Sun™ OC48 Packet Over Sonet Adapter Installation and User's Guide

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2. This device must accept any interference received, including interference that may cause undesired operation.

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- 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.

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Declaration of Conformity

Compliance Model Number: APOLLO
Product Family Name: Sun OC48 Packet-Over-SONET PCI Adapter

EMC

European Union

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

EN55022:1998/CISPR22:1997		Class A
EN55024:1998	Required Limits (as applicable):	
	EN61000-4-2	4 kV (Direct), 8 kV (Air)
	EN61000-4-3	3 V/m
	EN61000-4-4	1 kV AC Power Lines, 0.5 kV Signal and DC Power Lines
	EN61000-4-5	1 kV AC Line-Line and Outdoor Signal Lines
		2 kV AC Line-Gnd, 0.5 kV DC Power Lines
	EN61000-4-6	3 V
	EN61000-4-8	1 A/m
	EN61000-4-11	Pass
EN61000-3-2:1995 + A1, A2, A14		Pass
EN61000-3-3:1995		Pass

Safety

This equipment complies with the following requirements of the Low Voltage Directive 73/23/EEC:

EC Type Examination Certificates:

EN60950:1992, 2nd Edition, Amendments 1, 2, 3, 4, 11

Supplementary Information

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

/S/

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Preface

The *Sun OC48 Packet Over Sonet Adapter Installation and User's Guide* is intended for System and Network Administrators who will attach a Sun Fire™ or other compatible system to a Synchronous Optical Network (SONET).

Before You Read This Book

The Sun OC48 Packet Over Sonet adapter uses the Point-to-Point Protocol (PPP) and the Spatial Re-use Protocol (SRP). PPP requires one adapter on each node. SRP requires two adapters. Two SRP clock cables and a copper SRP data cable connect these adapters to each other. In both cases, Sun OC48 Packet Over Sonet adapters are connected to a SONET with fiber optic cables.

How This Book Is Organized

Chapter 1 describes the Sun OC48 Packet Over Sonet adapter hardware and software.

Chapter 2 describes how to install the one adapter in your system, driver software for PPP, and how to verify your installation.

Chapter 3 describes how to edit the network configuration file for PPP after the adapter has been installed in your system.

Chapter 4 describes how to install the two adapters in your system for SRP, the SRP software, and how to verify your installation.

Chapter 5 describes how to edit the network configuration files for SRP after the adapters have been installed in your system.

Chapter 6 describes how to configure the driver parameters used by the Sun OC48 Packet Over Sonet adapter.

Appendix A lists the specifications for the Sun OC48 Packet Over Sonet adapter.

Using UNIX Commands

This document does not contain information on basic UNIX® commands and procedures such as shutting down the system, booting the system, and configuring devices.

See one or more of the following for this information:

- *Solaris Handbook for Sun Peripherals*
- AnswerBook2™ online documentation for the Solaris™ operating environment
- Other software documentation that you received with your system

Typographic Conventions

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

Shell Prompts

Shell	Prompt
C shell	*machine_name*%
C shell superuser	*machine_name*#
Bourne shell and Korn shell	$
Bourne shell and Korn shell superuser	#

Related Documentation

Application	Title	Part Number
PPP protocol	*Solaris 8 7/01 User's Guide*	801-xxxx

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CHAPTER 1

Product Overview

This chapter describes the Sun OC48 Packet Over Sonet adapter hardware and software.

Hardware Overview

The Sun OC48 Packet Over Sonet adapter is available either as a single adapter for a Point-to-Point (PPP) network, or in a pair for use in dual counter-rotating SONET rings running Spatial Re-use Protocol (SRP). It is designed to operate in an optical network.

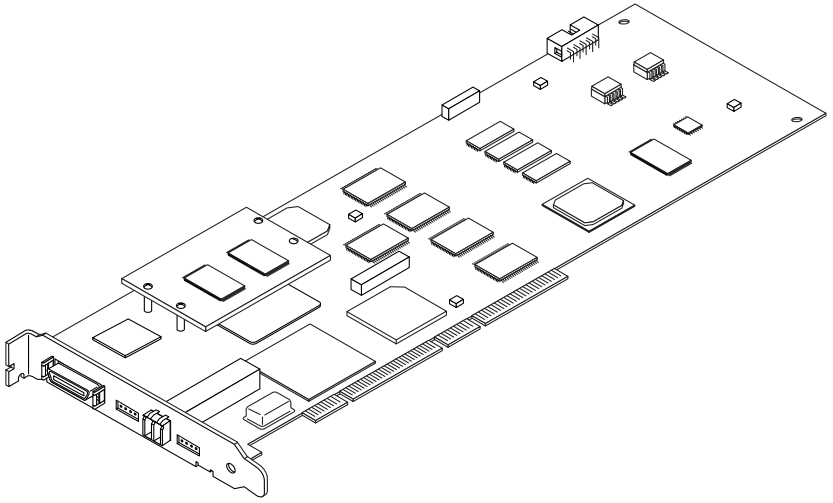

FIGURE 1-1 Sun OC48 Packet Over Sonet Adapter

Hardware and Software Requirements

Before using the Sun OC48 Packet Over Sonet adapter, make sure your system meets the following hardware and software requirements:

Hardware and Software	Requirements
Hardware	Sun Fire™ or other compatible systems
PCI Slots	Each system must have a 66 MHz/64-bit slot with 3.3v I/O signaling
OpenBoot™ PROM	Revision 4.x/5.x
Operating Environment	Solaris 8 10/01 or subsequent Solaris releases
Cables for PPP	One LC/SC fiber cable for connection to a switch, or One LC/LC fiber cable for a server-to-server connection Some switches have an LC connector. If your switch requires an LC connection, use an LC/LC fiber cable.

Product Features

You can install or replace the Sun OC48 Packet Over Sonet adapter.

Key Protocols and Interfaces

The Sun OC48 Packet Over Sonet adapter incorporates Packet-over-SONET at the OC-48 data rate of 2.488 Gigabits per second. Packet-over-SONET is also referred to as IP over SONET. This high performance PCI adapter allows Sun servers, such as Sun Fire™ systems, to connect directly to an OC-48 SONET (Synchronous Optical Network), needed for many high performance applications as, for example, in Metropolitan Area Networks (MAN).

The card has two ports. One optical port connects to a SONET ring. A single card uses only the optical port in PPP mode. When two cards are used for SRP mode, the second port is also used. The second port is a copper port. The copper port connects to a second Sun OC48 Packet Over Sonet adapter card in another 66 MHz/64-bit PCI

slot in the same system. This configuration connects a system with two Sun OC48 Packet Over Sonet adapter cards to dual, counter-rotating SONET rings for high availability.

The card supports two protocols: Point-to-Point Protocol (PPP) and Spatial Re-use Protocol (SRP).

- EPCI 66 MHz/64-bit interface, conforms to PCI 2.1 Spec.
- Full size PCI, 11 inch, card with 3.3/5V signaling
- Low CPU utilization by enhanced CPU interrupt management
- RFC 1661: PPP Protocol
- RFC-1662: PPP in HDLC - Like Framing
- RFC-2615: PPP over SONET/SDH
- RFC-2892: The Cisco SRP MAC-layer Protocol
- RAS support

CHAPTER 2

Installing the Adapter for PPP

This chapter describes how to install the adapter hardware and driver software in your system and how to verify your installation.

This chapter is divided into the following sections:

Installing the Adapter Hardware

This section contains a detailed description of each of the installation steps.

Connectors, Cables and LEDs

FIGURE 2-1 shows the front panel for the Sun OC48 Packet Over Sonet adapter. There are two sets of LEDs on the front panel. When you use the adapter for PPP mode, use only the common OC-48 LEDs. The SRP LEDs are not used when you are running the Sun OC48 Packet Over Sonet adapter in PPP mode.

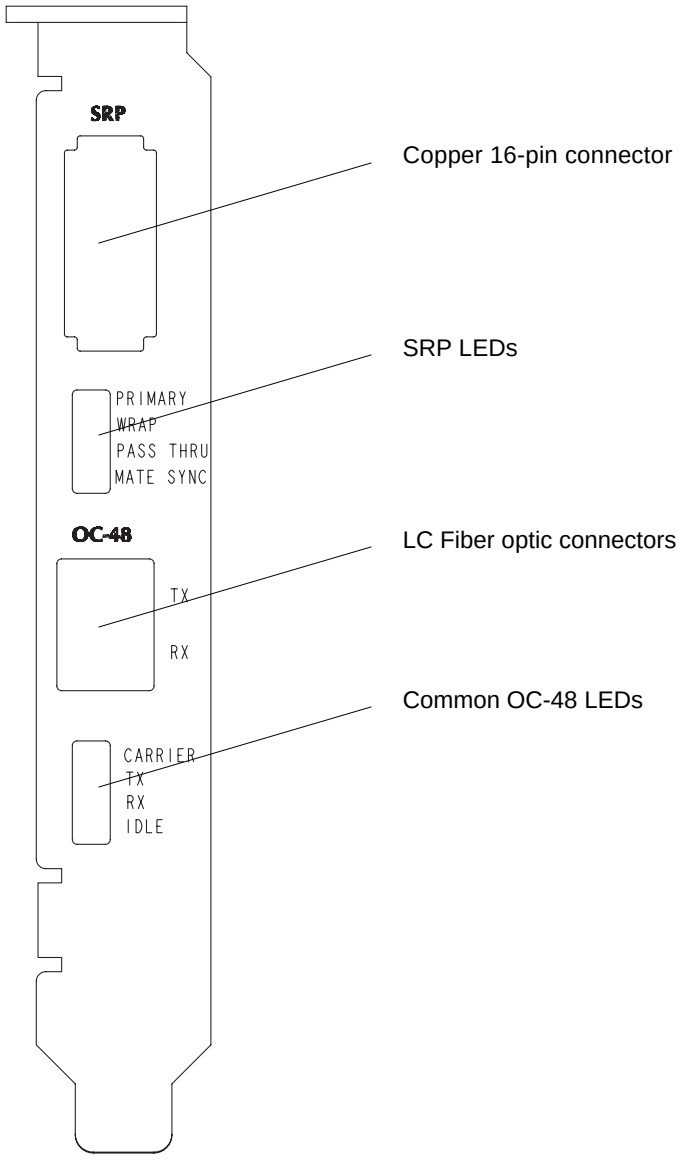

FIGURE 2-1 Front Panel for the Sun OC48 Packet Over Sonet Adapter

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Note – The SRP LEDs are not used for PPP.

TABLE 2-1 describes the common OC-48 LEDs.

- The Carrier LED will be on when the fiber cable is installed correctly and the software is up and running. The Carrier LED is on when the adapter is linked to an OC-48 port on either a switch or another Sun OC48 Packet Over Sonet adapter.
- When the software is working, the three LEDs labeled Tx (transmit), Rx (receive), and Idle can be on.
- The Idle LED blinks periodically when there is no Tx or Rx activity.
- Both the Tx and Rx LEDs can be on at the same time because the Sun OC48 Packet Over Sonet adapter provides full-duplex functioning.

TABLE 2-1 Common OC-48 LED States and Labels

Label	LED State	Indication
Carrier	ON	Cable is linked correctly.
	OFF	There is no link. This indicates that the carrier is not connected or the software is not running.
Tx	ON	Adapter is transmitting data.
	OFF	Adapter is not transmitting data.
RX	ON	Adapter is receiving data.
	OFF	Adapter is not receiving data.
Idle	BLINKING	Adapter is in idle state.
	OFF	Adapter is not in idle state.

▼ To Install the Adapter Hardware

1. **Follow the steps in the Administration Guide that came with your system to prepare the system for installation of an I/O adapter.**
2. **Holding the PCI adapter by the edges, unpack it and place it on an antistatic surface. Place an anti-static wrist strap on your wrist and attach it to the system enclosure.**
3. **Locate the 66 MHz/64-bit PCI slot**

   FIGURE 2-2 shows a detail of two PCI slots. The slot on the top is a 66 MHz slot. The slot on the bottom is a 33 MHz slot. Note that the key in the 66 MHz slot matches with the key in the Sun OC48 Packet Over Sonet adapter.

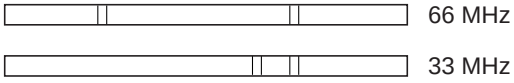

FIGURE 2-2 Detail Location of Keys for PCI Slots

4. **Using a Phillips screwdriver, remove the PCI filler panel from the slot in which you want to insert the PCI adapter.**

   Save the filler panel screw for (Step 7).

5. **Holding the PCI adapter by the edges, align the adapter edge connector with the PCI slot. Slide the adapter bracket into the small slot at the end of the PCI opening.**

6. **Applying pressure at both corners of the adapter, push the PCI adapter until it is firmly seated in the PCI slot.**

Caution – Do not use excessive force when installing the adapter into the PCI slot. You may damage the adapter's PCI connector. If the adapter does not seat properly when you apply even pressure, remove the adapter and carefully reinstall it again.

7. **Secure the adapter to the PCI slot using the screw you removed in Step .**

8. **Detach the wrist strap. Follow the steps in the Administration Guide that came with your system to complete installation of an I/O adapter and prepare to operate the system.**

9. **Follow the steps in the Administration Guide that came with your system to bring up the system after installation of an I/O adapter.**

▼ To Connect the Fiber Optic Cable.

1. **Determine the connection type you will use for your Sun OC48 Packet Over Sonet adapter.**

   - If you are connecting to a SONET network through a switch, use the LC/SC cable.

Note – Some switches have LC-type connectors. In such case, use the LC/LC cable instead.

   - If you are connecting to another Sun OC48 Packet Over Sonet adapter in another system, use the LC/LC cable.

2. **Remove the dust covers from the cable connectors.**

   FIGURE 2-3 shows a detail of the LC connector and the dust cover.

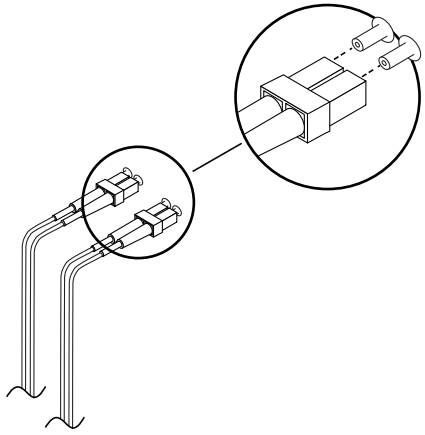

FIGURE 2-3 Detail of the LC Connector and Dust Cover

FIGURE 2-4 shows a detail of the SC connector and the dust cover.

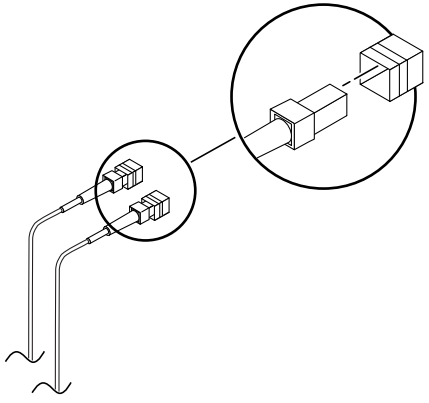

FIGURE 2-4 Detail of the SC Connector and Dust Cover

3. **Match the cable connectors with the connectors on the Sun OC48 Packet Over Sonet adapter bracket.**

4. **Seat the cable connectors into the connectors on the Sun OC48 Packet Over Sonet adapter bracket.**

   The following section describes how to verify that the adapter is correctly installed.

▼ To Verify the Installation

After you have installed the Sun OC48 Packet Over Sonet adapter, but *before* you boot your system, perform the following tasks to verify the installation. Refer to the *Solaris Handbook for Sun Peripherals* manual or your Solaris documentation for the detailed instructions.

1. **Follow the steps in the Administration Guide that came with your system to power on the system.**
2. **When the banner appears, press the Stop-A key sequence to interrupt the boot process and display the OpenBoot (`ok`) prompt.**
3. **List the network devices on your system.**

```
ok show-devs
```

Use the `show-devs` command to list the system devices. You should see the full path name of the `network` devices, similar to the example below. In this example, the `network@4` device is the Sun OC48 Packet Over Sonet adapter.

```
ok show-devs
...
/ssm@0,0/pci@18,600000/pci108e,a14@1,3
/ssm@0,0/pci@18,600000/pci108e,a13@1,2
/ssm@0,0/pci@18,600000/pci108e,a12@1,1
/ssm@0,0/pci@18,600000/pci108e,a11@1
...
```

In the example above, the names of the Sun OC48 Packet Over Sonet devices are shown in **bold**, for clarity.

Note – If you do not see the device listed, check that the adapter is properly seated and, if necessary, reinstall the adapter.

Booting the System

After verifying the adapter installation, follow the steps in the Administration Guide that came with your system to do a reconfiguration boot.

You are now ready to install the software packages from the Sun OC48 Packet Over Sonet 1.0 CD.

Installing the Driver Software

The Sun OC48 Packet Over Sonet 1.0 CD contains the driver software and utilities required to operate the adapter. Future revisions of the Solaris operating environment may contain Sun OC48 Packet Over Sonet adapter driver software and utilities. Refer to the documentation that shipped with the *Solaris Supplement* CD-ROM for a listing of the available network drivers.

1. **As superuser, insert the Sun OC48 Packet Over Sonet 1.0 CD into a CD-ROM drive that is connected to your system.**
   - If your system is running Volume Manager, it should automatically mount the CD-ROM to the `/cdrom/cdrom0` directory.
   - If your system is not running Volume Manager, mount the CD-ROM as follows:

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

You will see the following files and directories in the `/cdrom/cdrom0` directory.

TABLE 2-2 Files and Directories on the CD-ROM

File or Directory	Contents
`Copyright`	U.S. copyright file
`FR_Copyright`	French copyright file
`Packages`	Contains the Sun OC48 Packet Over Sonet adapter software packages: SUNWipsx.u SUNWipsut SUNWipsm
`Docs`	Sun OC48 PacketOverSonet PCI Adapter Installation and User's Guide
`Tools`	ipsstat, ipssnoop

2. **Install the software packages by typing at the command line:**

```
# /usr/sbin/pkgadd -d /cdrom/cdrom0/Packages/
The following packages are available:
  1  SUNWipsm       Sun OC-48 Packet Over Sonet Man Pages
                    (sparc) 1.0,REV=2001.11.19.21.03
  2  SUNWipsut      Sun OC-48 Packet Over Sonet Utilities to configure network
                    (sparc) 1.0,REV=2001.11.19.21.03
  3  SUNWipsx.u     Sun OC-48 Packet Over Sonet Device Driver and Boot Files
                    (64-bit) (sparc.sun4u) 1.0,REV=2001.11.19.21.03

Select package(s) you wish to process (or 'all' to process
all packages). (default: all) [?,??,q]:
```

3. **Press Return to accept the default.**

   You are now ready to configure the software for PPP. Continue on to Chapter 3 for the configuration steps.

Removing the Driver Software

1. **As superuser, type:**

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

   The following list of software packages is displayed.

```
system   SUNWipsm   Sun OC-48 Packet Over Sonet Man Pages
system   SUNWipsut  Sun OC-48 Packet Over Sonet Utilities to configure network
system   SUNWipsx   Sun OC-48 Packet Over Sonet Device Driver and Boot Files
(64-bit)
```

2. **Use the** `pkgrm` **command to remove the software packages listed.**

```
# /usr/sbin/pkgrm SUNWipsm SUNWipsut SUNWipsx
```

CHAPTER 3

Network Configuration For PPP

This chapter describes how to edit the network configuration files after you install the adapter in your system. The chapter contains the following sections:

Configuring the Driver

After installing the driver software, you must create a `/etc/ips/ips.cf` file for the adapter's SONET interface.

▼ To Edit the Network Configuration Files

1. **As superuser, use the `grep` command to search the `/etc/path_to_inst` file for `ips` interfaces.**

```
# grep ips /etc/path_to_inst
"/ssm@0,0/pci@18,600000/pci108e,a11@1" 0 "ips"
"/ssm@0,0/pci@18,600000/pci108e,a13@1,2" 2 "ips"
"/ssm@0,0/pci@18,600000/pci108e,a12@1,1" 1 "ips"
"/ssm@0,0/pci@18,600000/pci108e,a14@1,3" 3 "ips"
```

In the example above, the device instances are from a Sun OC48 Packet Over Sonet adapter. The instance numbers are in *bold* for clarity.

Note – Each Sun OC48 Packet Over Sonet adapter consists of four instances (four virtual devices). Each instance is capable of handling a separate interrupt. However, only the instance that corresponds to the "a11" device is significant to the user.

2. **Determine the instance number.**

   Determine the instance number by the following method.

   - Using Step 1, above, find the instance for *a11*.
   - Use the instance number that corresponds to *a11* for configuration.

3. **Copy files and modify options.**

   - Copy the `/etc/ips/ips.cf.template` file into the `/etc/ips/ips.cf` file.
   - Modify the /etc/ips/ips.cf by adding the following line to the end of the file or to where instructed by the comments inside the file:

```
ips0 SONET  PPP -
```

   The example above uses the instance, *ips0*. Verify that in your system the instance number corresponds to device *a11*.

4. **Copy** `/etc/ppp/options.ips.template` **to** `/etc/ppp/options.ips`***0***

   Use the instance number that corresponds with device *a11* in your system. This example uses instance *0*, so the file name is `options.ips0`. Modify the `options.ipsN` file accordingly.

5. **Modify the** `options.ipsN` **file on each system**

   Modify the `options.ips0` file on each system by changing the IP addresses. Use the following example.

   - Configure the local address on each system.
     - On system A: 192.12.25.10:
     - On system B: 192.12.25.24:
   - The `unit` option:
     - Place the instance number, N, in the unit option
     - Example:

```
unit 0
```

   The value of N must be the same as the instance number. In our example the instance number is 0, and it corresponds with the file name, options.ips0. The instance number in your system might have a different value.

- The `mtu` and `mru` options:
  - Change the `mtu` and `mru` values on both systems in a consistent manner. The `mtu` value of the transmission side must be the same value as the `mru` of the receiving side. In this release, the Sun OC48 Packet Over Sonet adapter software supports up to `9212`.
  - Example: On system A

```
mtu 9212
mru 9212
```

  - Example: On system B

```
mtu 9212
mru 9212
```

6. **Run the `/etc/init.d/sunipsinit` command to configure the Sun OC48 Packet Over Sonet adapter in the mode based on the `/etc/ips/ips.cf` configuration file.**

```
# /etc/init.d/sunipsinit
/usr/sbin/ipsconfig: Configuration completed successfully!
```

7. **Start the PPP daemon**

   Use the following command to start the PPP daemon:

```
# /etc/init.d/sunips start
```

   This concludes the installation and configuration process for one Sun OC48 Packet Over Sonet adapter with PPP. The following chapters describe the installation and configuration process for two Sun OC48 Packet Over Sonet adapters for SRP.

CHAPTER 4

Installing the Adapters For SRP

This chapter describes how to install two Sun OC48 Packet Over Sonet adapters in your system for SRP, how to install the SRP software, and how to verify that the adapters were correctly installed. This chapter is divided into the following sections:

Hardware and Software Requirements for SRP Installation

Here is a summary of the hardware and software required to install the Sun OC48 Packet Over Sonet adapter for SRP.

TABLE 4-1 Hardware and Software Installation Requirements

Hardware and Software	Requirements
System	Sun Fire™ and other compatible systems
Operating Environment	Solaris 8 10/01 and subsequent compatible releases in 64-bit kernel mode
PCI Slots	Each system must have two 66 MHz/64-bit slot with 3.3v I/O signaling
Software	The Sun OC48 Packet Over Sonet 1.0 CD contains the following packages SUNWipsx.u SUNWipsut SUNWipsm
Cards	Two Sun OC48 Packet Over Sonet adapters for each system
Cables for SRP	Two SRP clock cables for a clock connection between two adapters in a system One SRP data cable for a data connection between two adapters in a system Two LC/SC fiber cables for connection to a switch, or Two LC/LC fiber cables for a server-to-server connection Some switches have an LC connector. If your switch requires an LC connection, use an LC/LC fiber cable.

Installing the Adapter Hardware

Review the components that came with your Sun OC48 Packet Over Sonet adapter before you begin the installation procedures.

Connectors, Cables and LEDs

FIGURE 4-1 shows the front panel for the Sun OC48 Packet Over Sonet adapter. There are two sets of LEDs on the front panel. When you run the Sun OC48 Packet Over Sonet adapter for SRP, the SRP LEDs provide status. In addition, the common OC-48 LEDs are also used for SRP.

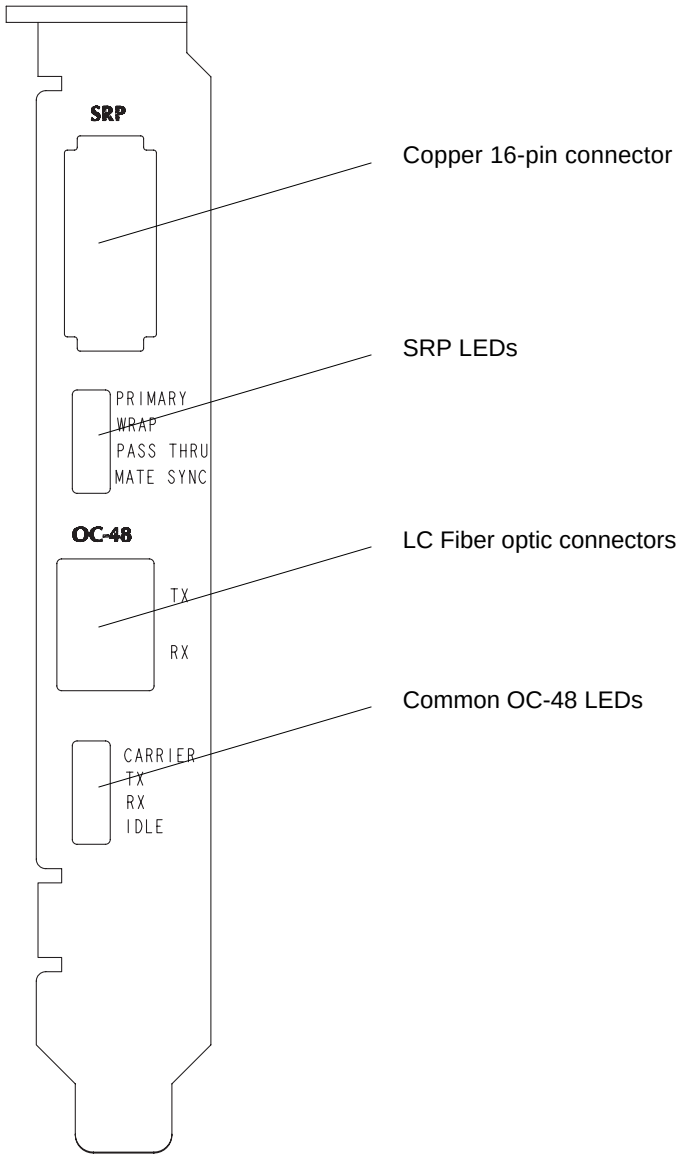

FIGURE 4-1 Front Panel for the Sun OC48 Packet Over Sonet Adapter

TABLE 4-2 describes the SRP LEDs.

- One Sun OC48 Packet Over Sonet adapter is assigned the primary role (Side A) and the other adapter is the Mate (Side B). This is reflected in the Primary LED. One of the two adapters will have the Primary LED on, and its mate will have the Primary LED off.

- The two Sun OC48 Packet Over Sonet adapters use SRP to create a wrap condition when a failure of an adjacent node on the SONET occurs. The Wrap LED is on during a wrap condition.
- The Pass Thru LED is on when the Sun OC48 Packet Over Sonet adapter is in Pass Through mode.
- Each adapter displays the Mate Sync LED concurrently when the SRP data cable is connected between the two copper 16-pin connectors.

TABLE 4-2 LED States for SRP

Label	LED State	Conditions
Primary	ON	LED is on when the adapter is Primary (Side A).
	OFF	LED is off when the adapter is the Mate (Side B).
Wrap	ON	LED is on when the adapter is in wrap mode.
	OFF	LED is off when the adapter is not in wrap mode.
Pass Thru	ON	LED is on when the adapter is in pass thru mode.
	OFF	LED is off when the adapter is not in pass thru mode.
Mate Sync	ON	LED is on when the two adapters are in sync (connected by the SRP data cable)
	OFF	LED is off when the two adapters are not in sync. This state indicates an error.

TABLE 4-3 describes the common OC-48 LEDs.

- The Carrier LED will be on when the fiber cable is installed correctly and the software is up and running. The Carrier LED is on when the adapter is linked to an OC-48 port on either a switch or another Sun OC48 Packet Over Sonet adapter.
- When the software is working, the three LEDs labeled Tx (transmit), Rx (receive), and Idle can be on.
- The Idle LED blinks periodically when there is no Tx or Rx activity.

- Both the Tx and Rx LEDs can be on at the same time because the Sun OC48 Packet Over Sonet adapter provides full-duplex function in Both the Tx and Rx LEDs can be on at the same time because the Sun OC48 Packet Over Sonet adapter provides full-duplex functioning.

TABLE 4-3 Common OC-48 LED States and Labels

Labels	LED State	Conditions
Carrier	ON	LED is on when the cable is linked correctly and software is up and running.
	OFF	LED is off when there is no link, or when the fiber cable is not properly connected. This indicates an error.
Tx	ON	LED is on when the adapter is transmitting data.
	OFF	LED is off when the adapter is not transmitting data.
Rx	ON	LED is on when the adapter is receiving data.
	OFF	LED is off when the adapter is not receiving data.
Idle	ON	LED blinks periodically when the adapter is in idle state.
	OFF	LED is off when the adapter is not in idle state.

▼ To Install the Adapter Hardware

1. **Follow the steps in the Administration Guide that came with your system to prepare the system for installation of an I/O adapter.**
2. **Holding the PCI adapter by the edges, unpack it and place it on an antistatic surface. Place an anti-static wrist strap on your wrist and attach it to the system enclosure.**
3. **Locate the two 66 MHz/64-bit PCI slots.**

   FIGURE 4-2 shows a detail of two PCI slots. The slot on the top is a 66 MHz slot. The slot on the bottom is a 33 MHz slot. Note that the key in the 66 MHz slot matches with the key in the Sun OC48 Packet Over Sonet adapter.

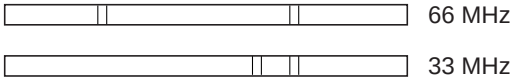

FIGURE 4-2 Detail Location of Keys for PCI Slots

4. **Using a Phillips screwdriver, remove the PCI filler panel from the slot in which you want to insert the PCI adapter.**

   Save the filler panel screw for (Step 7).

5. **Holding the PCI adapter by the edges, align the adapter edge connector with the PCI slot. Slide the adapter front panel into the small slot at the end of the PCI opening.**

6. **Applying pressure at both corners of the adapter, push the PCI adapter until it is firmly seated in the PCI slot.**

Caution – Do not use excessive force when installing the adapter into the PCI slot. You may damage the adapter's PCI connector. If the adapter does not seat properly when you apply even pressure, remove the adapter and carefully reinstall it again.

7. **Secure the adapter to the PCI slot using the screw you removed in Step 4.**

8. **Repeat Steps 1-7 to install the second Sun OC48 Packet Over Sonet adapter.**

9. **Detach the wrist strap. Follow the steps in the Administration Guide that came with your system to complete installation of an I/O adapter and prepare to operate the system.**

   After you install the cards, you will be ready to install the SRP clock and data cables. Continue on to the next section to install these cables.

▼ To Install the SRP Clock and Data Cables

Immediately after you install the cards, then install the SRP clock and data cables before you bring up the system.

1. **Connect the SRP clock cables.**

   FIGURE 4-3 shows a detail view of the SRP clock cable posts, and a detail view of the two crossed SRP clock cables attached to the Sun OC48 Packet Over Sonet adapters. This example shows the adapters installed in a Sun Fire 6800 server.

   - Connect the SRP clock cables to the two Sun OC48 Packet Over Sonet adapters.

Note – The SRP clock cables are crossed so that one board's output is the other board's input.

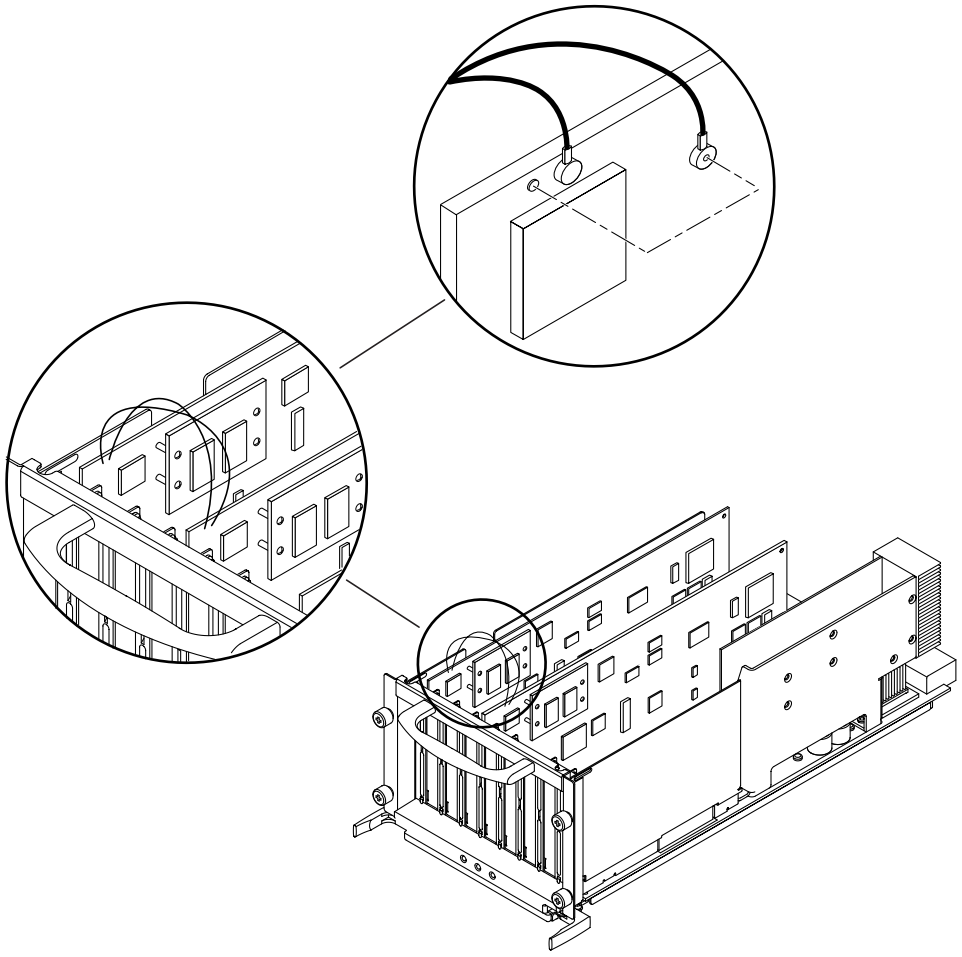

FIGURE 4-3 Detail of the SRP Clock Cables Connecting Two Sun OC48 Packet Over Sonet Adapters

Caution – Do not use any metal tools to attach or detach the two SRP data cables.

2. **Connect the SRP copper 16-pin data cable to the two adapters.**

   FIGURE 4-4 shows a detail of the copper 16-pin data cable connectors.

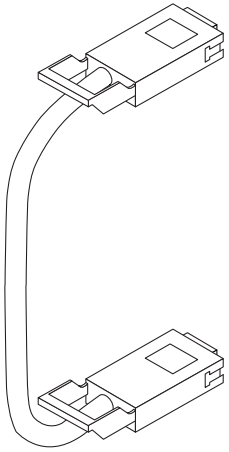

FIGURE 4-4 Detail of the Copper 16-pin Connectors of the SRP Data Cable

Bring Up the System

Follow the steps in the Administration Guide that came with your system to bring up the system after installation of an I/O adapter.

You are now ready to install the software packages from the Sun OC48 Packet Over Sonet 1.0 CD. The following section describes how to verify that the adapter is correctly installed.

▼ To Verify the Installation

After you have installed the two Sun OC48 Packet Over Sonet adapters, but *before* you boot your system, perform the following tasks to verify the installation. Refer to the *Solaris Handbook for Sun Peripherals* manual or your Solaris documentation for the detailed instructions.

1. **Follow the steps in the Administration Guide that came with your system to power on the system.**
2. **When the banner appears, press the Stop-A key sequence to interrupt the boot process and display the OpenBoot (**ok**) prompt.**

3. **List the network devices on your system.**

```
ok show-devs
```

Use the `show-devs` command to list the system devices. You should see the full path name of the `network` devices, similar to the example below. In this example, `pci108e,a11-a14`is the Sun OC48 Packet Over Sonet adapter.

```
ok show-devs
/ssm@0,0/pci@19,600000/pci108e,a14@1,3
/ssm@0,0/pci@19,600000/pci108e,a13@1,2
/ssm@0,0/pci@19,600000/pci108e,a12@1,1
/ssm@0,0/pci@19,600000/pci108e,a11@1
.
.
/ssm@0,0/pci@18,600000/pci108e,a14@1,3
/ssm@0,0/pci@18,600000/pci108e,a13@1,2
/ssm@0,0/pci@18,600000/pci108e,a12@1,1
/ssm@0,0/pci@18,600000/pci108e,a11@1
```

In the example above, the names of the Sun OC48 Packet Over Sonet devices are shown in *bold*, for clarity.

Note – If you do not see the device listed, check that the adapter is properly seated and, if necessary, reinstall the adapter.

Booting the System

After verifying the adapter installation, follow the steps in the Administration Guide that came with your system to do a reconfiguration boot.

Installing the Driver Software

The Sun OC48 Packet Over Sonet 1.0 CD contains the driver software required to operate the two adapters for SRP. Future revisions of the Solaris operating environment may contain Sun OC48 Packet Over Sonet adapter driver software. Refer to the documentation that shipped with the *Solaris Supplement* CD-ROM for a listing of the available network drivers.

1. **Insert the** *Sun OC48 Packet Over Sonet 1.0 CD* **into a CD-ROM drive that is connected to your system. As superuser, mount the Sun OC48 Packet Over Sonet 1.0 CD.**

   - If your system is running Volume Manager, it should automatically mount the CD-ROM to the `/cdrom/cdrom0` directory.
   - If your system is not running Volume Manager, mount the CD-ROM as follows:

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

   You will see the following files and directories in the `/cdrom/cdrom0` directory.

TABLE 4-4 Files and Directories on the CD-ROM

File or Directory	Contents
`Copyright`	U.S. copyright file
`FR_Copyright`	French copyright file
`Packages`	Contains the Sun OC48 Packet Over Sonet adapter software packages: SUNWipsx.u SUNWipsut SUNWipsm
`Docs`	Sun OC48 PacketOverSonet PCI Adapter Installation and User's Guide
`Tools`	ipsstat, ipssnoop

2. **Install the software packages by typing at the command line:**

```
# /usr/sbin/pkgadd -d /cdrom/cdrom0/Packages
```

3. **Install the software packages by typing at the command line:**

```
# /usr/sbin/pkgadd -d /cdrom/cdrom0/Packages/
The following packages are available:
  1  SUNWipsm       Sun OC-48 Packet Over Sonet Man Pages
                    (sparc) 1.0,REV=2001.11.19.21.03
  2  SUNWipsut      Sun OC-48 Packet Over Sonet Utilities to configure network
                    (sparc) 1.0,REV=2001.11.19.21.03
  3  SUNWipsx.u     Sun OC-48 Packet Over Sonet Device Driver and Boot Files
                    (64-bit) (sparc.sun4u) 1.0,REV=2001.11.19.21.03

Select package(s) you wish to process (or 'all' to process
all packages). (default: all) [?,??,q]:
```

4. **Press Return to accept the default.**

   You are now ready to configure the software for SRP. Continue on to Chapter 5 for the configuration steps.

Removing the Driver Software

1. **As superuser, type:**

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

   The following list of software packages is displayed.

```
system   SUNWipsm   Sun OC-48 Packet Over Sonet Man Pages
system   SUNWipsut  Sun OC-48 Packet Over Sonet Utilities to configure network
system   SUNWipsx   Sun OC-48 Packet Over Sonet Device Driver and Boot Files
(64-bit)
```

2. **Use the `pkgrm` command to remove the software packages listed.**

```
# /usr/sbin/pkgrm SUNWipsm SUNWipsut SUNWipsx
```

CHAPTER 5

Network Configuration and Cabling For SRP

This chapter describes how to edit the network configuration files for SRP after the adapters are installed in your system. This chapter contains the following sections:

Configuring the Driver

After installing the driver software, you must specify either an IP address or a host name for its SONET interface in the configuration files.

▼ To Configure the SRP Configuration Files

1. **At the command line, use the** `grep` **command to search the** `/etc/path_to_inst` **file for** `ips` **interfaces.**

```
# grep ips /etc/path_to_inst
...
"/ssm@0,0/pci@18,600000/pci108e,a11@1" 0 "ips"
"/ssm@0,0/pci@18,600000/pci108e,a13@1,2" 2 "ips"
"/ssm@0,0/pci@18,600000/pci108e,a12@1,1" 1 "ips"
"/ssm@0,0/pci@18,600000/pci108e,a14@1,3" 3 "ips"
...
"/ssm@0,0/pci@19,600000/pci108e,a11@1" 4 "ips"
"/ssm@0,0/pci@19,600000/pci108e,a13@1,2" 6 "ips"
"/ssm@0,0/pci@19,600000/pci108e,a12@1,1" 5 "ips"
"/ssm@0,0/pci@19,600000/pci108e,a14@1,3" 7 "ips"
...
```

   In the example above, the device instance is from two Sun OC48 Packet Over Sonet adapters installed in 66 MHz/64-bit PCI slots. The instance numbers are in *bold* for clarity. In this example, the two instances associated with device *a11* are on the top of the list for each adapter. The other instances are not to be used during the configuration steps. On your system, look for the two instances associated with the *a11* devices.

2. **Determine the instance number of the primary card.**

   Determine the instance numbers by the following method.

   - Using Step 1, above, find the instances for the two *a11* devices and use them for configuration.
   - Select the smaller instance number (for example 0) to be the instance number for the Primary card (Side A) and the larger one (for example 4) to be the Mate card (Side B). (As an option, choose the larger instance number to be the instance number for the Primary card and the smaller one for the Mate card, if you prefer. Be sure to use a consistent scheme in all nodes in the network.)

3. **Copy files and modify options**

- Copy `/etc/ips/ips.cf.template` file into `/etc/ips/ips.cf` file.
- Modify the `/etc/ips/ips.cf` file by adding the following to the end of the file:

```
ips0 SONET  SRP ips4
```

- If the instance numbers associated with the *a11* devices on your system are not *0* and *4*, then use the instance numbers determined in Step 2, above.

4. **Copy the configuration file,** `/etc/ips/srp-options.ips.template` **to the file** `/etc/ips/srp-options.ips`*N*.

   The letter, *N*, is the instance number of the Primary card For example, if the instance number of the Primary card is zero, the name of the file would be `srp-options.ips0`.

```
# cp /etc/ips/srp-options.ips.template /etc/ips/srp-options.ips N
```

5. **Edit the** `srp-options.ips`*N* **file.**
   - ip-addr: add the IP address for the SRP node, for example 192.12.25.30
   - mtu: the maximum mtu value is 9196 bytes
   - netmask: add the netmask value, such as 255.255.255.0
   - broadcast: add the broadcast value, such as 192.12.25.255
   - topology-timer: the frequency that the SRP node sends topology discovery packets (from 1 to 600 seconds); default is 60
   - ips-timer: the frequency that the SRP node sends intelligent protection switch (IPS) packets (from 1 to 60 seconds); default is 1
   - wtr-timer: 10 to 600 seconds, default is 60

6. **Run the** `/etc/init.d/sunipsinit` **command to configure the Sun OC48 Packet Over Sonet adapters in the mode based on the** `/etc/ips/ips.cf` **and the** `srp-options.ipsN` **configuration files**:

```
# /etc/init.d/sunipsinit
```

Connecting the Fiber Optic Cables for SRP

The following procedure completes the connection of your two Sun OC48 Packet Over Sonet adapters to a SONET.

▼ To Connect the Fiber Optic Cables

You are now ready to connect the SRP cables. After you configured the SRP node, one of the cards will be the primary card. The Primary LED on this card will be on. The Primary LED on the Mate card will be off.

1. **Locate the Primary card and the Mate card.**

   For clarity, consider the Primary card Side A and the Mate card Side B.

2. **Locate the Primary card and the Mate card for the neighbor node.**

   For clarity, consider the Primary card Side A and the Mate card Side B.

3. **Determine the connection type you will use for your Sun OC48 Packet Over Sonet adapter.**

   - If you are connecting to a SONET network through a switch, use the LC/SC cable.

   Note – Some switches have LC-type connectors. In such case, use the LC/LC cable instead.

   - If you are connecting to another Sun OC48 Packet Over Sonet adapter in another system, use the LC/LC cable.

4. **Remove the dust covers from the cable connectors.**

   FIGURE 5-1 shows a detail of the LC connector and the dust cover.

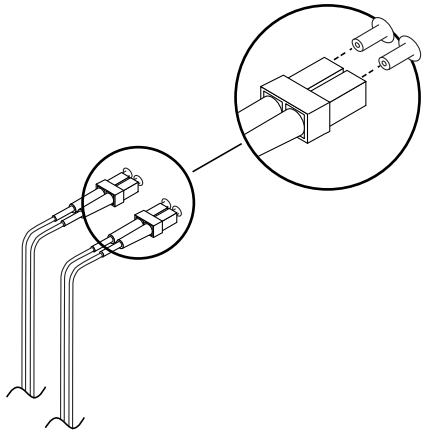

FIGURE 5-1 Detail of the LC Connector and Dust Cover

FIGURE 5-2 shows a detail of the SC connector and the dust cover.

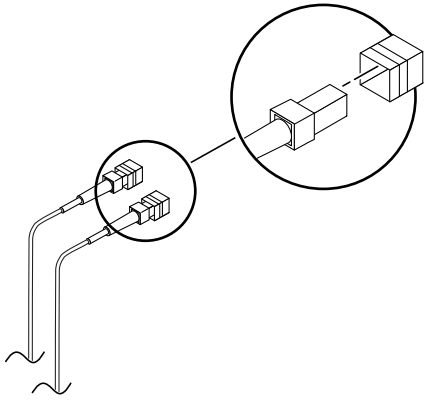

FIGURE 5-2 Detail of the SC Connector and Dust Cover

5. **Match the cable connectors with the connectors on the Sun OC48 Packet Over Sonet adapter front panel.**

Note – Connect the primary card (Side A) on this SRP node to the mate connection (Side B) on the neighbor SRP node. Likewise, connect the mate card (Side B) on this SRP node to the primary connection (Side A) on the neighbor SRP node.

---

6. **Seat the cable connectors into the connectors on the Sun OC48 Packet Over Sonet adapter front panel.**

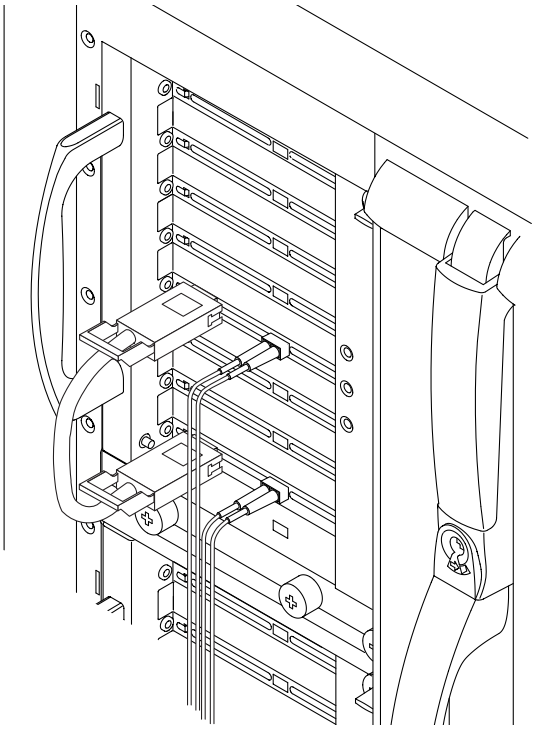

FIGURE 5-3 Two Sun OC48 Packet Over Sonet Adapters with SRP and Common OC-48 Cables Connected.

7. Check the IPS configuration

The following example shows the topology of a three-node SRP ring:

```
# ipsconfig -i ips0 top
Topology Map for Interface SRP0
 Topology pkt. sent every 20 sec. (next pkt. after 11 sec.)
   Nodes on the ring: 3
   Hops (outer ring)    Optimal    MAC Address          IP Addr.        Wrapped
      0                   --     08:00:20:e5:de:91       192.12.25.25    No
      1                 SIDE-A   08:00:20:e5:de:90       192.12.25.30    No
      2                 SIDE-B   00:03:a0:9c:58:55       192.12.25.111   No

   Hops (inner ring)    Optimal    MAC Address          IP Addr.        Wrapped
      0                   --     08:00:20:e5:de:91       192.12.25.25    No
      2                 SIDE-A   08:00:20:e5:de:90       192.12.25.30    No
      1                 SIDE-B   00:03:a0:9c:58:55       192.12.25.111   No
```

Wait until none of the nodes is in wrapped state (unless wrap state is expected).

▼ To Plumb the IP Stack

1. **Plumb the IP stack.**

```
# /etc/init.d/sunips start
```

2. **Execute the** `ifconfig` **command to verify the plumb.**

```
# ifconfig -a
ips0: flags=1000843<UP,BROADCAST,RUNNING,MULTICAST,IPv4> mtu 9196
index 20inet 192.12.25.30 netmask ffffff00 broadcast 192.12.25.255
ether 8:0:20:e5:de:90
```

CHAPTER 6

Configuring Driver Parameters

This chapter describes how to configure the driver parameters used by the Sun OC48 Packet Over Sonet adapter.

This chapter contains the following sections:

OC48 Packet Over Sonet Driver Parameters

The ips device driver controls the OC48 Packet Over Sonet devices. The ips driver is attached to the UNIX pci name property pci108e,a11 for the OC48 Packet Over Sonet adapter (108e is the vendor ID and a11 is the PCI device ID). There are also other three "virtual devices" (a12,a13 and a14) associated with each card.

You can manually configure the ips device driver parameters to customize each OC48 Packet Over Sonet adapter device in your system. This section provides an overview of the capabilities of the OC48 Packet Over Sonet device used in the adapter, lists the available ips device driver parameters, and describes how to configure these parameters.

Driver Parameter Values and Definitions

TABLE 6-1 describes the parameters and settings for the `ips` device driver.

TABLE 6-1 Driver Parameter, Status, and Descriptions

Parameter	Status	Description
`ips_instance`	Read and write	Device instance
`ips_iblanka_pkt`	Read and write	Interrupt blanking values
`ips_iblanka_tim`	Read and write	Interrupt blanking values
`ips_iblankb_pkt`	Read and write	Interrupt blanking values
`ips_iblankb_tim`	Read and write	Interrupt blanking values
`ips_iblankc_pkt`	Read and write	Interrupt blanking values
`ips_iblankc_tim`	Read and write	Interrupt blanking values
`ips_iblankd_pkt`	Read and write	Interrupt blanking values
`ips_iblankd_tim`	Read and write	interrupt blanking values
`ips_txqpri`	Read and write	Transmit queue values
`ips_txloadbal`	Read and write	Transmit queue values
`ips_txpolicy`	Read and write	Transmit queue values
`ips_txqos`	Read and write	Transmit queue values

Interrupt Blanking Parameters

TABLE 6-2 defines the interrupt blanking parameters.

TABLE 6-2 Interrupt Blanking Parameters

Parameter	Values	Description
`ips_iblanka_pkt`	0 to 8191	Interrupt after this number of packets have arrived since the last packet was serviced on INTA. A value of zero indicates no packet blanking. (Default=0)
`ips_iblanka_time`	0 to 524287	Interrupt after this number of clock ticks have elapsed since the last packet was serviced on INTA. A value of zero indicates no time blanking. (Default=0)
`ips_iblankb_pkt`	0 to 8191	Interrupt after this number of packets have arrived since the last packet was serviced on INTB. A value of zero indicates no packet blanking. (Default=0)
`ips_iblankb_time`	0 to 524287	Interrupt after this number of clock was serviced on INTB. A value of zero indicates no time blanking. (Default=0)
`ips_iblankc_pkt`	0 to 8191	Interrupt after this number of packets have arrived since the last packet was serviced on INTC. A value of zero indicates no packet blanking. (Default=0)

TABLE 6-2 Interrupt Blanking Parameters

Parameter	Values	Description
`ips_iblankc_time`	0 to 524287	Interrupt after this number of clock ticks have elapsed since the last packet was serviced on INTC. A value of zero indicates no time blanking. (Default=0)
`ips_iblankd_pkt`	0 to 8191	Interrupt after this number of packets have arrived since the last packet was serviced on INTD. A value of zero indicates no packet blanking. (Default=0)
`ips_iblankd_time`	0 to 524287	Interrupt after this number of clock ticks have elapsed since the last packet was serviced on INTD. A value of zero indicates no time blanking. (Default=0)

Transmit Queue Parameters

TABLE 6-3 lists the default values and allowable values for the transmit queue parameters.

TABLE 6-3 Transmit Queue Parameter Values and Descriptions

Parameter	Values	Description
`ips_txqpri`	0 to 13107	The value of priority level in the four transmit queues. There are a total of four priority level for each queue (0 to 3). A value of 0x3210 indicates that queue 0 has priority 0. Queue 1 has priority 1, queue 2 has priority 2, Queue 3 has priority 3. The hex value needs to be in the form of decimal when entering into this variable. (Default=12816 or 0x3210)
`ips_txloadbal`	0 to 1	A value of 1 enables Tx load balancing. A value of 0 disables Tx load balancing If Tx load balancing is turned on, the Tx packet header is parsed to determine which queue the packet is placed into. All control packet is placed into Queue0. All TCP packets will be parsed and load balanced according to the policy set into the ips_txpolicy parameter. When Tx load balancing is disabled, all packets default to queue 0.
`ips_txpolicy`	0 to 7	The value of this parameter will be logical ANDed with the source TCP port number to determine the Tx queue to be used for load balancing purpose. For example, if TCP source port number is 10001 and the value is set to 3, then the Tx queue used will be (10001 & 3) = Tx Queue #1. This parameter is only meaningful when the ips_txloadbal parameter is set to 1. Otherwise, the value in this parameter is ignored.
`ips_txqos`	0 to 1	A value of 1 enables Tx QoS A value of 0 disables Tx QoS When QoS is enabled, the Tx queue number is determined by the b_band field of the message block (mblk) delivered from IP. The current mapping is set as follows: b_band valueQueue# 0 to 640 65 to 1921 193 to 2242 225 to 2553 ips_txqos overrides the ips_txloadbal and ips_txpolicy. Therefore, when ips_txqos is enabled, the value of ips_txloadbal and ips_txpolicy parameters are ignored.

OC48 Packet Over Sonet Driver Operating Statistics

TABLE 6-4 lists and describes the OC48 Packet Over Sonet driver operating statistics.

TABLE 6-4 OC48 Packet Over Sonet Driver Operating Statistics

Parameter	Description
`allocbfail`	Number of times the allocb function is not able to allocate a message block
`badcrc`	Number CRC errors reported on incoming packets CRC errors on incoming packets
`brdcstrcv`	Number of incoming broadcast packets
`brdcstxmt`	Number of outgoing broadcast packets
`buserrack`	Number of PCI errors received reported by the FPGA
`ierrors`	Number of errors in incoming packets
`ifspeed`	Interface speed in bits per second
`inits`	Number of times the initialization function is called
`interrupts`	Number of times interrupts are asserted
`ipackets`	Number of incoming packets
`ipackets64`	Number of incoming packets accumulated in 64-bits value
`media`	Name of the physical layer
`multircv`	Number of multicast packet received
`multixmt`	Number of multicast packets transmitted
`nocanput`	Number of non successful putnext attempts
`norcvbuf`	Number of times receive buffers cannot be allocated
`noxmtbuf`	Number of times packets cannot be transmitted
`obytes`	Number of outgoing bytes
`obytes64`	Number of outgoing bytes accumulated in 64-bits value
`oerrors`	Number of errors in outgoing packets
`opackets`	Number of outgoing packets
`opackets64`	Number of outgoing packets accumulated in 64-bits value

TABLE 6-4 OC48 Packet Over Sonet Driver Operating Statistics

Parameter	Description
`outofrbuf`	Number of times receive buffers not available reported when receiving packets
`outoftbuf`	Number of times packets cannot be transmitted
`pppctlrcv`	Number of PPP control packets received
`pppctlxmt`	Number of PPP control packets transmitted
`promisc`	Promiscuous mode setting
`protocol`	Protocol setting
`rbytes`	Number of bytes received
`rbytes64`	Number of bytes received accumulated in 64-bits value
`rxoverflow`	Number of times receive FIFO overflowed
`rxparityerr`	Number of times Rx parity errors encountered
`srpctlrcv`	Number of SRP control packets received
`srpctlxmt`	Number of SRP control packets transmitted
`unknowns`	Number of received packets that have unknown protocol

Setting `ips` Parameters Using the `ndd` Utility

Use the `ndd` utility to configure parameters that are valid until you reboot the system.

- **To list all the parameters supported by the `ips` driver, type `ndd /dev/ips`.**

(See TABLE 6-1 for parameter descriptions.:

```
# ndd /dev/ips
name to get/set ? ?
?                               (read only)
ips_instance                    (read and write)
ips_iblanka_pkt                 (read and write)
ips_iblanka_tim                 (read and write)
ips_iblankb_pkt                 (read and write)
ips_iblankb_tim                 (read and write)
ips_iblankc_pkt                 (read and write)
ips_iblankc_tim                 (read and write)
ips_iblankd_pkt                 (read and write)
ips_iblankd_tim                 (read and write)
ips_txqpri                      (read and write)
ips_txloadbal                   (read and write)
ips_txpolicy                    (read and write)
ips_txqos                       (read and write)
name to get/set ?
```

The following section describes how you can use the `ndd` utility to modify (with the `-set` option) or display (without the `-set` option) the parameters for each `ips` device.

Note – The `ips_instance` can only accept a multiple of 4 including 0.

▼ To Specify Device Instances for the ndd Utility

Before you use the ndd utility to get or set a parameter for an ips device, you must specify the device instance for the utility.

1. **Check the** /etc/path_to_inst **file to identify the instance associated with a particular device.**

```
# grep ips /etc/path_to_inst
"/ssm@0,0/pci@18,600000/pci108e,a11@1" 0 "ips"
"/ssm@0,0/pci@18,600000/pci108e,a13@1,2" 2 "ips"
"/ssm@0,0/pci@18,600000/pci108e,a12@1,1" 1 "ips"
"/ssm@0,0/pci@18,600000/pci108e,a14@1,3" 3 "ips"
```

In the example above, the device instances are from a Sun OC48 Packet Over Sonet adapter. The instance numbers are in *bold* for clarity.

2. **Use the instance number to select the device.**

```
# ndd -set /dev/ips instance instance#
```

The device remains selected until you change the selection.

APPENDIX **A**

Specifications

This appendix lists the specifications for the Sun OC48 Packet Over Sonet adapter. It contains the following sections:

Fiber Optic Connector

TABLE A-1 lists the characteristics of the LC connector.

TABLE A-1 LC Connector Link Characteristics

Description	1300 nm single mode fiber
Operating range	Up to 2 kilometers

Technical Specifications

Feature	Specification
PCI slot	66 MHz PCI slot only
PCI data/address width	64 -bit
PCI modes	Master/slave
2.488 GBit/s, 1300 nm, single mode	2.488 GBit/s
Distance	Up to 2 kilometers

Physical Characteristics

Dimension	Measurement
Length	12.283 inches
Width	4.2 inches

Power Requirements

Specification	Measurement
Maximum power consumption	13.5 watts (PPP mode)
Voltage	3.3V and 5V

APPENDIX **B**

Receive Load Balancing

The device driver supports four distinct receive buffer queues. The on-board microprocessor is parses the headers of received packets to determine which of the queues to deliver the received packet to.

In TCP/IP networking, the received packets can be fanned out to multiple CPUs for processing. Based on the TCP port numbers, packets will be placed on one of four queues to be sent to four different processors.

The way the TCP IP header is parsed is determined by the Virtual IP Table (VIP Table). The VIP table contains a list of up to 127 IP addresses, which will be searched by the on-board microprocessor for each received packet. If it finds a match, the queue number for that entry is the base queue number to use for receiving the packets. This queue number will be further modified according to the policy of the entry. Add the VIP table entry to the file `/etc/ips/ips.cf`. The following shows the format of the VIP Table entry:

```
vipentry:
# Interface  Entry#       IP Address   Queue#       Policy
   ipsN      0 ~ 127      x.x.x.x      0 ~ 3        0 ~ 3
```

- Interface: The driver's name and interface's instance. For example, `ips0`
- Entry: The entry number of the VIP Table. Up to 128 entries can be supported
- IP Address: IPv4 or IPv6 address
- Queue#: The base receive buffer queue (one of 4 Rx buffer queues). Note: This may or may not be the target queue# depending on the TCP packet's port number and the Policy used.
- Policy:

  0 - no policy. Use the Queue# from the table entry.

  1 - 1-bit port based load balancing: add the lower bit of the TCP source port number to the Queue# from the entry.

2 - 2-bit port based balancing: add the lower 2 bits of the TCP source port number to the Queue# from the entry.

3 - 3-bit port based load balancing: add the lower 3 bits of the TCP source port number to the Queue# from the entry.

Example 1:

```
# Interface   Entry         IP Address    Queue#        Policy
  ips0        0             1.2.3.4       1             2
```

If the incoming packet's IP address matches the IP Address of the IP Address entry, then the target receive queue is equal to:

Target queue = Queue# + TCP Port Number & Policy

If the source port number of this packet is 32763 (0x7FFB), then the resulting target queue will be:

```
Target queue   = 1 + (0x7FFB & 2)
               = 3
```

This packet will be delivered to Queue #3. The CPU that runs this particular queue will handle the interrupt processing for this packet.

Example 2:

```
# Interface   Entry         IP Address    Queue#        Policy
  ips0        1             0.0.0.0       0             2
```

This setup is for receive side load balancing based on the TCPport number alone without considering the IP address.

In this example, if the incoming packet's source port number is 32763 (0x7FFB), then the result target queue will be:

```
Target queue   = 0 + (0x7FFB & 2
               = 2
```

This is a typical setup for receive load balancing within a single host.

All VIP entries are specified in the ips.cf configuration file.To disable the Receive Load Balancing feature, simply not to specify any vipentry in the ips.cf configuration file. The default setup is with receive load balancing disabled.

APPENDIX **C**

SRP Conventions

When the Sun OC48 Packet Over Sonet Adapters are used for SRP mode, each SRP node consists or two adapters. One of the adapters is named Primary, or Side A, the other one is named Mate (Side B). The Primary adapter is always connected to the Mate adapter of its neighbor node. The Mate adapter is always connected to the Primary adapter of its neighbor node. The two adapters (Primary and Mate) are connected together by the SRP Data Cable.

FIGURE C-1 illustrates an SRP node.

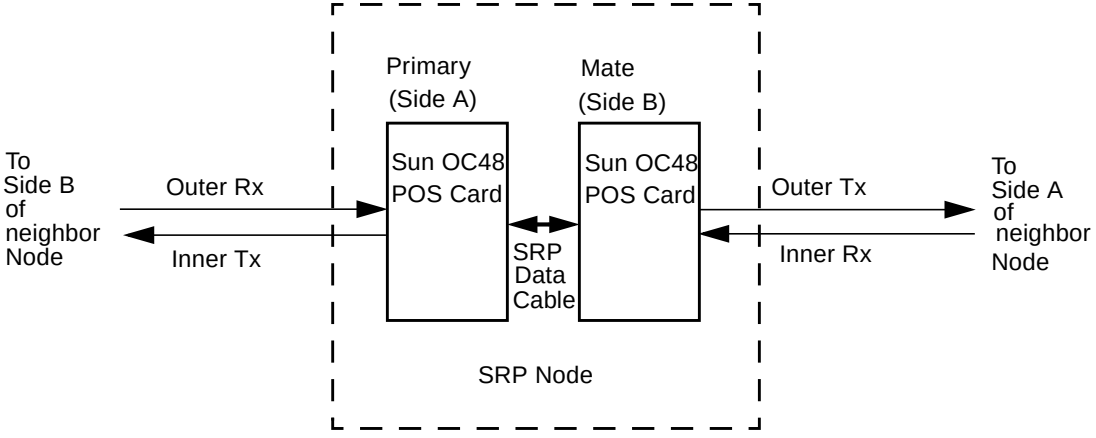

FIGURE C-1 SRP Node

In normal operation, the host can post packets to either the Primary or the Mate card, depending on the Topology. When the host needs to sends a packet from the Outer ring (as illustrated in FIGURE C-2), the host posts the packet to the Primary Adapter (Side A), the Primary Adapter will then forward the packet to the Mate Adapter and the Mate Adapter will then send the packet out to the Outer Tx fiber.

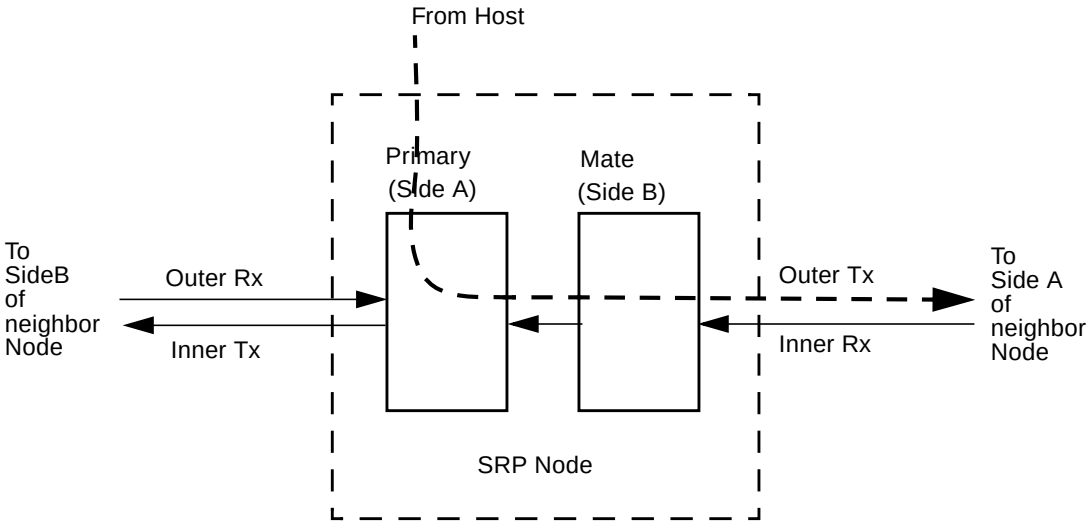

FIGURE C-2 Sending Packet from the Outer Ring of an SRP Node

Likewise, when the host needs to send a packet from the Inner Ring, the host posts the packet to the Mate Adapter (Side B), the Mate Adapter will then forward the packet to the Primary Adapter and the Primary Adapter will then send the packet out to the Inner Tx fiber, as shown in FIGURE C-3.

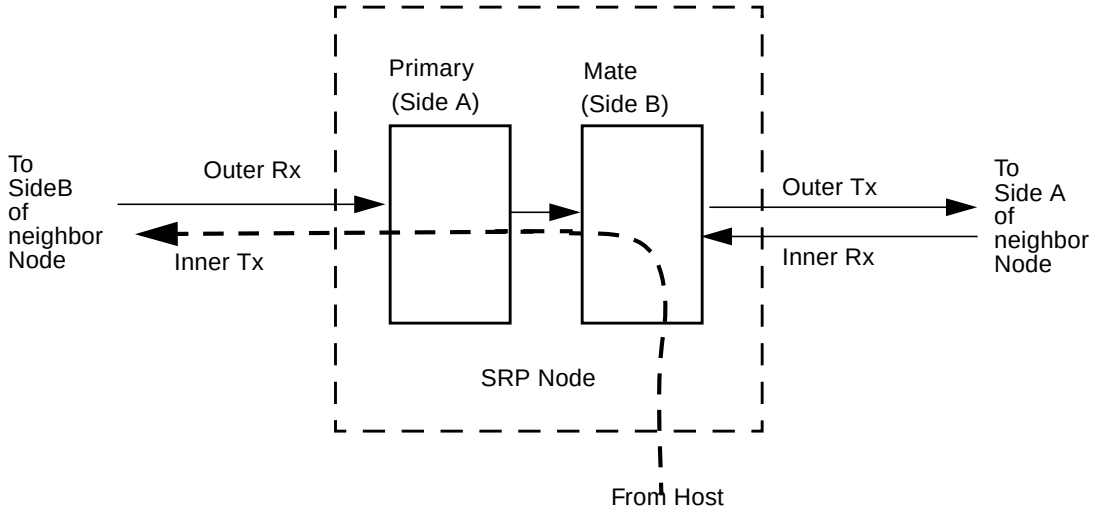

FIGURE C-3 Sending Packet from the Inner Ring of an SRP Node

In normal operation, either Primary or Mate adapter can receive packets. In each case, the adapter will send the packet up to the host directly, without any forwarding.

Both Primary and Mate can transmit and receive packets from either Outer or Inner ring simultaneously.

Three-Node Ring Example

This section shows a three-node ring example, illustrated in FIGURE C-4. Following are settings for each of the three nodes: Artic, Atlantic, and Pacific.

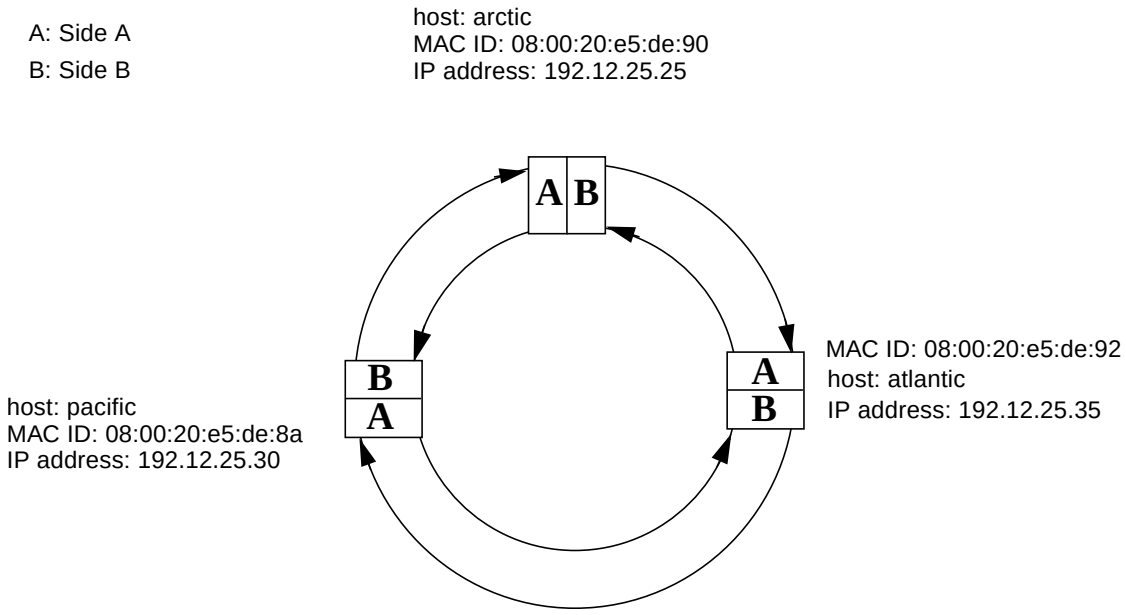

FIGURE C-4 Three-Node Ring

The following example shows the Topology Map on Node arctic as well as the command to print out the map:

```
# /usr/sbin/ipsconfig -i ips0 top
Topology Map for Interface SRP0
 Topology pkt. sent every 20 sec. (next pkt. after 13 sec.)
   Nodes on the ring: 3
Nodes on the ring: 3
  Hops (outer ring)    Optimal    MAC Address         IP Addr.      Wrapped
      0                   --    08:00:20:e5:de:90      192.12.25.25   No
      1                 SIDE-A  08:00:20:e5:de:92      192.12.25.35   No
      2                 SIDE-B  08:00:20:e5:de:8a      192.12.25.30   No

   Hops (inner ring)    Optimal    MAC Address         IP Addr.      Wrapped
      0                   --    08:00:20:e5:de:90      192.12.25.25   No
      2                 SIDE-A  08:00:20:e5:de:92      192.12.25.35   No
      1                 SIDE-B  08:00:20:e5:de:8a      192.12.25.30   No
```

The following example shows theTopology Map on Node atlantic as well as the command to print out the map:

```
# /usr/sbin/ipsconfig -i ips0 top
Topology Map for Interface SRP0
 Topology pkt. sent every 20 sec. (next pkt. after 15 sec.)
   Nodes on the ring: 3
   Hops (outer ring)    Optimal    MAC Address         IP Addr.      Wrapped
      0                   --    08:00:20:e5:de:92      192.12.25.35   No
      1                 SIDE-A  08:00:20:e5:de:8a      192.12.25.30   No
      2                 SIDE-B  08:00:20:e5:de:90      192.12.25.25   No

   Hops (inner ring)    Optimal    MAC Address         IP Addr.      Wrapped
      0                   --    08:00:20:e5:de:92      192.12.25.35   No
      2                 SIDE-A  08:00:20:e5:de:8a      192.12.25.30   No
      1                 SIDE-B  08:00:20:e5:de:90      192.12.25.25   No
```

The following example shows theTopology Map on Node pacific as well as the command to print out the map:

```
 # /usr/sbin/ipsconfig -i ips0 top
Topology Map for Interface SRP0
 Topology pkt. sent every 20 sec. (next pkt. after 17 sec.)
   Nodes on the ring: 3
   Hops (outer ring)    Optimal    MAC Address         IP Addr.      Wrapped
      0                   --    08:00:20:e5:de:8a      192.12.25.30   No
      1                 SIDE-A  08:00:20:e5:de:90      192.12.25.25   No
      2                 SIDE-B  08:00:20:e5:de:92      192.12.25.35   No

   Hops (inner ring)    Optimal    MAC Address         IP Addr.      Wrapped
      0                   --    08:00:20:e5:de:8a      192.12.25.30   No
      2                 SIDE-A  08:00:20:e5:de:90      192.12.25.25   No
      1                 SIDE-B  08:00:20:e5:de:92      192.12.25.35   No
```