ARTISAN®
TECHNOLOGY GROUP

Your **definitive** source for quality pre-owned equipment.

Artisan Technology Group
(217) 352-9330 | sales@artisantg.com | artisantg.com

Full-service, independent repair center
with experienced engineers and technicians on staff.

We buy your excess, underutilized, and idle equipment
along with credit for buybacks and trade-ins.

Custom engineering
so your equipment works exactly as you specify.

- Critical and expedited services
- In stock / Ready-to-ship
- Leasing / Rentals / Demos
- ITAR-certified secure asset solutions

Expert team | Trust guarantee | 100% satisfaction

All trademarks, brand names, and brands appearing herein are the property of their respective owners.

Find the *Oracle / Sun Microsystems UltraSPARC-II* at our website: *Click HERE*

Sun Ultra 2 Series Service Manual



THE NETWORK IS THE COMPUTER™

Sun Microsystems Computer Company
A Sun Microsystems, Inc. Business
901 San Antonio Road Palo Alto, CA 94303-4900 USA
650 960-1300
fax 650 969-9131

Part No.: 802-2561-11
Revision A, July 1998

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

1997 Sun Microsystems, Inc., 901 San Antonio Road, Palo Alto, California 94303-4900 U.S.A.

All rights reserved.

This product or document is protected by copyright and distributed under licenses restricting its use, copying, distribution, and decompilation. No part of this product or document may be reproduced in any form by any means without prior written authorization of Sun and its licensors, if any.

Portions of this product may be derived from the UNIX® system, licensed from Novell, Inc., and from the Berkeley 4.3 BSD system, licensed from the University of California. UNIX is a registered trademark in the United States and in other countries and is exclusively licensed by X/Open Company Ltd. Third-party software, including font technology in this product, is protected by copyright and licensed from Sun's suppliers. RESTRICTED RIGHTS: Use, duplication, or disclosure by the U.S. Government is subject to restrictions of FAR 52.227-14(g)(2)(6/87) and FAR 52.227-19(6/87), or DFAR 252.227-7015(b)(6/95) and DFAR 227.7202-3(a).

Sun, Sun Microsystems, the Sun logo, AnswerBook, SunDocs, Ultra, Ultra Enterprise, SunVTS, SunCD, SunMicrophone, SunCamera, Ultra Port Architecture, SunVideo, SunFastEthernet, PrestoServe, SunOS, and Solaris are trademarks or registered trademarks of Sun Microsystems, Inc. in the United States and in other countries. All SPARC trademarks are used under license and are trademarks or registered trademarks of SPARC International, Inc. in the United States and in other countries. Products bearing SPARC trademarks are based upon an architecture developed by Sun Microsystems, Inc.

The OPEN LOOK® and Sun™ Graphical User Interfaces were developed by Sun Microsystems, Inc. for its users and licensees. Sun acknowledges the pioneering efforts of Xerox Corporation in researching and developing the concept of visual or graphical user interfaces for the computer industry. Sun holds a nonexclusive license from Xerox to the Xerox Graphical User Interface, which license also covers Sun's licensees who implement OPEN LOOK GUIs and otherwise comply with Sun's written license agreements.

THIS PUBLICATION IS PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NON-INFRINGEMENT.

Copyright 1997 Sun Microsystems, Inc., 901 San Antonio Road, Palo Alto, Californie 94303-4900 U.S.A. Tous droits réservés.

Ce produit ou document est protégé par un copyright et distribué avec des licences qui en restreignent l'utilisation, la copie et la décompilation. Aucune partie de ce produit ou de sa documentation associée ne peut être reproduite sous aucune forme, par quelque moyen que ce soit, sans l'autorisation préalable et écrite de Sun et de ses bailleurs de licence, s'il y en a.

Des parties de ce produit pourront être derivées du système UNIX® licencié par Novell, Inc. et du système Berkeley 4.3 BSD licencié par l'Université de Californie. UNIX est une marque enregistrée aux Etats-Unis et dans d'autres pays, et licenciée exclusivement par X/Open Company Ltd. Le logiciel détenu par des tiers, et qui comprend la technologie relative aux polices de caractères, est protégé par un copyright et licencié par des fournisseurs de Sun.

Sun, Sun Microsystems, the Sun logo, AnswerBook, SunDocs, Ultra, Ultra Enterprise, SunVTS, SunCD, SunMicrophone, SunCamera, Ultra Port Architecture, SunVideo, SunFastEthernet, PrestoServe, SunOS, and Solaris sont des marques déposées ou enregistrées de Sun Microsystems, Inc. aux Etats-Unis et dans d'autres pays. Toutes les marques SPARC, utilisées sous licence, sont des marques déposées ou enregistrées de SPARC International, Inc. aux Etats-Unis et dans d'autres pays. Les produits portant les marques SPARC sont basés sur une architecture développée par Sun Microsystems, Inc.

Les utilisateurs d'interfaces graphiques OPEN LOOK® et Sun™ ont été développés de Sun Microsystems, Inc. pour ses utilisateurs et licenciés. Sun reconnaît les efforts de pionniers de Xerox Corporation pour la recherche et le développement du concept des interfaces d'utilisation visuelle ou graphique pour l'industrie de l'informatique. Sun détient une licence non exclusive de Xerox sur l'interface d'utilisation graphique, cette licence couvrant aussi les licenciés de Sun qui mettent en place les utilisateurs d'interfaces graphiques OPEN LOOK et qui en outre se conforment aux licences écrites de Sun.

CETTE PUBLICATION EST FOURNIE "EN L'ETAT" SANS GARANTIE D'AUCUNE SORTE, NI EXPRESSE NI IMPLICITE, Y COMPRIS, ET SANS QUE CETTE LISTE NE SOIT LIMITATIVE, DES GARANTIES CONCERNANT LA VALEUR MARCHANDE, L'APTITUDE DES PRODUITS A REPONDRE A UNE UTILISATION PARTICULIERE OU LE FAIT QU'ILS NE SOIENT PAS CONTREFAISANTS DE PRODUITS DE TIERS.





Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Contents

Preface xix

How This Book Is Organized xix

Typographic Conventions xxi

Shell Prompts xxi

Related Documentation xxii

Ordering Sun Documents xxiii

Sun Documentation on the Web xxiii

Sun Welcomes Your Comments xxiv

1. Product Description 1-1

1.1 Ultra 2 Series Overview 1-1

1.2 I/O Devices (Ultra 2 Series Desktop) 1-3

1.3 System Unit Features 1-4

1.4 System Unit Components 1-5

2. Sun VTS 2-1

2.1 SunVTS Description 2-1

2.2 SunVTS Operation 2-2

3. Power-On Self-Test 3-1

3.1 POST Overview 3-1

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

3.2 Pre-POST Preparation 3-2
3.2.1 Setting Up a Tip Connection 3-2
3.2.2 Verifying the Baud Rate 3-4
3.3 Initializing POST 3-4
3.4 Maximum and Minimum Levels of POST 3-6
3.4.1 Diag-Level NVRAM Variable Set to max 3-6
3.4.2 Diag-Level NVRAM Variable Set to min 3-11
3.5 POST Progress and Error Reporting 3-12
3.6 Bypassing POST 3-14
3.7 Additional Keyboard Control Commands 3-14
3.8 System and Keyboard LEDs 3-15
3.9 Initializing the Motherboard POST 3-15

4. Troubleshooting Procedures 4-1

4.1 Power-On Failure 4-1
4.2 Video Output Failure 4-2
4.3 Hard Drive or CD-ROM Drive Failure 4-3
4.4 Power Supply Test 4-4
4.5 DSIMM Failure 4-8
4.6 OpenBoot PROM On-Board Diagnostics 4-10
4.6.1 Watch-Clock Diagnostic 4-11
4.6.2 Watch-Net Diagnostic 4-11
4.6.3 Watch-Net-All Diagnostic 4-12
4.6.4 Probe-SCSI and Probe-SCSI-All Diagnostic 4-13
4.6.5 Test *alias name*, *device path*, *-All* Diagnostic 4-14
4.6.6 UPA Graphics Card Diagnostic 4-15

5. Safety and Tool Requirements 5-1

5.1 Safety Requirements 5-1
5.2 Symbols 5-1
5.3 Safety Precautions 5-2

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5.3.1 Modification to Equipment 5-2
5.3.2 Placement of a Sun Product 5-2
5.3.3 Power Cord Connection 5-3
5.3.4 Electrostatic Discharge 5-3
5.3.5 Lithium Battery 5-3
5.4 Tools Required 5-4

6. Powering On and Off 6-1

6.1 Powering On the System Unit 6-1
6.2 Powering Off the System Unit 6-2

7. Internal Access 7-1

7.1 Removing the System Unit Cover 7-1
7.2 Attaching the Wrist Strap 7-3
7.3 Replacing the System Unit Cover 7-4

8. Major Subassemblies 8-1

8.1 Power Supply 8-1
8.1.1 Removing the Power Supply 8-1
8.1.2 Replacing the Power Supply 8-3
8.2 Cable Assemblies 8-5
8.2.1 Removing the SCSI Cable Assembly 8-5
8.2.2 Replacing the SCSI Cable Assembly 8-7
8.2.3 Removing the Diskette Drive Cable Assembly 8-8
8.2.4 Replacing the Diskette Drive Cable Assembly 8-9
8.3 Shroud Assembly 8-10
8.3.1 Removing the Shroud Assembly 8-10
8.3.2 Replacing the Shroud Assembly 8-11
8.4 Shroud Assembly Speaker 8-12
8.4.1 Removing the Shroud Assembly Speaker 8-12
8.4.2 Replacing the Shroud Assembly Speaker 8-13

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

9. Storage Devices 9-1

9.1 Hard Drive 9-1

9.1.1 Removing a Hard Drive 9-1

9.1.2 Replacing a Hard Drive 9-3

9.2 Media Bay Chassis Bracket 9-4

9.2.1 Removing the Chassis Bracket 9-4

9.2.2 Replacing the Chassis Bracket 9-5

9.3 CD-ROM Drive or 4-mm/8-mm Tape Drive 9-6

9.3.1 Removing a CD-ROM Drive or 4-mm/8-mm Tape Drive 9-7

9.3.2 Replacing a CD-ROM Drive or 4-mm/8-mm Tape Drive 9-8

9.4 Diskette Drive 9-9

9.4.1 Removing a Diskette Drive 9-9

9.4.2 Replacing a Diskette Drive 9-11

10. Motherboard and Component Replacement 10-1

10.1 CPU Module 10-1

10.1.1 Removing a CPU Module 10-1

10.1.2 Replacing a CPU Module 10-3

10.2 NVRAM/TOD 10-4

10.2.1 Removing the NVRAM/TOD 10-4

10.2.2 Replacing the NVRAM/TOD 10-5

10.3 SBus Card 10-6

10.3.1 Removing an SBus Card 10-6

10.3.2 Replacing an SBus Card 10-8

10.4 UPA Graphics Card (Workstation Only) 10-11

10.4.1 Removing a UPA Graphics Card 10-11

10.4.2 Replacing a UPA Graphics Card 10-13

10.5 DSIMM 10-16

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

10.5.1 Removing a DSIMM 10-17
10.5.2 Replacing a DSIMM 10-18
10.6 Motherboard 10-20
10.6.1 Removing a Motherboard 10-21
10.6.2 Replacing a Motherboard 10-24

11. Illustrated Parts List 11-1

A. Product Specifications A-1
A.1 Physical Specifications A-1
A.2 Electrical Specifications A-2
A.3 Environmental Specifications A-3

B. Signal Description B-1
B.1 Keyboard / Mouse Connector, and Serial Ports A and B Connectors B-1
B.1.1 Keyboard / Mouse Connector B-1
B.1.2 Serial Port Connector A and B (RS-423 / RS-232) B-2
B.2 Twisted-Pair Ethernet Connector B-5
B.3 Fast / Wide SCSI Connector B-6
B.4 Audio Port Connectors B-8
B.5 Parallel Port Connector B-9
B.6 Media Independent Interface Connector B-11
B.7 UPA Graphics Card 13W3 Connector B-13

C. Functional Description C-1
C.1 System Unit / Server Overview C-1
C.1.1 UPA C-3
C.1.2 SBus C-3
C.1.3 UltraSPARC I Processor C-4
C.1.4 UltraSPARC II Processor C-4
C.1.5 Memory C-5
C.1.6 Graphics and Imaging (Workstation Only) C-7

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

C.1.6.1 Graphics Card Features C-7
C.1.6.2 Graphics Card Performance C-8
C.1.6.3 Graphics Not Supported C-8
C.1.7 Peripherals C-8
C.1.7.1 CD-ROM Drive C-9
C.1.7.2 Diskette Drive C-9
C.1.7.3 Hard Drive C-9
C.1.8 SCSI C-10
C.1.8.1 SCSI Implementation C-10
C.1.8.2 SCSI Cabling and Configuration C-11
C.1.9 Optional 4-mm and 8-mm Tape Drives C-12
C.1.9.1 4-mm Tape Drive C-12
C.1.9.2 8-mm Tape Drive C-12
C.1.10 Networking C-12
C.1.11 10BASE-T TPE Link Test C-13
C.1.11.1 Overview C-13
C.1.11.2 Technical Discussion C-15
C.1.11.3 Troubleshooting C-16
C.1.11.4 Moves and Changes C-16
C.1.11.5 Checking or Disabling the Link Test C-16
C.1.11.6 Enabling the Link Test C-17
C.1.12 Terminal, Modem, Keyboard, and Mouse Connectivity C-18
C.1.12.1 Setting Up the Modem C-18
C.1.12.2 Serial Port Speed Change C-19
C.1.12.3 Recommendations C-19
C.1.13 Printer Connectivity C-20
C.1.14 Audio C-20
C.1.14.1 Interface C-20
C.1.14.2 Built-in Speaker C-22
C.1.14.3 Microphone C-22
C.1.15 ASICs C-22

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

C.1.15.1 SC_MP C-23
C.1.15.2 SYSIO C-24
C.1.15.3 BMX C-24
C.1.15.4 RISC C-24
C.1.15.5 FEPS C-25
C.1.15.6 SLAVIO C-26
C.1.15.7 CBT C-26
C.2 Power Supply C-26
C.3 Power Management C-28
C.4 Motherboard C-28
C.5 Jumper Description C-29
C.5.1 Serial Port Jumpers C-30
C.5.2 Flash PROM Jumpers C-31
C.5.3 Additional Motherboard Jumper Blocks C-32
C.6 Enclosure C-33
C.6.1 Enclosure Basics C-33
C.6.2 Enclosure Features C-33
C.7 Environmental Compliance C-34
C.8 Agency Compliance C-34

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Figures

FIGURE 1-1 Ultra 2 Series Desktop System 1-2

FIGURE 1-2 Ultra Enterprise 2 Server 1-2

FIGURE 1-3 System Unit Interior 1-7

FIGURE 1-4 System Unit Rear Panel 1-8

FIGURE 3-1 Setting Up a tip Connection 3-3

FIGURE 3-2 Sun Type-5 Keyboard 3-5

FIGURE 3-3 Power LED 3-15

FIGURE 4-1 Power Supply Connector J3203 4-5

FIGURE 4-2 Power Supply Connector J3204 4-5

FIGURE 4-3 Power Supply Connector J3205 4-6

FIGURE 4-4 Power Supply Connector J3206 4-7

FIGURE 6-1 Rear View of the System Unit 6-2

FIGURE 6-2 Sun Type-5 Keyboard 6-2

FIGURE 7-1 Location of Lock Block 7-2

FIGURE 7-2 Removing the System Unit Cover 7-2

FIGURE 7-3 Attaching the Wrist Strap 7-3

FIGURE 7-4 Replacing the System Unit Cover 7-4

FIGURE 8-1 Removing the Power Supply 8-3

FIGURE 8-2 Replacing the Power Supply 8-5

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

FIGURE 8-3 Removing and Replacing the SCSI Cable Assembly 8-7
FIGURE 8-4 Removing and Replacing the Diskette Drive Cable Assembly 8-9
FIGURE 8-5 Shroud Assembly Removal 8-11
FIGURE 8-6 Removing and Replacing the Shroud Assembly Speaker 8-13
FIGURE 9-1 Removing and Replacing a Hard Drive 9-2
FIGURE 9-2 Removing and Replacing the Chassis Bracket 9-5
FIGURE 9-3 Removing and Replacing the CD-ROM Drive 9-8
FIGURE 9-4 Removing and Replacing the Diskette Drive 9-10
FIGURE 10-1 CPU Module Locations and Shroud Assembly Processor Area 10-2
FIGURE 10-2 Removing a CPU Module 10-3
FIGURE 10-3 NVRAM/TOD Location 10-5
FIGURE 10-4 Removing an SBus Card 10-7
FIGURE 10-5 Installing the Card Extractor 10-8
FIGURE 10-6 Removing the SBus Card Adapter Bracket 10-9
FIGURE 10-7 Removing an SBus Card Extractor 10-10
FIGURE 10-8 Replacing an SBus Card 10-11
FIGURE 10-9 Preparing to Remove a UPA Graphics Card 10-13
FIGURE 10-10 Removing a UPA Graphics Card 10-13
FIGURE 10-11 Replacing a UPA Graphics Card 10-15
FIGURE 10-12 Seating a UPA Graphics Card into the Socket 10-15
FIGURE 10-13 Securing a UPA Graphics Card into the Chassis 10-16
FIGURE 10-14 DSIMM Ejection Lever 10-18
FIGURE 10-15 Incorrect and Correct Ways to Seat the DSIMM 10-20
FIGURE 10-16 Removing a Motherboard 10-23
FIGURE 11-1 System Unit Exploded View 11-2
FIGURE B-1 Keyboard/Mouse Connector Pin Configuration B-2
FIGURE B-2 Serial Port A and B Connectors Pin Configuration B-3
FIGURE B-3 TPE Connector Pin Configuration B-5

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

FIGURE B-4 Fast/Wide SCSI Connector Pin Configuration B-6

FIGURE B-5 Audio Port Connectors Jack Configuration B-9

FIGURE B-6 Parallel Port Connector Pin Configuration B-10

FIGURE B-7 MII Connector Pin Configuration B-12

FIGURE B-8 UPA Graphics Card 13W3 Connector Pin Configuration B-13

FIGURE C-1 System Unit or Server Functional Block Diagram C-2

FIGURE C-2 DSIMM Group and Bank Layout C-6

FIGURE C-3 Connecting External Mass Storage Devices C-11

FIGURE C-4 Host(s)-to-Hub Star Configuration LAN C-14

FIGURE C-5 Ensuring a 10BASE-T Host-to-Hub Communication Network C-15

FIGURE C-6 Ultra 2 Series Motherboard Block Diagram C-29

FIGURE C-7 Selected Jumper Settings C-30

FIGURE C-8 Identifying Jumper Pins C-30

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Tables

TABLE P-1 Document Organization xix

TABLE P-2 Typographic Conventions xxi

TABLE P-3 Shell Prompts xxi

TABLE P-4 Related Documentation xxii

TABLE P-5 SunExpress Contact Information xxiii

TABLE 1-1 Supported I/O Devices 1-3

TABLE 1-2 System Unit Replaceable Components 1-5

TABLE 2-1 SunVTS Documentation 2-2

TABLE 3-1 diag-level switch? and diag-level Flag Settings 3-2

TABLE 3-2 Keyboard LED Patterns 3-13

TABLE 4-1 Internal Drives Identification 4-3

TABLE 4-2 Power Supply Connector J3203 Pin Assignments 4-5

TABLE 4-3 Power Supply Connector J3204 Pin Assignments 4-5

TABLE 4-4 Power Supply Connector J3205 Pin Assignments 4-6

TABLE 4-5 Power Supply Connector J3206 Pin Assignments 4-7

TABLE 4-6 DSIMM Physical Memory Addresses (16-Mbyte) 4-8

TABLE 4-7 DSIMM Physical Memory Addresses (32-Mbyte) 4-9

TABLE 4-8 DSIMM Physical Memory Addresses (64-Mbyte) 4-9

TABLE 4-9 DSIMM Physical Memory Addresses (128-Mbyte) 4-10

TABLE 4-10 Selected OBP On-board Diagnostic Tests 4-15

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TABLE 10-1 DSIMM Installation Location 10-17
TABLE 11-1 System Unit Replaceable Components 11-2
TABLE A-1 System/Server Units Physical Specifications A-1
TABLE A-2 System/Server Units Electrical Specifications A-2
TABLE A-3 System/Server Units Environmental Specifications A-3
TABLE B-1 Keyboard/Mouse Connector Pin Assignments B-2
TABLE B-2 Serial Port A and B Connectors Pin Assignments B-3
TABLE B-3 TPE Connector Pin Assignments B-5
TABLE B-4 Fast/Wide SCSI Connector Pin Assignments B-6
TABLE B-5 Audio Port Connectors Line Assignment B-9
TABLE B-6 Parallel Port Connector Pin Assignments B-10
TABLE B-7 MII Connector Pin Assignments B-12
TABLE B-8 UPA Graphics Card 13W3 Connector Pin Assignments B-13
TABLE C-1 Supported Hard Drives C-10
TABLE C-2 Audio Port Functions C-21
TABLE C-3 Audio Inputs and Outputs C-21
TABLE C-4 Built-in Speaker Specifications C-22
TABLE C-5 ASIC Characteristics C-23
TABLE C-6 Ultra 2 Series Workstation/Server Power Supply Budget C-27
TABLE C-7 Serial Port Jumper Settings C-31
TABLE C-8 Flash PROM Jumper Settings C-32
TABLE C-9 Additional Motherboard Jumper Blocks C-32

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Code Samples

CODE EXAMPLE 3-1 `diag-level` Variable Set to max 3-6

CODE EXAMPLE 3-2 `diag-level` Variable Set to min 3-11

CODE EXAMPLE 3-3 Typical Error Code Failure Message 3-13

CODE EXAMPLE 4-1 Watch-Clock Diagnostic Output Message 4-11

CODE EXAMPLE 4-2 Watch-Net Diagnostic Output Message 4-12

CODE EXAMPLE 4-3 Watch-Net-All Diagnostic Output Message 4-12

CODE EXAMPLE 4-4 Probe-SCSI Diagnostic Output Message 4-13

CODE EXAMPLE 4-5 Probe-SCSI-All Diagnostic Output Message 4-13

CODE EXAMPLE 4-6 Test Diagnostic Output Message 4-14

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Preface

The *Sun Ultra 2 Series Service Manual* provides detailed procedures that describe the removal and replacement of replaceable parts in the Sun™ Ultra™ 2 series computer (system unit) and the Ultra Enterprise™ 2 server (server). This book is written for technicians, system administrators, authorized service providers (ASPs), and advanced computer system end users who have experience troubleshooting and replacing hardware.

How This Book Is Organized

This document is organized into chapters and appendixes as listed in the following table. A glossary and an index are also included.

TABLE P-1 Document Organization

Chapter Number	Content Description
Chapter 1	Describes the major components of the system unit.
Chapter 2	Describes the execution of individual tests for verifying hardware configuration and functionality.
Chapter 3	Describes the execution of POST and provides examples of POST output patterns.
Chapter 4	Provides troubleshooting advice and suggested corrective actions for hardware problems.
Chapter 5	Explains how to work safely when servicing the system unit.
Chapter 6	Provides step-by-step procedures to power on and power off the system unit.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TABLE P-1 Document Organization (Continued)

Chapter Number	Content Description
Chapter 7	Provides step-by-step procedures to remove the side access panel, attach the wrist strap, and replace the side access panel.
Chapter 8	Provides step-by-step procedures to remove and replace major subassemblies.
Chapter 9	Provides step-by-step procedures to remove and replace storage devices.
Chapter 10	Provides step-by-step procedures to remove and replace the motherboard, and various components associated with motherboard operation.
Chapter 11	Lists replaceable parts for the system unit.
Appendix A	Provides product specifications, system requirements about power and environment, system unit dimensions, weight, memory mapping, and peripheral component interconnect (PCI) card slot specifications.
Appendix B	Provides signal descriptions.
Appendix C	Provides functional descriptions for the system unit.
Glossary	Provides a listing of acronyms, terms, and definitions.
Index	Provides a quick reference to specific topics.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Typographic Conventions

TABLE P-2 Typographic Conventions

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

Shell Prompts

TABLE P-3 Shell Prompts

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

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Related Documentation

TABLE P-4 Related Documentation

Application	Title	Part Number
Handbook	Solaris Handbook for SMCC Peripherals	802-7675
Installation	*Sun Ultra 2 Series Installation Guide*	802-2560
Installation	*Sun Ultra 2 Series Hardware AnswerBook Installation*	804-5318
Installation	*Creator Installation Guide*	802-7713
Installation	*Elite3D Installation Guide*	805-4391
Installation / user	*SunCD 12X Installation and User's Guide*	805-0940
Configuration	*Sun Ultra 2 Series Reference Manual*	802-2562
Setup	*Sun Ultra 2 Series Hardware Setup Instructions*	802-5933
User	19-Inch Premium Color Monitor Guide	801-3817
User	21-Inch Premium Color Monitor Guide	875-1844
User	*24-Inch Premium (22.5-inch Viewable) Color Monitor Guide*	875-1799
Specification	*17-Inch Entry, 17-Inch Premium, and 20-Inch Premium Color Monitors Specifications*	802-6178
Specification	*SunCD 4 Drive Specifications*	802-4157
Specification	*Diskette Drive Specifications*	802-5283
Specification	*8-mm Tape Drive Specifications*	802-5775
Specification	*4-mm Tape Drive Specifications*	802-5324
Supplement	SMCC Open Issues Supplement Solaris 2.5.1	802-5340
Diagnostics	*SunVTS 2.0 User's Guide*	802-5331
Diagnostics	*SunVTS 2.0 Test Reference Manual*	802-5330
Diagnostics	*SunVTS 2.0 Quick Reference Card*	802-5329

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Ordering Sun Documents

SunDocs[SM] is a distribution program for Sun Microsystems technical documentation. Contact SunExpress for easy ordering and quick delivery. You can find a listing of available Sun documentation and updated information related to the Sun Ultra 2 Series on the World Wide Web.

TABLE P-5 SunExpress Contact Information

Country	Telephone	Fax
Belgium	02-720-09-09	02-725-88-50
Canada	1-800-873-7869	1-800-944-0661
France	0800-90-61-57	0800-90-61-58
Germany	01-30-81-61-91	01-30-81-61-92
Holland	06-022-34-45	06-022-34-46
Japan	0120-33-9096	0120-33-9097
Luxembourg	32-2-720-09-09	32-2-725-88-50
Sweden	020-79-57-26	020-79-57-27
Switzerland	0800-55-19-26	0800-55-19-27
United Kingdom	0800-89-88-88	0800-89-88-87
United States	1-800-873-7869	1-800-944-0661
World Wide Web: `http://www.sun.com/sunexpress/`		

Sun Documentation on the Web

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

`http://docs.sun.com.`

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Sun Welcomes Your Comments

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

smcc-docs@sun.com.

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

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CHAPTER 1

Product Description

1.1 Ultra 2 Series Overview

The Ultra 2 series desktop workstation and the Ultra Enterprise 2 server are multi-processor devices that use the UltraSPARC™ family of processors. Both the desktop workstation and the server offer super-scalar processor technology, multiprocessing, high-performance memory interconnection, and high-bandwidth input/output (I/O). In addition, the desktop workstation provides accelerated graphics.

FIGURE 1-1 illustrates the Ultra 2 series desktop workstation. Major components include:

- I/O devices:
  - Monitor
  - Keyboard
  - Mouse
  - Microphone (not illustrated)
  - Color camera (optional, not illustrated)
- External cables (not illustrated)
- System unit

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

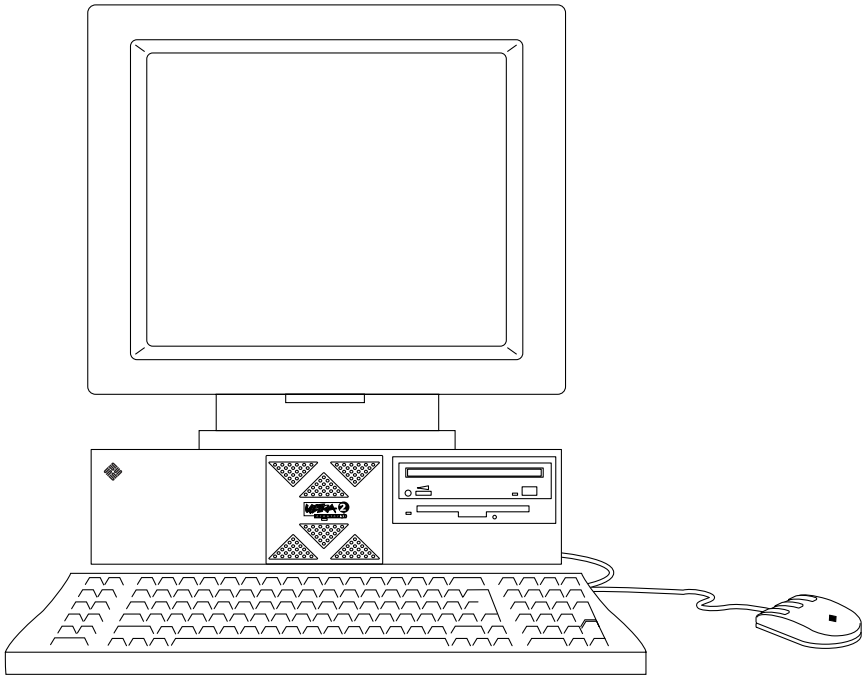


FIGURE 1-1 Ultra 2 Series Desktop System

The following figure illustrates the Ultra Enterprise 2 server. The major components include:

- External cables (not illustrated)
- System unit

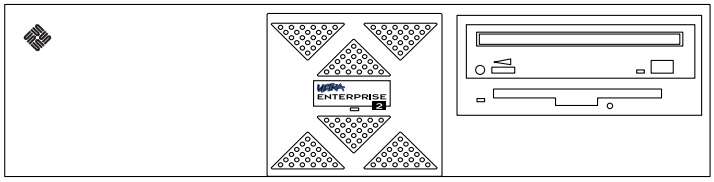


FIGURE 1-2 Ultra Enterprise 2 Server

The following sections provide a brief description of the Ultra 2 series desktop workstation I/O devices. Also included is a detailed overview of the Ultra 2 series and the Ultra Enterprise 2 system unit.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

1.2 I/O Devices (Ultra 2 Series Desktop)

The Ultra 2 series desktop workstation uses the following I/O devices:

- Keyboard
- Optical mouse
- Multimedia speaker system
- Microphone
- Color camera
- One of several types of monitors

The following table lists the supported I/O devices and provides a brief description of each device.

TABLE 1-1 Supported I/O Devices

I/O Device	Description
17-inch (43-cm) entry-level monitor	1152 x 900 resolution, 76- or 66-Hz refresh rate, 100 dots per inch (dpi)
	1280 x 1024 resolution, 76- or 66-Hz refresh rate, 110 dpi
	960 x 680 resolution, 112-Hz refresh rate, 81 dpi
19-inch (48-cm) color monitor	1280 x 1024 resolution (mode 1 or mode 3)
	1152 x 900 resolution (mode 2 or mode 4)
21-inch (53-cm) color monitor	1152 x 900 resolution, 76- or 66-Hz refresh rate, 84 dpi
	1280 x 1024 resolution, 76- or 66-Hz refresh rate, 93 dpi
	960 x 680 resolution, 112-Hz refresh rate, 79 dpi
24-1nch (61-cm) color monitor (with Creator3D)	1920 x 1200 resolution, 70-Hz refresh rate, 103 dpi
	1600 x 1000 resolution, 76- or 66-Hz refresh rate, 86 dpi
	1400 x 900 resolution, 76-Hz refresh rate, 77 dpi
	1280 x 800 resolution, 76-Hz refresh rate, 69 dpi
Microphone	SunMicrophone™ II

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TABLE 1-1 Supported I/O Devices *(Continued)*

I/O Device	Description
Color camera	Optional SunVideo™ and SunCamera™
Keyboard	Sun Type 5; AT 101 or UNIX layout available
Optical mouse	Optomechanical, three-button

1.3 System Unit Features

System unit components are located in a Sun Ultra 2 chassis. Overall chassis dimensions (height x width x depth) are 17.72 inches x 5.12 inches x 17.48 inches (45 cm x 13 cm x 44 cm). The chassis contains (or may be upgraded to contain) electrical components with the following features:

- SPARC™ V9 64-bit UltraSPARC processor on the module
  - One to two 167-Megahertz (MHz) processor modules with 512-Kilobyte (Kbyte) external caches each
  - One to two 200-MHz processor modules with 1-Megabyte (Mbyte) external cache each
- Solaris™ 2.5.1 operating system

Note – Sun Ultra 2 Series systems are supported by Solaris 2.5.1 or later.

- High performance Ultra Port Architecture™ (UPA)
- High bandwidth memory system using 144-bit, 60-nanosecond (ns) dynamic random access memory (DRAM) single in-line memory module (SIMM)
- 16 DRAM SIMM (DSIMM) sockets providing from 64 Mbytes to 2 Gigabytes (Gbytes) of memory using 16-Mbyte, 32-Mbyte, 64-Mbyte, and 128-Mbyte DSIMMs
- Fast frame buffer UPA graphics (67-MHz graphics clock) with 24-bit color and 8-bit overlay: single buffer graphics, double buffer graphics (Ultra 2 series desktop only). Double buffer graphics with 75-MHz graphics clock (200-MHz Ultra 2 series desktop only), and horizontal UPA graphics with 100-MHz graphics clock
- 16-bit CD quality audio with support for line in/out, headphone, and stereo microphone
- 20-Mbyte-per-second small computer system interface (SCSI)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

- 10-Megabits-per-second (Mbps)/100-Mbps twisted-pair Ethernet (TPE) networking
- 100-Mbps Media-Independent Interface (MII) networking
- Four IEEE 1496-compliant 25-MHz SBus I/O slots
- Two DB25-type standard connector serial ports

Note – Each serial port supports synchronous and asynchronous communication.

- DB25-type connector parallel port (Centronics compatible)
- Standard Sunness

Note – Standard Sunness includes the time of day (TOD)/nonvolatile random-access memory (NVRAM), and boot programmable read-only memory (PROM) or FlashPROM for Power-On Self-Test/OpenBoot PROM (POST/OBP)

- Built-in speaker
- Diagnostic LED
- Power conservation support

1.4 System Unit Components

System unit components are listed in the following table. FIGURE 1-3 illustrates the system unit interior. FIGURE 1-4 illustrates the system unit rear panel.

Note – Consult your authorized Sun sales representative or service provider prior to ordering a replacement part.

TABLE 1-2 System Unit Replaceable Components

Component	Description	Model
Motherboard	Motherboard	All
CPU module	167-MHz CPU module (UltraSPARC-I), 512-Kbyte external cache	Model 2170 only
CPU module	200-MHz CPU module (UltraSPARC-I), 1-Mbyte external cache	Models 1200 and 2200 only

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TABLE 1-2 System Unit Replaceable Components *(Continued)*

Component	Description	Model
CPU module	300-MHz CPU module (UltraSPARC-II), 2-Mbyte external cache	Models 1300 and 2300 only
DSIMM	16-Mbyte DSIMM, 60-nanosecond (ns)	All
DSIMM	32-Mbyte DSIMM, 60-ns	All
DSIMM	64-Mbyte DSIMM, 60-ns	All
DSIMM	128-Mbyte DSIMM, 60-ns	All
UPA graphics card	UPA graphics card, 67-MHz, DBZ	All
UPA graphics card	UPA graphics card, 67-MHz, SFB	All
UPA graphics card	UPA graphics card, 75-MHz, DBZ speed sort	All
UPA graphics card	Horizontal UPA graphics card, 100-MHz	All
Power supply	350-watt (W) power supply	All
Diskette drive	Diskette drive, 3.5-inch, 3D, black bezel	All
4x CD-ROM drive	4x CD-ROM drive	All
12x CD-ROM drive	12x CD-ROM drive	All
Speaker	Speaker (P/O shroud assembly)	All
4-mm tape drive	4-Gbyte/8-Gbyte, 4-mm DDS-2 tape drive	All
8-mm tape drive	8505XL 8-mm tape drive 7/14 Gbytes	All
TOD, 48T59Y, with carrier	TOD/NVRAM, 48T59Y, with carrier	All
SCSI cable assembly	SCSI cable	All
Diskette drive cable assembly	Floppy cable	All
Hard drive	535-Mbyte, 4500 RPM, wide	All
Hard drive	1-Gbyte, 5400 RPM, wide	All
Hard drive	2.1-Gbyte SCA, 7200 RPM, wide	All

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TABLE 1-2 System Unit Replaceable Components *(Continued)*

Component	Description	Model
Hard drive	4.2-Gbyte SCA, 7200 RPM, wide	All
Hard drive	9.1-Gbyte SCA, 7200 RPM, wide	All
Shroud assembly	Shroud assembly	All

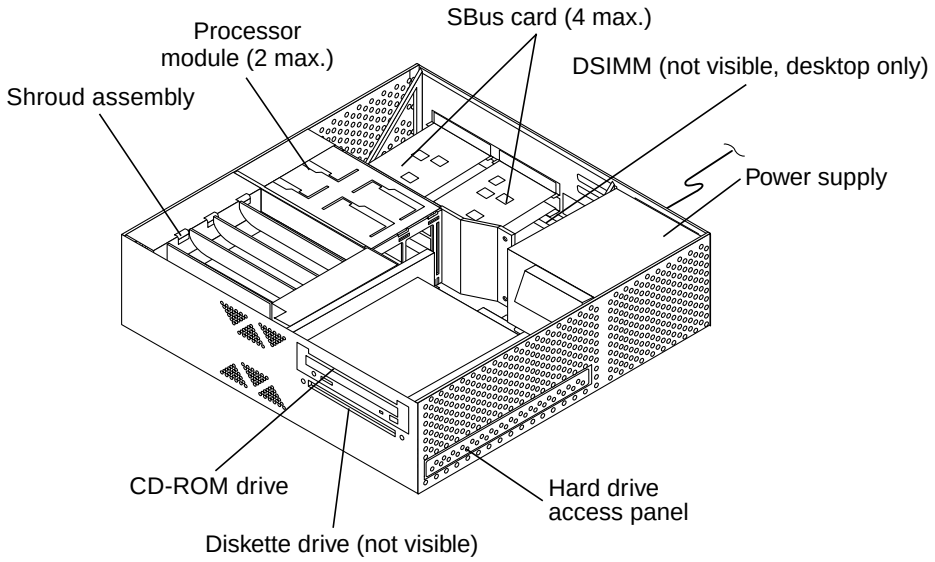


FIGURE 1-3 System Unit Interior

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

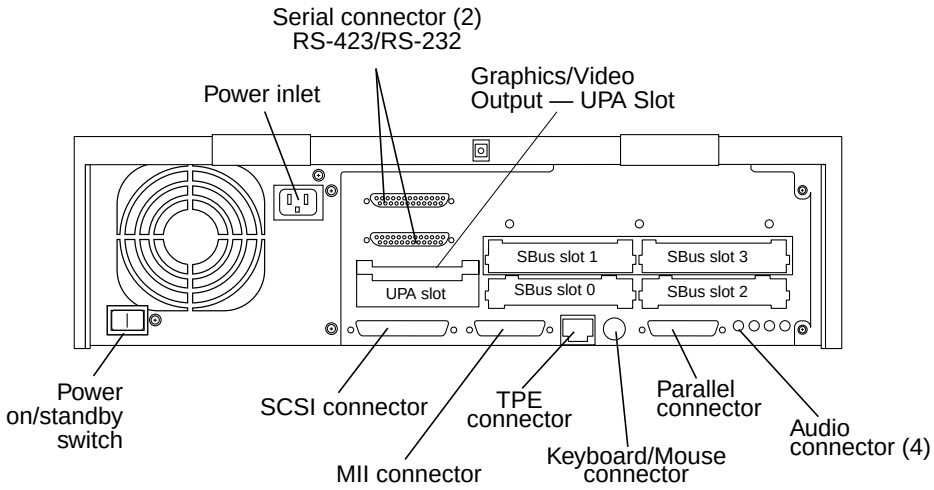


FIGURE 1-4 System Unit Rear Panel

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CHAPTER 2

Sun VTS

This chapter contains an overview of the SunVTS+ diagnostic tool.

This chapter contains the following topics:

- Section 2.1 “SunVTS Description” on page 2-1
- Section 2.2 “SunVTS Operation” on page 2-2

2.1 SunVTS Description

The SunVTS software executes multiple diagnostic hardware tests from a single user interface. SunVTS verifies the configuration, functionality, and reliability of most hardware controllers and devices.

The SunVTS software can be used in both the Common Desktop Environment (CDE) and the OPEN LOOK graphical user interface (GUI) environments, or from a TTY interface.

Within the CDE and OPEN LOOK GUI environments, test parameters can be set quickly and easily by pointing and clicking a mouse button.

With a TTY interface, the SunVTS software is used from a terminal or modem attached to a serial port. Data is input through the keyboard, rather than with a mouse, and only one screen of information is displayed at a time.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2.2 SunVTS Operation

The following table lists the documentation for the SunVTS software. These documents are available in the *Solaris on Sun Hardware AnswerBook*, which is in the *SMCC Updates* for the Solaris release.

TABLE 2-1 SunVTS Documentation

Title	Part Number	Description
SunVTS User's Guide	802-7299	Describes the SunVTS environment; starting and controlling various user interfaces; feature descriptions
SunVTS Test Reference Manual	802-7300	Describes each SunVTS test; provides various test options and command line arguments
SunVTS Quick Reference Card	802-7301	Provides overview of *vtsui* interface features

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CHAPTER 3

Power-On Self-Test

This chapter contains procedures to initiate the power-on self-test (POST) diagnostics. Procedures are also included to support pre-POST preparation, POST data interpretation, and bypassing POST diagnostics. The following is a list of the POST diagnostic topics presented in this chapter.

- Section 3.1 “POST Overview” on page 3-1
- Section 3.2 “Pre-POST Preparation” on page 3-2
- Section 3.3 “Initializing POST” on page 3-4
- Section 3.4 “Maximum and Minimum Levels of POST” on page 3-6
- Section 3.5 “POST Progress and Error Reporting” on page 3-12
- Section 3.6 “Bypassing POST” on page 3-14
- Section 3.7 “Additional Keyboard Control Commands” on page 3-14
- Section 3.8 “System and Keyboard LEDs” on page 3-15
- Section 3.9 “Initializing the Motherboard POST” on page 3-15

3.1 POST Overview

The POST is useful in determining if a portion of the system has failed and should be replaced. POST detects approximately 85 percent of Ultra 2 series system faults and is located in the system board OpenBoot PROM (OBP). The setting of the diag-

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

level switch determines the POST function. The following table lists the diag-level switch settings for disabling POST (off), enabling POST Maximum (max), or enabling POST Minimum (min).

TABLE 3-1 diag-level switch? and diag-level Flag Settings

diag-level Setting	diag-switch? Setting	POST Initialization	Serial Port A Output
Off	N / A	No	Disabled
N / A	False	No	Disabled
Max	True	Yes (power-on)	Enabled
Min	True	Yes (power-on)	Enabled

3.2 Pre-POST Preparation

Pre-POST preparation includes:

- Setting up a tip connection to another workstation or terminal to view POST progress and error messages. See Section 3.2.1 “Setting Up a Tip Connection” on page 3-2.
- Verifying baud rates between a workstation and a monitor or a workstation and a terminal. See Section 3.2.2 “Verifying the Baud Rate” on page 3-4.

If a terminal or a monitor is not connected to serial port B (default port) of a workstation or server to be tested, the keyboard LEDs are used to determine error conditions. See Section 3.8 “System and Keyboard LEDs” on page 3-15.

3.2.1 Setting Up a Tip Connection

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

To set up a tip connection:

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

1. **See the following figure. Connect serial port A of the system being tested to serial port B of another Sun workstation using a serial null modem cable (connect cable pins 2-3, 3-2, 7-20, and 20-7).**

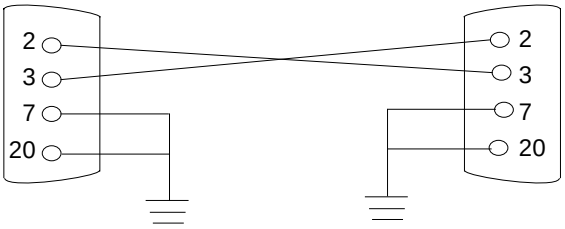


FIGURE 3-1 Setting Up a tip Connection

2. **On the other Sun workstation, check the** `/etc/remote` **file by changing to the** `/etc` **directory and 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:**

   Copy and paste the serial port B `remote` file.

   Modify the serial port B `remote` file by changing the `/b` to `/a`.

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

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

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

```
hostname% tip hardwire
connected
```

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

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

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

   Open a shell window.

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

   Type the following to stop the tip hardwire process.

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

3.2.2 Verifying the Baud Rate

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

1. **Open a shell window.**
2. **Type** `eeprom`**.**
3. **Verify the following serial port default settings as follows:**

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

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

3.3 Initializing POST

POST is initilized in two ways:

- By setting the `diag-switch?` flag to `true` and the `diag-level` flag 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:

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

1. **At the system prompt, type:**

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

2. **At the keyboard, power cycle the system unit by simultaneously pressing the Shift key and the Power-on key (see following figure). After a few seconds, press the Power-on key again.**

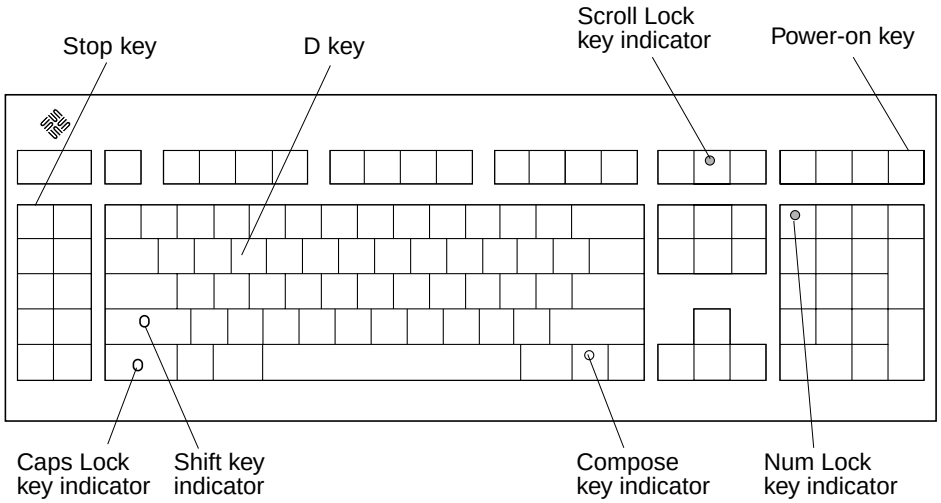


FIGURE 3-2 Sun Type-5 Keyboard

3. **Verify the following:**

   1. The display prompt is no longer displayed.
   2. The monitor power-on indicator flashes on and off.
   3. The keyboard Caps Lock key indicator flashes on and off.

4. **When the POST is complete, type the following at the system prompt:**

```
ok setenv diag-switch? false
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

3.4 Maximum and Minimum Levels of POST

Two levels of POST are available: maximum (max) level and minimum (min) level. The system initiates the selected level of POST based upon the setting of `diag-level`, a nonvolatile random access memory (NVRAM) variable.

The default setting for `diag-level` is `max`. An example of a `max` level POST output on serial port A is provided in Section 3.4.1 “Diag-Level NVRAM Variable Set to max” on page 3-6. An example of a `min` level POST output on serial port A is provided in Section 3.4.2 “Diag-Level NVRAM Variable Set to min” on page 3-11.

To set the `diag-level` variable to min, type:

```
ok setenv diag-level min
```

To return to the default setting, type the following:

```
ok setenv diag-level max
```

3.4.1 Diag-Level NVRAM Variable Set to max

When the diag-level NVRAM parameter is set to max, POST enables an extended set of diagnostic-level tests. This mode requires approximately 4.5 minutes to complete with a dual CPU configuration and 640 Mbytes of memory installed, or approximately 2.5 minutes to complete with a single CPU configuration and 640 Mbytes of memory installed. The following code example identifies a typical serial port A POST output with the diag-level NVRAM variable set to max.

CODE EXAMPLE 3-1 `diag-level` Variable Set to max

```
{0} ok `Hardware Power ON

Master CPU online
Master Version: 0000.0000.2200.1040
Slave Version: 0000.0000.2200.1040
CPU E$(M) 0000.0000.0010.0000 (S) 0000.0000.0010.0000
Button Power ON
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CODE EXAMPLE 3-1 `diag-level` Variable Set to max *(Continued)*

```
Master CPU online
Master Version: 0000.0000.2200.1040
Slave Version: 0000.0000.2200.1040
CPU E$(M) 0000.0000.0010.0000 (S) 0000.0000.0010.0000
Button Power ON

Master CPU online
Master Version: 0000.0000.2200.1040
Slave Version: 0000.0000.2200.1040
CPU E$(M) 0000.0000.0010.0000 (S) 0000.0000.0010.0000

Probing keyboard Done
%o0 = 0000.0000.0000.4001

Executing Power On SelfTest

0>@(#) Sun Ultra Enterprise 2 FCS_POST, version SB3.3.7 3/09/1998
02:14 PM
1>@(#) Sun Ultra Enterprise 2 FCS_POST, version SB3.3.7 3/09/1998
02:14 PM
0>  UltraSparc1 Version 4.0
1>  UltraSparc1 Version 4.0
0>Ecache Probe
0>  Ecache size 1024 Kb
0>Ecache Tag Test
1>Ecache Probe
1>  Ecache size 1024 Kb
1>Ecache Tag Test
0>Ecache RAM Test
1>Ecache RAM Test
0>Ecache Address Line Test
0>Initialize and Verify Ecache
1>Ecache Address Line Test
1>Initialize and Verify Ecache
0>SC Initialization
0>    SC_MP id=acf1, UPA Number=4, Impl=0, Ver=3
0>SC Dual Tag RAM Test
0>    Clearing DTAG's.
0>Initialize SC_MP memory control registers
0>BMX Test
0>    Checking BMX's
0>Probing Memory
0>  Found Memory Group #064Mb64Mb64Mb64Mb
0>  Found Memory Group #132Mb32Mb32Mb32Mb
0>  Found Memory Group #232Mb32Mb32Mb32Mb
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CODE EXAMPLE 3-1 `diag-level` Variable Set to `max` *(Continued)*

```
0>  Found Memory Group #332Mb32Mb32Mb32Mb
0>            Found 640 Megabytes of usable Main Memory
0>SIMM Group      Base Addr          Size    Group Status
0>   0          00000000.00000000   10000000     00
0>   1          00000000.20000000   08000000     00
0>   2          00000000.40000000   08000000     00
0>   3          00000000.60000000   08000000     00
0>Quick Memory Test
0>Clear and Test Stack Memory
0>
    SelfTest Initializing
0>Basic CPU Test
0>    Instruction Cache Tag RAM Test
0>    Instruction Cache Instruction RAM Test
0>    Instruction Cache Next Field RAM Test
0>    Instruction Cache Pre-decode RAM Test
0>    Data Cache RAM Test
0>    Data Cache Tags Test
0>MMU Enable Test
0>    DMMU Registers Access Test
0>    DMMU TLB DATA RAM Access Test
0>    DMMU TLB TAGS Access Test
0>    IMMU Registers Access Test
0>    IMMU TLB DATA RAM Access Test
0>    IMMU TLB TAGS Access Test
0>    DMMU Init
0>    IMMU Init
0>    Mapping Selftest Enabling MMUs
0>FPU Register Test
0>    FPU Registers and Data Path Test
0>    FSR Read/Write Test
0>EPROMs Test
0>    PROM Datapath Test
0>Serial Ports Test
0>    Slavio Serial Ports Test
0>NVRAM TOD Test
0>    M48T59 (TOD) Init
0>    M48T59 (TOD) Functional Part 1 Test
1>
    SelfTest Initializing
1>Basic CPU Test
1>    Instruction Cache Tag RAM Test
1>    Instruction Cache Instruction RAM Test
1>    Instruction Cache Next Field RAM Test
1>    Instruction Cache Pre-decode RAM Test
1>    Data Cache RAM Test
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CODE EXAMPLE 3-1 `diag-level` Variable Set to max *(Continued)*

```
1>    Data Cache Tags Test
1>MMU Enable Test
1>    DMMU Registers Access Test
1>    DMMU TLB DATA RAM Access Test
1>    DMMU TLB TAGS Access Test
1>    IMMU Registers Access Test
1>    IMMU TLB DATA RAM Access Test
1>    IMMU TLB TAGS Access Test
1>    DMMU Init
1>    IMMU Init
1>    Mapping Selftest Enabling MMUs
1>FPU Register Test
1>    FPU Registers and Data Path Test
1>    FSR Read/Write Test
1>Memory Test
0>Memory Test
1>    Memory Clear Test
0>    Memory Clear Test
1>  Test being relocated into Memory
0>  Test being relocated into Memory
1>    Memory RAM (blk) Test
0>    Memory RAM (blk) Test
1>  Test being relocated into Memory
0>  Test being relocated into Memory
1>    Memory Stress Test
1>  Test being relocated into Memory
0>    Memory Stress Test
0>  Test being relocated into Memory
1>    Memory Address Line Test
1>  Test being relocated into Memory
0>    Memory Address Line Test
0>  Test being relocated into Memory
1>CPU Speed
1>    CPU 1 Running at 200 MHZ.
0>Forcing ECC Faults Test
0>    ECC CE Pattern Test
0>    ECC CE Check bit Test
0>    ECC UE Pattern Test
0>    ECC UE Check bit Test
0>SysIO Registers Test
0>    SysIO Regsiter Initialization
0>    IOMMU Registers and RAM Test
0>    Streaming Buffer Registers and RAM Test
0>    SBus Control and Config Registers Test
0>    SysIO RAM Initialization
0>SysIO Functional Test
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CODE EXAMPLE 3-1 `diag-level` Variable Set to max *(Continued)*

```
0>    Mapping Selftest Enabling MMUs
0>    Clear Interrupt Map and State Registers
0>    SysIO Interrupts Test
0>    SysIO Timers/Counters Test
0>    IOMMU Virtual Address TLB Tag Compare Test
0>    Streaming Buffer Flush Test
0>    DMA Merge Buffer Test
0>CPU Speed
0>    CPU 0 Running at 200 MHZ.
0>Ecache Stress Test
0>    Ecache Stress Test
0>APC Test
0>    APC Registers Tests Test
0>    APC DVMA Test
0>Data Cache Test
0>    Dcache Init
0>    Dcache Enable Test
0>    Dcache Functionality Test
0>FEPS Test
0>    Parallel Port Registers Test
0>       Parallel Port ID is: 0x2
0>    Parallel Port DVMA burst mode read/write Test
0>    FAS366 Registers Test
0>    ESP FAS366 DVMA burst mode read/write Test
0>    FEPS Internal Loopbacks Test
0>    Ethernet Tranceiver Internal Loopbacks Test
0>CPU Functional Test
1>CPU Functional Test
0>    Mapping Selftest Enabling MMUs
1>    Mapping Selftest Enabling MMUs
0>    SPARC Atomic Instructions Test
1>    SPARC Atomic Instructions Test
0>    CPU Dispatch Control Register Test
1>    CPU Dispatch Control Register Test
0>    CPU Softint Registers and Interrupts Test
1>    CPU Softint Registers and Interrupts Test
0>    CPU Tick and Tick Compare Registers Test
1>    CPU Tick and Tick Compare Registers Test
0>    Uni-Processor Cache Coherence Test
0>  Base_address = 00100000
1>    Uni-Processor Cache Coherence Test
1>  Base_address = 00300000
0>    UltraSPARC-2 Prefetch Instructions Test
1>    UltraSPARC-2 Prefetch Instructions Test
0>  *UltraSparc-1 module detected, tests skipped
1>  *UltraSparc-1 module detected, tests skipped
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CODE EXAMPLE 3-1 `diag-level` Variable Set to max *(Continued)*

```
1>..... Processor 1 is in slave-wait phase...
0>Cross Calls Test
0>    Cross Calls Test
0>Cache Coherency Test
0>    Multi-Processor Cache Coherence Test
0>
     << POST COMPLETE >>
0>**Entering OBP (3b)


Power On Selftest Completed
```

3.4.2 Diag-Level NVRAM Variable Set to min

When the diag-level NVRAM parameter is set to min, POST enables an abbreviated set of diagnostic-level tests. This mode requires approximately 2 minutes to complete with a dual CPU configuration and 640 Mbytes of memory installed, or approximately 45 seconds to complete with a single CPU configuration and 640 Mbytes of memory installed. The following code example identifies a serial port A POST output with the diag-level NVRAM variable set to min.

CODE EXAMPLE 3-2 `diag-level` Variable Set to min

```
Button Power ON

Master CPU online
Master Version: 0000.0000.2200.1040
Slave Version: 0000.0000.2200.1040
CPU E$(M) 0000.0000.0010.0000 (S) 0000.0000.0010.0000
Button Power ON

Master CPU online
Master Version: 0000.0000.2200.1040
Slave Version: 0000.0000.2200.1040
CPU E$(M) 0000.0000.0010.0000 (S) 0000.0000.0010.0000

Probing keyboard Done
%o0 = 0000.0000.0000.2001

Executing Power On SelfTest
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CODE EXAMPLE 3-2 `diag-level` Variable Set to min *(Continued)*

```
0>@(#) Sun Ultra Enterprise 2 FCS_POST, version SB3.3.7 3/09/1998
02:14 PM
1>@(#) Sun Ultra Enterprise 2 FCS_POST, version SB3.3.7 3/09/1998
02:14 PM
0>  UltraSparc1 Version 4.0
1>  UltraSparc1 Version 4.0
0>
    POST is running with diag-level= min, please wait...
    POST is running with diag-level= min, please wait...
     << POST COMPLETE >>


Power On Selftest Completed
```

3.5 POST Progress and Error Reporting

While POST is initialized, the Caps Lock key on the Sun Type-5 keyboard flashes on and off to indicate that POST tests are being executed. Additional POST progress indications are also visible when a TTY-type terminal or a tip line is connected between serial port B (default port) of the system being tested and a POST monitoring system.

If an error occurs during the POST execution, the keyboard Caps Lock key indicator stops flashing and an error code is displayed using the Caps Lock, Compose, Scroll Lock, and Num Lock key indicators. The error code indicates a particular system hardware failure.

Note – An error code may only be visible for a few seconds. Observe the Caps Lock, Compose, Scroll Lock, and Num Lock key indicators closely while POST is active.

In most cases, POST also attempts to send a failure message to the POST monitoring system. The following code example identifies the typical appearance of a failure message. If a keyboard error code is displayed, determine the meaning of the error code by comparing the keyboard error code pattern to the corresponding error code meaning listed in the following table.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Note – The system does not automatically boot if a POST error occurs; it halts at the ok prompt to alert the user of a failure.

CODE EXAMPLE 3-3 Typical Error Code Failure Message

```
Executing Power On SelfTest

0>@(#) Sun Ultra Enterprise 2 FCS_POST, version SB3.3.7 3/09/1998
02:14 PM
1>@(#) Sun Ultra Enterprise 2 FCS_POST, version SB3.3.7 3/09/1998
02:14 PM
0>  UltraSparc1 Version 4.0
1>  UltraSparc1 Version 4.0
0>
    POST is running with diag-level= min, please wait...
    POST is running with diag-level= min, please wait...Error:
Mem_group=0 data= 00000000.07070707
0>ERROR: DSIMM's not fully populated/inserted in group_0, POST
terminated
0>  Entering OBP(0x00000000)


Power On Selftest Completed
```

TABLE 3-2 Keyboard LED Patterns

Caps Lock	Compose	Scroll Lock	Num Lock	Bit Value	Meaning of Pattern
Blink	Off	Off	Off	$x000_{(2)}$	POST in progress
Off	Off	Off	Off	$0000_{(2)}$	POST successfully completed
Off	Off	Off	On	$0001_{(2)}$	DSIMM in slot U 0401/0501 failed
Off	Off	On	Off	$0010_{(2)}$	DSIMM in slot U 0601/0701 failed
Off	Off	On	On	$0011_{(2)}$	DSIMM in slot U 0402/0502 failed
Off	On	Off	Off	$0100_{(2)}$	DSIMM in slot U 0602/0702 failed
Off	On	Off	On	$0101_{(2)}$	DSIMM in slot U 0403/0503 failed
Off	On	On	Off	$0110_{(2)}$	DSIMM in slot U 0603/0703 failed

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TABLE 3-2 Keyboard LED Patterns *(Continued)*

Caps Lock	Compose	Scroll Lock	Num Lock	Bit Value	Meaning of Pattern
Off	On	On	On	$0111_{(2)}$	DSIMM in slot U 0404/0504 failed
On	Off	Off	Off	$1000_{(2)}$	DSIMM in slot U 0604/0704 failed
On	Off	Off	On	$1001_{(2)}$	System board failed
On	Off	On	Off	$1010_{(2)}$	No memory found
On	Off	On	On	$1011_{(2)}$	Reserved
On	On	Off	Off	$1100_{(2)}$	Reserved
On	On	Off	On	$1101_{(2)}$	Reserved
On	On	On	Off	$1110_{(2)}$	Bad CPU0
On	On	On	On	$1111_{(2)}$	Bad CPU1

3.6 Bypassing POST

POST may be disabled and bypassed. To bypass POST:

1. **Prior to powering on the system, press and hold the Stop and D keys on the keyboard (**FIGURE 3-2**).**
2. **With holding down the keyboard Stop and D keys, press the Power-on to turn on the system unit.**

3.7 Additional Keyboard Control Commands

- Stop Key

If the diag-level is set to either max or min and the `diag-level switch?` variable is set to `true` and POST is not to be executed when the system unit is powered on, press and hold the Stop key and press the Power-on key.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Note – Press and hold the Stop key for approximately 5 seconds.

- Stop and N Keys

To set the system NVRAM parameters to the original default settings, press and hold the Stop and N keys before powering on the system. Continue to hold the Stop and N keys until the system banner is displayed on the monitor.

3.8 System and Keyboard LEDs

The power LED, located at the chassis front, remains lighted when the system is operating normally. The following figure shows the location of the power LED.

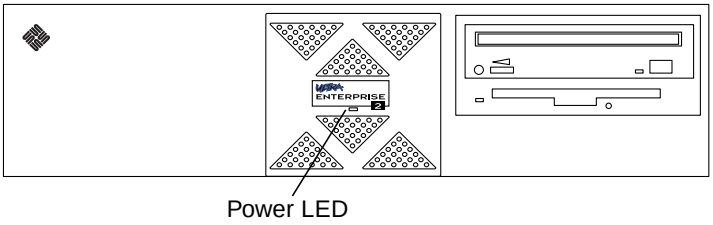


FIGURE 3-3 Power LED

While POST is executing and making progress, the Caps Lock key LED blinks while the rest of the LEDs are off. If POST finds an error, a pattern is encoded in the LEDs to indicate the defective part. If POST completes with no errors, all LEDs will be off and the system will return to the OpenBoot PROM (OBP). TABLE 3-2 on page 3-13 defines the keyboard LED patterns. FIGURE 3-2 shows the location of the LED keys on the keyboard.

3.9 Initializing the Motherboard POST

To initialize the motherboard POST:

1. **Power off the system unit.**

See Section 6.2 “Powering Off the System Unit” on page 6-2.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2. **At the keyboard, simultaneously press and hold the Stop and D keys and press the Power-on key.**

Note – Video output is disabled while POST is initialized.

Note – To view the POST output results, a tip connection must be set up. See Section 3.2.1 “Setting Up a Tip Connection” on page 3-2.

---

3. **Verify that the keyboard LEDs light to confirm the system is in the POST mode. Verify that the keyboard Caps Lock key LED flashes on and off to indicate the system has enabled POST.**

4. **If a failure occurs during POST, a keyboard key LED other than the Caps Lock key LED may light, indicating a failed system component.**

   See Section 3.8 “System and Keyboard LEDs” on page 3-15.

5. **If the Caps Lock key LED fails to flash after the Stop and D keys are pressed, the POST has failed.**

   See Section 3.8 “System and Keyboard LEDs” on page 3-15.

Note – The most probable cause of this type of failure is the motherboard. However, optional system components can also cause POST to fail.

---

6. **Before replacing the motherboard, remove any optional components, such as PCI cards and memory, and repeat the POST.**

Note – Non-optional components such as DSIMMs, the motherboard, the power supply, and the keyboard must be installed for POST to execute properly. Removing the optional system components and retesting the system unit isolates the possibility that those components are the cause of the failure.

---

7. **To view additional POST failure information, establish a tip connection.**

   See Section 3.2.1 “Setting Up a Tip Connection” on page 3-2.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CHAPTER 4

Troubleshooting Procedures

This chapter describes how to troubleshoot possible problems and includes suggested corrective actions.

- Section 4.1 “Power-On Failure” on page 4-1
- Section 4.2 “Video Output Failure” on page 4-2
- Section 4.3 “Hard Drive or CD-ROM Drive Failure” on page 4-3
- Section 4.4 “Power Supply Test” on page 4-4
- Section 4.5 “DSIMM Failure” on page 4-8
- Section 4.6 “OpenBoot PROM On-Board Diagnostics” on page 4-10

4.1 Power-On Failure

This section provides examples of power-on failure symptoms and suggested actions.

Symptom

The system unit does not power up when the keyboard Power-on key is pressed.

Action

Check the keyboard connection. Ensure that the keyboard is properly connected to the system unit. Check the AC power cord. Ensure that the AC power cord is properly connected to the system unit and to the wall receptacle. Verify that the wall receptacle is supplying AC power to the system unit.

Press the power switch. If the system unit powers on, the keyboard may be defective or the system unit is unable to accept the keyboard power-on signal. Power off the system unit and press the keyboard Power-on key again. If the system unit powers on, no further action is required. If the system unit does not power on, the CPU module may not be properly seated. Inspect the CPU module for proper seating. If

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

the system unit powers on, no further action is required. If the system unit does not power on, the keyboard may be defective. Connect a spare Sun Type-5 keyboard to the system unit and press the Power-on key.

If the wall receptacle AC power has been verified, the CPU module is properly seated, and a spare Sun Type-5 keyboard has been connected to the system unit and the Power-on key has been pressed but the system unit does not power up, the system unit power supply may be defective. See Section 4.4 “Power Supply Test” on page 4-4.

Symptom

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

Action

Press the keyboard Power-on key and watch the keyboard. The keyboard LEDs should light briefly and a tone from the keyboard should be heard. If a tone is not heard or if the keyboard LEDs do not light briefly, the system unit power supply may be defective. See Section 4.4 “Power Supply Test” on page 4-4. If a keyboard tone is heard and the keyboard LEDs light briefly but the system unit still fails to initialize, see Section 3.9 “Initializing the Motherboard POST” on page 3-15.

4.2 Video Output Failure

This section provides video output failure symptom and suggested action.

Symptom

No video at the system monitor.

Action

Check the monitor AC power cord. Ensure that the AC power cord is connected to the monitor and to the wall receptacle. Verify that the wall receptacle is supplying AC power to the monitor. Check the video cable connection between the monitor and the system graphics card output port at the rear of the system. Check that the CPU module is properly seated. If the AC connection to the monitor is correct, the video cable is correctly connected, and the CPU module is properly seated, the system monitor or the system graphics card may be defective. Replace the monitor or the graphics card.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

4.3 Hard Drive or CD-ROM Drive Failure

This section provides hard drive and CD-ROM drive failure symptoms and suggested actions.

Symptom

A hard drive read, write, or parity error is reported by the operating system or customer application.

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

Action

Replace the drive indicated by the failure message. The operating system identifies the internal drives as listed in the following table.

TABLE 4-1 Internal Drives Identification

Operating System Address	Drive Physical Location and Target
c0t0d0s#	SCSI hard drive, target 0
c0t1d0s#	SCSI hard drive, target 1
c0t6d0s#	CD-ROM drive, target 6

Note – The # symbol in the examples may be a number between 0 and 7 that describes the slice or partition on the drive.

Symptom

Hard drive or CD-ROM drive fails to respond to commands.

Note – To bypass POST, type: `setenv diag-switch? false` at the ok prompt.

Action

Test the drive response to the `probe-scsi` command as follows:

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

- **At the system prompt, type:**

```
ok reset-all
ok probe-scsi
```

If the drives respond and a message is displayed, the system SCSI controller has successfully probed the devices. This is an indication that the motherboard is operating correctly. If one drive does not respond to the SCSI controller probe but the others do, replace the unresponsive drive.

If one internal disk drive is configured with the system and the `probe-scsi` test fails to show the device in the message, replace the drive. If the problem is still evident after replacing the drive, replace the motherboard. If replacing both the hard drive and the motherboard does not correct the problem, replace the internal disk drive cable and SCSI backplane assembly.

4.4 Power Supply Test

The following provides instructions to test the power supply.

FIGURE 4-1 and TABLE 4-2 identify power supply connector J3203. FIGURE 4-2 and TABLE 4-3 identify power supply connector J3204. FIGURE 4-3 and TABLE 4-4 identify power supply connector J3205. FIGURE 4-4 and TABLE 4-5 identify power supply connector J3206.

1. **Using a volt-ohm-milliammeter (VOM), check the power supply output voltages as follows:**

Note – Power supply connectors J3203 through J3206 must remain connected to the motherboard.

---

2. **With the negative probe of the VOM meter placed on the ground (Gnd) pin, position the positive probe on each power pin.**
3. **Verify +12 VDC, -12 VDC, +5 VDC, +3.3 VDC and +3.0 VDC.**
4. **If any power pin signal is not present with the power supply active and properly connected to the motherboard, replace the power supply.**

Note – Pins listed in the following tables are referenced to the motherboard bottom view.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Note – The +3.0 VDC (A) that is listed in TABLE 4-2 is a programmable output from 2.5 VDC to 3.5VDC. The 3.3 (A) output provides the core voltage, VDDCORE_1, to CPU slot 1.

The +3.0 VDC (B) that is listed in TABLE 4-3 is a programmable output from 2.5 VDC to 3.5VDC. The 3.3 VDC (B) output provides the core voltage, VDDCORE_0, to CPU slot 0

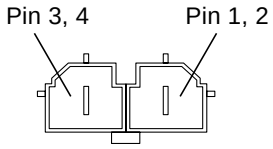


FIGURE 4-1 Power Supply Connector J3203

TABLE 4-2 Power Supply Connector J3203 Pin Assignments

Pin	Description
1, 2	Return
3, 4	+3.3 VDC (A)

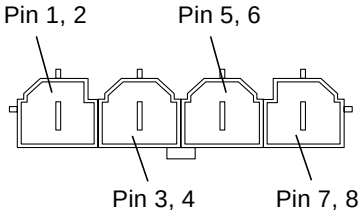


FIGURE 4-2 Power Supply Connector J3204

TABLE 4-3 Power Supply Connector J3204 Pin Assignments

Pin	Description
1, 2	Return +5.0 VDC
3, 4	+5.0 VDC
5, 6	Return +3.0 VDC (B)
7, 8	+3.0 VDC (B)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

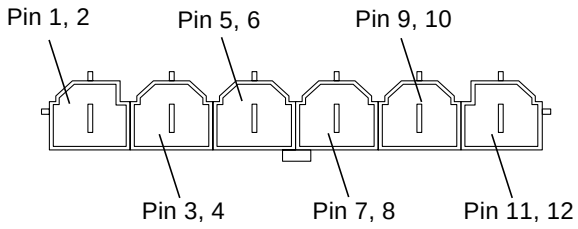


FIGURE 4-3 Power Supply Connector J3205

TABLE 4-4 Power Supply Connector J3205 Pin Assignments

Pin	Description
1, 2	Return
3, 4	Return
5, 6	Return
7, 8	+3.3 VDC
9, 10	+3.3 VDC
11, 12	+3.3 VDC

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

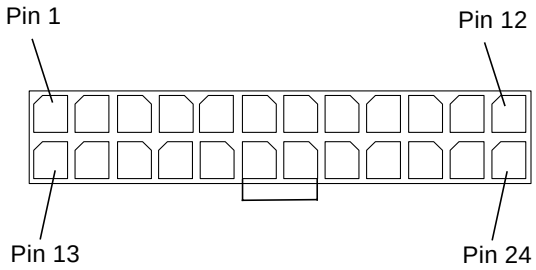


FIGURE 4-4 Power Supply Connector J3206

TABLE 4-5 Power Supply Connector J3206 Pin Assignments

Pin	Description
1	+3.0 VDC (A) Sense
2	+3.0 VDC (A) VPROG
3	+3.0 VDC (B) Sense
4	+3.0 VDC (A) VPROG
5	Fan Speed
6	+3.3 VDC +Sense
7	+5.0 VDC +Sense
8	+12.0 VDC
9	+12.0 VDC
10	-12.0 VDC
11	On
12	Temp Sense
13	+3.0 VDC (A) -Sense
14	+3.0 VDC (A) Ovp Prog
15	+3.0 VDC (B) -Sense
16	+3.0 VDC (B) Ovp Prog

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TABLE 4-5 Power Supply Connector J3206 Pin Assignments *(Continued)*

Pin	Description
17	Power On Reset
18	+3.3 -Sense
19	+5.0 -Sense
20	Return
21	Return
22	Interlock
23	Off
24	Temp Sense

4.5 DSIMM Failure

At times the operating system, diagnostic program, or POST may not display a DSIMM location (U number) as part of a memory error message. In this situation, the only available information is a physical memory address and failing byte (or bit). The following tables list the necessary information to locate a defective 16-, 32-, 64-, and 128-Mbyte DSIMM.

TABLE 4-6 DSIMM Physical Memory Addresses (16-Mbyte)

Group	Pair	Sockets	Bank	Address Range (Physical Address [30:0])
0	0	U0401 / U0501	0	0x0000_0000 to 0x03ff_ffff (first dbl wd)
0	1	U0601 / U0701	1	0x0000_0000 to 0x03ff_ffff (second dbl wd)
1	2	U0402 / U0502	0	0x2000_0000 to 0x23ff_ffff (first dbl wd)
1	3	U0602 / U0702	1	0x2000_0000 to 0x23ff_ffff (second dbl wd)
2	4	U0403 / U0503	0	0x4000_0000 to 0x43ff_ffff (first dbl wd)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TABLE 4-6 DSIMM Physical Memory Addresses (16-Mbyte) *(Continued)*

Group	Pair	Sockets	Bank	Address Range (Physical Address [30:0])
2	5	U0603 / U0703	1	0x4000_0000 to 0x43ff_ffff (second dbl wd)
3	6	U0404 / U0504	0	0x6000_0000 to 0x63ff_ffff (first dbl wd)
3	7	U0604 / U0704	1	0x6000_0000 to 0x63ff_ffff (second dbl wd)

TABLE 4-7 DSIMM Physical Memory Addresses (32-Mbyte)

Group	Pair	Sockets	Bank	Address Range (Physical Address [30:0])
0	0	U0401 / U0501	0	0x0000_0000 to 0x07ff_ffff (first double word)
0	1	U0601 / U0701	1	0x0000_0000 to 0x07ff_ffff (second double word)
1	2	U0402 / U0502	0	0x2000_0000 to 0x27ff_ffff (first double word)
1	3	U0602 / U0702	1	0x2000_0000 to 0x27ff_ffff (second double word)
2	4	U0403 / U0503	0	0x4000_0000 to 0x47ff_ffff (first double word)
2	5	U0603 / U0703	1	0x4000_0000 to 0x47ff_ffff (second double word)
3	6	U0404 / U0504	0	0x6000_0000 to 0x67ff_ffff (first double word)
3	7	U0604 / U0704	1	0x6000_0000 to 0x67ff_ffff (second double word)

TABLE 4-8 DSIMM Physical Memory Addresses (64-Mbyte)

Group	Pair	Sockets	Bank	Address Range (Physical Address [30:0])
0	0	U0401 / U0501	0	0x0000_0000 to 0x0fff_ffff (first double word)
0	1	U0601 / U0701	1	0x0000_0000 to 0x0fff_ffff (second double word)
1	2	U0402 / U0502	0	0x2000_0000 to 0x2fff_ffff (first double word)
1	3	U0602 / U0702	1	0x2000_0000 to 0x2fff_ffff (second double word)
2	4	U0403 / U0503	0	0x4000_0000 to 0x4fff_ffff (first double word)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TABLE 4-8 DSIMM Physical Memory Addresses (64-Mbyte) *(Continued)*

Group	Pair	Sockets	Bank	Address Range (Physical Address [30:0])
2	5	U0603 / U0703	1	0x4000_0000 to 0x4fff_ffff (second double word)
3	6	U0404 / U0504	0	0x6000_0000 to 0x6fff_ffff (first double word)
3	7	U0604 / U0704	1	0x6000_0000 to 0x6fff_ffff (second double word)

TABLE 4-9 DSIMM Physical Memory Addresses (128-Mbyte)

Group	Pair	Sockets	Bank	Address Range (Physical Address [30:0])
0	0	U0401 / U0501	0	0x0000_0000 to 0x1fff_ffff (first double word)
0	1	U0601 / U0701	1	0x0000_0000 to 0x1fff_ffff (second double word)
1	2	U0402 / U0502	0	0x2000_0000 to 0x3fff_ffff (first double word)
1	3	U0602 / U0702	1	0x2000_0000 to 0x3fff_ffff (second double word)
2	4	U0403 / U0503	0	0x4000_0000 to 0x5fff_ffff (first double word)
2	5	U0603 / U0703	1	0x4000_0000 to 0x5fff_ffff (second double word)
3	6	U0404 / U0504	0	0x6000_0000 to 0x7fff_ffff (first double word)
3	7	U0604 / U0704	1	0x6000_0000 to 0x7fff_ffff (second double word)

Each group listed in the preceeding tables (Group 0, Group 1, Group 2, and Group 3, respectively) allow enough address space to accommodate four 16-Mbyte, four 32-Mbyte, four 64-Mbyte, or four 128-Mbyte DSIMMs. Unused addresses are mapped by the memory management hardware. Regardless of the installed DSIMM capacity, the memory starting address is as listed in the supporting tables.

4.6 OpenBoot PROM On-Board Diagnostics

The following sections describe the OpenBoot PROM (OBP) on-board diagnostics. To execute the OBP on-board diagnostics, the system must be at the ok prompt.The OBP on-board diagnostics are listed as follows:.

- Watch-Clock Diagnostic—page 4-11

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

- Watch-Net Diagnostic—page 4-11
- Watch-Net-All Diagnostic—page 4-12
- Probe-SCSI and Probe-SCSI-All Diagnostic—page 4-13
- Test alias name, device path, -All Diagnostic—page 4-14
- UPA Graphics Card Diagnostic—page 4-15

4.6.1 Watch-Clock Diagnostic

The watch-clock diagnostic reads a register in the NVRAM/TOD chip and displays the result as a seconds counter. During normal operation, the seconds counter repeatedly increments from 0 to 59 until interrupted by pressing any key on the Sun Type-5 keyboard. The watch-clock diagnostic is initialized by typing the `watch-clock` command at the `ok` prompt. The following code example identifies the watch-clock diagnostic output message.

CODE EXAMPLE 4-1 Watch-Clock Diagnostic Output Message

```
{0} ok watch-clock
Watching the ‘seconds’ register of the real time clock chip.
It should be ‘ticking’ once a second.
Type any key to stop.
39
{0} ok
```

4.6.2 Watch-Net Diagnostic

The watch-net diagnostic monitors Ethernet packets broadcast on the Ethernet cable(s) connected to the system. Good packets received by the system are indicated by a period (.) displayed on the screen. Errors such as Framing error and Cyclic Redundancy Check (CRC) error are indicated with an X and an associated error description.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The watch-net diagnostic is initialized by typing the `watch-net` command at the `ok` prompt. The following code example identifies the watch-net diagnostic output message.

CODE EXAMPLE 4-2 Watch-Net Diagnostic Output Message

```
{0} ok watch-net
Hme register test --- succeeded.
Internal loopback test -- succeeded.
Transceiver check -- Using Onboard Transceiver - Link Up.
passed
Using Onboard Transceiver - Link Up.
Looking for Ethernet Packets.
‘.’ is a Good Packet. ‘X’ is a Bad Packet.
Type any key to stop.
..............
{0} ok
```

4.6.3 Watch-Net-All Diagnostic

The watch-net-all diagnostic monitors Ethernet packets on any Ethernet interface installed in the system. For example, if there is an SBus card installed in one of the system SBus slots, watch-net-all monitors the Ethernet transmissions occurring through that card. When the test is interrupted by pressing any key, watch-net-all searches to test the next Ethernet interface card installed in the system.

The watch-net-all diagnostic is initialized by typing the `watch-net-all` command at the `ok` prompt. The following code example identifies the watch-net-all diagnostic output message.

CODE EXAMPLE 4-3 Watch-Net-All Diagnostic Output Message

```
ok watch-net-all
/pci@1f,4000/network@1,1
Hme register test --- succeeded.
Internal loopback test -- succeeded.
Transceiver check -- Using Onboard Transceiver - Link Up.
passed
Using Onboard Transceiver - Link Up.
Looking for Ethernet Packets.
‘.’ is a Good Packet. ‘X’ is a Bad Packet.
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CODE EXAMPLE 4-3 Watch-Net-All Diagnostic Output Message *(Continued)*

```
Type any key to stop.
..
ok
```

4.6.4 Probe-SCSI and Probe-SCSI-All Diagnostic

The probe-SCSI diagnostic transmits an inquiry command to internal and external SCSI devices connected to the system unit on-board SCSI interface. If the SCSI device is connected and active, the target address, unit number, device type, and manufacturer name is displayed. The probe-SCSI-all diagnostic transmits an inquiry command to SCSI devices connected to the system SCSI host adapters. 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 probe-SCSI diagnostic is initialized by typing the `probe-scsi` command at the `ok` prompt and the probe-SCSI-all diagnostic is initialized by typing the `probe-scsi-all` command at the `ok` prompt. The following code example identifies the probe-SCSI diagnostic output message. CODE EXAMPLE 4-5 identifies the probe-SCSI-all diagnostic output message.

CODE EXAMPLE 4-4 Probe-SCSI Diagnostic Output Message

```
{0} ok probe-scsi

Target 0
Unit 0   Disk     QUANTUM VK2275J SUN2.1G1210
Target 1
  Unit 0   Disk     SEAGATE ST32171W SUN2.1G8254
Target 6
Unit 0  Removable Read Only device    TOSHIBA XM5701TASUN12XCD0997

{0} ok
```

CODE EXAMPLE 4-5 Probe-SCSI-All Diagnostic Output Message

```
{0} ok probe-scsi-all
probe-scsi-all?
{0} ok probe-scsi-all
/sbus@1f,0/SUNW,fas@e,8800000
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CODE EXAMPLE 4-5 Probe-SCSI-All Diagnostic Output Message *(Continued)*

```
Target 0
  Unit 0   Disk     QUANTUM VK2275J SUN2.1G1210
Target 1
  Unit 0   Disk     SEAGATE ST32171W SUN2.1G8254
Target 6
Unit 0  Removable Read Only device    TOSHIBA XM5701TASUN12XCD0997

{0} ok
```

4.6.5 Test *alias name, device path, -All* Diagnostic

The test diagnostic, when combined with a device *alias* or device *path*, enables a device self-test diagnostic program. If a device has no self-test program, the message: `No selftest method for device name` is displayed. To enable the self-test program for a device, type the `test` command followed by the device *alias* or device *path* name.

The following code example identifies the test diagnostic output message. TABLE 4-10 lists the test diagnostics that can be initialized by typing the `test` (*alias name, device path, -all*) command at the `ok` prompt, a description of the selection, and preparation.

Note – The diskette drive (floppy) is selected as the test *alias name* example.

CODE EXAMPLE 4-6 Test Diagnostic Output Message

```
{0} ok test floppy
Testing floppy disk system. A formatted disk should be in the
drive.
Test succeeded.
{0} ok
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TABLE 4-10 Selected OBP On-board Diagnostic Tests

Type of Test	Description	Preparation
`test screen`	Tests system video graphics hardware and monitor.	`diag-switch?` NVRAM parameter must be true for the test to execute.
`test floppy`	Tests diskette drive response to commands.	A formatted diskette must be inserted into the diskette drive.
`test net`	Performs internal/external loopback test of the system auto-selected Ethernet interface.	An Ethernet cable must be attached to the system and to an Ethernet tap or hub or the external loopback test fails.
`test ttya` `test ttyb`	Outputs an alphanumeric test pattern on the system serial ports: ttya, serial port A; ttyb, serial port B.	A terminal must be connected to the port being tested to observe the output.
`test keyboard`	Executes the keyboard self-test.	Four keyboard LEDs should flash once and a message is displayed: `Keyboard Present`.
`test -all`	Sequentially tests system-configured devices containing self-test.	Tests are sequentially executed in device-tree order (viewed with the `show-devs` command).

4.6.6 UPA Graphics Card Diagnostic

The ultra port architecture (UPA) graphics card diagnostic contains a built-in diagnostic test that is enabled through the OBP. The UPA graphics card built-in diagnostic test verifies basic graphics functionality without booting the operating system software.

To execute the built-in diagnostic test, the system must be at the `ok` prompt.

To initialize the UPA graphics card diagnostic:

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

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


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

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

```
ok test screen

Verifying Console Mode for Frame Buffer Board
This will take a few minutes
Verifying Frame Buffer Memory used for console mode
This will take about two minutes
FFB Frame Buffer functional test passed
ok
```

3. **When the UPA graphics card on-board diagnostics are completed, type:**

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


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CHAPTER 5

Safety and Tool Requirements

This chapter provides a description of safety requirements, symbols, safety precautions, and tools required for service of the Sun Ultra 2 series cpmputer.

- Section 5.1 “Safety Requirements” on page 5-1
- Section 5.2 “Symbols” on page 5-1
- Section 5.3 “Safety Precautions” on page 5-2
- Section 5.4 “Tools Required” on page 5-4

5.1 Safety Requirements

Before servicing any part of the Ultra 2 series system or server units, read the instructions and cautions in this section. This information explains how to work safely when servicing a Sun Microsystems product. For protection, observe the following safety precautions when setting up the equipment:

- Follow all cautions, warnings, and instructions marked on the equipment.
- Ensure that the voltages and frequency rating of the power receptacle match the electrical rating label on the equipment.
- Never push objects of any kind through openings in the equipment. They may touch dangerous voltage points or short components, resulting in fire or electric shock.
- Refer servicing of equipment to qualified personnel.

5.2 Symbols

The following symbols mean:

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



Caution – Risk of personal injury and equipment damage. Follow the instructions.



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



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

5.3 Safety Precautions

The following safety precautions mean:

5.3.1 Modification to Equipment



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

5.3.2 Placement of a Sun Product



Caution – To ensure reliable operation of a Sun product and to protect it from overheating, openings in the equipment must not be blocked or covered. A Sun product should never be placed near a radiator or hot air register.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5.3.3 Power Cord Connection



Caution – Not all power cords have the same current ratings. Household extension cords do not have overload protection. Do not use household extension cords with a Sun product.



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 connect the power cord into a grounded electrical receptacle 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.

5.3.4 Electrostatic Discharge



Caution – The motherboard and hard drives contain electrical components that are extremely sensitive to static electricity. Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.



Caution – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

5.3.5 Lithium Battery



Caution – On Sun motherboards, a lithium battery is molded into the real-time clock, SDS No. M48T59Y,MK48TXXB-XX, M48T18-XXXPCZ or M48T59W-XXXPCZ. Batteries are not customer replaceable parts. They may explode if mistreated. Do not dispose of a battery in fire. Do not disassemble it or attempt to recharge it.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5.4 Tools Required

The following tools are required to service the Ultra 2 series desktop workstation and the Ultra Enterprise 2 server:

- Phillips screwdriver
- Long-nose plier
- Grounding wrist strap
- Volt-ohm-milliammeter (VOM)
- Antistatic surface

Place ESD-sensitive components such as the motherboard, circuit cards, hard drives, and TOD/NVRAM on an antistatic surface. The following items can be used as an antistatic surface:

- Bag used to wrap a Sun replacement part
- Shipping container used to package a Sun replacement part
- Inner side (metal part) of the system unit cover
- Sun ESD mat, part no. 250-1088 (may be purchased through your Sun sales representative)
- Disposable ESD mat; shipped with replacement parts or optional system features

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CHAPTER 6

Powering On and Off

This chapter contains procedures to power on and power off the Ultra 2 series computer.

This chapter contains the following topics:

- Section 6.1 “Powering On the System Unit” on page 6-1
- Section 6.2 “Powering Off the System Unit” on page 6-2

6.1 Powering On the System Unit

To power on the system unit:

1. **Turn on power to all connected peripherals.**

Note – Peripheral power is activated prior to system unit power so the system unit can recognize the peripherals when it is activated.

2. **Connect the AC power cord.**
3. **Set the power on/standby switch to the on (I) position (**FIGURE 6-1**) or press the Sun Type-5 keyboard Power-on key (**FIGURE 6-2**).**

Note – The Sun Type-5 keyboard Power-on key is active only if the power on/standby switch is set to the on position.

4. **Verify the following:**
   a. **The front panel LED is on.**
   b. **The system unit fans are spinning.**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

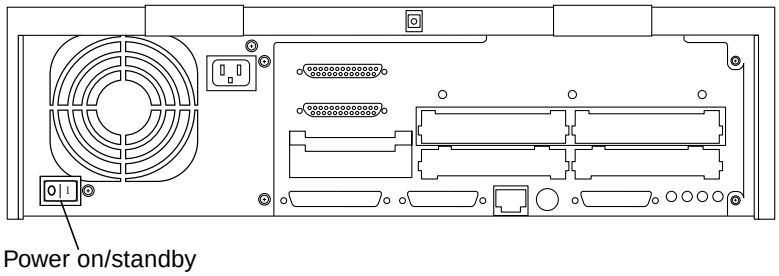


FIGURE 6-1 Rear View of the System Unit

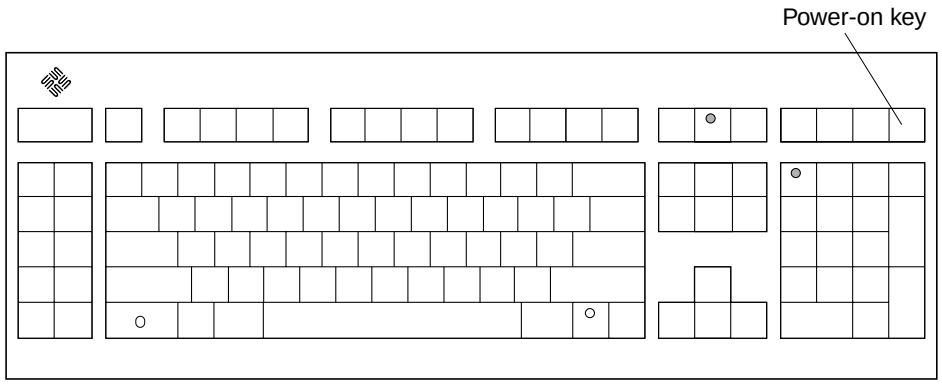


FIGURE 6-2 Sun Type-5 Keyboard

6.2 Powering Off the System Unit

Caution – Prior to turning off the system unit power, exit from the operating system. Failure to do so may result in loss of data.

Caution – Wear an antistatic wrist strap and use an ESD-protected mat when handling components. When servicing or removing system unit components, attach an ESD strap to your wrist, then attach the ESD strap to a metal area on the chassis, and then disconnect the power cord from the system unit and the wall receptacle. Following this caution equalizes all electrical potentials with the system unit.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

To power off the system unit:

1. **Notify users that the system is going down.**
2. **Back up system files and data.**

   See the *Solaris Handbook for SMCC Peripherals*, part number 802-7675.
3. **Halt the system.**



Caution – Pressing the front panel power switch does not remove all power from the system unit; a trickle voltage remains in the power supply. To remove all power from the system unit, disconnect the AC power cord from the system unit.

4. **Set the power on/standby switch to the stand-by (O) position (**FIGURE 6-1**).**
5. **Verify the following**:

   a. Front panel LED is extinguished.

   b. System fans are disabled.



Caution – When the power on/standby switch is in stand-by (0) and the AC power cord remains connected to a power receptacle, AC voltage is present in the power supply primary.



Caution – Disconnect the AC power cord from the AC receptacle prior to handling the power supply. When servicing system components other than the power supply, the AC power cord should remain connected to the AC receptacle.

6. **Turn off the power to the monitor and any peripheral equipment.**
7. **Disconnect cables to any peripheral equipment.**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CHAPTER 7

Internal Access

This chapter describes how to access the Ultra 2 series computer for service.

This chapter contains the following topics:

- Section 7.1 “Removing the System Unit Cover” on page 7-1
- Section 7.2 “Attaching the Wrist Strap” on page 7-3
- Section 7.3 “Replacing the System Unit Cover” on page 7-4

7.1 Removing the System Unit Cover

1. **Power off the system unit.**

   See Section 6.2 “Powering Off the System Unit” on page 6-2.

2. **Using a number 2 Phillips screwdriver, loosen the screw securing the lock block (if installed) to the cover and back panel. Remove the lock block (**FIGURE 7-1**).**

3. **Pull the two top cover tabs to free the cover from the back panel (**FIGURE 7-2**).**

4. **Grasp the sides of the cover and proceed as follows**:

   a. **Lift the cover from the back panel.**

   b. **When the cover clears the back panel, move the cover away from the front panel to free it from the chassis and set aside.**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

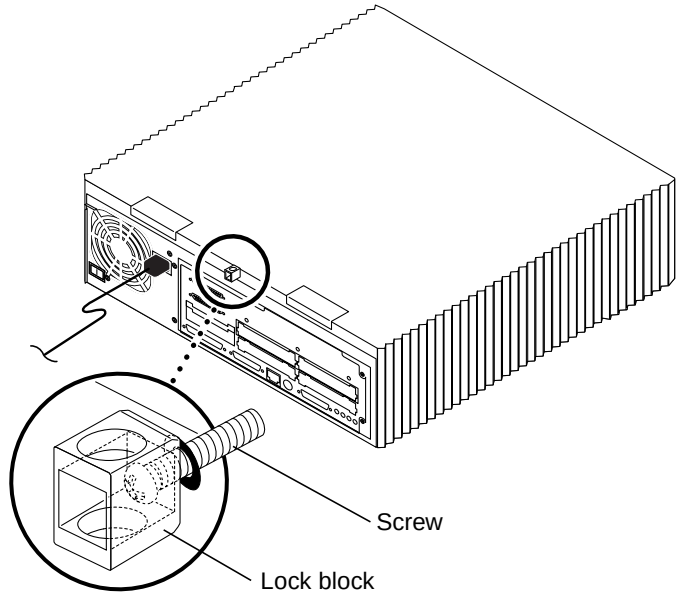


FIGURE 7-1 Location of Lock Block

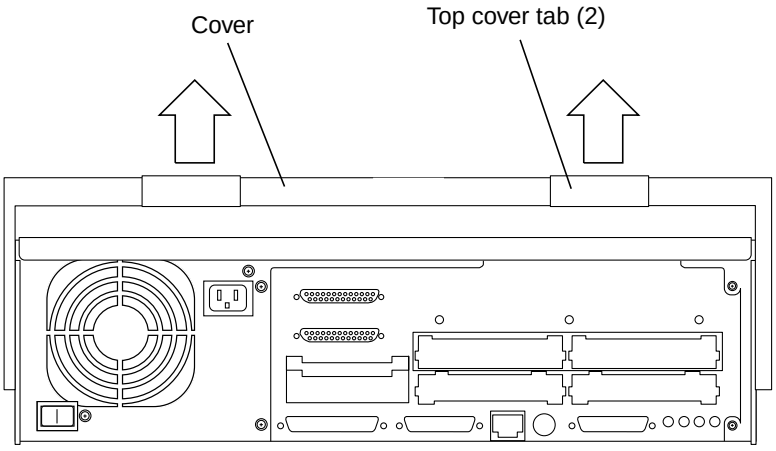


FIGURE 7-2 Removing the System Unit Cover

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

7.2 Attaching the Wrist Strap

Caution – Wear an antistatic wrist strap and use an ESD-protected mat when handling components. When servicing or removing system unit components, attach an ESD strap to your wrist, then attach the ESD strap to a metal area on the chassis, and then disconnect the power cord from the system unit and the wall receptacle. Following this caution equalizes all electrical potentials with the system unit.

1. **Unwrap the first two folds of the wrist strap and wrap the adhesive side firmly against the wrist (**FIGURE 7-3**).**
2. **Peel the liner from the copper foil at the opposite end of the wrist strap. Attach the copper end of the wrist strap to the chassis.**

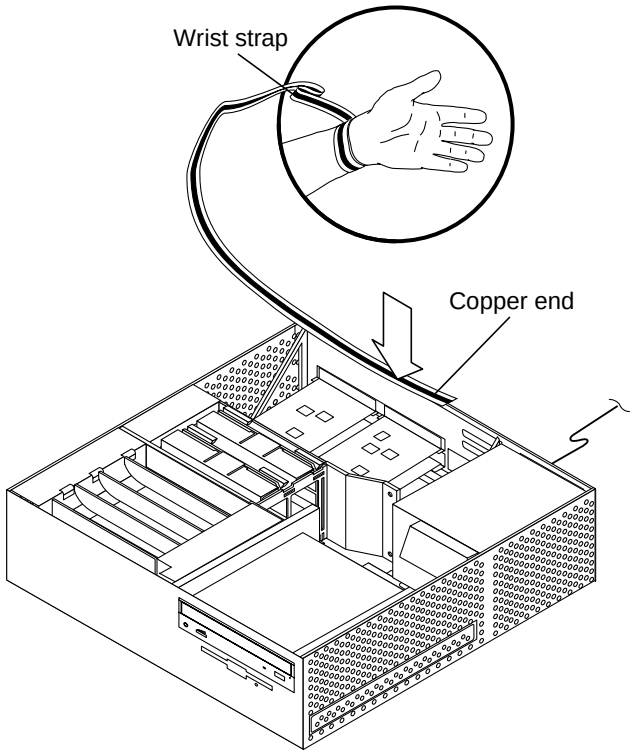


FIGURE 7-3 Attaching the Wrist Strap

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

7.3 Replacing the System Unit Cover

1. **Hold the cover at a 30-degree angle to the system unit.**
2. **Position the cover lip to the chassis lip.**
3. **Lower the cover onto the system unit so that the rear of the cover is supported by the chassis back panel (**FIGURE 7-4**).**
4. **Press down on both sides of the cover near the front edges until it firmly seats with the chassis back panel.**
5. **Press the tabs near the back panel.**
6. **Position the lock block. Tighten the screw securing the lock block to the cover and back panel.**
7. **Power on the system unit.**

   See Section 6.1 “Powering On the System Unit” on page 6-1.

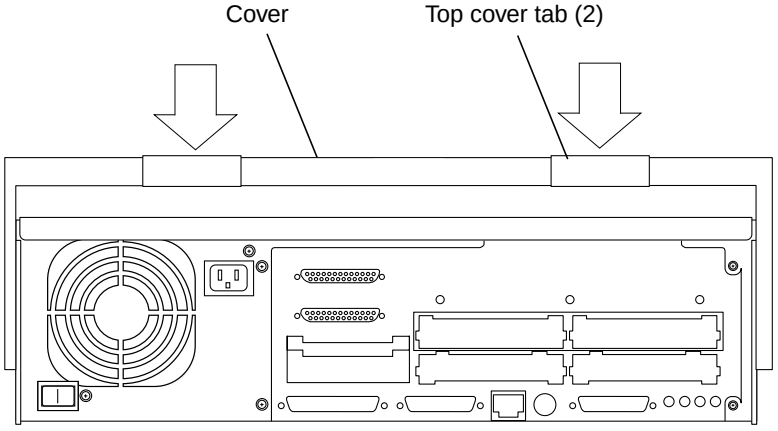


FIGURE 7-4 Replacing the System Unit Cover

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CHAPTER 8

Major Subassemblies

This chapter describes how to remove and replace the major subassemblies.

This chapter contains the following topics:

- Section 8.1 “Power Supply” on page 8-1
- Section 8.2 “Cable Assemblies” on page 8-5
- Section 8.3 “Shroud Assembly” on page 8-10
- Section 8.4 “Shroud Assembly Speaker” on page 8-12

8.1 Power Supply

To remove and replace the power supply, proceed as follows.

8.1.1 Removing the Power Supply

1. **Power off the system unit.**

   See Section 6.2 “Powering Off the System Unit” on page 6-2.

2. **Remove the system unit cover.**

   See Section 7.1 “Removing the System Unit Cover” on page 7-1.



Caution – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

3. **Attach the wrist strap.**



Caution – The AC power cord must be disconnected while the power supply is being removed and replaced. Do not reconnect the power cord while the power supply is outside of the chassis.

4. **Disconnect the AC power cord from the system unit.**
5. **Disconnect the J5 power supply connector from the CD-ROM drive (or 4-mm/8-mm tape drive).**

Note – When disconnecting the power supply connectors, use your thumb to press the retention latch on the connector shell.

6. **Disconnect the J6 power supply connector from the diskette drive.**
7. **Disconnect the following power supply connectors from the motherboard (**FIGURE 8-1**).**
   - J1 from J3206
   - J2 from J3205
   - J3 from J3203
   - J4 from J3204
8. **Using a number 2 Phillips screwdriver, loosen the two captive screws securing the power supply to the back panel.**
9. **Push the power supply toward the chassis front to disengage the mounting hooks.**
10. **Tilt the power supply slightly toward the motherboard; lift the power supply from the chassis.**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

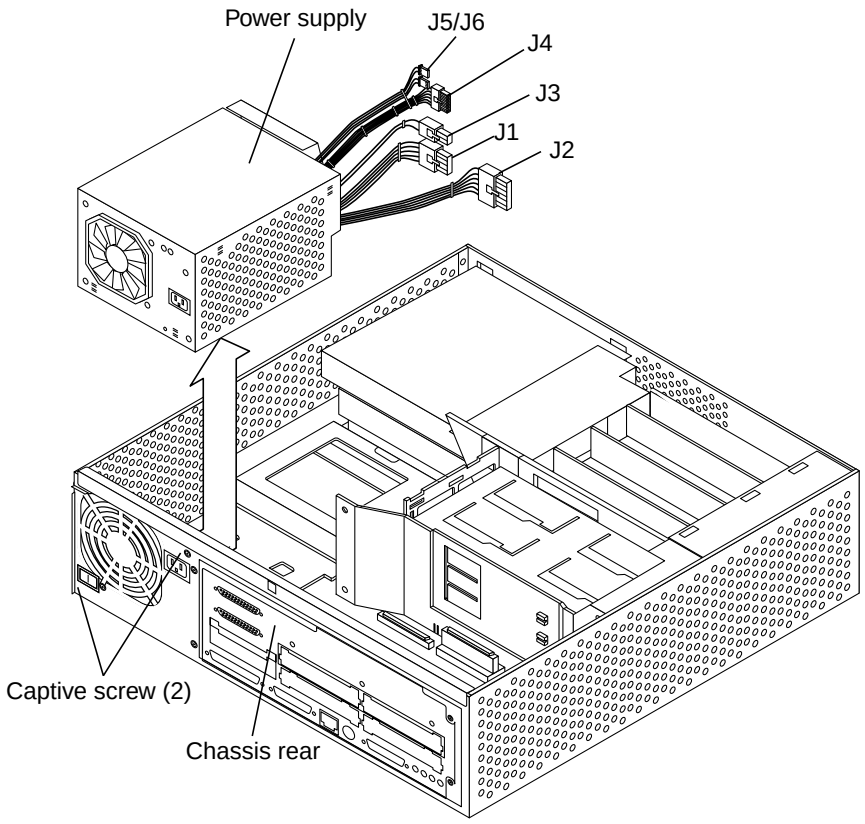


FIGURE 8-1 Removing the Power Supply

8.1.2 Replacing the Power Supply

Caution – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

Caution – The AC power cord must be disconnected while the power supply is being removed and replaced. Do not reconnect the power cord while the power supply is outside of the chassis.

1. **Position the power supply into the chassis.**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2. **Push the power supply toward the chassis rear, engaging the mounting hooks.**

Note – Ensure that the hooks located on the chassis base engage with the cutouts located on the bottom of the power supply.

---

3. **Using a number 2 Phillips screwdriver, tighten the captive screws securing the power supply to the back panel.**
4. **Connect the following power supply connectors to the motherboard (**FIGURE 8-2**:**
   - J4 to J3204
   - J3 to J3203
   - J2 to J3205
   - J1 to J3206
5. **Connect the J6 power supply connector to the diskette drive.**
6. **Connect the J5 power supply connector to the CD-ROM drive (or 4-mm/8-mm tape drive).**
7. **Connect the AC power cord.**
8. **Detach the wrist strap.**
9. **Replace the system unit cover.**

   See Section 7.3 “Replacing the System Unit Cover” on page 7-4.
10. **Power on the system unit.**

    See Section 6.1 “Powering On the System Unit” on page 6-1.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

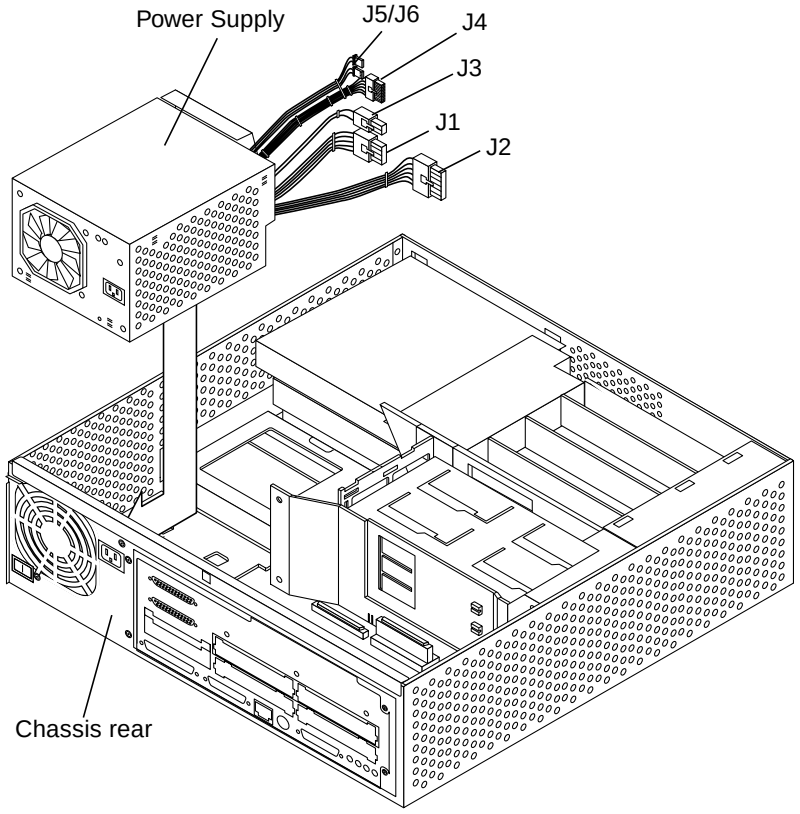


FIGURE 8-2 Replacing the Power Supply

8.2 Cable Assemblies

To remove and replace the SCSI cable assembly and the diskette drive cable assembly, proceed as follows.

8.2.1 Removing the SCSI Cable Assembly

1. **Power off the system unit.**
See Section 6.2 "Powering Off the System Unit" on page 6-2.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2. **Remove the system unit cover.**

   See Section 7.1 “Removing the System Unit Cover” on page 7-1.



Caution – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

3. **Attach the wrist strap.**

   See Section 7.2 “Attaching the Wrist Strap” on page 7-3.

4. **Disconnect the following (**FIGURE 8-3**):**

   a. **P2 connector from the CD-ROM drive (or 4-mm/8-mm tape drive).**

   b. **P1 connector from J1202 on the motherboard.**

   c. **P3 connector from J1203 on the motherboard.**

5. **Remove the SCSI cable assembly.**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

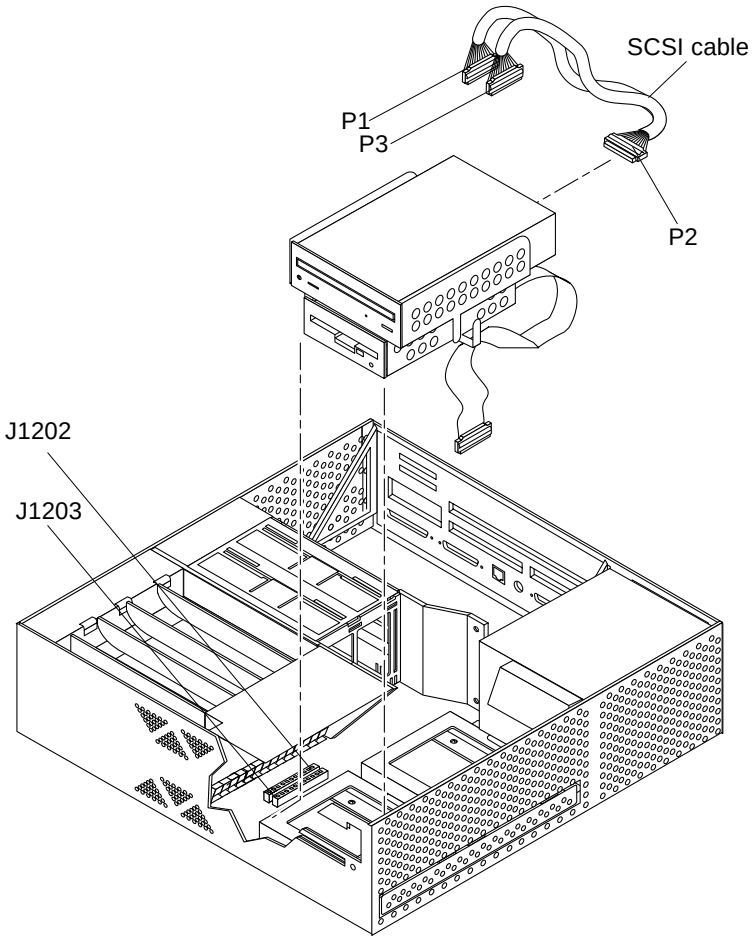


FIGURE 8-3 Removing and Replacing the SCSI Cable Assembly

8.2.2 Replacing the SCSI Cable Assembly

Caution – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

1. **Replace the SCSI cable assembly as follows (**FIGURE 8-3**):**

   a. **Position the SCSI cable.**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

b. Connect the following:

- P3 connector to J1203 on the motherboard.
- P1 connector to J1202 on the motherboard.
- P2 connector to the CD-ROM drive (or 4-mm/8-mm tape drive).

2. **Detach the wrist strap.**

3. **Replace the system unit cover.**

   See Section 7.3 “Replacing the System Unit Cover” on page 7-4.

4. **Power on the system unit.**

   See Section 6.1 “Powering On the System Unit” on page 6-1.

8.2.3 Removing the Diskette Drive Cable Assembly

1. **Power off the system unit.**

   See Section 6.2 “Powering Off the System Unit” on page 6-2.

2. **Remove the system unit cover.**

   See Section 7.1 “Removing the System Unit Cover” on page 7-1.



Caution – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

3. **Attach the wrist strap.**

   See Section 7.2 “Attaching the Wrist Strap” on page 7-3.

4. **Disconnect the following (**FIGURE 8-4**:**

   a. P2 connector from the rear of the diskette drive.

   b. P1 connector from J1201 on the motherboard.

5. **Remove the diskette drive cable.**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

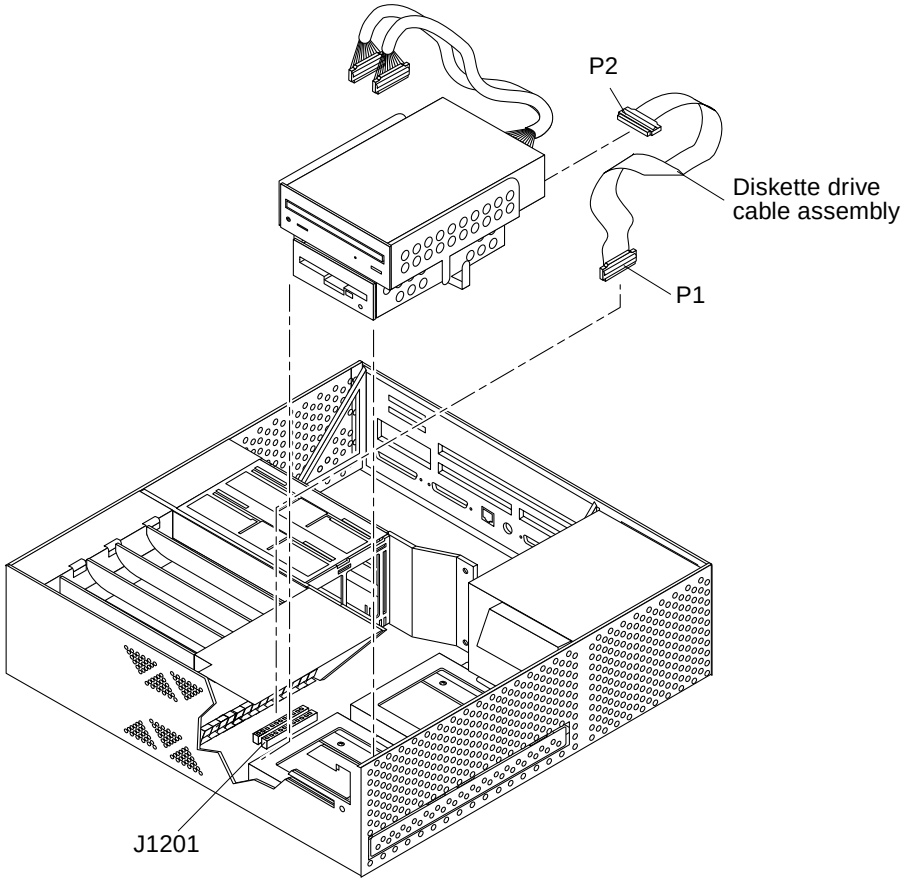


FIGURE 8-4 Removing and Replacing the Diskette Drive Cable Assembly

8.2.4 Replacing the Diskette Drive Cable Assembly

Caution – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

1. **Replace the diskette drive cable assembly as follows (**FIGURE 8-4**):**

   a. Position the diskette drive cable.

   b. Connect the following:

   - P1 connector to J1201 on the motherboard.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

- P2 connector to the rear of the diskette drive.

2. **Detach the wrist strap.**
3. **Replace the system unit cover.**

   See Section 7.3 “Replacing the System Unit Cover” on page 7-4.

4. **Power on the system unit.**

   See Section 6.1 “Powering On the System Unit” on page 6-1.

8.3 Shroud Assembly

To remove and replace the shroud assembly, proceed as follows.

8.3.1 Removing the Shroud Assembly

1. **Power off the system unit.**

   See Section 6.2 “Powering Off the System Unit” on page 6-2.

2. **Remove the system unit cover.**

   See Section 7.1 “Removing the System Unit Cover” on page 7-1.



Caution – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

3. **Attach the wrist strap.**

   See Section 7.2 “Attaching the Wrist Strap” on page 7-3.

4. **Disconnect the fan connections.**
5. **Disconnect the speaker connections.**
6. **Remove the motherboard.**

   See Section 10.6.1 “Removing a Motherboard” on page 10-21.

7. **Flip the motherboard over. Dislodge the five retaining clips securing the shroud assembly to the motherboard (**FIGURE 8-5**).**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

8. **Lift the motherboard from the shroud assembly.**

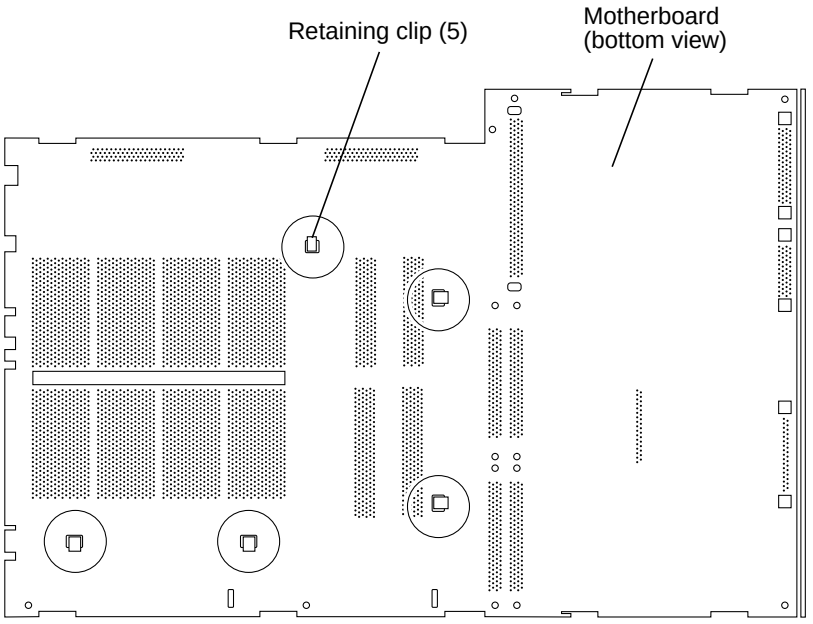


FIGURE 8-5 Shroud Assembly Removal

8.3.2 Replacing the Shroud Assembly

Caution – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

1. **Replace the shroud assembly as follows (**FIGURE 8-5**):**

   a. **Position the shroud assembly face down.**

   b. **Position the motherboard on the shroud assembly, ensuring that the shroud assembly retaining clips are aligned with the motherboard retaining clip holes.**

   c. **Secure each retaining clip by pressing down on the motherboard around the area of each retaining clip.**

   d. **Slowly turn over the motherboard, ensuring that the shroud assembly and the motherboard connection is secure.**

2. **Replace the motherboard.**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

3. **Connect the speaker connections.**
4. **Connect the fan connections.**
5. **Detach the wrist strap.**
6. **Replace the system unit cover.**

   See Section 7.3 “Replacing the System Unit Cover” on page 7-4.
7. **Connect all cables to the back of the system or server unit.**
8. **Power on the system unit.**

   See Section 6.1 “Powering On the System Unit” on page 6-1.

8.4 Shroud Assembly Speaker

To remove and replace the shroud assembly speaker, proceed as follows.

8.4.1 Removing the Shroud Assembly Speaker

1. **Power off the system unit.**

   See Section 6.2 “Powering Off the System Unit” on page 6-2.
2. **Remove the system unit cover.**

   See Section 7.1 “Removing the System Unit Cover” on page 7-1.



Caution – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

3. **Attach the wrist strap.**

   See Section 7.2 “Attaching the Wrist Strap” on page 7-3.
4. **Using a number 2 Phillips screwdriver, remove the screw securing the speaker to the shroud assembly (**FIGURE 8-6**).**
5. **Disconnect the speaker connections.**
6. **Remove the speaker.**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

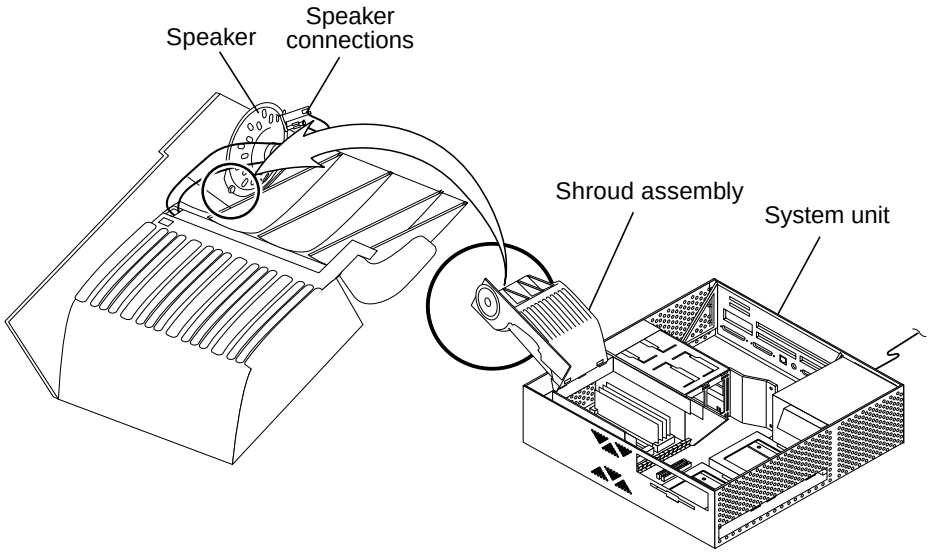


FIGURE 8-6 Removing and Replacing the Shroud Assembly Speaker

8.4.2 Replacing the Shroud Assembly Speaker

Caution – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

1. **Replace the shroud assembly as follows (**FIGURE 8-6**):**
   a. **Position the speaker into the shroud assembly.**
   b. **Connect the speaker connections.**
   c. **Using a number 2 Phillip screwdriver, replace the screw securing the speaker to the shroud assembly.**
2. **Detach the wrist strap.**
3. **Replace the system unit cover.**
   See Section 7.3 “Replacing the System Unit Cover” on page 7-4.
4. **Connect all cables to the back of the system or server unit.**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5. **Power on the system unit.**

   See Section 6.1 “Powering On the System Unit” on page 6-1.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CHAPTER 9

Storage Devices

This chapter describes how to remove and replace the Ultra 2 series storage devices.

This chapter contains the following topics:

- Section 9.1 “Hard Drive” on page 9-1
- Section 9.2 “Media Bay Chassis Bracket” on page 9-4
- Section 9.3 “CD-ROM Drive or 4-mm/8-mm Tape Drive” on page 9-6
- Section 9.4 “Diskette Drive” on page 9-9

9.1 Hard Drive

To remove and replace a hard drive, proceed as follows.

9.1.1 Removing a Hard Drive

1. **Power off the system unit.**

   See Section 6.2 “Powering Off the System Unit” on page 6-2.

2. **Remove the system unit cover.**

   See Section 7.1 “Removing the System Unit Cover” on page 7-1.



Caution – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

3. **Attach the wrist strap.**

4. **Remove the EMI door.**

5. **Remove a hard drive as follows (**FIGURE 9-1**):**

   a. **Open the hard drive handle.**

   b. **Extend the disk drive handle straight out (90 degrees) from the disk drive to disconnect the disk drive from the system.**



Caution – Do not extend the hard drive handle more than 90 degrees from the locked position. Do not use it as a lever against the system unit chassis to pry the hard drive from the drive bay. Doing either can break the lever or the hard drive mount.

---

   c. **Pull on the hard drive handle to remove the hard drive straight out from the drive bay.**

6. **Place the hard drive on an antistatic surface.**

Note – Ensure that the hard drive is placed on the antistatic mat with the printed circuit card side up.

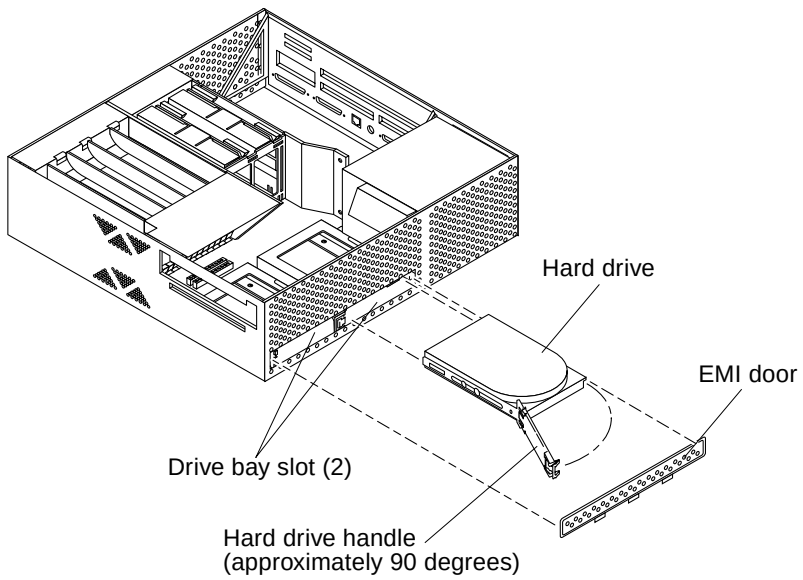


FIGURE 9-1 Removing and Replacing a Hard Drive

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

9.1.2 Replacing a Hard Drive

Note – Use only hard drives that are specifically designed for a Sun Ultra 2 series system. Sun Ultra 2 series systems do not support hard drives taller than 1 inch (2.54 cm).



Caution – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

---

1. **Replace a hard drive as follows (**FIGURE 9-1**):**

   a. Remove the hard drive from the antistatic bag.

Note – Read the hard drive product guide for information about jumpers, switch settings, or other installation tasks.



Caution – Each hard drive slot has a unique SCSI target address (rear drive slot is target address 0, front drive slot is target address 1). Make note of the drive slot in which each hard drive is installed. Installing a hard drive into the incorrect drive slot could cause a file system or system boot problem.

---

   b. Open the drive handle and proceed as follows:

   - Slide the drive into the chassis drive slot.
   - Firmly press the hard drive to connect it to the system.

   c. Close the hard drive handle.

Note – The drive handle will not latch if the hard drive is not properly installed.

---

2. **Replace the EMI door.**
3. **Detach the wrist strap.**
4. **Replace the system unit cover.**

   See Section 7.3 “Replacing the System Unit Cover” on page 7-4.

5. **Power on the system unit.**

   See Section 6.1 “Powering On the System Unit” on page 6-1.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

9.2 Media Bay Chassis Bracket

To remove and replace the media bay chassis bracket (chassis bracket), proceed as follows.

9.2.1 Removing the Chassis Bracket

1. **Power off the system unit.**

   See Section 6.2 “Powering Off the System Unit” on page 6-2.

2. **Remove the system unit cover.**

   See Section 7.1 “Removing the System Unit Cover” on page 7-1.



Caution – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

3. **Attach the wrist strap.**

   See Section 7.2 “Attaching the Wrist Strap” on page 7-3.

4. **Open the shroud assembly.**

5. **Remove the chassis bracket as follows (**FIGURE 9-2**)**

   a. **Remove the following:**

   - Screws securing the chassis bracket to the chassis.
   - DC harness from the clip located on the drive bracket.

   b. **Disconnect the DC harness from the peripheral power cable at P1.**

   c. **Push the chassis bracket toward the hard drive bay and gently turnit over. Place the chassis bracket on top of the power supply.**

   d. **Disconnect the SCSI cable from the CD-ROM drive or 4-mm or 8-mm tape drive.**

   e. **Disconnect the peripheral power cable:**

   - From the CD-ROM drive or 4-mm or 8-mm tape drive (P3).
   - From the diskette drive (P2) if any.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

   f. **Disconnect the diskette cable from the diskette drive (if any).**

g. Place the chassis bracket on an antistatic surface.

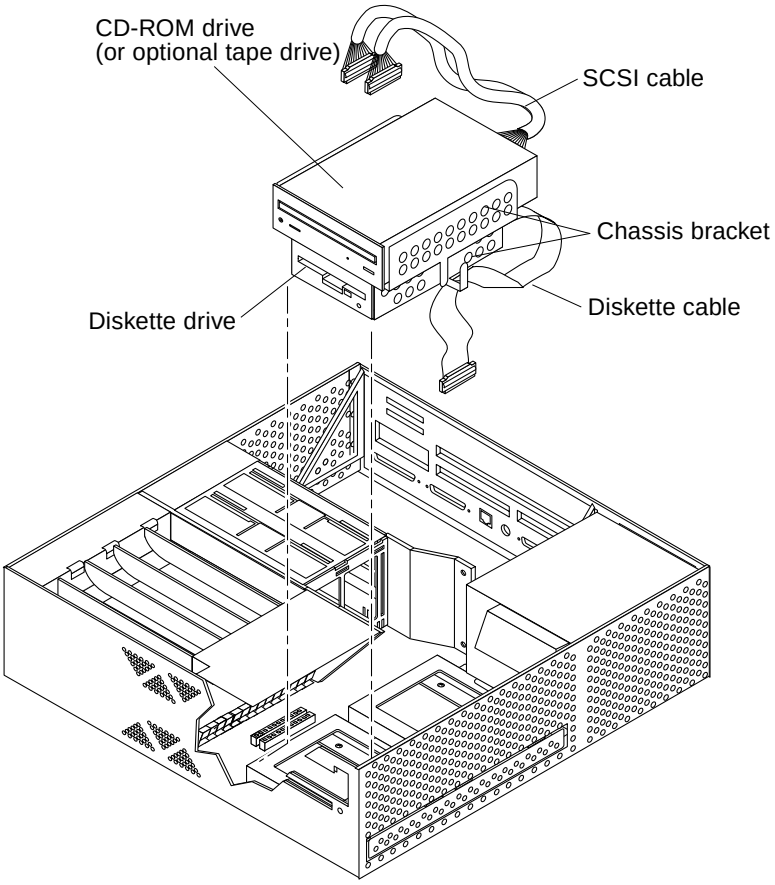


FIGURE 9-2 Removing and Replacing the Chassis Bracket

9.2.2 Replacing the Chassis Bracket



Caution – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

1. **Replace the chassis bracket as follows (**FIGURE 9-2**):**

   a. Position the chassis bracket upside down on top of the power supply.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

b. Connect the following if present:

- SCSI cable to the CD-ROM drive or 4-mm or 8-mm tape drive.
- Diskette cable to the diskette drive.
- Peripheral power cable to the CD-ROM drive or 4-mm or 8-mm tape drive (P3) and the diskette drive (P2).

c. Position the chassis bracket into the chassis.

d. Slide the chassis bracket toward the chassis side opening.

Note – Chassis base hooks must lock into the chassis bracket bottom holes.

---

e. Connect the DC harness to the peripheral power cable at P1.

f. Replace the following:

- DC harness to the clip located on the chassis bracket.
- Screws securing the chassis bracket to the chassis.

2. **Close the shroud assembly.**
3. **Detach the wrist strap.**
4. **Replace the system unit cover.**

   See Section 7.3 “Replacing the System Unit Cover” on page 7-4.

5. **Power on the system unit.**

   See Section 6.1 “Powering On the System Unit” on page 6-1.

9.3 CD-ROM Drive or 4-mm/8-mm Tape Drive

To remove and replace the CD-ROM drive or 4-mm/8-mm tape drive, proceed as follows.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

9.3.1 Removing a CD-ROM Drive or 4-mm/8-mm Tape Drive

1. **Power off the system unit.**

   See Section 6.2 “Powering Off the System Unit” on page 6-2.

2. **Remove the system unit cover.**

   See Section 7.1 “Removing the System Unit Cover” on page 7-1.



Caution – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

3. **Attach the wrist strap.**

   See Section 7.2 “Attaching the Wrist Strap” on page 7-3.

4. **Remove the chassis bracket.**

   See Section 9.2.1 “Removing the Chassis Bracket” on page 9-4.

5. **Remove the CD-ROM drive as follows (**FIGURE 9-3**):**

   a. **Position the bracket on a flat surface so that the CD-ROM drive or 4-mm or 8-mm tape drive is flat.**

   b. **Remove the SCSI cable assembly.**

      See Section 8.2.1 “Removing the SCSI Cable Assembly” on page 8-5.

   c. **Disconnect the J5 power supply connector from the CD-ROM drive (or 4-mm/8-mm tape drive).**

   d. **Using a number 2 Phillips screwdriver, remove the four screws securing the CD-ROM drive or 4-mm or 8-mm tape drive to the chassis bracket.**

6. **Remove the CD-ROM drive or 4-mm or 8-mm and place aside.**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

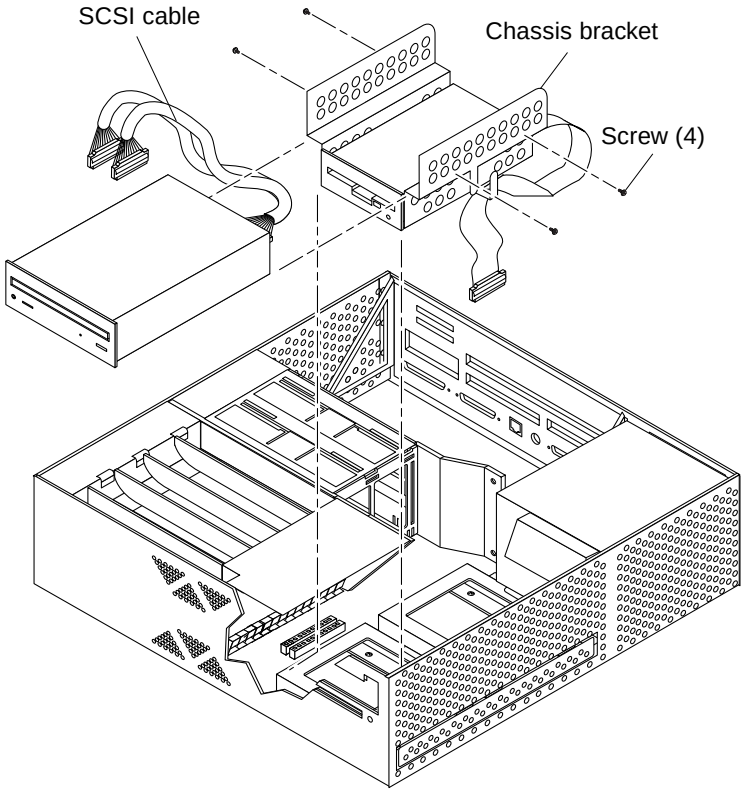


FIGURE 9-3 Removing and Replacing the CD-ROM Drive

9.3.2 Replacing a CD-ROM Drive or 4-mm/8-mm Tape Drive

1. **Replace the CD-ROM drive as follows (**FIGURE 9-3**):**

   a. **Position the CD-ROM drive or tape drive on an antistatic surface. Align the drive on the edge of the antistatic surface.**

   b. **Position the chassis bracket on top of the CD-ROM drive or tape drive.**

Note – If the system unit has a diskette drive, it is assembled on the chassis bracket.

---

   c. **Using a number 2 Phillips screwdriver, replace the four screws securing the CD-ROM drive or tape drive to the chassis bracket.**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

d. **Connect the J5 power supply connector to the CD-ROM drive (or 4-mm/8-mm tape drive).**

e. **Replace the SCSI cable assembly.**

See Section 8.2.2 “Replacing the SCSI Cable Assembly” on page 8-7.

2. **Replace the chassis bracket.**

See Section 9.2.2 “Replacing the Chassis Bracket” on page 9-5.

3. **Detach the wrist strap.**

4. **Replace the system unit cover.**

See Section 7.3 “Replacing the System Unit Cover” on page 7-4.

5. **Power on the system unit.**

See Section 6.1 “Powering On the System Unit” on page 6-1.

9.4 Diskette Drive

To remove and replace the diskette drive, proceed as follows.

9.4.1 Removing a Diskette Drive

1. **Power off the system unit.**

See Section 6.2 “Powering Off the System Unit” on page 6-2.

2. **Remove the system unit cover.**

See Section 7.1 “Removing the System Unit Cover” on page 7-1.



Caution – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

3. **Attach the wrist strap.**

See Section 7.2 “Attaching the Wrist Strap” on page 7-3.

4. **If necessary, remove the CD filler panel.**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5. **Remove the chassis bracket.**

6. **Remove the diskette drive as follows (**FIGURE 9-4**):**

   a. **Remove the diskette data cable assembly.**

      See Section 8.2.3 “Removing the Diskette Drive Cable Assembly” on page 8-8.

   b. **Position the chassis bracket on top of a flat surface.**

   c. **Using a number 2 Phillips screwdriver, remove the four screws securing the diskette drive to the chassis bracket.**

7. **Remove the diskette drive.**

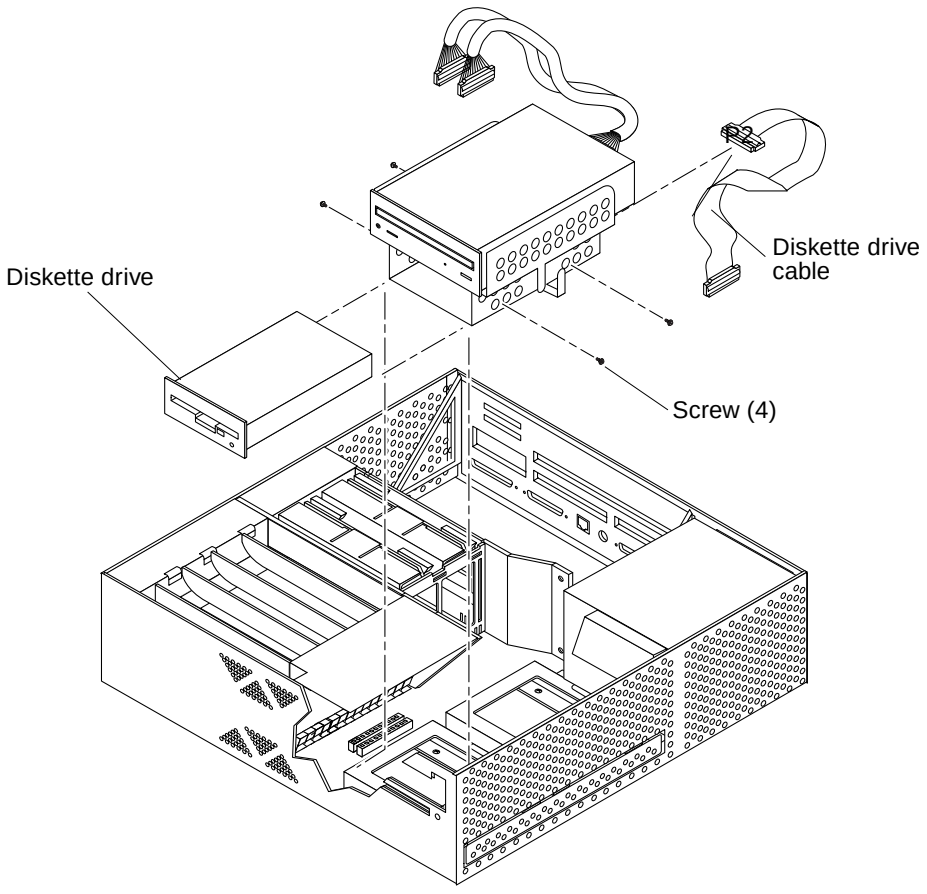


FIGURE 9-4 Removing and Replacing the Diskette Drive

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

9.4.2 Replacing a Diskette Drive



Caution – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

1. **Replace the diskette drive as follows (**FIGURE 9-4**):**

   Note – Read the disk drive product guide for information about jumpers, switch settings, or other installation tasks.

   a. **Using a number 2 Phillips screwdriver, replace the four screws securing the diskette drive to the chassis bracket.**

   b. **Remove the diskette data cable from the kit. Replace the diskette data cable assembly.**

      See Section 8.2.4 “Replacing the Diskette Drive Cable Assembly” on page 8-9.

2. **Replace the chassis bracket.**

   See Section 9.2.2 “Replacing the Chassis Bracket” on page 9-5.

3. **Route the diskette data cable under the clip on the side of the chassis bracket.**

4. **If necessary, replace the CD filler panel.**

5. **Detach the wrist strap.**

6. **Replace the system unit cover.**

   See Section 7.3 “Replacing the System Unit Cover” on page 7-4.

7. **Power on the system unit.**

   See Section 6.1 “Powering On the System Unit” on page 6-1.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CHAPTER 10FS

Motherboard and Component Replacement

This chapter describes how to remove and replace the Ultra 2 series motherboard and motherboard components.

This chapter contains the following topics:

- Section 10.1 “CPU Module” on page 10-1
- Section 10.2 “NVRAM/TOD” on page 10-4
- Section 10.3 “SBus Card” on page 10-6
- Section 10.4 “UPA Graphics Card (Workstation Only)” on page 10-11
- Section 10.5 “DSIMM” on page 10-16
- Section 10.6 “Motherboard” on page 10-20

10.1 CPU Module

To remove and replace a CPU module, proceed as follows.

10.1.1 Removing a CPU Module

1. **Power off the system unit.**

   See Section 6.2 “Powering Off the System Unit” on page 6-2.

2. **Remove the system unit cover.**

   See Section 7.1 “Removing the System Unit Cover” on page 7-1.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



Caution – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

3. **Attach the wrist strap.**

   See Section 7.2 “Attaching the Wrist Strap” on page 7-3.

4. **Grip the sides of the shroud assembly processor area (**FIGURE 10-1**).**

5. **With the thumb of each hand, simultaneously lift the CPU module levers upward and to the side at an approximate 135-degree angle (**FIGURE 10-2**).**

6. **Lift the CPU module upward until it clears the shroud assembly.**

7. **Place the CPU module on an antistatic surface.**

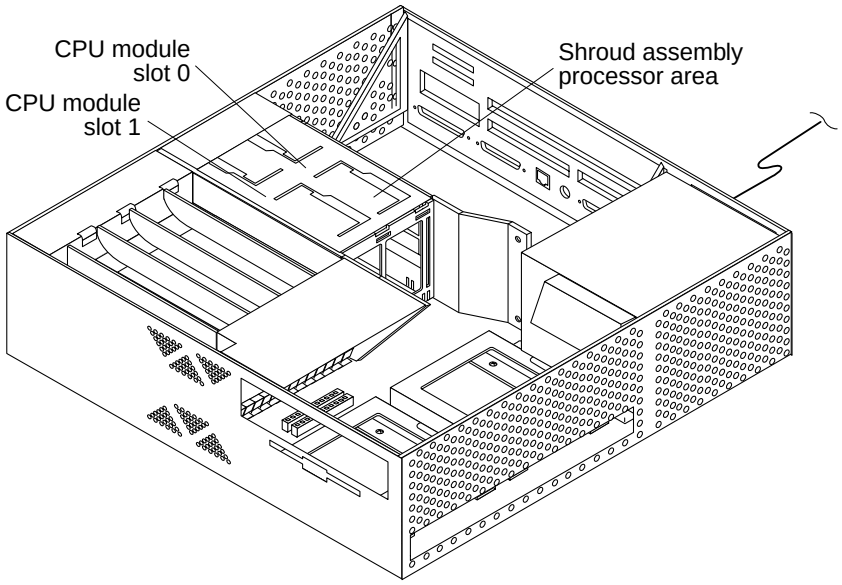


FIGURE 10-1 CPU Module Locations and Shroud Assembly Processor Area

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

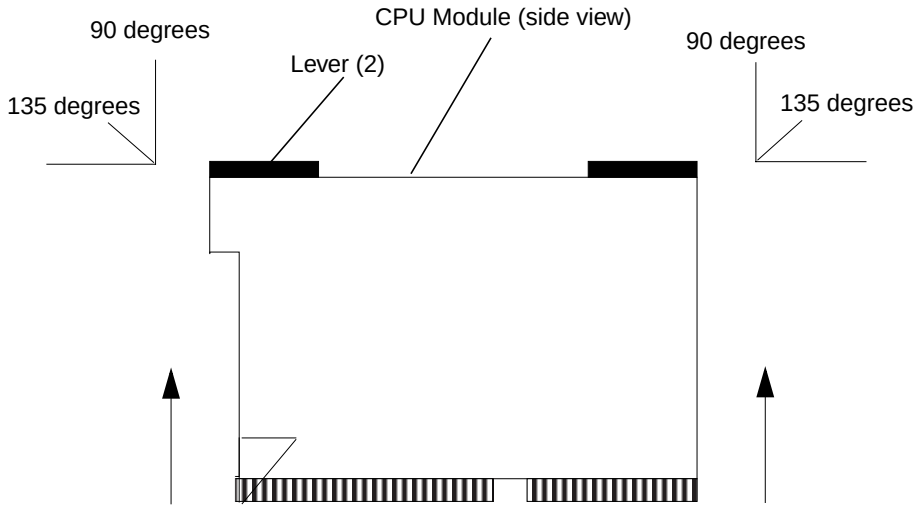


FIGURE 10-2 Removing a CPU Module

10.1.2 Replacing a CPU Module

Caution – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

1. **Unpack the CPU module.**
2. **Place the CPU module on an antistatic surface.**
3. **Identify the appropriate or available CPU module slot (**FIGURE 10-1**).**

Note – If the system unit or server is equipped with one CPU module, the module must be installed in slot 0. If the system unit or server is equipped with two CPU modules, each slot will have a module installed.

4. **On the antistatic surface, hold the CPU module in an upright position.**
5. **Open the CPU module levers to an approximate 135-degree angle (**FIGURE 10-2**).**
6. **Lower the CPU module along the shroud assembly vertical plastic guides until the module touches the motherboard slot socket.**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

7. **With both hands, simultaneously turn and press the CPU module levers downward to the fully horizontal position. Firmly press the CPU module downward into the socket until it is fully seated and the levers are fully locked.**
8. **Detach the wrist strap.**
9. **Replace the system unit cover.**

   See Section 7.3 “Replacing the System Unit Cover” on page 7-4.
10. **Connect all cables to the back of the system or server unit.**
11. **Power on the system unit.**

    See Section 6.1 “Powering On the System Unit” on page 6-1.

10.2 NVRAM/TOD

To remove and replace the NVRAM/TOD, proceed as follows.

10.2.1 Removing the NVRAM/TOD

1. **Power off the system unit.**

   See Section 6.2 “Powering Off the System Unit” on page 6-2.
2. **Remove the system unit cover.**

   See Section 7.1 “Removing the System Unit Cover” on page 7-1.



Caution – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

3. **Attach the wrist strap.**

   See Section 7.2 “Attaching the Wrist Strap” on page 7-3.
4. **Locate the NVRAM/TOD and carrier on the motherboard (**FIGURE 10-3**).**
5. **Grasp the NVRAM/TOD carrier at each end. Lift the NVRAM/TOD carrier straight up.**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Note – Gently wiggle the NVRAM/TOD as necessary to loosen it.

6. **Place the NVRAM/TOD and carrier on an antistatic surface.**

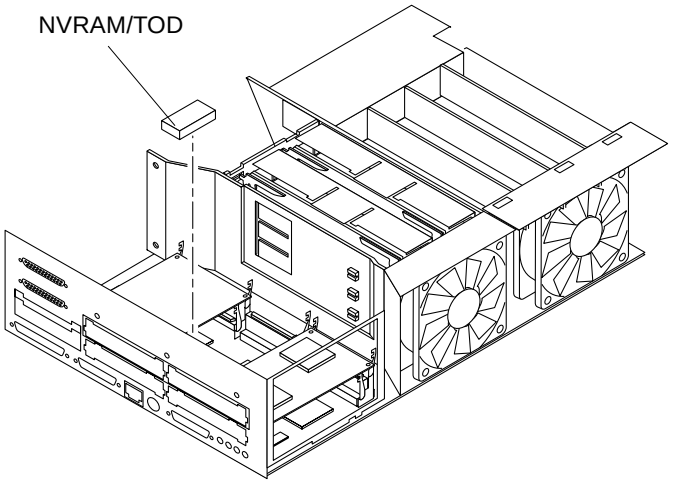


FIGURE 10-3 NVRAM/TOD Location

10.2.2 Replacing the NVRAM/TOD

Caution – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

1. **Position the replacement NVRAM/TOD and carrier on the motherboard** (FIGURE 10-3).
2. **Carefully insert the NVRAM/TOD and carrier into the socket.**

Note – The carrier is keyed so the NVRAM/TOD can be installed only one way.

3. **Push the NVRAM/TOD into the carrier until properly seated.**
4. **Detach the wrist strap.**
5. **Replace the system unit cover.**

See Section 7.3 “Replacing the System Unit Cover” on page 7-4.

6. **Power on the system unit.**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

10.3 SBus Card

To remove and replace the SBus card, proceed as follows.

Note – Illustrations supporting the SBus card removal and replacement are not representative of a system unit or sever chassis.

10.3.1 Removing an SBus Card

1. **Power off the system unit.**

   See Section 6.2 “Powering Off the System Unit” on page 6-2.

2. **Disconnect all cables from the SBus slots.**

3. **Remove the system unit cover.**

   See Section 7.1 “Removing the System Unit Cover” on page 7-1.



Caution – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

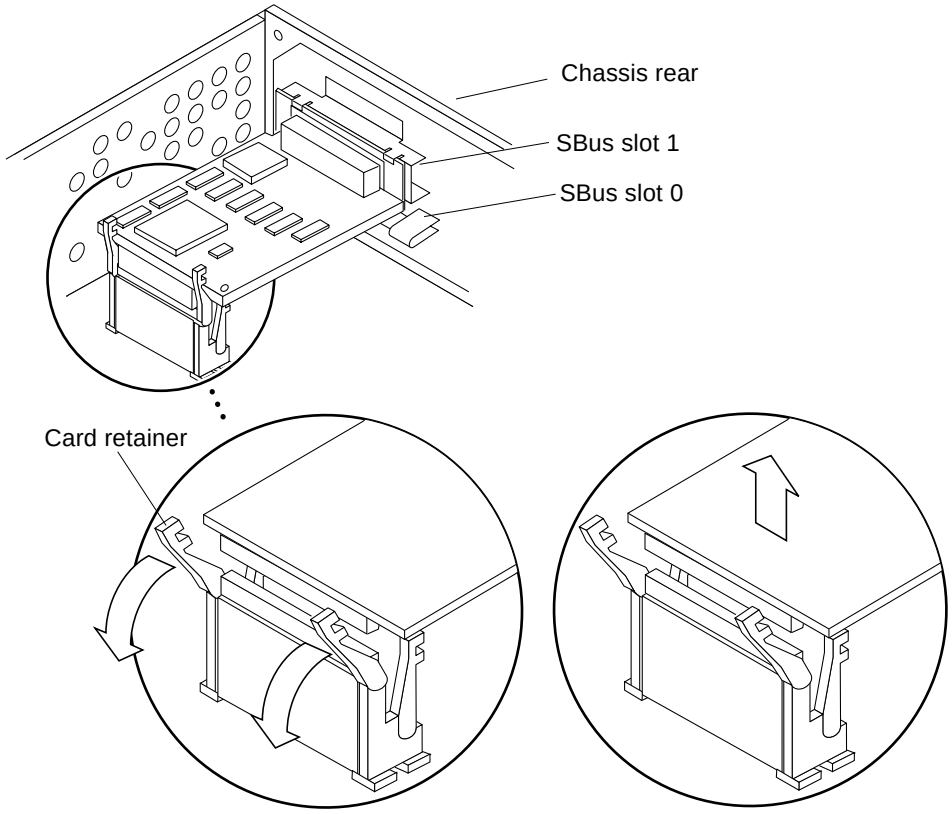
---

4. **Attach the wrist strap.**

   See Section 7.2 “Attaching the Wrist Strap” on page 7-3.

5. **Unlock the card retainers at the back edge of the SBus card by pushing the card retainers back from the edge of the SBus card (**FIGURE 10-4**).**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



Note: SBus slots 2 and 3 not shown

FIGURE 10-4 Removing an SBus Card

6. **Insert the extractor into the SBus card (**FIGURE 10-5**).**
7. **Holding both ends of the card extractor, pull upwards slowly until the connector is out of the slot.**
8. **Remove the card extractor from the SBus card.**
9. **Place the SBus card on an antistatic surface.**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

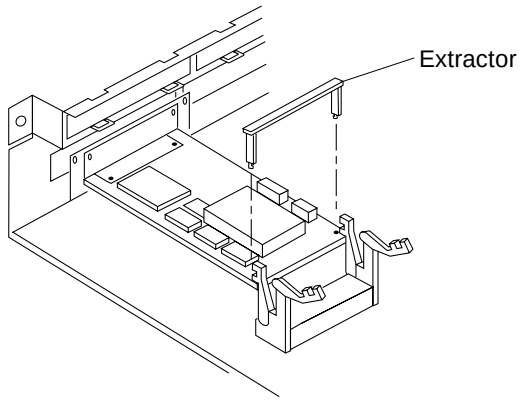


FIGURE 10-5 Installing the Card Extractor

10.3.2 Replacing an SBus Card

Caution – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

Note – Read the SBus card product guide for information about jumper or switch settings, slot requirements, and required tools.

1. **Identify the SBus slot and open the SBus card retainers.**
2. **As applicable, remove SBus filler panels as follows:**
   a. **Using both hands, grasp the tabs at the base of the SBus filler panel.**
   b. **Squeeze both tabs until the filler panel base disengages from the chassis.**
   c. **Swing the filler panel base toward you and remove it.**
3. **Holding the SBus card by the edges, proceed as follows:**
   a. **Unpack the SBus card..**
   b. **Place the SBus card on an antistatic surface.**
   c. **If required, set the SBus card jumpers or switches (refer to the SBus card product guide).**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

4. **If the SBus card being installed has backplate tabs, proceed as follows (**FIGURE 10-6**):**

   a. **Remove the screws securing the backplate adapter to the backplate.**

   b. **Remove the backplate adapter.**

   c. **Discard the screws and backplate adapter.**

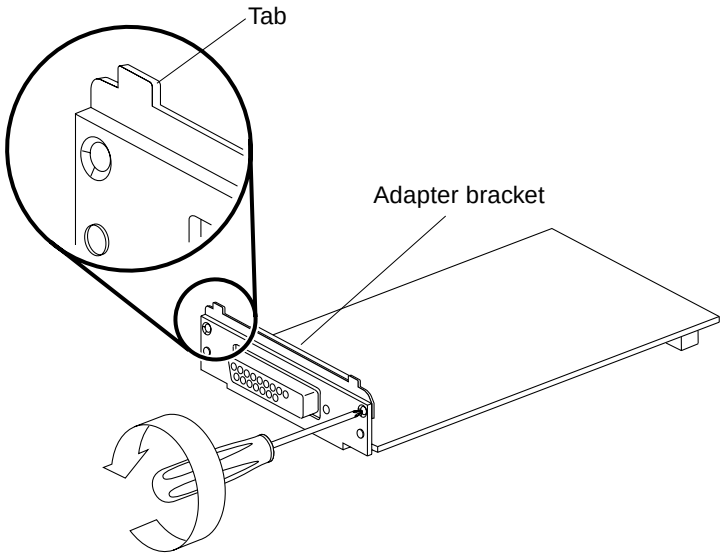


FIGURE 10-6 Removing the SBus Card Adapter Bracket

5. **Remove the SBus card extractor handle as follows (**FIGURE 10-7**):**

   a. **Bend one SBus card extractor handle leg slightly to the outside until the hook clears the hole in the SBus card.**

   b. **Remove the other side.**

Note – The extractor can be removed easily without bending.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

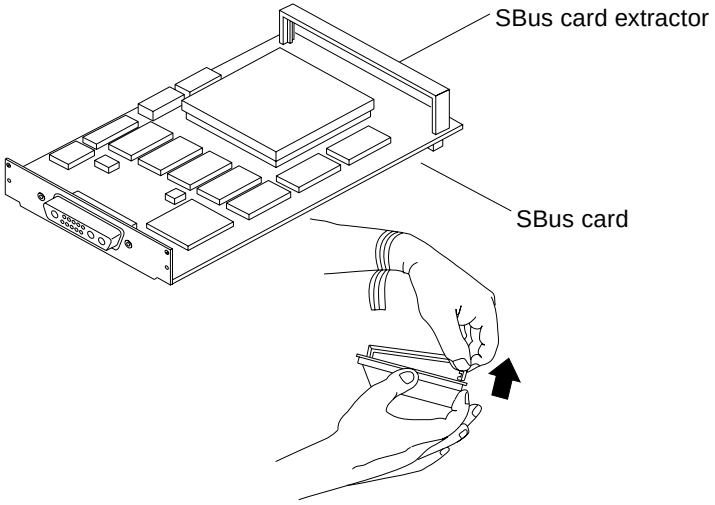


FIGURE 10-7 Removing an SBus Card Extractor

6. **Holding the SBus card at an angle, insert the SBus card backplate behind the tabs at the top of the card opening (**FIGURE 10-8**).**

7. **Lower the SBus card into position.**

Caution – Do not force the SBus card or SBus slot pin damage may occur.

---

8. **Push the SBus card into the SBus slot by carefully pressing the SBus card corners.**

9. **Push the card retainers forward over the edge of the SBus card.**

Note – Refer to the SBus card product guide to complete any required software installation, configuration, or setup procedures.

---

10. **Detach the wrist strap.**

11. **Replace the system unit cover.**

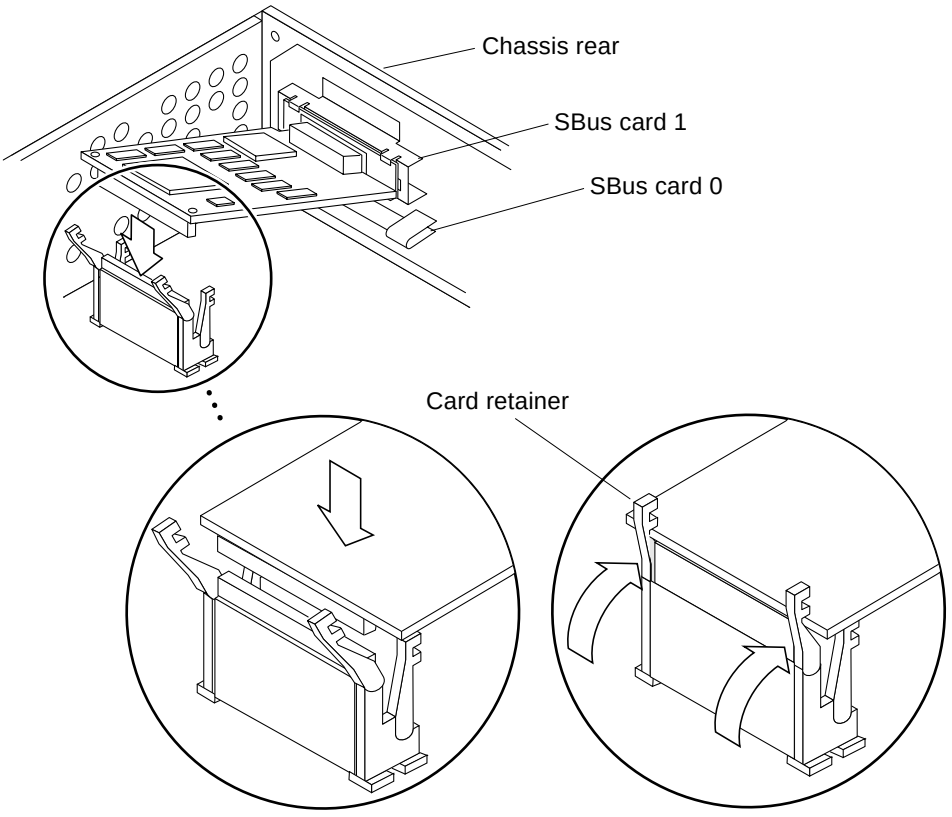
    Section 7.3 “Replacing the System Unit Cover” on page 7-4.

12. **Connect all cables to the SBus slots.**

13. **Power on the system unit.**

    See Section 6.1 “Powering On the System Unit” on page 6-1.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



Note: SBus slot 2 and 3 not shown

FIGURE 10-8 Replacing an SBus Card

10.4 UPA Graphics Card (Workstation Only)

To remove and replace a UPA graphics card, proceed as follows.

10.4.1 Removing a UPA Graphics Card

1. **Power off the system unit.**
   See Section 6.2 "Powering Off the System Unit" on page 6-2.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

3. **Remove the system unit cover.**

   See Section 7.1 “Removing the System Unit Cover” on page 7-1.

Caution – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

---

4. **Attach the wrist strap.**

   See Section 7.2 “Attaching the Wrist Strap” on page 7-3.

5. **Unlock the card retainers (**FIGURE 10-9**).**

Caution – Avoid applying unequal force to one end or one side of the UPA graphics card or connector pin damage may occur.

---

6. **Holding the UPA graphics card at each corner, gently pull the UPA graphics card up to disconnect it from the UPA socket (**FIGURE 10-10**).**

Note – Illustrations may not reflect actual UPA graphics card.

---

7. **Slowly lift the UPA graphics card at an upward angle.**
8. **Lower the UPA graphics card backplate.**
9. **Disengage the UPA graphics card backplate from the back panel.**
10. **Place the UPA graphics card on an antistatic surface.**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

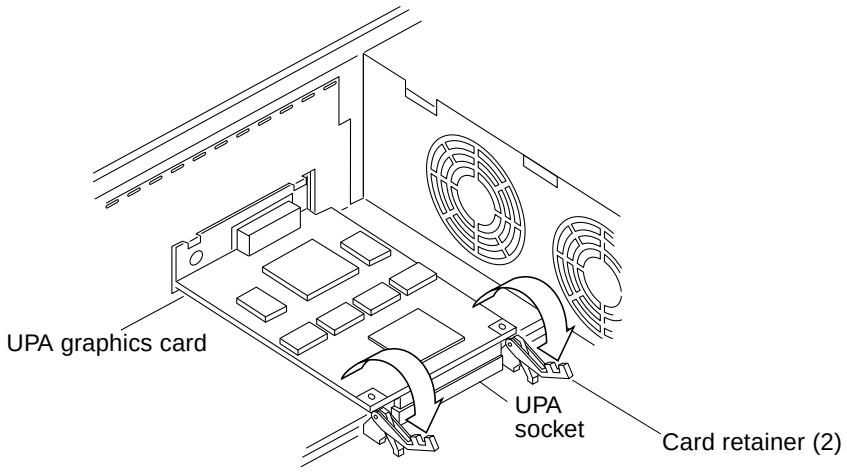


FIGURE 10-9 Preparing to Remove a UPA Graphics Card

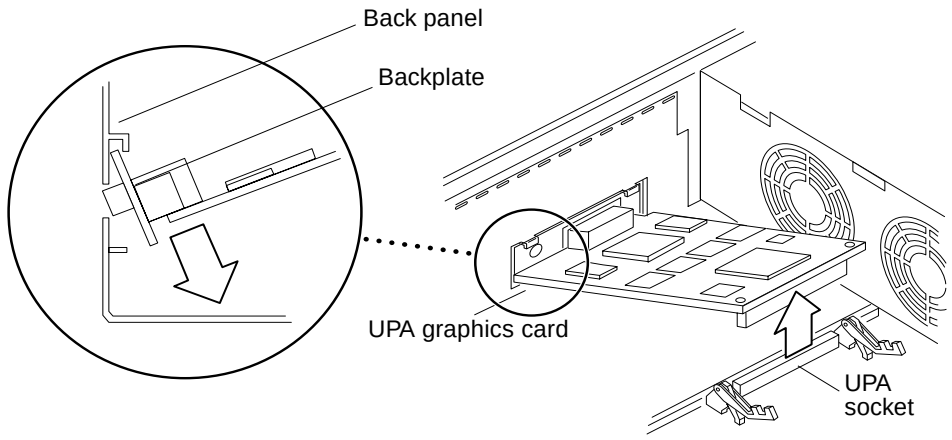


FIGURE 10-10 Removing a UPA Graphics Card

10.4.2 Replacing a UPA Graphics Card



Caution – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

---

Note – If an Elite3D UPA graphics card is being installed into a system unit that is operating with Solaris 2.5.1 HW:11/97:

Following the installation of the Elite3D UPA graphics card software, it is recommended that you install patch 105791-05 or later. This patch is available through SunService.

Patch 105789-01 is applied as part of the Elite3D UPA graphics card software installation process.

If an Elite3D UPA graphics card is being installed into a system unit that is operating with Solaris 2.6 HW:3/98:

Following the installation of the Elite3D UPA graphics card software, it is recommended that you install patch 105363-06 or later. This patch is available through SunService.

---

1. **Verify that both card retainers are pushed back (**FIGURE 10-11**).**
2. **Remove the replacement UPA graphics card from its container.**
3. **At an angle, lower the UPA graphics card into the chassis over the UPA socket.**
4. **Hook the UPA graphics card backplate under the chassis back panel tabs.**

Note – Ensure that the backplate is visible through the slot on the back panel.



Caution – Avoid applying unequal force to one end or one side of the UPA graphics card or connector pin damage may occur.

---

5. **Carefully press both corners of the UPA graphics card evenly to seat the UPA graphics card connector into the UPA socket (**FIGURE 10-12**).**
6. **Push the card retainer onto the UPA graphics card (**FIGURE 10-13**).**
7. **Using a number 2 Phillips screwdriver, replace the two screws and washers securing the UPA graphics card to the back panel.**
8. **Detach the wrist strap.**
9. **Replace the system unit cover.**

See Section 7.3 “Replacing the System Unit Cover” on page 7-4.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

10. **Connect the video cable to the graphics card 13W3 video connector.**

11. Power on the system unit.

See Section 6.1 “Powering On the System Unit” on page 6-1.

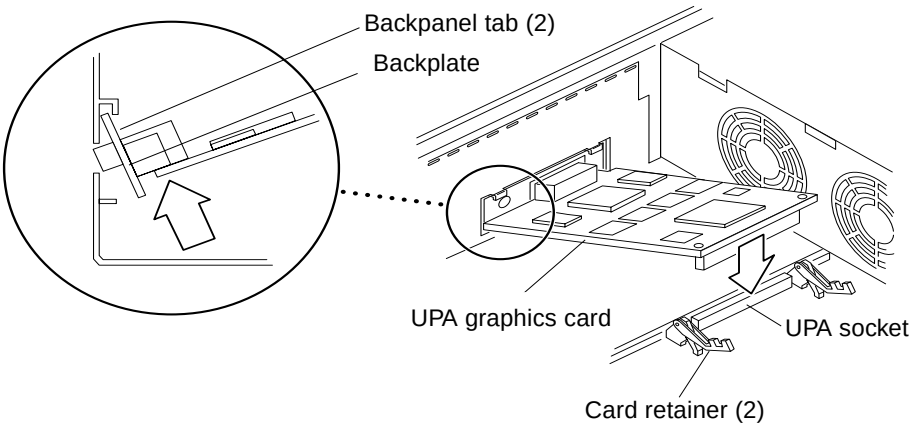


FIGURE 10-11 Replacing a UPA Graphics Card

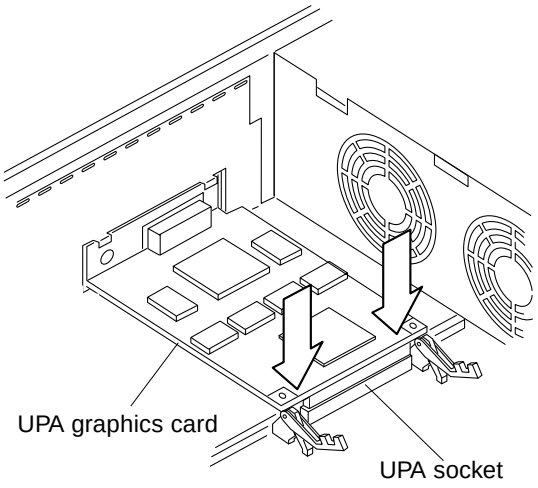


FIGURE 10-12 Seating a UPA Graphics Card into the Socket

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

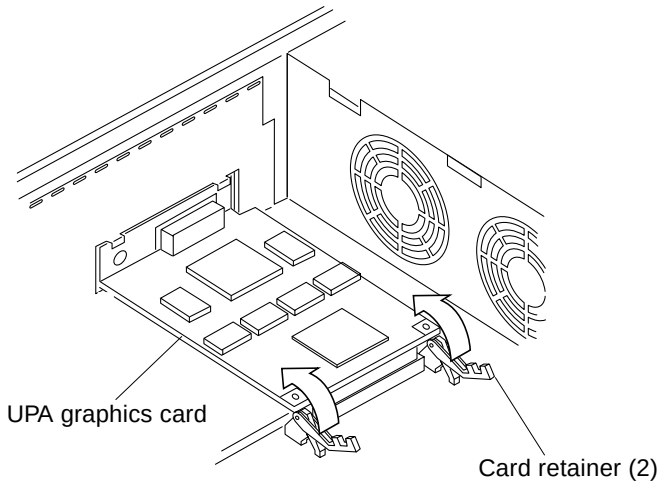


FIGURE 10-13 Securing a UPA Graphics Card into the Chassis

10.5 DSIMM

To remove and replace a DSIMM, proceed as follows.

Caution – DSIMMs consist of electronic components that are extremely sensitive to static electricity. Ordinary amounts of static electricity from clothing or work environment can destroy the DSIMM.

Note – The Ultra 2 system and server units support 16-, 32-, 64-, and 128-Mbyte DSIMMs.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Note – The Ultra 2 system and server units must have four DSIMMs in group 0 for the unit to boot. Up to 16 DSIMMs can be installed in the unit. DSIMM installation location is listed in TABLE 10-1.

TABLE 10-1 DSIMM Installation Location

Group	Bank	Pair	Slots
0	0	0	U0501, U0401
	1	1	U0701, U0601
1	0	2	U0502, U0402
	1	3	U0702, U0602
2	0	4	U0503, U0403
	1	5	U0703, U0603
3	0	6	U0504, U0404
	1	7	U0704, U0604

10.5.1 Removing a DSIMM



Caution – Handle DSIMMs only by the edges. Do not touch the DSIMM components or metal parts. Always wear a grounding strap when handling a DSIMM.

1. **Power off the system unit.**

   See Section 6.2 “Powering Off the System Unit” on page 6-2.

2. **Remove the system unit cover.**

   See Section 7.1 “Removing the System Unit Cover” on page 7-1.



Caution – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

3. **Attach the wrist strap.**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

4. **Locate the DSIMM to be removed.**
5. **Push the ejection lever away from the DSIMM (**FIGURE 10-14**).**
6. **Remove the DSIMM from the socket.**

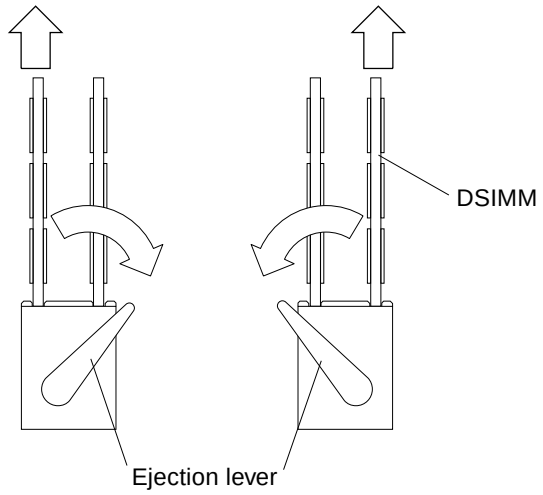


FIGURE 10-14 DSIMM Ejection Lever

10.5.2 Replacing a DSIMM

Caution – Do not remove any DSIMM from the antistatic container until ready to install it on the motherboard. Handle DSIMMs only by their edges. Do not touch DSIMM components or metal parts. Always wear a grounding strap when handling DSIMMs.

Caution – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

Caution – Each DSIMM group must contain four DSIMMs of equal density and at least 60-nanosecond speed (for example: four 16-Mbyte DSIMMs) to function properly. Do not mix DSIMM densities or speeds within any group.

1. **Unlock and lift the DSIMM cover.**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2. **Locate and select an available quartet of DSIMM slots on the motherboard.**

Note – Use only DSIMMs that are specifically designed for the system and server units.



Caution – Hold DSIMMs by edges only.

---

3. **Remove the DSIMM from the antistatic container.**

Note – DSIMMs must be added in groups of four. If all four DSIMMs are not of the same capacity, the four DSIMMs are treated as four times the lowest capacity DSIMM in the group.



Caution – If the DSIMM is not seated into its slot evenly, it can cause electrical shorts that will damage the system. Follow the procedure and refer to the illustration at right to seat the DSIMM properly.

Failure to comply with these instructions can result in damage to system components or assemblies and can void the warranty.

---

4. **Install the DSIMM as follows:**

   a. **Hold the DSIMM at the top left and right corners using the thumb and index finger of each hand.**

Note – Ensure that the DSIMM is being held straight and parallel to its slot.

---

   b. **For each DSIMM, align the notch on the side of the DSIMM with the ejector on the DSIMM slot.**

   c. **With even pressure, firmly push down simultaneously on** *both* **upper corners of the DSIMM until the bottom edge of the DSIMM (the edge with the gold pads) is firmly seated into the slot.**

Note – Do not rock the DSIMM into place. Ensure that all contacts engage at the same time. A “click” sound will be heard when the DSIMM is properly seated.

FIGURE 10-15 shows the incorrect and correct ways to seat the DSIMM.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

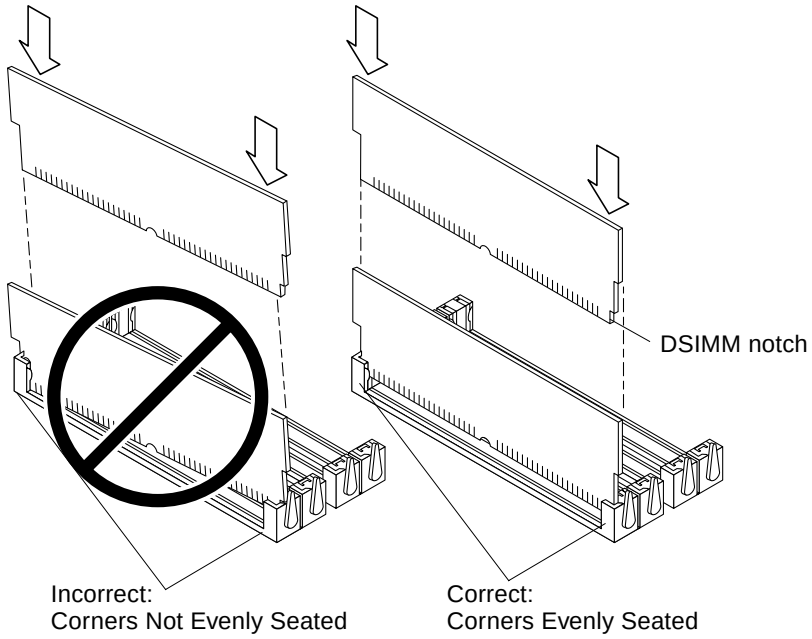


FIGURE 10-15 Incorrect and Correct Ways to Seat the DSIMM

5. **Detach the wrist strap.**
6. **Replace the system unit cover.**

   See Section 7.3 “Replacing the System Unit Cover” on page 7-4.
7. **Connect all cables to the back of the system or server unit.**
8. **Power on the system unit.**

   See Section 6.1 “Powering On the System Unit” on page 6-1.

10.6 Motherboard

To remove and replace a motherboard, proceed as follows.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Note – If the motherboard is being replaced, remove all DSIMMs and SBus card(s) prior to removing the motherboard. Note the chassis slot location for each DSIMM and SBus card prior to removal.

The disk drives must be disconnected from the motherboard prior to motherboard removal.

If a motherboard component is being replaced, you do not need to remove all DSIMMs and SBus card(s) prior to removing the motherboard.

Note – The NVRAM/TOD clock contains the system unit host identification (ID) and Ethernet address. If the same ID and Ethernet address are to be used on the replacement motherboard, remove the NVRAM/TOD from the removed motherboard and install it on the replacement motherboard after the replacement motherboard is installed.

10.6.1 Removing a Motherboard



Caution – Use an antistatic mat when working with the motherboard. An antistatic mat contains the cushioning needed to protect the underside components to prevent board flexing, and to provide antistatic protection.

1. **Power off the system unit.**

   See Section 6.2 “Powering Off the System Unit” on page 6-2.

2. **Disconnect all cables, excluding the power cable, from the back of the system or server unit.**

3. **Remove the system unit cover.**

   See Section 7.1 “Removing the System Unit Cover” on page 7-1.

4. **Attach a wrist strap.**

   See Section 7.2 “Attaching the Wrist Strap” on page 7-3.



Caution – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

a. Remove the following from the motherboard:

- All CPU modules (Section 10.1.1 “Removing a CPU Module” on page 10-1).
- NVRAM/TOD with carrier (Section 10.2.1 “Removing the NVRAM/TOD” on page 10-4).
- All SBus card(s) (Section 10.3.1 “Removing an SBus Card” on page 10-6).
- UPA graphics card (Section 10.4.1 “Removing a UPA Graphics Card” on page 10-11).
- All DSIMMs (Section 10.5.1 “Removing a DSIMM” on page 10-17).

b. Disconnect the following from the motherboard:

- SCSI cable (Section 8.2.1 “Removing the SCSI Cable Assembly” on page 8-5).
- DC power cable connectors; J1 from J3206, J2 from J3205, J3 from J3203, and J4 from J3204.
- Diskette drive cable (Section 8.2.3 “Removing the Diskette Drive Cable Assembly” on page 8-8).
- Hard drive (Section 9.1.1 “Removing a Hard Drive” on page 9-1).

6. Using a number 2 Phillips screwdriver, remove the four screws securing the motherboard back panel to the chassis.

Note – Ensure that the hooks located on the chassis base disengage with the slots located on the bottom of the motherboard.

---

7. Disconnect the motherboard from the chassis by grasping the motherboard shroud assembly and pushing the motherboard forward to disengage the chassis base hooks from the motherboard slots.



Caution – Handle the motherboard by the back panel or by the edges only.

---

8. Grasp the motherboard and lift it from the chassis (FIGURE 10-16**).**

9. Place the motherboard on an antistatic surface.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

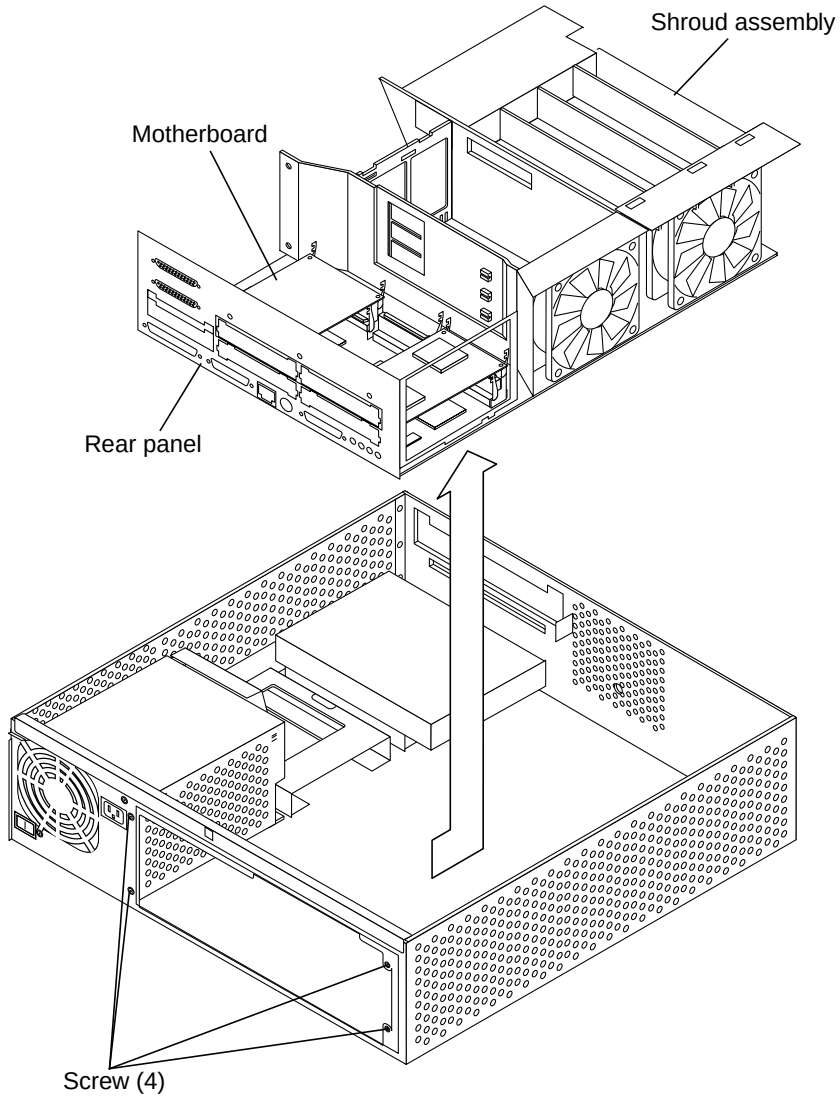


FIGURE 10-16 Removing a Motherboard

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

10.6.2 Replacing a Motherboard



Caution – Use proper ESD grounding techniques when handling components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

1. **Remove the SBus filler panel(s) from the replacement motherboard as follows:**
   a. **Squeeze the filler panel bottom locking tabs to unhook them from the back panel.**
   b. **Pull the filler panel away from the back panel.**
2. **Remove the NVRAM/TOD with carrier from the replacement motherboard.**
3. **Using long-nose pliers, set the serial port jumpers.**
   See Section C.5 “Jumper Description” on page C-29.
4. **Lower the motherboard into the chassis.**

Note – When lowering the motherboard, lower the motherboard at an angle to allow the bottom row of motherboard rear panel connectors to align with their respective chassis connector cutouts prior to lowering the motherboard front.

Note – Ensure that the hooks located on the chassis base engage with the slots located on the bottom of the motherboard.

5. **Align the chassis base hooks with the motherboard slots.**
6. **Using a number 2 Phillips screwdriver, replace the four screws securing the motherboard back panel to the chassis.**
7. **Populate the motherboard as follows:**
   a. **Connect the following to the motherboard:**
   - Hard drive (Section 9.1.2 “Replacing a Hard Drive” on page 9-3).
   - SCSI cable (Section 8.2.2 “Replacing the SCSI Cable Assembly” on page 8-7).
   - DC power cable connectors; J1 from J3206, J2 from J3205, J3 from J3203, and J4 from J3204.
   - Diskette drive cable (Section 8.2.4 “Replacing the Diskette Drive Cable Assembly” on page 8-9).

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

- All DSIMMs (Section 10.5.2 “Replacing a DSIMM” on page 10-18).
- UPA graphics card (Section 10.4.2 “Replacing a UPA Graphics Card” on page 10-13).
- All SBus card(s) (Section 10.3.2 “Replacing an SBus Card” on page 10-8).
- NVRAM/TOD with carrier (Section 10.2.2 “Replacing the NVRAM/TOD” on page 10-5).

Note – The NVRAM/TOD that was removed from the replacement motherboard may be stored as a spare.

- All CPU modules (Section 10.1.2 “Replacing a CPU Module” on page 10-3).

8. **Detach the wrist strap.**
9. **Replace the system unit cover.**

   See Section 7.3 “Replacing the System Unit Cover” on page 7-4.
10. **Connect all cables to the back of the system or server unit.**
11. **Power on the system unit.**

    See Section 6.1 “Powering On the System Unit” on page 6-1.
12. **Reset the** `#power-cycles` **NVRAM variable to zero as follows:**

    a. **Set the system unit power to On.**

    b. **Press Stop-A after the system banner appears on the monitor.**

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

```
ok setenv #power-cycles 0
```

    d. **Verify that the** `#power-cycles` **variable increments each time the system unit is power cycled.**

Note – The Solaris operating environment power management software uses this variable to control the frequency of automatic system shutdown if automatic shutdown is enabled.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CHAPTER **11**

Illustrated Parts List

This chapter lists the authorized replaceable parts for the Ultra 2 series system unit and the Ultra Enterprise 2 server. FIGURE 11-1 illustrates an exploded view of the system unit. TABLE 11-1 lists the system unit replaceable components. A brief description of each listed component is also provided.

Numerical references illustrated in FIGURE 11-1 correlate to the numerical references listed in TABLE 11-1. Consult your authorized Sun sales representative or service provider prior to ordering a replacement part.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

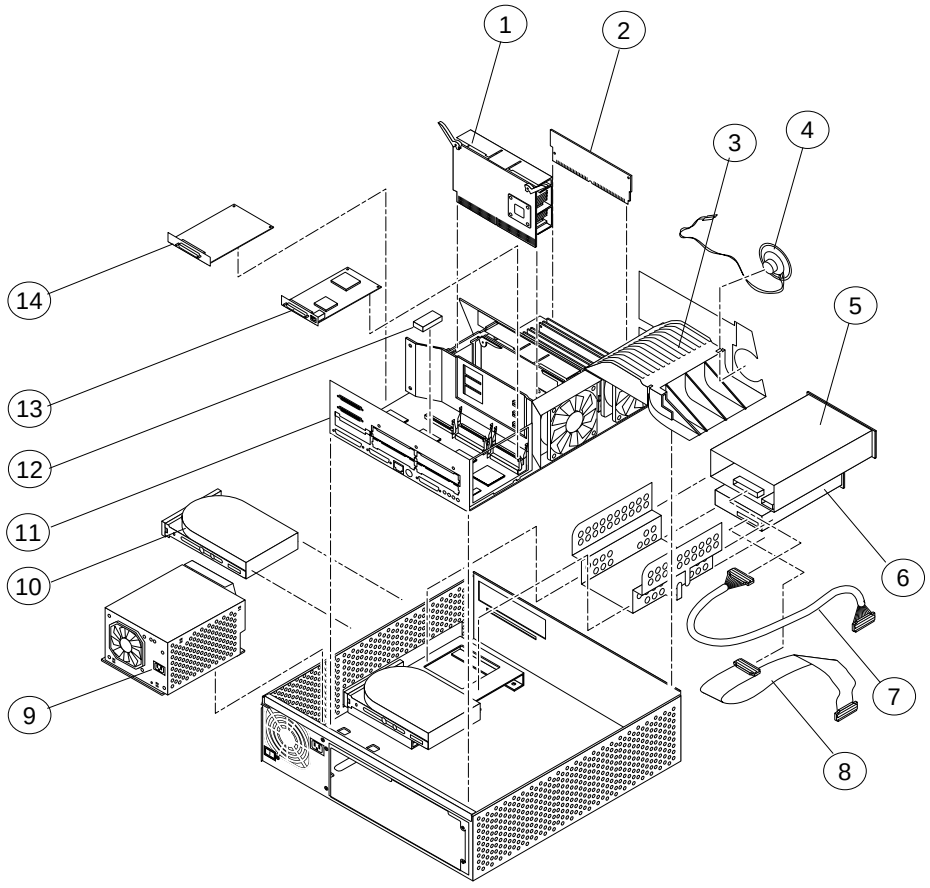


FIGURE 11-1 System Unit Exploded View

TABLE 11-1 System Unit Replaceable Components

Numerical Reference	Component	Description
1	CPU moduke	167-MHz CPU module, 512Kbyte cache, 6 ns
1	CPU module	200-MHz, CPU module,1Mbyte cache, 5 ns
1	CPU module	UltraSPARC-I, 250-MHz, 1-Mbyte external cache
1	CPU module	UltraSPARC-II, 300-MHz, 2-Mbyte external cache
2	DSIMM	16-Mbyte DSIMM assembly

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TABLE 11-1 System Unit Replaceable Components *(Continued)*

Numerical Reference	Component	Description
2	DSIMM	32-Mbyte DSIMM assembly
2	DSIMM	64-Mbyte DSIMM assembly
2	DSIMM	128-Mbyte DSIMM assembly
3	Shroud assembly	Shroud/fan/speaker assembly
4	Speaker	Speaker (P/O shroud assembly)
5	CD-ROM drive	4x CD-ROM drive
5	CD-ROM drive	12x CD-ROM drive
5	Tape drive (not illustrated)	4-mm tape drive, 4-/8-Gbyte,
5	Tape drive (not illustrated)	8-mm tape drive, 7-/14-Gbyte
6	Diskette drive	3.5-inch floppy drive
7	SCSI cable	SCSI cable assembly
8	Diskette drive cable	Diskette drive cable assembly
9	Power supply	350-watt power supply
10	Hard drive	Hard disk drive, 535-Mbyte, 4500 RPM, narrow
10	Hard drive	Hard disk drive, 1-Gbyte, 5400 RPM, wide
10	Hard drive	Hard disk drive, 2.1-Gbyte SCA, 7200 RPM, wide
10	Hard drive	Hard disk drive, 4.2-Gbyte SCA, 7200 RPM, wide
10	Hard drive	Hard disk drive, 9.1-Gbyte SCA, 7200 RPM, wide
11	Motherboard	Motherboard
12	TOD,w/carrier	Time of day, 48T59Y, W/Carrier
13	SBus card	SBus card
14	UPA graphics card	DFB, UPA graphics card, 67-MHz

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TABLE 11-1 System Unit Replaceable Components *(Continued)*

Numerical Reference	Component	Description
14	UPA graphics card	SFB, UPA graphics card, 67 MHz
14	UPA graphics card[1]	DFB, UPA graphics card, 75 MHz
14	UPA graphics card[2]	Horizontal UPA graphics card, 100-MHz

1. Require Solaris Hardware: 11/97 or Solaris 2..6 Hardware: 3/98 .
2. Require Solaris Hardware: 11/97 or Solaris 2..6 Hardware: 3/98 .

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

APPENDIX **A**

Product Specifications

This appendix provides product specifications for the Ultra 2 series system (system unit) and the Ultra Enterprise 2 server (server) and is divided into three parts:

- Section A.1 “Physical Specifications” on page A-1
- Section A.2 “Electrical Specifications” on page A-2
- Section A.3 “Environmental Specifications” on page A-3

A.1 Physical Specifications

The following table lists physical specifications for the system / server units.

TABLE A-1 System / Server Units Physical Specifications

Specification	Value
Height	17.72 in. (45 cm)
Width	5.12 in. (13 cm)
Depth	17.48 in. (44 cm)
Weight (approx)	27.00 to 35.00 lb. (12.27 to 15.91 kg)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

A.2 Electrical Specifications

The following table lists the electrical specifications for the system / server units.

TABLE A-2 System / Server Units Electrical Specifications

Parameter	Description	Value
Input	Voltage range Current range Frequency range	100 to 240 VAC 1.5 to 3.1 A 47 to 63 Hz
Output	1	+5 VDC, 18 A
Output	2	+3.3 VDC, 12 A
Output	3	+2.5 to 3.6 VDC, 12 to 8.3 A
Output	4	+12 VDC, 5.1 A
Output	5	-12 VDC, 0.3 A
Input power rating	Input power rating	260 W
Output power rating	Output power rating	350 W
Volt-ampere rating	Volt-ampere rating	260 VA
Power factor	Power factor	Greater than .98

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

A.3 Environmental Specifications

The following table lists operating and non-operating environmental specifications for the system / server units.

TABLE A-3 System / Server Units Environmental Specifications

Environmental	Operating	Non-Operating[2]
Temperature:	50 to 104 degrees F[1] (10 to 40 degrees C), 16-hour dwells at extremes	-4 to 131degrees F (-20 to 55 degrees C), 16-hour dwells at extremes
Humidity	20 to 80 percent noncondensing at 104 degrees F (40 degrees C), 16-hour dwells at extremes	95 percent noncondensing at 104 degrees F (40 degrees C) 16-hour dwells at extremes
Altitude:		
System without removable tape media	9,842.5 feet (3,000 meters) at 50 to 98.6 degrees F (10 to 37 degrees C), 2-hour dwells at extremes, to 104 degrees F (40 degrees C) at sea level	40,000 feet (12,192 meters) at 32 degrees F (0 degrees C), 2-hour dwells at extremes
System with removable tape media	9,842.5 feet (3,000 meters) at 50 to 89.6 degrees F (10 to 32 degrees C), 2-hour dwells at extremes, to 95 degrees F (35 degrees C) at sea level	40,000 feet (12,192 meters) at 32 degrees F (0 degrees C), 2-hour dwells at extremes
Maximum dwells at extremes	16 hours	16 hours
Shock	2.0 G peak for 11 ms, 3 shocks per face	15 G peak for 11 ms, 3 shocks per face
Vibration	0.1 G peak, 3 mutually perpendicular axes, 5 to 500 Hz sweep	0.5 G peak, 3 mutually perpendicular axes, 5 to 500 Hz sweep
Acoustic noise	5.4 bels	5.2 bels (idle)

1. Not to exceed 95 degrees F (35 degrees C) with tape media.
2. Refer to tape media specifications for recommended tape media storage.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

APPENDIX **B**

Signal Description

This appendix provides signal descriptions for the Ultra 2 series system unit back panel connectors.

- Section B.1 “Keyboard / Mouse Connector, and Serial Ports A and B Connectors” on page B-1
- Section B.2 “Twisted-Pair Ethernet Connector” on page B-5
- Section B.3 “Fast / Wide SCSI Connector” on page B-6
- Section B.4 “Audio Port Connectors” on page B-8
- Section B.5 “Parallel Port Connector” on page B-9
- Section B.6 “Media Independent Interface Connector” on page B-11
- Section B.7 “UPA Graphics Card 13W3 Connector” on page B-13

B.1 Keyboard / Mouse Connector, and Serial Ports A and B Connectors

B.1.1 Keyboard / Mouse Connector

The keyboard / mouse connector is a DIN-8 type connector located on the motherboard back panel. The following figure illustrates the keyboard / mouse connector configuration and the following table lists the keyboard / mouse connector pin assignments.

Note – All signals are standard TTL levels. The +5 VDC supply is fuse-protected.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

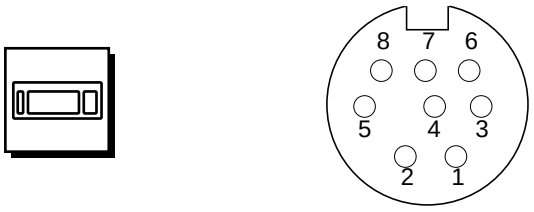


FIGURE B-1 Keyboard / Mouse Connector Pin Configuration

TABLE B-1 Keyboard / Mouse Connector Pin Assignments

Pin	Signal Name	Description
1	Gnd	Ground
2	Gnd	Ground
3	+5 VDC	+5 VDC
4	Mse-rxd	Mouse receive data
5	Kbd-txd	Keyboard out
6	Kbd-rxd	Keyboard in
7	Kbd-pwk	Keyboard power on
8	+5 VDC	+5 VDC

B.1.2 Serial Port Connector A and B (RS-423 / RS-232)

Serial port connectors A and B are DB-25 type connectors located on the motherboard back panel. The following figure illustrates the serial port A and serial port B connector configuration and the following table lists the serial A and B port connector pin assignments.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

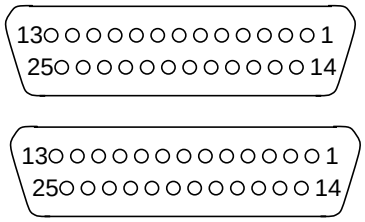


FIGURE B-2 Serial Port A and B Connectors Pin Configuration

TABLE B-2 Serial Port A and B Connectors Pin Assignments

Pin	Signal Name	I/O	Description
1	Not connected	none	None.
2	TXD	O	Transmit data. Used by the data terminal equipment (DTE) to transmit data to the data circuit equipment (DCE). Except when control data is being sent, RTS, CTS, SYNC, and DCD must be ON for this line to be active.
3	RXD	I	Receive data. Used by the DCE in response to received data from the DTE.
4	RTS	O	Ready to send. Used by the DTE to condition the DCE for data transmission. The transition to ON directs the DCE to go into transmit mode. The transition to OFF directs the DCE to complete the transmission.
5	CTS	I	Clear to send. Used by the DCE to indicate if it is ready to receive data from the DTE. When CTS, DSR, RTS, and DTR are ON, the DCE is ready to transmit data received from the DTE across the communications channel. When only CTS is ON, the DCE is ready to accept dialing or control signals only. When CTS is OFF, the DTE should not transfer data across TXD.
6	DSR	I	Data set ready. Used by the DCE to indicate if it is ready to operate. When DSR is ON, the DCE is connected to the line and ready to exchange further control signals to start data transfer.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TABLE B-2 Serial Port A and B Connectors Pin Assignments *(Continued)*

Pin	Signal Name	I/O	Description
7	Gnd		Signal Ground.
8	DCD	I	Data carrier detect. Used by the DCE to indicate it is receiving a suitable signal from the communications channel.
9 - 14	Not connected	none	None.
15	TRXC	I	Transmit clock. Used by the DCE to provide timing information to the DTE. The DTE provides data on TXD in which the transition of the bit corresponds to the rising edge of the clock.
16	Not connected	none	None.
17	RTXC	I	Receive clock. Used by the DCE to provide timing information to the DTE. The falling edge of the clock corresponds to the center of the data bit received on RXD.
18 -19	Not connected		None.
20	DTR	O	Data terminal ready. Used to control switching of the DCE to the communication channel. Once disabled, DTR cannot be enabled until SYNC is turned OFF.
21 - 23	Not connected		None.
24	TXC	O	Terminal clock. Generated by the DTE to provide timing information to the DCE. Used only in Synchronous mode and only when the driver requests a locally generated clock. Otherwise, TXC echoes the modem-generated clock. The falling edge of the clock corresponds to the center of the data bit transmitted on TXD.
25	Not connected		None.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

B.2 Twisted-Pair Ethernet Connector

The twisted-pair Ethernet (TPE) connector is an RJ-45 type connector located on the motherboard back panel. The following figure illustrates the TPE connector configuration and the following table lists the TPE connector pin assignments.

Caution – Connect only TPE cable into TPE connector.

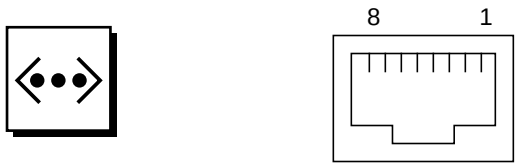


FIGURE B-3 TPE Connector Pin Configuration

TABLE B-3 TPE Connector Pin Assignments

Pin	Signal Name	Description
1	tpe0	Transmit data +
2	tpe1	Transmit data -
3	tpe2	Receive data +
4	Common mode termination	Termination
5	Common mode termination	Termination
6	tpe3	Receive data -
7	Common mode termination	Termination
8	Common mode termination	Termination

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

B.3 Fast / Wide SCSI Connector

The fast / wide small computer system interface (SCSI) connector is located on the motherboard back panel. The following figure illustrates the fast / wide SCSI connector configuration and the following table lists the fast / wide SCSI connector pin assignments.

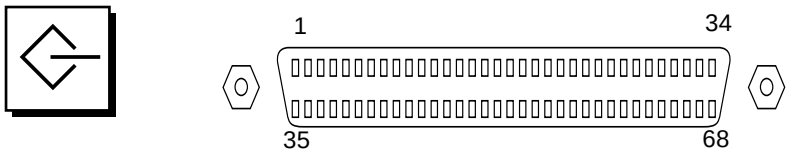


FIGURE B-4 Fast / Wide SCSI Connector Pin Configuration

TABLE B-4 Fast / Wide SCSI Connector Pin Assignments

Pin	Signal Name	Description
1 - 16	Gnd	Ground
17	Termpower	Termpower
18	Termpower	Termpower
19	Not used	Undefined
20 - 34	Gnd	Ground
35	Dat<12>_	Data 12
36	Dat<13>_	Data 13
37	Dat<14>_	Data 14
38	Dat<15>_	Data 15
39	Par1 l_	Parity 1
40	Dat<0>_	Data 0
41	Dat<1>_	Data 1
42	Dat<2>_	Data 2

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TABLE B-4 Fast/Wide SCSI Connector Pin Assignments *(Continued)*

Pin	Signal Name	Description
43	Dat<3>_	Data 3
44	Dat<4>_	Data 4
45	Dat<5>_	Data 5
46	Dat<6>_	Data 6
47	Dat<7>_	Data 7
48	Par0 l_	Parity 0
49	Gnd	Ground
50	Term_dis_	Term disable
51	Termpower	Termpower
52	Termpower	Termpower
53	Not used	Undefined
54	Gnd	Ground
55	Atn_	Attention
56	Gnd	Ground
57	Bsy_	Busy
58	Ack_	Acknowledge
59	Rst_	Reset
60	Msg_	Message
61	Sel_	Select
62	Cd_	Command
63	Req_	Request
64	IO_	In/Out
65	Dat<8>_	Data 8

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TABLE B-4 Fast/Wide SCSI Connector Pin Assignments *(Continued)*

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

B.4 Audio Port Connectors

The audio port connectors are located on the motherboard back panel. These ports use EIA standard 0.125-inch (3.5-mm) jacks. The following figure illustrates each audio port configuration and the following table lists each audio port line assignment.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

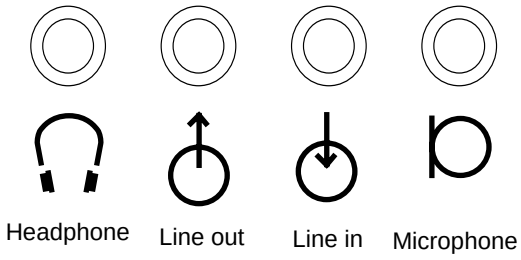


FIGURE B-5 Audio Port Connectors Jack Configuration

TABLE B-5 Audio Port Connectors Line Assignment

Component	Headphone	Line Out	Line In	Microphone
Tip	Left channel	Left channel	Left channel	Left channel
Ring (center)	Right channel	Right channel	Right channel	Right channel
Shield	Ground	Ground	Ground	Ground

B.5 Parallel Port Connector

The parallel port connector is a DB-25 type connector located on the motherboard back panel. The following figure illustrates the parallel port connector configuration and the following table lists the parallel port connector pin assignments.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

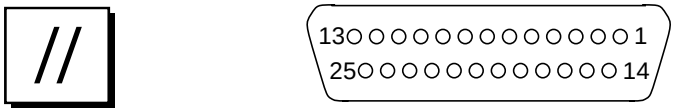


FIGURE B-6 Parallel Port Connector Pin Configuration

TABLE B-6 Parallel Port Connector Pin Assignments

Pin	Signal Name	Description
1	Data_Strobe_L	Data strobe low. Set low during forward channel transfers to latch data into peripheral device. Set high during reverse channel transfers.
2 to 9	Data[0..7]	Data0 through Data7. The main data bus for the parallel port. Data0 is the least significant bit (LSB). Pins are not used during reverse channel transfers.
10	ACK_L	Acknowledge low. Driven low by the peripheral device to acknowledge data byte transfer from host during forward channel transfer. Qualifies data being transferred to host in reverse channel transfer.
11	BUSY	Busy. Driven high to indicate the peripheral device is not ready to receive data during forward channel transfer. Used to send Data3 and Data7 during reverse channel transfer.
12	PERROR	Parity error. Driven high by peripheral device to indicate an error in the paper path during forward channel transfer. Used to send Data2 and Data6 during reverse channel transfer.
13	SELECT_L	Select low. Indicates the peripheral device is on line during forward channel transfer. Used to send Data1 and Data5 during reverse channel transfer.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TABLE B-6 Parallel Port Connector Pin Assignments *(Continued)*

Pin	Signal Name	Description
14	AFXN_L	Auto feed low. Set low by the host to drive the peripheral into auto-line feed mode during forward channel transfer. During reverse channel transfer, set low to indicate host can receive peripheral device data and then set high to acknowledge receipt of peripheral data.
15	ERROR_L	Error low. Set low by the peripheral device to indicate an error during forward channel transfer. In reverse channel transfer, set low to indicate peripheral device has data ready to send to the host. Used to send Data0 and Data4.
16	INIT_L	Initialize low. Driven low by the host to reset peripheral.
17	PAR_IN_L	Peripheral input low. Set low by the host to select peripheral device for forward channel transfer. Set high to indicate bus direction is from peripheral to host.
18 - 25	Signal Ground	Signal ground.

B.6 Media Independent Interface Connector

The media independent interface (MII) connector (designated J2501) is located on the motherboard back panel. The following figure illustrates the MII connector configuration and the following table lists the MII connector pin assignment.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

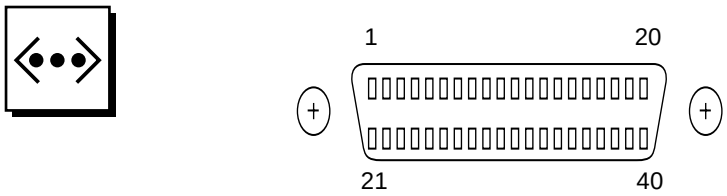


FIGURE B-7 MII Connector Pin Configuration

TABLE B-7 MII Connector Pin Assignments

Pin	Signal Name	Description
1	Pwr	Power
2	Mdio	Management data I/O
3	Mdc	Management data clock
4	Rxd3	Receive data 3
5	Rxd2	Receive data 2
6	Rxd1	Receive data 1
7	Rxd0	Receive data 0
8	Rx dv	Receive data valid
9	Rx clk	Receive clock
10	Rx er	Receive error
11	Tx er	Transmit error
12	Tx clk	Transmit clock
13	Tx en	Transmit data enable
14	Txd0	Transmit data 0
15	Txd1	Transmit data 1
16	Txd2	Transmit data 2
17	Txd3	Transmit data 3

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TABLE B-7 MII Connector Pin Assignments *(Continued)*

Pin	Signal Name	Description
18	Col	Collision detected
19	Crs	Carrier sense
20	Pwr	Power
21	Pwr	Power
22 - 39	Gnd	Ground
40	Pwr	Power

B.7 UPA Graphics Card 13W3 Connector

The UPA graphics card 13W3 connector is located on the UPA graphics card. The following figure illustrates the UPA graphics card connector configuration and the following table lists the UPA graphics card 13W3 connector pin assignments.

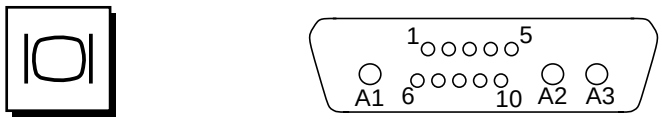


FIGURE B-8 UPA Graphics Card 13W3 Connector Pin Configuration

TABLE B-8 UPA Graphics Card 13W3 Connector Pin Assignments

Pin	Signal Name	I/O	Description
A1	R	O	Red
A2	G	O	Green
A3	B	O	Blue
1	Serial Read		Serial Read
2	Vert Sync	O	Vertical Sync
3	Sense <0>	I	Sense <0>

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TABLE B-8 UPA Graphics Card 13W3 Connector Pin Assignments *(Continued)*

Pin	Signal Name	I/O	Description
4	Gnd		Ground
5	Comp Sync	O	Composite Sync
6	Horiz Sync	O	Horizontal Sync
7	Serial Write		Serial Write
8	Sense <1>	I	Sense <1>
9	Sense <2>	I	Sense <2>
10	Gnd		Ground

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

APPENDIX **C**

Functional Description

This section provides a functional description of the system unit or server electronics.

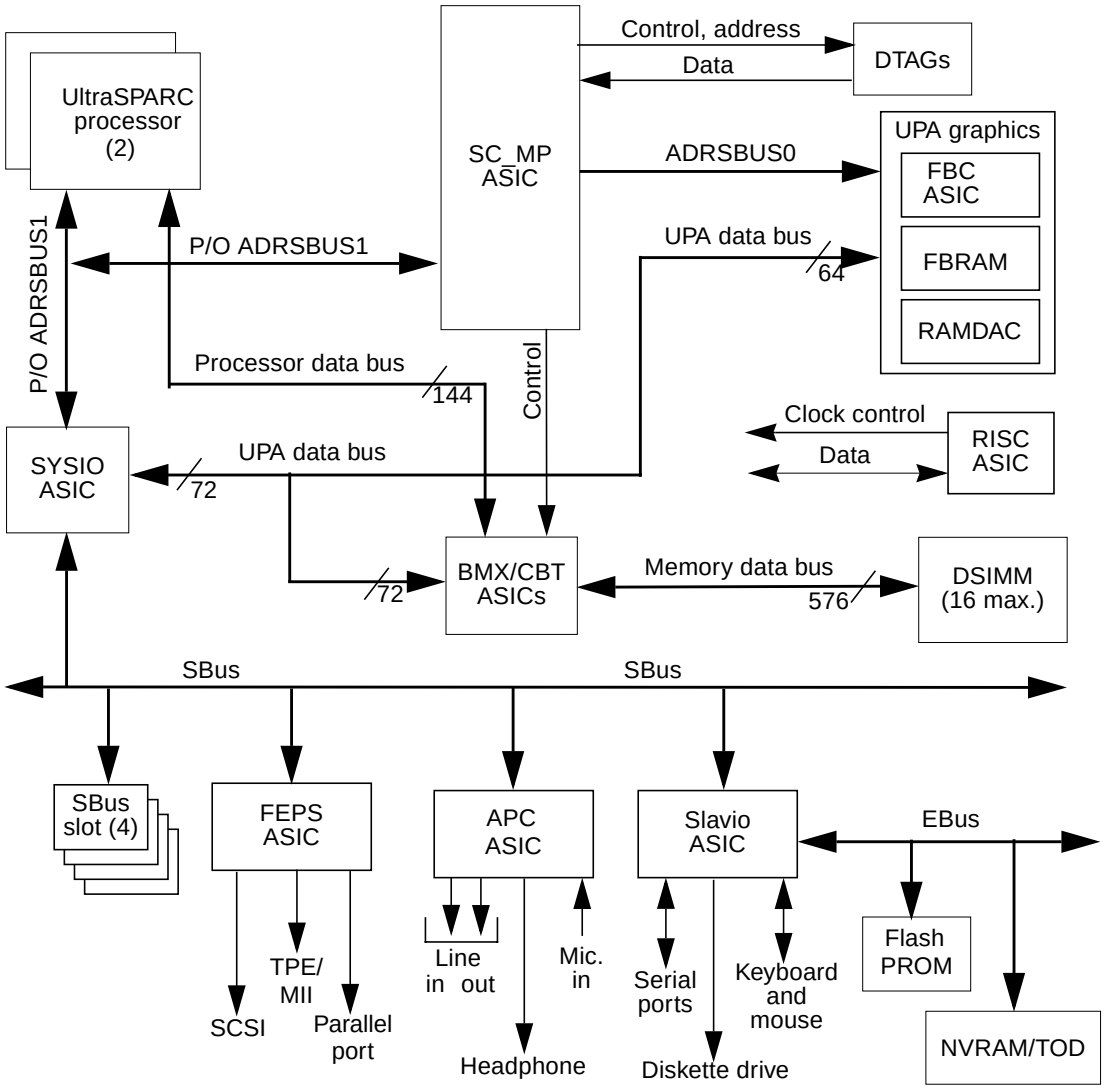
- Section C.1 “System Unit/Server Overview” on page C-1
- Section C.2 “Power Supply” on page C-26
- Section C.3 “Power Management” on page C-28
- Section C.4 “Motherboard” on page C-28
- Section C.5 “Jumper Description” on page C-29
- Section C.6 “Enclosure” on page C-33
- Section C.7 “Environmental Compliance” on page C-34
- Section C.8 “Agency Compliance” on page C-34

C.1 System Unit/Server Overview

The processor-to-memory interconnection is provided by the UPA mechanism (FIGURE C-1). The output of the UltraSPARC processor(s) and the output of the system I/O (SYSIO) ASIC reside on the UPA. A slave UPA port is provided for graphic device communications between the UPA graphic(s), the BMX and CBT ASICs, and the SYSIO ASIC. All UPA interactions are controlled by the multi-processing system controller (SC-MP) ASIC.

The I/O sub-system connects to the processor-to-memory subsystem through the SYSIO ASIC. The SYSIO ASIC provides connectivity to four SBus slots, the fast Ethernet parallel port SCSI (FEPS) ASIC, the audio (APC) ASIC, and the Slavio ASIC.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



Note: UPA graphics associated with desktop workstation only.

FIGURE C-1 System Unit or Server Functional Block Diagram

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

C.1.1 UPA

The UPA is a cache-coherent processor-to-memory interconnect. A key advantage of the UPA processor-to-memory interconnect is a scalable bandwidth through the support of multiple bussed interconnects for both data and address. Other advantages include more bandwidth, high-performance graphics support with two-cycle, single-word writes on the 64-bit UPA data bus, and centralized coherence and memory controller functions (see FIGURE C-1). The UPA consists of the following, as implemented on the motherboard:

- Eighteen buffered memory crossbar (BMX) ASICs and eighteen memory data multiplexer-demultiplexer (CBT) ASICs
  - The BMX ASICs connect the 144-bit UPA processor data bus to a 576-bit memory data bus through CBT ASICs, a 72-bit UPA data bus for graphics and I/O devices
  - The memory path is 576 bits using 18 CBT ASICs
- The processor(s) share(s) a UPA address bus (ADRSBUS1) with the SYSIO ASIC; a second address bus (ADRSBUS0) supports slave UPA connection to the expansion slot for graphics capability
- Low voltage transistor-transistor logic (TTL) voltage levels for signal input
- Low voltage complementary metal-oxide semiconductor (CMOS) voltage levels for signal output

UPA performance characteristics includea peak bandwidth of 1.3-Gbytes per second with one 144-bit processor data bus on an 83-MHz UPA.

C.1.2 SBus

The system unit or server uses the IEEE 1496 SBus (see FIGURE C-1). This includes:

- 16.6-MHz to 25-MHz operation. Default frequency is 25 MHz

Note – SBus frequency is independent of processor and UPA operating frequencies.

- Extended transfer mode (64-bit data path)
- Transfer sizes to 64 bytes (maximum)
- Parity
- Dedicated interrupts for each SBus slot.

The system unit or server supports four SBus slots. The four slots are configured in a side-by-side stacked configuration.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Note – The PrestoServe™ 2.4.2 release is incompatible with the Solaris 2.5.1 software environment when running on a Sun Ultra 2 Series system. For information about working around that problem, refer to *SMCC Open Issues Supplement Solaris 2.5.1*, part number 802-5340.

C.1.3 UltraSPARC I Processor

The UltraSPARC I processor is mounted on a module that is plugged into the system unit or server motherboard. Up to two modules are supported, one CPU for each module.

The UltraSPARC I processor has the following features:

- SPARC V9 compatibility:
  - V9 specifies a 64-bit instruction set architecture that is compatible with the 32-bit SPARC V8 architecture.
  - V9 provides for 64-bit data and addressing as well as other features to enhance operating system and application performance.
- Implements 44-bit virtual address bits and 41-bit physical address bits.
- Implements the visual instruction set (VIS) used by the UPA graphics device to provide optimal graphics performance (this also includes instructions to help with imaging performance).
- Execution of up to four instructions in parallel (one memory access, two integer ALU instructions, one floating point add class, one floating point multiply class, and one control transfer instruction).
- Each module receives a separate programmable core voltage to permit mixing of modules with different power requirements.
- Each module is thermo-coupled for temperature sensing; Ultra 2 series provides two levels; warning and shut-down.

UltraSPARC I processor performance characteristics include:

- 249 SpecInt92, 349 SpecFP92 for 168-MHz uniprocessor
- 332 SpecInt92, 505 SpecFP92 for 200-MHz multiprocessor

C.1.4 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

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

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 2-D and 3-D graphics, as well as image processing, video compression and decompression, and video effects through the sophisticated VIS. VIS provides high levels of multimedia performance, including real-time video compression/decompression and two streams of MPEG-2 decompression at full broadcast quality with no additional hardware support. The UltraSPARC II processor provides a 2-Mbyte ecache, with system operating frequencies from 250 MHz to 300 MHz.

UltraSPARC II processor characteristics and associated features include:

- SPARC-V9 architecture compliance
- Binary compatible with all SPARC application code
- Multimedia-capability VIS
  - Multiprocessing support
  - Glueless four-processor connection with minimum latency
- Snooping cache coherency
- Four-way superscalar design with nine execution units; four integer execution units
- Three floating-point execution units
- Two graphics execution units
- Selectable little- or big-endian byte ordering
- 64-bit address pointers
- 16-Kbyte non-blocking data cache
- 16-Kbyte instruction cache; single cycle branch following
- Power management
- Software prefetch instruction support
- Multiple outstanding requests

C.1.5 Memory

Memory uses conventional 5-VDC DRAM SIMMs (DSIMMs) with a 60-ns access time (see FIGURE C-1).

The system unit or server memory configuration allows 4, 8, 12, or 16 DSIMMs with DSIMM memory capacity options of 16 Mbytes, 32 Mbytes, 64 Mbytes, or 128 Mbytes. Memory upgrades are in 4-DSIMM increments. Each DSIMM in a 4-DSIMM group must contain the same memory capacity if not, the lower of the DSIMM memory capacities determines the other DSIMM capacities.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Characteristic memory performance includes a peak memory read bandwidth of 667 Mbytes per second and a peak memory write bandwidth of 485 Mbytes per second with random accesses to the DRAM using eight or more DSIMMs. The following figure shows the DSIMM group and bank layout.

Note – Two pairs of DIMMs form a group of four DIMMs. All four DIMMs within a group must be the same size. The minimum memory requirement is four DIMMs in Group 0. DIMMs can be installed in Group 1, Group 2, or Group 3 in any order. Each group addresses 512 Mbytes of memory. Unused memory is mapped out by the memory management hardware.

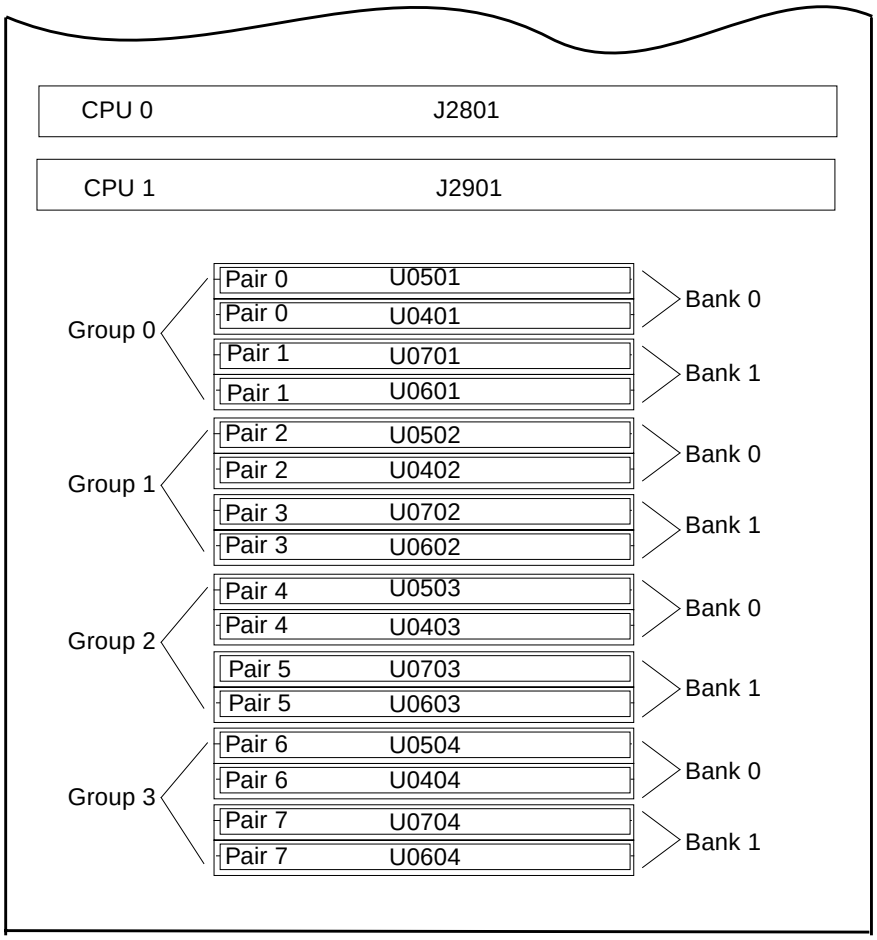


FIGURE C-2 DSIMM Group and Bank Layout

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

C.1.6 Graphics and Imaging (Workstation Only)

The system unit takes advantage of UPA features to provide high performance UPA graphics. An FBC ASIC provides acceleration for 2-D and 3-D imaging primitives (see FIGURE C-1).

The UPA graphics consist of the FBC ASIC, the FBRAM, RAMDAC, and associated circuitry. The UPA graphics connect to the system unit through the UPA64S expansion connector.

FBRAM is a standard DRAM that includes a multilevel cache. The FBC ASIC permits a write-mostly interface. This feature, combined with the 3DRAM cache and support for graphics operations, provides for a high performance frame buffer.

UPA graphics support the VESA standard for monitor control. UPA graphics also support stereo video.

Configuration restrictions:

- UPA graphics configuration are configured to operate the FBRAM interface at 66-MHz; single-buffer (SB), double-buffer plus Z (DBZ); or 75-MHz for the DBZ speed-sort.
- ZX is supported as an optional upgrade only.

C.1.6.1 Graphics Card Features

Features provided by the UPA graphics card include:

- YCC-to-RGB color space conversion for faster video decompression
- Contrast stretch support for imaging
- Line doubling for interlaced video writes
- Consecutive block prefetch for smart frame buffer reads
- DDC2B monitor serial communication with EDID default resolution support in the boot PROM
- 3DRAM OpenGL stencil function (four planes) support
- New RAMDAC support
- Single-buffered high-resolution (2.5 Mpixels) supports the following screen resolutions (DBZ graphics card only):
  - 1920 × 1360 pixel landscape mode (HDTV)
  - 1280 × 2048 pixel portrait mode (medical)
- Buffer B addressing for stateless (dumb frame buffer) and video accesses
- Simultaneous 8-bit and 24-bit visual support
- Multiple hardware color maps

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

- Programmable gamma correction; four-color lookup tables help eliminate color flashing within an 8-bit window system environment
- Texture cache for texture mapping
- Acceleration for X11 and XIL graphics libraries
- Acceleration for 3-D applications (XGL, OpenGL, and Java3D)
- 3-D solids, dynamic shading, rotation, and Z-buffered acceleration
- High resolution (1280 x 1024 pixels at 76 Hz, non-interlaced)
- Stereo ready (960 x 680 pixels at 122 Hz, non-interlaced)
- Dedicated graphics floating-point processing (can turn on more light points for enhanced visual display without a performance penalty)

C.1.6.2 Graphics Card Performance

The UPA graphics cards have identical window system performance characteristics, 2-D graphics, and imaging and video applications. In addition, the UPA graphics cards provide very fast, high-quality transformation and display of 3-D solid and wireframe objects and dramatically accelerate high-end functionality like double buffering, triangle and quad rendering, and lighting and shading. At the same time, the UPA graphics cards accelerate 2-D objects that meet X11 rules. Fast 8- and 24-bit window system and imaging performance are provided along with acceleration for decompression and display of compressed digital video.

C.1.6.3 Graphics Not Supported

The following graphics are not supported in the Ultra 2 series systems:

- GS SBus graphics accelerator (370-1329, 370-1370, 370-1407, and 370-1551)
- GT graphics subsystem (501-1624, 501-1692, 501-1694, and 501-1726)
- GT2 graphics subsystem SBus adapter card (501-1693)
- GX (501-1481 and 501-1645)
- GX+ (501-1717, 501-2018, and 501-2039)
- ZX2 (501-1694)

C.1.7 Peripherals

The following peripherals are supported by the system unit or server:

- CD-ROM drive
- Diskette drive

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

- Hard drive

A small computer system interface (SCSI) and optional tape drive components; 4-mm and 8-mm are also supported.

C.1.7.1 CD-ROM Drive

The CD-ROM drive is a standard device with multimedia features. This includes multisession capability and fast access for image and video data. Headphone access, eject, pin eject, and volume control is available on the front panel. Audio from the CD is available through either the front panel headphone connection, the line-out connector at the system unit or server rear (accessible by cabling from front to rear), or the internal speaker. The *SunCD 4 Drive Specifications*, document part number 802-4157, provides cleaning, jumper setting, and operating instructions for the 4x CD-ROM drive and the *SunCD 12X Installation and User's Guide*, document part number 805-0940, provides cleaning, jumper setting, and operating instructions for the 12x CD-ROM drive.

Note – Both multifunction and quadra-speed CD-ROM drives are supported as long as they conform to the 5.94-inch x 7.78-inch x 1.71-inch (15.10-cm x 19.80-cm x 4.30-cm) dimensions.

C.1.7.2 Diskette Drive

The system unit or server uses a standard 1.44-Mbyte diskette (floppy) drive that is 1 inch (2.50 cm) high. The system unit- or server-to-diskette drive interface is a 82077 style interface.

C.1.7.3 Hard Drive

The system unit or server supports two 1-inch drive bays that may hold a total hard drive storage capacity of 18.2 Gbytes. Each drive has a 3.5-inch (8.90-cm) form factor with a single connector configuration. A drive bracket is used to mount the drive to the system unit or server. The following table lists the supported hard drives.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TABLE C-1 Supported Hard Drives

Form Factor Dimension	Hard Drive Capacity	Fast/Wide SCSI	RPM	Access Time
1 inch	535 Mbytes	No	4500	12 ms
1 inch	1 Gbyte	Yes	5400	11 ms
1 inch	2.1 Gbytes	Yes	7200	9.5 ms
1 inch	4.2 Gbytes	Yes	7200	9.5 ms
1 inch	9.1 Gbytes	Yes	7200	9.5 ms

C.1.8 SCSI

The system unit or server provides a 20-Mbyte per second SCSI interface that is supported by the FEPS ASIC. 20 Mbytes per second is provided by 16-bit single-ended operation at 10 MHz. Both internal and external peripherals are connected to the same daisy chain. External connection is provided through a 68-pin SCSI connector (see FIGURE C-1).

System configuration requires external devices to be connected in a daisy chain configuration. A maximum of 12 external devices may be daisy-chained through a maximum cable length of 19.69 feet (6 meters). The end of the daisy chain must be terminated with an active terminator. If both 50-pin and 68-pin external devices are connected externally, the 68-pin device must be connected earlier in the daisy chain. A special terminator is available for the last 68-pin device that terminates the extra signals and converts the extra signals into a 50-pin configuration. The last 50-pin device must be terminated.

Note – When using the 535-Mbyte hard drive, contact your Sun representative to order a 50-to-68-pin SCSI cable: for 1.2-meter (1.3-yard) external SCSI cable, order X903A; for 2.0-meter (2.2-yard) external SCSI cable, order X904A.

C.1.8.1 SCSI Implementation

- Single-ended
- 16-bit (wide SCSI) with parity
- 20 megabits-per-second (Mbps) Fast/Wide SCSI

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

- Supports 16 SCSI addresses:
  - Targets 0 - 6 and targets 8 - F for devices
  - Target 7 reserved for motherboard SCSI host adapter
- Supports up to three internal SCSI drives:
  - SCSI hard drive target 0 (lower drive slot)
  - SCSI hard drive target 1 (upper drive slot)
  - SCSI CD-ROM drive target 6 or SCSI tape drive target 5
- External 8-bit and 16-bit SCSI devices supported through a 68-pin SCSI connector

C.1.8.2 SCSI Cabling and Configuration

When mixing 8-bit and 16-bit SCSI devices on the same physical SCSI bus, follow these cabling and configuration guidelines to insure proper device addressing and operation:

- If all external mass storage devices use 68-pin connectors, connect all non-Sun devices to the Ultra 2 Series system first, followed with Sun devices. Sun devices use autotermination.
- If external mass storage devices consist of 68-pin Sun devices and 50-pin devices, connect the Sun 68-pin devices to the Ultra 2 Series system first and terminate the daisy chain with the 50-pin device and its terminator.

The following figure provides an illustrated summary of cabling and configuration guidelines.

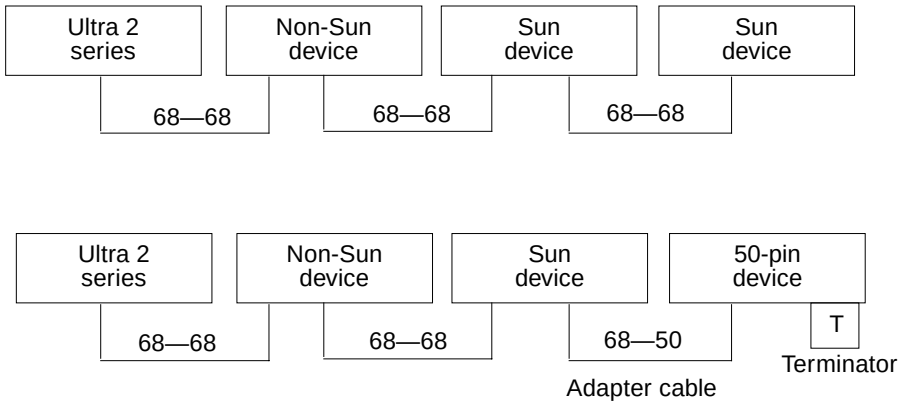


FIGURE C-3 Connecting External Mass Storage Devices

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

C.1.9 Optional 4-mm and 8-mm Tape Drives

The system unit or server supports the optional 4-mm and 8-mm tape drives. Either the 4-mm tape drive or the 8-mm tape drive may be installed in the system or server unit in place of the CD_ROM drive.

C.1.9.1 4-mm Tape Drive

The 4-mm tape drive is equipped with a single-ended SCSI controller and a 1-MByte on-drive buffer. The *4-mm Tape Drive Specifications*, document part number 802-5324, provides cleaning, jumper setting, and tape cartridge instructions for the 4-mm tape drive.

C.1.9.2 8-mm Tape Drive

The 8-mm tape drive is an enhanced 8-mm digital helical-scan cartridge tape subsystem. It is packaged in the industry standard 5.25-inch (13.335-cm) half-height form factor. The *8-mm Tape Drive Specifications*, document part number 802-5775, provides cleaning, jumper setting, and tape cartridge instructions for the 8-mm tape drive.

C.1.10 Networking

The system unit or server supports 10-Mbit and 100-Mbit local area Ethernet IEEE standard 802.3u (also known as 100BASE-T) through the FEPS ASIC. The FastEthernet standard is backwards-compatible with the standard 10-Mbits per second Ethernet standard. The speed is auto-sensed.

Twisted-pair Ethernet (TPE) support is provided through a RJ45 connector. In addition, a media independent interface (MII) connection provides support to any other form of Ethernet (AUI/TP/ThinNet). The MII connection is provided through a 40-pin MII connector. MII converters include MII-to-AUI and MII-to-fiber optic.

Note – The MII-to-AUI converter connects the MII connector on the backpanel of the Sun Ultra 2 series system unit or the SunFastEthernet™ adapter to AUI 10BASE-5 DB-15 Ethernet connectors. Contact your Sun representative to order an MII-to-AUI converter, order X467A.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

C.1.11 10BASE-T TPE Link Test

This section contains important information for getting your system to communicate correctly over a 10BASE-T TPE network. If you have no experience with TPE networks, ask your system or network administrator to perform the procedures in this section.

Note – This section *does not* apply to 100BASE-T networks. In such networks, the link test function must be enabled at both the host and the hub. If your host is connected to a 100BASE-T network, you must not disable the host link test function.

C.1.11.1 Overview

- The TPE link integrity test is a function defined by the IEEE 802.3 10BASE-T specification.
- For a networked workstation (host) to communicate with a network hub, the link test state (enabled or disabled) must be the same on the host and hub.
- If either the host or hub does not share the link test enabled / disabled state of the other, then the host cannot communicate effectively with the hub, and the hub cannot communicate effectively with the host.

The following figure illustrates an example of a star configuration local area network (LAN), showing the host(s)-to-hub relationship. FIGURE C-5 shows the importance of ensuring that the host-to-hub link test settings match in a 10BASE-T network.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

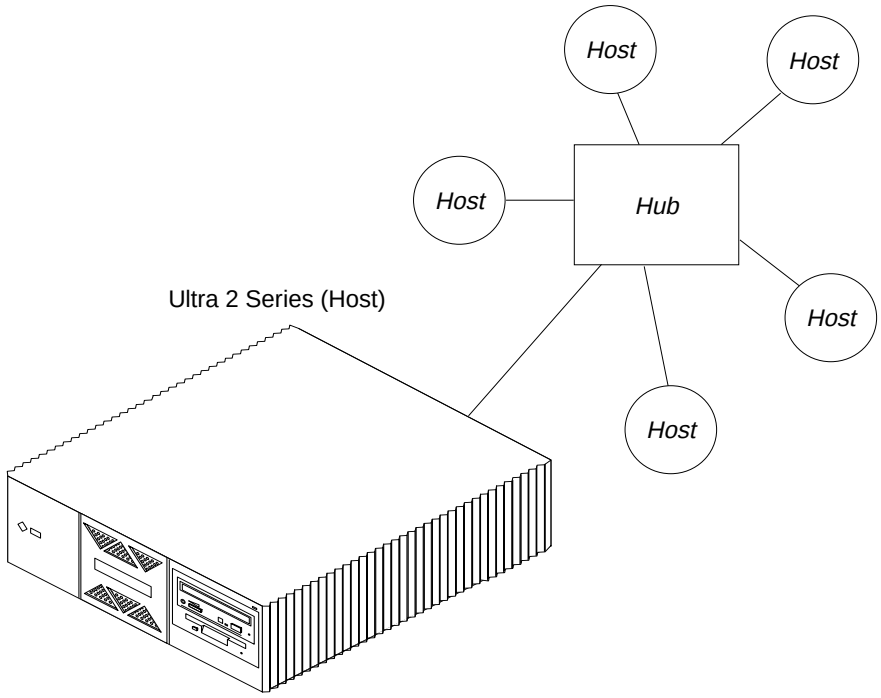


FIGURE C-4 Host(s)-to-Hub Star Configuration LAN

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

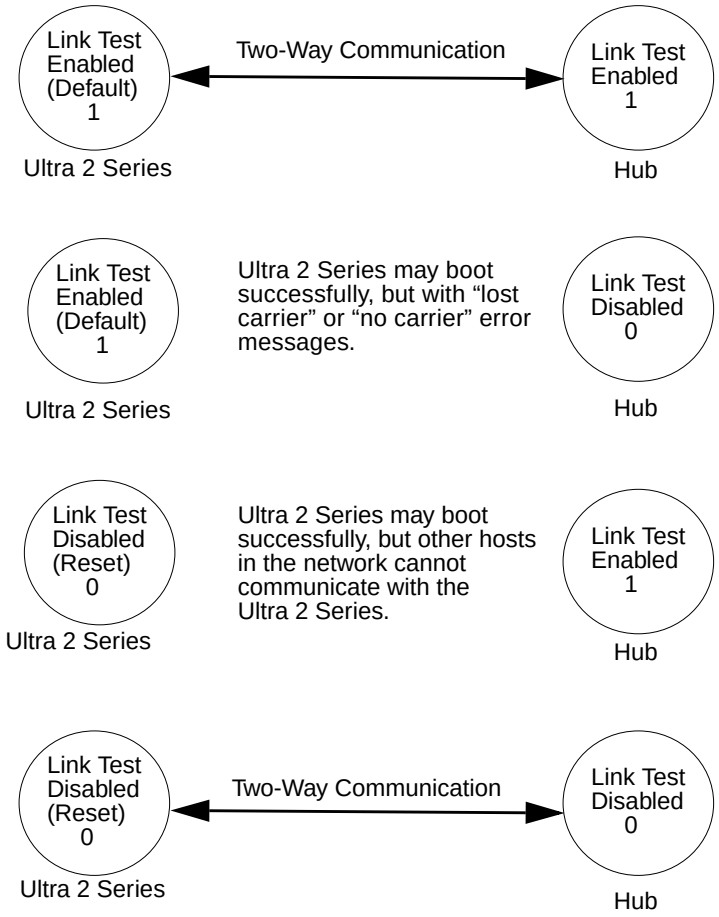


FIGURE C-5 Ensuring a 10BASE-T Host-to-Hub Communication Network

C.1.11.2 Technical Discussion

The TPE link integrity test determines the state of the twisted-pair cable link between the network host and hub. Both the host and hub regularly transmit a link test pulse. When either the host or hub has not received a link test pulse within a certain amount of time (50 - 150 ms), it makes the transition from the link-pass state to the link-fail state and remains in the link-fail state until it once again receives regular link test pulses.

The link integrity test is specific to TPE and is not applicable to the other physical layer implementations of IEEE 802.3 such as 10BASE5 (thicknet) or 10BASE2 (thinnet).

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The link test function at the host or hub is either enabled (link test enabled or 1) or disabled (link test disabled or 0). The IEEE 802.3 10BASE-T specification requires that the link test be enabled at both the host and the hub.

Although link test disabled does not conform to the specification, it is often encountered in real-world 10BASE-T network installations. Some hubs from various vendors can exhibit any of the following:

- Link test is “hardwired” enabled — link test is always enabled.
- Link test is “hardwired” disabled — link test is always disabled.
- Link test is configurable — the network administrator may enable or disable link test.

C.1.11.3 Troubleshooting

If you have connected an Ultra 2 Series host to a hub using TPE cable and observe either “no carrier” messages or fail to communicate effectively with another host in the same network, look first at the hub. If it supports configurable link test, then make sure “link test enabled” is configured. This is usually done by setting a hardware switch.

If the hub does not support configurable link test, then refer to the hub manufacturer’s documentation. Check to see if your hub is hardwired for link test disabled. If it is, refer to Section C.1.11.5 “Checking or Disabling the Link Test” on page C-16 to disable the link test at your Ultra 2 Series host.

C.1.11.4 Moves and Changes

If the Ultra 2 Series host is physically moved to another network location or if the hub is reconfigured, remember to refer back to FIGURE C-5. Unless the new network relationship between the host and the hub is functional (that is, 1-1 link test enabled-link test enabled or 0-0 link test disabled-link test disabled), there will be no full, regular two-way communication between the host and the hub.

C.1.11.5 Checking or Disabling the Link Test

To check the link test:

1. **If you do not see the** ok **prompt, press the Stop (L1) and A keys.**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

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

```
ok printenv tpe-link-test?
tpe-link-test?        true                true
ok
```

Note – The above screen shows the current link test state (true, or enabled), followed by the default state (true, or enabled).

To disable the host's link test:

1. **Type the following commands:**

```
ok setenv tpe-link-test? false
tpe-link-test? = false
ok reset-all
```

2. **Boot the host. Verify that the transceiver cable problem messages do not appear. Type either** `boot net` **or** `boot disk` **and press Return.**

C.1.11.6 Enabling the Link Test

1. **If you do not see the** `ok` **prompt, press the Stop (L1) and "A" keys.**

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

```
ok printenv tpe-link-test?
tpe-link-test?        false               true
ok
```

Note – The above screen shows the current link test state (false, or disabled), followed by the default state (true, or enabled).

---

3. **To enable the host's link test function, type the following commands:**

```
ok setenv tpe-link-test? true
tpe-link-test? =    true
ok reset-all
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

4. **Boot the host and verify that the transceiver cable problem messages do not appear. Type either** `boot net` **or** `boot disk` **and press Return.**

C.1.12 Terminal, Modem, Keyboard, and Mouse Connectivity

Terminal, modem, keyboard, and mouse connectivity is traditional Sunness connectivity (see FIGURE C-1). Two serial ports provide synchronous and asynchronous communication. The synchronous port supports data throughput rates up to 64 Kbaud. The asynchronous port supports data throughput rates up to 76.8 Kbaud.

Both RS-232 and RS-423 interface standards are supported. RS-232 or RS-423 interface selection is provided through a jumper setting. Default configuration is RS-423. Two DB25 connectors are provided for the two serial ports.

Keyboard and mouse functionality is provided through a DIN8 connector. Sun Type-5 keyboards and a new mechanical mouse are supported.

C.1.12.1 Setting Up the Modem

Any modem compatible with U.S. Robotics or CCITT V.24 can be connected to the Ultra 2 Series serial ports. Modems can be set up to function in one of three ways:

- Dial out only
- Dial in only
- Bidirectional calls

To set up your modem:

1. **Become superuser and type** `admintool`**.**

```
% su
Password:
# admintool
```

2. **Highlight** `Browse`**.**
3. **Select** `Serial Port`**.**
4. **Select** `Port A` **or** `Port B` **for your modem connection.**
5. **Select** `Edit`**.**
6. **Select** `Expert`**.**

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

7. **Open the** `Use Template` **menu, and select one of the following:**
   - `Modem - Dial-Out Only`
   - `Modem - Dial-In Only`
   - `Modem - Bidirectional`
8. **Select** `Apply`**.**
9. **Set your modem auto-answer switch to one of the following:**
   - For `Modem - Dial-Out Only`, set the switch to `Off`.
   - For `Modem - Dial-In Only`, set the switch to `On`.
   - For `Modem - Bidirectional`, set the switch to `On`.

C.1.12.2 Serial Port Speed Change

You must edit the `/etc/remote` file to change the speed of a serial port:

1. **Become rootsuperuser, and type** `cd /etc`**.**

```
% su
Password:
# cd /etc
```

2. **Type** `vi remote`**.**
3. **Type** `tip speed device-name`**.**
4. **Typical speeds are 9600, 19200 to 38400 bps. The device name is the serial port name — for example,** `/dev/tty[a,b]` **or** `/dev/term/[a,b]`**.**
5. **Press Return and type** `wq` **to save your file change(s) and to exit from the** `vi` **text editor.**

C.1.12.3 Recommendations

Cable

For a modem-to-host (system) connection, use an RS-423/RS-232 straight-through cable with DB-25 male connectors at both ends.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Modem Switch Settings (AT Commands)

- Enable transmit flow control (AT&H1) [suggested setting] (required for sending binary / 8-bit data)
- Set link rate to fixed (will not track modem data rate, AT&Bn; n equals menu choice in modem manual.)
- Set display result codes (ATQ0)
- Set verbal result codes (ATV1)
- Set result code subset (ATXn; n equals option choice)
- Save settings in NVRAM (AT&W)

Note – The above settings are guidelines to help you get started quickly. Changes to these guidelines should be expected depending on the site requirements and the modem being used. For additional information about modem switch settings, see the manual that came with your modem.

C.1.13 Printer Connectivity

Parallel printer port connectivity is provided with a DB25 connector. This interface supports up to two Mbytes-per-second data throughput and is Centronics-compatible. All SPARC printers are supported (see FIGURE C-1).

C.1.14 Audio

Audio includes interface, built-in speaker, and microphone (see FIGURE C-1).

C.1.14.1 Interface

The system unit or server includes the Codec for audio functionality. Four external connectors are supplied: line input, line output, a headphone, and stereo microphone. All connectors are 0.125-inch (3.5-mm) mini-stereo connectors. Line-in and line-out connectors support 16-bit CD quality stereo. The following table lists each audio port function. TABLE C-3 identifies the audio input and output specifications.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Note – Specifications listed in TABLE C-3 assume that the audio tool format setting, “CD-ROM or DAT” is selected. Also, the microphone input specifications listed in TABLE C-3 are for the SunMicrophone II.

TABLE C-2 Audio Port Functions

Port	Function
Headphones	Connects stereophonic headphones for private listening of audio output
Line Out	Connects the system audio output to an external stereophonic amplifier and loudspeakers
Line In	Connects external stereophonic audio sources such as a compact disc player or cassette tape player to the system
Microphone	Connects the SunMicrophone II (or other suitable microphone[1]) to the system

1. The Ultra 2 series microphone port accepts stereophonic input; however, the Sun Microphone II is a monophonic device. Note also that the older SunMicrophone is not compatible with the Ultra 2 Series system.

TABLE C-3 Audio Inputs and Outputs

Stereo I/Os	Specifications
Line In	2V typical, 4V max.; 5-50-ohm impedance
Frequency Response	20 Hz to 17 kHz (+/- 0.5 dB)
Internal CD Input	
Input Level	0.1 Vrms typical at 10 kohms; 2Vpp max.
Distortion	0.01percent, typical at 1 kHz
S/N Ratio	84 dB, typical IEC 179 A-weighted
Frequency response	20 Hz to 17 kHz (+/- 0.5 dB)
Microphone Input	15 mV typical, 0.6 to 1.0 kohm impedance;
	+5 VDC input bias through a 2.2-kohm resistor
Headphone Output	1V typical, 2.4V max.; 16-ohm to 1-kohm impedance
Line Out	1V typical, 2.4V max.; 5-ohm to 50-kohm impedance

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

C.1.14.2 Built-in Speaker

The system unit or server contains a cost-effective speaker. The speaker provides audio functionality in the absence of external speakers. Audio from all sources is available. The following table lists the built-in speaker specifications.

TABLE C-4 Built-in Speaker Specifications

Speaker	Specifications
Power output	1.5 W average, 3 W peak
Distortion	0.02 percent, typical at 1 kHz
Impedance	16 ohms (+/- 20 percent)
Frequency response	150 Hz to 17 kHz (+/- 0.5 dB)

C.1.14.3 Microphone

A SunMicrophone II mono microphone is included with each system unit.

C.1.15 ASICs

The system unit or server achieves a high level of integration through application-specific intergrated circuits (ASICs). All ASICs are 1149.1 (JTAG) compliant. The following ASICs are highlighted and are described in the following subsections:

- SC_MP—page C-23
- SYSIO—page C-24
- BMX—page C-24
- RISC—page C-24
- FEPS—page C-25
- SLAVIO—page C-26
- CBT—page C-26

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The following table lists each ASIC by name and provides characteristics of each device.

TABLE C-5 ASIC Characteristics

ASIC Name	Gates	RAM (bits)	Package	Die Size (mm x mm)	Power (W)	Reqd Per Unit
SC_MP	140K	0	372BGA		3.9	1
SYSIO	116K	14K	372BGA	10 x 10	2.7	1
BMX	7K	0	44TSSOP	NA	0.2	18
RISC	7k	0	160MQFP	6.25 x 6.25	0.4	1
FBC	202K	16K RAM, 32K ROM	313BGA	10.54 x 10.54	5.9	1
CBT	0.4K	0	56TSSOP	NA	0.2	18
RAMDAC			208PQFP	NA	2.0	1
FEPS	115K	4K	240PQFP		2.0	1

C.1.15.1 SC_MP

The multiprocessing system controller (SC_MP) ASIC is the key element for controlling the UPA and main memory. The SC_MP ASIC controls accesses from UPA master device to UPA slave device, and UPA accesses to memory. SC_MP includes a complete coherency controller which controls system dual tags (DTAGs).

The SC_MP ASIC:

- Integrates memory controller functionality. Memory controller is programmable to accommodate multiple DRAM and UPA speeds
- Supports four groups of memory, each with four DSIMMs
- Supports 16-Mbyte, 32-Mbyte, 64-Mbyte, and 128-Mbyte, 60-ns DSIMMs
- Supports maximum memory configurations of 2 Gbytes with sixteen 128-Mbyte DSIMMs
- Supports three UPA masters and one UPA slave with independent address busses (independent busses are required for graphics streaming)
- Controls the BMX ASIC which connects the UPA data bus and memory
- Controls the CBT ASICs

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

C.1.15.2 SYSIO

The system I/O controller (SYSIO) ASIC bridges between the UPA and the SBus.

The SYSIO ASIC:

- Contains the IOMMU
- Integrates streaming buffer to enhance sequential I/O performance
- Provides logic for dispatching interrupt vectors to processors
- Provides ECC generation and checking logic

C.1.15.3 BMX

The buffered memory crossbar (BMX) ASIC is a three-port crossbar connecting one 144-bit UPA data bus, one 288-bit-wide DRAM memory bus, and one 72-bit UPA data bus. To maintain a manageable pin count, the devices are sliced so that 18 BMX ASICs are needed to form the complete switch function.

The BMX ASIC includes:

- 8 bits of UPA 128, 4 bits of UPA 72, and 16 bits of DRAM bus per ASIC
- Switch connections controlled by SC

C.1.15.4 RISC

This 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 SYSIO ASIC. The RISC ASIC also integrates a JTAG controller. In cases where there are multiple processors, they are required to run at the same frequency. A 3-bit code is output by each processor module to indicate the speed for that module. Logic inside the RISC ASIC determines the minimum value of the processor codes, and outputs the selected value for the remaining clock logic to set the main system frequency.

The RISC ASIC:

- Determines system clock frequency
- Controls reset generation
- Provides JTAG
- Performs SBus and miscellaneous interrupt concentration for SYSIO
- Controls flash PROM programming, frequency margining, and lab console operation
- 25-MHz operation

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

C.1.15.5 FEPS

The fast Ethernet parallel port (FEPS) ASIC provides throughput for I/O devices connected to the Ethernet, SCSI, and parallel port interfaces. The FEPS ASIC consists of a frame buffer controller ASIC and a RAMDAC ASIC.

The FEPS ASIC:

- Integrates 20-Mbyte per second SCSI interface core with low system overhead
- Integrates 10-Mbit per second and 100-Mbit per second Ethernet
- Complies with IEEE 1496 SBus specification. Also provides for 64-bit SBus transfers
- Supports SBus extended transfer and 64-byte burst transfer
- Provides 25-MHz SBus operation

FBC

The frame buffer controller (FBC) ASIC is the graphics draw ASIC that interfaces to the UPA and to the UPA graphics FBRAM. The FBC ASIC provides graphics draw acceleration.

The FBC ASIC:

- Includes a UPA slave device with write-mostly philosophy
- Supports single-buffered and double-buffered with Z buffer configurations
- Interfaces with 3DRAM to achieve accelerated graphics performance
- Supports frame buffer to frame buffer copy
- Supports viewport clipping, picking, and pixel processing
- Supports byte, plane masks, raster operations, blend operations, and conditional writes in 3DRAM

RAMDAC

The RAM digital-to-analog converter (RAMDAC) ASIC is listed for reference. It is being designed in conjunction with an outside vendor.

The RAMDAC ASIC includes:

- Built-in VTG
- Direct interface to FBRAMs
- On-board phase-lock loop (PLL) and clock generator circuitry for the pixel clock
- 64 X 64 cursor LUT
- Direct support for X visual types

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

C.1.15.6 SLAVIO

The slave I/O (SLAVIO) ASIC provides most of the Sunness I/O requirements. It contains serial ports, floppy control, and extended bus (EBus) control.

The SLAVIO ASIC includes:

- Highly integrated for supplying Sunness I/O requirements
- Integrated keyboard/mouse interface
- Compliance with IEEE 1496 SBus specification
- 25-MHz SBus operation

C.1.15.7 CBT

The memory data multiplexer and de-multiplexer (CBT) ASIC is a two-port switch between a 576-bit memory bus (DSIMM side) and 288-bit memory bus (BMX side). To maintain a manageable pin count, the CBT ASICs are sliced into 18 parts to form the complete switch function.

The CBT ASIC provides:

- 16 bits of MEMORY 288 bus and 32 bits of DRAM bus per ASIC
- 5-VDC power supply voltage
- Switch connections controlled by SC_MP ASIC

C.2 Power Supply

The following table lists power budgets for the Ultra 2 series desktop workstation and the Ultra Enterprise 2 server power supply.

The power supply provides:

- Remote sensing on +3.0 VDC, +3.3 VDC, and +5.0 VDC
- Six cables that are required for power distribution: one to the CD-ROM drive, one to the diskette drive, and four to the motherboard
- A programmable supply that ranges from 2.5 VDC to 3.5 VDC. The programmable voltages are controlled by the CPU module(s) to permit CPU modules having different core voltages to operate conjointly within the same system unit or server.

Note – Motherboard cables consist of two for the programmable voltages, one for other voltages, and one for sensing.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Note – Power values listed in the following table translate to worse-case current requirements. Peak current requirements are greater. Note that the amount of power dissipated as heat is not listed. Also, the maximum delivered power is not the same as the sum of the output powers because of configuration restrictions and peripheral power-dissipation limits that are smaller than peak current requirements. All component power supply budget values are measured as a function of wattage.

TABLE C-6 Ultra 2 Series Workstation / Server Power Supply Budget

Component	3.3VDC	Programmable (2x)	5VDC	+12VDC	-12VDC	Maximum Power Delivered
UltraSPARC module (2x)[1]	30.0	70.0	0.0	0.0	0.0	100.0
Memory	0.0	0.0	45.0	0.0	0.0	45.0
Graphics (double-buffer, desktop workstation only)	16.0	0.0	2.5	0.5	0.0	19.0
Motherboard	12.3	0.0	6.6	17.7	0.5	37.1
SBus (4 slots)	0.0	0.0	40.0	4.8	4.8	40.0
Disks (2x)	0.0	0.0	15.0 (or less)	28.8 (or less)	0.0	30.0
CD-ROM drive	0.0	0.0	6.0 (or less)	12.0 (or less)	0.0	12.0
4-mm tape drive	0.0	10.0	5.5	6.0	0.0	10.0
8-mm tape drive	0.0	0.0	12.0	8.4	0.0	15.0
Diskette drive	0.0	0.0	1.5	0.0	0.0	1.5
Keyboard / mouse (desktop workstation only)	0.0	0.0	1.6	0.0	0.0	1.6
Output sized to	182.0	80.0	125.0	76.5	4.1	
Total						311.2

1. Power supply budget measurements for two 168-MHz UltraSPARC modules. Power supply budget values for two 200-MHz UltraSPARC modules are somewhat less.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

C.3 Power Management

To meet EPA Energy Star requirements, the system unit power consumption is lower than 30 watts.

In system unit software monitors system unit activity and based on the system unit control settings, system unit software saves the machine state (including the memory) onto the hard drive and halts the operation system. The system unit software then turns off the power supply.

Based on the setting of the NVRAM/TOD, which has an alarm clock, the system unit is turned on automatically if the alarm is set. This is done by having the interrupt out of the NVRAM/TOD directly connected to the power supply. The power supply requires a power_off signal for the system unit software to be able to write to a bit within a register and have the power supply shut down.

Note – If you experience RED State Exception failures when exercising Energy Star suspend/resume functions, install patch 104729-01. An alternative is to install the Solaris 2.5.1 Hardware: 4/97 release, which also incorporates a correction to this problem.

C.4 Motherboard

The following figure illustrates a block diagram of the Ultra 2 series motherboard.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

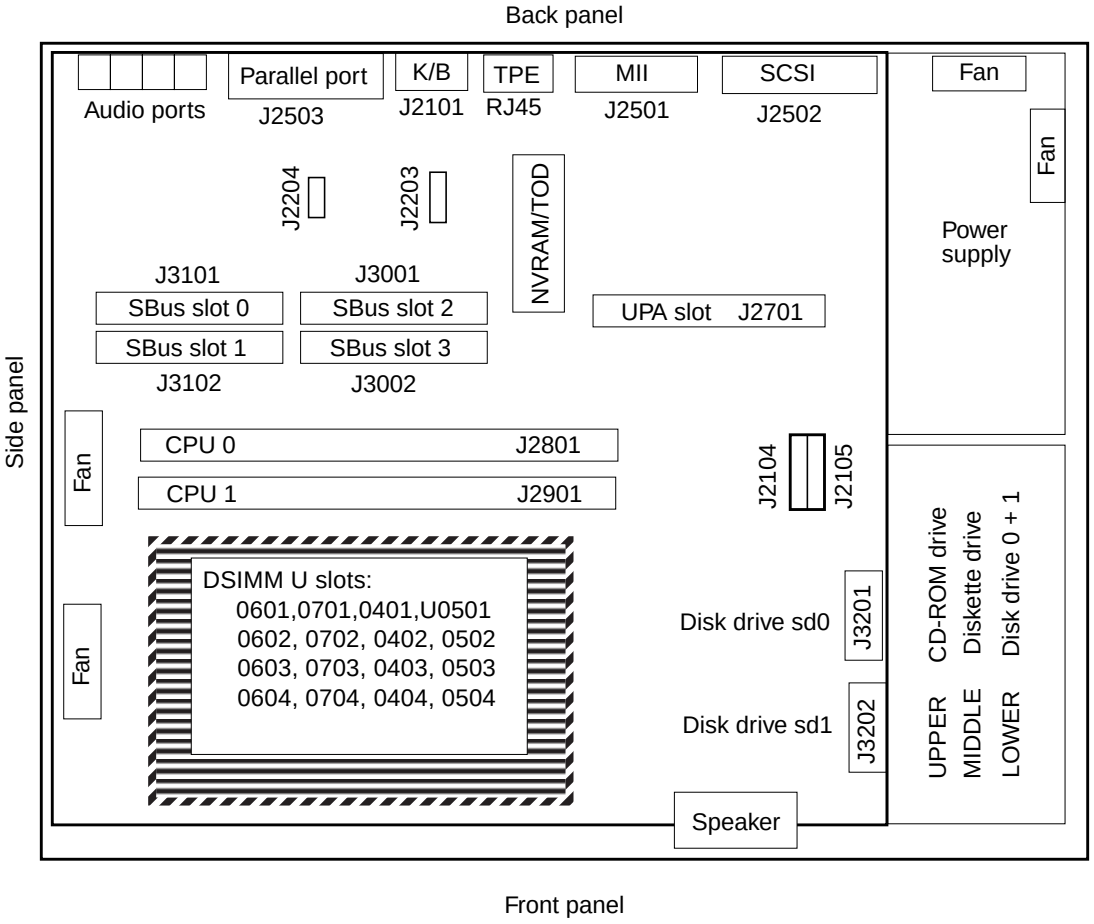


FIGURE C-6 Ultra 2 Series Motherboard Block Diagram

C.5 Jumper Description

Jumper configurations can be changed by setting jumper switches on the motherboard. The motherboard's jumpers are preset at the factory.

A jumper switch is *closed* (sometimes referred to as shorted) with the plastic cap inserted over two pins of the jumper. A jumper is *open* with the plastic cap inserted over one or no pin(s) of the jumper. The following figure shows the different jumper settings that are used on the motherboard.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

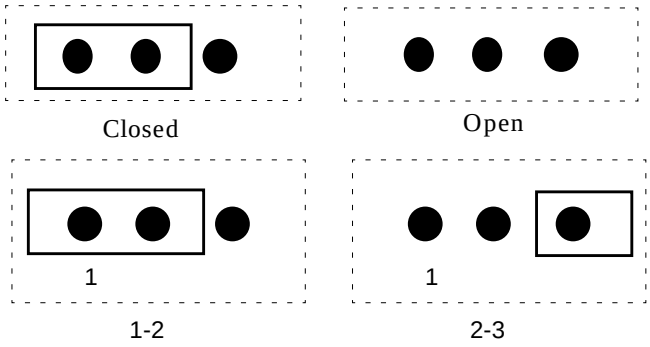


FIGURE C-7 Selected Jumper Settings

The jumper description includes a brief overview of serial port jumpers, flash PROM jumpers, and additional motherboard jumpers and connector blocks.

Jumpers are identified on the motherboard by J designations. The following figure distinguishes jumpers with identifying asterisks. Jumper pins are located immediately adjacent to the J designator. Pin 1 is marked with an asterisk in any of the positions shown by the following figure. Ensure that the serial port jumpers are set correctly.

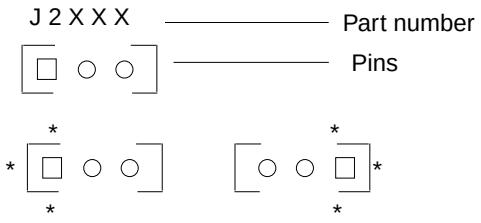


FIGURE C-8 Identifying Jumper Pins

C.5.1 Serial Port Jumpers

Serial port jumpers J2104 and J2105 can be set to either RS-423 or RS-232 serial interface. The jumpers are preset for RS-423. RS-232 is required for digital telecommunication within the European Community. The following table identifies serial port jumper settings. If the system is being connected to a public X.25 network, the serial port mode jumper setting may need to change from RS-423 to RS-232 mode.

To change the serial port mode jumper setting:

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

1. **Power off the system unit.**

   See Section 6.2 “Powering Off the System Unit” on page 6-2.

2. **Remove the system unit cover.**

   See Section 7.1 “Removing the System Unit Cover” on page 7-1.



Caution – Use proper ESD grounding techniques when handling components. Wear an antistatic wriststrap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing it on any surface.

3. **Attach the wrist strap.**

   See Section 7.2 “Attaching the Wrist Strap” on page 7-3.

4. **Locate the jumpers on the motherboard and change the selection of jumpers J2104 and J2105 to position B.**

5. **Detach the wrist strap.**

6. **Replace the system unit cover.**

   See Section 7.3 “Replacing the System Unit Cover” on page 7-4.

7. **Power on the system unit.**

   See Section 6.1 “Powering On the System Unit” on page 6-1.

TABLE C-7 Serial Port Jumper Settings

Jumper	Pins 1 + 2 Select	Pins 2 + 3 Select	Default Jumper on Pins	Signal Controlled
J2104	RS-232	RS-423	2 + 3	RS-232 / RS-423 SEL
J2105	RS-232	RS-423	2 + 3	RS-232 / RS-423 SEL

C.5.2 Flash PROM Jumpers

Flash PROM jumpers J2202, J2203, and J2204 permit the reprogramming of specific code blocks. The following table identifies the flash PROM jumper settings. The default setting of J2202 through J2204 is located on pins 1 and 2. The following table identifies the signals controlled by the non-default settings of jumpers J2203 and J2004.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Note – After reprogramming the system flash PROMs, verify that the flash PROM Write Protect/Enable jumper (J2203) is set to the Write Protect position to ensure system security.

TABLE C-8 Flash PROM Jumper Settings

Jumper	Pins 1 + 2 Select	Pins 2 +3 Select	Default Jumper on Pins	Signal Controlled
J2202	Flash PROM	Not to be used	1 + 2	FLASH PROM SEL
J2203	Write protect	Write enable	1 + 2	FLASH PROM PROG ENABLE
J2204	High half booting	Normal booting	2 + 3	XOR LOGIC SET

C.5.3 Additional Motherboard Jumper Blocks

Additional motherboard jumper blocks are identified in the following table and are listed for information purposes only.

Note – Do not attempt to add jumpers to jumper blocks identified in the following table.

TABLE C-9 Additional Motherboard Jumper Blocks

Jumper Block ID	Description
J2103	Enable test edge serial ports enable (manufacturing only)
J2201	External reset: jumper pin 1 to pin 2 to force XIR reset; jumper pin 2 to pin 3 to force POR reset
J2202	Manufacturing ROMBO connector
J2203	Manufacturing JTAG/Scan test connector
J3402	Enable test edge ethernet port (manufacturing only)
J3403	Enable test edge ethernet port (manufacturing only)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

C.6 Enclosure

The Sun Ultra 2 series uses an enclosure that reflects style, ergonomics, serviceability, functionality, versatility, and quality. The physical orientation of the enclosure enables you to install it in a rack-mount or desktop position. The enclosure design complies with all necessary environmental and regulatory specifications.

C.6.1 Enclosure Basics

Overall dimensions of the enclosure are (height x width x depth) are 17.72 inches x 5.12 inches x 17.48 inches (45 cm x 13 cm x 44 cm). The enclosure houses:

- One 3.5-inch (8.89-cm) diskette drive
- One 1.6-inch (4.064-cm) CD-ROM drive in an industry standard 1.6-inch bay

---

Note – The CD-ROM drive slot is used for either the CD-ROM drive or optional 4-mm and 8-mm tape drives.

- Two 1-inch (2.54-cm) single-connector 3.5-inch (8.89-cm) hard drives
- Two plug-in UltraSPARC modules
- Sixteen DSIMMs
- Four SBus modules
- One UPA64S graphics module

C.6.2 Enclosure Features

Enclosure features include:

- Good service access for internal upgrades and field replaceable units (FRUs)
- Optimized motherboard layout
- Graphics expansion module (UPA64S connector)
- Processors placed on plug-in modules. Allows for upgrades and conversion from UP to MP system
- Four SBus cards in a 2 x 2 configuration
- All standard connectors and no splitter cables on the rear panel

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

C.7 Environmental Compliance

The Ultra 2 series meets or exceeds the specifications defined by the “Controlled Office” classification of the 990-1146-03, Rev A document.

C.8 Agency Compliance

The Ultra 2 series complies with international and domestic regulatory requirements for safety, ergonomics, EMI, immunity, electrical, and telecommunication.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Glossary

ADC Analog-to-digital converter. A device that translates analog signals to digital signals.

address A number used by the system software to identify a storage location.

address bus A hardware pathway, typically consisting of from 20 to 32 separate lines, that carries the signals specifying locations in a computer's memory. The address bus enables the microprocessor to select a specific location in memory for transfer of data through the data bus.

ALU Arithmetic logic unit. A part of a computer that performs arithmetic, logical, and related operations.

ANSI American National Standards Institute. An organization that reviews and approves product standards in the United States.

ASCII American standard code for information interchange. The standard binary encoding of alphabetical characters, numbers, and other keyboard symbols.

ASIC Application-specific intergrated circuit. A gate array or other non-standard chip design for proprietary use.

asynchronous Without regular time relationship; unexpected and unpredictable with respect to the execution of a program's instructions.

Audio port A circuit to which the computer sends signals to be output as audible tones. The circuit is a DAC.

AUI Attachment unit interface. A special port built into some SPARCstation system units that attaches the system unit to a Sun SpeakerBox or to a thick Ethernet network.

bandwidth A measure of the volume of information that can be transmitted over a communications link.

baud rate The rate at which information is transmitted between devices; for example, between a terminal and the computer. Often incorrectly assumed to indicate the number of bits per second (bps) transmitted, baud rate actually measures

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

the number of events, or signal changes, that occur in 1 second. Because one event can actually encode more than one bit in high-speed digital communications, baud rate and bits per second are not always synonymous, and the latter is the more accurate term to apply to modems. For example, a so-called 9600-baud modem that encodes four bits per event actually operates at 2400 baud but transmits 9600 bits per second (2400 events times 4 bits per event) and thus should be called a 9600-bps modem.

BMX Buffered memory crossbar. Provides a three-port crossbar connecting a 144-bit UPA data bus, a 288-bit-wide DRAM memory bus, and a 72-bit UPA data bus.

boot Sometimes referred to as “bootstrap”. To load the system software into memory and start it running.

boot PROM Contains the PROM monitor program, a command interpreter used for booting, resetting, low-level configuration, and simple test procedures.

bus (1) A circuit over which data or power is transmitted, one that often acts as a common connection among a number of locations. (2) A set of parallel communication lines that connect the major components of a computer system, including CPU, memory, and device controllers.

CBT Memory data multiplexer and de-multiplexer. A two-port switch electrically connected between a 576-bit memory bus (DSIMM side) and a 288-bit memory bus (BMX side).

CD-ROM Compact disc, read-only memory. A form of storage characterized by high capacity (roughly 600 megabytes) and the use of laser optics rather than magnetic means for reading data.

chip (1) A small chunk of silicon bearing the equivalent of a large number of electrical components. (2) An integrated circuit (IC).

CMOS Complementary metal-oxide semiconductor. A semiconductor device that uses both NMOS (negative polarity) and PMOS (positive polarity) circuits. Since only one of the circuit types is on at any given time, CMOS chips require less power than chips using just one type of transistor. This makes them particularly attractive for use in battery-powered devices, such as portable computers. Personal computers also contain a small amount of battery-powered CMOS memory to hold the date, time, and system setup parameters.

codec An encoder-decoder.

console A terminal, or a dedicated window on the screen, where system messages are displayed.

CRC Cyclic redundancy check. An error check in which the check key is generated by a cyclic algorithm.(2) A system of error checking performed at both the send and receiving station after a block-check character (BCC) has been accumulated.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

DAC Digital-to-analog converter. A mechanical or electronic device used to convert discrete digital numbers to continuous analog signals.

data bus A set of hardware lines (wires) used for data transfer among the components of a computer system.

DBZ Double-buffer plus Z.

DCE Data communication equipment. A type of hardware, such as a modem, that is responsible for encoding a digital signal for delivery to a compatible DCE connected by a data link.

default An alternative value, attribute, or option assumed when none has been specified.

diagnostics The diagnostic firmware contained in the boot PROM. These diagnostics include the Power-On Self Test (POST) and on-board diagnostics.

DMA Direct memory access. The transfer of data directly into memory without supervision of the processor. The data is passed on the bus directly between the memory and another device.

dpi Dots per inch.

DPS Data path scheduler. Controls all data flow coordinating the activity of the BMX chips.

DRAM Dynamic random-access memory. A read/write dynamic memory in which the data can be read or written in approximately the same amount of time for any memory location.

DSIMM DRAM single in-line memory module. A small printed circuit card that contains dynamic random access memory (DRAM) chips.

DTAG Dual tag or data tag.

DTE Data terminal equipment. That part of a data station that serves as a data source, data sink, or both, and provides for the data communication control function according to protocols.

ECC Error checking and correction. The detection, in the processing unit, and correction of all single-bit errors, plus the detection of double-bit and some multiple-bit errors.

EEPROM Electrically erasable PROM. A non-volatile PROM that may be written to as well as read from. An EEPROM is used to hold information about the current system configuration, alternate boot paths, and so on.

EMI Electromagnetic interference. An electromagnetic phenomena which, either directly or indirectly, can contribute to a degradation in performance of an electronic system.

ESD Electrostatic discharge.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Ethernet A type of network hardware that permits communications between systems connected directly together by transceiver taps, transceiver cables, and coaxial or twisted-pair cables.

FBC Frame buffer controller. Provides the interface between the UPA and the frame buffer RAM (FBRAM). Also controls graphic draw acceleration.

FBRAM Frame buffer RAM. A special type of dynamic RAM (DRAM) used in high-speed frame buffers. Similar to video RAM, FBRAM is specifically designed for use in high-speed frame buffers and graphics accelerators.

FEPS Fast Ethernet parallel interface. Provides data throughput for I/O devices connected to Ethernet, SCSI, and parallel port interfaces.

FFB Fast frame buffer. Circuit card consisting of the FBC, FBRAM, RAMDAC, and associated circuitry.

Gbyte Gigabyte. One billion bytes.

GUI Graphical user interface. The graphical user interface, or GUI, provides the user with a method of interacting with the computer and its special applications, usually via a mouse or other selection device. The GUI usually includes such things as windows, an intuitive method of manipulating directories and files, and icons.

I/O Input/output. Refers to equipment used to communicate with a computer, the data involved in that communication, the media carrying the data, and the process of communicating that information.

ISO International Organization for Standardization. An international agency that reviews and approves independently designed products for use within specific industries. ISO is also responsible for developing standards for information exchange.

Kbyte Kilobyte. A unit of measure equal to 1024 bytes.

LED Light-emitting diode. A semiconductor diode that radiates light when the junction is forward biased and there is sufficient current through the diode.

Mbps Megabits-per-second.

Mbyte Megabyte. One million bytes.

MHz Megahertz. One million cycles per second.

MII Media independent interface. A 40-pin miniature-D connector that provides the electrical interface between some Sun systems and 10BASE-T or 100BASE-T Ethernet network transceivers.

MMU Memory management unit. The hardware that supports the mapping of virtual memory addresses to physical addresses.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Modem Modulator/demodulator. A device that enables a machine or terminal to establish a connection and transfer data through telephone lines. Because a computer is digital and a telephone line is analog, modems are needed to convert digital into analog and vice versa. When transmitting, modems impose (modulate) a computer's digital signals onto a continuous carrier frequency on the telephone line. When receiving, modems sift out (demodulate) the information from the carrier and transfer it in digital form to the computer.

Monitor: The video display that is part of a workstation. The term monitor usually refers to a video display and its housing. The monitor is attached to the workstation by a cable.

motherboard (1) The main circuit board containing the primary components of a computer system to which other boards may be attached. (2) In SBus terminology, a circuit board containing the central processor, SBus controller, and any SBus expansion connectors.

NVRAM Nonvolatile random access memory. A type of RAM that retains information when power is removed from the system.

OBP Open boot PROM. A program or routine used to locate and diagnose trouble in computer hardware or software.

PID Process ID. A unique, system-wide, identification number assigned to a process.

POST Power-on self-test. A set of routines stored in a computer's read-only memory (ROM). POST tests various system components such as RAM, disk drives, and keyboard to see if they are properly connected and operating.

RAMDAC Random-access memory digital-to-analog converter. A digital-to-analog converter that additionally contains tables for translating input digital color values.

RISC Reset, interrupt, scan, and clock. An ASIC responsible for reset, interrupt, scan, and clock functions.

RJ-45 connector A modular cable connector standard, used with consumer telecommunications equipment.

RMS Root mean square. A measure of a signal's average power.

RS-232-C standard An industry standard for serial communications connections. Adopted by the Electronic Industries Association (EIA), this standard defines the characteristics for serial communications between devices.

RS-423 The Electronics Industry Association standard defining interface voltage and current levels and other signal characteristics for connecting digital equipment to a transmission line.

SCSI Small computer system interface. An industry standard bus used to connect disk and tape devices to a workstation.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Slavio Slave I/O. Provides most of the Sunness I/O requirements. Contains serial ports, floppy control, and extended bus (EBus) control.

SC_MP Multiprocessing system controller.

S/N Signal-to-noise.

SunVTS Sun validation and test suite applications. A diagnostic tool designed to test Sun hardware.

sync (1) The process of synchronizing the scanning of receiving, processing, or display equipment with a video source. (2) A signal comprising the horizontal and vertical elements necessary to accomplish synchronization. (3) The component of a video signal that conveys synchronizing information.

synchronous Under control of a clock or timing mechanism.

SYSIO System I/O controller. Provides an electrical bridge between the UPA and the SBUS.

System unit The part of a workstation that contains the central processing unit (CPU), the disk, and other devices essential to operate the system.

TCP/IP Transport control protocol/interface program. The protocol suite originally developed for the Internet. It is also called the Internet protocol suite.

Thinnet Also known as 10BASE2, an Ethernet technology that evolved as a more cost effective method of computer interconnection than 10BASE5. A 10BASE2 network has a data transfer rate of 10 megabits per second and uses a thinner cable, but supports individual network segments of only 185 meters (607 yards).

TOD Time-of-day clock chip. A clock chip that contains the system date and time (year-month-day-hour-minutes).

TPE Twisted-pair Ethernet. Provides 10-Mbps or 100-Mbps networking.

TTL Transistor-transistor logic. A digital system semiconductor logic gate circuit design comprised of multiple emitter input transistors, a unique dual-mode coupling transistor, and a transistor totem pole output.

UPA Ultra port architecture.

UART Universal asynchronous receiver-transmitter. A device that contains both the receiver and transmitter circuits required for asynchronous serial communications.

VIS Visual instruction set.

VOM Volt-ohm-milliammeter. A multifunction, multirange instrument for troubleshooting and maintaining electrical and electronic equipment. It measures voltage, current, and resistance. Also called a multimeter.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

VTSK VTS Kernel. Part of SunVTS. Controls all testing. Used to probe the hardware configuration of the system and wait for instructions from the user interface.

VTSUI VTS Open Look User Interface. Part of SunVTS. Allows various user options, tests, read-log files, and start or stop testing sessions to be selected through the numerous buttons and windows of OpenWindows.

VTSTALK VTS Script Interface. Part of SunVTS. Allows individual commands to be transmitted and status messages to be received from `vtsk` without initiating a user interface.

VTS_CMD VTS Command. Part of SunVTS. Identical to VTSTALK.

Z-buffer The depth buffer in 3-D graphics. The Z-buffer memory locations, like those in the frame buffer, correspond to the pixels on the screen. The Z-buffer, however, contains information relating only to the z-axis (or depth axis). The Z-buffer is used in hidden surface removal algorithms, so that for each pixel written, the depth of that pixel is stored in the Z-buffer. When subsequent objects attempt to draw to that pixel, that object's z value is compared with the number in the Z-buffer, and the write is omitted if the object is farther away from the eye.

10BASE-T An evolution of Ethernet technology that succeeded 10BASE5 and 10BASE2 as the most popular method of physical network implementation. A 10BASE-T network has a data transfer rate of 10 megabits per second and uses unshielded twisted-pair wiring with RJ-45 modular telephone plugs and sockets.

100BASE-T Also known as Fast Ethernet, an Ethernet technology that supports a data transfer rate of 100 megabits per second over special grades of twisted-pair wiring. 100BASE-T uses the same protocol as 10BASE-T. There are three subsets of the 100BASE-T technology: 100BASE-TX defines digital transmission over two pairs of shielded twisted-pair wire. 100BASE-T4 defines digital transmission over four pairs of unshielded twisted-pair wire. 100BASE-TX defines digital transmission over fiber optic cable.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Index

NUMERICS

4-mm tape drive
  removing, 9-7
  replacing, 9-8
8-mm tape drive
  removing, 9-7
  replacing, 9-8

A

about this book, xix
additional
  keyboard control commands, 3-14
  motherboard jumper blocks, C-32
agency compliance, C-34
ASIC
  FBC, C-25
  RAMDAC, C-25
ASICS
  BMX, C-24
  CBT, C-26
  FEPS, C-25
  RISC, C-24
  SC_MP, C-23
  SLAVIO, C-26
  SYSIO, C-24
ASICs, C-22
attaching wrist strap, 7-3
audio, C-20
  built-in speaker, C-22
  interface, C-20
  microphone, C-22
  port connectors
    jack configuration, B-9
    line assignments, B-9
    signal description, B-8

B

baud rate, verifying, 3-4
BMX, C-24
built-in speaker
  specifications, C-22
built-in speaker, audio, C-22
bypassing POST, 3-14

C

CBT, C-26
CD-ROM drive, C-9
  failure, 4-3
  removing, 9-7
  replacing, 9-8
chassis bracket
  removing, 9-4
  replacing, 9-5
checking link test, C-16
compliance
  agency, C-34
  environmental, C-34
connectivity
  keyboard, C-18
  modem, C-18
  mouse, C-18
  printer, C-20

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

terminal, C-18
connector pin assignments
fast/wide SCSI connector, B-6
keyboard connector, B-2
MII connector, B-12
mouse connector, B-2
parallel port connector, B-10
serial port A connector, B-3
serial port B connector, B-3
TPE connector, B-5
UPA graphics card connector, B-13
correct way to seat DSIMM, 10-20
CPU module
locations, 10-2
removing, 10-1, 10-3
replacing, 10-3

D

description
functional, C-1
jumper, C-29
product, 1-1
signal, B-1
SunVTS, 2-1
desktop overview, I/O devices, 1-3
diag-level flag setting, 3-2
diag-level NVRAM variable
set to max, 3-6
set to min, 3-11
diag-level switch? flag setting, 3-2
diagnostic output message
probe-scsi-all, 4-13
test, 4-14
watch-clock, 4-11
watch-net, 4-12
disabling link test, C-16
diskette drive, C-9
cable
removing, 8-8
replacing, 8-9
removing, 9-9
replacing, 9-11
document organization, xix
drive identification, internal, 4-3
DSIMM
correct way to seat, 10-20
ejection lever, 10-18
failure, 4-8
incorrect way to seat, 10-20
installation location, 10-17
physical memory addresses, 4-10
physical memory addresses (16-Mbyte DSIMM), 4-8
physical memory addresses (32-Mbyte), 4-9
physical memory addresses (64-Mbyte), 4-9
removing, 10-17
replacing, 10-18

E

electrical specifications, A-2
electrostatic discharge, 5-3
Elite3D, installing, 10-14
enclosure
basics, C-33
features, C-33
environmental
compliance, C-34
specifications, A-3
error reporting, POST, 3-12

F

failure
DSIMM, 4-8
power-on, 4-1
fast/wide SCSI connector
pin assignments, B-6
pin configuration, B-6
signal description, B-6
FBC, C-25
FEPS, C-25
flag setting, diag-level switch?, 3-2
flash PROM
jumper, C-31
jumper settings, C-32
functional
block diagram
server, C-2
system unit, C-2
description, C-1

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

G

graphics, C-7
  card features, C-7
  card performance, C-8
  not supported, C-8

H

hard drive, C-9
  failure, 4-3
  removing, 9-1
  replacing, 9-3
  supported, C-10
hardware switch, C-16
host, C-13
hub, C-13

I

I/O devices, 1-3
identifying jumper pins, C-30
IEEE, C-13
imaging, C-7
incorrect way to seat DSIMM, 10-20
initializing POST, 3-4
installing Elite3D, 10-14
interface, audio, C-20
internal drive identification, 4-3

J

J3203
  connector pin assignments, 4-5
  power supply connector, 4-5
J3204
  connector pin assignments, 4-5
  power supply connector, 4-5
J3205
  connector pin assignments, 4-6
  power supply connector, 4-6
J3206
  connector pin assignments, 4-7
  power supply connector, 4-7
jack configuration, audio port connectors, B-9
jumper
  description, C-29
  flash PROM, C-31
  identifying pins, C-30
  serial port, C-30
  settings, selected, C-30

K

keyboard
  connectivity, C-18
  connector
    pin assignments, B-2
    pin configuration, B-2
    signal description, B-1
  control commands, additional, 3-14
  LEDs, 3-15

L

LAN, C-13
LED power, 3-15
LEDs, 3-5
  keyboard, 3-15
  system, 3-15
line assignments, audio port connectors, B-9
link test
  checking, C-16
  disabling, C-16
lithium battery, 5-3
lock block location, 7-2

M

major subassemblies, 8-1
maximum level of POST, 3-6
memory, C-5
microphone, audio, C-22
MII connector
  pin assignments, B-12
  pin configuration, B-12
  signal description, B-11
minimum level of POST, 3-6
modem connectivity, C-18
modification to equipment, 5-2
motherboard, 10-20, C-28
  initializing POST, 3-15
  jumper blocks, additional, C-32

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

removing, 10-21, 10-23
replacing, 10-24
mouse
connectivity, C-18
connector
pin assignments, B-2
pin configuration, B-2
signal description, B-1

N

networking, C-12
NVRAM/TOD
location, 10-5
removing, 10-4
replacing, 10-5

O

OBP
on-board diagnostics, 4-10
probe-scsi, 4-13
probe-scsi-all, 4-13
selected tests, 4-15
test, 4-14
UPA graphics card, 4-15
watch-clock, 4-11
watch-net, 4-11
watch-net-all, 4-12
operation, SunVTS, 2-2
optional
4-mm tape drive, C-12
8-mm tape drive, C-12
organization, document, xix
overview
POST, 3-1
server, C-1
system unit, C-1
Ultra 2 series, 1-1

P

parallel port connector
pin assignments, B-10
pin configuration, B-10
signal description, B-9
peripherals, C-8
4-mm tape drive, C-12
8-mm tape drive, C-12
CD-ROM drive, C-9
diskette drive, C-9
hard drive, C-9
SCSI interface, C-10
pin assignments
J3203 connector, 4-5
J3204 connector, 4-5
J3205 connector, 4-6
J3206 connector, 4-7
pin configuration
fast/wide SCSI connector, B-6
keyboard connector, B-2
MII connector, B-12
mouse connector, B-2
parallel port connector, B-10
serial port A connector, B-3
serial port B connector, B-3
TPE connector, B-5
UPA graphics card 13W3 connector, B-13
placement of Sun product, 5-2
POST
bypassing, 3-14
error reporting, 3-12
initializing, 3-4
maximum level, 3-6
minimum level, 3-6
motherboard, initializing, 3-15
overview, 3-1
progress reporting, 3-12
power cord connection, 5-3
power supply, C-26
connector
J3203, 4-5
J3204, 4-5
J3205, 4-6
J3206, 4-7
removing, 8-1, 8-3
replacing, 8-3, 8-5
test, 4-4
power, LED, 3-15
powering off system unit, 6-2
powering on system unit, 6-1
power-on
failure, 4-1
self-test, 3-1
preparing to remove UPA graphics card, 10-13

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

pre-POST preparation, 3-2
  setting up tip connection, 3-2
  verifying baud rate, 3-4
PrestoServe 2.4.2, C-4
printer connectivity, C-20
probe
  SCSI diagnostic, 4-13
  SCSI-all diagnostic, 4-13
probe-scsi-all diagnostic output message, 4-13
procedures, troubleshooting, 4-1
processor
  UltraSPARC I, C-4
  UltraSPARC II, C-4
product
  description, 1-1
  specifications, A-1
progress reporting, POST, 3-12

R

RAMDAC, C-25
rear view
  system unit, 6-2
removing
  4-mm tape drive, 9-7
  8-mm tape drive, 9-7
  CD-ROM drive, 9-7
  chassis bracket, 9-4
  CPU module, 10-1, 10-3
  diskette drive, 9-9
  diskette drive cable, 8-8
  DSIMM, 10-17
  hard drive, 9-1
  motherboard, 10-21, 10-23
  NVRAM/TOD, 10-4
  power supply, 8-1, 8-3
  SBus card, 10-6, 10-7
    extractor, 10-10
  SBus card adapter, 10-9
  SCSI cable, 8-5
  shroud assembly, 8-10, 8-11
    speaker, 8-12, 8-13
  system unit cover, 7-1, 7-2
  UPA graphics card, 10-11, 10-13
replaceable components, system unit, 1-5
replacement
  component, 10-1
  motherboard, 10-1
replacing
  4-mm tape drive, 9-8
  8-mm tape drive, 9-8
  CD-ROM drive, 9-8
  chassis bracket, 9-5
  CPU module, 10-3
  diskette drive, 9-11
  diskette drive cable, 8-9
  DSIMM, 10-18
  hard drive, 9-3
  motherboard, 10-24
  NVRAM/TOD, 10-5
  power supply, 8-3, 8-5
  SBus card, 10-8, 10-11
  SCSI cable, 8-7
  shroud assembly, 8-11
    speaker, 8-13
  system unit cover, 7-4
  UPA graphics card, 10-13, 10-15
RISC, C-24

S

safety
  precautions, 5-2
    electrostatic discharge, 5-3
    lithium battery, 5-3
    modification to equipment, 5-2
    placement of a Sun product, 5-2
    power cord connection, 5-3
  requirements, 5-1
SBus, C-3
SBus card
  extractor, removing, 10-10
  removing, 10-6, 10-7
  replacing, 10-8, 10-11
SBus card adapter, removing, 10-9
SC_MP, C-23
SCSI
  cable
    removing, 8-5
    replacing, 8-7
  interface, C-10
seating UPA graphics card, 10-15
securing UPA graphics card in chassis, 10-16
selected jumper settings, C-30
serial port
  jumper, C-30

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

serial port A connector
pin assignments, B-3
pin configuration, B-3
signal description, B-1
serial port B connector
pin assignments, B-3
pin configuration, B-3
signal description, B-1
server
functional block diagram, C-2
overview
memory, C-5
peripherals, C-8
SBus, C-3
UPA, C-3
setting up tip connection, 3-2
shroud assembly
processor area, 10-2
removing, 8-10, 8-11
replacing, 8-11
speaker
removing, 8-12, 8-13
replacing, 8-13
signal description, B-1
audio port connectors, B-8
fast/wide SCSI connector, B-6
keyboard connector, B-1
MII connector, B-11
mouse connector, B-1
parallel port connector, B-9
serial port A connector, B-1
serial port B connector, B-1
TPE connector, B-5
UPA graphics card 13W3 connector, B-13
SLAVIO, C-26
specifications
built-in speaker, C-22
electrical, A-2
environmental, A-3
product, A-1
star configuration, C-13
storage devices, 9-1
Sun
Type-5 keyboard, 3-5
Type-5 keyboard LEDs, 3-5
SunVTS
description, 2-1
operation, 2-2
supported hard drives, C-10
supported I/O devices, 1-3
symbols, 5-1
SYSIO, C-24
system
LEDs, 3-15
unit
components, 1-5
features, 1-4
system unit
cover
removing, 7-1, 7-2
replacing, 7-4
exploded view, 11-2
functional block diagram, C-2
overview, C-1
audio, C-20
audio interface, C-20
graphics, C-7
imaging, C-7
memory, C-5
networking, C-12
peripherals, C-8
SBus, C-3
UPA, C-3
powering off, 6-2
powering on, 6-1
rear view, 6-2
replaceable components, 1-5

T

terminal connectivity, C-18
test
diagnostic, 4-14
diagnostic, 4-14
all diagnostic, 4-14
power supply, 4-4
test diagnostic output message, 4-14
tip connection, setting up, 3-2
tools required, 5-4
TPE connector
pin assignments, B-5
pin configuration, B-5
signal description, B-5
troubleshooting procedures, 4-1
CD-ROM drive, 4-3
DSIMM, 4-8
hard drive, 4-3

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

OBP on-board diagnostics, 4-10
power supply, 4-4
power-on failure, 4-1
video output, 4-2

U

Ultra
2 series motherboard block diagram, C-29
2 series overview, 1-1
desktop system, 1-2
Enterprise 2 server, 1-2
UltraSPARC I processor, C-4
UltraSPARC II processor, C-4
UPA, C-3
UPA graphics card
13W3 connector
pin assignments, B-13
pin configuration, B-13
signal description, B-13
OPB on-board diagnostic, 4-15
preparing to remove, 10-13
removing, 10-11, 10-13
replacing, 10-13, 10-15
seating into socket, 10-15
securing in chassis, 10-16

V

verifying baud rate, 3-4
video output failure, 4-2

W

watch-clock diagnostic, 4-11
watch-clock diagnostic output message, 4-11
watch-net diagnostic, 4-11
watch-net diagnostic output message, 4-12
watch-net-all diagnostic, 4-12
wrist strap, attaching, 7-3

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group is an independent supplier of quality pre-owned equipment

Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

We buy equipment

Planning to upgrade your current equipment? Have surplus equipment taking up shelf space? We'll give it a new home.

Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

Artisan Scientific Corporation dba Artisan Technology Group is not an affiliate, representative, or authorized distributor for any manufacturer listed herein.

We're here to make your life easier. How can we help you today?

(217) 352-9330 | sales@artisantg.com | artisantg.com

ARTISAN® TECHNOLOGY GROUP