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5611 S/FDDI Adapter
Users Guide

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5611 S/FDDI Adapter
Users Guide

Document No. UG05611-000, REVA

Release Date: September 8, 1997

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- You received a damaged, incomplete or incorrect product.

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Customer Support

United States:	Telephone:	(214) 654-5555
	Fax:	(214) 654-5500
	E-Mail:	intouch@iphase.com
United Kingdom:	Telephone:	+ 44 (0) 1869-321222
	Fax:	+ 44 (0) 1869-247720
France:	Telephone:	+ 33 (0) 1 41 15 44 00
	Fax:	+ 33 (0) 1 41 15 12 13
Asia/Pacific Rim:	Telephone:	+ 81 35423 6513
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World Wide Web

http://www.iphase.com

Anonymous FTP Server

ftp.iphase.com

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The following general safety precautions must be observed during all phases of operation of this equipment. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the equipment. Interphase Corporation assumes no liability for the user's failure to comply with these requirements. You, as the user of the product, must observe all stated warnings and safety precautions in order to safely operate the equipment in your environment.

Do Not Substitute Parts or Modify Equipment

Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification of the equipment. Contact your local Interphase representative for service and repair to ensure that safety features are maintained.

Ground the Instrument

To minimize shock hazard, the equipment chassis and enclosure must be connected to an electrical ground. The power cable must either be plugged into an approved three-contact electrical outlet or used with a three-contact to two-contact adapter, with the grounding wire (green) firmly connected to an electrical ground (safety ground) at the power outlet.

Do Not Operate in an Explosive Atmosphere

Do not operate the equipment in the presence of flammable gases or fumes. Operation of any electrical equipment in such an environment constitutes a definite safety hazard.

Keep away from Live Circuits

Do not install or replace the component with power cable connected. Under certain conditions, dangerous voltages may exist even with the power cable removed. To avoid injuries, always disconnect power and discharge circuits before touching them.

Observe Dangerous Procedure Warnings

Warnings precede potentially dangerous procedures throughout this manual. Instructions contained in the warnings must be followed. You should also employ all other safety precautions which you deem

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necessary for the operation of the equipment in your operating environment.



WARNING

This equipment generates, uses, and can radiate electromagnetic energy. It may cause or be susceptible to electromagnetic interference (EMI) if not installed and used in a cabinet with adequate EMI protection.

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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.

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(according to ISO/IEC Guide 22 and EN 45014)

Manufacturer's Name:	Interphase Corporation
Manufacturer's Address and Phone Number:	13800 Senlac Dallas, Texas 75234 U.S.A. 214/654-5000

declares, that the product:

Product Name: SBUS FDDI DAS FIBER

Model Number: 5611

conforms to the following Standards:

Safety:	EN 60950:1988 + A1, A2 IEC 825 -1 & -2 1993
EMC:	EN 55022:1988 class A EN 50082-1 Part 1 1992

Supplementary Information:

This product complies with the requirements of the **Low Voltage Directive 73/23/EEC** and the **EMC directive 89/336/EEC**.

Dallas, July 17, 1996



Mike Jobe, Quality Manager

European Contact:

Interphase International
Astral House, Granville Way, Bicester, Oxon, England OX6 0JT
Phone: +44 (0) 1869-321222; Fax:+44 (0) 1869-247720

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Declaration of Conformity

(according to ISO/IEC Guide 22 and EN 45014)

Manufacturer's Name:	Interphase Corporation
Manufacturer's Address and Phone Number:	13800 Senlac Dallas, Texas 75234 U.S.A. 214/654-5000

declares, that the product:

Product Name: SBus FDDI UTP SAS

Model Number: 5611

conforms to the following Standards:

Safety:	EN 60950:1988 + A1, A2
EMC:	EN 55022:1988 class A EN 50082-1 Part 1 1992

Supplementary Information:

This product complies with the requirements of the **Low Voltage Directive 73/23/EEC** and the **EMC directive 89/336/EEC**.

Dallas, December 9, 1996



Mike Jobe, Quality Manager

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Conventions

Icon Conventions

Icons draw your attention to especially important information:



Note

The Note icon indicates important points of interest related to the current subject.



Caution

The Caution icon brings to your attention those items or steps that, if not properly followed, could cause problems in your machine's configuration or operating system.



Warning

The Warning icon alerts you to steps or procedures that could be hazardous to your health, cause permanent damage to the equipment, or impose unpredictable results on the surrounding environment.

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Text Conventions

The following conventions are used in this manual. Computer-generated text is shown in a monospace, typewriter-like font. Examples of computer-generated text are: program output (such as the screen display during the software installation procedure), commands, directory names, file names, variables, prompts, and sections of program code.

```
Computer-generated text example
```

Commands to be entered by the user are printed in **bold Courier** type. For example:

```
cd /usr/tmp
```

Pressing the return key (↵ **Return**) at the end of the command line entry is assumed, when not explicitly shown. For example:

```
/bin/su
```

is the same as:

```
/bin/su ↵ Return
```

Input required by the user, when mixed with program output, is printed in **bold Courier** type. References to UNIX programs and manual page entries follow the standard UNIX conventions.

When a user command, system prompt, or a system response is too long to fit on a single line in this user's guide, it will be shown as

```
Do you want the new kernel moved into
\ vmunix?[y]
```

with a backslash at the beginning of the continued line or with a backslash at the end of the previous line.

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Introduction 1

Adapter Overview

The 5611 S/FDDI adapter is a high-performance FDDI (Fiber Distributed Data Interface) network interface card for SBus-based SunSPARC and Sun 6000 series workstations. The adapter is designed to operate within the framework of today's open systems architectures by providing physical and data-link services as defined by the ANSI X3T9.5 specifications (changed to X3T12 in 1994) for FDDI. The 5611 adapter brings the advantages of FDDI networking to Sun systems, while optimizing open systems bus performance for SBus users. The 5611 adapter is fully interoperable with other standards-compliant products.

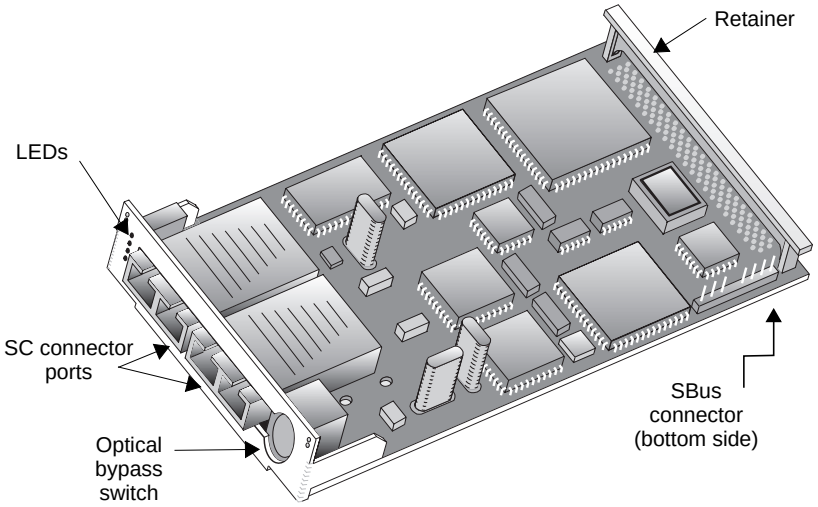


Figure 1-1. 5611 Dual Attachment Adapter

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The 5611 S/FDDI adapter supports both SAS (Single Attach Station) and DAS (Dual Attach Station) connectivity. The SAS versions of the 5611 adapter allow the host system to connect to the ring through a concentrator. Workstations and servers connecting directly to the ring require the use of a Dual Attach adapter. All adapters offer 100 Mbps network connectivity with support for optical fiber and twisted pair network media.

Product Features

- Occupies a single SBus slot
- SMT 7.3 support for Solaris 2.x systems
- SBus Master and Slave
- Integrated FDDI Station Management (SMT)
- Supports optical fiber and UTP copper media
- Supports Dual Attachment and Single Attachment
- Card and ring status shown by LEDs
- Motorola MC68840 FDDI chipset
- Supports 32-bit SBus data transfers with bursts of up to 64 bytes

5611 Adapter Compatibility

The 5611 S/FDDI adapter is available for use with:

- Sun Open Boot PROM 2.4 or later
- Operating System:

  Solaris (versions 2.3 through 2.5)
- Hardware:

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Table 1-1. 5611 Platform Support

Platform	# 5611s supported per platform for Solaris
Sun SPARCstation 2	2
Sun SPARCstation 5	2
Sun SPARCstation 10	2
Sun SPARCstation 20	2
Sun SPARCserver 1000	2
Sun SPARCcenter 2000	2
Sun 600 Series	2
Sun SPARCstation IPX	2
Sun SPARCstation Ultra 1	2



Caution

The 5611 adapter is sensitive to static electricity. Do not touch any components or metal parts without using a grounding strap. To prevent damage from electrostatic discharge, handle the adapter only while wearing a grounding strap.

Do not handle the retainer at the back of the adapter when inserting or removing the 5611 adapter. This retainer is used to secure the adapter in proper position when the cover of the unit is in place.

System Requirements

Requirements for a successful installation are the following:

- Solaris 2.2 or later running on the target system and

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  - Approximately 400 kilobytes of disk space in the / directory.
  - At least 1 megabyte of disk space in **/etc**.
  - At least 500 kilobytes of disk space in **$BASEDIR** (typically **/opt**).
- Open Boot PROM revision 2.4 or later on the motherboard.

  To verify the version of the boot PROM on your machine, refer to *Boot PROM Version Verification* on page 66.

Introduction to FDDI

Fiber Distributed Data Interface (FDDI) is a 100 Mbps, token-passing, single or dual ring interface that can be implemented with Fiber Optic or Unshielded Twisted-Pair (UTP) media. A Timed Token Protocol (TTP) is used to control when a station can transmit data to the network. A station can transmit a message on the network only after it has received a token. Upon receiving the token, a station begins transmitting data. The station may transmit until the message is transmitted or until the TTP timer expires. This allows all stations fair access to the ring. Once the message is sent or the timer expires, the station generates a new token and releases it on the ring. Any downstream station with data to send can capture the token and repeat the timed-transmission cycle.

A dual ring configuration for the network media provides a secondary backup ring in case of a fault on the primary ring. It is typically implemented as a campus backbone or in buildings where a failure in the primary ring would have serious consequences. A break in the primary ring causes the two stations on each side of the fault to automatically wrap the data

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to the secondary ring. Stations in a single ring configuration can only attach to the primary ring. There is no secondary backup path in the event of a failure.

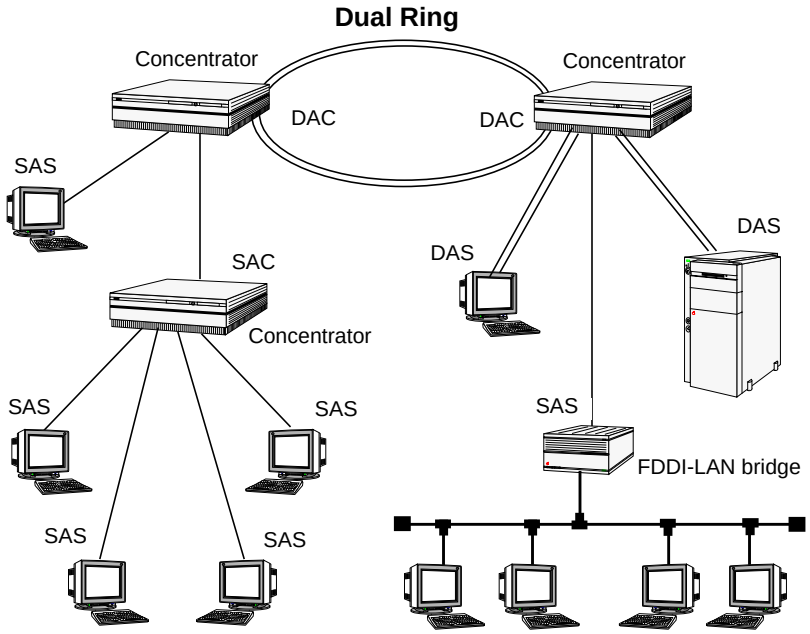


Figure 1-2. FDDI Architecture

To promote ease of installation and maintenance, FDDI allows for several types of networking devices. These include dual ring and single ring concentrators, and dual ring and single ring stations. Concentrators are the building blocks of an FDDI network. These stations and concentrators connect to the FDDI ring as follows:

- **Dual Attachment Concentrator (DAC):** Connects to the dual ring and serves as a hub for single or dual

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attachment devices. Also allows stations to be added and removed from the ring with minimal interruption of network traffic.

- **Single Attachment Concentrator (SAC):** Connects to the primary ring through a DAC and serves as a single ring hub. SACs can be stacked to form a sophisticated *span of trees* topology.
- **Dual Attachment Station (DAS):** Connects to a dual ring of primary and secondary network media.
- **Single Attachment Station (SAS):** Connects only to the primary ring. Generally, a SAS connects to the FDDI ring through a DAC.



Note

DAC and DAS connect directly to the FDDI dual ring while SAC and SAS only connect to a single, primary ring.

Dual attachment does not provide greater performance than single attachment. It only provides a secondary means of communication in case of failure on the primary ring.

A SAS must be used with an FDDI concentrator like Interphase's 1600, M100, M400, or M800 FDDI Concentrator. However, the DAS configuration can be connected to any dual attach ring.

Network designers and administrators are given the opportunity to balance the costs of installation and operation with the quality of service demanded by each segment. For example, a dual set of fiber running between stations is much more expensive than connecting the stations with a single fiber. Thus, a dual ring topology is typically used for major

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backbones in the system. Single rings are generally used to branch off the backbones to various workgroups and peripheral installations.

For information about Interphase's dual-attach cards and concentrators, contact the Interphase Sales Department.

Related Documents

- *System and Network Administration*, Sun Microsystems.
- *SunOS Reference Manual*, Sun Microsystems
- *SunOS 5.x Application Packaging and Installation Guide*, Sun Microsystems
- *Sun Hardware Installation Manuals*, Sun Microsystems
- *Installing SBus Cards in Desktop SPARCstations*, Sun Microsystems
- *CPU & Memory Installation Service Manual*, Sun Microsystems
- FDDI references:
  - ANSI X3T9.5/84-49 FDDI Station Management (SMT)
  - ANSI X3.139 - 1987 FDDI Token Ring Media Access Control (MAC)
  - ANSI X3.148 - 1988, Token Ring FDDI Physical Layer Protocol (PHY)
  - ANSI X3.166 - 1990 Token Ring FDDI Physical Layer Medium Dependent (PMD)
  - ANSI X3T9.5/92 - TP-PMD/220 - Rev 0.3, Feb. 17, 1993

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You can order these FDDI specifications from either of the following organizations:

Primary source:

Global Engineering
2805 McGraw Ave.
Irvine, CA 92714
(800) 854-7179

Secondary source:

American National
Standards Institute
1430 Broadway
New York, NY 10018
(212) 354-3300

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5611 Hardware Installation

2

Overview

This chapter describes the procedure for physically installing the 5611 S/FDDI Adapter in a Sun workstation or server and includes the following:

- Unpacking the adapter board
- Shutting down the host system
- Installing the board in a host workstation or server
- Connecting the adapter to the network

There is an installation procedure for each host system type. Each includes:

- Removing the cover of the system
- Inspecting the 5611 S/FDDI Adapter
- Inserting and seating the adapter
- Replacing the system cover

If this is your first adapter installation, or if you want a refresher course in your host system hardware, consult the following documents from Sun Microsystems:

- For the SPARCstation desktop, see:
  - *Installing SBus Cards in Desktop SPARCstations*
  - *Desktop SPARC—Hardware Owner's Guide*
- For the SPARCserver 600 MP, SPARCserver 1000, or SPARCcenter 2000, see:
  - *CPU & Memory Installation Service Manual*

Observe all notes, cautions, and warnings.

For technical specifications for the 5611, see Appendix A.

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Tools Required

You'll need the following tools to install the 5611:

- #1 Phillips head screwdriver
- Grounding strap or other grounding device

Unpacking the 5611



Caution

The board is packed in an antistatic bag to protect it during shipment. Keep the 5611 S/FDDI Adapter in the protective antistatic bag until you are ready to install it on the motherboard of the host computer. To prevent damage to the adapter due to electromagnetic discharge, wear a grounding strap and handle the adapter only by its edges. Do not touch the components or any metal parts on the adapter, except for the metal faceplate.

Do not handle the retainer at the back of the adapter when inserting or removing the 5611. This retainer is used to secure the adapter in proper position when the cover of the unit is in place.

To safely unpack the adapter, do the following:

1. Open the shipping container and carefully remove its contents.

   With a grounding strap attached to your wrist or ankle, remove the 5611 from the anti-static bag and visually inspect the adapter for damage that might have occurred during shipment. After inspecting the adapter, return it

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to the anti-static bag until you are ready to install the adapter in the host system.

2. Inspect the other items for damage.

   If you find any omissions or damage, contact your network supplier and the carrier that delivered the package.

3. Return all packing materials to the shipping container and save.

   If the board must be returned, ship it in its original box (or one providing equivalent protection). Failure to do so could nullify your warranty.

5611 Jumper

Jumper JA1 is a header for manufacturing use only, and is not a user-configurable jumper.

Powering Down the Host System

If your computer is up and running, power down the system as follows:

1. While logged in as a superuser, gracefully shut down your system using the **halt** command.
2. Power down the system by turning off the computer's power switch.
3. Unplug the unit from its power source.
4. Disconnect all cables that are connected to the main system unit.

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Warning

Your computer operates at voltages that can be lethal. Before you remove the computer cover, carefully review this procedure and observe all cautions and warnings to protect yourself and to prevent damage to the system.

The 5611's single mode media module uses a Class 1 Laser as a data transfer element. Take necessary precautions to avoid eye exposure to the laser beams.

5. Skip to the installation procedure for your host system:

- *SPARCstation 10/20* on page 13
- *SPARCserver 1000, SPARCcenter 2000* on page 20
- *SPARCserver 600 MP* on page 23

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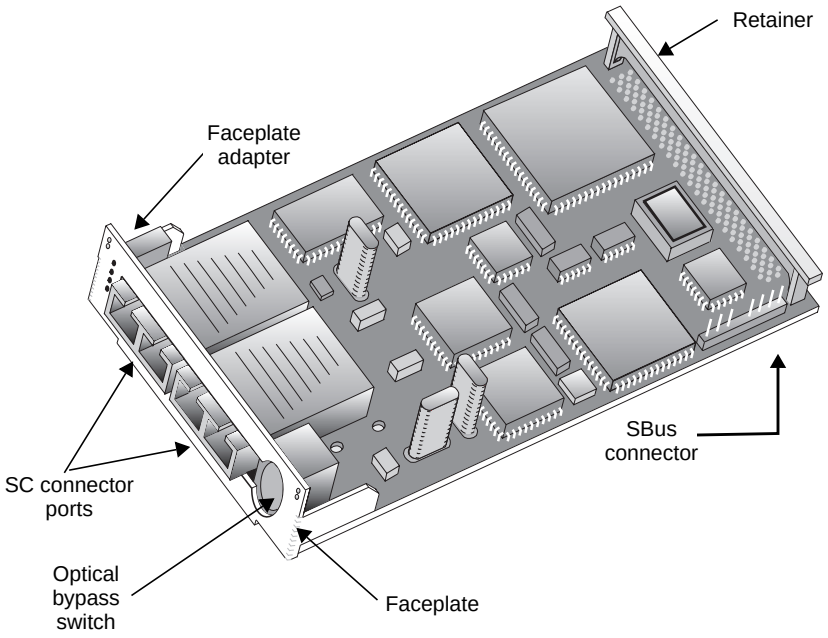


Figure 2-1. 5611 with Dual Fiber SC Ports

SPARCstation 10/20

The following steps detail the installation of the 5611 adapter in a SPARCstation 10/20.

1. Attach a grounding strap to your wrist or ankle and carefully remove the adapter from its antistatic bag. Inspect it for any damage that might have occurred during shipment. If necessary, remove any dust from the connector ports with dry, compressed air.
2. Remove the retainer and faceplate adapter (if any) as follows:

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a. Unsnap the black plastic retainer at the rear of the 5611 (see Figure 2-1 on page 13).

b. If the 5611 has a faceplate adapter, remove the screws that attach the faceplate adapter to the faceplate, as shown in Figure 2-2, and lift the faceplate adapter from the faceplate. The SPARCstation 10/20 implementation of the 5611 does not utilize the faceplate adapter.

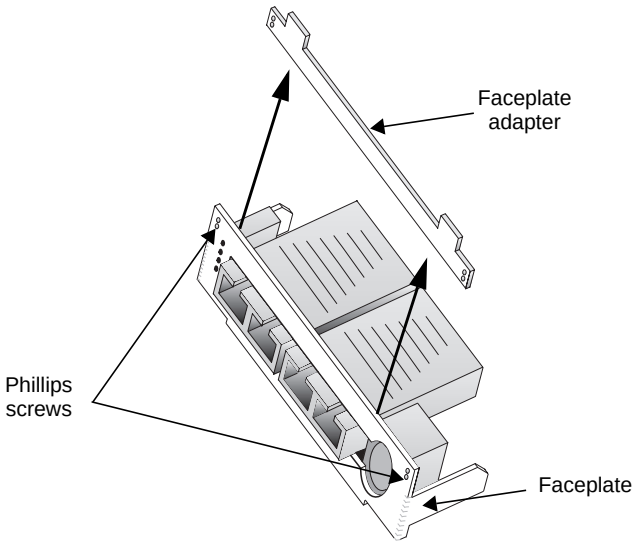


Figure 2-2. Removing the Faceplate Adapter

3. Remove the cover from the SPARCstation 10/20 as follows:

a. Remove the two screws in the two upper corners of the back panel (see Figure 2-3).

b. Raise the cover slightly and push to the front of the workstation. There are three plastic tabs on the inside of the cover; make sure that these tabs clear the unit.

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c. Lift the cover vertically to remove.

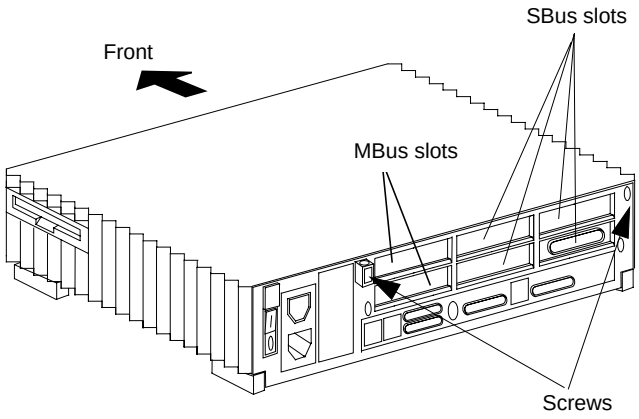


Figure 2-3. SBus Slots on a SPARCstation 10

4. Locate the SBus slots in the unit. The Sun SPARCstation 10/20 has four SBus slots and two MBus slots. The 5611 can be installed in any of the SBus slots.

Caution

Do not attempt to use an MBus slot.

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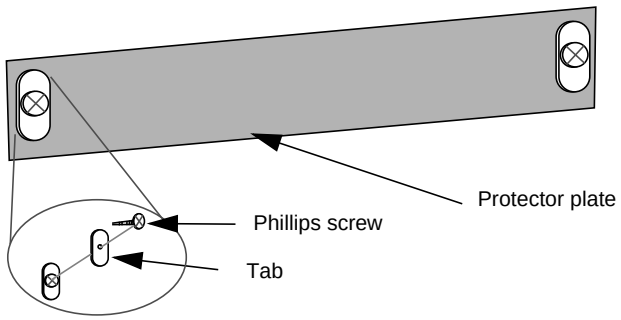


Figure 2-4. Removing the Protector Plate

5. Remove the protector plate from the slot where you will be installing the 5611 (see Figure 2-4).
6. Remove the screw and tab from each end of the slot. Set them aside. Remove the protector plate from the inside of the system.
7. If the 5611 has a MIC receptacle, remove its dust cover.

Caution

Handle the 5611 carefully, because the adapter is sensitive to static electricity. Hold the card by its edges and avoid touching the components or any metal parts on your card. To prevent adapter damage from electrostatic discharge, use a grounding strap.

8. Hold the 5611 at an angle and slide it into the slot.
9. Align the adapter's connector with the slot's connector and carefully press the adapter into place in the slot.

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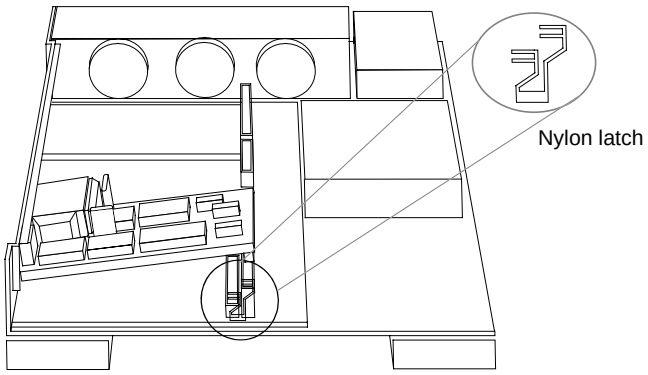


Figure 2-5. Placing the 5611 in a SPARCstation 10

10. Snap the back portion of the adapter into the nylon latches shown in Figure 2-5. The board must be parallel to the motherboard below it. If the adapter is in the lower slot, snap it into the lower latch. If the adapter is in the upper mezzanine slot, snap it into the upper latch.

11. Using the tabs and screws removed from the protector plate, secure the adapter's faceplate to the SBus opening in the back of the unit.

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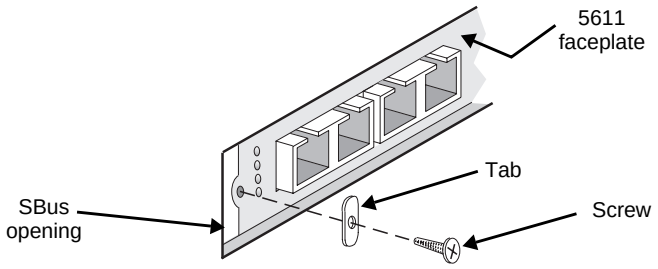


Figure 2-6. Securing the Faceplate to the SBus Opening

12. Secure the tab and screw on the left side of the adapter card first (see Figure 2-6).

13. Replace the system cover as follows:

a. Hold the cover at an angle. Align the plastic tabs on the cover with the slots on the unit chassis and move the cover forward so that the tabs are inserted in the slots (see Figure 2-7).

b. Lower the cover over the unit.

c. Push down on the cover. The cover should be outside of the front plate of the unit. Holding the cover to the unit, insert and tighten the screws with a screwdriver.

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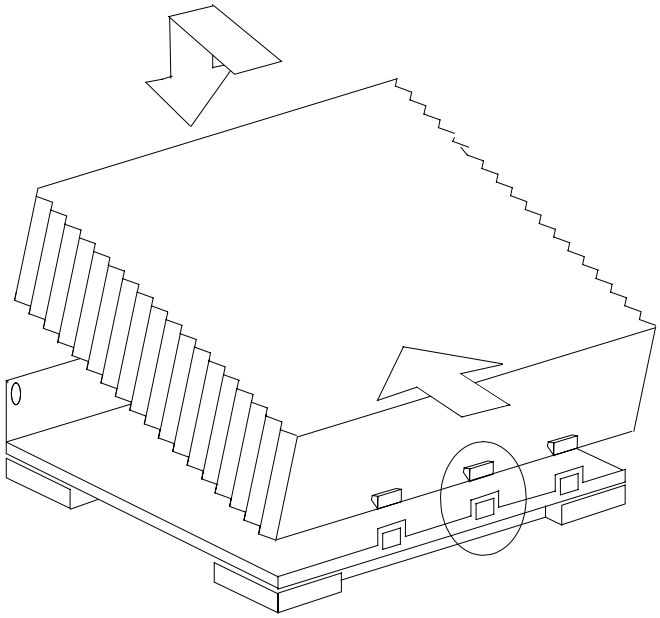


Figure 2-7. Replacing the Cover on a SPARCstation 10

Warning

Close the unit before powering up. Personal injury to you and/or damage to the system can occur if the unit is not closed before powering up.

Connect the FDDI cables to the 5611 as explained in *Connecting the 5611 to the Network* on page 26.

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SPARCserver 1000, SPARCcenter 2000

To install the 5611 in a Sun SPARCserver 1000 or a SPARCcenter 2000, do the following:



Note

For addtional information, see "SBus Card Removal and Replacement" in your Sun Microsystems *CPU & Memory Installation Service Manual.*

1. Attach a grounding strap to your wrist or ankle.
2. Remove the CPU board from the cardcage.
3. Carefully remove the adapter from its antistatic bag. Inspect it for any damage that might have occurred during shipment. If necessary, remove any dust from the connector ports with dry, compressed air.



Caution

Handle the 5611 carefully; it is sensitive to static electricity. Hold the card by its edges and avoid touching the components or any metal parts on your adapter. To prevent adapter damage from electrostatic discharge, use a grounding strap.

4. Remove the faceplate adapter and retainer as follows:
   a. Unsnap the black plastic retainer at the rear of the 5611 adapter. To identify the retainer, see Figure 2-1.

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b. Remove the screws that attach the faceplate adapter to the faceplate.

c. Lift the faceplate adapter from the faceplate shown in Figure 2-2. The faceplate adapter is not used on the SPARCserver 1000 or the SPARCcenter 2000.

5. Locate the SBus slots in the unit. The 5611 can be installed in any SBus slot.



Caution

Do not attempt to use an MBus slot.

6. Remove the protector plate from the slot where you will be installing the 5611.

7. Remove the screw and tab from each end of the slot. Set them aside. Remove the protector plate from the inside of the system.

8. If the 5611 has a MIC receptacle, remove its dust cover (see Figure 2-1).

9. Insert the 5611 adapter in the SBus slot. Hold the 5611 at an angle and slide it into the slot.

10. Align the adapter's connector with the slot's connector and carefully press the adapter into place in the slot.

11. Attach the back portion of the adapter with the nylon screws.

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12. Using the tabs and screws removed from the protector plate, secure the adapter's faceplate to the SBus opening in the back of the unit.
13. Secure the tab and screw on the left side of the adapter card first (see Figure 2-6).
14. Install the 5611 card.
15. Replace the CPU board in the cardcage.
16. Connect the FDDI cables to the 5611 as directed in *Connecting the 5611 to the Network* on page 26.

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SPARCserver 600 MP

To install the 5611 in a Sun SPARCserver 600 MP, do the following:

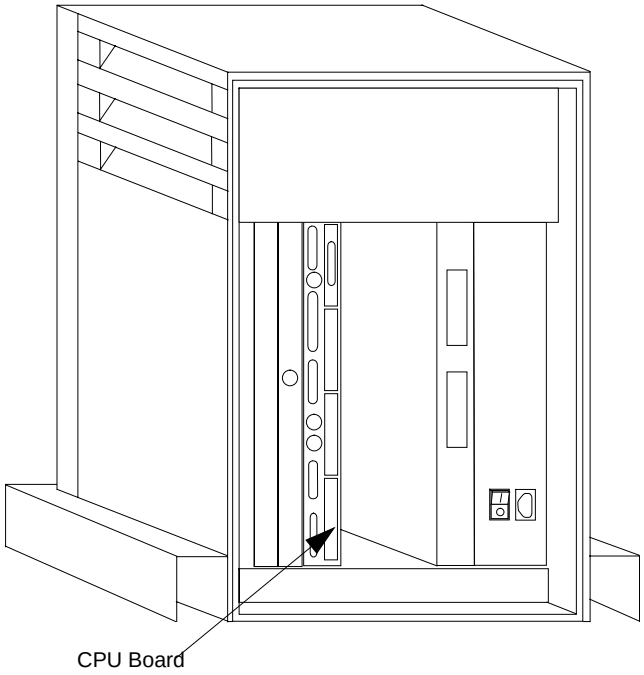


Figure 2-8. Card Cage with CPU Board

Note

For additional information, see "SBus Card Removal and Replacement" in your Sun Microsystems *CPU & Memory Installation Service Manual.*

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1. Attach a grounding strap to your wrist or ankle.
2. Remove the CPU board from the cardcage (see Figure 2-8).
3. Carefully remove the adapter from its antistatic bag. Inspect it for any damage that might have occurred during shipment. If necessary, remove any dust from the connector ports with dry, compressed air.



Caution

Handle the 5611 carefully; it is sensitive to static electricity. Hold the card by its edges and avoid touching the components or any metal parts on your adapter. To prevent adapter damage from electrostatic discharge, use a grounding strap.

4. Remove the adapter's faceplate and retainer as follows:
   a. Unsnap the black plastic retainer at the rear of the 5611 adapter. (See Figure 2-1 to identify the retainer.)
   b. Remove the screws that attach the faceplate adapter to the faceplate.
   c. Lift the faceplate adapter from the faceplate (see Figure 2-2). The faceplate adapter is not used on the 600 MP.
5. Locate the SBus slots in the unit. The 600 MP has four SBus slots and two MBus slots. The 5611 can be installed in any SBus slot.

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Caution

Do not attempt to use an MBus slot.

6. Remove the protector plate from the slot where you will be installing the 5611.
7. Remove the screw and tab from each end of the slot. Set them aside. Remove the protector plate from the inside of the system.
8. If the 5611 has a MIC receptacle, remove its dust cover. Refer to Figure 2-1.
9. Insert the 5611 adapter in the SBus slot. Hold the 5611 at an angle and slide it into the slot.
10. Align the adapter's connector with the slot's connector and carefully press the adapter into place in the slot.
11. Attach the back portion of the adapter with the nylon screws.
12. Using the tabs and screws removed from the protector plate, secure the adapter's faceplate to the SBus opening in the back of the unit.
13. Secure the tab and screw on the left side of the adapter card first (see Figure 2-6).

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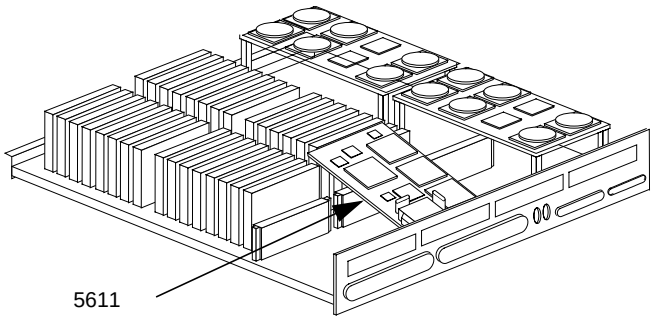


Figure 2-9. 5611 Mounted on CPU Board

14. Replace the CPU board in the card cage of the 600 MP.

Continue with the next section to connect the FDDI cables to the 5611.

Connecting the 5611 to the Network

Attach the cable to the adapter and to a concentrator, if used. The 5611 will usually attach to an M-port on a concentrator.

You are now ready to connect the 5611 to the network. Table 2-1 describes the cables and connectors for the 5611 SAS and DAS cards.

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Table 2-1. Connectors for the 5611

Fiber SC Duplex	Fiber ST	Fiber MIC	Copper RJ-45
SAS Single Mode SAS Multimode	SAS Single Mode SAS Multimode	SAS Single Mode SAS Multimode	SAS-UTP
DAS Single Mode DAS Multimode	DAS Single Mode DAS Multimode	n/a	n/a



Note

There is no difference in speed between fiber and copper. The clock rate and signaling for copper is the same as for fiber connections at 100 Mbps. The main disadvantages of copper are the distance limitation of 100 meters and its lack of inherent noise immunity.

1. Attach the appropriate network connector to the 5611.

- For FDDI over fiber:
  - The SC Duplex type connection is shown in Figure 2-10 on page 29.
  - The ST fiber connections are shown in Figure 2-11 on page 30.
  - The MIC fiber connections are shown in Figure 2-12 on page 31.
- For Unshielded Twisted Pair (UTP), a standard RJ-45 connector is used to attach the 5611 to a concentrator. See Figure 2-13 on page 32.

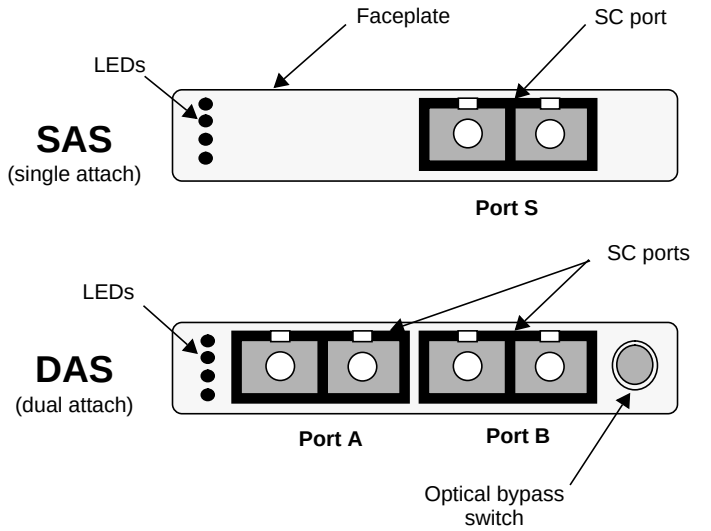
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- If you have a SAS card, carefully connect the cable to the 5611 card and to any free master (M) port on the concentrator.
- If you have a DAS card, connect your cables to the appropriate A and B ports.

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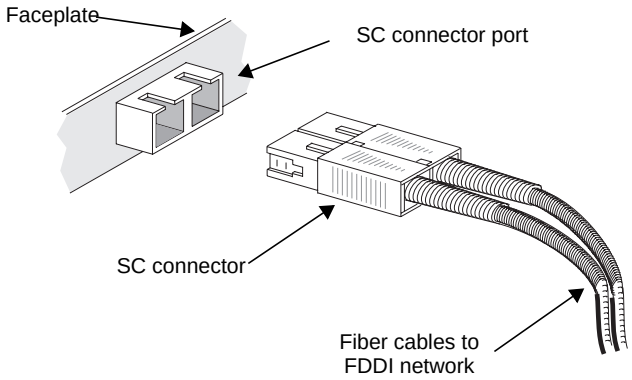


Figure 2-10. SC Duplex Connection

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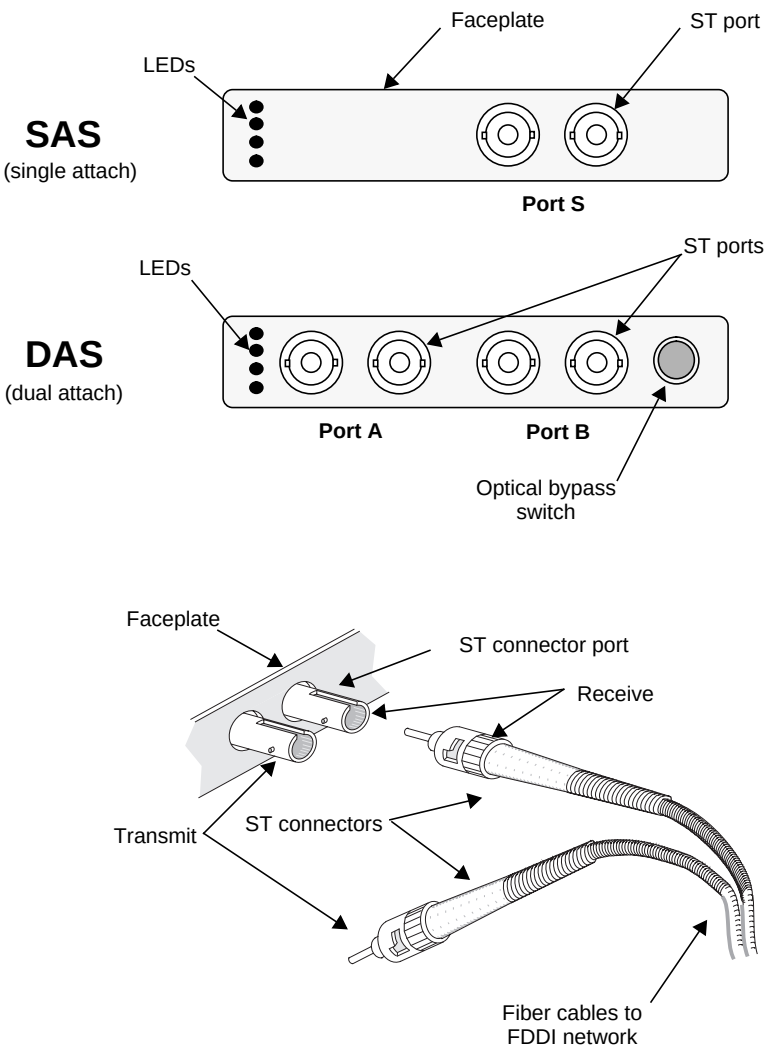


Figure 2-11. ST Fiber Connection

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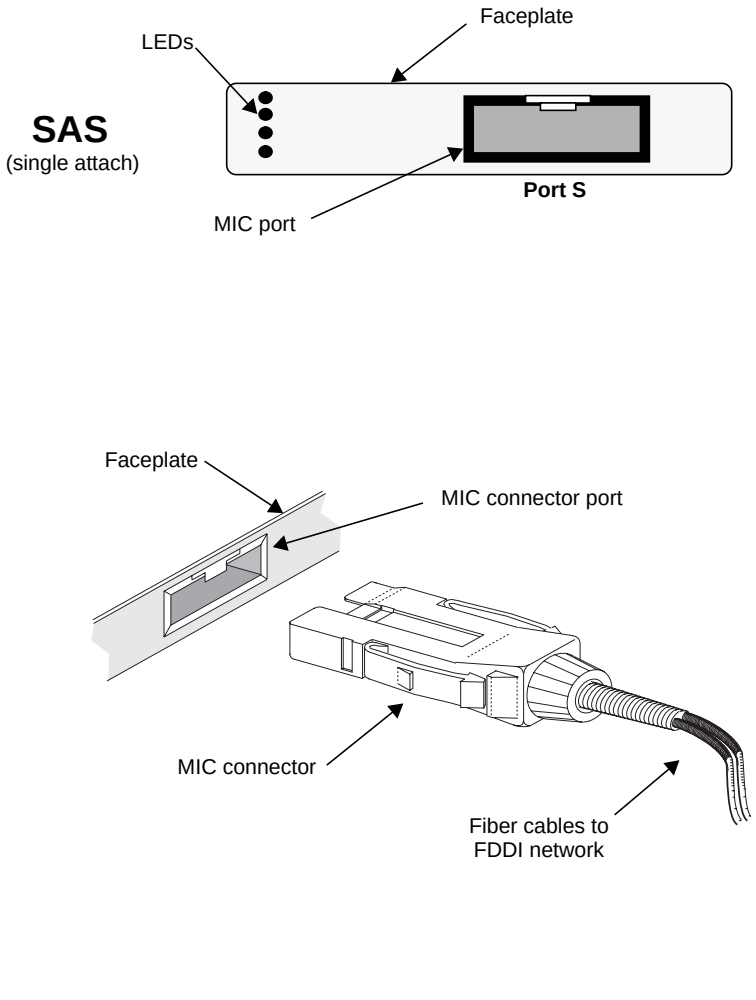


Figure 2-12. MIC Fiber Connection

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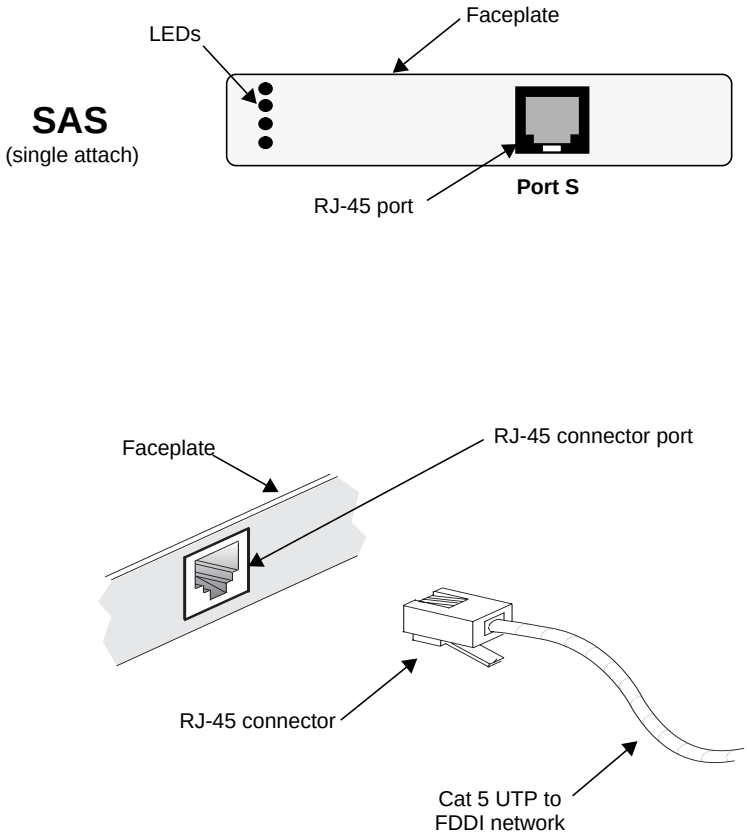


Figure 2-13. RJ-45 UTP Connection

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Warning

Personal injury to you and/or damage to the system may occur if the unit is not closed before powering up.

2. Turn on the power to the computer.
3. Check LED #1 on the faceplate of the adapter.

   When the power is turned on, it should momentarily display a red light and then change to green when the 5611 has completed its self-test diagnostics. If the red LED remains lit for an extended period of time, there is a hardware problem in your system, or the adapter is not installed correctly. Shut off the computer and reinstall the adapter. If the problem persists, refer to Chapter 4 for troubleshooting information.

   Other LEDs remain off until the software driver is installed.

The installation of the hardware for the 5611 S/FDDI Adapter is complete.

Next, install the network software driver for the adapter card.

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Solaris Software Installation 3

Overview

This chapter describes the procedure for installing a device driver for the 5611 S/FDDI adapter in workstations and file servers running Solaris 2.2 or later. Files changed by the 5611 software are backed up before any modification occurs. If the installation program aborts for any reason, an informative error message appears. After correcting the problem, run the installation program again. The system cannot be damaged by running the installation program several times.

Before You Start

Before starting the installation, it is recommended that you:

- Read any *Read Me First* documentation in your installation kit.
- Make sure the computer meets the minimum requirements listed in Chapter 1.
- Identify the hostname and IP address to be assigned to the 5611 adapter.
- Identify the drive device name if you are installing from a floppy or tape drive and not using the Volume Manager.
- Be familiar with the entire sequence of installation steps before beginning.
- Back up the system before starting the installation process.

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Caution

Ensure that all Sun Solaris 2.x patches are installed before installing the 5611 S/FDDI adapter.

You can access these patches via either http://sunsolve.sun.com/pub-cgi/patchpage.pl or the ftp site sunsolve.sun.com (192.9.9.24), in the /pub/patches directory.

Installing the Solaris Driver

This section explains how to install the software for the Interphase 5611 S/FDDI adapter for systems running Solaris 2.2 or later. If you are replacing an existing 5611 driver, you need to remove the old driver software before installing the new driver, as explained in *Removing an Existing Driver from Solaris* on page 44.

The software installation is largely automated. The Solaris **pkgadd**(1M) utility performs the software installation. If the installation aborts for any reason, an error message appears. Address the problem and begin the installation again. Once the software is installed, you can back out all of the changes with the **pkgrm**(1M) utility. However, you must re-install the software in order to use the 5611 adapter.



Note

The 5611 software can be installed using the Solaris Software Manager Utility. The installation process using that utility is very similar to the installation process described for pkgadd. For more information about the Solaris Software Manager Utility, see the *Solaris 2.2 Software Manager User's Guide.*

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Caution

It is recommended that you perform the installation in single-user mode or expel all users from the server and make sure no file systems are exported. However, the entire software installation process can be performed while the server is up and running in multi-user mode.

It is recommended that you use the **script**(1) command before starting the installation. This will keep a log of the installation in a file of your choice, and may prove useful if there is a problem.

To install the device driver for the 5611 S/FDDI adapter, do the following:

1. Log in as the **root (superuser)** with the **su** command.
2. Disable the Volume Manager by entering
   `/etc/init.d/volmgt stop`
3. Insert the diskette, tape, or CD-ROM in the proper drive.
4. Start the installation script by entering
   `# pkgadd -d` *`<mounted_directory or local_device>`* **`[`***`driver_name`***`]`**

   <mounted_directory or local_device> must be one of the following:
   - The directory where the CD-ROM is mounted.
   - The device name for the local floppy or tape drive.
   - The directory containing the 5611 S/FDDI adapter installation package.

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<*driver_name*> is **INH5611DA** for dual-attach stations, **INH5611SA** for single-attach stations.



Note

If *<mounted_directory>* is the directory where the CD-ROM is NFS mounted, then it is typically */cdrom/cdrom0* when the Volume Manager is running. If the Volume Manager is not running, then typically it is */cdrom*.

The following example shows a typical installation scenario on a SPARCstation IPX (assuming the installation package is already spooled to the disk). This example would be the same regardless of whether the installation is being done from diskette, tape, or CD-ROM, with modifications required to the command line.

The command **lxa[51]# pkgadd -d /dev/rdiskette,** for our example installation, brings up a menu for selecting a software package from the installation media, as shown in Figure 3-1.



Note

The installation procedures for SAS and DAS are identical. The Interphase diskette, tape, or CD-ROM contains a SAS driver (INH5611SA) and a DAS driver (INH5611DA). You *must* load the appropriate driver for your machine.

The media also contain a SunNet Manager agent (INPH5611s) that interfaces with both SAS and DAS systems. See Appendix D, *SunNet Manager Agent: Installation and Use* **for details. Do not install this package unless your system is an SNM console.**

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```
The following packages are available:

  1  INH5611DA  Interphase Sbus FDDI 5611 **DAS** Driver
                (SPARC) 1.0.1
  2  INH5611SA  Interphase Sbus FDDI 5611 **SAS** Driver
                (SPARC) 1.0.1
  3  INPH5611s     SunNet Manager 2.2 agents for S/FDDI 5611
                (SPARC) 1.0.1

Select package(s) you wish to process (or 'all' to process
all packages). (default: all) [?,??,q]: 1
```

Figure 3-1. Solaris pkgadd Menu

5. Enter the number corresponding to the software package you want to install: **1, 2,** or **3**.



Note

Do not use the option 'all' to process all packages. INH5611DA and INPH5611SA are mutually exclusive.

Our example uses option **1**, as shown in the last line of Figure 3-1. The system confirms the selection, displays the Interphase Copyright Notice, and begins a series of prompts for the needed information as follows:

```
Using </opt/INPH5611> as the package base directory.

Please enter the total number of S/FDDI 5611 Adapters which will
be installed in this machine. This number will be between 1 and 4,
inclusive. [1-4,?,q] 1
```


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a. Enter **1** for the total number of adapters being installed.

The system displays all the network interfaces that exist on the host, as shown in the following example:

```
The current status of the /etc/hostname.* files:
Interface       Host Name       Device Adapter
le0             ss10b           /dev/le
xx0             ss10b           /dev/xx

Would you like to update the /etc/hostname.* files
\ automatically? [y[ [y,n,?,q] y
```

b. Enter **y** (yes) for automatic update.

```
Please enter a host name to activate the fa0 interface or "NONE"
to deactivate it [ss10b_0]:  [?] ss10b-fddi
```

c. Enter the host name.

Our example uses the host name **ss10b-fddi**.

```
Would you like to see 'fa#: Ring up|down' messages when ring goes
up or down? [y]  [y,n,?,q] y
```

d. Enter **y** (yes) or **n** (no).

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Note

If the FDDI ring has many hosts and they bounce frequently, you may want to answer n (no) to step d to avoid seeing the messages on your console. When needed, the status of the ring can be obtained using the fa_mon utility. See Appendix C, *Monitoring the Network***.**

```
## Processing package information.
## Processing system information.
## Verifying disk space requirements.
## Checking for conflicts with packages already installed.
## Checking for setuid/setgid programs.

The following files are being installed with setuid and/or setgid
permissions or are overwriting files which are currently
setuid/setgid:
    /etc/opt/INPH5611/bin/fa_mon <setgid sys>
    /etc/opt/INPH5611/bin/fa_stats <setgid sys>

Do you want to install these setuid/setgid files [y,n,?,q] y
```

e. Enter **y** (yes).

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

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

f. Enter **y** (yes).

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```
Installing S/FDDI 5611 as <INPH5611>

## Installing part 1 of 1.
/etc/opt/INPH5611/bin/fa_mon
/etc/opt/INPH5611/bin/fa_smtd
/etc/opt/INPH5611/bin/fa_stats
/etc/rc2.d/S72fa.sh
/kernel/drv/fa
/opt/INPH5611/READMEFIRST
/opt/INPH5611/man/man1/fa_mon.1
/opt/INPH5611/man/man1/fa_smtd.1
/opt/INPH5611/man/man1/fa_stats.1
/opt/INPH5611/man/man7/fa.7
[ verifying class <none> ]
verifying /etc/devlink.tab
modifying /etc/system
[ verifying class <build> ]
## Executing postinstall script.

Interphase S/FDDI 5611 installation script.
Adding driver to system...
Creating /etc/hostname.* files.

Do not forget to update the /etc/hosts file and/or the “host” NIS
map if necessary. Write down the Ethernet interfaces and their
corresponding host names now for future reference:

Your /etc/hostname.* files are up to date with the following:
Interface       Host Name       Device Adapter
fa0             ss10b-fddi      /dev/fa
le0             ss10b           /dev/le
xx0             ss10b           /dev/xx
*** IMPORTANT NOTICE ***
Please do not move any of the INPH5611 files installed. This includes
files with the ‘preINPH5611’ suffix.

The man pages for the S/FDDI 5611 utilities and software are now
available on the system. To access them when using the man command,
set the MANPATH shell environment variable to include
“/opt/INPH5611/man”. You may need to export this directory for
mounting by clients who need access to these server-specific man
pages.

Installation of <INPH5611> was successful.
```


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6. Reboot the system.

   The machine must be rebooted now in order to ensure sane operation. Enter the command

   ```
   shutdown -y -i6 -g0
   ```

   and wait for the console login prompt.

7. Set the **MANPATH** environmental variable by editing the **/.cshrc** file and adding the following lines to the end of the file:

```
setenv MANPATH:/opt/INPH5611/man:$MANPATH
setenv PATH $PATH:/etc/opt/INPH5611/bin
```

Installation is complete.

Moving the 5611 to Another Slot

Once the 5611 adapter has been installed, it cannot be moved to another SBus slot without modifying a path file. Otherwise, the software sees it as a second 5611 card. If the 5611 must be moved after completing the installation, do the following:

1. Make a backup copy of the **/etc/path_to_inst** file.
2. Edit the **/etc/path_to_inst** file and remove all lines that refer to **fa**.
3. Shut down the system, power down the hardware, and move the 5611 to the target SBus slot.
4. Power up the system, and reboot with the **boot -r** command to reconfigure the slots.

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Removing an Existing Driver from Solaris

If you are upgrading from a prior 5611 software version, the older software should be backed out before installing the new version. Use the **pkgrm**(1M) command to identify and remove the old 5611 software packages. All of the 5611 software is removed from the system with this utility. To use the 5611 adapter again, the software must be reinstalled.

To remove an existing driver from Solaris, do the following:

1. Enter **pkgrm** at the prompt.

   The system begins to display all the installed drivers.

2. When the driver you want to remove appears, press **Ctrl-D.**

3. Enter the number corresponding to the driver package you want to remove.

4. Enter **y** to confirm that you want to remove the driver you selected.

   The following output and prompts appear, as shown in Figure 3-2, while the driver (INH5611DA, in this example) is being removed:

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```
## Removing installed package instance <INH5611DA>.
This package contains scripts which will be executed with super-user
permission during the process of removing this package.

Do you wish to continue with the removal of the package [y,n,q]: y

## Verifying package dependencies
## Processing package information
## Executing preremove script

Interphase S/FDDI 5611 deinstallation script.

There is an unedit to a system file which must be performed. This
can be done automatically now, or you may perform it manually. Would
you like it to be performed automatically now? [y,n,?,q] y

Removal of <INH5611DA> was successful.

*** IMPORTANT NOTICE ***
This machine must now be rebooted in order to ensure sane operation.
Execute
    shutdown -y -i6 -g0
and wait for the "Console Login:" prompt.
```

Figure 3-2. pkgrm Execution

5. Answer **y** (yes) to both prompts in Figure 3-2.
6. Reboot the computer.

The removal of the 5611 S/FDDI adapter driver is now complete. In order to use a 5611 adapter in this system, a driver must be installed.

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Troubleshooting & Diagnostics

4

Introduction

Table 4-1 on page 48 addresses the following symptoms, together with possible solutions:

- Adapter fails power-up test.
- Cannot communicate with other hosts on the network.
- Cannot reach a host on a remote network.
- Adapter fails to attach.
- Adapter is recognized with the wrong instance number.
- The 5611 does not respond.

If the possible solutions in this chapter do not solve the problem you are experiencing, check the following sections for additional diagnostic and verification utilities:

- *5611 LED Diagnostics* on page 52
- *Self-Test Diagnostics* on page 53
- *5611 FCode Diagnostics* on page 53
- *Installation Verification* on page 62
- *Boot PROM Version Verification* on page 66



Note

Prior to reporting installation or operation problems to Interphase or Sun, verify that all Sun Solaris 2.x patches are installed.

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Troubleshooting Symptoms and Actions

Table 4-1. Symptoms and Actions

Symptom	Action
Adapter fails power-up test.	• Inspect the LEDs on the back of the 5611. Refer to *5611 LED Diagnostics* on page 52 for active/on states. • Verify the correct Open Boot PROM revision level with the instructions on page 66. • Reseat the adapter. • Verify that the sbus-probe-list (*Self-Test Diagnostics* on page 53) includes the slot where the 5611 is installed. • Try another SBus slot. See *Moving the 5611 to Another Slot* on page 43. • Swap the adapter card with a known operational 5611 adapter.
5611 cannot communicate with other hosts on the network.	• Use **fa_mon** (see Appendix C, *Monitoring the Network*) to verify that upstream and downstream neighbors are correct. • Verify the state of the LEDs on the 5611. Refer to *5611 LED Diagnostics* on page 52 for active/on states. • Check the FDDI media. Make sure the FDDI media are correctly installed. See *Connecting the 5611 to the Network* on page 26. • **Ping** the failed system from another host on the network.

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Table 4-1. Symptoms and Actions

Symptom	Action
Cannot reach a host on a remote network.	• Use **ping** to test connectivity to stations on your local ring. • Distinguish between an unknown host, which indicates a host database problem, and a non-response, which usually indicates a routing problem. • Use **fa_mon** (see Appendix C, *Monitoring the Network*) to see if the 5611 is communicating with upstream and downstream neighbors on the ring. • Check the **arp** table with the **arp -a** command. • Use **netstat**(8C) **-r** to check routing tables. Refer to the man page for expected output.
Adapter is recognized with the wrong instance number.	Once the 5611 adapter has been installed, it cannot be moved to another SBus slot without editing the path files or reinstalling the software. See *Moving the 5611 to Another Slot* on page 43.

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Table 4-1. Symptoms and Actions

Symptom	Action
Adapter fails to attach.	• Inspect the LEDs on the back of the 5611 adapter. See *5611 LED Diagnostics* on page 52 for active/on states. • Check the **/dev** directory for a **fadev?** file. This file is created by the **add_drv** command. If it is not present, reboot with the **-r** switch (**boot -r**). • Reseat the adapter. • Try another SBus slot. See *Moving the 5611 to Another Slot* on page 43. • Swap the adapter card with a known operational 5611 adapter. • Verify that the FCode level is correct. See *FCode Verification* on page 54 for instructions on checking the FCode level. • Verify that the SBus interrupt level is set correctly.

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Table 4-1. Symptoms and Actions

Symptom	Action

The 5611 does not respond.	• Use the **ifconfig** utility to check the existence and status of the device as follows:
	`ifconfig fa0`
	`fa0:flags=63<UP,BROADCAST,NOTRAILERS,RUNNING>`
	• Check the **/etc/hosts** file or the NIS server for a valid **fa0** entry. Look for a line of the format *<IP address> <hostname_fddi>*.
	• Verify that the smt daemon **fa_smtd** is running:
	`ps -ef | grep fa_smtd`
	`81 ? S 0.02 /etc/lddrv/FA/fa_smtd`
	• Verify that the 5611 fa driver is loaded:
	`dmesg | grep fa0`
	`fa0: SBus slot 2 pri 7 (SBus level 4)`
	• Verify the state of the LEDs on the 5611. See *5611 LED Diagnostics* on page 52 for active/on states.
	• Verify FDDI media properly connected at both ends. See *Connecting the 5611 to the Network* on page 26.

Other Useful Network Commands

- **route**(8C)
- **netstat**(8C)
- **in.routed**(8C)
- **yp**(3R)
- **nis**(1)

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5611 LED Diagnostics

Figure 4-1 shows the locations of the LEDs on a dual attach 5611 adapter. All versions of the 5611 adapter have four LEDs, which are always located in the same position on the faceplate. LED #4 indicates connectivity of the second link to the FDDI ring on dual attach (DAS) cards only.

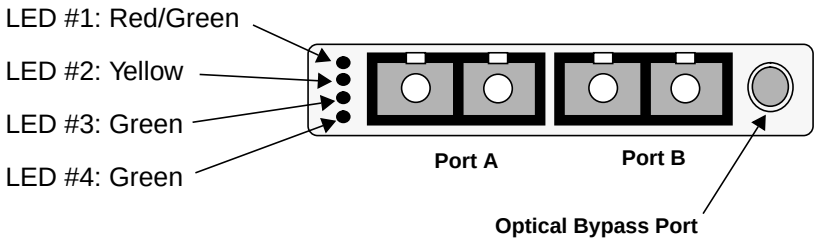


Figure 4-1. 5611 LEDs

LED #1, Red/Green: Displays **green** when the adapter passed its self-test diagnostics at power-up. Displays **red** when the self-test failed. There is either a problem in your system's hardware, or the 5611 is not installed correctly. Power down the system and reinstall the adapter. See the troubleshooting tips in the previous section.

LED #2, Yellow: Board operational. Remains lit when the board is operational on the FDDI ring.

LED #3, Green: Remains lit when the B Link of a dual-attach adapter, or the S Link of a single-attach adapter, has established communications with the FDDI network.

LED #4, Green (DAS only): Remains lit when the A Link of a dual-attach adapter has established communications with the FDDI network. It is not used on single-attach adapters.

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Self-Test Diagnostics

The 5611 has built-in, self-test diagnostics that are executed when the system probes the 5611's SBus slot. This occurs at power-up and reset. For the 5611 to execute the diagnostics, the monitor variable **sbus-probe-list** must include the SBus slot of the 5611. To determine the list of slots that are tested on system power-up, enter `printenv` at the **ok** prompt and examine the **sbus-probe-list** variable.



Note

Refer to any *Read Me First* documentation for additional information. This document contains any last minute information that could not be included in this manual. If the information in this chapter and any *Read Me First* documentation does not resolve the problem, contact Interphase Customer Service. Contact information is at the front of this user's guide.

5611 FCode Diagnostics

The 5611 FCode board diagnostics test basic board functions. They are run from the **ok** prompt in the monitor. You must **shutdown**(8) the system to get to that prompt.

For a system running Solaris, enter the command:

```
shutdown -y -i6 -g0
```

The FCode 5611 Diagnostics perform tests on the board. The following screen is an example of how to operate the 5611 FCode Diagnostics.

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```
ok " /sbus/fa" select-dev
ok words
board-loop    board-test    set-intr    show-
mac
restore-mac   set-cur-mac   closeopen
ok board-test
Testing FDDI Adapter
Timer 0 Test Passed
Timer 1 Test Passed
Self Test Passed
ok
```

Figure 4-2. FCode Diagnostics

A brief description of each command is as follows:

- **fa-test** or **board-test:** Executes the self-test diagnostics and displays the results. Precede this command with **von** to turn verbose mode on.
- **board-loop:** Repeats the **board-test** until an error is detected. Press **Return** to terminate the test.
- **show-mac:** Displays the current and default MAC addresses assigned to the board.
- **restore-mac:** Restores the MAC address to the default assigned when the board was manufactured.

FCode Verification

If the 5611 does not function correctly, or if an illegal interrupt level is reported on a Solaris system, verify the version of FCode embedded in the 5611 adapter.

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The FCode PROM version should be verified after the hardware installation, but before booting the system. The FCode attributes related to the SBus interrupt level should be verified and modified (if required) for each 5611 installed. This verification is run from the **ok** prompt in the monitor.



Note

See the previous section, *5611 FCode Diagnostics*, for instructions on getting to the *ok* prompt.

1. Find the SBus slot numbers used by each of the 5611 boards installed in the system with one of the following commands:

- For a SPARCserver 1000 or a SPARCcenter 2000, enter **`cd /io-unit@f,e`***<sb#>***`200000/sbi`** where *<sb#>* is the number of the system board that holds the 5611 being targeted (0, 1, 2, or 3).
- On all other Sun systems, enter **`cd /sbus`**.

2. Enter **`ls`**.

   The system responds with messages similar to those in Figure 4-3:

```
ffeada28 fa@1,0
ffeac140 le@0,c00000
ffea8c2c esp@0,800000
ffea8be8 dma@0,400000
ok
```

Figure 4-3. 5611 Identification Screen

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The digit following **fa@** indicates the slot number for the 5611.

3. To display the attributes for the selected 5611, enter one of the following commands:

- For a SPARCstation 1000 or SPARCcenter 2000, enter:
  cd /io-unit@f,e<*sb#*>**200000/sbi **
  /fa@<*slot#*>

  where <*sb#*> is the number of the system board that holds the selected 5611 (0, 1, 2, or 3), and <*slot#*> is the slot number identified in step 2.
- On all other Sun systems enter:
  cd /sbus/fa@<*slot#*>

  where <*slot#*> is the slot number identified in step 2.

4. Enter **.attributes**

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Messages similar to those in Figure 4-4 appear:

```
ok .attributes
default-mac-addr          00 00 77 87 1d 38 00
current-mac-addr          00 00 77 87 1d 38 00
intr                      00000008  00000000
interrupts                00000004
sbus_irq                  00000000
checksum                  00001b33
reg                    00000001  00000000  00020000
                       00000001  00080000  00000034
                       00000001  00080100  00000040
                       00000001  00080180  00000002
                       00000001  000801a0  00000020
transceiver-type          FIBER
station-type              DAS
copyright                Copyright (c) 1993, 1994,
1995 Interphase Corporation
prom-version            FA00124-A00 (Fri,29-Mar-96)
manufacturer              Interphase Corporation
device-type               network
model                     S/FDDI 5611
name                      fa
ok
```

Figure 4-4. 5611 Attributes Screen

Downloading New FCode

The following instructions describe how to download a new revision of FCode to the 5611 S/FDDI Adapter.



Note

The spaces in the command strings are essential, and must be included.

1. Copy the file **fa.fcode** to the / directory.

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2. Log in to the system as a superuser, then halt the system, displaying the **ok** prompt as follows:
   su
   halt

   If necessary, enter **n** at the monitor prompt (>) to access the **ok** prompt.

3. At the **ok** prompt, enter the following commands:
   cd /sbus
   ls

   The system responds with messages similar to those in Figure 4-5:

```
ffeada28 fa@1,0
ffeac140 le@0,c00000
ffea8c2c esp@0,800000
ffea8be8 dma@0,400000
ok
```

Figure 4-5. 5611 Identification Screen

   The digit following **fa@** indicates the slot number for the 5611. Throughout the remainder of this procedure, this number will be referred to as <*slot#*> and will have a value of 0, 1, 2, or 3.

4. Enter the following command at the **ok** prompt:
   <*slot#*> **probe-slot**

   The system responds **ok**.

5. Enter the following commands:
   " /sbus/fa" select-dev
   .attributes

   The system responds with the output in Figure 4-6:

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```
ok .attributes
default-mac-addr          XX XX XX XX XX XX
current-mac-addr          XX XX XX XX XX XX
intr                      00000008  00000000
interrupts                00000004
sbus_irq                  00000000
checksum                  00001b33
reg                       00000001  00000000  00020000
                          00000001  00080000  00000034
                          00000001  00080100  00000040
                          00000001  00080180  00000002
                          00000001  000801a0  00000020
transceiver-type          FIBER
station-type              DAS
copyright                 Copyright (c) 1993, 1994, 1995
Interphase Corporation
prom-version              FA00124-A00 (Fri,29-Mar-96)
manufacturer              Interphase Corporation
device-type               network
model                     S/FDDI 5611
name                      fa
ok
```

Figure 4-6. 5611 Attributes Screen

XX XX XX XX XX XX represents the default MAC address (factory-programmed into the 5611).

If the 5611 requires an FCode upgrade, make note of the default and current MAC addresses and the **interrupts** and **sbus_irq** levels.

6. Enter the following commands:
   `setenv fcode-debug? true`
   `setenv auto-boot? false`
   `reset`

   The **reset** command causes a system reset. At the end of the reset sequence, the system should return an **ok**

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prompt. If this does not happen, at the monitor prompt (>), enter **n** to access the **ok** prompt.

7. At the **ok** prompt, enter
   boot *<boot_dev>* **fa.fcode -h**

   The system loads the file **fa.fcode** into memory. When the system has finished loading the file, it responds with the **ok** prompt.

8. At the **ok** prompt, enter the following commands:
   0 0 " *<slot#>*,0" " /sbus" begin-package
   4010 1 byte-load

   The system responds with the message **ok**.

9. Enter the following commands.
   end-package
   " /sbus/fa" select-dev
   pgrom

   The system responds with the page number that is being programmed. When PROM programming is complete, the system responds with the messages shown in Figure 4-7:

```
Programming was successful
Calculating Checksum = NNNN
Checksum written to last page
ok
```

Figure 4-7. Checksum Screen

10. At the ok prompt, enter **perom-init**

    The system prompts you to enter the MAC address two characters at a time as follows:

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```
Byte 1  of 6, enter 2 hex digits:
```

11. Enter the MAC address you noted in step 5 on page 58, two characters at a time.

The system prompts you as follows:

```
Do you want the Current MAC Addr = Default
MAC Addr? (y/n)
```

12. Enter **y** or **n**

The system prompts you as follows:

```
Set SBus intr = 00 (auto select), or 01 to
07, enter 2 hex digits:
```

13. Enter **00**

The system prompts you as follows:

```
Set SBus interrupts between 01 to 07,
enter 2 hex digits:
```

14. Enter **04**

15. Enter **`.attributes`**

The system displays the 5611's attributes.

16. At the **ok** prompt, enter **`fa-test`**

The system responds with messages similar to those in Figure 4-8:

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```
ok fa-test
Testing FDDI Adapter
Timer 0 Test Passed
Timer 1 Test Passed
CSR Test Passed
PEROM Checksum OK, = 1b33
Current MAC Addr = 0 0 77 87 1d 38
Default MAC Addr = 0 0 77 87 1d 38
Intr Level = 0
Interrupts Level = 4
IFDDI/ELM Revision B
Internal ELM BIST Passed, Sig = 5b6b
ELM Revision D
External ELM BIST Passed, Sig = 5b6b
MAC Revision C
MAC BIST 1 Passed, Sig = 9fa2
IFDDI Test Passed
Self Test Passed
ok
```

Figure 4-8. Self Test Screen

17. At the **ok** prompt, enter the following commands:
    setenv fcode-debug? false
    setenv auto-boot? true
    reset

The system now resets and auto boots. The FCode upgrade is complete.

Installation Verification

This section provides techniques that are used to verify that the 5611 S/FDDI Adapter is properly installed. The following sections describe each verification module.

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Verification with dmesg

Use the **dmesg**(8) command to verify that the driver loaded successfully and that the station is connected to the ring.

Figure 4-9 is an example of the display produced by the **dmesg** utility. The values displayed on your system may not be identical to the following:

```
hostname # dmesg

   .
   .
   .

fa0: SBus slot 2 pri 7 (SBus level 4)
   .
   .
   .
   .
   .
   .
fa0: Ring up
```

Figure 4-9. dmesg Screen

Verification with ifconfig

Use the **ifconfig**(8C) command to check the status of the interface. An example using an IP address of **123.1.2.143** is shown in Figure 4-10:

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```
hostname # ifconfig fa0
fa0: flags=63<UP,BROADCAST,NOTRAILERS,RUNNING>
inet 123.1.2.143 netmask ffffff00
broadcast 123.1.2.0
ether 0:0:77:83:4e:78
```

Figure 4-10. ifconfig Screen

The fields for Figure 4-10 are shown in Table 4-2:

Table 4-2. `ifconfig(8C)` Fields

Field	Function
inet	Shows the current Internet/IP address.
netmask	Shows the current netmask.
broadcast	Shows the current broadcast address.
ether	Shows the MAC address for the board.

Verification with modinfo

Use the **modinfo**(1M) command to display information about the software modules loaded on the system. The information returned for each module includes the **Id**, **Loadaddr**, **Size**, **Info**, **Rev**, and **Module Name**:

```
hostname # modinfo | fgrep 5611
47 ff232000 322b4 93 1 fa (SFDDI 5611 1.1.0 (07 Aug 96.))
```

Figure 4-11. modinfo Screen

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Check the driver version number and date of the installed 5611 driver against the software you just installed.

If you need help with any of these verification modules, contact Interphase Customer Service. The contact information is at the front of this user's guide.

Verification with pkgchk and pkginfo

Use the **pkgchk**(1M) utility to check the accuracy of the installation. This utility can only be used on systems running Solaris 2.2 or later. It verifies that

- The 5611 adapter software has been installed properly.
- The 5611 files are in the right locations.
- The adapter card has been installed properly.
- The driver is attached.

Enter one of the following commands:

- **`pkgchk INH5611DA`** for dual-attach stations
- **`pkgchk INH5611SA`** for single-attach stations

Errors are reported on the screen. If the installation has been done correctly, no output appears. The appendices in this manual describe how to handle special circumstances.

Enter one of the following commands:

- **pkginfo -l INH5611DA**
- **pkginfo -l INH5611SA**

The output displays information such as the version and installation location.

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Boot PROM Version Verification

To verify the version of the boot PROM on your machine, do the following:

1. Shut down the system by entering **`halt`**
2. If you are at the monitor prompt (>), enter **`n`** to access the **ok** prompt.
3. Enter the **`banner`** command at the **ok** prompt.

   This produces a display that includes the version number of the Open Boot PROM.
4. At the **ok** prompt, enter **`boot`** to restart your system.

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Specifications A

5611 Specifications

Table A-1. Adapter Specifications

Item	Specification
Host Bus Interface	SBus revision B.0 with Sun Open Boot PROM 2.4 or later
Network Interface	ANSI X3T9.5 for FDDI @ 100 Mbps
Host Data Transfer	Supports 32-bit SBus data transfers with bursts of up to 64 bytes
IEEE Compliance	IEEE 1496 SBus specification
Timer Defaults	Default for TVX: 2.5 milliseconds. Default for T_req: 165 milliseconds.
Mechanical	The 5611 occupies a single SBus slot. Width: 3.300 inches Height: 5.776 inches
Operating Power	S/FDDI 5611: 1.8 Amps @ +5 Volts DC @ 25 degrees C
Software Drivers	Solaris version 2.2 or later
Operating Environment	Temperature: 0° to 55° C (32° to 131° F) Relative Humidity: 10–95%, non-condensing Altitude: -1000 to 15,000 feet
Storage Environment	Temperature: -40° to 85° C (-42° to 185° F) Relative Humidity: 10–95%, non-condensing Altitude: -1000 to 50,000 feet

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Table A-1. Adapter Specifications

Item	Specification
Network Connections	Single Mode Fiber (8.5/125): MIC, ST, or SC Duplex Dual Mode Fiber (62.5/125): MIC, ST, or SC Duplex Category 5 UTP Copper: RJ-45

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Fiber & UTP Cabling

B

FDDI can be transported over multiple types of physical media. The most common media include optical fiber and unshielded twisted pair (UTP) copper wire.

Fiber Optic Cable

Fiber optic cable consists of a glass cylinder core, surrounded by a tube of dissimilar glass with an outer coating of protective material. The core is composed of optically pure glass that is used to transmit the light waves that carry the data. The cladding that surrounds the core is a special glass coating designed to reflect the light waves back into the core. The PMD (Physical Layer Medium Dependent) standard for FDDI specifies the diameter of the glass core, the diameter of the glass coating, and the refractive index of the core material. The core can be either single mode or multimode type fibers.

Core/Coating Dimensions: A specification of 62.5/125 micron cable, for example, is calling out a 62.5 diameter for the core (fiber size) in micrometers. The second dimension, 125, is the outer diameter of the cladding (glass coating), also in micrometers.

Graded-index: The graded-index type of cable, used in FDDI applications, is highly refractive at the center of the core and becomes less refractive toward the core-cladding boundary. The refractive index of the core at the cladding boundary matches the refractive index of the glass used for the cladding.

Single Mode: Uses only one mode of transmission (light wave). It is normally used to carry data over distances up to 25 km.

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Multi-mode: Can transmit more than one light wave at a time, but cannot sustain quality of service beyond 2 kilometers.

Table B-1. FDDI Fiber Optic Cabling

Cable Type	Core/Coating (microns)	Refractive Index	Maximum Length
Single Mode	8.5/125	Graded	15 km
Multi-mode	62.5/125	Graded	2 km

To allow for less-than-optimal media and still support high data rates, FDDI uses a group encoding technique that allows four bits to be encoded in five bauds. This encoding technique is called 4B/5B encoding. Using this technique, FDDI provides 100 Mbps using a 125 MHz rate.

Fiber Optic Cable Maintenance

Fiber optic cable requires proper handling. Follow these basic guidelines in addition to the manufacturer's specifications for good cable maintenance:

- Do not stretch, puncture, or crush the fiber cable(s) with staples, heavy equipment, doors, and so on.
- Always maintain the minimum bend radii specified by the cable manufacturer. The minimum bend radii is usually 10-20 times a cable's outer diameter.
- Keep the dust caps on the cable ends, transmitter(s), and receiver(s) until you actually make the connections. Put the dust covers back on when the cable is disconnected.
- Do not polish the connectors with a cloth made of synthetic fibers, as this will charge the fiber and attract dust.

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Unshielded Twisted Pair (UTP) Cable

The transmission of 100 Mbps over UTP cable is accomplished using TP-PMD (Twisted Pair-Physical Media Dependent) topology. TP-PMD has three components:

Data Scrambling: A method of randomizing the NRZI data stream which has the effect of spreading the frequencies which emit energy across the frequency band.

MLT-3 encode/decode: A method of converting the scrambled NRZI (two-level signals) data into three-level signals. MLT-3 has the effect of reducing the fundamental frequency of NRZI to one-half of its unconverted value. With MLT-3 coding, 90 percent of the spectral energy lies below 40 MHz. See Figure B-1.

Adaptive Equalization: Required to compensate for amplitude attenuation and phase distortion of high-speed signals transported over twisted-pair copper cable of different lengths.

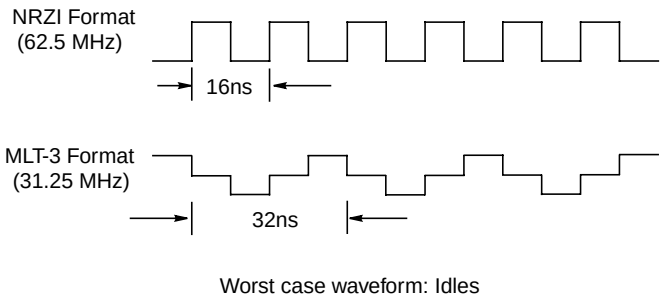


Figure B-1. MLT-3 Encoding

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TP-PMD allows the use of an RJ-45 connector for transmission over UTP category 5 cable. The connector pinout does not provide any differentiation between an S port and an M port. It is the responsibility of the user to ensure that the appropriate crossover cables are installed:

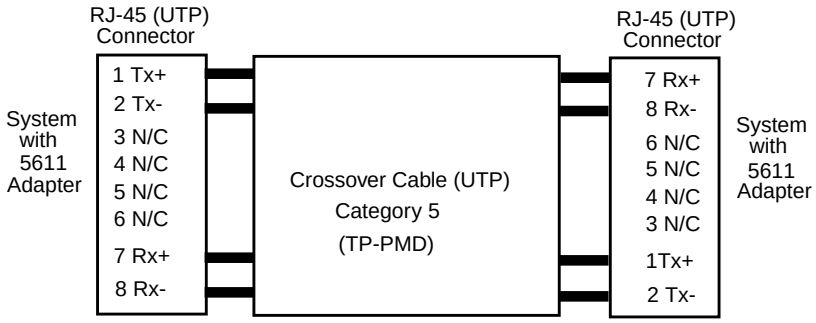


Figure B-2. Crossover TP-PMD Cabling

Note

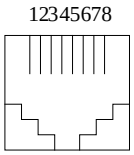
Pairs 3 through 6 are not used. They can be either connected or unconnected; the results are the same.

Connector: RJ-45 8-pin modular style.

Cable: EIA/TIA category 5 UTP Cable, 100 meters (330 feet) maximum distance

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Pin #	Signal
1	Transmit (Tx+)
2	Transmit (Tx-)
7	Receive (Rx+)
8	Receive (Rx-)

Figure B-3. RJ-45 Pin Assignments

UTP Cable Maintenance

- RJ-45 modular jacks must be EIA/TIA 568A or 568B type. This will ensure compliance with ANSI/EIA/TIA-568 and EIA/TIA/TSB-40.
- Ensure the category 5 cable has 4-5 turns per inch and no portion of the cable has any untwisted lengths greater than 0.5 inches.
- Ensure modular jack pitch panels are category 5.
- Ensure patch cabling is category 5.
- Ensure that the appropriate crossover cable between UTP ports is used. Use only one crossover per link for each connection.
- All cables, punchdown blocks, patch panels, and wall plates **must be** category 5.

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Avoid the following when using UTP cabling:

- Do not use *66* blocks as cross connect blocks. The *66* block does not conform to EIA/TIA 568 requirements for crosstalk (TSB-40).
- Do not use 25-pair wire. This type of wire enhances the possibility of data errors due to crosstalk.
- Do not share the 8 conductor cable with any other function (for example, local PBX or Ethernet).
- Do not mix services on the same wall jack, or Ethernet and UTP in a dual wall jack. This could cause interference on one or both data lines. This also creates the possibility of incorrect connections.
- Do not exceed 100 meters for category 5 UTP cables.



Caution

Failure to follow the above cable length recommendation increases the possible data error rate and degrades the throughput of the link.

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Monitoring the Network C

The fa_mon Utility

The **fa_mon** utility provides the information necessary to maintain the FDDI network and diagnose any problems. The monitor provides information about the node where the program is loaded, the upstream and downstream neighbor MAC addresses, and other SMT statistics. **fa_mon** can be run from a remote shell. The shell must be on a system containing an adapter.

fa_mon Functions

To run fa_mon, enter **fa_mon fa0**



Warning

Do not run *fa_mon* from a command tool window if you are running OpenWindows.

An example **fa_mon** composite menu appears in Figure C-1. Each menu window contains an upper screen and a lower screen.

- Press the **space bar** to switch the screen from an upper to lower screen and from a lower to an upper screen.
- To access another menu, enter the number of the menu (the choices appear at the bottom of the screen).

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- Press the **space bar** to view the next page of the current menu.
- To exit the **fa_mon** utility, enter **0**.

```
\:Poll Rate = 500 MS          Composite Data   SFDDI5611 1.1.0 (07 Aug 96)
  StationID: 0000 7785 E7AE     ECM-IN        CFM-C_WRAP_B RMT-RING_OP

  ManufactureData: XDI731 5611 Interphase Corp.
  UserData       : SMT 7.3                                <SPACE>=More \/



  SMT Version Op: 0x0002    Hi: 0x0002  Lo: 0x0002
  MAC:  UpStreamNbr    DownStreamNbr  :  OldUpStreamNbr  OldDownStreamNbr
   1   0000 7783 6097  0000 7783 6097 :  0000 F800 0000  0000 77F6 ADF1

  PHY: Cutoff Alarm ConState    RemoteType RMAC.t RMAC.r   PCM    LER
   B     7     8    Active          M      TRUE   FALSE   Active  11
   A     7     8    Connecting      NONE      FALSE  FALSE   Connect 9
  T-MAX Low: 165.000 ms                     MAC Attribute Counts
  TVX   Low:   2.500 ms    Frame    : 0x00000326    Error     : 0x00000000
  T-Req    : 165.007 ms    Copied   : 0x0000022A    Lost      : 0x00000000
  T-Neg    :  41.943 ms    Transmit : 0x0000014A    TvxExpired: 0x00000009

-------------------------------------------------------------------------------
MENU: '1' = COMPOSITE '2' = SMT  '3' = MAC_CFGS  '4' = MAC_CNTRS  '5' =
PORT B
     '6' = PORT A    '7' = PATH '8' = <unused>  '9' = SET_DLY    '0' = EXIT
-------------------------------------------------------------------------------
```

Figure C-1. fa_mon Main Menu

The fa_mon Main Menu

The opening screen is the Main Menu, or Composite Data screen (Figure C-1). It contains most of the information needed to monitor the state of the ring. It identifies the upstream and downstream neighbors, the ring state, and the token rotation times. The main menu parameters most commonly used are:

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- **Poll Rate** indicates the rate at which values are updated. This value can be changed by the Set-Delay function (option 9 at the bottom of the screen).
- **StationID** indicates the FDDI address (in "non-canonical" order) of the station where the **fa_mon** utility starts.
- **ECM** indicates the Entity Coordination Management. The "In" state is the normal state for a completed connection.
- **CFM** describes the internal configuration of ports and MACs on a station or concentrator. The normal state for a connected 5611 is **WRAP_S**. The primary path is wrapped to the S port.
- **RMT** indicates Ring Management (RMT) status information from the MAC and CFM. The ring operational (RING_OP) state is the normal state.
- **ManufactureData** indicates the manufacturer of the communication or adapter or node.
- **UserData** indicates the SMT version.
- **SMT Version Op** indicates the field in the SMT header that identifies the structure of the SMT Info field. This field, with others in the header, allows all protocol versions to recognize version mismatches.
- **MAC** stands for Media Access Control.
- **UpStreamNbr** indicates the MAC address of the upstream neighbor.
- **DownStreamNbr** indicates the MAC address of the downstream neighbor.
- **OldUpStreamNbr** indicates the MAC address of the previous upstream neighbor.
- **OldDownStreamNbr** indicates the MAC address of the previous downstream neighbor.

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- **PHY** indicates Physical Layer Protocol. DAS shows port status for ports A and B. SAS shows port status for port S.
- **ConPol** indicates the connection policies in effect for a node. *0000* means that all possible connections are allowed.
- **Cutoff** indicates the error rate estimate at which a connection is broken. The range is 10^{-4} to 10^{-15}. It is displayed as the absolute value of the base 10 logarithm. The default is 7 (10^{-7}).
- **Alarm** indicates the error rate at which a link connection generates an alarm. The range is 10^{-4} to 10^{-15}. The default is 8 (10^{-8}).
- **ConState** indicates the state of the connection. The possible values are Disabled, Connecting, Standby, and Active.
- **RemoteType** indicates the type of port connector at the other end of the physical connection. The possible values are A, B, M, S, or ? (unknown).
- **RemoteMAC** indicates the presence (1) or absence (0) of a MAC whose transmit path exits the station via this port. There can be only one present at any given time.
- **PCM** indicates the state of the Physical Connection Management (PCM) for this node. The possible values are Disable, Connect, Standby, and Active.
- **LER** indicates the Link Error Rate. It ranges from 10^{-4} to 10^{-15}.

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Other Menus in fa_mon

The remainder of this section contains supplemental information. For more information relating to the meaning and interpretation of the information presented by **fa_mon,** see your SMT 7.3 documentation.

- **SMT Menu**

  This menu displays the configuration policy and paths available plus other SMT features.

- **MAC-CFGS and MAC-CNTRS Menus**

  These menus show detailed MAC information. Some of the basic information is provided on the Composite Data screen.

- **Port S Menu (SAS) or Port A and B Menus (DAS)**

  This menu provides detailed information about the corresponding port. Some of the basic information is provided on the Composite Data screen.

- **Path Menu**

  This menu contains path information, Trace_Max expiration, and TVX and Max lower bound times.

- **Attach Menu**

  The information displayed on this menu includes whether the node is a single or dual attach station, if an optical bypass is present, and the I_Max Expiration time.

- **Set Delay Menu**

  This feature allows the user to set the rate at which the information on **fa_mon** screens is updated in milliseconds. To set the rate, enter the rate you want and press **Return**. The Composite Data screen appears.

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SunNet Manager Agent: Installation and Use

D

This appendix describes the software installation procedure for the SunNet Manager (SNM) agents, and how to use this software to manage the Interphase S/FDDI 5611 adapter.

The software installation takes about 5 minutes to complete. Please read and become familiar with the entire sequence before installing the SunNet Manager Agent. Before starting, make sure that all of the requirements are met.

Before You Start

The installation process has several requirements that must be fulfilled in order to have a successful installation. In addition, there are several questions asked during the installation. Check the requirements and have your answers ready before beginning the installation.

Requirements

- SunNet Manager version 2.1 or 2.2 must be installed on the console.
- The 5611 adapter must be installed on one or more of the systems in the network being managed. The 5611 system(s) must be running Solaris 2.2 or later.
- With the exception of the floppy drive, tape drive, or CD-ROM file system, none of the file systems being used can be mounted read-only.
- If any of the file systems being used are mounted remotely, the files must be accessible with root privileges from the local host.

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- There must be at least 1 megabyte of space available on one of the file systems that the install program uses to install the software (usually **/opt**).
- If using a tape drive on a remote host, be sure that the local host is in the remote host's **/.rhosts** file.

If these conditions are not present, do not start the installation.

Installation Overview

The installation process has two phases. In the first phase, the SunNet Manager (SNM) Agents are installed on the SunNet Manager console and the NIS master is updated. In the second phase, the 5611 SNM agents are installed on the systems where the 5611 adapters were installed.

The installation flow is illustrated in Figure D-1:

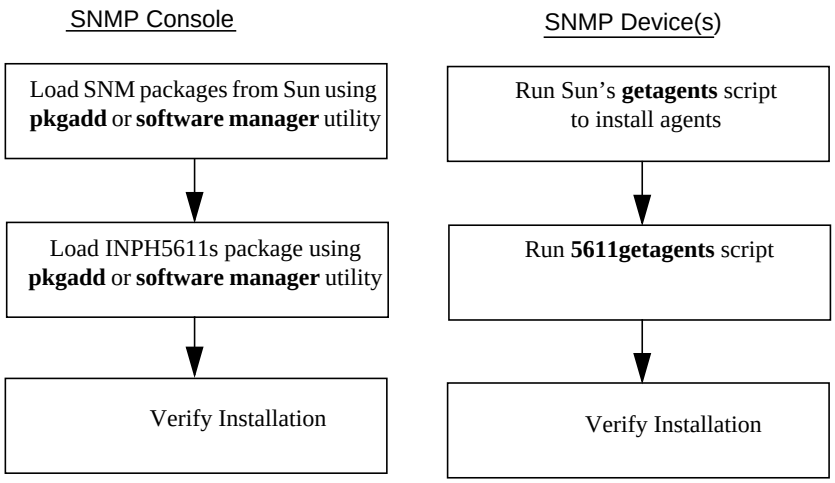


Figure D-1. SNMP Installation Flow

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When installing the SunNet Manager console, use the **pkgadd**(1M) command.

Depending on the installation media, you can install from a CD-ROM drive, a tape drive, or a floppy drive. The drive can be local or remote to the SunNet Manager console.

Installing the 5611 SNM Agents

The software installation is largely automated. If for any reason the installation should fail, the problem can be fixed and the process restarted. To install the SNM agents, do the following:

1. Log in as a superuser on the SNM console by entering the command **`% su`**.
2. Load the distribution media in the proper drive and execute the pkgadd script:
   `# pkgadd -d` *`<mounted_directory or local_device>`* **`[INPH5611s]`**

   <mounted_directory or local_device> must be one of the following:
   - The directory where the CD-ROM is mounted.
   - The device name for the floppy or tape drive.
   - The mounted directory that you spooled to from a remote device.



Note

If the mounted directory is the directory where the CD-ROM is NFS mounted, then it is typically /cdrom/cdrom0 when the Volume Manager is running. Otherwise, it is typically /cdrom.

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3. Answer the questions asked by the pkgadd software.

An example installation scenario is shown in Figure D-2:

```
classicb# pkgadd -d /cdrom

The following packages are available:
 1 INH5611DAInterphase Sbus FDDI 5611 **DAS** Driver
             (SPARC) 1.0.1
 2 INH5611SAInterphase Sbus FDDI 5611 **SAS** Driver
             (SPARC) 1.0.1
 3 INPH5611sSunNet Manager 2.2 agents for S/FDDI 5611
             (SPARC) 1.0.1

Select package(s) you wish to process (or 'all' to process all packages).
(default: all) [?,??,q]: 3

Processing package instance <INPH5611s> from </cdrom>

SunNet Manager 2.1 agents for S/FDDI 5611
             (SPARC) 1.0.SNM

*********************************************************************
*
*                                                                   *
* COPYRIGHT NOTICE                                                  *
*                                                                   *
* Copyright(c)1990-1993, Interphase Corporation. All Rights Reserved. *
*                                                                   *

         ... Copyright notice text has been abbreviated...

Using </opt/INPH5611s> as the package base directory.
Installing S/FDDI 5611 SNM agents.

Is this system running the SunNet Manager Console? y
## Processing package information.
## Processing system information.
3 package pathnames are already properly installed.
## Verifying disk space requirements.
## Checking for conflicts with packages already installed.
## Checking for setuid/setgid programs.

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

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

Installing SunNet Manager 2.2 agents for S/FDDI 5611 as <INPH5611s>
```

Figure D-2. Example 5611 SNM Agent Install

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```
## Installing part 1 of 1.
/etc/INPH5611s/rpc.add.5611
/etc/INPH5611s/snm.conf.add.5611
/etc/inet/INPH5611s/inetd.conf.add.5611
/opt/INPH5611s/README
/opt/INPH5611s/agents/5611_MIB.schema
/opt/INPH5611s/agents/na.5611_MIB
/opt/INPH5611s/bin/5611getagents
/opt/INPH5611s/icons/concentrator.icon
/opt/INPH5611s/icons/server_inph.icon
/opt/INPH5611s/icons/server_inph.iconmask
/opt/INPH5611s/icons/station_inph.icon
/opt/INPH5611s/icons/station_inph.iconmask
/opt/INPH5611s/install/undoadd.sh
/opt/INPH5611s/man/man1/na.5611_MIB.1M
/opt/INPH5611s/struct/elements_fddi.schema
/opt/INPH5611s/struct/elements_inph.schema
[ verifying class <none> ]

[ verifying class <none> ]
## Executing postinstall script.

Interphase SNM agents for S/FDDI 5611 installation.

Updating /etc/snm.conf...

Updating /etc/rpc...

Updating /etc/inet/inetd.conf...

Instructing inetd to re-read config file

Installation of <INPH5611s> was successful.

The following packages are available:
 1 INH5611DAInterphase Sbus FDDI 5611 **DAS** Driver
             (SPARC) 1.0.1
 2 INH5611SAInterphase Sbus FDDI 5611 **SAS** Driver
             (SPARC) 1.0.1
 3 INPH5611sSunNet Manager 2.2 agents for S/FDDI 5611
             (SPARC) 1.0.1

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

Figure D-3. Example 5611 SNM Agent Install (continued)

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Updating the NIS Table

If NIS is used on the network, it must be updated by the **rcp.by** number table on the NIS master.



Note

If the SNM manager's console is also the NIS master, the NIS master has already been updated.

1. Log in to the NIS master as a superuser with the following commands:
   ```
   % rlogin NIS_master
   % su
   #
   ```
2. Copy the **rpc.add.5611.a** file from the SNM Manager console by entering the following command:
   ```
   # rcp SNM_console: \
     /etc/INPH5611/rpc.add.5611 \
     /tmp/rpc.add.5611
   ```
3. Concatenate the **add** file to the **/etc/rpc** file as follows:
   ```
   # cat /tmp/rpc.add.5611 >> /etc/rpc
   ```
4. Update the NIS master with the following entry:
   ```
   # cd /var/yp
   # make rpc
   ```


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Using the 5611getagents Script

Install the 5611 agents on the system containing the 5611 adapter.



Note

This step can be performed using *pkgadd*(1M) or *swm*(1M) with the installation medium or the *5611getagents* script. In general, using the *5611getagents* script is the easiest method for most installations. The remainder of the installation process assumes that you are using the *5611getagents* script.

1. Log in as a superuser on the system that has the 5611 adapter by entering the following commands:
   ```
   % rlogin 5611system
   % su
   ```
2. Set the environment variable SNMHOME, if it is not already set, and copy the 5611getagents script from the SNM console as follows:
   ```
   # rcp SNM_console:/opt/INPH5611/bin \
     /5611getagents $SNMHOME/bin
   ```
3. Run the **5611getagents** script with the following entry:
   ```
   # $SNMHOME/bin/5611getagents
   ```

Example output of a **5611getagents** script is shown in Figure D-4:

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This section contains the output from the 5611getagents script.
ss1b# **5611getagents**

You must install SunNet Manager agents prior to the S/FDDI 5611 SNM agents. This script can first run SunNet Manager 'getagents' script. Would you like to do that? [y,n,?,q] **n**

Assuming that SunNet Manager agents have already been installed.

--- S/FDDI 5611 SNM agents installation ---

What is the name of the local root directory where S/FDDI 5611 SNM agents will be installed? Agents will be installed into the 'agents' subdirectory of the directory you specify. Type 'NFS' if you intend to run the agents via an NFS mount: [/opt/SUNWconn/snm] [?,q]

What is the name of the host where the agents are? Type <RETURN> if the agents directory is NFS mounted [localhost]: **classicb**

What is the name of the root directory on classicb under which the S/FDDI 5611 SNM agents are located [/opt/SUNWconn/snm]?

Getting the agents... done.

Adding S/FDDI 5611 SNM agents to /etc/opt/snm/snm.conf...done.

The NIS rpc.bynumber table has already been modified for the S/FDDI 5611 SNM agents.

Adding S/FDDI 5611 SNM agents to /etc/inet/inetd.conf... done.

Asking inetd to re-read its config file... done.

==========
S/FDDI 5611 SNM AGENTS WERE SUCCESFULLY INSTALLED.
==========

Figure D-4. Example 5611getagents Script

4. Repeat step 3 for each computer on the network that has one or more 5611 adapters installed.

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Verifying the Installation

To verify that the SNM Agent installation has been performed correctly, perform the following tests:

1. Run **rpcinfo -p** and check the following line:
   `390351 10 udp <number> 5611_MIB`
2. Check **/etc/snm.conf** for the following line:
   `na.5611_MIB 0 0`
3. Restart the SunNet Manager console by entering the command **`snm -i`**
4. Make sure that the 5611 **elements** file is being loaded with the following line:
   ```
   snm: loading /opt/snmconn/snm/struct \
     /elements_inph.schema
   ```

The installation of the 5611 SNM Agent is complete.

Using SunNet Manager with the 5611

This section briefly describes how to manage your 5611 adapter with SunNet Manager software. It assumes that you are familiar with SunNet Manager and have read Sun Microsystems's *SunNet Manager Installation User's Manual.*

Initializing the 5611 Agents

After installing the 5611 SNM agents on the SNM console, there are three new glyphs, or icons, that are also installed. They are called **concentrator**, **server_inph**, and **station_inph**. These glyphs are shown in Figure D-5:

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Figure D-5. SunNet Manager 5611 Glyphs

To add a glyph to your SunNet Manager Console window, do the following:

1. Create or change a component:

- Create a component by selecting the **Edit** button, and then selecting **Create-Component-<*glyph name*>** from the submenus.
- Change a component by selecting **Change Type-<*glyph name*>** from the submenu of the component.

  The <*glyph name*> can be **concentrator**, **server_inph**, or **station_inph**.

  The Properties dialog appears, as shown in Figure D-6:

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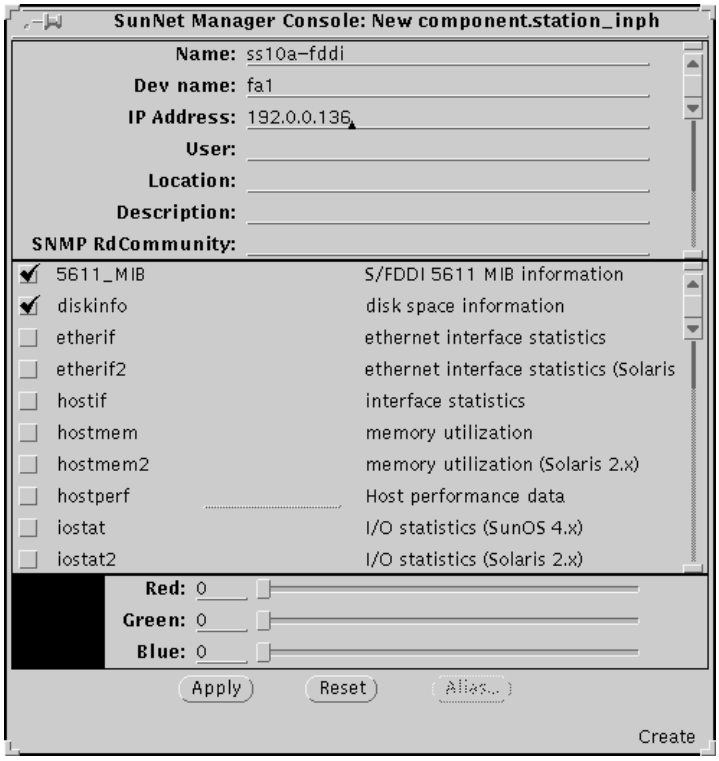


Figure D-6. Properties Window

2. Update the name(s) and IP address(es) used for the network interface(s) on this FDDI station. If there are multiple 5611 boards in a station, they can be represented in two ways:

- The first way is to represent them with one station_inph for each interface. This is the recommended way because the agent takes the host name and reports information about its associated interface.

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- The second way is to represent them with a single server_inph. If you use this method, the interface name must be supplied when requesting a report.

3. In the middle section of the Properties dialog box, select the **5611_MIB**, as shown in Figure D-6.
4. Select the Apply button at the bottom of the Properties dialog.

The Interphase *concentrator*, *station_inph*, and *server_inph* glyphs have the initials INPH under them to identify them as being different from the standard SunNet Manager glyphs. The Interphase glyphs can be used with the glyphs supplied by Sun. Figure D-7 shows the Sun FDDI glyph used with the Interphase glyphs.

The Sun FDDI glyph is not defined in the SNM **elements.struct** file. If this element has already been defined in a private element file, it can be used for this glyph. It is already copied in the **struct** directory along with 5611 agents.

Once the servers and the stations that use the **5611_MIB** component in the SunNet Manager have been defined, the agents can collect statistics on the status of the 5611 adapter boards.

To produce a report on the status of the 5611 adapter, click with the right mouse button on a glyph whose information you want to request. Then select a type of data report from the glyph menu. Next, select the agent to collect the 5611_MIB statistics, and then select one of the group displays. The possible report types are: Quick Dump, Data Report, Event Report, and Alarm Report. Data Report and Event Report can be requested by the Send Request menu.

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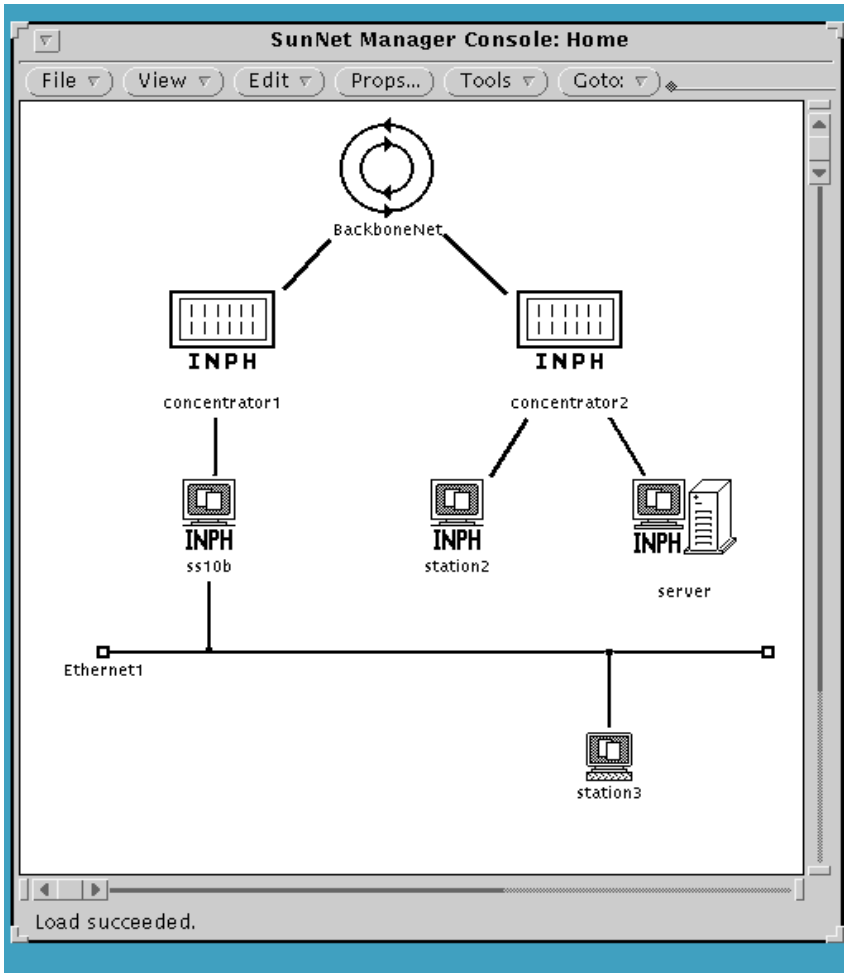


Figure D-7. SunNet Manager Console View Window

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The 5611_MIB Agent

The **5611_MIB** agent returns statistics for the 5611 S/FDDI adapter **fa** interface.

The **5611_MIB**(1M) man page describes how to interpret the fields for all of the reports generated by the **5611_MIB** agent. Note that the type of report is described in the title line of the report. Also, all fields in each report correspond to fields in the fa_mon utility.

Figure D-8 shows the main glyph window.

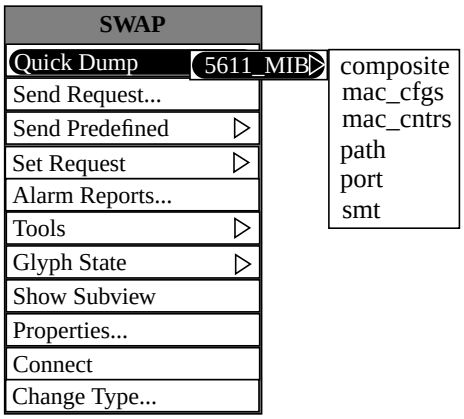


Figure D-8. Glyph Window

When requesting a custom Data Report or Event Report, fill out the following form. The KEY field has to be filled only when there are multiple 5611 boards in a station and the **server_inph** glyph component is used to represent the station.

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The KEY field format is **fa#**, **fadev#,** or **/dev/fadev#**, where # is the interface number, which ranges from 0 to 3 (for example, fa0, fadev3, /dev/fadev1).

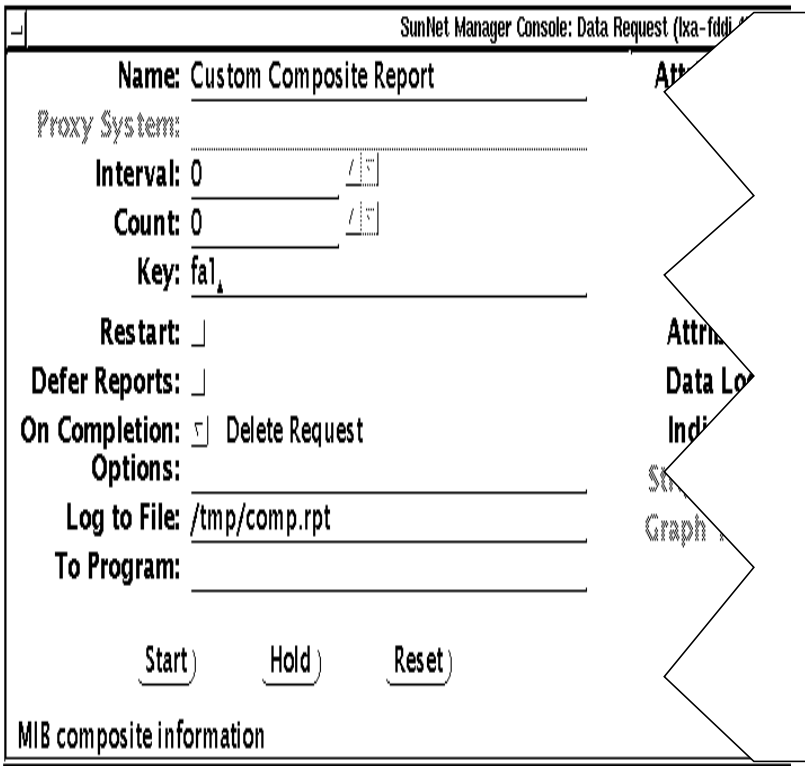


Figure D-9. Custom Data Request Form

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Glossary

4B/5B ◆ The physical layer (PHY) coding scheme for FDDI.

802.1 IEEE ◆ A set of standards for governing the OSI Data Link layer and the OSI physical layer. For example, 802.1d is the standard for bridging between the LAN standards.

802.2 IEEE ◆ Standards that govern the Logical Link Control (LLC) within the Data Link layer of the OSI model. LLC frames carry user information between the nodes on a network and define the transmission of a frame between two stations. These standards are common across the various lower level standards within the Data Link and the Physical layers.

adapter ◆ A device, usually in the form of a user interface card, that physically connects an endstation to the network medium; for example, twisted pair, coaxial, fiber.

ANSI (American National Standards Institute) ◆ Organization which coordinates, develops, and publishes standards used in the United States.

Application layer ◆ The seventh layer in the OSI model for data communications. It defines protocols for user or application programs.

ARP (Address Resolution Protocol) ◆ A TCP/IP protocol used to dynamically translate the IP address of a network host to its LAN hardware (MAC) address. This action is limited to LANs that support hardware broadcasts.

attenuation ◆ Signal power lost in a transmission medium as the signal travels from sender to receiver.

backbone ◆ A network configuration that connects LANs into an integrated network.

bandwidth ◆ Bandwidth typically indicates the data transmission capacity of a network over the network medium. Generally, the greater the bandwidth, the more information can be sent over the network medium during a given amount of time.

beacon ◆ A special frame used by media access control to announce to the other stations that the claim process was not successful. Beacon frames are useful for fault isolation.

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bridge ◆ An internetworking device used to connect two or more computer networks and to forward packets among the networks. Bridges operate at the Link layer of the OSI model.

bypass ◆ The ability of a station to be optically or electronically isolated from the network while maintaining the integrity of the ring.

CB (Common Boot) ◆ A firmware interface used for booting the controller and running diagnostics.

CB Running ◆ A state where the CB firmware interface is present and available.

CFM (Configuration Management) ◆ That portion of the Connection Management (CMT) within the Station Management (SMT) function of an FDDI station that provides for the configuration of PHY and MAC entities within a node.

claim process ◆ The technique used to determine which station will initialize the FDDI ring.

CMT (Connection Management) ◆ That portion of the Station Management (SMT) function within an FDDI station that controls the insertion, removal, and connection of the PHY and MAC entities within that station.

concentrator ◆ A sophisticated hub that provides attachment points (through M ports) for connecting stations to the FDDI ring. A concentrator can provide connectivity for these stations into a larger ring, or can stand alone for a smaller workgroup.

counter-rotating ring ◆ An arrangement where two signal paths, whose directions are opposite, exist in a ring topology.

CPU (Central Processing Unit) ◆ A computer's main microprocessor chip.

CRC (Cyclic Redundancy Check) ◆ An error checking procedure in which bytes at the end of a frame are used by the receiving node to detect a transmission problem.

DAC (Dual Attachment Concentrator) ◆ A concentrator that offers two connections to the FDDI network capable of accommodating the FDDI dual (counter-rotating) ring, and additional ports for the connection of other concentrators or FDDI stations.

DAS (Dual Attachment Station) ◆ An FDDI station that offers two connections to the FDDI dual counter-rotating ring.

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Differential Manchester encoding ◆ A signaling method that encodes clock and data information into bit symbols. Each bit symbol is divided into two halves, where the second half is the inverse of the first half. A zero is represented by a polarity change at the start of the bit time; a one is represented by no polarity change at the start of the bit time.

DMA (Direct Memory Access) ◆ A fast method of moving data between two processor subsystems without processor intervention.

downstream ◆ A term that refers to the relative position of two stations in a ring. A station is downstream of its neighbor if it receives the token after its neighbor receives the token.

dual homing ◆ A method of cabling concentrators and stations that permits an alternate or backup path to the dual ring in case the primary connection fails. Can be used in a tree or dual ring of trees configuration.

dual ring ◆ An FDDI network topology that uses two redundant rings to overcome fiber-optic failures between two nodes.

dual ring of trees ◆ A topology of concentrators and nodes that cascade from concentrators on a dual ring.

ECM (Entity Coordination Management) ◆ That portion of the Connection Management (CMT) within the Station Management (SMT) function of an FDDI station that provides for controlling bypass relays, signaling to PCM (Physical Connection Management) that the medium is available, and coordinating trace functions.

EIA/TIA (Electronics Industries Association/Telecommunication Industries Association)

ELM (Elasticity Buffer and Link Management) ◆ Implements PHY functions of the FDDI standard, including data framing, elasticity buffer, encoding, decoding, smoothing, line-state detection, and repeat filter.

encapsulating bridge ◆ A proprietary hardware device that encapsulates packets into specialized frames, usually by adding a header and a trailer to the frame.

extended LAN ◆ A collection of local area networks (similar or dissimilar) interconnected with a bridge.

FDDI (Fiber Distributed Data Interface) ◆ An ANSI standard (X3T9.5) for 100 Mbps LANs based on the token-passing protocol.

fiber optic cable ◆ A transmission medium designed to transmit digital signals in the form of pulses of light.

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fiber optics ◆ The technique of using fiber optic transmitters, receivers, and cables for the transmission of data.

fragmentation ◆ A process in which large frames from one network are broken up into smaller frames that are compatible with the frame size requirements of the network to which they will be forwarded.

fragment ◆ In FDDI, pieces of a frame left on the ring; caused by a station stripping the frame from the ring.

frame ◆ A Protocol Data Unit (PDU) transmitted between cooperating MAC entities on an FDDI ring, consisting of a variable number of bytes and control symbols.

graded index ◆ A characteristic of fiber optic cable in which the core refraction index is varied so that it is high at the center and matches the refractive index of the cladding at the core-cladding boundary.

header ◆ Control information added at the data source to allow data to reach its destination. At the destination, layers corresponding to those at the source that created the header read and remove it, so that only the data reaches the final destination.

host ◆ Generally, any computer on a network.

host name ◆ A unique name that identifies each host machine on a network.

ICMP (Internet Control Message Protocol) ◆ An integral part of the Internet Protocol (IP) that handles error and control messages. Specifically, gateways and hosts use ICMP to send reports of problems with datagrams back to the original source of the datagram. ICMP includes an echo request/reply used to test whether a destination is reachable or responding, most commonly used by the `ping` application.

IEEE (Institute of Electrical and Electronic Engineers) ◆ An information exchange organization. As part of its various functions, it coordinates, develops, and publishes network standards for use in the United States, following ANSI rules.

Inter-frame gap ◆ The interval between frames on the network media. It is defined by FDDI standards to prevent one frame from becoming confused with the next.

IP (Internet Protocol) ◆ A network layer protocol that contains addressing and control information to allow packets to be routed over dissimilar networks.

ISO (International Standards Organization) ◆ An international body that creates networking standards, including the Open Systems Interconnection (OSI) model.

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KB ◆ Kilobytes. 1024 bytes.

LAN (Local Area Network) ◆ A data communications network that spans a limited geographical area. The network provides high bandwidth communication over coaxial cable, twisted pair, fiber, or microwave media. It is usually owned by the user.

local ◆ Local refers to files and devices, such as disk drives, that are attached to or on your machine.

logical ring ◆ The circular path a token follows in an FDDI network made up of all the connected MAC sublayers. The physical topology can be a dual ring of trees, a tree, or a ring.

MAC (Media Access Control) ◆ The Data Link layer in the ISO model that describes how devices share access to a network. Ethernet, token-ring, and FDDI are MAC layer specifications. Wiring hubs deal primarily with MAC layer equipment.

Manchester encoding ◆ A signaling method by which clock and data bit information can be combined into a single, self-synchronizable data stream. A transition takes place in the middle of each bit time. A low-to-high transition represents a one; a high-to-low transition represents a zero.

Mbps ◆ Megabits (1,048,576 bits) per second.

MIB (Management Information Base) ◆ A set of variables that describe how data is stored, monitored, and managed. MIB-I and MIB-II are revisions of the database used in a TCP/IP network. The original MIB was renamed to MIB-I when the MIB-II was defined.

MIC (Media Interface Connector) ◆ A connector pair that links the network media to the FDDI node or another cable. The MIC consists of two halves. The MIC plug terminates a cable. The MIC receptacle is associated with the FDDI node.

multicast ◆ A technique that allows a single packet or cell to be copied by a selected subset of all possible destinations.

multimode ◆ A large-core (62.5 micron) optical fiber through which multiple modes of light will propagate.

network ◆ An interconnection of multiple stations or systems that are able to send messages to or receive messages from one another.

Network layer ◆ Layer 3 in the OSI model; permits communications between network nodes in an open network.

NIF (Neighborhood Information Frame) ◆ Special frames used by the SMT Frame Services within the Station Management (SMT) function of an FDDI station that periodically announce their addresses to down-

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stream neighbors. Each station in the ring makes such an announcement every 30 seconds by sending a NIF that uses Next Station Addressing (NSA), a special addressing mode that permits a station to send a frame to the next station on the token path without knowing the address of that station. This information can be used to create a logical ring map for the order in which each station appears within the ring.

NMS (Network Management Station) ◆ The system responsible for managing a network or a portion of a network. The NMS communicates to network management agents which reside in the managed node using a network management protocol.

node ◆ A device, such as a station or concentrator, connected to a network.

NRZ (Nonreturn to Zero) ◆ A data transmission technique where a polarity level, high or low, represents a logical 1 or 0.

NRZI (Nonreturn to Zero Invert on Ones) ◆ A data transmission technique where a polarity transition from low to high, or high to low, represents a logical 1. The absence of a polarity transition represents a 0.

NSA (Next Station Addressing) ◆ A special addressing mode in FDDI networks that permits a station to send a frame to the next station on the token path without knowing that station's address.

OBS (Optical Bypass Switch) ◆ A device that allows an FDDI station to be isolated from a dual ring but without breaking the continuity of the primary and secondary paths.

optical receiver ◆ An opto-electronic circuit that converts an incoming optical signal to an electrical signal, typically a photodetector.

optical transmitter ◆ An opto-electronic circuit that converts an electrical signal to an optical signal, typically a light emitting diode or a laser diode.

OSI Model (Open Systems Interconnection) ◆ The 7-layer protocol model defined by the International Standards Organization (ISO) for data communications.

packet ◆ Data information that is grouped and transmitted together, such as messages, commands, and control codes.

PCM (Physical Connection Management) ◆ That portion of the Connection Management (CMT) within the Station Management (SMT) function of an FDDI station that manages the physical connect between adjacent PHYs. This includes the signaling of the connection type, link confidence testing, and the enforcement of connection rules.

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peer-to-peer ◆ Assigning of communications tasks so that data transmission between logical groups or layers in a network architecture is accomplished between entities in the same sublayer of the OSI model.

PDU (Protocol Data Unit) ◆ The unit of data transfer between peer layer entities. It may contain control information, address information, and/or data (for example, a Service Data Unit from a higher layer entity). The FDDI MAC PDUs are tokens and frames.

PHY (Physical Layer Protocol) ◆ A standard protocol that defines symbols, line states, clocking requirements, and the encoding of data for transmission.

Physical layer ◆ Layer 1 in the OSI model; defines and handles the electrical and physical connections between systems. The physical layer can also encode data into a form that is compatible with the medium (coaxial, twisted pair, fiber, and so on).

PING (Packet Internet Groper) ◆ A TCP/IP protocol facility used to test the reachability of destinations by sending an ICMP (Internet Control Message Protocol) echo request and waiting for a reply.

PMD (Physical Layer Medium Dependent) ◆ A standard that defines the medium and protocols to transfer symbols between PHYs.

point-to-point ◆ Transmission of data between two nodes where one node is the sender and the other node is the receiver.

Presentation layer ◆ Layer 6 in the OSI model; details protocols governing data formats and conversions.

propagation delay ◆ The time it takes for a signal to travel across the network.

protocol ◆ A set of rules and conventions that govern the exchange of information between communicating parties on a network.

RC (Report/Command) ◆ A firmware interface used for sending FDDI operational commands to the controller and receiving responses to those commands.

RC Running ◆ State where the RC firmware interface is present and available. Some adapters have an LED that flashes to indicate this state. In this state, the host driver is communicating with the adapter.

reconfiguration ◆ The operation by which a station determines the location of a fault and isolates it by utilizing the redundancy of the dual FDDI ring.

repeat frame ◆ The operation of repeating a group of symbols on the network in exactly the same manner they were received by the station.

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repeater ◆ A level 1 hardware device that performs the basic actions of restoring signal amplitude, waveform, and timing of signals, before transmission onto another network segment.

ring ◆ Connections between two or more stations that form a circular data path through those stations.

RMT (Ring Management) ◆ That portion of the Station Management (SMT) function within an FDDI station that receives status information from the Media Access Control (MAC) and the Connection Management (CMT). The RMT then reports this status to the SMT and higher-level processes.

router ◆ A level 3 hardware device that uses layer 3 protocols to control network communication between stations and forwards messages to endstations or other routers.

SAC (Single Attachment Concentrator) ◆ A concentrator that offers one S port for attachment to the FDDI network and M ports for the attachment of stations or other concentrators.

SAS (Single Attachment Station) ◆ An FDDI station that offers one S port for attachment to the FDDI ring.

SBus ◆ Bus designed by Sun Microsystems that supports a data transfer rate of up to 125MB/s. Specification is IEEE 1496 (1993).

services ◆ A set of functions proved by one OSI/ISO layer or sublayer entity, for use by a higher layer or sublayer entity or by management entities.

Session layer ◆ Layer 5 in the OSI model; defines protocols governing communications between applications.

SIF (Station Information Frame) ◆ Special frames used by the SMT Frame Services within the Station Management (SMT) function of an FDDI station that contain more information about the station's configuration and characteristics than the associated Neighborhood Information Frame (NIF). This information can be used to create a physical ring map that shows the position of each station in both the token path and the network topology.

single mode ◆ A small-core (9 micron) optical fiber through which only one mode of light can propagate. This fiber can carry data much further than multimode.

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SMT (Station Management) ◆ An entity within a network station on an FDDI ring that monitors station activity and exercises control over station activity. The standard defines how to manage the Physical Layer Medium Dependent (PMD), the Physical Layer Protocol (PHY), and the Media Access Control (MAC) portions of FDDI.

SMT Frame Services ◆ That portion of Station Management (SMT) that provides the means to control and observe the FDDI network. The service uses Neighborhood Information Frames (NIF) and Station Information Frames (SIF) to pass an announcement, a request, and the response to a request.

SNMP (Simple Network Management Protocol) ◆ A high level standards-based protocol for network management, usually used in TCP/IP networks. An SNMP monitor controls and measures the activities of SNMP agents that are embedded in nodes and network devices on the network. SNMP relies on Management Information Bases (MIBs) embedded in the network resources to monitor and control the network's topology.

spanning tree ◆ A method of creating a loop-free logical topology on an extended LAN. Formation of a spanning tree topology for transmission of messages across bridges is based on the industry standard spanning tree algorithm defined in IEEE 802.1d.

station ◆ An addressable node on the network capable of transmitting and receiving data. In an FDDI ring, the station can repeat data. A station has at least one instance of SMT, at least one instance of PHY and PMD, and at least one MAC entity. (Without a MAC, a station is not addressable and is actually a repeater or hub.)

stuck beacon ◆ The condition where a station is locked into sending continuous beacon frames.

TCP/IP (Transmission Control Protocol/Internet Protocol) ◆ A set of communications protocols that define how different types of computers talk to each other. It is the standard architecture for internetworking multiple organizations, and the common link that ties the huge Internet together.

token ◆ A bit pattern consisting of a unique symbol sequence that circulates around the ring following a data transmission. The token grants stations the right to transmit.

token holding timer ◆ A timer that controls the amount of time a station may hold the token in order to transmit asynchronous frames.

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token passing ◆ A method where each node, in turn, receives and passes on the right to use the channel. The nodes are usually configured in a logical ring.

Token Ring ◆ A network topology utilizing a token-passing media access protocol in a ring topology. 100 Mbps FDDI and ANSI 802.5 4- and 16-Mbps Token Ring are token ring technologies.

TP-PMD (Twisted Pair—Physical Media Dependent) ◆ The ANSI standard defining the physical medium and protocols used to transfer FDDI data over Twisted Pair Category 5 cable.

trace ◆ A diagnostic process to recover from a stuck-beacon condition. The fault is localized to the beaconing MAC and its upstream neighbor MAC.

Transport layer ◆ Layer 4 in the OSI model; defines protocols governing message structure and some error checking.

TRT (Token Rotation Timer) ◆ A clock that times the period between the receipt of tokens.

TTP (Timed-Token Protocol) ◆ The rules defining how the target token rotation time is set, the length of time a station can hold the token, and how the ring is initialized.

TTRT (Target Token Rotation Time) ◆ The value used by the MAC receiver to time the operations of the MAC layer. The TTRT value varies, depending on whether or not the ring is operational.

TVX (Valid Transmission Timer) ◆ A timer that times the period between valid transmissions on the ring; used to detect excessive ring noise, token loss, and other faults.

upstream ◆ A term that refers to the relative position of two stations in a ring. A station is upstream of its neighbor if it receives the token before its neighbor receives the token.

UTP (Unshielded Twisted Pair) ◆ Cable with one or more twisted pairs where the wiring is not protected from electromagnetic and radio frequency, but covered with plastic or PVC.

WAN (Wide Area Network) ◆ A network spanning a large geographical area that provides communications among devices on a regional, national or international basis.

workgroup ◆ A network configuration characterized by a small number of attached devices spread over a limited geographical area.

workstation ◆ A networked computer typically reserved for end-user applications.

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X3T9.5 ANSI ◆ The standard specification for an FDDI network operating at 100 Mbps in a ring topology that can extend to hundreds of stations over tens of kilometers without degrading the system.

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