

SPARCstation 20 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.: 801-6189-12
Revision A, July 1996

Send comments about this document to: docfeedback@sun.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, 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 dérivées 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, le logo Sun, et 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.



Adobe PostScript

Contents

- 1. Product Description 1**
 - Standard Features 1
 - Subassemblies, Boards, and Components 2
 - Interior View 3
 - Rear View 4
 - Software Requirements 6
 - Internal Options 6
 - External Options 7

- 2. Troubleshooting Overview 9**
 - Default Boot Mode 9
 - Diagnostic Tools 11
 - OpenBoot PROM Diagnostics 12
 - SunDiag System Exerciser 14
 - Sun VTS 15

- 3. Power-On Self Test (POST) 17**
 - Normal Mode 17
 - Full Diagnostic Mode 17
 - Abbreviated Diagnostic Mode 19

Setting Up a <code>tip</code> Connection	19
POST Tests	20
POST Error Messages	23
Status LEDs and Indicators	23
Completing POST	25
4. Troubleshooting Procedures	27
Video Output Failure	28
Power-On Does Not Succeed	29
Power Supply Test	29
System Board Test	31
Caps Lock Key Fails to Flash During the POST	32
Disk Drive Errors	33
SIMM Errors	35
5. Safety and Tools Requirements	39
Safety Requirements	39
Symbols	40
System Precautions	41
Lithium Battery	42
Required Tools	42
Electrostatic Discharge (ESD) Precautions	42
6. Power On and Off	45
Removing Power from the System	45
Restarting the System While Troubleshooting	46
Reading Boot Messages	47
Turning On the Power	47
7. Internal Access	49

Removing the Cover	49
Attaching the Wrist Strap	50
Replacing the Cover	51
8. Removing and Installing Subassemblies	55
Power Supply	55
Removing the Power Supply	55
Installing the Power Supply	58
LED	60
Removing the LED	60
Installing the LED	63
Speaker	64
Removing the Speaker	64
Installing the Speaker	66
Fan Assembly	67
Removing the Fan	67
Installing the Fan	69
Removing the Fan DC Power Harness	74
Installing the Fan DC Power Harness	79
SCSI Backplane	83
Removing the SCSI Backplane	84
Installing the SCSI Backplane	87
SCSI Data Cable	88
Removing the SCSI Data Cable (SunCD 2Plus Drive-Type Chassis)	88
Installing the SCSI Data Cable (SunCD 2Plus Drive-Type Chassis)	91
Removing the SCSI Data Cable (SunCD 4 Drive-Type Chassis)	93

Installing the SCSI Data Cable (SunCD 4 Drive-Type Chassis)	96
DC Power Harness	97
Removing the DC Power Harness (SunCD 2Plus Drive-Type Chassis)	97
Installing the DC Power Harness (SunCD 2Plus Drive-Type Chassis)	102
Removing the DC Power Harness (SunCD 4 Drive-Type Chassis)	103
Installing the DC Power Harness (SunCD 4 Drive-Type Chassis)	106
Diskette Drive Cable	107
Removing the Diskette Drive Cable (SunCD 2Plus Drive-Type Chassis)	108
Installing the Diskette Drive Cable (SunCD 2Plus Drive-Type Chassis)	110
Removing the Diskette Drive Cable (SunCD 4 Drive-Type Chassis)	111
Installing the Diskette Drive Cable (SunCD 4 Drive-Type Chassis)	112
9. Storage Devices	117
Hard Disk Drive	117
Removing a Hard Disk Drive	117
Installing a Hard Disk Drive	120
CD-ROM Drive	123
Removing a CD-ROM Drive	123
Installing a CD-ROM Drive	124
Diskette Drive	126
Removing a Diskette Drive	127
Installing a Diskette Drive	132
10. System Board Overview	139
Preventing Damage	139
Handling System Boards and Assemblies	139
System Board Description	140
System Board FRUs	141

11. System Board and Component Replacement	143
MBus Module	143
Removing a Single-Wide MBus Module	143
Installing a Single-Wide MBus Module	146
Removing a Double-Wide MBus Module	147
Installing a Double-Wide MBus Module	149
SBus Card	152
Removing an SBus Card	152
Installing an SBus Card	156
DSIMMs, VSIMMs, and NVSIMMs	159
DSIMM	159
VSIMM	160
NVSIMM	161
Removing a SIMM	161
Installing a SIMM	163
Auxiliary Video Board	168
Removing an AVB	168
Installing an AVB	170
System Board	171
Removing the System Board	171
Jumper Settings	173
Installing the System Board	175
OpenBoot PROM	177
Removing an OpenBoot PROM	178
Installing an OpenBoot PROM	179
NVRAM/TOD	180
Removing a NVRAM/TOD	180

Installing a NVRAM/TOD 181

12. Illustrated Parts Breakdown 183

Replacement Parts List 183

Illustration of Selected FRUs 185

A. Product Specifications 191

Physical Specifications 191

Electrical Specifications 192

Environmental Specifications 194

B. Functional Description 195

System Overview 195

System Architecture 195

System Board 196

 SBus Card 197

 MBus Module 198

 MBus-to-SBus Interface 198

 Memory 198

 SBus-to-SCSI, Ethernet, and Parallel Interfaces 202

 SBus-to-External Bus Interface 203

 Clock Chip 204

C. System Board Connector Pinouts 205

Parallel Connector 205

AUI Connector 207

Keyboard and Mouse Connector 209

Serial Ports A and B Connector 210

Twisted-Pair Ethernet Connector 211

SCSI Connector 212

13W3 Connector	215
Audio Ports	216
Headphone Connector	217
D. SCSI Addresses	219
Disk Drives	219
E. Selected On-Board Diagnostics	221
test device alias, test device pathname	221
test-all	222
watch-clock	223
watch-net, watch-aui, watch-tpe, watch-net-all	224
probe-scsi, probe-scsi-all	226
test-memory	227
power-off	228
module-info	228
Glossary	229

Figures

FIGURE 1-1	SPARCstation 20 System	2
FIGURE 1-2	SPARCstation 20 System Exploded View	3
FIGURE 1-3	SPARCstation 20 System Overhead Interior View	4
FIGURE 1-4	SPARCstation 20 System Unit Rear View	5
FIGURE 2-1	Default Boot Mode (OpenBoot PROM Version 2.14 or Later)	10
FIGURE 3-1	System LED Location	24
FIGURE 3-2	Type-5 Keyboard Key LEDs	25
FIGURE 4-1	Power Supply Connector Pinouts	30
FIGURE 4-2	Power Supply and Power Supply Connector Location	31
FIGURE 4-3	System Board SIMM Slot Locations	36
FIGURE 5-1	Symbols Used in This Manual	41
FIGURE 6-1	Standby Switch	46
FIGURE 6-2	Power-On Switch	48
FIGURE 7-1	Lock Block Screw and Corner Screw	49
FIGURE 7-2	Removing the Cover	50
FIGURE 7-3	Grounding Wrist Strap to Power Supply	51
FIGURE 7-4	Replacing the Cover	52
FIGURE 7-5	Lock Block	52
FIGURE 7-6	Back Panel Corner Screw	53

FIGURE 8-1	Attaching a Wrist Strap to Back Panel and Removing the Power Supply	57
FIGURE 8-2	Power Supply and DC Power Harness	58
FIGURE 8-3	Power Supply Captive Screws	59
FIGURE 8-4	Connecting the DC Power Connector to the System Board	59
FIGURE 8-5	Speaker/LED Cable Detail	61
FIGURE 8-6	LED Light Pipe Detail	62
FIGURE 8-7	Speaker/LED Cable	63
FIGURE 8-8	Speaker Cover Detail	65
FIGURE 8-9	Speaker Connectors	66
FIGURE 8-10	Disconnecting the Fan DC Power Connector	68
FIGURE 8-11	Removing the Fan	69
FIGURE 8-12	Fan Assembly	70
FIGURE 8-13	Mounting the Fan Assembly	71
FIGURE 8-14	Securing the Fan Assembly Using the Fan Installation Tool	72
FIGURE 8-15	Connecting the Fan Assembly DC Power Connector	73
FIGURE 8-16	Securing the Fan Assembly DC Power Connector	74
FIGURE 8-17	Fan DC Power Harness	75
FIGURE 8-18	Fan DC Power Harness and Cable Restraint	76
FIGURE 8-19	Disconnecting the Fan Power Connector from the DC Power Connector	77
FIGURE 8-20	Lifting Fan DC Cable from the Cable Trough	78
FIGURE 8-21	Disconnecting the Fan Power Connector	79
FIGURE 8-22	CD-ROM Drive DC Power Connector Location	80
FIGURE 8-23	Connecting the Fan DC Power Connector	81
FIGURE 8-24	Routing Excess Cables in Cable Trough	82
FIGURE 8-25	Fan DC Power Connector	83
FIGURE 8-26	SCSI Backplane Sockets and Connectors	85
FIGURE 8-27	SCSI Backplane Screws	86
FIGURE 8-28	SCSI Backplane Bracket Tabs	87

FIGURE 8-29	Internal Cables and DC Power Connector (SunCD 2Plus Drive-Type Chassis)	89
FIGURE 8-30	Back Panel SBus Slots and Captive Screws	90
FIGURE 8-31	SCSI Backplane, SCSI Data, and DC Power Connectors	90
FIGURE 8-32	Cable Guide Detail	92
FIGURE 8-33	Internal Cables and DC Power Connector (SunCD 4 Drive-Type Chassis)	94
FIGURE 8-34	Removing the System Board	95
FIGURE 8-35	Attaching a Wrist Strap to Back Panel and Removing the Power Supply	98
FIGURE 8-36	Internal Cables and DC Power Connector (SunCD 2Plus Drive-Type Chassis)	99
FIGURE 8-37	Back Panel SBus Slots and Captive Screws	100
FIGURE 8-38	Detail of Cable Guide	101
FIGURE 8-39	SCSI Backplane, SCSI Data, and DC Power Connectors	102
FIGURE 8-40	Internal Cables and DC Power Connector (SunCD 4 Drive-Type Chassis)	104
FIGURE 8-41	Back Panel Captive Screws	104
FIGURE 8-42	Removing the System Board	105
FIGURE 8-43	Diskette Drive Cable Location	109
FIGURE 8-44	Diskette Drive Cable Plastic Tab	109
FIGURE 8-45	Pulling the Diskette Drive Cable Through the Drive Bracket Opening	110
FIGURE 8-46	System Board Cable Routing (SunCD 4 Drive-Type Chassis)	112
FIGURE 9-1	Location of Hard Disk Drives	118
FIGURE 9-2	Single Connector Hard Disk Drive	119
FIGURE 9-3	Removing a Hard Disk Drive	120
FIGURE 9-4	Installing a Hard Disk Drive	122
FIGURE 9-5	Removing the CD-ROM Drive	124
FIGURE 9-6	SunCD 2Plus Rear View and Jumper Settings	125
FIGURE 9-7	SunCD 4 Drive Rear View and Jumper Settings	125
FIGURE 9-8	Installing a CD-ROM Drive	126
FIGURE 9-9	Diskette Drive Location	127
FIGURE 9-10	CD-ROM Drive Filler Panel	128

FIGURE 9-11	Diskette Drive Power Cable	129
FIGURE 9-12	Diskette Drive Data Cable	130
FIGURE 9-13	Removing the Diskette Drive	131
FIGURE 9-14	Installing Grommets and Setting the Diskette Drive Switch	131
FIGURE 9-15	Unseating the Diskette Drive Grommets	132
FIGURE 9-16	Setting the Diskette Drive Microswitch	133
FIGURE 9-17	Moving the SCSI Disk Cable and the CD-ROM Drive Power Cable	133
FIGURE 9-18	Diskette Drive Power Cable (P4)	134
FIGURE 9-19	Installing the Diskette Drive	134
FIGURE 9-20	Connecting the Diskette Drive Power Cable	135
FIGURE 9-21	Connecting the Diskette Drive Data Cable	136
FIGURE 9-22	Installing the CD-ROM Drive Filler Panel	137
FIGURE 10-1	System Board	141
FIGURE 10-2	Exploded View of the System Board	142
FIGURE 11-1	MBus Module Retainers	144
FIGURE 11-2	Extractor Installation on a Single-Wide MBus Module	145
FIGURE 11-3	Removing a Single-Wide MBus Module	145
FIGURE 11-4	Installing a Single-Wide MBus Module	146
FIGURE 11-5	MBus Module and SBus Card Retainers	147
FIGURE 11-6	MBus Module Back Panel Screws and Washers	148
FIGURE 11-7	Removing a Double-Wide MBus Module	149
FIGURE 11-8	Installing a Double-Wide MBus Module	150
FIGURE 11-9	Seating a Double-Wide MBus Module back Plate, Side View	151
FIGURE 11-10	Locking the MBus Module Retainers	152
FIGURE 11-11	SBus Card Retainers	153
FIGURE 11-12	SBus Card Back Plate Screws and Washers	153
FIGURE 11-13	Installing the Card Extractor	154
FIGURE 11-14	Removing a Double-Wide SBus Card	154

FIGURE 11-15	Removing the SBus Card Extractor	155
FIGURE 11-16	Removing the SBus Card Adapter Bracket	156
FIGURE 11-17	Installing a Double-Wide SBus Card	157
FIGURE 11-18	Installing a Single-Wide SBus Card	157
FIGURE 11-19	SBus Card Back Panel Screws and Washers	158
FIGURE 11-20	DSIMM, Front View	159
FIGURE 11-21	DSIMM, Back View	160
FIGURE 11-22	VSIMM, Front View	160
FIGURE 11-23	VSIMM, Back View	161
FIGURE 11-24	NVSIMM, Battery Side	161
FIGURE 11-25	SIMM Slot Locations	162
FIGURE 11-26	SIMM Ejection Levers	163
FIGURE 11-27	DSIMM, Back View	164
FIGURE 11-28	VSIMM, Back View	165
FIGURE 11-29	NVSIMM, Battery Side	165
FIGURE 11-30	Aligning the NVSIMM in the Slot, Back View	166
FIGURE 11-31	Inserting a DSIMM	167
FIGURE 11-32	Inserting a VSIMM/NVSIMM	167
FIGURE 11-33	AVB Installed	169
FIGURE 11-34	Removing the AVB	169
FIGURE 11-35	Installing the Auxiliary Video Board	170
FIGURE 11-36	Disconnecting Diskette, SCSI, DC Power, and Speaker/LED Connectors	172
FIGURE 11-37	System Board Captive Screws	172
FIGURE 11-38	Removing the System Board	173
FIGURE 11-39	System Board Jumper Settings	174
FIGURE 11-40	Installing the System Board	175
FIGURE 11-41	System Board Captive Screws	176
FIGURE 11-42	Connecting Diskette, SCSI, DC Power, and Speaker/LED Connectors	177

FIGURE 11-43	OpenBoot PROM Location	178
FIGURE 11-44	OpenBoot PROM Orientation	180
FIGURE 11-45	NVRAM/TOD Location	181
FIGURE 11-46	NVRAM/TOD Orientation	182
FIGURE 12-1	Selected FRUs	186
FIGURE 12-2	SPARCstation 20 System Exploded View	187
FIGURE 12-3	Major Components of the System Board	188
FIGURE 12-4	Standard External Cables	189
FIGURE 12-5	Optional External Cables	190
FIGURE B-1	System Board Block Diagram	197
FIGURE B-2	DSIMM Memory System	200
FIGURE B-3	VSIMM Memory System	201
FIGURE B-4	MACIO ASIC Functional Block Diagram	203
FIGURE B-5	SEC ASIC Functional Block Diagram	204
FIGURE C-1	Parallel Connector	205
FIGURE C-2	AUI Connector	207
FIGURE C-3	Keyboard and Mouse Connector	209
FIGURE C-4	Serial Ports A and B Connector	210
FIGURE C-5	Twisted-pair Ethernet Connector	211
FIGURE C-6	SCSI Connector	212
FIGURE C-7	13W3 Connector	215
FIGURE C-8	Back Panel Audio Ports and Icons	216
FIGURE C-9	Microphone Icon	217
FIGURE C-10	Audio Line-Out Icon	217
FIGURE C-11	Audio Line-In Icon	217
FIGURE C-12	Audio Line-in Icon	217

Tables

TABLE 1-1	SPARCstation 20 System Configurations and Software Requirements	6
TABLE 1-2	Internal Options	6
TABLE 1-3	External SCSI Options	7
TABLE 2-1	Diagnostic Tools	11
TABLE 2-2	Autoboot and Diagnostic Switch Settings	12
TABLE 2-3	OpenBoot PROM Diagnostic Tests	12
TABLE 2-4	SunVTS Documentation	15
TABLE 3-1	Keyboard Key LED Description	25
TABLE 4-1	Troubleshooting Tips	27
TABLE 4-2	Power Supply Connector Pin Assignments	31
TABLE 4-3	Troubleshooting Disk Drive Errors	34
TABLE 4-4	SIMM Slots and Physical Address	35
TABLE 4-5	SIMM Slot Layout and Installation Sequence	36
TABLE 5-1	Safety Precautions	40
TABLE 12-1	Replacement Parts List and Part Numbers	183
TABLE A-1	Physical Specifications	191
TABLE A-2	Electrical Specifications (System Unit)	192
TABLE A-3	Electrical Specifications (17-inch Monitor)	192
TABLE A-4	Electrical Specifications (20-inch Monitor)	193
TABLE A-5	Environmental Specifications	194

TABLE B-1	Memory Allocations	199
TABLE B-2	DSIMM DRAM Densities	199
TABLE B-3	VRAM Densities	201
TABLE C-1	Parallel Connector Pin Assignments	206
TABLE C-2	AUI Connector Pin Assignments	207
TABLE C-3	Keyboard/Mouse Connector Pin Assignments	209
TABLE C-4	Serial Ports A and B Connector Pin Assignments	210
TABLE C-5	Twisted-Pair Ethernet Connector Pin Assignments	212
TABLE C-6	SCSI Connector Pin Assignments	212
TABLE C-7	13W3 Connector Pin Assignments	215
TABLE C-8	Audio Port Signals	216
TABLE D-1	SCSI Addresses, Solaris 1.1.1 Version B (SunOS 4.1.3_U1 Version B) Operating Environment	219
TABLE D-2	SCSI Addresses, Solaris 2.3 (SunOS 5.3) Operating Environment and Later Versions	220

Preface

This manual provides detailed procedures that describe the removal and replacement of field replaceable units (FRUs) in the SPARCstation™ 20 system. People that should use this book include technicians, advanced computer system end-users with experience in replacing hardware and troubleshooting, system administrators, and qualified service providers.

Document Organization

This book is comprised of seven parts. See the following table.

TABLE P-1 Document Organization

Part Number/Title	Chapter Number/Title	Description
Part 1, "System Information"	Chapter 1, "Product Description"	Describes the standard features, internal options, and external options of the SPARCstation 20 system
Part 2, "Troubleshooting"	Chapter 2, "Troubleshooting Overview"	Describes how to diagnose a problem and run diagnostic tests
	Chapter 3, "Power-On Self-Test (POST)"	Describes the execution of POST and provides troubleshooting errors displayed during POST
	Chapter 4, "Troubleshooting Procedures"	Provides corrective actions to generalized hardware symptom casualty

TABLE P-1 Document Organization (*Continued*)

Part Number/Title	Chapter Number/Title	Description
Part 3, "Preparing for Service"	Chapter 5, "Safety and Tool Requirements"	Explains how to work safely when servicing the SPARCstation 20 system
	Chapter 6, "Power On and Off"	Provides step-by-step procedures to power on and power off the SPARCstation 20 system
Part 4, "Subassembly Removal and Replacement"	Chapter 7, "Internal Access"	Provides step-by-step procedures to remove the SPARCstation 20 system cover, attach the wrist strap, and replace the cover
	Chapter 8, "Removing and Installing Subassemblies"	Provides step-by-step procedures to remove and install major subassemblies
	Chapter 9, "Storage Devices"	Provides step-by-step procedures to remove and replace storage devices
Part 5, "System Board"	Chapter 10, "System Board Overview"	Provides system board description and damage prevention; identifies replaceable system board components
	Chapter 11, "System Board and Component Replacement"	Provides step-by-step procedures to remove and replace the system board, and to remove and replace various components associated with system board operation
Part 6, "Illustrated Parts Breakdown"	Chapter 12, "Illustrated Parts Breakdown"	Lists replaceable parts for the SPARCstation 20 system
Part 7, "Appendixes, Glossary, and Index"	Appendix A, B, and C	Provides physical, electrical, and environmental specifications, a functional description of the SPARCstation 20 system, connector pinouts and signal descriptions, and information on SCSI targeting
	Glossary	Provides a listing of acronyms, terms, and definitions
	Index	Provides a quick reference to specific topics

Warnings and Cautions



Caution – This equipment contains lethal voltage. Accidental contact can result in serious injury or death.



Caution – The surface of the SuperSPARC™ and hyperSPARC™ CPU chips may be hot and cause personal injury if touched. Avoid contact.



Caution – Improper handling by unqualified personnel can cause serious damage to this equipment. Unqualified personnel who tamper with this equipment may be held liable for any resultant damage to the equipment.



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.

Individuals who service this equipment must observe all safety precautions and ensure compliance with skill level requirements, certification, and all applicable local and national laws.

Procedures in this document must be performed by trained maintenance providers. Only people who have been trained by the Sun Microsystems™ training facilities (or by Sun Microsystems affiliates) and have been certified as required by local and national laws are considered qualified.

Note – Prior to performing service or repair, carefully read the associated procedure. If a similar repair has not been performed on comparable equipment, do not attempt to perform the procedure.

Typographic Conventions

The following table lists typographic conventions used within this service manual.

TABLE P-2 Typographic Conventions

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

Related Documentation

The following table lists related documentation supporting SPARCstation 20 operation:

TABLE P-3 Related Documentation

Document Title	Part number
<i>OpenBoot™ 2.x Command Reference Manual</i>	802-3241
<i>SunDiag™™ User's Guide</i>	801-6627
<i>SunDiag™™ User's Guide (Addendum)</i>	801-7263
<i>SunVTS™™ 2.0 User's Guide</i>	802-5331
<i>SunVTS™™ 2.0 Test Reference Manual</i>	802-5330

TABLE P-3 Related Documentation (*Continued*)

Document Title	Part number
<i>SunVTS™™ 2.0 Quick Reference Card</i>	802-5329
<i>Product Notes—SPARCstation 20</i>	801-7464
System administration manual for your computer system	N/A
Operating system documentation	N/A

UNIX Commands

This manual does not include specific software commands or procedures. Instead, it names software tasks and refers to operating system documentation or the handbook that was shipped with the hardware.

See one or more of the following:

- *Solaris 2.x Handbook for SMCC Peripherals* contains Solaris™™ 2.x software commands.
- On-line AnswerBook for the complete set of documentation supporting the Solaris 2.x software environment.
- Other software documentation that you received with your system.

Shell Prompts

The following table lists the default system prompt and superuser prompt for the C shell, Bourne shell, and Korn shell.

TABLE P-4 Shell Prompts

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

Product Description

The SPARCstation™ 20 system accommodates up to 512 megabytes (Mbytes) of memory using dynamic single in-line memory modules (DSIMMs) and video single in-line memory modules (VSIMMs). Installing a second VSIMM is done through the optional auxiliary video board (AVB).

Standard Features

The SPARCstation 20 system has four audio ports on the back panel and contains an internal speaker. A variety of internal storage devices are available:

- 535-Mbyte hard disk drive
- 1.05-Gbyte hard disk drive
- 2.1-Gbyte hard disk drive
- Diskette drive
- SunCD 2Plus™™ drive
- SunCD™™ 4 drive

Note – The SPARCstation 20 system is configured with one of two chassis types: a chassis that supports the 1-inch SunCD 2Plus drive and a chassis that supports the 1.6-inch SunCD 4 drive.

FIGURE 1-1 shows a typical SPARCstation 20 system. Appendix B provides detailed system information.

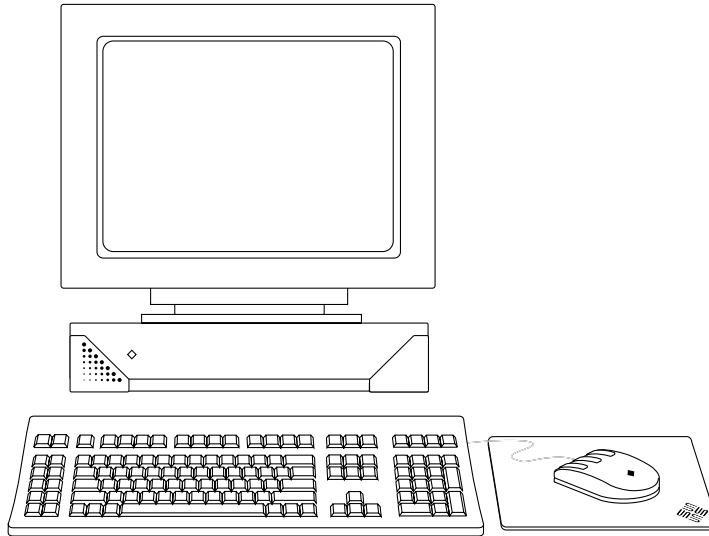


FIGURE 1-1 SPARCstation 20 System

Subassemblies, Boards, and Components

The SPARCstation 20 system contains the following subassemblies, boards, and components (see FIGURE 1-2):

- System board
- SIMMs
- DSIMMs (eight maximum)
- VSIMMs (two maximum)
- Non-volatile SIMM (NVSIMM) (one)
- SBus card (four maximum)
- MBus module (two maximum)
- Hard disk drive, 3.5-inch (88.0-mm), single connector (two maximum)
- SunCD 2Plus drive or SunCD 4 drive (optional)
- Diskette drive (3.5-inch) (optional)
- Power supply (150 watt, two-fan)

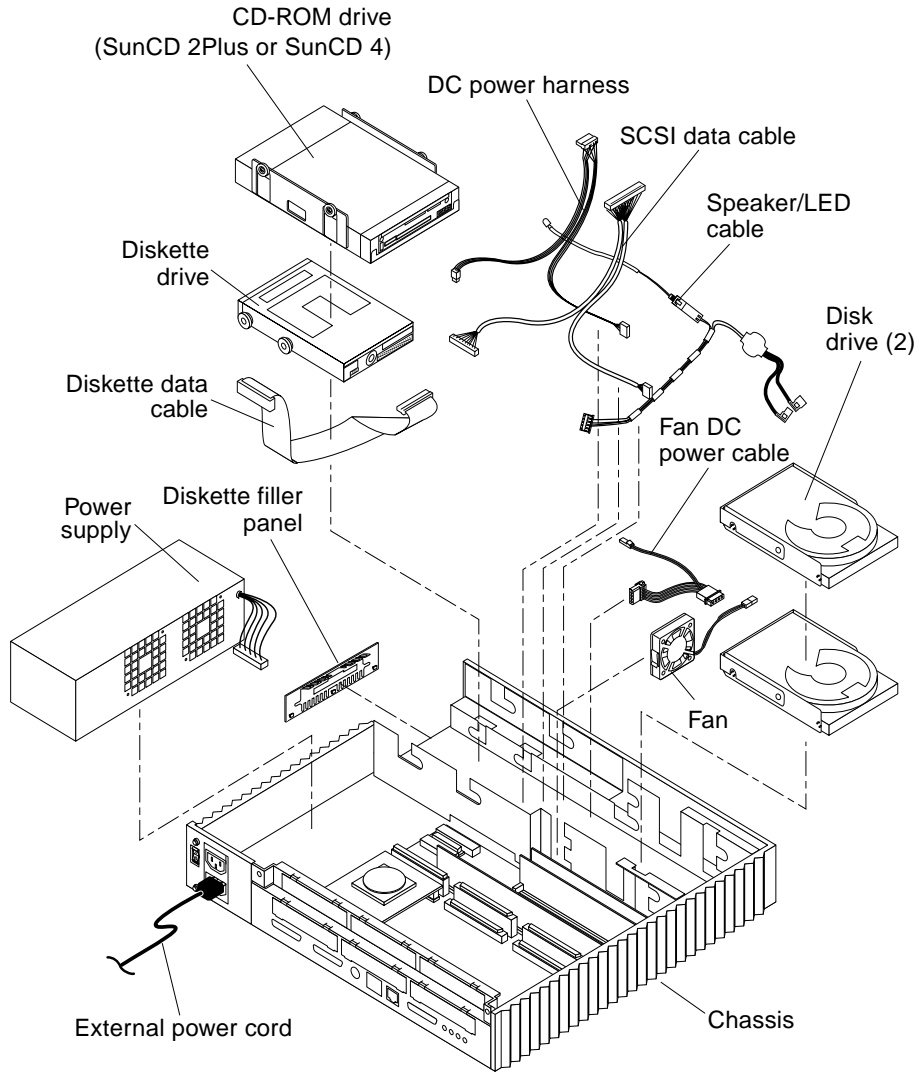


FIGURE 1-2 SPARCstation 20 System Exploded View

Interior View

FIGURE 1-3 shows an interior view of the major subassemblies and the system board.

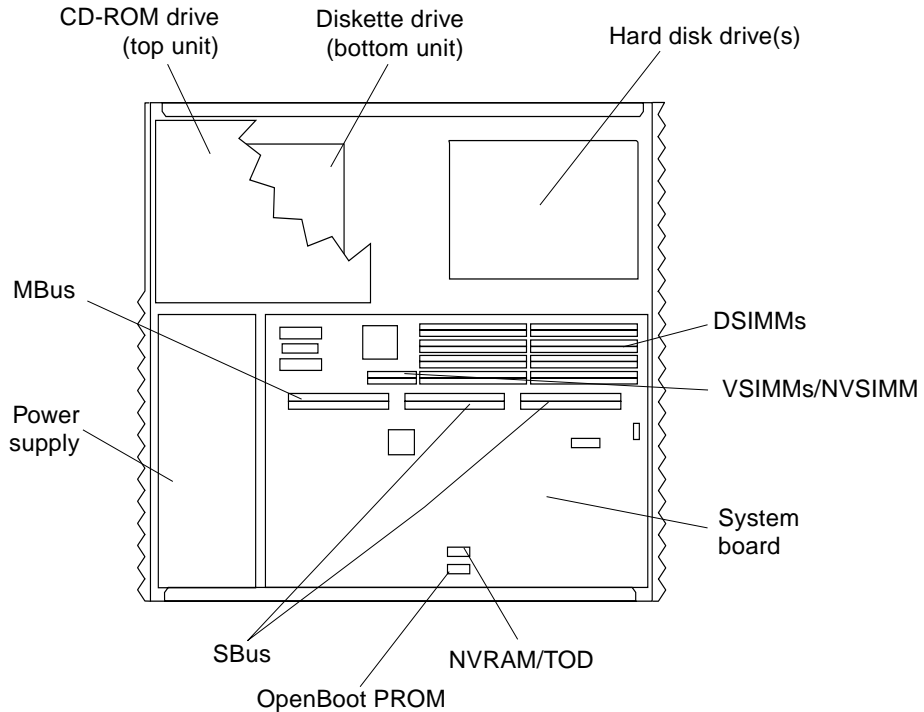
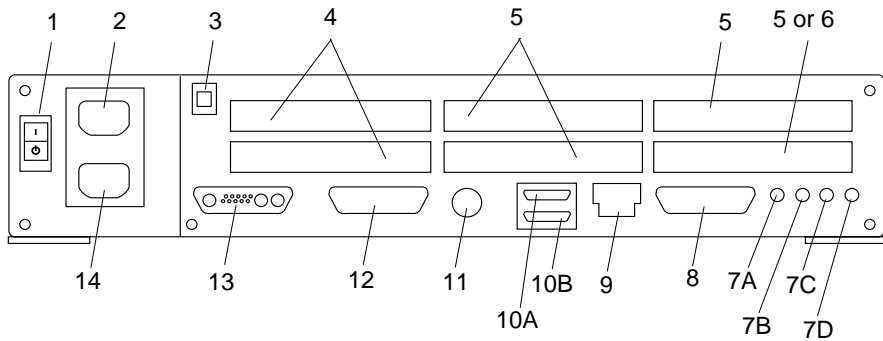


FIGURE 1-3 SPARCstation 20 System Overhead Interior View

Rear View

FIGURE 1-4 shows a rear view of the system. Appendix C provides additional information. The appendix describes each connector on the back panel, lists pin assignments, signal descriptions, and shows detailed connector illustrations.



Legend:

- | | |
|---------------------------|-------------------------|
| 1—Power-On/Standby switch | 7D—Audio, line-in |
| 2—AC power outlet | 8—SCSI |
| 3—Lock block | 9—Twisted-pair Ethernet |
| 4—MBus | 10A—Parallel |
| 5—SBus | 10B—AUI Ethernet |
| 6—AVB (13W3 video) | 11—Keyboard |
| 7A—Audio, headphone | 12—Serial port A/B |
| 7B—Audio, microphone | 13—13W3 video |
| 7C—Audio, line-out | 14—AC power receptacle |

FIGURE 1-4 SPARCstation 20 System Unit Rear View

Software Requirements

TABLE 1-1 lists the various system configurations and the corresponding software requirements.

TABLE 1-1 SPARCstation 20 System Configurations and Software Requirements

Configuration	Software Requirements
Basic System	Solaris 1.1.1 Version B software environment (SunOS 4.1.3_U1 Version B) or later Solaris 1.x releases Solaris 2.3 (SunOS 5.3) software environment and Solaris 2.3 Supplement, Revision B, or later Solaris 2.x releases
Multiprocessor versions	Solaris 2.3 (SunOS 5.3) software environment and Solaris 2.3 Supplement, Revision B, or later Solaris 2.x releases
Systems configured with VSIMMs	Solaris 2.3 (SunOS 5.3) software environment with Solaris 2.3 Supplement, Revision B, or later Solaris 2.x releases

Internal Options

TABLE 1-2 lists the internal options of the SPARCstation 20 system.

TABLE 1-2 Internal Options

Option	Quantity (max.)	Description
SBus card	4	System board contains four SBus slots, 32-bit-wide data bus, 25-MHz bus speed
MBus module	2	Provides additional microprocessor modules, 64-bit-wide data bus
Hard disk drive	2	Supports up to two 3.5-inch, 535-Mbyte or 1.05-Gbyte 2.1-Gbyte (formatted), single-connector disk drives
SunCD 2Plus	1	Internal, double-speed, 644-Mbyte CD-ROM drive
SunCD 4	1	Internal, quad-speed, 644-Mbyte CD-ROM drive

TABLE 1-2 Internal Options (Continued)

Option	Quantity (max.)	Description
Diskette drive	1	Internal diskette drive; triple density MS-DOS/IBM compatible
AVB	1	Operates with the second VSIMM option; provides second 13W3 video output
DSIMM	8	Supports up to 512 Mbytes of DSIMMs; DSIMM capacities are: 16-, 32-, and 64-Mbyte
VSIMM	2	Supports up to 2 VSIMMs; VSIMM capacities are: 4- and 8-Mbyte
NVSIMM	1	Provides non-volatile disk I/O storage for file system acceleration; occupies one VSIMM slot

External Options

TABLE 1-3 lists the external SCSI options.

TABLE 1-3 External SCSI Options

Unit	Description
Desktop backup pack	Tape drive: 150-Mbyte, .25-inch QIC-150, 2.5-Gbyte 5-Gbyte, 8-mm, 10-Gbyte, 14-Gbyte 5-Gbyte, 4-mm 20-Gbyte, 4-mm DAT
Desktop disk pack	Disk expansion unit with variety of SCSI disk drive capacities
Desktop SunCD 2Plus	External, double-speed, 644-Mbyte CD-ROM drive
Desktop SunCD 4	EXternal, quad-speed, 644-Mbyte CD-ROM drive

TABLE 1-3 External SCSI Options

Unit	Description
Desktop storage module	Disk drive: 1.3-Gbyte disk drive 5.0-Gbyte disk drive
SCSI expansion pedestal	Up to eight SCSI disks, CD-ROM drive, tape drive, other non-disk units. Requires a minimum of two SCSI controllers if all three trays are used. No more than seven SCSI devices on each SCSI bus.
Multiple disk pack	Desktop enclosure containing a disk array of SCSI disk drives

Troubleshooting Overview

This chapter describes how to diagnose a problem and execute diagnostic tests.

Default Boot Mode

FIGURE 2-1 is a flow diagram of the default boot mode for OpenBoot PROM Version 2.14 or later. The default boot mode initiates the power-on self-test (POST) diagnostics if any one of the following conditions exists:

- Keyboard Stop (L1) and D keys are pressed and held down
- `diag-switch?` parameter is set to true
- Keyboard is disconnected

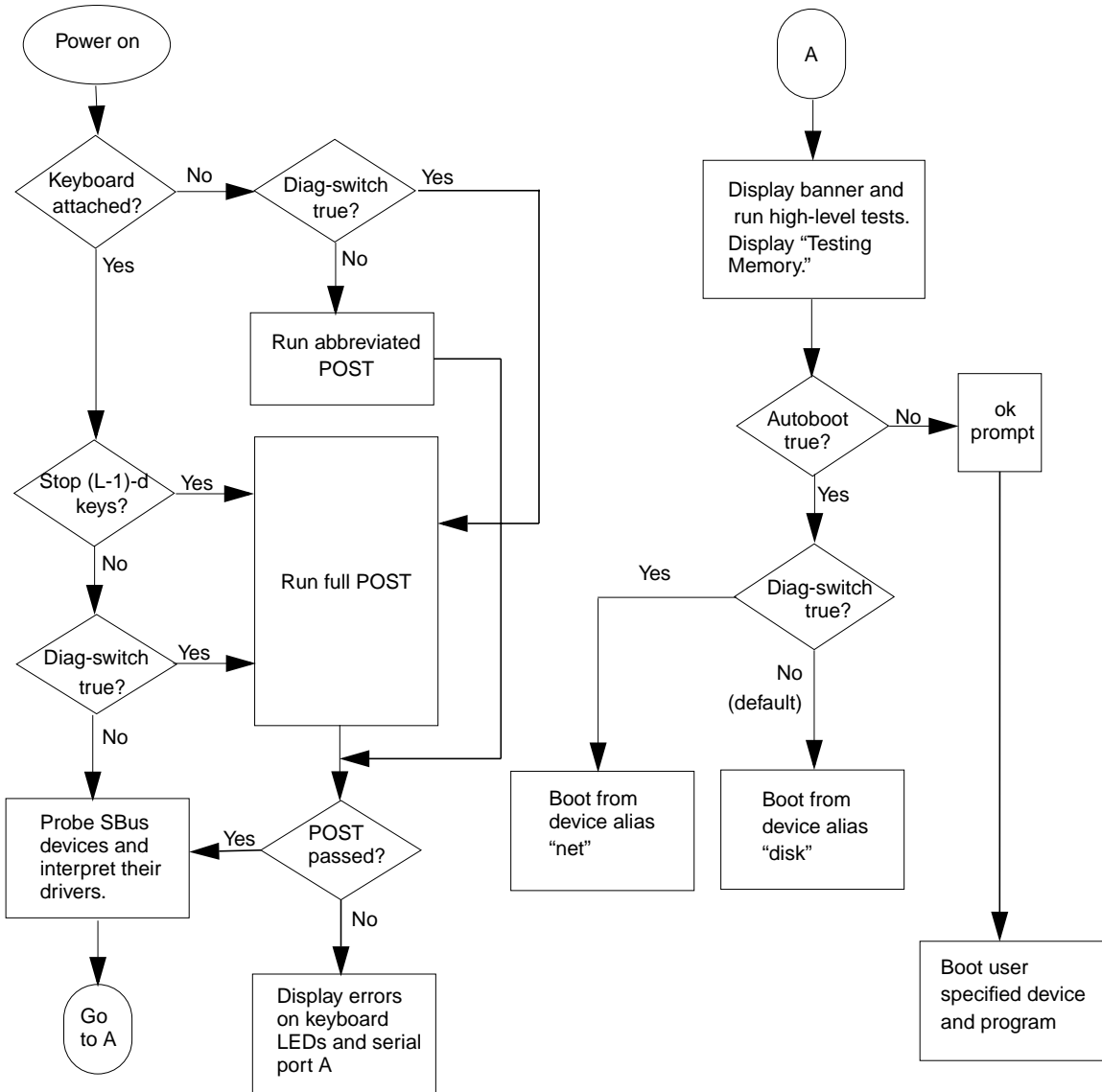


FIGURE 2-1 Default Boot Mode (OpenBoot PROM Version 2.14 or Later)

Diagnostic Tools

Diagnostic tools include power-on self-test (POST), OpenBoot PROM diagnostics, SunDiag system exerciser, and Sun verification test suite (SunVTS). A description of the POST is provided in Chapter 3. TABLE 2-1 lists the diagnostic tools and provides a description of each. TABLE 2-2 lists switch settings and results for the autoboot switch and the diagnostic switch. Descriptions of the OpenBoot PROM diagnostics, the SunDiag system exerciser, and SunVTS are provided in the following sections.

TABLE 2-1 Diagnostic Tools

Diagnostic	Description
Power-On Self-Test	Locates and diagnoses trouble in: system board, DSIMM in slot 0, MBus modules, and NVRAM. Resides in the OpenBoot PROM. Initialized at power-on when the keyboard <code>Stop (L1)-d</code> keys are pressed and held, or if the <code>diag-switch?</code> parameter is set to <code>true</code> , or if the keyboard is disconnected. See Chapter 3.
OpenBoot PROM	Includes Ethernet, diskette drive controller, and other tests. Must be at the <code>ok</code> prompt to execute on-board diagnostics. See “OpenBoot PROM Diagnostics” on page 12.
SunDiagSystem Exerciser (Solaris 1.1.1, Rev. B; 1.1.2; 2.3; 2.4)	Initiated under the operating system. Tests system resources and peripherals. See <i>SunDiag User’s Guide</i> for more information. See “SunDiag System Exerciser” on page 14.
SunVTS (Solaris 2.5 and later)	Executes multiple diagnostic hardware tests from a single user interface and is used to verifying configuration and functionality of most hardware controllers and devices. See <i>SunVTS 2.0 User’s Guide</i> for more information. See Section “Sun VTS” on page 2-15.

TABLE 2-2 Autoboot and Diagnostic Switch Settings

Autoboot Switch	Diagnostic Switch	Result
False	Either true or false	ok prompt (OpenBoot PROM commands)
True	False	Boot operating system from disk (default)
True	True	Boot operating system from network (default)

OpenBoot PROM Diagnostics

On-board diagnostics are executed from the `ok` prompt. If there is a problem with the operating system, the system will default to the `ok` prompt. The `ok` prompt can also be accessed by shutting down the operating system.

TABLE 2-3 describes selected OpenBoot PROM diagnostic tests and what must occur before each test can be executed. Some of the tests verify the proper operation of the network controller, while other tests verify the diskette drive system, memory, and system clock. Appendix E provides a detailed description of each test.

TABLE 2-3 OpenBoot PROM Diagnostic Tests

Type of Test	Description	Preparation
<code>test screen</code>	Tests the video graphics hardware and monitor	The <code>diag-switch?</code> NVRAM parameter must be set to true.
<code>test floppy</code>	Tests the diskette drive response to commands	Insert a formatted diskette into the drive.
<code>test scsi</code>	Tests the system board SCSI interface logic	The <code>diag-switch?</code> NVRAM parameter must be set to true.
<code>test net-aur</code>	Performs an internal and external loopback test on the AUI (Thick) Ethernet interface	A cable must be connected between the rear panel AUI Ethernet port and the Ethernet transceiver.
<code>test net-tpe</code>	Performs an internal and external loopback test on the TPE interface	A cable must be connected between the rear panel TPE port and a TPE hub. If the <code>tpe-link-test?</code> parameter is false (disabled), the external loopback test will appear to pass even if a cable is not connected.
<code>test net</code>	Performs an internal and external loopback test on the auto-selected system Ethernet interface	A cable must be connected between the system and the Ethernet transceiver or hub.

TABLE 2-3 OpenBoot PROM Diagnostic Tests (Continued)

Type of Test	Description	Preparation
test disk test disk0 test disk1 test disk2 test disk3	Tests internal or external SCSI disks that have self-test diagnostic programs on the drive controller	The disk drive must be spinning before this test is executed; enter a <code>boot disk alias</code> command to cause the drive to spin up.
test cdrom	Performs a self-test diagnostic on the CD-ROM drive	The CD-ROM drive must be set to SCSI address 6 and have a CD inserted.
test tape test tape0 test tape1	Tests the SCSI tape drive by executing the drive self-test program; <code>tape 0</code> and <code>tape 1</code> are the first tape drive. <code>tape 1</code> is the second tape drive	The tape drive must be set to SCSI address 4 (<code>tape 0</code>) or address 5 (<code>tape 1</code>) and a tape must be installed.
test ttya test ttyb	Tests serial ports. Outputs an alphanumeric test pattern on the system serial ports	Attach a terminal to the serial port to observe the output.
test keyboard	Executes the keyboard self-test; four keyboard LEDs should flash on once and the message, <code>Keyboard Present, is displayed</code>	Keyboard must be connected.
test-memory	Tests main memory	Set <code>diag-switch?</code> to <code>true</code> or set <code>selftest-#megs</code> to the desired parameter.
test-all	Tests all system devices (such as SBus cards) with built-in test programs; hard disks, tapes, and CD-ROMs are not tested	Set the <code>diag-switch?</code> parameter to <code>true</code> .
watch-clock	Displays seconds from the NVRAM/TOD chip	None.
watch-net	Monitors Ethernet packets on the auto-selected Ethernet cable connected to the system	A cable must be connected to the back panel Ethernet port.
watch-aui	Monitors Ethernet packets (10Base5—Thicknet) on the Ethernet cable connected to the system	A cable must be connected between the rear panel AUI Ethernet port and the Ethernet transceiver.
watch-tpe	Monitors Ethernet packets (10Base_T—twisted-pair Ethernet) on the Ethernet cable connected to the system	A cable must be connected between the rear panel TPE port and a TPE hub.
watch-net-all	Monitors Ethernet packets on all Ethernet interfaces installed in the system	Cables must be connected to all Ethernet ports being tested.

TABLE 2-3 OpenBoot PROM Diagnostic Tests (Continued)

Type of Test	Description	Preparation
probe-scsi	Returns the SCSI device address (internal and external) and respective SCSI targets connected to the built-in SCSI port	SCSI devices must be connected to the SCSI bus; SCSI devices must be powered on.
probe-scsi-all	Returns the SCSI device address and respective SCSI targets connected to all SCSI ports (both the built-in SCSI port and any additional SCSI host adapter cards)	SCSI devices must be connected to the SCSI bus; SCSI device must be powered on.
power-off	Powers off the system.	Must have a Type-5 keyboard.
module-info	Identifies the installed MBus module type(s) and clock speed; identifies installed SBus clock speed	None.

SunDiag System Exerciser

The SunDiag system exerciser is used to test and exercise system resources and peripheral equipment. The SunDiag system exerciser verifies that the system is functioning properly.

The SunDiag system exerciser program is located as follows:

- /usr/diag/sundiag (Solaris 1.1.x)
- /opt/SUNWdiag/bin (Solaris 2.x)

If the SunDiag system exerciser is not on the system hard disk or server, it can be loaded from either a CD or from a network server (for more information, see the *SunDiag User's Guide*).

If SunDiag system exerciser passes, the system is operating properly. If SunDiag system exerciser fails, error messages are displayed, indicating the part of the system that failed.

Note – If a SunDiag system exerciser error message is not descriptive enough, execute the POST for a more descriptive explanation (see Chapter 3.)

Sun VTS

The SunVTS software executes multiple diagnostic hardware tests from a single user interface and is used to verifying configuration and functionality of most hardware controllers and devices. SunVTS operates primarily from the OpenWindowsTM user interface, allowing test parameters to be set quickly and easily while a diagnostic test operation is being performed.

The SunVTS operation is provided in the documents listed in TABLE 2-4. These documents furnish detailed information about SunVTS and are available on the *Solaris on Sun Hardware AnswerBook*. The *Solaris on Sun Hardware AnswerBook* is provided on the SMCC Updates CD for the Solaris release being operated.

TABLE 2-4 SunVTS Documentation

Title	Part Number	Description
<i>SunVTS User's Guide</i>	802-5331	Describes the SunVTS environment; starting and controlling various user interfaces; feature descriptions
<i>SunVTS Test Reference Manual</i>	802-5330	Describes each SunVTS test; provides various test options and command line arguments
<i>SunVTS Quick Reference Card</i>	802-5329	Provides overview of vtsui interface features

The main features of the SunVTS environment include:

- SunVTS kernel
- SunVTS user interface
- SunVTS teletype

SunVTS Kernel

The SunVTS kernel (`vtsk`) diagnostic tool controls all testing and operates in the OpenWindows background. When activated, `vtsk` probes the hardware configuration of the system tested and responds to `vtsui`. `vtsk` coordinates execution of individual tests and manages the messages sent by these tests.

SunVTS User Interface

The SunVTS user interface (`vtsui`) diagnostic tool operates in the OpenWindows background. Upon activation, `vtsui` provides `vtsk` control, various user options, tests, and read log files.

SunVTS Teletype

The SunVTS teletype (`vtstty`) diagnostic tool controls the `vtsk` from either a command shell or a terminal attached to a serial port. Most options available in `vtstty` have equivalent options in `vtsui`. `vtstty` is applicable to server configurations only.

Power-On Self Test (POST)

The Power-on self-test (POST) diagnostics reside in the OpenBoot PROM, which is located on the system board. There are three POST modes: normal, full diagnostic, and abbreviated diagnostic. The following is a list of the POST diagnostic topics presented in this chapter.

Normal Mode

When the system is turned on in normal mode, the POST is not executed and control is sent to the OpenBoot PROM. If autoboot is enabled (set to true), the operating system is loaded. If autoboot is disabled, system initialization stops when the `ok` prompt is displayed.

Full Diagnostic Mode

Full diagnostic mode tests the system board components and the installed MBus modules. POST is executed if *one* of two actions occur:

- Press and hold the `Stop` (L1) and `D` keys while system power is being applied.
- Set the `diag-switch?` NVRAM parameter to true in the OpenBoot PROM.

CODE EXAMPLE 3-1 provides a typical POST progress message that is displayed through serial port A.

CODE EXAMPLE 3-1 Typical POST Progress Message

```
SMCC SPARCstation 10/20 UP/MP POST version xxx (xx/xx/xxxx)

CPU_#0 TI, TMS390Z55(3.x) 1Mb External cache
CPU_#2 TI, TMS390Z55(3.x) 1Mb External cache

CPU_#1 ***** NOT installed *****
CPU_#3 ***** NOT installed *****

<<< CPU_00000000 on MBus Slot_00000000 >>> IS RUNNING (MID =
00000008)

MMU Context Table Reg Test
MMU Context Register Test
.
.
.
.
.
```

The uniprocessor POST tests one MBus module. The multiprocessor POST tests all installed MBus modules. POST detects only major failures. In a fully configured system with two or more processors, POST may take several minutes to be completed.

To view POST progress and error messages, connect a terminal to serial port A or use a `tip` connection to another Workstation. See “Setting Up a `tip` Connection.”

If a terminal is not connected to serial port A, or a `tip` connection is not implemented, the screen will be blank during the POST diagnostic test mode. In this case, the keyboard LEDs are used to determine error conditions. See “Status LEDs and Indicators.”

Abbreviated Diagnostic Mode

POST is executed if the keyboard is disconnected and the `diag-switch?` NVRAM parameter is set to `false` in the OpenBoot PROM. During the abbreviated diagnostics, no progressive test messages are displayed and are not printed. If errors occur during the abbreviated POST, error messages are transferred through serial port A and are viewed by connecting a terminal or `tip` connection. If no errors occur, a message similar to CODE EXAMPLE 3-2 is displayed through serial port A.

CODE EXAMPLE 3-2 Typical Abbreviated POST Error-Free Message

```
SMCC SPARCstation 10/20 UP/MP POST version 3.1 (11/19/93)

CPU_#0      TI, TMS390Z55(3.x)      1Mb External cache

CPU_#1      ***** NOT installed *****
CPU_#2      ***** NOT installed *****
CPU_#3      ***** NOT installed *****

          >>>> Power On Self Test (POST) is running .... <<<<
```

Setting Up a `tip` Connection

The `tip` connection allows the use of a shell window on the Sun WorkstationTM as a terminal to the system being tested. In setting up a `tip` connection, serial port A is used to connect to another Sun Workstation (either the same type of SPARC system or a different type of Sun Workstation or server system). The `tip` connection uses the SunOSTM to help in working with the OpenBoot PROM.

To set up a `tip` connection, proceed as follows:

- 1. Connect the SPARCstation 20 serial port A to another Sun Workstation serial port using a serial connection cable. This connection is made with a 3-wire null modem cable. Connect wires 3-2, 2-3, and 7-7.**
- 2. At the other Sun Workstation, add the following line to the `/etc/remote` file:**

Note – The example shows connection to serial port A (ttya). To use serial port B on the other Sun Workstation, enter `ttvb`.

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

Note - For SunOS 4.1.3_V1 Rev. B and later
```

```
hardwire:\

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

Note - For SunOS 5.3 and later
```

3. At the system prompt, type the following: .

```
hostname% tip hardwire
connected
```

The shell window is now a `tip` window directed to the Sun Workstation serial port. When powering on the SPARCstation 20 in diagnostic mode, messages will be displayed at this window.

4. When POST is completed, disconnect the `tip` window by typing `~.` (tilde, period).

```
~.
[EOT]
hostname%
```

POST Tests

CODE EXAMPLE 3-3 provides a sample listing of the full diagnostic mode tests executed by POST in a system with two MBus modules installed. Note that the beginning of the test indicates the number of MBus modules installed.

CODE EXAMPLE 3-3 Sample Listing of the Full Diagnostic Mode Test

```
SMCC SPARCstation 10/20 UP/MP POST version xxx (xx/xx/xxxx)

CPU_#0 TI, TMS390Z55(3.x) 1Mb External cache
CPU_#2 TI, TMS390Z55(3.x) 1Mb External cache

CPU_#1 ***** NOT installed *****
CPU_#3 ***** NOT installed *****

<<< CPU_00000000 on MBus Slot_00000000 >>> IS RUNNING (MID =
00000008)

MMU Context Table Reg Test
MMU Context Register Test
MMU TLB Bit Pattern Tests
MMU Flush Tests
D-Cache RAM Write/Read Test
D-Cache PTAG Write/Read Test
D-Cache STAG Write/Read Test
I-Cache RAM Write/Read Test
I-Cache PTAG Write/Read Test
I-Cache STAG Write/Read Test
I-Cache Flush Test
Cache Flashclear Test
MXCC Register Test
MXCC E-Cache Tag RAM Test
MXCC E-Cache Data RAM Test (1 MB E$DATA RAM, MXCC_CSR=00000000)
MXCC Non-Cache Block Zero Test
MXCC Non-Cache Block Copy Test
MXCC Cacheable Block Read Test
MXCC Cacheable Block Write Test
EMC/SMC Control Regs Tests
ECC Multiple UE Test
ECC Multiple CE Test
ECC Multiple CE, UE Test
FPU Register File Test
FPU Misaligned Reg Pair Test
FPU Single-precision Tests
FPU Double-precision Tests
FPU SP Invalid CEXC Test
FPU SP Overflow CEXC Test
FPU SP Underflow CEXC Test
```

CODE EXAMPLE 3-3 Sample Listing of the Full Diagnostic Mode Test (Continued)

```
FPU SP Divide-by-0 CEXC Test
FPU SP Inexact CEXC Test
FPU SP Trap Priority > Test
FPU SP Trap Priority < Test
FPU SP UE Trap Priority Test
FPU DP Invalid CEXC Test
FPU DP Overflow CEXC Test
FPU DP Underflow CEXC Test
FPU DP Divide-by-0 CEXC Test
FPU DP Inexact CEXC Test
FPU DP Trap Priority > Test
FPU DP Trap Priority < Test
FPU DP UE Trap Priority Test
FPU DP CE Trap Priority Test
Memory Address Pattern Test
System Interrupt Regs Tests
PROC0 Interrupt Regs Tests
Soft Interrupts OFF Test
Soft Interrupts ON Test
PROC0 User Timer Test
PROC0 Counter/Timer Test
System Counter Test
MSI/MSBI Control Reg Tests
IOMMU CAM NTA Pattern Test
IOMMU TLB NTA Pattern Test
IOMMU CAM TLB Comparator Test
IOMMU TLB Flush Tests
DMA2/MACIO ID Register Test
DMA2/MACIO E_CSR Reg. Test
LANCE Address Port Tests
LANCE Data Port Tests
DMA2/MACIO D_CSR Reg. Test
DMA2/MACIO D_ADDR Reg. Test
DMA2/MACIO D_BCNT Reg. Test
DMA2/MACIO D_NADDR Reg. Test
ESP Registers Tests
DMA2/MACIO P_CSR Reg. Test
DMA2/MACIO P_ADDR Reg. Test
DMA2/MACIO P_BCNT Reg. Test
PPORT Registers Tests
DMA2/MACIO PPORT IO Lpbck Tst
DMA2/MACIO PPORT XFR Lpbck Tst
TOD Registers Test
```

POST Error Messages

Most POST error messages are displayed at the system monitor and are self-explanatory. Use the error messages returned by POST to troubleshoot the system. CODE EXAMPLE 3-4 lists typical POST error messages.

CODE EXAMPLE 3-4 Typical POST Error Messages

```
STATUS : Power-On SelfTest FAILED ... SIMM <J0201> Not Installed  
STATUS : Power-On SelfTest FAILED ... Replace MBUS0 Module  
STATUS : Power-On SelfTest FAILED ... Replace MBUS1 Module  
STATUS : Power-On SelfTest FAILED ... Replace Main Logic Board  
STATUS : TMS390Z55 and TMS390Z50 Modules can NOT be mixed. No POST  
run.
```

Note – In CODE EXAMPLE 3-4, the last error message indicates that an MBus processor module with external cache has been installed into the system with an MBus module with no external cache. This is not a supported configuration.

Status LEDs and Indicators

The system LED is located on the right front side of the chassis and lights when the system is operating. FIGURE 3-1 shows the location of the system LED. TABLE 4-1 on page 27 suggests corrective actions when the system LED is not lit.

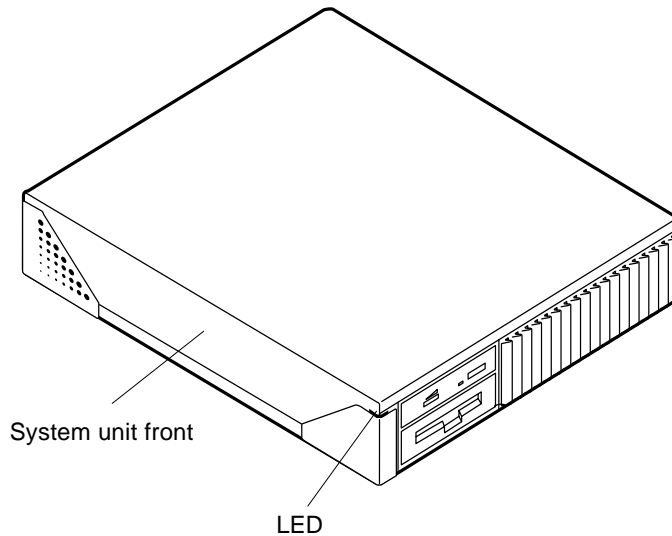


FIGURE 3-1 System LED Location

When POST fails at power-on, LED indicators on specific keyboard keys display a particular LED pattern. See FIGURE 3-2 and TABLE 3-1. Specific keyboard keys include:

- Scroll Lock
- Num Lock
- Compose

Note – During normal system operation, the keyboard key LEDs should not be interpreted as diagnostic error indicators.

Note – The Caps Lock key LED is not used as a power-on test failure indicator, but flashes on and off while POST is initialized.

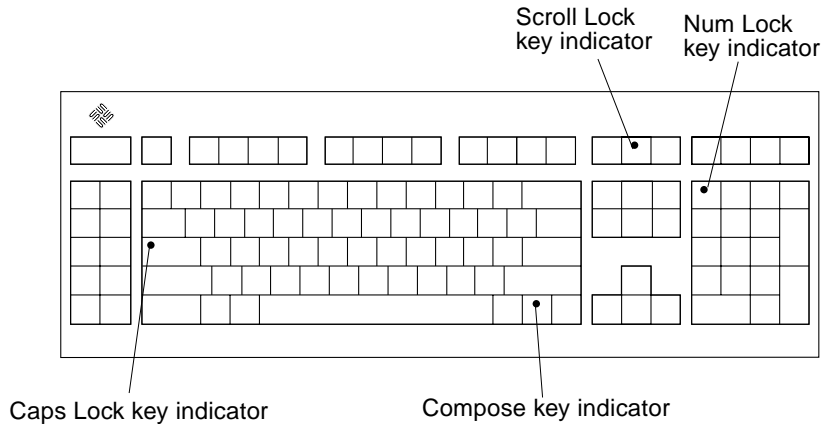


FIGURE 3-2 Type-5 Keyboard Key LEDs

TABLE 3-1 Keyboard Key LED Description

LED State	Description
Caps Lock flashing or lit	POST is executing
Num Lock on	System board failure
Scroll Lock on	MBus module in slot 0 failure
Compose on	DSIMM in slot J0201 failure

An indication of POST failure is when the keyboard `Stop` (L1) and `D` keys are pressed and held when powering on the system and the `Caps Lock` key indicator does not flash on and off. See “System Board Test for troubleshooting information.

Completing POST

When the POST is completed, determine if it passed or failed. If POST passed but operational integrity of the system is questionable, initiate the OpenBoot PROM diagnostics. If POST failed, use the keyboard LED indicator status or a displayed error message (if a terminal or tip window was established) to verify the failure.

Troubleshooting Procedures

This chapter describes how to troubleshoot possible problems and includes suggested corrective actions. TABLE 4-1 identifies system problems and corrective actions.

TABLE 4-1 Troubleshooting Tips

System Problem	Corrective Action
LED on front of system not lit	Verify that the power switch is turned on and that the power cord is connected to the system and an AC receptacle. If the power switch is in the on position and the power cord is connected, shut down the system and verify that the LED cable is connected. If the LED cable is connected, see “Power Supply Test” on page 29 and “System Board Test” on page 31.
Disk drive fails to boot or does not respond	Shut down the system. The SCSI controller or disk drive may be defective. See “Disk Drive Errors” on page 33 and “Power-On Does Not Succeed” on page 29; see also Chapter 9.
Operating system does not recognize disk drive at boot	Shut down the system. Verify that every disk drive on the SCSI bus is set to a different SCSI address. System internal drives are automatically assigned SCSI addresses as follows: 3 (bottom drive), 1 (top drive). See Chapter 9.”
No video output on monitor	Verify that the power cord is connected to the monitor and the monitor is turned on. Use a VOM to check voltages. See “Video Output Failure” on page 28.

TABLE 4-1 Troubleshooting Tips

System Problem	Corrective Action
Read, write, or parity error reported by the operating system or applications	Replace the disk drive indicated by the failure message. The operating system identifies the bottom drive (SCSI address 3) as <code>sd0</code> or <code>c0t3d0</code> . The top drive (SCSI address 1) is identified as <code>sd1</code> or <code>c0t1d0</code> .
Power on does not succeed; keyboard key LEDs do not light and there is no tone from the keyboard when system power is applied	The power supply may be defective. See “Power Supply Test” on page 29.
Power on does not succeed; the system fails to initialize but the keyboard key LEDs light and there is a tone from the keyboard	The system board may be defective. See “System Board Test” on page 31.

Video Output Failure

To check for a video output failure:

Note – This procedure is valid for primary graphics card only.

- 1. Check that the power cord is connected to the monitor and to the power supply outlet.**
- 2. Verify that the wall outlet is supplying AC power to the monitor and the power supply.**

Use a VOM (volt-ohm-milliammeter).

- 3. Verify that the video cable connection is secure between the monitor and the system video output port.**

Use a VOM to perform the continuity test on the video cable.

- 4. If the power cord and video cable connections are good and no video output occurs, reseat the video card for the monitor.**

The video card may be installed in one of the four SBus slots or in a memory slot if it is a VSIMM. VSIMMs can be installed in one or two of the memory slots:

- Slot J0304 is the default slot for the VSIMM in SPARCstation 20 systems with the SX graphics option. This enables video output on the monitor connector on the system back panel.
- Slot J0305 may be used for a DSIMM, VSIMM, or NVSIMM in SPARCstation 20 systems. An auxiliary video board (AVB) must be installed to enable video output from a VSIMM in slot J0305.

5. If the monitor power supply is internally fused, check the fuse.

Power-On Does Not Succeed

To check for a power-on failure:

1. Remove the DC power from the system by pushing the back panel power switch to the standby position.
2. Check that the power cord is properly connected to the system back panel power receptacle and to the wall outlet.



Caution – This equipment contains lethal voltage. Accidental contact can result in serious injury or death.

3. Using a VOM, verify that the wall outlet is supplying AC power to the system.
4. Restore DC power to the system. Press the back panel power switch to ON and observe the keyboard.

The keyboard LEDs should briefly light. An audible tone from the keyboard should be heard.

- If no tone is heard or if no lights are seen, the power supply may be defective. See “Power Supply Test” on page 29.
- If a tone is heard and lights are seen, but the system still fails to initialize, see “System Board Test” on page 31.

Power Supply Test

To test the power supply:

1. Using a VOM, check the output voltages of the power supply (FIGURE 4-1, FIGURE 4-2, and TABLE 4-2).

Place the VOM negative probe on one of the logic ground pins in the connector and test the +12V, -12V, and +5V power pins individually with the positive probe (pins 1 through 8).

Note – The power supply connector must remain connected to the system board during this test. This allows the power supply to regulate the voltage.

2. Replace the power supply assembly if any of the voltages are not present.
See "Power Supply" on page 55.

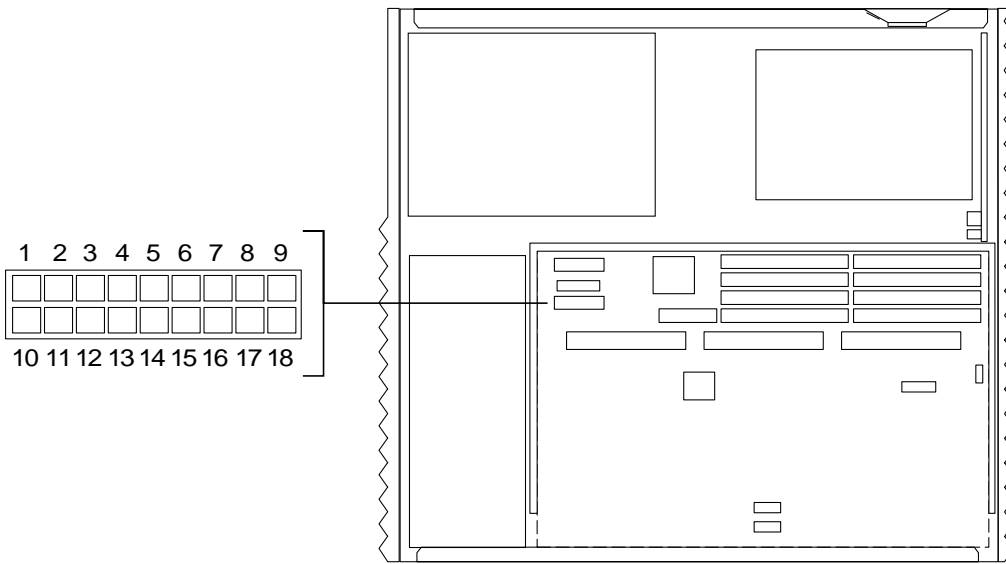


FIGURE 4-1 Power Supply Connector Pinouts

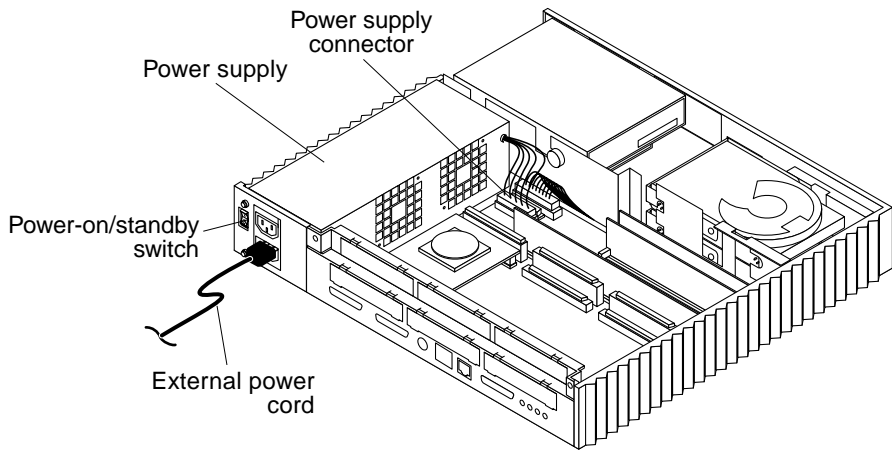


FIGURE 4-2 Power Supply and Power Supply Connector Location

TABLE 4-2 Power Supply Connector Pin Assignments

Pin	Color	Description	Pin	Color	Description
1	Blue	+12	10	Black	Ground
2	Brown	-12	11	Black	Ground
3	Red	+5	12	Black	Ground
4	Red	+5	13	Black	Ground
5	Red	+5	14	Black	Ground
6	Red	+5	15	Black	Ground
7	Red	+5	16	Green	AC Outlet
8	Red	+5	17	Purple	Fan
9	Grey	Power Off	18	Yellow	Power On

Note – All voltages are correct if they are within the +5% or -5% range.

System Board Test

To test the system board:

1. **Connect a terminal to serial port A or use a tip connection to another workstation to receive additional POST failure information.**

See “Setting Up a tip Connection” on page 19.

2. **Press and hold the keyboard Stop (L1) and D keys. While holding the keys down, turn the system power switch on. Release the keys. Watch the keyboard LEDs.**

- The Caps Lock key on the keyboard should flash, indicating that the system is executing the POST.
- If the Caps Lock key fails to flash after the keyboard Stop (L1) and D keys have pressed and held, POST failed. MBus module 0 or the system board may be defective.
- To further troubleshoot the system board, see “Caps Lock Key Fails to Flash During the POST” on page 32.

3. **Observe the keyboard LEDs.**

If a failure occurs during POST, an LED may light up. TABLE 3-1 in Chapter 3 describes types of problems that occur when an LED on the keyboard lights up.

4. **Observe serial port A diagnostic information.**

This may provide additional failure information.

5. **Replace the defective part indicated.**

Caps Lock Key Fails to Flash During the POST

If the Caps Lock key fails to flash during the POST:

1. **Remove optional SBus cards and all NVSIMMs, VSIMMs, and DSIMMs (except J0201, which is required).**
2. **Initiate POST again with only: an MBus module in slot 0, a DSIMM in slot J0201, the power supply assembly, and the keyboard installed.**
3. **Observe serial port A diagnostic information. This may provide additional failure information.**
4. **Replace the defective part indicated.**
5. **If POST passes with the optional parts removed, install the optional parts one at a time. Initiate POST after each optional part is installed; observe the diagnostic output on serial port A and the keyboard LEDs.**

Disk Drive Errors

The following procedure verifies the built-in SCSI controller. TABLE 4-3 lists disk drive error conditions and corrective actions.

To test the disk drive:

Note – To verify if the built-in SCSI controller is defective, test the disk drive response to the `probe-scsi` command. To test additional SCSI host adapters added to the system, use the `probe-scsi-all` command. Refer to “probe-scsi, probe-scsi-all” on page 226.

1. At the `ok` prompt, type `probe-scsi`.

See the following example.

```
ok probe-scsi
Target 1
  Unit 0 Disk SEAGATE ST31200W SUN1.05802200015063
          Copyright (c) 1993 Seagate
          All rights reserved 0000
Target 3
  Unit 0 Disk CONNER CP30548 SUN0535B0BB93086K4S
Target 6
  Unit 0 Removable Read Only device TOSHIBA CD-ROM XM4101TA289310/16/93
```

Note – If the disk drive responds and a message is displayed, the system SCSI controller has successfully probed the devices. This indicates that the system board is working correctly.

2. If a disk does not respond:

a. Ensure that every SCSI disk and other SCSI devices on the SCSI bus have a different SCSI address.

Note – Internal SCSI drives are automatically assigned SCSI address 3 (bottom drive) and 1 (top drive). SCSI address 6 is normally reserved for the optional internal CD-ROM drive. Do not assign SCSI address 7 to any device. This address is reserved for the SCSI controller on the system board.

- b. If external devices are connected, verify that all SCSI cables and the SCSI terminator are connected securely. The terminator must be connected to the last physical device in the SCSI chain.**
- c. Check the SCSI cables to ensure there are no bent pins.**
- d. If after checking the previous causes, the problem is still not identified, replace the disk drive.**
- e. If the problem still occurs after replacing the drive, replace the system board.**
- f. If replacing the disk drive and the system board does not correct the problem, replace the internal disk drive cable assembly.**

TABLE 4-3 Troubleshooting Disk Drive Errors

Symptom	Corrective Action
Read, write, or parity error reported by the operating system or applications	Replace the disk drive indicated by the failure message. The operating system identifies the Bottom drive (SCSI address 3) as <code>sd0</code> or <code>c0t3d0</code> and the top drive (SCSI address 1) as <code>sd1</code> or <code>c0t1d0</code> . SCSI controller or disk may be defective. See "Power-On Does Not Succeed" on page 29 or Chapter 9.
Drive fails to boot or does not respond to commands	The SCSI terminator is missing (if external devices are connected), or the drive is defective. Make sure that each SCSI device on the SCSI bus is assigned a unique address. Do not use SCSI address 7 for any device because it is reserved for the SCSI controller.
Slow disk drive response	If several SCSI devices are connected to the same SCSI bus and if some of these devices are "fast SCSI" devices, such as the external 1.05-Gbyte disk drive, install an FSBE/S SCSI host adapter card to the "fast SCSI" devices and put these "fast SCSI" devices on a separate SCSI bus to accelerate disk drive response.

SIMM Errors

If the operating system, diagnostic program, or POST does not display a SIMM location (“J” number) as part of the memory error message and the only available information is a physical memory address, use TABLE 4-4 to locate the failing SIMM.

TABLE 4-4 SIMM Slots and Physical Address

VSIMM or NVSIMM Slot Location	DSIMM Slot Location	Physical Memory Address Start	Physical Memory Address End
	J0201 (bank 0)	0000 0000(16)	03ff ffff(16)
	J0202 (bank 2)	0800 0000(16)	0bff ffff(16)
	J0203 (bank 5)	1400 0000(16)	17ff ffff(16)
	J0301 (bank 3)	0c00 0000(16)	0fff ffff(16)
	J0302 (bank 6)	1800 0000(16)	1bff ffff(16)
	J0303 (bank 1)	0400 0000(16)	07ff ffff(16)
VSIMM0, J0407	J0304 (bank 7)	1c00 0000(16)	1fff ffff(16)
VSIMM1 or NVSIMM, J0406	J0305 (bank 4)	1000 0000(16)	13ff ffff(16)

FIGURE 4-3 shows the SIMM locations in the system.

Note – The banks listed in TABLE 4-4 do not correspond to the physical order of the DSIMM slots on the system board. The physical order of the slots is based upon an alternating bank pattern: bank 0, bank 2, bank 5, bank 3, bank 6, bank 1, bank 7, and bank 4.

Each bank allows enough address space to accommodate a 64-Mbyte DSIMM. If a 16-Mbyte or 32-Mbyte DSIMM is installed in a bank, the unused addresses are “mapped out” by the memory management hardware. The physical memory starting address of any capacity DSIMM installed will always be as listed in TABLE 4-4. TABLE 4-4 lists SIMM slot layout and installation sequence.

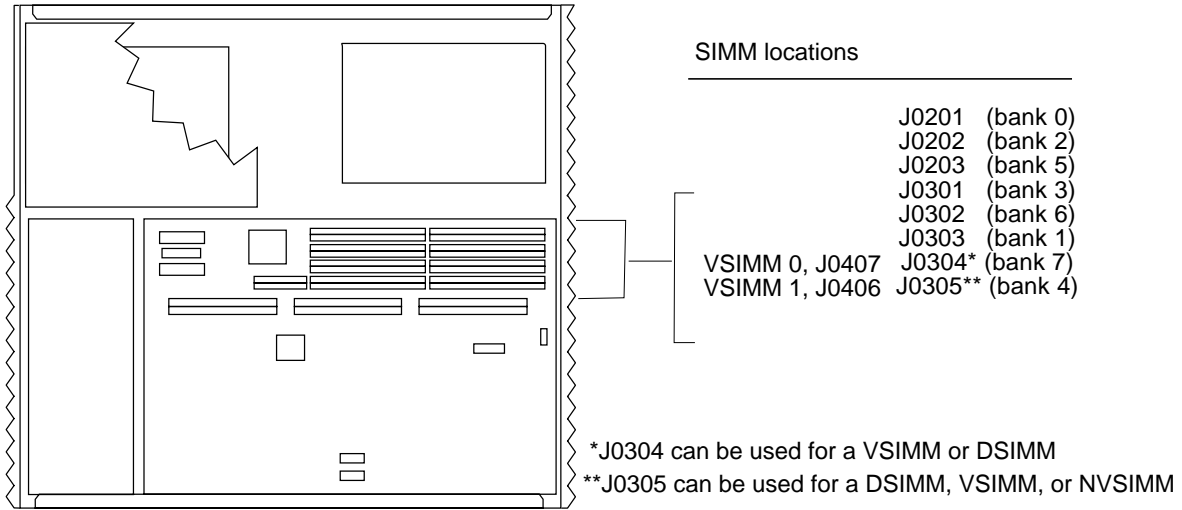


FIGURE 4-3 System Board SIMM Slot Locations

Note – The order of the banks listed in TABLE 4-4 are not the same as the physical order of the DSIMM slots on the system board. TABLE 4-5 shows the physical order of the slots. A DSIMM must always be installed in J0201 (DSIMM0 slot). The first VSIMM is always installed in J0304 (DSIMM6 slot). If a second VSIMM is installed in J0305 (DSIMM7 slot), an Auxiliary Video Board (AVB) must be installed on the system board. Only one NVSIMM is supported. If used, it is installed in J0305 (DSIMM7 slot).

TABLE 4-5 SIMM Slot Layout and Installation Sequence

VSIMMs and/or NVSIMM	Installation Sequence	Slot Layout
DSIMM	J0201	DSIMM0
DSIMM	J0202	DSIMM1
DSIMM	J0203	DSIMM2
DSIMM	J0301	DSIMM3
DSIMM	J0302	DSIMM4
DSIMM	J0303	DSIMM5
J0407(VSIMM0)	J0304(default)	(DSIMM6)
J0406(VSIMM1 or NVSIMM)	J0305	(DSIMM7)

Note – A DSIMM must be installed in J0201 for the system to function properly.

Safety and Tools Requirements

This chapter provides a description of safety requirements, symbols, safety precautions, and required tools.

Safety Requirements

For your protection, observe the following safety requirements:

- Follow all cautions, warnings, and instructions marked on the equipment.
- Ensure that the voltage and frequency rating of the power outlet to be used matches the electrical rating labels on the system.
- Use properly grounded power outlets.

To protect both yourself and the equipment, observe the safety precautions listed in TABLE 5-1.

TABLE 5-1 Safety Precautions

Item	Problem	Precaution
AC power cord	Electric shock	Unplug the AC cord from the AC wall socket before working on the power supply.
	Grounding	Leave the AC power cord plugged into the AC wall outlet when replacing drives, SIMMs, chips, or the system board. Leaving the AC power cord plugged into the wall outlet provides a grounding path for the wrist strap, which you must wear while servicing the system.
	Power-On/ Standby switch	Remove DC power from the system by pressing the Standby switch before unplugging a working unit or connecting a replacement unit. NOTE—If not set to standby before being unplugged, the power supply will turn on automatically when it is plugged in again, even if the power-on/standby switch or keyboard buttons are not touched.
Wrist strap	ESD	Wear a grounded wrist strap when handling printed circuit boards, drives, or other components such as SIMMs.
ESD mat	ESD	An approved antistatic mat, when used with a wrist strap, provides protection from static damage. The mat also cushions and protects small parts that are attached to printed circuit boards. Chapter 12 lists the part number of the mat.
Printed circuit boards	ESD	Handle a printed circuit board by the edges only. Store a board in an antistatic bag.
Cover	System damage and overheating	Replace the cover after performing service on the system.
SBus and MBus slot filler panels	System damage and overheating	Install filler panels in all unused SBus and MBus slots. Openings on the back panel reduce the cooling capability of the system.
Heat sinks on MBus module, and system board	Heat, burns	Do not touch the metal heat sinks on the MBus module or the system board. The heat sinks can be hot enough to cause personal injury.

Symbols

The following symbols are used throughout this manual:



Caution – This equipment contains lethal voltages. Accidental contact can result in serious injury or death.



Caution – Physical danger due to a non-electrical hazard or danger of irreversible damage to data or to the operating system.



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



AC – Terminal power outlet to which alternating current or voltage may be applied.



ON – Applies DC power to the system.



STANDBY – Removes DC power from the system.

FIGURE 5-1 Symbols Used in This Manual

System Precautions

Observe all safety precautions and ensure compliance with skill level requirements, certification, and all applicable local and national laws.

Procedures contained in this document must be performed by trained maintenance providers. Only people who have been trained by the Sun Microsystems training facilities (or by Sun Microsystems affiliates) and have been certified as required by local and national laws are considered qualified.



Caution – Before beginning a service task, carefully read each of the procedures in this manual. If similar operations on comparable equipment have not been performed, do not attempt to perform these procedures.

Lithium Battery



Caution – On SPARCstation 20 system boards, there is a lithium battery molded into the real-time clock, SGS No. MK48T18. Batteries are not customer replaceable parts. They may explode if mistreated. Do not dispose of the battery in fire. Do not disassemble it or attempt to recharge it.

Required Tools

You will need the following tools and equipment:

- Antistatic mat
- Wrist strap
- Long needlenose pliers
- Phillips screwdriver
- Flat-blade screwdriver
- SIMM installation tool
- Conductive foam to store chips
- DIP/IC extraction tool
- Fan installation tool
- Card extractor

Electrostatic Discharge (ESD) Precautions



Caution – The system chassis power must be set to standby, and the AC power cord must remain plugged in to ensure a proper ground.

To minimize electrostatic discharge, observe the following precautions:

- Hold the system board, SBus cards, MBus modules, SIMMs, or system components only by the edges.

- When removing a board, card, or module from an antistatic bag, lay it on an antistatic surface such as a Sun ESD mat, an antistatic bag, or a disposable antistatic mat.
- Transport boards, cards, or modules in an antistatic bag.
- Always wear an antistatic wrist strap connected to a metal surface on the chassis when working on system components and parts.
- Do not place the boards, cards, or modules on an unprotected surface. Use a cushioned antistatic mat or antistatic bag. Connectors and components have very thin pins that bend easily.
- Do not use an oscilloscope or VOM (Volt/Ohm meter) probe on the components. The soldered pins can be damaged or shorted by the probe point.

Power On and Off

Removing Power from the System

To remove power from the system:



Caution – Failure to terminate the operating system can cause data loss.

Note – Before turning off the system power, terminate the operating system.

1. **Notify users that the system is going down (if networked system).**
2. **Back up the system files and data.**
3. **Shut down the system.**
4. **Ensure that the power is turned off to the monitor and all peripherals connected to the system.**
5. **Remove DC power from the system by pressing the power-on/standby switch on the back panel (FIGURE 6-1).**

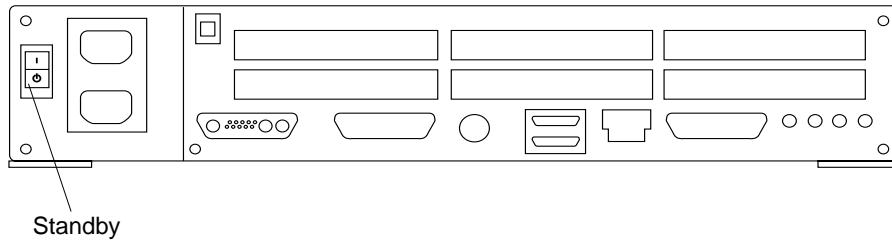


FIGURE 6-1 Standby Switch



Caution – When the power-on/standby switch is pressed and the AC power cord remains connected to a power receptacle, hazardous AC voltage is present in the power supply primary. When power is removed from the power supply, the power supply automatically returns to that state when power is restored, even if the system power-on/standby switch or the keyboard power-on key are not touched. Before servicing the power supply, press the standby switch prior to disconnecting the AC power cord.

Note – The AC power cord provides the grounding path to safely discharge static electricity. Take note where each cord and cable attaches to the system unit.

Restarting the System While Troubleshooting

When troubleshooting a problem and the POST power-on messages need to be viewed:

1. **Connect a terminal to serial port A or set up a tip connection to another workstation.**
If necessary, see “Setting Up a tip Connection” on page 19.
2. **Turn the power on as follows:**
 - a. **SCSI peripheral farthest from the system (peripheral with the SCSI terminator attached)**
 - b. **SCSI peripheral closest to the system (peripheral directly connected to the system)**

- c. Other peripherals, such as printers
 - d. Terminal (or graphics monitor if `tip` connection is used)
 - e. System unit (CPU)
3. Initiate the POST diagnostic mode by pressing and holding the keyboard Stop (L1) and D keys.
 4. Watch the screen for any POST error messages.

At the conclusion of testing, the OpenBoot PROM automatically configures the system, omitting any devices that have failed diagnostics. After POST ends, the system boots using the new configuration.

Note – POST does not test drives or SBus cards. To test these devices, run OpenBoot PROM diagnostics before the system has booted. Appendix E, “Selected On-Board Diagnostics,” describes using the `test` command to test SBus cards and drives. Also refer to *OpenBoot™ 2.x Command Reference Manual*.

Reading Boot Messages

After POST completes the system self-test, a message similar to the following is displayed, listing hardware detected in the system.

```
SPARCstation 20 Series (2 X XXXXXX)
ROM Rev. --, --- MB Memory installed, Serial #---.
Ethernet address -:-:---:--:---, Host ID: -----.
```

Turning On the Power

1. Turn on the power as follows:
 - a. External SCSI peripheral with the SCSI terminator attached
 - b. External SCSI peripheral daisy-chained to the SCSI peripheral with the SCSI terminator attached

- c. SCSI peripherals ending with the SCSI peripheral directly connected to the computer system
 - d. Monitor
 - e. Power on/Standby switch on the system back panel (FIGURE 6-2).
2. The operating system should load or the `ok` prompt should appear on the monitor.

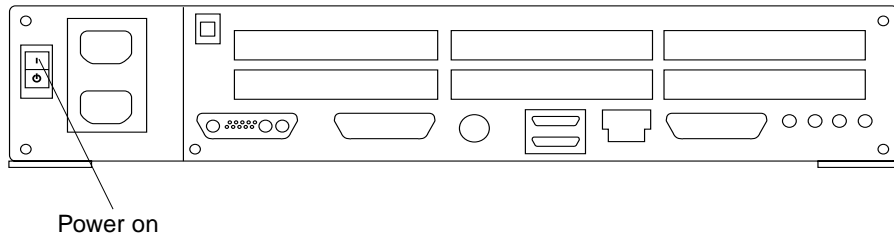


FIGURE 6-2 Power-On Switch

Internal Access

This chapter explains how to remove the cover, attach the wrist strap, and replace the cover.

Removing the Cover

To remove the cover:

- 1. Remove power from the system.**
See “Removing Power from the System” on page 45
- 2. Loosen the screw on the corner of the back panel (FIGURE 7-1).**

Note – Do not loosen the screw securing the power supply to the rear panel.

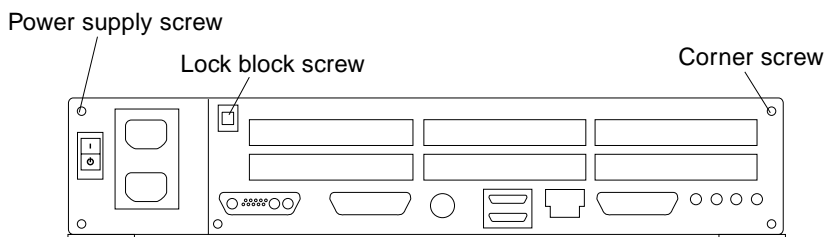


FIGURE 7-1 Lock Block Screw and Corner Screw

- 3. Loosen the screw securing the lock block to the cover. Remove the lock block and place it aside (FIGURE 7-1).**

4. Grasping the rear of the cover, lift the cover up and toward the system front. When the cover is at a 60-degree angle to the chassis, push the cover away from the front panel to free the cover hinge tabs from the chassis slots.
5. Put the cover aside (FIGURE 7-2).

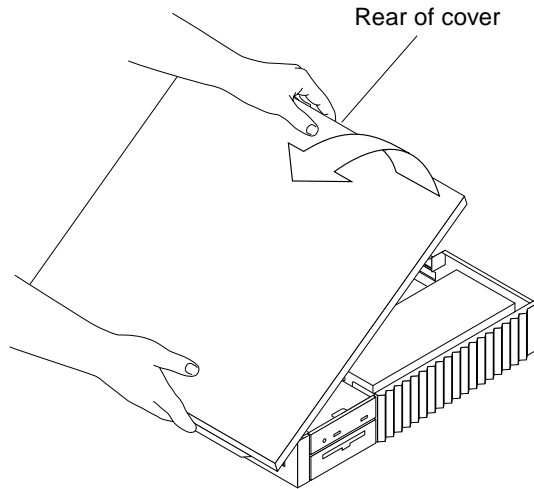


FIGURE 7-2 Removing the Cover

Attaching the Wrist Strap

To attach the wrist strap:



Caution – Wear an antistatic wrist strap and use an ESD-protected mat when handling components. When removing components other than the power supply, leave the power cord connected to both the system and the wall receptacle. When removing the power supply, attach the copper end of the wrist strap to the system chassis. Store ESD-sensitive components in antistatic bags before placing it on any surface.

1. Unwrap the first two folds of the wrist strap. Wrap the adhesive side firmly around the wrist (FIGURE 7-3).
2. At the opposite end of the wrist strap, peel the liner from the copper foil. Attach the copper foil to the power supply metal casing.

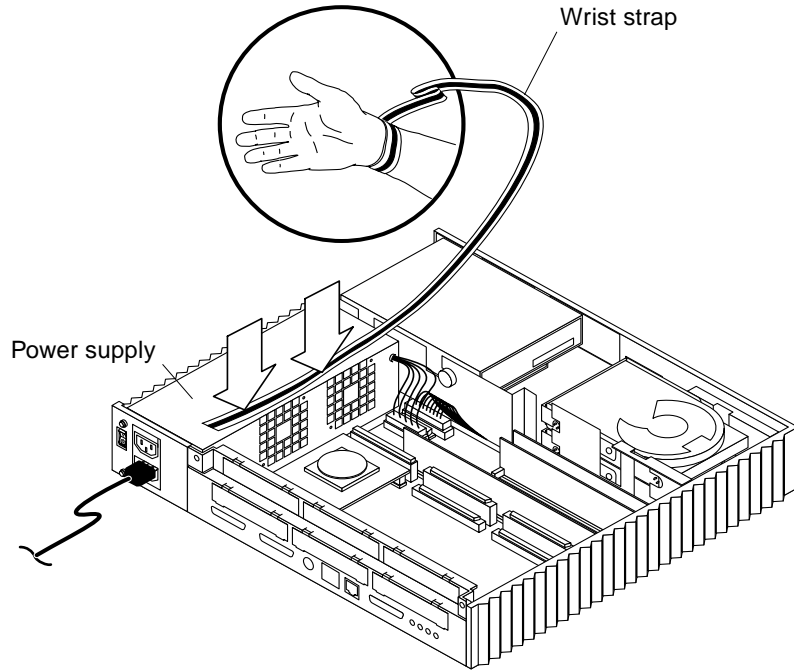


FIGURE 7-3 Grounding Wrist Strap to Power Supply

Replacing the Cover

To replace the cover:

1. **Remove the wrist strap.**
2. **Grasp the cover by the front and rear edges** (FIGURE 7-4).

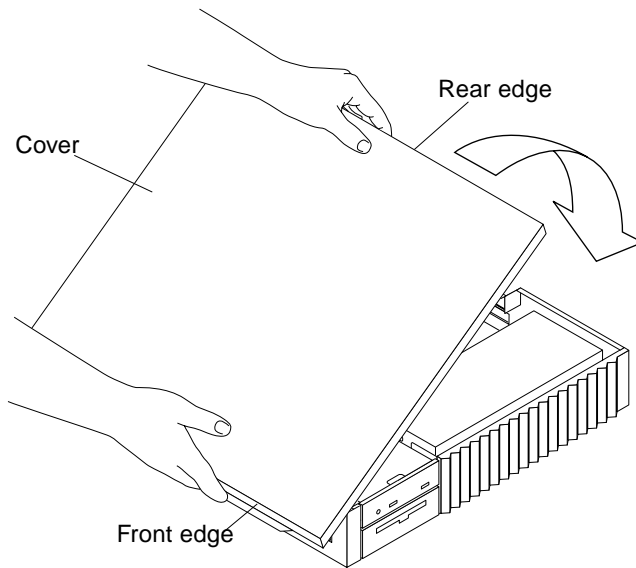


FIGURE 7-4 Replacing the Cover

- 3. Align the cover hinge tabs with the chassis tab slots on the bottom front of the system. Ensure that the tabs are locked into the chassis slots.**
- 4. Lower the cover onto the chassis (FIGURE 7-4).**
- 5. Replace the lock block (FIGURE 7-5).**

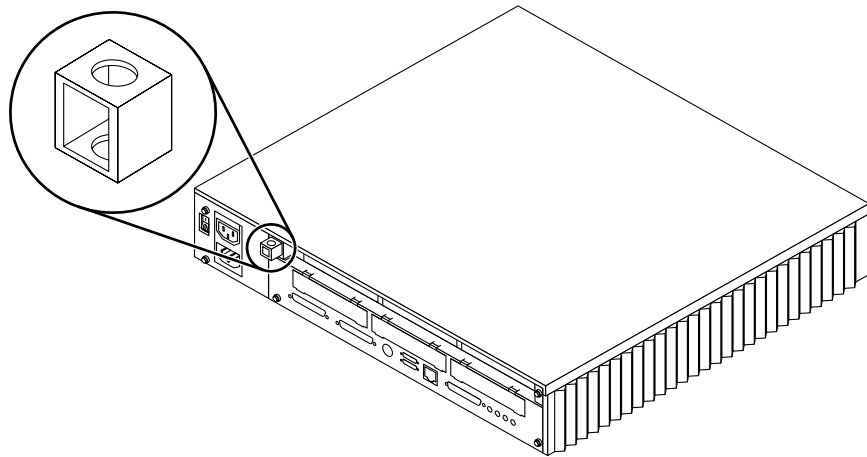


FIGURE 7-5 Lock Block



Caution – Do not use a power driver to tighten the back panel screws. Do not overtighten the back panel screws.

- 6. Tighten the screw on the back panel corner and secure the cover (FIGURE 7-6).**

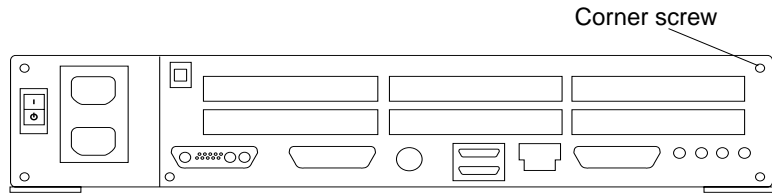


FIGURE 7-6 Back Panel Corner Screw

Removing and Installing Subassemblies

This chapter contains procedures for removing and installing the major subassemblies of the system unit. The following is the list of the major subassemblies:

Power Supply

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

Removing the Power Supply



Caution – To avoid system board or component damage, press the standby side of the power-on/standby switch before disconnecting the power cord from the back panel. When the power supply power is restored, the power supply automatically returns to the previous power state.

1. Remove power from the system.

See “Removing Power from the System” on page 45.



Caution – The AC power cord must be disconnected to replace the power supply. Do not reconnect the AC power cord while the power supply is outside of the chassis.

2. **Disconnect the power cord from the back of the system unit and from the wall receptacle.**



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. **Remove the cover and attach a wrist strap.**

See Chapter 7.

Note – The wrist strap is usually grounded to the power supply. When removing or installing the power supply, ground the wrist strap to the metal edge of the system back panel.

4. **Remove the power supply as follows (FIGURE 8-1):**

- a. **Loosen the back panel captive screws that secure the power supply to the chassis.**

Note – Some systems use only one captive screw to secure the power supply.

- b. **Disconnect the DC power connector from the system board.**
- c. **Slide the power supply toward the drive bracket and free of the chassis mounts.**
- d. **Lift the power supply from the chassis.**

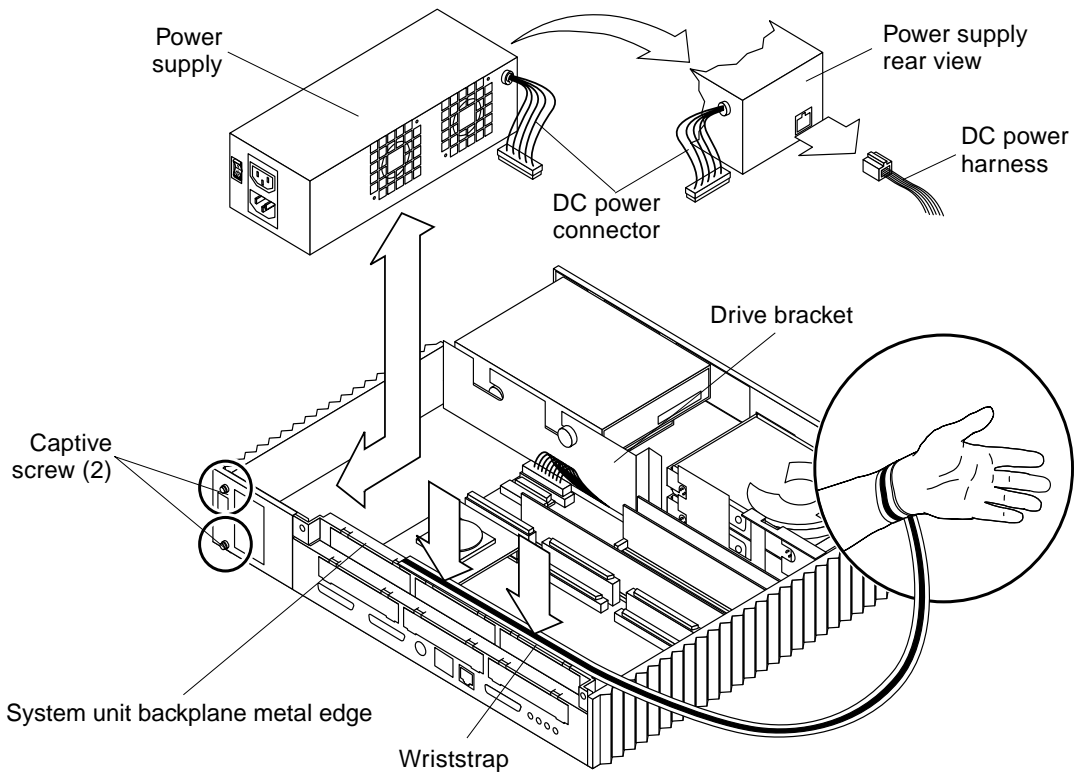


FIGURE 8-1 Attaching a Wrist Strap to Back Panel and Removing the Power Supply

- 5. Disconnect the DC power harness from the rear of the power supply (FIGURE 8-2).**
- 6. Set the power supply aside.**

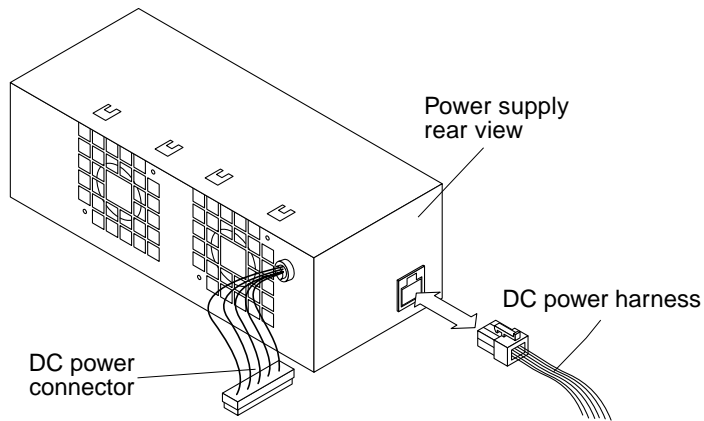


FIGURE 8-2 Power Supply and DC Power Harness

Installing 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.

1. Grasp the power supply with one hand; with the other hand, connect the DC power harness to the rear of the power supply (FIGURE 8-2).
2. Lower the power supply into the chassis at an angle such so the DC power harness fits under the edge of the chassis drive bracket.
3. Slide the power supply toward the rear of the chassis until it locks in the power supply chassis mounts.



Caution – Do not use a power driver to tighten the captive screws. Do not overtighten the captive screws.

4. Tighten the captive screw(s) that secure the power supply to the chassis (FIGURE 8-3).

Note – Some systems use only one captive screw to secure the power supply.

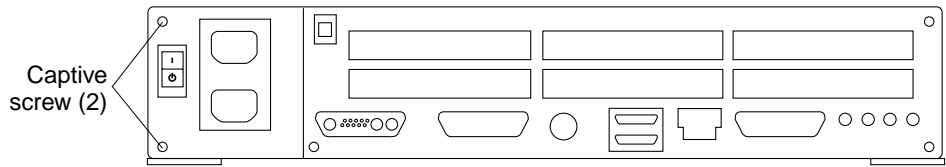


FIGURE 8-3 Power Supply Captive Screws

- 5. Connect the DC power connector to the system board (FIGURE 8-4).**
- 6. Remove the wrist strap and replace the cover.**
See Chapter 7.
- 7. Connect the power cord to the rear of the system unit and the wall receptacle.**
- 8. Power on the system.**
See “Turning On the Power” on page 47.

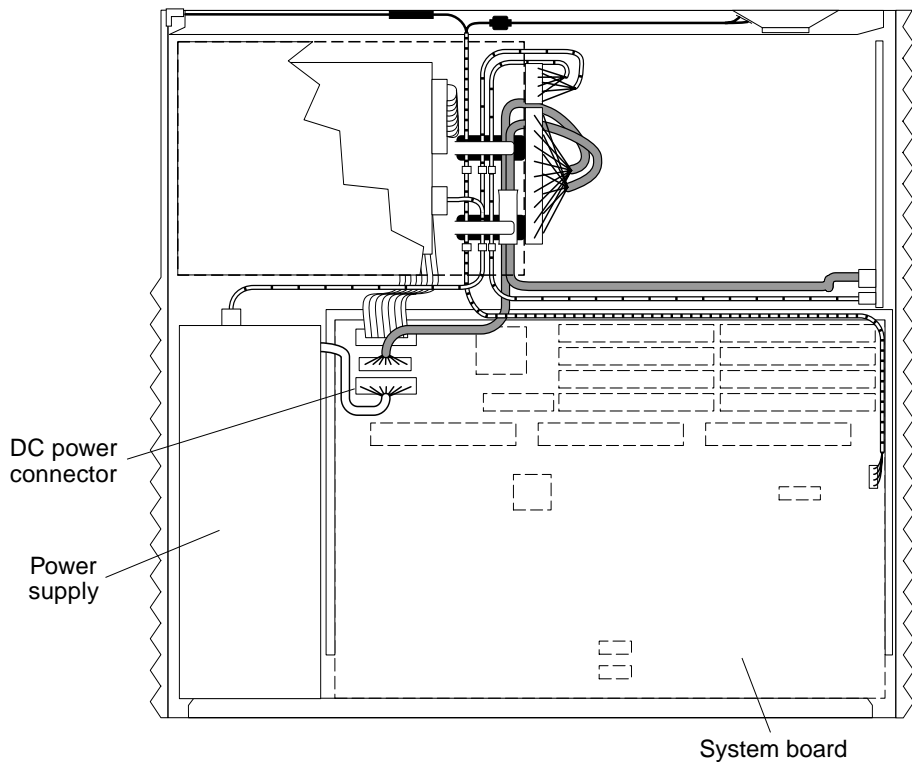


FIGURE 8-4 Connecting the DC Power Connector to the System Board

LED

To remove and install the LED, proceed as follows.

Removing the LED

Note – The LED is attached to one end of the speaker/LED cable by an in-line connector.

- 1. Remove power from the system.**
See “Removing Power from the System” on page 45.
- 2. Remove the cover and attach a wrist strap.**
See Chapter 7.



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. Locate the LED at the shrink-wrapped end of the LED cable and the in-line connector (FIGURE 8-5).**

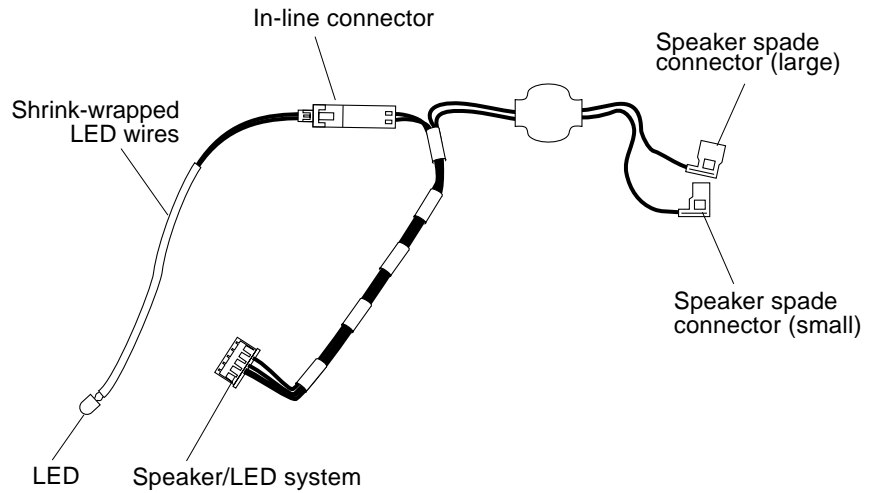


FIGURE 8-5 Speaker/LED Cable Detail

Note – Three tabs on the LED light pipe secure the LED to the right front corner of the chassis (FIGURE 8-6).

4. Use the tip of a small screwdriver to work the cable and LED free from the light pipe tabs (FIGURE 8-6).
5. Disconnect the shrink-wrapped section of the LED cable from the in-line connector (FIGURE 8-7).

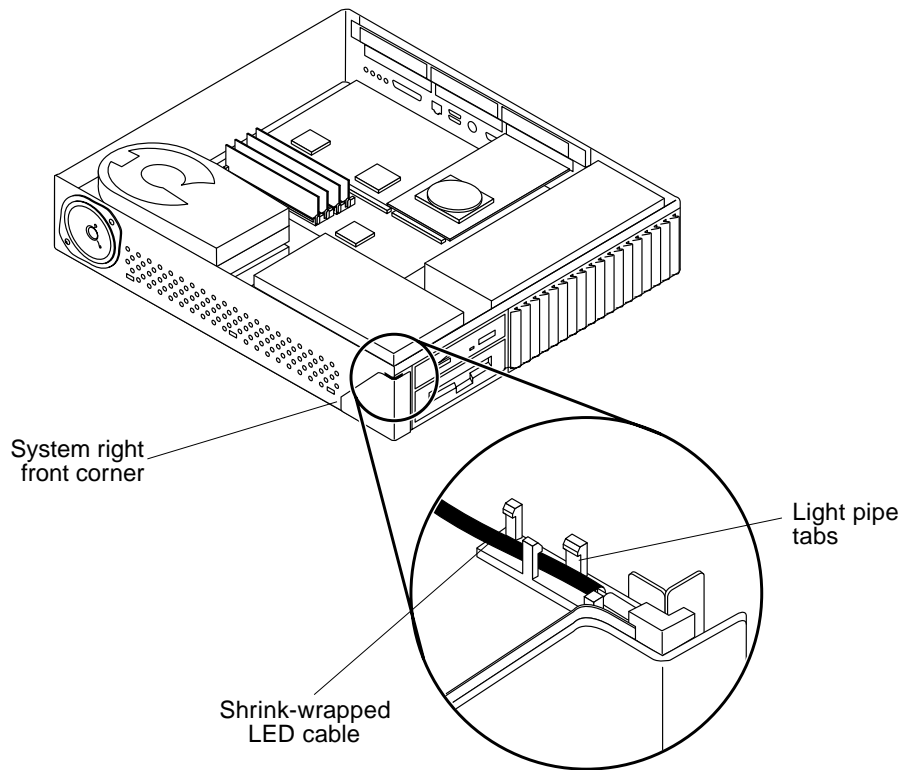


FIGURE 8-6 LED Light Pipe Detail

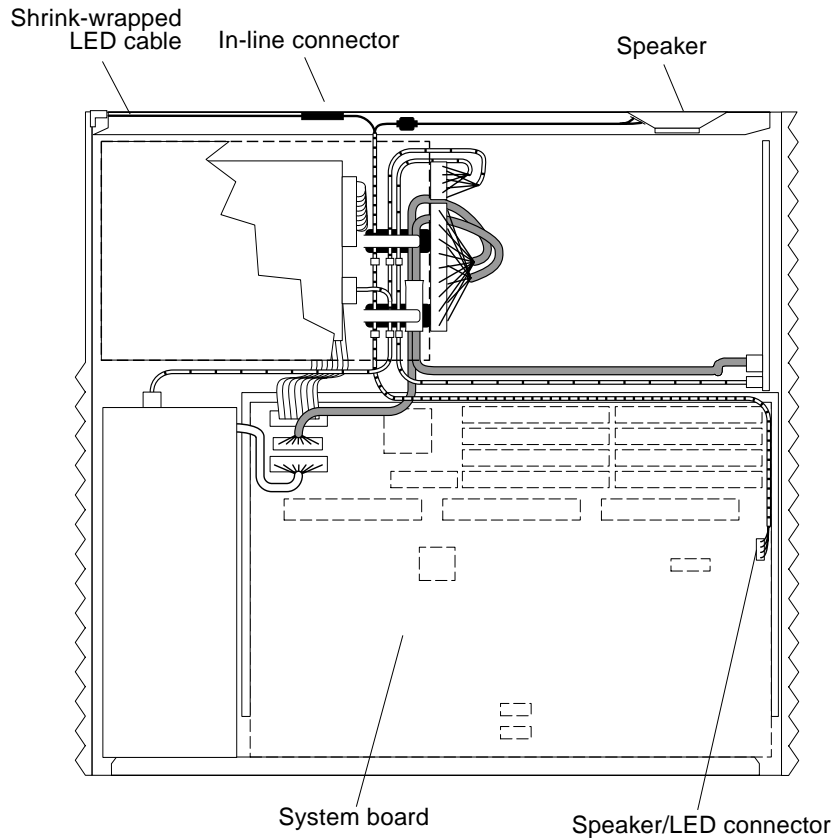


FIGURE 8-7 Speaker/LED Cable

Installing the LED



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 LED near the tabs and light pipe at the corner of the system** (FIGURE 8-6).
2. **Use the tip of a small flatblade screwdriver to work the shrink-wrapped LED wires through the tabs** (FIGURE 8-6).
3. **Route the LED wires along the top front edge of the chassis and connect them to the Speaker/LED in-line connector** (FIGURE 8-7).

4. Detach the wrist strap and replace the cover.

See Chapter 7.

5. Power on the system.

See “Turning On the Power” on page 47.

Speaker

To remove and install the internal speaker, proceed as follows.

Removing the Speaker

1. Remove power from the system.

See “Removing Power from the System” on page 45.

2. Remove the cover and attach a wrist strap.

See Chapter 7.



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 – Avoid damaging the speaker surface; use care when working near or handling the speaker. Do not touch the speaker diaphragm with tools or fingers. Grasp the speaker by the metal edges.

3. Remove the triangular-shaped speaker cover from the unit front as follows:

Note – The speaker cover is secured by three tabs; one tab is on the cover top and two tabs are on the cover bottom (see FIGURE 8-8).

- a. Insert the tip of a small flat-blade screwdriver between the speaker cover and the chassis. Press the top cover tab outward slightly to release it from the chassis slot.**

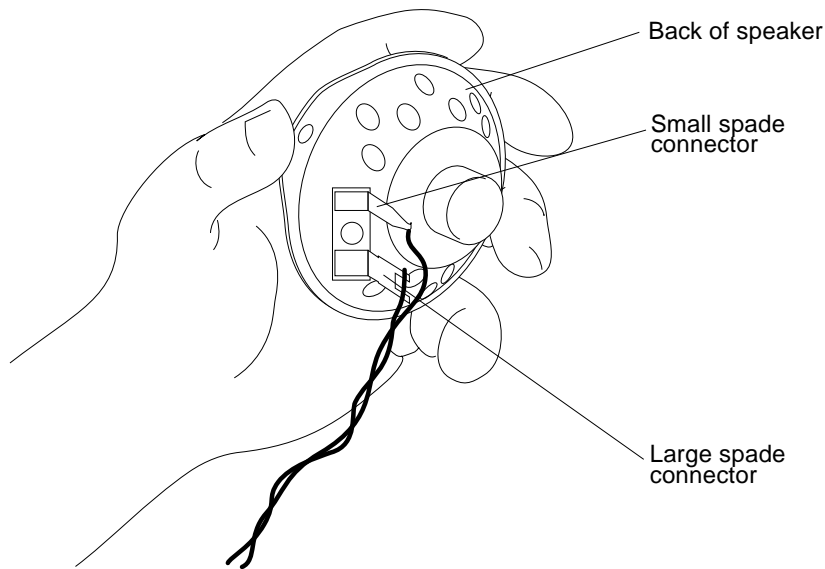


FIGURE 8-9 Speaker Connectors

Installing the 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.



Caution – Avoid damaging the speaker surface; use care when working near or handling the speaker. Do not touch the speaker diaphragm with tools or fingers. Grasp the speaker by the metal edges.

1. **Slide the spade connectors onto the speaker terminals** (FIGURE 8-9).

Note – Connectors and terminals are keyed to ensure proper connection.

2. **Install the speaker in the opening on the system front.**
3. **Replace the two screws that secure the speaker to the chassis and proceed as follows** (FIGURE 8-8):

- a. Align the tabs on the speaker cover with the slots in the chassis.
 - b. Press the speaker cover against the chassis; snap the speaker cover in place.
4. Detach the wrist strap and replace the cover.
See Chapter 7.
 5. Power on the system.
See “Turning On the Power” on page 47.

Fan Assembly

The proceeding paragraphs provide instructions for removing and installing the fan and the fan DC power harness. To remove and install the fan or the fan DC power harness, proceed as follows.

Note – If installed, the CD-ROM drive must be removed *before* the fan assembly can be removed or installed (see “Removing a CD-ROM Drive” on page 123).

Removing the Fan

1. Remove power from the system.
See “Removing Power from the System” on page 45.
2. Remove the cover and attach a wrist strap.
See Chapter 7.



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. Disconnect the fan DC power connector (FIGURE 8-10).
4. Detach the fan DC power cable free from beneath the metal cable restraint.
5. Remove the fan as follows:
 - a. Grasp the fan housing firmly.

- b. Place the tip of a small flat-blade screwdriver under the fan side mounting clip and pry it up to free the fan clip from the chassis metal drive bracket.
- c. While prying the clip up, pull the fan housing toward the center of the system to free the bottom clip from the chassis (FIGURE 8-11).
- d. Set the fan aside.

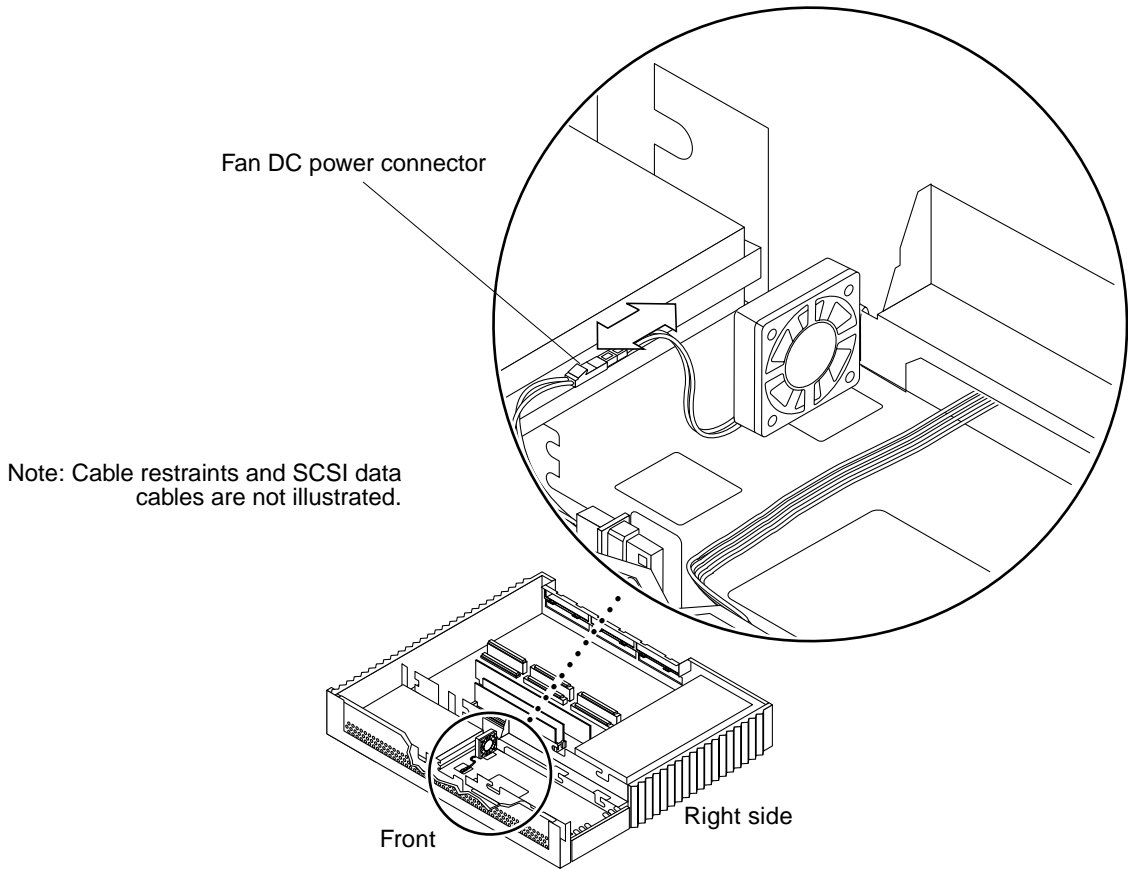


FIGURE 8-10 Disconnecting the Fan DC Power Connector

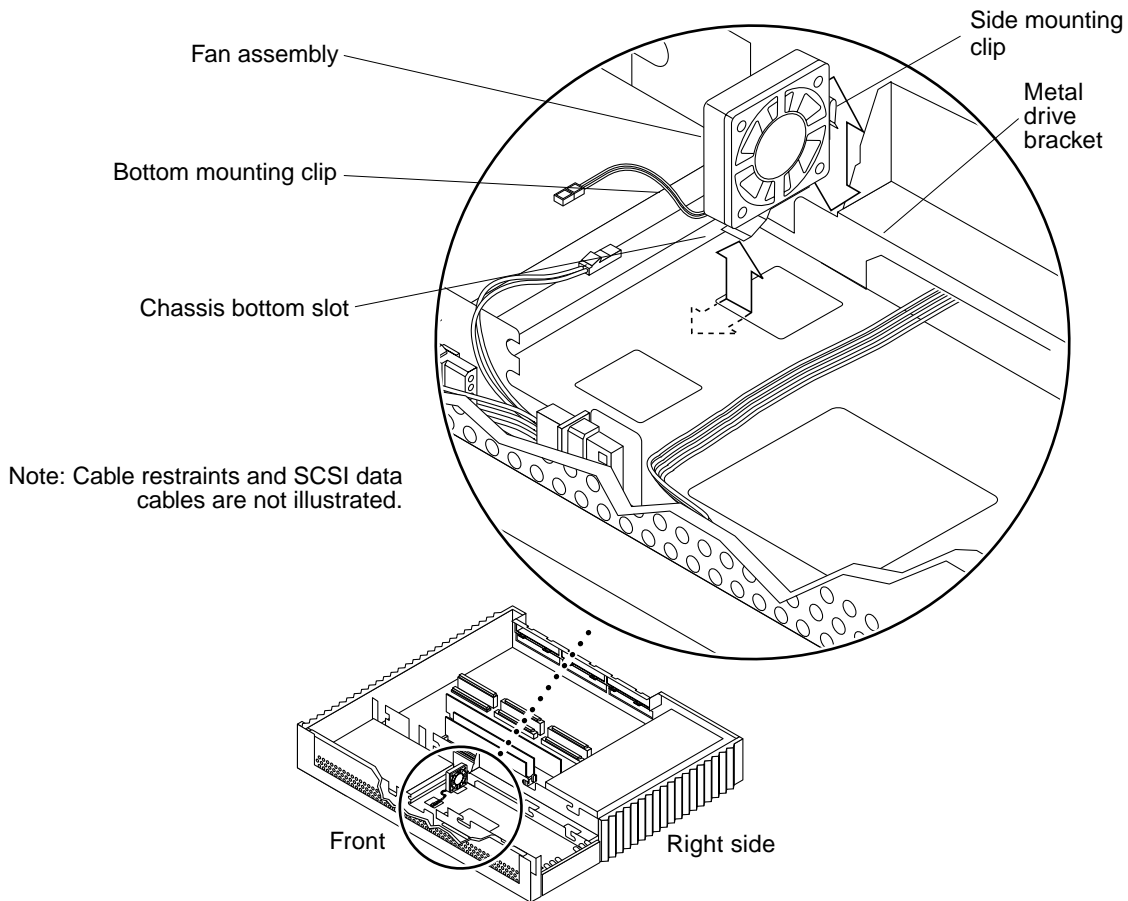


FIGURE 8-11 Removing the Fan

Installing the Fan



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 – Some units have built-in fan DC power cables in the system DC power harness and the separate fan DC harness is not used. Systems having separate fan DC power harness must have the fan DC power harness connected to the CD-ROM drive DC power connector.

1. **Insert the fan bottom mounting clip into the opening at the bottom of the system chassis. Place the side mounting clip over the edge of the chassis (FIGURE 8-12).**

Note – Position the fan assembly so that it does not interfere with the removal of the system hard disk drives.

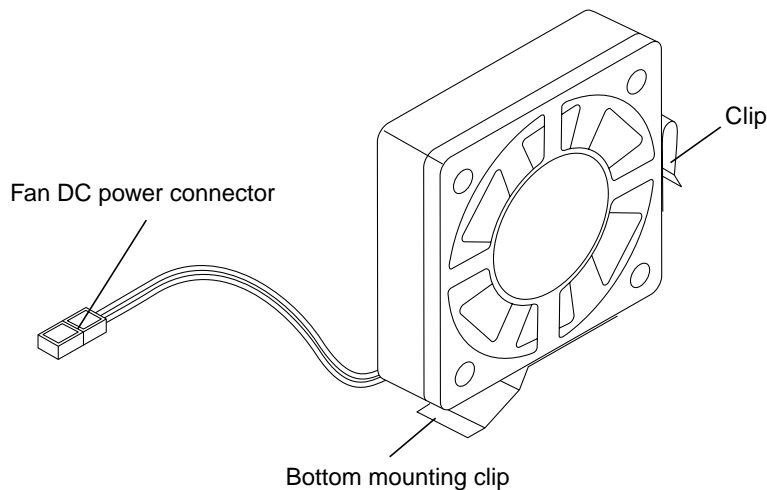


FIGURE 8-12 Fan Assembly

2. **Push the fan side mounting clip against the vertical edge of the chassis (FIGURE 8-13).**

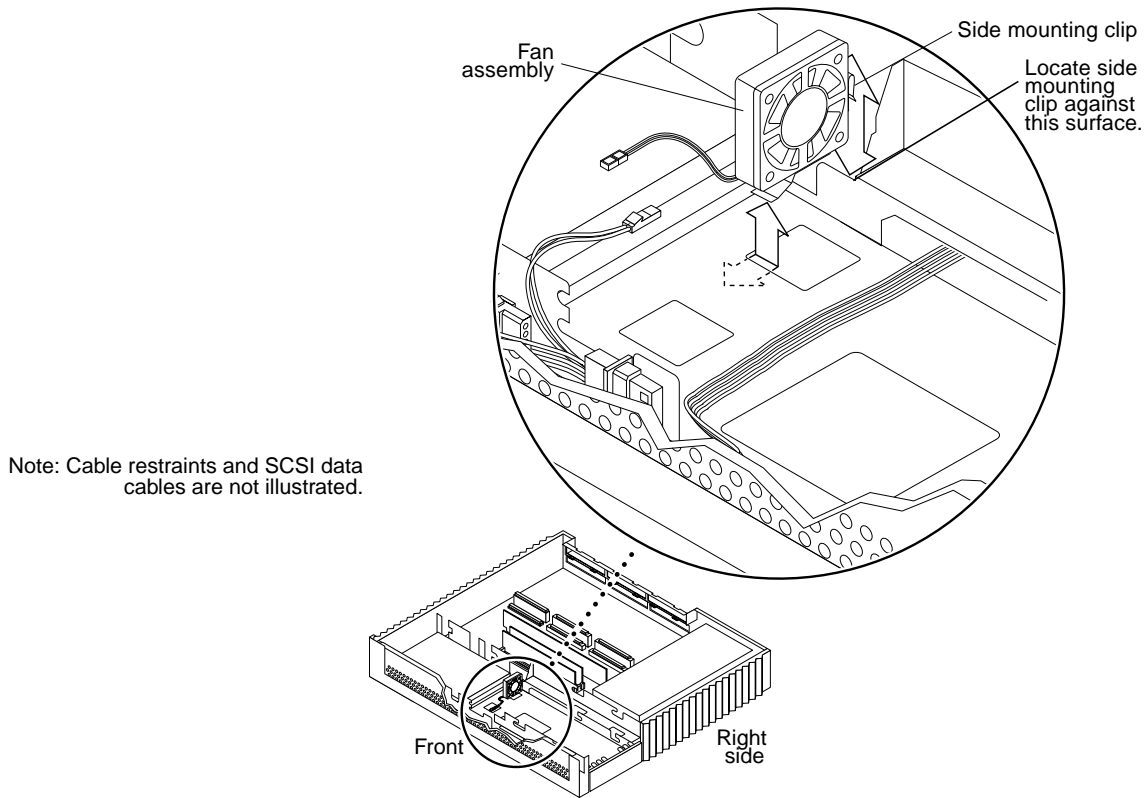


FIGURE 8-13 Mounting the Fan Assembly

- 3. Place the notched tip of the fan installation tool over the side mounting clip and press down (FIGURE 8-14).**

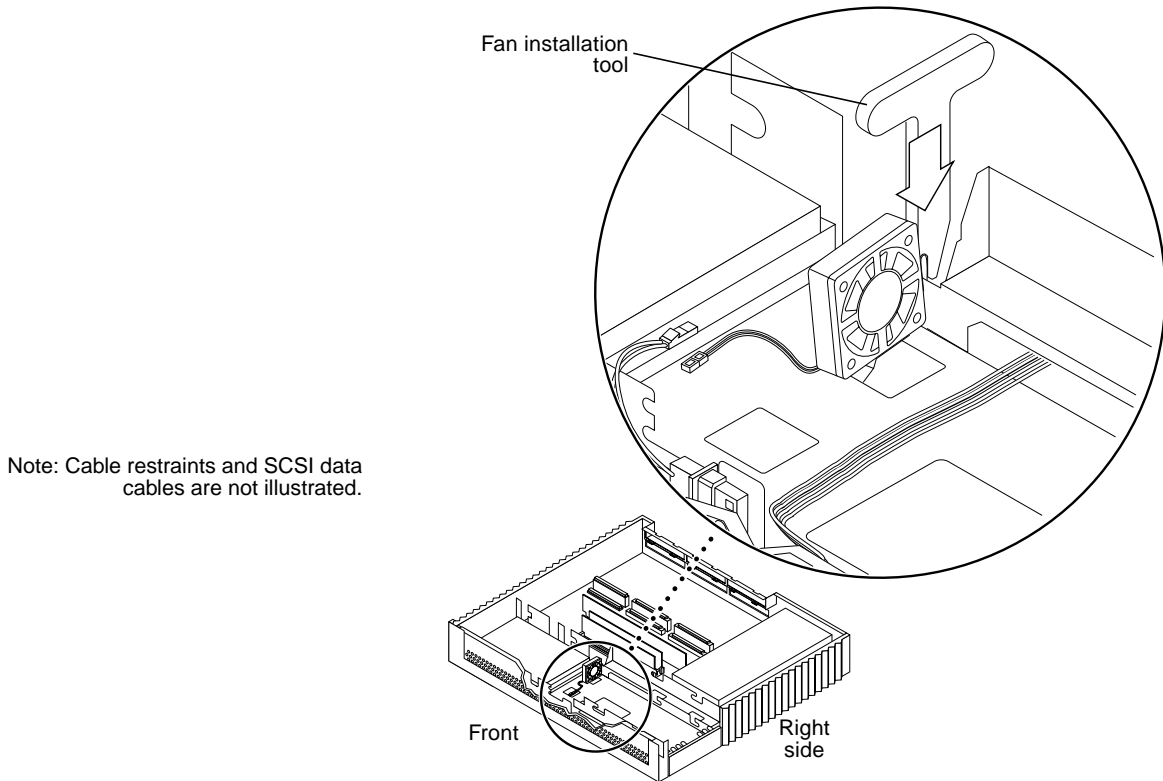


FIGURE 8-14 Securing the Fan Assembly Using the Fan Installation Tool

- 4. Connect the fan assembly power connector to the two-pin fan DC power connector (FIGURE 8-15).**

Note – Connectors and terminals are keyed to ensure proper connection.

- 5. Secure the fan DC harness beneath the cable restraint (FIGURE 8-15).**

Note – Store any excess cabling under the cable restraint.

- 6. If a CD-ROM drive was removed, install it now.**

See “Installing a CD-ROM Drive” on page 124.

7. Detach the wrist strap and replace the cover.

See Chapter 7.

8. Power on the system

See Section “Turning On the Power” on page 6-47.

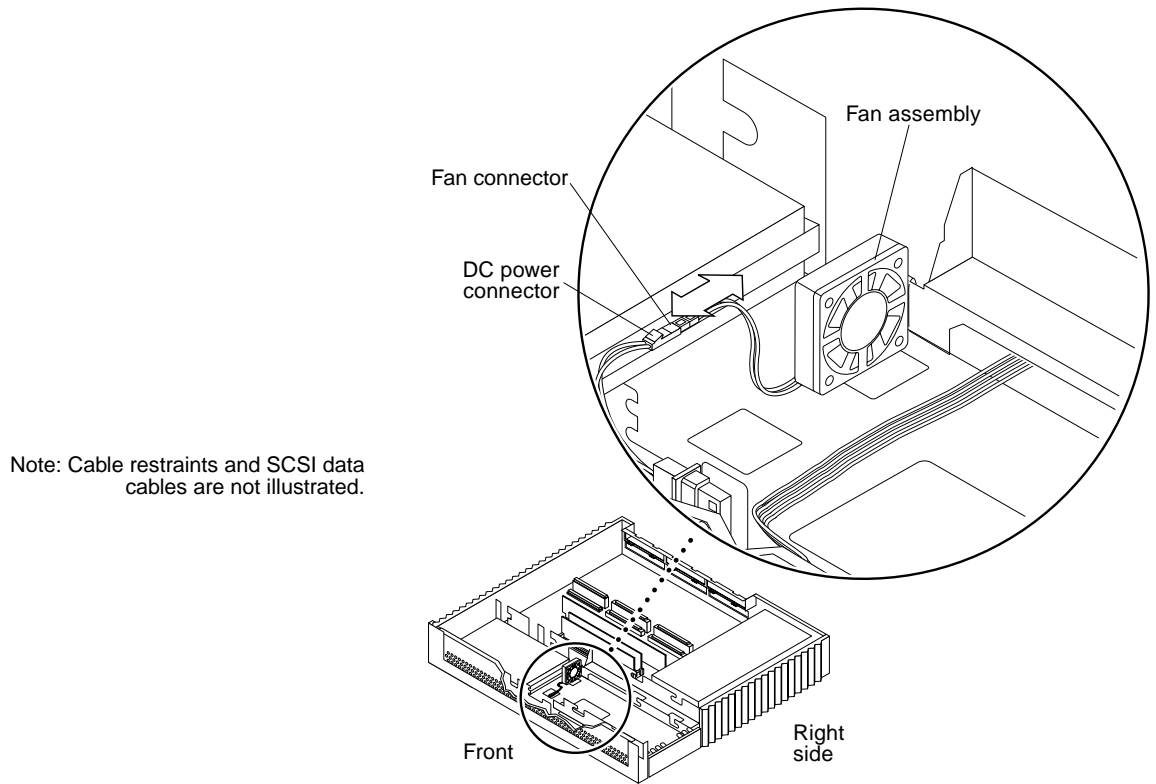


FIGURE 8-15 Connecting the Fan Assembly DC Power Connector

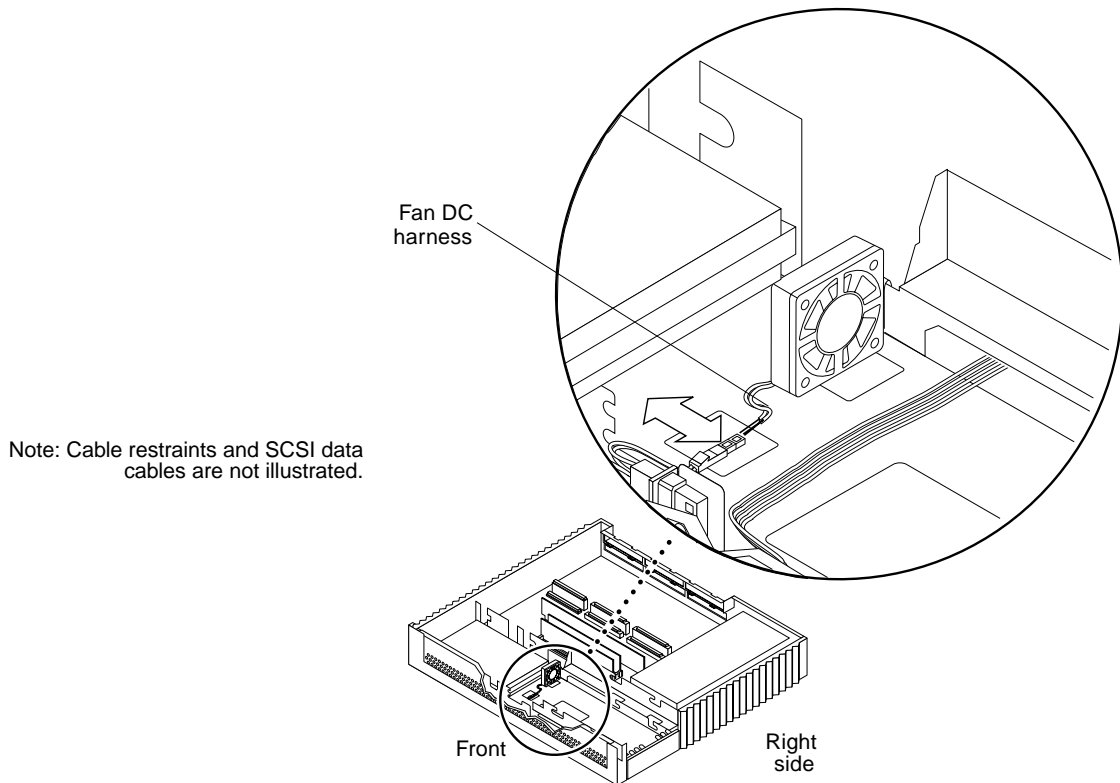


FIGURE 8-16 Securing the Fan Assembly DC Power Connector

Removing the Fan DC Power Harness

Note – Some units have built-in fan DC power cables in the system DC power harness and the separate fan DC harness is not used. For systems having the fan DC connector built into the system DC power harness, see “DC Power Harness” on page 97. If the system has a separate fan DC power harness, the fan DC power harness must be removed from the CD-ROM drive DC power connector. The separate fan DC power harness has a two-wire fan DC power connector, a CD-ROM drive DC power connector, and a power connector for the optional CD-ROM drive connector (FIGURE 8-17).

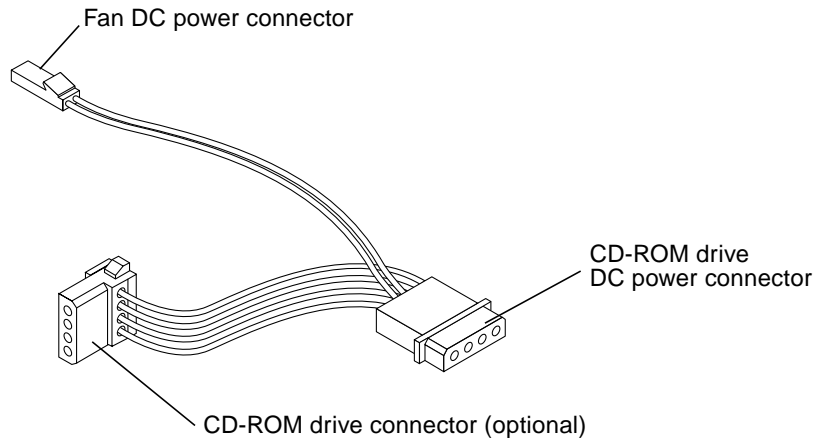


FIGURE 8-17 Fan DC Power Harness

- 1. Remove power from the system.**
See “Removing Power from the System” on page 45.
- 2. Remove the cover and attach a wrist strap.**
See Chapter 7.



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. Detach the fan DC power harness from under the cable restraint near the CD-ROM drive data cable (FIGURE 8-18).**

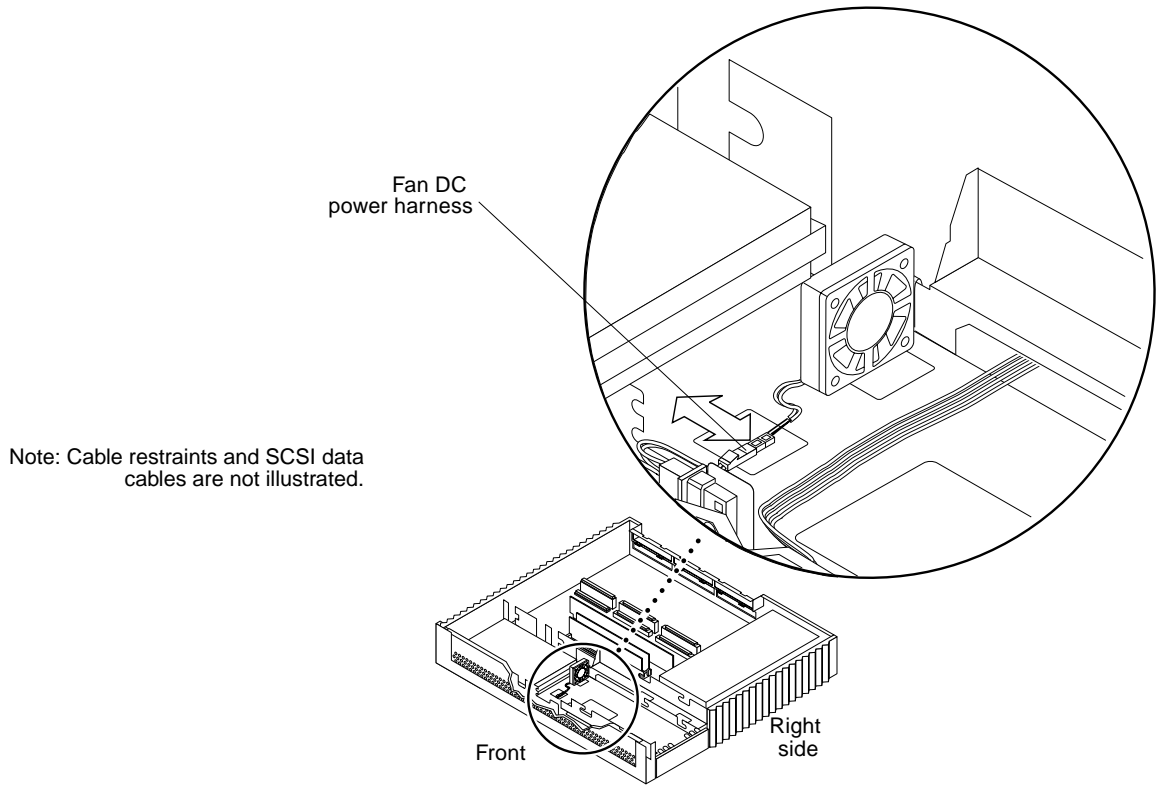


FIGURE 8-18 Fan DC Power Harness and Cable Restraint

- 4. Disconnect the fan power connector from the DC power connector (FIGURE 8-19).**

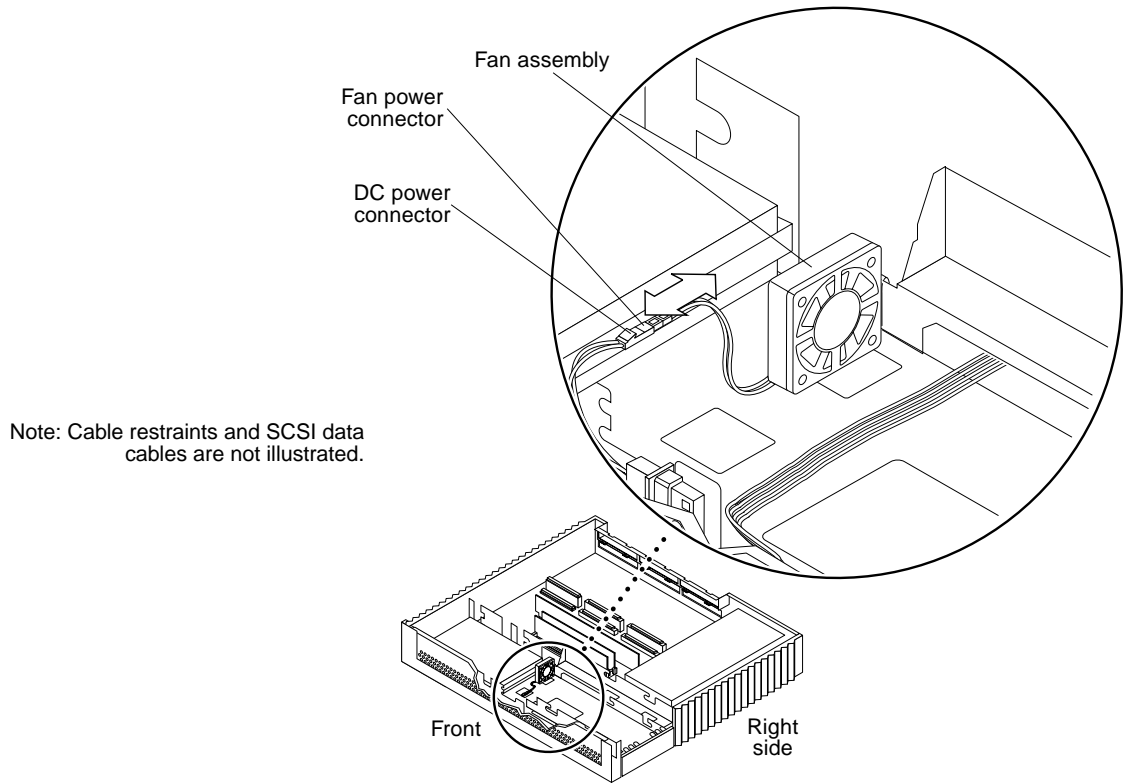


FIGURE 8-19 Disconnecting the Fan Power Connector from the DC Power Connector

- 5. Lift the excess fan DC cable from the cable trough along the front of the chassis; remove the fan DC power harness (FIGURE 8-20).**
- 6. Disconnect the fan DC power connector from the CD-ROM drive power connector (FIGURE 8-21).**

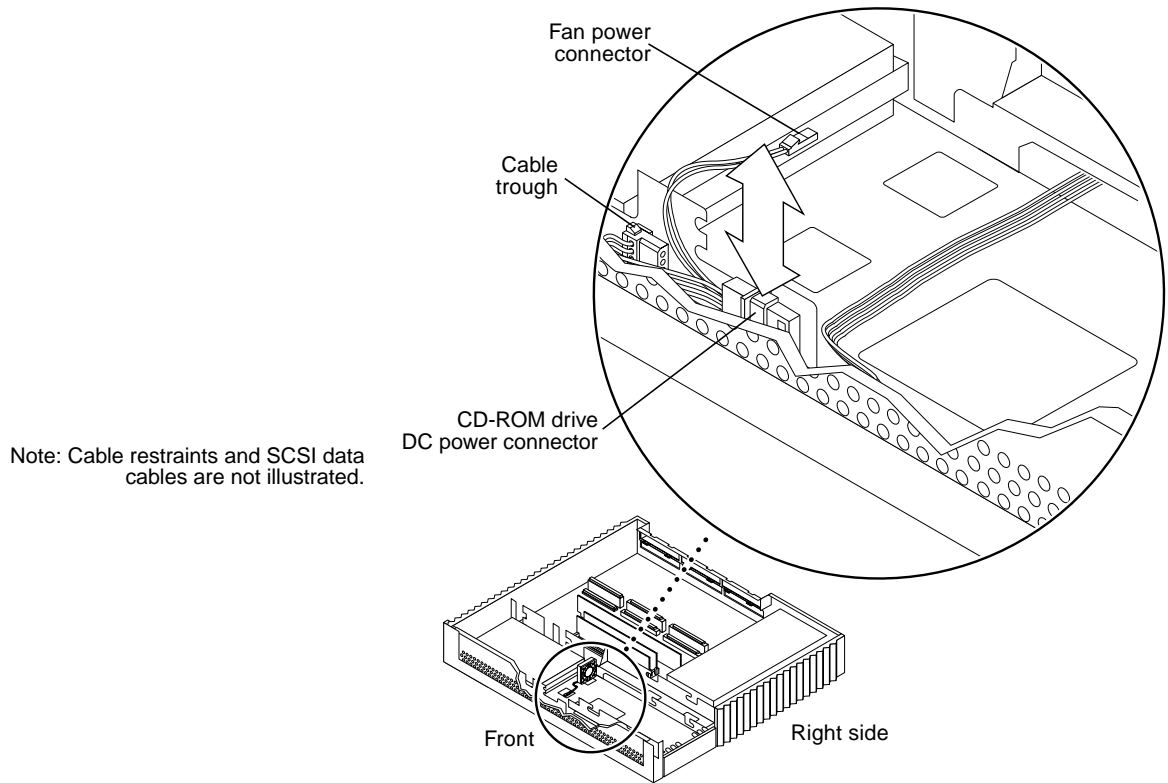


FIGURE 8-20 Lifting Fan DC Cable from the Cable Trough

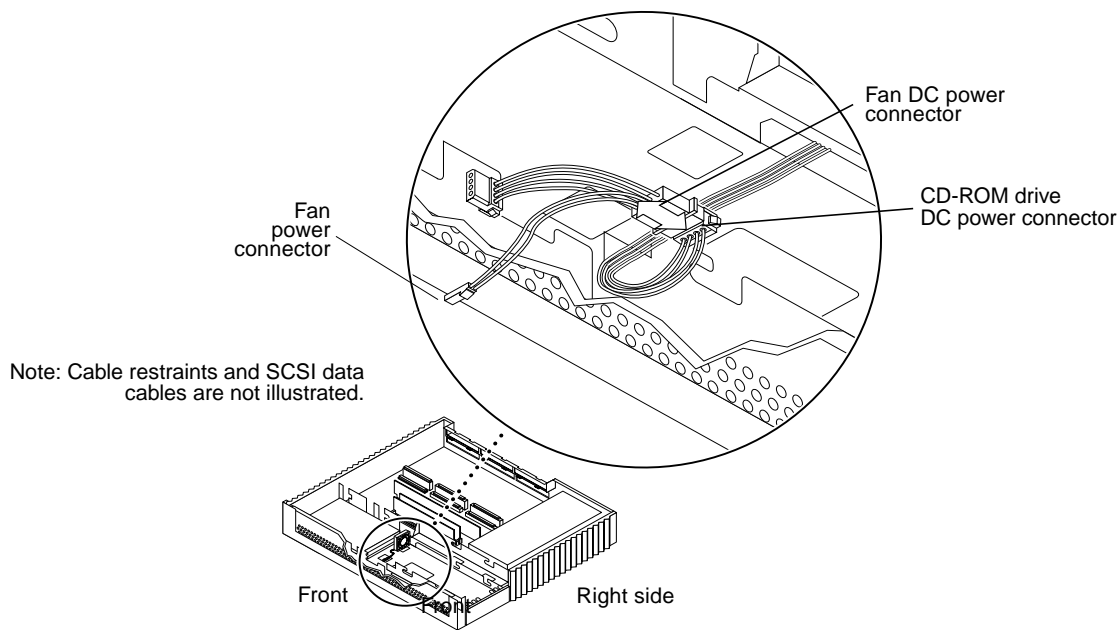


FIGURE 8-21 Disconnecting the Fan Power Connector

Installing the Fan DC Power Harness



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. **Locate the CD-ROM drive DC power connector** (FIGURE 8-22).

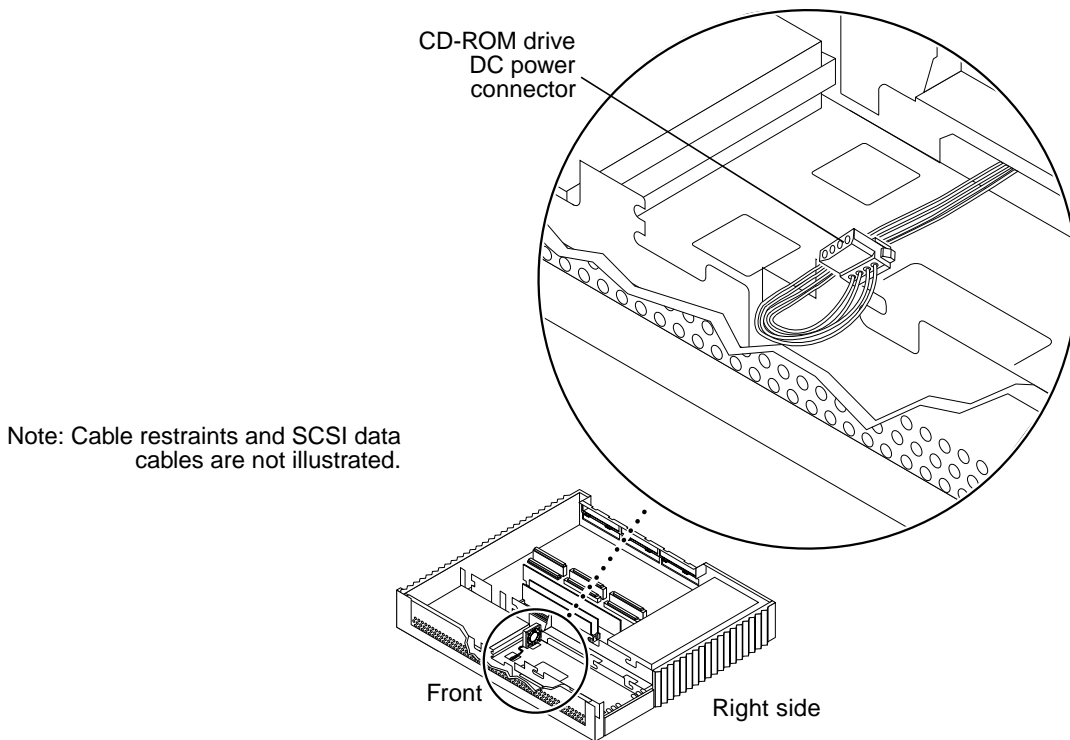


FIGURE 8-22 CD-ROM Drive DC Power Connector Location

- 2. Connect the fan DC power connector to the CD-ROM drive DC power connector (FIGURE 8-23).**

Note – Connectors and terminals are keyed to ensure proper connection.

- 3. Place the excess cable into the cable trough along the front of the chassis (FIGURE 8-24).**

Note – Be sure an adequate amount of two-wire fan DC cable is exposed to allow fan connection.

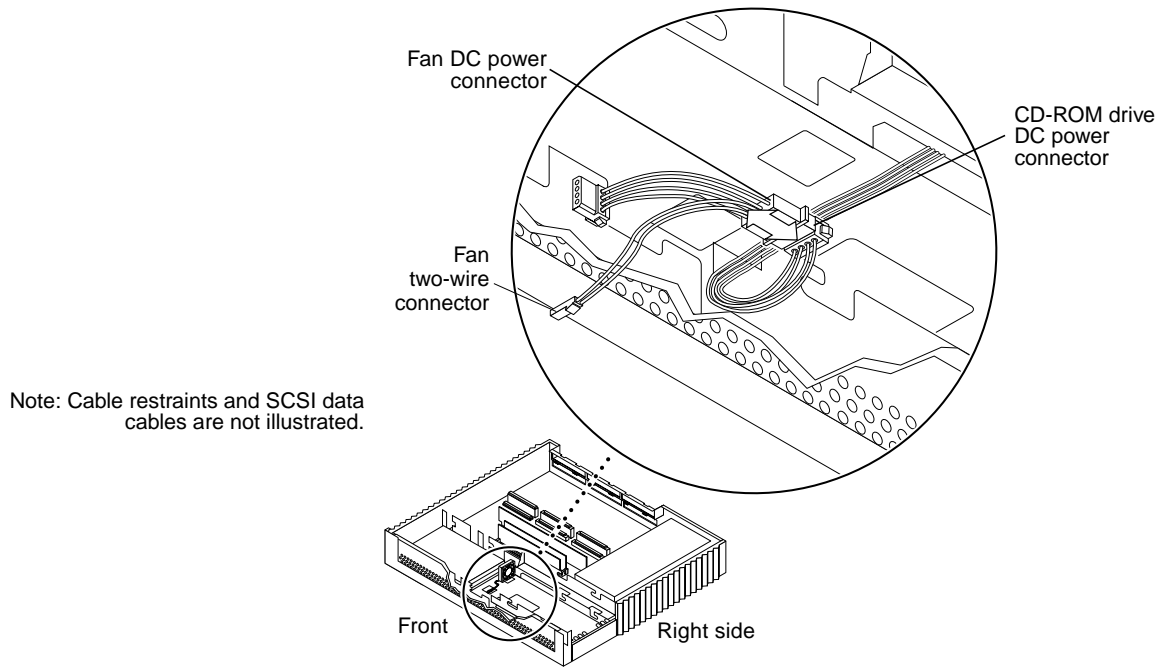
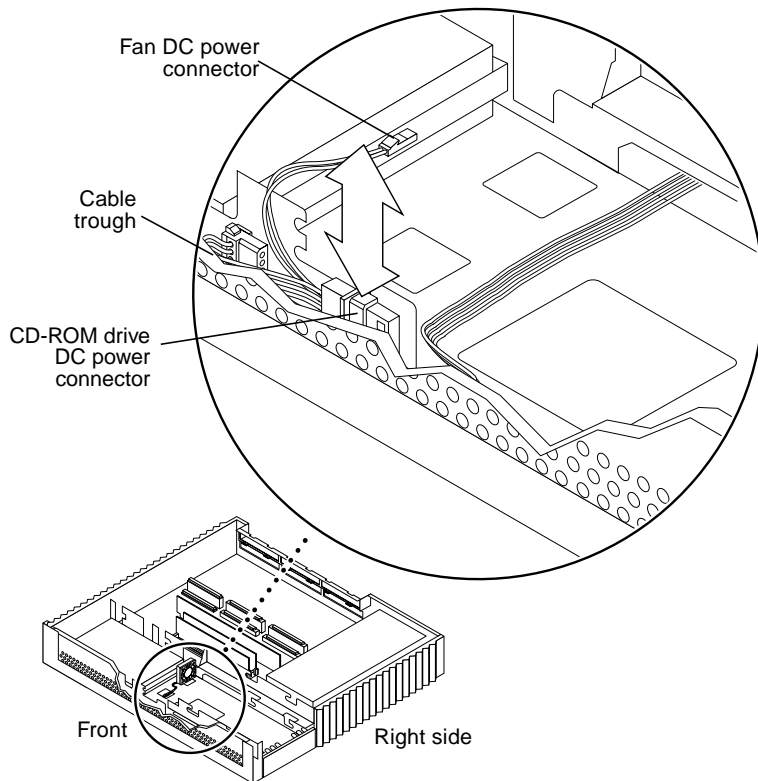


FIGURE 8-23 Connecting the Fan DC Power Connector



Note: Cable restraints and SCSI data cables are not illustrated.

FIGURE 8-24 Routing Excess Cables in Cable Trough

- 4. Connect the two-pin power connector to the fan assembly DC power connector (FIGURE 8-25).**

Note – Connectors and terminals are keyed to ensure proper connection.

- 5. Detach the wrist strap and replace the cover.**

See Chapter 7.

- 6. Power on the system.**

See “Turning On the Power” on page 47.

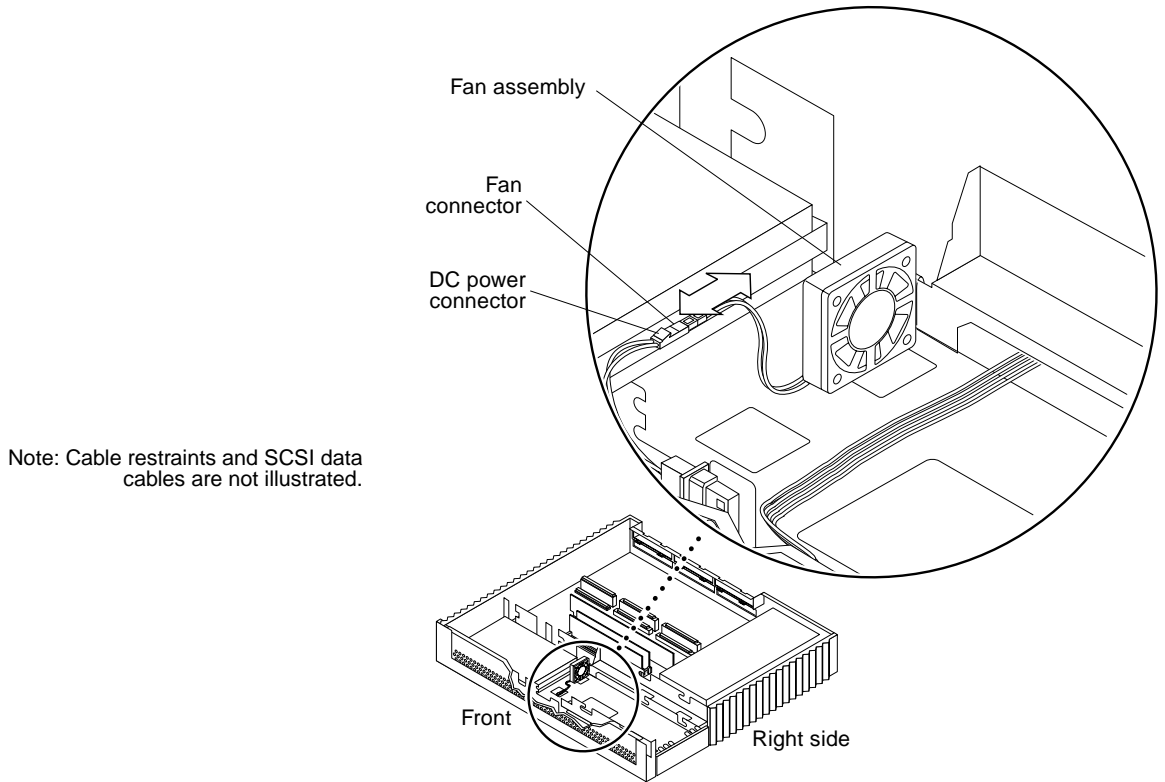


FIGURE 8-25 Fan DC Power Connector

SCSI Backplane

To remove and install the SCSI backplane, proceed as follows.

Removing the SCSI Backplane

Note – The SCSI backplane is a printed circuit board located in the drive bracket area of the chassis. A bracket and two screws secure the SCSI backplane to the vented sheetmetal chassis. One or two single-connector hard drives plug into the SCSI backplane. The SCSI single-connector drive sockets provide SCSI data, SCSI addressing, and power.

1. Remove power from the system.

See “Removing Power from the System” on page 45.

2. Remove the cover and attach a wrist strap.

See Chapter 7.



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. Remove the hard disk drive(s).

See “Removing a Hard Disk Drive” on page 117.

4. Disconnect the SCSI backplane sockets and connectors as follows (FIGURE 8-26):

a. Press the clip on the DC power connector.

b. Disconnect the DC power connector from the SCSI backplane socket.

c. Disconnect the DC power connector clip from the DC power socket.

d. Disconnect the SCSI data connector from the SCSI data socket.

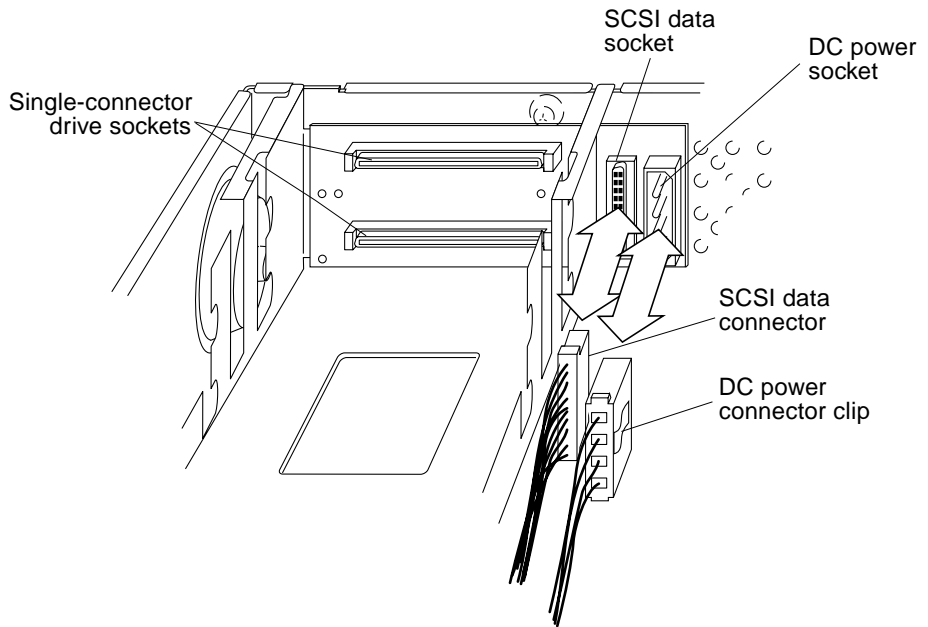


FIGURE 8-26 SCSI Backplane Sockets and Connectors

5. Remove the two Phillips-head screws that secure the SCSI backplane to the plastic mounting bracket (FIGURE 8-27).

Note – The DC power socket and the SCSI data socket are located on the right side of the SCSI backplane. This part of the SCSI backplane extends through a slot in the drive bracket.

6. Grasp the left edge of the SCSI backplane and rotate it away from the chassis.
7. Pull the end of the backplane with the SCSI data socket and the DC power socket out through the drive bracket area.
8. Remove the SCSI backplane from the chassis.

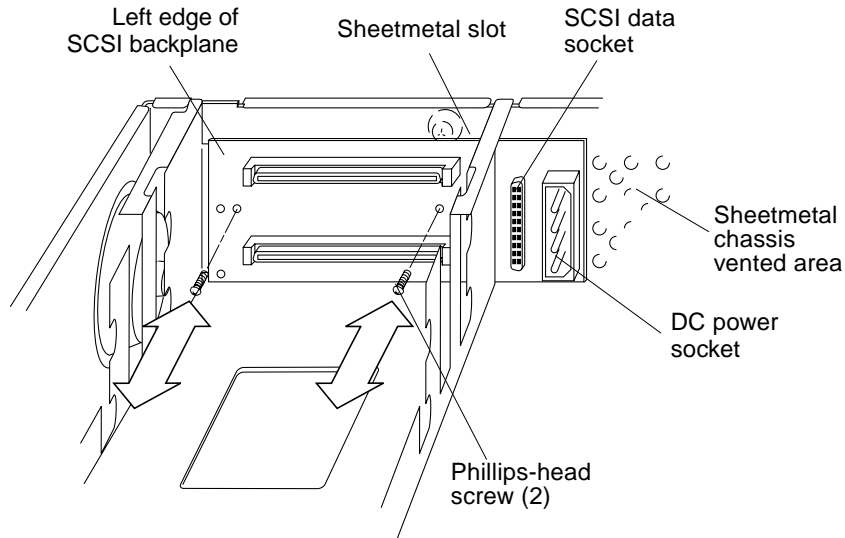


FIGURE 8-27 SCSI Backplane Screws

9. Remove the SCSI backplane bracket as follows (FIGURE 8-28):
 - a. Insert long needlenose pliers or a flat-blade screwdriver between the SCSI backplane bracket and the sheetmetal chassis.

Note – If there is difficulty in accessing the bottom plastic tab with needlenose pliers, use a flat-blade screwdriver to push the tabs toward the chassis corner.

- b. Squeeze the plastic bracket tabs together and release the SCSI backplane bracket from the slots that secure it to the sheetmetal chassis.

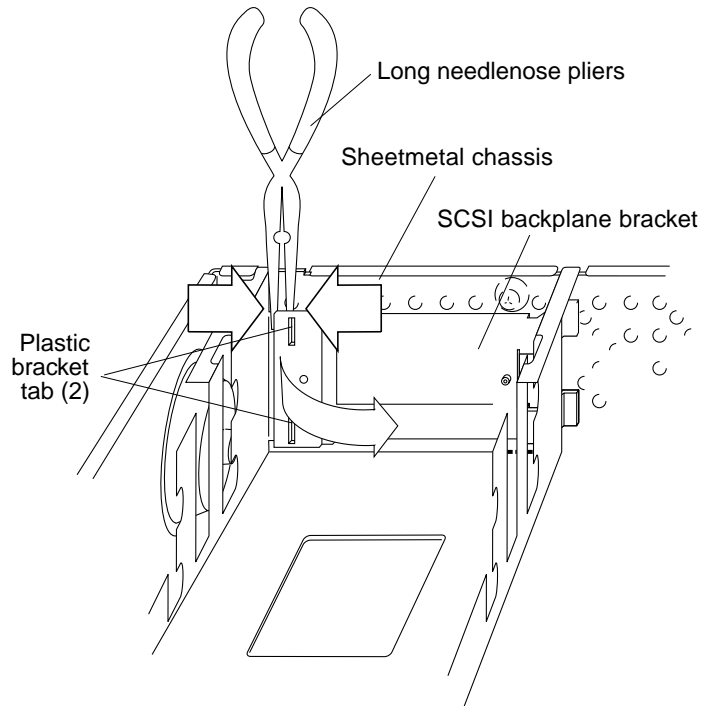


FIGURE 8-28 SCSI Backplane Bracket Tabs

Installing the SCSI Backplane



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 backplane bracket as follows (FIGURE 8-27):
 - a. Position the plastic SCSI backplane bracket so that the bracket tabs face the vented sheetmetal chassis.
 - b. Slide the right side of the SCSI backplane through the sheetmetal slot in the drive bracket.

Note – The two plastic legs on the right side of the SCSI backplane fit into the chassis sheetmetal slots.

c. Align the tabs on the left side of the SCSI backplane bracket with the sheetmetal slots near the chassis corner.

d. Firmly press the tabs into the chassis slots.

Note – Check to ensure that the bracket assembly snaps securely into place and that the two legs are in the chassis sheetmetal slots.

2. Connect the SCSI data connector and the DC power connector clip into the SCSI data socket and the DC power socket, respectively (FIGURE 8-26).

3. Replace the hard disk drive(s).

See “Installing a Hard Disk Drive” on page 120.

4. Detach the wrist strap and replace the cover.

See Chapter 7.

5. Power on the system.

See “Turning On the Power” on page 47.

SCSI Data Cable

The SPARCstation 20 system is configured with one of two chassis types:

- A chassis that supports the SunCD 2Plus drive (1-inch drive)
- A chassis that supports the SunCD 4 drive (1.6-inch drive)

Removing and installing the SCSI data cable varies depending on the chassis. The following sections provide SCSI data cable removal and installation for each chassis type.

Removing the SCSI Data Cable (SunCD 2Plus Drive-Type Chassis)

1. Remove power from the system.

See “Removing Power from the System” on page 45.

2. Remove the cover and attach a wrist strap.

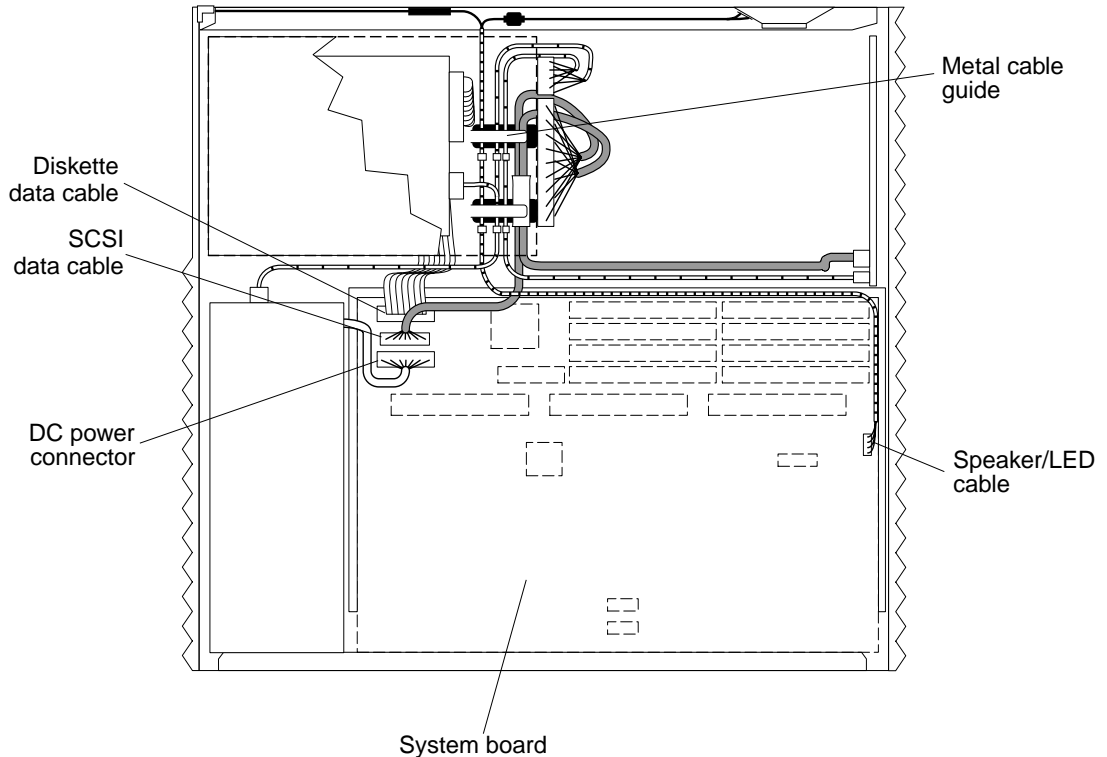
See Chapter 7.



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. Disconnect the following cables from the system board (FIGURE 8-29):

- Diskette data cable (optional)
- SCSI data cable
- DC power connector
- Speaker/LED cable



Note: Figure illustrates SunCD 2Plus drive-type (1-inch drive) chassis only.

FIGURE 8-29 Internal Cables and DC Power Connector (SunCD 2Plus Drive-Type Chassis)

4. Remove any SBus cards.

See “Removing an SBus Card” on page 152.

5. Loosen the two captive screws on the back panel that secure the system board to the chassis (FIGURE 8-30).

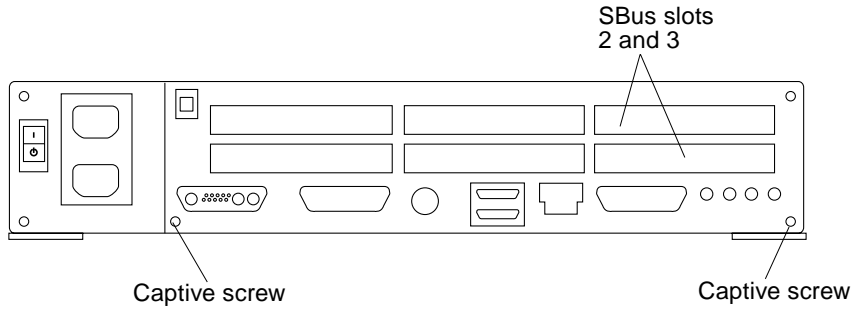


FIGURE 8-30 Back Panel SBus Slots and Captive Screws

6. Press the plastic connector clip and disconnect the DC power connector from the SCSI backplane (FIGURE 8-31).

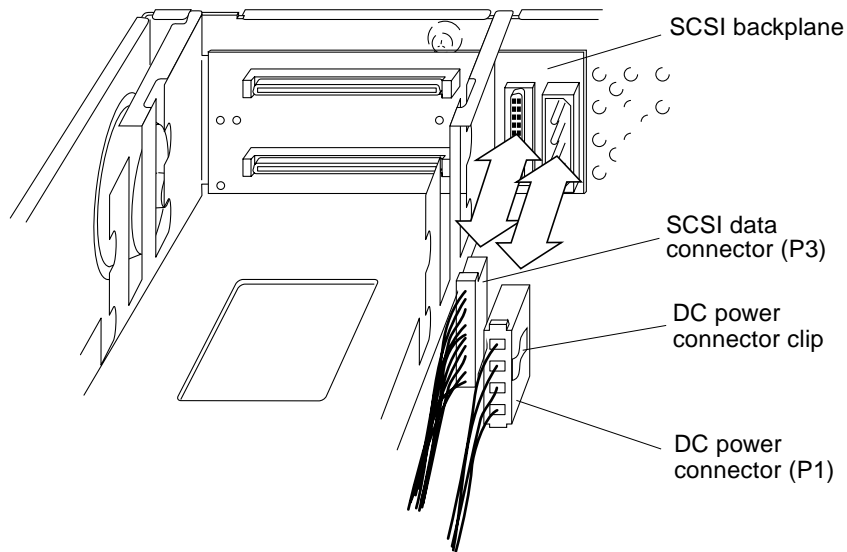


FIGURE 8-31 SCSI Backplane, SCSI Data, and DC Power Connectors

7. Slide the system board back slightly to access the internal cables.

8. **Remove the SunCD 2Plus CD-ROM drive, if installed.**
See “Removing a CD-ROM Drive” on page 123.
9. **Disconnect the SCSI data connector (P3) from the SCSI backplane.**
10. **Free the SCSI data cable from the metal cable guides on the chassis bottom and from the plastic hooks on the system board card guide.**
11. **Remove the SCSI data cable.**

Installing the SCSI Data Cable (SunCD 2Plus Drive-Type Chassis)



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 – Tape or tie-wrap markers on internal cables help in properly routing the cables through the metal cable guides. The part of each cable with a marker is to be visible between the metal cable guides on the chassis bottom.

1. **Route the SCSI data cable as follows (FIGURE 8-32):**
 - a. **Route the SCSI connectors (P3 and P1) through the drive bracket sheetmetal opening.**
 - b. **Position the SCSI cable marker under the metal cable guide; route the SCSI data cable through the chassis metal guides and the system board guide plastic hooks.**

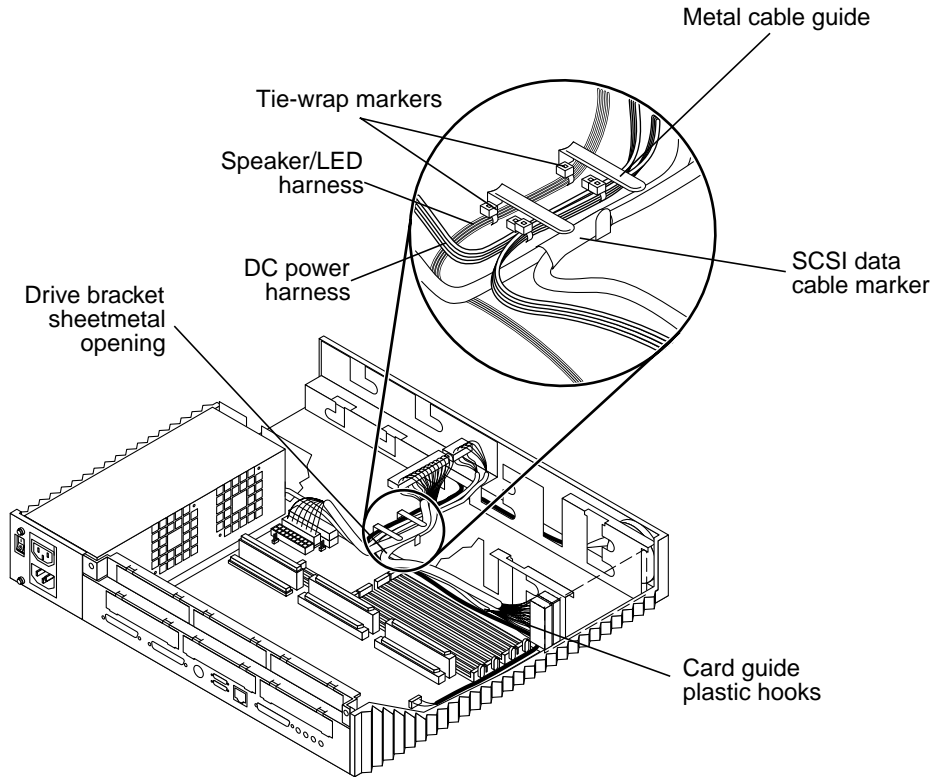


FIGURE 8-32 Cable Guide Detail

2. **Connect the following cables to the SCSI backplane (FIGURE 8-31):**
 - a. **SCSI data connector (P3)**
 - b. **DC power connector (P1).**
3. **Replace the SunCD 2Plus CD-ROM drive.**
See “Installing a CD-ROM Drive” on page 124.
4. **Position the system board into place and tighten the two captive screws on the back panel that secure the system board to the chassis (FIGURE 8-34).**
5. **Replace any SBus cards (see FIGURE 8-37).**
See “Installing an SBus Card” on page 156.
6. **Connect the following cables to the system board (FIGURE 8-40):**
 - **Speaker/LED cable**

- DC power connector
- SCSI data cable
- Diskette data cable (optional)

7. Detach the wrist strap and replace the cover.

See Chapter 7.

8. Power on the system.

See “Turning On the Power” on page 47.

Removing the SCSI Data Cable (SunCD 4 Drive-Type Chassis)

1. Remove power from the system.

See “Removing Power from the System” on page 45.

2. Remove the cover and attach a wrist strap.

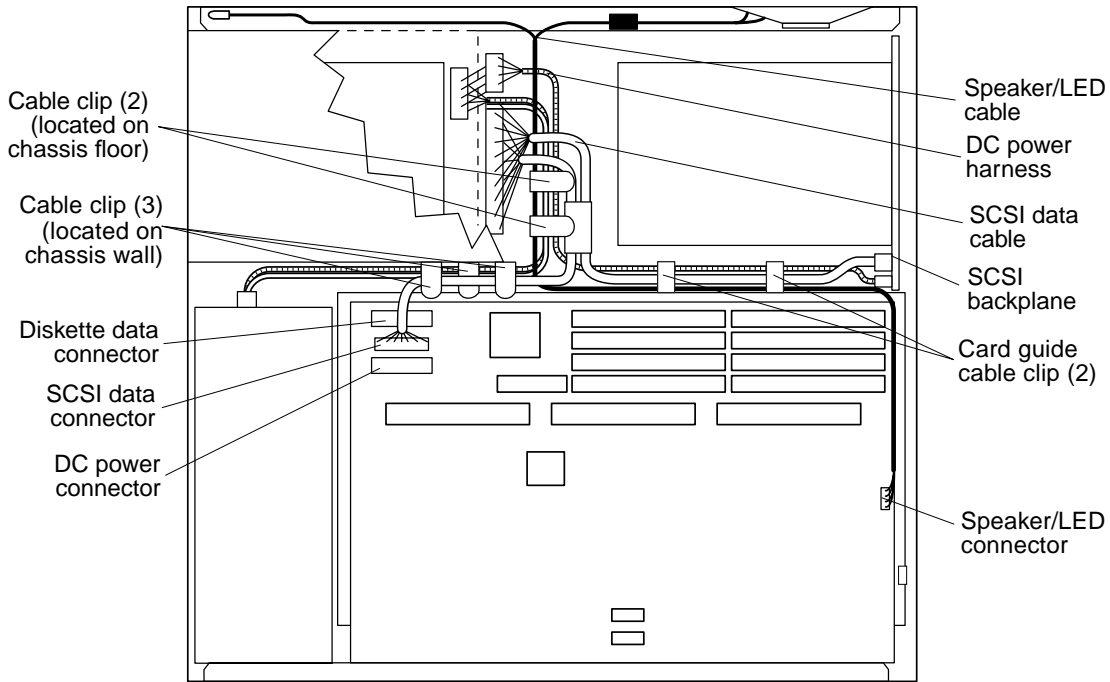
See Chapter 7.



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. Disconnect the following from the system board (FIGURE 8-33):

- DC power cable
- SCSI data cable
- Diskette data cable
- Speaker/LED cable



Note: Figure illustrates SunCD 4 drive-type (1.6-inch drive) chassis only.

FIGURE 8-33 Internal Cables and DC Power Connector (SunCD 4 Drive-Type Chassis)

4. Loosen the two captive Phillips-head screws that secure the system board to the rear chassis (FIGURE 8-34).
5. Pull the system board from the back of the chassis until it clears the plastic card guide (FIGURE 8-34).



Caution – Place the system board on an antistatic surface.

6. Remove the SunCD 4 CD-ROM drive.
See “Removing a CD-ROM Drive” on page 123.

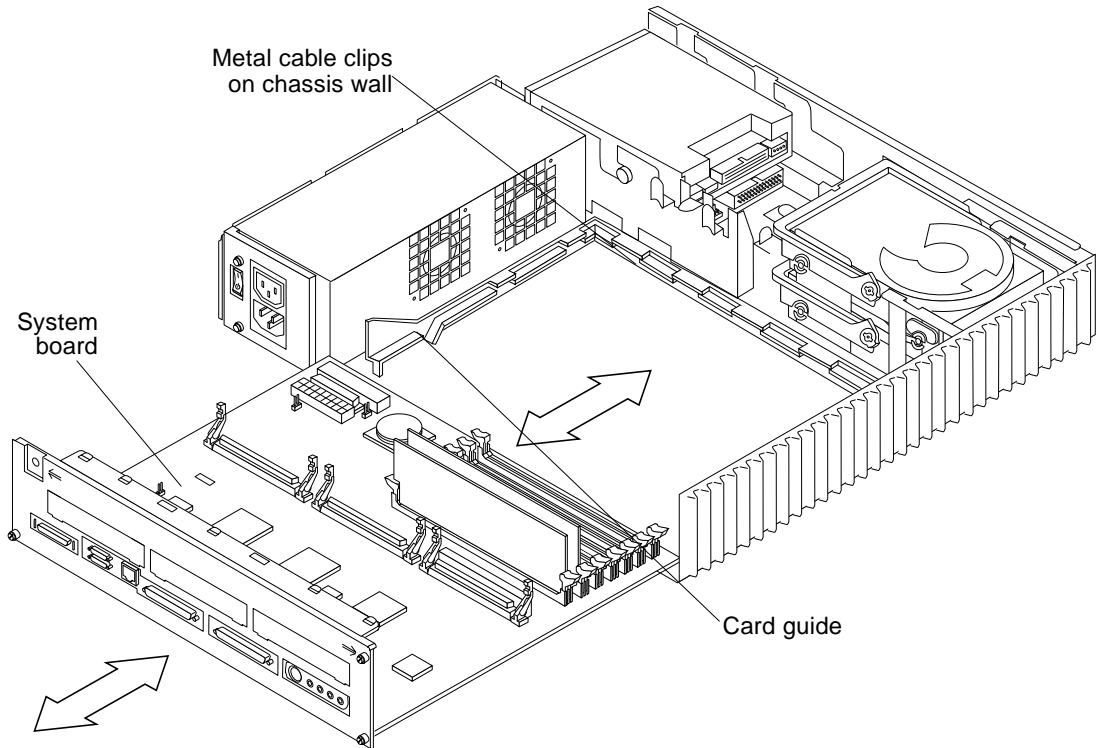


FIGURE 8-34 Removing the System Board

7. Disconnect the following (FIGURE 8-33):

- a. The SCSI data cable from the metal cable clips on the chassis wall, and from the plastic cable clips on the card guide.**
- b. The DC power harness from the SCSI backplane.**
- c. The internal SCSI data cable from the SCSI backplane.**

8. Remove the SCSI data cable.

Installing the SCSI Data Cable (SunCD 4 Drive-Type Chassis)



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 – The SCSI data cable is a three-connector pigtail cable with colored tape that joins two of the cables closest to the P2 connector. Visual markers are placed on the cables to aid cable alignment. When properly installed, the SCSI data cable P1 connector is connected to the SCSI backplane with the tape aligned between the card guide plastic cable clips (see FIGURE 8-38). The SCSI data cable P3 connector is connected to the system board and threaded through the chassis wall metal cable guides. The SCSI data cable P2 connector is routed through the gap between the hard disk drive and the chassis wall. P2 connects to the SunCD 4 drive (if installed), or is secured under the chassis floor metal cable clips.

- 1. Secure the SCSI data cable under the plastic card guide cable clips.**

Note – The taped portion of the SCSI data cable should be positioned directly between the plastic card guide cable clips as shown in FIGURE 8-38.

- 2. Connect the SCSI data cable to the SCSI backplane.**
- 3. Connect the DC power harness to the SCSI backplane.**
- 4. Insert the front edge of the system board into the card guide. Lift the rear of the board slightly and slide it along the card guide until it is fully inserted (FIGURE 8-30).**
- 5. Connect the DC power cable, SCSI data cable, diskette data cable, and speaker/LED cable to the system board.**

Note – Thread the SCSI data cable through the chassis wall metal cable clips *after* the SCSI data cable is connected to the system board (FIGURE 8-33).

- 6. Replace the SBus card.**

See “Installing an SBus Card” on page 156.

- 7. Tighten the two captive Phillips-head screws that secure the system board to the chassis rear (FIGURE 8-30).**

1. **Detach the wrist strap and replace the cover.**

See Chapter 7.

2. **Power on the system.**

See “Turning On the Power” on page 47.

DC Power Harness

The SPARCstation 20 system is configured with one of two chassis types:

- A chassis that supports the SunCD 2Plus drive (1-inch drive)
- A chassis that supports the SunCD 4 drive (1.6-inch drive)

Removing and installing the DC power harness varies depending on the chassis. The following sections provide DC power harness removal and installation for each chassis type.

Removing the DC Power Harness (SunCD 2Plus Drive-Type Chassis)

1. **Remove power from the system.**

See “Removing Power from the System” on page 45.

2. **Remove the cover.**

See “Removing the Cover” on page 49.



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 a wrist strap to the top metal edge of the system back panel (FIGURE 8-35).**

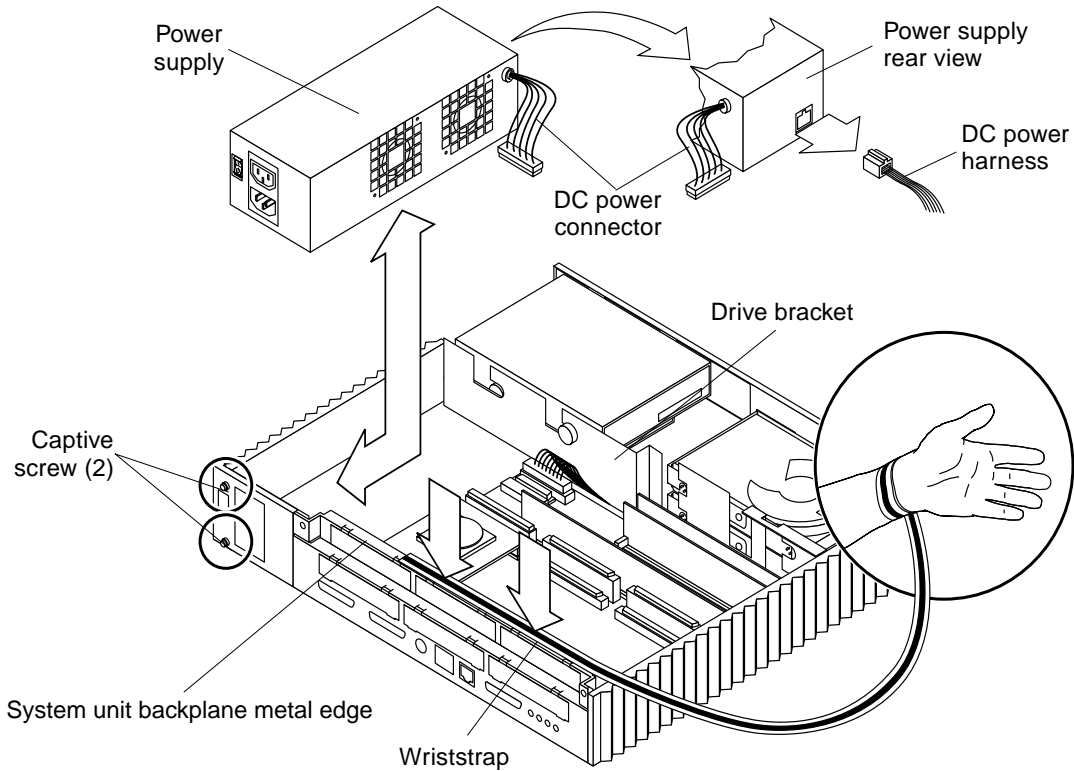


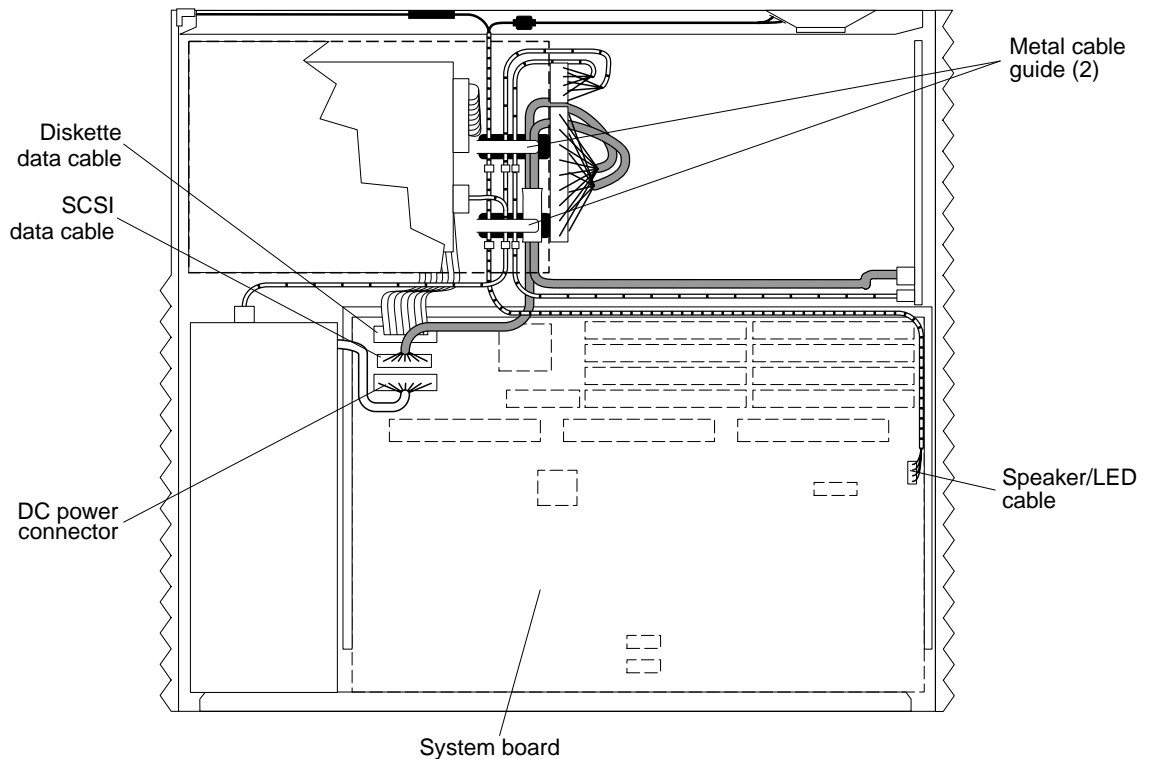
FIGURE 8-35 Attaching a Wrist Strap to Back Panel and Removing the Power Supply

Note – The wrist strap is usually grounded to the power supply. When removing or installing the power supply, ground the wrist strap to the upper edge of the back panel.

4. Remove any SBus cards.

See “Removing an SBus Card” on page 152.

5. Disconnect the diskette data cable (optional), SCSI data cable, DC power connector, and the speaker/LED cable from the system board (FIGURE 8-36).



Note: Figure illustrates SunCD 2Plus drive-type (1-inch drive) chassis only.

FIGURE 8-36 Internal Cables and DC Power Connector (SunCD 2Plus Drive-Type Chassis)

- 6. Loosen the two captive screws that secure the system board back panel to the chassis (FIGURE 8-37).**
- 7. Slide the system board back slightly to access the cables.**
- 8. Remove the power supply.**
See "Removing the Power Supply" on page 55.
- 9. Remove the CD-ROM drive.**
See "Removing a CD-ROM Drive" on page 123.

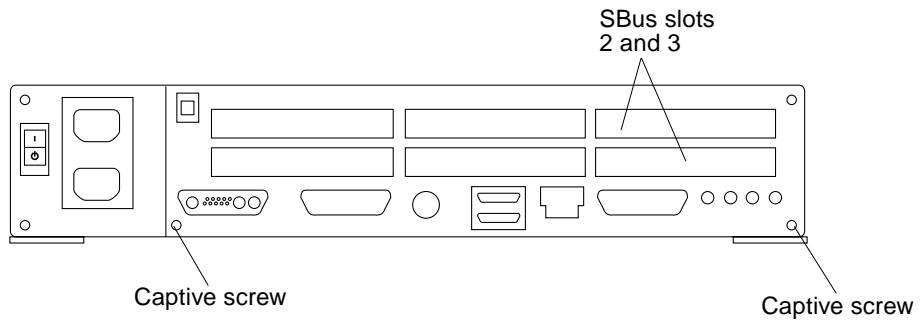


FIGURE 8-37 Back Panel SBus Slots and Captive Screws

10. Remove the diskette drive.

See "Removing a Diskette Drive" on page 127.

11. Free the SCSI cable from the metal cable guides (FIGURE 8-38).

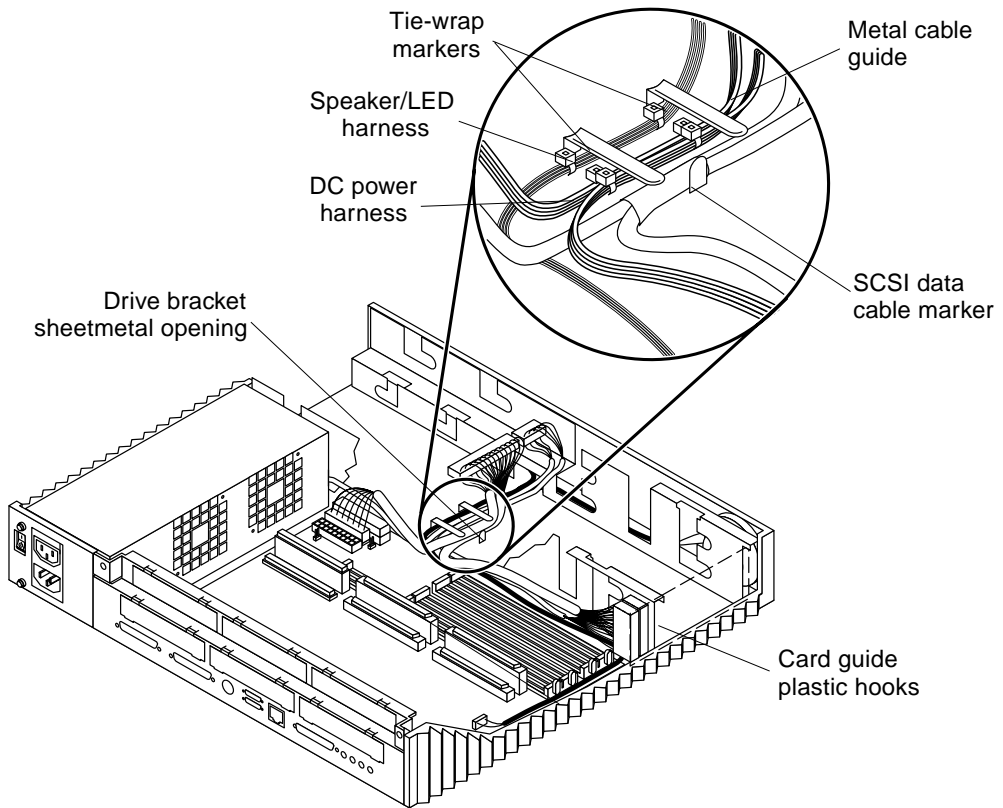


FIGURE 8-38 Detail of Cable Guide

- 12. Remove the DC power harness from the metal cable guides (FIGURE 8-39).**
- 13. Disconnect the DC power connector (P3) from the SCSI backplane (FIGURE 8-39).**
- 14. Remove the DC power harness from the chassis.**

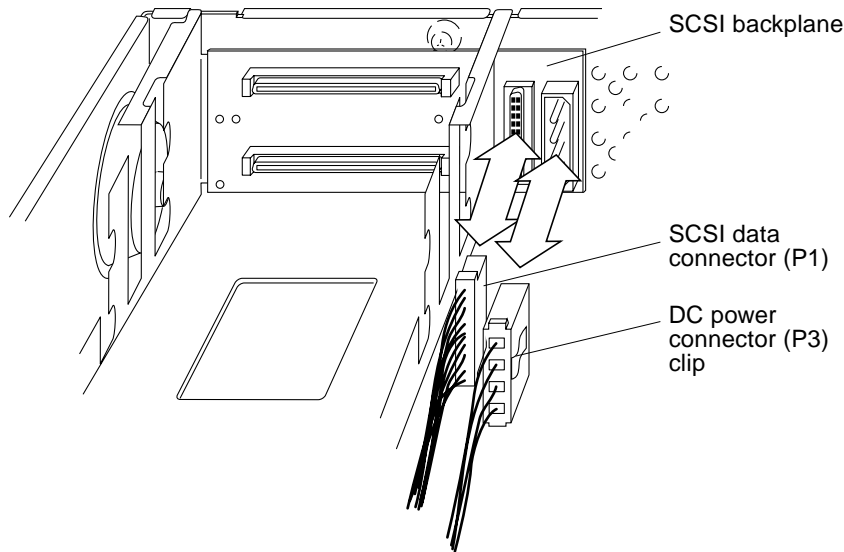


FIGURE 8-39 SCSI Backplane, SCSI Data, and DC Power Connectors

Installing the DC Power Harness (SunCD 2Plus Drive-Type Chassis)



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 – Tape or tie-wrap markers on internal cables help in properly routing the cables through the metal cable guides. The part of each cable with a marker is to be visible between the metal cable guides on the chassis bottom.

1. Place the DC power harness and SCSI data cable as follows (FIGURE 8-39):
 - a. Route the end of the DC power harness with connectors P1 and P3 through the sheetmetal opening in the drive bracket.

Note – Be sure the tie wrap markers are in the proper position beneath the metal cable guides.

- b. Route the DC power harness through the metal cable guides.
 - c. Route the SCSI data cable through the metal cable guides.
 - d. Press the cable down between the drive bracket and the plastic card guide.
2. **Connect P3 to the SCSI backplane** (FIGURE 8-39).
 3. **Install the power supply.**
See “Installing the Power Supply” on page 58.
 4. **Install the diskette drive, if it was removed earlier.**
See “Installing a Diskette Drive” on page 132
 5. **Slide the system board completely into the chassis. Tighten the two captive screws that secure the system board back panel to the chassis** (FIGURE 8-37).
 6. **Connect the diskette data cable, SCSI data cable, DC power connector, and speaker/LED cable to the system board** (FIGURE 8-36).
 7. **Install any SBus cards.**
See “Installing an SBus Card” on page 156.
 8. **Install the CD-ROM drive.**
See “Installing a CD-ROM Drive” on page 124.
 9. **Detach the wrist strap and replace the cover.**
See Chapter 7.”
 10. **Power on the system.**
See “Turning On the Power” on page 47.

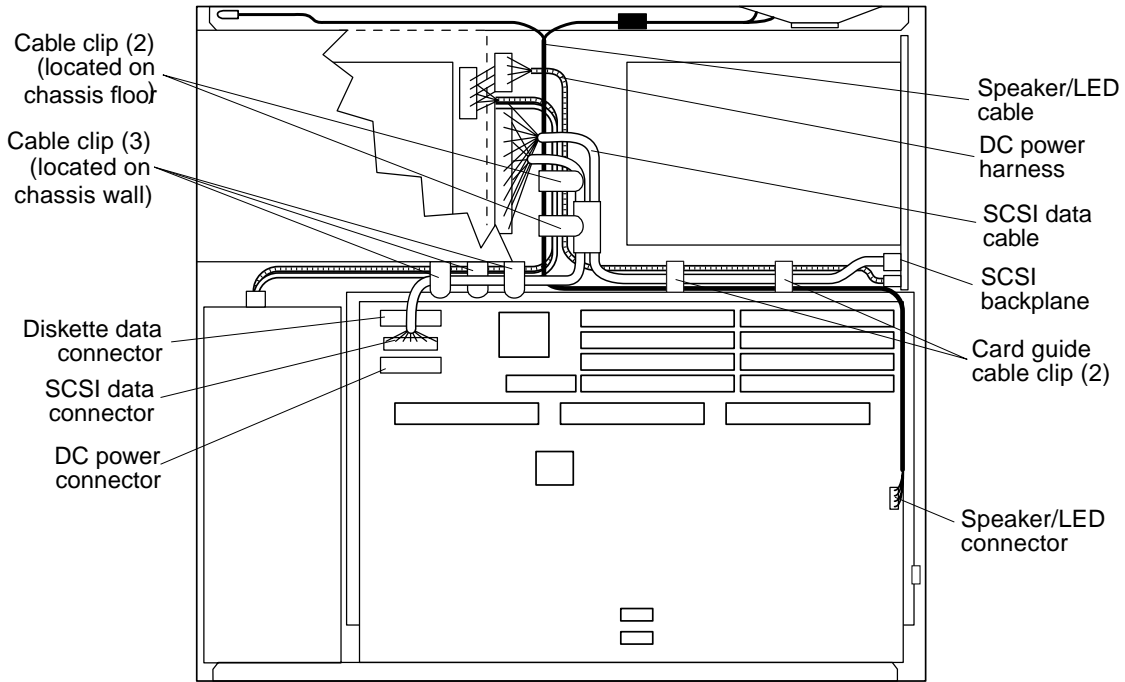
Removing the DC Power Harness (SunCD 4 Drive-Type Chassis)

1. **Remove power from the system.**
See “Removing Power from the System” on page 45.
2. **Remove the cover and attach a wrist strap.**
See Chapter 7.



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. Disconnect the DC power cable, SCSI data cable, diskette data cable, and speaker/LED cable from the system board (FIGURE 8-40).
4. Loosen the two captive Phillips-head screws that secure the system board to the chassis rear (FIGURE 8-41).



Note: Figure illustrates SunCD 4 drive-type (1.6-inch drive) chassis only.

FIGURE 8-40 Internal Cables and DC Power Connector (SunCD 4 Drive-Type Chassis)

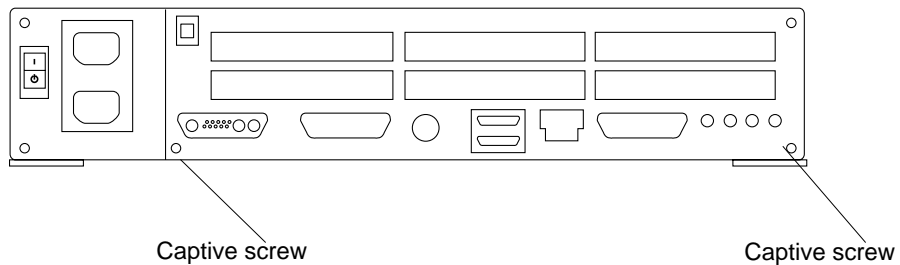


FIGURE 8-41 Back Panel Captive Screws

5. Pull the system board from the chassis back until the system board clears the plastic card guide (FIGURE 8-42).

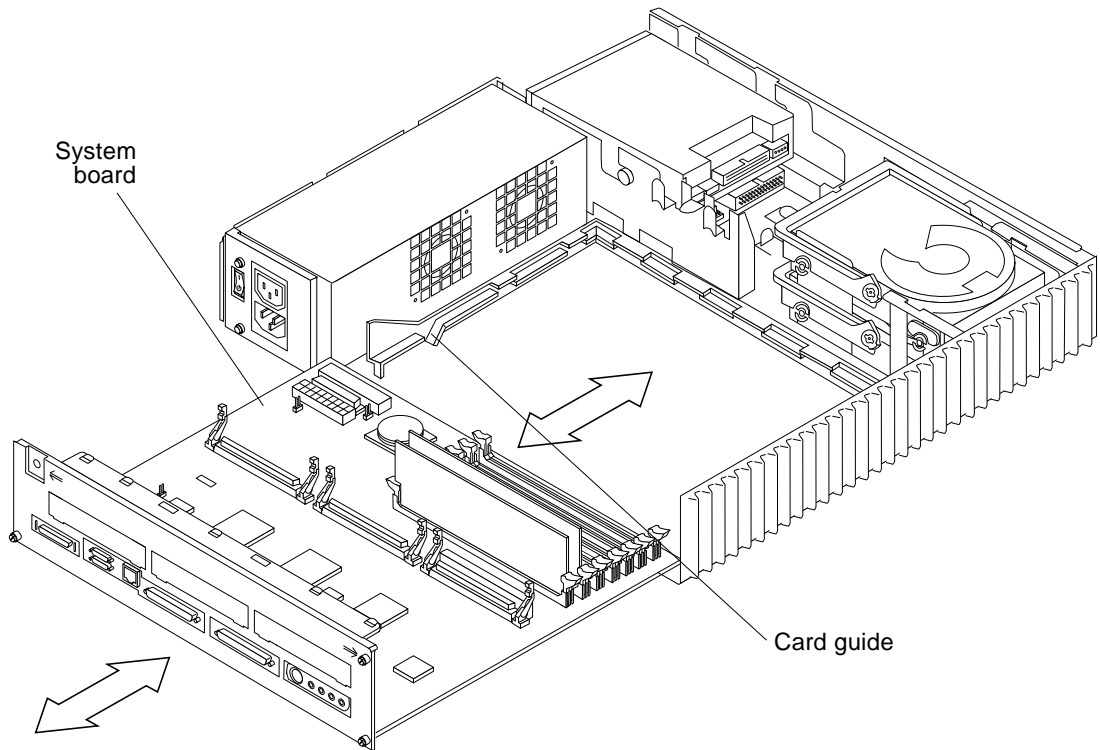


FIGURE 8-42 Removing the System Board



Caution – Place the system board on an antistatic surface.

6. Remove the SunCD 4 drive.
See “Removing a CD-ROM Drive” on page 123.
7. Disconnect the DC power harness from the diskette drive.
8. Remove the DC power harness from the SCSI backplane as follows (FIGURE 8-26):
 - a. Free the SCSI data cable from the metal cable clips on the chassis wall, and from the card guide plastic cable clips.
 - b. Disconnect the SCSI data cable from the SCSI backplane.

- c. Remove the DC power harness (labeled P3) from the card guide clips and disconnect the DC power harness from the SCSI backplane.
9. Remove the power supply.
See “Removing the Power Supply” on page 55.
10. Disconnect the DC power harness (labeled P1) from the power supply and carefully remove the harness from the system chassis.

Installing the DC Power Harness (SunCD 4 Drive-Type Chassis)



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 – Visual markers are placed on the DC power harnesses to aid cable alignment. When properly installed, the two colored tape marks on the P1 (power supply) harness should straddle the chassis wall metal cable clips that are nearest to the system board. The P2 (CD-ROM drive) harness should lie under the second chassis floor metal cable clip. The second colored tape mark (farthest from the P3 connector) of the P3 (SCSI backplane) harness should be centered under the second plastic cable guide clip. The P4 (diskette drive) harness should be threaded through the chassis wall, with the diskette data cable, and located under the first metal chassis floor cable clip.

1. Place the power supply harness, SCSI backplane DC power harness, diskette drive DC power harness, CD-ROM DC power harness, and SCSI data cable as follows (FIGURE 8-29):
 - a. Route the power supply harness (labeled P1) through the metal cable clips on the chassis wall.

Note – The two colored tape marks on the DC power harness should straddle the cable clips.

- b. Route the SCSI backplane DC power harness (labeled P3) under the plastic cable clips on the card guide to the SCSI backplane.
 - c. Thread the diskette drive DC power harness (labeled P4) through the hole in the chassis wall with the diskette data cable.

- d. Locate the CD-ROM DC power harness (labeled P2) under the second metal cable clip on the chassis floor.
 - e. Route the SCSI data cable (labeled P1) between the plastic clips at the rear of the card guide. Connect SCSI data cable to the SCSI backplane.
 - f. Connect the DC power harness (labeled P3) to the SCSI backplane.
 - g. Connect the DC power harness (labeled P1) to the rear of the power supply.
2. Install the power supply.
See “Installing the Power Supply” on page 58.
 3. Connect the DC power harness (labeled P4) to the diskette drive.
 4. Insert the front edge of the system board into the card guide, then lift the rear of the board slightly and slide it along the card guide until it is fully inserted (FIGURE 8-34).
 5. Connect the DC power cable, diskette data cable, SCSI data cable, and speaker/LED cable to the system board (FIGURE 8-40).

Note – Thread the SCSI data cable through the metal cable clips on the chassis wall *after* it is connected to the system board.

6. Install the SBus card.
See “Installing an SBus Card” on page 156.
7. Tighten the two captive Phillips-head screws that secure the system board to the chassis rear (FIGURE 8-34).
8. Install the CD-ROM drive.
See “Installing a CD-ROM Drive” on page 124.
9. Detach the wrist strap and replace the cover.
See Chapter 7.
10. Power on the system.
See “Turning On the Power” on page 47.

Diskette Drive Cable

The SPARCstation 20 system is configured with one of two chassis types:

- A chassis that supports the SunCD 2Plus drive (1-inch drive)
- A chassis that supports the SunCD 4 drive (1.6-inch drive)

Removing and installing the diskette data cable varies depending on the chassis. The following sections provide diskette data cable removal and installation for each chassis type.

Removing the Diskette Drive Cable (SunCD 2Plus Drive-Type Chassis)

1. Remove power from the system.

See “Removing Power from the System” on page 45.

2. Remove the cover and attach a wrist strap.

See Chapter 7.



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. Remove the CD-ROM drive.

See “CD-ROM Drive” on page 123.

4. Perform Step 1 through Step 3 in “Removing a Diskette Drive” on page 127.

5. Locate the diskette drive cable (FIGURE 8-43).

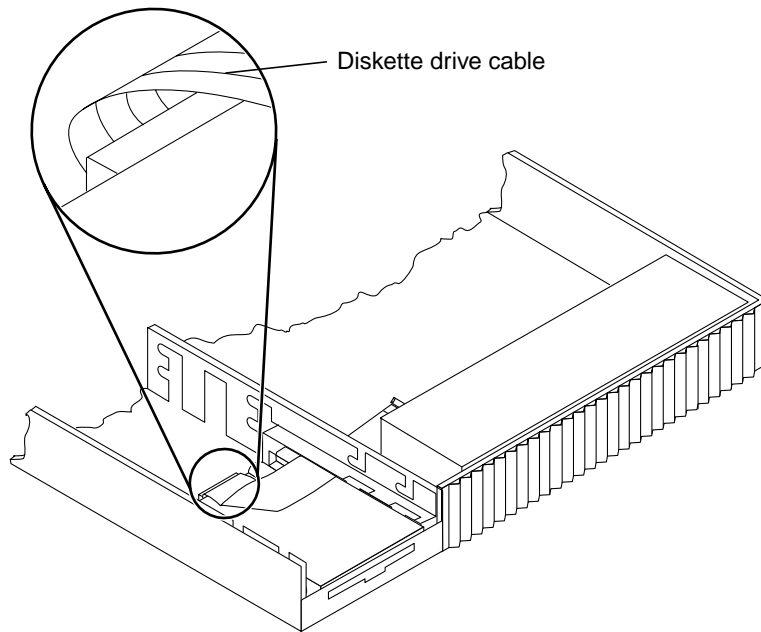


FIGURE 8-43 Diskette Drive Cable Location

6. Pull the plastic cable tab to disconnect the diskette drive cable from the system board (FIGURE 8-44).

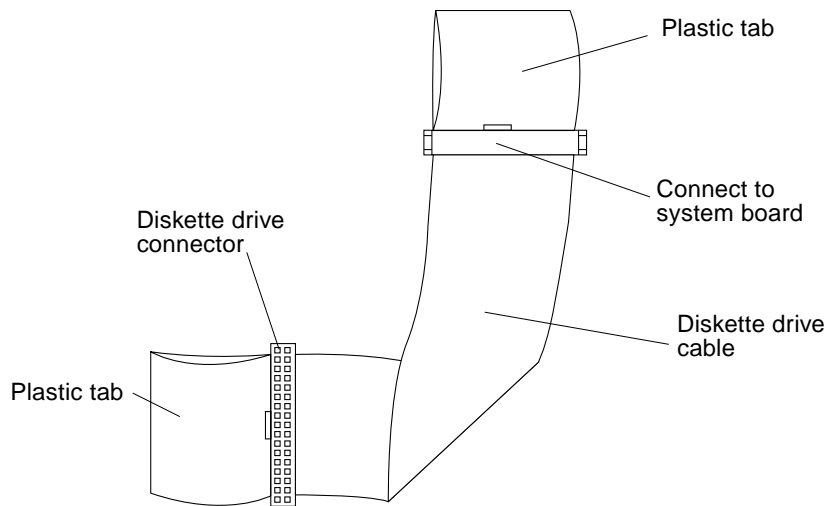


FIGURE 8-44 Diskette Drive Cable Plastic Tab

7. Carefully pull the end of the diskette drive cable that connects to the system board through the sheetmetal opening into the drive bracket area (FIGURE 8-45).
8. Remove the diskette drive cable from the drive bracket area of the chassis.

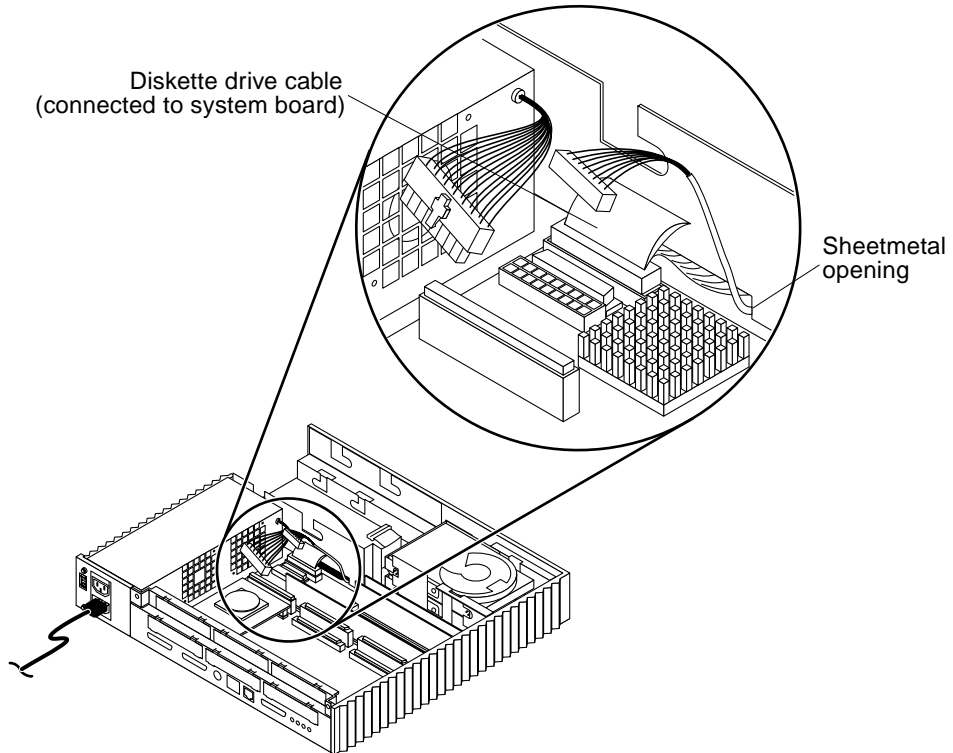


FIGURE 8-45 Pulling the Diskette Drive Cable Through the Drive Bracket Opening

Installing the Diskette Drive Cable (SunCD 2Plus Drive-Type Chassis)



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 – The replacement diskette drive cable should be folded at an angle to connect properly. See FIGURE 8-44.

1. **Work the end of the diskette drive cable that connects to the system board through the sheetmetal opening in the drive bracket and connect it to the system board** (FIGURE 8-45).

Note – Connectors and terminals are keyed to ensure proper connection.

2. **Pick up the diskette drive and hold it above the drive area of the chassis.**
3. **Perform Step 1 through Step 2 of Section “Installing a Diskette Drive” on page 9-132.**
4. **Install the CD-ROM drive, if it was removed earlier.**
See Section “Installing a CD-ROM Drive” on page 9-124.
5. **Remove the wrist strap and replace the cover.**
See Chapter 7.
6. **Power on the system.**
See Chapter 6.

Removing the Diskette Drive Cable (SunCD 4 Drive-Type Chassis)

1. **Remove power from the system.**
See “Removing Power from the System” on page 45.
2. **Remove the cover and attach a wrist strap.**
See Chapter 7.



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.

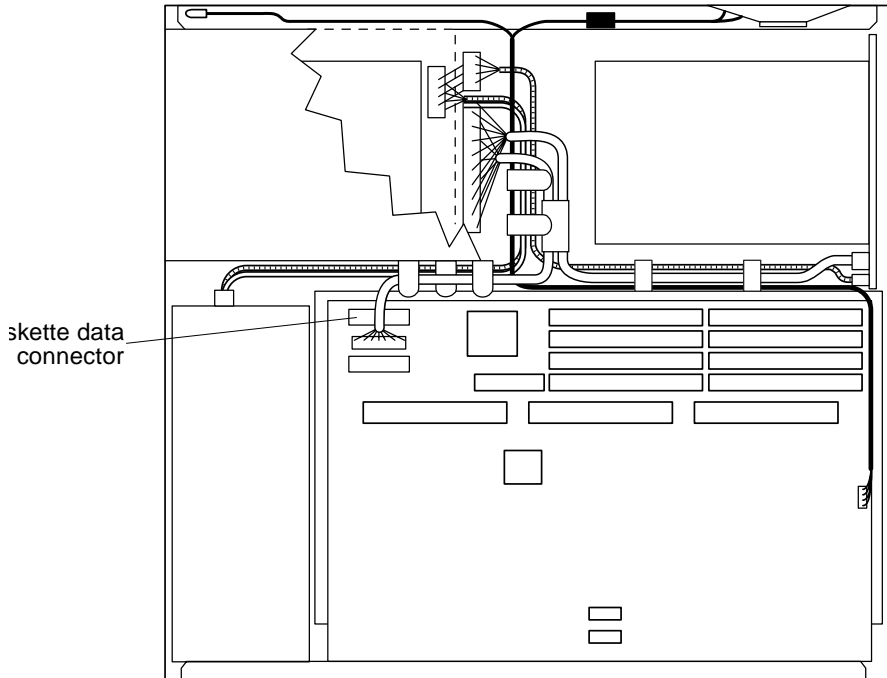
3. **Remove the CD-ROM drive.**
See “Removing a CD-ROM Drive” on page 123.

4. Remove the diskette drive.

See “Removing a Diskette Drive” on page 127.

5. Disconnect the diskette data cable from the system board (FIGURE 8-46).

6. Carefully note the diskette drive cable routing. Remove the diskette drive cable from the system chassis.



Note: Figure illustrates SunCD 4 drive-type (1.6-inch drive) chassis only.

FIGURE 8-46 System Board Cable Routing (SunCD 4 Drive-Type Chassis)

Installing the Diskette Drive Cable (SunCD 4 Drive-Type Chassis)



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. Route the diskette drive cable in the system chassis.

Note – The diskette drive cable should pass under the first metal cable clip in the chassis floor.

2. Connect the diskette drive cable to the system board (FIGURE 8-46).

3. Install the diskette drive.

See “Installing a Diskette Drive” on page 132.

4. Install the CD-ROM drive.

See “Installing a CD-ROM Drive” on page 124.

5. Detach the wrist strap and replace the cover.

See Chapter 7.

6. Power on the system.

See “Turning On the Power” on page 47.

Storage Devices

This chapter contains procedures for removing and installing storage devices. The following is the list of storage devices.

Hard Disk Drive

The SPARCstation 20 system uses 535-Mbyte, 1.05-Gbyte, and 2.0-Gbyte single-connector hard disk drives. Each disk drive connects to the SCSI backplane. A handle on each single-connector drive helps to install the hard disk drive into the SCSI backplane socket.

To remove and install a hard disk drive, proceed as follows.

Note – Do not remove the handle from the hard disk drive; it is part of the field replaceable unit (FRU).

Removing a Hard Disk Drive

- 1. Remove power from the system.**
See “Removing Power from the System” on page 45.
- 2. Remove the cover and attach the wrist strap.**
See Chapter 7.



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. **Determine which drive to remove (FIGURE 9-1); the system supports up to two internal hard disk drives.**

Note – Remove the top disk drive before removing the bottom disk drive.

Note – The disk drive position determines the assigned SCSI address. When installed, the bottom disk drive is assigned SCSI address 3 and the top disk drive is assigned SCSI address 1.

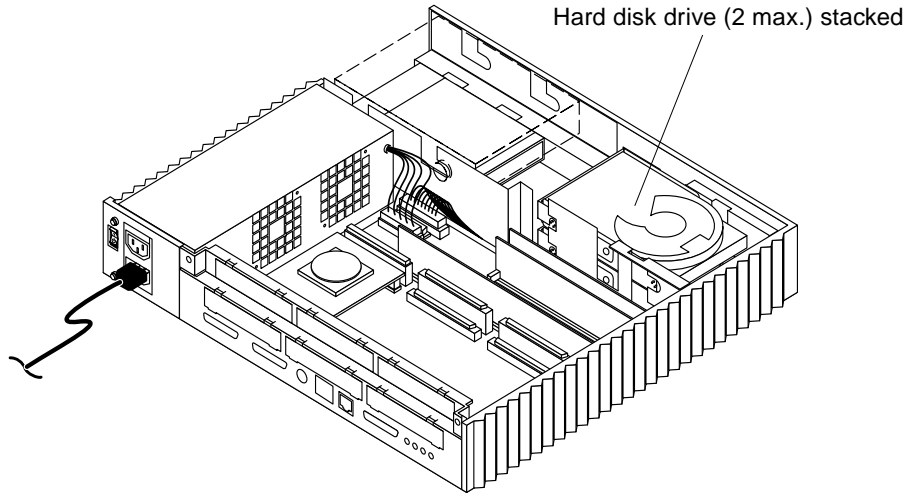


FIGURE 9-1 Location of Hard Disk Drives



Caution – When installing the hard disk drive, do not change the disk drive position. The system software expects the disk drive to be at a specific SCSI address.

4. **Press the plastic latch located beneath the handle at the rear of the drive to release the handle (FIGURE 9-2).**

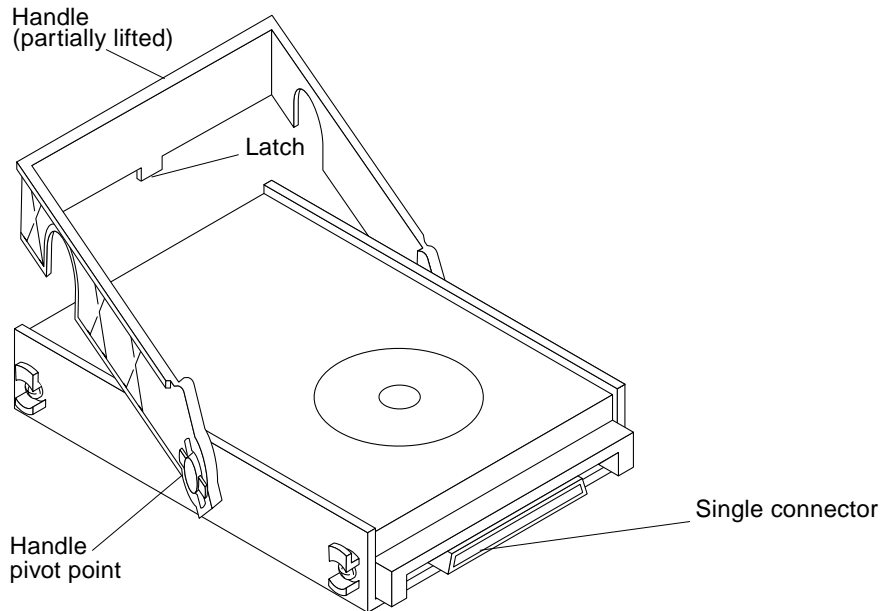


FIGURE 9-2 Single Connector Hard Disk Drive

5. Lift the drive handle up (FIGURE 9-3).

Note – When lifted, the drive handle pivots to disconnect the drive from the socket on the SCSI backplane.

- 6. Grasp the drive handle and lift the drive straight up and out of the chassis.**
- 7. Place the drive on an antistatic surface.**
- 8. Repeat Step 4 through Step 7 to remove the bottom disk drive (if installed).**

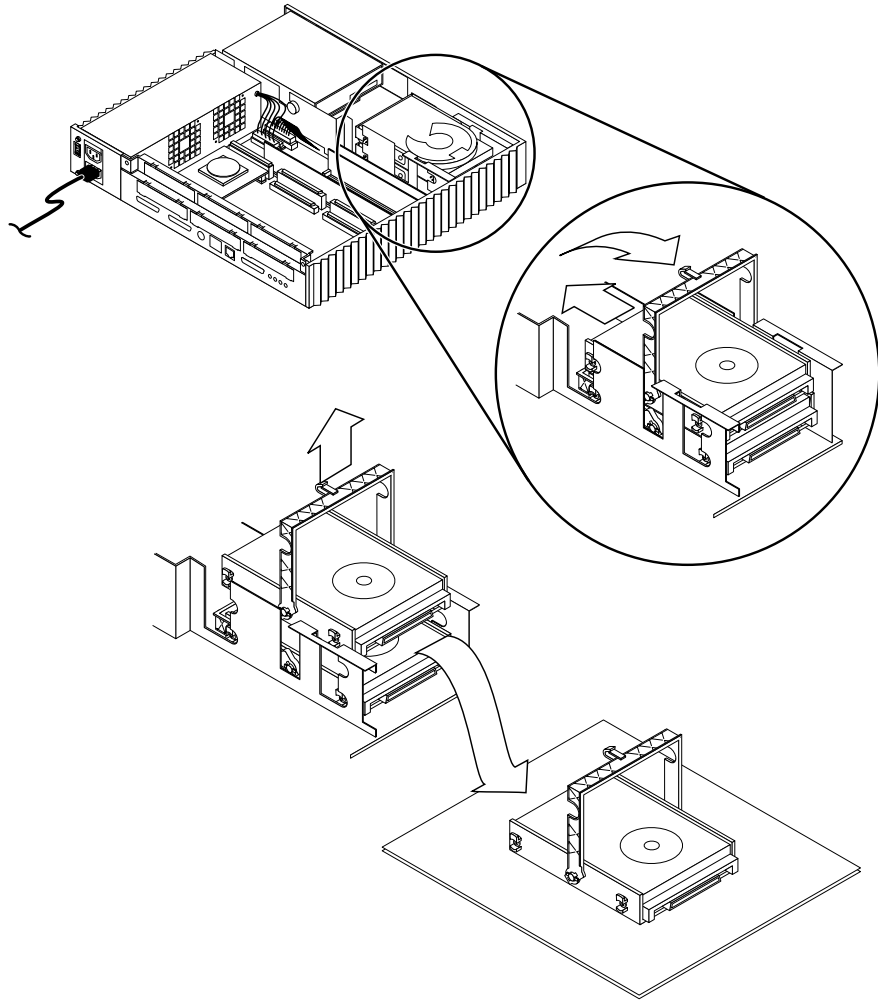


FIGURE 9-3 Removing a Hard Disk Drive

Installing a Hard Disk 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.

Note – The disk drive position determines the assigned SCSI address. When installed, the bottom disk drive is assigned SCSI address 3 and the top disk drive is assigned SCSI address 1.

Note – No jumper settings are required for the hard disk drives.

1. Position the hard disk drive as follows (FIGURE 9-4):

- a. Release the handle latch near the rear of the drive and lift the handle to the vertical position.**
- b. While grasping the drive handle with one hand, use the other hand to hold the drive steady; carefully lower the drive into the chassis.**

Note – Ensure that the drive is properly seated in the mounting slots of the drive bracket and that the SCSI connector on the hard drive is pointed toward the SCSI backplane.

- c. Push the drive handle down away from the connector until the handle locks into the latch.**

Note – When lowered, the drive handle acts as a mechanism to engage the drive connector with the SCSI backplane socket.

Note – Do not force the drive handle. If the drive handle does not move easily into the latched position, remove the drive and repeat Steps 3 and 4. If a hard disk drive is not installed in the top position, SCSI address 1 can be used by an external peripheral connected to the SCSI bus. However, if a hard disk drive is installed at the top position, the top position disk drive assumes SCSI address 1, and the external peripheral must either be re-jumpered to a new SCSI address or disconnected from the SCSI bus.

2. Remove the wrist strap and replace the cover.

See Chapter 7.

3. Power on the system.

See “Turning On the Power” on page 47.

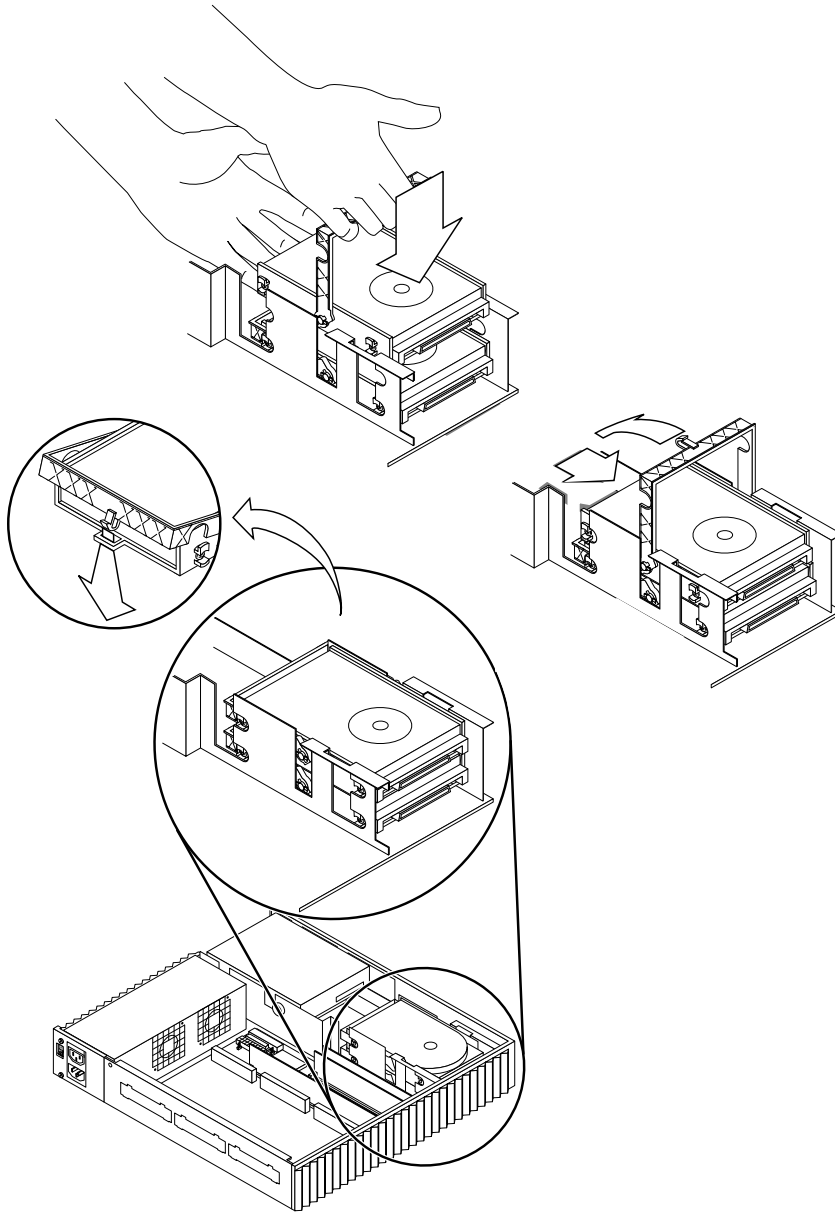


FIGURE 9-4 Installing a Hard Disk Drive

CD-ROM Drive

The SPARCStation 20 system is configured with one of two types of CD-ROM drives: a 1-inch SunCD 2Plus drive and a 1.6-inch SunCD 4 drive.

To remove and install a CD-ROM drive, proceed as follows.

Note – After removing a SunCD 2Plus or a SunCD 4 CD-ROM drive, be sure that the same drive-type is installed.

Removing a CD-ROM Drive

1. Remove power from the system.

See “Removing Power from the System” on page 45.

2. Remove the cover and attach a wrist strap.

See Chapter 7.



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

- a. Push the CD-ROM drive forward and slide it toward the outer edge of the chassis to disengage it.
- b. Disconnect the SCSI data cable and DC power cable from the CD-ROM drive.

Note – Leave the cables connected to the system board.

- c. Lift the CD-ROM drive up and toward the chassis edge and remove it from the chassis.
- d. Place the CD-ROM drive on an antistatic surface.

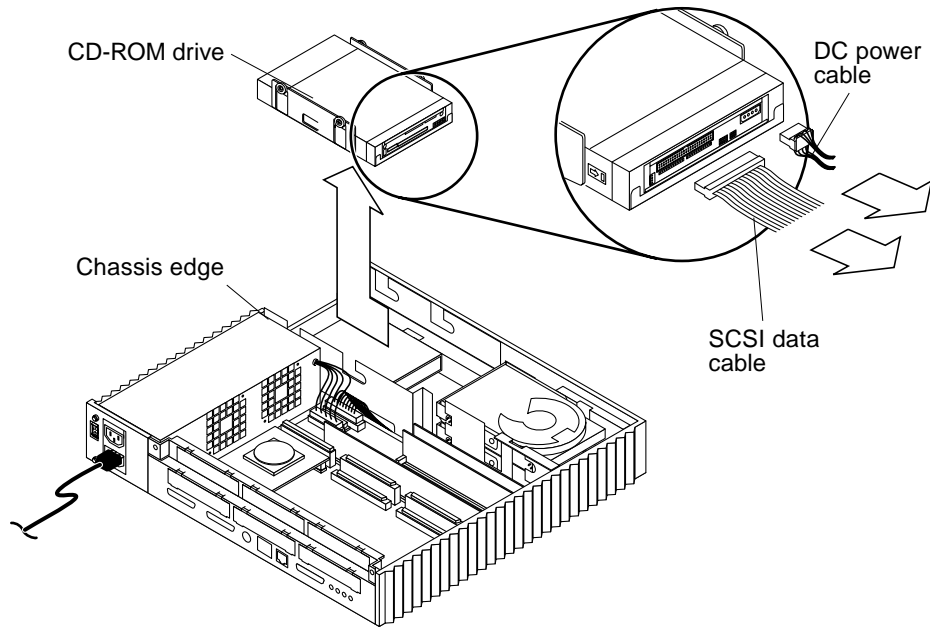


FIGURE 9-5 Removing the CD-ROM Drive

Installing a CD-ROM Drive

To install a CD-ROM 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.

Note – Ensure that the same drive-type is installed.

1. Ensure proper jumper installation as follows:

- a. For the SunCD 2Plus CD-ROM drive: at pins ID4, ID2, and Term power (FIGURE 9-6).
- b. For the SunCD 4 drive: at pins ID4, ID2, and Term power (FIGURE 9-7).

Note – The two ID select jumpers set the SCSI address of the drive to 6. A parity jumper may also need to be installed

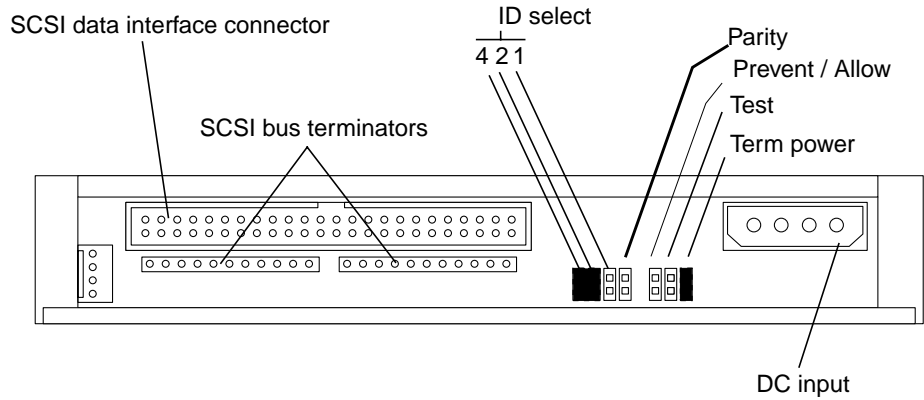


FIGURE 9-6 SunCD 2Plus Rear View and Jumper Settings

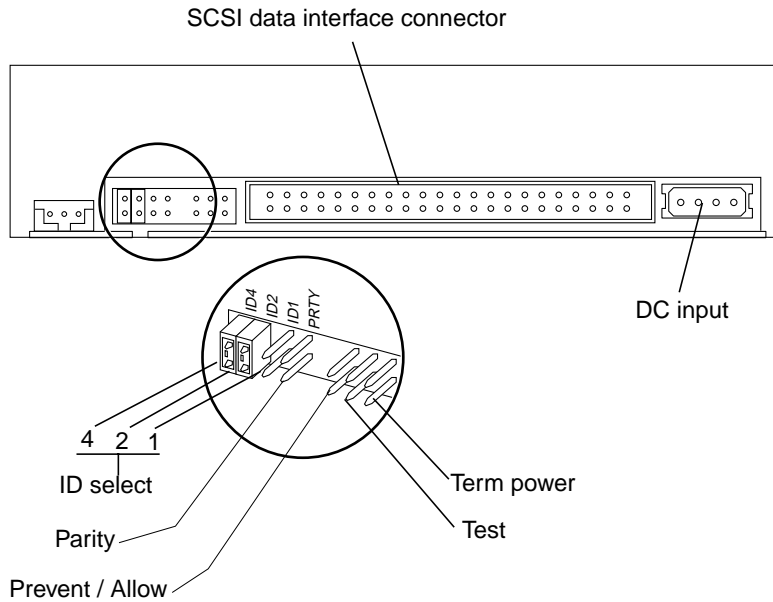


FIGURE 9-7 SunCD 4 Drive Rear View and Jumper Settings

2. Place the CD-ROM drive above the drive bracket slots.

Note – The drive grommets slide into the drive bracket slots. The drive sits on a shelf above the diskette drive.

3. **Install the CD-ROM drive as follows (FIGURE 9-8):**
 - a. **Connect the SCSI data cable and the DC power cable to the CD-ROM drive.**
 - b. **Push the CD-ROM drive down and toward the center of the unit so that the drive is properly seated in the drive bracket.**
4. **Detach the wrist strap and replace the cover.**
See Chapter 7.
5. **Power on the system.**
See “Turning On the Power” on page 47.

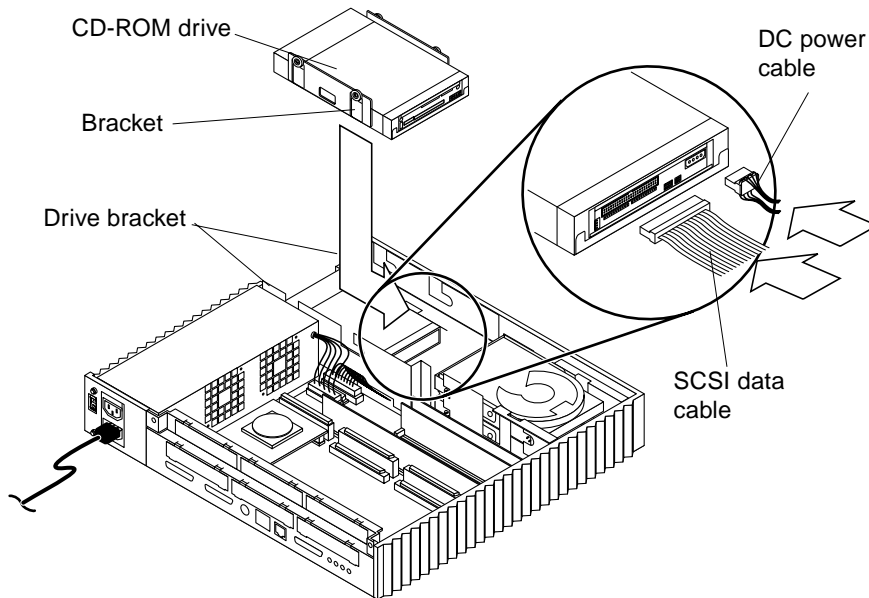


FIGURE 9-8 Installing a CD-ROM Drive

Diskette Drive

The optional internal diskette drive is located below the CD-ROM drive, adjacent to the power supply.

To remove and install a diskette drive, proceed as follows.

Note – If a CD-ROM drive is installed, it must be removed before a diskette drive can be removed or installed.

Removing a Diskette Drive

1. Remove power from the system.

See “Removing Power from the System” on page 45.

2. Remove the cover and attach a wrist strap.

See Chapter 7.



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. Remove the CD-ROM drive if installed (FIGURE 9-10).

See “Removing a CD-ROM Drive” on page 123.

Note – If a CD-ROM drive is not installed, the CD-ROM filler panel must be removed to access the diskette drive.

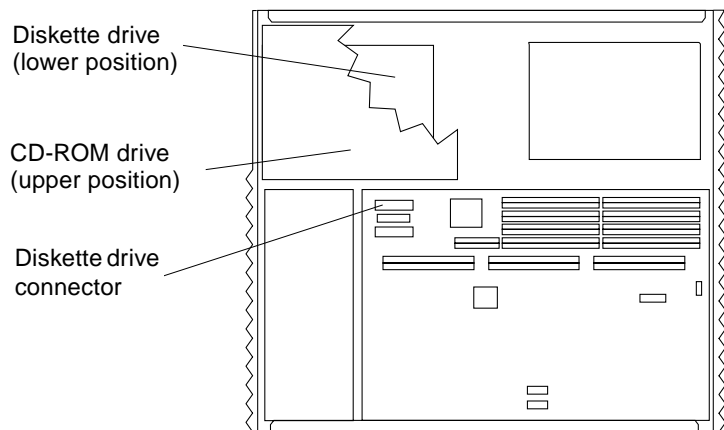


FIGURE 9-9 Diskette Drive Location

4. **Remove the filler panel as follows (FIGURE 9-10):**
 - a. **Press the filler panel tabs in.**
 - b. **Rotate the filler panel outward.**
 - c. **Remove the filler panel from the chassis.**

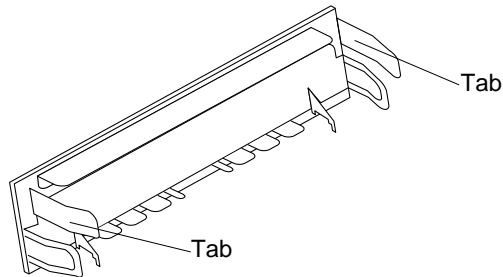


FIGURE 9-10 CD-ROM Drive Filler Panel

5. **Place the screwdriver tip into the drive bracket slot next to a diskette grommet. Use the screwdriver as a lever to move a diskette grommet forward, toward the center of the chassis (FIGURE 9-11).**
6. **Repeat Step 5 for other grommets to free the diskette drive.**
7. **Disconnect the power cable from the diskette drive (FIGURE 9-11).**

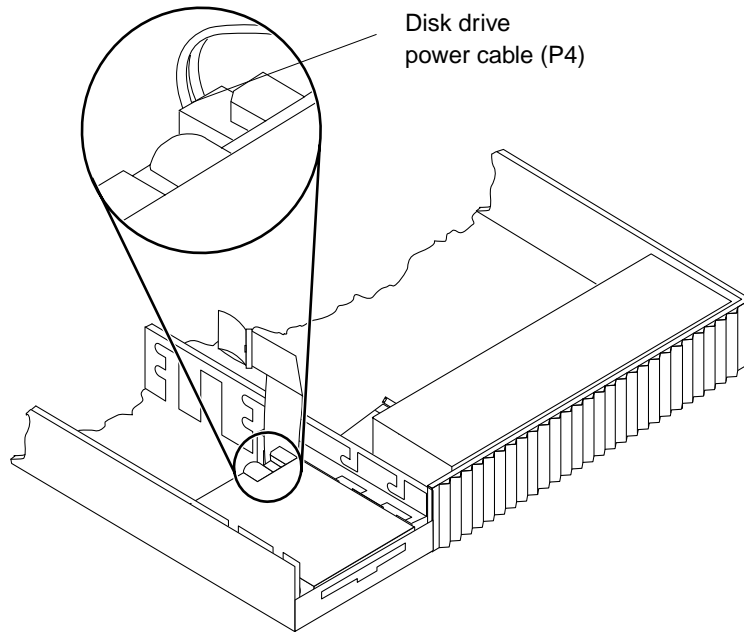


FIGURE 9-11 Diskette Drive Power Cable

8. Disconnect the diskette drive data cable (FIGURE 9-12).

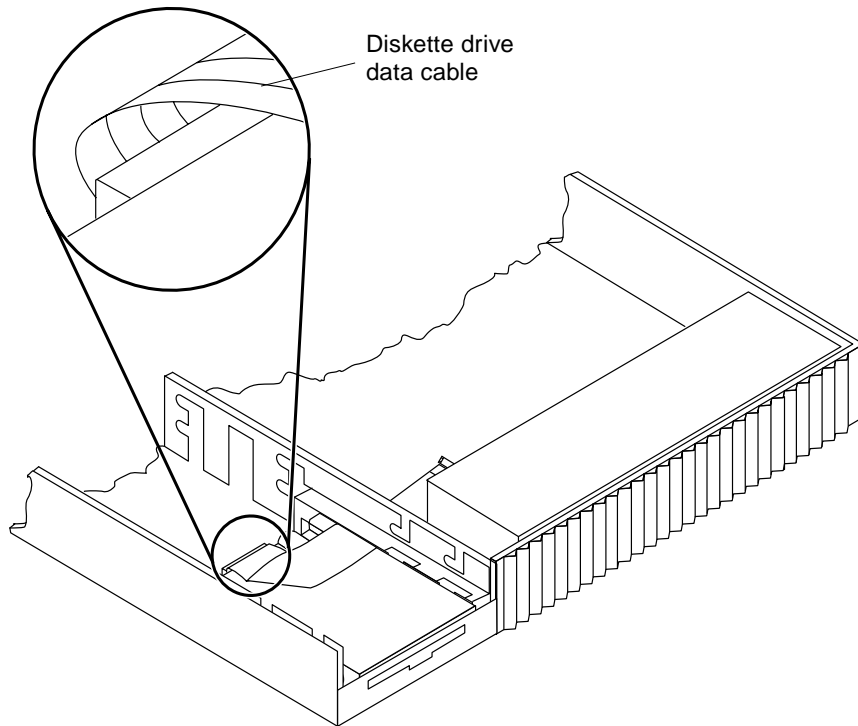


FIGURE 9-12 Diskette Drive Data Cable

- 9. Lift the diskette drive from the chassis; place the diskette drive on an antistatic surface (FIGURE 9-13).**
- 10. Remove the Phillips screws and grommets; set screws and grommets aside (FIGURE 9-13).**

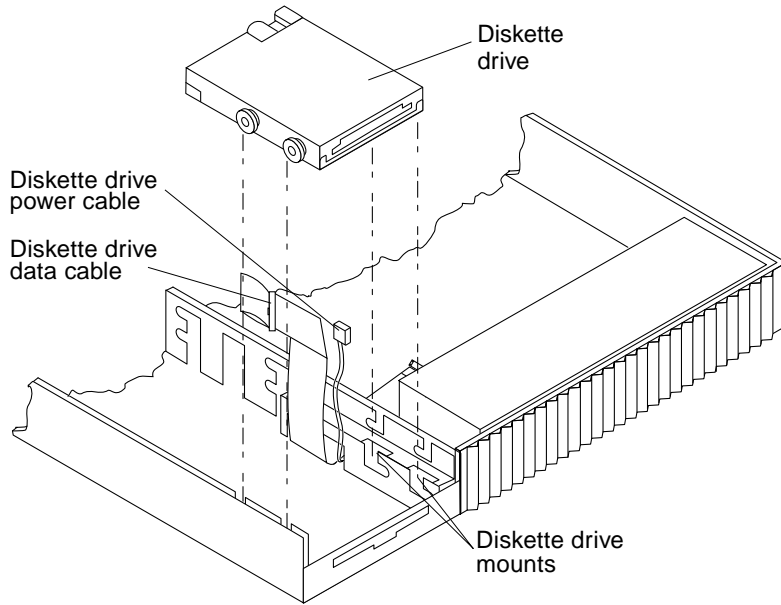


FIGURE 9-13 Removing the Diskette Drive

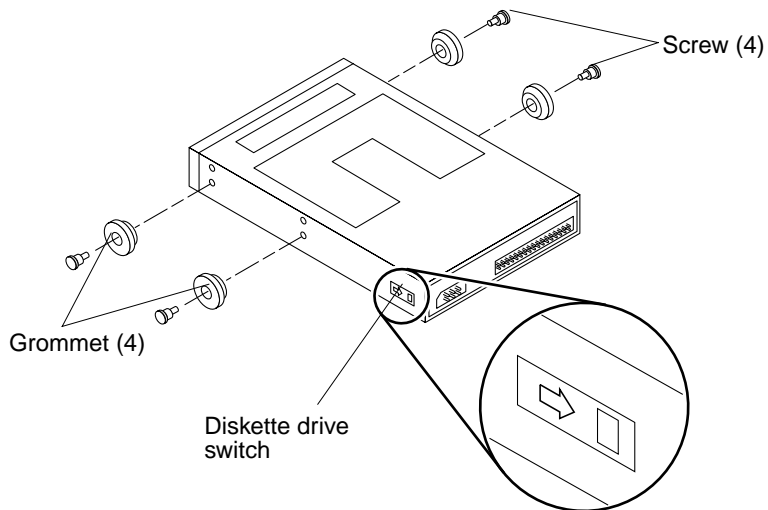


FIGURE 9-14 Installing Grommets and Setting the Diskette Drive Switch

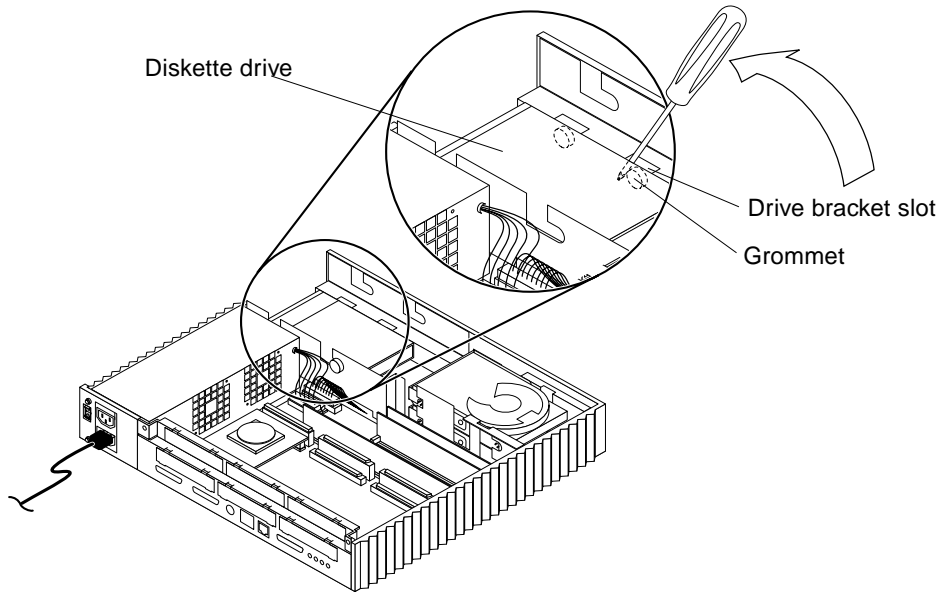


FIGURE 9-15 Unseating the Diskette Drive Grommets

Installing 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. Install the grommets and Phillips screws that were set aside in Step 4 of “Removing a Diskette Drive” on page 127”.
2. Set the diskette drive switch; perform either Step 3a or Step 3b.
 - a. If the diskette drive has a switch on the side of the drive, set the diskette drive switch all the way to the rear (FIGURE 9-16).

Note – This switch is not present on all models.

- b. If the diskette drive does not have a switch on the side of the drive, it has a microswitch (SW4) on the printed circuit board (PCB) side of the drive. Set SW4 to the 0 position by pressing it towards the rear of the diskette drive (FIGURE 9-16).

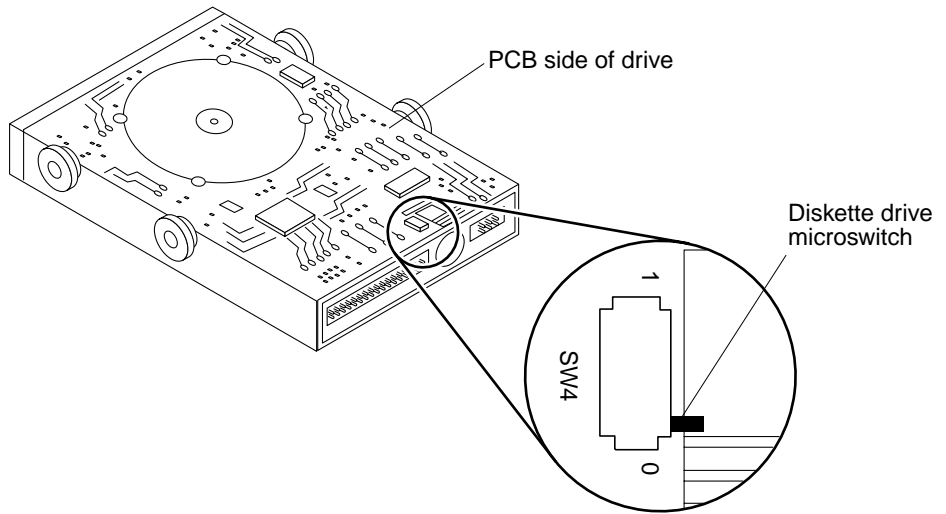


FIGURE 9-16 Setting the Diskette Drive Microswitch

- c. **Locate the two-wire diskette drive power cable labeled P4. Move the SCSI disk cable and the CD-ROM drive power cable away from the diskette drive opening (FIGURE 9-17 and FIGURE 9-17).**

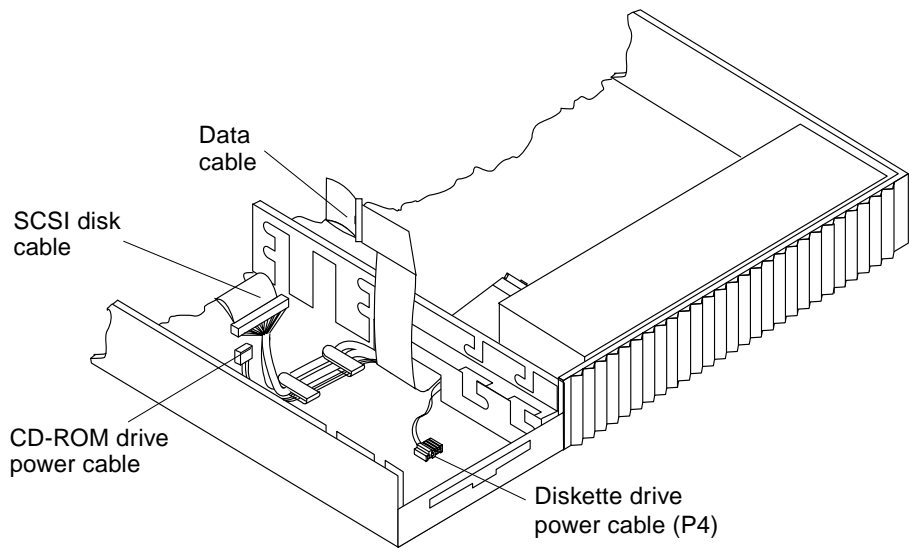


FIGURE 9-17 Moving the SCSI Disk Cable and the CD-ROM Drive Power Cable

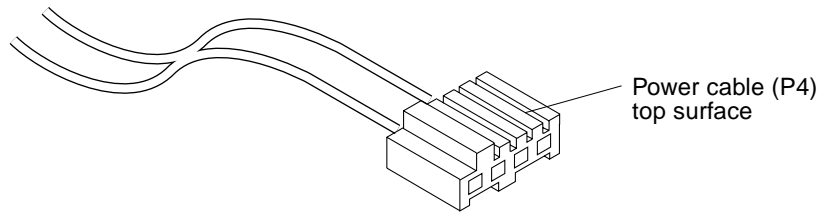


FIGURE 9-18 Diskette Drive Power Cable (P4)

3. Lift the diskette drive data cable and the diskette drive power cable up. Lower the diskette drive into position. Push the diskette drive forward to fully seat in the diskette drive mounts (FIGURE 9-19).

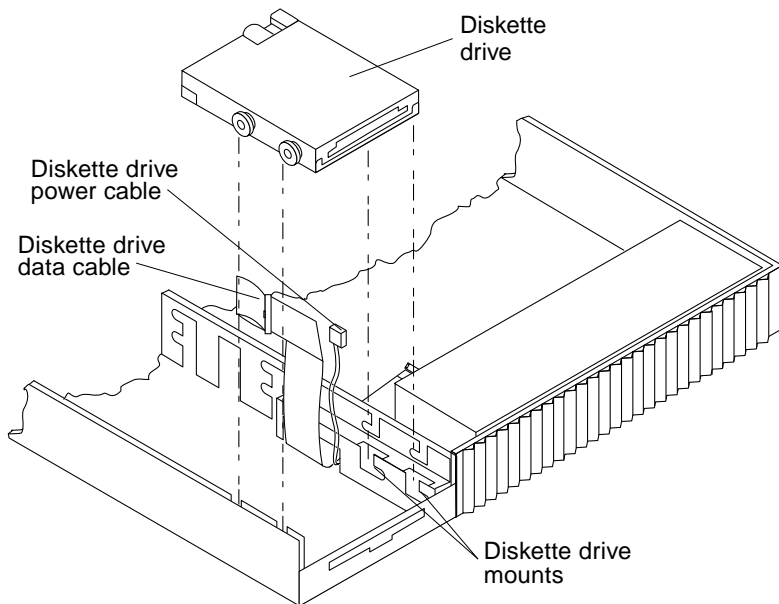


FIGURE 9-19 Installing the Diskette Drive

Note – The diskette drive data cable must be positioned between the diskette drive and the metal chassis.

Note – Push on the rear edge of the diskette drive chassis only. Do not push on exposed disk drive motors or connectors.

4. Attach the diskette drive power and data cables to the diskette drive in the following sequence:

a. Connect P4 (FIGURE 9-20).

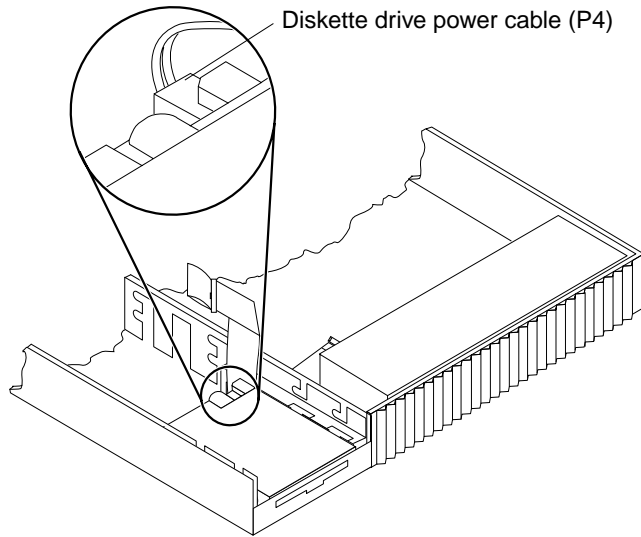


FIGURE 9-20 Connecting the Diskette Drive Power Cable

Note – The top faces up when connected to the drive.

b. Connect the data cable by routing it over the diskette drive (FIGURE 9-21).

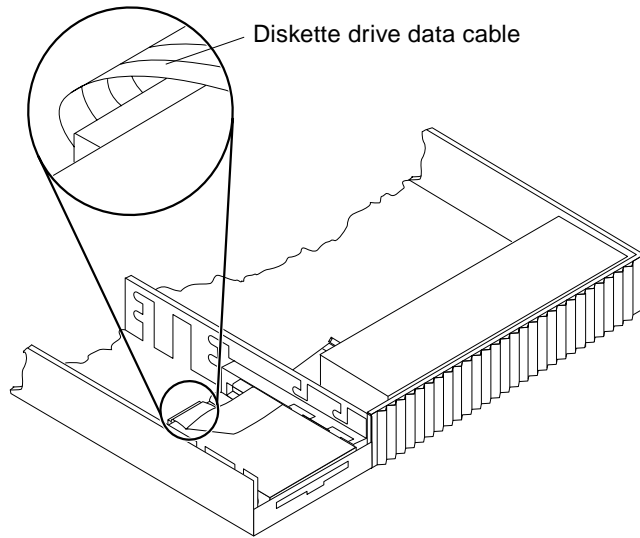


FIGURE 9-21 Connecting the Diskette Drive Data Cable

- 5. If applicable, replace the CD-ROM drive (see “Installing a CD-ROM Drive” on page 124) or replace the CD-ROM drive filler panel as follows:**
 - a. Align the filler panel such that the filler panel base is on top of the diskette drive filler panel (FIGURE 9-22).**
 - b. Verify that the two posts align with the chassis holes.**
 - c. Squeeze the two tabs together and rotate the filler panel inward until the tabs snap into the chassis slots.**

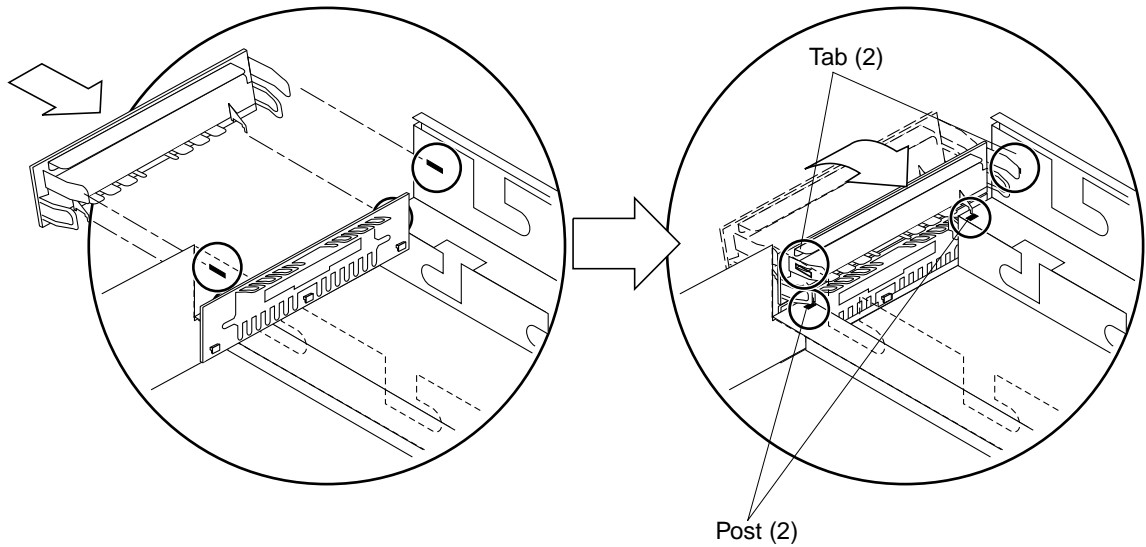


FIGURE 9-22 Installing the CD-ROM Drive Filler Panel

6. Detach the wrist strap and replace the cover.

See Chapter 7.

7. Power on the system.

See Chapter 6.

System Board Overview

This chapter contains descriptions of the system board. The following topics are presented in this chapter:

Preventing Damage



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

Handling System Boards and Assemblies



Caution – The system chassis power-on/standby switch must be set to standby mode, and the AC power cord must be plugged in to ensure proper grounding.



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



Caution – The system board and related modules and cards have surface-mount components that may break when the board is flexed.

To minimize the amount of board flexing, observe the following precautions:

- Hold the system board only by the edges.
- Do not place the system board or any component of the system board (SBus card, MBus module, SIMM, or chip) on a hard surface. Use a cushioned antistatic mat. See Chapter 12.
- Transport the system board in an antistatic bag.

System Board Description

FIGURE 10-1 identifies the major components of the SPARCstation 20 system board.

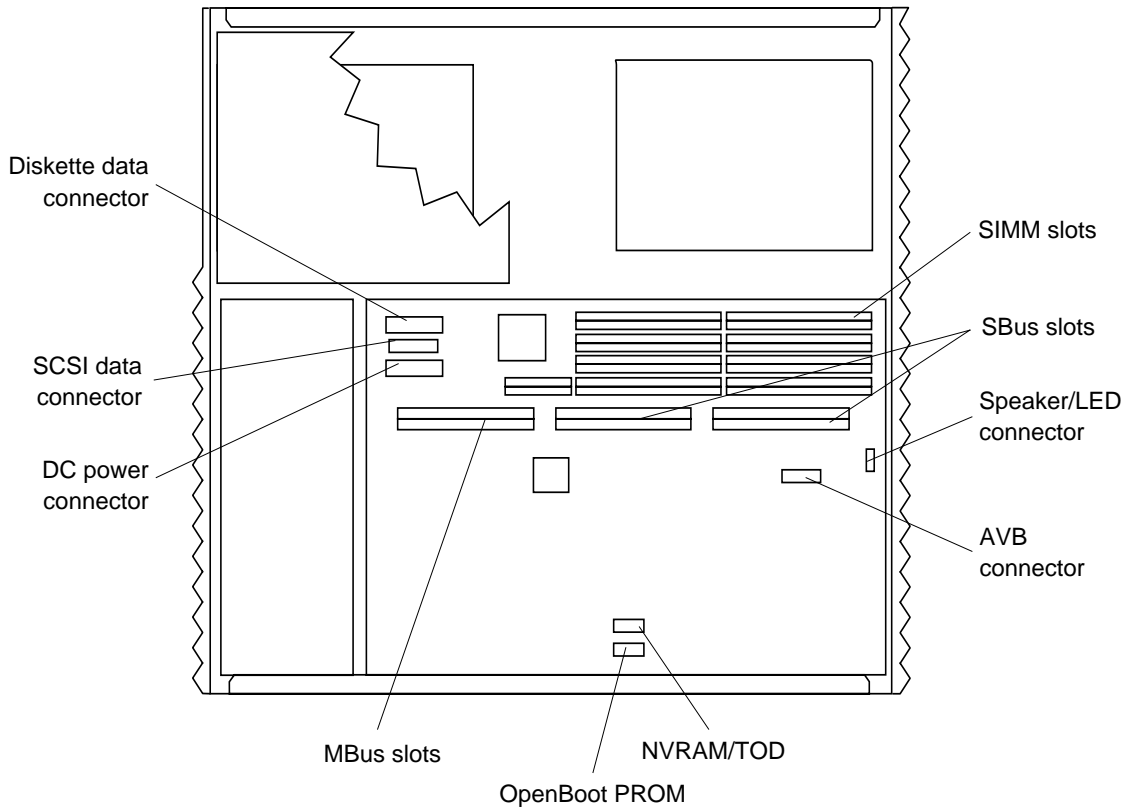


FIGURE 10-1 System Board

System Board FRUs

The following are system board FRUs:

- DSIMM
- VSIMM
- NVSIMM
- AVB
- SBus card
- MBus module
- OpenBoot PROM
- NVRAM/TOD

Chapter 11 provides procedures for removing and replacing these components. See FIGURE 10-2.

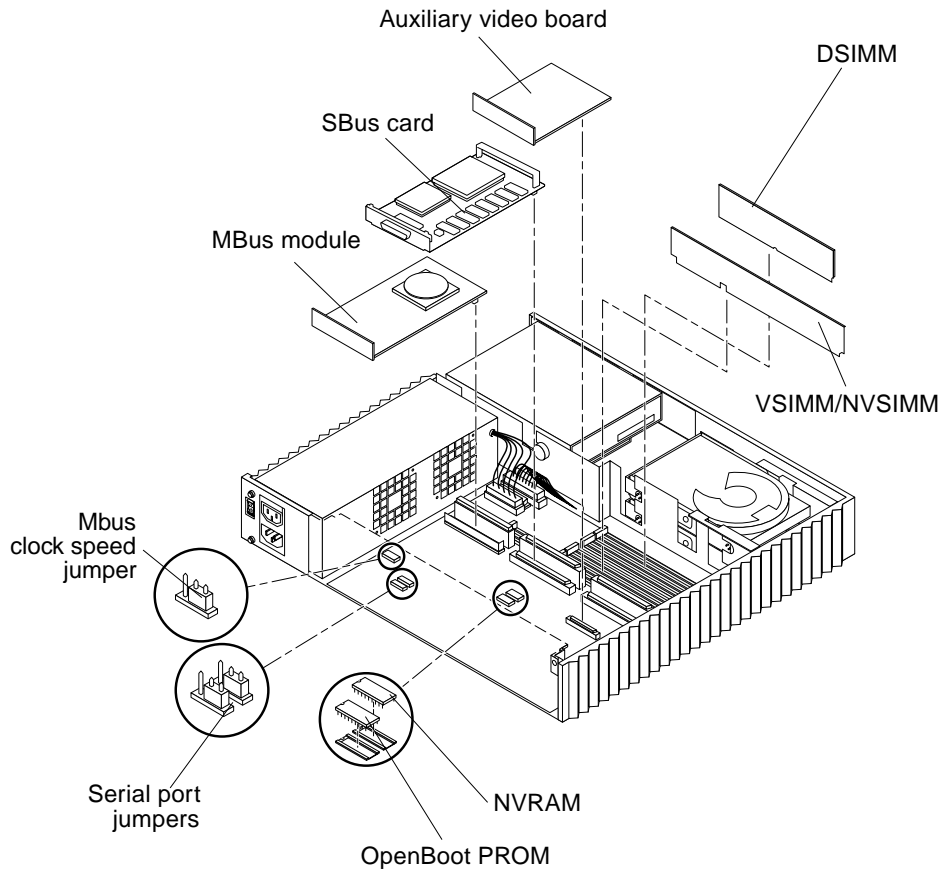


FIGURE 10-2 Exploded View of the System Board

System Board and Component Replacement

This chapter describes how to remove, replace, and configure the replacement parts.

MBus Module

The following paragraphs provide procedures for removing and installing a single-wide and a double-wide MBus module. To remove and install a single-wide and a double-wide MBus module, proceed as follows.

Removing a Single-Wide MBus Module



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

- 1. Remove power from the system.**
See “Removing Power from the System” on page 45.
- 2. Remove the cover and attach the wrist strap.**
See Chapter 7.



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. Unlock both MBus module retainers (FIGURE 11-1).

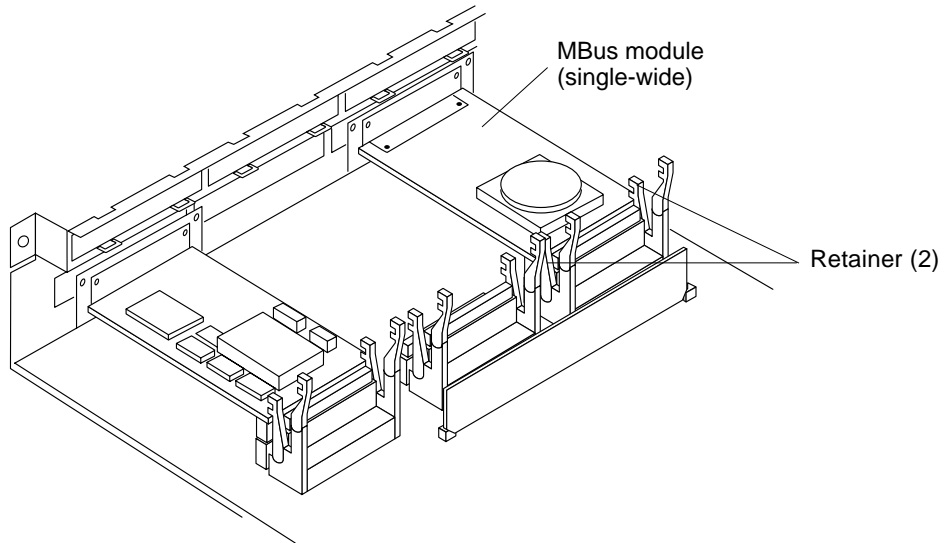


FIGURE 11-1 MBus Module Retainers

- 4. If the system contains two MBus modules (slot 1, upper; slot 0, lower), and the MBus module being removed is in the lower slot (slot 0), remove the slot 1 MBus module first.**
- 5. Install the card extractor on the MBus module (FIGURE 11-2).**
- 6. Holding each side of the card extractor, pull the MBus module up until the connector is out of the slot (FIGURE 11-3).**
- 7. Remove the card extractor from the MBus module.**

Note – Save the extractor for future use.

- 8. Place the MBus module on an antistatic surface.**

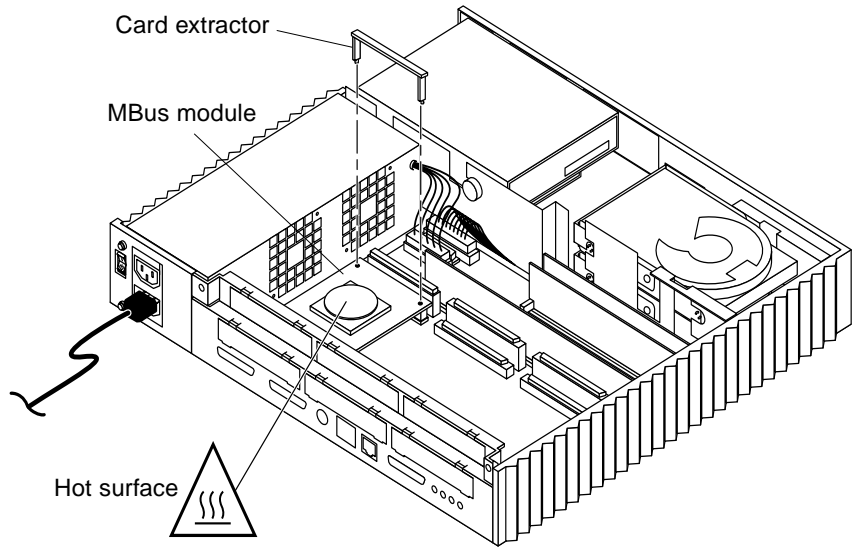


FIGURE 11-2 Extractor Installation on a Single-Wide MBus Module

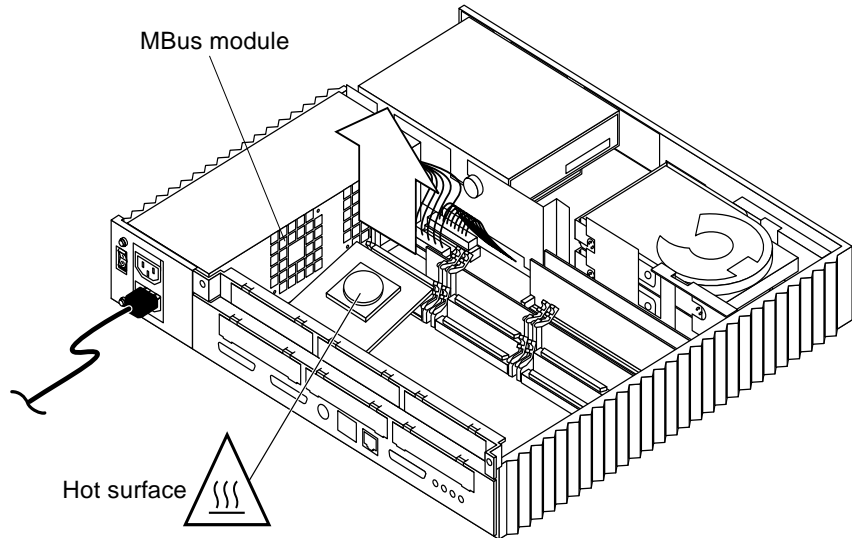


FIGURE 11-3 Removing a Single-Wide MBus Module

Installing a Single-Wide MBus 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. Push the MBus module retainers to the unlocked position.
2. Position the MBus module so that the MBus module connector faces the appropriate slot (FIGURE 11-4).

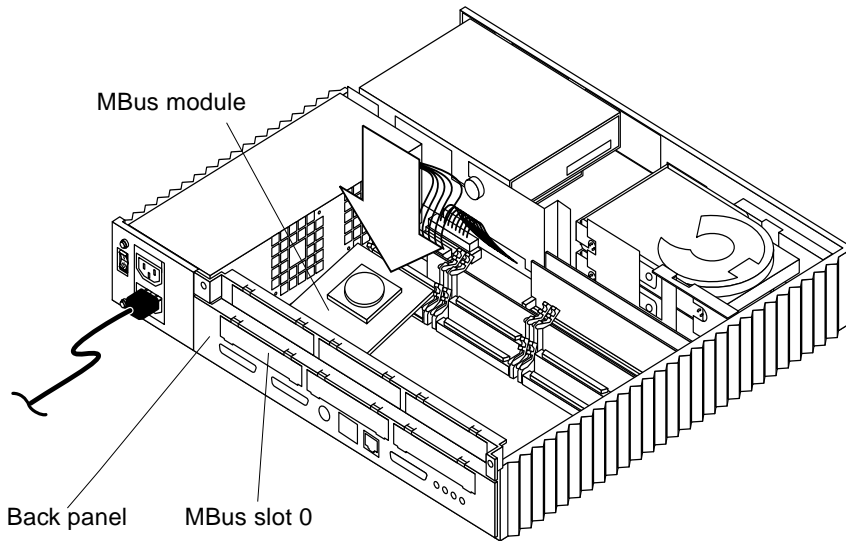


FIGURE 11-4 Installing a Single-Wide MBus Module



Caution – A module must be installed in MBus module slot 0 (lower slot) or the system will not work.

3. Insert the back edge of the module between the metal (lower) and plastic (upper) tabs on the back panel.
4. Hold the MBus module corners and press down firmly until the module is seated into the slot.

Note – Be sure the MBus module is fully inserted into the MBus slot. If it is not, the card retainers may not lock over the edge of the module properly.



Caution – Excessive force may bend or damage the pins.

5. **Lock the retainer arms over the edge of the MBus module (FIGURE 11-5).**

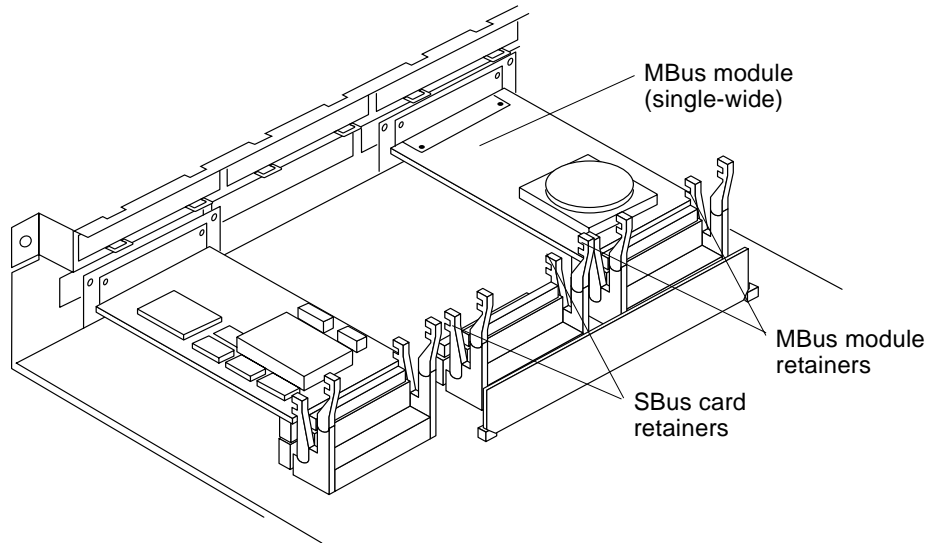


FIGURE 11-5 MBus Module and SBus Card Retainers

Removing a Double-Wide MBus Module



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

1. **Remove power from the system.**
See “Removing Power from the System” on page 45.
2. **Remove the cover and attach the wrist strap.**
See Chapter 7.



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. **Unlock the MBus module retainers and the SBus card retainers closest to the MBus slot (FIGURE 11-5).**
4. **Remove the four screws and rectangular washers from the MBus module and the back panel (FIGURE 11-6).**

Note – Save the screws and washers for future use.

5. **Hold each edge of the MBus module and pull up on the module until the connector is out of the slot (FIGURE 11-7).**
6. **Place the MBus module on an antistatic surface.**

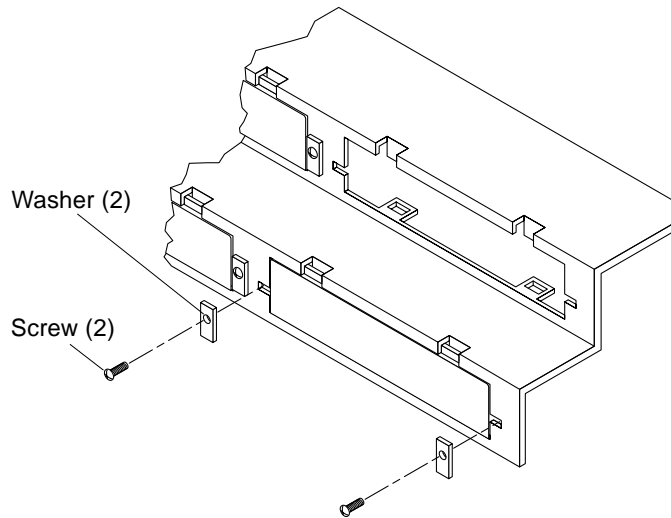


FIGURE 11-6 MBus Module Back Panel Screws and Washers

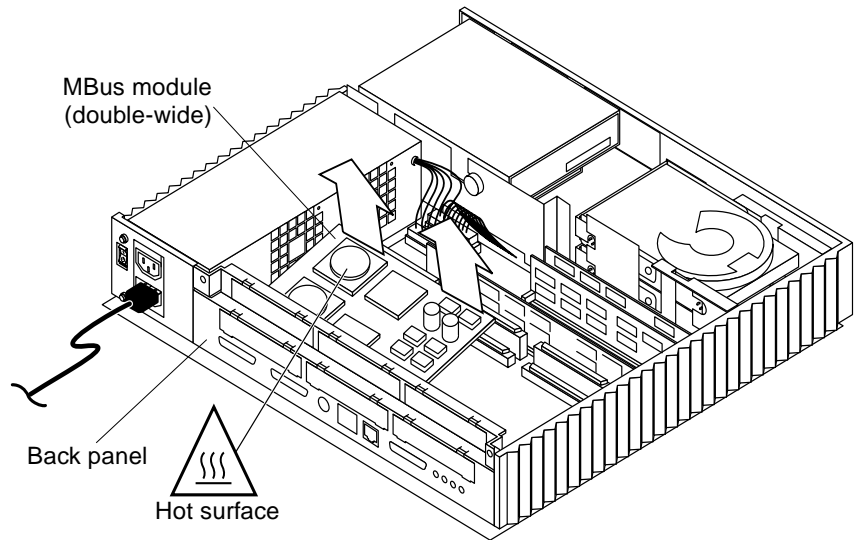


FIGURE 11-7 Removing a Double-Wide MBus Module

Installing a Double-Wide MBus 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. **Unlock the MBus module retainers and the SBus card retainers (FIGURE 11-8).**

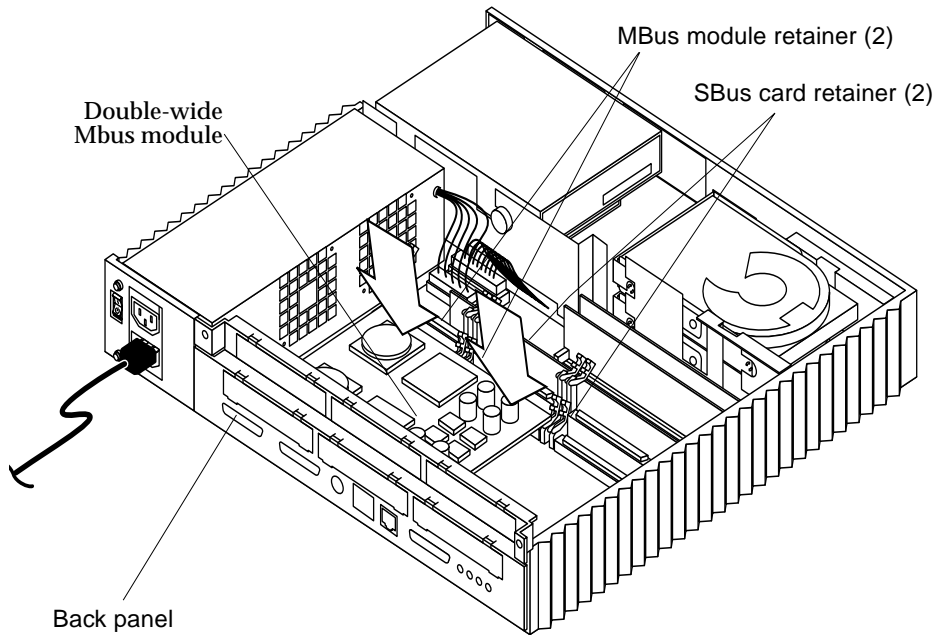


FIGURE 11-8 Installing a Double-Wide MBus Module

2. Insert the MBus module back plate into the system back panel; hook the MBus module back plate into the back panel slot (FIGURE 11-9).

Note – A double-wide MBus module installs and has a back plate like an SBus card. The connector on the MBus module should face the appropriate MBus module slot.



Caution – An MBus module must be installed in MBus module slot 0 or the system will not work.

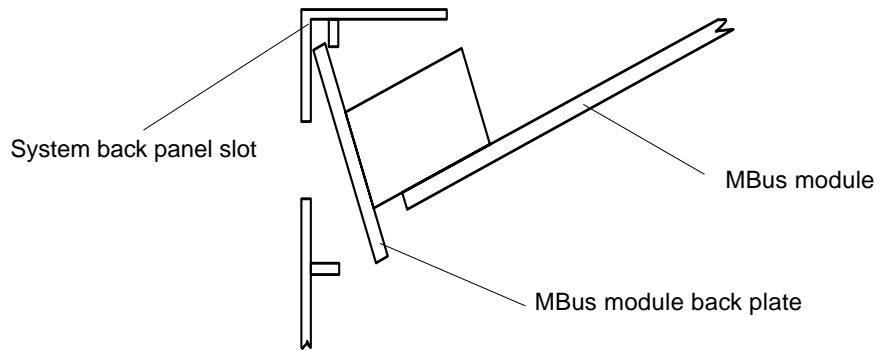


FIGURE 11-9 Seating a Double-Wide MBus Module back Plate, Side View



Caution – Fingers should be on either side of the MBus module connector. Do not press both ends of the MBus module because only one connector is on the module.

- 3. Place fingers over each side of the MBus module connector and press down firmly until the MBus module is fully inserted into the slot.**
- 4. Lock the retainers over the edge of the MBus module (FIGURE 11-10).**

Note – If the MBus module is not fully inserted into the MBus slot, the retainers may not lock over the edge of the MBus module. The arrows in FIGURE 11-10 point to the retainers that must lock.

- 5. Remove the wrist strap and replace the cover.**
See Chapter 7.
- 6. Power on the system.**
See Chapter 6.

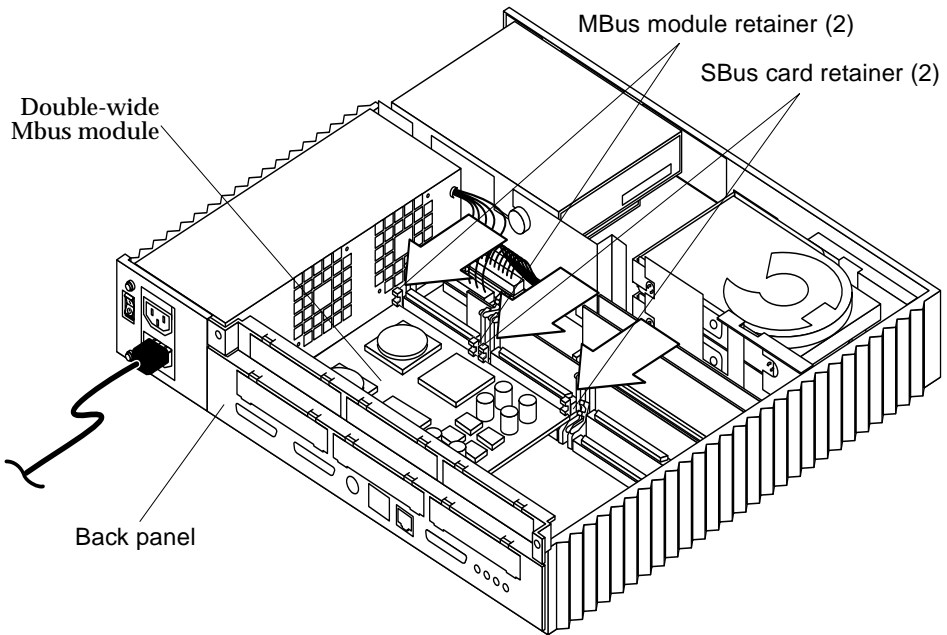


FIGURE 11-10 Locking the MBus Module Retainers

SBUS Card

To remove and install an SBUS card, proceed as follows.

Removing an SBUS Card

1. Remove power from the system.

See “Removing Power from the System” on page 45.

2. Remove the cover and attach the wrist strap.

See Chapter 7.



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. Unlock the retainers at the back edge of the SBus card (FIGURE 11-11).

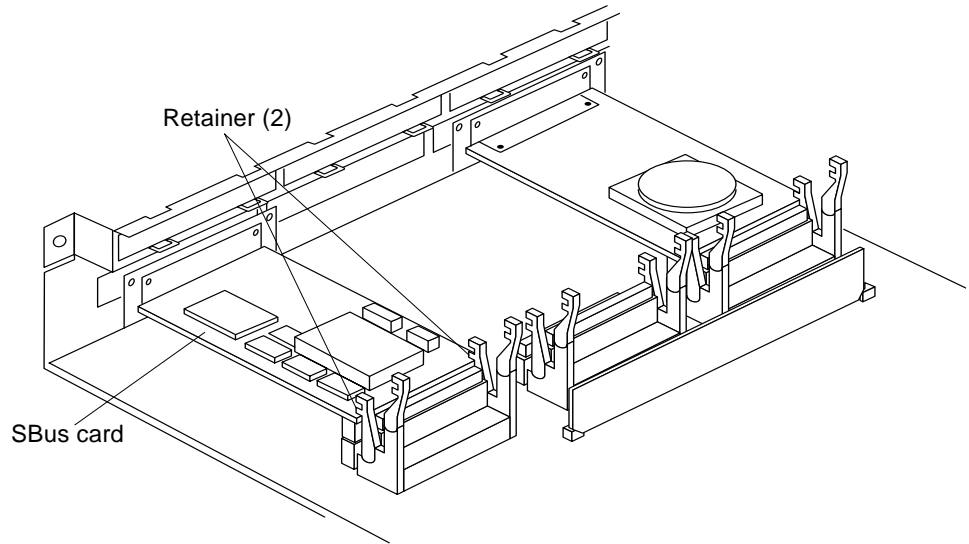


FIGURE 11-11 SBus Card Retainers

4. Remove the screws and washers from the SBus card back plate (FIGURE 11-12).

Note – Save the screws and washers for later use.

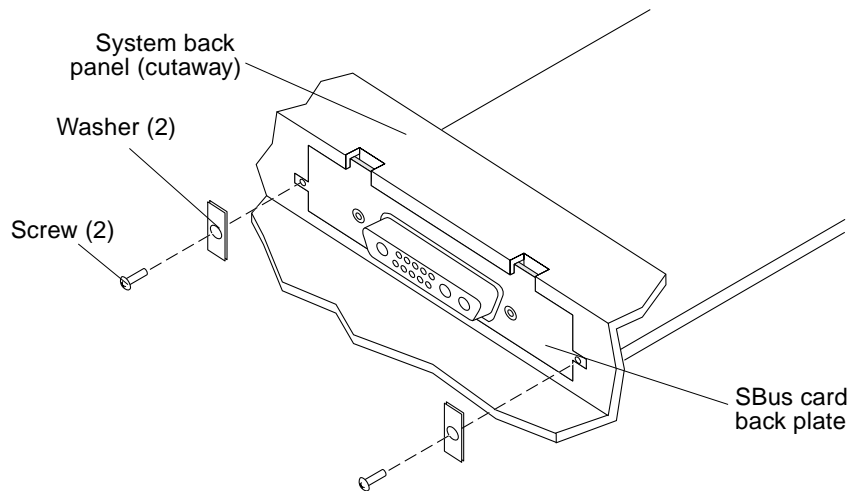


FIGURE 11-12 SBus Card Back Plate Screws and Washers

5. Insert the extractor into the SBus card (FIGURE 11-13) or insert two extractors into double-wide Sbus card (FIGURE 11-14).

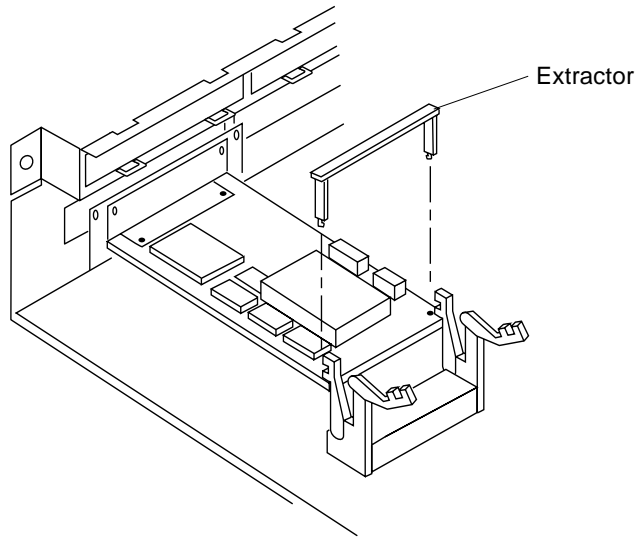


FIGURE 11-13 Installing the Card Extractor

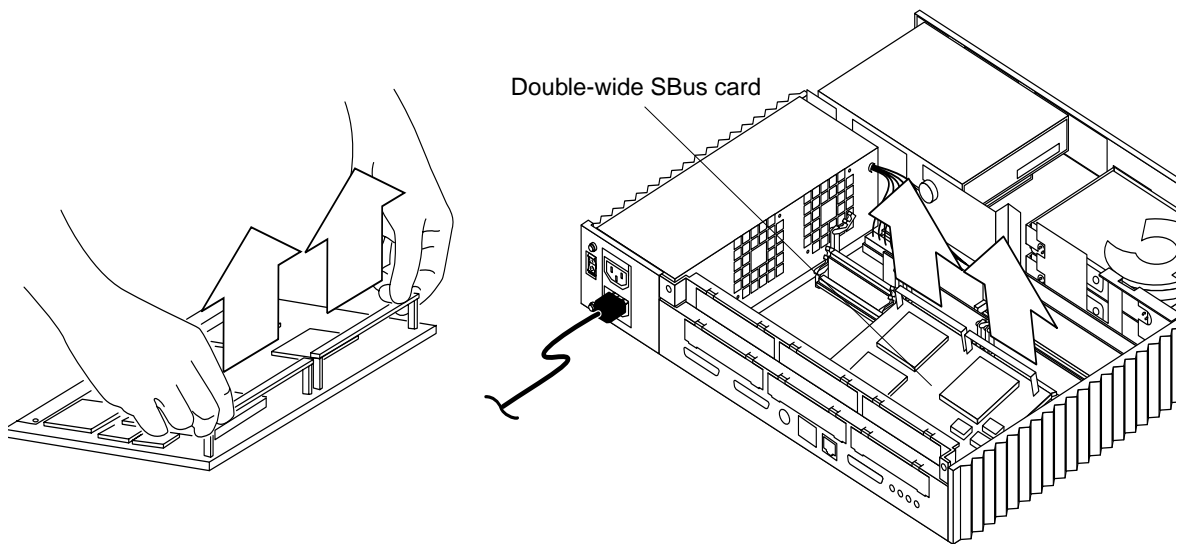


FIGURE 11-14 Removing a Double-Wide SBus Card

6. Hold each end of the extractor and pull up slowly until the connector is removed from the slot.

Note – There are single-wide and double-wide SBus cards. FIGURE 11-15 shows a double-wide SBus card being removed.

7. Remove the card extractor from the SBus card as follows:
 - a. Bend one leg of the extractor slightly to the outside until the hook clears the hole in the SBus card (FIGURE 11-15).
 - b. Remove the other side of the extractor, which should come out easily without bending.
8. Place the SBus card on an antistatic surface.

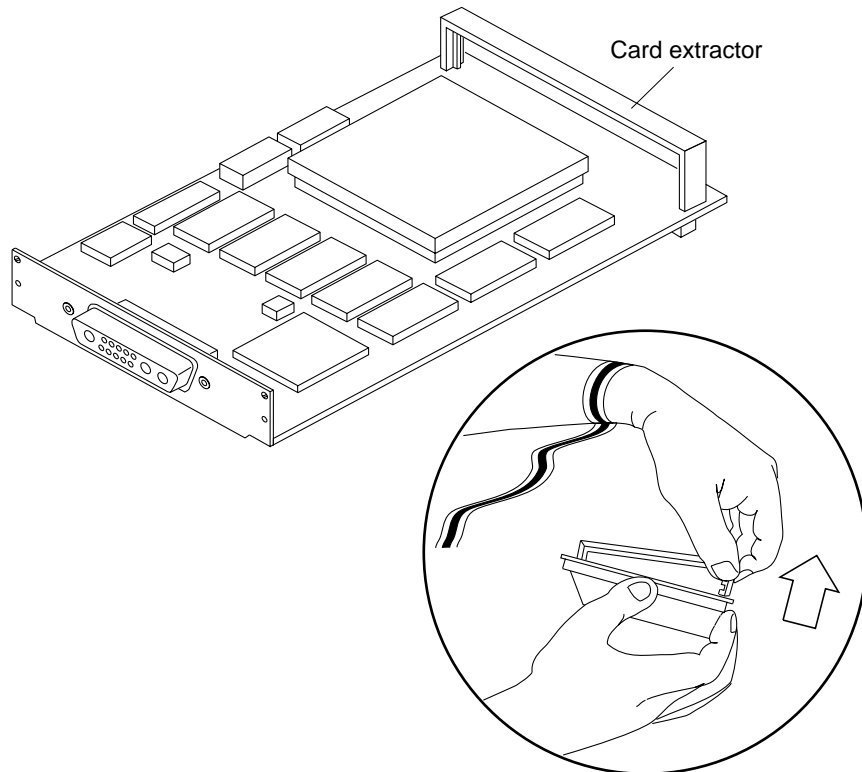


FIGURE 11-15 Removing the SBus Card Extractor

Installing 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.

1. **Place the SBus card on an antistatic surface.**
2. **If required, set the card jumpers or switches.**
See the manual for the SBus product.
3. **If the SBus card has tabs on the back plate, remove the two small Phillips screws that attach the adapter bracket to the back plate and remove the adapter bracket (FIGURE 11-16).**

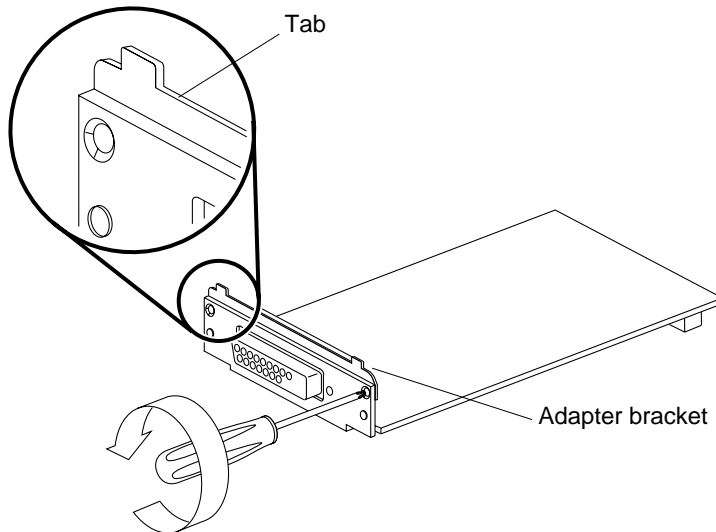


FIGURE 11-16 Removing the SBus Card Adapter Bracket

4. **Remove the card extractor from the SBus card as follows:**
 - a. **Bend one leg of the extractor outward slightly until the hook clears the hole in the SBus card (FIGURE 11-17).**
 - b. **Remove the other side of the extractor, which should come out easily without bending.**
5. **Push the rear card retainers back on the system board (FIGURE 11-17 and FIGURE 11-18).**

Note – FIGURE 11-17 and FIGURE 11-18 show a double-wide SBus card and a single-wide SBus card, respectively, being installed.

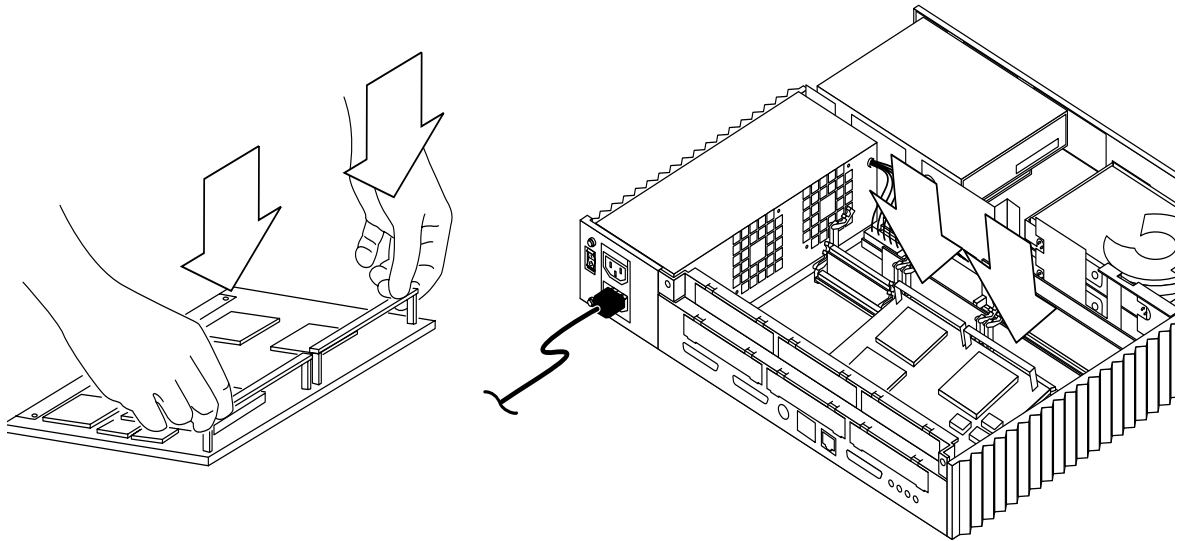


FIGURE 11-17 Installing a Double-Wide SBus Card

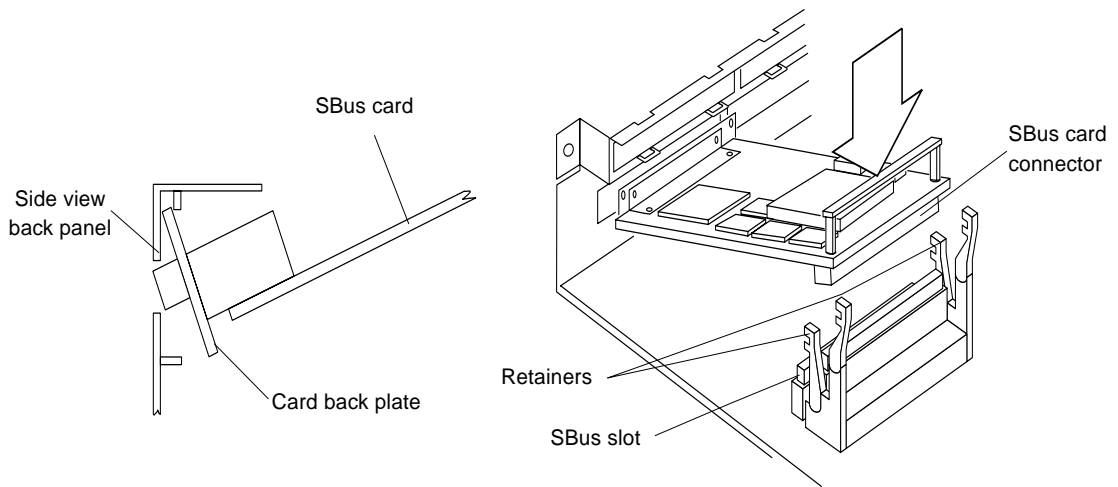


FIGURE 11-18 Installing a Single-Wide SBus Card

6. Install the Sbus card as follows (FIGURE 11-18):
7. Install the screws and washers into the SBus card back plate (FIGURE 11-19).
 - a. Slide the card at an angle into the back panel of the system. Hook the card back plate under the lip on the back panel. Be sure the SBus card back plate shows through the slots on the back panel.

Note – The back plate connector(s) may not align with other connectors in the back panel.



Caution – Do not use force. Align the card connector and slot properly or card pin damage may occur.

- b. Align the SBus card connector with the SBus slot on the system board. Gently press the corners of the card to seat the connector into the slot.
 - c. Push the retainers forward over the edge of the SBus card.
8. Remove the wrist strap and replace the cover.
See Chapter 7.
9. Power on the system.
See Chapter 6.

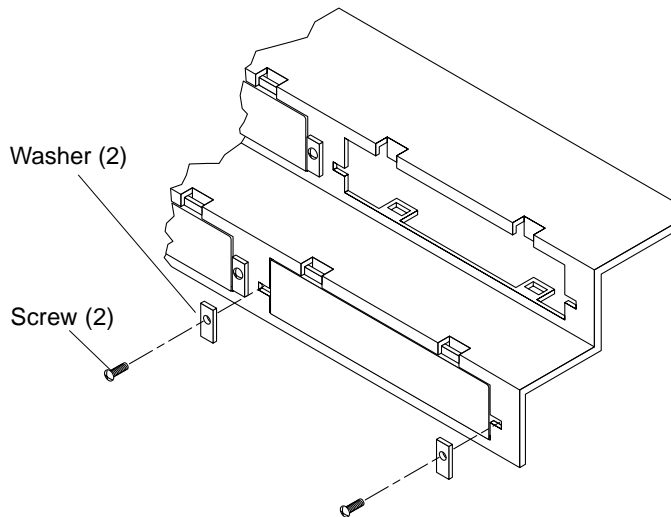


FIGURE 11-19 SBus Card Back Panel Screws and Washers

DSIMMs, VSIMMs, and NVSIMMs

The SPARCstation 20 system supports as many as eight dynamic single in-line memory modules (DSIMMs). DSIMMs are available in three capacities; 16-Mbyte, 32-Mbyte, and 64-Mbyte. In addition, the SPARCstation 20 system supports up to two video single in-line memory modules (VSIMMs) and one non-volatile SIMM (NVSIMM). VSIMMs are available in two capacities: 4-Mbyte and 8-Mbyte.

Each SIMM card has horizontally mounted intergrated circuits (ICs) on both sides of the card. The part of the card that plugs into the memory slot has a scalloped edge with a conductive surface, that is known as *gold fingers*.

Removing and installing all capacities and types of SIMMs (DSIMM, VSIMM, NVSIMM) is identical. The following sections provide a brief discussion of DSIMMs, VSIMMs, and NVSIMMs and is followed by procedures for removing and installing a SIMM.



Caution – A SIMM is made of delicate electronic components that are extremely sensitive to static electricity. Handle a SIMM only by the edges. Ordinary amounts of static from clothes or work environment can damage a SIMM. Do not touch the components on a SIMM or any metal parts. Wear a grounding strap before unpacking a SIMM and while handling a SIMM.

DSIMM

FIGURE 11-20 and FIGURE 11-21 show front and back views, respectively, of a DSIMM. When installed, the key notch should be near the DSIMM ejector levers.

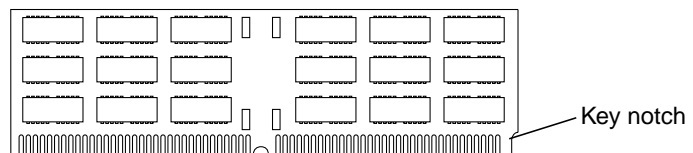


FIGURE 11-20 DSIMM, Front View

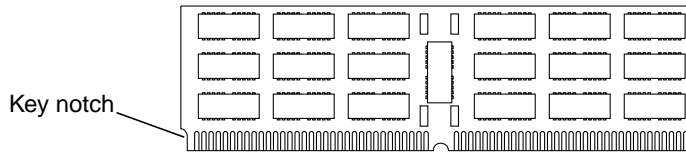


FIGURE 11-21 DSIMM, Back View

VSIMM

SPARCstation 20 systems with the SX graphics option are equipped with a minimum of 4 Mbytes of video random access memory (VRAM). Physically, VRAM chips are grouped together as VSIMMs.

Each VSIMM contains 4 or 8 Mbytes of video memory. Each VSIMM is a complete high-speed, high-resolution frame buffer that plugs into a memory slot located on the system board. A maximum of two VSIMMs may be installed. With two VSIMMs installed, a maximum of six DSIMMs (384 Mbytes) may be installed.

Note – If a second VSIMM is installed, an auxiliary video board (AVB) must also be installed to provide a second 13W3 video output connector. See “Auxiliary Video Board” on page 168.

A VSIMM differs in appearance from a DSIMM. FIGURE 11-22 shows the front view of a VSIMM. FIGURE 11-23 shows the back view of a VSIMM.

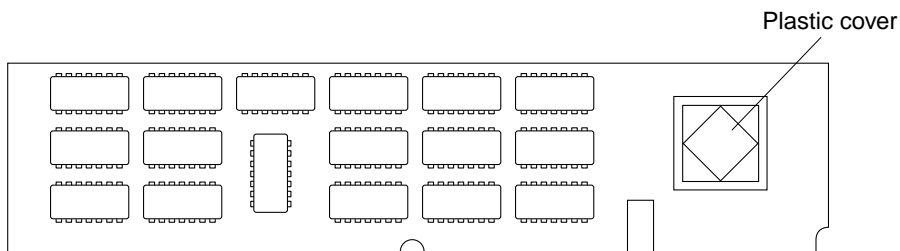


FIGURE 11-22 VSIMM, Front View

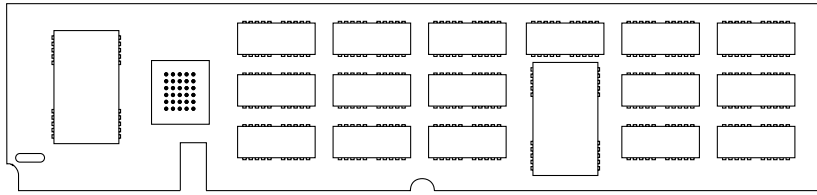


FIGURE 11-23 VSIMM, Back View

NVSIMM

Each NVSIMM contains 2 Mbytes of memory, a battery, and power controller circuitry to ensure memory is not lost when the system is shut down or halts because of abnormal conditions. The NVSIMM is a card with a round, non-replaceable battery mounted on one side. The NVSIMM plugs into a memory slot located on the system board. FIGURE 11-25 shows the battery side of the NVSIMM.

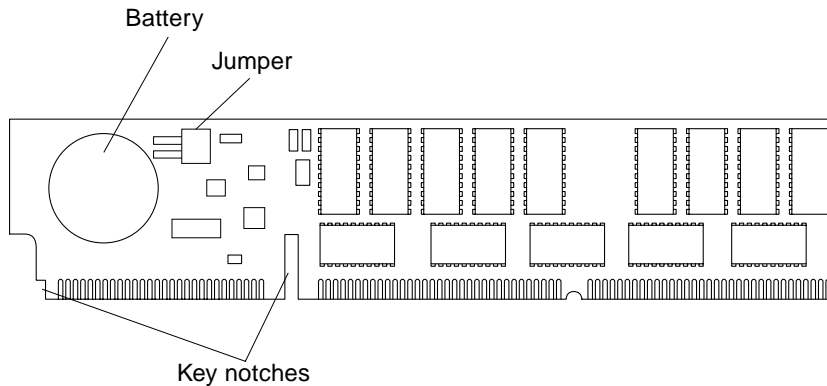


FIGURE 11-24 NVSIMM, Battery Side

Removing a SIMM

Refer to FIGURE 11-25 and proceed as follows:



Caution – The installed SIMMs are specifically designed to operate in the SPARCstation 20 system. *Do not* remove DSIMMs, VSIMMs, or NVSIMMs from different Sun systems and install them in a SPARCstation 20 system.



Caution – Do not disconnect the power cord from the system unit back panel connector. Be sure the power cord is connected to a grounded wall receptacle and that the system unit power switch is set to standby. Verify that the green LED at the chassis front is off.

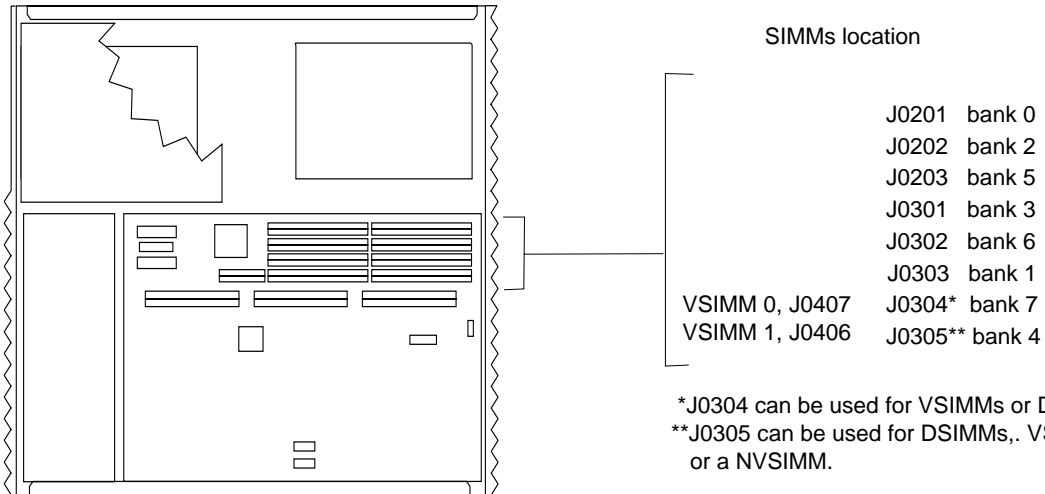


FIGURE 11-25 SIMM Slot Locations

1. Remove power from the system.

See “Removing Power from the System” on page 45.

2. Remove the cover and attach the wrist strap.

See Chapter 7.



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. Place an antistatic surface next to the system.



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

- Using the eraser end of a pencil, move the ejection lever away from the SIMM to be removed (FIGURE 11-26).

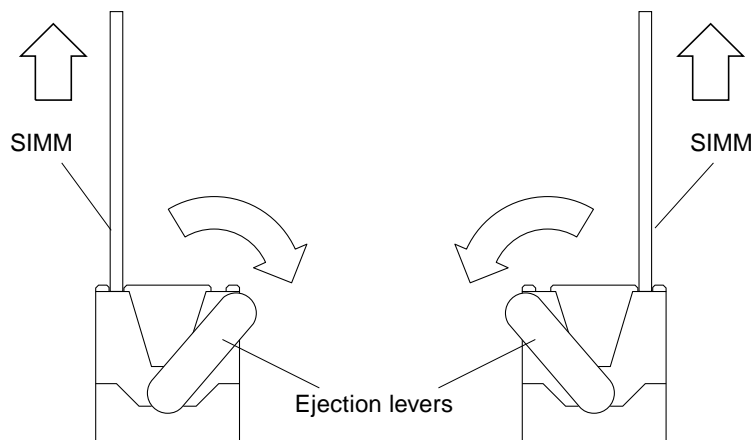


FIGURE 11-26 SIMM Ejection Levers

Note – Ejection levers are enlarged to show detail.

- Grasp the upper corners of the SIMM and lift to remove the SIMM from the slot.
- Place the SIMM on an antistatic surface.

Installing a SIMM

Note – Inspect the contents of the shipping box. Verify that a SIMM is in an antistatic bag and an antistatic wrist strap is supplied. After unpacking the contents of the shipping box, store the shipping box and packing material for future use.



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.

- Locate the SIMM slots on the system board (FIGURE 11-25).
 - Slot J0201 must have a DSIMM installed for the system to function properly. Other DSIMMs may be installed in any available slot.

- Slot J0304 is reserved for the single factory-installed VSIMM with the SX graphics option. If no VSIMM is present, the slot may be used for a DSIMM.
- Slot J0305 may be used for a DSIMM, VSIMM, or NVSIMM.

Note – Slot J0201 must be used for the first 64-Mbyte DSIMM when installing a combination of 64-Mbyte, 32-Mbyte, and 16-Mbyte DSIMMs. If a 16-Mbyte or 32-Mbyte DSIMM is previously installed in slot J0201, it must be removed from slot J0201 and installed in another unused DSIMM slot.



Caution – The NVSIMM is specifically designed to operate in the SPARCstation 20 system. Do not remove a NVSIMM from a different Sun system and install it in a SPARCstation 20 system. The SPARCstation 20 NVSIMM can only be used on systems executing the Solaris 2.3 (SunOS 5.3) operating environment (or later) and Prestoserve™ 2.4.1 or later. The SPARCstation 20 VSIMM can only be used on systems executing the Solaris 2.3 (SunOS 5.3) or later operating environment.

2. Remove the SIMM from the protective packaging and place it on an antistatic surface.
3. Hold the SIMM edges and insert it into the SIMM plastic guides.
4. If installing a DSIMM, position the DSIMM with the key notch near the ejection lever (FIGURE 11-27).

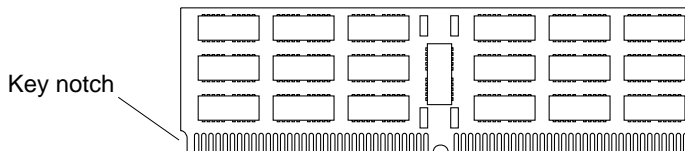


FIGURE 11-27 DSIMM, Back View

5. If installing a VSIMM, position the VSIMM with the plastic cover facing the system unit front panel. The notched portion of the VSIMM should be near the center of the system board (FIGURE 11-28).

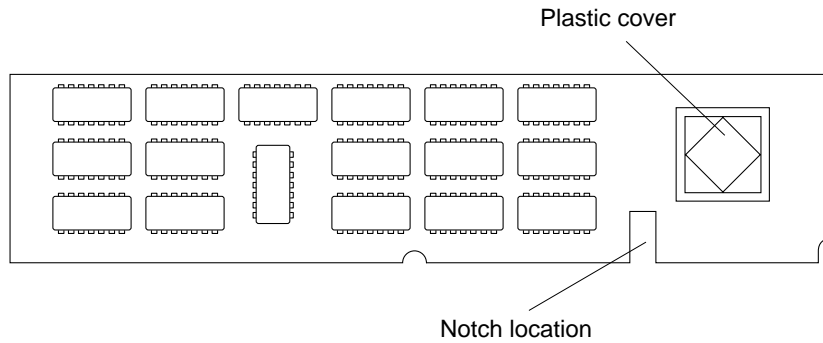


FIGURE 11-28 VSIMM, Back View



Caution – Once the battery is turned on, do not move or remove the jumper. Any data in the NVSIMM memory will be lost if the jumper is moved.

6. If installing an NVSIMM, proceed as follows (FIGURE 11-29):

- a. Turn on the battery.
- b. Locate the jumper on the battery side of the NVSIMM.
- c. Move the jumper to the battery On position.

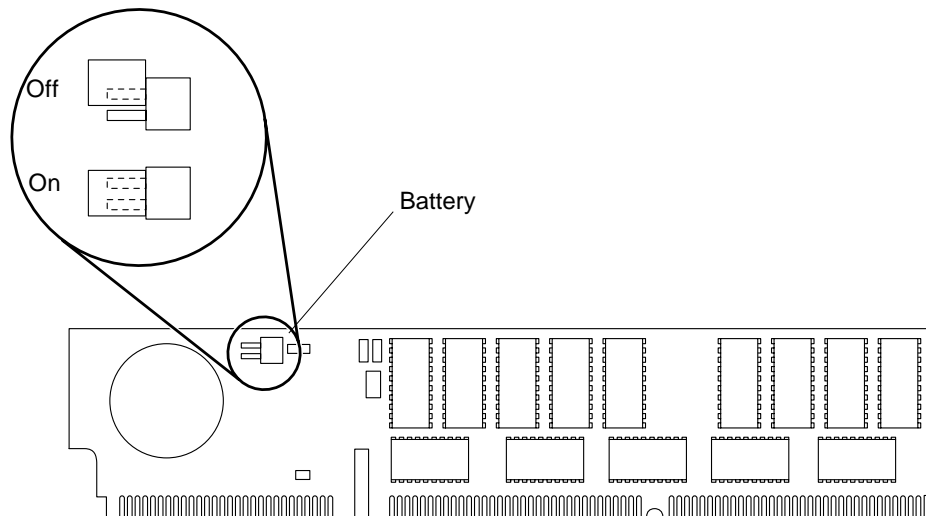


FIGURE 11-29 NVSIMM, Battery Side

7. Hold the NVSIMM by the edges and, align the notch with the area between the two SIMM slots. The surface with the battery must face the system unit back panel (FIGURE 11-30).

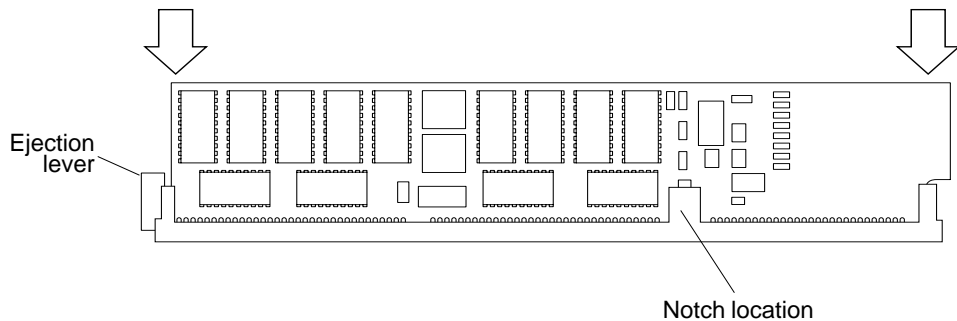


FIGURE 11-30 Aligning the NVSIMM in the Slot, Back View

Note – The notched part of the NVSIMM should be near the center of the system board.



Caution – Use care when aligning the NVSIMM center notch with the connector frame. If the center notch is not properly aligned, the NVSIMM could be damaged when inserted.

8. Place the grooved surface of the insertion tool at a 90-degree angle on the upper edge of the SIMM (FIGURE 11-31 and FIGURE 11-32).

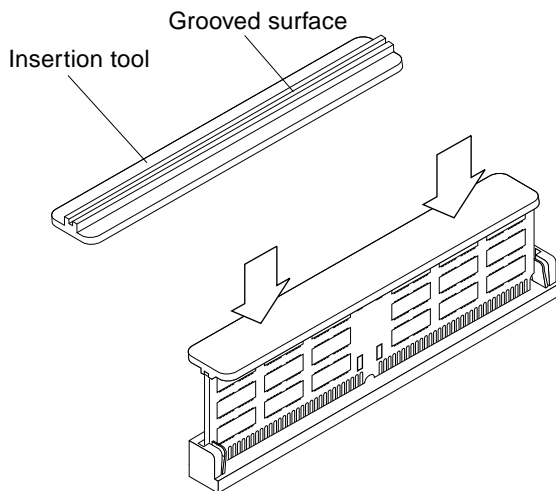


FIGURE 11-31 Inserting a DSIMM

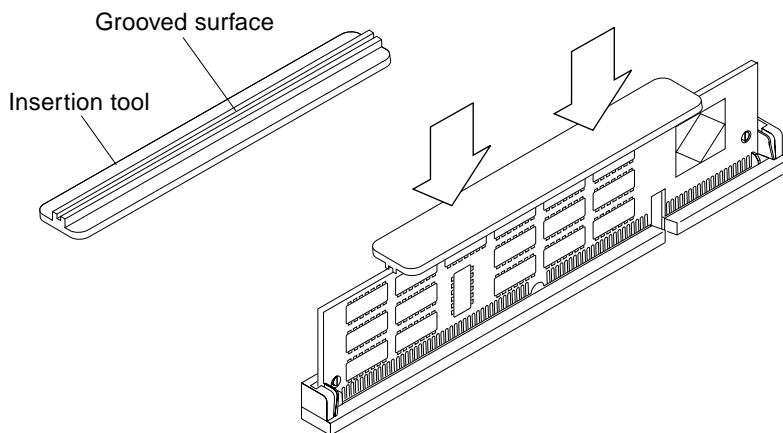


FIGURE 11-32 Inserting a VSIMM/NVSIMM

9. Put the heel of each hand on each side of the insertion tool pushing surface. Press firmly with both hands on the tool until the SIMM snaps into place.

Note – When installing a VSIMM in slot J0305, an AVB must also install. See “Auxiliary Video Board” on page 168.

10. Remove the insertion tool.

11. Remove the wrist strap and replace the cover.

See Chapter 7.

12. Turn on system power.

See Chapter 6.

Auxiliary Video Board

To remove and install an auxiliary video board (AVB), proceed as follows.

Note – If installing a VSIMM in slot J0305, an AVB must be installed to provide video output for the second VSIMM. The SPARCstation 20 system can accommodate one AVB.

Removing an AVB

1. Remove power from the system.

See “Removing Power from the System” on page 45

2. Remove the cover and attach the wrist strap.

See Chapter 7.



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. Locate the AVB (FIGURE 11-33).

4. If an SBus card is installed above the AVB, remove the SBus card.

See “Removing an SBus Card” on page 152.

5. Grasp the upper corners of the AVB and lift to remove the AVB from the slot (FIGURE 11-33).

6. Place the AVB on an antistatic surface.

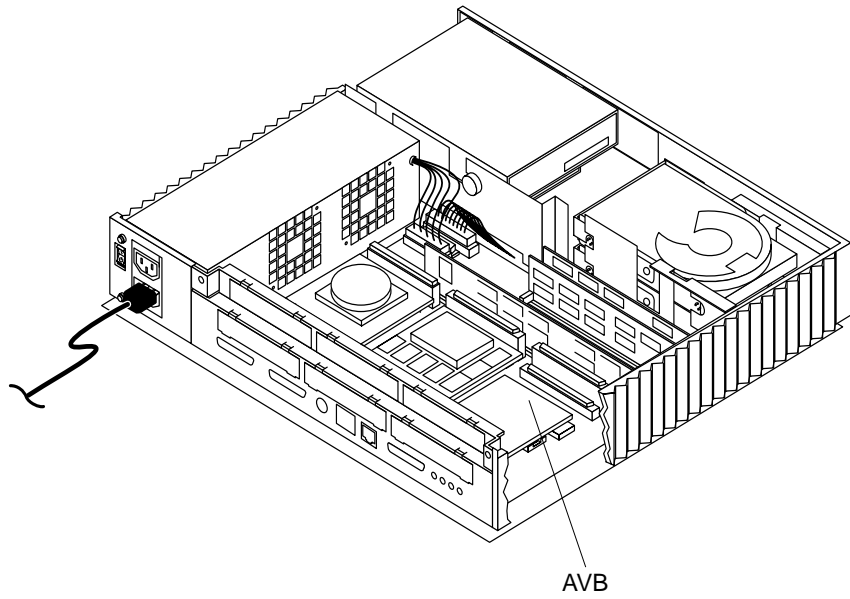


FIGURE 11-33 AVB Installed

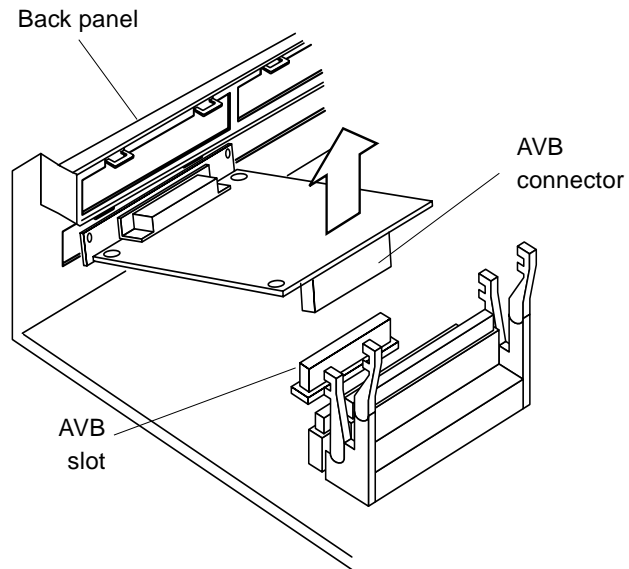


FIGURE 11-34 Removing the AVB

Installing an AVB



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. **Locate the AVB slot.**
2. **Install the AVB as follows (FIGURE 11-35):**
 - a. **Insert the back edge of the AVB between the tabs on the back panel.**
 - b. **Push the AVB connector into the slot.**
 - c. **Hold the corners of the AVB.**
 - d. **Press down firmly until the AVB connector is firmly seated in the slot.**



Caution – Excessive force may bend or damage the pins.

3. **Remove the wrist strap and replace the cover.**

See FIGURE 11-33.

4. **Turn on system power.**

See Chapter 6.

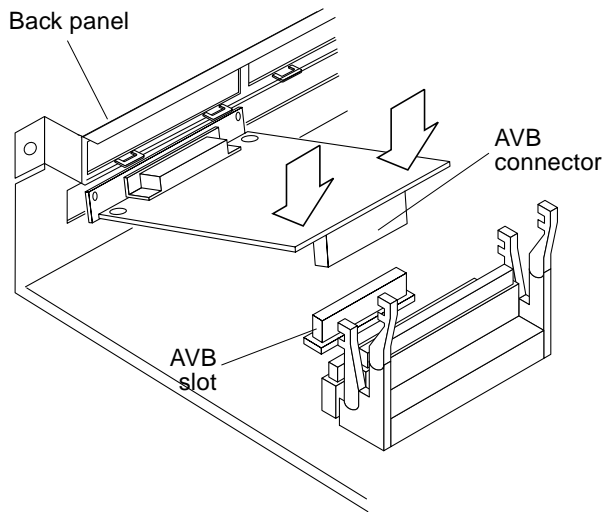


FIGURE 11-35 Installing the Auxiliary Video Board

System Board

The following sections describe how to remove and install the system board, and verify jumper settings

Removing the System Board

1. Remove power from the system.

See “Removing Power from the System” on page 45.

2. Remove the cover and attach the wrist strap.

See FIGURE 11-33.



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. Remove the following:

- MBus modules (see “MBus Module” on page 143)
- SBus cards (see “SBus Card” on page 152)
- SIMMs (see “DSIMMs, VSIMMs, and NVSIMMs” on page 159)
- AVB (see “Auxiliary Video Board” on page 168)
- NVRAM/TOD (see “Removing a NVRAM/TOD” on page 180)

Note – The NVRAM/TOD contains system configuration parameters, the Ethernet address, and host ID numbers. Install the removed NVRAM/TOD on the replacement system board to preserve this information.

4. Disconnect the following from the system board (FIGURE 11-36):

- Diskette connector (optional)
- SCSI connector
- DC power connector
- Speaker/LED connector

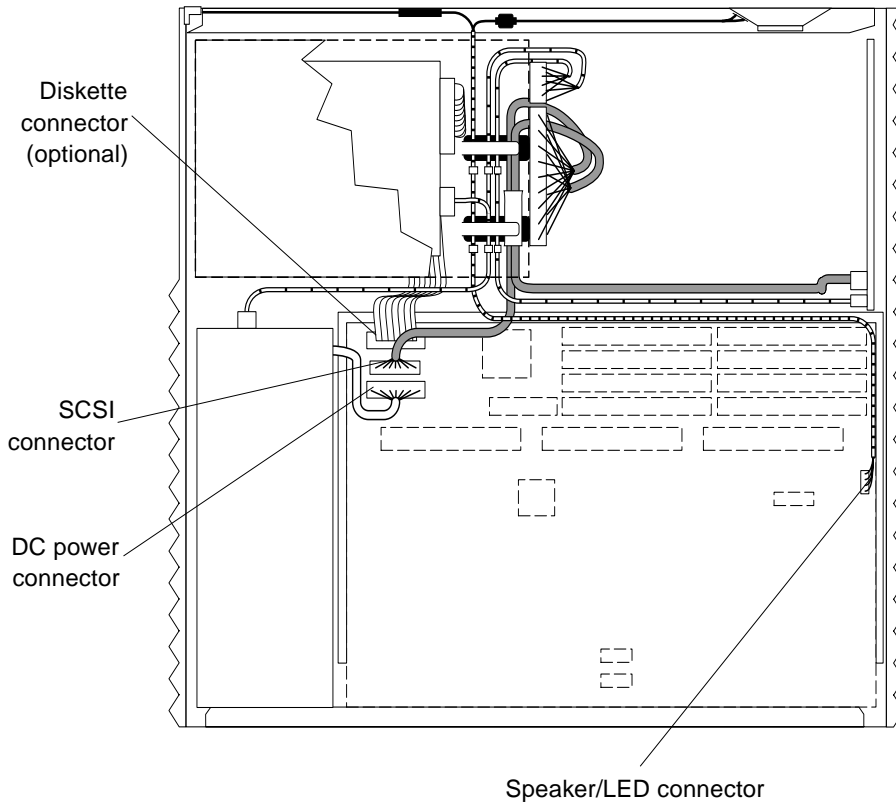


FIGURE 11-36 Disconnecting Diskette, SCSI, DC Power, and Speaker/LED Connectors

- 5. At the chassis rear, loosen the lower two captive screws (FIGURE 11-37).**

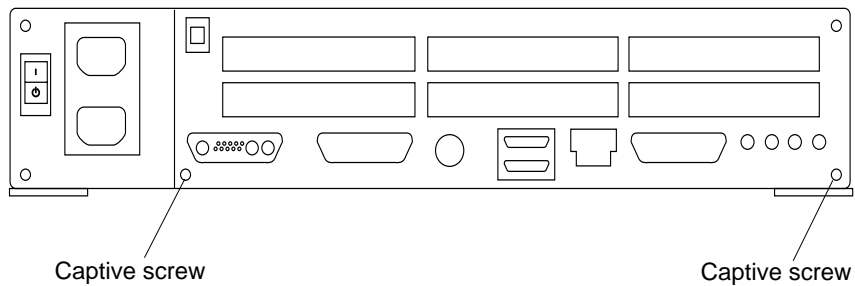


FIGURE 11-37 System Board Captive Screws

6. Slide the system board toward the back of the chassis until it clears the plastic card guide (FIGURE 11-38).
7. Lift the back of the system board slightly. Slide the system board clear of the plastic card guide and out of the chassis.
8. Place the system board on an antistatic surface.

Note – If a captive screw is in the upper right corner of the system board back panel, remove the screw by backing it out of the plastic back panel cover. This screw will be needed to secure the top cover to the chassis.

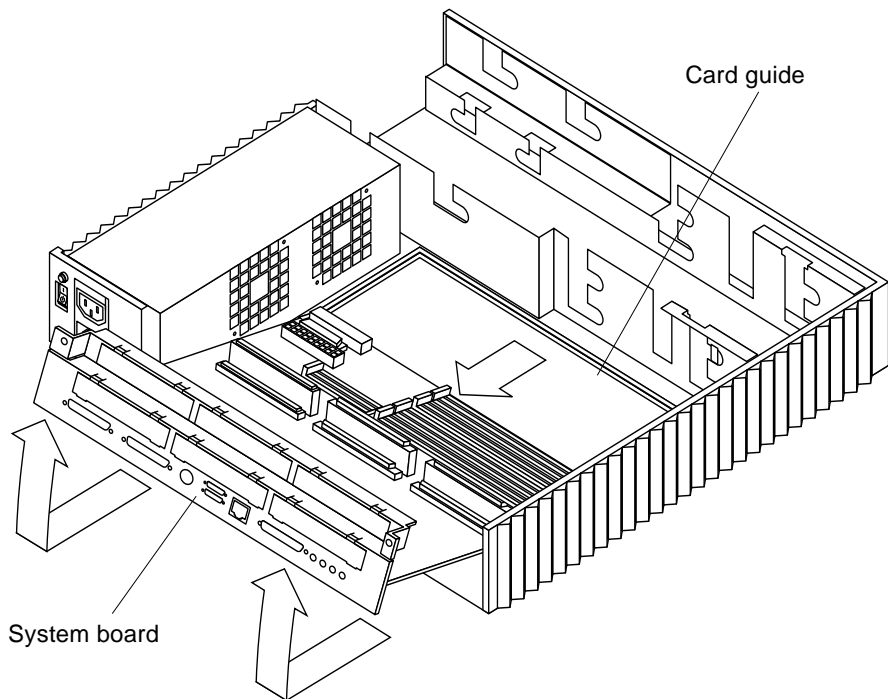


FIGURE 11-38 Removing the System Board

Jumper Settings

Verify the jumper settings of the clock speed jumper (J1401) and the serial port jumpers (J0801 and J0802) on the system board before installation. The jumpers are preset at the factory as shown in FIGURE 11-39.

Note – Leave the clock speed jumper set at 40/50 MHz for optimum performance. If the clock speed jumper is changed to the 40-MHz position, the MBus will only operate at 40 MHz and the SBus will only operate at 20 MHz.

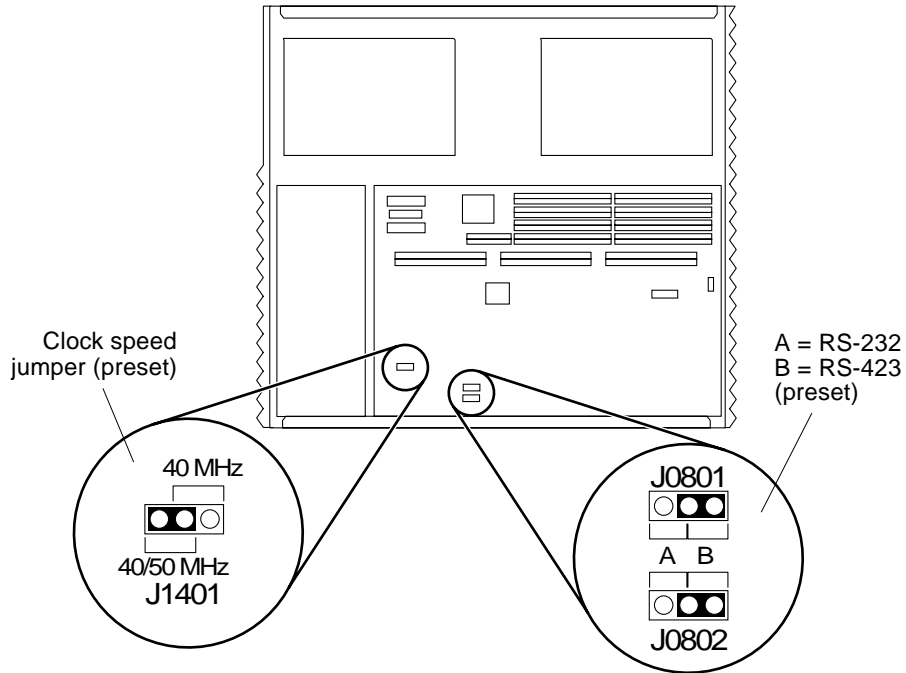


FIGURE 11-39 System Board Jumper Settings

The serial port jumpers are preset to RS-423 mode, but are changeable to RS-232 mode for connection to an X.25 network in Europe or Australia). To change the setting of serial port jumpers J0801 and J0802 from the RS-423 mode (position B) to the RS-232 mode (position A), refer to FIGURE 11-39 and proceed as follows:

1. Using needlenose pliers, remove the 2-pin shunt from position B.
2. Using needlenose pliers, replace the 2-pin shunt to position A.

Installing the System Board



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 system board over the back of the chassis so that the SIMM slots are facing the drive siderails and the chassis front.
2. Lift the back edge of the system board slightly, ensuring that the foot on the underside of the system board does not catch the metal edge of the chassis (FIGURE 11-40).

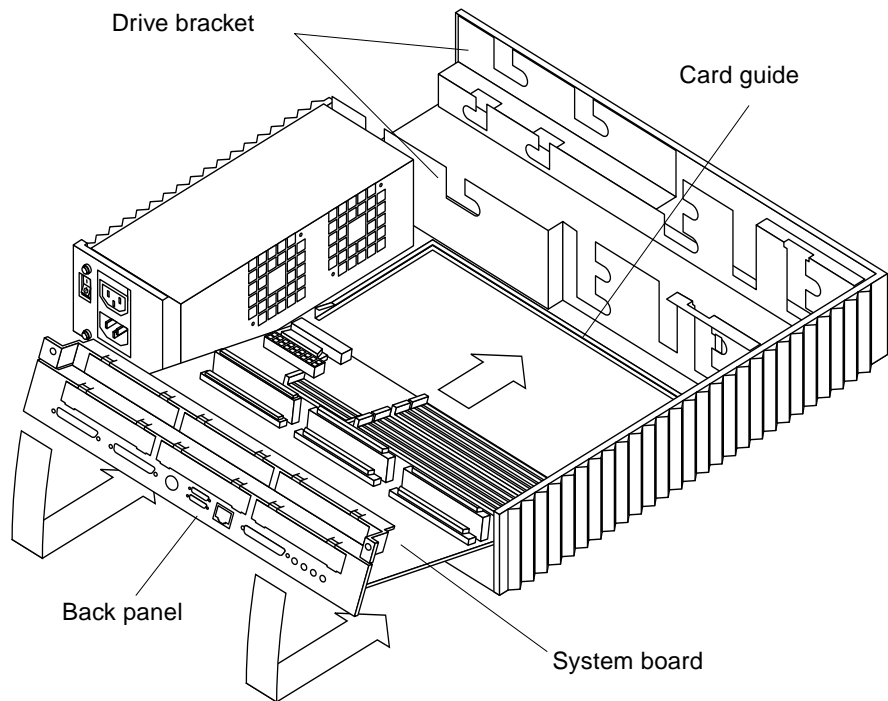


FIGURE 11-40 Installing the System Board

3. Position the system board edges into the plastic card guides; slide the system board toward the chassis front.
4. Tighten the captive screws at the back of the chassis (FIGURE 11-41).

Note – Do not overtighten captive screws.

5. Ensure that the configuration of the replacement system board is identical to the removed system board. Remove any SBus or MBus filler panels from the replacement system board, as necessary.

6. Replace the following:

- NVRAM/TOD (see “Installing a NVRAM/TOD” on page 181)
- AVB (see “Auxiliary Video Board” on page 168)
- SIMMs (see “DSIMMs, VSIMMs, and NVSIMMs” on page 159)
- SBus cards (see “SBus Card” on page 152)
- MBus modules (see “MBus Module” on page 143)

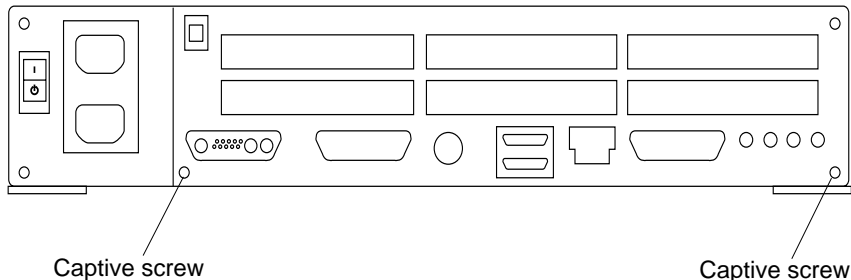


FIGURE 11-41 System Board Captive Screws

Note – It is not necessary to remove the OpenBoot PROM from the defective board. The new system board already has the correct OpenBoot PROM installed.

7. Connect the following to the system board (FIGURE 11-42):

- Diskette connector (optional)
- SCSI connector
- DC power connector
- Speaker/LED connector

8. Remove the wrist strap and replace the cover.

See Chapter 7.

9. Turn on system power.

See Chapter 6.

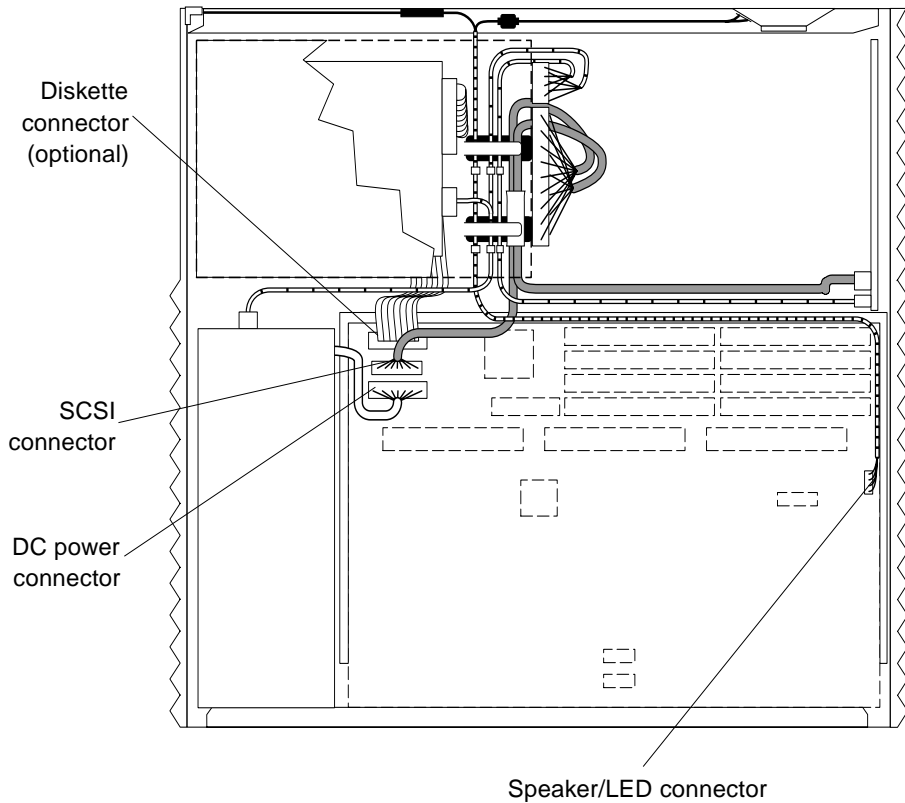


FIGURE 11-42 Connecting Diskette, SCSI, DC Power, and Speaker/LED Connectors

OpenBoot PROM

To remove and install an OpenBoot PROM, proceed as follows.

Note – It is not necessary to transfer the OpenBoot PROM from an existing system board to a replacement system board.

Removing an OpenBoot PROM

1. Remove power from the system.

See “Removing Power from the System” on page 45.

2. Remove the cover and attach the wrist strap.

See Chapter 7.



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. Remove any SBus cards.

See “Removing an SBus Card” on page 152.

4. Use a DIP/IC extractor tool or a small flat-blade screwdriver to remove the OpenBoot PROM (FIGURE 11-43).

5. Place the OpenBoot PROM on an antistatic surface.

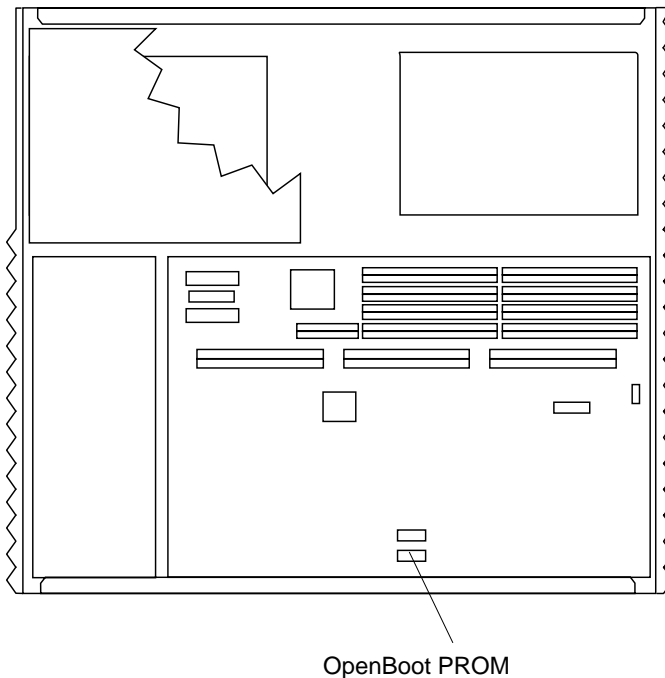


FIGURE 11-43 OpenBoot PROM Location

Installing an OpenBoot PROM



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. **Hold the OpenBoot PROM by the edges and align the notch on the OpenBoot PROM with the notch on the socket (FIGURE 11-44).**



Caution – Do not touch the OpenBoot PROM pins.

2. **Align the OpenBoot PROM pins with the sockets; insert the pins into the socket.**

Note – Press down firmly until the pins are seated into the socket.

3. **Replace any SBus cards.**

See “Installing an SBus Card” on page 156.

4. **Remove the wrist strap and replace the cover.**

See Chapter 7.

5. **Turn on system power.**

See Chapter 6.

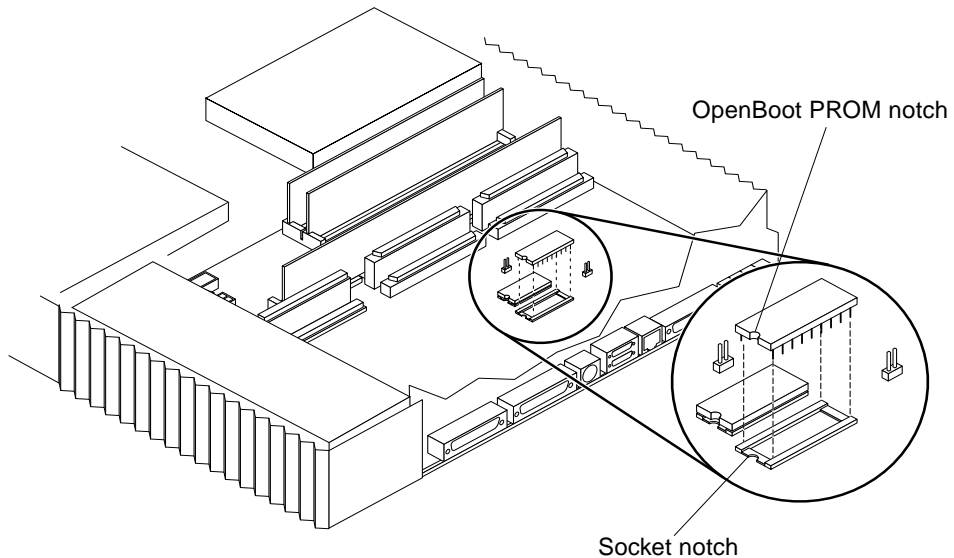


FIGURE 11-44 OpenBoot PROM Orientation

NVRAM/TOD

To remove and install a NVRAM/TOD, proceed as follows.

Removing a NVRAM/TOD

- 1. Remove power from the system.**
See “Removing Power from the System” on page 45.
- 2. Remove the cover and attach the wrist strap.**
See Chapter 7.



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. Remove any SBus cards.

See “Removing an SBus Card” on page 152.

4. Locate the NVRAM/TOD chip on the system board (FIGURE 11-45).

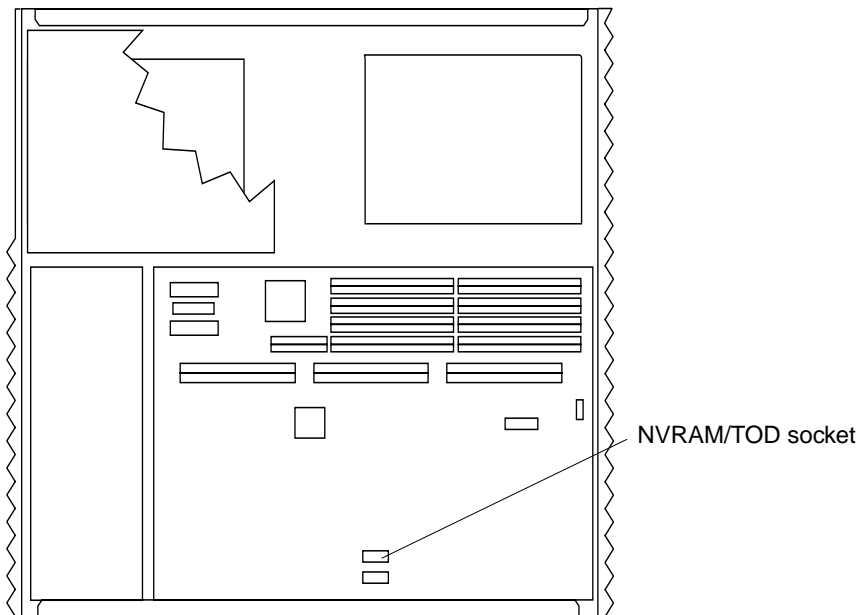


FIGURE 11-45 NVRAM/TOD Location

5. Grasp the NVRAM/TOD by the tabs on the NVRAM/TOD carrier and pull up on the carrier to extract the NVRAM/TOD.

6. Place the NVRAM/TOD on an antistatic surface.

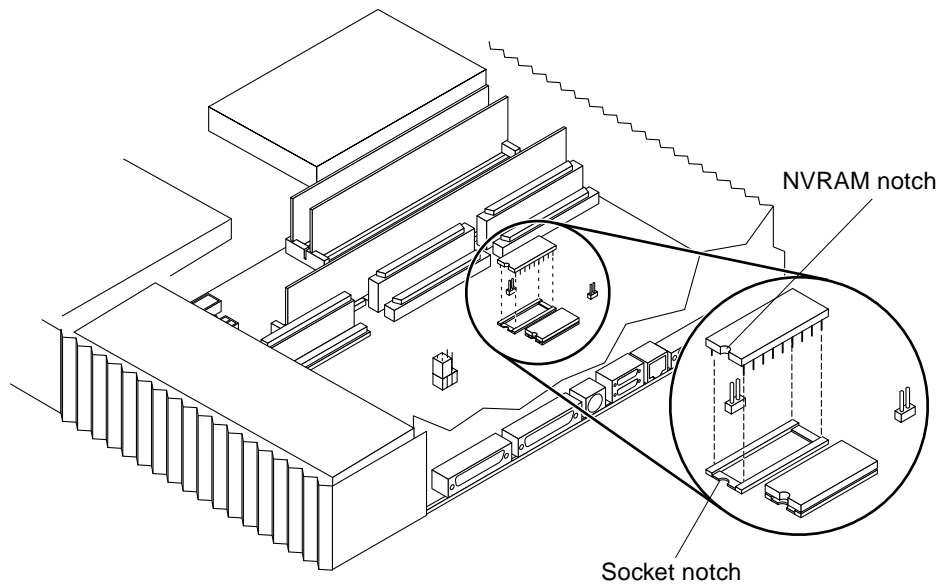
Installing a NVRAM/TOD



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. Locate the NVRAM/TOD socket on the system board (FIGURE 11-46).

2. **Insert the NVRAM/TOD into the carrier. Insert the NVRAM/TOD carrier into the socket, ensuring that the notches on the socket and the carrier are aligned properly (FIGURE 11-46).**



Note: NVRAM/TOD carrier not illustrated.

FIGURE 11-46 NVRAM/TOD Orientation

3. **Push the NVRAM/TOD carrier into the socket.**

Note – Press down firmly until the pins are seated in the socket.

4. **Replace any SBus cards removed earlier.**
See “Installing an SBus Card” on page 156.
5. **Detach the wrist strap and replace the cover.**
See Chapter 7.
6. **Power on the system.**
See Chapter 6.

Illustrated Parts Breakdown

This chapter lists the authorized replaceable parts for the SPARCstation 20 system.

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

Replacement Parts List

The following table lists the FRUs and associated part numbers.

TABLE 12-1 Replacement Parts List and Part Numbers

Replaceable Parts	Part Numbers
System board (0 Mbytes, 0 CPU)	501-2924
SCSI backplane	501-2462
OpenBoot PROM	525-1377
NVRAM/TOD chip	525-1378
NVSIMM, 2-Mbyte	501-2001
VSIMM, 4-Mbyte	501-2481
VSIMM, 8-Mbyte	501-2482

TABLE 12-1 Replacement Parts List and Part Numbers

Replaceable Parts	Part Numbers
DSIMM, 16-Mbyte	501-2479
DSIMM, 32-Mbyte	501-2622
DSIMM, 64-Mbyte	501-2480
Auxiliary video board	501-2488
SM50 (50-MHz SuperSPARC™)	501-2708
SM51 (50-MHz SuperSPARC with SuperCache™)	501-2754
SM52 (Dual 50-MHz SuperSPARC with SuperCache)	501-2780
SM61 (60-MHz SuperSPARC with SuperCache)	501-2825
SM71 (75-MHz SuperSPARC II with SuperCache)	501-3001
HS11 (100-MHz hyperSPARC™)	370-1866
HS12 (Dual 100-MHz hyperSPARC)	370-1867
HS21 (125-MHz hyperSPARC)	370-1865
SM151 (150-MHz hyperSPARC)	370-2162
Power supply	300-1279
644-Mbyte SCSI-2 SunCD 2Plus drive (SunCD 2Plus drive-type chassis)	540-2500
644-Mbyte SCSI-2 SunCD 4 drive (SunCD 4 CD-ROM drive-type chassis)	540-2852
1.44-Mbyte diskette drive (SunCD 2Plus drive-type chassis)	370-1419
1.44-Mbyte diskette drive (slim floppy) (SunCD 4 CD-ROM drive-type chassis)	540-2854
535-Mbyte SCSI-2 disk drive w/ mounting kit	540-2443
1.05-Gbyte SCSI-2 disk drive w/ mounting kit	540-2560
2.1-Gbyte SCSI-2 disk drive w/ mounting kit	540-2699
Speaker	370-1579

TABLE 12-1 Replacement Parts List and Part Numbers

Replaceable Parts	Part Numbers
Fan	540-2640
Power harness (SunCD 2Plus drive-type chassis)	530-2066
Power harness (SunCD 4 CD-ROM drive-type chassis)	530-2279
Speaker/LED cable (SunCD 2Plus drive-type chassis)	530-2080
Speaker/LED cable (SunCD 4 CD-ROM drive-type chassis)	530-2291
Fan cable	530-2159
SCSI data cable (SunCD 2Plus drive-type chassis)	530-2053
SCSI data cable (SunCD 4 CD-ROM drive-type chassis)	530-2278
Diskette drive cable (SunCD 2Plus drive-type chassis)	530-2067
Diskette drive cable (SunCD 4 CD-ROM drive-type chassis)	530-2277
AUI adapter cable	530-2021
Serial port splitter cable	530-1869
IBM parallel port adapter cable	530-1861
Centronics parallel port adapter cable	530-1857

Illustration of Selected FRUs

FIGURE 12-1 shows a top view of selected FRUs. FIGURE 12-2 shows an exploded view of the SPARCstation 20 system. FIGURE 12-3 shows the major components of the system board. FIGURE 12-4 shows standard external cables and FIGURE 12-5 shows optional external cables.

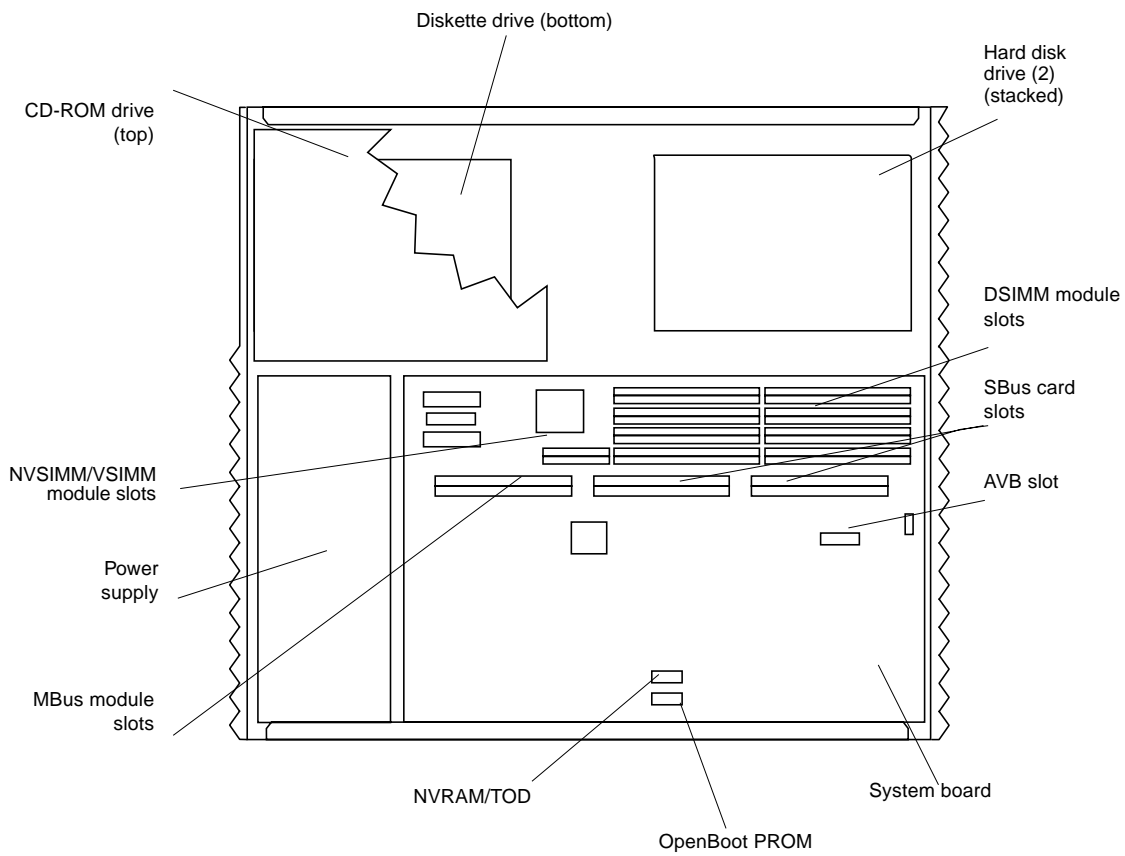


FIGURE 12-1 Selected FRUs

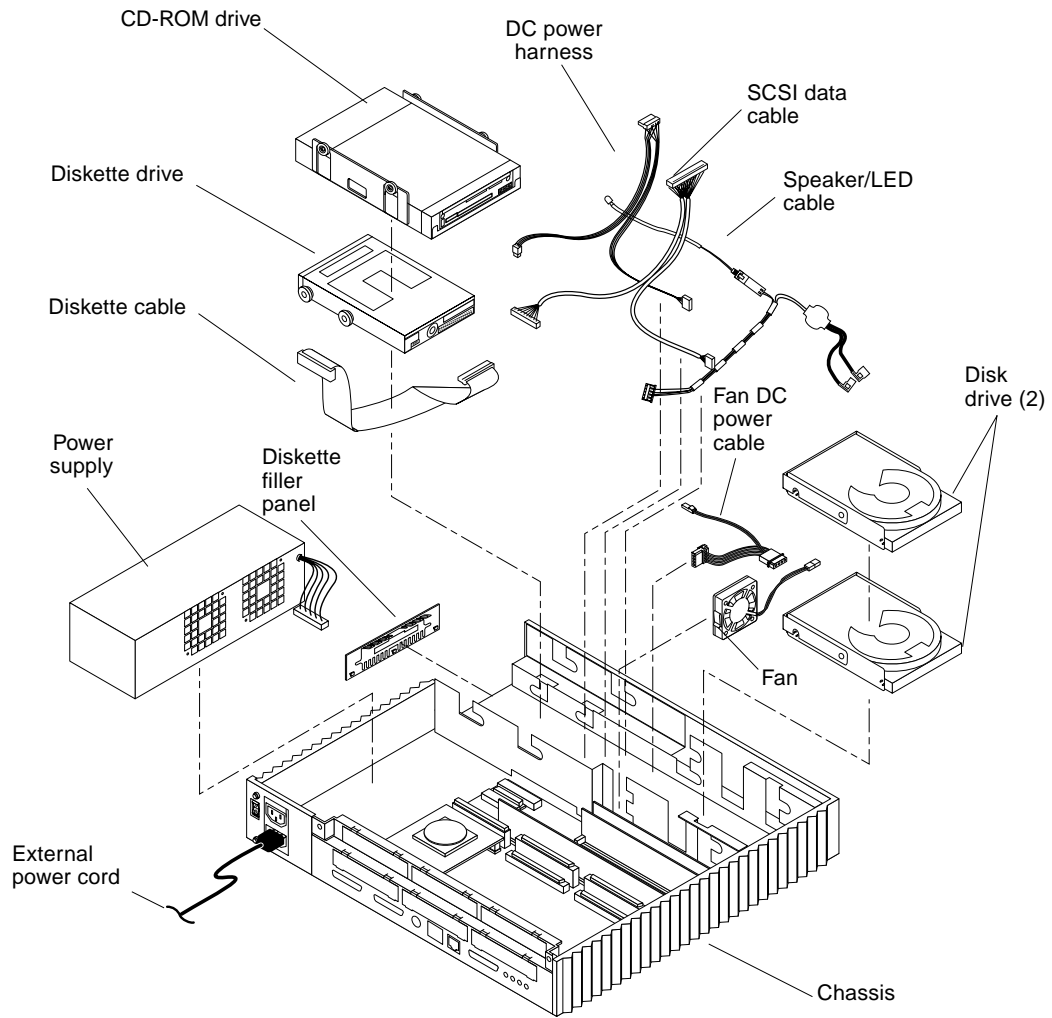
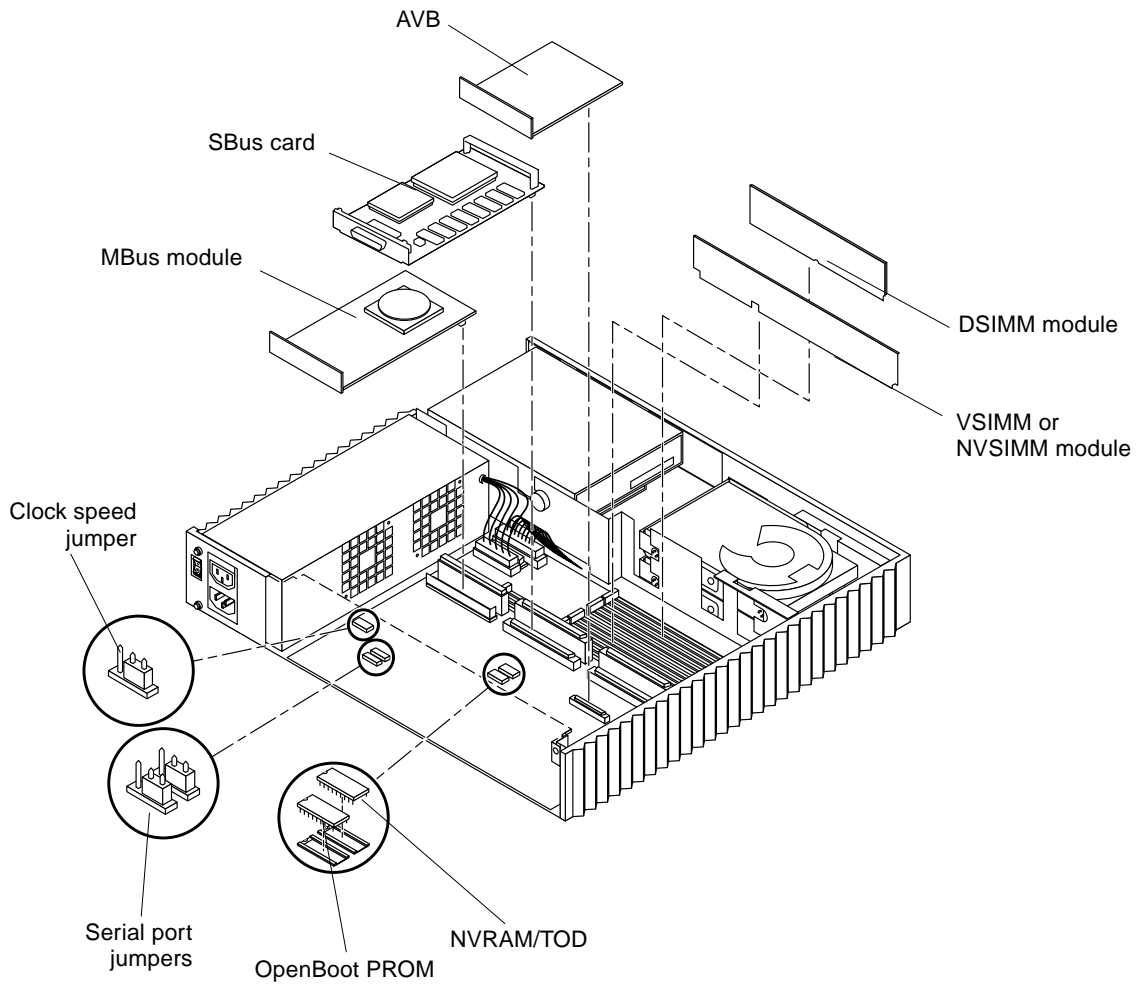


FIGURE 12-2 SPARCstation 20 System Exploded View

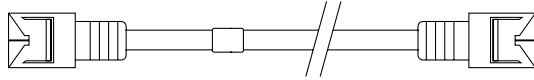


Note: NVRAM/TOD carrier not illustrated.

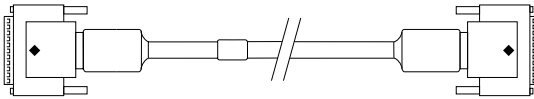
FIGURE 12-3 Major Components of the System Board



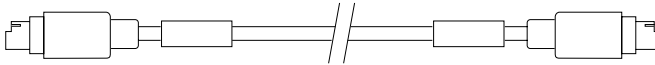
External power cable



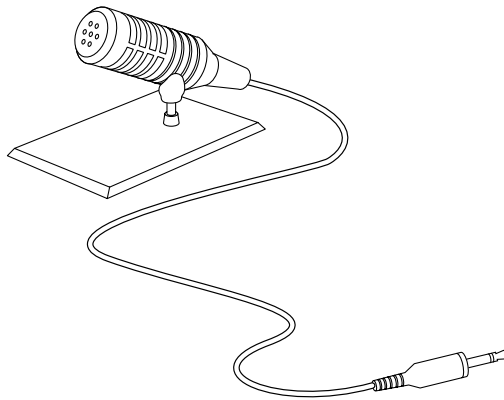
Twisted-pair Ethernet cable



Video cable

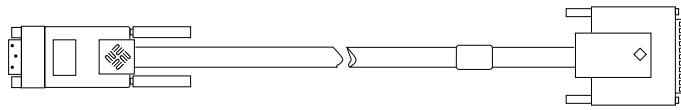


Keyboard cable

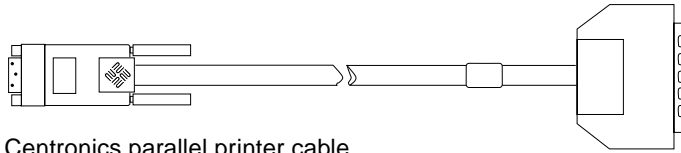


Microphone and cable

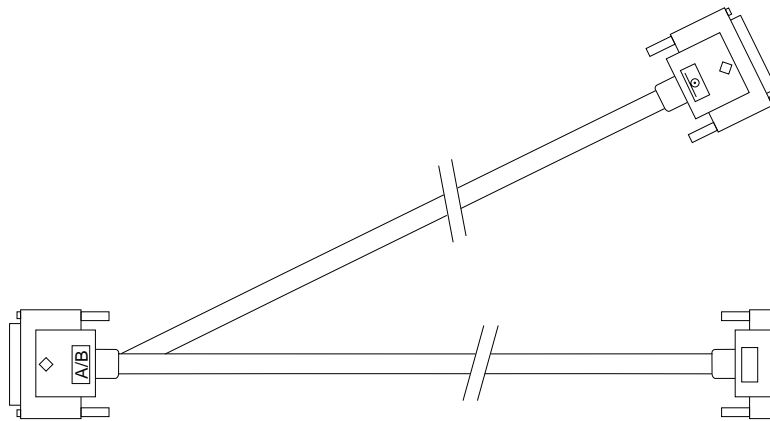
FIGURE 12-4 Standard External Cables



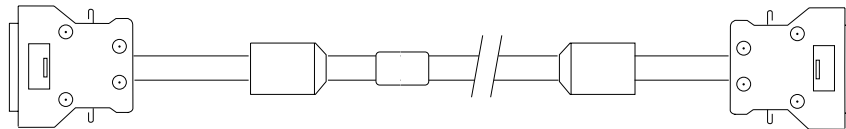
IBM parallel printer cable



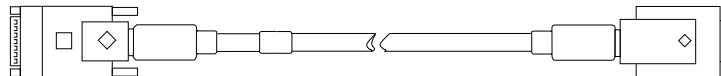
Centronics parallel printer cable



Serial port Y breakout cable



SCSI cable



Thick Ethernet AUI adapter cable

FIGURE 12-5 Optional External Cables

Product Specifications

This appendix provides product specifications for the SPARCStation 20 system and is divided into three parts:

- Physical specifications
- Electrical specifications
- Environmental specifications

Physical Specifications

TABLE A-1 lists the physical specifications for the SPARCStation 20 system.

TABLE A-1 Physical Specifications

Component	Height inches (mm)	Width inches (mm)	Depth inches (mm)	Net Weight lbs (kg)
System unit	3.07 (78)	16.40 (417)	16.10 (409)	27.00 (12.70)
Keyboard	1.70 (44)	20.10 (510)	7.20 (182)	3.50 (1.60)
Mouse	2.00 (50)	4.00 (100)	3.00 (80)	0.30 (0.14)
Color monitor (17-inch)	16.40 (414)	16.00 (406)	17.70 (450)	49.50 (22.50)
Color monitor (20-inch)	18.54 (471)	18.70 (475)	19.49 (495)	69.50 (31.50)

Electrical Specifications

TABLE A-2 lists the electrical specifications for the system unit. TABLE A-3 lists the electrical specifications for the 17-inch monitor. TABLE A-4 lists the electrical specifications for the 20-inch monitor.

TABLE A-2 Electrical Specifications (System Unit)

Parameter	Specification
Nominal frequencies	50 Hz or 60 Hz
Nominal voltage range	100-120 VAC or 200-240 VAC
Maximum current	2 A at 100 V, system unit 1 A at 200 V, system unit 4 A at 100 V, auxiliary output 2 A at 200 V, auxiliary output 6 A at 100 V, total maximum 3 A at 200 V, total maximum
Maximum VA rating	200 VA
Maximum power consumption	350 W
Heat output (without monitor)	683 BTUs/hr

TABLE A-3 Electrical Specifications (17-inch Monitor)

Parameter	Specification
Nominal frequencies	50 Hz or 60 Hz
Nominal voltage range	100 to 120 VAC or 200 to 240 VAC
Typical operating current	1.6 A at 100 VAC, 0.8 A at 240 VAC
Typical operating power	120 W
Maximum current	2.7 A at 100 to 120 VAC; 1.5 A at 200 to 240 VAC

TABLE A-3 Electrical Specifications (17-inch Monitor) *(Continued)*

Parameter	Specification
Maximum VA rating	290 VA
Maximum power consumption	200 W
Heat output	410 BTUs/hr

TABLE A-4 Electrical Specifications (20-inch Monitor)

Parameter	Specification
Nominal frequencies	50 Hz or 60 Hz (nominal)
Nominal voltage range	100 to 120 VAC or 200 to 240 VAC
Typical operating current	1.7 A at 110 VAC, 0.85 A at 220 VAC
Standby power	5 W
Typical operating power	125 W
Maximum current	2.2 A at 100 to 120 VAC, 1.4 A at 200 to 240 VAC
Maximum VA rating	295 VA
Maximum power consumption	150 W
Heat output	427 BTUs/hr

Environmental Specifications

TABLE A-5 lists the operating and non-operating environmental specifications for the SPARCStation 20 system.

TABLE A-5 Environmental Specifications

Operating Environment	
Temperature range	32° F to 104° F (0° C to 40° C)
Humidity	93% RH at 104° F (40° C)
Altitude range	0 to 10,000 feet (0 to 3 km)
Non-Operating Environment	
Temperature range	-40° F to 149° F (-40° C to 65° C)
Humidity	93% RH at 104° F (40° C)
Altitude	0 to 40,000feet (0 to 12 km)

Functional Description

This chapter describes the system architecture for the SPARCstation 20. See Chapter 1 for illustrations of the back panel.

System Overview

The SPARCstation 20 supports a system board, a power supply, up to two hard disk drives, a SunCD 2Plus or a SunCD 4 drive, and a diskette drive. A variety of SBus cards and MBus modules can be installed on the system board.

Memory is installed using DSIMMs. A maximum of eight DSIMMs may be installed. Available DSIMMs capacities include 16-Mbyte, 32-Mbyte, and 64-Mbyte.

Additionally, the SPARCstation 20 system supports up to two VSIMMs or one VSIMM and one NVSIMM. The VSIMM output is provided through the 13W3 connector that is built into the back panel. Optional installation of a second VSIMM is permitted but requires an AVB with a dedicated 13W3 video output. Although the second VSIMM (with AVB combination) provides a second video output for the SPARCstation 20 system, it reduces the number of I/O connectors from four to three.

System Architecture

The SPARCstation 20 system provides the following:

- SPARC architecture (scalable processor architecture)
- Memory management unit (MMU)
- MBus-based system processor architecture
- SBus-based system bus architecture

The following are located on the system board:

- MBus module (two maximum)
- SBus card (four maximum)

Note – A maximum of four SBus cards may be installed unless optional VSIMM/AVB is installed, in which case a maximum of three SBus cards may be installed.

- Main Memory
 - DSIMM (eight maximum)
 - VSIMM (two maximum, in conjunction with up to six DSIMMs)
 - NVSIMM (one maximum, in conjunction with a second VSIMM and five DSIMMs)

Note – Installing a second VSIMM and NVSIMM reduces the maximum number of DSIMMs to six.

- AVB (one maximum, used with a second VSIMM)

System Board

FIGURE B-1 shows a block diagram of the SPARCstation 20 system board.

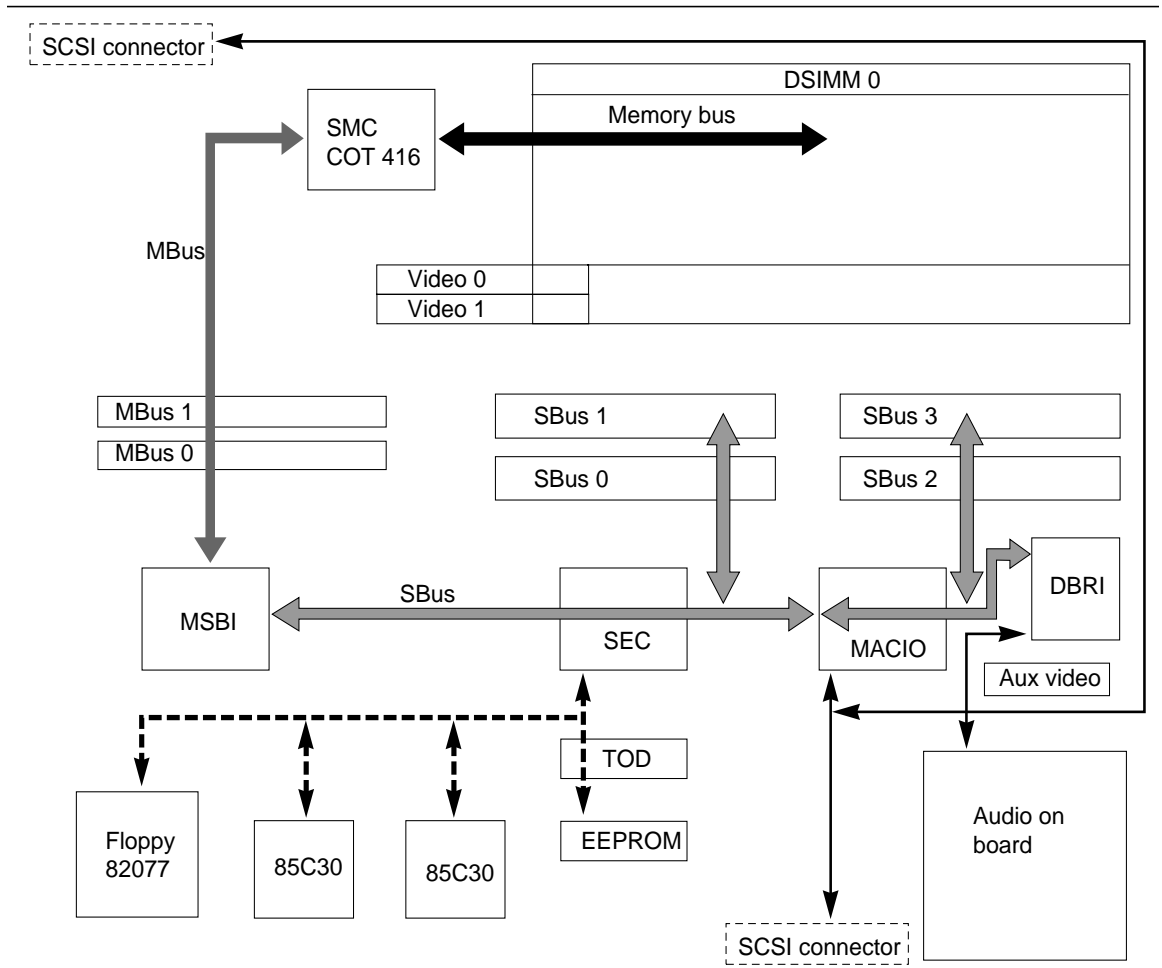


FIGURE B-1 System Board Block Diagram

SBus Card

Each system board supports one to four SBus cards. A wide variety of I/O options can be used with SBus cards, such as graphic displays, Ethernet, printers, and serial/parallel controllers.

MBus Module

The MBus module provides a high-speed interface between the processor modules, the physical memory, and the I/O devices. The MBus module operates at a clock rate starting at 40 MHz. Interface features of the MBus module include:

- Synchronous operation
- Automatic switching
- 64-bit multiplexed address and data
- 64-Gbyte physical address space
- Multiple master
- Centralized arbitration, reset, interrupt, and clock distribution
- Overlapped arbitration with parking
- Shared memory multiprocessor signals and transactions
- Write-invalidate cache coherency protocol

In the SPARCstation 20 system, the MBus module can automatically switch from a 40-MHz frequency to a 50-MHz frequency, depending on the type of MBus module installed. Changing jumpers on the system board is not required.

MBus-to-SBus Interface

The MBus-to-SBus interface (MSBI) is located in the MSBI chip. The MSBI contains:

- IOMMU
- Base address register
- IOMMU control register
- Arbiter enable register
- MBus-to-SBus asynchronous fault status and address registers

The IOMMU is used to perform address translations when SBus masters request the SBus.

Memory

Various memory allocations are configured in up to eight SIMM slots. Allocations include a combination of DSIMMs, VSIMMs, and NVSIMMs. TABLE B-1 lists the possible memory allocations using the three SIMM types.

The following sections provide brief descriptions of DSIMMs, VSIMMs, and NVSIMMs, and identifies the maximum available memory capacities based on possible memory allocations.

TABLE B-1 Memory Allocations

Memory Allocation	DSIMM	VSIMM	NVSIMM
	8 (max.)	0	0
	7	1	0
	7	0	1 (max.)
	6	2 (max.)	0
	6	1	1

DSIMM

The SPARCstation 20 memory system has a 144-bit-wide data path. The 144-bit-wide path is divided into a 128-bit-wide data path and 16 bits of error correcting code (ECC). Through the Scalable Memory Controller (SMC), the 60-nanosecond DSIMMs receive control, address information, and data. The maximum available DSIMM memory capacities, based upon possible memory allocations, are as follows:

- Eight DSIMMs, zero VSIMMs, zero DVSIMMs: 8 x 64 Mbytes or 512 Mbytes
- Seven DSIMMs with one VSIMM or one DVSIMM: 7 x 64 Mbytes or 448 Mbytes
- Six DSIMMs with two VSIMMs or one VSIMM and one DVSIMM: 6 x 64 Mbytes or 384 Mbytes

TABLE B-2 lists the DSIMM DRAM densities supported by the SMC. FIGURE B-2 illustrates the DSIMM memory system.

TABLE B-2 DSIMM DRAM Densities

RAM	Density	Number of RAMs	Capacity	Type
4-Mbit	1M x 4	36	16 Mbytes	ECC DRAM
8-Mbit	2M x 4	36	32 Mbytes	ECC DRAM
16-Mbit	4M x 4	36	64 Mbytes	ECC DRAM

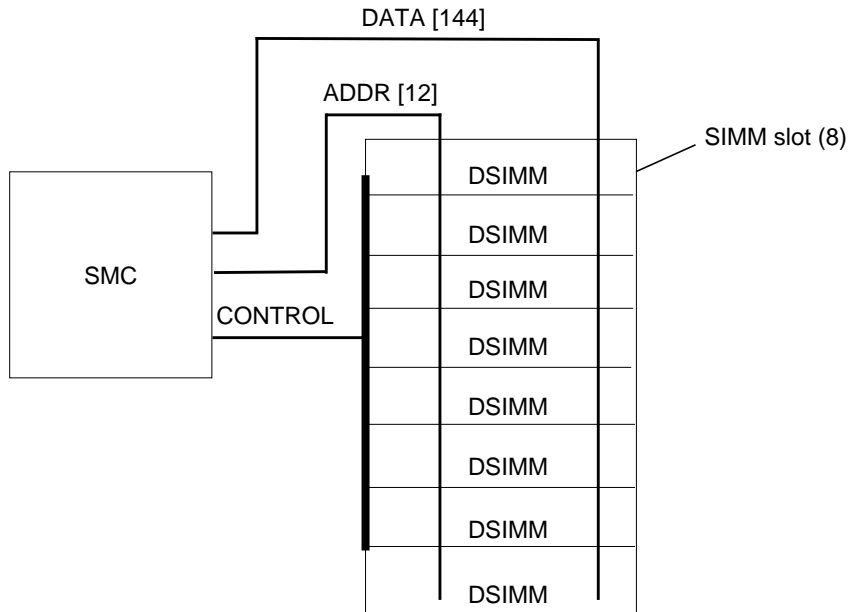


FIGURE B-2 DSIMM Memory System

The SPARCstation 20 system may contain one or more 32-Mbyte DSIMMs. The Solaris 1.1.1 Version B or later software environment for the SPARCstation 20 system supports up to eight 32-Mbyte DSIMMs or any combination of 16-Mbyte, 32-Mbyte, and 64-Mbyte DSIMMs.

The Solaris 2.3 software environment requires kernel patch 101318-34 or later to support certain 32-Mbyte DSIMM configurations. Install patch 101318-34, available from your local Answer Center, if additional DSIMMs are installed to create one of the following memory combinations:

- One 32-Mbyte DSIMM and seven 16-Mbyte or seven 64-Mbyte DSIMMs
- Two 32-Mbyte DSIMMs and five or more 16-Mbyte or 64-Mbyte DSIMMs
- Three 32-Mbyte DSIMMs and three or more 16-Mbyte or 64-Mbyte DSIMMs
- Four 32-Mbyte DSIMMs and one or more 16-Mbyte, 32-Mbyte or 64-Mbyte DSIMMs

Note – Install the patch before installing the DSIMMs or the operating system will fail to boot

VSIMM

Two versions of the SPARCstation 20 VSIMM are available: 4-Mbyte and 8-Mbyte. The maximum available VSIMM memory capacities, based upon possible memory allocations, are as follows:

- One VSIMM with seven DSIMMS: 8 Mbytes
- Two VSIMMs with six DSIMMS: 16 Mbytes

The VSIMM contains a memory display interface (MDI) chip, a video buffer chip (VBC), and a digital-to-analog converter (DAC). There is also pixel clock generation circuitry on the VSIMM. The SPARCstation 20 uses 60-nanosecond VRAMs on the VSIMM. VRAM densities are supported by the SMC and are listed in TABLE B-3. FIGURE B-3 illustrates the VSIMM memory system.

TABLE B-3 VRAM Densities

VRAM	Density	VRAMs/VSIMM	Capacity	Type
1-Mbit	256K x 4	32	4-Mbyte	128-bit VRAM
2-Mbit	256K x 8	32	8-Mbyte	256-bit VRAM

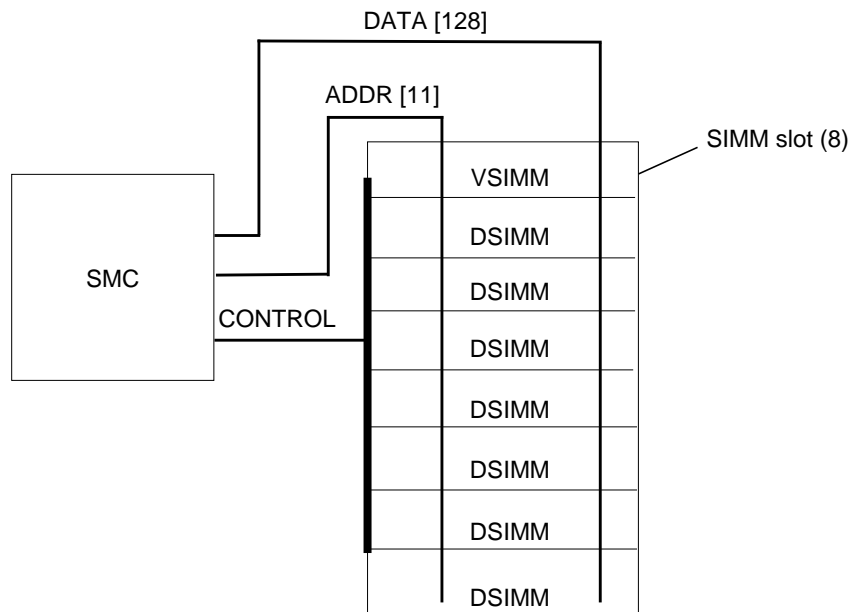


FIGURE B-3 VSIMM Memory System

NVSIMM

The NVSIMM provides an interface to the PrestoserveTM software. The NVSIMM furnishes a battery backed-up memory that is used as a cache for disk drive access. Operating conjointly with the Prestoserve software, the NVRAM accelerates both NFS and UFS disk access. The maximum available NVSIMM memory capacities based upon possible memory allocations is 2 Mbytes.

SBus-to-SCSI, Ethernet, and Parallel Interfaces

The SBus-to-SCSI, Ethernet, and parallel interface (MACIO) ASIC provides the interface between the SBus and the following:

- SCSI
- Thick AUI Ethernet
- Twisted-pair Ethernet (TPE)
- Parallel port

The MACIO ASIC integrates three functions:

- Direct memory access (DMA)
- Local area network control for Ethernet (LANCE)
- Fast SCSI bus interface

FIGURE B-4 illustrates a functional block diagram of the MACIO ASIC.

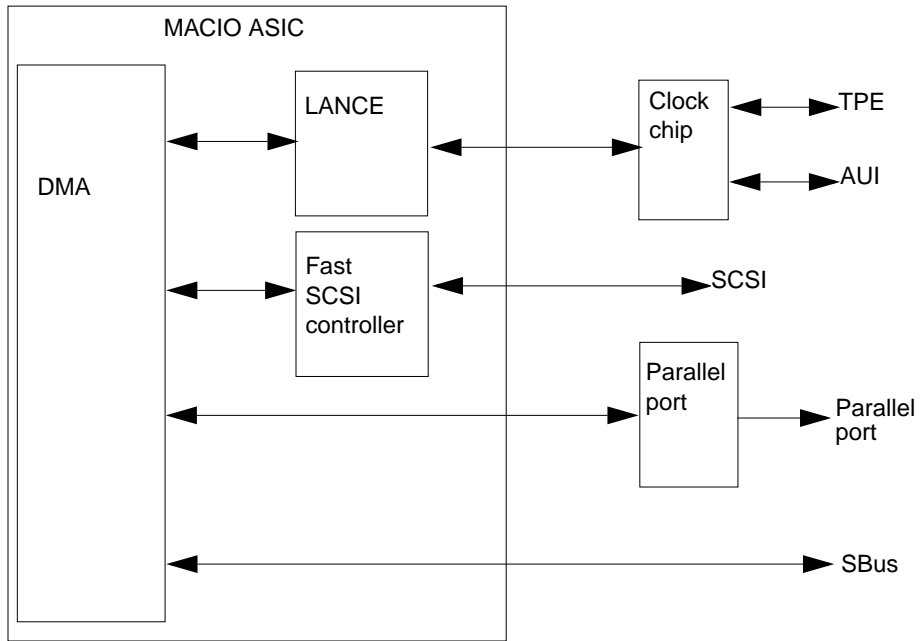


FIGURE B-4 MACIO ASIC Functional Block Diagram

SBus-to-External Bus Interface

The SBus-to-external bus interface (SEC) ASIC provides the interface between the SBus and the external bus. The external bus connects to the following:

- Serial port chips (2)
- Audio chip
- Diskette drive controller
- 4-Mbit EEPROM
- NVRAM/TOD chip
- LED interface

One of the serial port chips provides serial ports A and B. The second serial port chip provides the keyboard and mouse port. Line drivers interface the two serial port chips to the serial ports. FIGURE B-5 illustrates a functional block diagram of the SEC ASIC.

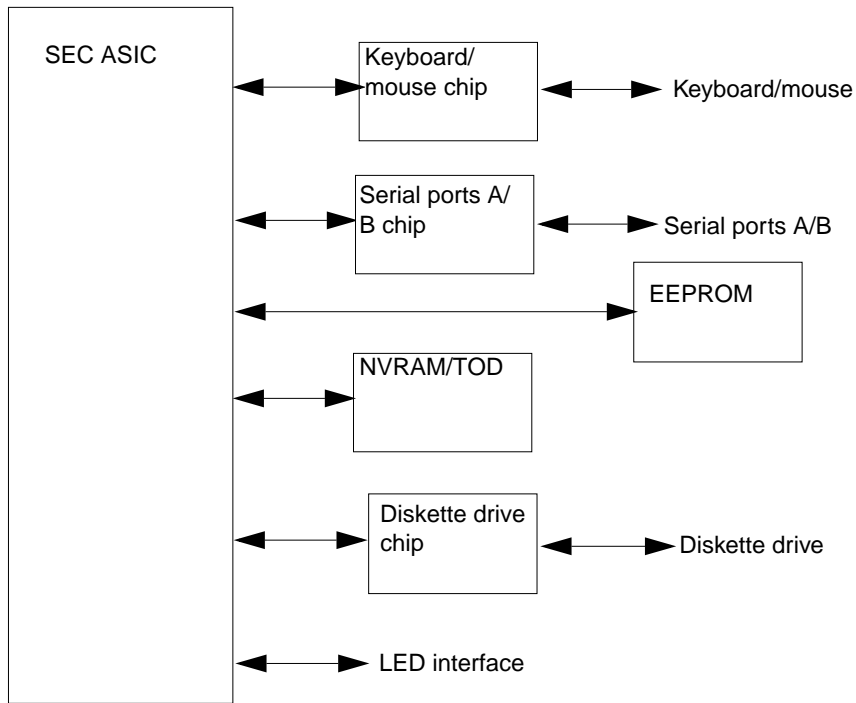


FIGURE B-5 SEC ASIC Functional Block Diagram

Clock Chip

The clock chip provides the MBus and SBus clocks for the system board and the VSIMMs. There are 14 MBus clocks generated by the clock chip, one for each receiver:

- Four MBus clock receivers for each of two MBus modules (8 total)
- One for the scalable memory controller (SMC)
- One for the MBus-to-SBus interface (MSBI)
- One for each pair of the eight memory SIMMs (4 total)
- One for the SBus-to-external bus interface (SEC)
- One for the SBus to DBRI Interface (DBRI)
- One for the SBus to external data interface (MACIO)
- One for SBus slots 0 and 1
- One for SBus slots 2 and 3

System Board Connector Pinouts

This appendix provides signal descriptions for the SPARCStation 20 system unit back panel connectors. TABLE C-1 through TABLE C-8 lists connector pin assignments and signal descriptions. An illustration of each connector is also provided.

Parallel Connector

TABLE C-1 lists connector pin assignments and signal descriptions for the parallel connector.

Parallel (Top)

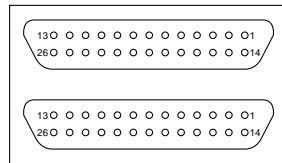


FIGURE C-1 Parallel Connector

TABLE C-1 Parallel Connector Pin Assignments

Pin	Function	I/O	Level	Signal Description
1	DataStrobe*	I/O	24-mA OC	Data valid strobe
2	Data Bit 0	I/O	24-mA OC	Data Bit 0
3	Data Bit 1	I/O	24-mA OC	Data Bit 1
4	Data Bit 2	I/O	24-mA OC	Data Bit 2
5	Data Bit 3	I/O	24-mA OC	Data Bit 3
6	Data Bit 4	I/O	24-mA OC	Data Bit 4
7	Data Bit 5	I/O	24-mA OC	Data Bit 5
8	Data Bit 6	I/O	24-mA OC	Data Bit 6
9	Data Bit 7	I/O	24-mA OC	Data Bit 7
10	Ack*	I	TTL	Data acknowledge
11	Busy	I	TTL	Busy
12	PE	I	TTL	Paper error
13	Select	I	TTL	Select
14	AutoFeed*	O	24-mA TTL	AutoFeed
15	Error*	I	TTL	Error
16	Reset*	O	24-mA TTL	Initialize
17	SlctIn*	O	24-mA TTL	Select in
18	Shield	None	GND	Shield
19	Shield	None	GND	Shield
20	Shield	None	GND	Shield
21	Shield	None	GND	Shield
22	Shield	None	GND	Shield

* Active low signal

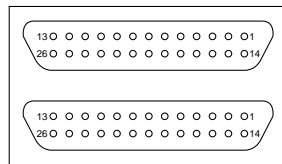
TABLE C-1 Parallel Connector Pin Assignments (*Continued*)

Pin	Function	I/O	Level	Signal Description
23	Shield	None	GND	Shield
24	Shield	None	GND	Shield
25	Shield	None	GND	Shield
26	Shield	None	GND	Shield

* Active low signal

AUI Connector

The AUI connector is the bottom connector in the stacked pair of 26-pin connectors on the SPARCstation 20 system. TABLE C-2 lists connector pin assignments and signal descriptions for the parallel connector.



AUI (bottom)

FIGURE C-2 AUI Connector

TABLE C-2 AUI Connector Pin Assignments

Pin	Function	I/O	Level	Signal Description
1	AUI_DO-	O	Analog	Data out negative
2	AUI_DI+	I	Analog	Data out positive
3	AUI_CI-	I	Analog	AUI collision negative
4	+12 VDC	O	DC	Power

TABLE C-2 AUI Connector Pin Assignments (*Continued*)

Pin	Function	I/O	Level	Signal Description
5	N.C.	None	GND	Not connected
6	N.C.	None	GND	Not connected
7	N.C.	None	GND	Not connected
8	N.C.	None	GND	Not connected
9	N.C.	None	GND	Not connected
10	N.C.	None	GND	Not connected
11	N.C.	None	GND	Not connected
12	N.C.	None	GND	Not connected
13	N.C.	None	GND	Not connected
14	AUI_DO+	O	Analog	Data out positive
15	AUI_DI_	I	Analog	Data out negative
16	AUI_CI+	I	Analog	AUI collision positive
17	Ground	None	GND	Ground
18	N.C.	None	GND	Not connected
19	N.C.	None	GND	Not connected
20	N.C.	None	GND	Not connected
21	N.C.	None	GND	Not connected
22	N.C.	None	GND	Not connected
23	N.C.	None	GND	Not connected
24	N.C.	None	GND	Not connected
25	N.C.	None	GND	Not connected
26	Ground	None	GND	Ground

Keyboard and Mouse Connector

TABLE C-3 lists connector pin assignments and signal descriptions for the keyboard and mouse connector.

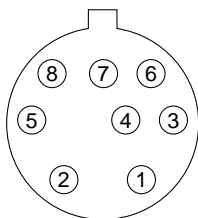


FIGURE C-3 Keyboard and Mouse Connector

TABLE C-3 Keyboard/Mouse Connector Pin Assignments

Pin	Function	I/O	Level	Signal Description
1	Ground	O	GND	Ground
2	Ground	O	GND	Ground
3	+5 VDC	O	VCC	Power
4	Mouse In	I	TTL	Input from mouse
5	KeyBd Out	O	TTL	Keyboard output
6	KeyBd In	I	TTL	Keyboard input
7	PowerOn*	I	TTL	Power-on key
8	+5VDC	O	VCC	Power

* Active low signal

Serial Ports A and B Connector

TABLE C-4 lists connector pin assignments and signal descriptions for the serial port A and serial port B connectors.

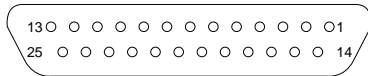


FIGURE C-4 Serial Ports A and B Connector

TABLE C-4 Serial Ports A and B Connector Pin Assignments

Pin	Function	I/O	Level	Signal Description
1	N.C.	None	GND	Not connected
2	Xmit Data A	O	RS-232/423	Xmit data A/transmit data port A
3	Rec Data A	I	RS-232/423	Receive data port A
4	RTS A	O	RS-232/423	Request to send port A
5	CTS A	I	RS-232/423	Clear to send port A
6	DSR A	I	RS-232/423	Data set ready port A
7	Ground		GND	Signal ground
8	DCD A	I/O	RS-232/423	Data carrier detect port A
9	N.C.	None	GND	Not connected
10	N.C.	None	GND	Not connected
11	DTR B	I	RS-232/423	Data terminal ready port B
12	DCD B	I	RS-232/423	Data carrier detect port B
13	CTS B	I	RS-232/423	Clear to send port B
14	Xmit Data B	O	RS-232/423	Transmit data port B

TABLE C-4 Serial Ports A and B Connector Pin Assignments (*Continued*)

Pin	Function	I/O	Level	Signal Description
15	TRxC A	I	RS-232/423	Receive/transmit clock port A (pullup)
16	Rec Data B	I	RS-232/423	Receive data port B
17	RTxC A	I	RS-232/423	Secondary/transmit clock (receive) port
18	TRxC B	I	RS-232/423	Receive/transmit clock port B (pullup)
19	RTS B	O	RS-232/423	Request to send port B
20	DTR A	O	RS-232/423	Data terminal ready port A
21	N.C.	None	GND	Not connected
22	N.C.	None	GND	Not connected
23	N.C.	None	GND	Not connected
24	TxC A	O	RS-232/423	Transmit clock port A
25	TxC B	O	RS2-32/423	Transmit clock port B

Twisted-Pair Ethernet Connector

TABLE C-5 lists connector pin assignments and signal descriptions for the twisted-pair Ethernet connector.

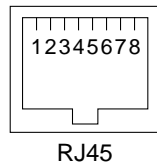


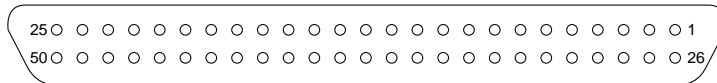
FIGURE C-5 Twisted-pair Ethernet Connector

TABLE C-5 Twisted-Pair Ethernet Connector Pin Assignments

Pin	Function	I/O	Level	Signal Description
1	TPO+	O	Analog	Differential twisted-pair transmit data
2	TPO-	O	Analog	Differential twisted-pair transmit data
3	TPI+	I	Analog	Differential twisted-pair receive data
4	N.C.	None	GND	Not connected
5	N.C.	None	GND	Not connected
6	TPI-	I	Analog	Differential twisted-pair receive data
7	N.C.	None	GND	Not connected
8	N.C.	None	GND	Not connected

SCSI Connector

TABLE C-6 lists the pin assignments and signal descriptions for the SCSI connector.

**FIGURE C-6** SCSI Connector**TABLE C-6** SCSI Connector Pin Assignments

Pin	Function	I/O	Level	Signal Description
1	Ground	None	GND	Ground
2	Ground	None	GND	Ground
3	Ground	None	GND	Ground
4	Ground	None	GND	Ground

TABLE C-6 SCSI Connector Pin Assignments (*Continued*)

Pin	Function	I/O	Level	Signal Description
5	Ground	None	GND	Ground
6	Ground	None	GND	Ground
7	Ground	None	GND	Ground
8	Ground	None	GND	Ground
9	Ground	None	GND	Ground
10	Ground	None	GND	Ground
11	Ground	None	GND	Ground
12	Ground	None	GND	Ground
13	Ground	None	GND	Ground
14	Ground	None	GND	Ground
15	Ground	None	GND	Ground
16	Ground	None	GND	Ground
17	Ground	None	GND	Ground
18	Ground	None	GND	Ground
19	Ground	None	GND	Ground
20	Ground	None	GND	Ground
21	Ground	None	GND	Ground
22	Ground	None	GND	Ground
23	Ground	None	GND	Ground
24	Ground	None	GND	Ground
25	Ground	None	GND	Ground
26	sd0*	I/O	TTL	SCSI data bit 0
27	sd1*	I/O	TTL	SCSI data bit 1

TABLE C-6 SCSI Connector Pin Assignments (*Continued*)

Pin	Function	I/O	Level	Signal Description
28	sd2*	I/O	TTL	SCSI data bit 2
29	sd3*	I/O	TTL	SCSI data bit 3
30	sd4*	I/O	TTL	SCSI data bit 4
31	sd5*	I/O	TTL	SCSI data bit 5
32	sd6*	I/O	TTL	SCSI data bit 6
33	sd7*	I/O	TTL	SCSI data bit 7
34	sdp*	I/O	TTL	SCSI data parity
35	Ground	None	GND	Ground
36	Ground	None	GND	Ground
37	Ground	None	GND	Ground
38	Termpower	I/O	TTL	Termination voltage
39	Ground	None	GND	Ground
40	Ground	None	GND	Ground
41	atn*	O	TTL	Attention
42	Ground	None	GND	Ground
43	bsy*	O	TTL	Busy
44	ack*	O	TTL	Acknowledge
45	rst*	O	TTL	Reset
46	msg*	O	TTL	Message
47	sel*	O	TTL	Select
48	cd*	O	TTL	Control/data

TABLE C-6 SCSI Connector Pin Assignments (*Continued*)

Pin	Function	I/O	Level	Signal Description
49	req*	O	TTL	Request
50	io*	O	TTL	Input/output

* Active low signal

13W3 Connector

TABLE C-7 lists the pin assignments and signal descriptions for the 13W3 connector.

Note – Connector 13W3 is not enabled unless a VSIMM is installed into SIMM slot J0304.

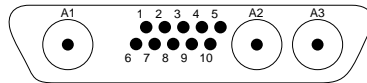


FIGURE C-7 13W3 Connector

TABLE C-7 13W3 Connector Pin Assignments

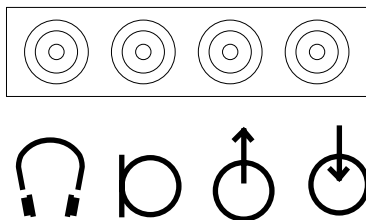
Pin	Function	I/O	Level	Signal Description
A1	Red	O	Analog	Video
A2	Green	O	Analog	Video
A3	Blue	O	Analog	Video
1	Serial Read	I	TTL	Serial read
2	Vert Sync	O	TTL	Vertical sync
3	Sense <0>	I	TTL	Sense
4	Ground	O	GND	Ground

TABLE C-7 13W3 Connector Pin Assignments

Pin	Function	I/O	Level	Signal Description
5	Comp Sync	O	GND	Composite sync
6	Hort Sync	O	TTL	Horizontal sync
7	Serial Write	O	TTL	Serial write
8	Sense <1>	I	TTL	Sense
9	Sense <2>	I	TTL	Sense
10	Ground	None	GND	Ground

Audio Ports

The audio ports include: headphone connector, microphone connector, audio line-in connector, and audio line-out connector. TABLE C-8 lists the pin assignments and signal descriptions for the audio ports.

**FIGURE C-8** Back Panel Audio Ports and Icons**TABLE C-8** Audio Port Signals

	Headphone	Microphone (old)	Microphone (new)	Line-Out	Line-In
Tip	Left Channel	Mono In	Left Channel	Left Channel	Left Channel
Ring (Center)	Right Channel	Microphone power	Right Channel	Right Channel	Right Channel
Shield	Return	Ground	Return	Return	Return

Headphone Connector

The headphone connector is for connecting a set of stereophonic headphones to the system for private listening of audio output.



FIGURE C-9 Microphone Icon

The microphone connector allows connection to the Sun Microphone II microphone.



FIGURE C-10 Audio Line-Out Icon

The audio line-out connector allows connection to a stereophonic amplifier and external loudspeakers.



FIGURE C-11 Audio Line-In Icon

The audio line-in connector allows connection to external sound sources: compact disc player or cassette tape player.



FIGURE C-12 Audio Line-out Icon

SCSI Addresses

This appendix describes the SCSI addresses for the two internal hard disk drives. Also described are the SCSI address conventions for optional SCSI peripherals. For complete SCSI address information regarding optional SCSI peripherals, see the installation manual for the particular SCSI peripheral.

Note – Assign each SCSI device on the SCSI chain a unique SCSI address.

Disk Drives

TABLE D-1 lists SCSI device addresses for the Solaris 1.1.1, Version B, operating environment. TABLE D-2 lists SCSI device addresses for the Solaris 2.3 (and later versions) operating environment.

TABLE D-1 SCSI Addresses, Solaris 1.1.1 Version B (SunOS 4.1.3_U1 Version B) Operating Environment

SCSI Device	SCSI Address
Internal disk: lower position (first internal disk drive)	3
Internal disk: upper position (second internal disk drive)	1
External disk drives	0, 2, 1*

TABLE D-1 SCSI Addresses, Solaris 1.1.1 Version B (SunOS 4.1.3_U1 Version B) Operating Environment (*Continued*)

SCSI Device	SCSI Address
External tape drives	4, 5
External CD-ROM drive	6

* Assign the external disk drive to SCSI address 1 only if a single disk drive is installed.

TABLE D-2 SCSI Addresses, Solaris 2.3 (SunOS 5.3) Operating Environment and Later Versions

SCSI Device	SCSI Address
Internal disk: lower position (first internal disk drive)	3
Internal disk: upper position (second internal disk drive)	1
External disk drives	0, 2, 1*, 4, 5, 6
External tape drives	0, 2, 1*, 4, 5, 6
External CD-ROM drive	0, 2, 1*, 4, 5, 6

* Assign the external disk drive to SCSI address 1 only if a single disk drive is installed.

Note – Do not change the physical position of the internal drive. Doing so may cause an operating system initialization failure.

The internal disk drives are assigned a SCSI address number based on the drive bay disk drive position. The lower drive bay disk drive position is automatically assigned SCSI address 3. The upper drive bay disk drive position is assigned SCSI address 1. These addresses cannot be changed. With the Solaris 2.3 operating environment (and later operating environment releases), *any* SCSI device (disk, tape, CD-ROM, etc.) may be assigned any SCSI address from 0 to 6.

Note – SCSI address 7 is reserved for the SCSI processor of the computer system or the SCSI host adapter card.

Selected On-Board Diagnostics

This appendix describes the OpenBoot PROM on-board diagnostics. To execute the on-board diagnostics, the system must be at the `ok` prompt.



Caution – To execute the OpenBoot PROM on-board diagnostics from the `ok` prompt, the system must be shut down in an orderly manner. When the operating system or any other stand-alone application is booted, do not use the keyboard `Stop(L1)` and `a` keys to halt the system. Abruptly aborting the operating system may cause damage to data files.

`test device alias, test device pathname`

The `test` command, combined with a device alias or device path name, initializes the self-test program for that device.

To execute the self-test program for a device, type the `test` command followed by the *device alias* or *device pathname*. If a device has no self-test program, the following is displayed: `No selftest method for device name`. CODE EXAMPLE E-1 identifies the test output message.

CODE EXAMPLE E-1 `test` Command Output Message

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

test-all

The `test-all` command tests all devices in the system that have a self-test program. Disks, tapes, and CDROMs are not tested by `test-all`. Tests are executed in the device tree (the device tree may be viewed with the `show-devs` command).

To execute the `test-all` program, type the `test-all` command.

CODE EXAMPLE E-2 `test-all` Command Output Message

```
ok test-all
```

watch-clock

`watch-clock` 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 keyboard. CODE EXAMPLE E-3 identifies the `watch-clock` command output message.

CODE EXAMPLE E-3 `watch-clock` Command Output Message

```
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
41
```

watch-net, watch-aui, watch-tpe, watch-net-all

The `watch-net`, `watch-aui`, `watch-tpe`, and `watch-net-all` commands monitor broadcast Ethernet packets on the Ethernet cable(s) connected to the system. Good packets received by the system are displayed by a period (.). Erroneous packets received by the system are indicated with an X and the error description. CODE EXAMPLE E-4 identifies the `watch-net` command output message.

CODE EXAMPLE E-4 `watch-net` Command Output Message

```
ok watch-net
  Internal loopback test -- succeeded.
  External loopback test -- Auto-selecting Ethernet cable I/F
Trying AUI
Received packet on AUI
Select cable - AUI
succeeded.
Looking for Ethernet packets.
'.' is a good packet. "X" is a bad packet.
Type any key to stop.
.....
.....
.....Framing error CRC error X.....
```

The SPARCstation 20 system has two types of on-board Ethernet interfaces: 10Base-T (also called twisted-pair Ethernet or TPE) and 10Base5 (also called thick Ethernet or AUI). Only one on-board interface may be connected at a time. The system automatically selects which interface is connected and active.

The AUI port is first tested by transmitting data packets and checking for No Carrier or response packets. If the AUI test fails, the TPE port is then tested.

This automatic selection occurs by typing `watch-net`. CODE EXAMPLE E-5 identifies the `watch-net` command output message. CODE EXAMPLE E-5 identifies the `watch-tpe` command output message. CODE EXAMPLE E-5 identifies the `watch-net-all` command output message.

Note – Selecting a specific Ethernet interface to monitor may be controlled through these user-specific commands: `watch-tpe` monitors the TPE connection; `watch-aui` monitors the thick Ethernet connection; `watch-net-all` monitors Ethernet packets on all installed Ethernet interfaces, one at a time

CODE EXAMPLE E-5 `watch-tpe` Command Output Message

```
ok watch-tpe
  Internal loopback test -- succeeded.
  External loopback test -- succeeded.
Looking for Ethernet packets.
'.' is a good packet.'X' is a bad packet.
Type any key to stop.
.....
```

The `watch-net-all` command monitors Ethernet packets on all Ethernet interfaces installed in the system, one at a time. For example, if an SBus Ethernet card is installed in one of the system SBus slots, `watch-net-all` monitors the Ethernet transmissions detected by that card.

Note – When `watch-net-all` is interrupted by pressing any key, it initiates testing of the next system Ethernet interface.

CODE EXAMPLE E-6 `watch-net-all` Command Output Message

```
ok watch-net-all
/iommu@f,e0000000/sbus@f,e0001000/lebuffer@1,40000/le@1,60000
  Internal loopback test -- succeeded.
  External loopback test -- succeeded.
Looking for Ethernet packets.
'.' is a good packet.'X' is a bad packet.
Type any key to stop.
.....
.....(keyboard key pressed here)

/iommu@f,e0000000/sbus@f,e0001000/ledma@f,400010/le@f,c00000
  Internal loopback test -- succeeded.
  External loopback test -- succeeded.
Looking for Ethernet packets.
'.' is a good packet.'X' is a bad packet.
Type any key to stop.
.....
.....
```

`probe-scsi`, `probe-scsi-all`

The `probe-scsi` command transmits an inquiry command to internal and external SCSI devices connected to the SPARCstation 20 on-board SCSI interface. If a SCSI device is connected and powered up, the target address, unit number, device type, and manufacturer name is displayed.

The `probe-scsi-all` command transmits an inquiry command to all SCSI devices connected to the built-in SCSI port and to *all* the SCSI host adapters installed in the system. The `probe-scsi-all` command returns the following information:

- SCSI host adapter address in the system device tree
- SCSI device identification data (SCSI address or target ID, unit number, and SCSI device information)

CODE EXAMPLE E-7 identifies the `probe-scsi` command output message.
CODE EXAMPLE E-8 identifies the `probe-scsi-all` command output message.:

CODE EXAMPLE E-7 `probe-scsi` Command Output Message

```
ok probe-scsi
Target 3
  Unit 0 Disk SEAGATE ST1480 SUN04245828 Copyright (c) 1991
  Seagate All rights reserved.
```

CODE EXAMPLE E-8 `probe-scsi-all` Command Output Message

```
ok probe-scsi-all
/iommu@f,e0000000/sbus@f,e0001000/dma@1,81000/esp@1,80000
Target 2
  Unit 0 Disk SEAGATE ST41600N SUN1.3G00286965 Copyright (c)1991
  Seagate All rights reserved.

/iommu@f,e0000000/sbus@f,e0001000/espdma@f,400000/esp@f,800000
Target 3
  Unit 0 Disk SEAGATE ST1480 SUN04245828 Copyright (c)1991 Seagate
  All rights reserved.
```

test-memory

The `test-memory` command tests the main memory if the system `diag-switch?` parameter is set to true. If the system `diag-switch?` parameter is set to false, the `test-memory` command verifies the memory according to a user-specified number of megabytes to be examined.

When the `test-memory` command is active, the quantity of memory being tested is displayed in megabytes and sequentially decrements to zero during the test. If the `diag-switch?` parameter is set to false, the `test-memory` command uses the `selftest-#megs` parameter in NVRAM to determine the quantity of memory to test. The default setting for the `selftest-#megs` parameter is 1, thus testing one megabyte of memory. To change the amount of memory to test, use the `selftest-#megs` parameter and enter the example command where `XX` is any whole number that does not exceed the actual size of memory in megabytes.

Example:

```
ok setenv selftest-#megs XX
```

power-off

The `power-off` command turns off the system power. A Type-5 keyboard must be attached for this command to work.

module-info

The `module-info` command is used to display the installed MBus module type and MBus module and SBus card clock speeds. If multiple MBus modules are installed, the `module-info` command identifies each module individually. CODE EXAMPLE E-9 identifies the `module-info` command output message for a uniprocessor. CODE EXAMPLE E-10 identifies the `module-info` command output message for multiprocessor.

CODE EXAMPLE E-9 Uniprocessor `module-info` Command Output Message

```
ok module-info
MBus: 40.00 MHz
SBus: 20.00 MHz
CPU#0: 50.00 MHz SuperSPARC/SuperCache
```

CODE EXAMPLE E-10 Multiprocessor `module-info` Command Output Message

```
<#0> ok module-info
MBus: 50.00 MHz
SBus: 25.00 MHz
CPU#0: 50.00 MHz SuperSPARC
CPU#2: 50.00 MHz SuperSPARC
```

Glossary

- address** Refers to a location within a computer system memory. The word *location* is a synonym. Reference is usually made to an *address* for the purpose of retrieving or storing information.
- AUI port** Attachment unit interface port. (The port on the SPARCstation 20 system unit where the AUI adapter cable is connected.)
- AVB** Auxiliary video board. Supports graphic capabilities when used with a second VSIMM option.
- back up** To make a copy of files on media, such as a disk or tape.
- board** See *printed circuit board*.
- Boot** To load the system software into memory and initiate system operation.
- boot PROM** Refers to the system board OpenBootTM PROM chip. This chip contains boot code and a Forth Monitor program. The OpenBoot PROM is connected to the I/O data bus.
- Boot PROM diagnostics** The diagnostic firmware in the boot PROM. These diagnostics include the Power-On Self-Test (POST) and on-board diagnostics.
- buffer** The auxiliary data-storage device that holds data temporarily, and which may also perform other functions in conjunction with various I/O machines.
- cables** Wires or bundles of wires configured with connectors at each end and used to connect two or more hardware devices.
- cache** A mechanism for accelerating a microprocessor performance. A cache is a small, fast memory between the microprocessor and main memory.
- card** See *printed circuit board*.
- CPU** Central processing unit.
- DAC** Digital-to-analog converter.

default	A preset value that is assumed to be correct unless changed by the user.
disk	A round platter, or set of platters, coated with magnetic medium and organized into concentric tracks for storing data.
disk drive	The mechanism that rotates a disk.
diskette	A removable disk of magnetic medium for storing software and information.
diskette drive	A device that reads and writes diskettes. If installed, the diskette drive access is located on the right side of the SPARCstation 20 system unit.
DMA	Direct memory access.
DRAM	Dynamic random access memory.
DSIMM	DRAM single in-line memory module. A small printed circuit card that contains DRAM chips.
Ecache	External cache is a cache that is located external to the microprocessor. See <i>cache</i> .
ECC	Error correcting code.
Ethernet	A type of network hardware that allows communications between systems connected together by transceiver taps, transceiver cables, and a coaxial cable.
Forth	A high-level programming language. A major feature of Forth is that user-defined operators can be used as primitives.
Forth Toolkit	An interactive command interpreter based upon the Forth programming language. The Toolkit provides access to an extensive set of functions for performing fault isolation and debugging.
frame buffer board	A printed circuit board installed in an SBus slot of the system unit that controls a video display.
IC	Integrated circuit.
ID	Identification.
I/O	input/output. A device that inputs data to a computer CPU and receives data from a computer CPU.
keyboard	Input device for entering data.
keyboard port	The port on the SPARCstation 20 system unit where the keyboard cable is connected.
LANCE	Local area network control for Ethernet.
LED	Light emitting diode.
location	See <i>address</i> .

MACIO	SBus-to-SCSI, Ethernet, and parallel interface. An ASIC that integrates three functions: DMA, LANCE, and fast SCSI bus interface. Provides the interface between the SBus and the following: SCSI, thick AUI Ethernet, TPE, and parallel port.
MBus module	A printed circuit board installed in an MBus slot of the system unit that contains the CPU circuitry and components.
Mbyte	Megabyte.
MDI	Memory display interface.
MMU	Memory management unit.
Monitor 1)	Indicated by the > prompt. From the > prompt, you can boot the system, continue the execution of a halted program, or enter the Forth Toolkit. If disaster happened to your operating system, the Monitor automatically starts.
Monitor 2)	A video display unit that is part of the SPARCstation 20 system. It is not the same as a terminal.
MSBI	MBus-to-SBus interface.
NVRAM	Non-volatile RAM.
NVSIMM	Non-volatile single in-line memory module.
on-board diagnostics	Tests that allow you to test the network controller, diskette drive system, memory, cache, system clock, and watch the network for valid Ethernet data packets.
Pok	Power ok. A signal from the power supply that is activated after DC voltages are nominal.
POST	Power-on self-test. Executes when you turn on the system power switch or reboot the system and press and hold the keyboard Stop (L1) and D keys. Initiated from the OpenBoot PROM, POST is a series of rudimentary tests designed to verify that the major components on the system board and the MBus modules installed within the system are operating properly.
printed circuit board	Any board with electronic wiring etched on it.
PROM	Programmable read-only memory.
RAM	Random access memory.
RH	Relative humidity.
ROM	Read-only memory.
SBus card	A printed circuit board installed in an SBus slot of the system unit.
SCC	Serial communications controller.

- SCSI** Small computer system interface.
- SEC** SBus-to-external bus interface. An ASIC ASIC that provides the interface between the SBus and the external bus.
- SIA** Serial Interface Adapter.
- SMC** Scalable memory controller.
- SunDiag System Exerciser** Diagnostic software that operates under SunOS system software; displays real-time use of system resources and peripheral equipment.
- SunVTS** Sun verification test suite. Diagnostic software that operates under SunOS software.
- system monitor** See *Monitor 1) or 2)*.
- terminal** A device that consists of a video display and keyboard. Used to type and display information. A terminal may be connected to either of the RS-423/RS-232 serial interface ports on the backpanel of the SPARCstation 20 system.
- TOD** Time of day.
- TPE** Twisted-pair Ethernet.
- UART** Universal asynchronous receiver/transmitter.
- VBC** Video buffer chip.
- VSIMM** Video single in-line memory module. A printed circuit board containing static random access memory (SRAM) chips. A primary system VSIMM uses the backpanel 13W3 graphics connector. Availability of a secondary system VSIMM through conjoint operation with optional AVB.
- wrist strap** A device that provides grounding for static electricity between your body and the system unit chassis. Electric current and voltage do not pass through the wrist strap.

Index

NUMERICS

- 13W3 connector, 215
 - pin assignments, 215

A

- abbreviated POST, 19
- access, internal, 49
- antistatic mat, 40
- architecture, system, 195
- attaching
 - cables, SPARCstation 20, 135
 - wrist strap, 50, 57
- audio
 - line-in connector, 217
 - line-out connector, 217
 - port, 1
 - port signals, 216
 - ports, 216
- audio line-in connector, 217
- audio line-out connector, 217
- AUI, 224
 - connector, 207
 - pin assignments, 207
- auxiliary video board, 168
- AVB
 - installed, 169
 - installing, 170
 - removing, 168, 169

B

- back panel
 - audio ports, 216
 - captive screws, 90, 100, 104
 - icons, 216
 - SBus slots, 90, 100
- battery, lithium, 42
- block diagram, system board, 197
- boards, 2
- boot messages, 47
- bracket, drive, 121

C

- cable
 - fan DC power, 70, 74
 - guide detail, 92
 - null modem, 19
 - serial connection, 19
 - trough, 77, 80
- cables, attaching, SPARCstation 20, 135
- captive screw, 56, 58
 - backpanel, 175
 - system board, 172, 176
- cautions, xx
- CD-ROM drive, 123
 - connector, optional, 74
 - DC power connector, 70
 - filler panel, 128
 - installing, 124, 126
 - removing, 123, 124

- clock chip, 204
- command output message
 - multiprocessor module-info, 228
 - probe-scsi, 227
 - probe-scsi-all, 227
 - test, 222
 - test-all, 222
 - uniprocessor module-info, 228
 - watch-clock, 223
 - watch-net, 224
 - watch-net-all, 226
 - watch-tpe, 225
- completing POST, 25
- component replacement, 143
- components, 2
- connecting
 - DC power connector, 177
 - diskette connector, 177
 - SCSI connector, 177
 - speaker/LED connector, 177
- connector
 - 13W3, 215
 - audio
 - line-in, 217
 - line-out, 217
 - audio line-in, 217
 - audio line-out, 217
 - AUI, 207
 - CD-ROM, optional, 74
 - headphone, 217
 - keyboard, 209
 - LED, in-line, 60, 61
 - microphone, 217
 - mouse, 209
 - parallel, 205
 - SCSI, 212
 - serial ports A and B, 210
 - single, 117
 - speaker, 66
 - speaker, spade, 65
 - system back panel, 4
 - twisted-pair Ethernet, 211
- controller, SCSI, 34
- corner screw, 49
- cover
 - removing, 50
 - replacing, 51
 - speaker, 64

D

- data cable, diskette drive, 130
- DC power
 - connector
 - (SunCD 2Plus drive-type chassis), 89, 99
 - (SunCD 4 drive-type chassis), 94, 104
 - harness, 97
- default boot mode, 9
- description
 - functional, 195
 - product, 1
 - system board, 140
- desktop enclosure
 - disk drive, 8
 - tape, 8
- detail, cable guides, 101
- diagnostic tools, 11
- disconnecting
 - DC power connector, 172
 - diskette connector, 172
 - fan DC power connector, 68
 - SCSI connector, 172
 - speaker/LED connector, 172
- disk drive
 - error, 33
 - errors, troubleshooting, 34
 - handle, 119
 - jumper settings not required, 121
 - position, 118, 121
 - single connector, 117
- disk expansion unit, 7
- diskette drive, 126
 - connecting data cable, 136
 - connecting power cable, 135
 - data cable, 130
 - filler panel, 128
 - grommet, 128
 - grommets, 128, 132
 - installing, 132, 134
 - location, 127
 - power cable, 129
 - power cable (P4), 134
 - removing, 127, 131
 - setting microswitch, 133
 - setting switch, 131
 - unseating grommets, 132
- diskette drive cable, 107

- location, 109
- plastic tab, 109
- proper fold, 111
- pulling through drive bracket opening, 110

document organization, xix

documentation, SunVTS, 15

double-wide

- MBus module
 - installing, 150
 - removing, 147, 149
- SBus card
 - installing, 157
 - removing, 154

DRAM densities, 199

drive

- address, 220
- bracket, 121
- positions, 220
- tape, 7
- test manually, 47

DSIMM, 1, 159, 199

- back view, 160, 164
- determining failed, 35
- front view, 159
- inserting, 167
- memory system, 200

E

- electrical specifications (17-inch monitor), 192
- electrical specifications (20-inch monitor), 193
- electrical specifications (system unit), 192
- electricity, static, 159
- electrostatic discharge, 42
 - ESD, 40
- environmental specifications, 194
- error
 - disk drive, 33
 - messages, POST, 23
 - parity, 28, 34
 - read, 28, 34
 - write, 28, 34
- ESD, 40
- Ethernet interface, 202
- expansion unit, disk, 7
- exploded view

- SPARCstation 20 system, 3, 187
- system board, 142

external

- cables
 - optional, 190
 - standard, 189
- options, 7

F

fan

- assembly, 70
- clip, 68, 70
- connector, 67, 72
- DC power, 67, 68, 70, 74
 - connector, 72
 - harness, 67, 74, 76
- housing, 67
- installation tool, 71
- mounting clip, 70
- removing, 69

features, standard, 1

floppy

- disk drive switch setting, 132

functional

- block diagram
 - MACIO ASIC, 203
 - SEC ASIC, 204
- description, 195

G

- grommet, diskette drive, 128

H

handle

- disk drive, 119
- latch, 119, 121

hard disk drive, 117

- installing, 120, 122
- removing, 117, 120
- single connector, 119

harness, fan, 74

headphone connector, 217

heat sinks, 40

I

illustrated parts breakdown, 183

in-line connector, LED, 61

inserting

DSIMM, 167

NVSIMM, 167

VSIMM, 167

install SIMMs, 35

installing

AVB, 170

card extractor, 154

CD-ROM drive, 124, 126

filler panel, 137

DC power harness

(SunCD 2Plus drive-type chassis), 102

(SunCD 4 drive-type chassis), 106

diskette data cable

(SunCD 4 drive-type chassis), 112

diskette drive, 132, 134

diskette drive cable

(SunCD 2Plus drive-type chassis), 110

double-wide

MBus module, 150

SBus card, 157

fan, 67

grommets, 131

hard disk drive, 120, 122

NVRAM/TOD, 181

SBus card, 156

SCSI data cable

(SunCD 2Plus drive-type chassis), 91

(SunCD 4 drive-type chassis), 96

single-wide

MBus module, 146

SBus card, 157

speaker, 66

subassemblies, 55

system board, 175

interior view of system, 3

internal

access, 49

cables

(SunCD 2Plus drive-type chassis), 89, 99

(SunCD 4 drive-type chassis), 94, 104

internal options, 6

J

jumper

serial port, 174

setting, 121

clock speed, 173

serial port, 173

SunCD 2Plus, 125

SunCD 4 drive, 125

K

kernel, SunVTS, 15

keyboard, 14

keyboard connector, 209

keyboard/mouse pin assignments, 209

L

LED, 23

cable, 60

Caps Lock, 25

Compose, 25

in-line connector, 60, 61

light pipe, 61

Num Lock, 25

removing, 60

Scroll Lock, 25

shrink-wrapped wires, 61

states and meaning, 25

tabs, 61

LED light pipe detail, 62

light pipe, 61

lithium battery, 42

location

diskette drive, 127

lock block screw, 49

locking MBus module retainers, 152

M

MACIO ASIC, 202

- functional block diagram, 203
- major components
 - system board, 188
- mat, antistatic, 40
- MBus module, 143
 - backplane screws, 148
 - backplane washers, 148
 - card extractor, 144
 - locking, retainers, 152
 - retainers, 144, 147
- memory, 1, 35, 198
- messages, boot, 47
- microphone connector, 217
- module-info, 14, 228
- mouse connector, 209
- multiprocessor, 6
- multiprocessor module-info command output message, 228

N

- null modem cable, 19
- NVRAM/TOD
 - installing, 181
 - removing, 180
- NVSIMM, 159, 161
 - aligning in slot, back view, 166
 - battery side, 161, 165
 - inserting, 167

O

- ok prompt, 12
- on-board diagnostics
 - tests, 12
- OpenBoot PROM, 177
 - diagnostics, 12
 - location, 178
 - orientation, 180
 - removing, 178
- operating system
 - requirements, 6
 - Solaris, 6
 - SunOS, 6
- optional

- CD-ROM drive connector, 74
 - external cables, 190
- options
 - external, 7
 - internal, 6
 - SCSI, 7
 - SX graphics, 6
- output voltage, 29
- overview
 - system, 195
 - system board, 139
 - troubleshooting, 9

P

- parallel
 - connector, 205
 - pin assignments, 206
 - interface, 202
- PCB, 40
- physical
 - memory, 35
 - specifications, 191
- pin assignments
 - 13W3 connector, 215
 - AUI connector, 207
 - keyboard/mouse connector, 209
 - parallel connector, 206
 - SCSI connector, 212
 - serial ports A/B connector, 210
 - twisted-pair Ethernet, 212
- port, audio, 1
- POST, 11
 - abbreviated, 19
 - does not test drives, 47
 - error messages, 23
 - error messages, typical, 23
 - error-free message, abbreviated, typical, 19
 - modes
 - full diagnostic, 17
 - normal, 17
 - progress message, typical, 18
 - tests, 20
- power
 - cable, diskette drive, 129
 - cord, 40
 - DC harness, 57

- harness, 58
- off, 45
- on, 45
- supply, 55
 - captive screws, 56, 58
 - chassis mounts, 56
 - connector pin assignments, 31
 - connector pinouts, 30
 - disconnecting, 56, 98
 - output voltages, 29
 - removing, 57
 - test, 29
- switch, 46
- switch, standby, 139
- system, 45
- power-off, 228
- power-on
 - does not succeed, 29
 - self-sest, 17
 - sequence, 46
 - standby, 46
- precautions, 41
 - ESD, 42
- preface, xix
- preventing damage, 139
- printed circuit board
 - handling, 40
 - PCB, 40
- probe
 - scsi, 14, 33
 - scsi-all, 14
- probe-scsi, 226
- probe-scsi command output message, 227
- probe-scsi-all, 226
- probe-scsi-all command output message, 227
- procedures
 - troubleshooting, 27
- product
 - description, 1
 - specifications, 191

R

- rear view
 - SunCD 2Plus, 125
 - SunCD 4 drive, 125

- related documentation, xxii
- removing
 - AVB, 168, 169
 - CD-ROM drive, 123, 124
 - cover, 50
 - DC power harness
 - (SunCD 2Plus drive-type chassis), 97
 - (SunCD 4 drive-type chassis), 103
 - diskette drive, 127, 131
 - diskette drive cable
 - (SunCD 2Plus drive-type chassis), 108
 - (SunCD 4 drive-type chassis), 111
 - double-wide
 - MBus module, 147, 149
 - SBus card, 154
 - fan, 67, 69
 - hard disk drive, 117, 120
 - LED, 60
 - NVRAM/TOD, 180
 - OpenBoot PROM, 178
 - power from the system, 45
 - power supply, 57
 - SBus card, 152
 - adapter bracket, 156
 - extractor, 155
 - SCSI backplane, 84
 - SCSI data cable
 - (SunCD 2 Plus drive-type), 88
 - (SunCD 4 drive-type chassis), 93
 - SIMM, 161
 - single-wide MBus module, 143, 145
 - speaker, 64
 - subassemblies, 55
 - system board, 95, 105, 171, 173
- replacement
 - component, 143
 - part numbers, 183
 - parts list, 183
 - system board, 143
- replacing
 - cover, 51
- requirements
 - operating systems, 6
 - safety, 39
 - software, 6
- restarting system while troubleshooting, 46
- RS-423 mode, 174

S

- safety, 41
 - precautions, 39
 - requirements, 39
- sample listing
 - full diagnostic test mode, 21
- SBus
 - to-external bus interface, 203
 - to-SCSI interface, 202
- SBus card, 152, 197
 - adapter bracket, removing, 156
 - back plate
 - screws, 153
 - washers, 153
 - backplane
 - screws, 158
 - washers, 158
 - extractor, 154
 - extractor, removing, 155
 - installing, 156
 - removing, 152
 - retainers, 147, 153
 - single-wide, 155
 - test manually, 47
- screw, captive, 56, 58
- SCSI
 - address
 - conventions, 219
 - addresses, 219
 - backplane, 87, 117
 - DC power
 - connector, 90
 - connectors, 102
 - SCSI data, 90, 102
 - cable, 84
 - connector, 212
 - pin assignments, 212
 - controller, verifying defective, 33
 - data cable, 88
 - defective controller, 33
 - device, 14, 220
 - target ID, 220
 - terminator, 34
- SCSI backplane, removing, 84
- SEC ASIC, 203
 - functional block diagram, 204
- selected FRUs, 186
- serial
 - cable, 19
 - port
 - jumper
 - RS-232, 174
 - RS-423, 174
 - jumpers, 173
 - ports A and B connector, 210
 - serial port jumper, 174
 - setting floppy disk drive switch, 132
 - setting up tip connection, 19
 - shell prompts, xxiv
- SIMM
 - address space, 35
 - determining failed, 35
 - ejection levers, 163
 - installation sequence, 35
 - location, 35
 - physical address, 35
 - removing, 161
 - slot, 35
 - slot layout, 35
 - slot locations, 162
 - video, 6
- SIMM slot
 - installation sequence, 36
 - layout, 36
- single connector
 - drive, 117
 - hard disk drive, 119
- single-wide
 - MBus module
 - installing, 146
 - removing, 143, 145
 - SBus card
 - installing, 157
- software requirements, 6
- Solaris
 - 1.1.1 Version B, 6
 - 2.3, 6
- spade connectors, 66
 - speaker, 65
- SPARCstation 20 system, 2
 - basic, 6
 - configurations, 6
 - exploded view, 3
 - multiprocessor, 6

- operating, 6
 - overhead interior view, 4
 - software requirements, 6
 - SX graphics option, 6
 - video SIMMs, 6
 - speaker, 1
 - connectors, 66
 - cover, 64
 - cover detail, 65
 - cover tabs, 64
 - installing, 66
 - removing, 64
 - spade connectors, 65
 - surface, 64, 66
 - terminals, 65, 66
 - speaker/LED cable, 63
 - speaker/LED cable detail, 61
 - specifications
 - electrical (17-inch monitor), 192
 - electrical (20-inch monitor), 193
 - electrical (system unit), 192
 - environmental, 194
 - physical, 191
 - product, 191
 - standard
 - external cables, 189
 - features, 1
 - standby
 - power switch, 45
 - switch, 40
 - static electricity, 159
 - storage devices, 117
 - subassemblies, 2, 3
 - SunCD 2Plus
 - jumper settings, 125
 - rear view, 125
 - SunCD 4 drive
 - jumper settings, 125
 - rear view, 125
 - SunDiag system exerciser, 11, 14
 - SunOS
 - 4.1.3_U1, 6
 - 5.3, 6
 - SunVTS
 - documentation, 15
 - kernel, 15
 - tty, 16
 - user interface, 15
 - SX graphics option, 6
 - symbols, 40
 - system
 - architecture, 195
 - interior view, 3
 - overview, 195
 - power, 45
 - SCSI options, external, 7
 - system board, 171, 196
 - block diagram, 197
 - captive screws, 172, 176
 - connector pinouts, 205
 - description, 140
 - exploded view, 142
 - FRUs, 141
 - installing, 175
 - jumper settings, 174
 - major components, 188
 - overview, 139
 - removing, 171, 173
 - SIMM slot locations, 36
 - test, 31
 - system board replacement, 143
 - system LED location, 24
- ## T
- tape drive, 7
 - terminals, speaker, 65
 - terminator, SCSI, 34
 - test, 221
 - all, 13
 - cdrom, 13
 - continuity, 28
 - disk, 13
 - disk0, 13
 - disk1, 13
 - disk2, 13
 - disk3, 13
 - drive, 47
 - drives, 47
 - floppy, 12
 - keyboard, 13
 - loopback, 12
 - memory, 13
 - module-info, 14

- net, 12
- net-aui, 12
- net-tpe, 12
- POST, 20
- power supply, 29
- SBus cards, 47
- screen, 12
- scsi, 12
- supported, 12
- system board, 31
- tape, 13
- tape0, 13
- tape1, 13
- ttya, 13
- ttyb, 13
- test command output message, 222
- test-all, 222
- test-all command output message, 222
- test-memory, 227
- thick ethernet, 224
- tip
 - window, 20
- tip connection, setting up, 19
- tips
 - troubleshooting, 27
- tools
 - diagnostic, 11
- troubleshooting
 - disk drive errors, 34
 - overview, 9
 - procedures, 27
 - tips, 27
- tty, SunVTS, 16
- turning on power, 47
- twisted pair Ethernet (TPE), 224
- twisted-pair Ethernet connector, 211
 - pin assignments, 212
- type-5 keyboard key LEDs, 25
- typical
 - abbreviated POST error-free message, 19
 - POST error messages, 23
 - POST progress message, 18
- typographic conventions, xxii

U

- uniprocessor module-info command output message, 228
- UNIX commands, xxiii
- user interface, SunVTS, 15

V

- video output
 - failure, 28
 - port, 28
- view
 - back panel connectors, 4
 - rear, of system, 4
 - system interior, 3
- voltage
 - check, 29
 - output, 29
- VRAM densities, 201
- VSIMM, 159, 160, 201
 - back view, 161, 165
 - front view, 160
 - inserting, 167
 - memory system, 201

W

- warnings, xx
- watch
 - aui, 13
 - clock, 13
 - net, 13
 - net-all, 13
 - tpe, 13
- watch-aui, 224
- watch-clock, 223
- watch-clock command output message, 223
- watch-net, 224
- watch-net command output message, 224
- watch-net-all, 224
- watch-net-all command output message, 226
- watch-tpe, 224
- watch-tpe command output message, 225
- wrist strap, 40

wrist strap, attaching, 50