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Class: 3

# Hardware Installation Manual

*for the*

# Sun-3/160 SunStation

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This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instructions manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

# Contents

# Contents

# Tables

# Figures

# Preface

Welcome to the Sun Workstation®. This manual is meant to help you get the Sun-3/160 up and running. It gives unpacking and set-up directions for the workstation and presents basic information about the hardware configuration of the workstation.

## Summary of Contents

This manual consists of six chapters and an appendix. Contents are:

Chapter 1 — *Unpacking and Setting Up the Sun-3/160* — is a guide to getting your Sun-3/160 out of its shipping cartons and setting it up ready to run.

Chapter 2 — *Basic Component Set-up* — describes how to set the voltage selectors; how to connect the Sun-3/160 to its keyboard, mouse, video monitor, and Ethernet; what the power-up self-test procedures mean; and connecting a modem, terminal or printer to the serial ports.

Chapter 3 — *Basic Hardware Configuration, and Options* — describes the basic configuration of the Sun-3/160, and the options available.

Chapter 4 — *How to Configure Your Sun-3/160* — describes how to add and remove the CPU board, Expansion board, and various options.

Chapter 5 — *Subsystem Set-up* — describes the subsystems which may be supplied with your Sun-3/160.

Chapter 6 — *Environmental and Electrical Specifications* — describes the physical environment and electrical specifications.

Appendix A — *Connector Pinouts* — lists and describes pinouts of various connectors and a signal description of the serial ports.

Finally, to help us maintain the currency and accuracy of this material we have supplied a reader comment sheet at the end of this guide. Please use the comment sheet to list errors and omissions. Your responses will help a great deal in our efforts to keep our documentation up to date.

## Applicable Documents

We emphasize that this manual outlines rather than exhausts many of the topics contained within. References to applicable documents supplied with your system are given throughout, however, and we urge you to read these documents should you need further information.

| *Part Number* | Description |
|---|---|
| 800-1133 | Complete Set of Sun User's Manuals |
| 800-1207 | M224XAS Disk Drives Engineering Specifications |
| 800-1210 | M2321/M2322 Micro-Disk Drives Engineering Specifications |
| 800-1243 | Ciprico Tapemaster Specification |
| 800-1267 | SunLink Communication Processor Installation and Configuration Guide |
| 800-1317 | Installing UNIX on a Sun Workstation — *(included in 800-1133)* |
| 800-1357 | Installation and Service Manual for VME-Multiple Terminal Interface |
| 800-1409 | Specification for Streaming Tape Drive |
| 800-1421 | Specification for Xylogics 472 Controller Board |
| 813-1000 | Sun Hardware Options Manual |
| 813-2000 | Sun Configuration Guideline |
| 800-1258 | Sun-3/160 Field Service Manual |

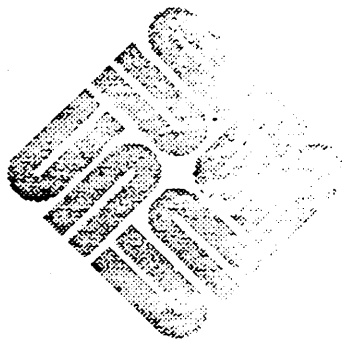
# Revision History

| Revision | Date | Comments |
|---|---|---|
| 50 | 15 October 1985 | Beta Release of this Hardware Installation Manual. |
| 51 | 15 December 1985 | Revised Beta release of this Hardware Installation Manual. |
| 52 | 10 January 1986 | Revised Beta release of this Hardware Installation Manual. |
| 53 | 20 January 1986 | Revised Beta release of this Hardware Installation Manual. |
| A | 3 March 1986 | FCS Release of this Hardware Installation Manual. |

# 1

# Unpacking and Setting up the Sun-3/160





# 1

# Unpacking and Setting up the Sun-3/160

This chapter describes how to unpack and set up your Sun-3/160. The "basic" Sun-3/160 consists of a monitor, single-board CPU, keyboard, and mouse.

Optional components of the Sun-3/160 include the Expansion board, color monitor (in place of the monochrome monitor), Sun-3 Color Video board, Ethernet transceiver and cabling, Multibus†-to-VME Adapter board, VME-to-VME Adapter board, Graphics Processor and Graphics Buffer boards, SCSI disk(s) and ¼-inch tape, SMD disk(s), and ½-inch streamer tape.

## 1.1. Safety Precautions

CAUTION — To avoid electric shock and/or a fire hazard, DO NOT REMOVE COVERS. Refer all servicing to qualified service personnel.

## 1.2. Unpacking Instructions for the Sun-3/160

The basic components of the Sun-3/160 are shipped in 3 separate cartons:

- the largest contains the pedestal;
- the smallest contains this and other manuals (as you have already discovered), the mouse, pad, and various cables;
- the remaining box contains the monitor and keyboard.

When you receive your shipment, inspect all shipping cartons *immediately* for evidence of damage. If any shipping carton is severely damaged, request that the carrier's agent be present when the carton is opened. If the carrier's agent is not present when a carton is opened and the contents are found to be damaged, keep all contents and packing materials for the agent's inspection.

## 1.3. Tools Needed

To unpack and install your Sun-3/160, you will need:

- a knife, to cut the packing tape and open the box
- a 4 inch-by-size #0 Phillips screwdriver
- a 4 inch-by-3/16 inch blade screwdriver

†Multibus is a trademark of Intel Corporation.

- a 4 inch-by-1/8 inch blade screwdriver.

## 1.4. Unpacking the Pedestal

NOTE

- *The shipping weight of the pedestal is about 100 pounds, so two people will be needed to unpack and set up the pedestal.*
- *Inside the large oblong carton is the pedestal and its four wheels, packed between two blocks (one block at each end) of styrofoam. These two blocks of styrofoam fit snugly into the Sun shipping carton, so it may be difficult to remove them.*

1. Place a pad or a cushion down upon a flat surface in an open working area (to protect the pedestal from being scratched while you unpack it). Give yourself plenty of space to move around.
2. Place the carton right-side up. Cut the shipping tape with a knife or scissors, taking care not to damage the contents within. Open the four top flaps.
3. The pedestal is encased in two styrofoam packing blocks (one block at each end) inside the shipping carton. Using care, roll the carton first on one side, then upside down, keeping the flaps open.
4. The open top of the carton is now facing down. Gently tug the cardboard carton up and off of the pedestal and packing blocks.
5. When you have removed the carton from the packing blocks, lift one end of the pedestal and remove the packing block.
6. If the wheels have not been attached to the pedestal, place this packing block beneath the pedestal. Lift the opposite end of the pedestal and remove the remaining block and place it under this opposite end of the pedestal.
7. Remove the plastic bag from the pedestal.
8. Complete this step only if the wheels are not already attached to the pedestal.

   With the pedestal still raised up on the two styrofoam blocks, use an open end wrench to screw the four rollers (one roller at each corner) into the base of the pedestal. You can identify the base of the pedestal by its four threaded holes — one at each corner.
9. Set the pedestal upright on its roller wheels.

## 1.5. Unpacking the Keyboard and (Color or Monochrome) Monitor

NOTE

- *Although the shipping weight of the keyboard and monitor is about 120 pounds, the packaging has been designed so that one person can unpack it alone. After unpacking the keyboard and monitor, you may need help moving the monitor to the place you finally want to set it up.*
- *Inside the large square carton are the keyboard and monitor, packed between two big blocks of styrofoam. The two halves of this styrofoam fit snugly into the Sun shipping carton, so it may be difficult to remove them.*
- *The keyboard is shipped with both types of monitor (color or monochrome). The monochrome monitor has a base; the color monitor does not (see figures following).*

1. Place a pad or a cushion down upon a flat surface in an open working area (to protect the monitor from being scratched while you unpack it). Give yourself plenty of space to move around.
2. Place the carton right-side up. Cut the shipping tape with a knife or scissors, taking care not to damage the contents within. Open the four top flaps.
3. The monitor and keyboard are encased in two styrofoam packing blocks inside the shipping carton. Using care, roll the carton first on one side, then upside down, keeping the flaps open.
4. The open top of the carton is now facing down. Gently tug the cardboard carton up and off of the styrofoam packing blocks.
5. When you have removed the carton from the packing blocks, roll the entire assembly over on its side so that the split between the two blocks of styrofoam is running horizontally. The monitor and keyboard are packed like this:

Figure 1-1 *Unpacking the Monochrome Monitor*

| *Key* | *Description* |
|---|---|
| 1 | Monitor Base |
| 2 | Monitor |
| 3 | Keyboard (goes here) |
| 4 | Foam Packing Blocks |

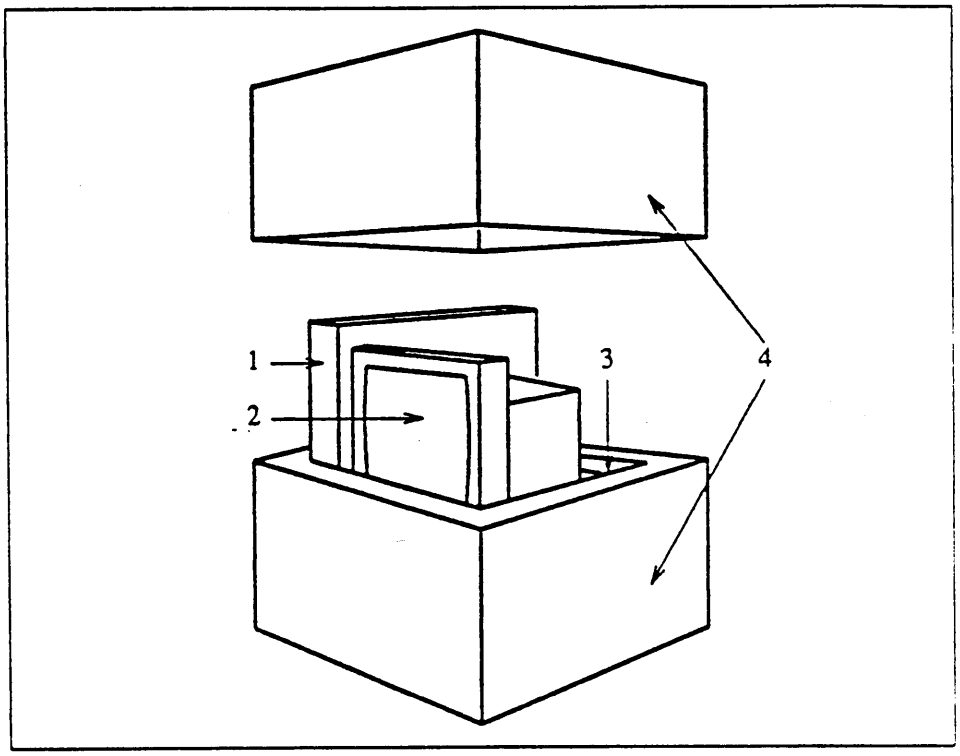
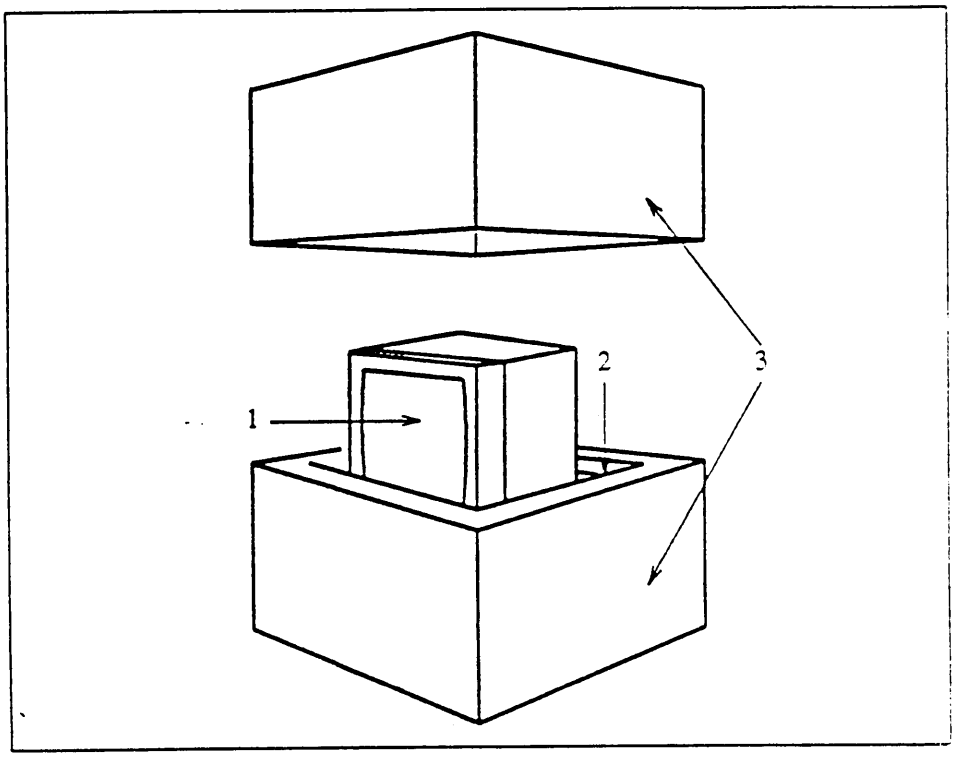


Figure 1-2 *Unpacking the Color Monitor*

| *Key* | *Description* |
|---|---|
| 1 | Monitor |
| 2 | Keyboard (goes here) |
| 3 | Foam Packing Blocks |




6. Remove the top piece of styrofoam packing. Remove the keyboard from the styrofoam, and set it aside.
7. Carefully turn the monitor upright and remove the remaining styrofoam block. Remove the plastic bag from around the monitor.
8. The monitor should now be sitting upright and facing you in your working area, with all packing material removed from it. Now is a good time to move your Sun-3/160 to the location at which you want to install it.

We recommend that you save the shipping carton and packing material for future use in case the product must be reshipped; any products shipped back to Sun must be repacked in their original Sun shipping cartons.

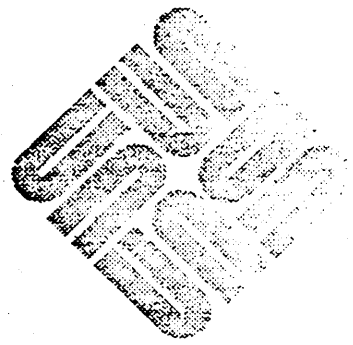
## 1.6. Unpacking the Mouse, Pad, Cables, Tapes, etc.

The final (and smallest) box contains the mouse and its pad, Ethernet cable (if ordered), software tapes, and various connecting cables. Open this box and take this equipment out, as needed.

# 2

# Basic Component Set-up





# 2

# Basic Component Set-up

CAUTION **Follow these safety precautions:**

- **Before plugging in the power cord of any component of your Sun system, be sure that the line power supply voltage and frequency are as required by the label on the back panel of your Sun-3/160 pedestal and monitor. (There is a table in Chapter 6, "Power Supply Specifications," which lists possible options. Refer to it if necessary.)**
- **Use only three-prong (grounded) outlets.**
- **Make certain that all servicing is performed by qualified personnel.**
- **Finally, DO NOT plug in the power cord until explicitly instructed to do so!**

## 2.1. Resetting the Voltage Selectors

In the domestic United States, the pedestal and monitor arrive from the factory set for 115 VAC operation. If you need to change the pedestal's input voltage setting, please contact Sun Microsystems Sales or Service and ask for the *Sun 3/160 Service Manual*, part number 800-1258.

If you need to change the monitor's voltage selection, continue with this section.

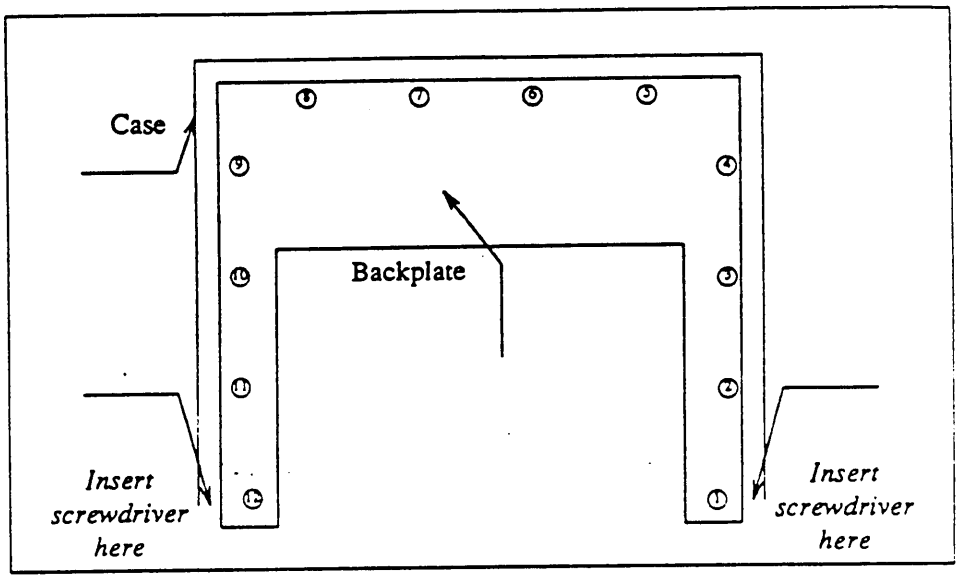
The monitors' voltage select mechanisms are located in several places:

1. a connector on the right side (when facing the front of the monitor) of the color monitor chassis,
2. either a switch or a printed circuit board (depending upon the brand of monitor you receive) on the rear of the monochrome monitor.

## 2.2. Voltage Selection on the Sun-3/160 Color Monitor

The color monitor arrives from the factory set for 115 VAC operation. Go on to the next section if you do not need to change the monitor's voltage selection.

Figure 2-1 *View of the Back of the Color Monitor*




CAUTION **Before attempting to reset the color monitor's voltage selection, make certain that:**

1. **the OFF/ON switch on the rear of the monitor chassis is OFF (side with the "0" is pushed in), and**
2. **the AC power cord is unplugged from the rear of the monitor.**

To change the voltage selection in the color monitor

1. remove screws 1 through 12 shown in the figure above, and
2. insert a blade screwdriver where it says "Insert screwdriver here" (in the figure above) between the case and backplate. Pop the cover up on both sides of the monitor. After loosening both sides you should be able to lift the cover off.
3. When facing the rear of the monitor, the 115/230 VAC jumper will be on the left side of the chassis.

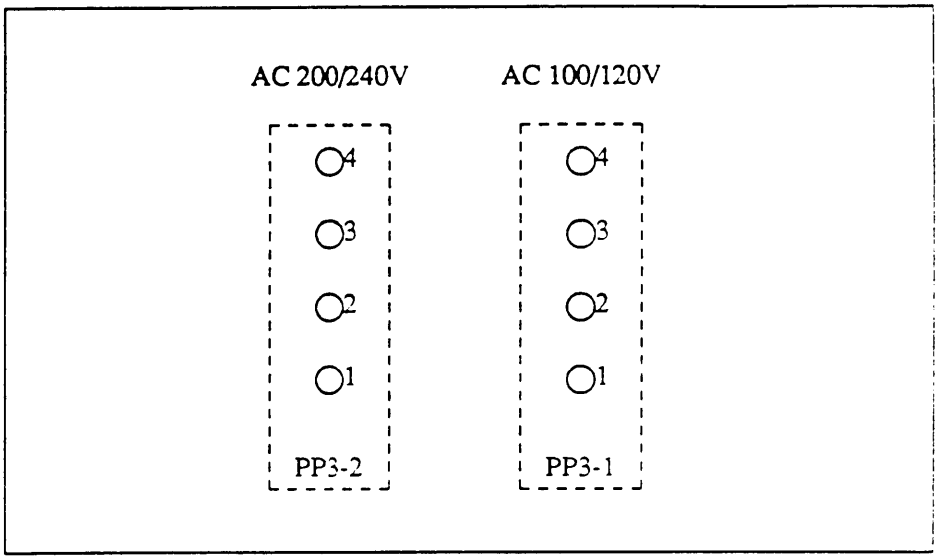
115 VAC Operation

For 115 VAC operation, set the shorting connector marked "PP3" over the three jumpers to the right marked "PP3-1," (also marked "AC 100/120V").

230 VAC Operation

For 230 VAC operation, set the shorting connector marked "PP3" over the three jumpers to the left marked "PP3-2," (also marked "AC 200/240V").

Figure 2-2 *Setting the Voltage Select Connector on the Color Monitor*




Replace the 5A fuse used with 115 VAC with the 3A, 250V fuse supplied with the unit, inside a plastic bag included with the monitor's service manual.

**Indicator Plate**

Finally, there may be a metal plate on the lower left-hand rear of the color monitor which, when removed, exposes information about the voltage range you have selected.

- If you have selected 115 VAC operation, make sure that the plate exposes this information and covers the information for 230 VAC operation.
- If you have selected 230 VAC operation, make sure that the plate exposes this information and covers the information for 115 VAC operation.

## 2.3. Voltage Selection on the Sun-3/160 Monochrome Monitor

There are two models of monochrome (black and white) monitors available with the Sun-3/160. In setting the voltage selection, no fuse change is required for either model.

Although essentially the same, and each has a different method of voltage selection. The two types of voltage selection are:

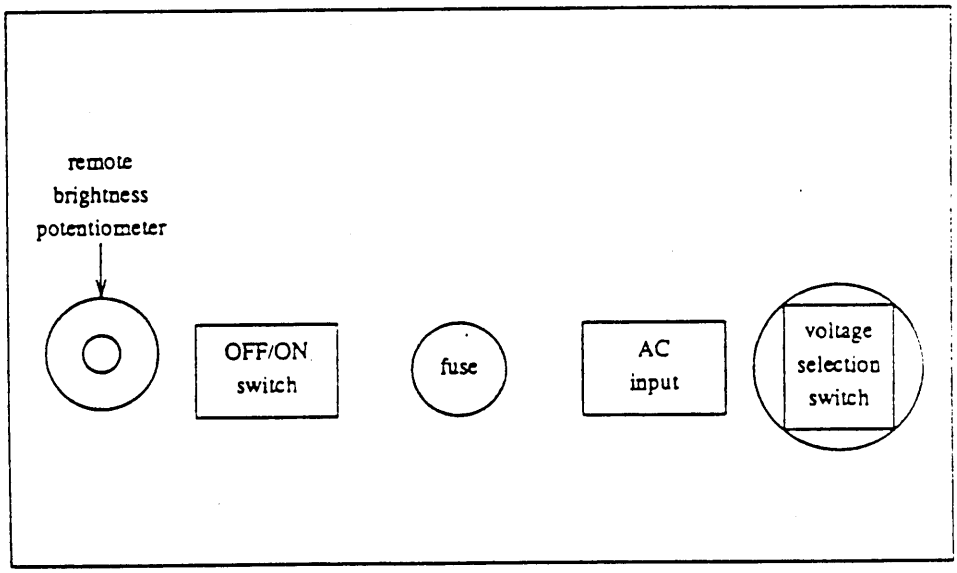
1. PC card
2. switch.

In neither case is a fuse change required.

If the type monitor you have sets its voltage selection by switch, you will see a (possibly red) switch to the right rear side of the monitor chassis (when facing from the rear). One setting of the switch will display "115 V," the other "230 V." Use a blade screwdriver to push the switch either up (so the "115 V" is displayed, for 115 VAC operation) or down (so the "230 V" is displayed, for 230 VAC operation).

The diagram below shows the relative location of the voltage selection switch.

Figure 2-3 *Location of the Voltage Selection Switch on Sun-3/160 Monochrome Monitor*

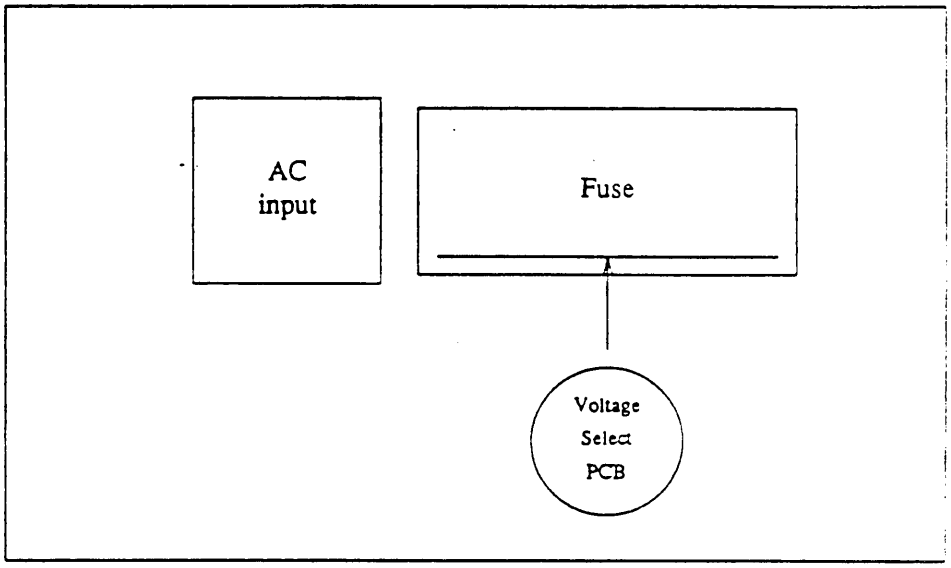


If the type of black and white monitor you have sets its voltage selection by PC card, things are a little more complicated. To set the voltage selection, you change the position of a PC card inside the fuse case. There are four voltages that can be selected, two from each side of the PC card, and they are:

1. 120 or 240 VAC, and
2. 100 or 230 (referred to as "220" on the voltage select PCB) VAC.

The diagram below shows the location of the voltage select PCB.

Figure 2-4 *AC Power, Voltage Select, and Fuse on Sun-3/160 Monochrome Monitor*



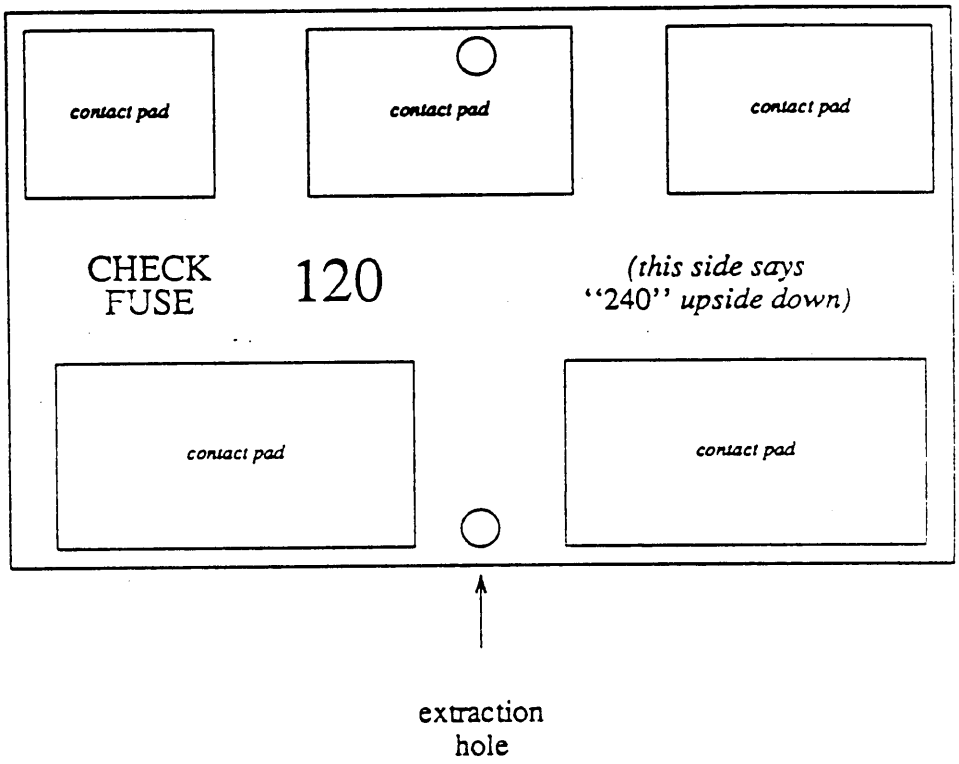

To access the voltage select PCB, you will have to

1. turn the power off to the base unit (by pressing the OFF/ON switch so the "0" side is pushed in);
2. pull the AC power cord from the AC input receptacle on the rear panel;
3. slide the clear plastic panel, which covers the fuse case, to the left. The fuse and voltage select PCB will now be accessible.
4. Pull the voltage select PCB out.

## 120/240 VAC Operation

Below is a diagram of the 120/240 VAC side of the voltage select PCB. For 120 VAC operation, slide the voltage select PCB into the fuse case with this side up (with the legend CHECK FUSE 120 on the left-hand side and facing out towards you).

Figure 2-5 *120/240 VAC Select on Sun-3/160 Monochrome Monitor*

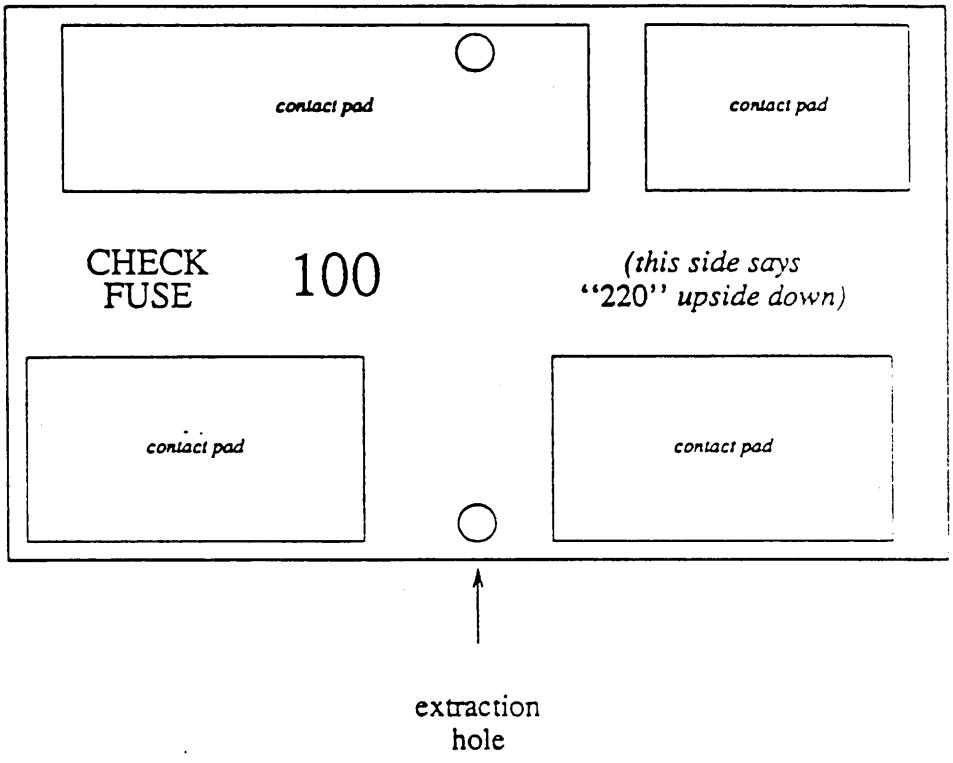



For 240 VAC operation, keep this side up and rotate the PCB 180 degrees, so that the legend "240" is on the left-hand side and faces out towards you. Slide the PCB into the fuse case in this position.

### 100/230 VAC Operation

For 100/230 VAC operation, flip the card over. It looks something like this:

Figure 2-6 *100/230 VAC Select on Sun-3/160 Monochrome Monitor*




For 100 VAC operation, position the card up so the legend CHECK FUSE 100 is on the left-hand side and facing out towards you. Slide the PCB into the fuse case in this position.

For 230 VAC operation, rotate the PCB 180 degrees so that the "220" is on the left-hand side, facing you. Slide the PCB into the fuse case in that position.

## 2.4. Connecting the Keyboard, Mouse, Ethernet, and Video

CAUTION **Before attempting any of the following connections, make certain that:**

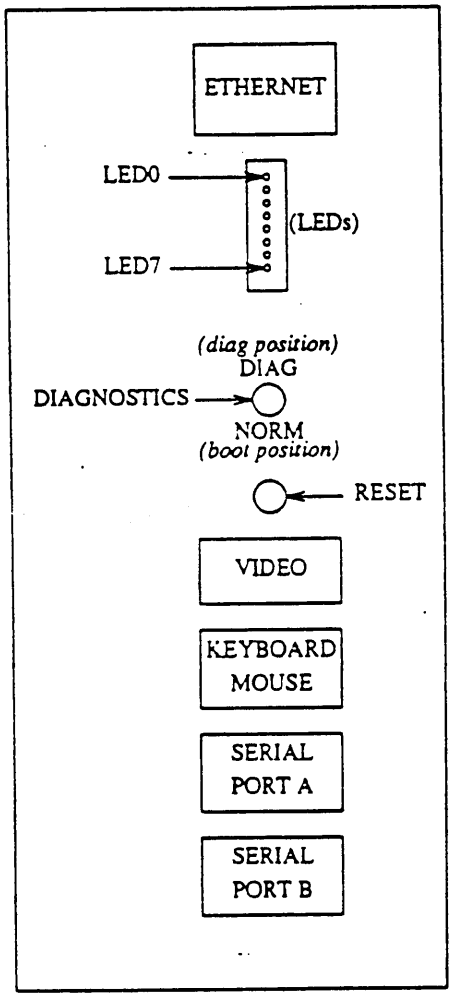
1. **the OFF/ON switch on the front of the pedestal is OFF (side with the "0" is pushed in), and**
2. **the AC power cord is unplugged from the rear of the pedestal.**

The Sun-3/160 comes with its boards already installed in the pedestal. (Should you want to add more boards, please see the chapter titled "Hardware Configuration and Options.") The CPU board, to which the keyboard, mouse, and

Ethernet will be connected, is in slot one, the slot to the furthest left when facing the rear of the machine. The Color board, to which RGB color will be connected, must be placed in the highest priority slot available — see the slot assignment chart in Chapter 4.

The keyboard, mouse, Ethernet, serial I/O, and video connectors are arranged on the backpanel of the CPU board as shown below. The CPU board will be in slot 1; you can identify it by its vertical row of D connectors, and the small bank of 8 diagnostic LEDs by these connectors.

Figure 2-7 *Sun-3/160 Connectors on the 2060 CPU Board*




This section describes how cables will be connected from the backpanel of the CPU board to each of the following items:

- keyboard,
- mouse,

- Ethernet,
- monitor.

This section also describes:

- DIAGNOSTICS switch, and
- RESET switch.

The two remaining connectors, marked SERIAL PORT A and SERIAL PORT B are serial I/O ports to which can be connected peripherals such as modems, printers, and other terminals.

After removing the manuals and cables from the smallest carton, attach the keyboard, mouse, and Ethernet to the pedestal's CPU board in the following ways:

## Keyboard and Mouse Connections

1. The keyboard cable is permanently connected to the keyboard; the other end plugs into the DB-15 (15-pin D connector) at the backpanel of the CPU board. Find your keyboard cable and plug it in now to the KEYBOARD connector on the backpanel, tightening the screwlocks.
2. Find the mouse and its cable. The mouse is a little rectangular box with three long buttons which is permanently attached to its connecting cable.
   - The mouse plugs directly into the keyboard itself; there is a phone connector for the mouse in the top middle area of the keyboard. Find the mouse and its cable and plug this cable into the phone connector on the keyboard now.

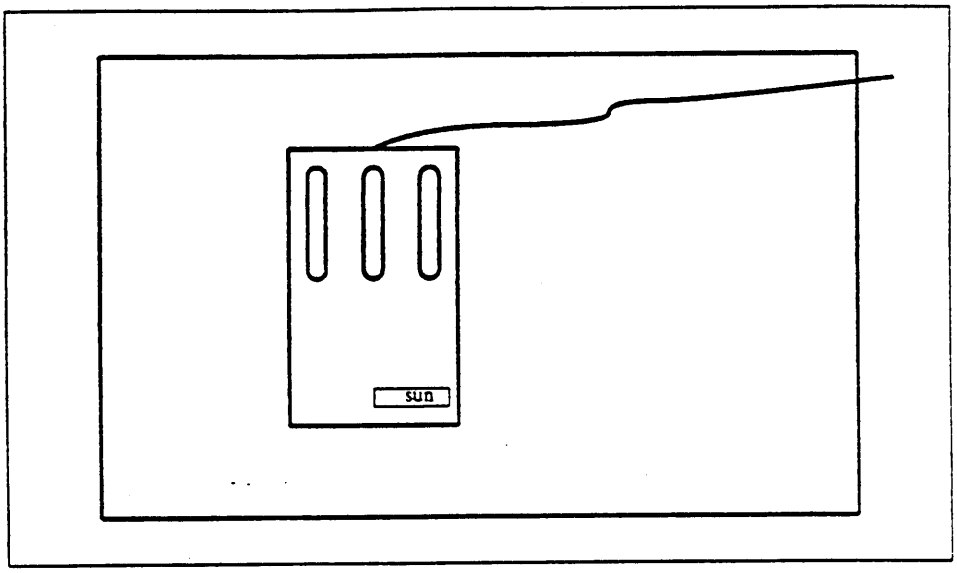
CAUTION — Once the system has been powered up by turning the AC power ON (described further on) DO NOT connect or disconnect either the keyboard or the mouse. Connection or disconnection of the keyboard or mouse when the AC power has been turned ON could result in permanent loss of functionality to the keyboard or the mouse.

- Take out the mouse pad, a hard shiny metallic plate about 9 inches by 11 inches. The mouse sits on the shiny side of the pad which has the grid of lines, and the pad must be oriented so that its length is horizontal in relation to the mouse (see the figure below, "Orienting the Mouse on its Pad").

NOTE — *After you have set up your system, installed UNIX,‡ and run SunWindows™, you will notice that moving the mouse across the face of the pad will cause an arrow-shaped cursor to move across the display.*

‡UNIX is a trademark of AT&T Bell Laboratories.

Figure 2-8 *Orienting the Mouse on its Pad*




## Connecting the Ethernet Cable to the Sun-3/160†

Find the Ethernet cable.† It is a thick cable with 15-pin D connectors at both ends.

NOTE *Before going on, make certain that J100, pins 7 and 8, on the CPU board is properly configured. If you are using a Level 1 Ethernet transceiver, the shunt between pins 7 and 8 must be IN. If you are using a Level 2 Ethernet transceiver, then the shunt must be OUT. If J100 is incorrectly configured, your transceiver will not work.*

1. The male end of the Ethernet cable has a pair of metal studs that fit into the slide lock assembly attached to the CPU board's "ETHERNET" connector. Plug this male end into the "ETHERNET" connector. Push the slide lock over the studs to fasten the D connector securely in place.
2. The female end of the cable has the slide lock assembly attached to *it*; plug this end into the Ethernet transceiver and lock it securely also.

NOTE *After completing the above connections, you should refer to "Connecting the Sun-3/160 to the Ethernet," below, for further instructions regarding Ethernet installation.*

†This section is optional, and is only for those who need to connect their Sun-3/160 to an Ethernet.

## Connecting RGB Video to the Sun-3/160

If you have a Sun-3/160C, then your machine comes with a color monitor and a Sun Color Video board. Four RGB-Sync cables (bundled together as one) connect the Color Video board to the color monitor.

The Color board must be placed in the highest priority slot available — see the slot assignment chart in Chapter 4 — and RGB-Sync cable connections are made from it to the back of the color monitor.

Find the RGB video cable. The video cable is a jacketed bundle of four 15-foot lengths of coaxial cable with color-coded male BNC connectors at each end. Refer to the figure titled "Color and Sync Connections," for the following Color board connections.

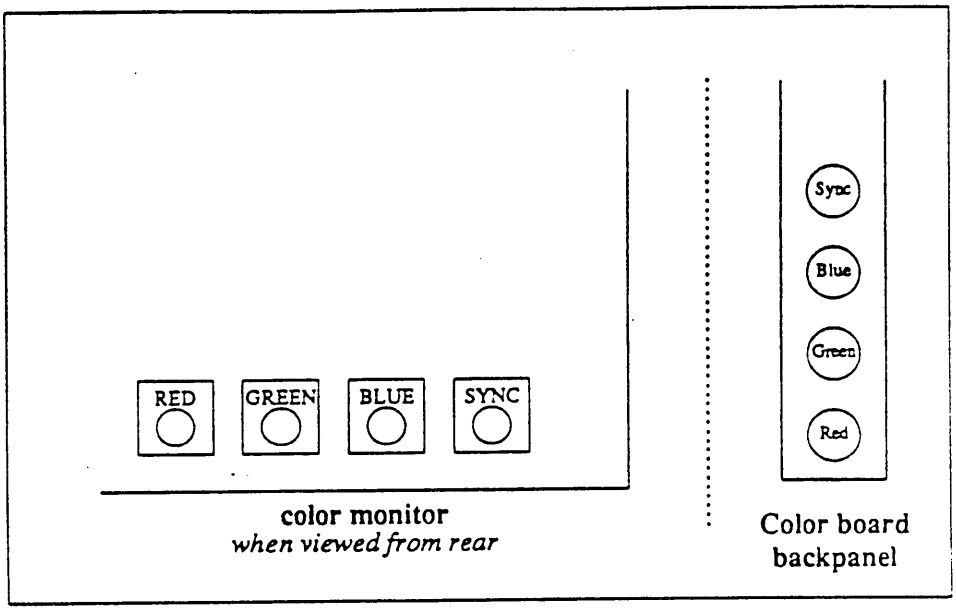
1. Plug the "red" cable into the female BNC connector marked "RED" on the Color board; connect the other end of this cable into the similar connector marked "Red" on the rear of the color monitor.
2. Plug the "green" cable into the female BNC connector marked "GREEN" on the Color board; connect the other end of this cable into the similar connector marked "Green" on the rear of the color monitor.
3. Plug the "blue" cable into the female BNC connector marked "BLUE" on the Color board; connect the other end of this cable into the similar connector marked "Blue" on the rear of the color monitor.
4. Plug the remaining cable (has no color code) into the female BNC connector marked "SYNC" (composite sync signals) on the Color board; connect the other end of this cable into the similar connector marked "Sync" on the rear of the color monitor.
5. Finally, make certain all the impedance switches on the back of the color monitor (marked "75Ω/High") are set to the "75Ω" position.

Find the monitor power cable; it is a standard three-prong cable. Make certain the monitor is OFF (side of the switch with "0" is pressed in).

1. Plug the female end into the power receptacle on the rear of the monitor.
2. Plug the male end into the AC source (wall receptacle).
3. Turn the monitor's power switch to the ON position.

The CRT screen will slowly come on. You should also notice a crackling sound of static — if the screen does not come on within fifteen seconds, try rotating the brightness control on the rear of the CRT.

Figure 2-9 *Color and Sync Connections*




## Connecting the Black and White Monitor to the Sun-3/160

CAUTION **Before beginning the following connections, make certain that the AC power switches of the base unit AND the monitor are OFF. The AC power is OFF when the side marked "0" is pushed in.**

If you have a Sun-3/160M workstation, you have a monochrome monitor. You will connect the monochrome monitor to the video connector on the CPU board.

Find the monochrome monitor's video cable. The monitor's video cable has a 9-pin D connector at each end.

1. Plug the male D connector of the video cable into the "VIDEO" jack on the rear of the pedestal, and tighten the screws.
2. Plug the female D connector of the video cable into the "VIDEO" input of the monitor and tighten the screws on it.

Find the monitor power cable; it is a standard three-prong cable.

1. Plug the female end into the power receptacle on the rear of the monitor.
2. Plug the male end into the AC source (wall receptacle).
3. Turn the monitor's power switch to the ON position.

The CRT screen will slowly come on. You should also notice a crackling sound of static — if the screen does not come on within fifteen seconds, try rotating the brightness control on the rear of the CRT.

### Diagnostic and User Reset Switches

There are two switches on the back of the 2060 CPU board, labelled DIAG/NORM and RESET.

- If you *do* want to enable "extended" diagnostics at the end of the standard power-on diagnostics, turn this switch to the DIAG position.

NOTE *If you place the DIAGNOSTICS switch in the DIAG position, power-on diagnostic messages are sent to serial port A — so you must have a terminal connected to port A in order to see them.*

- If you do *not* want to enable "extended" diagnostics when you power up, turn this switch to NORM. Ordinarily you place the DIAGNOSTICS switch in the NORM position when booting or running the system.

NOTE *If the switch is accidentally placed in the DIAG position, the monitor will pause for about ten seconds between the power-on diagnostics and the normal boot cycle. During this pause, if a key is depressed on either the keyboard or the Port A terminal, you will call up the extended diagnostics menu. If no key is depressed by the end of the ten second pause, normal boot cycle will automatically start and you will bypass the extended diagnostics.*

- To force a reset of the system after you have powered it up, press the RESET switch. This places you in a program called the "monitor." To exit the monitor, you must reboot the system.†

  Reboot the system by typing "b" (for "boot") and press the return key.

```
>b <return>
```

The system will now begin to automatically reboot.

## 2.5. Plugging in the Power Cords

CAUTION **Before going on, make certain that the AC power switch to the monitor is ON (the side with the "1" is pushed in) and the AC power switch to the pedestal is OFF (the side with the "0" is pushed in).**

So far you have made certain that

1. the monitor and pedestal have been set correctly for available AC power,
2. the monitor is plugged into AC power at a convenient wall outlet,
3. the DIAGNOSTICS switch is in the NORM position, and

†For more information, please see *Installing UNIX on a Sun Workstation*, part number 800-1317.

4. the power switch of the monitor is turned ON.

Find the AC power cord. The AC power cord has a three-slot female plug at one end and a three-pronged wall (or "mains," if European) plug at the other end. Plug the female end into the AC input on the bottom rear of the pedestal.

Again make certain that the AC power switch on the pedestal is OFF (side of the switch with the "0" is pushed in) then plug the other end of the AC power cord into the AC wall receptacle.

## 2.6. Powering Up the Sun-3/160

Turn the power switch on the front of the Sun-3/160 pedestal ON (side with the "1" is pushed in). You should see (or hear) two things happen:

- the fans inside the pedestal will come on, and
- the eight diagnostic LEDs on the CPU board will begin blinking on and off (see below, "Power-On Self Test Procedures" and the table following, "Diagnostic LEDs").

CAUTION **Once the system has been powered up by turning the AC power ON DO NOT connect or disconnect either the keyboard or the mouse. Connection or disconnection of the keyboard or mouse when the AC power has been turned ON could result in permanent loss of functionality to the keyboard or the mouse.**

The blinking LEDs indicate that the Sun-3/160 is going through a self-test; when this self-test is successfully completed, the following message will come onto your screen:†

```
Self Test completed successfully

Sun Workstation, Model Sun-3/75 or Sun-3/160, Sun-3 Keyboard
ROM Rev --, _MB Memory installed, Serial # - - - -
Ethernet address --:--:--:--:--:--
```

For further information describing how to bring up UNIX,‡ log on, and choose your password, please see *Installing UNIX on the Sun Workstation*, part number 800-1317.

## 2.7. Power-On Self Test Procedures

The central processor board (CPU) of the Sun-3/160 has a set of PROMs which contain a program generally known as the "monitor." The monitor controls the operation of the system before the UNIX kernel takes control.

When system power is first turned on, the monitor runs a quick self-test procedure, a running commentary of which is carried by the eight LEDs on the CPU board. Results of this self-test are contained in the table below; a solid circle

†Parts of this message are conditional: the "Sun-3/75" may not be displayed, or the message may read "Sun-3/160C" (if you are using a Sun Color board).
‡UNIX is a trademark of AT&T Bell Laboratories.

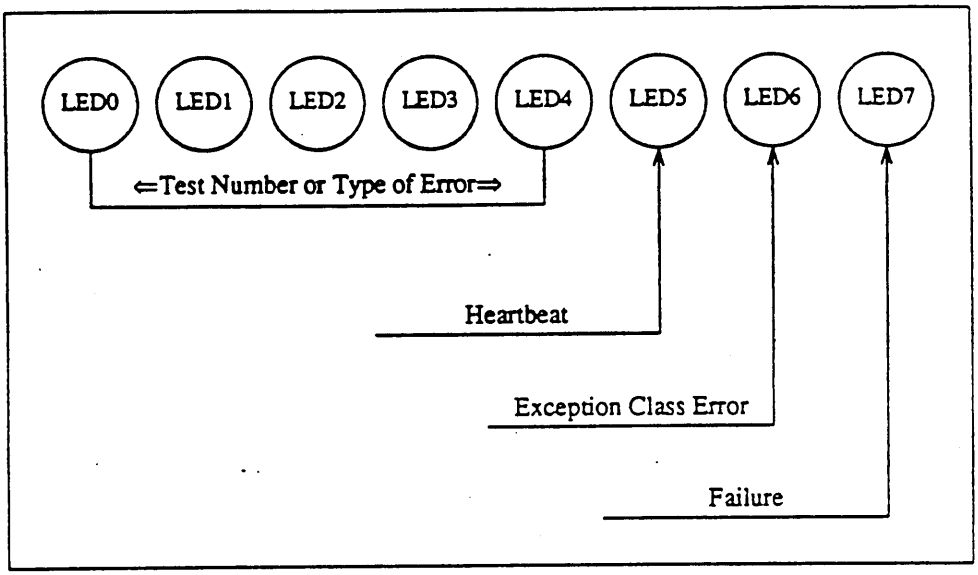
means the light is on; a hollow circle means the light is off. Also, left to right in the table is equivalent to reading the LEDs from top to bottom when the CPU board is in its slot.

If at some point in the above sequence, the LEDs freeze (keep the same pattern for more than a couple minutes), or the sequence restarts from the beginning, there is a critical hardware problem with the workstation. The appropriate thing to do in this case is to contact Sun Microsystems Field Service or your local Field Service organization. Copy down the pattern of lights (as well as you can, if it is repeating over and over); they contain important diagnostic information for Field Service.

Table 2-1 *Diagnostic LEDs*

| LEDs ● = ON, ○ = OFF 0 7 | *What the System is Doing When These LEDs Are Cycling* | *What Might Be Bad If This Indication Stays On And the bottom LED (bit 7) Lights* |
|---|---|---|
| ● ● ● ● ● ● ● ● | A reset sets LEDs to this state | CPU or PROMs bad |
| ● ○ ○ ○ ○ ○ ○ ○ | Test 1 checking the boot PROM | Boot PROM |
| ○ ● ○ ○ ○ ○ ○ ○ | Test 2 checking DVMA Register | CPU Board |
| ● ● ○ ○ ○ ○ ○ ○ | Test 3 checking the Context Register | CPU Board (MMU) |
| ○ ○ ● ○ ○ ○ ○ ○ | Test 4 Segment Map RAM Rd/Wr Test | CPU Board (MMU) |
| ● ○ ● ○ ○ ○ ○ ○ | Test 5 checking Segment Map RAM | CPU Board (MMU) |
| ○ ● ● ○ ○ ○ ○ ○ | Test 6 checking Page Map RAM | CPU Board (MMU) |
| ● ● ● ○ ○ ○ ○ ○ | Test 7 checks memory data path | CPU or Exp. Board |
| ○ ○ ○ ● ○ ○ ○ ○ | Test 8 checks bus error detection | CPU Board |
| ● ○ ○ ● ○ ○ ○ ○ | Test 9 checks interrupt capabilities | CPU Board |
| ○ ● ○ ● ○ ○ ○ ○ | Test 10 checking MMU read access | CPU Board |
| ● ● ○ ● ○ ○ ○ ○ | Test 11 checking MMU write access | CPU Board |
| ○ ○ ● ● ○ ○ ○ ○ | Test 12 writing to invalid page | CPU Board |
| ● ○ ● ● ○ ○ ○ ○ | Test 13 tries to write to protected page | CPU Board |
| ○ ● ● ● ○ ○ ○ ○ | Test 14 performs parity error check | CPU Board |
| ● ● ● ● ○ ○ ○ ○ | Test 15 performs parity error check | CPU Board |
| ○ ○ ○ ○ ● ○ ○ ○ | Test 16 performs memory tests | CPU or Memory Exp. Board |
| ○ ○ ○ ○ ○ ○ ○ ● | Self-Tests have found an error | CPU or Memory Exp. Board |
| ○ ○ ○ ○ ○ ○ ● ○ | An Exception Class error was found | CPU Board |
| ○ ○ ○ ○ ○ ● ○ ○ | Self-Test done, UNIX in boot-state (LED is blinking) | CPU Board |
| ○ ->○ ->○ ->○ ->○ ->○ ->○ ->○ | "Walking Ones" pattern | UNIX running okay |

Figure 2-10 *What the Diagnostic LEDs Mean*




1. If the LED in bit position 7 lights up during self-test, it indicates a failure. The exact test that failed is indicated by LEDs 0 through 4, which can be decoded by the "Diagnostic LEDs" table above.
2. If the LED in bit position 6 lights up during the self-test, it indicates the failure is an exception class failure — bus error trap, address error trap, unexpected interrupt, etc.
3. LED 5 is the heartbeat LED. It will start blinking after the conclusion of self-test and before the execution of UNIX to indicate that the CPU is actually executing code and not hung somewhere.
4. LEDs 0-4 indicate the exact test being undertaken during self-test. If LED 7 is not lit, then the tests are proceeding without error; if LED 7 lights up, then LEDs 0-4 will freeze, indicating which test failed. Refer to the table above, if necessary.

If all 8 LEDs are lighting up in sequence from 0 to 7 then back to 0 again, it means that you have exited self-test and UNIX is running successfully.

## 2.8. Accessing the EEPROM

The 2060 CPU board has an EEPROM that can be accessed through the boot PROM monitor. You must first enter the monitor program by pressing the L1 key (upper left-hand corner of the keyboard) and the A simultaneously. This will abort your present session and put you in the monitor program. The monitor displays as its characteristic prompt the "greater than" symbol:

```
>
```

To access the EEPROM now, type the letter Q, followed by the EEPROM address which you want to examine or modify (the characters you enter are in bold, and can be entered in either upper or lower case). Thus, if the location you want to access is hexadecimal address B8 (0xB8), you would type:

```
>Q B8
```

and press the return key. The system will then display the contents (a single byte) of address B8 in the EEPROM, which is part of the the data test pattern for the EEPROM data lines.

```
>EEPROM 0B8: AA
```

To update the contents of this location, merely enter the new information followed by a carriage return. This will write the new value to address 0xB8 — and then automatically allow you to access the next address.

Let's say you want to replace the value 0xAA with the value 0x66:

```
>EEPROM 0B8: AA 66 <return>
```

The address counter will now automatically increment and you will now be in the next location. If you want to terminate this process press the space bar (or any non-hexadecimal character), followed by a carriage return.

```
>EEPROM 0B8: <space> <return>
```

## Setting Your Primary Terminal

You can use different terminals with your Sun-3/160:

- a monochrome terminal, hooked to the video output of the CPU board:
- a color terminal, hooked to the video output of the Color board;
- either one or two ASCII terminals, connected to the serial port(s) — port A and port B — of the CPU board.

You must let the processor know which terminal you consider to be your "primary" terminal — the terminal over which you and the processor will communicate.

You set a byte in the EEPROM to select your primary terminal: either serial port A, serial port B, color monitor, or monochrome monitor.

Location of the byte which sets your primary terminal is 0x00001F. Terminal values are:

```
0x00 = monochrome monitor
0x10 = serial port A
0x11 = serial port B
0x12 = color monitor

Also, any other value selects the monochrome monitor.
```

NOTE *If location 0x1F is set for 0x12 (color monitor) but no color board is seen by the system, system software will default to the monochrome monitor.*

Let's say you want to set your primary terminal to be the color monitor. You would access EEPROM location 0x00001F, and then enter the value which identifies the color monitor — 0x12.

First, access location 0x00001F.

```
>Q 1F <return>
```

This puts you at EEPROM location 0x00001F. The value presently at this location will be displayed (we'll say it's 0x10, for serial port A).

```
>EEPROM 01F:  10
```

Enter the value for the color monitor — 0x12 — and then press the space and return keys, to escape.

```
>EEPROM 01F:  12 <space> <return>
```

## Setting Your Screen Size

The default (standard) screen size is 1152 by 900 pixels. Location 0x16 in the EEPROM handles special screen sizes, such as 1024 by 1024 (1Kx1K). Screen size values are:

```
0x12 = 1Kx1K
0x00 = 1152x900
```

However before you can complete your screen size change, you must replace the PROMs you are using with new vertical and horizontal timing PROMs. This must be done by Sun Field Service.

### EEPROM Contents

Banner and configuration data are also retained in the EEPROM; for more information, please see *Installing UNIX on a Sun Workstation*, part number 800-1317.

## 2.9. Asynchronous Serial Ports

You may attach modems, printers, plotters, or other serial devices which use the RS-232-C or RS-423 interface, to the serial port connectors labeled SERIAL PORT A and SERIAL PORT B on the CPU board's backpanel.

Each Sun-3/160 serial port provides a 25-pin connector (DB-25) compatible with RS-232-C equipment. All signals in our connector are semantically the same as their RS-232-C counterparts. However the Sun-3/160 uses improved electrical circuits which, while working with RS-232-C devices, are also compatible with the newer RS-423 standard.

The serial ports on the Sun-3/160 were designed for connecting to peripherals such as printers and plotters, and can drive these output lines at speeds up to 19.2 kilobaud; input lines may be driven to 9.6 kilobaud.

All ports provide DTR, RTS, and clock signals, and receive DSR, CTS, and DCD signals. All ports are wired as Data Terminal Equipment (DTE) ports (which means Transmit Data from the workstation is on pin 2 and Receive Data from the peripheral is on pin 3), and thus allow direct connection of Data Communications Equipment (DCE) such as modems. Computers, terminals, printers, and other DTE devices can also be connected directly to the serial ports by using the null modem cable available from Sun, part number 530-1056. For further information refer to *System Interface Manual for the Sun Workstation*, part number 800-1173, section ZS(4S), which discusses the Zilog serial interface.

Signals carried on the SERIAL PORT A and SERIAL PORT B connectors are listed in the appendix.

NOTE *The following sections — which describe connecting modems, terminals, and printers to the serial ports — are guidelines only, and specific devices may require more detailed information such as that contained in the System Interface manual.*

### Connecting a Modem to the Sun-3/160

The serial ports are wired as DTEs, and most modems are wired as DCEs. The cable connecting your modem to the Sun-3/160 should be "straight through" — the signals on pins 2, 3, 4, 5, 6, 7, 8, and 20 at the output of the cable should be the same as those signals on corresponding pins of the serial port. Do *not* use a null modem cable to connect the serial port to your modem. It does not matter which serial port you connect to; both are identical.

Refer to the manual which comes with your modem to see which signals you will need for proper operation of your modem. Refer also to *System Administration for the Sun Workstation*, part number 800-1150, and *Installing UNIX on the Sun Workstation*, part number 800-1317, which detail connecting to a modem.

## Connecting a Terminal to the Sun-3/160

The serial ports are wired as DTEs. Most terminals are wired as DTEs too. To connect a terminal to a serial port you must first make certain that the terminal you are using accepts the RS-232-C or RS-423 protocol. If it does, you may then connect the terminal to either serial port with a null modem cable, Sun part number 530-1056. In the null modem cable, pins

2 and 3 are crossed

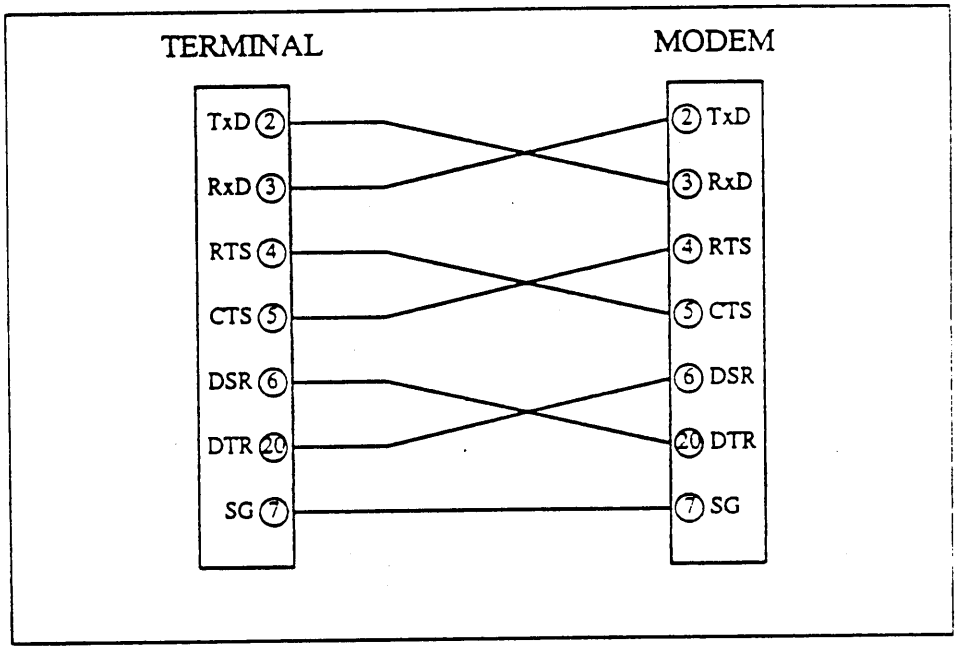
4 and 5 are crossed

6 and 20 are crossed

and pin 7 is wired straight through.

"Pins 2 and 3 crossed" means that the signal entering the cable on pin 2 emerges on pin 3, and vice versa (see the figure below). The connector on the left is the Serial I/O Port on the CPU board; the connector on the right is the terminal (DTE).

Figure 2-11 *Null Modem Cable Pin Arrangement*




Refer to the manual that comes with your terminal to make certain that the signals needed to operate the terminal are provided at the correct pins of the serial port. Refer also to *System Administration for the Sun Workstation*, part number 800-1150, and *Installing UNIX on the Sun Workstation*, part number 800-1317, which detail connecting to a terminal.

## Connecting a Printer to the Sun-3/160

The serial ports are wired as DTEs. Most printers are wired as DTEs too. To connect a printer to a serial port you must first make certain that the printer you are using has a DB-25 connector and uses the RS-232-C standard. Most serial printers do. However it should be noted that you cannot connect a parallel interface printer to a Sun-3/160 unless you also use a serial-to-parallel converter.

After determining that you have a serial interface printer (or a parallel interface printer with a serial-to-parallel converter), connect the printer to either serial port with a null modem cable, Sun part number 530-1056. In the null modem cable, pins

2 and 3 are crossed

4 and 5 are crossed

6 and 20 are crossed

and pin 7 is wired straight through.

"Pins 2 and 3 crossed" means that the signal entering the cable on pin 2 emerges on pin 3, and vice versa (see the figure above).

Refer to the manual that comes with your printer to make certain that the signals needed to operate the printer are provided at the correct pins of the serial port. Refer also to *System Administration for the Sun Workstation*, part number 800-1150, and *Installing UNIX on the Sun Workstation*, part number 800-1317, which detail connecting to a printer.

## 2.10. Connecting the Sun-3/160 to the Ethernet

If you ordered the Ethernet kit, you will find included in the box with the manuals and cables the Ethernet transceiver and transceiver cable (see the following figure, "Linking Up to an Ethernet"). The coaxial cable and terminators necessary to connect multiple machines to a network may be purchased separately from Sun.

NOTE *Before going on, make certain that J100, pins 7 and 8, on the CPU board is properly configured. If you are using a Level 1 Ethernet transceiver, the shunt between pins 7 and 8 must be IN. If you are using a Level 2 Ethernet transceiver, then the shunt must be OUT. If J100 is incorrectly configured, your transceiver will not work.*

Setting up an Ethernet with all Sun-supplied components is fairly straightforward:

1. Screw the 50 ohm coaxial cable into one of the transceiver N connectors (an N connector is a round, screw-on connector).
2. Each end of the coaxial cable must have a 50 ohm terminator attached. This may be done either by attaching the 50 ohm terminator
   - to the transceiver's vacant N connector, or to
   - the end of the coaxial cable, using a barrel connector. (A barrel connector is a double N connector.)

CAUTION **Handle the coaxial cable with some care, as it is fragile; don't install it in an area where it may be run over or stepped on.**

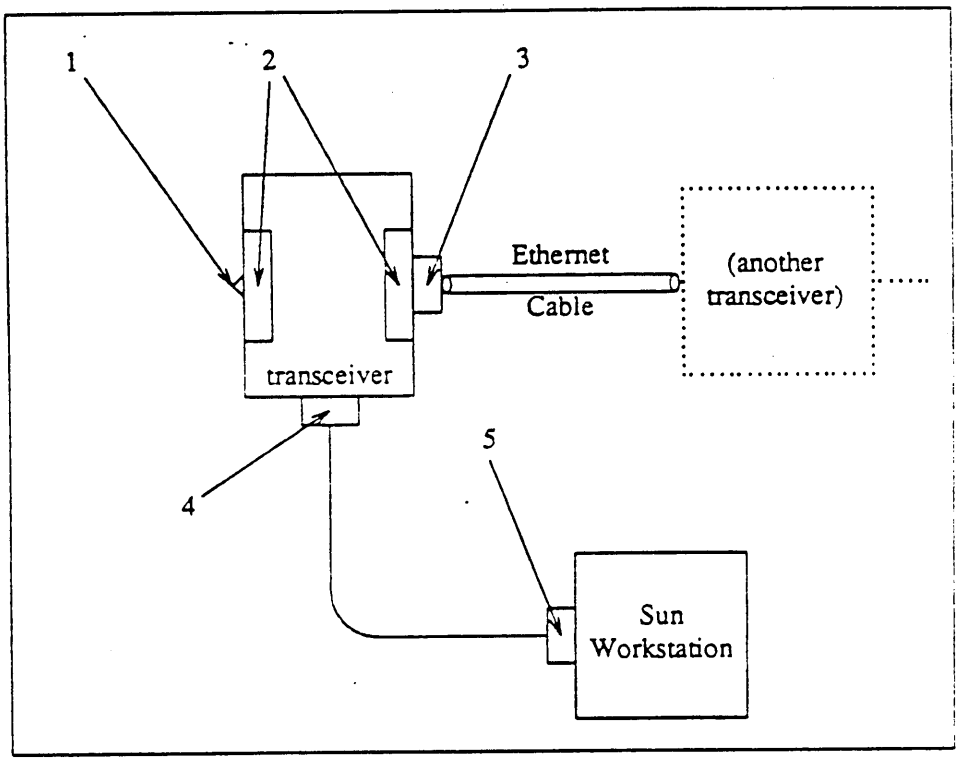
3. For each workstation, plug the female end of the workstation's transceiver cable into the 15-pin D connector on the transceiver, and the male end of the workstation's transceiver cable into the "ETHERNET" connector on the CPU board's backpanel.

4. Finally, J100, pins 7 and 8, on the 2060 CPU board must be set for either a Level 1 or Level 2 Ethernet transceiver. For Level 2 transceiver (which is the way the board arrives from the factory) J100, pins 7 and 8, will have its shunt out. Examples of a Level 2 transceiver are the TCL 2010I, 3COM 3C101, 3C102, BICC 1110. Multiplexer boxes such as Digital Equipment Corporation's DELNI are used with a Level 2 transceiver also. If you are using a Level 1 Ethernet transceiver, J100 must have a shorting shunt in. Examples of Level 1 transceivers are the TCL 2010E, 3COM 3C100, and the Interlan NT10.

NOTE *While these transceivers are compatible with Sun equipment, it should be understood that Sun does not guarantee the performance of any component not purchased from Sun.*

Figure 2-12 *Linking Up to an Ethernet*

| *Key* | *Description* |
|---|---|
| 1 | Terminator |
| 2 | Female N connector to transceiver |
| 3 | Male N connector to transceiver |
| 4 | Ethernet transceiver D connector |
| 5 | Sun workstation to Ethernet D connector at CPU backpanel |



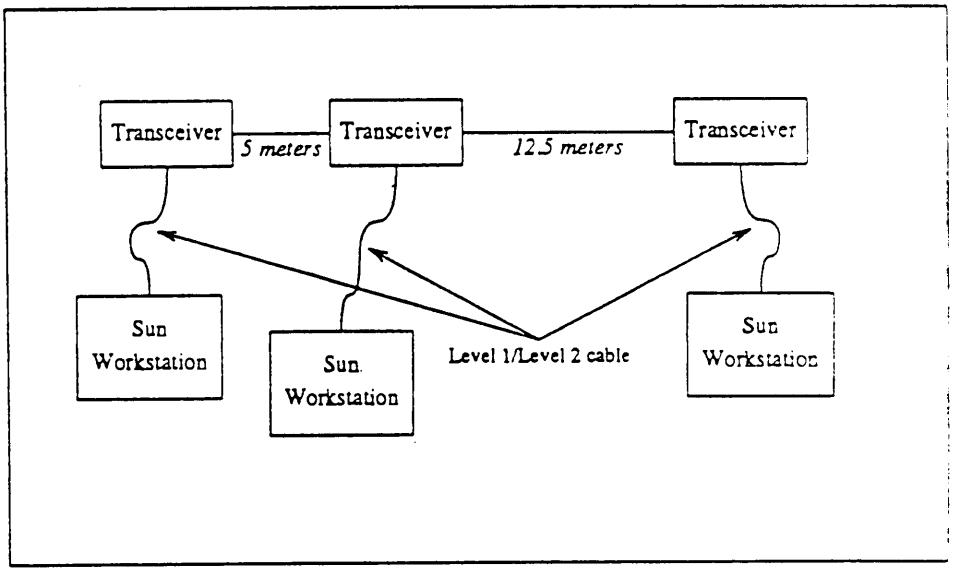

Please note that there are certain cabling limitations which must be observed for proper Ethernet implementation:

Table 2-2 *Ethernet Cabling Limitations*

| | |
|---|---|
| *MAXIMUM contiguous length of coaxial cable segments* | 500.0 meters |
| *Distance between transceivers** | 2.5 meter multiples* |
| *MAXIMUM length of transceiver cable* | 50.0 meters |

*Transceivers must be placed at 2.5 meter intervals along the coaxial cable. That is, you could connect transceivers 2.5 meters apart, but not 2.0 meters; you could connect transceivers 7.5 meters apart, but not 7.0 meters (see figure below).

Figure 2-13 *Ethernet Cabling Lengths*




Transceivers are connected to the Ethernet by female N connector (on the transceiver) to male N connector (on the Ethernet cable).

If you buy Ethernet cable in bulk, the cable must be marked every 2.5 meters. Make certain you attach each transceiver on a mark, and also make certain to cut the cable ends on marks.

## 2.11. SCSI ¼-Inch Tape Cassette

The SCSI controller board goes into a Multibus-to-VME adapter board, which in turn goes into the slot designated by the slot assignment chart in Chapter 4.

The SCSI ¼-inch tape drive is not field-installable, so its installation is not covered here, but is available in the Hardware Options manual, 813-1000, or the Configuration Procedure, 813-2000. The instructions below tell you how to insert

a tape cartridge.

There are two types of tape drives; one has an automatic locking mechanism, and is described immediately below; the other has a manual locking system.

### Automatic Locking ¼-inch Tape Drive

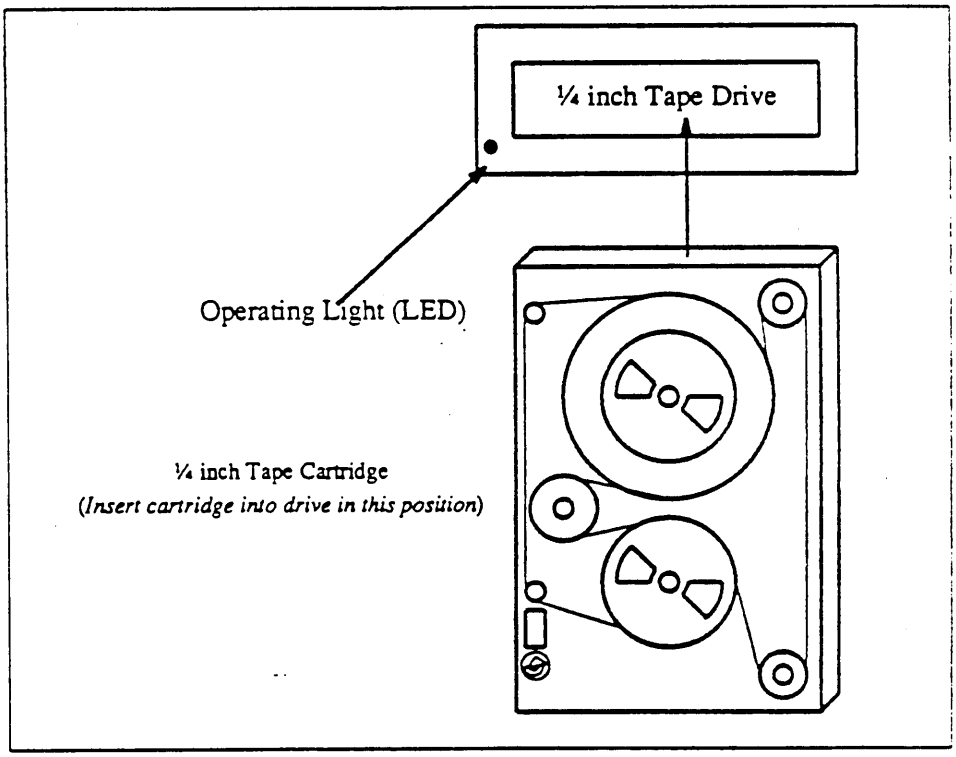
To load a cartridge into a tape drive that locks automatically,

1. Insert the tape cartridge as shown in the figure: read/write heads come in contact with the tape on the left side as the tape is inserted. Be careful not to actually touch the tape with your fingers.
2. Push the cartridge in until there is a click, and the cartridge locks in place.

To unload the tape cartridge,

1. wait until all read or write activity has ceased.
2. Push against the cartridge; it should pop out of the tape drive.
3. Pull out the tape cartridge, being careful not to actually touch the tape with your fingers.

Figure 2-14 *How to Insert a Cartridge Into the Automatic ¼-inch Tape Drive*



## Manual Locking ¼-inch Tape Drive

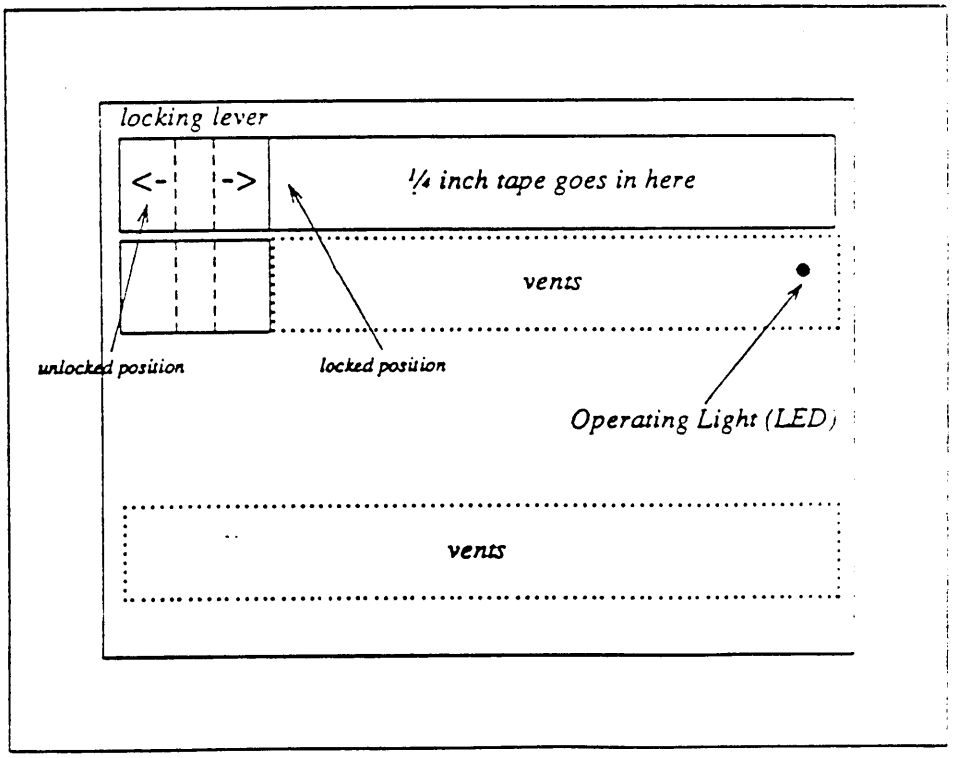
The other type of ¼-inch tape drive locks the tape in manually.

1. The lock/unlock lever is in the upper left-hand corner of the front of the drive with an arrow pointing to the right and an arrow pointing to the left. Find it (see the figure below for location).
2. Unlock the tape mechanism by pushing the locking lever to the left.
3. The tape cartridge must be inserted with the read/write heads coming in contact with the tape on the left side as the tape is inserted (same as the figure above). Be careful not to actually touch the tape with your fingers.
4. Push the ¼-inch tape cartridge into the open aperture (labelled "*¼ inch tape goes in here*" in the figure below).
5. Make certain the cartridge is securely in place, then press the locking lever to the right, locking the cartridge into the drive.

To unload the tape cartridge,

1. wait until all read or write activity has ceased.
2. Push the locking lever to its unlocked position — far left.
3. Pull out the tape cartridge, being careful not to actually touch the tape with your fingers.

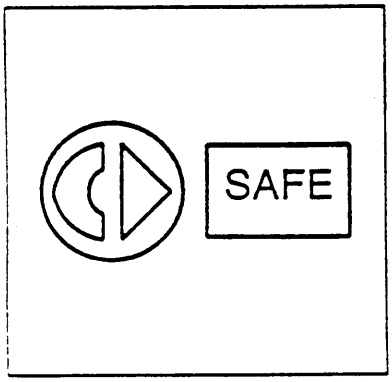
Figure 2-15 *How to Insert a Cartridge Into the Manual ¼-inch Tape Drive*



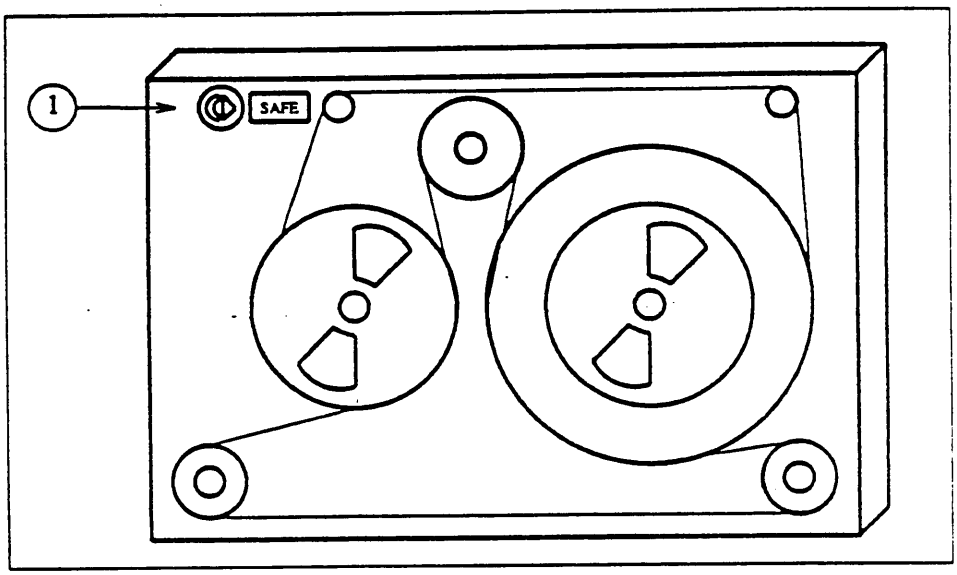
### Write-Protecting the Tape Casette

To protect the tape from being written on, turn the arrow that is on the left of the window marked "SAFE" until the arrow points at the word "SAFE" — the tape cannot be written when the arrow is in this position. Turning the arrow 180 degrees so that it points away from the word "SAFE" allows writing on the tape.

Figure 2-16 *Write Protecting a ¼-inch Tape Cartridge*




1 Write Protecting Tape Cartridge




CAUTION **Be careful to keep the cassette tapes out of sunlight, away from magnetic fields, and extreme temperatures.**

## 2.12. Degaussing the Color Monitor

During shipment, metal portions of the color monitor chassis can build up magnetic fields which interfere with the correct operation of the monitor. (A symptom of this interference is lack of color purity. Whenever this lack of purity cannot be corrected by changing the position of the system, you should try degaussing.)

These magnetic fields can be neutralized by using both the external degaussing coil and the internal degaussing circuitry. The internal degaussing circuitry is inside the color monitor; the external degaussing coil comes shipped separately with the monitor. The area around the coil itself is what does the demagnetizing; the area in the center of the coil does not do anything. Both internal and external degaussing is done with the monitor turned ON.

CAUTION **The degaussing coil will demagnetize EVERYTHING. Before plugging the degaussing coil in, make certain that ALL TEST EQUIPMENT AND MAGNETIC MEDIA (tapes, disk drives) are at least five feet from the coil, otherwise you will erase your media!**

1. Remove the degaussing coil from its container. Before plugging it in make doubly certain that —

- all magnetic peripherals and test equipment remain AT LEAST FIVE FEET away from the coil during the degaussing process, and
- the coil is AT LEAST SIX FEET from the monitor when you first turn it on.

2. Turn the monitor on. Remember, it is the coil itself which does the demagnetizing; the area in the center of the coil does not do anything. All available sides, the rear, the top, and the front of the monitor will have to be degaussed.
3. Hold the coil perpendicular to the monitor. Now, with the coil at least six feet from the monitor, plug the coil in and press the coil switch.

CAUTION The degaussing coil gets very hot; do not leave the coil on for more than two minutes at a time.

4. With the monitor on, turn the coil parallel to the screen of the monitor. Then bring the coil to within three inches of the screen.
5. With the coil held parallel about three inches from the the surface of the screen, move the coil in short circular motions over the screen. Do this for ten to fifteen seconds. DO NOT RELEASE THE SWITCH OR PULL THE PLUG!

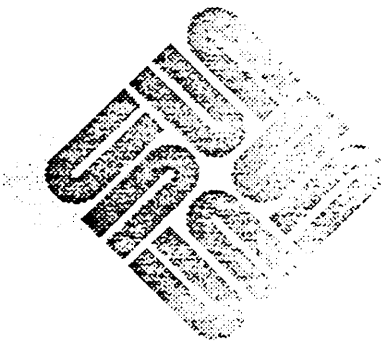
   If you do inadvertently release the coil switch, you must begin the degaussing procedure over again from the beginning.
6. Move to the sides of the monitor. Move the coil in short circular motions over each surface — sides, top, and rear. Again, do this for ten to fifteen seconds per surface. Finally, degauss the screen of the monitor again.
7. When you have degaussed the monitor, keep the coil parallel to the screen and slowly move the coil away from the monitor. When you are six feet away, turn the coil perpendicular to the screen and release the switch or pull the plug.
8. If the color distortion persists, the monitor may need to be internally degaussed. There is a button on the back of the monitor which says "DEGAUSSING." Turn the power to the monitor ON and press the "DEGAUSSING" button. The edges of the image will waver during degaussing; hold the button in until the image stops shimmering.

If neither the external nor the internal degaussing corrects the color distortion, notify your Sun service representative.

# 3

# Basic Hardware Configuration and Options





# 3

# Basic Hardware Configuration and Options

CAUTION **Some of the devices on the Sun-3/75 boards are very sensitive to electrostatic discharge, such as can be built up in the human body by walking across a carpet. Extreme care must be used when handling any of the boards.**

This chapter describes the basic Sun-3/160, along with options available. For jumper and switch settings, please contact Sun Microsystems Sales or Service, and request the Sun-3 Configuration Procedure, part number 813-2000. Further installation information may also be found in the Sun Hardware Options manual, 813-1000.

## 3.1. Basic Sun-3/160

The basic Sun-3/160 has

- Color or monochrome monitor — 19-inch, 66.6 Hz non-interlaced display with antiglare coating (standard on color and optional on monochrome display)
- Keyboard and mouse
- Pedestal — which will hold up to twelve Eurocard-format (triple-high VME) printed circuit boards
- CPU board
- Color Video board (with Sun-3/160C).

## 3.2. Standard Configuration

### Sun-3/160 CPU Board

The 2060 CPU (Central Processing Unit) board is installed in the first slot of the Sun-3/160. The CPU board contains the 68020 CPU, a minimum of two megabytes of memory, I/O connections, monochrome display controller, and Ethernet controller. Three jacks connect the 2060 board to the backplane inside the Sun-3/160 pedestal, and five I/O connectors are at the opposite end of the board.

In sequence, as the I/O connectors are aligned on the board, they are:

Table 3-1 *I/O Connectors on the CPU Card*

| *Connector Name* |
|---|
| Ethernet |
| Video |
| Keyboard (including Mouse) |
| Serial Port A |
| Serial Port B |

Pinouts of all the connectors are listed in Appendix A.

## 3.3. Options for the Sun-3/160†

The 2060 CPU board supplies a minimum of two megabytes and a maximum of four megabytes of main memory for the Sun-3/160. Additional memory is provided by the 2061 Expansion card(s): the Sun-3/160 can accommodate a maximum of 3 Expansion cards for a system total of 16 Mbytes of memory.

Each Expansion card contains up to 144 memory chips, in several optional configurations:

Table 3-2 *System Memory — Basic and Optional Configurations*

| *Option Number* | *Memory on Card* |
|---|---|
| Sun-3/160 - 2 | 2 Mbytes (on CPU board) |
| Sun-3/160 - 4 | 4 Mbytes (on CPU board) |
| Sun-3/160 - 102 | 2 Mbytes (on Expansion board) |
| Sun-3/160 - 104 | 4 Mbytes (on Expansion board) |

Other internal options to the Sun-3/160 include:

- Option 160: VME-to-VME Adapter board — provides interface for standard (double-width, single height) VME boards to the Sun-3/160 backplane
- Option 501: 85 Mbyte unformatted (71 Mbyte formatted) hard disk subsystem
- Option 502: 170 Mbyte unformatted (142 Mbyte formatted) disk subsystem
- Option 650: ¼ inch cartridge tape subsystem — backup option for disk subsystems

†For more extensive information on these options, please contact Sun Microsystems Sales or Service, and request the Sun-3 Options Guide, part number 813-1000.

### Sun-3 Color Board

The Sun-3 Color Video board provides the capability of upgrading the monochrome Sun-3/160M into a color workstation — the Sun-3/160C Color SunStation™. Please refer to the assignment chart in Chapter 4 for board placement.

The Sun-3 Color board incorporates:

- 1152 by 900 pixel resolution bit-mapped color graphics
- 8 color planes, allowing 256 different colors to be displayed simultaneously from a palette of over 16 million
- Performance enhancement via 8 custom VLSI RasterOp processors.

### 2061 Expansion Board

The 2061 Expansion board (if used) resides in slots 2 through 4 (see the slot assignment chart in Chapter 4) of the Sun-3/160, next to the CPU board, because the two boards must share a common memory (P2) bus. Up to three Expansion boards can be added to expand the CPU board's memory.

Each Expansion card can contain up to 144 memory chips, in several optional configurations:

Table 3-3 *Expansion Memory — Basic and Optional Configurations*

| *Option Number* | *Expansion Memory* |
|---|---|
| Option 102 | 2 Mbytes Expansion Memory |
| Option 104 | 4 Mbytes Expansion Memory |

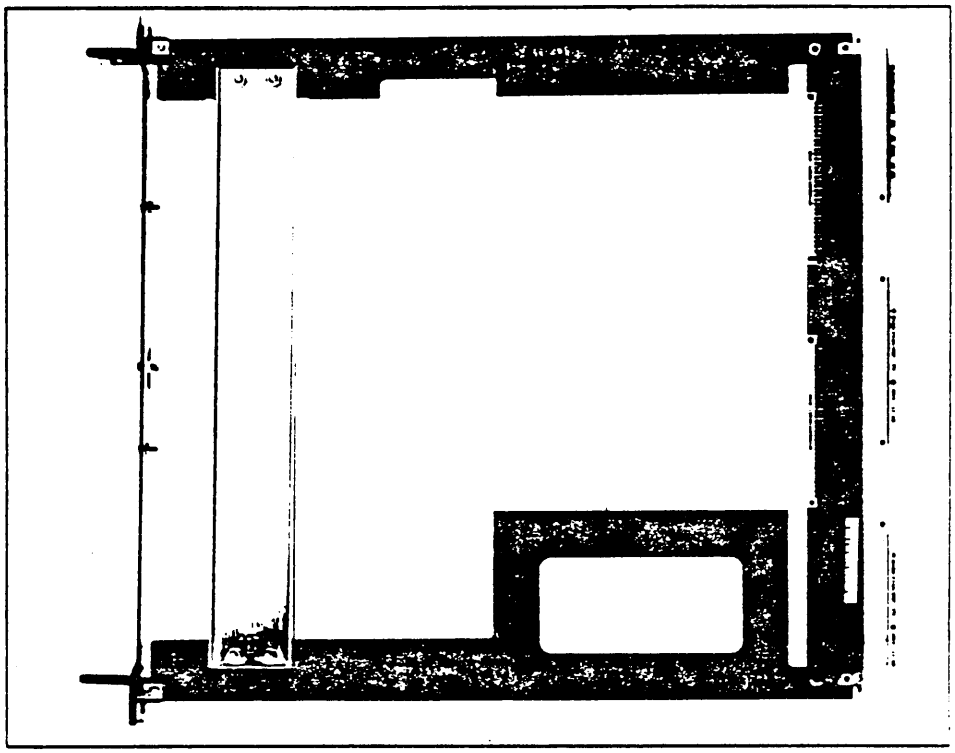
### Graphics Processor and Graphics Buffer Boards

The Graphics Processor and optional Graphics Buffer board(s) can be used in the Sun-3/160C to increase graphics performance. Refer to the slot assignment chart in Chapter 4 for placement of the GP and GB boards in the Sun-3/160.

### VME(2)-to-VME(3) Adapter Board

A VME-to-VME Adapter board is available to interface standard double-width single-height VME cards with the Sun-3/160 Eurocard-format (triple height) backplane.

Figure 3-1 *VME(2)-to-VME(3) Adapter Board*



### SCSI Board

The Sun SCSI controller board must be mounted on a VME(2)-VME(3) adapter board and must be plugged into the slot determined by the assignment chart in Chapter 4.

### Floating Point Accelerator Board

Also available is an optional Floating Point Accelerator (FPA) board, which increases floating-point performance by four times over the baseline MC68020/MC68881 performance. The FPA is plugged into the location determined by the assignment chart in Chapter 4.

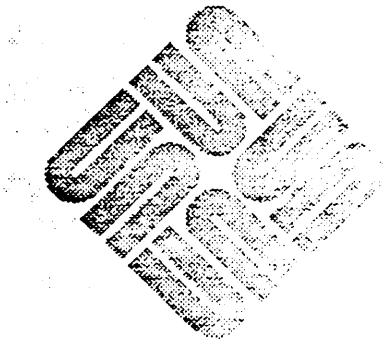
### SunLink Communications Processor (SCP) Board

The SunLink Communications Processor (SCP) board, which is available for SunLink SNA 3270 or the SunLink Internetwork Router, offers four communication ports, each with two channels of direct-memory access and a large complement of memory. The SCP board is plugged into the slot designated by the assignment chart in Chapter 4.

# 4

# How to Configure Your Sun-3/160





# 4

# How to Configure Your Sun-3/160

In general, the Sun-3/160 is shipped with its board(s) already installed. However if you are upgrading a Sun-3/160, you can use this section to determine how to install the boards. Please note, however, that this information may be updated at any time; for the *most current* information please contact Sun Microsystems Sales or Service, and request the Sun-3 Configuration Procedure, part number 813-2000, or the Sun Hardware Options Manual, 813-1000.

CAUTION

- Turn off the power and disconnect the power cord before inserting or removing any boards.
- Devices on the Sun-3/160 boards are very sensitive to electro-static discharge. Extreme care must be used when handling any of the boards.

## 4.1. Installing or Removing Boards

All boards are inserted or extracted from the back of the Sun-3/160.

To remove a board, unscrew the two size #0 Allen screws (one at the top and one at the bottom of the board) retaining the board at the rear of the pedestal. Then flip the two levers to their unlocked position (the top lever up and the bottom lever down) to loosen the board for removal. The board will slide right out.

To install a board, push it in on its sliderail until it is securely seated in the backplane. Flip the levers to their locked position (the top lever down and the bottom lever up). Finally, fasten the board to the chassis with two size #0 Allen screws.

## 4.2. VME System Backplane and P2 Connectors

The VME backplane is a single, large printed circuit board covering the P1, P2 and P3 buses. The backplane has three 96-pin connectors per slot which are aligned vertically and labeled P1, P2, and P3. Each connector has three rows of pins aligned horizontally in 32-pin increments, and each row of pins serves a different function. If all this seems a little confusing, it may help to remember that a "bus" is completely different from a "connector"; thus the P2 bus is not the same thing as the P2 connector. The table below explains this.

Table 4-1 *Sun-3/160 Backplane and Buses*

| *Connector* | *Pins* | *Function (Bus)* |
|---|---|---|
| P1 | 1-32 | VME |
| | 33-64 | VME |
| | 65-96 | VME |
| P2 | 1-32 | "P2" |
| | 33-64 | VME |
| | 65-96 | "P2" |
| P3 | 1-32 | Power |
| | 33-64 | "P2" |
| | 65-96 | Power |

The CPU and Expansion boards must be in slots 1 to 6 (slots are numbered from left to right, when facing the rear of the pedestal). This is because the CPU and Expansion boards must share a common memory (P2) bus, available in the 1-6 slot arrangement.

NOTE *Slots 1 through 6 share a common P2 bus and slots 10, 11, and 12 also share a common P2 bus, (although slots 1-6 and 10-12 are isolated from each other). This means that you cannot plug a Multibus-to-VME adapter board (for instance) into one of these slots (1, 2, 3, 4, 5, 6, 10, 11, 12) because the CPU, Expansion, GP, and GB boards are incompatible with the P2 signals on the Multibus-to-VME adapter board.†*

Bus priority is determined by that board's position relative to the CPU board in the card cage; a board in slot 4 has a higher bus priority than a card in slot 5. The recommended board arrangement is as follows:

†Actually, if you use the latest rev. Multibus-to-VME adapter board (part number 501-1054-04, rev A — or later) you can plug a Multibus board into slots 10-12. 501-1054-04, rev A (or higher) adapter boards have their P2 bus disconnected, and so there are no problems with signal contention. It is suggested that you use this adapter board to increase flexibility in your configuration.

Table 4-2 *Recommended Board Arrangement for the Sun-3/160*

| *Board name* | *Slot Position* | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| SUN-3 CPU | A | | | | | | | | | | | |
| SUN 2nd 4 MB | | A | | | | | | | | | | |
| SUN 3rd 4 MB | | | A | | | | | | | | | |
| SUN 4th 4 MB | | | | A | | | | | | | | |
| SUN VME FPA | | | | | A | | | | | | | |
| VME SCSI Ctlr | | | | | | | A | | | | | |
| SUN GP | | | | | | | | | | A | | |
| SUN GB | | | | | | | | | | | A‡‡ | |
| 2nd Ethr Ctlr | | | | | | | A | B | | | | |
| ½inch Tape Ctlr | | | | | | | A | B | C | | | |
| 1st SMD Ctlr | | | | | | | A | B | C | D‡ | | |
| 2nd SMD Ctlr | | | | | | | | A | B | C‡ | D‡,‡‡ | |
| SUN VME Color | | B | C | D | E | F | | A | | | | |
| SUN ALM‡‡ | | | | | | | | | | | | A‡ |
| SUN SCP | | | | | | | A | B | C | D‡ | E‡,‡‡ | F‡ |

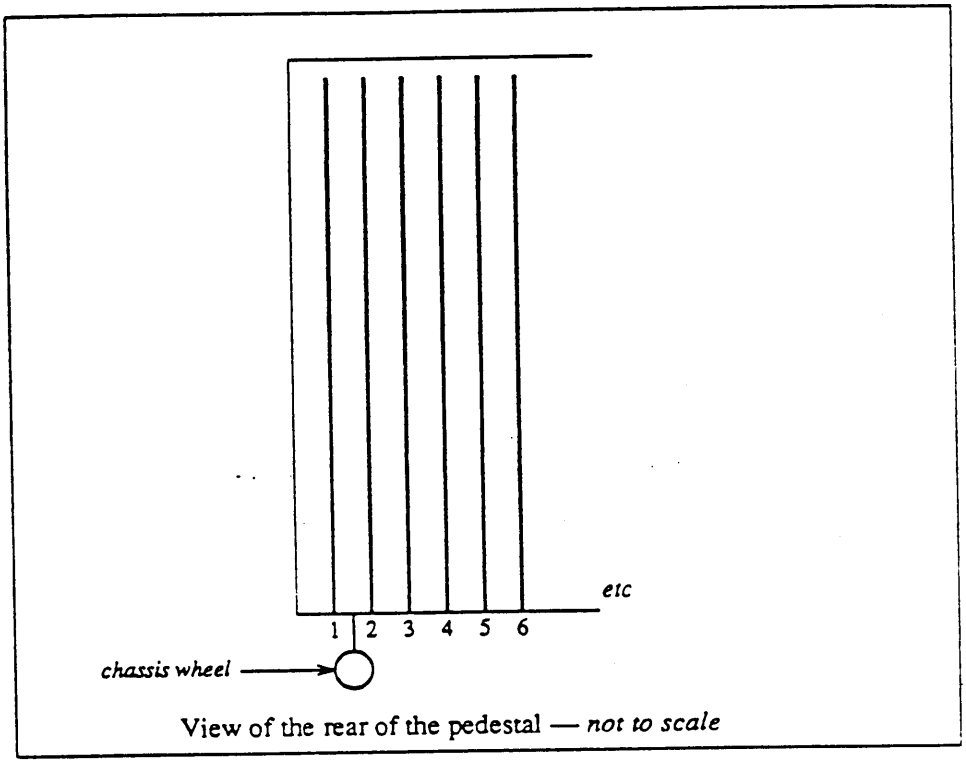
In the table above, slot allocations are assigned by precedence — "A" is the first recommended slot position for the board, "B" is next, and so on. If the slot is already occupied, you would move to the next recommended slot. For instance, if you have a VME SCSI controller already in slot 7 and you want to add a second Ethernet controller, the Ethernet controller would go in slot 8 — precedence "B."

Accordingly, if you wanted to add a ½-inch tape controller, and slots 7 and 8 were filled, you put the ½-inch tape controller in slot 9 — "C."

‡For slots 10, 11, and 12, if you are using the GB and/or GP in slots 10 and 11 and you want to use a Multibus-to-VME adapter board in one of the remaining slots, the adapter board *must* be 501-1054-04, rev A (or higher), to avoid problems of signal incompatibility on the P2 bus.

‡‡When the Sun ALM is installed, slot 11 *must* be left empty (even though space constraints force you to put the board in slot 12).

Figure 4-1 *How the Slots Are Numbered in the Sun-3/160 Pedestal*




## 4.3. Unused Slots

NOTE *Any slot which is unused (empty) must have an airflow restricter (Sun part number 340-1407) in it. This restricter must be removed before you try to put a board into its slot.*

Whenever you create a vacant slot between any two filled slots, you must short certain pins across that vacant slot. (As configured at the factory, the pedestal arrives with every vacant slot's jumpers already shorted.) For instance, if you have a CPU board in slot 1, an Expansion board in slot 2, nothing in slot 3 and some other board in slot 4, you have to short certain pins in slot 3 to continue the electrical connections between slots 2 and 4. If there are two empty slots between any two used slots, both empty slots must be shorted. And so on.

The signals that *always* come shorted from the factory are:

```
P1_BG0IN to P1_BG0OUT
P1_BG1IN to P1_BG1OUT
P1_BG2IN to P1_BG2OUT
```

Based upon the board in the slot, the signals that may or may not be shorted are:

```
P1_IACKIN to P1_IACKOUT
P1_BG3IN to P1_BG3OUT
```

The following table tells you which jumpers must be shorted for which boards.

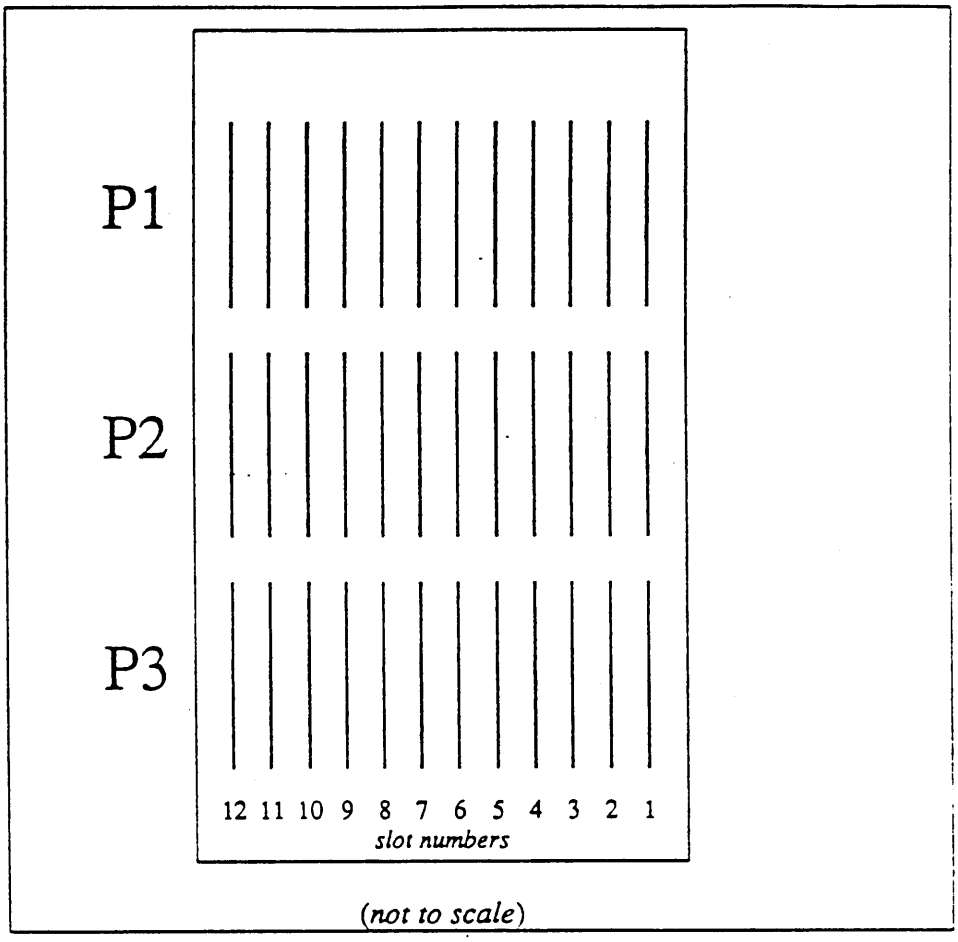
Table 4-3 *Jumpering for BUS GRANT and INTERRUPT ACKNOWLEDGE on the Backplane*

| Jumper IN or OUT | | Board |
|---|---|---|
| *Jumper Jx03* *Bus Grant* | *Jumper Jx04* *Interrupt Acknowdge* | |
| OUT | OUT | SUN-3 CPU |
| IN | IN | SUN 2nd Expansion board |
| IN | IN | SUN 3rd Expansion board |
| IN | IN | SUN 4th Expansion board |
| IN | IN | SUN VME FPA |
| OUT | OUT | VME SCSI Ctlr |
| OUT | OUT | SUN GP |
| IN | IN | SUN GB |
| OUT | OUT | 2nd Ethr Ctlr |
| OUT | OUT | 1/2" Tape Ctlr |
| OUT | OUT | 1st SMD Ctlr |
| OUT | OUT | 2nd SMD Ctlr |
| IN | OUT | SUN VME Color |
| OUT | OUT | SUN ALM Ctlr |

To configure correctly for these signals, you must:

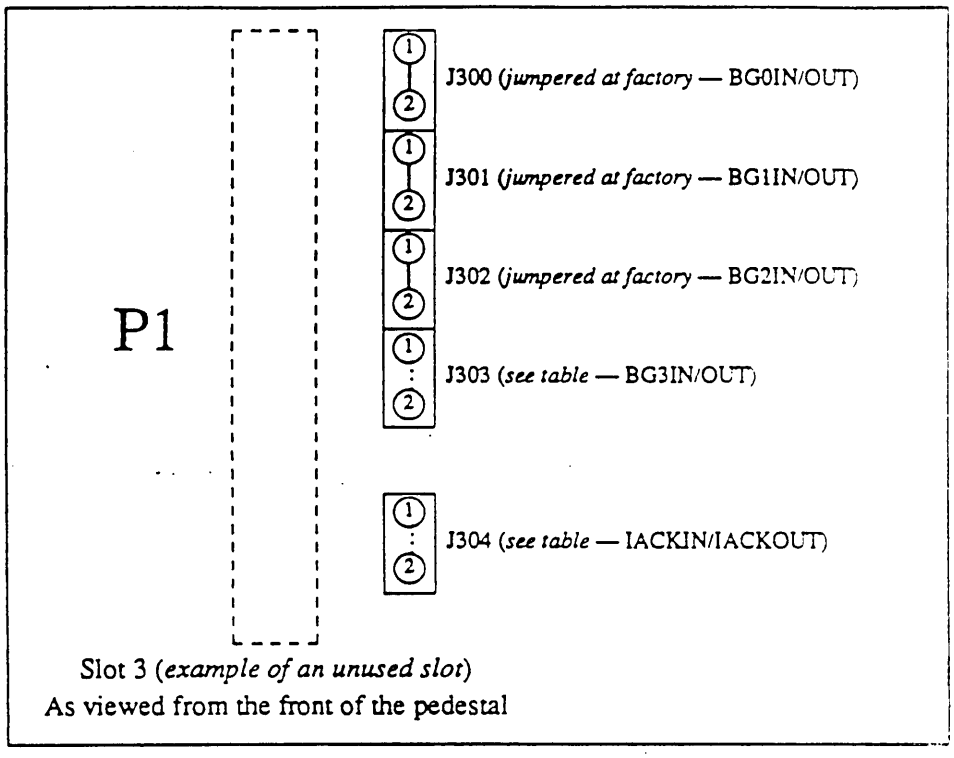
1. Open the front of the pedestal. Do this by removing the plastic bezel, (grab it around the edges and tug — it should pop right off), removing the four screws around the edges of the front cover, then swinging this front down until it is supported by the two hinges.
2. Inside the pedestal will now be visible the back-side of the backplane — the side of the backplane opposite the P connectors.
3. The three P connectors are aligned vertically with P1 at the top and P3 at the bottom (see the figure below).

Figure 4-2 *Slot Numbering and P Connectors — As Seen From the Front of Pedestal*




4. From the front of the pedestal, the slot numbering flows from right to left: slot 1 is furthest to your right, slot 12 furthest to your left. Find the vacant slot which you are going to have to configure (in our example, slot 3).

Figure 4-3 *Jumpering the Empty Slot Between Two Filled Slots*




5. Notice that all the P1 connectors have five two-pin jumper blocks coming out this side of the backplane. Each two-pin jumper block is labelled "J-" something, and represents a pair of signals. In our example, (using slot 3 as the empty slot), the jumper blocks would be numbered J300 through J304. As the backplane comes from the factory, Pin 1 is shunted to pin 2 in the top three jumper blocks, J300, J301 and J302. The bottom two jumper blocks, J303 and J304, may or may not be shorted (see the table above).†

   - J300 (BG0IN/OUT) — is shorted as it comes from the factory.
   - J301 (BG1IN/OUT) — is shorted as it comes from the factory.
   - J302 (BG2IN/OUT) — is shorted as it comes from the factory.
   - J303 — may or may not be shorted: pin 1 to pin 2 connects BG3IN to BG3OUT
   - J304 — may or may not be shorted: pin 1 to pin 2 connects IACKIN to IACKOUT

As shipped from the factory, the BG3IN/BG3OUT and IACKIN/IACKOUT are normally shorted for all unoccupied slots on the backplane.

†Of course, if the empty slot was slot 5, the jumper block numbers would be J500 through J504, and J503 and J504 would have to be shorted.

## 4.4. 2060 CPU Board

The CPU board goes in slot 1 of the backplane. For more information on the CPU board's jumper settings, please contact Sun Microsystems Sales or Service, and request the Sun-3 Configuration Procedure, part number 813-2000, or the Sun Hardware Options Manual, 813-1000.

## 4.5. 2061 Expansion Board

Each 2061 Expansion board arrives from the factory with its jumper blocks correctly set for your particular configuration. If you are using a single 2061 Expansion board, it goes in slot 2.

If you are using more than one Expansion board, each successive board goes in the slot to the right of the last — for instance, the second Expansion board would go in slot 3, and the third in slot 4. You can use a maximum of three expansion boards, for a maximum memory size of 16 Mbytes.

For more information, please contact Sun Microsystems Sales or Service, and request the Sun-3 Configuration Procedure, part number 813-2000, or the Sun Hardware Options Manual, 813-1000.

## 4.6. Color Video Board

The Color Video board goes in the slot recommended by the slot assignment chart at the beginning of this chapter. The Color board occupies a 4 Mbyte address space, and comes from the factory set for a base address of 0x400000.

For more information, please contact Sun Microsystems Sales or Service, and request the Sun-3 Configuration Procedure, part number 813-2000, or the Sun Hardware Options Manual, 813-1000.

## 4.7. SCSI Board

The SCSI controller board goes in a VME(2)-to-VME(3) adapter board, and the adapter board goes into the slot indicated by the slot assignment chart at the beginning of this chapter.

For more information, please contact Sun Microsystems Sales or Service, and request the Sun-3 Configuration Procedure, part number 813-2000, or the Sun Hardware Options Manual, 813-1000.

## 4.8. Graphics Processor/Graphics Buffer Boards

The Graphics Processor (GP) and Graphics Buffer (GB) boards only go into the Sun-3/160C in the slots recommended by the assignment guide at the beginning of this chapter.

There are two possible GP/GB configurations:

1. installing the GP only, and
2. installing both the GP and GB.

The GP and GB arrives from the factory with all of its jumpers set correctly. For more information regarding these jumper settings, please contact Sun Microsystems Sales or Service, and request the Sun-3 Configuration Procedure, part number 813-2000, or the Sun Hardware Options Manual, 813-1000.

## 4.9. Adding a Second Ethernet Controller

You can add a second Ethernet controller board to your system by putting it into a Multibus-to-VME adapter board, and the adapter board into the slot determined by the slot assignment chart in the beginning of this chapter.

For switch and jumper information, please contact Sun Microsystems Sales or Service, and request the Sun-3 Configuration Procedure, part number 813-2000, or the Sun Hardware Options Manual, 813-1000.

## 4.10. Reconfiguring for a 1K by 1K Display

The standard Sun-3/75 display monitor (1152 x 900 pixels) may be converted to a 1K by 1K display (1024 x 1024 pixels) by

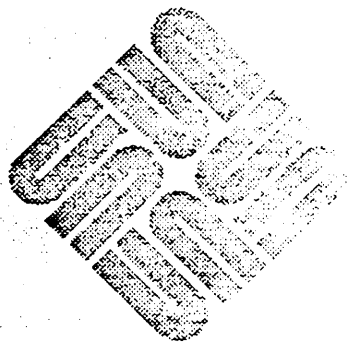
- replacing the vertical and horizontal state machine PROMs on the CPU board, and
- readjusting the CRT for a square display image by making an entry in the EEPROM (see chapter 2).

This reconfiguration must be done at the factory, however. Consult your local Field Service representative for more information.

# 5

# Sun VME Subsystem Set-Up





# 5

# Sun VME Subsystem Set-Up

This chapter describes the subsystems available for your Sun-3/160. Those options not mentioned in this section are not field-installable.

## 5.1. 450 Disk Controller

The 450 SMD disk controller is installed in the pedestal card cage of the Sun-3/160 if you have the SMD disk subsystem. It is mounted upon a Multibus-to-VME Adapter board, in the slot recommended by the slot assignment chart in Chapter 4. The disk controller board is a 450 controller which *can* control up to four drives; however because of software limitations the system is configured for a maximum of two drives per controller.

The 450 SMD is an intelligent storage module controller/formatter which connects directly (through industry-standard Command and Data cables) to one or two storage module drives which are available from a number of manufacturers. Sun Microsystems supports a family of such drives: the Fujitsu M2322 Micro-Disk Drive and the M2351 Mini-Disk Drive, both of which are field-installable.

Installation instructions for the SMD 450 disk controller may be found in the Sun Hardware Options manual, 813-1000. Jumper and switch setting information may be found in the Sun Configuration Guide, 813-2000.

CAUTION

**Before installing any board yourself, make certain that all power is off to the Sun Workstation by:**

- **making certain that the OFF/ON switches to the Sun-3/160 pedestal and subsystem enclosure are OFF, and**
- **disconnecting the power cord before opening up any portion of the Sun Workstation, doing cabling of any sort, or altering peripheral board configurations.**

If you need to install the board yourself, you should be aware of the following placement considerations and configuration details:

- The addressing scheme used for factory testing most likely does not match the addressing scheme you will be using at your site. To reset the board for your needs, refer to the Sun Configuration Procedure, part number 813-2000.

- The SMD board cannot share a P2 connector with the CPU or Expansion boards, as it has P2 traces which are incompatible with the CPU/Memory P2 bus. This means that the SMD board cannot go into any of slots 1 through 6† since the P2 bus in these six slots is shorted together. Likewise, the P2 connectors of slots 10, 11, and 12 are all shorted together; therefore if you are using a Graphics Processor board in one of these three slots,† you cannot place the SMD board in any of these three slots (see the discussion of recommended board positions and P2 bus conflicts in chapter 4).
- Because the SMD board is a bus master, its relative slot number determines its priority (slot 1 is the highest-priority master). The board must be placed in a lower-priority position than the Sun-3 CPU board for proper handling of bus arbitration. It should also be placed in a lower-priority position than the ½-inch Tape Controller board, if there is one in the system. Consult the board arrangement chart in Chapter 4 for proper placement of the board.
- Remove the single filler panel/air restricter from the slot you want to place the board in (referring to the board assignment table in Chapter 4) and place the board in this slot.
- After you have seated the board, lower the power supply door and remove Jx03 and Jx04 shunts as dictated by Table 4-3.

## 5.2. Fujitsu M2322 (130/260 Mbyte) Disk Subsystem

The Sun-3/160 may be supplied with one or two Fujitsu M2322 disk drives providing an additional 130 or 260 Mbytes (formatted) storage for the workstation. The drive(s) is (are) mounted in a second card cage/subsystem enclosure, and controlled by an SMD Disk Controller board. The SMD board is mounted upon a Multibus-to-VME Adapter board, inside the Sun-3/160 pedestal, and cables from the disk drives run between this SMD board and the subsystem enclosure.

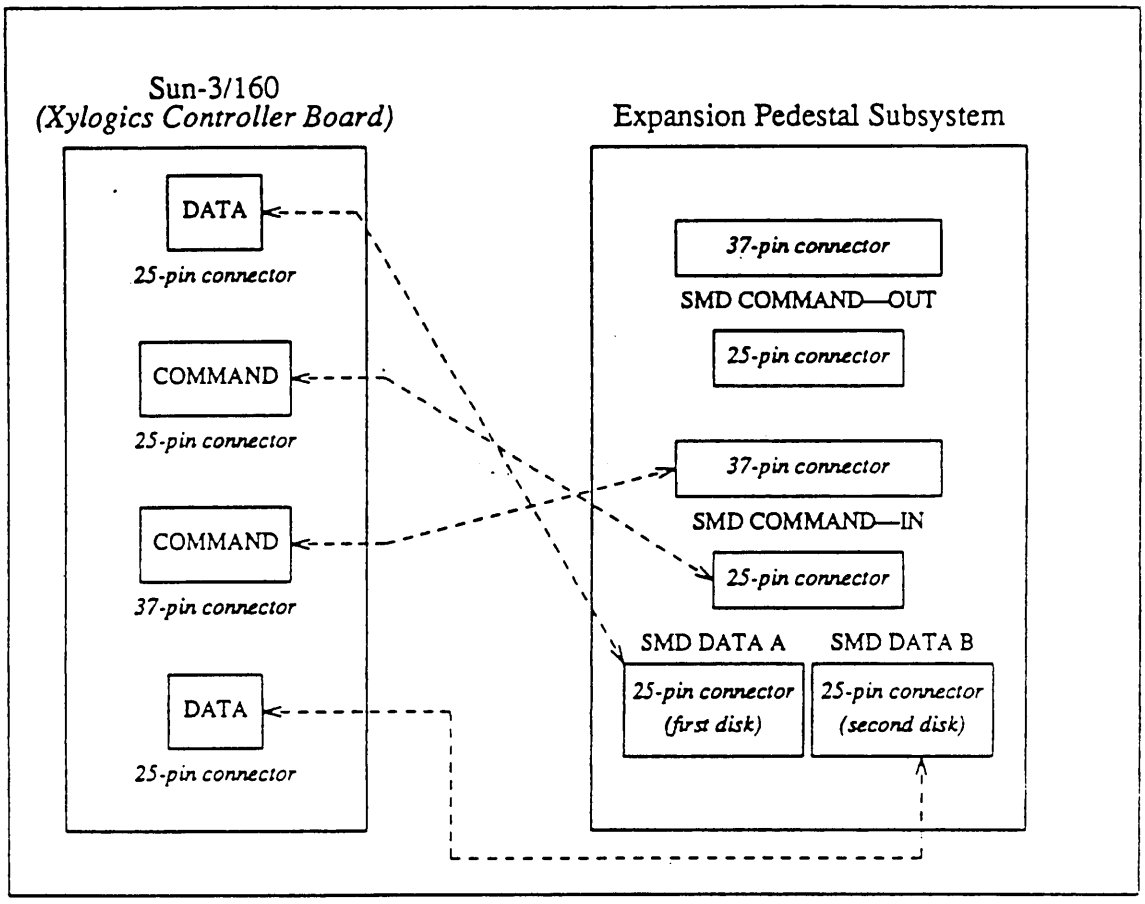
As shipped, all the internal cabling (including daisy-chaining) of the subsystem is complete and needs no set-up. Note also that head locks on the drives are fully automatic, so you should not have to open the subsystem enclosure at all.

CAUTION **Before installing any board yourself, make certain that all power is off to the Sun Workstation by:**

- **making certain that the OFF/ON switches to the Sun-3/160 pedestal and subsystem enclosure are OFF, and**
- **disconnecting the power cord before opening up any portion of the Sun Workstation, doing cabling of any sort, or altering peripheral/board configurations.**

†Actually, if you use the latest rev. Multibus-to-VME adapter board (part number 501-1054-04, rev A — or later) you can plug a Multibus board into slots 10-12. 501-1054-04, rev A (or higher) adapter boards have their P2 bus disconnected, and so there are no problems with signal contention.

Figure 5-1 *Cabling the M2322 Disk Subsystem*




External cabling runs as follows. The SMD subsystem enclosure is attached to the Sun-3/160 pedestal's backpanel by four shielded cables: two control cables (one 25-pin and one 37-pin), and one or two 25-pin data cables (depending upon whether one or two drives are shipped in the subsystem). The two control cables run from the connectors on the backpanel of the Sun-3/160 labelled "COMMAND" to the connectors on the SMD backpanel labelled "SMD COMMAND-IN."

The data cable for each drive runs from one of the two 25-pin "SMD DATA A" or "SMD DATA B" connectors on the disk subsystem backpanel to one of the two 25-pin "DATA" connectors on the Sun-3/160 backpanel as follows:

- For the first drive, the data cable runs from "SMD DATA A" to the upper "DATA" connector on the Sun-3/160 backpanel.
- For the second drive, the data cable runs from "SMD DATA B" to the lower "DATA" connector on the Sun-3/160 backpanel.

NOTE *If you are using two (or more) expansion pedestals, make certain you have the long command cable to daisy chain from the primary to the secondary disk subsystem. Also, if you are using two expansion pedestals, both drives will probably*

*arrive configured as Drive 0. Make certain that you reset your secondary drive to some other unique designation (such as Drive 1) to avoid confusion. For jumper and switch settings, please contact Sun Microsystems Sales or Service, and request the Sun-3 Configuration Procedure, part number 813-2000, or the Hardware Options manual, part number 813-1000.*

For further information on the drive itself, see the *M2321/M2322 Micro-Disk Drives Engineering Specifications* Manual (Sun Part Number: 800-1029).

## 5.3. M2351 (474 Mbyte) Disk

Each 474 Mbyte disk drive is shipped in a single carton. Its cables are shipped in a separate carton, along with bulkhead adapter panel. The drive itself is shipped in nested boxes, and wrapped in a polyethylene bag. To unpack, mount, and cable up the M2351, please refer to the Sun Hardware Options manual, part number 813-1000. For switch and jumper configuration, please contact Sun Microsystems Sales or Service, and request the Sun-3 Configuration Procedure, part number 813-2000.

If the drive is part of a rackmount subsystem, you may wish to refer to document number 800-1362, *Installation Manual for Sun-3/180 Rackmounted System.*

## 5.4. ½-inch Magnetic Tape

The Sun Workstation may be shipped with either a Control Data ½-inch Tape Unit in the 92180 family of tape drives or a Fujitsu M244X 1600/6250 bit-per-inch (bpi) tape drive. The CDC magnetic tape unit is controlled by a Ciprico TAPEMASTER tape controller, while the Fujitsu tape drive is controlled by a Xylogics 472 controller.

To unpack, mount, and cable up the ½-inch magnetic tape subsystem, please refer to the Sun Hardware Options manual, part number 813-1000. For switch and jumper configuration, please contact Sun Microsystems Sales or Service, and request the Sun-3 Configuration Procedure, part number 813-2000.

If the tape drive is part of a rackmount subsystem, you may wish to refer to document number 800-1362, *Installation Manual for Sun-3/180 Rackmounted System.*

## 5.5. ½-inch Tape Controller

If your Sun system is shipped with a ½-inch tape unit, there should be a tape controller for that subsystem installed on a Multibus-to-VME Adapter board in the Sun-3/160 pedestal. The tape controller is either a TAPEMASTER board from Ciprico, or a Xylogics tape controller. The Ciprico TAPEMASTER ½-inch tape controller board has two 50-pin cable connectors on its outside edge (as viewed when installed in the card cage), and supports a data density of 1600 bits per inch. The Xylogics tape controller handles densities of both 1600 bpi and 6250 bpi, with the switching done in software.

There are a few considerations to be aware of before installing your controller board:

- The addressing scheme used for factory testing most likely does not match the addressing scheme you will be using at your site. To reset the board for your needs, refer to the Sun Configuration Procedure, part number 813-2000.

- The TAPEMASTER or Xylogics board may not be connected to the same P2 connector as the Sun-3 CPU and Expansion boards. This means that the TAPEMASTER or Xylogics board cannot go into any of slots 1 through 6† if the Multibus-VME adapter board you are using has an active P2 connector, since the P2 bus in these six slots is shorted together.

  Likewise, the P2 connectors of slots 10, 11, and 12 are all shorted together; therefore if you are using a Graphics Processor board in one of these three slots, you cannot place the ½-inch tape controller board in any of these three slots† (see the discussion of recommended board positions and P2 bus conflicts in chapter 4).

- The ½-inch tape controller is a Multibus master. This means that the relative number of its slot determines its priority (slot 1 is the highest-priority master). The board must be placed in a lower-priority position than the CPU. If you have a 450 SMD Controller board in your system as well, place the ½-inch tape controller board in a higher-priority position; otherwise, the SMD board will lock out the ½-inch tape controller (due to its higher data transfer rate).

## 5.6. Systech ALM Board

The ALM‡ controller board goes in a Multibus-to-VME Adapter board, and the adapter board into the slot designated by the assignment chart in the beginning of Chapter 4 of this document.

Settings for the Multibus-to-VME board are contained in the configuration procedure available upon request from Sun Microsystems Sales or Service, part number 813-2000, and installation instructions are contained in the Sun Hardware Options Manual, 813-1000.

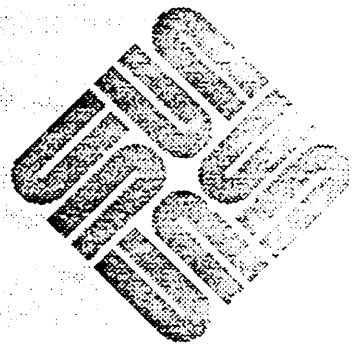
†Actually, if you use the latest rev. Multibus-to-VME adapter board (part number 501-1054-04, rev A — or later) you can plug a Multibus board into slots 10-12. 501-1054-04, rev A (or higher) adapter boards have their P2 bus disconnected, and so there are no problems with signal contention.

‡The ALM (Asynchronous Line Multiplexer) board is also known as the MTI (Multiple Terminal Interface) board.

# 6

# Environmental and Electrical Specifications





# 6

# Environmental and Electrical Specifications

This section describes the environmental requirements for the Sun-3/160.

NOTE *This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.*

## 6.1. Physical Environment

The Sun-3/160 is manufactured for the following physical environment:

Table 6-1 *Physical Environment Specifications for the Sun-3/160*

| | *Operating* | *Non-Operating* |
|---|---|---|
| Ambient Temperature | 10°C to 40°C | –20°C to 65°C† |
| | (50°F to 104°F) | (–4°F to 149°F) |
| Relative Humidity (non-condensing) at 40° Centigrade | 20% to 80% | 5% to 95% |
| Altitude | 0m to 2130m | 0m to 15,240m‡ |
| | 0 to 7,000 feet | 0 to 50,000 feet‡ |

† If the ¼-inch tape drive is installed, non-operating temperature range is –20°C to 60°C.
‡ If 71 Mbyte disk is installed, upper limit of the altitude range for a non-operating Sun-3/160 is 12,200 meters (40,000 feet).

## 6.2. Electrical Specifications

NOTE *All ratings (unless specified) are given for 115 VAC operation.*

Table 6-2 *DC Output Ratings for the Sun-3/160 Power Supply*

| *Voltage* | *Amps* |
|---|---|
| +5 VDC | 120 amps |
| +12 VDC | 15 amps |
| −12 VDC | 5 amps |
| −5.2 VDC | 10 amps |

Table 6-3 *Power Supply Specifications*

| *Nominal AC Input Voltage* | *Operating Range* | *Frequency Range* |
|---|---|---|
| 115 VAC | 90-132 VAC | 47-63 Hz |
| 230 VAC | 180-264 VAC | 47-63 Hz |

Table 6-4 *Monitor Power Consumption*

| *Monitor Requirements—(Worst Case)* | | |
|---|---|---|
| *B/W* | *Color* | *Grayscale* |
| 95 watts (324 BTUs/hour) | 250 watts (853 BTUs/hour) | 95 watts (324 BTUs/hour) |

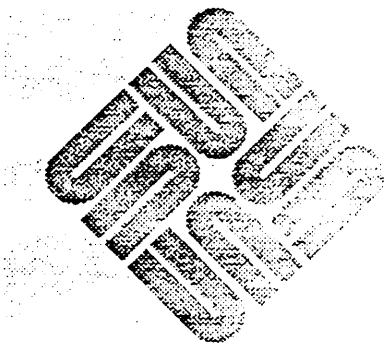
Table 6-5 *Fuses*

| *Item* | *AC Fuse size* | |
|---|---|---|
| | *90-132 VAC* | *180-264 VAC* |
| *Pedestal* | 15A/250V slow-blow | 5A/250V slow blow |
| *Color monitor* | 5A/250V slow-blow | 3A/250V slow-blow |
| *Monochrome monitor* | 1.5A/250V slow-blow | 1.5A/250V slow-blow |
| *Grayscale* | 1.5A/250V slow-blow | 1.5A/250V slow-blow |

# A

# Connector Pinouts and Serial Port Signals





# A

# Connector Pinouts and Serial Port Signals

This appendix contains the pinouts for the 2060 CPU board's:

- Keyboard/Mouse Connector
- Serial Port(s)
- Ethernet Connector
- Video Connector

and also contains a signal description of the serial ports.

NOTE *In the following connectors, only those pins actually connected to something are listed; open pins are not documented.*

## A.1. Connectors on the 2060 CPU board

Table A-1 *Pinout of Mouse/Keyboard Connector*

| *Mouse/Keyboard DB-15 Connector* | | | |
|---|---|---|---|
| Pin | Signal | Pin | Signal |
| 1 | RXD0† | 8 | GND |
| 2 | GND | 9 | GND |
| 3 | TXD0† | 10 | VCC |
| 4 | GND | 11 | VCC |
| 5 | RXD1† | 12 | VCC |
| 6 | GND | 14 | VCC |
| 7 | TXD1† | 15 | VCC |

Table A-2 *Pinout of Serial Ports A and B*

| *Serial Ports A and B* | | | |
|---|---|---|---|
| Pin | Signal | Pin | Signal |
| 2 | TXD | 8 | DCD |
| 3 | RXD | 15 | DB |
| 4 | RTS | 17 | DD |
| 5 | CTS | 20 | DTR |
| 6 | DSR | 24 | DA |
| 7 | GND | 25 | -5V |

†RXD0 and TXD0 are the keyboard serial lines; RXD1 and TXD1 are the mouse serial lines.

Table A-3 *Pinout of Ethernet Connector*

| *Ethernet* | | | |
|---|---|---|---|
| Pin | Signal | Pin | Signal |
| 1 | chassis ground (Level 1 only) | | |
| 2 | E.COL+ | 9 | E.COL- |
| 3 | E.TXD+ | 10 | E.TXD- |
| 4 | chassis ground (Level 2 only) | | |
| 5 | E.RXD+ | 12 | E.RXD- |
| 6 | GND | 13 | +12V |
| 7 | VCC | | |

Table A-4 *Pinout of Video Connector†*

| *Video* | | | |
|---|---|---|---|
| Pin | Signal | Pin | Signal |
| 1 | VIDEO+ | 6 | VIDEO- |
| 3 | HSYNC | 7 | GND |
| 4 | VSYNC | 8 | GND |
| | | 9 | GND |

†Video+ and Video- are at ECL voltage levels; HSYNC and VSYNC are at TTL voltage levels

## A.2. Description of Serial Port Signals

Below is a brief description of serial port signals. The "data communications equipment" mentioned below might be a printer, a plotter, a modem, or any other device which uses an RS-232-C or an RS-423 interface. A signal called "output" flows from the Sun-3/160 towards the peripheral device. An "input" signal flows from the peripheral into the Sun-3/160. Those pins not mentioned are not used on the Sun-3/160 — that is, they are open.

Figure A-1 *A Typical DTE/DCE Configuration*

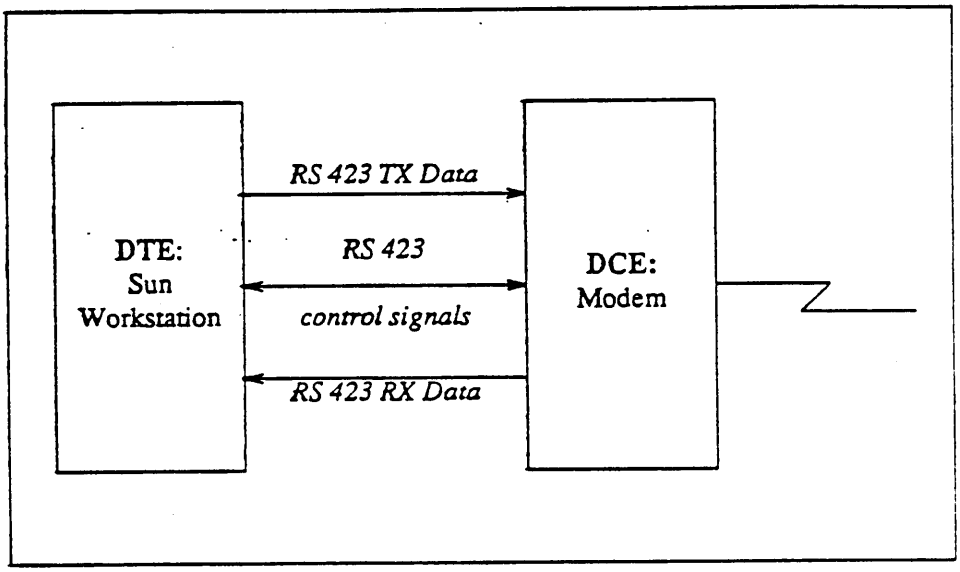



Table A-5 *Description of Serial Port Signals*

| *Pin* | *Signal* | *Signal Name* | *Direction (Input or Output)* | *Description* |
|---|---|---|---|---|
| 2 | TXD | Transmit Data | output | The actual data transmitted to the data communications equipment. |
| 3 | RXD | Receive Data | input | The actual data received from the data communications equipment. |
| 4 | RTS | Request to Send | output | Signal sent to the data communications equipment, asking if it is ready to start accepting data. |

Table A-5 *Description of Serial Port Signals— Continued*

| *Pin* | *Signal* | *Signal Name* | *Direction (Input or Output)* | *Description* |
|---|---|---|---|---|
| 5 | CTS | Clear to Send | input | Signal from the data communications equipment saying it is ready to accept data. |
| 6 | DSR | Data Set Ready | input | Signal from the data communications equipment indicates the status of the local data set — that is, a peripheral connected to the Sun. |
| 7 | GND | Signal Ground | none | Signal Gound provides a reference level for the signal voltages. |
| 8 | DCD | Data Carrier Detect | input | The data communications equipment has detected "carrier," for example, a modem senses tones sent to it by another modem over phone lines. |
| 15 | DB | Transmit Clock from DCE | input | Transmit clock from the modem. This signal is usually not used for asynchronous devices (most terminals, printers, modems, etc.). |
| 17 | DD | Receive Clock from DCE | input | Receive clock from the modem. This signal is usually not used for asynchronous devices (most terminals, printers, modems, etc.). |
| 20 | DTR | Data Terminal Ready | output | Indicates that the Sun is powered on and willing to communicate as the "local data terminal" with the data communication equipment (for example, the modem). |
| 24 | DA | Transmit Clock from DTE | output | Provides transmit clock from the Sun. This signal is usually not used for asynchronous devices (most terminals, printers, modems, etc.). |
| 25 | VERR | reference -5V level | output | This signal is used by some modems to sense connection to the workstation. |

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# Index