

Sun Enterprise™ 420R Server Service Manual



THE NETWORK IS THE COMPUTER™

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The *Enterprise 420R Server Service Manual* provides detailed procedures that describe the removal, installation, and replacement of serviceable parts and options in the Sun Enterprise 420R™ server. This service manual also includes information about diagnostics and maintenance of the system.

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Adobe PostScript







Declaration of Conformity

Compliance ID: E420R

Sun Enterprise 420R 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: E990550-1
EN50082-1	IEC801-2 (1991) IEC801-3 (1984) IEC801-4 (1988)	8 kV (Direct), 15kV (Air) 10 V/m, 80% AM at 1KHz 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)

EN60950 w/ Nordic Deviations

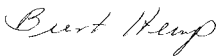
TUV Rheinland Certificate No:

pending

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).



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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 Enterprise 420R 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
Luokan 1 Laserlaite
Klasse 1 Laser Apparat
Laser Klasse 1

CD-ROM



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.

Class 1 Laser Product
Luokan 1 Laserlaitte
Klasse 1 Laser Apparat
Laser Klasse 1

CD-ROM



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

Conformité aux normes de sécurité

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

Mesures de sécurité

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

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

Symboles

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



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



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



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



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

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



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



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

Modification du matériel

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

Positionnement d'un produit Sun



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



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

Conformité SELV

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

Connexion du cordon d'alimentation



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



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



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

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



Attention: – 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 n°TLC02V50). 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.

Class 1 Laser Product
Luokan 1 Laserlaite
Klasse 1 Laser Apparat
Laser Klasse 1

CD-ROM



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:



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



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



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



Encendido – Aplica la alimentación de CA al sistema.

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



Apagado - Elimina la alimentación de CA del sistema.



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

Modificaciones en el equipo

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

Ubicación de un producto Sun



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



Precaución – De acuerdo con la norma DIN 45 635, 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.



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.

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.

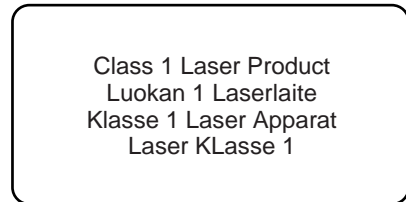
Paquete de pilas



Precaución – Las unidades Product Name contienen una pila de plomo sellada, Productos de energía portátil n° 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.

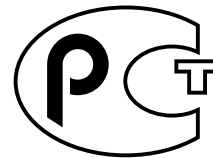


CD-ROM



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.

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Preface

The *Sun Enterprise 420R Server Service Manual* provides detailed procedures that describe the removal, installation, and replacement of serviceable parts and options in the Sun Enterprise™ 420R 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 420R 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 420R 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 <code>.login</code> file. Use <code>ls -a</code> to list all files. % You have mail.
AaBbCc123	What you type, when contrasted with on-screen computer output	% su Password:
<i>AaBbCc123</i>	Book titles, new words or terms, words to be emphasized	Read Chapter 6 in the <i>User's Guide</i> . These are called <i>class</i> options. You <i>must</i> be superuser to do this.
	Command-line 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 <code>rm filename</code> .

Shell Prompts

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

Related Documentation

The following documents contain topics that relate to the information in the *Sun Enterprise 420R Server Service Manual*.

Server rackmounting and setup	<i>Sun Enterprise 420R Server Setup and Rackmounting Guide</i>
Setting up and running the system; features and options, setup and installation, troubleshooting, and network administration for the system	<i>Sun Enterprise 420R Server Owner's Guide</i>
Late breaking product news and information	<i>Sun Enterprise 420R Server Product Notes</i>
Performing diagnostic tests	<i>SunVTS User's Guide</i> <i>SunVTS Quick Reference Card</i> <i>SunVTS Test Reference Manual</i> <i>Sun Enterprise SyMON User's Guide</i>
System and network administration	<i>Solaris System Administrator AnswerBook</i> <i>SPARC: Installing Solaris Software</i>
Using operating system software	<i>Solaris User's Guide</i>
Miscellaneous	<i>Solaris on Sun Hardware AnswerBook</i> <i>Solaris Handbook for Sun Peripherals</i> <i>Solaris 7 Sun Hardware Platform Guide</i>

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`docfeedback@sun.com`

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

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 “How to Power Off the System” on page 2.
- Except for replacing the main logic board, which is a workbench procedure, this system is serviceable while installed in the rack. See “How to Position the System for Service” on page 8.

The following tasks are covered in this chapter:

- “How to Power Off the System” on page 2
- “How to Power On the System” on page 3
- “How to Initiate a Reconfiguration Boot” on page 6
- “How to Position the System for Service” on page 8
- “How to Slide the System Into the Rack” on page 11
- “How to Remove the System Cover” on page 14
- “How to Replace the System Cover” on page 16
- “How to Avoid Electrostatic Discharge” on page 18
- “How to Remove the System From the Rack” on page 30
- “How to Place the System Into the Rack Glides” on page 34

The following information is also included:

- “About the Status and Control Panel” on page 20
- “About Communicating With the Server” on page 23
- “Tools Required for Installation and Service” on page 29

How to Power Off the System

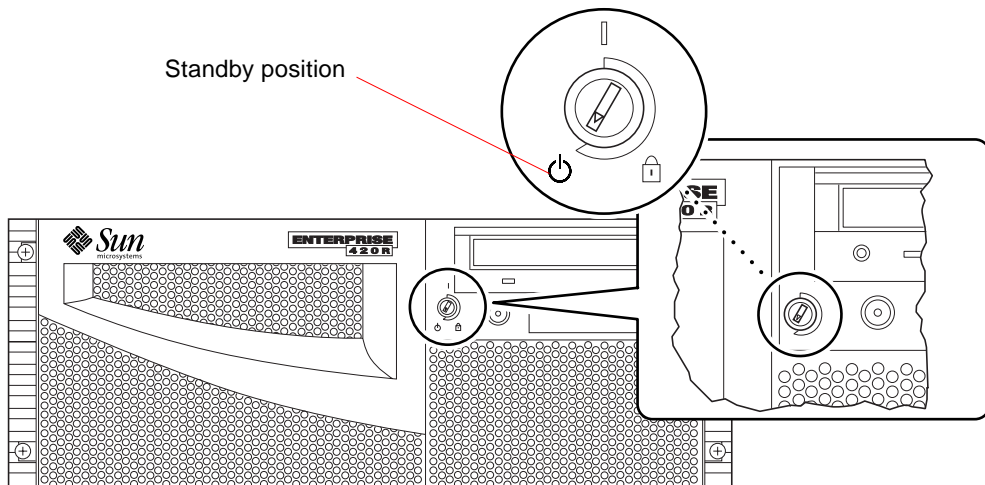


Caution – Before turning off system power, halt the operating system as described below. Failure to halt the operating system properly can result in loss of disk drive data.

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 "Keyswitch Settings" on page 21.

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.**



How to Power On the System

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:

- “About Communicating With the Server” on page 23
- “How to Configure a Local Graphics Console” on page 26

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 “How to Initiate a Reconfiguration Boot” on page 6 for further information.

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.

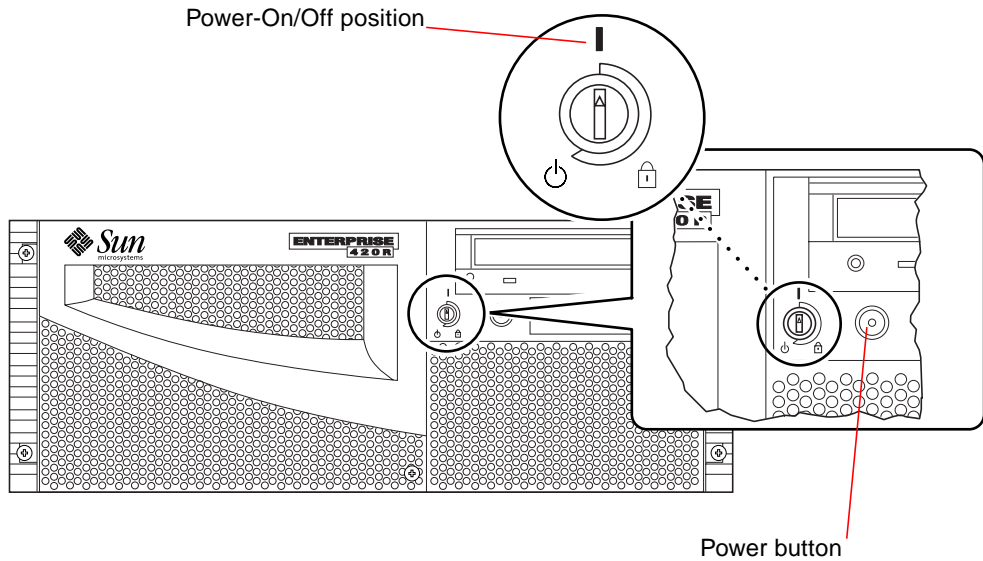
A terminal or monitor is required for viewing system messages. For setup instructions, see “How to Attach an Alphanumeric Terminal” on page 24 or “How to Configure a Local Graphics Console” on page 26.

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

See “Keyswitch Settings” on page 21 for information about each keyswitch setting.

4. Press the front panel Power button once.

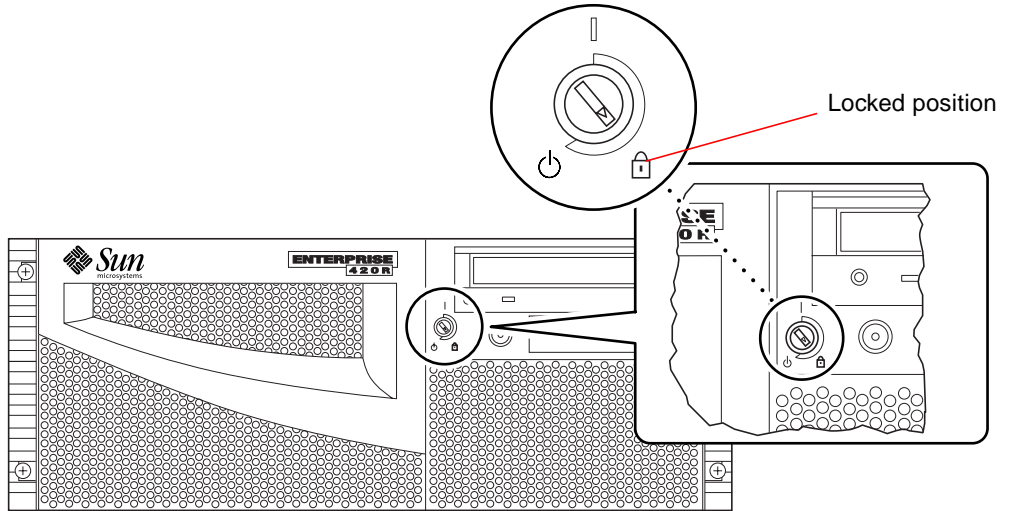
See “Keyswitch Settings” on page 21 for information about each keyswitch setting.



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 “Keyswitch Settings” on page 21 for information about each keyswitch setting.



How to Initiate a Reconfiguration Boot

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 “About Communicating With the Server” on page 23 or your *Sun Enterprise 420R 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.

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 “About the Status and Control Panel” on page 20.

To run OpenBoot™ Diagnostics(OBDiag) tests to verify that the system functions correctly with the new part(s) you have just installed, see “About OpenBoot Diagnostics (OBDiag)” on page 166.

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.

What Next

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

- “System LED Indicators” on page 22

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.

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.

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.**

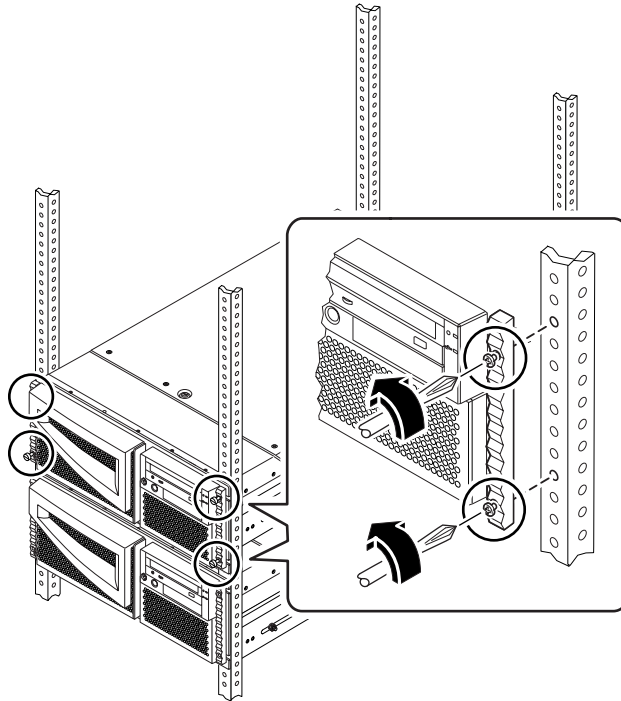
As you disconnect each cable, label it with a strip of masking tape indicating the cable's origin and its terminating connection.



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.

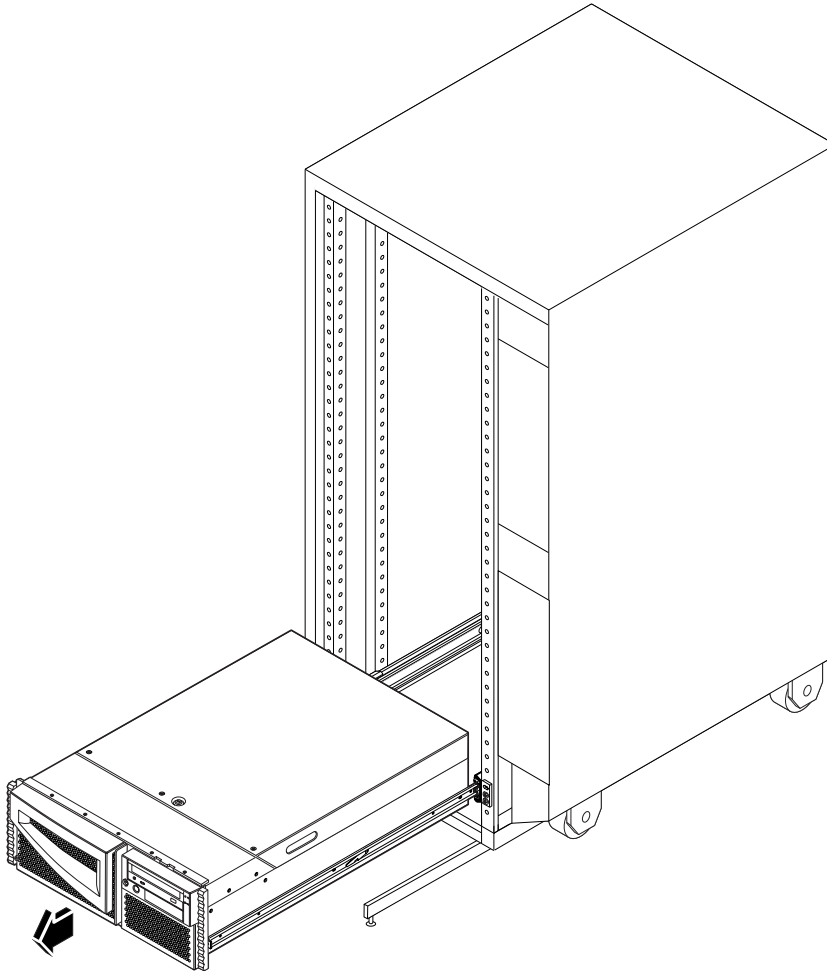
4. Loosen the four captive screws that secure the system to the left and right vertical rails at the front of the rack.

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.



What Next

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

- “How to Slide the System Into the Rack” on page 11

How to Slide the System Into the Rack

Before You Begin

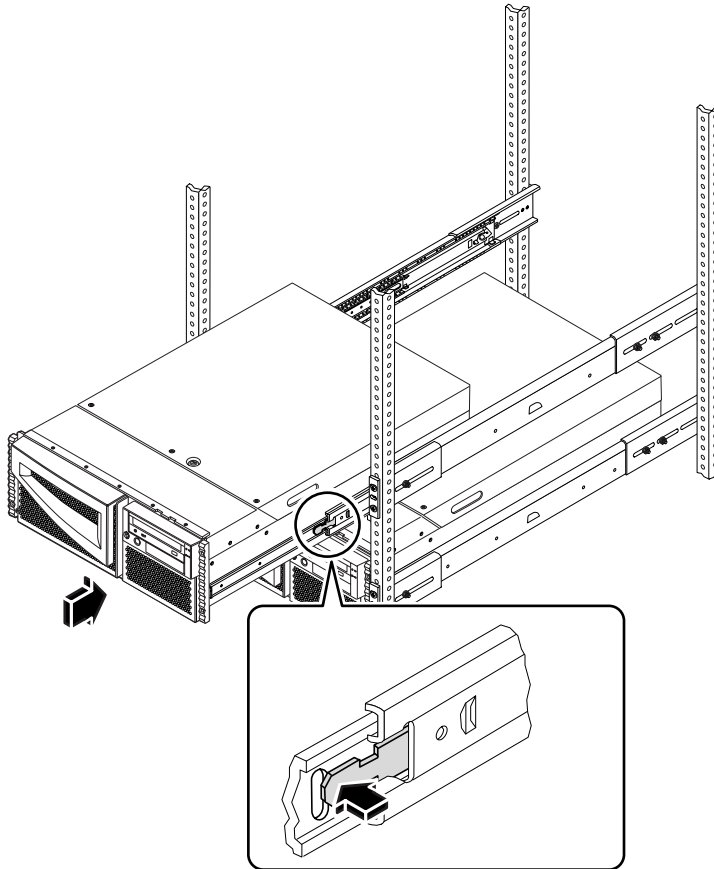
If you have been working inside the system, see:

- “How to Replace the System Cover” on page 16

What to Do

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

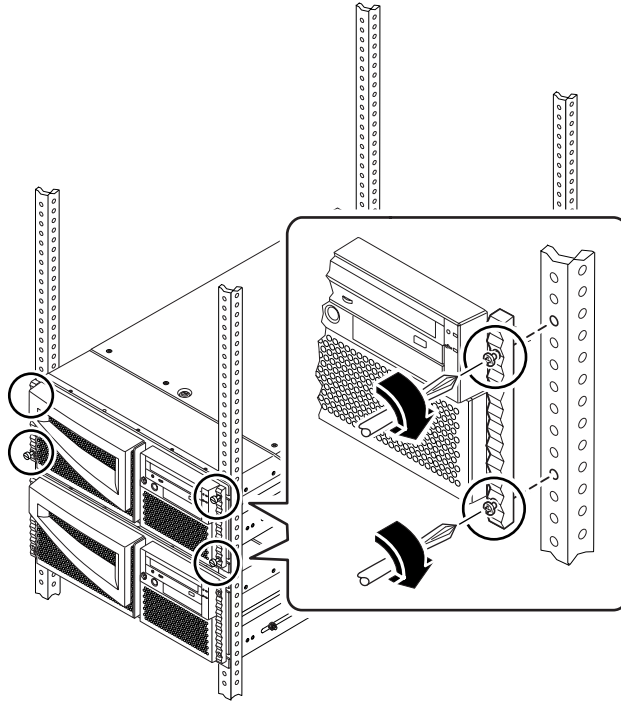
Press in on both spring catches to free the system glides. One flat spring catch is attached to each inner glide on the system chassis, as shown in the following figure



- 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.

What Next

To power on the system, see:

- "How to Power On the System" on page 3

How to Remove the System Cover



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

Before You Begin

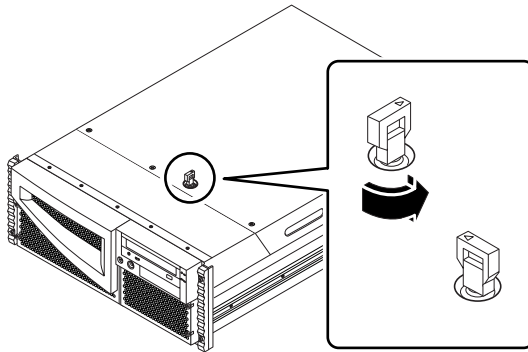
Complete this task:

- “How to Position the System for Service” on page 8

What to Do

1. Unlock the system cover.

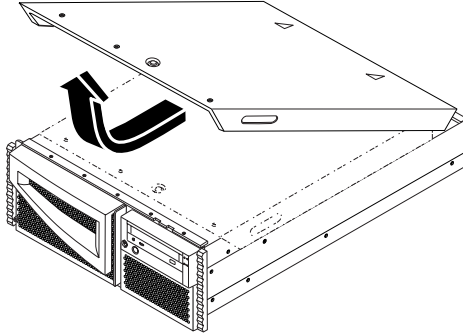
Use the front door key; turn the key counterclockwise to release the system cover.



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.



What Next

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

To reassemble the system, see:

- “How to Replace the System Cover” on page 16

How to Replace the System Cover

Before You Begin

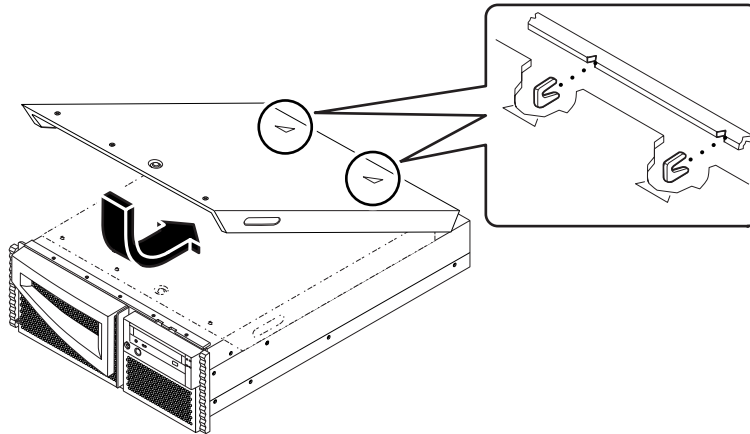


Caution – Do not operate the system while the system cover is removed.

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.**

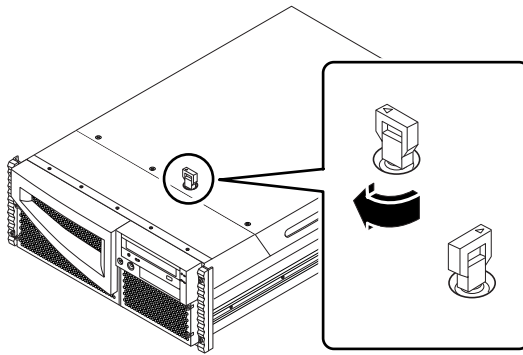
The system cover hinges on two recessed cutouts on the back panel of the enclosure.



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.



What Next

To restart the system, see:

- “How to Slide the System Into the Rack” on page 11
- “How to Power On the System” on page 3
- “How to Initiate a Reconfiguration Boot” on page 6

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.

Before You Begin

Complete these tasks:

- “How to Power Off the System” on page 2
- “How to Position the System for Service” on page 8
- “How to Remove the System Cover” on page 14

You must have the following items:

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

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.

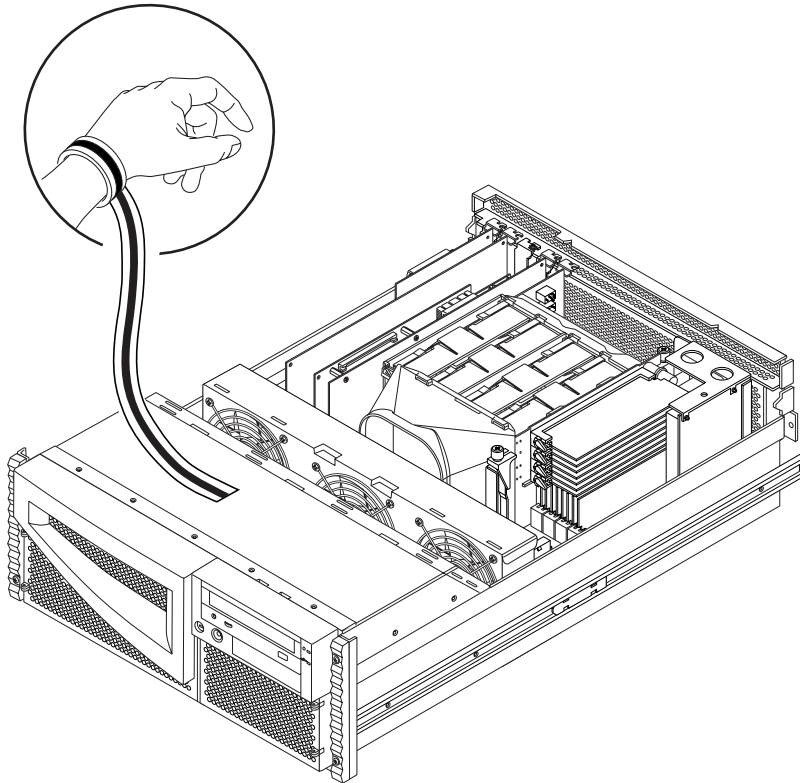
2. Use an antistatic mat or similar surface.

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.

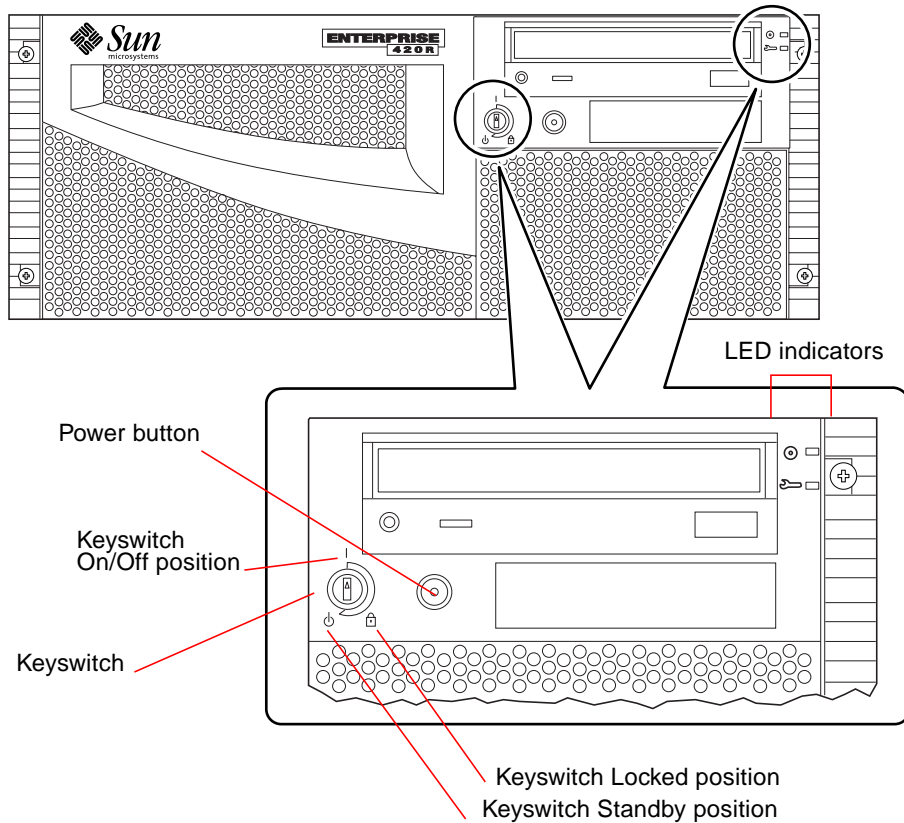
What Next

To reassemble the system, see:

- “How to Replace the System Cover” on page 16




About the Status and Control Panel

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



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. If Solaris is running, quickly pressing and releasing the power button initiates a software system shutdown.
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.

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).

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 “How to Attach an Alphanumeric Terminal” on page 24.

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

For information about establishing a `tip` connection, see your *Sun Enterprise 420R 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 “How to Configure a Local Graphics Console” on page 26.

How to Attach an Alphanumeric Terminal

Before You Begin

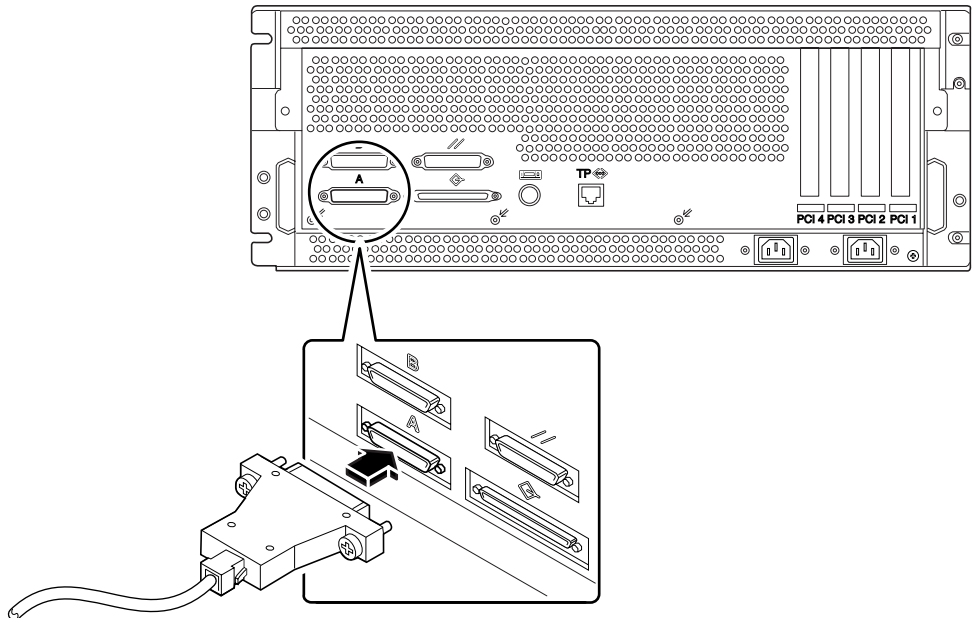
If your server is configured without a local graphics console, you need to attach an alphanumeric (ASCII) terminal (or establish a `tip` connection) to the server in order to install the system software and to run diagnostic tests. For background information, see “About Communicating With the Server” on page 23.

Alternatively, you can install a local graphics console on the server; see “How to Configure a Local Graphics Console” on page 26.

For information about establishing a `tip` connection, see your *Sun Enterprise 420R 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.

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.

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.

How to Configure a Local Graphics Console

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 “About Communicating With the Server” on page 23.

Alternatively, you can attach an alphanumeric (ASCII) terminal to the system’s serial port; see “How to Attach an Alphanumeric Terminal” on page 24.

To install a local graphics console, you must have:

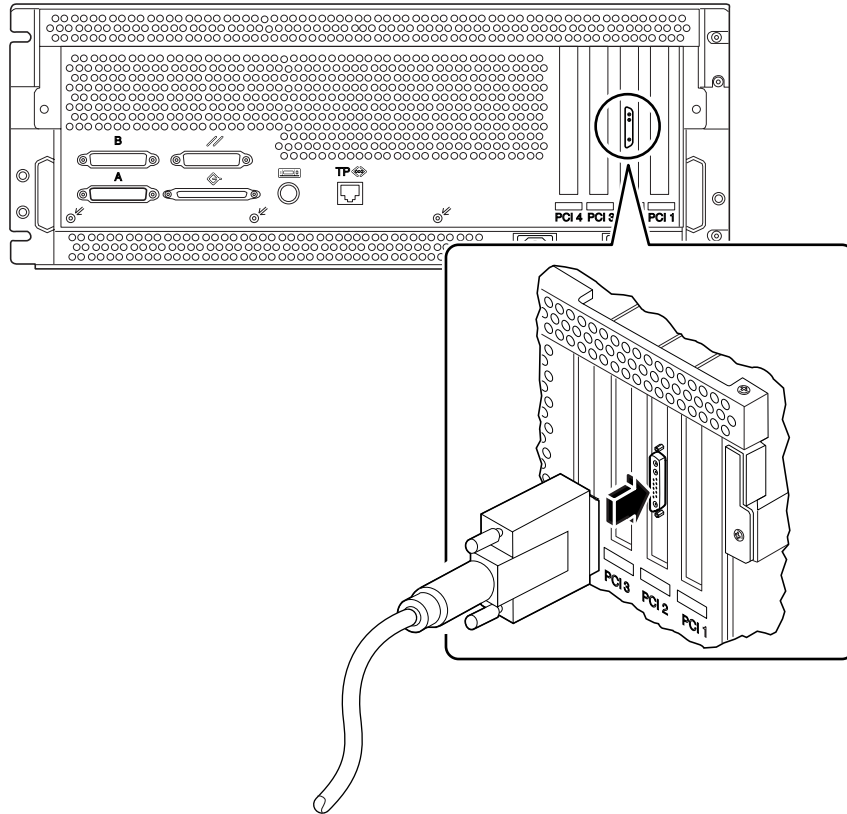
- A supported PCI-based graphics card
- A monitor with appropriate resolution
- A Sun-compatible keyboard
- A Sun-compatible mouse and mouse pad

What to Do

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

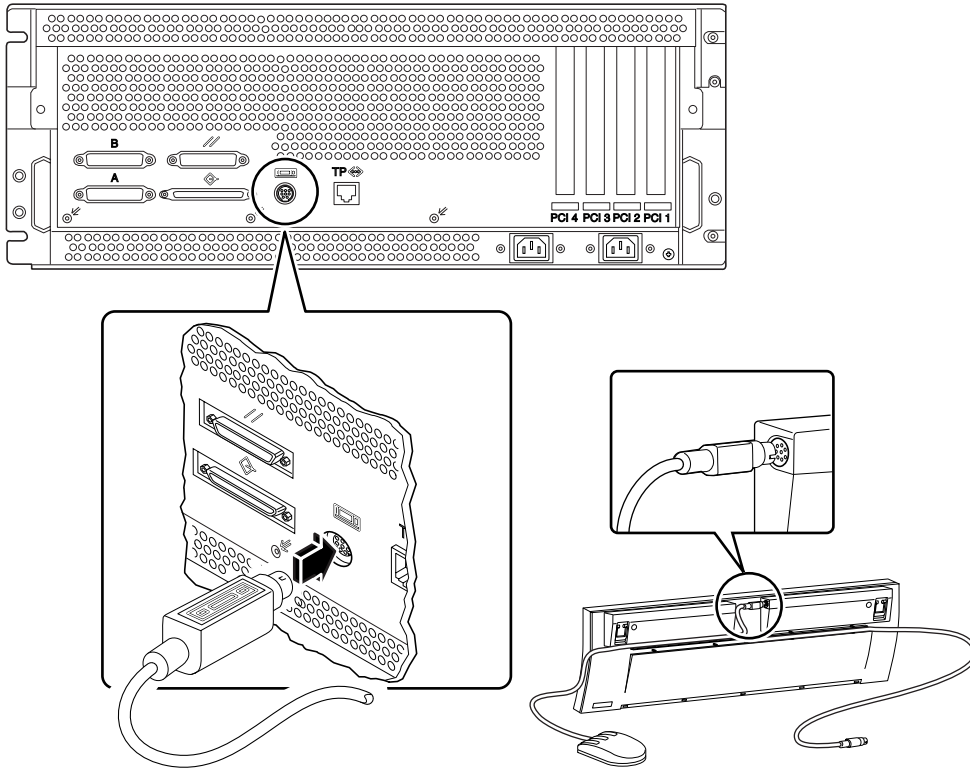
Note – Installation must be performed by a qualified Sun service provider. For further information, see “How to Install a PCI Card” on page 61.

- 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.

What Next

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

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
- Torque indicator driver, shipped with systems that do not have torque limiting screws on the memory riser assembly, Sun part number 340-6091
- 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 “How to Avoid Electrostatic Discharge” on page 18.

How to Remove the System From the Rack

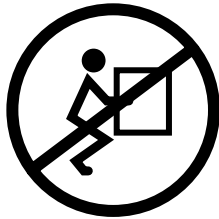
You must remove the system from the rack when removing and replacing the main logic board. You can perform all other procedures while the system is still attached to the rails extended from the rack. If you want to remove the system from the rack for any other reason, follow the instructions in this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



Before You Begin

Complete these tasks:

- Identify a helper to assist you in removing the system
- “How to Position the System for Service” on page 8

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.

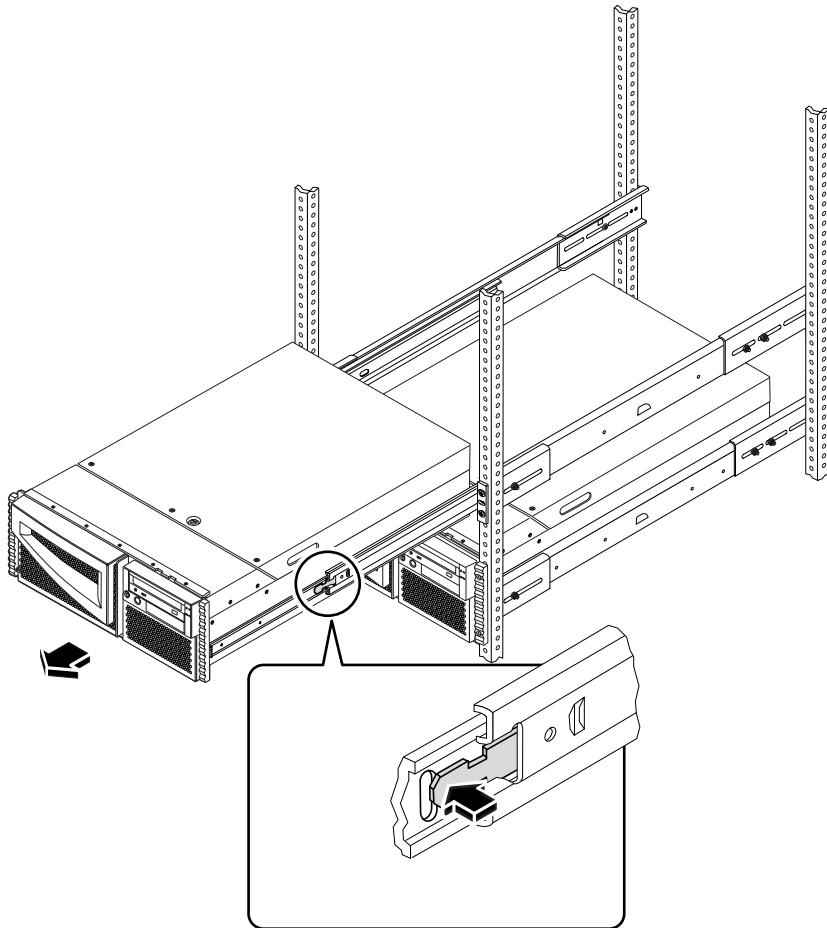
What to Do

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 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.**

What Next

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

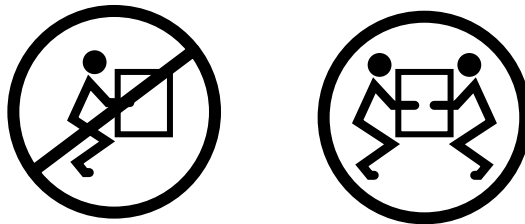
- “How to Place the System Into the Rack Glides” on page 34

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 420R 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.



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 “Tools Required for Installation and Service” on page 29.
- 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.

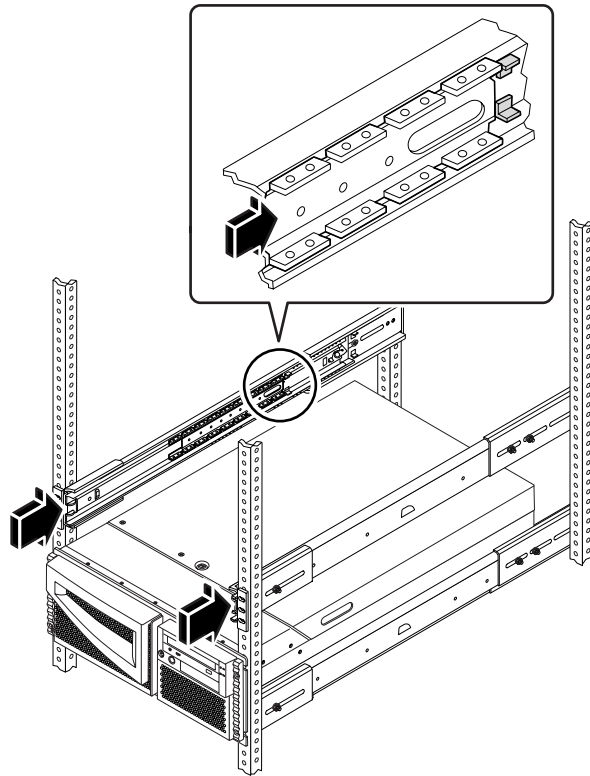
What to Do

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).

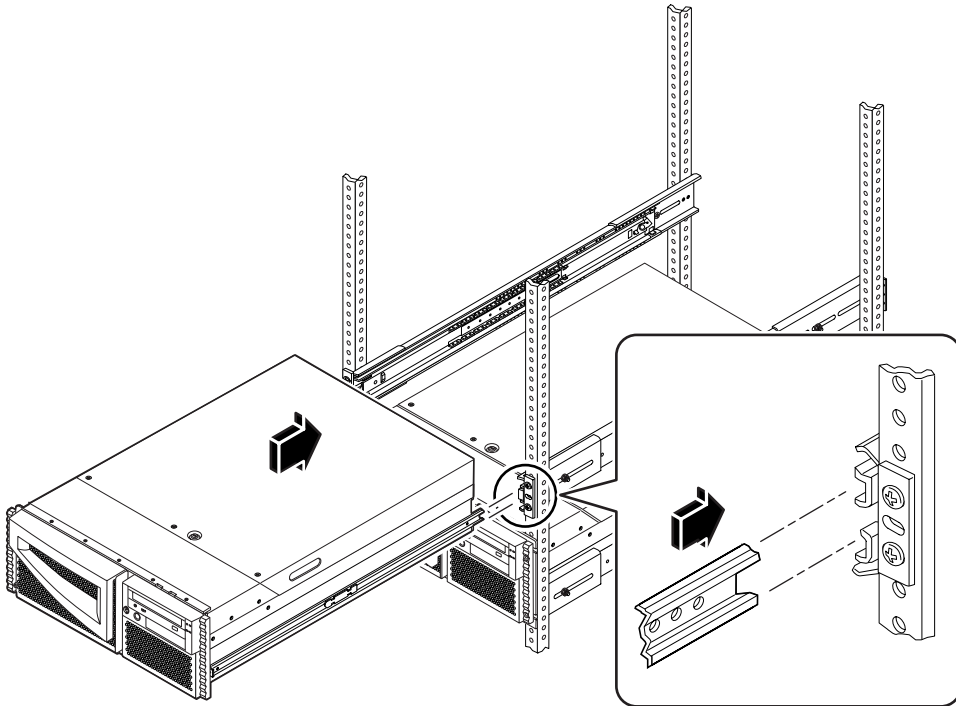
4. Lift the system.

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.

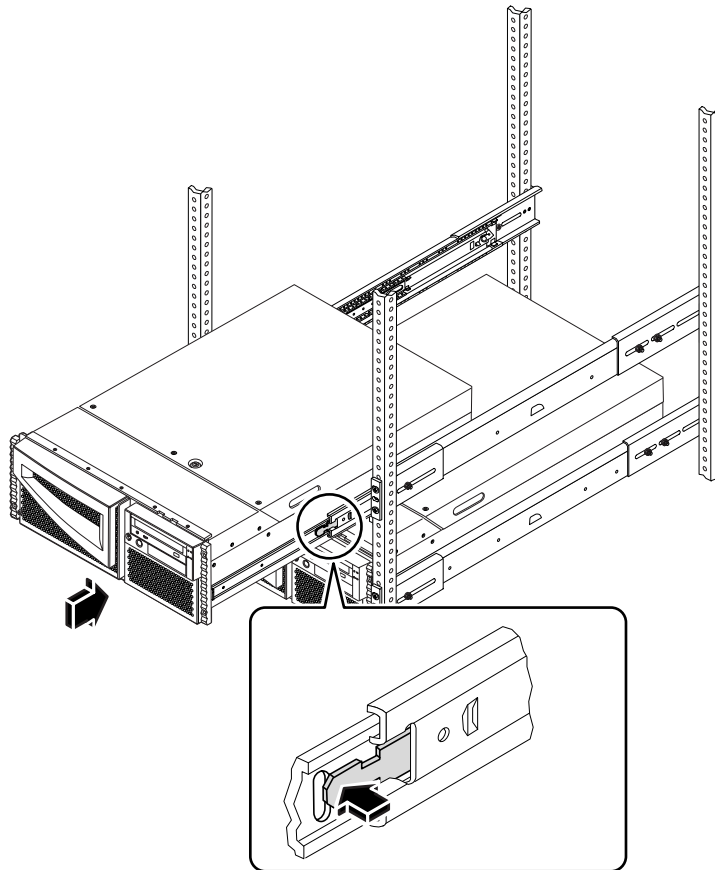
6. Insert the system glides into the inner slides of the rack glides.

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.



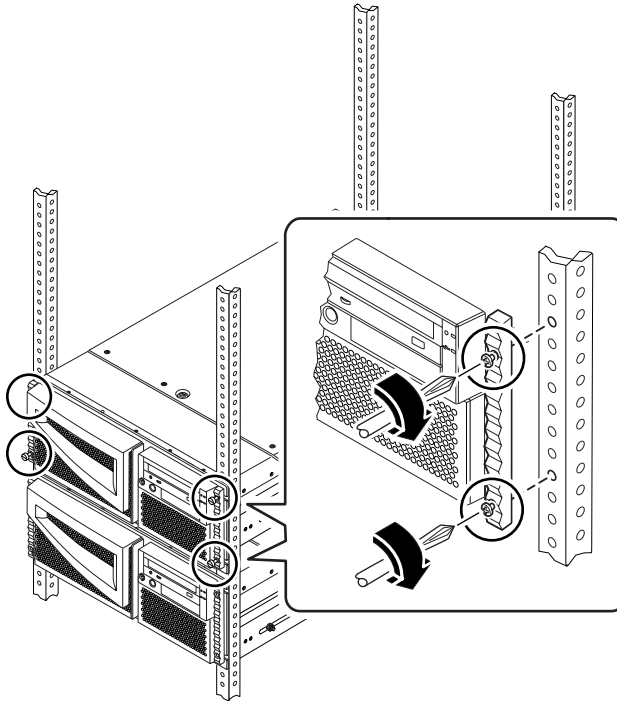
7. Slide the system smoothly into the rack until the flat spring catches stop the system.

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.

What Next

To power on the system, see:

- "How to Power On the System" on page 3

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 “Illustrated Parts Breakdown” on page 261.

The following tasks are covered in this chapter:

- “How to Remove the Memory Riser Assembly” on page 40
- “How to Replace the Memory Riser Assembly” on page 43
- “How to Remove a Memory Module” on page 46
- “How to Install a Memory Module” on page 48
- “How to Remove the DC-to-DC Converter” on page 54
- “How to Replace the DC-to-DC Converter” on page 56
- “How to Remove a PCI Card” on page 58
- “How to Install a PCI Card” on page 61
- “How to Remove a CPU Module” on page 65
- “How to Install a CPU Module” on page 68
- “How to Remove the NVRAM/TOD Module” on page 72
- “How to Replace the NVRAM/TOD Module” on page 74
- “How to Remove the Air Guide” on page 77
- “How to Replace the Air Guide” on page 79
- “How to Remove the CPU Card Cage Assembly” on page 81
- “How to Replace the CPU Card Cage Assembly” on page 83
- “How to Remove the Main Logic Board” on page 85
- “How to Replace the Main Logic Board” on page 89
- “How to Set the Serial Port Jumpers” on page 92
- “How to Set the Flash PROM Jumpers” on page 95

How to Remove the Memory Riser Assembly

Before You Begin

Complete these tasks:

- “How to Power Off the System” on page 2
- “How to Position the System for Service” on page 8
- “How to Remove the System Cover” on page 14
- “How to Avoid Electrostatic Discharge” on page 18
- “How to Remove the DC-to-DC Converter” on page 54



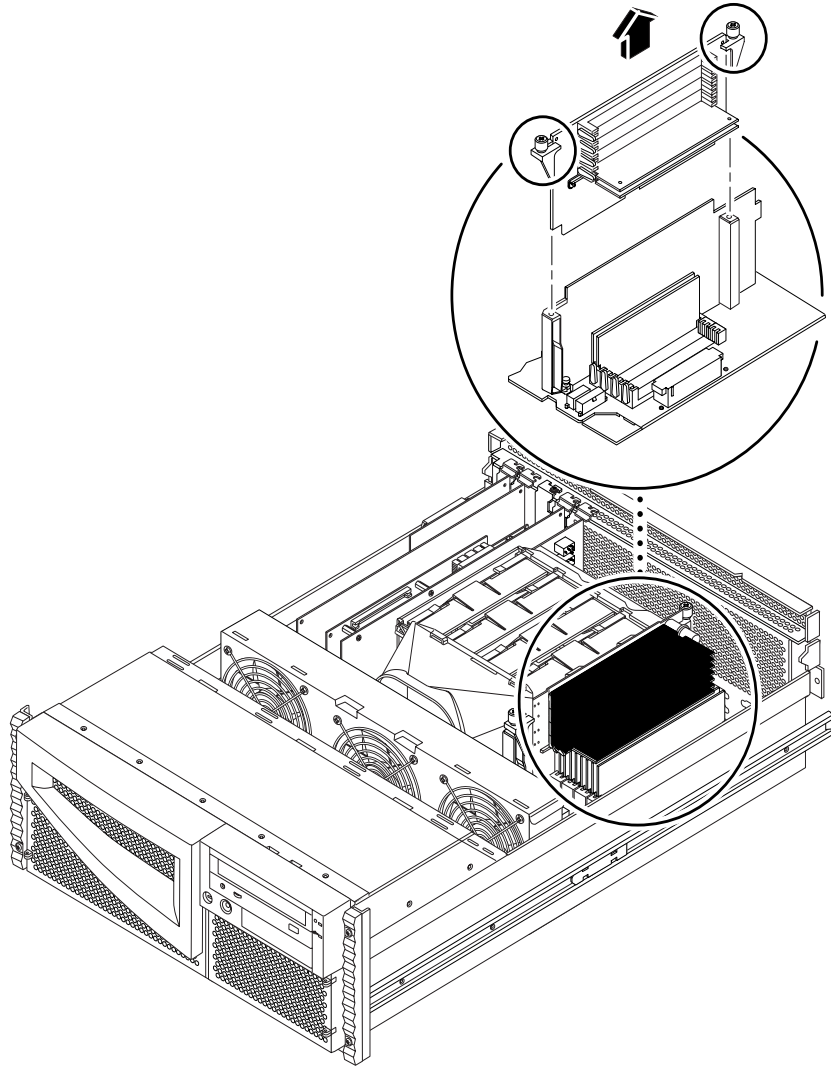
Caution – DIMMs are made of electronic components that are extremely sensitive to static electricity. Static electricity from your clothes or work environment can destroy the DIMM. Always wear a grounding strap when you handle the modules.



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.

What to Do

1. Using a Phillips #2 screwdriver, loosen the screws on the memory riser assembly. Once the screws have been loosened, you can use your fingers to loosen the screws as far as possible.



2. **Lift the memory riser assembly straight up and out of the system.**



Caution – Always lift the memory riser assembly straight up from the main logic board connectors to avoid damaging the connectors.

3. **Place the memory riser assembly on an antistatic mat.**

What Next

To replace the memory riser, complete this task:

- “How to Replace the Memory Riser Assembly” on page 43

How to Replace the Memory Riser Assembly

Before You Begin

Complete this task:

- “How to Avoid Electrostatic Discharge” on page 18



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 and the memory riser assembly.

The two thumbscrews on the top of the memory riser assembly will be one of two types:

If they have standard Phillips head screw holes, they are torque-limiting thumbscrews. You can tighten them with a Phillips #2 screwdriver.

If they have square-shaped screw head holes, you must tighten them with a torque-indicator driver to ensure that they are not overtightened.



Caution – Do not overtighten the thumbscrews on the memory riser. Overtightening these screws can damage the main logic board.

What to Do

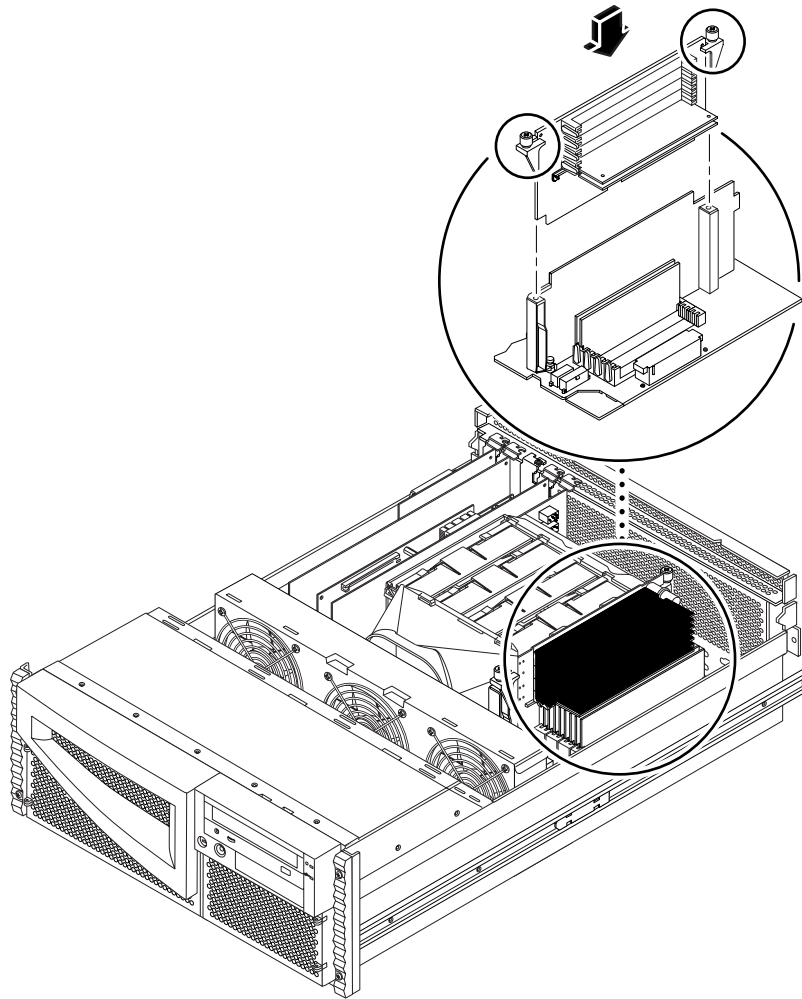
1. **Position the memory riser assembly on the main logic board connectors.**



Caution – The memory riser assembly connectors must be seated straight into the main logic board socket to avoid damaging the main logic board connection pins.

2. Ease the memory riser assembly into the main logic board socket.

Using your thumbs, apply pressure evenly along the top edge of the riser assembly.



3. Using your fingers, tighten the thumbscrews simultaneously on the memory riser assembly.



Caution – Do not overtighten the thumbscrews on the memory riser. Overtightening these screws can damage the main logic board.

4. Finish tightening the thumbscrews on the memory riser assembly.



Caution – Overtightening the screws can damage the main logic board.

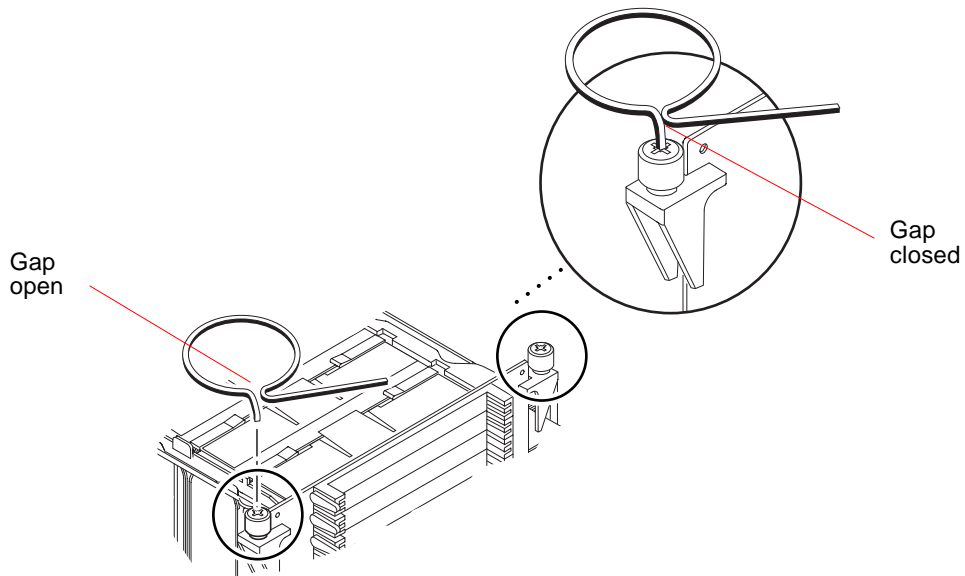
Use the method that is appropriate to the type of screws used in the assembly.

System with torque-limiting thumbscrews and a standard Phillips head:

- Use a Phillips # 2 screwdriver. A clicking sound indicates that the screws are fully tightened.

System with torque-limiting thumbscrews:

- Use the torque-indicator driver to tighten riser assemblies shipped without torque-limiting thumbscrews. Alternatively turn each thumbscrew clockwise one turn at a time. Stop turning each thumbscrew as soon as the gap on the torque-indicator driver closes.



What Next

Complete this task to reassemble the system:

- “How to Replace the DC-to-DC Converter” on page 56

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:

- “How to Use OpenBoot Diagnostics (OBdiag)” on page 169

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 256 Mbytes. See the *Sun Enterprise 420R Server Owner's Guide* for more information.

Before You Begin

Complete these tasks:

- “How to Power Off the System” on page 2
- “How to Position the System for Service” on page 8
- “How to Remove the System Cover” on page 14
- “How to Avoid Electrostatic Discharge” on page 18
- “How to Remove the Memory Riser Assembly” on page 40



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.

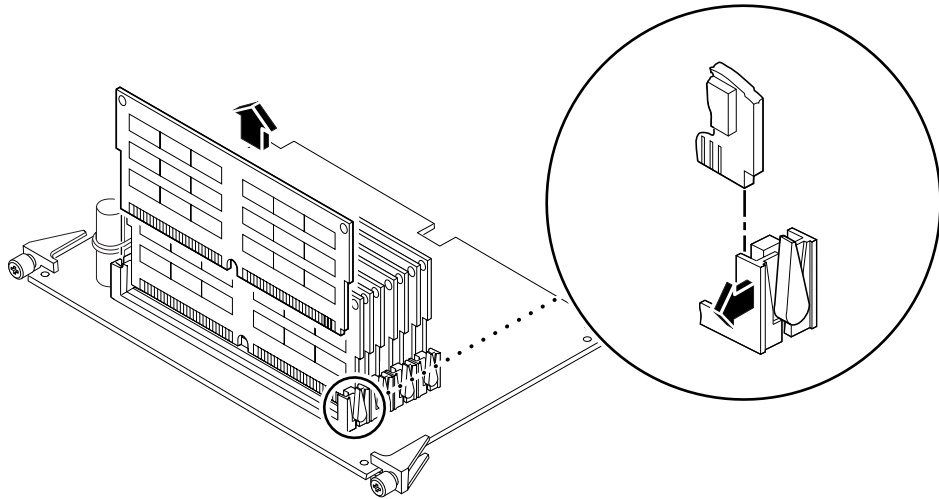
1. Locate the memory module(s) to be removed.

If the module is located on the memory riser assembly, remember that you must first remove the memory riser assembly before removing the memory modules.

Note – If the module to be removed is on a socket on the main logic board, use the same procedure explained in Steps 2 through 4.

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

Be sure that the back of the memory riser assembly is supported when you remove the module.



- 3. Grasp the top corners of the memory module and pull it out of its socket.**
- 4. Place the module on an antistatic mat.**
- 5. Repeat Steps 2 through 4 for each memory module being removed.**

What Next

To install a memory module, complete this task:

- “How to Install a Memory Module” on page 48

How to Install a Memory Module

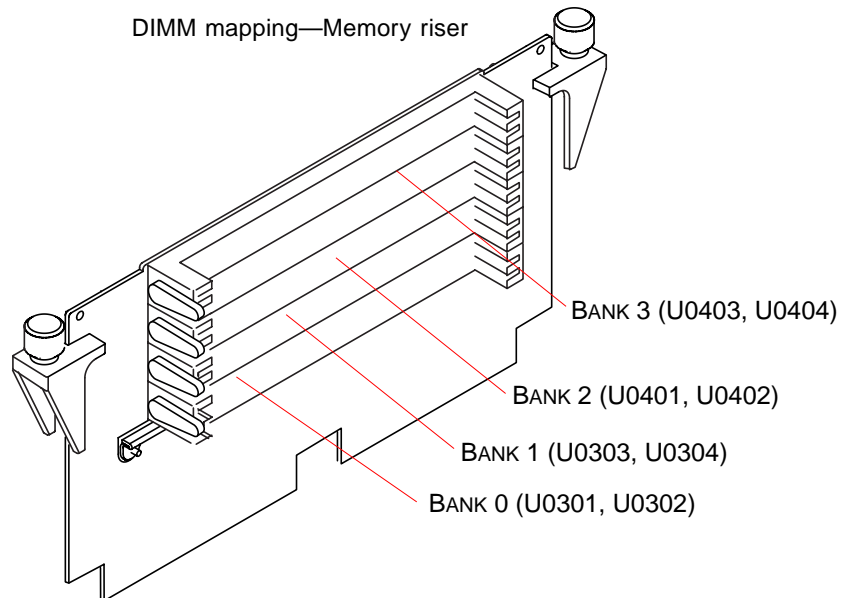
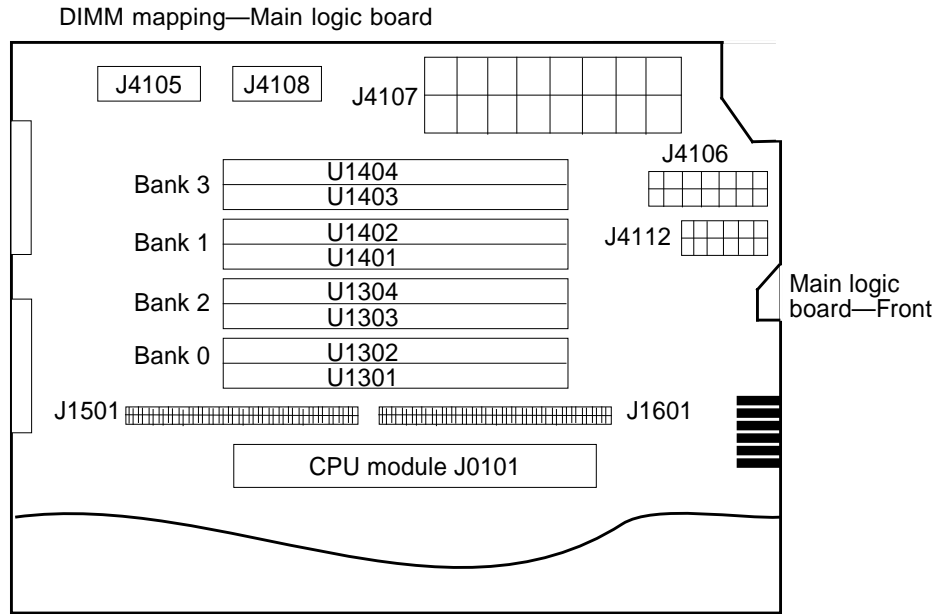
Memory modules for this system are dual inline memory modules (DIMMs). Each DIMM bank must contain four DIMMs of equal density (for example: four 64-Mbyte DIMMs) to function properly. Supported DIMM configuration options are 32, 64 and 256 Mbytes. See the *Sun Enterprise 420R Server Owner's Guide* for more information about memory.

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.
- In the Sun Enterprise 420R server, each memory bank comprises two slots on the main logic board and two slots on the memory riser card. As you add memory, fully populate a bank by inserting DIMMs into the two slots corresponding to that bank on *both* the main logic board and on the memory riser card.
- DIMM capacities can differ from one bank to the next—for example, four 64-Mbyte DIMMs installed in bank 0 and four 256-Mbyte DIMMs installed in bank 2 is permissible.

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



System Memory Interleaving

Whenever memory banks 0 and 1 are populated with identical capacity DIMMs, memory reads and writes are automatically interleaved between the two banks. This is called two-way interleaving. Two-way interleaving significantly reduces the average memory latency, thus improving overall system performance. When all four banks contain identical capacity DIMMs, the system interleaves across all four banks (called four-way interleaving) to further reduce average memory latency.

For maximum performance, install identical capacity DIMMs in all four memory banks. The following table lists how to best populate the memory banks when configuring a server for 512 Mbytes of memory.

Memory Performance Level	Memory Slot Population
Good	Banks 0 and 3 each have four, 64-Mbyte DIMMs (no interleaving)
Better	Banks 0 and 1 each have four 64-Mbyte DIMMs (2-way interleaving)
Best	Banks 0, 1, 2, and 3 all have four 64-Mbyte DIMMs (4-way interleaving)

Before You Begin

Complete these tasks:

- “How to Power Off the System” on page 2
- “How to Position the System for Service” on page 8
- “How to Remove the System Cover” on page 14
- “How to Avoid Electrostatic Discharge” on page 18
- “How to Remove the Memory Riser Assembly” on page 40



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.

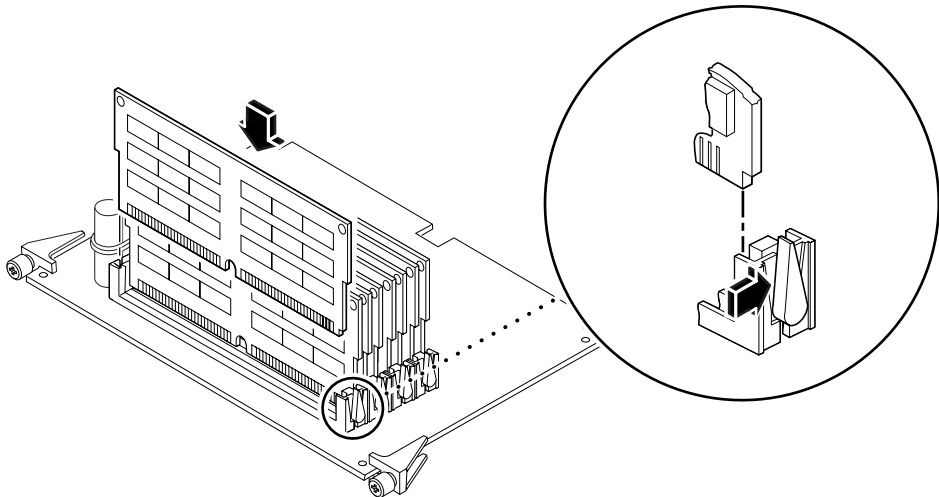
What to Do

1. Remove the new memory module from its antistatic packaging.
2. Locate the socket into which you will install the memory module.



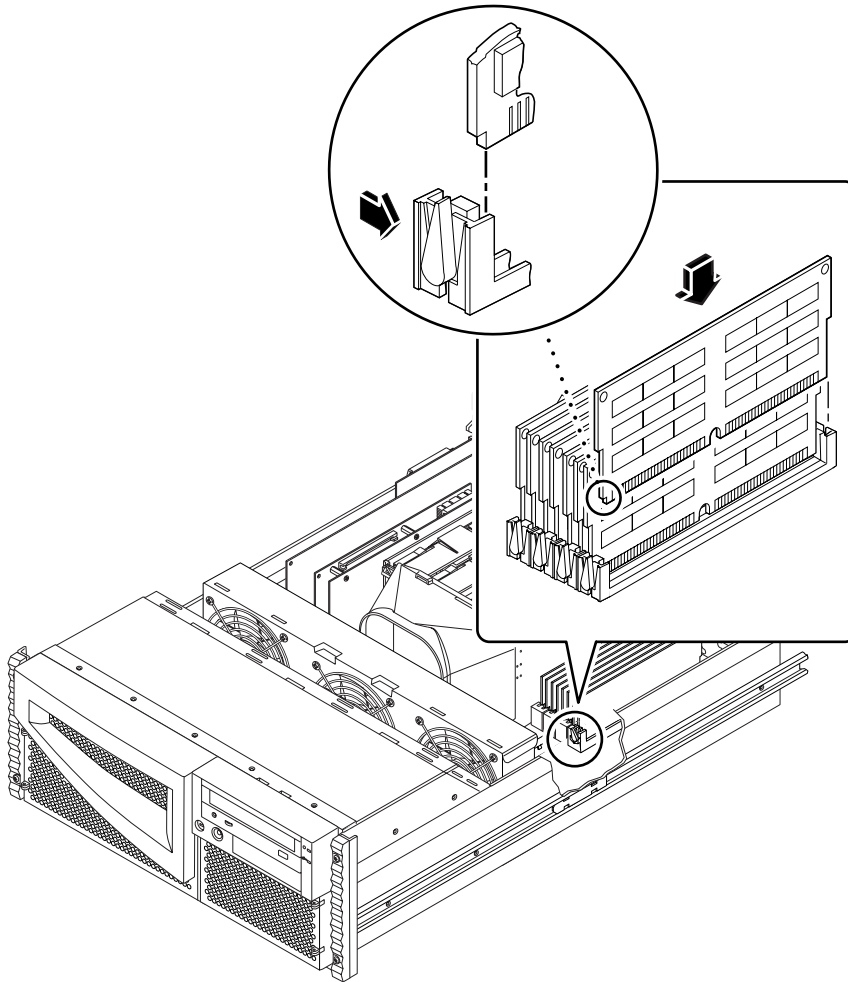
Caution – If you are installing a DIMM in the memory riser assembly, be sure to place the memory riser on an antistatic mat with the sockets facing up. You must support the assembly while inserting the DIMM to avoid flexing the card.

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.



Installing a DIMM in the memory riser assembly

4. **Align the module with its socket until it contacts the socket evenly along the socket's length.**



Installing a DIMM in the main logic board

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.**

What Next

Complete this task to reassemble the system:

- “How to Replace the Memory Riser Assembly” on page 43

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:

- “How to Use OpenBoot Diagnostics (OBDiag)” on page 169

How to Remove the DC-to-DC Converter

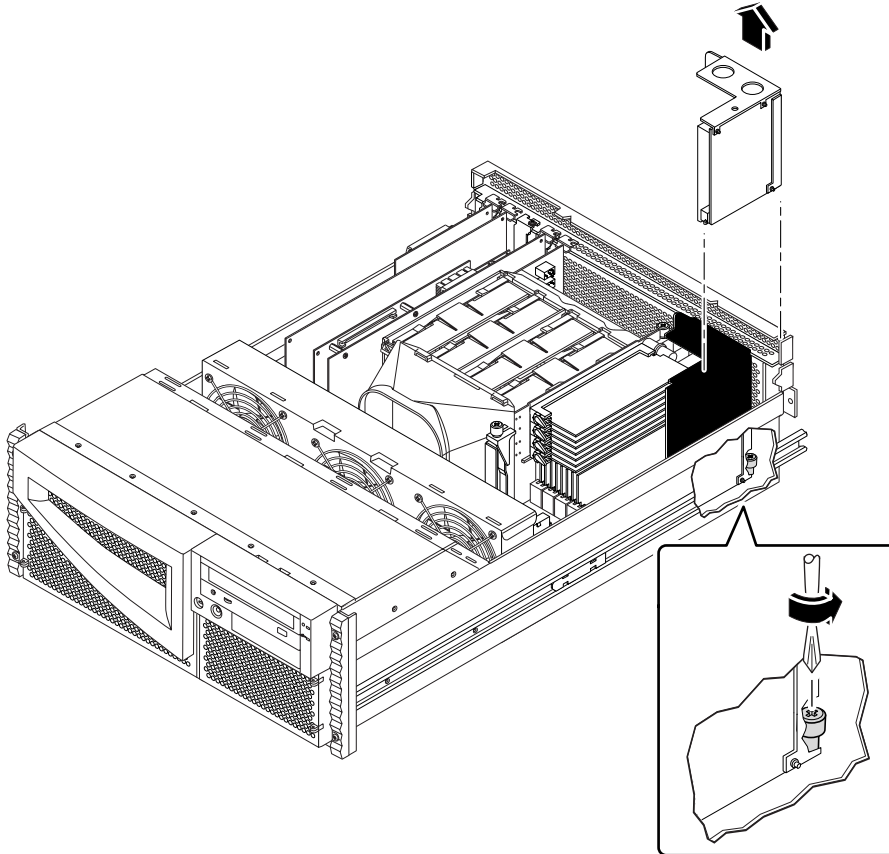
Before You Begin

Complete these tasks:

- “How to Power Off the System” on page 2
- “How to Position the System for Service” on page 8
- “How to Remove the System Cover” on page 14
- “How to Avoid Electrostatic Discharge” on page 18

What to Do

1. Using a Phillips #2 screwdriver, loosen the captive screw securing the DC-to-DC converter assembly to the main logic board.



2. Lift the converter straight up, disconnecting it from its main logic board connectors.

Use the two holes in the top of the converter's metal cage as finger grips.

What Next

Complete the following task to reassemble the system:

- “How to Replace the DC-to-DC Converter” on page 56

How to Replace the DC-to-DC Converter

Before You Begin

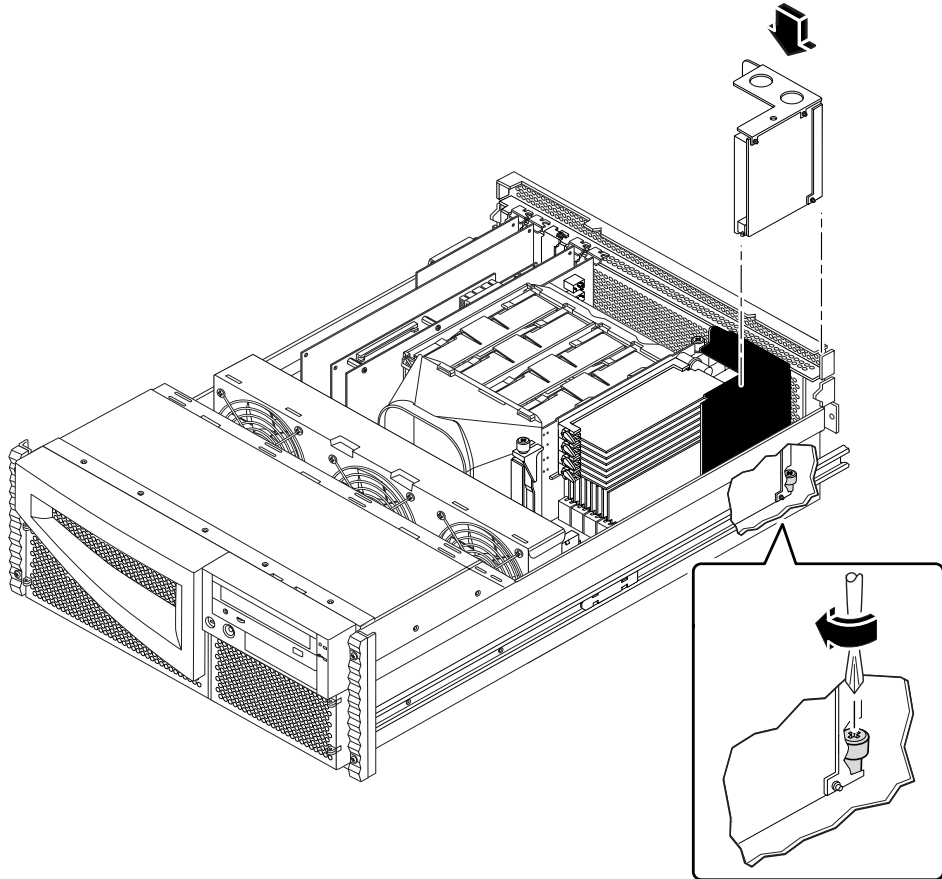
Complete this task:

- “How to Avoid Electrostatic Discharge” on page 18

What to Do

1. Align the DC-to-DC converter with its position in the chassis.

Make sure to align the two converter connectors with their main logic board connectors.



2. Lower the converter into place on the main logic board.

3. Using a Phillips #2 screwdriver, tighten the captive screw that secures the DC-to-DC converter assembly to the main logic board.

What Next

Complete this task to reassemble the system:

- “How to Replace the System Cover” on page 16

How to Remove a PCI Card

Before You Begin

Complete these tasks:

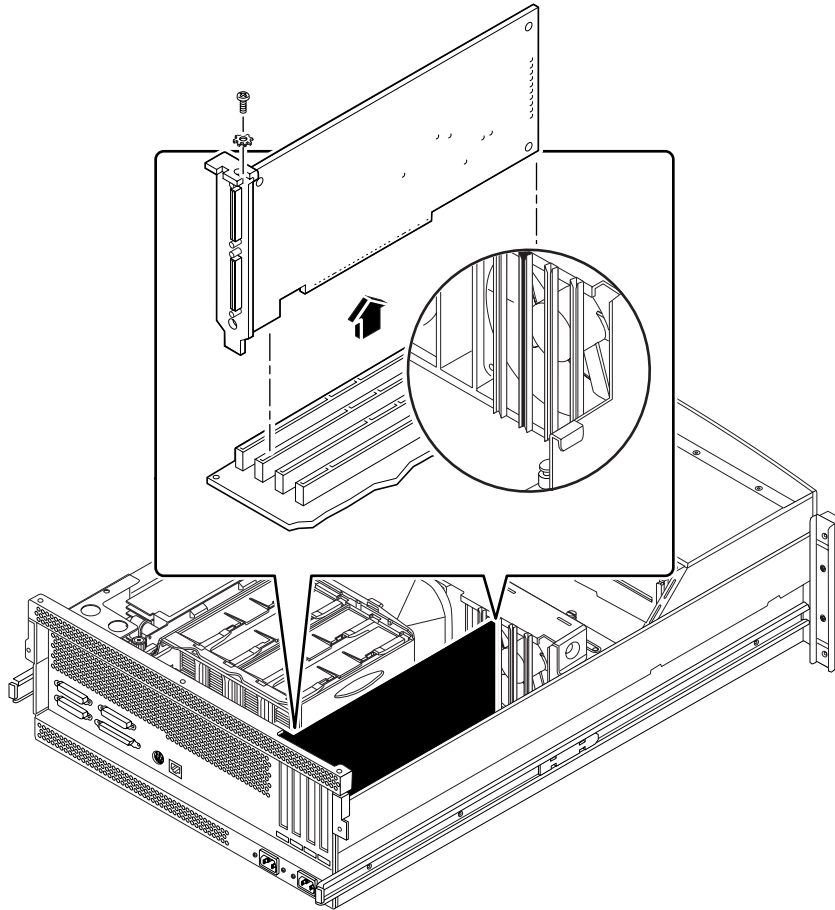
- “How to Power Off the System” on page 2
- “How to Position the System for Service” on page 8
- “How to Remove the System Cover” on page 14
- “How to Avoid Electrostatic Discharge” on page 18

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 and washer that secure the card to the system back panel.**



Caution – Do not apply excessive force to one end or one side of the card. Doing so could damage the card.

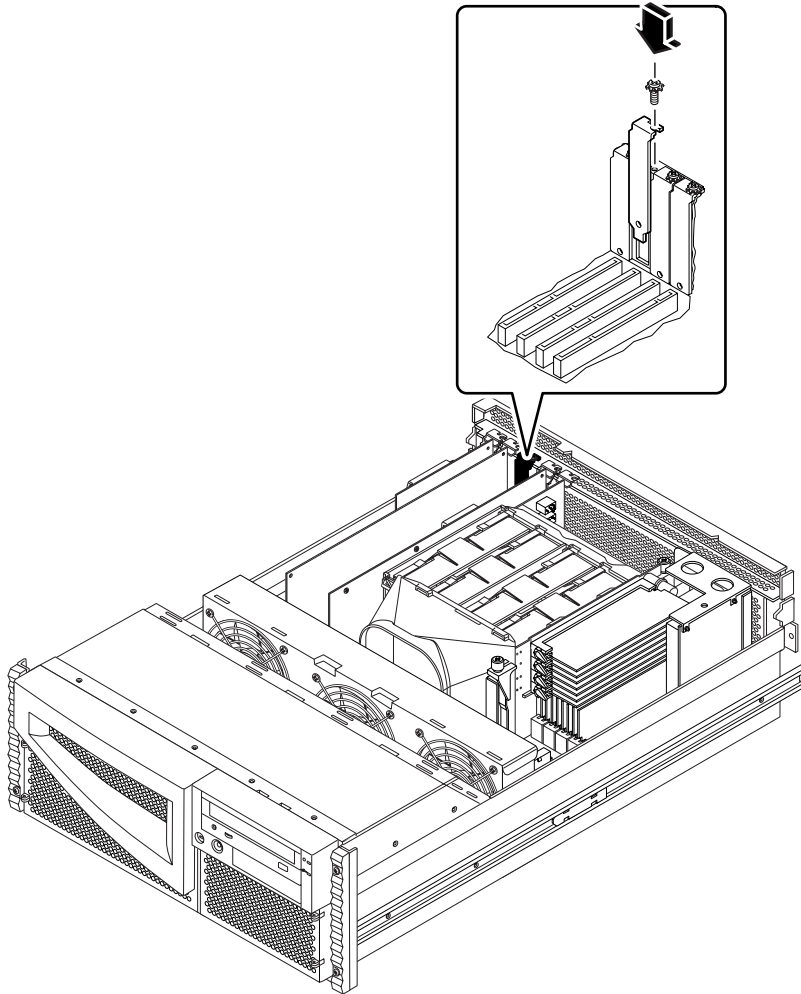


4. Pull the PCI card from its slot.

Hold the card by the faceplate and its opposite edge, and pull upward while gently 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.



What Next

To install a PCI card, complete this step:

- “How to Install a PCI Card” on page 61

How to Install a PCI Card

Before You Begin

Complete these tasks:

- “How to Power Off the System” on page 2
- “How to Position the System for Service” on page 8
- “How to Remove the System Cover” on page 14
- “How to Avoid Electrostatic Discharge” on page 18

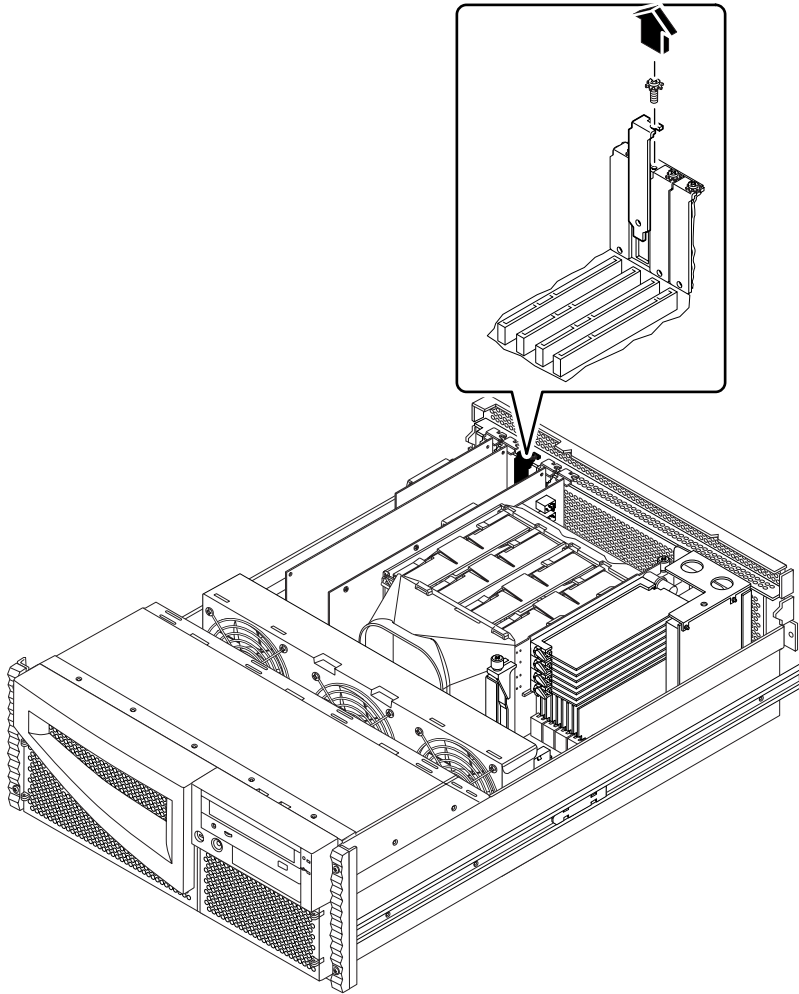
Read the documentation supplied with the PCI card for information about jumper settings, PCI slot requirements, and cable connections.

For information about the system’s PCI slots and locations, see “PCI Bus” on page 233.

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.

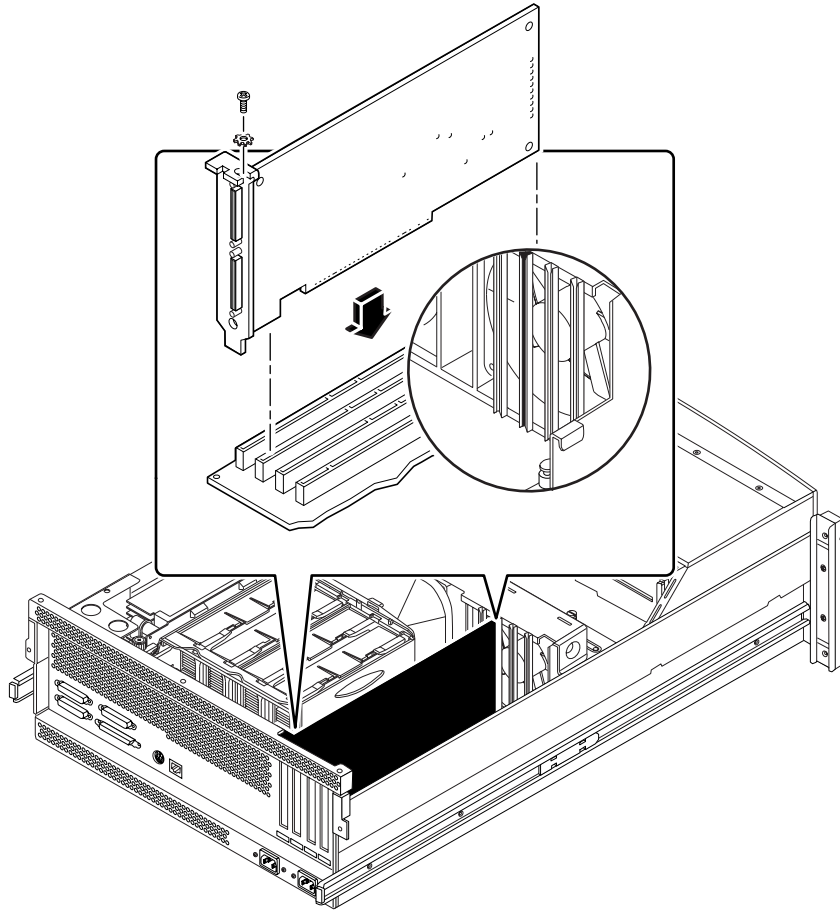


2. Insert the PCI card into the appropriate slot on the main logic board.

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 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.**

What Next

Complete this task to reassemble the system:

- “How to Replace the System Cover” on page 16

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:

- “How to Use OpenBoot Diagnostics (OBdiag)” on page 169

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

- “How to Initiate a Reconfiguration Boot” on page 6

How to Remove a CPU Module

Before You Begin

Complete these tasks:

- “How to Power Off the System” on page 2
- “How to Position the System for Service” on page 8
- “How to Remove the System Cover” on page 14
- “How to Avoid Electrostatic Discharge” on page 18

What to Do

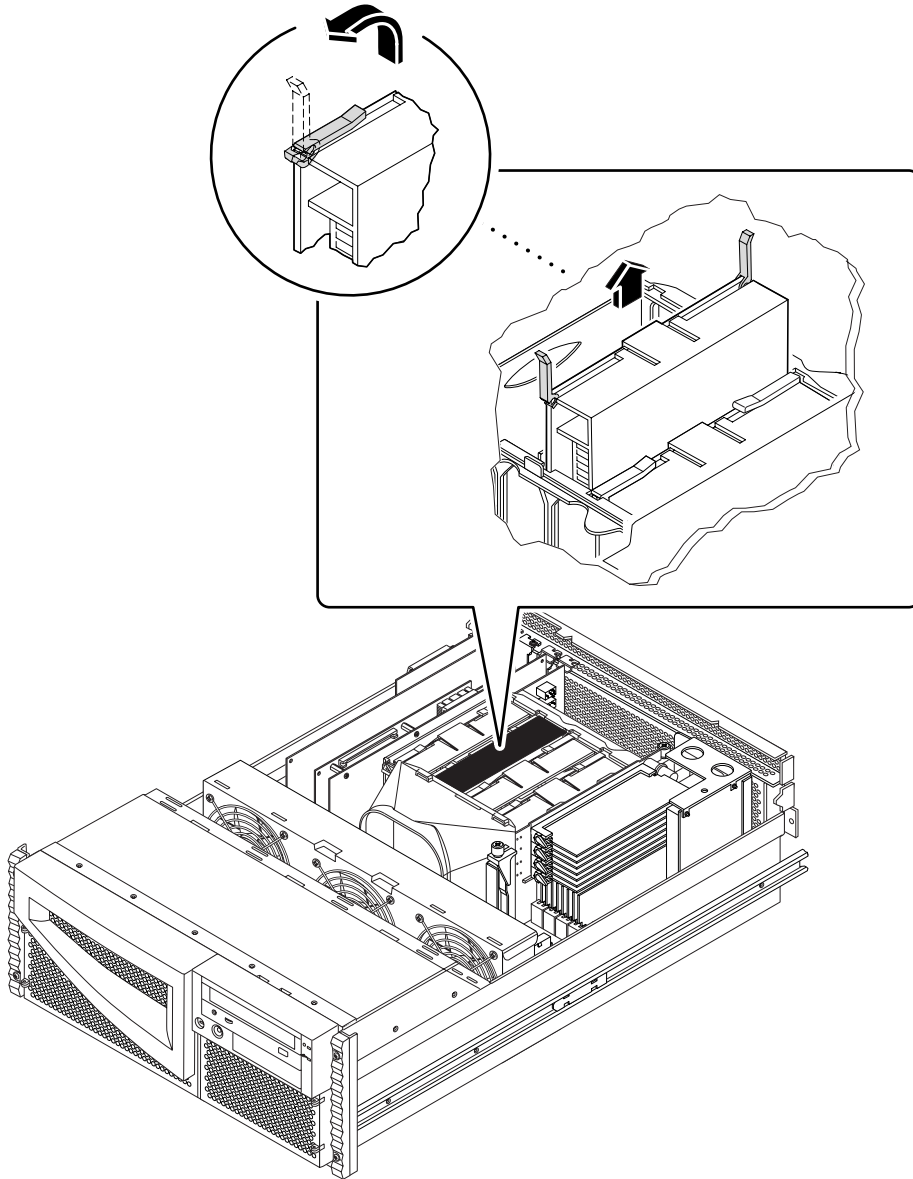


Caution – Your system will be shipped with CPU filler panels in every unpopulated CPU slot. If you remove and replace a CPU module, have the new CPU module on hand, if possible, before removing the defective one. If you must remove a CPU module before you have a replacement for it, you should obtain a filler panel and install it until you replace the CPU module. Contact your Sun service or sales representative for assistance if you do not have a CPU filler panel.

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

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.**
5. **If you are not replacing the CPU module, install a CPU filler panel.**

What Next

To install a CPU module, complete this task:

- “How to Install a CPU Module” on page 68

How to Install a CPU Module

Before You Begin

Complete these tasks:

- “How to Power Off the System” on page 2
- “How to Position the System for Service” on page 8
- “How to Remove the System Cover” on page 14
- “How to Avoid Electrostatic Discharge” on page 18

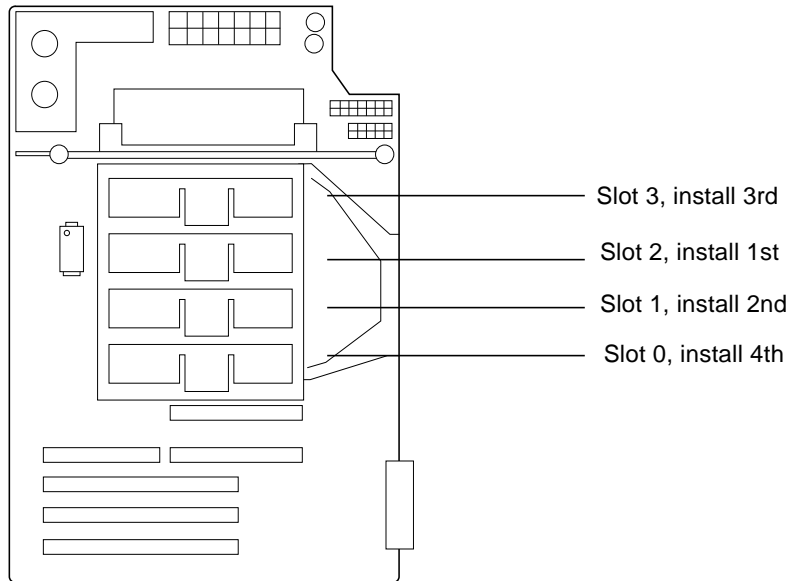
The system supports one, two, three, or four CPU module configurations. When replacing or installing CPU modules, you must fill the CPU slots in the following order.

System Configuration	Main Logic Board CPU Slot
One CPU	CPU slot 2
Two CPUs	CPU slots 2 and 1
Three CPUs	CPU slots 2, 1, and 3
Four CPUs	All Slots

For further information about CPU modules, see your *Sun Enterprise 420R Server Owner's Guide*.

What to Do

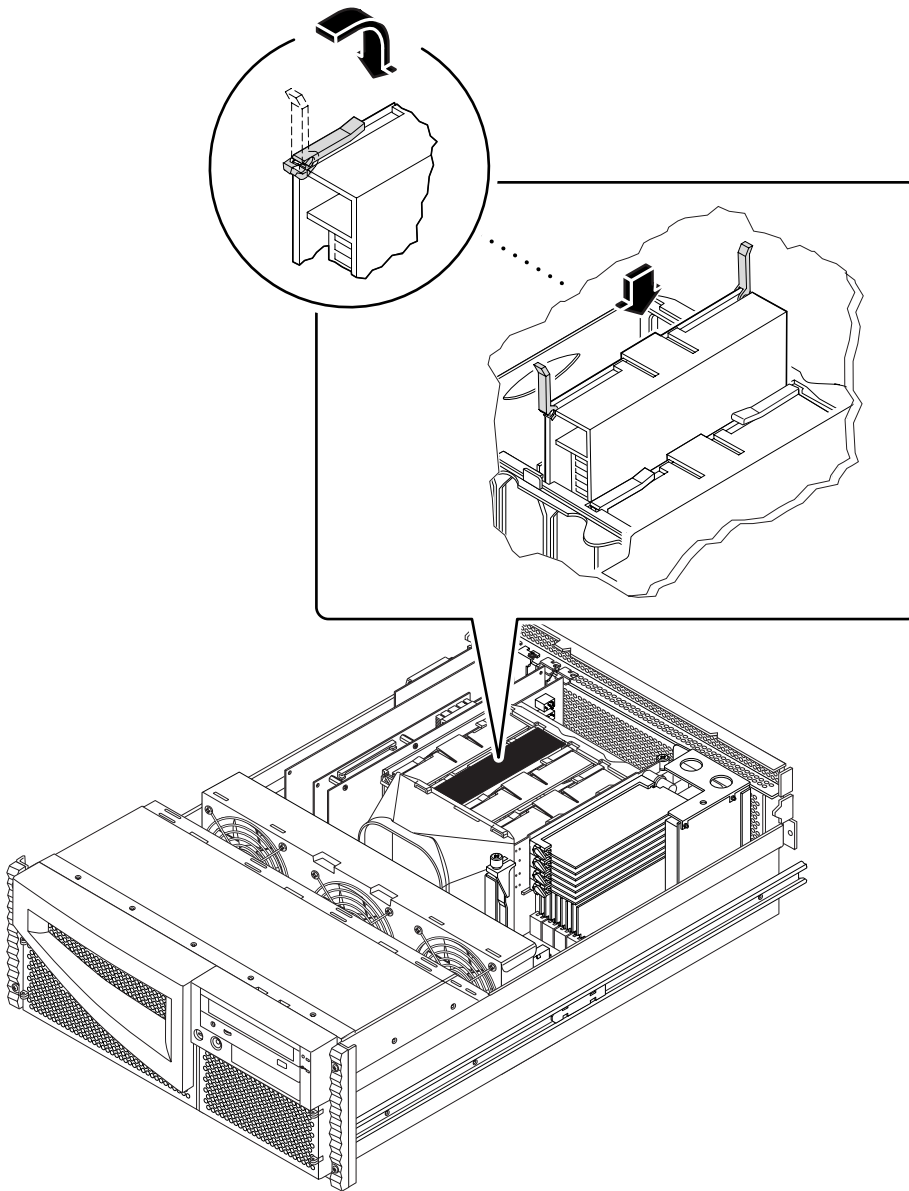
1. **Locate the appropriate slot for the CPU module that you are installing in the CPU card cage on the main logic board.**



2. **Remove the CPU filler panel if you are adding a new CPU module.**
Pull the CPU filler panel straight up from the CPU card cage assembly.
3. **Align the edges of the CPU module board with card guides in the CPU card cage.**
4. **Verify that the two ejection levers are open.**

5. Slide the CPU module evenly into the grooves in the CPU card cage.

Push down until the CPU module meets the connector at the back of the CPU card cage.



6. Engage the notch in each lever with its side of the CPU card cage.

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

What Next

Complete this task to reassemble the system:

- “How to Replace the System Cover” on page 16

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:

- “How to Use OpenBoot Diagnostics (OBDDiag)” on page 169

How to Remove the NVRAM/TOD Module

Before You Begin

Complete these tasks:

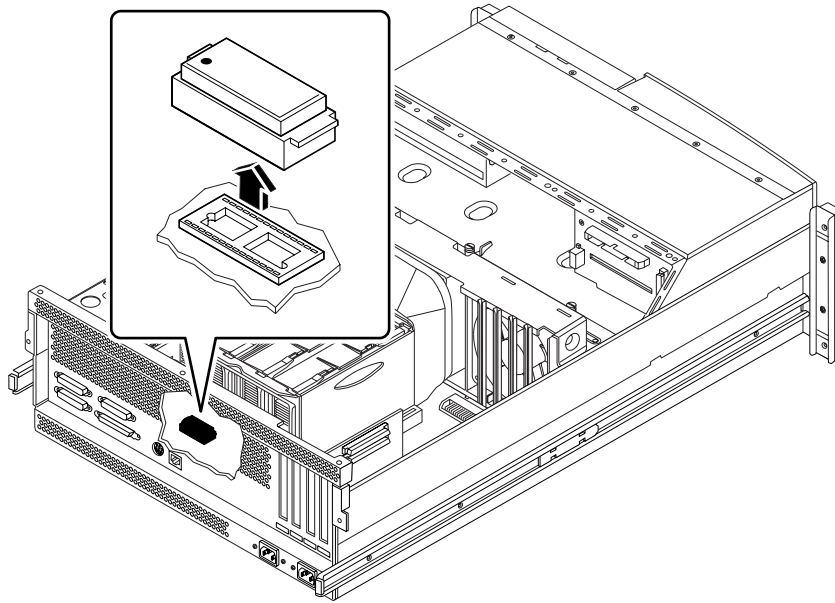
- “How to Power Off the System” on page 2
- “How to Position the System for Service” on page 8
- “How to Remove the System Cover” on page 14
- “How to Avoid Electrostatic Discharge” on page 18

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 and Ethernet address, consult your authorized Sun sales representative or service provider.

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.**

What Next

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

- “How to Replace the NVRAM/TOD Module” on page 74

How to Replace the NVRAM/TOD Module

Before You Begin

Complete this task:

- “How to Avoid Electrostatic Discharge” on page 18

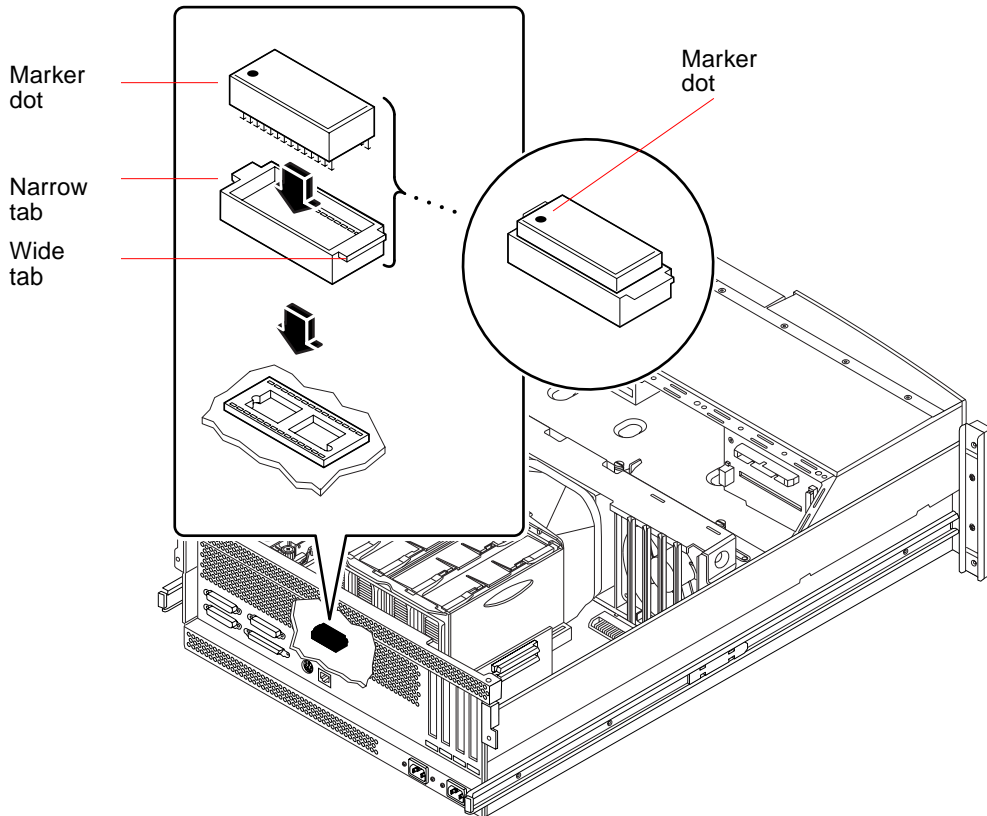
Note – If you are installing a new NVRAM/TOD module, the NVRAM/TOD must be programmed by a Sun authorized service representative before your system can resume normal operation. If you are installing a new main logic board, remember that you can migrate your former NVRAM/TOD module in order to preserve 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 “How to Set the Flash PROM Jumpers” on page 95.

What to Do

1. Insert the NVRAM/TOD module 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 in 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.



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

What Next

Complete the following task to reassemble the system:

- “How to Replace the System Cover” on page 16

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:

- “How to Use OpenBoot Diagnostics (OB DIAG)” on page 169

How to Remove the Air Guide

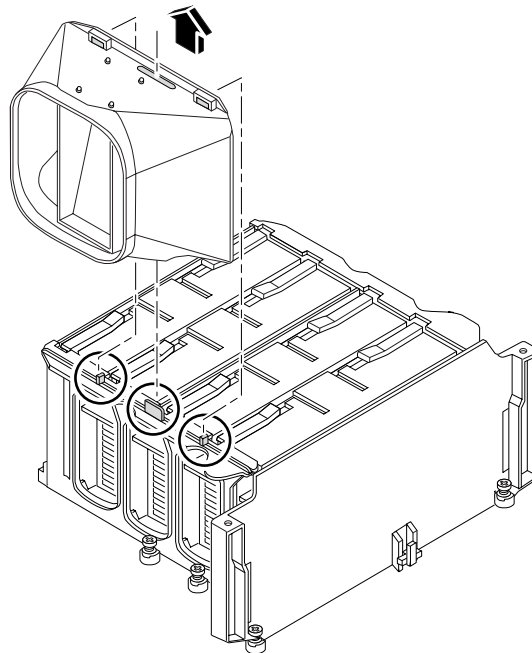
Before You Begin

Complete these tasks:

- “How to Power Off the System” on page 2
- “How to Position the System for Service” on page 8
- “How to Remove the System Cover” on page 14
- “How to Avoid Electrostatic Discharge” on page 18

What to Do

- **Gently pull the air guide up from the CPU card cage assembly.**
The air guide is attached to tabs on the top of the CPU card cage assembly.



What Next

To replace the air guide, complete this task:

- “How to Replace the Air Guide” on page 79

How to Replace the Air Guide

Before You Begin

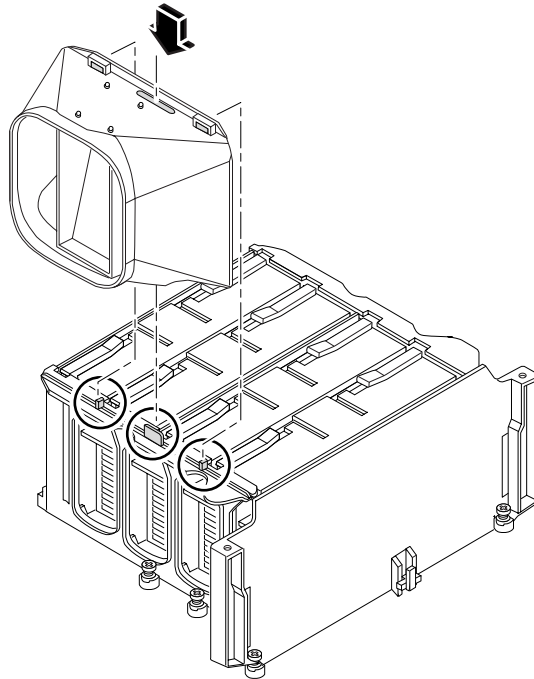
Complete this task:

- “How to Avoid Electrostatic Discharge” on page 18

What to Do

1. **Position the air guide on the CPU card cage assembly.**
2. **Gently press the air guide onto the CPU card cage assembly tab.**

Guide the air guide tab on the bottom of the air guide into the notch on the main logic board.



What Next

Complete the following task to reassemble the system:

- “How to Replace the System Cover” on page 16

How to Remove the CPU Card Cage Assembly

Before You Begin

Complete these tasks:

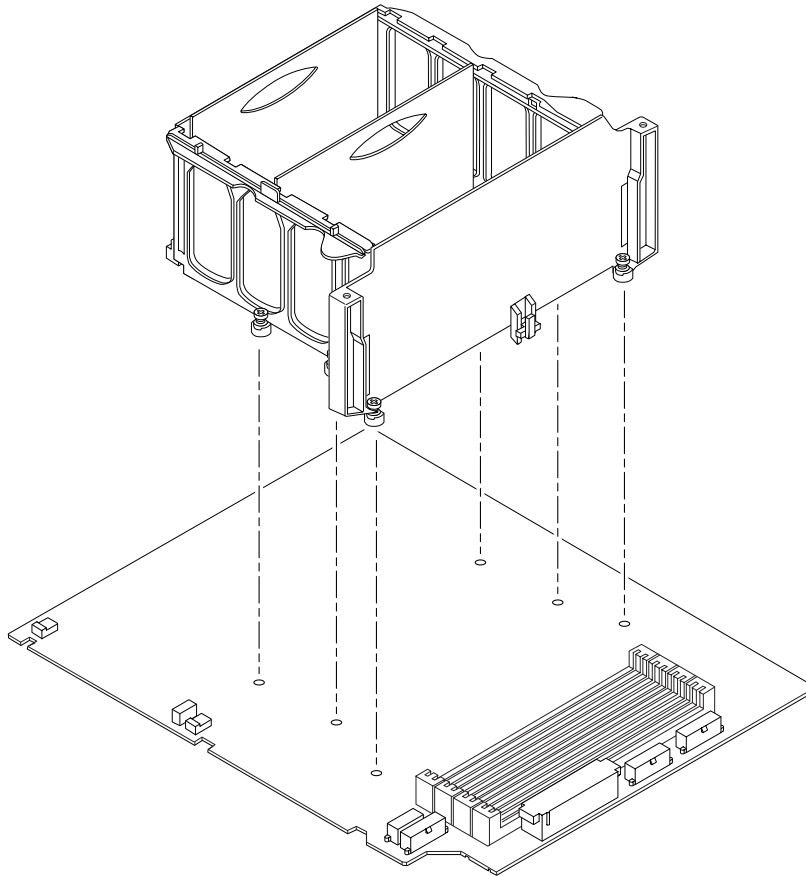
- “How to Power Off the System” on page 2
- “How to Position the System for Service” on page 8
- “How to Remove the System Cover” on page 14
- “How to Avoid Electrostatic Discharge” on page 18
- “How to Remove the Air Guide” on page 77
- “How to Remove a CPU Module” on page 65

Note – Remove CPU modules prior to removing the card cage.

What to Do

1. **Loosen the six 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.



What Next

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

- “How to Replace the CPU Card Cage Assembly” on page 83

How to Replace the CPU Card Cage Assembly

Before You Begin

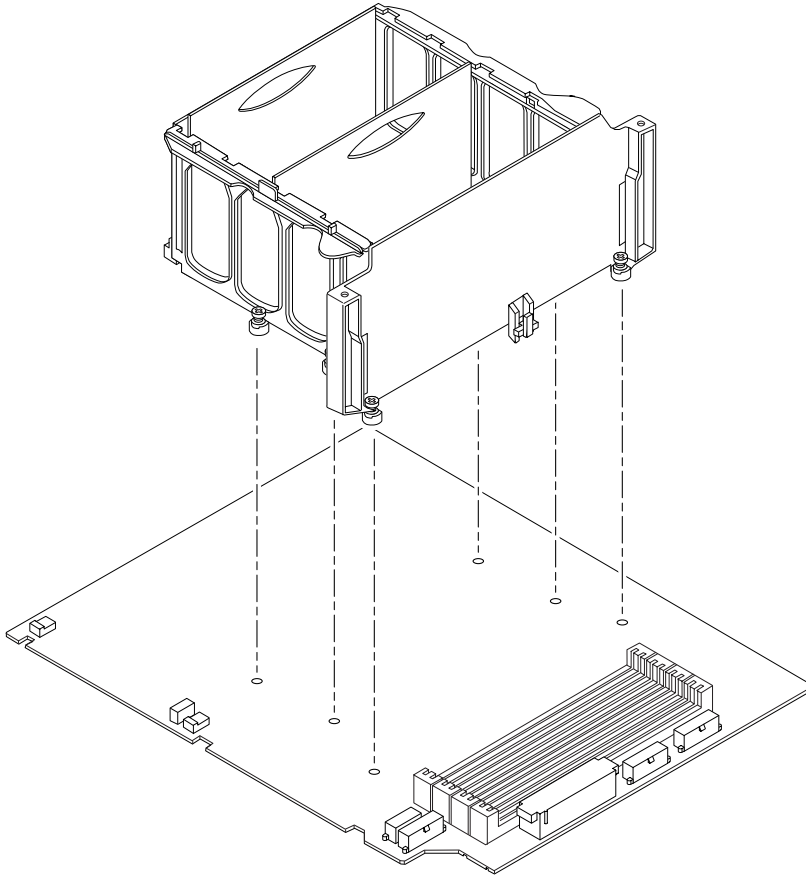
Complete this task:

- “How to Avoid Electrostatic Discharge” on page 18

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 six captive screws that secure the CPU card cage assembly to the main logic board.**

Use a Phillips #2 screwdriver to tighten the screws.

What Next

Complete these tasks to reassemble the system:

- “How to Replace the Air Guide” on page 79
- “How to Install a CPU Module” on page 68

How to Remove the Main Logic Board

Before You Begin



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.

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:

- “How to Power Off the System” on page 2
- “How to Remove the System From the Rack” on page 30
- “How to Remove the System Cover” on page 14
- “How to Avoid Electrostatic Discharge” on page 18
- “How to Remove the DC-to-DC Converter” on page 54
- “How to Remove the Memory Riser Assembly” on page 40
- “How to Remove a Memory Module” on page 46
- “How to Remove a PCI Card” on page 58
- “How to Remove the NVRAM/TOD Module” on page 72
- “How to Remove a CPU Module” on page 65
- “How to Remove the Air Guide” on page 77
- “How to Remove the CPU Card Cage Assembly” on page 81



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

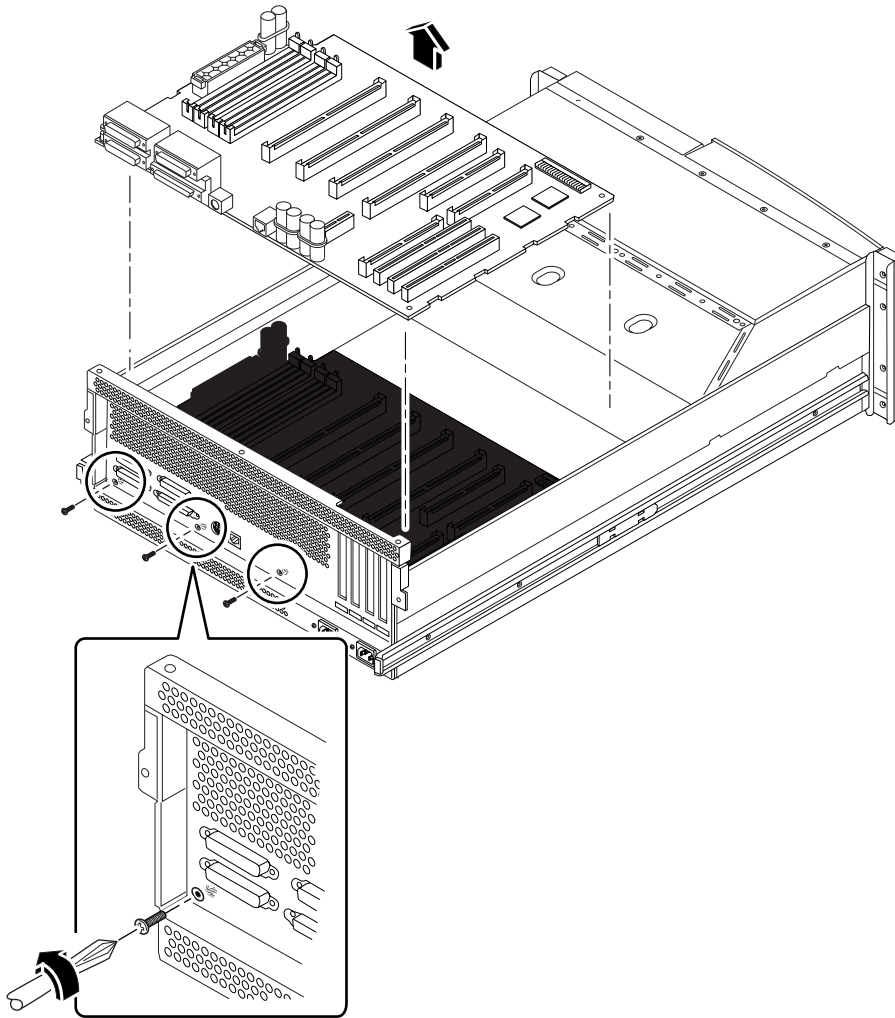
What to Do

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 "How to Connect the System Cables" on page 130.

- a. Disconnect the main power cable from connector J4107.**
- b. Disconnect the CPU power sense cable from connector J4106.**
- c. Disconnect the UltraSCSI data cable from connector J2101.**
- d. Disconnect the control cable from connector J4111.**

2. Remove the three screws securing the main logic board to the system 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 is free.
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 “How to Set the Serial Port Jumpers” on page 92 and “How to Set the Flash PROM Jumpers” on page 95.

What Next

To replace the main logic board, complete this task:

- “How to Replace the Main Logic Board” on page 89

How to Replace the Main Logic Board

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:

- “How to Remove the Main Logic Board” on page 85



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 the following task:

- “How to Avoid Electrostatic Discharge” on page 18

What to Do

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



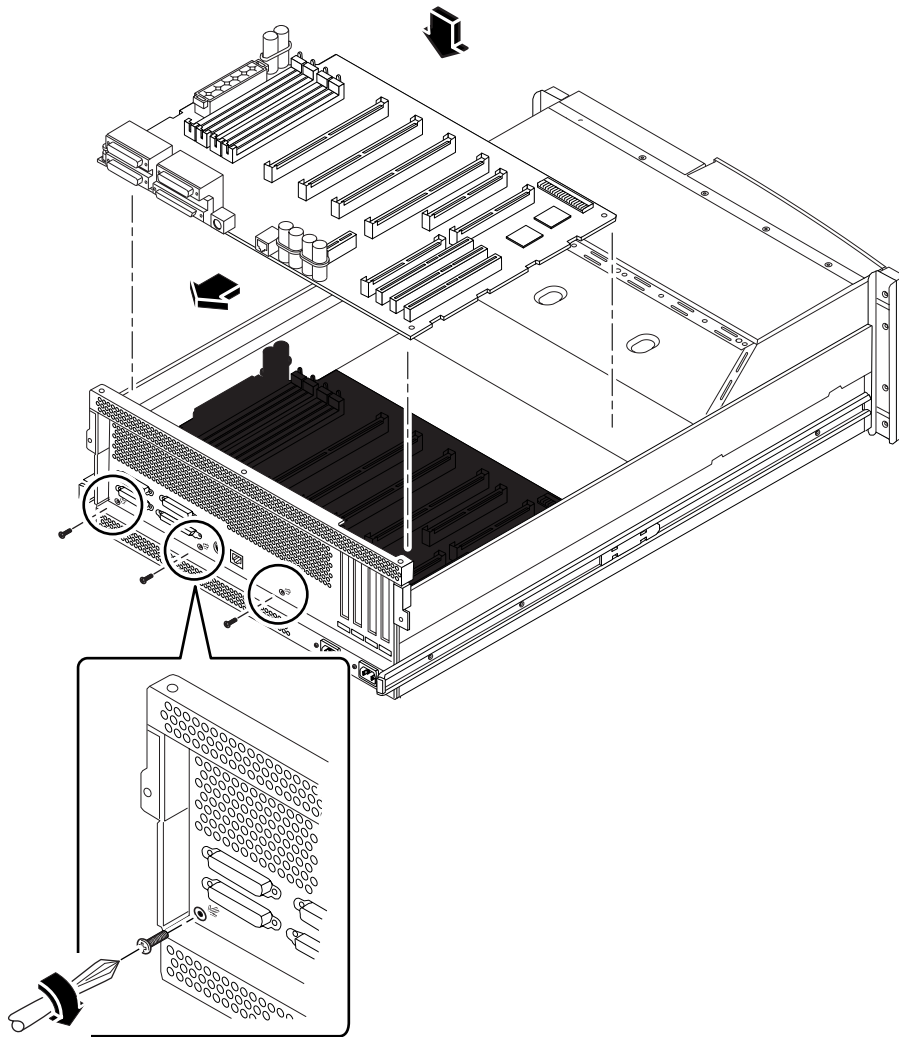
Caution – Handle the main logic board by the back panel or edges only.

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 “How to Set the Serial Port Jumpers” on page 92 and “How to Set the Flash PROM Jumpers” on page 95.

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 system back panel.

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

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

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

The connectors are keyed to connect in only one way. For information about cable connector locations, see “How to Connect the System Cables” on page 130.

- a. Connect the main power cable to connector J4107.**
- b. Connect the CPU power sense cable to connector J4106.**
- c. Connect the UltraSCSI data cable to connector J2101.**
- d. Connect the control cable to connector J4111.**

What Next

Complete these tasks to reassemble the system:

- “How to Replace the NVRAM/TOD Module” on page 74
- “How to Replace the CPU Card Cage Assembly” on page 83
- “How to Replace the Air Guide” on page 79
- “How to Install a CPU Module” on page 68
- “How to Install a Memory Module” on page 48
- “How to Replace the Memory Riser Assembly” on page 43
- “How to Replace the DC-to-DC Converter” on page 56
- “How to Install a PCI Card” on page 61
- “How to Replace the System Cover” on page 16

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:

- “How to Use OpenBoot Diagnostics (OBDiag)” on page 169

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

- “How to Initiate a Reconfiguration Boot” on page 6

How to Set the Serial Port Jumpers

The serial port jumpers on the main logic board (J2804 and J2805) 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 420R Server Owner's Guide*.

Before You Begin

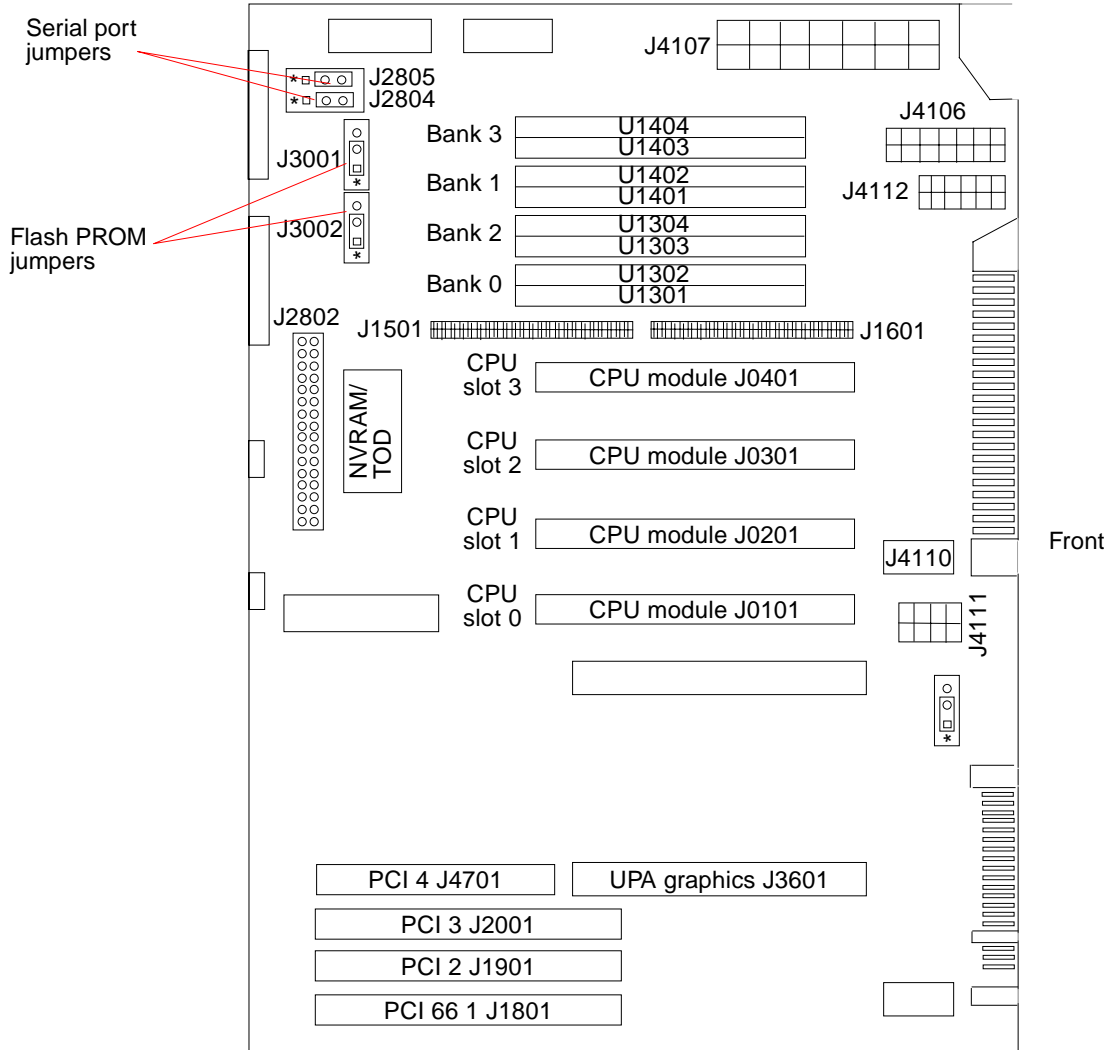
Complete these tasks:

- "How to Power Off the System" on page 2
- "How to Position the System for Service" on page 8
- "How to Remove the System Cover" on page 14
- "How to Avoid Electrostatic Discharge" on page 18

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. Pin 1 is marked with an asterisk.



2. Set the main logic board jumpers J2804 and J2805.

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
J2804	RS-232D	RS-432	2 and 3
J2805	RS-232D	RS-432	2 and 3

What Next

Complete the following task to reassemble the system:

- “How to Replace the System Cover” on page 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.

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.”

Before You Begin

Complete these tasks:

- “How to Power Off the System” on page 2
- “How to Position the System for Service” on page 8
- “How to Remove the System Cover” on page 14
- “How to Avoid Electrostatic Discharge” on page 18

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. Pin 1 is marked with an asterisk.

For information about the jumper locations, see “How to Set the Serial Port Jumpers” on page 92.

2. Set the main logic board jumpers J3001 and J3102.

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
J3001	Write-protect	Write-enable	1 and 2	FLASH PROM PROG ENABLE
J3002	High-half booting	Normal (low-half booting)	1 and 2	XOR LOGIC SET

What Next

Complete the following task to reassemble the system:

- “How to Replace the System Cover” on page 16

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

- “How to Use OpenBoot Diagnostics (OBdiag)” on page 169

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 "Illustrated Parts Breakdown" on page 261.

The following tasks are covered in this chapter:

- "How to Remove a Disk Drive" on page 98
- "How to Install a Disk Drive" on page 100
- "How to Remove the Removable Media Assembly (RMA)" on page 103
- "How to Replace the Removable Media Assembly (RMA)" on page 107
- "How to Remove a CD-ROM or Tape Drive" on page 110
- "How to Install a CD-ROM or Tape Drive" on page 112

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 420R Server Owner's Guide*.

Before You Begin

Complete this task:

- "How to Avoid Electrostatic Discharge" on page 18

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 "About Communicating With the Server" on page 23.

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 420R 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 "How to Power Off the System" on page 2.

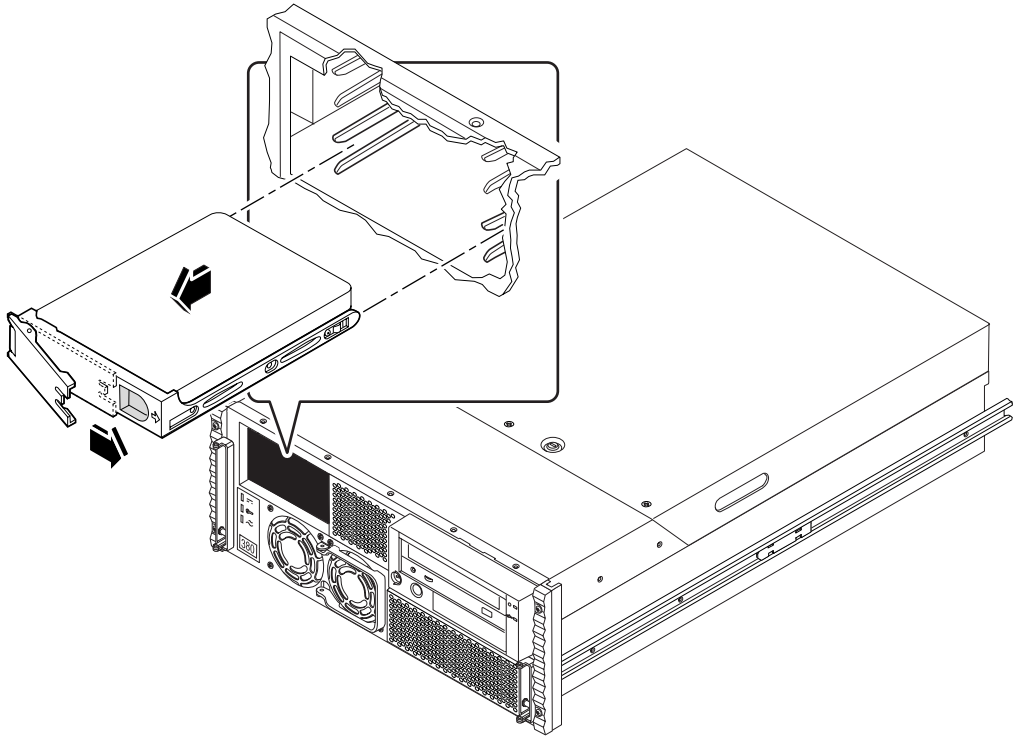
3. Unlock the front doors and swing them open.

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 "Disk Drive LEDs" on page 194.

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.

What Next

To install the disk drive, complete this task:

- “How to Install a Disk Drive” on page 100

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 420R Server Owner's Guide*.

Before You Begin

Complete this task:

- “How to Avoid Electrostatic Discharge” on page 18

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.

What to Do

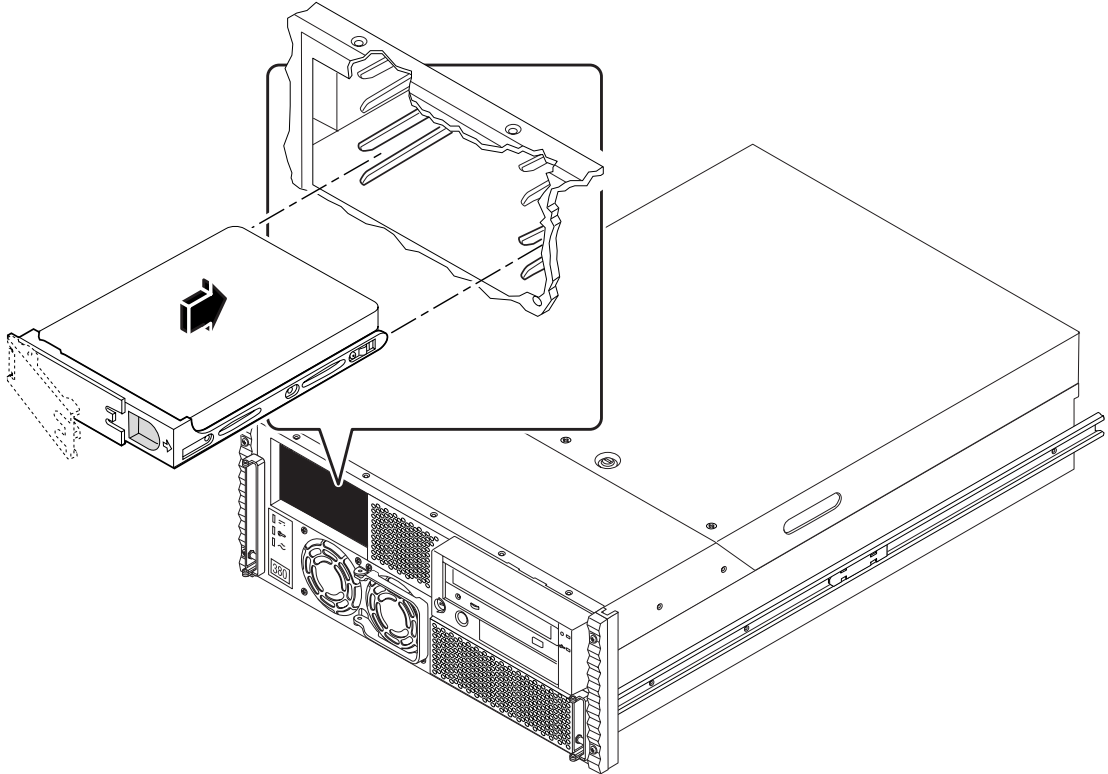
1. Prepare the system to receive the new disk drive.

The hot-plug installation procedure involves software commands for preparing the system prior to installing the disk drive. See your *Sun Enterprise 420R Server Owner's Guide*.

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

See “How to Power Off the System” on page 2.

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 420R Server Owner's Guide*.

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:

- “How to Use OpenBoot Diagnostics (OBdiag)” on page 169

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

- “How to Initiate a Reconfiguration Boot” on page 6

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.

Before You Begin

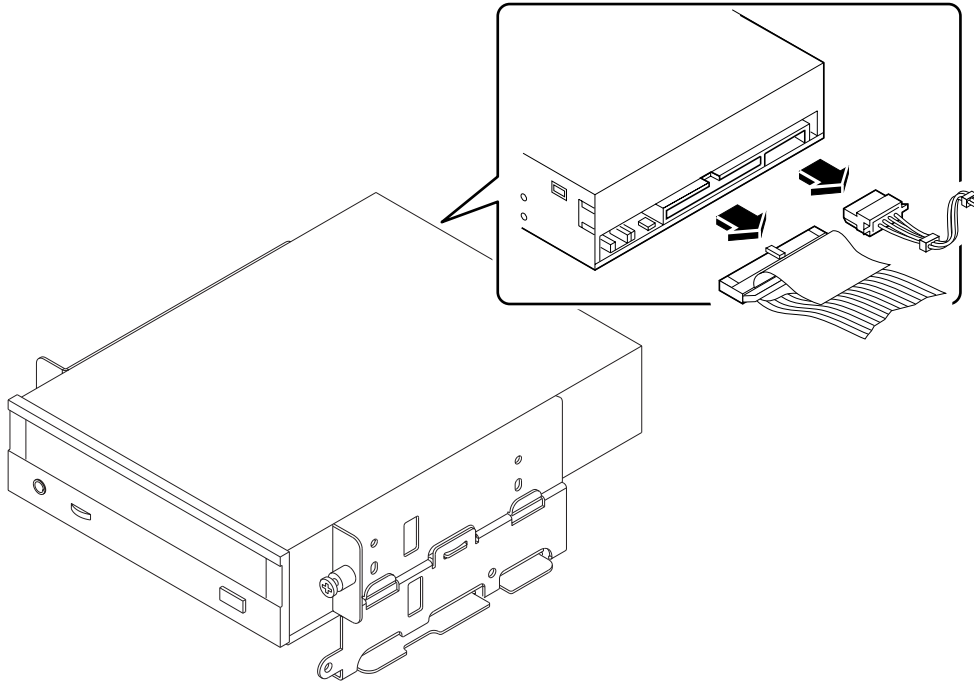
Complete these tasks:

- “How to Power Off the System” on page 2
- “How to Position the System for Service” on page 8
- “How to Remove the System Cover” on page 14
- “How to Avoid Electrostatic Discharge” on page 18

What to Do

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

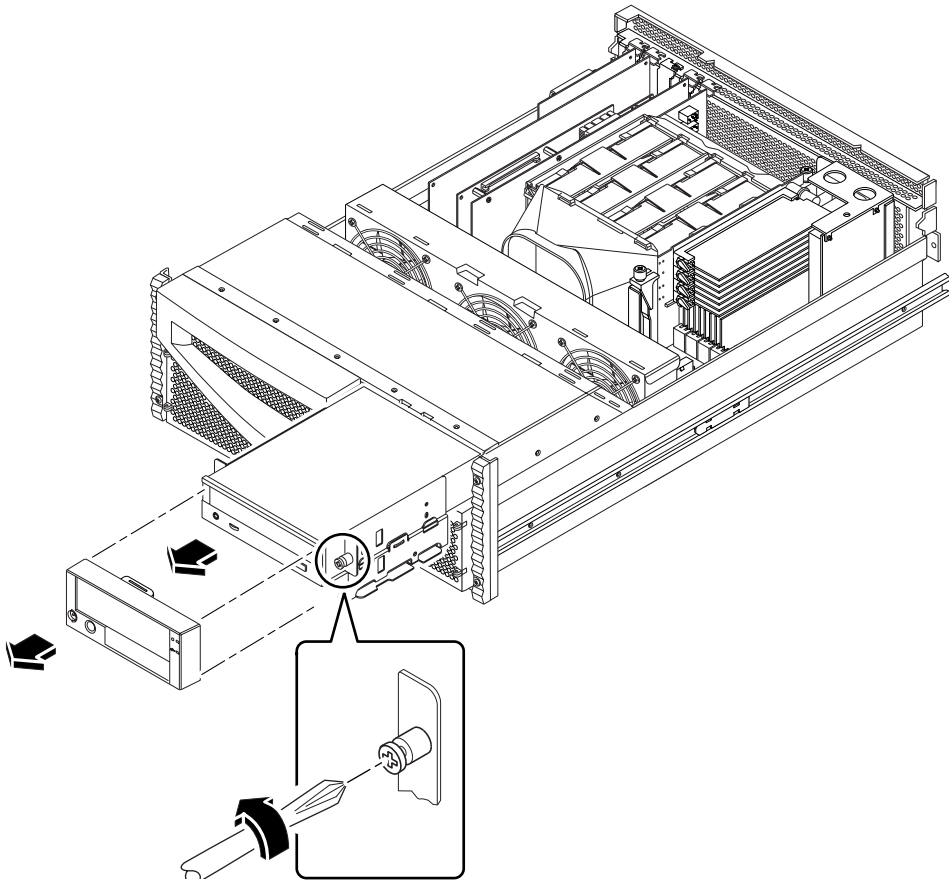
See the illustration in Step 3 for the location of the RMA in the system.



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.

What Next

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

- “How to Remove a CD-ROM or Tape Drive” on page 110

- “How to Install a CD-ROM or Tape Drive” on page 112

To replace the removable media assembly, complete this task:

- “How to Replace the Removable Media Assembly (RMA)” on page 107

How to Replace the Removable Media Assembly (RMA)

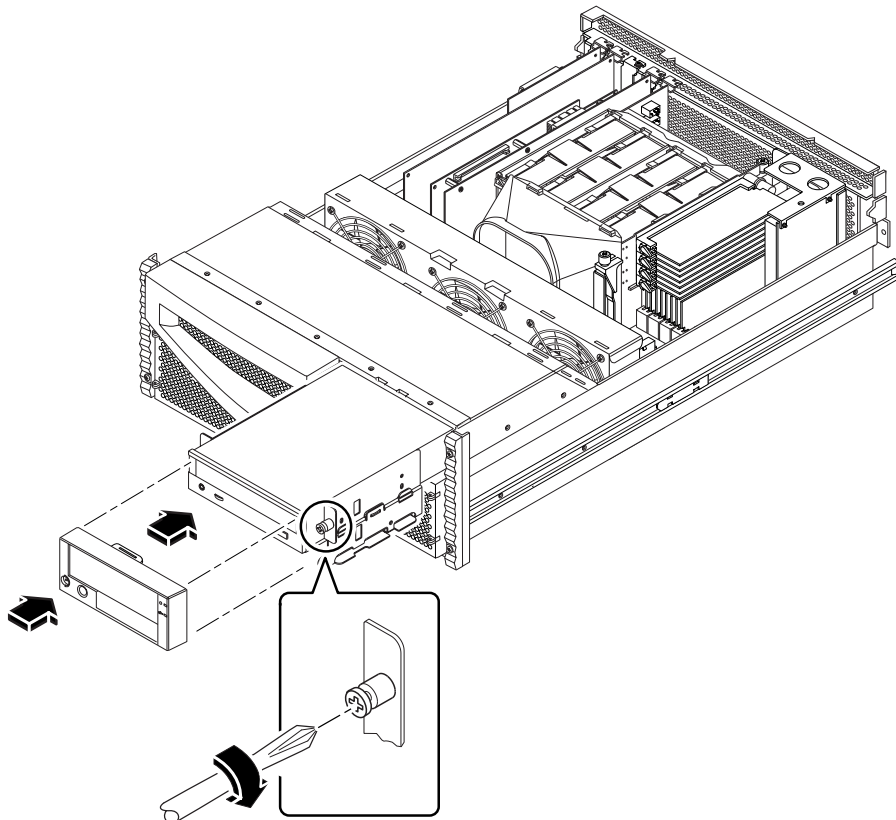
Before You Begin

Complete this task:

- “How to Avoid Electrostatic Discharge” on page 18

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.

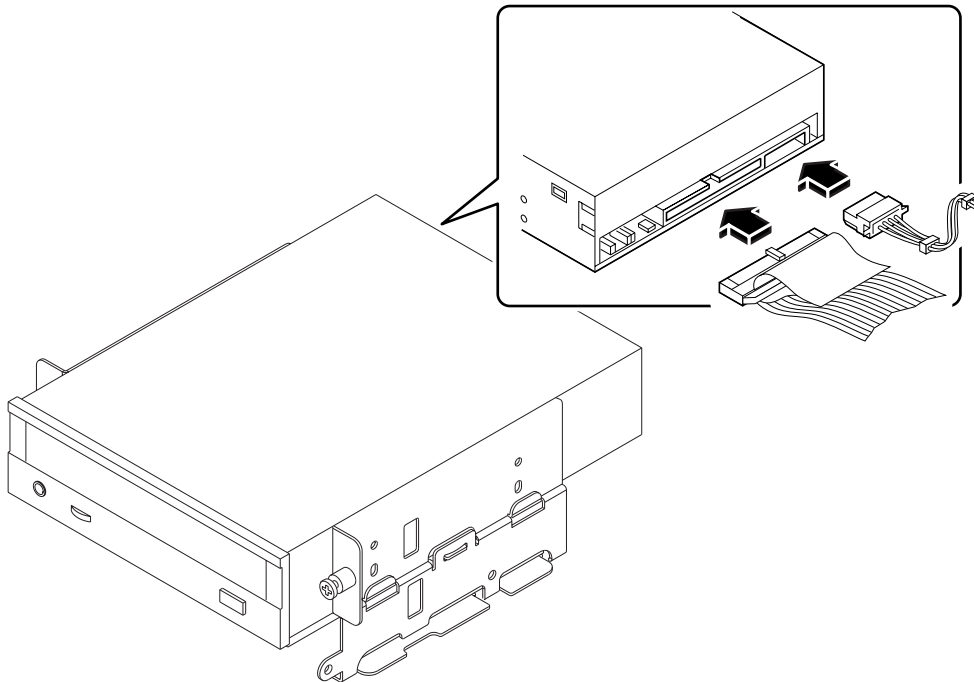
Align the filler panel with its opening and press it into place.

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 “How to Connect the System Cables” on page 130.



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.

What Next

To reassemble the system, complete this task:

- “How to Replace the System Cover” on page 16

How to Remove a CD-ROM or Tape Drive

Before You Begin

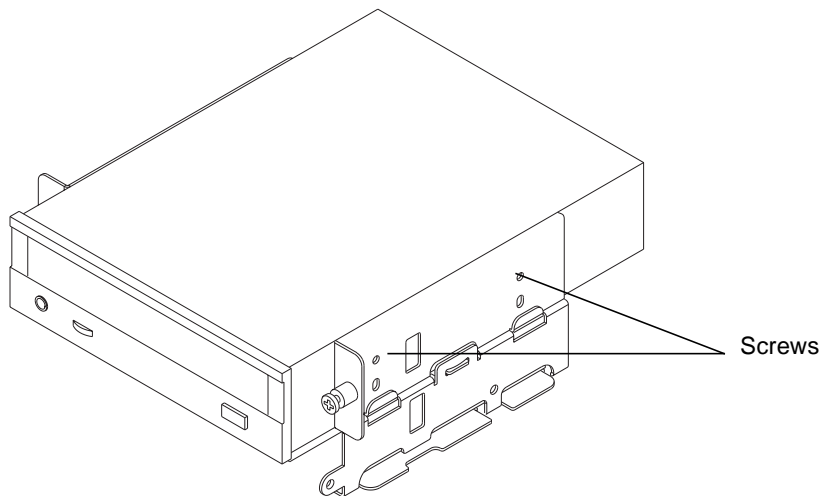
Complete these tasks:

- “How to Power Off the System” on page 2
- “How to Position the System for Service” on page 8
- “How to Remove the System Cover” on page 14
- “How to Avoid Electrostatic Discharge” on page 18
- “How to Remove the Removable Media Assembly (RMA)” on page 103

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.**

What Next

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

- “How to Install a CD-ROM or Tape Drive” on page 112

How to Install a CD-ROM or Tape Drive

Before You Begin

Know the configuration guidelines for installing removable media devices. For detailed information, see your *Sun Enterprise 420R Server Owner's Guide*.

Complete these tasks:

- “How to Power Off the System” on page 2
- “How to Position the System for Service” on page 8
- “How to Remove the System Cover” on page 14
- “How to Avoid Electrostatic Discharge” on page 18
- “How to Remove the Removable Media Assembly (RMA)” on page 103

What to Do

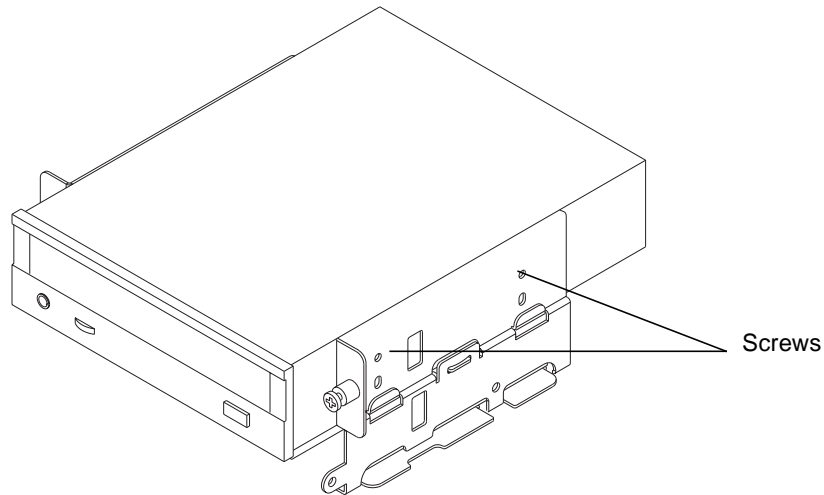
- 1. If necessary, remove the plastic filler panel from the removable media assembly plastic cover.**

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.



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.

What Next

To reassemble the system, complete these tasks:

- “How to Replace the Removable Media Assembly (RMA)” on page 107
- “How to Replace the System Cover” on page 16

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

- “How to Use OpenBoot Diagnostics (OB DIAG)” on page 169

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

- “How to Initiate a Reconfiguration Boot” on page 6

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 “Illustrated Parts Breakdown” on page 261.

The following tasks are covered in this chapter:

- “How to Remove the UltraSCSI Backplane” on page 116
- “How to Replace the UltraSCSI Backplane” on page 119
- “How to Remove the Power Distribution Board” on page 121
- “How to Replace the Power Distribution Board” on page 125
- “How to Connect the System Cables” on page 130

How to Remove the UltraSCSI Backplane

Before You Begin

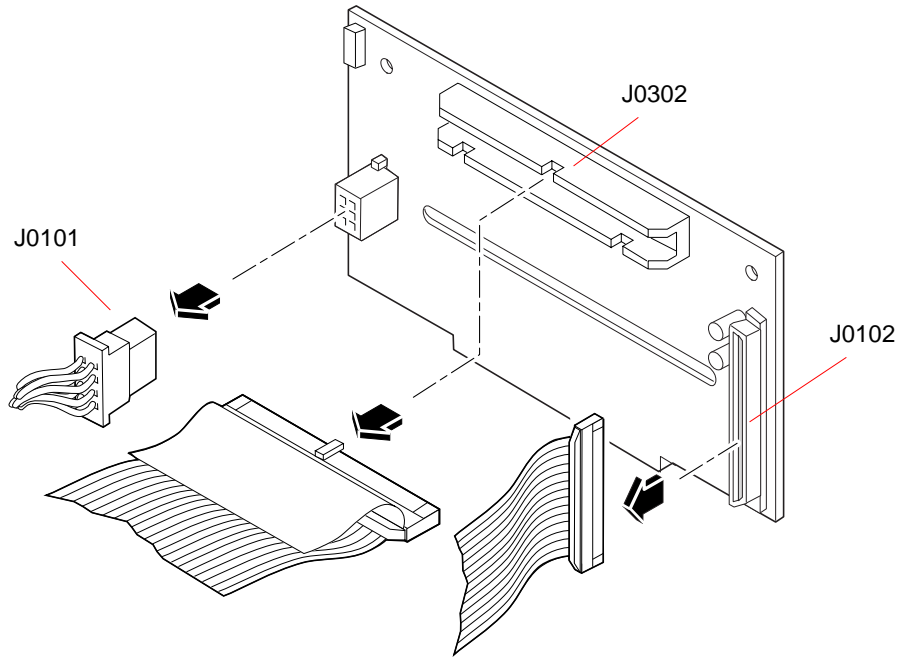
Complete these tasks:

- “How to Remove a Disk Drive” on page 98
- “How to Power Off the System” on page 2
- “How to Position the System for Service” on page 8
- “How to Remove the System Cover” on page 14
- “How to Avoid Electrostatic Discharge” on page 18

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.

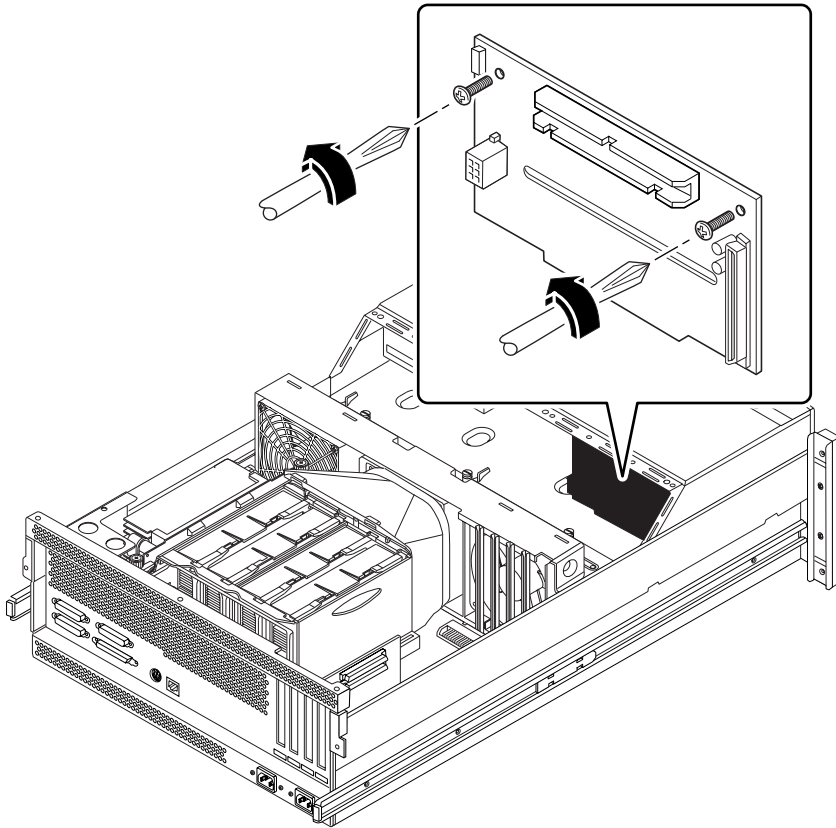
What to Do

- 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.

What Next

To replace the UltraSCSI backplane, complete this task:

- “How to Replace the UltraSCSI Backplane” on page 119

How to Replace the UltraSCSI Backplane

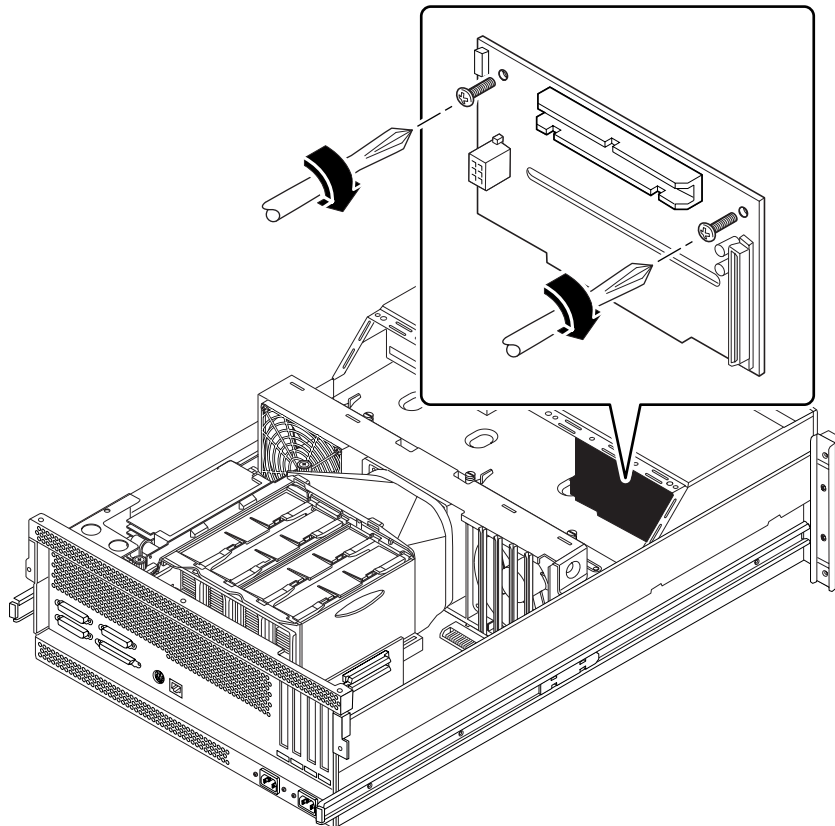
Before You Begin

Complete this task:

- “How to Avoid Electrostatic Discharge” on page 18

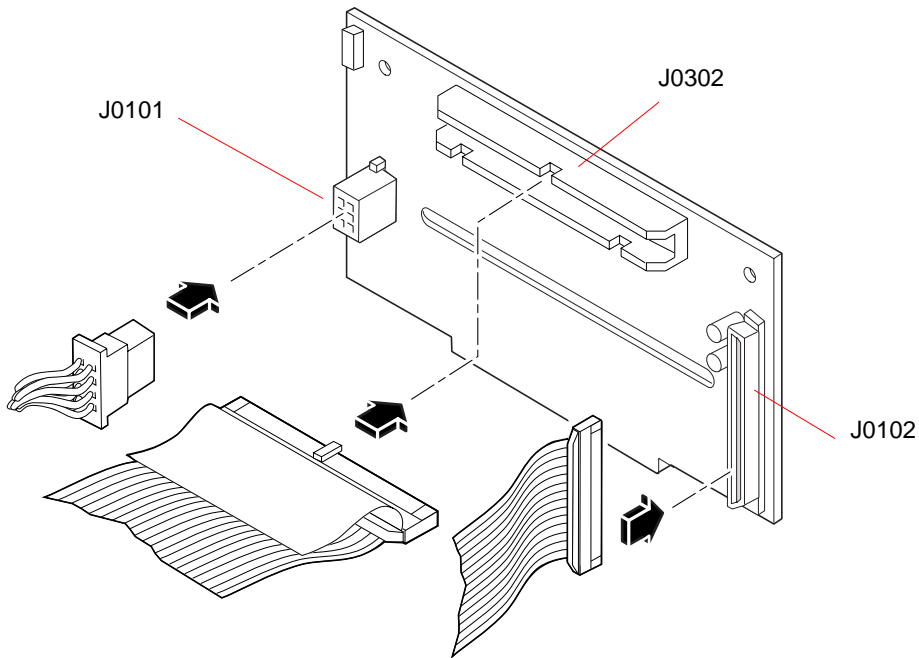
What to Do

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.

What Next

To reassemble the system, complete these tasks:

- “How to Replace the System Cover” on page 16
- “How to Install a Disk Drive” on page 100

How to Remove the Power Distribution Board

Before You Begin

Complete these tasks:

- “How to Power Off the System” on page 2
- “How to Remove a Power Supply” on page 136
- “How to Position the System for Service” on page 8
- “How to Remove the System Cover” on page 14
- “How to Avoid Electrostatic Discharge” on page 18
- “How to Remove the Fan Tray Assembly” on page 141



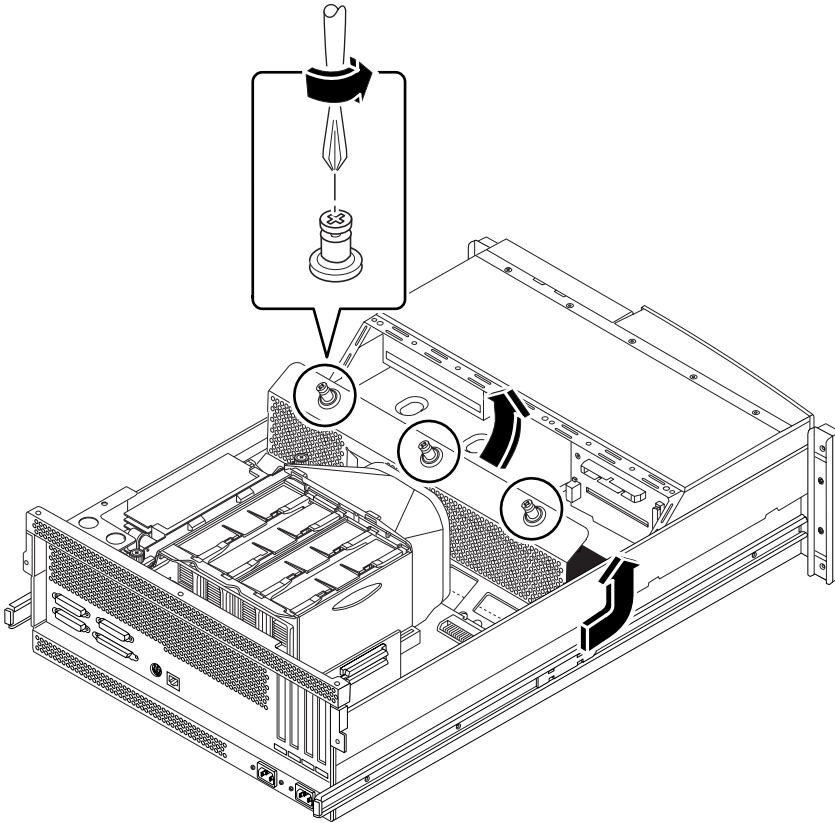
Caution – Unplug the AC power cord(s) from the back of the system before performing this procedure. Attempting to remove the power distribution board while the AC power cord is plugged into a power source can result in serious personal injury.

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

What to Do

1. **Disconnect the control cable from the power distribution board at connector J0209.**
For information about cable connector locations, see “How to Connect the System Cables” on page 130.
2. **Disconnect the I/O power cable from the power distribution board at connector J0210.**
3. **Disconnect the UltraSCSI data cable from the main logic board at connector J2101.**
4. **Disconnect the main power cable from the power distribution board at connector J0201.**

5. **Disconnect the CPU power sense cable from the power distribution board at connector J0205.**
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.

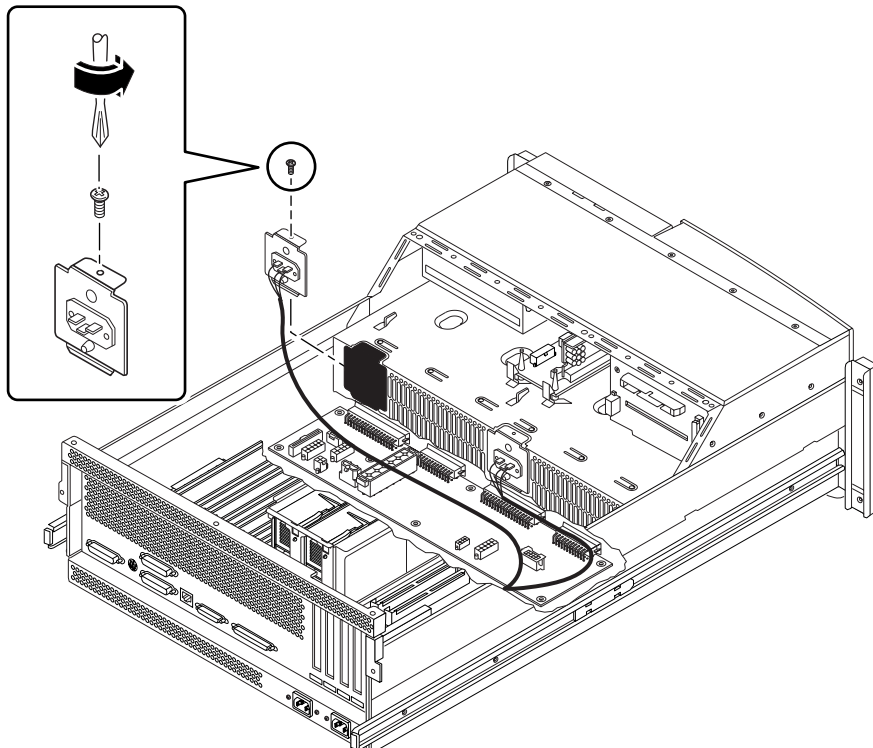




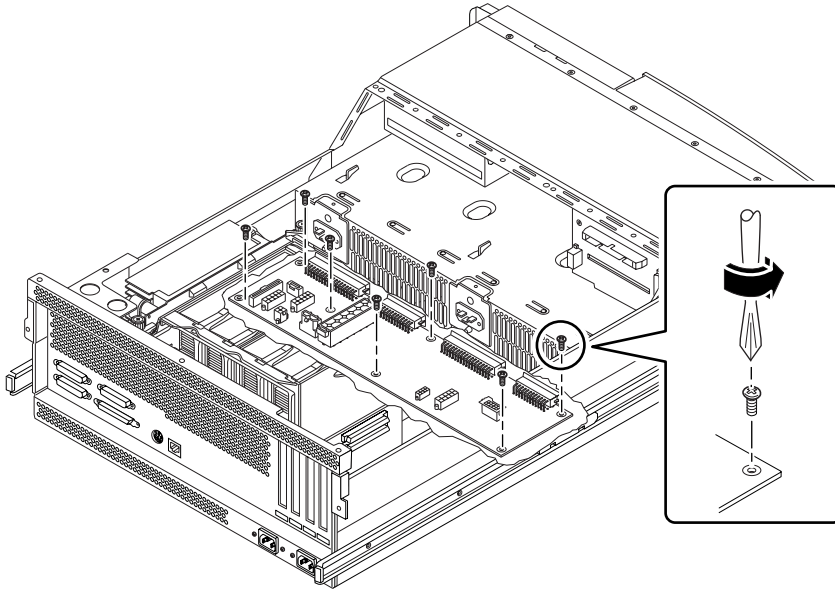
Caution – Be sure that the AC power cord(s) has been disconnected from the system before continuing. Attempting to remove the power distribution board while the AC power cord is plugged into a power source can result in serious personal injury.

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 does not 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 does not interfere with lifting the power distribution board out of the chassis.

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

Place it on an antistatic mat.

What Next

To replace the power distribution board, complete this task:

- “How to Replace the Power Distribution Board” on page 125

How to Replace the Power Distribution Board

Before You Begin

Complete this task:

- “How to Avoid Electrostatic Discharge” on page 18



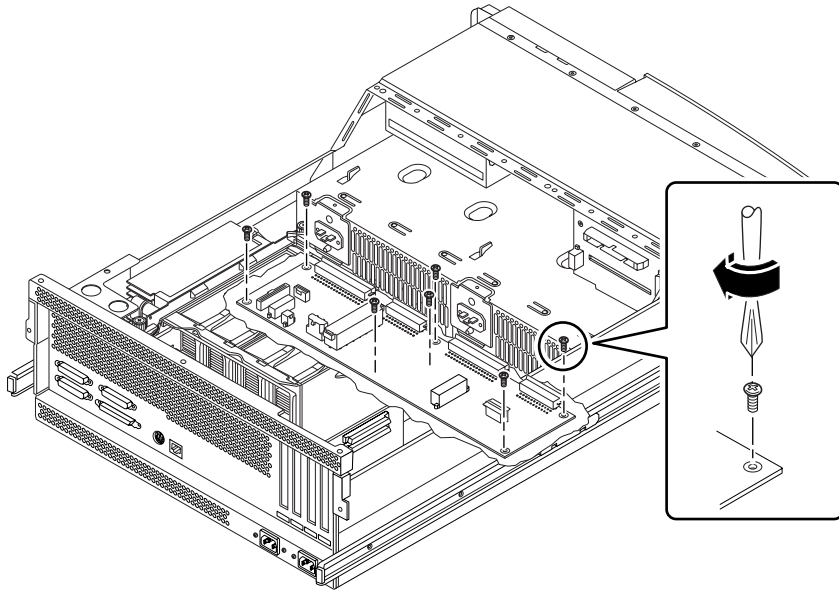
Caution – Be sure that the AC power cord(s) is disconnected from the back of the system before performing this procedure. Attempting to replace the power distribution board while the AC power cord is plugged into a power source can result in serious personal injury.

What to Do

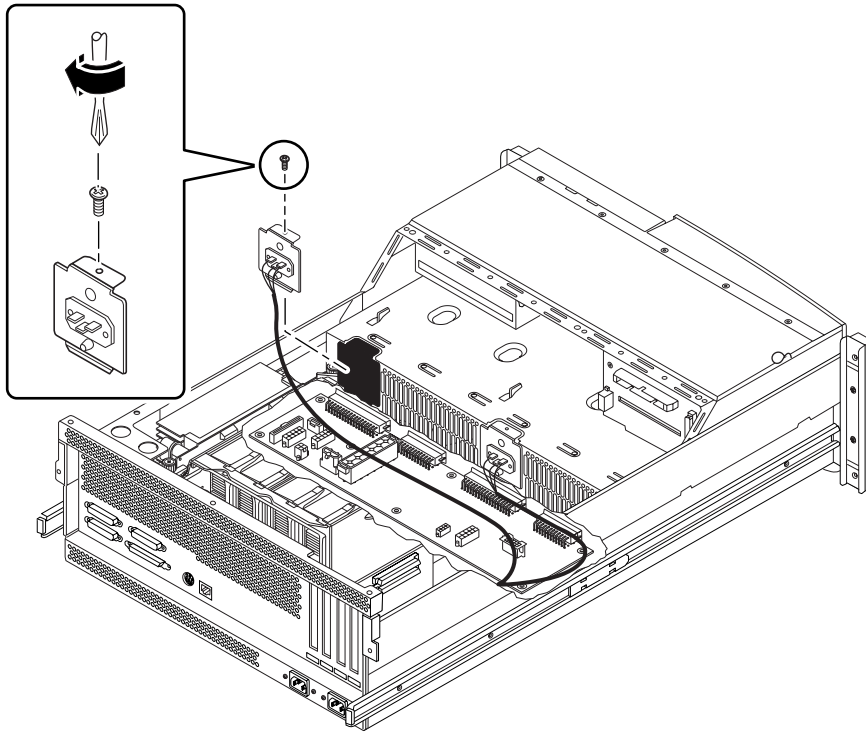
1. Position the power distribution board in the chassis floor.

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.

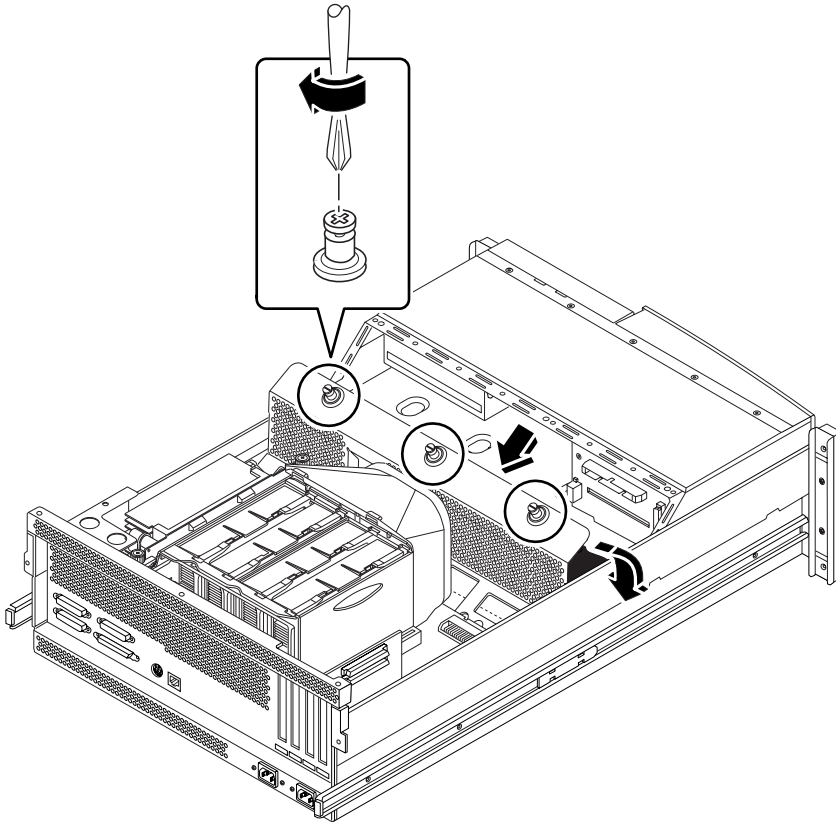


4. Replace the power distribution board cover panel.

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.



5. Tighten the three captive Phillips screws that secure the power distribution board cover to the system chassis.

6. Connect the control cable to the power distribution board at connector J0209.

Connectors are keyed and attach in only one way. For information about cable connector locations, see “How to Connect the System Cables” on page 130.

7. Connect the main power cable to the power distribution board at connector J0201.

8. Connect the CPU power sense cable to the power distribution board at connector J0205.

- 9. Connect the keyswitch/power button/LED cable to the power distribution board at connector J0500.**
- 10. Connect the I/O power cable to the power distribution board at connector J0210.**
- 11. Connect the UltraSCSI data cable to the main logic board at connector J2101.**

What Next

To reassemble the system, complete these tasks:

- “How to Replace the Fan Tray Assembly” on page 143
- “How to Install a Power Supply” on page 138

How to Connect the System Cables

This section provides an overview of cable connector locations and cable routing. Removing and replacing specific cables is covered within the removal and replacement process of the assemblies with which these cables are associated.

Before You Begin

Complete these tasks:

- “How to Power Off the System” on page 2
- “How to Position the System for Service” on page 8
- “How to Remove the System Cover” on page 14
- “How to Avoid Electrostatic Discharge” on page 18

What to Do

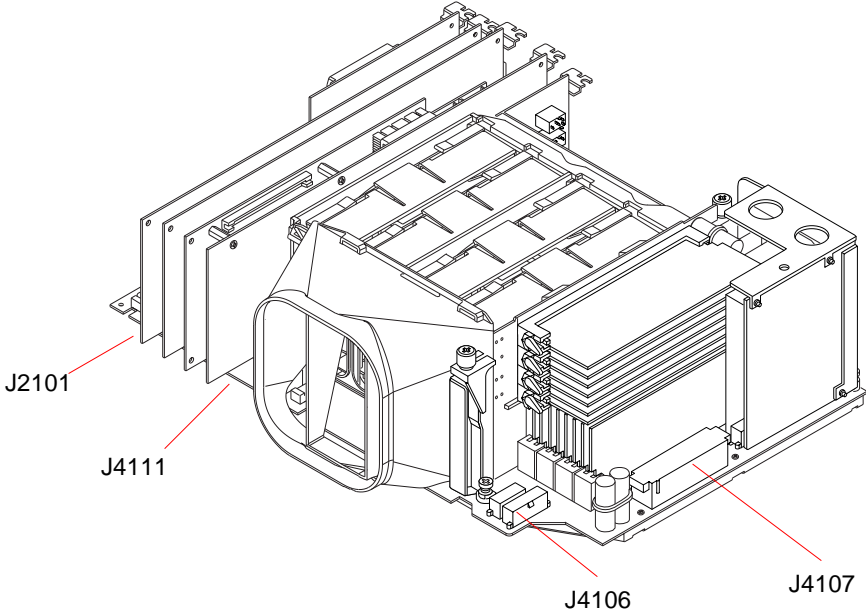
- 1. Identify the cable that you want to install or replace. Use the information in the following table and illustrations to determine where to connect each end of the cable.**
- 2. Install the cable according to the routing and cable management instructions provided in the table.**

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

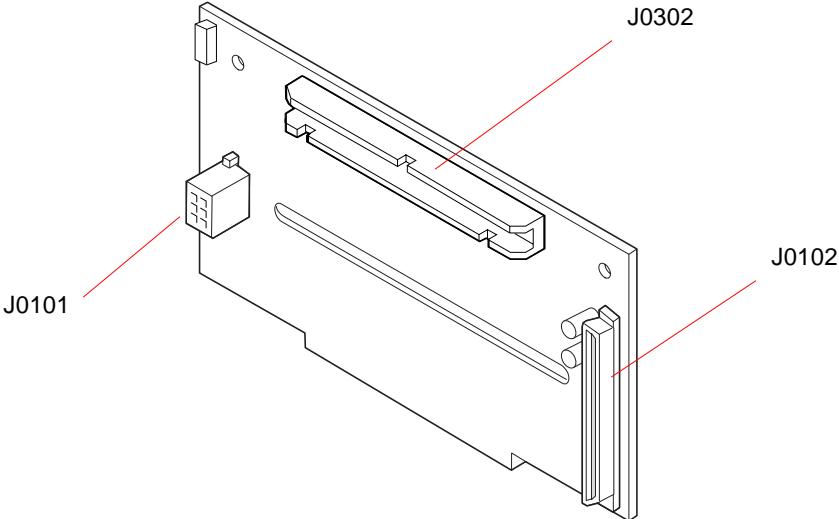
Cable Connectors and Routing

Cable Name	Connections	Routing and Management
CPU power sense cable	From: Power distribution board (J0205) To: Main logic board (J4106)	Routed from under the fan tray assembly to the main logic board
Main power cable	From: Power distribution board (J0201) To: Main logic board (J4107)	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) and To: RMA 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 (J2101) 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: Removable media SCSI connector	Routed from the UltraSCSI backplane to the RMA SCSI connector
Keypad/power button/LED cable	From: Power distribution board (J0500) To: Front of chassis	Routed under the notch on the fan tray assembly
Control cable	From: Power distribution board (J0209) To: Main logic board (J4111)	Routed from the main logic board to the power distribution board

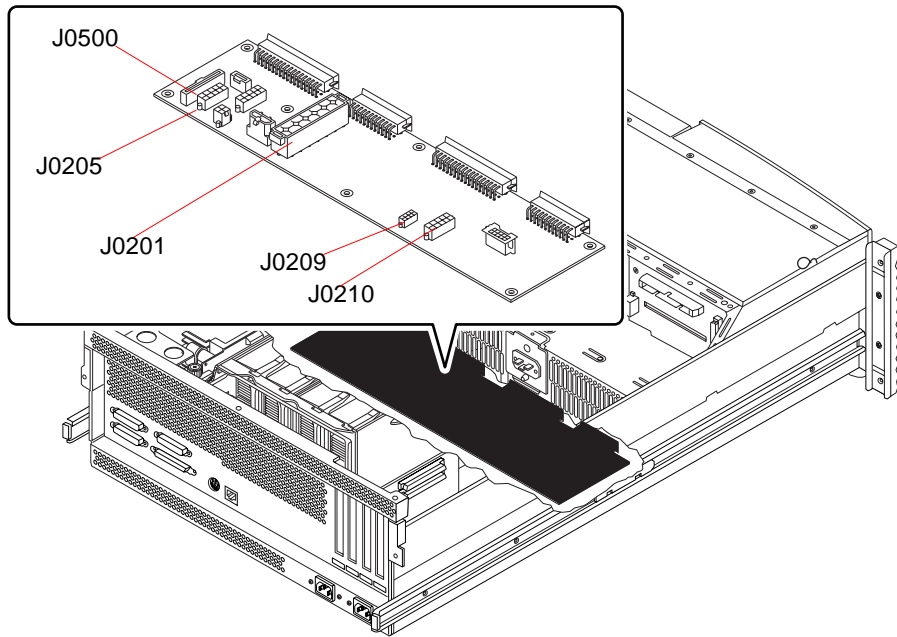
Main logic board connectors



SCSI backplane connectors



Power distribution board connectors



What Next

To reassemble the system, complete this task:

- “How to Replace the System Cover” on page 16

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 “Illustrated Parts Breakdown” on page 261.

The following tasks are covered in this chapter:

- “How to Remove a Power Supply” on page 136
- “How to Install a Power Supply” on page 138
- “How to Remove the Fan Tray Assembly” on page 141
- “How to Replace the Fan Tray Assembly” on page 143
- “How to Remove the Keypad/Power Button/LED Assembly and Cable” on page 145
- “How to Replace the Keypad/Power Button/LED Assembly and Cable” on page 148
- “How to Remove a System Door” on page 151
- “How to Replace a System Door” on page 154

How to Remove a Power Supply

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 420R Server Owner’s Guide*.

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

- “How to Power Off the System” on page 2

What to Do

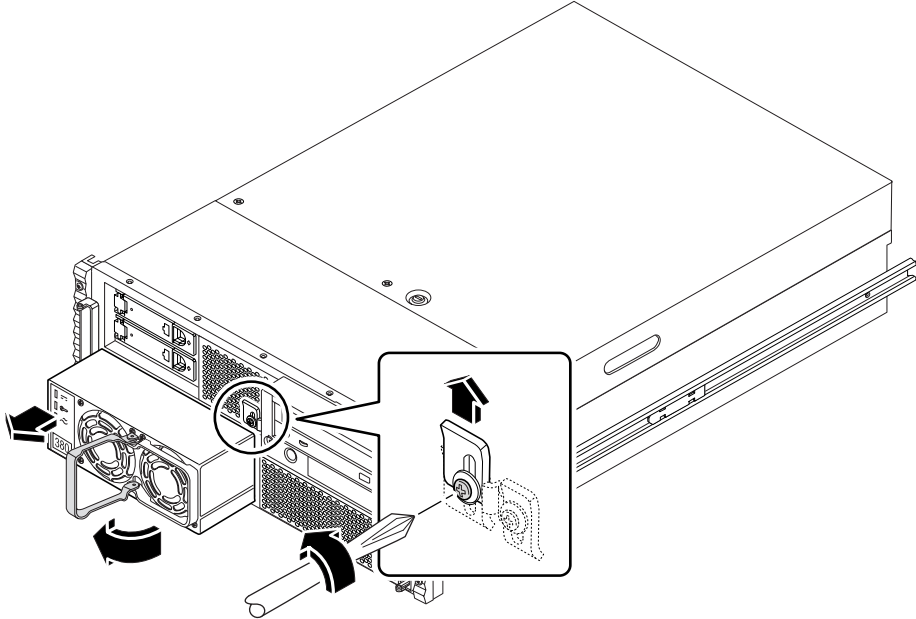
- 1. Identify the power supply that you want to remove.**
- 2. Unlock the system doors and swing them open.**

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.

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.

What Next

To replace a power supply, complete this task:

- “How to Install a Power Supply” on page 138

How to Install a Power Supply

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 420R Server Owner's Guide*.

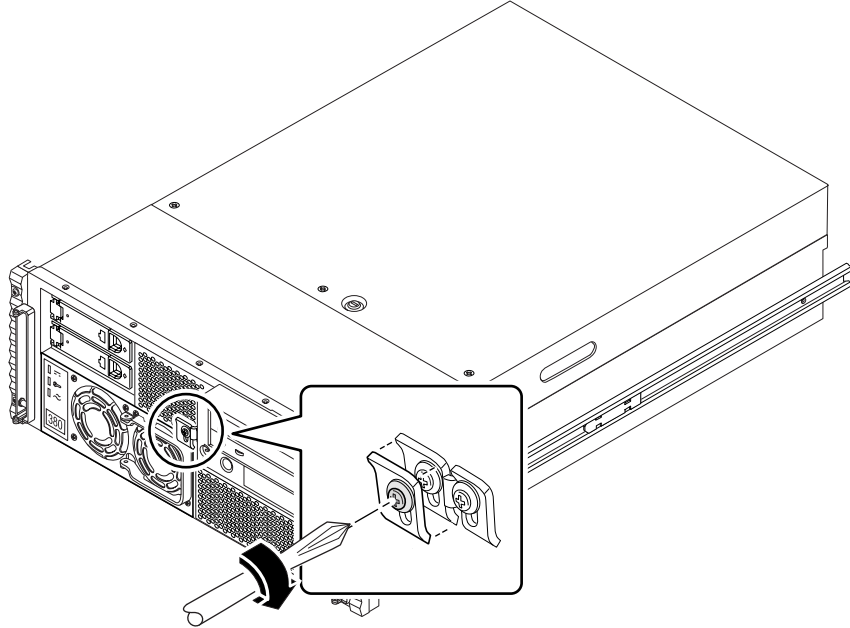
What to Do

- 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.

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:

- “Power Supply LEDs” on page 192

How to Remove the Fan Tray Assembly

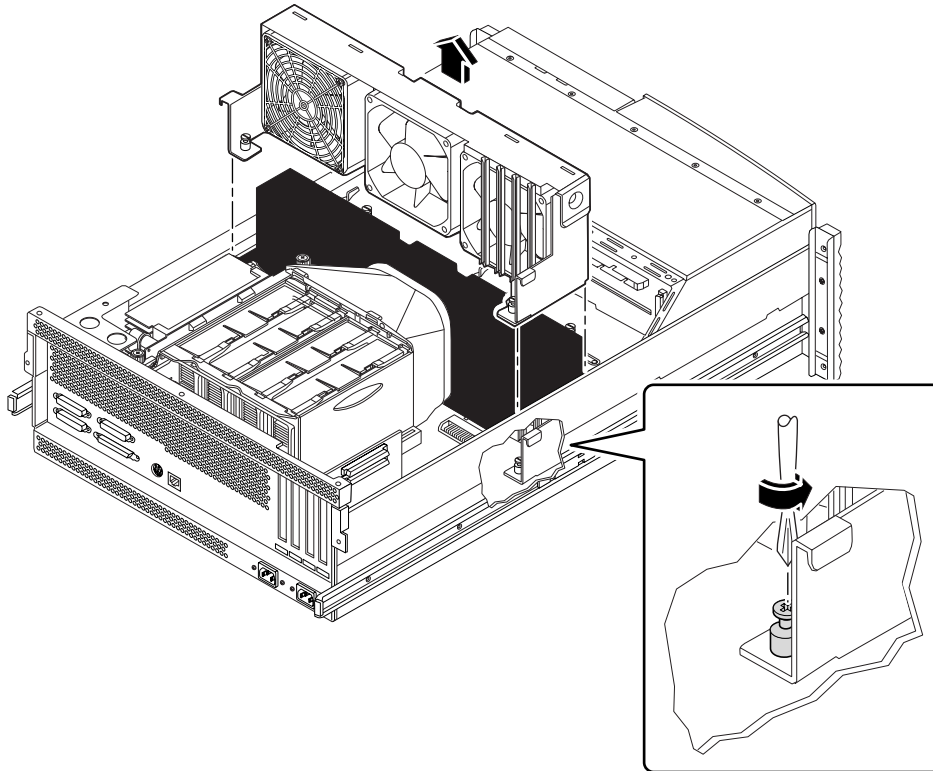
Before You Begin

Complete these tasks:

- “How to Power Off the System” on page 2
- “How to Position the System for Service” on page 8
- “How to Remove the System Cover” on page 14
- “How to Avoid Electrostatic Discharge” on page 18

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.

What Next

To replace the fan tray assembly, complete this task:

- “How to Replace the Fan Tray Assembly” on page 143

How to Replace the Fan Tray Assembly

Before You Begin

Complete this task:

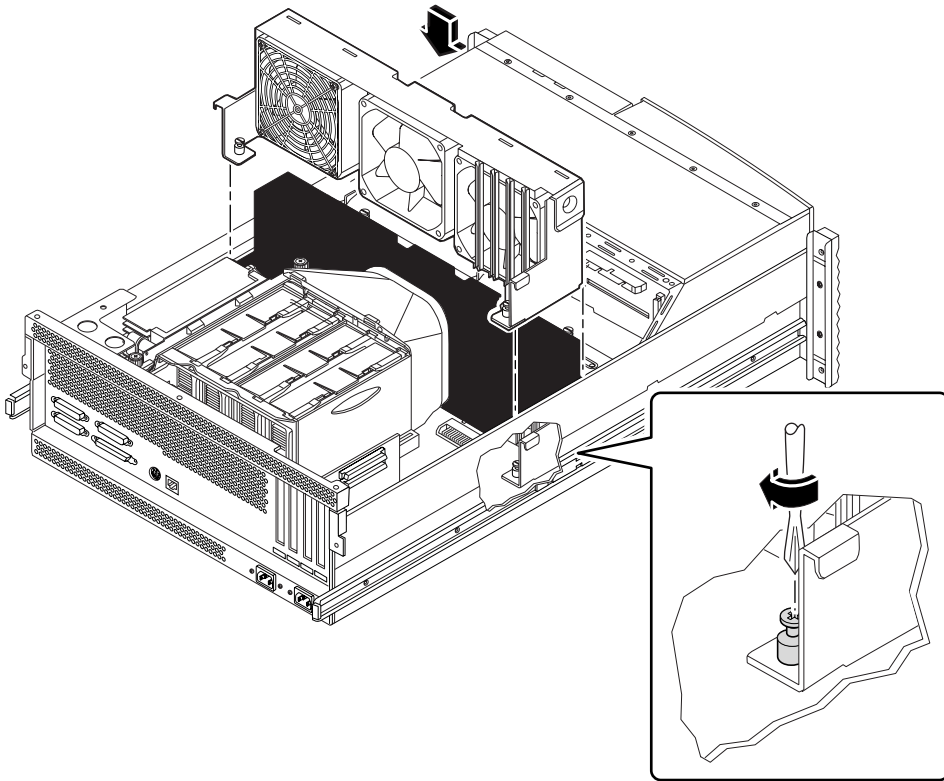
- “How to Avoid Electrostatic Discharge” on page 18

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 “How to Connect the System Cables” on page 130.
- 4. Route the I/O power and the control cables under 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.

What Next

To reassemble the system, complete this task:

- “How to Replace the System Cover” on page 16

How to Remove the Keyswitch/Power Button/LED Assembly and Cable

Before You Begin

Complete these tasks:

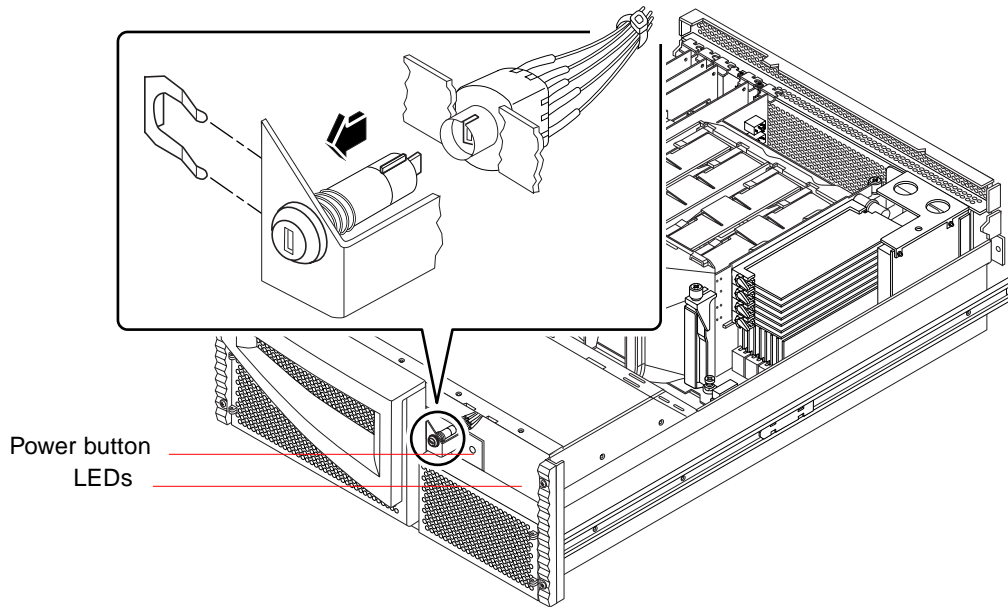
- “How to Power Off the System” on page 2
- “How to Position the System for Service” on page 8
- “How to Remove the System Cover” on page 14
- “How to Avoid Electrostatic Discharge” on page 18
- “How to Remove the Fan Tray Assembly” on page 141
- “How to Remove the Removable Media Assembly (RMA)” on page 103

What to Do

- 1. Remove the tab holding the keyswitch assembly to its mounting bracket.**

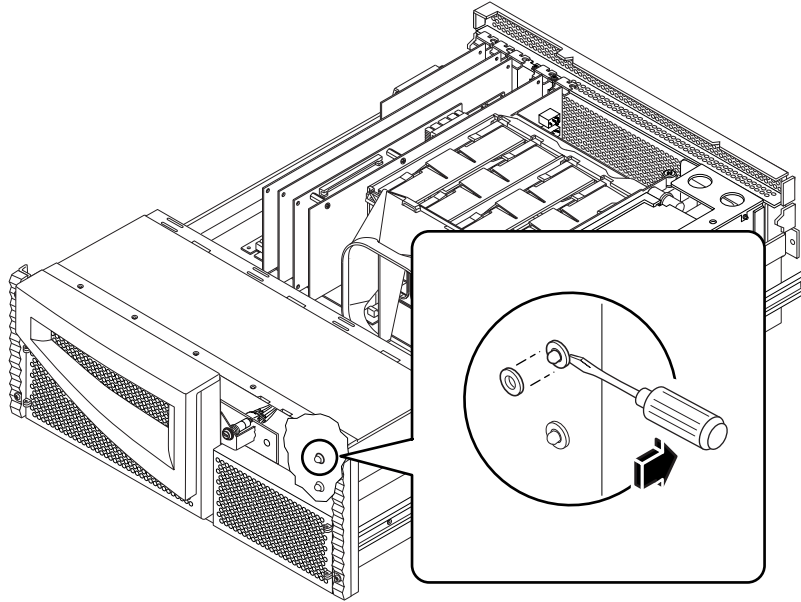
Hold the keyswitch assembly with one hand while pulling the tab off the assembly with a pair of pliers.

- 2. 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.



- 3. Remove the keyswitch from the chassis.**
Pull the keyswitch forward from its mounting bracket.
- 4. Remove the 3/16ths-inch nut from the front of the Power button.**
- 5. 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.



6. Pull the keyswitch/power button/LED cable out the back of the system.

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

What Next

To replace the keyswitch assembly, complete this task:

- “How to Replace the Keyswitch/Power Button/LED Assembly and Cable” on page 148

How to Replace the Keyswitch/Power Button/LED Assembly and Cable

Before You Begin

Complete this task:

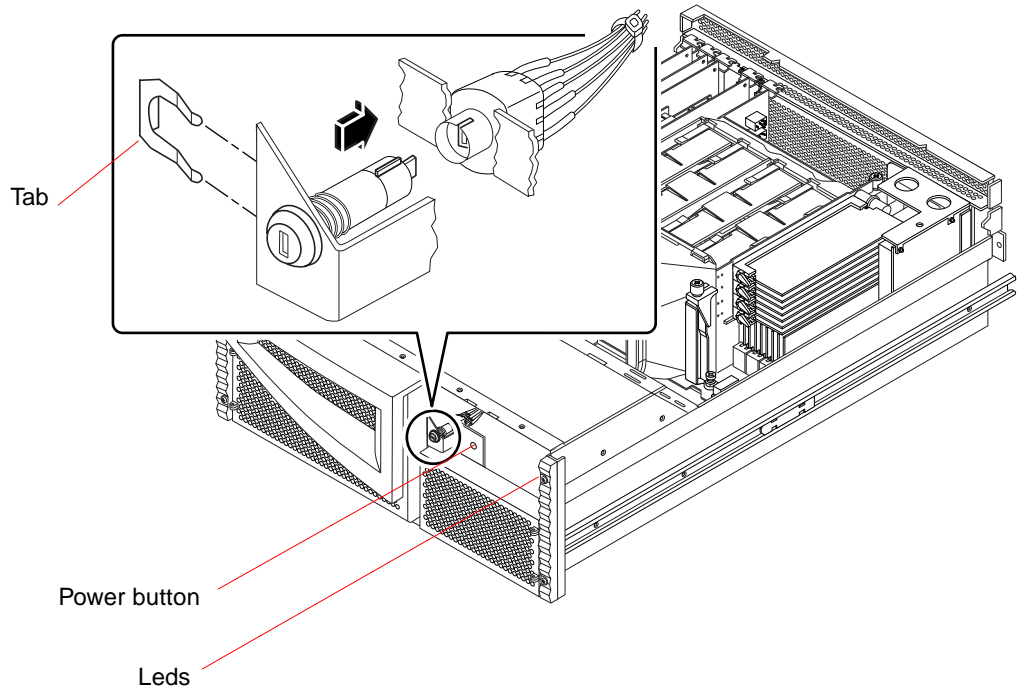
- “How to Avoid Electrostatic Discharge” on page 18

What to Do

- 1. 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.



2. **Position the keyswitch assembly into the mounting bracket.**

Route the keyswitch and power on-off assemblies and cables to their positions in the front of the chassis.

3. **Replace the tab that secures the keyswitch assembly to its mounting bracket.**

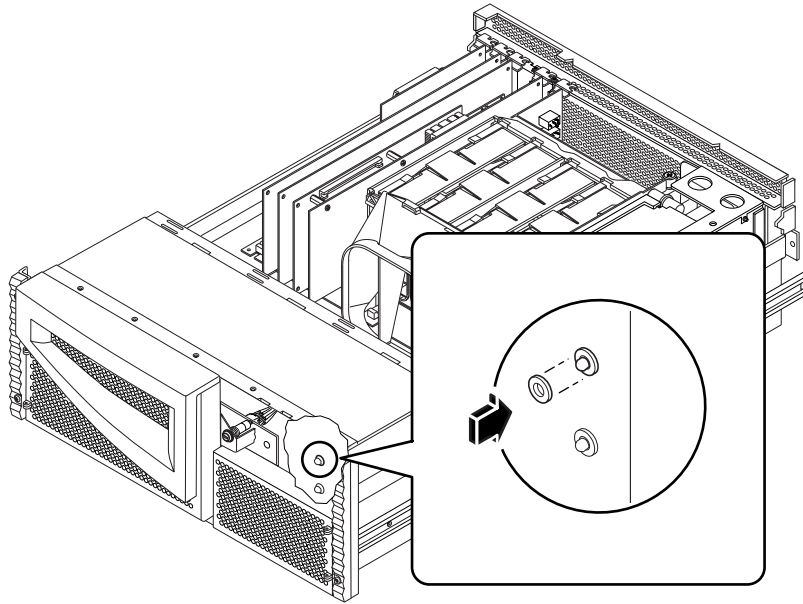
- a. **Insert the tab on the side of the mounting bracket.**

- b. **Push the tab onto the keyswitch assembly until the tab is fully inserted over the keyswitch and the keyswitch is firmly secured in the mounting bracket.**

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

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

6. Insert the plastic LED friction-fit collars into their cutouts on the chassis.



7. 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.

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

See “How to Connect the System Cables” on page 130.

What Next

To reassemble the system, complete these tasks:

- “How to Replace the Removable Media Assembly (RMA)” on page 107
- “How to Replace the Fan Tray Assembly” on page 143

How to Remove a System Door

Before You Begin

Complete these tasks:

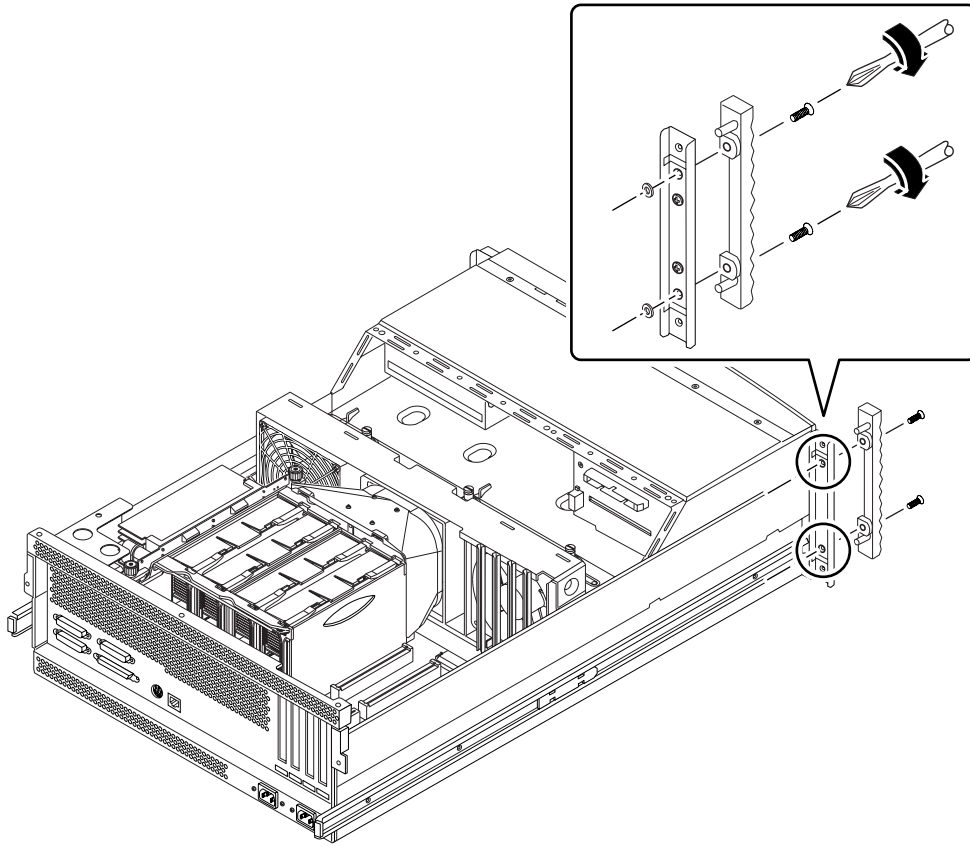
- “How to Power Off the System” on page 2
- “How to Position the System for Service” on page 8

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.**

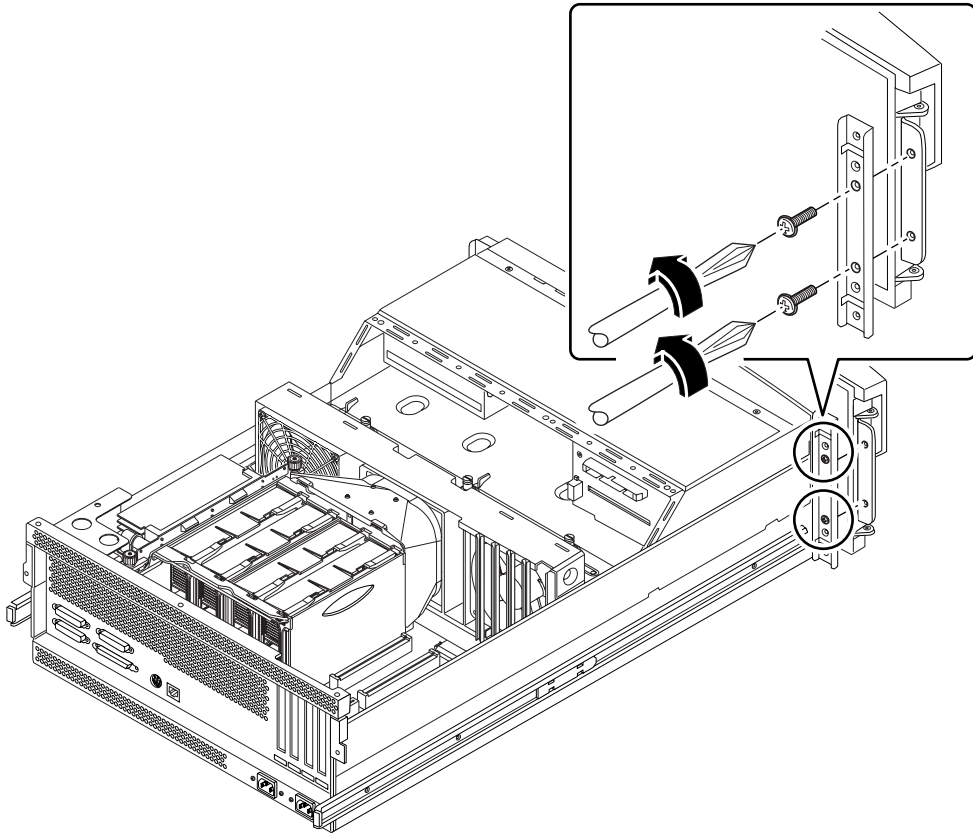
The washers are on the captive screws that attach the system to the rack rails.

b. Pull the decorative panel off the chassis flange.



3. Unscrew the hinge from the chassis flange.

Use a Phillips #2 screwdriver.



What Next

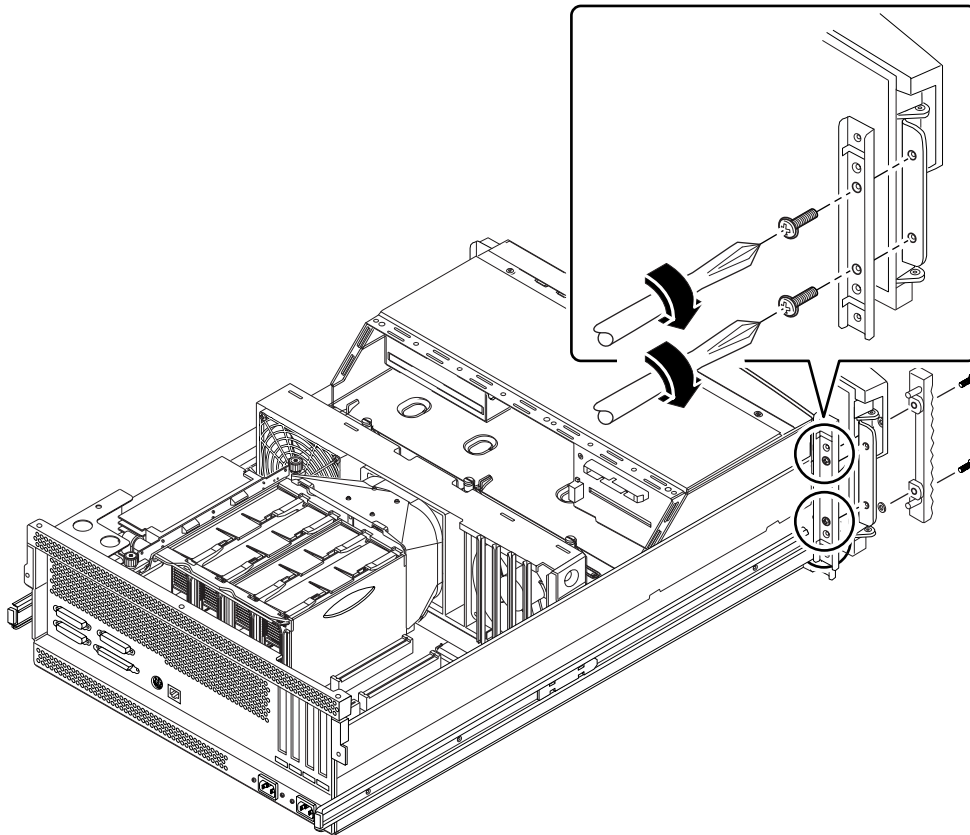
To replace a door, complete this task:

- “How to Replace a System Door” on page 154

How to Replace a System Door

What to Do

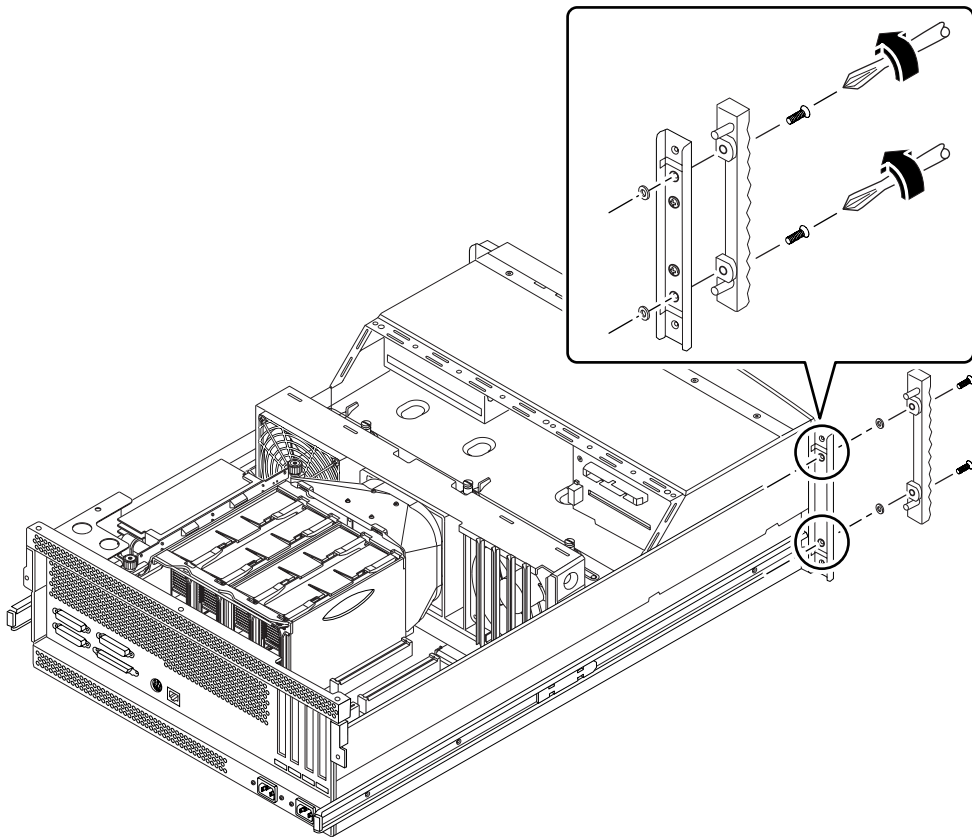
- 1. Position the door hinge on the chassis flange.**
The hinge goes on the front of the chassis flange.
- 2. Replace the two hinge screws securing the hinge to the chassis flange.**
Use a Phillips #2 screwdriver.



- 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.

What Next

To reassemble the system, complete this task:

- “How to Slide the System Into the Rack” on page 11

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 420R server, *all other component installation or replacement* must be performed by a qualified service provider.

The following tasks are covered in this chapter:

- “How to Use POST Diagnostics” on page 161
- “How to Use OpenBoot Diagnostics (OBdiag)” on page 169
- “How to Set the Diagnostic Level for POST and OBdiag” on page 182
- “How to Check Whether SunVTS Software Is Installed” on page 185
- “How to Use SunVTS Software” on page 186

Other information covered in this chapter includes:

- “About Diagnostic Tools” on page 158
- “About Power-On Self-Test (POST) Diagnostics” on page 160
- “About OpenBoot Diagnostics (OBdiag)” on page 166
- “About SunVTS Software” on page 183
- “About Sun Enterprise SyMON Software” on page 188
- “About Troubleshooting Your System” on page 189
- “About Diagnosing Specific Problems” on page 205

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 “About Power-On Self-Test (POST) Diagnostics” on page 160.

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 “About OpenBoot Diagnostics (OBDiag)” on page 166.

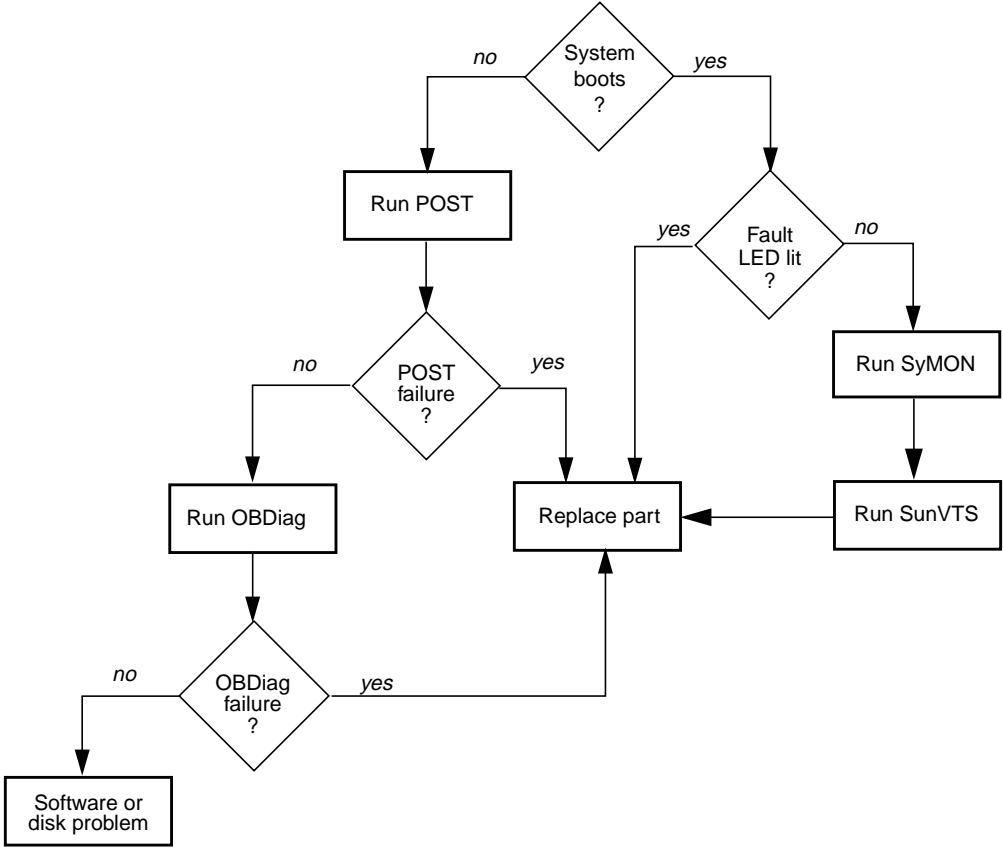
The SunVTS system exerciser is a graphics-oriented UNIX application that permits the continuous exercising of system resources and internal and external peripheral equipment. For more information about SunVTS, see “About SunVTS Software” on page 183.

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 “About Sun Enterprise SyMON Software” on page 188.

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.



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 "Error Indications" on page 189 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 "How to Use POST Diagnostics" on page 161.

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.

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 “About Communicating With the Server” or if you already have a console setup, see “How to Set Up a `tip` Connection” on page 164.

You must verify baud rates between a system and a monitor or a system and a terminal. See “How to Verify the Baud Rate” on page 165.

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 “How to Set the Diagnostic Level for POST and `OBdiag`” on page 182.

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 “Error Indications” on page 189.

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-6 keyboard, power cycle the system by simultaneously pressing the Shift key and the Power key. After a few seconds press the Power 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 “About OpenBoot Diagnostics (OBDiag)” on page 166 and “How to Use OpenBoot Diagnostics (OBDiag)” on page 169.

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)

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-6 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 “Error Indications” on page 189 for more information.

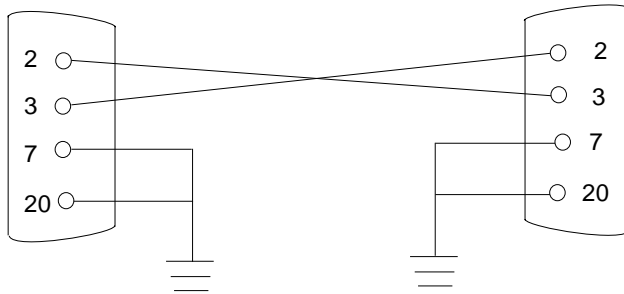
If POST detects an error condition that prevents the system from booting, it halts operation and displays the `ok` prompt. The last message displayed by POST prior to the `ok` prompt indicates which part you need to replace.

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 hardware`.

```
hostname% tip hardware
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 hardware` process.

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

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 `eeeprom`.
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.

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
- Serial
- Parallel
- Keyboard/mouse

OBDiag reports some test results by flashing or steadily illuminating the LEDs on the system front panel. See “Error Indications” on page 189 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 “How to Use OpenBoot Diagnostics (OBDiag)” on page 169.

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 “OBDiag Menu” on page 167.

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 “Configuration Variable” on page 168.

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 are 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 “OBDiag Tests” on page 171.

```
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) ==>
```


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 “Software Commands” on page 195.

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.	

How to Use OpenBoot Diagnostics (OBDDiag)

When you turn on the system power, OBDDiag 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 system'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 OBDDiag in an interactive mode and select which tests you want to perform. The following procedure describes how to run OBDDiag interactively from the system `ok` prompt.

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 OBDDiag; see “How to Set the Diagnostic Level for POST and OBDDiag” on page 182.

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

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

4. At the `ok` prompt, type:

```
ok obdiag
```

The OBDDiag 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.

OBDiag Tests

The OBDiag tests are described in the following sections:

- “PCI/Cheerio” on page 172
- “EBus DMA/TCR Registers” on page 173
- “Ethernet” on page 174
- “Keyboard” on page 175
- “Mouse” on page 176

- “Parallel Port” on page 176
- “Serial Port A” on page 177
- “Serial Port B” on page 178
- “NVRAM” on page 178
- “SCSI” on page 179
- “All Above” on page 179

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

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.
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) ==>
```

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) ==>
```

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.

```
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'
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) ====>
```

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.

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

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


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) ==>
```

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) ==>
```

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) ==>
```

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) ===>
```

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.

```
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) ===>
```

Audio

The audio diagnostic is not included for this system.

SCSI

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

The following example shows the SCSI diagnostic output message.

```
Enter (0-11 tests, 12 -Quit, 13 -Menu) ==> 10  
  
TEST='selftest'  
Enter (0-12 tests, 13 -Quit, 14 -Menu) ==>
```

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'
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) ===>

```

How to Set the Diagnostic Level for POST and OBDiag

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 “About Communicating With the Server” on page 23.

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 “Configuration Variable” on page 168 for information about each setting.

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
fpptest	Checks the floating-point unit
fstest	Tests the integrity of the software's file systems
m64test	Tests the PGX frame buffer card
mpptest	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)

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.

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.

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.

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.

What Next

For more information, refer to the appropriate Solaris documentation, as well as the `pkgadd` reference manual page.

How to Use SunVTS Software

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™ online documentation for the Solaris operating environment
- Other software documentation that you received with your system

What to Do

This procedure assumes that you will test your Sun Enterprise 420R server remotely by running a SunVTS session from a workstation using the SunVTS graphical interface. For information about other SunVTS interfaces and options, see “About Diagnostic Tools” on page 158.

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 420R 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 “How to Check Whether SunVTS Software Is Installed” on page 185.

4. To start the SunVTS software, type:

```
# cd /opt/SUNWvts/bin
# ./sunvts -display local_hostname:0
```

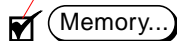
Substitute the name of the server you are using for *local_hostname*. Note that */opt/SUNWvts/bin* is the default */bin* directory for SunVTS software. If you have installed SunVTS software in a different directory, use the appropriate path instead.

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.)

To select or deselect all the tests in the Memory group



To select or deselect individual memory tests

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.

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.

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 “About Diagnostic Tools” on page 158.

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.

Front Panel LEDs

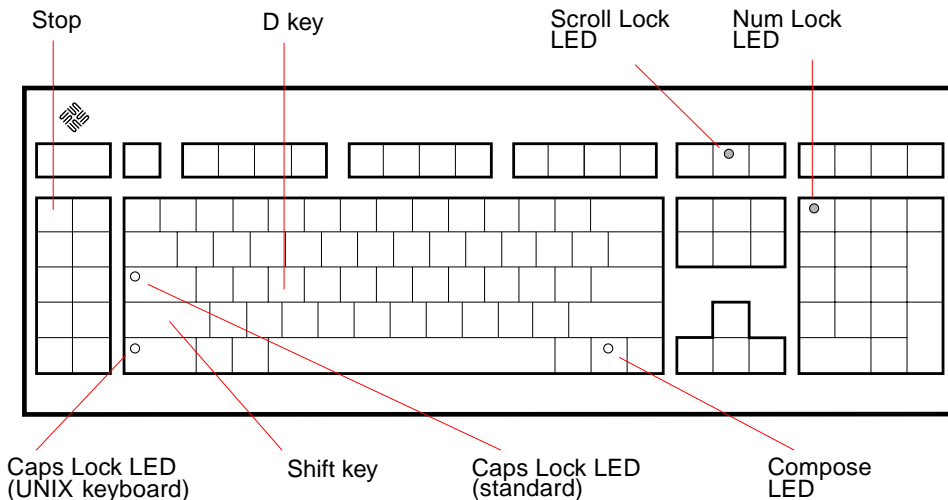
Front panel LEDs provide your first indication if there is a problem with your system. Usually, a front panel LED is not the sole indication of a problem. Error messages and even other LEDs can help to isolate the problem further.

The front panel has a general fault indicator that lights whenever POST or OBDDiag detects any kind of fault (including a fault reported by a power supply).

Keyboard LEDs

Four LEDs on the Sun Type-6 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.



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.

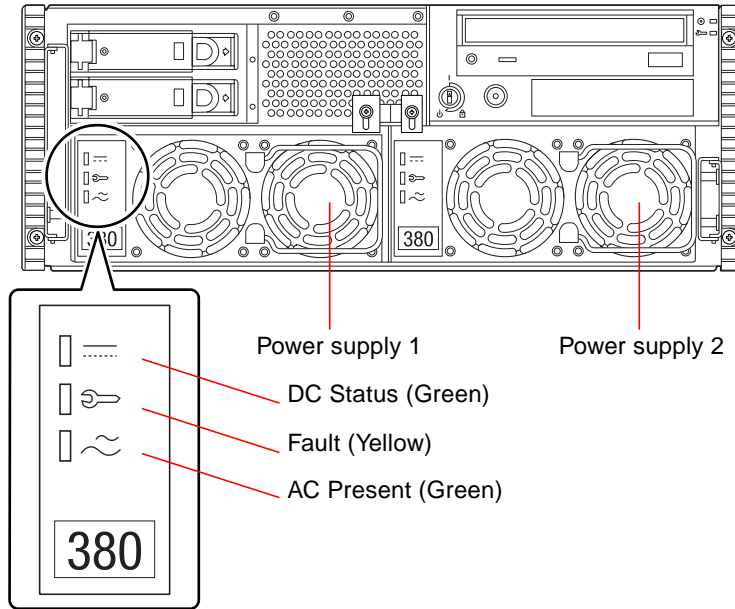
The following table provides error code definitions.

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	Off	On	CPU module 1
Off	On	On	Off	CPU module 2
Off	On	On	On	CPU module 3
On	Off	On	On	No memory detected
Off	Off	On	On	Memory bank 0
Off	On	On	On	Memory bank 1
On	Off	On	On	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.

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.

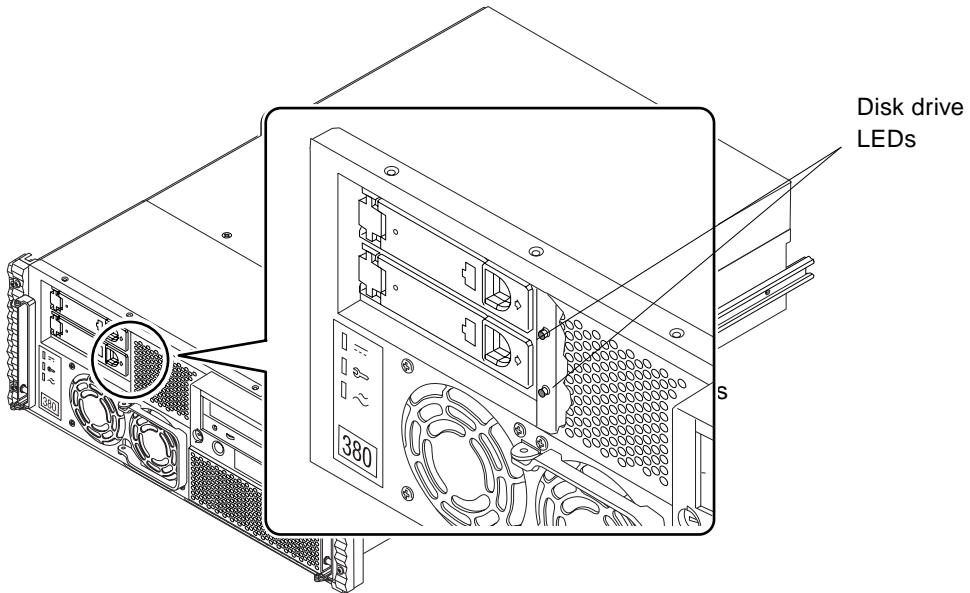


The following table provides a description of each LED.

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.

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.

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 “Configuration Variable” on page 168 for additional details.

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.)

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 420R
(4 X UltraSPARC-II 450MHz)
System clock frequency: 113 MHz
Memory size: 256 Megabytes
===== CPUs =====
      Run   Ecache   CPU   CPU
Brd  CPU  Module  MHz     MB   Impl.  Mask
---  ---  -
0    0    0      450    4.0  US-II   10.0
0    1    1      450    4.0  US-II   10.0
0    2    2      450    4.0  US-II   10.0
0    3    3      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 13:53   POST 1.2.7 1999/05/24 17:33

ok
```

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: 540-4115
banner-name: Sun Enterprise 420R
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
```

```
nvrामrc: 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 420R, enclosure-type= 540-4115, 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 420R"
% eeprom enclosure-type="540-4115"
% eeprom energystar-enabled?=false
```

Verify the variable settings by running the `eeeprom` command without any parameters, as shown in the following example.

```
% eeeprom
%
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:540-4115
banner-name: Sun Enterprise 420R
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
```


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
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        540-4115
banner-name           Sun Enterprise 420R
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

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 420R
ok setenv enclosure-type = 540-4115
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         540-4115
banner-name            Sun Enterprise 420R
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
input-device           keyboard
load-base              16384         16384
boot-command           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

```

nvrsrc		
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

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 “About Diagnostic Tools” on page 158 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
```

About Diagnosing Specific Problems

Network Communications Failure

Symptom

The system is unable to communicate over the network.

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.**

Power-On Failures

Symptom

The system attempts to power up but does not boot or initialize the monitor.

Action

1. Run POST diagnostics.

See “How to Use POST Diagnostics” on page 161.

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 “Power Supply LEDs” on page 192.

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.

Disk or CD-ROM Drive Failure

Symptom

A CD-ROM drive read error or parity error is reported by the operating system or a software application.

Action

- **Replace the drive indicated by the failure message.**

Symptom

Disk drive or CD-ROM drive fails to boot or is not responding to commands.

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 page 158 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.**

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 “OBP `printenv` Command” on page 200 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.

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 “Power Supply LEDs” on page 192 for more information about the LEDs.

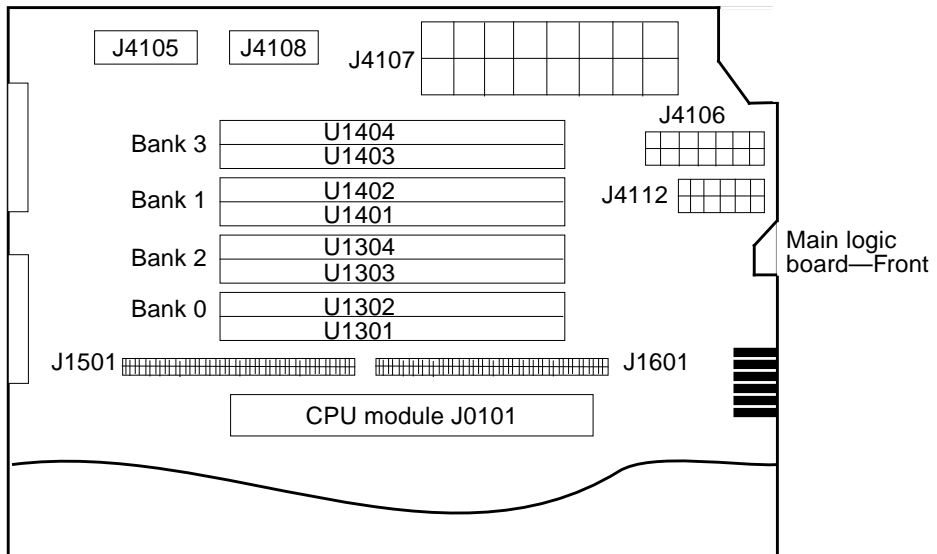
DIMM Failure

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.

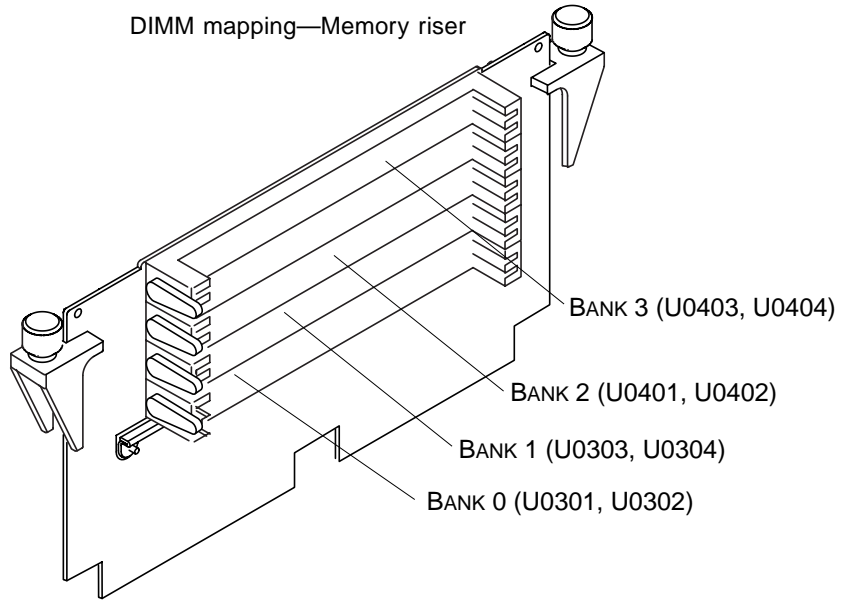
Use the following diagrams to identify the location of a failing memory module from its U number.

DIMM mapping—Main logic board

Main logic board—Side



DIMM mapping—Memory riser



Connector Signal Descriptions

This appendix describes the Sun Enterprise 420R system main logic board connector signals and pin assignments accessible from the back panel.

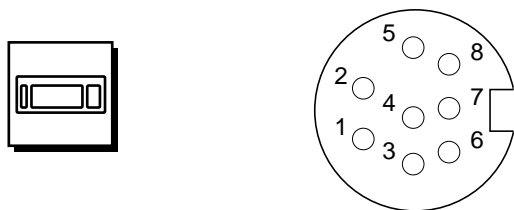
Topics covered in this appendix include:

- “Reference for the Keyboard/Mouse Connector” on page 214
- “Reference for the Serial Port A and B Connectors” on page 215
- “Reference for the Twisted-Pair Ethernet (TPE) Connector” on page 217
- “Reference for the UltraSCSI Connector” on page 219
- “Reference for the Parallel Port Connector” on page 223

Reference for the Keyboard/Mouse Connector

Keyboard/Mouse Connector Diagram

The keyboard/mouse connector (J2701) is a DIN-8 type connector located on the main logic board back panel.



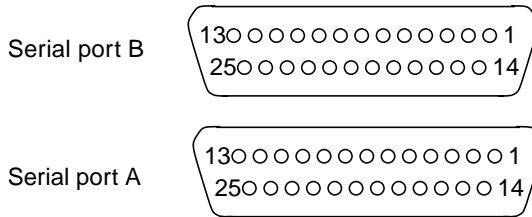
Keyboard/Mouse Connector Signals

Pin	Signal Name	Signal Description
1	Gnd	Ground
2	Gnd	Ground
3	+5 VDC	+5 VDC
4	MOUSE_IN_CONN	Mouse receive data
5	KBD_OUT_L	Keyboard out
6	KBD_IN_CONN	Keyboard in
7	KPOWERON_L	Keyboard power on
8	+5 VDC	+5 VDC

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.

Serial Port A and B Connector Diagram



Serial Port Signals

Pin	Signal	Description
1	NC	Not connected
2	SER_TDX_A_CONN	Transmit Data
3	SER_RXD_A_CONN	Receive Data
4	SER_RTS_A_L_CONN	Ready To Send
5	SER_CTS_A_L_CONN	Clear To Send
6	SER_DSR_A_L_CONN	Data Set Ready
7	Gnd	Signal Ground
8	SER_DCD_A_L-CONN	Data Carrier Detect

Pin	Signal	Description
9	BUTTON_POR	TBD
10	BUTTON_XIR_L	TBD
11	+5VDC	+5 VDC
12	NC	Not connected
13	NC	Not connected
14	NC	Not connected
15	SER_TRXC_A_L_CONN	Transmit Clock
16	NC	Not connected
17	SER_RXC_A_L_CONN	Receive Clock
18	NC	Not connected
19	NC	Not connected
20	SER_DTR_A_L_CONN	Data Terminal Ready
21	NC	Not connected
22	NC	Not connected
23	NC	Not connected
24	SER_TXC_A_L_CONN	Terminal Clock
25	None	None

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.

TPE Connector Diagram



TPE Connector Signals

Pin	Signal Name	Description
1	Common mode termination	Termination
2	Common mode termination	Termination
3	TX+	Transmit data +
4	+5 VDC	+5 VDC
5	TX-	Transmit data -
6	RX+	Receive data +
7	RX_	Receive data -
8	Common mode termination	Termination

TPE Cable-Type Connectivity

The following types of TPE cables can be connected to the TPE connector

- For 10BASE-T applications, unshielded twisted-pair (UTP) cable:
 - Category 3 (UTP-3, voice grade)
 - Category 4 (UTP-4)
 - Category 5 (UTP-5, data grade)
- For 100BASE-TX applications, UTP cable, UTP-5, data grade

External UTP-5 Cable Lengths

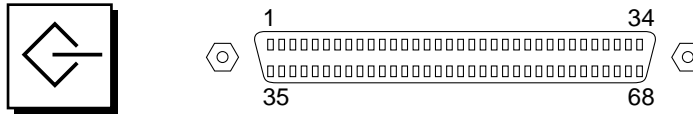
The following list describes the TPE UTP-5 cable applications and maximum lengths.

- Cable type - UTP-5, "data grade"
- Applications - 10BASE-T or 100BASE-TX
- Maximum length (metric) - 100 meters
- Maximum length (US) - 109 yards

Reference for the UltraSCSI Connector

The Ultra small computer system interface (UltraSCSI) connector is located on the main logic board back panel.

UltraSCSI Connector Diagram



UltraSCSI Connector Signals

Pin	Signal Name	Description
1	Gnd	Ground
2	Gnd	Ground
3	NC	Not connected
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

Pin	Signal Name	Description
16	Gnd	Ground
17	TERMPOWER	Termpower
18	TERMPOWER	Termpower
19	NC	Not connected
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	SCSI_B_DAT<12>	Data 12
36	SCSI_B_DAT<13>_	Data 13
37	SCSI_B_DAT<14>_	Data 14
38	SCSI_B_DAT<15>_	Data 15
39	SCSI_B_PAR<1>	Parity 1
40	SCSI_B_DAT<0>_	Data 0
41	SCSI_B_DAT<1>_	Data 1
42	SCSI_B_DAT<2>_	Data 2
43	SCSI_B_DAT<3>_	Data 3

Pin	Signal Name	Description
44	SCSI_B_DAT<4>_	Data 4
45	SCSI_B_DAT<5>_	Data 5
46	SCSI_B_DAT<6>_	Data 6
47	SCSI_B_DAT<7>_	Data 7
48	SCSI_B_PAR<0>	Parity 0
49	Gnd	Ground
50	NC	Not connected
51	TERMPower_B	Terminal B power
52	TERMPower_B	Terminal B power
53	NC	Not connected
54	Gnd	Ground
55	SCSI_B_ATN_L	Attention
56	Gnd	Ground
57	SCSI_B_BSY_L	Busy
58	SCSI_B_ACK_L	Acknowledge
59	SCSI_B_RESET_L	Reset
60	SCSI_B_MSG_L	Message
61	SCSI_B_SEL_L	Select
62	SCSI_B_CD_L	Command
63	SCSI_B_REQ_L	Request
64	SCSI_B_IO_L	In/out
65	SCSI_B_DAT<8>_	Data 8

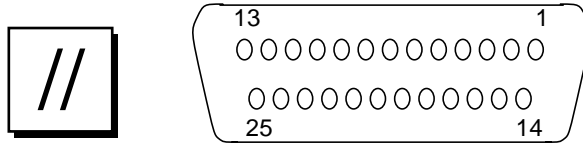
Pin	Signal Name	Description
66	SCSI_B_DAT<9>_	Data 9
67	SCSI_B_DAT<10>_	Data 10
68	SCSI_B_DAT<11>_	Data 11

Note – _ (underscore) signifies active low.

Reference for the Parallel Port Connector

The parallel port connector is a DB-25 type connector located on the main logic board back panel.

Parallel Port Connector Diagram



Parallel Port Signals

Pin	Signal	Description
1	PAR_DS_L_CONN	Data Strobe Low
2 to 9	PP_DAT[0..7]_CONN	Data0 Through Data7
10	PAR_ACK_L_CONN	Acknowledge Low
11	PAR_BUSY_CONN	Busy
12	PAR_PE_CONN	Parity Error
13	PAR_SELECT_L_CONN	Select Low
14	PAR_AFXN_L_CONN	Auto Feed Low
15	PAR_ERROR_L_CONN	Error Low
16	PAR_INIT_L_CONN	Initialize Low
17	PAR_IN_L_CONN	Peripheral Input Low

Pin	Signal	Description
18	Gnd	Chassis ground
19	Gnd	Chassisl ground
20	Gnd	Chassis ground
21	Gnd	Chassis ground
22	Gnd	Chassis ground
23	Gnd	Signal ground
24	Gnd	Signal ground
25	Gnd	Signal ground

System Specifications

This appendix provides product specifications for the Sun Enterprise 420R server.

- “Physical Specifications” on page 226
- “Electrical Specifications” on page 226
- “Environmental Specifications” on page 227

Reference for System Specifications

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

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

Parameter	Value
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.

Environmental Specifications

The environmental requirements for the system are as follows.

Parameter	Value
Operating	
Temperature	5°C to 35°C (41°F to 95°F)—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
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	-20°C to 60°C (-4°F to 140°F)—IEC 68-2-1, 68-2-2
Humidity	93% RH, noncondensing at 35°C—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 Times-Roman	1 m/s—SUN 900-1813

Functional Description

This appendix provides functional descriptions for the following:

- “System Unit” on page 230
- “Power Supply” on page 256
- “Main Logic Board” on page 259

The following items are not supported on the Sun Enterprise 440R server:

- Graphics and imaging card
- Diskette drive
- Audio card

System Unit

This section is organized into the following subsections:

- “System Overview” on page 230
- “UPA” on page 232
- “PCI Bus” on page 233
- “UltraSPARC II Processor” on page 235
- “Memory System” on page 236
- “Graphics and Imaging” on page 243
- “Peripherals” on page 243
- “Other Peripheral Assembly Options” on page 244
- “Keyboard and Mouse Port, and Parallel Port” on page 245
- “Serial Port” on page 246
- “Ethernet” on page 249
- “SCSI” on page 250
- “ASICs” on page 253
- “SuperIO” on page 256

System Overview

The system 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 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 requests packets through the UPA address bus and controls the flow of data using the XB9++ ASIC and the CBT switching network.

UPA

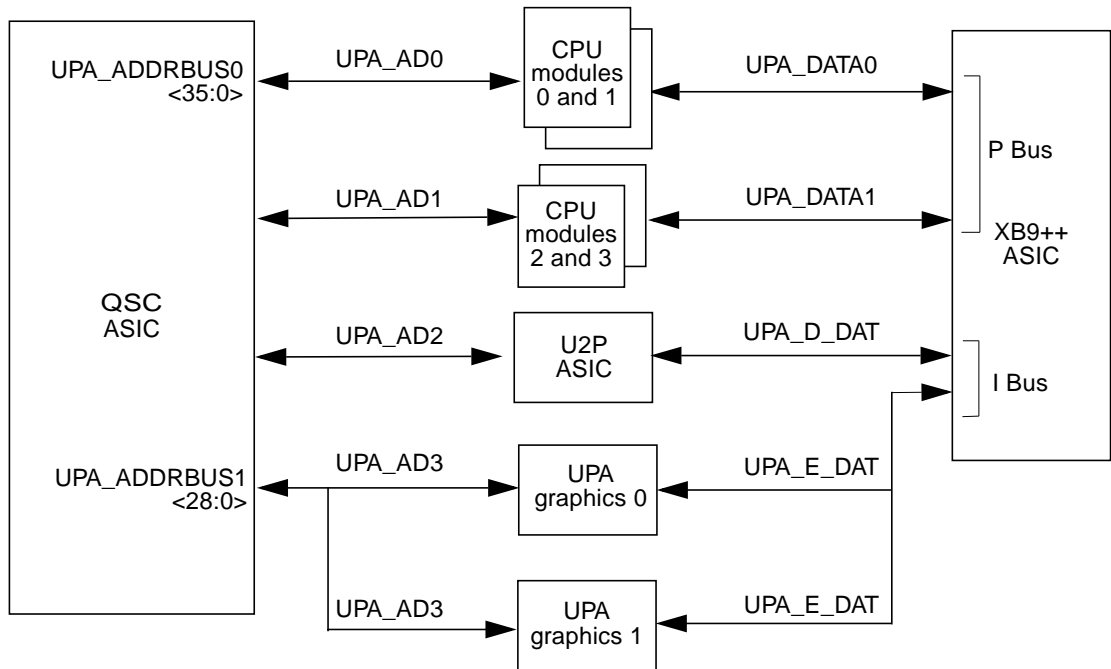
The UltraSPARC port architecture (UPA) provides a packet-based interconnect between the UPA clients: CPU modules, U2P ASIC, and UPA graphics cards. Electrical interconnection is provided through four address buses and four data buses.

Bus Name	Bus Designation	Bus Type	Function
UPA address bus 0	UPA_AD0	Address	Connects the QSC ASIC to the CPU modules and the U2P ASIC.
UPA address bus 1	UPA_AD1	Address	Connects the QSC ASIC to the CPU modules and the U2P ASIC.
UPA address bus 2	UPA_AD2	Address	Connects the QSC ASIC to the U2P ASIC.
UPA address bus 3	UPA_AD3	Address	Connects the QSC ASIC to the UPA graphics.
UPA data bus 0	UPA_DATA0	Data	A bidirectional 144-bit data bus (128 bits of data and 16 bits of ECC) that connects CPU modules 0 and 1 to the XB9++ ASIC.
UPA data bus 1	UPA_DATA1	Data	A bidirectional 144-bit data bus (128 bits of data and 16 bits of ECC) that connects CPU modules 2 and 3 to the XB9++ ASIC.
UPA data bus 2	UPA_D_DAT	Data	A 72-bit data bus (64 bits of data and 8 bits of ECC) that connects the XB9++ ASIC and the U2P ASIC.
UPA data bus 3	UPA_E_DAT	Data	A 64-bit data bus that connects the U2P ASIC and the UPA graphics.

The following table lists UPA port identification assignments.

UPA Slot Number	UPA Port ID <4:0>
CPU module slot 0	0x0
CPU module slot 1	0x1
CPU module slot 2	0x2
CPU module slot 3	0x3
U2P ASIC	0x1F

The following figure illustrates how the UPA address and data buses are connected between the UPA and the UPA clients.



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. Both buses are controlled by the UPA-to-PCI bridge (U2P) ASIC. There are also two on-board PCI controllers, the Symbios 53C876 SCSI controller and the PCI-to-Ebus/Ethernet controller (PCIO) ASIC, on the 33-MHz PCI bus.

PCI Cards

PCI cards come in a variety of configurations. Not all cards will fit or operate in all PCI slots, so it is important to know the specifications of your PCI cards and the types of cards supported by each PCI slot in the system.

Some PCI cards are as short as 6.875 inches (17.46 cm) in length, called “short” cards, while the maximum length of PCI cards is 12.28 inches (31.19 cm), called “long” cards. Each slot in the system can accommodate either a long or a short card.

Older PCI cards communicate over 32-bit PCI buses, while many newer cards communicate over wider 64-bit buses. PCI slot PCI 1 accepts 32-bit-wide PCI cards only and PCI slots 2 through 4 will accept either 32-bit or 64-bit wide cards.

Older PCI cards operate at 5 VDC, while newer cards are designed to operate at 3.3 VDC. Cards that require 5 volts will not operate in 3.3-volt slots, and 3.3-volt cards will not operate in 5-volt slots. “Universal” PCI cards are designed to operate on either 3.3 volts or 5 volts, so these cards can be inserted into either type of slot. The system provides three slots for 5-volt cards and one slot for a 3.3-volt card. All four PCI slots accept universal cards.

Most PCI cards operate at clock speeds of 33 MHz, while some newer cards operate at 66 MHz. All four PCI slots can accept 33-MHz cards. 66-MHz cards are restricted to the slot labelled PCI 1. The following table lists the mapping of the PCI slots to the two PCI buses, and the type of PCI cards supported in each slot.

Connector Label	Jack No.	PCI Bus	Slot Width (Bits)/ Card Type (Bits)	Clock Rates (MHz)	DC Voltage (VDC)/ Card Type
PCI 1	J1801	1	64/32 or 64	66	3/64-bit
PCI 2	J2001	0	64/32 or 64	33	5/universal
PCI 3	J1901	0	64/32 or 64	33	5/universal
PCI 4	J4701	0	32/32	33	5/32-bit

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 “U2P” on page 255.

SCSI Controller

The 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 a dual SCSI bus controller on the same PCI slot. SCSI “A” is used to interface to internal devices. SCSI “B” is used to interface to external devices.

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 devices. The PCIO ASIC also embeds the Ethernet controller. For a brief description of the PCIO ASIC, see “PCIO” on page 254.

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 module provides a second-level cache of up to 4 Mbytes.

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

Memory System

The system's main logic board provides sixteen slots for high-capacity dual inline memory modules (DIMMs). Eight of the sixteen slots are located on the main logic board and the other eight memory slots are located on the memory riser assembly. The system supports Sun standard 168-pin, 5-volt, 60-nanosecond DIMMs. DIMMs of 16-, 32-, 64-, 128-, and 256-Mbyte capacities can be installed in the system. Total system memory capacity ranges from 64 Mbytes to 4 Gbytes.

Memory slots are organized into four banks (bank 0 through bank 3), with each bank comprising four slots. Each bank is divided between the main logic board and the memory riser assembly. Consequently, the DIMMs must be installed in groups of four, with two DIMMs being installed in a main logic board bank and the second set of two DIMMs being installed in the associated memory riser assembly bank. The system reads from, or writes to, all four DIMMs in a bank at the same time.

The memory system (see the following figure) consists of four components: the QSC ASIC, the XB9++ ASIC, the CBT switching network, and the memory module.

The QSC ASIC generates memory addresses and control signals to the memory module. The QSC ASIC also coordinates the two 288-bit-wide data bus {MEM_DAT0 and MEM_DAT1} data transfers between the XB9++ ASIC. Coordination is provided by the BANK_SEL control signal to the CBT switching network.

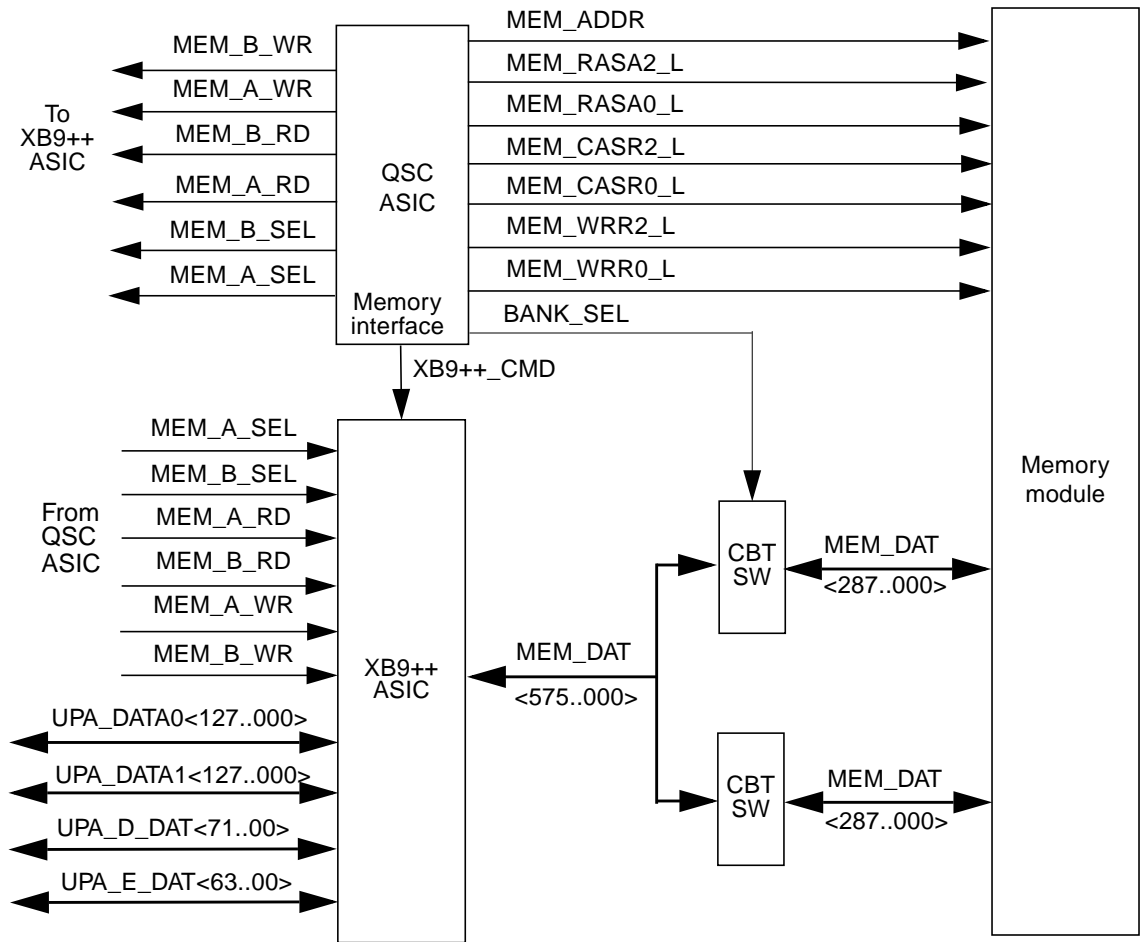
The XB9++ ASIC exchanges 144-bit-wide bus data with the two CPU data buses: UPA_DATA0 and UPA_DATA1; exchanges 64-bit-wide bus (UPA_E_DAT) data with the two UPA graphic slots; and exchanges 72-bit-wide bus (UPA_D_DAT) data with the U2P ASIC. This data is placed on a 576-bit-wide bus and exchanged with the CBT switching network where it is divided on to two 276-bit-wide data buses and exchanged with the memory module.

The following figures illustrates a functional block diagram of the memory system, including DIMMs on the main logic board and the memory riser assembly.

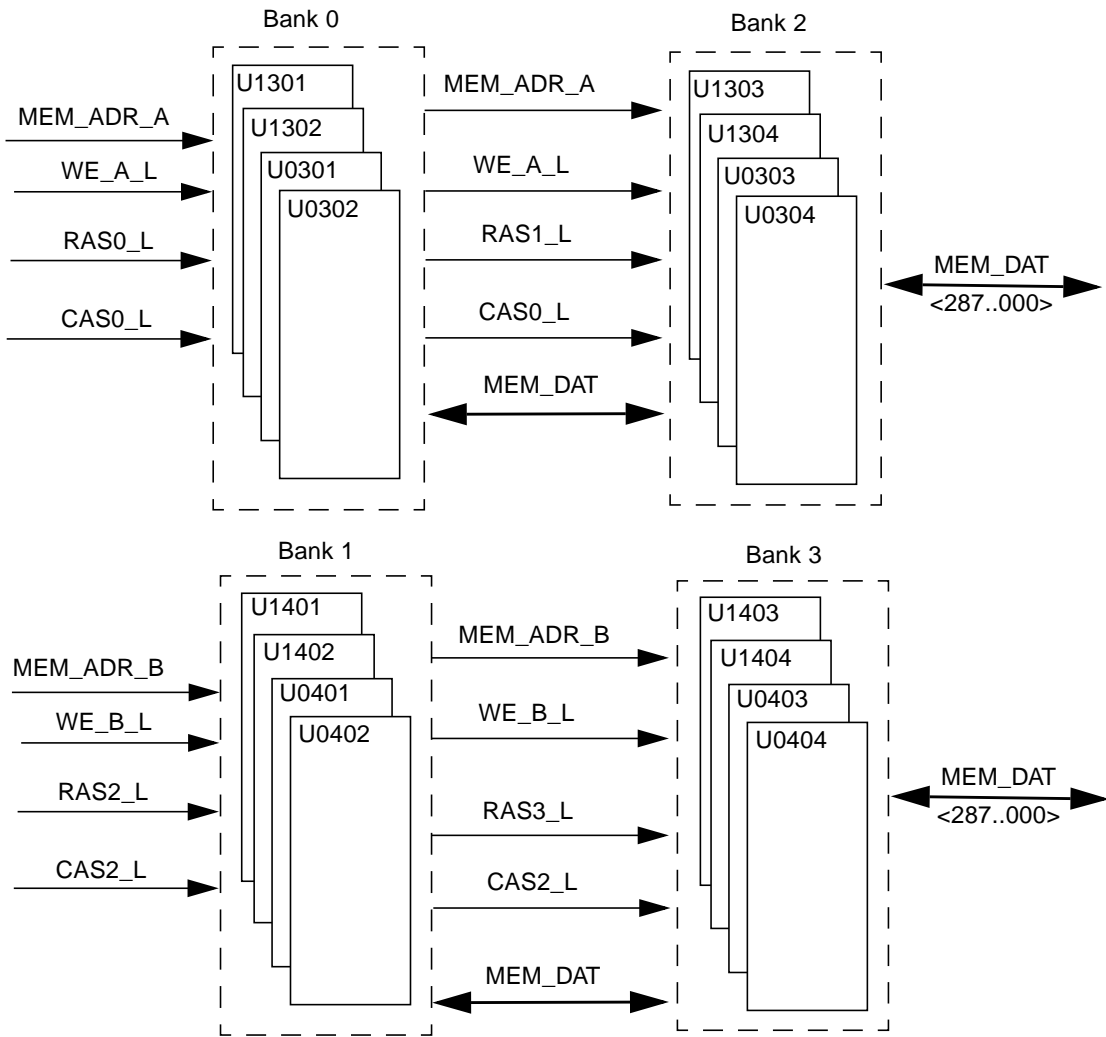


Caution – Failure to populate a memory bank with DIMMs of equal capacity will result in inefficient use of memory resource or system failure.

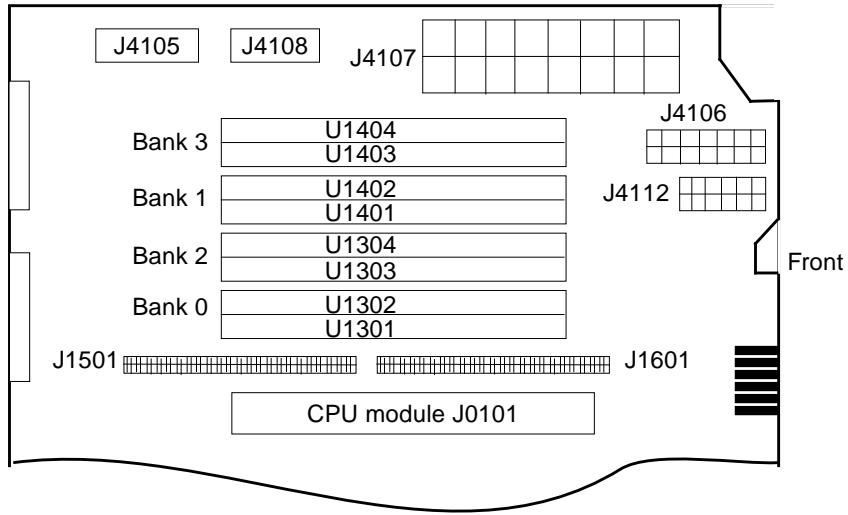
The following figure shows the memory system functional block diagram.



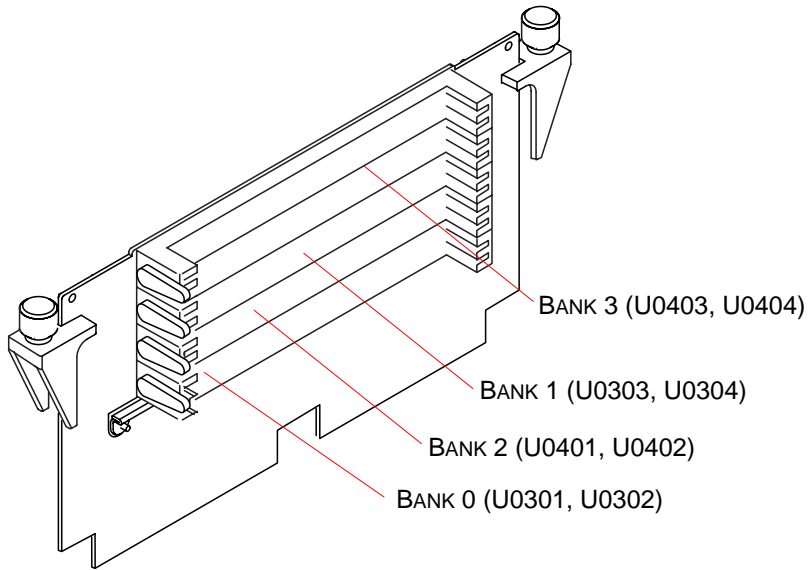
The following figure shows the memory module functional block diagram.



The following figure shows DIMM mapping on the main logic board.



The following figure shows DIMM mapping on the main logic board.



DIMM



Caution – DIMMs are made of electronic components that are extremely sensitive to static electricity. Static from your clothes or work environment can destroy the modules. Do not remove any DIMM from its antistatic packaging until you are ready to install it on the main logic board. 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.

The DIMM is a 60-nanosecond, fast-page-mode-style DIMM. Five DIMM configurations are possible in the system: -16, -32, 64-, 128-, and 256-Mbyte. The minimum memory capacity is 64 Mbytes (four 16-Mbyte DIMMs) and the maximum memory capacity is 4 Gbytes (sixteen 256-Mbyte DIMMs).

There are a total of four DIMM banks in the system. The following table matches the DIMM bank to the DIMM U number.

Bank	U Number (Main Logic Board)	U Number (Riser Card)
0	U1301 and U1302	U0301 and U0302
2	U1303 and U1304	U0303 and U0304
1	U1401 and U1402	U0401 and U0402
3	U1403 and U1404	U0403 and U0404

Interleaving

Whenever banks 0 and 1 are populated with identical capacity DIMMs, memory reads and writes are automatically interleaved between the two banks. This is called two-way interleaving. Two-way interleaving significantly reduces the average memory latency, thus improving overall system performance. When all four banks contain identical capacity DIMMs, the system interleaves across all four banks (called four-way interleaving), to further reduce average memory latency.

The system can operate with memory DIMMs of different capacities in different banks (for example four 64-Mbyte DIMMs in bank 0 and four 128-Mbyte DIMMs in bank 1), but for improved performance, populate all banks with DIMMs of identical capacity.

For maximum performance, install identical capacity DIMMs in all four memory banks. The following table lists how to best populate the memory banks when configuring the system for 512 Mbytes of memory. The following tables list memory addressing with various interleaving configuration scenarios.

The following table lists memory addressing with no interleaving.

DIMM Size/Quantity	Memory Bank	Addressing
16-Mbyte/4	0	0 x 0000.0000 to 0 x 03ff.ffc0
16-Mbyte/4	1	0 x 4000.0000 to 0 x 43ff.ffc0
16-Mbyte/4	2	0 x 8000.0000 to 0 x 83ff.ffc0
16-Mbyte/4	3	0 x c000.0000 to 0 x c3ff.ffc0
32-Mbyte/4	0	0 x 0000.0000 to 0 x 07ff.ffc0
32-Mbyte/4	1	0 x 4000.0000 to 0 x 47ff.ffc0
32-Mbyte/4	2	0 x 8000.0000 to 0 x 87ff.ffc0
32-Mbyte/4	3	0 x c000.0000 to 0 x c7ff.ffc0
64-Mbyte/4	0	0 x 0000.0000 to 0 x 0fff.ffc0
64-Mbyte/4	1	0 x 4000.0000 to 0 x 4fff.ffc0
64-Mbyte/4	2	0 x 8000.0000 to 0 x 8fff.ffc0
64-Mbyte/4	3	0 x c000.0000 to 0 x cfff.ffc0
128-Mbyte/4	0	0 x 0000.0000 to 0 x 1fff.ffc0
128-Mbyte/4	1	0 x 4000.0000 to 0 x 5fff.ffc0
128-Mbyte/4	2	0 x 8000.0000 to 0 x 7fff.ffc0
128-Mbyte/4	3	0 x c000.0000 to 0 x dfff.ffc0
256-Mbyte/4	0	0 x 0000.0000 to 0 x 3fff.ffc0
256-Mbyte/4	1	0 x 4000.0000 to 0 x 7fff.ffc0
256-Mbyte/4	2	0 x 8000.0000 to 0 x bfff.ffc0
256-Mbyte/4	3	0 x c000.0000 to 0 ffff.ffc0

The following table lists memory addressing for 2-way interleaving.

DIMM Size/Quantity	DIMM Bank	Addressing
16-Mbyte/4	0	0 x 0000.0000 to 0 x 07ff.ff80
16-Mbyte/4	1	0 x 0000.0040 to 0 x 07ff.ffc0
32-Mbyte/4	0	0 x 0000.0000 to 0 x 0fff.ff80
32-Mbyte/4	1	0 x 0000.0040 to 0 x 0fff.ffc0
64-Mbyte/4	0	0 x 0000.0000 to 0 x 1fff.ff80
64-Mbyte/4	1	0 x 0000.0040 to 0 x 1fff.ffc0
128-Mbyte/4	0	0 x 0000.0000 to 0 x 3fff.ff80
128-Mbyte/4	1	0 x 0000.0040 to 0 x 3fff.ffc0
256-Mbyte/4	0	0 x 0000.0000 to 0 x 3fff.ffff
256-Mbyte/4	1	0 x 0000.0040 to 0 x 7fff.ffc0

The following table lists memory addressing for 4-way interleaving

DIMM Size/Quantity	DIMM Bank	Addressing
16-Mbyte/4	0	0 x 0000.0000 to 0 x 0fff.ff00
16-Mbyte/4	1	0 x 0000.0040 to 0 x 0fff.ff40
16-Mbyte/4	2	0 x 0000.0080 to 0 x 0fff.ff80
16-Mbyte/4	3	0 x 0000.0000 to 0 x 0fff.ffc0
32-Mbyte/4	0	0 x 0000.0000 to 0 x 1fff.ff00
32-Mbyte/4	1	0 x 0000.0040 to 0 x 1fff.ff40
32-Mbyte/4	2	0 x 0000.0080 to 0 x 1fff.ff80
32-Mbyte/4	3	0 x 0000.00c0 to 0 x 1fff.ffc0
64-Mbyte/4	0	0 x 0000.0000 to 0 x 3fff.ff00
64-Mbyte/4	1	0 x 0000.0040 to 0 x 3fff.ff40
64-Mbyte/4	2	0 x 0000.0080 to 0 x 3fff.ff80
64-Mbyte/4	3	0 x 0000.00c0 to 0 x 8fff.ffc0
128-Mbyte/4	0	0 x 0000.0000 to 0 x 7fff.ff00
128-Mbyte/4	1	0 x 0000.0040 to 0 x 7fff.ff40

DIMM Size/Quantity	DIMM Bank	Addressing
128-Mbyte/4	2	0 x 0000.0080 to 0 x 7fff.ff80
128-Mbyte/4	3	0 x 0000.00c0 to 0 x 7fff.ffc0
256-Mbyte/4	0	0 x 0000.0000 to 0 x ffff.ff00
256-Mbyte/4	1	0 x 0000.0040 to 0 x ffff.ff40
256-Mbyte/4	2	0 x 0000.0080 to 0 x ffff.ff80
256-Mbyte/4	3	0 x 0000.00c0 to 0 x ffff.ffc0

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.

Graphics and Imaging

The system takes advantage of UPA features to provide high-performance graphics. High-performance graphics can include a vertical, single-buffer UPA graphics card, a vertical, double-buffer plus Z (DBZ) UPA graphics card, or an Elite3D UPA graphics card. A graphics card can be connected to the system through the UPA64S expansion connector.

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.

Peripherals

The following peripherals are supported by the system:

- CD-ROM drive
- Hard drives

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.

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 msec

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.

Other Peripheral Assembly Options

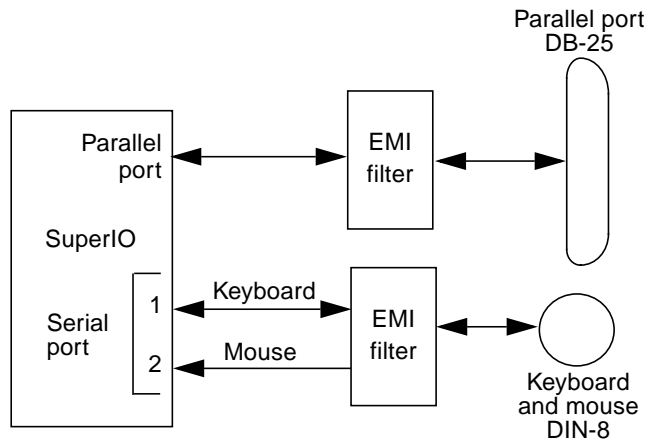
The system supports other peripheral assembly options that can be installed in the system in lieu of the CD-ROM drive. These options can include the 4-Gbyte 4-mm DDS2 tape drive; the 12-24-Gbyte 4-mm DDS3 tape drive; the 8705 7-Gbyte 8-mm tape drive; the 4-8-Gbyte tape drive; and the 14-Gbyte tape drive. For a listing of all optional components, refer to the product guide.

Keyboard and Mouse Port, and Parallel Port

The keyboard and mouse, diskette, and parallel port interfaces are managed by the SuperIO component. For a brief description of the SuperIO, see “SuperIO” on page 256.

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.



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, four-bit nibbles using 4 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.

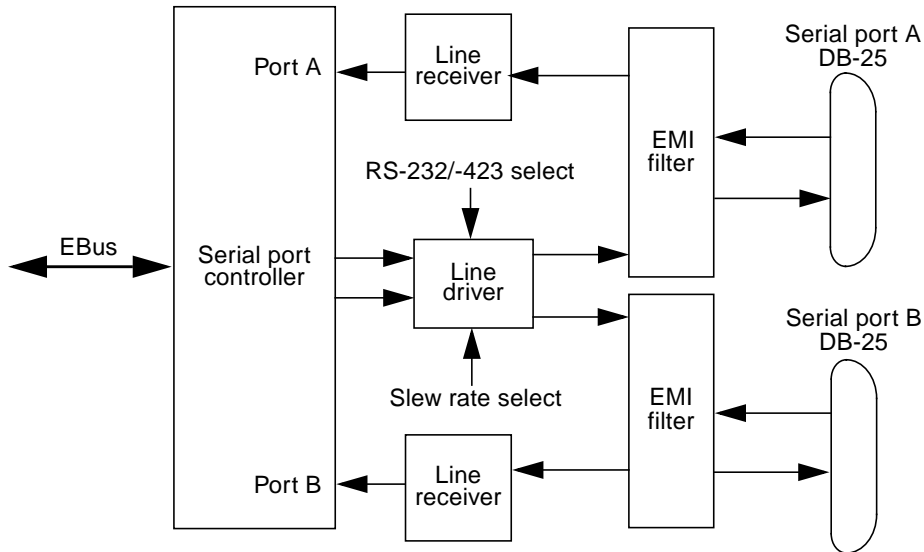
Serial Port

The system 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

The following figure shows a functional block diagram of the serial port.



Serial Port Components

Serial port components include a serial port controller, line drivers, and 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/ μ sec. For baud rates under 100K, the slew rate is set to 5 VDC/ μ sec.

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 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 (001_2) is anything greater than +3 VDC and a binary 0 (000_2) 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 J2804 and J2805. 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 the exception of 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.

Ethernet

The system supports 10-Mbps, 10BASE-T, twisted-pair Ethernet and 100-Mbps, 100BASE-TX. Twisted-pair Ethernet is provided through an 8-pin RJ45 connector. The Ethernet circuitry design is based on a Quality Semiconductor PHY.

The PHY chip integrates a 100BASE-T physical coding sub-layer (PCS) and a complete 10BASE-TX module in a single chip.

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 and 10BASE-T sections share the following functional characteristics:

- PCS control
- IEEE 802.3u auto negotiation

The following sections provide brief descriptions of the following:

- Automatic negotiation
- Connectors

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.

External Cables

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.

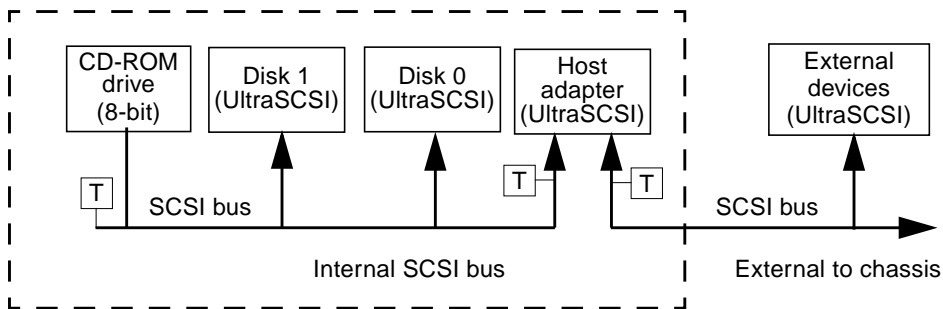
Note – The maximum cable segment lengths for the 100BASE-TX and 10BASE-T are 109 yards (100 meters) and 1094 yards (1000 meters), respectively.

SCSI

The system implements a small computer system interface (SCSI) FastWide-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 cable. A second set of terminators is located close to the SCSI host adapter. The following figure shows the SCSI bus configuration.



Configuration for the SCSI Bus

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 UltraSCSI single-ended drivers and receivers characteristics. The electrical characteristics of the output buffers include:

- V_{ol} (output low) equals 0 to 0.5 VDC with I_{ol} at 48 mA (signal asserted)
- V_{oh} (out high) equals 2.5 to 3.7 VDC (signal negated)
- t_{rise} (rising slew rate) equals 520 mV per nanosecond maximum (0.7 to 2.3 VDC)
- t_{fall} (falling slew rate) equals 520 mV per nanosecond maximum (2.3 to 0.7 VDC)

The UltraSCSI electrical characteristics for the host adapter and target device include:

- V_{il} (input low) equals 1.0 VDC maximum (signal true)
- V_{ih} (input high) equals 1.9 VDC minimum (signal false)
- I_{il} (input low current) equals +/- 20 μ A at V_i equals 0.5 VDC
- I_{ih} (input high current) equals +/- 20 μ A at V_i equals 2.7 VDC
- Minimum input hysteresis equals 0.3 VDC

Supported Target Devices

The SCSI subsystem supports a maximum of four internal devices, including the host adapter. A unipack with one drive or a six-pack, accommodating six drives, can be used as external devices. The following table lists the target devices supported by the SCSI subsystem.

Target Device	Comment
Internal hard drives	Up to two 1.0- x 4.0-inch (2.54-cm x 10.2-cm) 9.1-Gbyte, or up to two 18-Gbyte. 1.0- x 4.0 (2.54-cm x 10.2-cm). All internal hard drives 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.

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 approximate 32-inch (0.8-meter) UltraSCSI-compliant external cable is supported in addition to an approximate 6.5-foot (2-meter) UltraSCSI-compliant external cable.

Note – Consult your authorized Sun sales representative or service provider to order a 31.5-inch (0.8-meter) or a 2.2-yard (2-meter) UltraSCSI-compliant external cable.

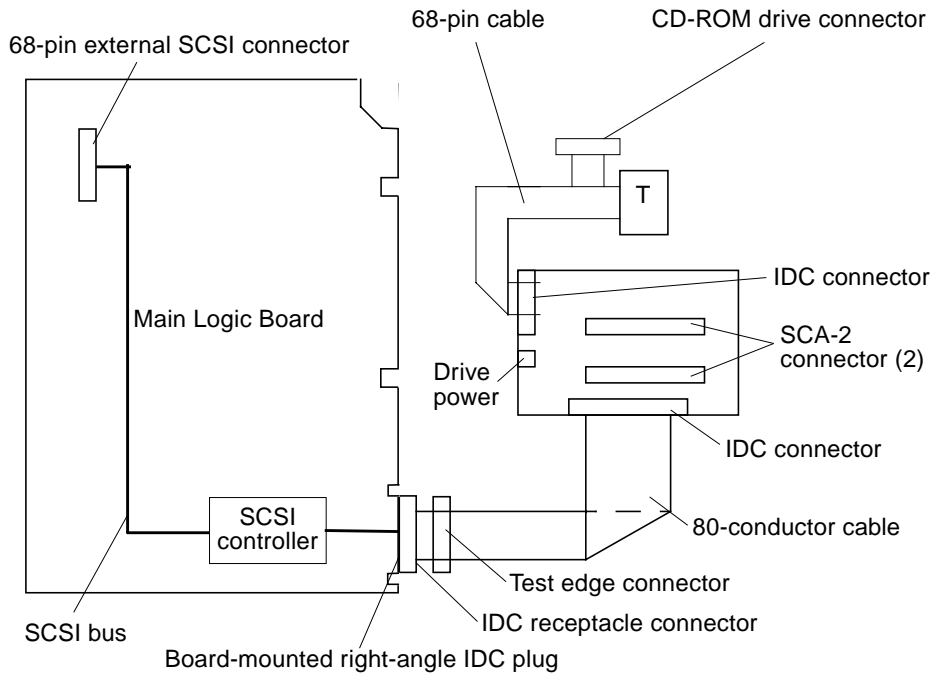
Internal SCSI Subassembly

The internal SCSI subassembly consists of two cable assemblies and one SCSI card. The SCSI subassembly is attached to the main logic board using an insulation displacement connector (IDC) receptacle attached to an 80-conductor cable. 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 power connector to supply 5-VDC and 12- VDC power to the hard drives, and two green right-angle LEDs.

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 subassembly.



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.

ASICs

The system achieves a high level of integration through application-specific integrated circuits (ASICs). The following ASICs are highlighted and are described in the following subsections:

- “XB9++”
- “QSC”
- “PCIO”

- “U2P”
- “RISC”

XB9++

The XB9++ ASIC is a buffered memory crossbar device that acts as the bridge between the six system buses. The six system 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)

QSC

The QSC ASIC provides system control. It controls the UPA interconnect between the major system 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

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.

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.

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

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
- IEEE 1284 parallel port interface

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)	Max 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.

Control Signals

With the exception of the PowerOn signal, all power supply control signals are at TTL signal levels.

Parameter	Min	Max
V _{OH} (high-level output voltage)	2.4 VDC	
V _{OL} (low-level output voltage)		0.4 VDC
V _{IH} (high-level input voltage)	2.0 VDC	
V _{IL} (low-level input voltage)		0.8 VDC

Remote Enable PowerOn

A remote interface can enable the DC outputs with a low signal to the PowerOn input. The signal is interfaced to the power supply through the main logic board and the power distribution board.

System Unit Power Budget

The following subsections present the system unit power budget.

PCI Cards

The system has four PCI card slots and a total power budget of 60 watts to power these slots. The PCI slots are one of three power levels; 7.5 watts, 15 watts, and 25 watts. The power is provided from either the 3.3-VDC or 5-VDC voltage rails. The 66-MHz PCI slot is 3.3 VDC only. The sum of the power requirements for all the PCI cards must be less than 60 watts as listed in the following examples:

- Two 25-watt cards plus one 7.5-watt card (equals 57.5 watts)
- One 25-watt card plus two 15-watt cards (equals 55 watts)
- Four 15-watt cards (equals 60 watts)

Note – A graphics card installed in the second UPA slot results in an unusable PCI slot. However, the unusable PCI slot must be counted as a 15-watt PCI card for power budgeting.

Internal Access Drive Bay

The power budget of the internal access drive bay is not to exceed 1.0 amps at 5 VDC; 1.5 amps at 12 VDC; 23 watts per drive (times 2 internal drive bays).

External Access Drive Bay

The power budget of the 5.25-inch external access drive bay is not to exceed 1 amp at 5 VDC; 1.0 amps at 12 VDC; 17 watts per bay.

The power budget of the 3.5-inch external access drive bay is not to exceed 1.2 watts (VDC only).

Standard System Facilities

In addition to the previously listed features, the system provides the following:

- TOD/NVRAM for clock and identification functions
- Flash PROM for operating system initialization. The flash PROM is reprogrammable through UNIX and OBP utilities.

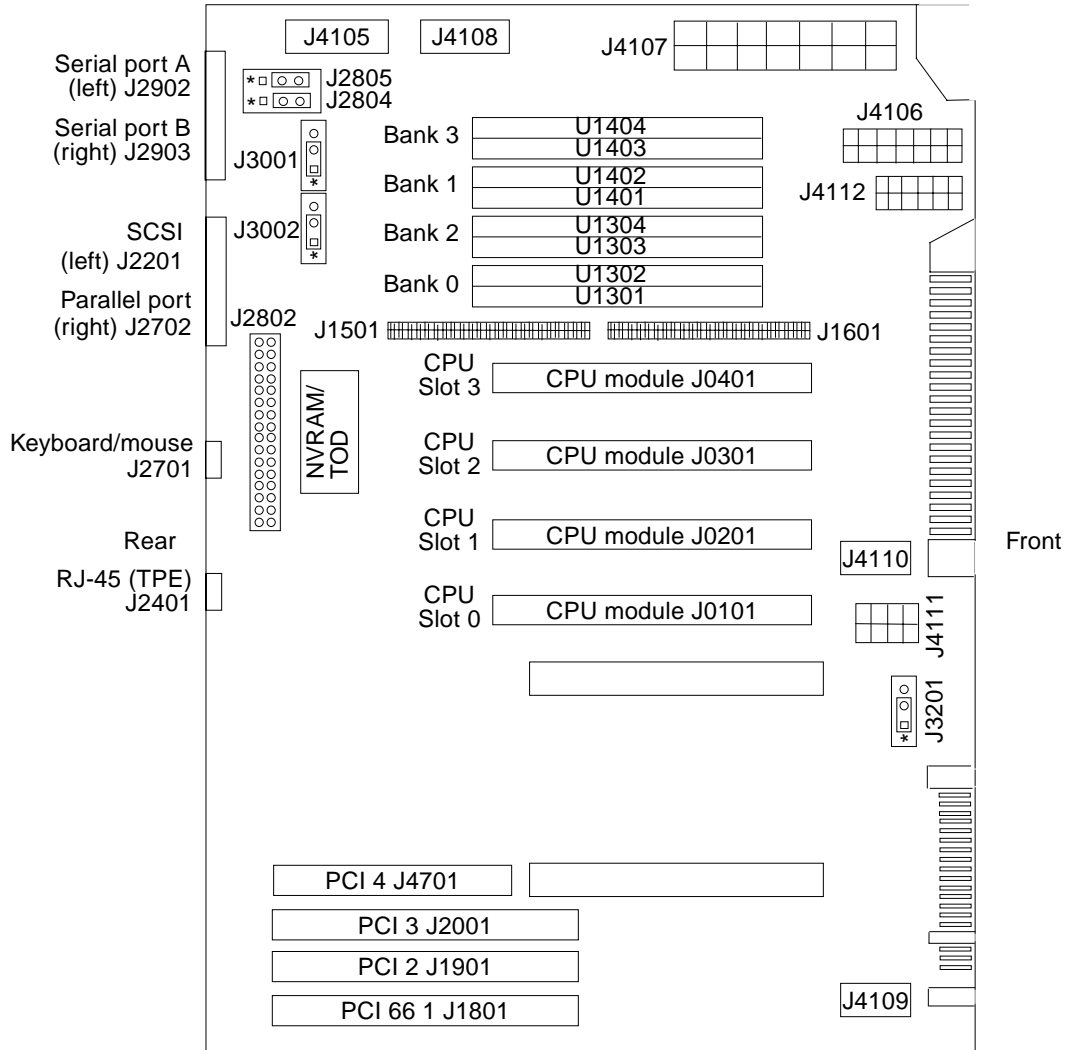
DC-to-DC Converter Assembly

The DC-to-DC converter assembly converts 5 VDC to 2.6 VDC/48 amps. The converted voltage is used to power up to four CPU modules. The DC-to-DC converter assembly is protected against overcurrents and provides current limiting. If an over-voltage condition occurs, the DC-to-DC converter assembly will turn off the power supply assembly.

The DC-to-DC converter assembly uses +12 VDC to power its fan and control circuitry. Included with the DC-to-DC converter assembly is a temperature dependent variable speed fan that is used to cool memory and the converter control circuitry.

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.

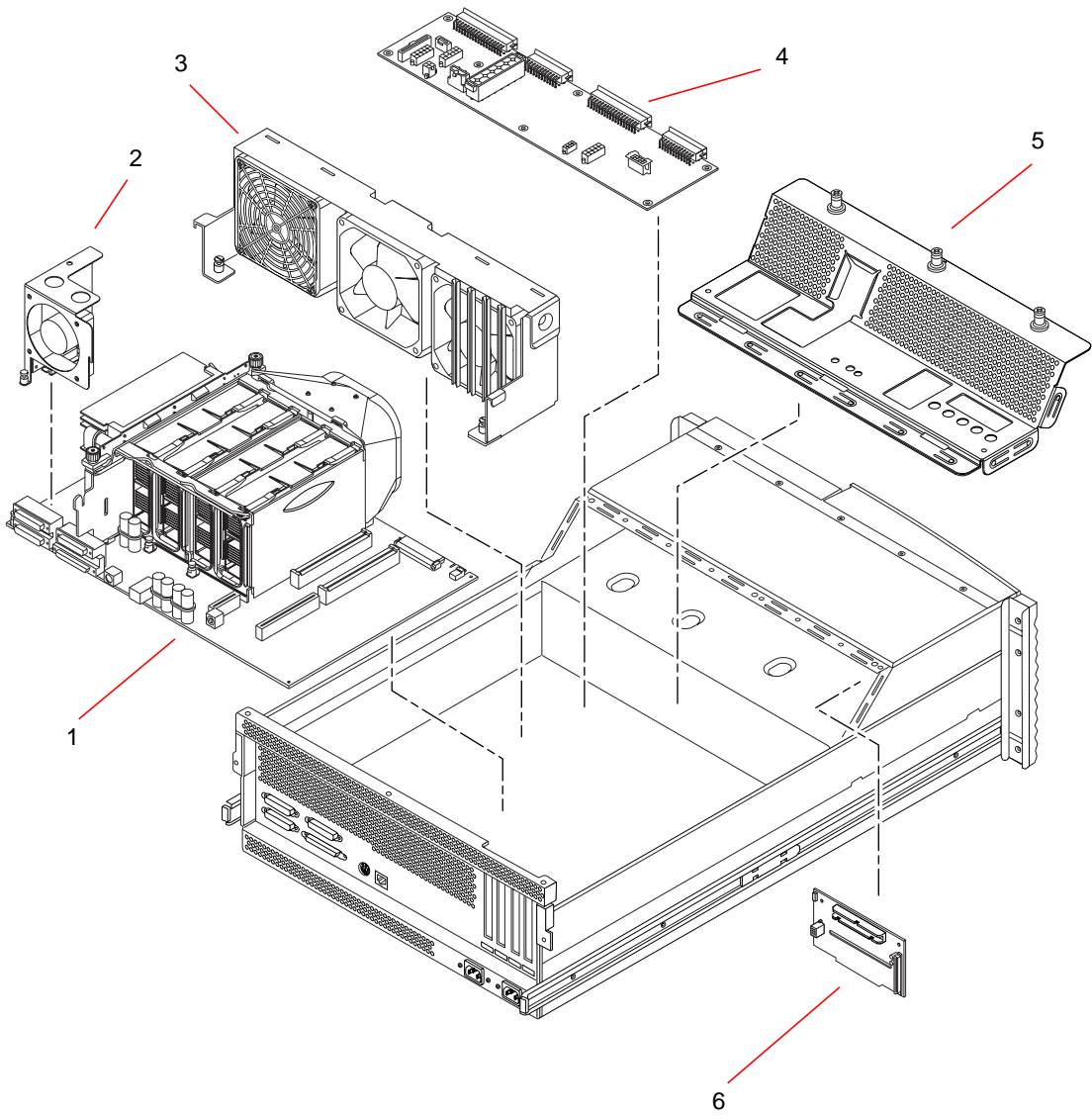
Part Numbers

The following items for the Sun Enterprise 420R server can be replaced at the customer site by a qualified service provider.

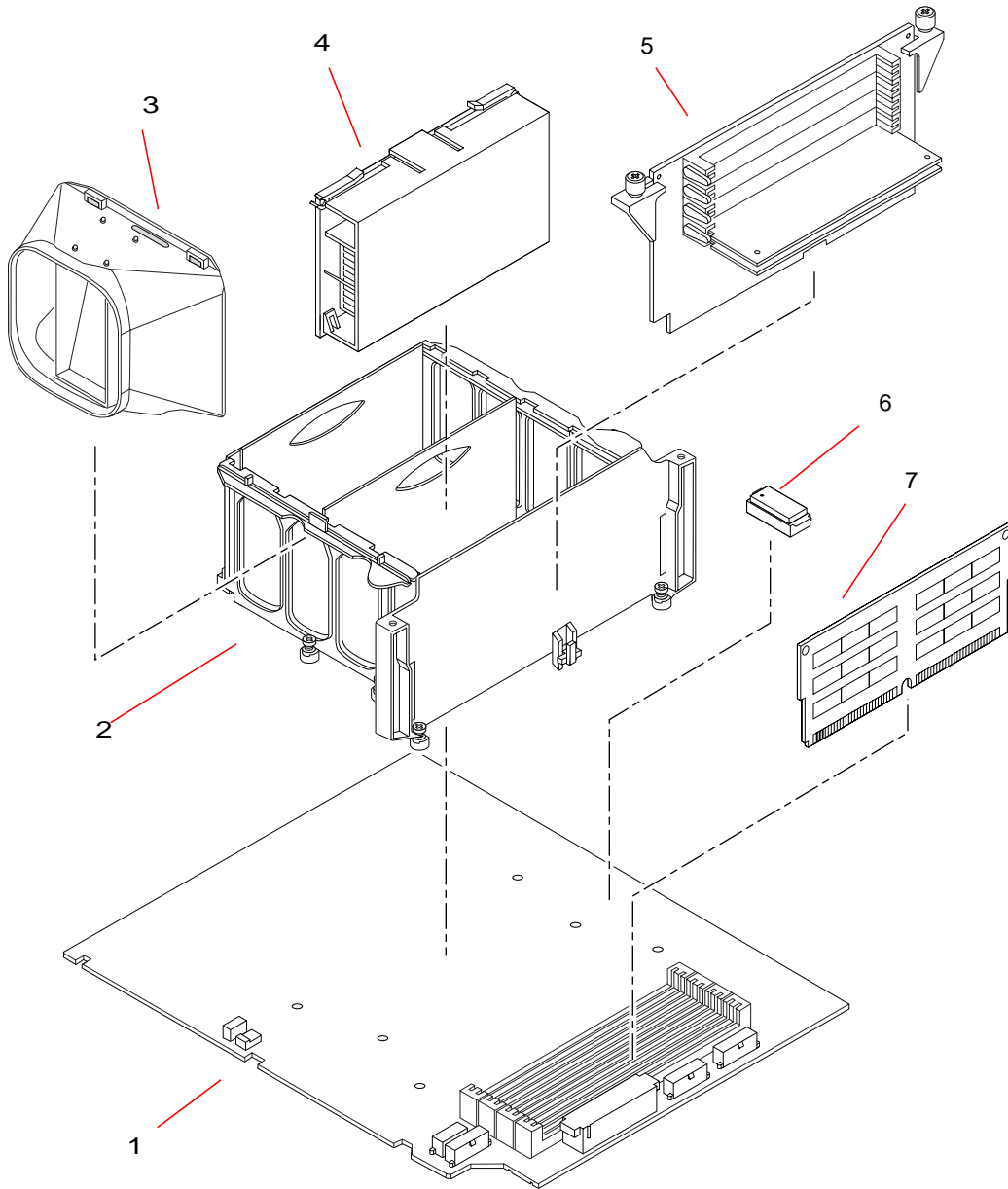
Note – The part numbers listed in the following table are correct as of the service manual publication date but are subject to change without notice. Consult your authorized Sun sales representative or service provider to confirm a part number prior to ordering a replacement part.

Category	Part	Part Number
Main Logic Board Components	Main Logic Board	501-5168
	CPU Card Cage	Not a FRU
	Air Guide	Not a FRU
	NVRAM	525-1430
	CPU Module	501-5539
	CPU Filler Panel	330-2805
	64 MB DIMM	501-4280
	256 MB DIMM	501-4743
	Memory Riser Assembly	501-5218
DC-to-DC Converter	300-1407	
Backplanes	UltraSCSI Backplane	501-5505
	Power Distribution Board	501-5506
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

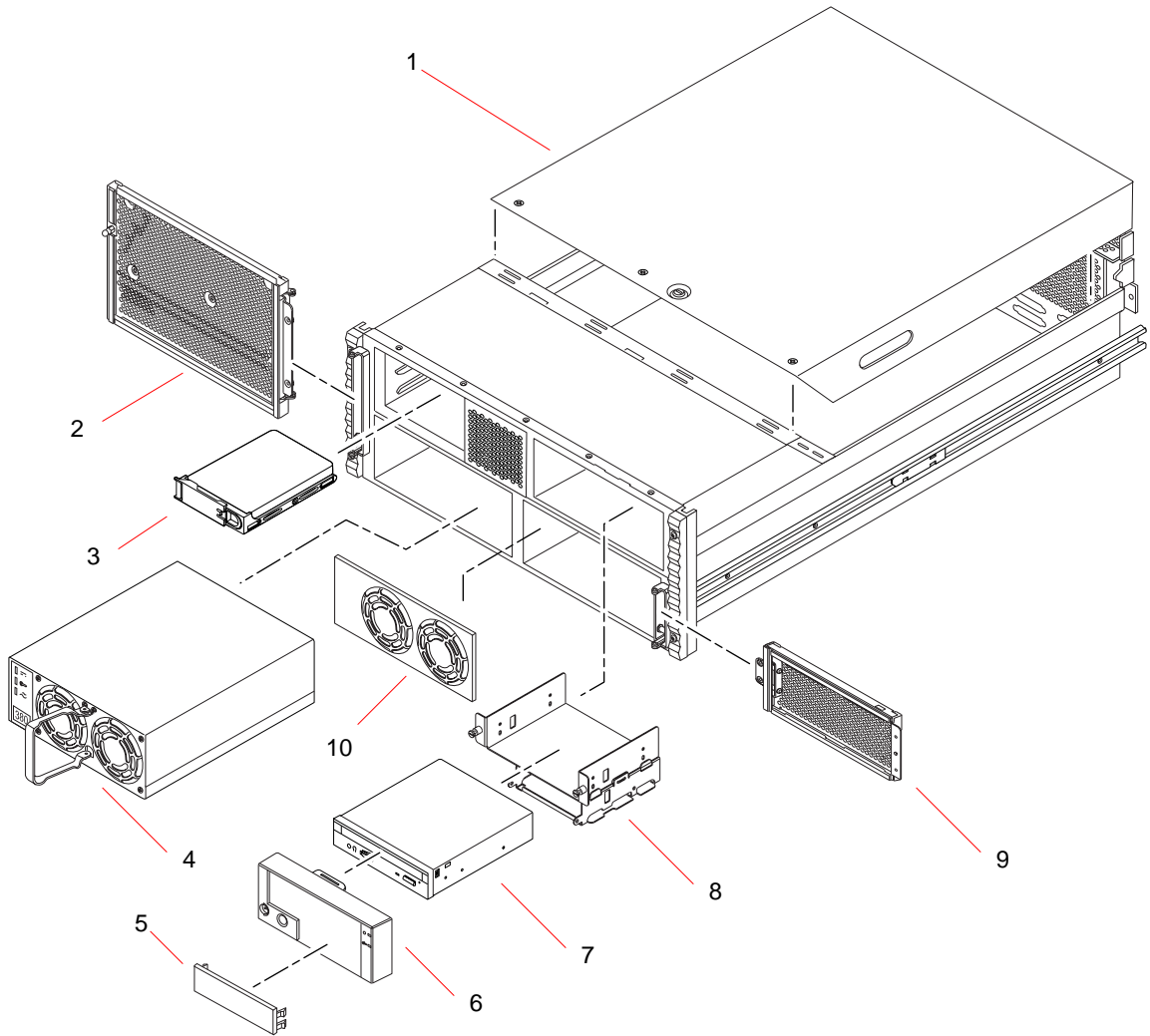
Category	Part	Part Number
Miscellaneous Assemblies	Fan Tray Assembly	540-4169
	Power Supply	300-1449
	PCI Filler Panel	Not a FRU
	RMA Filler Panel (Plastic)	Not a FRU
Panels and Doors	Front Door - Right	540-4186
	Front Door - Left	540-4230
	RMA Bezel (Plastic)	530-2824
	Key	250-1317
Internal Cables	UltraSCSI Data Cable	530-2827
	RMA SCSI Cable	530-2826
	I/O Power Cable	520-2823
	Control Cable	530-2830
	Main Power Cable	530-2822
	CPU Power Sense Cable	530-2821
	Keypresswitch/Power Button/LED Assembly	530-2824



Reference Number	Part	Part Number
1	Main Logic Board and Components	See next illustration
2	DC-to-DC Converter	300-1407
3	Fan Tray Assembly	540-4169
4	Power Distribution Board	501-5506
5	Power Distribution Board Cover	Not a FRU
6	UltraSCSI Backplane	501-5505



Reference Number	Part	Part Number
1	Main Logic Board	501-5168
2	CPU Card Cage	Not a FRU
3	Air Guide	Not a FRU
4	CPU Module	501-5539
5	Memory Riser Assembly	501-5218
6	NVRAM	525-1430
Not Shown	CPU Filler Panel	330-2805
7	64 MB DIMM	501-4280
Not Shown	256 MB DIMM	501-4743



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
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

