



SunSAI/P™ User's Guide

SunSAI/P Versions 2.0 and 3.0

Sun Microsystems, Inc.
www.sun.com

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Declaration of Conformity

Compliance ID: DIGI-70000414

Product Name: SunSAI/P Adapter

This product has been tested and complies with Part 15 of the FCC Rules.

Operation is subject to the following two conditions:

1. This equipment may not cause harmful interference.
2. This equipment must accept any interference that may cause undesired operation.

EMC

This equipment complies with the following requirements of the EMC Directive 89/336/EEC:

EN55022 / CISPR22 (1985)	Class B
EN50082-1 IEC801-2 (1991)	4 kV (Direct), 8 kV (Air)
IEC801-3 (1984)	3 V/m
IEC801-4 (1988)	1.0 kV Power Lines, 0.5 kV Signal Lines
EN61000-3-2/IEC1000-3-2(1994)	Pass (Class D)

Supplementary Information

This product was tested and complies with all the requirements for the CE Mark when connected to a Sun workstation or server.

/ S /

Dennis P. Symanski DATE

Manager, Product Compliance

/ S /

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Your Sun product is marked to indicate its compliance class:

- Federal Communications Commission (FCC) — USA
- Department of Communications (DOC) — Canada
- Voluntary Control Council for Interference (VCCI) — Japan

Please read the appropriate section that corresponds to the marking on your Sun product before attempting to install the product.

FCC Class B Notice

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

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

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/television technician for help.

Shielded Cables: Connections between the workstation and peripherals must be made using shielded cables in order to maintain compliance with FCC radio frequency emission limits. Networking connections can be made using unshielded twisted pair (UTP) cables.

Modifications: Any modifications made to this device that are not approved by Sun Microsystems, Inc. may void the authority granted to the user by the FCC to operate this equipment.

DOC Class B Notice - Avis DOC, Classe B

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.


VCCI 基準について

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Preface

The *SunSAI/P User's Guide* covers the installation and configuration of the SunSAI/P intelligent serial communications boards in Sun™ Microsystems™ PCI workstations running the Solaris™ 2.5.1 Hardware: 4/97, 8/97, 11/97, Solaris 2.6 and Solaris 7 operating environments using SAI/P 2.0 drivers, and Solaris 8 and Solaris 9 Operating Systems using SAI/P 3.0 drivers.

In addition to the adapter itself, you must also install device driver software for your operating system, so that programs can communicate with the board. Device driver installation instructions follow the hardware installation instructions in this manual.

This document is written for technicians, system administrators, authorized service providers (ASPs), and experienced Sun users.

How This Document Is Organized

[Chapter 1](#) provides an overview the SAI/P board.

[Chapter 2](#) describes how to install the SunSAI/P board.

[Chapter 3](#) describes the EIA-232 connectors and cables.

[Chapter 4](#) discusses various methods of connecting peripheral devices to the SunSAI/P adapter and provides sample cable diagrams to aid in constructing the correct cable for your application.

[Chapter 5](#) describes how to install and configure the driver software.

[Chapter 6](#) describes the supported TTY device types.

[Chapter 7](#) describes how to set the terminal options using the *sitty* utility program.

[Chapter 8](#) describes how to use the Sun Port Manager (SPM) tool.

[Appendix A](#) describes the error messages generated by the SAI/P device driver.

[Appendix B](#) lists the specifications for the SunSAI/P board.

[Appendix C](#) provides an overview of the SunVTS diagnostic application.

Using UNIX Commands

This document might not contain information about basic UNIX® commands and procedures such as shutting down the system, booting the system, and configuring devices. Refer to the following for this information:

- Software documentation that you received with your system
- Solaris™ Operating System documentation, which is at:

<http://docs.sun.com>

Shell Prompts

Shell	Prompt
C shell	<i>machine-name%</i>
C shell superuser	<i>machine-name#</i>
Bourne shell and Korn shell	\$
Bourne shell and Korn shell superuser	#

Typographic Conventions

Typeface*	Meaning	Examples
AaBbCc123	The names of commands, files, and directories; on-screen computer output	Edit your <code>.login</code> file. Use <code>ls -a</code> to list all files. <code>% You have mail.</code>
AaBbCc123	What you type, when contrasted with on-screen computer output	<code>% su</code> <code>Password:</code>
<i>AaBbCc123</i>	Book titles, new words or terms, words to be emphasized. Replace command-line variables with real names or values.	Read Chapter 6 in the <i>User's Guide</i> . These are called <i>class</i> options. You <i>must</i> be superuser to do this. To delete a file, type <code>rm filename</code> .

* The settings on your browser might differ from these settings.

Related Documentation

In this section, give the exact URL for the online documentation.

The documents listed as online are available at:

<http://www.sun.com/products-n-solutions/hardware/docs/>

Application	Title	Part Number	Format	Location
Installation	<i>ABC Release Notes</i>	801-xxxx-xx	Printed PDF	Shipping kit Online
Service	<i>ABC System Service Manual</i>	801-xxxx-xx	PDF HTML	Documentation CD and online Online

Documentation, Support, and Training

Sun Function	URL
Documentation	http://www.sun.com/documentation/
Support	http://www.sun.com/support/
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SunSAI/P User's Guide, part number 805-6947-11

Introduction

This chapter provides an overview of SunSAI/P board, including:

- [“Shipping Kit Contents” on page 1](#)
- [“Product Description” on page 1](#)
- [“Features” on page 2](#)
- [“Customer Assistance” on page 2](#)

Shipping Kit Contents

The carton in which your SunSAI/P board was shipped should contain the following items:

- SunSAI/P board
- *SunSAI/P User’s Guide*
- One or more software packets containing the device driver CD-ROM
- Connector assembly

Product Description

The SunSAI/P board is a multi-channel intelligent Serial Asynchronous Interface board for computers incorporating the PCI bus standard.

The heart of the SunSAI/P board is a 32-bit RISC processor. The board has 128 KB of dual-ported high-speed RAM used for program code and data buffering. The SunSAI/P board supports “preset” throughput speeds of up to 115K bps for each asynchronous port.

The processor and dual-ported RAM relieves your computer of the burden of managing the serial ports. The computer can transfer large blocks of data directly to the memory on the board, then move on to other tasks while the board sends the data out the serial ports one character at a time. Similarly, the board receives input data and stores it in buffers in its dual-ported RAM, so the computer only needs to check periodically to see if data is available.

The dual-ported RAM is memory that is accessible for read and write operations by both the board and the computer. To the computer, the dual-ported RAM looks exactly like its own memory and can be accessed by the same high-speed memory referencing commands the computer uses for its internal memory. This means that a block of data that may take a number of seconds for the SunSAI/P board to receive or transmit to the outside world can be transferred between the board and the computer in mere microseconds.

The SunSAI/P board's dual-ported RAM is mapped into a 4 Mbyte unused area in the host computer's memory address space.

Features

The SunSAI/P board has the following features:

- Serial asynchronous board with eight ports
- Maximum speed 115K bps per port
- Meets PCI local bus specification rev. 2.1
- PCI card: 32-bit data width, short length with 33 MHz operating frequency and 5.0 or 3.3 volts I/O signalling (universal card)

Customer Assistance

Be sure to read the Release Notes, if they are included with this software. The Release Notes contain late-breaking information.

For assistance in the United States, please call 1-800-USA-4SUN.

For information on how to get the latest patches and patch revisions, please visit the SunSolvesm website at <http://sunsolve.sun.com>, or contact your local Sun Service provider. For additional information, access Sun on the World Wide Web at <http://www.sun.com>.

Installing SunSAI/P Boards

This chapter describes how to install the SunSAI/P board into your computer, including:

- [“Before You Install the Board” on page 3](#)
- [“Memory Window Size and Starting Address” on page 5](#)



Before You Install the Board

- Write down the serial number of the board. You will need it if you have to contact Sun regarding the board.
- Note that there are no switches or jumpers on the SunSAI/P board.
- SunSAI/P boards contain static-sensitive components. Always touch a grounded surface to discharge static electricity before handling the circuit board.

Suggested Maximum Number of SunSAI/P Adapters Per System

The table below lists the suggested maximum number of SunSAI/P adapters per Sun™ system.

TABLE 2-1 Suggested Maximum Number of SunSAI/P Adapters Per System

Sun System	Number of SunSAI/P Adapters
Ultra™ 5	3
Sun Enterprise 5S	3
Ultra 10	4

TABLE 2-1 Suggested Maximum Number of SunSAI/P Adapters Per System (*Continued*)

Sun System	Number of SunSAI/P Adapters
Sun Enterprise 10S	4
Ultra 30	4
Ultra 60	4
Sun Enterprise™ 250	4
Sun Enterprise 450	4
Sun Enterprise 3000/4000/5000/6000	4
Sun Enterprise 3500/4500/5500/6500	4

Note – The SunSAI/P software has been tested on the following Solaris operating environments: Solaris 2.6 and Solaris 7 for SAI/P 2.0, and Solaris 8 for SAI/P 3.0

▼ Installing the Board

To install the SunSAI/P board in your computer, follow these steps:

Note – Refer to your system installation or service manual for detailed instructions for the following steps.

1. **Power off your system, using the standard shutdown procedures described in the *Solaris Handbook for Sun Peripherals* or your system service manual.**

The *Solaris Handbook for Sun Peripherals* is shipped with the Solaris operating environment software and is available on the <http://docs.sun.com> website.

2. **Locate an available PCI slot in your computer and remove the slot plate.**
3. **Install the SunSAI/P board according to the instructions in your system service or installation manual.**
4. **Install the connector box assembly on the SunSAI/P board by connecting the male 78-pin plug on the assembly to the female 78-pin connector on the end of the SunSAI/P board. Be sure that the plug is completely installed—it may be a snug fit.**

Note – If you have difficulty connecting the DB-78 connector, try loosening the screw in the endplate (the connector may not be exactly centered in the slot in the back of the computer). Be sure to re-tighten the endplate screw once the DB-78 connector is securely attached.

5. **Screw the connector into the board's endplate. Do not over-tighten the screws. If the screws don't go in several turns, or if they don't reach the nuts in the endplate, the 78-pin connectors are probably not completely mated.**
6. **Replace your computer's cover.**
7. **Power on your system, using the procedures described in the *Solaris Handbook for Sun Peripherals* or your system service manual.**

Memory Window Size and Starting Address

The memory starting address is determined by the system. No switches or jumpers are required to change these parameters.

The SunSAI/P board requires 4 Mbytes of unused PCI memory address space in your computer.

EIA-232 Connectors and Cables

This chapter describes the EIA-232 connectors and cables. It includes the following sections:

- [“Connectors” on page 7](#)
- [“Cables” on page 8](#)

Connectors

SunSAI/P boards are shipped with a connector box ([FIGURE 3-1](#)) that provides eight female DB-25 EIA-232 connectors wired for data terminal equipment (DTE) operation.

The pin assignments for the DB-25 connectors are shown in [TABLE 3-1](#) and follow the usual conventions for EIA-232 wiring.

TABLE 3-1 DB-25 Connector Pin Assignments

Signal	Description	DTE Use	Pin #
GND	Chassis Ground	N/A	Shell
TxD	Transmitted Data	Output	2
RxD	Received Data	Input	3
RTS	Request To Send	Output	4
CTS	Clear To Send	Input	5
DSR	Data Set Ready	Input	6
SG	Signal Ground	<i>reference</i>	7

TABLE 3-1 DB-25 Connector Pin Assignments

Signal	Description	DTE Use	Pin #
DCD	Data Carrier Detect	Input	8
DTR	Data Terminal Ready	Output	20
RI	Ring Indicator	Input	22

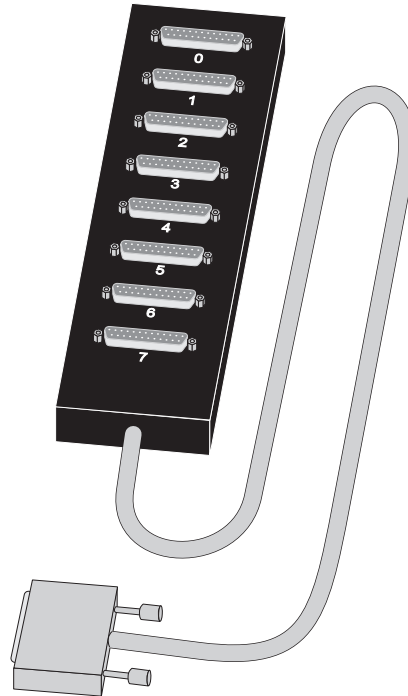


FIGURE 3-1 Eight-Port Connector Box

Cables

EIA-232 serial interface cables should be shielded, low capacitance cables, ideally designed specifically for serial data transmission.

Grounding

The shield should be grounded at both ends of the cable. Chassis Ground, available on the shell of the DB-25 connectors, is ideal for this purpose.

Environment

While good shielding provides reasonable protection against “noise” (Electro-Magnetic Interference, or EMI), cables should still be routed away from noise sources wherever possible. Avoid laying cables in close proximity to transformers, generators, motors, or fluorescent lights.

Capacitance Versus Length of Run

The total capacitance of a cable affects the integrity of transmitted data. As a rule of thumb, the total capacitance of a cable (including the connectors) should not exceed 2500 pF for baud rates of up to 57,600 (1200pF for 115K baud and 600 pF for 230K baud). Serial interface cable is usually rated in pico Farads per foot. Therefore, if a cable has a capacitance of 50 pF/ft, and the connectors are 100 pF each, the maximum recommended cable length is 46 feet for baud rates of up to 57,600. If the cable is rated at 12.5 pF/ft, the maximum recommended cable length is 184 feet, and 5 pF/ft cable can be run up to 460 feet.

In situations where low-capacitance cable is unavailable, or very long cable runs are required, “short-haul” modems, available from suppliers such as Black Box, can be used to increase the effective range of the EIA-232 interface. Short-haul modems are similar to standard modems, except that they are connected directly to each other via a cable instead of going through a telephone circuit.

Note – Use only externally-powered short-haul modems with the SunSAI/P board.

Connecting Peripherals

This chapter discusses various methods of connecting peripheral devices to the SunSAI/P adapter and provides sample cable diagrams to aid in constructing the correct cable for your application, including:

- [“Connecting to a Modem” on page 11](#)
- [“Connecting to a DTE Device” on page 12](#)

Note – The cables shown in this section are for information only and are not supplied by Sun Microsystems.

Connecting to a Modem

To connect the SunSAI/P board to a modem, use a standard “straight-through” cable ([FIGURE 4-1](#)) to connect the modem to one of the DB-25 connectors on the connector box.

Note – Shielded cable must be used to remain in compliance with Part 15 of FCC rules.

Note – If you use modems for dial-in purposes, you may experience a problem where a modem will not hang up the phone line connection after all processes running on the port exit. As a workaround, configure the modem to be a bi-directional modem. Please refer to the Sun bug report number 4178202 for more information.

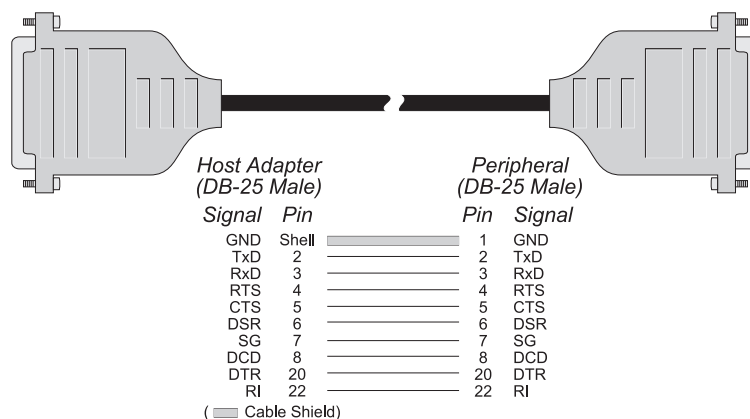


FIGURE 4-1 Modem Cable

Connecting to a DTE Device

Terminals, serial printers, or another computer's serial port are examples of DTE devices. To connect the SunSAI/P board (which is also a DTE device) to another DTE device, you need a null modem cable or adapter.

Software Handshaking (XON/XOFF)

In most cases, serial terminals and printers need only a “three-wire” connection to the SunSAI/P board. The Solaris device driver supports XON/XOFF (software) handshaking, so the only signal lines necessary are Transmitted Data (TxD), Received Data (RxD) and Signal Ground (SG). Cables must be shielded to remain in compliance with FCC certification requirements, and the shield should be connected to Chassis Ground (GND) at both ends of the cable run.

A simple cable for connecting a terminal or a printer to a DB-25 equipped SunSAI/P board is shown in [FIGURE 4-2](#).

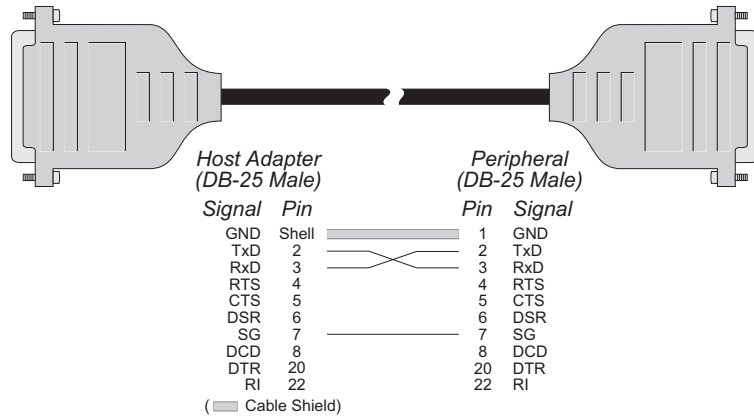


FIGURE 4-2 Simple Terminal/Printer Cable

Note – Shielded cable must be used to remain in compliance with Part 15 of FCC rules.

The cable shown in [FIGURE 4-2](#) is a three-wire null modem cable—that is, Transmitted Data on one end of the cable is connected to Received Data at the other end, and vice versa.

The male DB-25 end can be plugged directly into most serial terminals and printers without any adapters. The female DB-25 end plugs directly into one of the DB-25 connectors on the connector box assembly.

Hardware Handshaking (Ready/Busy)

Most terminals and printers use Data Terminal Ready (DTR) for Ready/Busy hardware handshaking. The cable shown in [FIGURE 4-3](#) supports this method.

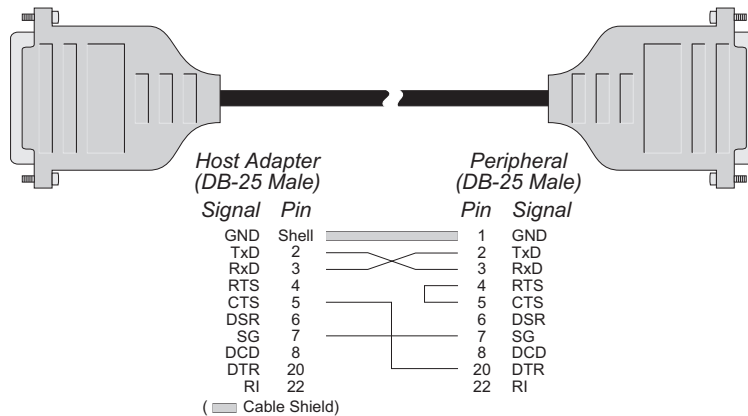


FIGURE 4-3 Terminal/Printer Cable with DTR Handshaking

Note – Shielded cable must be used to remain in compliance with Part 15 of FCC rules.

Note – Some Okidata printers use a control signal on pin 11, called Supervisory Send Data (SSD) instead of DTR. In this case, simply connect CTS on the female DB-25 side to pin 11 of the male DB-25, instead of pin 20. Other printer manufacturers may use different methods of flow control. Consult your printer's documentation for specific wiring requirements.

Using Hardware Flow Control

To use clear to send (CTS)/request to send (RTS) hardware flow control with devices such as modems, we recommend using the options provided by the `/opt/SUNWconn/bin/sitty` utility. Use the `sitty rtspc` and `ctspace` options instead of the following Solaris `stty` command options: `crtcts`, `crtxoff`, `rtxoff` and/or `ctxson`. Refer to the `sitty(1m)` man page and Chapter 7 of the *SunSAI/P User's Guide* for more information about the `sitty` utility.

Device Driver Installation

This chapter describes how to install and configure the driver software, including:

- [“Removing Previous Versions of the Driver Software” on page 15](#)
- [“Installing the SAI/P 2.0 Driver Software for Solaris 2.5.1, 2.6, or 7 Operating Environment” on page 16](#)
- [“Installing the SAI/P 3.0 Driver for the Solaris 8 or 9 Operating Environment” on page 21](#)
- [“Loading the Driver” on page 24](#)
- [“Using saipconfig to Configure the Driver Software” on page 24](#)
- [“Creating New Devices” on page 28](#)
- [“Enabling the New Ports” on page 29](#)
- [“Viewing the Man Pages” on page 30](#)

Removing Previous Versions of the Driver Software

Before installing the SunSAI/P driver software, you must first remove any previous version of the SunSAI/P software that may be present on your system. If you attempt to add the new software packages over existing SunSAI/P packages, the installation will fail.

1. **Become superuser (root).**
2. **Check for existing SunSAI/P software packages on your system:**

```
# /usr/bin/pkginfo | grep SUNWsaip
```

If you find any SunSAI/P packages, you must remove them.

3. Remove any existing SunSAI/P software packages:

```
# /usr/sbin/pkgrm SUNWsaip SUNWsaipu
```

Installing the SAI/P 2.0 Driver Software for Solaris 2.5.1, 2.6, or 7 Operating Environment

To install the driver software, you will first need to mount the CD-ROM on your system. You can then install the driver itself.

▼ To Install the Driver

1. Log onto your system console as superuser (root).
2. Insert the SunSAI/P CD into your system's CD-ROM drive.
 - If your system is running Volume Manager, it will automatically mount the SunSAI/P Software CD-ROM under the /cdrom/sunsaip_2_0 directory.
 - If your system is not running Volume Manager, mount the CD-ROM as follows:

```
# mkdir /cdrom/cdrom0
# mount -F hsfs -o ro /dev/dsk/c0t6d0s2 /cdrom/cdrom0
```

3. Start the software installation by adding the patch appropriate to your operating environment, as follows:

```
# pkgadd -d /cdrom/cdrom0/sunsaip_2.0_u1/Solaris_2.5.1/Packages SUNWsaip
SUNWsaipu
    or
    or
    or:
    or
# pkgadd -d /cdrom/cdrom0/sunsaip_3.0/Solaris_8/Packages SUNWsaip SUNWsaipu
```

Note – For more information about the `pkgadd` utility, refer to the `pkgadd(1m)` man page or the Solaris documentation.

You will see the following, or similar, output:

```
Processing package instance <SUNWsaip> from </cdrom/sunsaip_2.0_u1[or
3.0]/<Solaris Version>/Packages>

Serial Asynchronous Interface Driver (PCI)
(sparc) 2.0,REV=year.month.day or (sparc) 3.0,REV=year.month.day
Copyright 1998 Sun Microsystems, Inc. All rights reserved.
Using </> as the package base directory.
## Processing package information.
## Processing system information.
    10 package pathnames are already properly installed.
## Verifying package dependencies.
## Verifying disk space requirements.
## Checking for conflicts with packages already installed.

    if any conflicting files are found type y to install the file and proceed
## Checking for setuid/setgid programs.
```

4. Answer yes (y) when asked to allow scripts to be run as superuser on your system.

```
This package contains scripts which will be executed with super-user
permission during the process of installing this package.

Do you want to continue with the installation of <SUNWsaip> [y,n,?] y
```

After several status messages, you will see the following, or similar, output:

```
Installation of <SUNWsaip> was successful.

Processing package instance <SUNWsaipu> from </cdrom/sunsaip_2_0/Product>

Serial Asynchronous Interface Utilities (PCI)
(sparc) 2.0,REV=year.month.day
Copyright 1998 Sun Microsystems, Inc. All rights reserved.
Using </opt> as the package base directory.
```

Note – For SAI/P 3.0, the fourth line in the code above reads;
(sparc) 3.0,REV=*year.month.day*

5. Answer yes (y) when asked to allow scripts to be run as superuser on your system.

This package contains scripts which will be executed with super-user permission during the process of installing this package.

Do you want to continue with the installation of <SUNWsaipu> [y,n,?] **y**

The driver installation will continue automatically. You will see the following message when the driver software is successfully installed on your system.

Installation of <SUNWsaipu> was successful.

6. Unmount and eject the SunSAI/P CD.

Directory Structure

[FIGURE 5-1](#) shows the /etc and /kernel directory structure of the SunSAI/P software after it has been installed on your system.

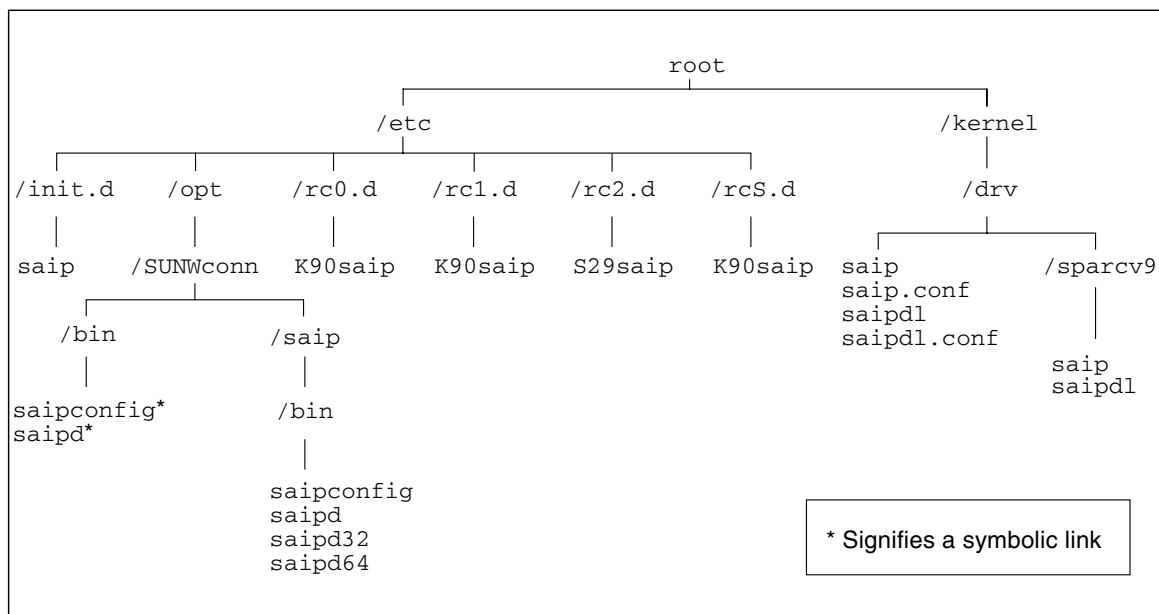


FIGURE 5-1 SunSAI/P Software /etc and /kernel Directory Structure for SAI/P 2.0

FIGURE 5-2 shows the /opt directory structure of the SunSAI/P software after it has been installed on your system.

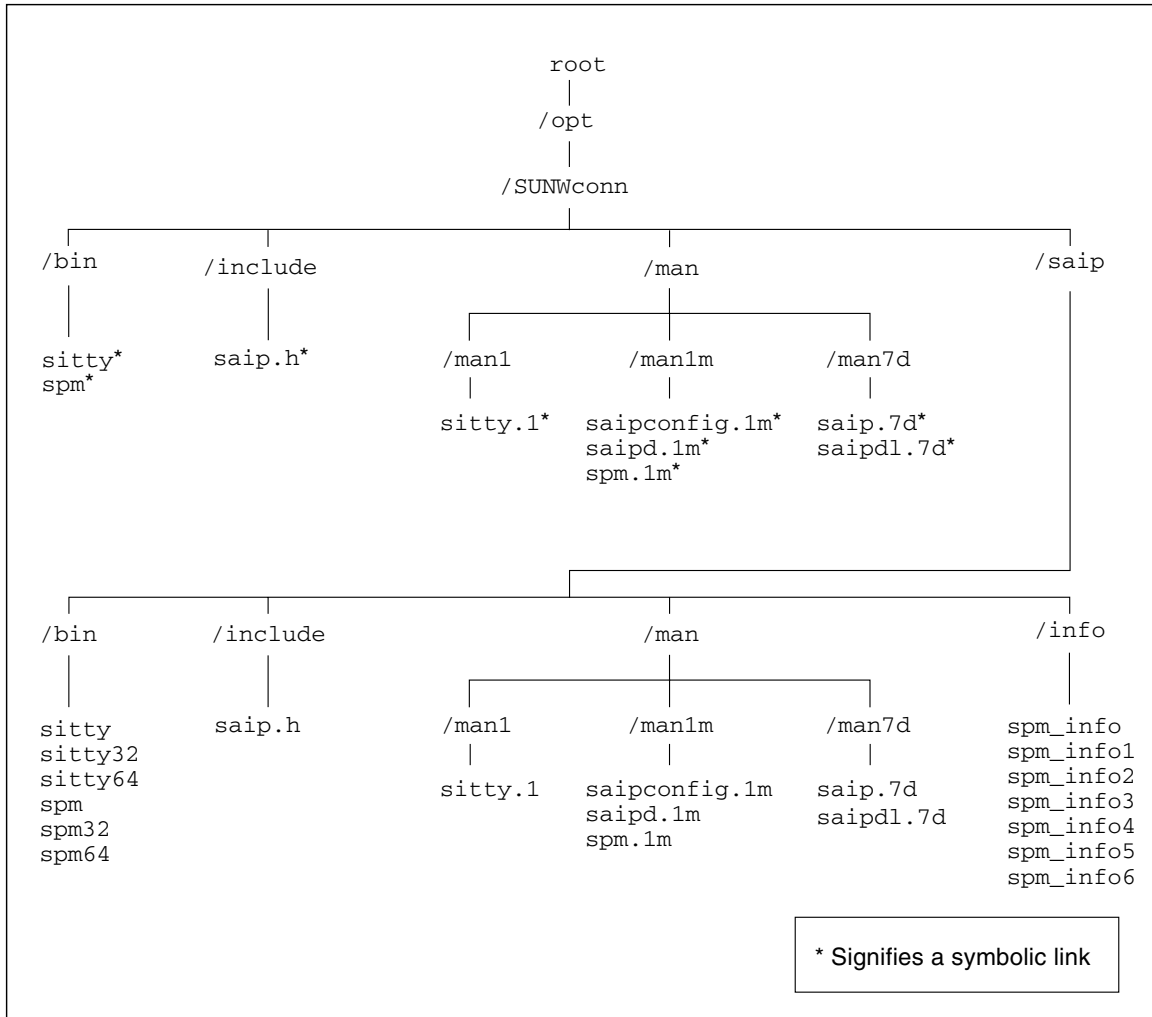


FIGURE 5-2 SunSAI/P Software /opt Directory Structure for SAI/P 2.0

Installing the SAI/P 3.0 Driver for the Solaris 8 or 9 Operating Environment

To install the driver software, first mount the CD-ROM on your system.

▼ To install the Driver

1. Log onto your system console as superuser (root).
2. Insert the SunSAI/P CD into your system CD-ROM drive.
 - If your system is running Volume Manager, it will automatically the SunSAI/P Software CD-ROM under the /cdrom/cdrom0 directory.
 - If your system is not running Volume Manager, mount the CD-ROM as follows:

```
# mkdir /cdrom/cdrom0
# mount -F hsfs -o ro /dev/dsk/c0t6d0s2 /cdrom/cdrom0
```

3. Start the software installation by adding the appropriate package to your Solaris 9 operating environment as follows:

```
# pkgadd -d /cdrom/cdrom0/sunsaip_3.0_u2/Solaris_9/Packages SUNWsaip SUNWsaipu
```

4. Answer **yes (y)** when asked to allow scripts to be run as superuser on your system.

The driver installation continues automatically. You will see the following message when the driver software is successfully installed on your system.

```
Installation of <SUNWsaip> was successful.
```

5. Unmount and eject the SunSAI/P CD-ROM.

Directory Structure

FIGURE 5-3 show the /etc and /kernel directory structure of the SunSAI/P software after it has been installed on your system.

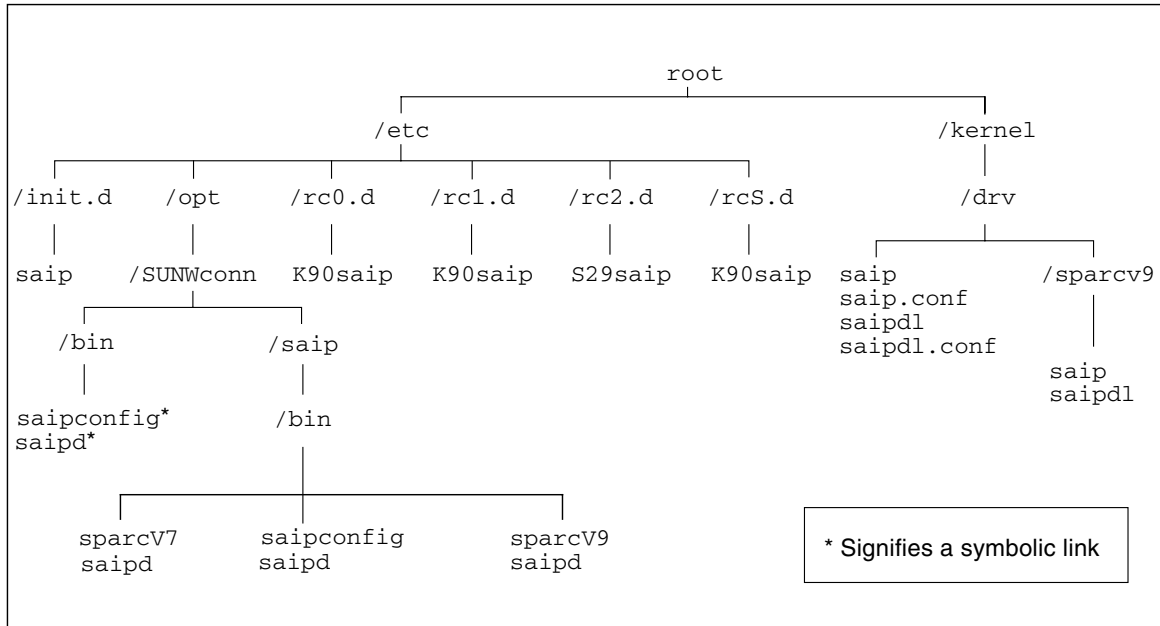


FIGURE 5-3 SunSAI/P Software /etc and /kernel Directory Structure for SAI/P 3.0

FIGURE 5-4 shows the /opt directory structure of the SunSAI/P software after it has been installed on your system.

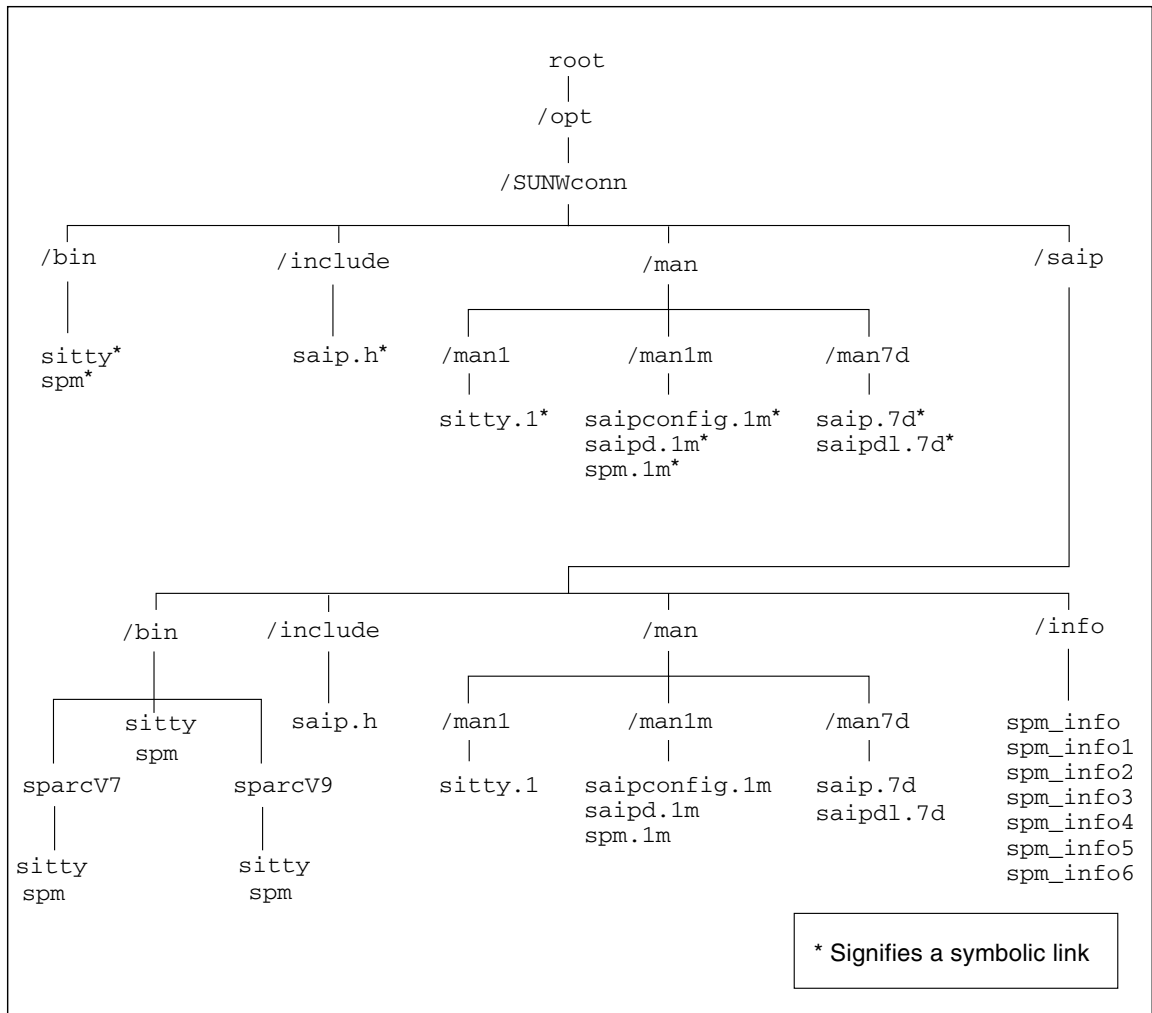


FIGURE 5-4 SunSAI/P Software /opt Directory Structure for SAI/P 3.0

Loading the Driver

The SAI/P driver is automatically loaded once you complete the software installation. When the driver loads, you see the following (or similar) message:

```
SUNWsaip  port:0x00000000  mem=0x00400000  ports=8  SunSAI/P V x.x.x
```

If there is a problem with the board or the driver configuration, you may see error messages after this screen. See [Appendix A](#) for explanations of the error messages.

sitty options set from a run control (rc) script must be set after the download program has run and must wait for the board to boot before running.

sitty options should be added to the end of `/etc/rc2.d`. This can be done by giving it a name such as “S99saip” or “S99sittystuff”, where the “S” must be a capital letter, and the greater the number, the later the script is run.

Using saipconfig to Configure the Driver Software

In some circumstances, you may want to configure the SunSAI/P device driver manually. For example, you may want to use more adapters than are currently loaded in the system, or you may need to change the default configuration. After you have installed the driver software, use the `saipconfig` utility to configure it.

The `saipconfig` utility can be used to configure up to 16 adapters. However, you should not install more adapters in your system than are suggested in [TABLE 2-1](#).



Caution – Only run the `saipconfig` utility on systems with at least one SunSAI/P adapter installed. Running the `saipconfig` utility on a system without a SunSAI/P adapter will cause the driver not to load if the adapter is installed later.

Rebooting the System

If you have installed additional boards since you have installed the driver software, perform a reconfiguration boot before using the `saipconfig` utility.

▼ To Reboot the System

1. Shut down your system and display the OpenBoot™ prompt (ok) using the procedures described in the *Solaris Handbook for Sun Peripherals* or your system service manual.

For example, you can shut down the system using the `shutdown` command:

```
# /usr/sbin/shutdown -y -g10 -i0
```

Refer to the `shutdown(1m)` man page for more information.

2. Perform a reconfiguration boot by typing the following at the OpenBoot prompt:

```
ok boot -r
```

Using the saipconfig Utility to Configure the System Automatically

The `saipconfig` utility enables you to configure the SunSAI/P interfaces on your system automatically.

▼ To Configure the System Automatically

1. Log onto your system console as superuser (root).
2. Start the `saipconfig` utility:

```
# /etc/opt/SUNWconn/bin/saipconfig
```

3. Answer yes (y) to accept the default configuration.

```
The installation has detected 1 SunSAI/P serial adapter.
```

```
Would you like to automatically install the default configuration? y
```

At this point, the `saipconfig` utility will configure the SunSAI/P interfaces automatically. When `saipconfig` has finished configuring the interfaces, you will see this message:

```
Configuration Completed.
```

Configuring the Driver Software Manually

Note – Since the last printing of the *SunSAI/P User's Guide*, the `saipconfig` procedure for manually configuring the driver software has changed. Please see the section below for the correct procedure.

Use the `saipconfig` utility to configure the SunSAI/P adapters on your system manually. The utility will ask you a series of questions about how you want to customize the adapters. After you have answered these questions, the utility will reconfigure the driver software.

▼ To Configure the Driver Software Manually

1. Become superuser, or log onto to your system console as root.
2. Start the `saipconfig` utility:

```
# /etc/opt/SUNWconn/bin/saipconfig
```

3. To configure the adapters manually, answer no (n) to this question:

```
The installation has detected 1 SunSAI/P serial adapter.
```

```
Would you like to automatically install the default configuration? n
```

4. Decide whether you want to select your own instance number:

```
Would you like to select your own instance numbers? (y/n)? y
```

In this example, we have answered `y`, so `saipconfig` will prompt us for instance numbers later in the procedure. If we answered `n`, then the utility would not prompt us for instance numbers.

The saipconfig utility will ask you questions about how you want to configure the SunSAI/P interfaces.

```
This script installs the Sun PCI Serial Asynchronous Interface
driver :
```

```
This script also installs the information needed by Solaris to use
the additional ports available through this driver. Depending upon
your system, this driver may support up to 16 Host Adapters and
(0-51) instances.
```

```
Press <CR> to proceed or "Q" to quit:
```

5. Press the Return key to configure your driver software.

6. Type the number of SunSAI/P adapters you want to configure on your system:

```
NOTE: Although (0-51) instances are allowed, this driver
only supports 16 actual adapters at one time.
How many adapters do you wish to install (1-16)?
```

For each adapter that you specified in [Step 6](#), you will be asked the questions shown in [Step 7](#) through [Step 9](#).

7. Decide if you want to enable interrupts on the SunSAI/P adapter.

Type “y” to disable interrupts (the default value), or type “n” to enable interrupts, on the adapter.

Note – We recommend that you use the default setting of disabled interrupts.

```
Configuring adapter 0.
```

```
Adapter type is 8-port PCI Async Intelligent Adapter.
```

```
8-port adapter:
```

```
In order to reduce response time to small packets (latency), it
may be helpful to enable interrupts on the adapter. However,
doing this will significantly increase driver CPU usage on your
Solaris system. By default, interrupts are disabled.
To enable interrupts, answer no.
```

```
Do you want to keep interrupts disabled on the adapter? (y/n)? y
```

8. If you answered **y** to [Step 4](#), you will be prompted for the instance number of the adapter:

```
What instance number would you like for this adapter? 0
```

The `saipconfig` utility will then display the selected configuration of the adapter.

```
You have selected the following configuration for adapter 0:
```

```
Adapter Type: 8-port PCI Async Intelligent Adapter.
```

```
Module  Port Names
```

```
-----
```

```
1          term/a000 - term/a007 -- also /dev/cua/axxx  
Interrupts disabled.
```

```
Is this configuration acceptable (y or n)? y
```

9. Type **"y"** if you are satisfied with this adapter's configuration.

Type **"n"** if you are not satisfied with the configuration.

```
Is this configuration acceptable (y or n)? n
```

```
Hit <CR> to re-configure adapter #0:
```

Press the Return key to return to [Step 7](#).

After answering these questions for all of the SunSAI/P adapters on your system, `saipconfig` will configure the interfaces automatically. When `saipconfig` has finished configuring the interfaces, you will see this message:

```
Configuration Completed.
```

Creating New Devices

Devices are created in `/dev`, giving the operating system the information to use the additional ports.

The device driver will support up to 16 SunSAI/P adapters, depending upon your system.

The devices are named according to the convention:shown in [TABLE 5-1](#)

TABLE 5-1 Format For Port Names

Format	Description
/dev/term/	Directory path for dial-in devices.
/dev/cua/	Directory path for dial-out devices.
a - z, A - Z	Module letter ID.
000 - 007	Port Number. For example, for the first board, the module letter and port numbers will be a000 - a007. For the second board, they will be b000 - b007.

Note – See [Chapter 6](#) for more information about TTY device names.

Enabling the New Ports

Refer to the Peripheral Setup section of the Solaris *System Administration Guide* for details on how to enable serial ports.

Note – The *System Administration Guide* is shipped with the Solaris operating environment and is also available at the <http://docs.sun.com/> website.

The following example shows how to set up serial ports for use with terminals:

▼ To Edit the New Ports

1. **Connect terminals to the ports (using a null modem, if necessary) and test the connections to each terminal by entering the following command for each port added:**

```
# date > /dev/cua/a000
```

(The command above assumes the terminal is connected to a000.)

Note that the `date` command is used as a simple test, to provide text output that can be redirected; there is no other significance to `date` in this test.

- If the date appears on the terminal screen, the device is properly connected.
- If the date does not appear on the terminal screen, then that terminal is not receiving data. Check the power, cables, connections, and so on.
- If nonsense characters are printed on the terminal screen, check the baud rates, data bits, stop bits, and parity setting on your terminal.

Once you can redirect output to a terminal with the test above, perform the following steps to enable that port:

2. Log onto the console as superuser (root).
3. Type (on a single command line):

```
# pmadm -a -p zsmon -s a000 -fu -i root -v `ttyadm -V` \
-m "`ttyadm -d /dev/cua/a000 -l 9600 -s /usr/bin/login`"
```

This will enable the port suitably for a terminal.

Note – Ports may also be enabled through the Solaris `admintool` program. Refer to the *System Administration Guide* for more information.

Viewing the Man Pages

The SunSAI/P man pages are installed in the `/opt/SUNWconn/man/` directory. Before you can view the man pages, you must add this directory to your `MANPATH` environment variable. The location of the `MANPATH` variable will depend on which UNIX shell you are using.

▼ To Edit the C Shell Environment

1. **Examine your `$HOME/.login` and `$HOME/.cshrc` files to locate the `MANPATH` variable.**

2. Using a text editor, add the following line to the end of the file that contained the `MANPATH` variable:

```
setenv MANPATH "/opt/SUNWconn/man/:$MANPATH"
```

If neither of these files contain this variable, add the following line to the end of one of the files, or contact your system administrator for assistance:

```
setenv MANPATH "/opt/SUNWconn/man/"
```

3. Use the `source` command on the file you edited to make the changes effective in your current window.

For example, if you added the `MANPATH` line to the `.login` file, you would type:

```
% source $HOME/.login
```

Note – If you log out and log back into your system, you will update the `MANPATH` variable in all command windows and shells.

▼ To Edit the Bourne or Korn Shell Environments

1. Using a text editor, add the following two lines to the end of the `$HOME/.profile` file:

```
MANPATH=/opt/SUNWconn/man:$MANPATH
export MANPATH
```

If this file did not already contain this variable, add the following lines to the end of the file, or contact your system administrator for assistance:

```
MANPATH=/opt/SUNWconn/man
export MANPATH
```

2. Make the changes effective in your current window:

```
$ . $HOME/.profile
```

Note – If you log out and log back into your system, you will update the MANPATH variable in all command windows and shells.

Viewing the Man Pages

Once you have added the `/opt/SUNWconn/man/` directory to your MANPATH variable, you can use the `/usr/man` command to view these SunSAI/P man pages:

- `saip(7d)`
- `saipconfig(1m)`
- `saipd(1m)`
- `saipdl(7d)`
- `sitty(1)`
- `spm(1m)`

▼ To Uninstall the Device Driver

Enter the following commands to uninstall the device driver software:

1. **Log onto the console as superuser (root).**
2. **Enter the following command:**

```
# /usr/sbin/pkgrm SUNWsaip SUNWsaipu
```

You will see:

```
This package contains scripts which will be executed with super-user  
permission during the process of removing this package.
```

```
Do you want to continue with the removal of this package [y,n,?,q] y
```

Answer `y`. The packages containing the driver and associated utilities will now be removed from the system. In the event that some of the ports were open when `pkgrm` was initiated, the unloading of the driver will fail. In this case, reboot your system to complete the driver removal.

TTY Devices

This chapter describes the two different device types supported by the SAI/P device driver, including:

- [“Supported TTY Device Types” on page 33](#)

Supported TTY Device Types

The device driver supports two different device types on each line. On line “a000”, where “a” refers to the first SunSAI/P board, and “000” refers to first line (port) on that board, there are two devices:

- `/dev/term/a000`

Dial-in TTY device, used for terminals, modems, printers, laboratory equipment, etc.

This device is a traditional UNIX port with modem control. It requires Data Carrier Detect (DCD) to be high before it will operate.

When used with a modem, the port will wait for carrier before sending out the `login:` prompt, so the user is greeted properly upon making a connection.

When used with a terminal or other device, it is usually wise to wire the SunSAI/P DCD signal to the terminal's DTR (Data Terminal Ready) line. When the terminal is turned on, the system outputs a `login:` prompt. When the terminal is turned off, any associated jobs are killed, and the user is logged out.

- `/dev/cua/a000`

Dial-out TTY device. This is the same as `/dev/term/a000` with the exception that Data Carrier Detect need not be present to open the device. Once a connection is established and DCD becomes active, standard devices behave in

the same way as modem devices— subsequent loss of the Data Carrier Detect signal will cause the jobs to be killed and the user will automatically be logged off.

Setting Terminal Options with the `sitty` Utility

This chapter describes how to set the terminal options using the `sitty` utility, including;

- [“Using the `sitty` Utility” on page 35](#)
 - [“Setting the `sitty` Command Options” on page 36](#)
-

Using the `sitty` Utility

The utility program `sitty` sets and displays the terminal options for the SunSAI/P adapter software.

The `sitty` command must be run each time the machine is booted if non-default settings are required for certain ports. Usually, the best way to do this is by adding `sitty` commands to your system initialization file. (You can put them in a text file in the `/etc/rc2.d` directory, and give the file a name such as `/etc/rc2.d/S99saip` or `/etc/rc2.d/S99sittystuff`; refer to the *Solaris System Administration Guide* for details.) Alternatively, you can include the `sitty` command sequence in your `.login` or `.profile` files. Your system administrator can help you edit these files. The full pathname for the command is `/opt/SUNWconn/bin/sitty`.

The format is:

```
sitty [-a] [option(s)] [< ttyname]
```

With no options, `sitty` displays all SunSAI/P special driver settings, modem signals, and all standard parameters for the TTY device referenced by standard input.

Setting the `sitty` Command Options

Command options are provided to change flow control settings, force modem control lines, and display all TTY settings (see [TABLE 7-1](#)). Any unrecognized options are passed to `stty(1)` for interpretation.

TABLE 7-1 `sitty` Options

Option	Description
<code>-a</code>	Displays all unique SunSAI/P option settings, as well as all of the standard TTY settings reported by <code>stty -a</code> .
<code>ttyname</code>	Sets and displays options for the given TTY device, instead of standard input. <i>ttyname</i> is the full pathname (e.g. <code>/dev/term/a000</code>) of the device.
The following options specify transient actions to be performed immediately.	
<code>break</code>	Sends a 250 MS break signal out on the TTY line.
<code>flush</code>	Immediately flushes (discards) TTY input and output.
<code>flushin</code>	Flushes TTY input only.
<code>flushout</code>	Flushes TTY output only.
The following options are “sticky”, which means that the effects continue until the system is rebooted or until the options are changed.	
<code>[-]fastbaud</code>	Alters the baud rate tables, so that the following baud rate changes take place: 50=56700, 75=76800, 110=115200 , 200=230000, 300=76800, 600=115200, 1200=230000, and 1800=28800. For example, 50 baud becomes 57,600 baud, 75 baud becomes 76,800 baud, and so on.
<code>[-]forcedcd</code>	Disables [re-enables] carrier sense, so the TTY may be opened and used even when carrier is not present.
<code>[-]altpin</code>	Switches the function of the DSR and the DCD inputs on the modular connector, so that DCD is available when using an 8-pin RJ-11 connector instead of the 10-pin RJ-45 connector.

TABLE 7-1 `sitty` Options (*Continued*)

Option	Description
<code>edelay n</code>	<p>Sets the number (<i>n</i>) of milliseconds of delay between the time the first character arrives after a period of no characters and notification of its arrival to the host. This delay is also referred to as the wakeup rate between the host adapter software (FEPOS) and the host device driver. This has the advantage of reducing host overhead by allowing the host to process larger blocks of incoming data.</p> <p>Larger <code>edelay</code> values result in more characters being sent in a given time period. This will reduce host processor overhead and increase overall system throughput. Smaller <code>edelay</code> values result in fewer characters being sent in a given time period. This will increase character response time and increase host processor overhead.</p> <p>The default value for <code>edelay</code> is 100. This is a good value for normal TTY activity such as typing. For some applications like <code>uucp</code>, decreasing the <code>edelay</code> value may increase character throughput, but will result in increased system overhead. For applications receiving continuous input at high speeds, increasing <code>edelay</code> will result in lowering host overhead and increasing overall system throughput. A value of 250 is reasonable.</p> <p>The following options specify actions which are not “sticky”, meaning that the changes are reset when the device is closed, and that the device will use the default values the next time it is opened.</p>
<code>stopout</code>	Stops output exactly as if an <code>xoff</code> character was received.
<code>startout</code>	Restarts stopped output exactly as if an <code>xon</code> character was received.
<code>stopin</code>	Activates flow control to stop input.
<code>startin</code>	Releases flow control to resume stopped input.
<code>[-]dtr</code>	Raises [drops] the DTR modem control line, unless DTR hardware flow control is selected.
<code>[-]rts</code>	Raises [drops] the RTS modem control line, unless RTS hardware flow control is selected.
<code>[-]rtspace</code>	Enables [disables] RTS hardware input flow control, so RTS drops to pause remote transmission.
<code>[-]ctspace</code>	Enables [disables] CTS hardware output flow control, so local transmission pauses when CTS drops.

TABLE 7-1 `sitty` Options (*Continued*)

Option	Description
<code>[-]dsrpace</code>	Enables [disables] DSR hardware output flow control, so local transmission pauses when DSR drops.
<code>[-]dcdpace</code>	Enables[disables] DCD hardware output flow control, so local transmission pauses when DCD drops.
<code>[-]dtrpace</code>	Enables [disables] DTR hardware input flow control, so DTR drops to pause remote transmission.

For more information, refer to the `sitty(1)`, `stty(1)`, `ioctl(2)`, `termio(7i)`, and `terminfo(4)` man pages.

Sun Port Manager

This chapter describes how to use the Sun Port Manager (SPM) tool, including:

- [“Using Sun Port Manager” on page 39](#)

Using Sun Port Manager

Sun Port Manager (SPM) is a software tool which provides a means to monitor the status of the Front End Processor/Operating System (FEP/OS), which is the on-board software run by the SunSAI/P.

SPM also shows the status of the individual ports on a module by displaying a simulated modem status register. Each of the eight supported EIA-232 signals is displayed, along with input and output flow control status.

Note – The `spm` utility will display the port settings of no more than eight SunSAI/P adapters. Refer to Sun bug report number 4176486 for more information.

SPM is installed automatically when you install this device driver, and can be run from any terminal on the system.

▼ To Use Sun Port Manager

- Enter the following command from any terminal, or the system console:

```
spm [-l logfile]
```

The `-l logfile` option specifies the file path for screen dumps. If this option is not specified, the default log file path is `/tmp/spmlog`. The Sun Port Manager is fully documented in context-sensitive help screens.

Note – The correct way to exit from the `spm` utility is to press the `q` key. If you attempt to use the Escape key to quit the utility, the `spm` utility may terminate with an error and create a core file.

Error Messages

This appendix describes the error messages generated by the SAI/P device driver.

- [“Error Message Meanings and Workarounds” on page 41](#)

Error Message Meanings and Workarounds

The following error messages are generated by the device driver:

WARNING: PCI SAI/8 memory allocation error. <2>

What it means: The operating system would not allocate memory to the driver.

Action to take: Adjust kernel resources. Reboot.

WARNING: PCI SAI/8 not resetting. <3>

What it means: The board doesn't respond to reset.

Action to take: Make sure the board is fully seated in the slot. Potential hardware problem.

WARNING: PCI SAI/8: No memory at 0xXX <4>.

What it means: The driver cannot read the board's dual ported memory.

Action to take: Make sure the board is fully seated in the slot. Potential hardware problem.

WARNING: PCI SAI/8: port X failed diagnostics <5>.

What it means: The driver encountered an error executing the on-board BIOS.

Action to take: Potential software problem.

WARNING: PCI SAI/8 FEPOS not functioning. <7>

What it means: The driver encountered an error executing the on-board FEPOS.

Action to take: Potential software problem. Potential hardware problem.

WARNING: saip_driver attach(0): Can't get config info for PCI saip8 (#0)

What it means: The driver found a board in the system that has not been configured.

Action to take: Uninstall driver with `pkgrm`. Install driver with `pkgadd`. Either use the auto-install option or select the appropriate number of boards.

Specifications

This appendix lists the specifications for the SunSAI/P board. This appendix contains the following sections:

- [“Power Requirements” on page 43](#)
- [“Physical Characteristics” on page 44](#)
- [“Environmental Requirements” on page 44](#)
- [“Serial Interface Surge Suppression Requirements” on page 45](#)

Power Requirements

- +5 VDC 5%:960 mA typical
- +12 VDC 5%:80 mA typical
- -12 VDC 5%:80 mA typical
- +3.3 VDC 5%:20 mA maximum

Physical Characteristics

TABLE B-1 Physical Characteristics

Dimension	Measurement
Length	6.875 inches(17.46 cm)
Width	0.5 inches inches (0.127 cm)
Height	4.2 inches (10.69 cm)
Weight	6.1 ounces (172.93 grams)

Environmental Requirements

TABLE B-2 Environmental Requirements

Specification	Measurement
Ambient temperature	10° C to 55° C
Relative humidity	5% to 90%
Air movement	30 CFM forced
Altitude	0 to 12,000 feet

Serial Interface Surge Suppression Requirements

TABLE B-3 Serial Interface Surge Suppression Requirements

Specification	Measurement
Threshold voltage (TxD & RxD)	12 Volts
Threshold voltage (Control Lines)	12 Volts
Response time	Less than 10 nS

SunVTS Diagnostic Testing

This appendix provides an overview of the SunVTS diagnostic application. This appendix contains the following section:

- “SunVTS Diagnostic Software” on page 47

SunVTS Diagnostic Software

The SunVTS™ software executes multiple diagnostic hardware tests from a single user interface and is used to verify the configuration and the functionality of most hardware controllers and devices. The SunVTS software primarily operates from a user interface that allows you to control all aspects of the diagnostic test operation.

The `saiptest` diagnostic, which is shipped with the SunVTS software, checks the functionality of SunSAI/P adapters. This diagnostic can be run from the SunVTS user interface, or it can be run from the command line. Refer to the *SunVTS Test Reference Manual* for more information about the `saiptest` test.

Refer to the SunVTS documentation (listed in [TABLE C-1](#)) for instructions on how to run and monitor the `nettest` diagnostic. These SunVTS documents are available online at the following URL:

http://www.sun.com/products-n-solutions/hardware/docs/Software/system_administration/tools/testing_valid/sunvts/index.html

Select the document for the Solaris release on your system.

TABLE C-1 SunVTS Documentation

Title	Description
<i>SunVTS User's Guide</i>	Describes the SunVTS diagnostic environment
<i>SunVTS Test Reference Manual</i>	Describes each SunVTS test (including the <code>nettest</code>) and describes the various test options and command-line arguments
<i>SunVTS Quick Reference</i>	Provides an overview of the user interface

The main features of the SunVTS environment include:

- SunVTS kernel

The SunVTS kernel (`vtsk`) controls all facets of the SunVTS environment. When activated, `vtsk` probes the hardware configuration of the system being tested and responds to commands from `vtsui` and `vtstty`. `vtsk` coordinates the operation of individual tests and manages the messages sent by these tests.

- SunVTS user interface

The SunVTS graphical user interface (`vtsui`) operates on the windowing system. `vtsui` controls `vtsk` and allows you to set user options, start and stop tests, and read log files.

- SunVTS TTY interface

The `vtstty` TTY user interface controls `vtsk` from either a command shell or a terminal attached to a serial port. Most options available in `vtsui` have equivalent options in `vtstty`.

Note – Some of the `saiptest` tests require a EIA-232 loopback plug (part number: 540-1558), which can be ordered through Sun.

Note – At the time of the printing of this document, the SunVTS™ `saiptest` diagnostic may fail when testing a SunSAI/P adapter using the external 25-port loopback mode option. As a workaround, you can verify the SunSAI/P adapter using the `saiptest` internal loopback test mode. For more information, refer to Sun bug report number 4171288.

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