Sun HSI/P User's Guide

Sun

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Regulatory Agency Compliance Statements

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 A 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 A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

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.

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 A Notice - Avis DOC, Classe A

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

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

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

第一種VCCI基準について

第一種VCCIの表示があるワークステーションおよびオプション製品は、第一種情報装置です。これらの製品には、下記の項目が該当します。

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EEC Electormagnetic Compatibility Directive

CE The product(s) described in this manual conform to the **EU 89/336/EEC Electromagnetic Compatibility Directive, ammended by 92/31/EEC and 93/68/EEC.**

The products described in this manual are:

Sun HSI/P (High-Speed Serial Interface/PCI Bus) Adapter

The product identified above comply with the **EU 89/336/EEC Electromagnetic Compatibility Directive** by meeting the applicable EU standards.

WARNING NOTICE

In order to comply with the EU 89/336/EEC Electromagnetic Compatibility Directive, shielded cables must be used with this product.

Declaration of Conformity

Compliance ID: PTI-334

Product Name: Sun/HSI/P Adapter

This equipment complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:1) This equipment may not cause harmful interference and 2) This equipment must accept any interference that may cause undesired operation.

In addition this equipment complies with the following requirements of the EMC Directive 89/336/ EEC and Low Voltage Directive 73/23/EEC;

EMC:	EN55022/CISPR22 (1985)		Class B
	EN50082-1	ICEC801-2 (1991)	4 kV (Direct), 8 kV (Air)
		ICEC801-3 (1984)	3 V/m
		ICEC801-4 (1988)	1.0 kV Power Lines, 0.5 kV Signal Lines
	EN61000-3/IEC1000-3-2 (1994)		Pass (Class D)

Supplementary Information:

This product was tested and complies with all the requirements for the CE Mark.

_____/S/_____   _____/S/_____

  Dennis Symanski Date   Stephen McGoldrick Date

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Preface

Introduction

This document provides information for users of the Sun HSI/P, High Speed Interface (HSI) adapter for PCI applications. Instructions include installation, setup, and use of the Sun HSI card and software, and is intended to be used by either first-time or experienced users.

If you have just acquired this product, review the introductory sections and follow the guidelines for installation and getting started.

More information regarding the technology used in the design of this product can be found in "Related Documents" on page xii.

How This Book Is Organized

The manual is organized as follows:

Glossary is a list of words and phrases found in this book and their definitions.

Chapter 1, "Overview," Provides an introduction and general overview of the Sun HSI. It is intended as a quick summary of HSI/P features and provides a framework for the rest of the document.

Chapter 2, "Installation," details how to configure and install the HSI/P Adapter hardware.

Chapter 3, "Installation Of The HSI/P Software," details how to install the HSI/P Adapter software.

Chapter 4, "Functional Description," The Functional Description provides a detailed description of Sun HSI architecture and functional blocks.

Appendix A, Gives information on the Pin Outs on the various connectors and how to create null modem adapters for the HSI/P Adapter hardware.

Index.

Related Documents

The following documents provide additional information regarding the technology used for the HSI/P product.

- PCI Local Bus Specification; Revision 2.1, 1995. PCI Special Interest Group; P. O. Box 14070, Portland, OR 97214.

- MC68360 Quad Integrated Communications Controller, User's Manual; M68360UM/AD; Motorola Incorporated. Motorola Literature Distribution; P.O. Box 20912; Phoenix, AZ 85036.

- M68000 Family Programmer's Reference Manual; M6800PM/AD. Motorola Incorporated, 1989. Motorola Literature Distribution; P.O. Box 20912; Phoenix, AZ 85036.

- PCI Bus Interface and Clock Distribution Chips; Product Catalog 1995. PLX Technology; 625 Clyde Avenue; Mountain View, CA 94043.

Ordering Sun Documents

The SunDocs℠ program provides more than 250 manuals from Sun Microsystems, Inc. If you live in the United States, Canada, Europe, or Japan, you can purchase documentation sets or individual manuals using this program.

For a list of documents and how to order them, see the catalog section of the SunExpress™ Internet site at `http://www.sun.com/sunexpress`.

What Typographic Changes Mean

The following table describes the typographic changes used in this book.

TABLE P-1   Typographic Conventions

Typeface or Symbol	Meaning	Example
`AaBbCc123`	The names of commands, files, and directories; on-screen computer output	Edit your `.login` file. Use `ls -a` to list all files. `machine_name% You have mail.`
`AaBbCc123`	What you type, contrasted with on-screen computer output	`machine_name%` **`su`** `Password:`
AaBbCc123	Command-line placeholder: replace with a real name or value	To delete a file, type `rm` *filename*.
AaBbCc123	Book titles, new words or terms, or words to be emphasized	Read Chapter 6 in *User's Guide*. These are called *class* options. You *must* be root to do this.

Shell Prompts in Command Examples

The following table shows the default system prompt and superuser prompt for the C shell, Bourne shell, and Korn shell.

TABLE P-2   Shell Prompts

Shell	Prompt
C shell prompt	`machine_name%`

TABLE P-2 Shell Prompts

Shell	Prompt
C shell superuser prompt	machine_name#
Bourne shell and Korn shell prompt	$
Bourne shell and Korn shell superuser prompt	#

Getting Help

If you have problems installing or using this product after reading this document, call you local service provider and have the following information ready:

- System model and serial numbers
- SunOS release number
- SunLink HSI/P software (1.0) version number
- Type of keyboard
- Number of CPUs
- Number of HSI/P adapter cards

You can display machine and software information needed for help calls by entering the following on-line command:

```
hostname% showrev
```

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 contact your local Sun Service provider.

For additional information, access Sun on the World Wide Web at **http://www.sun.com** and select **Sales and Service.**

If you have questions about Sun™ support services or your shipment, call your authorized service provider.

Glossary

Bps	Bytes per second.
bps	Bits per second.
CPU	Central Processing Unit.
DMA	Direct Memory Access, hardware controller block data transfers.
DMAC	Direct Memory Access Controller.
DRAM	Dynamic Random Access Memory.
half-word	In this manual, this term indicates a 16-bit value.
HDLC	High-Level Data Link Control.
Lbus	Local Sun HSI onboard bus.
MByte	Megabyte.
MPU	Micro-Processor Unit.
ms.	Millisecond.
PCI9060	PCI Bus Master Interface Chip.
QUICC	Quad Integrated Communications Controller.
reserved	The term used for bits, bytes, fields, code values, etc. that are set aside for future use.
SCC	QUICC Serial Communications Controller.
SDLC	Synchronous Data Link Control.
SMC	QUICC Serial Management Controllers.
word	In this manual, this term indicates a 32-bit value.
xxh	Numbers followed by lowercase h are hexadecimal values. All other numbers are decimal values To help with readability, large hexadecimal values use a '.' to indicate 16 bit (4 nibble) boundaries. In this document, the period does NOT indicate a decimal place in a hexadecimal number.

CHAPTER **1**

Overview

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1.1   Overview

The Sun HSI/P, High Speed Interface adapter for PCI applications (HSI/P), offers comprehensive "Plug N' Play" compatibility with SunLink WAN software packages available through SunSoft. This is accomplished through the Sun HSI/P, High Speed Interface adapter for PCI applications (HSI/P) software driver, a transparent interface that operates on the HSI/P and provides a compliant environment for the SunLink WAN packages that currently operate on similar Sun communication modules.

The HSI/P is an intelligent four port communication controller which includes an onboard CPU and memory dedicated to the WAN communication function. This architecture operates much more efficiently at high data rates than "unintelligent" WAN modules. Onboard intelligence allows the workstation/server to be off-loaded from many of the low level communication tasks that it must perform when there is no native intelligence on the controller.

The HSI/P comes with the RS-449 industry standard connectors (i.e. DB-37).

The SunLink protocol products that operate with Sun HSI/P, High Speed Interface adapter for PCI applications (HSI/P) on the HSI/P include SNA 3270, SNA Peer-To-Peer, OSI, X.25, Internetwork Router(IR), PPP, Frame Relay, etc. Sun HSI/P, High Speed Interface adapter for PCI applications (HSI/P) conforms to the Sun Synchronous Serial Driver Interface Specification and is supported under the Solaris 2.5.1 Hardware: 4/97 operating system.

1.2 Features

- T1/E1 transfer speed simultaneously on all 4 ports.

- Meets PCI local bus specification, rev. 2.1

- 32 bit data width, short form board.

- 33MHz operating frequency with 5 V I/O signaling

- Full RS-449 support on all four ports

- Synchronous

- Programmable speed

Hardware Installation

2.1 Process

A simplified version of the installation process follows:

1. **Configure the Sun HSI/P Adapter for your application. Section 2.2, "Configuring the Sun HSI/P," on page 2-2**

2. **Install the Sun HSI/P. Section 2.2.2, "HSI/P Installation," on page 2-3**

3. **Bring up your system.**

4. **Install the HSI/P Software. Section 3.1, "Software Installation," on page 3-1**

5. **Reboot your system.**

6. **Check to make sure that the hardware and software install is complete and correct. Section 3.1.3.5, "Testing The Hardware And Software Install," on page 3-8**

2.2 Configuring the Sun HSI/P

2.2.1 Mechanical Layout

FIGURE 2-1 Layout Drawing
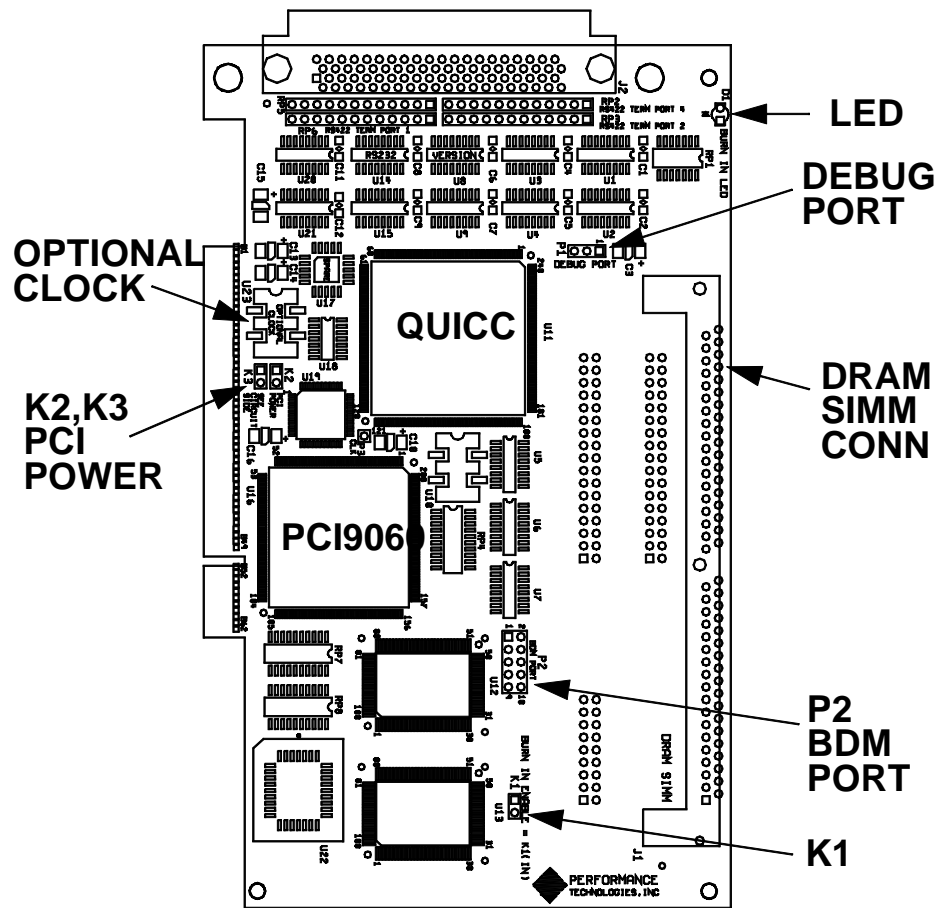
2.2.1.1   Jumper Block Options

Jumpers are factory installed at K-2 and K-3. The following indicates the factory default settings, with no jumper at K1.

TABLE 2-1   K2,K3 Jumper

K2,K3 Positions	Operations	Max DRAM
OUT,IN	Sun HSI/P max power = 15W	8-MB

2.2.2   HSI/P Installation

⚠️ **Caution –** CAUTION: Electronic components on printed circuit boards are extremely sensitive to static electricity. Ordinary amounts of static electricity generated by your clothing or work environment can damage the electronic equipment. It is recommended that when installing the HSI/P in a system that anti-static grounding straps and anti-static mats are used to help prevent damage due to electrostatic discharge.

1. Quit all applications. Power down the Quark P1 and any attached peripherals. Remove the cover according to the system hardware installation instructions.

2. Select an available 5 Volt PCI slot and remove the slot filler panel.

3. Slide the HSI/P into the PCI connector of the system unit. Make sure the front plate on the HSI/P card mounts flush with the chassis panel opening.

4. Install the front plate screw to secure the HSI/P card into the chassis. This also provides a chassis ground connection to the HSI/P.

5. Replace the cover.

6. Install the serial port cable assembly to the HSI/P connector.

7. Re-connect any cables from the peripheral devices.

This completes the hardware installation. At this point, turn power back on to the Quark P1 and proceed to the Software Installation Instructions that have been provided.

2.2.3 HSI/P Cabling

The Sun HSI/P provides external connectivity through a passive cabling system. A "Hydra style" connector provides front panel serial port connectivity to four DB37 connectors for the RS-449 in DTE configuration (female connector).

Installation Of The HSI/P Software

3.1 Software Installation

This chapter describes how to install the HSI/P software. Software for unbundled products running under Solaris 2.5.1 Hardware: 4/97 operating system, is distributed in the form of software packages. You need to mount the distribution device (CD-ROM or file system), then using the `pkgadd(1m)` to install the software packages, unmount the distribution device once the installation is complete.

You can use the `pkgadd` command to install software packages, to spool software packages for installation at a later date, or to remove software packages from your system. for more information see the *Solaris 2.5 System Configuration and Installation Guide*. When you have completed the installation of your software and run the post-installation script you will have created the software directories and files illustrated in "HSI/P Software Directories and Files" on page 2.

FIGURE 3-1 HSI/P Software Directories and Files

HSI/P Software Files

```
                              root
                    /opt              /usr
                /SUNWconn            /kernel
                                      /drv
                                     /HSIP
   /bin ──────────── /hsip ──────────── /man

 hsip_init
 hsip_loop
 hsip_stat
              /drv    /man     /sundiag  /utilities
              HSIP   hsip.7              hsip_init
                     hsip_init.1m        hsip_loop
                     hsip_loop.1m        hsip_stat
                     hsip_stat.1m
```
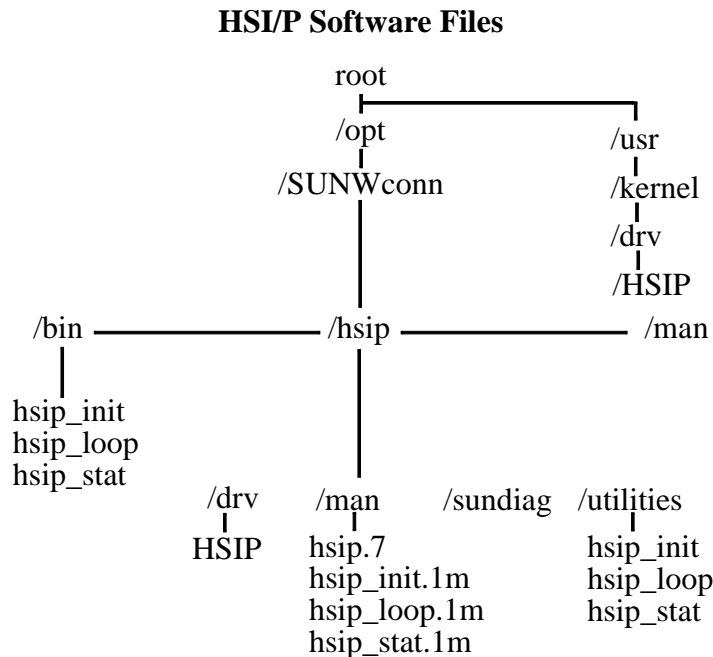
FIGURE 3-2 HSI/P Devices Created by the Postinstall Script

HSI/P Devices Created by the Postinstall Script

```
                              root
                              /dev

    /hihp        /hihp0      /hihp4      /hihp8      /hihpn
 Clone device    /hihp1      /hihp5      /hihp9      /hihpn
 (Control Port)  /hihp2      /hihp6      /hihp10     /hihpn
                 /hihp3      /hihp7      /hihp11     /hihpn
                 Board 1     Board 2     Board 3     Board N
```
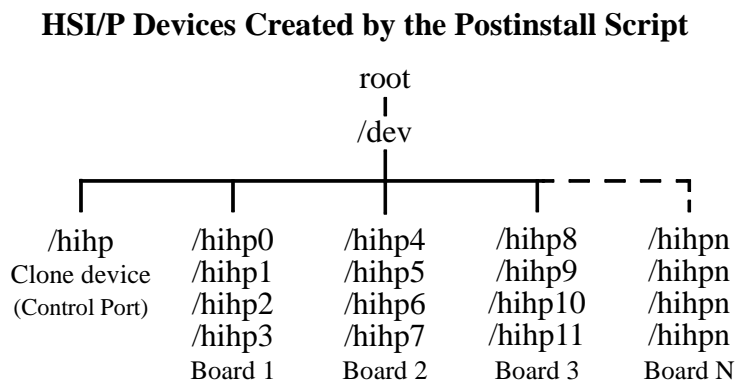
3.1.1 Installation Requirements

The following checklist is provided to help you gather information you must have to complete the installation procedures.

1. Does your Quark P1 have PCI slots? _____

2. Is your machine running Solaris 2.x O/S Hardware: 4/97 or later_____

3. Installation medium is a CD-ROM. Does your system have one? _____

4. Installation directory (default directory is /opt). _____

5. Use the following command to check for disk space _____

```
df -k /opt
```

TABLE 3-1   Required Free Space

Package Name	Required Free Space (MBytes)
ComLink	1

6. Do you have the superuser password for both the system where the software is to be installed and the system with the CD-ROM drive, if different?_____

3.1.2 Before Installing the HSI/P Software

1. Verify that your system meets the software and hardware installation requirements.

2. Log in as root or become superuser

You must possess superuser privileges to invoke the pkgadd command. This means that all pre-installation scripts that are delivered as part of the software package will be executed with superuser privileges.

```
hostname% /usr/bin/su
Password: <your root password>
```

3. Change to the root directory system

This step ensures that you will have write permission for the local directory.

```
hostname # cd /
```

3.1.3   Installing and Mounting the CD-ROM

The HSI/P software is distributed on a CD-ROM. You must have access to either a local CD-ROM drive, or a driver that is accessible remotely via an existing network.

Note – Your target machine for *installing* the HSI/P software must always be a system running Solaris 2.x O/S. You can use a remote SunOS 4.1.x system to provide the CD-ROM drive.

3.1.3.1   Mounting the CD-ROM from a Local CD Drive

Note – If your system is running Solaris 2.x it is not necessary to mount the CD-ROM. Your system will mount the CD-ROM automatically by the volume management software.

Use the following steps to mount the CD-ROM from a local CD drive if it is not automatically mounted as /cdrom:

1. **If you have not done so, login as the superuser:**

   You must possess superuser privileges to invoke the pkgadd command. This means that all pre-installation scripts that are delivered as part of the software package will be executed with superuser privileges.

   ```
   hostname% /usr/bin/su
   Password: <your root password>
   ```

2. **Make the directory to mount the CD-ROM if it does not already exist:**

   ```
   hostname# mkdir /cdrom
   ```

3. **Mount the CD-ROM:**

   ```
   hostname# mount -F -o ro /dev/dsk/c0t6d0s0 /cdrom
   ```

3.1.3.2   Mounting the CD-ROM from a Remote Drive

To install the software on a system that does not have its own CD-ROM drive, you must perform some activities on the remote system (the system with the CD-ROM device) and some on the local system (the system that you are installing the software on). Be sure you follow the directions carefully.

Exporting from the Remote Machine

Because you are NFS-mounting the software from a remote CD-ROM, you must first export it from the remote system. The methods to do this are different from Sun OS and Solaris systems. Both systems will require that you have the superuser password.

Exporting from a Remote SunOS 4.1.x System

Perform the following steps on the remote system:

1. **On the remote system, login as root or change to be asuperuser:**

   You must possess superuser privileges to invoke the following commands. This means that all pre-installation scripts that are delivered as part of the software package will be executed with superuser privileges.

   ```
   hostname% /usr/bin/su
   Password: <your root password>
   ```

2. **On the remote system, make the directory to mount the CD-ROM if it does not already exist:**

   ```
   hostname# mkdir /cdrom
   ```

3. **Mount the CD-ROM:**

   ```
   hostname# mount -r /dev/dsk/sr0 /cdrom
   ```

4. **Export the CD-ROM from the remote system:**

   ```
   hostname# exportfs /cdrom
   ```

5. **If they are not already running, start the NFS mount daemons by entering the following commands:**

   ```
   hostname# nfsd 8
   hostname# rpc.mountd &
   ```

6. **Check to see that the system is exporting the directory by entering the command** exportfs**. The screen should show the** /cdrom **directory:**

   ```
   hostname# exportfs
   . . .
   /cdrom
   ```

Go to "Mounting the Remote CD-ROM on the Local System" on page 6.

Exporting from a Remote Solaris 2.2 and above System

Perform the following steps on the remote system:

1. On the remote system, login as root or change to be asuperuser:

You must possess superuser privileges to invoke the following commands. This means that all pre-installation scripts that are delivered as part of the software package will be executed with superuser privileges.

```
hostname% /usr/bin/su
Password: <your root password>
```

2. If they are not already running, start the NFS mount daemons by entering the following commands:

```
hostname# /usr/lib/nfs/nfsd 8
hostname# /usr/lib/nfs/mountd
```

3. Export the CD-ROM directory from the remote system:

```
hostname# share -F nfs -o ro /cdrom/sunhsip_l_0
```

4. Check to see that the system is exporting the directory by entering the command share**. The screen should show the** /cdrom/unnamed_cdrom **directory:**

```
hostname# share
. . .
cdrom/sunhsip_l_0 ro '' ''
```

Go to "Mounting the Remote CD-ROM on the Local System" on page 6.

Mounting the Remote CD-ROM on the Local System

1. On the local system, login as root or change to be asuperuser:

You must possess superuser privileges to invoke the following commands. This means that all pre-installation scripts that are delivered as part of the software package will be executed with superuser privileges.

```
hostname% /usr/bin/su
Password: <your root password>
```

2. Make the directory to mount the CD-ROM if it does not already exist:

```
hostname# mkdir /cdrom/sunhsip_l_0
```

3. Mount the CD-ROM:

```
hostname# mount -r -F nfs remote_system_name:/cdrom/
sunhsip_l_0 /cdrom/sunhsip_l_0
```

3.1.3.3   Adding the HSI/P Driver

The HSI/P driver is distributed in the standard Solaris "pkgadd" CD-ROM distribution format. The pkgadd utility loads the SUNWhsip package onto the system from the distribution media.

1. Login as or change to be the superuser:

You must possess superuser privileges to invoke the following commands. This means that all pre-installation scripts that are delivered as part of the software package will be executed with superuser privileges.

```
hostname% /usr/bin/su
Password: <your root password>
```

2. Using the pkgadd command:

```
hostname # pkgadd -d /cdrom/sunhsip_l_0/Product
```

The pkgadd utility will install the driver, using the settings in the pkginfo file and the systems defaults.

Since the installation software must modify various system files such as /kernel/drv/ classes, the pkgadd program will ask you if you want to "install these conflicting files [y,n,?,q]y". The correct response is "y". Also, pkgadd will warn that some scripts must be executed with super-user permissions. Again, the correct response is "y".

3.1.3.4   Rebooting

Once the driver is installed, you must re-boot the system using the "reconfigure" option to boot. First, sync the hard disks and halt the system to enter the monitor mode:

1. On the local system, login as root or change to be asuperuser:

You must possess superuser privileges to invoke the following commands. This means that all pre-installation scripts that are delivered as part of the software package will be executed with superuser privileges.

```
hostname% /usr/bin/su
Password: <your root password>
hostname # /usr/sbin/sync
hostname # /usr/sbin/halt
```

Once the system is in the monitor command mode, perform the boot command with the "-r" option:

```
ok> boot -r
```

3.1.3.5 Testing The Hardware And Software Install

To test the install of the hardware and software please use the following command:

```
hostname% hsip_loop -c 100 -l 2048 -s 2048000 -t 1 hih0
```

This will run an internal loopback test. Please see the man page for `syncloop` (man `syncloop`) for a full description of the `hsip_loop` command.

3.1.3.6 Configuration

Use the HSI/P supplied system commands `hsip_init`, `hsip_loop` and `hsip_stat`. A short description of each command follows below. Please use the man page utility to get more information on each command.

The `hsip_init` utility allows the user to modify some of the hardware operating modes common to synchronous serial lines. This can be useful in troubleshooting a link, or necessary to the operation of a communications package. See the `hsip_init` man page for more information.

The `hsip_loop` command performs several loopback tests that are useful in exercising the various components of a serial communications link.

The `hsip_stat` command reports the event statistics maintained by a synchronous serial device driver. The report may be a single snapshot of the accumulated totals, or a series of samples showing incremental changes. Prior to these it prints the device name being used to query a particular device driver, along with a number indicating the channel number under control of that driver.

3.1.3.7 Removing the HSI/P Driver

To remove the Sun HSI/P driver package, use the `pkgrm` command:

```
hostname # pkgrm SUNWhsip
```

This will remove the driver object and configuration files and inform the kernel. Again, you should re-boot the system

3.1.3.8 Upgrading the HSI/P Driver

If it becomes necessary to upgrade to a newer version of the HSI/P driver, the following steps should be taken:

1. Remove the old version of the HSI/P driver by running pkgrm:

```
hostname # pkgrm SUNWhsip
```

2. Halt and reboot the system using the "boot -r" command.

3. Use the pkgadd utility to load the new HSI/P driver. Refer to the previous section on running the pkgadd utility.

3.1.3.9 Other Package Utilities

There are other useful utilities that can be run. The pkgparam command displays the packages parameter settings:

```
hostname% pkgparam -v -d /cdrom/sunhsip_l_0/SUNWhsip
```

This will read the distribution CD-ROM and display various information such as the release level, installation directory, etc.

Another utility, pkginfo, can be used to see what software packages are presently installed on the system:

```
hostname% pkginfo
```

The pkginfo command can also be used to displays the packages parameter settings, such as the release level, installation directory, etc.:

```
hostname% pkginfo -l SUNWhsip
```

Functional Description

The Sun HSI/P, High Speed Interface adapter for PCI applications (HSI/P) provides four serial channel interfaces for high performance synchronous communications on a PCI host system. The design incorporates a Motorola MC68360 Quad Integrated Communications Controller (QUICC) and a PLX PCI9060 with DMA capability. Code storage and data buffering are provided by a DRAM array which is shared between the QUICC and the PCI9060.

Serial line electrical interfacing is available on-board providing voltage level adaptation to a Recommended RS-449 Standard.

The frontplate interface connection on the Sun HSI/P uses an 80-pin amplimite receptacle containing the signals for all four ports. To provide an industry standard connection for each port, hydra style adapter cables are offered. Adapter cable wiring details for this cable is also provided.

The Sun HSI/P is configured so that an optional crystal oscillator can be added to provide non-standard or custom synchronous clock speeds.

The block diagram in FIGURE 4-1 on page 2, demonstrates the major components of this design.

4.0.1 Sun HSI/P Block Diagram

FIGURE 4-1 Block Diagram of a Sun HSI/P
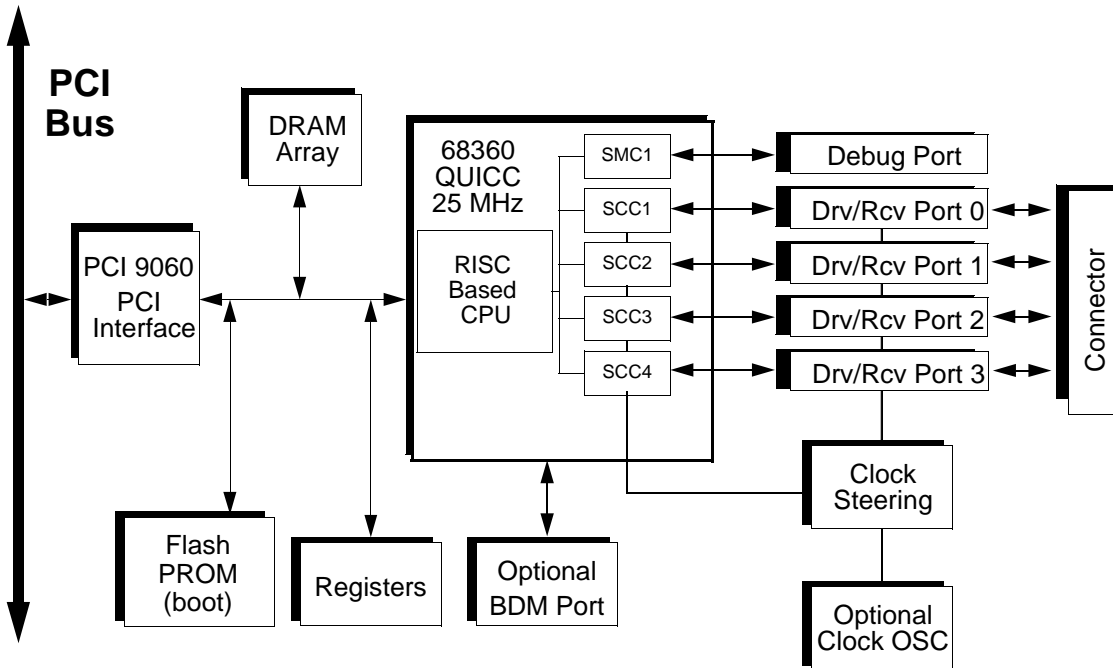
4.0.1.1 Modes Of Operation

Direct Master

The Sun HSI/P does not support direct access to the PCI bus by the QUICC. Only DMA accesses may be sourced to the PCI bus as discussed below. Although the PCI9060 specification mentions support of Direct Master operations, there is chip errata pertaining to this operation and therefore may not be used.

Direct Slave

The Sun HSI/P supports both memory mapped (Memory Read, Memory Read Multiple, Memory Read Line) and I/O mapped (I/O Read) accesses to the Local bus from the PCI bus. The direct slave interface contains a 16-byte FIFO. PCI base address registers are provided in

the PCI9060 configuration space to set up the adapter's location in PCI memory and I/O space. Byte (8-bit), Half-Word (16-bit), and Word (32-bit) accesses are supported to local DRAM, local registers, and the QUICC internal registers.

Setup of the PCI9060 Local Configuration Registers must include enabling the Ready Input and disabling the Bterm input for Memory Space 0. The Burst Enable bit may be set but offers no advantage. All sourced burst accesses from the PCI9060 are broken up into non-burst local accesses by hardware.

4.0.1.2   DMA Operation

The PCI9060 supports two independent DMA channels capable of transferring data from the Local bus (DRAM) to the PCI bus. Both chaining and non-chaining DMA transfers are supported. DMA channel 0 contains a 64-byte bi-directional FIFO and DMA channel 1 contains a 32-byte bi-directional FIFO. DMAs can generate Memory Read, Memory Write, Memory Read Multiple, and Memory Read Line PCI cycles. Demand mode DMA is not supported. Although the PCI9060 specification mentions support of Demand Mode DMA operations, there is chip errata pertaining to this operation and therefore may not be used.

The DMA registers inside the PCI9060 are accessible only from the Local bus (QUICC). Setup of the PCI9060's Local DMA Registers must include enabling the Ready Input and disabling the Bterm input for both DMA channels. The Burst Enable bit may be set but offers no advantage. All sourced burst accesses from the PCI9060 are broken up into non-burst local accesses by hardware.

4.0.1.3   PCI User In/Out

The PCI9060 contains two user defined bits. The User Out bit is an output of the PCI9060 which can be read from the Status Register. The User In bit is an input to the PCI9060 which can be set in the Misc Register. Both User bits are found in the PCI9060 EEPROM Control, PCI Command Codes, User I/O Control, Init Control Register.

4.0.1.4   Local bus Arbitration Priority

QUICC internal masters and DRAM refresh have highest priority during arbitration requests, followed by PCI accesses via the PCI9060. The QUICC's CPU32 core has the lowest priority. The arbitration between the CPU32, QUICC internal masters (such as IDMA or SDMA), and DRAM refresh is handled internal to the QUICC.

4.0.1.5 Line Drivers/Receivers

Line drivers and receivers provide electrical adaptation from TTL levels to the appropriate communications interface signal levels. Currently the RS-449 interface is only available. Serial ports 0-3 are connected to QUICC SCC1-4, respectively. The electrical interface supported by a Sun HSI/P can be read from the Board Configuration Register.

RS-449

The six inputs for each port are electrically terminated with a resistor SIP of 120-ohms between the designated "A" and "B" circuits of each. Cabling is available with DB-37 DTE connectors (female) to provide an RS-449 interface.

4.0.2 Power Budget

Typical and maximum power consumption of the Sun HSI/P is described in Table 4-1.

TABLE 4-1   Sun HSI/P Power Consumption

Board Type[1]	Voltage	Typical	Maximum
HSI/P	+5V	1.1A	1.75A
HSI/P	+12V	9.5mA	14mA
HSI/P	-12V	4.2mA	6mA

1. Includes a 4-MB DRAM SIMM for power consumption.

Features

A.1   Features

MC68360

- CPU32+ Processor (4.5 MIPS at 25 MHz)
    32-Bit Version of the CPU32 Core (Fully Compatible with the CPU32)
    Background Debug Mode
    Byte-Misaligned Addressing

- Four General Purpose Timers
    Superset of MC68302 Timers
    Four 16-Bit Timers or Two 32-Bit Timers

- Two Independent DMAs (IDMAs)
    Single Address Mode for Fastest Transfers
    Buffer Chaining and Auto Buffer Modes
    Automatically Performs Efficient Packing

- System Integration Module (SIM60)
    Bus Monitor
    Double Bus Fault Monitor
    Software Watchdog
    Periodic Interrupt Timer
    Low Power Stop Mode
    Breakpoint Logic Provides On-Chip Hardware Breakpoints

- Four Serial Communication Controllers (SCC)
  HDLC/SDLC™
  Signaling System #7
  Binary Synchronous Communication (BISYNC)
  Totally Transparent (Bit Streams)
  Totally Transparent (Frame Based with Optional Cyclic Redundancy Check (CRC))
  Asynchronous HDLC
  DDCMP™
  V.14
  X.21

- Two Serial Management Controllers (SMC)
  UART
  Transparent
  General Circuit Interface (GCI) Controller

- Communications Processor Module (CPM)
  RISC Controller
  224 Buffer Descriptors
  Supports Continuous Mode Transmission and Reception on All Serial Channels
  2.5 KBytes of Dual-Port RAM
  14 Serial DMA Channels

- Four Baud Rate Generators
  Independent (can be connected to any SCC or SMC)
  Allows Changes During Operation
  Autobaud Support Option

PCI9060

- PCI Compliance Revision 2.1

- PCI Bus Master Transfers up to 132 MBps

- Two Independent DMA Channels

- Bi-Directional Chaining DMA Controller

- Four Bi-Directional FIFOs

- Eight 32-bit Mailboxes and Two 8-bit Doorbell Registers

Serial Ports

• Full RS-449 Support on All Four Ports.

• Optional On-Board Clock Provision

• Internal or External Serial Data Clocks

• Five Modem Control Signals per Port

Other Features

• Dual Ported Dynamic RAM SIMM Connector (supporting 1MB - 32MB DRAM)

• 128 Kbyte (1Mbit) Flash PROM (boot)

• On-board RS-232 Debug Port

• Mechanical - Short Length, 5-V, 32-bit PCI Card

• PCI Compliance Checklist Rev. 2.0B Compliant

Background Debug Port Pin Assignments

The Sun HSI permits the addition of a 10 pin header strip in position P2 for the software developer so that a Background Debug Mode (BDM) Connector may be added (Samtec[1], part number TSM-15-01-S-DV). P2 allows a thru-hole header on the component side of the board. P2 is defined in the QUICC manual Section 9.9 (page 9- 94). A momentary reset switch may be attached to the RESETH pin (P2 PIN 7) to provide a convenience during development.

TABLE A-1   Background Debug Port Pin Assignments

2x5 Header (P2)	Signal Name	Dir	Description
1	-DS	I/O	Data Strobe
2	-BERR	I/O	Bus Error
3	GND	-	Signal Ground (Common Return)
4	-BKPT	I/O	Breakpoint
5	GND	-	Signal Ground (Common Return)
6	+FREEZE	I/O	Freeze
7	-RESETH	I/O	Reset
8	-IFETCH	I/O	Instruction Fetch
9	+5V	-	Power
10	-IPIPE0	Out	Instruction Pipe

1. Samtec can be reached at (800) 726-8329 or (812) 944-6733.

PCI Pin Assignments

In the following table '#' denotes an active low signal.

TABLE A-2   5V PCI Connections

Pin	Side B	Side A	Pin	Side B	Side A
1	-12V	TRST#	33	C/BE[2]#	+3.3V
2	TCK	+12V	34	GND	FRAME#
3	GND	TMS	35	IRDY#	GND
4	TDO	TDI	36	+3.3V	TRDY#
5	+5V	+5V	37	DEVSEL#	GND
6	+5V	INTA#	38	GND	STOP#
7	INTB#	INTC#	39	LOCK#	+3.3V
8	INTD#	+5V	40	PERR#	SDONE
9	PRSNT1#	RSVD	41	+3.3V	SBO#
10	RSVD	+5V (I/O)	42	SERR#	GND
11	PRSNT2#	RSVD	43	+3.3V	PAR
12	GND	GND	44	C/BE[1]#	AD[15]
13	GND	GND	45	AD[14]	+3.3V
14	RSVD	RSVD	46	GND	AD[13]
15	GND	RST#	47	AD[12]	AD[11]
16	CLK	+5V (I/O)	48	AD[10]	GND
17	GND	GNT#	49	M66EN	AD[09]
18	REQ#	GND	50	Key	Key
19	+5V (I/O)	RSVD	51	Key	Key
20	AD[31]	AD[30]	52	AD[08]	C/BE[0]#
21	AD[29]	+3.3V	53	AD[07]	+3.3V
22	GND	AD[28]	54	+3.3V	AD[06]
23	AD[27]	AD[26]	55	AD[05]	AD[04]
24	AD[25]	GND	56	AD[03]	GND
25	+3.3V	AD[24]	57	GND	AD[02]
26	C/BE[3]#	IDSEL	58	AD[01]	AD[00]

TABLE A-2   5V PCI Connections

Pin	Side B	Side A	Pin	Side B	Side A
27	AD[23]	+3.3V	59	+5V (I/O)	+5V (I/O)
28	GND	AD[22]	60	ACK64#	REQ64#
29	AD[21]	AD[20]	61	+5V	+5V
30	AD[19]	GND	62	+5V	+5V
31	+3.3V	AD[18]			
32	AD[17]	AD[16]			

Note: +3.3V, RSVD, REQ64#, ACK64#, SBO#, SDONE, INTB#, INTC#, INTD#, TCK, TMS, and TRST# pins are not connected on the Sun HSI.

Building a Synchronous Null Modem and an X.21 to RS-449 Converter Cable

---

D.1   Null Modem Cable Requirements

A synchronous null modem cable is a specially-configured cable that simulates modems that are connected back-to-back. When the distance between the two host systems is not great, you may be able to use a null modem cable instead of a synchronous modem or a synchronous modem eliminator.

The Maximum distance a null modem cable can work is determined by the specification for your serial port interface.

There are two steps you must perform to use a null modem cable for machine supplied clocking:

1. Run `hsip_init,` (Section D.1.1, "Configuring Internal or External Clocking," on page A-8), so that the Sun system, in the absence of a synchronous modem, supplies clocking on the serial line.

2. Configure the cable for the null modem.

Note – You must run `hsip_init` each time you reboot your system.

D.1.1　Configuring Internal or External Clocking

To configure an RS-449 port to provide transmit clocking for itself as well as receive clocking for the other end of the link, set the txc (transmit clock) and rxc (receive clock) parameters in hsip_init to baud and rxc, respectively. For example, the following hsip_init command, sets the data rate of the first Sun HSI serial port to 9600 pbs an sets the clocking as just described:

```
hostname % hsip_init hihp0 9600 txc=baud rxc=rxc
```

You enter such a command at both ends of a link if both sides are supplying clocking.

In the situation in which you have Sun systems at both ends of a link and have one system supplying clocking for both sides, on the system that is not supplying the clocking, you enter:

```
hostname % hsip_init hihp0 9600 txc=txc rxc=rxc
```

D.1.2　Building the Null Modem Cable

To build a null modem cable, you can configure your own cable or use a standard cable with an adapter box.

Note – Be sure to use shielded, twisted pair wire when building a null modem cable.

If you decide to use an adapter box, be sure to obtain an adapter that allows you to change the pin configurations. Pre-configured adapters generally do not work with synchronous protocols because they do not handle clock signals correctly.

D.1.2.1　RS-449 Null Modem Cable

Appendix TABLE A-3 and TABLE A-4 list the signals and names for RS-499 and X.21 circuits..

TABLE A-3　　RS-449 Signals

Circuit	Name	Direction
SD	Send Data	To DCE
RD	Receive Data	From DCE
TT	Terminal Timing	To DCE
ST	Send Timing	From DCE

TABLE A-3   RS-449 Signals

Circuit	Name	Direction
RT	Receive Timing	From DCE
RS	Request to Send	To DCE
CS	Clear to Send	From DCE

TABLE A-4   X.21 Signals

Circuit	Name	Direction
G	Signal Ground	
T	Transmit	To DCE
R	Receive	From DCE
C	Control	To DCE
I	Indication	From DCE
S	Signal Element Timing	From DCE
B	Byte Timing	From DCE

FIGURE A-1 illustrates a synchronous null modem cable that allows you to connect two Sun systems that each supply clocking, using the RS-449 interface. Each Sun supplies clocking on pins 17 and 35. The null modem cable routes this clocking to pins 8 and 26 on the opposite side to provide receive clocking.

Because the RS-449 interface is balanced, there are two pins for each signal. For example, Send Data (SD), pins 4 and 22, is connected to Received Data (RD), pins 6 and 24. This means that pin 4 is connected to pin 6 and pin 22 is connected to pin 24.

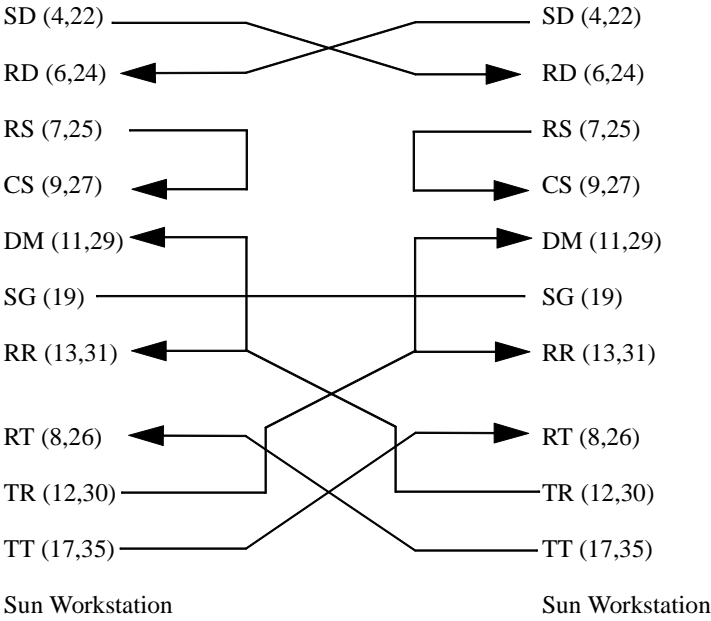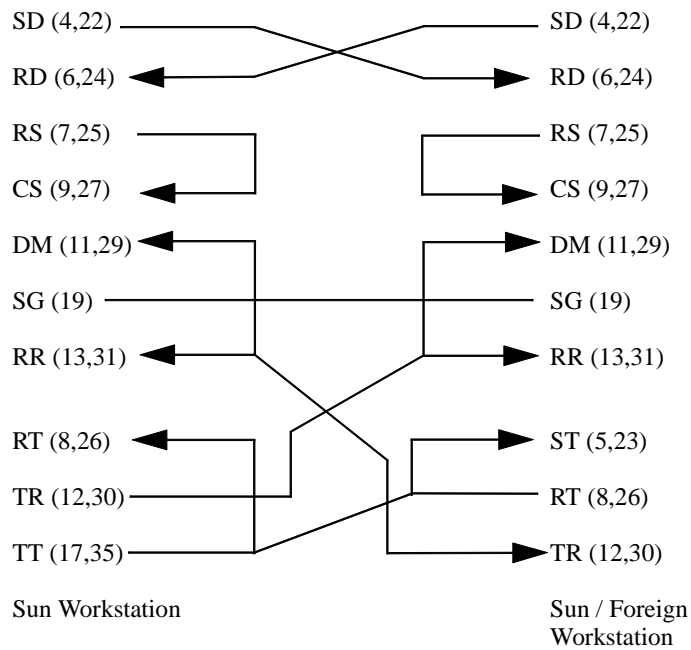**FIGURE A-1**   Null modem Cable (Both Suns Supply Clocking)

FIGURE A-2 illustrates a synchronous null modem cable that allows you to another system, Sun or non-Sun, using the RS-449 interface. The Sun supplies both the transmit and receive clocks for the other system. Note that this null modem cable is not symmetrical.

FIGURE A-2 Null modem Cable (Sun System Supplies Clocking for Both Sides)

```
SD (4,22) ─────────╲  ╱───────── SD (4,22)
                    ╲╱
RD (6,24) ◄─────────╱  ╲───────► RD (6,24)

RS (7,25) ─────┐        ┌───────── RS (7,25)
               │        │
CS (9,27) ◄────┘        └───────► CS (9,27)

DM (11,29) ◄───┐        ┌───────► DM (11,29)

SG (19) ───────┼────────┼───────── SG (19)

RR (13,31) ◄───┘        └───────► RR (13,31)


RT (8,26) ◄────┐        ┌───────► ST (5,23)

TR (12,30) ────┘        └───────── RT (8,26)

TT (17,35) ─────────────────────► TR (12,30)
```

Sun Workstation   Sun / Foreign
                                             Workstation

D.1.3   X.21 to RS-449 Converter

FIGURE A-3 illustrates the pin connections required for an X.21 to RS-499 converter.

FIGURE A-3   X.21 to RS-449 Converter

T (2,9)	SD (4,22)
S (6,13)	RT (8,26)
	ST (5,23)
C (3,10)	RS (7,25)
	CS (9,27)
R (4,11)	RD (6,24)
I (5,12)	RR (13,31)
G (8)	SG (19)

X.21 Interface
(15 Pin Connector)

RS-449 Interface
Workstation
(37 Pin Connector)
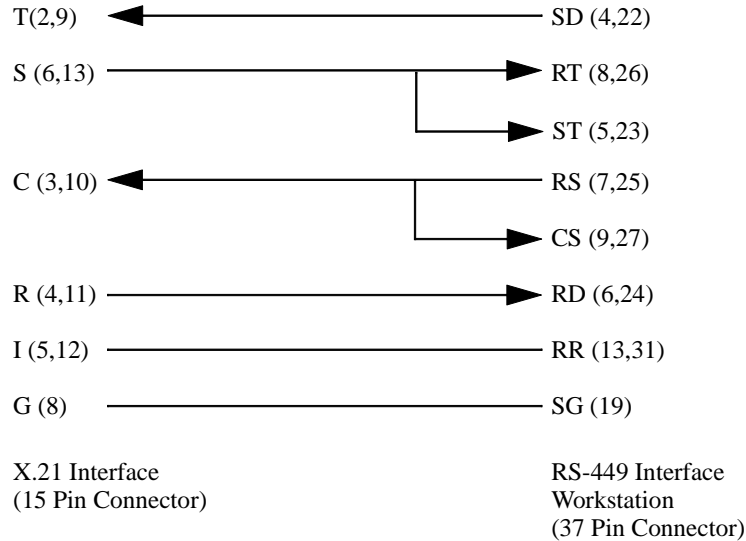
When using an X.21 conversion you must perform the following hsip_init operation:

hostname % **hsip_init hihp0 9600 txc=rxc rxc=rxc**

D.1.4   RS-449 Cabling

A shielded, hydra style breakout cable providing four 25-pin, D-shell (DB-25) DTE (pins) connectors is available for the HSI version. The pin assignments for the cabling and connectors are shown in TABLE A-5. .

TABLE A-5   RS-449 Connector Pin Assignments

80-Pin Amp. Pin No.	RS-449 Signal Name	RS-449 DB-37 Pin No.	Description
1	RXD1(A)	6	Port 1 Receive Data
2	RXD1(B)	24	Port 1 Receive Data
3	DTR1(A)	12	Port 1 Data Terminal Ready
4	DTR1(B)	30	Port 1 Data Terminal Ready
5	TXD1(A)	4	Port 1 Transmit Data

80-Pin Amp. Pin No.	RS-449 Signal Name	RS-449 DB-37 Pin No.	Description
6	TXD1(B)	22	Port 1 Transmit Data
7	RTS1(A)	7	Port 1 Request To Send
8	RTS1(B)	25	Port 1 Request To Send
9	TXC1(A)	17	Port 1 Transmit Clock
10	TXC1(B)	35	Port 1 Transmit Clock
11	TXCI1(A)	5	Port 1 Transmit Clock In
12	TXCI1(B)	23	Port 1 Transmit Clock In
13	DCD1(A)	13	Port 1 Data Carrier Detect
14	DCD1(B)	31	Port 1 Data Carrier Detect
15	DSR1(A)	11	Port 1 Data Set Ready
16	DSR1(B)	29	Port 1 Data Set Ready
17	CTS1(A)	9	Port 1 Clear To Send
18	CTS1(B)	27	Port 1 Clear To Send
19	RXC1(A)	8	Port 1 Receive Clock
20	RXC1(B)	26	Port 1 Receive Clock
21	RXD2(A)	6	Port 2 Receive Data
22	RXD2(B)	24	Port 2 Receive Data
23	DTR2(A)	12	Port 2 Data Terminal Ready
24	DTR2(B)	30	Port 2 Data Terminal Ready
25	TXD2(A)	4	Port 2 Transmit Data
26	TXD2(B)	22	Port 2 Transmit Data
27	RTS2(A)	7	Port 2 Request To Send
28	RTS2(B)	25	Port 2 Request To Send
29	TXC2(A)	17	Port 2 Transmit Clock
30	TXC2(B)	35	Port 2 Transmit Clock
31	TXCI2(A)	5	Port 2 Transmit Clock In
32	TXCI2(B)	23	Port 2 Transmit Clock In
33	DCD2(A)	13	Port 2 Data Carrier Detect
34	DCD2(B)	31	Port 2 Data Carrier Detect
35	DSR2(A)	11	Port 2 Data Set Ready
36	DSR2(B)	29	Port 2 Data Set Ready
37	CTS2(A)	9	Port 2 Clear To Send
38	CTS2(B)	27	Port 2 Clear To Send
39	RXC2(A)	8	Port 2 Receive Clock
40	RXC2(B)	26	Port 2 Receive Clock
41	RXD3(A)	6	Port 3 Receive Data
42	RXD3(B)	24	Port 3 Receive Data
43	DTR3(A)	12	Port 3 Data Terminal Ready
44	DTR3(B)	30	Port 3 Data Terminal Ready

TABLE A-5   RS-449 Connector Pin Assignments

80-Pin Amp. Pin No.	RS-449 Signal Name	RS-449 DB-37 Pin No.	Description
45	TXD3(A)	4	Port 3 Transmit Data
46	TXD3(B)	22	Port 3 Transmit Data
47	RTS3(A)	7	Port 3 Request To Send
48	RTS3(B)	25	Port 3 Request To Send
49	TXC3(A)	17	Port 3 Transmit Clock
50	TXC3(B)	35	Port 3 Transmit Clock
51	TXCI3(A)	5	Port 3 Transmit Clock In
52	TXCI3(B)	23	Port 3 Transmit Clock In
53	DCD3(A)	13	Port 3 Data Carrier Detect
54	DCD3(B)	31	Port 3 Data Carrier Detect
55	DSR3(A)	11	Port 3 Data Set Ready
56	DSR3(B)	29	Port 3 Data Set Ready
57	CTS3(A)	9	Port 3 Clear To Send
58	CTS3(B)	27	Port 3 Clear To Send
59	RXC3(A)	8	Port 3 Receive Clock
60	RXC3(B)	26	Port 3 Receive Clock
61	RXD4(A)	6	Port 4 Receive Data
62	RXD4(B)	24	Port 4 Receive Data
63	DTR4(A)	12	Port 4 Data Terminal Ready
64	DTR4(B)	30	Port 4 Data Terminal Ready
65	TXD4(A)	4	Port 4 Transmit Data
66	TXD4(B)	22	Port 4 Transmit Data
67	RTS4(A)	7	Port 4 Request To Send
68	RTS4(B)	25	Port 4 Request To Send
69	TXC4(A)	17	Port 4 Transmit Clock
70	TXC4(B)	35	Port 4 Transmit Clock
71	TXCI4(A)	5	Port 4 Transmit Clock In
72	TXCI4(B)	23	Port 4 Transmit Clock In
73	DCD4(A)	13	Port 4 Data Carrier Detect
74	DCD4(B)	31	Port 4 Data Carrier Detect
75	DSR4(A)	11	Port 4 Data Set Ready
76	DSR4(B)	29	Port 4 Data Set Ready
77	CTS4(A)	9	Port 4 Clear To Send
78	CTS4(B)	27	Port 4 Clear To Send
79	RXC4(A)	8	Port 4 Receive Clock
80	RXC4(B)	26	Port 4 Receive Clock

For Assistance

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 contact your local Sun Service provider.

For additional information, access Sun on the World Wide Web at **http://www.sun.com** and select **Sales and Service**.

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