S/50™ Service Manual

Convergent Technologies

S/50™ Service Manual

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First Edition (November 1986) Ø9-Ø13Ø8-Ø1

WARNING

This equipment has been certified to comply with the limits for a Class B computing device, pursuant to Subpart J of Part 15 of FCC Rules. Only peripherals (computer input/output devices, terminals, printers, etc.) certified to comply with the Class B limits may be attached to this computer, when installed in a residential environment. Operation with peripherals that are not certified to comply with Class B Subpart J of Part 15 of FCC Rules is likely to result in interference to radio and TV reception, if installed in a residential environment.

When this equipment is utilized in a commercial environment, the rules of FCC Part 15-J, Class A apply. Connection and operation of this equipment with other equipment that is verified to comply with the Rules applicable to Class A (Commercial) use is typically acceptable in the commercial use environment. Refer to the instructions supplied with the FCC Class A systems intended for interconnection to this equipment for direction.

This equipment generates and uses radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio and television reception. It has been type tested and found to comply with the limits for a Class B computing device in accordance with the specifications in Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient the receiving antenna.
- Relocate the computer with respect to the receiver.
- Move the computer away from the receiver.
- Plug in the computer to a different outlet so that computer and receiver are on different branch circuits.

If necessary, consult the dealer or an experienced radio/television technician for additional suggestions.

Preface

The AT&T **UNIX**™ PC Service Manual is intended for field personnel and users interested in independently servicing and maintaining the AT&T **UNIX**™ PC Model 7300 and 3B1. This manual is organized into the following sections:

- **System Features and Functions** briefly describes the physical features and functional capabilities of the **UNIX** PC system.

- **Using the Diagnostic Test Procedures** describes acceptance testing on the UNIX PC, the internal tests each of the diagnostics performs, and detailed procedures on how to use these diagnostics. A listing of the results of these diagnostics in terms of pass or fail messages is also included. The diagnostics are intended to isolate failures to field-replaceable assemblies.

- **Troubleshooting** contains troubleshooting information to isolate a failure to a field-replaceable assembly. It includes common operational problems associated with **UNIX** PC component assemblies and a recommended test or evaluation strategy leading to recommended replacement of a defective assembly.

- **Removing and Replacing Subassemblies** explains how to disassemble the **UNIX** PC and remove all replaceable subassemblies.

- **Appendix A Part Numbers for Field-Replaceable Items** contains a list of replacement assemblies and part numbers.

- **Appendix B Monitor Adjustments** lists adjustments that can be made to the monitor screen.

Other Useful Manuals

You will find additional information about the **UNIX** PC in these manuals:

AT&T **UNIX**™ PC Installation Guide

This manual contains all the information necessary to unpack, set up, and install your **UNIX** PC.

AT&T **UNIX**™ PC Getting Started Guide

This handbook introduces you to the **UNIX** PC through a series of practice lessons.

AT&T **UNIX**™ PC Owner's Manual

This manual provides detailed information about **UNIX** PC operation and step-by-step procedures for accomplishing office tasks and system administration.

AT&T **UNIX**™ PC Telephone Manager User's Guide

This guide in the Communications Management binder explains how to use the telephone features of your **UNIX** PC. It includes tutorial lessons for beginners.

Contents

1 System Features and Functions

The **UNIX** PC is an intelligent desktop workstation that provides users with personal computing and enhanced voice and data communications services. It provides the **UNIX** System V virtual memory operating system in a telephone network environment. The **UNIX** PC can connect to a telephone system to allow communication with other telephones, workstations, and computers. Direct connection or connection through a local area network to other terminals, workstations, or computers is also provided. The **UNIX** PC can be upgraded to a multiuser system.

The **UNIX** PC consists of the following parts, as illustrated in Figure 1-1:

- Base unit
- Keyboard
- Mouse.

The workstation base unit houses the monitor, power supply, hard disk drive, floppy disk drive, logic board, and three expansion slots. The logic board provides the processor logic, bit-mapped graphics logic, communications, and interface logic for all connected input/output (I/O) devices. The monitor is attached to a tiltable base; the monitor also swivels.

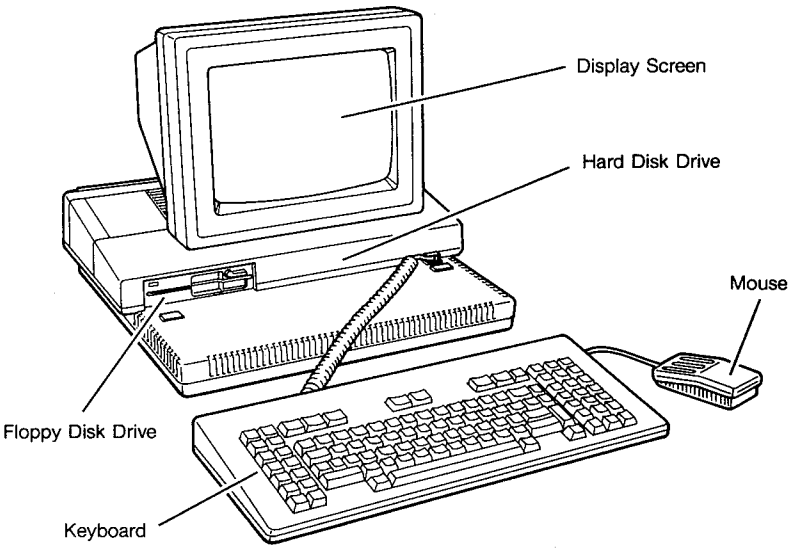


Figure 1-1 Base Unit, Keyboard, and Mouse

Functional Specifications

This subsection gives functional specifications for the **UNIX** PC.

Logic Board

- Motorola 68010 central processing unit (CPU) with 10MHz clock.
- Virtual memory address of 4 megabytes (MB).
- 1 megabyte standard random access memory (RAM). 2 megabyte RAM is an option.
- 720 by 348 bit-mapped graphics monitor interface.
- DTE RS-232-C serial port female connector.
- Centronics-compatible parallel printer port.
- Keyboard interface.
- Telephone interfaces for voice and data service. Three modular jacks are used: one for connection to a user-provided telephone and the other two for connection to tip/ring telephone lines. Also included is an integrated 300/1200 bits per second (bps) modem compatible with AT&T Models 103 and 212, offering asynchronous operation and autobaud capabilities.
- Hard disk interface.
- Floppy disk interface.
- Expansion bus interface that allows memory and I/O expansion. The bus has 21 address lines and 16 data lines and will support bus mastership by expansion hardware.
- A realtime clock that retains the time and date when the **UNIX** PC is powered down.

Terminal Subsystem

The monitor contains a green-phosphor, 12-inch cathode ray tube (CRT), a deflection board, and a yoke. It provides a 20-megahertz (MHz) screen capable of displaying 720 by 348 pixels. The display can be programmed either as light on black (normal) or black on light (inverse video).

The monitor is attached to the base. The monitor can tilt -5 degrees to +20 degrees relative to the horizontal plane and swivel.

The screen is treated to reduce glare. A brightness control is accessible to the operator, as shown in Figure 1-1.

Keyboard

Figure 1-2 illustrates the keyboard.

The keyboard is connected to the base with a flexible, coiled cable that can expand to a length of approximately six feet. One end of the cable has approximately an inch of straight cord that plugs into the base unit. Both ends of the cable have connectors that prevent accidental disconnection.

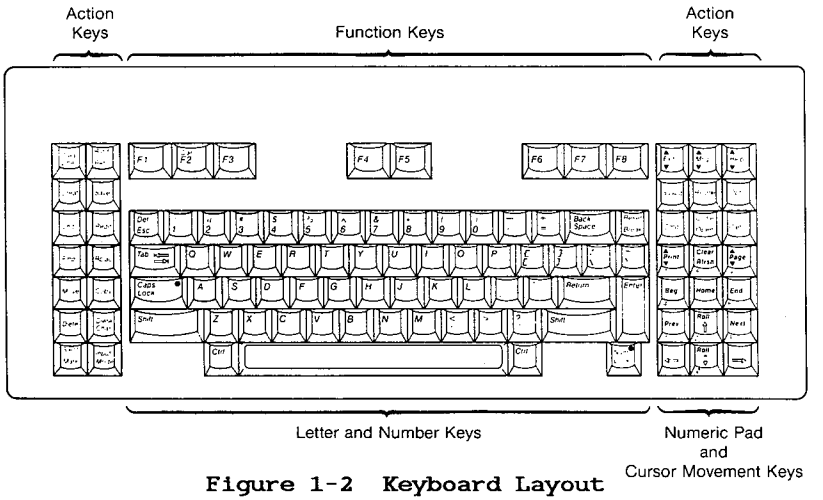


Figure 1-2 Keyboard Layout

Mouse

The mouse connects to the keyboard unit with a lightweight, uncoiled cable that is approximately four feet long. The cable has a connector that locks to prevent accidental disconnection. The cable plugs into the keyboard. These connections are shown below in Figure 1-3.

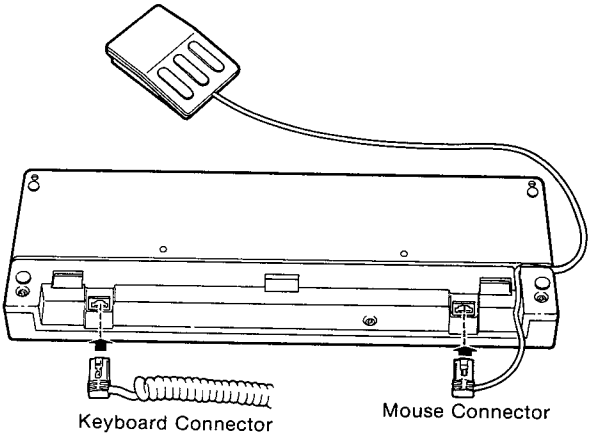


Figure 1-3 Keyboard and Mouse Connections

Audio Monitor

An audible indicator consisting of a small speaker is provided for monitoring telephone calls when you are using the Telephone Manager. A user-accessible volume control, illustrated in Figure 1-1, is located just under the right edge of the base unit.

Data Storage

- A 10MB, 20MB half-height, or 40MB, 67MB full-height hard disk (Winchester) for mass storage.
- A double-sided, 0.5MB, 5 1/4-inch, 48-tpi floppy disk drive with 320 KB formatted capacity.

Built-in RS-232-C Port

The RS-232-C port supports both synchronous and asynchronous data communications. Asynchronous bit rates of 110 bps to 19.2 Kbps are available.

RS-232-C Signals

The following list of signals applies to the RS-232-C connector. The list gives the pin number, signal name, and direction for the **UNIX** PC.

Pin	Name	Direction
1	Ground (Shield)	Bidirectional
2	Transmit Data	Output
3	Receive Data	Input
4	Request to Send	Output
5	Clear to Send	Input
6	Data Set Ready	Input
7	Ground	Bidirectional
8	Carrier Detect	Input
15	Transmit Clock	Input
17	Receive Clock	Input
20	Data Terminal Ready	Output
22	Ring Indicator	Input
24	DTE Transmit Clock	Output

Channel B of the 8274/7201 multiple protocol serial controller is connected to the modem. The following list describes the channel B signals:

8274/7201 Carrier detect <---RS-232-C ring indicator

8274/7201 Receive clock <----Modem receive clock

8274/7201 Clear to send <----RS-232-C data set ready

8274/7201 Transmit data----> Modem transmit data

8274/7201 Transmit clock <---Modem transmit clock

8274/7201 Receive data <-----Modem receive data

RS-232-C Signal Levels

The following tables illustrate possible cabling to a printer or terminal.

Active data and clock signals produce -12V on the line and control signals produce +12V when active.

UNIX PC to Terminal Cable Pinning

UNIX PC		Terminal
1	-------->	1
2	-------->	3
3	<--------	2
4-5-6		4-5-6
7	---------	7
8		20
20	---------	8

UNIX PC to Printer with CTS Control

UNIX PC		Printer
1	--------	1
2	------->	3
3	<-------	2
4	--------	4
5	<-------	5
6-8-20		
5	--------	7

Diagnostic Loopback Plug

The diagnostic floppy tests RS-232-C functions through the use of a loopback plug, which must be installed when a channel is being tested.

Loopback plug (male) pinning is as follows:

2	-------->	3
4	-------->	5
4	-------->	8
20	-------->	6
20	-------->	22

(2) Transmit data ---------- (3) Receive data

(4) Request to send --------- (5) Clear to send

(4) Request to send --------- (8) Carrier detect

(20) Data terminal ready ----- (6) Data set ready

(20) Data terminal ready ---- (22) Ring indicator

Diagnostic Expansion Loopback Plug

Expansion Loopback plug (male to male) pinning is as follows:

```
 2 -------- 3
 3 -------- 2
 4 -------- 5
 4 -------- 8
 5 -------- 4
 8 -------- 4
 6 --------20
20 -------- 6
15 --------24
17 --------24
24 --------15
24 --------17
```

Centronics Parallel Printer Interface Module

The following table is an example of how a parallel printer cable might be constructed. The **UNIX** PC has an Amphenol 57 series 36-pin connector. This is a standard Centronics connector. Signal ground is tied to pins 16, 19, 30, and 33 on the **UNIX** PC connector.

Make sure your printer is strapped for negative strobes and acknowledges. Do not let any signals float. For example, if you are not going to use BUSY+, ground it.

Cable Pinning

This table shows typical pin functions for the Centronics printer cable:

The Parallel Interface

Signal Pin	Return Pin[1]	Signal	Direction[2]	Description[3]
1	19	$\overline{\text{STROBE}}$	OUT	Pulse to read data in. Pulse width must be more than 0.5 microseconds at the receiving terminal.
2	20	DATA 1	OUT	These signals represent the 1st to 8th bits of data, respectively. Each signal is at HIGH level when data is logical 1 and LOW when it is logical 0.
3	21	DATA 2	OUT	
4	22	DATA 3	OUT	
5	23	DATA 4	OUT	
6	24	DATA 5	OUT	
7	25	DATA 6	OUT	
8	26	DATA 7	OUT	
9	27	DATA 8	OUT	
10	28	$\overline{\text{ACKNLG}}$	IN	Approximately 12-microsecond pulse. LOW indicates that data has been received and that the printer is ready to accept more data.
11	29	BUSY	IN	A HIGH signal indicates that the printer cannot receive data. The signal goes HIGH in the following cases: o During data entry o During printing o When off-line o During printer-error state.
12	30	PE	IN	A HIGH signal indicates that the printer is out of paper.

The Parallel Interface (continued)

Signal Pin	Return Pin[1]	Signal	Direction[2]	Description[3]
13	--	LP SELECT	--	Pulled up to +5 volts through 3.3K ohm resistance.
14	--	$\overline{\text{AUTO FEED XT}}$	--	When this signal is LOW, the paper is automatically fed 1 line after printing.
15	--	NC	--	Unused.
16	--	OV	--	Logic ground level.
17	--	CHASSIS GND	--	Printer's chassis ground, which is isolated from the logic ground.
18	--	NC	--	Unused.
19-30	--	GND	--	Twisted-pair return signal ground level.
31	--	INIT	OUT	When this level becomes LOW, the printer controller is reset to its initial state and the print buffer is cleared. This level is usually HIGH; its pulse width must be more than 50 microseconds at the receiving terminal.
32	--	$\overline{\text{ERROR}}$	IN	This level becomes LOW when the printer is in: o Paper-end state o Off-line o Error state.

The Parallel Interface (continued)

Signal Pin	Return Pin[1]	Signal	Direction[2]	Description[3]
33	--	GND	--	Same as for pins 19-30.
34	--	NC	--	Unused.
35	--	--	--	Pulled up to +5V through 3.3K ohm resistance.
38	--	$\overline{\text{SLCT IN}}$	OUT	Data entry to the printer is possible only when this level is LOW.

Notes

- "Return" denotes the twisted-pair return, to be connected at signal ground level. For the interface wiring, be sure to use a twisted-pair cable for each signal and to complete the connection on the return side. To prevent noise, these cables should be shielded and connected to the chassis of the host computer and the printer, respectively.
- The column heading "Direction" refers to the direction of signal flow as viewed from the base unit.
- All interface conditions are based on TTL level. Both the rise and the fall times of each signal must be fewer than 0.2 microseconds.

Status Signal Description

- LPNOPAPER+: Asserted by printer when paper-out sensor senses no paper in the printer.
- LPBUSY+: Asserted by the printer to indicate that it cannot receive data. Also indicates a paper empty or fault condition.
- LPSELECT+: Asserted by printer to indicate that it is selected and ready to receive data.
- ERROR*: Asserted when there is a problem with the printer.

Expansion Slots

Three expansion slots are provided as part of the base unit. Expansion cards can be installed in any slot. However, depending on the memory being added they must be located in accordance with the expansion memory location matrix in Appendix C.

Power is available for one memory expansion board and an additional 3 amps per slot is provided for the other two expansion boards. The total power available for all the slots is 45 watts.

Physical Specifications

- Base unit: Approximately 20 inches wide, 18 inches deep, and 18 inches high; weighs approximately 40 pounds.
- Keyboard: AT&T 103-key, low-profile design.
- Electrical: 100-130 volts; maximum power under 200 watts.

Logic Board Bus System

This section describes the logic board bus system, including the address and data bus. Also included is a system control block diagram, which explains how bus transfers are regulated. Figure 1-4 shows the layout of the **UNIX** PC logic board.

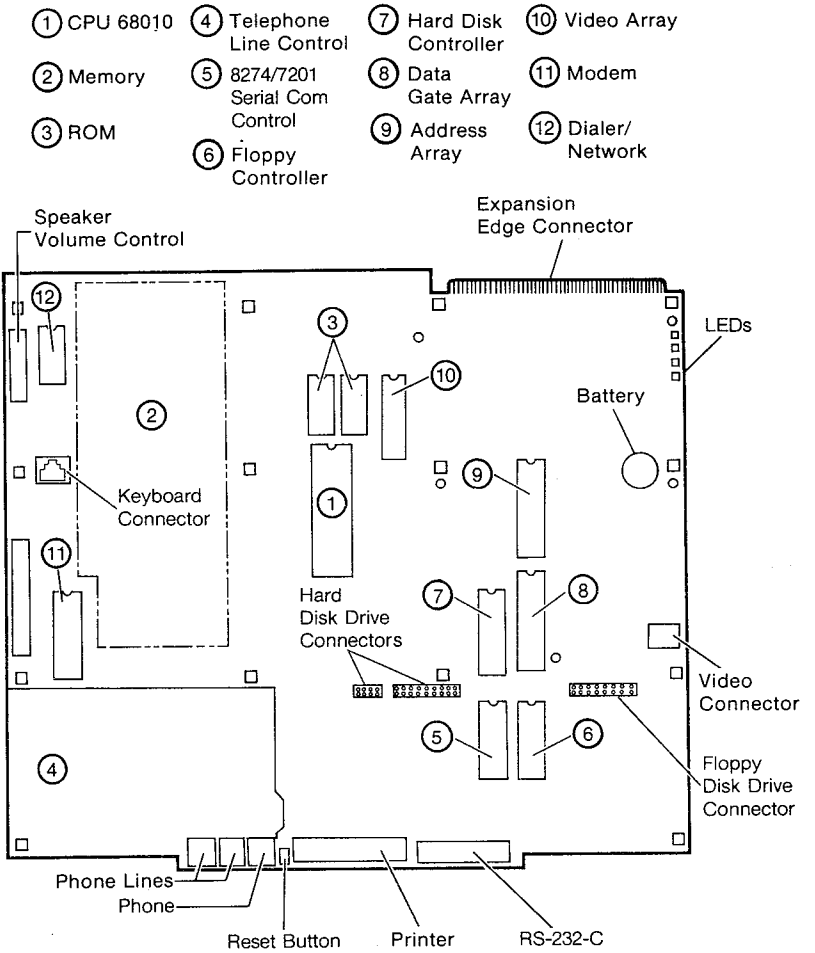


Figure 1-4 Logic Board

Simplified Address and Data Block Diagram

The system block diagram in Figure 1-5 shows how the system bus allows the various devices within the **UNIX** PC CPU board to transmit data to each other.

The right half of the drawing shows the peripheral devices. Each peripheral has special control interface circuitry that modifies information coming from or going to the peripheral into a form that is acceptable for the bus and the peripheral. These circuits are indicated in the drawing by the rectangular boxes marked **bit map, printer port, telephony controller,** and so on. The bus accepts data 16 bits wide. The keyboard, for example, generates data in the form of a serial bit stream. These control interface circuits also receive control signals that initiate and terminate data transfers.

The left half of Figure 1-5 shows devices that do internal information processing. These include the 68010 CPU and the three forms of memory: ROM, RAM, and disk storage. The bus itself is really two buses, a data bus and an address bus. The data bus consists of 16 wires, labeled D0 to D15, for transmission of 16-bit data words. The address bus consists of 23 wires, labeled A1 to A23. (There is an A0 function that is internal to 68010. From the programmer's point of view, the effect of the internal A0 is that all address references must be to even-numbered addresses because A0 is always 0.)

Data transfers on the **UNIX** PC bus are performed using a master-slave system. A master device such as the 68010 begins a transfer by first putting an address on the address bus to identify the device with which it will perform a data transfer. Then, depending on the direction of the data transfer, either master-to-slave or slave-to-master data is loaded onto the data bus, and the transfer takes place.

In the **UNIX** PC, the 68010 and the DMA (direct memory access) controller are both masters. There are other possible masters that are not shown for simplicity. Any of the devices on the right side of the drawing can be slaves to the 68010. The DMA controller for the disk drives transfers data only to RAM memory, so it has only one slave.

Before starting a DMA transfer, the 68010 must load information into the DMA controller, in which case the DMA controller is acting as a slave to the 68010. During the transfer, the DMA controller generates appropriate control signals that cause the transfer to begin and end and also determine the direction of the transfer, either from master to slave or slave to master. In the drawing, arrows are used to indicate the direction of transfer. Notice that the address bus differs from the data bus in that the address bus allows only a one-way transfer of information, from master to slave. The data bus allows two-way transmission, as indicated by the arrows.

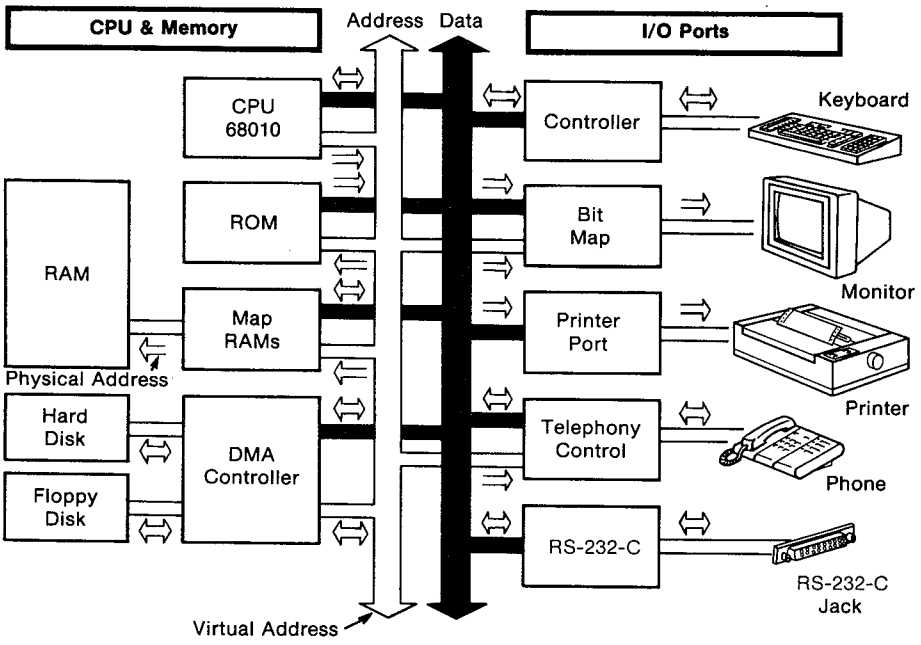


Figure 1-5 Bus System Block Diagram

Onboard Memory

Onboard memory consists of random access memory (RAM) and read-only memory (ROM).

RAM

The logic board provides a minimum of 512K of onboard RAM (random-access memory), which can be expanded to 2MB. A minimum memory configuration is made up of 72 type 4864, 64K by 1-bit, 150ns, dynamic RAM chips. The **1MB logic board** is made up of 36 type 4256, 256K by 1 bit, 150ns, dynamic RAM chips. The **2MB logic board** is made up of 72 type 4256, 256K by 1 bit, 150ns, dynamic ram chips. The memory is used for program execution. It is organized into a virtual memory system. The virtual memory system allows the programmer to write programs as if there were a much larger amount of memory available than is physically present. The **UNIX** PC virtual memory system is 4MB. The hardware provides this function through the use of a special set of memory chips called page map RAM's. These RAM's are 1K by 4-bit static RAM chips. Video bit-map RAM is 32KB.

ROM

The logic board contains two 2764/128 8K by 8-bit ROM (read-only memory) chips. They hold the initialization program that is run when the power is turned on or the Reset button is pressed.

System Control Block Diagram

The system control block diagram, Figure 1-6, shows how the system determines which bus master controls the bus at any given time. There are three elements to system control: interrupt, memory management, and bus arbitration.

The right side of the drawing shows the I/O controller logic. When a peripheral device such as the keyboard wants to send data to the system, its controller sends an interrupt signal to the interrupt logic. This is one method of communication between an I/O device and the system.

The interrupt signal is compared to a priority list. The highest priority pending at any given time causes the interrupt logic to send a signal to the 68010. The 68010 then responds by performing an interrupt acknowledge cycle. The function of the interrupt acknowledge cycle allows the processor to store its current status so that it can return to the same state after responding to the interrupt. First it completes execution of its current instruction and stores the status of its internal registers. Then it jumps to an interrupt service program that determines which device generated the interrupt. Finally, it jumps to a program to service that particular interrupt.

The priorities for interrupts are shown below:

Interrupt Priorities

Priority Level	Device
7 (highest)	Parity error (logic board)
6	Video 60-hertz bit-map (logic board)
5	Expansion slots 1, 2, and 3
4	8274/7201 communication (detection circuit, RS-232-C)
3	Keyboard/mouse, modem
2	Hard disk drive, floppy disk drive, or line printer
1 (lowest)	Expansion slots 1, 2, and 3

Note: Levels 1 and 5 are available to expansion slots 1, 2, and 3.

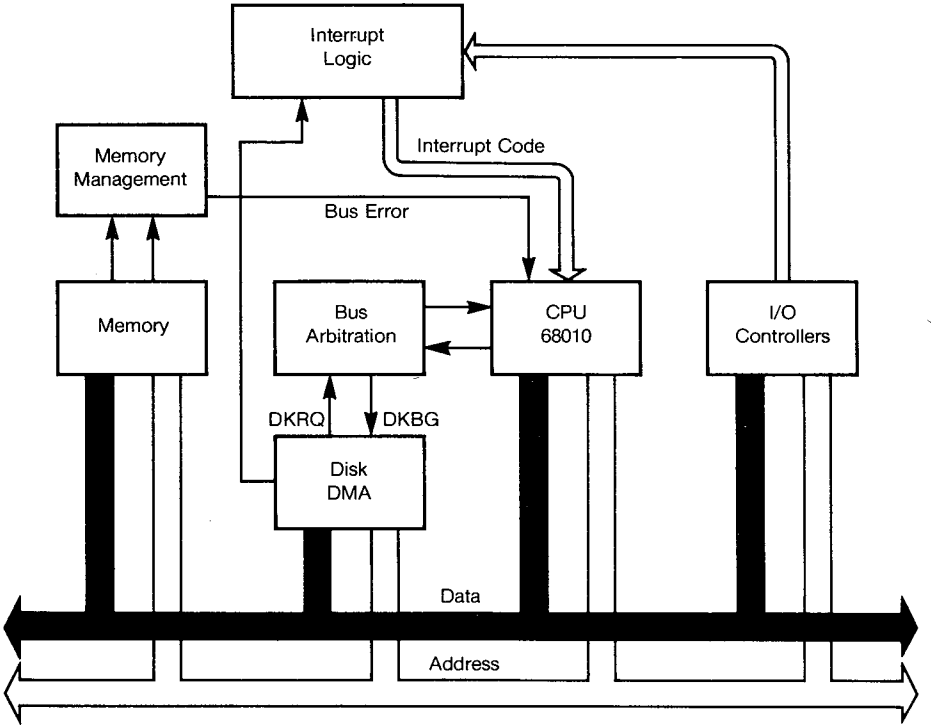


Figure 1-6 System Control Block Diagram

Memory Management

A second element of system control is the memory management unit shown in Figure 1-6. This unit monitors every access to the dynamic RAM memory chips. Certain accesses cause a memory management error. For example, if a user program attempts to write to a memory address that has been defined as being in disk space and not in physical RAM, the memory management unit generates a signal called a bus error. The 68010 then performs a data transfer with the disk DMA control unit. In this case, the disk is a slave and the 68010 is a master. The 68010 tells the disk DMA controller to do a transfer with the disk drives to correct the problem by moving data from disk storage to RAM. Then the 68010 starts performing other functions.

Bus Arbitration

At this point, the two bus masters both want control of the bus. The third element of system control, the bus arbitration unit, resolves the conflict. It evaluates requests for bus control from masters and grants bus control on a priority basis. The 68010 has lower priority than the disk control. The 68010 has to wait for the disk controller to release control of the bus before it can take control. When the disk controller has finished transferring data, it generates an interrupt to the interrupt logic. The interrupt logic then informs the 68010 that the transfer is complete, and the 68010 resumes program execution at the point where it left off when the memory management unit generated the original interrupt.

Priorities for bus arbitration are:

- Refresh (highest)
- Expansion slot 1
- Disk interface (hard and floppy)
- Expansion slot 2
- Expansion slot 3
- 68010 CPU (lowest).

Using Diagnostics and Troubleshooting

Using Diagnostics and Troubleshooting

2 Using the Diagnostic Test Procedures

This section explains how to load and use the diagnostic programs to test the hardware functions of the UNIX PC. The diagnostic programs exist in two levels: in boot ROM and on floppy disk.

This section consists of an acceptance test to verify proper operation. The acceptance test covers the following hardware areas:

- A detailed description of the boot ROM diagnostics.
- A detailed description of the floppy disk diagnostics. Includes the error messages that may occur for each test and the corrective response code for each error message.
- Explanation of telephone and data communications functions that are not tested by diagnostics but can be tested by logging into the UNIX system.

Acceptance Test

This test should be used to verify proper hardware operation after installation of the system or after field replacement of a defective assembly. The three main steps are outlined below. Details about how to perform the acceptance test and recognize correct responses from the system follow.

Step 1: Boot ROM Diagnostics

Insert the diagnostic floppy disk in the floppy disk drive. Push the Reset button at the rear of the base unit to run the boot ROM diagnostics. To determine whether the boot ROM diagnostics pass, read the binary number on the logic board LED's. The LED's are shown in Figure 2-1. The right LED, as seen as you face the left side of the base unit, is the least significant bit.

The boot ROM diagnostics test the logic board and then search for a loader. In normal operation the boot ROM diagnostics will find a loader on the floppy disk and write a binary 7 on the LED's. If a loader cannot be found on the floppy disk, the program looks for a loader on the hard disk. If neither loader can be found, the program turns on all the LED's and writes a sequence of small blocks on the screen. Each block represents an unsuccessful search for a loader, first on the floppy disk and then on the hard disk.

Step 2: Floppy Disk Diagnostics

Look for a loader message as diagnostics are loading. When the loader is found, the LED's are set to 7 and a loader message appears on the screen. When loading of the floppy disk diagnostics is complete, the Main Menu appears.

Run the Full System Test selection 1 on the Main Menu. This is an automatic test. When it finishes, select Test 6 - Goto Subsystem Menu and run the following subsystem tests:

Keyboard	Test 3
Video	Test 4
Dialer	Test 8
Parallel Printer	Test 10

These tests are interactive, which means the user evaluates success or failure and then aborts the test by pressing the <Break> key.

Step 3: Telephone Tests for Voice and Data

Remove the diagnostic floppy disk and push the Reset button. Log in as tutor. Open the Telephone Manager by pressing <Shift>-<Call>. Verify the ability of the UNIX PC to dial numbers, put lines on hold, and so on.

Verify communications using a modem. Call the Data Test Center to verify modem operation on a live phone line.

Note that the following chapters contain a more detailed explanation of booting and executing the diagnostic tests.

In Case of Difficulty...

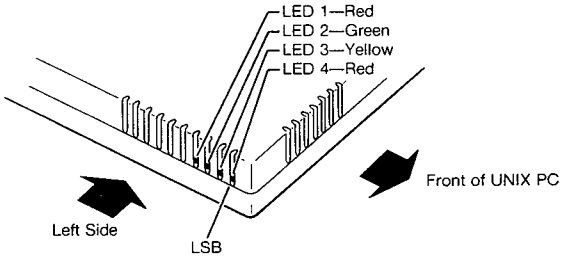
Failures during the acceptance test fall into these four general types:

- Could not load floppy disk diagnostics. Refer to **Troubleshooting** chapter in this manual for instructions on correcting this type of problem.
- Error messages were generated during the diagnostic tests. Refer to the instructions in this chapter for correcting this type of problem.
- The keyboard locked up during the running of a diagnostic test. This is covered in **Troubleshooting** chapter in this manual.
- Nonstandard performance was observed during interactive diagnostic tests or during "Telephone Tests for Voice and Data." The following chapters in this section describe proper performance; The **Troubleshooting** chapter, lists corrective actions.

Boot ROM Diagnostics

Pressing the Reset switch or turning on the power causes the ROM-resident diagnostics to run. The boot ROM program turns a set of LED's off and on in appropriate binary number patterns as it completes the steps listed below. The LED's are visible through the ventilation slots on the left side of the system.

Figure 2-1 shows the LED locations and off/on patterns for each test.



ROM Tests

Test Number	LED Status 4	3	2	1
Test 1	off	off	off	on
Test 2	off	off	on	off
Test 3	off	off	on	on
Test 4	off	on	off	off
Test 5	off	on	off	on
Test 6	off	on	on	off
Test 7	off	on	on	on

Figure 2-1 LED Locations and Off/On Patterns

When the system is working normally, the ROM test executes so fast that the blinking off and on of the LED's is not noticed. The successful completion of each test starts the next. If one of the tests fails, the binary number pattern of that test continues to be displayed as long as the power is turned on.

If the LED's and the fans do not come on, refer to corrective response R-13 in the **Troubleshooting** chapter. If the LED's come on but show a number of 6 or less, refer to corrective response R-3 in the **Troubleshooting** chapter.

Test 1: Initializes System

- Sets LED's to binary 1
- Initializes the system
- Clears the screen

Test 2: Tests Video RAM

A test pattern appears on the screen for about 1/2 second.

Tests 3-5: Test Memory

Test map RAM's and onboard memory. Expansion, if present, is not tested.

Test 6: Searches for Loader

- Advances LED's to 6 and puts a small reverse video block on the upper-left corner of the screen.
- Searches for a loader program. The floppy disk is searched first. If no loader is found or an error is found, the hard disk is be searched. If the hard disk has no loader or has an error (such as not being ready), a reverse video block is added to the screen and the process repeats until a loader is found.

Test 7: Jumps to Loader

When the loader is found, the LED's are advanced to 7 and the processor jumps to the loader program.

Floppy Disk Diagnostics

Run the diagnostics on a regular basis to verify the operation of your **UNIX** PC. If you experience or suspect a malfunction, run the diagnostics to isolate the problem.

Shutting Down from a Running System

To run diagnostics on a system that is currently running an application program, close all application windows and use the shutdown command before booting the diagnostics. This guarantees that you will not damage any files.

To shut down from a running system:

1. Close each open application window by pressing <Exit>, or <Ctrl>-<D>.

   If the current file contains changes, a window appears asking you whether or not you want to save the changes.

2. Select |Yes| or |No| and press <Enter>.

   The window for the current application closes. Repeat steps 1 and 2 above for each remaining application window.

3. Press <Cmd> to open the Commands menu.

4. Select |Shutdown| from the Commands menu and press <Enter>.

   You see the following prompt:

   Ready to power off or reset the machine.
   Press RETURN to reboot.

Continue with "Loading Floppy Disk Diagnostics."

Loading Floppy Disk Diagnostics

To load diagnostics from floppy disk if the power is on, follow the shutdown procedure described above; insert the DIAGNOSTICS DISK 1 of 1; and press the Reset button. If the system is off, insert the DIAGNOSTICS DISK 1 of 1 and turn on the system.

The floppy drive loads and positions the head to track zero to read the diagnostic floppy disk. You see this message:

```
*******************************************************
*                                                     *
*                                                     *
*                                                     *
*                  AT&T UNIX™ pc                      *
*                                                     *
*                    Model 7300                       *
*                                                     *
*                    Version 3.0                      *
*                                                     *
*                                                     *
*            Copyright (C) 1985                       *
*                                                     *
*            AT&T                                     *
*                                                     *
*            All Rights Reserved                      *
*                                                     *
*                                                     *
*******************************************************

Searching floppy disk...
############################################################
############################################################
############################################################
############################################################
##########
```

The pound signs are written one at a time. Each pound sign corresponds to the movement of 1KB of data from the floppy disk to memory. The writing of pound signs may pause occasionally. Loading takes about 15 seconds to complete. Then the screen fills with a random pattern as video memory is tested.

After the diagnostics have finished loading, a message similar to the following appears:

```
xxxxxx bytes On-board memory.
Type any key to continue.
```

Any additional memory is also listed.

Press the space bar to display the following menu:

```
UNIX PC DIAGNOSTICS, MAIN MENU
------------------------------

1) Full System test
2) Initialize Hard Disk
3) Enter Bad Blocks
4) Park Disk Heads
5) Remote Diagnostics
6) Goto Subsystem Menu
7) Reboot System

Choice( 1-7 ):
```

To select a test from the menu, type the number of the test and press <Return>.

To abort a test at any time, press the <Break> key.

To reboot the system from the Hard Disk, remove the Diagnostic floppy disk, and select number 7 from the above menu.

Test 1: Full System Test

Selecting test number 1 from the Main Menu runs the following subsystem tests in the order listed:

Floppy Disk	Test 2
Hard Disk	Test 1
Memory and Parity	Test 5
Processor	Test 9
Real Time Clock	Test 11
Modem	Test 7

Refer to the Subsystem Menu in this section for a description of each of the above tests.

Test 2: Initialize Hard Disk

This test is used to format and check the surface of the hard disk. Running this test erases all data currently on the disk. Therefore, you should back up any data that you want to save prior to running any part of Test 2. During the test, you are given the option to not format the disk. This allows you to check the surface of the disk without reformatting.

From the Main Menu, select Test 2. The following message appears:

```
        Format Disk
Volume Name:  WINCHE

Will this system be used by more than one user( Yes or
No )?
```

If more than one person will be using the system at any given time, answer Yes.

The following menu appears only if the disk or its Volume Home Block (VHB) cannot be read:

```
Select disk type: (hit RETURN to exit)

                    0 - Miniscribe ( 10 Megabyte )
                    1 - Atasi 3046 ( 40 Megabyte )
                    2 - Maxtor     ( 40 Megabyte )
                    3 - Seagate    ( 10 Megabyte )
                    4 - Miniscribe ( 20 Megabyte )
                    5 - Rodime     ( 40 Megabyte )
                    6 - Atasi 3051 ( 40 Megabyte )
                    7 - Hitachi    ( 40 Megabyte )
                    8 - Others

Please select a number: ( Current selection is 0 )
```

Once you have selected the drive type, the system asks you to verify that you do want to format the hard disk:

```
Initialize the WINCHESTER disk ?
( ALL DATA WILL BE ERASED ! ) - Yes or No :
```

If you answer No, the system does not format the disk; it returns to the main menu. Otherwise, the system begins formatting and displays the following message:

```
Formatting cylinder xxx
```

where **xxx** indicates the current cylinder being formatted. When formatting is complete, the following messages appear:

```
The Bad Block Table contains x entries

Format completed
```

You are then given the choice to run the Surface Test:

```
        Surface Test
Volume Name: WINCHE

You can now choose to do a surface test to ensure all
bad spots have been detected.  This is recommended and
takes 5 minutes.
Do Surface test( ALL DATA WILL BE ERASED!) Yes or No?
```

Note that running the Surface Test overwrites any data currently on the disk. Therefore you should have a complete backup of the disk before running this test.

Type **y** and press <Return> to check the surface of the disk. While running the Surface Test, the following messsages are displayed:

```
Pass 1
        WINCHESTER:Initiating Check Read for pass 1
```

When the test is complete, you are returned to the Main Menu. If any bad blocks are detected while running the Surface Test, they are posted and added automatically to the Bad Block table.

Error Messages

The following error messages may occur while running Test 2. The corrective response is R-2.

```
Error during Disk Format: Response = XX
VHB write failed.  Disk needs to be re-initialized.
Bad block table write failed. Disk needs to be re-
initialized.
Error on Write: Response = XX, start block = XX
Error on Read: Response = XX, start block = XX
Error on ReadCheck: Response = XX, start block = XX
```

Test 3: Enter Bad Blocks

If you select Test 3, the following message is displayed:

```
        Modify Bad Block Table
Volume Name: WINCHE

Do you want to modify bad blocks ( Yes or No ) ?
```

The bad block table is a table in the volume home block on the hard disk. The disk manufacturer records the bad blocks in this table before shipment. UNIX uses this table to tell which blocks to avoid. Normally, it is not necessary to make entries in it.

There are two rare occasions when entries should be made in the bad block table. The first one is when Test 2 reports that the bad block table does not exist or has invalid entries. In this case, the data contained in the manufacturer's bad block table, which is attached to the hard disk drive, should be entered. The second one is when UNIX generates an error message reporting a new bad block.

If you need to modify the bad block table, answer Yes to the above prompt. Be careful when entering bad block information. Some errors may prevent your using the hard disk.

The next menu appears giving you a choice of formats for entering new bad blocks:

```
Select entry format: (Return to Exit)
                1 - (Cylinder, Head and Byte)
                2 - Physical Sector
                3 - Logical Block
Which format ?
```

Format 1 is normally used for entering the bad block information provided by the disk drive manufacturer. Formats 2 and 3 are used to enter bad block information provided by error messages from UNIX.

An example of selecting format 1 is shown below. Do not enter these numbers. Only legitimate bad block information provided by the disk manufacturer should be entered.

```
Give Cylinder Number        :348
Give Head Number        :0
Give Byte Number        :215
Add, Delete, Ignore?(A, D, I)
```

The last prompt gives you the option to Add, Delete, or Ignore the bad block entry. If you have been following this example, you should type **i** and press <Return> to tell the system to ignore this entry.

Choosing Add or Delete adds or removes the entry in the bad block table.

You are then given the option to make another entry:

```
Another? (Y/N: RETURN = No)        :
```

Answering **Yes** allows you make another entry in the same format (format 1 in this example). A **No** response returns you to the Main Menu.

If you select format 2 from the format choices, the following prompt appears:

```
Give Physical Sector Number        :
```

Upon entering a physical sector number, you are given the choice to Add, Delete or Ignore the entry. Like format 1, choosing Add or Delete adds or removes the entry in the bad block table. You are then given the option to make another entry or to return to the Main Menu.

If you select format 3 from the format choices, you are prompted for the Logical Block Number:

```
Give Logical Block Number      :
```

Once you have entered a logical block number, the system operates the same way as described for formats 1 and 2 above.

Test 4: Park Disk Heads

This test moves the disk heads to a save location on the disk. This function must be performed whenever the system is going to be moved to a new location to prevent loss of stored files.

Test 5: Remote Diagnostic

This selection allows you to give up control of your system to a remote site either through the built-in modem or the EIA RS232 port.

Select number 5 from the Main Menu. The following menu is displayed:

```
REMOTE DIAGNOSTIC
-----------------

Remote diagnostic access from:

1) EIA RS232 Port
2) Modem
3) Return to Main Menu

Choice( 1-3 ):
```

If you choose number 1 from the above menu to run remote diagnostics through the RS232 port, you are asked to select the correct baud rate for the terminal connected at the EIA RS232 port:

Select Baud Rate:

1. 300
2. 1200
3. 2400
4. 4800
5. Exit
Choice(1-5):

Type the number corresponding to the baud rate of the terminal and press <Return>.

The following message is displayed briefly:

Remote diagnostic activated on EIA RS232.
Hit BREAK to abort at any time.

At this point, the Main Menu is redisplayed, and control of the system is turned over to the terminal connected to the EIA RS232 port. An operator can now run most diagnostics on your system from the remote terminal.

To regain control of the system, press the <Break> key. The system prompts:

Abort Remote diagnostic(Yes or No)?

Answering Yes returns control of the diagnostic program to your keyboard.

Modem Remote Diagnostics

To allow a remote operator to run the diagnostics through the built-in modem, your system must be set up to accept data calls. Refer to the AT&T UNIX PC Telephone Manager Guide, located in the Communications Management binder, for information on setting up data calls.

Select number 2 from the Remote Diagnostic Menu.

The system responds:

Waiting for incoming Data call.

A remote operator can then dial-in to your system, and run most diagnostics through the built-in modem.

If the remote operator is not successful in connecting to your system, you must reload the diagnostics to regain control of the system. Refer to **Loading Floppy Disk Diagnostics** in this chapter.

Subsystem Menu

To access the subsystem tests, select number **6** from the Main Menu. The following submenu is displayed:

```
SUBSYSTEM MENU
--------------

 1) Hard Disk
 2) Floppy Disk
 3) Keyboard
 4) Video
 5) Memory & Parity
 6) Communications
 7) Modem
 8) Dialer
 9) Processor
10) Parallel Printer
11) Real Time Clock
12) Return to Main Menu
```

To select any of the above tests, type the number corresponding to the desired test and press <Return>. Select number **12** to return to the Main Menu.

Subsystem Test 1: Hard Disk

Use this test to check a hard disk that has software loaded on it. The test does not format or write, so it does not destroy data on the disk.

Select Test **1** from the subsystem menu. First the disk is recalibrated to track 00:

```
WINCHESTER DISK TEST
        Recal Disk
Volume Name: WINCHE
```

Error Messages

During a recal of the hard disk, the following error message may occur. The corrective response is R-5.

Can't Recal: Response = XX
Recal failed

Next, the system performs a disk read test:

WINCHESTER DISK TEST
Disk Read
Volume Name: WINCHE

Error Messages

While reading the hard disk, the following error messages may occur. The corrective response is R-5.

Error on CheckRead: Response = XX, start block = XX

The system then performs a random seek test:

WINCHESTER DISK TEST
Random Seek
Volume Name: WINCHE

Error Messages

During a random seek of the hard disk, the following error messages may occur. The corrective response is R-5.

Error on check read:Response = XX Start block = XX

The last hard disk test is a non destructive disk surface test:

```
WINCHESTER DISK TEST
        Non Destructive Surface Test
Volume Name: WINCHE

You can now choose to do a non-destructive surface test
to ensure all bad spots have been detected.  This test
takes 10 minutes.
Do non-destructive Surface test( Yes or No )?
```

If you suspect problems with the disk, it is a good idea to run the surface test. This test does not add bad blocks to the Bad Block Table. Instead, it stops when it detects an error. Type **y** and press <Return> to run the test.

Error Messages

During a non destructive disk surface test, the following error messages may occur. The corrective response is R-5.

```
Error on CheckRead: Response = XX, Start Block = XX
Error on Write: Response = XX, Start Block = XX
Error on ReRead: Response = XX, Start Block = XX
ReRead Data miscompared: Start Block = XX,
Byte = XX, Received XX, Expected XX.
```

Subsystem Test 2: Floppy

The floppy disk test formats and checks the surface of the floppy disk. You will need a blank floppy disk to run this test. Select test **2** from the subsystem menu:

```
FLOPPY DISK TEST
        Format Disk

Initialize the FLOPPY disk ?
( ALL DATA WILL BE ERASED ! ) - Yes or No :
```

Insert a blank floppy disk. Type Y and press <Return>. The following message appears:

Formatting cylinder XX

where XX is a number indicating the current cylinder being formatted.

Error Messages

The following error messages may occur while formatting the floppy disk. The corrective response is R-4.

Error during Disk Format: Response = XX
VHB write failed. Disk needs to be re-initialized.
Re-read data fail: Start Block = xx,
Byte = xx, Received xx, Expected xx

After the last cylinder is formatted, the surface test begins:

FLOPPY DISK TEST
Non Destructive Surface Test
Volume Name: FLOPPY

Error Messages

The following error messages may occur while checking the surface of the floppy disk. The corrective response is R-4.

Can't Write the new VHB:Response = XX
Can't Write the new Bad Block Table:Response = XX
Error on Write:Response = XX, Start Block = XX
Error on Re-Read:Response = XX, Start Block = XX
Re-Read Data Fail:Start Block = XX, Byte = XX,
Received XX Expected XX
Error on Check-Read:Response = XX, Start Block = XX
Check-Read Data Fail:Response = XX, Start Block = XX
Initiating Check Read for pass XX
Bad Block Table Overflow when adding Sector XX
Bad Block Table: Multiple use of alternate XX

The surface test is followed by a random seek test:

FLOPPY DISK TEST
Random Seek
Volume Name: FLOPPY

Error Messages

The following error messages may occur while running a random seek on the floppy disk. The corrective response is R-7.

Error on check read: Response = XX,
Start block = XX

If there are no errors while running the floppy disk tests, the program returns to the Main Menu.

Subsystem Test 3: Keyboard

This is an interactive test in which you determine whether the keyboard and mouse work properly.

Select Test 3 from the subsystem test menu. A picture of the keyboard and mouse buttons is displayed. Every time you press a key or mouse button, the picture of the key or button is shown in inverse video.

If a key or mouse button does not appear in inverse video, the keyboard or mouse fails the test.

To escape the Keyboard Test, press both <Ctrl> keys at the same time.

If this test does not execute as described above, the corrective response is R-9.

Subsystem Test 4: Video

Select Test 4 from the subsystem menu. The following menu appears:

```
UNIX PC VIDEO TEST
------------------

0) All Black
1) All White
2) Half Tone
3) Vertical Bars
4) Horizontal Bars
5) Mosquito Net
6) Black pattern
7) White pattern
8) All w's
9) Exit
At the end of a test, press any key to get back to this
menu.

Choice( 0-9 Return is 0):
```

Test 1 makes the screen solid black.
Test 2 makes the screen solid light.
Test 3 displays a fine dot pattern.
Test 4 displays a sequence of vertical bars.
Test 5 displays a sequence of horizontal bars.
Test 6 displays a combination of Tests 4 and 5.
Test 7 displays a cross for checking screen alignment.
Test 8 is the same as Test 7 with inverse video.
Test 9 fills the screen with the letter w.

If the display differs from these descriptions, the corrective response is R-10.

If the picture has a slight jitter that causes eyestrain when watched for a long period of time, the corrective response is R-11.

Subsystem Test 5: Memory & Parity

This test checks the read/write memory in the system. Select Test 5 from the subsystem menu. As the system runs through the memory tests, the following messages are displayed:

```
MEMORY TEST

        Address Connection Test
        Test will begin at 22000, end at 7FFFF
        Data Bus Test
        Test will begin at 22000, end at 7FFFF
        Testing . . . . . .
        Random Pattern Test
        Test will begin at 22000, end at 7FFFF
```

Note that if you have additional memory installed in the expansion slots, the system also runs the above tests on the expansion memory boards.

Error Messages

The following error messages may occur during the memory testing. The corrective response is R-3.

```
Memory error: Connection on address line X is bad
              Wrote X to X, then wrote X to X, read
              back X from X
Memory error at Address X; Wrote X; Read Back X
```

After running the memory test, the system runs a parity check on the same memory locations:

PARITY TEST

```
Parity Test - Read Bad Parity
Test will begin at 22000, end at 7FFFF
        Reached Address 30000
        Reached Address 40000
        Reached Address 50000
        Reached Address 60000
        Reached Address 70000
```

Note that if the system contains expanded memory, the above parity test is also run on the expansion memory.

Error Messages

The following error messages may occur during parity testing. The corrective response is R-3.

No parity interrupt at location X
Unexpected parity error at location X
BSR incorrect after parity error at location X
BSR0=X, BSR1=X

Upon successful completion of the memory and parity tests, you are returned to the subsystem menu.

Subsystem Test 6: Communications

This loopback test checks all combinations of different baud rates, number of bits, and types of parity.

- Bit count is 7 or 8.
- Parity is none, odd, or even.

You must install a loopback plug before selecting this test. If you have an expansion board with RS232 ports you must also install an expansion board loopback plug between the two ports on the board.

Select Test 6 from the subsystem menu. The following messages appear:

COMMUNICATION TEST (Self-test & Transfer test)

SELF-TEST

TRANSFER TEST

300 Baud		
	7 bits/character	no parity
	7 bits/character	odd parity
	7 bits/character	even parity
	8 bits/character	no parity
1200 Baud		
	7 bits/character	no parity
	7 bits/character	odd parity
	7 bits/character	even parity
	8 bits/character	no parity
2400 Baud		
	7 bits/character	no parity
	7 bits/character	odd parity
	7 bits/character	even parity
	8 bits/character	no parity
4800 Baud		
	7 bits/character	no parity
	7 bits/character	odd parity
	7 bits/character	even parity
	8 bits/character	no parity
9600 Baud		
	7 bits/character	no parity
	7 bits/character	odd parity
	7 bits/character	even parity
	8 bits/character	no parity
19200 Baud		
	7 bits/character	no parity
	7 bits/character	odd parity
	7 bits/character	even parity
	8 bits/character	no parity

If you do not have an RS232 Expansion board installed, the program returns to the main diagnostics menu. If you do have a RS232 Expansion, the program runs a self test on each port:

SELF-TEST

SLOT X: Self-testing port X
Checking TRS,DTR,CTS,DCD,DSR
Testing Read/Write registers

Upon completion of the Self Tests, the program repeats the above Transfer Test using the following parameters:

Transmit using Xtal. Receiving using Xtal
Transmit using Xtal. Receiving using RxCk
Transmit using Xtal. Receiving using TxCk

Note that the last two parameters in the above list are tested only at 300 and 1200 baud. These Transfer Tests are performed using each port as both a transmitter and a receiver.

Error Messages

If you try to run Test 6 without a loopback plug installed in the main RS232 port, the following message appears:

**** ERROR ****
Test : Intel 8274 test.
Subtest: Self-test(Read/Write & Ext status).
Error : CD not working, check plug or data path
Enter y [Y] to Abort, Return to continue:

The corrective action is to install the loopback plug, and press <Return>. If you do not have a loopback plug you cannot run this test. Type **y** and press <Return> to return to the subsystem menu.

If you try to run Test 6 without an expansion board loopback plug connected between the two ports on the expansion board, the following message appears:

```
                    ** ERROR **
Test    : Zilog 8530 test.
Subtest: Self-test( R/W & Ext status on port X )
Pass    : 1
Error   : DSR or DTR not working, check loop-back plug
          or controller data path
          Enter y [Y] to Abort, Return to continue:
```

The corrective action is to install the loopback plug and press <Return>. If you do not have a loopback plug, you cannot test the Expansion RS232. Type **y** and press <Return> to return to the Subsystem Menu.

While testing communications, the following error messages may occur. The corrective response is R-3 or replace the Expansion board if the test failed during the Expansion test phase.

Tx buffer never became ready
Transmit timeout, sending XX
Receive timeout, expecting XX
Receive error, expected : XX, received XX
Error writng to controller, check data path
wrote XX, read XX
DSR or DTR not working check loopback plug or controller data path.
CTS or RTS not working check loopback plug or controller data path.
DCD or RTS not working check loopback plug or controller data path.
Receive error - overrun error, expected : XX
Receive error - framing error, expected : XX
Receive error - parity and framing error, expected : XX

Subsystem Test 7: Modem

An internal loopback test sequence is used to check all possible combinations of the following parameters:

1200 or 300 baud
No parity, odd parity or even parity
7-bit or 8-bit characters

Select test 7 from the subsystem menu. The following messages are displayed:

```
MODEM TEST (Self-test & Transfer test)
       SELF TEST (B212 mode) at 300 baud . .
                   Test passed with no error detected.
       SELF TEST (B212 mode) at 1200 baud . .
                   Test passed with no error detected.
       DATA TRANSFER TEST at 300 baud  . .
                7 bits/character, no parity
                7 bits/character, odd parity
                7 bits/character, even parity
                8 bits/character, no parity
                8 bits/character, odd parity
                8 bits/character, even parity
               Test passed with no error detected.
       DATA TRANSFER TEST at 1200 baud  . .
                7 bits/character, no parity
                7 bits/character, odd parity
                7 bits/character, even parity
                8 bits/character, no parity
                8 bits/character, odd parity
                8 bits/character, even parity
               Test passed with no error detected.
```

Upon successful completion of the test, you are returned to the subsystem menu.

Error Messages

The following error messages may occur during the Modem test. The corrective response is R-16.

```
SELF TEST failure detected
MODEM TRANSFER TEST, received error - parity error,
          expected XX
```

Subsystem Test 8: Dialer

Connect outside telephone lines (see the AT&T UNIX PC Installation Guide). This interactive test generates either touch tones or rotary dial pulses. Each number is dialed as you enter it, and you can hear it on the speaker. To connect the handset to the telephone line when answering a call, type c after the dialed number answers. To disconnect, type **q**.

Note: You must have the handset off-hook before you type **c**. You can then type **h** to put the line on hold.

Select Test 8 from the subsystem test menu. The following screen appears (DTMF means dual-tone multifrequency):

```
- -       INTERACTIVE DTMF TEST        - -
Select line 1 or line 2 for testing      :
```

When you select a line, the following message appears:

Enter digit 0 - 9, *, # for dialing. To connect the hand set for conversation, enter C/c. To toggle line between hold and active, enter H/h. To quit enter Q/q:

When you select a line and enter a number, you hear the touch tones as the number is transmitted, and the number is displayed on the screen. If you enter a series of numbers faster than they can be transmitted, they will be stored and transmitted.

When you type q, the above procedure can be repeated for Pulse dialing. When you select a line and enter numbers for the second time, dial pulses are generated.

Note

Pulse dialing may not work on certain internal electronic telephone systems.

When you type **q** the second time, the following message appears:

```
 - -      AUTO ANSWER        - -
Waiting for incoming call! Press Break key to exit!
```

At this point, dial the number of the telephone that is connected to your **UNIX** PC from another telephone.

If this test fails to execute as described, refer to response R-3 in the **Troubleshooting** chapter.

Subsystem Test 9: Processor

Select test **9** from the subsystem menu to test the processor. The following messages are displayed:

```
MAP RAM TEST

        Address Connection Test
        Test will begin at 400046, end at 4007FF
        Data Bus Test
        Test will begin at 400046, end at 4007FF
        Testing . . . . . .
        Random Pattern Test
        Test will begin at 400046, end at 4007FF
```

Error Messages

The following error messages may occur during the Map RAM testing. The corrective response is R-3.

```
Memory error: Connection on address line X is bad
              Wrote X to X, then wrote X to X, read
              back X from X.
Memory error at Address X; Wrote X; Read Back X
```

Next the system performs a Map Translation test:

```
MAP TRANSLATION TEST
       Map Translation Subtest 1
       Map Translation Subtest 2
```

Error Messages

While running the Map Translation Test the following error messages may occur. Corrective response is R-3.

```
Page dirty bit not set for page number X
Page Mapping Error
Page access bit not set for page number
Page access bits wrong: page number and page bits are X
```

The system then accesses I/O locations in User Mode to force an error and verify that the error does occur:

```
USER I/O INTERRUPT TEST
       User Accessing I/O Subtest 1
       User Accessing I/O Subtest 2
```

Error Message

The following error message may occur while running this test. The corrective response is R-3.

```
No bus error when user access I/O address X
```

The system runs a Clock test:

```
60 HZ CLOCK TEST
       Timer 1/Counter 2 TEST
              9 8 7 6 5 4 3 2 1 0
```

Error Message

The following error message may occur while running this test. The corrective response is R-3.

Time out while waiting for 60 Hz interrupt

Finally, the system runs a Page Protection test:

PAGE PROTECTION TEST
Subtest 1, CPU Accessing Invalid Page
Subtest 2, User Accessing Below 512K
Subtest 3, User Writing to Write Disabled Page
Subtest 4, DMA to Invalid Page

Error Messages

While running this test, the following error messages may occur. The corrective response is R-3.

No page fault received on write
Map addr = X, Map contents = X, Mem addr = X

No page fault received on read
Map addr = X, Map contents = X, Mem addr = X

GSR/BSR omcprrect after Bus error at location XX
GSR = XX
BSR0 = XX
BSR1 = XX

Bus Error when none expected
Map addr = X, Map contents = X, Mem addr = X

Disabled RAM writing failed at mem loc XX.

No Bus Error detected while user accessing below 512K
Mem addr = XX.

Subsystem Test 10: Parallel Printer

This interactive test checks the hardware portion of the printing function. You must have a parallel printer connected before running this test.

Select Test 10 from the subsystem menu. The following message appears:

```
LINE PRINTER TEST
       LINE PRINTER SUBTEST 1, Status test.
Line printer is selected.
       LINE PRINTER SUBTEST 2, Transfer test.
Line printer is selected.
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
```

The printer prints a test pattern of all characters. If this test does not execute as described, refer to corrective response R-12 in the **Troubleshooting** chapter.

Subsystem Test 11: Real Time Clock

Select test 11 to check the real time clock. The following messages are displayed:

```
REAL TIME CLOCK TEST
        Read/Write Test
        Test WEEKDAY..YEAR..MONTH..DAY..HOUR..MINUTES.
        Test succeeded with no errors detected!

REAL TIME CLOCK TEST
        Operation Test
        Test LEAP YEAR setting..MINUTES..HOUR..WEEKDAY.
        LEAP YEAR  handling.
        Test ..DAY..MONTH..YEAR.
        Test succeeded with no errors detected!
```

```
REAL TIME CLOCK TEST
        Interactive Test
        This test allows you to set or read the time
        and date from the real time clock.
        When the '>' prompt appears, enter 't' or 'd'
        to request the time (date) and to enter a new
        time(date).
        Press 'Return' alone to keep the old time
        (date).
        To exit, enter 'q'.

        It is day mm/dd/yyyy hh:mm:ss
        >
```

If this test does not run correctly, refer to response R-3 in the Troubleshooting chapter.

Trap Errors

Trap errors are general errors that can occur during any test. The corrective response is R-3 in the Troubleshooting chapter.

```
Type = XX, GSR = XX, BSR0 = XX, BSR1 = XX
Repeated fault
Bad GSR after page fault
Bad GSR after execution Page fault
BSR not correctly set after Page Fault
BSR0 = XX, should be XX BSR1 = , should be XX
Unexpected bus error, GSR = XX, PC = XX, RPS = X
Unexpected NMI, PC = XX, RPS = XX
GSR = XX BSR0 = XX BSR1 = XX
Unexpected interrupt from level XX
PC = XX RPS = XX GSR = BSR0 = XX BSR1 = XX
HD or DMA interrupt from level XX, PC = XX, RPS = XX
GSR = XX BSR0 = X BSR1 = XX
XX Interrupt level XX, PC = XX, RPS = XX
User I/0 flag in GSR not set during User I/0 test
LWT in GSR set during User I/0 fault
Bus Grant set to DMA cycle during User I/0 fault
BSR not correctly set after User I/0 fault
BSR0 = XX, should be XX BSR1 = XX, should be XX
```

Telephone Line and Data Communications Tests

During these tests the UNIX PC must be connected to two telephone lines. If these tests fail to execute as described, the corrective response is R-6 in the **Troubleshooting** chapter.

Dial and Voice Tests

To verify operation of telephone line 1:

1. Log in as tutor.
2. Press <Shift>-<F2> to invoke the Telephone Manager.

The call screen appears.

3. With your telephone on hook, type a telephone number and press <Enter>.
4. When the dialed number rings, pick up your telephone.

The sound switches from the speaker to your telephone.

5. Hang up by pressing <F2>.

The line status displayed in the upper left corner of the screen switches to IDLE.

Note

The REDIAL screen key works any time after you dial a number. The LINE SELECT screen key works when you are on-hook.

To verify operation of line 2, follow the procedure described above except that at step 3, press <F3> to select line 2 before typing a telephone number. Line 2 must be set for VOICE calls through Administration to make this voice test.

Hold Feature Testing

1 Repeat sequence above to step 4.

2 Listen for the voice of the called party.

The voice from the speaker should cease.

3 Press the <HOLD> screen key <F1>.

telephone status should go to HOLD.

4 Press the HOLD screen key <F1> again.

The telephone status should go to ACTIVE. The voice of the called party should resume.

5 Hang up the telephone to complete the hold feature testing.

Ringing Detection

Call the **UNIX** PC from another telephone while in telephone mode with line 1 idle. Verify Ringing status. Hang up the calling telephone to end the test.

Data Communications Test

Use the following procedure to verify modem data communications using a Data Test Center telephone number:

1 Log in as **tutor** and invoke the Telephone Manager.

Refer to the AT&T **UNIX**™ PC Telephone Manager User's Guide in the Communications Management binder for the procedure for entering a data call. Line 2 must be set for DATA calls, or Line 1 selected as a data line, to make the data communications test.

2 Select the Data Test Center number and press <Enter>.

You hear the speaker become active and the number being dialed.

When the Call Screen disappears, the system is in Terminal Emulation mode.

3 Press the space bar.

A menu similar to the following appears:

```
CUSTOMER SERVICE SUPPORT CENTER

          AT&T SAN RAMON, CA
          COMMANDS:
          TP1000 AND DS40 DEMO
          TEST
          AUTO
          ECHO
          HELP
          LINE
          *_
```

4 To select a test on the menu, type the name of the test and press <Enter>.

5 To exit Terminal Emulation, press <Shift>-<Exit>.

The following message appears:

Leaving Terminal Emulation

The line status message switches from ACTIVE to IDLE and the Call Screen reappears.

3 Troubleshooting

This section is designed to prepare service personnel for isolating a hardware failure to a field-replaceable assembly. The field replaceable parts are listed in Appendix A.

This section first describes typical problems associated with each replaceable assembly. Then a pair of charts show a recommended course of action for a list of possible complaints.

Troubleshooting Guidelines

In general, experience has shown that many problems initially reported as hardware failures turn out to be partial loss of program data or mistakes in using software.

Data can be lost when a bit or bits of a data byte (loaded into memory) change. This causes an error message. To correct the problem, simply reload the program from disk.

It may also happen that a data bit stored on disk changes. To correct this, use the diagnostics to identify the new bad blocks and reload the bad block table.

Although floppy disks are quite reliable, they are mechanical in nature and eventually wear out. If a program on a floppy disk requires several attempts before it loads correctly, this indicates that the floppy disk is near the end of its useful life. It should be immediately backed up onto a new floppy disk while it is still possible to load from it, and the old floppy disk should be discarded. Also, as a floppy disk drive is used, the heads may move out of alignment. This may cause old floppy disks to be unreadable. The drive can be readjusted, but doing so requires special equipment and training.

A set of diagnostic programs is provided on a floppy disk to thoroughly test all the hardware components in the system. The diagnostics are menu driven and allow selection of a subassembly for testing. Diagnostics can be used to resolve cases where it is not clear whether the problem is hardware or software. However, some hardware failures either do not produce error messages or prevent the diagnostics from running. Knowledge of the symptoms and troubleshooting procedures listed in this section is required for effective troubleshooting.

When replacing a hardware assembly, mishandling can often damage the new unit. Service personnel must be skillful in removal and replacement procedures. They should be strongly aware of units that are easily damaged. The hard disk drive in particular can easily be damaged. It contains most of the customer's data, which may represent many hours, days, or weeks of work. It is of particular importance that this data not be lost through careless handling. Refer to the **Removing and Replacing Subassemblies** chapter of this manual for details.

Rapid identification of the replaceable module causing a problem requires procedures that identify nonstandard behavior. Since most symptoms have more than one possible cause, it is good practice to perform tests that help to confirm a suspected assembly is the cause of the trouble before replacement. In some cases, the symptoms caused by failure of two different units are so similar that a sequential approach must be used: replace the most likely cause of the problem first, then the second most likely, and so on until the problem is corrected.

Each assembly, the known nonstandard behavior pattern, applicable verification procedure, and other possible but less likely causes of the problem are discussed below.

Typical Hardware Problems

This subsection discusses some commonly encountered hardware problems.

Power Supply

Figure 3-5 illustrates the power supply.

Voltages for
Power Supply Ribbon Cable

Pin	Voltage
18	-12
17	GND
16	+12
15	GND
14	+12
13	GND
12	+12
11	GND
10	+5
9	GND
8	+5
7	GND
6	+5
5	GND
4	+5
3	GND
2	+5
1	GND

Note

Pin 1 is toward the rear of the base unit.

The power supply converts the AC input voltage to DC voltages of +5, +12, and -12 volts required by the **UNIX** PC. All the replaceable modules are powered by the power supply, including the fans.

The most obvious failure mode of the power supply is no output voltage. The symptom for this is no response to the Power switch and Reset button. There will be no light on the monitor screen and no sound from the disk drives when the Reset button is pushed. Since no light on the screen can also be caused by the intensity knob, make sure the monitor brightness (intensity) is turned up. The Power switch includes a fuse that should also be checked.

The power supply contains overvoltage and overcurrent protection circuits to protect it and the assemblies connected to it. These circuits shut down the power supply when the overvoltage or overcurrent condition exists, and then periodically sample the output circuit to see if the condition is still present. Thus, if a module such as the monitor or a disk drive develops a short circuit, the symptom will be the same as if the power supply has failed because the output voltage will drop to zero.

If the shorted unit is disconnected, however, the power supply will come back on and the remaining units will work normally. Before deciding that the power supply has failed, turn the power off, disconnect everything except the fans, and then turn the power back on. If the fans do not operate, the power supply has failed. If they do operate, one of the units is shorted and can be identified by alternately turning the power off and connecting them one at a time. Continue until one is found that causes the voltage to drop.

Note that when a power supply has been shorted, there may be a slight delay in the voltage returning to normal levels after the short has been removed because of delay circuits in the power supply.

It is generally bad practice to connect or disconnect any replaceable assemblies while the power is on. Doing so may cause a sudden surge in voltage because of the sudden change in current, which can cause an integrated circuit failure.

The power supply can have a defective mode of operation in which small, rapid variations in output can cause the monitor picture to move or jitter. The amount of movement is generally very small, often just enough to be noticed. Even a very slight movement of the monitor picture will cause eyestrain.

Monitor

The common monitor failures are: no light on the screen, the screen is solid green, or the picture rolls vertically or has a pattern of diagonal stripes.

No light on the screen can also be caused by the intensity knob being turned down. In addition to the external intensity knob, there is an internal intensity adjustment. For more details, refer to Appendix B, **Monitor Adjustments**, in this manual.

Moving bars in the picture can also be caused by incorrect adjustment of the vertical and horizontal hold adjustments. Since sync pulses and video come from the logic board, it is possible for the logic board to cause similar problems. The monitor should be suspected first, however.

In general, problems that affect the overall size, shape, or position of the picture will most often be caused by the monitor.

Hard Disk Drive

The most common symptom of the hard disk drive is failure to boot up or failure to format. Failure to boot can be caused by the disk drive itself, but such problems can also be caused by failure of memory or other components on the logic board. Thus, if the hard disk cannot boot but the floppy disk can, the floppy disk drive should be used to load and run the diagnostics to check the logic board and memory. Then run the hard disk diagnostics.

Physical failure of a hard disk drive that is relatively new and has received proper handling during shipping and installation is a rare event. However, there can be problems in the use of the system or failure of the logic board that result in loss of data on the hard disk. In such cases, there may be no error messages from the diagnostics. The UNIX System V operating system may not boot, and it will have to be reinstalled. Thus it is extremely important that the customer periodically back up all work on floppy disks.

The hard disk drive can develop a small number of bad blocks or sectors that cannot be read reliably. The bad blocks are tested by the manufacturer before shipment and listed on a table attached to the drive. The UNIX operating system may detect a new bad block and generate an error message. If this happens, update the bad block table using the diagnostics.

When replacing either disk drive, make sure the jumpers on the new drive are set the same as the old. New drives from the vendor should be correct, but it is worthwhile to check them. When checking disk drives by substitution, you can run the drives on extension cables.

Note

To avoid damaging the hard disk drive, always park the heads using the diagnostic disk before physically moving the **UNIX** PC after the power has been turned off.

Note that running drives on extension cables may generate noise, which can cause a program to crash. Also note that it is physically possible to interchange and reverse ribbon cables when replacing drives; this can be avoided by noting the mark on the pin 1 side of the cable. Excessive force can easily damage the ribbon cables.

Floppy Disk Drive

A defective drive may not format correctly. When replacing a drive, make sure the jumpers are correct on the new drive. After extended use, the heads in the drive may require alignment. This requires field replacement of the floppy disk drive.

Logic Board

The following list describes typical symptoms of logic board failure:

- Nothing on the screen when power is on and LED's on board do not turn on or off.
- Screen shows a solid green pattern after Reset button is pressed, and neither drive will boot.
- Will boot from one drive but not from the other, and substitution of known good drive does not correct the problem.
- Will not boot from floppy disk drive but will boot from hard disk drive. This can be caused by failure of the 68010 CPU, especially when it is hot. This problem may be verified by spraying the 68010 with electronic cold spray. The problem can also be caused by an incorrectly adjusted VCO (voltage-controlled oscillator) or by failure of memory management PAL's (programmable array logic).
- Will not boot from either drive.
- The error message **No recal** appears during a disk diagnostic test.

- Floppy disk won't write while formatting a blank floppy disk.
- Hard disk won't move at all during diagnostic testing.
- No keyboard control.
- Dialer test gives wrong tone while dialing. Won't connect to operator.
- Locked screen during diagnostic tests.
- Failure of page protection test while running diagnostics.
- Line 1 or 2 will not connect to operator.

Keyboard

If keys do not respond or a character continuously repeats itself across the screen, substitution of a new or known good keyboard is indicated.

Possible Problems and Corrective Responses

For rapid troubleshooting, this section provides two charts. The first chart lists descriptions of possible problems and assigns a number to each one. Within each problem description is a number that refers to a corrective response listed in the second chart. For example, for problem description 1, the suggested response is R-1.

Possible Problems	Response Number
Cannot boot hard disk (1) System partially loads, then a panic error is generated. Floppy disk loads properly. (2) Can't Read Volume Home message appears. Floppy disk loads properly.	R-1
Cannot boot hard disk or system No response to Reset button when trying to boot from hard disk. Floppy disk loads properly.	R-2
Cannot boot either hard disk or floppy disk No response to Reset button.	R-3
Cannot boot floppy disk Drive light comes on, a click is heard, and then nothing further happens. Light stays on. Hard disk boots properly.	R-4

Cannot format hard disk R-5

Can't recal error message is generated.

Cannot format floppy disk R-6

Can't recal message is generated.

Cannot use telephones R-7

(1) A clicking noise is heard when phone lines are plugged in.

(2) Fuses in series with telephone lines on logic board are blown after a thunderstorm.

Cannot transmit data on a telephone line

No response when modem is called on the telephone line.

Cannot dial phone numbers

Dial tones and dialing pulses are heard, but number does not ring.

Monitor screen shows vertical bars that roll R-8

No Response or Wrong Response to keyboard R-9

Monitor screen displays solid light background all the time R-10

Monitor screen displays solid dark all the time

Disk drives make normal noises when Reset button is pressed.

Corrective Responses

R-1

This problem has four equally likely causes:

- Corrupted data in RAM memory
- Corrupted data on the hard disk
- A defective logic board
- A defective hard disk drive

To correct the problem, use the following test sequence:

1. Reboot.
2. If rebooting does not correct the problem, load diagnostics.
3. If diagnostics will not load, replace the logic board.
4. Run diagnostics memory and processor tests. If these tests fail, replace the logic board.
5. If memory and processor tests pass, run disk drive tests. If they fail, replace the hard disk drive.
6. If both sets of diagnostic tests pass, reload software on the hard disk.
7. If the hard disk cannot be loaded, replace the drive.
8. If the hard disk drive reloads but the problem persists, replace the logic board.

R-2

This problem can be caused by a bad hard disk drive or the logic board.

1. Check the hard disk drive cables.
2. If the cables are satisfactory, replace the drive.
3. If replacing the drive does not correct the problem, replace the logic board.

R-3

Replace the logic board.

R-4

This problem can be caused by a bad floppy disk, the floppy disk drive, or the logic board.

1. Replace the floppy disk.
2. If a new floppy disk does not correct the problem, replace the floppy disk drive.
3. If a new floppy disk drive does not correct the problem, replace the logic board.

R-5

This problem can be caused by either a bad logic board or a bad hard disk drive.

1. Replace the logic board.
2. If a new logic board does not correct the problem, replace the hard disk drive.

R-6

This problem could be caused by the floppy disk, the logic board, or the floppy disk drive.

1. Replace the floppy disk.
2. If the problem persists, replace the logic board.
3. If the problem persists, replace the floppy disk drive.

R-7

This problem is most likely caused by a bad logic board, but telephone lines and connections should be checked first.

1. Check telephone lines.
2. If telephone lines are active and installed correctly, replace the logic board.

R-8

This problem is most likely caused by the monitor adjustments, but it could be caused by monitor failure or the logic board.

1. Replace the monitor.
2. If replacing the monitor does not correct the problem, replace the logic board.

R-9

This problem can be caused by either the keyboard or the logic board.

1. Replace the keyboard.
2. If a new keyboard does not correct the problem, replace the logic board.

R-10

This problem is most likely caused by monitor failure, but it could also be caused by the logic board.

1. Replace the monitor.
2. If a new monitor does not correct the problem, replace the logic board.

R-11

Replace the power supply.

R-12

This problem is most likely caused by the logic board, but the printer and cables should be checked first.

1. Check the printer and cables.
2. If the cables are good and the printer is set up correctly (check the DIP switches on the printer), replace the logic board.

R-13

This problem is most likely caused by the power supply, but it can be caused by a short in an assembly connected to the supply.

1. Turn the power off.
2. Disconnect all assemblies except the fans from the power supply.
3. Turn the power back on. If the fans do not run, replace the power supply.
4. Turn the power off again.
5. Reconnect assemblies one at a time, waiting five seconds before turning the power back on each time. When an assembly is found that prevents the fans from running when it is connected, replace that assembly.

R-14

This problem is caused by a rundown realtime clock battery. (The battery is shown in Figure 1-4.)

The voltage of the realtime clock battery is 3 volts. It should be checked using only an electronic voltmeter with a minimum input impedance of 1 megohm. The voltage can be read by putting the positive lead of the voltmeter on the case of the battery and the negative lead on any ground. The battery is socketed in place and can be replaced in the field.

To correct this problem, replace the battery.

Note

On older models (7300) the battery is soldered in place. Replace the logic board to correct the problem.

R-15

This problem may be caused by a bad power supply or a shorted unit connected to the power supply.

To determine the cause, refer to "Power Supply" under "Typical Hardware Problems."

R-16

This problem is probably caused by failure of the modem chip.

To correct the problem, replace the modem chip.

Removing and Replacing Subassemblies

Removing and Replacing Subassemblies

4 Removing and Replacing Subassemblies

This section explains how to disassemble the **UNIX** PC (Model 7300 or Model 3B1) to replace the major assemblies. You should boot the diagnostics and park the disk heads before disassembling the unit to prevent damage or loss of data.

Note

When replacing assemblies, be sure to replace all screws and covers. These components are necessary for compliance with the FCC's Part 15 Rules!

Procedures to replace the following assemblies are discussed in sequence. Procedures that must be performed first are listed at the beginning of the removal or replacement section. Thus, when you want to remove a specific item on the list, skip to the appropriate section and determine which previous sections must be performed first. Procedures are identified as to which of the **UNIX** PC models (either 7300, 3B1 or both) is being discussed.

Note

The 3B1 Model of the **UNIX** PC is easily identified by the hump in the top cover which accomodates the full-height (40MB or 67MB) hard disk drive.

The removable assemblies are:

- Power supply
- Disk drives
  - Floppy
  - Half-height hard disk (10MB/20MB)
  - Full-height hard disk (40MB/67MB)
- Logic board

- Monitor
- Fans
- Power switch assembly
- Keyboard.

The tools required are:

- Phillips-head screwdriver
- Small flat-blade screwdriver
- 1/4-inch socket driver
- 3/16-inch socket driver
- Pair of side cutters
- Small tie wrap.

Removing the 7300 Cover

Cover removal is necessary to gain access to the disk drives, power supply, and logic board. Refer to Figures 4-1, 4-2, and 4-3.

To remove the cover:

1. Turn off the power. (The Power switch is shown in Figure 4-1.)
2. Remove the power cord.
3. Wait 15 seconds and then remove the keyboard by depressing the plastic locking tab at the end of the keyboard cable and pulling up (Figure 4-2).
4. Lift the two plastic screw covers and remove the four cover screws shown in Figure 4-2.
5. Lift the cover up and set it down (Figure 4-3).

Removing the 3B1 Cover

Cover removal on the 3B1 is the same as the 7300 except as follows:

1. After removing the four cover screws, you must also pull out three hooks at the front of the base bottom.

2. Use a flat-blade screwdriver and pry the cover forward. The cover lifts off.

The position shown in Figure 4-3 is the only possible way to set the cover down because of the short length of the cables from the pan to the cover.

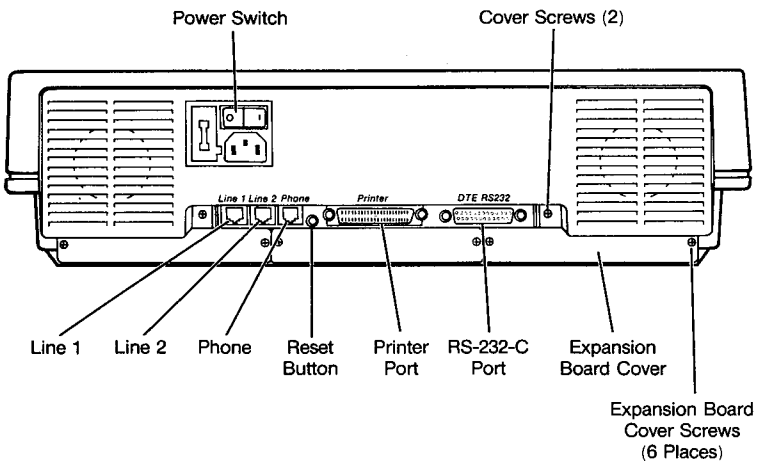


Figure 4-1 Rear View of UNIX PC

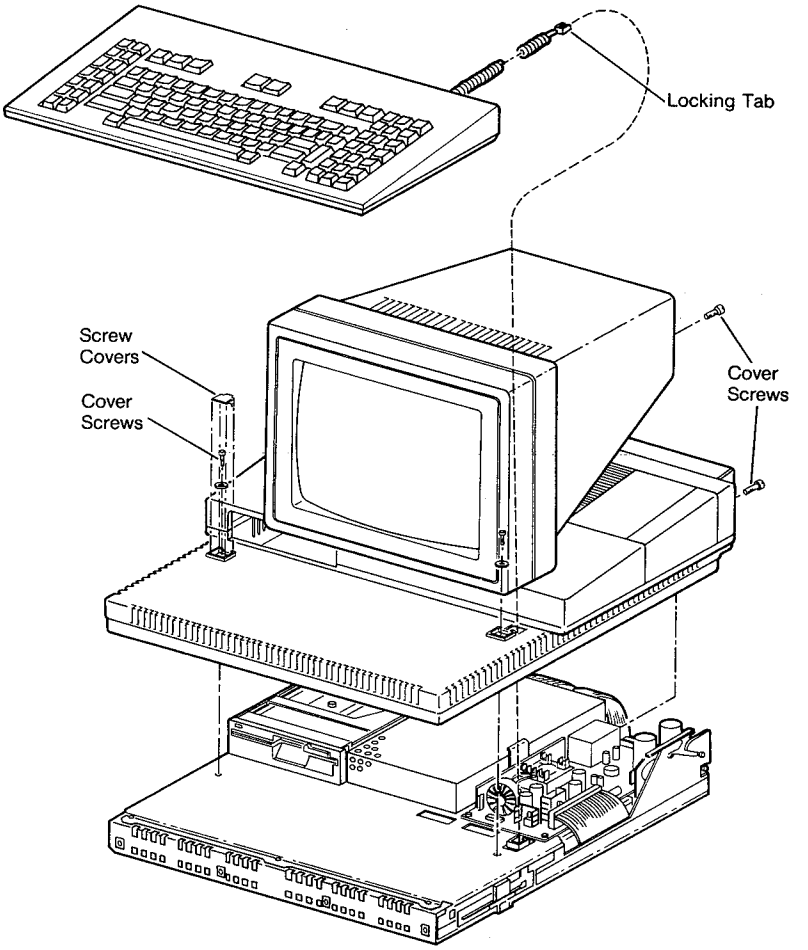


Figure 4-2 Removing Keyboard and Cover

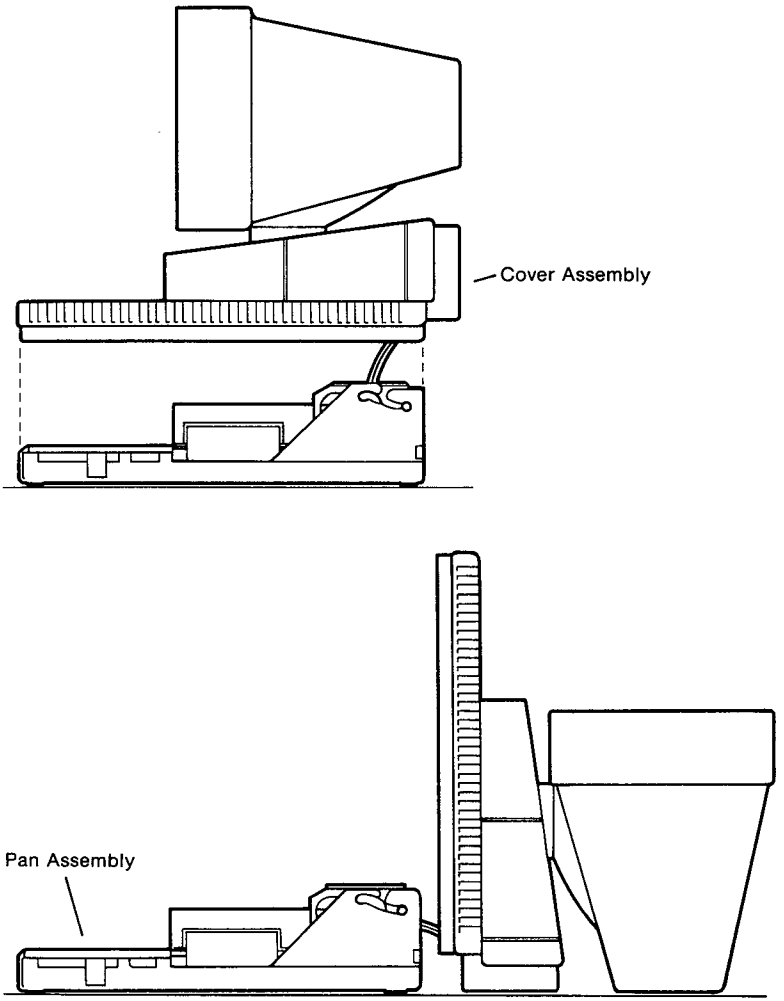


Figure 4-3 Removing Cover Assembly from Pan

Removing the 7300 Power Supply

Before removing the power supply:

- Unplug the power cord
- Remove the cover (Figure 4-2).

The following cables will be disconnected, as shown in Figure 4-4 and discussed below:

- AC power to power supply: brown and blue
- Fan: red and black
- Ground: green and yellow
- Power supply ribbon cable.

To remove the power supply:

1. Pull the brown and blue wires from the Power switch assembly using finger pressure.
2. Disconnect the cable to the fans, using a pair of side cutters to cut the tie wrap, and then unplug the cables. Note that the fan cables are keyed so that they cannot be connected incorrectly during reassembly.
3. Remove the green and yellow ground wire using a Phillips-head screwdriver.
4. Remove the power supply ribbon cable from the logic board by applying steady finger pressure on both sides. Note that excessive or uneven force can damage the connector.
5. Remove the four screws and lift out (Figure 4-5).

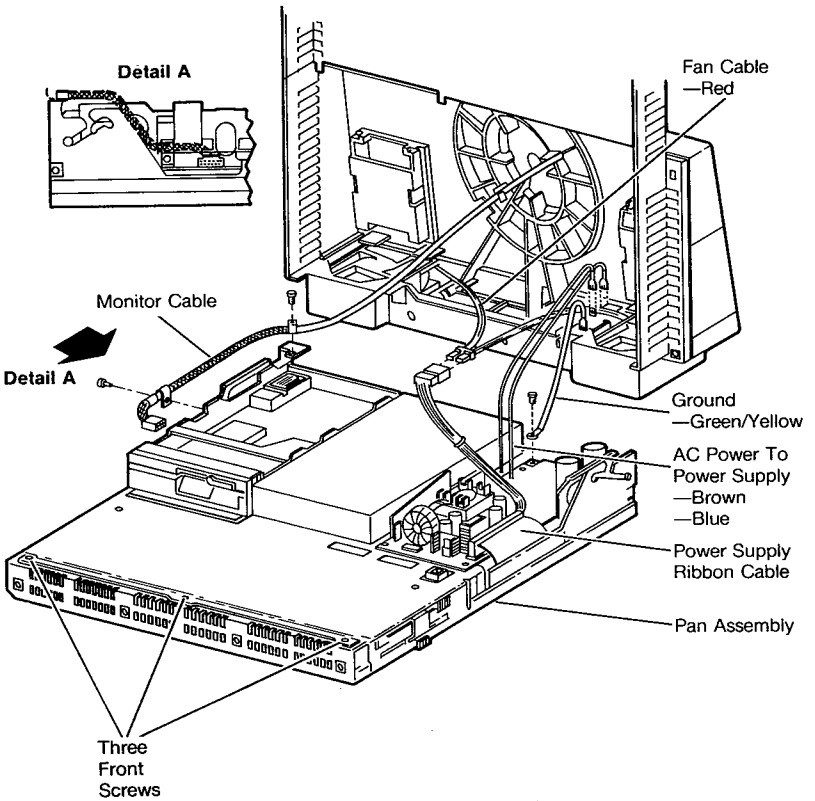


Figure 4-4 Disconnecting Rear Cables

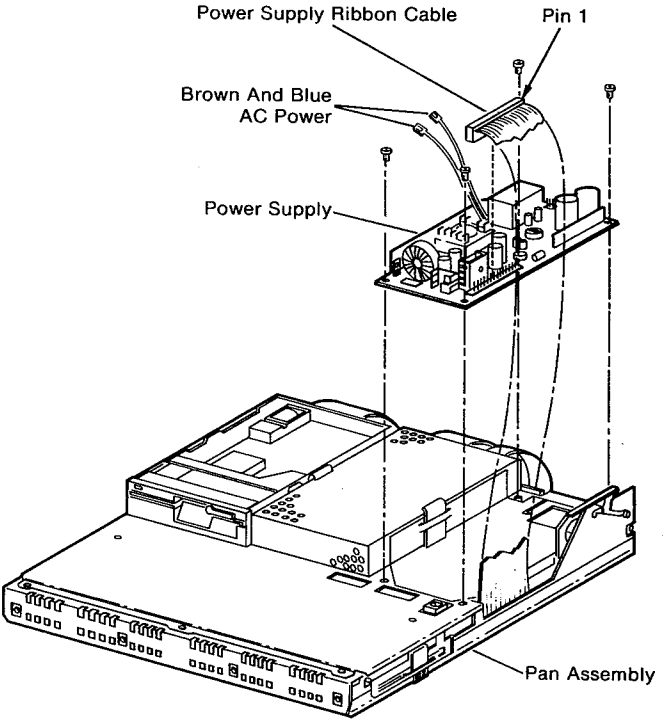


Figure 4-5 Removing Power Supply

Removing the 3B1 Power Supply

The following cables will be disconnected, as shown in Figure 4-4 and discussed below:

- AC power to power supply: brown and blue
- Fan: red and black
- Ground: green and yellow (may be other colors)
- Hard disk drive power cable: four-conductor cable at rear of hard disk drive.

To remove the power supply:

1. Pull the brown and blue wires from the Power switch assembly using finger pressure.
2. Disconnect the cable to the fans, using a pair of side cutters to cut the tie wrap, and then unplug the cables. The fan cables are keyed so that they cannot be disconnected incorrectly during reassembly.

Note

On most full height units, only the right fan is installed. The plug from the single fan will connect to either side of the power supply connector.

3. Remove the green and yellow ground wire using a Phillips-head screwdriver.
4. Remove the power supply ribbon cable from the logic board by applying steady finger pressure on both sides of the connector. Excessive or uneven force can damage the connector.
5. Remove the monitor cable. Note that the monitor cable connection is on the left (see detail A of Figure 4-4). This cable is easily damaged if care is not taken when reassembling the cover.

6 With the top housing assembly free of the base assembly, pull out the power supply connector at the rear of the hard disk drive as shown in Detail B of Figure 4-4.

7 Remove the four screws and lift out the power supply (Figure 4-5).

Removing the Pan Cover (both models)

Before placing the pan cover in an upright position:

- Remove the cover (Figure 4-2).
- Disconnect the power supply ribbon cable (Figure 4-4).

To place the pan cover in the upright position:

1 Remove the monitor cable, shown in Figure 4-4. Note that the monitor cable connection is easily damaged if care is not taken when reassembling the cover.

2 Remove the three screws in front (Figure 4-6).

3 Pull the pan cover up and toward you. Rotate it until the pivot pin is in the pivot notch of the hinge assembly.

4 Rotate the pan cover up until the hinge locks in the upright position.

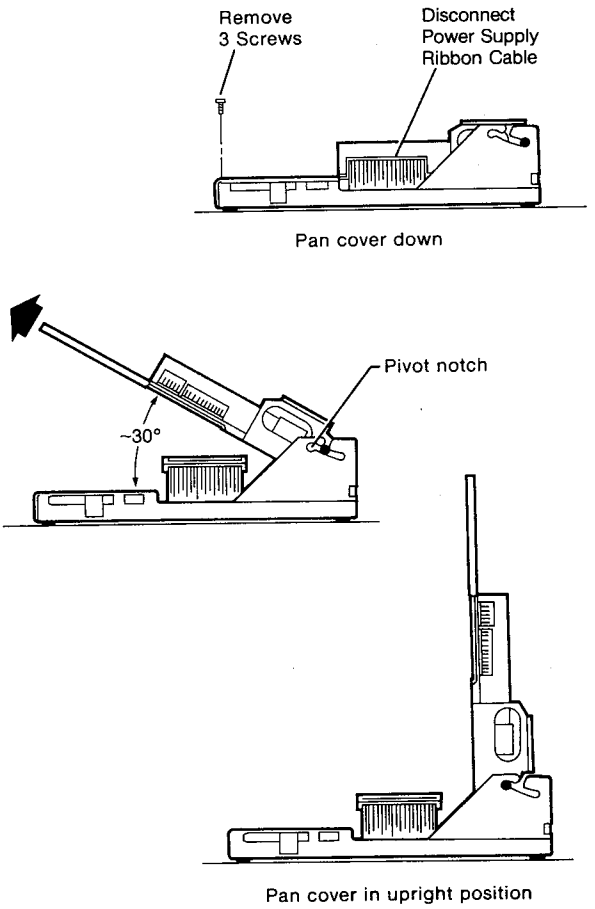


Figure 4-6 Pan Cover in Upright Position

Removing the Floppy Disk Drive (both models)

Before removing the floppy disk drive:

- Remove cover (Figure 4-2)
- Put pan cover in upright position (Figure 4-6).

To remove the floppy disk drive:

1. Disconnect the power and ribbon cables at the back of the floppy disk drive (Figure 4-7). Note the locations of pin 1 for reassembly.
2. Loosen but do not remove the four mounting screws that hold the floppy disk drive to the pan cover.
3. Remove the drive by sliding it forward and up.

Before installing a new drive, note the position of the cables to see that they are in the correct position, as shown in Figures 4-7.

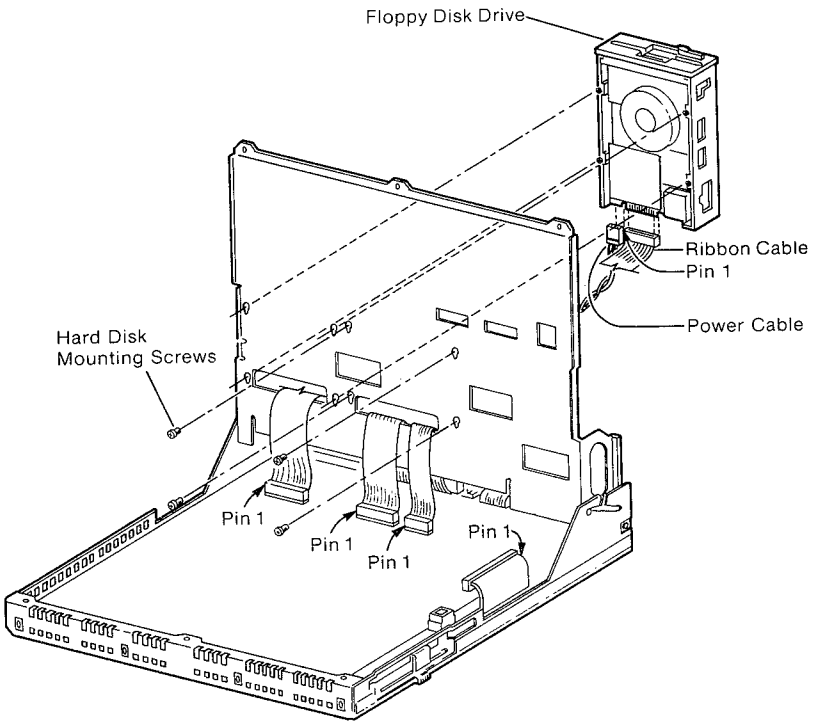


Figure 4-7 Removing Floppy Disk Drive

Handling the Hard Disk Drive (both models)

The hard disk drive contains magnetic record-playback heads. When the drive is in operation, a platter rotates under the heads. When rotating, the heads do not touch the platter; they float above the platter on a cushion of air. When the power is turned off, the heads come to rest on the platter. Any sudden vibration when moving the hard disk drive with the power off can cause the heads to scratch the recording platter. Before removing the hard disk, you should run the diagnostic test that parks the heads. This settles the heads in a safe zone on the platter, where data is never recorded.

Use the following precautions when handling the hard disk drive:

- If the hard disk drive is run outside the **UNIX** PC on extension cables for testing purposes, it should be placed on a foam pad to isolate it from vibration.
- Do not turn the track zero flag. This causes the heads to move across the platter and scratch it.
- Do not turn the spindle motor. The recording head and the platter were not designed to be rotated by hand.
- Do not open the case, because the air inside the drive must be carefully filtered to remove the normal contamination found outside the clean room environment where the drives are assembled.
- When repacking disk drives, use packing materials provided by the manufacturer.

Disconnecting the Hard Disk Drive Cables (both models)

Disconnect the two ribbon cables from the back of the hard disk drive (see Figure 4-8).

The ribbon cables attach to the back of the disk drive. Note carefully that pin 1 on the ribbon cable is marked with a red stripe so that you can return it to its original position. Use finger pressure to pull the cables loose. Excessive force can easily damage the ribbon cable and its connector.

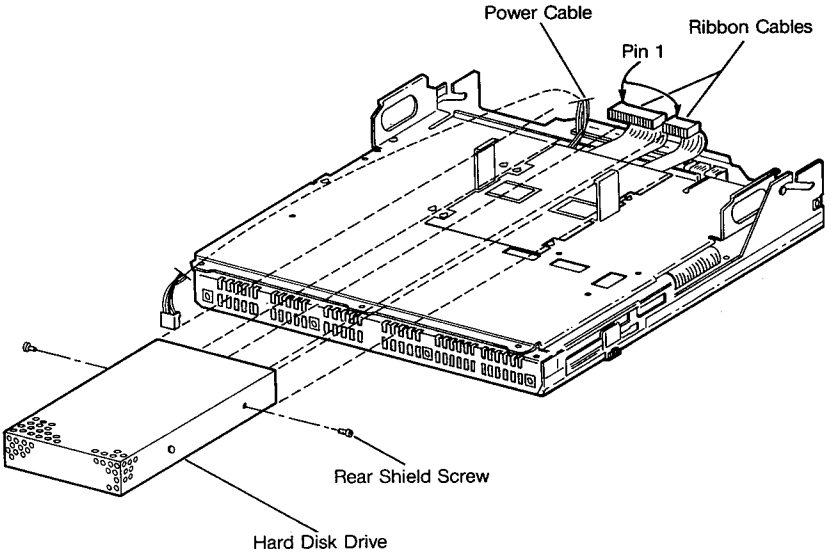


Figure 4-8 Removing Hard Disk Drive

Removing the Hard Disk Drive (both models)

Before removing the hard disk drive, you must:

- Park the disk drive heads before turning off the power.
- Remove the cover
- Remove the power supply
- Place the pan cover in an upright position

To remove either the half-height or full-height hard disk drive:

1. With the pan cover in the upright position (remove if 3B1). Hold onto the hard disk drive while removing the four mounting screws that hold it to the pan cover (Figure 4-9).
2. With the screws removed, lift the disk drive off the pan cover (Figure 4-8).
3. If a new shield is not already on the new hard disk drive, separate the shield from the old disk drive by removing the two screws on each side of the shield. The hard disk drive should then separate from the shield. Also, save the insulating paper underneath the hard disk drive. It will be used again.

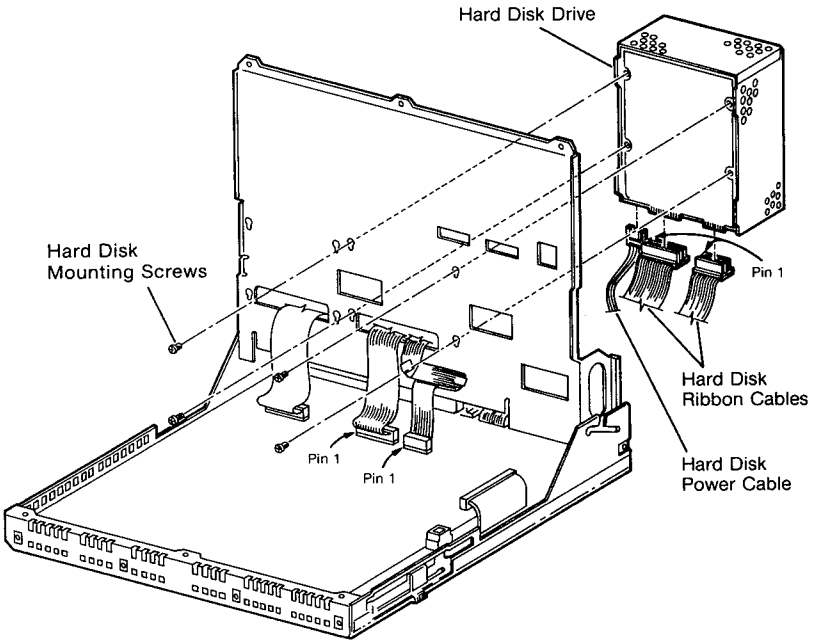


Figure 4-9 Removing Hard Disk Mounting Screws

Replacing the Half-Height Hard Disk Drive

Replace the half-height hard disk drive in the reverse order of removal. Refer to the removal figures to identify the assemblies to replace.

1. If necessary, replace the old shield on the new hard disk drive by attaching it with two screws on each side.
2. Replace the hard disk drive by lining it up with the four mounting holes on the cover pan. Be sure the four tabs on each side of the shield are aligned through the slots in the pan cover.
3. Replace the four mounting screws that attach the hard disk to the pan cover.
4. Connect the ribbon cables to the back of the hard disk drive. Remember that pin 1 is marked with a red stripe and that excessive force can damage ribbon cables.
5. Place the pan cover down and attach the three screws.
6. Connect the hard disk drive power cable from the power supply to the drive's power connector. The connector is keyed so that it will fit only one way. Route the cable underneath the lip of the hard disk drive shield.
7. Attach the monitor cable.
8. Attach the power supply ribbon cable to the logic board by applying steady finger pressure. Note that excessive or uneven force can damage the connector.
9. Attach the ground wire using a Phillips-head screwdriver.
10. Connect the fan cable(s). Note that the fan cables are keyed for correct connection. If two fans are used, attach a tie wrap to the cables.

11 Attach the brown and blue wires from the power switch assembly using finger pressure. Note that the blue wire connects to the top of the power block.

12 Replace the cover and four screws. Be careful not to damage the monitor cable when attaching the cover.

13 Replace the plastic screw covers.

14 Attach the keyboard.

Replacing the Full-Height Hard Disk Drive

Replace the full-height hard disk drive in the reverse order of removal. Refer to the removal figures to identify the assemblies to replace.

1 If necessary, replace the old shield on the new hard disk drive. Note that one end of the shield has a cutout in it to accommodate the drive's ribbon cables and power cable. Mate the full-height disk drive to its shield with four screws, two on each side of the shield.

2 Reinstall the insulating paper taken off the old disk drive on the underside of the new disk drive. It may be helpful to tape the paper to the drive with electrical tape.

3 Connect the ribbon cables to the back of the hard disk drive. Remember that pin 1 is marked with a red streak and that excessive force can damage the ribbon cables.

4 On the hard disk drive shield, note that there are four metal locating fingers, one near each corner of the shield. The locating fingers must slide through the slots provided for them on the new cover pan. Gently position the drive into place in the slots. The four mounting holes for the drive will line up at this time.

5 Install the four mounting screws in the hard disk drive.

6 Install the power cable for the hard disk drive from the power supply. Note that the connector is keyed so that it installs only one way. Route the cable underneath the lip of the hard disk drive shield.

7 Attach the monitor cable.

8 Attach the power supply ribbon cable to the logic board by applying steady finger pressure. Note that excessive or uneven force can damage the connector.

9 Attach the ground wire using a Phillips-head screwdriver.

10 Connect the fan cable(s). Note that the fan cables are keyed for correct connection. If two fans are used, attach a tie wrap to the cables.

11 Attach the brown and blue wires from the power switch assembly using finger pressure. Note that the blue wire connects to the top of the power block.

12 Replace the cover and four screws. Be careful not to damage the monitor cable when attaching the cover.

13 Replace the plastic screw covers.

14 Attach the keyboard.

Removing the Logic Board (both models)

Before removing the logic board:

- Remove cover (Figure 4-2)
- Disconnect the following cables (Figure 4-4):

  Ground
  Power connections to Power switch
  Power supply to fans
  Power supply ribbon cable to logic board
  Disk drive power cables to logic board
  Disk drive ribbon cables to logic board
  Monitor cable to logic board.

To remove the logic board:

1 Raise the pan cover to an upright position (Figure 4-6).

2 Remove the pan cover from the bottom assembly containing the logic board (Figure 4-10).

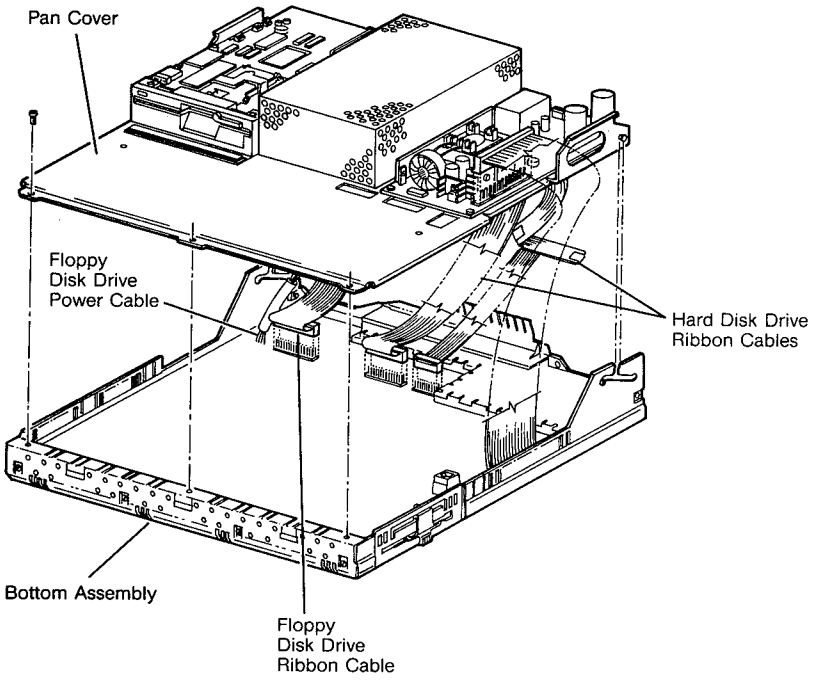


Figure 4-10 Removing Pan Cover

3 Remove the Phillips-head screws around the outside edge of the logic board and the standoffs in the middle (Figure 4-11).

4 Remove the four standoffs at either side of the port connectors (Figure 4-11). Use 1/4-inch and 3/16-inch sockets as required.

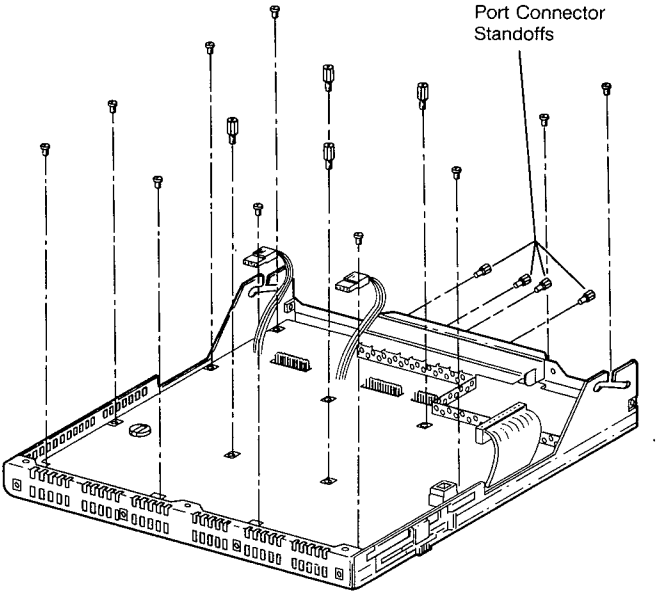


Figure 4-11 Removing Screws and Port Connector Standoffs

5 Remove the four screws that hold the rear port panel onto the base (Figure 4-12).

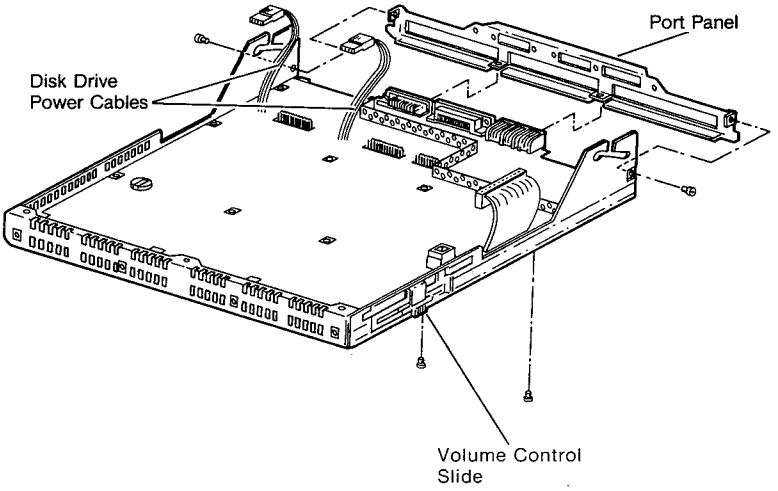


Figure 4-12 Removing Port Panel

At this point the logic board is being held in the base assembly only by the edge connector between it and the base. The speaker volume control potentiometer mounted on the logic board has a vertical arm that engages the plastic volume control slide assembly. The location of the edge connector and volume control is identified in Figure 4-13.

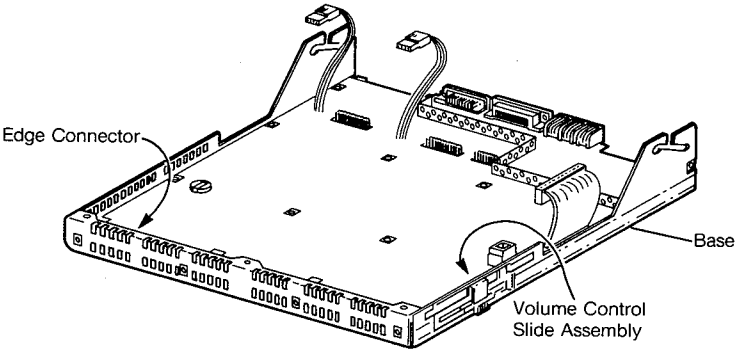


Figure 4-13 Location of Logic Board Edge Connector and Volume Control

6 Remove the logic board by pushing the volume control slide assembly aside and lifting the logic board up and out of the edge connector, as shown in Figure 4-13.

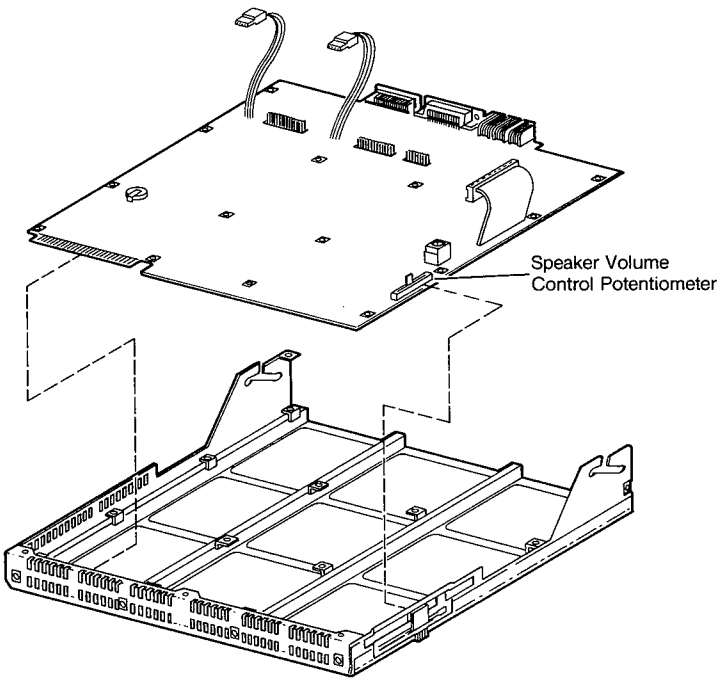


Figure 4-14 Removing the Logic Board

Removing the Monitor (both models)

To remove the monitor:

1. Remove the two screws that hold the back cover and remove the back cover (Figure 4-15).
2. Disconnect the cable that comes from the logic board to the monitor.
3. Disconnect the cable from the intensity control.
4. Remove the bezel by loosening the four screws around its outside edge.
5. Remove the two sets of three screws that hold the monitor onto its swivel base and lift it off. Note the monitor adjustment locations at the rear. Monitor adjustments are listed in Appendix B.

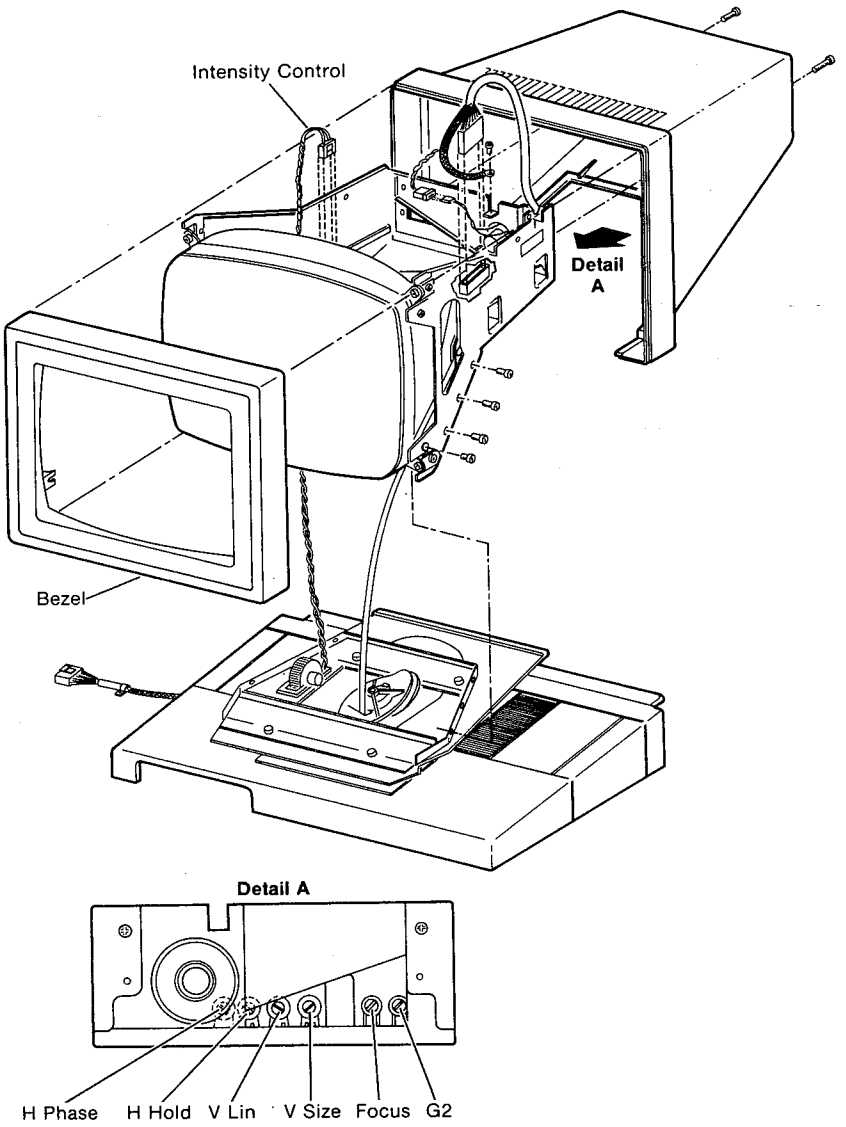


Figure 4-15 Removing the Monitor

Reinstalling the Monitor (both models)

Replace the monitor and perform final reassembly in reverse order of disassembly. Refer to the above figures and procedures if you need help remembering the assemblies to replace.

1. Reversing the disassembly procedure, attach the monitor to the base top assembly with four screws.
2. Replace the front bezel.
3. Replace the monitor bucket.
4. On the 3B1 only, install a tie wrap and anchor to hold the monitor cable in place on the top base assembly as shown in Figure 4-16.

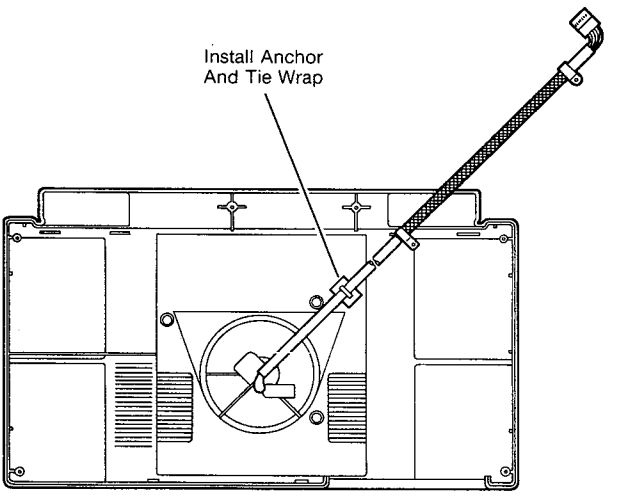


Figure 4-16 Top Base Cable Anchor

Removing the Power Switch and Fan(s) (both models)

Before removing the Power switch or fans:

- Remove the cover (see above).

To remove the Power switch and the fans:

1. Separate the upper and lower plastic portions of the cover. To do this, remove the four screws and separate the two pieces (Figure 4-15).
2. Lift the fans out.
3. Disconnect the fan cables. The cables from the fans are plugged into a cable from the power supply and secured with a tie wrap.
4. Remove the Power switch by depressing the locking tab with a screwdriver and pushing at the same time. The Power switch assembly contains a pair of fuses rated at 5 amps. The fuse assembly can be removed by inserting a flat-blade screwdriver into the tab of the fuse assembly.

Replacing the Fan(s) (both models)

1. Connect the fan cable(s). Note that the fan cables are keyed for correct connector. If two fans are used, attach a tie wrap to the cables.
2. Attach the brown and blue wires from the power switch assembly using finger pressure. The right angle connectors should have the wires pointing toward the fan, routed to the right of the hard disk drive when facing the front of the UNIX PC.
3. Replace the cover and the four screws. Be careful that all cables are out of the way when the cover is placed on the base assembly.
4. Replace the plastic screw covers.
5. Attach the keyboard.

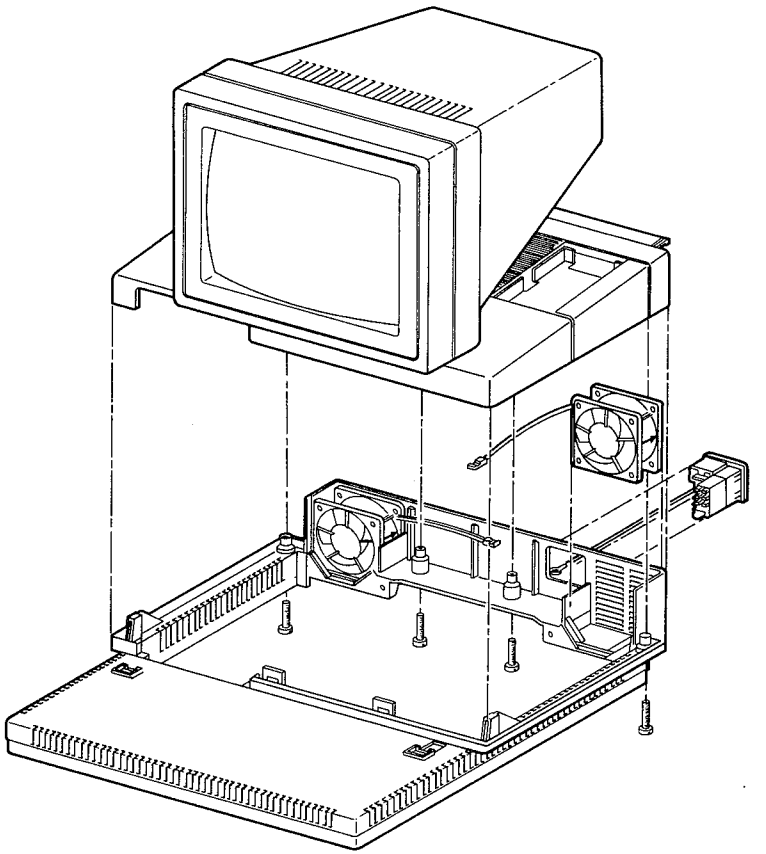


Figure 4-17 Removing the Power Switch and Fans

Appendixes

Appendixes

A Part Numbers for Field Replaceable Items

Name	Com Code
Monitor Bezel Assembly	405050139
Monitor Bucket Assembly	405050154
7300 Monitor Assembly (12 volt)	403865330
Logic CPU Board-.5MB RAM	403865231
Logic CPU Board-1MB RAM	405009804
Logic CPU Board-2MB RAM	404077992
Power Supply-10MB/20MB (Model 7300)	403865322
Power Supply-40MB/67MB (Model 3B1)	405076597
Power Cord	403865249
10MB Winchester Disk Drive HH	403865264
20MB Winchester Disk Drive HH	103973319
40MB Winchester Disk Drive FH	405058314
67MB Winchester Disk Drive FH	404069445
Floppy Disk Drive, 48TP Spares Kit	403865256
Floppy Disk Ribbon Cable	405050345
Winchester Disk Ribbon Cable	405050352
Floppy Disk DC Cable	405050360
Winchester Disk DC Cable	405050378
Keyboard Spares Kit	403865280
Keyboard Cable	403865298
Keyboard Bezel	405050162

Part Numbers for Field Replaceable Items

Name	Com Code
Keyboard Base	405050170
Keyboard (with Shield/Keycaps)	405049578
Fan Assembly Spares Kit	403865272
Mouse Spare Kit	403865314
Tel-Cable D4BU-29 Modular	102479896
512K RAM Expansion Board	103974820
Dual EIA Port Card	103973327
512K RAM W/2 RS-232C Ports	103973335
512K RAM Chip Sets	404086217
1A2 Key Adapter	103974838
DOS-73 Coprocessor Board	405049750
DOS-73 Keyboard Overlay	405083189
2MB RAM Expansion Board	405056359
23MB External TBU Sub Assembly	405057449
23MB TBU 37 Pin Cable	405057464
23MB TBU Controller Card	405057514
23MB TBU Bezel Assembly	404077935
23MB TBU Housing	404077943
23MB TBU Power Supply	405083155
23MB TBU Tape Drive	403754393
23MB TBU Fan Assembly	404077950
23MB TBU Tape Cartridge	104231311
40MB/67MB Retrofit Kit	405055534
40MB/67MB Top Cover	405077728

Name	Com Code
40MB/67MB Disk Shield/Insulator	405078064
40MB/67MB Pan Cover	405078080
40MB/67MB Video Cable	405078098
3B1 Monitor Assembly (9 volt)	405076571
Power Switch/Fuse Holder Assembly	405050196
10MB/20MB Top Cover (Model 7300)	405050212
Bottom Base Assembly	405050246
Speaker Volume Control Pot (SVCP)	405058287
Exterior Slide Assembly for SVCP	405050329
Speaker Assembly	405050394
10MB/20MB Video Cable (Model 7300)	405050402
Reset Button Assembly	405050410
IC Modem Chip	103822649
IC Dialer Network	103747309
Service Manual	845659697
Technical Reference Manual	845660117

B Monitor Adjustments

Monitor adjustments may vary with monitor vendors.

H-Phase

This adjustment can be used to center the display horizontally on the screen. It provides a movement of about 1/2 inch.

H-Hold

This adjustment controls the horizontal frequency. If it is out of adjustment, the screen shows diagonal lines.

V-Lin

This is the vertical linearity. If it is out of adjustment, letters at the top of the screen have a different height than the same letters at the middle or bottom of the screen.

V-Size

This control affects the overall vertical size of the picture. Note V-Lin above also affects the size of the picture. V-Lin should be adjusted first, then V-Size.

V-Hold

This control adjusts the vertical oscillator. If it is adjusted incorrectly, the picture rolls vertically or has a series of horizontal bars in it.

Focus

Focus adjusts the clarity of the picture.

G-2

This affects the brightness of the picture. If incorrectly adjusted, there may be either no picture at all or a picture with diagonal retrace lines in it.

Horizontal Size

A coil on the monitor printed circuit board with an adjustable slug in it adjusts the horizontal size of the picture.

Brightness

The brightness adjustment is under the monitor on the left side. If it is turned all the way down, there is no picture.

C Expansion Memory Locations

This appendix is a table listing the possible memory configurations for the UNIX PC.

The columns of the table are labeled as follows:

- Total System Memory - This is the total amount of Random Access memory (RAM) on the machine including on-board (CPU) memory and expansion memory.
- CPU On-Board Memory - This is the amount of RAM on the UNIX PC main sytem board.
- Expansion Memory Slot 1 - This is the first UNIX PC expansion slot. Facing the rear of the machine, it is located on the left side.
- Expansion Memory Slot 2 - This is the second UNIX PC expansion slot. Facing the rear of the machine, it is the middle slot.
- Expansion Memory Slot 3 - This is the third UNIX PC expansion slot. Facing the rear of the machine, it is located on the right.

The table also uses the following mnemonics:

MNEMONIC	MEANING
*	Empty slot or I/O card without memory
0.5 CPU	UNIX PC equipped with 0.5MB of on-board RAM
1.0 CPU	UNIX PC equipped with 1.0MB of on-board RAM
2.0 CPU	UNIX PC equipped with 2.0MB of on-board RAM
0.5 RAM	0.5MB RAM Expansion Board
2.0 RAM	2.0MB RAM Expansion Board
0.5 EIA	EIA/RAM Combo Board with 0.5MB of RAM
1.0 EIA	EIA/RAM Combo Board with 1.0MB of RAM
1.5 EIA	EIA/RAM Combo Board with 1.5MB of RAM

How to Use this Table

The table is organized according to the total amount of memory the system will have after installing additional memory cards. The following examples illustrate how to use the table.

1. You have a UNIX PC with 0.5MB of on-board memory and you want to install a 0.5MB memory expansion board, bringing the total memory to 1.0MB. First look in the Total System Memory column for 1.0MB. Then, locate the corresponding amount of on-board memory in the next column, in this case 0.5MB. Next, look at the last three columns. You'll see that you can put your 0.5MB RAM board in expansion slot 1, 2, or 3.

2. If you want to install a second 0.5MB RAM expansion board, bringing your systems total memory to 1.5MB, you would look in the Total System Memory column for 1.5MB. Then, you would look for the same amount of on-board memory, or 0.5MB. Next, you would look at the last three columns to see where you can place the additional expansion card. In this case, the two 0.5MB RAM cards have to be placed in either expansion slots 1 and 2, or in slots 2 and 3. You cannot place them slots 1 and 3.

Expansion Memory Locations

TOTAL SYSTEM MEMORY	CPU ON-BOARD MEMORY	EXPANSION MEMORY		
		SLOT 1	SLOT 2	SLOT 3
0.5 MB	0.5 CPU	*	*	*
1.0 MB	0.5 CPU	0.5 RAM * *	* 0.5 RAM *	* * 0.5 RAM
		0.5 EIA * *	* 0.5 EIA *	* * 0.5 EIA
	1.0 CPU	*	*	*
1.5 MB	0.5 CPU	0.5 RAM *	0.5 RAM 0.5 RAM	* 0.5 RAM
		0.5 EIA *	0.5 RAM 0.5 RAM	* 0.5 EIA
		1.0 EIA * *	* 1.0 EIA *	* * 1.0 EIA
	1.0 CPU	0.5 RAM * *	* 0.5 RAM *	* * 0.5 RAM
		0.5 EIA * *	* 0.5 EIA *	* * 0.5 EIA

Expansion Memory Locations (Continued)

TOTAL SYSTEM MEMORY	CPU ON-BOARD MEMORY	EXPANSION MEMORY		
		SLOT 1	SLOT 2	SLOT 3
2.0 MB	0.5 CPU	0.5 RAM	0.5 RAM	0.5 RAM
		0.5 RAM	0.5 RAM	0.5 EIA
		1.0 EIA *	* 1.0 EIA	0.5 RAM 0.5 RAM
		0.5 EIA 0.5 EIA 1.0 EIA * 1.0 EIA *	1.0 EIA * 0.5 EIA 0.5 EIA * 1.0 EIA	* 1.0 EIA * 1.0 EIA 0.5 EIA 0.5 EIA
		1.5 EIA * *	* 1.5 EIA *	* * 1.5 EIA
	1.0 CPU	0.5 RAM *	0.5 RAM 0.5 RAM	* 0.5 RAM
		0.5 EIA *	0.5 RAM 0.5 RAM	* 0.5 EIA
		1.0 EIA * *	* 1.0 EIA *	* * 1.0 EIA
	2.0 CPU	*	*	*

Expansion Memory Locations (Continued)

TOTAL SYSTEM MEMORY	CPU ON-BOARD MEMORY	EXPANSION MEMORY		
		SLOT 1	SLOT 2	SLOT 3
2.5 MB	0.5 CPU	2.0 RAM * *	* 2.0 RAM *	* * 2.0 RAM
	1.0 CPU	0.5 RAM	0.5 RAM	0.5 RAM
		0.5 RAM	0.5 RAM	0.5 EIA
		1.0 EIA * 0.5 EIA 0.5 EIA 1.0 EIA * 1.0 EIA * 1.5 EIA * *	* 1.0 EIA 1.0 EIA * 0.5 EIA 0.5 EIA * 1.0 EIA * 1.5 EIA *	0.5 RAM 0.5 RAM * 1.0 EIA * 1.0 EIA 0.5 EIA 0.5 EIA * * 1.5 EIA
	2.0 CPU	0.5 RAM * *	* 0.5 RAM *	* * 0.5 RAM
		0.5 EIA * *	* 0.5 EIA *	* * 0.5 EIA

Expansion Memory Locations (Continued)

TOTAL SYSTEM MEMORY	CPU ON-BOARD MEMORY	EXPANSION MEMORY		
		SLOT 1	SLOT 2	SLOT 3
3.0 MB	1.0 CPU	2.0 RAM * *	* 2.0 RAM *	* * 2.0 RAM
	2.0 CPU	0.5 RAM * 0.5 RAM	0.5 RAM 0.5 RAM *	* 0.5 RAM 0.5 RAM
		0.5 RAM 0.5 RAM 0.5 EIA * *	0.5 EIA * 0.5 RAM 0.5 RAM *	* 0.5 EIA * 0.5 EIA *
		1.0 EIA * *	* 1.0 EIA *	* * 1.0 EIA
3.5 MB	2.0 CPU	0.5 RAM	0.5 RAM	0.5 RAM
		0.5 RAM	0.5 RAM	0.5 EIA
		1.0 EIA *	* 1.0 EIA	0.5 RAM 0.5 RAM
		0.5 EIA 0.5 EIA 1.0 EIA * 1.0 EIA *	1.0 EIA * 0.5 EIA 0.5 EIA * 1.0 EIA	* 1.0 EIA * 1.0 EIA 0.5 EIA 0.5 EIA

Expansion Memory Locations (Continued)

TOTAL SYSTEM MEMORY	CPU ON-BOARD MEMORY	EXPANSION MEMORY		
		SLOT 1	SLOT 2	SLOT 3
3.5 MB (cont'd)	2.0 CPU (cont'd)	1.5 EIA * *	* 1.5 EIA *	* * 1.5 EIA
4.0 MB	2.0 CPU	2.0 RAM * *	* 2.0 RAM *	* * 2.0 RAM

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USER'S COMMENT SHEET

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