

Sun StorEdge™ A5000 Installation and Service Manual

*Includes the Entire Series of StorEdge A5000 Disk
Arrays (Formerly the Sun Enterprise Network
Array™)*



THE NETWORK IS THE COMPUTER™

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Regulatory Compliance Statements

Your Sun product is marked to indicate its compliance class:

- Federal Communications Commission (FCC) — USA
- Department of Communications (DOC) — Canada
- Voluntary Control Council for Interference (VCCI) — Japan

Please read the appropriate section that corresponds to the marking on your Sun product before attempting to install the product.

FCC Class A Notice

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.
2. This device must accept any interference received, including interference that may cause undesired operation.

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.

Shielded Cables: Connections between the workstation and peripherals must be made using shielded cables in order to maintain compliance with FCC radio frequency emission limits. Networking connections can be made using unshielded twisted-pair (UTP) cables.

Modifications: Any modifications made to this device that are not approved by Sun Microsystems, Inc. may void the authority granted to the user by the FCC to operate this equipment.

FCC Class B Notice

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.
2. This device must accept any interference received, including interference that may cause undesired operation.

Note: 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 communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

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

Shielded Cables: Connections between the workstation and peripherals must be made using shielded cables in order to maintain compliance with FCC radio frequency emission limits. Networking connections can be made using unshielded twisted pair (UTP) cables.

Modifications: Any modifications made to this device that are not approved by Sun Microsystems, Inc. may void the authority granted to the user by the FCC to operate this equipment.

DOC Class A Notice - Avis DOC, Classe A

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

DOC Class B Notice - Avis DOC, Classe B

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

VCCI 基準について


第一種VCCI基準について

第一種VCCIの表示があるワークステーションおよびオプション製品は、第一種情報装置です。これらの製品には、下記の項目が該当します。

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取り扱い説明書に従って正しくお取り扱いください。

第二種VCCI基準について

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取り扱い説明書に従って正しくお取り扱いください。

Safety Agency Compliance Statements

Read this section before beginning any procedure. The following text provides safety precautions to follow when installing a Sun Microsystems product.

Safety Precautions

For your protection, observe the following safety precautions when setting up your equipment:

- Follow all cautions and instructions marked on the equipment.
- Ensure that the voltage and frequency of your power source match the voltage and frequency inscribed on the equipment's electrical rating label.
- Never push objects of any kind through openings in the equipment. Dangerous voltages may be present. Conductive foreign objects could produce a short circuit that could cause fire, electric shock, or damage to your equipment.

Symbols

The following symbols may appear in this book:



Caution – There is risk of personal injury and equipment damage. Follow the instructions.



Caution – Hot surface. Avoid contact. Surfaces are hot and may cause personal injury if touched.



Caution – Hazardous voltages are present. To reduce the risk of electric shock and danger to personal health, follow the instructions.



On – Applies AC power to the system.

Depending on the type of power switch your device has, one of the following symbols may be used:



Off – Removes AC power from the system.



Standby – The On/Standby switch is in the *standby* position.

Modifications to Equipment

Do not make mechanical or electrical modifications to the equipment. Sun Microsystems is not responsible for regulatory compliance of a modified Sun product.

Placement of a Sun Product



Caution – Do not block or cover the openings of your Sun product. Never place a Sun product near a radiator or heat register. Failure to follow these guidelines can cause overheating and affect the reliability of your Sun product.

SELV Compliance

Safety status of I/O connections comply to SELV requirements.

Power Cord Connection



Caution – Sun products are designed to work with single-phase power systems having a grounded neutral conductor. To reduce the risk of electric shock, do not plug Sun products into any other type of power system. Contact your facilities manager or a qualified electrician if you are not sure what type of power is supplied to your building.



Caution – Not all power cords have the same current ratings. Household extension cords do not have overload protection and are not meant for use with computer systems. Do not use household extension cords with your Sun product.



Caution – Your Sun product is shipped with a grounding type (three-wire) power cord. To reduce the risk of electric shock, always plug the cord into a grounded power outlet.

The following caution applies only to devices with a **Standby** power switch:



Caution – The power switch of this product functions as a standby type device only. The power cord serves as the primary disconnect device for the system. Be sure to plug the power cord into a grounded power outlet that is nearby the system and is readily accessible. Do not connect the power cord when the power supply has been removed from the system chassis.

System Unit Cover

You must remove the cover of your Sun computer system unit in order to add cards, memory, or internal storage devices. Be sure to replace the top cover before powering up your computer system.



Caution – Do not operate Sun products without the top cover in place. Failure to take this precaution may result in personal injury and system damage.

Laser Compliance Notice

Sun products that use laser technology comply with Class 1 laser requirements.



Einhaltung sicherheitsbehördlicher Vorschriften

Auf dieser Seite werden Sicherheitsrichtlinien beschrieben, die bei der Installation von Sun-Produkten zu beachten sind.

Sicherheitsvorkehrungen

Treffen Sie zu Ihrem eigenen Schutz die folgenden Sicherheitsvorkehrungen, wenn Sie Ihr Gerät installieren:

- Beachten Sie alle auf den Geräten angebrachten Warnhinweise und Anweisungen.
- Vergewissern Sie sich, daß Spannung und Frequenz Ihrer Stromquelle mit der Spannung und Frequenz übereinstimmen, die auf dem Etikett mit den elektrischen Nennwerten des Geräts angegeben sind.
- Stecken Sie auf keinen Fall irgendwelche Gegenstände in Öffnungen in den Geräten. Leitfähige Gegenstände könnten aufgrund der möglicherweise vorliegenden gefährlichen Spannungen einen Kurzschluß verursachen, der einen Brand, Stromschlag oder Geräteschaden herbeiführen kann.

Symbole

Die Symbole in diesem Handbuch haben folgende Bedeutung:



Achtung – Gefahr von Verletzung und Geräteschaden. Befolgen Sie die Anweisungen.



Achtung – Hohe Temperatur. Nicht berühren, da Verletzungsgefahr durch heiße Oberfläche besteht.



Achtung – Gefährliche Spannungen. Anweisungen befolgen, um Stromschläge und Verletzungen zu vermeiden.

Ein – Setzt das System unter Wechselstrom.

Je nach Netzschaltertyp an Ihrem Gerät kann eines der folgenden Symbole benutzt werden:



Aus – Unterbricht die Wechselstromzufuhr zum Gerät.



Wartezustand (Stand-by-Position) - Der Ein-/Wartezustand-Schalter steht auf Wartezustand. Änderungen an Sun-Geräten.

Nehmen Sie keine mechanischen oder elektrischen Änderungen an den Geräten vor. Sun Microsystems, übernimmt bei einem Sun-Produkt, das geändert wurde, keine Verantwortung für die Einhaltung behördlicher Vorschriften

Aufstellung von Sun-Geräten



Achtung – Um den zuverlässigen Betrieb Ihres Sun-Geräts zu gewährleisten und es vor Überhitzung zu schützen, dürfen die Öffnungen im Gerät nicht blockiert oder verdeckt werden. Sun-Produkte sollten niemals in der Nähe von Heizkörpern oder Heizluftklappen aufgestellt werden.

Einhaltung der SELV-Richtlinien

Die Sicherung der I/O-Verbindungen entspricht den Anforderungen der SELV-Spezifikation.

Anschluß des Netzkabels



Achtung – Sun-Produkte sind für den Betrieb an Einphasen-Stromnetzen mit geerdetem Nulleiter vorgesehen. Um die Stromschlaggefahr zu reduzieren, schließen Sie Sun-Produkte nicht an andere Stromquellen an. Ihr Betriebsleiter oder ein qualifizierter Elektriker kann Ihnen die Daten zur Stromversorgung in Ihrem Gebäude geben.



Achtung – Nicht alle Netzkabel haben die gleichen Nennwerte. Herkömmliche, im Haushalt verwendete Verlängerungskabel besitzen keinen Überlastungsschutz und sind daher für Computersysteme nicht geeignet.



Achtung – Ihr Sun-Gerät wird mit einem dreidradigen Netzkabel für geerdete Netzsteckdosen geliefert. Um die Gefahr eines Stromschlags zu reduzieren, schließen Sie das Kabel nur an eine fachgerecht verlegte, geerdete Steckdose an.

Die folgende Warnung gilt nur für Geräte mit Wartezustand-Netzschalter:



Achtung – Der Ein/Aus-Schalter dieses Geräts schaltet nur auf Wartezustand (Stand-By-Modus). Um die Stromzufuhr zum Gerät vollständig zu unterbrechen, müssen Sie das Netzkabel von der Steckdose abziehen. Schließen Sie den Stecker des Netzkabels an eine in der Nähe befindliche, frei zugängliche, geerdete Netzsteckdose an. Schließen Sie das Netzkabel nicht an, wenn das Netzteil aus der Systemeinheit entfernt wurde.

Gehäuseabdeckung

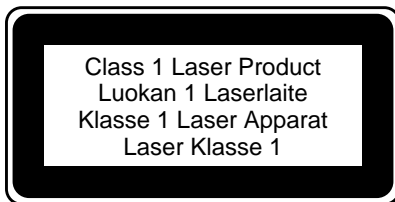
Sie müssen die obere Abdeckung Ihres Sun-Systems entfernen, um interne Komponenten wie Karten, Speicherchips oder Massenspeicher hinzuzufügen. Bringen Sie die obere Gehäuseabdeckung wieder an, bevor Sie Ihr System einschalten.



Achtung – Bei Betrieb des Systems ohne obere Abdeckung besteht die Gefahr von Stromschlag und Systemschäden.

Einhaltung der Richtlinien für Laser

Sun-Produkte, die mit Laser-Technologie arbeiten, entsprechen den Anforderungen der Laser Klasse 1.



Conformité aux normes de sécurité

Ce texte traite des mesures de sécurité qu'il convient de prendre pour l'installation d'un produit Sun Microsystems.

Mesures de sécurité

Pour votre protection, veuillez prendre les précautions suivantes pendant l'installation du matériel :

- Suivre tous les avertissements et toutes les instructions inscrites sur le matériel.
- Vérifier que la tension et la fréquence de la source d'alimentation électrique correspondent à la tension et à la fréquence indiquées sur l'étiquette de classification de l'appareil.
- Ne jamais introduire d'objets quels qu'ils soient dans une des ouvertures de l'appareil. Vous pourriez vous trouver en présence de hautes tensions dangereuses. Tout objet conducteur introduit de la sorte pourrait produire un court-circuit qui entraînerait des flammes, des risques d'électrocution ou des dégâts matériels.

Symboles

Vous trouverez ci-dessous la signification des différents symboles utilisés :



Attention : risques de blessures corporelles et de dégâts matériels. Veuillez suivre les instructions.



Attention : surface à température élevée. Evitez le contact. La température des surfaces est élevée et leur contact peut provoquer des blessures corporelles.



Attention : présence de tensions dangereuses. Pour éviter les risques d'électrocution et de danger pour la santé physique, veuillez suivre les instructions.



MARCHE – Votre système est sous tension (courant alternatif).

Un des symboles suivants sera peut-être utilisé en fonction du type d'interrupteur de votre système:



ARRET – Votre système est hors tension (courant alternatif).



VEILLEUSE – L'interrupteur Marche/Veilleuse est en position « Veilleuse ».

Modification du matériel

Ne pas apporter de modification mécanique ou électrique au matériel. Sun Microsystems n'est pas responsable de la conformité réglementaire d'un produit Sun qui a été modifié.

Positionnement d'un produit Sun



Attention : pour assurer le bon fonctionnement de votre produit Sun et pour l'empêcher de surchauffer, il convient de ne pas obstruer ni recouvrir les ouvertures prévues dans l'appareil. Un produit Sun ne doit jamais être placé à proximité d'un radiateur ou d'une source de chaleur.

Conformité SELV

Sécurité : les raccordements E/S sont conformes aux normes SELV.

Connexion du cordon d'alimentation



Attention : les produits Sun sont conçus pour fonctionner avec des alimentations monophasées munies d'un conducteur neutre mis à la terre. Pour écarter les risques d'électrocution, ne pas brancher de produit Sun dans un autre type d'alimentation secteur. En cas de doute quant au type d'alimentation électrique du local, veuillez vous adresser au directeur de l'exploitation ou à un électricien qualifié.



Attention : tous les cordons d'alimentation n'ont pas forcément la même puissance nominale en matière de courant. Les rallonges d'usage domestique n'offrent pas de protection contre les surcharges et ne sont pas prévues pour les systèmes d'ordinateurs. Ne pas utiliser de rallonge d'usage domestique avec votre produit Sun.



Attention : votre produit Sun a été livré équipé d'un cordon d'alimentation à trois fils (avec prise de terre). Pour écarter tout risque d'électrocution, branchez toujours ce cordon dans une prise mise à la terre.

L'avertissement suivant s'applique uniquement aux systèmes équipés d'un interrupteur VEILLEUSE:



Attention : le commutateur d'alimentation de ce produit fonctionne comme un dispositif de mise en veille uniquement. C'est la prise d'alimentation qui sert à mettre le produit hors tension. Veuillez donc à installer le produit à proximité d'une prise murale facilement accessible. Ne connectez pas la prise d'alimentation lorsque le châssis du système n'est plus alimenté.

Couvercle

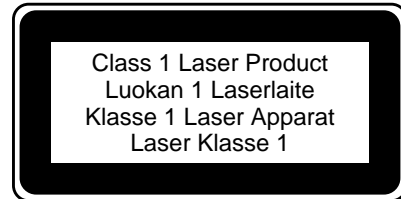
Pour ajouter des cartes, de la mémoire, ou des unités de stockage internes, vous devrez démonter le couvercle de l'unité système Sun. Ne pas oublier de remettre ce couvercle en place avant de mettre le système sous tension.



Attention : il est dangereux de faire fonctionner un produit Sun sans le couvercle en place. Si l'on néglige cette précaution, on encourt des risques de blessures corporelles et de dégâts matériels.

Conformité aux certifications Laser

Les produits Sun qui font appel aux technologies lasers sont conformes aux normes de la classe 1 en la matière.



Normativas de seguridad

El siguiente texto incluye las medidas de seguridad que se deben seguir cuando se instale algún producto de Sun Microsystems.

Precauciones de seguridad

Para su protección observe las siguientes medidas de seguridad cuando manipule su equipo:

- Siga todas las avisos e instrucciones marcados en el equipo.
- Asegúrese de que el voltaje y la frecuencia de la red eléctrica concuerdan con las descritas en las etiquetas de especificaciones eléctricas del equipo.

- No introduzca nunca objetos de ningún tipo a través de los orificios del equipo. Pueden haber voltajes peligrosos. Los objetos extraños conductores de la electricidad pueden producir cortocircuitos que provoquen un incendio, descargas eléctricas o daños en el equipo.

Símbolos

En este libro aparecen los siguientes símbolos:



Precaución – Existe el riesgo de lesiones personales y daños al equipo. Siga las instrucciones.



Precaución – Superficie caliente. Evite el contacto. Las superficies están calientes y pueden causar daños personales si se tocan.



Precaución – Voltaje peligroso presente. Para reducir el riesgo de descarga y daños para la salud siga las instrucciones.



Encendido – Aplica la alimentación de CA al sistema.

Según el tipo de interruptor de encendido que su equipo tenga, es posible que se utilice uno de los siguientes símbolos:



Apagado – Elimina la alimentación de CA del sistema.



En espera – El interruptor de Encendido/En espera se ha colocado en la posición de *En espera*.

Modificaciones en el equipo

No realice modificaciones de tipo mecánico o eléctrico en el equipo. Sun Microsystems no se hace responsable del cumplimiento de las normativas de seguridad en los equipos Sun modificados.

Ubicación de un producto Sun



Precaución – Para asegurar la fiabilidad de funcionamiento de su producto Sun y para protegerlo de sobrecalentamientos no deben obstruirse o taparse las rejillas del equipo. Los productos Sun nunca deben situarse cerca de radiadores o de fuentes de calor.

Cumplimiento de la normativa SELV

El estado de la seguridad de las conexiones de entrada/salida cumple los requisitos de la normativa SELV.

Conexión del cable de alimentación eléctrica



Precaución – Los productos Sun están diseñados para trabajar en una red eléctrica monofásica con toma de tierra. Para reducir el riesgo de descarga eléctrica, no conecte los productos Sun a otro tipo de sistema de alimentación eléctrica. Póngase en contacto con el responsable de mantenimiento o con un electricista cualificado si no está seguro del sistema de alimentación eléctrica del que se dispone en su edificio.



Precaución – No todos los cables de alimentación eléctrica tienen la misma capacidad. Los cables de tipo doméstico no están provistos de protecciones contra sobrecargas y por tanto no son apropiados para su uso con computadores. No utilice alargadores de tipo doméstico para conectar sus productos Sun.



Precaución – Con el producto Sun se proporciona un cable de alimentación con toma de tierra. Para reducir el riesgo de descargas eléctricas conéctelo siempre a un enchufe con toma de tierra.

La siguiente advertencia se aplica solamente a equipos con un interruptor de encendido que tenga una posición "En espera":



Precaución – El interruptor de encendido de este producto funciona exclusivamente como un dispositivo de puesta en espera. El enchufe de la fuente de alimentación está diseñado para ser el elemento primario de desconexión del equipo. El equipo debe instalarse cerca del enchufe de forma que este último pueda ser fácil y rápidamente accesible. No conecte el cable de alimentación cuando se ha retirado la fuente de alimentación del chasis del sistema.

Tapa de la unidad del sistema

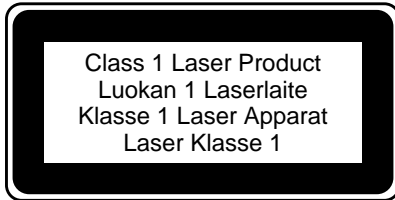
Debe quitar la tapa del sistema cuando sea necesario añadir tarjetas, memoria o dispositivos de almacenamiento internos. Asegúrese de cerrar la tapa superior antes de volver a encender el equipo.



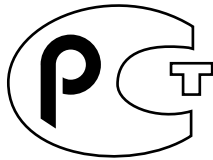
Precaución – Es peligroso hacer funcionar los productos Sun sin la tapa superior colocada. El hecho de no tener en cuenta esta precaución puede ocasionar daños personales o perjudicar el funcionamiento del equipo.

Aviso de cumplimiento con requisitos de láser

Los productos Sun que utilizan la tecnología de láser cumplen con los requisitos de láser de Clase 1.



GOST-R Certification Mark



Declaration of Conformity

Compliance ID: 1620

Product Name: Sun StorEdge A5000

This product has been tested and complies with:

EMC

European Union-EC

This equipment complies with the following requirements of the EMC Directive 89/336/EEC

EN55022 / CISPR22 (1985)		Class A
EN50082-1	IEC801-2 (1991)	4 kV (Direct), 8 kV (Air)
	IEC801-3 (1984)	3 V/m
	IEC801-4 (1988)	1.0 kV Power Lines, 0.5 kV Signal Lines
EN61000-3-2/IEC1000-3-2(1994)		Pass

Safety

This equipment complies with the following requirements of the Low Voltage Directive 73/23/EEC:

EC Type Examination Certificates:

EN60950/IEC950

EN60950 w/ Nordic Deviations

Supplementary Information

This product was tested and complies with all the requirements for the CE Mark when connected to a Sun workstation or server.

/ S /

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Preface

The Sun StorEdge A5000 Installation and Service Manual provides installation and service instructions for the Sun StorEdge™ A5000 disk array. These instructions are designed for an experienced system administrator or trained service provider.

Using UNIX Commands

This document does not contain information on basic UNIX® commands and procedures such as shutting down the system, booting the system, and configuring devices.

See one or more of the following for this information:

- *Solaris Handbook for Sun Peripherals*
- AnswerBook™ online documentation for the Solaris™ software environment
- Other software documentation that you received with your system

Typographic Conventions

TABLE P-1 Typographic Conventions

Typeface	Meaning	Examples
AaBbCc123	The names of commands, files, and directories; on-screen computer output	Edit your <code>.login</code> file. Use <code>ls -a</code> to list all files. % You have mail.
AaBbCc123	What you type, when contrasted with on-screen computer output	% su Password:
<i>AaBbCc123</i>	Book titles, new words or terms, words to be emphasized	Read Chapter 6 in the <i>User's Guide</i> . These are called <i>class</i> options. You <i>must</i> be superuser to do this.
	Command-line variable; replace with a real name or value	To delete a file, type <code>rm filename</code> .

Shell Prompts

TABLE P-2 Shell Prompts

Shell	Prompt
C shell	<i>machine_name%</i>
C shell superuser	<i>machine_name#</i>
Bourne shell and Korn shell	\$
Bourne shell and Korn shell superuser	#

Related Documentation

Refer to the *Sun StorEdge A5000 Installation and Documentation Guide*, part number 805-1903, for a list of related documentation.

Sun Documentation on the Web

The `docs.sun.comsm` web site enables you to access Sun technical documentation on the Web. You can browse the `docs.sun.com` archive or search for a specific book title or subject at:

`http://docs.sun.com`

Sun Welcomes Your Comments

We are interested in improving our documentation and welcome your comments and suggestions. You can email your comments to us at:

`docfeedback@sun.com`

Please include the part number of your document in the subject line of your email.

Product Description

The Sun StorEdge A5000 disk array is a high-availability mass storage subsystem capable of supporting up to fourteen 1.6-inch disk drives (14-slot) or twenty-two 1-inch disk drives (22-slot). Communication to other devices is through one or two interface boards, each with up to two gigabit interface converters (GBICs). A front panel module (FPM) enables the configuration of the enclosure to be displayed and modified. Active components in the disk array are redundant and can be replaced while the disk array is operating.



Caution – If over half of the disk drive bays are loaded and the disk array has two power supplies, the power system is not redundant. If one of the power supplies fails and there is heavy drive activity, the disk array may power off.

The enclosure is designed to be mounted in a Sun™ rack, on a tabletop, or on a Sun Enterprise™ caster configuration.

This chapter contains the following topics:

- Front Components—page 1-2
- Rear Components—page 1-4
- Internal Components—page 1-6

1.1 Front Components

FIGURE 1-1 and FIGURE 1-2 show and TABLE 1-1 describes the front components.

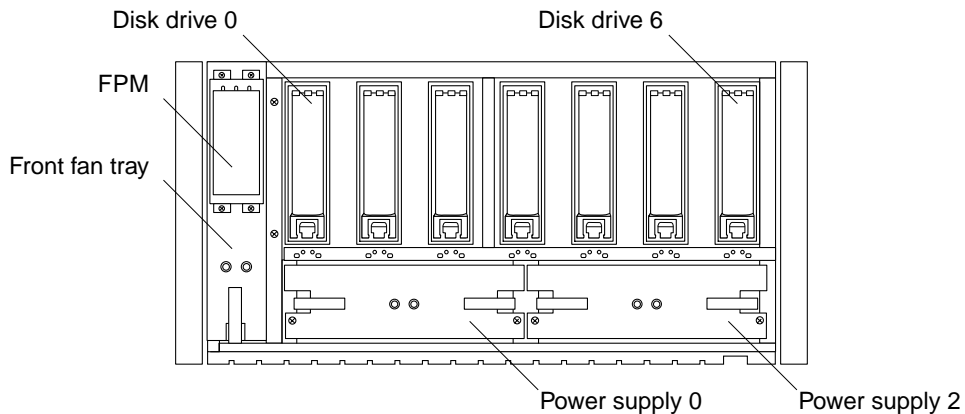


FIGURE 1-1 Front Components (14-slot)

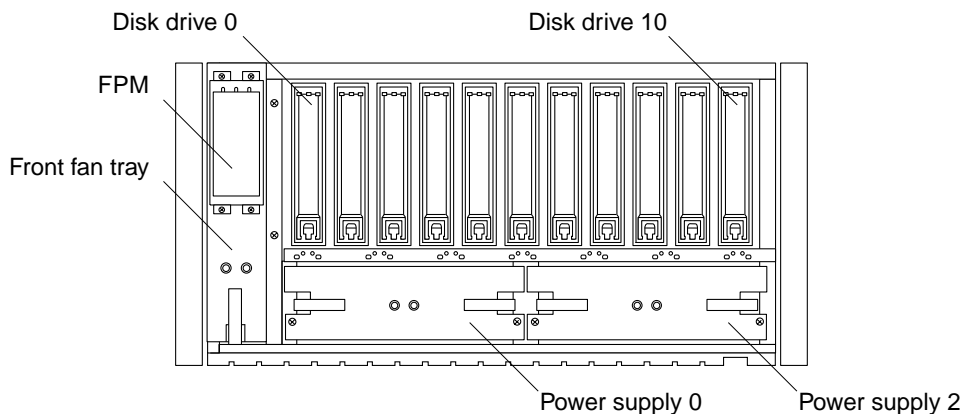


FIGURE 1-2 Front Components (22-slot)

TABLE 1-1 Front Components

Component	Description
Disk drives	3.5-inch disk drives, SFF-8045 Fibre Channel Single Connector specification. Dual 100 Mbytes/sec FC-AL ports on each drive.
Power supplies	Takes AC power from the interconnect board and supplies DC voltages of +5, +3.3, and +12 volts to a common power circuit.
FPM	<p>The front panel module (FPM) uses an electroluminescent display (ELD) panel to display configuration, status, and diagnostic information. The FPM is equipped with a touch screen that you can use to monitor and change configurations. See Section 5.2 “FPM Main Screens” on page 5-3 for more information.</p> <p>Three LEDs at the top of the FPM show the overall enclosure status. See Section 6.4 “Enclosure” on page 6-5 for more information.</p>
Fan trays	Provides cooling to the disk array.

In the minimum disk drive configuration for the 14-slot disk array, disk drives are shipped in front backplane slots 3 and 6.

In the minimum disk drive configuration for the 22-slot disk array, disk drives are shipped in front backplane slots 0, 5, and 10.

Note – Do not move disk drives from the minimum configurations.

1.2 Rear Components

FIGURE 1-3 and FIGURE 1-4 show and TABLE 1-2 describes the rear components.

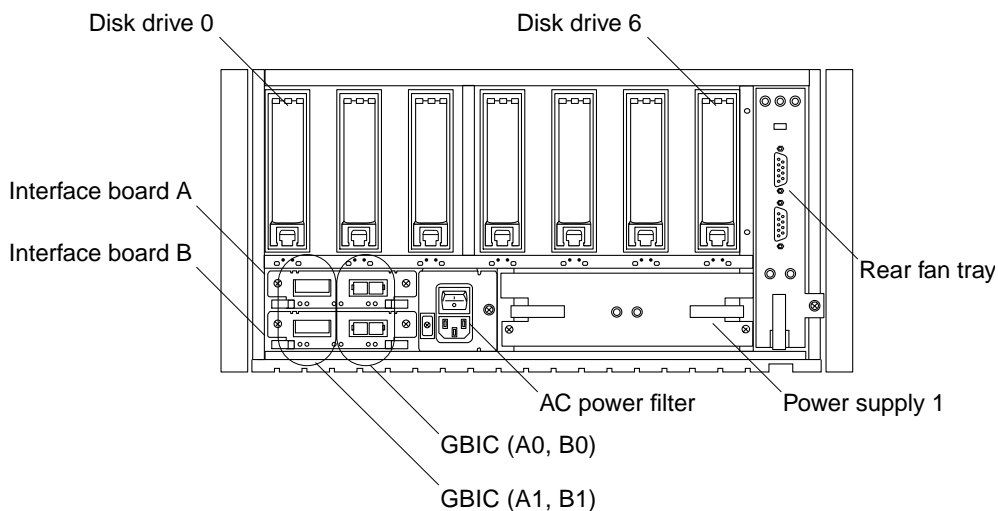


FIGURE 1-3 Rear Components (14-slot)

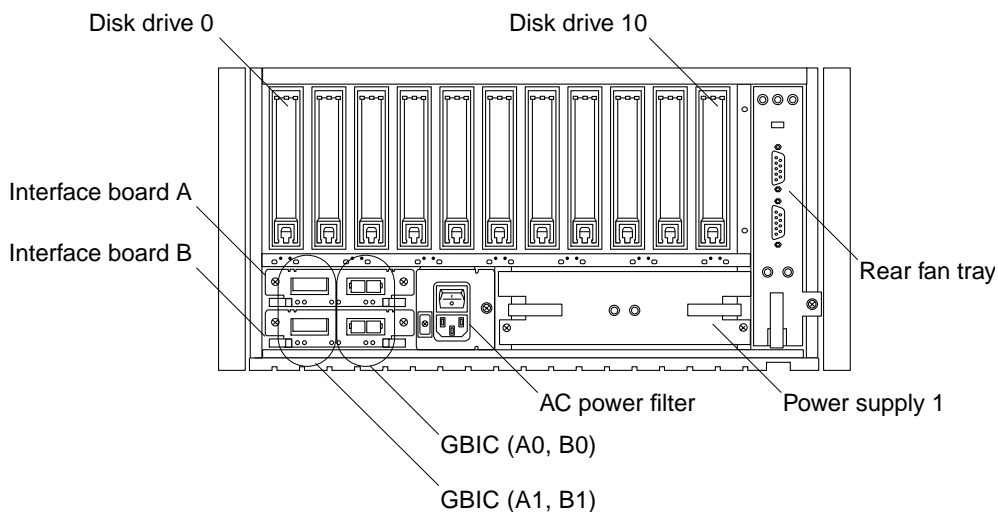


FIGURE 1-4 Rear Components (22-slot)

TABLE 1-2 Rear Components

Component	Description
Disk drives	3.5-inch disk drives, SFF-8045 Fibre Channel Single Connector specification. Dual 100 Mbytes/sec FC-AL ports on each drive.
Interface boards	Provides all intelligent controls in the enclosure, sensing and setting the environmental service signals as required by conditions inside the enclosure. The interface board receives, reclocks, and provides bypass services for two independent FC-AL ports and manages the configuration of the internal loops.
GBICs	The gigabit interface converter (GBIC) is a hot-pluggable unit that converts any of the standard Fibre Channel connectors and signaling technologies.
AC power filter	Filters AC power and routes it to the interconnect assembly.
Power supplies	Takes AC power from the interface board and supplies DC voltages of +5, +3.3, and +12 volts to a common power circuit.
Fan trays	Provides cooling to the disk array.

In the minimum disk drive configuration for the 14-slot disk array, disk drives are shipped in rear backplane slots 0, 3, and 6.

In the minimum disk drive configuration for the 22-slot disk array, disk drives are shipped in rear backplane slots 0, 3, 6, and 10.

Note – Do not move disk drives from the minimum configurations.

1.3 Internal Components

FIGURE 1-5 shows and TABLE 1-3 describes the internal components.

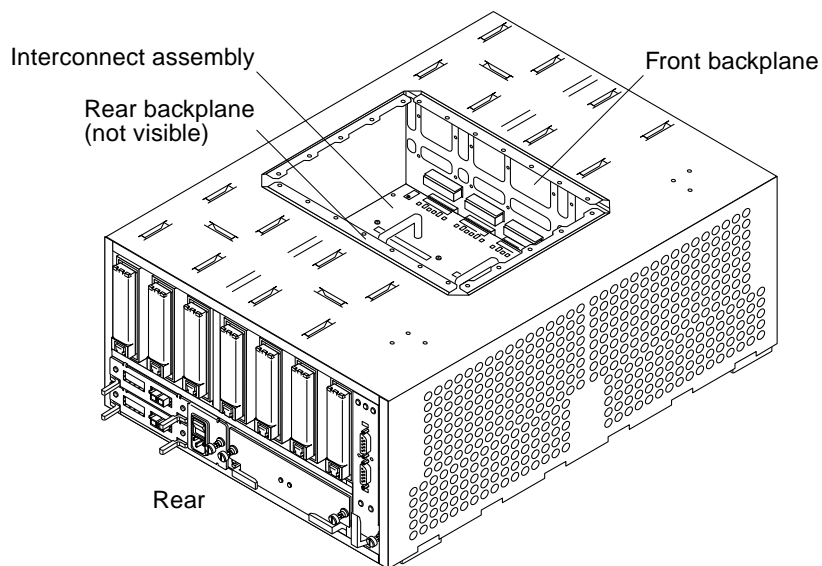


FIGURE 1-5 Internal Components

TABLE 1-3 Internal Components

Component	Description
Interconnect assembly	Routes power, control, sense, and Fibre Channel signals between internal components.
Backplanes	Routes power, control, sense, and Fibre Channel signals from the interconnect assembly to the disk drive slots.

Tabletop Installation

This chapter describes how to install a disk array in a tabletop configuration.

This chapter contains the following topics:

- Electrical Requirements—page 2-2
- Placement—page 2-2
- Inspecting the Disk Array—page 2-3
- Installing the Disk Array—page 2-3

2.1 Electrical Requirements

The disk array uses nominal input voltages of 100–120 VAC or 200–240 VAC. Sun products are designed to work with single-phase power systems having a grounded neutral conductor.



Caution – To reduce the risk of electrical shock, do not connect Sun products into another type of power source. Contact your facilities manager or a qualified electrician if you are unsure what type of power is supplied to your building.

2.2 Placement



Caution – This installation requires two people to lift and move the disk array. Use care to avoid injury. A disk array may weigh up to 120 pounds (54 kg).

The disk array is designed to sit on a desk or table. Use the following guidelines to prepare a location for your system.

- Choose a desk or table that can support up to 120 pounds (54 kg) for a fully configured disk array.
- Leave enough space in front of and behind the disk array so you can access internal components.
- Provide a minimum space of 6 inches (15 cm) on all sides of the disk array for adequate air flow.
- Keep power and interface cables clear of foot traffic. Route cables inside walls, under the floor, through the ceiling, or in protective channels.
- To avoid air flow from one subsystem air outlet to another subsystem air inlet, do not place tabletop disk arrays next to each other. Cooling air is heated as it passes through each machine and can become hot enough to exceed the operating temperature range of the disk array.

2.3 Inspecting the Disk Array

1. **Unpack the disk array.**
2. **Inspect the disk array for evidence of damage.**
If damaged, keep all contents and packing materials for the shipping company's agent to inspect.
3. **Save the packing materials for future use.**

2.4 Installing the Disk Array

Installing the disk array involves connecting the power cord, adding additional interface boards and GBICs if needed, and routing the fiber optic cables. Read this section before beginning the installation.

2.4.1 Connecting the Power Cord

1. **Make sure that the power switch for the disk array is off.**
2. **Connect the power cord to the AC connector on the rear panel of the disk array (FIGURE 2-1).**

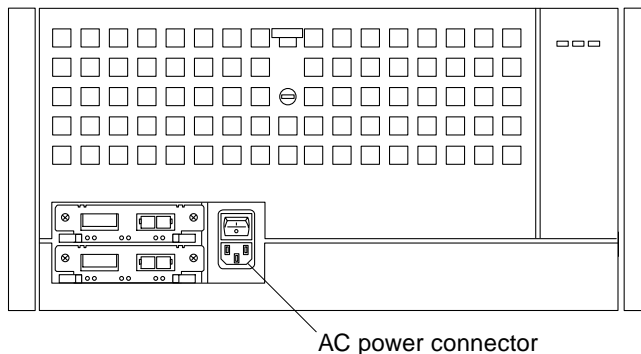


FIGURE 2-1 AC Power Connector

3. Connect the power cord to a grounded wall outlet.

The power cord provides a ground path that will keep the drives and boards installed in your unit from being damaged by static electricity.

Note – The outlet must be a 100–120 or 200–240 VAC 15A circuit.

2.4.2 Installing Additional Interface Boards and GBICs

Depending upon your configuration, you may need to install additional interface boards or GBICs. Refer to the *Sun StorEdge A5000 Hardware Configuration Guide*, part number 805-0264.

If you need to install additional GBICs, see Section 7.2.3 “GBIC” on page 7-9.

If you need to install an additional interface board, see Section 7.2.4 “Interface Board” on page 7-11.

2.4.3 Connecting Fiber Optic Cables

1. Power on the disk array.

2. Remove the covers from the connectors of the fiber optic cable that was shipped with your disk array.

Store the connector covers in a safe place. Always place the covers over the cable connectors when the cable is not in use.

You may find a cotton swab in the plastic bag with the fiber optic cable. Use this swab to clean the connector whenever it has been removed for a long time. You do not need to clean the connector now.

3. If you plan to connect more than one disk array to a loop, make sure the Box ID for each disk array is a unique value (0–3).

See Section 5.5 “Set-Up 1” on page 5-6.

4. Using the `luxadm` command, enter a unique Box Name for each disk array.

See Section 5.5 “Set-Up 1” on page 5-6.

5. Connect one end of the fiber optic cable to the GBIC (FIGURE 2-2).

Note – Fiber optic cable connectors are keyed to prevent improper insertion; they can only be installed as shown in FIGURE 2-2.

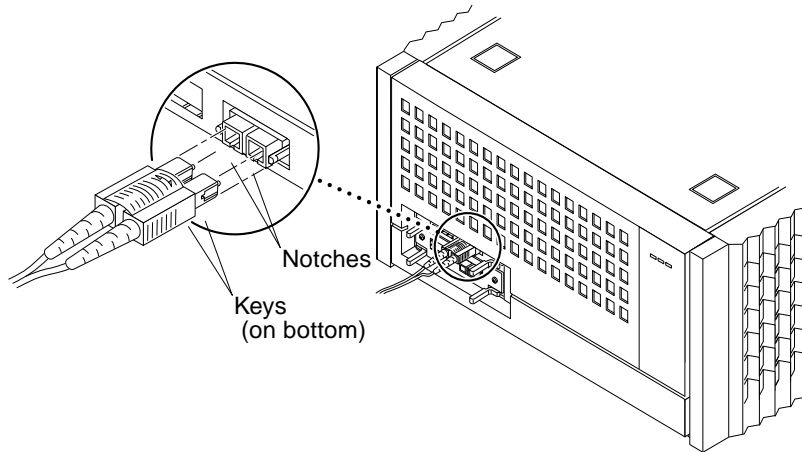


FIGURE 2-2 GBIC on the Rear Panel

6. Connect the other end of the fiber optic cable to the other device that will be connected to the disk array.

Refer to the *Sun StorEdge A5000 Hardware Configuration Guide* and the documentation that came with the device.

7. Repeat Step 5 through Step 6 to connect additional fiber optic cables.

Stacker Installation

The disk array can be stacked on top of a Sun Enterprise 4x00 system. For mounting instructions, refer to the *Sun Enterprise Caster Base Installation Guide*, part number 802-5034. For cabling instructions, see Chapter 2.

Note – The only supported configuration is a single Sun StorEdge A5000 disk array stacked on top of an Enterprise 4x00 system.

Rackmount Installation

This chapter describes how to install a disk array in system or expansion cabinets.

This chapter contains the following topics:

- Preparing the Disk Array—page 4-2
- Installing the Rails—page 4-7
- Installing the Chassis in the Cabinet—page 4-8

4.1 Rackmount Placement

Rackmount placement information for the disk array, as well as other devices that can be mounted in Sun system and expansion cabinets, is available on the Web at:

<http://docs.sun.com>

Click on “by Title,” and then open the *Rackmount Placement Matrix* document.

If you do not have access to the Web, contact your service provider.

Note – Retrieve the placement information for the disk array before beginning the installation.

4.2 Preparing the Disk Array

To install a tabletop version of the disk array in a rack, you must remove the side panels and install a baseplate on the bottom of the chassis. Go to Section 4.3 “Installing the Rails” on page 4-7 if your disk array is already configured for cabinet installation.



Caution – This procedure requires two people to lift and move the disk array. Use care to avoid injury. A disk array with a baseplate attached may weigh up to 130 pounds (59 kg).

4.2.1 Removing the Side Panels

1. Use a No. 1 Phillips screwdriver to remove the three screws from a side panel (FIGURE 4-1).

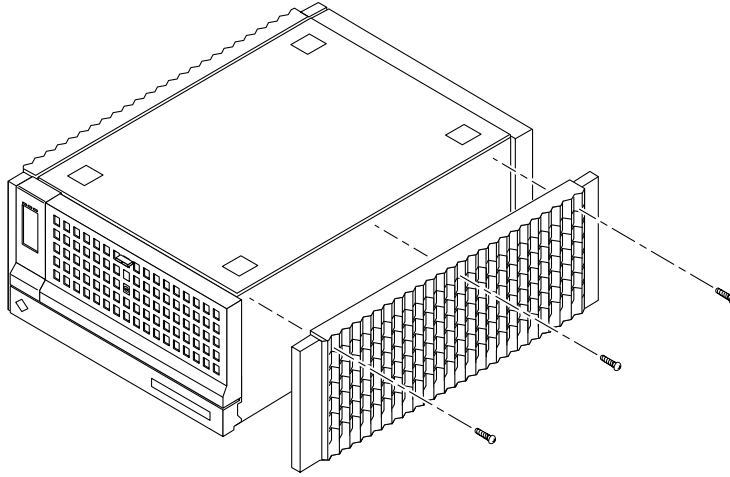


FIGURE 4-1 Removing the Side Panels

2. Pull the panel away from of the chassis and set it aside.
3. Repeat to remove the remaining side panel.

Note – The plastic panels are recyclable. They will not be reused. You can store them or recycle them in accordance with local regulations.

4.2.2 Installing the Baseplate on the Chassis

The baseplate mounts to the chassis underside.

Note – The Sun StorEdge Expansion Cabinet uses a two-part baseplate. Other system and expansion cabinets use a solid baseplate.

1. **With the aid of an assistant, invert the chassis with the front facing you** (FIGURE 4-2).
2. **Remove the screws from the feet.**
Discard the feet. They are not reused.

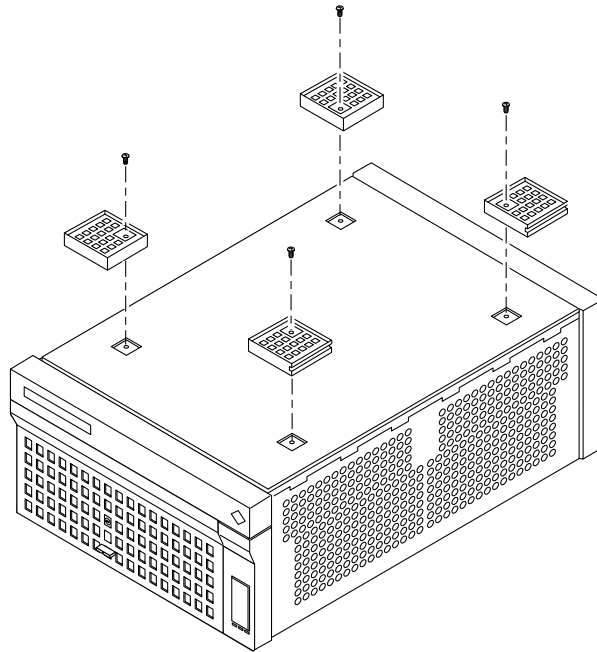


FIGURE 4-2 Removing the Feet

3. Place the baseplate on the chassis.

- For disk arrays being installed in a Sun StorEdge Expansion Cabinet, use the two-part baseplate (FIGURE 4-3).

Make sure that the vented baseplate is installed on the exhaust side of the disk array.

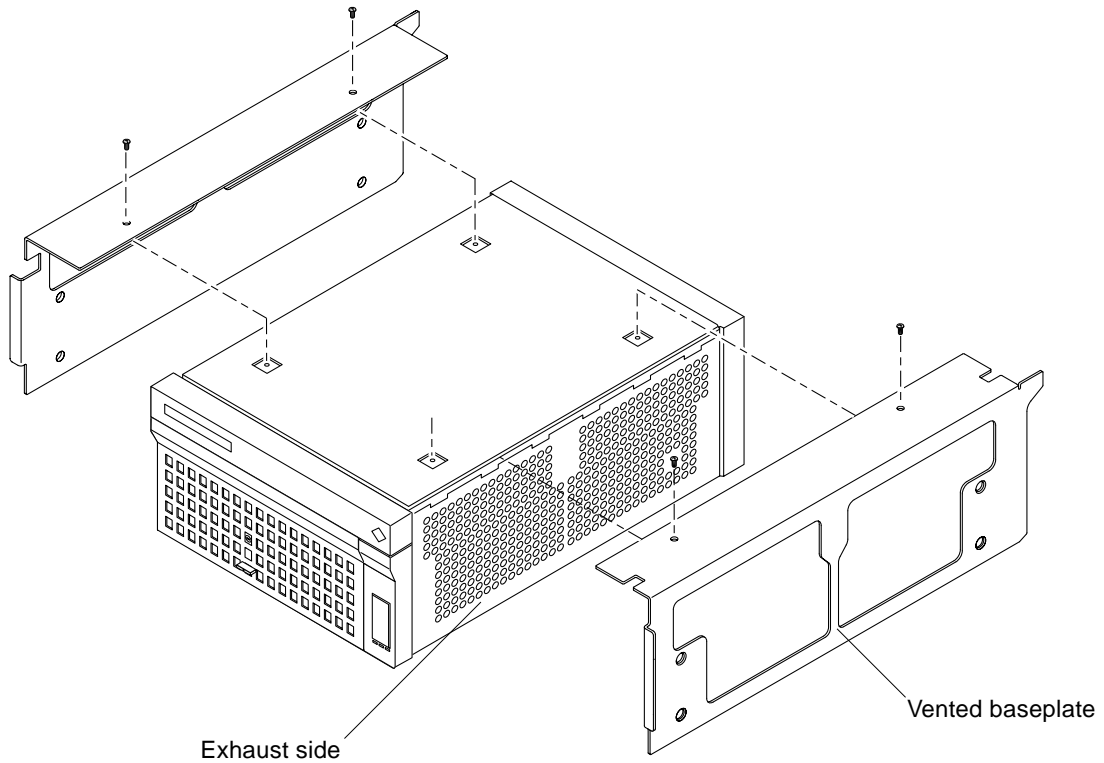


FIGURE 4-3 Baseplate for Sun StorEdge Expansion Cabinet

- For disk arrays being installed in other system or expansion cabinets, use the solid baseplate (FIGURE 4-4).

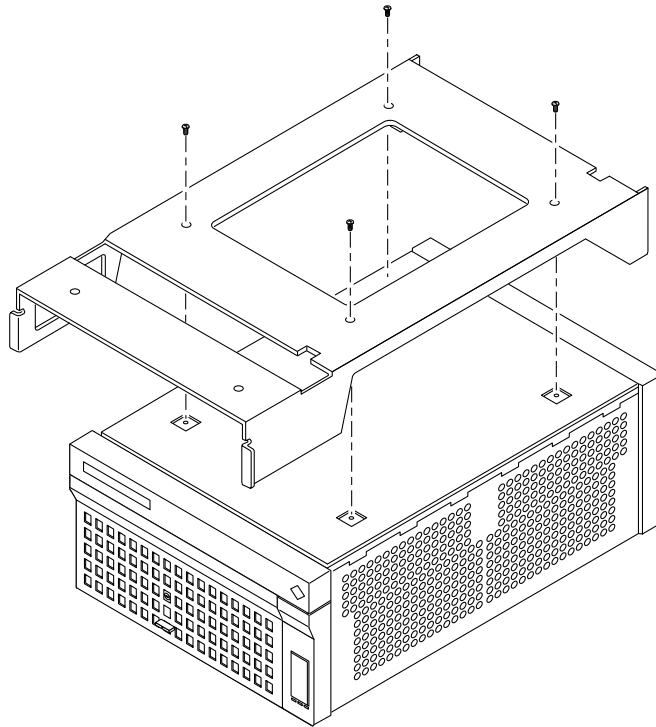


FIGURE 4-4 Baseplate for Other Cabinets

- 4. Loosely thread the four short screws you removed from the feet into all four holes.**
When all screws are started, tighten them.
- 5. With the aid of an assistant, restore the chassis to the upright position with the front of the chassis facing you.**

4.3 Installing the Rails

Follow the instructions on preparing for service in your system or expansion cabinet documentation. If necessary, be sure to:

- Extend the stabilizer legs
- Remove or open the top front panel
- Remove or open the vented rear panel

1. **Loosely thread in the two bottom screws on the left side of the cabinet (FIGURE 4-5).**

Install the screws as specified in the online *Rackmount Placement Matrix*.

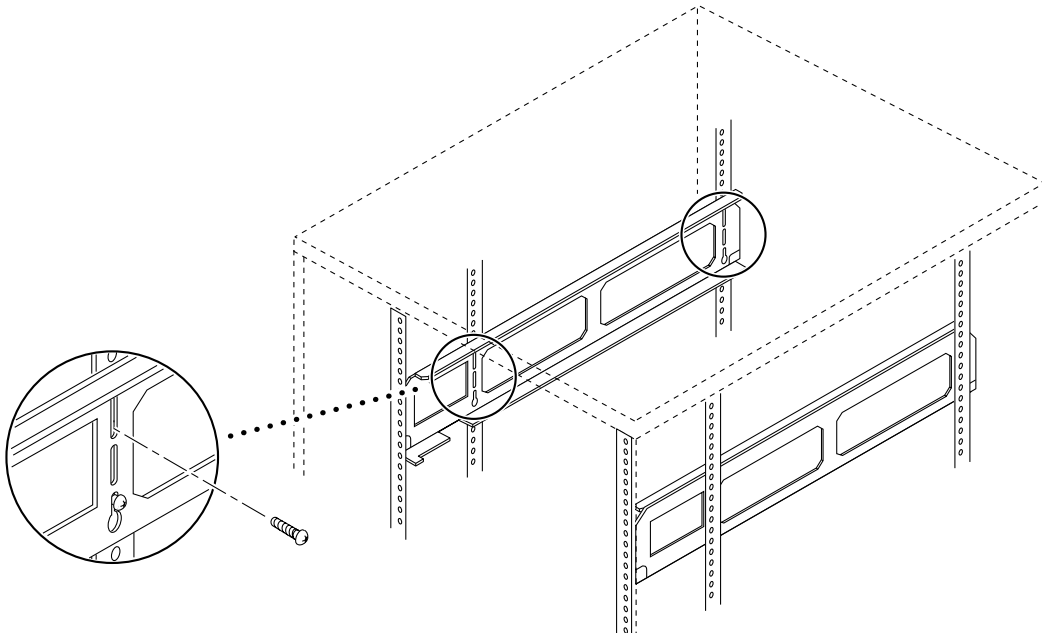


FIGURE 4-5 Threading Screws Into the Cabinet

2. **Place the left side rail in the cabinet. Align the open-slotted holes at the bottom of the rail with the screws installed in Step 1.**
3. **Install the screws in the front and rear top rail holes.**
Install the screws as specified in the online *Rackmount Placement Matrix*.
4. **Tighten all four screws.**
5. **Repeat Step 1 through Step 4 for the right side rail.**

4.4 Installing the Chassis in the Cabinet

Refer to the *Rackmount Placement Matrix* for the correct order to install the chassis.



Caution – The cabinet can become front-heavy while the chassis is being installed. Unless your cabinet is bolted to the floor, ensure that the stabilizer legs are extended before proceeding. Failure to extend the legs can result in the cabinet tipping forward and injuring personnel.



Caution – This installation requires two people to lift and move the disk array. Use care to avoid injury. A disk array with a baseplate attached may weigh up to 130 pounds (59 kg).

1. With the aid of an assistant, lift the chassis (one person on each side) and approach the expansion cabinet with the chassis back facing the cabinet.
2. Line up the chassis baseplate with the mating side rails in the cabinet (FIGURE 4-6).

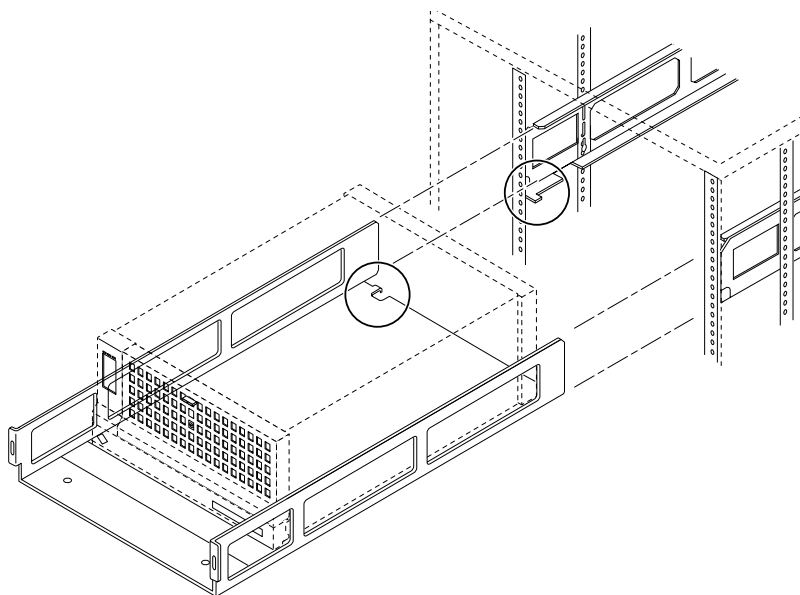


FIGURE 4-6 Aligning the Chassis and Baseplate With the Side Rails

3. Rest the chassis on the side rails, then slide the chassis in.

4. Tighten the screws in the front of the cabinet (FIGURE 4-7).

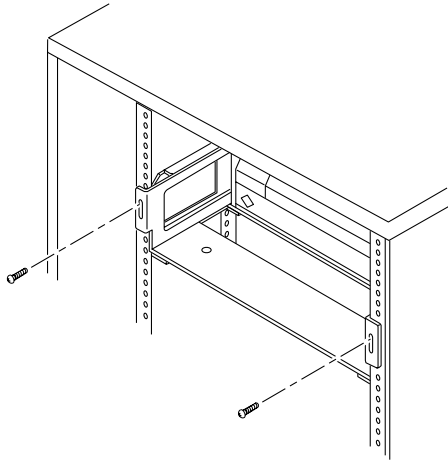


FIGURE 4-7 Installing Screws to Secure the Baseplate to the Side Brackets

4.4.1 Connecting the Power Cable

1. Connect the female end of the power cord to the power receptacle at the rear of the disk array (FIGURE 4-8).

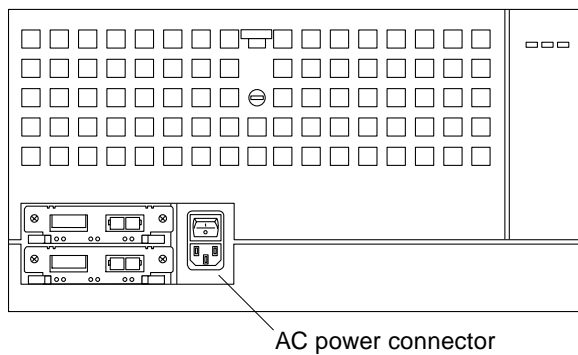


FIGURE 4-8 AC Power Connector

2. Route the power cord to the power distribution unit in the cabinet.



Caution – The power distribution unit serves as the primary disconnect device for the disk array. Do not connect the disk array into a power source other than the power distribution unit. Personal injury can occur if you work on a disk array that is connected into another power source, since that power source may still be active when you work on the disk array.

3. Connect the power cord for the disk array to the power distribution unit.

If your power distribution unit has a sequencer, connect the first disk array to one of the four lower outlets. Connect the second disk array to one of the four upper outlets.

Note – For disk arrays installed in Sun StorEdge Expansion Cabinets, follow the power cabling diagram in the *Sun StorEdge A5000 Hardware Configuration Guide*, part number 805-0264.

4. Secure the extra length of the power cord near the power distribution unit.

4.4.2 Installing Additional Interface Boards and GBICs

Depending upon your configuration, you may need to install additional interface boards or GBICs. Refer to the *Sun StorEdge A5000 Hardware Configuration Guide*, part number 805-0264.

If you need to install additional GBICs, see Section 7.2.3 “GBIC” on page 7-9.

If you need to install an additional interface boards, see Section 7.2.4 “Interface Board” on page 7-11.

4.4.3 Connecting Fiber Optic Cables

1. Power on the disk array.

2. Remove the covers from the cable connectors of the fiber optic cable that was shipped with your disk array.

Store the connector covers in a safe place. Always place the covers over the cable connectors when the cable is not in use.

You may find a cotton swab in the plastic bag with the fiber optic cable. Use this swab to clean the connector whenever it has been removed for a long time. You do not need to clean the connector now.

3. **If you plan to connect more than one disk array to a loop, make sure the Box ID for each disk array is a unique value (0–3).**
See Section 5.5 “Set-Up 1” on page 5-6.
4. **Using the `luxadm` command, enter a unique Box Name for each disk array.**
See Section 5.5 “Set-Up 1” on page 5-6.
5. **Connect one end of the fiber optic cable to the GBIC (FIGURE 4-9).**

Note – Fiber optic cable connectors are keyed to prevent improper insertion; they can be installed only as shown in FIGURE 4-9.

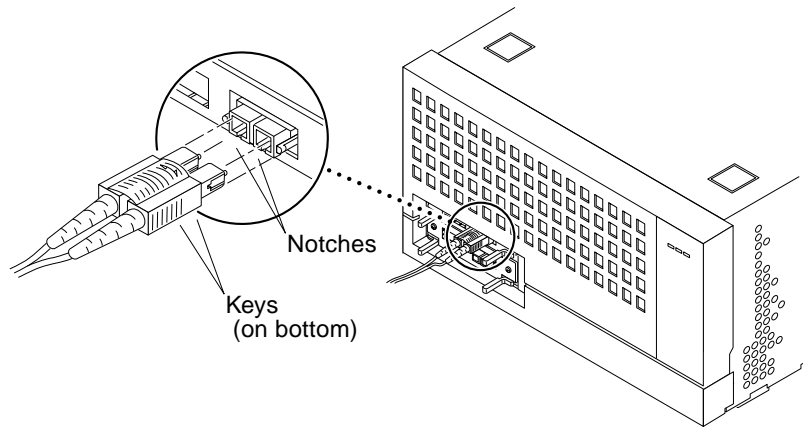


FIGURE 4-9 GBIC on the Rear Panel

6. **Connect the fiber optic cables to the other devices that will be connected to the disk array.**
Refer to the *Sun StorEdge A5000 Hardware Configuration Guide* and the documentation that came with the devices.
7. **Repeat Step 2 through Step 6 to connect additional cables.**

4.4.4 Reassembling the Cabinet

Follow the instructions on preparing for service in your system or expansion cabinet documentation. If necessary, be sure to:

- Replace or close the top front panel
- Replace or close the vented rear panel
- Push the stabilizer legs back into the cabinet

FPM Screens

This chapter describes the front panel module (FPM) screens on the disk array.

This chapter contains the following topics:

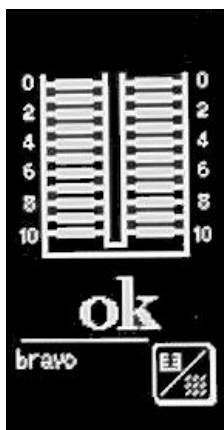
- Differences Between 14-Slot and 22-Slot Disk Arrays—page 5-2
- FPM Main Screens—page 5-3
- Menu and Level 2 Status Screens—page 5-4
- Power Supplies—page 5-5
- Set-Up 1—page 5-6
- Set-Up 2—page 5-7
- Test Screen—page 5-8
- Disk Drives—page 5-9
- Backplanes—page 5-10
- GBICs—page 5-11
- Fan Trays—page 5-12
- Disk View—page 5-13
- Interface Boards—page 5-14
- Interconnect Assembly—page 5-15

Note – Lightly touch the FPM when changing attributes.

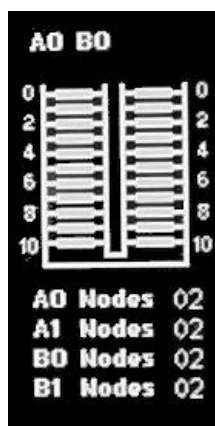
5.1 Differences Between 14-Slot and 22-Slot Disk Arrays

The illustrations in this section show the FPM screens for the 14-slot disk array. Except for the number of disk drives and nodes, the screens for the 14-slot disk array and the 22-slot disk array are the same.

The disk view, front drive, rear drive, and nodes screens for the 22-slot disk array are shown in FIGURE 5-1. See the following sections for descriptions of these screens.



Disk view screen



Nodes screen



Front drives screen



Rear drives screen

FIGURE 5-1 22-Slot Disk Array FPM Screens

5.2 FPM Main Screens

The two main (level 1) screens on the disk array are the disk view and menu screens (FIGURE 5-2). Press the buttons in the lower right corners of these screens to toggle between them.

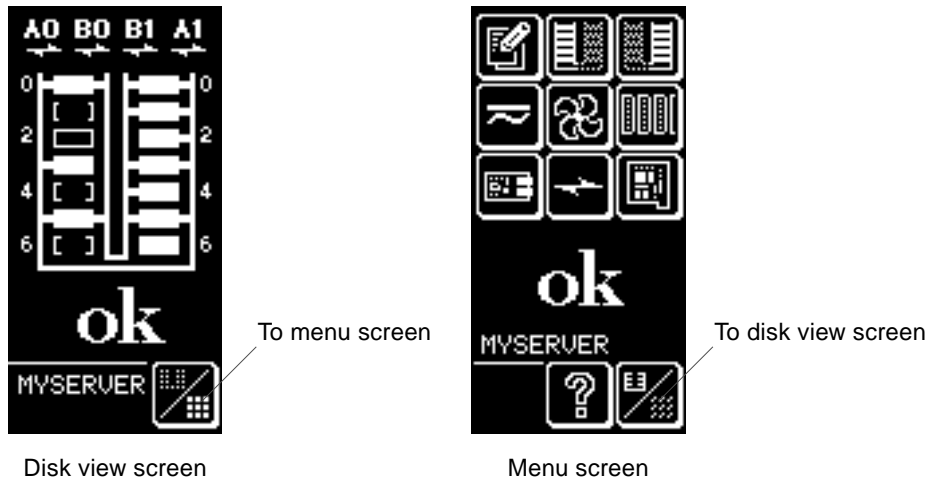
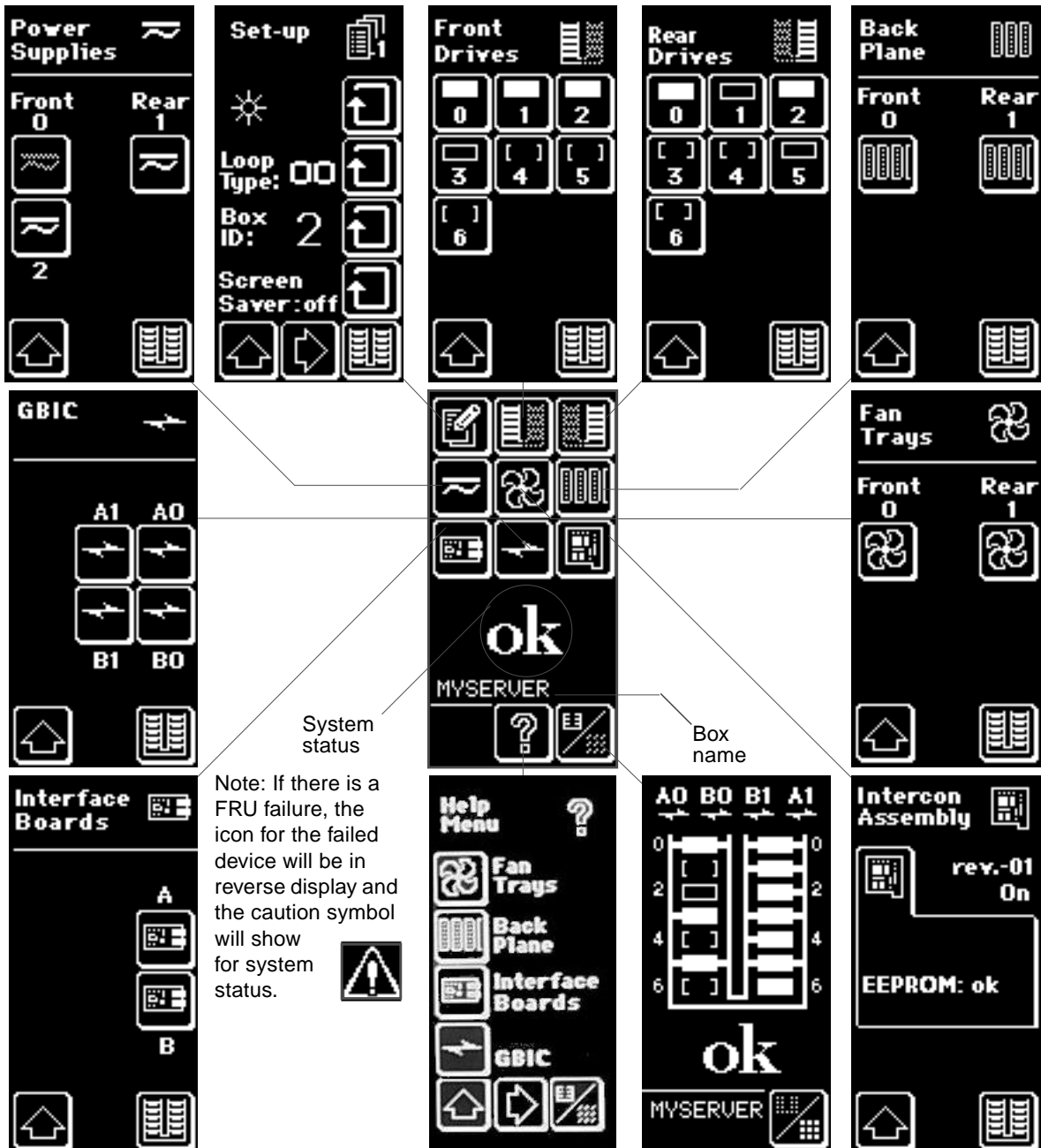
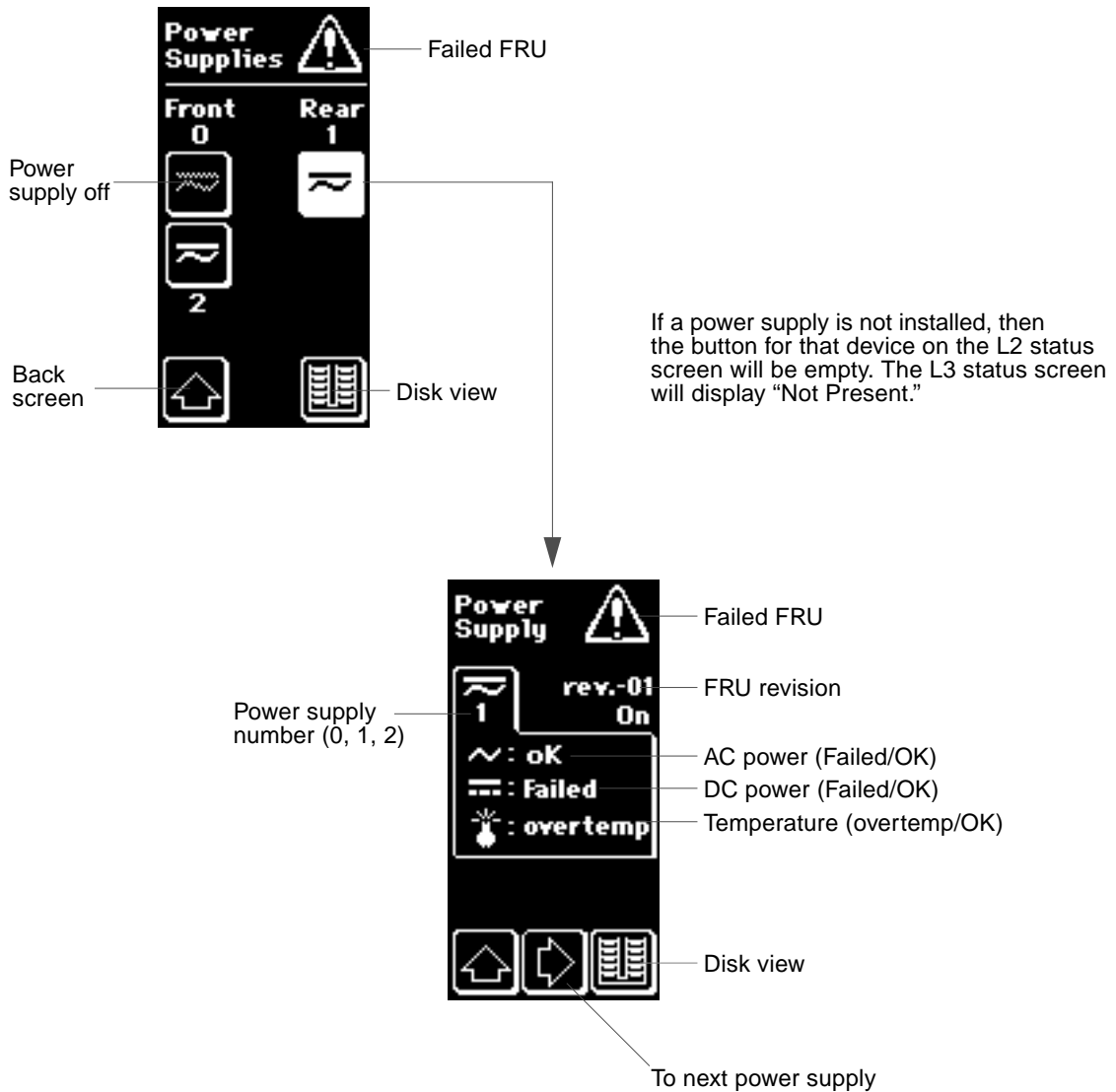


FIGURE 5-2 Level 1 Screens

5.3 Menu and Level 2 Status Screens



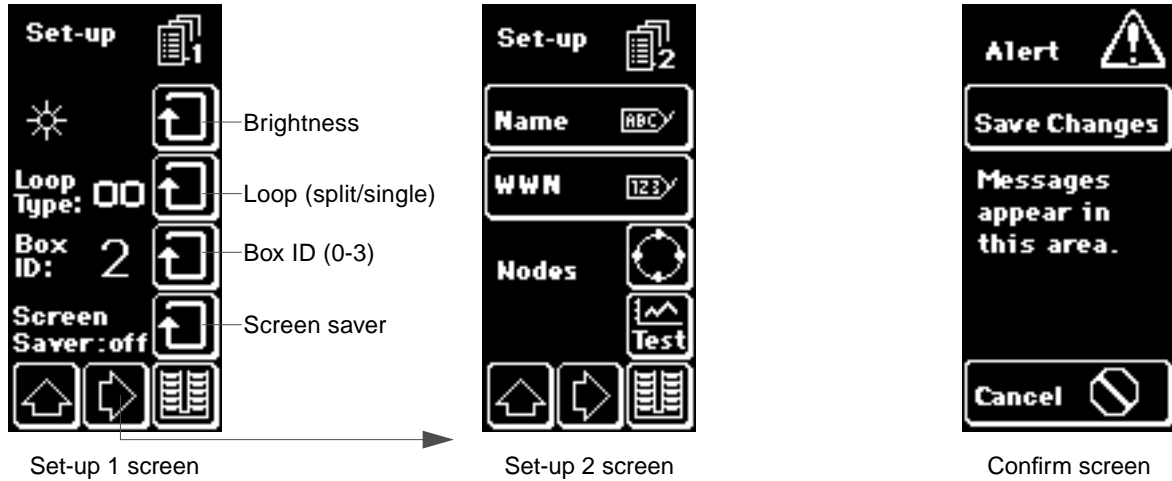
5.4 Power Supplies



If a power supply is not installed, then the button for that device on the L2 status screen will be empty. The L3 status screen will display “Not Present.”

To install or replace a power supply, see Section 7.2.8 “Power Supply” on page 7-15.

5.5 Set-Up 1



Screen saver: The screen saver for the disk array activates after one to four minutes of FPM inactivity. The Box Name (or the World Wide Name if the Box Name is not set) displays randomly around the screen when the screen saver is active. To exit, press anywhere on the FPM.

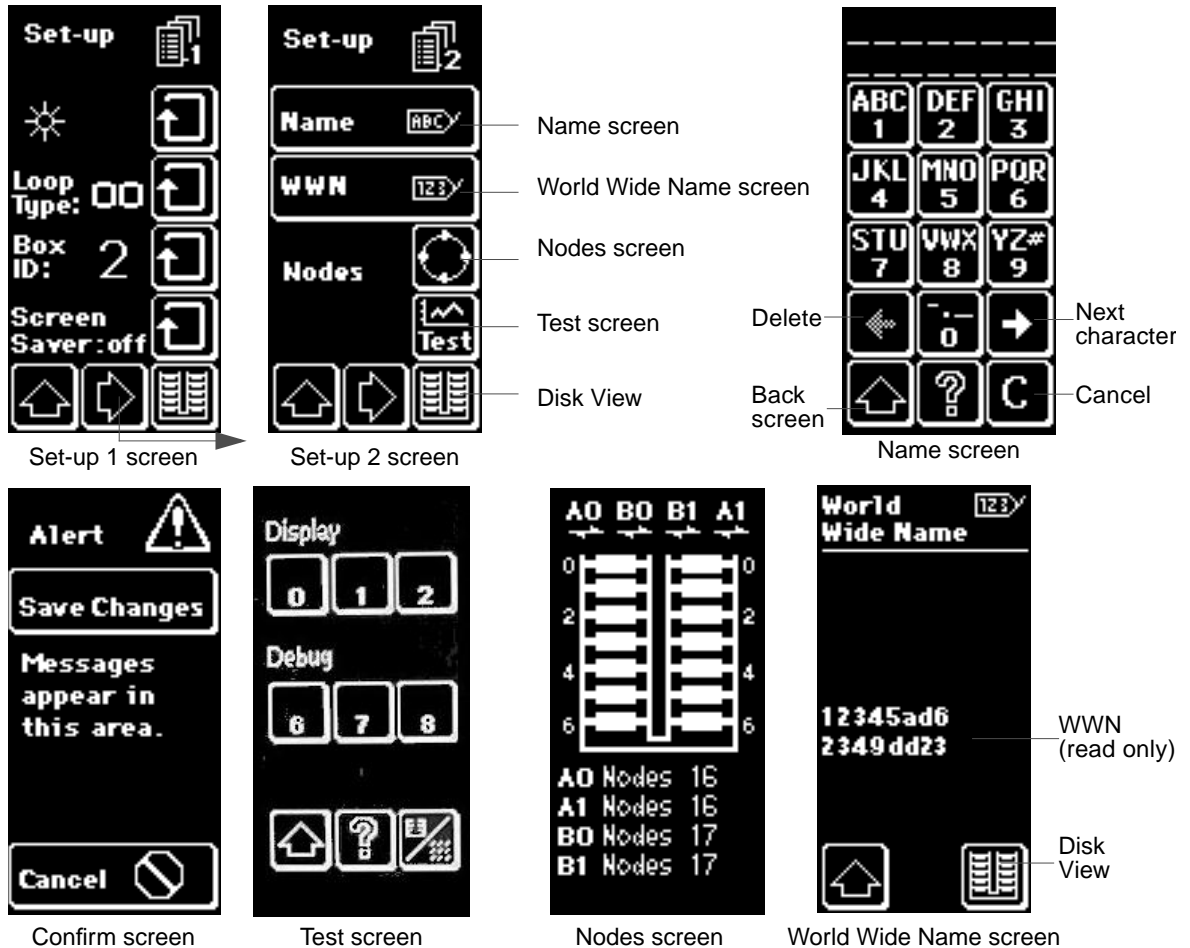
To stop the screen saver from activating, press the screen saver button.

Set-up screen: You can enter multiple changes at the same time on the Set-Up screen. For instance, if you want to change the Loop Type and Box ID, set the values for these attributes. Exit the screen using the Back screen key. The Confirm screen will be displayed.



Caution – Changing the Box ID or Loop Type causes the disk array to reset. If any disks in the disk array are involved in any I/O activity, a loss of data can result.

5.6 Set-Up 2



Name screen: Press the 1 through 9 keys multiple times to access characters. The keys have uppercase and lowercase letters. For example, the characters on the 1 key are: AaBbCc1. Save changes by pressing the Back screen key. Press the Save Changes key on the resulting Confirm screen. Cancel by pressing the Cancel key.

Nodes screen: This screen lists the number of active nodes per loop. This number includes the host GBICs, interface board GBICs, and disk drive connections.

Test screen: The test screen is described on the following page.

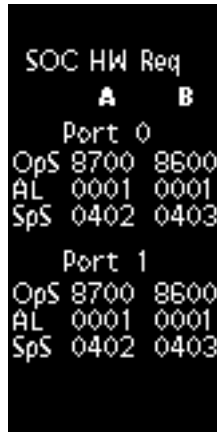
5.7 Test Screen



Test screen



Force Offline screen
(Test screen
button 6)



SOC+ Hardware
Register screen
(Test screen
button 7)



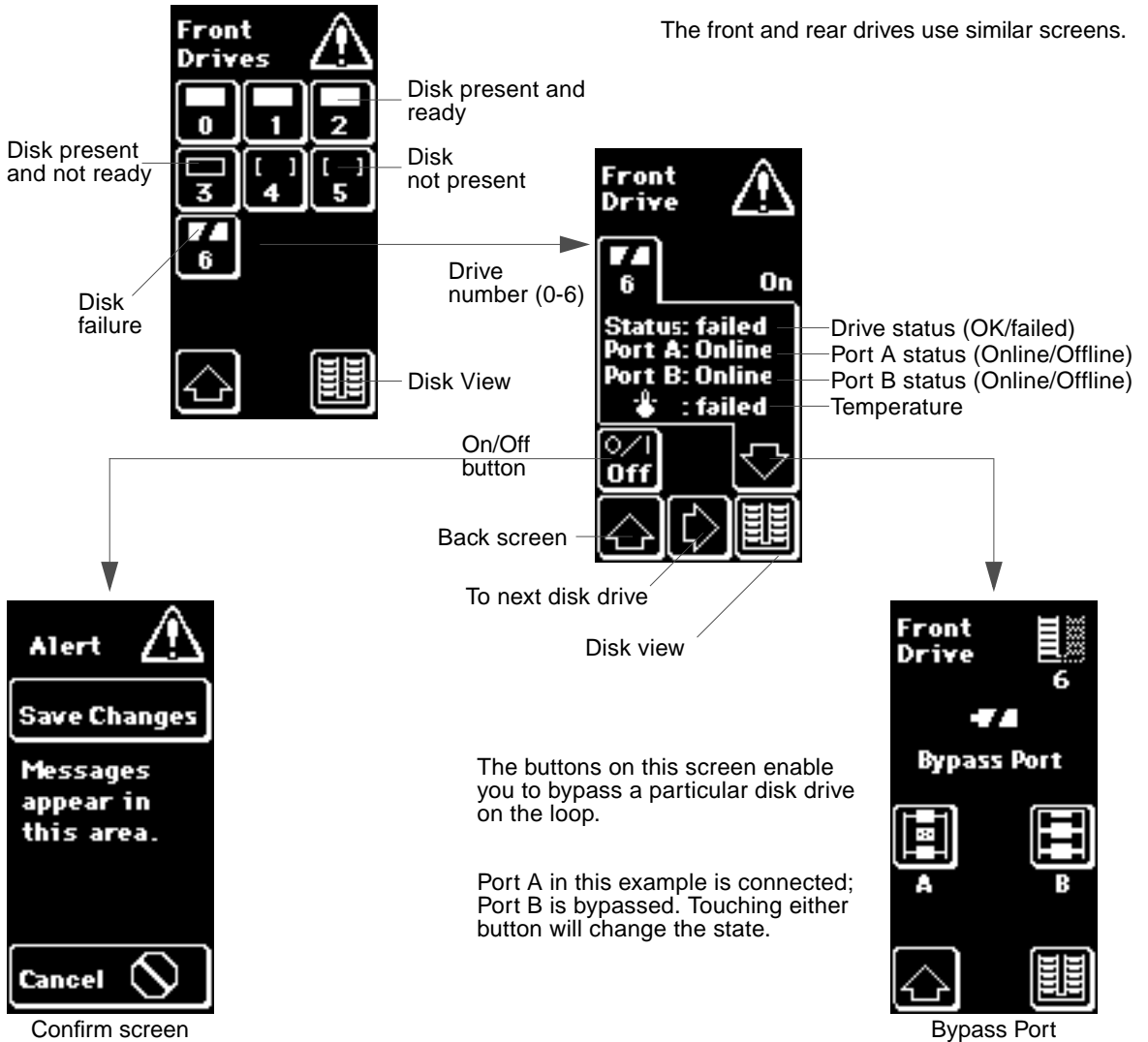
Autobypass screen
(Test screen
button 8)

TABLE 5-1 Test Screen Definitions

Test Screen Button	Calls Screen	Description
0	N/A	Turns off all pixels on the FPM screen.
1	N/A	Turns on all pixels on the FPM screen.
2	N/A	Puts the Sun Microsystems, Inc. logo on the FPM screen.
6	Force Offline	Forces a momentary offline on any of the 4 SOC+ ports (labeled A0, A1, B0, B1).
7	SOC+ HW Reg	Displays the value of some key FC-AL SOC+ status registers. The value of the registers are updated a couple of times per second.
8	Autobypass	Systematically bypasses all of the failing elements on a loop until loop initialization completes successfully. The feature can be enabled or disabled from the test screen and is written to EEPROM so that the state will be saved across a power cycle. Autobypass should be disabled for normal operation; it is used only for debug.

5.8 Disk Drives

The front and rear drives use similar screens.

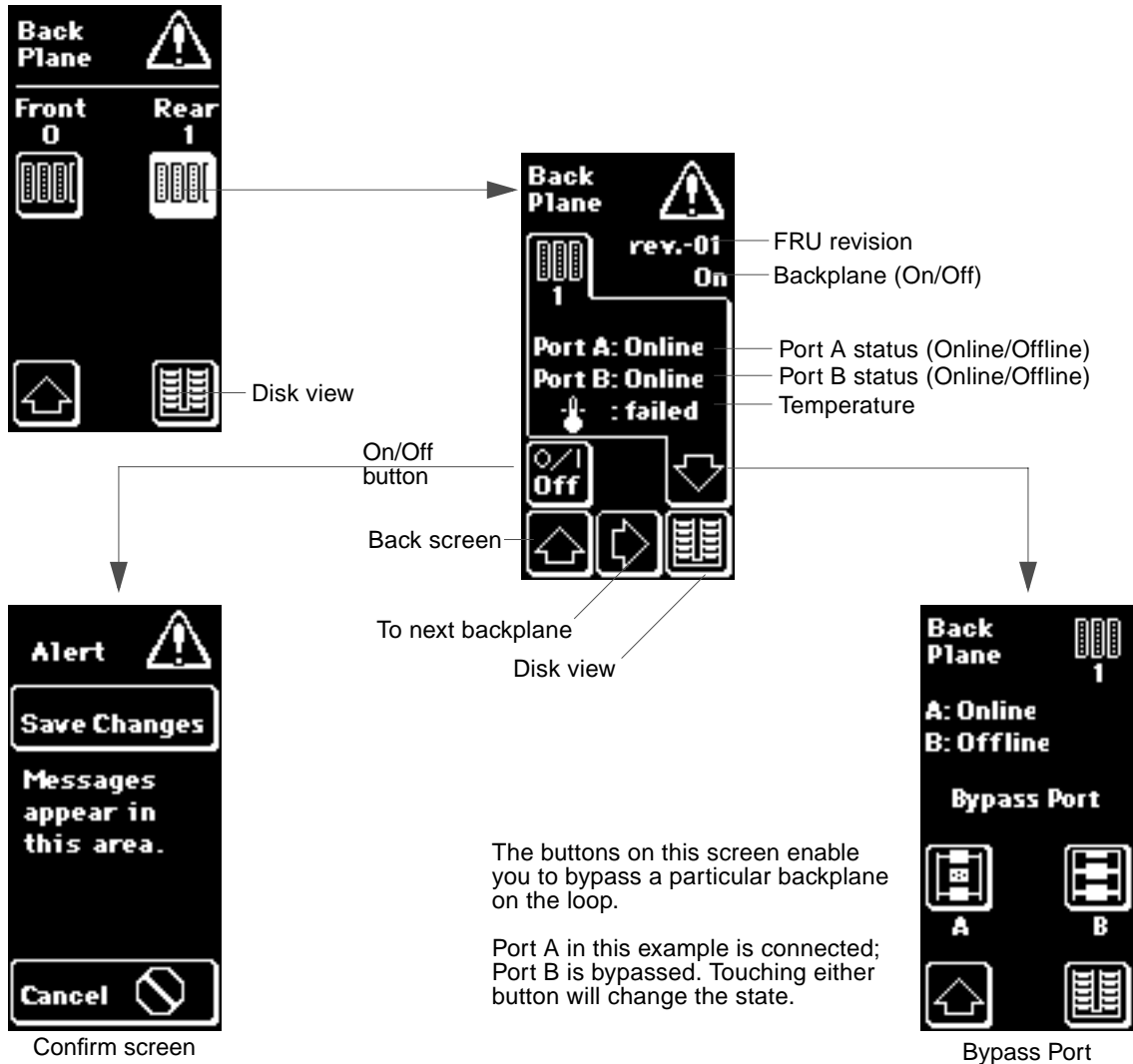


The buttons on this screen enable you to bypass a particular disk drive on the loop.

Port A in this example is connected; Port B is bypassed. Touching either button will change the state.

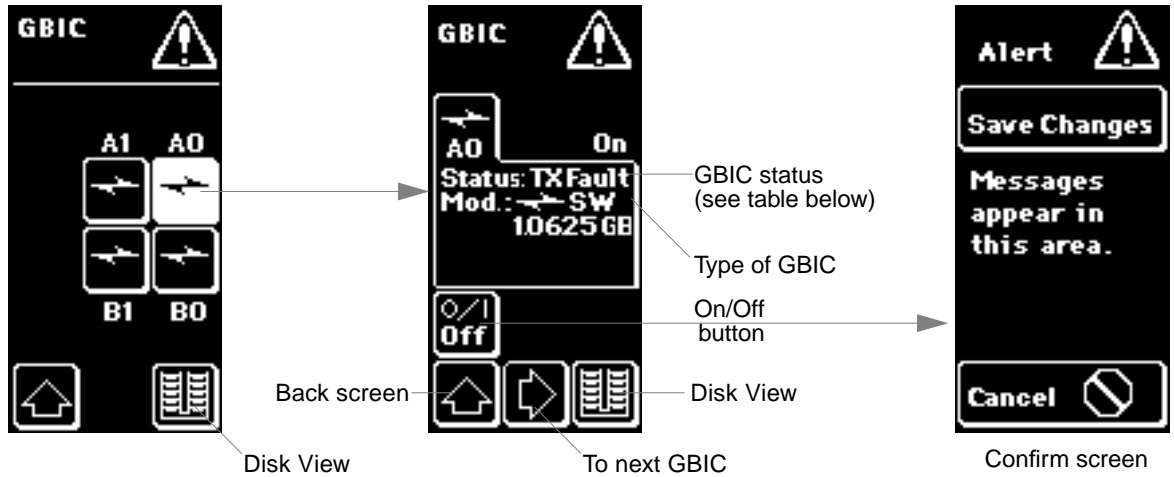
To install or replace a disk drive, see Section 7.2.1 "Disk Drive" on page 7-3.

5.9 Backplanes



To replace a backplane, see Section 7.2.10 "Backplane" on page 7-17.

5.10 GBICs



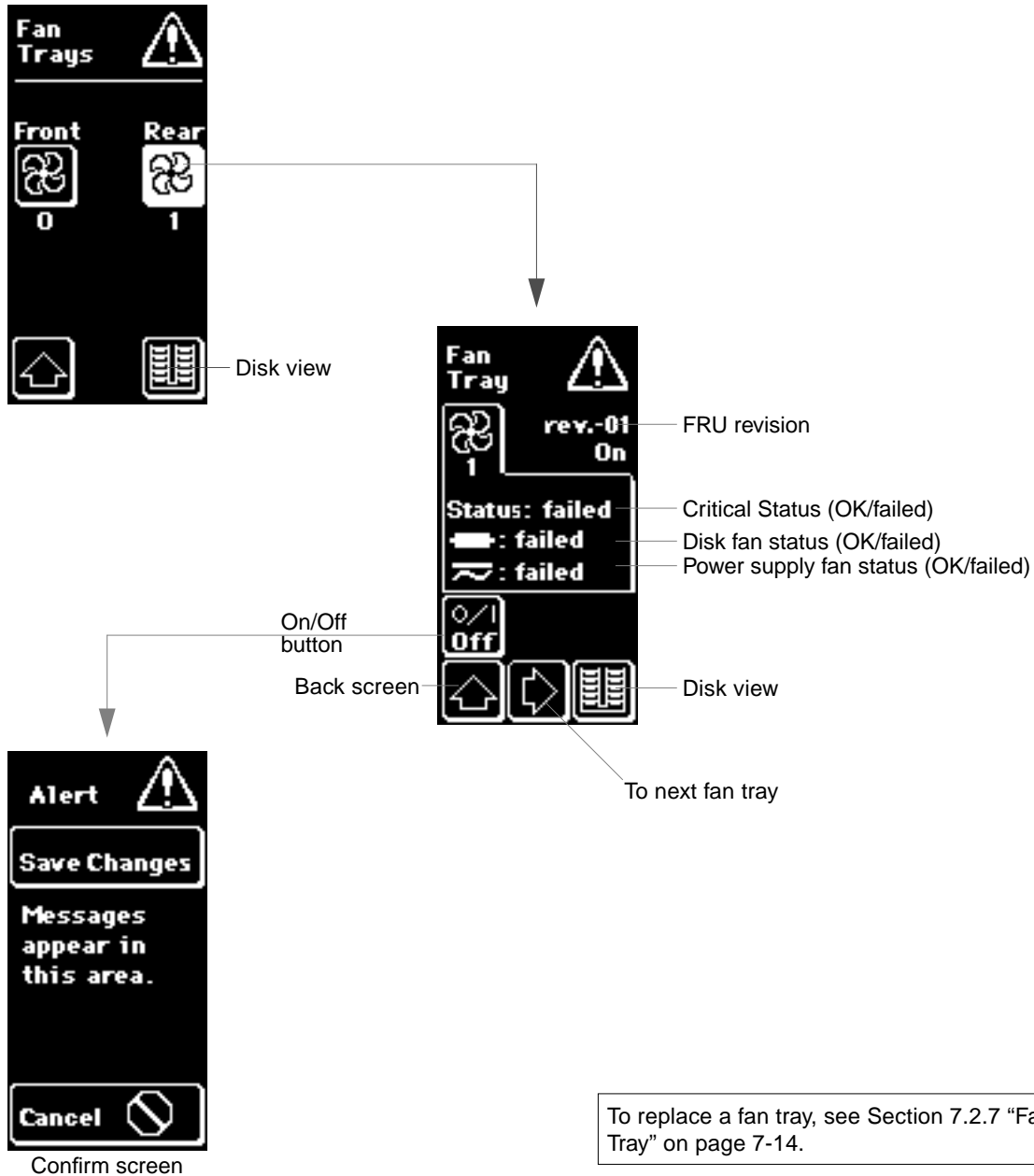
To install or replace a GBIC, see Section 7.2.3 “GBIC” on page 7-9.

TABLE 5-2 GBIC Status

Status	Definition
TXFault	Transmitter status: failure. The GBIC may be broken.
Online	The GBIC is okay.
ByteSync	Receiver status: there is byte sync, but the link is not online. The host adapter or hub port may be broken ¹ .
Signal	Receiver status: there is light, but no sync (bad signal). The host adapter or hub (or a GBIC in either) may be broken ¹ .
No Signal	Receiver status: no signal. A GBIC in the host adapter, hub, or interface board is probably broken.

1. Any broken component in the FC-AL loop can cause this error.

5.11 Fan Trays



5.12 Disk View

Vertical bars indicate that interface boards are present. Outer bars are for board A; inner bars are for board B.

GBIC number. If a number is not lit, a GBIC is not installed.

A lightning bolt means the GBIC is online. If the space is blank, the GBIC is offline.

Connected to Loops A and B

Disk not present

Connected to Loop A

Disk present but not spun up

Connected to Loop B

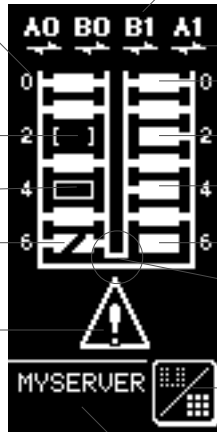
Disk failure

Not connected

Flashing icon indicates a system error. Go to menu screen to determine FRU group failure.

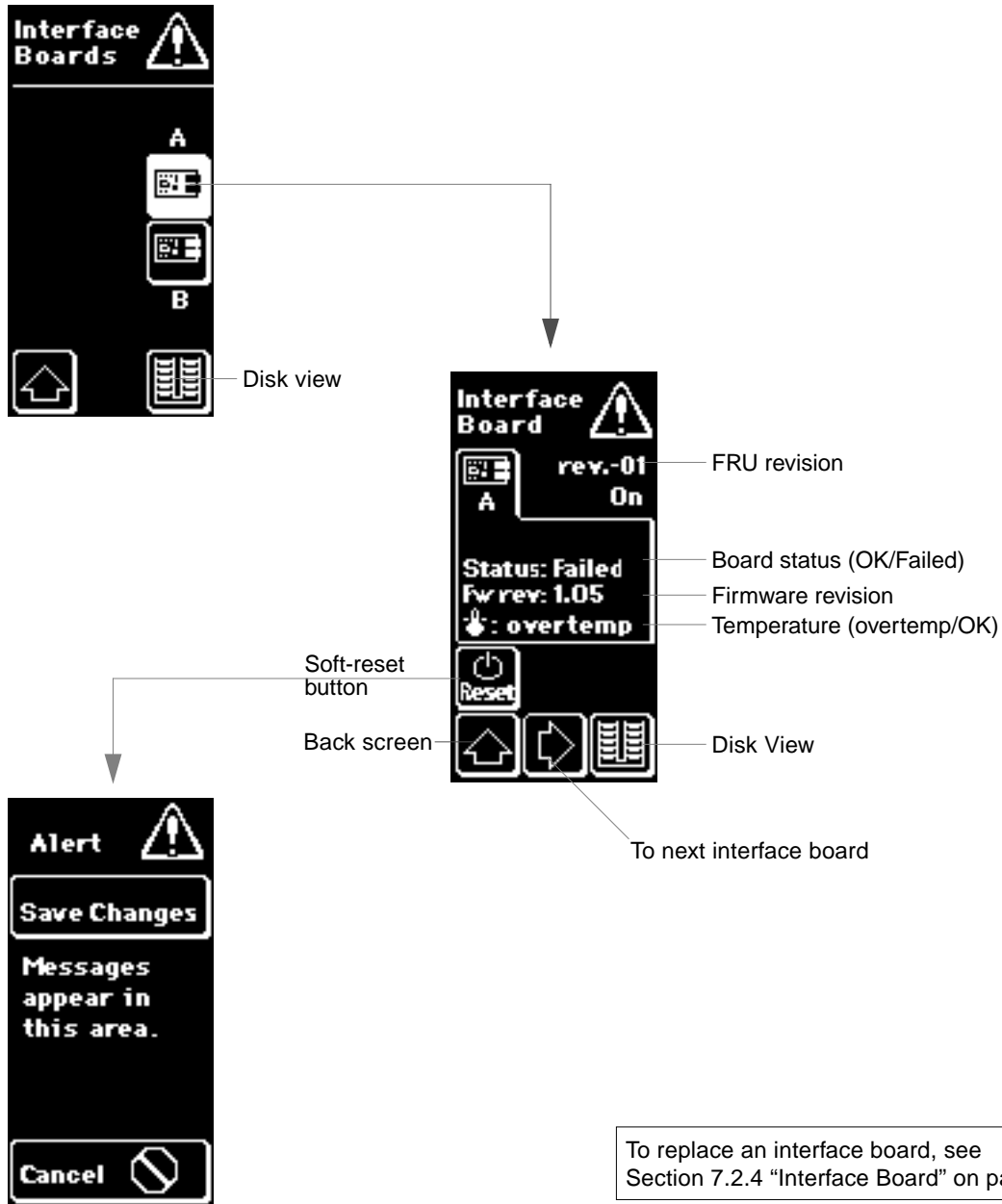
Signifies single loops. For split loops, horizontal bars are not present.

Menu screen

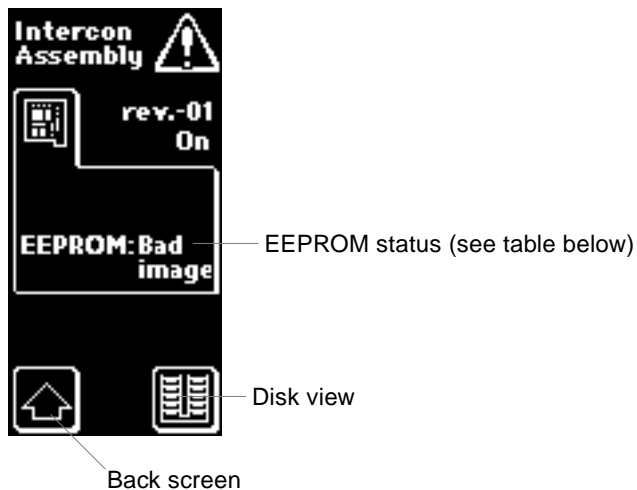


Box name. If there is no box name, the WWN is displayed.

5.13 Interface Boards



5.14 Interconnect Assembly



To replace an interconnect assembly, see Section 7.2.11 "Interconnect Assembly" on page 7-19.

TABLE 5-3 EEPROM Status

Status	Definition
Bad Image	The EEPROM has no magic word or the checksum is incorrect. Replace the interconnect assembly.
Ok	The EEPROM has a magic word and it has the correct checksum.
Fail	The interconnect assembly is broken. Replace the interconnect assembly.

LED Indicators

This chapter describes the LED indicators on the disk array. The LEDs show component status.

The chapter contains the following topics:

- Location of LED Indicators—page 6-2
- Interface Board and GBIC—page 6-3
- Fan Tray—page 6-4
- Enclosure—page 6-5
- Power Supply—page 6-6
- Disk Drive—page 6-7

Note – When the (amber) fault LED is lit for a field replaceable unit (FRU), the FRU most likely needs to be replaced. The state of the other LEDs associated with the FRU does not matter if a fault LED is lit. See Appendix A for a list of FRUs.

Note – The illustrations in this section show the LED indicators for the 14-slot disk array. The function of the LEDs for the 14-slot disk array and the 22-slot disk array are the same.

6.1 Location of LED Indicators

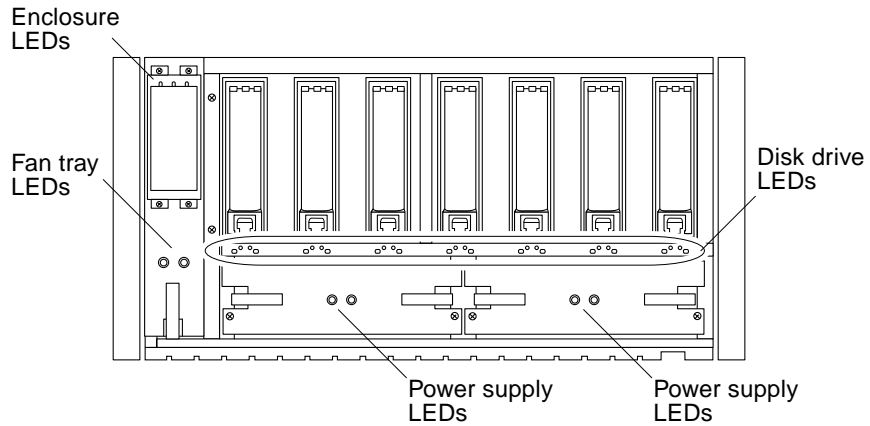


FIGURE 6-1 Front Panel LEDs

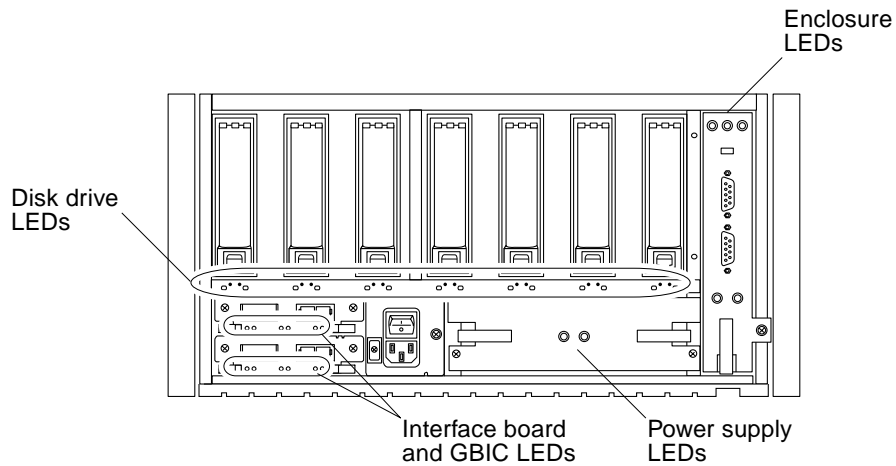


FIGURE 6-2 Rear Panel LEDs

6.2 Interface Board and GBIC

The interface board and GBIC LEDs are located on the interface board.

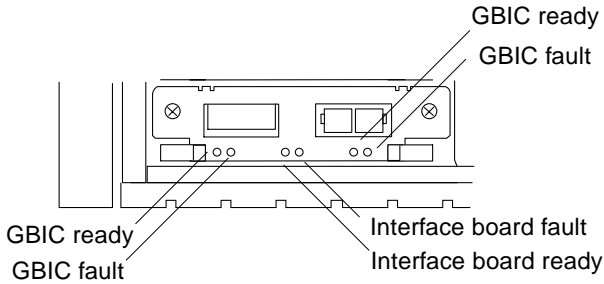


FIGURE 6-3 Interface Board and GBIC LEDs

TABLE 6-1 GBIC LEDs

Ready	Fault	Indication	Corrective Action
●	○	Okay	None
●	●	Fault in link to GBIC Fault in source to link	Verify link is installed and unbroken. Verify link source is operating.
N/A	●	Fault in GBIC	Replace GBIC. See Section 7.2.3 “GBIC” on page 7-9.
○	○	GBIC not installed No power to GBIC GBIC is incompletely inserted	Install GBIC if required. Verify system power is on. Reinsert GBIC.
		● On	○ Off

TABLE 6-2 Interface Board LEDs

Ready	Fault	Indication	Corrective Action
●	○	Okay	None
○	●	Fault condition	Replace the Interface Board. See Section 7.2.4 “Interface Board” on page 7-11.
		● On	○ Off

6.3 Fan Tray

The fan tray LEDs are located on the front and rear fan trays.

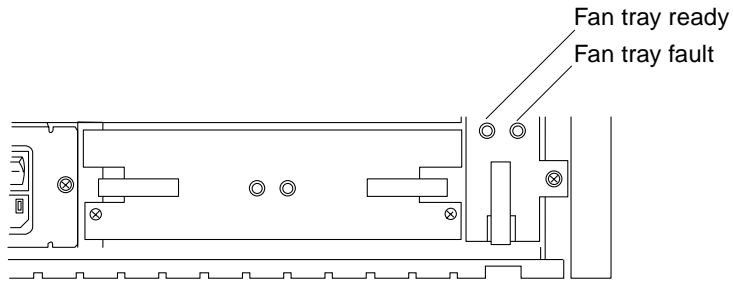


FIGURE 6-4 Fan Tray LEDs

TABLE 6-3 Fan Tray LEDs

Ready	Fault	Indication	Corrective Action
●	○	Okay	None
N/A	●	Fault condition	Replace the fan tray. See Section 7.2.7 “Fan Tray” on page 7-14.
○	○	Fan tray is turned off Fan tray is improperly inserted No power to fan tray	Turn on the fan tray if required. Reinsert the fan tray. Verify that the system power is on.
		● On	○ Off

6.4 Enclosure

The enclosure LEDs are located on the front of the disk array at the top of the FPM and on the back of the disk array near the top of the rear fan tray.

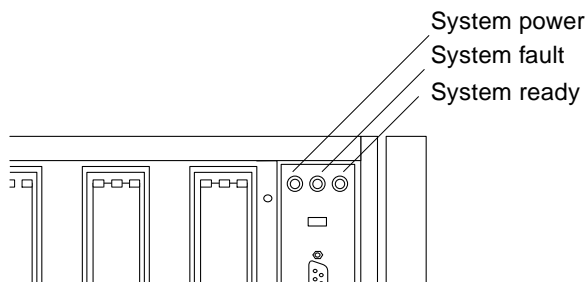


FIGURE 6-5 Enclosure LEDs

TABLE 6-4 Enclosure LEDs

Power	Fault	Ready	Indication	Corrective Action
●	○	○	Power is on	None
●	○	●	System is ready	None
●	○	●	System is active	None
N/A	●	N/A	A FRU has failed	Use the FPM (Chapter 5) to determine which FRU has failed.
○	○	○	No power to system	Make sure the system is connected. Verify that the system power is on.
			● On	○ Off
			● Flashing	

6.5 Power Supply

The power supply LEDs are located in the middle of each power supply.

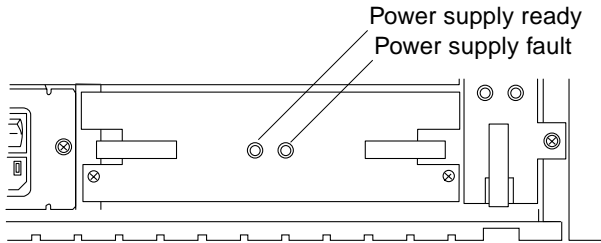


FIGURE 6-6 Power Supply LEDs

TABLE 6-5 Power Supply LEDs

Ready	Fault	Indication	Corrective Action
●	○	Okay	None
○	●	Fault condition	Replace the power supply. See Section 7.2.8 “Power Supply” on page 7-15.
○	○	The power supply is not installed. The power supply is improperly inserted. There is no power to the fan tray.	Install the power supply if required. Reinsert the power supply. Verify that the system power is on.
	●	On	○ Off

6.6 Disk Drive

The disk drive LEDs are located on the disk array beneath the disk drive slots.

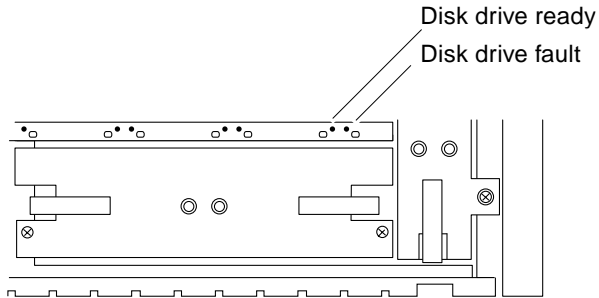


FIGURE 6-7 Disk Drive LEDs

TABLE 6-6 Disk Drive LEDs

Ready	Fault	Indication	Corrective Action
●	○	The disk drive is ready and active.	None
●	○	The disk drive is ready, but not active.	None
◐	○	The disk drive is becoming ready or spinning down in preparation for removal.	None
○	◐	The disk drive slot is identified and disk drive can be inserted or removed.	Insert or remove the disk drive.
N/A	●	Fault condition	Replace disk drive. See Section 7.2.1 “Disk Drive” on page 7-3.
○	○	The disk drive is not installed. The disk drive is improperly inserted. There is no power to disk drive. The disk drive is turned off. Disk drive power sequencing in progress.	Install the disk drive if required. Reinsert the disk drive. Verify that the system power is on. Turn on the disk drive if required. The disk drive ready LED should start flashing within 30 seconds.
	●	Rapid flashing	● On
	◐	Flashing	○ Off

Service

This chapter contains information on removing and replacing FRUs. You should have already determined which FRU is faulty (by using the FPM, LEDs, or software commands) before proceeding with this chapter.



Caution – Do not perform any procedures in this chapter until you have read Section 7.1 “Preparing for Service” on page 7-2, and prepared your system for service according to the instructions given there.

Note – All items in this chapter are hot-pluggable except for the AC filter module, the disk drive backplanes, and the interconnect assembly.

This chapter contains the following topics:

- Preparing for Service—page 7-2
- Disk Drive—page 7-3
- Fiber Optic Cable—page 7-8
- GBIC—page 7-9
- Interface Board—page 7-11
- Door Panel Assembly—page 7-12
- FPM—page 7-13
- Fan Tray—page 7-14
- Power Supply—page 7-15
- AC Power Filter—page 7-16
- Backplane—page 7-17
- Interconnect Assembly—page 7-19
- Removing a Rackmounted Disk Array—page 7-26

7.1 Preparing for Service

You will need a No. 1 Phillips screwdriver and a flat-head screwdriver to complete the tasks in this chapter.

7.1.1 Preparing the Cabinet

For disk arrays that are installed in a system or expansion cabinet, you may need to:

- Extend the antitilt bar
- Remove or open the front panel
- Remove the vented rear panel

Refer to the instructions in your system or enclosure documentation.

If you are servicing a FRU that is not hot-pluggable (the AC filter module, the disk drive backplane, or the interconnect assembly), then you will also need to:

- Power off the disk array



Caution – To avoid possible cooling issues, have hot-pluggable parts ready to insert before beginning any installation or replacement procedure.

7.1.2 Connecting the Antistatic Wrist Strap



Caution – The disk array is sensitive to static electricity. To prevent damage to the unit, connect an antistatic wrist strap between you and the disk array.

1. **Attach the adhesive copper strip of the wrist strap to a metal surface of the disk array.**
2. **Wrap the other side of the wrist strap twice around your wrist, with the adhesive side against your skin.**

7.2 Replacing and Installing Components

7.2.1 Disk Drive

This section explains how to replace a disk drive in a disk array that is under Sun™ StorEdge Volume Manager™ software administration (formerly known as Sun™ Enterprise Volume Manager™ software). Go to Appendix C if your disk array is under Solstice DiskSuite™ administration.

Note – If you are installing a new disk drive, remove the disk drive spacer and then go to Step 8.

The following is a summary of the steps for the disk replacement procedure:

- Prepare the software on each host for disk replacement.
- Use the `luxadm remove_device` command to remove the disk on each host.
- Use the `luxadm insert_device` command to install the new disk on each host.
- Notify the software of the new disk.

Note – For a disk in a multihost environment, the disk replacement procedure should first be performed on the host that currently has ownership access to the disk. Then the procedure can be performed in any order on the remaining host(s).

1. Identify all volumes or applications using the failed disk.

If the volumes are mirrored or RAID 5 protected, the disk can be replaced without taking the volume down. Otherwise all I/O to the disk must be stopped using the appropriate commands.

2. For disks under Sun StorEdge Volume Manager (volume manager) control, use the `vxdiskadm` command to take the disk drive offline.

```
# vxdiskadm
```

Note – To replace a disk drive, choose option 4, “Remove a disk for replacement” and then option 11, “Disable (offline) a disk device.”

3. Use the `luxadm remove_device` command to remove the disk from the FC-AL loop.

This command is interactive and will prompt you to physically remove the disk. For example:

```
#luxadm remove_device /dev/rdisk/c0t48d0s2

WARNING!!! Please ensure that no filesystems are mounted on these
device(s).
All data on these devices should have been backed up.

The list of devices which will be removed is:
 1: Box Name "box2" rear slot 0

Please enter 'q' to Quit or <Return> to Continue:

stopping: Drive in "box2" rear slot 0...Done
offlining: Drive in "box2" rear slot 0...Done

Hit <Return> after removing the device(s).
```

Note – Do not hit Return until Step 4 and Step 5 have been completed.

The `luxadm remove_device` command also accepts box name and drive location. For example:

```
# luxadm remove_device box2,r0
```

Note – If the `luxadm remove_device` fails to remove the disk, use of the `luxadm remove_device -F` option (for example, `luxadm remove_device -F box2,r0`) may be required. Make sure you have stopped all I/O to the disk drive before using the `-F` option. Refer to the `luxadm` man page for more information.

4. Open the door (FIGURE 7-1).

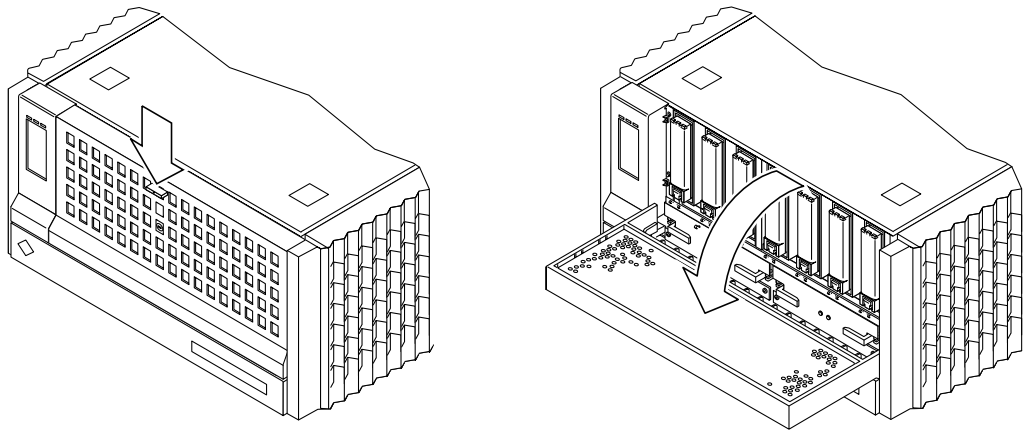


FIGURE 7-1 Opening a Door

5. Remove the disk drive (FIGURE 7-2).

Push down on the latch to release the bracket handle. Use the handle to pull the disk drive out of the slot.

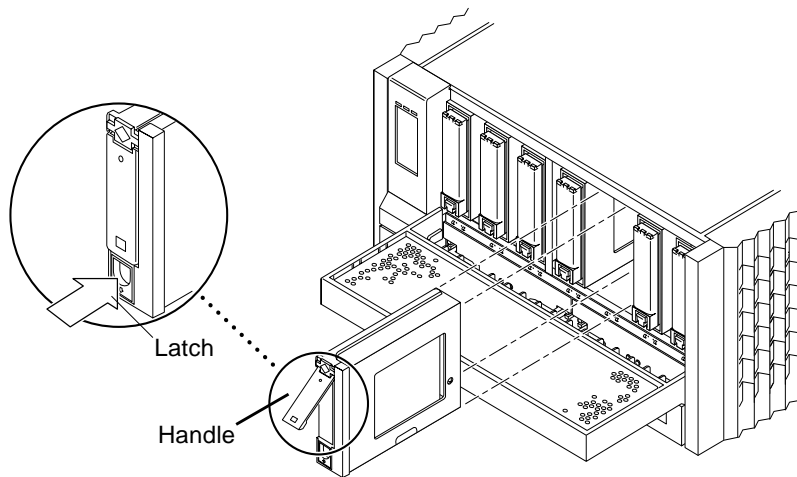


FIGURE 7-2 Removing a Disk Drive

6. Hit the Return key to complete the `luxadm remove_device` command.

For example:

```
Hit <Return> after removing the device(s).

Drive in Box Name "array1" front slot 0
  Removing Logical Nodes:
  Removing c2t32d0s0
  Removing c2t32d0s1
  Removing c2t32d0s2
  Removing c2t32d0s3
  Removing c2t32d0s4
  Removing c2t32d0s5
  Removing c2t32d0s6
  Removing c2t32d0s7
```

7. For a disk array that is accessed by multiple hosts, repeat Step 3 and Step 6 to remove the device entries for the removed disk.

8. Use the `luxadm insert_device` command to install the replacement disk drive.

For example:

```
# luxadm insert_device box2,r0

The list of devices which will be inserted is:
  1: Box Name "box2" rear slot 0

Please enter 'q' to Quit or <Return> to Continue:

Hit <Return> after inserting the device(s).
```

Note – Do not hit Return until Step 9 and Step 10 has been completed.

9. Install the new disk drive.

Slide the disk drive into the slot with the handle released. Once you have inserted the disk drive as far as it will go into the slot, push down on the handle to secure it.

Note – For arrays under volume manager or other RAID manager control, the new disk must be at least the same formatted capacity as the disk it is replacing.

10. Close the door.

Note – The doors are tight to ensure an adequate seal. To close, place your thumbs on either side of the latch and press firmly.

11. Hit the Return key to complete the `luxadm insert_device` command.

For example:

```
Hit <Return> after inserting the device(s).

Drive in Box Name "array1" front slot 0
Logical Nodes under /dev/dsk and /dev/rdisk :
c2t32d0s0
c2t32d0s1
c2t32d0s2
c2t32d0s3
c2t32d0s4
c2t32d0s5
c2t32d0s6
c2t32d0s7
```

12. For disks under volume manager control, notify volume manager of the new disk.

For example:

```
# vxdctl enable
```

13. Use the `vxdiskadm` command to bring the new disk into volume manager control.

```
# vxdiskadm
```

Note – To replace a disk drive, choose option 5. To add a disk drive, choose option 1, “Add or initialize one or more disks”.

14. The volume can now be restored if needed.

7.2.2 Fiber Optic Cable



Caution – Follow these guidelines to avoid causing damage to fiber optic cables.

The maximum bend radius for fiber optic cables is 1.2 inches (3 cm).

Make sure to grasp the connector when disconnecting a fiber optic cable. Never disconnect a fiber optic cable by pulling on the cable.

To avoid damage due to contamination or abrasion, always put dust covers on the fiber optic cable connectors when the cable is disconnected.

Note – Dirty fiber optic cable connectors can impeded data transfer. Before replacing a fiber optic cable, be sure that the connectors on the cable are clean. Disconnect the cable as described in the following procedure. Lightly dip a cotton swab in a solution of isopropyl (rubbing) alcohol. Use the swab and clean inside both connectors. Reconnect the connectors. If the fiber optic cable still registers as being faulty, replace the fiber optic cable.

1. **Disconnect the fiber optic cable from the GBIC (FIGURE 7-3).**

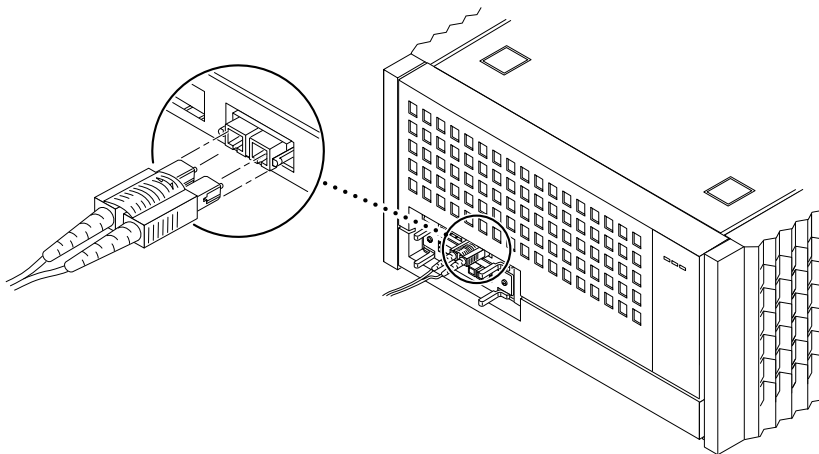


FIGURE 7-3 Disconnecting a Fiber Optic Cable From a GBIC

2. **Disconnect the fiber optic cable from the other device.**
3. **Replace the cable.**

7.2.3 GBIC

1. Disconnect the fiber optic cable (see Section 7.2.2).

2. Remove the GBIC.

Sun currently ships two types of GBICs: one with a bailed locking mechanism and one without.

- To remove a GBIC that does not have a bail, push the module tabs together and pull the GBIC out of the disk array.

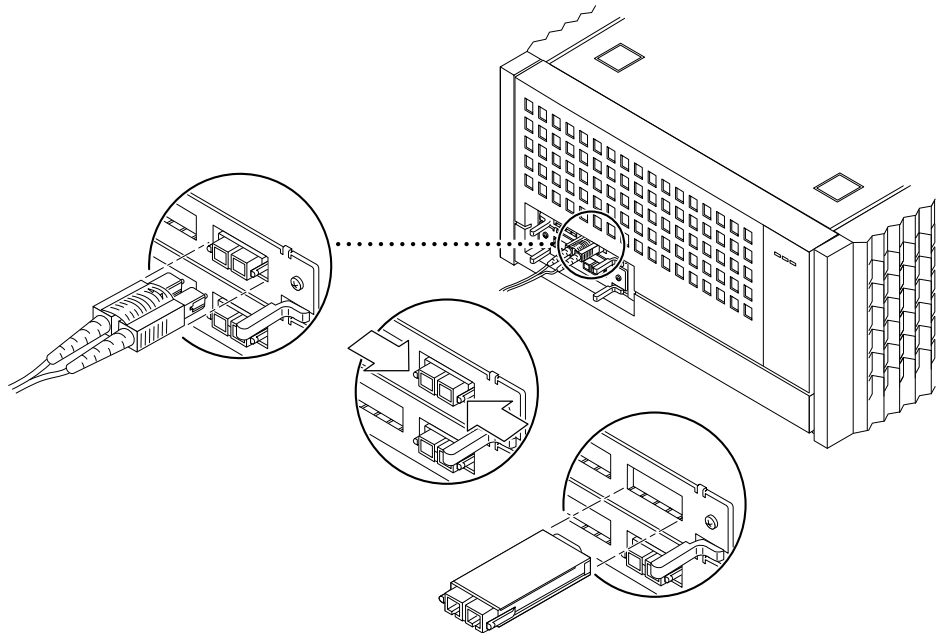


FIGURE 7-4 Removing a GBIC That Does Not Have a Bail

- To remove a GBIC that has a bail, move the bail up to the unlocked position and pull on the plastic tab of the bail.

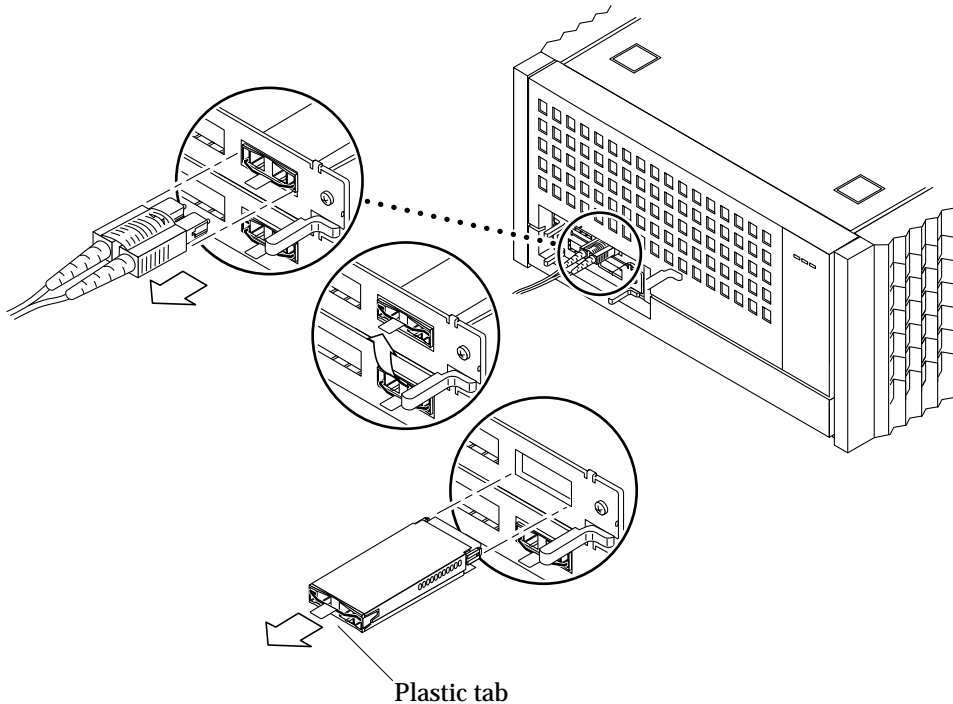


FIGURE 7-5 Removing a GBIC That Has a Bail

3. Replace the GBIC.

- To insert a GBIC that does not have a bail, slide the GBIC into the port until you hear a click. Be sure that both tabs on the left and right sides of the GBIC have engaged.
- To insert a GBIC that has a bail, slide the GBIC into the port with the bail in the unlocked (up) position. Once the GBIC is firmly seated in the port, move the bail down into the locked position.

4. Reconnect the fiber optic cable.

7.2.4 Interface Board

Note – If you are installing a second interface board, use a Phillips screwdriver to remove the screws securing the spacer to the interface board slot. Remove the spacer and install the interface board (FIGURE 7-6).

1. **Disconnect the fiber optic cable(s)** (see Section 7.2.2).
2. **Use a Phillips screwdriver to remove the screws.**
3. **Remove the interface board** (FIGURE 7-6).

Press the ejection levers outward to free the interface board from the chassis.

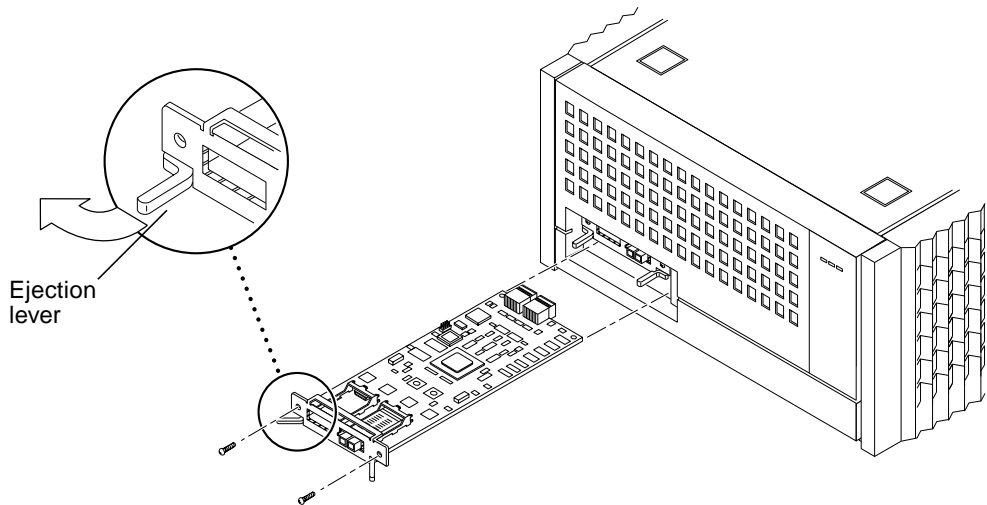


FIGURE 7-6 Removing an Interface Board

4. **Replace the interface board.**
5. **Reconnect the fiber optic cable(s).**

7.2.5 Door Panel Assembly

Note – The procedure is the same for removing the front or rear door assemblies.

1. Remove the door (FIGURE 7-7).

Rotate the door down about 30 degrees and lift it off the hinges.

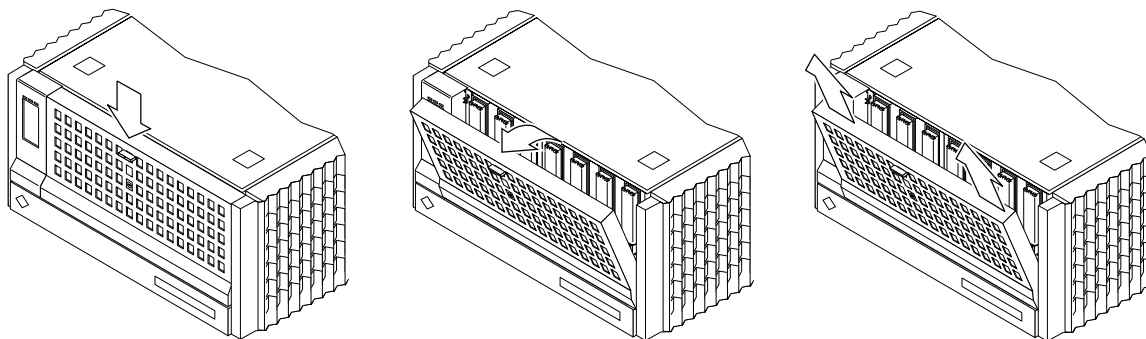


FIGURE 7-7 Removing a Door

2. Remove the three screws from the door panel assembly (FIGURE 7-8).

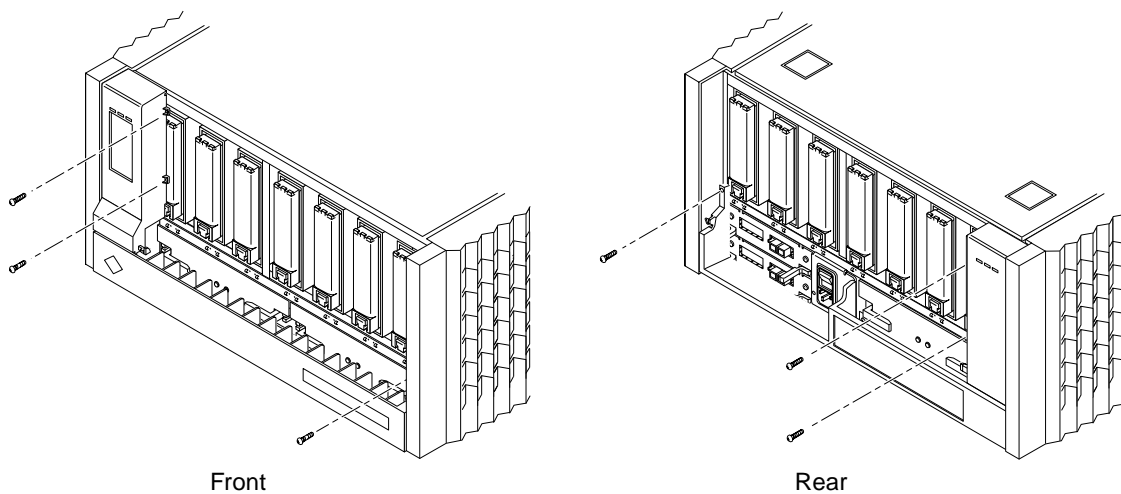


FIGURE 7-8 Removing the Screws From the Door Panel Assembly

3. Rotate the panel assembly down and lift it off the bottom panel (FIGURE 7-9).

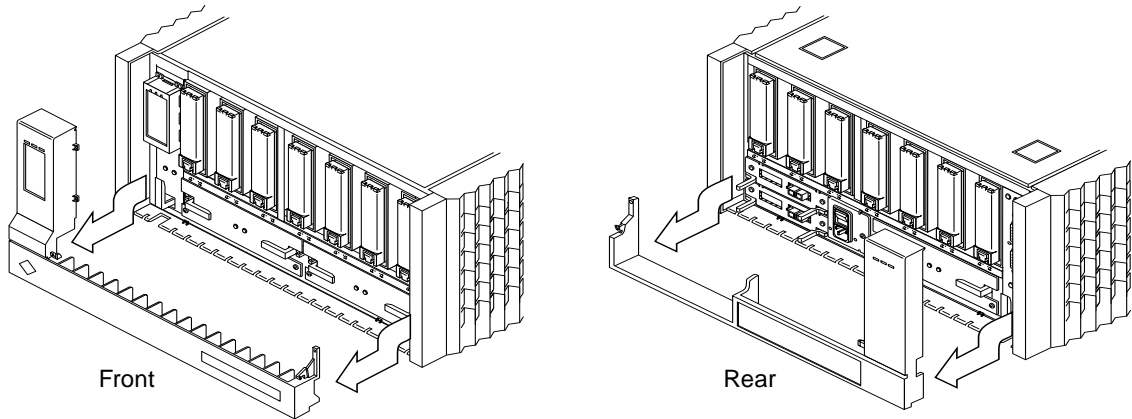


FIGURE 7-9 Removing a Door Panel Assembly

4. Reverse these steps to reinstall the door panel assembly.

7.2.6 FPM

1. Remove the front door and panel assembly (see Section 7.2.5).
2. Remove the four screws that secure the FPM to the fan tray (FIGURE 7-10).

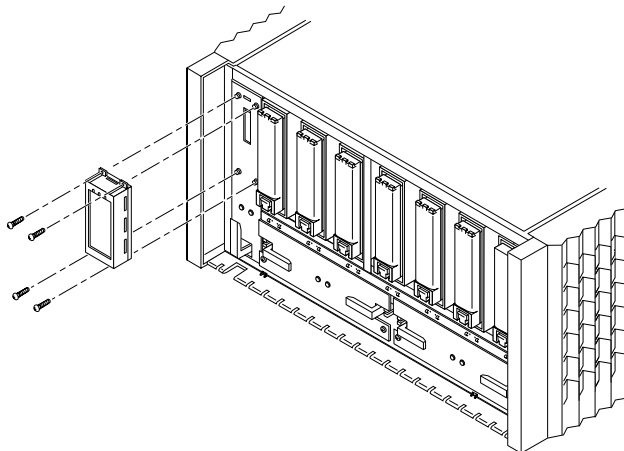


FIGURE 7-10 Removing the FPM

3. Replace the FPM.
4. Reinstall the front door and panel assembly.

7.2.7 Fan Tray



Caution – The disk array can only operate for up to 2 minutes with one functioning fan tray.

1. Remove the door and panel assembly (see Section 7.2.5).
2. Use the Phillips screwdriver to remove the screws (FIGURE 7-11).

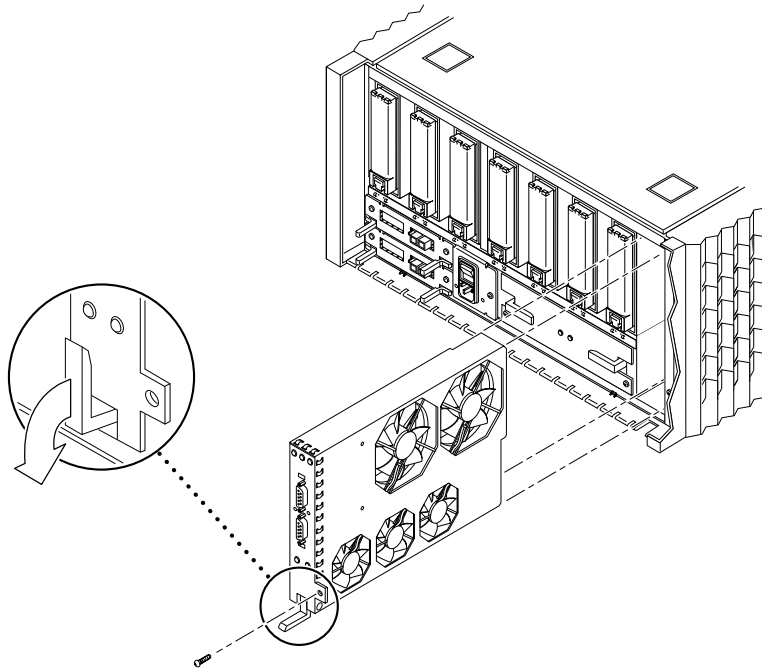


FIGURE 7-11 Removing a Fan Tray

3. Replace the fan tray.
4. Reinstall the screws.
5. Reinstall the door and panel assembly.

7.2.8 Power Supply



Caution – If over half of the disk drive bays are loaded and the disk array has two power supplies, the power system is not redundant. If one of the power supplies fails and there is heavy drive activity, the disk array may power off.

1. Remove the door and panel assembly (see Section 7.2.5).
2. Use the Phillips screwdriver to remove the screws (FIGURE 7-12).

Note – If you are installing an additional power supply, use a Phillips screwdriver to remove the screws securing the spacer to the power supply slot. Remove the spacer that covers the power supply slot.

3. Replace the power supply.

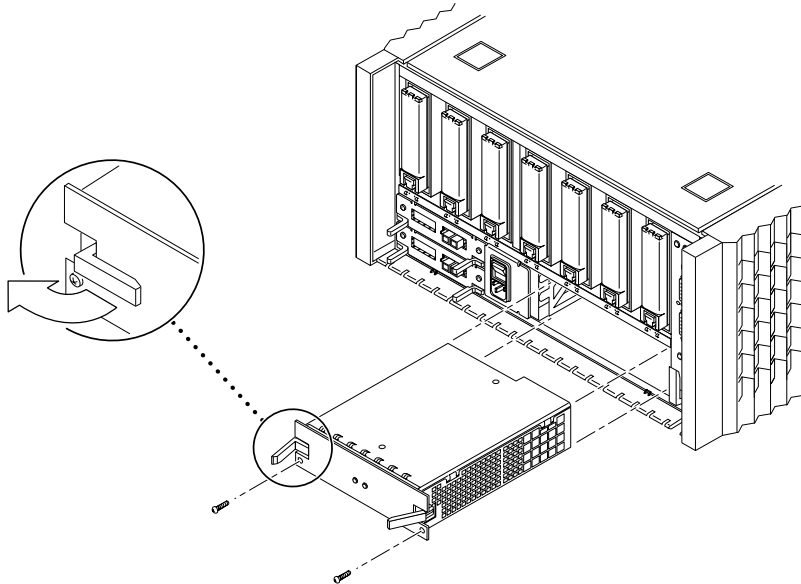


FIGURE 7-12 Removing a Power Supply

4. Tighten the screws.
5. Reinstall the door assembly.

7.2.9 AC Power Filter



Caution – The AC power filter is not a hot-plug item. You must remove power from the disk array before replacing the AC filter module.

1. **Power off the disk array.**
2. **Disconnect the power cable.**
3. **Remove the rear door and panel assembly (see Section 7.2.5).**
4. **Use the Phillips screwdriver to remove the retaining screw from the AC power filter (FIGURE 7-13).**
5. **Replace the AC power filter.**

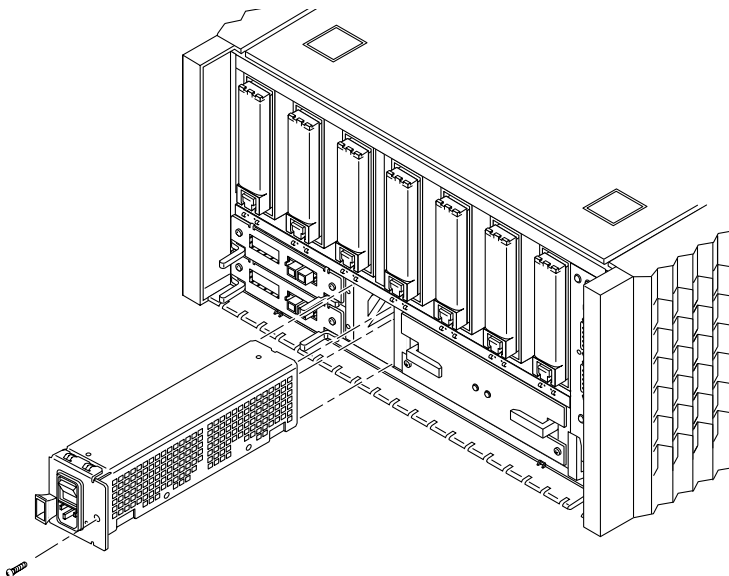


FIGURE 7-13 Removing the AC Power Filter

6. **Reinstall the screw.**
7. **Reinstall the door assembly.**
8. **Reconnect the power cable.**
9. **Power on the disk array.**

7.2.10 Backplane



Caution – The disk drive backplane is not a hot-plug item. You must remove power from the disk array before replacing the disk drive backplane.

1. Power off the disk array.
2. Disconnect the power cable.
3. Remove the disk drives (see Section 7.2.1).
4. Remove the door and panel assembly (see Section 7.2.5).
5. Use the flat-head screwdriver to release both lower disk drive guides (FIGURE 7-14).

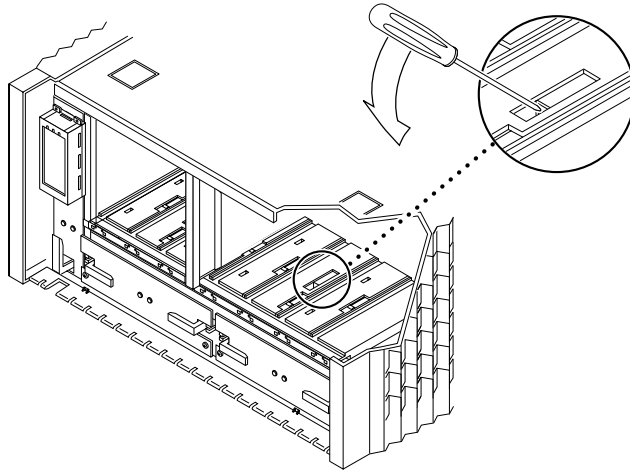


FIGURE 7-14 Releasing a Lower Disk Drive Guide

6. Remove the lower disk drive guides (FIGURE 7-15).

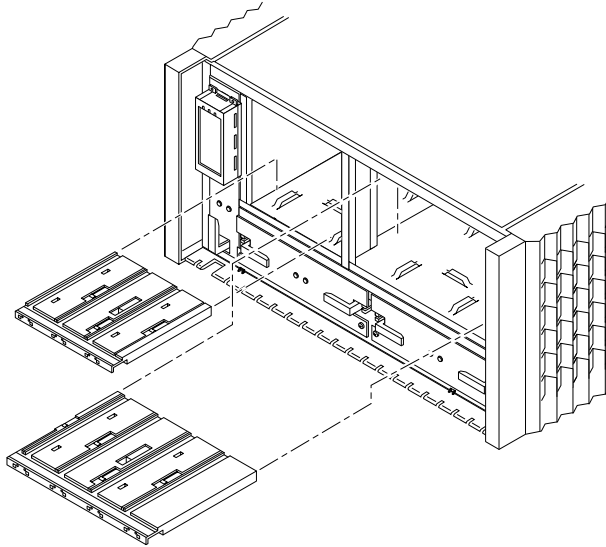


FIGURE 7-15 Removing the Lower Disk Drive Guides

7. Use a Phillips screwdriver to remove the screws securing the disk drive backplane (FIGURE 7-16).

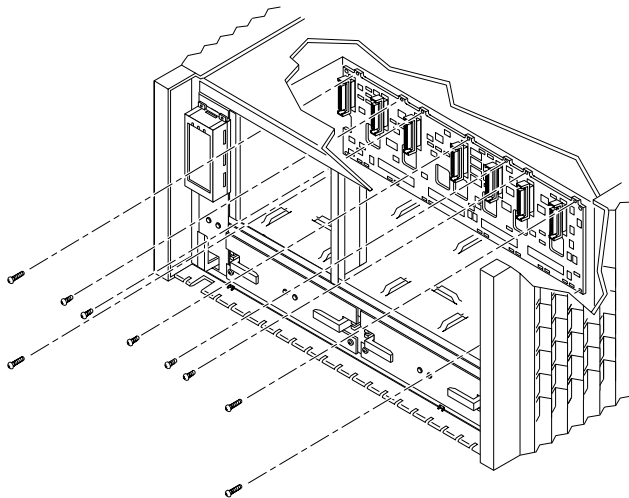


FIGURE 7-16 Removing the Screws From a Disk Drive Backplane

8. Remove and replace the disk drive backplane (FIGURE 7-17).

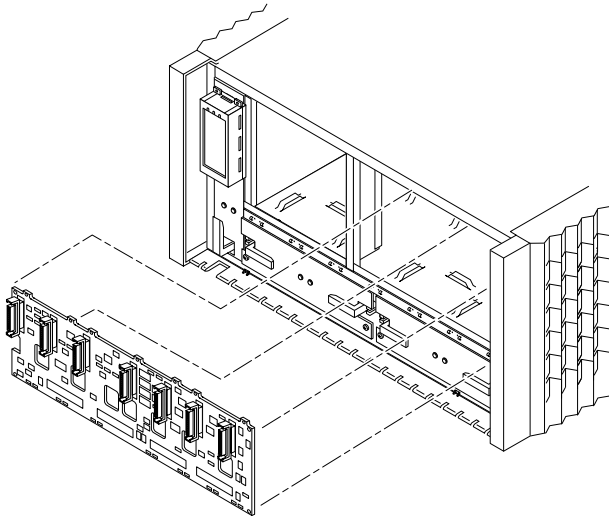


FIGURE 7-17 Removing a Disk Drive Backplane

9. Reverse the previous steps to reassemble the disk array.

7.2.11 Interconnect Assembly

Note – Rackmounted disk arrays must be removed from a cabinet before replacing an interconnect assembly. See Section 7.2.12 “Removing a Rackmounted Disk Array” on page 7-26 for removal instructions.



Caution – The interconnect assembly is not a hot-plug item. You must remove power to the disk array before replacing the interconnect assembly.

The disk array interconnect assembly contains the world wide number (WWN) of the disk array. The WWN is used by the SCSI Enclosure Services (SES) software to communicate with the disk array and obtain enclosure and environmental status. If the interconnect assembly is replaced, the WWN will change and SES will no longer see the disk array. Therefore, the `luxadm` command must be used to update the software.

1. Write down the FPM settings for the Loop Type (see Section 5.5), Box ID (see Section 5.5) and box name (see Section 5.12).

- Loop Type:
- Box ID:
- Box name:

You will need to restore these values later in the procedure.

2. Use the `luxadm remove_device` command to remove the SES path to the disk array.

For example:

```
# luxadm remove_device box2

WARNING!!! Please ensure that no filesystems are mounted on these
device(s).
All data on these devices should have been backed up.

The list of devices which will be removed is:
 1: Box: box6

Please enter 'q' to Quit or <Return> to Continue:

offlining: Drive in "box6" rear slot 1....Done
offlining: Drive in "box6" front slot 2....Done
offlining: Drive in "box6" rear slot 2....Done
offlining: Drive in "box6" front slot 3....Done
offlining: Drive in "box6" rear slot 3....Done
...

Hit <Return> after removing the device(s).
```

Note – Do not hit Return until the following step has been completed.

3. Power off the disk array.

4. Hit the Return key to complete the `luxadm remove_device` command.

For example:

```
Hit <Return> after removing the device(s).
```

```
Removing Logical Nodes:
```

```
Removing c2t49d0s0
```

```
Removing c2t49d0s1
```

```
...
```

```
Removing Ses Nodes:
```

```
Removing /dev/es/ses2
```

```
Removing /dev/es/ses3
```

```
#
```

5. Perform the steps in the following sections:

- Section 7.2.1 “Disk Drive” on page 7-3”
- Section 7.2.4 “Interface Board” on page 7-11
- Section 7.2.5 “Door Panel Assembly” on page 7-12
- Section 7.2.7 “Fan Tray” on page 7-14
- Section 7.2.8 “Power Supply” on page 7-15
- Section 7.2.9 “AC Power Filter” on page 7-16
- Section 7.2.10 “Backplane” on page 7-17

Note – Ensure that you disconnect the power cable in Section 7.2.9.

6. Remove the side panels (FIGURE 7-18).

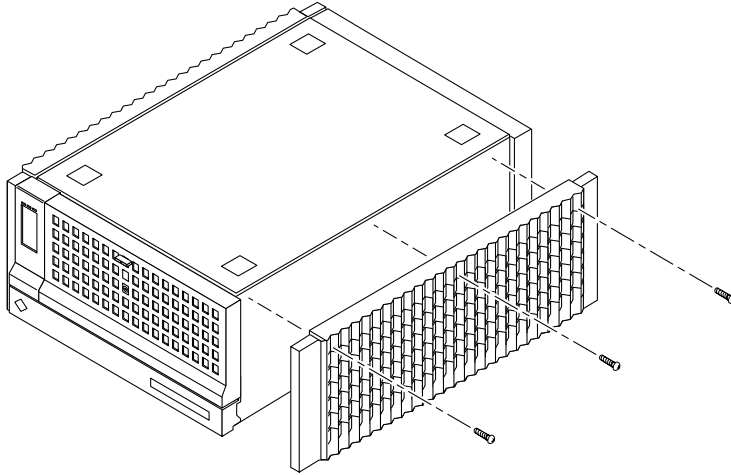


FIGURE 7-18 Removing the Side Panels

7. Remove the top panel (FIGURE 7-19).

Lift up on the front edges of the top panel while an assistant pushes it toward you.

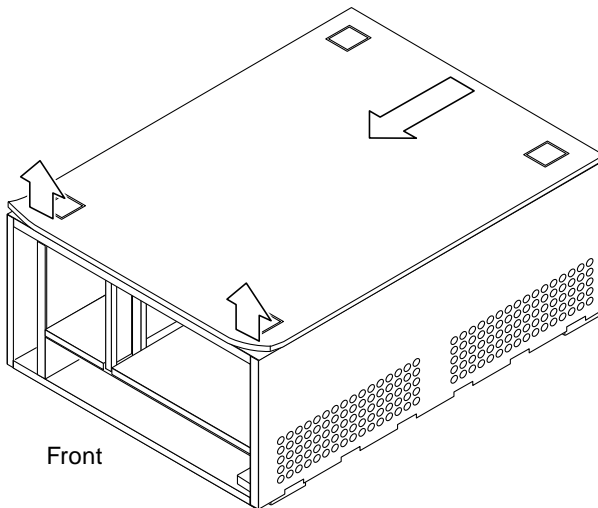


FIGURE 7-19 Removing the Top Panel

8. Use a Phillips screwdriver to remove the screws securing the metal access plate (FIGURE 7-20).

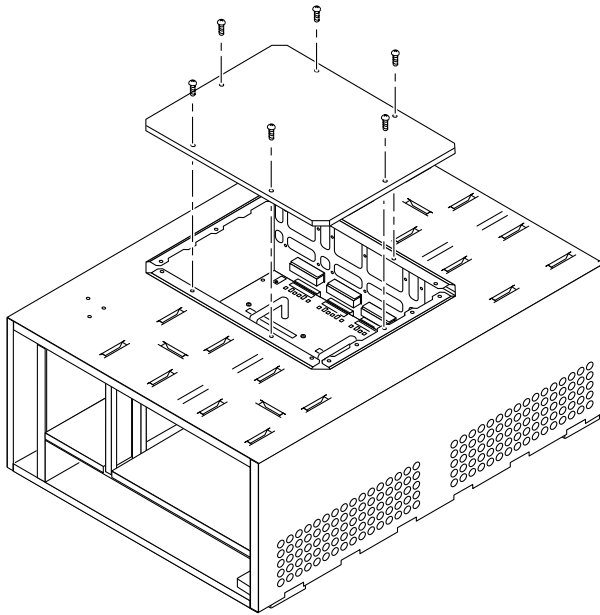


FIGURE 7-20 Removing the Metal Access Plate

9. Remove the metal access plate.

10. Remove and replace the interconnect assembly (FIGURE 7-21).
 - a. Remove the four screws holding the assembly. See FIGURE 7-21.
 - b. Lift the assembly and set it aside.

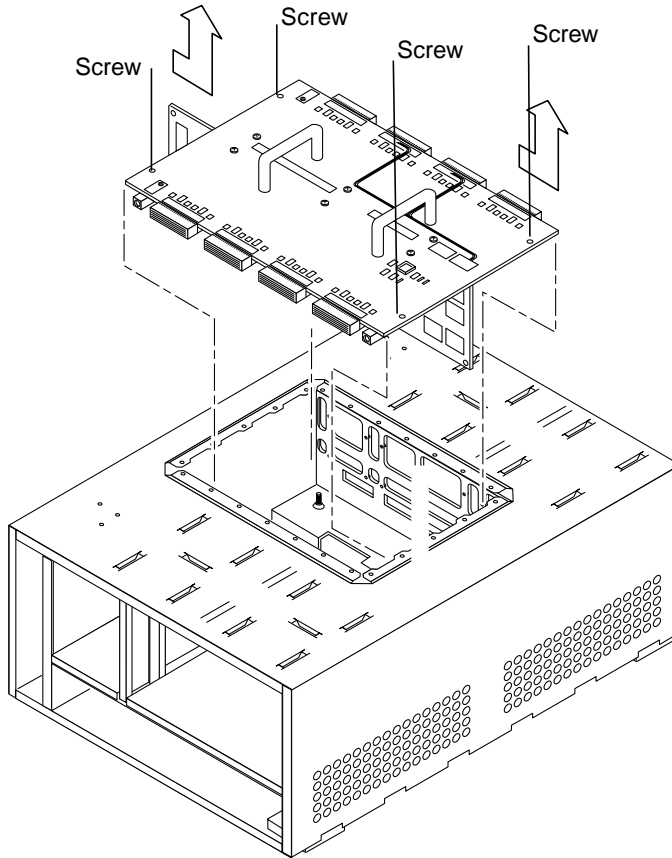


FIGURE 7-21 Removing the Interconnect Assembly

11. Reverse Step 5 through Step 9 to reassemble the disk array.
12. Power on the disk array.
13. Use the FPM to reset the Loop Type, Box ID, and box name to the settings you wrote down in Step 1.

14. Use the `luxadm insert_device` command to re-create the device paths and ses paths with the new WWN.

For example:

```
# luxadm insert_device
Please hit <enter> when you have finished adding photon(s):

Waiting for Loop Initialization to complete...
New Logical Nodes under /dev/es:
    ses2
    ses3
New Logical Nodes under /dev/dsk and /dev/rdisk :
    c2t52d0s0
    c2t52d0s1
    c2t52d0s2
    c2t52d0s3
    ...

#
```

7.2.12 Removing a Rackmounted Disk Array



Caution – This procedure requires two people to lift and move the disk array. Use care to avoid injury. A disk array with a baseplate attached may weigh up to 130 pounds (59 kg).

7.2.12.1 Removing the Chassis From the Cabinet

Follow the instructions on preparing for service in your system or expansion cabinet documentation. If necessary, be sure to:

- Extend the antitilt bar
- Remove or open the top front panel

1. **Power off the disk array.**
2. **Disconnect the power cable.**
3. **Disconnect the fiber optic cable(s) from the GBICs.**
4. **Remove the locking screws from the front of the disk array (FIGURE 7-22).**



Caution – Always extend a cabinet antitilt bar before removing the locking screws from the front of the disk array.

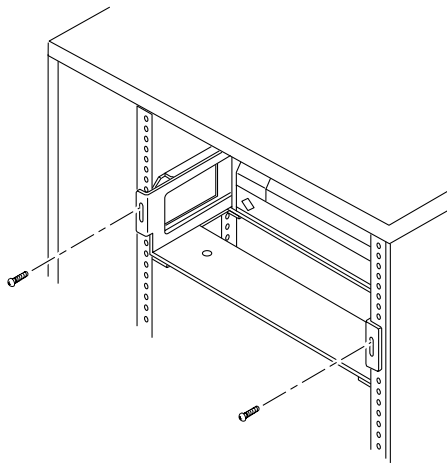


FIGURE 7-22 Removing the Screws That Secure the Baseplate to the Side Brackets

5. With the aid of an assistant, slide the disk array out of the cabinet until the chassis baseplate is stopped by the tabs on the side rails in the cabinet (FIGURE 7-23).

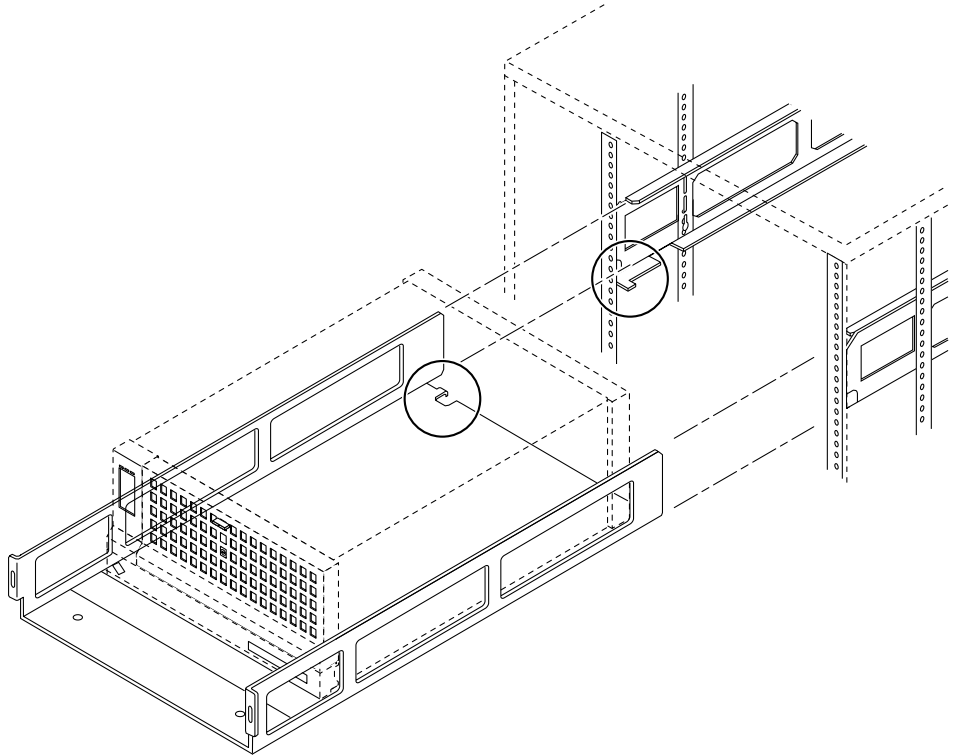


FIGURE 7-23 Removing the Chassis and Baseplate From the Cabinet

6. With the aid of an assistant (one person on each side), tilt the front of the chassis down and remove it from the rack.
7. Place the disk array on a surface capable of supporting 130 pounds (59 kg).

7.2.12.2 Removing the Chassis From the Baseplate

1. **With the aid of an assistant, invert the chassis with the front facing you (FIGURE 7-24).**
2. **Use a No. 1 Phillips screwdriver to remove the screws that secure the baseplate to the chassis.**

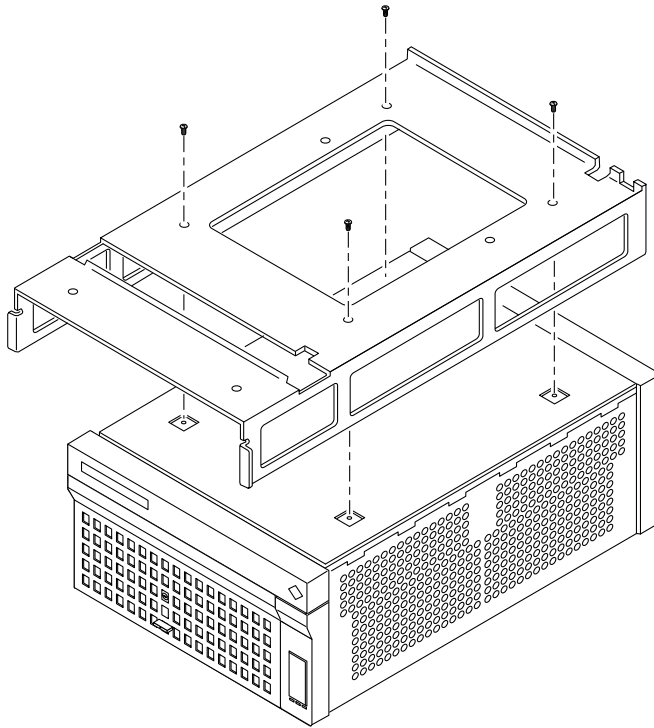


FIGURE 7-24 Removing the Baseplate From the Chassis

3. **With the aid of an assistant, restore the chassis to the upright position.**

Software, Firmware, and FCode Packages

This chapter explains how to check and upgrade (where appropriate) the various software, firmware, and FCode packages used with the disk array.

- Solaris Release and Installed Patches—page 8-2
- Host Adapter and I/O Board FCode—page 8-3
- Interface Board Firmware—page 8-5
- Disk Drive Firmware—page 8-7

8.1 Solaris Release and Installed Patches

8.1.1 Checking the Solaris Release

- To check the release of Solaris operating environment on your system, either use the `uname -a` command or look at the `/etc/release` file.

```
# uname -a
SunOS tm2 5.6 Generic sun4u sparc SUNW,Ultra-Enterprise
# cat /etc/release
    Solaris 2.6 s297s_smccDesktop_37cshwp SPARC
    Copyright 1996 Sun Microsystems, Inc. All Rights
Reserved.
                                Manufactured in the USA 18 July 1997
#
```

Note – The `uname -a` command does not currently display the sub-release information (such as `s297`) that may be relevant to some installations. The `/etc/release` file is not present on systems running the Solaris 2.5.1 operating environment or previous releases.

8.1.2 Checking for an Installed Patch

- To check for an installed patch, use the `showrev -p` command and `grep` for the patch number.

For example:

```
# showrev -p | grep 105375
Patch: 105375-04 Obsoletes: Requires: Incompatibles: Packages:
SUNWluxal, SUNWluxdv, SUNWluxop
#
```

For instructions on patch installation, read the `README` text file that accompanies the patch.

8.2 Host Adapter and I/O Board FCode

8.2.1 Checking FCode on the SBus FC-100 Host Adapter

- **To check the FCode version of a SBus FC-100 host adapter, use the `luxadm fcal` command.**

For example:

```
# luxadm fcal
Found Path to 1 FC100/S Cards
  Device: /devices/io-unit@f,e0200000/sbi@0,0/SUNW,socal@2,0
  Detected FC100/S Version: @(#) FCode 1.9 97/06/08
  Complete
#
```

8.2.2 Checking FCode on the PCI FC-100 Host Adapter

- **To check the FCode version of a PCI FC-100 host adapter, look for the boot message in the `/var/adm/messages` file.**

For example:

```
# grep Firmware /var/adm/messages
Mar 12 16:35:30 mississippi unix: ifp0: Firmware Version: v1.11
#
```

8.2.3 Checking FCode on the I/O+ Board

- **To check the FCode version on the I/O+ board, run the `/usr/platform/sun4u/sbin/prtdiag -v` command and look for information on the I/O+ board.**

You will be checking for the version of the OpenBoot™ PROM (OBP) FCode.

8.2.4 Upgrading Host Adapter FCode

- To upgrade the FCode, follow the instructions in the related patch README file.

Downloads must be done on idle disk arrays and the system must be rebooted after the upgrade is complete.

Note – Firmware on the PCI FC-100 host adapter cannot be upgraded. If you need to replace the firmware, contact your Sun service provider.

Here is an example of an SBus upgrade instruction:

```
# luxadm fcal_s_download -f /usr/lib/firmware/fc_s/fcal_s_fcode
Found Path to 1 FC100/S Cards
  Device: /devices/io-unit@f,e0200000/sbi@0,0/SUNW,socal@2,0
WARNING!! This program will update the Fcode in this FC100/S Sbus
Card.
This may take a few (5) minutes. Please be patient.
Do you wish to continue ? (y/n) y
Loading FCode: /usr/lib/firmware/fc_s/fcal_s_fcode
Loading 0x40000 bytes from /usr/lib/firmware/fc_s/fcal_s_fcode at
offset 0x0
Filling with zeroes...
selecting bank 0
selecting bank 1
selecting bank 2
selecting bank 3
Erasing...
FEprom erased after 118 attempts
Programming...
selecting bank 0
selecting bank 1
selecting bank 2
selecting bank 3
Programming done
  Complete
#
```

8.3 Interface Board Firmware

This firmware is referred to as the “IB firmware” because the functional code resides on the interface board. However, the interconnect assembly of the disk array contains a master copy that is used to download any IB that is installed. Be aware that this automatic download occurs even if the IB has a newer revision of firmware. This protects against the disk array ever running different versions in the two IBs.

8.3.1 Checking IB Firmware

When you replace an IB or an interconnect assembly, you should always check the firmware revision of the IBs.

- **To check the revision of IB firmware, use the `luxadm display` command and `grep` for “FW”.**

For this example, the firmware revision is 1.01:

```
# luxadm display box1 | grep FW
FW Revision:1.01 Box ID:1 Node WWN:50800200000009e8 Enclosure Name:box1
#
```

or

- **Use the FPM on the disk array.**

See Section 5.13 “Interface Boards” on page 5-14.

8.3.2 Downloading IB Firmware

1. **Stop all I/O to the disk array.**

Refer to the software documentation that came with your disk array or system.

2. **Check the IB firmware level.**

See Section 8.3.1 “Checking IB Firmware” on page 8-5.

Note – See the next section if your IB firmware revision is 1.01.

3. **Use the `luxadm download -s` command.**

The `-s` option saves the firmware to the Interconnect Assembly as well as the IBs.

For example:

```
# luxadm download -s box1
  Using the default file /usr/lib/locale/C/LC_MESSAGES/ibfirmware.
#
```

8.3.2.1 Upgrading From IB Firmware 1.01 to Later Revisions

You cannot directly upgrade from revision 1.01 to 1.05 or later versions of the firmware. For example, if you have an disk array running 1.01 and the current patch firmware is 1.07, you will need to upgrade to 1.03, and then to 1.07.

1. **Obtain a copy of the 1.03 firmware.**

You can obtain these 1.03 firmware from:

<http://sunsolve2.sun.com/fcs/A5000/index.html>

Contact your service representative if you cannot access this website.

2. **Use the `luxadm download -s -f` command to install the 1.03 firmware.**

The `-f` option specifies a file other than the default location for the firmware source.

For example:

```
# luxadm download -s -f /tmp/ibfirmware.1.03 box1
```

3. **Proceed with Step 3 of Section 8.3.2 “Downloading IB Firmware” on page 8-6.**

8.4 Disk Drive Firmware

8.4.1 Checking Disk Drive Firmware

The disk drives in the disk array contain firmware that may need periodic updates.

- **To check the disk drive firmware, use the `luxadm display` command on the physical paths to the disks and `grep` for “Revision”.**

For example:

```
# luxadm disp /dev/rdisk/c2*s2 | grep Revision
Revision:          1178
Revision:          1178
Revision:          1178
Revision:          1178
Revision:          117E
Revision:          1178
Revision:          1178
Revision:          1178
Revision:          117E
Revision:          117E
Revision:          1178
Revision:          1178
Revision:          1178
Revision:          1178
Revision:          1178
Revision:          1178
#
```

The first two characters are the revision; the last are a vendor hardware (HW) code.

For instructions on upgrading disk drive firmware, read the `README` text file that accompanies the patch.

Parts Breakdown

The disk array components listed in this appendix can be replaced at the customer site by a qualified service provider or by a user. For removal and replacement procedures, see Chapter 7.

A.1 14-Slot Disk Array

TABLE A-1 Front FRUs

Part Number	Description
370-2311	FPM
540-2858	Front fan tray
540-3852	Disk drive assembly (1.6-inch)
540-2877	Disk guide kit (1.6-inch)
501-4372	7-slot disk drive backplane
540-2864	Interconnect assembly
300-1295	Power supply

TABLE A-2 Rear FRUs

Part Number	Description
540-2859	Rear fan tray
540-3852	Disk drive assembly (1.6-inch)
540-2877	Disk guide kit (1.6-inch)
501-4372	7-slot disk drive backplane
370-2303	GBIC
501-2951	Interface board assembly

A.2 22-Slot Disk Array

TABLE A-3 Front FRUs

Part Number	Description
370-2311	FPM assembly
540-2858	Front fan tray
540-3869	Disk drive assembly (1-inch)
540-2879	Disk guide kit (1-inch)
501-4158	11-slot disk drive backplane
540-2864	Interconnect assembly
300-1295	Power supply

TABLE A-4 Rear FRUs

Part Number	Description
540-2859	Rear fan tray
540-3869	Disk drive assembly (1-inch)
540-2879	Disk guide kit (1-inch)
501-4158	11-slot disk drive backplane
370-2303	GBIC
501-2951	Interface board assembly

Specifications

This appendix describes the following specifications of the disk array:

- Physical Specifications—page B-2
- Service Access and Airflow Clearance—page B-3
- Electrical Specifications—page B-3
- Environmental Specifications—page B-4

B.1 Physical Specifications

B.1.1 14-Slot Disk Array

TABLE B-1 Physical Specifications

Height	Width ¹	Depth	Weight		
			Min Tabletop ²	Max Tabletop ³	Max Rackmount ^{3,4}
9.01 in	19.65 in	24.81 in	97 lbs	120 lbs	130 lbs
22.7 cm	49.5 cm	62.5 cm	44 kg	54 kg	59 kg

1. The width for a rackmounted disk array is 17.55 inches (44.2 cm). All other measurements are the same.

2. Min numbers are with five 1.6-inch high disk drives.

3. Max numbers are with fourteen 1.6-inch high disk drives.

4. This weight includes the mounting tray. The mounting tray can weigh up to 15 pounds (6.8 kg)

B.1.2 22-Slot Disk Array

TABLE B-2 Physical Specifications

Height	Width ¹	Depth	Weight		
			Min Tabletop ²	Max Tabletop ³	Max Rackmount ^{3,4}
9.01 in	19.65 in	24.81 in	90.5 lbs	113 lbs	126.5 lbs
22.7 cm	49.5 cm	62.5 cm	41.1 kg	51.3 kg	57.38 kg

1. The width for a rackmounted disk array is 17.55 inches (44.2 cm). All other measurements are the same.

2. Min numbers are with seven 1-inch high disk drives.

3. Max numbers are with twenty-two 1-inch high disk drives.

4. This weight includes the mounting tray. The mounting tray can weigh up to 15 pounds (6.8 kg)

B.2 Service Access and Airflow Clearance

Leave enough room in front and behind the disk array to access internal components. A disk array in a tabletop configuration should have at least 6 inches (15.24 cm) clearance on all sides to maintain proper airflow.



Caution – A Sun StorEdge Expansion Cabinet with Sun StorEdge A5000 disk arrays installed requires at least a two-inch clearance on the exhaust (vented) side of the expansion cabinet to maintain proper airflow.

B.3 Electrical Specifications

TABLE B-3 Electrical Specifications

Parameter	Value
Voltage	100–120 VAC (North America and Japan) 200–240 VAC (International)
Input current	6.6A (North America and Japan) ¹ 3.3A (International) ¹
Frequency	47–63 Hz
Input volt-amperes	660 VA ¹
Input power	650W ¹
Heat output	2220 BTUs/hr ¹

1. Maximum

B.4 Environmental Specifications

TABLE B-4 Environmental Specifications

Parameter	Operating	Non-Operating
Temperature	5°C to 40°C ambient	-20°C to 60°C ambient
Humidity	20% to 80%RH, noncondensing	93% RH
Altitude	3 km	12 km
Vibration	0.2Gs, 5 to 500 Hz swept sine	0.8Gs, 5 to 500 Hz swept sine
Shock	3Gs, 11 msec half sine	15Gs, 11 msec half sine

Disk Replacement Using Solstice DiskSuite

This chapter contains the procedure for replacing disk array disk drives that are managed by Solstice DiskSuite software.

1. Preserve the disk label if multiple slices on the disk drive are being used.

Perform this step if you are using a slice other than s2.

```
# prtvtoc /dev/rdisk/c2t17d0s2 > /var/tmp/c2t17d0.vtoc  
#
```

See the `prtvtoc` man page for more information.

2. Use the `metareplace` command to replace the disk slices if they have not been hotspared.

```
# metareplace d1 c2t17d0s2 c2t16d0s2  
d1: device c2t17d0s2 is replaced with c2t16d0s2  
#
```

3. Use the `luxadm remove -F` to remove the disk drive.

The `-F` option is required because SDS doesn't offline disks.

```
# luxadm remove -F /dev/rdisk/c2t17d0s2
WARNING!!! Please ensure that no filesystems are mounted on these
device(s).
All data on these devices should have been backed up.

The list of devices which will be removed is:
 1: Box Name "macs1" rear slot 1

Please enter 'q' to Quit or <Return> to Continue:

stopping: Drive in "macs1" rear slot 1...Done
offlining: Drive in "macs1" rear slot 1...Done

Hit <Return> after removing the device(s).
```

Note – The FPM icon for the disk drive to be removed should be blinking. In addition, the amber LED under the disk drive should also be blinking.

Note – Do not hit Return until Step 4 and Step 5 have been completed.

4. Open the door (FIGURE 8-1).

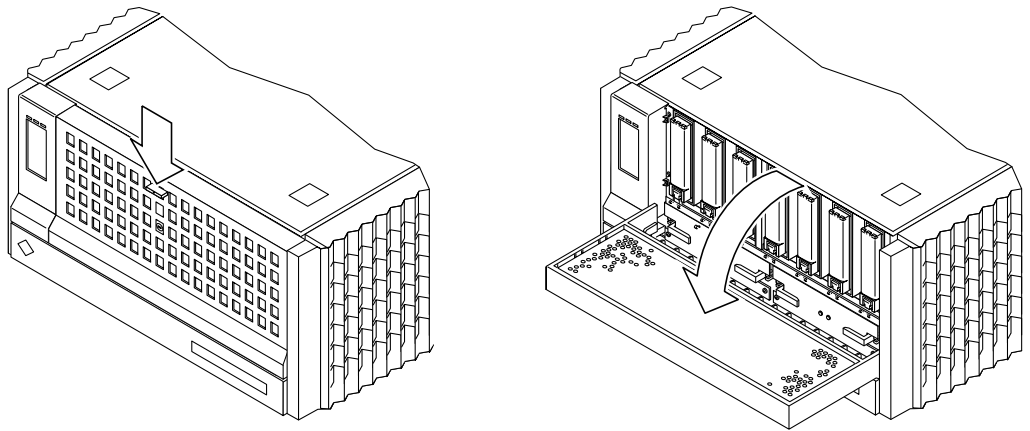


FIGURE 8-1 Opening a Door

5. Remove the disk drive (FIGURE 8-2).

Push down on the latch to release the bracket handle. Use the handle to pull the disk drive out of the slot.

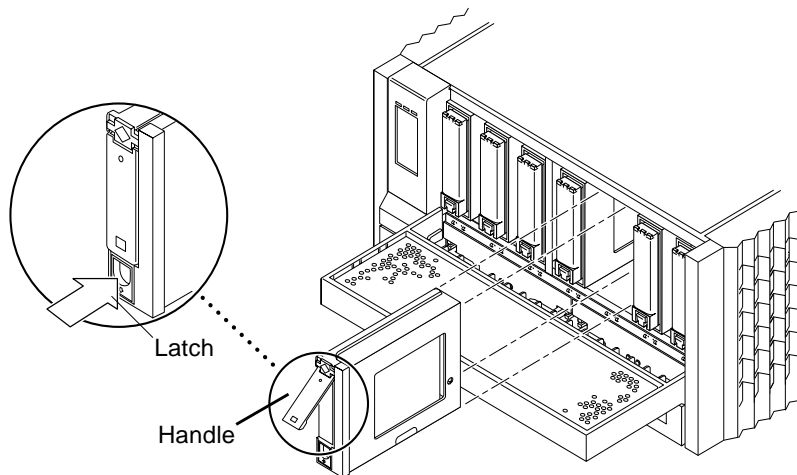


FIGURE 8-2 Removing a Disk Drive

6. Hit Return.

```
Hit <Return> after removing the device(s).
```

```
Drive in Box Name "macs1" rear slot 1
  Removing Logical Nodes:
  Removing clt17d0s0
  Removing clt17d0s1
  Removing clt17d0s2
  Removing clt17d0s3
  Removing clt17d0s4
  Removing clt17d0s5
  Removing clt17d0s6
  Removing clt17d0s7
  Removing c2t17d0s0
  Removing c2t17d0s1
  Removing c2t17d0s2
  Removing c2t17d0s3
  Removing c2t17d0s4
  Removing c2t17d0s5
  Removing c2t17d0s6
  Removing c2t17d0s7
```

```
#
```

7. Repeat for all hosts if the disk array is in a multihost configuration.

8. Use the `luxadm insert` command to insert the new disk drive.

```
# luxadm insert macs1,r1
The list of devices which will be inserted is:
  1: Box Name "macs1" rear slot 1

Please enter 'q' to Quit or <Return> to Continue:

Hit <Return> after inserting the device(s).
```

9. Insert the disk drive and hit the Return key.

Slide the disk drive into the slot with the handle released. Once you have inserted the disk drive as far as it will go into the slot, push down on the handle to secure it.

Note – The FPM icon for the disk drive you replaced should be lit. In addition, the green LED under the disk drive should be blinking.

```
Hit <Return> after inserting the device(s).

Drive in Box Name "macs1" rear slot 1
Logical Nodes under /dev/dsk and /dev/rdisk :
  c1t17d0s0
  c1t17d0s1
  c1t17d0s2
  c1t17d0s3
  c1t17d0s4
  c1t17d0s5
  c1t17d0s6
  c1t17d0s7
  c2t17d0s0
  c2t17d0s1
  c2t17d0s2
  c2t17d0s3
  c2t17d0s4
  c2t17d0s5
  c2t17d0s6
  c2t17d0s7

#
```

10. Close the door.

Note – The doors are tight to ensure an adequate seal. To close, place your thumbs on either side of the latch and press firmly.

11. Restore the disk label if you saved it in Step 1.

```
# cat /var/tmp/c2t17d0.vtoc | fmhard -s - /dev/rdisk/c2t17d0s2
#
```

12. Replace `metadb` if needed.

```
# metadb -d c2t17d0s0; metadb -a c2t17d0s0
#
```

See the `metadb` man page for more information.

13. Enable new disk slices with the `metareplace -e` command.

```
# metareplace -e d0 c2t17d0s0
d0: device c2t17d0s0 is enabled
#
```

See the `metareplace` man page for more information.

Firmware and Device Driver Error Messages

This appendix contains error messages that may be generated by the `socal` and `sf` device drivers and firmware of the Sun StorEdge A5000 disk array. Some of these error messages are the same as those generated by the SPARCstorage™ Array.

This appendix does not include error messages generated by Solstice DiskSuite software.

D.1 Target Numbers

The target number is the hexadecimal value for the physical target of the device that has an error. For instance, in the following error message, the target number is 33:

```
Jan 15 14:59:05 macs1 unix: sf1:    ELS 0x52 to target 0x33 timed out
```

To determine the errant device:

- 1. Convert the hexadecimal value to binary.**

In this case, 33 hexadecimal converts to 00110011 binary.

2. Decode the binary number according to the values in TABLE D-1.

Start on the left and work to the right.

TABLE D-1 Target Numbers

Bits	Description
0	Not used
1-2	The Box ID; 0 through 3
3	Backplane; 0 for front, 1 for rear
4-7	The location of the disk drive slot in the backplane

Note – If the target ends in a “d”, it is then a non-disk node (for example, a host adapter or an interface board).

Decoding the example of 00110011 yields the following results:

TABLE D-2 Target Number Example

Bits	Value	Decimal	Meaning
0	0	0	Not used
1-2	01	1	Box ID of 1
3	1	1	Rear backplane
4-7	0011	3	Slot 3 ¹

1. Since the numbering of slots starts with 0, this is the fourth disk drive in the backplane.

D.2 Message Formats

Error indications from the disk array drivers (`sf` and `socal`) are always sent to `syslog` (`/var/adm/messages`). Additionally, depending on the type of event that generated the message, it may be sent to the console. These messages are limited to significant events like cable disconnections.

Messages to the console are in the following form:

```
[WARNING:] instance: message
```

The `syslog` messages may contain additional text.

The above message ID identifies the message, its producer, and its severity.:

```
ID[SUNWssa.socal.messageid.XXXX] instance: message
```

For example:

```
WARNING: /sbus@6,0/SUNW,socal@d,10000/sf@0,0 (sf0): Transport
error on target=0x30: Fibre Channel CRC Error on frames

ID[SUNWssa.socal.link.6010] socal0: port 1: Fibre Channel Loop is
ONLINE
```

The messages in this appendix are shown with the message ID and the message text, even though the message ID is not displayed on the console. The character “#” stands for a numeric quantity, and “...” stands for a string of characters or numbers. The prefix “ID[SUNWssa]” is implied and not shown.

For example, the last message in the previous example will be shown as:

```
socal.link.6010 socal#: port #: Fibre Channel Loop is ONLINE
```

D.3 System Configuration Errors

This class of errors can occur because of insufficient system resources such as not enough memory to complete installation of the driver. They can also occur because of hardware restrictions of the server into which the disk array host adapter is installed.

This class of errors can also occur when your server encounters a hardware error on the system board, such as a failed memory module.

D.3.1 `socal` Driver Errors

```
socal.attach.4003 socal #: attach failed: alloc soft state
socal.attach.4004 socal #: attach failed: bad soft state
socal.attach.4010 socal #: attach failed: unable to map eeprom
socal.attach.4011 socal #: attach failed: unable to alloc xport struct
socal.attach.4012 socal #: attach failed: unable to alloc xport struct
socal.attach.4020 socal #: attach failed: unable to map XRAM
socal.attach.4030 socal #: attach failed: unable to map registers
socal.attach.4040 socal #: attach failed: unable to access status register
socal.attach.4050 socal #: attach failed: unable to write host adapter XRAM
socal.attach.4051 socal #: attach failed: unable to access host adapter XRAM
socal.attach.4052 socal #: attach failed: read/write mismatch in XRAM
socal.attach.4053 socal #: unable to create kstats
socal.attach.4060 socal #: attach failed: unable to install interrupt handler
```

The above messages indicate that the initialization of the `socal` driver was unable to complete. The most probable cause is insufficient system virtual address mapping resources (swap space) or kernel memory space for some of its internal structures. They can also be caused by an unsupported configuration. When these errors occur, the host adapter(s) associated with these messages will not be functional.

```
socal.driver.4020 socal #: alloc of dma handle failed
socal.driver.4030 socal #: alloc of dma space failed
socal.driver.4035 socal #: alloc of dma space failed
socal.driver.4040 socal #: bind of dma handle failed
socal.driver.4045 socal #: bind of dma handle failed
socal.driver.4050 socal #: alloc of dma handle failed
socal.driver.4060 socal #: alloc of dma space failed
socal.driver.4065 socal #: alloc of dma space failed
socal.driver.4070 socal #: bind of dma handle failed
socal.driver.4075 socal #: bind of dma handle failed
socal.driver.4110 socal #: Buffer pool DVMA alloc failed
```

These messages indicate there is not enough system DVMA or kernel heap resources available to complete driver initialization. They could also be caused by an unsupported configuration. The host adapter(s) associated with these messages will not be functional.

```
socal #: attach failed: device in slave-only slot
socal #: attach failed: hilevel interrupt unsupported
socal #: probe: Not self-identifying
```

The above messages indicate the SBus slot into which the host adapter is installed cannot support the features required to operate the disk array. The host adapter should be relocated to a different SBus slot. If you see this error message, you may be running an unsupported configuration (for example, you may have the disk array connected to a server that is not supported).

```
socal: start failed.
```

The above message is displayed only if the `socal` driver was forced into a reset condition and failed to restart. This indicates of a system resource (kernel memory) problem.

D.3.2 sf Driver Errors

```
sf #: failed to allocate soft state
sf #: bad soft state
sf #: failed to obtain transport handle
sf #: failed to allocate command/response pool
sf #: failed to allocate kmem cache
sf #: failed to allocate dma handle for lilp map
sf #: failed to allocate lilp map
sf #: failed to bind dma handle for lilp map
sf #: ddi_create_minor_node failed
sf #: scsi_hba_tran_alloc failed
sf #: scsi_hba_attach_setup failed
sf #: failed to create kstat
sf #: unable to create hotplug thread
```

In the above examples, the `sf` driver was unable to obtain enough kernel memory space for some of its internal structures. When these errors occur, the disk array associated with these messages will not be functional.

```
sf #: failed to attach
```

The above message is displayed after most of the error messages in the previous set.

```
sf_detach, sf%d: bad soft state
```

The above message can be result from either a loop reset or the removal of a node. In either case, the `sf` structure that is being detached is invalid. When this occurs, the disk array associated with this message will not be functional.

```
sf #: invalid lilp map
```

The above message occurs when the `SF_MAX_LILP_ENTRIES` variable is exceeded. It indicates that there are too many nodes on the loop for it to successfully complete initialization. When this occurs, the disk array associated with this message will not be functional.

```
sf #: target 0x%x, AL-PA 0x%x and hard address 0x%x don't match
```

The above message is displayed when the `target/al_pa` address does not match the hard address of the device. This can be caused by disks being removed and reinserted into the wrong slot of a disk array.

```
sf #: target 0x%x, duplicate port wwns sf #: target 0x%x, duplicate  
switch settings
```

The above messages are the result of an attempt to add a new device to an existing loop when a pre-existing device with the same ID already exists. When this error occurs, the device associated with this messages will not be functional.

```
sf #: wwn changed on target 0x%x
```

The above message is displayed if the `sf` driver senses that the WWN of a node is not the same as what it expects to find at the indicated target. When this error occurs, the device associated with this message will not be functional.

```
sf #: target 0x%x, unknown device type
```

The above message is displayed if the `sf` driver attempts to create a device that is not either an `ses` or `ssd` device. When this error occurs, the device associated with this message will not be functional.

```
sf #: ndi_devi_free failed
```

The above message is displayed if the `sf` driver attempts to create a device for which there is already existing device structures from a different device. When this error occurs, the device associated with this message will not be functional.

D.4 Hardware Errors

Errors under this classification are generally due to transient or permanent hardware failures or improper configuration of some subsystem components.

D.4.1 `socal` Driver Hardware Errors

```
socal.driver.3010 socal #: host adapter fw date code: <not available>
```

The above message may be displayed if no date code is present in the host adapter microcode. This situation should not occur under normal circumstances and may indicate the use of invalid disk array drivers or a failed host adapter.

Note – This message can be ignored if it occurs for each host adapter when the system is booting.

For reference, the expected message is:

```
socal.driver.1010 socal #: host adapter fw date code: %s
```

The above message is displayed at boot-up time to indicate the revision of the microcode loaded into the host adapter.

```
socal.link.4060 socal #: invalid FC packet; in, out, seqno = 0x%x,  
0x%x, 0x%x
```

The above message is displayed when the socal driver has detected some invalid fields in a packet received from the host adapter. The cause of this is most likely incorrectly functioning hardware (either the host adapter itself or some other SBus hardware).

```
socal.driver.4030 socal #: too many continuation entries  
socal.link.3020 socal #: unknown status: 0x%x  
socal.link.4050 socal #: unexpected state: flags: 0x%x
```

The above error messages may be displayed if the driver has detected an inconsistency in the state of the machine. This may be the result of failed hardware, such as the host adapter or SBus hardware.

```
socal.link.4010 socal #: incomplete continuation entry  
socal.link.4020 socal #: unsupported Link Service command: 0x%x  
socal.link.4030 socal #: unknown FC-4 command: 0x%x  
socal.link.4040 socal #: unsupported FC frame R_CTL: 0x%x
```

The above messages indicate the presence of invalid fields in the Fibre Channel frames received by the host adapter. This may indicate a non-Sun Fibre Channel device in the Fibre Channel loop of a disk array. These messages can also be caused by a failed host adapter, GBIC, or interface board.

D.4.2 sf Driver Hardware Errors

```
sf #: Target 0x%x Reset failed. Resp code 0x%x
sf #: Target 0x%x Reset Failed. Ret=%x
sf #: Target 0x%x Reset failed. Abort Failed
```

The above Reset errors indicate that an unsuccessful attempt was made to reset a particular target (as indicated by the `al_pa`). When these errors occur, the device associated with this message will not be functional.

```
sf #: Transport error on cmd=%x target=0x%x: %s
```

The above message will be followed by one of the following messages filling in the `%s` string:

```
FCP_RSP FCP_CMND fields invalid
  FCP_RSP Task Management Function Not Supported
  FCP_RSP Task Management Function Failed
  FCP_RSP FCP_DATA RO mismatch with FCP_XFER_RDY DATA_RO
  FCP_RSP FCP_DATA length different than BURST_LEN
  FCP_RSP invalid RSP_CODE
  Fibre Channel Offline
  Fibre Channel Timeout
  CMD_DATA_OVR
  Unknown CQ type
  Bad SEG CNT
  Fibre Channel Invalid X_ID
  Fibre Channel Exchange Busy
  Insufficient CQEs
  ALLOC FAIL
  Fibre Channel Invalid S_ID
  Fibre Channel Seq Init Error
  Fibre Channel Online Timeout
  Unknown FC Status
```



```
sf #: Transport error on target=0x%x: %s
```

The above message will be followed by one of the following messages filling in the %s string:

```
Fibre Channel CRC Error on frames
```

This transport error indicates that the driver or host adapter microcode has detected a bit error condition. The associated I/O operation will fail. This messages should be followed or preceded by other error messages; refer to these other error messages to determine what action you should take to fix the problem.

```
Fibre Channel: INCOMPLETE DMA XFER on sbus
```

This message means that the host adapter has failed and needs to be replaced as soon as possible.

```
sf #: ELS 0x%x to target 0x%x timed out
```

The above message indicates an Extended Loop Services (ELS) has encountered a problem in the loop and has exhausted retry attempts. Common ELS values are:

- 0x0 Loosely translates to a SCSI inquiry command
- 0x3 Login
- 0x5 Logout

0x0 is usually referencing a host adapter or interface board, whereas 0x3 and 0x5 are typically found in conjunction with a disk drive.

```
sf #: Offline Timeout
```

The above message indicates that attempts to `ONLINE` the offending loop have exceeded the number of retries and that the loop has timed out. When this occurs, the nodes on the loop associated with this message will not be functional.

```
sf #: soc lilp map failed status=0x%x
```

The above message indicates that the driver was unable to get a loop map from the firmware. This is usually caused by a failed LIP or certain devices on the loop that do not properly respond to report loop position, depending on the status.

D.5 Informational Messages

Messages in this category are used to convey some information about the configuration or state of various disk array subsystem components.

D.5.1 `socal` Driver Messages

```
socal.driver.1010 socal #: host adapter fw date code: %s
```

The above string is displayed at boot time to indicate the revision of the microcode loaded into the host adapter.

```
socal.link.5010 socal #: port #: Fibre Channel is OFFLINE
socal.link.6010 socal #: port #: Fibre Channel is ONLINE
socal.link.6010 socal #: port #: Fibre Channel Loop is ONLINE
```

The above message indicates that the loop is cycling between `ONLINE` and `OFFLINE`. Under a variety of circumstances, the Fibre Channel link may appear to the host adapter to have entered an inoperable state. This condition is usually temporary.

The Fibre Channel link can appear to go offline due to the following:

- A burst of errors occur on the fiber optic cable. In this case, the `OFFLINE` messages are usually followed by an `ONLINE` message shortly afterward.
- A fiber optic cable is disconnected from a host adapter, a disk array, or a hub.
- A connected disk array is powered off.

In addition, the failure of one or more of the following devices can also cause the messages:

- GBIC in a host adapter, a hub, or a disk array
- Fiber optic cable
- Interface board
- Host adapter

Following a link `OFFLINE`, any pending I/O operations to the disk array will be held by the driver for about one to two minutes. This is done so that pending operations can be completed if the link returns to an operable state. However, if the link does not transition from `OFFLINE` to `ONLINE` during that time, the driver will fail the I/O operations associated with the formerly connected disk array.

It is normal to see the `ONLINE` message for each connected disk array when the system is booting.

```
socal.link.1010 socal #: message: %s
```

Peripheral devices on the Fibre Channel (like the disk array) can cause the above message to be displayed on the system console/syslog under certain circumstances.

```
socal.link.3010 socal #: unknown LS_Command, %x
```

The unknown `LS_Command` messages will usually follow an `OFFLINE/ONLINE` sequence. These “errors” occur when multiple host adapters are connected to the same loop. Thus, loop logins are reflected multiple times. In short, such errors should not normally raise concerns.

D.5.2 `sf` Driver Messages

```
sf #: target 0x%x al_pa 0x%x offlined
```

The above message may be displayed in conjunction with any of numerous other messages that require the referenced target be taken offline. These messages usually follow the `socal ONLINE/OFFLINE` messages mentioned above. The most likely cause of the other message is the offlining of a target (most likely a disk) that requires a reset of the loop. The target associated with this message will not be functional.

```
sf #: Target 0x%x Reset successful  
sf #: sf_reset all
```

The above messages are displayed when the indicated target or all targets are successfully reset by the `sf` driver. No further action is required.

```
sf #: Lost Frame (write) got 0x%x al_pa 0x%x  
sf #: Lost Frame? (read) got 0x%x expected 0x%x al_pa 0x%x
```

The above messages indicates that the sender and receiver Frame counts within a packet do not agree. This sets a flag inside the packet structure that will cause the sender to resend the packet.

```
sf #: Force lip failed. Resetting
```

The above message indicates an unsuccessful attempt by the `sf` driver to force a lip (loop initiation process/primitive). The only recourse the driver has is to initiate a `socal` reset.

D.6 Internal Software Errors

Internal software error messages can be displayed when the driver detects some inconsistency in the state of the machine. These may be the result of failed hardware, usually either the disk array host adapter or SBus hardware.

The errors do not normally occur under normal operation.

D.6.1 `socal` Driver Software Errors

```
bad token = %x
```

The above message indicates a hardware or firmware problem. The token described here is actually a pointer to the driver's version of a packet. This pointer is either NULL or points to an invalid address.

D.6.2 `sf` Driver Software Errors

```
panic: sf #: sf_scsi_impl_pktfree: freeing free packet
```

The above message is displayed only during a system panic. The driver has been given a packet to free that is already on the Free List.

```
sf #: sync pkt failed
```

The above message indicates that some DDI routine tried to prepare a packet for DMA or make certain DMA has completed on the packet, and the operation failed. It is difficult to determine under what circumstances this would occur or what would cause it.

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