EXPRESS5800 ST8000
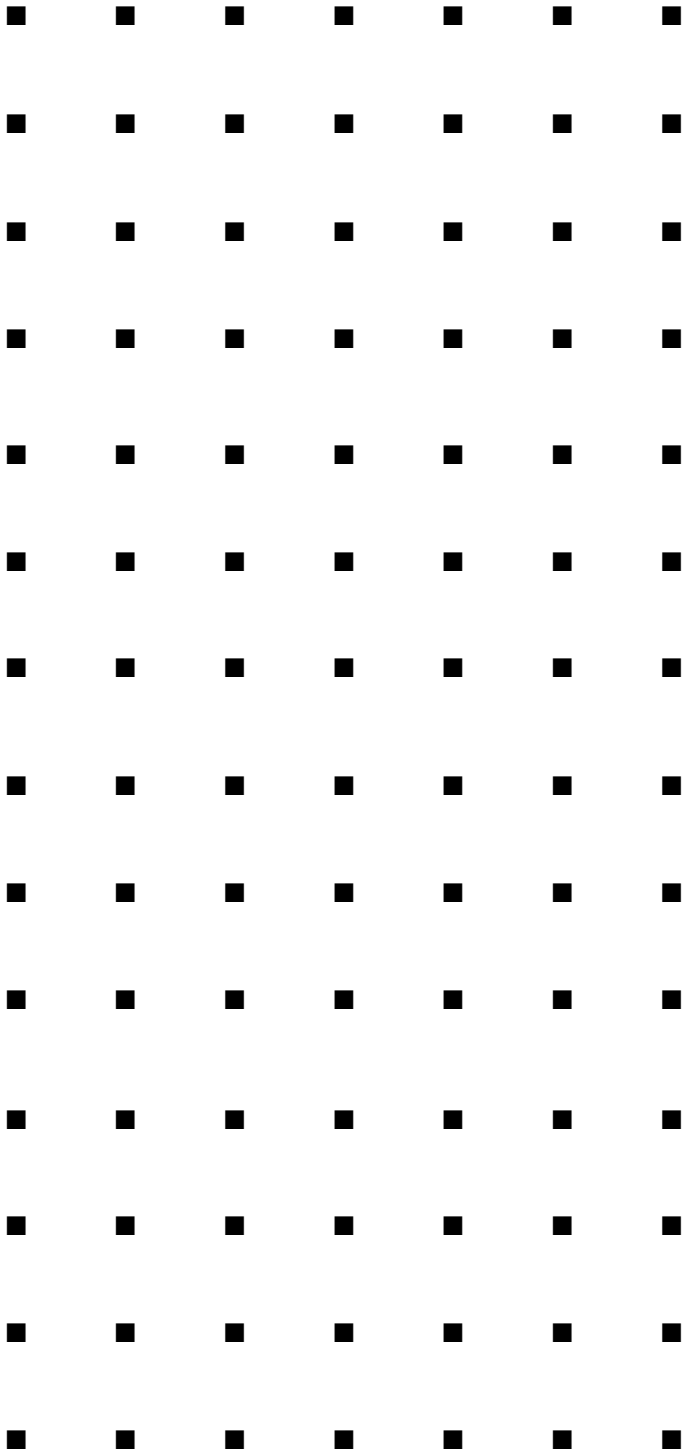
**Disk Expansion Unit
User's Guide**

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1 Introduction

Welcome

Congratulations on the purchase of your new ST8000 Disk Expansion Unit (DEU). The DEU provides a superior fault-tolerant network storage solution in a subsystem-based SAF-TE compliant RAID enclosure.

The SAF-TE compliant interface provides a standard, non-proprietary means for the RAID subsystem to automatically integrate with peripheral packaging that supports status signals, hot swapping drives and enclosure monitoring. Combined with the enterprise-wide RAID management software, additional levels of fault tolerance can be maintained.

The DEU is an eight drive enclosure designed to support a host system-based architecture. The architecture supports Ultra Wide SCSI (Fast-20).

Features

The following are major features of the DEU disk array subsystem:

- **RAID Levels** — Supports RAID levels 0, 1, 3, 5, 10 (1 + 0), 30, and 50.

- **Configuration** — Deskside tower-based system and rack-mount system (fits into a standard IAE 19-inch rack assembly). Dual-Bus or Single-Bus configuration modules provide for an "easy" PCB plug-in changeable bus configuration.

- **Drive Support** — Up to eight 3.5-inch, half-height form factor, hot swappable drives that use SCA-II technology. Disk drives featured include high performance 7,200 and 10,000 RPM Ultra SCSI hard disks.

- **Scalable Capacities** — Drive capacities are expandable and even further expansion through daisy-chaining of multiple cabinets.

- **Hot Swap Power Supplies** — Dual hot swappable power supplies expandable to three, all with current sharing circuitry. Power supply system provides monitoring and sequencing.

- **Cooling** — Dual high capacity cooling fans.

- **Notifications** — LEDs and audible alarms provide failure notifications.

  Inside door panel Fault LEDs provide drive failure identification.

- **Front Panel** — A password protected Operator Control Panel (OCP) for administration control and monitoring functions, including control of SCSI ID settings. Animated OCP icons for an "at-a-glance" determination of system status.

- **Option Cards** — Full support for Option cards available in Differential Converter and Ultra Extender versions providing data transfer rates up to 40 MBs per second. Both support either single or dual bus Differential SCSI and Ultra SCSI applications.

- **Termination** — Option cards configured for automatic SCSI-bus termination.

- **Remote/Delay Start** — A backplane jumper provides for subsystem control of disk drive spin up delay when the adapter does not supply this feature.

- **SCSI-to-SCSI Support** — Support for an Ultra S2S RAID Controller providing on-board Ultra SCSI-to-Ultra SCSI RAID processing.

- **Locking Door** — A key-locking front door that deters unauthorized access to the drives, controllers, and power switch.

- **SAF-TE** — Complete support of SAF-TE v1.0 standards (SCSI Accessed Fault Tolerant Enclosure) protocol.

- **Cluster-Ready** — Cluster-ready subsystem (refer to the Ultra S2S User's Guide).

- **OS Support** — Supports the following OS platforms: Novell NetWare, Microsoft® Windows NT™, and SCO UNIX compatible.

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- **Storage Management Solution** — Enterprise-wide managing and monitoring software.

Where to Find Answers

When you have questions about your DEU 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 DEU disk array subsystem. The manual assumes that the reader is already familiar with the operating system environments where the DEU will be installed.

- **ServerCare™ Service Support Program Guide:** Use this manual to locate telephone numbers for customer service, technical support, and conditions of the limited warranty.

- **Ultra S2S RAID Controller User's Guide:** Use this manual for procedures to install and use the Ultra S2S RAID Controller (DAC960SX), the S2S Interface card, and the software utility for each specific operating system.

Front Panel Components

The DEU front panel comprises seven major components: Operator Control Panel, Power-On Indicator LED, Status Indicator LEDs, Alarm Speaker, Door Lock, Status LEDs, and Activity LEDs.

Status Indicator LEDs
- Channel Mode LED
- Power Supply LED
- Fan Status LED

Operator Control Panel (OCP)

Speaker

Door Lock

Power-On LED

Status Indicator LEDs

Note: LEDs normally visible only when illuminated, shown here for identification.

Activity LEDs

Status LEDs
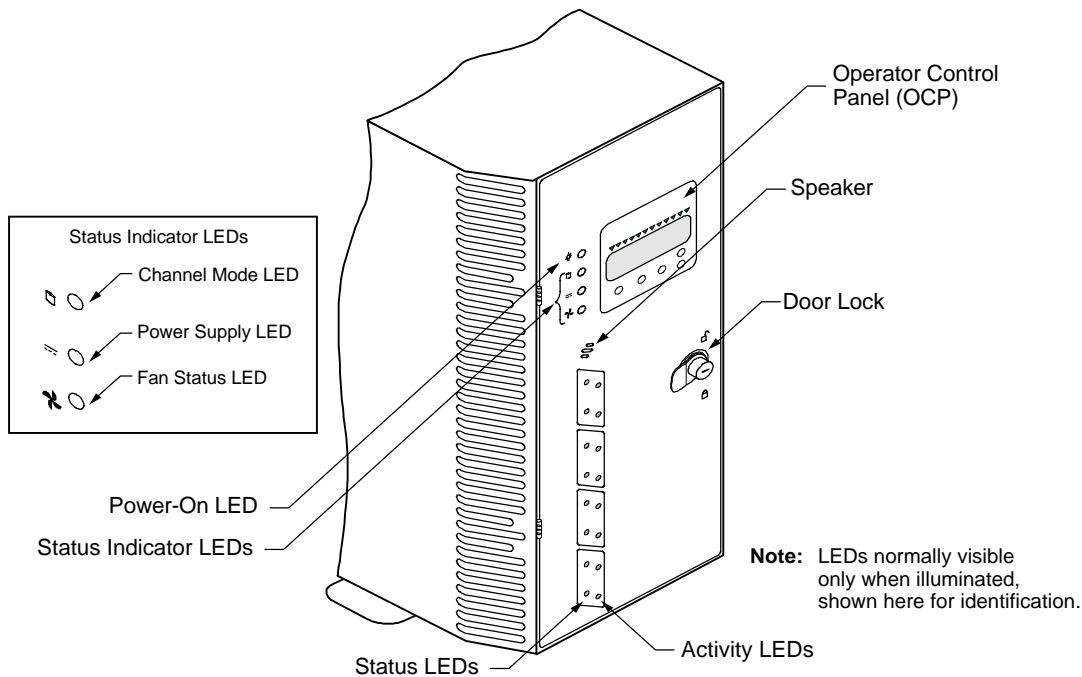
Operator Control Panel

The Operator Control Panel (OCP) provides for the control and monitoring capabilities of the DEU disk drives, power supplies, fans, and processor. From the panel's interface, the user can change SCSI IDs for the drives and SAF-TE processor, monitor the cabinet temperature and change the temperature threshold for the monitoring system.

Other menu functions provide for viewing component system status, silencing the audible alarm, establishing a password protection, determining which feature cards have been installed, establishing intra-cabinet communications (master/slave) and reading firmware information.

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The OCP provides a four line by twenty character display. There are five function keys for a menu driven interface.

An animated icon will appear on a static display 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 requests your 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. The user can also view individual power supply status and configurations.

Cabinet temperature is measured within the drive bay area between drive slots 2 and 3, and 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. A SAF-TE processor monitors the performance of each of the fans via tach pulses which tracks the speed of each fan impeller. The OCP displays information about the speed of each fan. Fan speed is controlled via the internal cabinet temperature, referenced from the user-established temperature threshold.

Power-On LED

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

Status Indicator LEDs

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

Channel Mode

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

When the LED changes to amber (flashing or steady) it indicates abnormal activities, for more information see *LED Descriptions* described later in this guide.

Power Supply Status

The Power Supply Status LED indicates the condition of the power supplies by changes in its color. 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 a "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 should fail.

When a failed component is present, use the Operator Control Panel to identify the failed fan, see *Hardware Menu* described later in this guide. The fans are identified on the rear door panel via placarded markings.

Alarm Speaker

An audible alarm will sound when any component's condition changes to an abnormal state. The Status Indicator LEDs will provide a general area of failure by the LED condition (color and/or state), 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", see *Main Menu* described later in this guide.

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 internal components. 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.

Status LEDs

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

These LEDs, in conjunction with an approved RAID controller, will indicate the status of that specific disk drive. The condition of the drive is indicated by the LED's state (flashing or steady) and/or color (amber or green).

For more information on interpreting these indications, see *LED Descriptions* described later in this guide.

Activity LEDs

There are eight Activity LEDs located in the 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 display a specific drive's activity, such as reads or writes.

Rear Panel Components

The DEU rear panel comprises four major components:
I/O Interface cards, power cord connector module, fuse,
and access doors to power supplies and fans.

VHD SCSI Connector

I/O Interface Card

Power Supply #3 with PSU Cover Plate

PSU "DC Good" LED

Fuse

AC Power Cord Connector

Rear Door Fastener

AC Power Cord Retainer

Rear Door Panel

I/O Interface Card

VHD SCSI Connector

Card Handle
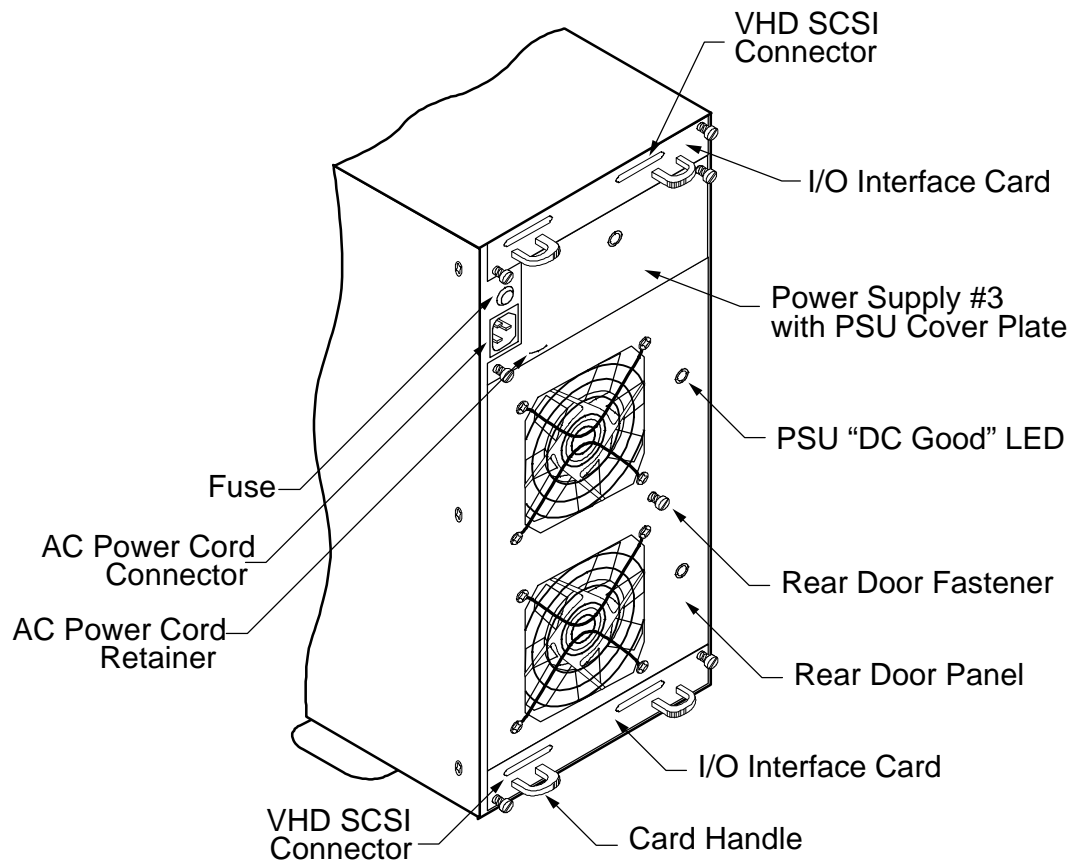
I/O Interface Card

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

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The I/O Interface card incorporates built-in automatic SCSI termination. When the 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 routes Term Power in the event that the host controller is not providing it.

The next set of jumpers addresses a specific set of controllers that use the DEC Fault Bus protocol. 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 DEU 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.

Internal Components

There are seven primary internal components: disk drives (up to eight), Fault LEDs, power switch, SAF-TE card, hot swappable cooling fans, hot swappable power supplies, and configuration module (Dual-Bus or Single-Bus).

Optional Bay for
Ultra S2S RAID Controller

SAF-TE Card

Fault LEDs

Power On/Off
Switch

Hard Disk Drive

Drive Rails

Note: Cover shown cut-away
to illustrate recessed power switch.

I/O Interface Card

Cooling Fan #2

Power Supply #3
with PSU Cover Plate

Cooling Fan #1

Power Supply #2

I/O Interface Card

"DC Good" LED

Power Supply #1
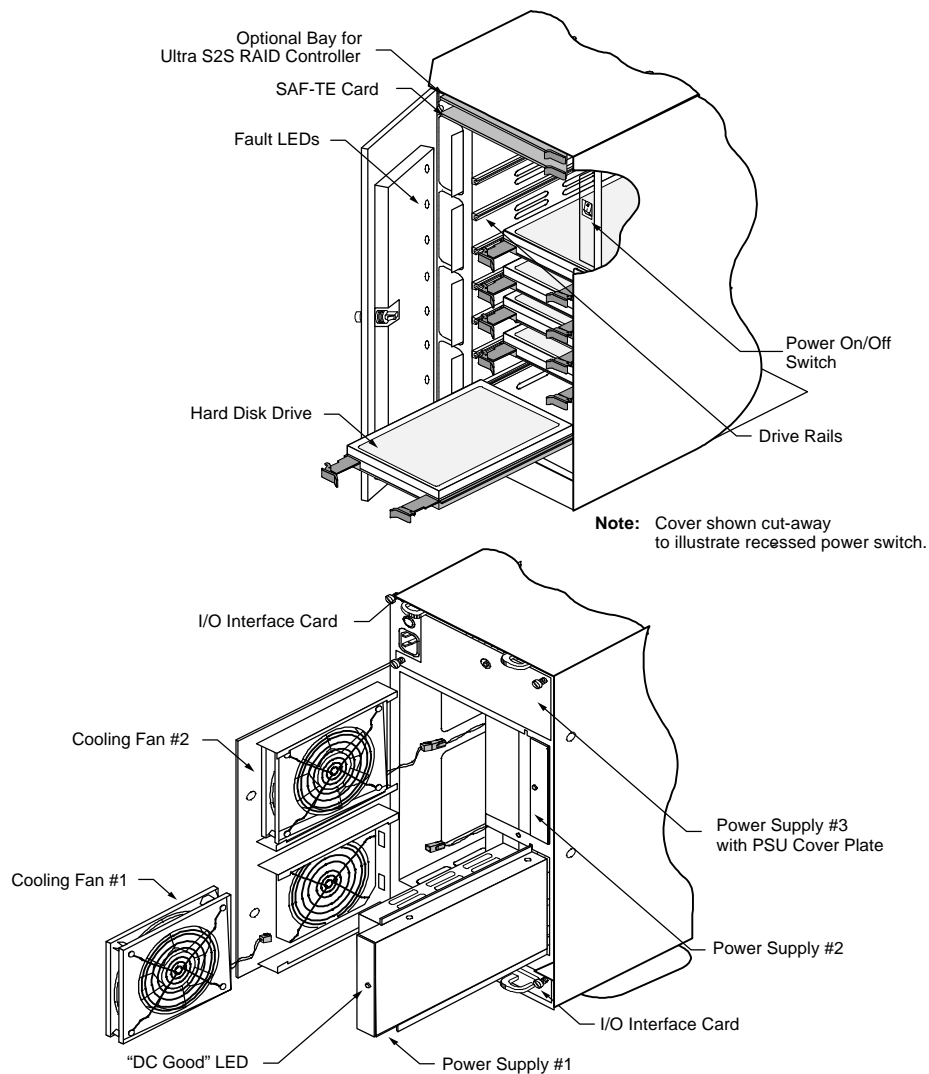
Hot Swappable Disk Drives

The DEU uses high performance, 3.5-inch form factor hot swappable disk drives. The drives are designed to operate on Small Computer System Interface (SCSI) and are SCSI-3/SCSI-2 command compatible.

Each drive has an 80-pin Wide Single Connector Attachment (SCA-II) interface, designed to allow the drive to be hot plugged directly into the backplane.

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The drive mounting design incorporates a rail system with built-in connectors making it possible to "hot swap" a drive without shutting down the system. This design allows for easy installation with minimal force and latching clips to secure the drives into place.

Note: All drives in an array should be of the same capacity. If the drives are mixed, all of the drives in the array are assigned the capacity of the smallest size drive.

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 DEU provided the door is locked. The switch is recessed to prevent inadvertent activation during service activity.

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.

Fault LEDs

Drive Fault LEDs are provided inside the front door to aide in identifying the failed (or problem) disk drive. These LEDs are aligned with their respective drive/drive bay. An illuminated LED (amber) indicates the failed or problem drive.

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 or the rack-mount systems' far left bay are two card slots. The Ultra S2S RAID Controller (optional) and the SAF-TE card are installed in these two slots. The Ultra S2S RAID Controller will be installed in the upper most (or furthest left) slot. The SAF-TE card is installed in the next slot down or to the right.

Hot Swappable Cooling Fans

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 cabinet temperatures approaching 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 alarms are keyed to the higher of the two temperatures. The SAF-TE processor monitors the Access the Operator Control Panel to determine the cause and failed component. Select "Hardware Menu" from the Main Menu and choose "Component Status", see *Operator Control Panel* described later in this guide. 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* described later in this guide.

Hot Swappable Power Supplies

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

If a failure occurs, the Power Supply Status LED will illuminate amber and the audible 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, see *Replacing a Power Supply* described later in this guide.

Configuration Modules

The DEU is available in two bus configurations which is determined by the configuration module installed.

The Dual-Bus module provides for a split bus design, while the Single-Bus module connects both SCSI buses together that can be used when all drives are required on one SCSI bus.

The Single-Bus module is larger in physical size than the Dual-Bus module and is easily identified by a description silk-screened on the module card. It is located on the backplane printed circuit board and is accessed from the rear door panel.

The configuration modules are installed at location JP1 on the backplane PCB. The connector is keyed and the module will install only one direction. For illustration purposes, the tower system is used to depict the location of the modules.

Backplane PCB
(JP1)

NOTE: The cover is cut
away to demonstrate
the location of the installed
configuration module.

Dual-Bus Module

Single-Bus Module
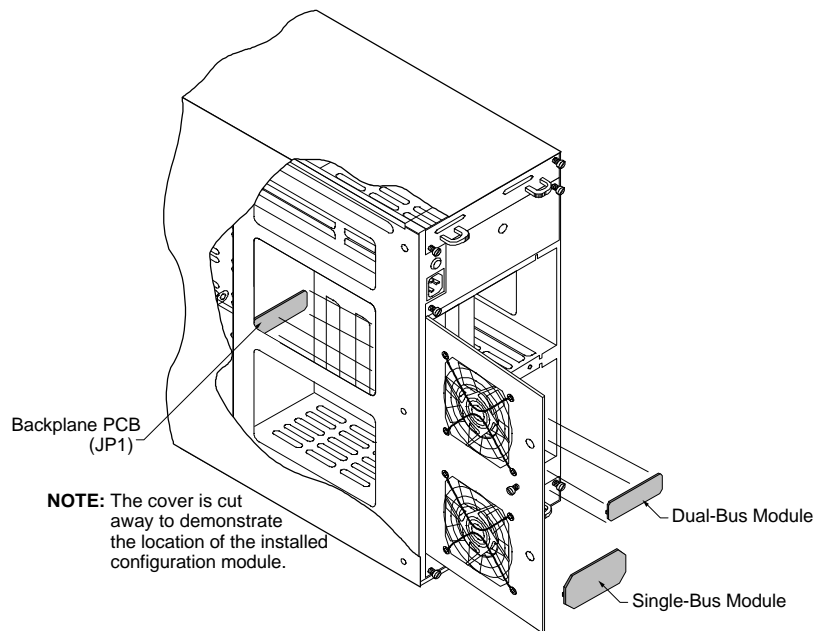
SAF-TE

The DEU is designed to be compliant with SAF-TE (SCSI Accessed Fault-Tolerant Enclosure) specification version 1.0. 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 RAID management software, the DEU can alert the user or LAN administrator of impending or imminent 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 DEU. This allows the administrator to react to conditions that could normally go unnoticed until data loss.

2 Installation

Setup

The installation of your DEU 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.

The DEU is designed with an open architecture that allows for many possible combinations of cabling schemes. Due to the inherent limitations of sampling all of the possible configurations, we will provide a few of the most typical cabling schemes and implementation of the configuration modules.

Additional configurations are available through the use of Ultra Extender or Differential Converter Option cards. Refer to Appendix D for information specific to each card and configuration.

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 deskside tower-based subsystems.

The Cabling Configuration section contains samples of cabling schemes and configuration modules. If your desired configuration is not shown in the samples, refer to the example most similar and follow the cabling topology schemes expanding the example to fit your needs.

When configuring the array, refer to the *Ultra S2S RAID Controller User's Guide* provided with your controller.

If you are setting up a rack-mount subsystem continue with "Rack-Mount Subsystem Assembly" described later in this guide, otherwise skip to "Component Installation" also described later in this guide.

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 DEU.

- Secure all cable connectors using the thumb screws (finger tight only).

Rack-Mount Subsystem Assembly

Install the DEU into any standard IAE 19" rack cabinet.

Caution: Ensure that the location of the DEU 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 DEU. If you are installing multiple systems, review the cabling configuration section later in this chapter for your cable scheme to determine the optimum location.
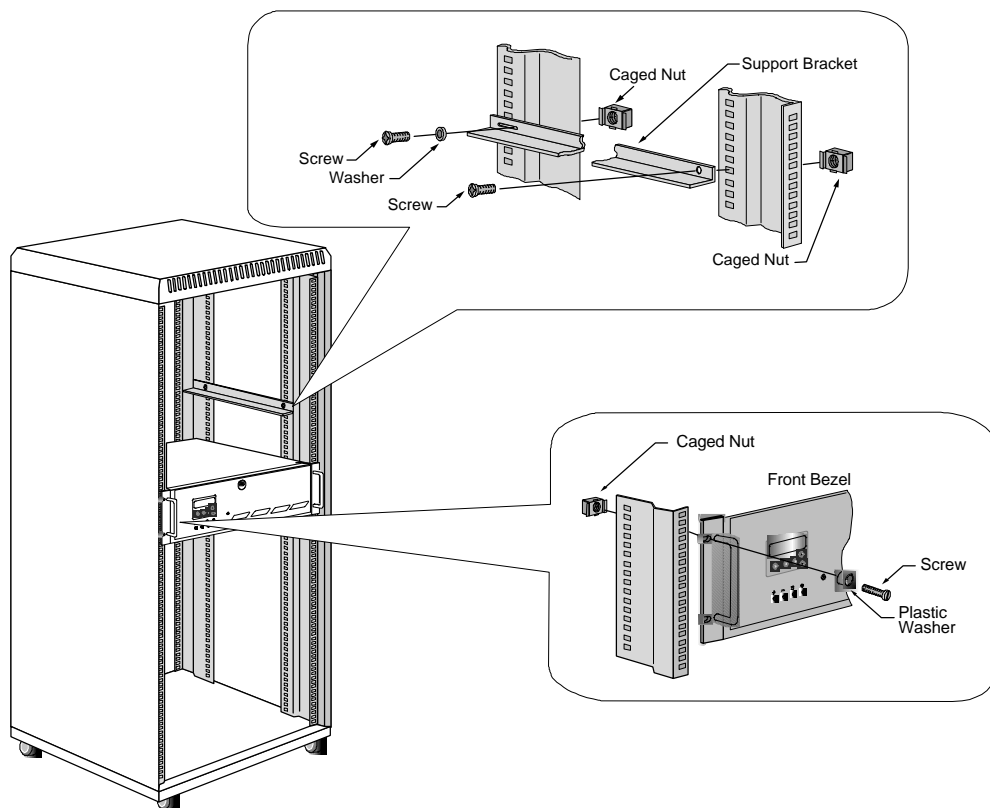
2 Locate the two support brackets. Mount the two brackets to the rack cabinet verticals using the four screws, two washers, and caged nuts provided. The bracket has a slotted hole and a countersunk hole. Mount the slotted hole on the rear vertical. The slotted hole receives a "pan head" screw with a washer and the countersunk hole receives a "flat head" screw.

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

3 Install the caged nuts that will secure the front bezel in step (6) prior to inserting the DEU into the rack assembly.

4 Locate the two "D" handle assemblies.

   a Position a handle assembly on each handle mounting bracket located on the sides of the cabinet. The handles are universal and will fit either side.

   b Secure the handles with the two screws provided.
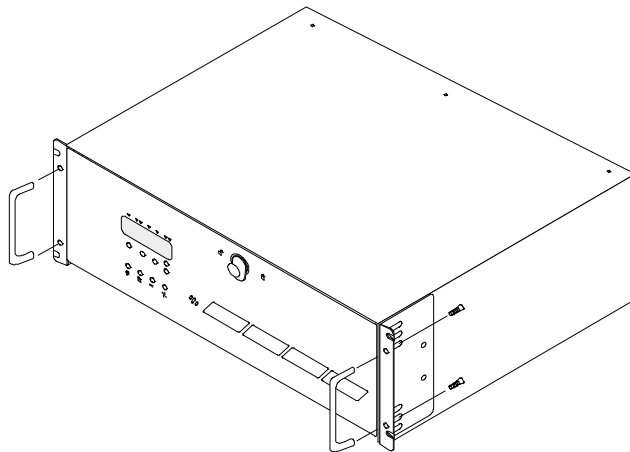
5 Lift the DEU up and onto the support brackets previously installed in step 2. Slide the DEU toward the rear of the rack cabinet.

6 Secure the front bezel to the rack verticals using the four screws and plastic washers provided.

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 controller.

2   Install the RAID Controller into your host computer. For specific instructions, refer to your host system's manual.

   The controller must be installed in slot 1 of the host system (master slot) when booting from this controller.

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

3   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 front four drive slots and the other bus connects the right or lower front four drive slots. The Single-Bus module connects all eight drive slots to one bus.

   Depending on which bus the drives will be configured to, begin populating the drives starting with the far right slot or lowest slot for Channel 0 and the fifth drive slot for Channel 1.

Populate drive bays from
the lower (right) slot first.

Drive Label

Component side

Upper (left) bay,
four drive slots

Lower (right) bay,
four drive slots
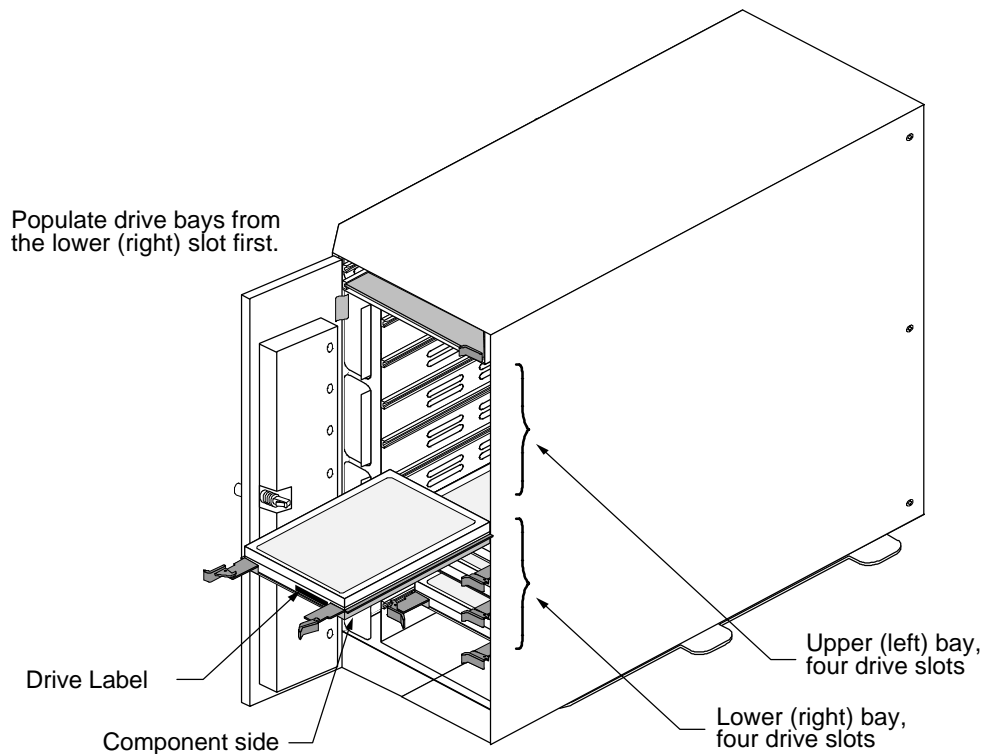
Single-Bus module: Begin populating the drive with
the far right slot or lowest slot and work to your left
or up.

6 Fully seat the drive by applying light 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 DEU 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* section and
follow the procedures to cable your system.

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.

Note: There is no need to power off the DEU 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.
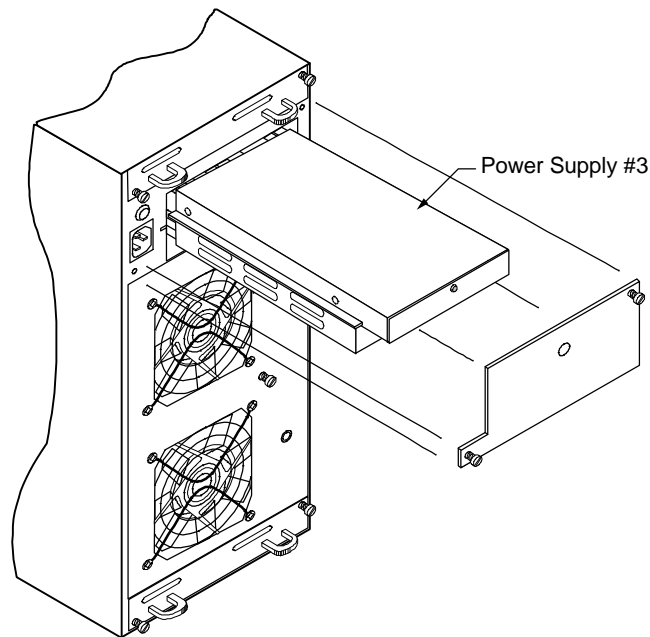
Power Supply #3

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.

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Cabling Configuration

This section provides the recommended cable configurations when operating the DEU in a specific mode.

The Ultra Wide SCSI mode provides enhanced performances with data transfers up to 40 MBs per second (20 MHz).

Note: Be sure to enable the Ultra SCSI (Fast-20) mode in the SCSI Adapter Setup.

The DEU 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.

These standards define 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.

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 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.

The Host Controller card provides termination for one end of the SCSI bus, while the I/O Interface card provides final termination at the other end of the bus.

JP3 and JP4
Fault Bus Protocol
Jumpers (Add to
disable termination)

Channel 0

Channel 1

Channel 0 and 1
Term Power Jumpers

I/O Interface Card
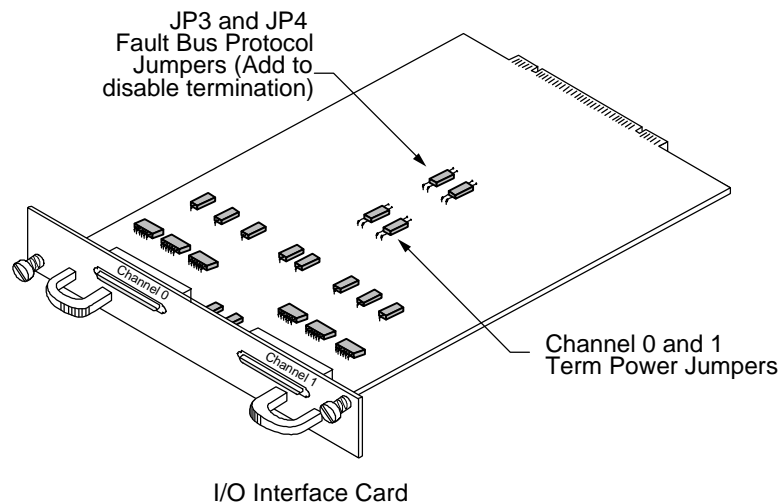
Cables

Cable length is another consideration when configuring the subsystems.

When considering the total length of your cabling requirements, the internal length of cables and printed circuit board traces (known as the internal cable length) must be subtracted from your total cable length. The DEU 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.

Because of the enhancements in the DEU, 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 Technical Support for further assistance. *Data loss is possible under conditions of SCSI bus lockup.*

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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 with your system. These cables have been tested and meet stringent guidelines set forth by SCSI-3 ANSI specifications.

Ultra Wide SCSI Mode

Several possible configurations exist for the DEU 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 cabinet and single-bus module in a single cabinet. Refer to the Appendix D when using the Ultra Extender card.

Note: When configuring a dual-bus cabinet, both channels of the Host Controller are connected to each bank of drives through each channel on the I/O Interface card. When configuring the single-bus cabinet, one channel of the Host Controller connects both banks of drives only through the right or upper channel (Channel 1) on the I/O Interface card.

Dual-Bus Cabinet

This configuration provides two separate SCSI bus connections to the 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.

The SCSI IDs of the drives are set by 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 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 DEU subsystem before connecting any cables.

1 Connect one end of a one meter data cable to the Channel #1 connector on the Ultra SCSI 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 Ultra SCSI 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.
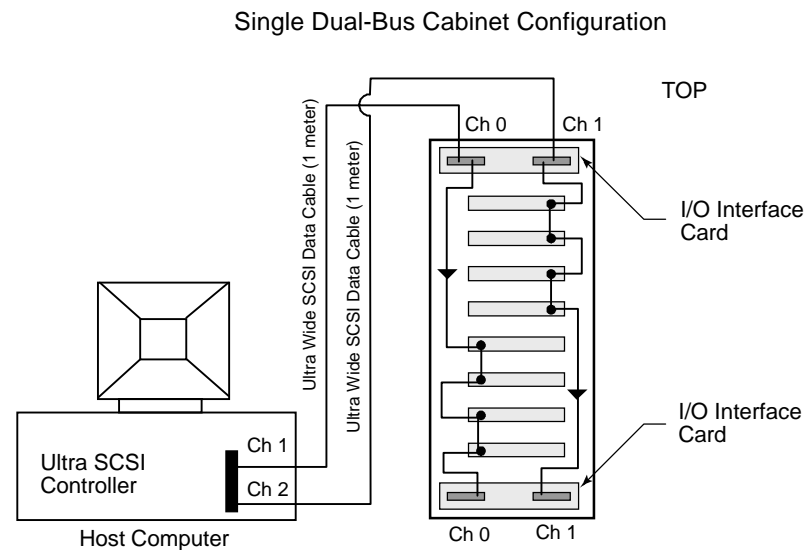
Single Dual-Bus Cabinet Configuration

Note: SCSI termination in the DEU is automatic and requires no user configuration. Refer to "Cabling Configuration" described earlier for information on systems using DEC Fault bus protocol.

5 Turn on the power to the DEU. 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" described later in this guide.

PRINTER NOTE: Page size 9" x 9.25". Align this page to top, right hand corner. Back box bleeds off top and right edge. Left side of page extends to 9.25 inches.

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 Cabinet

The Single-Bus module links all of the drives in the DEU cabinet to a single SCSI bus. This configuration provides the user with 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 DEU subsystem before connecting any cables.

1 Connect one end of a one meter data cable to the Channel #1 connector on the Host 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.

Single-Bus Cabinet Configuration
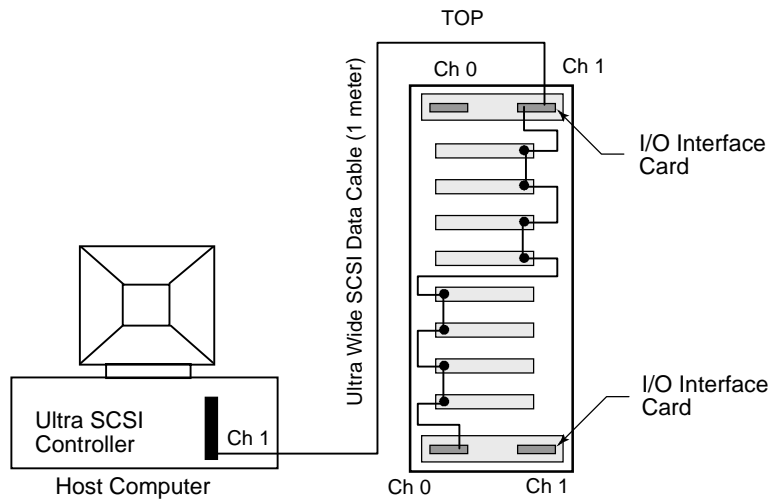
TOP

Ch 0   Ch 1

Ultra Wide SCSI Data Cable (1 meter)

I/O Interface Card

I/O Interface Card

Ultra SCSI Controller   Ch 1

Host Computer

Ch 0   Ch 1

Note: SCSI termination in the DEU is automatic and requires no user configuration. Refer to "Cabling Configuration" described earlier for information on systems using DEC Fault bus protocol.

3 Turn on the power to the DEU. 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" described later in this guide.

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 Appendix D.

Other Configurations

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

Note: For additional configuration options while operating under the Ultra Wide SCSI mode, refer to Appendix D.

3 Using the DEU

Power-On Self Diagnostics

When the DEU is powered on, it will perform a power on self-test (POST) procedure. If no errors are detected, all of the Status Indicator LEDs will illuminate solid green.

During the diagnostic self-test 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

In addition to the LED indications, the POST procedure can be monitored from the Operator Control Panel.

The results of the test can be viewed from the Operator Control Panel by selecting "Hardware Menu" at the Main Menu and then choosing "POST Results", see *Operator Control Panel* described later in this guide.

RAM Read/Write, ROM Checksum, and Register Read/Write Failures

Note: None of the following error conditions will compromise the data integrity on the DEU drives.

Any of these failures will generate the following: Channel Mode LED will blink amber eight times and the speaker will sound eight tones. The Channel Mode LED will change to green and normal operations will be attempted after the tones are sounded. These failures indicate that the LEDs and audible alarm functions may not be reliable.

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

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

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

If the errors occur consistently, the DEU needs to be serviced. Contact your service provider.

RAM Checksum Failure

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 Technical Support.

SCSI Bus Access Failure

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 DEU 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 be solid green regardless of the error conditions. The DEU needs to be serviced if this error occurs consistently and is not cleared by cycling the power on the DEU. Contact Technical Support.

Note: The DEU will not respond to the software if this error occurs.

LED Descriptions

Use the following LED description matrix to determine the status of the DEU LEDs when the SAF-TE card is installed and the RAID controller is powered on.

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

The Operator Control Panel is used to control and monitor the power supplies and fans. The user can also change SCSI IDs for the drives and SAF-TE processor, monitor the cabinet temperature or change the temperature threshold for the monitoring system. Other menu functions provide for viewing component system status, silencing the alarm, establishing a passcode to protect SCSI ID options, and reading the firmware.

Menu
Selector

TURN OFF ALARM
HARDWARE MENU
OPTIONS MENU

Appears When
More Options are
Available Above

Appears When
More Options are
Available Below

Moves Menu
Selector Up

Animated
Icon

MENU   ENTER   ESCAPE

Moves Menu
Selector Down

Selects Menus Option or
Returns to Main Menu

Selects the Option
Indicated by Selector

Backs Up One Level
or Cancels Action
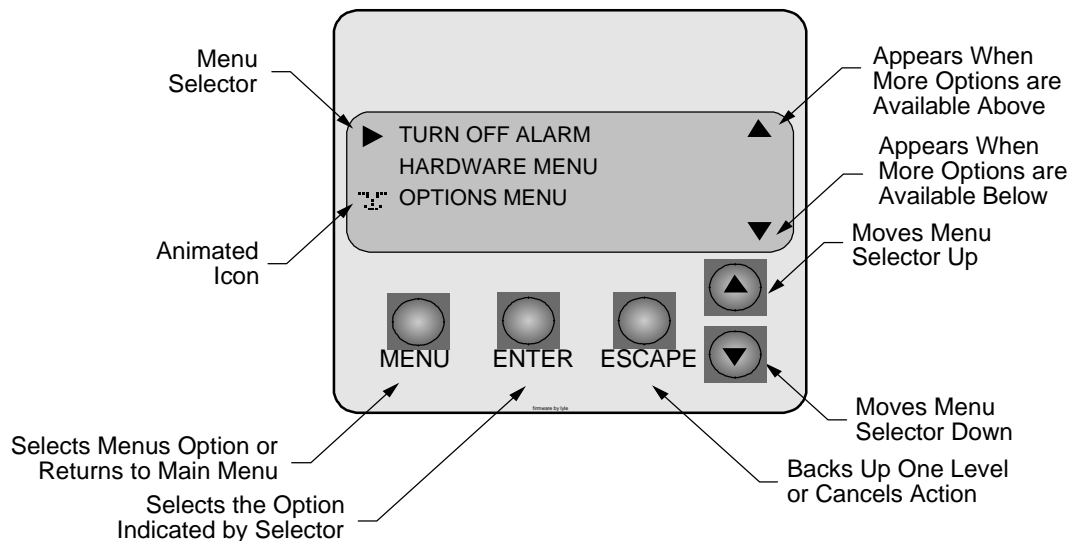
Startup Screens

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

STARTING DUAL-BUS CONFIGURATION	STATUS : OK
MENU ENTER ESCAPE	MENU ENTER ESCAPE
Startup Screen	Status OK Screen

Normal Screens
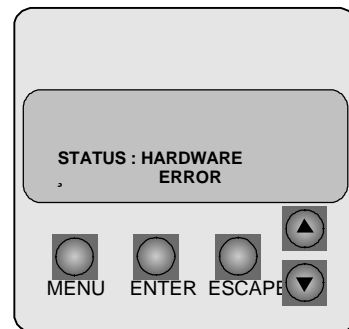
STATUS : HEAT THRESHOLD EXCEEDED	STATUS : HARDWARE ERROR
MENU ENTER ESCAPE	MENU ENTER ESCAPE
Temperature Exceeeded Screen	**Hardware Error Screen**

Abnormal Screens

If one of the errors occur during the startup, you will have a continuous tone from the alarm and will need to access the Component Status Menu to verify the suspected failed component.

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

PRINTER NOTE: Page size 9" x 9.25". Align this page to top, right hand corner. Back box bleeds off top and right edge. Left side of page extends to 9.25 inches.
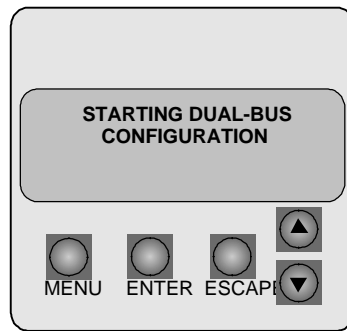
If you install five (5) or more drives with only two (2) power supplies installed, an alarm will sound, the Power Supply LED will illuminate steady amber, and the OCP display will indicate "Non-Redundant Power." Install a third power supply and the display will clear followed by the Power Supply LED will return to steady green.

System Status Icon

A feature of the DEU OCP is the "at-a-glance" animated icon that appears indicating subsystem status. The icon that appears approximately 30 seconds after a static display in the location where the cursor would normally be located.

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.

Happy Icon
(system nominal)

Sad Icon
(system nominal)
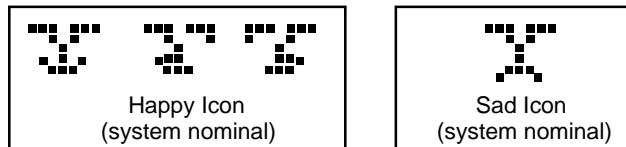
Main Menu

From the Main Menu you can select from the following options:

- Turn off the audible alarm

- Choose the hardware menu

- Choose 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.
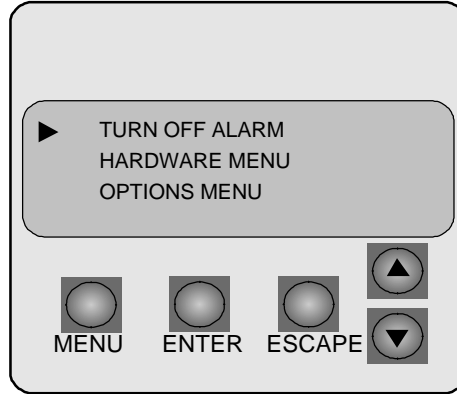
PRINTER NOTE: Page size 9" x 9.25". Align this page to top, right hand corner. Back box bleeds off top and right edge. Left side of page extends to 9.25 inches.

Hardware Menu

From the Hardware Menu you can choose from the following options:

- Component Status

- Configuration Info

- POST Results (Power-On Self Test)

- Internal Temp

```
  TURN OFF ALARM
► HARDWARE MENU
  OPTIONS MENU


  MENU    ENTER   ESCAPE
```

```
►
  COMPONENT STATUS
  CONFIGURATION INFO
  POST RESULTS
  INTERNAL TEMP


  MENU    ENTER   ESCAPE
```

Component Status

The Component Status Menu provides a list of the power supplies and fans installed in the DEU and their current status. Component status is either OK, Missing, or Failed. If you receive a Hardware Error, access the Main menu and choose Hardware menu, then select "Component Status."

Use the up/down arrow buttons to view the complete list of the components.

```
▶ COMPONENT STATUS
  CONFIGURATION INFO
  POST RESULTS
  INTERNAL TEMP
```
MENU   ENTER   ESCAPE   ▲ ▼

```
▶ PWR SPLY 1...OK
  PWR SPLY 2...OK
  PWR SPLY 3...MISSING
  FAN 1...........FAILED          ▼
```
MENU   ENTER   ESCAPE   ▲ ▼

```
▶ FAN 2...........OK              ▲
  FAN 1 SPEED..79%
  FAN 2 SPEED..79%
  BUS CONFIG...SINGLE/DUAL
```
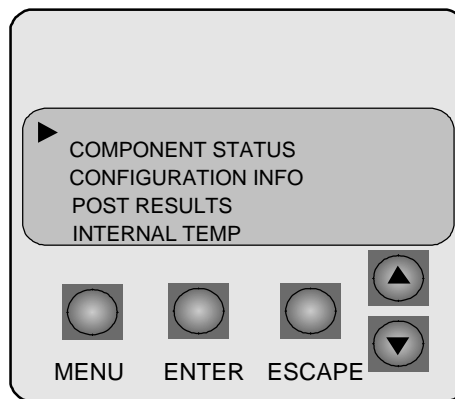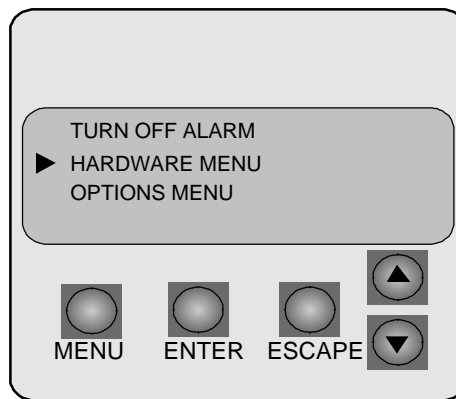MENU   ENTER   ESCAPE   ▲ ▼

PRINTER NOTE: Page size 9" x 9.25". Align this page to top, right hand corner. Back box bleeds off top and right edge. Left side of page extends to 9.25 inches.

Configuration Info

This selection provides information about the subsystem's configuration including such items as the installed feature cards (I/O Interface, 1-CH Diff Converter, 2-CH Diff Converter, 1-CH Ultra Extender, 2-CH Ultra Extender, S2S Interface [SCSI-to-SCSI interface]), and firmware information. Slot 1 is the lower/ left feature card slot and slot 2 is the upper/right feature card slot.

```
COMPONENT STATUS
POWER STATUS
▶ CONFIGURATION INFO
  POST RESULTS                  ▼

   ◯        ◯        ◯       ▲
  MENU    ENTER   ESCAPE     ▼
```

```
PROD: xxxxx       SAF-TE
SLOT 1 CARD:
   I/O INTERFACE
SLOT 2 CARD:                  ▼

   ◯        ◯        ◯       ▲
  MENU    ENTER   ESCAPE     ▼
```

```
SLOT 1 CARD:                  ▲
   1-CH DIFF CONVERTER
SLOT 2 CARD:
   2-CH ULTRA EXTENDER        ▼

   ◯        ◯        ◯       ▲
  MENU    ENTER   ESCAPE     ▼
```

```
  I/O INTERFACE               ▲
RAM REVISION:   0.21
ROM REVISION:   1.05
ID: FFFFFFFFh

   ◯        ◯        ◯       ▲
  MENU    ENTER   ESCAPE     ▼
```

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POST Results

> This screen provides a list of the diagnostics performed during the startup power-on self-test. If an error has occurred it will be displayed here in addition to the sequence of LED blinks and alarm tones, see *Power-On Self Diagnostics* described earlier.

COMPONENT STATUS
POWER STATUS
FW REVISION
▶ POST RESULTS

MENU   ENTER   ESCAPE

ROM CHKSUM...OK
RAM CHKSUM...FAILED
RAM R/W.........OK
SCSI BUS 0......OK.

MENU   ENTER   ESCAPE

RAM R/W. ......OK
SCSI BUS 0 ....OK
SCSI BUS 1 ....OK
PROCESSOR.....OK

MENU   ENTER   ESCAPE

PRINTER NOTE: Page size 9" x 9.25". Align this page to top, right hand corner. Back box bleeds off top and right edge. Left side of page extends to 9.25 inches.
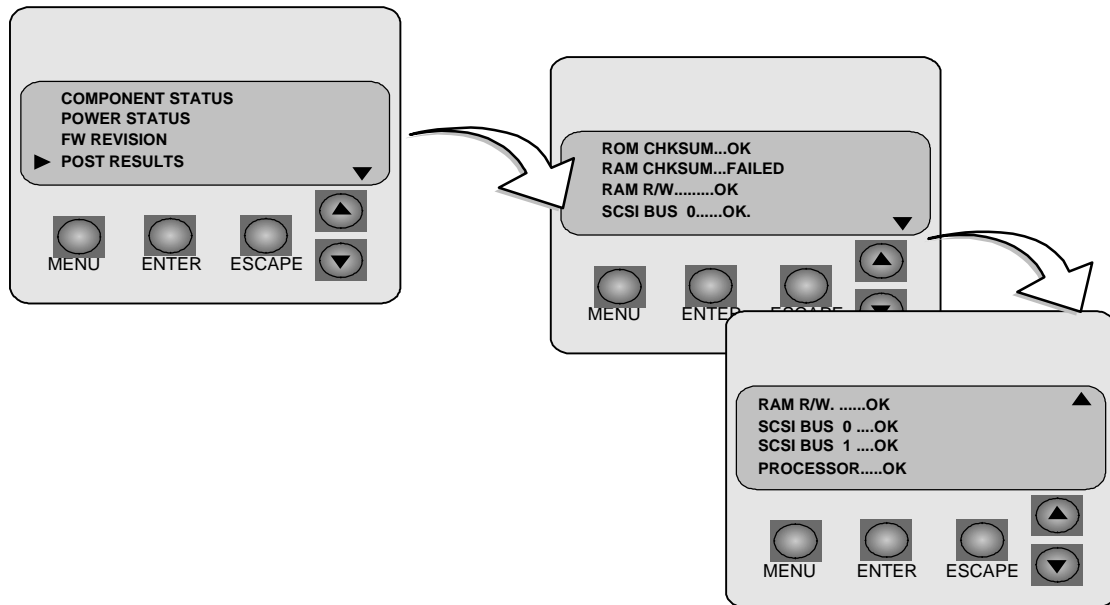
Internal Temp

This screen displays the current internal cabinet temperature (highest of the two sensors). To change the temperature threshold of the monitoring system, see *Heat Threshold* described later in this guide.
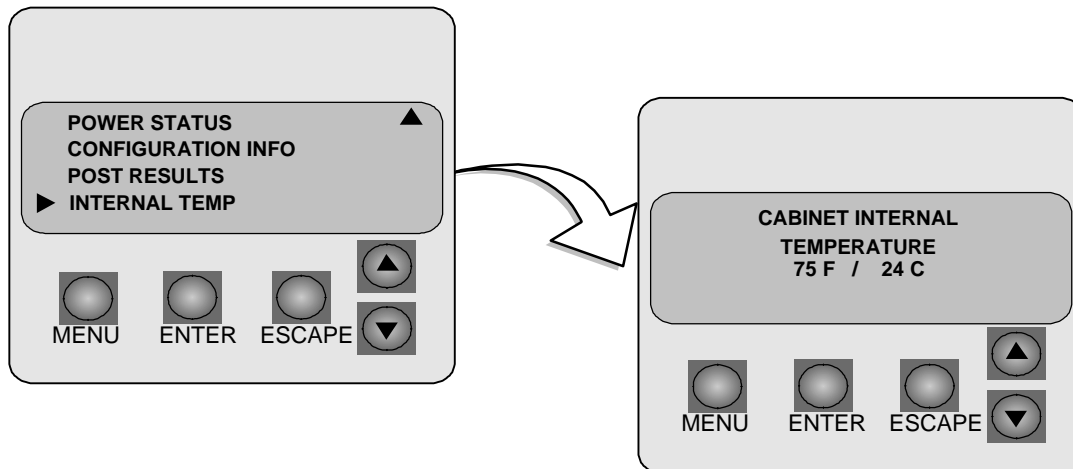
Options Menu

The Options Menu provides access to the following menus:

■ 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), set the DEU (SAF-TE) processor ID, set the SCSI ID of the Ultra S2S RAID Controller (RAID Module). SCSI IDs 0 - 15 are available.
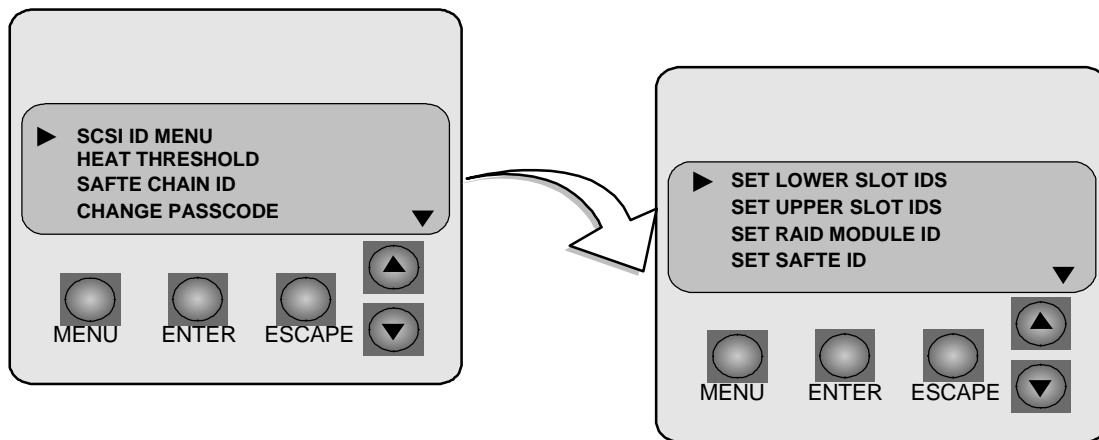
Manual ID Selection

You can set SCSI IDs manually for each group of devices from a pre-defined table of IDs. The currently set IDs will be flashing. The IDs will be assigned sequentially beginning with the lowest device in the group. Drive SCSI IDs cannot be set individually. Choose "Set Lower Slot Ids" or "Set Upper Slot Ids" for the appropriate drives and press the Enter button.

Note: SCSI ID #7 should not be used when a Ultra S2S RAID Controller is installed.

When selecting IDs manually, SCSI ID 3 is normally used by the DEU processor. The SAFTE card ID may use the setting "OB" which indicates Off Bus. However, if SAFTE is off bus, LEDs and other error reporting will not function properly.
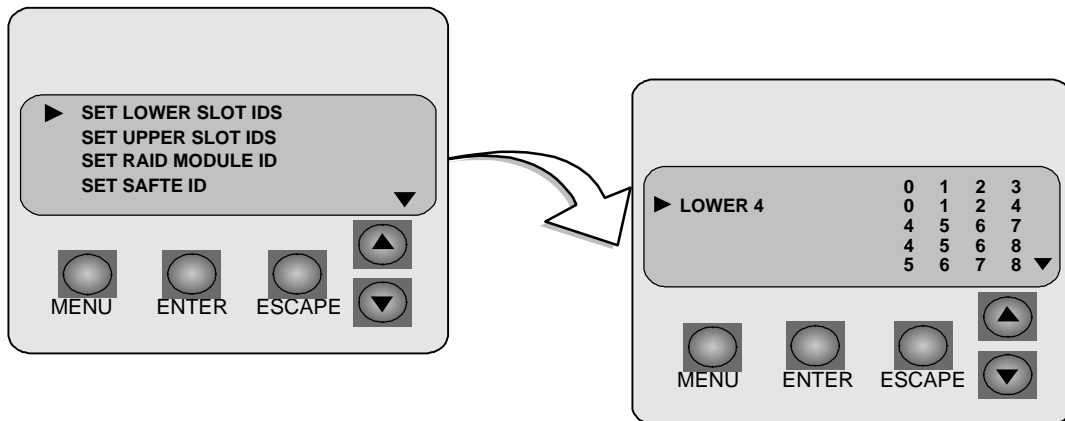
Reset Default IDs Selection
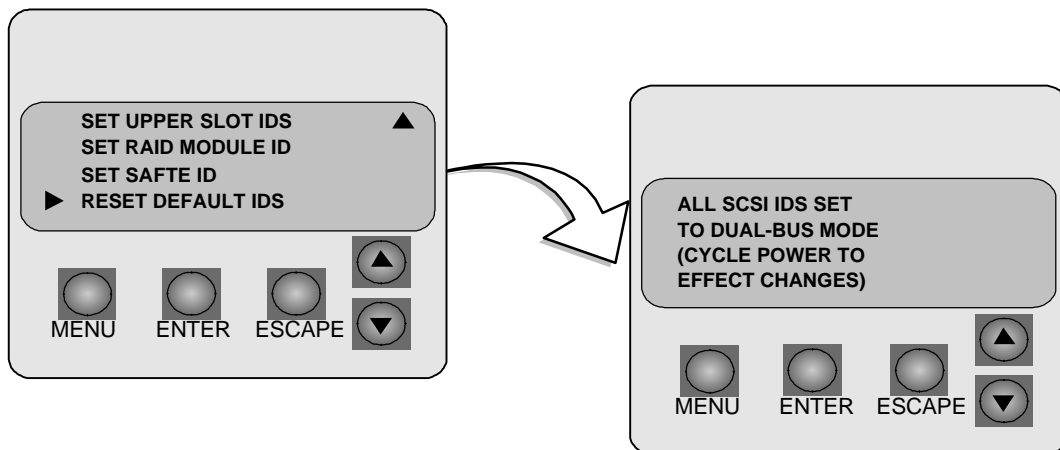
Choosing the "Reset Default Ids" option will automatically set the SCSI IDs to IDs 0, 1, 2, and 4 for the drives, and ID 3 for the processor. SCSI ID values for the drives will be the same for both SCSI bus channels.

If an Ultra S2S RAID Controller is installed the SCSI ID will automatically be set to ID # 0.

Note: When the "Reset Default Ids" is selected or anytime you change a SCSI ID setting, you must power the DEU OFF and ON at that screen for those settings to take effect. Be sure to power OFF the host computer prior to cycling the power on the DEU. Otherwise, the PCI RAID Controller (if used) will "kill" all drives in the array.

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Heat Threshold

Note: The Heat Threshold value is pre-set at the factory and should not be changed unless directed by Technical Support. The default setting is 114°F/45°C.

Choose the Heat Threshold Menu to change the temperature value for the temperature monitoring system. If the temperature exceeds the value set here, a "Temperature Threshold Exceeded" screen will appear, see *Internal Temp* described earlier.

```
SCSI ID MENU
►  HEAT THRESHOLD
   SAFTE CHAIN ID
   CHANGE PASSCODE              ▼

MENU    ENTER   ESCAPE
```

```
ARROWS TO CHANGE
ENTER TO SET
ESC TO EXIT
              114 F  /  45 C

MENU     ENTER   ESCAPE
```
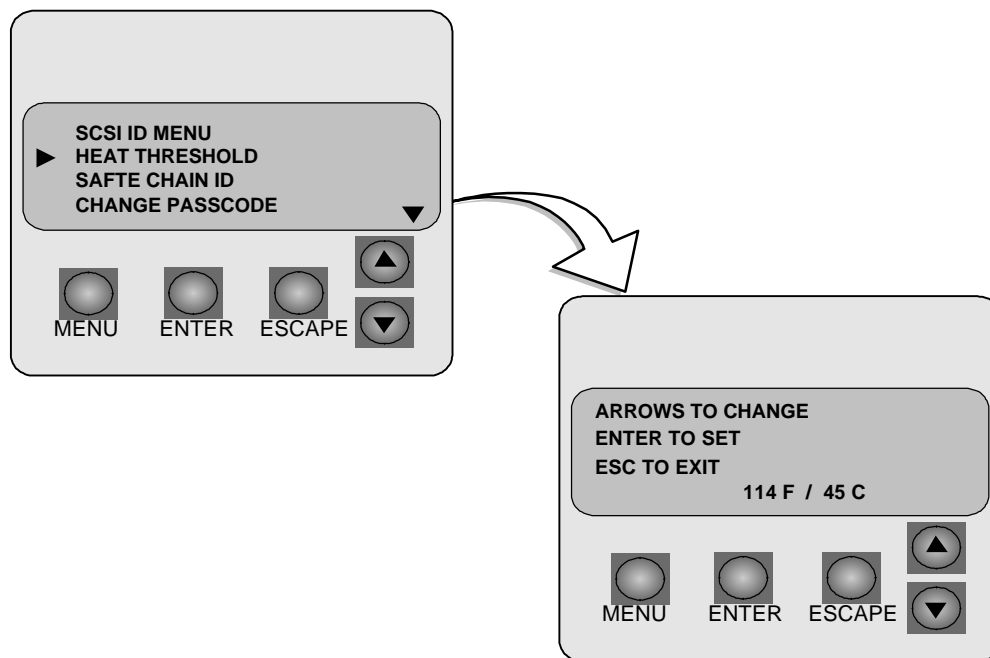
SAFTE CHAIN ID

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 RAID 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 "Manual ID Selection" described earlier.

PRINTER NOTE: Page size 9" x 9.25". Align this page to top, right hand corner. Back box bleeds off top and right edge. Left side of page extends to 9.25 inches.

1. Choose the *SAFTE CHAIN ID* selection and press the <Enter> button.

2. Use the up and down arrow buttons to choose between the options: none, master, slave 1, and slave 2 and 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 DEU for the changes to take effect.

```
HEAT THRESHOLD            ▲
► SAFTE CHAIN ID
CHANGE PASSCODE
UNLOCK OPTIONS

MENU    ENTER   ESCAPE   ▲
                         ▼
```

```
► NONE
MASTER
SLAVE 1
SLAVE 2

MENU    ENTER   ESCAPE   ▲
                         ▼
```
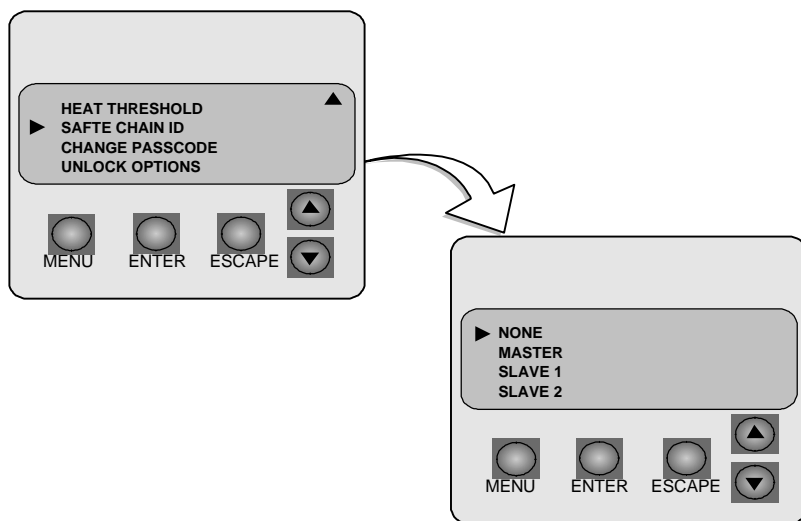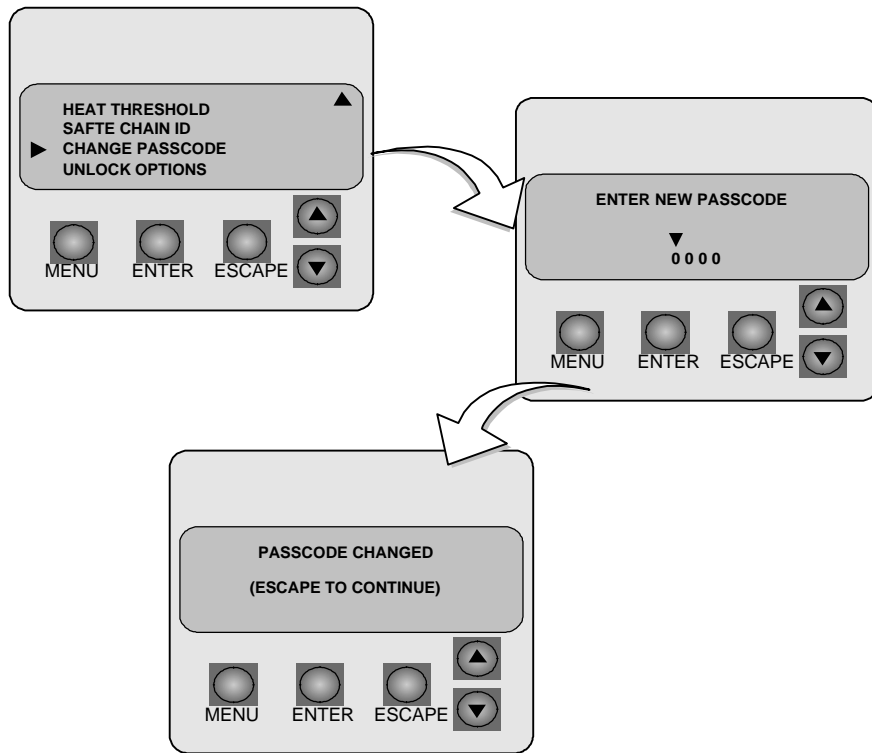
Change Passcode

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 arrow buttons to change the code value (0-9) and the enter button to move from one field to the next.

2 Press the enter button after you have made your selections.

3 You will be prompted to press the escape button after the passcode is changed for the change to take affect. The default code is "0000."

Note: The lock will not take effect until you have returned to the main screen "Status OK."

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```
┌─────────────────────────────┐
│                             │
│  HEAT THRESHOLD        ▲     │
│  SAFTE CHAIN ID             │
│ ► CHANGE PASSCODE           │
│  UNLOCK OPTIONS             │
│                         ◉   │
│  ◯    ◯    ◯    ▲           │
│ MENU ENTER ESCAPE ▼         │
└─────────────────────────────┘
```

```
┌─────────────────────────────┐
│                             │
│   ENTER NEW PASSCODE        │
│                             │
│         ▼                   │
│        0 0 0 0          ◉   │
│                             │
│  ◯    ◯    ◯    ▲           │
│ MENU ENTER ESCAPE ▼         │
└─────────────────────────────┘
```

```
┌─────────────────────────────┐
│                             │
│   PASSCODE CHANGED          │
│                             │
│  (ESCAPE TO CONTINUE)       │
│                         ◉   │
│  ◯    ◯    ◯    ▲           │
│ MENU ENTER ESCAPE ▼         │
└─────────────────────────────┘
```

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.

HEAT THRESHOLD
SAFTE CHAIN ID
CHANGE PASSCODE
▶ UNLOCK OPTIONS
▲

MENU   ENTER   ESCAPE

ENTER 4 DIGIT
PASSCODE
▼
0000

MENU   ENTER   ESCAPE

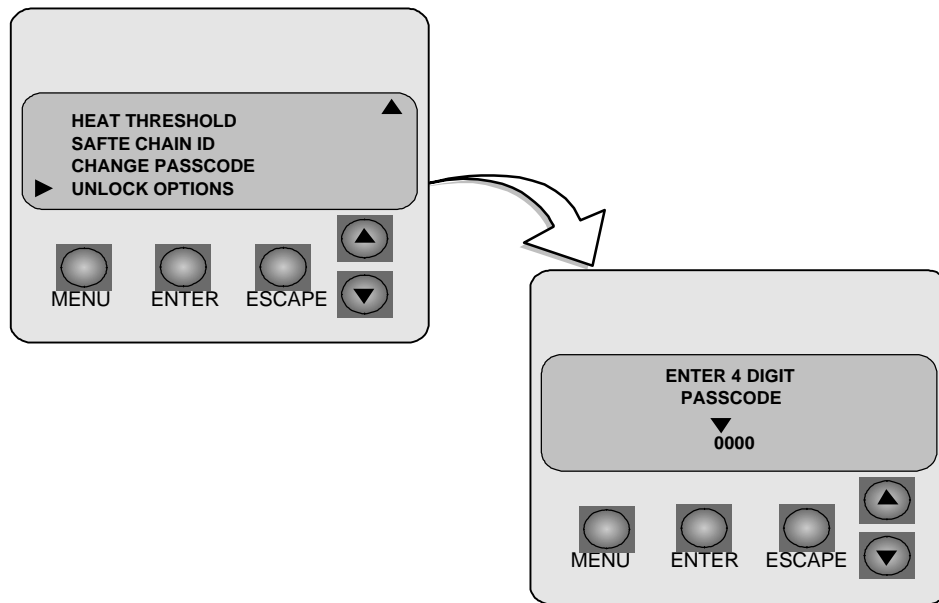**1** Select the "Unlock Options" from the Options menu.

2 Use the 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.
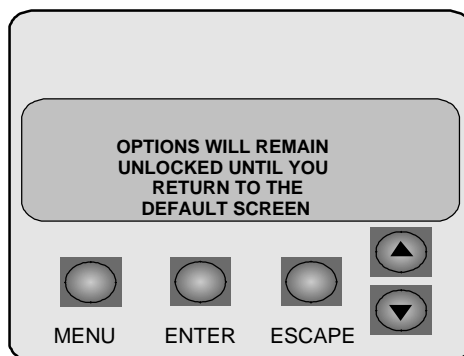
OPTIONS WILL REMAIN
UNLOCKED UNTIL YOU
RETURN TO THE
DEFAULT SCREEN

MENU   ENTER   ESCAPE

PRINTER NOTE: Page size 9" x 9.25". Align this page to top, right hand corner. Back box bleeds off top and right edge. Left side of page extends to 9.25 inches.

PRINTER NOTE: Page size 9" x 9.25". Align this page to top, right hand corner. Back box bleeds off top and right edge. Left side of page extends to 9.25 inches.

4 Maintenance

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 DEU or the computer system. The drives are hot swappable.

1 Unlock and open the door on the DEU cabinet.

2 Identify the failed drive using the Status LEDs and the Fault LED.

3 Using your thumbs, apply a slight pressure outward to release the drive latch clips, unlocking the failed drive and remove the drive.

4 Remove your new disk drive from the shipping carton and inspect the shipment. Remove the anti-static protective packaging.

5 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.

6 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 light pressure with your thumb to the front of the drive.

7 Press the Drive Latching Clips until they "snap" into place.

Replacing a Power Supply

Note: There is no need to power off the DEU or the computer system. The power supplies are hot swappable.

1 Use the Operator Control Panel to identify the failed power supply, refer to the illustration below to identify the components.

Select "Hardware Menu" from the Main Menu and choose "Component Status."

Power Supply #3

Power Supply #2

"DC Good" LED
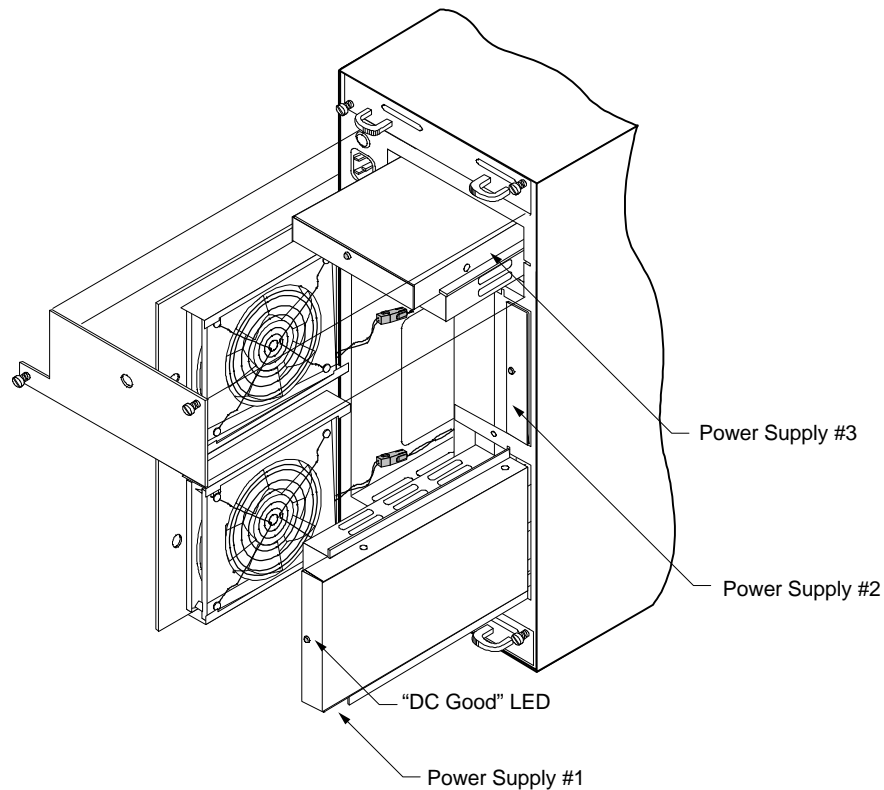
Power Supply #1

2 Locate the failed component from the rear panel of the DEU. The "DC Good" LED for the failed power supply will be OFF.

3 Loosen the rear door panel access screw, using a flat-blade screwdriver.

If you are replacing the #3 power supply, loosen the two PSU Cover Plate screws. Remove the cover plate and skip to step 4.

4 Open the panel to gain access to power supplies #1 and #2. The panel is hinged.

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5 Grasp the handle of the subject power supply and pull the supply out of the DEU cabinet.

6 Remove the new power supply from the shipping carton and inspect the shipment. Save the packaging material.

7 Slide the new power supply into the cabinet until it reaches its locked position. Orient the 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.

8 Close the rear door panel. The door has a latch mechanism to hold 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.

Replacing the Cooling Fans

Note: There is no need to power off the DEU 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 identify the components.

Fan #2
Power Cable

Fan #2

Fan #1
Power Cable

Fan #1

Door Latch

Fan #1
Power Cable
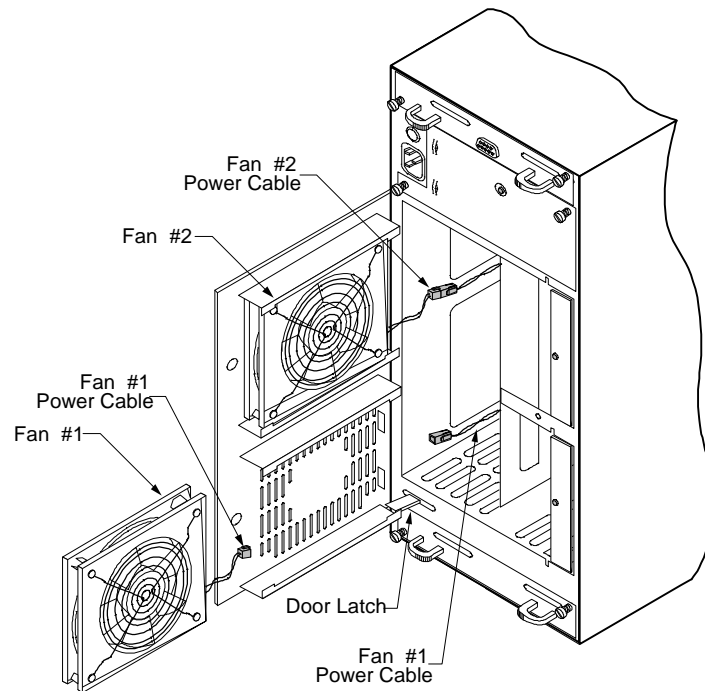
Select "Hardware Menu" from the Main Menu and choose "Component Status." You may need to scroll through the list with the arrows buttons to locate the failed component.

2 Loosen the rear door panel access screw, using a flat-blade screwdriver.

3 Open the panel to gain access to the fans. The panel is hinged.

4 Disconnect the fan's power cable connector.

5 Remove the failed fan by sliding it out from the door assembly.

6 Remove the new cooling fan from the shipping carton and inspect the shipment. Save the packaging material.

7 With the fan guard facing toward the inside of the cabinet, slide the new fan into its housing.

8 Reconnect the fan's power cable connector. The connector is keyed and will install only one direction.

9 Close the rear door panel. The door has a latch mechanism to hold the door in the open position. Squeeze the latch to release the door allowing it to be closed.

10 Secure the door with the access panel screw.

Replacing the DEU 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 cabinet from the shipping carton and inspect the shipment. Save the packaging material.

2 Down your server and turn off the computer system. Turn the power off to the old DEU cabinet.

Note: Note the position of the data cables, disk drives, and the jumpers on termination 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.

5 (Rack Mount Systems Only) Remove the DEU from the rack assembly.

6 (Single-Bus Modules Only) Remove the Single-Bus configuration module from the old cabinet and install it into the new cabinet.

7 (Rack Mount Systems Only) Install the new DEU cabinet into the rack assembly.

8 If you have a third power supply unit installed in the old cabinet, remove it and install the PSU into the new cabinet.

9 Reconnect and secure the power cord and data cables.

10 Install the drives into the new cabinet in exactly the same order as they were in the old cabinet.

11 Power ON the new DEU subsystem.

12 Power ON the computer system or server.

Replacing a Fuse

Caution: Disconnect power before changing the fuse.

1 Locate the fuse holder on the rear panel of the DEU.

Fuse Assembly —
Power Connector Module —

Fuse (250V 10A)
Fuse Holder
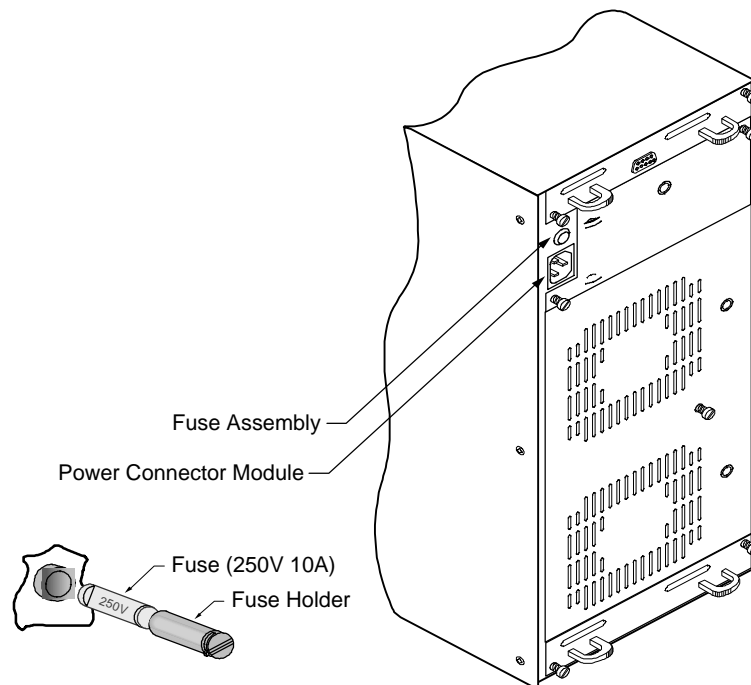
2 Using a small coin, turn the fuse holder counter-clockwise one quarter turn, releasing the holder from its locked position.

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.

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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.

5 Troubleshooting

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

Symptom	Reason	Solution
Fails to power on.	Power cord not connected properly.	Verify that the power cord is properly connected to the power module.
	Power not available at the outlet.	If the DEU 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.
	Power switch not in the proper position.	Be sure that the power switch is in the "ON" position, labeled "I".
	Faulty fuse.	Replace fuse, see *Replacing a Fuse* described earlier in this guide.
	Faulty power cord.	Replace power cord.
		If the DEU is not responding, contact your service provider.
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 *Maintenance* 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 *Power-On Self Diagnostics* described earlier in this guide.

LED Status	Reason	Solution
Operator Control Panel display indicates cabinet temperature threshold has been	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

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exceeded.		component. Follow the procedures in the *Maintenance* chapter to replace the failed component.
	Temperature threshold too low.	Change the temperature threshold value, see *Heat Threshold* described earlier in this guide..
	Cooling fan vent blocked.	Examine the cooling fan vents for blockage and clear.
	Inadequate ventilation around the DEU.	The location chosen for the DEU probably has poor air circulation. Choose a better location.
Status Indicator LEDs not functioning properly.	SCSI data cable not properly connected.	Verify that the SCSI data cable is properly connected to the DEU 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 DEU is in a non-fault tolerant mode.	Replace the disk drive and begin rebuilding the array, see *Replacing a Disk Drive* described earlier in this guide.
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 DEU 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 DEU is in a non-fault tolerant mode.	Insert a disk drive and begin an array rebuild, see *Replacing a Disk Drive* described earlier in this guide.
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 *RAID Utilities User's Guide*.

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 DEU 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 DEU is in a non-fault tolerant mode.	Replace the disk drive and begin rebuilding the array, see *Replacing a Disk Drive* described earlier in this guide.
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 DEU 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 DEU is in a non-fault tolerant mode.	Insert a disk drive and begin an array rebuild, see *Replacing a Disk Drive* described earlier in this guide.
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 Ultra S2S RAID Controller User's Guide.

A Certificate and Agency 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.

The manufacturer 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/adapter 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.

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. Ver Wenden Sie eine IEC 320-Buchse und einen für das Installationsland passenden Stecker, der auf 6A und 250V gesichert ist.

B 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

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	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.
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 (*n*Stor) 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.

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C   Technical Information

Specifications

DEU

Operating Environment	40°F to 94°F (+5°C to +34°C)
Relative Humidity	
Operating/Non-Operating	5% - 95% (non-condensing)
Power Requirements	100 - 240 VAC (auto-sensing) 50-60 Hz 6.0 Amperes 3 x 150 watts
Rack Mount System	
Dimensions (HxWxD) w/o Handles	6.83" x 17.40" x 19.00"
Tower-Based System	
Dimensions (HxWxL)	17.40" x 6.83" x 19.00"
Weight (basic configuration of cabinet includes two cooling fans)	48.0 lbs. without drives installed
	56.6 lbs. with three drives installed
Altitude	-200 to 10,000 feet
Number of Drives Supported	8
Interface Transfer Rate	Up to 40 MB/sec
Host Interface	Fast/Wide SCSI-3
Drive Interface	Fast/Wide SCSI-3
HDD Termination	Automatic Termination
Electromagnetic Emissions Requirements (EMI)	FCC, Part 15, Class B
	EN55022-B
Safety Requirements	UL1950 CSA C22.2 #950 TUV/EN60950

DEU (continued)

CE Compliance (EMC)	89/336/EEC EMC Directive
Shock Operating	1.0 G, 2 - 50 ms

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|	
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 DEU 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

1   34

35   68
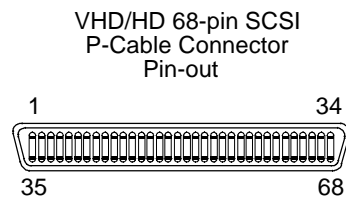
Signal Name	Pin Number	Conductor Number	Signal Name	Pin Number	Conductor Number
+DB(12)	1	1	– DB(12)	35	2
+DB(13)	2	3	– DB(13)	36	4
+DB(14)	3	5	– DB(14)	37	6
+DB(15)	4	7	– DB(15)	38	8
+DB(P1)	5	9	– DB(P1)	39	10
+DB(0)	6	11	– DB(0)	40	12
+DB(1)	7	13	– DB(1)	41	14
+DB(2)	8	15	– DB(2)	42	16
+DB(3)	9	17	– DB(3)	43	18
+DB(4)	10	19	– DB(4)	44	20
Signal Name	Pin Number	Conductor Number	Signal Name	Pin Number	Conductor Number
+DB(5)	11	21	– DB(5)	45	22
+DB(6)	12	23	– DB(6)	46	24

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+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 DEU 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 unjumpering 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.
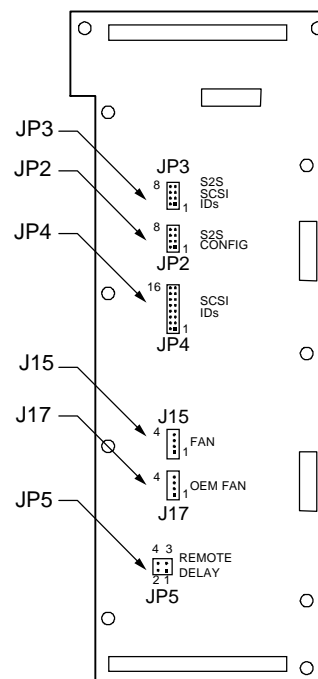
Rear View of Backplane PCB

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 DEU subsystem. This process is accomplished by adding jumpers to JP2. The jumper block is a four position dual-row header.

8 ⬚⬚⬚⬚ S2S
         1 CONFIG
JP2

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.

JP3

8   S2S
     SCSI
   1 IDs
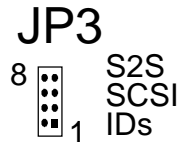
Jumper Positions				
1 & 2	**3 & 4**	**5 & 6**	**7 & 8**	**SCSI-to-SCSI ID Settings**
ON	ON	ON	ON	15
OFF	ON	ON	ON	14
ON	OFF	ON	ON	13
OFF	OFF	ON	ON	12
ON	ON	OFF	ON	11
OFF	ON	OFF	ON	10
ON	OFF	OFF	ON	9
OFF	OFF	OFF	ON	8
ON	ON	ON	OFF	7
OFF	ON	ON	OFF	6
ON	OFF	ON	OFF	5
OFF	OFF	ON	OFF	4
ON	ON	OFF	OFF	3
OFF	ON	OFF	OFF	2
ON	OFF	OFF	OFF	1
OFF	OFF	OFF	OFF	0

JP4 (SCSI ID Settings)

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

PRINTER NOTE: Page size 9" x 9.25". Align this page to top, right hand corner. Back box bleeds off top and right edge. Left side of page extends to 9.25 inches.

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.

16
SCSI
IDs
1

JP4
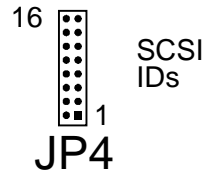
Jumper Positions for Drives 1, 2, 3, and 4 ID Settings				
1 & 2	3 & 4	5 & 6	7 & 8	SCSI ID (1, 2, 3, and 4)
ON	ON	ON	ON	0, 1, 2, 3
OFF	ON	ON	ON	0, 1, 2, 4
ON	OFF	ON	ON	4, 5, 6, 7
OFF	OFF	ON	ON	4, 5, 6, 8
ON	ON	OFF	ON	5, 6, 7, 8
OFF	ON	OFF	ON	5, 6, 8, 9
ON	OFF	OFF	ON	8, 9, 10, 11
OFF	OFF	OFF	ON	9, 10, 11, 12
ON	ON	ON	OFF	10, 11, 12, 13
OFF	ON	ON	OFF	12, 13, 14, 15

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	12, 13, 14, 15

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.

```
4 3
 . .   REMOTE
 . .   DELAY
2 1
  JP5
```
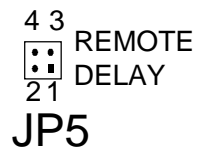
Pins 1 and 2	Pins 3 and 4	Drive Spinup Mode
ON	ON	Motor spins up only on SCSI "start" commands.
ON	OFF	Motor spins up after a delay of 12 (may vary depending on drive type) seconds times the numeric SCSI ID setting of the associated drive.
OFF	ON	Motor spins up only on SCSI "start" commands.
OFF	OFF	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 DEU. 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.

J15

4 ⋮ 1 FAN

4 ⋮ 1 OEM FAN

J17
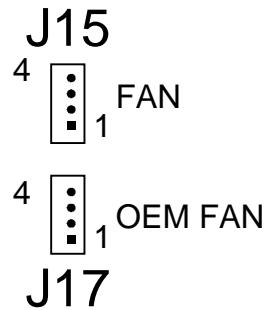
D   Option Cards

Introduction

The Ultra Extender and Differential Converter Option cards provide a single solution allowing the extension of device connectivity and/or cable length of the SCSI bus for the DEU subsystems.

When the Ultra Extender card is used, the circuitry functions as a SCSI bus repeater for multiple single-ended to single-ended cabling schemes while being electrically isolated from each other. When the Differential Converter card is used, the circuitry functions as a SCSI bus converter for differential to single-ended cabling schemes again while being electrically isolated from each other. As SCSI command and data passes from the source bus to the load bus, signal filtering and re-timing are employed to maintain the SCSI signal.

The cards feature TolerANT® technology, which includes active negation on the SCSI drivers and input signal filtering on the SCSI receivers. Active negation causes the SCSI Request, Acknowledge, Data, and Parity signals to be actively driven high rather than passively pulled up by terminators. The receiver technology improves data integrity in unreliable cabling environments, where other devices would be subject to data corruption. The TolerANT receivers filter the SCSI bus signals to eliminate unwanted transitions without long signal delays. This improved driver and receiver helps eliminate double clocking of data, the largest reliability issue with SCSI operations.

Features

The following are major features of the Option Cards:

- **Dual Configurations** — Both cards available in single and dual channel models.

- **High Speed Transfers** — Asynchronous or synchronous data transfer rates up to 40 MBs with Ultra Wide SCSI.

- **No Required SCSI ID** — Does not consume a SCSI ID on the SCSI bus.

- **Fast-20 Support** — Complete support for SCSI-3 (Fast-20) and backwards compatible with SCSI-2 standards.

- **Active Negation** — Employs TolerANT active negation technology.

- **Electrical Isolation** — Provides internal device protection against externally generated noise on the SCSI bus.

- **Expanded Technology** — Extends Ultra SCSI cable lengths and the total number of Ultra SCSI devices.

- **Independent Platform** — Completely software and host system independent.

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Quick Install

The following procedures outline the steps necessary to setup your DEU subsystems. These guidelines are generally for those individuals who don't like to read manuals.

- **Install the Disk Drives —** Open the front door of each cabinet and insert the disk drives. Be sure each drive seats properly and the drive latches are secured.

- **Install the Option Cards —** Install the correct Option cards in the correct slot for your configuration.

- **Connect the Cables —** Connect the data and jumper cables. Refer to DEU Subsystems Installations later in this section for the supported configurations under Single-ended Ultra SCSI or Differential SCSI.

- **Configure your system —** Run your system configuration program to setup the drives, and/or your RAID software configuration.

DEU Subsystem Installations

Setup

This section contains the procedures to install and configure the Ultra Extender and Differential Converter Option cards in your DEU disk array subsystems.

The installation is essentially a three step process: the cards are installed in the DEU subsystem, the cabling is completed based on the supported configuration, and the array is then configured.

Several rules will apply when cabling and configuring multiple cabinets in a "master/slave" environment.

- The DEU subsystem supports one "master" subsystem and up to two "slave" subsystems interconnected.

- No more than two Option cards can be installed on one SCSI bus (master/ slave environment).

- When DEU's are operated in split bus mode (dual-bus module installed), all drives on one channel from one cabinet must be connected to the same channel on the other cabinet. Channel 0 drives cannot be connected to Channel 1 drives in any configuration nor can the reverse condition exist.

- When implementing an Ultra Wide SCSI configuration, cable lengths are limited to one (1) meter from the Ultra Extender card to the next cabinet.

- Single channel cards must be installed in the DEU upper or right side Option card slots.

Cabling Configuration

The cabling configuration is divided into two subsections in this section, configurations pertaining to Single-ended Ultra Wide SCSI and those for Differential Ultra Wide SCSI. These two sections are divided into groups describing the cabinet/cabling scheme and provide the recommended cable and termination configurations when operating the DEU in a specific mode.

Cable length is a primary consideration when configuring the subsystems. There are different limitations for Single-ended Ultra Wide SCSI (Fast-20) and Differential Ultra Wide SCSI.

Ultra Wide SCSI

According to SCSI-3 ANSI specifications (X3T10/1071D) the total SCSI cable length for Single-ended Ultra Wide SCSI is 3 meters (118 inches) with four SCSI devices distributed evenly across the cable and 1.5 meters (59 inches) with eight drives distributed evenly across the cable with each SCSI device having a 25 pico farad load. By controlling the SCSI device loading and impedance on the SCSI bus, SCSI device spacing and cable lengths can vary and be improved. In a standard configuration, the DEU is designed to accommodate a total of nine SCSI devices in a single cabinet (eight drives and one SAF-TE controller), all connected to a host controller using a 1 meter cable. The DEU has an internal equivalent SCSI bus cable length of just under 1 meter giving an overall cable length of 2 meters (external 1 meter cable plus the internal 1 meter equivalent cable length).

The number of SCSI devices and cable lengths on the SCSI bus can also be increased and improved by adding SCSI buffers that recondition the SCSI signals. With the optional Ultra Extender card installed in the DEU, SCSI signals are buffered and reconditioned allowing the external cable length to be increased to a maximum of 3 meters and still support nine SCSI devices in a Single-ended Ultra SCSI environment. The Ultra Extender Feature card also provides the DEU with the ability to add a second cabinet on the same SCSI bus supporting an additional six SCSI devices for a total of sixteen SCSI devices. The maximum number of SCSI devices supported by this specification on a single bus is sixteen SCSI devices.

Differential SCSI

According to SCSI-3 ANSI specifications for Differential Ultra Wide SCSI, the total SCSI cable length is 25 meters (984 inches). The internal SCSI bus of the DEU is a Single-ended bus and therefore a conversion is required when interfacing to an external differential SCSI bus.

The DEU supports Differential SCSI by using the Differential Converter Feature card. This card provides the termination and drivers necessary to interface to a differential SCSI bus. The external cable length can be up to a maximum of 25 meters as described by the SCSI-3 ANSI specifications.

A symptom of exceeding the cable limits 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 your Service Provider 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 with your system. These cables have been tested and meet stringent guidelines set forth by the SCSI-3 ANSI specifications.

Guidelines

Before installation, you will need to consider the following:

- Identify which DEU subsystem will be the "master" subsystem and which will be the "slave" subsystem(s). The Differential Converter and Ultra Extender cards install differently for each configuration.

- Determine which mode the DEU will be configured. This includes the type of host controller (RAID Controller – single-ended or SCSI host adapter – differential). Also the number of controllers (adapters) that will be used in the host system.

- Determine the number subsystems that will be used per controller (adapter). Each section provides diagrams for the supported configurations using the minimum number of controller channels. Maximizing the channels per subsystem may be accomplished by mixing supported configuration with available channels.

Installation Precautions

Please observe the following cautions and notes prior to and during installation:

- 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 printed circuit board components.

- Exercise care when handling any electrical component.

- Do not overtighten the thumb screws on the feature cards and cable connectors. Secure them to finger tight only.

- Interface and feature cards are keyed and will install only one way.

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Single-Ended Ultra Wide SCSI

Prior to beginning the cabling, identify the configuration for your installation. Note the card locations in the illustrations for each configuration. Install your cards and connect the cables based on the procedures and diagrams shown. The diagrams depict the configuration using the minimum number of controller channels.
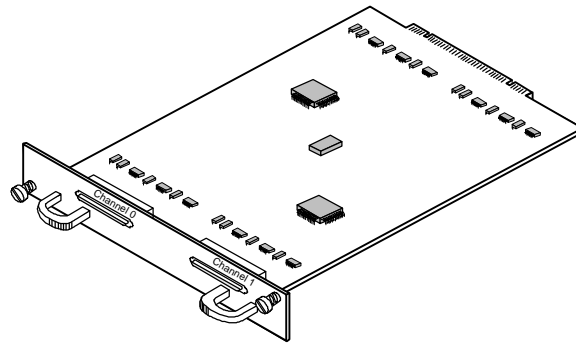
Ultra Extender Card

Two Single-Bus Cabinets

With this configuration, you will have up to fourteen (14) disk drives per controller channel. Due to the fourteen drives per channel limitation, two disk drive slots will not be available.

If you are using multiple controllers you can expand your capacity by using up to four controllers per CPU system. Refer to "Default Configurations" later in this section for information on special SCSI ID settings.

1 Power off your computer system or workstation.

2 Be sure to complete the "Setup" and "Component Installation" sections described earlier in this Guide. The DEU ships from the factory with I/O Interface cards installed in both card slots. Therefore during the installation, you may be required to remove one or both I/O Interface cards.

3 Identify the subsystem which will be the master cabinet. Loosen the two thumb screws and remove the I/O Interface card installed in the upper or right side card slot of the master cabinet.

Ultra Extender
Option Card

Slave Cabinet

I/O Interface Card

4 Install a single channel Ultra Extender Feature card in the upper or right side card slot where the I/O Interface card was removed and tighten the thumb screws.

5 Repeat steps 3 and 4 for the slave #1 cabinet (second subsystem).

TOP Master

TOP Slave #1

Chl #0   Chl #1

1-CH Ultra
Extender Card

← 1-CH Ultra
Extender Card

SAF-TE Card

← SAF-TE Card

Chl #0   Chl #1

Single-Bus Module

Single-Bus Module

Ultra Wide SCSI Data Cable (3 meters)

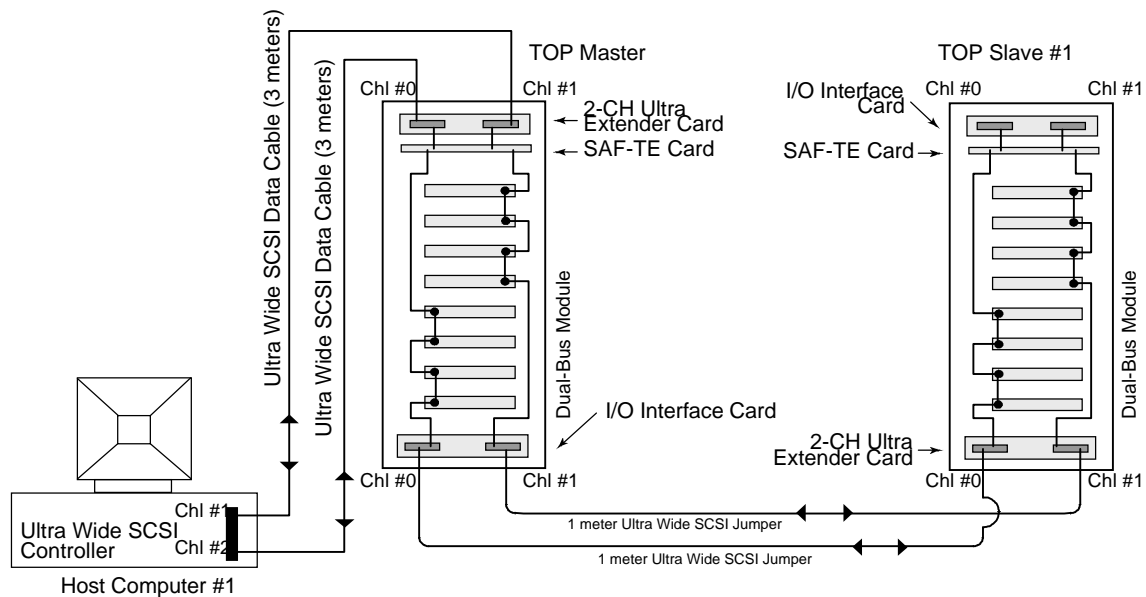I/O Interface Card

I/O Interface Card

Chl #0   Chl #1

Chl #0   Chl #1

Ultra Wide SCSI
Controller   Chl #1

Host Computer #1

1 meter Ultra Wide SCSI Jumper

Available Drive

Unavailable Drive
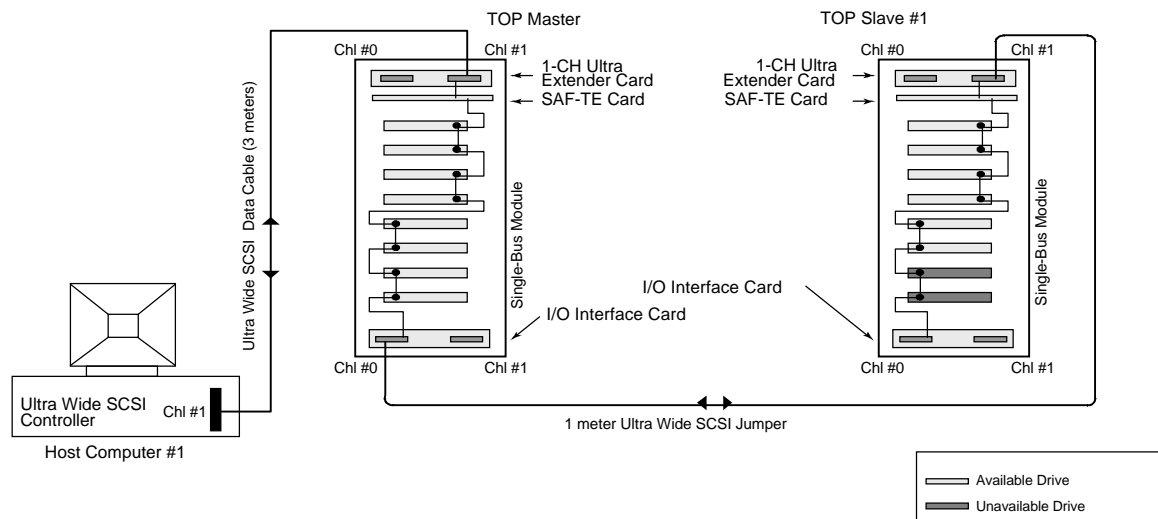
6   Connect one end of a 3 meter data cable to the Channel #1 connector on the RAID Controller.

7   Connect the other end of the data cable to the Channel 1 connector on the upper or right side single channel Ultra Extender Option card installed in the master cabinet.

8   Connect one end of a 1 meter jumper cable to the Channel 0 connector on the lower or left side I/O Interface card in the master cabinet.

9   Connect the other end of the 1 meter jumper cable to the Channel 1 connector on the upper or right side single channel Ultra Extender Option card installed in the Slave #1 cabinet.

Note: SCSI termination is automatic and requires no user configuration.

10   Power on the DEU subsystems. After the power-on self-test has completed, HDD Status and Channel Mode LEDs will be solid green.

11   Access the Options menu on the Operator Control Panel and choose the SAFTE CHAIN ID selection. Set the cabinet identities of the master and slave subsystems. Refer to "SAFTE CHAIN ID" described earlier in this Guide.

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12 After setting the cabinet identifications you must power cycle the subsystems. Observe normal power cycling precautions by waiting a minimum of five seconds before adding power again.

This will reset the SCSI IDs to a default setting that prevents a SCSI ID conflict under normal conditions, refer to "Default Configurations" later in this section.

13 Power up your computer system and run the configuration program.

This completes the setup and configuration.

Two Dual-Bus Cabinets

With this configuration you will have up to eight (8) disk drives per controller channels. If you are using multiple RAID Controllers you can further expand your capacity by using up to four controllers per CPU system.

1 Power off your computer system or workstation.

2 Be sure to complete the "Setup" and "Component Installation" sections described earlier in this Guide. The DEU ships from the factory with I/O Interface cards installed in both card slots. Therefore during installation, you may be required to remove one or both I/O Interface cards.

3 Identify the subsystem which will be the master cabinet. Loosen the two thumb screws and remove the I/O Interface card installed in the upper or right side card slot of the master cabinet.

Ultra Extender
Option Card

Master Cabinet

I/O Interface Card

4 Install a two-channel Ultra Extender Feature card into the upper or right side card slot where the I/O Interface card was removed and tighten the thumb screws.

5 On the subsystem that will be the slave #1 cabinet, remove the I/O Interface card by loosening the two thumb screws and removing the card located in the lower or left side card slot.

6 Install a two-channel Ultra Extender Feature card into the empty card slot vacated in the previous step and tighten the thumb screws.
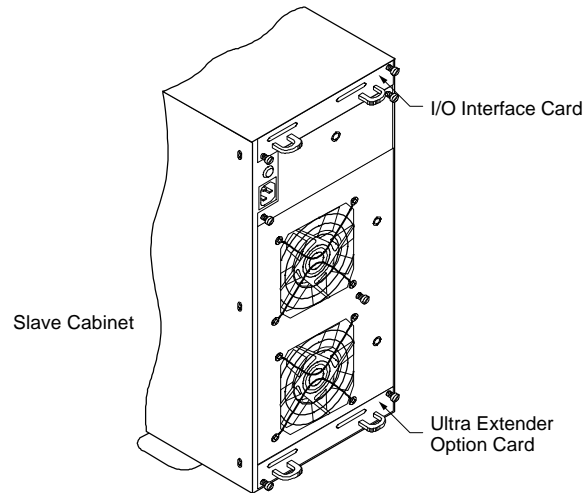
I/O Interface Card

Slave Cabinet

Ultra Extender Option Card

7 Connect one end of a 3 meter data cable to the Channel #1 connector on the RAID Controller.

Ultra Wide SCSI Data Cable (3 meters)

Ultra Wide SCSI Data Cable (3 meters)

TOP Master

Chl #0   Chl #1

2-CH Ultra Extender Card

SAF-TE Card

Dual-Bus Module

I/O Interface Card

Chl #0   Chl #1

TOP Slave #1

I/O Interface Card   Chl #0   Chl #1

SAF-TE Card

Dual-Bus Module

2-CH Ultra Extender Card

Chl #0   Chl #1

Ultra Wide SCSI Controller

Chl #1

Chl #2

Host Computer #1

1 meter Ultra Wide SCSI Jumper

1 meter Ultra Wide SCSI Jumper

8 Connect the other end of the data cable to the Channel 0 connector on the upper or right side two-channel Ultra Extender Option card installed in the master cabinet.

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9 Connect one end of a 1 meter jumper cable to the Channel 0 connector on the lower or left side I/O Interface card in the master cabinet.

10 Connect the other end of the 1 meter jumper cable to the Channel 0 connector on the lower or left side two-channel Ultra Extender card installed in the slave #1 cabinet.

11 Connect one end of a second 3 meter data cable to the Channel #2 connector on the RAID Controller (or the Channel #1 connector of a *second* single channel RAID Controller).

12 Connect the other end of the data cable to the Channel 1 connector on the upper or right side two-channel Ultra Extender card.

13 Connect one end of a second 1 meter jumper cable to the Channel 1 connector on the lower or left side I/O Interface card in the master cabinet.

14 Connect the other end of the second 1 meter jumper cable to the Channel 1 connector on the lower or left side two-channel Ultra Extender Option card installed in the slave cabinet.

Note: SCSI termination is automatic and requires no user configuration

15 Power on the DEU subsystems. After the power-on self-test has completed, HDD Status and Channel Mode LEDs will be solid green.

16 Access the Options menu on the Operator Control Panel and choose the SAFTE CHAIN ID selection. Set the cabinet identities of the master and slave subsystems. Refer to "SAFTE CHAIN ID" described earlier in this Guide.

17 After setting the cabinet identifications you must power cycle the subsystems. Observe normal power cycling precautions by waiting a minimum of five seconds before adding power again.

This will reset the SCSI IDs to a default setting that prevents a SCSI ID conflict under normal conditions, refer to "Default Configurations" later in this section.

18 Power up your computer system and run the configuration program.

This completes the setup and configuration.

One Dual-Bus Cabinet and Two Single-Bus Cabinets

With this configuration you will have up to twelve (12) drives per controller channel. If you are using multiple RAID Controllers you can further expand your capacity by using up to four controllers per CPU system.

1 Power off your computer system or workstation.

2 Be sure to complete the "Setup" and "Component Installation" sections described earlier in this Guide. The DEU ships from the factory with I/O Interface cards installed in both card slots. Therefore during installation, you may be required to remove one or both I/O Interface cards.

3 Identify which subsystem will be the master cabinet. Loosen the two thumb screws and remove the I/O Interface card installed in the lower or left side card slot of the master cabinet.

I/O Interface Card

Ultra Extender
Option Card
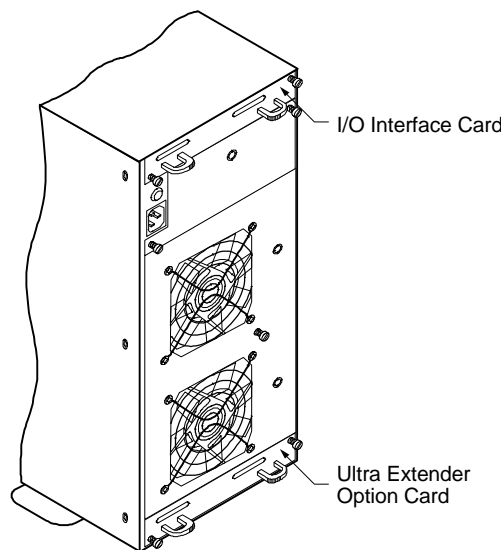
4 Install a two-channel Ultra Extender Option card into the lower or left side card slot where the I/O Interface card was removed and tighten the thumb screws.

5 On the subsystem that will be the slave #1 cabinet, remove the I/O Interface card by loosening the two thumb screws and removing the card in the upper or right side card slot.

PRINTER NOTE: Page size 9" x 9.25". Align this page to top, right hand corner. Back box bleeds off top and right edge. Left side of page extends to 9.25 inches.

6 Install a two-channel Ultra Extender Option card into the empty card slot vacated in the previous step and tighten the thumb screws.

Ultra Extender
Option Card

Slave Cabinet

I/O Interface Card
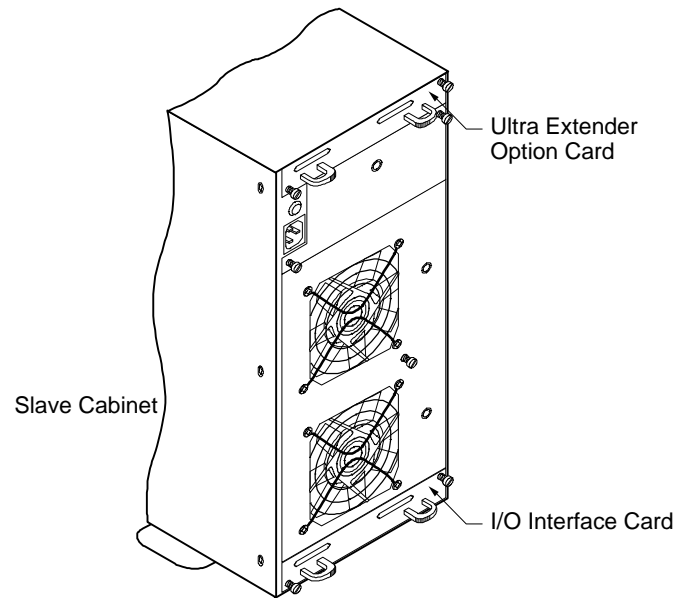
7 Repeat steps 5 and 6 for the slave #2 cabinet (third cabinet).

8 Connect one end of a 3 meter data cable to the Channel #1 connector on the RAID Controller.

9 Connect the other end of the data cable to the Channel 0 connector on the lower or left side two-channel Ultra Extender Option card installed in the master cabinet.

10 Connect one end of a 1 meter jumper cable to the Channel 0 connector on the upper or right side I/O Interface card in the master cabinet.

11 Connect the other end of the 1 meter jumper cable to the Channel 1 connector on the upper or right side single-channel Ultra Extender Option card installed in the slaveÊ#1 cabinet.

12 Connect one end of the second 3 meter data cable to the Channel #2 connector on the RAID Controller (or the Channel #1 connector of a second single channel RAID Controller).

13 Connect the other end of the data cable to the Channel 1 connector on the lower or left side two-channel Ultra Extender Option card.

14 Connect one end of a second 1 meter jumper cable to the Channel 1 connector on the upper or right side I/O Interface card in the master cabinet.

15 Connect the other end of the second 1 meter jumper cable to the Channel 1 connector on the upper or right side single-channel Ultra Extender Option card installed in the slave #2 cabinet.

Note: SCSI termination is automatic and requires no user configuration

16 Power on the DEU subsystems. After the power-on self-test has completed, HDD Status and Channel Mode LEDs will be solid green.

17 Access the Options menu on the Operator Control Panel and choose the SAFTE CHAIN ID selection. Set the cabinet identities of the master and slave subsystems. Refer to "SAFTE CHAIN ID" in the DEU User's Guide.

18 After setting the cabinet identifications you must power cycle the subsystems. Observe normal power cycling precautions by waiting a minimum of five seconds before adding power again.

This will reset the SCSI IDs to a default setting that prevents a SCSI ID conflict under normal conditions, refer to "Default Configurations" later in this section.

19 Power up your computer system and run the configuration program.

This completes the setup and configuration.

Differential Ultra Wide SCSI

Prior to beginning the cabling, identify the configuration for your installation. Note the card locations in the illustrations for each configuration. Install your cards and connect the cabling based on the procedures and diagrams shown. The diagrams depict the configuration using the minimum number of controller channels.
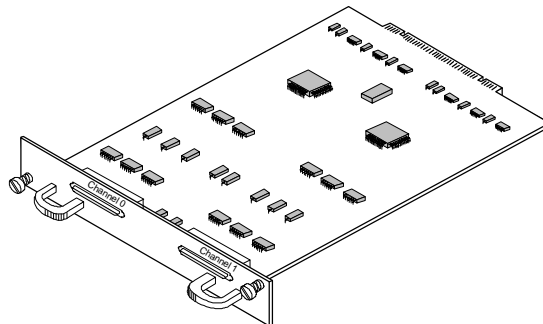
Differential Converter Card

Two Single-Bus Cabinets

With this configuration you will have up to fourteen (14) disk drives per differential host adapter channel. Due to the fourteen drives per channel limitation, two disk drive slots will not be available.

If you are using multiple controllers you can expand your capacity by using up to four controllers per CPU system. Refer to "Default Configurations" later in this section for information on special SCSI ID settings.

1 Power off your computer system or workstation.

2 Be sure to complete the "Setup" and "Component Installation" sections described earlier in this Guide. The DEU ships from the factory with I/O Interface cards installed in both card slots. Therefore during the installation, you may be required to remove one or both I/O Interface cards.

3 Identify the subsystem which will be the master cabinet. Loosen the two thumb screws and remove the I/O Interface card installed in the upper or right side card slot of the master cabinet.

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Differential Converter
Option Card

Master Cabinet

I/O Interface Card

4 Install a single-channel Differential Converter Option card into the upper or right side card slot in the master cabinet and tighten the thumb screws.

5 Loosen the two thumb screws and remove the I/O Interface card installed in the upper or right side card slot of the slave #1 cabinet.

6 Install a single-channel Ultra Extender Option card into the upper or right side card slot in the slave #1 cabinet and tighten the thumb screws.

Ultra Extender
Option Card

Slave Cabinet

I/O Interface Card
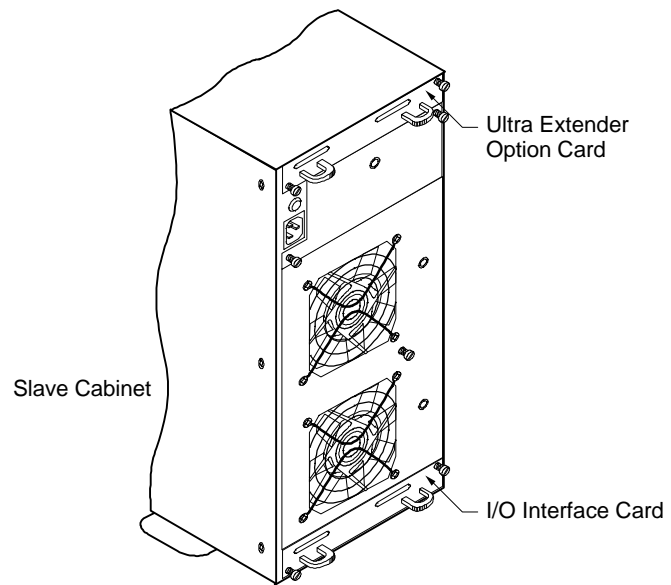
PRINTER NOTE: Page size 9" x 9.25". Align this page to top, right hand corner. Back box bleeds off top and right edge. Left side of page extends to 9.25 inches.

7 Connect one end of a 25 meter data cable to the Channel #1 connector on the differential host adapter.

TOP Master

TOP Slave #1

Chl #0 Chl #1

1-CH Differential Converter Card

1-CH Ultra Extender Card

SAF-TE Card

Chl #0 Chl #1

SAF-TE Card

Differential SCSI Data Cable (25 meters)

Single-Bus Module

Single-Bus Module

I/O Interface Card I/O Interface Card

Chl #0 Chl #1

Chl #0 Chl #1

Differential SCSI Host Adapter Chl #1

Host Computer #1

1 meter Ultra Wide SCSI Jumper

Available Drive
Unavailable Drive
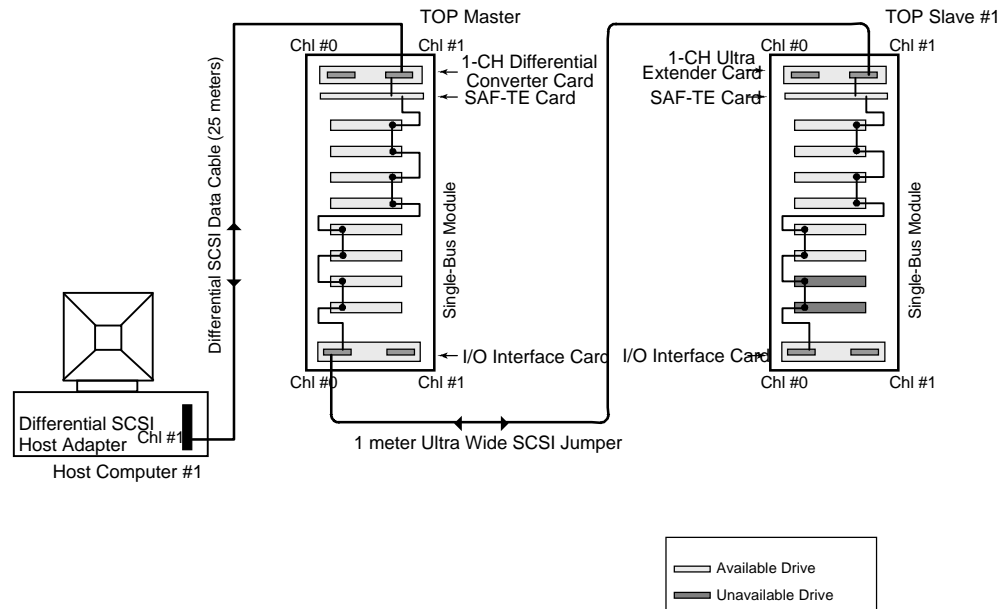
8 Connect the other end of the data cable to the Channel 1 connector on the upper or right side single-channel Differential Converter Option card installed in the master cabinet.

9 Connect one end of a 1 meter jumper cable to the Channel 0 connector on the lower or left side I/O Interface card in the master cabinet.

10 Connect the other end of the 1 meter jumper cable to the Channel 1 connector on the upper or right side single-channel Ultra Extender Option card installed in the slave #1 cabinet.

Note: SCSI termination is automatic and requires no user configuration.

11 Power on the DEU subsystems. After the power-on self-test has completed, HDD Status and Channel Mode LEDs will be solid green.

12 Access the Options menu on the Operator Control Panel and choose the SAFTE CHAIN ID selection. Set the cabinet identities of the master and slave subsystems. Refer to "SAFTE CHAIN ID" described earlier in this Guide.

PRINTER NOTE: Page size 9" x 9.25". Align this page to top, right hand corner. Back box bleeds off top and right edge. Left side of page extends to 9.25 inches.

13 After setting the cabinet identifications you must power cycle the subsystems. Observe normal power cycling precautions by waiting a minimum of five seconds before adding power again.

This will reset the SCSI IDs to a default setting that prevents a SCSI ID conflict under normal conditions, refer to "Default Configurations" later in this section.

14 Power up your computer system and run the configuration program.

This completes the setup and configuration.

Two Dual-Bus Cabinets

With this configuration you will have up to eight (8) disk drives per controller channel. If you use multiple differential host adapters you can further expand your capacity.

1 Power off your computer system or workstation.

2 Be sure to complete the "Setup" and "Component Installation" sections earlier in this Guide. The DEU ships from the factory with I/O Interface cards installed in both card slots. Therefore during the installation, you may be required to remove one or both I/O Interface cards.

3 Identify which subsystem will be the master cabinet. Loosen the two thumb screws and remove the I/O Interface card installed in the upper or right sidecard slot of the master cabinet.

Differential Converter Option Card

Master Cabinet
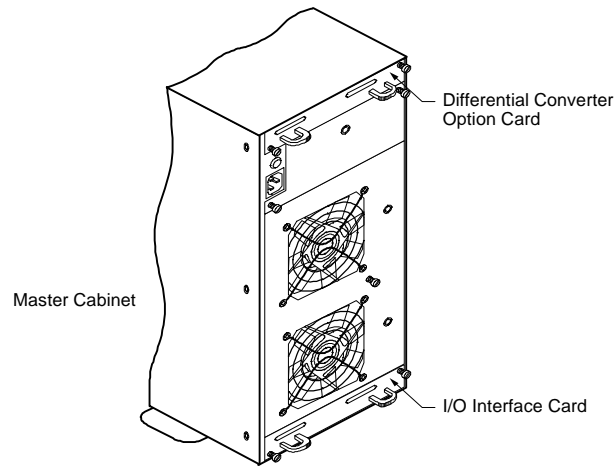
I/O Interface Card

4 Install a Differential Converter Feature card into the upper or right side card slot in the master cabinet and tighten the thumb screws.

5 Loosen the two thumb screws and remove the I/O Interface card in the lower or left side card slot in the slave #1 cabinet.
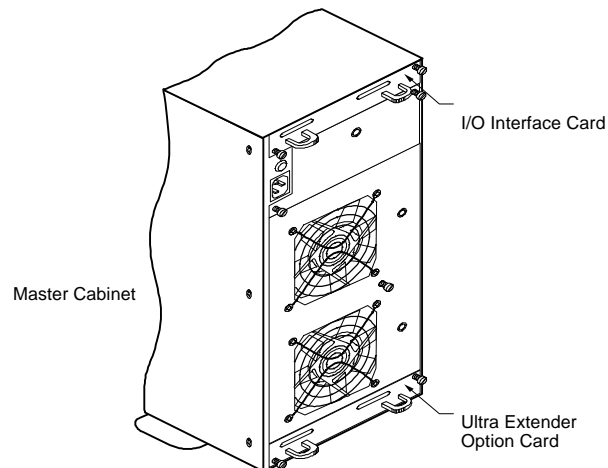
I/O Interface Card

Master Cabinet

Ultra Extender Option Card

6 Install a two-channel Ultra Extender Option card into the lower or left side card slot in the slave #1 cabinet and tighten the thumb screws.

TOP Master

TOP Slave #1

Chl #0   Chl #1

Chl #0   Chl #1

2-CH Differential Converter Card

I/O Interface Card →

SAF-TE Card

SAF-TE Card →

Differential SCSI Data Cable (25 meters)

Differential SCSI Data Cable (25 meters)

Single-Bus Module

Single-Bus Module

I/O Interface Card

2-CH Ultra Extender Card →

Chl #0   Chl #1

Chl #0   Chl #1

1 meter Ultra Wide SCSI Jumper

1 meter Ultra Wide SCSI Jumper

Differential SCSI Host Adapter   Chl #1   Chl #2

Host Computer #1

Available Drive
Unavailable Drive
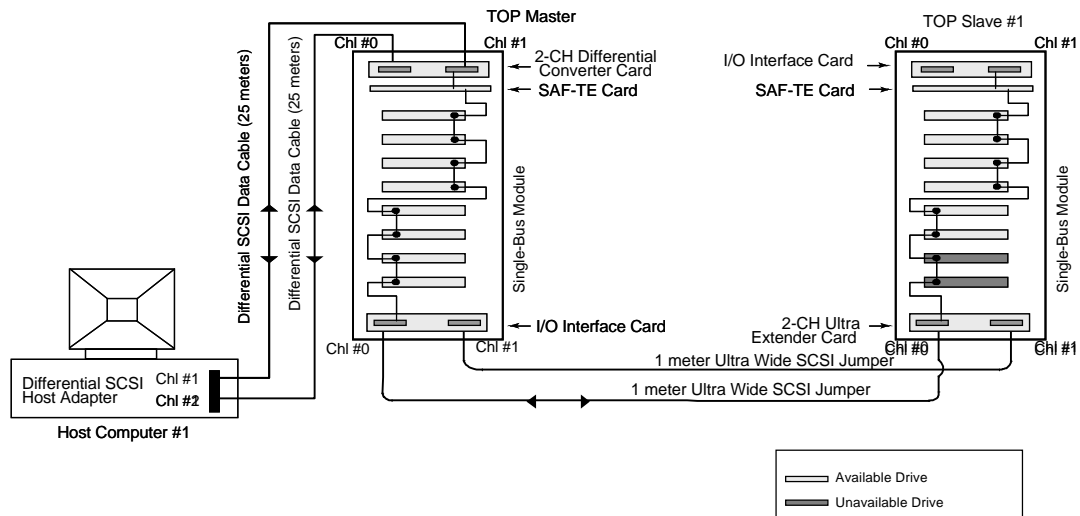
7 Connect one end of a 25 meter data cable to the Channel #1 connector on the differential host adapter.

8 Connect the other end of the data cable to the Channel 1 connector on the upper or right side two-channel Differential Converter Option card installed in the "master" cabinet.

9 Connect one end of a 1 meter jumper cable to the Channel 0 connector on the lower or left side I/O Interface card in the "master" cabinet.

10 Connect the other end of the 1 meter jumper cable to the Channel 0 connector on the lower or left side two-channel Ultra Extender Option card installed in the "slave #1" cabinet.

11 Connect one end of a second 25 meter data cable to the Channel #2 connector on the differential host adapter.

12 Connect the other end of that data cable to the Channel 0 connector on the upper or right side 2-channel Differential Converter Option card in the "master" cabinet.

13 Connect one end of a second 1 meter jumper cable to the Channel 1 connector on the lower or left side I/O Interface card in the "master" cabinet.

14 Connect the other end of the second 1 meter jumper cable to the Channel 1 connector on the lower or left side two-channel Ultra Extender Option card installed in the "slave #1" cabinet.

Note: SCSI termination is automatic and requires no user configuration.

15 Turn on the power to the DEU. After the power-on self-test has completed, HDD Status and Channel Mode LEDs will be solid green.

16 Access the Options menu on the Operator Control Panel and choose the SAFTE CHAIN ID selection. Refer to "SAFTE CHAIN ID" earlier in this Guide.

17 After setting the cabinet identifications you must power cycle the subsystems. Observe normal power cycling precautions by waiting a minimum of five seconds before adding power again.

    This will reset the SCSI IDs to a default setting that prevents a SCSI ID conflict under normal conditions, refer to "Default Configurations" later in this section.

18 Power up your computer system and run the configuration program.

This completes the setup and configuration.

One Dual-Bus Cabinet and Two Single-Bus Cabinets

With this configuration you can create an array that contains twelve (12) drives per channel on a differential host adapter. If you are using multiple differential host adapters you can further expand your capacity.

1 Power off your computer system or workstation.

2 Be sure to complete the "Setup" and "Component Installation" sections described earlier in this Guide. The DEU ships from the factory with I/O Interface cards installed in both card slots.

Caution: Exercise care when handling any electrical components.

3 Identify which subsystem will be the master cabinet. Loosen the two thumb screws and remove the I/O Interface card on the lower or left side card slot.
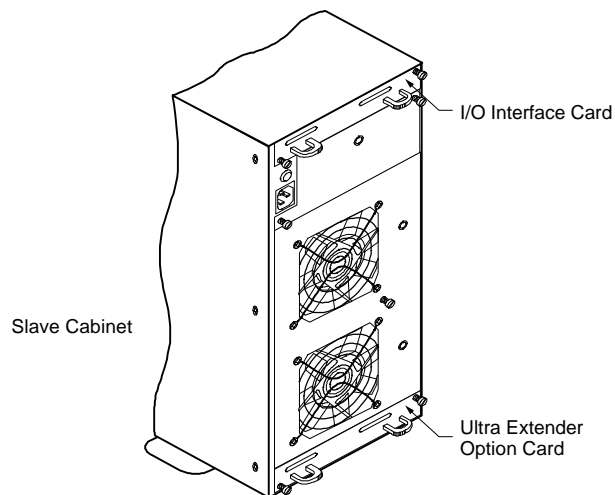
4 Install an Ultra Extender Option card into the lower or left side card slot and tighten the thumb screws. The card is keyed and will install only one way, component side up or to the right. Do not overtighten the thumb screws.

5 Identify which subsystem will be the Slave #1 cabinet. Loosen the two thumb screws and remove the I/O Interface card on the upper or right side card slot.

6 Install a two-channel Ultra Extender Option card into the upper or right side card slot and tighten the thumb screws.

Ultra Extender Option Card

I/O Interface Card
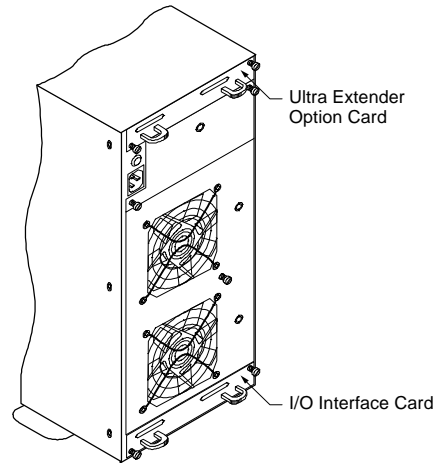
7 Repeat steps 5 and 6 for the second (Slave #2) cabinet.

1 meter Ultra Wide SCSI Jumper

1 meter Ultra Wide SCSI Jumper

TOP Master
Chl #0   Chl #1

TOP Slave #1
Chl #0   Chl #1

TOP Slave #2
Chl #0   Chl #1

← I/O Interface Card
← SAF-TE Card

1-CH Ultra Extender Card
SAF-TE Card

Dual-Bus Module

Single-Bus Module

1-CH Ultra Extender Card →
SAF-TE Card →

Single-Bus Module

I/O Interface Card →

I/O Interface Card →

Chl #0   Chl #1

Chl #0   Chl #1

Differential SCSI Data Cable (25 meters)

Chl #0   Chl #1

2-CH Differential Converter Card

Differential SCSI Host Adapter

Chl #1
Chl #2

Host Computer #1

Differential SCSI Data Cable (25 meters)

Note: Secure the cable connectors using the thumb screws (finger tight only).

8 Connect one end of a 25 meter data cable to the Channel #1 connector on the differential host adapter.

9 Connect the other end of the data cable to the Channel 0 connector on the lower or left side 2-channel Differential Converter card installed in the master cabinet.

10 Connect one end of a 1 meter jumper cable to the Channel 0 connector on the upper or right side I/O Interface card in the master cabinet.

11 Connect the other end of the 1 meter jumper cable to the Channel 1 connector on the upper or right side 1-channel Ultra Extender card installed in the slave #2 cabinet.

12 Connect one end of the second 25 meter data cable to the Channel #2 connector on the differential host adapter.

13 Connect the other end of the data cable to the Channel 1 connector on the lower or left side 2-channel Differential Converter card.

14 Connect one end of a second 1 meter jumper cable to the Channel 1 connector on the upper or right side I/O Interface card in the master cabinet.

15 Connect the other end of the second 1 meter jumper cable to the Channel 1 connector on the upper or right side 1-channel Ultra Extender card installed in the slave #1 cabinet.

Note: SCSI termination is automatic and requires no user configuration.

16 Turn on the power to the DEU.

17 After the power-on self-test has completed, HDD Status and Channel Mode LEDs will be solid green.

18 Access the Options menu on the Operator Control Panel and choose the SAFTE CHAIN ID selection. Refer to "SAFTE CHAIN ID" earlier in this Guide.

19 After setting the cabinet identifications you must power cycle the subsystems. Observe normal power cycling precautions by waiting a minimum of five seconds before adding power again.

This will reset the SCSI IDs to a default setting that prevents a SCSI ID conflict under normal conditions, refer to "Default Configurations" later in this section.

20 Power up your computer system and run the configuration program.

This completes the setup and configuration.

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Default Configurations

The following table provides the default SCSI ID settings that will be set by subsystem processor when a specific configuration is chosen in the OCP Menu option SAFTE CHAIN ID setting.

	Master Cabinet - Single-Bus Mode	Master Cabinet - Dual-Bus Mode	Slave 1 Cabinet - Single-Bus Mode	Slave 1 Cabinet - Dual-Bus Mode	Slave 2 Cabinet - Single-Bus Mode	Slave 2 Cabinet - Dual-Bus Mode
Upper **Bay**	9	4	13	9	13	13
	8	2	12	8	12	12
	6	1	11	6	11	11
	5	0	10	5	10	10
Lower **Bay**	4	4	9	9	9	13
	2	2	8	8	8	12
	1	1	6	6	6	11
	0	0	5	5	5	10

When two single-bus cabinets are installed as a Master and a Slave system, two drive slots will be unavailable to the controller. Under this condition you will be required to manually configure these IDs setting. The two upper bay disk drive slots on the Slave system should be set with the ID setting of "XX." These two drive slots will then be taken off bus.

Option Card Specifications

DEU Ultra Extender Option Card

Operating Environment	40°F to 104°F (+5°C to +40°C)
Relative Humidity	5 - 95% (non-condensing)
Power Requirements	+5VDC, 2.0 A
Dimensions (HxW)	10.5" x 5.5"
Weight	2 lbs.
Altitude	-200 to 6,500 feet
Interface Transfer Rate	Up to 40 MB/sec
Termination	Automatic Termination

DEU Differential Converter Option Card

Operating Environment	40°F to 104°F (+5°C to +40°C)
Relative Humidity	5 - 95% (non-condensing)
Power Requirements	+5VDC, 5.5 A
Dimensions (HxW)	10.5" x 5.5"
Weight	2 lbs.
Altitude	-200 to 6,500 feet
Interface Transfer Rate	Up to 40 MB/sec
Termination	Automatic Termination

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