SPARCstation Voyager Service Manual

THE NETWORK IS THE COMPUTER™

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Preface

The *SPARCstation Voyager Service Manual* describes how to remove and replace system parts. Chapter 11 lists the replacement parts. This manual also describes how to troubleshoot system problems by running diagnostic programs.

This book is written for Sun® field service representatives, original equipment manufacturers (OEMs), value-added resellers (VARs), and other customers with self-maintenance contracts.

What Typographic Changes Mean

The following table describes the typographic changes used in this book.

TABLE P-1 Typographic Conventions

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

Shell Prompts in Command Examples

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

TABLE P-2 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	`#`

Related Documentation

The following documents provide additional information and are referenced in this manual:

TABLE P-3 Related Documents

Application	Title	Part Number
Diagnostics	*Introduction to Open Boot 2.0*	800-5674
Diagnostics	*SunDiag User's Guide*	801-6627
Installation	*SPARCstation Voyager User's Guide*	801-4083
Installation	*SPARCstation Voyager Memory Card Installation*	801-4335

Notes, Cautions, and Warnings

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

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.

Individuals who remove any outer panels or open covers to access this equipment must 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 qualified service-trained maintenance providers.

Note – Before you begin, carefully read each of the procedures in this manual. If you have not performed similar operations on comparable equipment, *do not attempt* to perform these procedures.

CHAPTER 1

Product Description

System Unit

The major system components are:

- CPU unit
- Display Panel
- Sun Compact 1 (or Type 5) Keyboard
- Mouse
- PCMCIA cards (optional)
- Memory cards (optional)
- Battery (optional)

The following figures illustrate the SPARCstation™ Voyager™ workstation:

- FIGURE 1-1 shows the front view of the unit
- FIGURE 1-2 shows the rear view
- FIGURE 1-3 shows the internal front view
- FIGURE 1-4 shows the internal rear view
- FIGURE 1-5 shows the back panel

Systems Illustrations

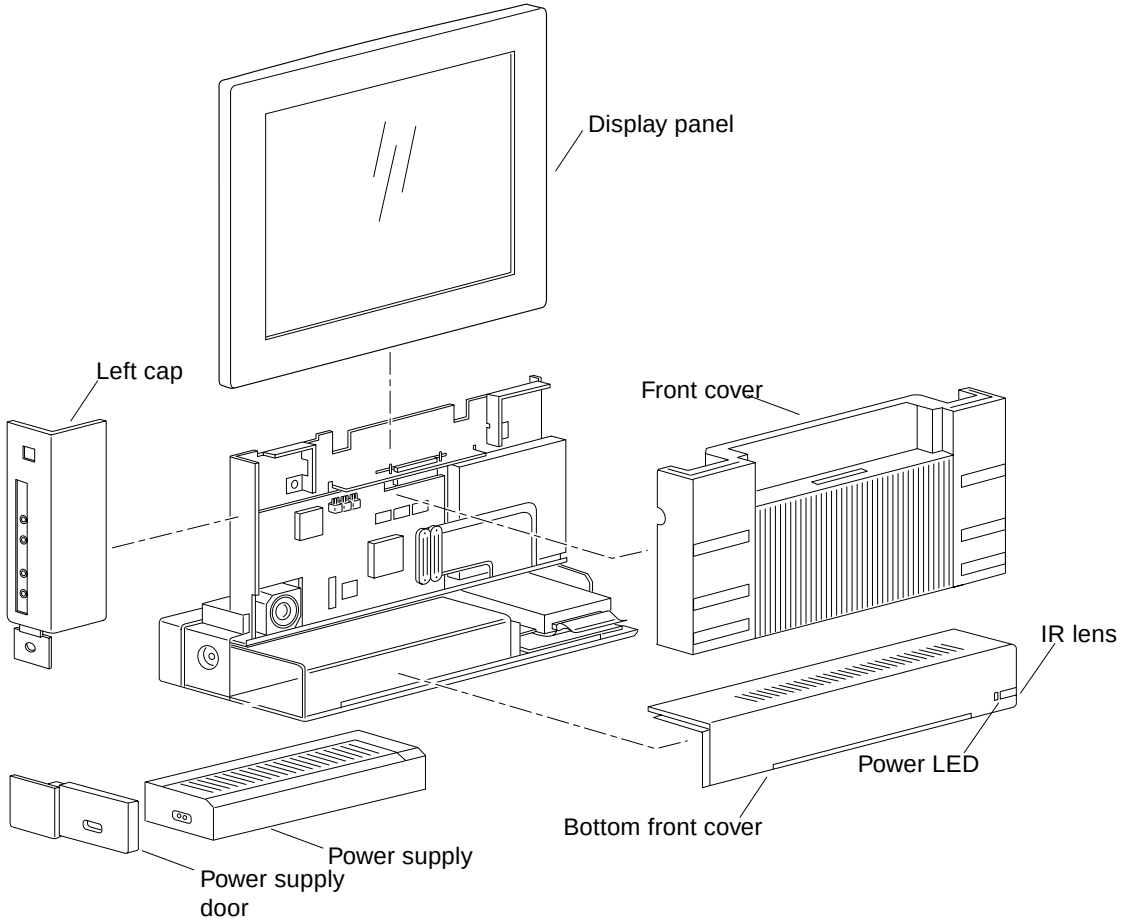

FIGURE 1-1 Front View—Exploded

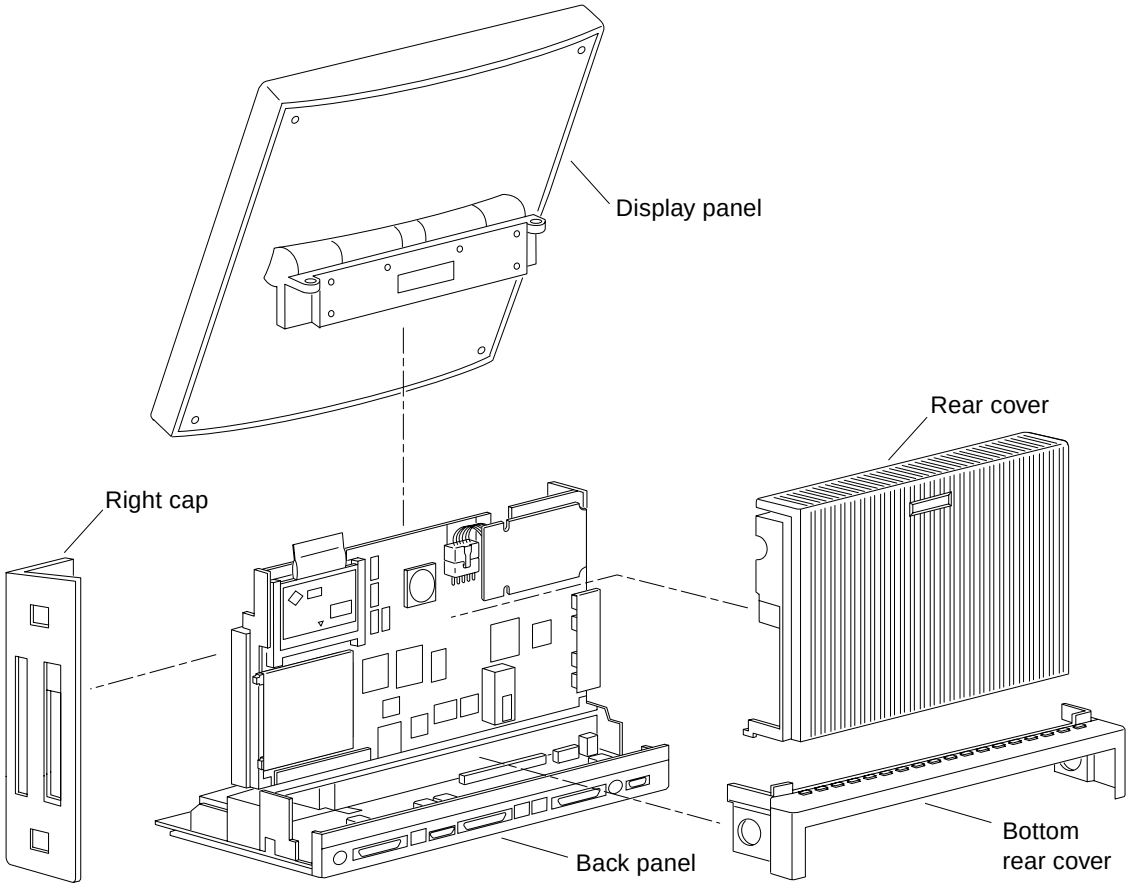

FIGURE 1-2 Rear View—Exploded

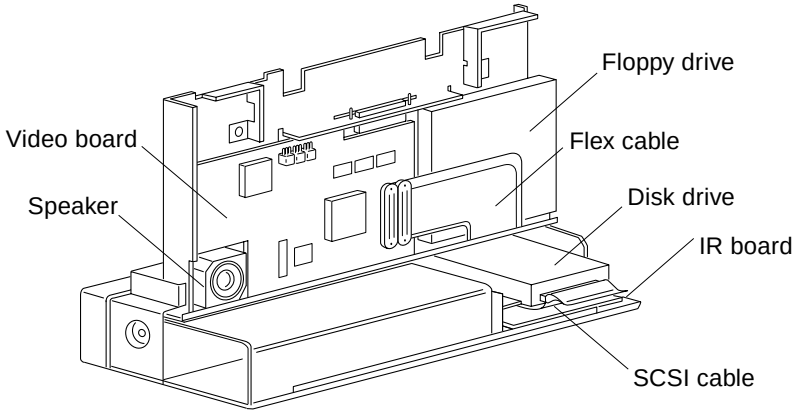

FIGURE 1-3 Front View—Internal

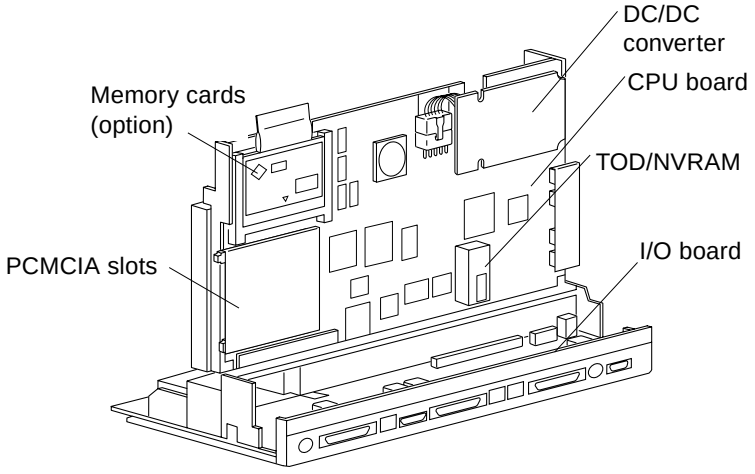

FIGURE 1-4 Rear View—Internal

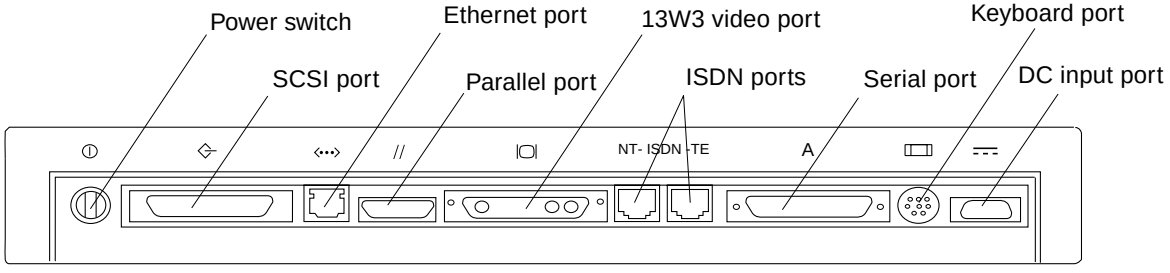

FIGURE 1-5 Back Panel

Display Panel

Each system uses a keyboard, a mouse, and one of several types of AMLCD (Active Matrix Liquid Crystal Display) panels or video monitors. Video monitors up to 1152 x 900 resolution are supported. TABLE 1-1 lists the display panels supported.

TABLE 1-1 Display Panel Types

Display Panel Type
12-inch (307 mm) AMLCD color panel
14-inch (356 mm) AMLCD monochrome panel

CHAPTER 2

Diagnostic Overview

This chapter describes how to diagnose a problem with a SPARCstation Voyager workstation and run diagnostic tests. You should be familiar with troubleshooting hardware, running diagnostic tests, and replacing or upgrading hardware.

- "Diagnostic Overview" on page 7
- "Diagnostic Tools" on page 9

Default Boot Mode

To troubleshoot a problem, it is helpful to know what part of the system has control of system operations at any moment.

When you turn on the power, control of the system passes in this order:

- OpenBoot‘ initialization (initializes serial-controller-chip and checks the keyboard)
- Power-On Self-Test (POST) program (if Stop-D keys are pressed or `diag-switch?` true or if keyboard is not attached)
- OpenBoot program
- Operating system

The flowchart in FIGURE 2-1 outlines the roles played by various diagnostics during the default boot mode.

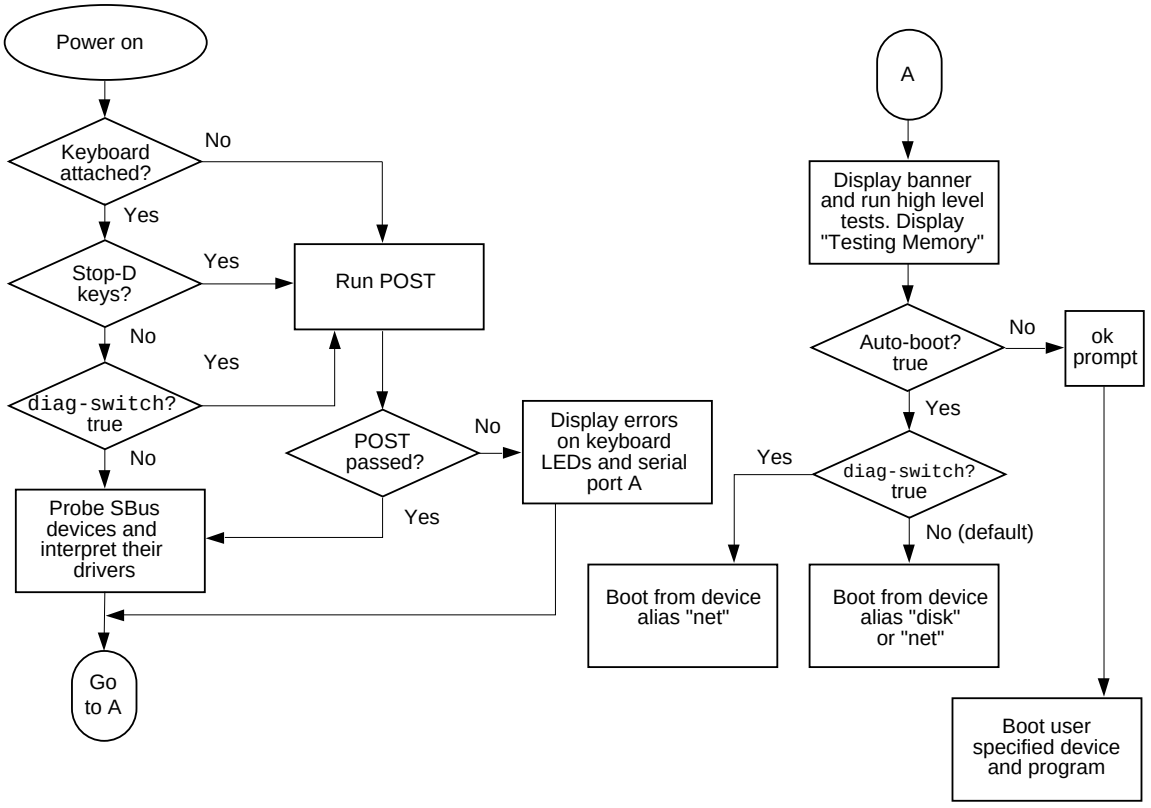

FIGURE 2-1 Default Boot Mode

This section describes how the various diagnostic tools work together in the different power-on modes.

Note – POST will run at power on if the `Stop-D` keys are pressed or the `diag-switch?` parameter is set to true, or the keyboard is disconnected.

While the POST code executes, the Caps Lock LED on the keyboard flashes to indicate that testing is in progress. If a failure occurs in POST, the failing replaceable unit is encoded on three LEDs located on the keyboard and failure messages are output to the serial port. See Chapter 3, “Power-On Self-Test (POST).

If the POST passes, the system probes for SBus devices and interprets their drivers. Next, high-level tests are performed. You will see the words `Testing Memory` while the high-level tests are running. After `Testing Memory` is displayed, if you want to use the OpenBoot PROM commands (`ok` prompt), press the `Stop-A` keys simultaneously.

If the auto-boot? parameter is set to false (not the default), you will get the ok prompt. To change to the monitor prompt (>) see the manual *OpenBoot Command Reference*.

If the auto-boot? parameter is set to true (default), and the diag-switch? parameter is set to false (default), the operating system is booted using the device alias disk. If the auto-boot? parameter is set to true (default), and the diag-switch? parameter is set to true (not the default), the operating system is booted using the device alias net. See TABLE 2-1.

To run user-specified programs, you must be at the ok prompt.

TABLE 2-1 describes the auto-boot? and diag-switch? parameters.

TABLE 2-1 Definition of auto-boot? and diag-switch? Parameters

Autoboot Switch set to:	Diagnostic Switch set to:	Results will be:
False	Don't care	ok prompt (OpenBoot PROM commands)
True	False	Boot operating system (/kernel/unix) from disk automatically only if the boot-device is set to disk (default setting)
True	True	Boot operating system (/kernel/unix) from network automatically only if diag-device is set to net (default setting)

Diagnostic Tools

The main categories of diagnostic tests are:

- OpenBoot PROM diagnostics
  - Power-On Self-Test (POST)
  - On-Board diagnostics
- SunDiag™ System Exerciser

TABLE 2-2 provides a summary of the available diagnostic tools and lists when to use each diagnostic tool.

TABLE 2-2 Diagnostic Tools

Diagnostic	Description
Power-On Self-Test	POST tells you if the CPU board or memory card fails. POST code, residing in the OpenBoot PROM, executes at power-on when you press and hold the `Stop-D` keys, or the `diag-switch?` parameter is set to `true`, or the keyboard is disconnected.
On-Board Diagnostics	Includes tests such as: Ethernet and the diskette drive controller tests. To run on-board diagnostics, you must be at the `ok` prompt. See Appendix C, "Selected On-Board Diagnostics."
Forth Toolkit	Allows input to the system at the OpenBoot PROM level. Supports functions such as changing NVRAM parameters, resetting the system, running diagnostic tests, displaying system information, and redirecting input and output. See the manual *OpenBoot Command Reference.*
SunDiag System Exerciser	Runs under the operating system and displays real-time use of the system resources and peripherals. See the *SunDiag User's Guide* for more information. If SunDiag fails, run the Power-On Self-Test.

OpenBoot PROM Diagnostics

The diagnostics stored in the OpenBoot PROM include:

- POST
- On-board diagnostics

See TABLE 2-2 and Chapter 3 for information on POST. If there is system trouble, you can run on-board diagnostics for thorough tests, including but not limited to:

- Ethernet test
- Memory test
- Diskette drive test
- SCSI disk test

You can run on-board diagnostics from the `ok` prompt. If there is a problem with the operating system, the operating system brings the system to the `ok` prompt. You can also get to the `ok` prompt by shutting down the operating system.

TABLE 2-3 describes selected on-board diagnostic tests and what you must do before you run each test. Some of the tests verify the proper operation of the network controller, the diskette drive system, memory, and the system clock.

TABLE 2-3 Selected On-Board Diagnostic Tests

Type of Test	Description	Preparation
`test screen`	Tests the system video graphics hardware and monitor.	The `diag-switch?` NVRAM parameter must be set to true.
`test floppy`	Tests the diskette drive ability to respond to commands.	Insert a formatted diskette into the drive.
`test scsi`	Tests the SCSI interface logic on the system board.	The `diag-switch?` NVRAM parameter must be set to true.
`test net-tpe` test net	Performs an internal and external loopback test on the TPE interface.	A cable must be connected to the system TPE port and to a TPE hub or the test will fail the external loopback phase. If the `tpe-link-test?` parameter is false (disabled), the external loopback test will appear to pass even if a cable is not connected.

`test disk`
`test disk0`
`test disk1`
`test disk2`
`test disk3`
	Tests internal or external SCSI disks which have a self-diagnostic program contained in the drive controller.	The drive must be spinning before this test is executed or the test will fail. Enter a boot *disk alias* command to cause the drive to spin up.

`test cdrom`	Performs a self-test diagnostic on the CD-ROM drive.	The CD-ROM must be set to SCSI address and have a CD inserted or the test will fail.

`test tape`
`test tape0`
`test tape1`
	Tests the SCSI tape drive by executing the drive self-test program. `tape` and `tape 0` are the first tape drive. `tape 1` is the second tape drive.	The tape drive must be set to SCSI address 4 (tape 0) or address 5 (tape 1) and a tape must be installed.

`test ttya`	Tests serial port. Outputs an alphanumeric test pattern on the system serial port (ttya = serial port A).	Attach a terminal to the serial port to observe the output.

TABLE 2-3 Selected On-Board Diagnostic Tests *(Continued)*

Type of Test	Description	Preparation
`test keyboard`	This test executes the keyboard self- test. The four LEDs on the keyboard should flash on once, and the message `Keyboard Present` is displayed.	Keyboard must be connected.
`test-memory`	Tests all of the system main memory.	Set `diag-switch?` or `selftest-#megs` to the desired parameter.
`test-all`	Tests all devices in the system which have a built-in test program. Hard disks, tapes, and CD-ROMs are not tested.	Set the `diag-switch?` parameter to true.
`watch-clock`	Displays seconds from the system's Time of Day chip.	None.
`watch-net`	Monitors broadcast Ethernet packets on the Ethernet cable connected to the system.	A cable must be connected to the Ethernet port on the system's backpanel.
`watch-tpe`	Monitors broadcast Ethernet packets (10BaseT—Twisted Pair Ethernet) on the Ethernet cable connected to the system.	A cable must be connected to the TPE Ethernet port on the system's backpanel.
`probe-scsi`	Returns the SCSI devices (internal and external) and their SCSI targets connected to the built-in SCSI port.	SCSI devices must be connected to the system's SCSI bus and must be powered on.
power-off	Powers off the system.	You must have a Compact 1 or type 5 keyboard to use this command.

SunDiag System Exerciser

Use the SunDiag system exerciser, which is shipped with and runs under the operating system, to test system resources and peripheral equipment.

If the SunDiag program has been selected during the operating system loading procedure, it can be run at any time. The SunDiag system exerciser is usually located in the directory `/opt/SUNWdiag/bin`. If the SunDiag system exerciser is not on the system hard disk or server, you can load it from CD-ROM. For more information, see the *SunDiag User's Guide*.

If the SunDiag tests pass, the system is operating properly. If the SunDiag tests fail, the error messages indicate the part of the system which has failed. If the error messages are not descriptive enough, you can run POST. See Chapter 3

CHAPTER 3

Power-On Self-Test (POST)

- "Normal Mode" on page 15
- "Diagnostic Mode" on page 15
- "How to Invoke POST at Power On" on page 17
- "Tests POST Runs" on page 17
- "Status Lights (LEDs) and Indicators" on page 20
- "Power-On Self-Test" on page 21

The Power-On Self-Test (POST) diagnostics reside in the OpenBoot PROM located on the system board. There are two POST modes: Normal and Diagnostic.

Normal Mode

Under normal mode, when the system is turned on, control is sent to the OpenBoot PROM. Depending on the options set in the OpenBoot PROM, for example if `diag-switch?` is disabled (set to false) and `auto-boot?` is enabled (set to true), the operating system will load.

Low level diagnostic testing is not run, but memory will be tested based on the setting of the `selftest-#megs` parameter in the system's NVRAM. The default for `selftest-#megs` is 1 (one megabyte). Change this parameter to increase the amount of memory tested at power on time.

Diagnostic Mode

You need to remove the PCMCIA card from the system to run a full diagnostic mode test by POST. If there is any PCMCIA card inserted in the system, POST will not run the following tests:

- PCMCIA Status Chnge Intr Test
- PCMCIA I/O Interrupt Test
- PCMCIA Card Detect Intr Test
- PCMCIA I/O St Chnge Intr Test

If an error or errors occur during the POST, all error messages are displayed on the TTY, `tip` window or display panel.

Setting Up a `tip` Connection to Another Workstation

You can use the serial port on the SPARCstation Voyager workstation to connect to another Sun workstation (either the same type of SPARC system or a different type of Sun workstation or server system). This connection lets you use a shell window on the Sun workstation as a terminal to the SPARCstation Voyager workstation being tested.

The `tip` method is recommended, because it lets you use SunOS windowing and operating system features to help you work with the boot PROM.

1. **Connect the SPARCstation Voyager workstation serial port (TTYa) to another Sun workstation TTYa 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 lines to the file** `/etc/remote`**:**

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

3. **In a shelltool window on the Sun workstation, type** `tip hardwire`**. (Some commands will not work properly in a command tool window.)**

   The system will reply `connected`.

```
hostname% tip hardwire
connected
```

   The shell window is now a `tip` window directed to the Sun workstation serial port.

4. **When you are finished running POST and want to disconnect the** `tip` **window, type** `kill -9` **and the process ID number of the** `tip` **hardwire process.**

```
hostname% kill -9 PID# of tip hardwire process
```

How to Invoke POST at Power On

You can invoke POST at power on with or without a keyboard. The following flowchart shows the steps to POST and the options available.

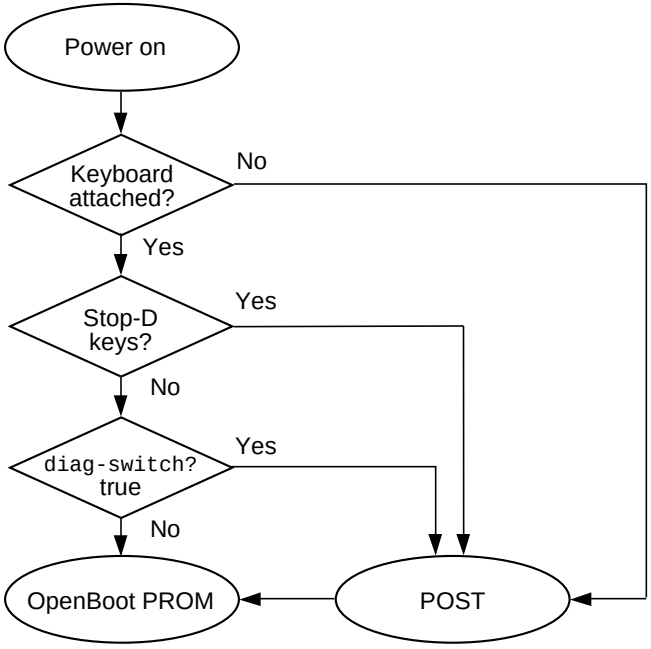

FIGURE 3-1 How to Invoke POST

Tests POST Runs

Following is a sample listing from OpenBoot PROM version 2.15, or later versions of the diagnostic mode tests completed by POST in a SPARCstation Voyager workstation.

These messages are sent to the system's serial port and can be viewed by attaching a terminal or `tip` window to the port.

```
SMCC SPARCstation Voyager POST version x.x (xx/xx/xx)

MMU Context Table Reg Test
MMU Context Register Test
MMU TLB Replace Ctrl Reg Test
MMU Sync Fault Stat Reg Test
MMU Sync Fault Addr Reg Test
MMU TLB RAM NTA Pattern Test
MMU TLB CAM NTA Pattern Test
MMU TLB LCAM NTA Pattern Test
IOMMU SBUS Config Regs Test
IOMMU Control Reg Test
IOMMU Base Address Reg Test
IOMMU TLB Flush Entry Test
IOMMU TLB Flush All Test
SBus Read Timeout Test
EBus Read Timeout Test
D-Cache RAM NTA Test
D-Cache TAG NTA Test
I-Cache RAM NTA Test
I-Cache TAG NTA Test
Memory Address Pattern Test
Memory Checker Pattern Test
FPU Register File Test
FPU Single -precision Test
FPU Double-precision Test
FPU SP Invalid CEXC Test
FPU SP Overflow CEXC Test
FPU SP Divide-by-O CEXC Test
FPU DP Inexact CEXC Test
FPU DP Trap Priority > Test
FPU DP Trap Priority < Test
PROCO Interrupt Regs Tests
```

```
Soft Interrupts OFF Test
Soft Interrupts ON Test
PROCO User Time Test
PROCO Counter/Timer Test
DMA E CSR Register Test
LANCE Address Port Tests
LANCE Data Port Tests
DMA D_CSR Register Test
DMA D_ADDR Register Test
DMA D_BCNT Register Test
DMA D_NADDR Register Test
ESP Registers Tests
DMA P_CSR Register Test
DMA P_ADDR Register Test
DMA P_BCNT Register Test
PPORT Registers Test
NVRAM Access Test
TOD Registers test
PMC Registers test
PMC SCSI Power test
PMC Audio Power Test
PMC D/A to A/D Loop Test
MIC Registers Test
MIC FIFO Loop Test
MIC SCC Internal Loop Test
MIC SCC TX Empty Intr Test
MIC RX Timeout Intr Test
MIC RX Watermark Intr Test
MIC TX Watermark Intr Test
MIC Flow Control Test
MIC IR Board Loop Test
PCMCIA Registers Test
PCMCIA Internal Loop Test
PCMCIA Status Chnge Intr Test
PCMCIA I/O Interrupt Test
PCMCIA Card Detect Intr Test
PCMCIA I/O St Chnge Intr Test
```

Status Lights (LEDs) and Indicators

The power light emitting diode (LED) at the front of the chassis remains lit when the system is operating normally. FIGURE 3-2 shows the location of the power LED.

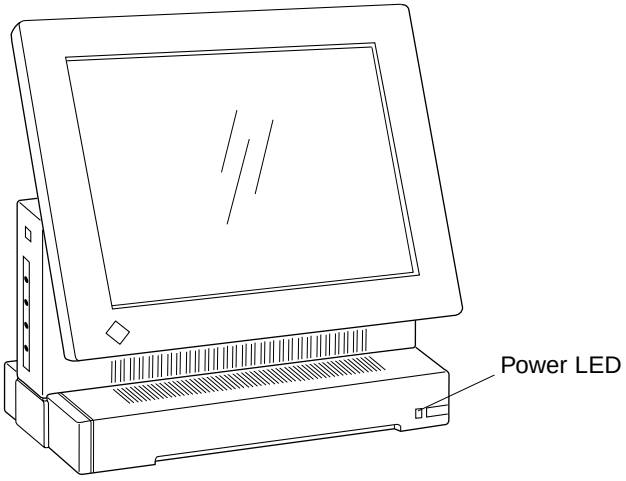

FIGURE 3-2 Power LED

This section describes the keyboard LED sequences displayed at power on when POST fails. If a failure occurs in POST, the keyboard displays a specific LED pattern. See FIGURE 3-3 and TABLE 3-1. After POST is completed and during normal system operation, the LEDs should not be interpreted as diagnostic error indicators.

Following system initialization, the operating system boots automatically, unless the NVRAM configuration options specify not to do so.

Note – The Caps Lock key LED, located just below the left Shift key, is not used as a power-on test failure indicator, but flashes on and off while POST is running.

Power-On Self-Test

This section describes the keyboard LED patterns as a result of POST and their meaning. FIGURE 3-3 shows the location of the LED keys on the Sun Compact 1 keyboard. TABLE 3-1 lists the meaning of the LED keys.

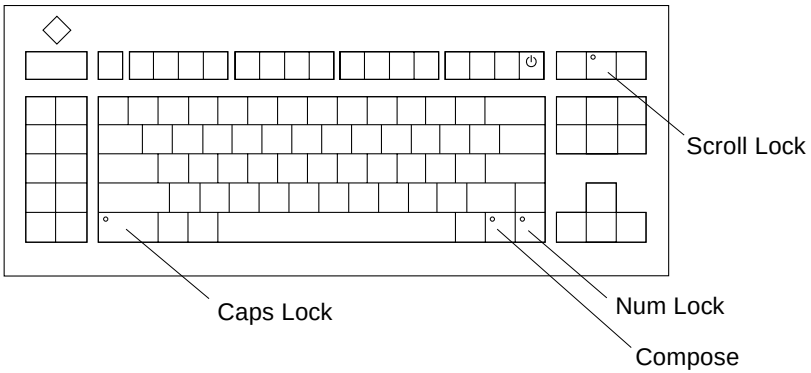

FIGURE 3-3 Arrangements of the Sun Compact 1 Keyboard LEDs

TABLE 3-1 Keyboard LEDs Description

LED State	Description
Caps Lock flashing or lit	POST is running
Num Lock on	Either CPU board or a memory card has failed. See “POST Error Messages” on page 21.
Scroll Lock on	Is not applicable
Compose on	Is not applicable

If the Caps Lock key fails to flash on and off after you have pressed and held the Stop-D keys when you power on the system, POST failed.

POST Error Messages

The following are the possible POST error messages that will be displayed after POST runs.

If the CPU failed:

```
STATUS : Power-On Selftest FAILED ... Replace Main Logic Board
```

If the upper memory card failed:

```
STATUS : Power-On Selftest FAILED ... Replace Upper Memory Card
```

If the lower memory card failed:

```
STATUS : Power-On Selftest FAILED ... Replace Lower Memory Card
```

The upper memory card is the one located farthest from the CPU board. The lower memory card is the one located closest to the CPU board.

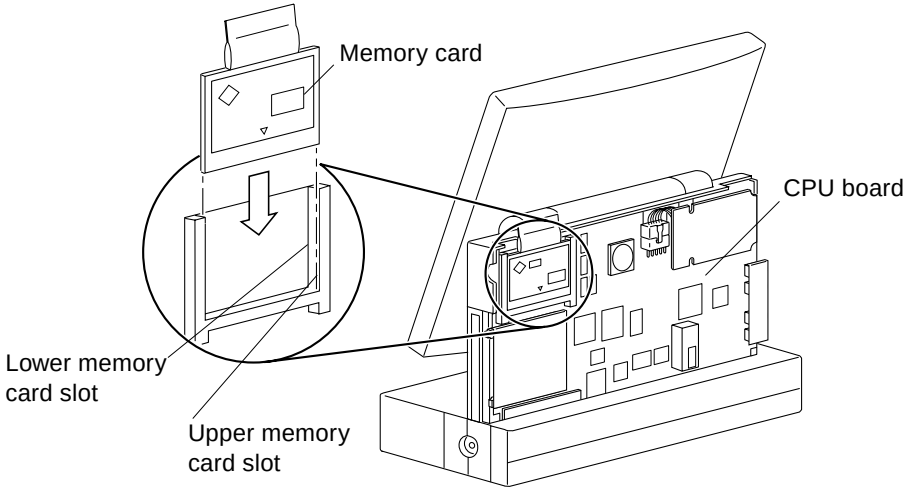

FIGURE 3-4 Upper and Lower Memory Cards Location

After POST Ends

Use FIGURE 3-5 to determine what diagnostics tests to run after the POST ends.

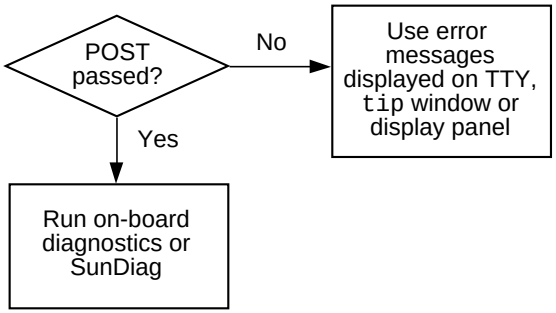

FIGURE 3-5 Tests to Run After Running POST

CHAPTER 4

Troubleshooting Procedures

This chapter describes how to troubleshoot problems you might experience and the corrective actions you can take.

- "Troubleshooting Tips" on page 25
- "Power On Does Not Succeed" on page 26
- "Display Panel Problems" on page 28
- "Disk Drive or SCSI Errors" on page 29

Troubleshooting Tips

TABLE 4-1 lists the potential problems and corrective measures.

TABLE 4-1 Troubleshooting Tips

Symptoms	Corrective Actions	References
Panel display is off	Press the Shift, Control or Alt key	
	Press Power key	
	Make sure all cable connections are secure	See *SPARCstation Voyager* hardware setup or *SPARCstation Voyager User's Guide*
	Make sure the power supply is installed properly	See *SPARCstation Voyager* ~ ⎓ battery installation and charging or *SPARCstation Voyager User's Guide*
	Make sure wall outlet has power if it is running on AC power	
	Recharge the battery, or replace the battery with the power supply if a battery is used	See *SPARCstation Voyager* ~ ⎓ battery installation and charging or *SPARCstation Voyager User's Guide*

TABLE 4-1 Troubleshooting Tips

Symptoms	Corrective Actions	References
System doesn't power on	Do corrective actions as if your panel display is off	
	Press Stop-D keys immediately after power on to call up POST	
Battery needs recharging too soon	Use the Power Manager to decrease power usage	See *SPARCstation Voyager User's Guide*
Mouse pointer is not on the panel display	Make sure the mouse cable is connected properly	
Mouse does not work smoothly	Clean the mouse	See *SPARCstation Voyager User's Guide*

Power On Does Not Succeed

1. **Check that the AC power cord is connected to the wall outlet and to the power supply.**
2. **Verify that AC power is being supplied from the wall outlet by using a VOM.**
3. **Remove the power supply from the system and connect it to the wall outlet. The LED on the power supply should light to indicate the power supply is working. If the LED does not light, the power supply is defective.**
4. **If the system runs on battery, connect the external DC cable to the DC input connector on the back panel and to the power supply. The battery may be dead or defective.**
5. **If power on fails using the keyboard power-on key, press the power switch at the rear of the system. If power on succeeds, the cable for the keyboard may be damaged or incorrectly connected. Or, the keyboard may be defective.**
6. **The CPU board may have failed. See Section "System Board Test" on page 4-27.**
7. **The DC/DC converter may have failed. See Section "DC/DC Converter Test" on page 4-27.**

System Board Test

1. **Connect a terminal to the system serial port, or use a `tip` connection to another workstation to view POST progress and failure information.**

   See Section "Setting Up a tip Connection to Another Workstation" on page 3-16.

2. **Press and hold the `Stop-D` keys. While holding the keys down, press the power-on key. Observe the keyboard LEDs.**

   - The Caps Lock key should flash on and off, indicating the system is running the POST.
   - If the `Caps Lock` key fails to flash, POST failed to start or a test has failed. Remove optional parts of the system such as memory cards and PCMCIA cards, and try to run POST again.
   - If a test fails, POST uses other keyboard LEDs to indicate which part of the system has failed. See Section "Power-On Self-Test" on page 3-21.

3. **Observe the POST progress messages on the system serial port. It provides additional diagnostic information.**

DC/DC Converter Test

1. **Remove the rear cover of the system to expose the DC/DC converter.**

   See Section "Opening the Rear of the System" on page 7-43.

2. **Press the power switch on. Use a VOM to measure the voltages at the DC/DC converter connector (location J0900 on the CPU board).**

   See TABLE 4-2 below for the expected voltages.

Note – The DC/DC converter should remain connected to the CPU board during this test.

TABLE 4-2 DC/DC Converter Voltages

Pin	Wire Color	Description
1	White	BATT_VSPL
2	Black	BATT_RTN
3	Orange	+12V
4	Red	+5V
5	Red	+5V

TABLE 4-2 DC / DC Converter Voltages

Pin	Wire Color	Description
6	Brown	Ground
7	Brown	Ground
8	Blue	Ground
9	Yellow	+3.3V
10	Green	BATT_RTN

3. **Replace the DC/DC converter if any of the expected DC voltage is not present.**
4. **Replace the CPU board if DC voltages are still not present after replacing the DC/DC converter. This may indicate a shorted component on the CPU board.**

Display Panel Problems

No Video Output on Display Panel

1. **Check the following connections to make sure they are secured**:
   - Connection between the display panel and the video board
   - Connection between the flex cable and the video board
   - Connection between the flex cable and the CPU board
2. **If a monitor is available, connect it to the 13W3 video port at the rear of the system and power on the system. If data appears on the monitor, the video board is not defective. Replace the display panel.**
3. **If no monitor is available to test the video board, replace the video board first and retest the system. If video output is still not seen, replace the display panel. Replace the CPU and the flex cable if the previous steps fail to restore the video.**

Lines or Blank Areas on the Display Panel

1. **If a monitor is available, connect it to the 13W3 video port at the rear of the system and power on the system. If similar defects appear on the monitor, replace the video board.**

2. **If solid lines appear, replace the display panel.**

   Solid lines usually indicates display panel failures.

3. **If lines persist after replacing the display panel, replace the video board and/or the flex cable.**

Disk Drive or SCSI Errors

TABLE 4-3 lists disk drive error conditions and corrective actions.

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 internal disk as c0t3d0. If a different drive id is indicated, it is probably an external disk.
Drive fails to boot or does not respond to commands.	SCSI controller or disk may be defective. See Section “Testing the System SCSI Controller” on page 4-29. If the problem is with an external disk, the SCSI terminator may be missing, defective, or incorrectly installed on the last device in the SCSI chain.

Testing the System SCSI Controller

To test the system’s SCSI controller, test the drive’s response to the `probe-scsi` command.

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

   See the following example:

```
ok probe-scsi
Target 3
Unit 0   Disk      TOSHIBA MK2326FB      A10S
```

   If the internal disk drive responds and a message similar to the example above is displayed, the system's SCSI controller has successfully probed the device. This indicates that the CPU board is working properly.

   If the disk drive does not respond:

2. **Verify that all SCSI devices on the SCSI chain have a different SCSI address. The internal disk drive is set to SCSI address 3. Do not assign SCSI address 7 to any device. This address is reserved for the system SCSI controller.**
3. **If external SCSI devices are connected to the system, verify that all SCSI cables and the SCSI terminator are connected securely. The SCSI terminator must be connected to the last physical SCSI device in the chain.**
4. **Check the SCSI cables to make sure there are no bent pins.**
5. **After checking the previous causes and the problem persists, replace the unresponsive SCSI device.**
6. **If the problem still occurs after replacing the SCSI device, replace the CPU board.**
7. **If replacing the SCSI device and the CPU board does not correct the problem, replace the I/O board.**

Memory Errors

If the operating system, diagnostic program, or POST does not display a memory card location as part of a memory error message, and the only available information is a physical memory address, use TABLE 4-3 to locate the memory errors. See FIGURE 4-1 for memory cards locations.

TABLE 4-4 Physical Memory Address and Memory Locations

	Physical Memory Address Range	Memory Location
Bank #0	0000000 - 0ffffff 1000000 - 1ffffff	CPU on-board memory 16 MBytes
Bank #1	2000000 - 2ffffff 3000000 - 3ffffff	Lower memory card 16 or 32 MBytes
Bank #3	6000000 - 6ffffff 7000000 - 7ffffff	
Bank #5	a000000 - affffff b000000 - bffffff	Upper memory card 16 or 32 MBytes
Bank #7	e000000 - effffff f000000 - fffffff	

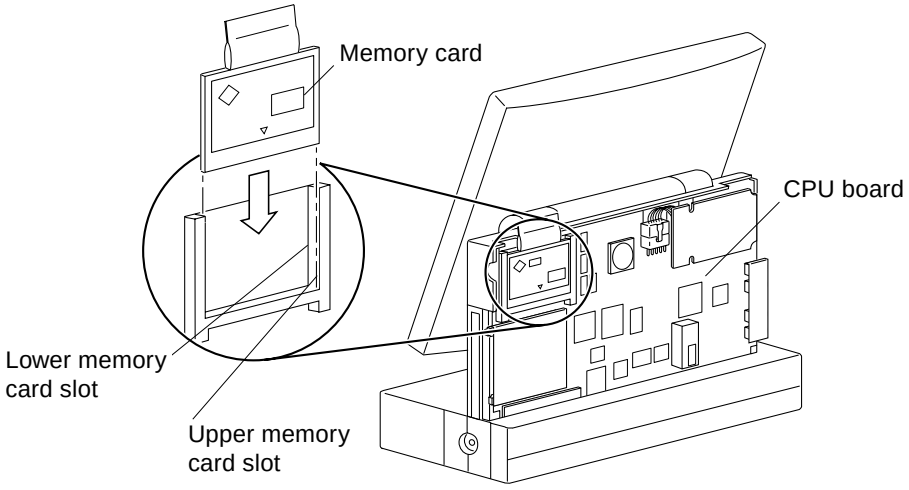

FIGURE 4-1 Upper and Lower Memory Card Location

For example, if physical memory address 125febc is indicated as the failing memory location, TABLE 4-3 shows that this address is within the CPU on-board memory range. The CPU board should be replaced to correct this failure.

If memory errors occur between the address ranges of 2000000 and 7ffffff, replace the lower memory card. If memory errors occur between the address ranges of a000000 and fffffff, replace the upper memory card.

CHAPTER 5

Safety and Tools Requirements

Before beginning any procedure, read the instructions and cautions in this section. This information explains how to work safely when servicing a Sun Microsystems product.

Safety Requirements

For your protection, observe the following safety precautions when setting up your equipment:

- Follow all cautions, warnings, and instructions marked on the equipment.
- Ensure that the voltage and frequency rating of the power outlet you use matches the electrical rating label on the equipment.
- Never push objects of any kind through openings in the equipment as they may touch dangerous voltage points or short out components that could result in fire or electric shock.
- Refer servicing of equipment to qualified personnel.

Symbols

The following symbols mean:

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

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

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

Safety Precautions

Modification to Equipment

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

Placement of a Sun product

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

Power Cord Connection

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

Electrostatic Discharge

Caution – The boards and hard disk drive contain electronic components that are extremely sensitive to static electricity. Ordinary amounts of static from your clothes or work environment can destroy components.

Do not touch the components themselves or any metal parts. Wear a wrist strap when handling the drive assembly, board, or card.

Lithium Battery

Caution – On Sun CPU boards, there is a lithium battery molded into the real-time clock, SGS No. MK48T08. 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.

Rechargeable Battery

Caution – Handle damaged or leaking lithium-ion battery with extreme care. If the battery is damaged, electrolyte may leak from the cells and may cause personal injury.

Display Panel

Caution – High voltage is present in the backlight assembly interior. Do not disassemble the panel.

Caution – The florescent tubes in the backlight assembly contain mercury vapor. Breathing the mercury vapor can be harmful. If breakage occurs, move out of the vicinity until the vapor clears.

Caution – The liquid crystal material can be harmful if breakage occurs. Be sure to wash your hands to avoid accidentally ingesting the liquid crystal material.

Caution – The display panel's front surface is plastic and easily damaged. Do not press on the front of the display panel. Discoloration and damage can occur. Clean it with a soft cloth dampened with water.

Tools Required

- Screwdriver, Phillips #1
- Hex nut driver, 3/16 inches
- Flat blade screwdriver
- Grounding wrist strap
- Volt-Ohmmeter (VOM) for checking voltages and continuity
- Antistatic surface

You will need an antistatic surface on which to place static-sensitive parts such as boards, cards, disk drive, and TOD/NVRAM. The following items can be used as an antistatic surface:

- Bag used to wrap a Sun replacement part
- Shipping container used to package a Sun replacement part
- Sun ESD mat, P/N 250-1088. You can purchase it through your Sun sales representative

CHAPTER 6

Power Off and On

This chapter tells you how to turn the power off before you service the system and how to turn the power back on after you have serviced the system.

Powering Off the System

Note – Do not suspend the system prior to removing or replacing any part. You must power off the system.

1. **Become superuser by typing su.**
2. **Type your superuser password.**
3. **Type `init 0`.**

```
machinename% su
password%
machinename# init 0
screen messages
ok
```

4. **Turn off the power to all external units.**

   External units can include external drives, printers, or other serial or parallel devices. See the document supplied with each device.

5. **Press the Shift and power keys to turn off the system.**

   See FIGURE 6-1. If your system does not have a keyboard, go to Step 1.

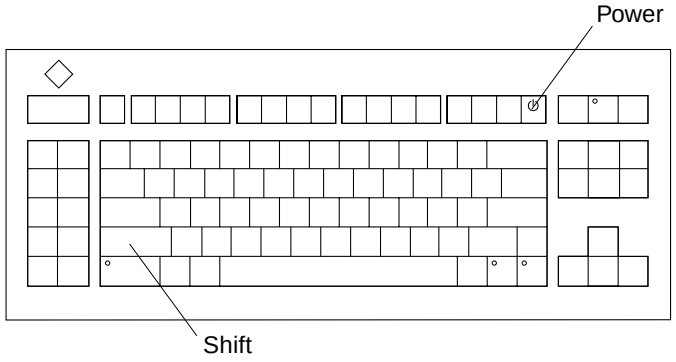

FIGURE 6-1 Power Key Location - Sun Compact 1 Keyboard

6. **Disconnect the keyboard cable from the keyboard port labeled on the back panel of the system.**

   Go to Step 1.

7. **Press the power switch on the back panel.**

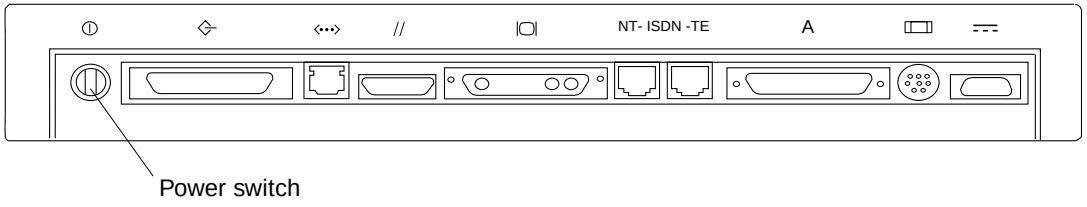

FIGURE 6-2 Power Switch Location

8. **Disconnect the power source.**

   a. **For the system that runs on the power supply:**

      Disconnect the AC power cable from the wall outlet and the power supply.

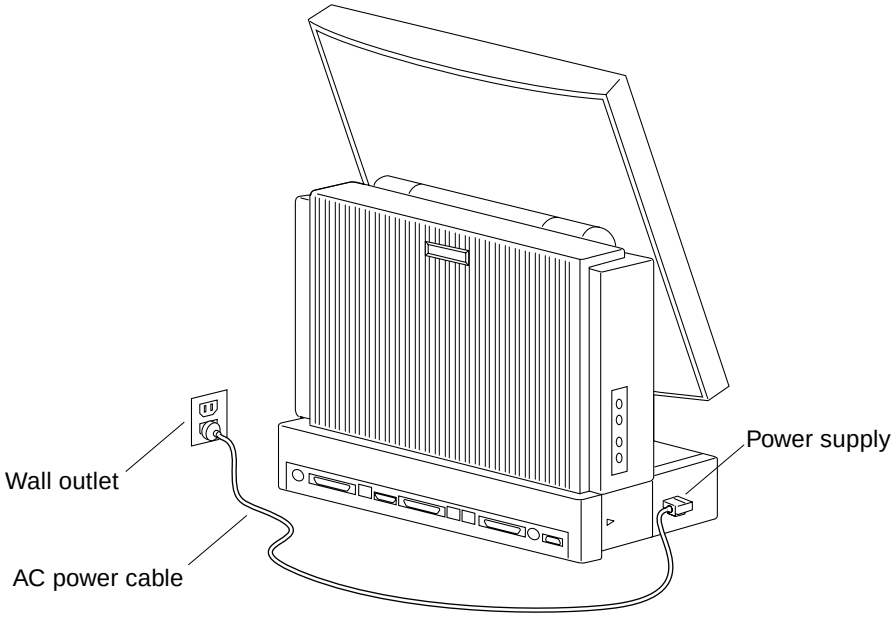

FIGURE 6-3 System With the Power Supply

b. For the system that runs on the battery:

There is no power cable to be disconnected.

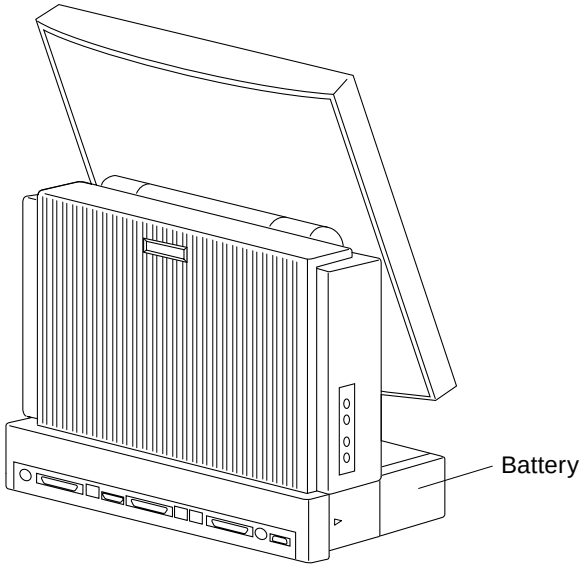

FIGURE 6-4 System With the Battery Installed

c. For the system that contains a battery and runs on the power supply (slow charging the battery):

Disconnect the external DC cable from the DC input connector on the back panel, and disconnect the AC power cable from the wall outlet.

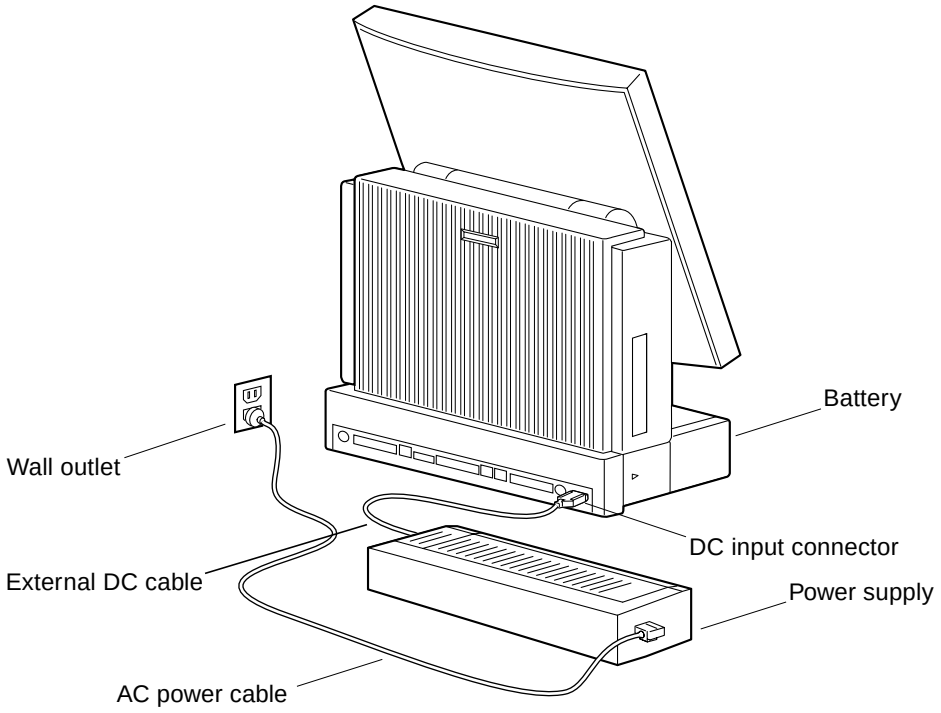

FIGURE 6-5 System With the Battery and Power Supply Installed

9. **Disconnect cables to any external units.**

   See the document supplied with each device.

Powering On the System

1. **Connect the keyboard cable to the keyboard port labeled on the back panel of the system if your system has a keyboard.**
2. **Connect the power source.**

   a. **For the system that runs on the power supply:**

      Connect the AC power cable to the power supply and to the wall outlet. See FIGURE 6-3.

   b. **For the system that runs on the battery:**

      There is no power cable to be connected. See FIGURE 6-4.

c. For the system that contains battery and runs on the power supply (slow charging the battery):

Connect the external DC cable to the DC input connector on the backpanel, and connect the AC power cable to the wall outlet. See FIGURE 6-5.

3. Connect the cables to all external units.

See the manual supplied with each device for instructions.

4. Turn on the power to all external units starting with the unit farthest electrically from the system unit.

The external units can include external drives, printers, or other serial or parallel devices.

5. Press the power key on the system unit keyboard, or press the power switch on the back panel for a system without a keyboard.

See FIGURE 6-1 or FIGURE 6-2. The system will reboot.

CHAPTER 7

Internal Access

Follow the procedure in Section “Powering Off the System” on page 6-37, before you begin.

Opening the Rear of the System

Removing the Power Supply

1. **Slide the power supply door to the unlock position and remove it.**

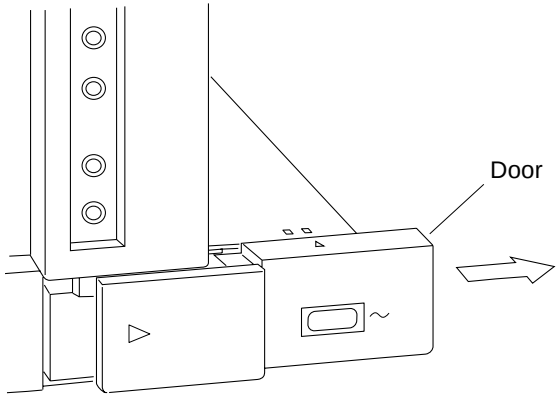

FIGURE 7-1 Removing the Power Supply Door

2. **Pull the pull ring to remove the power supply out of the tunnel.**

   See FIGURE 7-2.

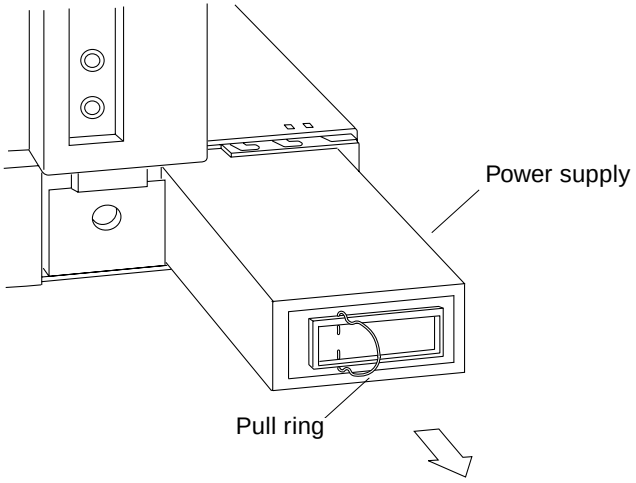

FIGURE 7-2 Removing the Power Supply

Removing the Left Cap

1. **Remove the rubber plug from the left cap.**

   See FIGURE 7-3. Puncture the end of a paper clip into the center of the rubber plug, then pull it out.

2. **Loosen the two screws on the left cap with a Phillips screwdriver.**

3. **Slide the left cap off the unit.**

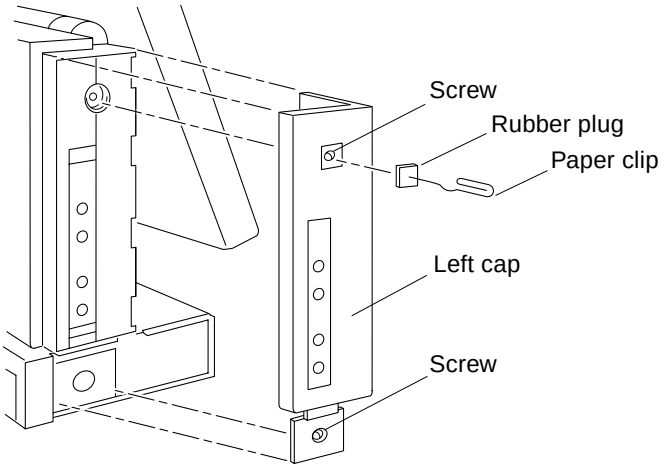

FIGURE 7-3 Removing the Left Cap

Removing the Right Cap

1. **Remove both rubber plugs from the right cap.**

   See FIGURE 7-4. If the lock block was installed, you need to remove the top rubber plug only.

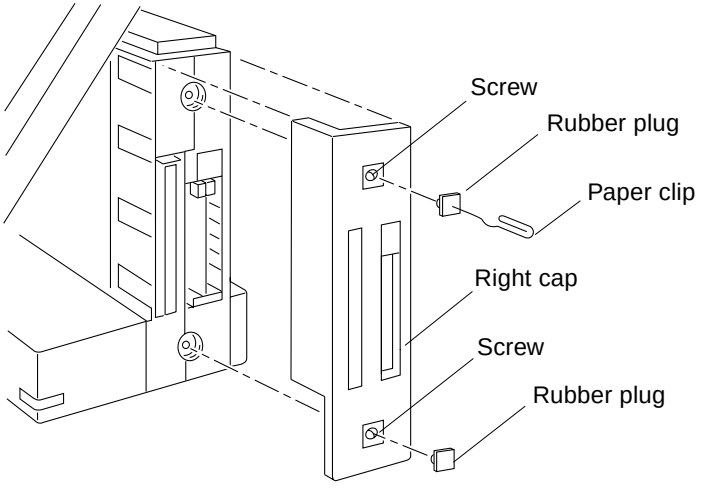

FIGURE 7-4 Removing the Right Cap

2. **Loosen the two screws holding the right cap of the unit with a Phillips screwdriver.**

   See FIGURE 7-4. If the lock block was installed, loosen the top screw only.

Note – If the system has a lock block installed, remove the lock block with a Phillips screwdriver.

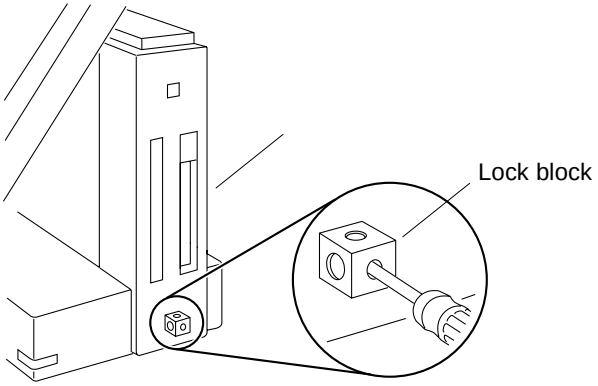

FIGURE 7-5 Removing the Lock Block

3. **Slide the right cap off the unit.**

Removing the Rear cover

- **Hold both ends of the rear cover, slide it back, and then lift it up away from the unit as shown.**

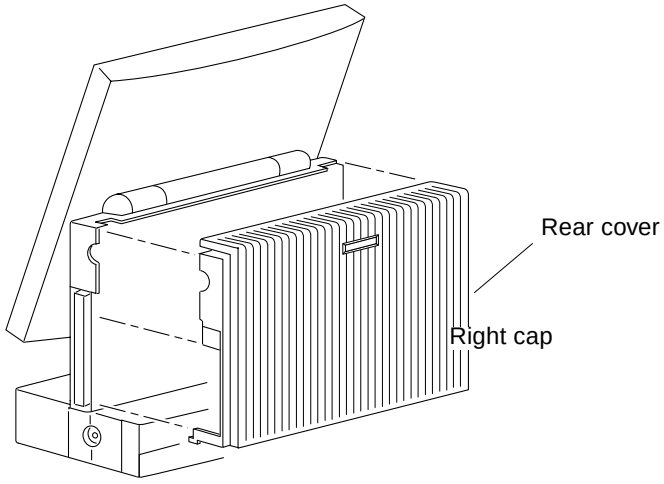

FIGURE 7-6 Removing the Rear Cover

Now you have access to the memory card slots, the CPU board, floppy cable, flex cable and the DC/DC converter.

Caution – Surfaces on the DC/DC converter and the heatsink on the microSPARC II processor may be hot. Avoid contact with these surfaces while they are hot.

Caution – You must attach your wrist strap now. Ordinary amounts of static from your clothes or work environment can destroy components.

For information on how to attach a wrist strap, see the next section, “Attaching the Wrist Strap” on page 47.

Attaching the Wrist Strap

1. **Unwrap the first two folds of the wrist strap. Wrap the adhesive side firmly around your wrist.**

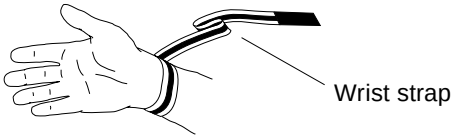

FIGURE 7-7 Wrapping the Wrist Strap Around Your Wrist

2. **Peel the liner from the copper foil at the opposite end of the wrist strap and attach the end to the metal part of the system.**

   See FIGURE 7-8.

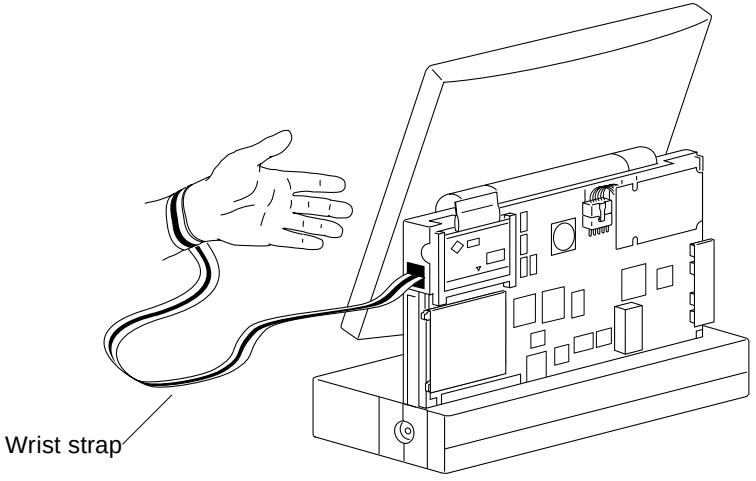

FIGURE 7-8 Attaching the Wrist Strap to the System

Opening the Front of the System

Follow the procedure in Section "Opening the Rear of the System" on page 7-43 before you begin.

Removing the Filler Cover

This section applies to headless (no display panel) systems only. Otherwise, see Section "Removing the Display Panel" on page 7-49.

1. **Loosen the two screws on the filler cover.**

2. **Remove the filler cover by lifting it up.**

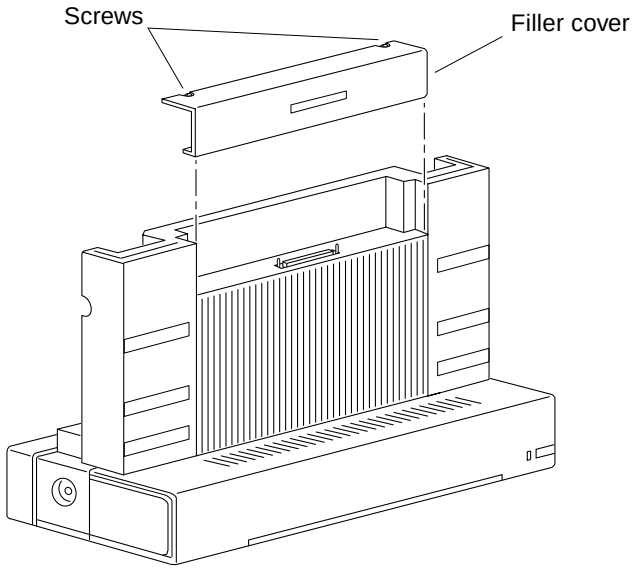

FIGURE 7-9 Removing the Filler Cover

3. **Proceed to Section "Removing the Front Cover" on page 7-50.**

Removing the Display Panel

1. **Loosen the two Phillips screws behind the display panel.**

   See FIGURE 7-10.

2. **Remove the display panel from the system by wiggling it upward.**

Caution – Place the display panel with its front facing down on a flat and clean surface. The front surface could be damaged otherwise.

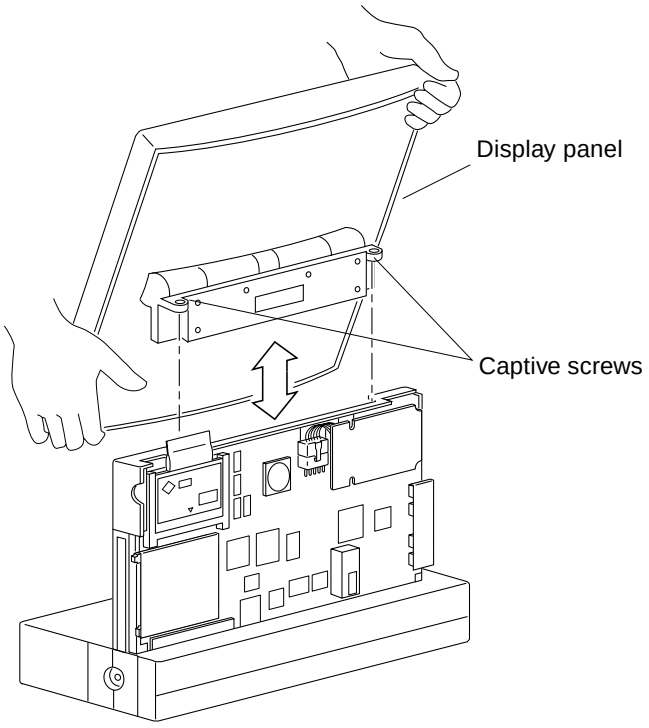

FIGURE 7-10 Removing the Display Panel

Removing the Front Cover

- **Hold both ends of the front cover, and lift it up away from the unit.**

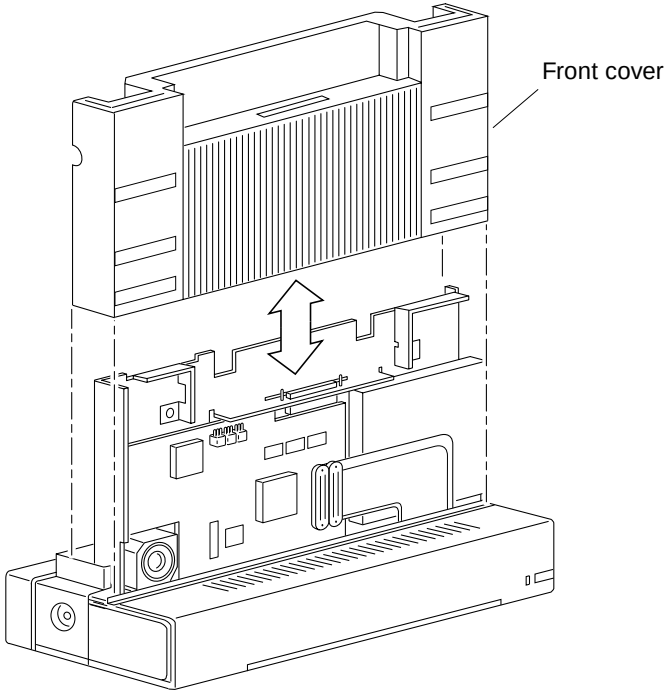

FIGURE 7-11 Removing the Front Cover

Now you have access to the video board, speaker, and floppy drive.

Removing the Bottom Front Cover

- **Remove the bottom front cover by sliding it off the unit.**

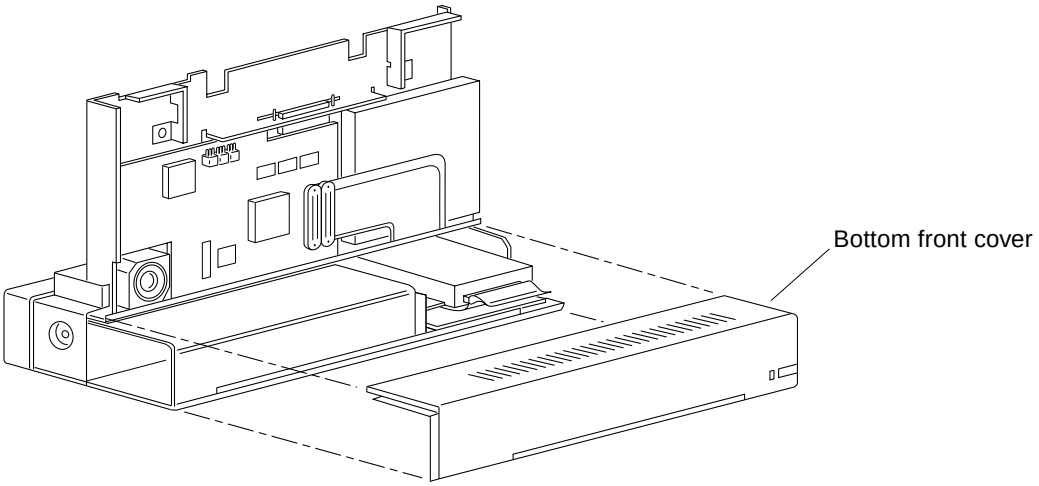

FIGURE 7-12 Removing the Bottom Front Cover

Now you have access to the hard disk drive, the SCSI cable and the IR board.

Removing the Bottom Rear Cover

Caution – You must remove the display panel before laying the unit on its front, to avoid possible damage to the panel.

1. **Lay the system gently on its front.**

   See FIGURE 7-13.

2. **Loosen the Phillips screws attaching the bottom rear cover of the base as shown.**

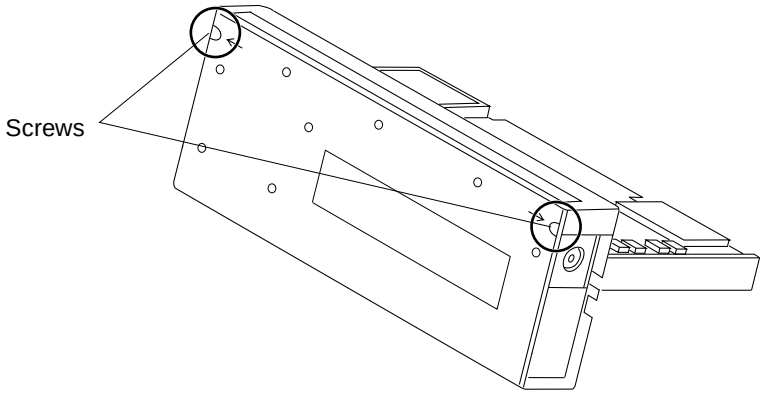

FIGURE 7-13 Loosening the Screws from the Bottom Rear Cover

3. **Place the system right side up.**

4. **Move the floppy drive out of the way.**

   The floppy drive must be moved to allow removal of the bottom rear cover.

   a. Disconnect the flex cable from the video board.

   See FIGURE 7-14. Hold both ends of the connectors and wiggle them out of the sockets.

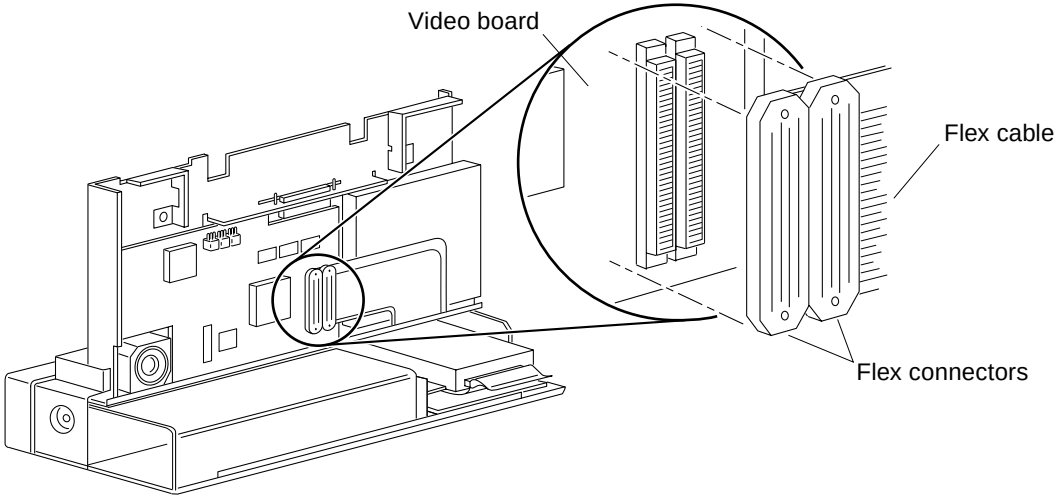

FIGURE 7-14 Flex Connectors Location on the Video Board

b. Loosen the screw on the floppy drive locking lever.

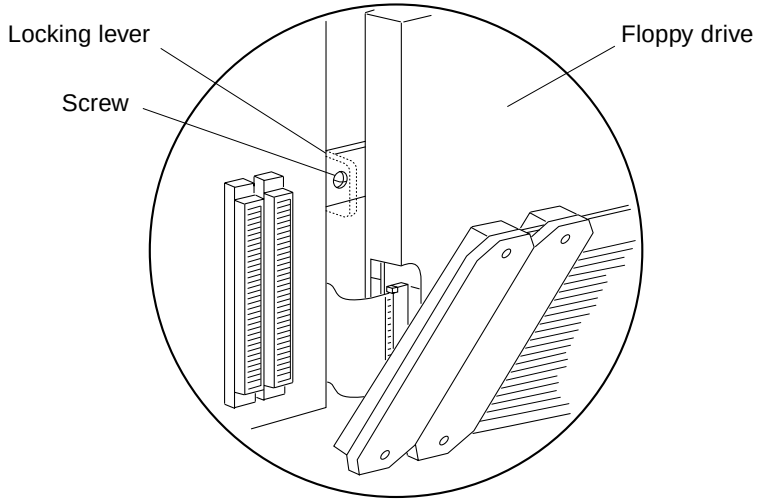

FIGURE 7-15 Screw on the Floppy Drive Locking lever

c. Gently pull the locking lever toward the drive, slide the floppy drive to the right, and leave it hanging.

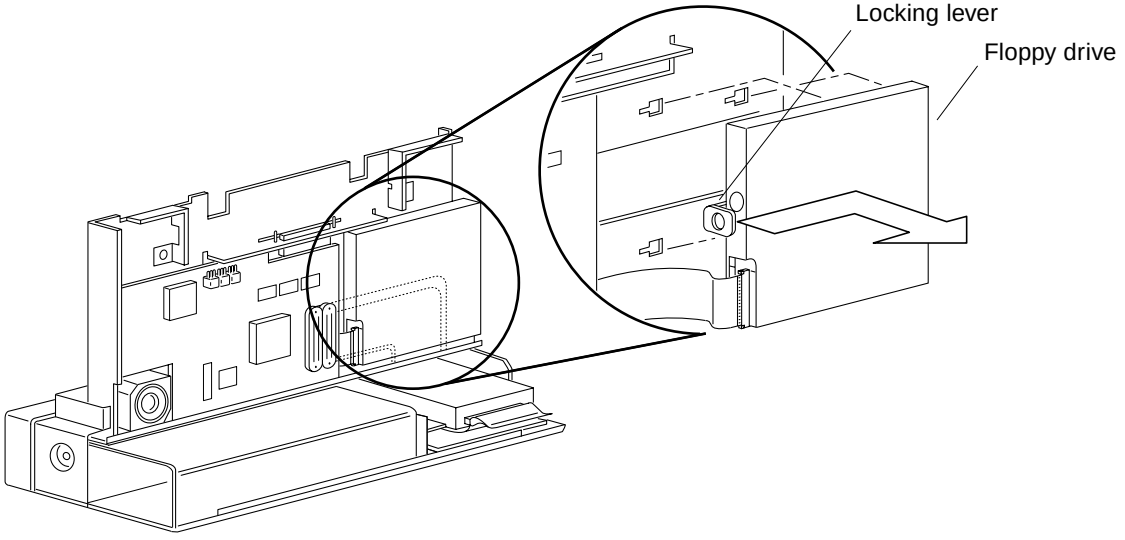

FIGURE 7-16 Removing the Floppy Drive

5. Hold and raise the bottom rear cover slightly, then pull the left side toward the right side of the unit.

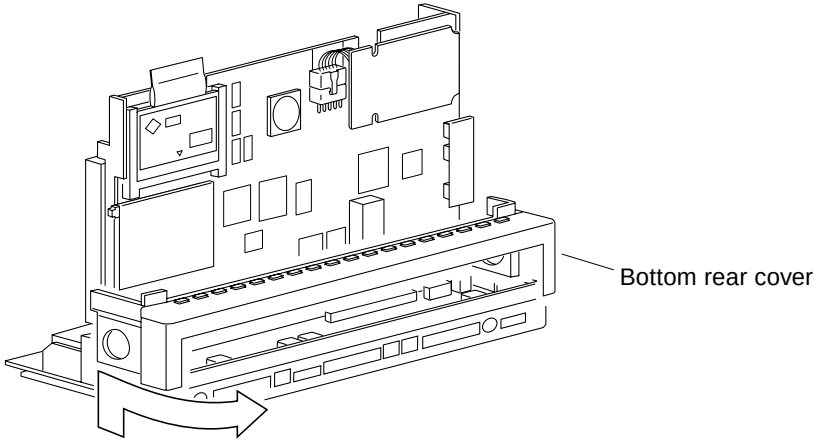

FIGURE 7-17 Removing the Bottom Rear Cover

Now you have access to the IR cable and the I/O board.

Closing the System

Replacing the Bottom Rear Cover

Replace the bottom rear cover if it has been removed.

1. **Hold the bottom rear cover at both ends and place it on the unit.**

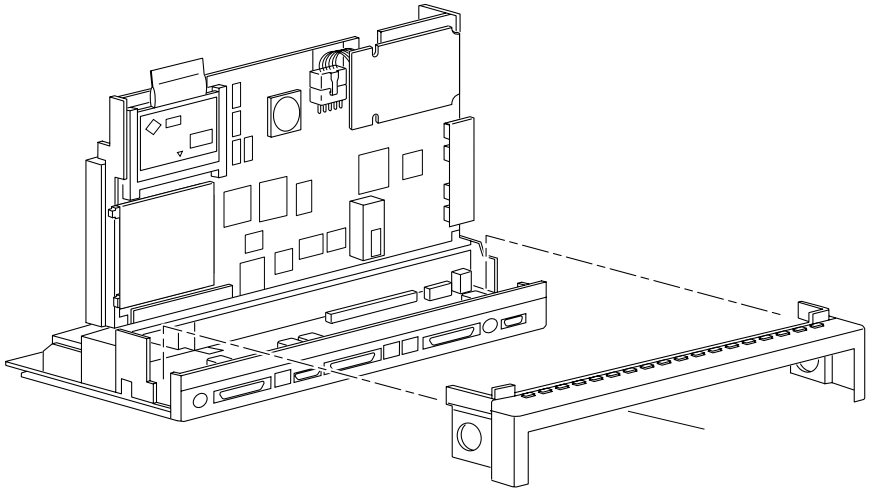

FIGURE 7-18 Replacing the Bottom Rear Cover

2. Replace the floppy drive.

a. Position the floppy drive so that the four mounting feet are aligned with the four slots on the system.

See FIGURE 7-19.

b. Push the four mounting feet in the slots and slide the floppy drive toward the video board until you hear it click.

See FIGURE 7-19.

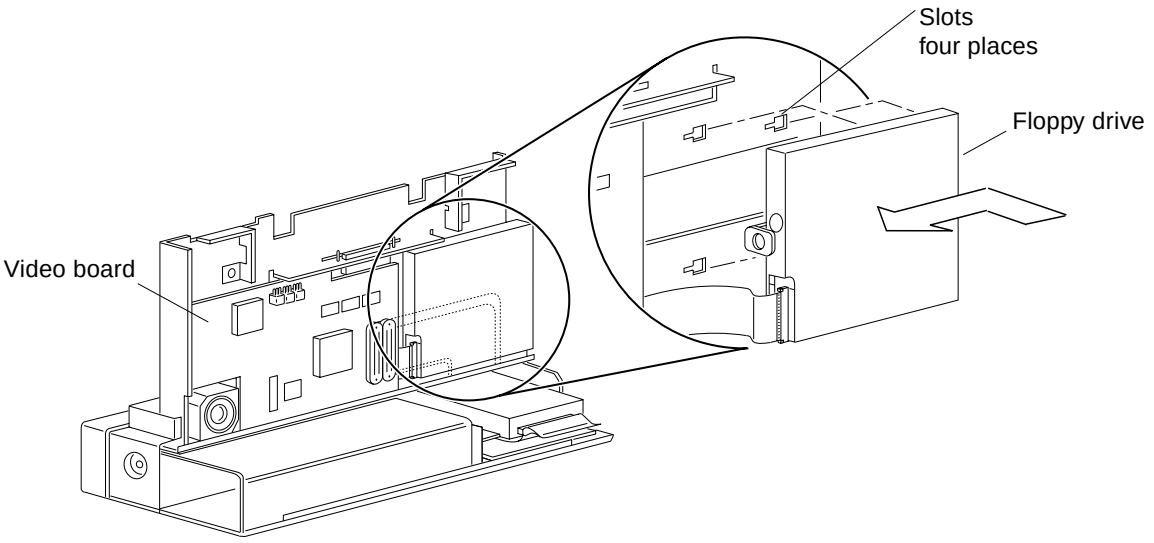

FIGURE 7-19 Replacing the Floppy Drive

c. Tighten the screw on the floppy drive locking lever.

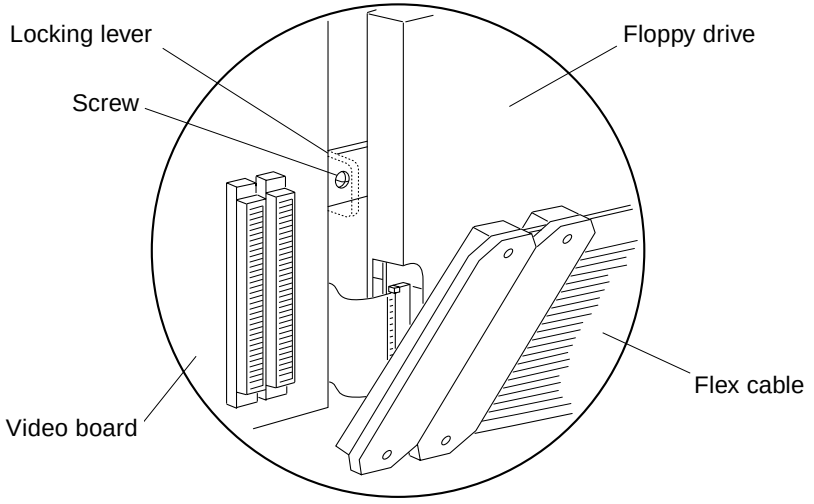

FIGURE 7-20 Screw on the Floppy Drive Locking Lever

d. Connect the flex cable to the video board.

See FIGURE 7-20.

e. Lay the system on its front.

See FIGURE 7-13.

Caution – You must remove the display panel before laying the unit on its front, to avoid possible damage to the panel.

3. Tighten the two screws to secure the bottom rear cover to the base.

See FIGURE 7-13. Do not overtighten the screws.

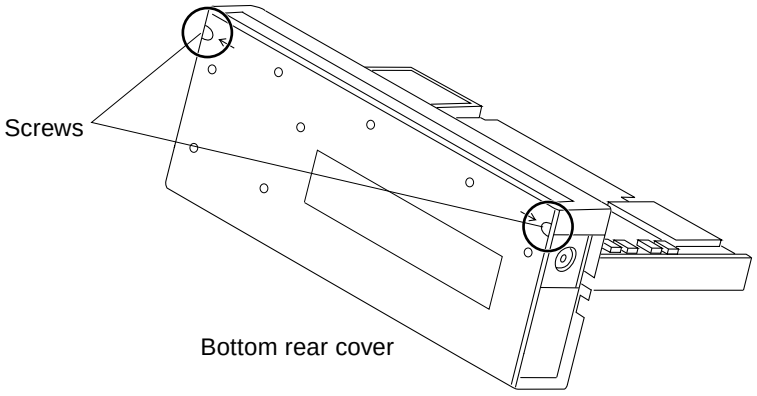

FIGURE 7-21 Screws in the Bottom Rear Cover

Replacing the Bottom Front Cover

Replace the bottom front cover, if it has been removed.

- **Hold the bottom front cover at both ends and gently slide it onto the system.**

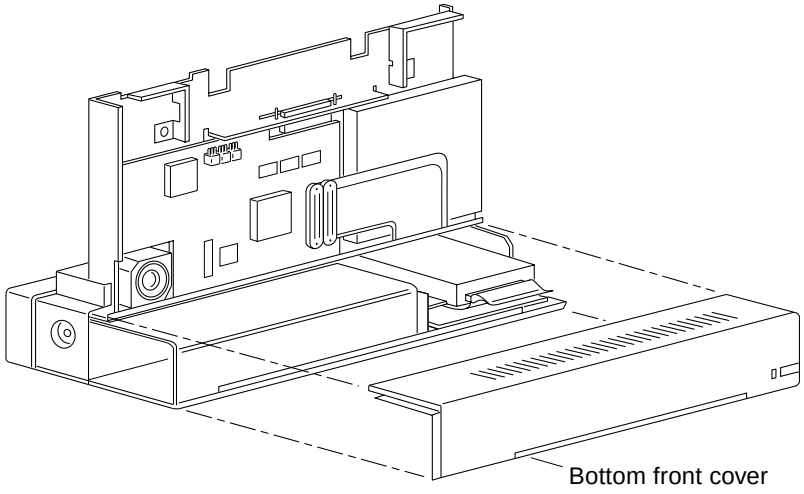

FIGURE 7-22 Replacing the Bottom Front Cover

Replacing the Front Cover

1. **Hold both ends of the front cover and line it up with the system.**

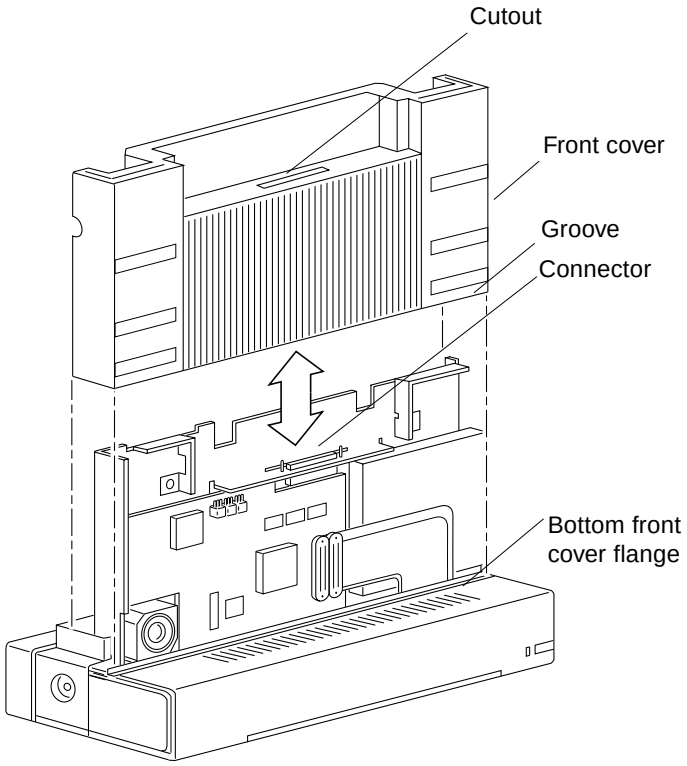

FIGURE 7-23 Replacing the Front Cover

2. **Slide the front cover down so the connector comes through the cutout at the center, and the flange of the bottom front cover slides into the groove at the bottom of the front cover.**

Replacing the Display Panel

1. **Hold the display panel with both hands, position it as shown in** FIGURE 7-24**, and push it down until the connector sits in the socket.**

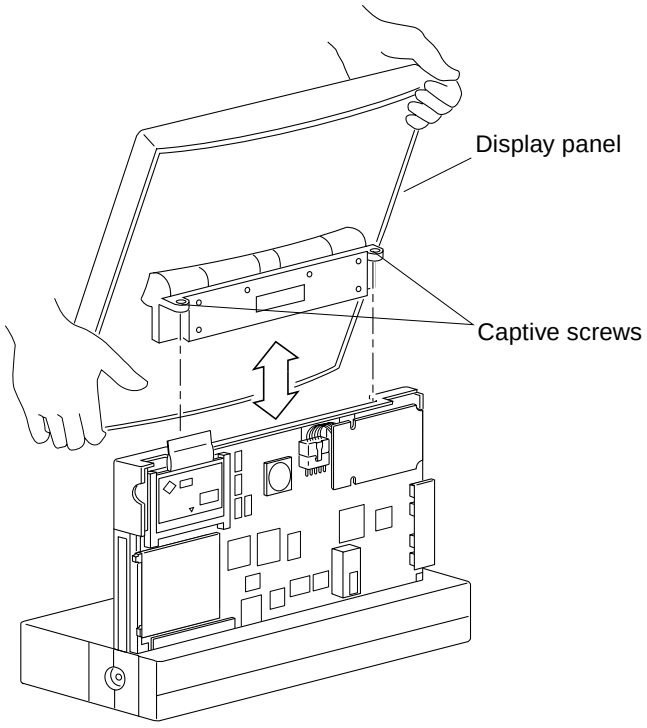

FIGURE 7-24 Replacing the Display Panel

2. **Tighten the two captive screws on the display panel.**
   Do not overtighten the screws.

Replacing the Rear Cover

1. **Remove the wrist strap from the system and your wrist.**
2. **Hold both ends of the rear cover, line it up as shown, and then slide it in.**

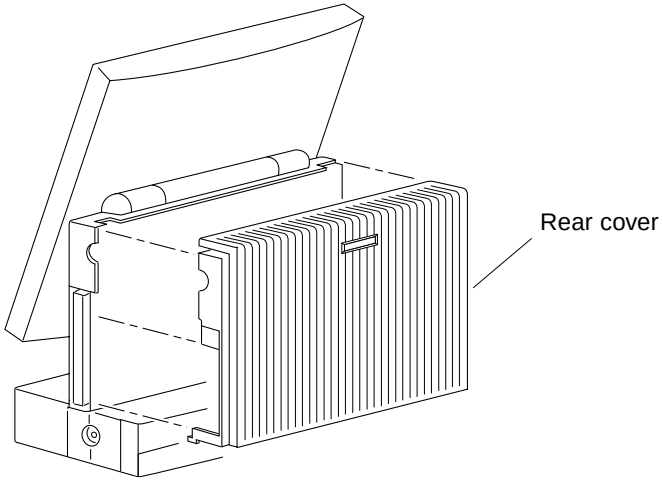

FIGURE 7-25 Replacing the Rear Cover

Replacing the Right Cap

1. **Hold the front and rear covers together and slide the right cap onto the unit.**

   See FIGURE 7-26.

2. **Tighten the two screws to secure the right cap on the unit.**

   Do not overtighten the screws. If a lock block was installed, tighten the top screw only.

3. **Insert both rubber plugs into the right cap.**

   If a lock block was installed, insert the top rubber plug only.

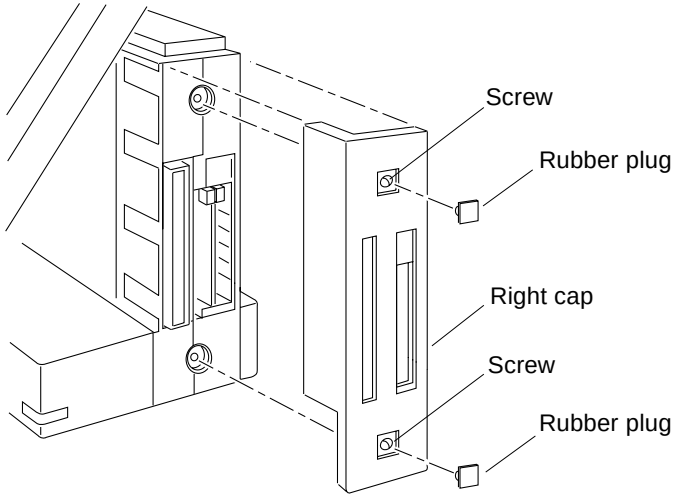

FIGURE 7-26 Replacing the Right Cap

Note – If the system has a lock block installed, insert the lock bock into the lower right cap hole and tighten the screw.

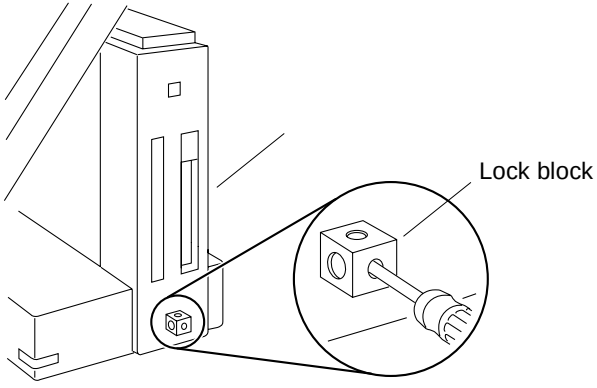

FIGURE 7-27 Replacing the Lock Block

Replacing the Left Cap

1. **Hold the front and rear covers together and slide the left cap onto the unit.**

   See FIGURE 7-28.

2. **Tighten the two screws to secure the left cap on the unit.**
   Do not overtighten the screws.
3. **Insert the rubber plug in the left cap.**

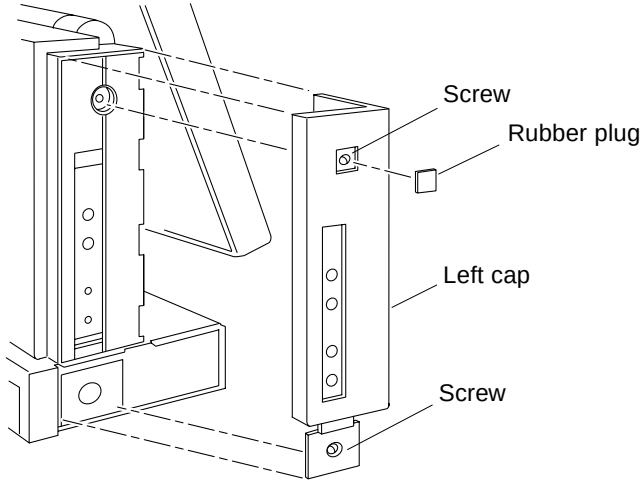

FIGURE 7-28 Replacing the Left Cap

Replacing the Power Supply

1. **Insert the power supply into the tunnel, and slide it in.**

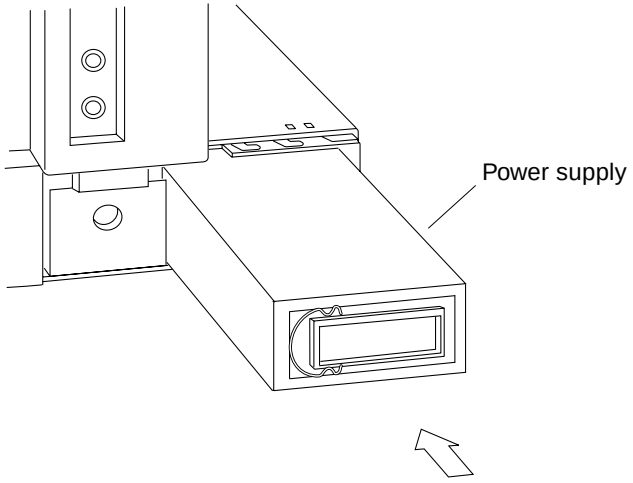

FIGURE 7-29 Replacing the Power Supply

2. Replace the power supply door by sliding it to the locked position.

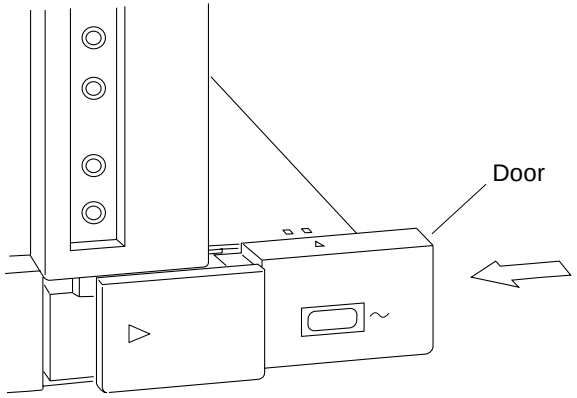

FIGURE 7-30 Replacing the Power Supply Door

CHAPTER 8

Major Subassemblies

This chapter explains how to remove and replace the major subassemblies. See Section "List of Replacement Parts" on page 11-111 for the part numbers and description of replaceable parts. The following is the list of the major subassemblies:

- "Display Panel" on page 68
- "Power Supply" on page 69
- "Speaker" on page 69
- "DC/DC Converter" on page 70
- "SCSI Cable" on page 72
- "Floppy Cable" on page 73
- "Flex Cable" on page 81

Refer to the following before you remove any part:

- "Safety Requirements" on page 33
- "Powering Off the System" on page 37
- "Opening the Rear of the System" on page 43
- "Attaching the Wrist Strap" on page 47
- "Opening the Front of the System" on page 48
- "Removing the Bottom Rear Cover" on page 52
- "Removing the Bottom Front Cover" on page 51

Refer to the following after replacing any part:

- "Closing the System" on page 55
- "Powering On the System" on page 41

Display Panel

Removing the Display Panel

1. **Open the rear of the system.**
   See Section "Opening the Rear of the System" on page 7-43.
2. **Remove the display panel.**
   See Section "Removing the Display Panel" on page 7-49.

Replacing the Display Panel

1. **Install the new display panel.**
   See Section "Replacing the Display Panel" on page 7-60.
2. **Replace the rear cover.**
   See Section "Replacing the Rear Cover" on page 7-61.
3. **Replace the right cap.**
   See Section "Replacing the Right Cap" on page 7-62.
4. **Replace the left cap.**
   See Section "Replacing the Left Cap" on page 7-63.
5. **Replace the power supply.**
   See Section "Replacing the Power Supply" on page 7-64.
6. **Power on the system.**
   See Section "Powering On the System" on page 6-41.

Power Supply

Removing the Power Supply

To remove the power supply, follow the steps in Section “Removing the Power Supply” on page 7-43.

Replacing the Power Supply

1. **Replace the power supply.**

   See Section “Replacing the Power Supply” on page 7-64.

2. **Power on the system.**

   Section “Powering On the System” on page 6-41.

Speaker

Removing the Speaker

1. **Remove the CPU board from the system.**

   See Section “Removing the CPU Board” on page 10-96.

2. **Gently press the speaker tabs and pull the speaker out of the system.**

   See FIGURE 8-1.

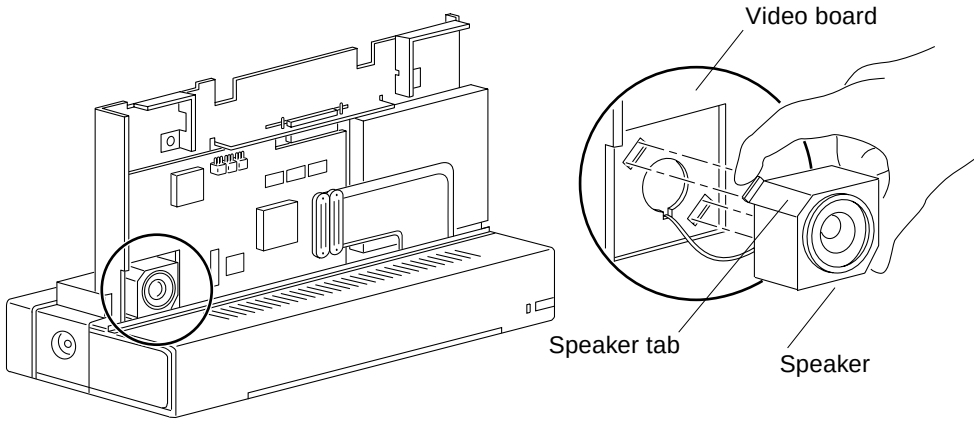

FIGURE 8-1 Removing/Replacing the Speaker

Replacing the Speaker

1. **Gently press the speaker tabs and insert the replacement speaker into its cavity.**

   See FIGURE 8-1. Make sure that the speaker cable is routed to the rear side of the system.

2. **Replace the CPU board on the system.**

   See Section "Replacing the CPU Board" on page 10-99.

DC/DC Converter

Removing the DC/DC Converter

1. **Disconnect the DC/DC converter connector from the CPU board.**

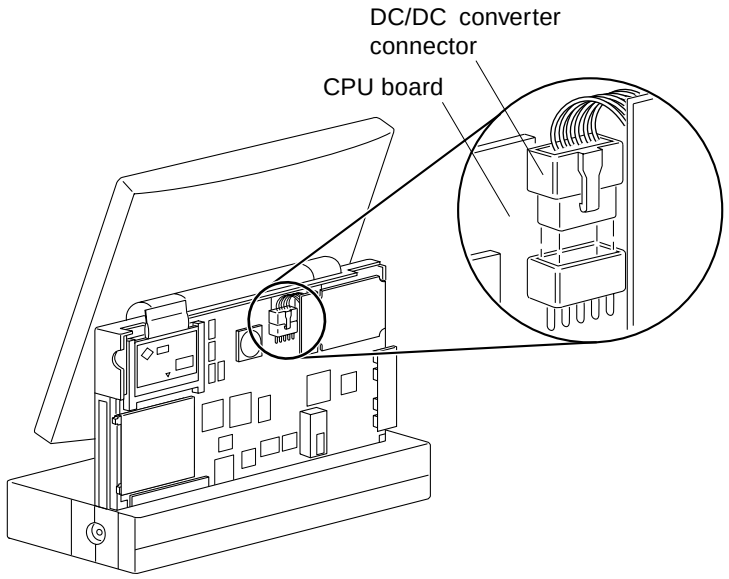

FIGURE 8-2 DC/DC Converter Connector

2. **Loosen the four threaded standoffs.**

   Use a 3/16” hex nut driver. See FIGURE 8-3.

3. **Remove the DC/DC converter.**

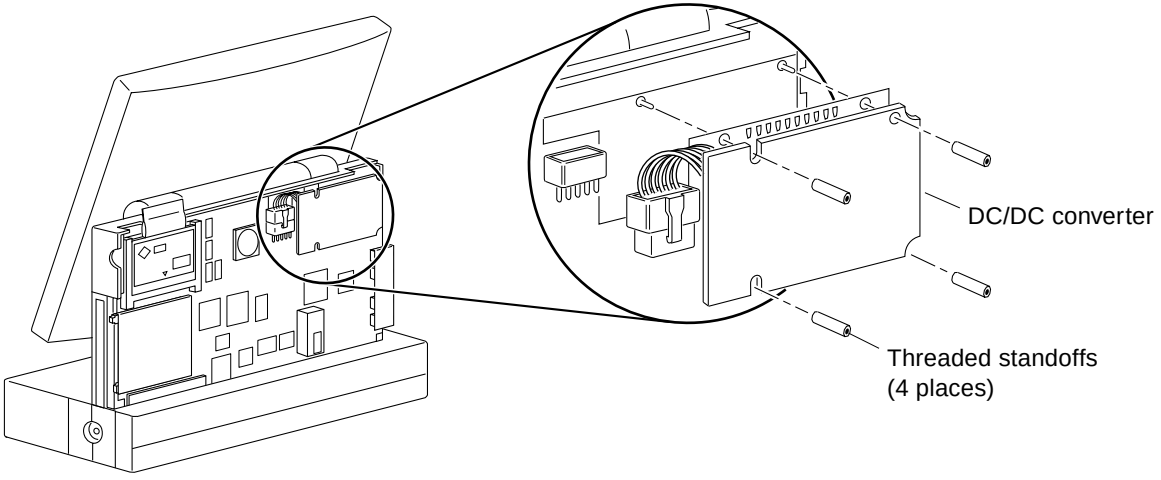

FIGURE 8-3 Removing/Replacing the DC/DC Converter

Replacing the DC/DC Converter

1. **Align the DC/DC converter on the four threaded studs.**
   See FIGURE 8-3.
2. **Install and tighten the four threaded standoffs on the studs.**
   See FIGURE 8-3.
3. **Connect the DC/DC converter connector to the CPU board connector.**
   See FIGURE 8-1.
4. **Close the system and power it on.**

SCSI Cable

Removing the SCSI Cable

1. **Remove the hard disk drive.**
   See Section "Removing the Hard Disk Drive" on page 9-92.
2. **Disconnect the SCSI cable from the I/O board.**

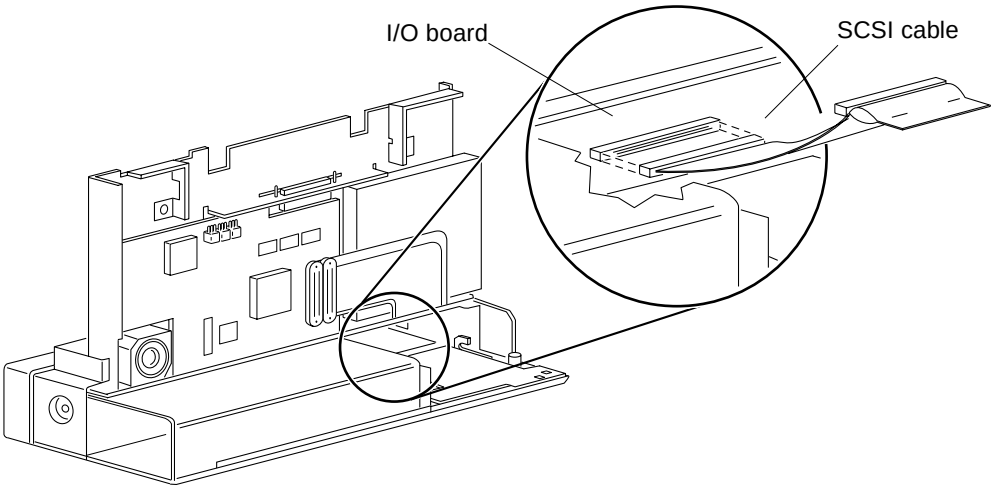

FIGURE 8-4 Disconnecting the SCSI Cable from the I/O Board

Replacing the SCSI Cable

1. **Connect the SCSI cable to the I/O board.**

   See FIGURE 8-4.

Note – Check both ends of the SCSI connector to make sure it is lined up with the I/O board socket.

---

2. **Replace the disk drive.**

   See Section "Replacing the Hard Disk Drive" on page 9-94.

3. **Close the system and power it on.**

Floppy Cable

Removing the Floppy Cable

1. **Remove the CPU board.**

   See Section "Removing the CPU Board" on page 10-96.

2. **Remove the video board.**

   a. **Place an antistatic surface on your work area.**

   b. **Press the speaker at both tabs lightly and pull it out of its cavity.**

      See FIGURE 8-5.

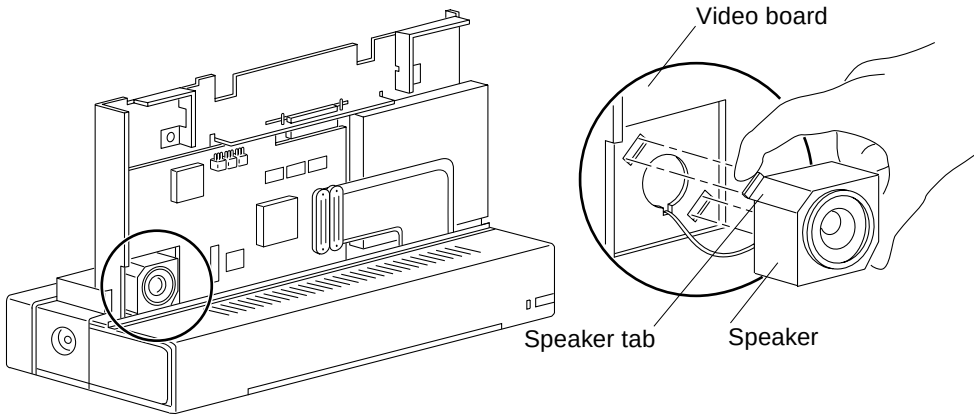

FIGURE 8-5 Removing/Replacing the Speaker

c. Disconnect the flex cable from the video board.

Hold both ends of the connectors and wiggle them out of the sockets.

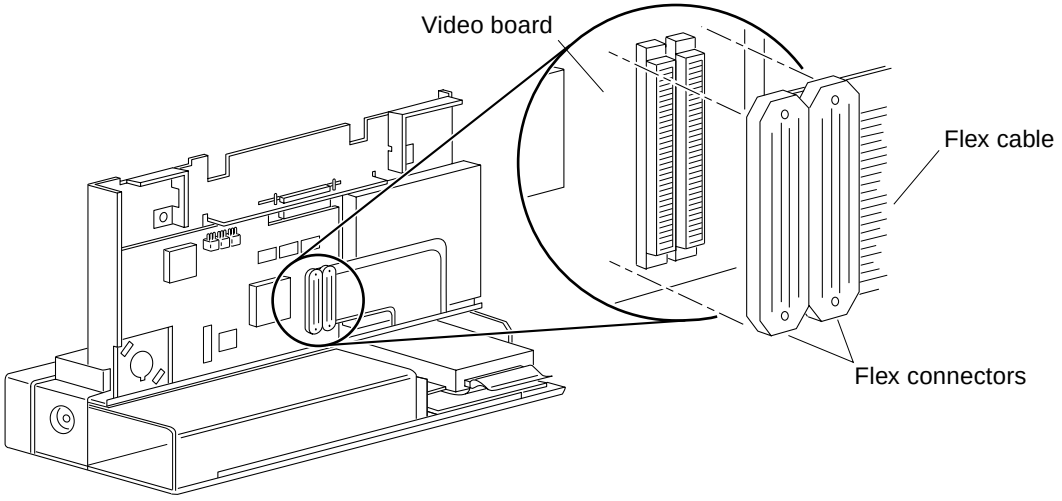

FIGURE 8-6 Flex Connectors Location on the Video Board

d. Remove all three screws from the video board.

See FIGURE 8-7.

e. Gently pull down the video board, remove it from the chassis and put it aside on the antistatic surface.

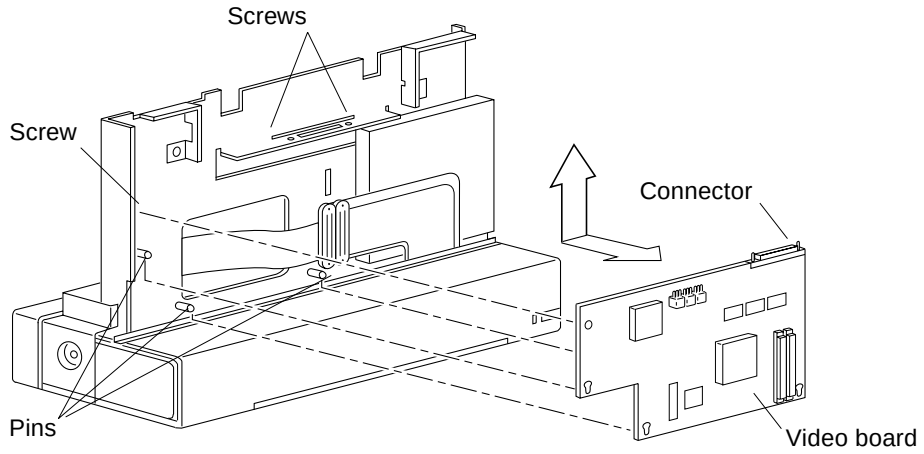

FIGURE 8-7 Removing the Video Board

3. Disconnect the floppy cable from the floppy drive.

Use the tip of a flat blade screwdriver or similar tool to push both ends of the connector locking device away from the drive. Gently, pull the floppy cable from the drive.

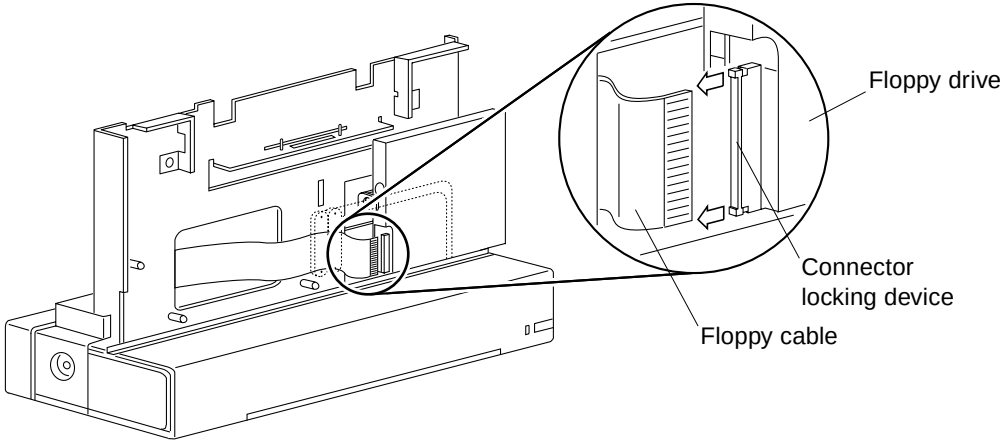

FIGURE 8-8 Removing the Floppy Cable From the Floppy Drive

4. Remove the floppy cable from the system.

Replacing the Floppy Cable

1. **Place the replacement floppy cable in the system.**

   See FIGURE 8-9.

2. **Replace the CPU Board.**

   a. **Position the CPU board on the system so that the four slots on the CPU board line up with the four pins on the system.**

      See FIGURE 8-9. The card edge should be seated in the I/O board socket.

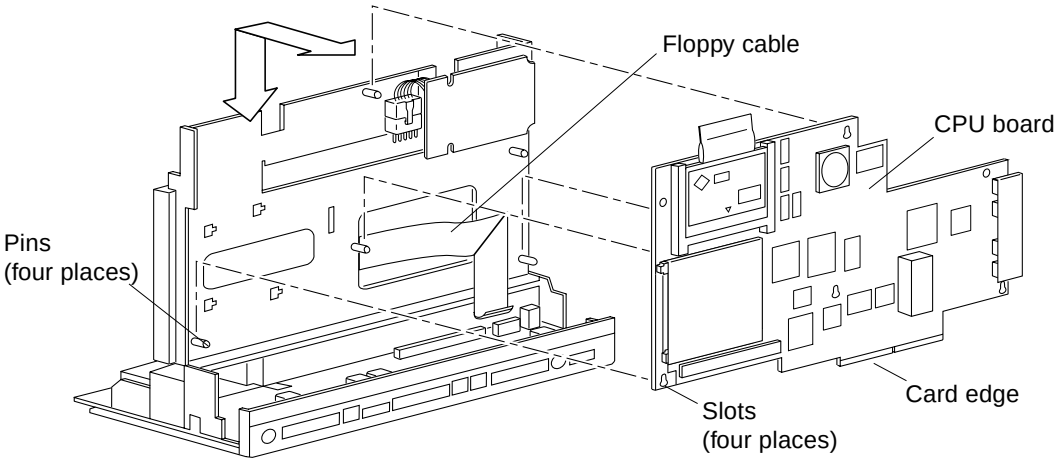

FIGURE 8-9 Positioning the CPU Board

   b. **Connect the floppy cable to the CPU board.**

      See FIGURE 8-10.

      i. **Make sure the connector locking device is unlocked.**

         Use the tip of a flat blade screwdriver or similar tool to push both ends of the connector locking device away from the board.

      ii. **Insert the floppy cable into the connector.**

      iii. **Lock the connector locking device by pushing in both ends of the locking device toward the CPU board.**

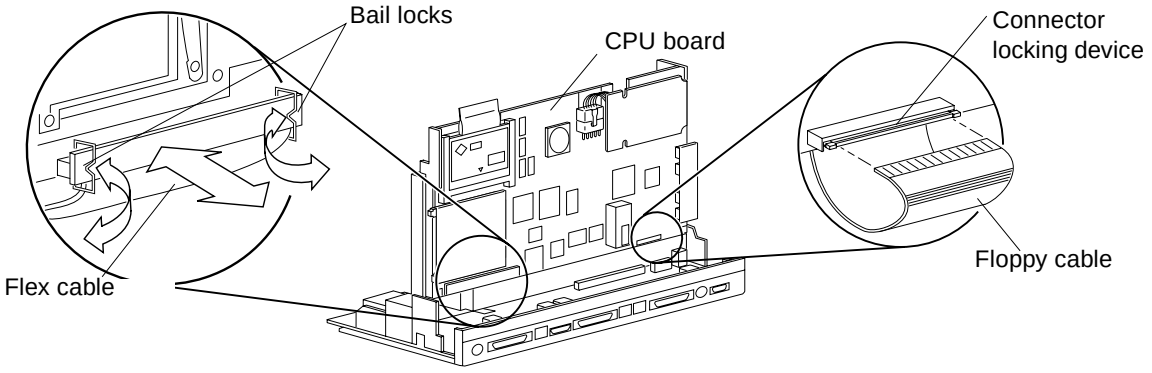

FIGURE 8-10 Connecting the Floppy and Flex Cables to the CPU Board

c. Connect the flex cable to the CPU board.

d. Snap in both bail locks to lock the flex connector on the CPU board.

e. Connect the speaker cable to the CPU board.

See FIGURE 8-11.

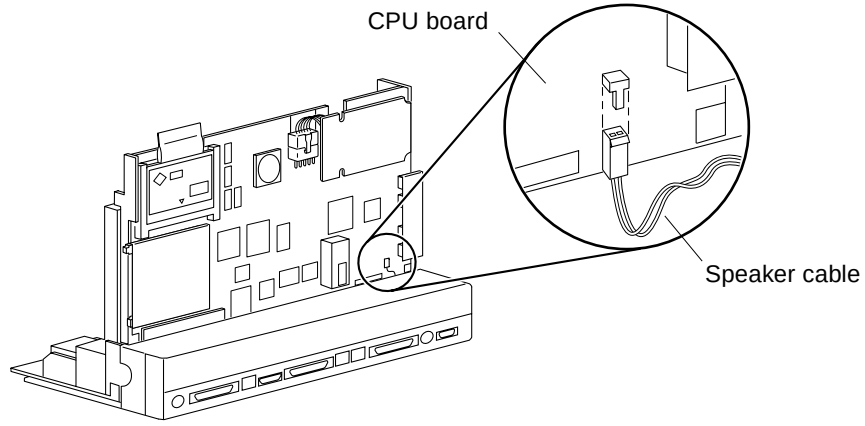

FIGURE 8-11 Connecting/Disconnecting the Speaker Cable

f. Push the CPU board down so the card edge is seated in the I/O board socket.

See FIGURE 8-12. Insert a screwdriver or similar tool through the openings at the top of the CPU board and the chassis. Use the tool as a lever to push the CPU board down into the socket on the I/O board.

g. Replace and tighten the two screws on the CPU board.

See FIGURE 8-12.

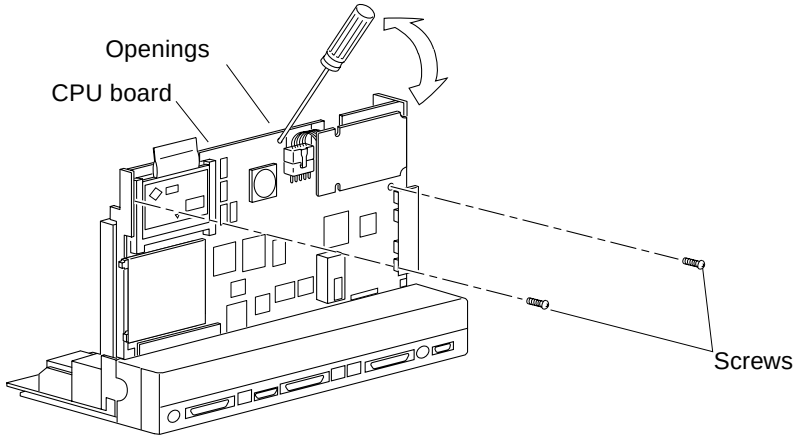

FIGURE 8-12 Replacing the CPU Board

h. Connect the DC/DC converter connector to the CPU board.

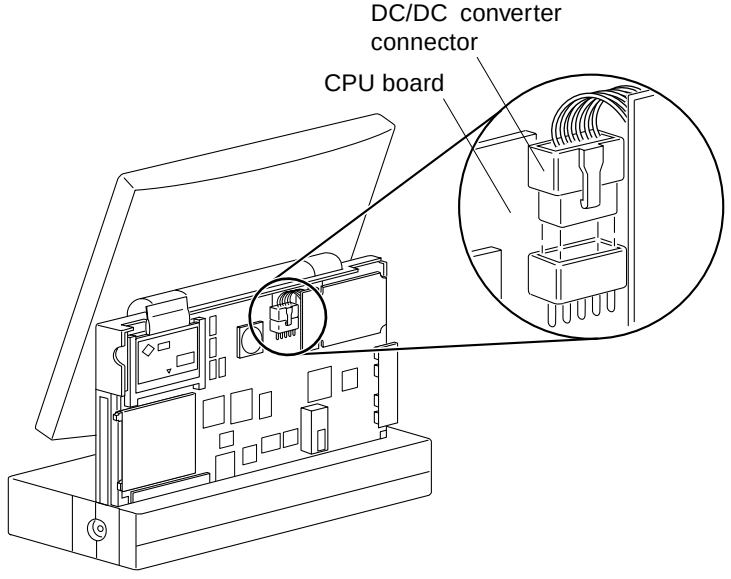

FIGURE 8-13 Connecting the DC/DC Converter

i. Tuck the pull tab behind the memory card.

3. Connect the floppy cable to the floppy drive.

a. Unlock the connector locking device.

See FIGURE 8-14. Use the tip of a flat blade screwdriver or similar tool to push both ends of the locking device away from the drive.

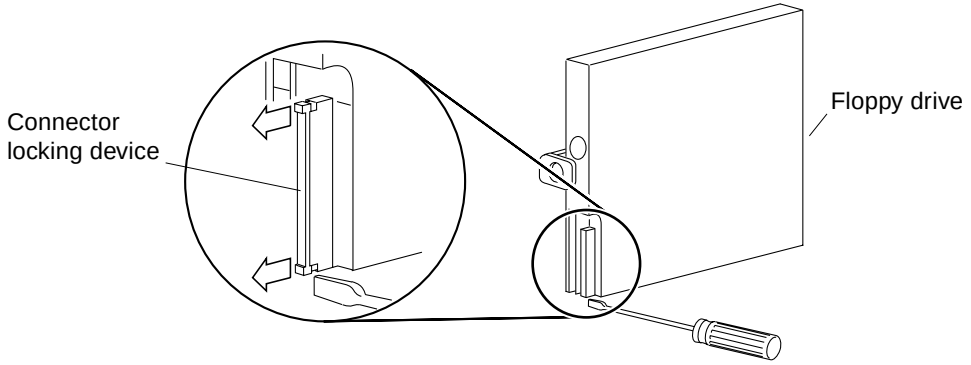

FIGURE 8-14 Unlocking the Floppy Connector

b. Insert the floppy cable into the connector.

See FIGURE 8-15.

c. Push down both sides of the connector locking device to secure the floppy cable in the floppy connector.

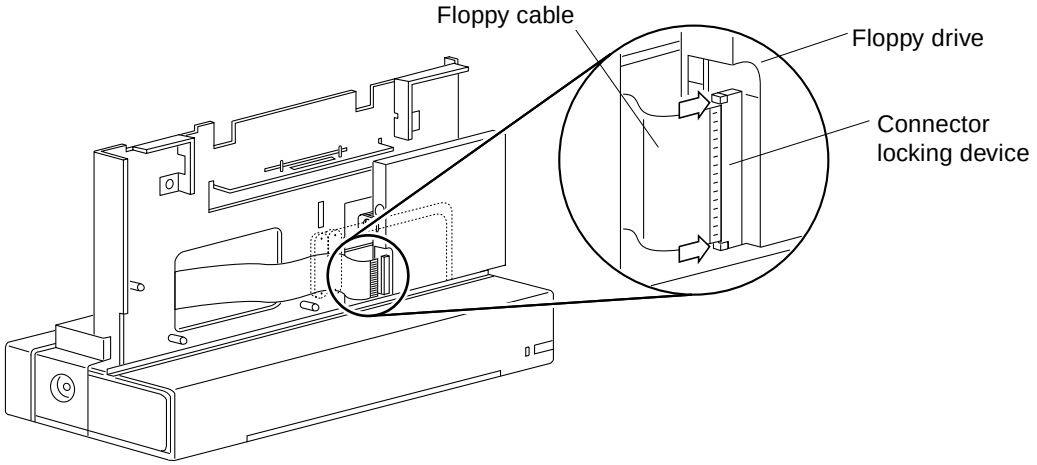

FIGURE 8-15 Connecting the Floppy Cable to the Floppy Drive

4. Replace the video board.

a. Position the new video board on the system.

See FIGURE 8-7. The connector of the video board should stick out through the slot on the system.

b. Insert and tighten the three mounting screws.

c. Connect the flex cable to the video board.

See FIGURE 8-7.

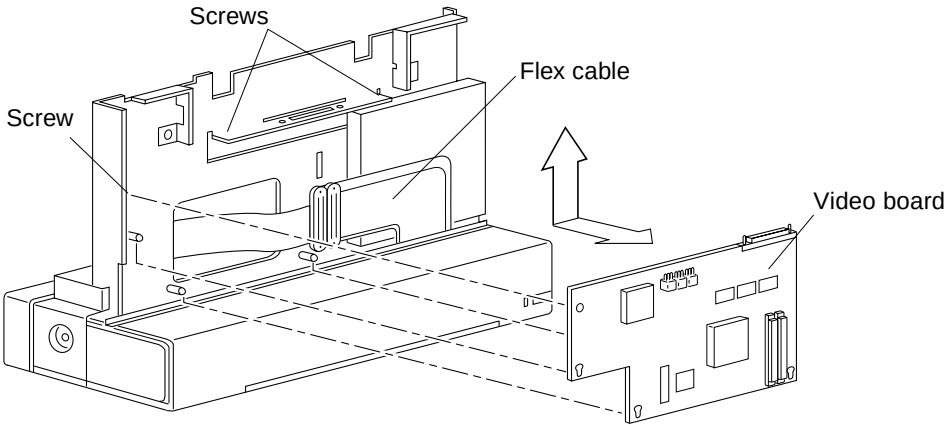

FIGURE 8-16 Replacing the Video Board

5. Replace the speaker

Gently press the speaker tabs and insert the speaker into its cavity.

See FIGURE 8-17.

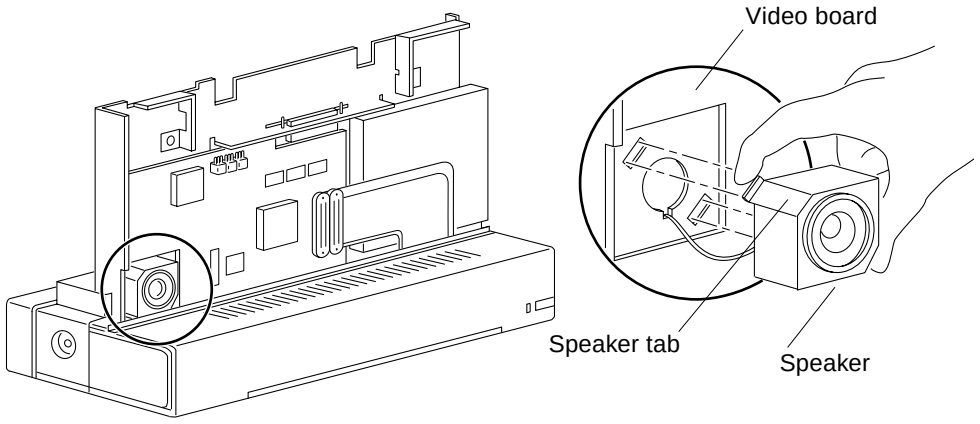

FIGURE 8-17 Replacing the Speaker

6. **Close the system and power it on.**

Flex Cable

Removing the Flex Cable

1. **Remove the hard disk drive.**
   See Section "Removing the Hard Disk Drive" on page 9-92.
2. **Disconnect the flex cable from the video board.**

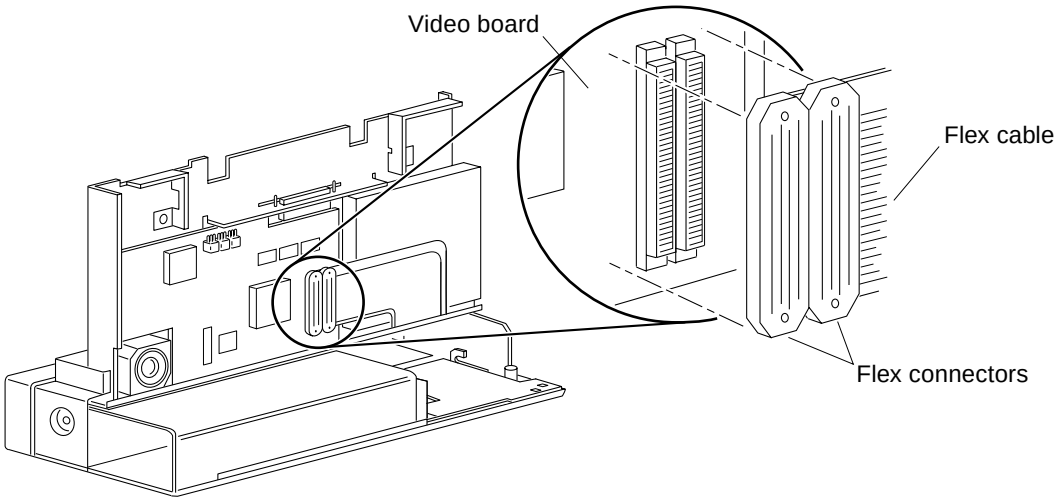

FIGURE 8-18 Removing/Replacing the Flex Cable from the Video Board

3. **Snap open the bail locks at both ends of the flex connector.**
   See FIGURE 8-19.
4. **Disconnect the flex cable from the CPU board.**
   See FIGURE 8-19.

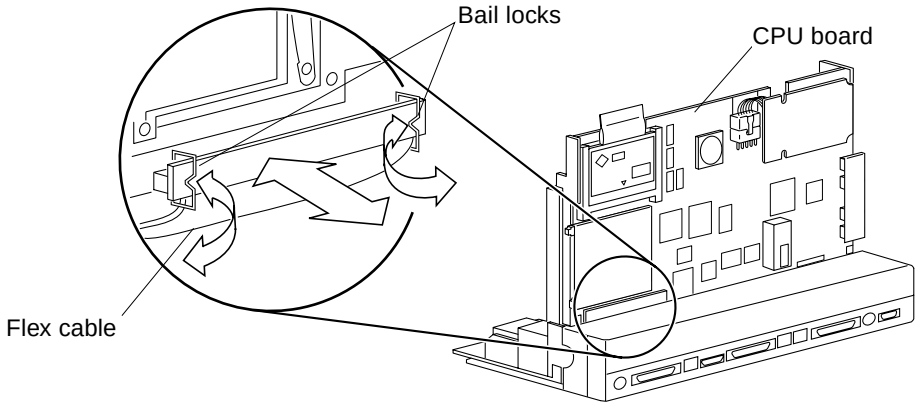

FIGURE 8-19 Connecting / Disconnecting the Flex Cable—the CPU Board

5. **Remove the flex cable from the system.**

Replacing the Flex Cable

1. **Connect the replacement flex cable to the CPU board.**

   See FIGURE 8-19.

2. **Snap in both bail locks to secure the flex connector to the CPU board.**

3. **Connect the flex cable to the video board.**

   See FIGURE 8-18.

4. **Replace the disk drive.**

   See Section “Replacing the Hard Disk Drive” on page 9-94.

5. **Close the system and power it on.**

IR Cable

Removing the IR Cable

1. **Remove the hard disk drive.**

   See Section “Removing the Hard Disk Drive” on page 9-92.

2. **Disconnect the SCSI cable from the I/O board.**

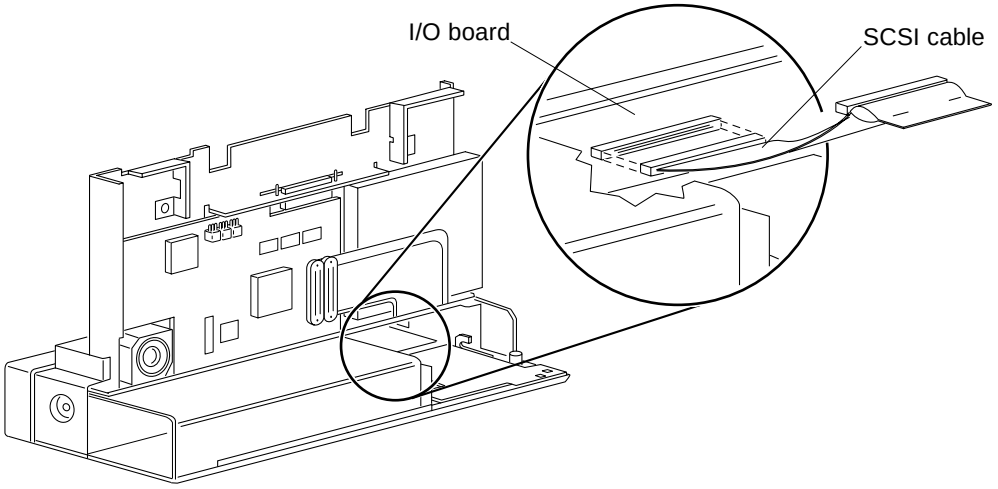

FIGURE 8-20 Connecting/Disconnecting the SCSI Cable—the I/O board

3. **Disconnect the IR cable from the IR board.**

   See FIGURE 8-21.

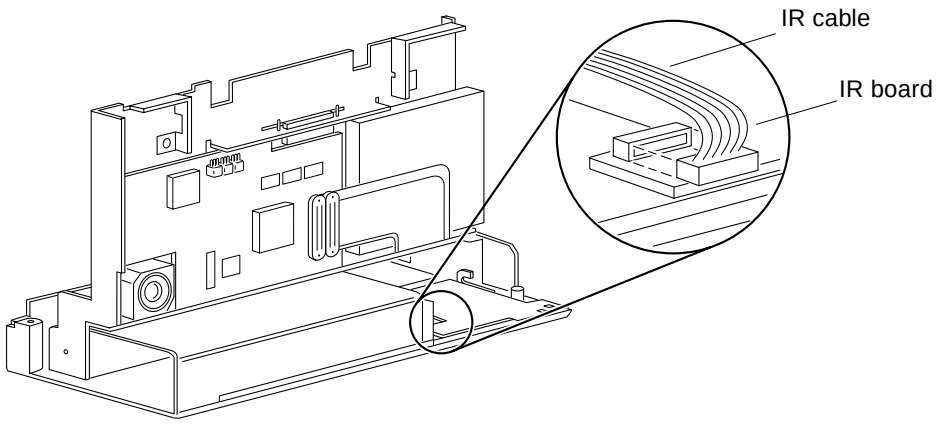

FIGURE 8-21 IR Cable Connection to the IR Board

4. **Remove the two screws from the IR board.**
   Use a Phillips screwdriver.

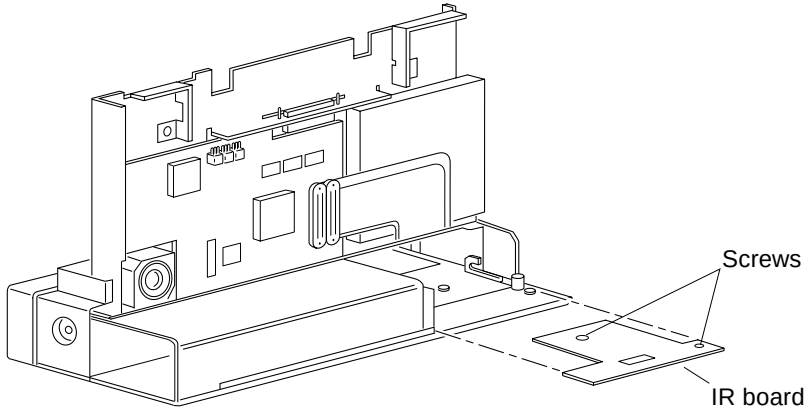

FIGURE 8-22 Removing/Replacing the IR Board

5. **Remove the IR board.**
   Place it on an antistatic surface.
6. **Disconnect the IR cable from the I/O board.**

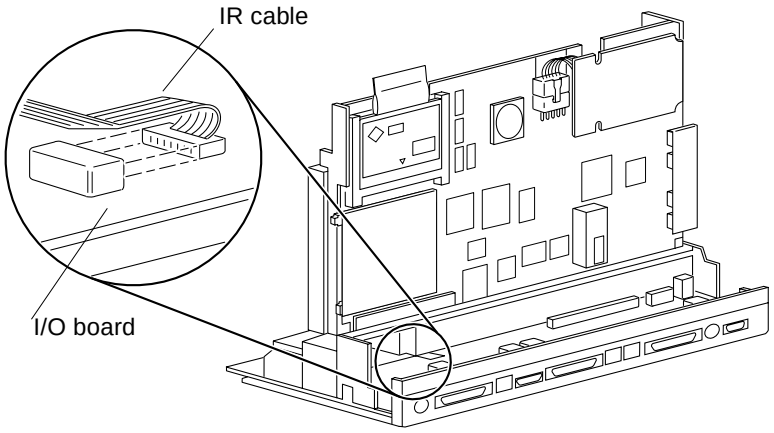

FIGURE 8-23 IR Cable Connection to the I/O Board

7. **Remove the IR cable.**

Replacing the IR Cable

1. **Connect the replacement IR cable to the I/O board.**

   See FIGURE 8-23.

2. **Replace the IR board in the system and connect the IR cable to the IR board.**

   See FIGURE 8-21.

3. **Insert and tighten the two Phillips screws on the IR board.**

   See FIGURE 8-22.

4. **Connect the SCSI cable to the I/O board.**

   See FIGURE 8-20.

5. **Replace the hard disk drive.**

   See Section “Replacing the Hard Disk Drive” on page 9-94.

6. **Close the system and power it on.**

CHAPTER 9

Storage Devices

This chapter describes how to remove and replace the storage device units:

- "Floppy Drive" on page 87
- "Hard Disk Drive" on page 92

Refer to the following before you remove any part:

- "Safety Requirements" on page 33
- "Powering Off the System" on page 37
- "Opening the Rear of the System" on page 43
- "Attaching the Wrist Strap" on page 47
- "Opening the Front of the System" on page 48
- "Removing the Bottom Front Cover" on page 51

Refer to the following after replacing any part:

- "Closing the System" on page 55
- "Powering On the System" on page 41

Floppy Drive

Removing the Floppy Drive

1. **Place an antistatic surface on your work area.**
2. **Disconnect the flex cable from the video board.**

   See FIGURE 9-1. Hold both ends of the connectors and wiggle them out of the sockets.

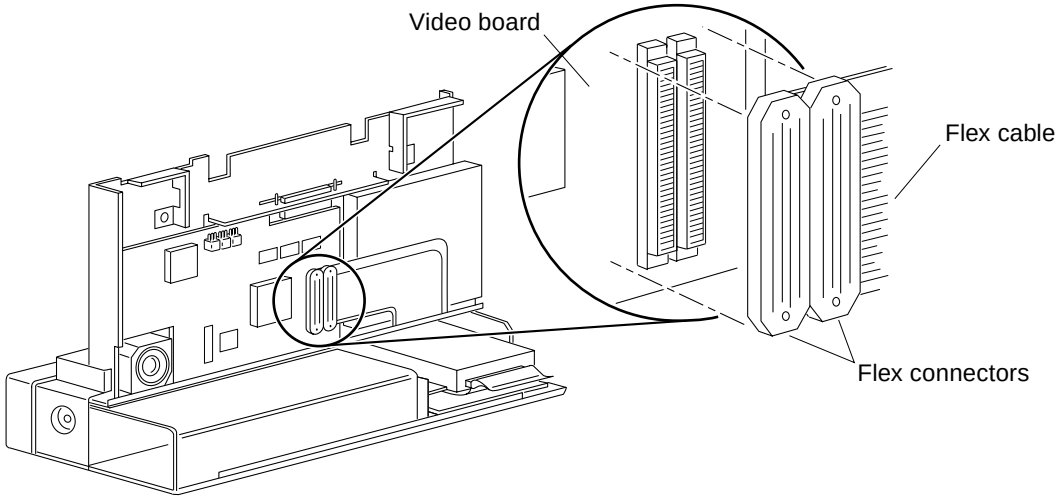

FIGURE 9-1 Flex Connectors Location on the Video Board

3. Disconnect the floppy cable from the floppy drive.

See FIGURE 9-2. Use the tip of a flat blade screwdriver or similar tool to release the connector locking device. Pull the floppy cable out of the connector.

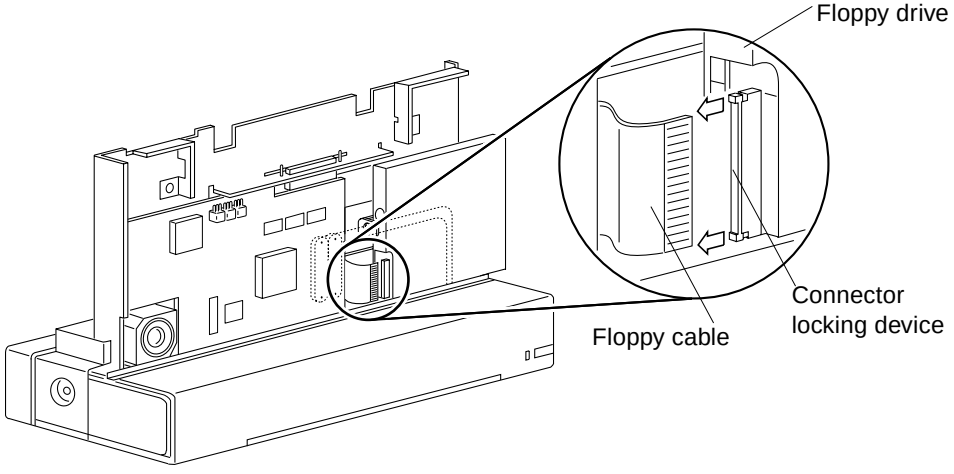

FIGURE 9-2 Removing the Floppy Cable From the Floppy Drive

4. Loosen the screw on the locking lever.

Use a Phillips screwdriver.

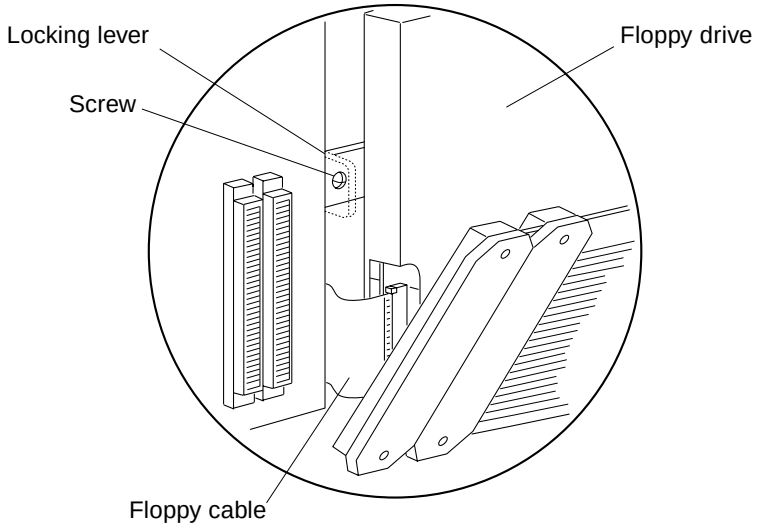

FIGURE 9-3 Loosening the Screw on the Locking Lever

5. **Gently pull the locking lever toward the drive, slide the floppy drive to the right, and pull it away from the unit.**

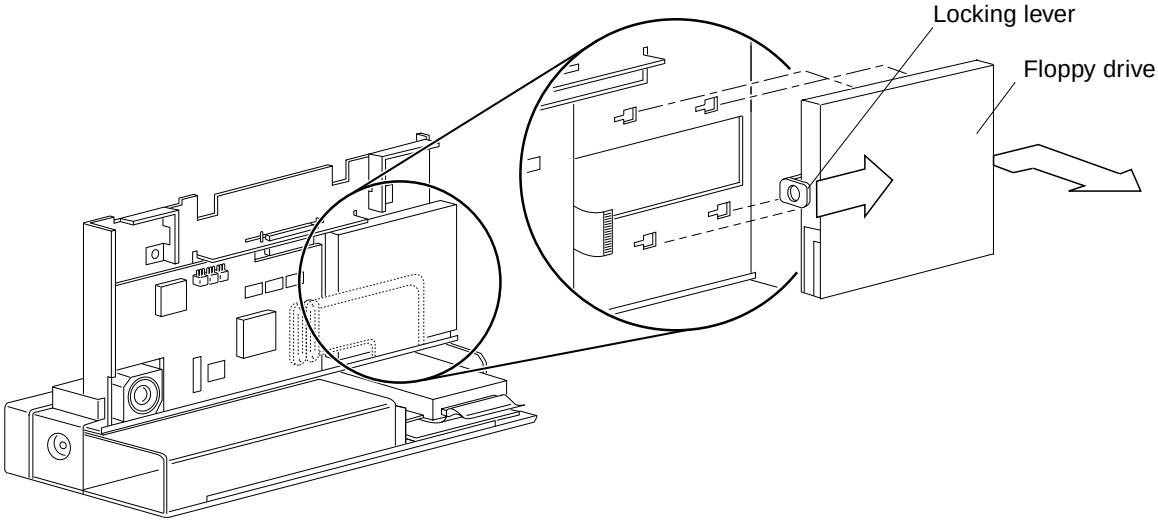

FIGURE 9-4 Removing the Floppy Drive

Replacing the Floppy Drive

1. **Unlock the connector locking device at both ends of the floppy drive connector.**

   See FIGURE 9-5. Use the tip of a flat blade screwdriver or similar tool to push both ends of the locking device away from the connector.

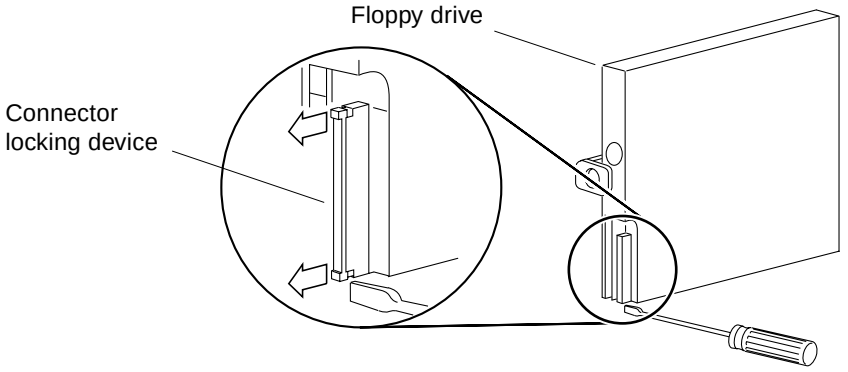

FIGURE 9-5 Unlocking the Floppy Connector

2. **Insert the floppy cable into the floppy drive connector.**

   See FIGURE 9-6.

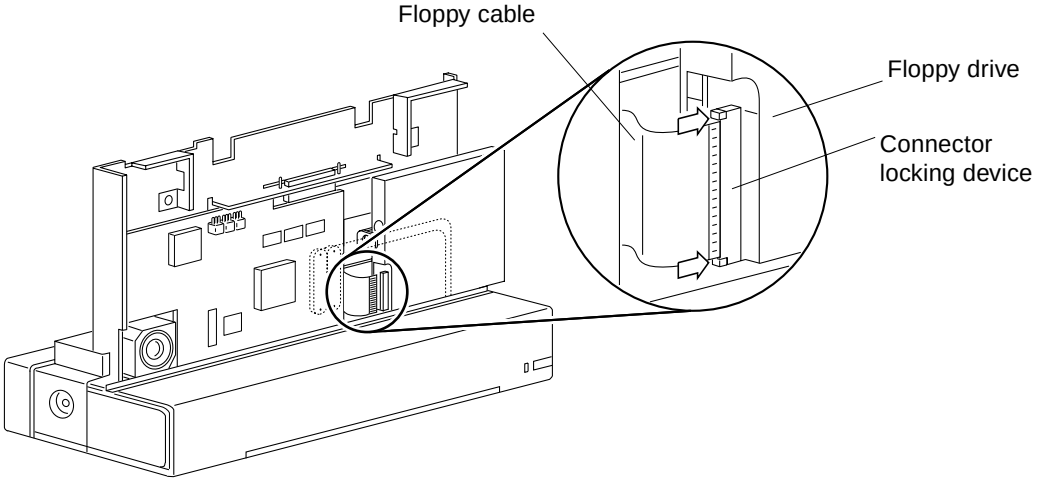

FIGURE 9-6 Connecting the Floppy Cable to the Floppy Drive

3. **Push in both ends of the connector locking device to secure the floppy cable in the floppy connector.**

4. **Position the floppy drive so that the four mounting feet are aligned with the four slots on the system.**

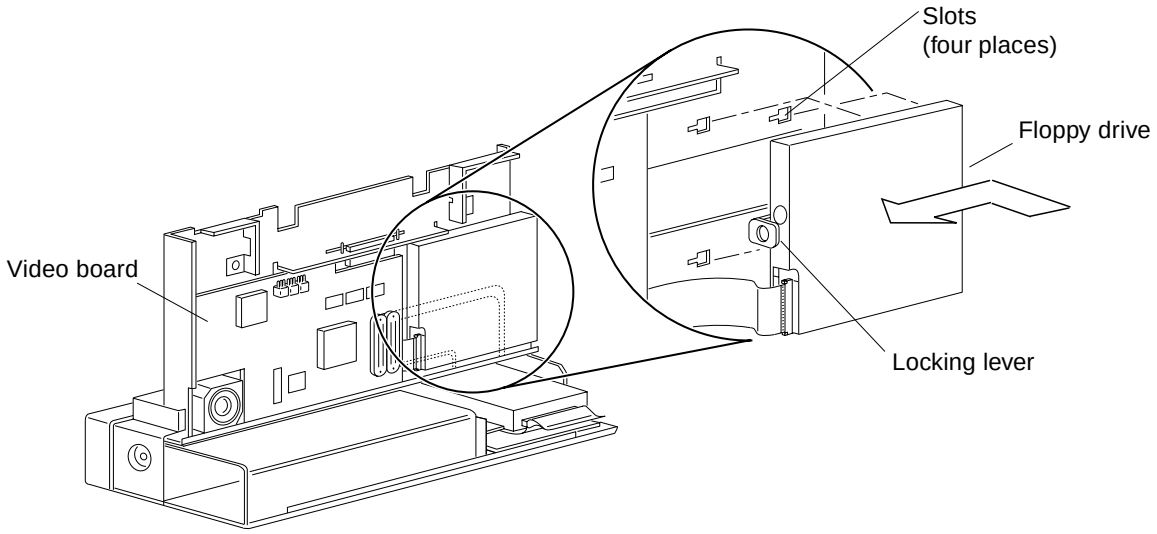

FIGURE 9-7 Replacing the Floppy Drive

5. **Push the four mounting feet in the slots and slide the floppy drive toward the video board until you hear the floppy locking lever click.**

   See FIGURE 9-7.

6. **Insert and tighten the screw on the locking lever.**

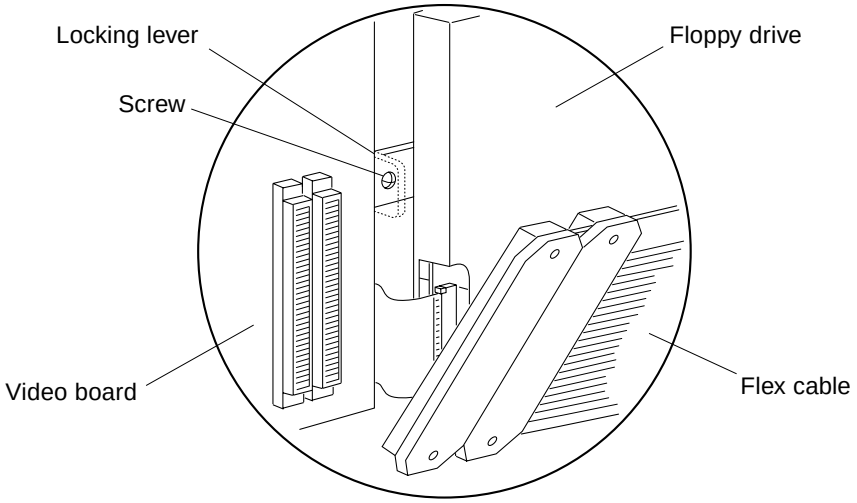

FIGURE 9-8 Tightening the Screw on the Locking lever

7. **Connect the flex cable to the video board.**
   See FIGURE 9-8.
8. **Close the system and power it on.**

Hard Disk Drive

Removing the Hard Disk Drive

1. **Place an antistatic surface on your work area.**
2. **Disconnect the SCSI cable from the drive by pulling on the pull tab.**
   See FIGURE 9-9.

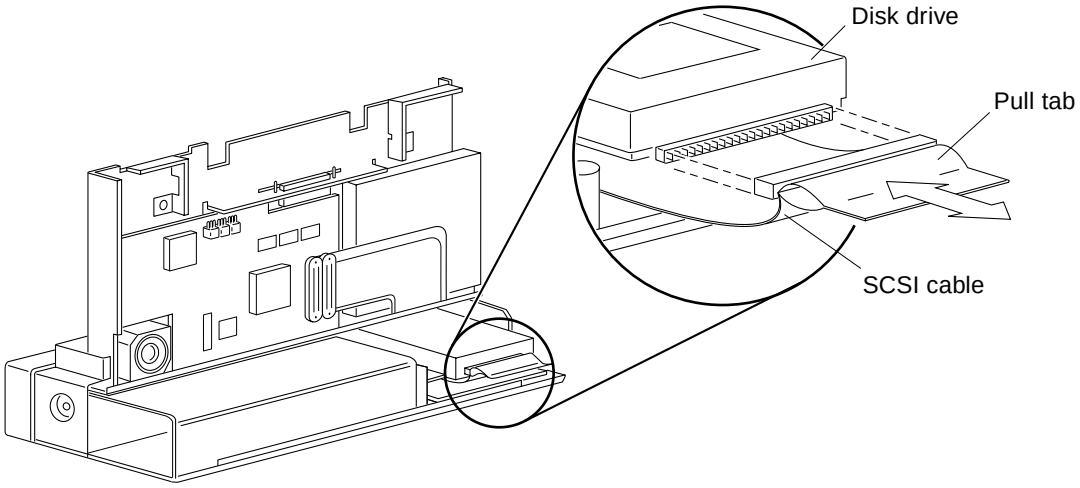

FIGURE 9-9 Connecting / Disconnecting the SCSI Cable—the Disk Drive

3. **Loosen the two screws on the drive mounting bracket.**

   See FIGURE 9-10.

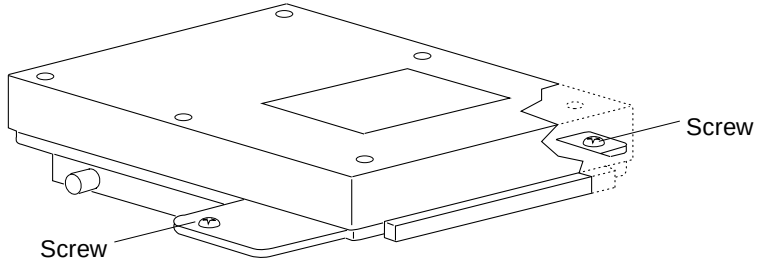

FIGURE 9-10 Location of Screws on the Disk Drive Mounting Bracket

Caution – Handle the drive by its ends only. Do not press on the top of the drive.

4. **Slide the disk drive forward and up out of the unit.**

   Place it on an antistatic surface.

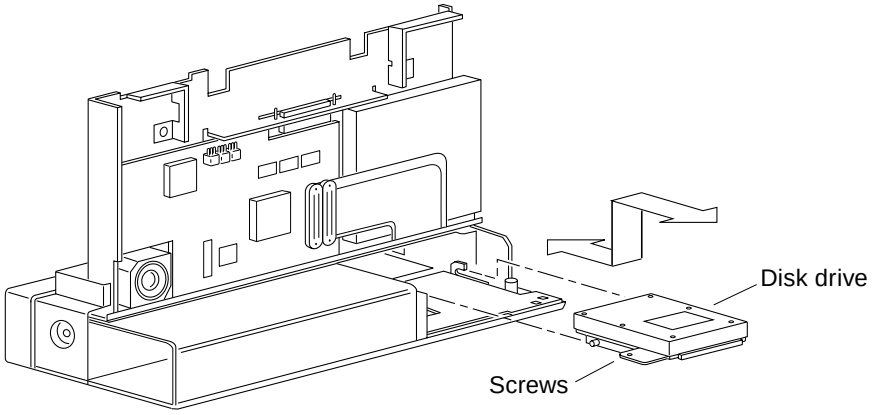

FIGURE 9-11 Removing/Replacing the Disk Drive

Replacing the Hard Disk Drive

Caution – Handle the drive by its ends only. Do not press on the top of the drive.

1. **Position the replacement drive so both screws line up with the mounting holes.**

   See FIGURE 9-11.

2. **Tighten both screws to secure the drive into the unit.**

3. **Connect the SCSI cable to the drive.**

   See FIGURE 9-9. Align the cable to the connector carefully so that the cable is correctly inserted.

4. **Close the system and power it on.**

CHAPTER 10

System Boards and Component Replacement

This chapter provides information on removing and replacing the boards and the TOD/NVRAM on the CPU board:

- "CPU Board" on page 96
- "TOD/NVRAM" on page 100
- "Video Board" on page 101
- "Memory Card" on page 103
- "IR Board" on page 105
- "I/O Board" on page 108

Refer to the following before you remove any part:

- "Safety Requirements" on page 33
- "Powering Off the System" on page 37
- "Opening the Rear of the System" on page 43
- "Attaching the Wrist Strap" on page 47
- "Opening the Front of the System" on page 48
- "Removing the Bottom Rear Cover" on page 52
- "Removing the Bottom Front Cover" on page 51

Refer to the following after replacing any part:

- "Closing the System" on page 55
- "Powering On the System" on page 41

CPU Board

Removing the CPU Board

1. **Place an antistatic surface on your work area.**
2. **Loosen and remove the two Phillips screws from the CPU board.**

   See FIGURE 10-1.
3. **Disconnect the DC/DC converter cable from the CPU board.**

   See FIGURE 10-2.
4. **Disconnect the CPU board by pushing it up and away from the system unit.**

   Insert a screwdriver or similar tool through the openings at the top of the CPU board and the top of the chassis. Use the tool as a lever to push the CPU board up. Do not remove the CPU board from the system yet.

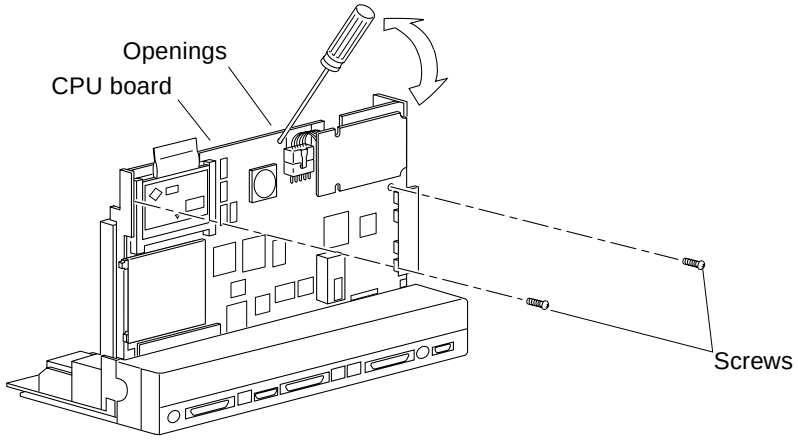

FIGURE 10-1 Removing/Replacing the CPU Board to the System

5. **Disconnect the floppy cable from the CPU board.**

   See FIGURE 10-2. Use the tip of a flat blade screwdriver or similar tool to push both ends of the connector locking device away from the CPU board. Then, disconnect the floppy cable from the CPU board.

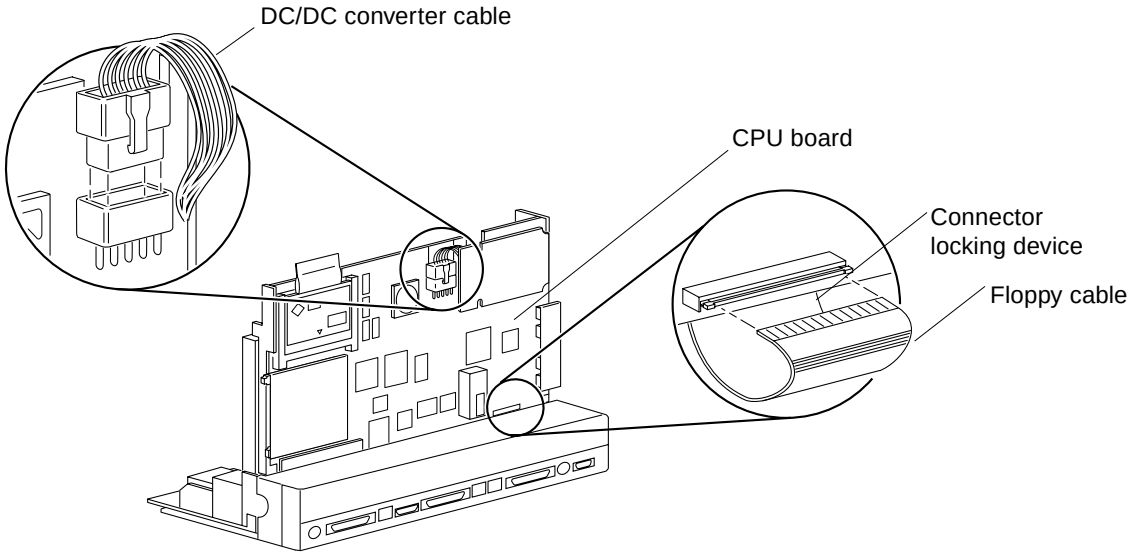

FIGURE 10-2 Disconnecting Connectors from the CPU Board

6. **Snap open the bail lock ends from the flex connector and disconnect the connector from the CPU board.**

   See FIGURE 10-3.

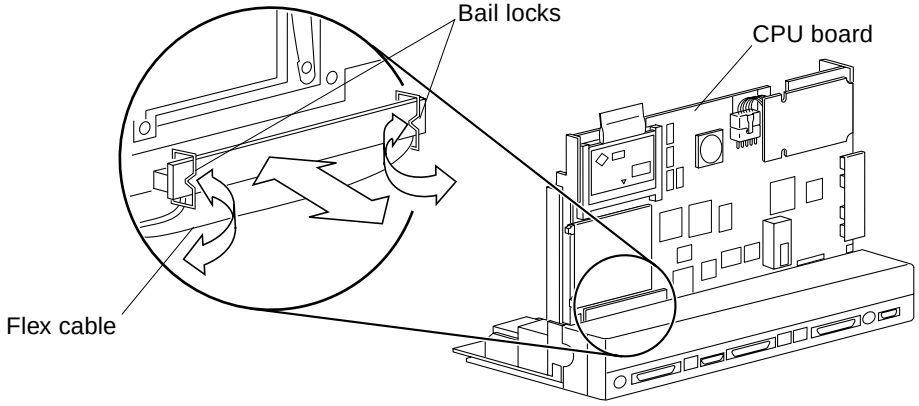

FIGURE 10-3 Disconnecting the Flex Cable from the CPU Board

7. **Disconnect the speaker cable from the CPU board.**

   See FIGURE 10-4.

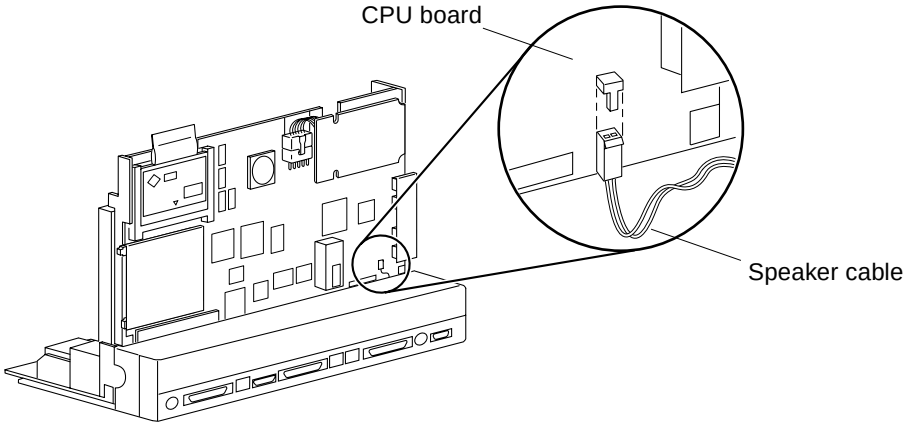

FIGURE 10-4 Connecting / Disconnecting the Speaker Cable

8. Remove the CPU board from the system.

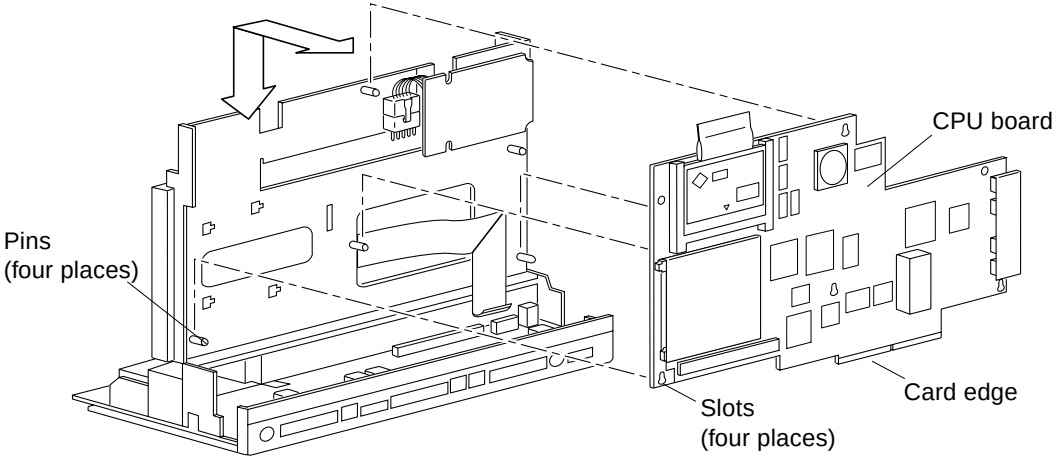

FIGURE 10-5 Removing / Positioning the CPU Board

9. Place the CPU board on an antistatic surface.

Replacing the TOD / NVRAM

Remove the TOD from your defective CPU board, and install it on the replacement CPU board.

1. **Locate the TOD on the replacement CPU board.**

   See FIGURE 10-6.

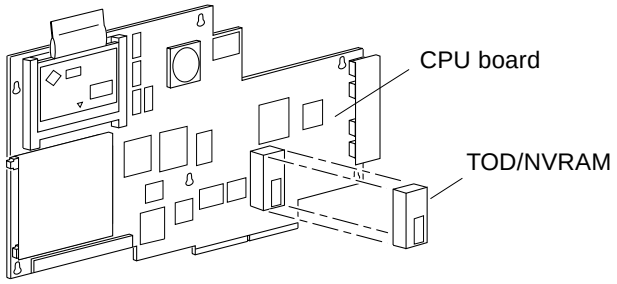

FIGURE 10-6 Location of the TOD / NVRAM

2. **Hold the TOD carrier on both ends and pull it away from the board.**

   See FIGURE 10-6. Gently wiggle the chip carrier as necessary.

3. **Put the TOD with its carrier on an antistatic surface.**

   You must send this TOD back with the defective CPU board to Sun.

4. **Locate the TOD on the defective CPU board, hold the TOD carrier on both ends and lift it straight up.**

   Gently wiggle the chip carrier as necessary.

5. **Carefully align the pins and insert the TOD in the socket of the replacement CPU board.**

   The carrier is keyed so the TOD can be installed only one way.

6. **Push the TOD into the carrier until it sits tightly in the socket.**

Replacing the CPU Board

1. **Position the replacement CPU board so that the four slots on the CPU board line up with the four pins on the system unit.**

   See FIGURE 10-5.

2. **Connect the floppy cable to the CPU board.**

   See FIGURE 10-2.

   a. **Make sure the connector locking device is unlocked.**

      Use the tip of a flat blade screwdriver or similar tool to push both ends of the connector locking device away from the board.

b. Insert the floppy cable into the connector.

c. Lock the connector locking device by pushing in both ends of the locking device toward the CPU board.

3. Connect the flex cable to the CPU board.

See FIGURE 10-3.

4. Snap in both bail locks to lock the flex connector on the CPU board.

See FIGURE 10-3.

5. Connect the speaker cable to the CPU board.

See FIGURE 10-4.

6. Push the CPU board down so the connector is seated in the I/O board socket.

See FIGURE 10-1. Insert a screwdriver or similar tool through the openings at the top of the CPU board and the chassis. Use the tool as a lever to push the board down into the socket on the I/O board.

7. Tighten the two screws on the CPU board.

See FIGURE 10-1. If the CPU board is not installed correctly, the screw holes will not line up with the chassis.

8. Connect the DC/DC converter cable to the CPU board.

See FIGURE 10-2.

9. Remove any memory cards from the defective CPU and install them in the replacement CPU.

a. Remove the memory card(s) from the defective CPU.

See Section "Removing the Memory Card" on page 10-103.

b. Replace the memory card(s) in the replacement CPU.

Section "Replacing the Memory Card" on page 10-104.

10. Close the system and power it on.

TOD / NVRAM

You need to remove the CPU board from the system and place it on an antistatic mat before removing the TOD from the CPU board.

Removing the TOD / NVRAM

1. **Remove the CPU Board**
   See Section "Removing the CPU Board" on page 10-96.
2. **Locate the TOD on the CPU board.**
   See FIGURE 10-6.
3. **Hold the TOD carrier on both ends and lift it straight up.**
   Gently wiggle the chip carrier as necessary.
4. **Place it on an antistatic surface.**

Replacing the TOD / NVRAM

1. **Position the replacement TOD on the CPU board.**
   See FIGURE 10-6.
2. **Carefully align the pins and insert the TOD into the socket.**
   The carrier is keyed so the TOD can be installed only one way.
3. **Push the TOD into the carrier until it sits tightly in the socket.**
4. **Replace the CPU Board**
   See Section "Replacing the CPU Board" on page 10-99.
5. **Close the system and power it on.**

Video Board

Removing the Video Board

1. **Place an antistatic surface on your work area.**
2. **Gently press the speaker tabs and pull the speaker out of its cavity.**
   See FIGURE 10-7. Leave the speaker cable connected to the CPU board.

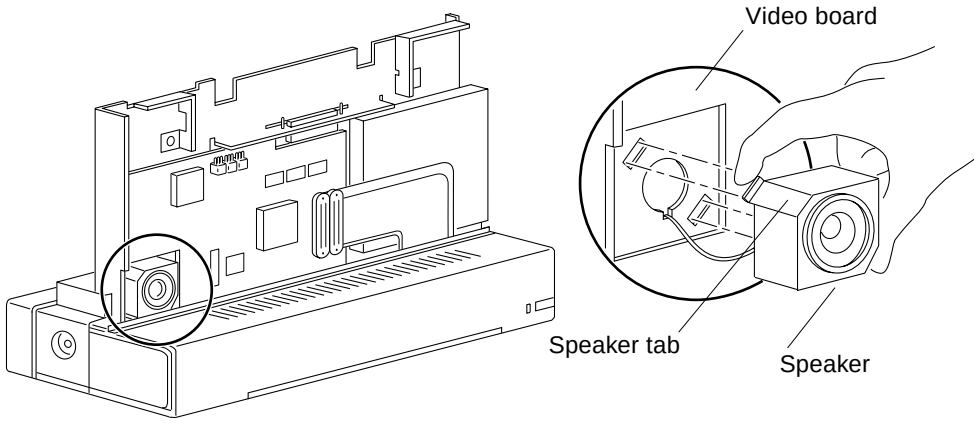

FIGURE 10-7 Removing/Replacing the Speaker

3. **Disconnect the flex cable from the video board.**

   See FIGURE 10-8.

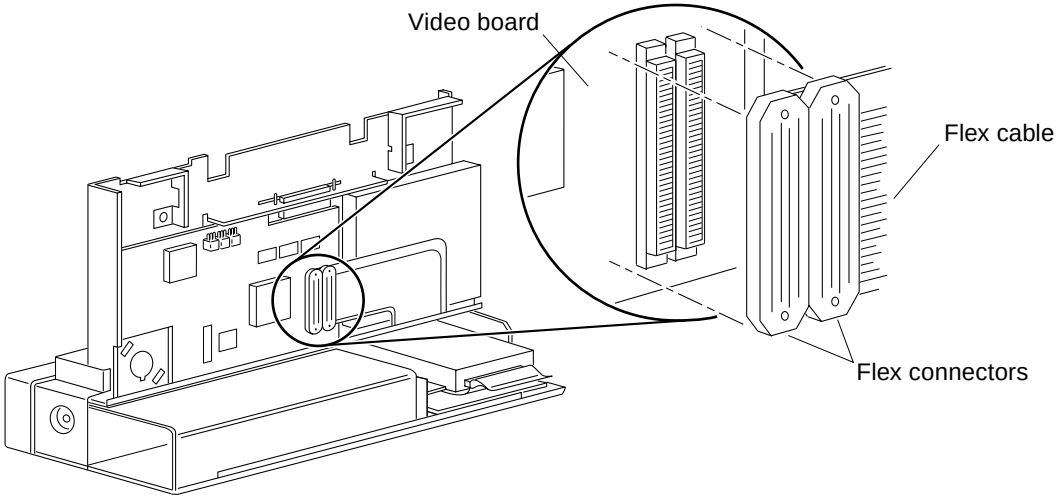

FIGURE 10-8 Flex Connectors Location on the Video Board

4. **Remove the three screws from the video board.**

   See FIGURE 10-9. Use a Phillips screwdriver.

5. **Pull the video board down slightly and slide it out of the three pins.**

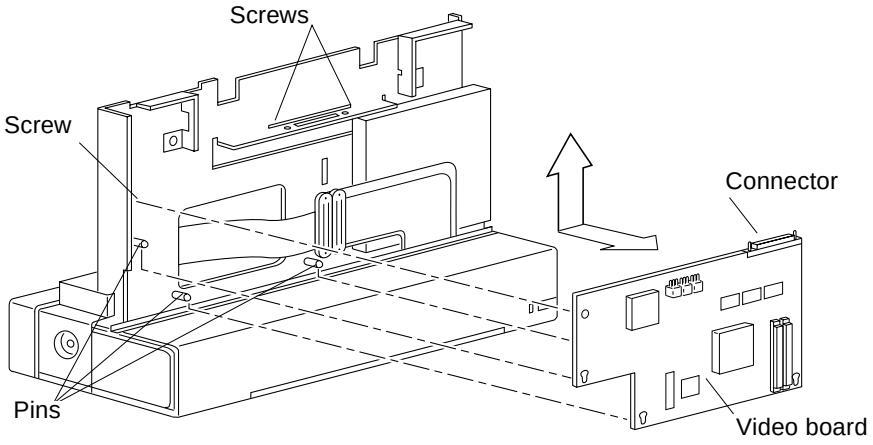

FIGURE 10-9 Removing /Replacing the Video Board

Replacing the Video Board

1. **Position the new video board on the three pins.**

   See FIGURE 10-9. The video board connector should stick out of the slot on the system unit.

2. **Insert and tighten the three screws.**

3. **Connect the flex cable to the video board.**

   See FIGURE 10-8.

4. **Gently press the speaker tabs and insert the speaker back into its cavity.**

   See FIGURE 10-7.

5. **Close the system and power it on.**

Memory Card

Removing the Memory Card

1. **Pull the pull tab out from behind the defective memory card.**

2. **Gently pull up the pull tab to remove the memory card.**

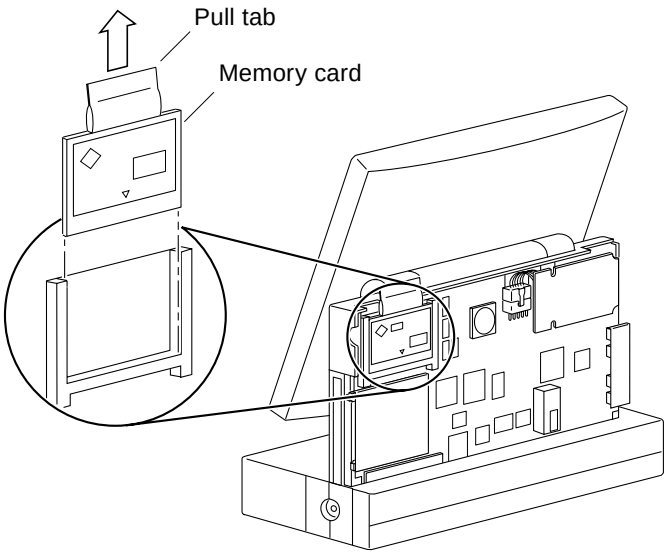

FIGURE 10-10 Removing the Memory Card

Replacing the Memory Card

1. **Push the replacement memory card all the way into the slot.**

   See FIGURE 10-11. The Sun logo on the memory card should be facing out. The memory card is keyed so it fits one way only.

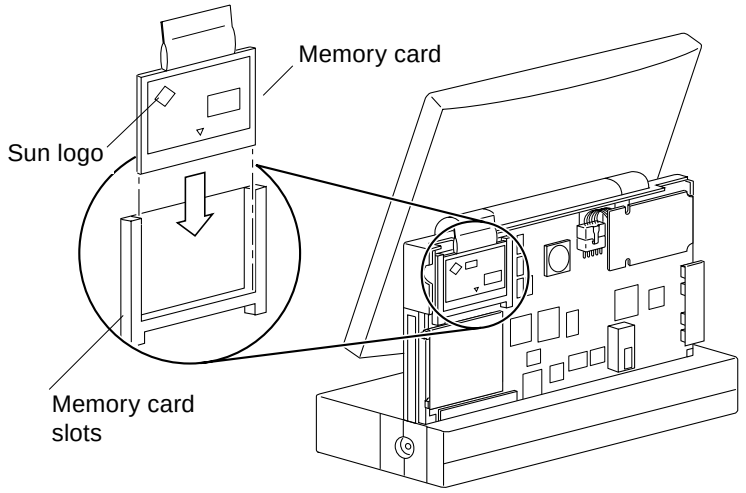

FIGURE 10-11 Replacing a Memory Card

2. **Tuck the pull tab behind the memory card.**
   The pull tab interferes with the rear cover installation if not tucked in.
3. **Close the system and power it on.**

IR Board

Removing the IR Board

1. **Remove the hard disk drive.**
   See Section "Removing the Hard Disk Drive" on page 9-92.
2. **Disconnect the SCSI cable from the I/O board.**

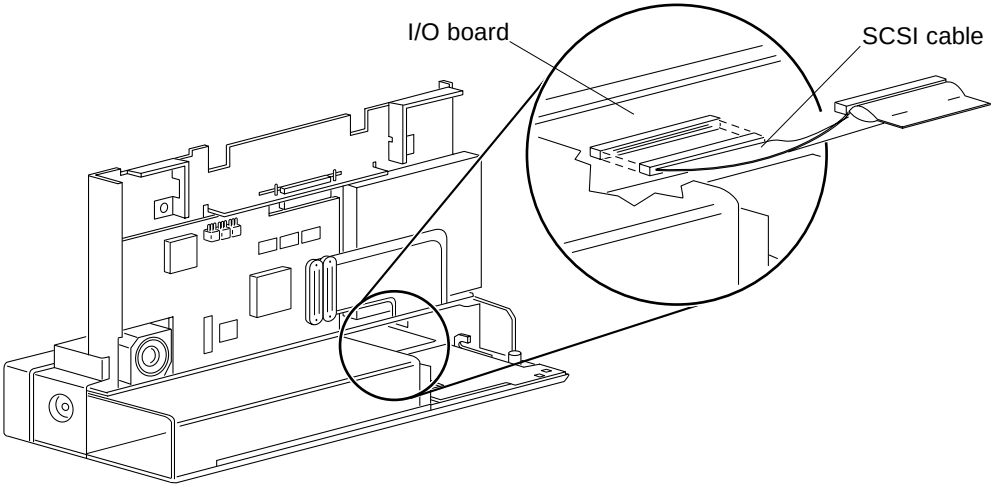

FIGURE 10-12 Connecting / Disconnecting the SCSI Cable—the I / O board

3. Disconnect the IR cable from the IR board.

See FIGURE 10-13.

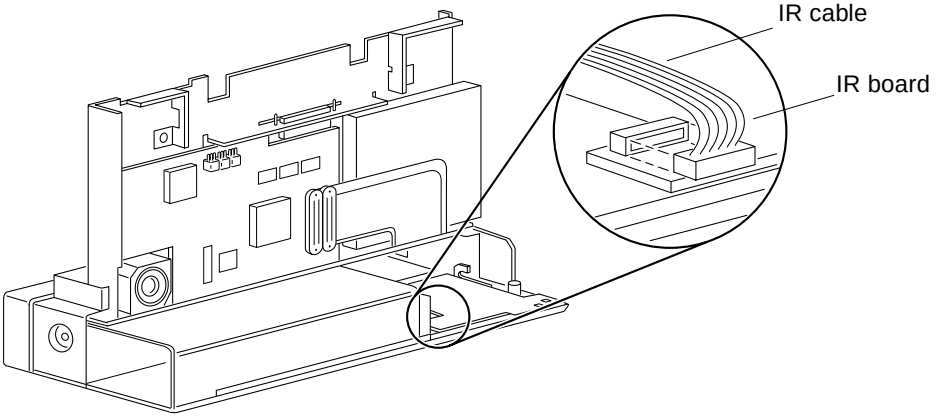

FIGURE 10-13 IR Cable Connection to the IR Board

4. Remove the two screws from the IR board.

Use a Phillips screwdriver.

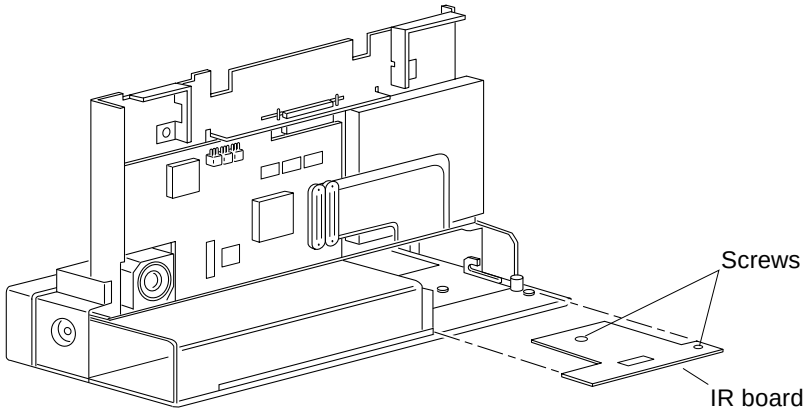

FIGURE 10-14 Removing/Replacing the IR Board

5. **Remove the IR board.**

   Place it on an antistatic surface.

Replacing the IR Board

1. **Position the replacement IR board in the unit.**

   See FIGURE 10-14.

2. **Install both screws to secure the IR board to the unit.**

3. **Connect the IR cable to the IR board.**

   See FIGURE 10-13.

4. **Connect the SCSI cable to the I/O board.**

   See FIGURE 10-12.

5. **Replace the hard disk drive.**

   See Section "Replacing the Hard Disk Drive" on page 9-94.

6. **Close the system and power it on.**

I/O Board

Removing the I/O Board

1. **Remove the hard disk drive.**

   See Section "Removing the Hard Disk Drive" on page 9-92.

2. **Disconnect the SCSI cable from the I/O board.**

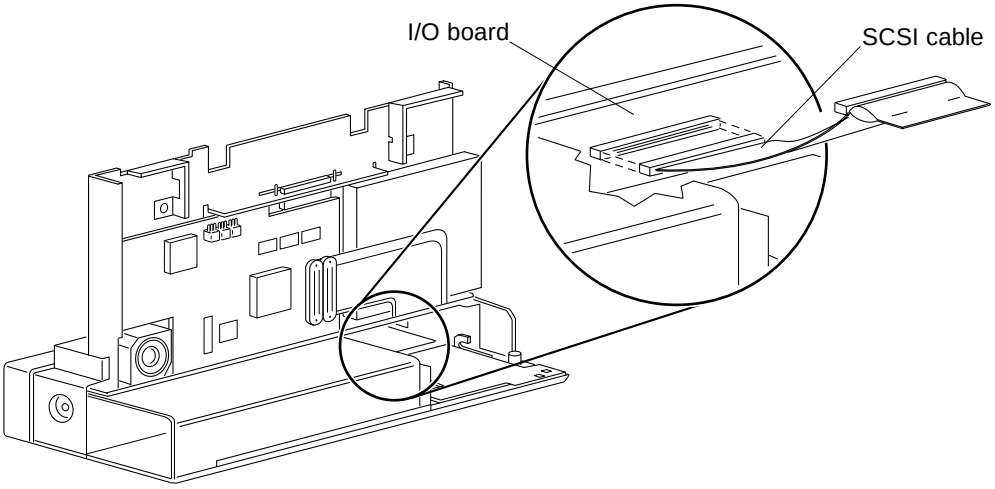

FIGURE 10-15 Connecting/Disconnecting the SCSI Cable—the I/O board

3. **Remove the CPU board.**

   Section "Removing the CPU Board" on page 10-96.

4. **Disconnect the DC harness from the I/O board.**

   See FIGURE 10-16.

5. **Disconnect the IR cable from the I/O board.**

6. **Remove all screws from the back panel.**

   See FIGURE 10-16.

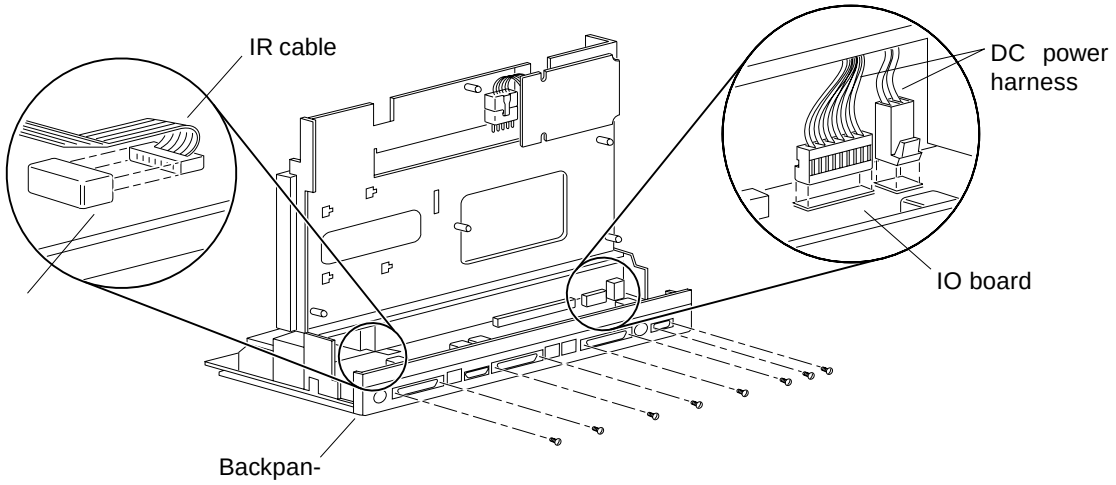

FIGURE 10-16 I/O Board and Backpanel

7. Remove the screw from the I/O board.

See FIGURE 10-17.

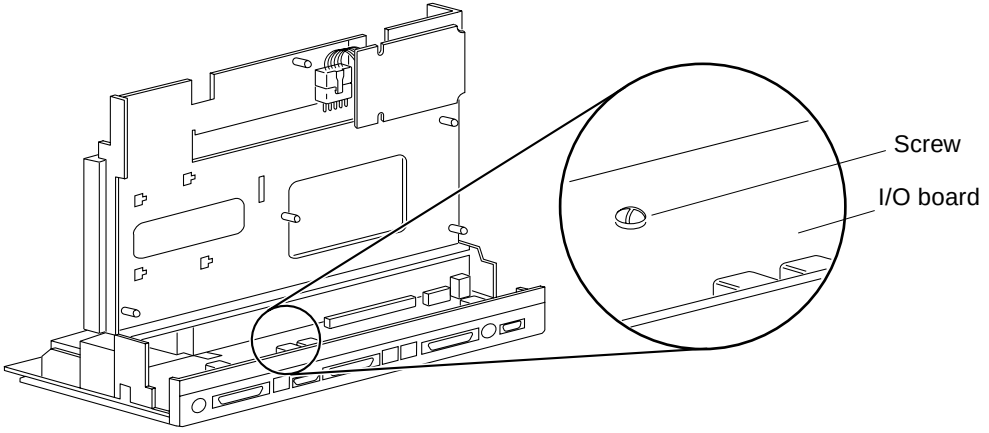

FIGURE 10-17 Screw Location at the Bottom of I/O Board

8. Grasp the I/O board at both ends and gently lift it up and out of the unit.

See FIGURE 10-18. Place it on an antistatic surface.

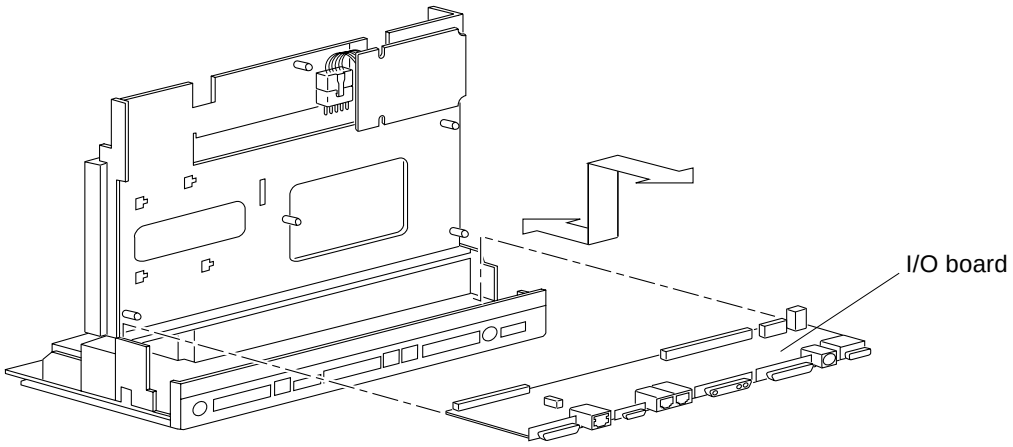

FIGURE 10-18 Removing/Replacing the I/O Board

Replacing the I/O Board

1. **Replace the I/O board into the unit.**

   See FIGURE 10-18.

2. **Insert and tighten all screws on the back panel.**

   See FIGURE 10-16.

3. **Tighten the screw on the I/O board.**

   See FIGURE 10-17.

4. **Connect the DC power harness to the I/O board.**

   See FIGURE 10-16.

5. **Connect the IR cable to the I/O board.**

   See FIGURE 10-16.

6. **Connect the SCSI cable to the I/O board.**

   See FIGURE 10-12.

7. **Replace the CPU board.**

   See Section "Replacing the CPU Board" on page 10-99.

8. **Replace the hard disk drive.**

   See Section "Replacing the Hard Disk Drive" on page 9-94.

CHAPTER 11

Replacement Parts

This chapter provides the replacement parts list and figures to illustrate the SPARCstation Voyager workstation.

List of Replacement Parts

This section lists part numbers and describes replacement parts for the system. Although these part numbers are correct as of the publication date of this document, they are subject to change. Consult your authorized Sun sales representative or service provider to confirm part numbers before you order new or replacement parts.

TABLE 11-1 Replacement Parts List

Replacement Parts	Part Number	Description
CPU Board	501-2581	Assy, CPU, w/ 16 MB Memory
CPU Components	525-1373	TOD/NVRAM
Video Boards	501-2494	Assy, VOB-1, Mono, Tested
	501-2583	Assy, VOB-1, Color, Tested
I/O Board	501-2582	Assy, I/O Board, Tested
IR Board	501-2491	Assy, IR Board, Tested
Memory Cards	595-3092	Assy, Memory Card, 16MB, Tested
	595-3093	Assy, Memory Card, 32MB, Tested
Power Supplies	300-1212	Power Supply and Charger, 60W
	300-1234	Power Supply, 40W DC/DC Converter

TABLE 11-1 Replacement Parts List *(Continued)*

Replacement Parts	Part Number	Description
Drives	540-2445	Drive, Floppy
	540-2446	Hard Disk Drive, 340MB, 2.5” (6.125 cm)
Speaker	540-2454	Speaker, Internal
Display Panels	540-2452	Flat Panel, Color
	540-2453	Flat Panel, Mono
Cables	530-2049	Cable, Flex, Circuit
	530-2061	Cable, Floppy Drive
	530-2062	Cable, SCSI
	530-2063	Cable, Ext, DC Power
	530-2071	Cable, IR, Internal
	530-2123	Cable, Keyboard, 1.5 m
	530-1442	Cable, Keyboard, 2.0 m
Keyboards	320-1194	Sun Compact 1, Keyboard, US
	320-1197	Sun Compact 1, Keyboard, UNIX
	320-1200	Sun Compact 1, Keyboard, German
	320-1206	Sun Compact 1, Keyboard, Swedish
	320-1210	Sun Compact 1, Keyboard, UK
	320-1213	Sun Compact 1, Keyboard, UNIX, Logoless
	320-1214	Sun Compact 1, Keyboard, Japan, Logoless
	320-1072	Type 5 Keyboard, U.S.
Mouse	370-1586	Sun Compact 1, Mouse, Opto-mechanical
	370-1587	Sun Compact 1, Mouse, Logoless
PCMCIA Modem Card	370-1791	PCMCIA Modem Card, U.S.
	370-1795	PCMCIA Modem Card, U.K.
	370-1796	PCMCIA Modem Card, German
	370-1797	PCMCIA Modem Card, Japan
	370-1798	PCMCIA Modem Card, Sweden
	370-1799	PCMCIA Modem Card, Australian
	370-1802	PCMCIA Modem Card, French
Power Cord	530-2073	Power Cord Assy. British

TABLE 11-1 Replacement Parts List *(Continued)*

Replacement Parts	Part Number	Description
	530-2074	Power Cord Assy. European
	530-2075	Power Cord Assy. Australian
	530-2076	Power Cord Assy. N. American
	530-2122	Power Cord Assy. Japanese
Door	540-2493	Battery Door
	540-2494	Power Supply Door
ACCESSORIES		
Battery Pack	595-3146	Battery Pack
Microphone	370-1678	Microphone
Screw Cover	330-1743	Screw Cover (Rubber plug)

Illustrated Parts Breakdown

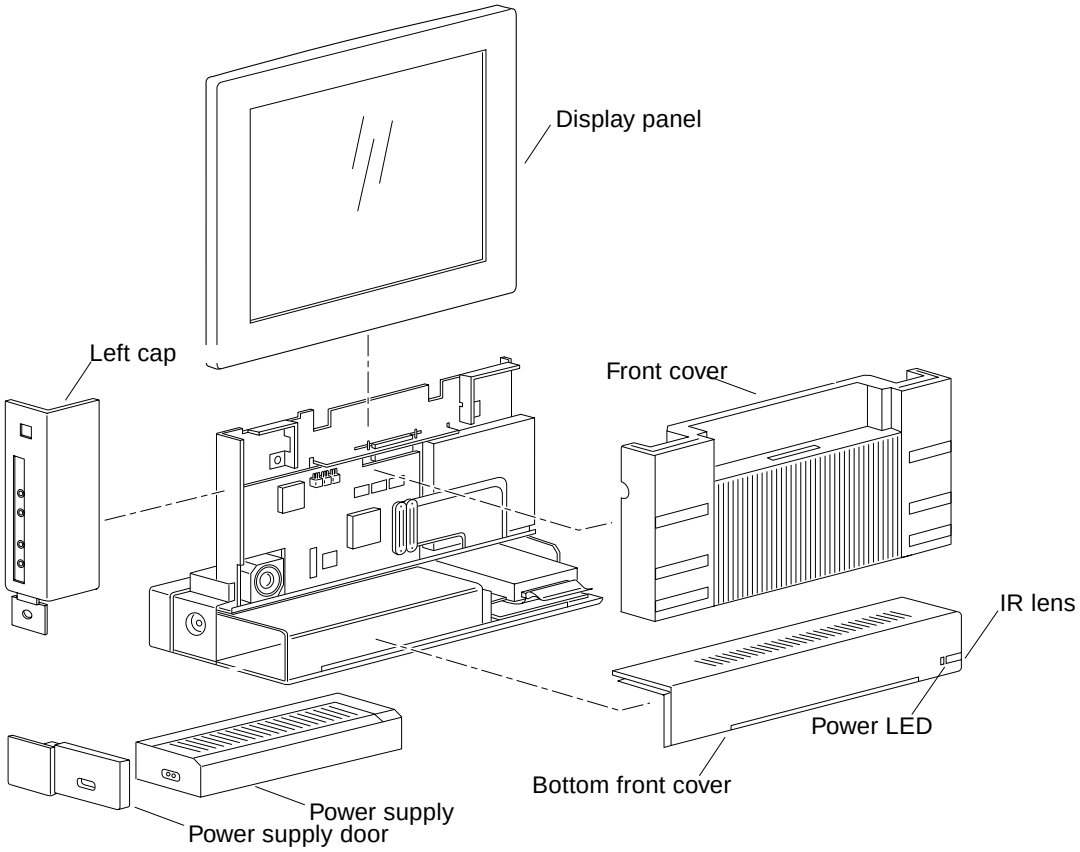

FIGURE 11-1 Front View—Exploded

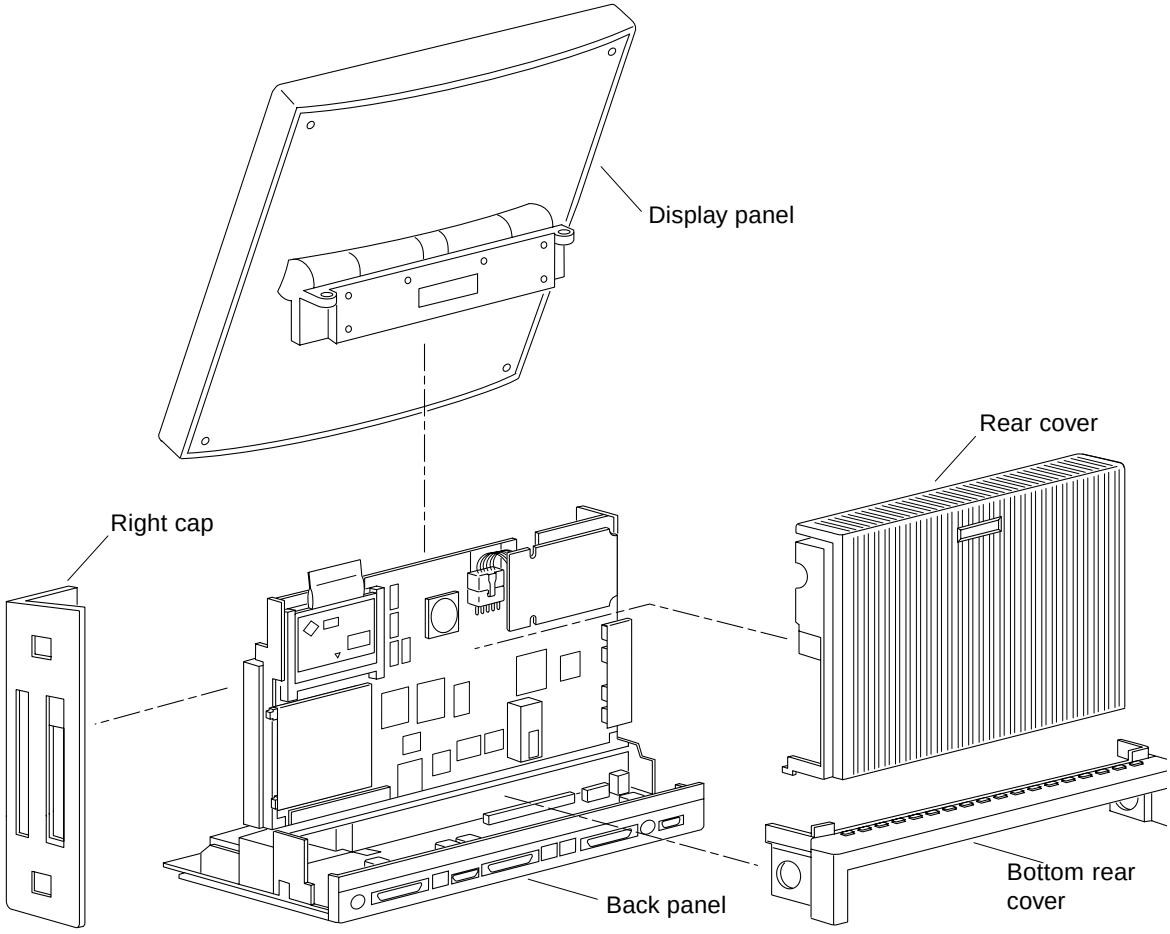

FIGURE 11-2 Rear View—Exploded

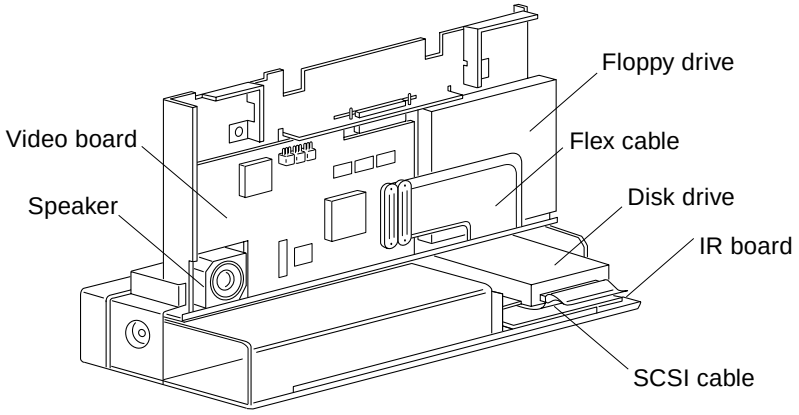

FIGURE 11-3 Front View—Internal

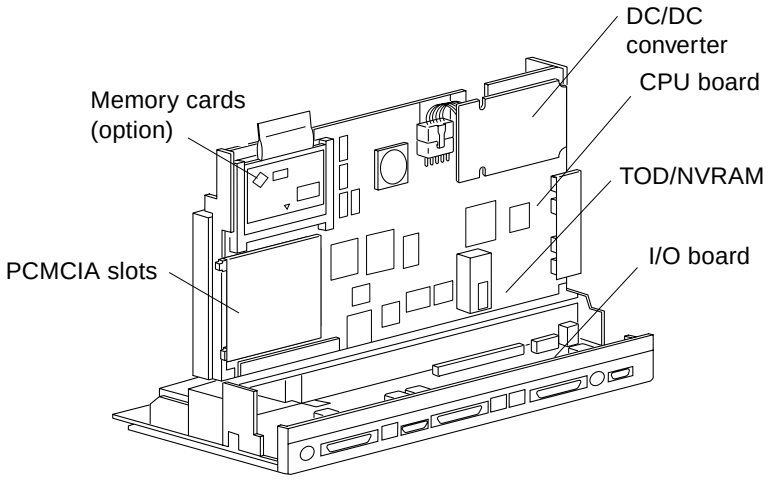

FIGURE 11-4 Rear View—Internal

APPENDIX **A**

Product Specifications

Physical Specifications

TABLE A-1 Color System Physical Specifications

	U.S.	Metric
Height	13.5 in	34.4 cm
Width	14.3 in	36.2 cm
Depth	5.4 in	13.8 cm
Weight, system w/ power supply	13.2 lb	6.0 kg

TABLE A-2 Monochrome System Physical Specifications

	U.S.	Metric
Height	14.1 in	35.7 cm
Width	14.3 in	36.2 cm
Depth	5.4 in	13.8 cm
Weight, system w/ power supply	13.2 lb	6.0 kg

TABLE A-3 Headless System Physical Specifications

	U.S.	Metric
Height	8.4 in	21.3 cm
Width	14.3 in	36.2 cm
Depth	5.4 in	13.8 cm
Weight, system w/ power supply	7.9 lb	3.6 kg

Electrical Specifications

TABLE A-4 AC/DC Power Supply Specifications

Parameter		Value
Input	Voltage range	100 to 120 VAC or 200 to 240 VAC
	Current, maximum	1A
	Current frequency range	47-63 Hz
Output	16.8 VDC, maximum	3.5A
Input power rating	Total continuous power	72W
Volt-Ampere rating		80 VA
Btu/hr rating		245 Btu/hr
Power factor		0.8-0.99

Environmental Requirements

TABLE A-5 Recommended Operating Ranges

	U.S.	Metric
Temperature	50° to 90°F	10° to 32°C
Humidity	20% to 80% RH	20% to 80% RH
Altitude	to 9843 ft	to 3 km

TABLE A-6 Environmental Limits

	Operating		Non-operating	
	U.S.	Metric	U.S.	Metric
Temperature	32° to 104°F	0° to 40°C	–13 το140°F	-25 to 60°C
Humidity	5% to 93% RH	5% to 93% RH	5% to 93% RH	5% to 93% RH
Altitude	10.2 psi (9843 ft)	70kPa (3.0 km)	3.6 psi (34,000 ft)	25 kPa (10.4 km)
Maximum Gradient	1.8F / min noncondensing 1.5 psi / min	1C / min noncondensing 10 kPa / min	1.8F / min noncondensing 1.5 psi / min	1C / min noncondensing 10 kPa / min
Max Dwells at Extremes	16 hours	16 hours	120 hours	120 hours

APPENDIX **B**

Signal Descriptions

External Battery Connector

This connector is located on the I/O board and is designated as J0201.

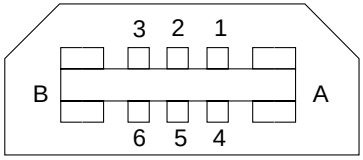

FIGURE B-1 Power Connector

TABLE B-1 Power Connector Pin Assignments

Pin	Name	I/O	Description	Pin	Name	I/O	Description
1	batt_rtn	O	Battery Return	6	batt_ac	I	Battery AC
2	batt_rtn	O	Battery Return	7	batt_vsp1	I	Battery Voltage Supply
3	batt_txd	I	Battery Transmit Data	8	batt_rtn2	O	Battery Return 2
4	batt_rxd	O	Battery Receive Data	9	batt_vsp1	I	Battery Voltage Supply
5	batt_cpu	I	Battery CPU	10	batt_vsp1	I	Battery Voltage Supply

Internal Battery Connector

This connector is located on the I/O board and is designated as J0202.

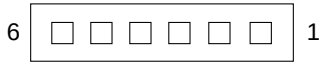

FIGURE B-2 Battery Signal Connector

TABLE B-2 Battery Signal Connector Pin Assignments

Pin	Name	I/O	Description	Pin	Name	I/O	Description
1	batt_rxd	O	Battery Receive Data	4	batt_vsp1	I	Battery Voltage Supply
2	batt_ac	I	Battery AC	5	batt_CPU	I	Battery CPU
3	batt_txd	I	Battery Transmit Data	6	batt_rtn2	O	Battery Return 2

This connector is located on the I/O board and is designated as J203.

FIGURE B-3 Battery Power Connector

TABLE B-3 Battery Power Connector Pin Assignment

Pin	Name	I/O	Description
1	Batt-vspl	I	Battery Voltage Supply
2	Batt-RTN	O	Battery Return

CPU Board to I/O Board Connector

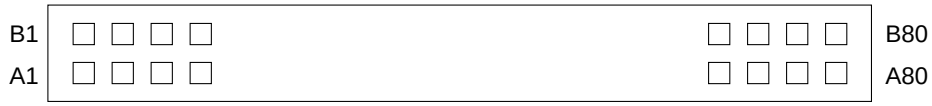

FIGURE B-4 CPU to I/O Board Connector

TABLE B-4 CPU to I/O Board Pin Assignments

Pin	Name	I/O	Pin	Name	I/O
A1	VID GREEN	O	B1	VID_RED	O
A2	VGND	gnd	B2	VID_BLUE	O
A3	VID_RXD	I	B3	VGND	gnd
A4	VID_TXD	O	B4	VID_CLK	O
A5	VCC/G	vcc	B5	VID_CSYNC	O
A6	VCC/G	vcc	B6	GND\G	gnd
A7	SCSI_TERMPWR	O	B7	SCSI_DATA<0>	I/O
A8	SCS_BUSY	I	B8	SCSI_DATA<1>	I/O
A9	SCSI_ACK	I	B9	SCSI_DATA<2>	I/O
A10	SCSI_MESSAGE	O	B10	SCSI_DATA<3>	I/O
A11	SCSI_SEL	O	B11	SCSI_DATA<4>	I/O
A12	SCSI_CONTROL	O	B12	SCSI_DATA<5>	I/O
A13	SCSI_REQ	I	B13	SCSI_DATA<6>	I/O
A14	SCSI_RESET	O	B14	SCSI_DATA<7>	I/O
A15	SCSI_ATTENTION	I	B15	SCSI_PWRDN	O
A16	SCSI_PARITY	I/O	B16	SCSI_DIR	O
A17	GND\G	gnd	B17	GND\G	gnd
A18	TPE_DAT<0>	O	B18	GND\G	gnd
A19	GND\G	gnd	B19	TPE_DAT<2>	I
A20	TPE_DAT<1>	O	B20	TPE_DAT<3	I
A21	GND\G	gnd	B21	GND\G	gnd
A22	GND\G	gnd	B22	TPE_CAB_SENSE	I

TABLE B-4 CPU to I/O Board Pin Assignments *(Continued)*

Pin	Name	I/O	Pin	Name	I/O
A23	PP_SELECT	O	B23	PP_IN*	I
A24	PP_PE	O	B24	PP_RESET*	O
A25	PP_BUSY	I/O	B25	PP_ERROR	I
A26	PP_ACK*	I	B26	PP_AUTO_FEED*	O
A27	PP_DATA<7>	O	B27	PP_DATA<6>	O
A28	PP_DATA<5>	O	B28	PP_DATA<4>	O
A29	PP_DATA<3>	O	B29	PP_DATA<2>	O
A30	PP_DATA<1>	O	B30	PP_DS*	O
A31	PP_DATA<0>	O	B31	GND\G	gnd
A32	GND\G	gnd	B32	GND\G	gnd
A33	SHIELD		B33	SHIELD	
A34			B34		
A35			B35		
A36			B36		
A37	ISDN_TE_1	I/O	B37	ISDN_NT_1	I/O
A38	ISDN_TE_3	I/O	B38	ISDN_NT_3	I/O
A39	ISDN_TE_2	I/O	B39	ISDN_NT_2	I/O
A40	ISDN_TE_4	I/O	B40	ISDN_NT_4	I/O
A41			B41		
A42			B42		
A43	SHIELD		B43	SHIELD	
A44			B44		
A45			B45		
A46	PANIC*	I	B46		
A47	PANIC	I	B47	VCC\G	vcc
A48	POK	O	B48	VID_SENSE0	I
A49	GND\G	gnd	B49	VID_SENSE1	I
A50	V3		B50	VID_SENSE2	I
A51	V3		B51	IR_CLK	O
A52	jtag_clk	I	B52	SYS_LED	O

TABLE B-4 CPU to I/O Board Pin Assignments *(Continued)*

Pin	Name	I/O	Pin	Name	I/O
A53	jtag_ms	I	B53	IR_DIN1	O
A54	jtag_din_macio	I	B54	IR_DIN2	O
A55	jtag_dout_slavio	I	B55	IR_DIN3	O
A56	jtag_jscc_rst	I	B56	IR_DOUT	O
A57	inhibit	I	B57	GND\G	gnd
A58	VPP	O	B58	+12VDC	
A59	fd_index	I	B59	SP_TXC	O
A60	fd_drv_sel	O	B60	SP_DCD	I
A61	fd_dsk_chng	I	B61	SP_DTR	O
A62	fd_eject	O	B62	SP_DSR	I
A63	fd_den_sense	I	B63	SP_CTS	I
A64	fd_motor_en	O	B64	SP_RTXC	I
A65	fd_desnsity_sel	O	B65	SP_RTS	O
A66	fd_dir	O	B66	SP_RXD	I
A67	fd_step	O	B67	SP_TRXC	I
A68	fd_wr_data	O	B68	SP_TXD	O
A69	fd_wr_en	O	B69	KBD_PWR	O
A70	fd_track0	I	B70	KBD_TXD	0
A71	fd_wr_prot	I	B71	KBD_PWK*	I
A72	fd_rd_data	I	B72	MSE_RXD	I
A73	fd_hd_sel	I	B73	KBD_RXD	I
A74	GND\G	gnd	B74	GND\G	gnd
A75	BATT_EXT_RXD	I	B75	BATT_RTN2	0
A76	BATT_AC	I	B76	BATT_TXD	0
A77	BATT_CPU	I	B77	BATT_RXD	I
A78	BATT_VSPL	I	B78	BATT_RTN	0
A79	BATT_VSPL	I	B79	BATT_RTN	0
A80	BATT_VSPL	I	B80	BATT_RTN	0

* Indicates an active low signal.

CPU Board to Video Board Connector

FIGURE B-5 CPU to Video Board Connector

TABLE B-5 CPU to Video Board Pin Assignments

Pin	Name	I/O	Pin	Name	I/O
A1	sb_reset*	O	B1	+12v	
A2	sba<27>	I/O	B2	+12v	
A3	sba<26>	I/O	B3	+12v	
A4	sba<25>	I/O	B4	+12v	
A5	sba<24>	I/O	B5	+12v	
A6	GND	gnd	B6	sb_ack<2>	I/O
A7	sba<22>	I/O	B7	sba<23>	I/O
A8	sba<20>	I/O	B8	sba<21>	I/O
A9	sba<18>	I/O	B9	sba<19>	I/O
A10	sb_ack<1>	I/O	B10	VCC	vcc
A11	sba<16>	I/O	B11	sba<17>	I/O
A12	sba<14>	I/O	B12	sba<15>	I/O
A13	sba<12>	I/O	B13	sba<13>	I/O
A14	sb_ack<0>	I/O	B14	GND	gnd
A15	sba<10>	I/O	B15	sba<11>	I/O
A16	sba<8>	I/O	B16	sba<9>	I/O
A17	sba<6>	I/O	B17	sba<7>	I/O
A18	sb_lerr*	I/O	B18	VCC	vcc
A19	sba<4>	I/O	B19	sba<5>	I/O
A20	sba<2>	I/O	B20	sba<3>	I/O
A21	sba<0>	I/O	B21	sba<1>	I/O
A22	sb_rd	O	B22	GND	gnd

TABLE B-5 CPU to Video Board Pin Assignments

Pin	Name	I/O	Pin	Name	I/O
A23	sb_siz<1>	I/O	B23	sb_siz<2>	I/O
A24	sbd<31>	I/O	B24	sb_siz<0>	I/O
A25	VCC	vcc	B25	sbd<30>	I/O
A26	sbd<28>	I/O	B26	sbd<29>	I/O
A27	sbd<26>	I/O	B27	sbd<27>	I/O
A28	sbd<24>	I/O	B28	sbd<25>	I/O
A29	sbd<23>	I/O	B29	GND	gnd
A30	sbd<21>	I/O	B30	sbd<22>	I/O
A31	sbd<19>	I/O	B31	sbd<20>	I/O
A32	VCC	vcc	B32	sbd<18>	I/O
A33	sbd<16>	I/O	B33	sbd<17>	I/O
A34	sbd<14>	I/O	B34	sbd<15>	I/O
A35	sbd<12>	I/O	B35	sbd<13>	I/O
A36	sbd<11>	I/O	B36	GND	gnd
A37	sbd<9>	I/O	B37	sbd<10>	I/O
A38	sbd<7>	I/O	B38	sbd<8>	I/O
A39	VCC	vcc	B39	sbd<6>	I/O
A40	sbd<4>	I/O	B40	sbd<5>	I/O
A41	sbd<2>	I/O	B41	sbd<3>	I/O
A42	sbd<0>	I/O	B42	sbd<1>	I/O
A43	sb_as*	I/O	B43	GND	gnd
A44	sb_bg<0>	O	B44	sb_br<0>	I/O
A45			B45	sb_clk3	O
A46	fb_sel*	O	B46	sb_intr<5>	I/O
A47	spkr-b	O	B47	spkr-a	O
A48	tab_tx	O	B48	tab_rx	I
A49	brightness	O	B49	VGND	gnd
A50	VGND	gnd	B50	VID_RED	I
A51	VID_SENSE0	O	B51	VGND	gnd
A52	VID_SENSE1	O	B52	VID_GREEN	O

TABLE B-5 CPU to Video Board Pin Assignments

Pin	Name	I/O	Pin	Name	I/O
A53	VID_SENSE2	O	B53	VGND	gnd
A54	VID_CSYNC	O	B54	VID_BLUE	O
A55	VGND	gnd	B55	VGND	gnd
A56			B56	VID_CLK	O
A57	VID_TXD	O	B57	VID_RXD	I
A58	batt_vspl	O	B58	batt_rtn	I
A59	batt_vspl	O	B59	batt_rtn	I
A60	batt_vspl	O	B60	batt_rtn	I

* Indicates an active low signal

Mono Display Panel Connector

This connector is located on the mono video board.

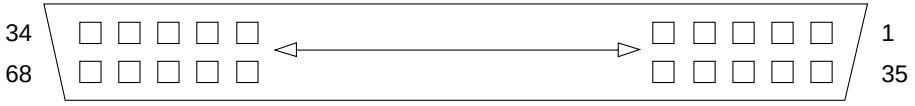

FIGURE B-6 Mono Display Panel Connector

TABLE B-6 Mono Display Panel Pin Assignments

Pin	Name	I/O	Pin	Name	I/O
1	GND	gnd	35	TAB RX	I
2	TAB TX	O	36	PWR 5V	pwr
3			37		
4	BATT_RTN	I	38	BRIGHT	O
5	OHSYNC	I	39	BATT_RTN	I
6	BATT_RTN	I	40	BATT_RTN	I
7	BLENB	I	41	BATT	O
8	BATT	O	42	BATT	O

TABLE B-6 Mono Display Panel Pin Assignments

Pin	Name	I/O	Pin	Name	I/O
9	GND	gnd	43	FPS2	I
10	FPS1	I	44	FPS0	I
11	GND	gnd	45	GND	gnd
12	PWR 5V	pwr	46	PWR 5V	pwr
13	GND	gnd	47	GND	gnd
14	PWR 12V	pwr	48	PWR 12V	pwr
15			49		
16			50		
17			51		
18			52		
19			53		
20			54		
21			55	GND	gnd
22	FLCD<0>	O	56	FLCD<1>	O
23	FLCD<2>	O	57	FLCD<3>	O
24	GND	gnd	58	FLCD<4>	O
25	FLCD<5>	O	59	FLCD<6>	O
26	FLCD<7>	O	60	GND	gnd
27	FLCD<8>	O	61	FLCD<9>	O
28	FLCD<10>	O	62	FLCD<11>	O
29	GND	gnd	63	FLCD<12>	O
30	FLCD<13>	O	64	FLCD<13>	O
31	FLCD<15>	O	65	GND	gnd
32	FHS	O	66	GND	gnd
33	FVS	O	67	GND	gnd
34	FDCLK	O	68	GND	gnd

Color Display Panel Connector

This connector is located on the color video board.

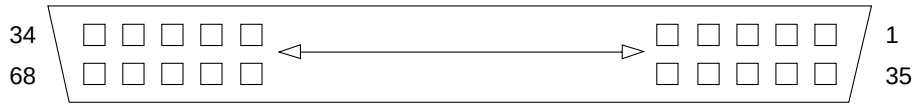

FIGURE B-7 Color Display Panel Connector

TABLE B-7 Color Display Panel Pin Assignments

Pin	Name	I/O	Pin	Name	I/O
1	GND	gnd	35	TAB RX	I
2	TAB TX	O	36	PWR 5V	pwr
3			37		
4	BATT_RTN	I	38	BRIGHT	O
5	OHSYNC	I	39	BATT_RTN	I
6	BATT_RTN	I	40	BATT_RTN	I
7	BLENB	I	41	BATT	O
8	BATT	O	42	BATT	O
9	GND	gnd	43	FPS2	I
10	FPS1	I	44	FPS0	I
11	GND	gnd	45	GND	gnd
12	PWR 5V	pwr	46	PWR 5V	pwr
13	GND	gnd	47	GND	gnd
14	PWR 12V	pwr	48	PWR 12V	pwr
15			49		
16			50	GND	gnd
17	B13	O	51	B12	O
18	B11	O	52	B10	O
19	GND	gnd	53	B03	O
20	B02	O	54	B01	O
21	B00	O	55	GND	gnd

TABLE B-7 Color Display Panel Pin Assignments

Pin	Name	I/O	Pin	Name	I/O
22	G13	O	56	G12	O
23	G11	O	57	G10	O
24	GND	gnd	58	G03	O
25	G02	O	59	G01	O
26	G00	O	60	GND	gnd
27	R13	O	61	R12	O
28	R11	O	62	R10	O
29	GND	gnd	63	R03	O
30	R02	O	64	R01	O
31	R00	O	65	GND	gnd
32	FHS	O	66	GND	gnd
33	FVS	O	67	GND	gnd
34	FDCLK	O	68	GND	gnd

PCMCIA Connector(s)

These connectors are located on the CPU board.

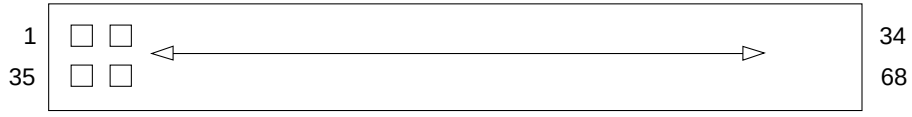

FIGURE B-8 PCMCIA Connector(s)

TABLE B-8 PCMCIA Pin Assignments

Pin	Name	I/O	Description	Pin	Name	I/O	Description
1	GND		Ground	35	GND		Ground
2	D3	I/O	Data bit 3	36	CD1	O	Card detect
3	D4	I/O	Data bit 4	37	D11	I/O	Data bit 11
4	D5	I/O	Data bit 5	38	D12	I/O	Data bit 12

TABLE B-8 PCMCIA Pin Assignments

Pin	Name	I/O	Description	Pin	Name	I/O	Description
5	D6	I/O	Data bit 6	39	D13	I/O	Data bit 13
6	D7	I/O	Data bit 7	40	D14	I/O	Data bit 14
7	CE1	I	Card enable	41	D15	I/O	Data bit 15
8	A10	I	Address bit 10	42	CE2	I	Card enable
9	OE	I	Output enable	43	RFSH	I	Refresh
10	A11	I	Address bit 11	44	IORD	I	IO read
11	A9	I	Address bit 9	45	IOWR	I	IO write
12	A8	I	Address bit 8	46	A17	I	Address bit 17
13	A13	I	Address bit 13	47	A18	I	Address bit 18
14	A14	I	Address bit 14	48	A19	I	Address bit 19
15	WE/PGM	I	Write enable	49	A20	I	Address bit 20
16	IREQ	O	Interrupt request	50	A21	I	Address bit 21
17	Vcc			51	Vcc		
18	Vpp1		Prgrm periph supply	52	Vpp2		Prgrm periph supply 2
19	A16	I	Address bit 16	53	A22	I	Address bit 22
20	A15	I	Address bit 15	54	A23	I	Address bit 23
21	A12	I	Address bit 12	55	A24	I	Address bit 24
22	A7	I	Address bit 7	56	A25	I	Address bit 25
23	A6	I	Address bit 6	57	RFU		Reserved
24	A5	I	Address bit 5	58	RESET	I	Card reset
25	A4	I	Address bit 4	59	WAIT	O	Extend bus cycle
26	A3	I	Address bit 3	60	INPACK	O	Input Port Acknowledge
Pin	Name	I/O	Description	Pin	Name	I/O	Description
27	A2	I	Address bit 2	61	REG	I	Register select & IO enbl
28	A1	I	Address bit 1	62	SPKR	O	Audio digital waveform
29	A0	I	Address bit 0	63	STSCHG	O	Card status change
30	D0	I/O	Data bit 0	64	D8	I/O	Data bit 8

TABLE B-8 PCMCIA Pin Assignments

Pin	Name	I/O	Description	Pin	Name	I/O	Description
31	D1	I/O	Data bit 1	65	D9	I/O	Data bit 9
32	D2	I/O	Data bit 2	66	D10	I/O	Data bit 10
33	IOIS16	O	IO port is 16-bit	67	CD2	O	Card detect
34	GND		Ground	68	GND		Ground

Keyboard / Mouse and Serial Port

Keyboard / Mouse

This connector is located on the I/O board and is designated J0404.

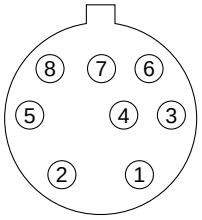

FIGURE B-9 Keyboard / Mouse Connector

TABLE B-9 Keyboard / Mouse Connector Pin Assignments

Pin	Name	I/O	Description	Pin	Name	I/O	Description
1	GND		Ground	5	Kbd-txd	O	Keyboard transmit data
2	GND		Ground	6	Kbd-rxd	I	Keyboard receive data
3	kbd-pwr	O	Keyboard power	7	Kbd-pwk*	I	Keyboard power key
4	mse-rxd	I	Mouse Receive Data	8	Kbd-pwr	O	Keyboard power

* Indicates an active low signal

ISDN Ports

ISDN TE

This connector is located on the I/O board and is designated J0301.

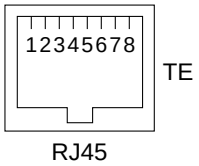

FIGURE B-10 ISDN TE Connector

TABLE B-10 ISDN TE Connector Pin Assignments

Pin	Name	I/O	Pin	Name	I/O
1	isdn_te_ps3_p	I/O	5	isdn_te_3	I/O
2	isdn_te_ps3_n	I/O	6	isdn_te_4	I/O
3	isdn_te_1	I/O	7	isdn_te_ps2_n	I/O
4	isdn_te_2	I/O	8	isdn_te_ps2_p	I/O

ISDN NT

This connector is located on the I/O board and is designated J0302.

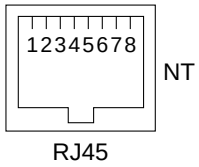

FIGURE B-11 ISDN NT Connector

TABLE B-11 ISDN TE Connector Pin Assignments

Pin	Name	I/O	Pin	Name	I/O
1	isdn_nt_ps3_p	I/O	5	isdn_nt_3	I/O
2	isdn_nt_ps3_n	I/O	6	isdn_nt_4	I/O
3	isdn_nt_1	I/O	7	isdn_nt_ps2_n	I/O
4	isdn_nt_2	I/O	8	isdn_nt_ps2_p	I/O

Serial Port

This serial port is located on the I/O board and is designated as J0403.

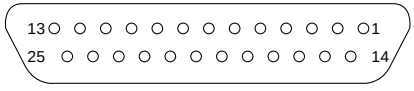

FIGURE B-12 Serial Port Connector

TABLE B-12 Serial Port Connector Pin Assignments

Pin	Name	I/O	Description	Pin	Name	I/O	Description
1				14			
2	sp_txd	O	Transmit Data	15	sp_trxc	I	Transmit Signal Clock
3	sp_rxd	I	Receive Data	16			
4	sp_rts	O	Request to Send	17	sp_rtxc	I	Receive Signal Clock
5	sp_cts	I	Clear to Send	18			
6	sp_dsr	I	Data Set Ready	19			
7	GND	O	Ground	20	sp_dtr	O	Data Terminal Ready
8	sp_dcd	I	Data Carrier Detect	21			

TABLE B-12 Serial Port Connector Pin Assignments

Pin	Name	I/O	Description	Pin	Name	I/O	Description
9				22			
10				23			
11				24	sp_txc	O	Transmit Clock
12				25			
13							

Twisted Pair Ethernet

This connector is located on the I/O board and is designated as J0205.

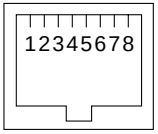

FIGURE B-13 Twisted Pair Ethernet Connector

TABLE B-13 Twisted Pair Ethernet Pin Assignments

Pin	Name	I/O	Description	Pin	Name	I/O	Description
1	tpe_1	O	Data Out (+)	5	N.C.		
2	tpe_0	O	Data Out (-)	6	tpe-3	I	Data In (-)
3	tpe_2	I	Data In (+)	7	tpe_cab_sen	I	Cable Sense
4	N.C.			8	GND	O	Ground

Floppy Connector

This connector is located on the system board and is designated as J1200.

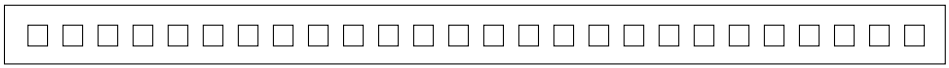

FIGURE B-14 Floppy Connector

TABLE B-14 Floppy Pin Assignments

Pin	Name	I/O	Description	Pin	Name	I/O	Description
1	VCC	O	Voltage (+)	14	fd_step	O	Step
2	fd_index	I	Index Signal	15	GND	O	Ground
3	VCC	O	Voltage (+)	16	fd_wr data	O	Write Data
4	fd_drv sel	O	Drive Select	17	GND	O	Ground
5	VCC	O	Voltage (+)	18	fd_wr en	I	Write Enable
6	fd_dsk chng	I	Disk Change	19	GND	O	Ground
7				20	fd_track 0	I	Track 0 Signal
8	fd_eject	O	Eject	21	GND	O	Ground
9	fd_den sense	I	Density Sense	22	fd_wr prot	I	Write Protect
10	fd_motor en	O	Motor Enable	23	GND	O	Ground
11	fd_density sel	I	Density Select	24	fd_rd data	I	Read Data
12	fd_dir	I	Direction	25	GND	O	Ground
13	GND	O	Ground	26	fd_hd sel	O	Head Select

SCSI Connector (Internal)

This connector is located on the I/O board and is designated as J0303.

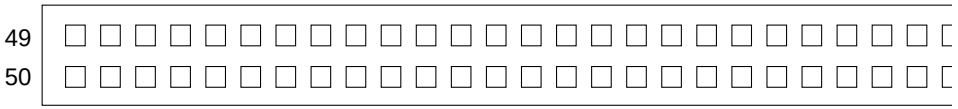

FIGURE B-15 SCSI Connector (Internal)

TABLE B-15 SCSI (Internal) Pin Assignments

Pin	Name	I/O	Description	Pin	Name	I/O	Description
1	N.C.			26	scsi-data 2	I/O	Data bit 2
2	N.C.			27	N.C.		
3	N.C.			28	scsi-data 1	I/O	Data bit 1
4	N.C.			29	GND	O	Ground
5	GND	O	Ground	30	scsi-data 0	O	Data bit 0
6	GND	O	Voltage (+)	31	GND	O	Ground
7	VCC	O	Voltage (+)	32	scsi-parity	I/O	Parity bit
8	N.C.			33	GND	O	Ground
9	N.C.			34	scsi-termpwr	O	Termination Power
10	N.C.			35	scsi-attention	I/O	Attention
11	VCC	O	Voltage (+)	36	scsi-busy	I/O	Busy
12	VCC	O	Voltage (+)	37	GND	O	Ground
13	GND	O	Ground	38	scsi-ack	I/O	Acknowledge
14	GND	O	Ground	39	scsi-reset	I/O	Reset
15	GND	O	Ground	40	scsi-message	I/O	Message
16	scsi-data7	I/O	Data bit 7	41	GND	O	Ground
17	GND	O	Ground	42	scsi-sel	I/O	Select
18	scsi-data 6	I/O	Data bit 6	43	scsi-dir	I/O	Direction
19	GND	O	Ground	44	scsi-control	I/O	Control
20	scsi-data 5	I/O	Data bit 5	45	GND	O	Ground
21	GND	O	Ground	46	scsi-req	I/O	Request
22	scsi-data 4	I/O	Data bit 4	47	GND	O	Ground
23	GND	O	Ground	48	GND	O	Ground
24	scsi-data 3	I/O	Data bit 3	49	VCC	O	Voltage (+)
25	GND	O	Ground	50	VCC	O	Voltage (+)

SCSI Connector (External)

This connector is located on the I/O board and is designated as J0304.

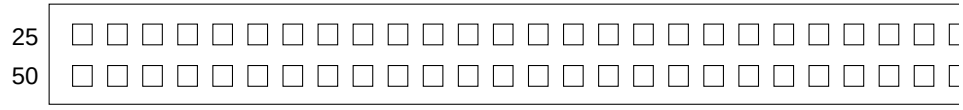

FIGURE B-16 SCSI Connector (External)

TABLE B-16 SCSI (External) Pin Assignments

Pin	Name	I/O	Description	Pin	Name	I/O	Description
1	GND	O	Ground	26	scsi-data 0	I/O	Data bit 0
2	GND	O	Ground	27	scsi-data 1	I/O	Data bit 1
3	GND	O	Ground	28	scsi-data 2	I/O	Data bit 2
4	GND	O	Ground	29	scsi-data 3	I/O	Data bit 3
5	GND	O	Ground	30	scsi-data 4	I/O	Data bit 4
6	GND	O	Ground	31	scsi-data 5	I/O	Data bit 5
7	GND	O	Ground	32	scsi-data 6	I/O	Data bit 6
8	GND	O	Ground	33	scsi-data 7	I/O	Data bit 7
9	GND	O	Ground	34	scsi-parity	I/O	Parity
10	GND	O	Ground	35	GND	O	Ground
11	GND	O	Ground	36	GND	O	Ground
12	GND	O	Ground	37	GND	O	Ground
13	Shield			38	scsi-termpwr	O	Termination Power
14	GND	O	Ground	39	GND	O	Ground
15	GND	O	Ground	40	GND	O	Ground
16	GND	O	Ground	41	scsi-attention	I/O	Attention
17	GND	O	Ground	42	GND	O	Ground
18	GND	O	Ground	43	scsi-busy	I/O	Busy
19	GND	O	Ground	44	scsi-ack	I/O	Acknowledge
20	GND	O	Ground	45	scsi-reset	I/O	Reset
21	GND	O	Ground	46	scsi-message	I/O	Message

TABLE B-16 SCSI (External) Pin Assignments *(Continued)*

Pin	Name	I/O	Description	Pin	Name	I/O	Description
22	GND	O	Ground	47	scsi-sel	I/O	Select
23	GND	O	Ground	48	scsi-control	I/O	Control
24	GND	O	Ground	49	scsi-req	I/O	Request
25	GND	O	Ground	50	scsi-dir	I/O	Direction

Audio Connectors

The Microphone Input connector is located on the CPU board and is designated as J0601.

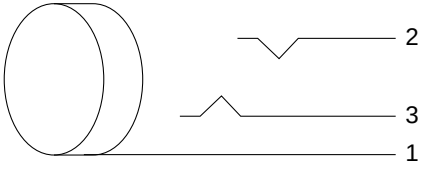

FIGURE B-17 Audio Connector—Microphone Input

TABLE B-17 Audio—Microphone Input Pin Assignments

Pin	Name	I/O	Description
1	GND	O	Ground
2	audi- in & pw- out	I/O	Audio In & Power Out
3			

The Line Input connector is located on the CPU board and is designated as J0700.

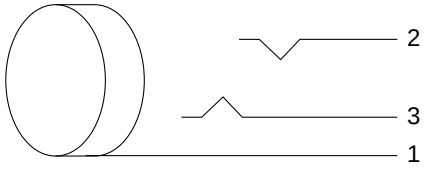

FIGURE B-18 Audio Connector—Line Input

TABLE B-18 Audio—Line Input Pin Assignments

Pin	Name	I/O	Description
1	GND	O	Ground
2	line-in-1	I	Line in left
3	line-in-r	I	Line in right

The Line Output connector is located on the CPU board and is designated as J0701.

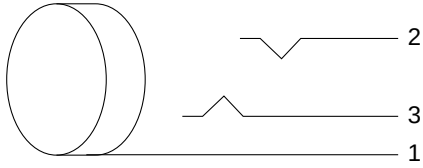

FIGURE B-19 Audio Connector—Line Output

TABLE B-19 Audio—Line Output Pin Assignments

Pin	Name	I/O	Description
1	GND	O	Ground
2	line 0-out-l	O	Line out left
3	line 0-out-r	O	Line out right

The Headphone Output connector is located on the CPU board and is designated as J0602.

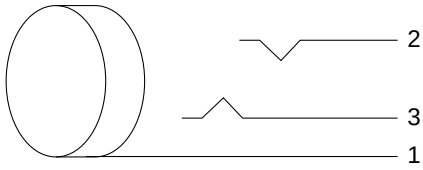

FIGURE B-20 Audio Connector—Headphone Output

TABLE B-20 Audio—Headphone Output Pin Assignments

Pin	Name	I/O	Description
1	GND	O	Ground
2	head-out-l	O	Headphone output left
3	head-out-r	O	Headphone output right

APPENDIX **C**

Selected On-Board Diagnostics

This appendix describes the selected on-board diagnostics. These tests will help you in troubleshooting the system.

Caution – To run diagnostics at the `ok` prompt, you must shut down the system in an orderly manner. When the operating system or any other stand-alone program is booted, do not use the `Stop(L1)-A` keys to halt the system. Abruptly aborting the operating system may cause damage to data files.

- "test Device Alias, test Device Pathname" on page 143
- "test-all" on page 144
- "watch-clock" on page 144
- "watch-net, watch-tpe" on page 145
- "probe-scsi" on page 146
- "test-memory" on page 146
- "power-off" on page 147

`test` Device Alias, `test` Device Pathname

The `test` command, combined with a device alias or device pathname, executes that device selftest program. If a device has no selftest program, this message is displayed: `No selftest method for device name`.

To run the selftest program for a device, type the `test` command followed by the *device alias* or *device pathname*.

For example:

```
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 which have a selftest program. Disks, tapes, and CD-ROMs are not tested by `test-all`. Tests are executed in order using the device tree (viewed with the `show-devs` command) as reference. The `diag-switch?` parameter must be set true to run this test.

```
ok test-all
```

watch-clock

Displays seconds from the NVRAM/TOD (Non-Volatile RAM/Time of Day). The counter counts from 0 to 59 repeatedly. For example:

```
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
```

To interrupt the test, press any key on the keyboard.

watch-net, watch-tpe

These tests monitor broadcast Ethernet packets on the Ethernet cable connected to the system. Good packets received by the system are displayed on the screen by a period (.). Errors are indicated with an `X` and the error description. For example:

```
ok watch-net
 Internal loopback test -- succeeded.
 External loopback test -- Auto-selecting Ethernet cable I/F
Trying TPE
Received packet on TPE
Select cable - TPE
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 Voyager workstation has one on-board 10Base T Ethernet interface, (also called twisted-pair Ethernet or TPE).

You can also use `watch-tpe` to monitor the 10BaseT (TPE) connection. For example:

```
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.
.............................................................
```

probe-scsi

The `probe-scsi` test sends an inquiry command to internal and external SCSI devices connected to the SPARCstation Voyager workstation on-board SCSI interface. If a SCSI device is connected and powered up, the target address, unit number, device type, and manufacturer name should be displayed. For example:

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

test-memory

Tests all of the system main memory if the system `diag-switch?` parameter is true. If the `diag-switch?` is set to false, it tests the memory according to the number specified in `selftest-#megs`. When the `test-memory` diagnostic is running, the number of Mbytes being tested is displayed and counted down to zero during the test.

If the `diag-switch?` parameter is false, this test uses the `selftest-#megs` parameter in NVRAM to determine how much memory to test. The default for the `selftest-#megs` parameter is 1, so only 1 Mbyte of memory is tested.

To change the amount of memory tested using the `selftest-#megs` parameter to 16 Mbytes, type this command:

```
ok setenv selftest-#megs 16
```

This sets the desired memory size to 16 Mbytes. Use any whole number as long as it does not exceed the actual size of memory (in Mbtyes) installed in the system. When the `test-memory` diagnostic is running, the number of megabytes being tested is displayed and counted down to zero during the test.

power-off

This commands turn the power off. You must have a Compact 1 or type 5 keyboard attached in order to use this command.

Glossary

AMLCD An acronym for Active Matrix Liquid Crystal Display. A specific style of flat panel display technology.

ASIC An acronym for Application Specific Integrated Circuit. A silicon chip designed to implement functions that would otherwise require several chips or parts.

boot To load the system software into memory and start it running.

boot PROM In Sun workstations, contains the PROM monitor program, a command interpreter used for booting, resetting, low-level configuration, and simple test procedures.

DBRI An acronym for Dual Basic Rate Interface. A Sun designed ASIC that implements the hardware end of an ISDN interface.

default A preset value that is assumed to be correct unless changed by the user.

Desktop Storage Module An external data storage that contains a disk drive or a tape drive. Abbreviated as DSM.

Desktop Storage Pack An external data storage unit that contains a disk drive (Desktop Disk Pack), a tape drive (Desktop Backup Pack), or a CD-ROM drive (Desktop SunCD Pack), and that can be connected to a SPARCstation Voyager workstation. Abbreviated as DSP.

Ethernet A type of network hardware that allows communication between systems connected directly together by transceiver taps, transceiver cables, and a coaxial cable. Implemented in the SPARCstation Voyager workstation using twisted-pair telecommunications wire and cable.

External Storage Module An external unit that contains disk/tape drives and that can be connected to a SPARCstation Voyager workstation. Abbreviated as ESM.

ISDN An acronym for Integrated Services Digital Network. A technical standard that provides for fully digital transmission and reception of data, and fully digital end-to-end connectivity of telecommunications devices across a public network.

Memory Card A small board which usually contains several DRAMs. These cards are added to a system to increase the amount of memory available to the CPU.

NVRAM An acronym for non-volatile random access memory. The NVRAM is used to store system variables used by the boot PROM. It also contains the system's hostid number and Ethernet address.

PCMCIA Personal Computer Memory Card International Association is an international organization that has defined interface standards for Personal Computer Cards. These PC Cards add memory, mass storage and I/O capabilities to mobile computing systems. You can use a Sun modem contained on a PCMCIA card on your SPARCstation Voyager workstation.

point-to-point protocol (PPP) The successor to SLIP, PPP provides router-to-router and host-to-network connections over both synchronous and asynchronous circuits.

power management The regulation of a computer's power consumption.

Resume Turning the power on after a suspend. The resume operation restores the system to the point at which it was suspended.

SCSI Small Computer System Interface; pronounced "scuzzy."

SLAVIO This chip contains all of the control logic referred to as slave I/O devices. These devices are serial ports, floppy controller, EPROM, TOD chip and NVRAM.

suspend A means of turning off the power in which the system state is saved to disk. See also resume.

system Any computer that allows you to run programs or applications. In this book, it means the SPARCstation Voyager workstation unit together with the Sun operating system and peripheral hardware devices.

system unit The enclosure containing the system memory, central processing unit, hard disk, floppy drive, and video board.

TOD An acronym of Time of Day. This is a special timekeeping chip that keeps track of what day and time it is.

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