Sun Enterprise 220R Server
Service Manual

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Contents

Declaration of Conformity

Compliance ID: E220R

Sun Razor Server

This product has been tested and complies with the following rules and requirements.

EMC

USA—FCC Class A

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.

European Union—EC

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

EN55022/CISPR22 (1985)		Class A	Curtis-Straus LLC.
			Report No: E990551-1
EN50082-1	IEC801-2 (1991)	8 kV (Direct), 15kV (Air)	
	IEC801-3 (1984)	10 V/m, 80% AM at 1KHz	
	IEC801-4 (1988)	4.0 kV Power Lines, 1 kV Signal Lines	
	IEC801-5	2 kV Power Lines (L-L, L-G)	
		1 kV Signal Lines (L-G, Shield-G)	
EN61000-3-2/IEC1000-3-2 (1994)		Pass	

Safety

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

EC Type Examination Certificates:	
EN60950/IEC950 (1993)	TUV Rheinland Certificate No: pending
EN60950 w/ Nordic Deviations	CB Scheme Certificate No: pending

Supplementary Information

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

[signatures]

Burt Hemp   June   John Shades   June
30th, 1999   30th, 1999

Manager, Power and Compliance   Quality Assurance Manager
Engineering

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Regulatory Compliance Statements

Your Sun product is marked to indicate its compliance class:

■ Federal Communications Commission (FCC) — USA

■ Department of Communications (DOC) — Canada

■ Voluntary Control Council for Interference (VCCI) — Japan

■ 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.

DOC Class A Notice - Avis DOC, Classe A

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

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

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。

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。

Safety Agency Compliance Statements

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

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

Lithium Battery

Caution – On Sun CPU boards, there is a lithium battery molded into the real-time clock, SGS No. MK48T59Y, MK48TXXB-XX, MK48T18-XXXPCZ, M48T59W-XXXPCZ, 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 sealed lead acid battery in Product Name units. Portable Energy Products No. TLC02V50. There is danger of explosion if the battery pack is mishandled or incorrectly replaced. Replace only with the same type of Sun Microsystems battery pack. 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.

Class 1 Laser Product
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⚠ **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 dreiadrigen Netzkabel für geerdete Netzsteckdosen geliefert. Um die Gefahr eines Stromschlags zu reduzieren, schließen Sie das Kabel nur an eine fachgerecht verlegte, geerdete Steckdose an.

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

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

Lithiumbatterie

Achtung – CPU-Karten von Sun verfügen über eine Echtzeituhr mit integrierter Lithiumbatterie (Teile-Nr. MK48T59Y, MK48TXXB-XX, MK48T18-XXXPCZ, M48T59W-XXXPCZ, 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 wiederaufzuladen.

Batterien

Achtung – Die Geräte Product Name enthalten auslaufsichere Bleiakkumulatoren. Produkt-Nr. TLC02V50 für portable Stromversorgung. Werden bei der Behandlung oder beim Austausch der Batterie Fehler gemacht, besteht Explosionsgefahr. Batterie nur gegen Batterien gleichen Typs von Sun Microsystems austauschen. Nicht demontieren und nicht versuchen, die Batterie außerhalb des Geräts zu laden. Batterie nicht ins Feuer werfen. Ordnungsgemäß entsprechend den vor Ort geltenden Vorschriften entsorgen.

Gehäuseabdeckung

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

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

Einhaltung der Richtlinien für Laser

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

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⚠ **Warnung** – Die Verwendung von anderen Steuerungen und Einstellungen oder die Durchfhrung von Prozeduren, die von den hier beschriebenen abweichen, knnen gefhrliche 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** – Vot re 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: – le commutateur d'alimentation de ce produit fonctionne comme un dispositif de mise en veille uniquement. C'est la prise d'alimentation qui sert à mettre le produit hors tension. Veillez donc à installer le produit à proximité d'une prise murale facilement accessible. Ne connectez pas la prise d'alimentation lorsque le châssis du système n'est plus alimenté.

Batterie au lithium

Attention: – sur les cartes CPU Sun, une batterie au lithium (référence MK48T59Y, MK48TXXB-XX, MK48T18-XXXPCZ, M48T59W-XXXPCZ, 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:** – Les unités Product Name contiennent une batterie étanche au plomb (produits énergétiques portatifs ñTLC02V50). Il existe un risque d'explosion si ce bloc-batterie est manipulé de façon erronée ou mal mis en place. Ne remplacez ce bloc que par un bloc-batterie Sun Microsystems du même type. Ne le démontez pas et n'essayez pas de le recharger hors du système. Ne faites pas brûler la batterie mais mettez-la au rebut conformément aux réglementations locales en vigueur.

Couvercle

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

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

Conformité aux certifications Laser

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

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$\triangle$	**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 todas los avisos e instrucciones marcados en el equipo.

- Asegúrese de que el voltaje y la frecuencia de la red eléctrica concuerdan con las descritas en las etiquetas de especificaciones eléctricas del equipo.

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

Símbolos

En este libro aparecen los siguientes símbolos:

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

$\triangle$	**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 sobrecalentamien-tos 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, Parte 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 del que se dispone en su edificio.

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

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

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

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

Batería de litio

⚠️ **Precaución** – En las placas de CPU Sun hay una batería de litio insertada en el reloj de tiempo real, tipo SGS Núm. MK48T59Y, MK48TXXB-XX, MK48T18-XXXPCZ, M48T59W-XXXPCZ, o MK48T08. Las baterías no son elementos reemplazables por el propio cliente. Pueden explotar si se manipulan de forma errónea. No arroje las baterías al fuego. No las abra o intente recargarlas.

Paquete de pilas

⚠️ **Precaución** – Las unidades Product Name contienen una pila de plomo sellada, Productos de energía portátil nº TLC02V50. 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 paquete 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

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

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

Aviso de cumplimiento con requisitos de láser

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

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⚠ **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
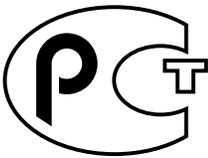
Nordic Lithium Battery Cautions

Norge

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

Sverige

⚠ **VARNING** – 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.

Preface

The *Sun Enterprise 220R Server Service Manual* provides detailed procedures that describe the removal, installation, and replacement of serviceable parts and options in the Sun Enterprise™ 220R server. This service manual also includes information about diagnostics and maintenance of the system. This book is written for technicians, system administrators, qualified service providers, and advanced computer system end users who have experience troubleshooting and replacing server hardware.

This manual presents information in a modular format designed to answer the type of questions that you might ask while servicing the Sun Enterprise 220R server. Typically, the modules cover specific tasks for a service-related procedure for a specific component.

Service providers who would like more general information about the system should refer to the appropriate chapter or section in the *Sun Enterprise 220R Server Owner's Guide.*

How This Book Is Organized

The chapters in this manual refer to a series of related service tasks. Using the table of contents or the task list on the first page of each chapter, you can quickly find the information you need to perform a specific task. The information modules for the tasks are brief; however, they are interrelated and refer to other modules in the book. For instance, the procedure "Replacing the Main Logic Board" is related to many tasks covered by other modules. You must perform these requisite tasks before or after replacing the main logic board.

This book is divided into six chapters and appendixes, as described below.

Chapter 1 describes tasks that you need to perform before or after each service procedure.

Chapter 2 explains tasks related to main logic board components.

Chapter 3 provides information about tasks related to system storage devices.

Chapter 4 describes tasks related to system backplanes and cables.

Chapter 5 explains tasks related to various subassemblies in the system.

Chapter 6 details the diagnostic tools and troubleshooting procedures for the system.

The Appendixes list system specifications, accessible connector pinouts, safety information, and field-replaceable unit (FRU) information.

Using UNIX Commands

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

See one or more of the following for this information:

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

Typographic and Command Entry Conventions

Typeface or Symbol	Meaning	Examples
AaBbCc123	The names of commands, files, and directories; on-screen computer output	Edit your `.login` file. Use `ls -a` to list all files. `% You have mail.`
AaBbCc123	What you type, when contrasted with on-screen computer output	`% `**`su`** `Password:`

Typeface or Symbol	Meaning	Examples
AaBbCc123	Book titles, new words or terms, words to be emphasized	Read Chapter 6 in the *User's Guide*. These are called *class* options. You *must* be superuser to do this.
	Command-line command and variable entry; replace the variable with a real name or value, and then press the Return or Enter key	To delete a file, type `rm` *filename*.

Shell Prompts

Shell	Prompt
C shell	*machine_name*%
C shell superuser	*machine_name*#
Bourne shell and Korn shell	$
Bourne shell and Korn shell superuser	#

Related Documentation

The following documents contain topics that relate to the information in the *Sun Enterprise 220R Server Service Manual*.

Server rackmounting and setup	*Sun Enterprise 220R Setup and Rackmounting Guide*
Setting up and running the system; features and options, setup and installation, troubleshooting, and network adminstration for the system	*Sun Enterprise 220R Server Owner's Guide*
Late breaking product news and information	*Sun Enterprise 220R Server Product Notes*
Performing diagnostic tests	*SunVTS User's Guide*
	SunVTS Quick Reference Card
	SunVTS Test Reference Manual
	Sun Enterprise SyMON User's Guide
System and network administration	*Solaris System Administrator AnswerBook*
	SPARC: Installing Solaris Software
Using operating system software	*Solaris User's Guide*
Miscellaneous	*Solaris on Sun Hardware AnswerBook*
	Solaris Handbook for Sun Peripherals
	Solaris 7 Sun Hardware Platform Guide

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Please include the part number (8xx-xxxx-xx) of your document in the subject line of your email.

Video Demonstration of Servicing the System

This chapter includes four video demonstrations of dissassembling the system and reassembling the system. The demonstrations are intended to provide overall familiarity with system parts and options and how they are removed and installed. The video is divided into parts because the video files are very large; providing them in smaller files improves performance. The four videos (each about five to six minutes long) are the following:

- Section 1.1.1 "Disassembling the System, Part 1" on page 51
- Section 1.1.2 "Disassembling the System, Part 2" on page 52
- Section 1.2.1 "Reassembling the System, Part 1" on page 52
- Section 1.2.2 "Reassembling the System, Part 2" on page 52

Click here for Appendix E.

1.1 Video of System Disassembly

1.1.1 Disassembling the System, Part 1

Click on the icon above for the video demonstration. This video file is very large; loading it may take over a minute.

Click here for Appendix E.

1.1.2 Disassembling the System, Part 2

Click on the icon above for the video demonstration. This video file is very large; loading it may take over a minute.

Click here for Appendix E.

1.2 Video of System Reassembly

1.2.1 Reassembling the System, Part 1

Click on the icon above for the video demonstration. This video file is very large; loading it may take over a minute.

Click here for Appendix E.

1.2.2 Reassembling the System, Part 2

Click on the icon above for the video demonstration. This video file is very large; loading it may take over a minute.

Click here for Appendix E.

Preparing to Service the System

This chapter tells you what you need to know about preparing for and completing service procedures.

Except for removing and installing disk drives, this system should be serviced by a qualified hardware service provider. Please be sure to keep the following guidelines in mind:

- Internal disk drives and power supplies are hot-pluggable. For the servicing of any other parts internal to the system, you must first power off the system. See Section 2.1 "How to Power Off the System" on page 54.

- Except for replacing the main logic board, which is a workbench procedure, this system is serviceable while installed in the rack. See Section 2.4 "How to Position the System for Service" on page 60.

The following tasks are covered in this chapter:

- Section 2.1 "How to Power Off the System" on page 54
- Section 2.2 "How to Power On the System" on page 55
- Section 2.3 "How to Initiate a Reconfiguration Boot" on page 58
- Section 2.4 "How to Position the System for Service" on page 60
- Section 2.5 "How to Slide the System Into the Rack" on page 63
- Section 2.6 "How to Remove the System Cover" on page 65
- Section 2.7 "How to Replace the System Cover" on page 67
- Section 2.8 "How to Avoid Electrostatic Discharge" on page 69
- Section 2.14 "How to Remove the System From the Rack" on page 78
- Section 2.15 "How to Place the System Into the Rack Glides" on page 81

The following information is also included:

- Section 2.9 "About the Status and Control Panel" on page 71

2.1 How to Power Off the System

Caution - Before turning off system power, halt the operating system as described below. Failure to halt the operating system properly can result in loss of disk drive data.

Note - If the system "hangs" and you cannot issue an operating system command to turn the system power off, turn the keyswitch to the Standby position. This turns off power to all internal system components. For further information on keyswitch positions, see Section 2.9.1 "Keyswitch Settings" on page 72.

2.1.1 What to Do

1. **Notify users that the system will be powered down.**

2. **Back up the system files and data, if necessary.**

3. **Halt the operating system using the appropriate commands.**
   Refer to the Solaris Handbook for Sun Peripherals that corresponds to your operating system.

4. **Wait for the system halt messages and the** ok **prompt.**

5. **Turn the keyswitch on the front panel of the system to the Standby position.**

Standby position
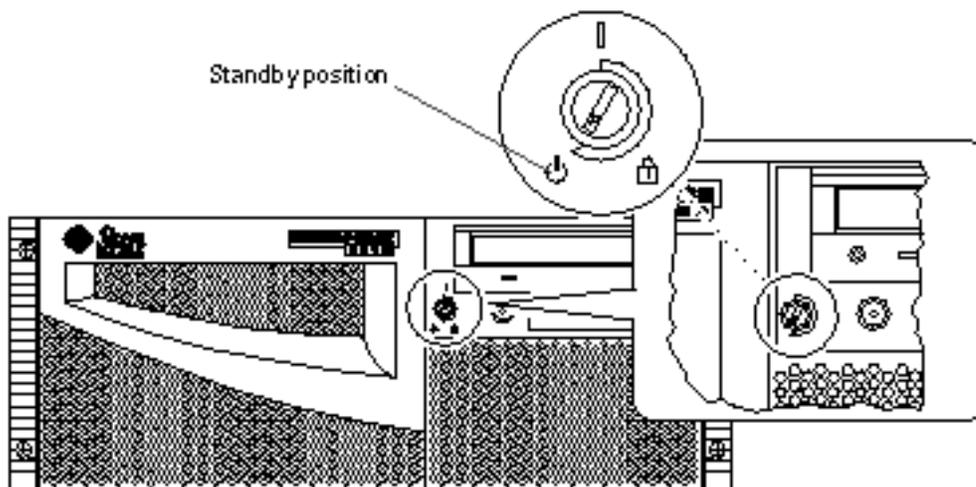
2.2 How to Power On the System

2.2.1 Before You Begin

If a terminal or local console is not already connected to the system, you need to install one before continuing the startup procedure. For information, see:

- Section 2.10 "About Communicating With the Server" on page 73
- Section 2.12 "How to Configure a Local Graphics Console" on page 75

Note - Use the Reconfiguration Boot procedure instead of the power-on procedure if you have just installed an internal or external device or any new part that plugs into the main logic board except a CPU or a DIMM. See Section 2.3 "How to Initiate a Reconfiguration Boot" on page 58 for further information.

2.2.2 What to Do

⚠️ **Caution -** Never move the system when system power is on. Movement can cause catastrophic disk drive failure. Always power off the system before moving it.

⚠️ **Caution -** Before you power on the system, make sure that the cover is properly installed.

1. **Turn on power to any peripherals and external storage devices.**

   Read the documentation supplied with the device for specific instructions.

2. **Turn on power to the monitor or terminal.**

   A terminal or monitor is required for viewing system messages. For setup instructions, see Section 2.11 "How to Attach an Alphanumeric Terminal" on page 74 or Section 2.12 "How to Configure a Local Graphics Console" on page 75.

3. **Turn the front panel keyswitch to the Power-On/Off position.**

   See Section 2.9.1 "Keyswitch Settings" on page 72 for information about each keyswitch setting.

4. **Press the front panel Power button once.**

   See Section 2.9.1 "Keyswitch Settings" on page 72 for information about each keyswitch setting.

Power-On/Off position

Power button
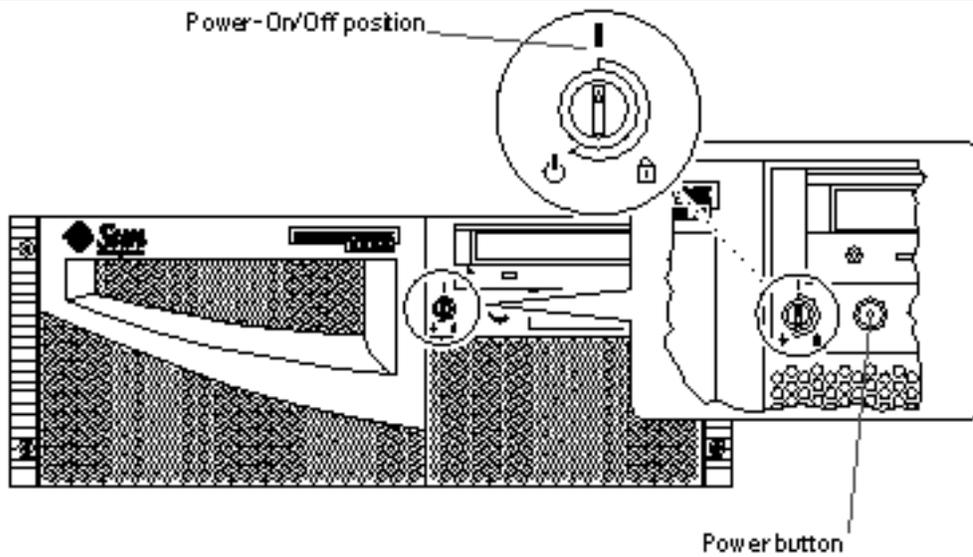
Note - The system may take anywhere from 30 seconds to two minutes before video is displayed on the system monitor or the `ok` prompt appears on an attached terminal. This time depends on the level of power-on self-test (POST) diagnostics being performed.

5. **Turn the keyswitch to the Locked position.**

Note - The Locked position prevents *accidentally* powering-off the system. See Section 2.9.1 "Keyswitch Settings" on page 72 for information about each keyswitch setting.
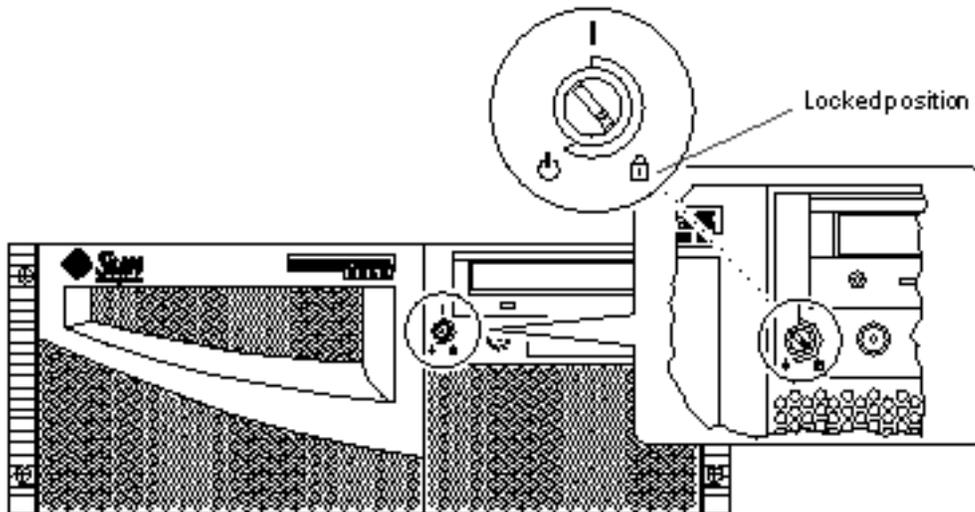
2.3 How to Initiate a Reconfiguration Boot

2.3.1 Before You Begin

After installing any internal or external storage device, or any new part that plugs into the main logic board, except CPU modules or DIMMs, you must perform a reconfiguration boot so that your system is able to recognize the newly installed option(s).

A terminal or a graphics console is required for viewing system messages. For information about connecting a terminal or a console, see Section 2.10 "About Communicating With the Server" on page 73 or your *Sun Enterprise 220R Server Owner's Guide.*

Caution - Before you power on the system, make sure that the system cover is properly installed and that the and doors are closed.

2.3.2 What to Do

1. **Turn on power to any peripherals and external storage devices.**

   Read the documentation supplied with the device for specific instructions.

2. **Turn on power to the monitor or terminal.**

3. **Turn the front panel keyswitch to the Power-On/Off position.**

   See Section 2.9 "About the Status and Control Panel" on page 71.

   To run OpenBoot™ Diagnostics(OBDiag) tests to verify that the system functions correctly with the new part(s) you have just installed, see Section 7.5 "About OpenBoot Diagnostics (OBDiag)" on page 192.

4. **When the system banner is displayed on the terminal or console, immediately enter the Stop-a sequence on the Sun keyboard or press the Break key on the terminal keyboard.**

   The system banner contains the Ethernet address and host ID. To enter the `Stop-a` sequence, hold down the `Stop` key and press the a key.

   Note - The system may take anywhere from 30 seconds to two minutes before the system banner appears. This time depends on the level of power-on self-test (POST) diagnostics being performed.

   ---

5. **When the `ok` prompt is displayed, enter the following command:**

   ```
   ok boot -r
   ```

   This command rebuilds the device trees for the system, incorporating any newly installed options. After a device has been added to a device tree, it can be recognized by the system. After the reconfiguration reboot has successfully completed, the system prompt will be displayed.

Caution - Never move the system when system power is on. Movement can cause catastrophic disk drive failure. Always power off the system before moving it.

2.3.3 What Next

The system's front panel LED indicators provide power-on status information. For information about the system LEDs, see:

■ Section 2.9.2 "System LED Indicators" on page 72

2.4   How to Position the System for Service

This procedure describes placing the system in position for service by sliding it out of the rack enclosure without removing it from the rack. All service procedures except removing and replacing the main logic board can be performed while the system is still attached to the rack enclosure.

Note - Sliding the system out of the rack is not required for servicing disk drives and power supplies.

2.4.1   Before You Begin

Caution - Unless the rack is bolted to the floor, you must extend the cabinet's anti-tip legs and adjust their stabilizing feet to the floor. You must level and secure the cabinet to provide a safe working environment.

2.4.2   What to Do

1. **Extend and adjust the cabinet's anti-tip legs.**

2. **Open (or remove) the front and back rack enclosure door(s).**

3. **Disconnect all external cables attached to the back panel of the system.**

    As you disconnect each cable, label it with a strip of masking tape indicating the cable's origin and its terminating connection.

Caution - Do not disconnect the power cable(s) from the system power inlet(s) unless you are installing or replacing the power distribution board, the main logic board, or a power supply. The power cord grounds the system.

4. **Loosen the four captive screws that secure the system to the left and right vertical rails at the front of the rack.**

Use a Phillips #2 screwdriver to loosen the captive screws, which are in recessed access holes in the decorative panels affixed to the system's front panel.
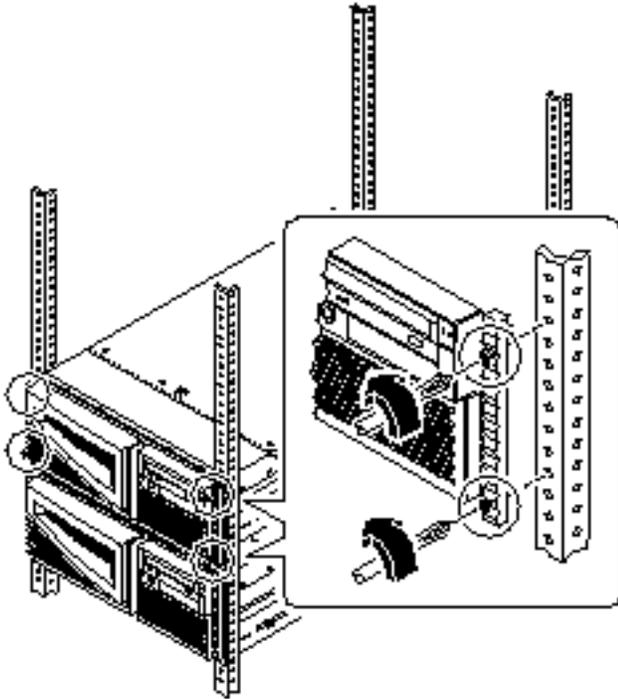
5. **Slide the system chassis evenly out of the rack enclosure until the inner glides stop in the slide.**

   Grasp the system's front bezel and pull the system smoothly out of the enclosure. Continue pulling the system until the back of the chassis clears the enclosure and you hear the flat spring catches in the glides engage with an audible clicking sound. The system is then fully extended and secure.
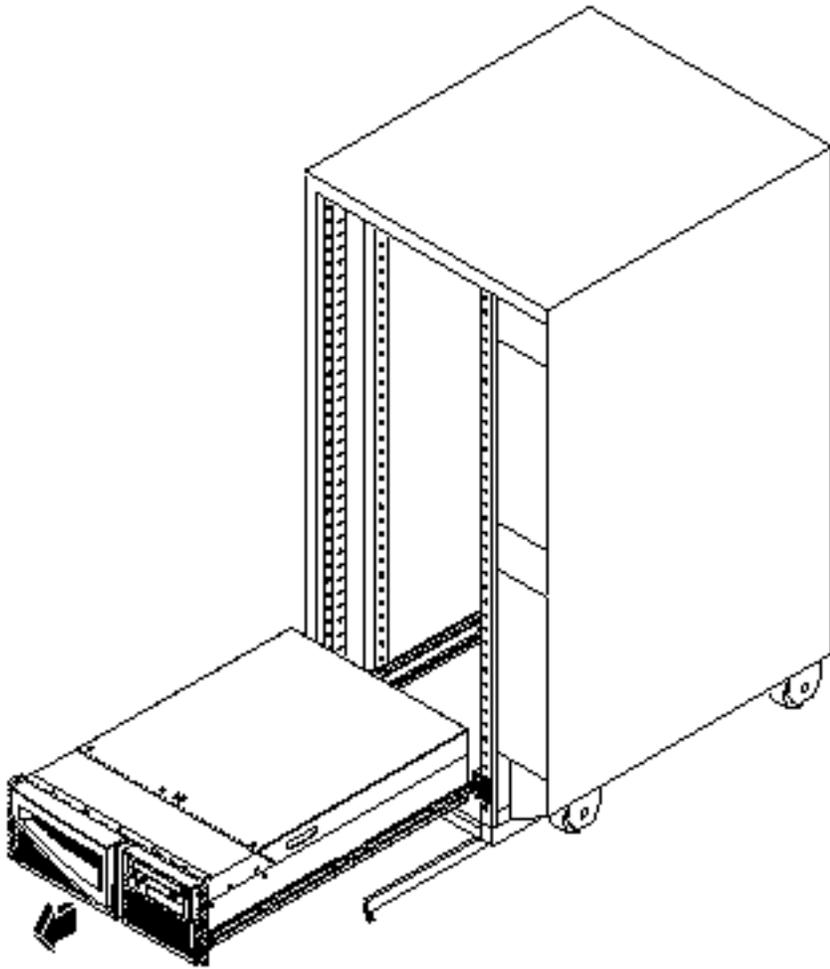
2.4.3 What Next

For information about sliding the system into the rack enclosure, see:

- Section 2.5 "How to Slide the System Into the Rack" on page 63

2.5 How to Slide the System Into the Rack

2.5.1 Before You Begin

If you have been working inside the system, see:

■ Section 2.7 "How to Replace the System Cover" on page 67

2.5.2 What to Do

1. **Release the two flat spring catches that lock the system into its current position.**

   Press in on both spring catches to free the system glides. One flat spring catch is attached to each inner glide on the system chassis, as shown in the following figure
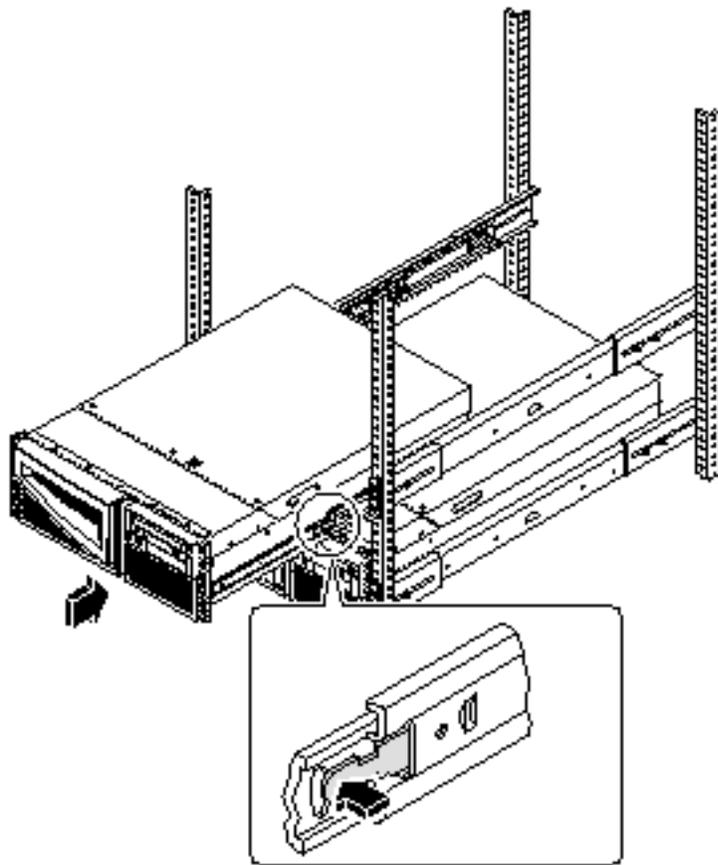
2. **Slide the system chassis evenly into the rack enclosure until the system comes to a complete stop.**

3. **Secure the system to the left and right vertical rails at the front of the rack.**

   Use a Phillips #2 screwdriver to tighten the four captive screws that secure the system in the rack enclosure. These screws are in recessed access holes in the decorative panels affixed to the system's front panel.
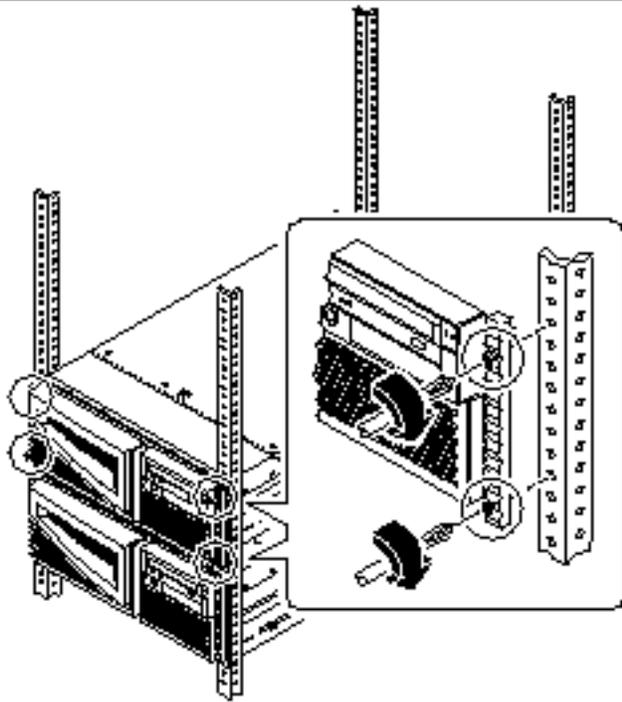
4. **Reconnect all external cables that were attached to the back panel of the system.**

   Examine each disconnected cable for information indicating the cable's origin and its terminating connection.

5. **Replace, close, and lock the rack enclosure door(s), as appropriate.**

2.5.3 What Next

To power on the system, see:

- Section 2.2 "How to Power On the System" on page 55

2.6 How to Remove the System Cover

Caution - Do not operate the system while the system cover is removed.

2.6.1　Before You Begin

Complete this task:

- Section 2.4 "How to Position the System for Service" on page 60

2.6.2　What to Do

1. Unlock the system cover.

Use the front door key; turn the key counterclockwise to release the system cover.
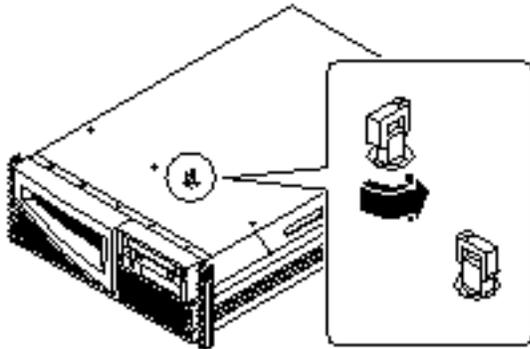
2. Loosen the three captive screws securing the cover to the enclosure.

3. Grasp the system cover by its sides, and lift the cover upward and away from the front of the enclosure; remove the cover and set it aside.

The system cover hinges on two cutouts in the enclosure back panel. Lift the system cover away from the back of the enclosure.
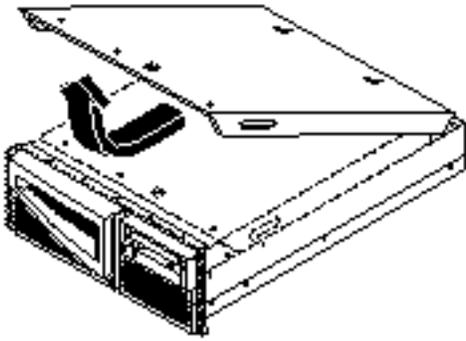
2.6.3 What Next

You are now ready to install, remove, or replace components inside the
system chassis.

To reassemble the system, see:

■ Section 2.7 "How to Replace the System Cover" on page 67

2.7 How to Replace the System Cover

2.7.1 Before You Begin

⚠ **Caution -** Do not operate the system while the system cover is removed.

2.7.2 What to Do

1. **Insert the system cover into the recessed hinge cutouts on the back panel.
   Grasp the system cover by its sides, and lower the panel downwards and
   toward the front of the enclosure.**

   The system cover hinges on two recessed cutouts on the back panel of the
   enclosure.
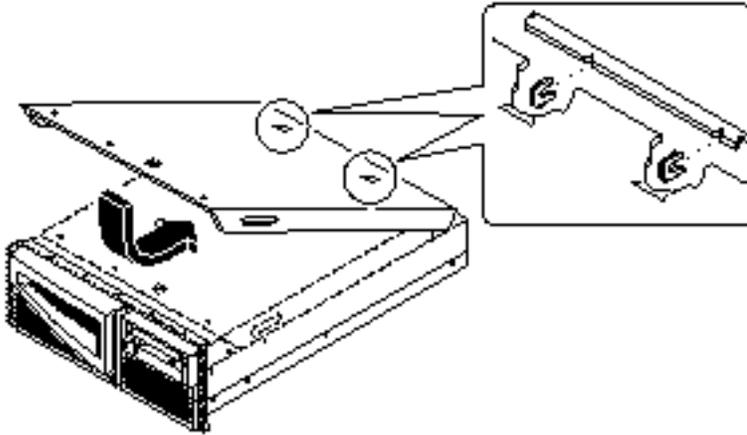
2. **Tighten the captive screws securing the panel to the enclosure.**

3. **Lock the system cover.**

   Turn the key clockwise to engage the system cover lock.
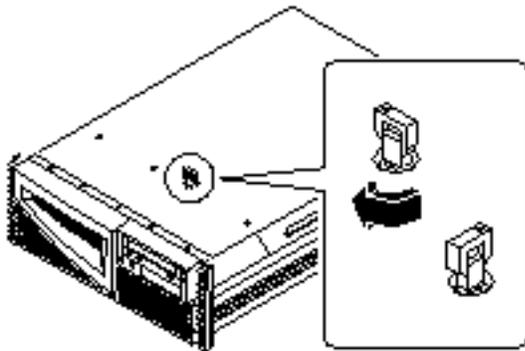
2.7.3   What Next

To restart the system, see:

- Section 2.5 "How to Slide the System Into the Rack" on page 63

2.8   How to Avoid Electrostatic Discharge

Use the following procedure to prevent static damage whenever you are accessing any of the internal components of the system.

2.8.1   Before You Begin

Complete these tasks:

- Section 2.1 "How to Power Off the System" on page 54
- Section 2.4 "How to Position the System for Service" on page 60
- Section 2.6 "How to Remove the System Cover" on page 65

You must have the following items:

- Antistatic wrist or foot strap
- Antistatic mat (or the equivalent)

2.8.2   What to Do

Caution - Printed circuit boards and hard disk drives contain electronic components that are extremely sensitive to static electricity. Ordinary amounts of static from your clothes or the work environment can destroy components. Do not touch the components or any metal parts without taking proper antistatic precautions.

1. **Disconnect the AC power cord from the wall power outlet only when performing the following procedures.**
    - Removing and replacing the power distribution board
    - Removing and replacing the main logic board
    - Removing and installing a power supply

    The AC power cord provides a discharge path for static electricity, so it should remain plugged in except when you are servicing the parts noted above.

2. **Use an antistatic mat or similar surface.**

When performing any service procedure, place static-sensitive parts, such as boards, cards, and disk drives, on an antistatic surface. The following items can be used as an antistatic surface:

- The bag used to wrap a Sun™ replacement part
- The shipping container used to package a Sun replacement part
- Sun electrostatic discharge (ESD) mat, part number 250-1088 (available through your Sun sales representatives)
- Disposable ESD mat, shipped with replacement parts or options

3. **Use an antistatic wrist strap.**

Attach the appropriate end to the system chassis sheet metal and attach the other end of the strap to your wrist. Refer to the instructions that come with the strap.
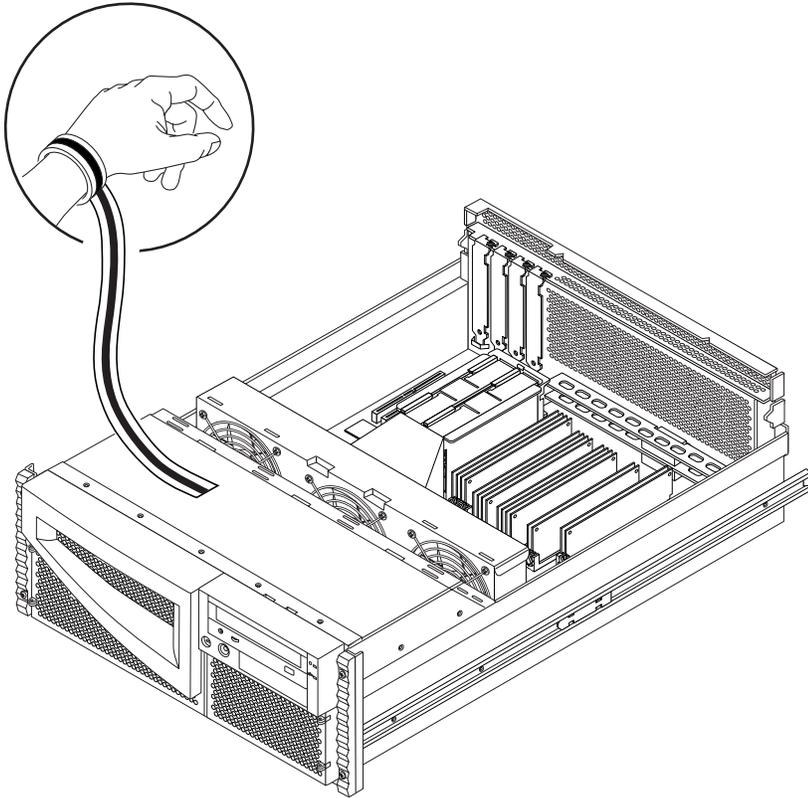
4. **Detach both ends of the strap after you have completed the installation or service procedure.**

2.8.3 What Next

To reassemble the system, see:

■ Section 2.7 "How to Replace the System Cover" on page 67

2.9 About the Status and Control Panel

The status and control panel includes two LED indicators and a three-position security keyswitch.
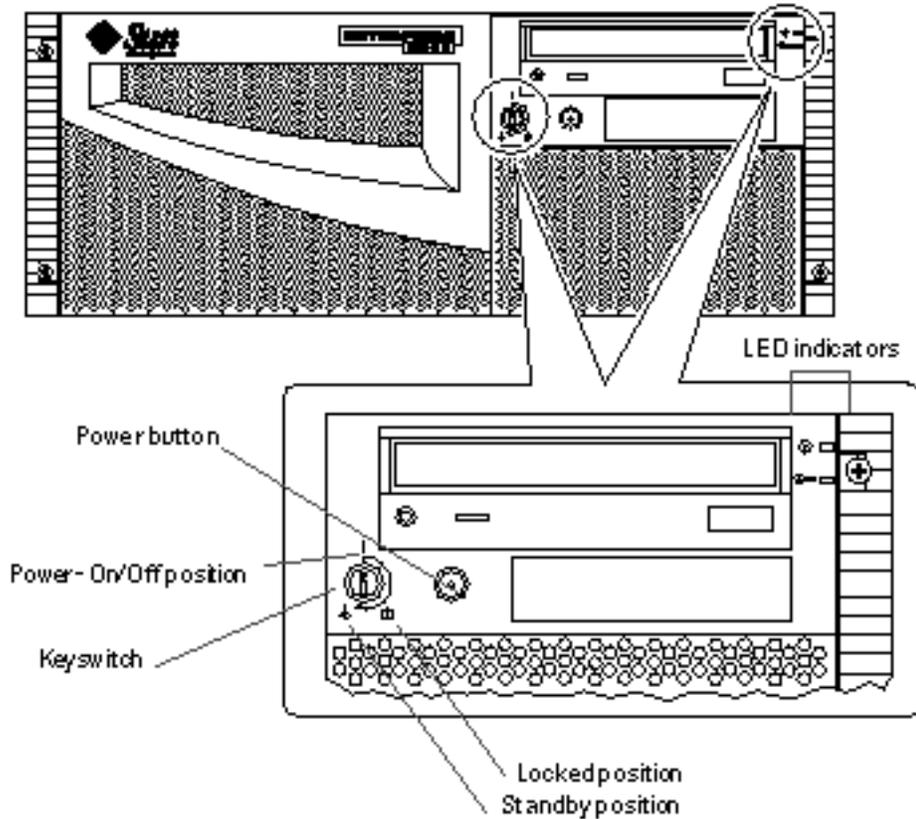
2.9.1 Keyswitch Settings

The front panel keyswitch controls the power-on modes of the system. The following table describes the function of each switch setting.

Keyswitch Position	Icon	Description
Power-On/Off		This setting enables the system's Power button to turn the system power on or power off. If the system has power, holding the Power button down for five seconds while the keyswitch is in this position will cause an immediate hardware power off.
Locked		This setting disables the system's Power button, and also locks the front doors preventing access to the disk drives and to the power supplies. The Locked position is the recommended setting for normal day-to-day operation of the system.
Standby		This setting places the system in Standby mode by turning off power to all internal system components and by placing the power supplies in Standby mode. When the keyswitch is in this position, the keyboard power switch and the server's Power button are disabled.

2.9.2 System LED Indicators

The two system LEDs consist of a system health indicator and a fault indicator. The system health indicator lights continuously green to show that the system is functioning normally. The fault indicator lights when a problem is detected in the system. Because it is important to know that a fault exists in the system, the fault indicator remains lit whether the system is in normal operating mode, or is switched to Standby mode using the keyswitch.

When you first power on the system, the LEDs individually blink on and off to verify that each one is working correctly. After that, the LEDs operate as described in the following table.

Name	Icon	Description
Power-on/ activity		This green LED lights continuously when the system power is on.
General fault		This yellow LED lights steadily when any fault is detected (including a fault reported by a power supply LED fault).

2.10 About Communicating With the Server

To initiate a reconfiguration boot or to diagnose problems, you need some way to enter system commands and view system output. There are three ways to do this.

1. Attach an ACSII character terminal to serial port A.

   You can attach a simple terminal (or modem line) to serial port A. The terminal can be capable of displaying and entering alphanumeric but not graphical data. For instructions, see Section 2.11 "How to Attach an Alphanumeric Terminal" on page 74.

2. Establish a `tip` connection from another Sun system.

   For information about establishing a `tip` connection, see your *Sun Enterprise 220R Server Owner's Guide* or the *OpenBoot 3.x Command Reference Manual*, an online version of which is included with the *Solaris System Administrator AnswerBook* that ships with Solaris software.

3. Install a local graphics console on your server.

   The server is shipped without a mouse, keyboard, monitor, or frame buffer for the display of graphics. To install a local graphics console on a server, you must install a graphics frame buffer card into a PCI slot, and attach a monitor, mouse, and keyboard to the appropriate back panel ports. For detailed instructions, see Section 2.12 "How to Configure a Local Graphics Console" on page 75.

2.11 How to Attach an Alphanumeric Terminal

2.11.1 Before You Begin

If your server is configured without a local graphics console, you need to attach an alphanumeric (ASCII) terminal (or establish a `tip` connection) to the server in order to install the system software and to run diagnostic tests. For background information, see Section 2.10 "About Communicating With the Server" on page 73.

Alternatively, you can install a local graphics console on the server; see Section 2.12 "How to Configure a Local Graphics Console" on page 75.

For information about establishing a `tip` connection, see your *Sun Enterprise 220R Server Owner's Guide* or the *OpenBoot 3.x Command Reference Manual*, an online version of which is included with the *Solaris System Administrator AnswerBook* that ships with Solaris software.

2.11.2 What to Do

1. Connect the terminal's data cable to serial port A on the server's back panel.
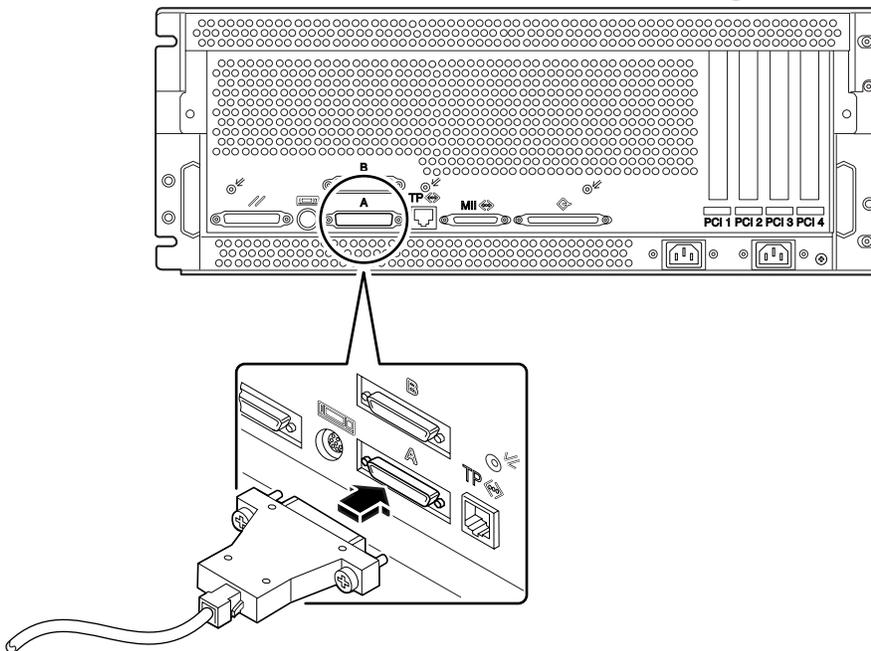
2. **Connect the terminal's power cable to an AC outlet.**

3. **Set the terminal to receive:**
   - At 9600 baud
   - An 8-bit signal with no parity and 1 stop bit

See the documentation accompanying your terminal for more information.

2.11.3 What Next

You can now issue system commands from the terminal keyboard and view system messages. Continue with your service or diagnostic procedure as needed.

2.12 How to Configure a Local Graphics Console

2.12.1 Before You Begin

If your server is configured without a local graphics console, you need to install one in order to install the system and to run diagnostic tests. For background information, see Section 2.10 "About Communicating With the Server" on page 73.

Alternatively, you can attach an alphanumeric (ASCII) terminal to the system's serial port; see Section 2.11 "How to Attach an Alphanumeric Terminal" on page 74.

To install a local graphics console, you must have:

- A supported PCI-based graphics card
- A monitor with appropriate resolution
- A Sun-compatible keyboard
- A Sun-compatible mouse and mouse pad

2.12.2 What to Do

1. **Install the graphics card in a vacant PCI slot.**

> **Note -** Installation must be performed by a qualified Sun service provider. For further information, see Section 3.4 "How to Install a PCI Card" on page 97.

2. **Attach the monitor video cable to the graphic card's video port.**

   Tighten the thumbscrews to secure the connection.
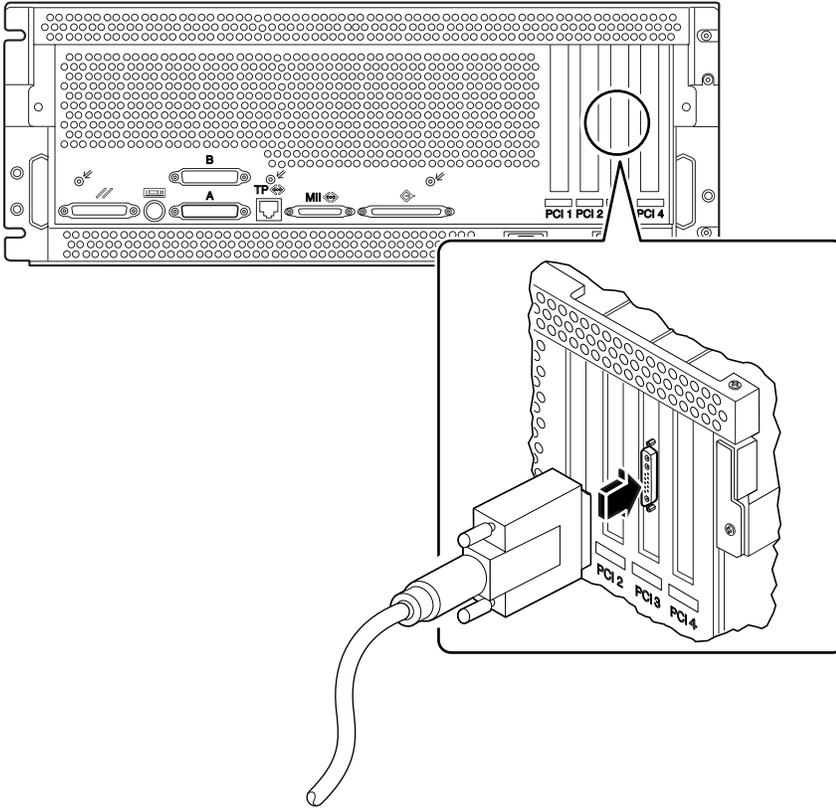
3. **Connect the monitor's power cord to an appropriate AC power outlet.**

4. **Connect the keyboard cable to the server's keyboard/mouse port.**
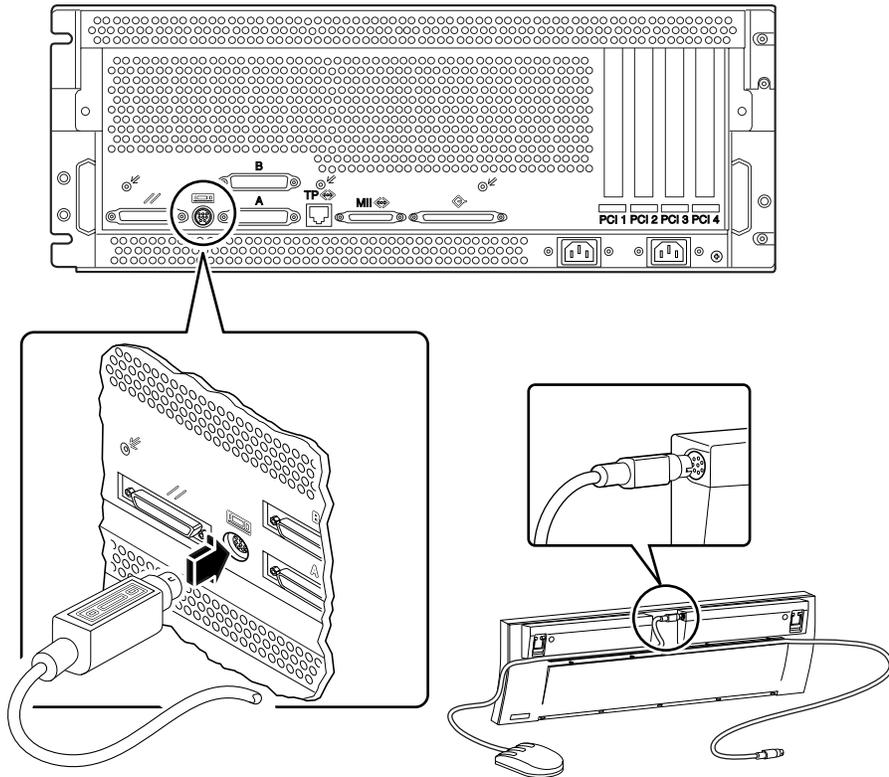
5. Connect the mouse cable to the appropriate receptacle on the keyboard.

2.12.3 What Next

You can now issue system commands from the keyboard and view system messages. Continue with your service or diagnostic procedure as needed.

2.13 Tools Required for Installation and Service

The following tools are required to install and service the system:

- Screwdriver, Phillips #1
- Screwdriver, Phillips #2

- Screwdriver, long flat-blade #2
- Needle-nose pliers
- Wrench, 5/16ths inch
- Wrench, 1/2 inch
- Electrostatic discharge mat, Sun part number 250-1088, or equivalent
- Grounding wrist or foot strap

The latter two items help protect the server against damage due to electrostatic discharge. For more information, see Section 2.8 "How to Avoid Electrostatic Discharge" on page 69.

2.14 How to Remove the System From the Rack

You must remove the system from the rack when removing and replacing the main logic board. You can perform all other procedures while the system is still attached to the rails extended from the rack. If you want to remove the system from the rack for any other reason, follow the instructions in this section.

Caution - Unless the rack is bolted to the floor, you must extend the cabinet's anti-tip legs and adjust their stabilizing feet to the floor. Level and secure the cabinet to provide a safe working environment.

Caution - The chassis is heavy. Two people are required to remove the system from the rack enclosure in the following procedure.

2.14.1 Before You Begin

Complete these tasks:

- Identify a helper to assist you in removing the system
- Section 2.4 "How to Position the System for Service" on page 60

Discuss the task and verify that your helper can safely lift and carry 34 lbs (17 kg), which is approximately half the weight of a fully-equipped system.

Review the steps in the next section with your helper beforehand and discuss how to coordinate your efforts to ensure your mutual safety.

Caution - When completing a two-person procedure, always communicate your intentions clearly before, during, and after each step to minimize confusion.

2.14.2 What to Do

1. **Position one person on each side of the system, facing the system glides.**

   When you are both in position, verify that your helper understands what to do with the system after you remove it. Also agree on a route to follow, and visually inspect it for potential safety hazards (for example, cables on the floor, other people working in the vicinity, and so on).

2. **Locate the flat spring catches on the inner glides.**

   Each person should visually locate one of the two flat spring catches that release the system from the rack glide. One catch is attached to each inner glide, as shown in the following figure.
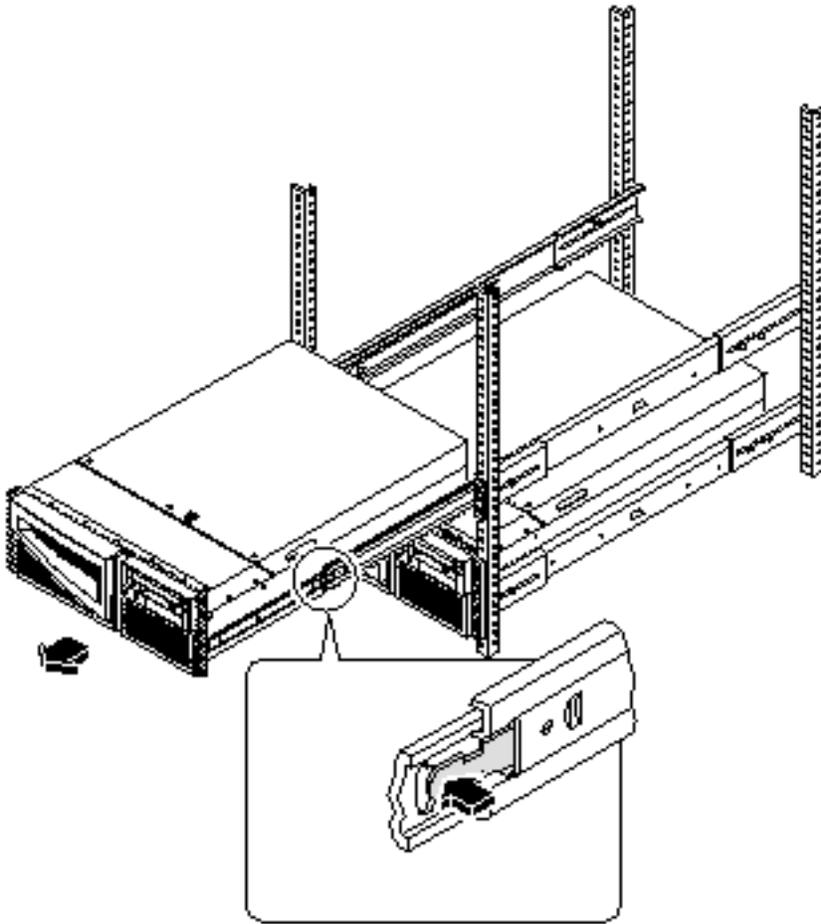
3. **Prepare to remove the system.**

   Each person should place one hand on the flat spring catch and their other hand beneath the chassis, palm up, ready to support the weight of the chassis.

4. **Simultaneously press in on both flat spring catches and slide the system out of the glides.**

   Each person presses one spring catch and helps slide the system free of the outer glide, supporting the weight of the system as it slides free of the glides.

5. **Set the system on a workbench or other stable surface.**

6. **Slide the empty rack slides back into their protective outer glides.**

7. **Reattach, close, and lock the rack doors as appropriate.**

2.14.3   What Next

For information about placing the system into the rack glides, see:

- Section 2.15 "How to Place the System Into the Rack Glides" on page 81

2.15   How to Place the System Into the Rack Glides

This procedure assumes that the slide assembly is already installed in the rack. For further information on assembling the slide assemblies and rack enclosures, see the *Sun Enterprise 220R Server Setup and Rackmounting Guide.*

Caution - The chassis is heavy. Two people are required to place the system into the rack enclosure glides in the following procedure.
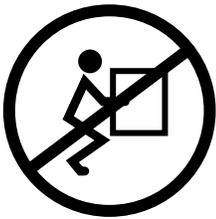
2.15.1   Before You Begin

Complete the following tasks:

- Identify a helper to assist you in removing the system.
- Verify that your helper can safely lift and carry 34 lbs (17 kg), which is approximately half the weight of a fully-equipped system.
- Assemble the correct tools for the procedure. See Section 2.13 "Tools Required for Installation and Service" on page 77.
- Open (and remove) the rack enclosure front door.

Caution - When completing a two-person procedure, always communicate your intentions clearly before, during, and after each step to minimize confusion.

2.15.2 What to Do

1. **Extend the cabinet's anti-tip legs.**

Caution - Unless the rack is bolted to the floor, you must extend the cabinet's anti-tip legs and adjust the stabilizing feet to the floor.

2. **Push the runner on each slide assembly as far back as possible into the slide assembly.**
   a. **Push in the inner rail on each slide assembly until it reaches the stops that are located furthest away from the front of the rack.**

   b. **Push in the runner until it stops in the slide assembly.**
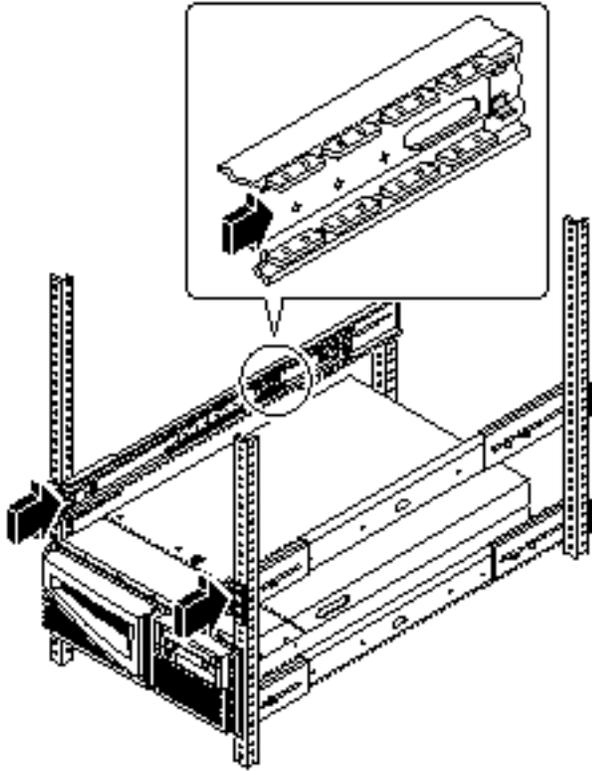
3. **Position one person on each side of the system, facing the inner glides on the system chassis.**

   When you are both in position, verify that your helper understands what to do with the system after you lift it. Also agree on a route to follow to the rack enclosure, and visually inspect the route for potential safety hazards (for example, cables on the floor, other people working in the vicinity, and so on).

4. **Lift the system.**

   Each person should place both hands beneath the chassis and support half the weight of the system.

5. **Carry the system from its location to the front of the rack enclosure.**

6. **Insert the system glides into the inner slides of the rack glides.**

Verify that the empty rack slides are completely inside their protective outer glides. Slide the crimped end of each system glide into the corresponding inner slide within the rack glide.
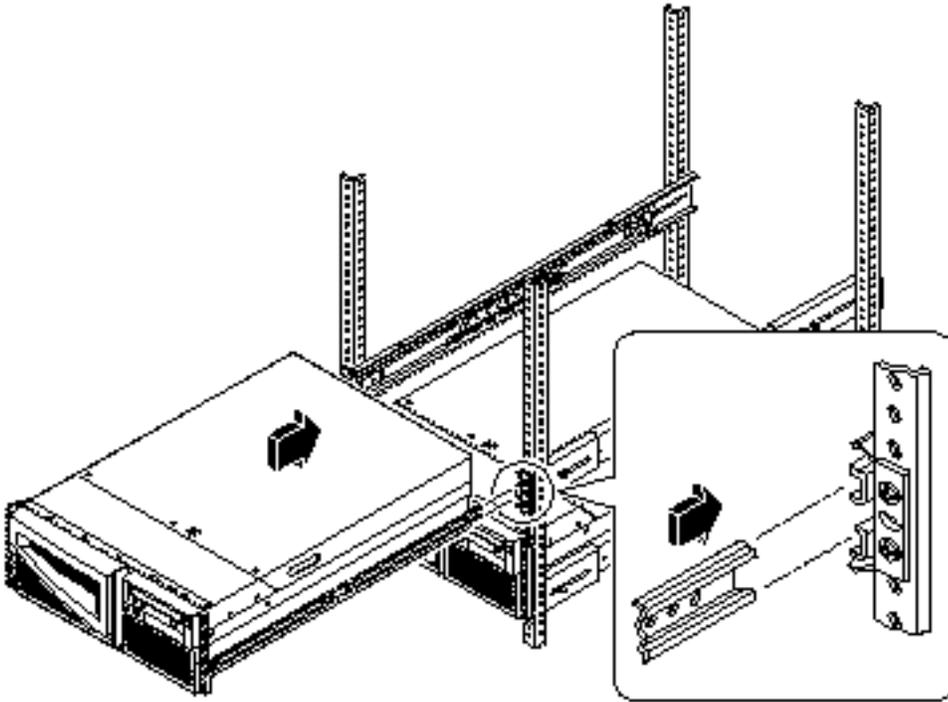
7. **Slide the system smoothly into the rack until the flat spring catches stop the system.**

8. **Simultaneously press in on both flat spring catches and finish sliding the system completely into the rack.**
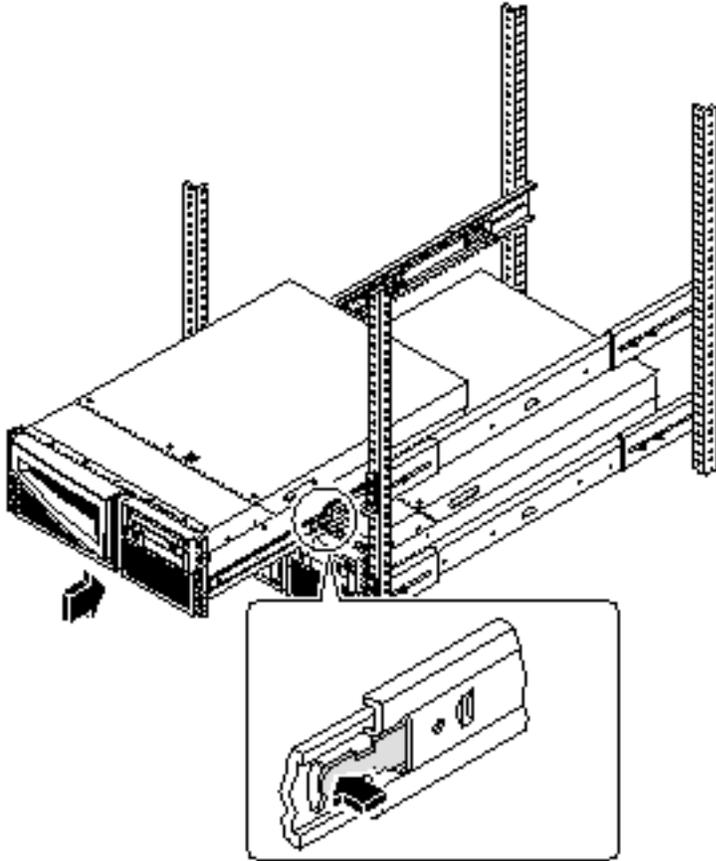
9. **Tighten the four captive screws securing the system to the left and right
   vertical rails at the front of the rack.**

   Use a Phillips #2 screwdriver to tighten the captive screws, which are in recessed
   access holes in the filler panels affixed to the system's front panel.
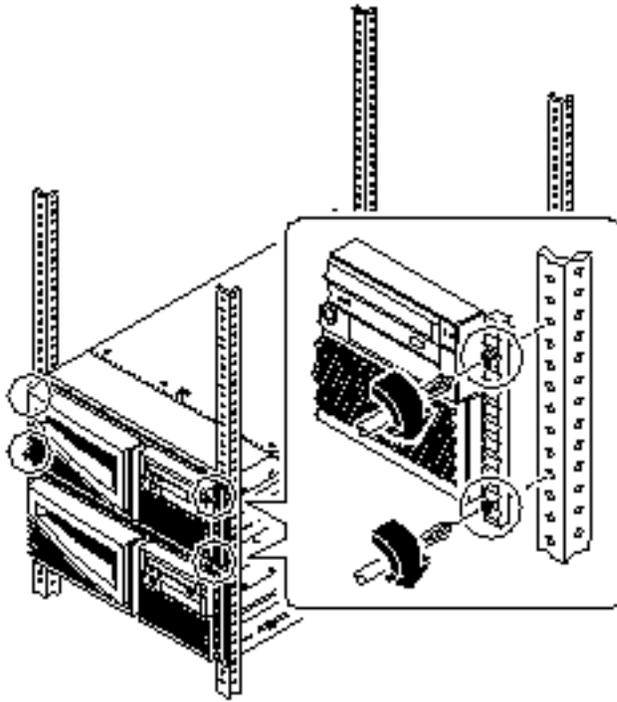
10. **Reconnect every external cable previously attached to the back panel of the system.**

    As you reconnect each cable, check it for information indicating the cable's origin and its terminating connection.

11. **Reattach, close, and lock the rack door(s) as appropriate.**

2.15.3   What Next

To power on the system, see:

- Section 2.2 "How to Power On the System" on page 55

Servicing the Main Logic Board and Components

This chapter describes how to remove and replace the system main logic board and main logic board components. For a list of part numbers for field-replaceable units and optional equipment, see Appendix D.

The following tasks are covered in this chapter:

- Section 3.1 "How to Remove a Memory Module" on page 88
- Section 3.2 "How to Install a Memory Module" on page 90
- Section 3.3 "How to Remove a PCI Card" on page 94
- Section 3.4 "How to Install a PCI Card" on page 97
- Section 3.5 "How to Remove a CPU Module" on page 100
- Section 3.6 "How to Install a CPU Module" on page 102
- Section 3.7 "How to Remove the NVRAM/TOD Module" on page 106
- Section 3.8 "How to Replace the NVRAM/TOD Module" on page 108
- Section 3.9 "How to Remove the Air Guide" on page 110
- Section 3.10 "How to Replace the Air Guide" on page 111
- Section 3.11 "How to Remove the CPU Card Cage Assembly" on page 112
- Section 3.12 "How to Replace the CPU Card Cage Assembly" on page 114
- Section 3.13 "How to Remove the Main Logic Board" on page 116
- Section 3.14 "How to Replace the Main Logic Board" on page 119
- Section 3.15 "How to Set the Serial Port Jumpers" on page 122
- Section 3.16 "How to Set the Flash PROM Jumpers" on page 124

3.1 How to Remove a Memory Module

Memory modules for this system are dual inline memory modules (DIMMs). Each DIMM bank must contain four DIMMs of equal density (for example, four 64-Mbyte DIMMs) to function properly. Supported DIMM configuration options are 32, 64, and 128 megabytes. See the *Sun Enterprise 220R Server Owner's Guide* for more information.

3.1.1 Before You Begin

Complete these tasks:

- Section 2.1 "How to Power Off the System" on page 54
- Section 2.4 "How to Position the System for Service" on page 60
- Section 2.6 "How to Remove the System Cover" on page 65
- Section 2.8 "How to Avoid Electrostatic Discharge" on page 69

Caution - DIMMs are made of electronic components that are extremely sensitive to static electricity. Static electricity from your clothes or work environment can destroy the DIMM. Always wear a grounding strap when you handle the modules.

Caution - Do not remove any DIMM from its antistatic packaging until you are ready to install it. Handle the modules only by their edges. Do not touch the components or any metal parts. Always wear a grounding strap when you handle the modules.

3.1.2 What to Do

1. **Locate the memory module(s) to be removed.**

2. **Push the ejection lever away from the memory module and eject it from the socket.**

3. **Grasp the top corners of the memory module and pull it upward and out of its socket.**
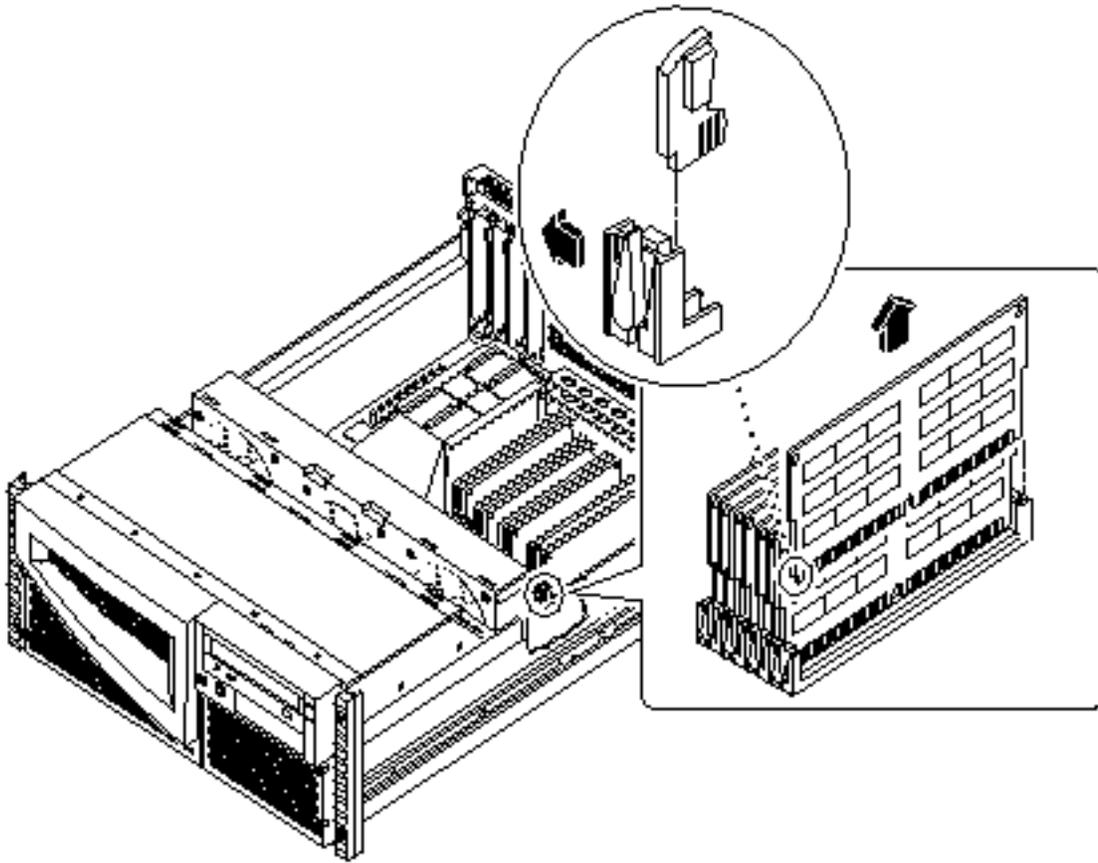
4. **Place the module on an antistatic mat.**

5. **Repeat Steps 2, 3, and 4 for each memory module being removed.**

3.1.3   What Next

To install a memory module, complete this task:

■ Section 3.2 "How to Install a Memory Module" on page 90

3.2 How to Install a Memory Module

Memory modules for this system are dual inline memory modules (DIMMs). Each DIMM bank must contain four DIMMs of equal density (for example, four 64-Mbyte DIMMs) to function properly. Supported DIMM configuration options are 32, 64, and 128 megabytes. See the *Sun Enterprise 220R Server Owner's Guide* for more information about memory.

3.2.1 Configuration Rules

The following memory configuration rules apply to your system:

- At least one memory bank (all four bank slots) must be filled for the system to boot.

- DIMMs must be added four at a time within the same bank.

- DIMM capacities can differ from one bank to the next—for example, four 64-Mbyte DIMMs installed in bank 0 and four 128-Mbyte DIMMs installed in bank 2 is permissible.

Refer to the following diagram for memory locations in your system.

System Side

U1004
U1003
Bank 3
U1002
U1001

U0904
U0903
Bank 2
U0902
U0901

U0804
U0803
Bank 1
U0802
U0801

U0704
U0703
Bank 0
U0702
U0701
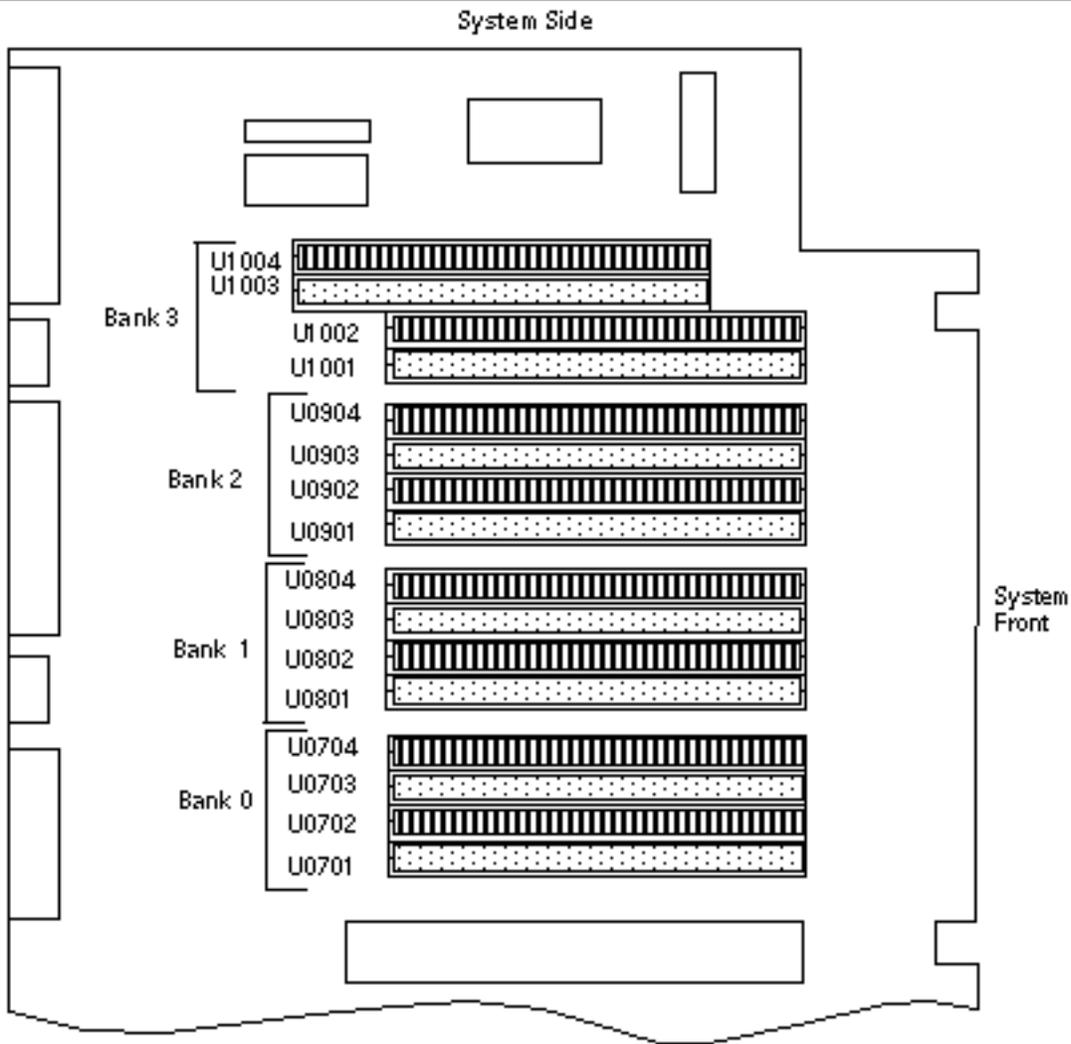
System
Front

3.2.2 Before You Begin

Complete these tasks:

- Section 2.1 "How to Power Off the System" on page 54
- Section 2.4 "How to Position the System for Service" on page 60
- Section 2.6 "How to Remove the System Cover" on page 65
- Section 2.8 "How to Avoid Electrostatic Discharge" on page 69

> ⚠️ **Caution -** DIMMs are made of electronic components that are extremely sensitive to static electricity. Static electricity from your clothes or work environment can destroy the DIMM. Always wear a grounding strap when you handle the modules.

> ⚠️ **Caution -** Do not remove a DIMM from its antistatic packaging until you are ready to install it. Handle the modules only by their edges. Do not touch the components or any metal parts. Always wear a grounding strap when you handle the modules.

3.2.3   What to Do

1. **Remove the new memory module from its antistatic packaging.**

2. **Locate the socket into which you will install the module.**

3. **Position the module so that the small notch on the bottom corner of the module is at the same end as the socket's ejection lever.**
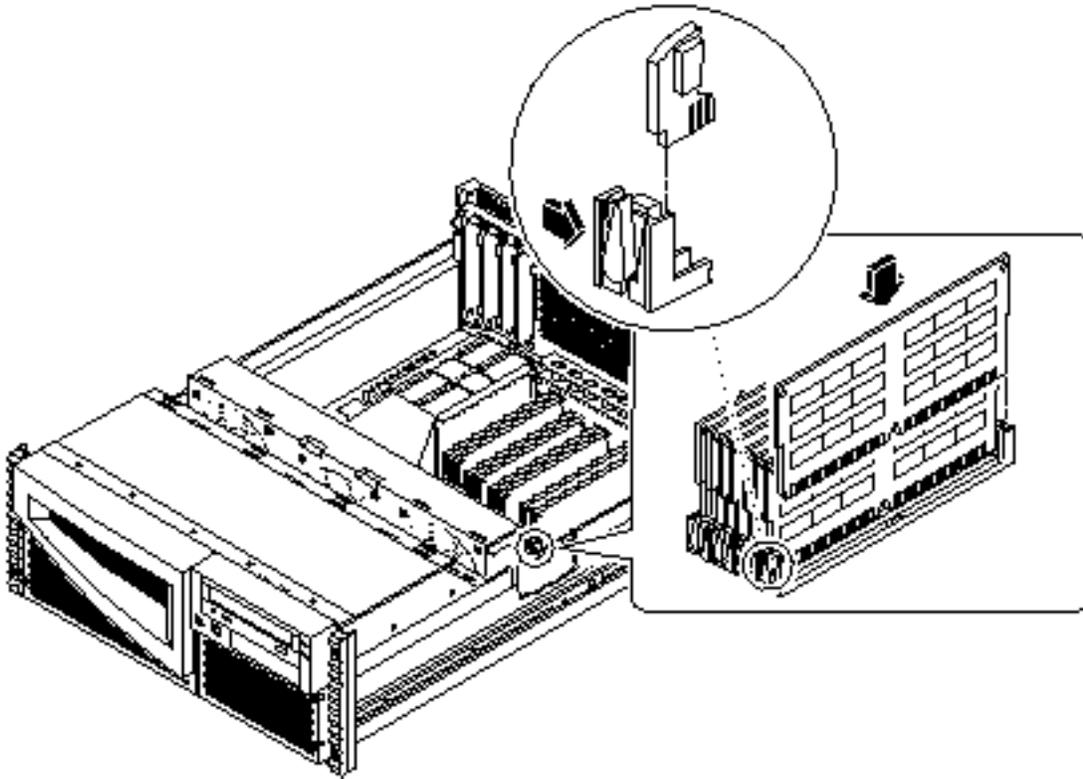
4. **Align the module with its socket until it contacts the socket evenly along the socket's length.**

5. **Press firmly down on both corners of the module until the bottom edge is firmly seated in the socket.**

   You will hear a clicking sound when the module is fully seated.

6. **Repeat Steps 3 through 5 for each module you want to install.**

3.2.4   What Next

Complete this task to reassemble the system:

■ Section 2.7 "How to Replace the System Cover" on page 67

When you are ready to restart the system, be sure to run OpenBoot Diagnostics tests to verify that the system functions correctly with the new parts you have just installed. For additional information, see:

■ Section 7.6 "How to Use OpenBoot Diagnostics (OBDiag)" on page 195

3.3 How to Remove a PCI Card

3.3.1 Before You Begin

Complete these tasks:

■ Section 2.1 "How to Power Off the System" on page 54

■ Section 2.4 "How to Position the System for Service" on page 60

■ Section 2.6 "How to Remove the System Cover" on page 65

■ Section 2.8 "How to Avoid Electrostatic Discharge" on page 69

3.3.2 What to Do

1. **Disconnect any external cable(s) attached to the faceplate of the PCI card.**

2. **Disconnect any cables connected to the PCI internal connectors.**

3. **Using a Phillips #2 screwdriver, remove the screw that secures the card to the system back panel.**

Caution - Do not apply excessive force to one end or one side of the board. Doing so could damage the card.
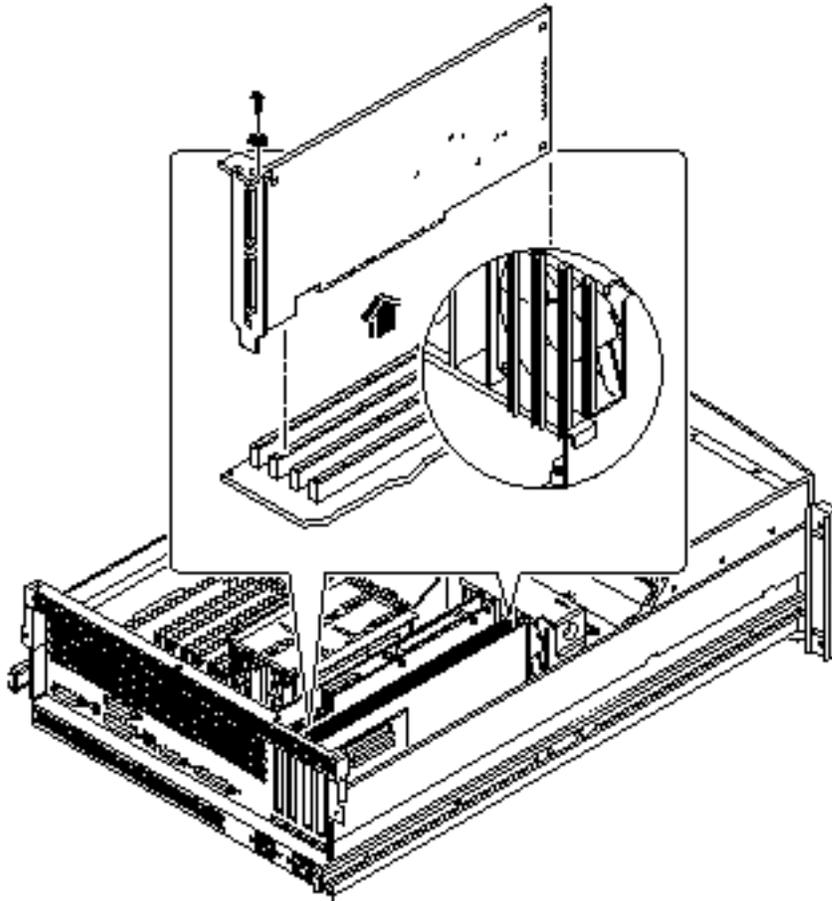
4. **Pull the PCI card from its slot.**

    Hold the card by the faceplate and its opposite edge, and pull upward while
    rocking the card from end to end until it is freed from its slot.

5. **Place the PCI card on an antistatic mat.**

6. **If you are not replacing the PCI card, cover the vacated space with a PCI filler
    panel.**

    a. **Slide the filler panel into the appropriate slot.**

    b. **Replace the Phillips screw that secures the filler panel to the system back
        panel.**
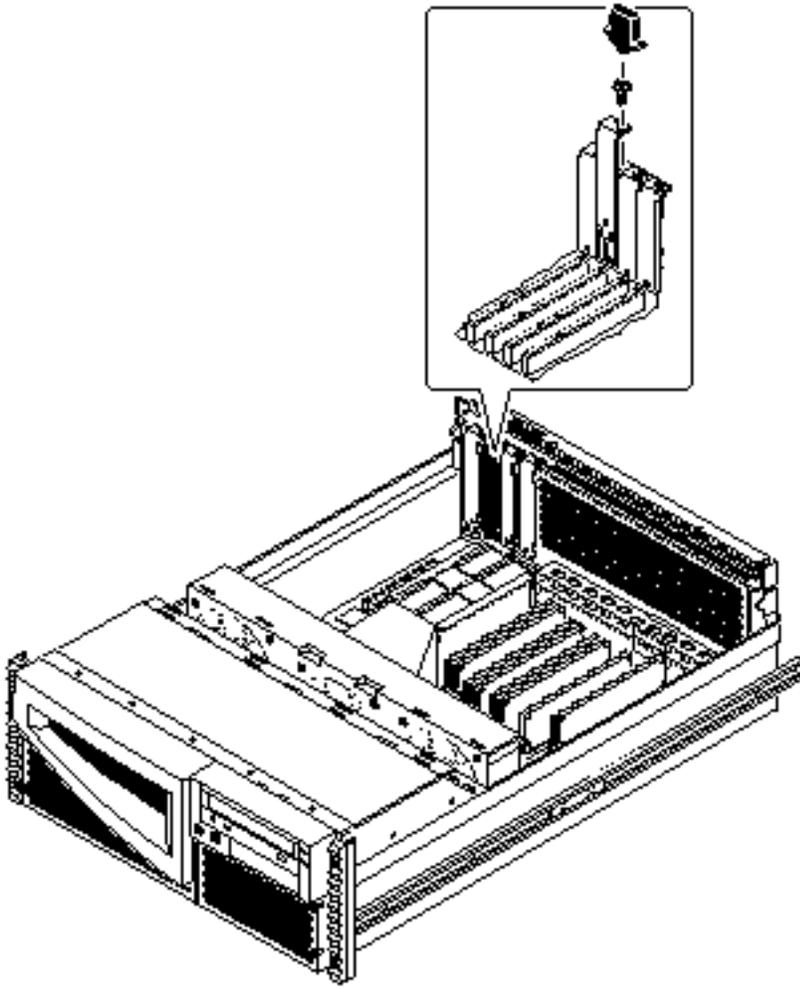
3.3.3 What Next

To install a PCI card, complete this step:

■ Section 3.4 "How to Install a PCI Card" on page 97

3.4 How to Install a PCI Card

3.4.1 Before You Begin

Complete these tasks:

- Section 2.1 "How to Power Off the System" on page 54
- Section 2.4 "How to Position the System for Service" on page 60
- Section 2.6 "How to Remove the System Cover" on page 65
- Section 2.8 "How to Avoid Electrostatic Discharge" on page 69

Read the documentation supplied with the PCI card for information about jumper settings, PCI slot requirements, and cable connections.

For information about the system's PCI slots and locations, see Section C.1.2 "PCI Bus" on page 253.

3.4.2 What to Do

1. **If you are installing a PCI card in an unused slot, remove the corresponding filler panel from the back of the system. Otherwise go to Step 2.**

   a. **Remove the Phillips screw that secures the PCI filler panel to the system back panel.**

   b. **Lift out the filler panel.**
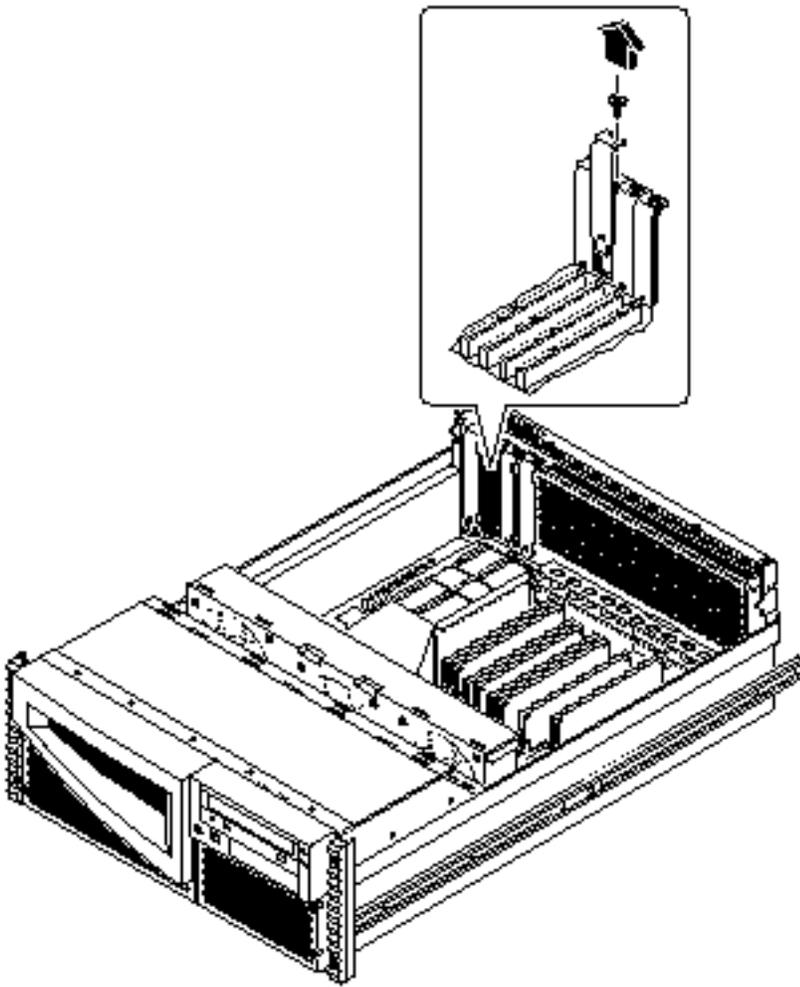
2. **Insert the PCI card into the appropriate slot on the main logic board.**

   a. **Insert the faceplate end of the card into the appropriate opening in the back panel.**
   If you are installing a PCI long card, guide the opposite end of the PCI card into the card slot on the fan tray assembly.

   b. **Push the card into the corresponding connector on the main logic board.**
   Apply even pressure along the edge of the card.
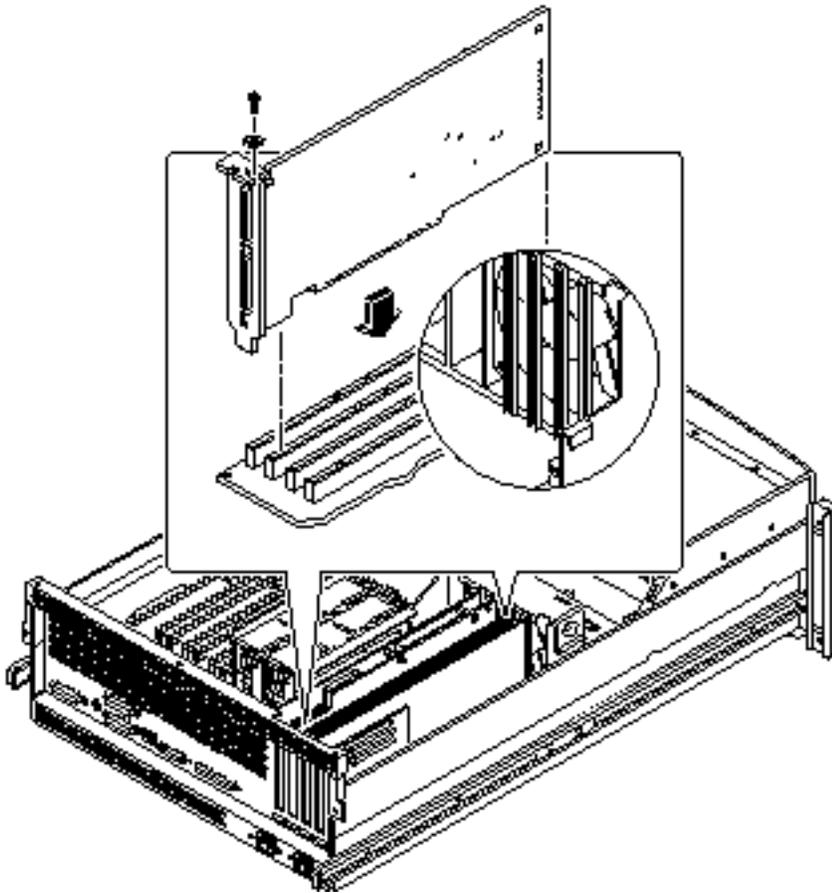
3. **Secure the PCI card faceplate to the back panel with the Phillips screw.**

4. **If necessary, connect any internal cables to the PCI card's internal connectors.**

5. **If necessary, connect any external cables to the PCI card.**

3.4.3   What Next

Complete this task to reassemble the system:

■ Section 2.7 "How to Replace the System Cover" on page 67

When you are ready to restart the system, be sure to run OpenBoot Diagnostics tests to verify that the system functions correctly with the new parts you have just installed. For additional information, see:

- Section 7.6 "How to Use OpenBoot Diagnostics (OBDiag)" on page 195

You must also perform a reconfiguration boot so that your system is able to recognize the new PCI card. For additional information, see:

- Section 2.3 "How to Initiate a Reconfiguration Boot" on page 58

3.5 How to Remove a CPU Module

3.5.1 Before You Begin

Complete these tasks:

- Section 2.1 "How to Power Off the System" on page 54
- Section 2.4 "How to Position the System for Service" on page 60
- Section 2.6 "How to Remove the System Cover" on page 65
- Section 2.8 "How to Avoid Electrostatic Discharge" on page 69

3.5.2 What to Do

1. **Determine which CPU module must be removed from the CPU card cage on the main logic board.**

   For information about the CPU module location, see Section 3.6 "How to Install a CPU Module" on page 102.

2. **Pull the CPU module ejection levers up from the CPU module to disengage the module from its main logic board connector.**

   The ejection levers are located on each side of the front of each CPU module. Rotate the levers away from the center of the CPU module.
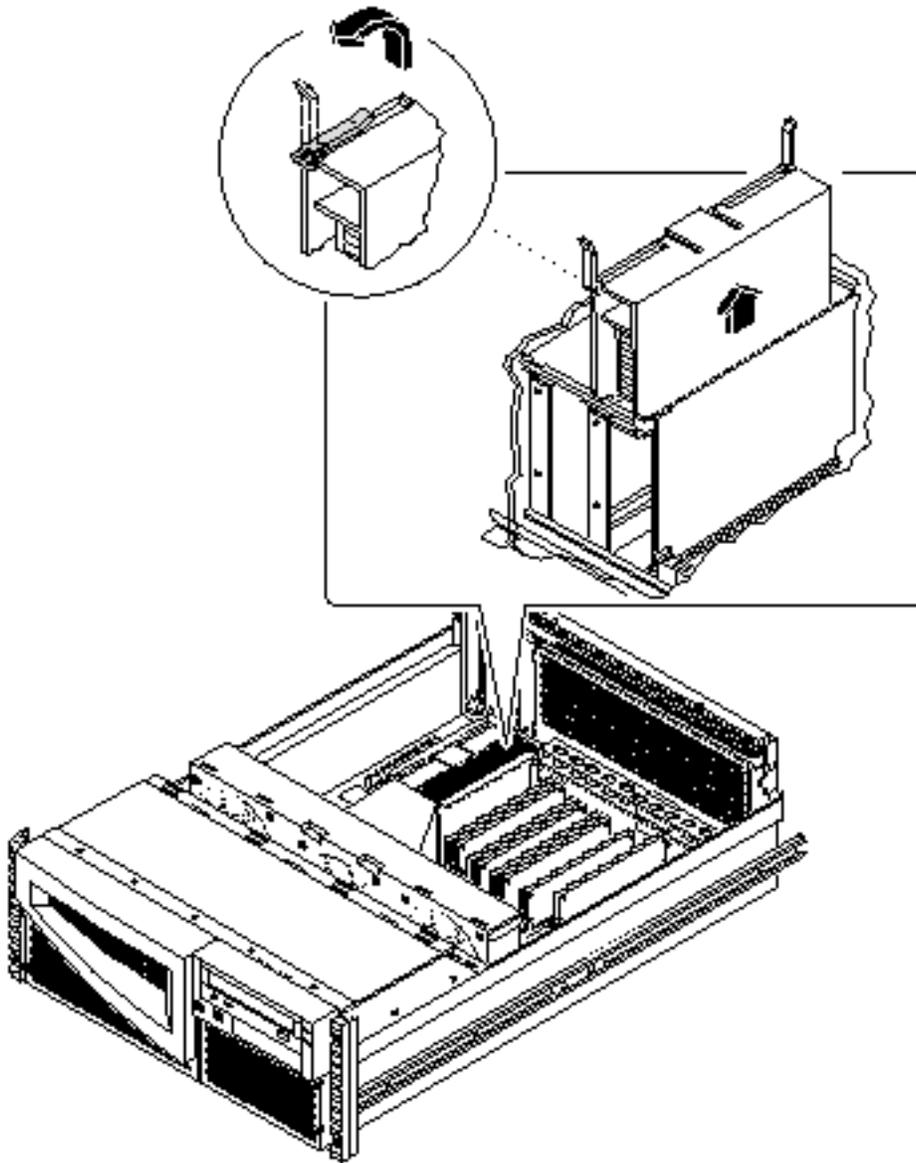
3. **Grasp the upper corners of the CPU module and slide the module out of the CPU card cage.**

4. **Place the CPU module on an antistatic mat.**

3.5.3 What Next

To install a CPU module, complete this task:

- Section 3.6 "How to Install a CPU Module" on page 102

3.6 How to Install a CPU Module

3.6.1 Before You Begin

Complete these tasks:

- Section 2.1 "How to Power Off the System" on page 54
- Section 2.4 "How to Position the System for Service" on page 60
- Section 2.6 "How to Remove the System Cover" on page 65
- Section 2.8 "How to Avoid Electrostatic Discharge" on page 69

The system supports one and two CPU module configurations. When replacing or installing CPU modules, you must fill the CPU slots in the following order.

System Configuration	Main Logic Board CPU Slot
One CPU	CPU slot 0
Two CPUs	CPU slots 0 and 1

J2703

NVRAM/
TOD

Bank 3
U1004
U1003
U1002
U1001

Bank 2
U0904
U0903
U0902
U0901

Bank 1
U0804
U0803
U0802
U0801

Bank 0
U0204
U0203
U0202
U0201

J2702
J2604
J2605
J0102 J2801 J2804
J3001 J0101 J0202 J0204

Front

CPU slot 1,
install second — CPU Module J0101

CPU slot 0,
install first — CPU Module J0201

PCI661 J1301
PCI2 J1401
PCI3 J1501
PCI4 J1601

Internal SCSI
J1801
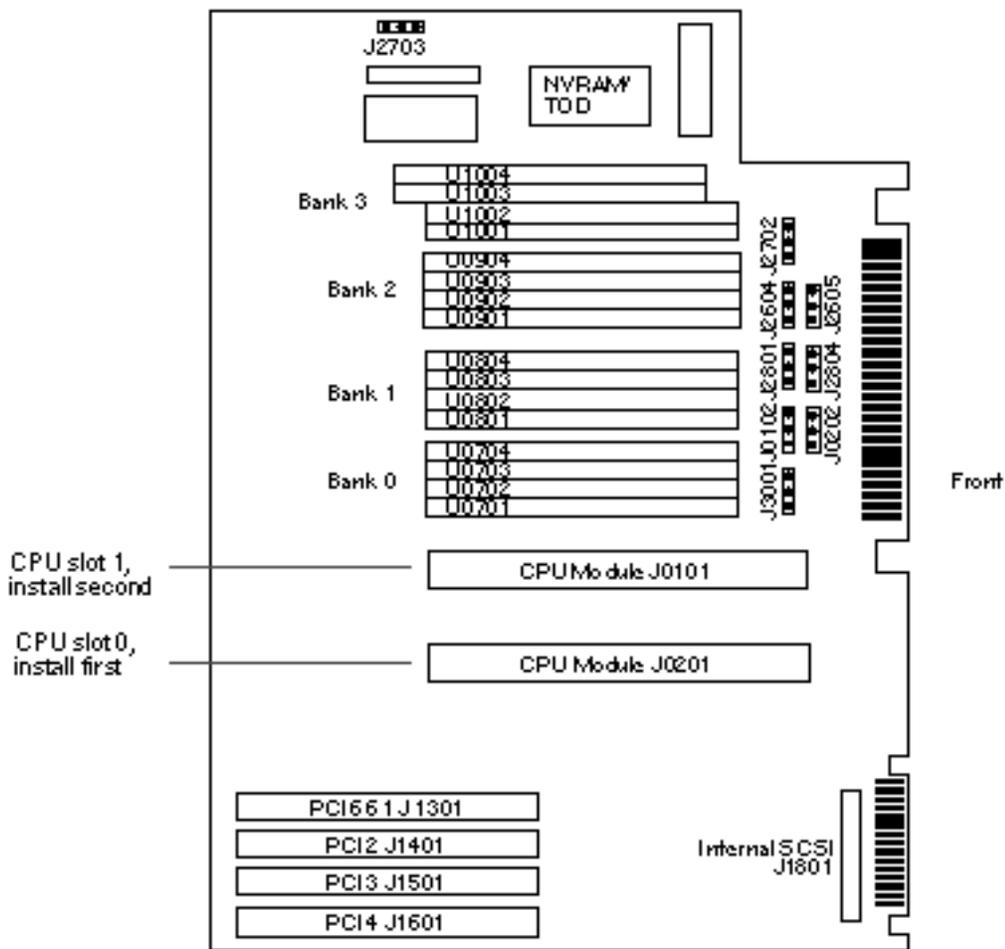
For further information about CPU modules, see your *Sun Enterprise 220R Server Owner's Guide.*

3.6.2   What to Do

1. **Locate the appropriate slot for the CPU module that you are installing in the CPU card cage on the main logic board.**

2. **Align the edges of the CPU module board with the corresponding grooves in the CPU card cage.**

3. **Verify that the two ejection levers are open.**

4. **Slide the CPU module evenly into the grooves in the CPU card cage.**
   Push down until the CPU module meets the connector at the bottom of the CPU card cage.
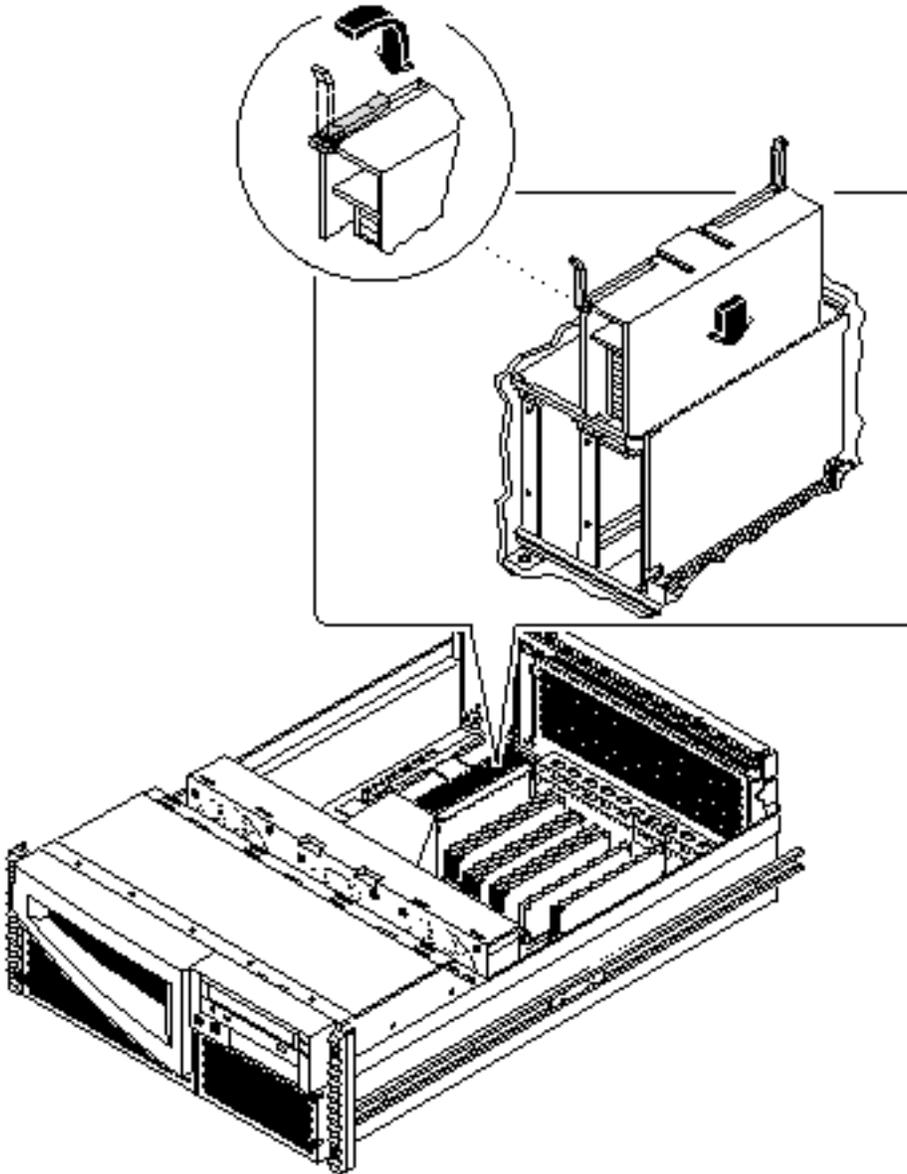
5. Engage the notch in each lever with its side of the CPU card cage.

6. Simultaneously push both levers toward the center of the CPU module until the CPU module seats in its connector.

3.6.3   What Next

Complete this task to reassemble the system:

- Section 2.7 "How to Replace the System Cover" on page 67

When you are ready to restart the system, be sure to run OpenBoot Diagnostics tests to verify that the system functions correctly with the new parts you have just installed. For additional information, see:

- Section 7.6 "How to Use OpenBoot Diagnostics (OBDiag)" on page 195

3.7   How to Remove the NVRAM/TOD Module

3.7.1   Before You Begin

Complete these tasks:

- Section 2.1 "How to Power Off the System" on page 54
- Section 2.4 "How to Position the System for Service" on page 60
- Section 2.6 "How to Remove the System Cover" on page 65
- Section 2.8 "How to Avoid Electrostatic Discharge" on page 69

The non-volatile random access memory/time of day (NVRAM/TOD) module contains the system host identification (ID) and Ethernet address. You may be migrating a functioning NVRAM/TOD module to a new main logic board in order to preserve host ID information. However, if you are replacing a defective NVRAM/TOD module and want to retain the same host ID, consult your authorized Sun sales representative or service provider.

3.7.2   What to Do

1. Locate the NVRAM/TOD module and its carrier on the main logic board.

2. Grasp the NVRAM/TOD carrier assembly at each end and pull straight up.

   If necessary, gently rock the NVRAM/TOD from side to side to facilitate removal.

3. Place the NVRAM/TOD module and carrier on an antistatic mat.

3.7.3   What Next

To replace the NVRAM/TOD module, complete this task:

- Section 3.8 "How to Replace the NVRAM/TOD Module" on page 108

3.8 How to Replace the NVRAM/TOD Module

3.8.1 Before You Begin

Complete this task:

■ Section 2.8 "How to Avoid Electrostatic Discharge" on page 69

Note - If you are installing a new NVRAM/TOD module, the NVRAM/TOD must be programmed by a Sun authorized service representative before your system can resume normal operation. If you are installing a new main logic board, remember that you can migrate your former NVRAM/TOD module in order to preserve your system's host ID and Ethernet address.

Note - For information about setting the flash PROM jumpers to enable you to program the NVRAM, see Section 3.16 "How to Set the Flash PROM Jumpers" on page 124.

3.8.2 What to Do

1. **Insert the NVRAM/TOD module and its carrier into its socket on the main logic board.**

   The carrier is keyed to ensure correct installation of the NVRAM/TOD module into its socket on the main logic board. Make sure that the NVRAM/TOD module is placed into its carrier correctly. The small marker dot on the top of the NVRAM/TOD module should be on the same side as the narrow tab on the carrier assembly.

Marker dot

Narrow tab

Wide tab
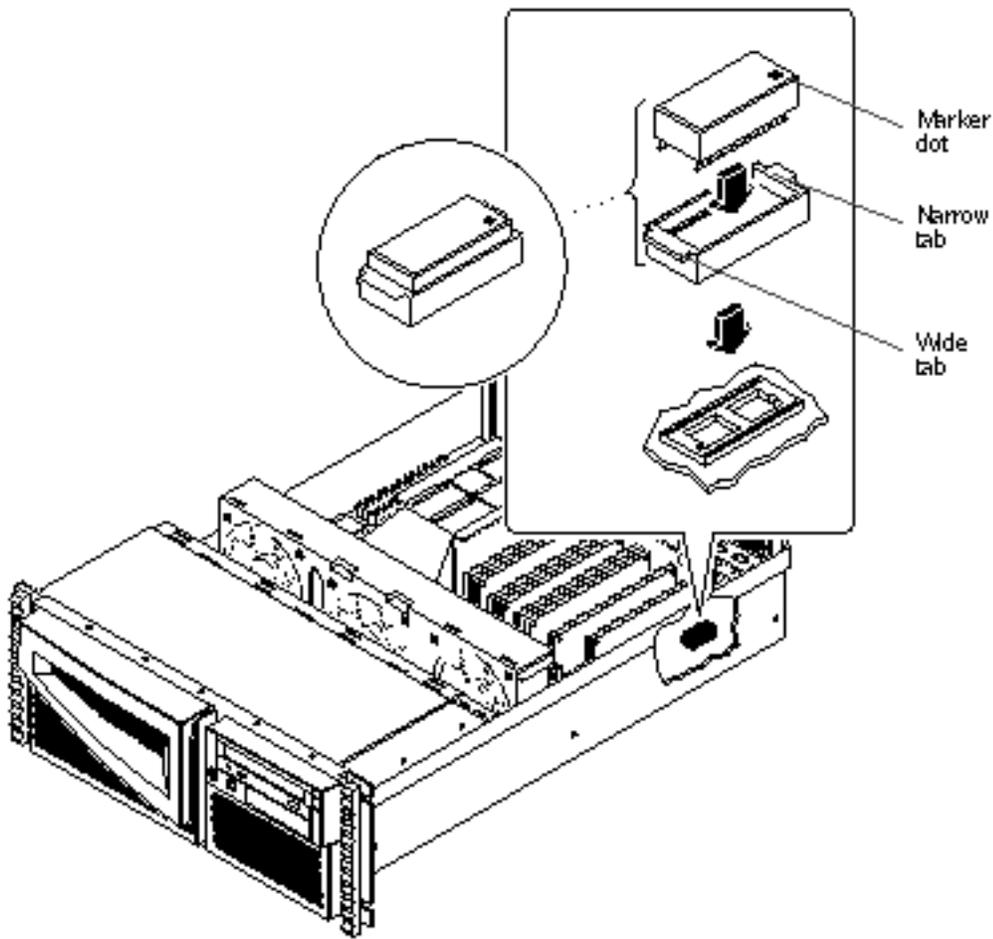
2. Push down firmly on the NVRAM/TOD module until it seats in its socket.

3.8.3   What Next

Complete the following task to reassemble the system:

■ Section 2.7 "How to Replace the System Cover" on page 67

When you are ready to restart the system, be sure to run OpenBoot Diagnostics tests to verify that the system functions correctly with the new part you have just installed. For additional information, see:

■ Section 7.6 "How to Use OpenBoot Diagnostics (OBDiag)" on page 195

3.9 How to Remove the Air Guide

3.9.1 Before You Begin

Complete these tasks:

- Section 2.1 "How to Power Off the System" on page 54
- Section 2.4 "How to Position the System for Service" on page 60
- Section 2.6 "How to Remove the System Cover" on page 65
- Section 2.8 "How to Avoid Electrostatic Discharge" on page 69

3.9.2 What to Do

1. Remove the Phillips screw attaching the air guide to the CPU card cage.

2. Lift the air guide up from the CPU card cage.

3.9.3 What Next

To replace the air guide, complete this task:

■ Section 3.10 "How to Replace the Air Guide" on page 111

3.10 How to Replace the Air Guide

3.10.1 Before You Begin

Complete this task:

■ Section 2.8 "How to Avoid Electrostatic Discharge" on page 69

3.10.2 What to Do

1. **Position the air guide on the CPU card cage assembly.**

   Align the two tabs on the top of the air guide with the slots on the CPU card cage assembly.
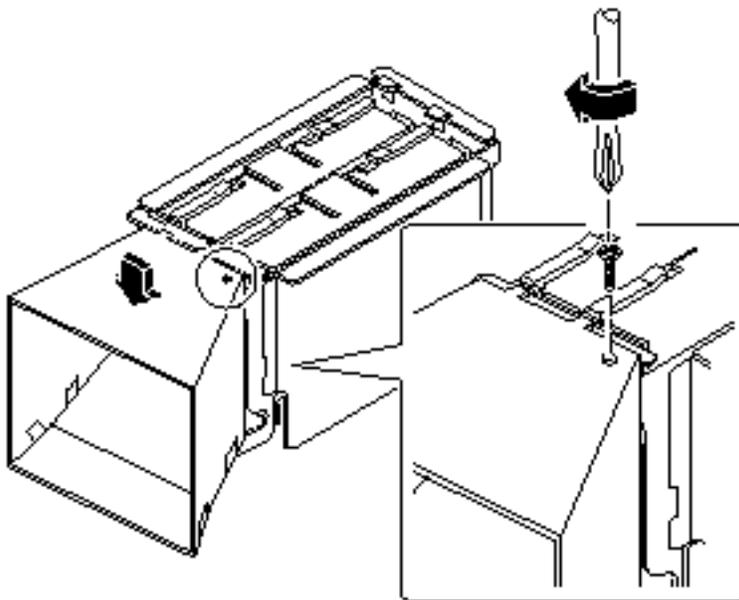
2. Replace the Phillips screw attaching the air guide to the side of the card cage.

3.10.3   What Next

Complete the following task to reassemble the system:

- Section 2.7 "How to Replace the System Cover" on page 67

3.11   How to Remove the CPU Card Cage Assembly

3.11.1   Before You Begin

Complete these tasks:

- Section 2.1 "How to Power Off the System" on page 54
- Section 2.4 "How to Position the System for Service" on page 60
- Section 2.6 "How to Remove the System Cover" on page 65
- Section 2.8 "How to Avoid Electrostatic Discharge" on page 69
- Section 3.5 "How to Remove a CPU Module" on page 100
- Section 3.9 "How to Remove the Air Guide" on page 110

Note - Remove all CPU modules prior to removing the card cage.

3.11.2   What to Do

1. Loosen the two captive screws securing the CPU card cage assembly to the main logic board.

Use a Phillips #2 screwdriver to loosen the screws.

2. Lift the CPU card cage assembly from the main logic board.
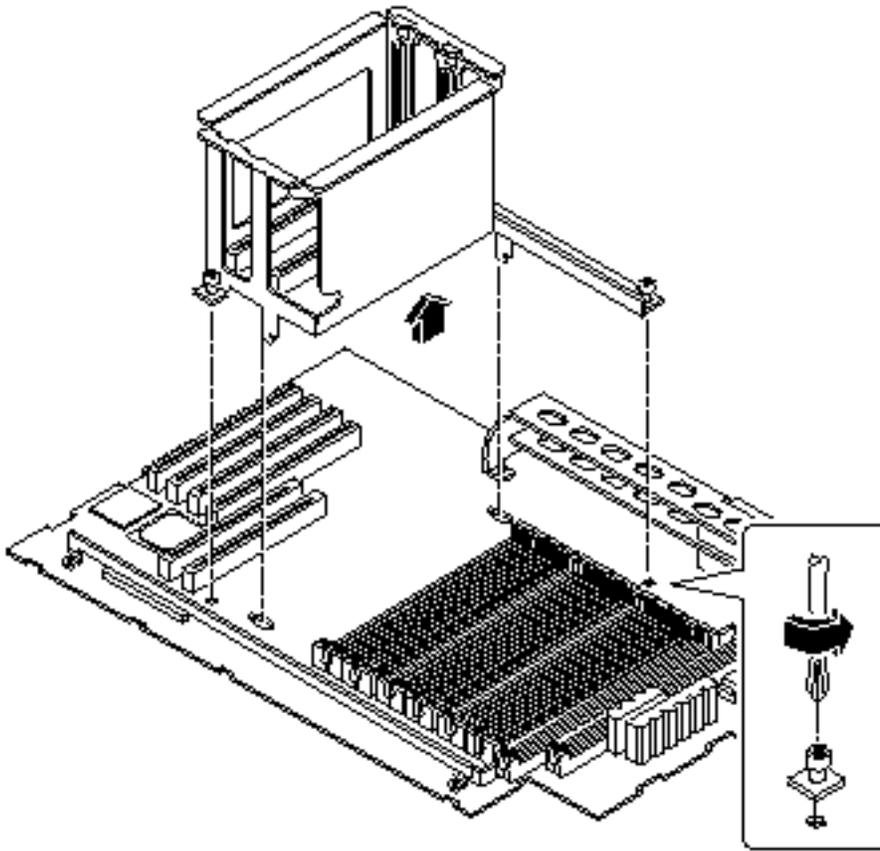
3.11.3   What Next

To replace the CPU card cage assembly, complete this task:

■ Section 3.12 "How to Replace the CPU Card Cage Assembly" on page 114

3.12 How to Replace the CPU Card Cage Assembly

3.12.1 Before You Begin

Complete this task:

■ Section 2.8 "How to Avoid Electrostatic Discharge" on page 69

3.12.2 What to Do

1. **Position the CPU card cage assembly on the main logic board.**

2. **Align the CPU card cage assembly screw holes with the corresponding holes on the main logic board.**
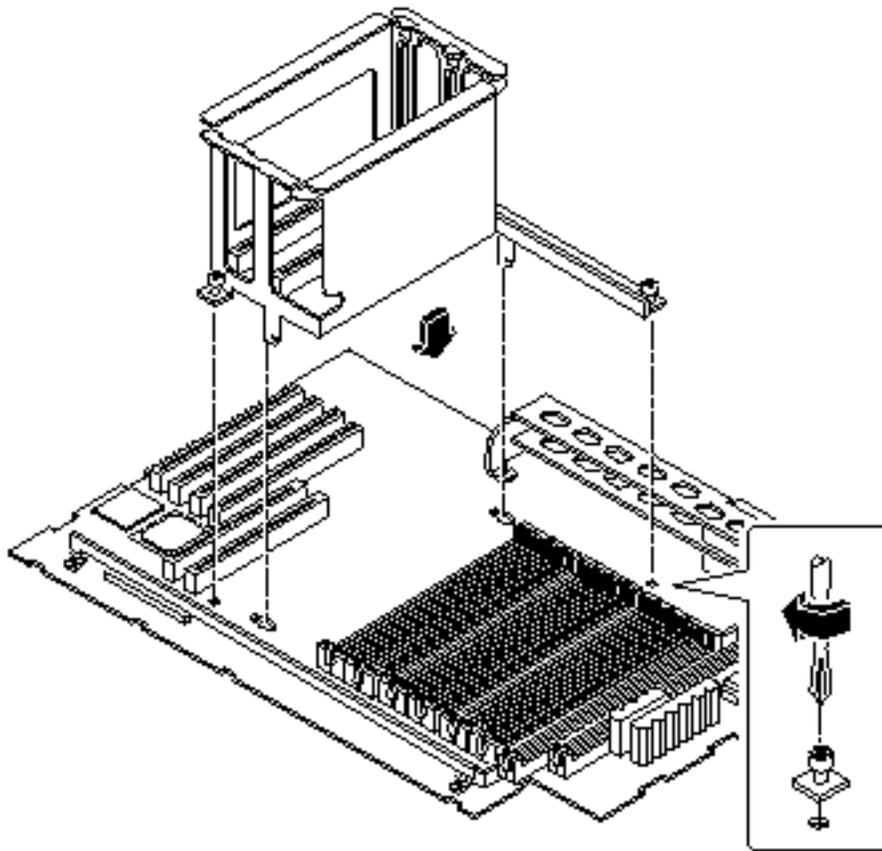
3. **Tighten the two captive screws that secure the CPU card cage assembly to the main logic board.**

   Use a Phillips #2 screwdriver to tighten the screws.

3.12.3   What Next

Complete these tasks to reassemble the system:

- Section 3.6 "How to Install a CPU Module" on page 102
- Section 3.10 "How to Replace the Air Guide" on page 111

3.13 How to Remove the Main Logic Board

3.13.1 Before You Begin

Caution - Use an antistatic mat when working with the main logic board. An antistatic mat provides the cushioning required to protect under the board, to prevent the main logic board from flexing, and to provide antistatic protection.

Caution - Perform this procedure on a workbench. Sun Microsystems does not support changing the main logic board while the system is installed in a rack.

The NVRAM/TOD module contains the system host identification (ID) and Ethernet address. You can migrate your NVRAM/TOD module from your old board to preserve your host ID and Ethernet address. However, if you are replacing the NVRAM/TOD module and want to retain the same host ID and Ethernet address on the new main logic board, consult your authorized Sun sales representative or service provider.

Before you remove the main logic board, you must remove all removable components from it. You can then transfer the components to the new main logic board after you install it. Complete these tasks to remove the necessary components:

- Section 2.1 "How to Power Off the System" on page 54
- Section 2.14 "How to Remove the System From the Rack" on page 78
- Section 2.6 "How to Remove the System Cover" on page 65
- Section 2.8 "How to Avoid Electrostatic Discharge" on page 69
- Section 3.1 "How to Remove a Memory Module" on page 88
- Section 3.3 "How to Remove a PCI Card" on page 94
- Section 3.7 "How to Remove the NVRAM/TOD Module" on page 106
- Section 3.5 "How to Remove a CPU Module" on page 100
- Section 3.9 "How to Remove the Air Guide" on page 110
- Section 3.11 "How to Remove the CPU Card Cage Assembly" on page 112

Caution - Do not attempt to remove components from the board after it has been removed from the system. Doing so can damage the main logic board.

3.13.2   What to Do

1. **Disconnect the following internal cables from the main logic board.**
   Press the tab on the cable connector to detach each cable. For information about cable connector locations, see Section 5.5 "How to Connect the System Cables" on page 155

   a. **Disconnect the main power cables from connectors J2902 and J2903.**

   b. **Disconnect the CPU power sense cable from connector J2901.**

   c. **Disconnect the UltraSCSI data cable from connector J1801.**

2. **Remove the three screws securing the main logic board to the back panel.**
   Small arrows on the back panel point to the screws you must loosen.

3. **Slide the main logic board away from the back panel until it clears the notched hold-down tabs.**
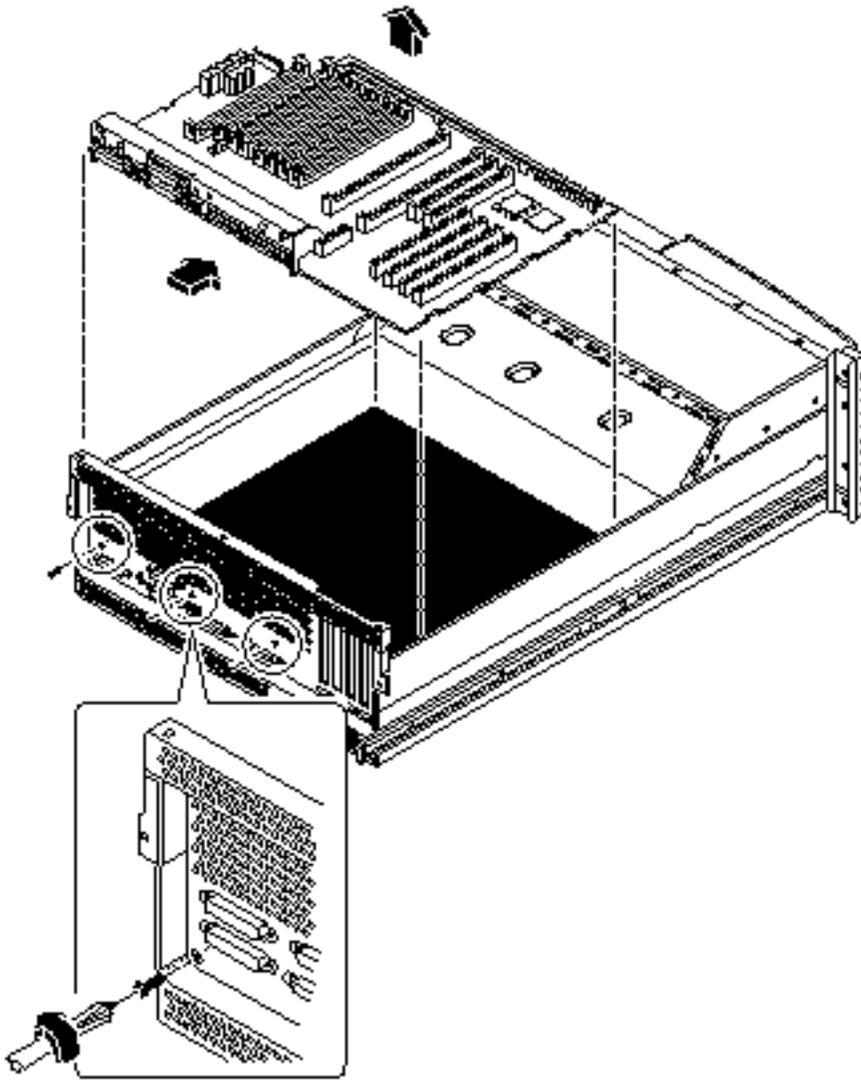
4. Lift the main logic board out of the system.

5. Place the main logic board on an antistatic mat.

6. If you are replacing this main logic board, note the serial port and flash PROM jumper settings.

See Section 3.15 "How to Set the Serial Port Jumpers" on page 122 and Section 3.16 "How to Set the Flash PROM Jumpers" on page 124.

3.13.3 What Next

To replace the main logic board, complete this task:

■ Section 3.14 "How to Replace the Main Logic Board" on page 119

3.14 How to Replace the Main Logic Board

3.14.1 Before You Begin

All removable components should have been removed from the old main logic board prior to removing the board from the system. You can transfer the components to the replacement board after it is installed in the system. For more information, see:

■ Section 3.13 "How to Remove the Main Logic Board" on page 116

Caution - Use an antistatic mat when working with the main logic board. An antistatic mat provides the cushioning required to protect the board, to prevent the main logic board from flexing, and to provide antistatic protection.

Caution - Perform this procedure on a workbench. Sun Microsystems does not support changing the main logic board while the system is installed in a rack.

Caution - Do not attempt to install components on the main logic board while it is outside the system. Doing so can damage the main logic board.

Be sure to complete this task before starting the procedure:

■ Section 2.1 "How to Power Off the System" on page 54

3.14.2 What to Do

1. **Remove the main logic board from its antistatic packaging and place it on an antistatic mat.**

Caution - Handle the main logic board by the back panel or edges only.

2. **Set the jumper settings on the replacement main logic board so that they match the jumper settings on the original main logic board.**

See Section 3.15 "How to Set the Serial Port Jumpers" on page 122 and Section 3.16 "How to Set the Flash PROM Jumpers" on page 124.

3. Position the replacement main logic board in the chassis.

Align the notches on the sides of the board with the corresponding tabs on the chassis.
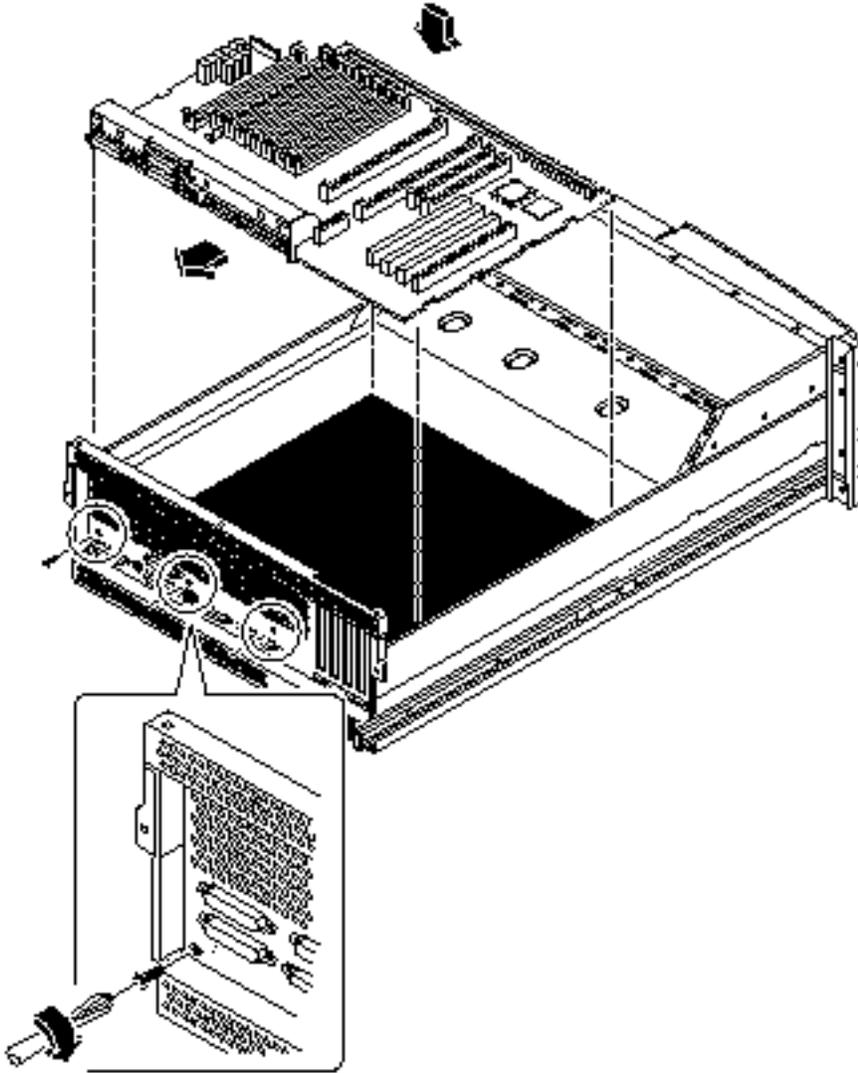
4. Slide the main logic board toward the back of the system.

Ensure that each connector on the main logic board slides through the corresponding cutout in the chassis back panel.

5. **Replace the three screws securing the main logic board to the system back panel.**

6. **Connect the following internal cables to the main logic board.**

   The connectors are keyed to connect in only one way. For information about cable connector locations, see Section 5.5 "How to Connect the System Cables" on page 155.

   a. **Connect the main power cables to connectors J2902 and J2903.**

   b. **Connect the CPU power sense cable to connector J2901.**

   c. **Connect the UltraSCSI data cable to connector J1801.**

3.14.3   What Next

Complete these tasks to reassemble the system:

- Section 3.8 "How to Replace the NVRAM/TOD Module" on page 108
- Section 3.12 "How to Replace the CPU Card Cage Assembly" on page 114
- Section 3.10 "How to Replace the Air Guide" on page 111
- Section 3.6 "How to Install a CPU Module" on page 102
- Section 3.2 "How to Install a Memory Module" on page 90
- Section 3.4 "How to Install a PCI Card" on page 97
- Section 2.7 "How to Replace the System Cover" on page 67

When you are ready to restart the system, be sure to run OpenBoot Diagnostics tests to verify that the system functions correctly with the parts you have just installed. For additional information, see:

- Section 7.6 "How to Use OpenBoot Diagnostics (OBDiag)" on page 195

You may also have to perform a reconfiguration boot so that your system is able to recognize any new parts. For additional information, see:

- Section 2.3 "How to Initiate a Reconfiguration Boot" on page 58

3.15 How to Set the Serial Port Jumpers

The serial port jumpers on the main logic board (J2604 and J2605) permit the configuration of the system's two serial ports for either EIA-432 or EIA-232D signal levels. EIA-432 levels are the default standard for North American users. EIA-232D levels are required for digital telecommunication in nations of the European Economic Community.

For further information, see your *Sun Enterprise 220R Server Owner's Guide.*
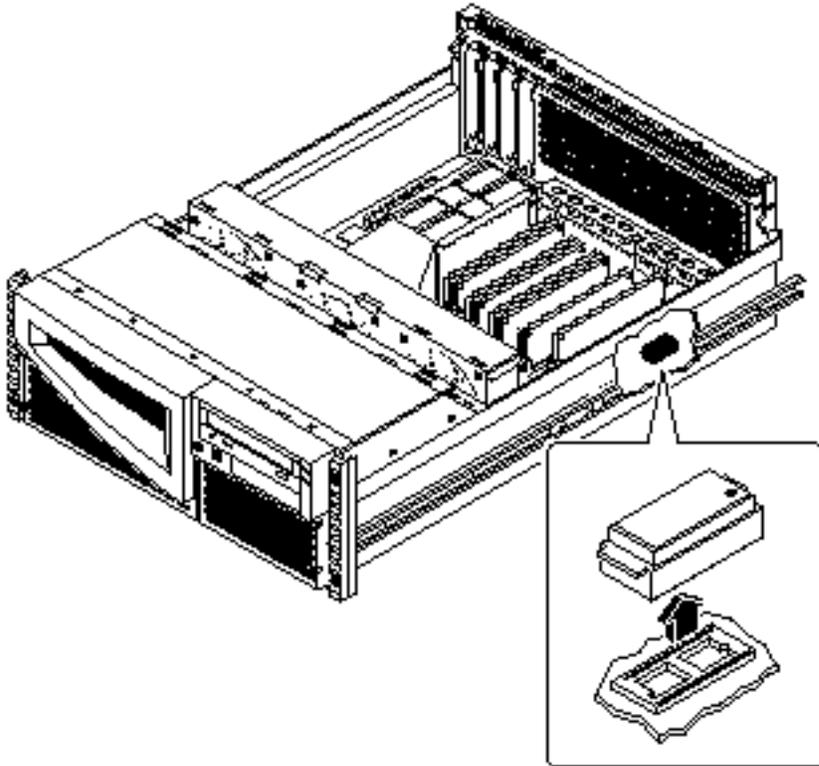
3.15.1 Before You Begin

Complete these tasks:

- Section 2.1 "How to Power Off the System" on page 54
- Section 2.4 "How to Position the System for Service" on page 60
- Section 2.6 "How to Remove the System Cover" on page 65
- Section 2.8 "How to Avoid Electrostatic Discharge" on page 69

3.15.2 What to Do

1. **Locate the jumpers on the main logic board.**

   A main logic board jumper is identified by its jumper address, labeled on the board with the letter "J" followed by four numbers (JXXXX). Jumper pins are located immediately adjacent to the jumper address. On the board, pin 1 is marked with an asterisk.

Figure labels:
- J2703
- NVRAM/TOD
- Flash PROM jumpers
- Serial port jumpers
- Bank 3: U1004, U1003, U1002, U1001
- Bank 2: U0904, U0903, U0902, U0901
- Bank 1: U0804, U0803, U0802, U0801
- Bank 0: U0704, U0703, U0702, U0701
- J2702, J2604, J2605, J2804, J0102, J2804, J0202, J3001
- CPU module J0101
- CPU module J0201
- PCI 66 1 J1301
- PCI 2 J1401
- PCI 3 J1501
- PCI 4 J1601
- Internal SCSI J1801
- Front

2. Set the main logic board serial port jumpers J2604 and J2605.

Using long-nose pliers, place a shunt over the appropriate pins according to the following table.

Serial port jumper	A shunt on pins 1 and 2 selects	A shunt on pins 2 and 3 selects	The default shunt is on pins
J2604	RS-232D	RS-432	2 and 3
J2605	RS-232D	RS-432	2 and 3

3.15.3   What Next

Complete the following task to reassemble the system:

■ Section 2.7 "How to Replace the System Cover" on page 67

3.16   How to Set the Flash PROM Jumpers

The system uses flash PROMs to permit the reprogramming of specific code blocks that are held in non-volatile system memory, and to permit remote reprogramming of that code by an authorized system administrator over a local area network.

Two jumpers, J2703 and J2804, on the main logic board affect flash PROM operation. The default shunt setting of J2703 is on pins 1 and 2. Placing a shunt on pins 2 and 3 enables reprogramming of the flash PROM.

When you reprogram NVRAM, it stores the old program in the high half of NVRAM as a backup copy, in case something goes wrong in the new program. The jumper switches enable you to select which half of NVRAM you want to boot from: the low-half (or normal, default) or the high-half. This means that you can set the jumpers to select either "high-half booting" or "low-half booting."
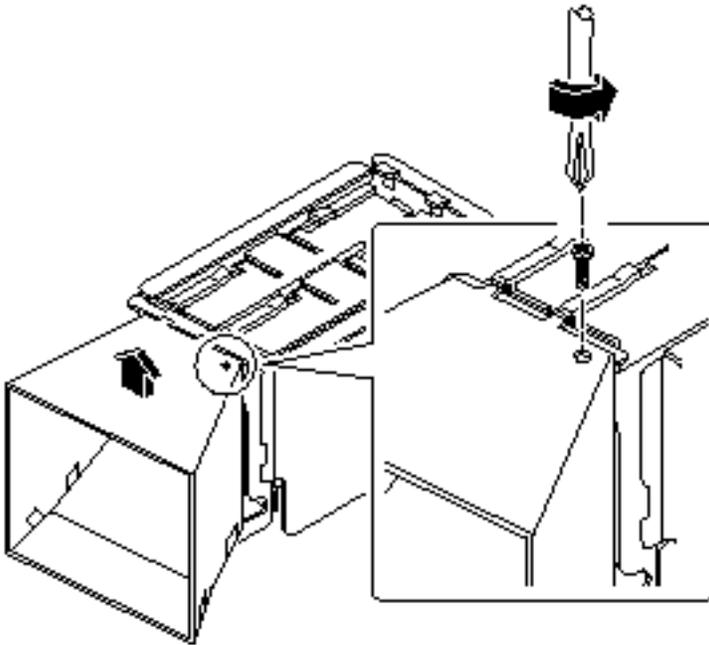
3.16.1   Before You Begin

Complete these tasks:

■ Section 2.1 "How to Power Off the System" on page 54

■ Section 2.4 "How to Position the System for Service" on page 60

■ Section 2.6 "How to Remove the System Cover" on page 65

■ Section 2.8 "How to Avoid Electrostatic Discharge" on page 69

3.16.2   What to Do

1. Locate the jumpers on the main logic board.

A main logic board jumper is identified by its jumper address, labeled on the board with the letter "J" followed by four numbers (JXXXX). Jumper pins are located immediately adjacent to the jumper address. On the board, pin 1 is marked with an asterisk.

For information about jumper locations, see Section 3.15 "How to Set the Serial Port Jumpers" on page 122.

2. Set the main logic board jumpers J2703 and J2804.

Using long-nose pliers, place a shunt over the appropriate pins according to the following table.

Flash PROM jumper	A shunt on pins 1 and 2 selects	A shunt on pins 2 and 3 selects	The default shunt is on pins	Signal that is controlled
J2703	Write-protect	Write-enable	1 and 2	FLASH PROM PROG ENABLE
J2804	High-half booting	Normal (low-half) booting	2 and 3	XOR LOGIC SET

3.16.3   What Next

Complete the following task to reassemble the system:

- Section 2.7 "How to Replace the System Cover" on page 67

Removing and Installing Storage Devices

This chapter describes how to remove and install the system's storage and removable media devices. For a list of part numbers for field-replaceable units and optional equipment, see Appendix D.

The following tasks are covered in this chapter:

- Section 4.1 "How to Remove a Disk Drive" on page 127
- Section 4.2 "How to Install a Disk Drive" on page 130
- Section 4.3 "How to Remove the Removable Media Assembly (RMA)" on page 132
- Section 4.4 "How to Replace the Removable Media Assembly (RMA)" on page 135
- Section 4.5 "How to Remove a CD-ROM or Tape Drive " on page 138
- Section 4.6 "How to Install a CD-ROM or Tape Drive" on page 139

4.1   How to Remove a Disk Drive

The system's disk "hot-plug" feature lets you remove a disk drive without shutting down the operating system or turning off the system power. For more information, see your *Sun Enterprise 220R Server Owner's Guide.*

4.1.1   Before You Begin

Complete this task:

- Section 2.8 "How to Avoid Electrostatic Discharge" on page 69

Note - If the system is set up without a local graphics console, terminal, or monitor, you need to set up one of these options in order to issue software commands. For more information, see Section 2.10 "About Communicating With the Server" on page 73.

4.1.2   What to Do

1. **Prepare the system for disk removal.**

   The hot-plug removal procedure involves software commands for preparing the system prior to removing the disk drive. See your *Sun Enterprise 220R Server Owner's Guide.*

2. **If you are not hot-plugging the disk drive, halt the operating system and turn off the system power.**

   See Section 2.1 "How to Power Off the System" on page 54.

3. **Unlock the front doors and swing them open.**

   Turn the keyswitch to the Power-On/Off position. This unlocks the system front doors.

4. **Identify the disk drive to be removed and note the bay in which it is installed.**

   For information about disk status LEDs, see Section 7.12.1.4 "Disk Drive LEDs" on page 215.

5. **Push the disk drive latch to the right to release the disk drive handle.**
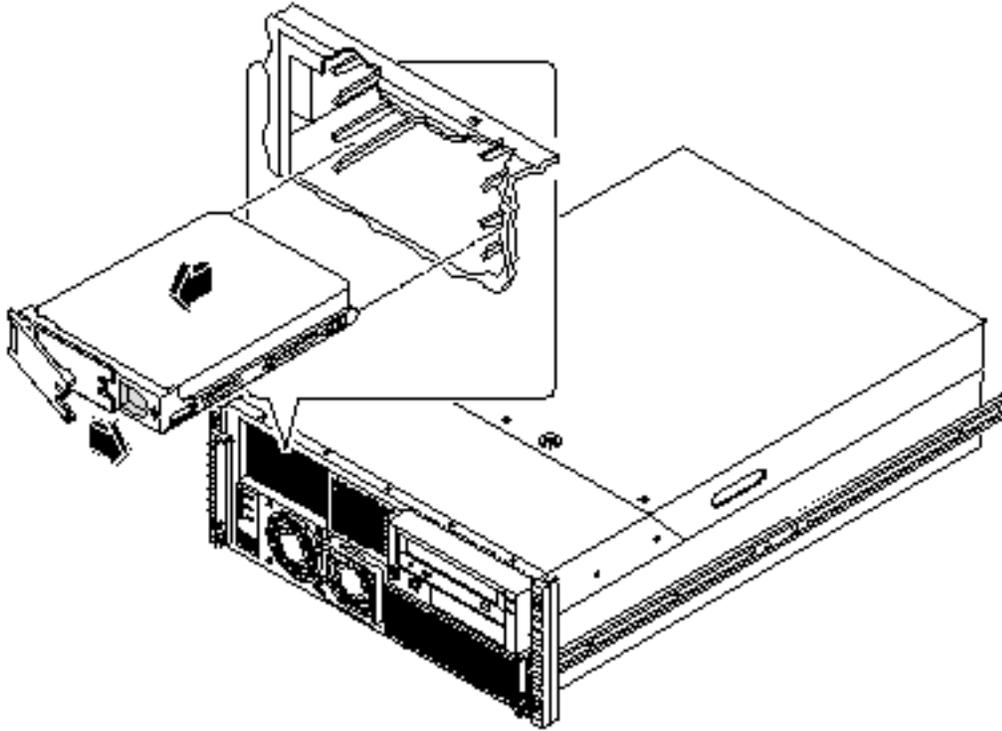
6. **Swing the handle away from the drive until you feel the drive connector disengage from the backplane.**

7. **Holding the disk drive by the handle, slide it out of the drive bay.**

8. **Place the disk drive on an antistatic mat.**

4.1.3   What Next

To install the disk drive, complete this task:

■ Section 4.2 "How to Install a Disk Drive" on page 130

4.2 How to Install a Disk Drive

The system's disk *hot-plug* feature lets you install a disk drive without shutting down the operating system or turning off the system power. For more information, see your *Sun Enterprise 220R Server Owner's Guide.*

4.2.1 Before You Begin

Complete this task:

■ Section 2.8 "How to Avoid Electrostatic Discharge" on page 69

Note - If the server is setup without a local graphics console, terminal, or monitor, you need to set up one of these options in order to issue software commands. See "About Setting Up a Console" on page 40 for further information.

4.2.2 What to Do

1. **Prepare the system to receive the new disk drive.**

   The hot-plug installation procedure involves software commands for preparing the system prior to installing the disk drive. See your *Sun Enterprise 220R Server Owner's Guide.*

2. **If you are not hot-plugging the disk drive, halt the operating system and turn off system power.**

   See Section 2.1 "How to Power Off the System" on page 54.

3. **Push the disk drive latch to the right to release the disk drive handle.**
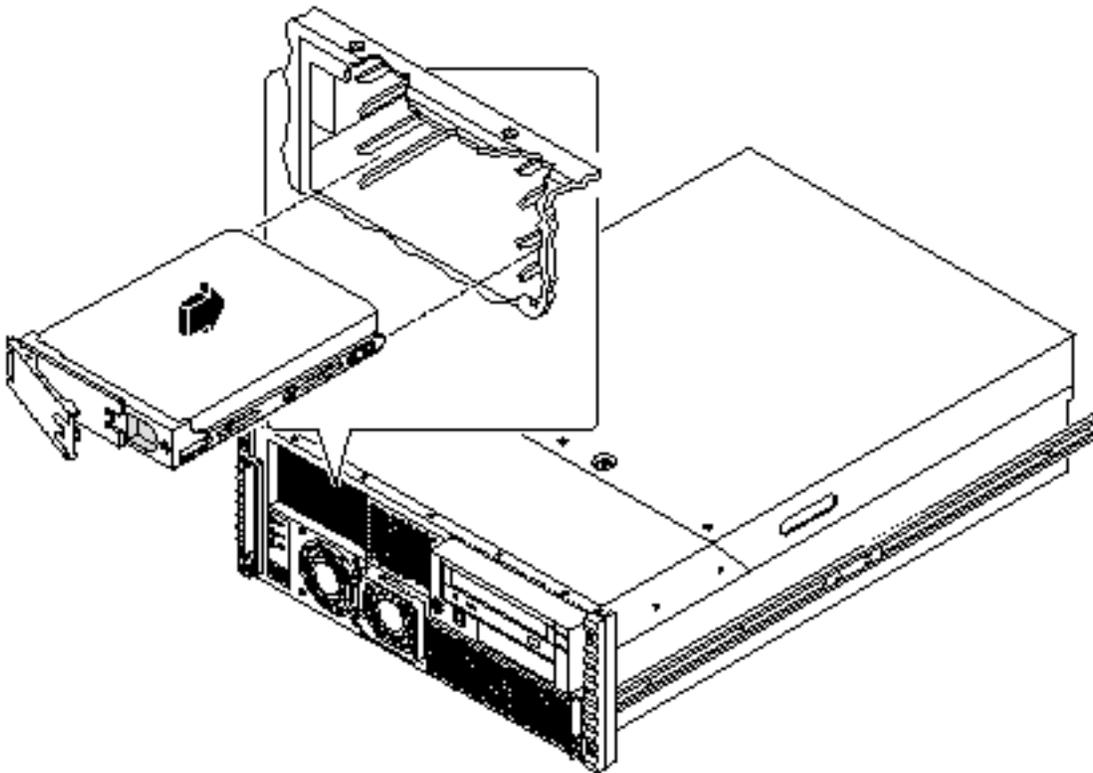
4. **Align the disk drive to its drive bay.**

   Orient the drive so that the drive handle's hinge is on the left side of the drive bay.

   Note - If you are reinstalling a drive that you previously removed, be sure to reinstall the drive in the same bay from which it was removed.

   ---

5. **Holding the drive by its handle, fit the drive into the guide rails at the left and right of the drive bay.**

6. **Slide the drive into the bay until it lightly contacts the backplane.**

7. **Press carefully on the center of the drive and watch as the handle begins to close.**

   The drive handle begins to close as the drive engages its backplane connector.

8. **Press the handle firmly toward the drive until the latch closes, securing the drive in the bay.**

9. **Close and lock the system doors.**

   Turn the keyswitch to the Locked position. This locks the system front doors, preventing access to the power supply(s) and to the disk drive(s).

10. **If you are performing a hot-plug installation, complete the software part of the installation procedure.**

    For further information, see your *Sun Enterprise 220R Server Owner's Guide.*

4.2.3   What Next

When you are ready to restart the system, be sure to run OpenBoot Diagnostics tests to verify that the system functions correctly with the new parts you have just installed. For additional information, see:

- Section 7.6 "How to Use OpenBoot Diagnostics (OBDiag)" on page 195

You must also perform a reconfiguration boot so that your system is able to recognize any new device(s). For additional information, see:

- Section 2.3 "How to Initiate a Reconfiguration Boot" on page 58

4.3   How to Remove the Removable Media Assembly (RMA)

Note - The removable media assembly can include a CD-ROM drive or a 4-mm tape drive.

4.3.1   Before You Begin

Complete these tasks:

- Section 2.1 "How to Power Off the System" on page 54
- Section 2.4 "How to Position the System for Service" on page 60
- Section 2.6 "How to Remove the System Cover" on page 65
- Section 2.8 "How to Avoid Electrostatic Discharge" on page 69

4.3.2   What to Do

1. **Disconnect the I/O power cable from the removable media assembly power connector.**

   See the illustration in Step 3 for the location of the RMA in the system.
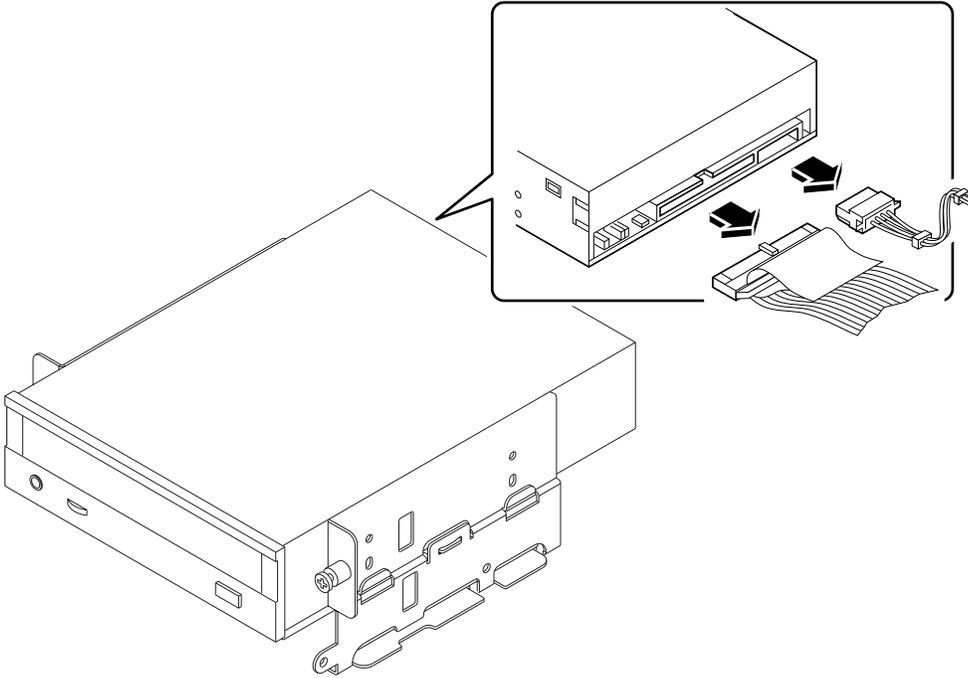
2. **Disconnect the removable media SCSI cable from the removable media SCSI connector.**

3. **Pull off the plastic cover from the front of the removable media assembly.**

   Press down on the top of the plastic cover with your fingers until the tab on the top of the cover disengages from the chassis.
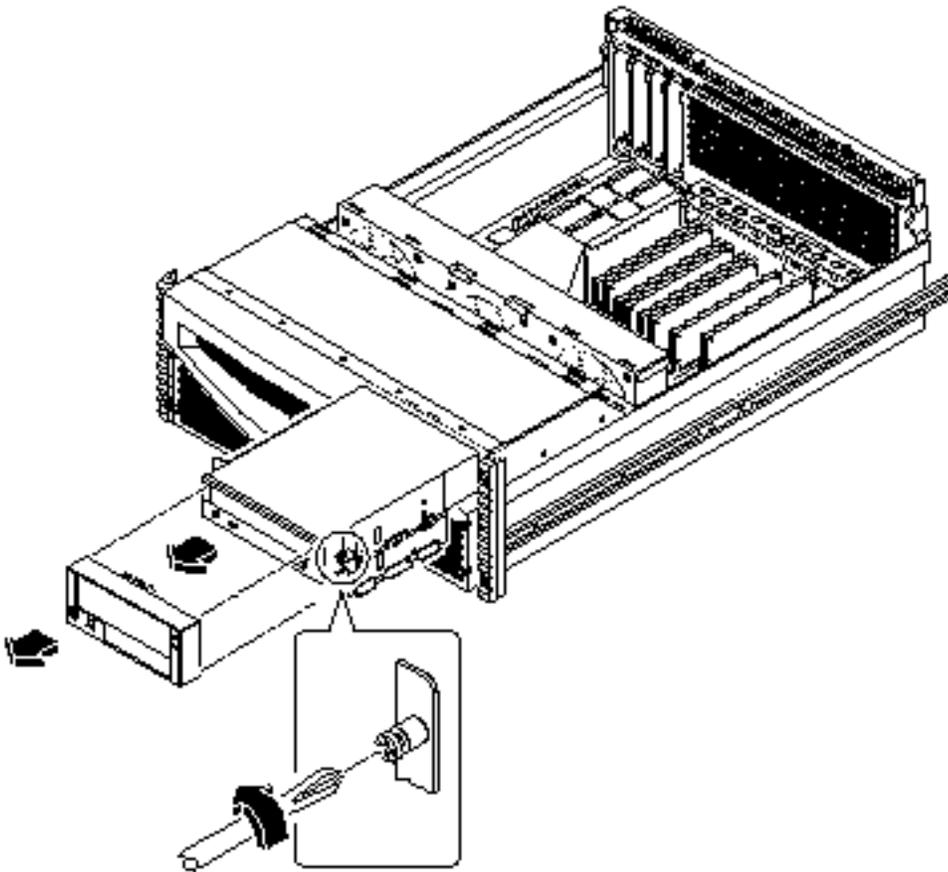
4. **Loosen the two captive Phillips screws securing the removable media assembly to the chassis.**

5. **Slide the removable media assembly out of the system chassis.**

6. **Place the assembly on an antistatic mat.**

4.3.3 What Next

For information about removing drives from, or installing drives into the removable media assembly, see

- Section 4.5 "How to Remove a CD-ROM or Tape Drive " on page 138

- Section 4.6 "How to Install a CD-ROM or Tape Drive" on page 139

To replace the removable media assembly, complete this task:

■ Section 4.4 "How to Replace the Removable Media Assembly (RMA)" on page 135

4.4 How to Replace the Removable Media Assembly (RMA)

4.4.1 Before You Begin

Complete this task:

■ Section 2.8 "How to Avoid Electrostatic Discharge" on page 69

4.4.2 What to Do

1. **Slide the removable media assembly into the system chassis.**
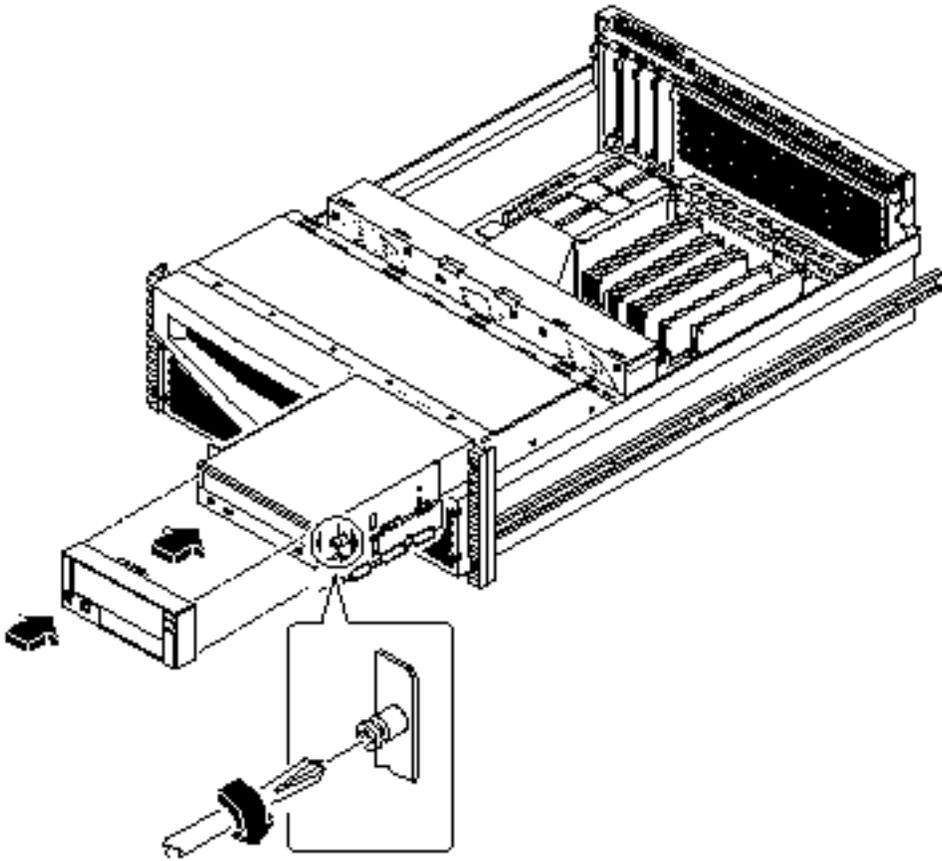
2. **Tighten the two captive Phillips screws securing the removable media assembly to the system chassis.**

3. **If necessary, install one or more plastic filler panels into any empty drive bay openings in the RMA plastic cover.**

   Align the filler panel with its opening and press it into place.

4. **Replace the RMA plastic cover.**

   Align the two posts on the bottom of the cover with the corresponding holes at the front of the chassis, and align the tab on the top of the cover with its corresponding hole and press down on the top of the center of the cover evenly until it snaps into place.

5. **Reconnect the removable media assembly SCSI cable to the removable media SCSI cable connector.**

The connector is keyed so that it connects in only one way. For information about cable connector locations, see Section 5.5 "How to Connect the System Cables" on page 155.
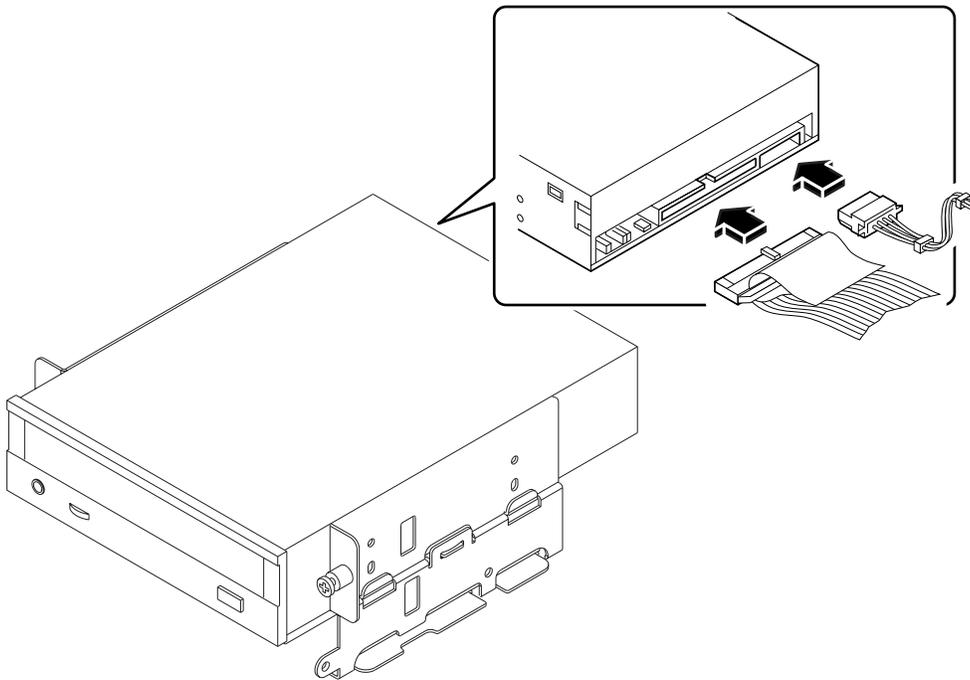
6. **Connect the I/O power cable to the removable media assembly power connector.**

   The connector is keyed so that it connects in only one way.

4.4.3   What Next

To reassemble the system, complete this task:

- Section 2.7 "How to Replace the System Cover" on page 67

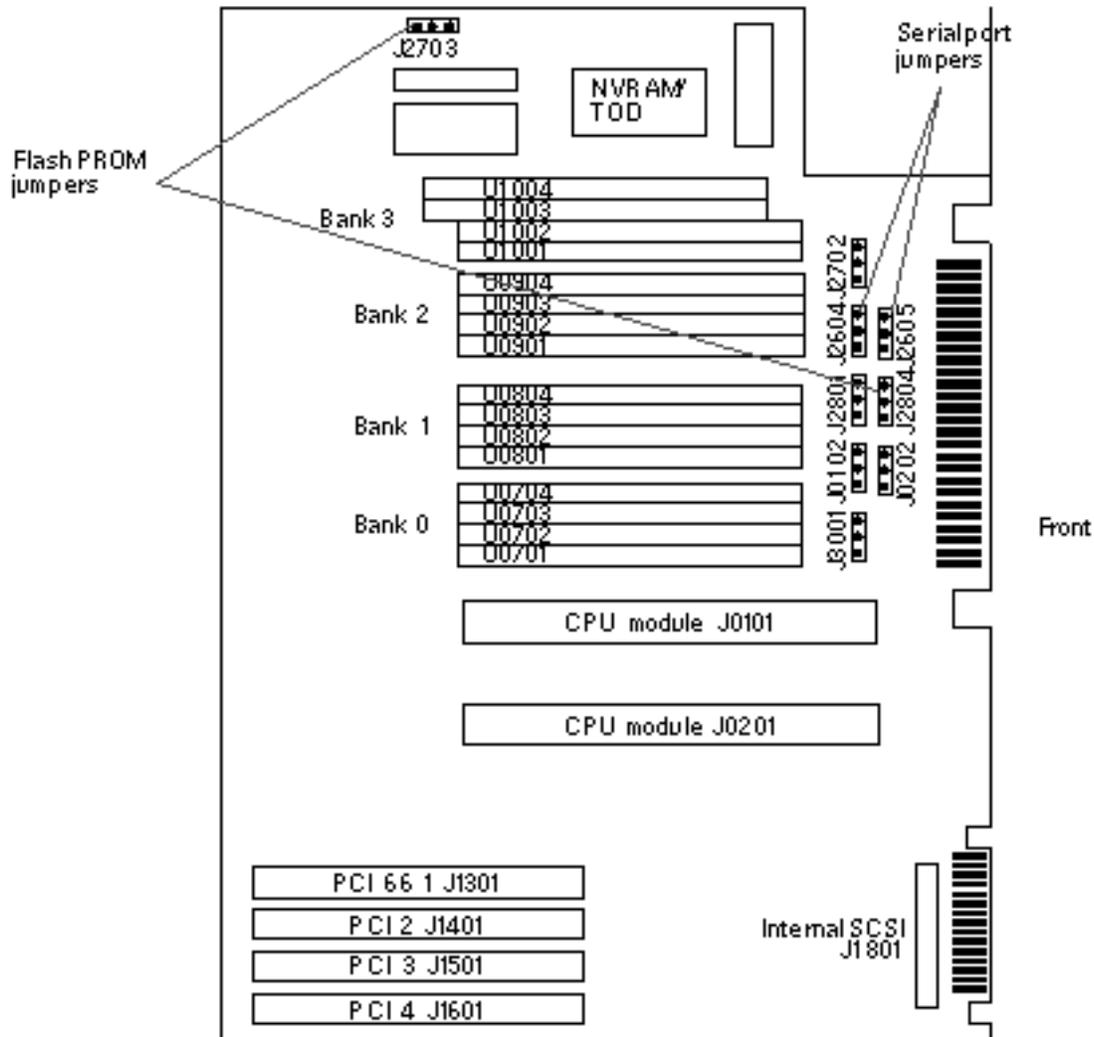# 4.5 How to Remove a CD-ROM or Tape Drive

4.5.1 Before You Begin

Complete these tasks:

- Section 2.1 "How to Power Off the System" on page 54
- Section 2.4 "How to Position the System for Service" on page 60
- Section 2.6 "How to Remove the System Cover" on page 65
- Section 2.8 "How to Avoid Electrostatic Discharge" on page 69
- Section 4.3 "How to Remove the Removable Media Assembly (RMA)" on page 132

4.5.2 What to Do

1. **Remove the four screws securing the drive to the removable media assembly.**

   There are two screws on each side of the drive.

2. **Slide the drive out from the front of its bay in the removable media assembly.**

   Push the drive from the back to start the removal process.

3. **Place the drive on an antistatic mat.**

4.5.3   What Next

To install the CD-ROM or tape drive, complete this task:

■ Section 4.6 "How to Install a CD-ROM or Tape Drive" on page 139

4.6   How to Install a CD-ROM or Tape Drive

4.6.1   Before You Begin

Know the configuration guidelines for installing removable media devices. For detailed information, see your *Sun Enterprise 220R Server Owner's Guide.*

Complete these tasks:

■ Section 2.1 "How to Power Off the System" on page 54

■ Section 2.4 "How to Position the System for Service" on page 60

■ Section 2.6 "How to Remove the System Cover" on page 65

■ Section 2.8 "How to Avoid Electrostatic Discharge" on page 69

■ Section 4.3 "How to Remove the Removable Media Assembly (RMA)" on page 132

4.6.2   What to Do

1. **If necessary, remove the plastic filler panel from the removable media assembly plastic cover.**

   On the back side of the RMA cover, push the filler panel retainer tabs inward to disengage the filler panel.

2. **If you are replacing a defective drive, make sure that the jumper settings on the new drive match the settings on the old drive.**

3. **Slide the CD-ROM or tape drive into its drive bay.**

   Align the two screw holes on each side of the drive with the corresponding holes in each side of the drive bay.
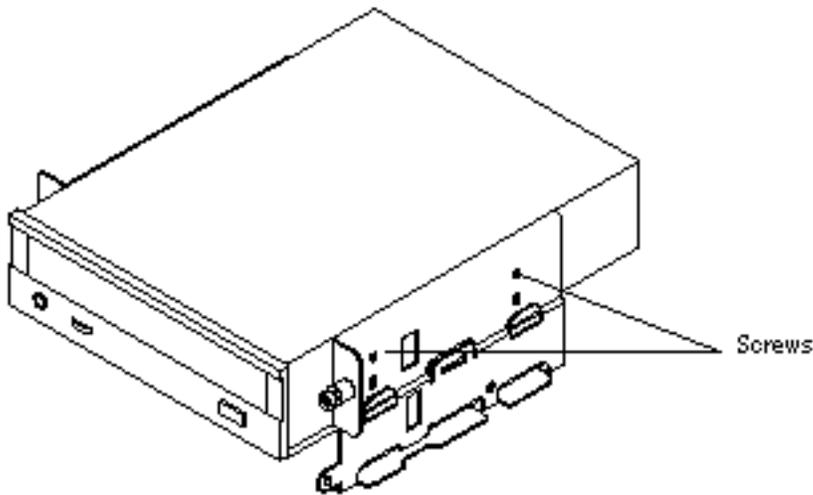
Screws

4. Insert and tighten the four flat-head Phillips screws that secure the drive in its bay.

There are two screws on each side that secure the drive in the RMA.

4.6.3 What Next

To reassemble the system, complete these tasks:

- Section 4.4 "How to Replace the Removable Media Assembly (RMA)" on page 135

- Section 2.7 "How to Replace the System Cover" on page 67

When you are ready to restart the system, be sure to run OpenBoot Diagnostics (OBDiag) tests to verify that the system functions correctly with the new parts you have just installed. For additional information, see:

- Section 7.6 "How to Use OpenBoot Diagnostics (OBDiag)" on page 195

You must also perform a reconfiguration boot so that your system is able to recognize any new device(s). For additional information, see:

- Section 2.3 "How to Initiate a Reconfiguration Boot" on page 58

Removing and Replacing Backplanes and Cables

This chapter describes how to remove and replace backplanes and cables within the system. For a list of part numbers for field-replaceable units and optional equipment, see Appendix D.

The following tasks are covered in this chapter:

- Section 5.1 "How to Remove the UltraSCSI Backplane" on page 141
- Section 5.2 "How to Replace the UltraSCSI Backplane" on page 144
- Section 5.3 "How to Remove the Power Distribution Board" on page 147
- Section 5.4 "How to Replace the Power Distribution Board" on page 151
- Section 5.5 "How to Connect the System Cables" on page 155

5.1 How to Remove the UltraSCSI Backplane

5.1.1 Before You Begin

Complete these tasks:

- Section 4.1 "How to Remove a Disk Drive" on page 127
- Section 2.1 "How to Power Off the System" on page 54
- Section 2.4 "How to Position the System for Service" on page 60
- Section 2.6 "How to Remove the System Cover" on page 65

■ Section 2.8 "How to Avoid Electrostatic Discharge" on page 69

Note - You must remove all disk drives from the disk cage assembly. Be sure to note the disk slot number associated with each drive. Later, when you reinstall the disk drives, it is important to return each drive to its original location.

5.1.2   What to Do

1. **Disconnect the I/O power cable from the UltraSCSI backplane at connector J0101.**

   See Step 4 for the location of the UltraSCSI backplane in the system.
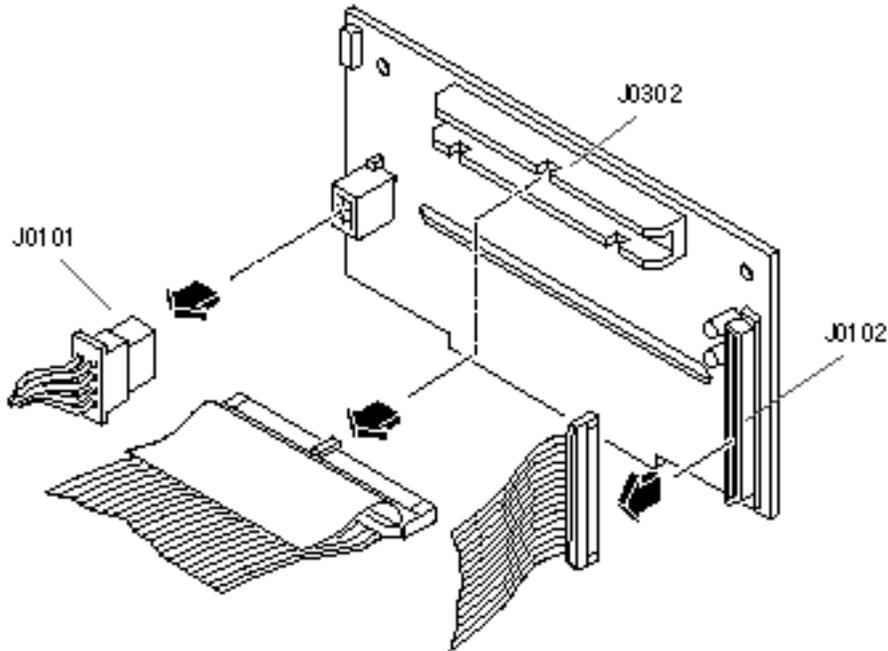
2. **Disconnect the UltraSCSI data cable from the UltraSCSI backplane at connector J0102.**

   Press the levers on the sides of the backplane connector.

3. **Disconnect the removable media SCSI cable from the UltraSCSI backplane at connector J0302.**

4. **Remove the two Phillips screws that secure the UltraSCSI backplane to the chassis.**
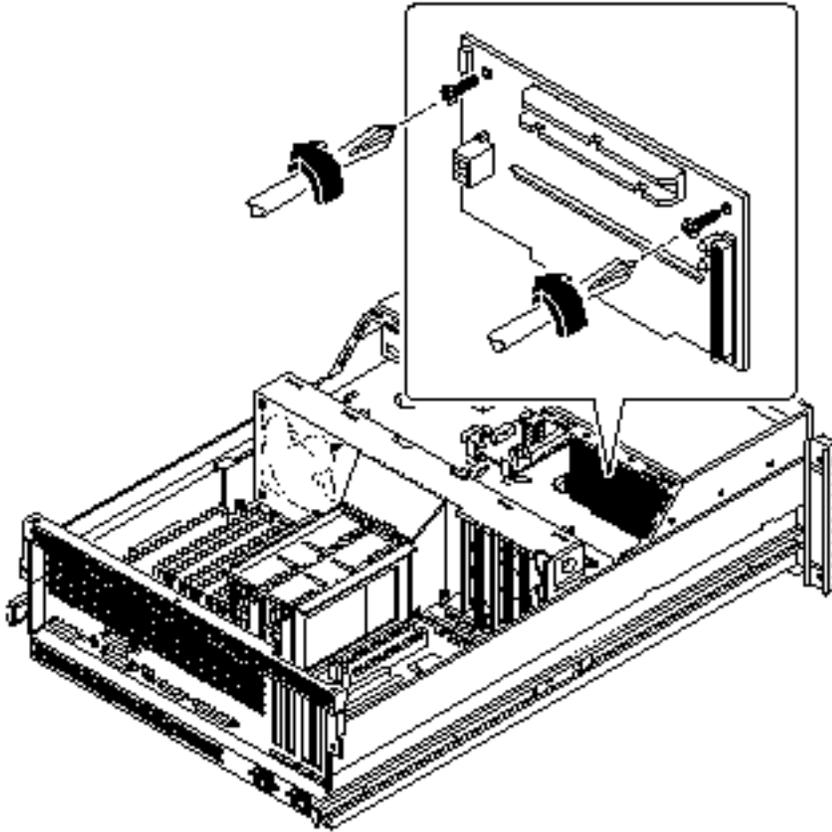
5. **Remove the backplane from the chassis.**

   Place the backplane on an antistatic mat.

5.1.3   What Next

To replace the UltraSCSI backplane, complete this task:

■ Section 5.2 "How to Replace the UltraSCSI Backplane" on page 144

5.2 How to Replace the UltraSCSI Backplane

5.2.1 Before You Begin

Complete this task:

- Section 2.8 "How to Avoid Electrostatic Discharge" on page 69

5.2.2 What to Do

1. **Position the UltraSCSI backplane in place behind the disk drive bay in the chassis.**

2. **Replace the two Phillips screws that secure the UltraSCSI backplane to the chassis.**
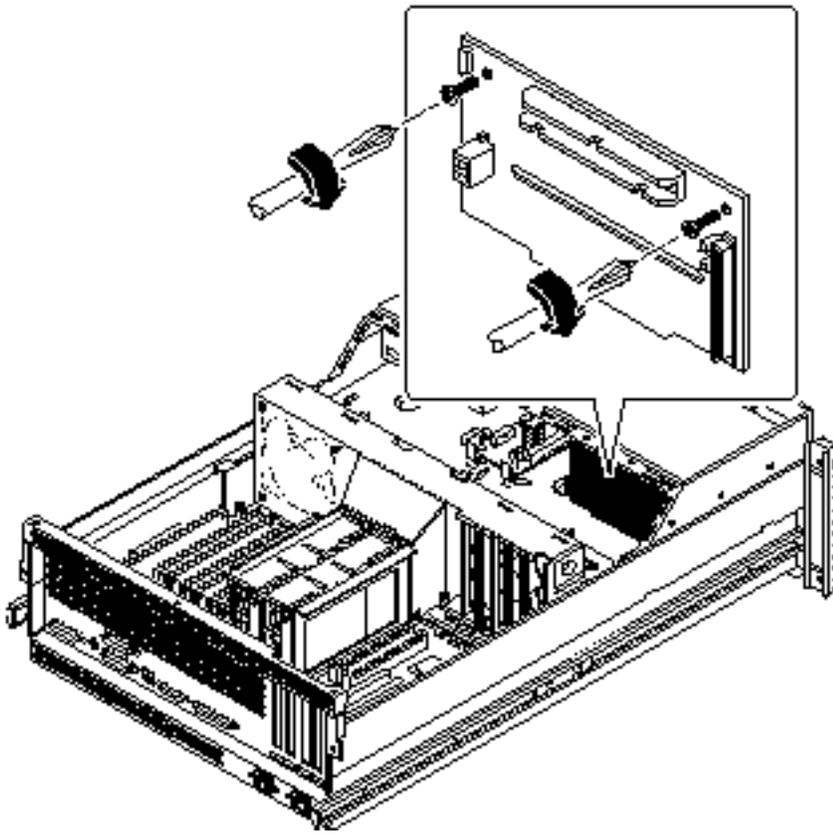
3. **Connect the UltraSCSI data cable from the main logic board to connector J0102 on the UltraSCSI backplane.**

   The connector is keyed to attach in only one way.
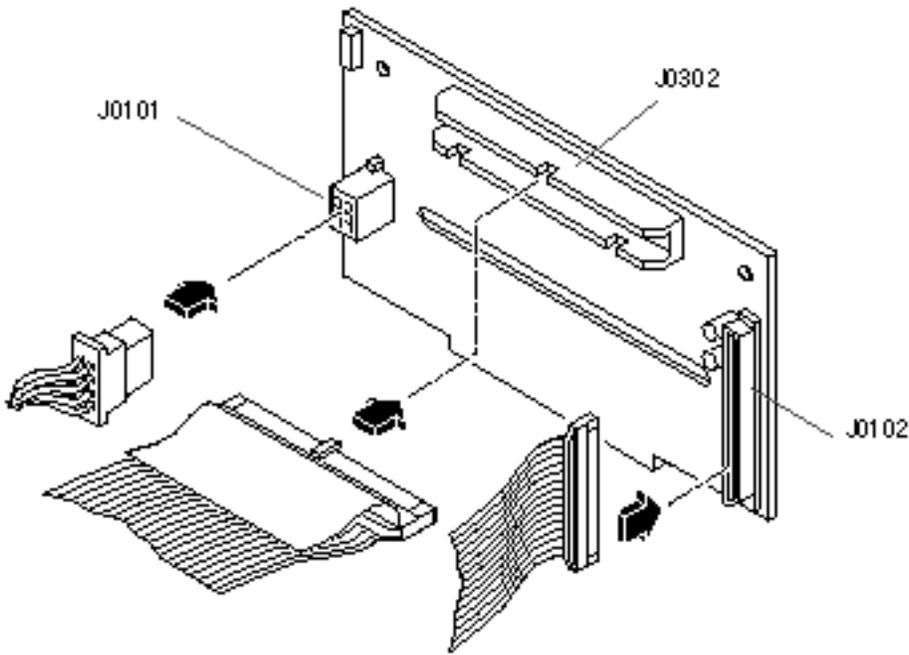
4. **Connect the removable media assembly SCSI cable to connector J0302 on the UltraSCSI backplane.**

   The connector is keyed to attach in only one way.

5. **Connect the I/O power cable to connector J0101 on the UltraSCSI backplane.**

   The connector is keyed to attach in only one way.

5.2.3   What Next

To reassemble the system, complete these tasks:

■ Section 2.7 "How to Replace the System Cover" on page 67

■ Section 4.2 "How to Install a Disk Drive" on page 130

5.3 How to Remove the Power Distribution Board

5.3.1 Before You Begin

Complete these tasks:

- Section 2.1 "How to Power Off the System" on page 54
- Section 6.1 "How to Remove a Power Supply" on page 160
- Section 2.4 "How to Position the System for Service" on page 60
- Section 2.6 "How to Remove the System Cover" on page 65
- Section 2.8 "How to Avoid Electrostatic Discharge" on page 69
- Section 6.3 "How to Remove the Fan Tray Assembly" on page 164

Caution - Unplug the AC power cord(s) from the back of the system before performing this procedure. Attempting to remove the power distribution board while the AC power cord is plugged into a power source can result in serious personal injury.

Note - You need to remove the system power supplies before attempting to remove the power distribution board.

5.3.2 What to Do

1. **Disconnect the CPU core voltage power cable and the CPU core voltage power sense cable from the power distribution board at connectors J0202 and J0203.**

   For information about cable connector locations, see Section 5.5 "How to Connect the System Cables" on page 155.

2. **Disconnect the UltraSCSI data cable from the main logic board at connector J1801.**

3. **Disconnect the I/O power cable from the power distribution board at connector J0210.**

4. **Disconnect the main power cable from the power distribution board at connectors J0201 and J0207.**

5. **Disconnect the CPU power sense cable from the power distribution board at connectors J0205 and J0206.**

6. **Disconnect the keyswitch/power button/LED cable from the power distribution board at connector J0500.**

7. **Loosen the three captive Phillips screws that secure the power distribution board cover panel to the chassis.**

8. **Remove the power distribution board cover panel.**

   a. **Tilt the panel toward the back of the system approximately 30 degrees.**
      Hold the cover panel by the edge nearest the chassis front.

   b. **Gently pull the cover panel forward and up, out of the system.**
      Set the power distribution cover panel aside.
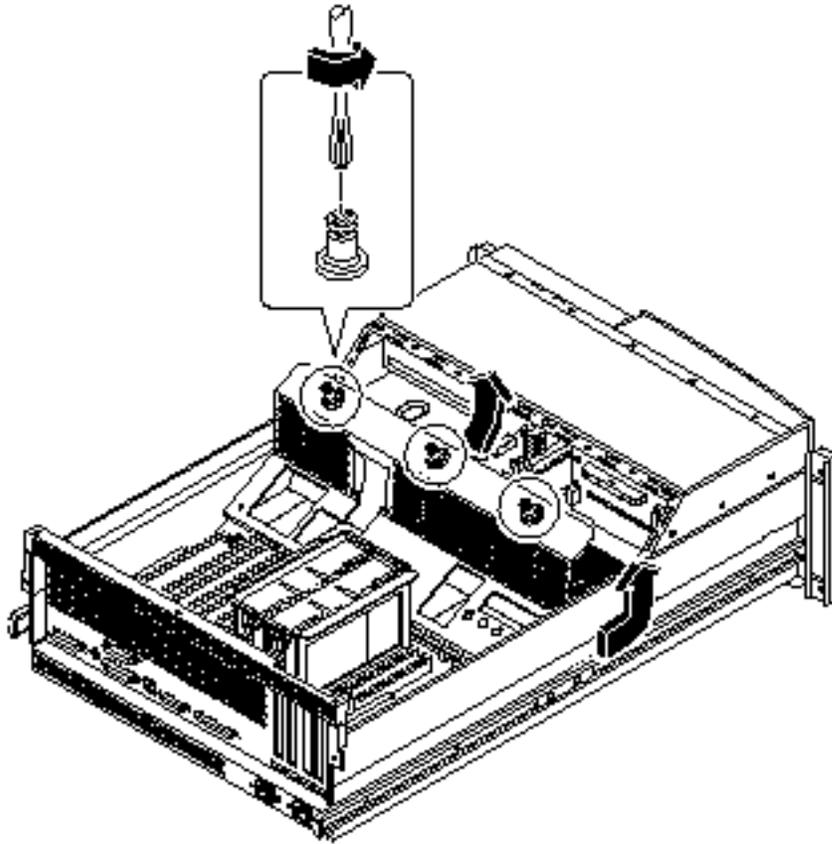
⚠ **Caution -** Be sure that the AC power cord(s) has been disconnected from the system before continuing. Attempting to remove the power distribution board while the AC power cord is plugged into a power source can result in serious personal injury.

9. **Remove the left (when looking from the back of the system) AC power connector assembly from the chassis.**

   Keep the cable attached to the connector assembly. Use a Phillips #2 screwdriver to remove the screw. Set the end of the cable aside in the back of the system so that the cable doesn't interfere with lifting the power distribution board out of the chassis.
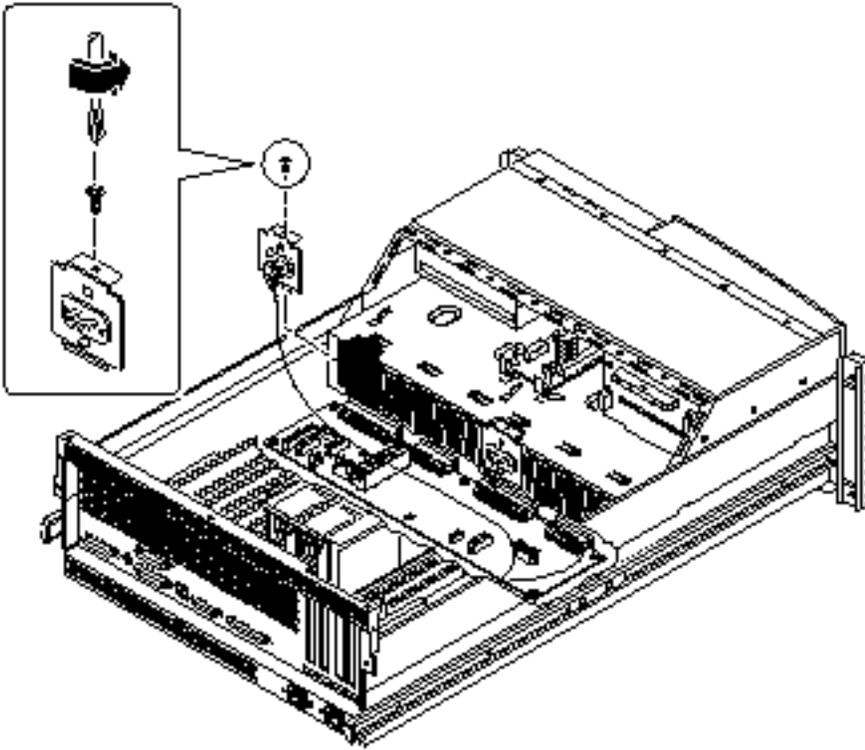
10. Remove the seven screws securing the power distribution board to the chassis.
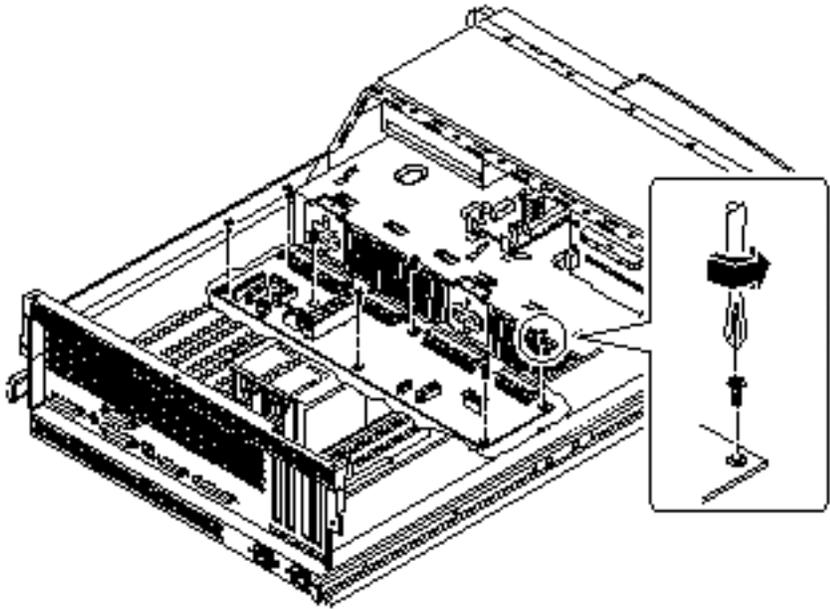
11. Adjust the cable connected to the center AC power connector assembly so that it doesn't interfere with lifting the power distribution board out of the chassis.

12. Lift the power distribution board out of the chassis.

Place it on an antistatic mat.

5.3.3   What Next

To replace the power distribution board, complete this task:

■ Section 5.4 "How to Replace the Power Distribution Board" on page 151

5.4   How to Replace the Power Distribution Board

5.4.1   Before You Begin

Complete this task:

■ Section 2.8 "How to Avoid Electrostatic Discharge" on page 69

⚠ **Caution -** Be sure that the AC power cord(s) is disconnected from the back of the system before performing this procedure. Attempting to replace the power distribution board while the AC power cord is plugged into a power source can result in serious personal injury.

5.4.2   What to Do

1. **Position the power distribution board in the chassis floor.**

   You may need to adjust the cable attached to the center AC power connector assembly so that it does not interfere with the positioning of the power distribution board.

2. **Replace the seven Phillips screws that secure the board to the chassis.**
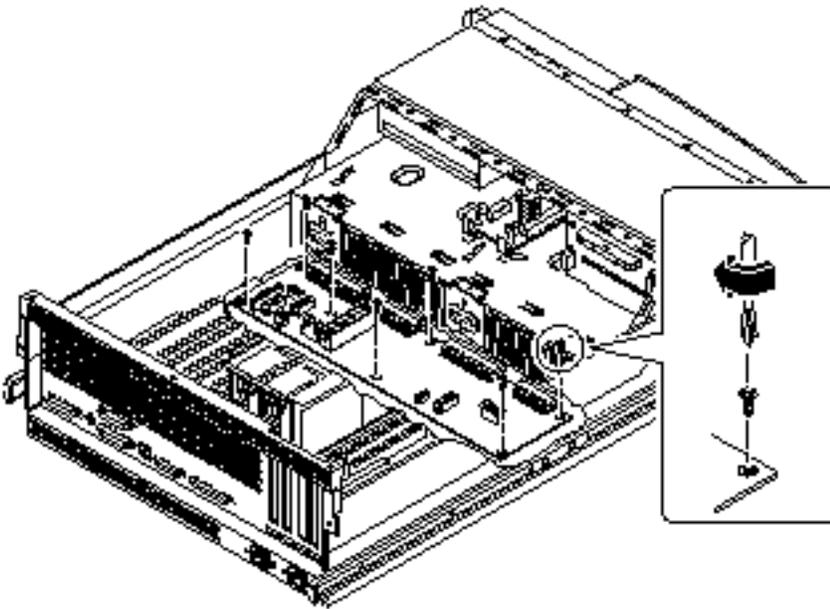
3. **Replace the AC power connector assembly (and the cable attached to it).**
   Use a Phillips #2 screwdriver.
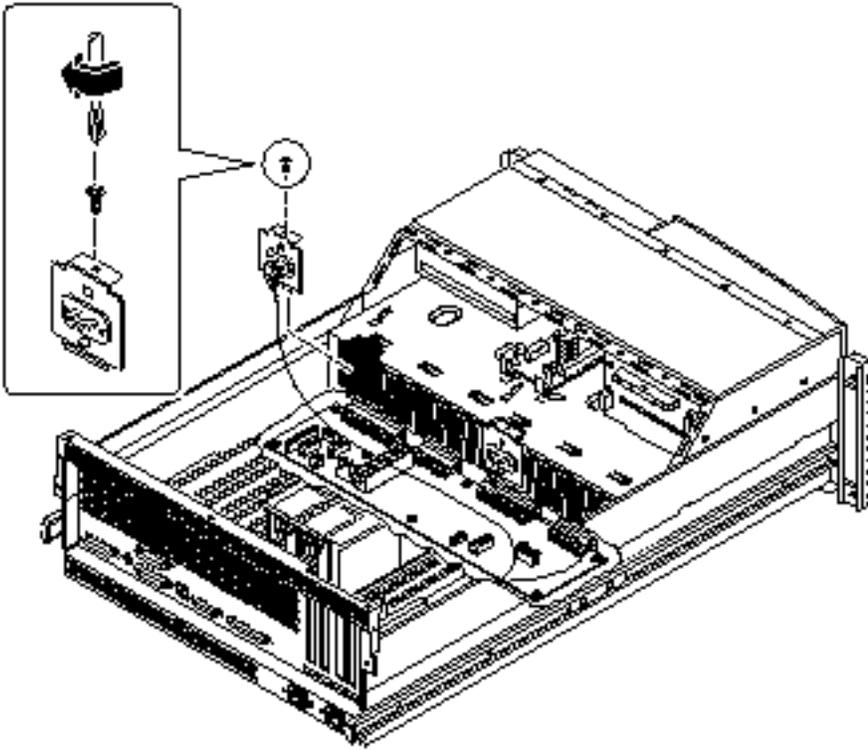
4. **Replace the power distribution board cover panel.**

   a. **Position the cover in place over the system chassis.**

   Hold the cover at an approximately 30-degree angle from the chassis, aligning the slots on the cover with the tabs on the main logic board mounting plate.

   b. **Lower the cover into place.**

   Make sure you insert the tabs on the cover into the slots on the main logic board mounting plate.
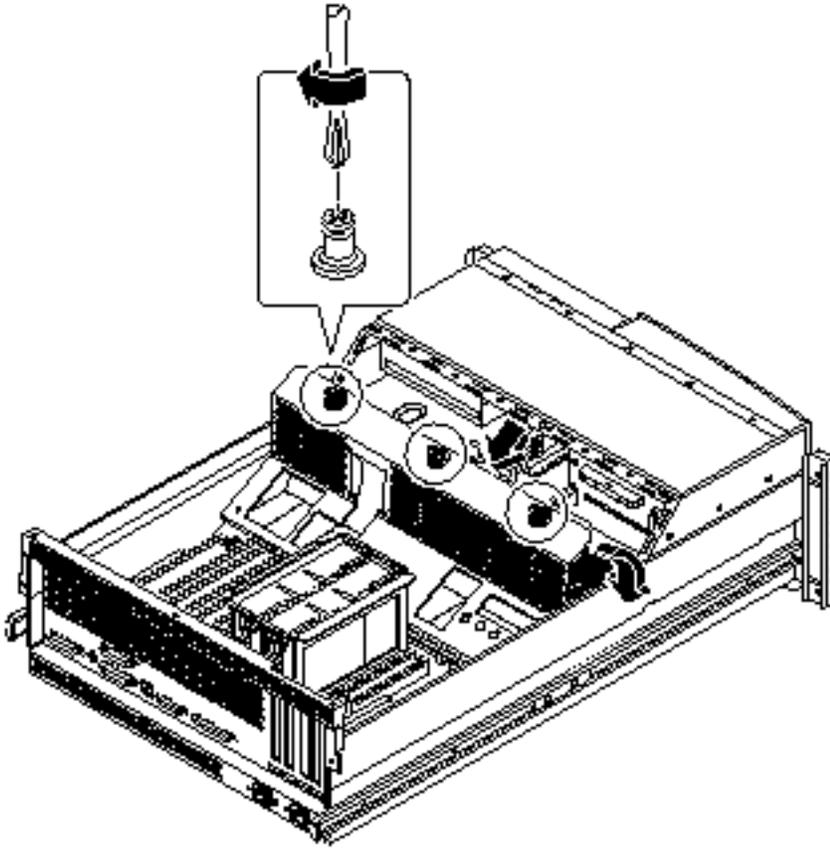
5. **Tighten the three captive Phillips screws that secure the power distribution board cover panel to the system chassis.**

6. **Connect the CPU core voltage power cable to the power distribution board at connector J0202.**

   For information about cable connector locations, see Section 5.5 "How to Connect the System Cables" on page 155. Connectors are keyed and attach in only one way.

7. **Connect the CPU core voltage power sense cable to the power distribution board at connector J0203.**

8. **Connect the main power cable to the power distribution board at connectors J0201 and J0207.**

9. **Connect the CPU power sense cable to the power distribution board at connectors J0205 and J0206.**

10. **Connect the keyswitch/power button/LED cable to the power distribution board at connector J0500.**

11. **Connect the I/O power cable to the power distribution board at connector J0210.**

12. **Connect the UltraSCSI data cable to the main logic board at connector J1801.**

5.4.3 What Next

To reassemble the system, complete this task:

- Section 6.4 "How to Replace the Fan Tray Assembly" on page 165
- Section 6.2 "How to Install a Power Supply" on page 162

5.5 How to Connect the System Cables

This section provides an overview of cable connector locations and cable routing. Procedures for removing and replacing specific cables are covered within the removal and replacement process of the assemblies with which these cables are associated.
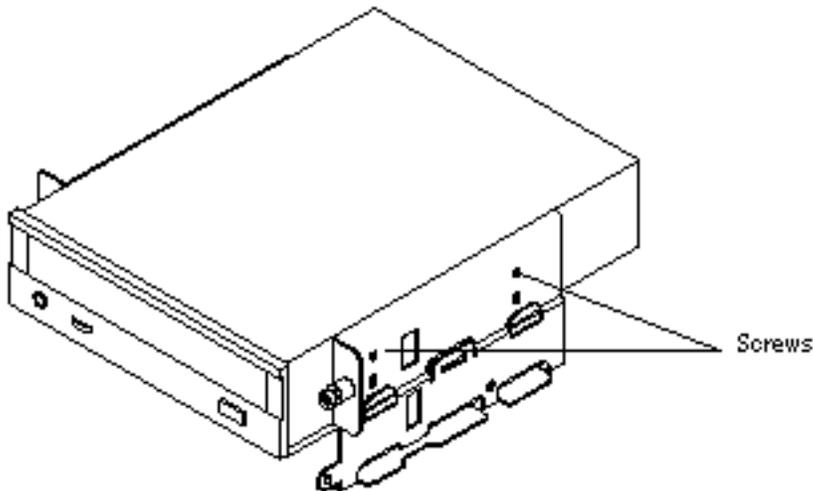
5.5.1 Before You Begin

Complete these tasks:

- Section 2.1 "How to Power Off the System" on page 54
- Section 2.4 "How to Position the System for Service" on page 60
- Section 2.6 "How to Remove the System Cover" on page 65
- Section 2.8 "How to Avoid Electrostatic Discharge" on page 69

5.5.2 What to Do

1. **Identify the cable that you want to install or replace. Use the information in the following table and illustrations to determine where to connect each end of the cable.**

2. **Install the cable according to the routing and cable management instructions provided in the table.**

   Each cable connector is keyed so that it can be connected in only one way.

5.5.3   Cable Connectors and Routing

Cable Name	Connections	Routing and Management
CPU power sense cable	From: Power distribution board (J0205) and (J0206)To: Main logic board (J2901)	Routed from under the fan tray assembly to the main logic board
Main power cable	From: Power distribution board (J0201) and (J0207)To: Main logic board (J2902) and (J2903)	Routed from under the fan tray assembly to the main logic board
I/O power cable	From: Power distribution board (J0210)To: UltraSCSI backplane (J0101) andTo: Removable media assembly power connector	Routed from under the fan tray assembly, through the notch on the fan tray assembly to the UltraSCSI backplane and the RMA power connector
UltraSCSI data cable	From: Main logic board (J1801)To: UltraSCSI backplane (J0102)	Routed flat under the tab on the side of the fan tray assembly
Removable media SCSI cable	From: UltraSCSI backplane (J0302)To: RMA SCSI Connector	Routed from the UltraSCSI backplane to the removable media assembly SCSI connector
Keyswitch/ power button/ LED cable	From: Power distribution board (J0500)To: Front of chassis	Routed under the notch on the fan tray assembly
CPU core voltage power cable	From: Power distribution board (J0202)To: DC-to-DC board (J0103)	Routed from the power distribution board to the DC-to-DC board
CPU core voltage power sense cable	From: Power distribution board (J0203)To: DC-to-DC board (J0102)	From the power distribution board to the DC-to-DC board

Main logic board connectors

J1801

J2902   J2901   J2903

SCSI backplane connectors

J0302

J0101

J0102

Removing and Replacing Backplanes and Cables   **157**
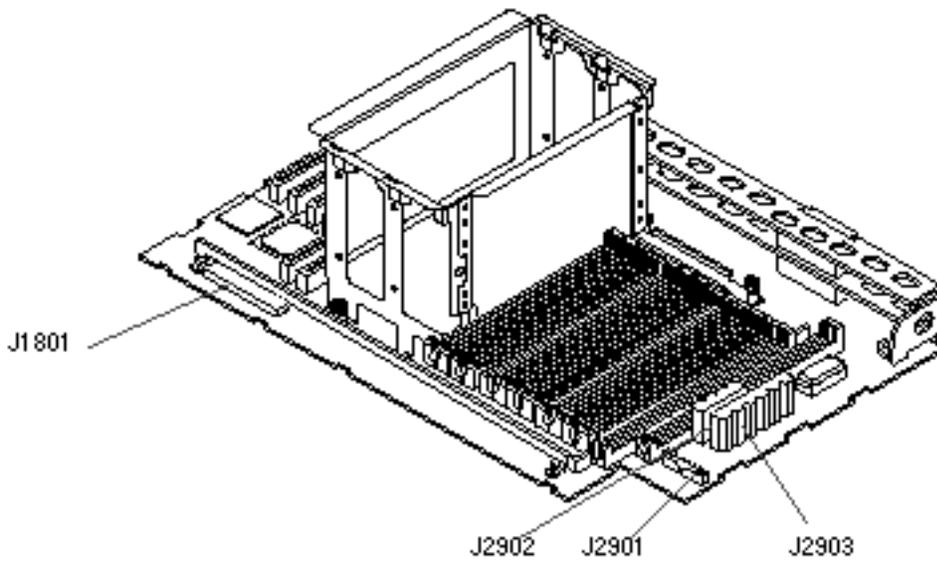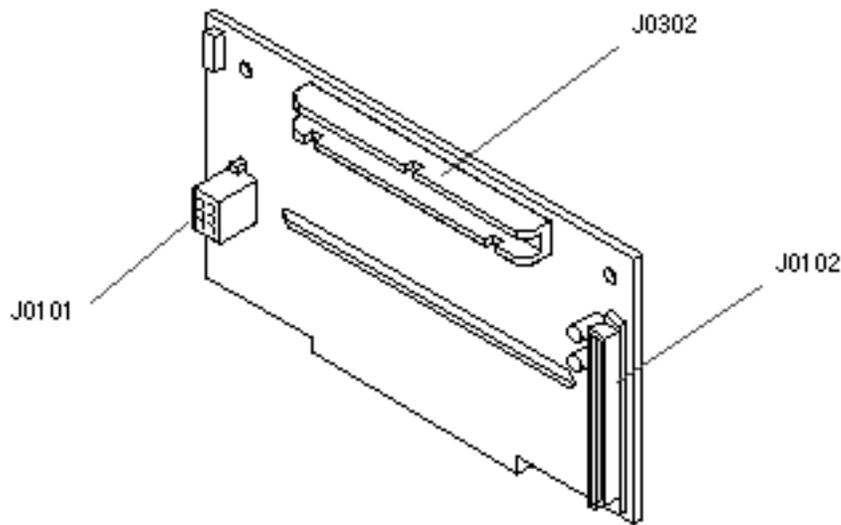
Power Distribution Board Connectors
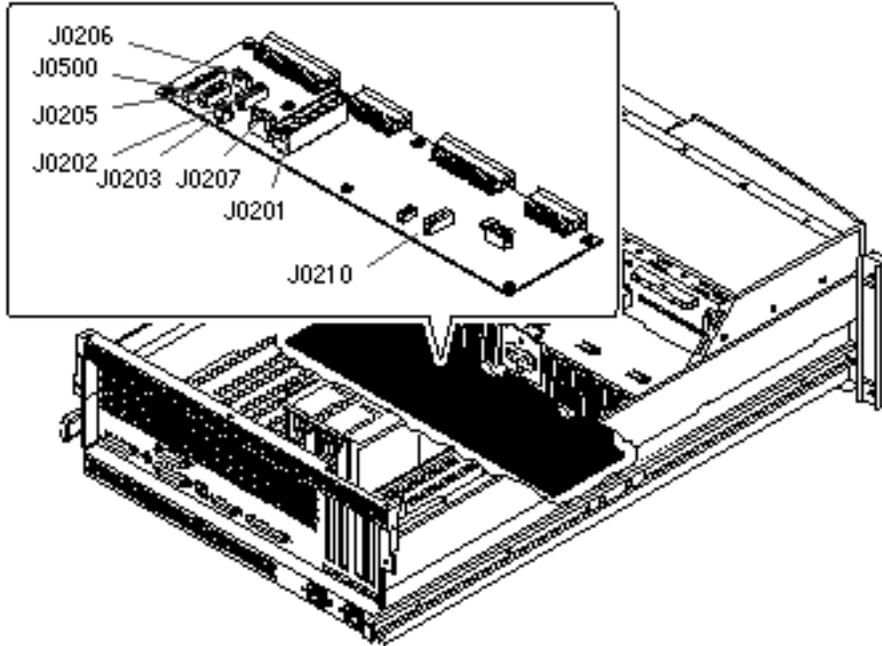
5.5.4   What Next

To replace a cable, complete this task:

■ Section 2.7 "How to Replace the System Cover" on page 67

Removing and Replacing Miscellaneous Assemblies

This chapter describes how to remove and replace the miscellaneous assemblies within the system. For a list of part numbers for field-replaceable units and optional equipment, see Appendix D.

The following tasks are covered in this chapter:

- Section 6.1 "How to Remove a Power Supply" on page 160
- Section 6.2 "How to Install a Power Supply" on page 162
- Section 6.3 "How to Remove the Fan Tray Assembly" on page 164
- Section 6.4 "How to Replace the Fan Tray Assembly" on page 165
- Section 6.5 "How to Remove the DC-to-DC Converter" on page 167
- Section 6.6 "How to Replace the DC-to-DC Converter" on page 171
- Section 6.7 "How to Remove the Keyswitch/Power Button/LED Cable" on page 174
- Section 6.8 "How to Replace the Keyswitch/Power Button/LED Cable" on page 176
- Section 6.9 "How to Remove a System Door" on page 179
- Section 6.10 "How to Replace a System Door" on page 181

6.1 How to Remove a Power Supply

6.1.1 Before You Begin

It is not necessary to power off the system if you are removing a redundant power supply. For more information, see "About Power Supplies" in your *Sun Enterprise 220R Server Owner's Guide.*

If your system has only one power supply, complete this task:

■ Section 2.1 "How to Power Off the System" on page 54

6.1.2 What to Do

1. **Identify the power supply that you want to remove.**

2. **Unlock the system doors and swing them open.**

   Turn the keyswitch to the Power-On/Off position. This unlocks the system front access doors.

3. **Loosen the Phillips screw that secures the power supply retaining clip until you can push the clip upward.**

4. **Using your thumb, push up the retaining clip until it clears the power supply.**

Caution - Keep the thumb holding the retainer clip up clear of the power supply as you slide it out from its bay.

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5. **With your other hand, rotate the power supply handle so that it is perpendicular to the front face of the unit.**
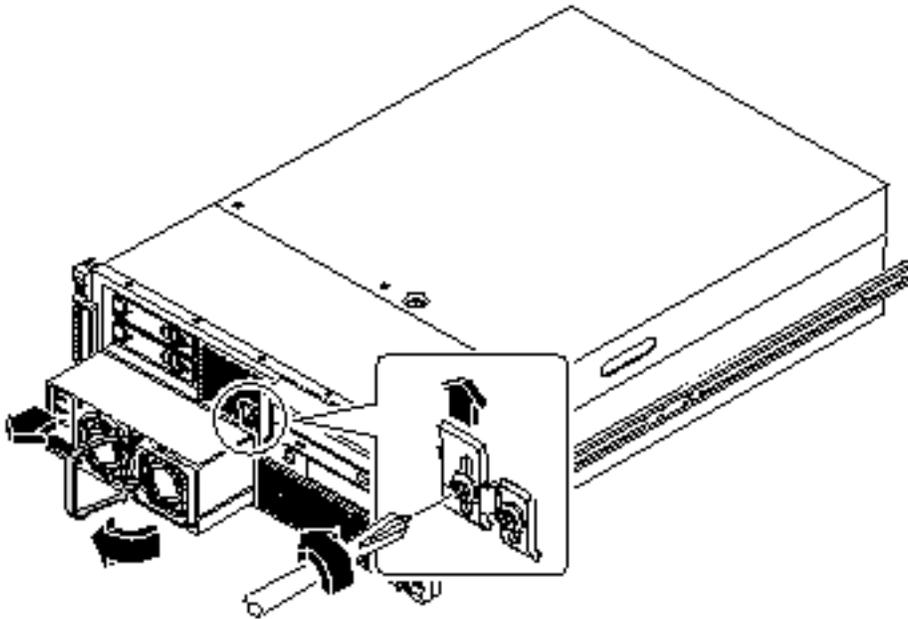
6. **Pull out the power supply in a smooth motion until the unit is free of the bay.**

   Note - When removing a hot-pluggable power supply, do not disengage and reengage the supply in rapid succession.

7. **If you have removed a redundant power supply and are not replacing it immediately, install a power supply filler panel.**

   The filler panel maintains proper system cooling and prevents electromagnetic interference. Align the filler panel over the empty bay and push it into place.

8. **Tighten the Phillips screw on the power supply retaining clip.**

6.1.3   What Next

To replace a power supply, complete this task:

■ Section 6.2 "How to Install a Power Supply" on page 162

6.2 How to Install a Power Supply

6.2.1 Before You Begin

If you are installing a redundant power supply, it is not necessary to power off the system. For more information, see "About Power Supplies" in your *Sun Enterprise 220R Server Owner's Guide.*

6.2.2 What to Do

1. **Unlock the system doors and swing them open.**

   Turn the keyswitch to the Power-On/Off position. This unlocks the system front access doors.

2. **Loosen the Phillips screw that secures the power supply retaining clip until you can push the clip upward.**

3. **If you are upgrading your system with an additional power supply, remove the filler panel covering the power supply bay.**

   a. **With one hand, push up the retaining clip until it clears the filler panel.**

   b. **Partially pry the top of the filler panel out of the bay, using a flat-blade screwdriver.**

   c. **Lift the filler panel out and away from the bay, and set it aside.**

   d. **Keep the filler panel in case you need to remove the power supply later.**

      The filler panel maintains proper system cooling and prevents electromagnetic interference in the absence of a second power supply.

4. **Using your thumb, push up the retaining clip until there is enough clearance to slide the power supply into its bay.**
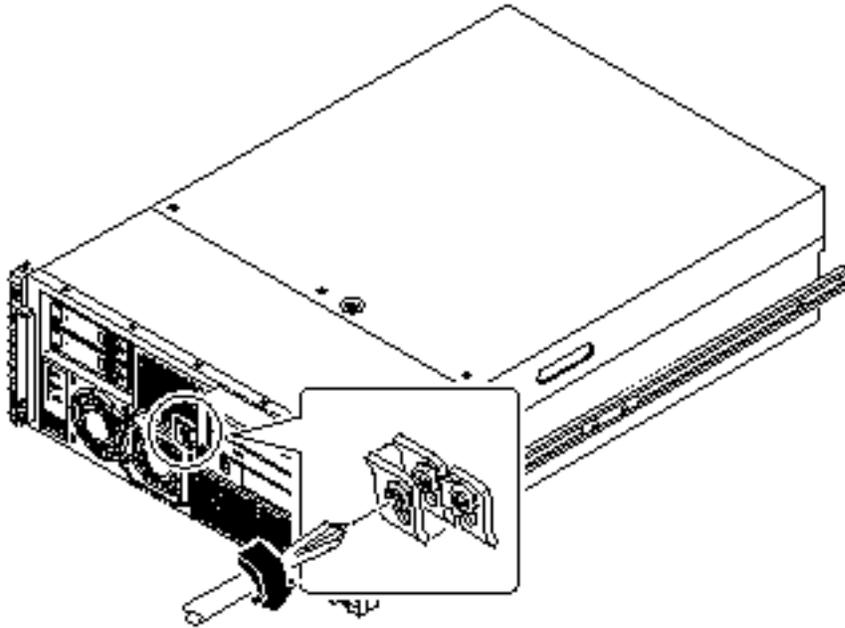
5. **With your other hand, align the new power supply with its bay.**

6. **Slide the new power supply into the power supply bay until the power supply connectors start to engage the connectors on the power distribution board.**

⚠ **Caution -** Be sure to keep the thumb holding up the retainer clip out of the way as you slide the power supply into its bay.

When the back of the power supply has cleared the retainer clip and is in the bay, release the clip.

7. **Push on the front of the power supply firmly to engage the connectors with the power distribution board.**

⚠ **Caution -** If you are hot-plugging a redundant supply, take care to avoid jarring or shocking the system.

8. **Tighten the Phillips screw on the power supply retaining clip.**

Note - As you tighten the screw, the lower end of the retaining clip presses on the front of the power supply. Fully tightening the Phillips screw ensures that the power supply is properly seated in its bay.

6.2.3 What Next

Verify correct operation of the power supply by checking the fan and LED indicators on the power supply. You should hear the fan start spinning and two green LEDs should light within three seconds of completing a hot-plug installation (or after restoring power to the system).

For more information about the power supply LEDs, see:

- Section 7.12.1.3 "Power Supply LEDs" on page 214

6.3 How to Remove the Fan Tray Assembly

6.3.1 Before You Begin

Complete these tasks:

- Section 2.1 "How to Power Off the System" on page 54
- Section 2.4 "How to Position the System for Service" on page 60
- Section 2.6 "How to Remove the System Cover" on page 65
- Section 2.8 "How to Avoid Electrostatic Discharge" on page 69

6.3.2 What to Do

1. **Loosen the two captive Phillips screws securing the fan tray assembly to the chassis.**
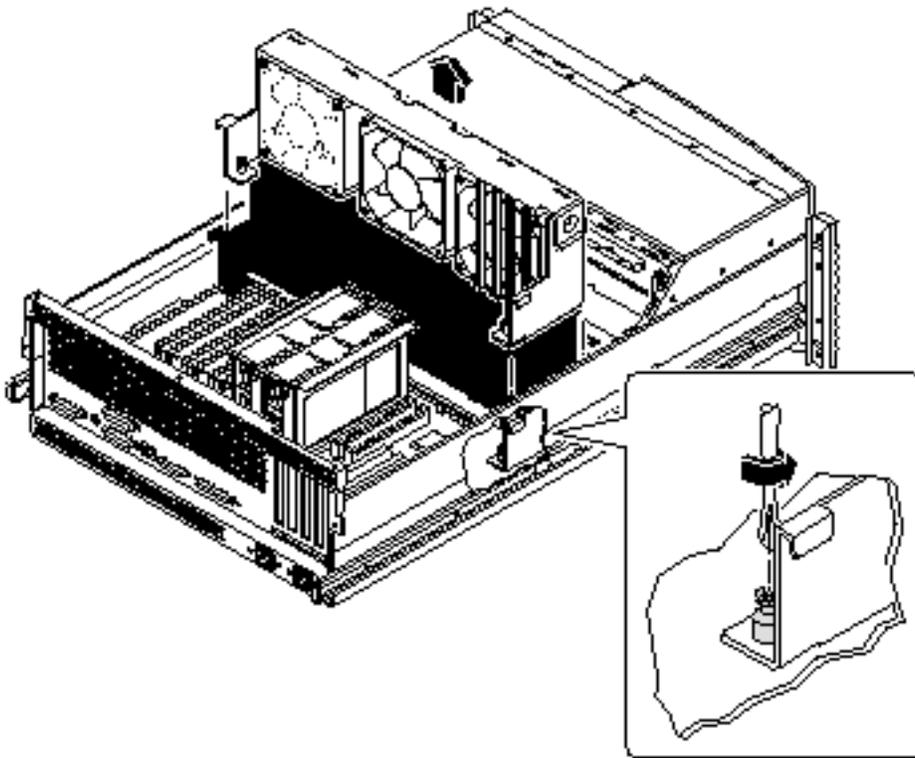
2. Lift the fan tray assembly out of the system chassis.

6.3.3 What Next

To replace the fan tray assembly, complete this task:

■ Section 6.4 "How to Replace the Fan Tray Assembly" on page 165

6.4 How to Replace the Fan Tray Assembly

6.4.1 Before You Begin

Complete this task:

■ Section 2.8 "How to Avoid Electrostatic Discharge" on page 69

6.4.2   What to Do

1. **Position the fan tray approximately 2 inches (5 centimeters) over its final location in the system chassis.**

2. **Route the UltraSCSI disk data cable flat under the tab on the side of the fan tray assembly.**

3. **Route the main power and keyswitch/power button/LED cables under the right notch on the fan tray assembly.**

    For information about cable locations, see Section 5.5 "How to Connect the System Cables" on page 155.

4. **Route the I/O power cableunder the left notch on the fan tray assembly.**

5. **Lower the fan tray into place in the system chassis.**

    Align the tabs on the fan tray assembly with the notches on the chassis. Make sure that you keep the UltraSCSI data cable flat against the side of the fan tray assembly.
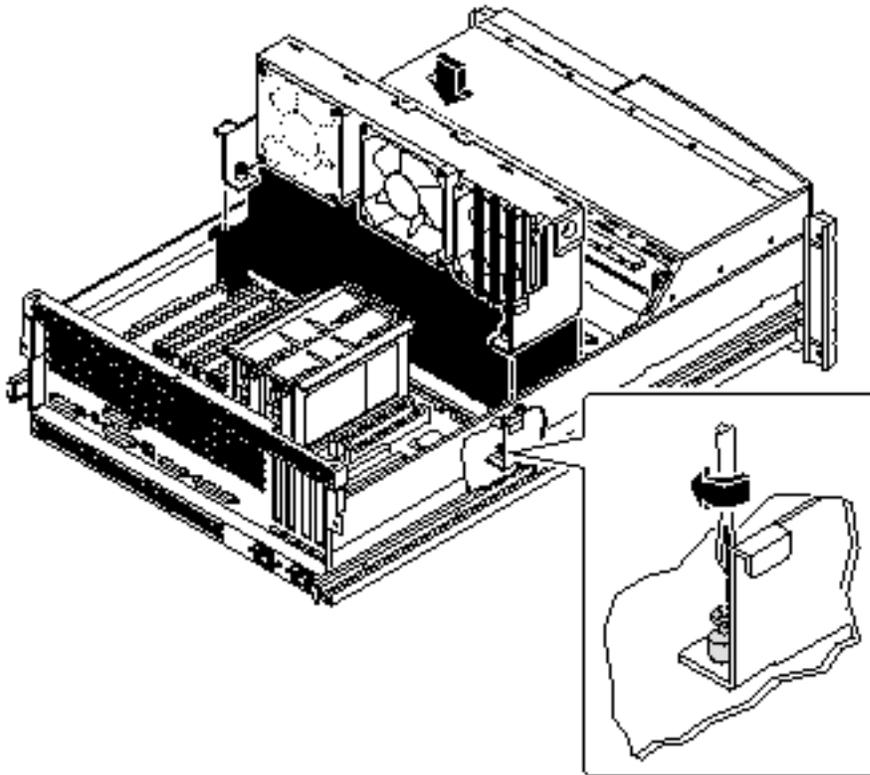
> **Note -** As you lower the fan tray assembly, ensure that the cables remain properly routed under their notches on the fan tray assembly.

6. **Tighten the two captive Phillips screws securing the fan tray assembly to the chassis.**

6.4.3 What Next

To reassemble the system, complete this task:

- Section 2.7 "How to Replace the System Cover" on page 67

6.5 How to Remove the DC-to-DC Converter

6.5.1 Before You Begin

Complete these tasks:

- Section 2.1 "How to Power Off the System" on page 54
- Section 2.4 "How to Position the System for Service" on page 60
- Section 2.6 "How to Remove the System Cover" on page 65
- Section 2.8 "How to Avoid Electrostatic Discharge" on page 69

6.5.2 What to Do

1. **Disconnect the AC power cord(s) from the system.**

2. **Disconnect the CPU core voltage power cable from connector J0103 on the DC-to-DC converter board.**

    Press the tab on the connector.

J0102

J0103
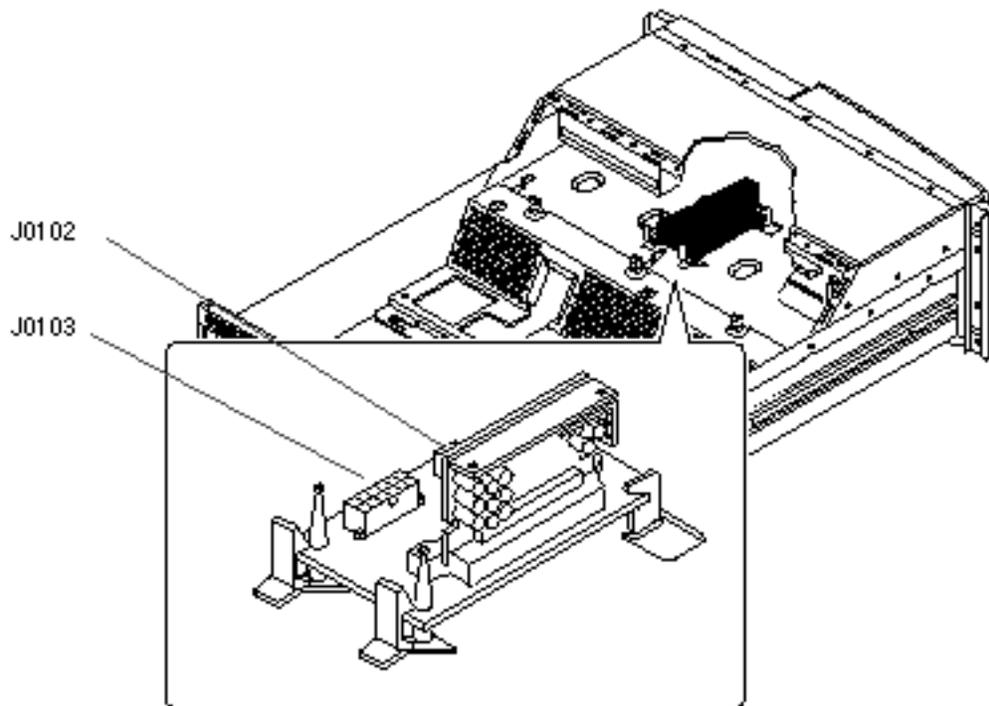
3. **Disconnect the CPU core voltage power sense cable from connector J0102 on the DC-to-DC converter board.**

4. **Unclip the DC-to-DC converter board from the plastic retaining clips.**

    Push down on the plastic tabs while carefully lifting the end of the DC-to-DC converter board.
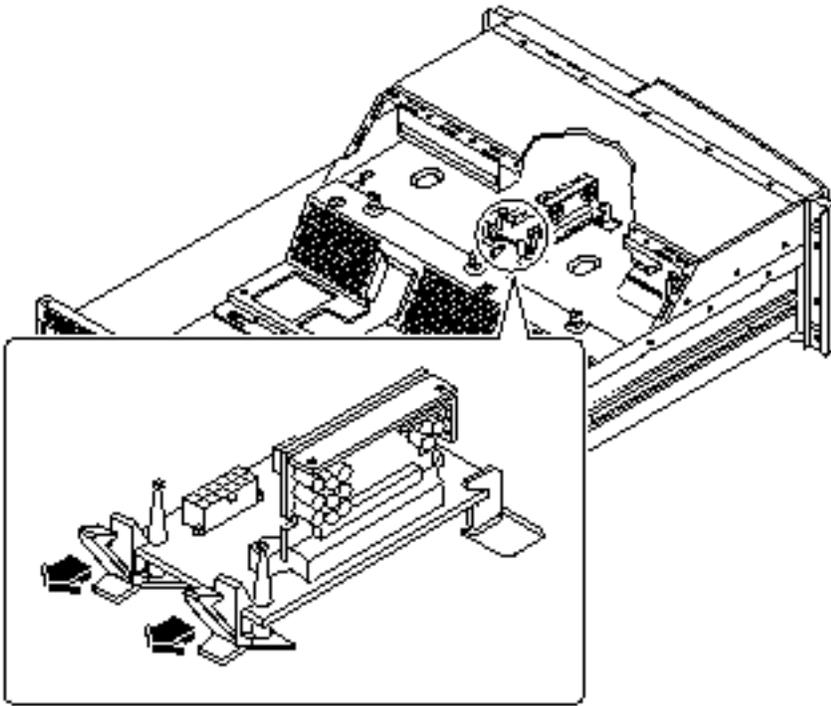
5. Remove the DC-to-DC converter from the chassis.

Lift the DC-to-DC converter board off the plastic retaining posts while carefully pulling the board back and out from the metal tabs in the chassis.
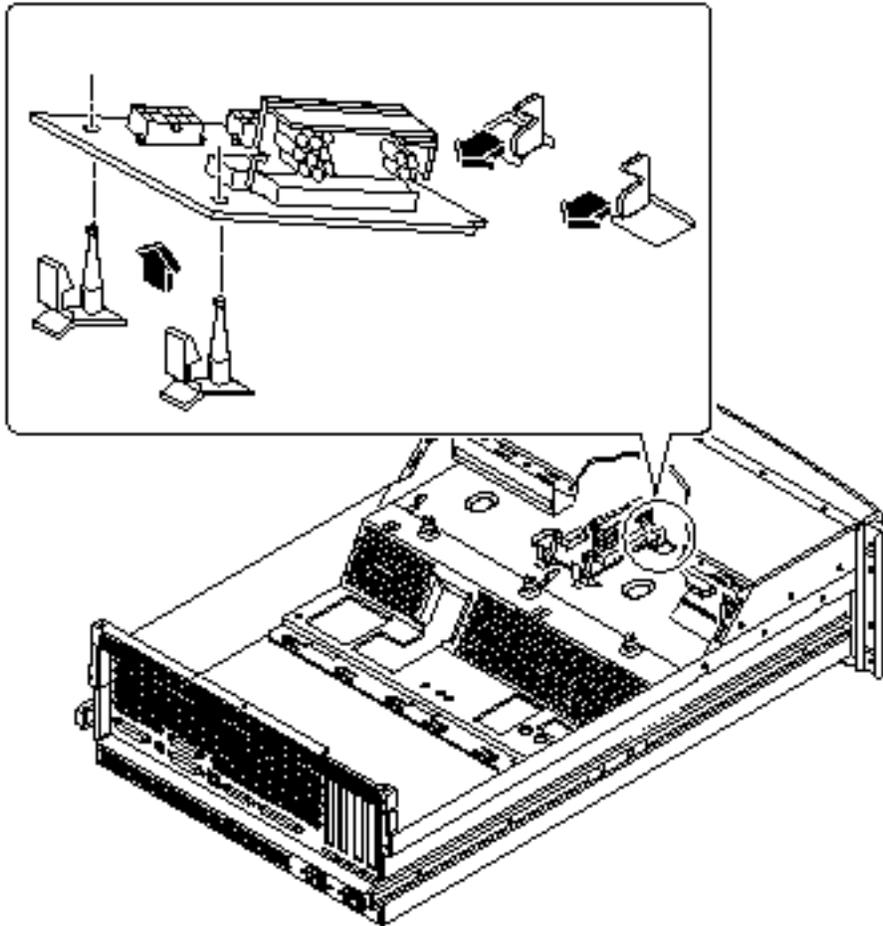
6.5.3   What Next

Complete the following task to reassemble the system:

- Section 6.6 "How to Replace the DC-to-DC Converter" on page 171

Note - The DC-to-DC converter on this system is an assembly consisting of two parts, part numbers 375-0094 and 300-1455. Be sure to order both parts if you need to replace the DC-to-DC converter.

6.6 How to Replace the DC-to-DC Converter

6.6.1 Before You Begin

Complete this task:

- Section 2.8 "How to Avoid Electrostatic Discharge" on page 69

Note - The DC-to-DC converter on this system is an assembly consisting of two parts, part numbers 375-0094 and 300-1455. Be sure you have both parts when your are replacing the DC-to-DC converter.

6.6.2 What to Do

1. **Insert the replacement VRM DC-to-DC card into the replacement DC-to-DC converter board.**
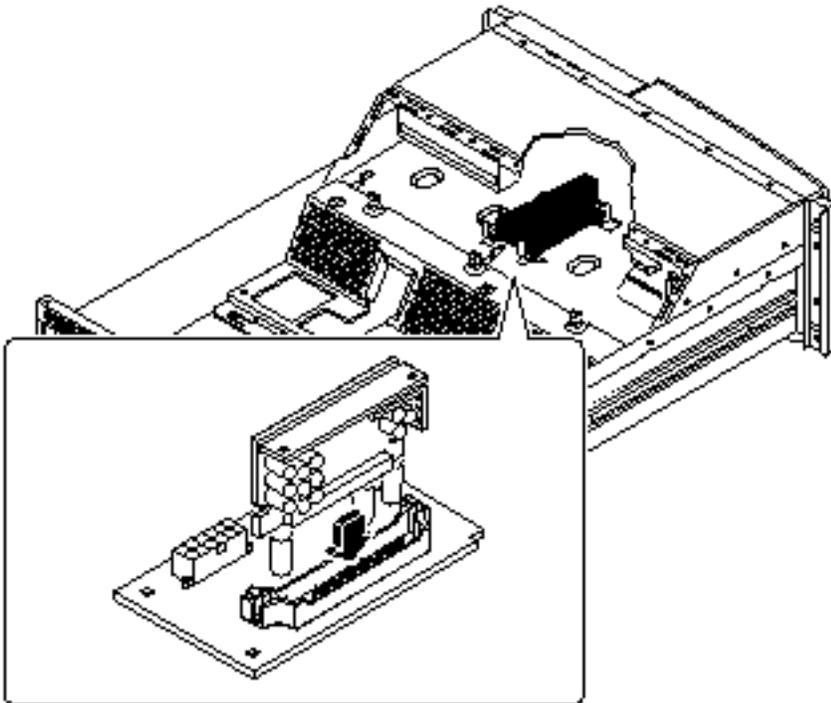
2. **Insert the cutout end of the DC-to-DC converter board into the slots on the metal tabs in the chassis.**

   Insert the DC-to-DC board into the metal slots at an angle so that the post holes on the back of the converter board align with the plastic retaining clip posts.
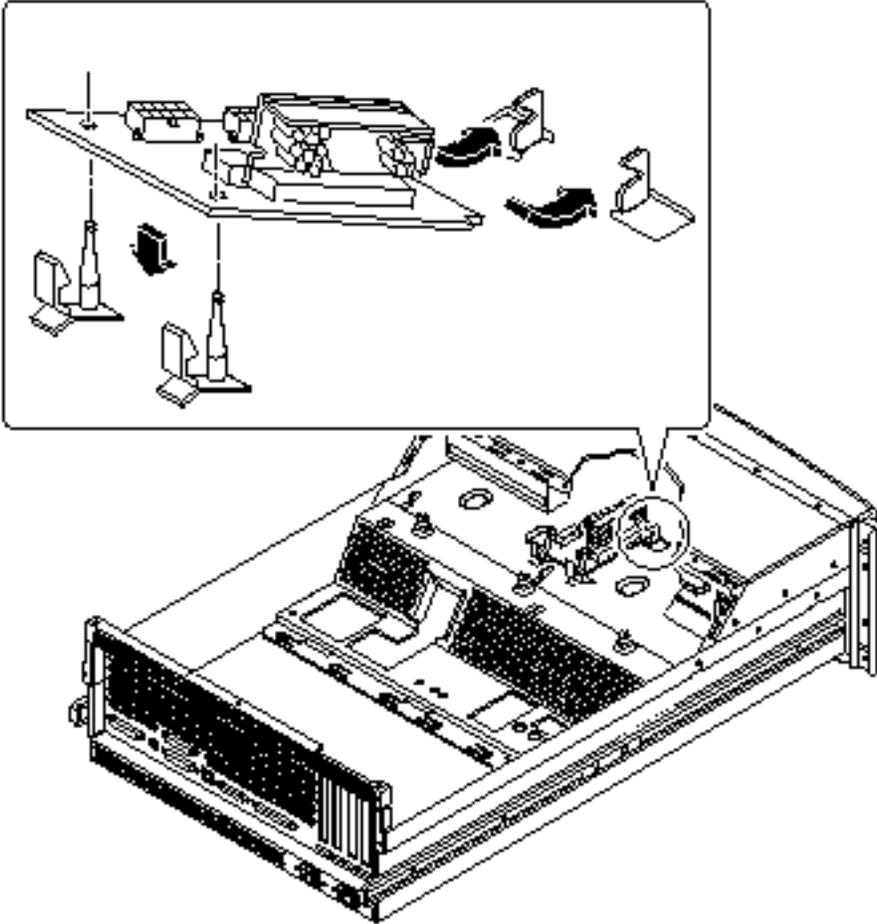
3. **Lower the DC-to-DC converter onto the plastic retaining clips.**

   Ensure that the other end of the DC-to-DC converter board remains in place in the metal tabs.

4. **Secure the DC-to-DC converter board in place.**

   Push down on the board until the plastic tabs secure the board in place.
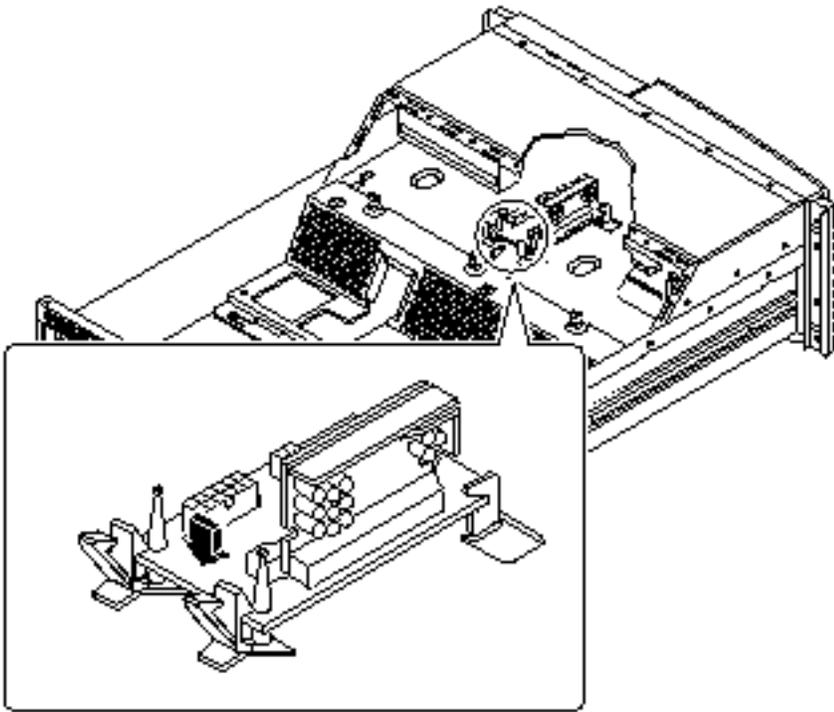
5. **Connect the CPU core voltage power cable to connector J0103 on the DC-to-DC converter board.**

   The connector is keyed so that it installs in only one way.

6. **Connect the CPU core voltage power sense cable to connector J0102 on the DC-to-DC converter board.**

   The connector is keyed so that it installs in only one way.

J01 02

J01 03
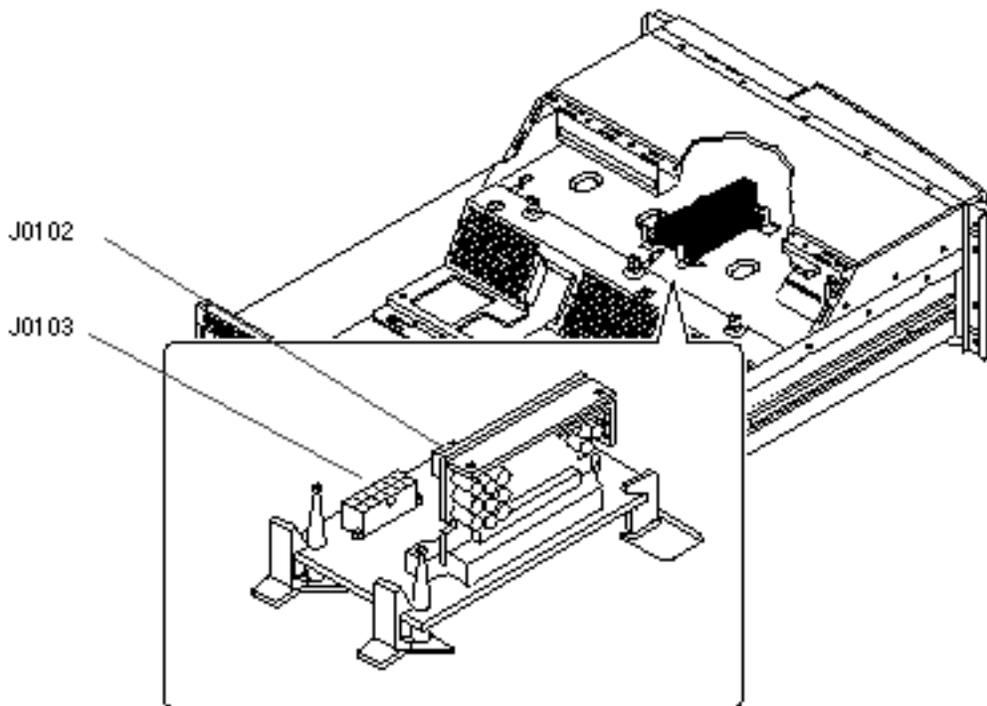
6.6.3 What Next

Complete this task to reassemble the system:

■ Section 2.7 "How to Replace the System Cover" on page 67

6.7 How to Remove the Keyswitch/Power Button/LED Cable

6.7.1 Before You Begin

Complete these tasks:

■ Section 2.1 "How to Power Off the System" on page 54

■ Section 2.4 "How to Position the System for Service" on page 60

■ Section 2.6 "How to Remove the System Cover" on page 65

6.7.2   What to Do

1. **Pull the keyswitch cable assembly from the back of the keyswitch assembly.**

   Gently twist the cable assembly back and forth while pulling it away from the keyswitch.
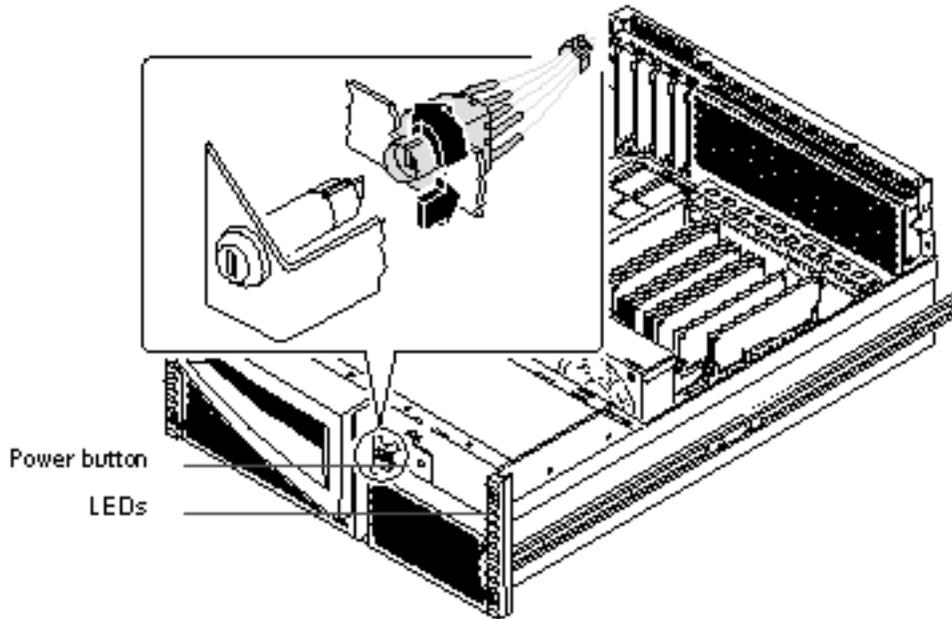
2. **Remove the 3/16ths-inch nut from the front of the Power button.**

3. **Remove the LEDs and their cables from the system.**

   a. **Using a flat-blade screwdriver, gently pull the plastic friction fit collars securing the LEDs from the chassis.**

   b. **Gently push the LED's through their cutouts in the chassis.**

Removing and Replacing Miscellaneous Assemblies   **175**
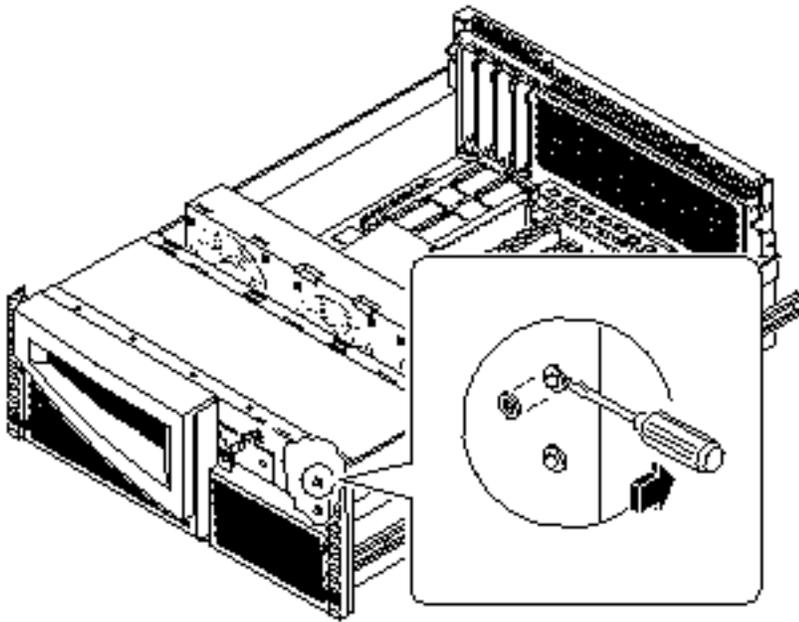
4. **Pull the keyswitch/power button/LED cable out the back of the system.**

5. **Disconnect the keyswitch/power button/LED cable from connector J0500 on the power distribution board.**

6.7.3   What Next

To replace the keyswitch/power button/LED cable, complete this task:

■ Section 6.8 "How to Replace the Keyswitch/Power Button/LED Cable" on page 176

6.8   How to Replace the Keyswitch/Power Button/LED Cable

6.8.1   Before You Begin

Complete this task:

■ Section 2.8 "How to Avoid Electrostatic Discharge" on page 69

6.8.2   What to Do

1. **Route the keyswitch and power on-off cables to their positions in the front of the chassis.Attach the keyswitch cable to the keyswitch assembly.**

   a. **Align the post on the keyswitch with the socket in the connector.**

   b. **Gently insert the keyswitch into the connector.**

   c. **Rotate the keyswitch in the connector until the tabs on the keyswitch snap into place.**
      The long tab on the keyswitch should lock into the corresponding groove on the cable connector when the keyswitch is properly seated in the connector.
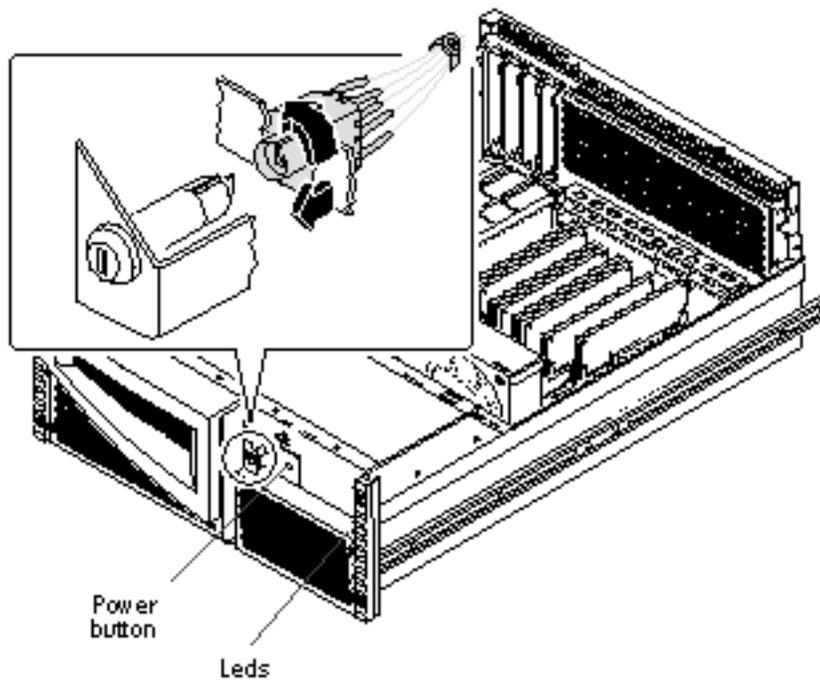
Power button

Leds

2. **Position the Power button in the chassis.**

3. **Replace the 3/16ths-inch nut on the front of the Power button.**

4. Insert the plastic LED friction-fit collars into their cutouts on the chassis.
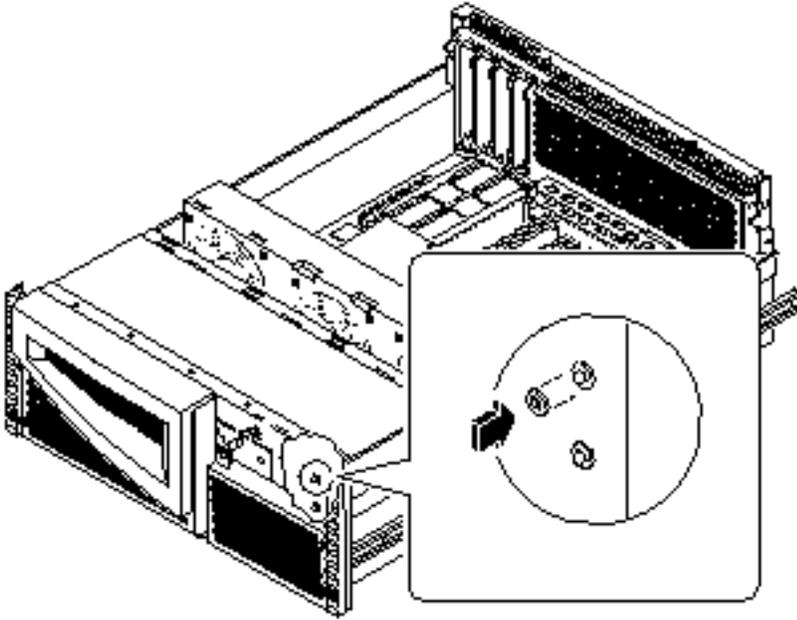
5. Insert the LEDs into their friction fit collars on the chassis.

The green LED goes in the top collar. The yellow LED goes in the bottom collar.

6. Connect the keyswitch/power button/LED cable to connector J0500 on the power distribution board.

See Section 5.5 "How to Connect the System Cables" on page 155.

6.8.3   What Next

To reassemble the system, complete these tasks:

- Section 4.4 "How to Replace the Removable Media Assembly (RMA)" on page 135
- Section 6.6 "How to Replace the DC-to-DC Converter" on page 171
- Section 6.4 "How to Replace the Fan Tray Assembly" on page 165

6.9 How to Remove a System Door

6.9.1 Before You Begin

Complete these tasks:

- Section 2.1 "How to Power Off the System" on page 54
- Section 2.4 "How to Position the System for Service" on page 60

6.9.2 What to Do

1. **Unlock the system doors.**

2. **Remove the decorative panel from the flange of the system chassis.**

   a. **Remove the washers from the screws securing the decorative panel to the chassis flange.**

   The washers are on the captive screws that attach the system to the rack rails.

   b. **Pull the decorative panel off the chassis flange.**
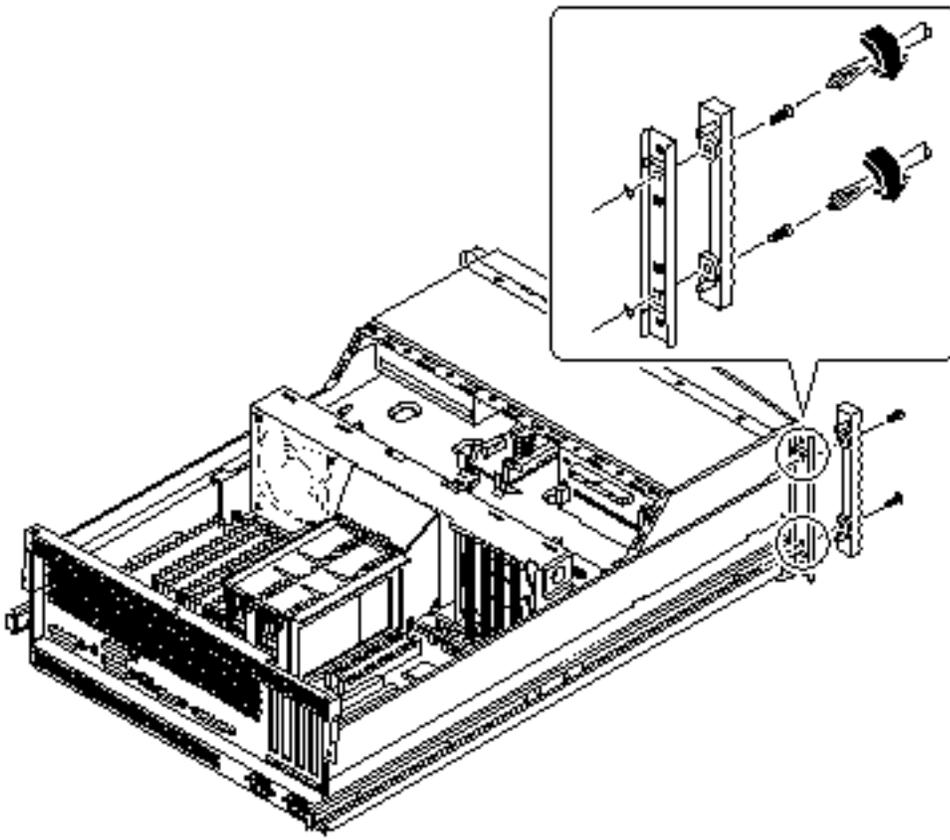
3. Unscrew the hinge from the chassis flange.

Use a Phillips #2 screwdriver.
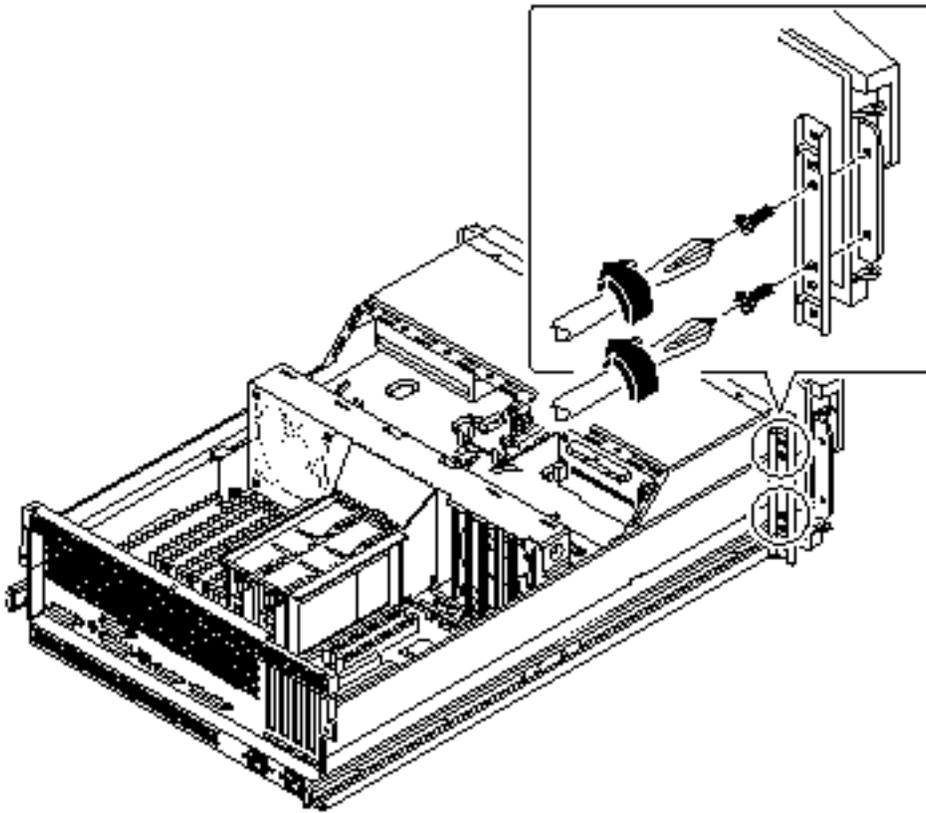
6.9.3　What Next

To replace a door, complete this task:

- Section 6.10 "How to Replace a System Door" on page 181

6.10　How to Replace a System Door

6.10.1　What to Do

1. **Position the door hinge on the chassis flange.**
   The hinge goes on the front of the chassis flange.

2. **Replace the two hinge screws securing the hinge to the chassis flange.**

   Use a Phillips #2 screwdriver.
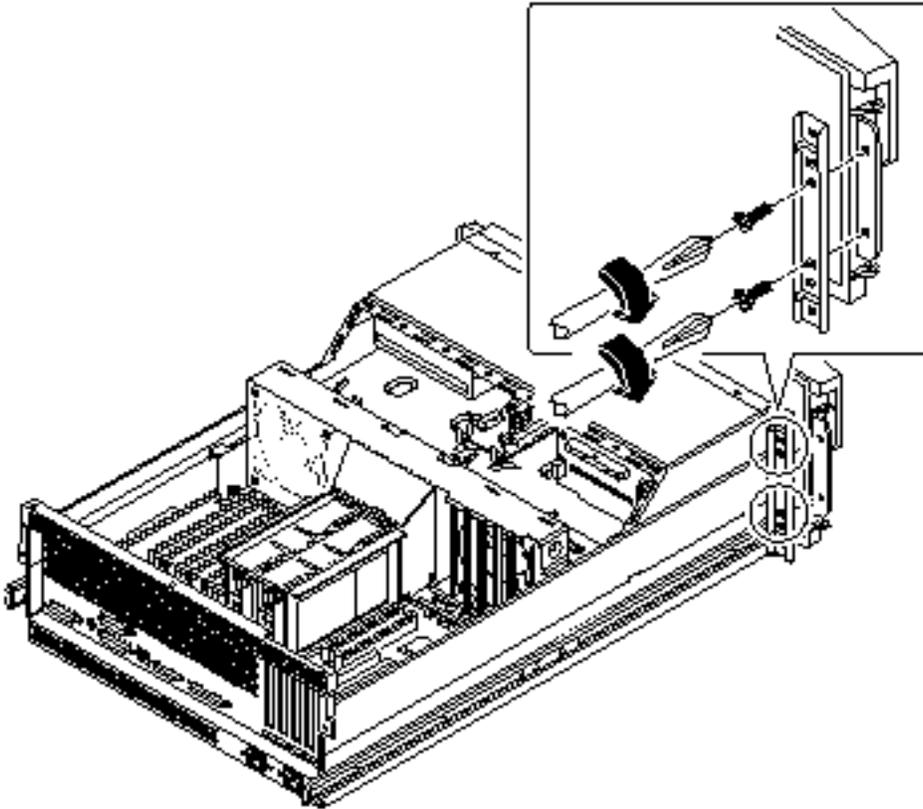
3. **Replace the decorative panel on the chassis flange.**

   a. **Press the decorative panel into place on the chassis flange.**

   b. **Replace the washers on the back of the decorative panel captive screws.**

   Tighten the washers on the screws until the decorative panel is secure on the flange.
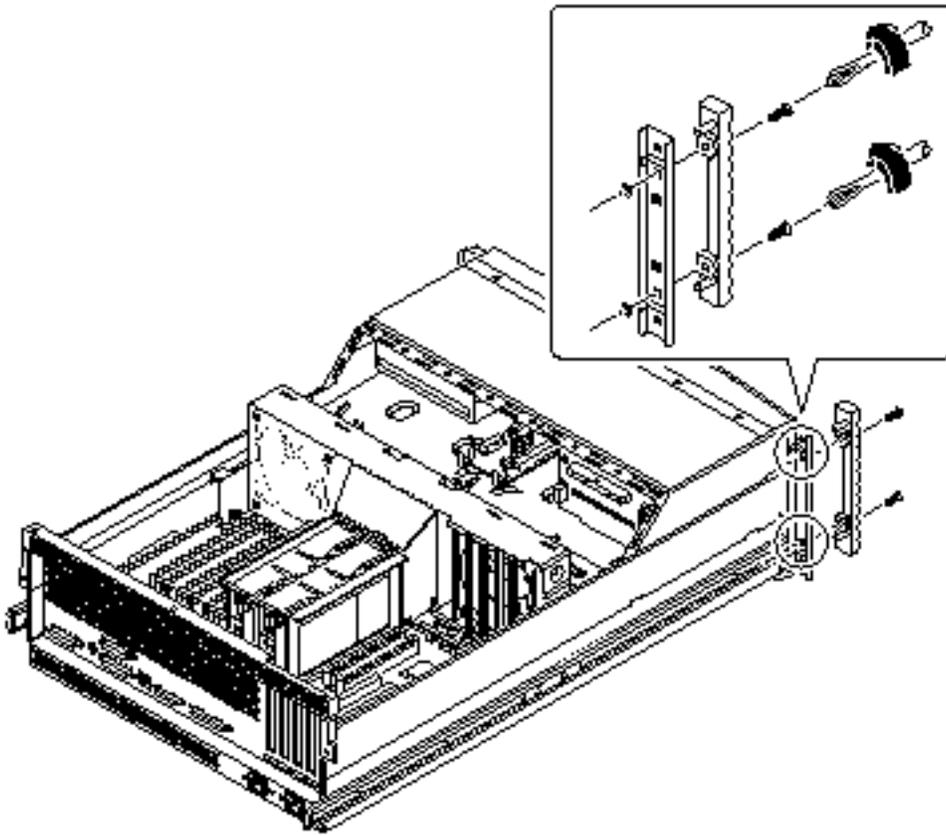
4. Close and lock the system doors.

6.10.2   What Next

To reassemble the system, complete this task:

- Section 2.5 "How to Slide the System Into the Rack" on page 63

Diagnostics and Troubleshooting

This chapter describes the diagnostic tools available for the system and provides an introduction to using these tools. The chapter also provides information about error indications and software commands to help you determine what component of the system you need to replace.

With the exception of internal disk drives in the Sun Enterprise 220R server, *all other component installation or replacement* must be performed by a qualified service provider.

The following tasks are covered in this chapter:

- Section 7.3 "How to Use POST Diagnostics" on page 188
- Section 7.6 "How to Use OpenBoot Diagnostics (OBDiag)" on page 195
- Section 7.7 "How to Set the Diagnostic Level for POST and OBDiag" on page 205
- Section 7.9 "How to Check Whether SunVTS Software Is Installed" on page 208
- Section 7.10 "How to Use SunVTS Software" on page 209

Other information covered in this chapter includes:

- Section 7.1 "About Diagnostic Tools" on page 186
- Section 7.2 "About Power-On Self-Test (POST) Diagnostics" on page 187
- Section 7.5 "About OpenBoot Diagnostics (OBDiag)" on page 192
- Section 7.8 "About SunVTS Software" on page 206
- Section 7.11 "About Sun Enterprise SyMON Software" on page 211
- Section 7.12 "About Troubleshooting Your System" on page 211
- Section 7.13 "About Diagnosing Specific Problems" on page 225

7.1 About Diagnostic Tools

The system provides both firmware-based and software-based diagnostic tools to help you identify and isolate hardware problems. These tools include:

- Power-on self-test (POST) diagnostics
- OpenBoot Diagnostics (OBDiag)
- SunVTS™ software
- Sun Enterprise SyMON™ software

POST diagnostics verify the core functionality of the system, including the main logic board, system memory, and any on-board I/O devices. You can run POST even if the system is unable to boot. For more information about POST, see Section 7.2 "About Power-On Self-Test (POST) Diagnostics" on page 187.

OBDiag tests focus on system I/O and peripheral devices. Like POST, you can run OBDiag even if the system is unable to boot. For more information about OBDiag, see Section 7.5 "About OpenBoot Diagnostics (OBDiag)" on page 192.

The SunVTS system exerciser is a graphics-oriented UNIX application that permits the continuous exercising of system resources and internal and external peripheral equipment. For more information about SunVTS, see Section 7.8 "About SunVTS Software" on page 206.

UNIX-based Sun Enterprise SyMON allows you to monitor the system hardware status and operating system performance of your server. For information about SyMON, see Section 7.11 "About Sun Enterprise SyMON Software" on page 211.

Which method or tool you use to diagnose system problems depends on the nature of those problems:

- If your machine is not able to boot its operating system software, you need to run POST and OBDiag tests.
- If your machine is "healthy" enough to start up and load its operating system software, you can use Sun Enterprise SyMON software and SunVTS software to diagnose system problems.

The following chart provides an overview of when to use the various diagnostic tools to diagnose hardware problems.
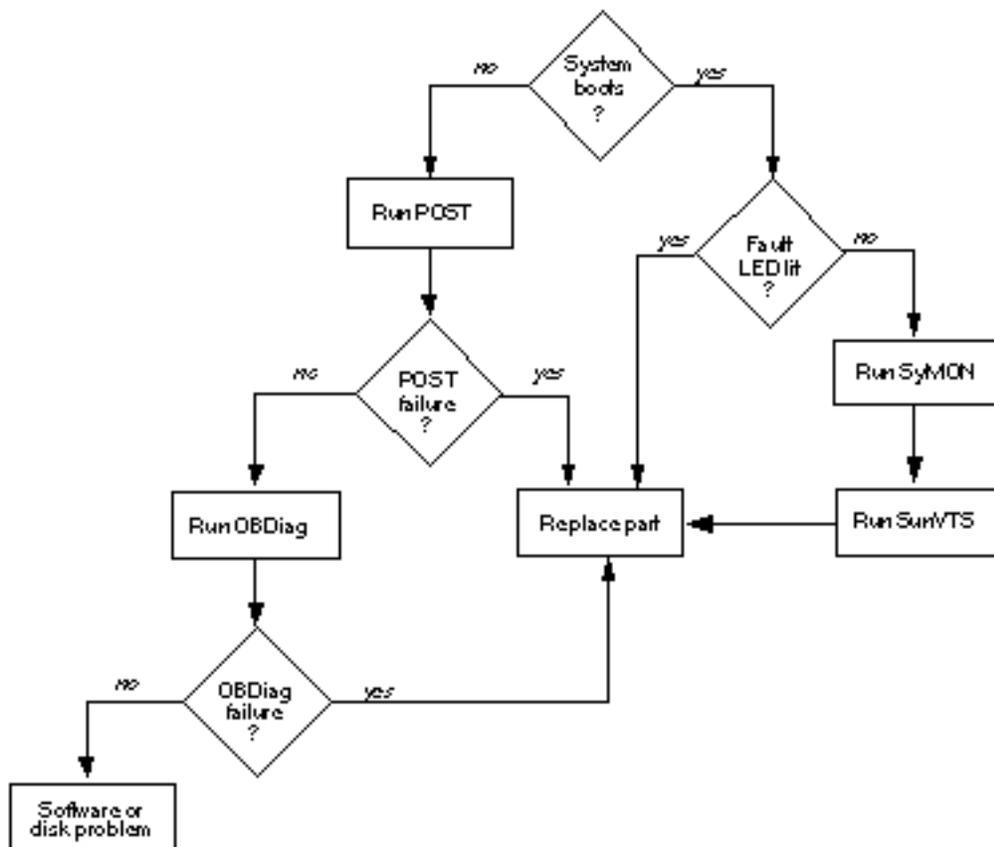
7.2 About Power-On Self-Test (POST) Diagnostics

The POST diagnostic code resides in flash PROM on the main logic board. The flash PROM that holds the POST code is known as the OpenBoot PROM (OBP) because it also holds the OpenBoot Diagnostic code.

POST tests the following system components each time the system is turned on or a system reset is issued:

■ CPU modules

- Memory modules
- NVRAM
- Main logic board

POST reports its test results by flashing or steadily illuminating LEDs on the system's front panel. If a keyboard is installed, POST also displays test results on the keyboard LEDs. See Section 7.12.1 "Error Indications" on page 212 for more information about LEDs and error messages.

POST displays detailed diagnostic and error messages on a local terminal, if one is attached to the system's serial port A. For information about running POST, see Section 7.3 "How to Use POST Diagnostics" on page 188.

7.3   How to Use POST Diagnostics

When you turn on the system power, POST diagnostics run automatically if any of the following conditions apply:

- The OpenBoot PROM variable `diag-switch?` is set to `true` when you power on the system.
- You hold down the keyboard's Stop and D keys as you power on the system.

7.3.1   Before You Begin

You can view POST diagnostic and error messages locally on an attached terminal.

To view POST diagnostic and error messages on the local system, you need to connect an alphanumeric terminal or establish a `tip` connection to another Sun system. For more information, see Section 2.10 "About Communicating With the Server" on page 73 or if you already have a console setup, see Section 7.4 "How to Set Up a tip Connection" on page 190.

You must verify baud rates between a system and a monitor or a system and a terminal. See Section 7.4.1 "How to Verify the Baud Rate" on page 192.

You can choose to run an abbreviated POST with concise error and status reporting or run an extensive POST with more detailed messages. For more information, see Section 7.7 "How to Set the Diagnostic Level for POST and OBDiag" on page 205.

If a console or a monitor is not connected to serial port A (default port) of a system to be tested, the keyboard LEDs are used to determine error conditions. See Section 7.12.1 "Error Indications" on page 212.

7.3.2   What to Do

Ensure that the front panel keyswitch is in the Standby position.

You can initialize POST one of two ways:

- By setting the `diag-switch?` to `true` and the `diag-level` to `max` or `min`, followed by power cycling the system unit
- By simultaneously pressing the keyboard Stop and D keys while power is applied to the system unit

To set the `diag-switch?` to `true` and power cycle the system unit:

1. **When the** `ok` **prompt is displayed, type the following command:**

```
ok setenv diag-switch? true
```

2. **At the Type-5 keyboard, power cycle the system by simultaneously pressing the Shift key and the Power-on key After a few seconds press the Power-on key again, or press the Power button on the system once.**

Note - The keyswitch must be set to the Power-On/Off position.

The system runs the POST diagnostics. POST displays status and error messages on the system console. For more information, see the "Results" section below.

Upon successful completion of POST, the system runs OBDiag. For more information about OBDiag, see Section 7.5 "About OpenBoot Diagnostics (OBDiag)" on page 192 and Section 7.6 "How to Use OpenBoot Diagnostics (OBDiag)" on page 195.

7.3.3   Results

While POST is running, you can observe its progress and any error indications in the following locations:

- System console or through a tip connection
- Front panel fault LEDs
- Keyboard LEDs (if a keyboard is present)

7.3.3.1 Observing POST in Progress

As POST runs, it displays detailed diagnostic status messages on the system console. If POST detects an error, it displays an error message on the system console that indicates the failing part. A sample error message is provided below:

```
Power On Self Test Failed. Cause: DIMM U0702 or System Board
ok
```

POST status and error conditions are indicated by the general fault LED on the system front panel. The LED flashes slowly to indicate that POST is running. It remains lit if POST detects a fault.

If a Sun Type-5 keyboard is attached, POST status and error indications are also displayed via the four LEDs on the keyboard. When POST starts, all four keyboard LEDs flash on and off simultaneously. After that, the Caps Lock LED flashes slowly to indicate POST is running. If an error is detected, the pattern of the lit LEDs provides an error indication. See Section 7.12.1 "Error Indications" on page 212 for more information.

If POST detects an error condition that prevents the system from booting, it halts operation and displays the `ok` prompt. The last message displayed by POST prior to the `ok` prompt indicates which part you need to replace.

7.4 How to Set Up a tip Connection

A tip connection enables you to use a remote shell window as a terminal to display test data from a system. Serial port A or serial port B of a tested system is used to establish the tip connection between the system being tested and another Sun system monitor or TTY-type terminal. The tip connection is used in a terminal window and provides features to help with the OBP.

To set up a tip connection:

1. **Connect serial port A of the system being tested to serial port B of another Sun system using a serial null modem cable (connect cable pins 2-3, 3-2, 7-20, and 20-7).**
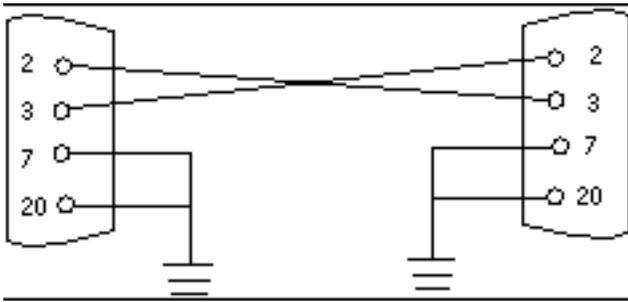
2. **At the other Sun system, check the** /etc/remote **file by changing to the** /etc **directory and then editing the** remote **file:**

```
hardwire:/ dv=/dev/term/b:br#9600:el=^C^S^Q^U^D:ie=%$:oe=^D:
```

Note - The example shows connection to serial port B.

---

3. **To use serial port A:**

   a. **Copy and paste the serial port B** remote **file.**

   b. **Modify the serial port B** remote **file as follows:**

   ```
   hardwire:\ dv=/dev/term/a:br#9600:el=^C^S^Q^U^D:ie=%$:oe=^D:
   ```

4. **In a shell window on the Sun system, type** `tip hardwire`**.**

   ```
   hostname% tip hardwire
   connected
   ```

Note - The shell window is now a `tip` window directed to the serial port of the system being tested. When power is applied to the system being tested, POST messages will be displayed in this window.

---

5. **When POST is completed, disconnect the tip window as follows:**

   a. **Open a shell window.**

b. Type `ps -a` to view the active tip line and process ID (PID) number.

c. Type the following to kill the tip hardwire process.

```
% kill -9 PID#
```

7.4.1 How to Verify the Baud Rate

To verify the baud rate between the system being tested and a terminal or another Sun system monitor:

1. **Open a shell window.**

2. **Type `eeprom`.**

3. **Verify the following serial port default settings as follows:**

```
ttyb-mode = 9600,8,n,1
ttya-mode = 9600,8,n,1
```

Note - Ensure that the settings are consistent with TTY-type terminal or system monitor settings.

7.5 About OpenBoot Diagnostics (OBDiag)

The OpenBoot Diagnostics (OBDiag) utility resides in flash PROM on the main logic board. OBDiag can isolate errors in the following system components:

- Main logic board
- Diskette drive (if applicable)
- CD-ROM drive
- Tape drive

- Disk drives

- Any option card that contains an on-board self-test

On the main logic board, OBDiag tests not only the main logic board but also its interfaces:

- PCI

- SCSI

- TPE Ethernet including MII Ethernet

- Serial

- Parallel

- Keyboard/mouse

OBDiag reports some test results by flashing or steadily illuminating the LEDs on the system front panel. See Section 7.12.1 "Error Indications" on page 212 for more information about LEDs and error messages.

OBDiag also displays detailed diagnostic and error messages on a local console or terminal, if one is attached to the system.

OBDiag tests run automatically under certain conditions. You can also run OBDiag interactively from the system ok prompt. For information about running OBDiag, see Section 7.6 "How to Use OpenBoot Diagnostics (OBDiag)" on page 195.

When you run OBDiag interactively from the ok prompt, OBDiag displays a menu that lists all of the diagnostic tests that OBDiag can perform. For information about the OBDiag menu, see Section 7.5.1 " OBDiag Menu" on page 193.

The system also provides configuration variables that you can set to alter the operation of the OBDiag tests. For information about the configuration variables, see Section 7.5.2 "Configuration Variable" on page 194.

7.5.1   OBDiag Menu

The OBDiag menu is created dynamically whenever you invoke OBDiag in interactive mode. Therefore, the menu entries may vary from system to system, depending on the system configuration. OBDiag also determines whether any optional devices installed in the system. If the device has an on-board self-test, OBDiag incorporates the test name into the list of menu entries. It displays the menu entries in alphabetical order and numbers them accordingly. Consequently, the number and position of menu items may vary from system to system, depending on the system configuration. For example, the Keyboard and Mouse test options are displayed only if your system includes a keyboard and mouse.

The OBDiag menu displays the core tests that exercise parts of the basic system. These tests can be seen in the sample OBDiag menu displayed below. For a description of each test, see Section 7.6.2 "OBDiag Tests" on page 197.

```
 OBDiag Menu

  0 ..... PCI/Cheerio
  1 ..... EBUS DMA/TCR Registers
  2 ..... Ethernet
  3 ..... Keyboard
  4 ..... Mouse
  5 ..... Parallel Port
  6 ..... Serial Port A
  7 ..... Serial Port B
  8 ..... NVRAM
  9 ..... Audio
 10 ..... SCSI
 11 ..... All Above
 12 ..... Quit
 13 ..... Display this Menu
 14 ..... Toggle script-debug
 15 ..... Enable External Loopback Tests
 16 ..... Disable External Loopback Tests

Enter (0-11 tests, 12 -Quit, 13 -Menu) ===>
```

7.5.2   Configuration Variable

The following table provides information about the OpenBoot PROM configuration
variable stored in NVRAM. This variable affects the operation of OBDiag. Use the
`printenvs` command to show current values and the `setenv` command to set or
change a value. Both commands are described in Section 7.12.2 "Software
Commands" on page 216.

Variable	Setting	Description	Default
diag-level	off	No tests are run at power up.	
	min	Performs minimal testing of core functionality.	min
	max	Runs exhaustive tests for all functions except external loopbacks. External loopback tests are not available.	

7.6 How to Use OpenBoot Diagnostics (OBDiag)

When you turn on the system power, OBDiag runs automatically if any of the following conditions apply:

- The `diag-switch?` OpenBoot PROM variable is set to `true`.

- You hold down the keyboard's Stop and D keys as you power on the system. The systems's `ok` prompt will appear.

In the event of an automatic system reset, POST diagnostics run under the following condition:

- The OpenBoot PROM variable `diag-switch?` is set to `true`.

You can also run OBDiag in an interactive mode and select which tests you want to perform. The following procedure describes how to run OBDiag interactively from the system `ok` prompt.

7.6.1 What to Do

Note - Perform this procedure with the power *on* and the keyswitch in the Power-On/Off position.

1. **With the keyswitch in the Power-On/Off position, press the Break key on your alphanumeric terminal keyboard, or enter the `Stop-a` sequence on a Sun keyboard.**

   To enter the Stop-a sequence, press the Stop key and the a key simultaneously. The `ok` prompt is displayed.

2. **(*Optional*) Select a diagnostic level.**

   Three different levels of diagnostic testing are available for OBDiag; see Section 7.7 "How to Set the Diagnostic Level for POST and OBDiag" on page 205.

3. **At the `ok` prompt type:**

   ```
   ok setenv diag-switch? true
   diag-switch? = true
   ```

4. **At the** `ok` **prompt, type:**

```
ok obdiag
```

The OBDiag menu is displayed.

Note - The OBDiag menu is built dynamically each time you run the **obdiag** command. The exact number and order of menu items in the example might not match the menu items on your system.

```
 OBDiag Menu

  0 ..... PCI/Cheerio
  1 ..... EBUS DMA/TCR Registers
  2 ..... Ethernet
  3 ..... Keyboard
  4 ..... Mouse
  5 ..... Parallel Port
  6 ..... Serial Port A
  7 ..... Serial Port B
  8 ..... NVRAM
  9 ..... Audio
 10 ..... SCSI
 11 ..... All Above
 12 ..... Quit
 13 ..... Display this Menu
 14 ..... Toggle script-debug
 15 ..... Enable External Loopback Tests
 16 ..... Disable External Loopback Tests

Enter (0-11 tests, 12 -Quit, 13 -Menu) ===>
```

5. **At the OBDiag menu prompt, type 14 to select toggle script-debug.**

Note - Selecting toggle script-debug enables verbose test message displays.

---

6. **At the Enter prompt, type the appropriate test number.**

7.6.2   OBDiag Tests

The OBDiag tests are described in the following sections:

Note - The OBDiag Audio test is not available for this system.

7.6.3   PCI/Cheerio

The PCI/Cheerio test performs the following diagnostics.

Test	Function
vendor_ID_test	Verifies that the U2P ASIC vendor ID is 108e.
device_ID_test	Verifies that the U2P ASIC device ID is 1000.
mixmode_read	Verifies that the PCI configuration space is accessible as half-word bytes by reading the EBus2 vendor ID address.
e2_class_test	Verifies the address class code. Address class codes include bridge device (0 x B, 0 x 6), other bridge device (0 x A and 0 x 80), and programmable interface (0 x 9 and 0 x 0).
status_reg_walk1	Performs walk-one test on status register with mask 0 x 280 (U2P ASIC is accepting fast back-to-back transactions, DEVSEL timing is 0 x 1).
line_size_walk1	Performs tests a through e.
latency_walk1	Performs walk-one test on latency timer.

Test	Function
line_walk1	Performs walk-one test on interrupt line.
pin_test	Verifies that the interrupt pin is logic-level high (1) after reset.

The following example shows the PCI/Cheerio diagnostic output message.

```
Enter (0-11 tests, 12 -Quit, 13 -Menu) ===> 0
Test
vendor_ID_test
device_ID_test
mixmode_read
e2_class_test
status_reg_walk1
line_size_walk1
latency_walk1
line_walk1
pin_test
SUBTEST='pin_test'
Enter (0-11 tests, 12 -Quit, 13 -Menu) ===>
```

7.6.4   EBus DMA/TCR Registers

The EBus DMA/TCR registers diagnostic performs the following tests.

Test	Function
DMA_reg_test	Performs a walking ones bit test for control status register, address register, and byte count register of each channel. Verifies that the control status register is set properly.
DMA_func_test	Validates the DMA capabilities and FIFOs. Test is executed in a DMA diagnostic loopback mode. Initializes the data of transmitting memory with its address, performs a DMA read and write, and verifies that the data received is correct. Repeats for four channels.

The following example shows the EBus DMA/TCR registers diagnostic output message.

```
Enter (0-11 tests, 12 -Quit, 13 -Menu) ===> 1

TEST='all_dma/ebus_test'
SUBTEST='dma_reg_test'
SUBTEST='dma_func_test'
Enter (0-11 tests, 12 -Quit, 13 -Menu) ===>
```

7.6.5   Ethernet

The Ethernet diagnostic performs the following tests.

Test	Function
`my_channel_reset`	Resets the Ethernet channel.
`hme_reg_test`	Performs walk-one on the following registers set: global register 1, global register 2, bmac xif register, bmac tx register, and the mif register.
`MAC_internal_loopback_test`	Performs Ethernet channel engine internal loopback.
`10_mb_xcvr_loopback_test`	Enables the 10BASE-T data present at the transmit MII data inputs to be routed back to the receive MII data outputs.
`100_mb_phy_loopback_test`	Enables MII transmit data to be routed to the MII receive data path.
`100_mb_twister_loopback_test`	Forces the twisted-pair transceiver into loopback mode.

The following example shows the Ethernet diagnostic output message.

CODE EXAMPLE 7–2

```
Enter (0-11 tests, 12 -Quit, 13 -Menu) ===> 2

TEST='ethernet_test'
SUBTEST='my_channel_reset'
SUBTEST='hme_reg_test'
SUBTEST='global_reg1_test'
SUBTEST='global_reg2_test'
SUBTEST='bmac_xif_reg_test'
```

(continued)

```
SUBTEST='bmac_tx_reg_test'
SUBTEST='mif_reg_test'
SUBTEST='mac_internal_loopback_test'
SUBTEST='10mb_xcvr_loopback_test'
SUBTEST='100mb_phy_loopback_test'
Enter (0-12 tests, 13 -Quit, 14 -Menu) ===>
```

7.6.6   Keyboard

The keyboard diagnostic consists of an external and an internal loopback. The external loopback requires a passive loopback connector. The internal loopback verifies the keyboard port by transmitting and receiving 128 characters.

The following example shows the keyboard diagnostic output message.

CODE EXAMPLE 7–3

```
Enter (0-11 tests, 12 -Quit, 13 -Menu) ===> 3

TEST='keyboard_test'
SUBTEST='internal_loopback'
Enter (0-11 tests, 12 -Quit, 13 -Menu) ===>
```

7.6.7   Mouse

The mouse diagnostic performs a keyboard-to-mouse loopback.

The following example shows the mouse diagnostic output message.

```
Enter (0-11 tests, 12 -Quit, 13 -Menu) ===> 4

TEST='mouse_test'
Enter (0-11 tests, 12 -Quit, 13 -Menu) ===>
```

7.6.8   Parallel Port

The parallel port diagnostic performs the following tests.

Test	Function
sio_passive_lb	Sets up the Super I/O configuration register to enable extended/compatible parallel port select, then does a write 0, walk one, write 0 x ff to the data register. It verifies the results by reading the status register.
dma_read	Enables ECP mode and ECP DMA configuration, and FIFO test mode. Transfers 16 bytes of data from memory to the parallel port device and then verifies the data is in FIFO device.

The following example shows the parallel port diagnostic output message.

```
Enter (0-11 tests, 12 -Quit, 13 -Menu) ===> 5

TEST='parallel_port_test'
SUBTEST='dma_read'
Enter (0-11 tests, 12 -Quit, 13 -Menu) ===>
```

7.6.9   Serial Port A

The serial port A diagnostic invokes the uart_loopback test, which transmits and receives 128 characters and checks the transaction validity. The following baud rates are tested in asynchronous mode: 460800, 307200, 230400, 153600, 76800, 57600, 38400, 19200, 9600, 4800, 2400, and 800.

The following example shows the serial port A output message when serial port A is being used for the tip connection.

```
Enter (0-11 tests, 12 -Quit, 13 -Menu) ===> 6

TEST='uarta_test'
'UART A in use as console - Test not run.'
Enter (0-11 tests, 12 -Quit, 13 -Menu) ===>
```

The following example shows the serial port A diagnostic output message.

```
Enter (0-11 tests, 12 -Quit, 13 -Menu) ===> 7

TEST='uartb_test'
BAUDRATE='1200'
BAUDRATE='1800'
BAUDRATE='2400'
BAUDRATE='4800'
BAUDRATE='9600'
BAUDRATE='19200'
BAUDRATE='38400'
BAUDRATE='57600'
BAUDRATE='76800'
BAUDRATE='115200'
BAUDRATE='153600'
BAUDRATE='230400'
BAUDRATE='307200'
BAUDRATE='460800'
Enter (0-11 tests, 12 -Quit, 13 -Menu) ===>
```

7.6.10   Serial Port B

The serial port B diagnostic is identical to the serial port A diagnostic.

The following example shows the serial port B diagnostic output message.

```
Enter (0-11 tests, 12 -Quit, 13 -Menu) ===> 7

TEST='uartb_test'
BAUDRATE='1200'
BAUDRATE='1800'
BAUDRATE='2400'
BAUDRATE='4800'
BAUDRATE='9600'
BAUDRATE='19200'
BAUDRATE='38400'
BAUDRATE='57600'
BAUDRATE='76800'
BAUDRATE='115200'
BAUDRATE='153600'
BAUDRATE='230400'
BAUDRATE='307200'
BAUDRATE='460800'
Enter (0-11 tests, 12 -Quit, 13 -Menu) ===>
```

7.6.11   NVRAM

The NVRAM diagnostic verifies the NVRAM operation by performing a write and
read to the NVRAM.

The following example shows the NVRAM diagnostic output message.

CODE EXAMPLE 7–4

```
Enter (0-11 tests, 12 -Quit, 13 -Menu) ===> 8

TEST='nvram_test'
SUBTEST='write/read_patterns'
SUBTEST='write/read_inverted_patterns'
Enter (0-11 tests, 12 -Quit, 13 -Menu) ===>
```

7.6.12   Audio

The audio diagnostic is not included for this system.

7.6.13   SCSI

The SCSI diagnostic validates both the SCSI chip and the SCSI bus subsystem.

The following example shows the SCSI diagnostic output message.

CODE EXAMPLE 7–5

```
Enter (0-11 tests, 12 -Quit, 13 -Menu) ===> 10

TEST='selftest'
Enter (0-12 tests, 13 -Quit, 14 -Menu) ===>
```

7.6.14   All Above

The all above diagnostic validates the system.

The following example shows the all above diagnostic output message.

Note - The all above diagnostic stalls if the tip line is installed on serial port A or
serial port B.

```
Enter (0-11 tests, 12 -Quit, 13 -Menu) ===> 11

TEST='all_pci/cheerio_test'
SUBTEST='vendor_id_test'
SUBTEST='device_id_test'
SUBTEST='mixmode_read'
SUBTEST='e2_class_test'
SUBTEST='status_reg_walk1'
SUBTEST='line_size_walk1'
SUBTEST='latency_walk1'
SUBTEST='line_walk1'
SUBTEST='pin_test'

TEST='all_dma/ebus_test'
SUBTEST='dma_reg_test'
SUBTEST='dma_func_test'

TEST='ethernet_test'
SUBTEST='my_channel_reset'
SUBTEST='hme_reg_test'
SUBTEST='global_reg1_test'
SUBTEST='global_reg2_test'
SUBTEST='bmac_xif_reg_test'
SUBTEST='bmac_tx_reg_test'
SUBTEST='mif_reg_test'
SUBTEST='mac_internal_loopback_test'
SUBTEST='10mb_xcvr_loopback_test'
SUBTEST='100mb_phy_loopback_test'

TEST='keyboard_test'
SUBTEST='internal_loopback'

TEST='mouse_test'
SUBTEST='mouse_loopback'

###OBDIAG_MFG_START###
TEST='mouse_test'
STATUS='FAILED'
SUBTEST='mouse_loopback'
ERRORS='1 '
TTF='456 '
SPEED='450.04 MHz'
PASSES='1 '
MESSAGE='Error: Timeout receiving a character'

TEST='floppy_test'
SUBTEST='floppy_id0_read_test'

TEST='parallel_port_test'
SUBTEST='dma_read'

TEST='uarta_test'
'UART A in use as console - Test not run.'

TEST='uartb_test'
BAUDRATE='1200'
BAUDRATE='1800'
BAUDRATE='2400'
```

(continued)

```
BAUDRATE='4800'
BAUDRATE='9600'
BAUDRATE='19200'
BAUDRATE='38400'
BAUDRATE='57600'
BAUDRATE='76800'
BAUDRATE='115200'
BAUDRATE='153600'
BAUDRATE='230400'
BAUDRATE='307200'
BAUDRATE='460800'

TEST='nvram_test'
SUBTEST='write/read_patterns'
SUBTEST='write/read_inverted_patterns'

TEST='audio_test'
SUBTEST='cs4231_test'
Codec_ID='8a'
Version_ID='a0'
SUBTEST='external_lpbk'
External Audio Test not run: Please set the mfg-mode to sys-ext.
###OBDIAG_MFG_START###
TEST='audio_test'
STATUS='FAILED'
SUBTEST='external_lpbk'
ERRORS='1 '
TTF='468 '
SPEED='450.04 MHz'
PASSES='1 '
MESSAGE='Error: internal_loopback TBD'

TEST='selftest'
Enter (0-12 tests, 13 -Quit, 14 -Menu) ===>
```

7.7   How to Set the Diagnostic Level for POST and OBDiag

7.7.1   Before You Begin

Three different levels of diagnostic testing are available for power-on self-test (POST) and OpenBoot Diagnostics (OBDiag): *max* (maximum level), *min* (minimum level),

and *off* (no testing). The system runs the appropriate level of diagnostics based on the setting of the OpenBoot PROM variable `diag-level`.

The default setting for `diag-level` is `min`.

If your server is set up without a local console or terminal, you will need to set up a monitor, console, or terminal before setting the diagnostic level. See Section 2.10 "About Communicating With the Server" on page 73.

7.7.2   What to Do

Note - Perform this procedure with the power on and the keyswitch set to the Power-On/Off position.

1. **With the keyswitch in the Power-On/Off position, press the Break key on your alphanumeric terminal's keyboard, or enter the Stop-a sequence on a Sun keyboard.**

   To enter the Stop-a sequence, press the Stop key and the a key simultaneously. The `ok` prompt is displayed.

2. **To set the `diag-level` variable, type the following:**

   ```
   ok setenv diag-level value
   ```

   The *value* can be `off`, `min`, or `max`. See Section 7.5.2 "Configuration Variable" on page 194 for information about each setting.

7.8   About SunVTS Software

SunVTS™, the Sun Validation and Test Suite, is an online diagnostics tool and system exerciser for verifying the configuration and functionality of hardware controllers, devices, and platforms. You can run SunVTS using any of these interfaces: a command-line interface, a TTY interface, or a graphical interface that runs within a windowed desktop environment.

SunVTS software lets you view and control a testing session over modem lines or over a network. Using a remote system, you can view the progress of a SunVTS testing session, as well as change testing options and control all testing features of another system on the network.

Useful tests to run on your system are listed below.

SunVTS Test	Description
ecpptest	Verifies the ECP1284 parallel port printer functionality
cdtest	Tests the CD-ROM drive by reading the disc and verifying the CD table of contents (TOC), if it exists
disktest	Verifies local disk drives
fputest	Checks the floating-point unit
fstest	Tests the integrity of the software's file systems
m64test	Tests the PGX frame buffer card
mptest	Verifies multiprocessor features (for systems with more than one processor)
nettest	Checks all the hardware associated with networking (for example, Ethernet, token ring, quad Ethernet, fiber optic, 100-Mbit per second Ethernet devices)
pmem	Tests the physical memory (read only)
sptest	Tests the system's on-board serial ports
tapetest	Tests the various Sun tape devices
vmem	Tests the virtual memory (a combination of the swap partition and the physical memory)

7.8.1 For More Information

The following documents provide information about SunVTS software. They are available on the *Solaris on Sun Hardware AnswerBook*. This AnswerBook documentation is provided on the *Sun Updates CD* for the Solaris release you are running.

- *SunVTS User's Guide*

  This document describes the SunVTS environment, including how to start and control the various user interfaces. SunVTS features are described in this document.

- *SunVTS Test Reference Manual*

This document contains descriptions of each test SunVTS software runs in the SunVTS environment. Each test description explains the various test options and gives command-line arguments.

■ *SunVTS Quick Reference Card*

This card gives an overview of the main features of the SunVTS Open Look interface.

7.9 How to Check Whether SunVTS Software Is Installed

SunVTS software is an optional package that may or may not have been loaded when your system software was installed.

7.9.1 Before You Begin

To check whether SunVTS software is installed, you must access your system either from a console or from a remote machine logged in to the system.

7.9.2 What to Do

1. **Type the following:**

```
% pkginfo -l SUNWvts
```

■ If SunVTS software is loaded, information about the package will be displayed.
■ If SunVTS software is not loaded, you'll see an error message:

```
ERROR: information for "SUNWvts" was not found
```

2. **If necessary, use the** pkgadd **utility to load the** SUNWvts **package onto your system from the Sun Updates CD.**

Note that /opt/SUNWvts is the default directory for installing SunVTS software.

7.9.3   What Next

For more information, refer to the appropriate Solaris documentation, as well as the `pkgadd` reference manual page.

7.10   How to Use SunVTS Software

7.10.1   Before You Begin

If your system passes the firmware-based diagnostics and boots the operating system, yet does not function correctly, you can use SunVTS software, the Sun Validation and Test Suite, to run additional tests. These tests verify the configuration and functionality of most hardware controllers and devices.

You must have root or superuser access to run SunVTS tests and the system must be booted to the multiuser level (level 3). If you are not familiar with these or other basic UNIX commands and procedures, such as shutting down the system, booting the system, and configuring devices, you can find the information you need in the following sources:

- *Solaris Handbook for Sun Peripherals*
- *AnswerBook2*^{TM} *online documentation for the Solaris operating environment*
- Other software documentation that you received with your system

7.10.2   What to Do

This procedure assumes that you will test your Sun Enterprise 220R server remotely by running a SunVTS session from a workstation using the SunVTS graphical interface. For information about other SunVTS interfaces and options, see Section 7.1 "About Diagnostic Tools" on page 186.

1. Use `xhost` to give the remote server access to the workstation display.

On the system from which you will be running the SunVTS graphical interface, type:

```
% /usr/openwin/bin/xhost + remote_hostname
```

Substitute the name of the Sun Enterprise 220R server for *remote_hostname*. Among other things, this command gives the server display permissions to run

the SunVTS graphical interface in the OpenWindows™ environment of the workstation.

2. **Remotely log in to the server as superuser (root).**

3. **Check whether SunVTS software is loaded on the server.**

   SunVTS is an optional package that may or may not have been loaded when the server software was installed. For more information, see Section 7.9 "How to Check Whether SunVTS Software Is Installed" on page 208.

4. **To start the SunVTS software, type:**

```
# cd /opt/SUNWvts/bin
# ./sunvts -display local_hostname:0
```

   Substitute the name of the server you are using for *local_hostname*. Note that /opt/SUNWvts/bin is the default /bin directory for SunVTS software. If you have installed SunVTS software in a different directory, use the appropriate path instead.

   When you start SunVTS software, the SunVTS kernel probes the test system devices. The results of this probe are displayed on the Test Selection panel. For each hardware device on your system, there is an associated SunVTS test.

5. **Fine-tune your testing session by selecting only the tests you want to run.**

   Click to select and deselect tests. (A check mark in the box indicates the item is selected.)
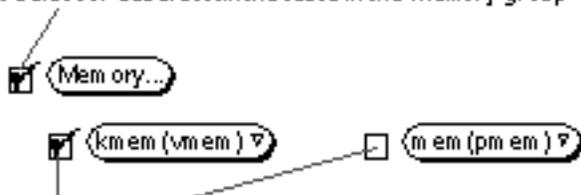
7.10.3   Results

If SunVTS tests indicate an impaired or defective part, see the procedures in this service manual or contact your qualified Sun service provider to replace the defective part.

7.11   About Sun Enterprise SyMON Software

Sun Enterprise SyMON software is a GUI-based diagnostic tool designed to monitor system hardware status and UNIX operating system performance. It offers simple, yet powerful monitoring capabilities that allow you to:

- Diagnose and address potential problems such as capacity problems or bottlenecks
- Display physical and logical views of your exact server configuration
- Monitor your server remotely from any location in the network
- Isolate potential problems or failed components

For instructions about installing and using Sun Enterprise SyMON software, see the Sun Enterprise SyMon User's Guide.

See the Web site `www.sun.com/symon` for current software and documentation information.

7.12   About Troubleshooting Your System

The system provides the following features to help you identify and isolate hardware problems:

- Error indications
- Software commands
- Diagnostic tools

This section describes the error indications and software commands provided to help you troubleshoot your system. Diagnostic tools are covered in Section 7.1 "About Diagnostic Tools" on page 186.

7.12.1　Error Indications

The system provides error indications via LEDs and error messages. Using the two in combination, you can isolate a problem to a particular field-replaceable unit (FRU) with a high degree of confidence.

The system provides fault LEDs in the following places:

- Front panel
- Keyboard
- Power supplies
- Disk drives

Error messages are logged in the /var/adm/messages file and are also displayed on the system console by the diagnostic tools.

7.12.1.1　Front Panel LEDs

Front panel LEDs provide your first indication if there is a problem with your system. Usually, a front panel LED is not the sole indication of a problem. Error messages and even other LEDs can help to isolate the problem further.

The front panel has a general fault indicator that lights whenever POST or OBDiag detects any kind of fault (including a fault reported by a power supply).

7.12.1.2　Keyboard LEDs

Four LEDs on the Sun Type-5 keyboard are used to indicate the progress and results of POST diagnostics. These LEDs are on the Caps Lock, Compose, Scroll Lock, and Num Lock keys as shown below.

Note - A keyboard is not shipped with the system. To read keyboard LEDs you must obtain a keyboard of the appropriate type (see the following graphic) and connect it to the keyboard/mouse port on the system's back panel.

Stop   D key   Scroll Lock LED   Num Lock LED

Caps Lock LED (UNIX keyboard)   Shift key   Caps Lock LED (standard)   Compose LED
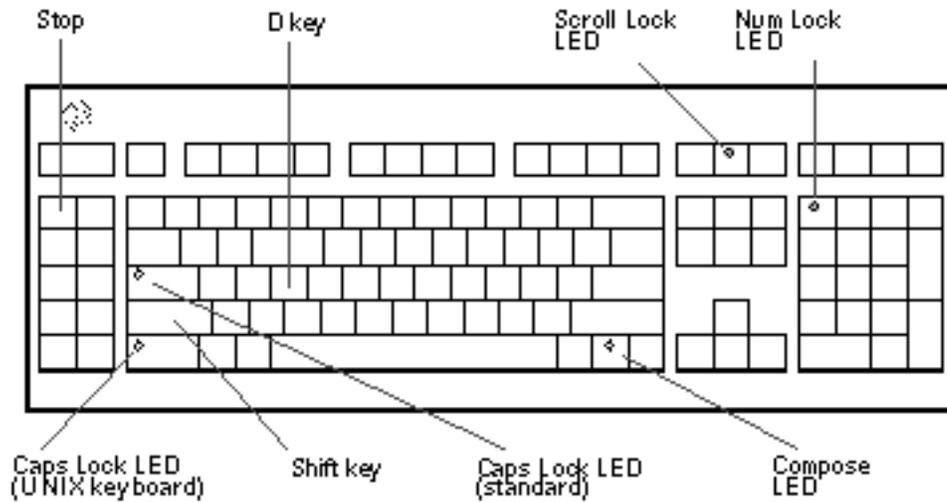
To indicate the beginning of POST diagnostics, the four LEDs briefly light all at once. The monitor screen remains blank, and the Caps Lock LED flashes for the duration of the testing.

If the system passes all POST diagnostic tests, all four LEDs light again and then go off. Once the system banner appears on the monitor screen, the keyboard LEDs assume their normal functions and should no longer be interpreted as diagnostic error indicators.

If the system fails any test, one or more LEDs will light to form an error code that indicates the nature of the problem.

Note - The LED error code may be lit continuously, or for just a few seconds, so it is important to observe the LEDs closely while POST is running.

The following table provides error code definitions.

Caps Lock	Compose	Scroll Lock	Num Lock	Failing FRU
On	Off	Off	Off	Main logic board
Off	On	Off	Off	CPU module 0
Off	On	On	Off	CPU module 1
On	Off	Off	On	No memory detected

Caps Lock	Compose	Scroll Lock	Num Lock	Failing FRU
On	On	On	On	Memory bank 0
On	On	Off	On	Memory bank 1
On	On	On	Off	Memory bank 2
On	On	On	On	Memory bank 3
Off	Off	Off	On	NVRAM

Note - The Caps Lock LED flashes on and off to indicate that POST diagnostics are running; all other LEDs are off. When the LED lights steadily, it indicates an error.

7.12.1.3 Power Supply LEDs

Power supply LEDs are visible from the front of the system when the doors are open. The following figure shows the LEDs on the power supply in bay 1.
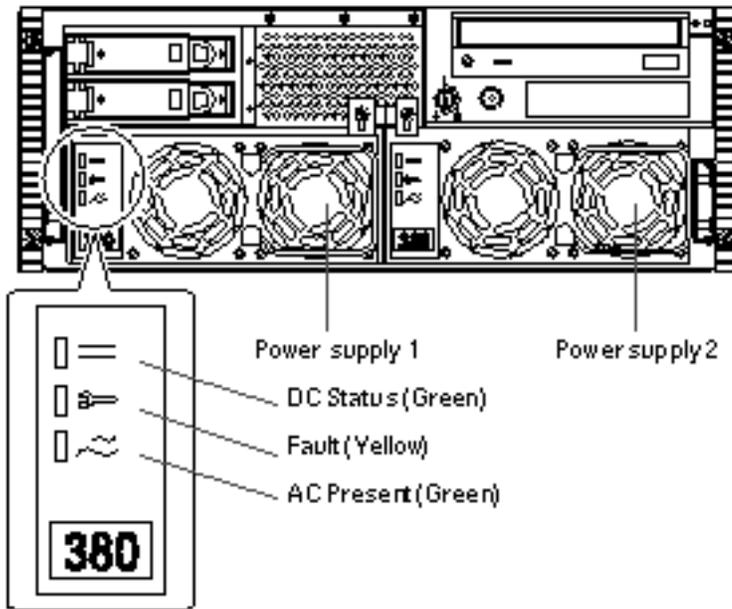
The following table provides a description of each LED.

LED Name	Icon	Description
DC Status		This green LED is lit to indicate that all DC outputs from the power supply are functional.
Fault		This yellow LED is lit to indicate a fault in the power supply. The power supply is non-functional and there is no DC output to the system. The yellow LED on the system front panel also lights if this LED is lit.
AC-Present		This green LED is lit to indicate that the primary circuit has power. When this LED is lit, the power supply is providing standby power to the system.

7.12.1.4 Disk Drive LEDs

The disk drive LEDs are visible from the front of the system when the left door is open, as shown in the following figure.
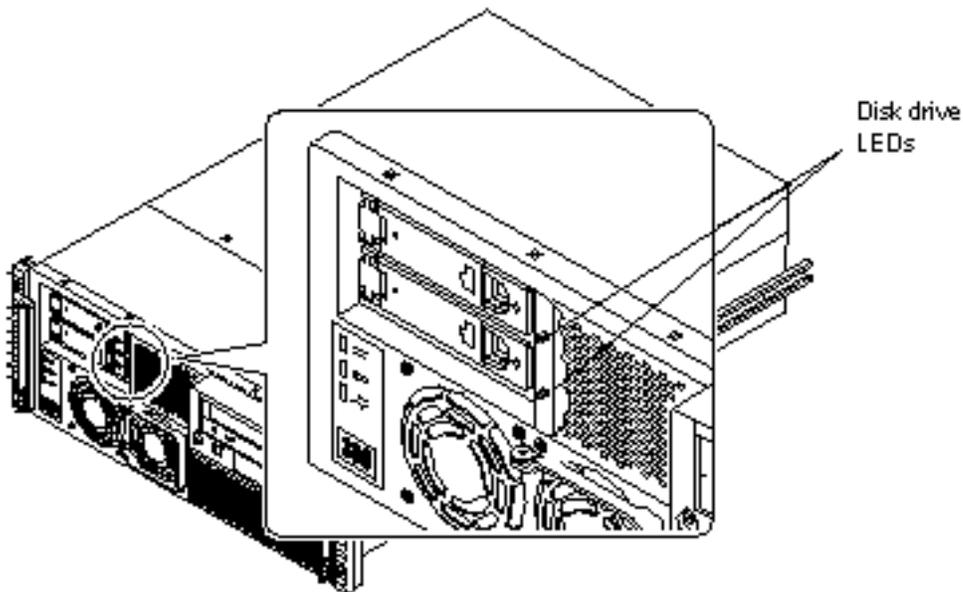
When a disk drive LED lights steadily and is green, it indicates that the slot is populated and that the drive is receiving power. When an LED is green and flashing, it indicates that there is activity on the disk. Some applications use the LED to indicate a fault on the disk drive. In this case, the LED changes color to yellow and lights steadily. The disk drive LEDs retain their state when the system is powered off. A yellow indicator also results in the yellow general fault indicator being lit on the system front panel.

7.12.1.5 Error Messages

Error messages and other system messages are saved in the file `/var/adm/messages`.

The two firmware-based diagnostic tools, POST and OBDiag, provide error messages either locally on the system console, or terminal, or in a remote console window through a tip connection. These error messages can help to further refine your problem diagnosis. The amount of error information displayed in diagnostic messages is determined by the value of the OpenBoot PROM variable `diag-verbosity`. See Section 7.5.2 "Configuration Variable" on page 194 for additional details.

7.12.2 Software Commands

System software provides Solaris operating system commands that you can use to diagnose problems, and OBP commands that enable you to diagnose problems even if the Solaris operating environment is unavailable for any reason. For more information on Solaris commands, see the appropriate man pages. For additional information on OBP commands, see the *OpenBoot 3.x Command Reference Manual*. (An online version of the manual is included with the Solaris System Administrator AnswerBook that ships with Solaris software.)

7.12.2.1 Solaris `prtdiag` Command

The `prtdiag` command is a UNIX shell command used to display system configuration and diagnostic information, such as:

- System configuration, including information about clock frequencies, CPUs, memory, and I/O card types
- Diagnostic information
- Failed field-replaceable units (FRUs)

To run `prtdiag`, type:

```
% /usr/platform/sun4u/sbin/prtdiag
```

To isolate an intermittent failure, it may be helpful to maintain a prtdiag history log. Use prtdiag with the -l (log) option to send output to a log file in /var/adm.

Note - Refer to the prtdiag man page for additional information.

An example of prtdiag output follows. The exact format of prtdiag output depends on which version of the Solaris operating environment is running on your system.

prtdiagoutput:

```
ok /usr/platform/sun4u/sbin/prtdiag -v


System Configuration:  Sun Microsystems  sun4u Sun Enterprise 220R (UltraSPARC-
II 450MHz)
System clock frequency: 112 MHz
Memory size: 128 Megabytes
========================= CPUs ========================
                      Run   Ecache   CPU     CPU
Brd    CPU   Module   MHz     MB    Impl.   Mask
---    ---   -------  -----  ------  ------  ----
 0      0      0       450    4.0   US-II    10.0
======================= IO Cards =======================
      Bus
Brd  Type  MHz   Slot  Name                              Model
---  ----  ----  ----  -----------------  ---------------------
 0   PCI   33     1    network-SUNW,hme
 0   PCI   33     3    scsi-glm/disk (block)       Symbios,53C875
 0   PCI   33     3    scsi-glm/disk (block)       Symbios,53C875

No failures found in System
===========================

==================== HW Revisions =====================
ASIC Revisions:
PCI: pci Rev 4
Cheerio: ebus Rev 1

System PROM revisions:
----------------------
   OBP 3.23.0 1999/06/30 14:57   POST 2.0.2 1998/10/19 10:46

ok
```

7.12.2.2 Solaris `eeprom` Command

The `eeprom` command is a UNIX shell command. You invoke it to list the names and current values of the OpenBoot PROM configuration variables stored in system NVRAM. You can also use the eeprom command to set new values for the OpenBoot PROM configuration variables.

To run the `eeprom` command:

1. **Boot the operating system.**

2. **Become root.**

3. **Type the following command at the command-line prompt:**

```
% eeprom
%
scsi-initiator-id=7
keyboard-click?=false
keymap: data not available.
ttyb-rts-dtr-off=false
ttyb-ignore-cd=true
ttya-rts-dtr-off=false
ttya-ignore-cd=true
ttyb-mode=9600,8,n,1,-
ttya-mode=9600,8,n,1,-
pcia-probe-list=1
pcib-probe-list=1,3,2,4,5
enclosure-type: 540-4284
banner-name: Sun Enterprise 220R
energystar-enabled?=false
mfg-mode=off
diag-level=min
#power-cycles=35
system-board-serial#=5014450071228
system-board-date=371c1bc9
fcode-debug?=false
output-device=screen
input-device=keyboard
load-base=16384
boot-command=boot
auto-boot?=true
watchdog-reboot?=false
diag-file: data not available.
diag-device=net
boot-file: data not available.
boot-device=disk net
local-mac-address?=false
ansi-terminal?=true
screen-#columns=80
screen-#rows=34
silent-mode?=false
use-nvramrc?=false
```

(continued)

```
nvramrc: data not available.
security-mode=none
security-password: data not available.
security-#badlogins=0
oem-logo: data not available.
oem-logo?=false
oem-banner: data not available.
oem-banner?=false
hardware-revision: data not available.
last-hardware-update: data not available.
diag-switch?=true
```

Caution - If the NVRAM is a new part, you must reset the values of the following OpenBoot PROM configuration variables: `banner-name=` Sun Enterprise 220R, `enclosure-type=` , **540-4284**and `energystar-enabled?=` false.

To set the values for the OpenBoot PROM configuration variables shown in the following example, boot the operating system, log on as root, and enter the following commands.

```
%
% eeprom banner-name=''Sun Enterprise 220R''
% eeprom enclosure-type=''540-4284''
% eeprom energystar-enabled?=false
```

Verify the variable settings by running the `eeprom` command without any parameters, as shown in the following example.

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```
% eeprom
%
scsi-initiator-id=7
keyboard-click?=false
keymap: data not available.
ttyb-rts-dtr-off=false
ttyb-ignore-cd=true

ttya-rts-dtr-off=false
ttya-ignore-cd=true
ttyb-mode=9600,8,n,1,-
ttya-mode=9600,8,n,1,-
pcia-probe-list=1
pcib-probe-list=1,3,2,4,5
enclosure-type: 540-4284
banner-name: Sun Enterprise 220R
energystar-enabled?=false
mfg-mode=off
diag-level=min
#power-cycles=35
system-board-serial#=5014450071228
system-board-date=371c1bc9
fcode-debug?=false
output-device=screen
input-device=keyboard
load-base=16384
boot-command=boot
auto-boot?=true
watchdog-reboot?=false
diag-file: data not available.
diag-device=net
boot-file: data not available.
boot-device=disk net
local-mac-address?=false
ansi-terminal?=true
screen-#columns=80
screen-#rows=34
silent-mode?=false
use-nvramrc?=false
```

7.12.2.3   OBP `printenv` Command

To display the names, current values, and default values of the OpenBoot PROM
configuration variables stored in NVRAM, enter the OBP `printenv` command at the
OBP `ok` prompt, as shown in the following example

```
ok printenv
variable name            Value                    Default Value

scsi-initiator-id        7                        7
keyboard-click?          false                    false
keymap
ttyb-rts-dtr-off         false                    false
ttyb-ignore-cd           true                     true
```

(continued)

```
ttya-rts-dtr-off         false                 false
ttya-ignore-cd           true                  true
ttyb-mode                9600,8,n,1,-          9600,8,n,1,-
ttya-mode                9600,8,n,1,-          9600,8,n,1,-
pcia-probe-list          1                     1
pcib-probe-list          1,3,2,4,5             1,3,2,4,5
enclosure-type            540-4284
banner-name              Sun Enterprise 220R
energystar-enabled?      false                 true
mfg-mode                 off                   off
diag-level               min                   min
#power-cycles                                  35
system-board-serial#     5014450071228
system-board-date        371c1bc9
fcode-debug?             false                 false
output-device            screen                screen
input-device             keyboard              keyboard
load-base                16384                 16384
boot-command             boot                  boot
auto-boot?               true                  true
watchdog-reboot?         false                 false
diag-file
diag-device              net                   net
boot-file
boot-device              disk net              disk net
local-mac-address?       false                 false
ansi-terminal?           true                  true
screen-#columns          80                    80
screen-#rows             34                    34
silent-mode?             false                 false
use-nvramrc?             false                 false
```

.

```
silent-mode?             false                 false
security-mode            none
security-password
security-#badlogins      0
oem-logo
oem-logo?                false                 false
oem-banner
oem-banner?              false                 false
hardware-revision
last-hardware-update
diag-switch?             true                  false
```

7.12.2.4   OBP `setenv` Command

To set the value of an OpenBoot PROM configuration variable stored in NVRAM, enter the OBP `setenv` command at the OBP `ok` prompt, as shown in the following example.

> ⚠ **Caution -** If the NVRAM is a new part, you must reset the three OpenBoot PROM configuration variables shown in this example. These variables are named `banner-name`, `enclosure-type`, and `energystar-enabled?` and they must be set to the values shown in the example.

```
ok setenv banner-name =  Sun Enterprise 220R
ok setenv enclosure-type = 540-4284
ok setenv energystar-enabled? = false
ok printenv
variable name           Value                   Default Value

scsi-initiator-id       7                       7
keyboard-click?         false                   false
keymap
ttyb-rts-dtr-off        false                   false
ttyb-ignore-cd          true                    true
ttya-rts-dtr-off        false                   false
ttya-ignore-cd          true                    true
ttyb-mode               9600,8,n,1,-            9600,8,n,1,-
ttya-mode               9600,8,n,1,-            9600,8,n,1,-
pcia-probe-list         1                       1
pcib-probe-list         1,3,2,4,5               1,3,2,4,5
enclosure-type           540-4284
banner-
name                Sun Enterprise 220R
energystar-enabled?     false
mfg-mode                off                     off
diag-level              min                     min
#power-cycles                                   35
system-board-serial#    5014450071228
system-board-date       371c1bc9
fcode-debug?            false                   false
output-device           screen                  screen
input-device            keyboard                keyboard
load-base               16384                   16384
boot-command            boot                    boot
auto-boot?              true                    true
watchdog-reboot?        false                   false
diag-file
diag-device             net                     net
boot-file
boot-device             disk net                disk net
local-mac-address?      false                   false
ansi-terminal?          true                    true
screen-#columns         80                      80
screen-#rows            34                      34
silent-mode?            false                   false
```

(continued)

```
use-nvramrc?            false                   false
```

```
nvramrc
security-mode           none
security-password
security-#badlogins     0
oem-logo
oem-logo?               false                   false
oem-banner
oem-banner?             false                   false
hardware-revision
last-hardware-update
diag-switch?            true                    false
```

7.12.2.5 OBP `probe-scsi` and `probe-scsi-all` Commands

To diagnose problems with the SCSI subsystem, you can use the OBP `probe-scsi` and `probe-scsi-all` commands. Both commands require that you halt the system.

Note - When it is not practical to halt the system, you can use SunVTS software as an alternative method of testing the SCSI interfaces. See Section 7.1 "About Diagnostic Tools" on page 186 for more information.

The `probe-scsi` command transmits an inquiry command to all SCSI devices connected to the main logic board SCSI interfaces. These include any tape or CD-ROM drive in the removable media assembly (RMA), any internal disk drive, and any device connected to the external SCSI connector on the system back panel. For any SCSI device that is connected and active, its target address, unit number, device type, and manufacturer name are displayed.

The `probe-scsi-all` command transmits an inquiry command to all SCSI devices connected to the system SCSI host adapters, including any host adapters installed in PCI slots. The first identifier listed in the display is the SCSI host adapter address in the system device tree followed by the SCSI device identification data.

The first example that follows shows a `probe-scsi` output message. The second example shows a `probe-scsi-all` output message.

`probe-scsi` output:

```
ok probe-scsi
This command may hang the system if a Stop-A or halt command
has been executed. Please type reset-all to reset the system
before executing this command.
Do you wish to continue? (y/n) n
ok reset-all

ok probe-scsi
Primary UltraSCSI bus:
Target 0
  Unit 0   Disk     SEAGATE ST34371W SUN4.2G3862
Target 4
  Unit 0   Removable Tape     ARCHIVE Python 02635-XXX5962
Target 6
  Unit 0   Removable Read Only device TOSHIBA XM5701TASUN12XCD0997
Target 9
  Unit 0   Disk     SEAGATE ST34371W SUN4.2G7462
Target b
  Unit 0   Disk     SEAGATE ST34371W SUN4.2G7462
ok
```

probe-scsi-all output:

```
ok probe-scsi-all
This command may hang the system if a Stop-A or halt command
has been executed. Please type reset-all to reset the system
before executing this command.
Do you wish to continue? (y/n) y

/pci@1f,4000/scsi@4,1
Target 0
  Unit 0 Disk     SEAGATE ST39102LC SUN9.0G0828
Target 1
  Unit 0 Disk     SEAGATE ST39102LC SUN9.0G0828
Target 6
  Unit 0 Removable Read Only deviceTOSHIBA XM6201TA SUN32XCD1103
ok
```

7.13   About Diagnosing Specific Problems

7.13.1   Network Communications Failure

7.13.1.1   Symptom

The system is unable to communicate over the network.

7.13.1.2   Action

Your system conforms to the Ethernet 10BASE-T/100BASE-TX standard, which states that the Ethernet 10BASE-T link integrity test function should always be enabled on both the host system and the Ethernet hub. The system cannot communicate with a network if this function is not set identically for both the system and the network hub (either enabled for both or disabled for both). This problem applies only to 10BASE-T network hubs, where the Ethernet link integrity test is optional. This is not a problem for 100BASE-TX networks, where the test is enabled by default. Refer to the documentation provided with your Ethernet hub for more information about the link integrity test function.

If you connect the system to a network and the network does not respond, use the OpenBoot PROM command `watch-net-all` to display conditions for all network connections:

```
ok watch-net-all
```

For most PCI Ethernet cards, the link integrity test function can be enabled or disabled with a hardware jumper on the PCI card, which you must set manually. (See the documentation supplied with the card.) For the standard TPE and MII main logic board ports, the link test is enabled or disabled through software.

Remember also that the TPE and MII ports share the same circuitry and as a result, you can use only one port at a time.

Note - Some hub designs permanently enable (or disable) the link integrity test through a hardware jumper. In this case, refer to the hub installation or user manual for details of how the test is implemented.

Determining the Device Name of the Ethernet Interface

To enable or disable the link integrity test for the standard Ethernet interface, or for a PCI-based Ethernet interface, you must first know the device name of the desired Ethernet interface. To list the device name:

1. **Shut down the operating system and take the system to the** ok **prompt.**

2. **Determine the device name for the desired Ethernet interface, using one of the two solutions that follow.**

Solution 1

Use this method while the operating system is running:

1. **Become superuser.**

2. **Type:**

```
# eeprom nvramrc=''probe-all install-console banner apply disable-link-pulse device-name''
  (Repeat for any additional device names.)
# eeprom ''use-nvramrc?''=true
```

3. **Reboot the system (when convenient) to make the changes effective.**

Solution 2

Use this alternative method when the system is already in OpenBoot:

1. **At the** ok **prompt, type:**

```
ok nvedit
0: probe-all install-console banner
1: apply disable-link-pulse device-name
(Repeat this step for other device names as needed.)
(Press CONTROL-C to exit nvedit.)
ok nvstore
ok setenv use-nvramrc? true
```

2. **Reboot the system to make the changes effective.**

7.13.2   Power-On Failures

7.13.2.1   Symptom

The system attempts to power up but does not boot or initialize the monitor.

7.13.2.2   Action

1. **Run POST diagnostics.**
   See Section 7.3 "How to Use POST Diagnostics" on page 188.

2. **Observe POST results.**
   The front panel general fault LED should flash slowly to indicate that POST is running. Check the POST output using a locally attached terminal or a `tip` connection.

3. **If you see no front panel LED activity, a power supply may be defective.**
   See Section 7.12.1.3 "Power Supply LEDs" on page 214.

4. **If the POST output contains an error message, then POST has failed.**
   The most probable cause for this type of failure is the main logic board. However, before replacing the main logic board you should:
   a. **Remove optional PCI cards.**

   b. **Remove optional DIMMs.**
      Leave only the four DIMMs in Bank A.

   c. **Repeat POST to determine if any of these modules caused the failure.**

   d. **If POST still fails, then replace the main logic board.**

7.13.3   Disk or CD-ROM Drive Failure

7.13.3.1   Symptom

A CD-ROM drive read error or parity error is reported by the operating system or a software application.

7.13.3.2 Action

1. Replace the drive indicated by the failure message.

7.13.3.3 Symptom

Disk drive or CD-ROM drive fails to boot or is not responding to commands.

7.13.3.4 Action

Test the drive response to the `probe-scsi-all` command as follows:

1. At the system `ok` prompt, type:

```
ok reset-all
ok probe-scsi-all
```

2. If the SCSI device responds correctly to `probe-scsi-all`, a message similar to the one shown in the probe-scsi output example on Section 7.1 "About Diagnostic Tools" on page 186 is printed out.

If the device responds and a message is displayed, the system SCSI controller has successfully probed the device. This indicates that the main logic board is operating correctly.

a. If one drive does not respond to the SCSI controller probe but the others do, replace the unresponsive drive.

b. If only one internal disk drive is configured with the system and the `probe-scsi-all` test fails to show the device in the message, replace the drive.

c. If the problem is still evident after replacing the drive, replace the main logic board.

d. If replacing both the disk drive and the main logic board does not correct the problem, replace the associated UltraSCSI data cable and UltraSCSI backplane.

7.13.4 SCSI Controller Failures

To check whether the main logic board SCSI controllers are defective, test the drive response to the `probe-scsi` command. To test additional SCSI host adapters added to the system, use the `probe-scsi-all` command. You can use the OBP `printenv` command to display the OpenBoot PROM configuration variables stored in the system NVRAM. The display includes the current values for these variables as well as the default values. See Section 7.12.2.3 "OBP `printenv` Command" on page 220 for more information.

1. **At the `ok` prompt, type:**

```
ok probe-scsi
```

   If a message is displayed for each installed disk, the system SCSI controllers have successfully probed the devices. This indicates that the main logic board is working correctly.

2. **If a disk does not respond, make sure that each SCSI device on the SCSI bus has a unique SCSI target ID.**

3. **If the problem persists, replace the unresponsive drive.**

4. **If the problem remains after replacing the drive, replace the main logic board.**

5. **If the problem persists, replace the associated SCSI cable and backplane.**

7.13.5 Power Supply Failure

If there is a problem with a power supply, POST lights the general fault indicator and the power supply fault indicator on the front panel. If you have more than one power supply, then you can use the LEDs located on the power supplies themselves to identify the faulty supply. The power supply LEDs indicate any problem with the AC input or DC output. See Section 7.12.1.3 "Power Supply LEDs" on page 214 for more information about the LEDs.

7.13.6 DIMM Failure

SunVTS and POST diagnostics can report memory errors encountered during program execution. Memory error messages typically indicate the DIMM location number ("U" number) of the failing module.

Use the following diagram to identify the location of a failing memory module from its U number.

System Side

Bank 3
U1004
U1003
U1002
U1001

Bank 2
U0904
U0903
U0902
U0901

Bank 1
U0804
U0803
U0802
U0801

Bank 0
U0704
U0703
U0702
U0701
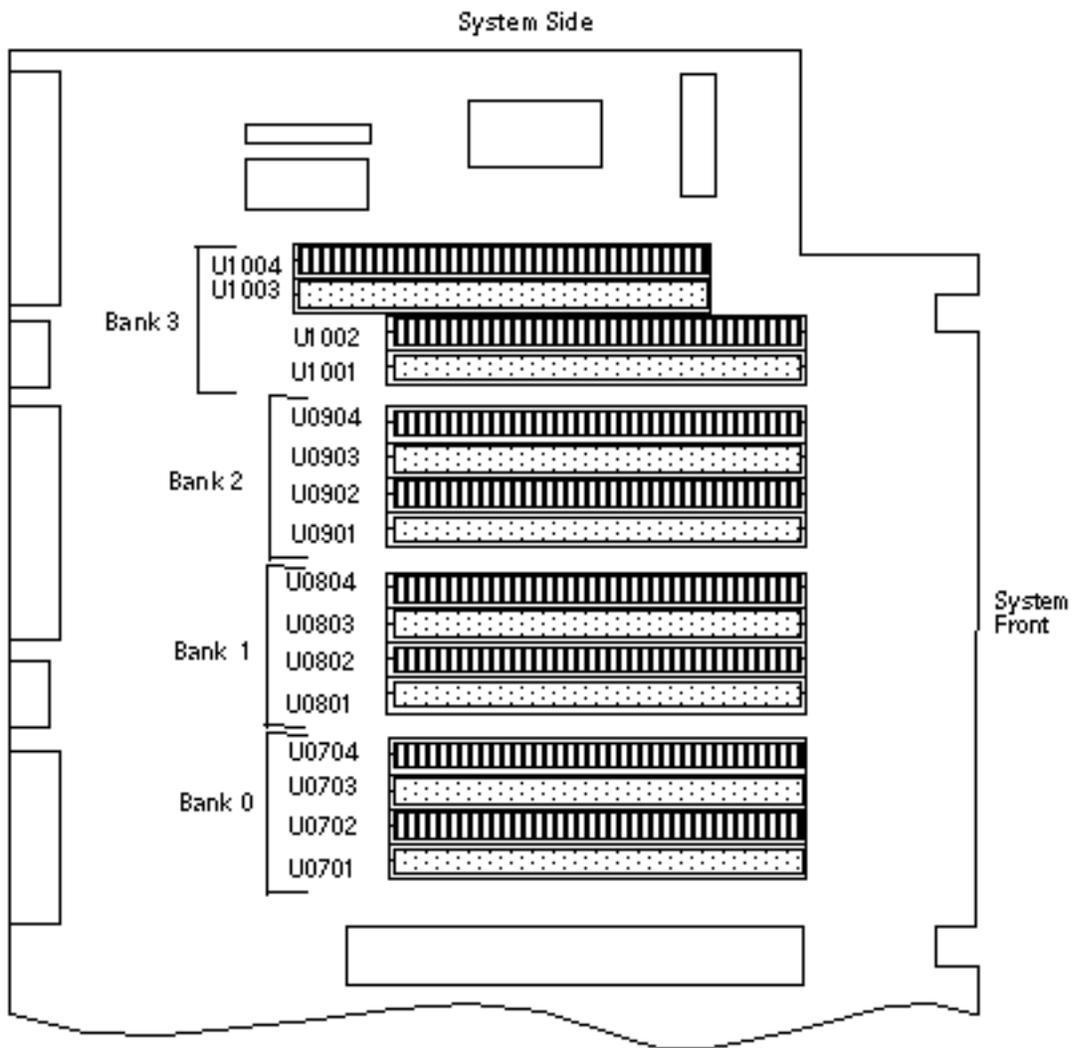
System
Front

Connector Signal Descriptions

This appendix describes the Sun Enterprise 220R system main logic board connector signals and pin assignments accessible from the back panel.

Topics covered in this appendix include:

- Section A.1 "Reference for the Keyboard/Mouse Connector" on page 231
- Section A.2 "Reference for the Serial Port A and B Connectors" on page 232
- Section A.3 "Reference for the Twisted-Pair Ethernet (TPE) Connector" on page 235
- Section A.4 "Reference for the UltraSCSI Connector" on page 236
- Section A.5 "Reference for the Parallel Port Connector" on page 240
- Section A.6 "Reference for the Media Independent Interface (MII) Connector" on page 242

A.1 Reference for the Keyboard/Mouse Connector

A.1.1 Keyboard/Mouse Connector Diagram

The keyboard/mouse connector (J2701) is a DIN-8 type connector located on the main logic board back panel.
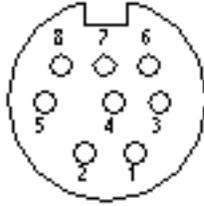
A.1.2 Keyboard/Mouse Connector Signals

Pin	Signal Name	Signal Description
1	Gnd	Ground
2	Gnd	Ground
3	+5 VDC	+5 VDC
4	Mse-rxd	Mouse receive data
5	Kbd-txd	Keyboard out
6	Kbd-rxd	Keyboard in
7	Kbd-pwk	Keyboard power on
8	+5 VDC	+5 VDC

A.2 Reference for the Serial Port A and B Connectors

The serial port A and B connectors (J2902 and J2903, respectively) are DB-25 type connectors located on the main logic board back panel. Both serial ports conform to RS-423/RS-232 specifications.

A.2.1　Serial Port A and B Connector Diagram

A.2.2　Serial Port Signals

Pin	Mnemonic	Signal Name	Description
1		Not Connected	None.
2	TXD	Transmit Data	Used by the data terminal equipment (DTE) to transmit data to the data circuit equipment (DCE). Except when control data is being sent, RTS, CTS, and DCD must be ON for this line to be active.
3	RXD	Recive Data	Used by the DCE in response to received data from the DTE.
4	RTS	Ready to Send	Used by the DTE to condition the DCE for data transmission. The transition to ON directs the DCE to go into transmit mode. The transition to OFF directs the DCE to complete the transmission.
5	CTS	Clear to send	Used by the DCE to indicate if it is ready to receive data from the DTE. When CTS, DSR, RTS and DTR are ON, the DCE is ready to transmit data received from the DTE across the communications channel. When only CTS is ON, the DCE is ready to accept dialing or control signals only. When CTS is OFF, the DTE should not transfer data across TXD.

Pin	Mnemonic	Signal Name	Description
6	DSR	Data Set Ready	Used by the DCE to indicate if it is ready to operate. When DSR is ON, the DCE is connected to the line and ready to exchange further control signals to start data transfer.
7	Gnd	Signal Ground	
8	DCD	Data Carrier Detect	Used by the DCE to indicate it is receiving a suitable signal from the communications channel.
9		Not connected	None.
10		Not connected	None.
11		Not connected	None.
12		Not connected	None.
13		Not connected	None.
14		Not connected	None.
15	TRXC	Transmit Clock	Used by the DCE to provide timing information to the DTE. The DTE provides data on TXD in which the transition of the bit corresponds to the rising edge of the clock.
16		Not Connected	None.
17	RTXC	Receive Clock	Used by the DCE to provide timing information to the DTE. The falling edge of the clock corresponds to the center of the data bit received on RXD.
18		Not connected	None.
19		Not connected	None.

Pin	Mnemonic	Signal Name	Description
20	DTR	Data Terminal Ready	Used to control switching of the DCE to the communication channel.
21		Not connected	None.
22		Not connected	None.
23		Not connected	None
24	TXC	Terminal Clock	Generated by the DTE to provide timing information to the DCE. Used only in synchronous mode and only when the driver requests a locally generated clock. Otherwise, TXC echoes the modem-generated clock. The falling edge of the clock corresponds to the center of the data bit transmitted on TXD.
25		Not connected	None.

A.3 Reference for the Twisted-Pair Ethernet (TPE) Connector

The twisted pair Ethernet (TPE) connector is a RJ-45 type connector located on the main logic board back panel.

Connect only TPE cables into the TPE connector.

A.3.1   TPE Connector Diagram

A.3.2   TPE Connector Signals

Pin Number	Signal Name	Description
1	tpe0	Transmit data +
2	tpe1	Transmit data -
3	tpe2	Receive data +
4	Common mode termination	Termination
5	Common mode termination	Termination
6	tpe3	Receive data -
7	Common mode termination	Termination
8	Common mode termination	Termination

A.4   Reference for the UltraSCSI Connector

The Ultra small computer system interface (UltraSCSI) connector is located on the main logic board back panel.

A.4.1   UltraSCSI Connector Diagram
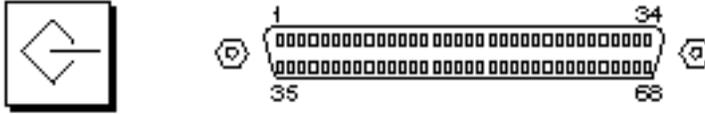
A.4.2   UltraSCSI Connector Signals

Pin	Signal Name	Description
1	Gnd	Ground
2	Gnd	Ground
3	Gnd	Ground
4	Gnd	Ground
5	Gnd	Ground
6	Gnd	Ground
7	Gnd	Ground
8	Gnd	Ground
9	Gnd	Ground
10	Gnd	Ground
11	Gnd	Ground
12	Gnd	Ground
13	Gnd	Ground
14	Gnd	Ground
15	Gnd	Ground
16	Gnd	Ground
17	Termpower	Termpower

Pin	Signal Name	Description
18	Termpower	Termpower
19	Not used	Undefined
20	Gnd	Ground
21	Gnd	Ground
22	Gnd	Ground
23	Gnd	Ground
24	Gnd	Ground
25	Gnd	Ground
26	Gnd	Ground
27	Gnd	Ground
28	Gnd	Ground
29	Gnd	Ground
30	Gnd	Ground
31	Gnd	Ground
32	Gnd	Ground
33	Gnd	Ground
34	Gnd	Ground
35	Dat<12>_	Data 12
36	Dat<13>_	Data 13
37	Dat<14>_	Data 14
38	Dat<15>_	Data 15
39	Par1 l_	Parity 1
40	Dat<0>_	Data 0
41	Dat<1>_	Data 1

Pin	Signal Name	Description
42	Dat<2>_	Data 2
43	Dat<3>_	Data 3
44	Dat<4>_	Data 4
45	Dat<5>_	Data 5
46	Dat<6>_	Data 6
47	Dat<7>_	Data 7
48	Par0 l_	Parity 0
49	Gnd	Ground
50	Term_dis_	Term disable
51	Termpower	Termpower
52	Termpower	Termpower
53	Not used	Undefined
54	Gnd	Ground
55	Atn_	Attention
56	Gnd	Ground
57	Bsy_	Busy
58	Ack_	Acknowledge
59	Rst_	Reset
60	Msg_	Message
61	Sel_	Select
62	Cd_	Command
63	Req_	Request
64	IO_	In/Out
65	Dat<8>_	Data 8

Pin	Signal Name	Description
66	Dat<9>_	Data 9
67	Dat<10>_	Data 10
68	Dat<11>_	Data 11

A.5 Reference for the Parallel Port Connector

The parallel port connector is a DB-25 type connector located on the main logic board back panel.

A.5.1 Parallel Port Connector Diagram
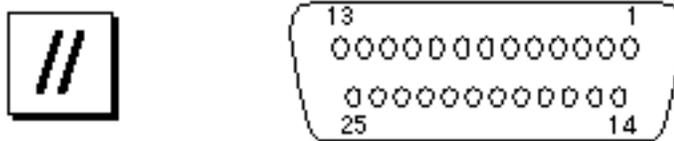
A.5.2 Parallel Port Signals

Pin	Mnemonic	Signal Name	Description
1	Data_Strobe_L	Data Strobe Low	Set low during forward channel transfers to latch data into peripheral device. Set high during reverse channel transfers.
2 to 9	Data[0..7]	Data0 Through Data7	The main data bus for the parallel port. Data0 is the least significant bit (LSB). Are not used during reverse channel transfers.

Pin	Mnemonic	Signal Name	Description
10	ACK_L	Acknowledge Low	Driven low by the peripheral device to acknowledge data byte transfer from host during forward channel transfer. Qualifies data being transferred to host in reverse channel transfer.
11	BUSY	Busy	Driven high to indicate the peripheral device is not ready to receive data during forward channel transfer. Used to send Data3 and Data7 during reverse channel transfer.
12	PERROR	Parity Error	Driven high by peripheral device to indicate an error in the paper path during forward channel transfer. Used to send Data2 and Data6 during reverse channel transfer.
13	SELECT_L	Select Low	Indicates the peripheral device is on-line during forward channel transfer. Used to send Data1 and Data5 during reverse channel transfer.
14	AFXN_L	Auto Feed Low	Set low by the host to drive the peripheral into auto-line feed mode during forward channel transfer. During reverse channel transfer, set low to indicate host can receive peripheral device data and then set high to acknowledge receipt of peripheral data.
15	ERROR_L	Error Low	Set low by the peripheral device to indicate an error during forward channel transfer. In reverse channel transfer, set low to indicate peripheral device has data ready to send to the host. Used to send Data0 and Data4.
16	INIT_L	Initialize Low	Driven low by the host to reset peripheral.

Pin	Mnemonic	Signal Name	Description
17	PAR_IN_L	Peripheral Input Low	Set low by the host to select peripheral device for forward channel transfer. Set high to indicate bus direction is from peripheral to host.
18		Signal ground	Signal ground
19		Signal ground	Signal ground
20		Signal ground	Signal ground
21		Signal ground	Signal ground
22		Signal ground	Signal ground
23		Signal ground	Signal ground
24		Signal ground	Signal ground
25		Signal ground	Signal ground

A.6 Reference for the Media Independent Interface (MII) Connector

The media independent interface (MII) connector is located on the main logic board back panel.

A.6.1 MII Connector Diagram
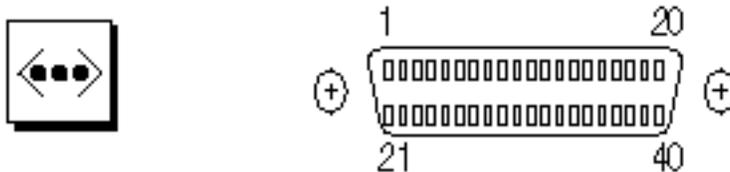
A.6.2   MII Connector Signals

Pin	Signal Name	Description
1	Pwr	Power
2	Mdio	Management data I/O
3	Mdc	Management data clock
4	Rxd3	Receive data 3
7	Rxd0	Receive data 0
8	Rx_dv	Receive data valid
9	Rx_clk	Receive clock
10	Rx_er	Receive error
11	Tx_er	Transmit error
12	Tx_clk	Transmit clock
13	Tx_en	Transmit data enable
14	Txd0	Transmit data 0
15	Txd1	Transmit data 1
16	Txd2	Transmit data 2
17	Txd3	Transmit data 3
18	Col	Collision detected
19	Crs	Carrier sense
20	Pwr	Power
21	Pwr	Power
22	Gnd	Ground
23	Gnd	Ground
24	Gnd	Ground
25	Gnd	Ground

Pin	Signal Name	Description
26	Gnd	Ground
27	Gnd	Ground
28	Gnd	Ground
29	Gnd	Ground
30	Gnd	Ground
31	Gnd	Ground
32	Gnd	Ground
33	Gnd	Ground
34	Gnd	Ground
35	Gnd	Ground
36	Gnd	Ground
37	Gnd	Ground
38	Gnd	Ground
39	Gnd	Ground
40	Gnd	Power

System Specifications

This appendix provides product specifications for the Sun Enterprise 220R server.

- Section B.1.1 "Physical Specifications" on page 245
- Section B.1.2 "Electrical Specifications" on page 245
- Section B.1.3 "Environmental Specifications" on page 246

B.1 Reference for System Specifications

B.1.1 Physical Specifications

The dimensions and weight of the system are as follows.

Specification	U.S.A.	Metric
Height	7.00 inches	17.8 centimeters
Width	17.25 inches	43.8 centimeters
Depth	27.25 inches	69.2 centimeters
Weight (approximate)	65 pounds	34 kilograms

B.1.2 Electrical Specifications

The electrical specifications of the system are as follows.

Parameter	Value
Input	
Nominal Frequencies	50 Hz or 60 Hz nominal
Nominal Voltage Range	100 to 240 VAC
Maximum Current AC RMS	6.3 A @ 100 VAC
AC Operating Range	90 to 264 Vrms, 47 to 63Hz
Outputs	
5.1 VDC[1]	0.1 to 1 A
+3.3 VDC[2]	3 to 50 A
+5 VDC[3]	3 to 40 A
+12 VDC	0.5 to 5 A
-12 VDC	0 to 0.5 A
Maximum DC Power Output	380 Watts
Maximum AC Power Consumption	610 Watts
Maximum Heat Dissipation	2080 BTUs/hr
Volt-Ampere Rating	630 VA with 380 Watt load

1. Standby output.
2. Combined output power of the +33 VDC and +5 VDC outputs must not exceed 320 Watts.
3. Combined output power of the +3.3 VDC and +5 VDC outputs must not exceed 320 Watts.

B.1.3   Environmental Specifications

The environmental requirements for the system are as follows.

Parameter	Value
Operating	
Temperature	5̊C to 35̊C (41̊F to 95̊F)—IEC 68-2-1, 68-2-2
Humidity	20% to 80% RH, noncondensing; 27˚C max wet bulb—IEC 68-2-2, 68-2-3

Parameter	Value
Altitude	0 to 3000 meters (0 to 10,000 feet)—IEC 68-2-40, 68-2-41
Vibration	0.2 gravity (g) peak, 5–500 Hz (swept sine); 0.0002 g^2/Hz, 5–500 Hz (random); vertical axis only (castered configuration); vertical and horizontal axes (foot glide configuration)—IEC 68-2-6
Shock	4g peak, 11 milliseconds half-sine pulse—IEC 68-2-27
Non-Operating	
Temperature	-2ôC to 6ôC (-4̊F to 14̊0F)—IEC 68-2-1, 68-2-2
Humidity	93% RH, noncondensing at 35̊C—IEC 68-2-2, 68-2-3
Altitude	0 to 12,000 meters (0 to 40,000 feet)—IEC 68-2-40, 68-2-41
Vibration	1g peak, 5–500 Hz (swept sine); 0.002 g^2/Hz, 5–500 Hz (random); 3 perpendicular axes—IEC 68-2-6
Shock	15g peak, 11 milliseconds half-sine pulse—IEC 68-2-27e
Threshold Impact	1 m/s—SUN 900-1813

Functional Description

This appendix provides a functional description for the following:

- Section C.1 "System Unit" on page 249
- Section C.1.14 "Power Supply" on page 274
- Section C.1.17 "Main Logic Board" on page 277

The following items are not supported on the Sun Enterprise 220R server:

- Graphics and imaging card
- Diskette drive
- Audio card

C.1 System Unit

The system unit is an UltraSPARC port architecture (UPA)-based multiprocessor machine that uses peripheral component interconnect (PCI) as the I/O bus. The CPU modules, U2P ASIC (UPA-to-PCI bridge), and UPA graphics cards communicate with each other using the UPA protocol. The CPU modules and the U2P ASIC are UPA master-slave devices. The UPA graphics cards are UPA slave-only devices. The QSC ASIC routes UPA request packets through the UPA address bus and controls the flow of data using the XB9+ ASIC. For further information, see the following items:

- Section C.1.1 "UPA" on page 252
- Section C.1.2 "PCI Bus" on page 253
- Section C.1.3 "UltraSPARC II Processor" on page 254
- Section C.1.4 "Memory System" on page 255
- Section C.1.5 "Graphics and Imaging" on page 259

The following figure shows the system unit functional block diagram.

UPA_AD2

UPA_AD3

UPA_AD0

QSC ASIC

Memory address/control

CPU module 0

CPU module 1

UPA_AD1

U2P ASIC

Control

Memory

UPA_DATA0

144

UPA_DATA1

144

UPA_DATA2

64

XB9+ ASIC

Memory data

576

UPA graphics slots 0, 1

UPA_DATA3

72

Clock control

RISC ASIC

33-MHz/64-bit PCI bus

Symbios controller

SCSI bus

(External)

SCSI bus

(Internal)

66-MHz/64-bit PCI bus

PCI slot 2

PCIO ASIC

8

EBus2

PCI slot 3

Serial ports

1-Mbyte flash PROM

XCVR

PCI slot 4

SuperIO ASIC

NVRAM/ TOD

PCI 66 Slot 1

10/100 Ethernet

Keyboard/mouse/parallel port

Serial ports

C.1.1 UPA

The UltraSPARC port architecture (UPA) provides a packet-based interconnect between the UPA clients: CPU modules, U2P ASIC, and UPA graphics cards. Electrical interconnection is provided through four address buses and four data buses.

The four address buses are:

- UPA address bus 0 (UPA_AD0)
- UPA address bus 1 (UPA_AD1)
- UPA address bus 2 (UPA_AD2)
- UPA address bus 3 (UPA_AD3)

The four data buses are:

- UPA data bus 0 (UPA_DATA0)
- UPA data bus 1 (UPA_DATA1)
- UPA data bus 2 (UPA_DATA2)
- UPA data bus 3 (UPA_DATA3)

UPA_AD0 and UPA_AD1 connect the QSC ASIC to the CPU modules and the U2P ASIC. UPA_AD2 connects the QSC ASIC to the U2P ASIC. UPA_AD3 connects the QSC ASIC to the UPA graphics.

Two processor data buses (UPA_DATA0 and UPA_DATA1) are bidirectional 144-bit data buses (128 bits of data and 16 bits of ECC) that connect each CPU module to the XB9+ ASIC. The I/O data bus is a bidirectional 72-bit data bus (64 bits of data and 8 bits of ECC) that connects the U2P ASIC and the UPA graphics (UPA_DATA2) to the XB9+ ASIC (UPA_DATA3). The UPA graphics do not have ECC, and therefore only consists of 64 bits of data.

The following table illustrates UPA slot number port addresses.

UPA Slot Number	UPA Port ID <4:0>
CPU module slot 0	0x0
CPU module slot 1	01
U2P ASIC	0x1F

The following figure shows the data buses functional block diagram.

UPA_ADDR BUS0
<35:0>

UPA_AD0 → CPU module 0 → UPA_DATA0

UPA_AD1 → CPU module 1 → UPA_DATA1

QSC ASIC

UPA_AD2 → U2P ASIC → UPA_DATA3

P Bus

XB9+ ASIC

I Bus

UPA_ADDR BUS1
<28:0>

UPA_AD3 → UPA graphics 0 → UPA_DATA2

UPA_AD3 → UPA graphics 1 → UPA_DATA2
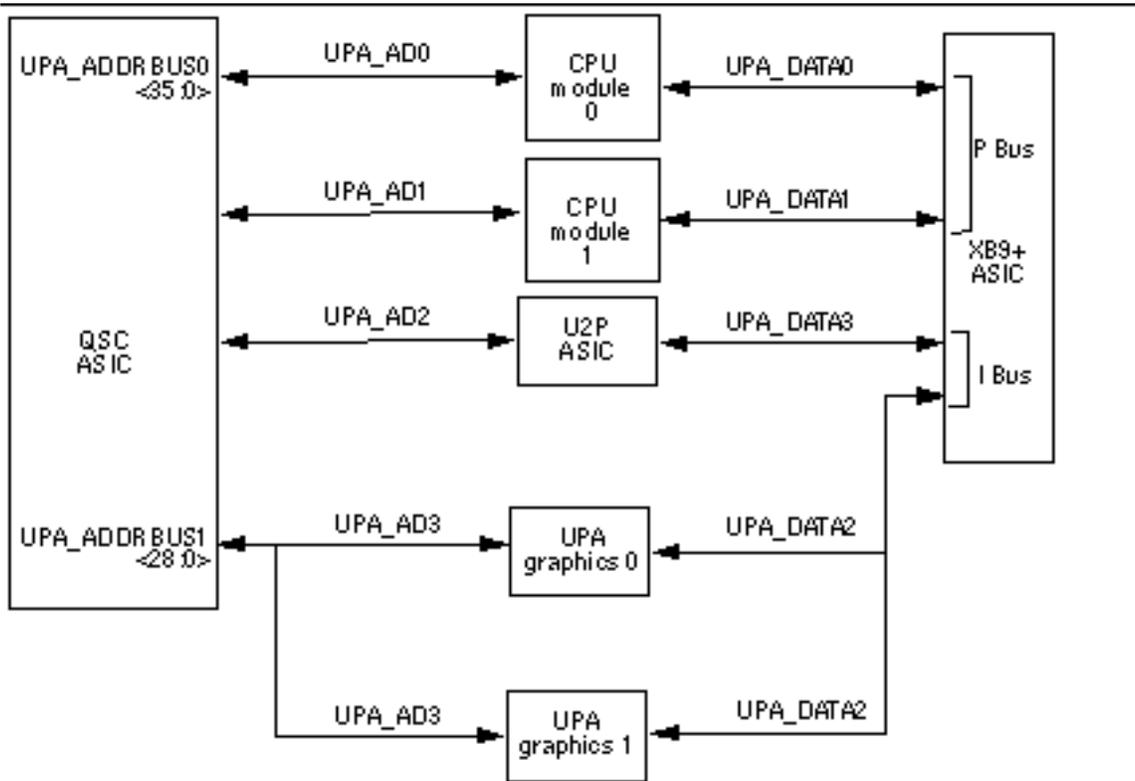
C.1.2   PCI Bus

The peripheral component interconnect (PCI) bus is a high-performance 32-bit or 64-bit bus with multiplexed address and data lines. The PCI bus provides electrical interconnection between highly integrated peripheral controller components, peripheral add-on devices, and the processor/memory system.

There are two PCI buses. The first bus is a one-slot, 3.3-VDC, 64-bit or 32-bit, 66-MHz or 33-MHz bus. The second bus is a three-slot, 5.0-VDC, 64-bit or 32-bit, 33-MHz bus. Each bus is controlled by the UPA-to-PCI bridge (U2P) ASIC. There are also two on-board controllers, the Symbios 53C876 SCSI controller and the PCI-to-Ebus/Ethernet controller (PCIO) ASIC, on the 33-MHz PCI bus.

C.1.2.1 U2P ASIC

The UPT-to-PCI bridge (U2P) ASIC controls the PCI buses. It forms the bridge from the UPA bus to the PCI buses. For a brief description of the U2P ASIC, see Section C.1.12 "ASICs" on page 271.

C.1.2.2 Symbios 53C876 SCSI Controller

The Symbios 53C876 SCSI controller provides electrical connection between the main logic board and the internal and external SCSI buses to the PCI bus. The Symbios controller is two SCSI controllers on the same PCI slot. Controller "A" is used to interface to internal devices. The second controller, controller "B," is used to interface to external devices.

C.1.2.3 PCIO ASIC

The PCI-to-EBus/Ethernet controller (PCIO) ASIC bridges the PCI bus to the EBus, enabling communication between the PCI bus and all miscellaneous I/O functions, as well as the connection to slower on-board functions. The PCIO ASIC also embeds the Ethernet controller.

C.1.3 UltraSPARC II Processor

The UltraSPARC II processor is a high-performance, highly-integrated superscalar processor implementing the SPARC-V9 64-bit RISC architecture. The UltraSPARC II processor is capable of sustaining the execution of up to four instructions per cycle even in the presence of conditional branches and cache misses. This sustained performance is supported by a decoupled prefetch and dispatch unit with instruction buffer.

The UltraSPARC II processor supports both 2D and 3D graphics, as well as image processing, video compression and decompression, and video effects through the sophisticated visual instruction set (VIS). VIS provides high levels of multimedia performance, including real-time video compression/decompression and two streams of MPEG-2 decompression at full broadcast quality with no additional hardware support. The UltraSPARC II processor provides a 2-Mbyte ecache, with an 300-MHz operating frequency.

UltraSPARC II processor characteristics and associated features include:

- SPARC-V9 architecture compliant
- Binary compatible with all SPARC application code
- Multimedia capable visual instruction set (VIS)
- Multiprocessing support

- Glueless four-processor connection with minimum latency
- Snooping cache coherency
- Four-way superscalar design with nine execution units; four integer execution units
- Three floating-point execution units
- Two graphics execution units
- Selectable little- or big-endian byte ordering
- 64-bit address pointers
- 16-Kbyte non-blocking data cache
- 16-Kbyte instruction cache; single cycle branch following
- Power management
- Software prefetch instruction support
- Multiple outstanding requests

C.1.4   Memory System

The memory system consists of three components: the QSC ASIC, the XB9+ ASIC, and the memory module. The QSC ASIC generates memory addresses and control signals to the memory module. The QSC ASIC also coordinates the data transfers among the DIMMs through two 144-bit-wide processor data buses (UPA_DATABUS0) and the 72-bit-wide I/O data bus (UPA_DATABUS1).

DIMMs are organized in banks in groups of four (quads). DIMM capacities of 32-Mbyte, 64-Mbyte, and 128-Mbyte are supported by the memory module. When all DIMM banks are populated with 128-Mbyte DIMMs, maximum memory capacity is 2 Gbytes.

Organizing the four DIMM banks with 128-Mbyte (plus ECC bit) DIMMs allows data streams to be transferred on a 512-bit-wide (plus ECC) memory data bus. The XB9+ ASIC coordinates all buses, which include the following: memory data, UPA_DATA0, UPA_DATA1, UPA_DATA2, and UPA_DATA3.

The memory module is arranged in four banks. DIMMs are always accessed four at a time. Consequently, the DIMMs must be installed in groups of four (quad) and individual DIMMs within a bank must be of equal capacity.

The following figure illustrates the memory module functional block diagram.

```
                              MEM_ADDR
        ┌──────────┐          MEM_RASA2_L
        │          │          MEM_RASA0_L
        │   QSC    │          MEM_CASR2_L
        │   ASIC   │          MEM_CASR0_L
        │          │          MEM_WRR2_L
        │ Memory   │          MEM_WRR0_L
        │ interface│
        └──────────┘
```

MEM_A_SEL

MEM_B_SEL

MEM_A_RD

MEM_B_RD

MEM_A_WR

MEM_B_WR

XB9+ ASIC

MEM_DAT<575..000>

Memory module

UPA_DATA0<163..000>

UPA_DATA1<163..000>

UPA_DATA2<63..00>
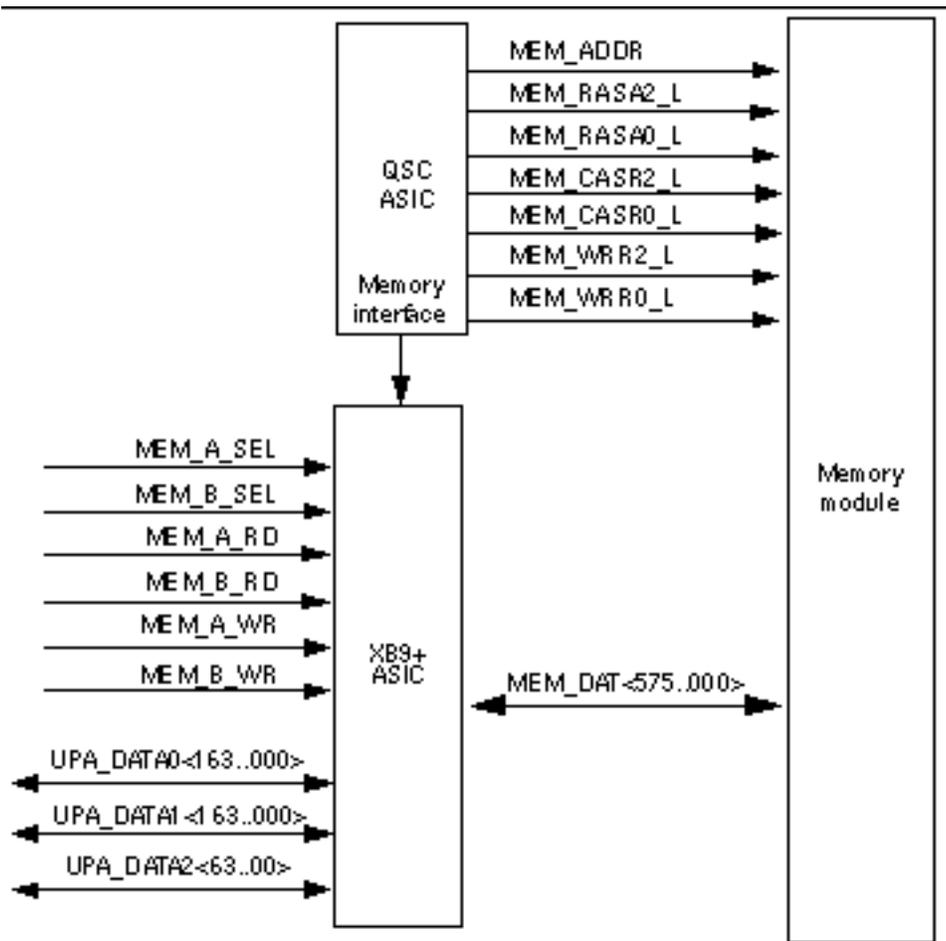
> ⚠ **Caution -** Failure to populate a DIMM bank with DIMMs of equal capacity will result in inefficient use of memory resource or system failure.

The following figure shows the system memory functional block diagram.
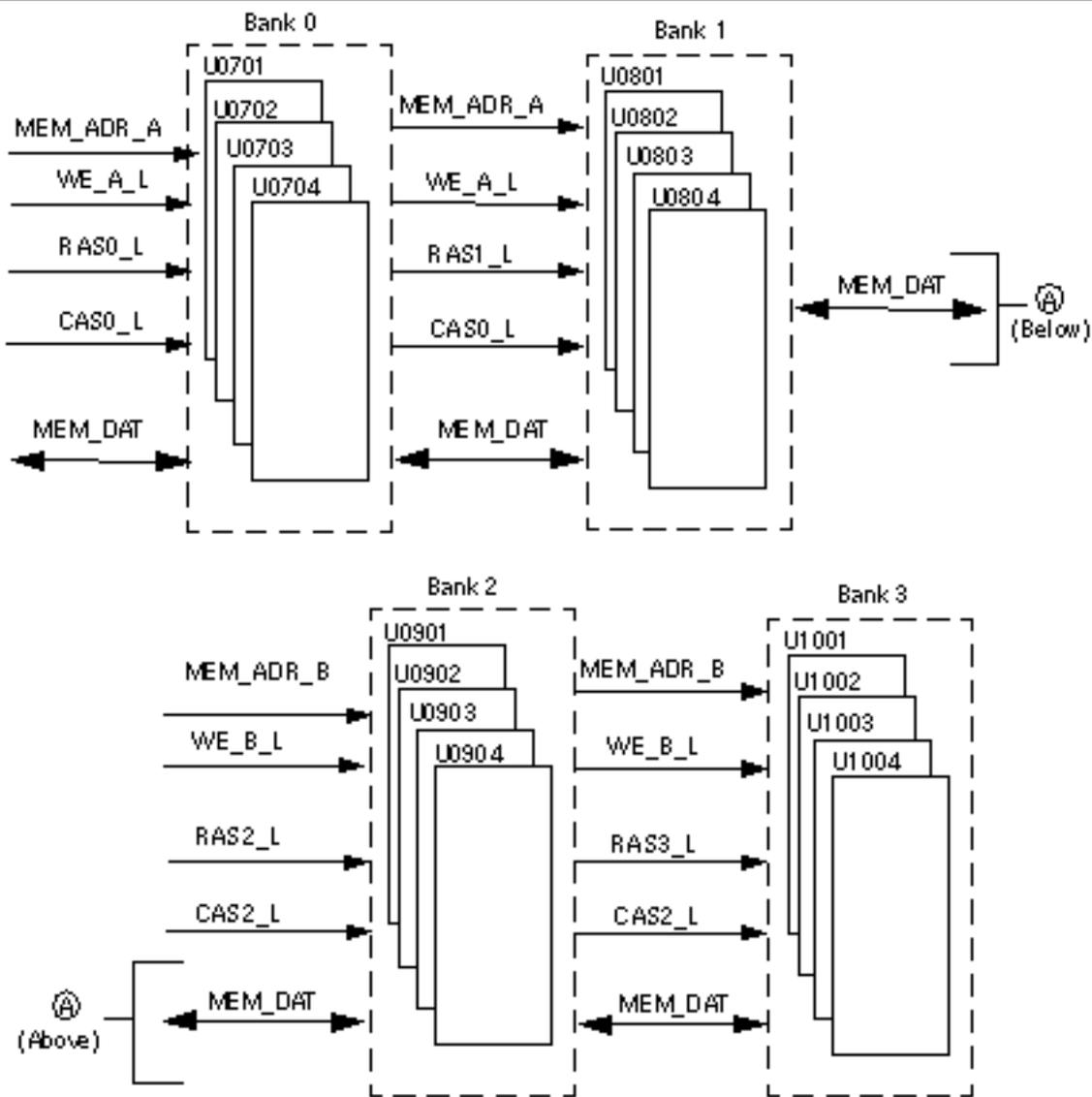
The following figure shows system memory bank locations and addresses on the main logic board.
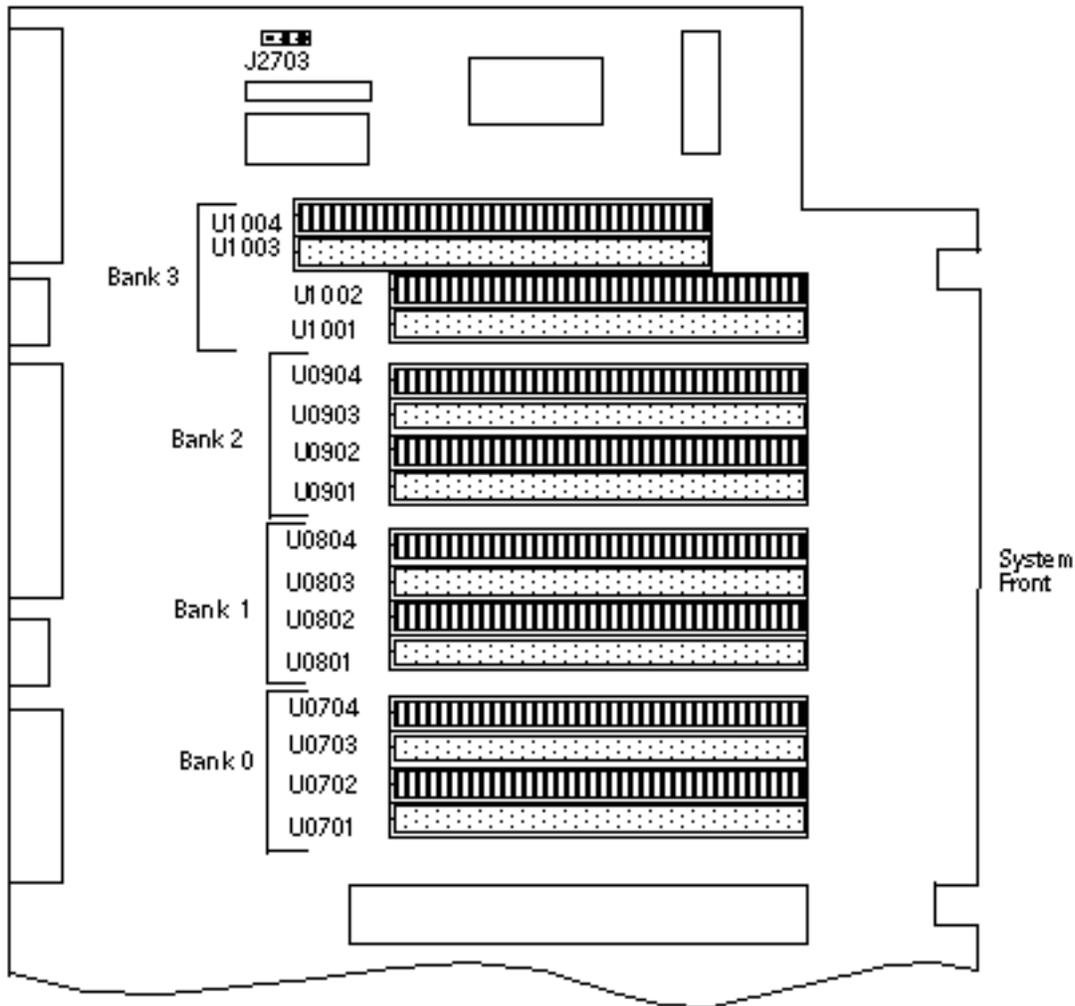
C.1.4.1 DIMM

The DIMM is a 60-nanosecond, fast-page-mode-style DIMM. Three DIMM configurations are supported in the system unit: 32-Mbyte, 64-Mbyte, and 128-Mbyte. The minimum memory capacity is 128 Mbytes (four 32-Mbyte DIMMs). The maximum memory capacity is 2 Gbytes (sixteen 128-Mbyte DIMMs).

A block of data (64 bytes) always comes from one bank of DIMMs. An error code containing the address of where a failure occurred, as well as the associated syndrome, is logged when an ECC error occurs.

There are a total of four DIMM banks in the system unit.

DIMM Bank	U Number
0	U0701 through U0704
1	U0801 through U0804
2	U0901 through U0904
3	U1001 through U1004

DIMM Bank	PA[30:28]
0	0000
	0001
1	0010
	0011
2	1000
	1001
3	1010
	1011

C.1.4.2 Memory System Timing

The QSC ASIC generates the memory addresses and control signals to the memory system. The UPA clock is the clock source for the QSC ASIC and operates as fast as 120 MHz.

C.1.5 Graphics and Imaging

The system unit takes advantage of UPA features to provide high-performance graphics capabilities. High-performance graphics can include a vertical, single-buffer UPA graphics card or a vertical, double-buffer plus Z (DBZ) UPA graphics card.

The 3DRAM is a standard dynamic random access memory (DRAM) that includes a multi-level cache and a separate graphics port. The FBC ASIC provides acceleration for 2D and 3D imaging primitives. This, combined with the 3DRAM cache and support for graphics operations, supports a high-performance frame buffer.

C.1.6 Peripherals

The following sections describe peripherals that are supported by the system:

- Section C.1.6.1 "CD-ROM Drive" on page 260
- Section C.1.6.2 "Hard Drives" on page 260

C.1.6.1 CD-ROM Drive

The Sun StorEdge™ CD32 CD-ROM drive is a 32x-speed (maximum) read-only random access CD-ROM device. It operates on the industry-standard SCSI-2 interface. The CD32 drive uses standard 4.76-inch (120-mm), 644-Mbyte compact disks. The *Sun StorEdge CD32 Installation and User's Guide*, part number 805-4237, provides cleaning, jumper setting, and operation instructions for the CD-ROM drive.

Note - The CD-ROM drive is factory set to SCSI target ID 6. Refer to the *Sun StorEdge CD32 Installation and User's Guide*, part number 805-4237, to change the target address.

C.1.6.2 Hard Drives

The system supports two SCSI hard drive capacities: 9.1-Gbyte and 18-Gbyte. The hard drives have a single connector configuration. A drive bracket is used to mount the drive. The following table lists the supported hard drives.

Form Factor Dimension	Disk Drive Capacity	Wide	RPM	Average Seek Time (Read/ Write)
1.00-inch (2.54 cm)	9.1 Gbytes	Yes	10K	5.4 msec/6.2 msec
1.00-inch (2.54 cm)	18 Gbytes	Yes	10K	7/5 msec/8.5 mses

The *9-Gbyte 10K rpm Disk Drive Specifications SCA Interface*, part number 805-5637, provides installation instructions, power requirements, and performance data for the 9.1-Gbyte hard drive. The *18-Gbyte 10K rpm Disk Drive Specifications*, part number

806-1057, provides installation instructions, power requirements, and performance data for the 18-Gbyte 10K rpm hard drive.

C.1.7 Other RMA Storage Device X-Options

The system unit supports other removable media assembly (RMA) storage device X-options that you can install in the system unit in lieu of the CD-ROM drive. These storage device X-options include the 12-24-Gbyte 4mm DDS3 tape drive. For a listing of all X-options, refer to the product guide.

C.1.8 Keyboard and Mouse Port, and Parallel Port

The keyboard and mouse port, as well as the parallel port interfaces are managed by the SuperIO component. For a brief description of the SuperIO, see Section C.1.13 "SuperIO" on page 274.

C.1.8.1 Keyboard and Mouse Port

The keyboard and mouse are connected to an 8-pin DIN connector, located on the main logic board, and to two serial ports on the SuperIO component. Each serial port on the SuperIO ASIC provides 16-byte FIFO buffering. Data is asynchronously exchanged with the keyboard and mouse at 1200 baud. Keyboard current is limited to 700 milliamperes (mA) by a resettable fuse. Only the Sun Type-5 keyboard is supported.
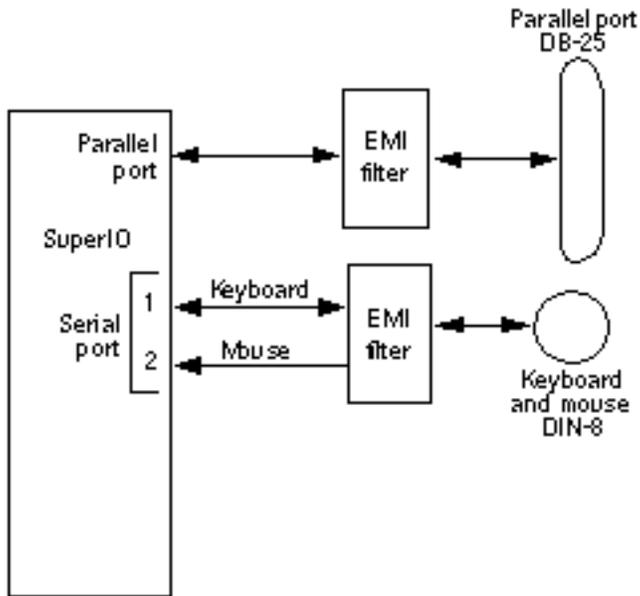
C.1.8.2   Parallel Port

The parallel port is supported by an IEEE 1284-compatible parallel port controller that is located on the SuperIO component. The parallel port controller is a PC-industry-standard controller that achieves a 2-megabits per second (Mbps) data transfer rate. The parallel port controller interface supports the ECP protocol as well as the following:

- *Centronics* – Provides a widely accepted parallel port interface.

- *Compatibility* – Provides an asynchronous, byte-wide forward (host to peripheral) channel with data and status lines used according to their original definitions.

- *Nibble mode* – Provides an asynchronous, reverse (peripheral-to-host) channel, under control of the host. Data bytes are transmitted as two sequential, 4-bit nibbles using four peripheral-to-host status lines.

Parallel Port Cables

The parallel port cable is IEEE1284 compliant and comprises 18 pairs of signal wires that are double shielded with braid and foil. The maximum length of the parallel port cable is 2.2 yards (2 meters).

Electrical Characteristics

Drivers operate at a nominal 5-VDC transistor-transistor logic (TTL) levels. The maximum open circuit voltage is 5.5 VDC and the minimum is -0.5 VDC. A logic high-level signal is at least 2.4 VDC at a source current of 0.32 mA and a logic low-level signal is no more than 0.4 VDC at a sink current of 14 mA.

Receivers also operate at nominal 5-VDC TTL levels and can withstand peak voltage transients between -2 VDC and 7 VDC without damage or improper operation. The high-level threshold is less than or equal to 2.0 VDC and the low-level threshold is at least 0.8 VDC. Sink current is less than or equal to 0.32 mA at 2.0 VDC and source current is less than or equal to 12 mA at 0.8 VDC.

C.1.9 Serial Port

The system unit incorporates two serial ports. Each serial port is synchronous and asynchronous with full modem controls. All serial port functions are controlled by a serial port controller that is electrically connected to the system through the EBus. Line drivers and line receivers control the serial port signal levels and provide RS-232 and RS-423 compatibility. Each serial port interfaces through its own DB-25 connector.

The major features of each serial port include:

- Two fully functional synchronous and asynchronous serial ports

- DB-25 connectors

- Increased baud rate speed (to 384 Kbaud, synchronous; 460.8 Kbaud, asynchronous)

- Variable edge rate for greater performance

- EBus interface

C.1.9.1 Serial Port Components

Serial port components include a serial port controller, line drivers, and the line receivers.

The serial port controller contains 64-byte buffers on both the input and output. This enables the serial port to require less CPU bandwidth. Interrupts are generated when the buffer reaches 32 bytes or half full. The serial port controller contains its own crystal oscillator that supports rates of up to 921.6 Kbaud.

The line drivers and line receivers are compatible with both RS-232 and RS-423. Two system board jumpers are used to set the line drivers and line receivers to either RS-232 or RS-423 protocols. The line driver slew rate is also programmable. For baud rates over 100K, the slew rate is set to 10 VDC/msec. For baud rates under 100K, the slew rate is set to 5 VDC/msec.

Serial Port Functions

The serial port provides a variety of functions. Modem connection to the serial port allows access to the internet. Synchronous X.25 modems are used for telecommunications in Europe. An ASCII text window is accessible through the serial port on non-graphic systems. Low-speed printers, button boxes (for CAD/CAM applications) and exotic devices that function like a mouse are also accessible through the serial port. The additional speed of the serial port can be used to execute communications with a CSU/DSU for a partial T1 line to the internet at 384 Kbaud per second.

EIA Levels

Each serial port supports both RS-232 and RS-423 protocols. RS-232 signaling levels are between -3 VDC and -15 VDC and +3 VDC and +15 VDC. A binary 1 (0012) is anything greater than +3 VDC and a binary 0 (0002) is anything less than -3 VDC. The signal is undefined in the transition area between -3 VDC and +3 VDC. The line driver switches at -10 VDC and +10 VDC with a maximum of -12 VDC and +12 VDC in RS-232 mode. RS-423 is similar except that signaling levels are between -4 VDC to -6 VDC and +4 VDC and +6 VDC. The line driver switches at -5.3 VDC and +5.3 VDC with a maximum of -6 V and +6 VDC. Switching from RS-232 to RS-423 protocol is accomplished by changing jumpers J2604 and J2605. Jumper positions 1 and 2 are for RS-232 and jumper positions 2 and 3 are for RS-423.

The preferred signaling protocol is RS-423. The higher voltages of R-232 make it difficult to switch at the higher baud rates. The maximum rate for RS-232 is approximately 64 Kbaud while the maximum rate for RS-423 is 460.8 Kbaud. The system default is set to RS-232.

Synchronous Rates

The serial synchronous ports operate at any rate from 50 Kbaud to 256 Kbaud when the clock is generated from the serial port controller. When the clock is generated from an external source, the synchronous ports operate at up to 384 Kbaud. Clock generation is accurate within 1 percent for any rate that is generated between 50 Kbaud and 256 Kbaud.

Asynchronous Rates

The serial asynchronous ports support twenty baud rates that are all exact divisors of the crystal frequency (with exception for 110, which is off by less than 1 percent). Baud rates include 50, 75, 110, 200, 300, 600, 1200, 1800, 2400, 4800, 9600, 19200, 38400, 57600, 76800, 115200, 153600, 230400, 307200, and 460800.

Slew Rate and Cable Length

The maximum RS-423 cable length is 118 feet (30 meters) and the maximum RS-232 cable length is 50 feet (15.24 meters). The slew rate changes depending on the speed. For speeds less than 100 Kbaud, the slew rate is set at 5 VDC per microsecond. For rates greater than 100 Kbaud, the slew rate is increased to 10 VDC per microsecond. This allows maximum performance for the greater baud rates and better signal quality at the lesser baud rates.

C.1.10   Ethernet

The system unit supports 10-Mbps, 10BASE-T, twisted-pair Ethernet and 100-Mbps, 100BASE-TX, media independent interface (MII) Ethernet with the use of a single magnetics module. Twisted-pair Ethernet is provided through an 8-pin RJ45 connector. MII Ethernet is provided through a 40-pin MII connector. The MII port allows connection to any cable medium, including unshielded twisted-pair (UTP), shielded twisted-pair (STP), and fiber optic accompanied by the appropriate external transceiver. The system automatically senses an external transceiver, thus disabling an on-board transceiver.The Ethernet circuitry design is based on a Quality Semiconductor PHY.

The PHY chip integrates a 100BASE-TX physical coding sub-layer (PCS) and a complete 10BASE-T module in a single chip. It provides a standard MII to

communicate between the physical signaling and the medium access control layers for both 100BASE-TX and 10BASE-T operations. The PHY IC interfaces to the 100-Mbps physical-medium-dependent transceiver Twister IC.

The 100BASE-TX portion of the PHY IC consists of the following functional blocks:

- Transmitter
- Receiver
- Clock generation module
- Clock recovery module

The 10BASE-T section of the PHY IC consists of the 10-Mbps transceiver module with filters.

The 100BASE-TX transceiver is included in a separate Twister IC and features adaptive equalization, baseline wander correction, and transition time control on the output signals.

The 100BASE-TX and 10BASE-T sections share the following functional characteristics:

- PCS control
- MII registers
- IEEE 1149.1 controller (JTAG compliance)
- IEEE 802.3u auto negotiation

The next sections provide brief descriptions of the following:

- Automatic negotiation
- External transceivers
- External cables
- Connectors
- MII power
- MII port timing

C.1.10.1 Automatic Negotiation

Automatic negotiation controls the cable when a connection is established to a network device. It detects the various modes that exist in the linked partner and advertises its own abilities to automatically configure the highest performance mode of inter-operation, namely, 10BASE-T, 100BASE-TX, or 100BASE-T4 in half- and full-duplex modes.

The Ethernet port supports automatic negotiation. At power up, an on-board transceiver advertises 100BASE-TX in half-duplex mode, which is configured by the automatic negotiation to the highest common denominator based on the linked partner.

C.1.10.2   External Transceivers

The following external transceivers are connected through the MII port:

- 6211 Micro 100BASE-FX FastEthernet transceiver
- CT4-1030 100BASE-T4 transceiver
- CFX-107X 100BASE-FX transceiver
- XF467A MII-to-AUI transceiver

C.1.10.3   External Cables

The MII port supports an 18 inch (0.5-meter) long, 40-conductor, 20 signal-ground, STP cable. The single-ended impedance of the cable is 68 ohms (+/-10%). The propagation delay for each twisted-pair, measured from the MII connector to the PHY, does not exceed 2.5 nanoseconds.

The RJ45 Ethernet port supports a Category 5, UTP cable for the 100BASE-TX, and a Category 3, 4, or 5 UTP cable for the 10BASE-T operation.

Note - The maximum cable segment lengths for the 100BASE-TX and 10BASE-TX are 300 feet (100 meters) and 3000 feet (1000 meters), respectively.

C.1.10.4   Connectors

A 40-pin connector is used for the MII connector. A standard 8-pin RJ45 connector with a shield is used for the AUI connector.

C.1.10.5   MII Power

A regulated 5-VDC (+/- 5%) voltage is supplied to the PHY IC over the load range of from 0 to 750 mA. A 2-amp overcurrent protection circuit is provided by a polymer-based resettable fuse to the MII supply voltage.

MII-to-AUI connection to a 10-Mbps medium attachment unit requires a supplemental power source to meet the AUI power supply requirements. The MII-AUI converter provides the necessary supplemental power.

C.1.10.6   MII Port Timing

MII port timing encompasses two configurations involving the use of either an on-board transceiver or external transceivers. For either transceiver configuration, the MII port timing is the same because MII operates with a 40-nanosecond cycle time.

MII is used to interconnect both integrated circuits and circuit assemblies. This enables separate signal transmission paths to exist between the reconciliation sublayer, embedded in the PCIO ASIC, and a local PHY IC, and between the reconciliation sublayer and a remote PHY IC. The unidirectional paths between the reconciliation sublayer and the local PHY IC are composed of sections A1, B1, C1 and D1. The unidirectional paths between the reconciliation sublayer and the remote PHY IC are composed of sections A2, B2, C2, and D2.
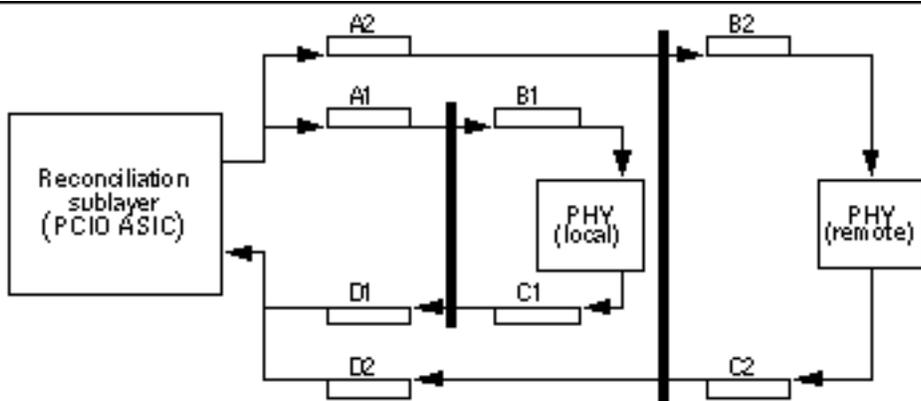
C.1.11   SCSI

The system unit implements a small computer system interface (SCSI) Fast-20 (UltraSCSI) parallel interface bus. The UltraSCSI provides the following:

- Efficient peer-to-peer I/O bus devices

- Mechanical, electrical, and timing specification definition that support transfer rates of 20 or 40 Mbytes per second (corresponding to the data path width of an 8-bit, or 16-bit bus, respectively)

- Peak bandwidth of 40 Mbytes per second (with implemented 16-bit bus width)

The internal SCSI bus is terminated at each end. One set of terminators is located close to the CD-ROM drive connector on the CD-ROM SCSI card. A second set of terminators is located close to the 68-pin external SCSI connector.
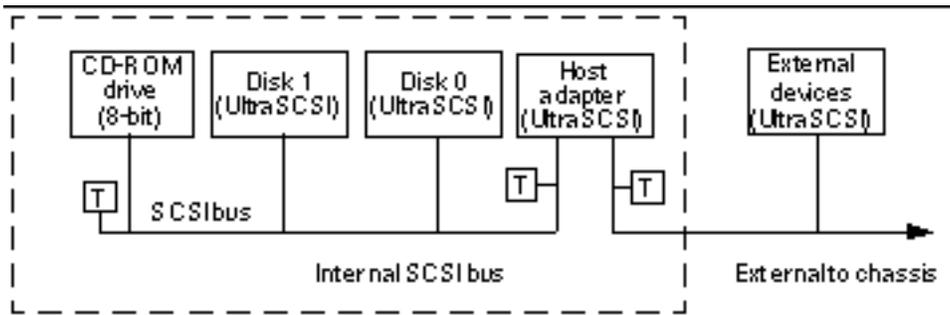
C.1.11.1   Host Adapter

The host adapter is a Symbios Logic PCI-SCSI I/O processor IC. The host adapter and all target devices comply with the Fast-20 single-ended drivers and receivers characteristics. The electrical characteristics of the output buffers include:

- Vol (output low) equals 0 to 0.5 VDC with Iol at 48 mA (signal asserted)
- Voh (out high) equals 2.5 to 3.7 VDC (signal negated)
- trise (rising slew rate) equals 520 mV per nanosecond maximum (0.7 to 2.3 VDC)
- tfall (falling slew rate) equals 520 mV per nanosecond maximum(2.3 to 0.7 VDC)

The Fast-20 electrical characteristics for the host adapter and target device include:

- Vil (input low) equals 1.0 VDC maximum (signal true)
- Vih (input high) equals 1.9 VDC minimum (signal false)
- Iil (input low current) equals +/- 20 mA at Vi equals 0.5 VDC
- Iih (input high current) equals +/- 20 mA at Vi equals 2.7 VDC
- Minimum input hysteresis equals 0.3 VDC

C.1.11.2   Supported Target Devices

The SCSI subsystem supports a maximum of four internal devices, including the host adapter. The CD-ROM drive is a narrow device. A unipack with one drive or a six-pack, accommodating six drives, can be used as external devices.

Target Device	Comment
Internal disks	Up to two 3.5-inch x 1.6-inch disks (9.1-Gbyte or 18-Gbyte). All internal disks are UltraSCSI-compliant.
Internal CD-ROM drive	Optional 644-Mbyte SunCD 32X speed; photo CD compatible. Headphone jack with volume control. CD-ROM drive is a narrow SCSI device.
Internal tape drive(s)	Refer to product guide.
External SPARCstorage UniPack	Refer to product guide.
External SPARCstorage SixPack	Refer to product guide.

C.1.11.3 External Cables

External UltraSCSI-compliant SCSI cables have an impedance of 90 ohm (+/- 6 ohm) and are required for UltraSCSI interface. Sun's implementation of UltraSCSI requires that the total SCSI bus length be limited to no more than approximately 20 feet (6 meters) with up to 12 Sun compensated devices. Due to the considerably short bus length, an approximately 32-inch (0.8-meter) UltraSCSI-compliant external cable is supported (part number 530-2883) in addition to an approximate 6.5-foot (2-meter) UltraSCSI-compliant external cable (part number 530-2884).

C.1.11.4 Internal SCSI Subassembly

The internal SCSI subassembly consists of two cable assemblies and two SCSI cards. The SCSI subassembly is attached to the main logic board using an insulation displacement connector (IDC) receptacle attached to a 80-conductor cable. In addition to the SCSI signals, the 80-conductor cable carries system LED signals to the SCSI backplane card. The IDC receptacle mates with a right-angle plug that is mounted on the main logic board.

The 80-conductor cable attaches on the other end to the SCSI backplane card with another IDC connector. The SCSI backplane card incorporates two SCA-2 connectors for mounting the hard drives, a four-circuit power connector to supply 5 VDC and 12 VDC power to the hard drives, and a green, right-angle LED.

A 68-conductor cable exits the SCSI backplane card, carrying 27 SCSI signals and the Termpower to the internal CD-ROM drive (or tape drive). The SCSI backplane card houses the CD-ROM drive connector and one SCSI bus terminator. The Termpower is routed through the SCSI subassembly to connect to the terminator on the SCSI

backplane card in support of the multi-host configuration. The following figure shows the functionality of the internal SCSi assembly.
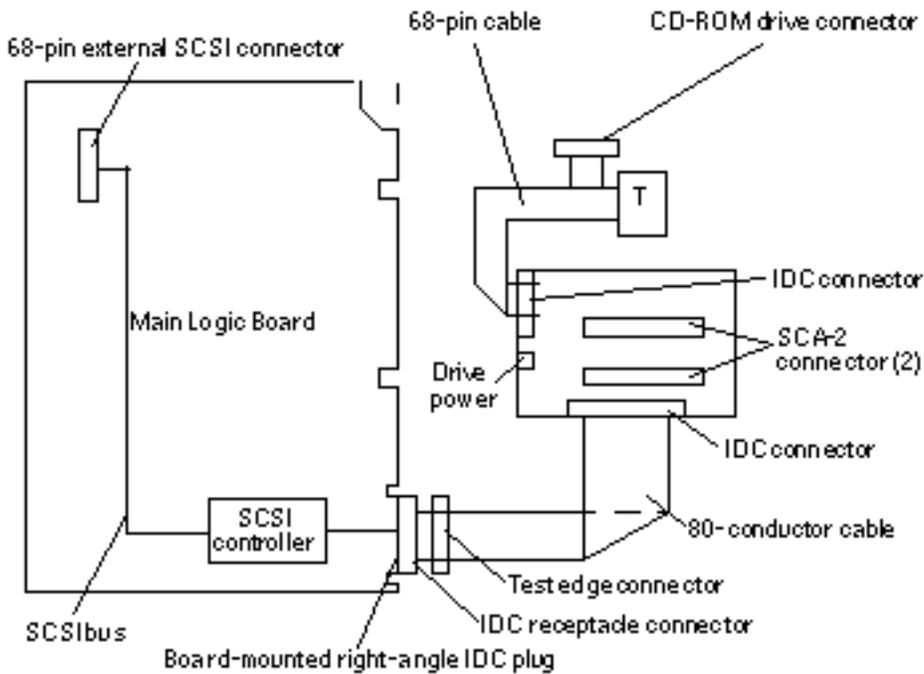
C.1.11.5 SCSI ID Selection

The main logic board host adapter is assigned the SCSI identification of 7 for both ports. The two internal drives attached to the SCA-2 connectors have a SCSI identification of 0 and 1, while the CD-ROM has an identification of 6.

C.1.12 ASICs

The system unit achieves a high level of integration through application-specific intergrated circuits (ASICs). All ASICs are 1149.1 (JTAG) compliant. The following ASICs are highlighted and are described in the following subsections:

- XB9+

- QSC

- PCI-to EBus/Ethernet controller (PCIO)
- UPA-to-PCI bridge (U2P)
- Frame buffer controller (FBC)
- Reset, interrupt, scan, and clock (RISC)

C.1.12.1   XB9+

The XB9+ ASIC is a buffered memory crossbar device that acts as the bridge between the six system unit buses. The six system unit buses include two processor buses, a memory data bus, a graphics bus, and two I/O buses. The XB9+ ASIC provides the following:

- Six-port crossbar
- Decoupled memory port; loading and unloading of memory data can take place in parallel with other operations
- Burst transfers operate on a doubleword of data per slice
- A total of eight two-entry first-in-first-out (FIFO) devices for read data storage
- Power-up safe buses (tristated)

C.1.12.2   QSC

The QSC ASIC provides system control. It controls the UPA interconnect between the major system unit components and main memory. The QSC ASIC provides the following:

- Interconnect packet receive
- Memory arbiter
- Non-cached arbiter
- Memory controller
- Snoop interface
- Coherence controller
- S_register dispatcher
- Internet packet send
- Datapatch scheduler
- EBus interface

C.1.12.3   PCIO

The PCI-to-EBus/Ethernet controller (PCIO) ASIC performs dual roles: PCI bus-to-Ebus bridging and Ethernet control. The PCIO ASIC provides the electrical

connection between the PCI bus and all other I/O functions. In addition, the PCIO ASIC contains an embedded Ethernet controller to manage Ethernet transactions and provides the electrical connection to slower on-board functions, such as the flash PROM and the audio module.

C.1.12.4   U2P

The UPA-to-PCI bridge (U2P) ASIC provides an I/O connection between the UPA bus and the two PCI buses. The U2P ASIC features include:

- Full master and slave port connection to the high-speed UPA interconnect. The UPA is a split address/data packet-switched bus that has a potential data throughput rate of greater than 1 Gbyte per second. UPA data is ECC protected.

- Two physically separate PCI bus segments with full master and slave support:

- 66-MHz PCI bus segment (PCI bus A): 3.3-VDC I/O signaling, 64-bit data bus, compatible with the PCI 66-MHz extensions, support for up to four master devices (at 33 MHz only)

- 33-MHz PCI bus segment (PCI bus B): 5.0-VDC I/O signaling, 64-bit data bus, support for up to six master devices

- Two separate 16-entry streaming caches, one for each bus segment, for accelerating some kinds of PCI DVMA activity. Single IOMMU with 16-entry TLB for mapping DVMA addresses for both buses (IOMMU used to translate 32-bit or 64-bit PCI addresses into 41-bit UPA addresses).

- A mondo-vector dispatch unit for delivering interrupt requests to CPU modules, including support for PCI interrupts from up to six slots, as well as interrupts from on-board I/O devices.

C.1.12.5   FBC

The frame buffer controller (FBC) ASIC is the graphics draw ASIC that provides interface between the UPA and the 3DRAM. The FBC ASIC provides 2D and 3D graphics draw acceleration. Highlights of the FBC ASIC features include:

- UPA slave device with write-mostly philosophy

- Interfaces with 3DRAM to achieve accelerated graphics performance

- Supports single buffered and DBZ configurations

- Supports frame buffer-to-frame buffer copy

- Supports viewport clipping, picking, and pixel processing

- Supports byte, plane masks, raster operations, blend operations, and conditional writes in 3DRAM

- 83.3-MHz UPA operation and 75-MHz 3DRAM operation

- 3.3-VDC and 5-VDC (for RAMDAC ASIC) supply voltage

C.1.12.6 RISC

The reset, interrupt, scan, and clock (RISC) ASIC implements four functions: reset, interrupt, scan, and clock. Generation and stretching of the reset pulse is performed in this ASIC. Interrupt logic concentrates 42 different interrupt sources into a 6-bit code, which communicates with the U2P ASIC. It also integrates a JTAG controller.

Highlights of the RISC ASIC features include:

- Determines system clock frequency
- Controls reset generation
- Performs PCI bus and miscellaneous interrupt concentration for U2P
- Controls flash PROM programming, frequency margining, and lab console operation
- 33-MHz operation
- 3.3-VDC and 5-VDC supply voltage

C.1.13 SuperIO

The SuperIO is a commercial, off-the-shelf component that controls the keyboard, diskette, and parallel port interfaces. It contains a DMA-driven diskette controller, two serial port controllers, an IEEE 1284 parallel port interface, and an IDE disk interface (not currently used). The SuperIO drives the various ports directly with some EMI filtering on the keyboard and parallel port signals. Support for mixed voltage modes and power management features for low power operation are also included. Features of the SuperIO include:

- Two independent serial ports used for keyboard and mouse
- N82077 diskette drive interface
- IEEE 1284 parallel port interface

C.1.14 Power Supply

The system unit uses a 380-watt power supply that operates under the voltage range of 90 to 264 volts root-mean-square (Vrms) and a frequency range of 47 to 63 Hz. The maximum input current is 6.3.

The power supply continues to regulate all outputs for 20 milliseconds after AC power is removed.

Output	Voltage (VDC)	Maximum Current (A)	Regulation Band
1	3.3	50.0	3.23 to 3.43
2	5.0	40.0	4.95 to 5.15
3	12.0	5.0	11.40 to 12.60
4	-12.0	0.5	-12.60 to -11.40
5	5.1	1.0	4.95-5.25

Note - The combined power of output 1 and output 3 must be less than 320 watts.

C.1.15 Control Signals

With the exception of the PowerOn signal, all power supply control signals are at TTL signal levels.

Parameter	Minimum	Maximum
VOH (high-level output voltage)	2.4 VDC	
VOL (low-level output voltage)		0.4 VDC
VIH (high-level input voltage)	2.0 VDC	
VIL (low-level input voltage)		0.8 VDC

C.1.15.1 Remote Enable PowerOn

A remote interface can enable the DC outputs with a low signal to the PowerOn input and the DC outputs with a high signal to the PowerOn input. The signal is interfaced to the power supply through the main logic board and the power distribution board.

C.1.15.2 System Unit Power Budget

The following subsections present the system unit power budgets.

PCI Cards

The PCI card power budget supports a total of 60 watts, which is distributed among four PCI cards in an arbitrary way as long as the total PCI power does not exceed 60 watts.

The following table lists 5 VDC PCI card power estimates

Voltage Rail (VDC)	PCI Cards (Maximum Number)	Current Each (Amps)	Current Total (Amps)	Total Power (Watts)
5	4	3.0	12.0	<= 60 for all voltage rails combined
3.3	0	0	0	
+12	4	0.4	1.6	
-12	4	0.1	0.4	

.

The following table lists 3.3VDC PCI card power estimates.

Voltage Rail (VDC)	PCI Cards (Maximum Number)	Current Each (Amps)	Current Total (Amps)	Total Power (Watts)
5	0	0	0	<= 60 for all voltage rails combined
3.3	4	4.5	18.0	
+12	4	0.4	1.6	
-12	4	0.1	0.4	

Memory System

The following table lists the memory system power budget.

Number of DIMMs	WC Current Total (Amps)	Total Power @5 VDC (Watts)
16	9.33	46.66

C.1.16   Standard System Facilities

In addition to the previously listed features, the system unit provides the following:

- TOD/NVRAM for clock and identification functions
- Flash PROM for operating system initialization. The flash PROM is re-programmable through UNIX and OBP utilities.

C.1.17   Main Logic Board

The following figure illustrates a block diagram of the system's main logic board.
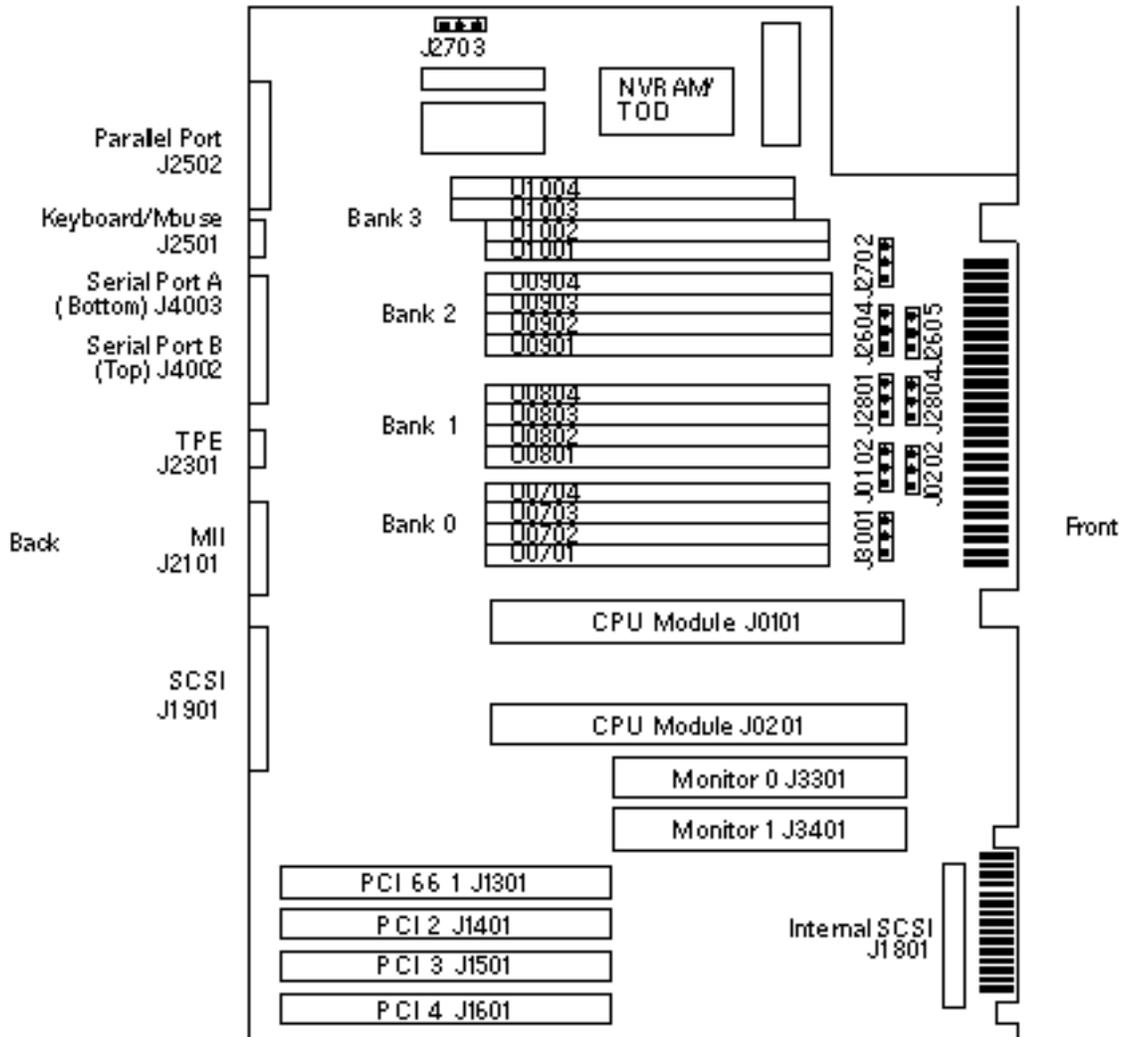
Illustrated Parts Breakdown

This appendix consists of a sequence of illustrations that show how the various pieces of the system fit together. Part numbers are also provided.

D.1 Part Numbers

The following items for the Sun Enterprise 220R server can be replaced at the customer site by a qualified service provider.

Note - The part numbers listed in the following table are correct as of the service manual publication date but are subject to change without notice. Consult your authorized Sun sales representative or service provider to confirm a part number prior to ordering a replacement part.

Category	Part	Part Number
Main Logic Board Components	Main Logic Board	501-4450
	CPU Card Cage	Not a FRU
	Air Guide	Not a FRU
	NVRAM	525-1430

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Category	Part	Part Number
	CPU Module	501-5539
	64 MB DIMM	501-4280
	128 MB DIMM	501-3136
Backplanes	UltraSCSI Backplane	501-5505
	Power Distribution Board	501-5506
	DC-to-DC Converter	300-1455
	VRM DC-to-DC Converter	375-0094
Storage Devices	9 GB 10K RPM UltraSCSI Disk Drive	540-3881
	18 GB 10K RPM UltraSCSI Disk Drive	540-4177
	12-24 GB 4mm DDS3 Tape Drive	370-2376
	32X CD-ROM Drive	370-3416
Miscellaneous Assemblies	Fan Tray Assembly	540-4169
	Power Supply	300-1449
	PCI Filler Panel	Not a FRU
	RMA Filler Panel (Plastic)	Not a FRU
Panels and Doors	Front Door - Right	540-4186
	Front Door - Left	540-4230
	RMA Bezel (Plastic)	530-2824
	Key	250-1317
Internal Cables	UltraSCSI Data Cable	530-2827

Category	Part	Part Number
	RMA SCSI Cable	530-2826
	I/O Power Cable	520-2823
	Main Power Cable	530-2828
	CPU Power Sense Cable	530-2829
	CPU Core Voltage Power Cable	530-2831
	CPU Core Voltage Power Sense Cable	530-2842
	Keyswitch/Power Button/LED Assembly	530-2824
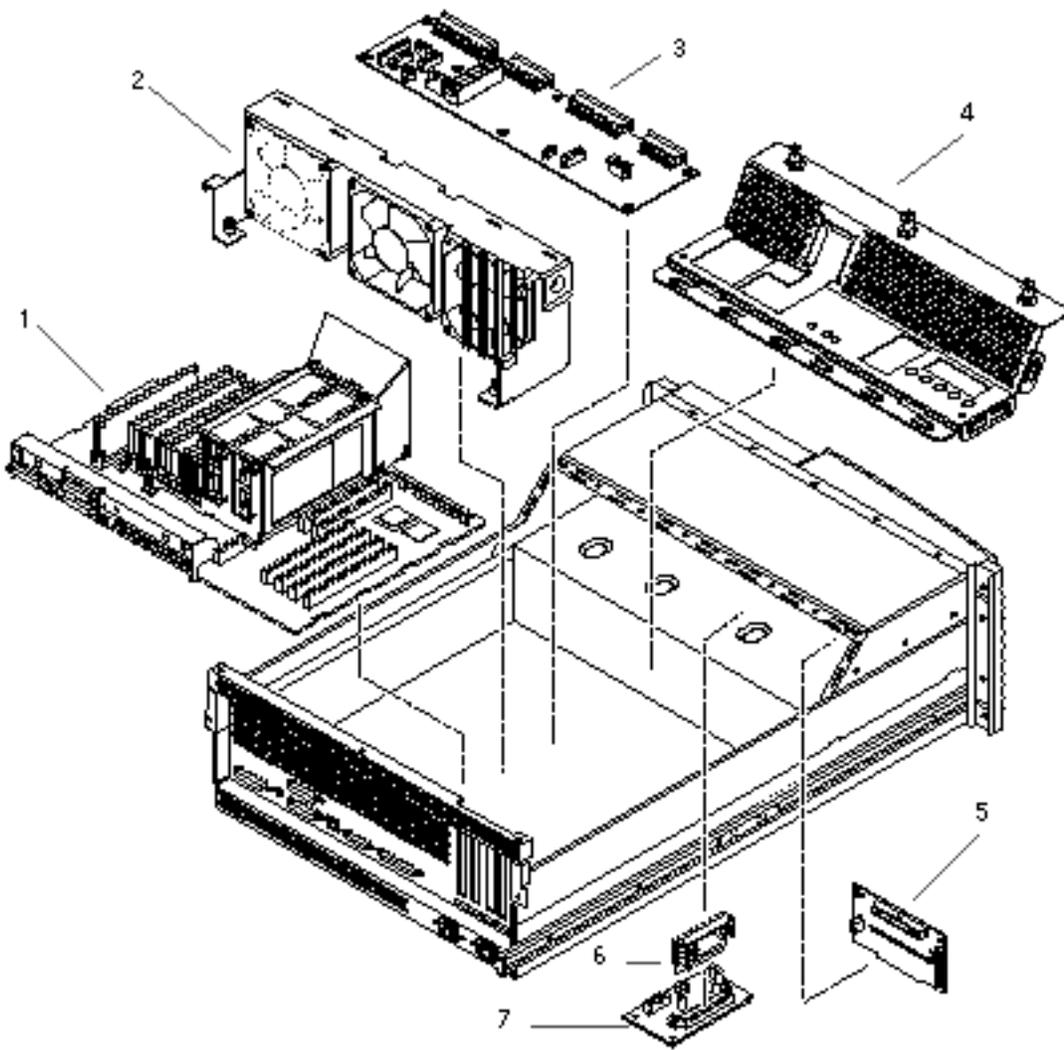
Reference Number	Part	Part Number
1	Main Logic Board Components	See next illustration
2	Fan Tray Assembly	540-4169
3	Power Distribution Board	501-5506

Reference Number	Part	Part Number
4	Power Distribution Board Cover	Not a FRU
5	UltraSCSI Backplane	501-5505
6	DC-to-DC Converter	300-1455
7	VRM DC-to-DC Converter	375-0094
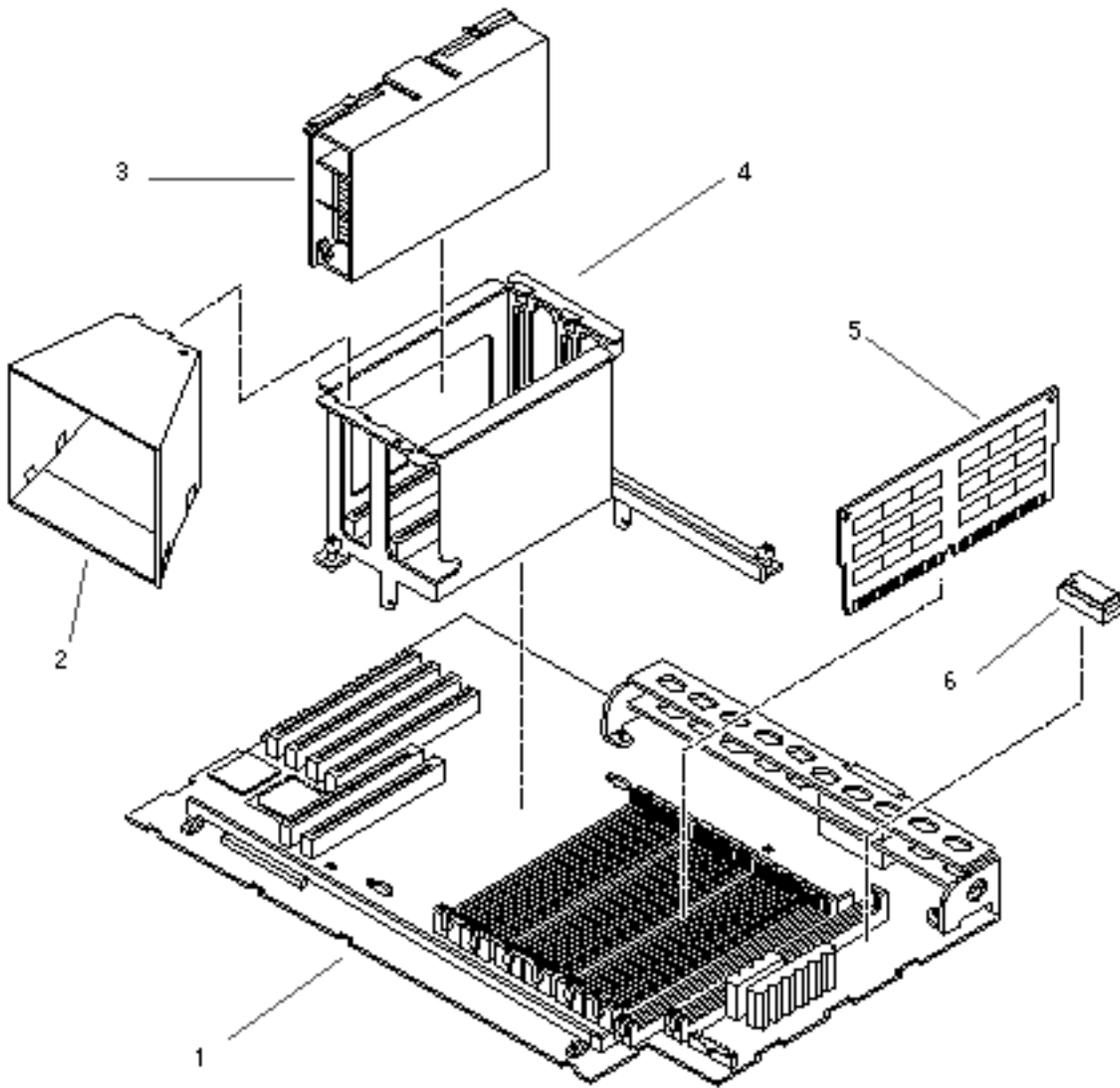
Reference Number	Part	Part Number
1	Main Logic Board	501-4450
2	Air Guide	Not a FRU

Reference Number	Part	Part Number
3	CPU Module	501-5539
4	CPU Card Cage	Not a FRU
5	32 MB DIMM	501-2622
6	NVRAM	525-1430
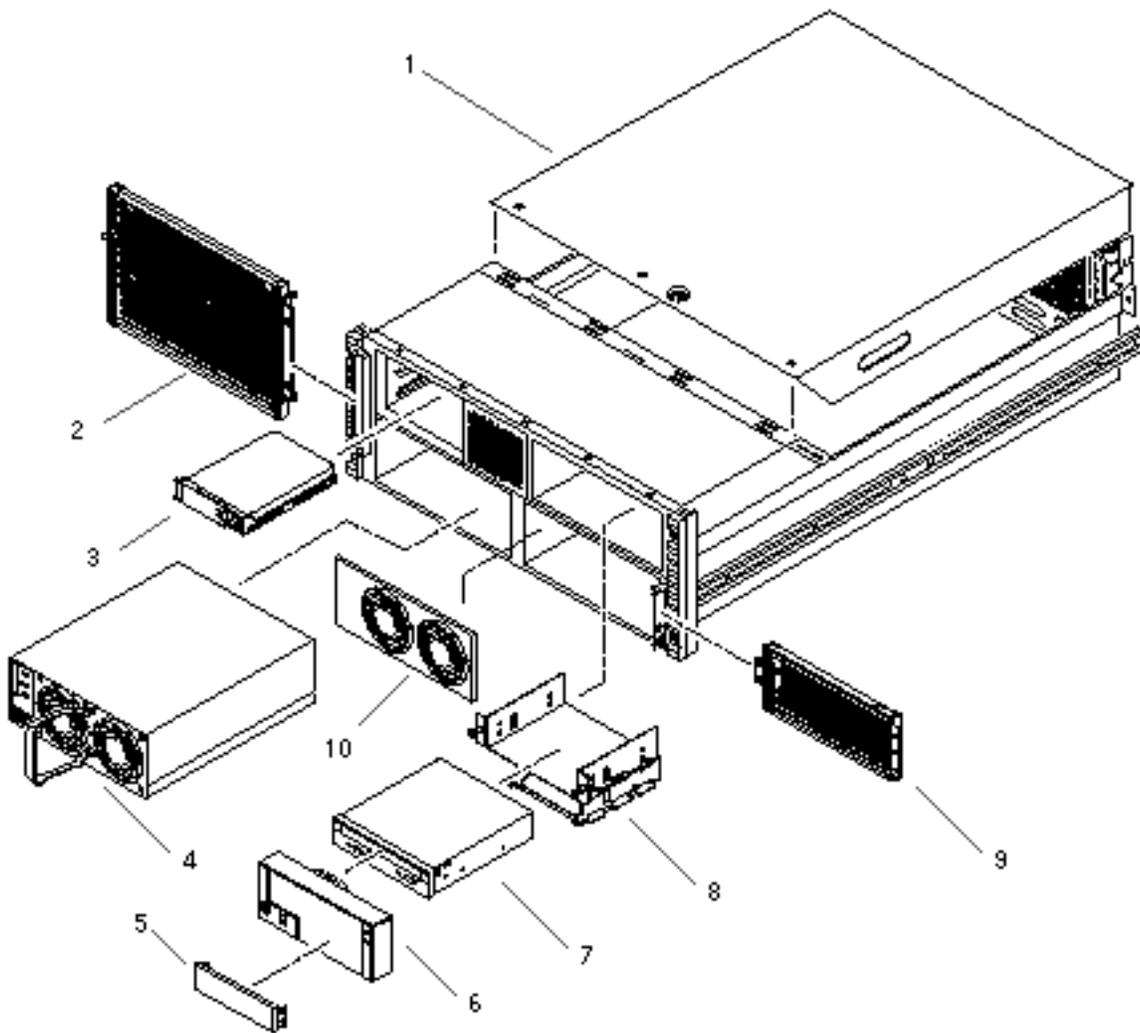
Reference Number	Part	Part Number
1	System Cover	Not a FRU
2	Front Door - Left	540-4186
3	9 GB 10K RPM UltraSCSI Disk Drive	540-3881

Reference Number	Part	Part Number
Not Shown	18 GB 10K RPM UltraSCSI Disk Drive	540-4177
Not Shown	12-24 GB 4mm DDS3 Tape Drive	370-2376
4	Power Supply	300-1449
5	RMA Filler Panel (Plastic)	Not a FRU
6	RMA Bezel	530-2824
7	32X CD-ROM Drive	370-3416
8	RMA Cage Assembly	Not a FRU
9	Front Door - Right	540-4230
10	Power Supply Filler Panel	Not a FRU

Video Player Help

This appendix is designed to help you if you are having difficulty playing the online video demonstrations of the Sun server disassembly or reassembly from your browser. To view the videos you need access to the AnswerBook2 software running on a server in the network, and you need to configure your web browser to play MPEG videos.

To play an online video in an AnswerBook2 document, just click on the video icon (illustrated below) wherever it occurs in the document.

If the video does not start playing, then consult the following topics in this appendix:

E.1 Do You Have a Problem Playing Video?

In order to browse the AnswerBook2 documentation that accompanied this product, your administrator must install server version 1.70, or a later compatible version, of the AnswerBook2 software. Consult your system administrator to confirm that the correct version of the server software is being used, that the server is running and accessible to your browser, and that the AnswerBook2 collection for your product is installed. You also need to configure your browser so that it will play a video player.

E.1.1 Sun Server Users

- If you are unsure of what the problem might be, see Section E.2 "Requirements for Playing Video" on page 291.

- If you cannot get a video player to start from the browser, or a video player starts but does not work, see Section E.3 "Obtaining and Accessing the ShowMe TV Player on Solaris Systems" on page 292.

- If you have installed a supported video player, but your browser is not finding it, see Section E.4 "Configuring Web Browsers to View AnswerBook2 Video" on page 295.

- If the movie files take several minutes to download, if the color is not acceptable, or if you get video but no audio, see Section E.5 "Improving Online Video Performance" on page 298.

E.1.2 PC Users

You can view AnswerBook2 videos using ActiveMovie, which is commonly available for Windows95, Windows NT, and later compatible operating systems. ActiveMovie configures itself automatically to your browser.

- If you are unsure of what the problem might be, see Section E.2 "Requirements for Playing Video" on page 291.

- If the movie files take several minutes to download, if the color is not acceptable, or if you get video but no audio, see Section E.5 "Improving Online Video Performance" on page 298.

E.2   Requirements for Playing Video

On both Sun systems and PCs, you must configure the system on which you are viewing the videos with adequate memory and space in your local system's `/tmp` or `/swap` directory. For more information about configuring systems, see Section E.5.1 "Video Files and Your System Resources" on page 298.

On a Sun system, you will need to install the ShowMe TV software and configure one of the supported browsers listed below to use ShowMe TV.

With a Sun server running the Solaris 2.4 operating environment, or later compatible version, the following browser-video player combinations are supported:

■ ShowMe TV™, version 1.2 or later, and Netscape™ version 3.*x* or later

■ ShowMe TV, version 1.2 or later, and HotJava™ version 1.1 or later

If clicking on the video icon does not launch a video player capable of playing AnswerBook2 videos, you must do one or more of the following:

■ Install ShowMe TV software, if it is not already installed on your system

■ Configure your browser to use the installed ShowMe TV player

■ Make sure you have adequate space in your local system's `/tmp` or `/swap` directory. See Section E.5.1 "Video Files and Your System Resources" on page 298, for more detailed information

On a PC, ActiveMovie should work with the supported platforms listed below. If you do not have ActiveMovie on your system, you must obtain it. No special installation or configuration procedures are required.

With a PC running either Windows 95 or later, or Windows NT software, version 4.0 or a later compatible version, the following browser-video player combinations are supported:

■ ActiveMovie and Netscape, version 3.*x* or later

■ ActiveMovie and Internet Explorer, version 4.0 or later

Note - Other browser-player combinations may work, but have not been tested.

E.3 Obtaining and Accessing the ShowMe TV Player on Solaris Systems

If you are using a PC to access the AnswerBook2 documentation, you do *not* need to read this section. PC users can view online videos using ActiveMovie, which is widely available but not supplied by Sun. This section includes the following topics:

■ Section E.3.1 "Obtaining ShowMe TV Software" on page 292

■ Section E.3.2 "Accessing ShowMe TV Software" on page 292

■ Section E.3.3 "How to Install ShowMe TV on Your System" on page 293

E.3.1 Obtaining ShowMe TV Software

If you are using a Sun server, ShowMe TV is the supported movie player.

Note - To view the videos that are included in the AnswerBook2 collection, Solaris system users need to install ShowMe TV software.

For information about downloading and decompressing the latest ShowMe TV software components, and about the user guide and the installation instructions, consult the information at the following URL:

`http://sun.com/desktop/products/software/ShowMeTV/`

For software installation instructions, consult the product release notes information on the web site.

If you do not have web access, you can obtain the ShowMe TV software (version 1.2.1) for Solaris 7 from the Solaris Computer Systems Supplement CD that accompanies the operating environment software. Contact your Sun sales representative to obtain the supplement CD if you did not receive it.

E.3.2 Accessing ShowMe TV Software

There are two ways to access the ShowMe TV software. The first way does not require any software installation procedure on your part.

1. If you or your system administrator has stored the ShowMe TV player in a mounted, exported file system, you can already access this software without any installation. Consult your system administrator to determine if this applies to you, and if the ShowMe TV player version is correct.

If the exported file system is *in* your PATH variable, you should be able to type showmetv in a command window, and the ShowMe TV player will start. In this case, you can skip to Section E.4.1 "Configuring Web Browsers to Use ShowMe TV" on page 295 and configure your browser to use the accessible version of the video player.

If the exported file system is *not* in your PATH variable, you need to find out the showmetv executable's full directory path name from your administrator and then skip to Section E.4.1 "Configuring Web Browsers to Use ShowMe TV" on page 295. You will need to enter the full showmetv path name to configure the executable in your browser.

2. If your administrator has not installed the ShowMe TV player in a mounted, exported file system, you will need to obtain or download the ShowMe TV product, and install the ShowMe TV player software on your local system.

E.3.3   How to Install ShowMe TV on Your System

If your AnswerBook2 server is not a network-mounted file server, the ShowMe TV software must be either copied via the FTP program from a server where the files are located, or downloaded from the web site (see Section E.3.1 "Obtaining ShowMe TV Software" on page 292), or loaded from the Solaris Computer Systems Supplement CD. You need to load the files into your /tmp directory so that you can install the software. If you are using the CD, follow the instructions in the accompanying installation booklet.

Instructions for using the ftp command to copy the software from a server are provided below. If you need further assistance, please consult your system administrator.

Note - If the AnswerBook2 server is also a file server, you can copy the tar file using the Solaris cp command instead of using ftp.

---

1. **Log in as the root user of your system. You must have root access to your system to install software on it. Type:**

```
hostname console login: root
password: password
```

Or

```
hostname% su
password: password
```

2. **To retrieve the client software via FTP, follow these steps.**

   a. **Activate the FTP program by typing this command:**

   ```
   # ftp servername
   ```

   Where *servername* is the hostname of the AnswerBook2 server.

   b. **The FTP program will request that you type in your user name and password:**

   ```
   Name: username
   Password: password
   ```

   c. **While in the FTP environment, type these commands:**

   ```
   ftp> binary
   ftp> get /smtvtmp/smtv.tar /tmp/smtv.tar
   ftp> bye
   ```

   The FTP program will close.

3. **To extract the contents of the** smtv.tar **file, type:**

   ```
   # tar -xvf /tmp/smtv.tar /tmp
   ```

4. **Install the ShowMe TV package. Type:**

   ```
   # pkgadd -d /tmp SUNWsmtvh SUNWsmtvr SUNWsmtvu
   ```

   The packages are installed in your /opt directory by default; however, the pkgadd command gives you the option to select a directory other than /opt.

5. **Log out as the root user. Type:**

```
# exit
```

When you have completed the installation, you will need to configure your browser to use the ShowMe TV software. See Section E.4.1 "Configuring Web Browsers to Use ShowMe TV" on page 295.

E.4 Configuring Web Browsers to View AnswerBook2 Video

After you have installed the ShowMe TV video player software for Solaris users, and made it accessible to them (see Section E.3 "Obtaining and Accessing the ShowMe TV Player on Solaris Systems" on page 292), individual browsers need to be configured to use ShowMe TV. PC users should configure their browsers to use ActiveMovie, or another suitable MPEG1 video player.

The following instructions help you configure the HotJava and Netscape Navigator™ browsers to use ShowMe TV software.

Note - Configuring web browsers other than HotJava or Netscape Navigator requires slightly different procedures.

E.4.1 Configuring Web Browsers to Use ShowMe TV

To view AnswerBook2 videos, users of Solaris systems must configure their browsers to use ShowMe TV software.

E.4.1.1 To Configure HotJava Browser 1.0 or 1.1

1. **Log in to the client as a user:**

```
hostname console login: username
password: password
```

(continued)

2. **Start the HotJava browser.**

3. **From the Edit menu, choose Preferences ä Viewer Applications...**

   The Viewer Applications window opens.

4. **Scroll through the large Content Types field to find MPEG Video Clip and select it.**

5. **At the Action selector, choose View in Application.**

6. **In the Application field, type the path to the ShowMe TV software. If you install the software in the default location, the path will be as follows:**

   ```
   /opt/SUNWsmtv/bin/showmetv -exit %s
   ```

   The path may specify an exported file system instead, if that is how the system administrator made the ShowMe TV player accessible to users. The `-exit %s` option instructs the video player to shut down at the end of the movie.

7. **Click Apply and then click the Back button.**

E.4.1.2 To Configure Netscape Navigator 3.x or 4.x

1. **Log in to the client as a user:**

   ```
   hostname console login: username
   password: password
   ```

2. **Start the Navigator browser.**

3. **For Navigator 4.x, go to Step 4 on page 297. For Navigator 3.x, perform the following steps:**

   a. **From the Options menu, choose General Preferences...**

      The General Preferences window opens.

b. **Click on the Helpers tab.**

The MIME Configuration Files window is displayed.

c. **Scroll through the field to find** `video/mpeg` **and select it.**

d. **Go to Step 5 on page 297.**

4. **For Navigator 4.x, perform the following steps:**

a. **From the Edit menu, choose Preferences...**

The Netscape: Preferences window opens.

b. **Click on the triangle next to Navigator, and then click on Applications.**

The Applications window is displayed.

c. **Scroll through the large field to find** `MPEG Video` **and select it.**

5. **Click the Edit button.**

The Netscape: Helper/Application window opens.

6. **Choose Application and in the adjacent field, type the path to the ShowMe TV software. If you install the software locally, the default path is as follows:**

```
/opt/SUNWsmtv/bin/showmetv -exit %s
```

The path may specify an exported file system instead, if that is how the system administrator made the ShowMe TV player accessible to users. The `-exit %s` option instructs the video player to shut down at the end of the movie.

7. **Click OK.**

8. **Repeat Steps 3 through 7 to change the settings for** `video/*`**. When you have finished, or if you cannot find** `video/*`**, continue on to Step 9 on page 297.**

9. **Click OK to complete the task.**

E.5 Improving Online Video Performance

Playing video online requires considerable computer resources compared to other computer applications. This section informs you about resources, and alerts you to measures you can take to improve performance and conserve system resources. To find out about each topic, go to:

- Section E.5.1 "Video Files and Your System Resources" on page 298
- Section E.5.2 "Improving File Loading Time" on page 298
- Section E.5.3 "Configuring Web Browsers Not to Use Proxies for the AnswerBook2 Server" on page 299
- Section E.5.4 "Quitting the Video Player" on page 301
- Section E.5.5 "Adjusting the Brightness of ShowMe TV Files" on page 302
- Section E.5.6 "Playing the Movies From the AnswerBook2 CD" on page 302

E.5.1 Video Files and Your System Resources

On Sun systems, the video files are loaded into your AnswerBook2 server's directory. Each video file in this AnswerBook2 document can be as large as 60 Mbytes. The size of the video file is displayed next to its video icon in the AnswerBook2 documentation.

When you click on the video icon, AnswerBook2 downloads the file to your local system's /tmp or /swap directory, and then launches the video player for which your browser is configured.

On Sun systems, usually the system administrator often configures the /tmp or /swap directory to be about twice the capacity of the system memory. On the Sun system where you will be viewing these videos, make sure that the system administrator configures the system /tmp or /swap directory to support playing video files as large as 60 Mbytes.

When you quit the video player, the /tmp or /swap space is released. If you do not quit the player, then it is possible for your /tmp or /swap directory to become full. We recommend that you quit the player after watching each video.

E.5.2 Improving File Loading Time

Downloading video files can take a few minutes, depending on the size of the file and the amount of network traffic. Because load time is so dependent on your network environment, it is impossible to be more specific. The status bar at the

bottom of your browser window will generally provide real-time reports on what percentage of the file has been downloaded.

To improve access times to the videos, you can store the AnswerBook2 collection on your local disk. Keep in mind that the size of this AnswerBook2 collection can be as large as 300 Mbytes. If storing the AnswerBook2 locally is not an option, load times will be improved by having the AnswerBook2 stored on the same subnetwork as your own system. If you find the load times of videos are unacceptable, speak to your administrator about storing the AnswerBook2 collection on your subnetwork.

E.5.3 Configuring Web Browsers Not to Use Proxies for the AnswerBook2 Server

Some web browsers are configured to use proxies. These proxies can slow down viewing of the AnswerBook2 videos. The following procedures describe how to configure the web browsers not to use proxies when viewing AnswerBook2 documents.

E.5.3.1 To Configure HotJava Browser 1.0 or 1.1

1. **Log in to the client as a user:**

   ```
   hostname console login: username
   password: password
   ```

2. **Start the HotJava browser.**

3. **From the Edit menu, choose Preferences ä Proxies...**
   The Proxies window opens.

4. **In the large Don't Proxy field, type the hostname of the AnswerBook2 server.**

5. **Click Apply and then click the Back button once.**

E.5.3.2 To Configure Netscape Navigator 3.x or 4.x

1. **Log in to the client as a user:**

```
hostname console login: username
password: password
```

2. **Start the Navigator browser.**

3. **For Navigator 4.x, go to Step 4 on page 297. For Navigator 3.x, perform the following steps:**

   a. **From the Options menu, choose Network Preferences...**
      The Network Preferences window opens.

   b. **Click on the Proxies tab.**
      The Proxy Configuration window is displayed.

   c. **Go to Step 5 on page 300.**

4. **For Navigator 4.x, perform the following steps:**

   a. **From the Edit menu, choose Preferences...**
      The Netscape: Preferences window opens.

   b. **Click on the triangle next to Advanced, and then click on Proxies.**
      The Proxies window is displayed.

5. **If Manual proxy configuration has been selected, click on the View button. Otherwise, go to Step 7 on page 300.**
   The Netscape: View Manual Proxy Configuration window is displayed.

6. **In the No Proxy for field, type the hostname of the AnswerBook2 server and click OK. Then go to Step 8 on page 300.**

7. **If the Automatic proxy setting is in use, obtain and enter a different server name that will bypass the AnswerBook2 server proxy.**

8. **Click OK to complete the task.**

E.5.3.3   To Configure Microsoft Internet Explorer

1. **Log in to the client as a user.**

2. **Start the Internet Explorer browser.**

3. **From the View menu, choose Options.**

   The Options window opens.

4. **Click on the Connection tab.**

   The Proxy Server window is displayed.

5. **If Connect Through Proxy Server is checked, click on the Settings button. Otherwise, click OK to complete the task.**

   The Proxy Settings window opens.

6. **In the field of the Exception window, type the hostname of the AnswerBook2 server and click OK on the window, and click OK to complete the task.**

E.5.4   Quitting the Video Player

Although AnswerBook2 and your browser software will launch the video player for you, it will not quit the player for you. The software has no way to determine when you have finished watching the video, or whether you intend to use it for watching other videos that are not part of the AnswerBook2 collection. Quitting the player is up to you. If you are using the ShowMe TV player on a Sun server, you should configure it to quit after playing the video file. Otherwise, it will play the file continuously until you stop it. For instructions, see Section E.4.1 "Configuring Web Browsers to Use ShowMe TV" on page 295.

Here are some reasons to make sure you quit the video player when you have finished viewing a video:

- If you stop or pause a video player, the large video file remains in your /swap space. You should quit your video player when it is not in use to free /swap space.

- On a Sun server the ShowMe TV video player will appropriate the audio device on your system, so if you try to play a second video, or use another application that requires audio, the second application will not be able to deliver its audio portion. You should quit the video player to keep the audio device available for other videos or other applications.

- If you are using ActiveMovie on a PC, quitting the movie player is still advisable but less critical. ActiveMovie does not loop the video file, nor does it capture the audio device exclusively. But ActiveMovie will remain on your desktop until you exit the application, and the file you are playing remains in your swap space.

E.5.5 Adjusting the Brightness of ShowMe TV Files

The settings on your monitor partly determine how bright or dark the video appears on your screen. The AnswerBook2 videos are digitized to look their best on an "average" monitor setting. If your monitor or video card does not fit this average profile, the video may seem too light or dark. First try adjusting your monitor brightness setting.

When using the ShowMe TV player, on some systems you can adjust the brightness of the video file you are playing by selecting the Properties option under the TV pull-down menu. The Properties control sheet has a Brightness slider bar that will make the video lighter or darker.

There is no Brightness control available for ActiveMovie.

E.5.6 Playing the Movies From the AnswerBook2 CD

The AnswerBook2 installation instructions also include a method for viewing the AnswerBook2 contents (including the movies) directly from the AnswerBook2 CD. This viewing method may offer better performance than other online methods. See "Viewing the Collection From the CD" in the appropriate *Sun Enterprise Server Documentation Installation Guide*.