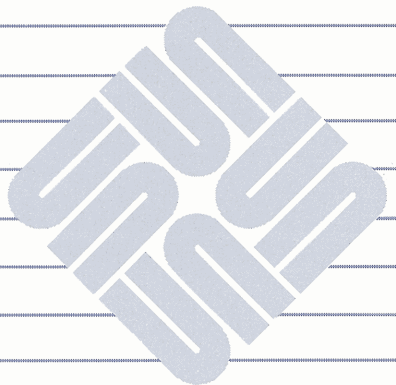
sun microsystems

Sun 3400 CPU Board Installation Manual



Part No: Part Number: 800-2399-11
Revision A of 15 May 1989

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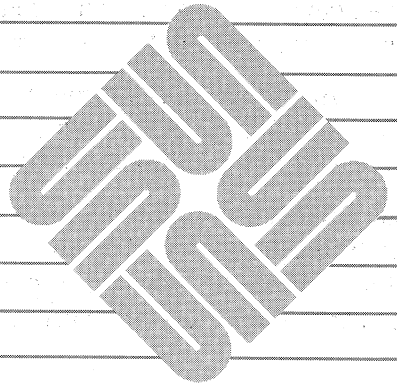

Part No: Part Number: 800-2399-11
Revision A of 15 May 1989

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.

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe A prescrites dans le Règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.

WARNING

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

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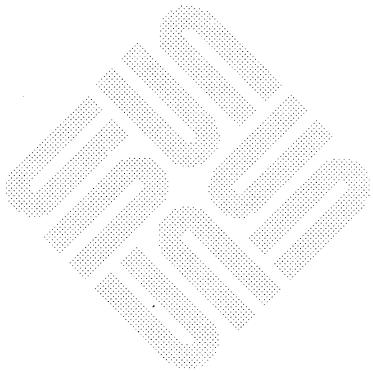
Tables



Figures

Preface

This manual contains procedures for installing, cabling, and removing a Sun 3400 CPU Board.

Procedures for configuring a Sun 3400 CPU Board are covered in the separate *Sun 3400 CPU Configuration Procedures* manual.

Subjects that are not directly related to the boards, such as unpacking and setting up the system, connecting the monitor and accessing the backplane, are covered in the installation manual that came with your system.

Summary of Contents

The contents of this manual are:

Chapter 1 — *General Description* — describes the features of the Sun 3400 CPU board.

Chapter 2 — *Board Installation and Removal* — describes how to install and how to remove the Sun 3400 CPU board.

Chapter 3 — *Cabling* — describes how to connect the keyboard cable and an Ethernet cable to the Sun 3400 CPU board and how to connect a mouse cable to the keyboard. This chapter also includes information to help you predetermine compatibility before connecting peripheral devices to the Sun 3400 CPU board's serial ports.

Chapter 4 — *Power-Up and Self-Test* — describes the functions of the Sun 3400 CPU board's switches and LEDs indicators. This chapter also briefly describes procedures for selecting normal or diagnostic mode boot-up.

Appendix A — *CPU Board Connector Pinouts and Serial Port Signals* — provides tables showing the pinouts for the keyboard/mouse connector, the Ethernet connector, the monochrome frame buffer board (video) connector, and the serial port connectors on the Sun 3400 CPU board.

Appendix B — *Customer Service Repairs* — describes how to remove the Sun 3400 CPU board from a Sun workstation and prepare the board for shipment to a Sun Customer Service repair facility.

Appendix C	*Power Consumption Table* — provides tables that list the power consumption of the Sun 3400 CPU board when it is in an isolated state and when various graphics daughter boards are mounted on it.
Revisions	The table of *Revisions* is a record of the revisions to this manual.
Reader Comment Sheet	The *Reader Comment Sheet* at the back of this manual is for you to tell SUN what you think of the usefulness and accuracy of this manual. Your comments are important to us. Anything you tell us is greatly appreciated. After your new 3400 CPU board is installed and running, please take a few minutes to fill out this sheet and return it to us.

Related Documents

We would like to emphasize that this Sun 3400 CPU Board Installation Procedures manual outlines rather than exhausts any of the topics it contains. The documents listed below include related information. We urge you to read these documents should you need further information on related topics.

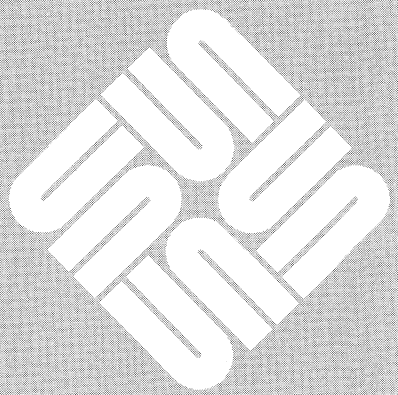
A number of Sun systems use the Sun 3400 CPU. These systems are shipped with a set of three documents; the System Overview, the System Enclosure Installation Manual, and the CPU Installation Manual. The System Overview describes the system and the documentation, the System Enclosure Installation Manual describes how to unpackage and install the system, and the CPU Installation Manual (that's this one) describes how to cable the CPU and how to remove and replace it. It also provides other information specific to the CPU.

Table 0-1 *Related Documentation*

Part #	***Manual Description***
Varies with system	System Overview. Describes your system and documentation.
Varies with system	System enclosure installation. Describes how to install your system.
800-2018	Sun 501-1102 Memory Board Configuration Procedures
800-2123	Installation Notes for the 32 Mbyte Memory Board
813-2055	Sun 3400 CPU Configuration Procedures
813-2056	Sun 3/460 & 3/480 Cardcage Slot Assignments and Backplane Configuration Procedures
813-2073	Sun 3/470 Cardcage Slot Assignments and Backplane Configuration Procedures
813-1000	Sun Hardware Options Guide
800-1700	Sun Release 4.0 Docubox
800-1701	Beginner's Guides

1

General Description



1

General Description

General Description of the Sun 3400 CPU Board

Standard features of the Sun 3400 CPU board include:

- A 68030 central processor with separate internal 256 byte instruction and data caches and an address translation cache (ATC) for CPU address translation. The data cache is designed as a write–through cache. Both the data and instruction caches are structured as 32 blocks of 16 bytes each. The 68030 runs at 33 MHz.
- A central cache configured as a 64 kbyte writeback cache.
- An I/O cache that supports 16 byte blocks.
- A 68882 Floating Point Coprocessor running on the same 33MHz clock as the CPU.
- A VMEbus arbitration and diagnostic mode for DVMA interface testing on the board.
- 64–bit multiplexed address/data bus memory with support for both 8MB and 32MB ECC memory boards and the Sun–3 Floating Point Accelerator Board. The main memory address space is 30 bits.
- P4 bus support that allows a variety of video daughter boards to be used.
- P2 MEZZ bus support that allows the Sun FPA+ to be used.
- Interface circuitry that supports the VMEbus, Ethernet, two serial ports, the keyboard, and the mouse.

An optional feature is the Data Ciphering Protocol (DCP) Processor chip set. This chip set provides additional security for your sensitive files by encrypting network data.

2

Board Removal and Installation

2

Board Removal and Installation

This chapter gives an outline of how to remove and how to install a Sun 3400 CPU board. As needed, refer also to Appendix B which contains much of the detailed information and to the *Sun 3400 CPU Configuration Procedures* manual.

NOTE *If you are installing a new Sun system, skip this chapter. The Sun 3400 CPU board is already installed. Instead, refer to the system installation manual that came with your system and to Chapter 3 in this manual, which explains how to connect cables to the Sun 3400 CPU board.*

Before reading anything else in this chapter, read all the cautions in this chapter. There are quite a few. It is important that you understand and heed each one to prevent inadvertent damage and downtime.

2.1. Tools Needed for Board Removal and Installation

- A 5/64-inch or 2mm Allen (hex) wrench to secure the CPU board's backplate in the cardcage.
- A screwdriver with a flat blade 1/8-inch wide for the screws that secure the cables to the CPU board.
- A pair of needle-nose pliers to remove or install jumpers on the CPU board.
- An antistatic wrist strap attached to an earth ground location whenever you handle the boards. This wrist strap is to conduct electrostatic charges (static electricity) from your body to ground before these charges can damage components on the CPU board.
- A #2 Phillips screwdriver to remove/install the screws that secure the backplane access panel.
- A large flat-blade screwdriver to help in opening the system enclosure.

2.2. Replacing Your Current CPU Board with a New CPU Board

The normal procedure for replacing a CPU board is to remove the old board, remove selected chips from the board, return the board to Sun Customer Service, obtain a replacement CPU board from Sun, inspect the replacement board, install the removed chips on the replacement board, configure the replacement board, and then install the board in the system.

Handling Boards and Components

Any board can be damaged. Damage can occur during shipping, during unpacking, during configuration, and during installation. **Do not drop the board or allow static electricity to discharge through the board.**

Printed circuit boards contain components that are sensitive to damage from static electricity. The discharge of static electricity is known as electrostatic discharge (ESD). A common cause of ESD is walking across a carpet and then touching a conductor such as the CPU board.

Before handling a board, discharge any static electricity you may have on your body or clothes by placing your hand on a conductive surface that is grounded to a common earth ground, (such as an unpainted metal cover plate or cover plate screw of an AC wall receptacle).

To minimize the risk of ESD damage, handle the board only by its edges, and store the board in the anti-static bag provided. If you are going to work on the board, use appropriate grounding devices.

Components on the board are fragile and should be handled with care to avoid damage.

2.3. Removing the Old CPU Board

Before you attempt to remove or install a board in your system, you should read and understand the cautions in this chapter. If you have never removed or installed a board before, it is recommended that you obtain the help of someone who is experienced in the procedures.

CAUTION **Before attempting to remove or install any board in your system, make sure that your system is powered down.**

CAUTION **Before powering down any system, the system administrator should warn all clients and other users that the system is about to be powered down.**

CAUTION **Ensure that any data in the buffers are written to disk before the system is halted. To do this, use a command such as**

```
/etc/halt
```

CAUTION **This circuit board may only be installed by qualified service personnel.**

Cautions Concerning the Springfingers

Springfingers are metal strips that are installed between the edge of a PC board and the outer panel to reduce RFI emissions. (The name *springfingers* comes from the serrated springy metal "fingers" that protrude from the side of the strip.)

CAUTION **Boards with springfingers must be properly installed. If they are not, other boards may be damaged and the system may no longer be in FCC compliance.**

CAUTION **Installation of a board WITHOUT springfingers may increase RFI emissions from the system enclosure, and may therefore adversely affect FCC compliance. Sun is not responsible for FCC compliance if boards WITHOUT springfingers are added to a system originally shipped WITH springfingers and FCC approval.**

CAUTION **Ensure that the insulator strip between the inner side of the springfingers and the CPU board is intact at all times. A missing or broken insulator can allow a springfinger to short against a component lead on the board.**

CAUTION **When removing and replacing boards with springfingers, check the condition of the insulator strip/shield(s). If the insulator is damaged, replace it. Call your SUN hotline number with questions or for information on how to obtain additional insulator strips or shields.**

If a system enclosure contains boards WITH and WITHOUT springfingers, use the following guidelines:

- **If a board WITH springfingers is installed below a board WITHOUT springfingers (or to the left of it in a pedestal installation), always remove the board WITH the springfingers before removing the board WITHOUT the springfingers.**
- **If a board WITH springfingers is to be installed below a board WITHOUT springfingers (or to the left of it in a pedestal installation), always install the board WITHOUT springfingers first. Then install the board WITH springfingers.**
- **If a board WITH springfingers is installed next to a board WITHOUT springfingers, the insulator shield on the outside of the fingers MUST be present to prevent possible shorting between the springfingers and components on the adjacent board.**
- **Replace any filler panel equipped WITH springfingers by pulling out the air flow restrictor panel far enough to allow the springfingers to lay against the panel. Push both units into place simultaneously and fasten with the appropriate fasteners. This procedure makes replacement of the filler panels easier, and reduces the chance of damage to the springfingers.**

If a board WITH springfingers is installed next to a board or filler panel that is also equipped WITH springfingers, the outside insulator shields should be removed.

Removing a Board

Refer to Appendix B for the complete instructions on how to remove a CPU board from your system.

Preparing a Board for Return to Sun

Refer to Appendix B for the complete instructions on how to remove selected chips from the CPU board, and how to return the board to Sun Customer Service.

Obtaining a Replacement Board from Sun

Refer to Appendix B for the complete instructions on how to obtain a replacement 3400 CPU board from Sun.

2.4. Installing a New 3400 CPU Board

Installing a replacement board includes inspecting the board, installing the chips that were removed from the original board, configuring the board (refer to the *Sun 3400 CPU Board Configuration Procedures* manual), and mounting the board in the card cage in your system.

Inspecting Boards

It is possible for a board to be damaged during shipping. It is easy for a board to be damaged when it is being unpacked.

1. When you receive a board, *immediately* inspect the shipping container for evidence of damage. If the carrier's agent is not present when a container is opened and the contents are found to be damaged, keep all the contents and packing materials for the agent's inspection.
2. If there is no evidence of damage, attach a *grounded* antistatic wrist strap to your wrist. Carefully remove the board from the shipping container. Save the carton and the packing material for later use.
3. Inspect the board for any socketed components that may have worked loose during shipment. Place the board on a flat antistatic surface and firmly seat any loose components back in their sockets.

NOTE *When reseating chips, make sure that the dot or "v–shaped" notch on the chip is aligned with the "v" printed on the board. Then make sure that the pins on the chip are aligned with the holes in the socket. Gently push down on the center of the chip until the chip is firmly seated in its socket.*

Installing Chips on a Board

Install the original CPU board's ID PROM and any chips purchased as an upgrade onto the replacement 3400 CPU board. This procedure must be completed before the replacement 3400 CPU board is installed in your system. (If your original CPU board is still in your system, these chips are on that board. You must remove all these chips from your original CPU board before you send your original CPU board to Sun Customer Service.) Refer to Appendix B, *Customer Service Repairs* for step–by–step instructions on how to remove and install these chips.

NOTE *The ID PROM contains the workstation's unique Ethernet address and serial number, so it must stay with the 3400 CPU board installed in the workstation.*

Configuring a New CPU Board

If the replacement 3400 CPU board is not yet configured for your installation, refer to the *Sun 3400 CPU Board Configuration Procedures* manual for board configuration information. The board must be configured before you install it.

Installing the New CPU Board

1. Before installing a new CPU board, ensure the ID PROM and all the upgrade chips have been installed on the new CPU board. (If you have not already installed the chips, refer to *Customer Service Repairs* Appendix B for instructions.)
2. Ensure that the new 3400 CPU board is correctly configured for your system. (If you have not already configured the CPU board, refer to the *Sun 3400 CPU Board Configuration Procedures* manual.)
3. Cards installed in the cardcage in the Sun 3/460, 3/470, and 3/480 are installed in a vertical orientation. Align the new CPU board in its cardcage slot so that the component side of the board faces right when viewed from the rear of the unit.
4. Carefully slide the board all the way into the card cage. As the connectors on the board start seating in the backplane connectors, the resistance to further inward movement will rapidly increase indicating that the board is nearly seated.

For information on where to install the CPU memory boards and other options, refer to the *Cardcage Slot Assignments and Backplane Configuration Procedures* manual that came with the system.

CAUTION **The CPU board should slide easily into its cardcage slot (until it makes initial contact with the backplane connectors). If the CPU board does not insert and slide in easily , inspect the cardcage slot for any obvious obstructions. Also inspect both the CPU board and the backplane for damage (bent connector pins, springfingers, etc.). If there is no damage and there are no obstructions, push the board the rest of the way in, until its connectors are seated in the backplane connectors. If the connector fit is unusually snug, it may help to slide the CPU board in until it is about one inch from the backplane connectors and then give the board a slow, firm push.**

5. After the CPU board is seated firmly in the the backplane connectors, replace and tighten the four hex-head screws removed earlier when you removed the former CPU. Note that tightening these screws draws the CPU board the rest of the way into the backplane connectors. **The 3400 CPU board may not function properly if these screws are not tightened.**

3

Cabling

3

Cabling

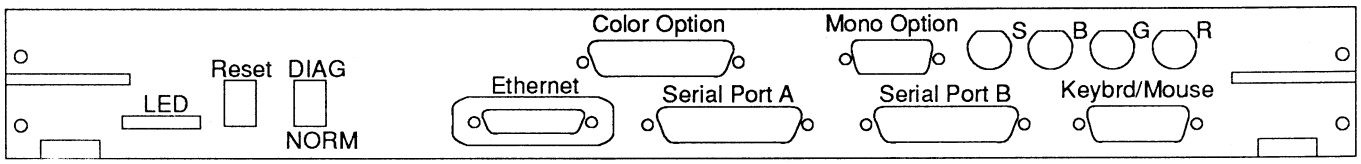
This chapter describes how to connect the keyboard, the mouse, Ethernet, and some peripherals to your system.

CAUTION **Before attempting to cable anything into your system, make certain that:**

1. **The power switch for the system is switched OFF**
2. **The AC power cord is unplugged from the wall outlet.**

Figure 3–1 below shows the 3400 CPU board backplate and connectors. In Figure 3–1, the component side is up. When the board is installed, it is in a vertical orientation in most systems, with the component side to the right.

Figure 3-1 *Sun 3400 CPU Board (Backplate) Edge Connectors*



3.1. Connecting the Keyboard and the Mouse

1 One end of the keyboard cable is permanently attached to the system's keyboard. The other end of the keyboard cable terminates in a male 15–pin subminiature D-connector. Plug the connector on the end of the keyboard cable into the female 15–pin subminiature D-connector labeled "KEYBRD/MOUSE" on the CPU board's backplate (as shown in Figure 3–1 above).

2. One end of the mouse cable is permanently attached to the system's mouse. The other end of the mouse cable terminates in a connector similar to a telephone cable J11 plug. Insert this plug into the matching socket on the back of the keyboard.

3.2. Connecting the Ethernet Transceiver Cable

If the host system functions as an Ethernet node, connect the transceiver cable as described below:

1. The Ethernet cable is terminated on one end with a male 15–pin subminiature D-connector and on the other end with a matching female 15–socket subminiature D-connector. The male connector on the Ethernet cable has a pair of metal studs. The female "ETHERNET" connector on the CPU board's backplate has a slide lock assembly. The studs on the male connector fit into the holes in the slide lock assembly. Plug the male end of the Ethernet cable into the female "ETHERNET" connector on the CPU board's backplate. Push the slide lock over the studs to fasten the Ethernet cable connector securely in place.
2. The female connector on the other end of the Ethernet cable also has a slide lock assembly. Plug this female connector into the Ethernet transceiver. Push the slide lock over the studs to fasten the Ethernet connector securely in place.

For information on the Ethernet coaxial cable installation, refer to the System Enclosure Installation manual shipped with the system.

3.3. Connecting the Monitor

For either monochrome or color monitors, the frame buffer board is mounted as a daughter board on the CPU board. This daughter board's edge connectors are labeled "VIDEO", "S", "B", "G", and "R". For instructions on connecting the monitor video cables to either the monochrome or color daughter boards, refer to the installation guide that came with your particular frame buffer board and to instructions in the System Enclosure Installation manual that came with your system.

The C63, C65, and C69 color video boards are not daughter boards. They mount independently of the 3400 CPU board.

3.4. General Information about the Asynchronous Serial Ports

The serial port connectors on the CPU board's backplate are labeled "SERIAL PORT A" and "SERIAL PORT B".

Each serial port uses a 25–pin connector (DB–25) compatible with RS–232–C equipment. These serial ports were designed for connecting to serial peripherals that use the RS–232–C or RS–423 interface. All signals at the connector are semantically the same as their RS–232–C counterparts. The 3400 CPU board uses improved electrical circuits which, while working with RS–232–C devices, are also compatible with the newer RS–423 standard.

Both serial ports:

1 Transmit DTR (Data Terminal Ready), RTS (Request To Send), and clock signals. (The DTR and RTS signals may be inhibited through EEPROM programming.)

2 Receive DSR (Data Set Ready), CTS (Clear To Send), and DCD (Data Carrier Detect) signals.

During a normal boot-up, both serial ports come up at 9600 baud with 8 data bits, 1 stop bit, and no parity. If your peripheral requires a different baud rate, the baud rate can be changed. These serial ports can run at speeds up to 19.2 kilo-baud. (Refer to the *Sun PROM Manual* for details.) Note that Serial Port B comes up at 1200 baud during a diagnostic boot–up.

The CPU board's serial ports are wired as Data Terminal Equipment (DTE) ports (which means the workstation transmits data out pin 2 and receives data in from peripherals on pin 3)

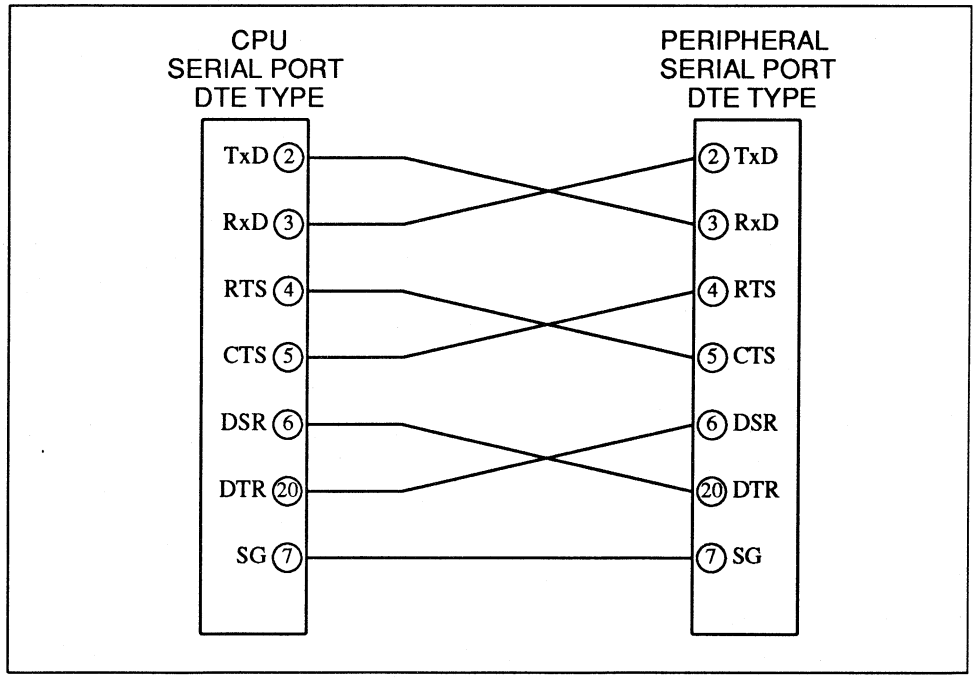
Some peripherals are wired as Data Communications Equipment ports. (This means that most of the pin assignments are different. For example, the (DCE) peripheral transmits data out pin 3 and receives data in from the system on pin 2).

Null Modem Cables

Signals carried on the CPU board's "SERIAL PORT A" connector and "SERIAL PORT B" connector are described in Appendix A.

Null modem cables (Sun P/N 530–1056) are used for serial communication between two devices when both devices have (DTE) ports. Most computers, terminals, and printers are configured as DTE devices, and so require a null modem cable for serial communications between them. Refer to Figure 3–2 below for a wiring diagram of a null modem cable.

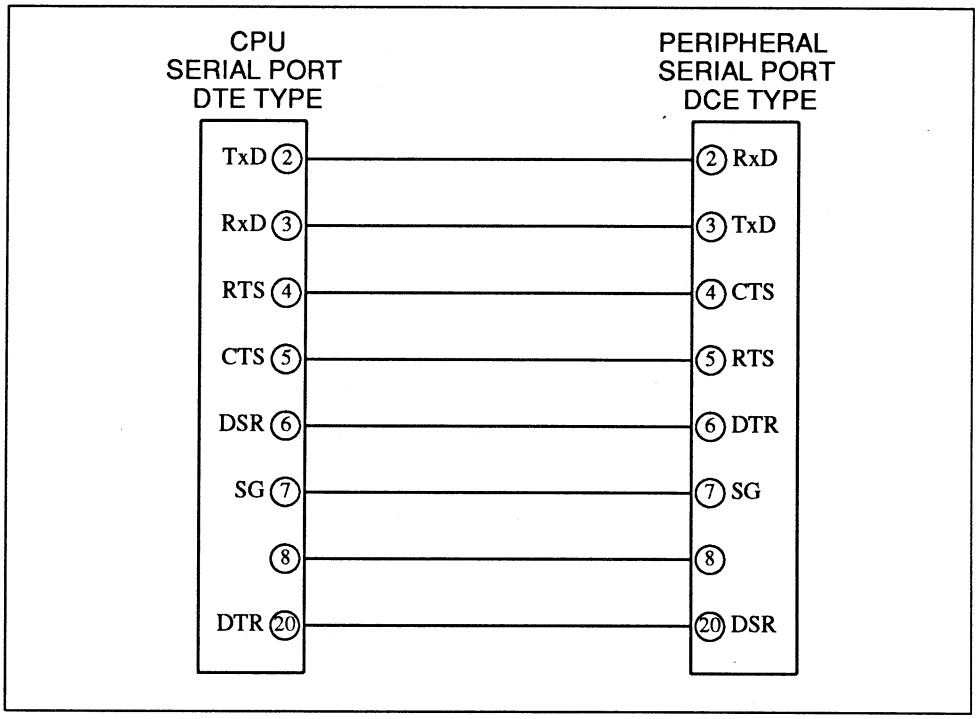
Figure 3-2 *Null Modem Cable Pin Arrangement*



Standard Serial Cables

Standard serial cables are used for communication between two devices when one device has a (DTE) port and the other device has a (DCE) port. Most modems and a few other devices are configured as DCE devices, and so require a standard serial cable for serial communications between them and a computer. Refer to Figure 3–3 below for a wiring diagram of a standard serial cable.

Figure 3-3 *Standard Serial Cable Pin Arrangement*



For further information about the serial interface and the required cabling, refer to Appendix A of this manual and to the *SunOS Interface Reference Manual*, section ZS(4S).

3.5. Connecting a Printer, Modem, or Terminal

These procedures are guidelines for the connection of peripherals to the serial ports. The connection of peripheral devices may require the more detailed information that is contained in the *SunOS Interface Reference Manual* and the manual accompanying the peripheral device.

Connecting a Printer to Your Sun 3400 CPU Board

Before trying to connect your printer to a serial port on your 3400 CPU board's backplate, you must first make certain that your printer uses a serial interface and that the interface uses the RS–232–C or RS–423 standard. You **cannot** connect a parallel interface printer to a Sun 3400 CPU board. If you wish to use a parallel interface printer, you must first add a serial interface to your printer or add a parallel–to–serial–converter between your printer and the Sun 3400 CPU board.

After you have determined that you have a serial interface printer (or have added a parallel–to–serial converter), check the printer or converter manual to determine if its interface is a DTE type or a DCE type. If the printer (or converter) serial interface is a DTE type, you will need a null modem cable. If the printer (or converter) serial interface is a DCE type, you will need a standard serial cable.

After you have the correct cable, connect one end of the cable to your printer and the other end of the cable to the appropriate serial port on the 3400 CPU board's backplate.

NOTE *For software installation, you will need to know that during a normal boot–up, both serial ports are configured to run at 9600 baud with 8 data bits, 1 stop bit, and no parity. If your printer requires a different baud rate, the baud rate can be changed. (Refer to the Sun PROM Manual for details.) Note that during a diagnostic boot–up, Serial Port B is configured to run at 1200 baud.*

Normally, other issues with printers must be resolved before the printer will work properly with a computer system. Refer to the manual that came with your printer and the *System and Network Administration for the Sun Workstation* manual for more complete printer connection information.

Connecting a Modem to your Sun 3400 CPU Board

Before trying to connect your modem to a serial port on your 3400 CPU board's backplate, you must first determine if your modem's serial interface is a DTE type or a DCE type. Most modems are wired as a DCE type. If your modem's serial interface is the common DCE type, you will need a standard serial cable. If your modem is one of the few DTE types, you will need a null modem cable.

After you have the correct cable, connect one end of the cable to your modem and the other end of the cable to the appropriate serial port on the 3400 CPU board backplate.

Refer to the manual that comes with your modem and follow the installation procedure detailed there. See also the *System and Network Administration for the Sun Workstation* manual and the *SunOS Interface Reference Manual, ZS(4S)* for more information about connecting a modem to your system.

NOTE *For software installation, you will need to know that during a normal boot–up, both serial ports are configured to run at 9600 baud with 8 data bits, 1 stop bit, and no parity. If your modem requires a different baud rate, the baud rate can be changed. (Refer to the Sun PROM Manual for details.) Note that during a diagnostic boot–up, Serial Port B is configured to run at 1200 baud.*

Connecting a Terminal to Your Sun 3400 CPU Board

Before trying to connect a terminal to a serial port on your CPU board's backplate, you must first determine if the terminal's interface accepts the RS–232–C or RS–423 standard.

After you have determined that your terminal accepts the RS–232–C or RS–423 protocol, check your terminal's manual to determine if the terminal's interface is a DTE type or a DCE type. If your terminal's serial interface is a DTE type, you will need a null modem cable. If your terminal's serial interface is a DCE type, you will need a standard serial cable.

After you have the correct cable, connect one end of the cable to your terminal and the other end of the cable to the appropriate serial port on the CPU board's backplate.

Very often, there are many other issues with terminals that must be resolved before the terminal will work properly with your system. Refer to the manual that came with your terminal to ascertain that the signals needed to operate the terminal are provided at the correct pins of the serial port. If the pinouts are all correct, follow the installation procedure detailed in the terminal's manual. Refer to the *System and Network Administration for the Sun Workstation* manual for more information about connecting a terminal to your system.

For proper operation, some terminals require that you disable the DTR and RTS signals. To do this, enter the EEPROM program as described in the *Sun PROM Manual.* If your EEPROM is not P/N 800–2531–01 Revision 8, then refer to your *Sun PROM Manual* for the location in your EEPROM of the Port A or Port B DTR/RTS control code. If your EEPROM is P/N 800–2531–01 Revision 8, then set location 0x059 (for Port A), or location 0x061 (for Port B) as follows:

EEPROM Value	*Resulting Action*
0x00	Assert DTR and RTS signals
0x12	Do NOT assert DTR RTS signals

4

Power-Up and Self-Test

4

Power-Up and Self-Test

This chapter provides:

- Information on 3400 CPU board switches
- Information on self-tests executed by the PROM monitor program that is resident on the 3400 CPU board
- Examples of the displays that appear on the console screen during power-up
- Interpretation of the 3400 CPU board's diagnostic LED patterns.

CAUTION **Read the installation manual that comes with the system before plugging in the AC power cord. Make sure that the available AC line voltage matches the label on the system and that you have taken all the precautions and followed the procedures outlined in the installation manual before applying power to the system.**

4.1. Conventions Used in This Chapter

Anything printed in typewriter font in this text is a reproduction of a screen display. For example:

```
Testing 32 megabytes of memory ... Completed.
```

Boldfaced text within that display means that you must enter that information exactly as shown. For example:

```
>b
```

Roman Italic font is used for titles or chapters within documents and for notes. For example:

Installing the SunOS.

Hexadecimal values in the text are preceded with *0x*. Leading zeros (in memory addresses, for example) are not shown. For example:

0x18.

The Diagnostic Switch

One of the switches on the back of the CPU board is labeled DIAG/NORM. For a normal boot–up and for normal operation, set this switch to the NORM position.

If you want to run the Boot PROM resident extended diagnostic tests or automatically boot an EEPROM-specified diagnostic, set the DIAG/NORM switch to the DIAG position. This selects the diagnostic mode.

NOTE *During a diagnostic boot–up, Serial Port B comes up at 1200 baud.*

In the diagnostic mode, if you attach a terminal to Serial Port A (9600 baud) or to Port B (1200 baud) you may interact with the power-on self–tests.

In the diagnostic mode, if you do not press a key when prompted, the system will react according to EEPROM programming (explained more fully in the *Sun PROM Manual*), and you may see a > on the screen (the PROM monitor prompt).

The Reset Switch

The RESET switch is located between the LEDs and the DIAG/NORM switch. It is a momentary contact switch. Pressing the RESET switch causes the 3400 CPU board to perform a cold reboot. Do not press this switch unless there is a problem that less drastic measures cannot solve.

4.2. Power-up and Self-tests

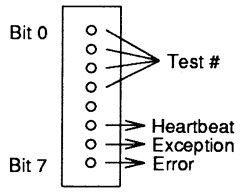
DO NOT SWITCH ON THE SYSTEM POWER OR MONITOR POWER UNTIL THE MANUAL TELLS YOU TO DO SO. Follow the power–up procedures and heed the cautions in the workstation hardware installation manual. You should be familiar with the *Installing the SunOS* manual (for new systems) or the appropriate software release manual (for upgrades), and the *System and Network Administration for the Sun Workstation* manual before attempting to power up the SunOS.

Memory Tests

During a normal boot–up, the quantity of memory specified in EEPROM is tested. During a diagnostic boot–up, all memory is automatically tested.

General Information about the Diagnostic LEDs

There are eight LEDs on the edge of 3400 CPU board. These are used for software and hardware diagnosis. These LEDs are visible through a slot near one end of the 3400 CPU board backplate. The slot is labeled "LED".



Vertical Installation Orientation

The illustration to the left of this text depicts the orientation of the LEDs when the 3400 CPU board is installed vertically.

Upon power–up or reset, these LEDs flash once. While the system is booting, the current LED pattern identifies the self–test that is running. Table 4–1 explains the meaning of the LED patterns displayed during a normal boot–up.

After a successful self–test, LED 5 (the "monitor heartbeat") will flash regularly to indicate that the CPU is receiving clock interrupts. This indicates that the monitor is awaiting commands or the SunOS is in a boot state.

After the SunOS is running, the LEDs flash rapidly, in a regular signature pattern. The signature pattern for the 3400 CPU board is LED 0; then 0 and 1 light together; then 0, 1, and 2 light together; then 0, 1, 2, 3; then ... then 0, 1, 2, 3, 4, 5, 6, and 7. This pattern continually repeats as long as the CPU is processing or waiting to process instructions.

Diagnostic Interpretation of LED Patterns

Table 4–1 on the following page provides a brief interpretation of the non-error patterns displayed by the LED indicators on the edge of the 3400 CPU board. The table shows the LEDs as they would appear if the 3400 CPU board were in a horizontal installation. In an actual installation, the board is mounted vertically, with LED 0 at the top. In Table 4–1 a darkened "bullet" represents a lit LED and a hollow "bullet" represents an unlit LED.

If an error condition is detected, the self–test will halt, LED 7 will light, and LEDs 0 – 3 will remain in an unchanging pattern. Some combination of LEDs 4–6 may also be lit.

The meanings of LED patterns not illustrated in this table 4–1 are documented in the separate system software *PROM User's Manual*

Table 4-1 *CPU Board LED Interpretation*

LED Display ●= ON ○= OFF 0 1 2 3 4 5 6 7	*SelfTest being Performed*
● ● ● ● ● ● ● ●	A reset will set LEDs to this state
○ ○ ○ ○ ○ ○ ○ ○	Serial Ports A,B SCC Write/Read Test
● ○ ○ ○ ○ ○ ○ ○	Keyboard/Mouse SCC Write/Read Test
● ● ○ ○ ○ ○ ○ ○	System Enable Register Read Test
○ ○ ● ○ ○ ○ ○ ○	PROM Checksum Test
● ○ ● ○ ○ ○ ○ ○	I/O Mapper RAM Test(s)
○ ● ● ○ ○ ○ ○ ○	Bus Error Register Test
● ● ● ○ ○ ○ ○ ○	Interrupt Test(s)
○ ○ ○ ● ○ ○ ○ ○	ECC Memory Sizing and Test(s)
○ ● ○ ● ○ ○ ○ ○	ECC Memory Forced Error Test(s)
● ● ○ ● ○ ○ ○ ○	Central Cache Tag RAM Test(s)
○ ○ ● ● ○ ○ ○ ○	Central Cache Data RAM Test(s)
● ○ ● ● ○ ○ ○ ○	Central Cache Hit/Miss Test(s)
○ ● ● ● ○ ○ ○ ○	Block Copy Test(s)
● ● ● ● ○ ○ ○ ○	Memory Write/Write/Read Test(Central Cache on)
○ ○ ○ ○ ● ○ ○ ○	IOC Tag RAM Test(s)
● ○ ○ ○ ● ○ ○ ●	IOC Data RAM Test(s)
○ ● ○ ○ ● ○ ○ ○	VME Loopback Test
● ● ○ ○ ● ○ ○ ○	VME Loopback and DVMA
○ ○ ● ○ ● ○ ○ ○	IOC Read/Write/Flush Test(s)
● ○ ● ○ ● ○ ○ ○	P4 Overlay Frame Buffer Test(s)

Faults Detected During Self–test

If during a self–test, LED 7 remains on and LEDs 0 – 4 stop flashing, a 3400 CPU board fault is indicated. Record the pattern of lit and unlit LEDs, contact the Sun Customer Support Center and describe the LED pattern to Field Service Personnel to assist them in troubleshooting.

If the LED in bit position 6 lights, an exception class failure, such as a bus error trap or an unexpected interrupt, has occurred.

Console Display

During a normal boot–up when the DIAG/NORM switch is set to the NORM position, the banner appears and memory tests begin. (If a self–test fails, the display will "freeze".) During the memory tests, to indicate the tests are progressing normally, a rotating diagonal symbol (known as the "packet pump") appears on the console screen after the message:

```
Testing __ megabytes of memory /
```

Normal Display

After a successful self–test, a display resembling the following should appear on the console screen:

```
Self-test Completed Successfully.

        Sun Workstation, Model Sun-3/_ _ _ Series.
        Type-4 keyboard.
        ROM Rev __, __  MB memory installed, Serial #____
        Ethernet address __:__:__:__:__:__

Testing __ megabytes of memory ... Completed
```

The values left blank will vary, depending on system configuration.

If an error message appears on the screen in place of

```
Testing __ megabytes of memory ... Completed.
```

the memory portion of the power-up self–tests has failed and you should contact your Sun Customer Support Center.

Blank Display

If the LEDs indicate that self–tests were successful and that SunOS is booting, but the console screen remains blank for more than 30 seconds after power-up, make sure that:

- The monitor (CRT) is cabled correctly
- The AC power is switched ON
- The DIAG/NORM switch is set to the NORM position

If this does not solve the problem, then check the EEPROM value set in the PROM monitor program, as described in the following section. The **q 1F** value may be incorrect.

As a troubleshooting aid, you may connect a terminal (set for 9600 baud, 8 data bits, 1 stop bit and no parity) to SERIAL PORT A, set the diagnostic switch to the DIAG position, and then reboot the system. (If you wish to use SERIAL PORT B, set your terminal to 1200 baud.) In the DIAG mode, you may determine which, if any, self–test is failing.

4.3. Setting EEPROM Values

To set the EEPROM values, you need to be in the PROM monitor program.

1 First, halt the extended test program, as follows: If you are using a functioning console, then while holding down the **L1** key, press the **a** key.

— or —

If you are using a dumb terminal connected to one of the serial ports with the diagnostic switch set to the DIAG position, press the BREAK key.

2 Then exit the extended test program and enter the PROM monitor program. Do this by typing a **q** and then pressing the [RETURN] key.

3 You should now see a > prompt. Use the PROM monitor q command to make sure that location 0x01F in the EEPROM contains the appropriate value for the type of monitor in use. For example, if your monitor is a P4 color monitor, the value in EEPROM location 0x01F should be 0x20. After you finish your query in this example, your monitor should show the following display:

```
q 1F [RETURN]
EEPROM 01F: 20
```

4 If you wish to change a value in the EEPROM, check the following table. Type the appropriate hexadecimal value, then type any non-hexadecimal character (such as a period) and then press the [RETURN] key.

Screen size is determined dynamically in the Boot PROM. Display type values are assigned as follows:

EEPROM Value	*Display Device*
0x10	Terminal Connected to Serial Port A
0x11	Terminal Connected to Serial Port B
0x12	Color Monitor (for a non – P4 color board present in the system)
0x20	A P4 Video Device

High Resolution Monitor

If your system includes a high resolution (1600 x 1280) monitor, Version 1.0 or later firmware, but your software requires a standard resolution monitor display, you may need to set the EEPROM column and row values as follows, to provide an 80 x 34 terminal configuration.

Location	*Value*	*Configuration*
0x050	0x50	80 columns
0x051	0x22	34 rows

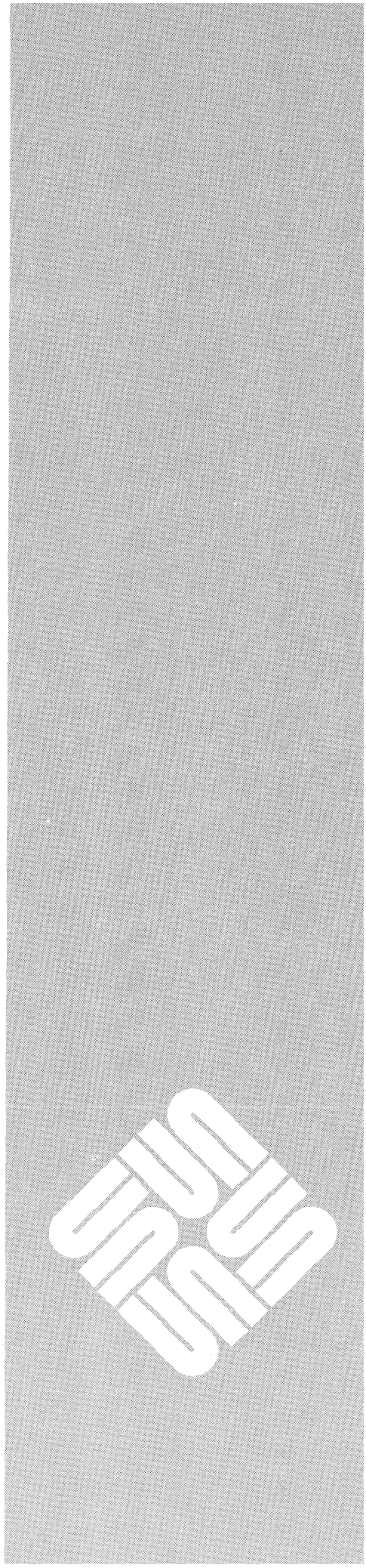
If your software supports a 120 column by 48 row display, you may wish to set your high resolution monitor for its full–screen display. The values are:

Location	*Value*	*Configuration*
0x050 0x051	0x78 0x30	120 columns 48 rows

NOTE *Check your software manual to ensure that there will be no incompatibilities between your software and the display size.*

A

3400 CPU Board Connector Pinouts and Serial Port Signals



A

3400 CPU Board Connector Pinouts and Serial Port Signals

This appendix contains the pinouts for the connectors in the 3400 CPU board's backplate:

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

It also contains a signal description of the serial ports.

NOTE *Only electrically connected pins are listed; open–circuit pins are not documented.*

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

Keyboard/Mouse Pinout			
Pin	**Signal**	**Pin**	**Signal**
1	RXDA (Keyboard)	5	RXDB (mouse)
2	GND	6	GND
3	TXDA (Keyboard)	14	VCC
4	GND	7	VCC

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

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

An EEPROM parameter may be used to inhibit the DTR and RTS signals (refer to the *Sun PROM Manual*).

Table A-3 *Pinout of Ethernet Connector*

Ethernet			
Pin	**Signal**	**Pin**	**Signal**
1	chassis ground		
2	E.COL +	9	E.COL –
3	E.TXD +	10	E.TXD –
4	chassis ground		
5	E.RXD +	12	E.RXD –
6	GND	13	+12V
7	Unused		

Table A-4 *Pinout of Monochrome Video Connector*

MonochromeVideo			
Pin	**Signal**	**Pin**	**Signal**
1	Video +	6	Video –
3	HSYNC	7	GND
4	VSYNC	8	GND

Video+ and Video– are at ECL voltage levels; HSYNC and VSYNC are at TTL voltage levels.

Serial Port Signals

Following 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 that uses an RS–232–C or an RS–423 interface. A signal called "output" flows from the 3400 CPU board towards the peripheral device. A signal called "input" flows from the peripheral device into the 3400 CPU board. Disregard pins that are not mentioned since they are unconnected open circuits.

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

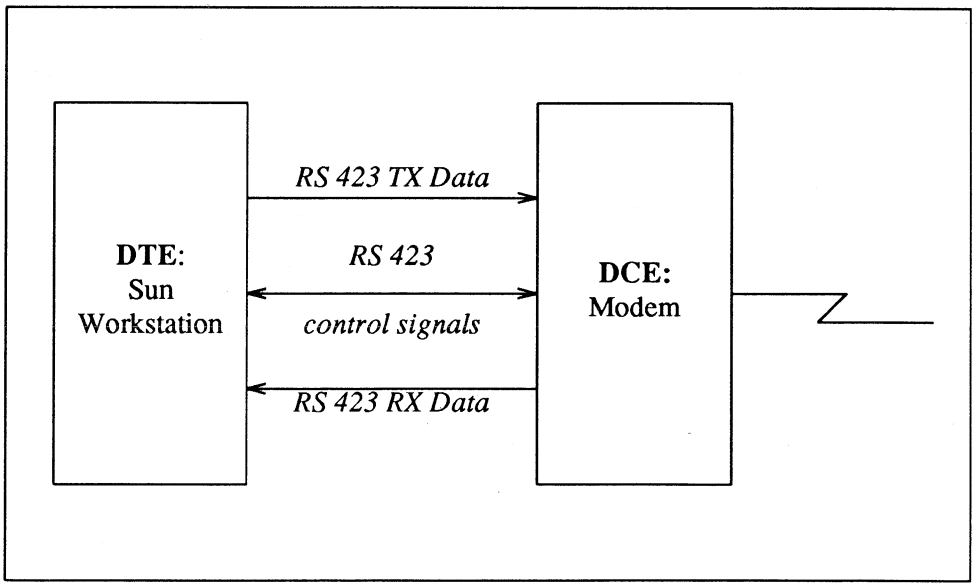


Table A-5 *Description of Serial Port Signals*

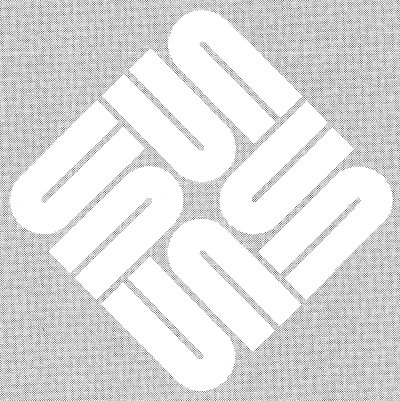
Pin	*Signal*	*Signal Name*	*Direction (Input or Output)*	*Description*
2	TXD	Transmit Data	output	The actual data transmitted to the data communications equipment.
3	RXD	Receive Data	input	The actual data received from the data communications equipment.
4	RTS	Request to Send	output	Signal sent to the 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.
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 workstation.
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 workstation is powered on and willing to communicate as the "local data terminal" with the data communication equipment (for example, the modem).

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

Pin	*Signal*	*Signal Name*	*Direction (Input or Output)*	*Description*
24	DA	Transmit Clock from DTE	output	Provides transmit clock from the Sun workstation. This signal is usually not used for asynchronous devices (most terminals, printers, modems, etc.).
25	VERR	reference -5V level	none	This signal is used by some modems to sense connection to the workstation.

B

Customer Service Repairs



B

Customer Service Repairs

Before sending in your 3400 CPU board for repair or replacement, you will need to remove the ID PROM chip and any optional chips that were purchased as an upgrade to your original board. For example, the Data Ciphering Protocol (DCP) chip set is an optional chip set.

NOT removing these items may greatly increase the repair time of your board.

B.1. Removing the CPU Board from the System

The board removal procedure is relatively simple and straightforward. Use the right tools, follow the precautions, follow the directions, and be careful.

Workstation Power–Down

Use the following steps to power–down the workstation:

Before removing the board set, make sure that the host system is powered–down. First, warn all users that the system is about to be powered–down. Begin the power–down procedure by changing to the "superuser" mode or to your "root" directory and then entering the command:

```
/etc/halt
```

or

```
/etc/fasthalt
```

on the console keyboard. This procedure ensures that any data in the buffers is written to disk before the UNIX operating system is halted.

After the SunOS is halted, the system power may be switched OFF.

CAUTION **Do not disconnect the system power cord from the AC power outlet. Connection to the AC power outlet provides the grounding necessary for the antistatic strap to work properly.**

Attaching the Wrist Strap

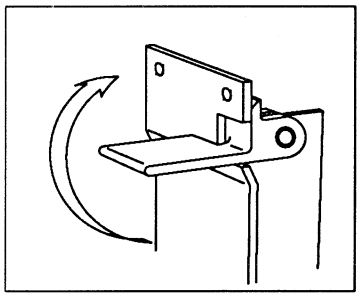
The antistatic wrist strap should be attached to your wrist and to a bare–metal portion of the system chassis before handling the 3400 CPU board or any chips. Permanent damage to the chips could occur if you fail to do so.

NOTE *The "ESD Kit" comsisting of an antistatic wrist strap and antistatic mat comes only with options and upgrades shipped separately from your original system. Before handling any boards: If you do not have an "ESD Kit" to use when de–installing a board or component, place your hand on a conductive grounded surface (such as the metal parts of the system chassis or the metal cover of a properly installed AC outlet) to discharge any static electricity present in your body. It is also recommended that you install and de–install any system components while working over a non–carpeted surface.*

CPU Board Removal

First, remove all cables and connectors from the system back panel. Then use the following procedures to extract the CPU board:

1. Disconnect all cables from the CPU board backplate.
2. Remove the four 2mm recessed hex–head machine screws that secure the CPU board in its card cage slot within the system chassis.
3. Place the antistatic mat nearby on a flat surface with the shiny side down.
4. As illustrated at the left, push the board extraction levers outward from the CPU board to back the board out a short distance.
5. Carefully slide the CPU board the rest of the way out of the card cage.
6. Carefully place the CPU board onto the antistatic mat.



Extraction Lever

B.2. Preparing the Board for Return to Sun

Before returning your CPU board to Sun, you will need to remove certain chips from it, contact Sun, and pack it properly for shipping.

Removing the ID PROM

The ID PROM can be identified by the "P5X8" etched on the component surface. It is located at coordinate C–32 on the 3400 CPU board. The CPU board is mapped using the alphabet to form the X axis and numbers to form the Y axis to assist in the location of board–mounted components. Illustrations and tables have been provided in the *Sun 3400 Board Set Configuration Procedures* to aid in identifying specific components.

The ID PROM contains the workstation's unique Ethernet address and serial number, so it must stay with the workstation.

Using a small flat–bladed screwdriver, in very small equal increments, gently pry alternate ends of the component away from the CPU board, very gently working the component out of its board socket. Be extremely careful not to bend any of the pins. This can easily happen if, for example, one end of a component is pryed loose before the other end is loose.

Removing the Data Ciphering Protocol Chip Set

If you have the optional DCP chip set, remove it in the same manner as the ID PROM. The processor is located at coordinate D–34, and is etched with "9518". The DCP PAL is located at coordinate H–24, and is etched on the top with "22V10". There are about fifteen chips labeled with "22V10", so carefully confirm the correct coordinate position before removing the chip.

Sending the CPU Board in for Repair

For specific packing and mailing instructions, please call 800–USA–4SUN.

B.3. Installing the ID PROM and Other Chips

When installing the ID PROM and other chips on the 3400 CPU board, ensure that the "V-shaped" cut in the chip is facing the same direction as the other chips around it.

CAUTION

Powering–up a 3400 CPU board with the ID PROM installed backwards will destroy the ID PROM chip and possibly damage the board.

To insert the ID PROM, hold the chip by its edges, align the pins with the holes in the socket, insert the pins into the socket holes, and then firmly press the chip into the socket until the bottom of the chip is resting flush on top of the socket face.

C

Power Consumption Tables

C

Power Consumption Tables

Table C-1 *Sun 3400 CPU Board Power Consumption*

Sun 3400 CPU Board without FPA+						
Frame Buffer	**Type**	**@ +5V**	**@ –5.2V**	**@ +12V**	**@ –12V**	**Total Watts**
None	–	24.5	–	0.3	–	126.0
Hi-Res Mono (MG3)	P4	25.5	1.3	0.3	–	138
Graphics Accelerator and Color Frame Buffer (CX1)	P4	26.3	–	0.3	–	135.0
8-bit Color Frame Buffer (Cg4)	P4	27.2	–	0.3	–	140
24-bit True-color (CG8)	P4	28.27	–	0.3	–	147

Readings include Keyboard–3, Mouse–3, and Ethernet.

Table C-2 *Sun 3400 CPU Board Power Consumption*

Sun 3400 CPU Board with FPA+						
Frame Buffer	**Type**	**@ +5V**	**@ –5.2V**	**@ +12V**	**@ –12V**	**Total Watts**
None	–	26.4	–	0.3	–	136.0
Hi-Res Mono (MG3)	P4	27.8	1.3	0.3	–	149.0
Graphics Accelerator and Color Frame Buffer (CX1)	P4	28.2	–	0.3	–	145
8-bit Color Frame (CG4)	P4	28.7	–	0.3	–	147.0
24-bit True-color (CG8)	P4	30.9	–	0.3	–	158.0

Readings include Keyboard–3, Mouse–3, and Ethernet.

Revision History

Revision	*Dash Number*	*Date*	*Comments*
01	**01**	11 April 1988	Alpha Review Draft
02	**02**	3 October 1988	Second Review Draft
50	**03**	14 November 1988	Beta Review and Engineering Release
50	**04**	23 January 1989	Review Draft
50	**05**	29 January 1989	Beta Review
A	**10**	17 April 1989	Released for customer shipment
A	**11**	15 May 1989	FCS

SUN 3400 CPU Installation Manual Reader Comment Sheet

Dear Reader,

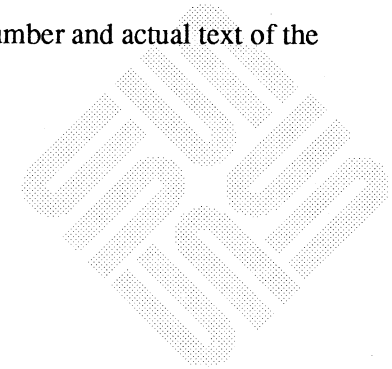
We who work at Sun Microsystems wish to provide the best possible documentation for our products. To this end, we solicit your comments on the *Sun 3400 CPU Installation Manual*, Part Number 800-2399-11. We would appreciate your telling us about errors in the content of the manual, and about any material that you feel should be there but isn't.

Typographical Errors

Please list typographical errors by page number and actual text of the error.

Technical Errors

Please list errors in technical accuracy by page number and actual text of the error.



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Revision A of 15 May 1989

Content

Did this guide meet your needs? If not, please indicate what you think should be added or deleted in order to do so. Please comment on any material that you feel should be present but is not. Is there material found in other manuals that would be more convenient if it were in this manual?

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