RR-1422-LVD Installation and User Guide

Part No. 39958-03A

Issue 3.0

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Notices

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Contents

Preface

What is in this guide

This user guide gives you step-by-step instructions on how to install, configure and connect the RR-1422-LVD storage subsystem to your host computer system, and how to use and maintain the system.

Who should use this guide

This user guide assumes that you have a working knowledge of the Ultra-3 Small Computer Systems Parallel Interface 3 (SPI-3) environment into which you are installing the RR-1422-LVD system. If you do not have these skills, or are not confident with the instructions in this guide, do not proceed with the installation.

International Standards

The RR-1422-LVD storage system complies with the requirements of the following agencies and standards:

- CE to IEC 950/EN60950
- UL
- cUL

Potential for Radio Frequency Interference

USA Federal Communications Commission (FCC)

Note   This equipment has been tested and found to comply with the limits for a class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. The supplier is not responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

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

European Regulations

This equipment complies with European Regulations EN 55022 Class A: Limits and Methods of Measurement of Radio Disturbance Characteristics of Information Technology Equipments and EN50082-1: Generic Immunity.

Safety

All plug-in modules are part of the fire enclosure and must only be removed when a replacement can be immediately added. The system must not be run without all units in place.

Permanently unplug the unit if you think that it has become damaged in any way and before you move it.

- An RR-1422-LVD enclosure can weigh up to 37kg (81lb). Do not try to lift it by yourself.
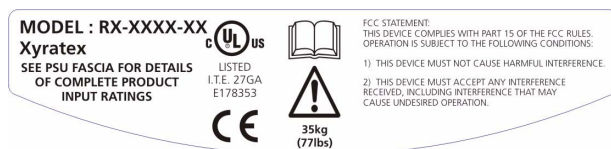
Chassis Warning Label: Weight Hazard

- Do not lift the RS-1422-LVD by the handles on the PSU/Cooling module, they are not designed to support the weight of the populated enclosure.

- In order to comply with applicable safety, emission and thermal requirements no covers should be removed and all bays must be fitted with plug-in modules.

Typical Module Label: Do not operate with modules missing

MODEL: RS-PSU-450-AC2
INPUT : 100-120 / 200-240 VAC
7 / 3.5 A
60 / 50 Hz
0.7 KVA
OUTPUT : 450W MAX.
+5V ⎓30A
+12V ⎓21.8A
+3.3V ⎓10A
+5V ⎓2A

YY WW X   MALAYSIA

S/N: ZZVPPPPPSSSSSSS

Barcode to appear here

XYR P/N: XXXXX-XXX

Barcode to appear here

DO NOT REMOVE THIS
ITEM UNLESS A BAY
BLANK OR REPLACEMENT
MODULE IS INSTALLED.
SERVICE BY TRAINED
PERSONNEL ONLY.

HIGH POT / SAFETY
GROUND PASS

CE   c℞ US

PSU/Cooling Module Caution Label: Do not operate with modules missing

- The RR-1422-LVD unit must only be operated from a power supply input voltage range of 100 - 120VAC or 200-240 VAC.

- The plug on the power supply cord is used as the main disconnect device. Ensure that the socket outlets are located near the equipment and are easily accessible.

- The RR-1422-LVD system is powered by multiple AC sources, disconnect all supply power for complete isolation

⚠ 📖 CAUTION	• Disconnect power cord before removing module • Powered by multiple power sources • Disconnect all supply power for complete isolation • See manual for correct supply cord details	**Input ratings for complete product:** • High Pot / Safety Ground Pass • 100-120 / 200-240 V AC • 7 / 3.5 A • 50 / 60 Hz • 0.7 KVA
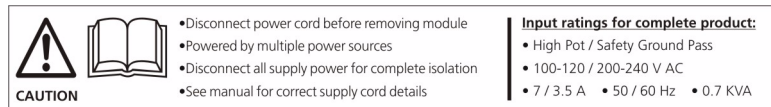
PSU Warning Label: Power Hazards

- The power connection must always be disconnected prior to removal of the Power Supply module from the enclosure.

- A safe electrical earth connection must be provided to the power cord. Check the grounding of the enclosure before applying power.

- Provide a suitable power source with electrical overload protection to meet the requirements laid down in the technical specification.

Warning   **Do not remove covers from the PSU. Danger of electric shock inside. Return the PSU to your supplier for repair.**

PSU Safety Label: Electric Shock Hazard Inside

Caution   *If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.*

Dual Power Supply Operation

This equipment is intended to operate with two working power supplies. A faulty power supply/cooling module must be replaced with a fully operational power supply/cooling module within 24 hours or less.

-48V DC PSU/Cooling Module Safety Requirements

The following paragraphs summarize additional safety requirements to be observed when installing or operating a -48V DC Power Supply/Cooling module: Please refer to section 2.3.3, "-48V DC PSU Installation Procedure" for full details of European and North American safety requirements applicable to this module.

Voltage Rating

The marked rated voltage for the-48VDC Power Supply/Cooling module is -40V DC to -60V DC. The equipment is intended to operate from a centralized dc supply system with a NOMINAL voltage of -48V DC or -60V DC.The voltage from a nominal -48V DC system may vary, due to float charging or discharge conditions, from -40V DC to -60V DC.The voltage from a nominal -60V DC system may vary, due to float charging or discharge conditions, from -48V DC to -72V DC.

Caution   *If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.*

Equipment Location

The rear of this Equipment (in particular the supply terminals and wiring to the terminals on the power supply) must only be located in a "**RESTRICTED ACCESS LOCATION"** where both of the following apply (Ref.UL60950):

- access can only be gained by SERVICE PERSONNEL or by USERS who have been instructed about the reasons for the restrictions applied to the location and about any precautions that shall be taken; and
- access is through the use of a TOOL or lock and key, or other means of security and is controlled by the authority responsible for the location.

Disconnect Device

The wiring installation must provide a disconnect device close to the product.

Wiring

Must be connected in accordance with the local and National wiring regulations.

Wire Temperature Rating

The supply wiring to the power supply terminal blocks must have a minimum temperature rating of 75ºC.

Circuit Protection

The building installation must provide overcurrent and short circuit protection in the non earthed supply conductor.

-48V DC PSU: USA and Canadian Safety Requirements

Wiring Methods

Wiring method must be code compliant in the field.

Wiring methods must be in accordance with the U.S. National Electric Code, Article 300.

Earthing

This equipment is designed to permit the connection of the earthed conductor (+) of the dc supply circuit to the earthing conductor at the equipment.

Protective Earth Conductor Size

The protective earth conductor size must be suitable for the maximum fault current that the installation can provide. U.S. National Electric Code, Article 250-122

Branch Circuit Protection

The PSU must be connected to a Branch circuit that is protected by a LISTED Branch Protector. The rating of the LISTED Branch Protector >= 125% of the product rating and the rating of the LISTED Branch Protector =< current rating of wire supplying the equipment. U.S. National Electric Code, Article 210-3, Article 240.

Battery Safety

- The battery is not user replaceable and should only be disconnected by the manufacturer.

Warning   **There is a danger of explosion if batteries are incorrectly replaced.**

- The battery should be disposed of in accordance with the manufacturer's instructions and National regulations.

Rack System Precautions

The following safety requirements must be considered when the unit is mounted in a rack.

- The rack design should incorporate stabilizing features suitable to prevent the rack from tipping during installation.

- When loading a rack with the units, fill the rack from the bottom up and empty from the top down.

- The rack design should incorporate stabilizing features suitable to prevent the rack from tipping or being pushed over in normal use.

- The rack should comply with the airflow requirements detailed in the technical specification.

- The rack design should take into consideration the maximum operating ambient temperature for the unit, which is 40°C.

- The rack should have a safe electrical distribution system. it must provide overcurrent protection for the unit and must not be overloaded by the total number of units installed in the rack. Consideration of the units nameplate rating should be used when addressing these concerns.

- The electrical distribution system must provide a reliable earth for each unit and the rack.

- Each power supply in each unit has an earth leakage current of 1.7mA. The design of the electrical distribution system must take into consideration the total earth leakage current from all the power supplies in all the units. The rack will require labelling with "HIGH LEAKAGE CURRENT. Earth connection essential before connecting supply".

- The rack when configured with the units must meet the safety requirements of UL60950 and IEC 60950.

- The battery is not user replaceable and should only be disconnected by the manufacturer.

ESD Precautions

Caution   *It is recommended that you fit and check a suitable anti-static wrist or ankle strap and observe all conventional ESD precautions when handling RR-1422-LVD plug-in modules and components. Avoid contact with backplane components and module connectors, etc.*

Data Security

- Power down your host computer and all attached peripheral devices before beginning installation.

- Each enclosure contains up to 14 removable disk drive modules. Disk units are fragile. Handle them with care, and keep them away from strong magnetic fields.

- *All* the supplied plug-in modules must be in place for the air to flow correctly around the enclosure and also to complete the internal circuitry.

- If the subsystem is used with modules missing for more than a few minutes, the enclosure can overheat, causing power failure and data loss. Such use may also invalidate the warranty.

- If you remove any drive module, you may lose data.
  - If you remove a drive module, replace it immediately. If it is faulty, replace it with a drive module of the same type and capacity

- Ensure that all disk drives are removed from the enclosure before attempting to manhandle or move the rack installation.

- Do not abandon your backup routines. No system is completely foolproof.

Special Tools and Equipment

There are no special tools required but in order to complete the assembly of some configurations you may need the following (not supplied):

- Security keys (one of these should be included with your RR-1422-LVD enclosure for use with the drive locks).

Related Documentation

- *Chaparral Network Storage: JSS122 External RAID Controller User Guide.*

Chapter 1

Introduction

1.1 The RR-1422-LVD System

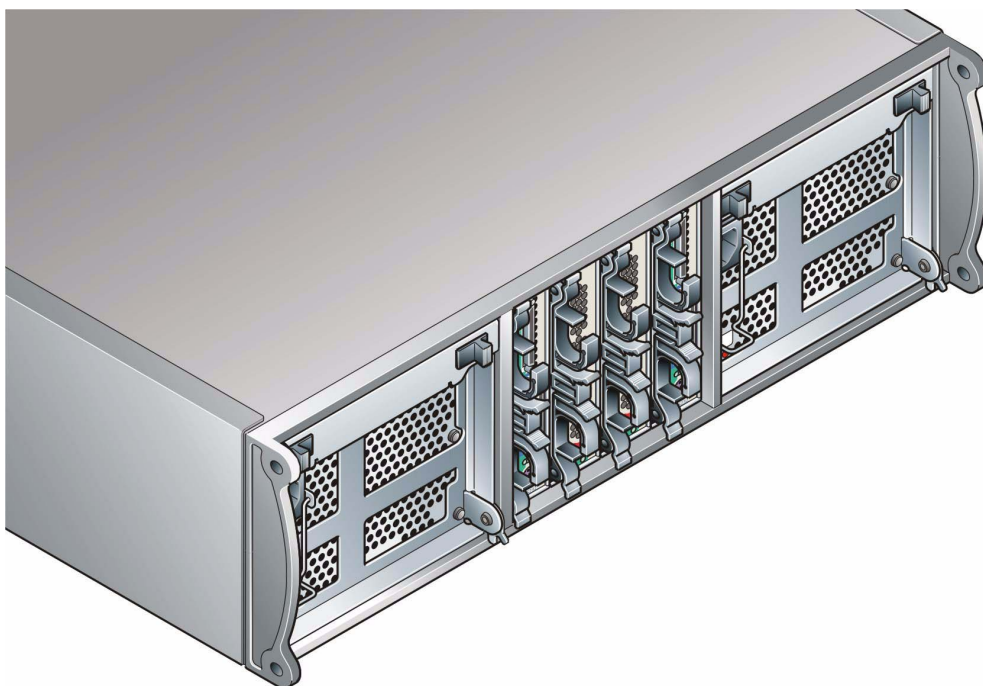**Figure 1–1**   The RR-1422-LVD System

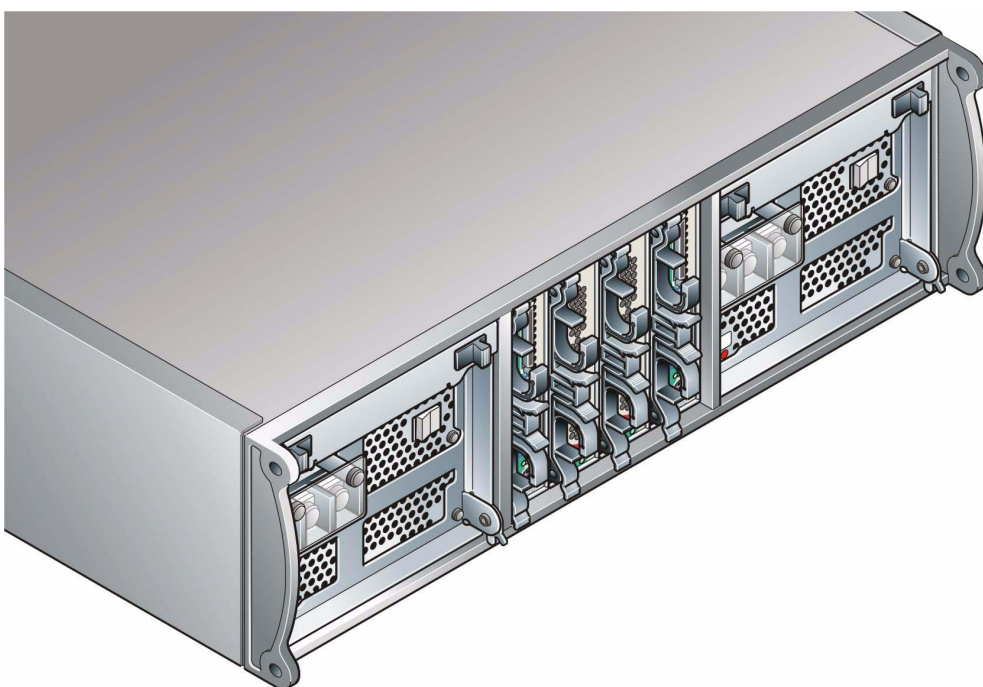**Figure 1–2**   RR-1422-LVD Rear View (AC PSU Fitted)

Figure 1–3   RR-1422-LVD Rear View (-48V DC PSU Fitted)

1.2 The Enclosure Core Product

The RR-1422-LVD design concept is based on a subsystem together with a set of plug-in modules. The RR-1422-LVD subsystem as supplied comprises:

- Chassis and Backplane with integral front mounted Operators Panel.

- 2 Power Supply/Cooling plug-in modules
    - .AC, 450W PSU (see Figure 1–6)
    - -48V DC, 450W PSU (see Figure 1–7)

- Ultra-3 Drive Carrier Modules and associated dummy carrier modules (See Figure 1–14).

- Ultra-3 Input/Output Modules, two variants are available:
    - RAID I/O module (See Figure 1–8).
    - JBOD I/O module (See Figure 1–10).

- Plug-in RAID Modules, based around the Chaparral JSS122 RAID Controller and associated blank RAID modules (See Figure 1–12).

1.2.1 Enclosure Chassis

The chassis consists of a sheet metal enclosure assembly containing a Backplane PCB and module runner system. This chassis assembly also includes an integral Operators Panel, mounted at the front.

The chassis assembly contains 14 vertical drive bays at the front, each of which accommodates a plug-in drive carrier module. At the rear, the chassis assembly contains 6 module bays to house 2 Power Supply/Cooling modules, 2 I/O modules and 2 RAID modules[1].

Bay numbers are defined by column/row.

The Backplane PCB provides logic level signal and low voltage power distribution paths. Figure 1–4 and Figure 1–5 show front and rear views of an RR-1422-LVD chassis respectively.

* Immediate spin-up when only 1 PSU fitted (other bays delayed)

Mute Button
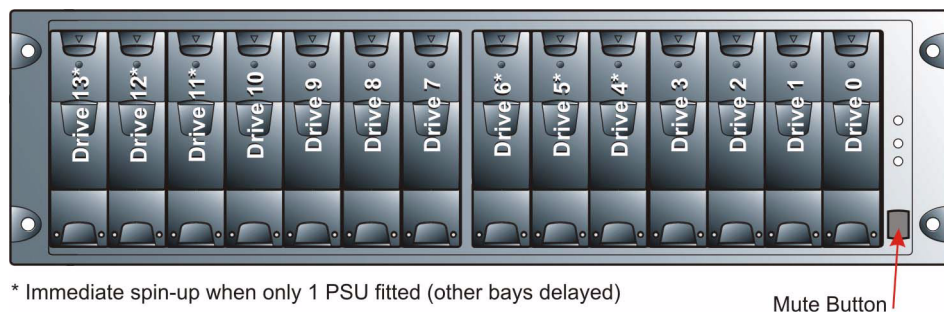
Figure 1–4   Enclosure Chassis (Front)

The chassis is fitted with 19 inch Rack mounting features which enables it to be fitted to standard 19 inch racks and uses 3EIA units of rack space.

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1. Alternatively 1 RAID module with 1 RAID blank module may be fitted in place of 2 RAID modules.

A Bay is defined as the space required to house a single 1.0" high 3.5 inch disk drive in its carrier module, housed vertically.
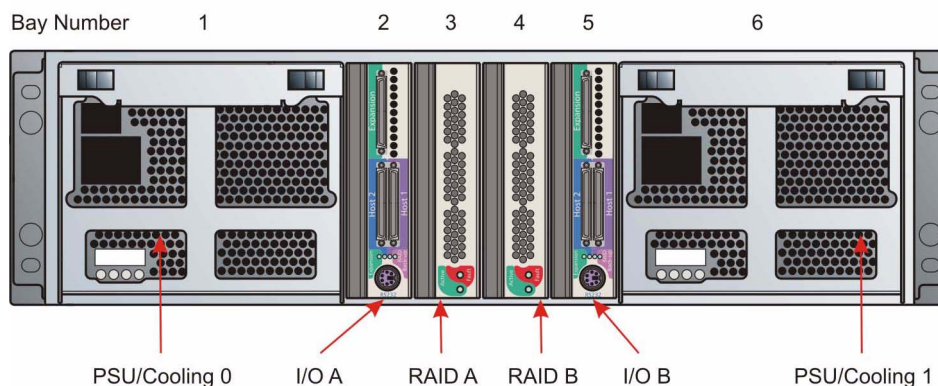
Figure 1–5   Enclosure Chassis (Rear)

1.3 The Plug-in Modules

An RR-1422-LVD Enclosure requires one or more of the following modules for normal operation:

1.3.1 Power Supply/Cooling Module

Two variants of the Power Supply/Cooling module are available for the RR-1422-LVD:
- Auto ranging AC 450W PSU/Cooling module
- -48V DC 450W PSU/Cooling module

Warning   **Do not mix PSU/Cooling modules of different types.**

1.3.1.1   AC PSU/Cooling Module

Two Power Supply/Cooling modules (Figure 1–6) are supplied mounted in the rear of the enclosure as part of the subsystem core product.

Figure 1–6   AC Power Supply/Cooling Module

PSU voltage operating ranges are nominally 115V or 230V AC, selected automatically.

Four LEDs mounted on the front panel of the Power Supply/Cooling Module (see Figure 1–6) indicate the status of the PSU and the fans.

1.3.1.2 -48V DC PSU/Cooling Module

A -48V DC Input Power Supply/Cooling Module variant is also available (Figure 1–7).
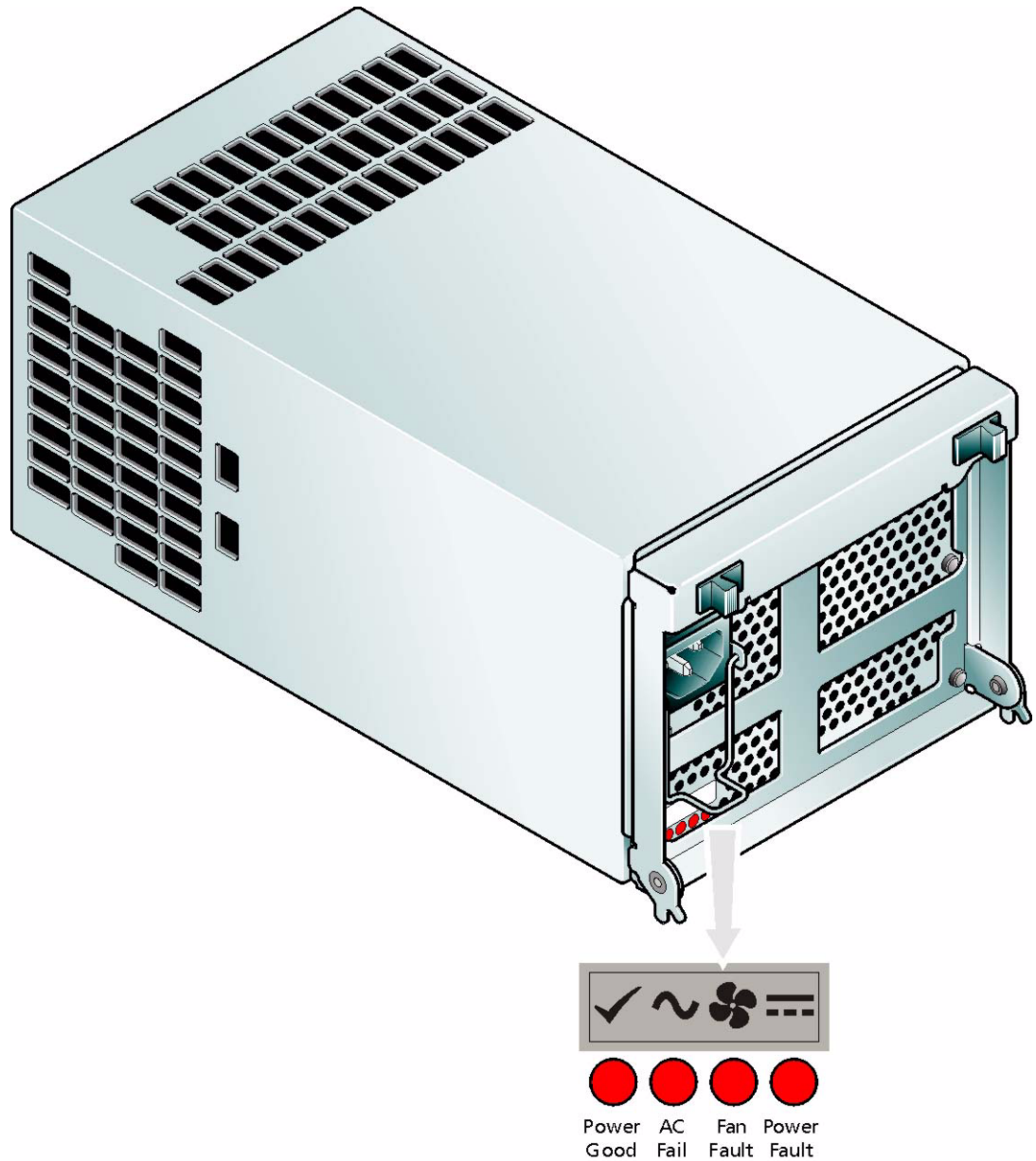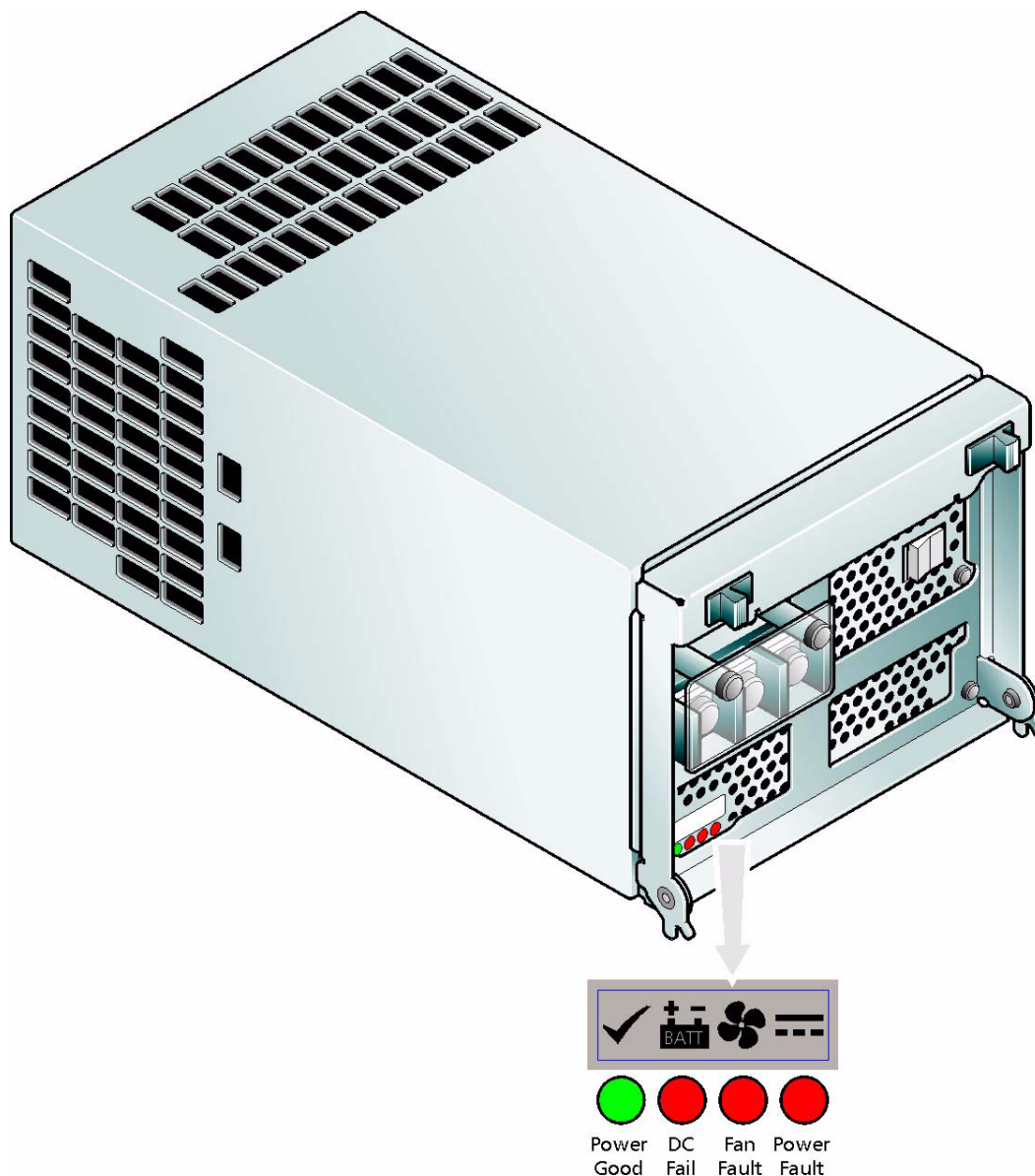

Figure 1–7 -48V DC PSU

Warning **The Power Supply/Cooling module is not an operator removable part. It should only be removed by a technician who has knowledge of the hazards present within the module.**

1.3.1.3 Multiple Power Supply/Cooling Modules

The RR-1422-LVD system must always be operated with two Power Supply/Cooling modules fitted. The two Power Supply/Cooling modules operate together so that if one fails the other maintains the power supply and cooling while you replace the faulty unit.

Module replacement should only take a few minutes to perform but must be completed within 10 minutes from removal of the failed module.

1.3.2 Operators Panel

The front Operator (Ops) Panel forms an integral part of the Enclosure core product and is not user replaceable. It displays the status of the enclosure with a micro controller which is used to monitor and control all elements of the Enclosure.

1.3.2.1 Ops Panel Indicators and Switches

The Ops Panel includes Light Emitting Diodes (LEDs) which show the status for all modules and a push-button Alarm Mute switch. The Audible Alarm Sounder is mounted on the drive backplane and indicates when a fault state is present,

The Ops Panel switch functions are shown in Table 1–1.

Table 1–1   Operator Panel LEDs

Power/ On (Green)	PSU/Cooling Fault (Amber)	System (Amber)	Definition
On	N/A	N/A	Power on. All functions good.
On	N/A	On	ESI processor failure.
On	N/A	Flash	RAID Fault
On	On	N/A	Two PSUs present, one failed.
On	On	N/A	One or more fan fail.

1.3.3 Input/Output Modules

The Input/Output (I/O) modules have been designed for integration into an RR-1422-LVD enclosure, utilizing Ultra-3 SCSI interfacing with the host computer system.

The RAID I/O module provides the enclosure with connections to two host ports for the RAID module and allows expansion to another enclosure. The RAID module may also be used in a JBOD application by connecting the Host to the expansion port, although this terminates the bus internally, limiting the number of drives that can be connected to 7 per channel.

The JBOD I/O module is for dedicated JBOD operation where access to both ends of the SCSI bus is required, either in the form of dual host initiators or when both Host and expansion are required.

1.3.3.1 RAID Input/Output Module

The RAID I/O module incorporates 3 x 68 pin VHDCI connectors to external connection. The module houses a single channel SAF-TE processor on the expansion SCSI bus for the provision of enclosure status. An external RS/232 connection for RAID configuration is provided, I/O module "A" RS/232 port configures RAID A and I/O module "B" RS/232 port configures RAID B. Two of these modules will be required in the enclosure.

The I/O module incorporates automatic termination on the drive expansion channels. A Termination Active LED indicates the state of the termination (Green for active, Off for off).

The I/O module also incorporates a mounting for the RAID backup battery and a RAID Backup (battery in use) LED indicator.

The I/O modules are housed in rear Bays 2 and 5.

Important   **Two IO modules are always required.**

The module incorporates the following LED indicators:
- Expansion (Green) Termination Active
- Host Port 1 (Green) Termination Active
- Host Port 2 (Green) Termination Active
- RAID Back-up (Amber)
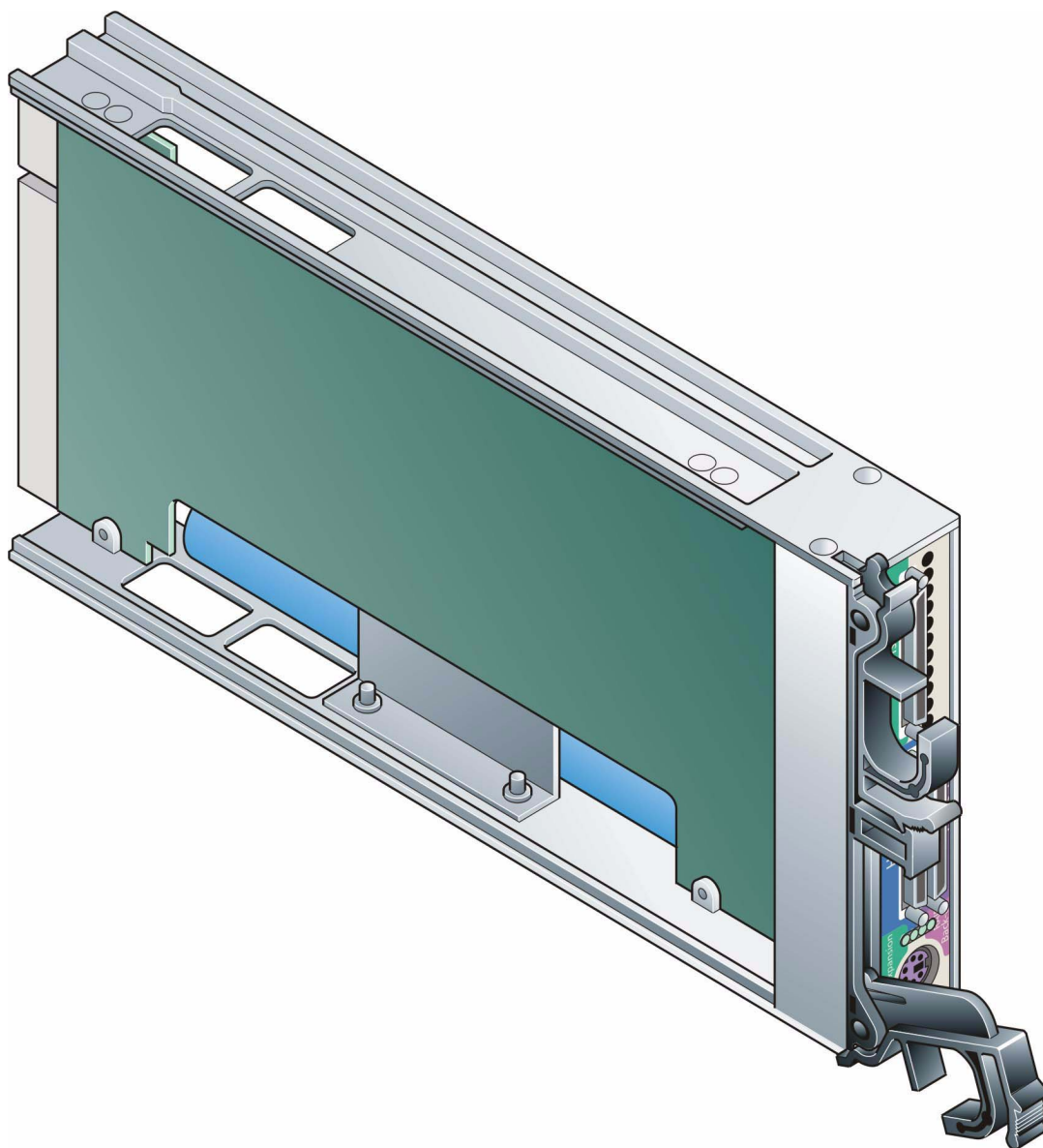
Figure 1–8   RAID I/O Module
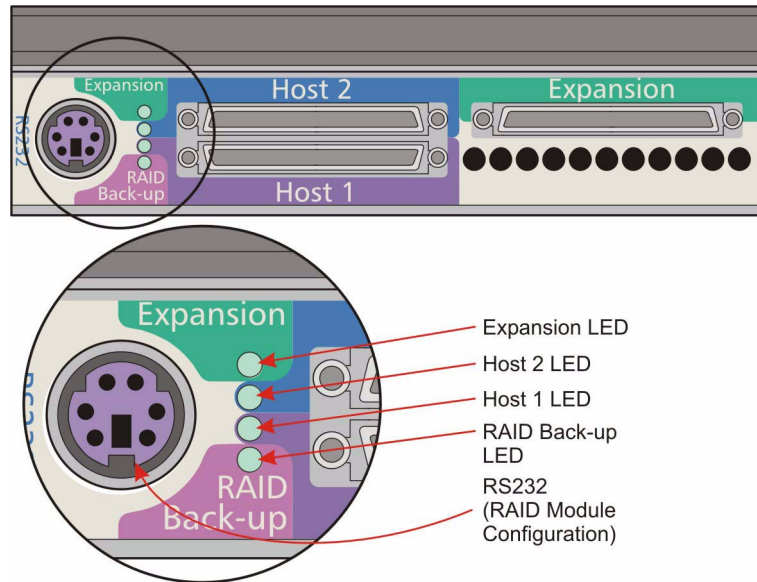
Figure 1–9   RAID I/O Module Panel Layout

1.3.3.2   JBOD Input/Output Module

The JBOD I/O module incorporates 2 x 68 pin VHDCI connectors to external connection. The module houses a single channel SAF-TE processor on the expansion SCSI bus for the provision of enclosure status. The module allows connection to one channel of 7 drives.

The I/O module incorporates automatic termination on the drive expansion channels. A Termination Active LED indicates the state of the termination (Green for active, Off for off).

The I/O modules are housed in rear Bays 2 and 5.

Important   **Two IO modules are always required.**

Figure 1–10 JBOD I/O Module
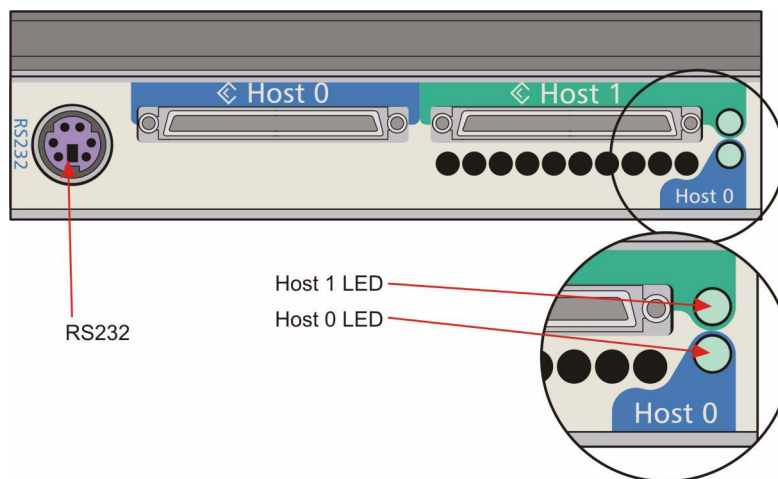
Figure 1–11 JBOD I/O Module Panel Layout

1.3.4 RAID Module

The enclosure may be configured with either 1 or 2 RAID modules. If only 1 module is fitted a matching blank RAID module must be fitted and the RAID Module must be installed in slot A (rear bay 3, see Figure 1–5)

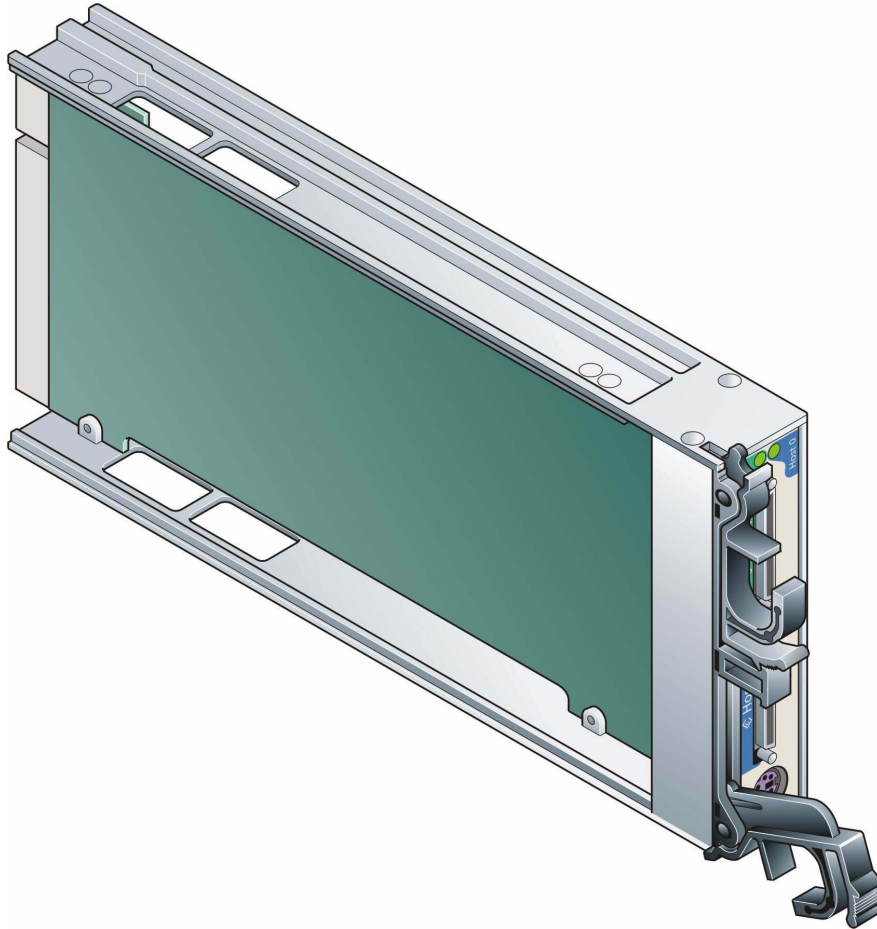The RAID module is based around the Chaparral type JSS122 RAID controller.

The Chaparral JSS122 is an Ultra 160 SCSI-to-Ultra 160 SCSI, fault-tolerant RAID controller. It enables SCSI disk drives to be configured as fault-tolerant arrays. The arrays are presented as logical units to one or two host Ultra 160 SCSI channels. The JSS122 has a user configurable battery backed up memory for supporting fault-tolerant, write back, RAID disk cache.

The JSS122 supports a 2x2-stand-alone, dual host port controller configuration with two SCSI disk channels. (user-defined configuration).

The RAID module is of similar size and mechanical features as the SAF-TE module. It houses the RAID controller and docks to the drive Backplane assembly.

Figure 1–12   RAID Module

1.3.4.1 RAID Status Indicators

Two RAID status indicators are provided on the module (see Figure 1–13), via light pipe from the backplane, as follows:
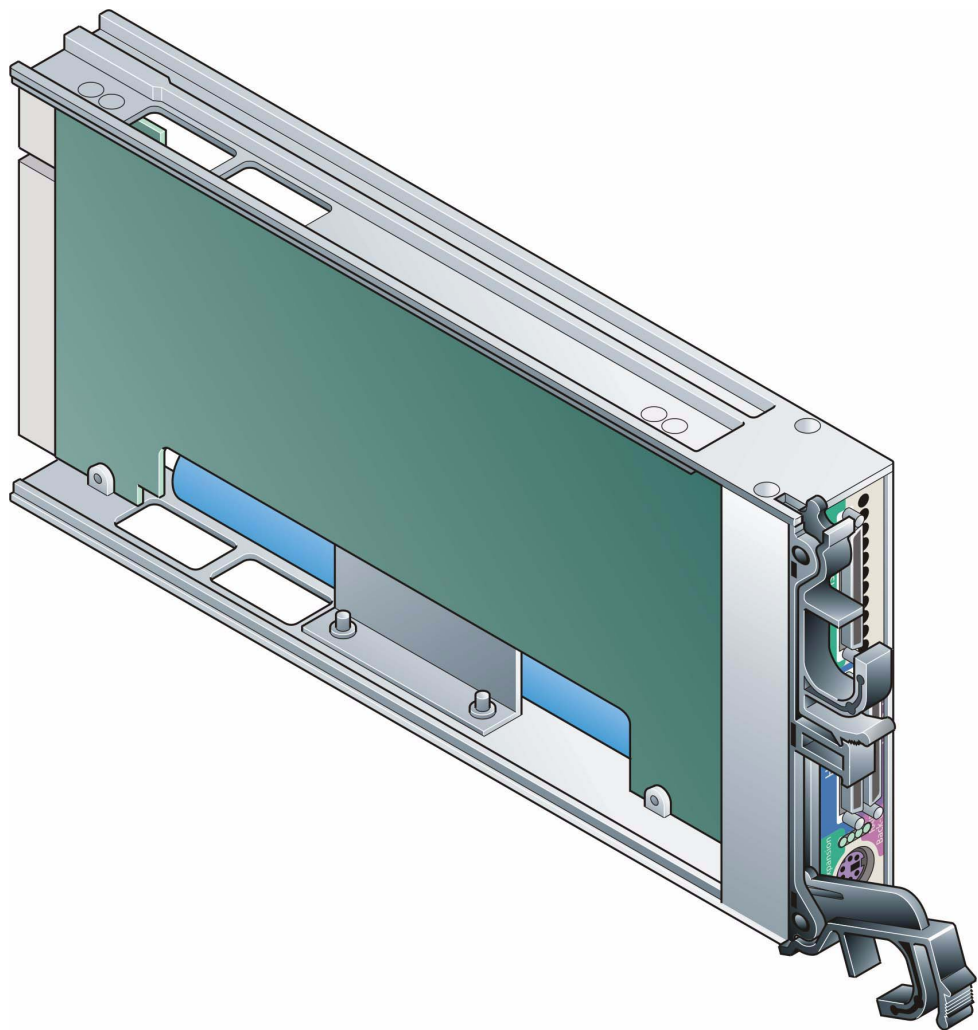
Activity   Green
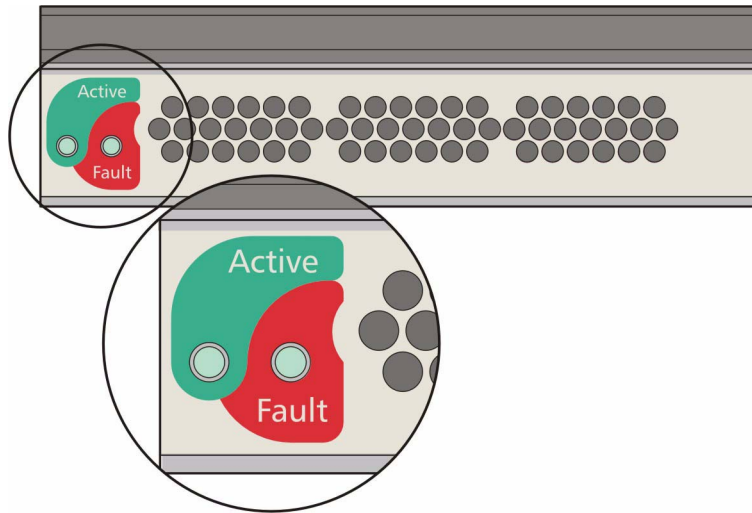**Fault**   Amber

Figure 1–13   RAID Module Panel Layout

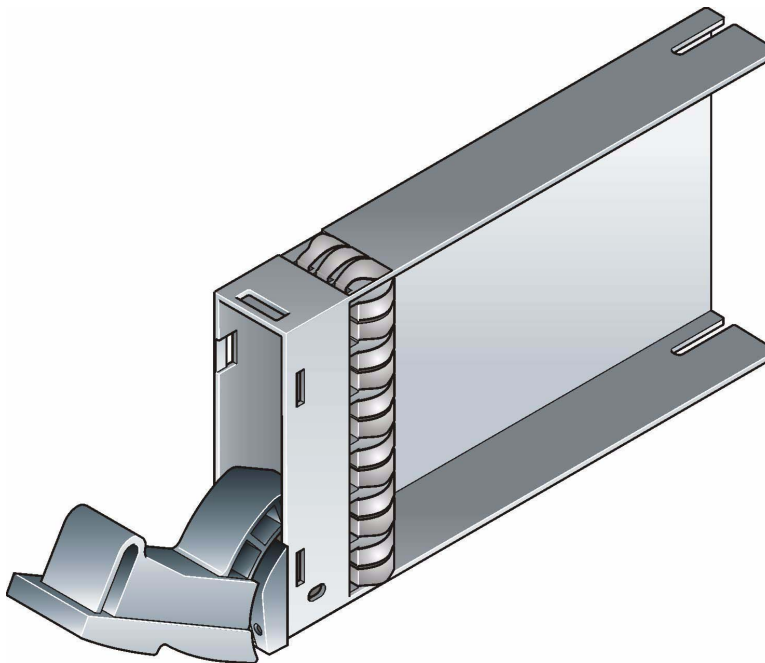## 1.3.5 Drive Carrier Module

Figure 1–14   Drive Carrier Module

The Drive Carrier module comprises a hard disk mounted in a carrier. Each drive bay will house a single 1.0 inch high, 3.5 inch disk drive in its carrier.

Each disk drive is enclosed in a die-cast aluminum carrier which provides excellent thermal conduction, radio frequency and electro-magnetic induction protection and affords the drive maximum physical protection.

The front cap also supports an ergonomic handle which provides the following functions:

- Camming of carrier into and out of drive bays.
- Positive 'spring loading' of the drive/backplane connector.
- An anti-tamper lock operated by a torx socket type key.

1.3.5.1 Drive Status Indicators

Each drive carrier incorporates two indicators, Left (Green) and Right (Amber). In normal operation the green indicator will be ON and will flicker as the drive operates.

1.3.5.2 Anti-tamper Locks

Anti-tamper locks are fitted in the drive carrier handles (Figure 1–15) and are accessed through the small cutout in the latch section of the handle.These are provided to disable the normal 'pinch' latch action of the carrier handle.
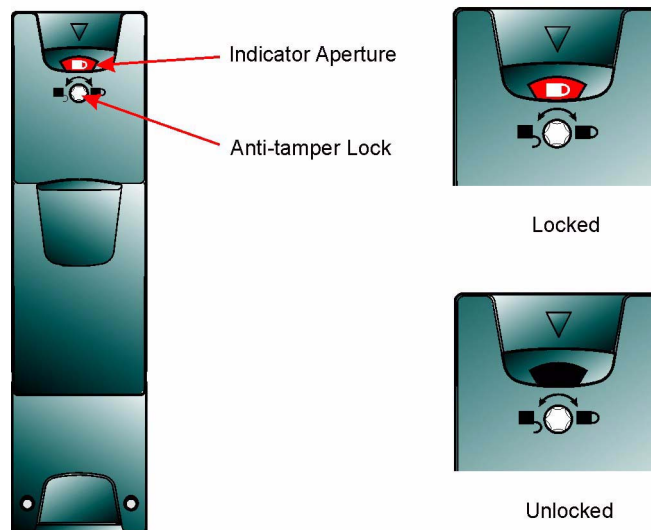
Figure 1–15   Anti-tamper Lock

1.3.6 **Dummy Carrier Modules**

Dummy carrier modules are provided for fitting in all unused drive bays. They are designed as integral drive module front caps with handles and must be fitted to all unused drive bays to maintain a balanced airflow.

Warning   **Operation of the Enclosure with *ANY* modules missing will disrupt the airflow and the drives will not receive sufficient cooling. It is *ESSENTIAL* that all apertures are filled before operating the unit. Dummy Carriers are available for this purpose.**

1.4 Visible and Audible Alarms

The functional modules have associated status LEDs. The Ops Panel shows a consolidated status for all modules. LEDs show constant green for good or positive indication. Constant Amber LEDs indicate there is a fault present within that module.

The Ops Panel also incorporates an Audible Alarm to indicate when a fault state is present and also an Alarm Mute push-button.

Warning   **The Ops Panel is an integral part of the enclosure chassis assembly.**

1.5 Technical Specification

1.5.1 Dimensions

Rack Enclosure: Height 134mm, Width 446mm, Depth 500mm

1.5.2 Weight

Maximum Configuration	Rack mount:	37kg (81lb)
Empty Enclosure (Rack)		9kg (19.8lb)
PSU/Cooling Module		4kg (8.8lb)
I/O Module		1.25kg (lb.)
RAID Module		1.25kg (lb.)

1.5.3 AC Power (450W PSU)

Voltage Range	100-120 / 200-240 VAC Rated
Voltage Range Selection	Automatic
Frequency	50/60 Hz
Inrush Current	50A @ 260VAC
Power Factor	>0.98
Harmonics	Meets EN61000-3-2

1.5.4 -48V DC Power (450W PSU)

DC Input Voltage Range	-40V to -60V DC Rated
DC Line Inrush Current	50A peak

1.5.5 PSU Safety and EMC Compliance

Safety Compliance

	UL 60950
	IEC 60950
	EN 60950
EMC Compliance	CFR47 ParT 15BClass A
	EN55022
	EN55024

1.5.6 Power Cord

(minimum requirements)

Cord Type	SV 0r SVT, 18 AWG minimum, 3 conductor
Plug	250V, 10A
Socket	IEC 320 C-14, 250V, 15A

1.5.7 Environment

Table 1–2   Ambient Temperature and Humidity

	Temperature Range	Relative Humidity	Max. Wet Bulb
Operational	+5°C to +40°C	20% to 80% non-condensing	23°C
Non-Operational	0°C to +50°C	8% to 80% non-condensing	27°C
Storage	+1°C to +60°C	5% to 80% non-condensing	29°C
Shipping	-40°C to +60°C	5% to 100% non-precipitating	29°C

Altitude, Operational	0 to 2133 m (0 to 7,000ft)
Altitude, Non-Operational	-305 to 12,192m (-1000 to 40,000ft)
Shock, Operational	Vertical axis 5g peak 1/2 sine, 10ms
Shock, Non-Operational	30g 10ms 1/2 sine
Vibration, Operational	0.21grms 5-500 Hz Random
Vibration, Non-Operational	1.04grms 2-200 Hz Random
Vibration, Relocation	0.3g 2-200 Hz sine
Acoustics	Less than 6.4 B LwA - operating at 20°C
Orientation & Mounting	19" Rack mount (3EIA Units)
• Rack Rails	To fit 800mm depth Racks compliant with IEC 297
• Rack Characteristics	Back pressure not exceeding 5 pascals (0.5mm water gauge)
Safety & Approvals	CE, UL, cUL
• EMC	EN55022 (CISPR - A)

1.5.8   Interfaces

Drive support	See Ultra-3 SCSI drive carrier specification	
Attachment	Ultra-3 SCSI	2 Host Channels (2 connectors per channel) 10 metres maximum cable length
	Ultra-3 SCSI	2 Expansion Channels 10 metres maximum total cable length

1.5.9   RAID I/O Module Specification

Channels	3 (Host A/B and Expansion)
SAF-TE	single channel SAF-TE processor on expansion channel
Mounting	Rear Bay (2 and 5)

Connectors	3 x 68 pin VHDCI (0.8mm Very High Density Connectors)
	1 x 6 pin mini-DIN stereo jack socket providing RS232
	    – I/O module A configures RAID controller A and I/O module B configures RAID controller B
	    – ESI enclosure debug *(manufacturing use only)*

Termination	Automatic termination on all SCSI channels
Indicators	Termination Active LED (green) on all SCSI channels
Current Limit	1.5A Termination Power

1.5.10   JBOD I/O Module Specification

Channels	2 (Host and Expansion)
SAF-TE	single channel SAF-TE processor on expansion channel
Mounting	Rear Bay (2 and 5)
Connectors	2 x 68 pin VHDCI (0.8mm Very High Density Connectors) 1 x 6 pin mini-DIN stereo jack socket providing RS232 – ESI enclosure debug *(manufacturing use only)*
Termination	Automatic termination on all SCSI channels
Indicators	Termination Active LED (green) on all SCSI channels
Current Limit	1.5A Termination Power

1.5.11   RAID Module Specification

Controller Type	Chaparral JSS122 2x2, stand-alone dual host port controller with two SCSI disk channels.
CPU	Intel Mobile Pentium II – 266MHz processor core – Integrated 16kB instruction/16kB data L1 cache. – Integrated 256kbyte on-die L2 cache.
Host Interface	2 x Ultra 160 SCSI channels
Drive Interface	2 x Ultra 160 SCSI channels
RAID Levels	• 0, 1, 3, 4, 5 and 0 + 1 • JBOD
Configuration & Management	• RS232 serial port • I^2C serial port (failover inter-controller configuration, heartbeat and SDRAM DIMM configuration. • Analogue-to-digital converter for power/temperature/enclosure monitoring. • Onboard standard PC-type lithium disk battery for continuous Real Time Clock (RTC) power when unit is shut down.
Indicators	• Activity and Status LEDs • Audible alarm connection to Backplane mounted buzzer.
Memory	16Mbyte, 66MHz, 72-bit SDRAM: supporting ECC.
Disk Cache	32Mb to 128Mb size modularity
Battery Interface	• Nickel Metal Hydride (NiMHi) battery pack - up to 72 hours continuous backup disk cache memory, connections to backplane interface. • Battery charger and battery control interface

For further information please refer to the *Chaparral JSS122 External RAID Controller User Guide.*

1.5.12   Drive Carrier Module Specification

Please contact your supplier for details of approved drives.

Important   **Operating the RR-1422-LVD subsystem with non-approved drives may invalidate the warranty.**

Module Dimensions	Height 29.1mm Width 106.55mm Depth 207mm
Weight	0.88kg (1.0" 36Gb drive)
Operating Temperature	5° C to 40° C (when installed in an RR-1422-LVD system enclosure with dual Power Supply/Cooling Modules)
Power Dissipation	21 Watts maximum

Chapter 2

Getting Started

2.1 Introduction

In this chapter, you are shown how to install your RR-1422-LVD Enclosure and plug-in modules into an industry standard 19 inch rack cabinet.

Caution   *When connecting up the RR-1422-LVD system, use only the power cords supplied or cords which match the specification quoted in section 1.5.6.Planning Your Installation*

Before you begin installation you should become familiar with the configuration requirements of your RR-1422-LVD system, detailed in Table 2–1. The correct positions of each of the optional plug-in modules are shown in Figure 2–1.

Table 2–1   RR-1422-LVD Configuration

Module	Location
Drive Bays	ALL drive bays must be fitted with either a drive carrier module or a dummy carrier, no bays should be left completely empty.
Power Supply/Cooling Modules	Two Power Supply/Cooling modules must be fitted. Full power and cooling redundancy is provided while a faulty module is replaced. Install the Power Supply/Cooling modules in rear Bays 1 & 6. **Note:** Rear bays are numbered from 1 to 6 commencing from the Left hand side)
I/O Modules	Install in rear Bays 2 and 5. **Important: Two IO modules of the same type are always required.**
RAID Modules	Install in rear Bays 3 and 4. If only 1 module is fitted a matching blank RAID module must be fitted and the RAID module installed in slot A
Caution: Operation of the Enclosure with ANY modules missing will disrupt the airflow and the drives will not receive sufficient cooling. It is ESSENTIAL that all apertures are filled before operating the unit. Dummy Drive Carriers are available for this purpose.	

2.1.1 Enclosure Bay Numbering Convention

The enclosure bay numbering convention is shown in Figure 2–1. A Bay is defined as the space required to house a single module. In the front of the enclosure this is the space required by a single 1.0" high 3.5 inch disk drive in its carrier module. In the rear of the enclosure this is the space required by a single PSU, I/O or RAID module
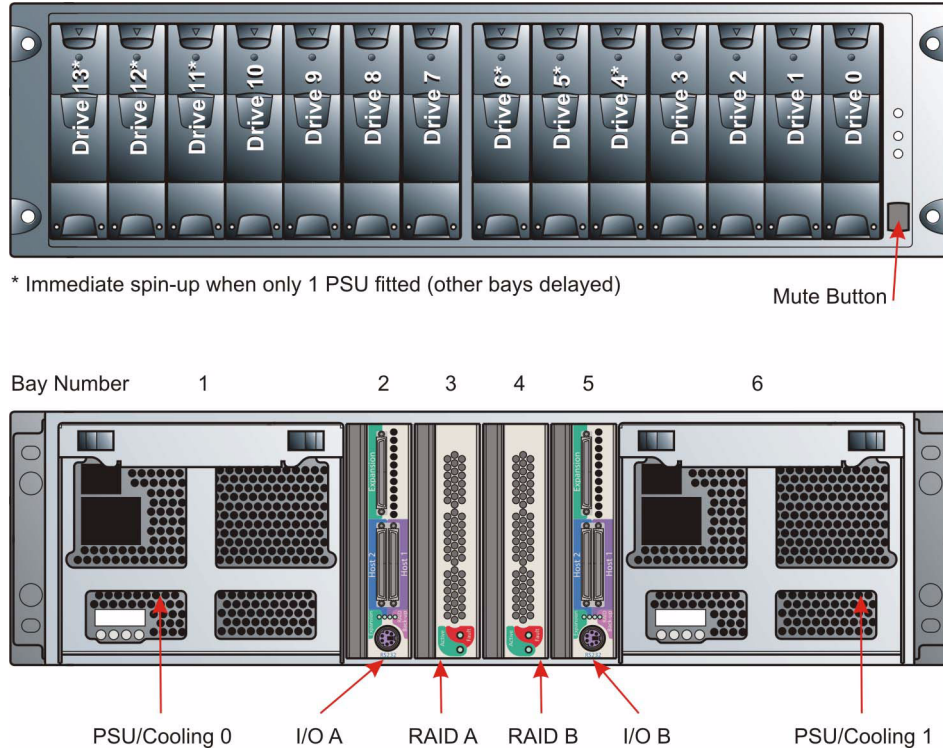

Figure 2–1   Module locations

2.2 Enclosure Installation Procedures

Caution   *The RR-1422-LVD enclosure with all its component parts installed is too heavy for easy installation into a Rack cabinet. The following procedures describe the installation of the RR-1422-LVD enclosure and highlights any critical co-requisite requirements and good handling practices which we encourage you to follow so as to ensure that a successful installation is achieved in the easiest manner.*

Warning   **Ensure that you have fitted and checked a suitable anti-static wrist or ankle strap and observe all conventional ESD precautions when handling RR-1422-LVD modules and components. Avoid contact with Backplane components and module connectors, etc.**

2.2.1 Pre-Requisites

The RR-1422-LVD Enclosure is designed for installation into an industry standard 19 inch cabinet capable of holding the unit.

• Minimum depth 500 mm from front flange to rear metalwork (excludes rear cabling).

- Weight: up to 37kg dependent upon configuration) per enclosure.

- A minimum gap of 25mm (1inch) clearance between the rack cover and front of drawer; and 50mm (2 inches) rear clearance between rear of drawer and rear of rack is recommended in order to maintain the correct air flow around the enclosure.

- The rack should present a maximum back pressure of 5 pascals (0.5mm water gauge).

2.2.2 Rack Mounting Rail Kit

A set of mounting rails is available for use in 19 inch rack cabinets. These rails have been designed and tested to handle the maximum enclosure weight and to ensure that multiple RR-1422-LVD enclosures may be installed without loss of space within the rack. Use of other mounting hardware may cause some loss of rack space.
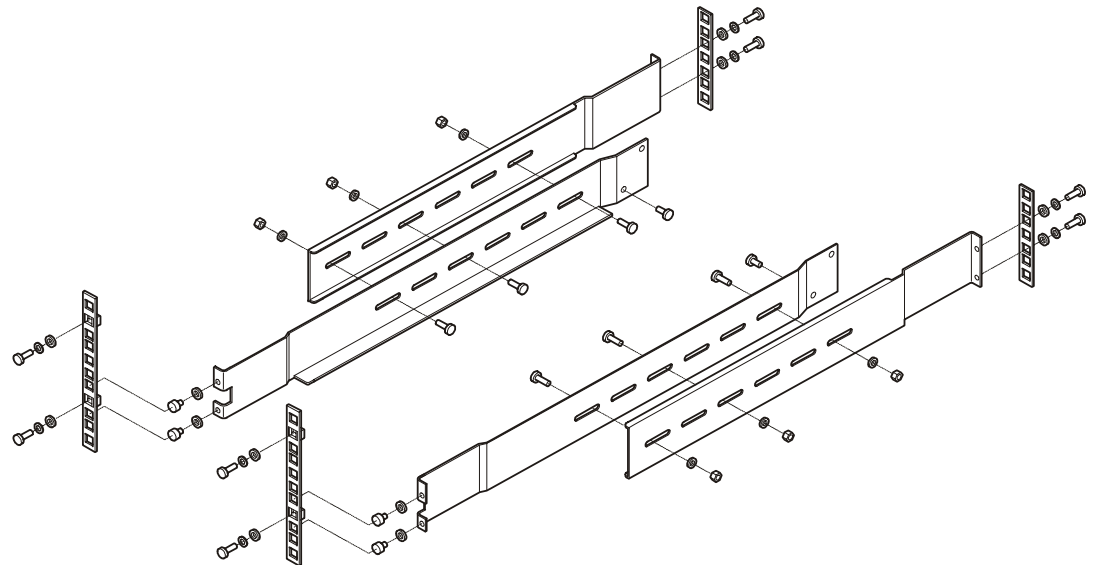

Figure 2–2   Rack Mounting Rail Kit

The rack mounting rail kit also incorporates a rear hold down mechanism to ensure shock and vibration immunity.

Please contact your supplier to ensure suitable mount rails are available for the rack you are using.

2.2.2.1 Parts Check List
- Rack Mounting Rail Kit.

2.2.2.2 Installation Procedure
Please see detail drawings supplied with the rack mounting rail kit for assembly details.

2.2.3   Chassis Installation

2.2.3.1   Parts Check List

- Chassis (complete with Backplane and Ops Panel installed but excluding all plug-in modules).
- Rack mount front flange mounting screws (4 off).

2.2.3.2   Procedure

1   Check for damage.

2   Slide the chassis assembly onto the rack rails until the front flanges engage on the rack. Ensure the chassis is centrally located.

3   If in doubt about correct orientation, the operator panel (at front) should be on the right hand side of the enclosure when viewed from the front.

4   Screw the 4 front rack mount screws through the flanges and tighten.

5   Fit and tighten the rear hold down screws ensuring the enclosure is in tight contact to both the side and top of the chassis to avoid any movement of the chassis in the rack.

2.3   Power Supply/Cooling Module Installation

Install in the rear of the enclosure in positions 1 and 5.

Warning   **Do not remove covers from the power supply unit. Danger of electric shock inside. Return the PSU to your supplier for repair.**

2.3.1   Parts Check List

2 Power Supply (PSU)/Cooling Modules of the following types:
- **Either** 2 x AC 450W PSU
- **or** 2 x -48V DC 450W PSU

Warning   **Do not mix PSU/Cooling modules of different types.**

2.3.2   AC PSU Installation Procedure

1   Check for damage, especially to the rear connector on the supply.

Caution   *Handle the module carefully and avoid damaging the connector pins. Do not install the module if any pins appear to be bent.*

2   With the PSU handle in the open position (Figure 2–3), slide the module into the enclosure (Figure 2–4).

3   Cam the module home by manually closing the PSU handle (Figure 2–5). A click should be heard as the handle latches engage.
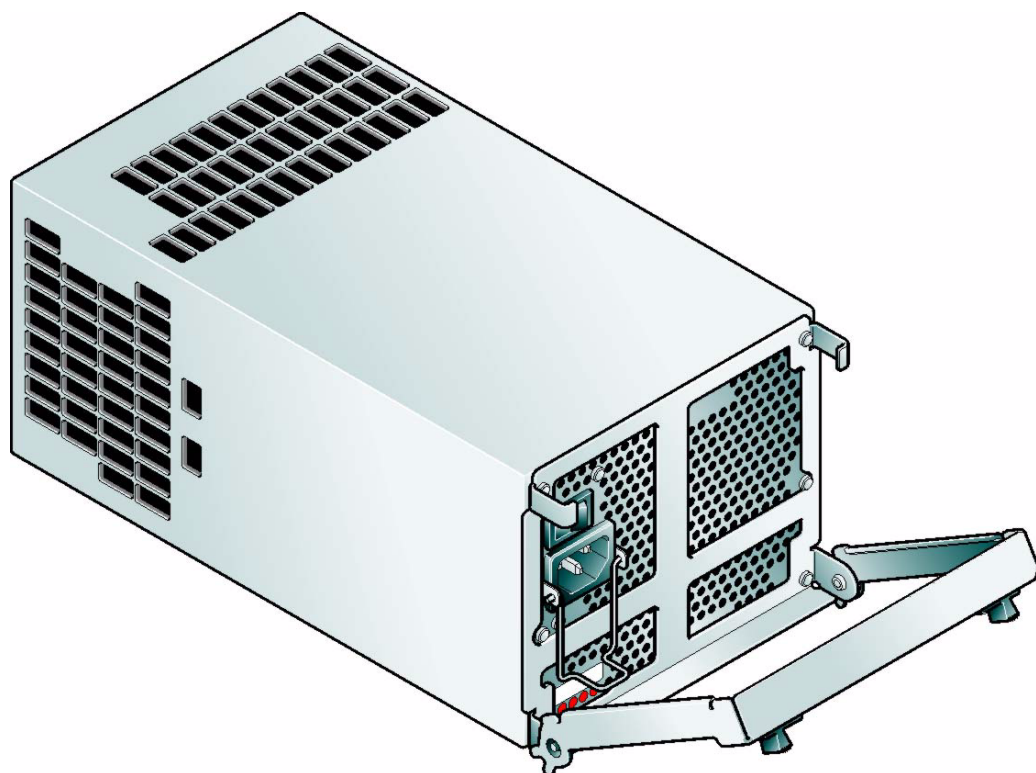
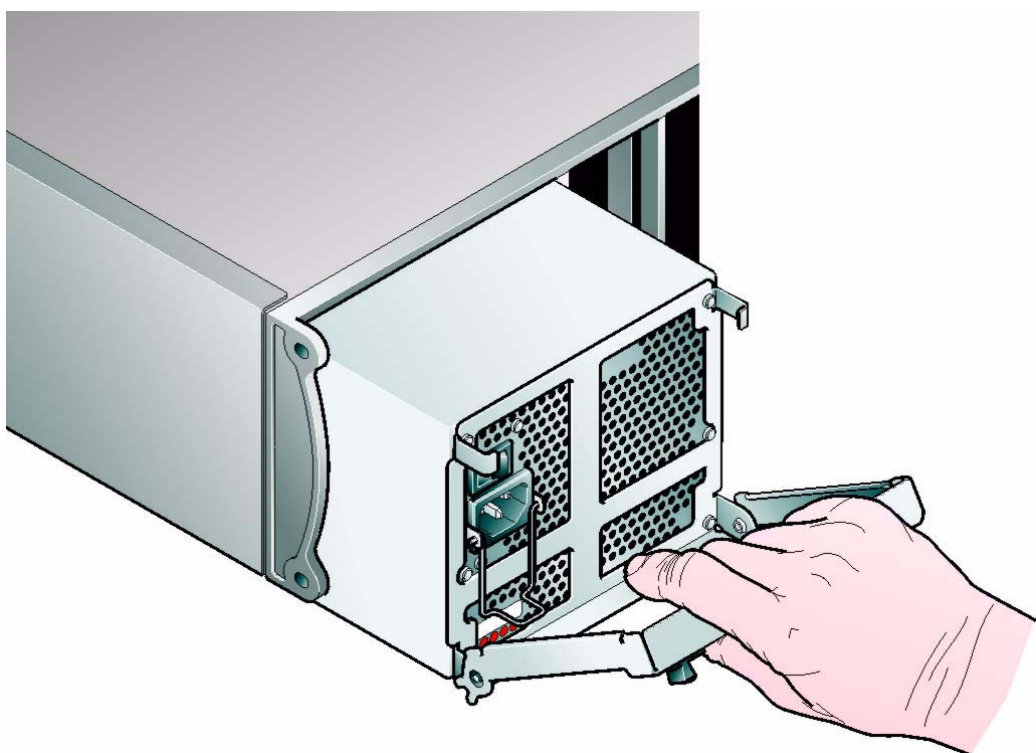**Figure 2–3**   AC PSU Module - Handle in Open Position

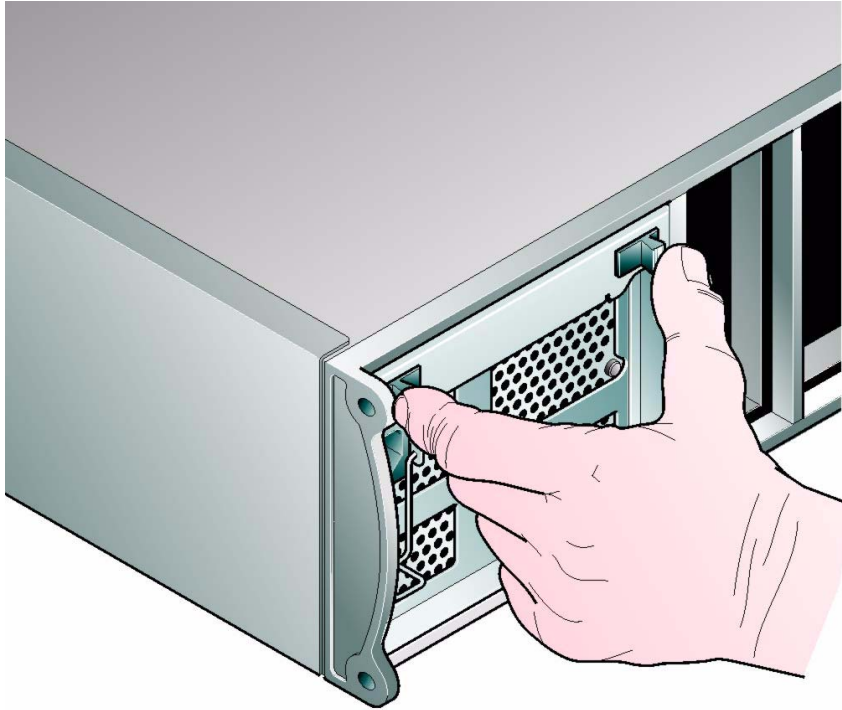**Figure 2–4**   Installing an AC Power Supply Cooling Module (1)

Figure 2–5   Installing an AC Power Supply Cooling Module (2)

2.3.3   -48V DC PSU Installation Procedure

2.3.3.1   Safety Requirements

Voltage Rating
The marked rated voltage for the -48V DC Power Supply/Cooling module is -40V DC to -60V DC. The equipment is intended to operate from a centralized dc supply system with a NOMINAL voltage of -48V DC or -60V DC.The voltage from a nominal -48V DC system may vary, due to float charging or discharge conditions, from -40V DC to -60V DC.The voltage from a nominal -60V DC system may vary, due to float charging or discharge conditions, from -48V DC to -72V DC.

Caution   *If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.*

Equipment Location
The rear of this Equipment (in particular the supply terminals and wiring to the terminals on the power supply) must only be located in a "**RESTRICTED ACCESS LOCATION"** where both of the following apply (Ref.UL60950):

- access can only be gained by SERVICE PERSONNEL or by USERS who have been instructed about the reasons for the restrictions applied to the location and about any precautions that shall be taken; and

- access is through the use of a TOOL or lock and key, or other means of security and is controlled by the authority responsible for the location.

Access restrictions are applicable where:

- The DC mains wiring to the terminals on the PSU are not enclosed.

- The PSU input terminals have exposed voltages that may exceed the 60 volt SELV limit during float charging of battery supply.

- The PSU input terminals have exposed hazardous energy levels, i.e. very high current capability.

Disconnect Device
The wiring installation must provide a disconnect device close to the product.

Wiring
Must be connected in accordance with the local and National wiring regulations.

Wire Temperature Rating
The supply wiring to the power supply terminal blocks must have a minimum temperature rating of 75ºC.

Terminal Block Screw Torque
The screws on the terminal block must be tightened to a torque of 2.4 Nm (21 in-lb.)

Circuit Protection
The building installation must provide overcurrent and short circuit protection in the non earthed supply conductor.

2.3.3.2 USA and Canadian Safety Requirements

Wiring Methods
Wiring method must be code compliant in the field.
Wiring methods must be in accordance with the U.S. National Electric Code, Article 300.

Earthing
This equipment is designed to permit the connection of the earthed conductor (+) of the dc supply circuit to the earthing conductor at the equipment.

If this connection is made, all of the following conditions must be met (Ref. UL60950):

1 This equipment shall be connected directly to the dc supply system earthing electrode conductor or to a bonding jumper from an earthing terminal bar or bus to which the dc supply system earthing electrode conductor is connected.

2 This equipment shall be located in the same immediate area (such as adjacent cabinets) as any other equipment that has a connection between the earthed conductor of the same dc supply circuit and the earthing conductor, and also the point of earthing of the dc system. The dc system shall not be earthed elsewhere.

3 The DC supply source is to be located within the same premises as this equipment.

4 Switching or disconnecting devices shall not be in the earthed circuit conductor between the dc source and the point of connection of the earthing electrode conductor."

Protective Earth Conductor Size

The protective earth conductor size must be suitable for the maximum fault current that the installation can provide. U.S. National Electric Code, Article 250-122

Branch Circuit Protection

The PSU must be connected to a Branch circuit that is protected by a LISTED Branch Protector. The rating of the LISTED Branch Protector >= 125% of the product rating and the rating of the LISTED Branch Protector =< current rating of wire supplying the equipment. U.S. National Electric Code, Article 210-3, Article 240.

Minimum Wire Size

12 AWG minimum must be used for the input connections to the terminal block on the power supply.

Terminal Block Connections

The terminal block is suitable for Field Wiring and Factory Wiring.

2.3.3.3   Installation Procedure

Warning   **Installation of this PSU module should only be performed by qualified personnel.**

1   Check for damage, especially to the rear connector on the Power Supply/Cooling module.

Caution   *Handle the module carefully and avoid damaging the connector pins. Do not install the module if any pins appear to be bent.*

2   With the PSU handle (Figure 2–6) in the open position, slide the module into the enclosure.

3   Cam the module home by manually closing the PSU handle (see Figure 2–7). A click should be heard as the handle latches engage (see Figure 2–8).

4   **Remove all supply power by turning off the supply at the disconnect device located near to the equipment.**

5   Remove the terminal block cover.

6   Connect the wires in accordance with the Wiring Instructions in section 2.3.3.4.

7   Replace the terminal block cover.

8   Turn the supply power back on.

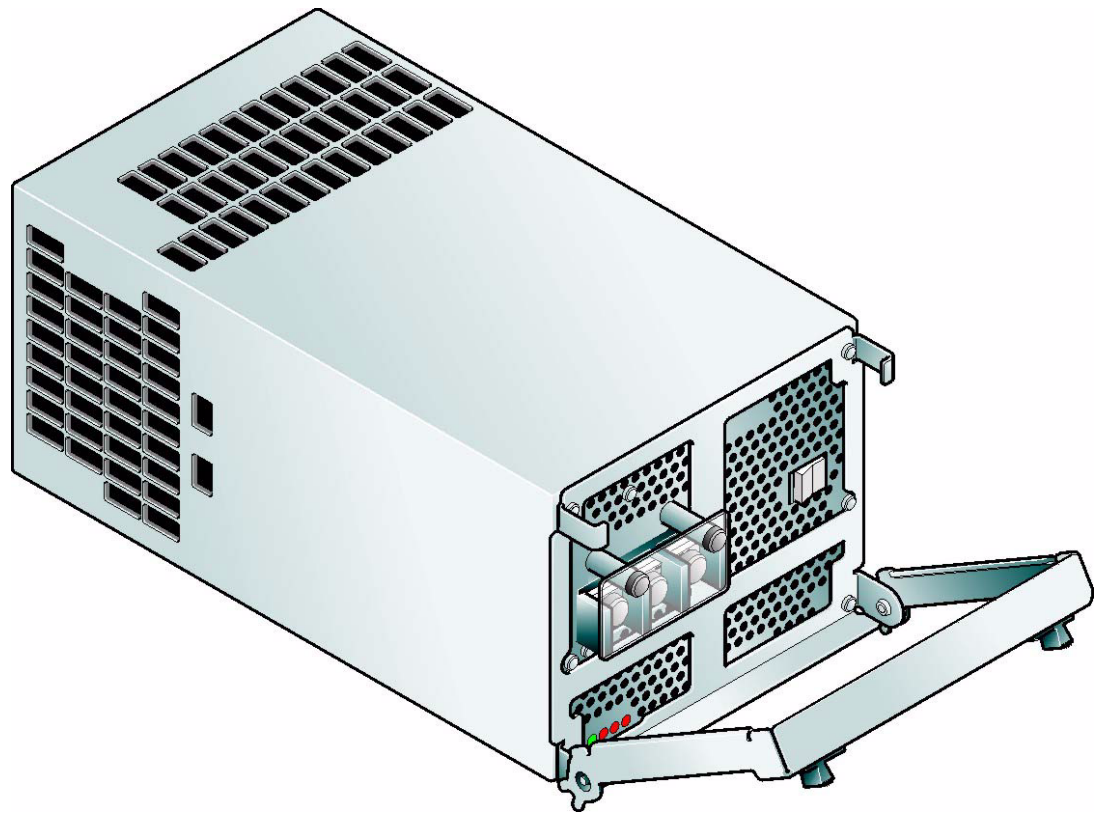**9**   Switch on power at the PSU switch.

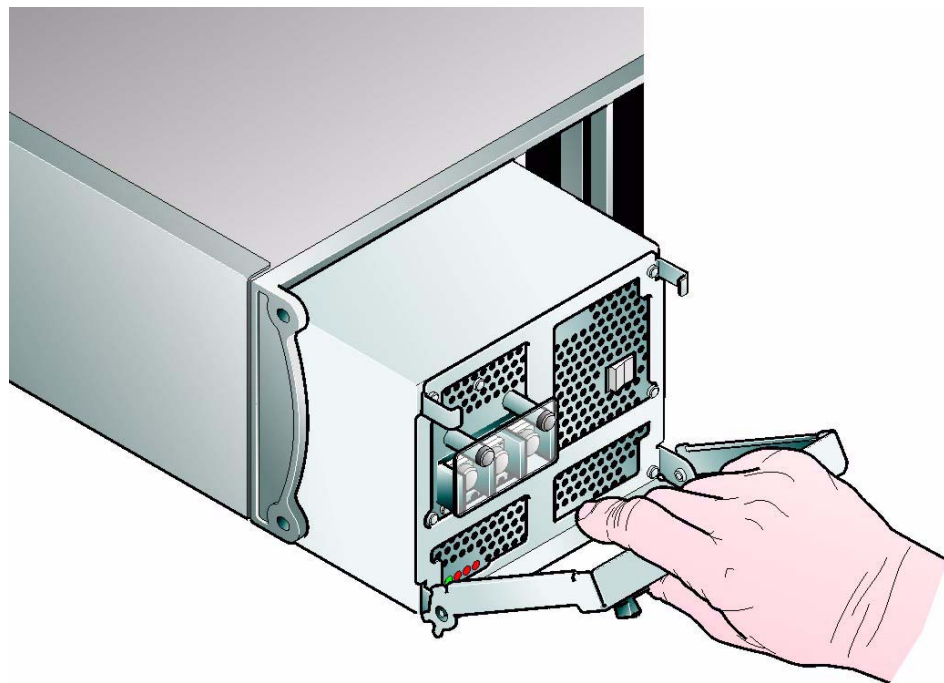**Figure 2–6**   -48V PSU Module - Handle in Open Position

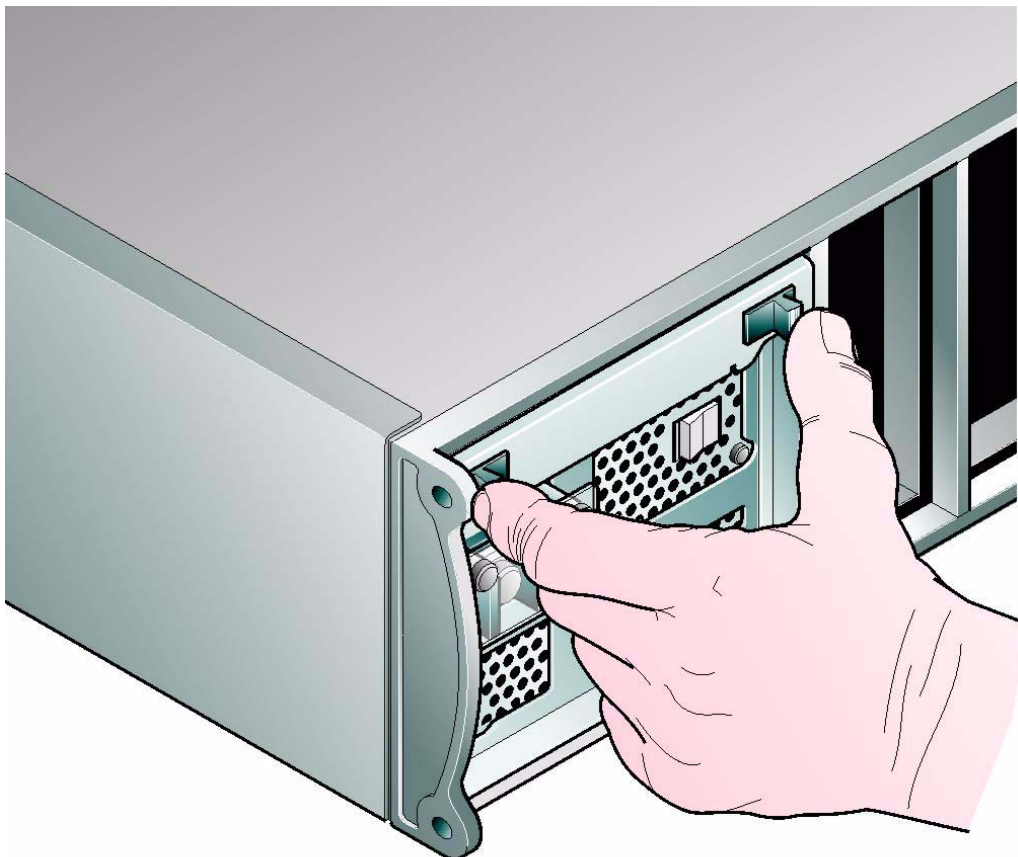**Figure 2–7**   Installing a -48V DC PSU (1)

Figure 2–8   Installing a -48V DC PSU (2)

2.3.3.4   Wiring Instructions for -48V DC PSU

Warning   **The +48V and-48V terminals are not connected to chassis earth.**

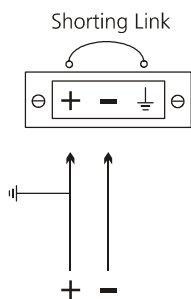**1**   For installations with -48V earthed a shorting link must be added (see Figure 2–9).

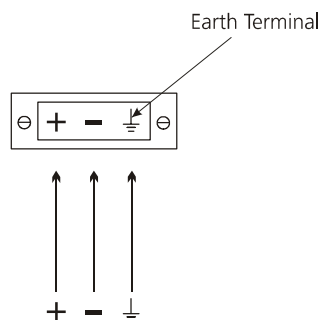**Figure 2–9**   Shorting Link

Figure 2–10   Separate Earth

2   For installations with a separate earth, connect the earth cable to the earth terminal (see Figure 2–10)

2.4 I/O Module Configuration

2.4.1 Ultra-3 SCSI Internal Channel Configurations

The system has 2 channels of 7 drives, each device bay accepts a 3.5" Ultra-3 (LVDS) compatible disk drive with 80 pin SCA-2 connector with burst data transfer speeds of 160MB/s.

Each host channel is routed from one of the VHDCI (0.8mm pitch) SCSI connectors on the rear I/O modules to the RAID module. Drive channels are routed from the RAID module, through the drives and out to the Expansion channel VHDCI SCSI connector on the rear I/O modules.

2.5 I/O Module Installation

Note Installation procedures for the I/O and RAID modules are the same.

Warning **Ensure that I/O and RAID modules are inserted in their correct bay locations (see Figure 2–1).**

2.5.1 Parts Check List

- **Either** RAID I/O module x 2
- **or** JBOD I/O module x 2

Important **Please ensure that both modules are of the same type/**

2.5.2 Procedure

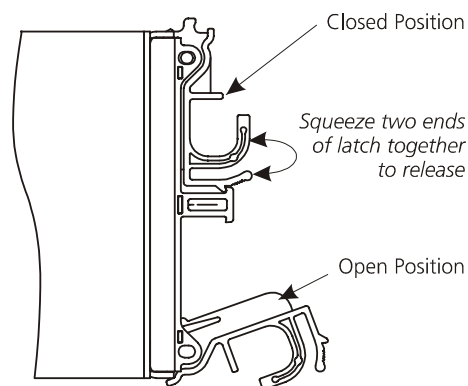Check for damage especially to the interface connector, do not install if any pins are bent.

Figure 2–11   I/O Module Latch Operation

1 The modules should be installed in rear bays 2 and 5 of the Enclosure (Figure 2–1).

2   With the latch in the open position, see Figure 2–11, slide the I/O module into the enclosure until the latch engages automatically.

3 Cam the module home by manually closing the latches, see Figure 2–12.

4   A click should be heard as the latch engages.

Warning   **Ensure that modules are fully aligned before camming the module home.**
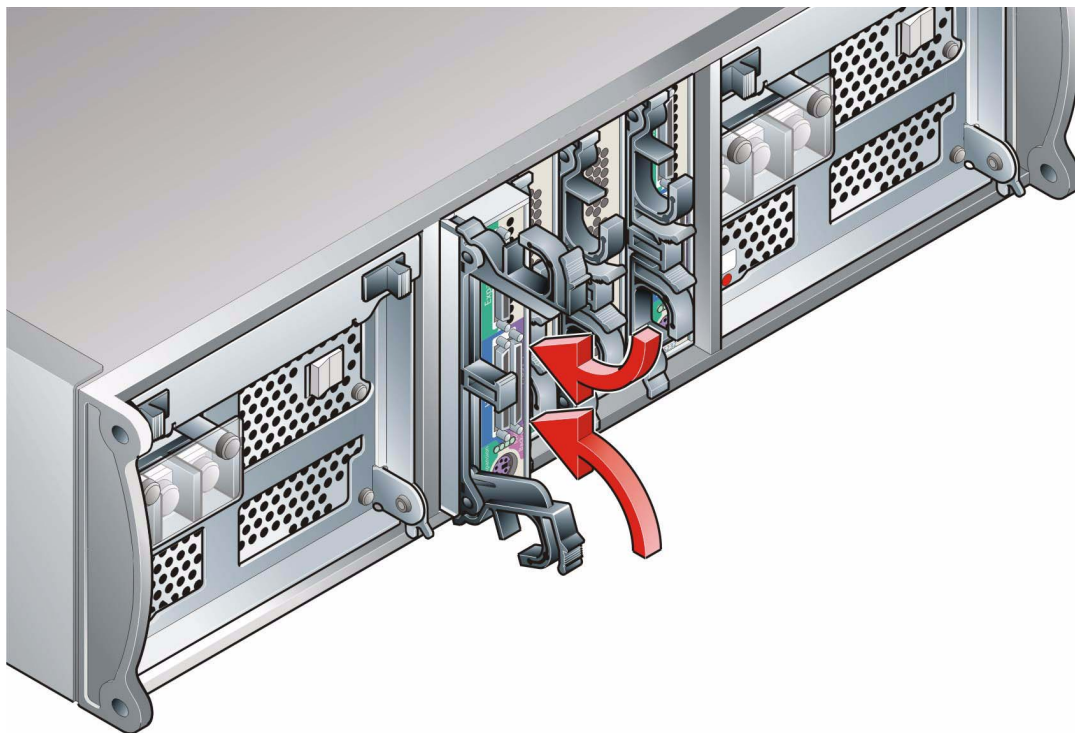

Figure 2–12   Installing an I/O Module

2.6 RAID Module Installation

Note   Installation procedures for the I/O and RAID modules are the same.

Warning   **Warning: Ensure that I/O and RAID modules are inserted in their correct bay locations (see Figure 2–1).**

2.6.1 Parts Check List

- RAID Module
- Blank RAID Module

2.6.2 Procedure

Check for damage especially to the interface connector, do not install if any pins are bent.

1   If only one RAID module is being installed it should be located in rear bay 3 of the Enclosure with a RAID module blank in rear bay 4. If 2 modules are being installed they should be located in rear bays 3 and 4 of the Enclosure (see Figure 2–1).

2   With the latch in the open position, see Figure 2–13, slide the RAID module into the enclosure until the latch engages automatically.
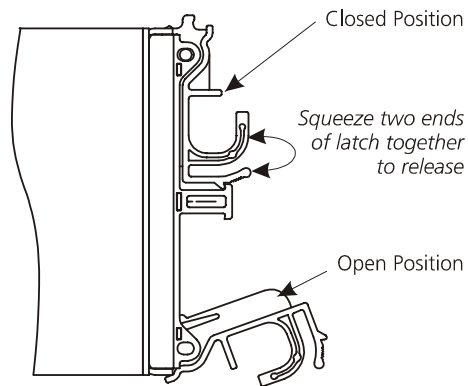
Figure 2–13   RAID Module Latch Operation

3   Cam the module home by manually closing the latches, see Figure 2–14.

4   A click should be heard as the latch engages.

Warning   **Ensure that modules are fully aligned before camming the module home.**
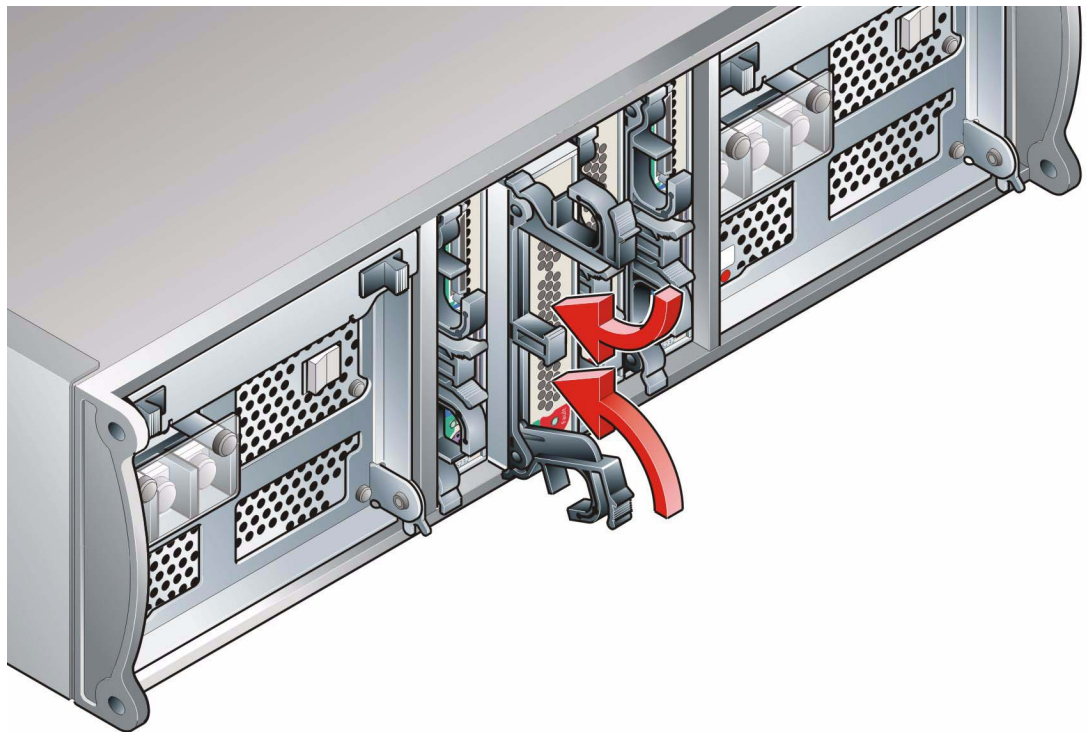

Figure 2–14   Installing a RAID Module

2.7 Drive Enclosure Device Addressing

The SCSI_ID base address of each drive in the enclosure is automatically set to a range defined by presence of the RAID controller, an I/O module mounted range jumper and the drive bay location.These lines are set via the backplane logic.

2 ranges are defined, a RAID range, and a JBOD range. There are insufficient SCSI bus addresses for a JBOD to be connected directly to a RAID, however the addresses are complementary to allow a JBOD to be connected to a RR-0812-LVD RAID, or a RR-0812-LVD JBOD to be connected to a RR-1422-LVD RAID with no manual intervention of switch setting.

If the I/O mounted range jumper is used, the range defined by the right I/O module will control the IDs of the right 7 drives and the left I/O will control the IDs of the left 7 drives (i.e. Right I/O: I/O A, 0-6 and Left I/O: I/O B, 7-13 when viewed from the front).

Range	Device Slot*	0 or 7	1 or 8	2 or 9	3 or 10	4 or 11	5 or 12	6 or 13	SAF-TE†
RAID	SCSI_ID	0	1	2	3	4	5	8	E
JBOD	SCSI_ID	8	9	A	B	C	D	0	F

* As viewed from the front of the enclosure (14 drive bays)
† Reserved for SAF-TE requirements

If the RAID module is present, device addresses default to the values shown for the RAID range. If no RAID module is present, device addresses default to the values shown for the JBOD range. To force device addresses to the alternate values, set the jumper on the appropriate I/O module.

To set the jumper, slide it towards the ON position to set the alternate address range.

Note All bays use immediate spin start.

Typical configurations for single and multiple enclosures are shown in the following diagrams:
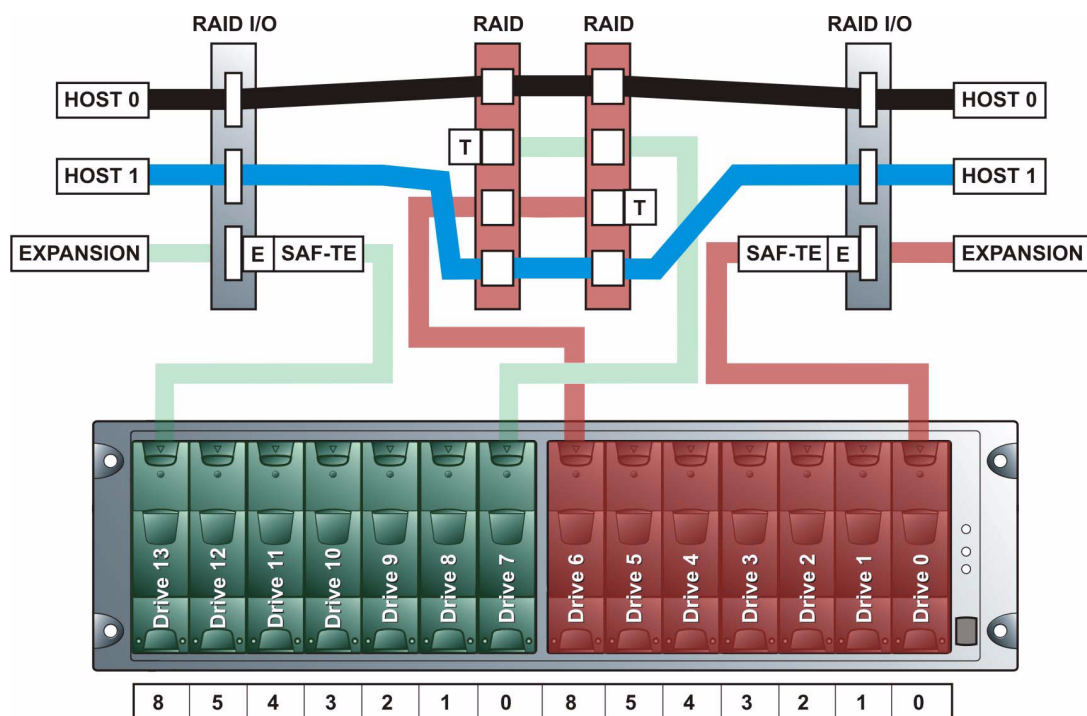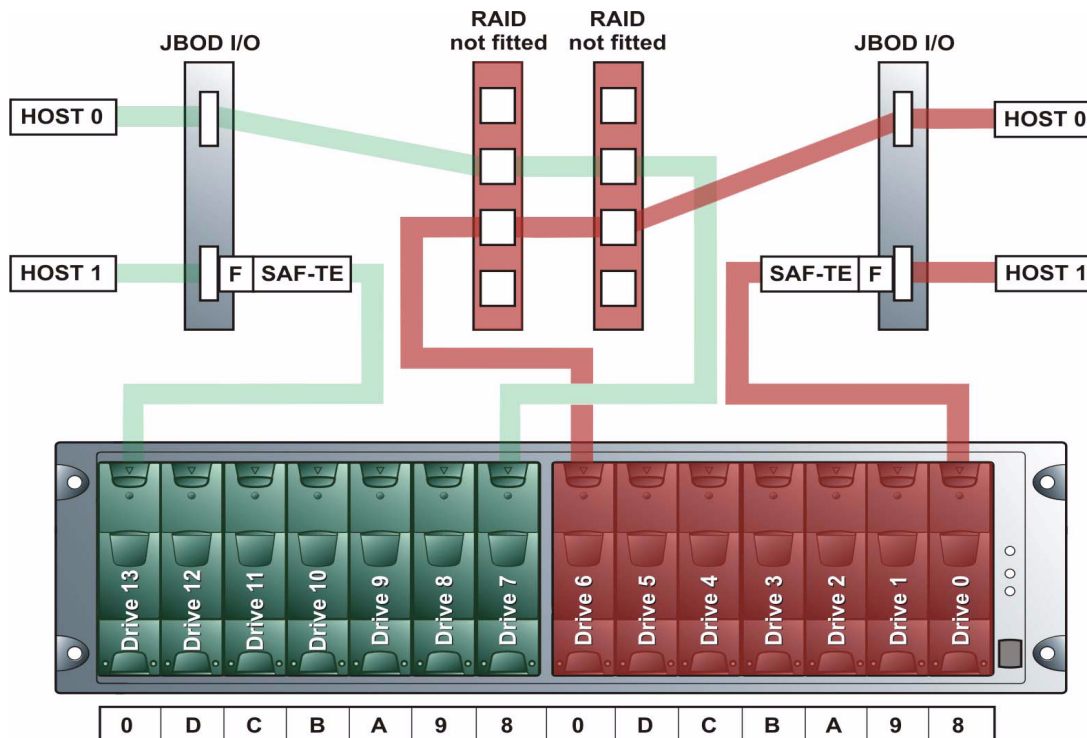
Figure 2–15   RR-1422-LVD RAID Configuration

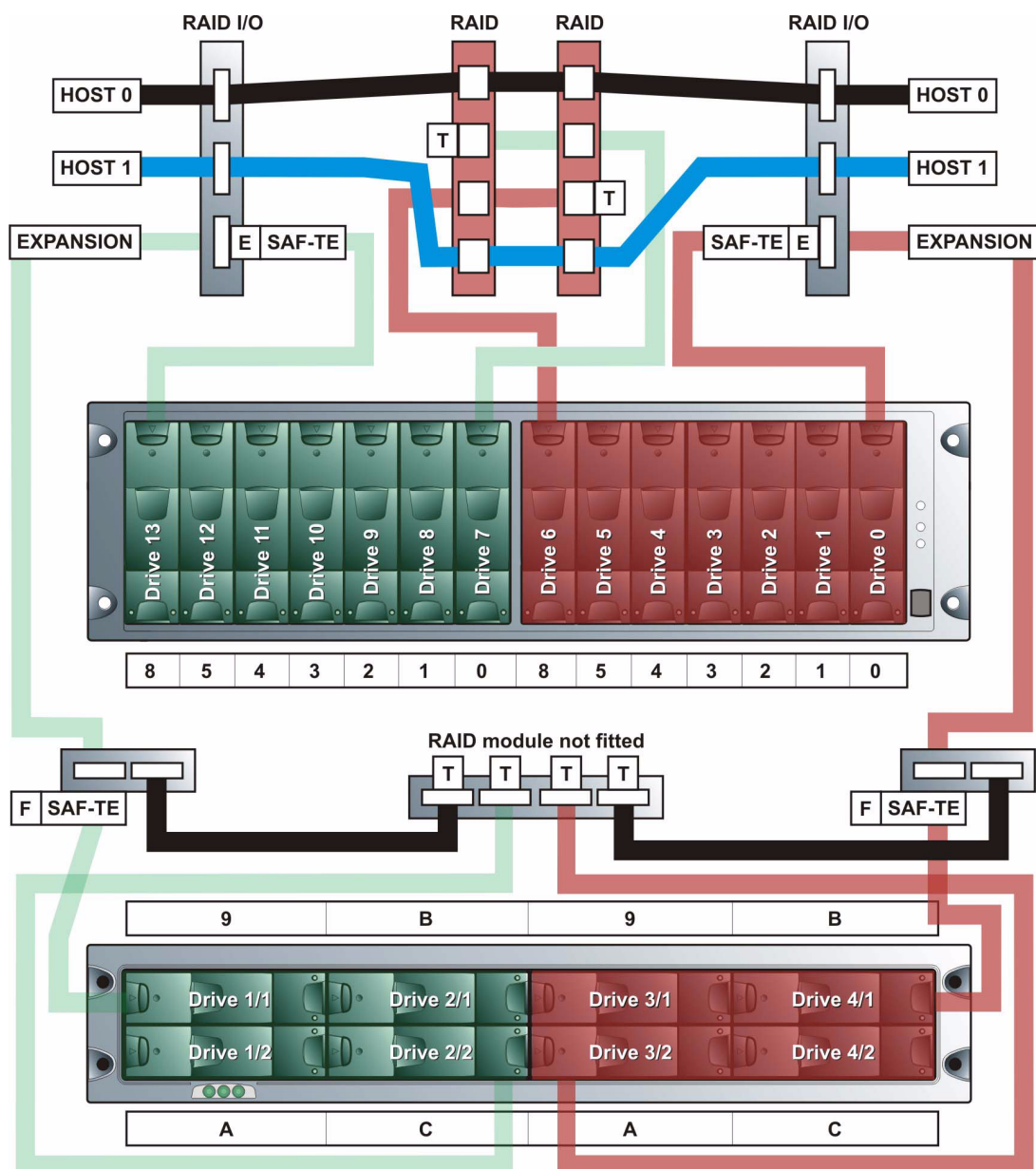**Figure 2–16**   RR-1422-LVD JBOD Configuration

Figure 2–17 RR-1422-LVD RAID with RR-0812-LVD Expansion Enclosure

2.8 Drive Carrier Configuration

2.8.1 Planning and Configuring Your Installation

2.8.1.1 System Configuration

Important   **Before you begin installation you should become familiar with the configuration requirements of your RR-1422-LVD system. Please refer to Section 2.4 for information on your overall system configurations.**

When planning your system configuration, please remember that all RR-1422-LVD enclosure drive bays must be filled with either a drive carrier or front dummy fascia, no bays should be left completely empty.

2.8.1.2 Drive Configuration

Important   **After you have installed the drive carrier modules in your RR-1422-LVD enclosure, please refer to Section 2.4 for configuration information relevant to the I/O module you are installing.**

2.9 Drive Carrier Installation

2.9.1 Parts Check List

- Drive Carrier module or
- Dummy Carrier module

2.9.2 Procedure

1   Release the carrier handle, by pressing the latch in the handle downwards and insert the carrier into the enclosure in the vertical position (Figure 2–18).

Important   **Ensure that the carrier is orientated so that the drive is on the right side and the handle opens from the top (see Figure 2–18).**

2   Slide the carrier, gently, all the way into the enclosure until it is stopped by the camming lever on the bottom of the carrier (Figure 2–19)

3   Cam the carrier home - the camming foot on the left side of the carrier will engage into a slot in the enclosure. Continue to push firmly until the handle fully engages. A click should be heard as the latch engages and holds the handle closed (Figure 2–20).

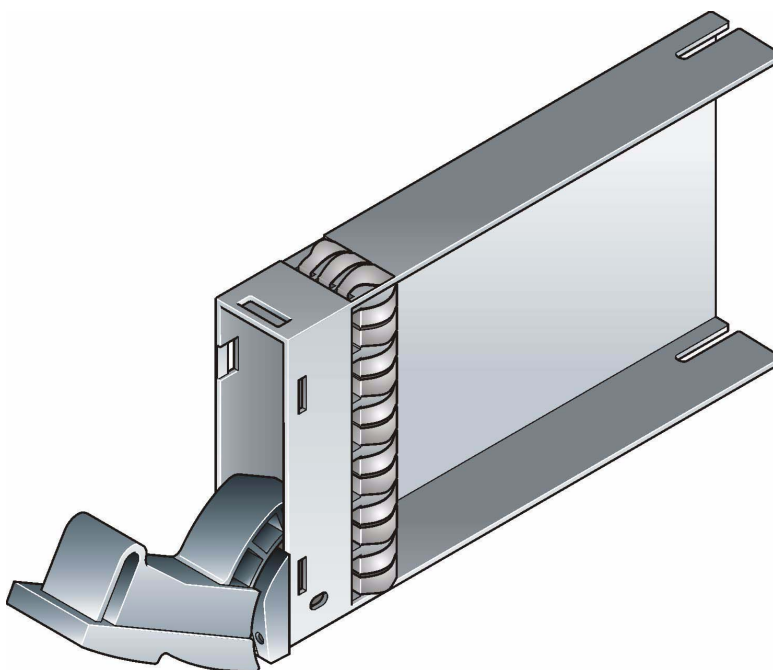**Note**   Ensure that the Handle always opens from the top.

Figure 2–18   Installing an Ultra-3 SCSI Drive Carrier Module (1)
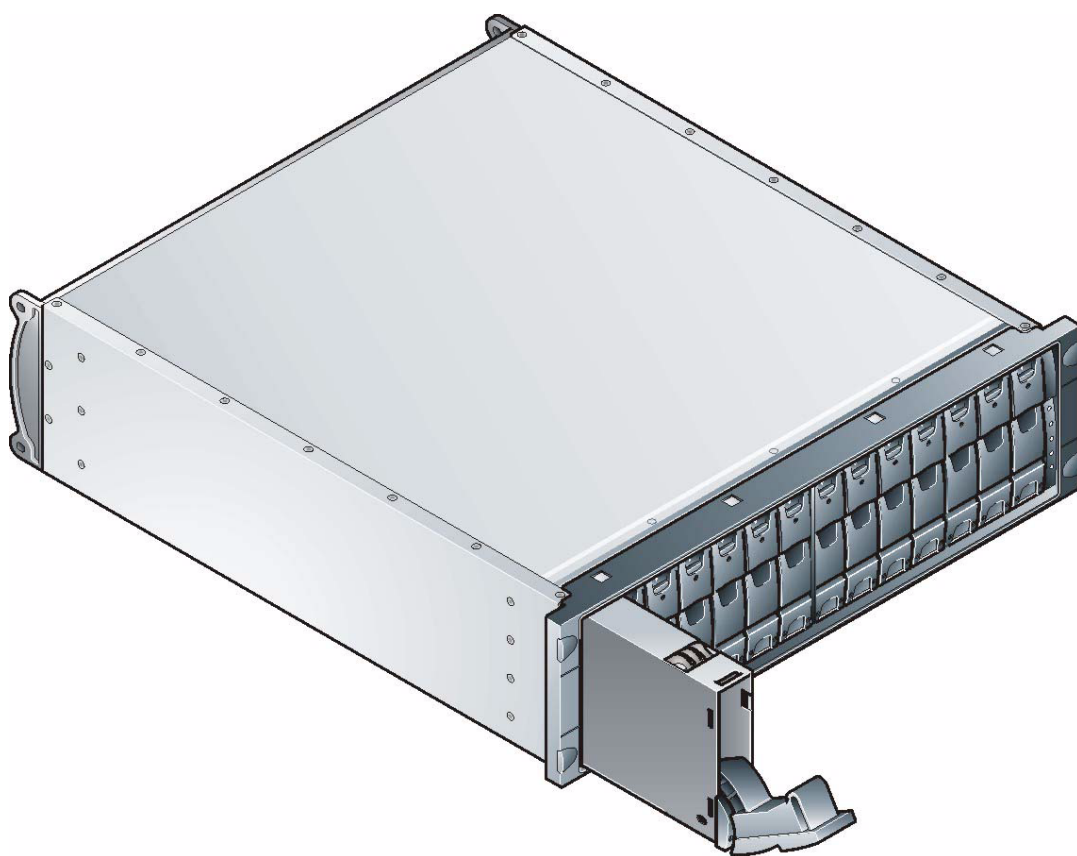

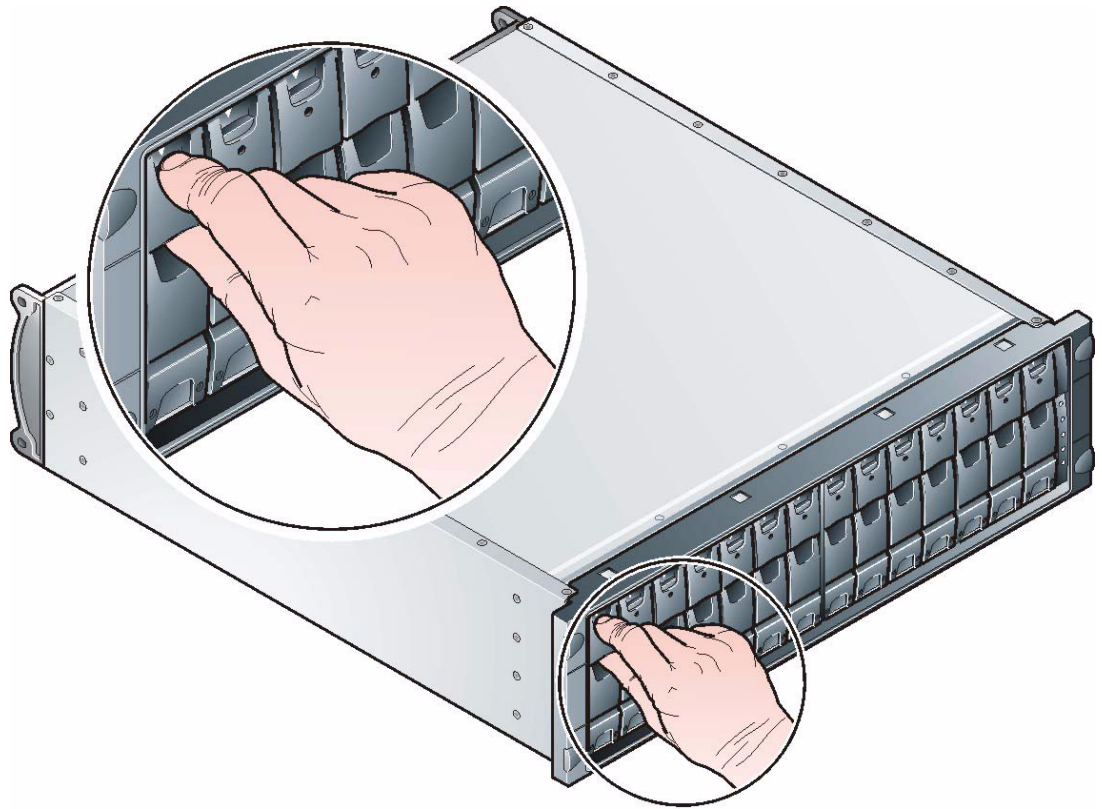**Figure 2–19**   Installing an Ultra-3 SCSI Drive Carrier Module (2)

Figure 2–20   Installing an Ultra-3 SCSI Drive Carrier Module (3)

Note   Removal is the reverse of this procedure (press on the latch to release the handle).

2.9.3   Dummy Carrier Modules

Any unused drive bays must be fitted with a dummy carrier module.

2.9.4   Engaging the Anti-tamper Locks

The anti-tamper locks are fitted in the drive carrier handles and are accessed through the small cutout in the latch section of the handle.

Drives are supplied with the locks set in the locked position.

2.9.4.1   Activating the Locks

1   Carefully insert the lock key provided into the cutout in the handle.

2   Locate the key into its socket.

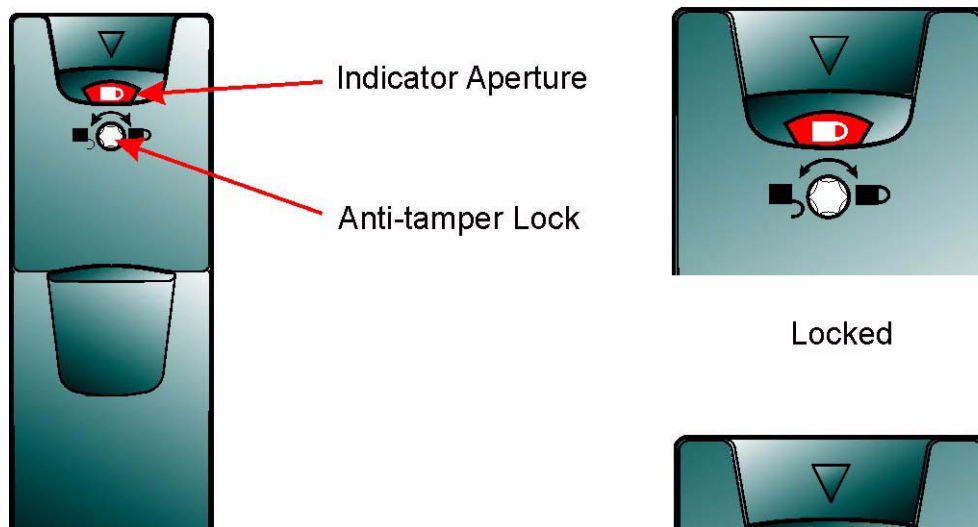3   Rotate the key in a clockwise direction until the indicator is visible in the aperture beside the key.

Figure 2–21   Activating the Anti-tamper Lock

4   Remove the key.
De-activation is the reverse of this procedure, that is:

- Rotate the key in a anti-clockwise direction until the indicator is no longer visible in the aperture beside the key.

Note   A drive carrier cannot be installed if its anti-tamper lock is activated outside the Enclosure.

2.10 AC Power Cord Connection

2.10.1 Parts Check List

- Bifurcated power cord
- Power cord to requisite local standards

2.10.2 Procedure

Attach the power cords to the Power Supply/Cooling Modules.

Warning   **The power connections must always be disconnected prior to removal of the Power Supply/ Cooling module from the enclosure.**

2.11 DC Power Cord Connection

Please refer to Section 2.3.3, ”-48V DC PSU Installation Procedure” for safety procedures to be observed when handling this module and its wiring.

2.12 Grounding Checks

Perform these checks to ensure that a safe grounding system is provided.

- If a rack distribution system is being used.
  - Ensure power is removed from the rack.
  - Connect the RR-1422-LVD power cord to the rack distribution and the enclosure.

- If a direct connection is made with the RR-1422-LVD power cord, ensure that it is connected to the enclosure.

Warning   **Some electrical circuits could be damaged if external signal cables or power control cables are present during the grounding checks.**

- Check for continuity between the earth pin of the IEC 320 connector on one of the Power Supply/ Cooling modules and any exposed metal surface of the RR-1422-LVD enclosure.

Chapter 3

Operation

3.1 Before You Begin

Before powering up your RR-1422-LVD enclosure please ensure that all the modules are firmly seated in their correct bays.

3.2 Power On

Do not operate the subsystem until the ambient temperature is within the specified operating range. If the drives have been recently installed ensure they have had time to acclimatize before operating them.

Note   Please refer to Section 3.3 for details of the Ops Panel LEDs and related fault conditions.

Follow the procedure below to power up the enclosure.

1   Apply AC Mains power to the enclosure. Turn the Power Supply/Cooling modules to ON.

2   On the Ops Panel, the Audible Alarm beeps once, all LEDs flash for 7 seconds then the Alarm double beeps.

3   All LEDs on the Ops Panel should be lit (Green) when the enclosure power is activated (and the disk drive motors should start).

Note   All LEDs on the Ops Panel should be lit Green at power up to indicate that the system is functioning correctly. If any show Amber then a problem exists and the procedure in Chapter 4 , "Troubleshooting and Problem Solving" should be followed.

Important   **If mains power is lost for any reason, on restoration of power the enclosure will re-start automatically.**

3.2.1 Power Supply/Cooling Module LEDs

The Power Supply/Cooling module incorporates 4 LEDs, located below the On/Off switch and shown in Table 3–1.

- Under Normal conditions the LEDs should all be illuminated constant GREEN
- If a problem is detected the color of the relevant LED will change to AMBER.

Table 3–1   PSU LEDs

AC PSU		-48V DC PSU	
Power AC Fan Power Good Fail Fault Fault		Power DC Fan Power Good Fail Fault Fault	
PSU Good	Green	PSU Good	Green
AC input Fail	Amber	Battery Fail	Amber
Fan Fault	Amber	Fan Fault	Amber
DC Output Fail	Amber	DC Output Fail	Amber

3.3 Ops Panel LEDs

The Ops Panel LEDs fault and status conditions are defined in Table 3–2.

Table 3–2   Operator Panel LEDs

Power/ On (Green)	PSU/Cooling Fault (Amber)	System (Amber)	Definition
On	N/A	N/A	Power on. All functions good.
On	N/A	On	ESI processor failure.
On	N/A	Flash	RAID Fault
On	On	N/A	Two PSUs present, one failed.
On	On	N/A	One or more fan fail.

Please refer to Chapter 4 , "Troubleshooting and Problem Solving" for details of any fault indication.

3.4 Starting the Drives

When the enclosure is powered on, all drives in the enclosure should automatically start their motor. If this has not occurred there may be a power problem (an alarm and power fault indication would normally be active). if there is only one Power Supply/Cooling Module functional, the drive motors will spin up in a delayed sequence.

3.4.1 Disk Drives LEDs

Each drive carrier incorporates two indicators, Left (GREEN) and Right (AMBER). In normal operation the Green LED will be ON and will flicker as the drive operates.

Table 3–3   Drive Status Indicators

LED		
Green	**Amber**	**Status**
Off	Off	No drive installed
On / Flash	Off	Drive OK
X	On	SAF-TE drive fault
X	Flash (3/sec)	SAF-TE device identity set

3.5 Power Down

To power the Enclosure down, either

• switch off the Power Supply/Cooling modules installed in the Enclosure

  or

• remove AC Mains at the power source.

Chapter 4

Troubleshooting and Problem Solving

4.1 Overview

The RR-1422-LVD Enclosure includes a processor and associated monitoring and control logic to enable it to diagnose problems within the enclosure's power, cooling and drive systems.

The Enclosure Services/Ops Panel function is mounted on the drive backplane while the Ops Panel is housed in the front of the enclosure.

The sensors for power and cooling conditions are housed within the Power Supply/Cooling modules. There is independent monitoring for each unit.

If a fault is indicated on the Ops Panel, please refer to Table 4–2, "Operator Panel LEDs".

4.1.1 Initial Start-up Problems

4.1.1.1 Faulty Cords

First check that you have wired up the subsystem correctly. Then, if:
- cords are missing or damaged
- plugs are incorrect
- cords are too short

Call your supplier for a replacement.

4.1.1.2 Alarm Sounds On Power Up

Please refer to Section 4.3.

4.1.1.3 Computer Doesn't Recognize the RR-1422-LVD Subsystem

1 Check that the Ultra-3 SCSI interface cables from the RR-1422-LVD enclosure to the host computer are fitted correctly.

2 Check the SCSI ID settings on your RR-1422-LVD subsystem and on your system host.

3   Check that the LEDs on all installed drive carrier modules are illuminated Green. Note that the drive LEDs will not be lit during drive spinup.

4   Check that all drive carrier modules have been correctly installed.

5   Check the I/O module setup as follows:

-    Check that the I/O module has been correctly installed and all external links and cables are securely fitted.

-    Check the maximum cable length has not been exceeded.

-    Check that different IDs have been selected for all devices on a channel.

4.2 LEDs

Green LEDs are always used for good or positive indication, flashing Green/Amber if non-critical conditions exist. Amber LEDs indicate there is a critical fault present within the module.

4.2.1 Power Supply/Cooling Module

The Power Supply Cooling LEDs are shown in Table 4–1.

• Under Normal conditions the LEDs should all be illuminated constant GREEN

• If a problem is detected the color of the relevant LED will change to AMBER.

Table 4–1   PSU LEDs

AC PSU		-48V DC PSU	
 Power AC Fan Power Good Fail Fault Fault		 Power DC Fan Power Good Fail Fault Fault	
PSU Good	Green	PSU Good	Green
AC input Fail	Amber	Battery Fail	Amber
Fan Fault	Amber	Fan Fault	Amber
DC Output Fail	Amber	DC Output Fail	Amber

4.2.2 Ops Panel

The Ops Panel displays the aggregated status of all the modules. The Ops Panel LEDs are defined in Table 4–2.

4.3 Audible Alarm

The Ops Panel also includes an Audible Alarm which indicates when a fault state is present. The following conditions will activate the Audible Alarm:

- Drive Fault
- Fan Fault
- Voltage out of range
- Over temperature
- Thermal overrun
- System fault

4.3.1 Audible Alarm Mute

When the Audible Alarm sounds, it may be muted by pressing the Alarm Mute push-button. Automatic muting will take place after two minutes if the mute switch is not manually operated. The Alarm Mute push-button is located above the indicators on the Ops Panel.

When the alarm is muted it will continue to sound with short intermittent bleeps to indicate that a problem still exists, It will be silenced when all problems are cleared.

LED Test Mode

The Alarm Mute push-button can also be used to test the LEDs on the drives and Ops Panel. When the Mute push-button is held, all LEDs will be illuminated if there are no faults present. Pressing Mute again clears this mode.

4.4 Troubleshooting

Table 4–2   Operator Panel LEDs

Power/ On (Green)	PSU/Cooling Fault (Amber)	System (Amber)	Definition
On	N/A	N/A	Power on. All functions good.
On	N/A	On	ESI processor failure.
On	N/A	Flash	RAID Fault
On	On	N/A	Two PSUs present, one failed.
On	On	N/A	One or more fan fail.

4.4.1 System Faults

Symptom	Cause	Action
1 The SYSTEM LED will illuminate AMBER on the Ops Panel.	The ESI processor has detected an internal fault (e.g. failure of an internal communications path)	1 Check for other AMBER LED indications on the Power Supply/Cooling modules. If there is a PSU error present there may be a communications problem with that Power Supply/Cooling module. Remove and then re-fit the module, if the problem persists then change the module. 2 Check for other AMBER LED indications on the drives carriers. If none are evident then there may either be an ESI processor problem or a Backplane problem.

4.4.2 Power Supply/Cooling Faults

Symptom	Cause	Action
1 Ops Panel FAULTLED AMBER 2 An AMBER LED on one or more Power Supply/Cooling Modules. 3 Audible Alarm Sounding.	1 Any power fault. 2 A fan failure. 3 A thermal condition which could cause PSU overheating.	1 Check Power On/Off Switch on rear of Power Supply/Cooling module is switched ON.(not accessible on later models) 2 Check AC Mains Connections to Power Supply/Cooling module is live. 3 Disconnect the Power Supply/Cooling module from mains power and remove the module from the system, Re-install: if problem persists, replace Power Supply/Cooling Module. 4 Reduce the ambient temperature.

.

Table 4–3   PSU LEDs Status

PSU OK (Green)	AC/DC Fail (Amber)	Fan Fail (Amber)	Power Fail (Amber)	Definition
On	Off	Off	Off	PSU on OK
Off	On	Off	On	No Input power (this PSU only).
Off	Off	Off	On	Input power present/standby On
Off	Off	Off	Off	No Input power (either PSU).
Off	Off	Off	On	PSU fail (over temp/over volt/over current).
Off	Off	On	X	Fan fail.

4.4.3 Thermal Control

The RR-1422-LVD Enclosure uses extensive thermal monitoring and takes a number of actions to ensure component temperatures are kept low and also to minimize acoustic noise.Air flow is from front to rear of the enclosure.

Symptom	Cause	Action
If the ambient air is cool (below 25 °C) and the fans are observed to increase in speed then some restriction on airflow may be causing additional internal temperature rise. **Note:** This is not a fault condition.	The first stage in the thermal control process is for the fans to automatically increase in speed when a thermal threshold is reached. This may be caused by higher ambient temperatures in the local environment and may be perfectly normal. **Note:** This threshold changes according to the number of drives and power supplies fitted.	1 Check the installation for any airflow restrictions at either the front or rear of the enclosure. A minimum gap of 25mm at the front and 50mm at the rear is recommended. 2 Check for restrictions due to dust build-up, clean as appropriate. 3 Check for excessive re-circulation of heated air from rear to the front, use in a fully enclosed rack installation is not recommended. 4 Check that all Blank modules are in place. 5 Reduce the ambient temperature.

4.4.4 Thermal Alarm

Symptom	Cause	Action
1 Ops Panel FAULT LED AMBER. 2 An AMBER LED on one or more Power Supply/Cooling Modules. 3 Audible Alarm Sounding. 4 Air temperature exiting PSU above 55°C.	If the internal temperature measured in the airflow through the enclosure exceeds a pre-set threshold a thermal alarm will sound.	1 Check local ambient environment temperature is below the upper 40°C specification. 2 Check the installation for any airflow restrictions at either the front or rear of the enclosure. A minimum gap of 25mm at the front and 50mm at the rear is recommended. 3 Check for restrictions due to dust build-up, clean as appropriate. 4 Check for excessive re-circulation of heated air from rear to the front, use in a fully enclosed rack installation is not recommended. 5 If possible shutdown the enclosure and investigate the problem before continuing.

4.5 Drive Carrier Module Faults

Disk drive status is monitored by a Green LED and an Amber LED mounted on the front of each Drive Carrier Module, providing the following indications:

Table 4–4   Drive Status Indicators

LED		
Green	**Amber**	**Status**
Off	Off	No drive installed
On / Flash	Off	Drive OK
X	On	SAF-TE drive fault
X	Flash (3/sec)	SAF-TE device identity set

4.5.1 Dummy Carrier Modules

Dummy Carrier modules must be fitted to all unused drive bays to maintain a balanced air flow.

4.5.2 Auto Start Failure

With two Power Supply/Cooling modules operating, all drives in the enclosure should automatically start their motors after power is applied. If this has not occurred there is a power problem (An alarm and power fault indication would normally be active).

4.6 Dealing with Hardware Faults

Ensure that you have obtained a replacement module of the same type *before* removing any faulty module.

Warning   **If the RR-1422-LVD subsystem is powered up and you remove any module, replace it immediately. If the subsystem is used with modules or module blanks missing for more than a few minutes, the Enclosure can overheat, causing power failure and data loss. Such use will invalidate the warranty.**

- Replace a faulty drive with a drive of the same type and capacity.

- All drive bays must be fitted with a Drive Carrier module or a dummy carrier module in order to maintain a balanced air flow.

- All the supplied plug-in power supply units, electronics modules and blank modules must be in place for the air to flow correctly around the cabinet.

4.7 Continuous Operation During Replacement

Depending on how the subsystem is set up, if a disk unit fails, it can normally be replaced without interrupting the use of the system.

In addition, each enclosure contains two Power Supply/Cooling modules, either of which can maintain power and cooling to the subsystem while the other is replaced.

4.8 Replacing a Module

Please refer to Chapter 2 , "Getting Started" for information on the initial installation of the plug-in modules in the RR-1422-LVD enclosure.

Warning   **Observe all conventional ESD precautions when handling RR-1422-LVD modules and components. Avoid contact with Backplane components and module connectors, etc.**

4.8.1 Power Supply/Cooling Modules

Warning   **Do not remove covers from the power supply unit. Danger of electric shock inside. Return the PSU to your supplier for repair.**

4.8.1.1 Removing an AC PSU Module

Warning   **Do not remove the faulty Power Supply/Cooling module unless you have a replacement unit of the correct type ready for insertion. The system must not be run without all modules in place.**

If a power supply unit or its fan is faulty, you must replace the whole Power Supply/Cooling module.

As there should always be two power supply units installed, you can continue working while replacing the faulty module.

1   Make sure you identify the faulty Power Supply/Cooling module correctly, from the two modules installed,

2   Switch off and disconnect the power supply cord.

3   Squeeze the two latches on the PSU handle together (Figure 4–1) and open the handle to cam the PSU out of the enclosure (Figure 4–2).

4   Grip the handle and withdraw the PSU (Figure 4–3).

4.8.1.2 Inserting the Module

1   Check for damage, especially to the rear connector on the PSU.

Caution   *Handle the module carefully and avoid damaging the connector pins. Do not install the module if any pins appear to be bent.*

2   With the PSU handle (Figure 4–2) in the open position, slide the module into the enclosure

3 Cam the module home by manually closing the PSU handle (see Figure 4–3). A click should be heard as the handle latches engage (see Figure 4–1).

4 Connect the power supply cord to the power source and switch the power supply ON.

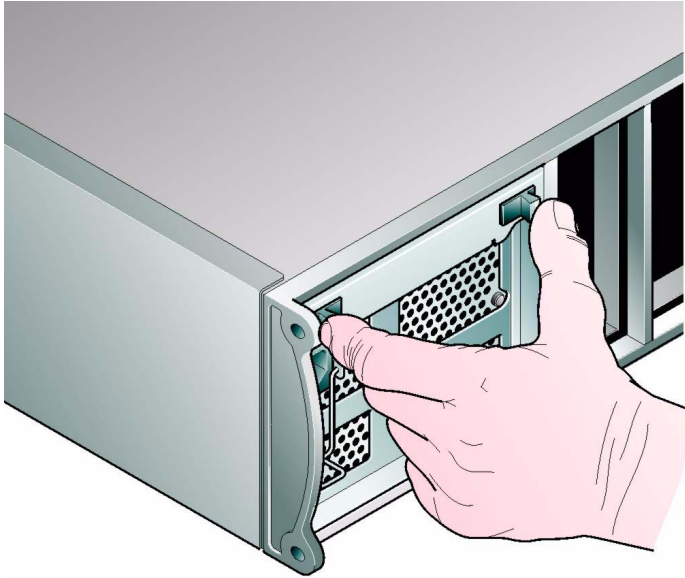**Note** The alarm will sound until the new Power Supply/Cooling module is operating correctly.

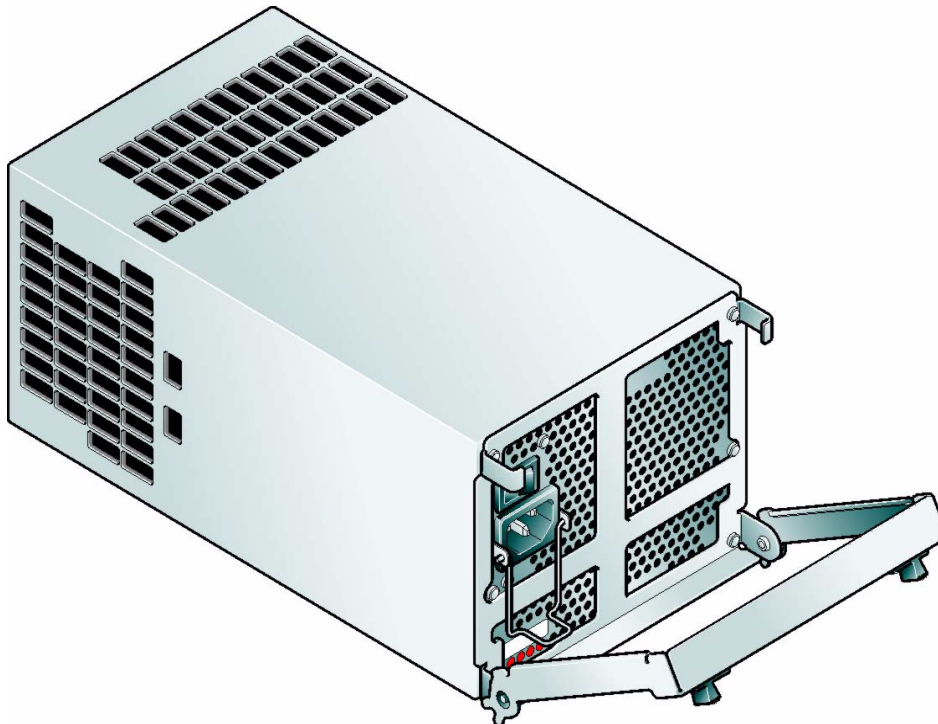**Figure 4–1**   Removing/Inserting an AC Power Supply/Cooling Module (1)
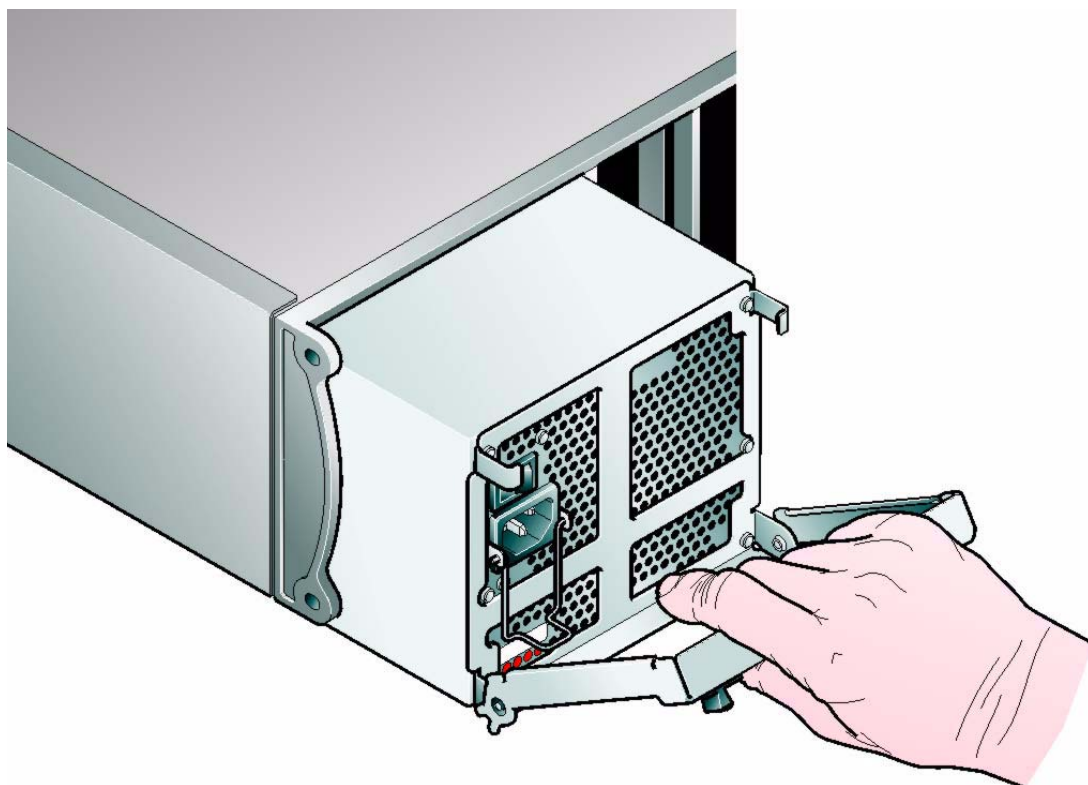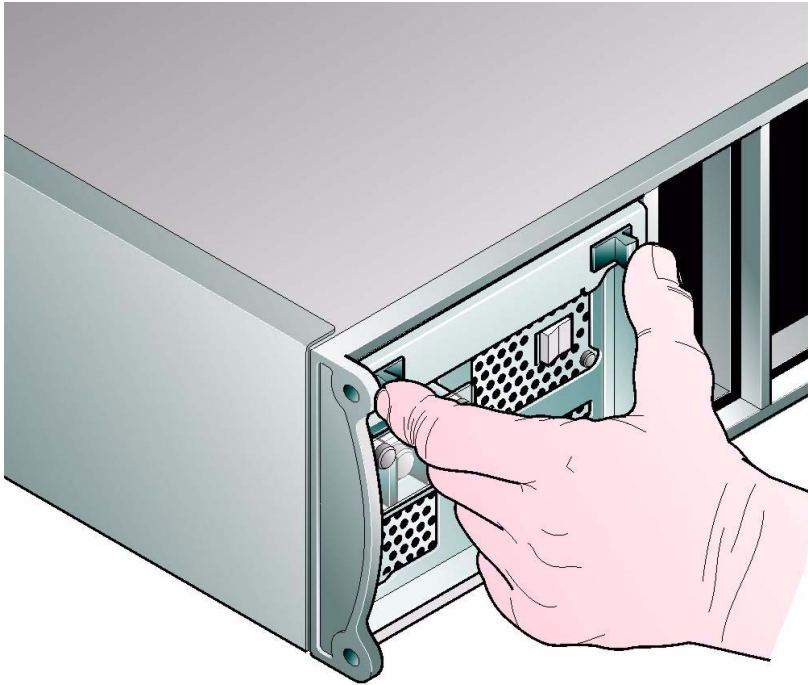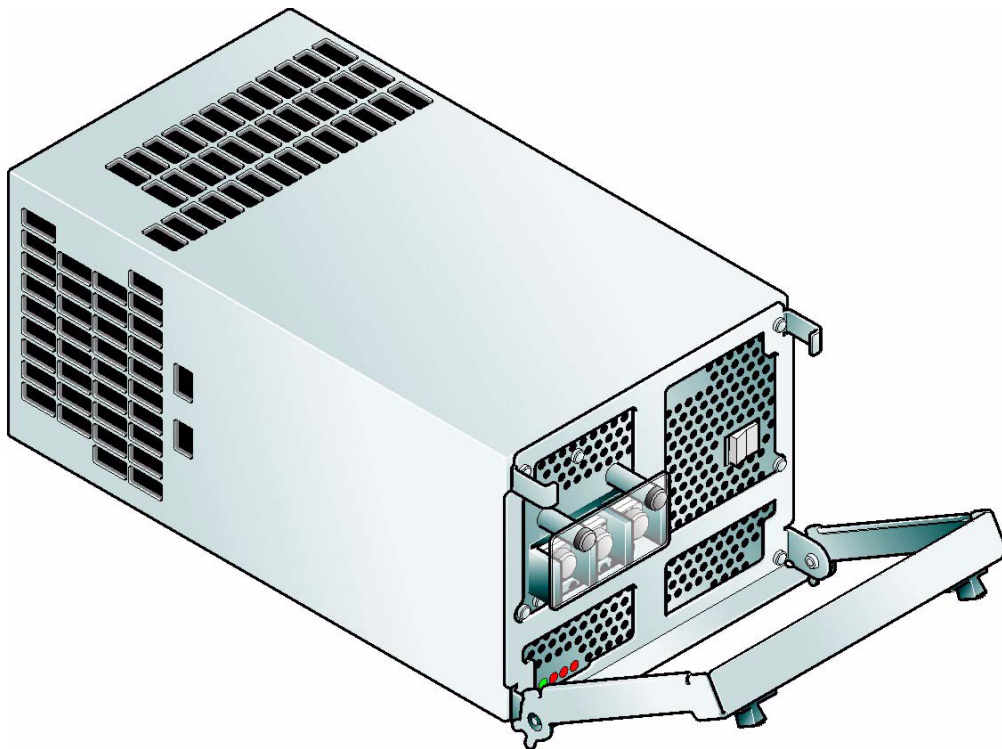

Figure 4–2   Removing/Inserting an AC Power Supply/Cooling Module (2)

Figure 4–3   Removing/Inserting an AC Power Supply/Cooling Module (3)

4.8.1.3   Removing a -48V DC PSU

Warning   **Removal of this module should only be performed by qualified personnel.**

Warning   **Do not remove the faulty Power Supply/Cooling module unless you have a replacement unit of the correct type ready for insertion. The system must not be run without all modules in place.**

Safety Requirements

Warning   **Please refer to Section 2.3.3.1, "Safety Requirements", on page 24 before proceeding with the following Removal procedures.**

1   Switch off power at the PSU switch.

2   Remove all supply power by turning off the supply at the **disconnect** device located near to the equipment.

3   Remove the terminal block cover.

4   Disconnect the wires.

5   Replace the terminal block cover.

6   Squeeze the two latches on the PSU handle together and open the handle (see Figure 4–4) to cam the Power Supply/Cooling module out of the enclosure.

7 Grip the handle and withdraw the module.(see Figure 4–6).

Figure 4–4   Removing/Inserting a -48V Power Supply/Cooling Module (1)

Figure 4–5   Removing/Inserting a -48V Power Supply/Cooling Module (2)
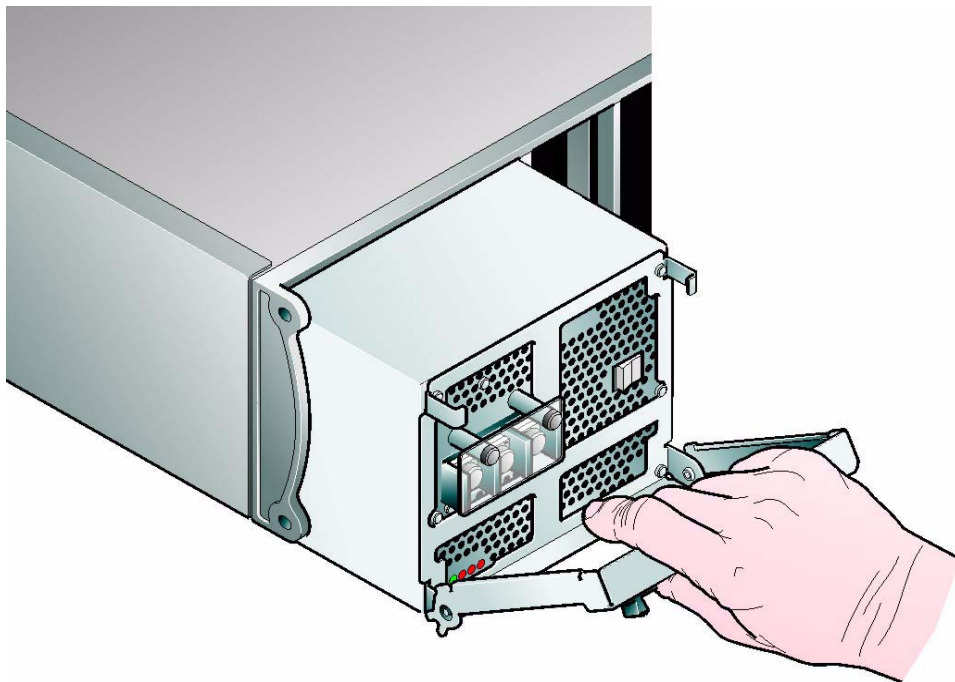
Figure 4–6   Removing/Inserting a -48V Power Supply/Cooling Module (3)

4.8.1.4   Installing a -48V DC PSU

Warning   **Installation of this PSU module should only be performed by qualified personnel.**

Warning   **Do not remove the faulty Power Supply/Cooling module unless you have a replacement unit of the correct type ready for insertion. The system must not be run without all modules in place.**

Safety Requirements

Warning   **Please refer to Section 2.3.3.1, "Safety Requirements", on page 24 before proceeding with the following Installation procedures.**

1   Check for damage, especially to the rear connector on the Power Supply/Cooling module.

Caution   *Handle the module carefully and avoid damaging the connector pins. Do not install the module if any pins appear to be bent.*

2   With the PSU handle (Figure 4–5) in the open position, slide the module into the enclosure.

3   Cam the module home by manually closing the PSU handle (see Figure 4–6). A click should be heard as the handle latches engage (see Figure 4–4)0.

4   **Remove all supply power by turning off the supply at the disconnect device located near to the equipment.**

5   Remove the terminal block cover.

6   Connect the wires in accordance with the Wiring Instructions in section 4.8.1.5.

55

7   Replace the terminal block cover.

8   Turn the supply power back on.

9   Switch on power at the PSU switch.

4.8.1.5   Wiring Instructions for -48V DC PSU

Warning   **The +48V and-48V terminals are not connected to chassis earth.**

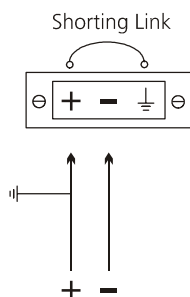**1**   For installations with +48V earthed a shorting link must be added (see Figure 4–7).

Figure 4–7   Shorting Link

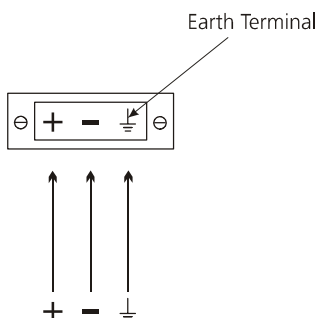**2**   For installations with a separate earth, connect the earth cable to the earth terminal (see Figure 4–8)

Figure 4–8   Separate Earth

4.8.2   I/O Module

Please refer to section 2.5, "I/O Module Installation", on page 29 for full information on installing the I/O module.

Note   Removing/Installing procedures for the I/O and RAID modules are the same.

4.8.2.1   Removing the Module

Warning   **Do not remove this module unless a replacement module of the same type can be immediately added. The system must not be run without all units in place.**

1   Switch off and disconnect the power supply cord.

2 Using two hands, grasp each latch between the thumb and forefinger of each hand. Squeeze thumb and forefinger together to release the latch. Pull the latches forward to cam the module out of the enclosure (Figure 4–9).
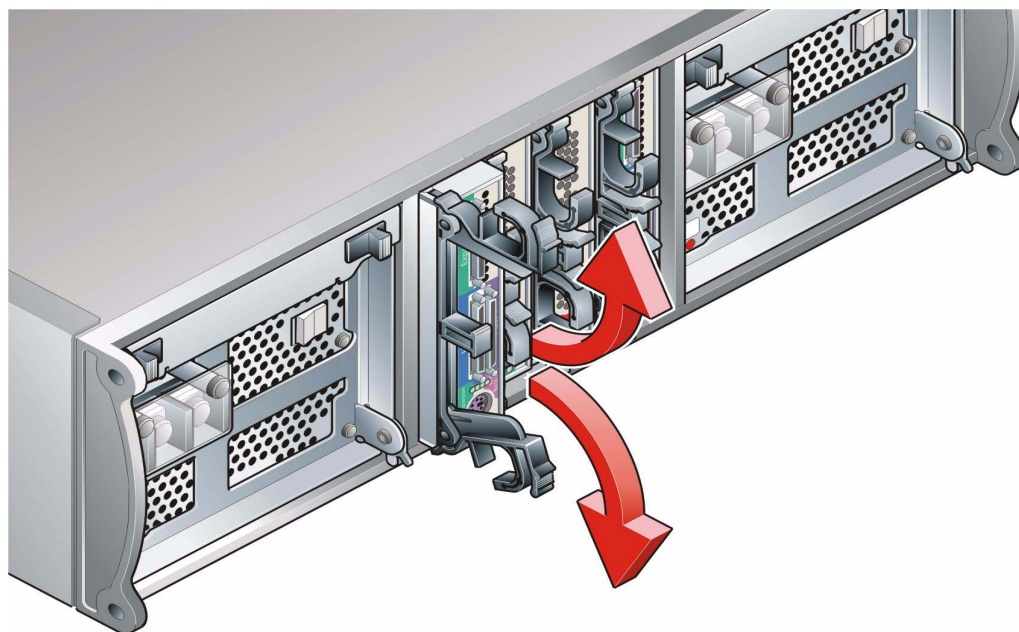
3 Grip the latch handles and withdraw the module.

Figure 4–9   Removing an I/O Module (1)

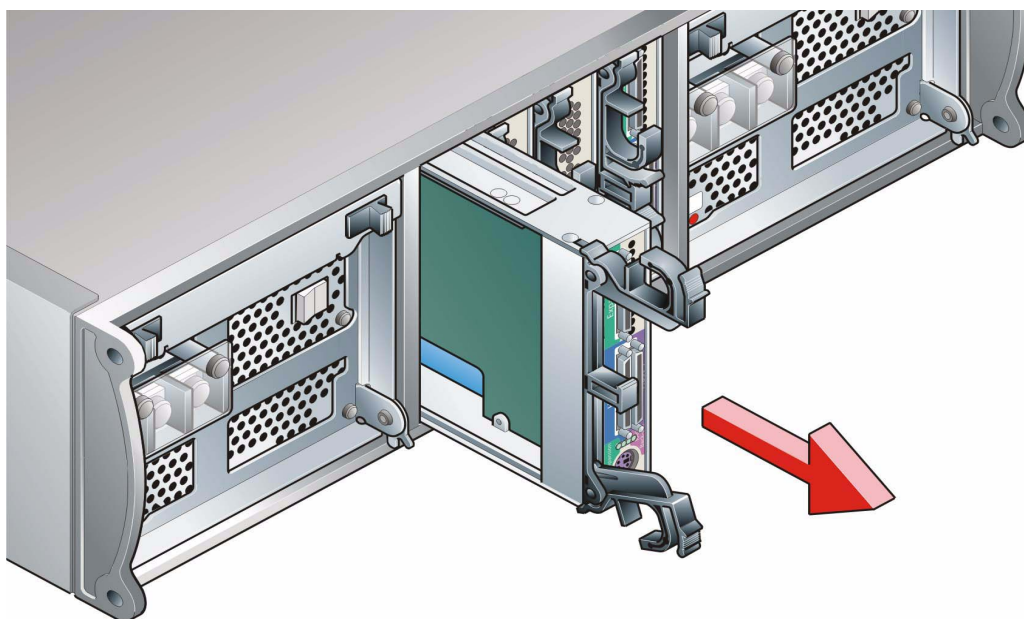**4** Grip the latch handles and withdraw the LRC (Figure 4–10).

Figure 4–10   Removing an I/O Module (2)

4.8.2.2 Inserting the Module

1 With the latch in the open position, slide the I/O module into the enclosure until the latch engages automatically.

2 Cam the module home by manually closing the latches (see Figure 4–11).

3 A click should be heard as the latch engages.

Closed Position

Squeeze two ends of latch together to release

Open Position
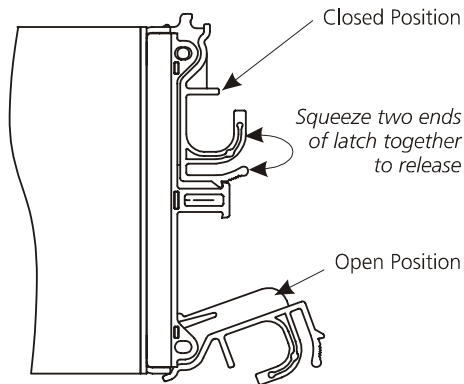
Figure 4–11   LRC Module Latch Operation

Warning   **Ensure that modules are fully aligned before camming the module home.**

4.8.3   RAID Module

Please refer to section 2.6, "RAID Module Installation", on page 30 for full information on installing the RAID module.

Note   Removing/Installing procedures for the I/O and RAID modules are the same.

4.8.3.1 Removing the Module

Warning   **Do not remove this module unless a replacement can be immediately added. The system must not be run without all units in place.**

Important   **This module is designed for Hot Plug replacement. Do not remove the module unless you have a replacement of the correct type ready for insertion. The replacement should have the same firmware level and memory size as the module being replaced. If you are upgrading a single RAID enclosure to dual RAID, the additional RAID module _MUST_ have the same firmware level and memory size as the existing module.**

1 Using two hands, grasp each latch between the thumb and forefinger of each hand. Squeeze thumb and forefinger together to release the latch. Pull the latches forward to cam the module out of the enclosure (Figure 4–9).
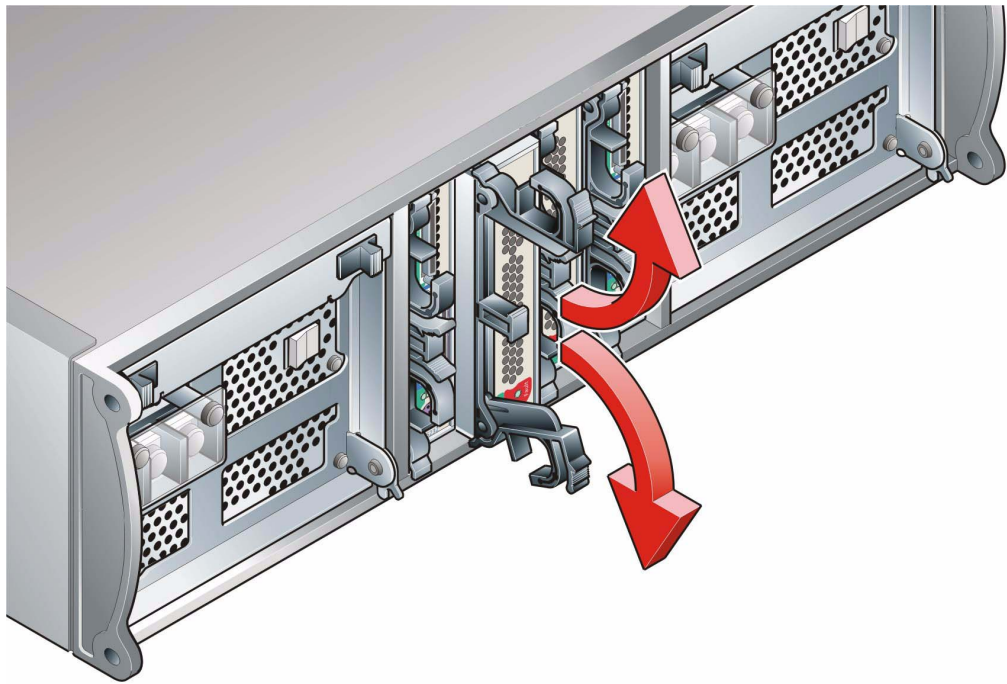
2 Grip the latch handles and withdraw the module.
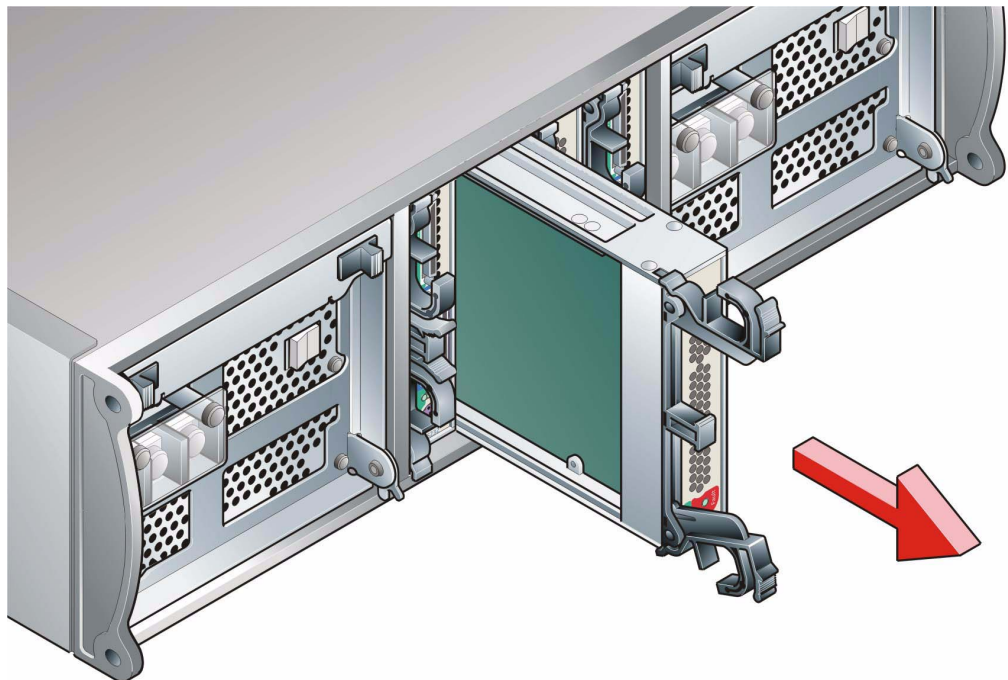
Figure 4–12   Removing a RAID Module (1)

Figure 4–13   Removing a RAID Module (2)

4.8.3.2   Inserting the Module

1   With the latch in the open position, slide the RAID module into the enclosure until the latch engages automatically.

2   Cam the module home by manually closing the latches (see Figure 4–11).

3   A click should be heard as the latch engages.

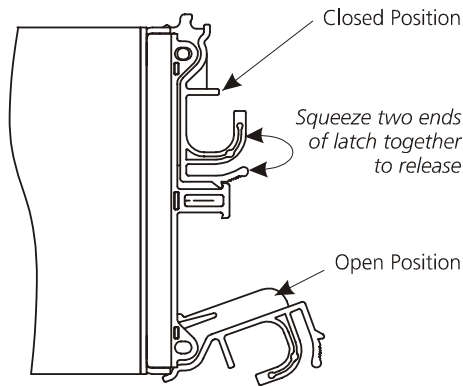**Warning**   **Ensure that modules are fully aligned before camming the module home.**

Figure 4–14   RAID Module Latch Operation

4.8.4   Drive Carrier Module

Please see section 2.9, "Drive Carrier Installation", on page 35 for information on the initial installation of the plug-in modules in the RR-1422-LVD enclosure.

Warning   **Observe all conventional ESD precautions when handling RR-1422-LVD modules and components. Avoid contact with backplane components and module connectors, etc.**

4.8.4.1   Removal and Replacement

Caution   *Drive spin down*
*Damage can occur to a drive if it is removed while still spinning. If possible use the operating system to spindown the drives prior to removal. If this is not possible we recommend that you perform **All** steps of the following procedure to ensure that the drive has stopped prior to removal:*

1   Release the carrier handle, by pressing the latch in the handle downwards.

Note   The anti-tamper lock must be off.

2   Gently withdraw the Drive Carrier module approximately1 inch (25mm) and wait 30 seconds.

3   Withdraw the module from the drive bay and fit a replacement module in accordance with the instructions in Section 2.9, "Drive Carrier Installation".
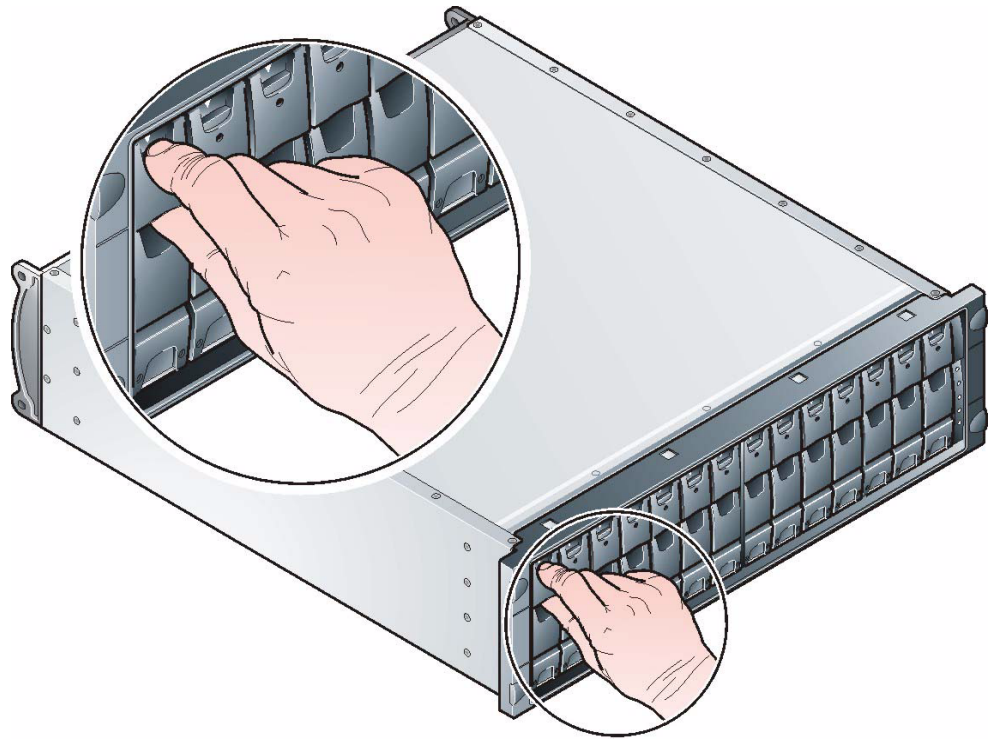
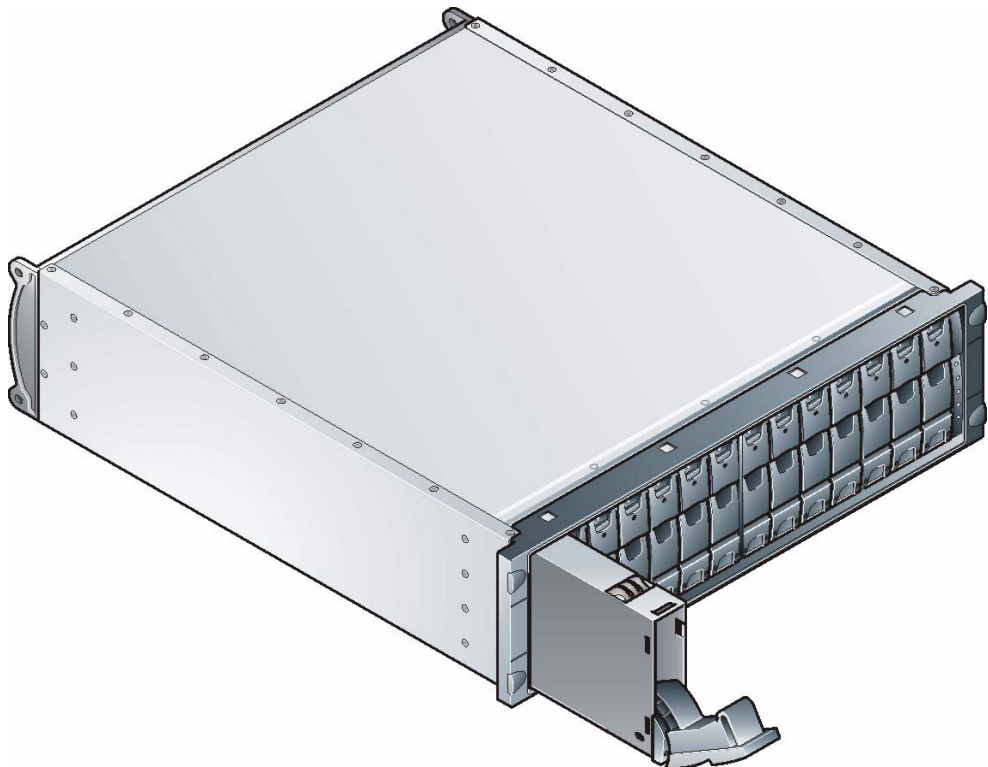**Figure 4–15**   Removing a Drive Module (1)

Figure 4–16   Removing a Drive Module (2)

4.9 Spare Parts and Ancillary Items

The following replaceable parts are available for the RR-1422-LVD subsystem:

- Chassis (including Backplane)
- 19 inch rack mounting rail kit
- AC Power Supply/Cooling Module
- DC Power Supply/Cooling Module
- Drive Carrier Module
- Dummy Carrier Module
- I/O Module
- RAID Module
- Blank RAID Module

- External Ultra-3 SCSI Signal Cables
- Bifurcated power cords
- (Country specific) power cords
- Keys for Drive Carrier modules.
- All documentation
-
-
-

Glossary

In glossary definition*s, italics* are used for items defined elsewhere in the glossary and **bold** is used for the items shown in brackets after the main heading of the entry.

ASCII   American Standard Code for Information Interchange. A 7-bit binary code (0's, 1's) used to represent letters, numbers, and special characters such as $,!, and /. Supported by almost every computer and terminal manufacturer.

Attribute   Setting that controls access to a specific file. Often used to protect important files (such as the Registry files) from accidental change or deletion. Set using the ATTRIB command in MS-DOS.

Backplane   A printed circuit board incorporated in the chassis assembly to provide logic level signal, and low voltage power distribution paths.

Bay   The slot that a unit or media device fits into.

Byte   A group of binary digits stored and operated upon as a unit. A byte may have a coded value equal to a character in the ASCII code (letters, numbers), or have some other value meaningful to the computer. In user documentation, the term usually refers to 8-bit units or characters.
1 kilobyte (K) is equal to 1,024 bytes or characters; 64K indicates 65,536 bytes or characters.

Cable   Throughout this RR-1422-LVD user guide this term is used in accordance with the preferred US context of: "an insulated flexible electric wire used for the transmission of data signals between computer equipment."
Note: Cable is UK preferred terminology for either a power cord or a data cable:

Character   A representation, coded in binary digits, of a letter, number, or other symbol.

Characters Per Second   A data transfer rate generally estimated from the bit rate and the character length. For example, at 2400 bps, 8-bit characters with Start and Stop bits (for a total of ten bits per character) will be transmitted at a rate of approximately 240 characters per second (cps).

Chassis   A sheet metal enclosure incorporating a Backplane PCB and module runner system. The chassis contains a number of 'Bays', each of which can accommodate a plug in module. There are sixteen *drive* carrier bays at the front and five bays at the rear which house *power supply/cooling* and LRC *I/O modules* and also the *Ops Panel*.

Configure   To set up a hardware device and its accompanying software.

Data Communications   A type of communications in which computers and terminals are able to exchange data over an electronic medium.

Disk (drive, carrier, module)   A Ultra-3 SCSI disk **drive** mounted in a **carrier**. You can have up to sixteen disk drive carrier **modules** in each RR-1422-LVD enclosure.

Enclosure   The chassis assembly which houses the plug-in modules that make up the RR-1422-LVD storage subsystem.

ESI/Ops module   A unit used to monitor and control all elements of the Enclosure. The **ESI/Operators (Ops)** panel is supplied as an integral part of the RR-1422-LVD enclosure core product

Hot plugging   A device with the capability of being connected to a subsystem without interrupting the power supplies to that subsystem.

Hot swap   Hot swapping is the term used for manually swapping a failed disk unit with a replacement while the RR-1422-LVD subsystem is in normal use.

Hz (Hertz)   A frequency measurement unit used internationally to indicate cycles per second.

Initialize   To prepare a hardware device for use.

I/O module   A plug-in module used to connect the internal Ultra-3 SCSI channels from the RR-1422-LVD backplane to the rear of the enclosure.

LED   Light Emitting Diode. A small light displayed on the cabinet, disk units and power supply units.

Module (power supply, drive, RAID, SAF-TE I/O)   A module is a power supply, disk drive or electronics unit held in a carrier that plugs into a bay inside the enclosure. A RR-1422-LVD enclosure can contain fourteen **drive** modules and two **power supply/cooling** modules, two **RAID** modules and two **SAF-TE I/O** modules.

Operating system   The software running the host computer. For example, on PCs it is often Windows 95/98, Windows NT or OS/2 and on Hewlett-Packard machines it could be HP-UX.

Parallel Transmission   The transfer of data characters using parallel electrical paths for each bit of the character, for example, 8 paths for 8-bit characters. Data is stored in computers in parallel form, but may be converted to serial form for certain operations. See *Serial Transmission*.

Power Cord   Throughout this RR-1422-LVD user guide this term is used in accordance with the preferred US context of: "an insulated flexible electric wire fitted with connectors at each end and used for the transmission of electrical power to computer equipment.

Protocol   A system of rules and procedures governing communications between two or more devices. Protocols vary, but communicating devices must follow the same protocol in order to exchange data. The format of the data, readiness to receive or send, error detection and error correction are some of the operations that may be defined in protocols.

Redundant   Not essential.

SCSI (channel, ID, interface)   Small Computer Systems Interface. A SCSI **channel** connects a host computer to some or all of its peripheral *devices*. The channel leaves the computer at a SCSI **interface** and enters the first device in the *chain*. On a standard channel, up to seven devices can be chained together. Both ends of the channel are normally terminated.
The SCSI **ID** is the address of the device on the SCSI channel. It is set on the device using buttons. Differentia*l* and Single-ended SCSI devices cannot be mixed on the same channel

Serial Transmission   The transfer of data characters one bit at a time, sequentially, using a single electrical path. See *Parallel Transmissio*n.
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Index