsystem. Observe normal power cycling precautions by waiting a minimum of five (5) seconds before adding power again.

This will reset the SCSI IDs to a default setting that prevents a SCSI ID conflict under normal conditions.

- 8 Power up your computer system and run the configuration program.

This completes the hardware installation.

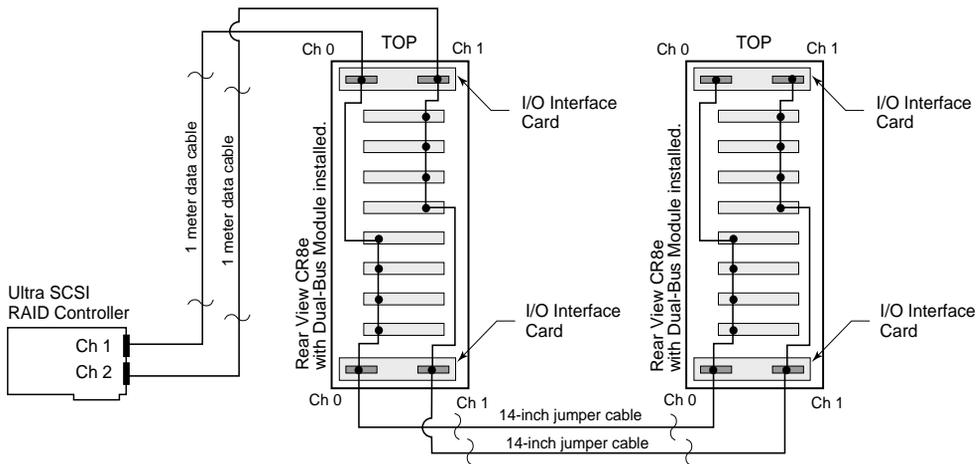
Two Dual-Bus Enclosures

With this configuration you will have a total storage capacity of up to 290 GB (using 18 GB disk drives) which provides 145 GB per channel per subsystem enclosure.

This configuration is similar to the “Single Dual-Bus Enclosure” except that the capacity is expanded with a second cabinet providing a total of eight drives per SCSI channel.

CAUTION: Ensure that the power switch is in the OFF (O) position for both the host system and the CR8e subsystem before connecting any cables.

- 1 Connect one end of a one meter data cable to the Channel #1 connector on the AM RAID Controller.
- 2 Connect the other end of the first data cable to the Channel #0 SCSI connector on the right side or upper I/O Interface card.
- 3 Connect one end of the second one meter data cable to the Channel #2 connector on the AM RAID Controller.
- 4 Connect the other end of the second data cable to the Channel #1 SCSI connector on the right side or upper I/O Interface card.



- 5 Locate the jumper cables. Connect one end of a jumper cable to the Channel #0 SCSI connector on the left side or lower I/O Interface card in the first cabinet.

- 6** Connect the other end of the jumper cable to the Channel #0 SCSI connector on the left side or lower I/O Interface card in the second cabinet.
- 7** Connect one end of a second jumper cable to the Channel #1 SCSI connector on the left side or lower I/O Interface card in the first cabinet.
- 8** Connect the other end of the second jumper cable to the Channel 1 SCSI connector on the left side or lower I/O Interface card in the second cabinet.

NOTE: SCSI termination is automatic and requires no user configuration. Refer to “Termination” on page 21 for information on systems using DEC Fault bus protocol.

- 9** Turn on the power to the CR8e. After the power-on self-test has completed, Status and Channel Mode LEDs will be solid green.
- 10** Access the Options menu on the Operator Control Panel and choose the SAFTE CHAIN ID selection. For each subsystem, identify which subsystem will be the master cabinet and which will be the slave cabinet. (Generally, the master cabinet will be the subsystem connected to the controller.) Refer to “SAFTE CHAIN ID” on page 50.
- 11** After setting the cabinet identifications you must power cycle the subsystem. Observe normal power cycling precautions by waiting a minimum of five (5) seconds before adding power again.

This will reset the SCSI IDs to a default setting that prevents a SCSI ID conflict under normal conditions.
- 12** Power up your computer system and run your configuration program.

This completes the hardware installation.

Single-Bus Enclosure

With the Single-Bus module installed, all of the disk drives in the CR8e enclosure are on the same SCSI bus. With this configuration you will have a total storage capacity of up to 145 GB (using 18 GB disk drives) per subsystem enclosure and have access to the drives independently or as a single large array.

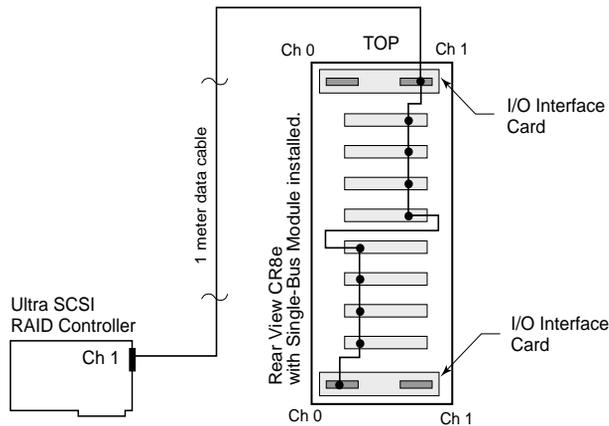
The SCSI IDs of the drives are set by SAF-TE card defaults to IDs 0 through 9, and are assigned sequentially beginning with the lowest or far right drive.

NOTE: SCSI ID 3 is reserved for the SAF-TE card processor and ID 7 reserved for the RAID controller.

CAUTION: Ensure that the power switch is in the OFF (O) position for both the host system and the CR8e subsystem before connecting any cables.

- 1 Connect one end of a one meter data cable to the Channel #1 connector on the AM RAID Controller.
- 2 Connect the other end of the data cable to the Channel #1 SCSI connector on the upper or right side I/O Interface card.

NOTE: The Channel #1 connector located on the upper or right side I/O Interface card is the active connector when the Single-Bus module is installed.



NOTE: SCSI termination is automatic and requires no user configuration. Refer to “Termination” on page 21 for information on systems using DEC Fault bus protocol.

- 3** Turn on the power to the CR8e. After the power-on self-test has completed, Status and Channel Mode LEDs will be solid green.
- 4** Access the Options menu on the Operator Control Panel and choose the SAFTE CHAIN ID selection. Choose the “None” selection, refer to “SAFTE CHAIN ID” on page 50.
- 5** After setting the cabinet identifications you must power cycle the subsystem. Observe normal power cycling precautions by waiting a minimum of five (5) seconds before adding power again.

This will reset the SCSI IDs to a default setting that prevents a SCSI ID conflict under normal conditions.

- 6** Power up your computer system and run the configuration program.

This completes the hardware installation.

Two Single-Bus Enclosures

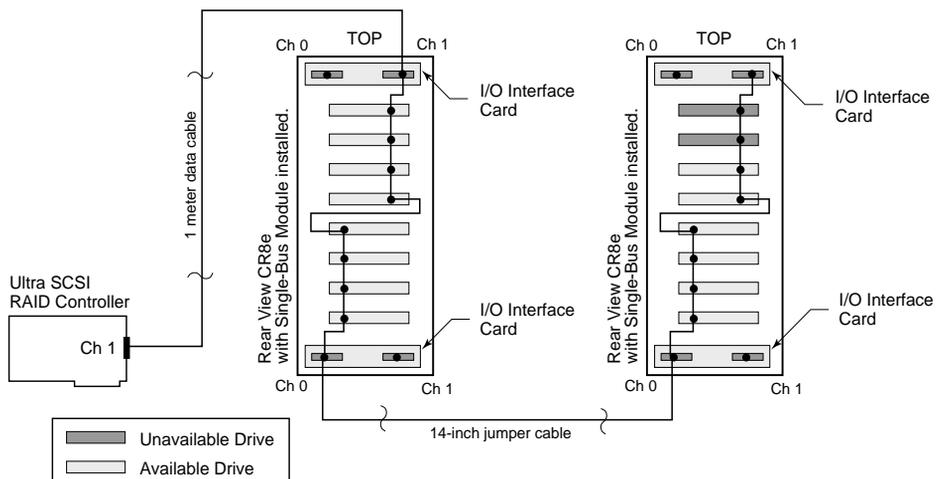
This configuration is similar to the “Single-Bus Enclosure” except that the capacity is expanded with a second cabinet providing a total of fourteen drives per SCSI channel.

In this configuration a total of 16 SCSI IDs are available, one ID is consumed by the AM RAID Controller, and ID 3 is taken by the SAF-TE processor, leaving the fourteen remaining SCSI IDs available for the disk drives. Since the two CR8e enclosures provide for sixteen drives, with only 14 IDs available two drive slots will remain empty under this configuration.

CAUTION: Ensure that the power switch is in the OFF (O) position for both the host system and the CR8e subsystem before connecting any cables.

- 1 Connect one end of a one meter data cable to the Channel #1 connector on the AM RAID Controller.
- 2 Connect the other end of the data cable to the Channel #1 SCSI connector on the upper or right side I/O Interface card.

NOTE: The Channel #1 connector located on the upper or right side I/O Interface card is the active connector when the Single-Bus module is installed.



- 3 Locate the jumper cables. Connect one end of a jumper cable to the Channel #0 SCSI connector on the left side or lower I/O Interface card in the first cabinet.

- 4** Connect the other end of the jumper cable to the Channel #0 SCSI connector on the left side or lower I/O Interface card in the second cabinet.

NOTE: SCSI termination is automatic and requires no user configuration. Refer to “Termination” on page 21 for information on systems using DEC Fault bus protocol.

- 5** Turn on the power to the CR8e. After the power-on self-test has completed, Status and Channel Mode LEDs will be solid green.
- 6** Access the Options menu on the Operator Control Panel and choose the SAFTE CHAIN ID selection. For each subsystem, identify which subsystem will be the master cabinet and which will be the slave cabinet. (Generally, the master cabinet will be the subsystem connected to the controller.) Refer to “SAFTE CHAIN ID” on page 50.
- 7** After setting the cabinet identifications you must power cycle the subsystem. Observe normal power cycling precautions by waiting a minimum of five (5) seconds before adding power again.

This will reset the SCSI IDs to a default setting that prevents a SCSI ID conflict under normal conditions.
- 8** Power up your computer system and run your configuration program.

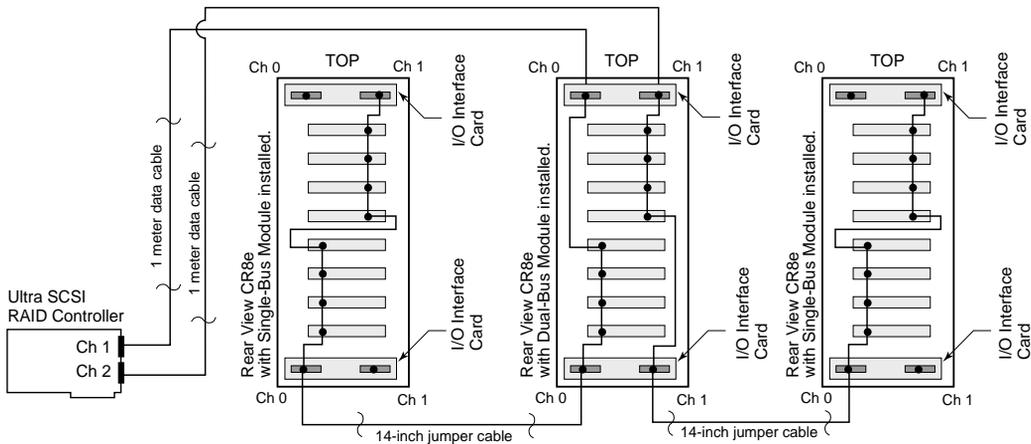
This completes the hardware installation.

A Dual-Bus Enclosure with Two Single-Bus Enclosures

With this configuration you will be able to expand the capacity of each SCSI channel of a Dual-Bus enclosure by adding a Single-Bus enclosure to each channel. This provides up to twelve drives per SCSI channel for a total capacity of 218 GB (using 18 GB disk drives) on each channel.

CAUTION: Ensure that the power switch is in the OFF (O) position for both the host system and the CR8e subsystem before connecting any cables.

- 1 Connect one end of a one meter data cable to the Channel #1 connector on the AM RAID Controller.
- 2 Connect the other end of the first data cable to the Channel #0 SCSI connector on the right side or upper I/O Interface card.
- 3 Connect one end of the second data cable to the Channel #2 connector on the AM RAID Controller.
- 4 Connect the other end of the second data cable to the Channel #1 SCSI connector on the right side or upper I/O Interface card.



- 5 Locate the jumper cables. Connect one end of one jumper cable to the Channel #0 SCSI connector on the left side or lower I/O Interface card installed in the Dual-Bus enclosure (master).

- 6** Connect the other end of the first jumper cable to the Channel #0 SCSI connector on the left side or lower I/O Interface card installed in the Single-Bus enclosure (Slave #1).
- 7** Connect one end of a second jumper cable to the Channel #1 SCSI connector on the left side or lower I/O Interface card installed in the Dual-Bus enclosure (master).
- 8** Connect the other end of the second jumper cable to the Channel #0 SCSI connector on the left side or lower I/O Interface card installed in the Single-Bus enclosure (Slave #2).

NOTE: SCSI termination is automatic and requires no user configuration. Refer to “Termination” on page 21 for information on systems using DEC Fault bus protocol.

- 9** Turn on the power to the CR8e. After the power-on self-test has completed, Status and Channel Mode LEDs will be solid green.
- 10** Access the Options menu on the Operator Control Panel and choose the SAFTE CHAIN ID selection. For each subsystem, identify which subsystem will be the master cabinet and which will be the slave cabinets. (Generally, the master cabinet will be the subsystem connected to the controller.) Refer to “SAFTE CHAIN ID” on page 50.
- 11** After setting the cabinet identifications you must power cycle the subsystem. Observe normal power cycling precautions by waiting a minimum of five (5) seconds before adding power again.

This will reset the SCSI IDs to a default setting that prevents a SCSI ID conflict under normal conditions.

- 12** Power up your computer system and run your configuration program.

This completes the hardware installation.

Other Configurations

There are many possible combinations of controllers and cabling schemes when configuring the CR8e subsystem enclosures. The sample configurations in the previous sections provide the basic configurations. However, the CR8e is based on an open-architecture expandable subsystem and allows for customization to fit your current or future needs.

Some other possible schemes within SCSI bus length limitations for both Ultra Wide SCSI and Fast Wide SCSI are:

- A 3-channel AM RAID Controller where two channels connect to a dual-bus cabinet with two single-bus cabinets (Fast Wide). The third channel of the controller can be connected to another Single-Bus enclosure (Ultra Wide or Fast Wide).
- A 3-channel AM RAID Controller with a Single-Bus enclosure connected to each channel (Ultra Wide or Fast Wide).
- A 3-channel AM RAID Controller with two Single-Bus enclosures connected to each channel (Fast Wide).
- A 3-channel AM RAID Controller with two Single-Bus enclosures connected to two channels and a dual-bus cabinet connected to the third channel (Fast Wide).
- A 3-channel AM RAID Controller with four Single-Bus enclosures connected to two channels and a dual-bus cabinet connected to the third channel (Fast Wide).
- A 2-channel AM RAID Controller with two Single-Bus enclosures connected to each channel (Ultra Wide or Fast Wide).
- A 2-channel AM RAID Controller with one Single-Bus enclosure connected to each channel (Ultra Wide or Fast Wide).

NOTE: For additional configuration options while operating under the Ultra Wide SCSI mode, refer to the *nStor Feature Card User's Guide*.

3

Using the CR8e

In this chapter you will find information on the subsystem's enclosure notifications systems, and the proper use and operation of the Operator Control Panel.

Notifications and Error Conditions

When the CR8e subsystem has powered applied, it will perform a power on self-test (POST) procedure. During the POST operation, in addition to the LED notifications, you can also monitor the operation of the subsystem tests and the subsystem component conditions all from the Operator Control Panel.

Power-On Self Test

During the diagnostic POST, a continuous tone will sound and the following will be observed:

The Operator Control Panel will display "Testing ROM", "NVRAM", and "SCSI Access" followed by the startup mode screen and the Status OK (default) screen, provided no errors are detected. The Status Indicator LEDs will be as follows:

- Fan Status LED will be solid amber and change to solid green
- Power Supply LED will be solid green
- Channel Mode LED will be solid amber and change to solid green

If no errors are detected, all of the Status Indicator LEDs will be illuminating solid green.

Firmware Error Conditions

NOTE: None of the following error conditions will compromise the data integrity on the CR8e drives.

Any of these failures listed below will generate the following: Channel Mode LED blinks amber eight times and the alarm will sound eight tones. After the tones have sounded the Channel Mode LED will change to green and normal operations will be attempted. These error conditions indicate that the LEDs and alarm functions may not be reliable.

RAM Read/Write Failure - This error condition indicates that one or more bytes of the microprocessor RAM failed a write/read test.

ROM Checksum Failure - This error condition indicates that the microprocessor ROM failed to generate the proper checksum.

Register Read/Write Failure - This error condition indicates that one or more of the microprocessor's registers have become defective.

If the errors occur constantly, the CR8e needs to be serviced. Contact nStor Technical Support.

RAM Checksum Failure

If this error condition occurs, the Channel Mode LED will alternately blink green and amber indefinitely. This indicates that the firmware stored in the non-volatile RAM has become corrupted and new firmware data will need to be downloaded from the SCSI bus to correct this problem. Contact nStor Technical Support.

SCSI Bus Access Failure

If this error condition occurs, the Channel Mode LED will blink amber four times and the speaker will sound four tones. This indicates that either the SCSI controller failed to respond to a reset command or another device has control of the SCSI bus.

Note that this may be caused by other devices having control of the bus at the time the CR8e is powered ON. After the tones have sounded, there will be a two second delay, and the microprocessor will again attempt to initialize the SCSI controller. Turning the system OFF then ON again may help resolve this condition. Normal operations will be impossible while the SCSI controller remains unresponsive.

All drive LEDs will illuminate solid green regardless of the error conditions. The CR8e needs to be serviced if this error occurs consistently and is not cleared by cycling the power on the CR8e. Contact nStor Technical Support.

NOTE: The CR8e subsystem will not respond to the firmware if this error occurs.

LED Descriptions

Use the following LED matrix to interpret the CR8e LEDs when the SAF-TE card is installed and an accompanied SAF-TE compliant RAID controller is installed.

SAF-TE LED Matrix

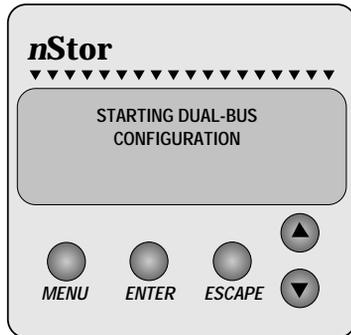
	STATUS LEDs	CHANNEL MODE LEDs
AT POWER UP	Steady Green	Steady Green
DRIVE READY NOT ASSIGNED	Blinking Green	Steady Green
DRIVE READY ASSIGNED	Steady Green	Steady Green
HOT SPARE READY ASSIGNED	Blinking Green	Steady Green
DRIVE ERROR NOT ASSIGNED	Blinking Green	Steady Amber
DRIVE ERROR ASSIGNED	Blinking Amber	Steady Amber
ARRAY CRITICAL REMAINING GOOD DRIVES	Steady Amber	Steady Amber
HOT SPARE REBUILD MODE	Steady Amber	Steady Amber
DRIVE MANUALLY DISABLED	Blinking Amber	Steady Amber
STATUS LEDs		
ASSIGNED TO ARRAY	Steady Green	
UNASSIGNED DRIVE	Blinking Green	
HOT SPARE	Blinking Green	
ALL EMPTY BAYS	Off	
FAILED DRIVE	Blinking Amber	
REBUILD MODE	Steady Amber (all drives)	
CHANNEL MODE LEDs		
ARRAY IS FAULT-TOLERANT	Steady Green	
ARRAY IS IN REBUILD MODE	Steady Amber	
ARRAY HAS A FAILED DRIVE	Steady Amber	
FIRMWARE CHECKSUM ERROR	Alternating Amber and Green	

Operator Control Panel

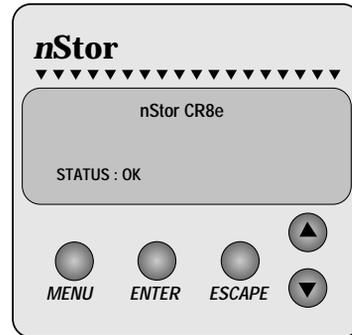
In this section you will find an explanation of the Operator Control Panel screen displays, as well as a description and subsequent procedures for using each of the OCP menu functions.

Startup Screens

The following are sample screens that could occur during the startup POST operation for normal conditions and abnormal conditions:

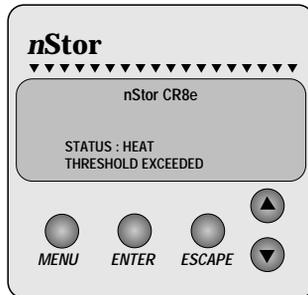


Startup Screen
(You will see either Dual-Bus or Single-Bus, depending on the configuration module installed.)

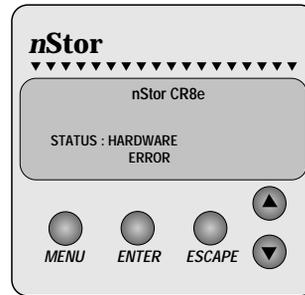


Status OK Screen

Normal Screens



Temperature Exceeded Screen



Hardware Error Screen

Abnormal Screens

If a subsystem error occur during the startup, you will hear a continuous tone from the alarm. Access the Component Status Menu to identify the suspected failed component.

Power Supply Error Conditions

During normal operation, anytime one of the required number of power supplies becomes inoperative, you will hear a continuous alarm and a warning message will appear on the display. This message is simply a notification that the state of the power system is no longer redundant. Use the Component Status menu to determine which power supply has failed and identify the failed unit by the absence of its “DC Good” LED on the PSU. Replace the failed component to return the subsystem to a redundant state.

If you install five (5) or more disk drives and only have two (2) power supplies installed, an alarm will sound. The Power Supply LED will illuminate steady amber and the OCP display will indicate “Non-Redundant Power.” Install a third power supply and the error message will clear followed by the Power Supply LED returning to a steady green. For more information see *Installing the Third Power Supply* on page 19.

Subsystem Status Icon

A feature of the CR8e OCP is the “at-a-glance” animated icon that appears to indicate subsystem status. The icon will appear at the Main menu screen after 30 seconds of no OCP input activity and provides an “at-a-glance” look at system status. The icon will be located where the cursor normally appears.

The animated icon will have a “happy” face and looks “left and right”, if all the systems are operating normally. If an abnormality occurs within the subsystem, the icon will change to a “sad” face requesting your attention.

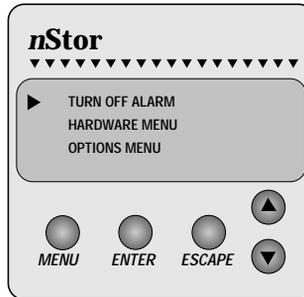


Main Menu

From the Main Menu selection the following options are available:

- Turn off the audible alarm
- Select the hardware menu
- Select the options menu

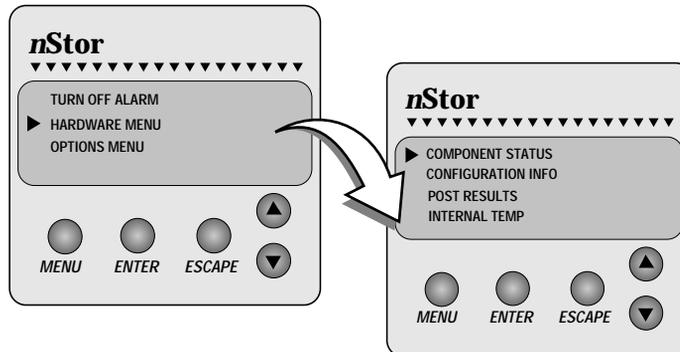
To access the Main menu, press the Menu button. Use the up and down arrow buttons to make your selection and press the Enter button.



Hardware Menu

From the Hardware Menu selection the following options are available:

- Component Status
- Configuration Info
- POST Results (Power-On Self Test)
- Internal Temp



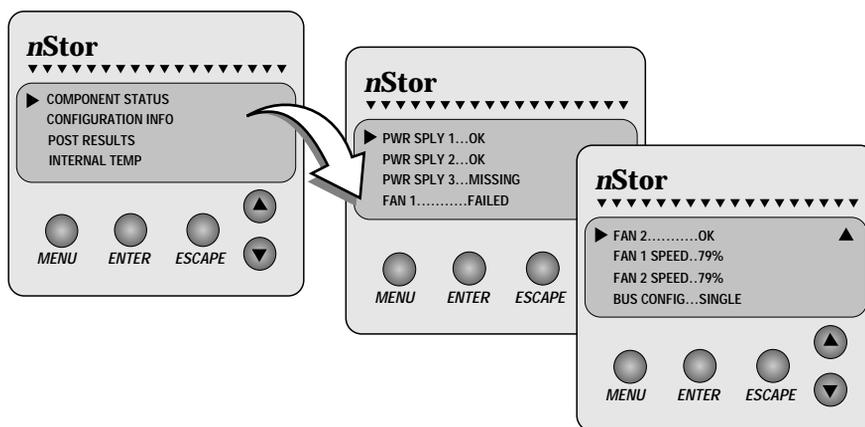
Component Status

The Component Status menu provides a view of the power supplies and fans installed in the CR8e and their current status. Component status can be either OK, Missing, or Failed.

- 1 If you receive a Hardware Error, access the Main menu and choose the *Hardware Menu*.
- 2 Use the up/down arrow buttons to select *Component Status* and press the *Enter* button.
- 3 Use the up/down arrow buttons scrolling to view the complete list of the components.

Fan speeds are expressed in % of RPM. The bus configuration will be displayed for the type of Configuration Module you have installed.

- 4 Press the *Escape* button to return to the previous menu or the *Menu* button to return to the Main “Status OK” screen.

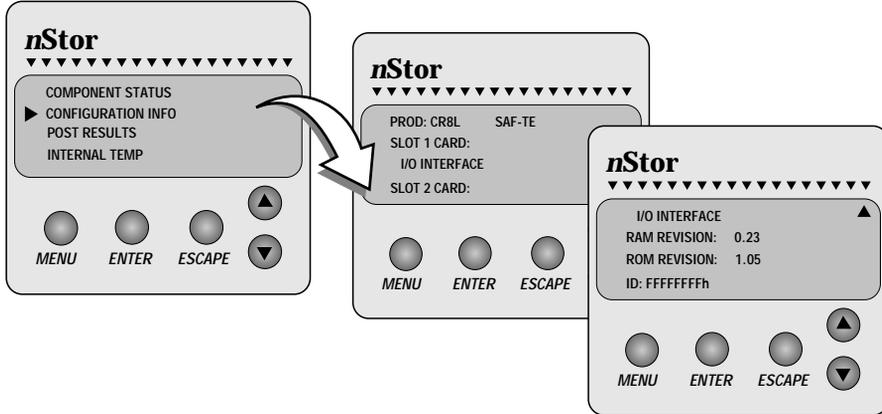


Configuration Info

This selection provides information about the subsystem’s configuration including such items as the installed feature cards and firmware information.

NOTE: Slot “x” Cards are the feature cards located on the subsystem rear panel. Slot 1 is the lower/left feature card slot and slot 2 is the upper/right feature card slot.

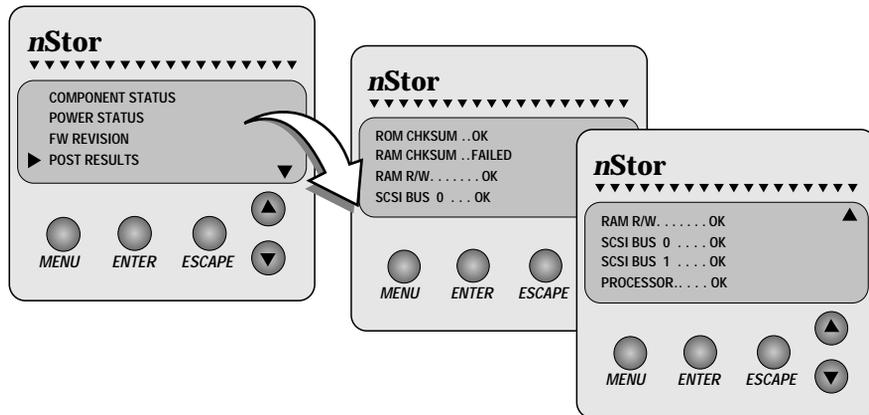
- 1 To view the current enclosure configuration, access the Main menu and choose *Hardware Menu*.



- 2 Use the up/down arrow buttons to select *Configuration Info* and press the *Enter* button.
- 3 Use the up/down arrow buttons scrolling to view the current configuration.
- 4 Press the *Escape* button to return to the previous menu or the *Menu* button to return to the Main “Status OK” screen.

POST Results

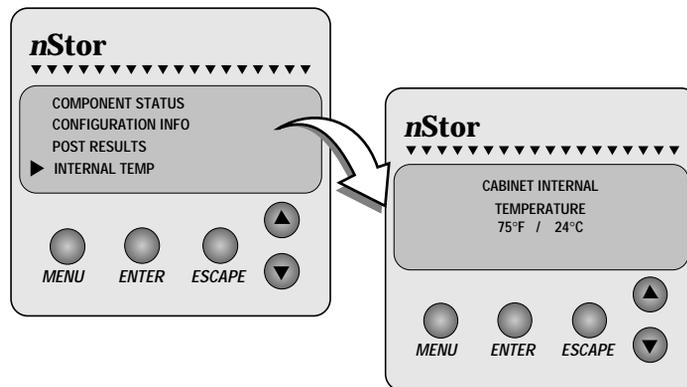
This screen provides a list of the diagnostics performed during the POST procedure. If an error has occurred it will be displayed here in addition to the notification provided by the LEDs and alarms, see *Power-On Self Test* on page 37.



- 1 To view the POST results, access the Main menu and choose *Hardware Menu*.
- 2 Use the up/down arrow buttons to select *Post Results* and press the *Enter* button.
- 3 Use the up/down arrow buttons scrolling to view the complete POST results lists.
- 4 Press the *Escape* button to return to the previous menu or the *Menu* button to return to the Main “Status OK” screen.

Internal Temp

This screen displays the current internal enclosure temperature (highest of the two sensors). To change the temperature threshold of the monitoring system, see *Heat Threshold* on page 49.



- 1 To view the cabinet internal temperature, access the Main menu and choose *Hardware Menu*.
- 2 Use the up/down arrow buttons to select *Internal Temp* and press the Enter button.
- 3 Press the *Escape* button to return to the previous menu or the *Menu* button to return to the Main “Status OK” screen.

Options Menu

From the Options Menu the following are available:

- SCSI ID Menu
- Heat Threshold
- SAFTE Chain ID
- Change Passcode
- Unlock Options

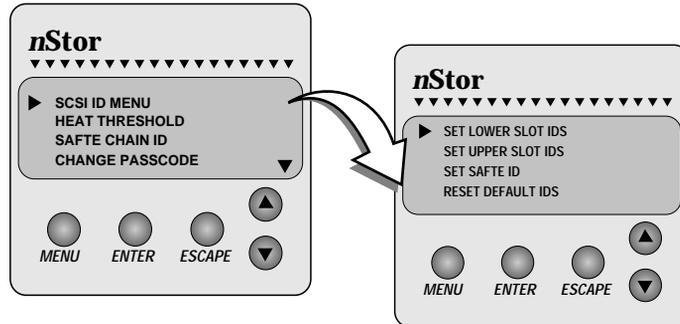
SCSI ID Menu

From the SCSI ID Menu you can set SCSI IDs for drives attached to each of the SCSI channels (lower slot and upper slot), and set the CR8e SAF-TE processor ID (upper or lower bus if a Dual-bus module is installed).

You can manually set SCSI IDs for each group of drives from a pre-defined table of IDs, see *JP4 (SCSI ID Settings)* on page 74 for a list of the possible ID combinations. The SCSI IDs which are currently set will be flashing. The IDs will be assigned sequentially beginning with the lowest device in the group.

NOTE: Drive SCSI IDs cannot be set individually.

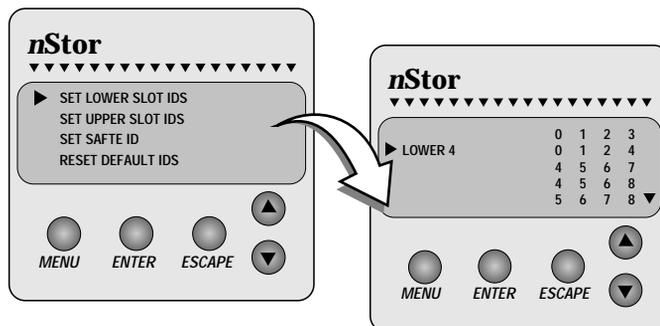
- 1 To manually set the SCSI IDs for the drive sets found in the upper or lower slots, access the Main menu and choose *Options Menu*.



- 2 Use the up/down arrow buttons to select *SCSI ID Menu* and press the *Enter* button.
- 3 Use the up/down arrow buttons to select either the *Lower* or *Upper* drive slot IDs, or the *SAFTE ID*, and press the *Enter* button.

- 4 Use the up/down arrow buttons to make your SCSI ID group selection and press the *Enter* button.

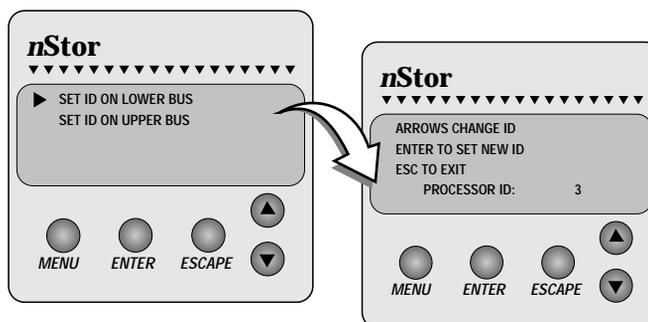
Note the flashing set of IDs, if present. These will be the group currently configured.



- 5 Press the *Escape* button twice or the *Menu* button to return to the Main “Status OK” screen, then power cycle the host computer and CR8e subsystem.

NOTE: You must power cycle the subsystem for the SCSI IDs changes to take effect.

To change the SAF-TE card SCSI ID, follow the five steps above, except select “Set SAFTE ID” in step 3 and choose from “Set ID on Lower Bus” or “Set ID on Upper Bus” in step 4. Use the up/down arrow buttons to change the ID value.



Since the subsystem is available in either a split SCSI bus design or as a single SCSI bus, you can set the SAF-TE card SCSI ID for each bus if a conflict is occurring. The default setting is SCSI ID 3 for each bus. The setting for SCSI ID “OB” indicates Off Bus and is generally used when the subsystem is installed in a “Slave” subsystem in a Master/Slave environment.

NOTE: When the SAF-TE card is set to off bus, LEDs and other error reporting are not driven by the subsystem's off bus SAF-TE card, but are reported and controlled from the "Master" subsystem's SAF-TE card.

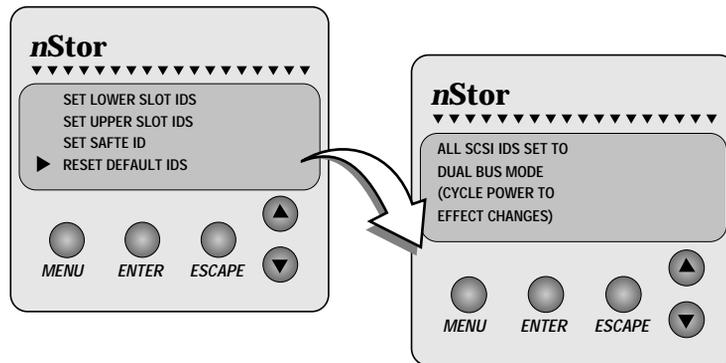
Reset Default IDs Selection

Choosing the "Reset Default IDs" option will reset all subsystem SCSI IDs to their factory default settings.

The default drive ID settings when a dual-bus module is installed are 0, 1, 2, and 4 for both the upper and lower drive groups.

The default drive ID settings when a single-bus module is installed are 0, 1, 2, 4, 5, 6, 8, and 9.

The default SCSI ID for the SAF-TE card is ID 3. SCSI ID 7 is reserved for the host bus adapter.



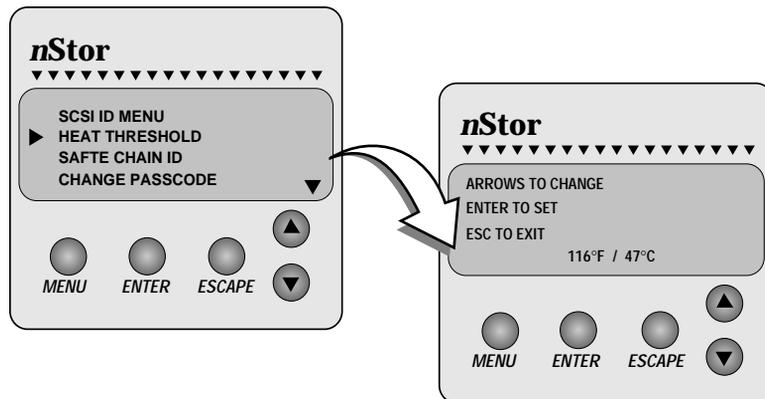
NOTE: You must power cycle the subsystem for the SCSI IDs changes to take effect. Also be sure to power cycle the host computer. If a PCI-based RAID Controller is being used and the host is not power cycled, it will "kill" all drives in the array.

- 1 To reset the SCSI IDs, access the Main menu and choose *Options Menu*.
- 2 Use the up/down arrow buttons to select *SCSI ID Menu* and press the *Enter* button.
- 3 Use the up/down arrow buttons to select *RESET DEFAULT IDS*.
- 4 Press the *Escape* button twice to return to the Main "Status OK" screen, then power cycle the host computer and CR8e subsystem.

Heat Threshold

NOTE: The Heat Threshold value is pre-set at the factory and should not be changed unless directed by nStor Technical Support. The default setting is 116°F/47.°C.

Choose the Heat Threshold Menu to change the temperature value for the thermal monitoring system. If the temperature exceeds the value set here, a “Temperature Threshold Exceeded” screen will appear, see *Internal Temp* on page 45.



- 1 Use the up/down arrow buttons to select *Heat Threshold* and press the *Enter* button.
- 2 Using the up/down arrow buttons, change the temperature threshold setting. The up arrow button will increase the temperature and the down arrow button will lower the temperature threshold. The temperature value will change by 2°C increments.
- 3 Press the *Enter* button the set the *new temperature value*.
- 4 Press the *Escape* button twice or press the *Menu* button to return to the Main “Status OK” screen, then power cycle the host computer and CR8e subsystem.

SAFTE CHAIN ID

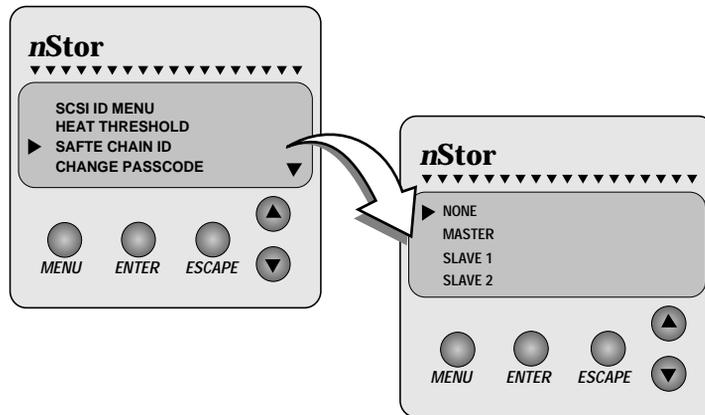
This option allows the administrator to establish the intercabinet SAF-TE communication to support a master and slave cabinets. The master cabinet can report component failure for both the master cabinet and up to two slave cabinets to the AdminiStor Storage Management software. Each cabinet's individual OCP will function normally for that cabinet's components.

Once the slave cabinets have been established, the administrator *must* use the slave cabinet's OCP to manually take that slave cabinet SAF-TE card off bus, refer to "SCSI ID Menu" on page 46.

- 1 Choose the *SAFTE CHAIN ID* selection and press the *Enter* button.
- 2 Use the up/down arrow buttons and choose between the options: *None*, *Master*, *Slave 1*, and *Slave 2*, then press the *Enter* button.

NOTE: Choose "NONE" when the cabinet is used in a stand-alone configuration or the master/slave option is not desired.

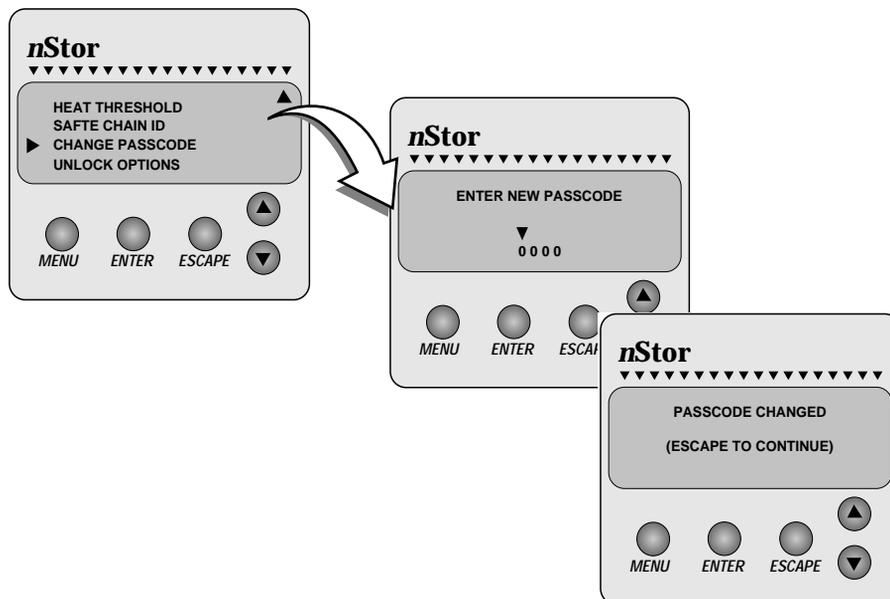
- 3 You will be prompted to cycle the power on the CR8e for the changes to take effect.



Change Passcode

This option allows the administrator to create or change a passcode that will protect access to all the items under the selections SCSI ID Menu, Heat Threshold, and Change Passcode.

- 1 Use the up/down arrow buttons to select *Change Passcode* and press the *Enter* button.

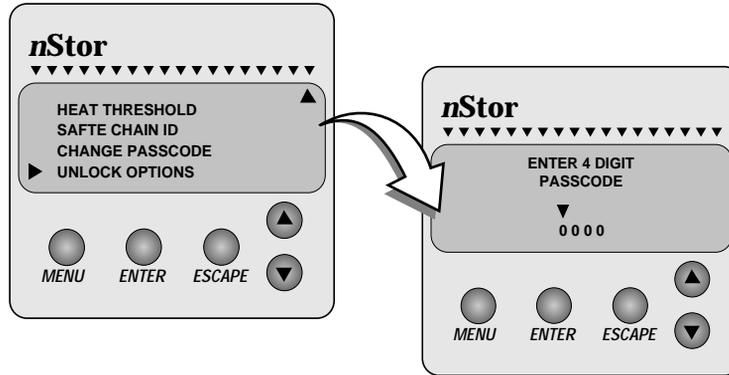


- 2 Use the up/down arrow buttons to change the code value (0-9) and the *Enter* button to move from one field to the next.
- 3 Press the *Enter* button after you have made your selections.
- 4 You will be prompted to press the *Escape* button after the passcode has been modified to enable the change to take affect. The default code is "0000."

NOTE: The passcode lock will not take effect until you have returned to the Main screen displaying "Status OK."

Unlock Options

This option allows the administrator to unlock the items found under the SCSI ID Menu, Heat Threshold, and Change Passcode selections. This enables the user to change these values and protects these values from being changed by those not authorized to do so.



- 1 To change the Unlock Options, access the Main menu and choose *Options Menu*.
- 2 Use the up/down arrow buttons to change the code value (0-9) and the *Enter* button to move from one field to the next.
- 3 Press the *Enter* button after you have made your selections.

You will be prompted that the SCSI ID Menu options are unlocked until you have cycled the menus back to the default “Status OK” screen. An “unlock” icon will appear in place of the cursor while the options remain unlocked.



4

Troubleshooting

This chapter provides solutions for some of the problems you may encounter while using the CR8e subsystem.

Common Enclosure Problems

Symptom	Reason	Solution
Fails to power on.	Power cord not connected properly. Power not available at the outlet. Power switch not in the proper position. Faulty fuse. Faulty power cord.	Verify that the power cord is properly connected to the power module. If the CR8e is plugged into a three-hole grounded outlet, verify if power to the outlet has been interrupted. This can be accomplished by testing the outlet with a known working appliance, like a lamp. Be sure that the power switch is in the “ON” position, labeled “I”. Replace fuse, see <i>Replacing a Fuse</i> on page 62. Replace power cord. If the CR8e is not responding, contact nStor Technical Support.

Symptom	Reason	Solution
Operator Control Panel display indicates "Hardware Error."	Possible component failure.	From the Operator Control Panel, "Hardware Menu" from the Main Menu and select "Component Status." Scroll down through the list to locate the failed component. Follow the procedures in the <i>Maintenance</i> chapter to replace the failed component.
LED and audible alarms indicate the system failed the diagnostic test.	Power-on self-test failed.	From the Operator Control Panel, "Hardware Menu" from the Main Menu and select "POST Results." Scroll down through the list to locate the failed component, see <i>Power-On Self Test</i> on page 37.
Operator Control Panel display indicates cabinet temperature threshold has been exceeded.	Cooling fan failure.	From the Operator Control Panel, "Hardware Menu" from the Main Menu and select "Component Status." Scroll down through the list to locate the failed component. Follow the procedures in the <i>Maintenance</i> chapter to replace the failed component.
	Temperature threshold too low.	Change the temperature threshold value, see <i>Heat Threshold</i> on page 49.
	Cooling fan vent blocked.	Examine the cooling fan vents for blockage and clear.
	Inadequate ventilation around the CR8e.	The location chosen for the CR8e probably has poor air circulation. Choose a better location.

Common SCSI Bus Problems

SCSI Bus problems can usually be attributed to cabling issues or faulty I/O Interface cards. Refer to the chart on the following page to review troubleshooting and fault isolation procedures to assist you in identifying the suspect component.

SCSI Bus Symptom	Probable Cause	Solution
<p>SCSI Bus hangs, SCSI Bus excessive retries, and/or drives drop offline.</p>	<p>Faulty connectivity.</p> <p>Faulty I/O Interface card.</p>	<p>Re-check the cables to the I/O Interface card and host adapter.</p> <p>Depending on how many subsystem are connected on the SCSI bus, you will need to perform some fault isolation.</p> <p>If all the drives on one bus are offline, start with the subsystem furthestmost out on the chain. Disconnect the data cable. If the remaining drives return to a normal state it indicates that the isolated subsystem has the faulty component.</p> <p>If this does not return the remaining drives to a normal state, continue removing each data cable on that bus until the first subsystem is the remaining subsystem.</p> <p>If you had to remove all the data cables up to the first subsystem and the problem is still not resolved, this could indicate that the I/O Interface card in the first subsystem is the suspect faulty card. Use one of the cards from the previous subsystems or a “new” known good card. This should return the subsystem bus to a normal condition.</p> <p>Note: A return to a normal condition is indicated by the drives coming back online.</p> <p>After the faulty card is replaced, begin re-connecting the data cables on the remaining I/O Interface cards noting the bus remains in a normal state.</p>

Common Problems and Interpreting the LED Indications

LED Status	Reason	Solution
Status Indicator LEDs not functioning properly.	SCSI data cable not properly connected.	Verify that the SCSI data cable is properly connected to the CR8e SCSI-2 connector and to the controller card.
A specific drive's Status LED is blinking amber and the Channel Mode LED is steady amber.	An assigned drive has failed. The CR8e is in a non-fault tolerant mode.	Replace the disk drive and begin rebuilding the array, see <i>Replacing a Disk Drive</i> on page 57.
A specific drive's Status LED is blinking amber, the remainder of the drive's Status LEDs in that array are steady amber, and the Channel Mode LED is steady amber.	An assigned drive has failed. The CR8e is in a non-fault tolerant mode and a rebuild operation is in progress.	Replace the failed disk drive (Drive's Status LED blinking amber).
A specific drive's Status LED is OFF and the Channel Mode LED is steady amber.	The disk drive is missing. The CR8e is in a non-fault tolerant mode.	Insert a disk drive and begin an array rebuild, see <i>Replacing a Disk Drive</i> on page 57.
A specific drive's Status LED is blinking green and the Channel Mode LED is steady green.	A drive has not been assigned into an array or the drive is a hot spare, however it is in a ready state.	Assign the drive to an array, refer to the <i>nStor AM RAID Utilities User's Guide</i> .

5

Maintenance

In this chapter you will find the maintenance procedures to replace individual components, as well as the entire subsystem enclosure.

Replacing a Disk Drive

CAUTION: Drives and printed circuit board components are sensitive to electrostatic discharge. To prevent operating failure or damage, observe the following: Establish a ground for yourself by using the wrist grounding strap, or by touching the metal chassis prior to handling or installing the drives or printed circuit board components.

NOTE: There is no need to power OFF the CR8e or the computer system. The drives are hot swappable.

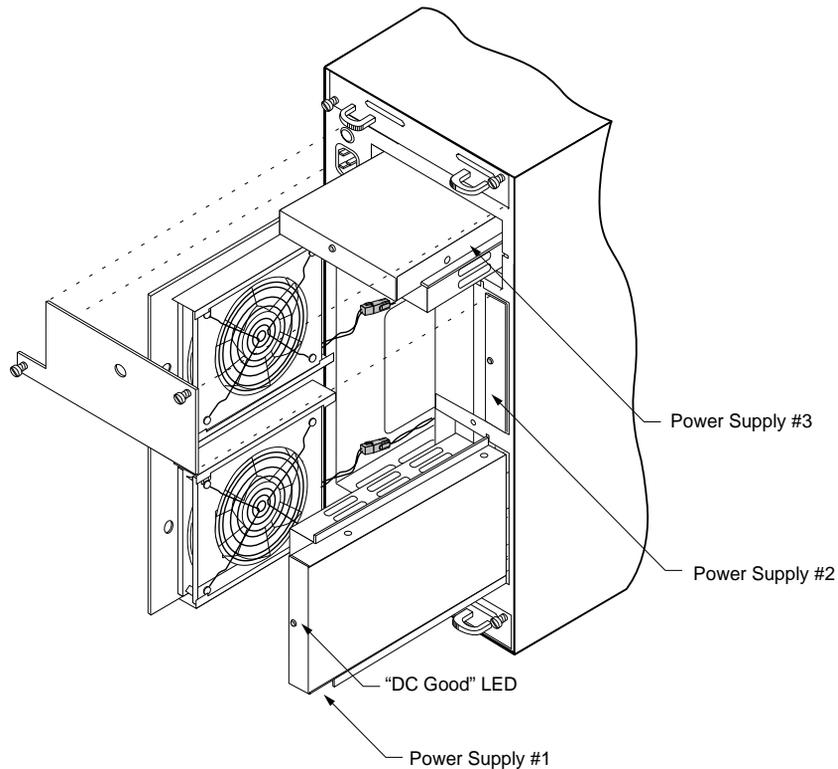
- 1 Unlock and open the door on the CR8e cabinet.
- 1 Identify the failed drive using the Status LEDs and the Fault LED.
- 2 Using your thumbs, apply a slight pressure outward to release the drive latch clips, unlocking the failed drive and remove the drive.
- 3 Remove your new disk drive from the shipping carton and inspect the shipment. Remove the anti-static protective packaging.
- 4 Holding the drive by its edges, locate the Drive Latching Clips and pull out on the latches to unlock them. The Drive Latching Clips are placed in the locked position for shipping purposes.

- 5 Insert the drive into the drive bay by aligning its rails into the drive bay slots, component side toward the right (rack) or down (tower). Seat the drive by applying pressure with your thumb to the front of the drive.
- 6 Press the Drive Latching Clips until they “snap” into place.
- 7 Using the packaging materials from the replacement disk drive, repackage the failed drive and return it to nStor Corporation, refer to the nStor Resource Guide for information on “*Obtaining a Return Material Authorization.*”

Replacing a Power Supply

CAUTION: Power supplies must be replaced by qualified service personnel only.

- 1 Using the Operator Control Panel, identify the failed power supply.
Select “Hardware Menu” from the Main Menu and choose “Component Status.” For more information, refer to “Component Status” on page 43.



NOTE: When locating the failed power supply, the “DC Good” LED will be OFF.

- 2** Using a flat-blade screwdriver, loosen the rear door access screw. Open the door to gain access to power supplies #1 and #2.

If you are replacing the #3 power supply, loosen the two PSU Cover Plate screws. Remove the cover plate and skip to step 3.

- 3** Grasp the handle of the subject power supply and pull the supply out of the CR8e enclosure.

NOTE: The orientation of the power supply being removed. This will facilitate the installation of the replacement supply.

- 4** Remove the new power supply from the shipping carton and inspect the shipment. Save the packaging material.

- 5** Slide the new power supply into the cabinet until it reaches its locked position.

NOTE: Orient the power supply in the same manner as the removed power supply. (Air slots in the PSU case face toward the center of the cabinet.)

The new power supply’s LED should illuminate.

- 6** Close the rear door panel. The door has a latch mechanism that holds the door in the open position. Squeeze the latch to release the door allowing it to be closed.

If you are replacing the #3 power supply, re-install the PSU Cover Plate and then re-secure the power cord retainer.

- 7** Using the packaging materials from the replacement power supply, repackage and return it to nStor Corporation, refer to the nStor Resource Guide for information on “*Obtaining a Return Material Authorization.*”

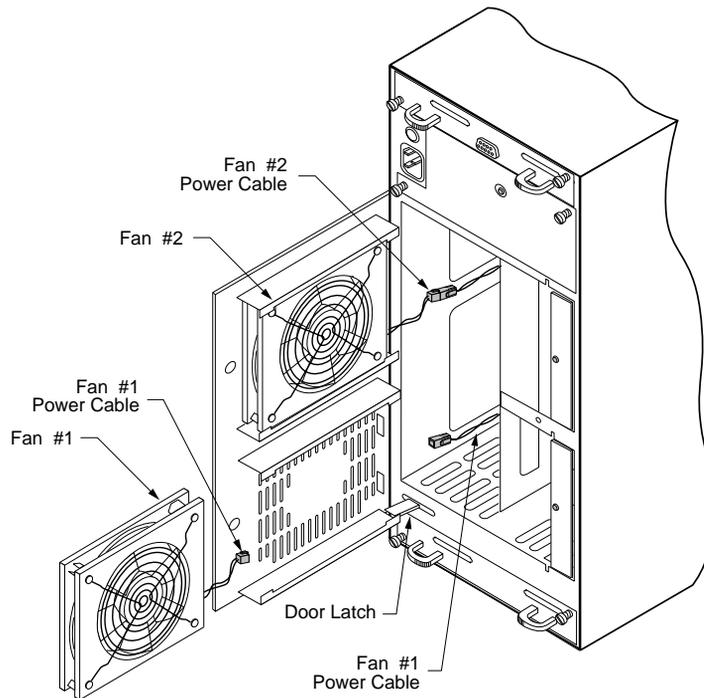
Replacing the Cooling Fans

CAUTION: Cooling fans must be replaced by qualified service personnel only.

NOTE: There is no need to power off the CR8e or the computer system. The cooling fans are hot swappable.

- 1 Use the Operator Control Panel to identify the failed fan, refer to the illustration below to locate the components.

Select “Hardware Menu” from the Main Menu and choose “Component Status.” For more information, refer to “Component Status” on page 43.



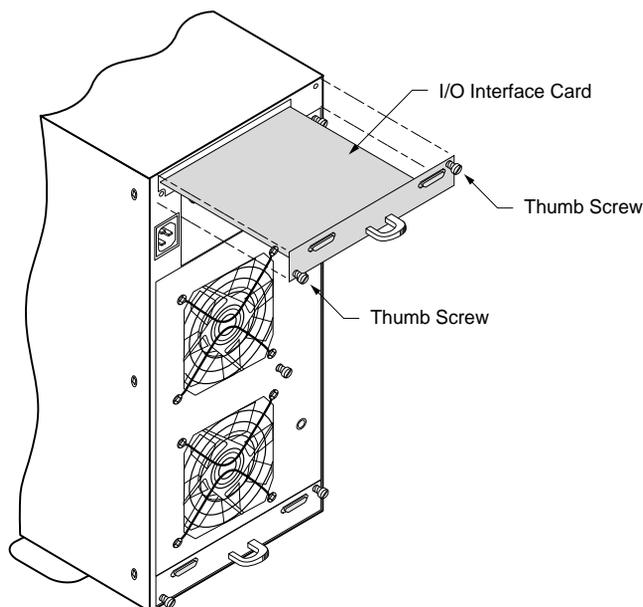
You may need to scroll through the list with the arrows buttons to locate the failed component.

- 2 Using a flat-blade screwdriver, loosen the rear door access screw. Open the door to gain access to the fans.
- 3 Disconnect the failed fan's power cable connector.
- 4 Remove the failed fan by sliding it out from the door assembly.

- 5 Remove the new cooling fan from the shipping carton and inspect the shipment. Save the packaging material.
- 6 With the fan guard facing toward the inside of the cabinet, slide the new fan into its housing.
- 7 Reconnect the fan's power cable connector. The connector is keyed and will install only one direction.
- 8 Close the rear door panel. The door has a latch mechanism that holds the door in the open position. Squeeze the latch to release the door allowing it to be closed.
- 9 Secure the door with the access panel screw.
- 10 Using the packaging materials from the replacement power supply, repackage and return it to nStor Corporation, refer to the nStor Resource Guide for information on "*Obtaining a Return Material Authorization.*"

Replacing an I/O Interface Card

- 1 Identify the failed I/O Interface card. Refer to the Troubleshooting chapter for information on identifying failed cards, "Troubleshooting" on page 53.
- 2 Turn the power OFF to the CR8e subsystem. The cards are not hot swappable.

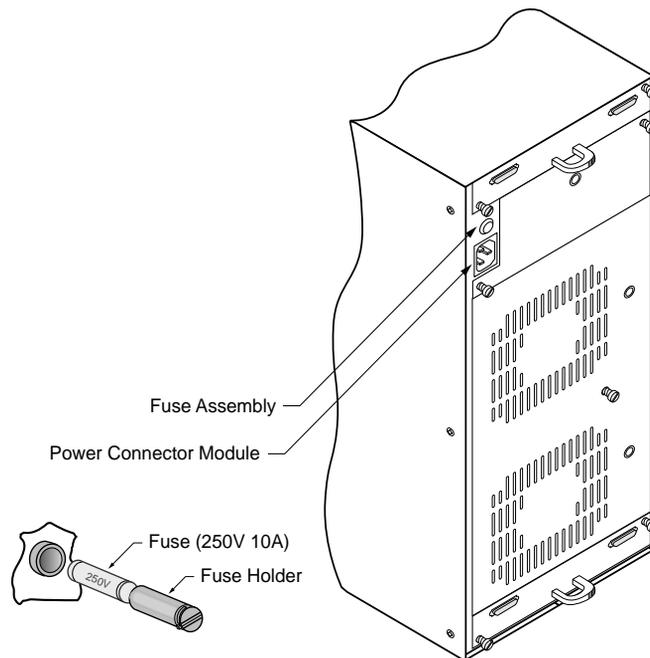


- 3 Loosen the two thumb screws that secures the card.
- 4 Insert the new I/O Interface card and tighten the thumb screws. Do not overtighten the fasteners.
- 5 Using the packaging materials from the replacement card, repackage the failed card and return it to nStor Corporation. Refer to the nStor Resource Guide for information on “*Obtaining a Return Material Authorization.*”

Replacing a Fuse

CAUTION: Power off the subsystem and disconnect the power cord before changing the fuse.

- 1 Locate the fuse holder on the rear panel of the CR8e.



- 2 Using a small coin, turn the fuse holder counter-clockwise one quarter turn, releasing the holder from its locked position.

- 3 Using the tip of your finger nail, ease the holder away from the unit.
- 4 Once removed, separate the fuse from the holder.
- 5 Replace the fuse with one of identical type and rating (250V 10A).
- 6 Insert the fuse into the holder.
- 7 Insert the fuse holder into the unit and secure it. Push in while turning clockwise one quarter turn, locking it into place. Do not overtighten.

Replacing the CR8e Cabinet

CAUTION: Drives and printed circuit board components are sensitive to electrostatic discharge. To prevent operating failure or damage, observe the following: Establish a ground for yourself by using the wrist grounding strap, or by touching the metal chassis prior to handling or installing the drives or printed circuit board components.

- 1 Remove your new enclosure cabinet from the shipping carton and inspect the shipment. Save the packaging material.
- 2 Turn the power OFF to the computer system and the old CR8e enclosure.

NOTE: Note the position of the data cables, disk drives, and the jumpers on I/O Interface cards prior to disconnecting or removing the items. To facilitate correct installation, you may want to tag the cables appropriately. The drives should have a drive label located on the front of each drive unit.

- 3 Remove each drive noting its position and store them in a safe location.
- 4 Disconnect the data and power cables from the old subsystem enclosure.
- 5 (Rack Mount Systems Only) Remove the CR8e subsystem from the rack cabinet assembly.
- 6 (Single-Bus Modules Only) Remove the Single-Bus configuration module from the old enclosure and install it into the new subsystem enclosure.
- 7 (Rack Mount Systems Only) Install the new CR8e subsystem enclosure into the rack assembly.

- 8** If you have a third power supply installed in the old subsystem, remove it and install the PSU into the new enclosure.
- 9** Reconnect and secure the power cord and data cables.
- 10** Install the drives into the new cabinet enclosure in exactly the same order as they were in the old subsystem.
- 11** Power ON the new CR8e subsystem and the host computer system.
- 12** Verify that all systems are operating normally.
- 13** Using the packaging materials from the new cabinet, repackage the old cabinet enclosure and return it to nStor Corporation, refer to the nStor Resource Guide for information on “*Obtaining a Return Material Authorization.*”

A

Glossary

The following terms are used throughout this manual and may be helpful background information on the technology.

Asynchronous Operations	Operations that bear no relationship to each other in time and can overlap. The concept of asynchronous I/O operations is central to independent access arrays in throughput-intensive applications.
Cache Flush	Refers to an operation where all un-written blocks in a Write-Back Cache are written to the target disk. This operation is necessary before powering down the system.
Channel	Refers to one of the SCSI bus connectors on the controllers or termination interface cards.
Consistency Check	Refers to a process where the integrity of redundant data is verified. For example, a consistency check of a mirrored drive will make sure that the data on both drives of the mirrored pair are exactly the same. For RAID level 3 and 5 redundancy, a consistency check will involve reading all associated data blocks, computing parity, reading parity, and verifying that the computed parity matches the read parity.
Disconnect/Reconnect	Disconnect is a function that allows a target SCSI device (typically a disk drive that received a request to perform a relatively long I/O operation) to release the SCSI bus so that the controller can send commands to other devices. When the operation is complete and the SCSI bus is needed by the disconnected target again, it is reconnected.

Disk Mirroring	Data written to one disk drive is simultaneously written to another disk drive. If one disk fails, the other disk can be used to run the system and reconstruct the failed disk.
Disk Spanning	Several disks appear as one large disk using this technology. This virtual disk can then store data across disks with ease without the user being concerned about which disk contains what data. The subsystem handles this for the user.
Disk Striping	Data is written across disks rather than on the same drive. Segment 1 is written to drive 0, segment 2 is written to drive 1, and so forth until a segment has been written to the last drive in the chain. The next logical segment is then written to drive 0, then to drive 1, and so forth until the write operation is complete.
Duplexing	This refers to the use of two controllers to drive a disk subsystem. Should one of the controllers fail, the other is still available to provide disk I/O. In addition, depending how the controller software is written, both controllers may work together to read and write data simultaneously to different drives.
Fault-Tolerant	When something is fault-tolerant it is resistant to failure. A RAID 1 mirrored subsystem, for example, is fault-tolerant because it can still provide disk I/O if one of the disk drives in a mirrored system fails.
Hot Spare	The “Hot Spare” is one of the most important features the controller provides to achieve automatic, non-stop service with a high degree of fault tolerance. This rebuild operation will be carried out by the controller automatically when a SCSI disk drive fails.
Logical Drive	A set of contiguous chunks of a physical disk. Logical disks are used in array implementations as constituents of logical volumes or partitions. Logical disks are normally transparent to the host environment, except when the array containing them is being configured.
Mapping	The conversion between multiple data addressing schemes, especially conversions between member disk block addresses of the virtual disks presented to the operating environment by the array management software.
Mirroring	Refers to the 100% duplication of data on one disk drive to another disk drive. Each disk will be the mirror image of the other.

Partition	An array virtual disk made up of logical disks rather than physical ones. Also called logical volume.
Physical Drive	A physical array (or drive) is a collection of physical disks governed by the RAID management software. A physical drive appears to the host computer as one or more logical drives.
RAID	(Redundant Array of Independent Disks) An approach to using multiple low cost drives as a group to improve performance, yet also provide a degree of redundancy that makes data loss remote.
RAID 0	Block “striping” is provided, yielding higher performance than is possible with individual drives. This level does not provide any redundancy.
RAID 1	Drives are paired and mirrored. All data is 100% duplicated on an equivalent drive.
RAID 10	RAID 10 is a combination of RAID levels 0 and 1. The data is striped across disks as in RAID 0. Each disk has a mirror disk, as in RAID 1.
RAID 3	Data is striped across several physical drives. For data redundancy one drive is encoded with rotated XOR redundancy.
RAID 30	Data striping of two or more RAID 3 arrays. RAID level 30 is a combination of 0 and 3.
RAID 5	Data is striped across several physical drives. For data redundancy drives are encoded with rotated XOR redundancy.
RAID 50	RAID level 50 is a combination of RAID level 0 and 5.
AM RAID Controller	This refers to the controller card that routes data to and/or from the CPU. Disk array controllers perform all RAID algorithms onboard the controller.
Rebuild	The regeneration of all data from a failed disk in a RAID level 1, 3, 5, or 6 array to a replacement disk. A disk rebuild normally occurs without interruption of application access to data stored on the array virtual disk.
Rotated XOR Redundancy	This term (also known as “parity”) refers to a method of providing complete data redundancy while requiring only a fraction of the storage capacity for redundancy. In a system configured under RAID 3 and 5, all data and parity blocks are divided between the drives in such a way that if any single drive is removed (or fails), the data on it can be reconstructed using the data on the remaining drives. (XOR refers to the Boolean “Exclusive-OR” operator.)

SAF-TE	Is the acronym for SCSI Accessed Fault-Tolerant Enclosures. It is a monitoring and communication specification developed by Conner (<i>nStor</i>) and Intel for sending and receiving server and storage system status information via the SCSI bus.
Session	Refers to the period of time between any two consecutive system shutdowns. System shutdown may be either a power off/on, or a hardware reset.
SCSI Drive	A disk drive equipped with a small computer system interface (SCSI). Each disk drive will be assigned a SCSI address (or SCSI ID), which is a number from 0 to 15. The SCSI address uniquely identifies the drive on the SCSI bus or channel.
Spanning	Disk spanning allows multiple disk drives to function like one big drive. Spanning overcomes lack of disk space and simplifies storage management by combining existing resources or adding relatively inexpensive resources.
Striping	Disk striping writes data across multiple disks rather than on one disk. disk striping involves partitioning each drive storage space into stripes that can vary in size from one sector (1 KB) to several megabytes.
Stripe Order	The order in which SCSI Drives appear within a Physical Pack. This order must be maintained, and is critical to the controller's ability to "Rebuild" failed drives.
Stripe Width	Refers to the number of kilobytes per stripe block.
Target ID	A target ID is the SCSI ID of a device attached to the disk array controller. Each SCSI channel can have up to sixteen SCSI devices (target ID from 0 to 15) attached to it.
Write-Through Cache	Refers to a cache writing strategy whereby data is written to the SCSI Drive before a completion status is returned to the host operating system. This caching strategy is considered more "secure," since a power failure will be less likely to cause loss of data. However, a Write-Through cache results in a slightly lower performance, in most environments.
Write-Back Cache	Refers to a caching strategy whereby write operations result in a completion signal being sent to the host operating system as soon as the cache (not the disk drive) receives the data to be written. The target SCSI Drive will receive that data at a more appropriate time, in order to increase controller performance.

B

Technical Information

SPECIFICATIONS

CR8e

<i>Operating Environment</i>	40°F to 94°F (+ 5°C to + 34°C)
<i>Relative Humidity</i>	
<i>Operating/Non-Operating</i>	5% - 95% (non-condensing)
<i>Power Requirements</i>	100 - 240 VAC (auto-sensing) 50-60 Hz 6.0 Amperes 3 x 150 watts
<i>Rack Mount System</i>	
<i>Dimensions (HxWxD) w/o Handles</i>	6.83" x 17.40" x 19.00"
<i>Tower-Based System</i>	
<i>Dimensions (HxWxL)</i>	17.40" x 6.83" x 19.00"
<i>Weight (basic configuration of cabinet includes two cooling fans)</i>	48.0 lbs without drives installed 56.6 lbs with three drives installed
<i>Altitude</i>	-200 to 10,000 feet
<i>Number of Drives Supported</i>	8
<i>Total Capacity</i>	72.8 gigabytes (9.1 GB Drives)
<i>Interface Transfer Rate</i>	Up to 40 MB/sec
<i>Host Interface</i>	Fast/Wide SCSI-3
<i>Drive Interface</i>	Fast/Wide SCSI-3
<i>HDD Termination</i>	Automatic Termination
<i>Electromagnetic Emissions Requirements (EMI)</i>	FCC, Part 15, Class B EN55022-B

CR8e (continued)

Safety Requirements

UL1950
 CSA C22.2 #950
 TUV/EN60950

CE Compliance (EMC)

89/336/EEC EMC Directive

Shock

Operating

1.0 G, 2 - 50 ms

Non-Operating

20.0 G, 2 - 20 ms

Vibration

Operating

5 - 500 Hz, 0.25 G (pk to pk)

Non-Operating

5 - 500 Hz, 1.0 G (pk to pk)

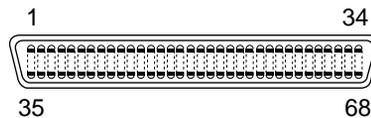
CONNECTORS AND JUMPERS

This section provides information about the connector pinouts on the termination interface card and jumper settings on the backplane printed circuit board for your nStor CR8e subsystem.

Connectors

Located on each termination interface card are two VDH SCSI connectors. They provide the input/output interface from the subsystem bus to the RAID controller or host adapter card.

VHD/HD 68-pin SCSI
 P-Cable Connector
 Pin-out



Signal Name	Pin Number	Conductor Number	Signal Name	Pin Number	Conductor Number
+ DB(12)	1	1	- DB(12)	35	2
+ DB(13)	2	3	- DB(13)	36	4
+ DB(14)	3	5	- DB(14)	37	6

Signal Name	Pin Number	Conductor Number	Signal Name	Pin Number	Conductor Number
+ DB(15)	4	7	- DB(15)	38	8
+ DB(P1)	5	9	- DB(P1)	39	10
+ DB(0)	6	11	- DB(0)	40	12
+ DB(1)	7	13	- DB(1)	41	14
+ DB(2)	8	15	- DB(2)	42	16
+ DB(3)	9	17	- DB(3)	43	18
+ DB(4)	10	19	- DB(4)	44	20
+ DB(5)	11	21	- DB(5)	45	22
+ DB(6)	12	23	- DB(6)	46	24
+ DB(7)	13	25	- DB(7)	47	26
+ DB(P)	14	27	- DB(P)	48	28
GROUND	15	29	GROUND	49	30
DIFFSENS	16	31	GROUND	50	32
TERMPWR	17	33	TERMPWR	51	34
TERMPWR	18	35	TERMPWR	52	36
RESERVED	19	37	RESERVED	53	38
GROUND	20	39	GROUND	54	40
+ ATT	21	41	- ATN	55	42
GROUND	22	43	GROUND	56	44
+ BSY	23	45	- BSY	57	46
+ ACK	24	47	- ACK	58	48
+ RST	25	49	- RST	59	50
+ MSG	26	51	- MSG	60	52
+ SEL	27	53	- SEL	61	54
+ C/D	28	55	- C/D	62	56
+ REQ	29	57	- REQ	63	58
+ I/O	30	59	- I/O	64	60
+ DB(8)	31	61	- DB(8)	65	62
+ DB(9)	32	63	- DB(9)	66	64
+ DB(10)	33	65	- DB(10)	67	66
+ DB(11)	34	67	- DB(11)	68	68

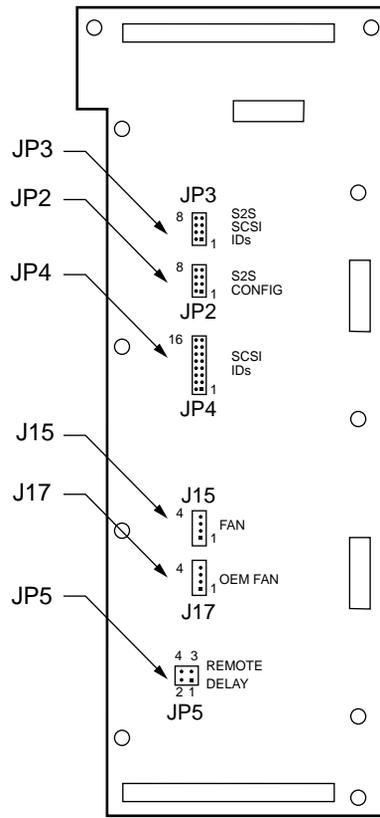
Jumpers

CAUTION: Jumper configuration to be performed by qualified service personnel only.

Disconnect the AC power cord prior to accessing any component inside the rear cabinet.

Located on the backplane printed circuit board are six jumper blocks. From these jumpers system integrators can manually configure the CR8e subsystem. To change the jumper setting, pull the jumper plug off its pin(s) and carefully fit in down onto the pin(s) as indicated. This allows the user to make reversible changes to the circuitry on the printed circuit board.

The jumper settings are known as “open” or “unjumpered” and “jumpered.” When unjumping the setting remove the jumper plug from both pins and seat it over just one of the pins. This allows the jumper plug to be stored for later use.



Rear View of Backplane PCB

JP2 (SCSI-to-SCSI Configuration)

CAUTION: Jumper configuration to be performed by qualified service personnel only.

This jumper (JP2) is used to place the SCSI-to-SCSI RAID controller in a configuration that is known to the CR8e subsystem. This process is accomplished by adding jumpers to JP2. The jumper block is a four position dual-row header.



Jumper Positions	SCSI-to-SCSI Settings
1 & 2	Reserved.
3 & 4	Add this jumper to place the SCSI-to-SCSI controller into VT100 mode for the serial channel. Remove the jumper to place the SCSI-to-SCSI controller into the SLIP port mode.
5 & 6	Add this jumper to place the SCSI-to-SCSI controller into the Fixed Baud Rate mode for the serial channel. Remove the jumper to place the SCSI-to-SCSI controller into the Variable Baud Rate mode for the serial channel.
7 & 8	Add this jumper to place the SCSI-to-SCSI controller in a Master configuration. Remove the jumper to place the SCSI-to-SCSI controller in a Slave mode.

JP3 (SCSI-to-SCSI IDs)

CAUTION: Jumper configuration to be performed by qualified service personnel only.

These jumpers (JP3) are used to manually set the SCSI-TO-SCSI IDs for the SCSI-to-SCSI RAID controller. JP3 is an four position dual-row header.



Jumper Positions				
1 & 2	3 & 4	5 & 6	7 & 8	SCSI-to-SCSI ID Settings
ON	ON	ON	ON	15
OFF	ON	ON	ON	14
ON	OFF	ON	ON	13
OFF	OFF	ON	ON	12
ON	ON	OFF	ON	11
OFF	ON	OFF	ON	10

Jumper Positions				
1 & 2	3 & 4	5 & 6	7 & 8	SCSI-to-SCSI ID Settings
ON	OFF	OFF	ON	9
OFF	OFF	OFF	ON	8
ON	ON	ON	OFF	7
OFF	ON	ON	OFF	6
ON	OFF	ON	OFF	5
OFF	OFF	ON	OFF	4
ON	ON	OFF	OFF	3
OFF	ON	OFF	OFF	2
ON	OFF	OFF	OFF	1
OFF	OFF	OFF	OFF	0

JP4 (SCSI ID Settings)

CAUTION: Jumper configuration must be performed by qualified service personnel only.

These jumpers (JP4) are used to manually set the SCSI IDs for all of the disk drive slots. JP4 is an eight position dual-row header.

The tables for Drives 1, 2, 3, 4, and Drives 5, 6, 7, 8 found on this page and the following page also provides a list of the possible combinations of SCSI IDs that can be set when using the Operator Control Panel preset feature for each drive group.



Jumper Positions for Drives 1, 2, 3, and 4 ID Settings				
1 & 2	3 & 4	5 & 6	7 & 8	SCSI ID (1, 2, 3, and 4)
ON	ON	ON	ON	0, 1, 2, 3
OFF	ON	ON	ON	0, 1, 2, 4
ON	OFF	ON	ON	4, 5, 6, 7
OFF	OFF	ON	ON	4, 5, 6, 8
ON	ON	OFF	ON	5, 6, 7, 8
OFF	ON	OFF	ON	5, 6, 8, 9
ON	OFF	OFF	ON	8, 9, 10, 11
OFF	OFF	OFF	ON	9, 10, 11, 12

Jumper Positions for Drives 1, 2, 3, and 4 ID Settings				
1 & 2	3 & 4	5 & 6	7 & 8	SCSI ID (1, 2, 3, and 4)
ON	ON	ON	OFF	10, 11, 12, 13
OFF	ON	ON	OFF	10, 11, X, X

Jumper Positions for Drives 5, 6, 7, and 8 ID Settings				
9 & 10	11 & 12	13 & 14	15 & 16	SCSI ID (5, 6, 7, and 8)
ON	ON	ON	ON	0, 1, 2, 3
OFF	ON	ON	ON	0, 1, 2, 4
ON	OFF	ON	ON	4, 5, 6, 7
OFF	OFF	ON	ON	4, 5, 6, 8
ON	ON	OFF	ON	5, 6, 7, 8
OFF	ON	OFF	ON	5, 6, 8, 9
ON	OFF	OFF	ON	8, 9, 10, 11
OFF	OFF	OFF	ON	9, 10, 11, 12
ON	ON	ON	OFF	10, 11, 12, 13
OFF	ON	ON	OFF	10, 11, X, X

JP5 (SCA Remote/Delay start)

CAUTION: Jumper configuration to be performed by qualified service personnel only.

The spin-up of the drive slots is determined by adding jumpers to JP5. JP5 is a two position dual-row header. Position 1 & 2 control the “Delayed_Start” signal and position 3 & 4 control the “Remote_Start” signal.



Pins 1 and 2	Pins 3 and 4	Drive Spinup Mode
ON	ON	Motor spins up only on SCSI “start” commands.
ON	OFF	Motor spins up after a delay of 12 (may vary depending on drive type) seconds times the numeric SCSI ID setting of the associated drive.

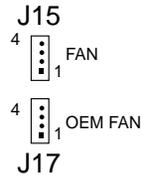
Pins 1 and 2	Pins 3 and 4	Drive Spinup Mode
OFF	ON	Motor spins up only on SCSI "start" commands.
OFF	OFF	Motor spins up at DC power on.

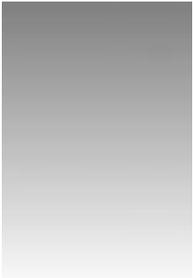
J15 (FAN) and J17 (OEM FAN)

CAUTION: Jumper configuration to be performed by qualified service personnel only.

There are two separate fan connectors that are located at J15 and J17. Fan connector J15 is used when a SAF-TE card is present in the CR8e. When the fans are plugged into J15, the SAF-TE card controls and monitors fan speed.

Fan connector J17 is used in OEM applications when there is no SAF-TE card installed. Fan connector J17 supplies each fan with + 12 volts for full speed operation.





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