Installing and Administering HP EISA FDDI/9000 and HP HSC FDDI/9000

Edition 1

J3703-90004
HP 9000 Networking
E1097

Printed in: U.S.A.

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Printing History

New editions are complete revisions of the manual. The dates on the title page change only when a new edition or a new update is published.

Note that many product updates and fixes do not require manual changes and, conversely, manual corrections may be done without accompanying product changes. Therefore, do not expect a one-to-one correspondence between product updates and manual updates.

Edition 1 October 1997

Safety Considerations

Safety Symbols

WARNING **A WARNING denotes a hazard that can cause personal injury.**

CAUTION A CAUTION denotes a hazard that can damage equipment.

FCC Statement (USA Only)

The United States Federal Communications Commission has specified that the following notice be brought to the attention of users of this products:

FCC rules part 15, subpart A, class A devices.

Information to User (section 15.105)

WARNING **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.**

EMI Statement (European Union Only)

This is a Class A product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures.

DOC Statement (Canada Only)

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

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

Radio Frequency Interference (Japan Only)

VCCI, Class A

Figure 1

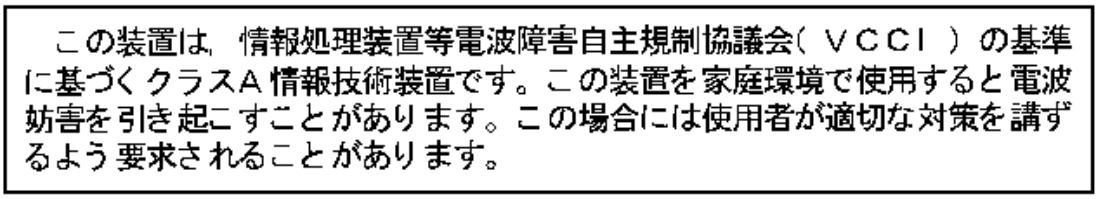

Figure 2

DECLARATION OF CONFORMITY
according to ISO/IEC Guide 22 and EN 45014

Manufacturer's Name: Hewlett-Packard Company

Manufacturer's Address: 8000 Foothills Blvd.
Roseville, CA 95747
USA

declares, that the product

Product Name: HP HSC FDDI LAN Adapter

Model Number(s): A3722A, A3723A

Product Options: All

conforms to the following Product Specifications:

Safety: IEC 950:1991 + A1, A2, A3 / EN 60950:1992 + A1, A2, A3

EMC: CISPR 22:1993 / EN 55022:1994 - Class A[1]

EN 50082-1:1992, Generic Immunity, including:
IEC 801-2:1991 / prEN 55024-2:1992, 4 kV CD, 8 kV AD
IEC 801-3:1984 / prEN 55024-3:1991, 3 V/m
IEC 801-4:1988 / prEN 55024-4:1992, 0.5 kV Signal Lines

Supplementary Information:

The product herewith complies with the requirements the EMC Directive 89/336/EEC and carries the CE marking accordingly.

1) The Product was tested in a typical configuration with a Hewlett-Packard computer system.

Roseville, January 28, 1997 Jeff James, Quality Manager

European Contact: Your local Hewlett-Packard Sales and Service Office or Hewlett-Packard GmbH, Department TRE, Herrenberger Straße 130, D-71034 Böblingen (FAX: + 49-7031-14-3143)

Figure 3

DECLARATION OF CONFORMITY
according to ISO/IEC Guide 22 and EN 45014

Manufacturer's Name: Hewlett-Packard Company

Manufacturer's Address: 8000 Foothills Blvd.
Roseville, CA 95747
USA

declares, that the product

Product Name: HP EISA FDDI LAN Adapter

Model Number(s): A3659A, all options

Product Options: All

conforms to the following Product Specifications:

Safety: IEC 950:1991 + A1, A2, A3 / EN 60950:1992 + A1, A2, A3

EMC: CISPR 22:1993 / EN 55022:1994 - Class A[1]

EN 50082-1:1992, Generic Immunity, including:
IEC 801-2:1991 / prEN 55024-2:1992, 4 kV CD, 8 kV AD
IEC 801-3:1984 / prEN 55024-3:1991, 3 V/m
IEC 801-4:1988 / prEN 55024-4:1992, 0.5 kV Signal Lines

Supplementary Information:

The product herewith complies with the requirements the EMC Directive 89/336/EEC and carries the CE marking accordingly.

1) The Product was tested in a typical configuration with a Hewlett-Packard computer system.

Roseville, January 28, 1997

Frank Dembski, Quality Manager

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In This Book

This manual describes how to install, configure, and troubleshoot the EISA and HSC versions of HP FDDI/9000. The information in this manual is intended for network managers who install and administer FDDI networks. It is assumed the reader is experienced with the basics of local and wide area networking.

Chapter 1	"HP FDDI/9000 Resources" provides references to other useful tools for installing, configuring, and maintaining HP EISA and HSC FDDI/9000 software.
Chapter 2	"Installing the HP EISA FDDI/9000 Adapter" provides step-by-step instructions on installing EISA hardware adapters.
Chapter 3	"Installing the HP HSC FDDI/9000 Adapter" provides step-by-step instructions on installing HSC hardware adapters.
Chapter 4	"Configuring and Verifying HP EISA and HSC FDDI/9000" provides step-by-step instructions on installing and configuring the EISA and HSC FDDI/9000 software.
Chapter 5	"Troubleshooting" describes the `fddilink` and `fddiif` utilities. This chapter also provides possible solutions for problems encountered while using HP EISA and HSC FDDI/9000.
Appendix A	"Technical Specifications" provides technical information about the EISA and HSC FDDI/9000 adapters.
Appendix B	"Fiber Cabling" provides technical information about FDDI optical fiber media.

1 HP FDDI/9000 Resources

In addition to this manual, use the resources described in this chapter to maintain and administer HP EISA and HSC FDDI/9000.

About HP EISA FDDI/9000

HP EISA FDDI/9000 is a high-performance Fiber Distributed Data Interface (FDDI) networking soluction for HP servers and workstations. HP EISA FDDI/9000 provides the physical and data-link services as defined by the ANSI X3T9.5 specifications for FDDI and is supported over the TCP/IP network protocol stack.

HP EISA FDDI/9000 offers a back-to-back or single-attach connections used via an FDDI concentrator, and a dual-attach connection which connected directly onto an FDDI dual-ring network.

EISA FDDI/9000 can be installed on D-class servers or B, C, or J class workstations. Series 700 systems with an EISA bus are also supported.

Servers		**Workstations**	
System	**Max. Cards**	**System**	**Max. Cards**
D-class	4	B-class	2
		C-class	4
		J-class	4

About HP HSC FDDI/9000

HP HSC FDDI/9000 is a high-speed network link offering a dual-attach connection to a Fiber Distributed Data Interface (FDDI) dual-ring network. The product can be run in single-attach mode if only one cable is connected. HSC FDDI/9000 includes FDDI adapter hardware and FDDI driver software and is compliant with ANSI X3T9.5 specifications for FDDI.

HSC (High Speed Connect) FDDI can be installed on K, T-600, and D class servers or B, C, or J class workstations running HP-UX 11.0. The maximum number of HSC FDDI cards that can be installed on each system is shown below:

Servers		**Workstations**	
System	**Max. Cards**	**System**	**Max. Cards**
K2xx K4xx	4	B-class	2
K570	6	C-class	4
T-600	4	J-class	4
D-class	4		

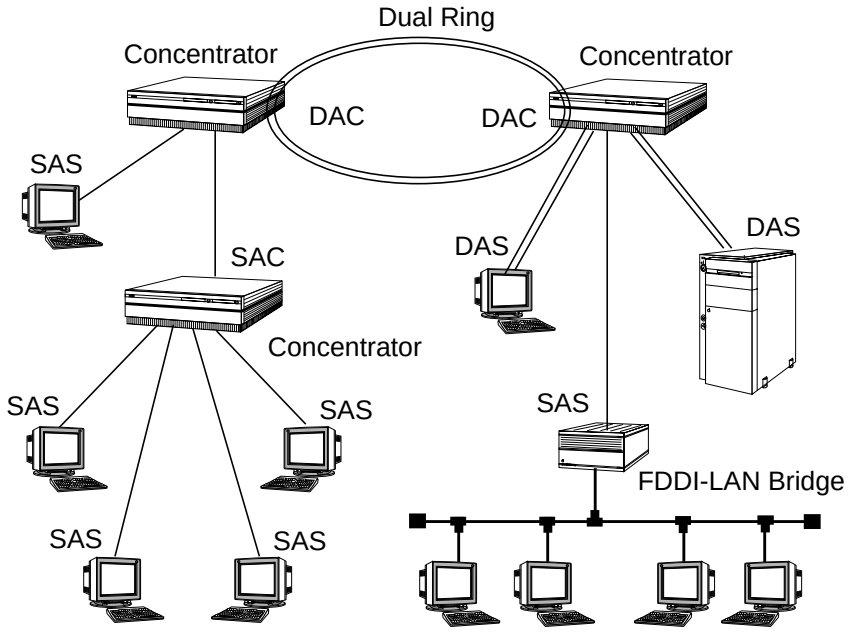
FDDI Concepts

The **Fiber Distributed Data Interface (FDDI)** is a high speed local area network which has been defined as a standard by an American National Standards Institute committee, ANSI X3T9.5 and by ISO.

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 can 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 within 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 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. A typical FDDI network layout is shown in Figure 1-1.

Figure 1-1 FDDI Architecture



FDDI Devices

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 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 span of trees topology.
- Dual Attachment Station (DAS): Connects to a dual ring. Both primary and secondary paths are connected.

- Single Attachment Station (SAS): Connects only to the primary ring. Generally, a SAS connects to the FDDI ring through a DAC.

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

NOTE

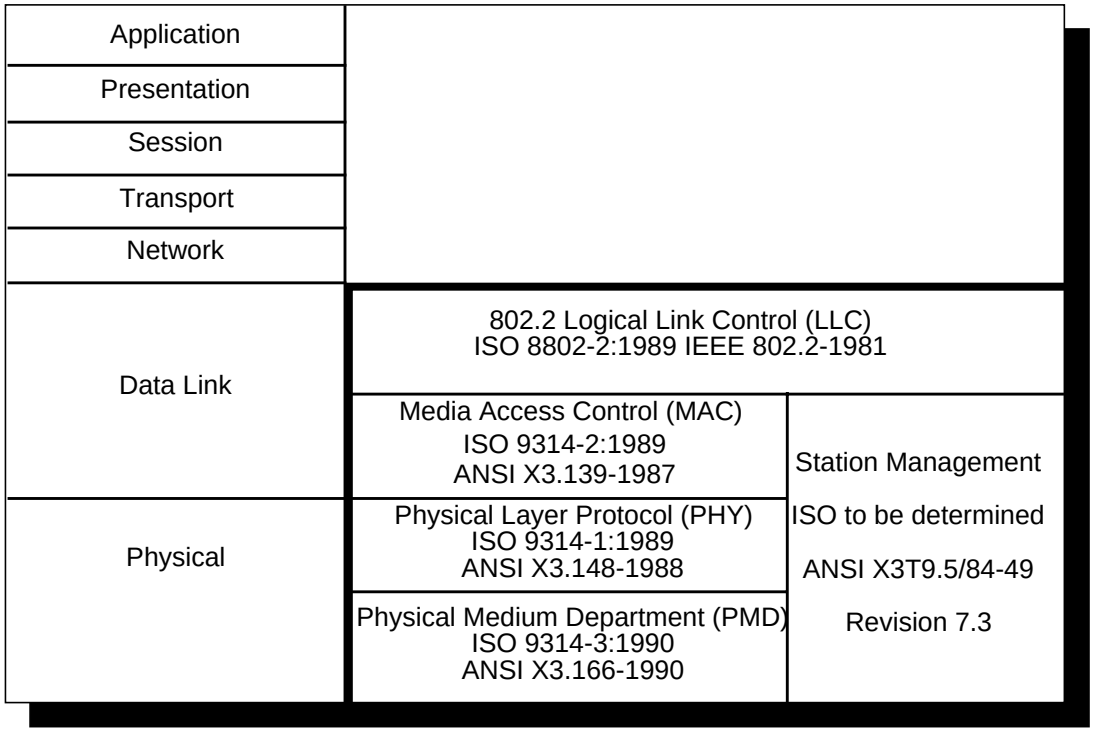
DAC and DAS connect directly to the FDDI dual ring while SAC and SAS only connect to a single, primary ring.

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.

ANSI FDDI Standards

Figure 1-2 shows the four ANSI FDDI standards and how they combine to form a completely functional fiber optic network. This figure also shows how these standards fit into the OSI model.

Figure 1-2 FDDI Standards and the OSI Model



The physical layer includes two pieces, the **Physical Medium Dependent (PMD)** layer that provides the point-to-point communications between stations in the network, and the **Physical Layer Protocol (PHY)** layer that handles synchronization between higher layer data and control symbols, and the code bit representation which is transmitted on the medium.

The data link layer includes the **Media Access Control (MAC)** standard and the **Logical Link Control (LLC)** standard. The MAC's primary function is the scheduling, routing and delivery of Frames, the vehicles used to transmit information on and off the ring. In an FDDI network, information is transmitted sequentially, within frames, as a stream of encoded symbols from one station to the next. The order of the symbols within the frames is predetermined by the MAC standard. The LLC provides a common protocol between the MAC and the network layer. In addition to FDDI, the LLC standard also applies to IEEE 802.3, 802.4, and 802.5 networks.

The **Station Management (SMT)** standard is a layer management entity which interfaces with the other sublayers. It manages connections with the ring as well as station configuration and ring configuration. HP EISA FDDI/9000 and HSC FDDI/9000 support SMT version 7.3.

HP-UX Manual Reference Pages

While installing, configuring, or troubleshooting EISA or HSC FDDI/9000, you may need to refer to any of the following online manual reference pages (man pages) for useful HP-UX operating system or EISA or HSC FDDI commands. To display a man page, type the following at the system prompt:

`man <`*`command name`*`>`

NOTE

The `fddilink` utility displays the operating statistics of an EISA or HSC FDDI network, while the `fddiif` utility collects operating statistics on the EISA or HSC FDDI adapter. These utilities are described in Chapter 5 “Troubleshooting.”

- `arp(1M)` displays a list of addresses associated with a specified host. The `arp -a` command displays all current Address Resolution Protocol (ARP) entries.
- `ifconfig(1M)` can be run to manually bring up the Net-Interface or to verify if the Net-Interface is up.
- `ioscan(1M)` scans system hardware, usable I/O system devices, or kernel I/O system data structures as appropriate, and lists the results.
- `lanadmin(1M)` is a local area network administration program that allows you to display statistics for the card and, if necessary, to reset the card.
- `lanscan(1M)` displays information about LAN adapters that are successfully bound to the system.
- `linkloop(1M)` verifies network connectivity through the Data Link Layer.
- `mksf(1M)` or `insf (1M)` creates device files.
- `netstat(1)` provides network statistics and information about network connections. `netstat -i` displays inbound and outbound statistics.
- `nettl(1M)` captures and controls network tracing and logging information. `netfmt(1M)` formats the `nettl` tracing and logging binary files.

- `ping (1M)` verifies network connectivity through the Network Layer and reports round-trip time of communications between the local and remote hosts.
- `route(1M)` adds and deletes entries to the network routing table, allowing your system to communicate through a gateway.
- `sam(1M)` configures networking software.
- `swinstall(1M)` loads software filesets onto HP-UX 11.x systems.
- `swremove(1M)` removes HP-UX functionality (filesets).
- `swverify(1M)` verifies the software installation onto HP-UX 11.x systems.

Logging and Tracing Messages

EISA FDDI/9000 and HSC FDDI/9000 come with an online message catalog that reports problems, probable causes, and actions for you to take to correct the problems. Messages are sent either to the system console or log files, and come in the following format:

<*message ID*> <*messsage*>

The following is an example of an HSC FDDI message:

```
7001 HP HSC FDDI card failed to initialize in slot 1.
```

EISA FDDI/9000 and HSC FDDI/9000 use the `nettl` logging and tracing facility supplied with HP- UX to capture, control, and format messages. When using `nettl`, note the following:

- log and trace messages are sent by default to the files `/var/adm/nettl.LOG##` or `/var/adm/nettl.TRC##`
- all disaster messages are sent to the system console
- tracing and logging have an impact on system performance and should be used judiciously

Listed below are some example commands.

- To examine the log file with message, cause, and action:

  ```
  netfmt -v -f /var/adm/nettl.LOG00 -t 50
  ```

- To check network logging and tracing status:

  ```
  nettl  -status
  ```

- To start all tracing to the file `/var/adm/tracefile`:

  ```
  nettl -traceon all -entity HSC_FDDI -f /var/adm/tracefile
  ```

- To stop tracing:

  ```
  nettl -entity HSC_FDDI -traceoff
  ```

- To format the trace file into the file `/var/adm/traceout`:

  ```
  netfmt -f /var/adm/tracefile.TRC0 > /var/adm/traceout
  ```

Using Support Tools Manager

Use HP Support Tools Manager (STM) with the EISA or HSC FDDI adapter to gather information about the adapter and to diagnose problems. Refer to the *Support Media User's Manual* for more details about STM.

STM provides the following tools for HP LAN adapters:

- Information Tool provides a quick access to the most useful information about a particular device, such as slot number, hardware path, soft physical address, and hard physical address.
- Verify Tool provides a quck verification that a particular device is properly connected and functional.
- Exercise Tool stresses the hardware and can assist in reproducing intermittent problems.
- Diagnostics Tool tests a particular device and isolates any failures down to the most suspect field replaceable unit (FRU).

The Support Tools Manager can be run in three ways:

- in the X Windows environment by entering the following at the system prompt: `xstm &`
- in Command Line Mode by entering the following at the system prompt: `cstm`
- in Menu Mode by entering the following at the system prompt: `mstm`

Contacting Your HP Representative

If you have no service contract with HP, you may follow the procedure described below, but you will be billed accordingly for time and materials.

If you have a service contract with HP, document the problem as a Service Request (SR) and forward it to your HP representative. Include the following information where applicable:

- A characterization of the problem. Describe the events and symptoms leading up to the problem. Attempt to describe the source of the problem.

  Your characterization should include: HP-UX commands; communication subsystem commands; functionality of user programs; result codes and messages; and data that can reproduce the problem.

- Obtain the version, update, and fix information for all software:

  `what /stand/vmunix | grep` *adapter_number*

  where *adapter_number* is one of the following:

  - A3659A for EISA FDDI/9000 on servers
  - B5502A for EISA FDDI/9000 on workstations
  - A3722A for HSC FDDI/9000 on servers
  - A3723A for HSC FDDI/9000 on workstations

  To check the version of your kernel, execute `uname -r`.

  This allows HP to determine if the problem is already known, and if the correct software is installed at your site.

- Illustrate as clearly as possible the context of any message(s). Record all error messages and numbers that appear at the user terminal and the system console.
- Save all network log files.
- Prepare the formatted output and a copy of the log file for your HP representative to further analyze.
- Prepare a listing of the HP-UX I/O configuration you are using for your HP representative to further analyze.

- Try to determine the general area within the software where you think the problem exists. Refer to the appropriate reference manual and follow the guidelines on gathering information for that product.
- Document your interim, or “workaround,” solution. The cause of the problem can sometimes be found by comparing the circumstances in which it occurs with the circumstances in which it does not occur.
- Create copies of any EISA or HSC FDDI/9000 link trace files that were active when the problem occurred for your HP representative to further analyze.
- In the event of a system failure, obtain a full memory dump. If the directory `/var/adm/crash` exists, the HP-UX utility `/sbin/savecore` automatically executes during reboot to save the memory dump. Hewlett-Packard recommends that you create the `/tmp/syscore` directory after successfully installing this product. Send the output of your system failure memory dump to your HP representative.

2 Installing the HP EISA FDDI/9000 Adapter

This chapter describes how to install HP EISA FDDI/9000 adapters in your HP-UX system.

Checking FDDI Installation Prerequisites

Prior to loading the EISA FDDI product onto your system, check that you have met the following hardware and software prerequisites:

1. Check that the `/usr/bin`, `/usr/sbin` and `/sbin` directories are in your PATH using the command: `echo $PATH`.
2. The operating system has been upgraded to the required version. Refer to the product release notes.

   To obtain this information, use the `uname -a` command.
3. You have a fiber cable terminated with a Media Interface Connector (MIC) to connect your FDDI adapter to your concentrator. See Appendix B, “Fiber Cabling,” for more information.
4. You have an IP address, subnet mask (if the adapter will be on a subnetwork), and host name alias for your new FDDI adapter.
5. You have super-user privileges.

NOTE Prior to the installation of HP EISA FDDI/9000, FDDI fiber optic cabling must be installed by a non-HP third party cabling vendor, and all networking appliances must be correctly attached and configured including concentrators.

Installing the Adapter

HP EISA FDDI/9000 is supported on D Class server systems, B, C, and J class workstations, and Series 700 systems with EISA bus. For more detailed information and illustrations, refer to the sections in this chapter or to the appropriate owner's guides for each of the models.

HP EISA FDDI/9000 contains electronic components that can easily be damaged by small amounts of static electricity. To avoid damage, follow these guidelines:

- Store adapters in their antistatic plastic bags until you are ready to install them.
- If possible, work in a static-free area.
- Handle the adapter only by the edges. Do not touch electronic components or electrical traces.
- Use the disposable grounding wrist strap provided with this product (HP 9300-1408). Follow the instructions provided with the strap.
- A suitable electrical ground is any exposed metal surface on the computer chassis.

To install the EISA FDDI adapter:

1. Attach the grounding strap to your wrist or ankle.
2. Shut down the system:

   ```
   /usr/sbin/shutdown -h
   ```

   Wait until the system responds with “OK to press reset” or “Halted, you may now cycle power”, then power off the system.
3. Disconnect the AC power cord from the system unit and from the AC power source.
4. Remove the power supply cover plate.

Installing the EISA FDDI Adapter

To install the adapter, do the following:

NOTE The following steps should be done while wearing a grounding strap.

1. Locate an empty EISA expansion slot and remove the blank cover plate.

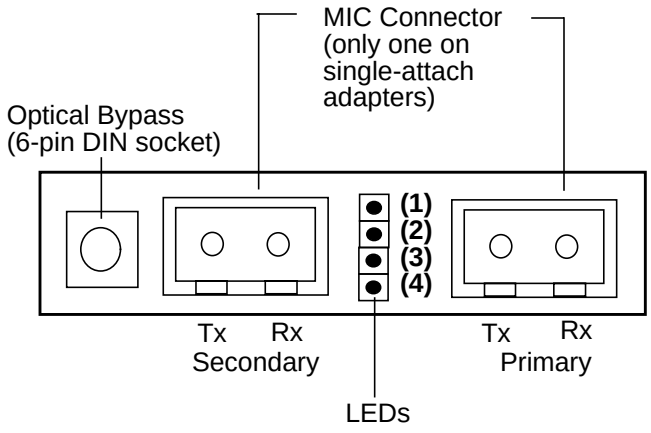
   Save the screw(s) to secure the adapter to the chassis in a later step.

2. Remove the adapter from its antistatic packaging.

3. Align the EISA connector on the EISA FDDI adapter with the I/O Expansion connector in the slot. Press the adapter firmly into place, making sure that the two connectors are flush with each other. Screw the EISA FDDI adapter into place by screwing in the two screws on the front of the slot.

   Figure 2-1 shows the EISA FDDI cable connectors and LEDs. Note that the numbers shown correspond to the LEDs.

Figure 2-1 EISA FDDI Cable Connectors and LEDs



4. Secure the adapter to the system chassis with the screw(s) that you removed from the blank cover plate in step 1.

Next you will attach your EISA FDDI adapter to the network. Go to the section “Connecting the Adapter to the Network” for this step.

Connecting the Adapter to the Network

Keep the dust cap(s) on the ends of the cable and on the transceivers of the adapter until the connections are ready to be made. This prevents dirt and oils from soiling any important surfaces. Do not attempt to polish the connectors with a cloth made of synthetic fibers; this charges the fiber and attracts dust.

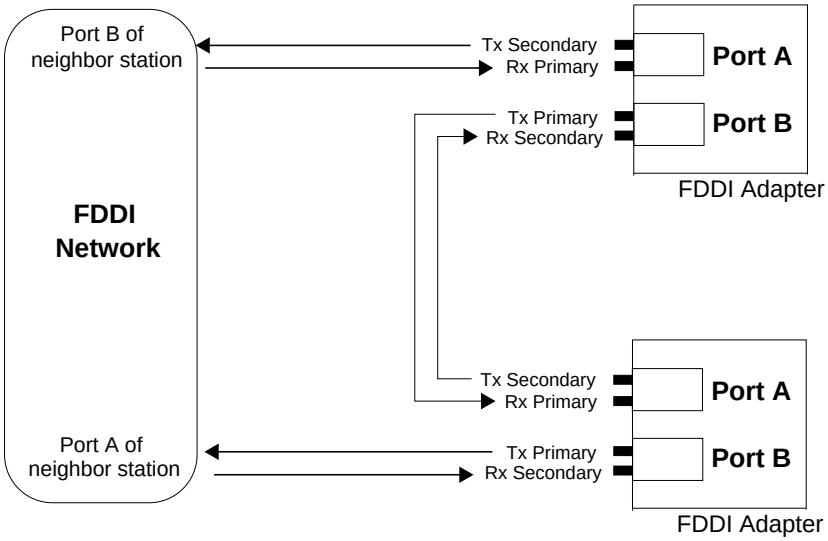
When connecting a fiber optic cable, do not stretch, puncture, or crush the cable with staples or heavy equipment. Always maintain the minimum bend radii specified by the cable manufacturer. The fiber in fiber optic cable can suffer damage if the cable is bent in small radii. The minimum bend radius is usually 10-20 times a cable's outer diameter.

CAUTION Do not force the connectors when attaching the cable — they are keyed connections and fit one way only.

There are two ways to connect the adapter to the FDDI network. It can be connected directly to the adjacent stations in a dual-ring network or to a concentrator (DAC or SAC), typically dual-homed for additional fault tolerance. You can use an Optical Bypass Switch (OBS) between the adapter and the dual ring. An OBS maintains continuity of the primary and secondary ring when the station is powered down, or in the event of an adapter failure.

Signals must be routed such that the primary Tx output from each station is routed to the primary Rx input of its neighbors, and the secondary Tx output is routed to the secondary Rx input of the other neighbor, and so forth, as shown in Figure 2-2.

Figure 2-2 Dual-Ring Tx/Rx Topology



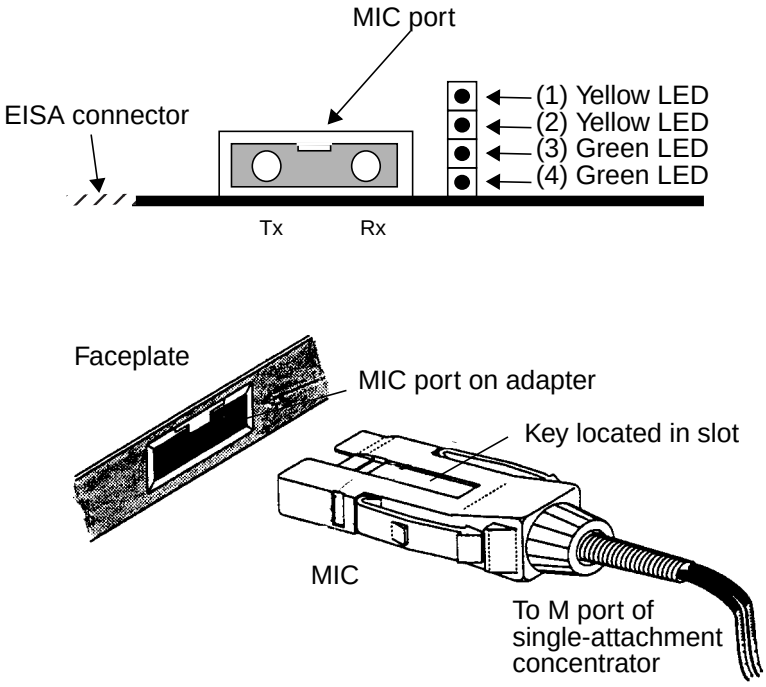
Single-Attachment MIC Adapter Connections

A single-attachment station (SAS) adapter cannot be connected directly to the FDDI ring. It must be connected to an M port on a single-attachment concentrator (SAC). The fiber cable used to attach the adapter is normally a MIC connection at the concentrator with M keying. The signals must be routed such that the Tx output of one station is routed to the Rx input of its downstream neighbor.

To connect a SAS adapter to the concentrator, do the following:

1. Connect the cable from the adapter to any available M port on the concentrator, as shown in Figure 2-3.

Figure 2-3 SAS MIC Connection



2. Recheck your connections, ensuring that each connector is plugged into the correct Tx or Rx receptable or jack, as discussed in the previous step.
3. Reconnect the AC power cord to the system and the power source.
4. Power up the system.

   The adapter runs a self-test automatically. During power up, system messages may appear regarding the absence of the EISA configuration for the adapter. You can safely ignore these messages since the EISA configuration happens automatically after the adapter software is installed.

   Now that your adapter is installed, continue to Chapter 4, “Configuring and Verifying HP EISA and HSC FDDI/9000.”

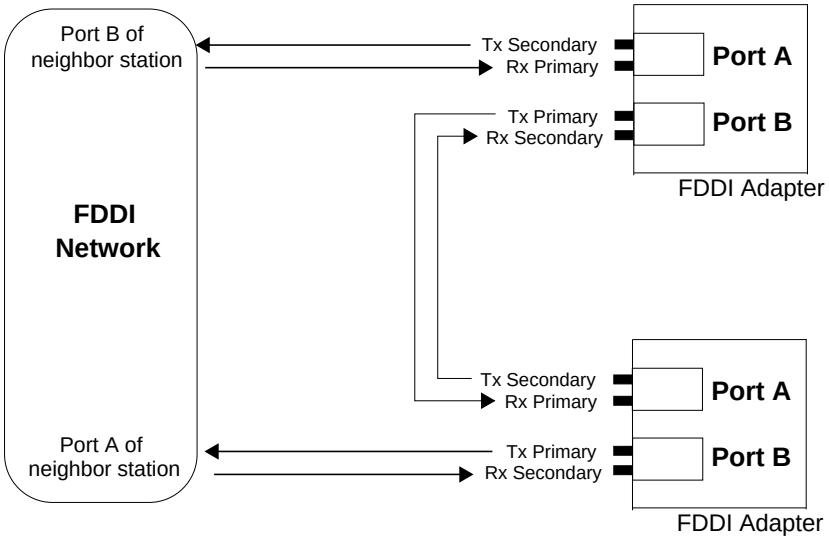
Dual-Attachment MIC Adapter Connections

This section illustrates the dual-attachment MIC adapter connections.

There are two ways to connect the adapter to the FDDI network. It can be connected directly to the adjacent stations in a dual-ring network or to a concentrator (DAC or SAC), typically dual-homed for additional fault tolerance. You can use an Optical Bypass Switch (OBS) between the adapter and the dual ring. An OBS maintains continuity of the primary and secondary ring when the station is powered down, or in the event of an adapter failure.

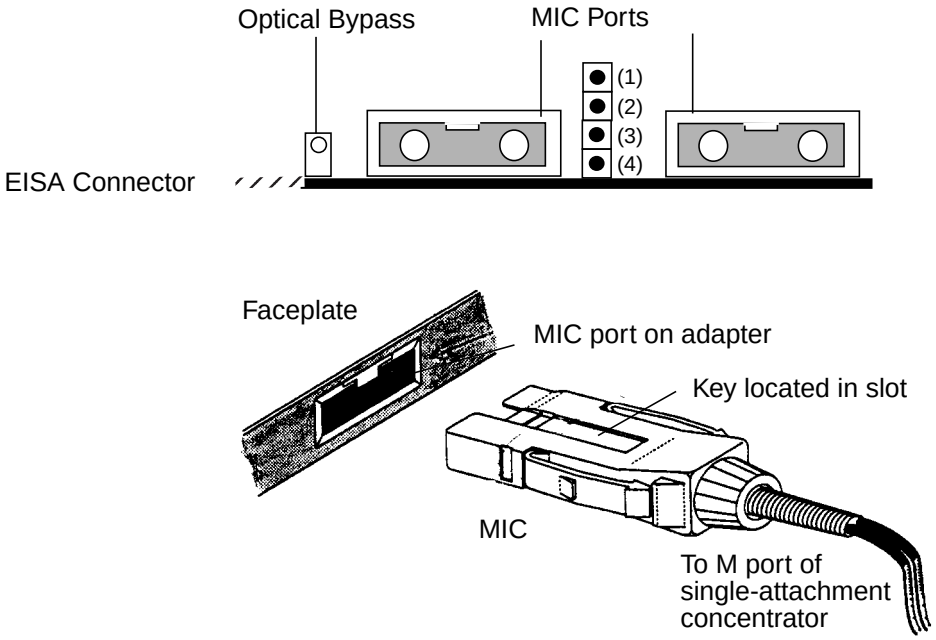
Signals must be routed such that the primary Tx output from each station is routed to the primary Rx input of its neighbors, and the secondary Tx output is routed to the secondary Rx input of the other neighbor, and so forth, as shown in Figure 2-2.

Figure 2-4 Dual-Ring Tx/Rx Topology



MIC connectors are individually keyed to fit type A or type B ports. The key is located in the slot on one side of the connector. Be sure the key type of the plug matches the port type on the adapter.

Figure 2-5 DAS MIC Fiber Connections

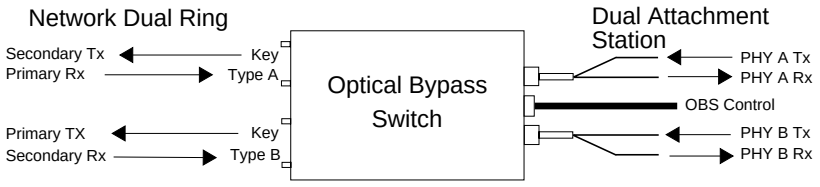


Connecting Directly to the Dual Ring

This adapter can be connected directly to the dual ring by connecting the A and B ports of its neighbors.

During normal operation of a dual ring with no faults, each station receives and transmits all traffic on the primary ring, while the secondary ring is idle. If a station is turned off or disconnected from the ring, neighboring stations detect this as a fault or discontinuity, and wrap the traffic onto the secondary ring, thus keeping remaining stations in communication. However, if a second fault occurs during this time, the ring could become segmented, separating groups of stations into independent rings. An Optical Bypass Switch (OBS) can be used to bypass a station that is turned off or disconnected, protecting against multiple faults on a dual ring. Figure 2-6 shows the connection of the OBS to a dual ring.

Figure 2-6 Optical Bypass Switch Configuration



To connect an EISA FDDI adapter to a dual ring using an OBS, do the following:

1. Connect the cables from the OBS to the appropriate Phy A and Phy B ports on the adapter.
2. Connect the control cable from the OBS to the adapter. The optical bypass socket on the adapter is a 6-pin mini-DIN connection.
3. Connect the cables from the FDDI network to the appropriate ports on the OBS.

3 Installing the HP HSC FDDI/9000 Adapter

This chapter describes how to install HP HSC FDDI/9000 adapters in your HP-UX system.

Checking FDDI Installation Prerequisites

Prior to loading the HSC FDDI product onto your system, check that you have met the following hardware and software prerequisites:

1. Check that the `/usr/bin`, `/usr/sbin` and `/sbin` directories are in your PATH using the command: `echo $PATH`.
2. The operating system has been upgraded to the required version. Refer to the product release notes.

   To obtain this information, use the `uname -a` command.
3. You have a fiber cable terminated with an SC connector to connect your FDDI adapter to your concentrator.
4. You have an IP address, subnet mask (if the adapter will be on a subnetwork), and host name alias for your new FDDI adapter.
5. You have super-user privileges.

NOTE Prior to the installation of HP HSC FDDI/9000, FDDI fiber optic cabling must be installed by a non-HP third party cabling vendor, and all networking appliances must be correctly attached and configured including concentrators.

Installing the Adapter

HP HSC FDDI/9000 is supported on K, T-600, and D Class server systems and B, C, and J class workstations. For more detailed information and illustrations, refer to the sections in this chapter or to the appropriate owner's guides for each of the models.

HP HSC FDDI/9000 contains electronic components that can easily be damaged by small amounts of static electricity. To avoid damage, follow these guidelines:

- Store adapters in their antistatic plastic bags until you are ready to install them.
- If possible, work in a static-free area.
- Handle the adapter only by the edges. Do not touch electronic components or electrical traces.
- Use the disposable grounding wrist strap provided with this product (HP 9300-1408). Follow the instructions provided with the strap.
- A suitable electrical ground is any exposed metal surface on the computer chassis.

To install the HSC FDDI adapter:

1. Attach the grounding strap to your wrist or ankle.
2. Shut down the system:

   ```
   /usr/sbin/shutdown -h
   ```

   Wait until the system responds with "OK to press reset" or "Halted, you may now cycle power", then power off the system.
3. Disconnect the AC power cord from the system unit and from the AC power source.
4. Remove the power supply cover plate.

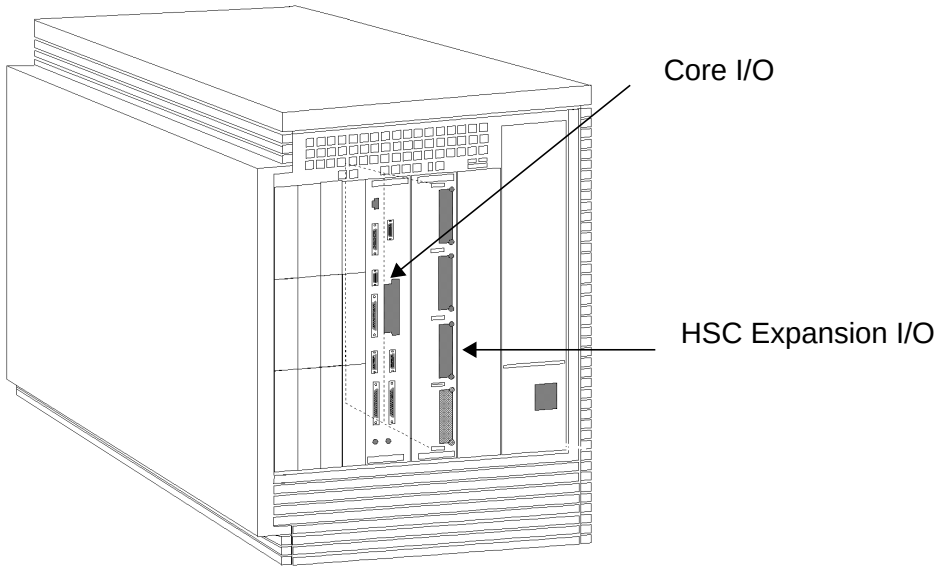
Installing the HSC FDDI Adapter on K and T-600 Systems

The HSC FDDI adapter may be installed on either the HSC Expansion I/O card or on the Core I/O card. All K class systems have a Core I/O card already installed. Some systems also have an HSC Expansion I/O card installed.

NOTE The following steps should be done while wearing a grounding strap.

1. Determine whether you will install the HSC FDDI adapter on the HP 9000 Core I/O card or the HSC Expansion I/O card. Figure 3-1 shows a system that contains both cards. The Core I/O card provides one adapter slot. The HSC Expansion I/O card provides four adapter slots. If the system does not have an HSC Expansion I/O card, install the adapter on the Core I/O card.

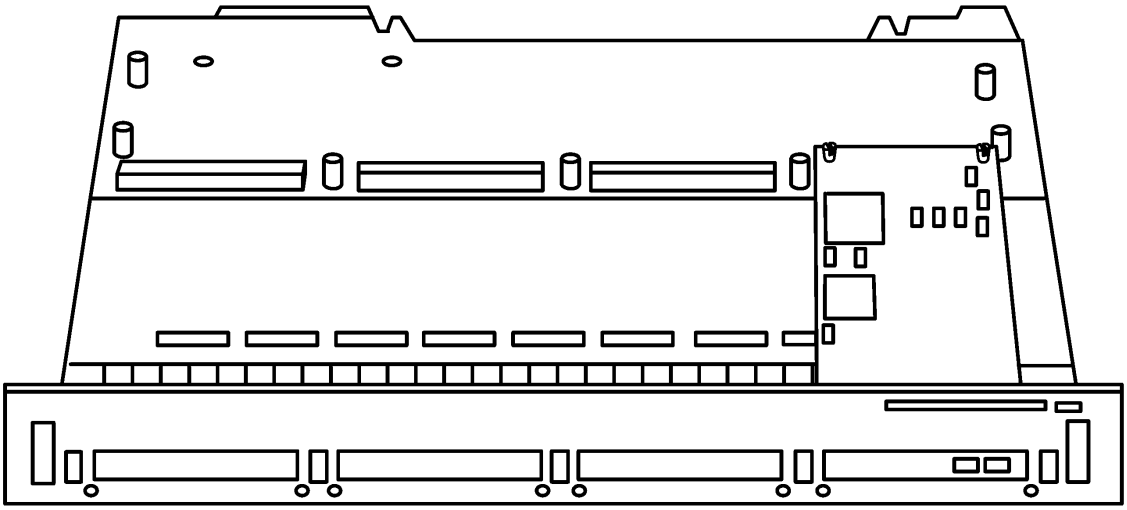
Figure 3-1 System with Core I/O and HSC Expansion I/O



2. Remove the Core I/O or the HSC Expansion I/O card from the system by unscrewing the two screws on either end of the card which secure the card in the system. Unscrew the screws until they pop out.

3. Simultaneously pull out the extractor levers on both ends of the Core I/O or HSC Expansion I/O card. Carefully pull the card out of its system slot. Allow the card to follow the runners as you pull out the card to avoid bending it.
4. If you are installing the HSC FDDI adapter on the Core I/O card, install the adapter in the available HSC slot. If you are installing the HSC FDDI adapter on the HSC Expansion I/O card, choose one of the four available slots for installation. Using a screwdriver, unscrew the two screws on the front of the slot until they pop out.
5. Remove the HSC FDDI adapter from its antistatic plastic bag.
6. Align the HSC connector on the HSC FDDI adapter with the HSC connector in the slot. Press the adapter firmly into place, making sure that the two HSC connectors are flush with each other. Screw the HSC FDDI adapter into place by screwing in the two screws on the front of the slot. Figure 3-2 shows the HSC FDDI adapter installed in the HSC Expansion I/O card.

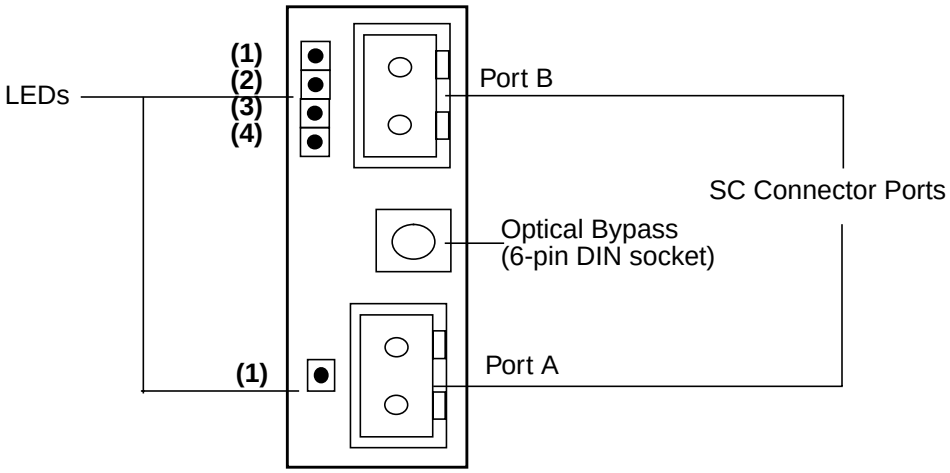
Figure 3-2 HSC FDDI Adapter Installed in HSC Expansion I/O Card



7. The Core I/O or HSC Expansion I/O card is now ready to be reinstalled into the system. Align the Core I/O or HSC Expansion I/O card with the runners in its slot and gently push the card back into the system. Carefully use the runners in the slot to guide it.

8. Push the Core I/O or HSC Expansion I/O card firmly back into place. Push down firmly on the extractor levers on both ends of the card to secure the card in place. Screw the two slot screws back into place. Figure 3-3 shows the HSC FDDI cable connectors and LEDs. Note that the numbers shown correspond to the LEDs.

Figure 3-3 HSC FDDI Cable Connectors and LEDs (K and T-600 Systems)



NOTE On T-600 systems, the LEDs are not visible when the HSC FDDI card is installed.

Next you will attach your HSC FDDI adapter to the network. Go to the section “Connecting the Adapter to the Network” for this step.

Installing the HSC FDDI Adapter on D Class Servers and B, C, and J Class Workstations

To install the adapter in B, C, D, or J class systems, do the following:

NOTE The following steps should be done while wearing a grounding strap.

1. Locate an empty HSC expansion slot and remove the blank cover plate.

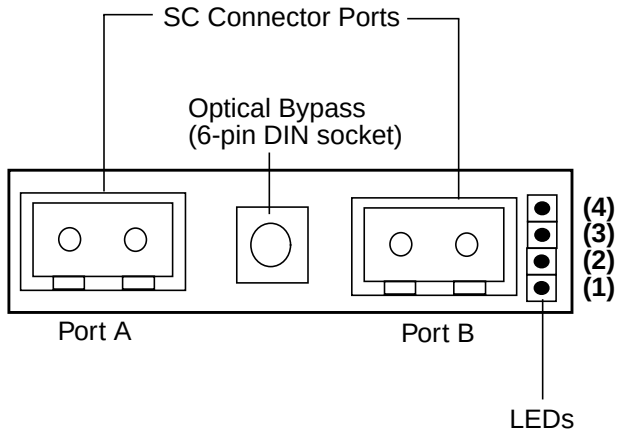
   Save the screw(s) to secure the adapter to the chassis in a later step.

2. Remove the adapter from its antistatic packaging.

3. Align the HSC connector on the HSC FDDI adapter with the I/O Expansion connector in the slot. Press the adapter firmly into place, making sure that the two connectors are flush with each other. Screw the HSC FDDI adapter into place by screwing in the two screws on the front of the slot.

   Figure 3-4 shows the HSC FDDI cable connectors and LEDs. Note that the numbers shown correspond to the LEDs.

Figure 3-4 HSC FDDI Cable Connectors and LEDs (B, C, D, J Class Systems)



4. Secure the adapter to the system chassis with the screw(s) that you removed from the blank cover plate in step 1.

Next you will attach your HSC FDDI adapter to the network. Go to the section “Connecting the Adapter to the Network” for this step.

Connecting the Adapter to the Network

Keep the dust cap(s) on the ends of the cable and on the transceivers of the adapter until the connections are ready to be made. This prevents dirt and oils from soiling any important surfaces. Do not attempt to polish the connectors with a cloth made of synthetic fibers; this charges the fiber and attracts dust.

When connecting a fiber optic cable, do not stretch, puncture, or crush the cable with staples or heavy equipment. Always maintain the minimum bend radii specified by the cable manufacturer. The fiber in fiber optic cable can suffer damage if the cable is bent in small radii. The minimum bend radius is usually 10-20 times a cable's outer diameter.

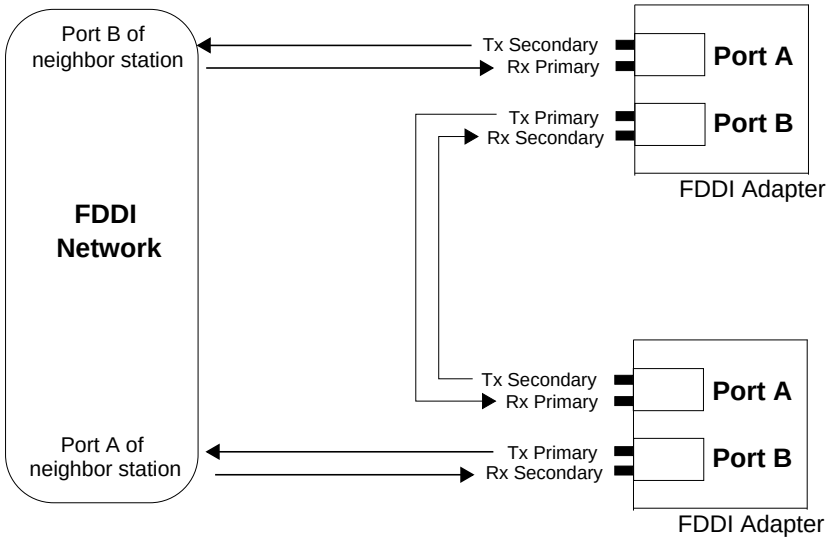
CAUTION Do not force the connectors when attaching the cable — they are keyed connections and fit one way only.

There are two ways to connect the adapter to the FDDI network. It can be connected directly to the adjacent stations in a dual-ring network or to a concentrator (DAC or SAC), typically dual-homed for additional fault tolerance. You can use either SC-to-SC duplex cables or SC duplex-to-MIC adapter cables with MIC-to-MIC cables.

You can use an Optical Bypass Switch (OBS) between the adapter and the dual ring. An OBS maintains continuity of the primary and secondary ring when the station is powered down, or in the event of an adapter failure.

Signals must be routed such that the primary Tx output from each station is routed to the primary Rx input of its neighbors, and the secondary Tx output is routed to the secondary Rx input of the other neighbor, and so forth, as shown in Figure 3-5.

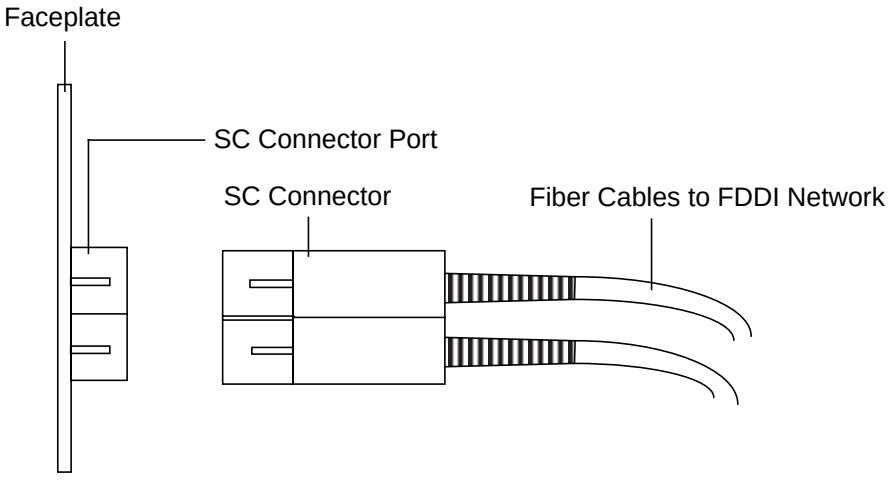
Figure 3-5 Dual-Ring Tx/Rx Topology



Dual-Attachment SC Adapter Connections

This section illustrates the dual-attachment SC adapter connections.

Figure 3-6 SC Fiber Connections



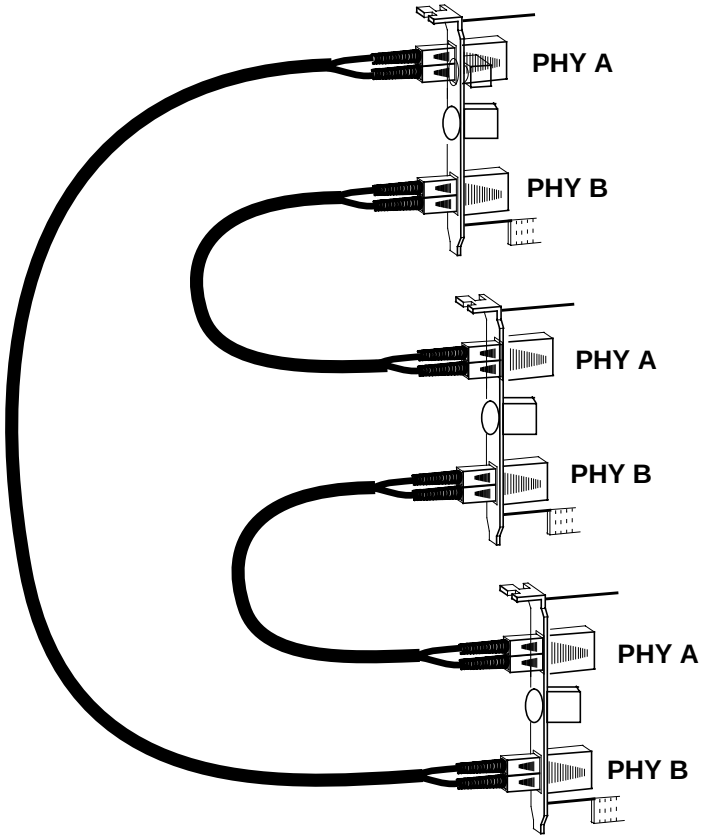
SC connectors are a duplex style connector where the two fiber leads snap together to form a keyed connection. Make sure the Rx and Tx leads are marked in some common scheme for your network. For example, if the fiber lead with a blue ring routes Tx signals from this station, follow this convention for all other stations.

If you are connecting your dual-attachment adapter directly to the dual ring, proceed to the next section, “Connecting Directly to the Dual Ring.” Otherwise, continue to Chapter 4, “Configuring and Verifying HP EISA and HSC FDDI/9000.”

Connecting Directly to the Dual Ring

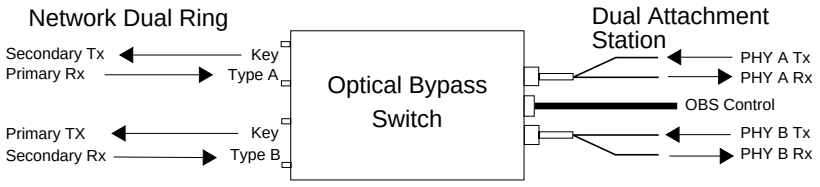
This adapter can be connected directly to the dual ring by connecting the A and B ports of its neighbors. Figure 3-7 illustrates a 3-node dual ring topology with no concentrator. Note that the A port of each station is connected to the B port of a neighbor, continuing around the network until the ring is complete.

Figure 3-7 Typical Dual Ring with DAS Adapters



During normal operation of a dual ring with no faults, each station receives and transmits all traffic on the primary ring, while the secondary ring is idle. If a station is turned off or disconnected from the ring, neighboring stations detect this as a fault or discontinuity, and wrap the traffic onto the secondary ring, thus keeping remaining stations in communication. However, if a second fault occurs during this time, the ring could become segmented, separating groups of stations into independent rings. An Optical Bypass Switch (OBS) can be used to bypass a station that is turned off or disconnected, protecting against multiple faults on a dual ring. Figure 3-8 shows the connection of the OBS to a dual ring.

Figure 3-8 Optical Bypass Switch Configuration



To connect an HSC FDDI adapter to a dual ring using an OBS, do the following:

1. Connect the cables from the OBS to the appropriate Phy A and Phy B ports on the adapter.
2. Connect the control cable from the OBS to the adapter. The optical bypass socket on the adapter is a 6-pin mini-DIN connection.
3. Connect the cables from the FDDI network to the appropriate ports on the OBS.

4 Configuring and Verifying HP EISA and HSC FDDI/9000

Follow the steps in this chapter to load the EISA or HSC FDDI/9000 software and configure, verify, and if necessary, fine tune the HP EISA or HSC FDDI/9000 hardware and software.

Loading the FDDI Software

Follow the steps below to load HP EISA or HSC FDDI/9000 software using the HP-UX `swinstall` program. See the note at the end of this section for information on unloading the FDDI software.

1. Log in as `root`.
2. Insert the software media into the appropriate drive.
3. Run the `swinstall` program using the command:

   `/usr/sbin/swinstall`

   This opens the Software Selection Window and Specify Source Window.
4. Change the Source Host Name if necessary, enter the mount point of the drive in the *Source Depot Path* field, and activate the **OK** button to return to the *Software Selection* Window. Activate the Help button to get more information.

   The *Software Selection* Window now contains a list of available software to install.
5. Highlight the software you are installing.
6. Choose **Mark for Install** from the "Actions" menu to choose the product to be installed.
7. Choose **Install** from the "Actions" menu to begin product installation and open the Install Analysis Window.
8. Activate the OK button in the *Install Analysis* Window to confirm that you want to install the software. `swinstall` displays the *Install Window*.

   `swinstall` loads the filesets, runs the control scripts for the filesets, and builds the kernel. Estimated time for processing: 3 to 5 minutes.

   View the *Install Window* to read processing data while the software is being installed. When the Status field indicates Ready, the *Note Window* opens.
9. Activate the OK button on the Note Window to reboot. The user interface disappears and the system reboots.

10. Once the system comes back up, log in as `root` and view the `/var/adm/sw/swagent.log` and `/var/adm/sw/swinstall.log` files to view any error or warning messages that may have occurred during the installation.
11. Go to the next section to configure and verify the EISA or HSC FDDI/9000 hardware and software.

NOTE Using the `swremove` command to remove EISA or HSC FDDI filesets disables all EISA or HSC FDDI cards on the system.

Configuration Overview

These instructions describe how to configure HP EISA FDDI/9000 or HSC FDDI/9000 on HP- UX version 11.0 or above. To determine the operating system version you are using, type the following command:

```
uname -a
```

Once you have installed HP EISA FDDI/9000 HSC FDDI/9000 hardware and software, you can use SAM to automatically configure networking.

SAM stands for System Administration Manager, a menu-driven utility for system administration tasks, including configuration of networking software. SAM has two user interfaces, an X-Window system interface and a text terminal interface. The primary components and functionality of SAM are the same for both interfaces. The differences are the screen appearance and the navigation methods.

You can get to the SAM online help system using the following methods:

- Choose an item from the “Help” menu (located in the menubar). This gives you information about the current SAM screen, keyboard navigation within SAM, using the SAM help system, and displaying the version of SAM you are currently running.
- Activate the `Help` button from a dialog or message box. This gives you information about the attributes and tasks you can do from the currently displayed window.
- Press the F1 key. This gives you context-sensitive information for the object at the location of the cursor.

Using SAM, configuring HP EISA FDDI/9000 or HSC FDDI/9000 can be divided into two procedures:

1. Configuring the EISA FDDI or HSC FDDI link
2. Configuring network connectivity

When configuring the EISA or HSC FDDI link, you will add the IP address, any alias names, and, if the EISA or HSC FDDI card is on a subnetwork, the subnet mask for your FDDI card. This procedure will automatically initialize the FDDI link and attach your node to the local

area network (LAN). When configuring network connectivity, you will add remote system names and remote system IP addresses for network connectivity, and specify default gateway information.

NOTE

Using SAM is the preferred method for HP EISA FDDI/9000 or HSC FDDI/9000 configuration. However, SAM currently does not support the domain name format. The domain name format is used with the BIND name service provided with Internet Services/ 9000. If you are using the BIND name service, you can configure the Network Interface Card, but you cannot configure remote connectivity. You may want to configure HP EISA FDDI/9000 or HSC FDDI/9000 manually. See the *Installing and Administering LAN/9000 Software* manual for detailed instructions on how to install and configure software manually.

Configuring the Local EISA or HSC FDDI Adapter

NOTE Make sure the HP EISA FDDI/9000 or HSC FDDI/9000 adapter and software are installed in the system before you use SAM to configure the software.

Log in as `root` and do the following:

1. At the HP-UX prompt, type: `sam`
2. Select *Networking and Communications* in the SAM main window.
3. Select *Network Interface Cards* in the *Networking and Communications* window.
4. Highlight the EISA or HSC FDDI card that you want to configure from the object list.

   If you do not know the PPA of the card interface, use the `lanscan` command to obtain this information.
5. Verify that the hardware path is correct for your EISA or HSC FDDI adapter.
6. If you are configuring the first logical interface for a card type (also called the "initial interface"), choose *Configure* from the "Actions" menu to open the *Configure LAN Card* window.

   If you are adding logical interfaces to a card type, choose *Add IP Logical Interfaces* from the "Actions" menu to open the *Configure LAN Card* window.

   a. Enter the information about the EISA or HSC FDDI card. To do so, press the Tab key to move through the data entry fields.

NOTE SAM displays the Card Name, Hardware (H/W) Path, and Station Address fields with the appropriate values. These fields cannot be modified.

   b. Choose FDDI as the card type for your EISA or HSC FDDI card.

NOTE The Enable DHCP button specifies that the system is a Dynamic Host Configuration Protocol (DHCP) client. If you activate this button, the IP parameters for this system will be set using DHCP.

c. Enter the Internet address for your EISA or HSC FDDI card.

   Upon exiting the Internet Address field, SAM checks to make sure that the IP address you entered is correctly formatted and is not currently in use.

d. Specify whether your EISA or HSC FDDI card will be on a subnetwork.

   If you choose YES, enter the subnet mask for your subnetwork.

e. Optionally, enter comments about your EISA or HSC FDDI card.

f. Choose Add Aliases for Internet Address to open the *Add/Modify Aliases* window.

g. Add, modify, or remove alias names for your EISA or HSC FDDI card.

h. Activate the OK button to perform the task and return to the *Configure LAN Card* window.

7. Activate the OK button at the *Configure LAN Card* window to enable your EISA or HSC FDDI card.

NOTE If the software is correctly configured, SAM displays the Network Card Configuration object list with the status Enabled for your EISA or HSC FDDI card; otherwise, SAM displays an error message.

8. At the *Network Interface Card* window, choose *Exit* from the "File" menu.

NOTE If you have moved or removed any EISA or HSC FDDI cards from the system, HP recommends that you verify the IP address of every card in the backplane before leaving SAM.

9. At the *Networking and Communications* window, choose *Exit SAM* from the "File" menu.

10. Go to the next section, "Verifying the Installation."

Verifying the Installation

1. Verify that the appropriate device files have been created. In the example below, the first line lists the HP device files. The major number for EISA or HSC FDDI cards is dynamically allocated by the system. For EISA or HSC FDDI cards, the card instance consists of the two leftmost digits in the minor number. The second line lists the diagnostic device files.

   ```
   ls -l /dev/lan*
   ```

   ```
   ls -l /dev/nettrace /dev/netlog
   ```

2. Check that the hardware state of your EISA or HSC FDDI adapter is up using the `lanscan` command:

   ```
   /usr/sbin/lanscan
   ```

   In the Net-Interface name (for example `lan`*x*), *x* is the instance number.

3. Verify that the EISA or HSC FDDI adapter is found by the system using the `dmesg` command:

   ```
   dmesg
   ```

If you want to configure your system for network connectivity, continue with the next section, “Configuring Network Connectivity.” If not, continue with “Verifying Remote System Configuration.”

Configuring Network Connectivity

Your system may not be able to communicate with other systems (for example, PCs, workstations, servers, etc.) until you configure system-to-system connections. You can use SAM to do this automatically by completing the following steps.

1. Log in as `root`.
2. At the HP-UX prompt, type:

   `sam`
3. Double-click on *Networking and Communications* in the SAM main window.
4. Double-click on *Internet Addresses* in the *Networking and Communications* window.

   SAM displays the remote system names and IP addresses that are already configured.
5. Choose Add from the "Actions" menu to open the *Add Internet Connectivity* window.

   Use the SAM online help system for information about adding remote system connections.

   a. Enter the Internet address for the remote system.

NOTE Upon exiting the Internet Address field, SAM checks to make sure you have entered a valid IP address. SAM also determines if a gateway is required for the connection.

   b. Enter the remote system name.

NOTE Upon exiting the Remote System Name field, SAM checks to make sure that connectivity has not already been configured for this system. If it has, SAM displays an error message.

   c. Optionally, choose Add Aliases to open the *Aliases for Remote System Name* window.

   d. Add, modify, or remove alias names for the remote system.

e. Activate the OK button to perform the task and return to the *Add Internet Connectivity* window.

NOTE SAM displays fields for entering gateway information if a gateway is required for this remote system connection. Use the SAM online help system for information about gateways.

6. Activate the OK button to enable your system to communicate with the remote system and return to the Internet Addresses window.

   SAM updates the object list to include the remote system you configured.

NOTE You can modify or remove remote systems and modify default gateways by highlighting the Remote System Name from the object list and choosing Modify, Remove, or Modify Default Gateway from the “Actions” menu.

7. Exit the *Internet Addresses* window, then exit SAM.

To verify that you can communicate with a remote system using the HP EISA FDDI/9000 or HSC FDDI/9000 product, continue to the section “Verifying Remote System Configuration.”

Verifying Remote System Configuration

Once your HP EISA FDDI/9000 or HSC FDDI/9000 software is installed, fully configured, and running, you should execute the following commands to verify LAN hardware and software installation. See the online HP-UX manual reference pages for complete descriptions of the commands listed below.

1. View the list of remote systems you can communicate with, using a symbolic name, by typing the following command at the HP-UX prompt:

   ```
   more /etc/hosts
   ```

2. View the configured destinations reached through gateways and the gateways used to reach those destinations, by typing the following command at the HP-UX prompt:

   ```
   netstat -r
   ```

3. Test for link level connectivity. First, use `lanscan` on the local system to obtain the PPA of the interface you want to test. Then, use `lanscan` on the remote system to obtain the remote station's address. Finally, use the `linkloop` command on the local system with the following syntax:

   `linkloop -i` <*PPA*> <*remote station address*>

   For example:

   ```
   linkloop -i 5 0x080009266C3F
   ```

4. To check that your system can communicate with other systems, type the `ping` command at the HP-UX prompt. In this example, 191.2.1.2 is the IP address of the remote system. Type [CNTRL]-C to stop `ping`.

   ```
   ping 191.2.1.2
   ```

5. HP EISA FDDI/9000 or HSC FDDI/9000 installation is verified if the steps above succeed. If the above steps do not succeed, go to chapter 5, "Troubleshooting."

Reconfiguring IP Addresses

If you have rearranged any network interface cards in the system, you may need to reconfigure the IP addresses. Follow the steps below:

1. At the HP-UX prompt, type: `sam`
2. At the main menu, select *Networking and Communications*.
3. Select Network Interface Cards.
4. Verify the IP addresses of all the adapters in the system by reviewing the Card Name, Hardware Path, and Internet Address displayed in the *Network Interface Cards* window.
5. For adapters with incorrect IP addresses, follow the steps below:
   a. Select the adapter you wish to modify.
   b. Select Configure from the Actions menu.
   c. Modify the Internet Address and select OK.

5 Troubleshooting

This chapter provides possible solutions for common problems encountered while installing and using HP EISA FDDI/9000 or HP HSC FDDI/9000. This chapter also describes the `fddilink` and `fddiif` utilities.

If you cannot solve the problem on your own, contact your HP representative. Use the guidelines in the section “Contacting Your HP Representative” in Chapter 1 to help you effectively communicate what is wrong.

Using the fddilink Utility

The `fddilink` utility is used to display the operating characteristics of an FDDI network. The monitor provides information about the node on which the program is loaded, the upstream and downstream neighbors, the ring state, the token rotation times, and so forth. It can be run from a remote shell where the shell is located on a system that contains an adapter.

To monitor the network, enter the following:

`fddilink lan`*x*

where *x* is the instance number for the adapter.

Navigating Menu Screens

Each menu item 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 from the choices at the bottom of the screen.
- To view the next page of the current menu, press the Space bar.
- To exit the `fddilink` utility, press Esc.

Composite Data Screen

The opening screen is the Composite Data screen. It contains most of the information needed to monitor the state of the ring, along with a menu for navigating the utility. Sample upper and lower opening screens for a dual-attach adapter are shown below.

```
\:Poll Rate = 1000 MS              Composite Data
StationID      : 1000 906B 017C  ECM-IN       CFM-C_WRAP_B RMT-RING_OP
ManufactureData: XDI731-Interphase Corp.
UserData       : P5511-Interphase Corp.

SMT Version Op : 0x0002    Hi: 0x0002  Lo: 0x0002

MAC:  UpStreamNbr    DownStreamNbr  :  OldUpStreamNbr  OldDownStreamNbr
 1   1000 9038 D344  1000 9038 D344 :  0000 0000 0000  0000 0000 0000
```

```
PHY: ConPol Cutoff Alarm ConState    RemoteType RemoteMAC   PCM    LER
 A    0000     7     8   CONNECTING      ?          0      BREAK     9
 B    0000     7     8   ACTIVE          S          1      ACTIVE   11
T-MAX Low: 1336.934 ms                   MAC Attribute Counts
TVX   Low:   5.222 ms    Frame    : 0x000001F0    Error     : 0x00000000
T-Req    : 165.007 ms    Copied   : 0x000000C5    Lost      : 0x00000000
T-Neg    : 165.000 ms    Transmit : 0x00000123    TvxExpired: 0x00000001
T-Max    : 167.772 ms    Frame/sec: 0x00000000    NotCopied : 0x00000003
TvxValue :   2.519 ms    Token    : 0x00000000    Late      :     0x0000
                         RingOp   : 0x00000000


-- Exit-<ESC> ----------------------- Menu --------------------- More-<Space> -
- 1:Composite 2:SMT 3:MAC 4:Counters 5:Port-A 6:Port-B 7:Path 8: N/A   9:Delay

:Poll Rate = 1000 MS              Composite Data
StationID      : 1000 906B 01DC  ECM-IN       CFM-C_WRAP_B RMT-RING_OP
ManufactureData: XDI731-Interphase Corp.
UserData       : P5511-Interphase Corp.

Lem PHYA: 0x00000000 Reject: 0x00000000
Lem PHYB: 0x00000000 Reject: 0x00000000

MAC Count:   0x01    ConfigCap  : 0x0000
NonMaster:   0x02    ConfigPol  : 0x0000
Master   :   0x00    ConnectPol : 0x8000
PathsAval:   0x03


-- Exit-<ESC> ----------------------- Menu --------------------- More-<Space> --
1:Composite 2:SMT 3:MAC 4:Counters 5:Port-A 6:Port-B 7:Path 8: N/A   9:Delay
```

NOTE Select option 9: Delay at the bottom of the screen to start polling the adapter at the regular intervals. Otherwise, the display will only be updated with the current information when other menu options are selected.

The parameters most commonly used are defined below:

- Poll Rate indicates the rate at which values are updated. This value can be changed by the Delay function (option 9 at the bottom of the screen).
- StationID indicates the FDDI address (in non-canonical order) of the station from which the `fddilink` 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 within a station or concentrator. The CFM state can be one of the following:
  - WRAP_A, WRAP_B, WRAP_AB, C_WRAP_A, and C_WRAP_B states indicate that there is only a single data ring. Data for the ring is transmitted and received through the same port (A or B).
  - For an Single Attached Station where the A or B port is attached to the M port of an FDDI device (such as a concentrator), C_WRAP_A or C_WRAP_B is the normal operating state, depending on the port used.
  - In dual homing mode (connecting the station to two concentrators), C_WRAP_B is the normal state. (Since port B is usually the active port, port A would be in standby mode.)
  - For a Dual Attached Station, the normal state is THRU. A wrap state usually indicates that the dual ring is wrapped (a failure was detected and a surrounding node is "wrapping" and using either the A or B port to send and receive data). The wrap state can also be a transitory startup state indicating that the A or B port is ready to be incorporated into the ring.
  - The ISOLATED state indicates that there is no internal connection between the Media Access Control (MAC) and Physical Layer Protocol (PHY) modules. Usually, this means that the card is not cabled to the ring.

  Refer to the CF_State variable description in the ANSI FDDI/SMT specification for more details.
- RMT indicates Ring Management (RMT) status information from the MAC and CFM. The RMT state can be one of the following:
  - ISOLATED is the initial state.
  - NON_OP indicates that the ring is not operational.
  - RING_OP indicates that the ring is operational.
  - DETECT indicates that a duplicate address was detected, rendering the ring non-operational.
  - NON_OP_DUP indicates the ring is not operational because this MAC has a duplicate address.
  - RING_OP_DUP indicates that this MAC has a duplicate address.

  - DIRECTED indicates that this MAC sends beacon frames to notify the ring of a stuck condition.
  - TRACE indicates that this MAC initiates a trace function. Trace provides a recovery mechanism from a stuck beacon.
- ManufactureData indicates the manufacturer of the communication adapter or node.
- UserData indicates the communication board used by the node.
- 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. The value of the Version ID for NIFs (Neighbor Information Frames), SIFs (Status Information Frames) and ECFs (Echo Frames) value Op, Hi and Lo is a constant value of 0x0001.
- MAC stands for Media Access Control.
- UpStreamNbr indicates the upstream MAC address of the unit from which data is received.
- DownStreamNbr indicates the downstream MAC address of the unit from which data is received.
- OldUpStreamNbr indicates the previous upstream MAC address of the unit from which data is received.
- OldDownStreamNbr indicates the previous downstream MAC address of the unit from which data is received.
- PHY indicates Physical Layer Protocol.
- ConPol indicates the connection policies in effect for a node. 0000 means that all possible connections are allowed.
- Cutoff indicates 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 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 ? (a question mark for 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 one 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 Link Error Rate. It ranges from 10^{-4} to 10^{-15}.

Menu Items

The remainder of this section contains supplemental information about the menu items.

The Composite Menu [1:Composite]

Is the opening screen and contains the most-used parameters.

The SMT Menu [2:SMT]

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

The MAC Menu [3:MAC]

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

The Counters Menu [4:Counters]

displays values from the FDDI Counter Group, such as, frame_ct and token_ct. Also, Status Group flags are displayed.

The Port A Menu (for DAS only) [5:Port-A]

This menu provides detailed information about the A port of a dual attach station. Some of the basic information is provided in the Composite Data screen.

The Port B Menu (for DAS only) [6:Port-B]

This menu provides detailed information about the B port of a dual attach station. Some of the basic information is provided in the Composite Data screen.

The Path Menu [7:Path]

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

The Attach Menu [8:Attach]

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

The Delay Menu [9:Delay]

This feature allows the user to set the rate measured in seconds, for which the information on the `fddilink` screens is updated. To set the delay rate, enter the desired rate in seconds, and press Enter.

Using the fddiif Utility

The `fddiif` utility is used to collect operating statistics in real-time on the FDDI adapter driver.

To invoke the `fddiif` utility, enter the following:

`fddiif lan`*x*

where *x* is the instance number of the adapter.

A sample console output is shown below.

```
\                                       Hit Ctrl-C to quit any time.

Transmit statistics:                    Receive statistics
Transmitted bytes                 4499  Packets rcvd by IP                    3
Transmitted packets                  7  Packets dropped by IP                 0
Transmit errors/port error           0  Packets received by ARP               0
Transmit errors/abort                0  Packets dropped by ARP                0
Transmit errors/underrun             0  Packets received by OSI               0
Transmit errors/parity               0  Unknown protocol received             0
Error building header                0  Unknown SNAP prot recvd               0
BAD FSI interrupts                   0  Total Frames w/ Err Indic's           0
Dropped frames <SMT counter>         0  Frames w/ Overrun Inds                0
FSI frame err condition<SMT>         0  Frames w/ Parity Errors               0
Frames with E Flag set               0
Frames w/ CRC error set              0
Frames dropped/no first bit          0
Partial pkt/lack of rcv bufs         0
No receive bufs at fill time         0
Receive overflow interrupts          0
LLC rx resets                        0
```

Troubleshooting

The following table describes various symptoms and corrective actions for the HP EISA or HSC FDDI adapter.

Table 5-1 Symptoms and Actions

Symptom	Action
Card fails power-up test.	• Inspect the LEDs on the back of the adapter. A constant, solid LED (4) indicates a failure in the power-up diagnostics. For HSC FDDI, solid LEDs (2) and (3) indicate power-up diagnostics succeeded. For EISA FDDI, solid LEDs (1) and (3) indicate power-up diagnostics succeeded. If power-up diagnostics fail, turn the power off, reseat the adapter, then turn the power back on. • Try another EISA or HSC slot. • Swap adapter with another which is known to operate.
Adapter does not respond.	• Use the `ifconfig` command to check the existence and status of the device. For example: `ifconfig lan0` • Verify that the host to IP mapping is known to the local system by either doing an `nslookup` on the host name or by checking the `/etc/hosts` file. • Verify that the FDDI cable is properly connected at both ends.
`ioscan` output shows that the adapter is unclaimed.	Check that the driver software is loaded.

Symptom	Action
Adapter cannot communicate with other hosts on the local network.	• Use `fddilink` to verify that upstream and downstream neighbors are correct. • Examine the LEDs. • Check the FDDI cable. Make sure the FDDI media is correctly installed. `ping` the failed system from another host on the network. • Distinguish between an unknown host, which indicates a `/etc/hosts` file problem; and a non-response, which usually indicates a routing problem. • Check the `arp` table with `arp -a`.
(Dual-ring only) Adapter can only communicate with a subset of hosts on the local network.	• See above. • Check for “twisted ring” (port A cabled to port A or port B cabled to port B). Visually inspect the cabling. Or, check the syslog file (default is `/var/adm/syslog/syslog.log`) for a message like the following: Undesired Connection Attempt: A ->A. • Check for link failures. Run `fddilink` on local and remote systems and check for “WRAP_A” or “WRAP_B” CFM states.

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 `/etc/hosts` file problem; and a non-response, which usually indicates a routing problem. • Use `fddilink` to see if you are communicating with your upstream and downstream neighbors on the ring. • Check the `arp` table with `arp -a`. • Use `netstat -r` to check routing tables. Refer to the man page for expected output.
Cannot connect to ring.	For dual attach stations, check the cables for PHY A and PHY B to verify appropriate connections to neighbor stations.
Ring state is unstable.	• Use `fddilink` to check for abnormal statistics. If the attribute LER is near the Alarm value, check for poor connections. • Verify optical power loss does not exceed 11 decibels between transmitter and receiver pairs.

LED Diagnostics

The HP EISA and HSC FDDI adapters have built-in self-test diagnostics that are executed when the system probes the bus adapter/slot. This occurs at power-up or reset of the card. These self-test diagnostics test both the card's hardware and firmware and the card's functionality. Observing the adapter's LEDs will indicate at what stage the card is functioning. These LEDs exhibit various illumination, dependent upon the state of the card.

The LEDs are located on the faceplate. Figure 5-1 shows the configuration of the LEDs for port B for both EISA and HSC FDDI. Table 5-2 defines HP EISA FDDI card states. Table 5-3 defines HP HSC FDDI card states.

Figure 5-1 LED Configuration (Port B)

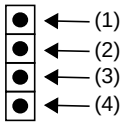


Table 5-2 HP EISA FDDI Adapter LED States (Port B)

LEDs by Colors				Card States
Yellow (1)	**Yellow (2)**	**Green (3)**	**Green (4)**	
Solid	Off	Off	Off	Power on
Solid	Solid	Off	Off	Power on diagnostics
Solid	Off	Solid	Off	Passed power-on diagnostics
Solid	Off	Solid	Blink	CB running
Solid	Off	Blink	Off	RC running
Solid	Off	Blink	Solid	Ring connect
Solid	Solid	Off	Off	Failure

Table 5-3 HP HSC FDDI Adapter LED States (Port B)

LEDs by Colors				Card States
Green (1)	**Green (2)**	**Yellow (3)**	**Yellow (4)**	
*	Solid	Solid	Off	Hardware power-on diagnostics completed; driver not yet initialized
*	Blink	Off	Off	Connecting to ring (local cables may not be connected or cables may not be connected at remote end)
Solid	Blink	Solid	Off	Ring connected (normal function)
*	Off	Off	Solid	Failure

* indicates that this LED will be Solid if a link is detected, otherwise it will be Off. The state of this LED should be ignored if the card is in the Failure state.

NOTE Port A of the HP HSC FDDI adapter has only one LED. This LED is Solid if a link is detected, otherwise it is Off.

Performance Troubleshooting

This section is intended to provide system administrators or advanced users with detailed information on how to troubleshoot performance-related problems with the HP EISA FDDI/9000 or HSC FDDI/9000 products. A few key terms are defined below to help in understanding the troubleshooting information:

Key Terms

Transmit Threshold: This value determines how many bytes must be in the FDDI transmit FIFO before transmission of the bits onto the FDDI cable will begin.

Transmit Underrun: A transmit underrun error occurs when the FDDI transmitter encounters an empty transmit FIFO during the transmission of bits onto the FDDI cable.

Memory Subsystem Latency: The time it takes to move data from system memory to an I/O device. This time includes the arbitration delay for the I/O device and for each bus bridge between the system memory controller and the I/O device.

Arbitration Delay: The time it takes an I/O device or bus bridge to acquire the I/O bus for data transfer.

Transmit FIFO: A buffer on the FDDI card used to hold data transferred from system memory to the FDDI card.

The EISA FDDI/9000 and HSC FDDI/9000 products are currently optimized to achieve the best single card performance. While the current Transmit Threshold value allows the FDDI products to achieve their best performance, it also increases the probability of Transmit Underrun errors. A large number of Transmit Underrun errors (more than 1 out of every 10,000 packets) can cause a noticeable drop in networking performance.

Transmit Underrun errors may occur in some HP systems that have high memory subsystem latencies combined with sufficient bus contention from competing I/O devices. These errors can be monitored in two ways:

- Examine the output from `netstat -I` *interface*
- Examine the output from `fddiif` *interface*

If the number of output errors is high (more than 1 out of every 10,000 packets), then the system is most likely suffering from transmit underruns on the specified network interface and corrective action must be taken to resolve the problem.

EISA FDDI/9000

For the EISA FDDI/9000 product, use the `lanadmin -S` command to toggle the use of onboard memory for transmit on or off. (By default, use of onboard memory for transmit is off.) For example:

`lanadmin -S 1` *PPA*

Note that the value specified after the `-S` parameter is not important, as the command is simply a toggle. After issuing the above command, the current speed of the interface is echoed; this output may be ignored. You must then wait at least 5 seconds before attempting to use the specified network interface.

HSC FDDI/9000

In order to achieve the best single card performance, the HSC FDDI/9000 product has set the Transmit Threshold to an aggressive value. The Transmit Threshold is set so that transmission will begin after 1024 bytes are in the transmit FIFO.

The HSC FDDI product supports four levels of Transmit Threshold. These four levels are modified via the `-S` option of the `lanadmin` command, as follows:

`lanadmin -S` *TransmitThreshold PPA*

where *TransmitThreshold* can be one of the following values:

1024 is most aggressive (this is the default value)
2048 is somewhat aggressive
3072 is somewhat conservative
4096 is conservative

In all of the cases above, after setting the *TransmitThreshold* mode as specified, the `lanadmin` command will echo the current speed of the interface; this output may be ignored. The following example shows output for 100 Mbits/s operation:

```
old speed= 100000000
new speed= 100000000
```

After issuing `lanadmin -S`, you must wait at least 5 seconds before attempting to use the specified network interface.

HSC FDDI transfers data from memory on the card to memory on the host via Direct Memory Access (DMA) operations. By default, the data transfer burst size for DMA operations is 128 bytes. If the HSC FDDI card is installed in an HSC bus that is shared with other HSC devices (for example, an HSC SCSI card and other network cards), the bus competition among those devices may be increased. If setting the Transmit Threshold value with the `lanadmin` command results in increased “receive overrun” errors, it may be because of the HSC bus competition with other devices. To reduce the receive ovverun errors, change the data transfer burst size from 128 bytes to 32 bytes with the special command `lanadmin -S 0`. Note that if you issue the `lanadmin -S 0` command, any subsequent setting of the Transmit Threshold value with the `lanadmin` command restores the data transfer burst size to 128 bytes.

A Technical Specifications

This appendix contains the technical specifications for EISA and HSC FDDI/9000 adapters.

EISA FDDI/9000

General Features:

Supported Systems:	HP 9000 B, C, D, and J Class systems with EISA and HP-UX 11.0 or later
Standards:	Complies with the ANSI standards (ANSI X3T9.5) for FDDI.
Connector	MIC
Performance:	Dual-attach adapter (assembly number B5502-66001) 100 Mbps
	Single-attach adapter (assembly number B5502-66002) 100 Mbps

Physical:

Length: 340.74 mm (13.415 in.)
Width: 18.53 mm (.730 in.)
Thickness: 1.58 mm (.062 in.)
Height: 127 mm (5.0 in.)
Weight: 308 grams (11 ounces, dual-attach), 280 grams (10 ounces, single-attach)

Environmental:

Temperature:	0 to +40 degrees C (32 to +104 F), operating; 0 to +70 degrees C (32 to +177 F), non-operating
Relative Humidity:	5% to 80% @ 40 degrees C (104 degrees F), operating, condensing; 5% to 90% @ 40 degrees C (104 degrees F), non-operating, condensing
Altitude:	10,000 feet, operating; 15,000 feet, non-operating

Electrical:

Power Consumption	18 watts typical

Electromagnetic:

USA	FCC Class A
Europe	CISPR-22 Class A
Germany	FTX-1046 (VDE Level B)
Japan	VCCI Class I

HSC FDDI/9000

General Features:

Supported Systems:	HP 9000 K, T600, B, C, D, and J Class systems with HSC and HP-UX 11.0 or later
Standards:	Complies with the ANSI standards (ANSI X3T9.5) for FDDI.
Assembly Numbers:	K Class: A3722A (assembly number A3722-60001) T-600 Class: A3722A (assembly number A3722-60002) B, C, D, and J Class: A3723A (assembly number A3723-60001)
Connector	SC Duplex

Physical:

K Class	1.2 inch height 3.5 inch width 6.1 inch depth 4.7 ounces weight
T600	.95 inch height 3.85 inch width 6.1 inch depth 4.9 ounces weight
D Class	.87 inch height 5.56 inch width 13.86 inch depth 8.1 ounces weight

Environmental:

Temperature:	+5 to +40 degrees C, operating; -40 to +70 degrees C, non-operating

Relative Humidity:	5% to 90% non-operating/storage 5% to 80% @ 22 degrees C operating 10% to 90% @ 22 degrees C recommended operating
Altitude:	4600 meters

Electromagnetic:

USA	FCC Class A
Europe	EN 55022 Class A
Japan	CISPR 22 Class A
Canada	CSA C108-8-1983 Class A

B Fiber Cabling

FDDI can be transported over multiple types of physical media. The most common media includes optical fiber.

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.

Multimode - can transmit more than one light wave at a time, but cannot sustain a quality of service beyond 2 kilometers. Note that both HP EISA FDDI and HSC FDDI use multimode.

Table B-1 FDDI Fiber Optic Cabling

Cable Type	Core/Coating (microns)	Refractive Index	Maximum Length
Single Mode	8.5/125	Graded	15 km
Multimode	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 manufacturers specifications for good cable maintenance:

- Do not stretch, puncture, or crush the fiber cable(s) with staples, heavy equipment, doors, etc.
- 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 up the fiber and attract dust.

Connectors

HP HSC EISA FDDI/9000 adapters use MIC connectors. HP HSC FDDI/9000 adapters use SC connectors.

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 infobetween two stations. These standards are common across the various lower level standards within the Data Link and the Physical layers.

A

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.

Assert A signal is asserted by driving it to a logical true state. For positive-true signals this state is high logic voltage, and for negative-true signals this state is the low logic voltage.

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

B

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

bandwidth Bandwidth typically indicates the data transmission capacity of a network through a given circuit. Generally, the greater

the bandwidth, the more information can be sent through a circuit during a given amount of time.

baud Measurement of signaling speed indicating line changes per second, where line changes can represent one or more bits. The baud is equal to bits-per-second only for line changes representing a single bit.

beacon A special frame used by media access control to announce to the other stations that the ring is broken. The resulting action attempts to restructure the network to account for the probable fault.

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.

Bus Latency Elapsed time from bus master request until bus master is given control of the bus.

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

C

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 A 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 An FDDI node that provides attachment points (through M ports) for stations that are not connected directly to the dual ring. The concentrator is the focal point of the dual ring of trees topology.

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

Glossary

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.

D

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.

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.

DMA Controller Provides control of the larger part of the system's DMA (Direct Memory Access) facility. The DMA controller responds to requests from the DMA device and provides address and control signals to the memory slaves and DMA device.

DMA Device The DMA device is typically located on a peripheral board on the EISA or ISA bus. The DMA device initiates DMA transfers, which are controlled by signals generated by the system DMA controller. The DMA device either presents or receives data during a DMA transfer and uses several signals to inform the DMA controller of the staus of the transfer.

Glossary

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.

E

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.

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

encode The act of changing data into a series of electrical or optical pulses that can travel efficiently over a medium.

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

F

FDDI (Fiber Distributed Data Interface) An ANSI standard (X3T9.5) for 100 Mbps LANs based on the token-passing access method. It is often used to bridge several Ethernet segments at high speed.

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

Glossary

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

Float Signal is placed in the high impedance state.

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 a 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.

G

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.

H

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 CPU The main system processor. The host CPU typically has its own local bus allowing the CPU to access cache or local memory without using the EISA bus. The host CPU accesses the EISA bus like any other bus master, with the exception of a few special features. The data size of the host CPU does not determine the EISA bus size; the CPU can have an 8-, 16-, or 32-bit data bus and still access the 16- or 32-bit EISA bus.

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

Glossary

I

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.

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.

K

KB Kilobytes. 1024 bytes.

L

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.

Glossary

M

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) An optical fiber connector pair that links the fiber media to the FDDI node or another cable. The MIC consists of two halves. The MIC plug terminates an optical fiber cable. The MIC receptacle is associated with the FDDI node.

multicast A technique that allows copies of a single packet or cell to be passed to a selected subset of all possible destinations.

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

N

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 downstream 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.

O

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.

P

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.

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). A valid PDU is at least 24 bits in length. 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.

R

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.

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 topology.

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.

S

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.

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 can propagate.

Slave A memory or I/O device that uses EISA control signals to interface to the bus.

Slot Specific Signal Each connector has a unique variant of the signal (instead of a single signal that is bused to all connnectors).

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 an optional MAC entity.

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

T

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.

Glossary

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.

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.

U

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) Type 3 cable with one or more twisted pairs where the wiring is not protected from electromagnetic and radio frequency, but covered with plastic or PVC.

W

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.

X

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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