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Class: 3

Hardware Installation Manual

for the

Sun-3/75 Desktop SunStation

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WARNING

There is a Lithium Battery (BBCV2), Matsushita Electric Type No. BR2325, located on the Sun CPU Board. This battery is NOT a field replaceable part. The battery is marked as follows: "Warning— Replace battery with MATSUSHITA ELECTRIC or PANASONIC Part No. BR2325 only."

The battery may explode if mistreated. Do not dispose of the battery in fire. Do not disassemble it or recharge it.

CAUTION

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.

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Preface

Welcome to the Sun Workstation®. This manual is meant to help you get the Sun-3/75 Desktop SunStation™ 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 five chapters and an appendix. Contents are:

Chapter 1 — *Unpacking and Setting Up the Sun-3/75* — is a guide to getting your Sun-3/75 out of its shipping carton 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-3/75 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-3/75, and the options available.

Chapter 4 — *Sun-3/75 Configuration Notes* — describes how to configure (and where to find specific installation information) for optional configurations of the Sun-3/75.

Chapter 5 — *Environmental and Electrical Specifications* — describes the physical environment and electrical specifications.

Appendix A — *Connector Pinouts* — describes the 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

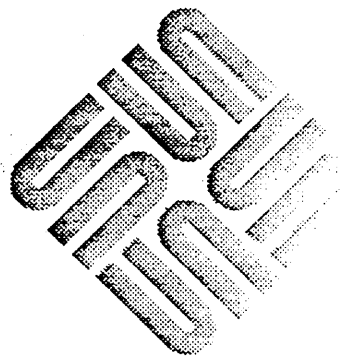
We emphasize that this manual outlines rather than exhausts many of the topics contained within. References to applicable documents supplied with your system are given throughout, however, and we urge you to read these documents should you need further information.

Table 1 *Documentation*

Part Number	*Description*
800-1317	Installing UNIX on the Sun Workstation
813-1000	Sun Hardware Options Manual
813-2000	Sun Configuration Guideline

1

Unpacking and Setting up the Sun-3/75



1

Unpacking and Setting up the Sun-3/75

This chapter describes how to unpack and set up your Sun-3/75. The "basic" Sun-3/75 consists of the single-board CPU, CRT, keyboard, and mouse. Optional components of the Sun-3/75 include the memory expansion board and the VME(2)-to-VME(3) adapter board, the 71 Mbyte (formatted) disk subsystem, and the Ethernet transceiver.

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-3/75

The basic components of the Sun-3/75 are shipped in a single carton: it contains the CRT, base, keyboard, this and other manuals (as you have already discovered), the mouse, and various cables.

When you receive your shipment, inspect the shipping carton *immediately* for evidence of damage. If the 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-3/75, 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
- a 4 inch-by-1/8 inch blade screwdriver.

† We realize that you may have had to open the carton in order to read these instructions. If so, and you see evidence of damage, keep all contents and packing materials for the shipping agent's inspection.

Sun-3/75 — Unpacking

NOTE *Inside the larger carton are the keyboard, monitor, and base, 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.*

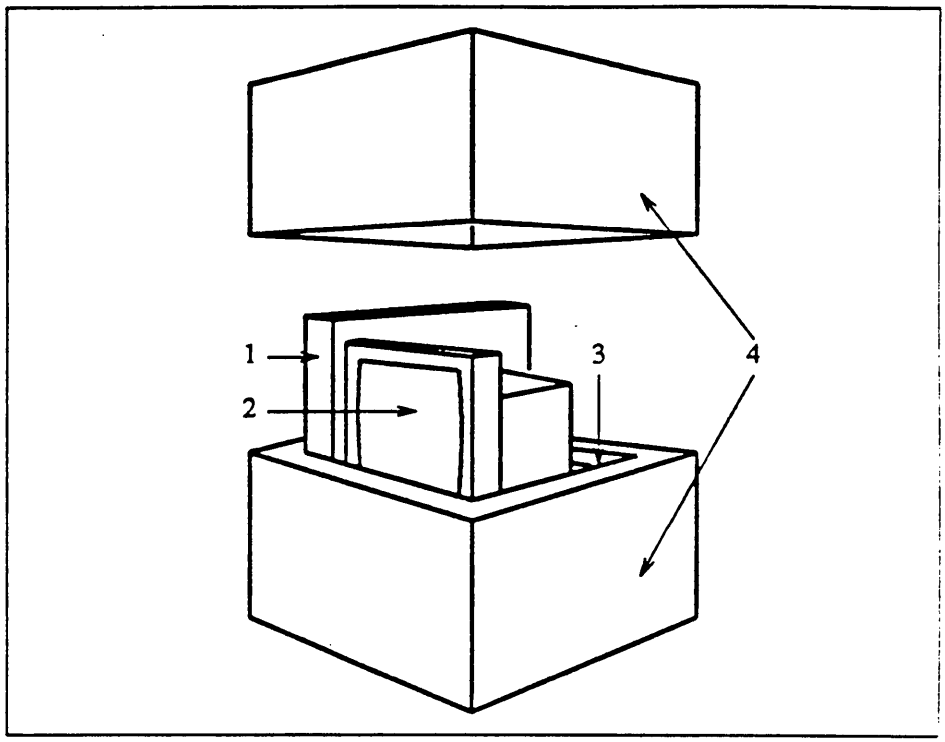
1. Place a pad or a cushion down on a flat surface in an open working area (to protect the machine from being scratched while you unpack it). Give yourself plenty of space to move around.
2. Place the carton right-side up. Cut the shipping tape with a knife or scissors, taking care not to damage the contents within. Open the four top flaps.

NOTE *Although the shipping weight of the Sun-3/75 is about 80 pounds, the packaging has been designed so that one person can unpack it alone. After unpacking the Sun-3/75, you may need help moving the workstation to the place you finally want to set it up.*

3. Remove the mouse and cables from their recess in the styrofoam.
4. The workstation 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.
5. The open top of the carton is now facing down. Gently tug the cardboard carton up and off of the styrofoam packing blocks.
6. When you have removed the carton from the packing blocks, roll the entire workstation assembly over on its side so that the split between the two blocks of styrofoam is running horizontally. It should look like this:

Figure 1-1 *Unpacking the Sun-3 Monitor and Logic Enclosure*

Key	*Description*
1	Monitor Base (with logic enclosed)
2	Monitor
3	Keyboard (goes here)
4	Foam Packing Blocks (with mouse and cables in an interior recess)



7. Remove the top piece of styrofoam packing. Remove the keyboard from its slot in the styrofoam, and set it aside.
8. **Carefully** turn the workstation upright and remove the remaining styrofoam block. Remove the plastic bag from around the workstation.
9. The board extractors (levers which are pulled outward to loosen the CPU and Expansion boards for removal) are covered with a piece of styrofoam as protection. Remove this styrofoam.
10. The workstation should now be sitting upright and facing you in your working area, with all packing material removed from it. This is a good time to move the Sun-3/75 to the location at which you want to install it. Pick it up from beneath the base (tipping it from one side to the other to get your fingers underneath) and move your Sun-3/75 to this location.

We recommend that you save the shipping carton and packing material for future use in case the product must be reshipped.

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 workstation. (There is a section in this manual, "Environmental and Electrical Specifications," which lists possible options. Refer to it if necessary.) You can reset these voltage selectors yourself, if necessary (see the instructions below, "Resetting the Voltage Selectors").**
- **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

Voltage select mechanisms are located in two places:

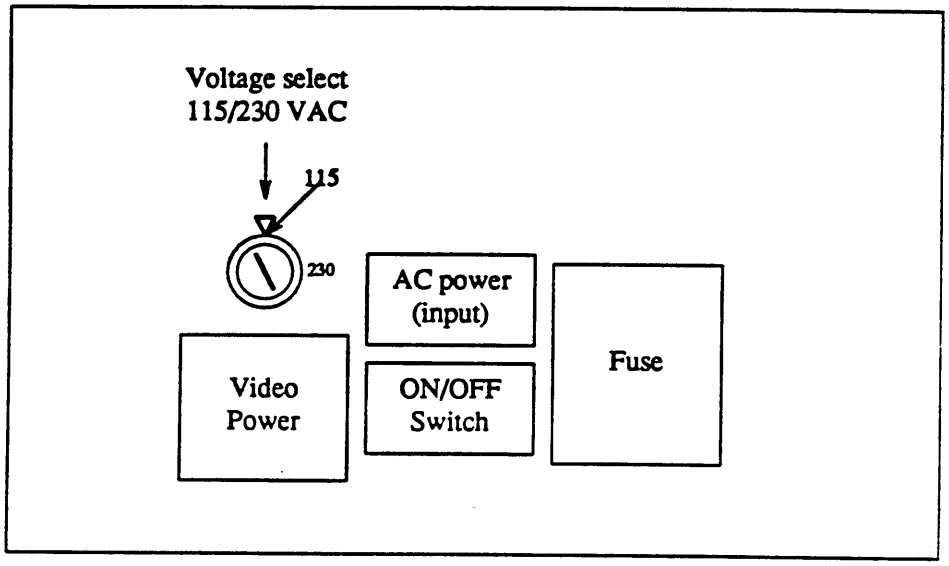
1. on the back of the base unit of the Sun-3/75, and
2. on the rear of the monitor.

2.2. Voltage Selection on the Sun-3/75 Base Unit

The voltage selector for the Sun-3/75's base unit is on the rear panel, to the left (when facing from the rear) of the AC power switch — see the following figure, "Sun-3/75 Workstation: Power Connections on the Base Unit," for location. It is a round plastic mechanism with a slot in it for a blade screwdriver.

To reset the voltage selector, use a 4 inch-by-1/8 inch blade screwdriver and twist the inner core of the voltage selector so that the voltage you want is aligned with the arrowhead at twelve o'clock on the outer edge of the voltage selector. For instance, if you want to set the Sun-3/75 to 115 VAC operation, the "115" would be aligned with the arrow.

Figure 2-1 *Sun-3/75 Workstation: Power Connections on the Base Unit*



2.3. Voltage Selection on the Monitor

There are two methods of voltage selection on the monitor (depending on the type monitor you have), and they are:

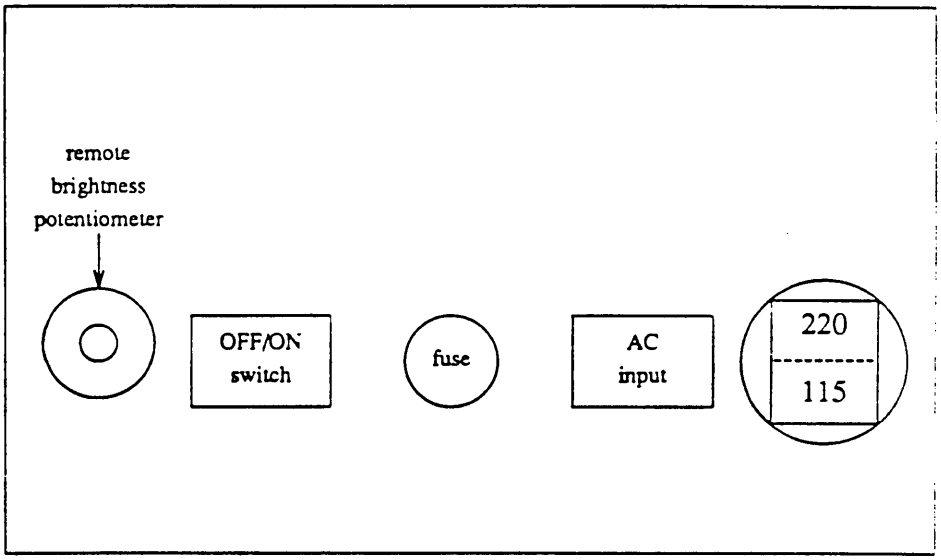
1. PC card
2. switch.

In neither case is a fuse change required.

If voltage selection is done 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 "220 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 "220 V" is displayed, for 220 VAC operation).

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

Figure 2-2 *Location of the Voltage Selection Switch*

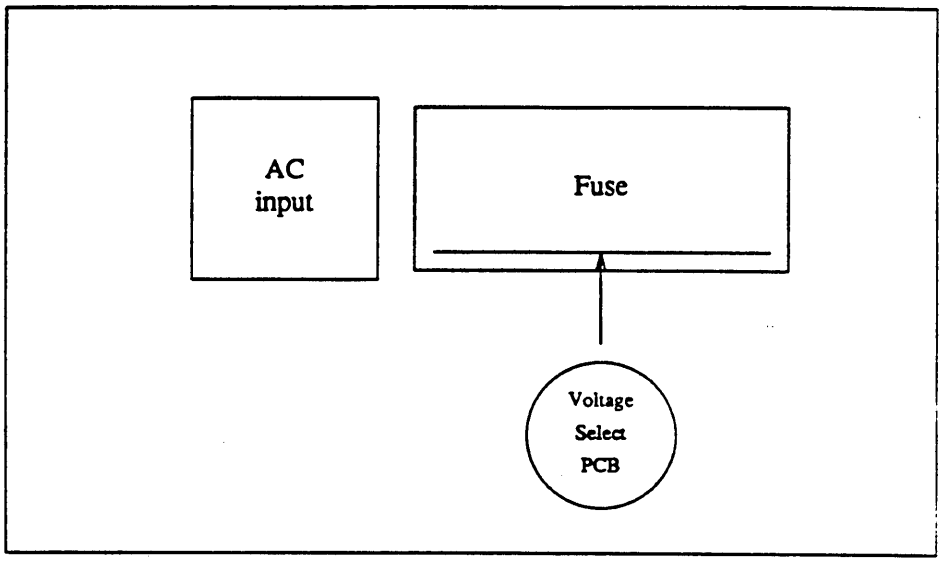


The other method of voltage selection is a little more complicated. It is done by changing the position of a PC card inside the fuse case. There are four voltages that can be selected, two from each side of the PC card, and they are:

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 2-3 *AC Power, Voltage Select, and Fuse*



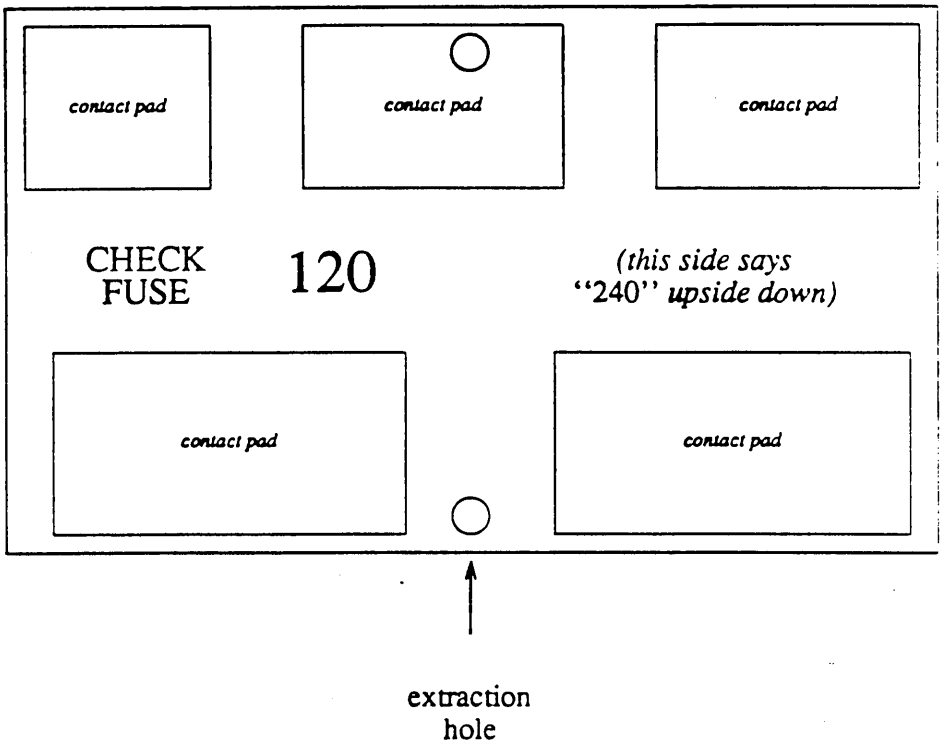
To access the voltage select PCB, you will have to

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 2-4 *120/240 VAC Select*

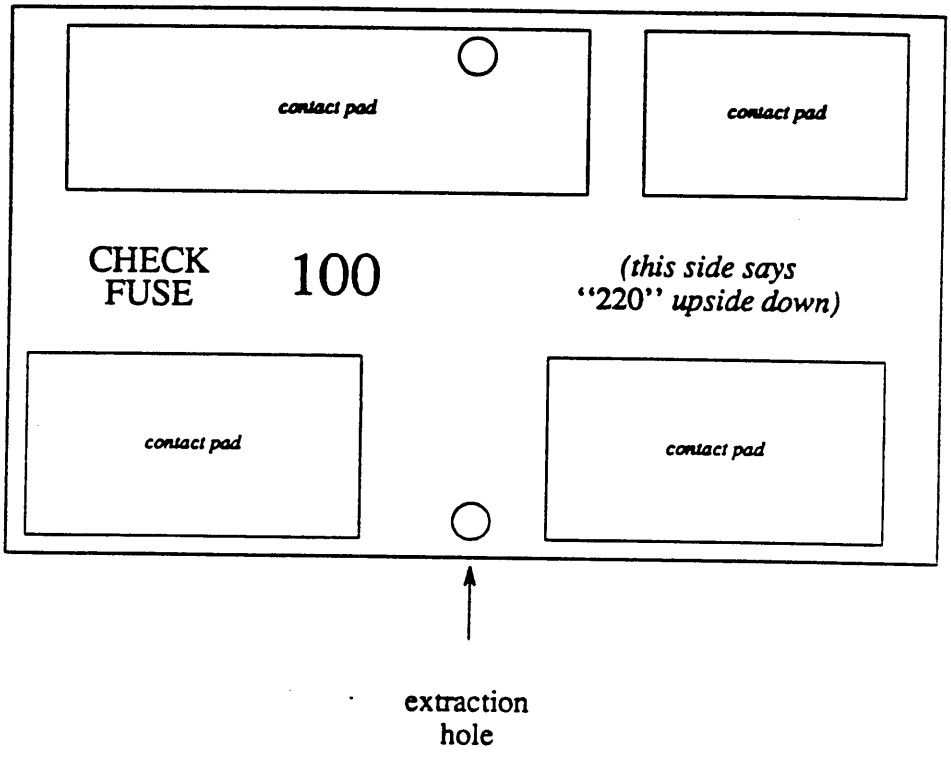


For 240 VAC operation, keep this side up and rotate the PCB 180 degrees, so that the legend "240" is on the left-hand side and faces out towards you. Slide the PCB into the fuse case in this position.

100/230 VAC Operation

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

Figure 2-5 *100/230 VAC Select*



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. Keyboard, Mouse, Ethernet, and Video

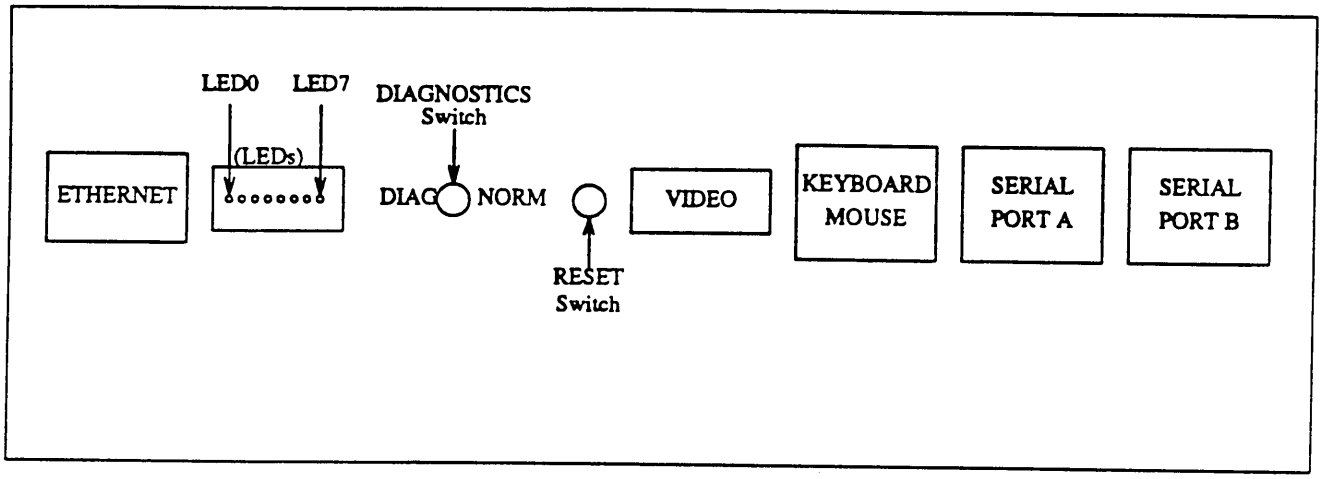
CAUTION **Before attempting any of the following connections, make certain that:**

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

There is a video power outlet on the base of the Sun-3/75 (labeled "VIDEO") which is to be used for providing power to the monitor only. Serious damage can occur if anything else is inadvertently plugged into this outlet. Specifically, make VERY certain that you do not plug AC power from the wall into this outlet!

Connectors on the backpanel are arranged like this:

Figure 2-6 *Sun-3/75 Backpanel Connectors*



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 smaller carton, attach the keyboard, mouse, Ethernet, and video monitor to the base 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 (see figure above) and tighten 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

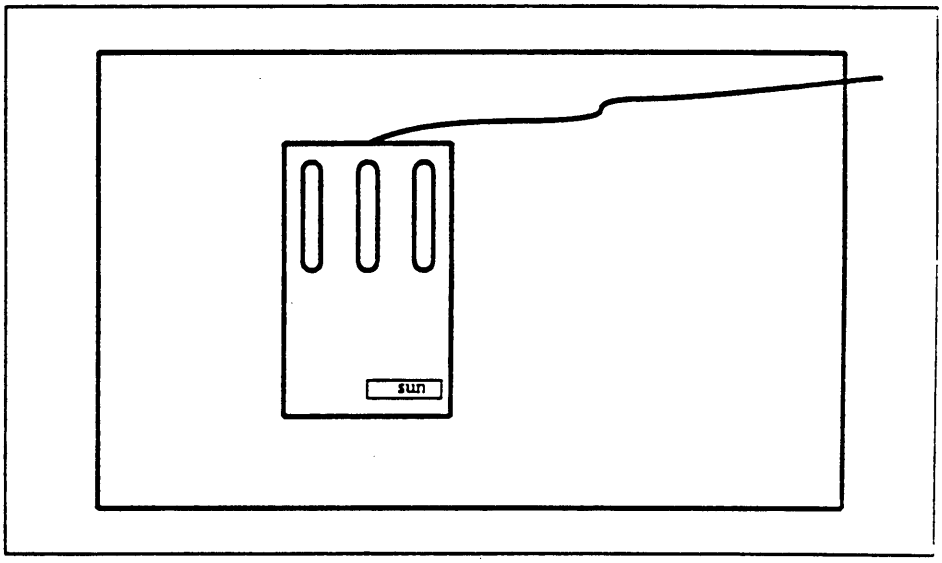
keyboard now.

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, 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.*

Figure 2-7 *Orienting the Mouse on its Pad*



Connecting the Ethernet Cable to the Sun-3/75†

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

NOTE *Before going on, you may wish to make certain that your Sun-3/75 CPU board is properly configured for your particular Ethernet transceiver. The board comes from the factory set for Level 2. If you are using a Level 1 Ethernet transceiver, the shunt shorting pins 7 and 8 of J2503†† at board location K-11 must be IN. If you are using a Level 2 Ethernet transceiver, the shunt must be OUT. If J2503 is*

‡UNIX is a trademark of AT&T Bell Laboratories.
†This section is optional, and is only for those who need to connect their Sun-3/75 to an Ethernet.
††On some early versions of the CPU board, this was labelled J2505

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-3/75 to the Ethernet," below, for further instructions regarding Ethernet installation.*

Connecting the Monitor to the Sun-3/75

CAUTION **Before completing 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.**

Find the 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 CPU board, 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's power cable; it is a short, coiled 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 dedicated outlet at the left rear of the base, next to the power OFF/ON switch.
3. Turn the monitor's power switch to the ON position.

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 Cord

CAUTION **Before completing the following connections, make certain that the AC power switch of the base unit is OFF and the the power switch of the monitor is ON. The AC power is OFF when the side marked "0" is pushed in.**

So far you have made certain that

1. the monitor and base unit have been set correctly for available AC power,
2. the monitor's AC cord is plugged into the base unit's receptacle,
3. the DIAGNOSTICS switch is to the right — in the NORM position,
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 back of your Sun-3/75.

Again make certain that the AC power switch on the back panel 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.

NOTE *The monitor can be powered up or powered down independently of the base unit.*

2.6. Powering Up the Sun-3/75

Turn the power switch on the back of the Sun-3/75 ON (side with the "1" is pushed in).

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") and the CRT screen will slowly come on. You may also notice a

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

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 back and forth.

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-3/75 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-3/75 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 black bullet "•" means the light is on; a circle "o" means the light is off.

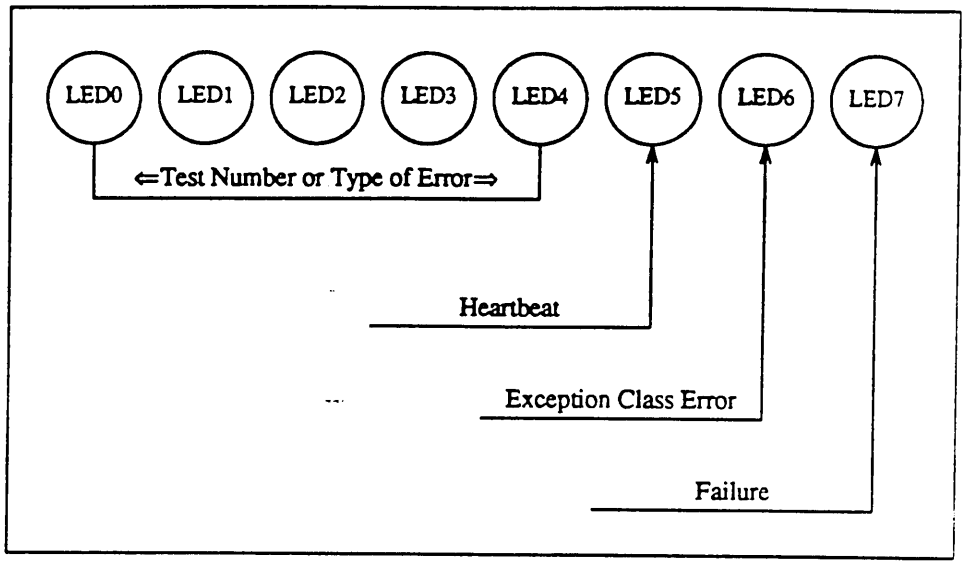
If at some point in the above sequence, the LEDs freeze (keep the same pattern for more than a couple minutes), or the sequence restarts from the beginning, there is a critical hardware problem with the workstation. The appropriate thing to do in this case is to contact Sun Microsystems Field Service 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.

† UNIX is a registered trademark of AT&T.

Table 2-1 *Diagnostic LEDs*

LEDs ●= ON, o = 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
● o o o o o o o	Test 1 checking the boot PROM	Boot PROM
o ● o o o o o o	Test 2 checking DVMA Register	CPU Board
● ● o o o o o o	Test 3 checking the Context Register	CPU Board (MMU)
o o ● o o o o o	Test 4 Segment Map RAM Rd/Wr Test	CPU Board (MMU)
● o ● o o o o o	Test 5 checking Segment Map RAM	CPU Board (MMU)
o ● ● o o o o o	Test 6 checking Page Map RAM	CPU Board (MMU)
● ● ● o o o o o	Test 7 checks memory data path	CPU or Exp. Board
o o o ● o o o o	Test 8 checks bus error detection	CPU Board
● o o ● o o o o	Test 9 checks interrupt capabilities	CPU Board
o ● o ● o o o o	Test 10 checking MMU read access	CPU Board
● ● o ● o o o o	Test 11 checking MMU write access	CPU Board
o o ● ● o o o o	Test 12 writing to invalid page	CPU Board
● o ● ● o o o o	Test 13 tries to write to protected page	CPU Board
o ● ● ● o o o o	Test 14 performs parity error check	CPU Board
● ● ● ● o o o o	Test 15 performs parity error check	CPU Board
o o o o ● o o o	Test 16 performs memory tests	CPU or Memory Exp. Board
o o o o o o o ●	Self-Tests have found an error	CPU or Memory Exp. Board
o o o o o o ● o	An Exception Class error was found	CPU Board
o o o o o ● o o	Self-Test done, UNIX in boot-state (LED is blinking)	CPU Board
o ->o ->o ->o ->o ->o ->o ->o ->o	"Walking Ones" pattern	UNIX running okay

Figure 2-8 *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 of address B8 in the EEPROM, which is 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-3/75:

- a monochrome terminal, hooked to the video output of the CPU 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 can set a byte in the EEPROM to select your primary terminal: either serial port A, serial port B, 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

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

Let's say you want to set your primary terminal to be serial port A. You would access EEPROM location 0x00001F, and then enter the value which identifies the serial port A — 0x10.

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 0x00, for monochrome monitor).

```
>EEPROM 01F:  00
```

Enter the value for serial port A — 0x10 — and then press the space and return keys, to escape.

```
>EEPROM 01F:  10 <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 enclosure backpanel.

Each Sun-3/75 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-3/75 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-3/75 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-3/75

The serial ports are wired as DTEs, and most modems are wired as DCEs. The cable connecting your modem to the Sun-3/75 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-3/75

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

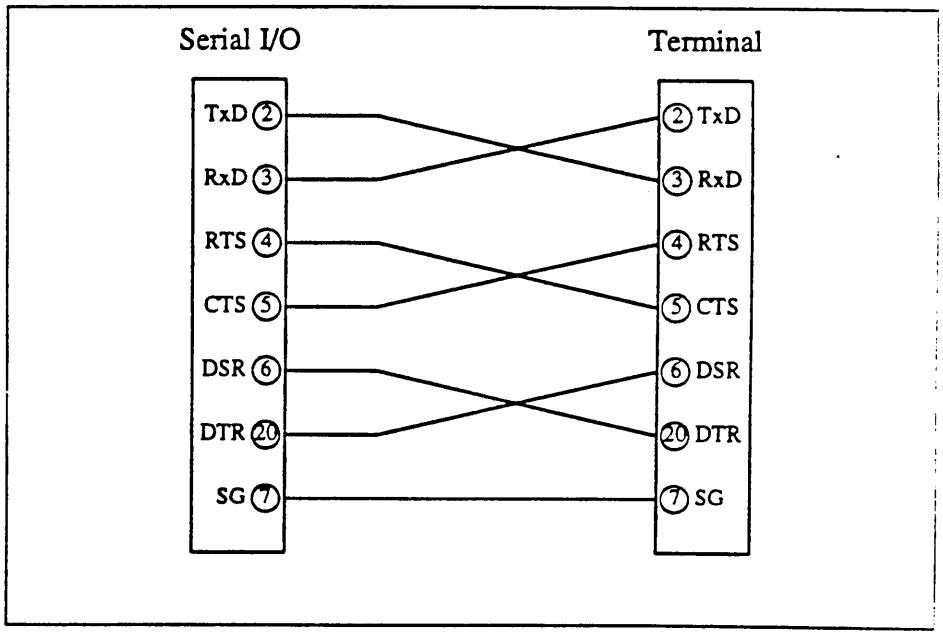
4 and 5 are crossed

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 2-9 *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-3/75

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-3/75 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-3/75 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, you may wish to make certain that your Sun-3/75 CPU board is properly configured for your particular Ethernet transceiver. The board comes from the factory set for Level 2. If you are using a Level 1 Ethernet transceiver, the shunt shorting pins 7 and 8 of J2503 at board location K-11 must be IN. If you are using a Level 2 Ethernet transceiver, then the shunt must be OUT. If J2503 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.**

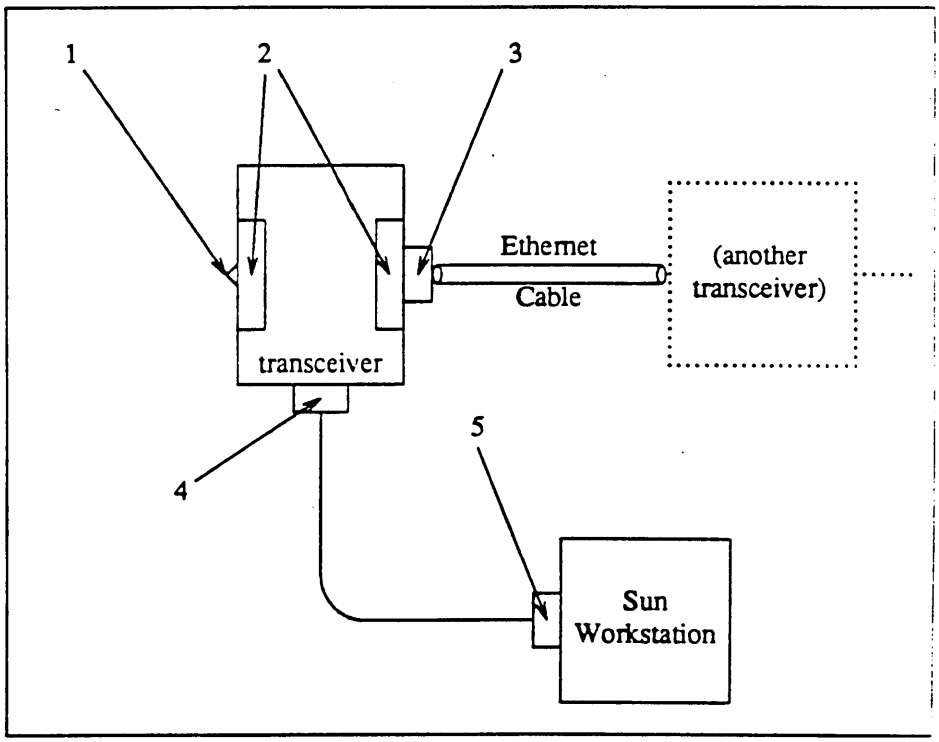
3. For each workstation, plug the female end of the workstation's transceiver cable into the 15-pin D connector on the transceiver, and the male end of the workstation's transceiver cable into the "ETHERNET" connector on the workstation's backpanel.

4. Finally, J2503 at board location K-11 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) J2503 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, pins 7 and 8 of J2503 must have a 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 2-10 *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



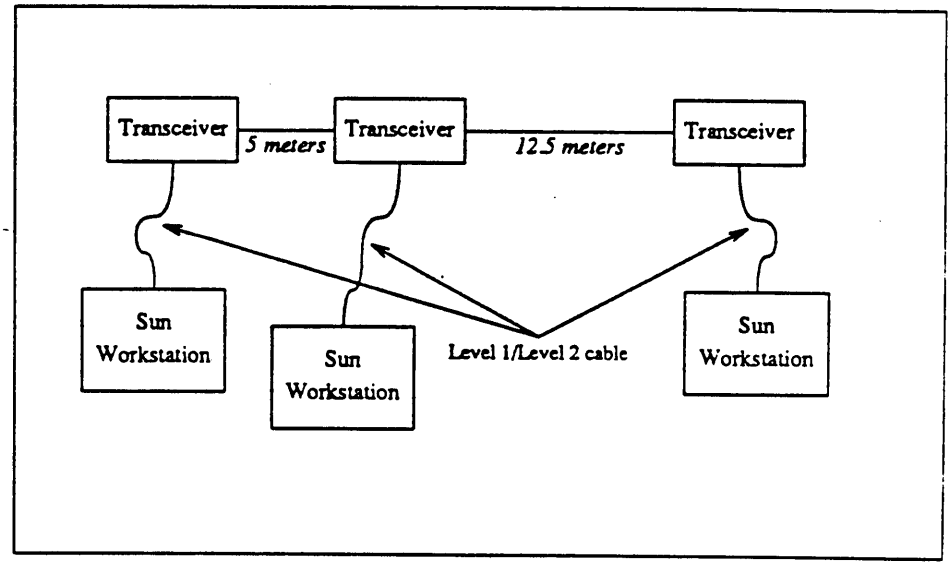
Please note that there are certain cabling limitations which must be observed for proper Ethernet implementation:

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 2-11 *Ethernet Cabling Lengths*

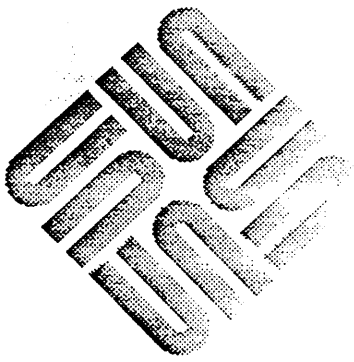


Transceivers are connected to the Ethernet by female N connector (on the transceiver) to male N connector (on the Ethernet cable).

If you buy Ethernet cable in bulk, the cable should 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.

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 electro-static 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 hardware configuration for the Sun-3/75, including monitor, keyboard, mouse, and optional memory expansion.

Basic configuration of the Sun-3/75 is with a 2060 CPU board. To this basic model you may add a 2061 expansion board, an SCSI board, a 71 Mbyte disk subsystem, or a blank VME(2)-to-VME(3) adapter board.

In general, the Sun-3/75 is shipped with its board(s) already installed. However, if you are upgrading a Sun-3/75, you can use this section to install the boards.

3.1. The Sun-3/75 Configuration

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.**

3.2. Installing or Removing Boards

All boards are inserted or extracted from the back of the Sun-3/75.

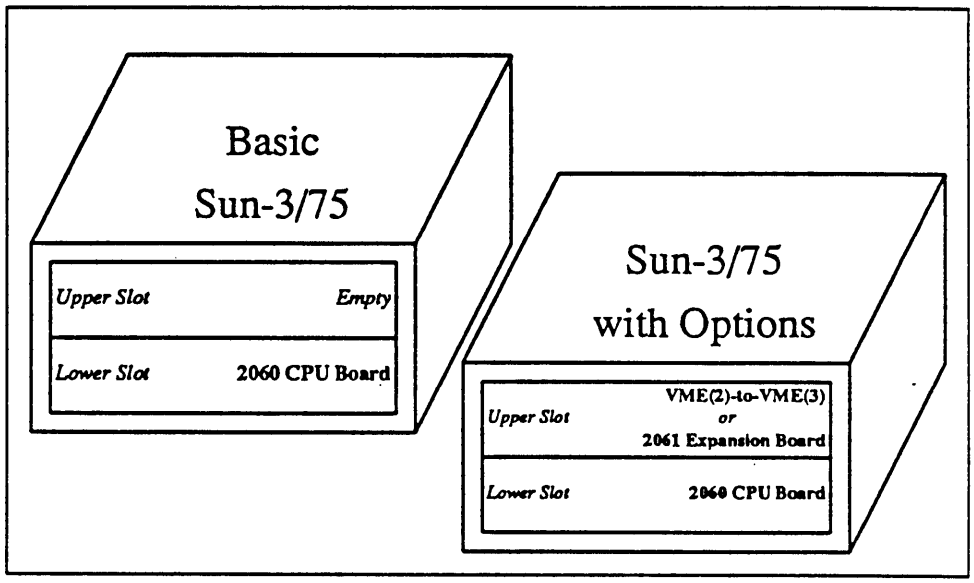
To remove a board, unscrew the four size #0 Allen screws (one at each corner of the board) retaining the board to the chassis. Then flip the two levers outward to loosen the board for removal. The board will slide right out.

To install the board, slide it in on its sliderails and make certain that it is securely seated in the backplane. Flip the two levers inward to lock the board in place. Screw in the four size #0 Allen screws that fasten the board to the chassis.

3.3. Board Arrangements

Board arrangements for the Sun-3/75 look like this:

Figure 3-1 *Board Arrangements and Options for Sun-3/75*



Sun-3/75 CPU Board

WARNING

There is a Lithium Battery (BBCV2), Matsushita Electric Type No. BR2325, located on the Sun-3/75 CPU Board. This battery is NOT a field replaceable part. The battery is marked as follows: "Warning—Replace battery with MATSUSHITA ELECTRIC or PANASONIC Part No. BR2325 only." The battery may explode if mistreated. Do not dispose of the battery in fire. Do not disassemble or attempt to recharge it.

The 2060 CPU (Central Processing Unit) board is installed in the lower slot of the Sun-3/75. It contains the 68020 CPU, a minimum of two megabytes of memory, I/O connections, Ethernet controller, and monochrome video circuitry. Three jacks connect the 2060 board to the backplane inside the Sun-3/75 base, and five I/O connectors are at the opposite end of the board.

I/O Connectors

The rear of the CPU board is terminated in five I/O connectors. In sequence, as they 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 these connectors are listed in Appendix A; an illustration of their location is given in Chapter 2.

3.4. Options for the Sun-3/75

The 2060 CPU board supplies a minimum of two megabytes and a maximum of four megabytes of main memory for the Sun-3/75; additional memory is provided by the 2061 Expansion card.

Each 2061 Expansion board arrives from the factory with its jumper blocks correctly set for your particular configuration. The 2061 Expansion board goes in the upper slot.

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

Option Number	*Memory on Card*
Sun-3/75M - 2	2 Mbytes (on CPU board)
Sun-3/75M - 4	4 Mbytes (on CPU board)
Sun-3/75M - 102	2 Mbytes (on Expansion board)
Sun-3/75M - 104	4 Mbytes (on Expansion board)

Thus, a maximum of 8 Mbytes are allowed.

2061 Expansion Board

The 2061 expansion board resides in the *upper* slot of the backplane. The memory on the 2061 expansion board is connected to the processor by the P2 bus.

The 2060 CPU board supplies a minimum of two megabytes (and a maximum of four megabytes) of main memory for the Sun-3/75; additional memory is provided by the 2061 expansion card. The expansion card contains up to 144 memory chips, in several optional configurations:

Table 3-3 *Expansion Memory Configurations*

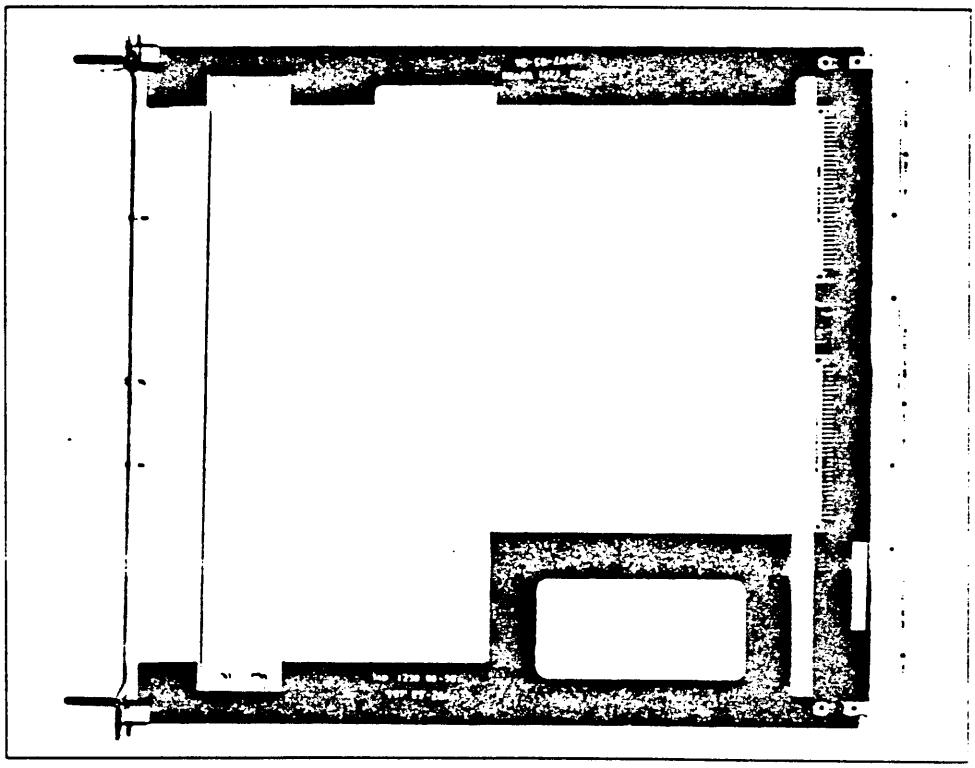
Option Number	*Expansion Memory*
Option 102	2 Mbytes Expansion Memory
Option 104	4 Mbytes Expansion Memory

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

In place of the 2061 Expansion board, a blank VME adapter board — two-high to three-high — can be placed in the options slot.

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

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



SCSI Controller

An optional SCSI controller board is available, which sits piggyback on the Expansion board. When used with the SCSI controller, the Expansion board comes in three different configurations:

- 2 Mbyte Expansion board — option 3/75M-102
- 4 Mbyte Expansion board — option 3/75M-104

- "blank" Expansion board (no memory resident on it) — option 3/75M-599.

71 Mbyte Disk Subsystem

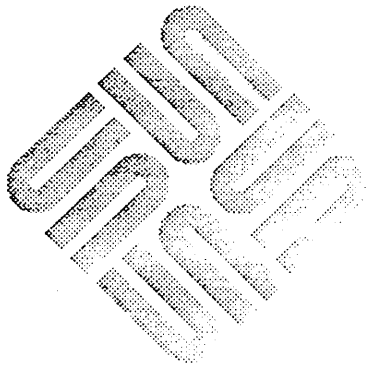
A 71 Mbyte disk subsystem is available in three configurations:

- option 3/75M-501 — 71 Mbyte (formatted) disk subsystem
- option 3/75M-503 — 71 Mbyte (formatted) expansion disk
- option 3/75M-511 — 71 Mbyte (formatted) disk subsystem with 1/4" cartridge tape

Options 501 and 511 have an SCSI controller included; option 503 does not, and is intended to be daisy-chained onto option 501 or 511.

4

Sun-3/75 Configuration Notes



4

Sun-3/75 Configuration Notes

NOTE *For more extensive information on Sun-3/75 configurations, please contact Sun Microsystems Sales or Service, and request the Sun-3 Configuration Procedures, series part number 813-2000, or the Hardware Options manual, 813-1000.*

4.1. SCSI Controller

The Sun-3/75 can be configured with an optional SCSI controller, which resides on either a blank (no memory on it), 2, or 4 Mbyte Expansion board. For further installation information, request the Hardware Options manual, 800-1000.

4.2. 71 Mbyte Disk Subsystem

A 71 Mbyte (formatted) disk subsystem is also available for use with the Sun-3/75; installation procedures are given in the Hardware Options manual, 800-1000.

4.3. 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

Environmental and Electrical Specifications

5

Environmental and Electrical Specifications

This section describes the environmental and electrical requirements for the Sun-3/75.

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.*

5.1. Physical Environment

The Sun-3/75 is manufactured for the following physical environment:

Table 5-1 *Physical Environment Specifications*

	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)	20% to 80%†	5% to 95%†
Altitude	0m to 2130m	0m to 15,240m
	0 to 7,000 feet	0 to 50,000 feet

† at 40° Centigrade

5.2. Electrical Specifications

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

Table 5-2 *DC Output Ratings*

Output	*Voltage*	*Amps*
Output 1	+5 VDC	25 amps
Output 2	-5.2 VDC	1.5 amps
Output 3	+12 VDC	1.5 amps

Table 5-3 *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 5-4 *Power Consumption—(Worst Case)*

Total System Power
310 watts (1058 BTU/hr)

Table 5-5 *Fuses*

Item	*AC Fuse size*	
	90-132 VAC	*180-264 VAC*
Base Unit	4A/250 VAC slow-blow	4A/250 VAC slow blow
Monochrome monitor	1.5A/250 VAC slow-blow	1.5A/250 VAC slow-blow

A

Connector Pinouts

A

Connector Pinouts

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

- Mouse/Keyboard 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 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

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

Table A-2 *Pinout of 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

Table A-3 *Pinout of Ethernet Connector*

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†*

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 and RS-423 interface. A signal called "output" flows from the Sun-3/75 towards the peripheral device. An "input" signal flows from the peripheral into the Sun-3/75. Those pins not mentioned are not used in the Sun-3/75; that is, they are open.

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

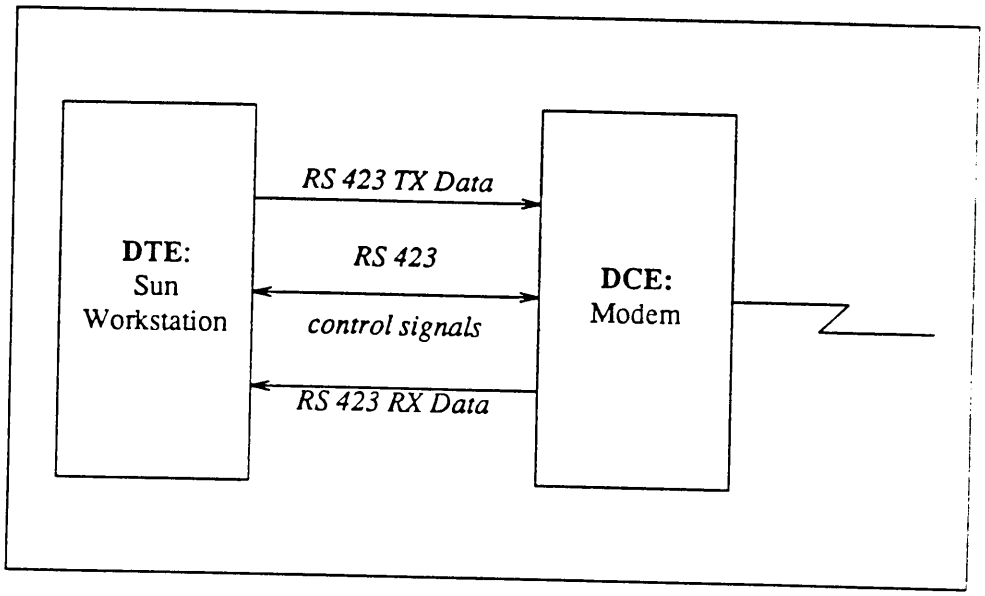


Table A-5 *Description of Serial Port Signals*

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.
5	CTS	Clear to Send	input	Signal from the data communications equipment saying it is ready to accept data.

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

Pin	*Signal*	*Signal Name*	*Direction (Input or Output)*	*Description*
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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U

V

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	22 January 1986	Revised Beta release of this Hardware Installation Manual.
A-10	31 September 1986	Revised packing procedures, voltage labels and Ethernet jumpering information. Added Lithium battery warning. Production release of manual.