



Sun StorEdge™ T3 and T3+ Array Field Service Manual

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Regulatory Compliance Statements

Your Sun product is marked to indicate its compliance class:

- Federal Communications Commission (FCC) — USA
- Industry Canada Equipment Standard for Digital Equipment (ICES-003) - Canada
- Voluntary Control Council for Interference (VCCI) — Japan
- Bureau of Standards Metrology and Inspection (BSMI) — Taiwan

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 it is not installed and used in accordance with the instruction manual, it 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 to comply 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.

ICES-003 Class A Notice - Avis NMB-003, Classe A

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

ICES-003 Class B Notice - Avis NMB-003, Classe B

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.


VCCI 基準について

クラス A VCCI 基準について

クラス A 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、クラス A 情報技術装置です。これらの製品には、下記の項目が該当します。

この装置は、情報処理装置等電波障害自主規制協議会 (VCCI) の基準に基づくクラス A 情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

クラス B VCCI 基準について

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BSMI Class A Notice

The following statement is applicable to products shipped to Taiwan and marked as Class A on the product compliance label.

警告使用者：

這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。

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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.



Caution – The workplace-dependent noise level defined in DIN 45 635 Part 1000 must be 70Db(A) or less.

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 switches of this product function as standby type devices only. The power cords serve as the primary disconnect device for the system. ALL power cords must be disconnected to remove power from the product. Be sure to plug the power cords into a grounded power outlet that is nearby the system and is readily accessible.

Lithium Battery



Caution – On the system control board, there is a lithium battery molded into the real-time clock, SGS No. MK48T59Y, MK48TXXB-XX, MK48T18-XXXPCZ, M48T59W-XXXPCZ, M4T28 XXYSHZ or MK48T08. Batteries are not customer replaceable parts. They may explode if mishandled. Do not dispose of the battery in fire. Do not disassemble it or attempt to recharge it.

Battery Pack



Caution - There is a Nickel Metal Hydride battery in the product power supply. Panasonic Model HHR200SCP. There is danger of explosion if the battery is mishandled or incorrectly replaced. Replace only with the same type of Sun Microsystems battery. Do not disassemble it or attempt to recharge it outside the system. Do not dispose of the battery in fire. Dispose of the battery properly in accordance with local regulations.

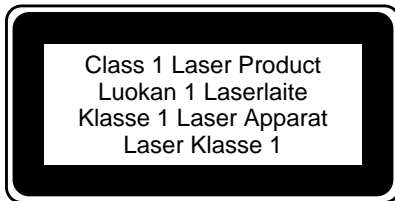
System Unit Cover



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.



Caution – Use of controls, adjustments, or the performance of procedures other than those specified herein may result in hazardous radiation exposure.

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.



Achtung – Der arbeitsplatzbezogene Schalldruckpegel nach DIN 45 635 Teil 1000 beträgt 70Db(A) oder weniger.

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 dreidadrigen 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 – Die Ein/Aus-Schalter dieses Geräts schalten nur auf Wartezustand (Stand-By-Modus). Um die Stromzufuhr zum Gerät vollständig zu unterbrechen, müssen Sie die Netzkabel aus der Steckdose ziehen. Alle Netzkabel müssen ausgesteckt sein, um die Stromverbindung zum Produkt zu unterbrechen. Schließen Sie die Stecker der Netzkabel an eine in der Nähe befindliche, frei zugängliche, geerdete Netzsteckdose an.

Lithiumbatterie



Achtung – Systemsteuerungskarten verfügen über eine Echtzeituhr mit integrierter Lithiumbatterie (Teile-Nr. MK48T59Y, MK48TXXB-XX, MK48T18-XXXPCZ, M48T59W-XXXPCZ, M4T28 XXYSHZ oder MK48T08). Diese Batterie darf nur von einem qualifizierten Servicetechniker ausgewechselt werden, da sie bei falscher Handhabung explodieren kann. Werfen Sie die Batterie nicht ins Feuer. Versuchen Sie auf keinen Fall, die Batterie auszubauen oder wiederauzuladen.

Batterien



Achtung – Das Netzteil des Panasonic-Modells HHR200SCP enthält eine Nickel-Metall-Hydridbatterie. Werden bei der Behandlung oder beim Austausch der Batterie Fehler gemacht, besteht Explosionsgefahr. Tauschen Sie Batterien nur gegen Batterien gleichen Typs von Sun Microsystems aus. Demontieren Sie die Batterie nicht, und versuchen Sie nicht, die Batterie außerhalb des Geräts zu laden. Werfen Sie die Batterie nicht ins Feuer. Entsorgen Sie die Batterie ordnungsgemäß entsprechend den vor Ort geltenden Vorschriften.

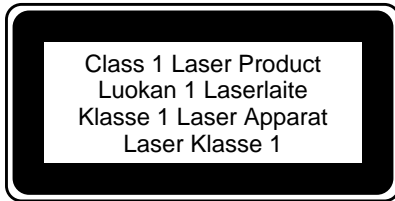
Gehäuseabdeckung



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.



Warnung – Die Verwendung von anderen Steuerungen und Einstellungen oder die Durchführung von Prozeduren, die von den hier beschriebenen abweichen, können gefährliche Strahlungen zur Folge haben.

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.



Attention : le niveau de pression acoustique au poste de travail s'élève selon la norme DIN 45 635 section 1000, à 70 dB (A) ou moins.

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 : les commutateurs d'alimentation de ce produit fonctionnent comme des dispositifs de mise en veille uniquement. Ce sont les prises d'alimentation qui servent à mettre le produit hors tension. Vous devez débrancher TOUTES les prises d'alimentation afin de couper l'alimentation du produit. Veillez donc à installer le produit à proximité d'une prise murale facilement accessible.

Batterie au lithium



Attention : sur la carte de contrôle du système, une batterie au lithium (référence MK48T59Y, MK48TXXB-XX, MK48T18-XXXPCZ, M48T59W-XXXPCZ, M4T28-XXXYYSHZ ou MK48T08) a été moulée dans l'horloge temps réel SGS. Les batteries ne sont pas des pièces remplaçables par le client. Elles risquent d'exploser en cas de mauvais traitement. Ne pas jeter la batterie au feu. Ne pas la démonter ni tenter de la recharger.

Bloc-batterie



Attention : l'alimentation du produit contient une batterie nickel-hydrure métallique (Panasonic modèle HHR200SCP). Il existe un risque d'explosion si cette batterie est manipulée de façon erronée ou mal mise en place. Ne remplacez cette batterie que par une batterie Sun Microsystems du même type. Ne la démontez pas et n'essayez pas de la recharger hors du système. Ne faites pas brûler la batterie mais mettez-la au rebut conformément aux réglementations locales en vigueur.

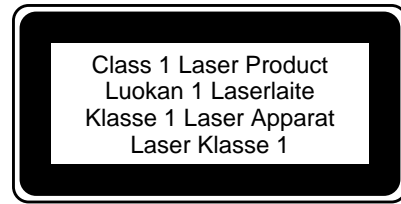
Couvercle



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.



Attention : l'utilisation de contrôles, de réglages ou de performances de procédures autre que celle spécifiée dans le présent document peut provoquer une exposition à des radiations dangereuses.

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 todos los avisos e instrucciones que se indican 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. El voltaje puede ser peligroso. 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.



Precaución – De acuerdo con la norma DIN 45 635, sección 1000, se admite un nivel de presión acústica para puestos de trabajo máximo de 70Db(A).

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 que existe 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. Los enchufes de la fuente de alimentación están diseñados para ser el elemento primario de desconexión del equipo. Debe desconectar TODOS los enchufes de alimentación del equipo antes de desconectar la alimentación. El equipo debe instalarse cerca del enchufe de forma que este último pueda ser fácil y rápidamente accesible.

Batería de litio



Precaución – En las placas de control del sistema hay una batería de litio insertada en el reloj de tiempo real, tipo SGS Núm. MK48T59Y, MK48TXXB-XX, MK48T18-XXXPCZ, M48T59W-XXXPCZ, M4T28-XXYYSHZ o MK48T08. El usuario no debe reemplazar las baterías por sí mismo. Pueden explotar si se manipulan de forma errónea. No arroje las baterías al fuego. No las abra o intente recargarlas.

Paquete de pilas



Precaución – Existe una pila de hidruro metálico de níquel en el sistema de alimentación de la unidad Panasonic modelo HHR200SCP. Existe riesgo de estallido si el paquete de pilas se maneja sin cuidado o se sustituye de manera indebida. Las pilas sólo deben sustituirse por el mismo tipo de pilas de Sun Microsystems. No las desmonte ni intente recargarlas fuera del sistema. No arroje las pilas al fuego. Deséchelas siguiendo el método indicado por las disposiciones vigentes.

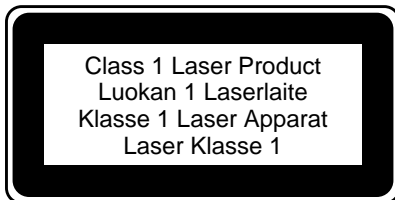
Tapa de la unidad del sistema



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.



Precaución – El manejo de los controles, los ajustes o la ejecución de procedimientos distintos a los aquí especificados pueden exponer al usuario a radiaciones peligrosas.

GOST-R Certification Mark

Nordic Lithium Battery Cautions

Norge



ADVARSEL – Litiumbatteri — Eksplosjonsfare. Ved utskifting benyttes kun batteri som anbefalt av apparatfabrikanten. Brukt batteri returneres apparatleverandøren.

Sverige



WARNING – Explosionsfara vid felaktigt batteribyte. Använd samma batterityp eller en ekvivalent typ som rekommenderas av apparattillverkaren. Kassera använt batteri enligt fabrikantens instruktion.

Danmark



ADVARSEL! – Litiumbatteri — Eksplosionsfare ved fejlagtig håndtering. Udskiftning må kun ske med batteri af samme fabrikat og type. Levér det brugte batteri tilbage til leverandøren.

Suomi



VAROITUS – Paristo voi räjähtää, jos se on virheellisesti asennettu. Vaihda paristo ainoastaan laitevalmistajan suosittelemaan tyyppiin. Hävitä käytetty paristo valmistajan ohjeiden mukaisesti.

Contents

Regulatory Compliance Statements iii

Preface xxv

1. Troubleshooting Overview 1-1

1.1 Network Storage Overview 1-1

1.2 Error Messages and Logs 1-2

1.2.1 Sun StorEdge T3 Array Generated Messages 1-2

1.2.2 Host-Generated Message 1-2

1.3 Sun StorEdge Component Manager 1-4

1.4 Sun StorEdge StorTools Software 1-4

1.5 Static Electricity Precautions 1-5

2. Connecting to the Sun StorEdge T3 and T3+ Array 2-1

2.1 Establishing a Serial Port Connection 2-1

2.2 Establishing a Telnet Session 2-3

2.3 Establishing an FTP Session 2-5

2.4 Using `tftpboot` to Boot a Single Array or a Partner Group Remotely 2-6

2.5 Configuring a Server for Remote Booting 2-9

2.6 Setting Up Remote Logging 2-10

- 3. Diagnosing Problems 3-1**
 - 3.1 Diagnostic Information Sources 3-1
 - 3.2 Troubleshooting Flow Charts 3-3
 - 3.3 Initial Troubleshooting Guidelines 3-7
 - 3.3.1 Troubleshooting Sources 3-7
 - 3.3.2 Troubleshooting Checks 3-7
 - 3.4 Verifying the Data Host Connection 3-8
 - 3.5 StorTools Connectivity Tests 3-8
 - 3.5.1 Primary Path Verification by the Host 3-8
 - 3.5.2 Verifying Hub Connectivity 3-11
 - 3.6 Checking Array Boot Status 3-11
 - 3.7 Telnet Connection Status Checks 3-14
 - 3.7.1 Determining Failover 3-14
 - 3.7.2 Verifying the Firmware Level and Configuration 3-15
 - 3.7.3 Checking FRU Status 3-18
 - 3.7.4 Testing the Array With StorTools 3-19
 - 3.8 Identifying Miscabled Partner Groups 3-19
 - 3.9 Identifying Data Channel Failures 3-23

- 4. Controller Card Assembly 4-1**
 - 4.1 Controller Card LEDs 4-1
 - 4.2 Removing and Replacing a Controller Card 4-4
 - 4.3 Upgrading Controller Firmware 4-5
 - 4.3.1 Sun StorEdge T3 Array Controller Firmware 4-6
 - 4.3.2 Sun StorEdge T3+ Array Controller Firmware 4-8

- 5. Disks and Drives 5-1**
 - 5.1 Monitoring Drive Status 5-1
 - 5.1.1 Checking Drive Status Codes 5-2
 - 5.1.2 Checking the Hot Spare 5-3
 - 5.1.3 Checking Data Parity 5-4
 - 5.1.4 Checking Drive Temperature 5-5
 - 5.2 Disk Drive LEDs 5-6
 - 5.3 Repairing Disk Drives 5-7
 - 5.3.1 Removing and Replacing a Disk Drive 5-8
 - 5.3.2 Rebuilding a Replaced Drive FRU 5-11
 - 5.4 Upgrading Disk Drive Firmware 5-13
 - 5.5 Clearing Corrupted Disk Labels 5-15

- 6. Interconnect Card Assemblies 6-1**
 - 6.1 Interconnect Card LEDs 6-2
 - 6.2 Removing and Replacing an Interconnect Card 6-3
 - 6.3 Upgrading Interconnect Card Firmware 6-5

- 7. Power and Cooling Unit Assemblies 7-1**
 - 7.1 Power and Cooling Unit 7-1
 - 7.2 Power and Cooling Unit LEDs 7-2
 - 7.2.1 Power and Cooling Unit LEDs 7-3
 - 7.3 Removing and Replacing a Power and Cooling Unit 7-4
 - 7.4 UPS Battery 7-6
 - 7.4.1 Checking the Battery 7-7
 - 7.4.2 Battery Maintenance 7-8
 - 7.4.3 Removing and Replacing the UPS Battery 7-10

- 8. Diagnosing and Correcting FC-AL Loop Problems 8-1**
 - 8.1 Overview 8-1
 - 8.2 Normal Status 8-2
 - 8.2.1 The `fru stat` Command 8-5
 - 8.2.2 The `vol mode` Command 8-6
 - 8.2.3 The `port listmap` Command 8-6
 - 8.2.4 The `.loop stat` Command 8-6
 - 8.2.5 The `.disk pathstat` Command 8-7
 - 8.2.6 The `.disk linkstat` Command 8-8
 - 8.3 Diagnosing an FC-AL Loop 8-10
 - 8.3.1 FC-AL Loop Problem Indicators 8-10
 - 8.3.2 Checking Performance Against Baseline Data 8-12
 - 8.3.3 StorTools Message Monitoring 8-13
 - 8.3.4 Component Manager Status Indicator 8-13
 - 8.3.5 Manual Examination of the `syslog` File 8-13
 - 8.3.6 Example `syslog` Error Messages 8-14
 - 8.3.7 Using CLI Diagnostic Commands 8-15
 - 8.3.8 Using the `ofdg` Diagnostic Utility 8-16
 - 8.4 Repair Procedures 8-21
 - 8.4.1 Interconnect Card Replacement Procedure 8-21
 - 8.4.2 RAID Controller Replacement Procedure 8-22
 - 8.4.3 Off-Line Drive Diagnostics and Replacement 8-23
 - 8.4.4 Chassis Replacement Procedure 8-29

- 9. Chassis/Backplane Assembly 9-1**
 - 9.1 Troubleshooting the Chassis/Backplane Assembly 9-1
 - 9.2 Replacing the Chassis/Backplane Assembly 9-2

10. Hardware Reconfiguration	10-1
10.1 Connecting Single Controller Units to Form a Partner Group	10-1
10.1.1 Preparing the Arrays	10-2
10.1.2 Cabling a Partner Group	10-4
10.1.3 Establishing a New IP Address	10-7
10.1.4 Defining and Mounting Volumes on the Alternate Master	10-10
10.2 Disconnecting a Partner Group to Form Single Controller Units	10-15
10.2.1 Preparing the Arrays	10-15
10.2.2 Establishing a New IP Address	10-17
10.2.3 Establishing a Network Connection	10-17
10.2.4 Defining and Mounting Volumes	10-18
10.3 Changing the Port ID on the Array	10-23
A. Illustrated Parts Breakdown	A-1
A.1 Sun StorEdge T3 Array	A-2
A.2 Sun StorEdge T3 Array Assemblies	A-3
A.3 Door Assembly	A-4
A.4 Interconnect Card Assembly	A-5
A.5 Power Supply and Cooling Unit	A-6
A.6 Controller Card	A-7
A.7 Drive Assembly	A-8
A.8 Cable and Interconnect Assemblies	A-9
B. Sun StorEdge T3 Array System Defaults	B-1
B.1 Boot Defaults	B-1
B.2 System Defaults	B-2
B.3 Volume Defaults	B-3
B.4 Default Directories and Files	B-4

C. Sun StorEdge T3 and T3+ Array Messages C-1

C.1 Message Syntax C-1

C.2 Reset Log Types C-3

C.3 Boot Messages C-4

D. Sun StorEdge T3 Array System Commands D-1

D.1 Commands List D-1

D.2 FRU Identifiers D-3

E. FC-AL Loop Identifiers E-1

F. Sun StorEdge T3 Array Configuration Worksheets F-1

F.1 Worksheets F-1

F.2 System Information Worksheets F-2

Glossary Glossary-1

Figures

- FIGURE 2-1 Serial Port Location 2-2
- FIGURE 3-1 Data Connection Troubleshooting Flow Chart 3-4
- FIGURE 3-2 Ethernet Troubleshooting Flow Chart 3-5
- FIGURE 3-3 Procedure “A” 3-6
- FIGURE 3-4 MAC Address on the Pull-Out Tab 3-20
- FIGURE 3-5 Power Switch Locations 3-22
- FIGURE 4-1 Sun StorEdge T3 Array Controller Card LEDs 4-2
- FIGURE 4-2 Sun StorEdge T3+ Array Controller Card LEDs 4-3
- FIGURE 4-3 Removing the Controller Card 4-4
- FIGURE 5-1 Disk Drive LEDs (Viewed Through Front Cover) 5-6
- FIGURE 5-2 Removing the Front Panel 5-8
- FIGURE 5-3 Disk Drive Numbering 5-8
- FIGURE 5-4 Releasing the Latch Handle 5-9
- FIGURE 5-5 Removing a Disk Drive 5-10
- FIGURE 6-1 Interconnect Card LEDs 6-2
- FIGURE 6-2 Removing the Interconnect Card 6-4
- FIGURE 7-1 Power Cords Connected to the Power and Cooling Units 7-2
- FIGURE 7-2 Power and Cooling Unit LEDs 7-3
- FIGURE 7-3 Removing the Power and Cooling Unit 7-5
- FIGURE 7-4 Turning the PCU upside down 7-10

FIGURE 7-5	Removing the Screws from the PCU Bottom Panel	7-11
FIGURE 7-6	Lifting the PCU Bottom Panel and Battery Slightly Away from the Unit	7-12
FIGURE 7-7	The Battery Connector Details Inside the PCU	7-13
FIGURE 7-8	UPS Battery Setting Right Side Up	7-14
FIGURE 8-1	Backend Loop Configuration	8-3
FIGURE 9-1	Power Switch Location	9-3
FIGURE 9-2	Serial Number and MAC Address on Pull-out Tab	9-3
FIGURE 9-3	Removing the Chassis	9-4
FIGURE 9-4	Serial Number and MAC Address on Pull-out Tab	9-6
FIGURE 10-1	Connecting the Interconnect Cables	10-6
FIGURE 10-2	Fully Cabled Partner Group	10-7
FIGURE 10-3	Location of Pull-Out Tab With MAC Address	10-8
FIGURE 10-4	Interconnect Cable Location	10-16
FIGURE A-1	Sun StorEdge T3 Array (Front View)	A-2
FIGURE A-2	Sun StorEdge T3 Array (Back View)	A-3
FIGURE A-3	Door Assembly	A-4
FIGURE A-4	Interconnect Card Assembly	A-5
FIGURE A-5	Power Supply	A-6
FIGURE A-6	Controller Card	A-7
FIGURE A-7	Drive Assembly	A-8
FIGURE A-8	Cables and Interconnects	A-9

Tables

TABLE 1-1	Levels of Message Notification	1-3
TABLE 1-2	FRU Identifiers	1-3
TABLE 3-1	Diagnostic Functions and Tools	3-1
TABLE 3-2	Firmware Status Indicators	3-13
TABLE 4-1	FC-AL Channel-Active LED Descriptions (Sun StorEdge T3 array)	4-2
TABLE 4-2	Controller Status LED Descriptions (Sun StorEdge T3 array)	4-2
TABLE 4-3	Sun StorEdge T3+ Array Controller Card LED Descriptions	4-3
TABLE 4-4	Channel Active LED Descriptions	4-11
TABLE 5-1	Drive Status Messages	5-2
TABLE 5-2	Disk Drive LED Descriptions	5-6
TABLE 6-1	Interconnect Card LED Descriptions	6-2
TABLE 7-1	Power and Cooling Unit LED Descriptions	7-3
TABLE A-1	Sun StorEdge T3 Array Assemblies	A-3
TABLE A-2	Door Assembly	A-4
TABLE A-3	Interconnect Card Assembly	A-5
TABLE A-4	Power Supply	A-6
TABLE A-5	Controller Card	A-7
TABLE A-6	Drive Assembly	A-8
TABLE A-7	Cable and Interconnect Assemblies	A-10
TABLE B-1	Default Settings—set List	B-1

TABLE B-2	System Default Settings	B-2
TABLE B-3	Volume Defaults	B-3
TABLE B-4	Default Directories and Files	B-4
TABLE C-1	Message Types	C-2
TABLE C-2	FRU Identifiers	C-2
TABLE C-3	Reset Log Types	C-3
TABLE C-4	Default System Files and Directories	C-3
TABLE C-5	Boot Message Acronyms	C-4
TABLE C-6	Firmware Status Boot Messages	C-6
TABLE D-1	Commands Listed in Alphabetical Order	D-2
TABLE D-2	FRU Identifiers	D-3
TABLE E-1	Assigned Loop Identifier	E-1
TABLE F-1	Sun StorEdge T3 and T3+ array Information Worksheet	F-2

Preface

The *Sun StorEdge T3 and T3+ Array Field Service Manual* is designed to provide the qualified service-trained maintenance provider with sufficient information to effectively troubleshoot and resolve any Sun StorEdge™ T3 or T3+ array failure. The procedures in this manual describe how to isolate the failure, remove and replace component(s), effectively reconfigure the module and system, and place the product back into the customer's network.

Before You Read This Book

Make sure you have prepared by reviewing the *Sun StorEdge T3 and T3+ Array Installation, Operation, and Service Manual*; *Sun StorEdge T3 and T3+ Array Administrator's Guide*; and *Sun StorEdge T3 and T3+ Array Release Notes*. Work with the site system administrator to determine if any external hardware or software products are required to repair this device.

How This Book Is Organized

This manual is organized as follows:

Chapter 1 provides a troubleshooting overview on the Sun StorEdge T3 and T3+ array.

Chapter 2 describes how to connect to and boot the Sun StorEdge T3 and T3+ array.

Chapter 3 provides the qualified service provider with troubleshooting techniques for the Sun StorEdge T3 and T3+ array.

Chapter 4 describes how to monitor and replace the controller card, and upgrade the firmware.

Chapter 5 describes how to monitor and replace the disk drives, and upgrade the firmware.

Chapter 6 describes how to monitor and replace the interconnect card, and upgrade the firmware.

Chapter 7 describes how to replace the power and cooling unit and monitor the UPS.

Chapter 8 describes how to diagnose and correct back-end FC-AL drive loop problems with the Sun StorEdge T3 and T3+ array.

Chapter 9 describes how to replace the chassis/backplane assembly.

Chapter 10 describes how to reconfigure the Sun StorEdge T3 array into partner groups and single controller units.

Appendix A contains part numbers and illustrations of field-replaceable units.

Appendix B lists the Sun StorEdge T3 and T3+ array defaults.

Appendix C contains a description of the messages that can be reported by the array.

Appendix D contains descriptions of the commands supported by the Sun StorEdge T3 and T3+ array.

Appendix E lists the FC-AL loop identified by AL_PA switch and setting values.

Appendix F contains a blank worksheet for the qualified service provider to make notes at each customer site.

Using UNIX Commands

This document contains some information on basic UNIX[®] commands and procedures such as booting the devices. For more information outside of this document, see the following:

- AnswerBook2[™] 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, glossary terms	Read Chapter 6 in the <i>User's Guide</i> . These are called <i>class</i> options. The user <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

Application	Title	Part Number
Installation overview	<i>Sun StorEdge T3 and T3+ Array Start Here</i>	816-0772
Safety procedures	<i>Sun StorEdge T3 and T3+ Array Regulatory and Safety Compliance Manual</i>	816-0774
Site preparation	<i>Sun StorEdge T3 and T3+ Array Site Preparation Guide</i>	816-0778
Configuration	<i>Sun StorEdge T3 and T3+ Array Configuration Guide</i>	816-0777
Installation and service	<i>Sun StorEdge T3 and T3+ Array Installation, Operation, and Service Manual</i>	816-0773
Cabinet installation	<i>Sun StorEdge T3 Array Cabinet Installation Guide</i>	806-7979
Latest array updates	<i>Sun StorEdge T3 and T3+ Array Release Notes</i>	816-1983
Administration	<i>Sun StorEdge T3 and T3+ Array Administrator's Guide</i>	816-0776
Disk drive specifications	<i>18 Gbyte 10K rpm Disk Drive Specifications</i>	806-1493
	<i>36 Gbyte, 10K rpm Disk Drive Specifications</i>	806-6383
	<i>73 Gbyte, 10K rpm Disk Drive Specifications</i>	806-4800
Component Manager installation	<i>Sun StorEdge Component Manager Installation Guide - Solaris</i>	806-6645
	<i>Sun StorEdge Component Manager Installation Guide - NT</i>	806-6646
Using Component Manager	<i>Sun StorEdge Component Manager User's Guide</i>	806-6647
Component Manager Release Notes	<i>Sun StorEdge Component Manager Release Notes</i>	806-6648
Testing the array	<i>Sun StorEdge StorTools User's Guide, Version 4.1</i>	816-1179

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Troubleshooting Overview

This chapter provides an introduction to some of the tools available to troubleshoot the Sun StorEdge T3 and T3+ array and describes the following sections:

- Section 1.1, “Network Storage Overview” on page 1-1
- Section 1.2, “Error Messages and Logs” on page 1-2
- Section 1.3, “Sun StorEdge Component Manager” on page 1-4
- Section 1.4, “Sun StorEdge StorTools Software” on page 1-4
- Section 1.5, “Static Electricity Precautions” on page 1-5

1.1 Network Storage Overview

An understanding of a *network storage* environment is required before any troubleshooting can take place.

Each Sun StorEdge T3 and T3+ array can be structured to a maximum of two different RAID volumes, or logical unit numbers (LUNs). This means that each array can store information from two completely different applications or sources, but both sources uniquely transmit their data delivery and retrieval through the same host adapter.

The Sun StorEdge T3 and T3+ array partner group consists of two independent controller RAID units sharing only one of the controllers for system management. If one controller fails, the system management facilities fail over to the other RAID controller. This configuration gives the partner group redundancy.

Thus, when there is a Sun StorEdge T3 and T3+ array partner group, which consists of a minimum of two arrays, a maximum of four RAID volumes (LUNs) are available to the server for data delivery and retrieval.

The interruption of data can happen anywhere on the storage network. This manual addresses data interruption problems from the output of the host to the Sun StorEdge T3 and T3+ array, and to the individual components in the array.

1.2 Error Messages and Logs

Both the Sun StorEdge T3 and T3+ array and the host server create log message files of system conditions and events. These log files are the most useful *immediate* tools for troubleshooting.

1.2.1 Sun StorEdge T3 Array Generated Messages

A `syslog` daemon in the Sun StorEdge T3 and T3+ array writes system error message logs to a location determined by the site system administrator. Consult with the site system administrator to obtain access to this log. See Section 2.6, “Setting Up Remote Logging” on page 2-10 to set up this service.

1.2.2 Host-Generated Message

A `syslog` daemon in the host hardware writes system error message logs to `/var/adm/messages`.

The data host sees a array as one or two logical volumes. A host-generated message indicates that the host cannot communicate with the array through the Fibre Channel-Arbitrated Loop (FC-AL) channel, or that an excessive number of channel errors are occurring. If the host loses access to the array through the channel connection, then any host messages regarding the array will refer only to the LUNs. To see details of problems internal to the Sun StorEdge T3 and T3+ array, use the `telnet` command to connect to the array and run the `fru stat` command.

In a partner group configuration where alternate pathing failover has been established, the failure of a channel path or array controller causes the host to redirect I/O from the failed channel to the second FC-AL connection.

A variety of software logging tools monitor the various branches of the storage network. When an error is detected, the error's severity level is categorized and classified. Errors are reported or logged according to severity level (TABLE 1-1).

TABLE 1-1 Levels of Message Notification

Message Level	Description
Error	Indicates a critical system or storage network event or failure, requiring immediate intervention or attention
Warning	Indicates a possible system or storage network event or failure, requiring eventual intervention
Notice	Indicates a system event that could be a normal periodic notification, a system fault, operator keyboard commands, or a result of other events
Information	Indicates a system event that has no impact upon the system or storage networks ability to perform tasks.

The syntax of the error message uses a field-replaceable unit (FRU) identifier to refer to a particular FRU in a Sun StorEdge T3 and T3+ array (TABLE 1-2). This identifier contains a unit constant (*u*), the unit number (*n*), the FRU constant (*ctr* for controller card, *pcu* for power and cooling unit, *l* for unit interconnect card, *d* for disk drive), and the FRU number (*n*).

TABLE 1-2 FRU Identifiers

FRU	Identifier	Unit number
Controller card	<i>unctr</i>	<i>n</i> = unit number (1, 2,...)
Power and cooling unit	<i>unpcun</i>	<i>n</i> = unit number (1, 2,...) <i>n</i> = pcu number (1, 2)
Unit interconnect card	<i>unln</i>	<i>n</i> = unit number (1, 2,...) <i>n</i> = interconnect number (1, 2)
Disk drive	<i>undn</i>	<i>n</i> = unit number (1, 2,...) <i>n</i> = disk drive number (1 to 9)

1.3 Sun StorEdge Component Manager

The Sun StorEdge T3 and T3+ array can be used with management software, such as Sun StorEdge Component Manager, to aid in its operation. Sun StorEdge Component Manager provides a graphical user interface (GUI) to monitor and manage one or more Sun StorEdge T3 and T3+ arrays that are connected to a host.

Sun StorEdge Component Manager software enables the administration of some of the components of the array and constantly monitors system health. Alarm notification and remote reporting alert the system administrator of abnormal activities or conditions that require attention.

The *Sun StorEdge Component Manager Installation Guide* provides instructions for installing the software, and also covers the necessary steps to verify the installation, launch the software, and uninstall the software. The *Sun StorEdge Component Manager User's Guide* describes how to use the GUI to administer Sun StorEdge T3 and T3+ arrays.

The Sun StorEdge Component Manager software communicates with the array via an Ethernet connection. It must be installed, configured, and initialized on the management host. The management host does not have to be the application host directly connected to the array.

The software recognizes the unit through the Ethernet address and monitors it through a polling routine. The Sun StorEdge Component Manager GUI displays information on the unit, including the suspected problem area. The software can be configured to route error messages to a log file, generate an email, or page an on-call person. The log file contains information that can be used to determine the fault and what caused the message to be sent.

For more information about using the Component Manager, see the *Sun StorEdge Component Manager User's Guide*.

1.4 Sun StorEdge StorTools Software

Errors in the host data channel are outside of the scope of the Sun StorEdge T3 and T3+ array. To determine failures in the data path, use host-based application diagnostics, such as the Sun StorEdge StorTools™ product for the Solaris operating environment.

Host-to-array channel failures occur when the connection between the array and the host is either severed or intermittent. The components that make up this data channel connection are:

- Host bus adapter (HBA), which resides on the host
- Gigabit interface converter (GBIC) adapter, used to connect the FC-AL cable to an SBus HBA
- Fibre Channel cable that connects the array to the host
- Media interface adapter (MIA), which converts the light source from the host to an electron source for use in the array
- Channel interface port in the array

Refer to Section 3.7.4, “Testing the Array With StorTools” on page 3-19” and the *Sun StorEdge StorTools User’s Guide* for information identifying data channel failures.

1.5 Static Electricity Precautions

Follow these procedures to prevent damaging the FRUs:

- Remove plastic, vinyl, and foam from the work area.
- Before handling a FRU, discharge any static electric charge by touching a ground surface.
- Wear an antistatic wrist strip.
- Do not remove a FRU from its antistatic protective bag until you are ready to install it.
- When removing a FRU from the array, immediately place it in an antistatic bag and packaging.
- Handle a FRU only by its edges and avoid touching the circuitry.
- Do not slide a FRU over any surface.
- Limit body movement (which builds up static electricity) during FRU installation.

Connecting to the Sun StorEdge T3 and T3+ Array

This chapter describes how to connect to the Sun StorEdge T3 and T3+ array and contains the following sections:

- Section 2.1, “Establishing a Serial Port Connection” on page 2-1
- Section 2.2, “Establishing a Telnet Session” on page 2-3
- Section 2.3, “Establishing an FTP Session” on page 2-5
- Section 2.4, “Using tftpboot to Boot a Single Array or a Partner Group Remotely” on page 2-6
- Section 2.5, “Configuring a Server for Remote Booting” on page 2-9
- Section 2.6, “Setting Up Remote Logging” on page 2-10

2.1 Establishing a Serial Port Connection

The serial port is a direct connection to the array from any serial port on any host or system. Individual commands can be run to query and repair the unit from this interface using the command-line interface (CLI). The serial port connection provides the following advantages over the Telnet connection:

- Boot messages are displayed when the array boots.
- The `tftp boot` configuration is available.
- EPROM access is available.
- Useful for debugging RARP/IP address assignment issues.

The status of the array unit can quickly be determined from the CLI. The `syslog` file of the array file system contains a record of events that have occurred in the unit.

To start a serial connection and session with the array:

1. **Connect a serial cable from the serial port on the array master unit to any host system available serial port.**

Note – The serial cables used by the Sun StorEdge T3 and T3+ arrays are different. Both cables are supplied in the F370-4119-02 Diagnostic Kit. The T3 array uses the serial cable with RJ-11 connectors and the T3+ array uses the serial cable with RJ-45 connectors.

The serial port on the array is on the controller card backplane.

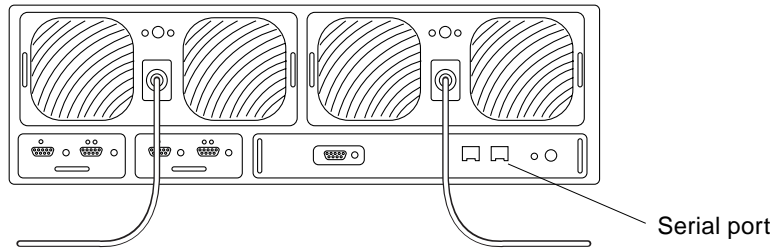


FIGURE 2-1 Serial Port Location

2. **On the host system, open a terminal window, type `tip`, the baud rate, and the serial port designation.**

For example:

```
mymachine# tip -9600 /dev/ttya
connected
Password:
Invalid name.
Login:root
Password:

T300 Release 1.13 2000/05/17 16:15:41 (129.150.47.104)
Copyright (C) 1997-2000 Sun Microsystems, Inc.
All Rights Reserved.

name: / :<1>
```

If the Sun StorEdge T3 disk tray is being booted, the following message is displayed:

```
auto boot is enabled
hit the RETURN key within 3 seconds to cancel...
```

In a boot situation, if the Return key is pressed within 3 seconds, the array stops booting and the EPROM takes control of the array. If the Return key is not pressed, the array continues to boot. Note that in a partner group the alternate master unit continues to boot and appears as the master if the boot sequence of the master is stopped. Screen messages are displayed (Section 3.6, “Checking Array Boot Status” on page 3-11 for an example)

The following commands are available for use at the EPROM level:

- boot
- reset
- set
- id

Once the array has fully booted, all the commands available through the CLI are accessible.

For more information on serial connections, see:

- Section 2.6, “Setting Up Remote Logging” on page 2-10,
- Section 3.6, “Checking Array Boot Status” on page 3-11.

2.2 Establishing a Telnet Session

The Telnet session is a direct network link to the array unit through the command-line interface (CLI). You can execute individual commands to query and repair the unit from this interface. The Telnet session requires access to the unit’s IP address. The CLI can then be run from any host that is part of the same subnetwork.

The advantages that a Telnet connection provides over a serial port connection are as follows:

- ftp images are displayed.
- You can have multiple windows open for each array.
- The Telnet connection provides a faster interface than the serial port connection, which can be useful for displaying `syslog` information.

You can quickly determine the status of the array unit from the CLI. The `syslog` file of the array file system contains a record of events that have occurred in the unit and can also be examined through the CLI.

To open a Telnet connection and start a session with the array:

1. **On the host, use the `telnet` command with the array name (or IP address) to connect to the array.**

For example, to telnet to a array named T3-1:

```
mgmt-host# telnet T3-1
> Trying 123.123.123.1...
> Connected to T3-1.
> Escape character is '^]'.
> pSOSystem (123.123.123.1)
> Login:
```

2. **Log in to the array by typing `root` and the root password at the prompts.**

The array prompt is displayed.

3. **To view the available commands on the array, type `help` at the prompt.**

```
:/:<1>help
ftp      telnet
arp      cat      cd        cmp       cp        date      echo      head
help     ls       mkdir     mv        ping     pwd       rm        rmdir
tail     touch
boot     disable disk    enable   fru       id        logger   lpc
more     passwd  port     proc     reset    set       shutdown
sync     sys     tzset    ver      vol      ep        refresh  route
```

For more information on how to set up the `syslog` file and interpret it, see Section 2.6, “Setting Up Remote Logging” on page 2-10, and for information on how to use the CLI commands, see *Sun StorEdge T3 and T3+ Array Administrator’s Guide*.

2.3 Establishing an FTP Session

To establish an FTP session:

1. **Start an FTP session from the management host to the array.**

For example:

```
mgmt-host:/:<15>ftp 123.123.123.2
Connected to 123.123.123.2.
Escape character is '^]'.

123.123.123.2 pSOSystem (NUPPC/2.0.0-G) ready

Name (123.123.123.2:root):
```

2. **Log in to the array by typing `root` and the supervisor password at the prompts.**

```
Name (123.123.123.2:root): root

331 Password required for root.
Password: password
230 User root logged in.
ftp>
```

Note – Be sure to set Binary mode if transferring firmware.

2.4 Using tftpboot to Boot a Single Array or a Partner Group Remotely

If you have a partner group that cannot boot on its own, you can use `tftp boot` to boot it remotely.

Note – The tftpboot server must be on the same subnet as the array.

To remotely boot a Sun StorEdge T3 and T3+ array:

1. Set up the remote server.

See Section 2.5, “Configuring a Server for Remote Booting” on page 2-9.

2. Unplug the Ethernet cable connected to the alternate master.

Leave the Ethernet cable on the master connected.

3. Get to the array EPROM as described in Section 2.1, “Establishing a Serial Port Connection” on page 2-1.

4. Set the array boot mode to tftpboot.

```
T3-1>set bootmode tftp
T3-1>set
bootmode tftp
bootdelay 3
sn 000596
ip 123.123.123.4
netmask 255.255.255.0
gateway 0.0.0.0
tftpghost 123.123.123.6
tftpfile nb100.bin
hostname mgmts-host
spindelay 0
revision 0210
mac 00:20:f2:00:02:ba
rarp on
```

5. Set tftphost IP address and tftp filename.

```
T300-EP>set tftphost 123.123.123.6
T300-EP>set tftpfile filename.bin
T300-EP>set
bootmode tftp
bootdelay 3
sn 000596
ip 123.123.123.99
netmask 255.255.255.0
gateway 0.0.0.0
tftphost 129.150.47.37
tftpfile nb113.bin
hostname T3-1
spindelay 0
revision 0210
mac 00:20:f2:00:02:ba
rarp on
```

6. Reset the master to initiate the tftp boot cycle.

```
T3-1>reset
Starting...

T3-1 Release 2.10 1999/11/24 13:05:57 (123.123.123.3)
Copyright (C) 1997-1999 Sun Microsystems, Inc.
All Rights Reserved.

Found units: [ul-ctr]
tftp boot is enabled
hit the RETURN key within 3 seconds to cancel...
Initializing TFTP...
Loading 123.123.123.6:nb113.bin
...
...
login:
```

7. Copy the firmware from the tftp boot server to the Sun StorEdge T3 and T3+ array.

Note that `ftp` is initiated from the `tftp` server since at this point you are no longer on the array.

```
mgmt_host# ftp 123.123.123.3
Connected to 123.123.123.3.
220 123.123.123.3 pSOSystem FTP server (NUPPC/2.0.0-G) ready.
Name (123.123.123.3:root): root
331 Password required for root.
Password:
230 User root logged in.
ftp> lcd /tftpboot
Local directory now /tftpboot
ftp> bin
200 Type set to I.
ftp> put filename.bin
200 PORT command successful.
150 Opening BINARY mode data connection for filename.bin.
226 Transfer complete.
local: filename.bin remote: filename.bin
2514468 bytes sent in 51 seconds (47.87 Kbytes/s)
ftp>
```

Where `filename.bin` is the name of the current firmware file. For example, `nb113.bin`.

8. Boot the newly transferred controller firmware image on the master.

```
:/:<3>boot -i filename.bin
file header: size 265e14, checksum be4ec46, start 20010, base 20000
```

This copies the firmware to the bootable reserved areas on the local disk.

9. Set the bootmode back to auto

(If you forget this step, the system will continue doing `tftpboots`.)

```
:/:<4>set bootmode auto
```

10. Reset the system.

```
:/:<5>reset
Reset the system, are you sure? [N]: y
```

11. Reconnect the Ethernet cable to the alternate master.

2.5 Configuring a Server for Remote Booting

If a Sun StorEdge T3 and T3+ array is unable to boot you can use `tftboot` to reload the firmware. This requires configuring a remote server.

To configure a remote server to `tftp` boot a Sun StorEdge T3 and T3+ array, follow these steps:

1. In a user file system, create a directory on the server called `tftpboot`.

```
boothost# mkdir /tftpboot
```

2. Set permissions to allow users read/write access.

```
boothost# chmod 777 /tftpboot
```

3. Copy the Sun StorEdge T3 disk tray boot code into the `tftpboot` directory.

```
boothost# cp nbnnn.bin /tftpboot
```

Where `nbnnn.bin` is the current boot-code file identification number. For example, `nb101.bin`.

4. Verify that `/tftpboot/nbnnn.bin` is readable.

```
boothost# chmod 755 /tftpboot/nbnnn.bin
```

5. Edit the `/etc/inetd.conf` file and uncomment the `tftp` line.

```
tftp dgram udp wait root /usr/sbin/in.tftpd in.tftpd -s /tftpboot
```

6. Restart `inetd`.

```
boothost# ps -eaf | grep inetd
root 140 1 0 Feb 08 ? 0:00 /usr/sbin/inetd -s
root 7715 7701 0 11:22:32 pts/18 0:00 grep inetd
# kill -HUP 140
```

2.6 Setting Up Remote Logging

The Sun StorEdge T3 and T3+ array can provide remote notification of array events to designated hosts using Simple Network Management Protocol (SNMP) traps. To enable SNMP notification, edit the `/etc/syslog.conf` and the `/etc/hosts` files on the array to configure system message logging. Because files cannot be edited on the array, `ftp` the files to a host to make the edits and then `ftp` the files back to the array.

Refer to the *Sun StorEdge T3 and T3+ Array Administrator's Guide* for instructions on setting up remote logging.

Diagnosing Problems

This chapter provides the qualified service provider with troubleshooting techniques for the Sun StorEdge T3 and T3+ array and contains the following sections:

- Section 3.1, “Diagnostic Information Sources” on page 3-1
- Section 3.2, “Troubleshooting Flow Charts” on page 3-3
- Section 3.3, “Initial Troubleshooting Guidelines” on page 3-7
- Section 3.4, “Verifying the Data Host Connection” on page 3-8
- Section 3.5, “StorTools Connectivity Tests” on page 3-8
- Section 3.6, “Checking Array Boot Status” on page 3-11
- Section 3.7, “Telnet Connection Status Checks” on page 3-14
- Section 3.8, “Identifying Miscabled Partner Groups” on page 3-19
- Section 3.9, “Identifying Data Channel Failures” on page 3-23

3.1 Diagnostic Information Sources

TABLE 3-1 summarizes the diagnostic tools available to you.

TABLE 3-1 Diagnostic Functions and Tools

Function	Tools That Can Be Used
Array boot monitoring	LEDs, CLI(S),
Array boot PROM commands	CLI(S)
Host data path diagnosis	StorTools(A) application
Internal monitoring	LEDs, CM, CLI (E), CLI(S), SNMP, StorTools (M) application, syslog, SRS
Configuration	LEDs, CM, CLI (E), CLI(S)

TABLE 3-1 Diagnostic Functions and Tools (Continued)

Function	Tools That Can Be Used
System (admin domain) configuration	CM, CLI(E), CLI(S)
System (admin domain) monitoring	CM, CLI(E), CLI(S), SRS, SNMP(CA), syslog(CA)
Version level check	CM, CLI(E), CLI(S)
LUN configuration	CM, CLI(E), CLI(S)
FRU failure monitoring	LED, CM, CLI(E), CLI(S), SRS, SNMP(CA), syslog(CA)
Performance monitoring	CM, CLI(E), CLI(S), SNMP(CA), syslog(CA)
Firmware download	CLI(E)
Syslog access (mgmt host)	CLI(E), CLI(S), syslog(CA and StorTools(M) with 2nd copy of StorTools running on management host with ethernet connection to disk tray
Loop resiliency check (manual)	OFDG, CLI(E), CLI(S)
Manual loop resiliency check	OFDG, CLI(E), CLI(S)
Clear supervisor password	CLI(S)
Host data path diagnosis	StorTools(A) application
Statistics logging	syslog(CA) and StorTools(M) application with 2nd copy of StorTools application running on management host with Ethernet connection to disk tray
Service commands	CLI(E), CLI(S)
Mfg/repair commands	CLI(E), CLI(S)

- LED = Light emitting diodes on the array.
- CM = Component Manager.
- CLI(E) = Command-line utilities run via ethernet connection as described in *Sun StorEdge T3 and T3+ Array Administrator's Guide*.
- CLI(S) = Command-line utilities run via a serial connection as described in Section 2.1, "Establishing a Serial Port Connection" on page 2-1.
- OFDG = Off-line Drive Diagnostic utility as described in Section 8.3.8, "Using the ofdg Diagnostic Utility" on page 8-16.
- SNMP = Simple Network Monitoring Protocol as described in *Sun StorEdge T3 and T3+ Array Administrator's Guide*.
- SNMP(CA) = Simple Network Monitoring Protocol used with a customer-written application as described in *Sun StorEdge T3 and T3+ Array Administrator's Guide*.

- StorTools(A) = The StorTools application runs on an application host as described in *Sun StorEdge StorTools User's Guide, Version 4.1*.
- StorTools(M) = The StorTools application runs on a management host as described in *Sun StorEdge StorTools User's Guide, Version 4.1*.
- syslog = Sun StorEdge T3 and T3+ array `syslog` file.
- syslog(CA) = Sun StorEdge T3 and T3+ array `syslog` with customer-written application.
- SRS = Sun Remote Service.

3.2 Troubleshooting Flow Charts

The following three charts illustrate typical diagnostic procedures.

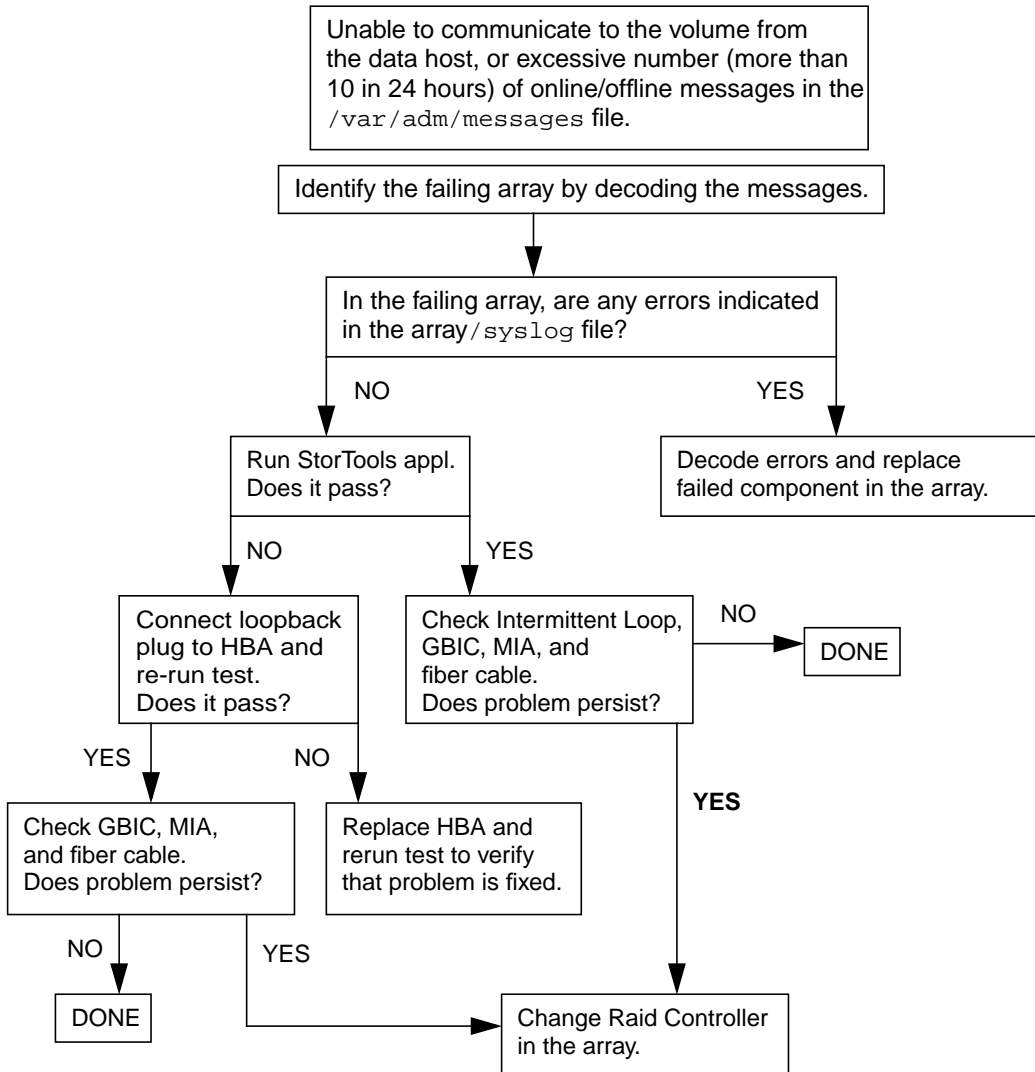


FIGURE 3-1 Data Connection Troubleshooting Flow Chart

Note that only SBus systems can test with a loopback plug. You cannot use a loopback cable with a PCI card.

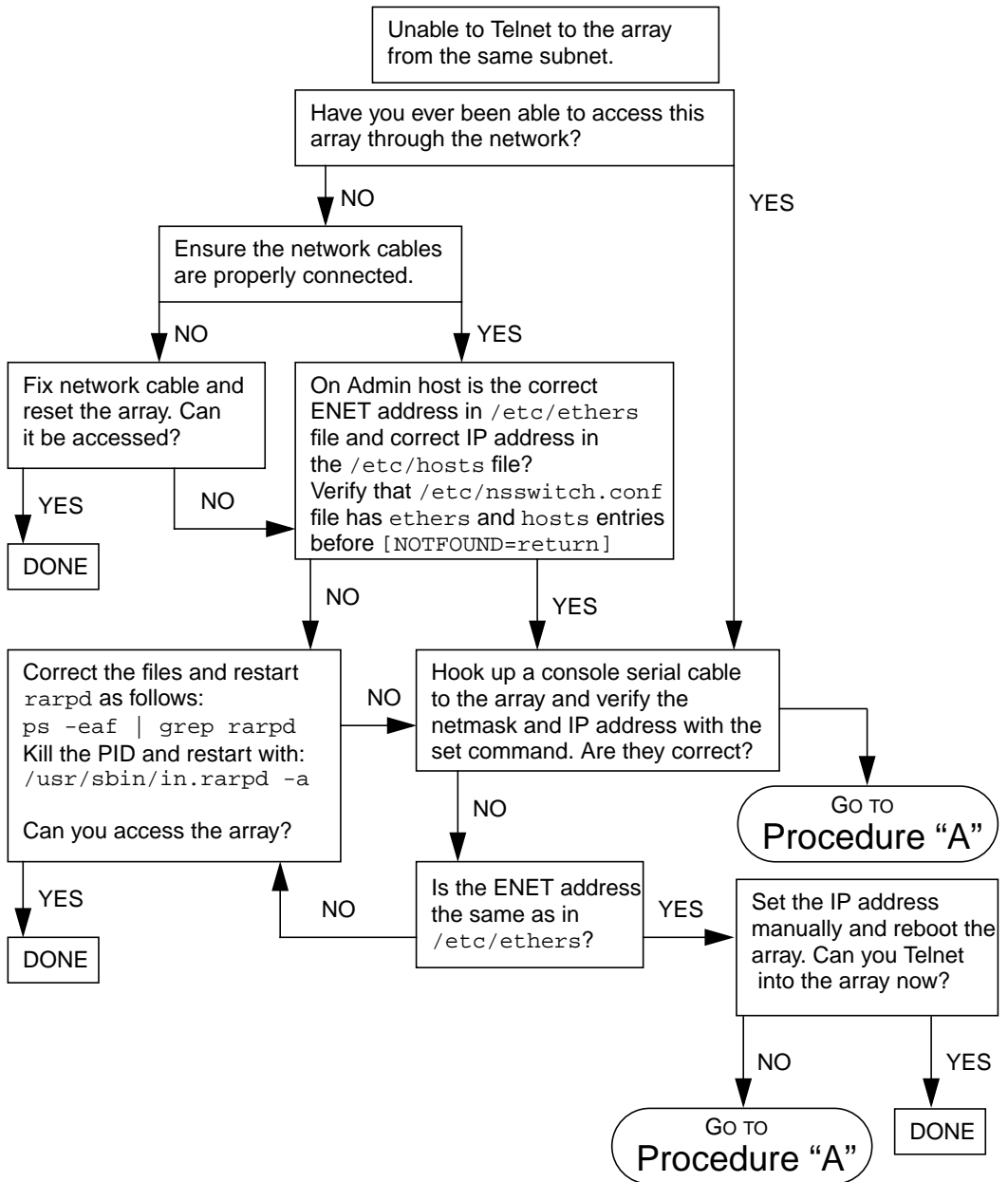


FIGURE 3-2 Ethernet Troubleshooting Flow Chart

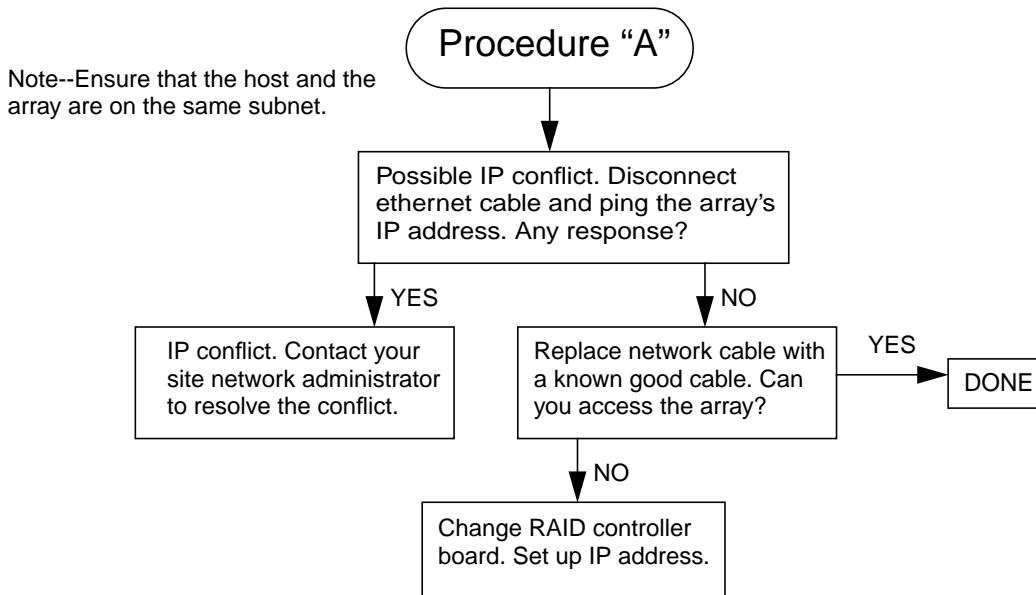


FIGURE 3-3 Procedure "A"

3.3 Initial Troubleshooting Guidelines

To begin a problem analysis, check one or more of the following information sources for troubleshooting and/or perform one or more of the following checks.

3.3.1 Troubleshooting Sources

1. **The array LEDs, which provide a visual status as described in *Sun StorEdge T3 and T3+ Array Installation, Operation, and Service Manual*.**
2. **Sun StorEdge T3 array generated messages, found in a log file, indicating a problem or system status with the array. See Section 1.2.1, “Sun StorEdge T3 Array Generated Messages” on page 1-2 for more information about array generated messages.**
3. **Host-generated message, found in the `/var/adm/messages` file, indicating a problem with the host channel connection to the array unit. See Section 1.2.2, “Host-Generated Message” on page 1-2 for more information about host generated messages.**
4. **Messages generated by the Sun StorEdge Component Manager software indicating a problem. See Section 1.3, “Sun StorEdge Component Manager” on page 1-4 for more information about Component Manager.**

3.3.2 Troubleshooting Checks

1. **The connection between the host and the Sun StorEdge T3 array as described in Section 3.5, “StorTools Connectivity Tests” on page 3-8.**
2. **The array boot status as described in Section 3.6, “Checking Array Boot Status” on page 3-11.**
3. **FRU status as described in the *Sun StorEdge T3 and T3+ Array Administrator’s Guide*.**
4. **Array status as described in Section 3.7, “Telnet Connection Status Checks” on page 3-14.**
5. **Array operation as described in Section 3.7.4, “Testing the Array With StorTools” on page 3-19.**
6. **Miscabled partner groups as described in Section 3.8, “Identifying Miscabled Partner Groups” on page 3-19.**

7. Data channel as described in Section 3.9, “Identifying Data Channel Failures” on page 3-23.

3.4 Verifying the Data Host Connection

To verify the physical connection between the host and the array, use a utility such as the `format` command in the Solaris environment. The output of the command confirms whether a volume is on the array. For example:

- On the application host, enter `format` at the supervisor prompt.

```
# format
Searching for disks...done

clt1d0: configured with capacity of 133.38GB

AVAILABLE DISK SELECTIONS:
  0. c0t2d0 <drive type unknown>
     /sbus@1f,0/SUNW,fas@e,8800000/sd@2,0
  1. c0t3d0 <SUN2.1G cyl 2733 alt 2 hd 19 sec 80>
     /sbus@1f,0/SUNW,fas@e,8800000/sd@3,0
  2. clt1d0 <SUN-T3-0100 cyl 34145 alt 2 hd 64 sec 128>
     /sbus@1f,0/SUNW,socal@1,0/sf@0,0/ssd@w50020f2300000121,0
Specify disk (enter its number):
```

In this example, device number 2 is a volume on the array, as identified by the SUN-T3-0100 label.

3.5 StorTools Connectivity Tests

Use StorTools to verify the physical connection between the host and the array and to determine the primary and alternate paths.

3.5.1 Primary Path Verification by the Host

To determine a Sun StorEdge T3 array’s primary and alternate paths, from the host console, do the following:

1. On the application host, enter `format -e` at the supervisor prompt.

Specify the disk number when prompted.

```
# format -e
Searching for disks...done

AVAILABLE DISK SELECTIONS:
  0. c0t2d0 <drive type unknown>
     /sbus@1f,0/SUNW,fas@e,8800000/sd@2,0
  1. c0t3d0 <SUN2.1G cyl 2733 alt 2 hd 19 sec 80>
     /sbus@1f,0/SUNW,fas@e,8800000/sd@3,0
  2. c1t1d0 <SUN-T3-0100 cyl 34145 alt 2 hd 32 sec 128>
     /sbus@1f,0/SUNW,socal@1,0/sf@0,0/ssd@w50020f2300000172,0
  3. c1t1d1 <SUN-T3-0100 cyl 34145 alt 2 hd 32 sec 128>
     /sbus@1f,0/SUNW,socal@1,0/sf@0,0/ssd@w50020f230000015a,0
  4. c2t2d0 <SUN-T3-0100 cyl 34145 alt 2 hd 64 sec 128>
     /sbus@e,0/SUNW,socal@d,0/sf@0,0/ssd@w50020f2300000172,1
  5. c2t2d1 <SUN-T3-0100 cyl 34145 alt 2 hd 32 sec 128>
     /sbus@e,0/SUNW,socal@d,0/sf@0,0/ssd@w50020f230000015a,1
Specify disk (enter its number): 2
selecting c1t1d0
[disk formatted]
```

In this example, four Sun StorEdge T3 disk devices are shown as disk numbers 2 through 5. They are identified by the SUN-T3-0100 label.

Note – To view device paths using the `format` command, the `mp_support` setting on the array must be set to `rw`. For more information on the `mp_support` setting, refer to the *Sun StorEdge T3 and T3+ Array Administrator's Guide*.

In this example, selection 2 (`c1t1d0`) is the primary path, while selection 4 (`c2t2d0`) is the alternate path in the partner group. Since both these paths have the same number (`50020f2300000172`) they point to the same volume. The following step determines whether selection 2 is the primary or alternate path to the logical volume.

2. Enter `scsi` to select SCSI menu.

```
FORMAT MENU:
  disk      - select a disk
  type      - select (define) a disk type
  partition - select (define) a partition table
  current   - describe the current disk
  format    - format and analyze the disk
  repair    - repair a defective sector
  label     - write label to the disk
  analyze   - surface analysis
  defect    - defect list management
  backup    - search for backup labels
  verify    - read and display labels
  save      - save new disk/partition definitions
  inquiry   - show vendor, product and revision
  scsi      - independent SCSI mode selects
  volname   - set 8-character volume name
  !<cmd>    - execute <cmd>, then return0
  quit
format> scsi
```

3. Enter `inquiry` at the prompt.

```
SCSI MENU:
  disk      - select a disk
  type      - select (define) a disk type
  partition - select (define) a partition table
  current   - describe the current disk
  format    - format and analyze the disk
  repair    - repair a defective sector
  label     - write label to the disk
  analyze   - surface analysis
  defect    - defect list management
  backup    - search for backup labels
  verify    - read and display labels
  save      - save new disk/partition definitions
  inquiry   - show vendor, product and revision
  scsi      - independent SCSI mode selects
  volname   - set 8-character volume name
  !<cmd>    - execute <cmd>, then return0
  quit
scsi> inquiry
```


The output of the `inquiry` command is as follows (the sample output below assumes that `mp_support` is set to `rw` (otherwise there is only one path to each volume)):

```
Inquiry:
 00 00 03 12 5b 00 10 02 53 55 4e 20 20 20 20 20 20  ....[...SUN
 54 33 30 30 20 20 20 20 20 20 20 20 20 20 20 20  T3
 30 30 39 36 30 30 30 30 30 32 35 38 31 30 00 00  01000000025810..
 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  .....
 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  .....
 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  .....

      Vendor:                SUN
      Product:                T3
      Revision:               0100
      Removable media:       no
      Device type:           0
```

The seventh byte in the inquiry screen (bold for this example) indicates whether the LUN is the primary or alternate path. **10** indicates primary path, **30** indicates alternate path.

In this example, `c1t1d0` is the primary path.

3.5.2 Verifying Hub Connectivity

The StorTools application tests include testing any hubs in the data path.

If you suspect a hub-related problem, use the StorTools A5x00 FRU Isolation tool (`filtr`) in manual mode and the disk tray FRU Isolation tool (`sedr`) in verbose mode as described in the *Sun StorEdge StorTools User Guide*.

Note – Running the StorTools application affects performance.

3.6 Checking Array Boot Status

1. Establish a serial connection with the array as described in Section 2.1, “Establishing a Serial Port Connection” on page 2-1.

2. Boot the array.

There are several ways to initiate a boot cycle:

- Power off the Sun StorEdge T3 or T3+ array and power on again.
- Log into a disk tray and issue a `reset` command.
- Log into a disk tray and issue a `shutdown` command (this requires a power cycle to get the system to start booting).
- If the disk tray is already running, you can reboot by issuing a `boot` command with options.

Screen messages similar to the following appear:

```
:/> tip -9600 /dev/ttyb

Connected.

T3-EP Release 2.10 1999/11/24 13:05:27 (IP Address of tray)
Copyright (c) 1997-1999 Sun Microsystems, Inc.
All Rights Reserved
Found units:  u1-ctrl  [u2-ctrl]
auto boot is enabled
hit the RETURN key within 3 seconds to cancel...
Default master is 1
Default alternate master is 2
Initializing System Drives...
Initializing XPT Components...
Initializing QLCF Components
Initializing Loop 1 ISP2100...firmware status 3
Detecting 20 FC-AL ports on loop 1
Initializing Loop 2 ISP2100...firmware status 3
Detecting 20 FC-AL ports on loop 2
Initializing SVD Services...
Found (18) disks in the system
Found 9 disks in U1...
Found 9 disks in U2...
Trying to boot from encid 1...
Booting from U1D1...
Executing...
Starting...

Login: root
password: root-password
```

Once the array starts a full boot, any system problems detected by the system are displayed. `pSOSystem` also identifies any controllers not responding, or if the master has failed over to the alternate master, in the boot messages.

Firmware status codes are good indicators of internally detected system and configuration problems. In the previous `boot` message example, a firmware status of 3 is displayed. This status implies the array is ready for operation. TABLE 3-2 lists other firmware status codes that can be reported through the serial-port console during a array `boot` cycle.

TABLE 3-2 Firmware Status Indicators

Status	Definition
0	ISP is waiting for configuration process to complete
1	ISP is waiting for ALPA assignment
2	ISP is waiting for port login
3	ISP is ready and optimal
4	ISP has lost loop synchronization
5	ISP has experienced an unrecoverable error
6	Reserved
7	ISP is not participating on the loop

Once the array has fully booted, all the commands available through the CLI are accessible.

Note – If you make configuration changes at the EPROM prompt, they can be overwritten when the array boots completely. Check the array settings after the array has booted to ensure that they are correct.

A message such as the following might appear after you log in:

```
6.1/:: device not mounted
```

It is possible that the serial cable is connected to the alternate master unit instead of the master unit. To determine if this is true, enter `fru myuid`.

```
::: fru myuid
u1
```

If you are connected the master, `u1` is returned. If you are connected to the alternate, `u2` is returned. If you are connected the alternate, stop the tip session, reconnect the serial cable to the master unit, and start the session again.

3.7 Telnet Connection Status Checks

Check array status using a variety of CLI commands. This section contains the following topics:

- Section 3.7.1, “Determining Failover” on page 3-14
- Section 3.7.2, “Verifying the Firmware Level and Configuration” on page 3-15
- Section 3.7.3, “Checking FRU Status” on page 3-18

3.7.1 Determining Failover

1. **On the host, use the `telnet` command with the array name (or IP address) to connect to the array.**

```
mngt_host# telnet disk-tray-name
Trying 123.123.123.3...
Connected to 123.123.123.3.
Escape character is '^]'.

pSOSystem (123.123.123.3)
```

2. **Log in to the array by typing `root` and the supervisor password at the prompts.**
3. **To determine which unit is the master or alternate master unit, enter `sys stat`.**

The following example shows a partner group in a normal state:

```
:/:<2>sys stat
Unit   State      Role      Partner
-----
 1     ONLINE    Master    2
 2     ONLINE    AlterM    1
```

In a failover state, unit 2 assumes the role of master controller and unit 1 is disabled, as shown in the following example:

```
:/:<3>sys stat
Unit   State      Role      Partner
-----
 1     DISABLED   Slave
 2     ONLINE     Master
```

4. Use the `port list` command to display how paths are mapped from the host ports to the volume.

This displays World Wide Names (WWNs) that can be compared to the WWNs displayed by the Solaris command `format(1M)`.

```
:/:<4>port list

port    targetid  addr_type  status  host    wwn
ulp1    1          hard       online  sun     50020f23000002ba

mgmt-host# format
          Searching for disks...done

AVAILABLE DISK SELECTIONS:
0. c0t0d0 <SUN4.2G cyl 3880 alt 2 hd 16 sec 135>
   /pci@1f,4000/scsi@3/sd@0,0
1. c2t1d0 <SUN-T300-0101 cyl 34145 alt 2 hd 64 sec 128>
   /pci@6,2000/SUNW,ifp@1/ssd@w50020f23000002ba,0
Specify disk (enter its number):
```

In the example above, the WWN of 50020f23000002ba identifies the port and volume match.

3.7.2 Verifying the Firmware Level and Configuration

The Sun StorEdge T3 array has four different types of firmware:

- Controller firmware. See Section 4.3, “Upgrading Controller Firmware” on page 4-5”.
- Controller electrically erasable programmable read-only memory (EPROM) firmware. See Section 4.3.1.2, “Controller EPROM Firmware” on page 4-6”.
- Disk drive firmware. See Section 5.4, “Upgrading Disk Drive Firmware” on page 5-13”.
- Interconnect card firmware. See Section 6.3, “Upgrading Interconnect Card Firmware” on page 6-5”.

The firmware upgrade procedures must be done through the Ethernet connection. The latest firmware versions are located on the SunSolveSM web site:

<http://sunsolve.sun.com>

Firmware file naming restrictions are as follows:

- The name consists of a string of 1 to 12 characters.
- The name must start with an alphabetic character and not a numeral. For example:

- file1.bin is acceptable
- 1file.bin is not acceptable
- The characters can be a combination of the following:
 - alphabetic letters
 - digits (0 through 9)
- Special characters such as:
 - _ (underscore)
 - . (period)
 - \$ (dollar symbol)
 - - (dash).
- Names are case-sensitive. (For example, ABC and abc are different files.)

Make sure the latest firmware versions are installed and that the array configuration information indicates that the unit is ready for operation.

Check the firmware versions and array information in a telnet session with the array.

1. **On the host, use the `telnet` command with the array name (or IP address) to connect to the array.**

For example:

```
# telnet array-name
Trying 23.123.123.3...
Connected to 123.123.123.3.
Escape character is '^]'.

pSOSystem (123.123.123.3)
```

2. **Log in to the array by typing `root` and the supervisor password at the prompts.**
The array prompt is displayed.

3. Enter `ver` to identify the controller firmware.

For example:

```
:/:<5>ver

T3 Release 1.13 2000/05/17 16:15:41 (129.150.47.104)
Copyright (C) 1997-2000 Sun Microsystems, Inc.
All Rights Reserved.
```

The `ver` command displays the header information. In the example above, the controller firmware is listed as Release 1.13.

4. Enter `fru list` to display the firmware for the disk drives, interconnect card, and EPROM level.

In the event of a FRU failure, `fru list` output contains the serial numbers helpful in verifying correct FRU replacement.

```
:/:<7>fru list
ID          TYPE          VENDOR      MODEL      REVISION    SERIAL
-----
ulctr      controller card  SUN        0082f-f0   0210        000596
uld1       disk drive      SEAGATE    ST118202FSUN EA29        LKG88867
uld2       disk drive      SEAGATE    ST118202FSUN EA29        LKG89225
uld3       disk drive      SEAGATE    ST118202FSUN EA29        LKG88938
uld4       disk drive      SEAGATE    ST118202FSUN EA29        LKG89528
uld5       disk drive      SEAGATE    ST118202FSUN EA29        LKG89846
uld6       disk drive      SEAGATE    ST118202FSUN EA29        LKG90455
uld7       disk drive      SEAGATE    ST118202FSUN EA29        LKG89362
uld8       disk drive      SEAGATE    ST118202FSUN EA29        LKG55303
uld9       disk drive      SEAGATE    ST118202FSUN EA29        LKG78649
ull1       loop card       SCI-SJ     375-0085-01- 5.01 Flash 000867
ull2       loop card       SCI-SJ     375-0085-01- 5.01 Flash 001491
ulpcu1     power/cooling unit TECTROL-CAN 300-1454-01( 0000        002469
ulpcu2     power/cooling unit TECTROL-CAN 300-1454-01( 0000        003134
ulmpn     mid plane       SCI-SJ     370-3990-01- 0000        000698
```

In this example:

- EPROM firmware version is Controller card, Revision 0210
- Disk drive firmware version is Revision EA29
- Interconnect card (loop card) firmware version is Revision 5.01 Flash

3.7.3 Checking FRU Status

Use the `fru stat` command to provide a status of each FRU, including temperatures.

```

:/:<43>fru stat
CTLR      STATUS  STATE      ROLE      PARTNER    TEMP
-----  -
ulctr     ready   enabled    master    u2ctr      34.5
u2ctr     ready   enabled    alt master ulctr      35.5

DISK      STATUS  STATE      ROLE      PORT1      PORT2      TEMP  VOLUME
-----  -
uld1      ready   enabled    data disk ready      ready      33    v0
uld2      ready   enabled    data disk ready      ready      30    v0
uld3      ready   enabled    data disk ready      ready      29    v0
uld4      ready   enabled    data disk ready      ready      27    v0
uld5      ready   enabled    data disk ready      ready      24    v0
uld6      ready   enabled    data disk ready      ready      26    v0
uld7      ready   enabled    data disk ready      ready      25    v0
uld8      ready   enabled    data disk ready      ready      31    v0
uld9      ready   enabled    data disk ready      ready      34    v0
u2d1      ready   enabled    data disk ready      ready      31    v1
u2d2      ready   enabled    data disk ready      ready      31    v1
u2d3      ready   enabled    data disk ready      ready      30    v1
u2d4      ready   enabled    data disk ready      ready      26    v1
u2d5      ready   enabled    data disk ready      ready      34    v1
u2d6      ready   enabled    data disk ready      ready      26    v1
u2d7      ready   enabled    data disk ready      ready      28    v1
u2d8      ready   enabled    data disk ready      ready      32    v1
u2d9      ready   enabled    data disk ready      ready      27    v1

LOOP      STATUS  STATE      MODE      CABLE1     CABLE2     TEMP
-----  -
u2l1      ready   enabled    master    installed  -          31.5
u2l2      ready   enabled    slave     installed  -          35.0
u1l1      ready   enabled    master    -          installed  31.5
u1l2      ready   enabled    slave     -          installed  35.0

POWER     STATUS  STATE      SOURCE    OUTPUT     BATTERY     TEMP  FAN1  FAN2
-----  -
ulpcu1    ready   enabled    line      normal     normal      normal normal normal
ulpcu2    ready   enabled    line      normal     normal      normal normal normal
u2pcu1    ready   enabled    line      normal     normal      normal normal normal
u2pcu2    ready   enabled    line      normal     normal      normal normal normal

```

Note – The `fru stat` command reports temperature readings on the interconnect cards, controller board, disk drives, and PCUs. For the PCU, the `fru stat` output does not display a temperature value, but reports a normal value. For all other FRUs, `fru stat` reports a numerical temperature.

System firmware monitors only the temperature state reported by the PCUs. This means a high temperature reading on an interconnect card, for example, will not cause the firmware to take evasive action (such as powering off the array).

3.7.4 Testing the Array With StorTools

Access the StorTools main menu through the `stormenu` command. Once executed, this command runs the `initcheck` program to identify any failing loops that could cause a program to hang. `initcheck` runs a quick loop back frame (lbf) test and performs disk inquiries.

Note – Since `lbf` is not supported on PCI FC-100 host board adapters, `initcheck` performs disk inquiries only on those systems.

Consult your StorTools documentation for information on how to perform StorTools diagnostic tests.

Note – The StorTools diagnostic package expects the software and firmware files to be at certain minimum revision levels to run the tools. Always use the `Check Revisions` selection and ensure that the system is up to the minimum revision requirements before using any of the other main menu selections.

3.8 Identifying Miscabled Partner Groups

If a partner group has booted successfully but is unable to establish a Telnet connection with the management host, the partner group might be cabled together incorrectly.

The interconnect cable connections between dual controller units are critical for determining which unit is the master controller and which is the alternate master. If the interconnect cables are not properly installed on the interconnect cards, the top

unit could boot as the master controller, and the bottom unit would assume alternate master status. Because the host has been configured to use the MAC address of the bottom unit, this alternate configuration can cause the units to malfunction.

If the bottom unit is incorrectly cabled, making the bottom unit the alternate master, the bottom unit's Ethernet port will be inactive unless a fail over situation occurs. In that event, the IP and MAC address of the bottom unit will take over the values of the master (top) unit.

If the partner group has been cabled together incorrectly, the following procedure can help determine if the top unit is acting as the master controller.

1. Determine the MAC address of the top unit.

The MAC address is located on a pull-out tab at the front of the unit, to the left of the first disk drive. (FIGURE 3-4).

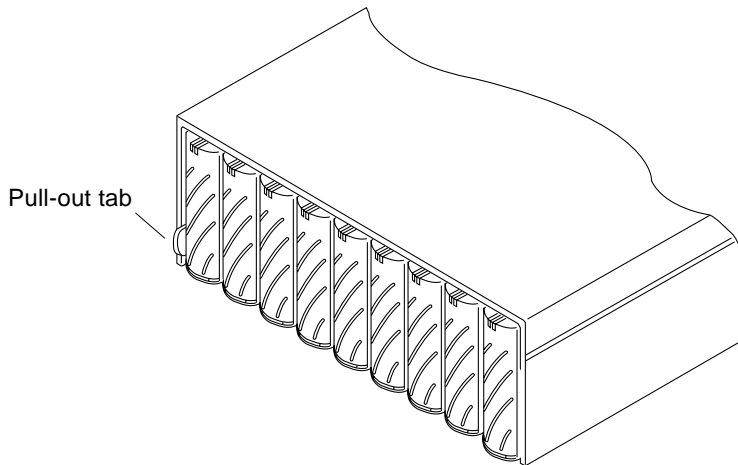


FIGURE 3-4 MAC Address on the Pull-Out Tab

2. Edit the files on the RARP server to include the MAC address of the top unit.

a. Edit the `/etc/ethers` file by adding the MAC address and array name.

For example:

```
8:0:20:7d:93:7e array name
```

In this example:

- `8:0:20:7d:93:7e` is the MAC address
- `array name` is the name of the master controller unit.

b. Edit the `/etc/hosts` file with the IP address and array name.

For example:

```
123.123.123.111 array name
```

In this example, 123.123.123.111 is the assigned IP address.

c. Edit the `/etc/nsswitch.conf` file to reference the local system files.

To ensure the Solaris software environment uses the changes made to `/etc/ethers` and `/etc/hosts` files, edit the `host` and `ethers` entries in the `/etc/nsswitch.conf` file so that the `files` parameter appears before the `[NOTFOUND=return]` statements as shown:

```
hosts:      nis files [NOTFOUND=return]
ethers:     nis files [NOTFOUND=return]
```

d. Determine if the RARP daemon is running by typing:

```
# ps -eaf | grep rarpd
```

- If the RARP daemon is running, proceed to Step 3.
- If the RARP daemon is not running, continue to Step e.

e. Start the RARP daemon in the Solaris environment by typing:

```
# /usr/sbin/in.rarpd -a &
```

3. Ensure that there is an Ethernet connection to the 10BASE-T port of the top unit.

4. Press the power switch on the power and cooling units on both arrays to remove AC power (FIGURE 3-5).

It may take some time for the units to power off while shutdown procedures are performed. Wait until the units have powered off completely.

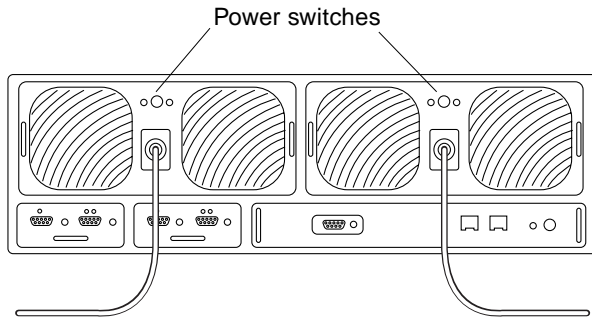


FIGURE 3-5 Power Switch Locations

5. **After both units have powered off, press the power switch on the power and cooling units again to restore power to and reset the arrays.**

It may take up to several minutes for the arrays to power on and come back online. All LEDs will be green when the unit is fully powered on.

6. **After the units are fully powered on, start a Telnet session.**

The Telnet session will connect to the top unit.

If the host cannot telnet to the array, investigate the following other possible causes:

- **RARP server not responding.** To determine if this is the problem:
 - Verify that the RARP daemon is running on the host system.
 - Verify that the `/etc/nsswitch.conf` file is properly configured on the RARP server.
 - In the Solaris environment, use the `snoop` command to verify that the array is attempting to establish RARP communication with the Solaris server.
- **MAC address is incorrect.** In the Solaris environment, use the `snoop` command to specify the MAC address of the array and to determine if any RARP packets are transmitted. If you observe no transmissions during a reboot of the array, verify that the MAC address on the array label matches the MAC address configured on the RARP server.
- **Netmask is incorrect.** The default netmask address used on the array is `255.255.255.0`. If the local subnet uses a different netmask, the RARP operation might not work.
- **Inoperable network connections.** If using hubs to connect to the network, try eliminating or replacing the hub.
- **Incorrect IP address.** Connect to the array through the serial port, and verify that the IP address is correct.

3.9 Identifying Data Channel Failures

The data channel encompasses the host data path that extends from the host bus adapter to the media interface adapter (MIA) attached to the array. Errors in the host data channel are outside of the scope of the Sun StorEdge T3 and T3+ array. To determine failures in the data path, use host-based application diagnostics, such as the StorTools product for the Solaris operating environment.

Refer to the documentation of the selected diagnostics tool for information on identifying data channel failures.

Controller Card Assembly

This chapter describes how to monitor and replace the controller card and how to upgrade the firmware. The chapter contains the following sections:

- Section 4.1, “Controller Card LEDs” on page 4-1
- Section 4.2, “Removing and Replacing a Controller Card” on page 4-4
- Section 4.3, “Upgrading Controller Firmware” on page 4-5

4.1 Controller Card LEDs

The controller card LEDs for a Sun StorEdge T3 array differ from that of a Sun StorEdge T3+ array. The controller LEDs of both array models are described in the following sections.

Sun StorEdge T3 Array Controller LEDs

The Sun StorEdge T3 array controller card has a channel-active LED for the host interface port, a controller status (online) LED, and a reset switch. TABLE 4-1 lists the possible states of the channel-active LED and describes each state. TABLE 4-2 lists the possible states and descriptions for the controller status LED.

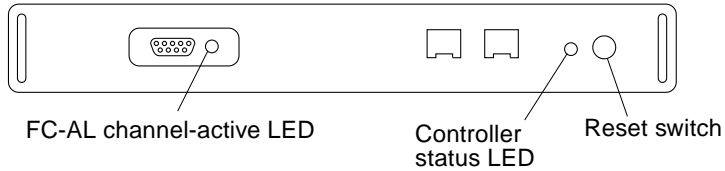


FIGURE 4-1 Sun StorEdge T3 Array Controller Card LEDs

TABLE 4-1 FC-AL Channel-Active LED Descriptions (Sun StorEdge T3 array)

Channel Active LED (green)	Description
Off	Port disabled
Amber	Port enabled and not receiving signal from host
Green	Port enabled and idle
Blinking green	Port enabled and active

TABLE 4-2 Controller Status LED Descriptions (Sun StorEdge T3 array)

Controller Status LED (green or amber)	Description
Off	Controller not installed (not recognized)
Green	Controller OK
Amber	Controller boot, shutdown, or firmware download in progress
Blinking amber	Controller failure; OK to replace controller

Note—Verify a controller card failure using the CLI or Sun StorEdge Component Manager.

Sun StorEdge T3+ Array Controller Card LEDs

The Sun StorEdge T3+ array controller card has two channel-active LEDs, one for the FC-AL interface port and one for the Ethernet port, and a controller status (online) LED. TABLE 4-3 lists the possible states of the controller card LEDs and describes each state.

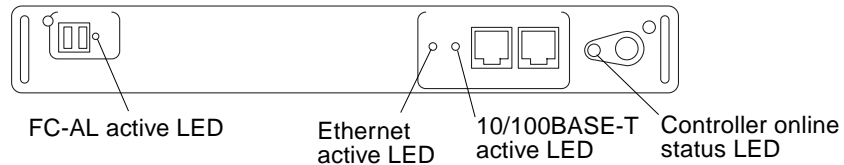


FIGURE 4-2 Sun StorEdge T3+ Array Controller Card LEDs

TABLE 4-3 Sun StorEdge T3+ Array Controller Card LED Descriptions

LED	Action	Description
FC-AL Channel Active LED (green)	Off	Port disabled
	Green	Port enabled and idle
	Blinking green	Port enabled and active
Ethernet Active LED (green)	Off	Link invalid
	Green	Link valid and idle
	Blinking green	Link valid and active
10/100 BASE-T Active LED (green)	Off	Port disabled (10 Mbps rate)
	Green	Port enabled and idle (100 Mbps rate)
	Blinking green	Port enabled and active
Controller Status LED (green or amber)	Off	Controller not installed (not recognized)
	Green	Controller OK
	Amber	Controller boot, shutdown, or firmware download in progress
	Blinking amber	Controller failure; OK to replace controller

Note—Verify a controller card failure using the CLI or Sun StorEdge Component Manager.

4.2 Removing and Replacing a Controller Card

A controller card can be replaced without system interruption *only* if the array is one in a partner group (redundant controller unit configuration).



Caution – A removed controller card must be replaced within 30 minutes or the Sun StorEdge T3 and T3+ array and all attached arrays will automatically shut down and power off.

To replace the controller card:

- 1. Observe static electricity precautions.**
See Section 1.5, “Static Electricity Precautions” on page 1-5.
- 2. Ensure that the controller card is showing failure status.**
- 3. Remove the Ethernet cable from the 10BASE-T connector.**
- 4. Remove the fiber-optic cable and MIA from the FC-AL connector.**
- 5. Unlock the controller card by pushing in on the latch handle.**
Use a coin or small screwdriver to press in and release the latch handle.

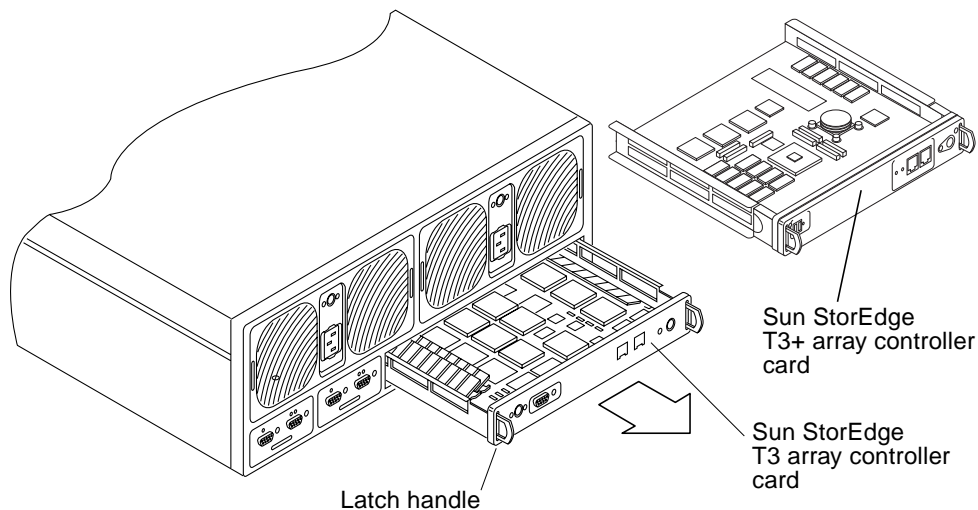


FIGURE 4-3 Removing the Controller Card

6. Pull the controller card out using the latch handles.
7. Insert the new controller card.
8. Lock the new controller card by pushing in the latch handles.
Use a coin or small screwdriver to press in and secure the latch handle.
9. Insert the fiber-optic cable and MIA back into the FC-AL connector.
10. Insert the Ethernet cable into the 10BASE-T connector.
11. Check the controller status LED to determine when the controller is operational.
While the controller boots, the controller status LED is solid amber. When the controller is operational, the LED is green.
12. Verify the status of the controller card using either the CLI or Component Manager.
Refer to Section 3.7.3, “Checking FRU Status” on page 3-18, or the *Sun StorEdge Component Manager User’s Guide* for instructions.

Note – In a partner group configuration, the controller fails over to the alternate master when there is a controller card failure in a master unit. After the controller board is replaced, the partner group performs a reset command to return to the *original* failover configuration of master and alternate master.

4.3 Upgrading Controller Firmware

The controller firmware can be upgraded on an operational system. However, for the upgrade to take effect, the controller must be reset (booted). While the controller boots, the array is not available for storage.

The firmware upgrade procedures that follow must be done through the Ethernet connection. The latest firmware version is located on the SunSolve web site:

`http://sunsolve.sun.com`

The following conditions apply to firmware upgrades:

- The firmware has to be resident on the host for this operation.
- The Sun StorEdge T3 and T3+ array has to have a *supervisor password* prior to attempting this procedure.

4.3.1 Sun StorEdge T3 Array Controller Firmware

4.3.1.1 Controller Firmware

To upgrade the firmware:

1. Use the `ftp` binary mode to transfer the firmware to the storage system's directory.
See Section 2.3, "Establishing an FTP Session" on page 2-5.
2. Establish a Telnet connection to the array.
See Section 2.2, "Establishing a Telnet Session" on page 2-3.
3. Install the firmware using the `boot -i` command.

```
:/:<2> boot -i filename
```

Check the firmware patch README file for instructions specific to that release.

4. Power cycle the array to reset it.

a. Type:

```
:/:<3> shutdown  
shutdown the system, are you sure? [N] : y
```

b. Press the power button on each power and cooling unit to remove AC power.

c. Press the power buttons again to return AC power to the array.



Caution – Power cycling a Sun StorEdge T3 and T3+ array causes an interruption in array operation.

4.3.1.2 Controller EPROM Firmware

The EPROM firmware is stored in the FLASH memory device (FMD) on the controller card. The array can be operational during the EPROM firmware upgrade.

Note – To upgrade the EPROM firmware in a partner group, you need to perform this procedure only once for both units to be upgraded.

The latest firmware versions are located on the SunSolve web site:

`http://sunsolve.sun.com`

Firmware is released as a patch which consists of an entire `tar` file with an automated uploader script that copies the files (including the `ep` and `lpc` images) to the Sun StorEdge T3 array being upgraded.

The generalized firmware upgrade procedures described below must be done through the Ethernet connection. The firmware must be resident on the host for this operation.

Note – Create a supervisor password for the Sun StorEdge T3 and T3+ array prior to attempting this procedure.

To upgrade the EPROM firmware:

- 1. Use `ftp` to transfer the firmware to the storage systems / directory using binary mode.**
See Section 2.3, “Establishing an FTP Session” on page 2-5.
- 2. Establish a Telnet connection to the array.**
See Section 2.2, “Establishing a Telnet Session” on page 2-3.
- 3. Install the firmware using the `ep download` command.**

```
:/:<2> ep download filename
```

The `ep download` command updates all controllers in a partner group at the same time.

The EPROM firmware is effective immediately after download. A reset is not required. However, the release version number is not updated in a `fru list` output until the array is rebooted.

4.3.2 Sun StorEdge T3+ Array Controller Firmware

4.3.2.1 Boot Code Explanation

There are three levels of boot code.

- The first level selects and jumps to one of the two copies of the second level code. The second level code initializes memory and loads itself to RAM locations starting from 0x500000.
- The second level code can allow tftp boot or ROM boot for the third level code. In ROM boot, the second level code selects one of the two copies of the third level (RAID application) code. The second level code loads the RAID application code to RAM locations from 0x20000.
- The third level is the RAID application.

First Level Boot Code

The level 1 boot code starts at 0xFFFF00100 which is the processor's reset vector. The first level code initializes the MPC107 bridge chip and the console serial port. It prints T3B- when the initialization is done. Then it waits about 1.5 seconds to allow the user to select one of the two copies of level 2 code to boot. The user can type 1 or 2, but there is no echo for the character typed. If the user makes no selection, level 2 code does the selection automatically.

In the automatic selection, the level 1 code verifies the level 2 boot code stored in ROM. It finds which one is newer and jumps to the selected code.

If the user has entered the selection before automatic selection, level 1 code jumps to the one the user has selected after verifying the code is valid. If the user selects an invalid copy, then level 1 code jumps to the valid one instead of the user selected one.

After the level 1 code has decided which copy of level 2 code to use, it prints 1 or 2 to notify the user which copy is selected as a feedback.

The level 1 code starts at 0xFFFF00100 and extends to 0xFFFF20000.

If there is no valid level 2 code, the code prints 0 after T3B- and reboot.

Second Level Boot Code

The second level boot code is comparable to the EPROM mode of the Sun StorEdge T3 Array except the auto bootmode will boot from ROM instead of from disks. The level 2 code allows the user to:

- Set basic system configuration. For example, IP, Gateway, and bootmode.
- Allow `tftpboot` for the level 3 code.
- Allow `autoboot` for the level 3 code.
- Allow update of the ROM code when bootmode is `tftp`.

There are two copies of level 2 code; one in `0xFFFF4000-0xFFFF9FFF`, the other in `0xFFFFA000-0xFFFFFFFF`.

To update the EPROM, the following commands should be used.

- `.ep netload1 filename`

This updates the level 1 boot code. Since there is only one copy of level 1 code in ROM, if this update fails, the controller may not be able to boot after the failure.

- `.ep netload2 filename`

This updates the level 2 boot code. Two copies of level 2 boot code are kept in ROM. Level 1 boot code selects the most recent updated one to boot. The user can override the automatic selection by typing 1 or 2 within 1.5 seconds after `T3B-` is displayed on the console.

If the command fails in the middle of update, it will be an invalid level 2 code, and level 1 code will not select the invalid level 2 code for booting.

If a bad level 2 code is programmed into ROM successfully, then the user can manually select which copy to boot in order to work around the bad level 2 code. If this happens, it is better to update the level 2 code again in order to override the bad level 2 code copy.

Level 2 code has a size limitation of 384 Kbytes.

During boot up, the level 2 code occupies RAM space starting at `0x500000`, and the level 3 code is loaded by the level 2 code. Currently the starting location of level 3 code is fixed at `0x20000`. Although level 3 code can start at another location, the code space after upload to RAM cannot go over `0x500000`.

The network of level 2 code will be enabled only when the bootmode is set to “`tftp`”. Thus, the `.ep` command will only work when bootmode is “`tftp`”.

The level 2 code also includes POST (Power-On Self Test) code in the booting process.

Third Level Boot Code

The third level boot code is the RAID application. The code has assumed that level 2 code would have set up the MPC 107 and cleared the RAM if it is cold-boot.

There are two copies of level 3 code in ROM; one in 0xFF800000-0xFFB7FFFF, the other in 0xFFB80000- 0xFFF00000.

EPROM and tftp Download File

The file to be downloaded into ROM or through tftp must have specific header information with a structure such as listed below.

```
typedef struct ep_header_struct {
    init code_size;          /* code      size */
    init code_cksum;        /* code      checksum */
    init code_start;        /* code      start */
    init code_base;         /* code      base */

    init code_signature;    /* code      signature */
    init code_rev;          /* code      revision */
    init code_subrev;       /* code      subrevision */
    init code_date;         /* code      date */

    init code_time          /* code      time */
    init hdr_counter;       /* code      counter */
    init code_flags;        /* code      flags */
    init reserved;

    init reserved[3];
    init hdr_cksum;         /* header    checksum */
    EP_HEADER;
}
```

The file content must be the binary image to be loaded into ROM or RAM. It cannot be an elf file, a hex file, or a srecord file.

The following explains each field in the header.

TABLE 4-4 Channel Active LED Descriptions

Header	Description
<code>code_size</code>	This is the size of the code without the header information. This value must be a multiple of four. The real file size should be <code>code_size</code> plus <code>sizeof (EP_HEADER)</code> .
<code>code_cksum</code>	The 32-bit checksum value of the code. <code>code_cksum</code> = sum of all 32-bit words in code OR <code>0xFFFFFFFF+1</code> .
<code>code_start</code>	The execution starting location. For example, after downloading level 3 code into RAM, the level 2 code jumps to this location.
<code>code_base</code>	The starting location for download. For example, the level 2 code downloads the level 3 code from ROM into RAM starting at this location. However, notice that when the starting location is <code>0x20000</code> , the image in the file is loaded to <code>0x20040</code> in RAM. The first <code>0x40</code> bytes are occupied by the header information. That is to say that the <code>code_base</code> includes the space occupied by the header information.
<code>code_signature</code>	Each level of boot code has a unique signature. For example, the level 3 signature is "P2L3".
<code>code_rev</code>	The revision of the code.
<code>code_subrev</code>	The subrevision of the code.
<code>code_date</code>	The date stamp of the code. For example, <code>20001225</code> means <code>2000/12/25</code> .
<code>code_time</code>	The time stamp of the code. For example, <code>01020300</code> means <code>01:02:03</code> .

TABLE 4-4 Channel Active LED Descriptions

Header	Description
<code>hdr_counter</code>	For the file to be downloaded to ROM by the <code>.ep</code> command to RAM through <code>tftp</code> , this field should be <code>-1</code> . But, after the code is programmed into ROM, the <code>.ep</code> command will change this field automatically. This field is used to identify which of two copies of level 2 code or level 3 code is newer. The smaller the value is, the older the code is. Thus, <code>0xFFFFFFFF</code> is older than <code>0xFFFFFFFFE</code> . The <code>.ep</code> command will automatically update this field by taking the value of this field from the other copy and add 1 to the value.
<code>code_flags</code>	This field is used to identify whether special handling of the code file is needed. For example, the code file may be zipped, when it needs to be unzipped before uploading to RAM.
<code>hdr_cksum</code>	This is the checksum for the header portion. Since the <code>.ep</code> command will change <code>hdr_counter</code> when downloading code into ROM, this field will be updated accordingly by the <code>.ep</code> command.

Currently, only `code_signature` and `hdr_counter` affects the automatical selection done by level 1 code or level 2 code. Of course, `code_cksum` and `hdr_cksum` are used to validate the code.

4.3.2.2 Level 1 Controller Firmware

This procedure upgrades the level 1 firmware in only one controller. Therefore, you must perform it twice for each array partner group.

1. Connect a console to the serial port (the right RJ-45 port) of the array.

See Section 2.1, “Establishing a Serial Port Connection” on page 2-1.

Note – The serial cables used by the Sun StorEdge T3 and T3+ arrays are different. Both cables are supplied in the F370-4119-02 Diagnostic Kit. The T3 array uses the serial cable with RJ-11 connectors and the T3+ array uses the serial cable with RJ-45 connectors.

2. Set up the tftp host.

See Section 2.5, “Configuring a Server for Remote Booting” on page 2-9.

3. Reset the controller and press any key on the console when the system prompt appears (within three seconds).
4. Set the bootmode and tftp settings as follows:

```
T3B-EP> set bootmode tftp
T3B-EP> set tftphost xxx.xxx.xxx.xxx
```

Where *xxx.xxx.xxx.xxx* is the host IP address.

5. Reset the T3+ system with the `reset -y` command.

```
T3B-EP> reset -y
```

6. Press a key from a serial port connection when the system prompts to press a key within three seconds.
7. Install the firmware using the `.ep netload1` command.

```
T3B-EP> .ep netload1 level-1_image_filename
```

8. Set the bootmode to automatic.

```
T3B-EP> set bootmode auto
```

9. Power cycle the array to reset it.

- a. Type:

```
:/:<4> shutdown
shutdown the system, are you sure? [N] : y
```

- b. Press the power button on each power and cooling unit to remove AC power.
- c. Press the power buttons again to return AC power to the array.

4.3.2.3 Level 2 Controller Firmware

In an enterprise configuration, the `ep` command downloads level 2 firmware to both the master unit and alternate master unit at one time. To upgrade the Level 2 controller firmware perform the following steps.

1. **Use the ftp binary mode to transfer the firmware to the storage systems directory.**
See Section 2.3, “Establishing an FTP Session” on page 2-5.
2. **In a telnet session with the array, install the level 2 image. Type:**

```
:/:<1> ep download level-2_image_filename
```

4.3.2.4 Level 3 Controller Firmware

In an enterprise configuration, this procedure downloads level 2 firmware to both the master unit and alternate master unit at one time. To upgrade the Level 3 controller firmware perform the following steps.

1. **Use the ftp binary mode to transfer the firmware to the storage systems directory.**
See Section 2.3, “Establishing an FTP Session” on page 2-5.
2. **In a telnet session with the array, set the `bootmode` to `auto`.**

```
:/:<2> set bootmode auto
```

3. **Install the level 3 image on the array.**

```
:/:<3> boot -i level-3_image_filename
```

4. **Power cycle the array to reset it.**

- a. **Type:**

```
:/:<4> shutdown  
shutdown the system, are you sure? [N] : y
```

- b. **Press the power button on each power and cooling unit to remove AC power.**
- c. **Press the power buttons again to return AC power to the array.**

Note – If during the boot process, a controller detects a level 3 firmware version on the system disk different than the level 3 image loaded in flash, the controller will reflash its local level 3 image and reset. This can appear as two sequential boot cycles. This process is expected behavior.

Disks and Drives

This chapter describes how to monitor and replace the disk drives, upgrade the firmware, and repair corrupted disk labels. This chapter contains the following sections:

- Section 5.1, “Monitoring Drive Status” on page 5-1
- Section 5.2, “Disk Drive LEDs” on page 5-6
- Section 5.3, “Repairing Disk Drives” on page 5-7
- Section 5.4, “Upgrading Disk Drive Firmware” on page 5-13
- Section 5.5, “Clearing Corrupted Disk Labels” on page 5-15

5.1 Monitoring Drive Status

The following sections describe commands for monitoring the status of the drives. Disk status can be checked by using a variety of CLI commands. This section discusses how to monitor the following:

- Section 5.1.1, “Checking Drive Status Codes” on page 5-2
- Section 5.1.2, “Checking the Hot Spare” on page 5-3
- Section 5.1.3, “Checking Data Parity” on page 5-4
- Section 5.1.4, “Checking Drive Temperature” on page 5-5

1. **On the host, use the `telnet` command with the array name (or IP address) to connect to the array.**

```
mngt_host# telnet array name
Trying 129.150.47.101...
Connected to 129.150.47.101.
Escape character is '^]'.

pSOSystem (129.150.47.101)
```

2. Log in to the array by typing `root` and the supervisor password at the prompts.

5.1.1 Checking Drive Status Codes

- Use the `vol stat` command to check drive status codes.

All drives should show a status of 0 under normal conditions.

```
:/:<40> vol stat

v0          u1d1  u1d2  u1d3  u1d4  u1d5  u1d6  u1d7  u1d8  u1d9
mounted    0      0      0      0      0      0      0      0      0
v1          u2d1  u2d2  u2d3  u2d4  u2d5  u2d6  u2d7  u2d8  u2d9
mounted    0      0      0      0      0      0      0      0      0
```

The following table lists numeric drive status codes.

TABLE 5-1 Drive Status Messages

Value	Description
0	Drive mounted
2	Drive present
3	Drive is spun up
4	Drive is disabled
5	Drive has been replaced
7	Invalid system area on drive
9	Drive not present
D	Drive is disabled and is being reconstructed
S	Drive substituted

5.1.2 Checking the Hot Spare

1. Use the `vol list` command to check the location of the hot spare (standby) drive.

```
:/:<41> vol list

volume      capacity  raid  data      standby
v0          125.2 GB   5     u1d1-8    u1d9
v1          125.2 GB   5     u2d1-8    u2d9
```

2. Use the `vol stat` command to check the status of the hot spare drive.

```
:/:<42> vol stat

v0          u1d1  u1d2  u1d3  u1d4  u1d5  u1d6  u1d7  u1d8  u1d9
mounted    0      0      0      0      0      0      0      0      0
v1          u2d1  u2d2  u2d3  u2d4  u2d5  u2d6  u2d7  u2d8  u2d9
mounted    0      0      0      0      0      0      0      0      0
```

All drives should show a status of 0. See TABLE 5-1 for definitions of drive status codes.

5.1.3 Checking Data Parity



Caution – It can take up to several hours for the parity check once the `vol verify` command is executed. Execution of this command might affect system performance, depending on system activity and the verification rate selected.

- Use the `vol verify` command to perform a parity check of the drives.

```
:/:<7> vol verify volume name
```

You can also use the `fix` and `rate` options:

```
:/:<7> vol verify volume name [fix] [rate <1-8>]
```

Where:

- `fix` recalculates and rewrites the parity block if a mismatch is detected.
- `rate` specifies the speed with 1= slowest and 8 = fastest.

Note – The `vol` command is not re-entrant. Other `vol` commands cannot run on the array or partner group until the `vol verify` operation has completed.

Note – It is a good practice to run `vol verify` before recycling backup tapes to be sure the image is correct before over-writing previous images.

5.1.4 Checking Drive Temperature

- Use the `fru stat` command on the array to check disk drive temperatures.

```

:/:<43> fru stat

```

CTLR	STATUS	STATE	ROLE	PARTNER	TEMP		
ulctr	ready	enabled	master	u2ctr	33.5		
u2ctr	ready	enabled	alt master	ulctr	33.5		

DISK	STATUS	STATE	ROLE	PORT1	PORT2	TEMP	VOLUME
uld1	ready	enabled	data disk	ready	ready	25	v0
uld2	ready	enabled	data disk	ready	ready	20	v0
uld3	ready	enabled	data disk	ready	ready	24	v0
uld4	ready	enabled	data disk	ready	ready	26	v0
uld5	ready	enabled	data disk	ready	ready	27	v0
uld6	ready	enabled	data disk	ready	ready	27	v0
uld7	ready	enabled	data disk	ready	ready	25	v0
uld8	ready	enabled	data disk	ready	ready	31	v0
uld9	ready	enabled	data disk	ready	ready	31	v0
u2d1	ready	enabled	data disk	ready	ready	25	v1
u2d2	ready	enabled	data disk	ready	ready	21	v1
u2d3	ready	enabled	data disk	ready	ready	26	v1
u2d4	ready	enabled	data disk	ready	ready	25	v1
u2d5	ready	enabled	data disk	ready	ready	23	v1
u2d6	ready	enabled	data disk	ready	ready	22	v1
u2d7	ready	enabled	data disk	ready	ready	29	v1
u2d8	ready	enabled	data disk	ready	ready	28	v1
u2d9	ready	enabled	data disk	ready	ready	29	v1

LOOP	STATUS	STATE	MODE	CABLE1	CABLE2	TEMP		
u2l1	ready	enabled	master	installed	-	29.5		
u2l2	ready	enabled	slave	installed	-	34.0		
u1l1	ready	enabled	master	-	installed	30.5		
u1l2	ready	enabled	slave	-	installed	33.5		

POWER	STATUS	STATE	SOURCE	OUTPUT	BATTERY	TEMP	FAN1	FAN2
ulpcu1	ready	enabled	line	normal	normal	normal	normal	normal
ulpcu2	ready	enabled	line	normal	normal	normal	normal	normal
u2pcu1	ready	enabled	line	normal	normal	normal	normal	normal
u2pcu2	ready	enabled	line	normal	normal	normal	normal	normal

Note – A warning message will appear in the array `syslog` file if a disk drive reaches 65 degrees C. The array automatically starts spinning down an individual drive if the drive's temperature reaches 75 degrees C.

5.2 Disk Drive LEDs

LEDs at the top of each disk drive indicate drive activity and status. These LEDs appear in the front cover on the unit. TABLE 5-2 lists the possible drive LED states and a description for each state.

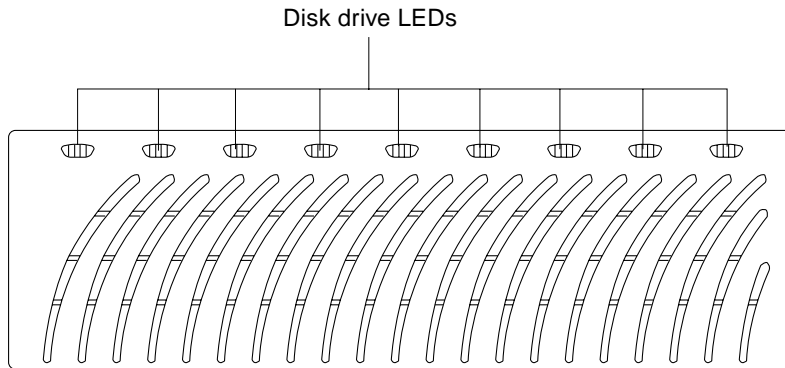


FIGURE 5-1 Disk Drive LEDs (Viewed Through Front Cover)

TABLE 5-2 Disk Drive LED Descriptions

Drive Activity (Green)	Drive Status (Amber)	Descriptions
Off	Off	Drive not installed (not recognized)
Slow blink	Off	Drive is spinning up or down
Solid	Off	Drive OK, idle

TABLE 5-2 Disk Drive LED Descriptions (Continued)

Drive Activity (Green)	Drive Status (Amber)	Descriptions
Flashing	Off	Drive OK, activity
Off	Solid	Drive reconstruct/firmware download in progress
Off	Slow blink	Drive failure; OK to replace drive

Note – Even if the LED indicates a drive failure, always verify the FRU status using either the CLI or Component Manager before replacing the drive. Refer to Section 3.7.3, “Checking FRU Status” on page 3-18, or the *Sun StorEdge Component Manager User’s Guide* for instructions.

5.3 Repairing Disk Drives



Caution – Replace only one disk drive in a array at a time to ensure that no data is lost. Before replacing another disk drive in the same array, complete any volume reconstructions before and ensure that the disk drive is fully functional and in operation.

By default the array automatically spins up and reenables a replaced disk drive, then automatically reconstructs the data from the parity or hot spare disk drives. The disk drive spinup takes about 30 seconds. Reconstruction of the data on the disk drive can take up to one hour depending on system activity.

Note – For the array to automatically reconstruct drive data, the array must remain powered on while a disk is replaced.

To prevent automatic reenabling of the disk drive, change the default setting using the `sys` command. For more information on the `sys` command, refer to the *Sun StorEdge T3 and T3+ Array Administrator’s Guide*.

5.3.1 Removing and Replacing a Disk Drive

1. Observe static electricity precautions.

See Section 1.5, “Static Electricity Precautions” on page 1-5

2. Remove the front panel by pressing in on the side latches and pulling the cover forward. See FIGURE 5-2.

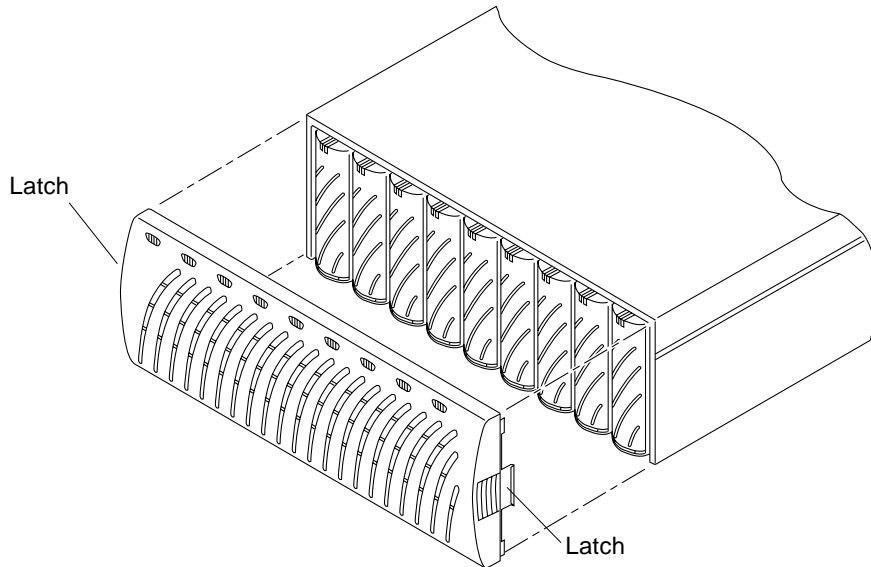


FIGURE 5-2 Removing the Front Panel

3. Locate the disk drive that needs to be replaced.

Disk drives are numbered from 1 to 9 starting on the left side of the array.

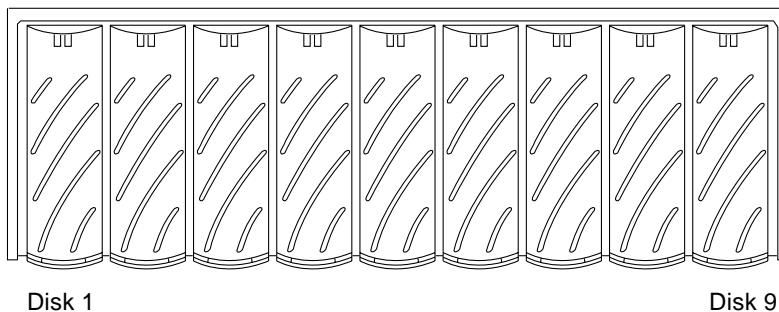


FIGURE 5-3 Disk Drive Numbering

4. Use a coin or small screwdriver to press in and release the drive latch handle.

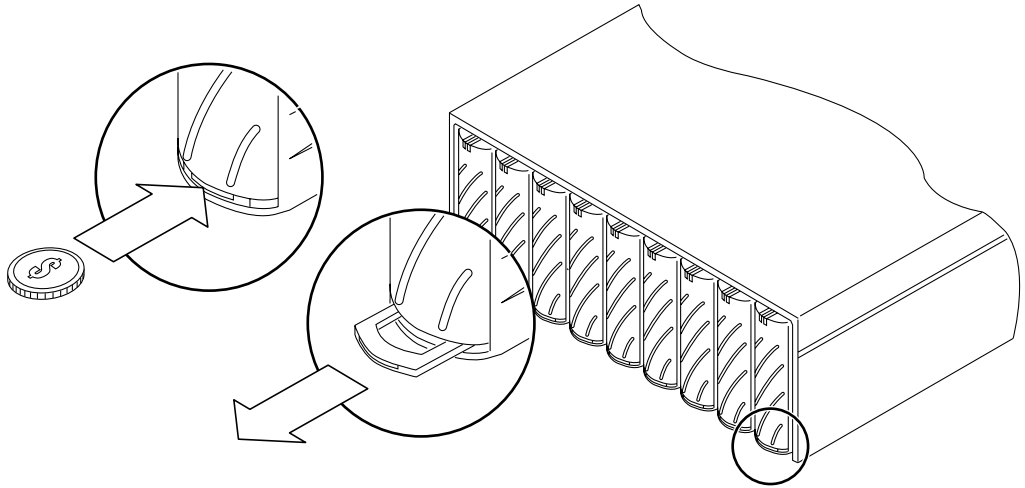


FIGURE 5-4 Releasing the Latch Handle

5. Use the latch handle to slowly pull the disk drive out 1 inch (2.5 cm).

Wait 30 seconds, and then pull the drive out completely. This gives the disk drive time to spin down.

6. Remove the disk drive from the array. See FIGURE 5-5.

Push in the latch handle on the removed disk drive to protect it from damage.



Caution – Any disk drive that is removed must be replaced within 30 minutes or the Sun StorEdge T3 and T3+ array and all attached arrays will automatically shut down and power off.

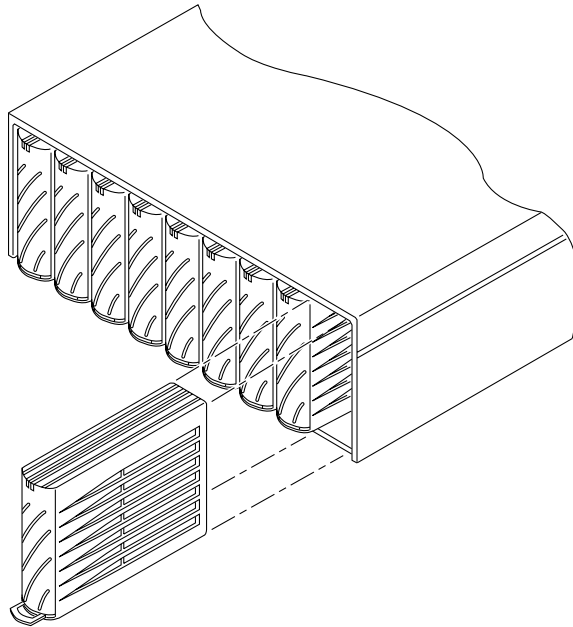


FIGURE 5-5 Removing a Disk Drive

7. **Release the latch handle on the disk drive to be installed.**
8. **Insert the new disk drive gently on the middle of the rails and push it in until it is seated with the centerplane connector.**
Use a coin or small screwdriver to press in and lock the latch handle.
9. **Replace the front panel.**

Note – Replace the front panel for the array to meet FCC compliance requirements.

10. **Type `fru list undn` to verify the firmware revision of the new disk drive, where:**
 - `un` is the unit (`u`) number (`n`)
 - `dn` is the drive (`d`) number(`n`).See Section 5.4, “Upgrading Disk Drive Firmware” on page 5-13,” for instructions, if necessary.

5.3.2 Rebuilding a Replaced Drive FRU

A replaced drive FRU should begin to rebuild itself automatically.

Note – Data is not copied back from a hot spare to a newly replaced data drive until the reconstruction of data to the hot spare from parity is completed. This means that you might not see any activity lights immediately after replacing a drive.

If automatic reconstruction does not start or fails, begin the rebuild of the replaced drive FRU manually as follows:

1. **On the host, use the `telnet` command with the array name (or IP address) to connect to the array.**

```
mngt_host# telnet array name
Trying 129.150.47.101...
Connected to 129.150.47.101.
Escape character is '^]'.

pSOSystem (129.150.47.101)
```

2. **Log in to the array by typing `root` and the supervisor password at the prompts.**
3. **On the array, type:**

```
:/:<34> vol recon volume-name from_standby
```

4. **Start a second Telnet session with the array to check rebuild progress.**
5. **Check the rebuild progress.**

Use the information in the `PERCENT` column and the `TIME` column, which shows the elapsed time, for estimating when the volume will complete reconstruction.

```
:/:<35> proc list

VOLUME          CMD_REF PERCENT    TIME COMMAND
v1              20241   23      0:09 vol recon
```

Note – If all power is removed from the array while the drive is being reconstructed, the reconstruction process restarts at the beginning when power is restored.

6. Check the drive status to ensure that the reconstruction of the replaced drive FRU has completed.

```

:/:<43> fru stat
CTLR      STATUS   STATE     ROLE      PARTNER    TEMP
-----
ulctr     ready    enabled   master    u2ctr      34.5
u2ctr     ready    enabled   alt master ulctr      35.5

DISK      STATUS   STATE     ROLE      PORT1      PORT2      TEMP  VOLUME
-----
uld1      ready    enabled   data disk ready       ready      33    v0
uld2      ready    enabled   data disk ready       ready      30    v0
uld3      ready    enabled   data disk ready       ready      29    v0
uld4      ready    enabled   data disk ready       ready      27    v0
uld5      ready    enabled   data disk ready       ready      24    v0
uld6      ready    enabled   data disk ready       ready      26    v0
uld7      ready    enabled   data disk ready       ready      25    v0
uld8      ready    enabled   data disk ready       ready      31    v0
uld9      ready    enabled   data disk ready       ready      34    v0
u2d1      ready    enabled   data disk ready       ready      31    v1
u2d2      ready    enabled   data disk ready       ready      31    v1
u2d3      ready    enabled   data disk ready       ready      30    v1
u2d4      ready    enabled   data disk ready       ready      26    v1
u2d5      ready    enabled   data disk ready       ready      34    v1
u2d6      ready    enabled   data disk ready       ready      26    v1
u2d7      ready    enabled   data disk ready       ready      28    v1
u2d8      ready    enabled   data disk ready       ready      32    v1
u2d9      ready    enabled   data disk ready       ready      27    v1

LOOP      STATUS   STATE     MODE      CABLE1     CABLE2     TEMP
-----
u2l1      ready    enabled   master    installed   -          31.5
u2l2      ready    enabled   slave     installed   -          35.0
u1l1      ready    enabled   master    -          installed  31.5
u1l2      ready    enabled   slave     -          installed  35.0

POWER     STATUS   STATE     SOURCE    OUTPUT     BATTERY    TEMP    FAN1    FAN2
-----
ulpcu1    ready    enabled   line     normal    normal     normal  normal  normal
ulpcu2    ready    enabled   line     normal    normal     normal  normal  normal
u2pcu1    ready    enabled   line     normal    normal     normal  normal  normal
u2pcu2    ready    enabled   line     normal    normal     normal  normal  normal

```

5.4 Upgrading Disk Drive Firmware

The latest disk drive firmware versions are located on the SunSolve web site:

`http://sunsolve.sun.com`

During a disk drive firmware download, the functionality of the array is limited. To avoid system problems, verify that:

- A current backup copy of array data exists.
- The data path to the host has been quiesced. There must not be any I/O activity during the disk drive firmware download.
- The Ethernet connection is not being used for any other operation during this procedure. If Component Manager is being used to monitor the array, disable the automatic polling utility. Refer to the current *Sun StorEdge Component Manager Users Guide* for instructions to disable polling.



Caution – If a host-mounted utility program such as Component Manger is actively polling, problems might occur during the firmware download. Disable the polling utility within Component Manager during this procedure to avoid problems.

- No unnecessary command line program interaction with the array is performed during the disk drive firmware download.

Note – The disk firmware download takes approximately 20 minutes for 9 drives. Do not attempt to interrupt the download or perform other command-line functions during the process. The command prompt reappears after the download process has completed.

To upgrade the firmware:

1. Use `ftp` to transfer the firmware to the array `root` directory in binary mode.

See Section 2.3, “Establishing an FTP Session” on page 2-5 for additional information.

Note – The file name of files being transferred to the local disk must be 12 characters or less in size and start with an alphabetic character (not numeric).

2. Establish a Telnet connection to the array.

See Section 2.2, “Establishing a Telnet Session” on page 2-3.

3. Verify that all disk drives are in an optimal state as follows:
 - a. Use the `fru stat` command to confirm that all disks are ready and enabled.
 - b. Use the `vol stat` command to confirm that all disks that are configured into volumes are in an optimal state, reported as drive state 0.

If either of these commands display drive issues, correct problems before proceeding with the firmware download.

4. Use the `proc list` command to verify that there are no volume operations in progress.

Allow a volume operation in progress to complete before proceeding with the firmware download.

5. Use the `refresh -s` command to verify that there are no battery refresh operations in progress.

Allow a battery refresh in progress to complete before proceeding with the firmware download.

6. Unmount the array volume(s) from the host to ensure there is no host I/O activity.

```
# unmount /t3 filesystem name
```

7. Unmount internal array volume(s).

```
:::<1> vol unmount volume name
```

8. Install the firmware using the `disk download` command.

```
:::<2> disk download u1d1-9 filename
```

The *filename* is the file name of the disk drive firmware image that was transferred by FTP to the array in Step 1.



Caution – If the array is configured with different manufacturers types of disk drives, the `disk` command can download firmware for only one manufacturers drive type at a time. Verify that the download was successful using either the CLI or Component Manager.

9. Use the `fru list` command to verify that the firmware download was successful.

The current drive firmware level is displayed in the `fru list` output.

10. Use the `reset` command to reboot the Sun StorEdge T3 and T3+ array after all drives have been upgraded.

```
:/:<3> reset
```

11. After the array is back online, log in to the array and verify that all FRU states are optimal as follows:
 - a. Use the `fru stat` command to confirm that all drives are ready and enabled.
 - b. Use the `fru list` command to display the current drive model number and firmware version.
 - c. Use the `vol stat` command to display drive states.
All drives must report a drive state of 0 for optimal condition.
12. Remount the volume(s) on the array.

```
:/:<4> vol mount volume name(s)
```

5.5 Clearing Corrupted Disk Labels

This procedure describes how to recover from corruption of disk labels on all nine disks of a master unit.



Caution – This procedure is equivalent to executing the `newfs` command on the Sun StorEdge T3 local disk. It will destroy all disk data. *This procedure uses a private command intended for Sun internal use only. It should not be used unless all other avenues to fix the problem have been exhausted!*

An indication of corrupted labels are messages similar to:

```
Checking local file system...
Local volume can not be fixed
Verify volume fails on uld1
error code = 0X2202
The File System in uld1 is BAD
```

Note – Prior to doing this procedure, ensure all data that is salvageable is backed up. *Backup customer data if you are able to access the LUNs from the host.*

Delete and restore the files in the Sun StorEdge T3 and T3+ array's local `/etc`, `/web`, and `/webgui` directories so the array works correctly with Component Manager.

To recover from corrupted labels, do the following:

1. Configure the `tftpboot` server so the Sun StorEdge T3 and T3+ array can be `tftp` booted.

See Section 2.5, “Configuring a Server for Remote Booting” on page 2-9.

2. Establish a serial port connection to the array.

See Section 2.1, “Establishing a Serial Port Connection” on page 2-1.

3. Ensure that the `tftpfile` and `tftphost` values are properly set.

```
#!/: set tftphost host_IP_address
#!/: set tftpfile nbxxx.bin
```

Where `host_IP_address` is the IP address of the host and where `nbxxx.bin` is the current boot code file identification number. For example `nb101.bin`.

4. Verify that the `tftpfile` is readable from the `/tftpboot` directory of the `tftphost`.

```
#!/: ls /tftpboot
# nb101.bin
```

5. Verify the boot values with the `set` command.

```
:/: set
bootmode auto
bootdelay 3
sn 000596
ip 123.123.123.7
netmask 255.255.255.0
gateway 0.0.0.0
tftpghost 123.123.123.6
tftpfile nb113.bin
hostname T3-1
vendor SUN
model 0082f-f0
revision 0210
logto *
loglevel 3
rarp on
mac 00:20:f2:00:02:ba
```

Where:

- `bootmode` should be `tftp`
- `tftpghost` should be the IP address of the `tftpboot` host machine
- `tftpfile` is the file you specified in Step 3

6. Enable `tftp` booting.

```
:/: set bootmode tftp
```

7. Reboot system with the `.boot -c` command.

Answer “Yes” to the “Clear internal disk label...” question.

```
:/:% .boot -c
Clear internal disk label and configuration, then system will
reset, are you sure? [N]:
y
```

The system boots and displays the `u1: Configuration local data display`.

8. Once system is back up, log in and ftp the bootcode file (nbxxx.bin) into the array's supervisor directory (/).

Where xxx is the current boot code identification number that was set in Step 3. For example nb101.bin. See Section 5.4, "Upgrading Disk Drive Firmware" on page 5-13 for a description of this process.

9. Set bootmode back to auto.

```
#!/: set bootmode auto
```

10. Install the autoboot firmware onto the disk drives with the boot -i command.

```
#!/: boot -i nbxxx.bin
```

Where xxx is the current boot code identification number that was set in Step 3. For example nb101.bin. (There is also a SunSolve patch that uploads all files to the array.)

11. Use ftp to restore the files in the /etc, /web, and /webgui directories from <http://sunsolve.sun.com>.

12. Reset the Sun StorEdge T3 and T3+ array.

```
#!/: reset -y
```

The array should cleanly boot off its own disks.

13. Recreate the volumes and restore customer data.

Interconnect Card Assemblies

This chapter describes how to monitor and replace the interconnect card, and upgrade firmware. The chapter contains the following sections:

- Section 6.1, “Interconnect Card LEDs” on page 6-2
- Section 6.2, “Removing and Replacing an Interconnect Card” on page 6-3
- Section 6.3, “Upgrading Interconnect Card Firmware” on page 6-5

6.1 Interconnect Card LEDs

Each of the interconnect cards has a status LED for each interconnect cable. TABLE 6-1 lists the possible interconnect card status LED states with descriptions of each state.

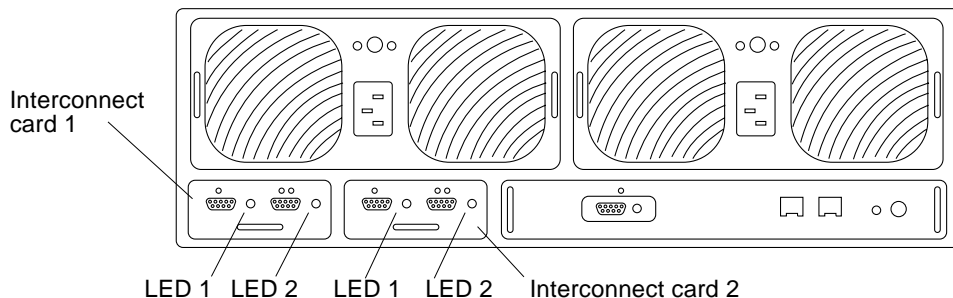


FIGURE 6-1 Interconnect Card LEDs

TABLE 6-1 Interconnect Card LED Descriptions

Interconnect Card Status LED (Green or Amber)	Description
Off	Interconnect card not installed (not recognized)
Green—solid	Interconnect card OK Cable OK (if present)
Green—slow blink	Interconnect card OK, possible communication problem with other cards. Cable may be bad, OK to replace cable
Amber—solid	Interconnect card firmware download in progress
Amber—slow blink	Interconnect card failure, OK to replace interconnect card

Note – Even if the LED indicates an interconnect card failure, always verify the FRU status using either the CLI or Component Manager before replacing the interconnect card. Refer to Section 3.7.3, “Checking FRU Status” on page 3-18, or the *Sun StorEdge Component Manager User’s Guide* for instructions.

6.2 Removing and Replacing an Interconnect Card



Caution – Use the interconnect cables only for cabling Sun StorEdge T3 and T3+ arrays together using the interconnect card connectors. Do *not* use these cables for any other FC-AL connection.



Caution – The interconnect card is extremely sensitive to static electricity. Use proper antistatic wrist straps and antistatic procedures when handling any FRU.



Caution – Replace one interconnect card at a time. Pulling both interconnect cards at one time could cause a system shutdown. Follow the procedure as described to ensure that there is no interruption in system operation or loss of data.

To prevent interruption of the data host system operation during interconnect card replacement, ensure that:

- In a single controller unit configuration, remove only the failed interconnect card. Leave the second interconnect card intact in the array.
- In a partner group, remove the interconnect cable only from the failed interconnect card. Leave the interconnect cable attached to the working interconnect card.

To replace an interconnect card:

1. **Ensure that the interconnect card to be replaced is showing failure status.**
Refer to FIGURE 6-1.
2. **Observe static electricity precautions.**
See Section 1.5, “Static Electricity Precautions” on page 1-5.
3. **Remove the interconnect cable from the failed interconnect card only.**

Note – If a single controller-unit configuration, ignore this step and proceed to Step 4.

Mark the connector with either 1 or 2.

4. **Unlock the failed interconnect card by pushing in on the latch handle.**
Use a coin or small screwdriver to press in and release the latch handle.

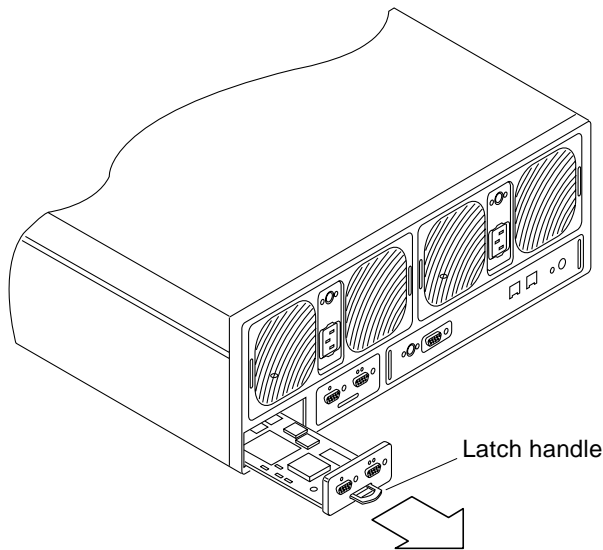


FIGURE 6-2 Removing the Interconnect Card

5. **Pull the interconnect card out using the latch handle.**



Caution – The interconnect card that is removed must be replaced within 30 minutes or the Sun StorEdge T3 and T3+ array and all attached arrays will automatically shut down and power off.

6. **Insert the new interconnect card, making sure that the card sits on the frame.**
7. **Lock the new interconnect card in place by pushing in the latch handle.**
Use a coin or small screwdriver to press in and secure the latch handle.
8. **Reconnect the interconnect cable to the interconnect card.**
9. **Verify that the LEDs on the interconnect card show that the interconnect card has initialized properly.**
10. **Verify the status of the interconnect card using either the CLI or Component Manager.**
Refer to Section 3.7.3, “Checking FRU Status” on page 3-18, or the *Sun StorEdge Component Manager User’s Guide* for instructions.

11. **Type `lpc version` to view and verify the firmware level of the new interconnect card.**

See Section 6.3, “Upgrading Interconnect Card Firmware” on page 6-5” for instructions, if necessary.

6.3 Upgrading Interconnect Card Firmware

The interconnect card firmware is stored in the FLASH memory device on the interconnect card. The array can be operational during the interconnect card firmware upgrade.

The firmware upgrade procedures that follow must be done through the Ethernet connection. The latest firmware versions are located on the SunSolve web site:

`http://sunsolve.sun.com`

- The firmware must be resident on the host for this operation.
- The Sun StorEdge T3 and T3+ arrays must have a supervisor password prior to attempting this procedure.

To upgrade the firmware:

1. **Use `ftp` to transfer the firmware to the storage system’s directory using binary mode.**

See Section 2.3, “Establishing an FTP Session” on page 2-5.

2. **Establish a Telnet connection to the array.**

See Section 2.2, “Establishing a Telnet Session” on page 2-3.

3. **Install the firmware using the `lpc` command.**

The example shows downloading the firmware to a partner group (four interconnect cards).

```
T3:/:<2> lpc download u111 /filename
T3:/:<3> lpc download u112 /filename
T3:/:<4> lpc download u211 /filename
T3:/:<5> lpc download u212 /filename
```

Install the firmware on each interconnect card as shown in the example.

4. **Verify the version level. Type `lpc version`.**

Note – It is not necessary to reboot the array for the interconnect card firmware to become effective.

Power and Cooling Unit Assemblies

This chapter describes how to replace the power and cooling unit and monitor the UPS battery. The chapter contains the following sections:

- Section 7.1, “Power and Cooling Unit” on page 7-1
- Section 7.2, “Power and Cooling Unit LEDs” on page 7-2
- Section 7.3, “Removing and Replacing a Power and Cooling Unit” on page 7-4
- Section 7.4, “UPS Battery” on page 7-6

7.1 Power and Cooling Unit

The power and cooling unit has two active power sources: standby and primary power. Standby power, which is used to power the micro controller on the interconnect card, is activated when AC power is present. Primary power, which is used to power all remaining circuits and disk drives, is activated when AC or battery power is present and the power switch is on.

Each power and cooling unit has a power switch in the rear upper center of the unit. Turning off the power on a power and cooling unit affects only that power and cooling unit. Therefore, to power off all primary power to the unit, both power switches on both power and cooling units must be turned off. After the switches are turned off, system primary power will not actually turn off until the controller has performed an orderly shutdown, including writing any data cache to disk. This process can take up to two minutes.

Separate power cords are used for the connector on each power and cooling unit to provide redundant cabling. The power cords need to be connected to separate AC power sources for full redundancy.

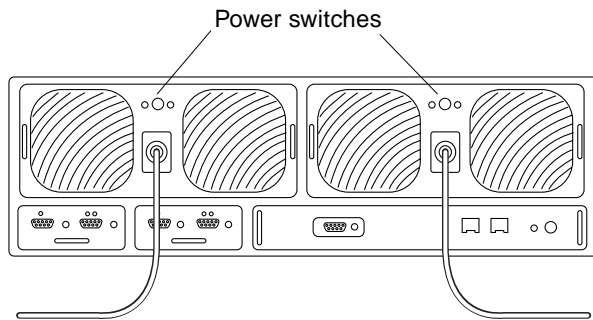


FIGURE 7-1 Power Cords Connected to the Power and Cooling Units



Caution – Do not handle the power and cooling unit when the power cord is connected. Line voltages are present within the power and cooling unit when the power cord is connected even if the power switch is off.

At the rear of the power and cooling unit is a recessed PC card connector. Do not touch this connector or allow any metal object to touch it. The power and cooling unit contains the UPS battery backup. There are no serviceable parts inside this unit.

Note – The batteries in the power and cooling units recharge after powering on the array. If the batteries are less than fully charged, `fru stat` output displays batteries in a “fault” condition, and write-behind cache is disabled until the batteries are charged. Note that the system can take several hours to determine the health of the batteries after the system is turned back on. Batteries reflect a non optimal state after power loss events and also after turning off power switches.

7.2 Power and Cooling Unit LEDs

Each of the power and cooling units has an AC LED and a power supply (PS) LED. TABLE 7-1 lists the possible conditions of these LEDs with a description of each state.

7.2.1 Power and Cooling Unit LEDs

Each power and cooling unit has an AC LED and a power-supply (PS) LED. TABLE 7-1 lists the possible conditions of these LEDs and describes each state.

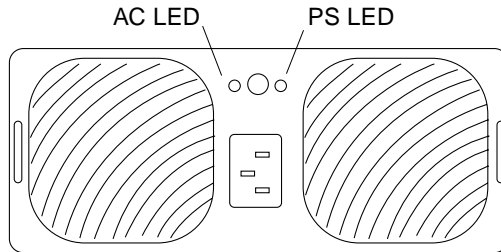


FIGURE 7-2 Power and Cooling Unit LEDs

TABLE 7-1 Power and Cooling Unit LED Descriptions

AC LED (Green or Amber)	PS LED (Green or Amber)	Description
Off	Off	<ul style="list-style-type: none"> Power is off No AC input
Amber	Off	<ul style="list-style-type: none"> Power is off Power switch turned off AC power is available
Green	Off	Occurs when array is shut down: <ul style="list-style-type: none"> PCU disabled AC power is available
Green	Green	Normal operating state: <ul style="list-style-type: none"> PCU receiving AC power Power switch is turned on AC power is available
Amber	Amber	<ul style="list-style-type: none"> Switch is off. Array powers off after PCU is disabled

TABLE 7-1 Power and Cooling Unit LED Descriptions (Continued)

AC LED (Green or Amber)	PS LED (Green or Amber)	Description
Green	Amber	Indicates one or more of following: <ul style="list-style-type: none"> • Over-temperature condition; PCU disabled • DC power not available; PCU disabled • Both fans fault; PCU disabled • Battery on refresh cycle
Green	Blinking green	<ul style="list-style-type: none"> • Battery not ready; charging
Green	Blinking amber	Indicates one or more of following: <ul style="list-style-type: none"> • PCU disabled • One fan fault • Battery hold-time low; PCU remains enabled • Battery out of warranty; PCU remains enabled • Battery life-span failure; PCU remains enabled <p>Note—Verify a power and cooling unit failure using the CLI or Component Manager.</p>

Note – Even if the LED indicates a power cooling unit failure, always verify the FRU status using either the CLI or Component Manager before replacing the power cooling unit. Refer to Section 3.7.3, “Checking FRU Status” on page 3-18, or the *Sun StorEdge Component Manager User’s Guide* for instructions.

7.3 Removing and Replacing a Power and Cooling Unit



Caution – To ensure correct airflow for system cooling, both power and cooling units must be in the installed position for normal operation. A failed power and cooling unit should be removed only when a replacement power and cooling unit is available to be inserted.



Caution – Replace only one power and cooling unit at a time to prevent system interruption.

To replace a power and cooling unit:

1. Observe static electricity precautions.

See Section 1.5, “Static Electricity Precautions” on page 1-5

2. Power off the power and cooling unit by pressing the power switch (FIGURE 7-1).

Make sure that the AC LED is amber and the PS LED is off (FIGURE 7-2).

3. Disconnect the power cord from the AC outlet.

4. Disconnect the power cord from the power and cooling unit connector by squeezing both sides of the connector and pulling straight out (FIGURE 7-1).

5. Unlock the power and cooling unit by using a coin or small screwdriver to push in and release the two latch handles (FIGURE 7-3).

6. Pull the power and cooling unit out of the array.

Put one index finger through each of the latch handles. With your thumbs on the top of the chassis for support, pry the power and cooling unit out of its connectors with an upward rotation. Once it is out approximately 1 inch (2.5 cm), the unit will be free to slide out of the frame on its rails.



Caution – Any power and cooling unit that is removed must be replaced within 30 minutes or the Sun StorEdge T3 and T3+ array and all attached arrays automatically shut down and power off.

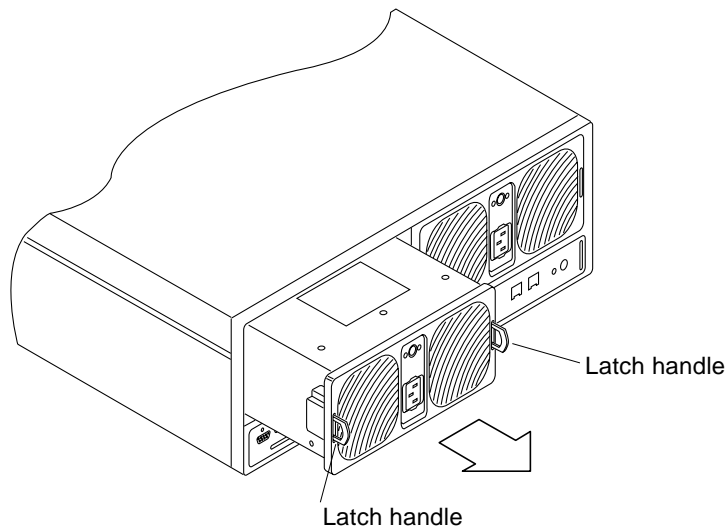


FIGURE 7-3 Removing the Power and Cooling Unit

7. **Insert the new power and cooling unit.**
8. **Lock the new power and cooling unit by pushing in both latch handles.**
9. **Insert the power cord into the power and cooling unit connector.**
10. **Connect the power cord into the AC outlet.**

Verify that the AC LED on the power and cooling unit is amber, indicating that AC power is present.
11. **Push the power and cooling unit power switch on.**

Verify that both LEDs on the power and cooling unit are green, indicating that the unit is receiving power.
12. **Verify the status of the power and cooling unit using either the CLI or Component Manager.**

Refer to Section 3.7.3, “Checking FRU Status” on page 3-18, or the *Sun StorEdge Component Manager User’s Guide* for instructions.

Note – After installing the new power and cooling unit, the batteries will take some time to recharge.

7.4 UPS Battery

The uninterruptible power supply (UPS) battery is located within the power and cooling unit. The battery provides backup in case of a complete AC power failure and sustains power to the array long enough to flush cache data to the drives.

When a Sun StorEdge T3 and T3+ array is first powered up, write-behind caching is disabled (cache runs in write-through mode) for a short time. The write-behind caching is disabled during cold boots (even if AC power has not been removed from the array) as the firmware attempts to determine the condition of the internal PCU batteries. Once the system determines that the batteries are in an optimal state, system cache mode returns to write-behind. After a power down, a array re-enables write-behind cache mode in approximately two hours.

During a power failure, if the battery is flushing cache data to the drives, battery power becomes depleted. Once AC power is available, the battery recharges. While the battery is recharging, write-behind cache mode is disabled and write-through cache mode is enabled until the battery is fully recharged. The battery recharge could take up to 12 hours, depending on the length of the power outage and the amount of cache data that was flushed to the drives.

Note – The batteries in the power and cooling units recharge after powering on the array. If the batteries are less than fully charged, `fru stat` output will display batteries in a fault condition, and write-behind cache is disabled until the batteries are charged.

7.4.1 Checking the Battery

1. On the host, use the `telnet` command with the array name (or IP address) to connect to the array.

```
mngr_host# telnet array-name
Trying 123.123.123.101...
Connected to 123.123.123.101.
Escape character is '^]'.

pSOSystem (123.123.123.101)
```

2. Log in to the array by typing `root` and the supervisor password at the prompts.
3. Use the `id read` command to display battery life related information.
(Unit number $n = 1$ or 2 ; power cooling unit number $n = 1$ or 2 .)

```
:/:<51> id read unpcun
Revision           : 0000
Manufacture Week   : 00421999
Battery Install Week : 00421999
Battery Life Used   : 24 days, 21 hours
Battery Life Span   : 730 days, 12 hours
Serial Number      : 005277
Battery Warranty Date: 20000124142032
Battery Internal Flag: 0x00000000
Vendor ID          : TECTROL-CAN
Model ID           : 300-1454-01(50)
```

4. Use the `refresh -s` command to check the status of a battery refresh cycle.

The following examples show a battery refresh in progress and a normal battery status (no refresh cycle):

```
:/:<53> refresh -s

PCU1                PCU2
-----
U1                  Completed                Recharging

Current Time        Fri May 26 18:32:07 2000
Start Time          Thu May 25 20:31:19 2000
Last Refresh        Thu May 11 20:27:53 2000
Next Refresh        Thu Jun 08 20:31:19 2000
Total time elapsed : 22 hours, 0 minutes, 48 seconds.
```

```
:/:<53> refresh -s
No battery refreshing Task is currently running.

                PCU1                PCU2
-----
U1              Normal                Normal
U2              Normal                Normal

Current Time        Wed Dec 08 18:54:26 1999
Last Refresh        Fri Nov 12 07:41:51 1999
```

7.4.2 Battery Maintenance

The battery refresh cycle occurs automatically once every 14 days. The battery refresh cycle is sequential, ensuring that only one battery in a unit is refreshed at a time. The refresh cycle consists of a 10-12 minute discharge period, followed by a recharge period of 10 to 12 hours.

The refresh cycle verifies the health of the battery. During the refresh, if a problem is detected with the battery, future refresh operations are suspended until the problem is fixed. When refresh is suspended, battery write-behind caching is turned off automatically as a safety precaution.

Note – During the discharge period of a refresh cycle (approximately 12 minutes), write-behind cache is turned off.

The `syslog` file indicates battery refresh operation in progress. Use the `refresh -s` command to view an active refresh operation. Refer to the *Sun StorEdge T3 and T3+ Array Administrator's Guide* for more information on this command. Refresh cycle time is controlled by the array's `/etc/schd.conf` file. For example:

```
:/><14> cat /etc/schd.conf
BAT_CYC 14
```

You can tune the `/etc/schd.conf` file to specify the interval between battery refresh cycles and initiate a refresh on a particular day. To specify beginning a battery refresh cycles at a particular time, edit the `BAT_BEG MM-DD-YYYY, hh-mm-ss` value in the `/etc/schd.conf` file. Where:

- *MM* is the month number (January = 1)
- *DD* is the day number
- *YYYY* is the year
- *hh* is the hour using a 24 hour clock (6pm = 18)
- *mm* is the minute
- *ss* is the second (this element is optional)



Caution – The battery service life depends on a battery refresh cycle of 14 days. Altering this time span can decrease battery life.

For example, specify that a battery refresh cycle begin on January 15, 2001 at 11 p.m., the entry in the `/etc/schd.conf` file:

```
BAT_BEG 1-15-2001,23-00-00
```

Note that the next refresh start time is always calculated from the start time of the previous refresh cycle. If a user manually starts a refresh cycle, then the next refresh depends on the starting time of the manually activated refresh cycle.

Note – If a controller failover occurs, the scheduler daemon starts and behaves as it does during a normal system boot. The scheduler reads the `schd.log` file, and based on `schd.conf` file, begins the next refresh process. If during the discharge period (10 to 12 minutes) or recharge period (10 to 12 hours) a controller failover occurs, the current refresh process is killed and the next refresh cycle starts at the scheduled refresh time based on the `schd.conf` file. Consequently, the refresh cycles begins as scheduled previously.

The battery service life is 2 years. When the battery approaches its end of life, warning messages are sent to the `syslog` file. The first message is sent 45 days before the end of life, followed by a warning message every five days thereafter. The

power and cooling unit that contains the battery *must* be replaced within forty-five days of receiving the first warning message. The warning message indicates which power and cooling unit needs to be replaced.

7.4.3 Removing and Replacing the UPS Battery

Note – REVIEWERS—This is a cold-swap procedure.

7.4.3.1 Remove the UPS Battery

1. Remove the PCU from the array.

See “Removing and Replacing a Power and Cooling Unit” on page 4.



Caution – Any power and cooling unit that is removed must be replaced within 30 minutes or the Sun StorEdge T3 and T3+ array and all attached arrays automatically shut down and power off.

2. Turn the PCU over such that the bottom of the unit is facing up as shown in FIGURE 7-4.

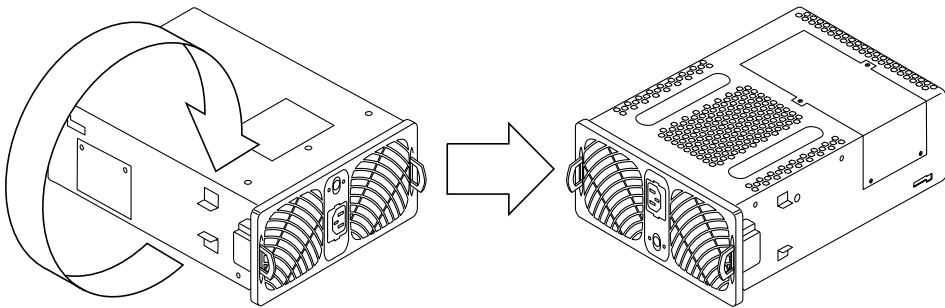


FIGURE 7-4 Turning the PCU upside down

3. Remove the four Phillips screws from the panel on the bottom and side of the PCU as shown in FIGURE 7-5.

Use care in removing the screws so they do not fall into the vent holes of the PCU.

Note – The battery is attached to the bottom panel of the PCU. When removing the bottom panel, do not attempt to remove it completely as the battery is still connected to the unit.

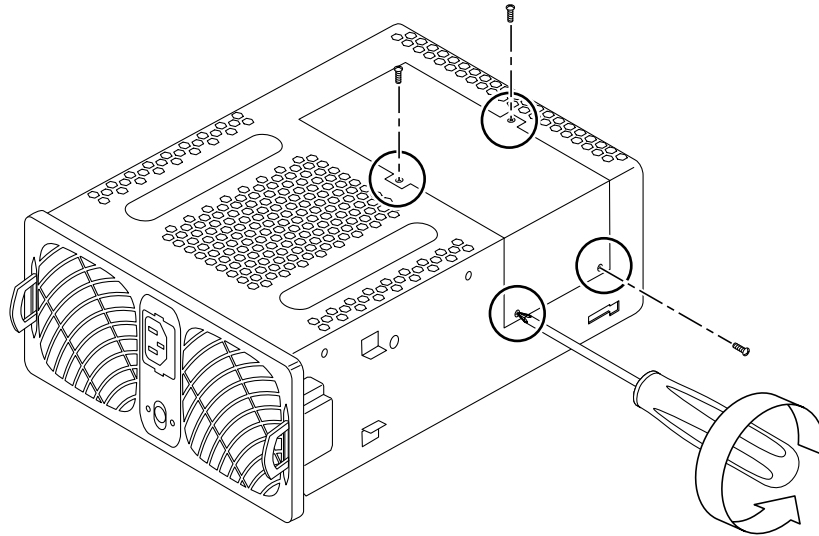


FIGURE 7-5 Removing the Screws from the PCU Bottom Panel

- 4. Slide the bottom panel off the unit slightly, enough to expose the battery connector as shown in FIGURE 7-6 and FIGURE 7-7.**

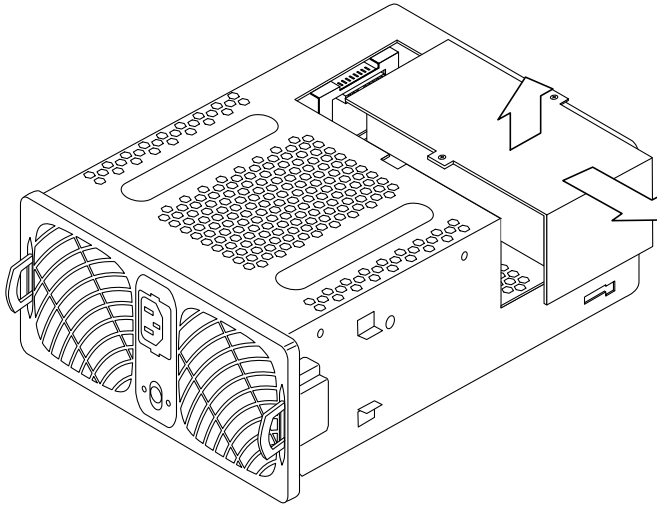


FIGURE 7-6 Lifting the PCU Bottom Panel and Battery Slightly Away from the Unit

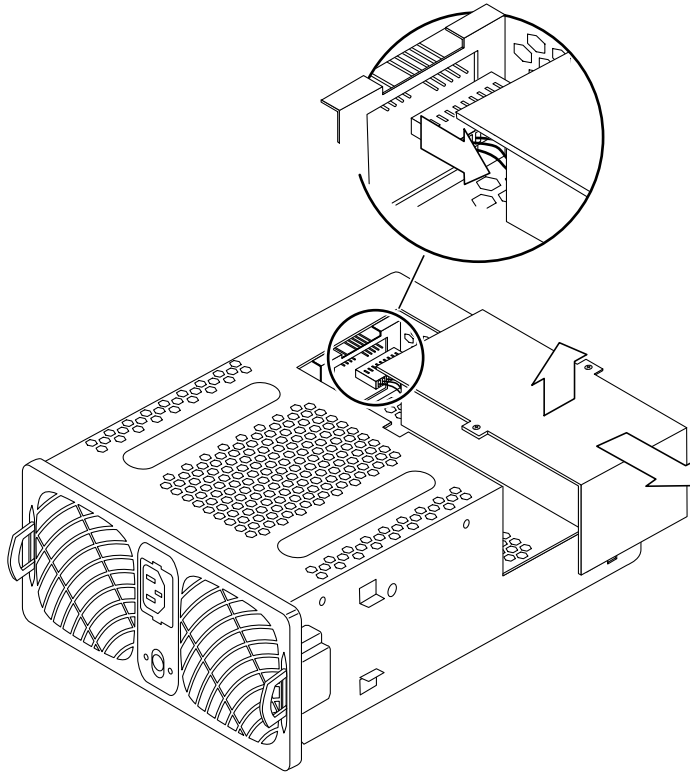


FIGURE 7-7 The Battery Connector Details Inside the PCU

- 5. Remove the battery connector by pulling on it firmly straight out from the connector inside the PCU.**
- 6. Lift the bottom panel with the battery away from the unit and set it aside as shown in FIGURE 7-8.**

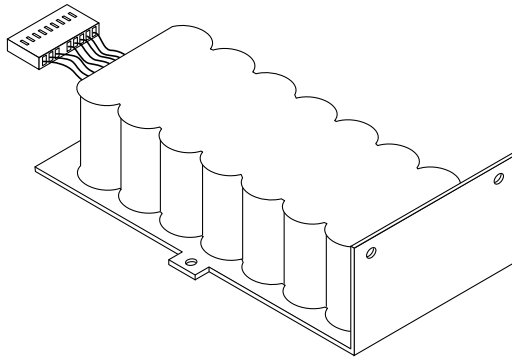


FIGURE 7-8 UPS Battery Setting Right Side Up

7.4.3.2 Replace the UPS Battery

- 1. Connect the replacement battery to the battery connector of the PCU.**

See FIGURE 7-7.

Firmly push the connector all the way into the PCU battery connector. There is no indication, such as a mechanical click, that indicates that it is fully inserted.

- 2. Seat the battery pack in the PCU such that the bottom panel is flush with the edges of the PCU.**

See FIGURE 7-5.

- 3. Replace the four Phillips screws and secure the bottom panel to the PCU.**
- 4. Replace the PCU in the array and prepare the PCU for return to service as described in “Removing and Replacing a Power and Cooling Unit” on page 4.**

Diagnosing and Correcting FC-AL Loop Problems

This chapter describes how to diagnose and correct back-end FC-AL drive loop problems with the array. It contains the following sections:

- Section 8.1, “Overview” on page 8-1
- Section 8.2, “Normal Status” on page 8-2
- Section 8.3, “Diagnosing an FC-AL Loop” on page 8-10
- Section 8.4, “Repair Procedures” on page 8-21

There are several failure conditions within the back-end loop that do not appear as a failed FRU status. These kind of failures can only be diagnosed by collecting data from various sources within the system such as, `iostat` performance data, CLI status commands, StorTools, StorTools message monitoring, Component Manager, the Sun StorEdge T3 array `syslog`, and the FC-AL connected host messages file. Data from these sources is used to determine the most likely failed FRU within the Sun StorEdge T3 array system.

8.1 Overview

The procedures in this chapter assume that the person servicing the equipment has been trained on the product and that the required service manuals are available.

A serial maintenance cable kit must be available (part number 370-4119), along with a terminal or host port connection.

Note – In order to collect the information required to diagnose back-end FC-AL loop problems, several of the engineering-only “dot” commands must be used. Only the status options of these dot commands are used.

Diagnosing and correcting back-end FC-AL loop problems can take up to five steps:

1. Determine that there has been a failure in the back-end drive loop.

Diagnosing the problem requires that you analyze the collected data and make a determination of which is the most likely failed FRU from the data available. This procedure is described in Section 8.3, “Diagnosing an FC-AL Loop” on page 8-10.

Once you identify a suspected FRU, use one or more of the following steps to isolate and then replace the failed FRU.

2. Isolate, replace, and verify the interconnect cards and/or the loop cable.

Interconnect cards (sometimes referred to as *unit interconnect cards* or *UIC*) can be replaced without affecting the online operation of the product, though there may be some performance impact. See Section 8.4.1, “Interconnect Card Replacement Procedure” on page 8-21.

3. Isolate, replace, and verify the RAID controllers.

Replacing RAID controllers causes a LUN/controller path failover. This failover might require some kind of manual procedure by the customer to continue running and it might affect the overall system performance. See Section 8.4.2, “RAID Controller Replacement Procedure” on page 8-22.

4. Isolate, replace, and verify the FC-AL disk drives.

Perform this step only if steps 2 and 3 fail to resolve the problem. To run the loop diagnostics to identify a failed drive FRU, the Sun StorEdge T3 array must be removed from operation. Removing the array is highly disruptive to the customer. See Section 8.4.3, “Off-Line Drive Diagnostics and Replacement” on page 8-23.

5. Replace and verify the chassis and mid-plane.

If by the end of step 4 there is still a problem the chassis and mid-plane will need to be replaced. Perform this step only if steps 2, 3, and 4 fail to resolve the problem. This is highly disruptive to the customer. See Section 8.4.4, “Chassis Replacement Procedure” on page 8-29 and Section 9.2, “Replacing the Chassis/Backplane Assembly” on page 9-2.”

8.2 Normal Status

This section presents an overview of the product FC-AL architecture for clarity on determining back-end loop problems.

FIGURE 8-1 contains a block diagram showing the two back-end drive loops in a normal (no failures) configuration.

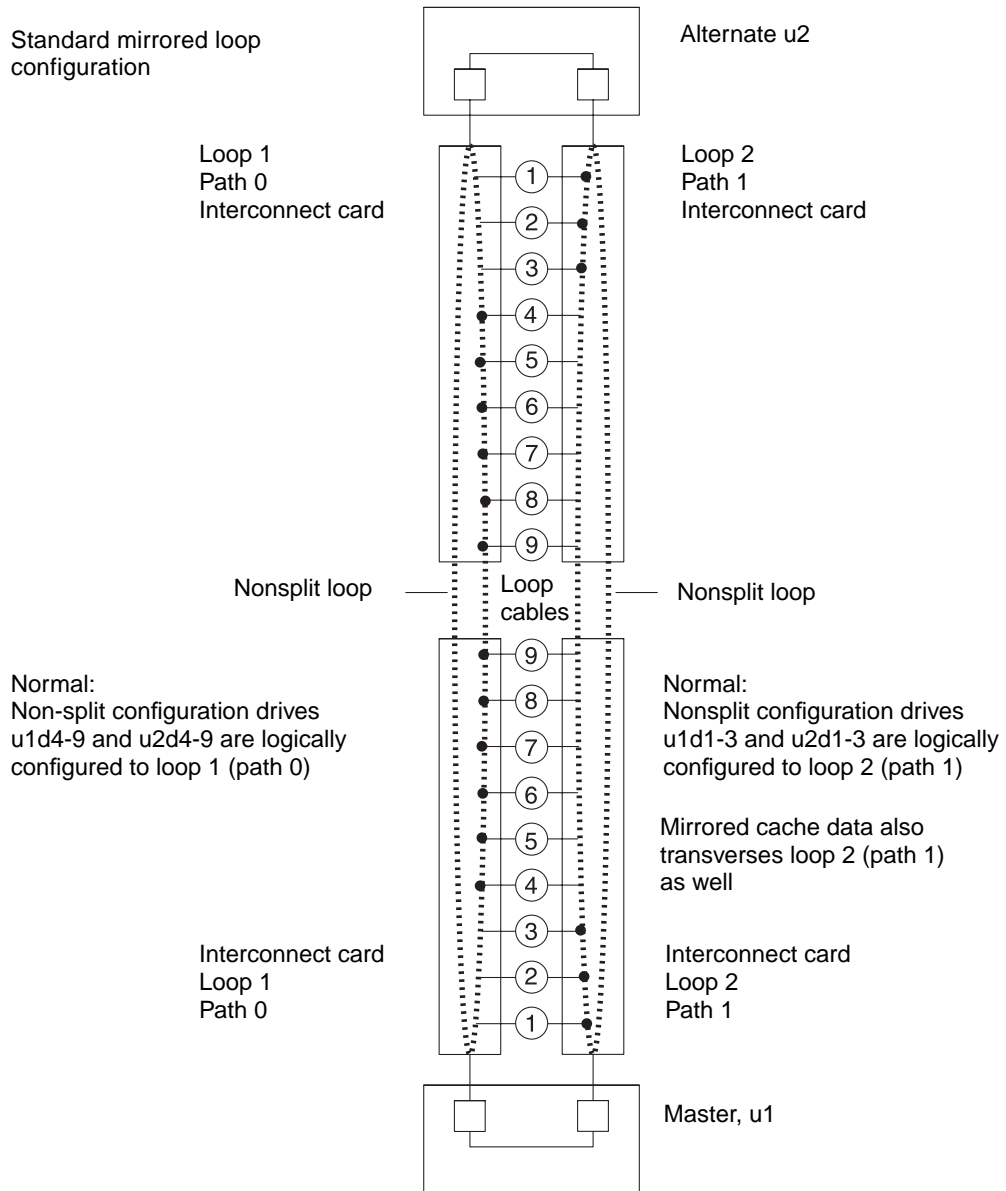


FIGURE 8-1 Backend Loop Configuration

Drives u1d1-9 and u2d1-9 are logically configured and electrically connected to both RAID controllers through loop 2 (path 1). During normal operations, drive u1d1-3 are accessed only by u1ctr through u1l2, loop 2 (path 1). Drives u2d1-3 are accessed only by u2ctr through u2l2, loop 2 (path 1).

Drives u1d1-9 and u2d1-9 are logically configured and electrically connected to both RAID controllers through loop 1 (path 0) and loop 2 (path 1).

The normal configuration information can be determined by using the following CLI commands and interpreting the results.

- `fru stat` (see Section 8.2.1, “The fru stat Command” on page 8-5)
- `vol mode` (see Section 8.2.2, “The vol mode Command” on page 8-6)
- `port listmap` (see Section 8.2.3, “The port listmap Command” on page 8-6)
- `.loop stat` (see Section 8.2.4, “The .loop stat Command” on page 8-6)
- `.disk pathstat` (see Section 8.2.5, “The .disk pathstat Command” on page 8-7)
- `.disk linkstat` (see Section 8.2.6, “The .disk linkstat Command” on page 8-8)

The examples that follow show a Sun StorEdge T3 and T3+ array in a redundant partner group configuration, with no failed FUR's.

8.2.1 The fru stat Command

The fru stat command returns the current condition of both disk ports (port 1 and port 2), as well as the status of the interconnect cards. If there are loop problems, this might indicate certain disk ports have a status other than ready, or the loop cards with a status other than ready or enabled.

CODE EXAMPLE 8-1 fru stat Command Output

```

:/:<1> fru stat
CTRLR STATUS STATE  ROLE          PARTNER TEMP
-----
ulctr ready enabled master      u2ctr  37.5
u2ctr ready enabled alt master ulctr  39.5
DISK STATUS STATE  ROLE          PORT1 PORT2 TEMP VOLUME
-----
uld1 ready enabled data disk ready ready 35 v0
uld2 ready enabled data disk ready ready 30 v0
uld3 ready enabled data disk ready ready 30 v0
uld4 ready enabled data disk ready ready 29 v0
uld5 ready enabled data disk ready ready 35 v0
uld6 ready enabled data disk ready ready 31 v0
uld7 ready enabled data disk ready ready 35 v0
uld8 ready enabled data disk ready ready 32 v0
uld9 ready enabled data disk ready ready 37 v0
u2d1 ready enabled data disk ready ready 33 v1
u2d2 ready enabled data disk ready ready 33 v1
u2d3 ready enabled data disk ready ready 31 v1
u2d4 ready enabled data disk ready ready 31 v1
u2d5 ready enabled data disk ready ready 27 v1
u2d6 ready enabled data disk ready ready 32 v1
u2d7 ready enabled data disk ready ready 35 v1
u2d8 ready enabled data disk ready ready 30 v1
u2d9 ready enabled data disk ready ready 33 v1

LOOP STATUS STATE  MODE  CABLE1  CABLE2  TEMP
----
u211 ready enabled master installed - -
u212 ready enabled slave installed - -
u111 ready enabled master - installed 37.5
u112 ready enabled slave - installed 41.0

POWER STATUS STATE  SOURCE OUTPUT BATTERY TEMP  FAN1  FAN2
-----
ulpcu1 ready enabled line normal normal normal normal normal
ulpcu2 ready enabled line normal normal normal normal normal
u2pcu1 ready enabled line normal normal normal normal normal
u2pcu2 ready enabled line normal normal normal normal normal

```

8.2.2 The vol mode Command

The `vol mode` command returns the current cache mode. A cache status other than `writebehind`, might indicate loop problems.

CODE EXAMPLE 8-2 `vol mode` Command—Normal Outputs

```
:/:<2> vol mode
volume mounted cache      mirror
v0      yes      writebehind on
v1      yes      writebehind on
```

8.2.3 The port listmap Command

The `port listmap` command returns the current controller to volume path. One controller controlling all the configured volumes, might indicate loop problems.

CODE EXAMPLE 8-3 `port listmap` Command—Normal Output

```
:/:<3> port listmap
port targetid addr_type lun volume owner access
ulp1 1        hard      0   v0     u1    primary
ulp1 1        hard      1   v1     u2    failover
u2p1 2        hard      0   v0     u1    failover
u2p1 2        hard      1   v1     u2    primary
```

8.2.4 The .loop stat Command

The `.loop stat` command returns the current loop configuration with regard to the electrical connections between the loop cards. A loop configuration other than the example below, might indicate loop problems.

Note – The “+” symbol represents the presence of the `isp2100` chip.

CODE EXAMPLE 8-4 `.loop stat` Command—Normal Output

```
:/:<4> .loop stat
Loop 1: <1+2+>
Loop 2: <1+2+>
```

Where:

- <1+> means u1d1-9 and u1ctr ISP2100 are on the loop.
- <2+> means u2d1-9 and u2ctr ISP2100 are on the loop.
- <1+><2+> means the loop is split into 2 segments.
- <1+2+> means u1d1-9 and u2d1-9 and u1ctr and u2ctr ISP2100s are all on the loop.
- <1+2> means u1d1-9 and u2d1-9 and u1ctr ISP2100 are on the loop(1 CU and 1 EU would result in this configuration).

8.2.5 The .disk pathstat Command

The .disk pathstat command returns the current disk path logical configuration. A path status other than what is displayed below, might indicate loop problems.

Note – The Telnet session always runs the command through the master controller. Although it is possible to connect directly to the alternate controller, it is not supported.

CODE EXAMPLE 8-5 .disk pathstat Command—Normal Output

```
:/:<5> .disk pathstat u1d1-9
DISK PPATH APATH CPATH PATH_POLICY FAIL_POLICY
-----
u1d1 [0 U] [1 U] APATH APATH          PATH
u1d2 [0 U] [1 U] APATH APATH          PATH
u1d3 [0 U] [1 U] APATH APATH          PATH
u1d4 [0 U] [1 U] PPATH PPATH          PATH
u1d5 [0 U] [1 U] PPATH PPATH          PATH
u1d6 [0 U] [1 U] PPATH PPATH          PATH
u1d7 [0 U] [1 U] PPATH PPATH          PATH
u1d8 [0 U] [1 U] PPATH PPATH          PATH
```

CODE EXAMPLE 8-5 .disk pathstat Command—Normal Output

```
u1d9 [0 U] [1 U] PPATH PPATH      PATH
pass

:/:<6> .disk pathstat u2d1-9
DISK PPATH APATH CPATH PATH_POLICY FAIL_POLICY
-----
u2d1 [0 U] [1 U] APATH APATH      PATH
u2d2 [0 U] [1 U] APATH APATH      PATH
u2d3 [0 U] [1 U] APATH APATH      PATH
u2d4 [0 U] [1 U] APATH PPATH      PATH
u2d5 [0 U] [1 U] APATH PPATH      PATH
u2d6 [0 U] [1 U] APATH PPATH      PATH
u2d7 [0 U] [1 U] APATH PPATH      PATH
u2d8 [0 U] [1 U] APATH PPATH      PATH
u2d9 [0 U] [1 U] APATH PPATH      PATH
```

Where:

- [0 U] means Loop 1 (path_id = 0) is Up.
- [1 U] means Loop 2 (path_id = 1) is Up.
- [0 D] means Loop 1 (path_id = 0) is Down.
- [1 D] means Loop 2 (path_id = 1) is Down.
- PPATH means primary path.
- APATH means alternate path.
- CPATH means current path.
- PATH_POLICY means the preferred path (notice the 3/6 split).
- FAIL_POLICY is not supported (always PATH for path failover vs. loop failover).

Note that .disk failover causes CPATH to change to the other loop and .disk failback causes CPATH to change to the preferred path.

8.2.6 The .disk linkstat Command

The .disk linkstat command returns whether a device port link status register can be accessed by a controller in its current configuration. If the link status register cannot be accessed this may indicate a path problem to those disk(s) ports.

Note – The Telnet session will always run the command through the master controller. Although it is possible to connect directly to the alternate controller, it is not supported.

CODE EXAMPLE 8-6 .disk linkstat Command—Normal Ouput

```
:/:<9> .disk linkstat u1d1-9 path 0
DISK LINKFAIL LOSSSYNC LOSSSIG PROTOERR INVTXWORD INVCRC
-----
u1d1 1          10          0          0          77          0
u1d2 1           1          0          0          20          0
u1d3 2          24          0          0          112         0
u1d4 1          10          0          0          78          0
u1d5 1           1          0          0          20          0
u1d6 1           7          0          0          90          0
u1d7 1          11          0          0          76          0
u1d8 1           2          0          0          20          0
u1d9 1          16          0          0          45          0
```

The status for the command example shown below is correct for the normal loop configuration when you execute the command from the alternate controller.

CODE EXAMPLE 8-7 .disk linkstat Command—Normal Ouput (alternate)

```
:/:<28> .disk linkstat u1d1-9 path 0
DISK LINKFAIL LOSSSYNC LOSSSIG PROTOERR INVTXWORD INVCRC
-----
u1d1 1          16          0          0          10          0
u1d2 1           1          0          0           0          0
u1d3 3          31          0          0          102         0
u1d4 1          12          0          0          75          0
u1d5 1           0          0          0           0          0
u1d6 1          13          0          0          76          0
u1d7 1          13          0          0          75          0
u1d8 1           4          0          0           0          0
u1d9 1          16          0          0          75          0
pass
```

CODE EXAMPLE 8-7 .disk linkstat Command—Normal Output (alternate)

```
:/:<29> .disk linkstat u1d1-9 path 1

DISK LINKFAIL LOSSSYNC LOSSSIG PROTOERR INVTXWORD INVCRC
-----
u1d1 1          11          0          0          27          0
u1d2 1          1           0           0          12          0
u1d3 2          32          0           0          45          0
u1d4 1          10          0           0          42          0
u1d5 1           1           0           0          12          0
u1d6 1          16          0           0          32          0
u1d7 1          11          0           0          90          0
u1d8 1           2           0           0          12          0
u1d9 1          16          0           0          32          0
pass
```

8.3 Diagnosing an FC-AL Loop

This section describes how to diagnose an FC-AL loop problem. This section contains the following sub-sections:

- Section 8.3.1, “FC-AL Loop Problem Indicators” on page 8-10
- Section 8.3.2, “Checking Performance Against Baseline Data” on page 8-12
- Section 8.3.3, “StorTools Message Monitoring” on page 8-13
- Section 8.3.4, “Component Manager Status Indicator” on page 8-13
- Section 8.3.5, “Manual Examination of the syslog File” on page 8-13
- Section 8.3.6, “Example syslog Error Messages” on page 8-14
- Section 8.3.7, “Using CLI Diagnostic Commands” on page 8-15
- Section 8.3.8, “Using the ofdg Diagnostic Utility” on page 8-16

8.3.1 FC-AL Loop Problem Indicators

The following symptoms indicate possible FC-AL loop problems:

1. The first indication observed by a customer might be performance degradation in the suspect Sun StorEdge T3 array. See Section 8.3.2, “Checking Performance Against Baseline Data” on page 8-12 for more detail.
2. A second indication might be StorTools message monitoring from a host that is receiving remote array `syslog` messages. StorTools monitoring can be configured to look for particular message classes in the log file that the array entries are written to. The program looks through this log file at a customer- determined

frequency for the specified type of messages, and sends email if a match is made. Typically, StorTools message monitoring is configured to scan for warning or error messages. These message can also be examined in the disk tray's local `syslog`. The email recipient can be the customer or any other destination the customer desires. See Section 8.3.3, "StorTools Message Monitoring" on page 8-13 for more detail.

3. A third indication of a problem may be a message or change of status in the Component Manager maintenance program GUI display, for example, a suspect FRU highlighted in red. Component Manager also sends email to whomever the customer specifies and logs the failure into a customer-designated log file on the host that Component Manager is running on. See Section 8.3.4, "Component Manager Status Indicator" on page 8-13 and Section 8.3.6, "Example syslog Error Messages" on page 8-14 for more details.
4. A fourth indication of a problem may be a warning or error log entry in the local Sun StorEdge T3 array `syslog` file. Examine this file by using CLI commands via a Telnet or Tip connection. This file can also be transferred via `ftp` to another host for examination and archiving. See Section 8.3.5, "Manual Examination of the syslog File" on page 8-13 and Section 8.3.6, "Example syslog Error Messages" on page 8-14 for more details.
5. Additional indications of an FC-AL loop problem can provided by running the CLI commands described in Section 8.2, "Normal Status" on page 8-2. See Section 8.3.7, "Using CLI Diagnostic Commands" on page 8-15 for more detail.

If after this information has been gathered and examined and it has been determined that one of the back-end FC-AL loops has failed, but no definitive FRU an be identified, perform one or more of the diagnostic procedures described in the following sections.

8.3.2 Checking Performance Against Baseline Data

If the customer regularly runs a performance monitoring program where thresholds have been set, the `iostat` command shows whether one path to a Sun StorEdge T3 and T3+ array partner group is not performing to the established base line. For example:

CODE EXAMPLE 8-8 `iostat` Output for Normal (Baseline) Operation

```
r/s w/s Mr/s Mw/s wait actv wsvc_t asvc_t %w %b device
0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0 0 c1t6d0
0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0 0 c0t0d0
0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0 0 c0t2d0
0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0 0 c2t7d0
0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0 0 c2t6d0
0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0 0 c3t1d0
0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0 0 c4t2d1
0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0 0 c5t1d1
54.0 28.5 0.4 7.0 0.0 0.7 0.0 8.3 0 60 c5t1d0 (normal u1ctr I/O)
0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0 0 c3t1d1
0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0 0 c4t2d0
53.3 26.1 2.2 6.4 0.0 1.6 0.0 19.7 0 59 c6t2d1 (normal u2ctr I/O)
0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0 0 c6t2d0
```

CODE EXAMPLE 8-9 `iostat` Output for Abnormal (Problem) Operation

```
r/s w/s Mr/s Mw/s wait actv wsvc_t asvc_t %w %b device
0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0 0 c1t6d0
0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0 0 c0t0d0
0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0 0 c0t2d0
0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0 0 c2t7d0
0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0 0 c2t6d0
0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0 0 c3t1d0
0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0 0 c4t2d1
0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0 0 c5t1d1
13.6 2.1 0.1 0.4 0.0 0.1 0.0 4.4 0 5 c5t1d0 (abnormal u1ctr I/O)
0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0 0 c3t1d1
0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0 0 c4t2d0
53.0 18.6 3.9 4.4 0.0 2.5 0.0 34.6 0 37 c6t2d1 (normal u2ctr I/O)
0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0 0 c6t2d0
```

In the above example, if the normal `iostat` is used as a notification threshold, the impacted `iostat` indicates that there might be a problem in the master u1ctr controller in this redundant partner group.

8.3.3 StorTools Message Monitoring

If StorTools message monitoring is installed and running, it sends email messages indicating problems. For example, in the case of the performance impact illustrated above, the email might have the following data in it:

CODE EXAMPLE 8-10 Example StorTools Message Monitoring Email Message Data

```
Mar 07 18:33:22 T3a ISR1[1]: W: u1d9 SVD_PATH_FAILOVER: path_id = 0
Mar 07 18:33:22 T3a ISR1[1]: W: u1d8 SVD_PATH_FAILOVER: path_id = 0
Mar 07 18:33:22 T3a ISR1[1]: W: u1d7 SVD_PATH_FAILOVER: path_id = 0
Mar 07 18:33:22 T3a ISR1[1]: W: u1d6 SVD_PATH_FAILOVER: path_id = 0
Mar 07 18:33:22 T3a ISR1[1]: W: u1d5 SVD_PATH_FAILOVER: path_id = 0
Mar 07 18:33:22 T3a ISR1[1]: W: u1d4 SVD_PATH_FAILOVER: path_id = 0
```

In this example, this data was pulled by StorTools message monitoring from the remote host log file that the Sun StorEdge T3 array sent `syslog` entries to. StorTools message monitoring was run on that host and scanned the log looking for array log file messages of a warning or error class. The data in the example above indicates that drives u1d4-9 in the u1ctr controller completed a path failover from loop 1 (path 0) to loop 2 (path 1). This means that a hard failure or a threshold count was exceeded on the u1l1 loop. At this time, drives u1d4-9 are being serviced by the u1ctr only through the u1l2 loop. This is a good indication that there has been some kind of failure in the u1l1 interconnect card, the u1ctr controller, or one of the u1d1-9 drives.

8.3.4 Component Manager Status Indicator

Component Manager only changes its state if there has been a change of status for a FRU in a partner group. Unless a FRU has been marked as failed, missing or disabled by the array firmware, no red highlighted FRU appears in the GUI display. Most back-end loop problems do not change FRU status. The example failure illustrated in Section 8.3.3 does not change the normal status displayed by the GUI. If the array marks a FRU as failed, Component Manager displays that change in status. That FRU becomes the first choice for removal and replacement.

8.3.5 Manual Examination of the `syslog` File

If neither StorTools message monitoring nor Component Manager are running, the Sun StorEdge T3 and T3+ array CLI interface can be used to examine the unit's `syslog`. Use either the `cat` or `more` command on the log file. Either command outputs the complete log to the Telnet or Tip session screen. Alternatively, you can

ftp the syslog file to the telnet or tip host and examine it with a text editor capable of performing text searches with a character match. In the case of the example shown above, a search would be done for the error message type field of a w:. Such a search might display data similar to the following:

```
Mar 07 18:33:22 ISR1[1]: W: u1d9 SVD_PATH_FAILOVER: path_id = 0
Mar 07 18:33:22 ISR1[1]: W: u1d8 SVD_PATH_FAILOVER: path_id = 0
Mar 07 18:33:22 ISR1[1]: W: u1d7 SVD_PATH_FAILOVER: path_id = 0
Mar 07 18:33:22 ISR1[1]: W: u1d6 SVD_PATH_FAILOVER: path_id = 0
Mar 07 18:33:22 ISR1[1]: W: u1d5 SVD_PATH_FAILOVER: path_id = 0
Mar 07 18:33:22 ISR1[1]: W: u1d4 SVD_PATH_FAILOVER: path_id = 0
```

As can be seen, the data is the similar to what StorTools message monitoring would display, and indicates the same possible failure condition on loop 1 (path 0).

8.3.6 Example syslog Error Messages

CODE EXAMPLE 8-11 displays some example syslog error messages that might indicate a back-end FC-AL drive loop problem.

CODE EXAMPLE 8-11 Drive Loop Problem Example Error Messages

```
Sep 27 18:36:53 T3A ROOT[1]:W:u1ctr Hardware Reset (1000) occurred
Sep 27 18:48:46 T3A ISR1[1]:W:SCSI Disk Error Occurred (path = 0x1, port =
0x1, lun = 0x0)
Sep 28 06:52:23 T3A CFGT[1]:W:u2ctr:Disabled
Sep 28 06:53:49 T3A LPCT[1]:E:u2ctr:Not present
Sep 28 06:53:49 T3A TMRT[1]:E:u2ctr:Missing; system shutting down in 30
minutes
Sep 28 06:53:49 T3A LPCT[1]:E:u2ctr:Not present
Sep 28 07:01:41 T3A ISR1[2]:W:u2d1 SCSI Disk Error Occurred (path = 0x1)
Sep 28 07:01:41 T3A ISR1[2]:W:Sense Data Description = Logical Unit Not
Ready, Initializing CMD Required
Sep 28 07:01:41 T3A ISR1[2]:W:u2d1 SCSI Disk Error Occurred (path = 0x1)
Sep 28 07:01:41 T3A ISR1[2]:W:Sense Key = 0x2, Asc = 0x4, Ascq = 0x2
Sep 28 07:01:41 T3A WXFT[2]:W:u2d1:Failed
Sep 28 07:01:41 T3A WXFT[2]:W:u2d1 hard err in vol (vol001) starting auto
disable
Sep 28 07:10:27 T3A LT01[1]:W:u2d1 Recon attempt failed
Sep 28 07:15:05 T3A ISR1[1]:W:SCSI Disk Error Occurred (path = 0x1, port =
0x1, lun = 0x0)
Sep 28 07:15:05 T3A ISR1[1]:W:Sense Data Description = SCSI Parity Error
Sep 28 07:18:03 T3A ISR1[1]:W:Sense Data Description = SCSI Parity Error
```

8.3.7 Using CLI Diagnostic Commands

Once the `syslog` file has been examined for warning or error messages and a conclusion is reached on which loop might have failed, other CLI commands can be used to verify or support that conclusion. These commands display the various status and current configuration of the loops.

Use a serial cable and Tip session to collect and analyze both controller's loop status information. The serial cable is necessary to see the loop configuration for the alternate controller, as the Telnet session only displays the current loop status as seen from the master controller.

For the example problem above, the CLI commands produce these results.

- The `fru stat` command would show a normal status for this failure.
- The `vol mode` command would show a normal status for this failure.
- The `port listmap` command would show a normal status for this failure.
- The `.loop stat` command would show a normal status for this failure.
- The `.disk pathstat` command would show a normal status for this failure.
- The `.disk linkstat` command would show the following error conditions for this failure.

CODE EXAMPLE 8-12 Example `.disk linkstat` Error Data

```
.disk linkstat uld1-9 path 0 (master controller)
DISK LINKFAIL LOSSSYNC LOSSSIG PROTOERR INVTXWORD INVCRC
-----
uld1 Disk Link Status Failed
uld2 Disk Link Status Failed
uld3 Disk Link Status Failed
uld4 Disk Link Status Failed
uld5 Disk Link Status Failed
uld6 Disk Link Status Failed
uld7 Disk Link Status Failed
uld8 Disk Link Status Failed
uld9 Disk Link Status Failed
fail
```

When the `.disk linkstat` command is run from the master controller, it is unable to access any of the link registers for drives `uld1-9`. This supports the conclusion that loop 1 (path 0) has had a failure.

Once a suspect loop has been determined, use a process of elimination to locate the failed FRU on that loop as described in the following sections.

8.3.8 Using the `ofdg` Diagnostic Utility

If the problem is still unresolved, the last diagnostic tool to use is the off-line drive diagnostic utility (`ofdg`). Because the `ofdg` diagnostic requires that the T3 partner group be removed from host access it is a highly disruptive procedure stops all data access to the T3 system. Coordinate and schedule this down time with the customer.

To view the available `ofdg` utility command parameters, simply enter `ofdg` on the command line with no options.

```
:/:<15> ofdg
usage:
ofdg health_check
ofdg fast_test u<1-8>l<1-2> [count <loops>]
ofdg fast_find u<1-8>l<1-2>
ofdg find u<1-8>l<1-2>
```

The `ofdg` parameters are:

- `health_check` does a fast Go/No-Go test of both loops using the current loop configuration. `health_check` uses `fast_test`, but no other parameters are required. (See Section 8.3.8.1, “The `health_check` Option” on page 8-18 for additional details.)
- `fast_test` does a fast Go/No-Go test of the selected enclosure and loop with the current loop configuration. (See Section 8.3.8.2, “The `ofdg fast_test` Option” on page 8-18 for additional details.)
- `fast_find` does a fast Go/No-Go test of the selected enclosure and loop. It also runs a simplified loop fault isolation diagnostic. (See Section 8.3.8.3, “The `ofdg fast_find` Option” on page 8-19 for additional details.)
- `find` does an extensive Go/No-Go test. If loop failures are detected, it automatically initiates the full loop fault isolation diagnostic. This is similar to `ondg find`. (See Section 8.3.8.4, “The `ofdg find` Option” on page 8-19 for additional details.)

See Section 8.4.3, “Off-Line Drive Diagnostics and Replacement” on page 8-23 for a step-by-step description of using this utility to diagnose and replace a bad drive.



Caution – There are limitations to using the `ofdg` utility. Make sure you are aware of these limitations before running `ofdg`.

The following are limitations for using `ofdg`:

- Before running the `ofdg` utility, all disks other than those located in the `u1` tray must be assigned to a LUN. Problems might occur if `ofdg` is run on systems where non `u1` disks have not been assigned to volumes.

- ofdg does not detect missing loop cables.
- ofdg output goes to the `syslog` and serial port only.
- ofdg assumes at least one back-end loop cable is functional.

After installing a new drive, wait two minutes before running `ofdg`. Follow these steps to run `ofdg`:

1. Perform an `ofdg health_check` operation.

```
:/:<1> ofdg health_check
```

All loops are given either a Go or No-Go status.

- If there is a Go status, this indicates that the `ofdg` test did not detect any problems with the configuration and that there is no need for further tests.
- If there is a No-Go status, proceed to the next step.

2. Perform an `ofdg fast_test` operation.

```
:/:<2> ofdg fast_test u111
```

All loops are given either a Go or No-Go status.

- If there is a Go status, this indicates that the `ofdg` test did not detect any problems with the configuration and that there is no need for further tests.
- If there is a No-Go status, proceed to the next step.

3. Perform an `ofdg fast_find` operation.

```
:/:<3> ofdg fast_find u111
```

The loop is given a Go or No-Go status with progress indications. If a failure is reported on the first or nearest enclosure then the loop card in that enclosure should be swapped before repeating the test with the next unit.

If a failure is reported for the second (or further) enclosure, `fast_find` isolates the bad FRU(s) to either a bad interconnect cable or the two interconnect cards (which are connected to the interconnect cable in question). In this case, `fast_find` should be run from the partner controller to eliminate some FRUs.

If, after running `fast_find` in both directions, the problem has not been isolated to a single bad FRU, the bad FRU might be either the interconnect cable, the interconnect card, or both.

a. Replace the interconnect cable and retest.

b. Replace the interconnect card and retest

If the problem persists, continue to the next step.

4. Perform an `ofdg find` operation.

```
:/:<4> ofdg find u111
```

The loop is given a Go or No-Go status with progress indications. If a failure is detected, then Loop Fault Diag is automatically invoked to find the bad disk ports.

If `ofdg find` is not successful in solving the problem, the backplane should be suspected. See Section 9.2, “Replacing the Chassis/Backplane Assembly” on page 9-2” for details.

8.3.8.1 The `health_check` Option

The `health_check` option provides a fast Go/No-Go Loop test for all the loops in the Sun StorEdge T3 array. The `health_check` option calls `fast_test` multiple times, one time for each loop.

8.3.8.2 The `ofdg fast_test` Option

The `fast_test` option provides a fast Go/No-Go Loop test.

The `fast_test` option performs the following steps:

1. LAC_Reserve the FC-AL Loop device under test (DUT).
2. Test next nearest enclosure on Loop DUT.
3. Repeat Step 2 until all enclosures are tested.
4. LAC_Release the FC-AL Loop device under test (DUT).

The `fast_test` option uses only the two worst case data patterns as shown below:

```
#define ONDG_PATTERN_FOUR          0x7E7E7E7E    /* from SUN */  
#define ONDG_PATTERN_SIX         0x4A4A4A4A    /* from SUN */
```

For each data pattern, the `fast_test` option performs the following:

- 2 synchronous Write/Read/Compares at 64-KB.
- 250 asynchronous Read/Writes at 64-KB.
- Monitors for errors (using all the FC-AL port counters on the Loop DUT, plus the counters from the single disk DUT).

8.3.8.3 The `ofdg fast_find` Option

The `fast_find` option provides a fast Go/No-Go Loop test (identical to `fast_test`), plus a simplified Loop Fault Diag.

The `fast_find` option performs the following steps:

1. LAC_Reserve the FC-AL Loop device under test (DUT)
2. Reconfigure Loop (via MUX) with next nearest enclosure on Loop DUT
3. Test next nearest enclosure on Loop DUT
4. Repeat Step 2 and Step 3 until all enclosures are tested
- 5) LAC_Release the FC-AL Loop device under test (DUT)

The big difference between `fast_find` and `find` is that `fast_find` does not attempt to drill down to a disk port (that is, detect and isolate down to a bad disk port), while `find` will try using Type 1 and Type 2 algorithms.

The `fast_find` option assumes that the probability of loop failures caused by either a bad interconnect cable or loop card is much higher than the probability of loop failures caused by a bad disk port. Therefore, `fast_find` should be used before `find` to first weed out bad interconnect cables and loop cards (then `find` should be used to weed out bad disk ports if problems still exist).

8.3.8.4 The `ofdg find` Option

The `find` option provides a Go/No-Go Loop test. If the loop test fails Loop Fault Diag is invoked to drill-down and find the bad FRU(s).

The `find` option uses two different Drill-down algorithms in order to detect bad FRU(s).

- Type 1—bypass one disk port at a time and test
- Type 2—find any three disk ports that work, then enable one disk port at a time and test. Use Type 2 only if Type 1 is unsuccessful.

The Loop Fault Diag has the capability to detect and isolate down to a single disk port but, depending on the system configuration, can be time consuming.

8.3.8.5 Known ofdg Issues

4339555: ofdg run with a bad u2l1 can cause array reboot loop.

If ofdg is run on a system with failed FRUs, this results in both back-end loops being disabled. If this occurs and you detect a reboot loop:

1. **Power off the partner group.**
2. **Remove AC power from the master unit for 5 seconds.**
3. **Power on and boot the system.**

4340656: Running ofdg fast_find with a bad drive in u2 can cause drives in u1 to be bypassed.

To avoid this limitation, use the fru stat and fru list commands to detect bad drive FRUs before using ofdg. Correct any drive errors before proceeding with ofdg diagnostic operations.

4338471: An open interconnect cable between u1l1 and u2l1 causes ofdg to fail on all interconnect cards.

In certain cases where interconnect cables have problems, ofdg has proven ineffective in isolating the root cause of the failure. In some cases, ofdg health_check operations indicate that all interconnect cards fail the test. If you observe these kind of results, replace both back-end interconnect cables before replacing the interconnect cards.

4341673: Open serial lines in an interconnect cable causes inconsistent results with ofdg.

If broken pins in the interconnect cable are responsible for serial communication between controllers, ofdg test results can be inconsistent. For example, an ofdg health_check operation can return pass/fail results that are inconsistent with ofdg fast_find operations on the same unit. If you observe this behavior, replace both back-end interconnect cables and run the ofdg operation again.

8.4 Repair Procedures

Begin by replacing the FRU that have the minimum impact to the customer's operation, as shown in the following order:

1. Section 8.4.1, "Interconnect Card Replacement Procedure" on page 8-21
2. Section 8.4.2, "RAID Controller Replacement Procedure" on page 8-22
3. Section 8.4.3, "Off-Line Drive Diagnostics and Replacement" on page 8-23
4. Section 8.4.4, "Chassis Replacement Procedure" on page 8-29

8.4.1 Interconnect Card Replacement Procedure

A single interconnect card can be removed without affecting the customer operation (assuming that the other card is working, of course). Data accessibility is maintained during the replacement and testing of a single interconnect card with no change in the host configuration.

For the example of a suspected loop 1 (path 0) problem, perform the following steps.

- 1. From the CLI, disable the u111 interconnect card.**

```
:/:<1> disable u111
```

- 2. When the u111 LED is flashing amber, remove and replace the interconnect card from the u111 position.**

See Section 6.2, "Removing and Replacing an Interconnect Card" on page 6-3

- 3. From the CLI, enable the u111 interconnect card.**

```
:/:<2> enable u111
```

- 4. Verify the repair by using the listed CLI status commands.**

See Section 8.3.7, "Using CLI Diagnostic Commands" on page 8-15.

- 5. If this did not correct the problem, proceed to replacing the RAID controller as described in the next section.**

8.4.2 RAID Controller Replacement Procedure

If replacing the interconnect cards and cables did not resolve the loop 1 (path 0) problem, the next least-disruptive repair action is the removal and replacement of a RAID controller.

In a partner group, a single RAID controller card can be removed without denying access to all data (assuming appropriate multipathing software has been configured on the host). While data accessibility is maintained during the replacement and testing of a single RAID controller, performance is reduced during this procedure. The customer might elect to schedule the repair action during a time of reduced operations to the Sun StorEdge T3 and T3+ array system.

For the above example of a suspected loop 1 (path 0) problem, perform the following steps.

1. From the CLI, disable the u1 RAID controller card.

```
:/:<1> disable u1
```

This causes a controller failure over to the other controller. The Telnet session fails and Component Manager reports a loss of polling as the alternate controller becomes the master. VERITAS, if used, redirects the host I/O through the remaining path for the failed controller's volumes.

2. When the u1 LED flashes amber, remove and replace the u1 controller card.

See Section 4.2, "Removing and Replacing a Controller Card" on page 4-4.

3. After the controller boots, verify the LED on u1 interconnect card is a solid green.

4. Restart a Telnet session to the Sun StorEdge T3 array.

5. It may be necessary to disable and then enable the controller with the CLI commands to return it to service.

For example:

```
:/:<2> disable u1
:/:<3> enable u1
```

6. Verify that VERITAS, if used, completes a path fail back to the replaced controller.

Consult your VERITAS documentation for VERITAS diagnostic procedures.

7. Verify the repair by using the listed CLI status commands.

See Section 8.3.7, "Using CLI Diagnostic Commands" on page 8-15.

8. If replacing the u1 controller card does not correct the problem, replace the u2 RAID controller in the u2 enclosure.
9. If replacing the two RAID controllers does not correct the problem, proceed to replacing disk drives as described in the next section.

8.4.3 Off-Line Drive Diagnostics and Replacement

If replacing the interconnect and RAID controller cards does not resolve the loop 1 (path 0) problem, the next step is to test, and if necessary replace, any suspect disk drives.

The test to use is the `ofdg` off-line diagnostic utility. The `ofdg` diagnostic requires the Sun StorEdge T3 array partner group to be removed from host access. This is a highly disruptive procedure that stops all data access to the disk tray. Coordinate and schedule this down time with the customer.

This test also requires that Component Manager halt all polling to the Sun StorEdge T3 array. Because HTTP polling by Component Manager is blocked during the course of this test, Component Manager may report rejected requests or other problems.

To administer and monitor the test, connect a serial maintenance cable and open a Tip session to the Sun StorEdge T3 and T3+ array.

The following steps describe how to test for the above example of a suspected loop 1 (path 0) problem.

Note – Before running the `ofdg` utility, all disks other than those located in the u1 tray must be assigned to a LUN. Problems may occur if `ofdg` is run on systems where non u1 disks have not been assigned to volumes.

1. **Make sure that all disks other than u1 are assigned to a LUN.**
2. **Quiesce all I/O going to all volume(s) in that disk array and associated partner group.**

Notify all applications to stop accessing any affected volumes. This may require stopping the application.

Verify that all drive activity has stopped. The solid green drive activity LEDs indicate that the drives are idle.

3. If the disk array is using any volume manager software, such as VERITAS, disable transactions to the volumes that reside on the array backplane you wish to replace and all other volumes in that partner group.

Consult the appropriate volume manager documentation for information on disabling the data hosts access to the array volumes.

4. Unmount the volume(s) from the Solaris host.

```
# unmount /T3-filesystem-name
```

5. Unmount the internal array volume(s).

```
:/:<4> vol unmount v0
```

6. Disconnect the fiber optic cables from the array MIAs.

7. Disable Component Manager polling to the target Sun StorEdge T3 array.

Consult your Component Manager documentation for details.

8. Establish a serial connection and Tip session to the Master RAID controller of the problem array.

See Section 2.1, "Establishing a Serial Port Connection" on page 2-1.

9. Execute the `set` command and note the current values of `logto` and `loglevel`.

```
:/:<1> set
bootmode auto
bootdelay 3
sn 001893
ip 123.123.123.24
netmask 255.255.255.0
gateway 123.123.123.1
tftp host 0.0.0.0
tftpfile hostname T3a
vendor SCI-SJ
model 375-0084-01-j-j2
revision 0210 logto * ( in nvram)
loglevel 3
rarp on
mac 00:20:f2:00:07:65
```

You will need these values in step Step 21.

10. From the host Tip session, set the logto to 1 and the loglevel to 4.

```
:/:<5> set logto 1
:/:<6> set loglevel 4
```

These settings display all messages to the Tip session screen. The output includes all messages from information up to error.

11. Run a find test against loop 1.

```
:/:<7> ofdg find u111
WARNING - Volume data will be offline while OFDG is running.
Continue ? [N]: y
```

How far the test has go into the loop to identify the failed FRU determines how long the test runs. The find test may also have to be run again with the u211 parameter if no failures are found with the u111 parameter.

12. Examine the output in detail to identify the failed FRU.

For comparison, a test run that found no errors is shown in CODE EXAMPLE 8-13. (This test might take 8 minutes to complete.)

CODE EXAMPLE 8-13 ofdg Sample Output (No Errors)

```
:/:<8> ofdg find u111
WARNING - Volume data will be offline while OFDG is running.
Continue ? [N]: y
ONDG Initiated
FIND Initiated on u111
Loop 1 Configured as <1>
Loop 2 Not Available
Loop 1 Configured as <1+>
Loop 2 Not Available
Loop 1 Configured as <1>
Loop 2 Not Available
Loop 1 Configured as <1+>
Loop 2 Not Available
FIND Completed on u111
STATUS = PASS
u1 PASS
ONDG Completed
```

In Syslog:

```
May 26 19:18:03 pshc[1]: N: ofdg find ullp1
May 26 19:18:18 pshc[1]: N: ofdg find ull1
May 26 19:18:22 ONDG[1]: N: ONDG Initiated
May 26 19:18:22 ISR1[1]: N: ulctr ISP2100[2] Received LIP(f7,e8) async event
May 26 19:18:22 FCC0[1]: N: ulctr Port event received on port 0, abort 0
May 26 19:18:23 BELP[1]: N: ull1 ONDG Loop Fault Diag Initiated
May 26 19:18:28 CFGT[1]: N: ulctr: Reserved A Loop: A Mask=<1>; B Mask=<1>
May 26 19:18:38 ISR1[1]: W: uld4 SVD_PATH_FAILOVER: path_id = 0
May 26 19:18:38 ISR1[1]: W: uld5 SVD_PATH_FAILOVER: path_id = 0
May 26 19:18:38 ISR1[1]: W: uld6 SVD_PATH_FAILOVER: path_id = 0
May 26 19:18:38 ISR1[1]: W: uld7 SVD_PATH_FAILOVER: path_id = 0
May 26 19:18:38 ISR1[1]: W: uld8 SVD_PATH_FAILOVER: path_id = 0
May 26 19:18:38 ISR1[1]: W: uld9 SVD_PATH_FAILOVER: path_id = 0
May 26 19:18:41 LPCT[1]: N: ulctr: ISP not ready on loop 1
May 26 19:18:50 LPCT[1]: N: uld1: Bypassed on loop 1
May 26 19:18:50 LPCT[1]: N: uld2: Bypassed on loop 1
May 26 19:18:50 LPCT[1]: N: uld3: Bypassed on loop 1
May 26 19:18:50 LPCT[1]: N: uld4: Bypassed on loop 1
May 26 19:18:50 LPCT[1]: N: uld5: Bypassed on loop 1
May 26 19:18:50 LPCT[1]: N: uld6: Bypassed on loop 1
May 26 19:18:50 LPCT[1]: N: uld7: Bypassed on loop 1
May 26 19:18:50 LPCT[1]: N: uld8: Bypassed on loop 1
May 26 19:18:50 LPCT[1]: N: uld9: Bypassed on loop 1
May 26 19:19:11 LPCT[1]: N: ulctr: ISP not ready on loop 1
May 26 19:19:31 ISR1[1]: N: ulctr ISP2100[0] Received LIP(f8,d1) async event
May 26 19:19:32 LPCT[1]: N: uld1: Not bypassed on loop 1
May 26 19:19:32 LPCT[1]: N: uld2: Not bypassed on loop 1
May 26 19:19:32 LPCT[1]: N: uld3: Not bypassed on loop 1
May 26 19:19:32 LPCT[1]: N: uld4: Not bypassed on loop 1
May 26 19:19:32 LPCT[1]: N: uld5: Not bypassed on loop 1
May 26 19:19:32 LPCT[1]: N: uld6: Not bypassed on loop 1
May 26 19:19:32 LPCT[1]: N: uld7: Not bypassed on loop 1
May 26 19:19:32 LPCT[1]: N: uld8: Not bypassed on loop 1
May 26 19:19:32 LPCT[1]: N: uld9: Not bypassed on loop 1
May 26 19:19:33 SVDT[1]: N: 9 fcal ports were detected on l1
May 26 19:19:41 ISR1[1]: N: ulctr ISP2100[0] Received LIP(f7,ef) async event
May 26 19:19:43 SVDT[1]: N: 10 fcal ports were detected on l1
May 26 19:20:04 BELP[1]: N: ull1 ONDG No Loop Trouble Found
```

```

May 26 19:20:04 CFGT[1]: N: ulctr: Release A Loop: A Mask=<1>; B Mask=<1>
May 26 19:20:05 ISR1[1]: N: uld4 SVD_PATH_FAILBACK: path_id = 1
May 26 19:20:05 ISR1[1]: N: uld5 SVD_PATH_FAILBACK: path_id = 1
May 26 19:20:05 ISR1[1]: N: uld6 SVD_PATH_FAILBACK: path_id = 1
May 26 19:20:05 ISR1[1]: N: uld7 SVD_PATH_FAILBACK: path_id = 1
May 26 19:20:05 ISR1[1]: N: uld8 SVD_PATH_FAILBACK: path_id = 1
May 26 19:20:05 ISR1[1]: N: uld9 SVD_PATH_FAILBACK: path_id = 1
May 26 19:20:10 BELP[1]: N: ull1 ONDG Loop Fault Diag Completed
May 26 19:20:10 ONDG[1]: N: FIND Initiated on ull1
May 26 19:20:10 ONDG[1]: N: FIND Completed on ull1
May 26 19:20:10 ONDG[1]: N: STATUS = PASS
May 26 19:20:10 ONDG[1]: N: ul PASS
May 26 19:20:13 ONDG[1]: N: ONDG Completed

```

13. Once the failed disk drive FRU has been identified, remove the suspect disk drive from the configuration with the `vol disable` command.

```
:/:<9> fru s uld1-9
```

DISK	STATUS	STATE	ROLE	PORT1	PORT2	TEMP	VOLUME
uld1	ready	enabled	data disk	ready	ready	44	v0
uld2	ready	enabled	data disk	ready	ready	45	v0
uld3	ready	enabled	data disk	ready	ready	37	v0
uld4	ready	enabled	data disk	ready	ready	35	v0
uld5	ready	enabled	data disk	ready	ready	38	v0
uld6	ready	enabled	data disk	ready	ready	39	v0
uld7	ready	enabled	data disk	ready	ready	40	v0
uld8	ready	enabled	data disk	ready	ready	38	v0
uld9	ready	enabled	data disk	ready	ready	37	v0

```
:/:<10> vol disable uld9
```

```
:/:<11> fru s uld1-9
```

DISK	STATUS	STATE	ROLE	PORT1	PORT2	TEMP	VOLUME
uld1	ready	enabled	data disk	ready	ready	44	v0
uld2	ready	enabled	data disk	ready	ready	45	v0
uld3	ready	enabled	data disk	ready	ready	37	v0
uld4	ready	enabled	data disk	ready	ready	35	v0
uld5	ready	enabled	data disk	ready	ready	38	v0
uld6	ready	enabled	data disk	ready	ready	39	v0
uld7	ready	enabled	data disk	ready	ready	40	v0
uld8	ready	enabled	data disk	ready	ready	39	v0
uld9	fault	disabled	data disk	ready	ready	-	v0

14. Remove and replace the suspect disk drive from the enclosure.

See Section 5.3, “Repairing Disk Drives” on page 5-7.

The drive spins up and the `sysarea` data copies to it from another drive in the u1 enclosure. After the copy is complete, a volume reconstruction starts.

15. Stop the volume reconstruction operation.

Perform a `proc list` command to determine the process number of the volume reconstruction. Use that process number with the `proc kill` command to stop the reconstruction.

```
:/:<12> proc list

VOLUME          CMD_REF PERCENT   TIME COMMAND
v0                8465     3    1:05 vol recon
:/:<13> proc kill 8465
```

16. Rerun the `ofdg find` diagnostic through the suspect loop as described in Step 11 and Step 12.

Once the test completes, examine and compare the two outputs to insure that the fault has been corrected.

a. If the problem is resolved, proceed with Step 18 through Step 17.

b. If the problem is not resolved, proceed with Step 18 through Step 17 and then replace the backplane chassis.

See Section 8.4.4, “Chassis Replacement Procedure” on page 8-29 and Section 9.2, “Replacing the Chassis/Backplane Assembly” on page 9-2”.

17. Remount the volumes.

```
:/:<14> vol mount v0

:/:<15> vol stat

v0          u1d1  u1d2  u1d3  u1d4  u1d5  u1d6  u1d7  u1d8  u1d9
mounted    0      0      0      0      0      0      0      0      0
v1          u2d1  u2d2  u2d3  u2d4  u2d5  u2d6  u2d7  u2d8  u2d9
mounted    0      0      0      0      0      0      0      0      0
```

18. Restart the volume reconstruction with the `vol recon` command on the replaced disk drive.

```
:/:<16> vol recon u1d9
```


19. Reconnect the fibre optic cable to the MIAs,

20. Re-enable Component Manager polling of the unit.

Consult your Component Manager documentation for details.

21. Reset `logto` and `loglevel` to the original values noted in Step 9.

```
:/:<17> set logto *  
:/:<18> set loglevel 3
```

8.4.4 Chassis Replacement Procedure

If none of the above procedures resolve the problem, the next repair action is replacement of the chassis/backplane assembly. A replacement part must be on site before beginning this procedure. Before starting, the customer must off load all the data that is contained in the Sun StorEdge T3 array. The array must then be removed from host operation.

The procedure for replacing a backplane is described in Section 9.2, “Replacing the Chassis/Backplane Assembly” on page 9-2.

Once the backplane has been replaced and the previous FRUs installed, the `ofdg` diagnostics need to be rerun.

If the problem persists, replace the entire Sun StorEdge T3 and T3+ array.

Chassis/Backplane Assembly

This chapter describes how to replace the chassis/backplane assembly and contains the following sections:

- Section 9.1, “Troubleshooting the Chassis/Backplane Assembly” on page 9-1
- Section 9.2, “Replacing the Chassis/Backplane Assembly” on page 9-2

9.1 Troubleshooting the Chassis/Backplane Assembly

The array chassis FRU rarely needs to be replaced. However, the chassis part number is available to replace the backplane and chassis if necessary. (These must be replaced together, because they are factory aligned.)

Problems with the backplane most likely occur because of an electrical short or a bent or broken pin connector. These problems first appear as a failure of another FRU component, such as an interconnect failure or drive failure. If replacing the FRU that appears to be failed does not correct the problem, then examine the backplane connector that the FRU connects to for bent or broken pins. If nothing is obvious, then install another spare FRU to verify that a failed FRU component is not causing the problem. If all possibility of a FRU component failure has been eliminated and the problem still remains, it is likely to be a backplane failure.

9.2 Replacing the Chassis/Backplane Assembly

If there is a backplane failure, replace it with the following procedure.



Caution – Replacing a Sun StorEdge T3 and T3+ array chassis interrupts array operation.

Note – If the Sun StorEdge T3 and T3+ array is part of a partner group, access to all volumes in the partner group is unavailable during this backplane replacement procedure. Assess the impact of unmounting volumes and stopping applications prior to starting this procedure.

1. **Perform full backups of data on affected partner groups for all accessible volumes.**
2. **From the data hosts, quiesce all I/O going to all volume(s) in that disk array and associated partner group.**
 - Notify all applications to stop accessing any affected volumes by unmounting the volume(s) or stopping the application if necessary.
 - Verify that all drive activity has stopped. The drive activity LEDs become solid green, indicating that the drives are idle.
3. **If any volume manager software is running, such as VERITAS, disable transactions to the volumes that reside on the Sun StorEdge T3 and T3+ array backplane you are replacing and to all other volumes in that partner group.**
 - Consult the appropriate volume manager documentation for information on disabling the data hosts access to the Sun StorEdge T3 and T3+ array volumes.
4. **Execute the `shutdown` command.**

```
:/:<1> shutdown
Shutdown the system, are you sure? [N]: y
```

5. Power down the failed disk array.

Press the power button once on each power and cooling unit to turn the switch off (FIGURE 9-1).

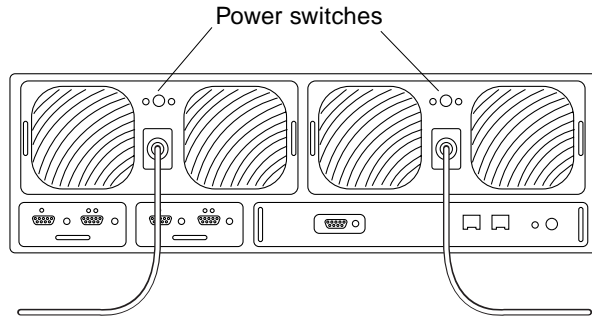


FIGURE 9-1 Power Switch Location

All arrays power down automatically when any one array in the partner group is powered down.

6. Record the Sun StorEdge T3 and T3+ array system serial number and MAC address.

Locate the pull-out tab at the left side of the array next to the first disk drive as shown in FIGURE 9-2. This tab contains the array serial number and media access control (MAC) address. The serial number is located on the top left portion of the pull-out tab and begins with the part number 595-xxxx. Record this information to transcribe it onto the new chassis.

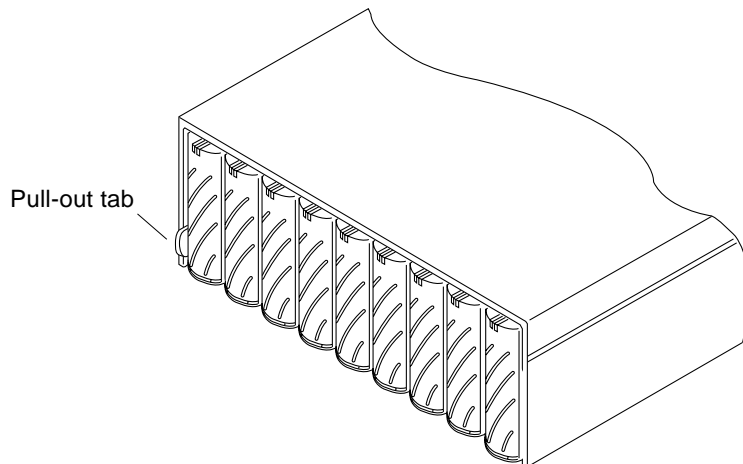


FIGURE 9-2 Serial Number and MAC Address on Pull-out Tab

7. On the Sun StorEdge T3 and T3+ array, disconnect all external cables.

Disconnect all power, interconnect, host FC-AL, MIA, and Ethernet cables.

Note – If the array is part of a partner group, note down the placement of the host FC-AL connections and loop cables. You need this information in Step 12.

8. Remove the chassis if it is mounted in a cabinet:

a. Remove the two screws at the back of the chassis that secure it to the side rails in the cabinet.

b. Slide the chassis out of the cabinet (FIGURE 9-3).

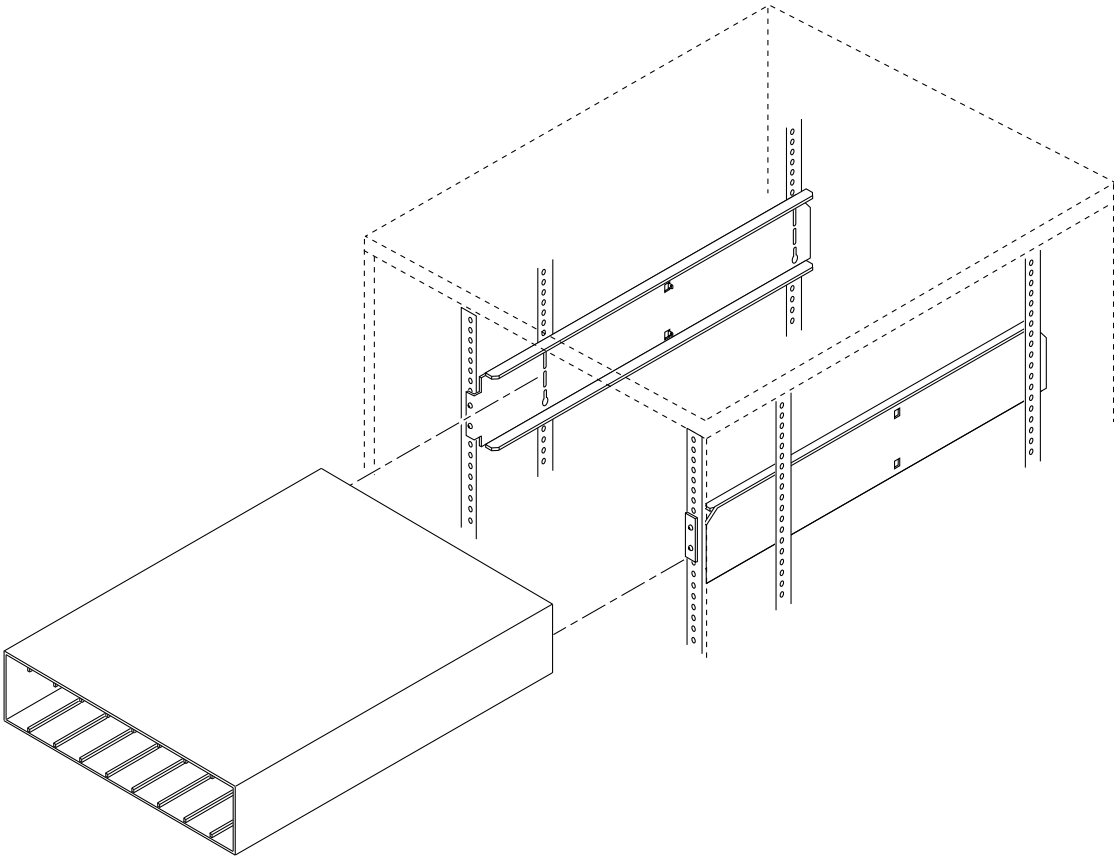


FIGURE 9-3 Removing the Chassis

9. Move the failed array to an area that both the front and back can be easily accessed.



Caution – Use two people to lift and move the array. It can weight up to 67 lbs (30 kg).

10. One at a time, remove all the FRU components from the failed chassis and put them in the new chassis, ensuring same location placement.



Caution – FRUs are extremely sensitive to static electricity. Use proper antistatic wrist strap and procedures when handling any FRU. Observe all static electricity precautions as described in Section 1.5, “Static Electricity Precautions” on page 1-5.

- a. Unlock a FRU by pushing in on the latch handle(s) with a coin or small screwdriver to release the latch handle(s).
- b. Pull the FRU straight out.
- c. Lock the FRU back into place in the new chassis by pushing in and securing the latch handle(s) with a coin or small screwdriver.



Caution – Maintain disk positions or data could be lost.

- d. Remove and replace the controller card.

See Section 4.2, “Removing and Replacing a Controller Card” on page 4-4 for instructions.

- e. Remove and replace the interconnect cards.

See Section 6.2, “Removing and Replacing an Interconnect Card” on page 6-3 for instructions.

- f. Remove and replace the power and cooling units.

See Section 7.3, “Removing and Replacing a Power and Cooling Unit” on page 7-4 for instructions.

- g. Remove and replace the disk drives.

See Section 5.3, “Repairing Disk Drives” on page 5-7 for instructions.

Note – When removing disk drives, label each one with its slot position in the unit so you can be replace the drives in the correct slots.

11. Move the replacement chassis back into place.

- If you are mounting the chassis in a cabinet:
 - Prepare for the new chassis by installing the base plate. Use the base plate from the old chassis.
 - Align the new chassis with the side rails and slide the chassis into the cabinet.
 - Replace the two screws at the back of the chassis to secure the chassis to the cabinet.

12. Connect all cables previously removed, but *do not* power up the array(s).

Note – If the array is part of a partner group, make sure that the host FC-AL cables are recabled to the same Sun StorEdge T3 and T3+ array FC-AL connections that they were removed from as you noted down in Step 7. Also ensure that loop cables are properly recabled.

13. Add the T3 system serial number and the MAC address to the new chassis.

Locate the pull-out tab at the left side of the array next to the first disk drive. Use a fine-tipped permanent marker to write the information on this tab—you also need the information for the next two steps.

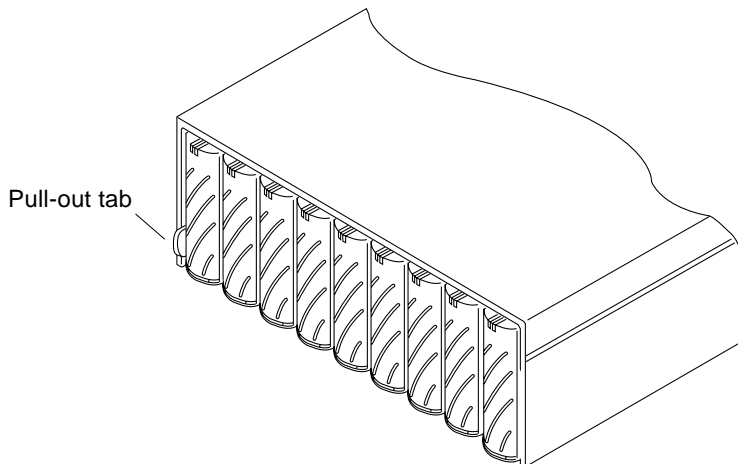


FIGURE 9-4 Serial Number and MAC Address on Pull-out Tab

14. Contact the appropriate Contract Administrator (CA) of the Contracts Verification Group (CVG) to relay the system serial number and new chassis information.

15. On the RARP server, update the `/etc/ethers` file.

Replace the MAC address of the failed chassis with the MAC address of the new chassis. For example:

```
8:0:20:6d:93:7e array-name
```

In this example:

- `8:0:20:6d:93:7e` is the new MAC address
- `array-name` is the name of the old array.

Note that if the failed unit was an alternate master, the unit's MAC address may not be in the `/etc/ethers` file. In this case, no file changes are required.

16. Verify that the `/etc/hosts` file contains the previous IP address and array name.

For example:

```
192.129.122.111 array-name
```

In this example, `192.129.122.111` is the IP address assigned previously.

17. Verify that the `/etc/nsswitch.conf` file on the RARP server references the local system files.

To ensure that the Solaris software environment uses the changes made to the `/etc/ethers` and `/etc/hosts` files, edit the `host` and `ethers` entries in the `/etc/nsswitch.conf` file so that the `files` parameter appears before the `[NOTFOUND=return]` statements. For example:

```
hosts:      nis files [NOTFOUND=return]
ethers:     nis files [NOTFOUND=return]
```

18. Ensure that the RARP daemon is running on the RARP server:

```
rarpserver# ps -eaf | grep rarpd
```

19. If the RARP daemon is not already running on the RARP server, start it by entering:

```
rarpserver# /usr/sbin/in.rarpd -a &
```

20. Verify that AC power is present on each of the chassis' power and cooling units.

The AC LED on each power and cooling unit glows solid amber and the fans turn at low speed.

21. Press the power button on the power and cooling units to power on the array(s).

FIGURE 9-1 shows the power button location. The AC and power supply (PS) LEDs on the power and cooling units show green.

After you power on, the Sun StorEdge T3 and T3+ array JumpStart™ feature reassigns the array's previous IP address to the new MAC address.

Allow time to complete the boot cycle. When all LEDs are green, proceed to the next step.

22. Check the LEDs at the front and back of the unit to ensure that all components are receiving power and are functional.

While the drives are spinning up, the LEDs blink. The array boot time take up to several minutes, after which all LEDs should be solid green, indicating that the unit is receiving power and there is no drive activity.

Note – The batteries in the power and cooling units recharge after powering on the unit. While the batteries are recharging, write-behind cache is disabled.

Note – If the green power and cooling unit LEDs on connected units do not light, press the power switches on those units.

23. Use either the CLI or Component Manager to verify that all components are functioning properly.

- To verify status using the CLI, open a Telnet session to the disk array and verify volume and FRU status. as described Section 3.7.3, "Checking FRU Status" on page 3-18.
- To verify status using Component Manager, consult the *Sun StorEdge Component Manager User's Guide*.

```
:/:<1> fru stat
:/:<2> vol stat
```

Note that when the backplane is replaced, the data host volume's WWN changes. The WWN is derived from the backplane serial number. Since the volume WWN is part of the volume's device path on the data host, the device path definition on the data host changes. Therefore, you must reconfigure the data host to recognize the new WWNs.

24. Configure the data host to recognize the new WWNs by executing the following command on the data host:

```
datahost# drvconfig; disks; devlinks
```

Note – Any applications specifically dependent on the volume's device path also need to be changed. Refer to each application's documentation for instructions.

25. Execute a `format` command on the data host to verify that the Sun StorEdge T3 and T3+ array devices are seen.

The Sun StorEdge T3 and T3+ array volumes are now usable by the data host and can be mounted or re-enabled with the appropriate volume manager software.

Hardware Reconfiguration

This chapter provides procedures for reconfiguring existing array hardware to create new configurations. It includes the following sections:

- Section 10.1, “Connecting Single Controller Units to Form a Partner Group” on page 10-1
- Section 10.2, “Disconnecting a Partner Group to Form Single Controller Units” on page 10-15
- Section 10.3, “Changing the Port ID on the Array” on page 10-23

10.1 Connecting Single Controller Units to Form a Partner Group



Caution – This procedure destroys data. Back up all your data before beginning this procedure.

This section describes how to reconfigure two existing single controller units that contain data to form a partner group (redundant controller units). You will need two interconnect cables to connect the units. See Appendix A for a part number and illustration of the interconnect cable.

This procedure includes the following sections:

- Section 10.1.1, “Preparing the Arrays” on page 10-2
- Section 10.1.2, “Cabling a Partner Group” on page 10-4
- Section 10.1.3, “Establishing a New IP Address” on page 10-7
- Section 10.1.4, “Defining and Mounting Volumes on the Alternate Master” on page 10-10

10.1.1 Preparing the Arrays

1. Decide which unit is the master controller and which is the alternate master.
2. Back up the data on both arrays.



Caution – Make sure you back up data on both units *before* proceeding! You need to re-create the volume(s) on the alternate master after cabling the units together.

3. Ensure that the data path between the host and both arrays has been quiesced.

There must not be any I/O activity.

4. Start a Telnet session with both arrays.

- a. On the host, use the `telnet` command with the array name (or IP address) to connect to the array.

```
# telnet array_name
Trying 129.150.47.101...
Connected to 129.150.47.101.
Escape character is '^]'.

pSOSystem (129.150.47.101)
```

- b. Log in to the array by typing `root` and your password at the prompts.

The array prompt is displayed.

5. Verify that firmware levels for all array firmware are the same on the master unit and alternate master unit.

On both arrays:

- a. Type `ver` to display the controller firmware level.

For example:

```
:/:<1> ver

T300 Release 1.14 2000/08/01 10:43:22 (129.150.47.135)
Copyright (C) 1997-2000 Sun Microsystems, Inc
All Rights Reserved.
```

In this example, the controller firmware level is listed as Release 1.14

b. Type fru list to display EPROM, disk drive, and interconnect card firmware levels.

For example:

```
:/:<2> fru list
```

ID	TYPE	VENDOR	MODEL	REVISION	SERIAL
ulctr	controller card	SUN	0082f-f0	0210	000596
uld1	disk drive	SEAGATE	ST118202FSUN	EA29	LKG88867
uld2	disk drive	SEAGATE	ST118202FSUN	EA29	LKG89225
uld3	disk drive	SEAGATE	ST118202FSUN	EA29	LKG88938
uld4	disk drive	SEAGATE	ST118202FSUN	EA29	LKG89528
uld5	disk drive	SEAGATE	ST118202FSUN	EA29	LKG89846
uld6	disk drive	SEAGATE	ST118202FSUN	EA29	LKG90455
uld7	disk drive	SEAGATE	ST118202FSUN	EA29	LKG89362
uld8	disk drive	SEAGATE	ST118202FSUN	EA29	LKG55303
uld9	disk drive	SEAGATE	ST118202FSUN	EA29	LKG78649
ull1	loop card	SCI-SJ	375-0085-01-	5.01 Flash	000867
ull2	loop card	SCI-SJ	375-0085-01-	5.01 Flash	001491
ulpcu1	power/cooling unit	TECTROL-CAN	300-1454-01(0000	003132
ulpcu2	power/cooling unit	TECTROL-CAN	300-1454-01(0000	003134
ulmpn	mid plane	SCI-SJ	370-3990-01-	0000	000698

In this example:

- EPROM firmware version is listed as Controller card, Revision 0210
- Disk drive firmware version is listed as Revision EA29
- Interconnect card (loop card) firmware version is listed as Revision 5.01 Flash

c. Upgrade firmware, if necessary.

- If the firmware levels are the same on each unit, then proceed to Step 6.
- If the firmware levels for any of the four types of firmware are different between the master and alternate master, upgrade the firmware that does not match on both units. Refer to the upgrading firmware instructions in Section 4.3, “Upgrading Controller Firmware” on page 4-5 or in Chapter 5 of the *Sun StorEdge T3 and T3+ Array Installation, Operation, and Service Manual*.

6. On both units, use the `set -z` command to return critical array settings to factory defaults.

When prompted to respond, answer `y` (yes). For example:

```
:/:<3> set -z
WARNING - Resetting system NVRAM to default, are you sure? [N]: y
t300:/:<4>
```

Note – The `set -z` command resets the system cache block size back to the factory default, 64 Kbytes. If you want a block size other than the default, change the size after connecting the partner group. To change the block size, delete the master unit volumes, set the block size, and then re-create the master unit volumes. Refer to the *Sun StorEdge T3 and T3+ Array Administrator's Guide* for more detailed information on setting block size.



Caution – The `set -z` command resets the IP address of the units to 0.0.0.0. You will need to reassign the IP address to the master unit after you cable the partner group together, but *before* powering on, as described in the next section.

7. Power off both units.

a. Type:

```
:/:<4> shutdown
Shutdown the system, are you sure? [N]: y
```

b. Press the power button once on each power and cooling unit to turn the switch off.

10.1.2 Cabling a Partner Group

After changing the array settings on the alternate master to the factory default and verifying that both units run the same firmware levels, you are ready to connect the arrays.

1. Place the alternate master on top of the master unit.

- If the units are installed in a cabinet, make sure that the alternate master is installed in the slot directly above the master unit. If you need to change the position in the cabinet, refer to the rackmount installation instructions in the *Sun StorEdge T3 and T3+ Array Installation, Operation, and Service Manual*.
 - If the units are cabled to the hosts and power sources such that they cannot be placed in close proximity, rearrange the cabling so that the units can be placed together.
- 2. Make sure that the 10BASE-T cables are connected to a network with the same management host.**

3. Connect the interconnect cables to the interconnect cards as shown in FIGURE 10-1.

Make sure you connect the cables to the correct interconnect card connectors *exactly* as shown in the figure. This cable connection determines the master and alternate master relationship. Tighten the retaining screws.

The remaining connectors are reserved for expansion units.

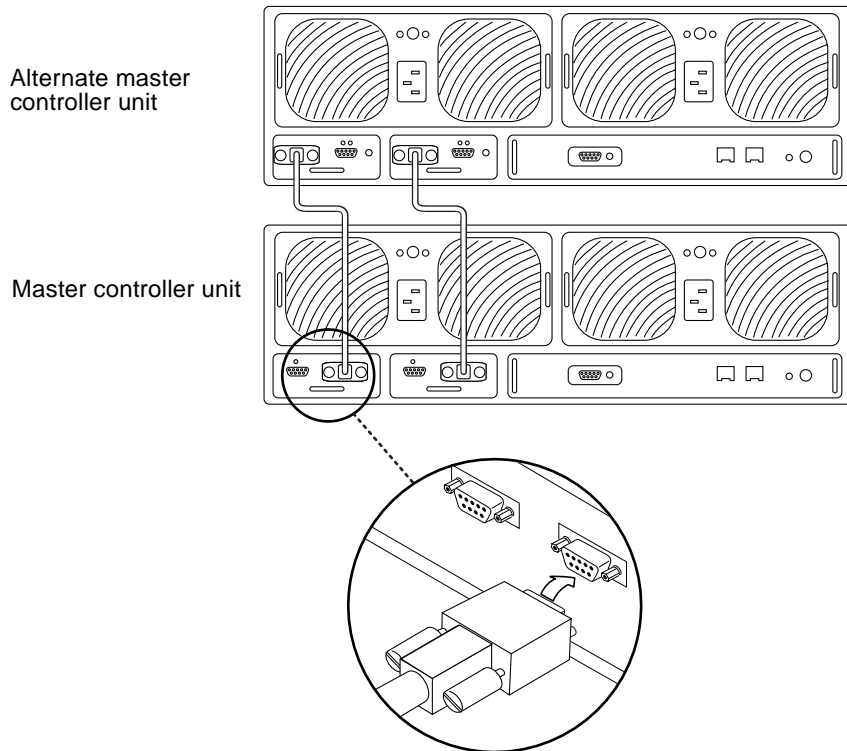


FIGURE 10-1 Connecting the Interconnect Cables

A fully cabled partner group is shown below.

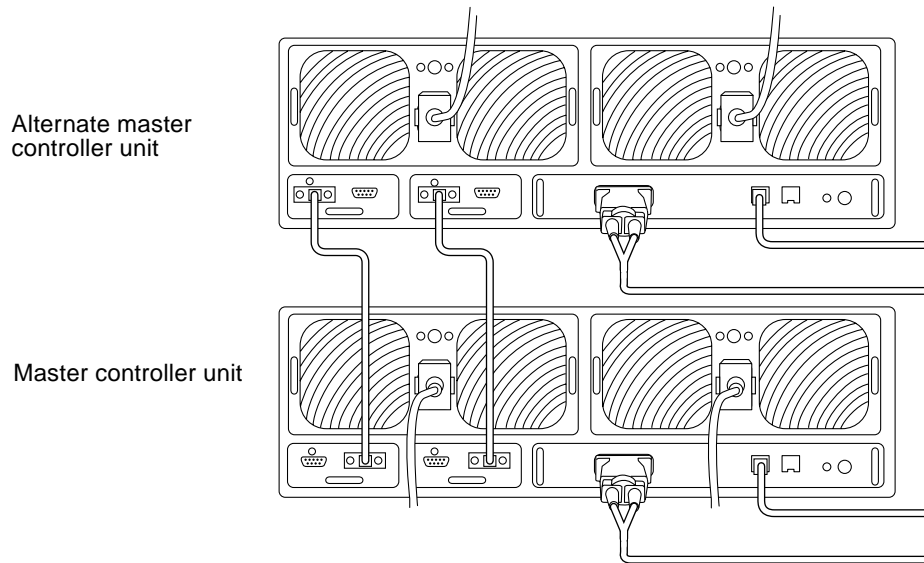


FIGURE 10-2 Fully Cabled Partner Group



Caution – Do not power on the arrays yet. You must configure a RARP server, connected to the array, with the IP address *before* powering on.

10.1.3 Establishing a New IP Address

The JumpStart feature automatically downloads a newly assigned IP address to the array. To enable this feature, you must edit your host file on a RARP server before powering on the array. After you power on, the IP address is automatically assigned. Before you begin, make sure you have the following:

- **MAC address.** The MAC address is located in the pullout tab at the front of the array (FIGURE 10-3).

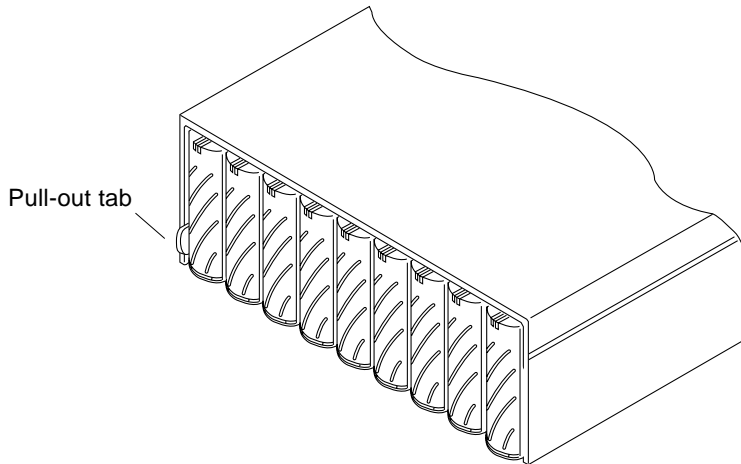


FIGURE 10-3 Location of Pull-Out Tab With MAC Address

- **IP address.** For this information, contact the person who maintains your network.
- **Array name.** This is the user-assigned name of the array.

To set the network IP address for the array:

- 1. On a host connected to the same subnet as the array, edit the `/etc/ethers` file by adding the MAC address and array name.**

For example:

```
8:0:20:7d:93:7e array-name
```

In this example:

- `8:0:20:7d:93:7e` is the MAC address.
- `array-name` is the name of the array you are installing.

- 2. Edit the `/etc/hosts` file with the IP address and array name.**

For example:

```
192.129.122.111 array-name
```

In this example, `192.129.122.111` is the assigned IP address.

3. Edit the `/etc/nsswitch.conf` file to reference the local system files.

To ensure that the Solaris software environment uses the changes made to `/etc/ethers` and `/etc/hosts` files, edit the `host` and `ethers` entries in the `/etc/nsswitch.conf` file so that the `files` parameter appears before the `[NOTFOUND=return]` statements.

```
hosts:      nis files [NOTFOUND=return]
ethers:     nis files [NOTFOUND=return]
```

4. Determine if the RARP daemon is running by typing:

```
# ps -eaf | grep rarpd
```

- If the RARP daemon is running, proceed to Step 6.
- If the RARP daemon is not running, proceed to the next step.

5. Start the RARP daemon in the Solaris software environment by typing:

```
# /usr/sbin/in.rarpd -a &
```

6. Power on both arrays by pressing the power button on each power and cooling unit.

All power and cooling unit LEDs on both units turn green, indicating that power has been restored. The IP address automatically downloads to the master controller unit after you power on.

Note – In some cases, the array times out before receiving the RARP request through an Ethernet switch. If this time out happens, the array cannot receive the assigned IP address. An improper spanning-tree setting of the Ethernet switch might cause this time out. Refer to your switch vendor documentation for information on spanning-tree settings and how to change them. Changing this setting properly enables the array to receive the RARP request before timing out.

10.1.4 Defining and Mounting Volumes on the Alternate Master

Once the units are cabled and power has been restored to both units successfully, define and mount the volume(s) on the alternate master.

Note – Make sure that both units are online and that all LEDs are green. It can take several minutes after powering on for the units to be ready.

1. Start a Telnet session with the master controller unit.

- a. On the host, use the `telnet` command with the array name (or IP address) to connect to the master unit.

```
# telnet disk_tray_name
Trying 129.150.47.101...
Connected to 129.150.47.101.
Escape character is '^]'.

pSOSystem (129.150.47.101)
```

Note – The Telnet session verifies that your network connection is good. If you cannot connect through the Telnet session, you might have miscabled the partner group. See Section 3.8, “Identifying Miscabled Partner Groups” on page 3-19 to determine if this is the problem. If the partner group is cabled correctly, then the IP address might not be assigned correctly. If you suspect this as the problem, verify the IP address in a serial cable connection and verify that the RARP server is functional.

- b. Log in to the array by typing `root` and your password at the prompts.

The array prompt is displayed.

2. Check the FRU status using the fru list and fru stat commands.

Make sure that all FRUs are displayed and that FRU conditions are good, as shown in the following examples:

```

:/:<1> fru list
ID          TYPE          VENDOR      MODEL      REVISION    SERIAL
-----
ulctr      controller card  SCI-SJ      375-0084-01- 0210        000980
u2ctr      controller card  SCI-SJ      375-0084-01- 0210        001098
uld1       disk drive      SEAGATE     ST118202FSUN EA29        LKG78761
uld2       disk drive      SEAGATE     ST118202FSUN EA29        LKG89101
uld3       disk drive      SEAGATE     ST118202FSUN EA29        LKG86881
uld4       disk drive      SEAGATE     ST118202FSUN EA29        LKG89487
uld5       disk drive      SEAGATE     ST118202FSUN EA29        LKH31924
uld6       disk drive      SEAGATE     ST118202FSUN EA29        LKH32009
uld7       disk drive      SEAGATE     ST118202FSUN EA29        LKG90435
uld8       disk drive      SEAGATE     ST118202FSUN EA29        LKG82282
uld9       disk drive      SEAGATE     ST118202FSUN EA29        LKG95302
u2d1       disk drive      SEAGATE     ST118202FSUN EA29        LKG63405
u2d2       disk drive      SEAGATE     ST118202FSUN EA29        LKH57340
u2d3       disk drive      SEAGATE     ST118202FSUN EA29        LKD20515
u2d4       disk drive      SEAGATE     ST118202FSUN EA29        LKG89040
u2d5       disk drive      SEAGATE     ST118202FSUN EA29        LKG89845
u2d6       disk drive      SEAGATE     ST118202FSUN EA29        LKG82866
u2d7       disk drive      SEAGATE     ST118202FSUN EA29        LKG95090
u2d8       disk drive      SEAGATE     ST118202FSUN EA29        LKG90324
u2d9       disk drive      SEAGATE     ST118202FSUN EA29        LKG95460
u1l1      loop card       SCI-SJ      375-0085-01- 5.01 Flash  001594
u1l2      loop card       SCI-SJ      375-0085-01- 5.01 Flash  001579
u2l1      loop card       SCI-SJ      375-0085-01- 5.01 Flash  001562
u2l2      loop card       SCI-SJ      375-0085-01- 5.01 Flash  001735
ulpcu1    power/cooling unit TECTROL-CAN 300-1454-01( 0000        001274
ulpcu2    power/cooling unit TECTROL-CAN 300-1454-01( 0000        001566
u2pcu1    power/cooling unit TECTROL-CAN 300-1454-01( 0000        002283
u2pcu2    power/cooling unit TECTROL-CAN 300-1454-01( 0000        002072
ulmpn     mid plane      SCI-SJ      370-3990-01- 0000        000963
u2mpn     mid plane      SCI-SJ      370-3990-01- 0000        000833

```

```

:/:<2> fru stat

```

CTLR	STATUS	STATE	ROLE	PARTNER	TEMP			
u1ctr	ready	enabled	master	u2ctr	32.5			
u2ctr	ready	enabled	alt master	u1ctr	32.5			

DISK	STATUS	STATE	ROLE	PORT1	PORT2	TEMP	VOLUME
uld1	ready	enabled	data disk	ready	ready	37	v0
uld2	ready	enabled	data disk	ready	ready	39	v0
uld3	ready	enabled	data disk	ready	ready	36	v0
uld4	ready	enabled	data disk	ready	ready	38	v0
uld5	ready	enabled	data disk	ready	ready	37	v0
uld6	ready	enabled	data disk	ready	ready	35	v0
uld7	ready	enabled	data disk	ready	ready	40	v0
uld8	ready	enabled	data disk	ready	ready	36	v0
uld9	ready	enabled	data disk	ready	ready	29	v0
u2d1	ready	enabled	unassigned	ready	ready	38	-
u2d2	ready	enabled	unassigned	ready	ready	40	-
u2d3	ready	enabled	unassigned	ready	ready	40	-
u2d4	ready	enabled	unassigned	ready	ready	34	-
u2d5	ready	enabled	unassigned	ready	ready	39	-
u2d6	ready	enabled	unassigned	ready	ready	38	-
u2d7	ready	enabled	unassigned	ready	ready	42	-
u2d8	ready	enabled	unassigned	ready	ready	36	-
u2d9	ready	enabled	unassigned	ready	ready	37	-

LOOP	STATUS	STATE	MODE	CABLE1	CABLE2	TEMP		
u2l1	ready	enabled	master	installed	-	29.5		
u2l2	ready	enabled	slave	installed	-	33.0		
u1l1	ready	enabled	master	-	installed	28.0		
u1l2	ready	enabled	slave	-	installed	32.0		

POWER	STATUS	STATE	SOURCE	OUTPUT	BATTERY	TEMP	FAN1	FAN2
ulpcu1	ready	enabled	line	normal	normal	normal	normal	normal
ulpcu2	ready	enabled	line	normal	normal	normal	normal	normal
u2pcu1	ready	enabled	line	normal	normal	normal	normal	normal
u2pcu2	ready	enabled	line	normal	normal	normal	normal	normal

Note – The batteries in the power and cooling units recharge after powering on the unit. During the recharge, a fault message is displayed in the fru stat output for the batteries. While the batteries are recharging, write-behind cache is disabled.

3. Use the `vol add` command to create the volume(s) on the alternate master as follows:

- a. Define the volume name** (`vol add volume-name`).
- b. Define the drives** (`data u2dn-n`) on which the volume resides, where:
 - `u2` is the array unit number.
 - `dn-n` are the disk drives, $n = 1$ to 9.
- c. Define the RAID level** (`raid n`), where $n = 0, 1, \text{ or } 5$.
- d. Optional: define the hot spare drive** (`standby und9`) where:
 - `u2` is the array unit number.
 - `d9` is the number of the hot spare disk drive .

```
:/:<3> vol add volume-name data undn-n raid n standby und9
```

For example:

```
:/:<4> vol add v1 data u2d1-8 raid 5 standby u2d9
```

- `v1` is the volume name.
- `u2d1-8` indicates the location of the volume: unit 2, disk drives 1 through 8.
- `raid 5` is RAID level 5.
- `standby u2d9` is the location of the hot spare: unit 2, drive 9.

4. Check the status of the volumes to ensure that you created the volume correctly.

The status of all drives must be 0. For example:

```
:/:<5> vol stat

v0          u1d1  u1d2  u1d3  u1d4  u1d5  u1d6  u1d7  u1d8  u1d9
mounted     0      0      0      0      0      0      0      0      0
v1          u2d1  u2d2  u2d3  u2d4  u2d5  u2d6  u2d7  u2d8  u2d9
unmounted   0      0      0      0      0      0      0      0      0

:/:<6> vol list

volume      capacity  raid  data      standby
v0          125.2 GB  5     u1d1-8    u1d9
v1          125.2 GB  5     u2d1-8    u2d9
```

5. Initialize the volume.

Depending on system activity at the time of initialization, it can take up to an hour to initialize a volume. Only one volume can be initialized at a time.

```
:/:<7> vol init volume-name data
```

6. After the `vol init` process has completed, mount the volume.

```
:/:<8> vol mount volume-name
```

7. Use the `luxadm(1M)` command on a Solaris host to recognize the new volume.

The `luxadm(1M)` command probes for new devices. Refer to the `luxadm(1M)` man page for more information on this command.

a. Make sure there is a `/dev/es` directory on the host system. If not, type:

```
# mkdir /dev/es
```

The `/dev/es` directory is necessary for running the `luxadm` command.

b. On the host system, type `luxadm insert`:

```
# luxadm insert
```

Note – If the `luxadm` utility is not available, execute a reconfiguration reboot (`boot -r`) to ensure that the host recognizes the new volumes.

After the `luxadm` command has completed, you can remount the volumes on the data host and restore the original data.

10.2 Disconnecting a Partner Group to Form Single Controller Units



Caution – Back up all data before beginning this procedure.

This section describes how to reconfigure a partner group to form two existing single controller units.

This procedure includes the following sections:

- Section 10.2.1, “Preparing the Arrays” on page 10-15
- Section 10.2.2, “Establishing a New IP Address” on page 10-17
- Section 10.2.3, “Establishing a Network Connection” on page 10-17
- Section 10.2.4, “Defining and Mounting Volumes” on page 10-18

10.2.1 Preparing the Arrays

1. **Back up all data on the partner group.**



Caution – Make sure you back up data *before* proceeding.

2. **Ensure that the data path between the host and the partner group has been quiesced.**

There must not be any I/O activity.

3. **Start a Telnet session with the master unit.**

- a. **On the host, use the `telnet` command with the array name (or IP address) to connect to the array.**

```
# telnet array_name
Trying 129.150.47.101...
Connected to 129.150.47.101.
Escape character is '^]'.

pSOSystem (129.150.47.101)
```

- b. **Log in to the array by typing `root` and your password at the prompts.**

The array prompt is displayed.

4. Power off both units.

a. Type:

```
:/:<5> shutdown  
Shutdown the system, are you sure? [N]: y
```

b. Press the power button once on each power and cooling unit to turn the switch off.

5. Remove the interconnect cables from the back of each array.

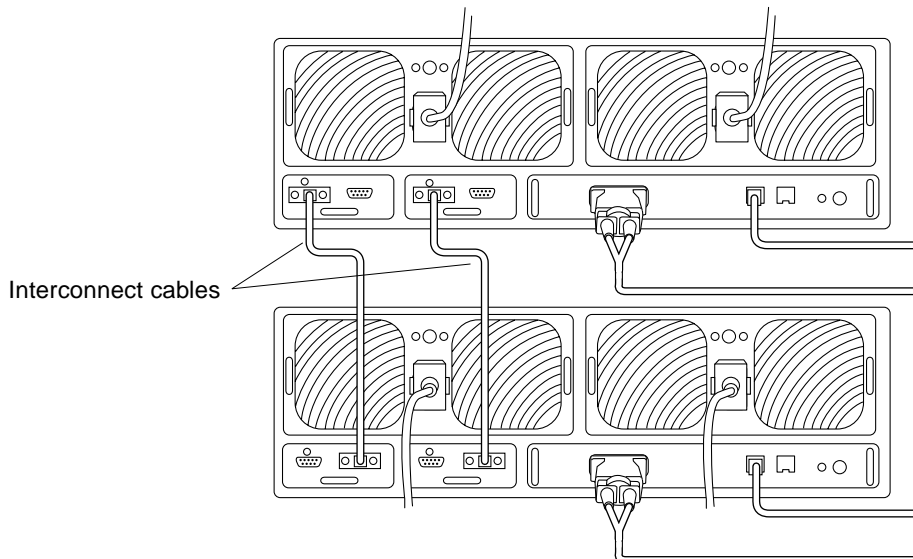


FIGURE 10-4 Interconnect Cable Location

At this point, you can physically move the arrays apart. If you are moving the arrays to different locations, remove the other cables. Replace all cables except the interconnect cable, when the arrays are at their permanent locations.

Note – Do not power on the arrays until you complete the instructions in Section 10.2.2, “Establishing a New IP Address” on page 10-17.

10.2.2 Establishing a New IP Address

In a partner group, the alternate master unit assumes the IP address of the master unit. When the partner group is disconnected, assign a new IP address to the previous alternate master unit for it to operate as a single controller unit. The JumpStart feature automatically downloads a newly assigned IP address to the array. To enable this feature, you must edit your host file on a RARP server before powering on the array. After you power on, the IP address is automatically assigned. See Section 10.1.3, “Establishing a New IP Address” on page 10-7 for detailed instructions.

10.2.3 Establishing a Network Connection

After powering on, establish a network connection to each array. This ensures that both arrays function properly and recognize the host.

1. **On the host, use the `telnet` command with the array name (or IP address) to connect to the array.**

```
# telnet array_name
Trying 129.150.47.101...
Connected to 129.150.47.101.
Escape character is '^]'.

pSOSystem (129.150.47.101)
```

Note – The Telnet session verifies that your network connection is good. If you cannot connect through the Telnet session, you might have miscabled the partner group. See Section 3.8, “Identifying Miscabled Partner Groups” on page 3-19 to determine if this is the problem. If the partner group is cabled correctly, then the IP address might not be assigned correctly. If you suspect this as the problem, verify the IP address in a serial cable connection and verify that the RARP server is functional.

2. **Log in to the array by typing `root` and your password at the prompts.**
 - If you are logging in to the previous master unit, use the password for that unit.
 - If you are logging in to the previous alternate master unit, you need to assign a new password. When prompted for a password, press Return.

Note – If you need to create a new password or change some of the parameters, such as the gateway, netmask, and others, refer to Chapter 2 of the *Sun StorEdge T3 and T3+ Array Installation, Operation, and Service Manual* for instructions.

10.2.4 Defining and Mounting Volumes

This section describes the steps required for configuring the former master and alternate master units into single controller units.

10.2.4.1 Master Unit to a Single Controller Unit

After you disconnect the arrays from each other and power on the former master unit, the former master unit continues to display volumes formerly available in the partner group on the alternate master unit. These *phantom* volumes do not exist but continue to display from the command line.

In the example that follows, `v1` is a phantom volume on a standalone array that was previously connected in a partner group:

```
:/:<1> vol list

volume      capacity  raid  data      standby
v0          289.6 GB  5     u1d1-9    none
v1          0.0 GB   5     u2d1-9    none

:/:<2> vol stat

v0          u1d1  u1d2  u1d3  u1d4  u1d5  u1d6  u1d7  u1d8  u1d9
mounted    0     0     0     0     0     0     0     0     0
v1          u2d1  u2d2  u2d3  u2d4  u2d5  u2d6  u2d7  u2d8  u2d9
mounted    9     9     9     9     9     9     9     9     9
```

Note – This situation occurs only on the former master unit. The former alternate master unit does not require this procedure.

To correct this issue, unmount the phantom volume and delete it:

1. **Type** `vol unmount v1`.
2. **Type** `vol remove v1`.

3. Use the `vol list` and `vol stat` commands to verify that the phantom volume has been deleted and that the existing volume remains.

For example:

```

:/:<3> vol list

volume          capacity  raid  data    standby
v0              289.6 GB   5     u1d1-9  none

:/:<4> vol stat
v0              u1d1    u1d2    u1d3    u1d4    u1d5    u1d6    u1d7    u1d8    u1d9
mounted        0       0       0       0       0       0       0       0       0
  
```

4. Use the `fru list` and `fru stat` commands to verify that the array is functional and ready for operation.

For example:

```

:/:<5> fru list
ID          TYPE          VENDOR      MODEL      REVISION      SERIAL
-----
ulctr      controller card  SCI-SJ      375-0084-01- 0210          003636
u1d1      disk drive      SEAGATE     ST136403FSUN D44A          LT067917
u1d2      disk drive      SEAGATE     ST136403FSUN D44A          LT128949
u1d3      disk drive      SEAGATE     ST136403FSUN D44A          LT182205
u1d4      disk drive      SEAGATE     ST136403FSUN D44A          LT133265
u1d5      disk drive      SEAGATE     ST136403FSUN D44A          LT152632
u1d6      disk drive      SEAGATE     ST136403FSUN D44A          LT183848
u1d7      disk drive      SEAGATE     ST136403FSUN D44A          LT187470
u1d8      disk drive      SEAGATE     ST136403FSUN D44A          LT188683
u1d9      disk drive      SEAGATE     ST136403FSUN D44A          LT151139
u1l1      loop card       SCI-SJ      375-0085-01- 5.02 Flash    002719
u1l2      loop card       SCI-SJ      375-0085-01- 5.02 Flash    003711
ulpcu1    power/cooling unit TECTROL-CAN 300-1454-01( 0000          008917
ulpcu2    power/cooling unit TECTROL-CAN 300-1454-01( 0000          008831
ulmpn     mid plane       SLR-MI      370-3990-01- 0000          010519
  
```

```

:/:<6> fru stat
CTLR   STATUS   STATE   ROLE     PARTNER  TEMP
-----
ulctr  ready   enabled master    -        34.5

DISK   STATUS   STATE   ROLE     PORT1    PORT2    TEMP  VOLUME
-----
uld1   ready   enabled data disk ready    ready    33    v0
uld2   ready   enabled data disk ready    ready    29    v0
uld3   ready   enabled data disk ready    ready    30    v0
uld4   ready   enabled data disk ready    ready    28    v0
uld5   ready   enabled data disk ready    ready    28    v0
uld6   ready   enabled data disk ready    ready    36    v0
uld7   ready   enabled data disk ready    ready    27    v0
uld8   ready   enabled data disk ready    ready    27    v0
uld9   ready   enabled data disk ready    ready    34    v0

LOOP   STATUS   STATE   MODE     CABLE1   CABLE2   TEMP
-----
ull1   ready   enabled master    -        -        28.0
ull2   ready   enabled slave    -        -        31.0

POWER  STATUS   STATE   SOURCE  OUTPUT  BATTERY  TEMP  FAN1  FAN2
-----
ulpcu1 ready   enabled line    normal  normal  normal  normal normal normal
ulpcu2 ready   enabled line    normal  normal  normal  normal normal normal

```

If the array reports a ready status with functional FRUs, you can now restore the data, if necessary, and return the array to operation as a single controller unit.

10.2.4.2 Alternate Master Unit to a Single Controller Unit

The former alternate master unit contains the same volume(s) as it did when connected in the partner group. Those volumes are available when the unit is powered on. However, the former alternate master unit might be operating on an outdated file system. If you apply a firmware patch to the arrays while they were connected in the partner group, the files contained on the array's reserved system area are not upgraded on the alternate master, but only on the master unit. When the units are disconnected, the alternate master unit reverts to the file system stored on its reserved system area.

To correct this situation and ensure that the array is ready for operation:

1. Install the latest firmware patch on the array.

This patch is available on the SunSolve web site: <http://sunsolve.sun.com>

a. From the SunSolve web site, select Patches under the SunSolve Online column.

b. Select the Storage Products option from the Patches web page.

Refer to the README file on the web page for specific details on installing the patch for the Sun StorEdge T3 array firmware.

2. Use the `vol list` and `vol stat` commands to verify that the volume(s) is mounted correctly.

For example:

```
:/:<7> vol list

volume          capacity  raid  data    standby
v1              289.6 GB   5    u1d1-9  none

:/:<8> vol stat
v1              u1d1    u1d2    u1d3    u1d4    u1d5    u1d6    u1d7    u1d8    u1d9
mounted         0        0        0        0        0        0        0        0        0
```

3. Use the `fru list` and `fru stat` commands to verify that the array is functional and ready for operation.

For example:

```
:/:<9> fru list
ID          TYPE          VENDOR      MODEL      REVISION    SERIAL
-----
ulctr      controller card  SCI-SJ      375-0084-01- 0210        003636
u1d1       disk drive      SEAGATE     ST136403FSUN D44A        LT067917
u1d2       disk drive      SEAGATE     ST136403FSUN D44A        LT128949
u1d3       disk drive      SEAGATE     ST136403FSUN D44A        LT182205
u1d4       disk drive      SEAGATE     ST136403FSUN D44A        LT133265
u1d5       disk drive      SEAGATE     ST136403FSUN D44A        LT152632
u1d6       disk drive      SEAGATE     ST136403FSUN D44A        LT183848
u1d7       disk drive      SEAGATE     ST136403FSUN D44A        LT187470
u1d8       disk drive      SEAGATE     ST136403FSUN D44A        LT188683
u1d9       disk drive      SEAGATE     ST136403FSUN D44A        LT151139
u1l11     loop card       SCI-SJ      375-0085-01- 5.02 Flash  002719
u1l12     loop card       SCI-SJ      375-0085-01- 5.02 Flash  003711
ulpcu1    power/cooling unit TECTROL-CAN 300-1454-01( 0000        008917
ulpcu2    power/cooling unit TECTROL-CAN 300-1454-01( 0000        008831
ulmpn     mid plane       SLR-MI      370-3990-01- 0000        010519
```

```

:/:<10> fru stat

```

CTLR	STATUS	STATE	ROLE	PARTNER	TEMP			
ulctr	ready	enabled	master	-	34.5			

DISK	STATUS	STATE	ROLE	PORT1	PORT2	TEMP	VOLUME
uld1	ready	enabled	data disk	ready	ready	33	v0
uld2	ready	enabled	data disk	ready	ready	29	v0
uld3	ready	enabled	data disk	ready	ready	30	v0
uld4	ready	enabled	data disk	ready	ready	28	v0
uld5	ready	enabled	data disk	ready	ready	28	v0
uld6	ready	enabled	data disk	ready	ready	36	v0
uld7	ready	enabled	data disk	ready	ready	27	v0
uld8	ready	enabled	data disk	ready	ready	27	v0
uld9	ready	enabled	data disk	ready	ready	34	v0

LOOP	STATUS	STATE	MODE	CABLE1	CABLE2	TEMP		
ull1	ready	enabled	master	-	-	28.0		
ull2	ready	enabled	slave	-	-	31.0		

POWER	STATUS	STATE	SOURCE	OUTPUT	BATTERY	TEMP	FAN1	FAN2
ulpcu1	ready	enabled	line	normal	normal	normal	normal	normal
ulpcu2	ready	enabled	line	normal	normal	normal	normal	normal

If the array reports a ready status with functional FRUs, you can now restore the data, if necessary, and return the array to operation as a single controller unit.

10.3 Changing the Port ID on the Array

To add a partner group to a hub configuration, you must set the port ID values on the arrays to unique values. Sun systems support hard addressing only. However, the `port` command on the Sun StorEdge T3 array contains the option to set soft addressing. Changing the setting to soft addressing can create problems with host site HBAs. In addition, with soft addressing, there is the risk of ending up with new `ctxdx` node names after performing a system reboot.

Note – Sun StorEdge T3 arrays that are factory configured in cabinets with hubs have unique port ID values assigned. This procedure applies only to standalone partner groups that are being added to an existing hub configuration.

To change the port ID on a Sun StorEdge T3 array:

1. Connect to the array in a telnet session.

See Section 2.2, “Establishing a Telnet Session” on page 2-3 for instructions.

2. Use the `port` command on the array to change the port ID.

You must select a new numerical value for the port identifier. For example, to change a port id on `u1p1` from a value of 1 to a value of 20, Type:

```
:/:<l> port set u1p1 targetid 20
```

3. On the array, type `reset` for the new port ID to take effect.

Illustrated Parts Breakdown

This appendix contains part numbers and illustrations of field-replaceable units (FRUs).

The following assemblies are illustrated in this chapter:

- Section A.1, “Sun StorEdge T3 Array” on page A-2
- Section A.2, “Sun StorEdge T3 Array Assemblies” on page A-3
- Section A.3, “Door Assembly” on page A-4
- Section A.4, “Interconnect Card Assembly” on page A-5
- Section A.5, “Power Supply and Cooling Unit” on page A-6
- Section A.6, “Controller Card” on page A-7
- Section A.7, “Drive Assembly” on page A-8
- Section A.8, “Cable and Interconnect Assemblies” on page A-9

A.1 Sun StorEdge T3 Array

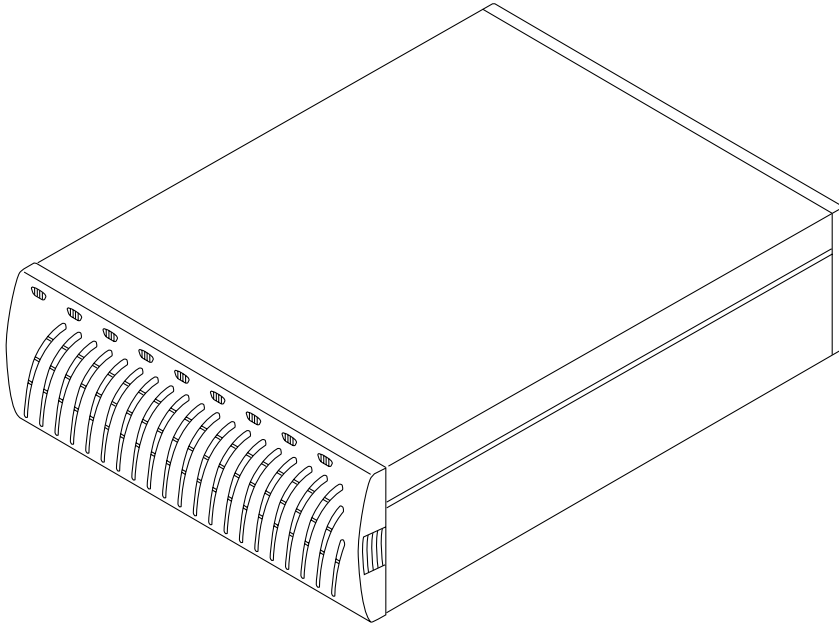


FIGURE A-1 Sun StorEdge T3 Array (Front View)

A.2 Sun StorEdge T3 Array Assemblies

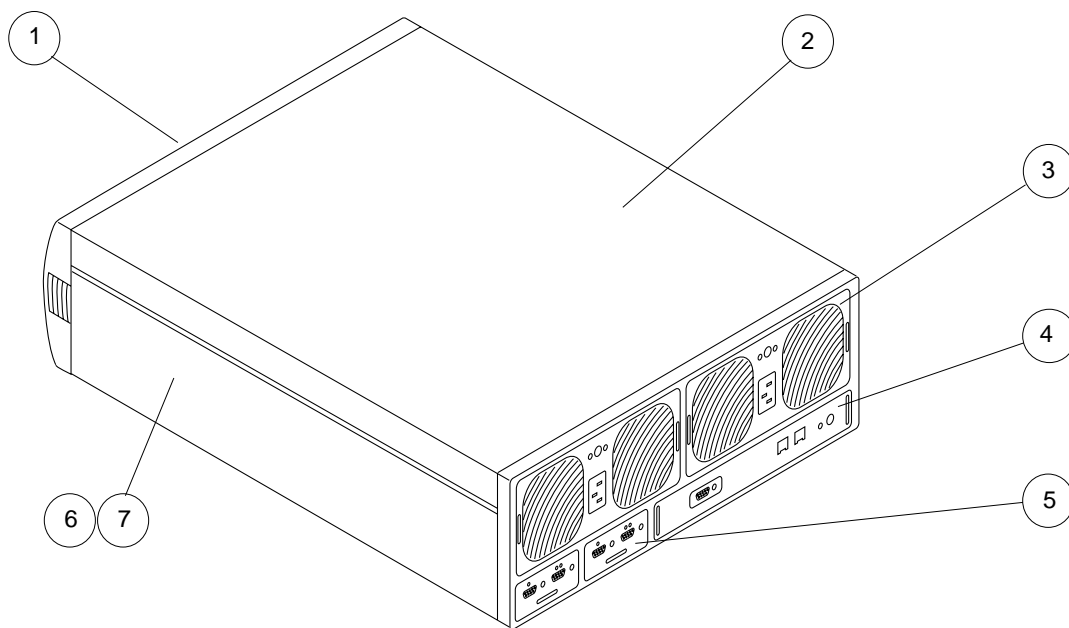


FIGURE A-2 Sun StorEdge T3 Array (Back View)

TABLE A-1 Sun StorEdge T3 Array Assemblies

Item	Part Number	Description
1	F540-4306	Door assembly
2	F370-3990	Empty chassis/backplane assembly
3	F300-1454	Power supply and cooling unit
4	F375-0084	T3 controller card (shown)
4	F501-5710	T3+ controller card
5	F375-0085	Interconnect card assembly
6	F540-4287	Drive assembly, 18 GB (not shown in this view)
7	F540-4367	Drive assembly, 36 GB (not shown in this view)

A.3 Door Assembly

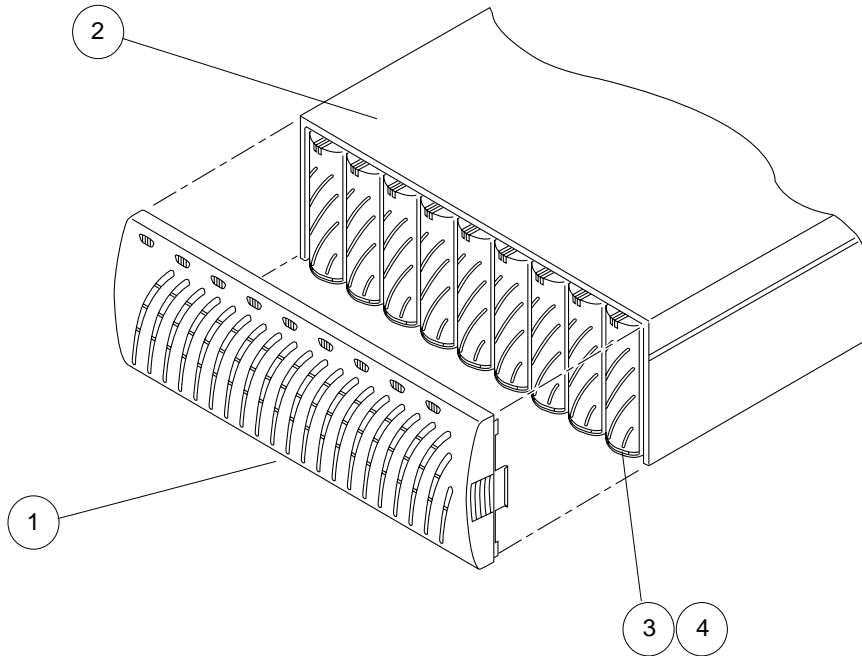


FIGURE A-3 Door Assembly

TABLE A-2 Door Assembly

Item	Part Number	Description
1	F540-4306	Door assembly
2	F370-3990	Empty chassis/backplane assembly
3	F540-4287	Drive assembly, 18 GB
4	F540-4367	Drive assembly, 36 GB

A.4 Interconnect Card Assembly

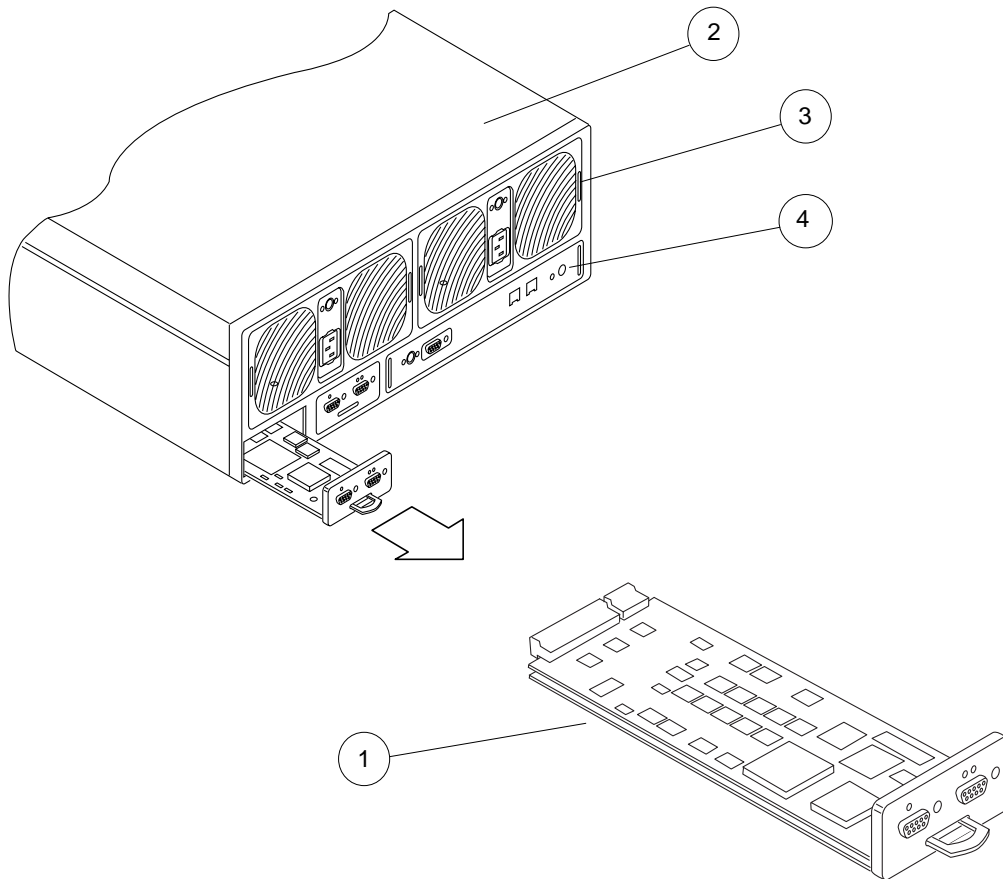


FIGURE A-4 Interconnect Card Assembly

TABLE A-3 Interconnect Card Assembly

Item	Part Number	Description
1	F375-0085	Interconnect card assembly
2	F370-3990	Empty chassis/backplane assembly
3	F300-1454	Power supply and cooling unit
4	F375-0084	T3 controller card (shown)
4	F501-5710	T3+ controller card

A.5 Power Supply and Cooling Unit

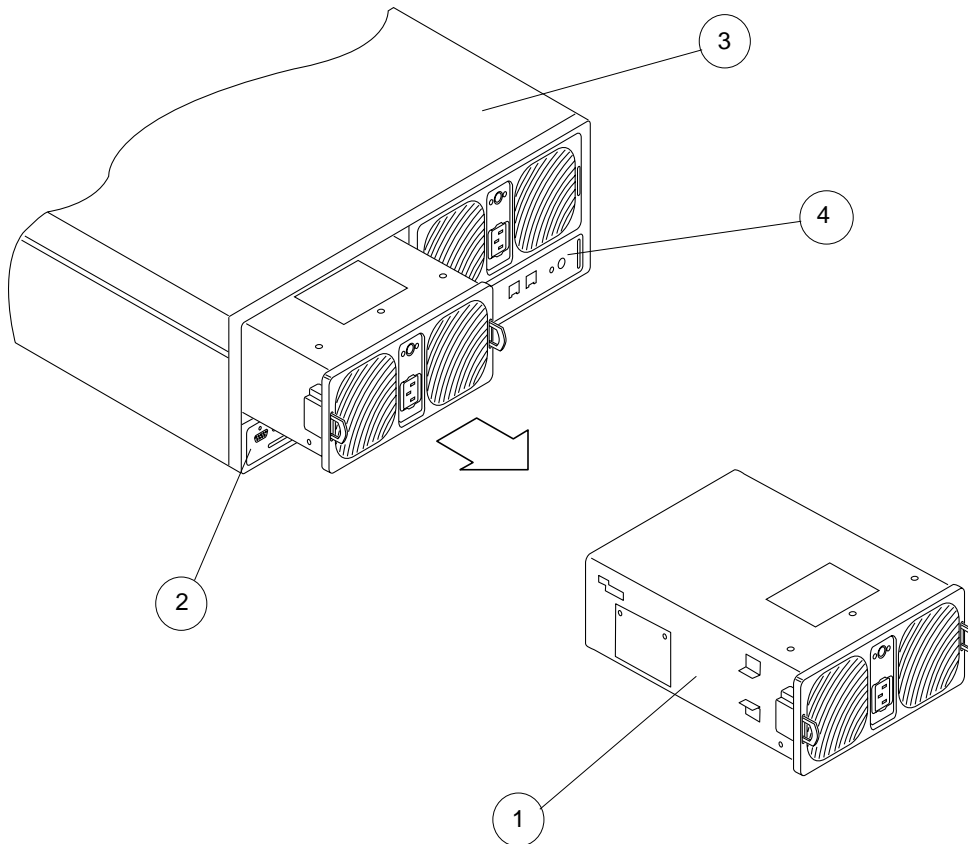


FIGURE A-5 Power Supply

TABLE A-4 Power Supply

Item	Part Number	Description
1	F300-1454	Power supply and cooling unit
2	F375-0085	Interconnect card assembly
3	F370-3990	Empty chassis/backplane assembly
4	F375-0084	T3 controller card (shown)
4	F501-5710	T3+ controller card
	F370-3956	Battery pack, NIMH

A.6 Controller Card

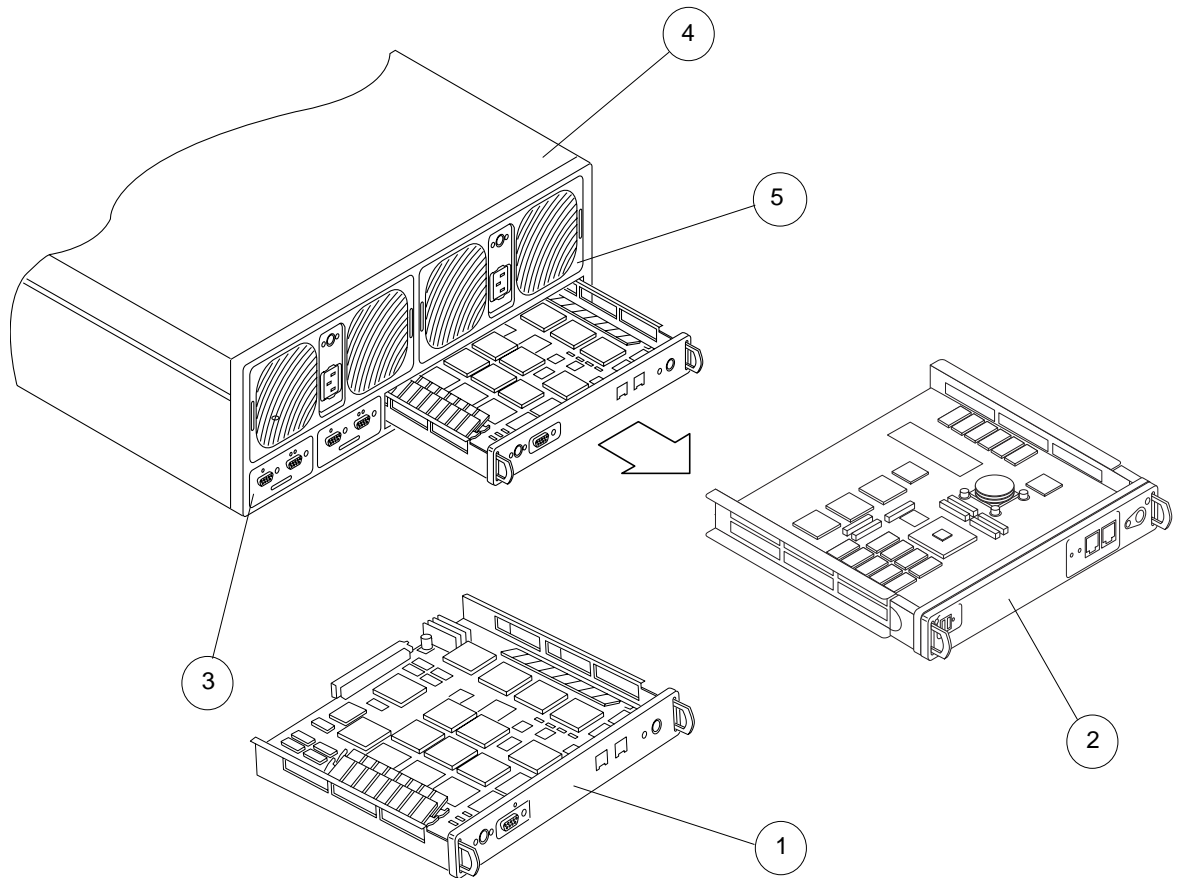


FIGURE A-6 Controller Card

TABLE A-5 Controller Card

Item	Part Number	Description
1	F375-0084	T3 controller card
2	F501-5710	T3+ controller card
3	F375-0085	Interconnect card assembly
4	F370-3990	Empty chassis/backplane assembly
5	F300-1454	Power supply and cooling unit

A.7 Drive Assembly

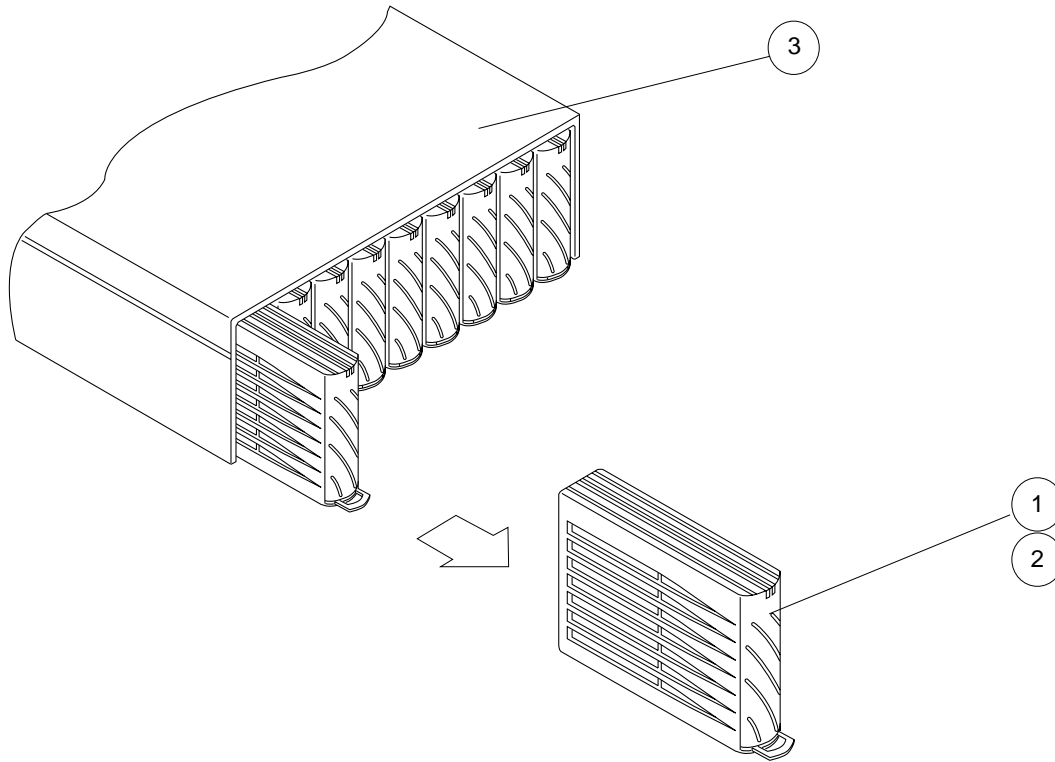


FIGURE A-7 Drive Assembly

TABLE A-6 Drive Assembly

Item	Part Number	Description
1	F540-4287	Drive assembly, 18 GB
2	F540-4367	Drive assembly, 36 GB
3	F370-3990	Empty chassis/backplane assembly

A.8 Cable and Interconnect Assemblies

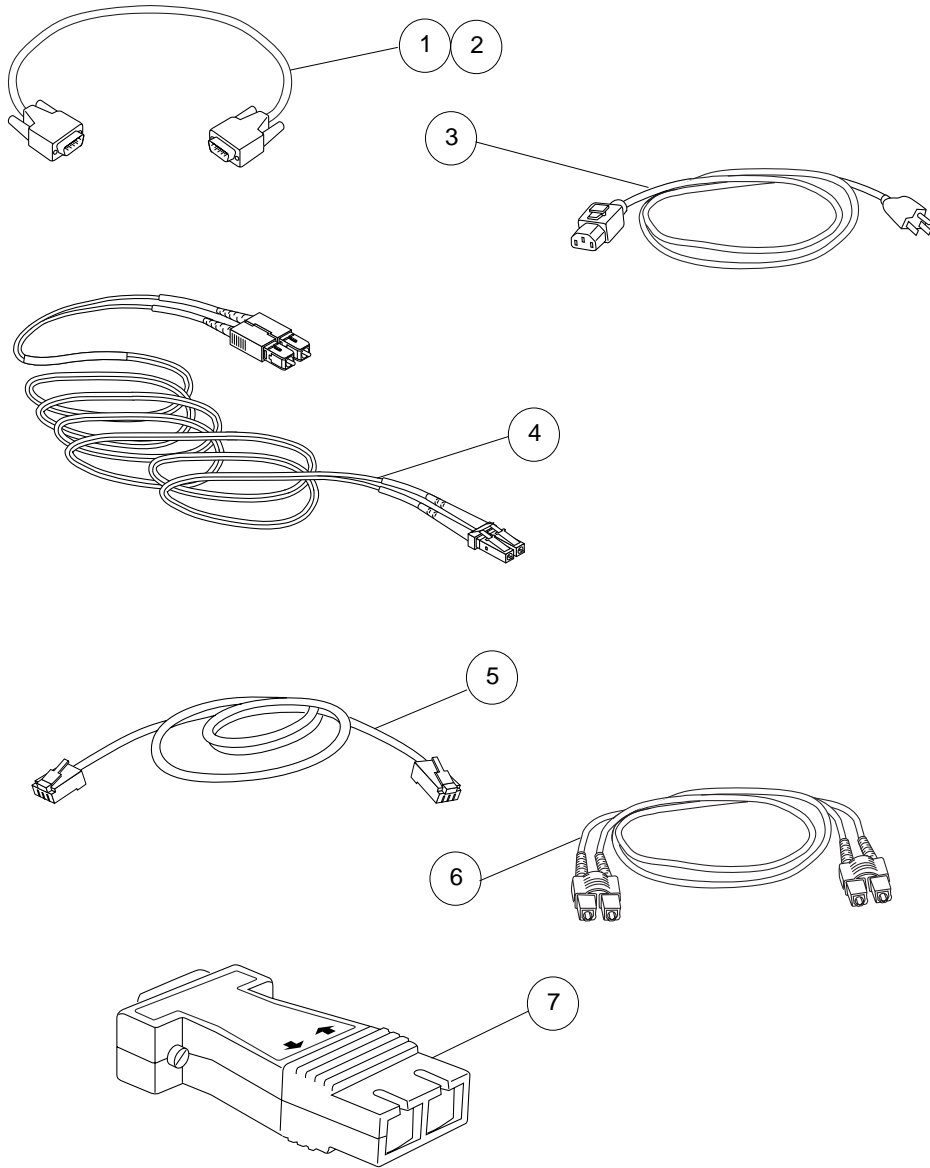


FIGURE A-8 Cables and Interconnects

TABLE A-7 Cable and Interconnect Assemblies

Item	Part Number	Description
1	F530-2842	Interconnect cable, short
2	F530-2843	Interconnect cable, long
3	F180-1918	Locking power cord
4	F537-1034	Fiber-optic cable, Sun StorEdge T3+ array (LC-SFF to SC)
5	1	Shielded Ethernet cable (category 5)
6	F537-1020	Fiber-optic cable, Sun StorEdge T3 array
7	F370-3989	MIA adapter

1. Found in F370-4119-02 Diagnostic Cable Kit

Sun StorEdge T3 Array System Defaults

This appendix lists the Sun StorEdge T3 and T3+ array defaults and is divided into the following sections:

- Section B.1, “Boot Defaults” on page B-1
- Section B.2, “System Defaults” on page B-2
- Section B.3, “Volume Defaults” on page B-3
- Section B.4, “Default Directories and Files” on page B-4

B.1 Boot Defaults

Specify boot defaults with the `set` command. When run without any parameters, the `set` command displays the current values. See the *Sun StorEdge T3 and T3+ Array Administrator's Guide* for information on using the `set` command.

TABLE B-1 Default Settings—`set` List

Parameter	Default	Variables
<code>bootmode</code>	<code>auto</code>	[<code>auto</code> <code>tftp</code> <code>none</code>]
<code>bootdelay</code>	<code>3</code>	Number of seconds
<code>sn</code>	<i>Number</i>	Serial number
<code>ip</code>	<i>n.n.n.n</i>	Unit IP address
<code>netmask</code>	<code>255.255.255.0</code>	Unit netmask
<code>gateway</code>	<i>n.n.n.n</i>	Network gateway IP address
<code>tftphost</code>	<i>n.n.n.n</i>	IP address of TFTP server

TABLE B-1 Default Settings—set List

Parameter	Default	Variables
tftpfile	<i>value</i>	Boot code file identification number (39 character maximum)
hostname	<i>machinename</i>	Machine name of the Sun StorEdge T3 host machine (39 character maximum)
vendor	<i>vendorname</i>	Name of manufacturer or vendor
model	<i>modelnumber</i>	Controller model number (set at EP level)
revision	0nnn	Controller EP revision (EP writes this value)
logto	*	[1 * <i>filename</i>] where: 1=Forces logging to serial console *=Directs logging daemon to direct logging as specified in the <code>/etc/syslog.conf</code> file.
loglevel	3	[0 1 2 3 4-] where: 0=No logging at all 1=Error messages only 2=Warning and higher messages 3=Notice and higher messages 4=All message levels including info
rarp	on	[on off]
mac	<i>n:n:n:n:n</i>	Controller MAC address. Set by firmware

B.2 System Defaults

Specify system defaults with the `sys` command. See the *Sun StorEdge T3 and T3+ Array Administrator's Guide* for more information on using the `sys` command.

TABLE B-2 System Default Settings

Sys Parameter	Default	Variables
blocksize	64k	[16k 32k 64k]
cache	auto	[auto writebehind writethrough off]
mirror	auto	[auto off]
mp_support	none	[rw none] Multi-pathing support
rd_ahead	on	Set to off to always perform datablock read ahead.

TABLE B-2 System Default Settings

Sys Parameter	Default	Variables
recon_rate	medium	[high, medium, low] Reconstruction rate.
memsize	32	Set by controller, read-only. In MBytes
cache memsize	256	Set by controller, read-only. In MBytes

B.3 Volume Defaults

Specify system defaults with the `vol` command. See the *Sun StorEdge T3 and T3+ Array Administrator's Guide* for more information.

TABLE B-3 Volume Defaults

Parameter	Default	Variables
init [rate <i>n</i>]	16	[1-16] 1 is lowest, 16 is highest...
verify [rate <i>n</i>]	1	[1-8] Rate parameter refers to host interleave factor (contention with host IOs). Default is 1. There is currently no feature that spawns a <code>vol verify</code> process.

The default for the SCSI “vendor ID field” is Sun. Display or change this value with the `port` command.

The default Sun StorEdge T3 and T3+ array volume configuration as shipped from the factory is 9 drive RAID 5 with no standby disk.

The volume is configured as follows:

- `vol add v0 data u1d1-9 RAID 5`
- `vol init v0 sysarea`
- `vol init v0 data rate 16`

B.4 Default Directories and Files

TABLE B-4 lists the default file system shipped with the array.

TABLE B-4 Default Directories and Files

Filename	Description
/nb113.bin	Controller firmware (RR Sum: 23020 5000)
/lplc_05.01	Interconnect card FW (RR Sum: 63295 21)
/BITMAP.SYS	Contains a map of used and free blocks
/ep2_10.bin	Controller EPROM flash (RR Sum: 3221 1023)
/FLIST.SYS	Contains the file descriptors
/cmdlog	Log of all commands executed on the system
/adm	Legacy directory formerly used for syslog files
/webgui	Contains old browser based admin files
/etc/hosts	Default hosts with comments on format of file
/etc/schd.conf	Battery refresh file. Contents: BAT_CYC 14
/etc/syslog.conf	System logging configuration file
/syslog	Default system logging file
/web/*.htm	Component Manager required file
/web/snmp/T3.mib	SNMP required file

Note – At time of manufacture, Sun StorEdge T3 and T3+ array system disks do not contain controller firmware, interconnect card binaries, EP binaries, or drive firmware images. You can download all of these from the SunSolve web site.

Sun StorEdge T3 and T3+ Array Messages

This appendix contains a description of array error messages.

See the *Sun StorEdge T3 and T3+ Array Administrator's Guide* for explanations of the more important error messages.

This chapter contains the following sections:

- Section C.1, “Message Syntax” on page C-1
- Section C.2, “Reset Log Types” on page C-3
- Section C.3, “Boot Messages” on page C-4
 - “Interpreting Boot Messages” on page 4
 - “Examples of Boot Messages” on page 7

C.1 Message Syntax

Error message syntax consists of the following two components:

- Section C.1.1, “Message Types” on page C-2
- Section C.1.2, “FRU Identifiers” on page C-2

The following sub-sections describe these components and list possible error and warning messages. See the *Sun StorEdge T3 and T3+ Array Administrator's Guide* for explanations of the more important error messages.

C.1.1 Message Types

A syslog daemon exists in the hardware RAID controller that records system messages and provides for remote monitoring. There are four possible levels of messages, listed in TABLE C-1 in order of severity.

TABLE C-1 Message Types

Message Type	Definition
Error	Indicates a critical system event requiring immediate user intervention or attention. For example, an over temperature condition or a detected FRU being removed.
Warning	Indicates a possible event requiring eventual user intervention. For example, a FRU being disabled and recovery procedure executed.
Notice	Indicates a system event that might be a side effect of other events or may be a normal condition. For example, the power switch is turned off.
Information	Indicates a system event that has no consequence on the running health of the system. For example, a good state of a FRU.

C.1.2 FRU Identifiers

The syntax of the error message uses a FRU identifier to refer to a particular FRU in a disk tray. This identifier contains a unit constant (*u*), the unit number (*n*), the FRU constant (*ctr* for controller card, *pcu* for power and cooling unit, *1* for interconnect card, *d* for disk drive), and the FRU number (*n*).

TABLE C-2 FRU Identifiers

FRU	Identifier	Unit Number
Controller card	<i>unctr</i>	<i>n</i> = unit number (1, 2, ...)
Power and cooling unit	<i>unpcun</i>	<i>n</i> = unit number (1, 2, ...) <i>n</i> = pcu number (1, 2)
Interconnect card	<i>unln</i>	<i>n</i> = unit number (1, 2, ...) <i>n</i> = interconnect number (1, 2)
Disk drive	<i>undn</i>	<i>n</i> = unit number (1, 2, ...) <i>n</i> = disk drive number (1 to 9)

C.2 Reset Log Types

If the error level is set to Notice (2) or higher (Warning or Error), trace the reason for the reset through the syslog file.

TABLE C-3 Reset Log Types

Index	Type	Type Value	Description
0	Hardware	0x1000	User reset
1	Exception	0x2000	Exception
2	Assertion	0x3000	Software assertion
3	RAIDFail	0x4000	RAID fatal error
4	Takeover	0x5000	Takeover
5	pSOSFail	0x6000	pSOS fatal error
6	SysFail	0x7000	System error

TABLE C-4 Default System Files and Directories

Files and Directories	Description
/adm	Empty directory
/etc/hosts	Default hosts with comments on format of file
/etc/schd.conf	Battery Refresh File - Contents: BAT_CYC 7
/etc/syslog.conf	System Logging Configuration File
/web/elemprop.htm	Component Manager Req'd File
/web/encmap.htm	Component Manager Req'd File
/web/sysprop.htm	Component Manager Req'd File
/web/voloper.htm	Component Manager Req'd File
/web/snmp/t3.mib	SNMP Req'd File
/webgui	Contains old browser based admin files

C.3 Boot Messages

Boot messages can be extremely useful in troubleshooting situations. The following are examples of standard boot messages on T3 arrays having no failures. Typical boot messages for the T3 and T3+ workgroup and enterprise configurations appear below for reference.

This section consists of the following components:

- Section C.3.1, “Interpreting Boot Messages” on page C-4
 - Section C.3.1.1, “Boot Message Acronyms” on page C-4
 - Section C.3.1.2, “Boot Message Bracket Placement” on page C-5
 - Section C.3.1.3, “Detecting FC-AL Ports and Reporting Firmware Status” on page C-5
- Section C.3.2, “Examples of Boot Messages” on page C-7
 - Section C.3.2.1, “Sun StorEdge T3 Array Workgroup Configuration” on page C-7
 - Section C.3.2.2, “Sun StorEdge T3 Array Enterprise Configuration” on page C-9
 - Section C.3.2.3, “Sun StorEdge T3+ Array Workgroup Configuration” on page C-11
 - Section C.3.2.4, “Sun StorEdge T3+ Array Enterprise Configuration” on page C-13
 - Section C.3.2.5, “Sun StorEdge T3+ Array Enterprise Configuration as seen from the Alternate Master Controller” on page C-15

C.3.1 Interpreting Boot Messages

C.3.1.1 Boot Message Acronyms

The acronyms used in boot messages are given in TABLE C-5.

TABLE C-5 Boot Message Acronyms

Files and Directories	Explanation
XPT	Refers to the SCSI transport driver
QLCF	Refers to the QLogic Fibre Channel driver
ISP2x00	The intelligent SCSI processor used in the T3
ECC	The error checking and correcting mechanism used in the T3+ array controller

TABLE C-5 Boot Message Acronyms *(Continued)*

Files and Directories	Explanation
XOR	The exclusive OR logic operation used in RAID 5
PGR	This is the persistent group reservation information user that aexists when the T3 array is attached to a cluster
ALPA	The arbitrated loop physical address assigned to each device on a FC-AL loop

C.3.1.2 Boot Message Bracket Placement

The synonomous boot message lines shown below gives the field service engineer information about how and where they are connected to the T3 array:

```
Found units: [u1-ctr] u2-ctr
or
Found units: u1-ctr [u2-ctr]
```

The position of the brackets indicates which serial port is providing the output. Brackets around u1-ctr indicate that the boot messages are coming from the master controller's serial port. The field service engineer is using tip to connect to that controller's serial port. The same is true with u2-ctr.

C.3.1.3 Detecting FC-AL Ports and Reporting Firmware Status

Compare two sections of boot messages, one from the master controller and one from the alternate master controller:

```
Initializing loop 1 ISP2200 ... firmware status = 3
Detected 19 FC-AL ports on loop 1
Initializing loop 2 ISP2200 ... firmware status = 3
Detected 19 FC-AL ports on loop 2
and
Initializing loop 1 ISP2200 ... firmware status = 3
Detected 20 FC-AL ports on loop 1
Initializing loop 2 ISP2200 ... firmware status = 3
Detected 20 FC-AL ports on loop 2
```

These messages are generated by the ISP devices that service the back-end loops. They are polling the FC-AL loops for FC-AL devices. The first section of output from the master controller detects 19 FC-AL ports. The next section detects 20 FC-AL ports.

The missing port is actually the alternate master controller. It is missing because it has not completed its own boot process when the master controller polls FC-AL devices.

Once the alternate master boots, it also polls for FC-AL devices. Since the master controller and all the drives are already running, 20 (9 drives per T3 array, a master controller, and an alternate master controller) devices are found on the FC-AL loop at this time.

The firmware status codes generated during the boot cycle can be good indicators of internally detected system and configuration problems. TABLE C-6 specifies the firmware status codes that can be reported through a serial port console during a T3 boot cycle:

TABLE C-6 Firmware Status Boot Messages

Status	Explanation
firmware status = 0	ISP is waiting for configuration process to complete
firmware status = 1	ISP is waiting for ALPA assignment
firmware status = 2	ISP is waiting for port login
firmware status = 3	ISP is ready and optimal
firmware status = 4	ISP has lost loop synchronization
firmware status = 5	ISP has experienced an unrecoverable error
firmware status = 6	ISP re-initialization
firmware status = 7	ISP is not participating in the loop

If the firmware status given in either of these boot messages is not 3, a drive or other component in the array could be faulty. The number of devices found is important when trying to determine the failing device. For example, if only half of the devices are found, a loop card or loop cable could be faulty.

The following message is generated by the ISP that services the front-end or host loop. A status of 7 (not participating) does not necessarily indicate a problem. The attached host might not be running, and thus cannot respond to the T3 array.

```
Initializing host port u2p1 ISP2200 ... firmware status = 7
```


C.3.2 Examples of Boot Messages

C.3.2.1 Sun StorEdge T3 Array Workgroup Configuration

Starting...

```
T300-EP Release 2.10 1999/11/24 13:05:57 (129.150.28.80)
Copyright (C) 1997-1999 Sun Microsystems, Inc.
All Rights Reserved.
```

```
Found units: [ul-ctr]
auto boot is enabled
hit the RETURN key within 3 seconds to cancel...
Default master is 1
```

```
Assigning Select IDs: ul(1)
Loop A Configured as <1>
Loop B Configured as <1>
Disable CT Bypass LRC...
Initializing System Drivers...
Initializing XPT Component...
Initializing QLCF Component...
Initializing loop 1 ISP2100 ... firmware status = 3
Detected 10 FC-AL ports on loop 1
Initializing loop 2 ISP2100 ... firmware status = 3
Detected 10 FC-AL ports on loop 2
Initializing SVD Services...
Found (9) disks in the system...
Found 9 disks in U1...
Trying to boot from encid 1...
Booting from U1D1...
Executing ...
Starting...
```

```
T300 Release 1.16 2000/08/21 19:42:08 (129.150.28.80)
Copyright (C) 1997-2000 Sun Microsystems, Inc.
All Rights Reserved.
```

```
Initializing software...
Found units: [ul-ctr]
Default master is ul
Starting Heartbeats...
Assigning Select IDs: ul(1)
Initializing system drivers...
Initializing XPT component...
Initializing QLCF component...
Initializing loop 1 ISP2100 ... firmware status = 3
Detected 10 FC-AL ports on loop 1
Initializing loop 2 ISP2100 ... firmware status = 3
Detected 10 FC-AL ports on loop 2
Initializing QLCS component...
Initializing SVD services...
Cold Boot detected; initializing cache memory ...
Cache Mem Addr Toggle Test begin...
Cache Mem Addr Toggle Test complete... Passed
256 MBytes Cache Memory Detected
Testing CPU DRAM... Passed
Testing ISP2100... Passed
Testing Cache memory... Passed
Testing XOR Memory... Passed
Initializing system DB structure...
Initializing configuration...
Initializing port configuration...
Initializing loop 2 to accept SCSI commands...
Mounting root volume...
Checking local file system...
Initializing network routes...
Starting Syslog Daemon...
System has 1 active controller(s)
Initializing TFTP...
Starting ftpd...
Starting telnetd...
Starting timed...
Starting pshd...
Starting httpd...
Starting snmpd...
Starting schd...
Checking disk positions...
Initializing host port ulp1 ISP2100 ... firmware status = 7
Host port ulp1 TARGET_ID = 0xffff (ALPA = 0x7c)
Starting psh...
```

Login:

C.3.2.2 Sun StorEdge T3 Array Enterprise Configuration

Starting...

T300-EP Release 2.10 1999/11/24 13:05:57 (129.150.28.80)
Copyright (C) 1997-1999 Sun Microsystems, Inc.
All Rights Reserved.

Found units: [u1-ctr] u2-ctr
auto boot is enabled
hit the RETURN key within 3 seconds to cancel...
Default master is 1
Default alternate master is 2

Assigning Select IDs: u1(1) u2(2)
Loop A Configured as <12>
Loop B Configured as <12>
Disable CT Bypass LRC...
Initializing System Drivers...
Initializing XPT Component...
Initializing QLCF Component...
Initializing loop 1 ISP2100 ... firmware status = 3
Detected 19 FC-AL ports on loop 1
Initializing loop 2 ISP2100 ... firmware status = 3
Detected 19 FC-AL ports on loop 2
Initializing SVD Services...
Found (18) disks in the system...
Found 9 disks in U1...
Found 9 disks in U2...
Trying to boot from encid 1...
Booting from U1D1...
Executing ...
Starting...

T300 Release 1.16 2000/08/21 19:42:08 (129.150.28.80)
Copyright (C) 1997-2000 Sun Microsystems, Inc.
All Rights Reserved.

```
Initializing software...
Found units: [u1-ctr] u2-ctr
Default master is u1
Default alternate master is u2
Alternate Master is not active; boot up as Master
Starting Heartbeats...
Assigning Select IDs: u1(1) u2(2)
Initializing system drivers...
Initializing XPT component...
Initializing QLCF component...
Initializing loop 1 ISP2100 ... firmware status = 3
Detected 19 FC-AL ports on loop 1
Initializing loop 2 ISP2100 ... firmware status = 3
Detected 19 FC-AL ports on loop 2
Initializing QLCS component...
Initializing SVD services...
Cold Boot detected; initializing cache memory ...
Cache Mem Addr Toggle Test begin...
Cache Mem Addr Toggle Test complete... Passed
256 MBytes Cache Memory Detected
Testing CPU DRAM... Passed
Testing ISP2100... Passed
Testing Cache memory... Passed
Testing XOR Memory... Passed
Initializing system DB structure...
Initializing configuration...
Initializing port configuration...
Initializing loop 2 to accept SCSI commands...
Mounting root volume...
Checking local file system...
Initializing network routes...
Starting Syslog Daemon...
Waiting for 1 slave controller(s) to come up...
u1: Configuring local data
u2: Initializing drives
u2: Configuring local data
u2: Waiting for configuration data from master
System has 2 active controller(s)
Initializing TFTP...
Starting ftpd...
Starting telnetd...
Starting timed...
Starting pshd...
Starting httpd...
Starting snmpd...
Starting schd...
Checking disk positions...
```

```
Initializing host port ulp1 ISP2100 ... firmware status = 7
Host port ulp1 TARGET_ID = 0xffff (ALPA = 0x7c)
Starting psh...
```

Login:

C.3.2.3 Sun StorEdge T3+ Array Workgroup Configuration

```
T3B-2
Starting POST
.....
POST end
```

Starting...

```
T3B-EP Release 2.00 2001/03/26 16:33:52 (129.150.28.81)
Copyright (C) 1997-2001 Sun Microsystems, Inc.
All Rights Reserved.
```

```
Found units: [ul-ctr]
auto boot is enabled
hit the RETURN key within 3 seconds to cancel...
```

Starting...

```
T3B Release 2.00 2001/04/02 15:21:29 (129.150.28.81)
Copyright (C) 1997-2001 Sun Microsystems, Inc.
All Rights Reserved.
```

```
Initializing software...
Found units: [ul-ctr]
Default master is ul
Starting Heartbeats...
Assigning Select IDs: ul(1)
Initializing system drivers...
Initializing XPT component...
```

```
Initializing QLCF component...
Initializing loop 1 ISP2200 ... firmware status = 3
Detected 10 FC-AL ports on loop 1
Initializing loop 2 ISP2200 ... firmware status = 3
Detected 10 FC-AL ports on loop 2
Initializing SVD services...
Detected data cache size in system: 1GB
Testing ISP2200... Passed
Testing ECC mechanism... Passed
Testing XOR functions and datapaths... Passed
Cold Boot detected; destructive tests OK...
Testing data cache memory... Passed
Initializing Cache Memory...
Initializing system DB structure...
Initializing configuration...
Initializing port configuration...
Initializing loop 2 to accept SCSI commands...
Mounting root volume...
Checking local file system...
Initializing network routes...
Read PGR data ... Done.
Starting Syslog Daemon...
System has 1 active controller(s)
Initializing TFTP...
Starting ftpd...
Starting telnetd...
Starting timed...
Starting pshd...
Starting httpd...
Starting snmpd...
Starting schd...
Checking disk positions...
Initializing host port ulp1 ISP2200 ... firmware status = 7
Host port ulp1 TARGET_ID = 0xffff (ALPA = 0x5)
Starting psh...
```

Login:

C.3.2.4 Sun StorEdge T3+ Array Enterprise Configuration

```
T3B-2
Starting POST
.....
POST end
```

Starting...

```
T3B-EP Release 2.00 2001/03/26 16:33:52 (129.150.28.80)
Copyright (C) 1997-2001 Sun Microsystems, Inc.
All Rights Reserved.
```

```
Found units: [ul-ctr] u2-ctr
auto boot is enabled
hit the RETURN key within 3 seconds to cancel...
```

Starting...

```
T3B Release 2.00 2001/04/02 15:21:29 (129.150.28.80)
Copyright (C) 1997-2001 Sun Microsystems, Inc.
All Rights Reserved.
```

```
Initializing software...
Found units: [ul-ctr] u2-ctr
Default master is ul
Default alternate master is u2
Master coming up...
Starting Heartbeats...
Assigning Select IDs: ul(1) u2(2)
Initializing system drivers...
Initializing XPT component...
Initializing QLCF component...
Initializing loop 1 ISP2200 ... firmware status = 3
Detected 19 FC-AL ports on loop 1
Initializing loop 2 ISP2200 ... firmware status = 3
Detected 19 FC-AL ports on loop 2
Initializing SVD services...
```

```
Detected data cache size in system: 1GB
Testing ISP2200... Passed
Testing ECC mechanism... Passed
Testing XOR functions and datapaths... Passed
Cold Boot detected; destructive tests OK...
Testing data cache memory... Passed
Initializing Cache Memory...
Initializing system DB structure...
Initializing configuration...
Initializing port configuration...
Initializing loop 2 to accept SCSI commands...
Mounting root volume...
Checking local file system...
Initializing network routes...
Read PGR data ... Done.
Starting Syslog Daemon...
Waiting for 1 slave controller(s) to come up...
u1: Configuring local data
u2: Initializing drives
System has 1 active controller(s)
Initializing TFTP...
Starting ftpd...
Starting telnetd...
Starting timed...
Starting pshd...
Starting httpd...
Starting snmpd...
Starting schd...
Checking disk positions...
Initializing host port ulp1 ISP2200 ... firmware status = 7
Host port ulp1 TARGET_ID = 0xffff (ALPA = 0x5)
Starting psh...
```

Login:

C.3.2.5 Sun StorEdge T3+ Array Enterprise Configuration as seen from the Alternate Master Controller

```
T3B-2
Starting POST
.....
POST end
```

Starting...

```
T3B-EP Release 2.00 2001/03/26 16:33:52 (129.150.28.80)
Copyright (C) 1997-2001 Sun Microsystems, Inc.
All Rights Reserved.
```

```
Found units: u1-ctr [u2-ctr]
auto boot is enabled
hit the RETURN key within 3 seconds to cancel...
```

Starting...

```
T3B Release 2.00 2001/04/02 15:21:29 (129.150.28.80)
Copyright (C) 1997-2001 Sun Microsystems, Inc.
All Rights Reserved.
```

```
Initializing software...
Found units: u1-ctr [u2-ctr]
Default master is u1
Default alternate master is u2
Waiting for Master to come up...
Starting Heartbeats...
Initializing system drivers...
Initializing XPT component...
Initializing QLCF component...
Initializing loop 1 ISP2200 ... firmware status = 3
Detected 20 FC-AL ports on loop 1
Initializing loop 2 ISP2200 ... firmware status = 3
Detected 20 FC-AL ports on loop 2
Initializing SVD services...
```

```
Detected data cache size in system: 1GB
Testing ISP2200... Passed
Testing ECC mechanism... Passed
Testing XOR functions and datapaths... Passed
Cold Boot detected; destructive tests OK...
Testing data cache memory... Passed
Initializing Cache Memory...
Initializing loop 2 to accept SCSI commands...
Starting Syslog Daemon...
Waiting for configuration data from master...
Initializing host port u2p1 ISP2200 ... firmware status = 7
Host port u2p1 TARGET_ID = 0xffff (ALPA = 0x5)
Starting psh...
```

Login:

Sun StorEdge T3 Array System Commands

This appendix lists the commands supported by the Sun StorEdge T3 and T3+ array and is divided into the following sections:

- Section D.1, “Commands List” on page D-1
- Section D.2, “FRU Identifiers” on page D-3

D.1 Commands List

To view the available command-line interface (CLI) commands on the array, type `help` at the prompt.

```
:/:<184>help
arp      cat      cd       cmp      cp       date     echo     head
help     ls       mkdir    mv       ping     pwd      rm       rmdir
tail     touch
boot     disable disk    enable  fru      id       logger  lpc
more     passwd  port     proc     reset   set      shutdown
sync     sys     tzset    ver      vol     ep       refresh route
ofdg
```

To display command syntax, use the *command-name* `help` command. For example, for information on the `reset` command, type:

```
:/:<1> reset help
usage:  reset [ -y ]
```

TABLE D-1 contains an alphabetical listing of the CLI commands supported by the array.

See the *Sun StorEdge T3 and T3+ Array Administrator's Guide* for a detailed description of each command's syntax, options, and arguments.

TABLE D-1 Commands Listed in Alphabetical Order

Command	Description
boot	Boot system
disable	Disable certain FRUs
disk	Disk administration
enable	Enable certain FRUs
ep	Program the flash EPROM
fru	Display the FRU information
help	Display reference manual pages
id	Display FRU identification summary
logger	Generate messages to the <code>syslog</code> in the unit; dump the reset log and display system crash information
lpc	Get interconnect card property
port	Configure the interface port
proc	Displays status of outstanding <code>vol</code> processes
refresh	Start/stop battery refreshing or display its status
reset	Reset system
set	Display or modify the set information
shutdown	Shut down array or partner group
sys	Display or modify the system information
ver	Display software version
vol	Display or modify the volume information

D.2 FRU Identifiers

Many commands use a FRU identifier to refer to a particular FRU in a array. This identifier contains a unit constant (*u*), the unit number (*encid*), the FRU constant (*ctr* for controller card, *pcu* for power and cooling unit, *1* for interconnect card, *d* for disk drive) and the FRU number (*n*). TABLE D-2 lists the possible FRU variables as they appear in this appendix

TABLE D-2 FRU Identifiers

FRU	Identifier	Unit number
Controller card	<i>uencidctr</i>	<i>encid</i> = unit number (1, 2, ...)
Power and cooling unit	<i>uencidpcu</i> [1 2]	<i>encid</i> = unit number (1, 2, ...) <i>n</i> = pcu number (1, 2)
Interconnect card	<i>uencid1</i> [1 2]	<i>encid</i> = unit number (1, 2, ...) <i>n</i> = interconnect card number (1, 2)
Disk drive	<i>uencidn</i>	<i>encid</i> = unit number (1, 2, ...) <i>n</i> = disk drive number (1 to 9)

FC-AL Loop Identifiers

This Appendix lists the FC-AL loop identifies by AL_PA (hex), Switch (hex) and Setting (decimal) values.

The values are listed from lowest to highest priority. The AL_PA value of 00 is reserved for an FL_PORT. The value -- is not available.

TABLE E-1 Assigned Loop Identifier

AL_PA (hex)	Switch (hex)	Setting (dec)	AL_PA (hex)	Switch (hex)	Setting (dec)	AL_PA (hex)	Switch (hex)	Setting (dec)
EF	00	2	9F	2C	44	4B	58	88
E8	01	1	9E	2D	45	4A	59	89
E4	02	2	9D	2E	46	49	5A	90
E2	03	3	9B	2F	47	47	5B	91
E1	04	4	98	30	48	46	5C	92
E0	05	5	97	31	49	45	5D	93
DC	06	6	90	32	50	43	5E	94
DA	07	7	8F	33	51	3C	5F	95
D9	08	8	88	34	52	3A	60	96
D6	09	9	84	35	53	39	61	97
D5	0A	10	82	36	54	36	62	98
D4	0B	11	81	37	55	35	63	99
D3	0C	12	80	38	56	34	64	100
D2	0D	13	7C	39	57	33	65	101
D1	0E	14	7A	3A	58	32	66	102
CE	0F	15	79	3B	59	31	67	103

TABLE E-1 Assigned Loop Identifier (Continued)

AL_PA (hex)	Switch (hex)	Setting (dec)	AL_PA (hex)	Switch (hex)	Setting (dec)	AL_PA (hex)	Switch (hex)	Setting (dec)
CD	10	16	76	3C	60	2E	68	104
CC	11	17	75	3D	61	2D	69	105
CB	12	18	74	3E	62	2C	6A	106
CA	13	19	73	3F	63	2B	6B	107
C9	14	20	72	40	64	2A	6C	108
C7	15	21	71	41	65	29	6D	109
C6	16	22	6E	42	66	27	6E	110
C5	17	23	6D	43	67	26	6F	111
C3	18	24	6C	44	68	25	70	112
BC	19	25	6B	45	69	23	71	113
BA	1A	26	6A	46	70	1F	72	114
B9	1B	27	69	47	71	1E	73	115
B6	1C	28	67	48	72	1D	74	116
B5	1D	29	66	49	73	1B	75	117
B4	1E	30	65	4A	74	18	76	118
B3	1F	31	63	4B	75	17	77	119
B2	20	32	5C	4C	76	10	78	120
B1	21	33	5A	4D	77	0F	79	121
AE	22	34	59	4E	78	08	7A	122
AD	23	35	56	4F	79	04	7B	123
AC	24	36	55	50	80	02	7C	124
AB	25	37	54	51	81	01	7D	125
AA	26	38	53	52	82			
A9	27	39	52	53	83	00	7E	126
A7	28	40	51	54	84	--	7F	127
A6	29	41	4E	55	85			
A5	2A	42	4D	56	86			
A3	2B	43	4C	57	87			

Sun StorEdge T3 Array Configuration Worksheets

This chapter contains a blank worksheet for the qualified service provider to make notes at each customer site and contains the following sections:

- Section F.1, “Worksheets” on page F-1
- Section F.2, “System Information Worksheets” on page F-2

F.1 Worksheets

The following information is required to successfully troubleshoot a Sun StorEdge T3 and T3+ array.

Use this worksheet to access the data, Ethernet, and TFTP connections from the application, management, and TFTP host system(s). The application, management, and TFTP host can all be resident on the same server.

Supervisor access is required for all hosts during troubleshooting.

Host types are defined as the following:

Application host	The application host utilizes the FC-AL connection as a data path to and from the Sun StorEdge T3 and T3+ array.
Management host	The management host administers configuration and health monitoring of the Sun StorEdge T3 and T3+ array, through a network connection.
TFTP host	The TFTP host is used to download bootcode to the Sun StorEdge T3 and T3+ array, through a network connection.

F.2 System Information Worksheets

The following information should be documented before troubleshooting any Sun StorEdge T3 and T3+ array. Make copies of this blank form, and complete it for each Sun StorEdge T3 and T3+ array.

TABLE F-1 Sun StorEdge T3 and T3+ array Information Worksheet

	Management Host	Application Host	TFTP Host
Host ID			
Host name			
Host IP address			
Gateway IP address			
Sun StorEdge T3 IP address			
Sun StorEdge T3 array name			
TFTP host address			
OS/patch revision level			
VERITAS DMP release			
Primary application			
Sun StorTools release			
Component Manager release			

TABLE F-1 Sun StorEdge T3 and T3+ array Information Worksheet *(Continued)*

	Management Host	Application Host	TFTP Host
--	-----------------	------------------	-----------

Legend:

Required Field	
Optional Field	
Not Applicable	

Glossary

A

- administrative domain** Partner groups (interconnected controller units) that share common administration through a master controller.
- alternate master unit** The secondary array unit in a partner group that provides failover capability from the master unit.
- alternate pathing (AP)** A mechanism that reroutes data to the other array controller in a partner group upon failure in the host data path. Alternate pathing requires special software to perform this function.
- auto cache mode** The default cache mode for the Sun StorEdge T3 array. In a fully redundant configuration, cache is set to write-behind mode. In a nonredundant configuration, cache is set to write-through. Read caching is always performed.
- auto disable** The Sun StorEdge T3 array default that automatically disables a disk drive that has failed.
- auto reconstruction** The Sun StorEdge T3 array default that automatically reconstructs data onto a new disk drive from one of the other drives.

B

- buffering** The process of data transfer between the host and the drives.

C

**command-line interface
(CLI)**

The interface between the Sun StorEdge T3 array's pSOS operating system and the user in which the user types commands to administer the array.

controller unit

A Sun StorEdge T3 array that includes a controller card. It can be use as a standalone unit or configured with other Sun StorEdge T3 arrays.

E

expansion unit

A Sun StorEdge T3 array without a controller card. It must be connected to a Sun StorEdge T3 array to be operational.

**erasable programmable
read-only memory
(EPROM)**

Memory stored on the controller card; useful for stable storage for long periods without electricity while still allowing reprogramming.

F

**Fibre Channel-
Arbitrated Loop
(FC-AL)**

A 100 MB/sec serial channel, which allows connection of multiple devices (disk drives and controllers).

**field-replaceable unit
(FRU)**

A component that is easily removed and replaced by a field service engineer or a system administrator.

G

**gigabit interface
converter (GBIC)**

An adapter used on an SBus card to convert fiber-optic signal to copper.

gigabyte (GB or Gbyte) One gigabyte is equal to one billion bytes (1x10⁹).

graphical user interface (GUI) A software interface that enables configuration and administration of the Sun StorEdge T3 array using a graphic application.

H

hot spare A drive in a RAID 1 or RAID 5 configuration that contains no data and acts as a standby in case another drive fails.

hot-swap The characteristic of a field-replaceable unit (FRU) to be removed and replaced while the system remains powered on and operational.

I

input/output operations per second (IOPS) A performance measurement of the transaction rate.

interconnect cable An FC-AL cable with a unique switched loop architecture that is used to interconnect multiple Sun StorEdge T3 arrays. Sometimes referred to as a *loop cable*.

interconnect card A array component that contains the interface circuitry and two connectors for interconnecting multiple Sun StorEdge T3 array units. Sometimes referred to as a *loop card*.

L

light emitting diode (LED) A device that converts electrical energy into light that is used to display activity.

logical unit number (LUN) One or more drives that can be grouped into a unit; also called a *volume*.

loop cable Interconnect cable.

loop card Interconnect card.

M

master unit	The main controller unit in a partner group configuration.
media access control (MAC) address	A unique address that identifies a storage location or a device.
media interface adapter (MIA)	An adapter that converts fiber-optic light signals to copper.
megabyte (MB or Mbyte)	One megabyte is equal to one million bytes (1x10 ⁶).
megabytes per second (MB/sec)	A performance measurement of the sustained data transfer rate.

P

parity	Additional information stored with data on a disk that enables the controller to rebuild data after a drive failure.
partner group	A pair of interconnected controller units. Expansion units interconnected to the pair of controller units can also be part of the partner group.
power and cooling unit	A FRU component in the Sun StorEdge T3 array. The unit contains a power supply, cooling fans, and an integrated UPS battery. A Sun StorEdge T3 array contains two power and cooling units.
pSOS	A real-time operating system used as the primary operating system for the Sun StorEdge T3 array.

R

read caching	Data for future retrieval, to reduce disk I/O as much as possible.
reliability, availability, serviceability (RAS)	Product features that include high availability, easily serviced components that are very dependable.

**redundant array of
independent disks
(RAID)**

A configuration in which multiple drives are combined into a single virtual drive, to improve performance and reliability.

S

**Simple Network
Management Protocol
(SNMP)**

A protocol for remotely managing a computer network.

**synchronous dynamic
random access memory
(SDRAM)**

A form of dynamic random access memory (DRAM) that can run at higher clock speeds than conventional DRAM.

system area

Located on the disk drive label, the space that contains configuration data, boot firmware, and file system information.

U

**uninterruptable power
source (UPS)**

A component within the power and cooling unit. The UPS supplies power from a battery in the case of an AC power failure.

**unit interconnect card
(UIC)**

See Interconnect Card.

V

volume

Also called a logical unit number (LUN), a volume is one or more drives that can be grouped into a unit for data storage.

W

write caching Data used to build up stripes of data, eliminating the read-modify-write overhead. Write caching improves performance for applications that are writing to disk.

Index

SYMBOLS

.boot -c command, 5-17
.disk linkstat command, 8-8, 8-15
.disk pathstat command, 8-7
.loop stat command, 8-6
/etc/ethers file, 9-7
/etc/hosts file, 2-10, 9-7
/etc/inetd.conf file, 2-9
/etc/nsswitch.conf file, 9-7
/etc/sched.conf file, 7-9
/etc/syslog.conf file, 2-10
/tftpboot directory, 5-16
/usr/sbin/in.rarpd daemon, 9-7
/var/adm/messages file, 1-2

NUMERICS

0X2202 error code, 5-15

A

APATH, 8-8
Assertion (reset log type), C-3
auto boot, 2-3

B

back-end loop *see* loop problems
batteries, 7-6
 /etc/sched.conf file, 7-9
 checking, 7-7

 id read command, 7-7
 maintenance, 7-8
 not fully charged, 7-7
 refresh cycle, 7-8
 refresh -s command, 7-8
 removing and replacing, 7-10
 service life, 7-9
blocksize, B-2
boot
 auto, 2-3
 commands, 2-3
 defaults, B-1
 how to, 3-12
 -i option, 2-8
 mode, 2-6
 tftp, 2-6
 tftp server, 2-9
boot -i command, 5-18
bootcode file, 5-18
bootdelay, B-1
bootmode, B-1

C

cable assemblies, A-9
cabled partner group, 10-7
cache, B-2
cache memsize, B-3
chassis *see* midplane, 9-1
check revisions selection, 3-19
commands
 descriptions of, D-1
 See Also individual commands

- Component Manager, 1-4
- connecting the cables
 - interconnect cables, 10-6
- controller cards, A-7
 - enabling/disabling, 8-22
 - firmware upgrade, 4-5
 - LEDs, 4-1
 - replacing, 4-4, 8-22
 - upgrading EPROM, 4-6
- CPATH, 8-8

D

- data, 10-14
- data parity, checking, 5-4
- device not mounted message, 3-13
- diagnosing problems *see* troubleshooting
- disk array *see* Sun StorEdge T3 disk tray
- disk download command, 5-14
- disk drives
 - assembly, A-8
 - corrupted labels, 5-15
 - firmware, 5-13
 - hot spare, 5-3
 - label corruption, 5-15
 - LEDs, 5-6
 - monitoring, 5-1
 - rebuilding, 5-11
 - removing and replacing, 5-7
 - repair, 5-7
 - status, 5-2
 - status codes, 5-2
 - status messages, 5-2
 - upgrading firmware, 5-13
- disk labels, corruption of, 5-15
- .disk linkstat command, 8-8, 8-15
- .disk pathstat command, 8-7
- disk tray *see* Sun StorEdge T3 disk tray
- disk tray settings, 10-1
- door assembly, A-4
- dot commands, 8-1

E

- ep download command, 4-7
- EPROM, 2-3, 4-6
- error (message type), C-2

- Error (severity level), 1-3
- error code = 0X2202, 5-15
- error messages *see* messages
- Exception (reset log type), C-3

F

- fail over, determining, 3-14
- FAIL_POLICY, 8-8
- failed FRU status, 8-1
- FC-AL loop identifiers, E-1
- FC-AL loop problems *see* loop problems
- file system in uldl is BAD, 5-15
- firmware
 - controller, 3-17
 - disk drive, 3-17
 - EPROM, 3-17
 - interconnect card, 3-17
 - level, 3-15
 - upgrading, 4-5, 4-6, 5-13, 6-5
 - verifying level, 3-17
- FLASH memory device, 4-6
- flow charts, 3-3
- FMD *see* FLASH memory device
- format command, 3-8
- format utility, 3-9
- front panel, replacing, 5-8
- FRU identifiers, 1-3, D-3
- fru list command, 3-17, 5-10
- fru myuid command, 3-13
- fru stat command, 3-18, 5-12, 8-5
- ftp, 2-5

G

- gateway, B-1

H

- hardware (reset log type), C-3
- host-generated messages, 1-2
- hostname, B-2
- hosts file, 2-10
- hot spare
 - checking, 5-3

I

- id read command, 7-7
- inetd.conf file, 2-9
- information (message type), C-2
- Information (severity level), 1-3
- init, B-3
- initcheck command, 3-19
- installation
 - setting the IP address, 10-8
- interconnect assemblies, A-9
- interconnect cable
 - connection, 10-6
- interconnect cards, D-2, D-3
 - assembly, A-5
 - firmware, 6-5
 - FRU identifiers, D-3
 - LEDs, 6-2
 - removing and replacing, 6-3
 - upgrading firmware, 6-5
- iostat output, 8-12
- ip, B-1

L

- LAC_Reserve, 8-19
- lbf, 3-19
- LEDs
 - controller cards, 4-1
 - interconnect cards, 6-2
 - power and cooling unit, 7-3
- local volume can not be fixed, 5-15
- logging (remote), 2-10
- logical unit numbers *see* LUNs, 1-1
- loglevel, B-2
- logto, B-2
- .loop stat command, 8-6
- loop identifiers, E-1
- loop problems, 8-1
 - baseline data, 8-12
 - Component Manager indicators, 8-13
 - diagnosis, 8-2, 8-10
 - error messages, 8-14
 - indicators, 8-10
 - normal status, 8-2
 - Product Watch messages, 8-13
 - repair procedures, 8-2, 8-21
 - syslog file, 8-13
- lpc command, 6-5

- LUNs, 1-1

M

- mac, B-2
- MAC addresses
 - location, 3-20, 9-3, 9-6
- memsize, B-3
- messages
 - syntax, 1-3, C-1
 - types, C-2
- midplane, 9-1
 - /etc/ethers file, 9-7
 - /etc/hosts, 9-7
 - /etc/nsswitch.conf, 9-7
 - disk positions, 9-5
 - MAC address, 9-6
 - partner groups, 9-2, 9-6
 - replacement, 9-2
- mirror, B-2
- model, B-2
- mp_support, B-2

N

- netmask, B-1
- notice (message type), C-2
- Notice (severity level), 1-3
- notice message *see* messages
- nsswitch.conf file, 9-7

O

- ofdg utility, 8-16, 8-23
 - Component Manager, 8-23
 - example, 8-23
 - fast_find option, 8-17, 8-19
 - find option, 8-19
 - go/no-go, 8-17
 - health_check option, 8-18
 - http polling, 8-23
 - LUN assignments, 8-16
 - options, 8-16
 - requirements, 8-16
- off-line diagnostics *see* ofdg utility

- P**
- partner group, 1-1
 - fully cabled, 10-7
 - PATH_POLICY, 8-8
 - PCI FC-100 host board adapters, 3-19
 - PCU *see* power and cooling unit
 - port command, B-3
 - port list command, 3-15
 - port listmap command, 8-6
 - power and cooling unit, 7-1, A-6
 - LEDs, 7-2, 7-3
 - removing and replacing, 7-4
 - PPATH, 8-8
 - proc list command, 5-11, 8-28
 - Product Watch messages, 8-13
 - pSOSFail (reset log type), C-3
- R**
- RAID controller *see* controller cards
 - RAID volumes, 1-1
 - RAIDFail (reset log type), C-3
 - rarp, B-2
 - RARP daemon, 9-7
 - rd_ahead, B-2
 - recon_rate, B-3
 - refresh -s command, 7-8
 - remote logging, 2-10
 - reset log types, C-3
 - reset -y command, 5-15, 5-18
 - revision, B-2
- S**
- Safety Agency Compliance statements
 - French, x
 - German, viii
 - Spanish, xi
 - SCSI Disk Error Occurred, 8-14
 - scsi inquiry command, 3-10
 - scsi inquiry output, 3-11
 - scsi menu, 3-10
 - SCSI Parity Error, 8-14
 - serial number location, 3-20, 9-3, 9-6
 - set bootmode command, 5-17, 5-18
 - set command, B-1
 - set tftpfile command, 5-16
 - set tftphost command, 5-16
 - setting the IP address, 10-8
 - shell prompts, xxviii
 - shutdown command, 9-2
 - Simple Network Management Protocol, 2-10
 - sn, B-1
 - SNMP, 2-10
 - static electricity, 1-5
 - status codes, 5-2
 - StorTools, 1-4
 - Sun Documentation Online, xxx
 - Sun StorEdge T3 disk tray
 - boot defaults, B-1
 - cable assemblies, A-9
 - commands, 2-4
 - controller cards, A-7
 - default directories, B-4
 - default settings, 10-1
 - disk tray, A-2
 - disks & drives, 5-1
 - door assembly, A-4
 - drive assemblies, A-8
 - FC-AL, 8-2
 - files, B-4
 - FTP connection, 2-5
 - interconnect assemblies, A-9
 - interconnect cards, 6-1, A-5
 - overview, 1-1
 - parts, A-1
 - remote logging, 2-10
 - serial connection, 2-1
 - system defaults, B-1
 - Telnet connection, 2-3
 - tftp booting, 2-6
 - troubleshooting, 3-1
 - troubleshooting introduction, 1-1
 - worksheets, F-1
 - SunSolve web site, 3-15
 - sys command, 3-14
 - sys stat command, 3-14
 - SysFail (reset log type), C-3
 - syslog daemon, 1-2
 - syslog file, 2-1, 8-13
 - syslog.conf file, 2-10
 - system
 - defaults, B-2
 - remote logging, 2-10
 - verifying firmware level, 3-15
 - System generated messages, 1-2

T

- Takeover (reset log type), C-3
- telnet command, 2-4, 5-1, 5-11
 - master vs alternate controller, 8-9
- Telnet connection, 2-3
- tftp command, 5-16
- tftp filename, 2-7
- tftpboot command, 2-6, 2-9, 5-16
- tftpfile, 5-16, B-2
- tftphost, 5-16, B-1
- tip command, 2-2
- tools, troubleshooting, 3-1
- troubleshooting, 3-1
 - flow charts, 3-3
 - info sources, 3-1
 - initial steps, 3-7
 - tools, 3-1
- typographic conventions, xxviii

U

- UPS battery *see* batteries

V

- vendor, B-2
- vendor ID field, B-3
- ver command, 3-17
- verify, B-3
- verify volume fails on uldl, 5-15
- verifying firmware level, 3-17
- vol command
 - adding a volume, 10-13
 - checking data parity, 5-4
 - initializing volumes, 10-14
 - mounting volume, 10-14
 - rebuilding a replaced FRU, 5-11
 - verify subcommand, 5-4
- vol disable command, 8-27
- vol list command, 5-3
- vol mode command, 8-6
- vol mount command, 5-15
- vol recon command, 5-11, 8-28
- vol stat command, 5-2
- vol unmount command, 5-14
- vol verify command, 5-4
- volume

- defaults, B-3
- initializing, 10-14
- mounting, 10-14
- volume WWN, 9-8
- volumes
 - disabling, 8-27
 - mounting, 8-28
 - reconstruction of, 8-28
 - unmounting, 5-13, 8-24

W

- warning (message type), C-2
- Warning (severity level), 1-3
- web site (SunSolve), 3-15
- worksheets, F-1
- WWN, 9-8

