4811 E/FDDI Adapter
Users Guide

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4811 E/FDDI Adapter
Users Guide

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Safety Precautions

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

Do Not Substitute Parts or Modify Equipment

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

Ground the Instrument

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

Do Not Operate in an Explosive Atmosphere

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

Keep away from Live Circuits

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

Observe Dangerous Procedure Warnings

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

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

WARNING

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

4811 UTP FCC Regulatory Compliance

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.

4811 Fiber FCC Regulatory Compliance

Tested to Comply With FCC Standards

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

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

Radio Frequency Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15, Subpart B of the FCC Rules. This equipment generates, uses, and can radiate radio frequency energy. If not installed and used in accordance with the instructions, it may cause interference to radio communications.

The limits are designed to provide reasonable protection against such interference in a residential situation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment on and off, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna of the affected radio or television.
- Increase the separation between the equipment and the affected receiver.
- Connect the equipment and the affected receiver to power outlets on separate circuits.
- Consult the radio/TV dealer or an experienced radio/TV technician for help.

Modifications

Changes or modifications not expressly approved by Interphase Corporation could void the user's authority to operate the equipment.

Interphase Fiber Products' Compliance

All Interphase fiber products comply with IEC regulations 825-1 and 825-2 for Class 1 laser devices.

Declaration of Conformity

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

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

declares, that the product:

Product Name: EISA FDDI FIBER

Model Number: 4811

conforms to the following Standards:

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

Supplementary Information:

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

Dallas, September 19, 1996

Mike Jobe, Quality Manager

European Contact:

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

Declaration of Conformity

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

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

declares, that the product:

Product Name: EISA FDDI UTP DAS

Model Number: 4811-3-B

conforms to the following Standards:

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

Supplementary Information:

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

Dallas, February 25, 1997

Mike Jobe, Quality Manager

European Contact:

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APPENDIX B Fiber & UTP Cabling

Conventions

Icon Conventions

Icons draw your attention to especially important information:

Note

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

Caution

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

Warning

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

Text Conventions

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

```
Computer-generated text example
```

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

```
cd /usr/tmp
```

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

```
/bin/su
```

is the same as:

```
/bin/su ↵ Return
```

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

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

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

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

Introduction 1

Overview

The 4811 E/FDDI Adapter brings the benefits and advantages of FDDI networking to HP systems by providing a high-performance FDDI networking interface for EISA bus-based systems. This adapter is designed to operate within the framework of today's open systems architectures by providing physical and data-link services as defined by the ANSI X3T9.5 specifications for FDDI. Combined with a standardized host software driver, this adapter can be integrated beneath a variety of network protocols: TCP/IP, OSI, IPX, or any other protocol supported by the underlying driver. There are two types of 4811 adapters: the single attach station (SAS) and the dual attach station (DAS). Both offer 100 Mbps (megabits per second) network connectivity. The 4811 architecture provides high-performance features such as on-board SMT processing and EISA/FDDI data transfers. The 4811 is available for the desktop or workgroup LAN environments, with support for Fiber Optic and Twisted Pair physical media.

Note

In this manual, HP-UX 9.x refers to releases 9.01 through 9.07.

HP-UX 10.x refers to HP-UX 10.01, 10.10, and 10.20.

4811 Installation Kit Contents

- 4811 E/FDDI Adapter
- Mini-jack optical bypass pigtail (dual MIC cards only)

- 4811 E/FDDI Adapter Users Guide
- Appropriate software drivers

Caution

The adapter is packed in an antistatic bag to protect it during shipment. Keep the adapter in its protective antistatic bag until you are ready to install it in the host computer. To prevent damage to the adapter due to electrostatic discharge, wear a grounding strap and handle the adapter only by its edges. Do not touch its components or any metal parts other than the faceplate.

Product Features

- EISA version 3.12 compliance
- Up to three adapters per system supported
- On-board integrated SMT versions 6.2 and 7.3 included
- Bus Master data transfers supported
- Fiber and UTP network media interfaces available
- Dual-attach and single-attach adapters available
- 33 MBps burst mode data transfer supported
- Card and ring connect status shown by LEDs
- 128K or 512K local buffering
- Motorola MC6883x FDDI chipset
- Drivers for HP-UX 9.x and 10.x operating systems
- Network monitoring utility **(fddimon)**
- 4811 monitoring utility **(seahmon)**

Network Monitoring Utility (*fddimon*)

The **fddimon** utility is included in your 4811 software pack. It is used to monitor and display the operating parameters of an FDDI network. The monitor provides information about the node where 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 containing an adapter. For more detailed information, see *fddimon Utility* on page 55.

4811 Monitoring Utility (*seahmon*)

The **seahmon** utility is used to collect operating statistics in real time from the 4811 drivers. It is most beneficial as a troubleshooting aid, and works the same for both HP-UX 9.x and HP-UX 10.x operating systems. For more detailed information, see *Using the seahmon Utility* on page 63.

System Requirements

- Approximately 100 KB of free disk space in the **root (/)** file system and 300 KB of free disk space in the **/usr** file system.
- HP-UX release 9.x or 10.x running on the target system.
- An EISA expansion bus in the target system.

Note

Use the bdf(1) command to display file system usage.

4811 Compatibility

The 4811 is compatible with the following software and EISA-based machines:

- Software:
  - HP-UX 9.x Operating System
  - HP-UX 10.x Operating System
- Hardware:
  - HP 9000/700 Series with EISA expansion slots
    - 700 Series workstations
    - C Class workstations
    - J Class workstations
  - HP 9000/800 Series with EISA expansion slots
    - D Class Servers running HP-UX 10.x

EISA Overview

EISA is a superset of the 8-bit/16-bit ISA bus architecture. By extending the capabilities of the ISA standard, EISA provides full compatibility with the ISA standard.

EISA architecture features include:

- 32-bit memory addressing for CPU, Direct Memory Access (DMA), and bus master devices.
- 16-bit or 32-bit data transfers for CPU, DMA, and bus master devices.
- Support for up to three adapters per system.
- Efficient synchronous data transfer protocol. Normal single transfers and high-speed burst transfers are allowed.
- Automatic translation of bus cycles between EISA and ISA master and slaves.

- Intelligent bus master peripheral controllers support.
- DMA arbitration and transfer rates enhancements.
- 33 MBytes per second data transfer rate for bus masters and DMA devices.
- Interrupts can be shared and programmed for edge or level triggering.
- Automatic configuration of system and expansion boards.

FDDI Overview

Fiber Distributed Data Interface (FDDI) is a 100 Mbps, token-passing, single or dual ring interface that can be implemented with Fiber Optic or Unshielded Twisted-Pair (UTP) media. A Timed Token Protocol (TTP) is used to control when a station can transmit data to the network. A station can transmit a message on the network only after it has received a token. Upon receiving the token, a station begins transmitting data. The station 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.

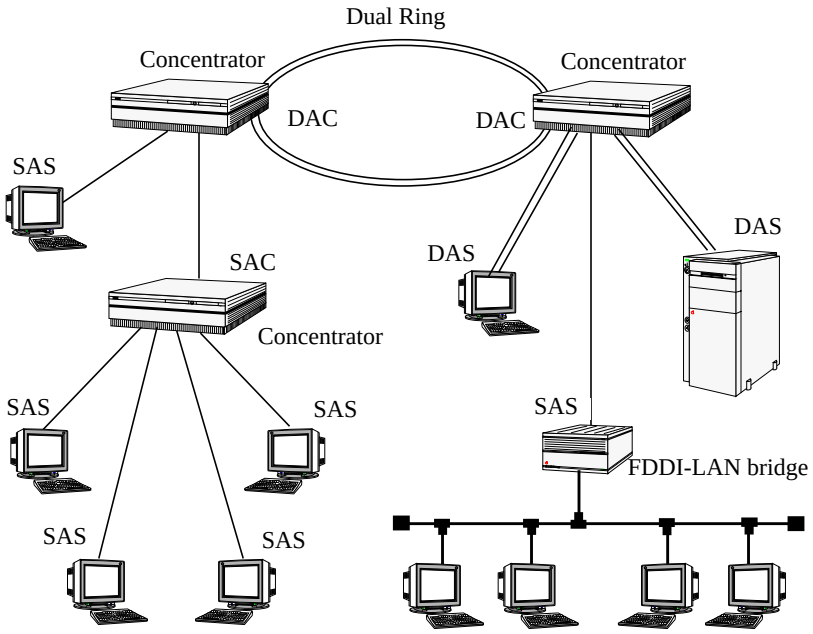


Figure 1-1. FDDI Architecture

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.

Note

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

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

A SAS must be used with an FDDI concentrator like the Interphase M1600 or M800 FDDI Concentrator. However, the DAS configuration can be connected to any dual attach ring.

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

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

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

Related Reference Documents

- ANSI X3T9.5 FDDI standards.
- EISA Specification, version 3.12. BCPR Services, Inc. 1992.

Hardware Installation 2

Overview

This chapter explains how to install the adapter in a bus master EISA slot in a host workstation or server. Before installing the adapter in your system, check *4811 Compatibility* on page 4. Some systems, such as the HP 720 model, do not have a native EISA interface. In these cases, the EISA interface must be ordered and installed in the system.

Note

The EISA configuration process is handled automatically by the HP-UX system once the machine reboots.

You will need a Phillips head and/or a standard flat-blade screwdriver to install the card.

Inspecting the Adapter

Before installing the adapter in your computer, you need to visually inspect it for damage that might have occurred during shipment from the factory.

Caution

The adapter is packed in an antistatic bag to protect it during shipment. Keep the adapter in its protective antistatic bag until you are ready to install it in the host computer. To prevent damage to

the adapter due to electrostatic discharge, wear a grounding strap and handle the adapter only by its edges. Do not touch its components or any metal parts other than the faceplate.

1. Open the shipping container and carefully remove its contents.
2. Inspect each item for damage. If you find any omissions or damage, contact your network supplier and the carrier (for example, UPS or Federal Express) that delivered the package.

Installing the Adapter

To install the adapter in your workstation or server, do the following:

1. Attach a grounding strap to your wrist or ankle.
2. Shut down your system. At the prompt, type:

   ```
   /etc/shutdown -h
   ```

   Wait for the system to respond with the following message before turning off the system:

   ```
   Halted, you may now cycle power
   ```

3. Disconnect the AC power cord from the system unit and from the AC power source.
4. Remove the power supply cover plate.
5. 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.

6. Remove the adapter from its antistatic packaging.
7. Slide the adapter into the EISA expansion slot and press down firmly until the adapter is securely seated.
8. Secure the adapter to the system chassis with the screw(s) that you removed from the blank cover plate in step 5.

Continue with the next section to attach the adapter to the FDDI network.

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 radii 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.

The following types of connectors are available for the 4811 (SAS and DAS):

- Fiber FSD MIC
- Fiber ST
- Fiber Duplex SC
- TP-PMD UTP RJ-45

Note

ST-to-MIC and SC-to-MIC cables are available for a nominal charge. Contact Interphase Customer Service for information.

Do one of the following:

- If you are connecting a dual-attachment adapter to the FDDI network, go to the section *Cabling a Dual Attachment Station* on page 18.
- Otherwise, continue with the next section to connect a single-attachment adapter to the FDDI network.

Cabling a Single-Attachment Station

A 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. UTP connections use a cross-over RJ-45 cable. In all cases, the signals must be routed such that the Tx output of one station is routed to the Rx input of its downstream neighbor. A typical connection of a single-attachment adapter to a single-attachment concentrator is shown in Figure 2-1:

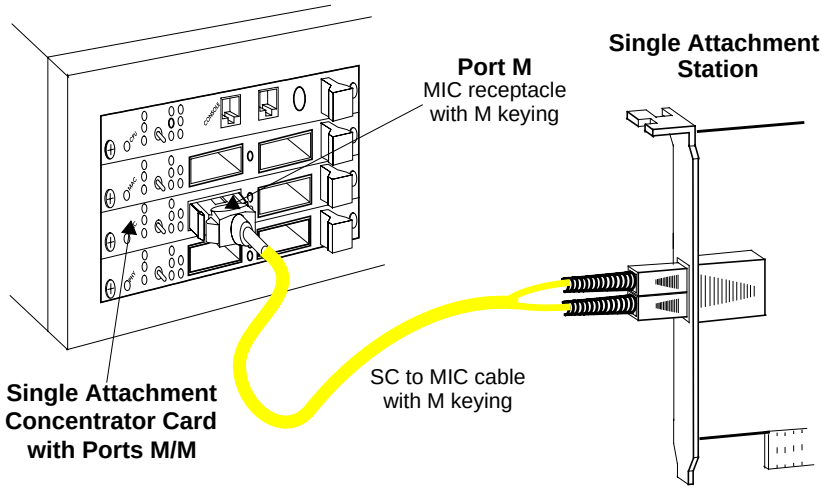


Figure 2-1. Typical SAS to SAC Fiber Connection

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 2-1 and in one of the following:
   - For FSD MIC connections, skip to Figure 2-2 on page 14.
   - For ST connections, skip to Figure 2-3 on page 15.
   - For SC connections, skip to Figure 2-4 on page 16.
   - For RJ-45 connections, skip to Figure 2-5 on page 17.

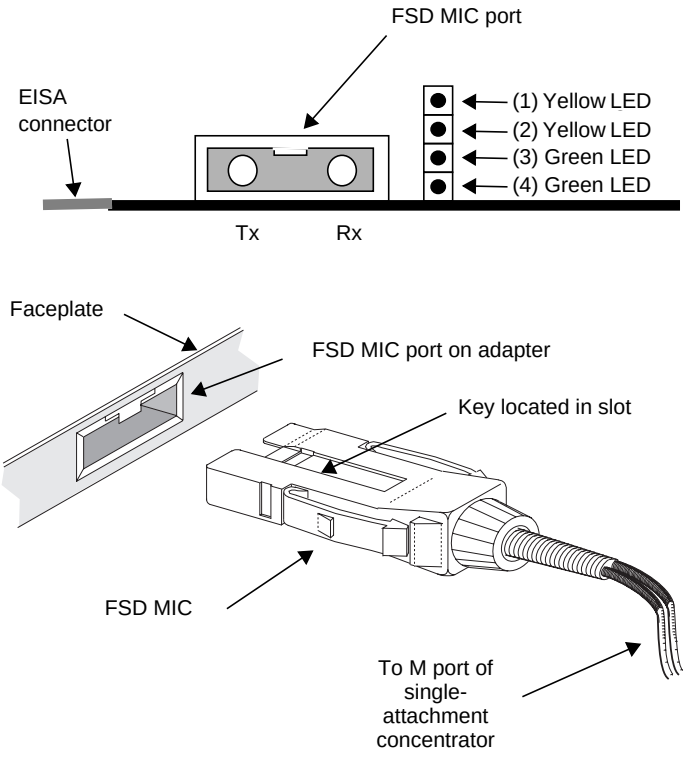


Figure 2-2. SAS MIC Connection

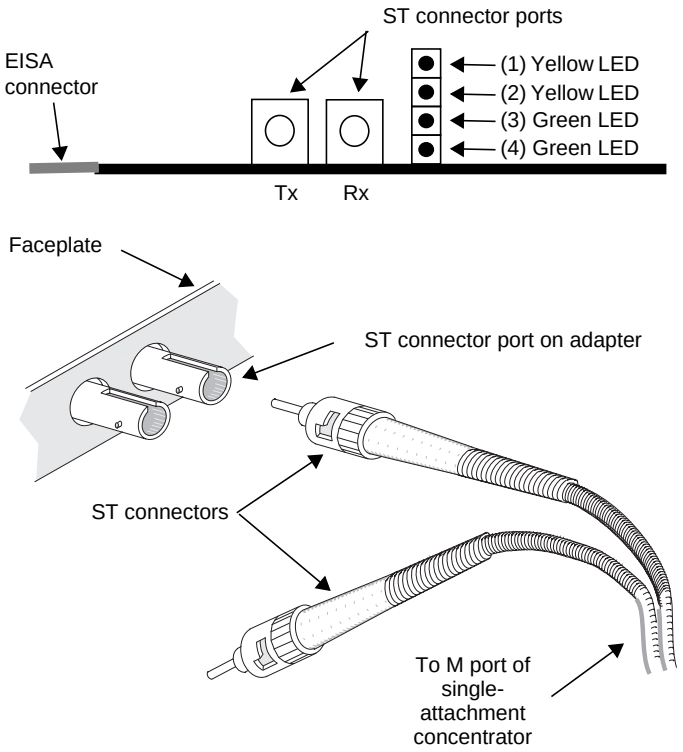


Figure 2-3. SAS ST Fiber Connection

ST connectors are individual bayonet connections for Rx and Tx routing. There is no physical difference in the connectors, but the cable is usually marked in some way to distinguish between the two leads. Use these marks consistently to cable all stations in your installation. For example, if you decide to use the ST connector marked with a blue ring to route Tx signals from this station, do so for all other stations. Signals must be routed such that the Tx output of one station is routed to the Rx input of its downstream neighbor.

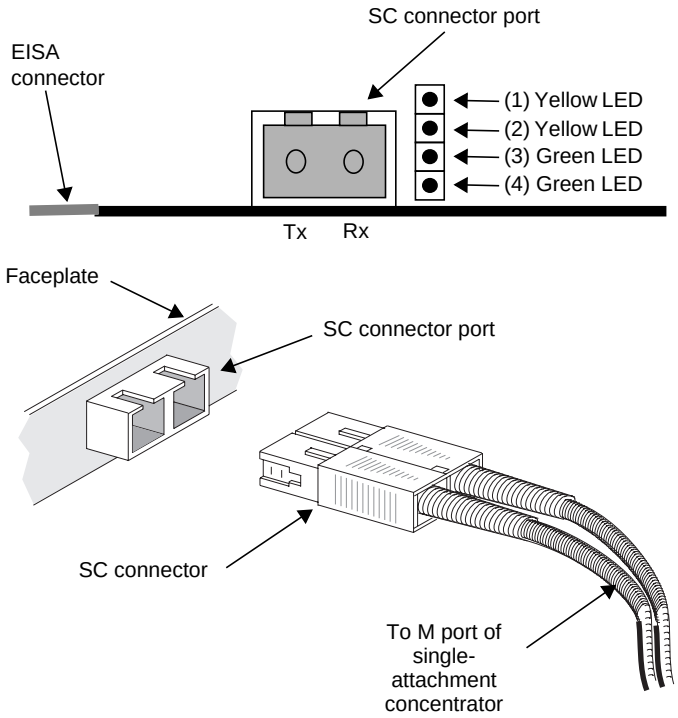


Figure 2-4. SAS SC Fiber Connection

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. Signals must be routed such that the Tx output of one station is routed to the Rx input of its downstream neighbor.

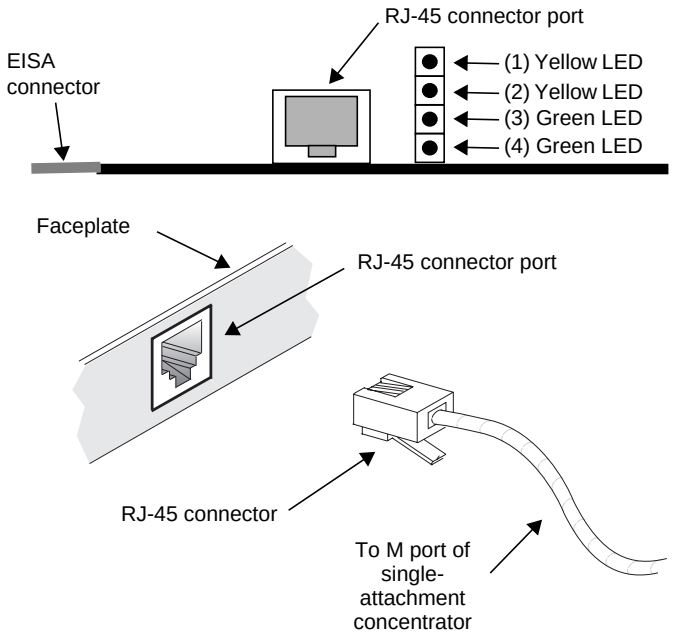
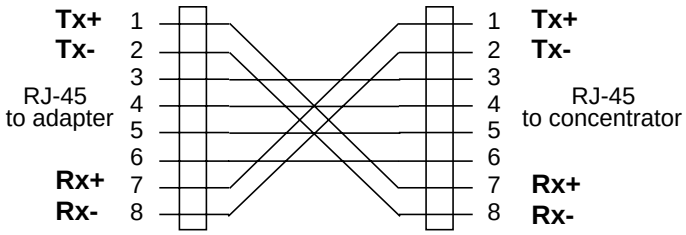


Figure 2-5. SAS RJ-45 UTP Connection

The copper wiring defined for TP-PMD by ANSI uses the following cross-over connections:



This fixed cross-over at the connectors assures the Tx output from the adapter is routed to the Rx input of its downstream neighbor, in this case the concentrator.

2. Recheck your connections, ensuring that each connector is plugged into the correct Tx or Rx receptacle 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. A sample message is:

```
Warning one or more EISA cards could \
   not be configured.
```

For more detailed information about installing the adapter in your system, see the information about installing EISA cards in your HP owner's manual.

Now that your adapter is installed, continue with the appropriate software chapter to install the driver.

Cabling a Dual Attachment Station

There are two ways to connect a dual-attachment 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 2-6.

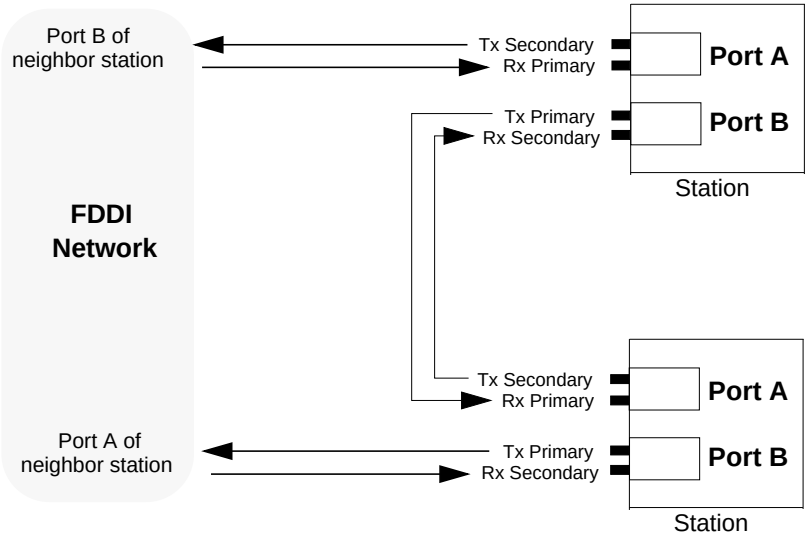


Figure 2-6. Dual Ring Tx/Rx Topology

The remainder of this section (Figure 2-7 through Figure 2-10) illustrates the dual attachment adapter connections.

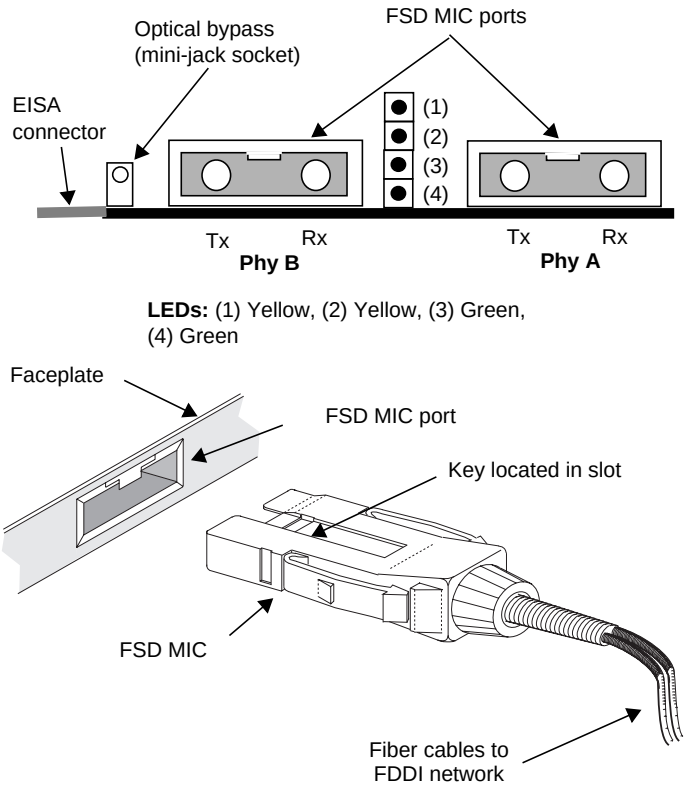


Figure 2-7. DAS MIC Fiber Connections

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.

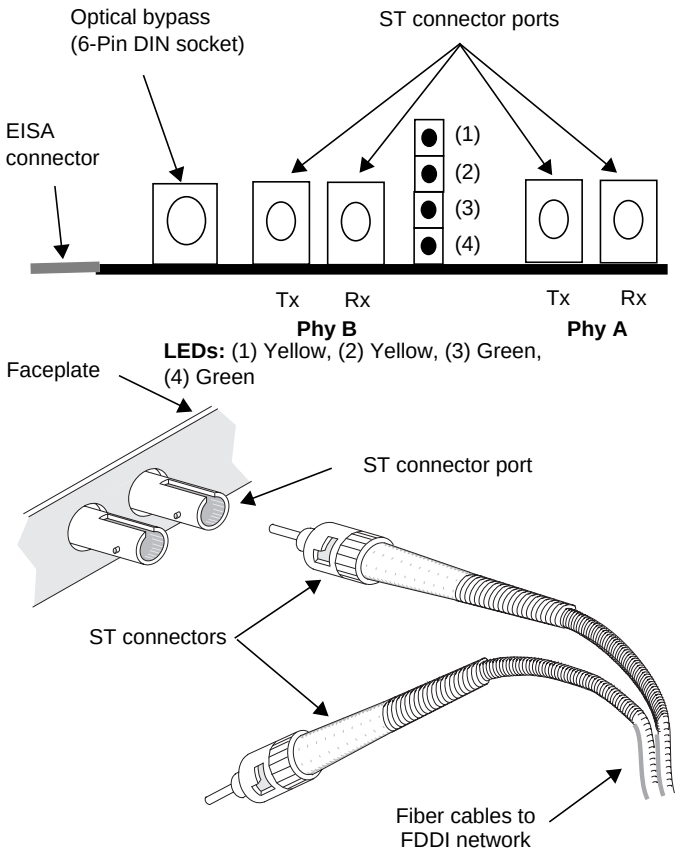


Figure 2-8. DAS ST Fiber Connections

ST connectors are individual bayonet connections for Rx and Tx routing. There is no physical difference in the connectors, but the cable is usually marked in some way to distinguish between the two leads. For example, if you decide to use the ST connector marked with a blue ring to route Tx signals from this station, do so for all other stations.

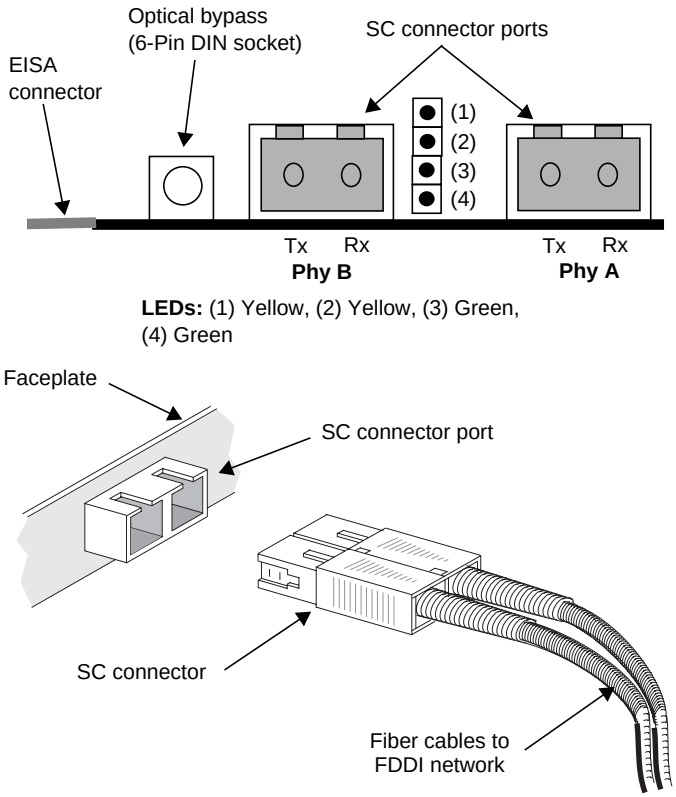


Figure 2-9. DAS SC Fiber Connections

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.

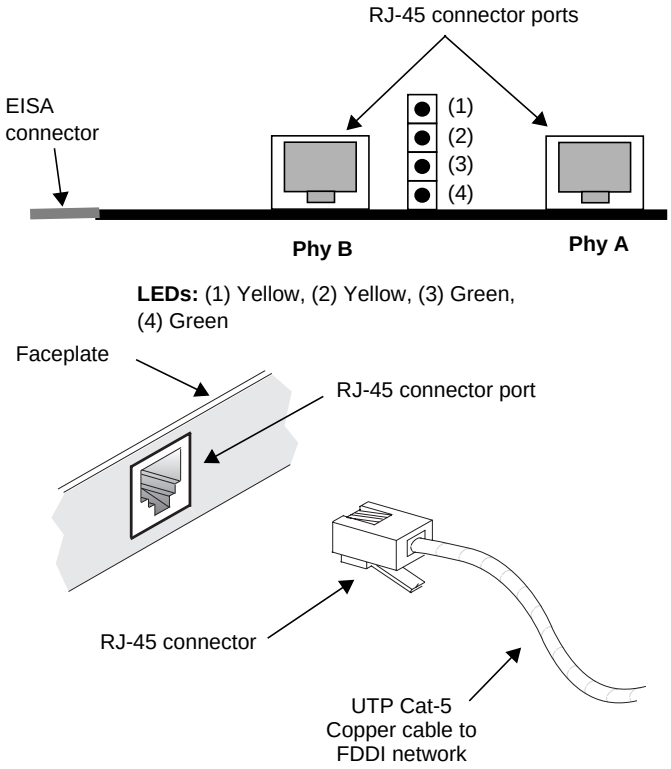
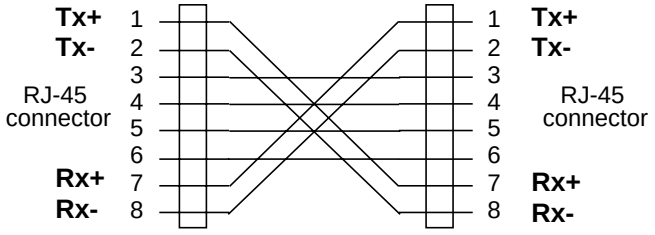


Figure 2-10. DAS RJ-45 UTP Connections

The copper wiring defined for TP-PMD by ANSI uses the following cross-over connections:

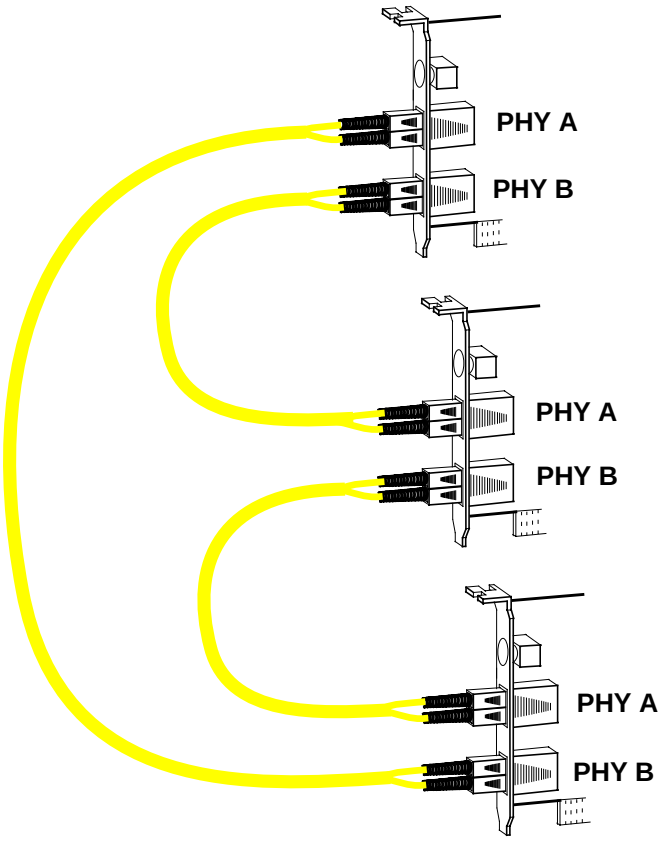


Do one of the following:

- If you are connecting your dual-attachment adapter directly to the dual ring, skip to *Connecting Directly to the Dual Ring* on page 24.
- Otherwise, continue with the next section.

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 2-11 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.



Note: You can create a UTP dual ring like the one shown above; use cross-over cables instead of fiber. For more detailed information, see Figure 2-10 on page 23 and *Unshielded Twisted Pair (UTP) Cable* on page 79.

Figure 2-11. 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 OBS can be used to bypass a station that is turned off or disconnected, protecting against multiple faults on a dual ring. Figure 2-12 shows a typical connection of an OBS between a dual-attachment station and the dual ring. The installation procedures in this section include such a connection.

Note

The example in Figure 2-12 uses MIC connectors with type A and type B keying to illustrate the connection of an OBS to the FDDI network. Our example also shows SC duplex cabling (for the network) from the OBS to the dual-attachment adapter. Your cabling requirements will depend upon the type of OBS and 4811 that you are installing. For Tx/Rx assignments of the OBS, see Figure 2-13.

To connect a DAS 4811 to a dual ring using an Optical Bypass Switch, do the following:

1. Connect the cables from the OBS to the appropriate **Phy A** and **Phy B** ports on the 4811 as shown in Figure 2-12, Figure 2-13, and one of the following:
   - For MIC connections, see Figure 2-7 on page 20.
   - For ST connections, see Figure 2-8 on page 21.

- For SC connections, see Figure 2-9 on page 22.
- For RJ-45 connections, see Figure 2-10 on page 23.

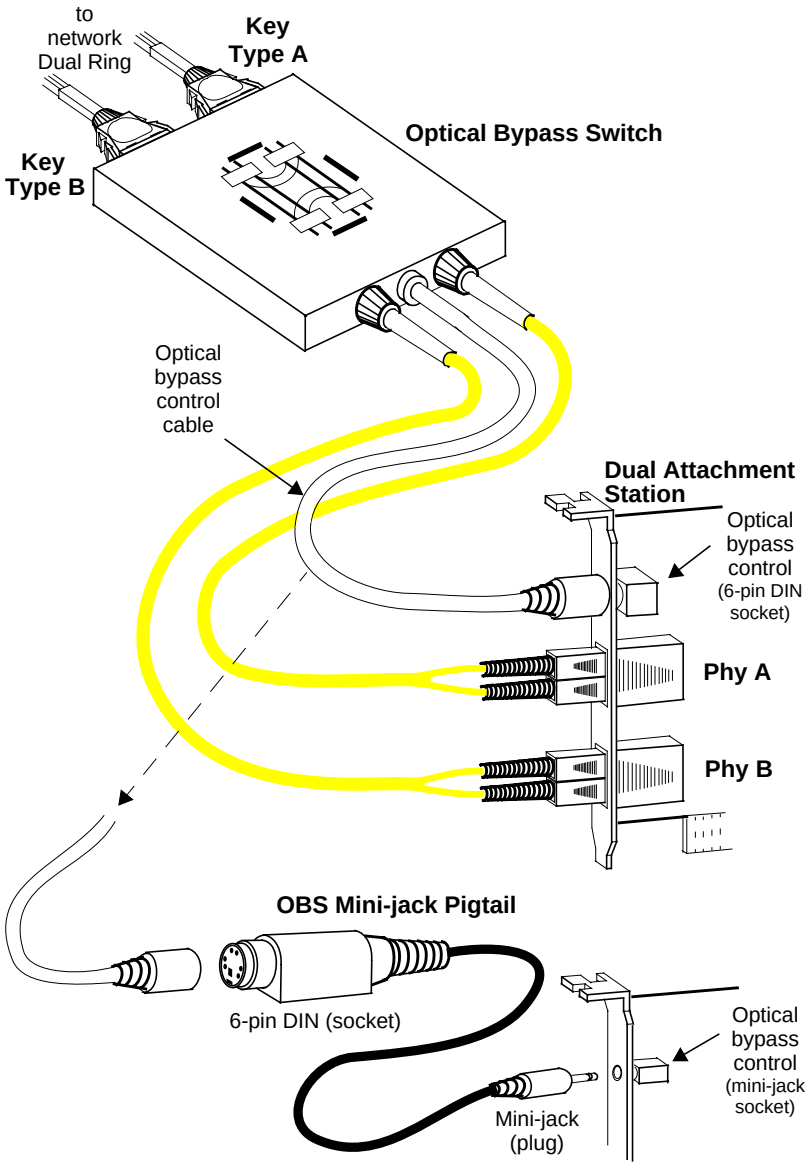


Figure 2-12. Typical Optical Bypass Connection

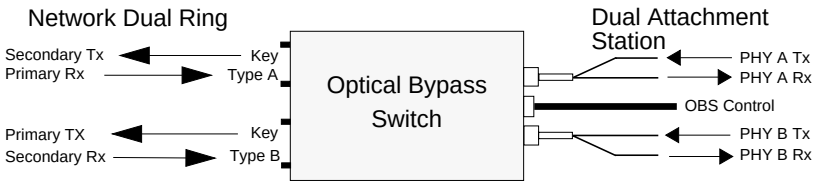


Figure 2-13. Optical Bypass Switch Tx/Rx Configuration

2. Connect the control cable from the OBS to the 4811.

On all dual-attachment 4811s, except the MIC series, the optical bypass socket on the adapter is a 6-pin mini-DIN connection.

The dual-attachment 4811 with MIC connectors has a mini-jack socket for the optical bypass instead of the larger 6-pin DIN (See Figure 2-12). Use the jumper cable included with your 4811 to connect the end of the control cable (from the OBS) to the mini-jack socket on the adapter's faceplate.

Caution

DO NOT operate the 4811 with a mini-jack pigtail installed to the adapter unless the DIN end is connected to an Optical Bypass Switch.

DO NOT disconnect the OBS from the pigtail or disconnect the pigtail from the 4811 unless the power is turned OFF to the machine.

3. Connect the cables from the FDDI network to the appropriate ports on the OBS.

Our example shown in Figure 2-12 uses MICs to connect the cable from the B port of one neighbor to the **Key Type A** port on the OBS. The cable from port A of the other neighbor is connected to the Key Type B port of the OBS. For Tx/Rx configurations of the connections, see Figure 2-13.

4. Reconnect the AC power cord to the system and the power source.

5. Power up the system.

   The 4811 runs a self-test automatically. During power up, system messages may be displayed regarding the absence of the EISA configuration for the 4811 adapter. You can safely ignore these messages since the EISA configuration is done automatically after the 4811 software is installed. A sample message is:

```
Warning one or more EISA cards could \
  not be configured.
```

For more detailed information about installing the 4811 in your system, see *Installing an EISA Card* in your HP Series 700 owner's manual.

Now that your adapter is installed, continue with the appropriate software chapter to install the device driver.

HP-UX 9.x Software Driver Installation

3

Overview

This chapter contains the procedures for installing the adapter driver using the HP **update(1M)** utility. This release of the software works with HP-UX versions 9.0 through 9.7, supports FDDI Station Management (SMT) versions 6.2 and 7.3, and supports a maximum of three 4811s per system.

The software package for HP-UX 9.x also includes a network monitor utility **(fddimon**) to assist you in managing your FDDI network.

The following points are described:

- System requirements
- Installing the HP-UX 9.x driver
- Configuring the network interface
- Verifying the network interface
- Special notices and support information

Note

The procedures in this chapter assume the adapter is already installed in the endstation. If not, go to Chapter 2, *Hardware Installation*, and install the adapter before installing the software driver.

System Requirements

Before installing the adapter in your endstation, the following software, hardware, and network prerequisites should be met:

- HP-UX version 9.x operating system.
- Host Machine:
  - HP 9000/700 Series with EISA expansion slots
    - 700 Series workstations
    - C Class workstations
    - J Class workstations
- Approximately 1 megabyte of free disk space in the local **/usr** directory.
- CD-ROM drive or DDS tape drive, whichever is appropriate.
- New IP address, subnet mask (optional), and host name alias for the adapter.
- Appropriate cables to connect the adapter to the network.
- If you have a single-attach 4811, you need an FDDI Single Attachment Concentrator in order to connect your station to the ring.
- If you have a dual-attach 4811, it can connect directly to the dual ring (Optical Bypass Switch recommended) or to an FDDI Dual Attachment Concentrator.

Installing the Software Driver

Caution

The native Hewlett-Packard network driver *lan2* must be installed prior to installing this driver. All driver control block structures are defined in *lan2* and must be in place before loading any hardware drivers. Otherwise, building the kernel will fail.

Note

This driver can be installed over a previous release. It is not necessary to remove the old version.

There are two types of distribution media for the HP-UX 9.x software driver, CD-ROM and DDS tape.

Do one of the following:

- If you are installing the driver from DDS tape, go to the section *Installing the 9.x Driver from DDS Tape* on page 36.
- Otherwise, continue with the next section to install the driver from CD.

Installing the 9.x Driver from CD-ROM

The installation files are located in directories sorted by operating system. Use the directory structure as a guide to locate the latest version of the driver for your operating system. A *readme* file, explaining the CD installation for the latest driver, sits at the top of each directory tree. Within each

operating system's directory is a list of driver installation files noted as (sx000nn.nnn). The extension of the filename is the revision version of the file.

Note

Each directory contains individual readme files noted (rmfnn.txt) associated with each driver. They contain notes for tape images and driver-specific configuration options. They are not used until after the installation from CD-ROM is complete. Use the readme file located at the top of each directory for CD-ROM installation instructions.

The files on the CD are in ISO 96602 format. On Hewlett Packard machines, the file names appear in upper case with a version number appended (;1). For example: the readme file **rmf490.a** will appear as RMF490.A;1. To read this file the name must be in quotes due to the semicolon as follows:

```
view "RMF490.A;1"
```

To install the driver from a CD-ROM drive in a HP-UX 9.x operating system, follow these steps:

1. With the endstation up and running, log in as **root**.
2. If you are not sure of the operating system installed on the endstation, type:

   ```
   uname -a
   ```

3. Insert the installation CD-ROM in the appropriate drive and mount accordingly.
4. Locate the latest version of the driver in the **/cdrom/HPUX_9** directory on the CD-ROM.

Record the path and name of this file for later use. For example:

Source: **/cdrom/HPUX_9/SX00097.A08;1**

5. Use the **update** command to begin the installation of the driver. At the prompt, enter the following command:

   /etc/update -s "*<source>***" -c > **
   <filename>

   where <*source*> is the path and file name recorded in the previous step, and <*filename*> is any name of your choice to store the driver script. The <*source*> is enclosed with quotes (" ") due to the semicolon (;) embedded in the line.

   For example, if <*filename*> is set at **seah_inst**, the command is as follows:

   ```
   /etc/update -s \
     "/cdrom/HPUX_9/SX00097.A08;1" \
     -c > seah_inst
   ```

   The fileset information is extracted about the driver from the CD-ROM.

6. At the prompt, enter the following command:

   update -s "*<source>***" -r -f** ***<filename>***

   Using the <*source*> and <*filename*> from our example in the previous steps, the command is as follows:

   ```
   update -s \
     "/cdrom/HPUX_9/SX00097.A08;1" \
     -r -f seah_inst
   ```

   This command generates the following actions:

   - Reads the fileset information
   - Updates the system's **eisa_config** file

- Rebuilds the kernel
- Creates the device nodes for the driver
- Reboots the system.

Note

The time required to rebuild the kernel varies with each system.

If the **update** command fails for any reason, the installation will abort before extracting all the 4811 files from the CD-ROM. If this occurs, repeat step 5 and step 6. See the man pages for more information about the **update(1M)** utility.

7. After the system reboots, check for error messages at the end of **/tmp/update.log.**
8. After the installation is complete, view the associated readme file (rmfnn.txt) to obtain the driver-specific configuration options.

To continue the installation of the driver, skip to *Configuring the Network Interface* on page 38.

Installing the 9.x Driver from DDS Tape

To install the driver from a DDS tape drive in a HP-UX 9.x operating system, do the following:

1. With the endstation up and running, log in as **root**.

2. If you are not sure of the operating system installed on the endstation, type:

   uname -a

3. Insert the installation DDS tape in the appropriate drive and mount accordingly.

4. At the prompt, type:

   /etc/update -s *<device>* **-c >** *<filename>*

   where *<device>* is the device name of the DDS tape drive, and *<filename>* is any file name of your choice to store the driver script.

   For example, the command where
   <device> = /dev/rmt/c201d4m
   <filename> = seah_inst
   is as follows:

   **/etc/update -s /dev/rmt/c201d4m -c > **
   seah_inst

   The fileset information is extracted about the 4811 driver from the DDS tape.

5. At the prompt, enter the following command:

   update -s *<device>* **-r -f** *<filename>*

   Using the *<device>* and *<filename>* from our the previous step, the command is as follows:

   **update -s /dev/rmt/c201d4m -r -f **
   seah_inst

   This command generates the following actions:

   - Reads the fileset information
   - Updates the system's **eisa_config** file
   - Rebuilds the kernel

- Creates the device nodes for the driver
- Reboots the system.

If the **update** command fails for any reason, the installation will abort before extracting all the 4811 files from the DDS tape. If this occurs, repeat the installation from step 4 forward. See the man pages for more information about the **update(1M)** utility.

Note

The time required to rebuild the kernel varies with each system.

6. After the system reboots, check for error messages at the end of **/tmp/update.log.**

Continue the installation with the next section for configuring the adapter to the FDDI network.

Configuring the Network Interface

This section is a continuation of the procedures for installing the driver in an HP-UX 9.x operating system. The 4811 driver must already be installed in the endstation before you configure the network interface.

To configure the 4811 to the network, do the following:

1. Add the new FDDI IP address for the adapter to the **/etc/hosts/** by manually editing the file.
2. Edit the **/etc/netlinkrc** file to identify the hostname and netmask for each 4811 installed in your machine (maximum of 3 4811s per machine) as follows:

Note

If this is a first-time install, the driver script automatically inserts the template shell script into the */etc/netlinkrc* file. Before editing any file, make a backup of */etc/netlinkrc* in the event the file is damaged.

a. In the **/etc/netlinkrc** file, locate the line similar to

```
# /etc/ifconfig seah0 inet HOST_NAME \
    netmask NET_MASK -trailers
```

b. Remove the **#** comment notation at the beginning of the line.

c. Change the HOST_NAME and NET_MASK placeholders to your FDDI hostname and netmask for the adapter.

d. Repeat the above three substeps for each additional 4811 installed in your machine (maximum of 3 4811s per machine).

The second 4811 (if installed) has a device and instance number of **seah1**, and the third (if installed) is **seah2**.

e. Save and exit the file.

Note

If you brought up the FDDI interface from the command line, the following step to reboot can be omitted.

3. Restart the system again by entering:

   `reboot`

4. Verify the adapter is installed using the following command at the system prompt:

   `ifconfig seah0`

   Figure 3-1 shows a sample console output for the **ifconfig** command where the placeholders for **seah0** in the previous step 2 were set to:

   HOST_NAME: 111.222.33.115
   NET_MASK: ffffff00

```
seah0:flags=63<UP,BROADCAST,NOTRAILERS,RUNNING>
     inet 111.222.33.115 netmask ffffff00 broadcast 111.222.33.255
```

Figure 3-1. Sample *ifconfig* Output

   The UP flag in Figure 3-1 means an IP address was successfully assigned to the adapter. Also, verify the console output for the IP address, netmask, and broadcast settings are what you expected for this adapter.

5. To verify that the adapter can communicate with other hosts, use the **ping (1M)** command as follows:

   `ping` `<remote_host>`

   where <*remote host*> is the network name or the IP address of the endstation you want to ping. For

example, if you are pinging a station with an IP address of 111.222.33.130, the command would be:

`ping 111.222.33.130`

A sample console output from a ping command is shown in Figure 3-2.

```
64 bytes from 111.222.33.130: icmp_seq=1. time=3 ms
64 bytes from 111.222.33.130: icmp_seq=2. time=1 ms
64 bytes from 111.222.33.130: icmp_seq=3. time=1 ms
:
:
```

Figure 3-2. Sample *ping* Output

The adapter and its software driver are now installed in your endstation. Review the items in the next section before running any utilities or applications.

Notices and Support Information

SMT Support

This driver supports FDDI Station Management (SMT) versions 6.2 and 7.3:

- For SMT 6.2, use firmware FA00073 and FB00073
- For SMT 7.3, use firmware FA00074 and FB00074

HP *nettl* Utilities

In order to use the HP **nettl** utilities in HP-UX 9.x, it is necessary to set the LANG variable to **C** with the following command:

```
setenv LANG C
```

If the LANG variable is not set prior to running **nettl**, the utilities will report that the appropriate error message was not found in the catalog file.

UDP Transfers

If you have problems with UDP transfers (NFS traffic) in HP-UX 9.x, enable the UDP checksums on the host system. Log in as **root** and enter the following:

```
adb -w /hp-ux /dev/kmem
udpcksum/W 1
kudp_checksumming/W 2
^D (control-D to exit)
```

Special Device Files

The install script creates a file **/sbin/init.d/seahawk** which in turn creates the necessary character special device files upon bootup of the machine. These files are necessary only to run the provided utilities, such as **fddimon**.

HP-UX 10.x Software Driver Installation

4

Overview

This chapter contains the procedures for installing this driver using the HP **swinstall** utility. This release of the software works with HP-UX versions 10.01, 10.10, and 10.20. You can also use it on multiprocessor systems. This driver supports FDDI Station Management (SMT) versions 6.2 and 7.3, and a maximum of three 4811s per system.

The software package for HP-UX 10.x also includes two network monitor utilities **(fddimon** and **seahmon**) to assist you in managing your FDDI network.

The following points are described:

- System requirements
- Installing the HP-UX 10.x driver
- Configuring the network interface
- Verifying the network interface
- Special notices and support information

Note

The procedures in this chapter assume the adapter is already installed in the endstation. If not, go to Chapter 2, *Hardware Installation*, and install the adapter before installing the software driver.

System Requirements

Before installing the adapter in your endstation, the following software, hardware, and network prerequisites should be met:

- HP-UX version 10.x operating system:
- Host Machine:
  - HP 9000/700 Series
    - 700 Series workstations
    - C Class workstations
    - J Class workstations
  - HP 9000/800 Series
    - D Class Servers
- Approximately 1 megabyte of free disk space in the **/usr** directory.
- CD-ROM drive or DDS tape drive, whichever is appropriate.
- New IP address, subnet mask (optional), and host name alias for the adapter.
- Appropriate cables to connect the adapter to the network.
- If you have a single-attach 4811, you will need an FDDI concentrator in order to connect your station to the ring.
- If you have a dual-attach 4811, it can connect directly to the dual ring or to an FDDI concentrator.

Installing the Software Driver

Caution

The native Hewlett-Packard network driver *lan2* must be installed prior to installing this driver. Otherwise, building the kernel will fail.

Note

This driver can be installed over a previous release. It is not necessary to remove the old version. However, if for some reason you need to remove an existing driver, use the SAM utility to remove this driver from the kernel before running the *swremove* command. See the HP documentation for your operating system for how to Add and Remove drivers from a kernel.

This driver is loaded via the HP-UX 10.x **swinstall** program. There are two types of distribution media for the HP-UX 10.x software driver, CD-ROM and DDS tape.

Do one of the following:

- If you are installing the driver from DDS tape, go to the section *Installing the 10.x Driver from DDS Tape* on page 47.
- Otherwise, continue with the next section to install the driver from a CD drive.

Installing the 10.x Driver from CD-ROM

The installation files are located in directories sorted by operating system. Use the directory structure as a guide to locate the latest version of the driver for your operating system. A *readme* file, explaining the CD installation for the latest driver, sits at the top of each directory tree. Within each operating system's directory is a list of driver installation files noted as (sx0000nn.nnn). The extension of the filename is the revision version of the file.

Note

Each directory contains individual readme files noted (rmfnn.txt) associated with each driver. They contain notes for tape images and driver-specific configuration options. You cannot read them until after the installation from CD-ROM is complete. Use the readme file located at the top of each directory for 4811 driver installation instructions.

The files on the CD are in ISO 96602 format. On a Hewlett-Packard machine the file names appear in upper case with a version number appended (;1). For example: the readme file **rmf490.a** will appear as RMF490.A;1. To read this file the name must be in quotes due to the semicolon as follows:

```
view "RMF490.A;1"
```

To install this driver from a CD-ROM drive in a HP-UX 10.x operating system, do the following:

1. With the endstation up and running, log in as **root**.
2. If you are not sure of the operating system installed on the endstation, type:

   ```
   uname -a
   ```

3. Insert the installation CD-ROM in the appropriate drive and mount accordingly.

4. Locate the latest version of the driver in the **/cdrom/HPUX_10** directory on the CD-ROM.

   Record the path and name of this file for later use. For example:

   Source: **/cdrom/HPUX_10/SX00076.A03;1**

5. Use the **swinstall** command to begin the installation of the driver. At the prompt, enter the following command:

   ```
   /usr/sbin/swinstall
   ```

   The *Source Depot Path* defaults to **/var/spool/sw**.

6. For the Specify Source option, set **Source Depot Path** to point to the 4811 driver (identified in step 4 above) on your mounted CD-ROM drive. For example:

   ```
   "/cdrom/HPUX_10/SX00076.A03;1"
   ```

   Note: The Source Path is enclosed with quotes (" ") due to the semicolon (;) embedded in the line.

7. Select **OK**.

Go to the section *Sample swinstall Installation* on page 48 to continue the driver installation.

Installing the 10.x Driver from DDS Tape

To install this driver from DDS tape in an HP-UX 10.x operating system, do the following:

1. Insert the software DDS tape into the appropriate drive.

2. At the prompt, enter the following command:

   ```
   /usr/sbin/swinstall
   ```

The *Source Depot Path* defaults to **/var/spool/sw**.

3. Change the Source Depot Path to point to your tape drive (for example, `/dev/rmt/0m`).

   When viewing the products on tape, the Interphase products will appear as *SeaHawk Driver* with the information field reading *Interphase E/FDDI SeaHawk 4811 Software Distribution*.

4. Select **OK**.

Continue the installation of this driver with the instructions in the next section.

Sample *swinstall* Installation

This section is a continuation from one of the previous sections, *Installing the 10.x Driver from CD-ROM* or *Installing the 10.x Driver from DDS Tape* where you set the path to the appropriate device containing the 4811 driver and initiated the **swinstall** command.

To continue the installation, do the following:

1. If a message appears to the console with output similar to Figure 4-1, select **OK.**

   This is a normal operating prompt in the **swinstall** utility.

```
The software view is set to show bundles,
but no bundles were found on the source
“hostname:/dev/rmt/0m”. The software will
be shown as products.
```

Figure 4-1. Initial *swinstall* Prompt

2. Highlight the **SeaHawk_Driver** fileset (this will be the only one available) and mark it for installation.
3. Go to the Action menu and select **Install (analysis)...**
4. When the analysis is complete, select **OK**.

   The prompt in Figure 4-2 appears.

```
Installation will now begin ...

Do you wish to begin Installation?

[Yes]
```

Figure 4-2. Prompt to Begin Installation

5. Select **Yes**.

   The confirmation dialog in Figure 4-3 appears.

```
Kernel filesets will be installed on
the local system. The installation
process will include building a new
kernel and rebooting the system.

The system will be rebooted as soon
as Installation is complete.
```

Figure 4-3. Prompt to Confirm Installation

6. Select **Yes**.

   The time required to rebuild the kernel varies with each system.

7. After the installation is complete, click **Done,** and then click **OK** to reboot the machine.

The adapter is now ready to be configured to the network with the procedures in the next section.

Configuring the Network Interface

Before the adapter can talk to other hosts on the network, its interface must be configured. This section describes the use of the HP System Administration Manager (SAM) program to configure the network interface. Once this is done, the adapter is automatically configured each time the system is booted.

With the adapter driver installed and the machine rebooted as directed in the previous section, do the following to configure the adapter to the FDDI network:

1. To invoke SAM, at the HP-UX prompt, type:

   ```
   sam
   ```

2. To access the **Networking and Communications** window, do the following:

   a. Double-click the **Networking and Communications** icon.

   b. Double-click the **Network Interface Cards** icon.

3. To name the 4811 interface, do the following:

   a. Highlight the line with a **Card Type** of *FDDI* and a **Status** of *Not Configured.*

   b. From the **Actions** pull-down, select **Modify System Name . . .**

   c. When the **Set/Modify System Name** dialog appears, enter the name for the 4811 interface, a

hostname unique in your system, in **System Name,** and click **OK.** (SAM uses this name to create an association between the interface and the IP address you supply in the next step, in your `/etc/hosts` file.)

4. To supply the Internet address and subnet mask for the 4811 interface, do the following:

   a. Highlight the entry corresponding to the adapter you are configuring again.

   b. From the **Actions** pull-down, select **Configure . . .**

   c. When the **Configure LAN Card** dialog appears, enter an **Internet Address** and a **Subnet Mask,** and click **OK.**

   SAM configures the 4811 interface UP using the values you supplied. It also updates the `/etc/hosts` and `/etc/rc.config.d/netconf` files accordingly.

Verifying the Network Interface

If you want to verify the network interface, you can look at your `/etc/rc.config.d/netconf` file and/or use any of the following system utilities. If you find any problems, you can solve them by editing the `/etc/rc.config.d/netconf` and `/etc/hosts` files. For more detailed information, see your Hewlett-Packard system documentation.

- To verify the new file settings, look at your `/etc/rc.config.d/netconf` file. The entries for the first 4811 should be similar to the following example:

```
INTEFACE_NAME[1]=seah1
IP_ADDRESS[1]="111.222.33.12"
SUBNET_MASK[1]="255.255.255.0"
BROADCAST_ADDRESS[1]="111.222.33.255"
LANCONFIG_ARGS[1]=
```

  And the entries for the next board might look something like this:

```
INTEFACE_NAME[2]=seah2
IP_ADDRESS[2]="111.222.34.15"
SUBNET_MASK[2]="255.255.255.0"
BROADCAST_ADDRESS[2]="111.222.34.255"
LANCONFIG_ARGS[2]=
```

- To verify that the configuration is correct, you can use `lanscan` and `ifconfig` as follows:

  a. At the system prompt, enter:

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

  A list of devices appears.

  b. Look for the **seah** device followed by its instance number. For example, **seah1**.

  Use this information in the next step.

  c. Use the **ifconfig** command followed by the device number from the previous substep as follows:

  ```
  ifconfig seah1
  ```

  A message similar to the console output in Figure 4-4 appears:

```
seah1:
flags=63<UP,BROADCAST,NOTRAILERS,RUNNING>
   inet 111.222.33.12 netmask 255.255.255.0
broadcast 111.222.33.255
```

Figure 4-4. Sample *ifconfig* Output

The UP flag in Figure 4-4 means an IP address was successfully assigned to the adapter. Also, verify the console output for the IP address, netmask, and broadcast settings are what you expected for this adapter.

- To verify that there are no conflicting IP addresses, enter **`netstat -i`**

  Make sure that, for each interface, the information in the **Network** and **Address** columns is unique.

- To verify that the adapter can communicate with other hosts, use the **ping (1M)** command as follows:

  `ping` `<remote_host>`

  where *<remote host>* is the network name or the IP address of the endstation you wish to ping. For example, if you are pinging a station with an IP address of 111.222.33.130, the command would be:

  `ping 111.222.33.130`

  Figure 4-5 shows a sample console output:

```
64 bytes from 111.222.33.130: icmp_seq=1.
time=3 ms
64 bytes from 111.222.33.130: icmp_seq=2.
time=1 ms
64 bytes from 111.222.33.130: icmp_seq=3.
```

Figure 4-5. Sample *ping* Output

Notices and Support Information

SMT Support

This driver supports FDDI Station Management (SMT) versions 6.2 and 7.3:

- For SMT 6.2, use firmware FA00073 and FB00073
- For SMT 7.3, use firmware FA00074 and FB00074

Special Device Files

The install script creates a file **/sbin/init.d/seahawk** which in turn creates the necessary character special device files upon bootup of the machine. These files are necessary only to run the provided utilities, such as **fddimon**.

fddimon Utility 5

Overview

The **fddimon** utility is used to display the operating statistics 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 containing an adapter.

Note

There are two versions of the *fddimon* utility, one that supports SMT 6.23 and one that supports SMT 7.3. They are called *fddimon6* and *fddimon7*, respectively. Both are installed into the */user/bin* directory. For your convenience, you may wish to link the appropriate version to *fddimon*.

To begin monitoring the network, enter the following:

```
fddimon <device>
```

- For HP-UX 9.x <*device*> corresponds to **seah0** for the first adapter, **seah1** for the second adapter, and **seah2** for the third adapter.
- For HP-UX 10.x <*device*> corresponds to **seah1** for the first adapter, **seah2** for the second adapter, and **seah3** for the third adapter.

The 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. A sample opening screen for a single-attach adapter is displayed in Figure 5-1. The upper half of the Composite Data screen for a SAS and a DAS are identical. The lower half of the DAS screen has two PHY types instead of one, and the Menu (located at the bottom of the screen) is expanded to manipulate two ports instead of one. The lower half of a sample DAS screen is shown in Figure 5-2.

```
\:Poll Rate = 1000 MS     Composite Data
 StationID       : 0000 EE77 0430 ECM-IN     CFM-WRAP_S   RMT-RING_OP
 ManufactureData : XDI623-Interphase Corp.
 UserData        : E4811-Interphase Corp.

 SMT Version Op  : 0x0001     Hi: 0x0001     Lo: 0x0001

MAC:UpStreamNbr      DownStreamNbr :  OldUpStreamNbr OldDownStreamNbr
 1  0001 1B04 8207   0000 EEC1 7E8F : 0000 0000 0000 0000 0000 0000

 PHY: ConPol Cutoff Alarm ConState     RemoteType RemoteMAC    PCM  LER
   S  0000     7     8   ACTIVE           M          0      ACTIVE 15

  T-MAX Low  :    4.001ms            :       MAC Attribute Counts
  TVX Low    :    2.500ms Frame      :0x000005BD  Error      :0x00000000
  T-Req      :  165.002ms Copied     :0x00000229  Lost       :0x00000000
  T-Neg      :   41.943ms Transmit   :0x0000022E  TvxExpired :0x00000000
  T-Max      :  165.002ms Frame/sec  :0x00000000  NotCopied  :0x00000000
  TvxValue   :    2.500ms Token      :0x11E762FE  Late       :    0x0000
  T-Min      :    4.001   RingOp      0x00000001

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

Figure 5-1. Single-attach *fddimon* Screen

```
 PHY: ConPol Cutoff Alarm ConState     RemoteType RemoteMAC    PCM LER
   A  0000     7     8   ACTIVE           M          0      ACTIVE 15
   B  0000     7     8   ACTIVE           M          0      ACTIVE 15

  T-MAX Low  :    4.001ms             :       MAC Attribute Counts
  TVX Low    :    2.500ms F rame      :0x000005BD  Error      :0x00000000
  T-Req      :  165.002ms Copied      :0x00000229  Lost       :0x00000000
  T-Neg      :   41.943ms Transmit    :0x0000022E  TvxExpired :0x00000000
  T-Max      :  165.002ms Frame/sec   :0x00000000  NotCopied  :0x00000000
  TvxValue   :    2.500ms Token       :0x11E762FE  Late       :    0x0000
  T-Min      :    4.001   RingOp       0x00000001

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

Figure 5-2. Lower Half of Dual-Attach *fddimon* Screen

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 **fddimon** 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 normal state for a connected 4611 is WRAP_S. The primary path is wrapped to the S port.
- **RMT** indicates Ring Management (RMT) status information from the MAC and CFM. The ring operational (RING_OP) state is the normal state.
- **ManufactureData** indicates the manufacturer of the communication 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}.

Navigating the 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 **fddimon** utility, press **Esc**.

Menu Items

The remainder of this chapter contains supplemental information about the menu items. For more information relating to the meaning and interpretation of the parameters presented by **fddimon** refer to your SMT documentation.

- The Composite Menu [**1:Composit**]
  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 S Menu (for SAS only) [**5:Port-S**]
  This menu provides detailed information about the port of a single attach station. Some of the basic information is provided in the Composite Data screen.
- 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 *fddimon* screens is updated. To set the delay rate, enter the desired rate in seconds, and press **Enter**.

seahmon Utility 6

Using the *seahmon* Utility

The **seahmon** utility is used to collect operating statistics in real-time on the E/FDDI 4811 SeaHawk Adapter driver. It is most beneficial as a troubleshooting aid and works in the same manner for both HP-UX 9.x and HP-UX 10.x operating systems. To invoke the seahmon utility, enter the following command:

seahmon *<device>*

where *<device>* is the device number and instance number of the adapter. For example if you want to see the statistics for **seah1**, the command is

seahmon seah1

A sample console output is shown in Figure 6-1 on page 64.

When contacting Interphase customer service, be sure to have a copy of the console output at hand to assist the service personnel in diagnosing your problem.

```
Type Control-C to quit at any time.       Elapsed time:
0:01:29
Receive statistics:
Packets dropped by IP (rcv)                          56
Packets received by IP                          1534283
Packets dropped by ARP (rcv)                         0
Packets received by ARP                              49
Packets received by OSI                              0
Unknown protocol received (SNAP)                     0
Unknown protocol received                            0
Receive Overrun Interrupts                           0
LLC RX resets                                        0
Total Frames with Error Indications                  0
Frames with Overrun Indications                      0
Frames with Parity Error Indications                 0
Frames with E Flag set                               0
Frames with CRC error set (no errors ind)            0
Frame not copied count (SMT mib counter)             0
Frames dropped because first bit not set             0
Frames dropped because last bit not set              0
last bit not set (as above but different)            0
Partial packets due to lack of receive buffers       0
Receive deferred because DMA not complete            0
Receive buffers exhausted at fill time               12
No buffers allocated by fill routine                 32
Transmit statistics:
Frames dropped because seah_gather_mbufs failed      0
Frames dropped because xring is full                 0
Frames dropped bacause eisa_map failed               0
Total frames with error indications                  0
Transmit errors due to port error                    0
Transmit errors due to abort                         0
Transmit errors due to underrun                      0
Transmit errors due to parity errors                 0
```

Figure 6-1. Console Output for *seahmon* Utility

Troubleshooting and Diagnostics 7

Overview

This chapter provides possible solutions for common problems encountered while installing and operating the adapter. Table 7-1 on page 66 describes various symptoms and corrective actions for the 4811. Table 7-2 on page 69 describes symptoms and resulting actions that could occur executing the **update** software in the HP-UX 09.x operating system. Table 7-4 on page 74 describes the adapter's LEDs.

If the information in this chapter does not resolve the problem, contact Interphase Customer Service (see the Assistance page at the front of this users guide). Before calling, use the **seahmon** utility and have a copy of the adapter's statistics. See the section *Using the seahmon Utility* on page 63 for operating instructions.

Troubleshooting

Table 7-1. Symptoms and Actions

Symptom	Action
Card fails power-up test.	• Inspect the LEDs on the back of the adapter. A solid yellow LED (1) indicates a failure in the power-up diagnostics. A solid yellow LED (2) indicates power-up diagnostics succeeded. Reseat the adapter. • Try another EISA slot. • Swap adapter with another 4811, which is known to operate.

The adapter does not respond.	• Use the **`ifconfig`** command to check the existence and status of the device. For example:
	`ifconfig seah0`
	`seah0:flags=63<UP,BROADCAST, NOTRAILERS>`
	• Check `/etc/hosts` file.
	• Verify FDDI cable is properly connected at both ends.

The adapter cannot communicate with other hosts on the network.	• Use **fddimon**, 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.

Table 7-1. Symptoms and Actions (continued)

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 **fddimon** to see if you are communicating with your upstream and downstream neighbors on the ring. • Check the **arp** table with: **arp**(8C) **-a** • Use **netstat**(8C) **-r** to check routing tables. Refer to man page for expected output.
Cannot connect to ring.	• For DAS card users, check PHY A and PHY B to verify in appropriate port.
(HP-UX 9.x only) Running fddimon returns the error message: fddimon: I/O error	• Check **/etc/master** and **/etc/newconfig/master** for duplicate of the major device number for **seah0**. Assign a new unused major device number to **seah0** and rebuild the kernel. Use **mknod** to create a new **/dev/seah0** entry.
Other useful network commands (see man pages for more detailed information)	• **netstat**(8C) • lanscan (HP-UX 10.x only) • nettl • dmesg • nfsstat

Table 7-1. Symptoms and Actions (continued)

Symptom	Action
The ring state is unstable	• Use fddimon 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 db between transmitter and receiver pairs.

Troubleshooting the HP-UX 9.x Installation

Table 7-2. HP-UX 9.x Installation Troubleshooting

Symptom	Cause	Action
Updating from a local tape drive	Cannot verify the specified source. Change the source specified, or ensure the media is loaded and ready to read.	Take the following actions: 1. Have the media inserted in the drive and wait until the drive finishes the initialization process (the indicator says the drive is ready). 2. Ensure your source is correct: The default source is **/dev/update.src**. If your system does not have the default device file or if you are updating from a different source, you must specify the correct name of the source device's device file. 3. List the table of contents on the tape using **tar** utility: `tar tvf <device>`

Table 7-2. HP-UX 9.x Installation Troubleshooting (continued)

Symptom	Cause	Action
A customize script has failed.	Type **exit** to return to update.	Check **/tmp/update.log** and re-run the customize script as indicated.
Garbled display or odd behavior after the update.	No error message appears.	The **TERM** variable is probably set incorrectly.
Destination disk is almost full.	System message: 1. It is recommended you free **n** kbytes. 2, Loading the selected fileset would result in less free disk space.	Refer to *freeing up disk space* in the *Updating HP-UX* section of *Installing and Updating HP-UX 9.0*. Also see *Managing the File System* in the *System Administrator Tasks* manual.
Not enough disk space to complete the update.	System message: 1. You MUST free up n kbytes. 2. Loading the selected filesets is impossible due to insufficient space on one or more file systems.	Refer to *freeing up disk space* in the *Updating HP-UX* section of *Installing and Updating HP-UX 9.0*. Also see *Managing the File System* in the *System Administrator Tasks* manual.

Troubleshooting the HP-UX 10.x Installation

Table 7-3. HP-UX 10.x Installation Troubleshooting

Symptom	Cause	Action
Script failure with message about failed permissions on remote file. For example: `ERROR: Could not access remote file "/tmp/seah.o" in software item "Seahawk_Driver. SEAH-KRN,1" due to an internal error on the remote system.`	`swinstall` is attempting to access a local file as if it were on a remote system. Root cause unknown.	Work around this problem by disabling Ethernet. Remove the Ethernet connection and reboot. Install the driver, and then re-enable the Ethernet interface.
`sam` and `set-parms` do not configure unique hostnames.	Unknown.	Use **`set-parms`** ***`hostname`*** to choose the system name you want. Then manually edit the `/etc/hosts` and `/etc/rc.config.d/netconf` files to select unique host names and addresses.

Problems with the HP *nettl* Utility

In HP-UX 9.x systems, it is necessary to set the LANG environment variable prior to invoking the **nettl** utility as follows:

```
setenv LANG C
```

If the LANG variable is not set the **nettl** utility will report that the appropriate error message was not found in the catalog file.

Problems with UDP Transfers

If you have problems with UDP transfers (NFS traffic) in HP-UX 9.x, enable the UDP checksums on the host system. Log in as **root** and enter the following:

```
adb -w /hp-ux /dev/kmem
udpcksum/W 1
kudp_checksumming/W 2
^D (control-D to exit)
```

LED Diagnostics

The 4811 has built-in self-test diagnostics that are executed when the workstation probes the 4811 EISA 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. The configuration is the same for both single-attach and dual attach adapters Figure 7-1 shows the configuration of the LEDs. Table 7-4 contain the LED states for the SAS and DAS adapters.

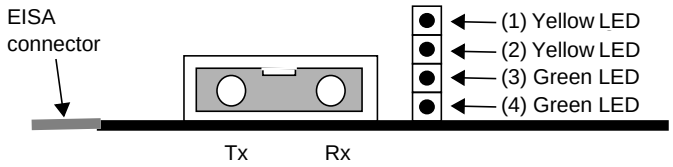


Figure 7-1. SAS LED Configuration

Table 7-4. LED States

LEDs by Color				Card States
Yellow (1)	Yellow (2)	Green (3)	Green (4)	
Off	Off	Off	Solid	Power to card
Solid	Off	Off	Solid	Power on Diagnostics
Off	Off	Solid	Solid	Passed Diagnostics
Off	Blink	Solid	Solid	CB Running
Off	Off	Blink	Solid	RC Running
Off	Solid	Blink	Solid	Ring Connect
Solid	Off	Off	Solid	Failure

Specifications A

E/FDDI Adapter

Timer Defaults

The default value of TVX .....2.5 milliseconds
The default for T_req .....165 milliseconds

Electrical Requirements

Power:
+5 V_{DC} 5% @ 3.5 Amps maximum
12V_{DC} ± 5% @ 0/034 Amps maximum
-12V_{DC} 10% @ 0.034 Amps maximum

Operating Environment

Temperature: .....0-55 degrees C
Relative Humidity .....10-95% non-condensing
Altitude.....15,000 feet max
Storage Temperature .....0 -125 degrees C

Storage Environment

Temperature: .....0 to 125 degrees C
Relative Humidity: .....10% to 95% non-condensing
Altitude: .....0 to 50,000 feet max

Mechanical

The adapter occupies a single EISA slot
Length: .....339mm (13.415 inches)
Width: .....107mm (5.00 inches)

Fiber & UTP Cabling

B

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

Fiber Optic Cable

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

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

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

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

Multimode - can transmit more than one light wave at a time, but cannot sustain a quality of service beyond 2 kilometers.

Table B-1. FDDI Fiber Optic Cabling

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

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

Fiber Optic Cable Maintenance

Fiber optic cable requires proper handling. Follow these basic guidelines in addition to 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.

Unshielded Twisted Pair (UTP) Cable

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

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

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

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

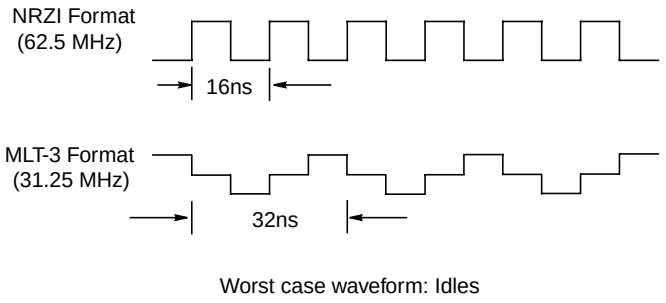


Figure B-1. MLT-3 Encoding

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

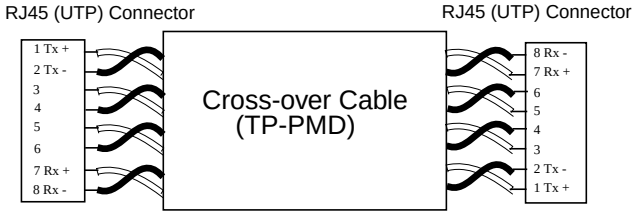


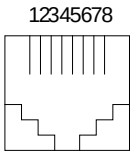
Figure B-2. Cross-over TP-PMD Cabling

Caution

For cross-over cabling to meet EMI specifications, the unused twisted pairs must be connected to the RJ-45 connectors as shown in Figure B-2.

Connector: RJ-45 8-pin modular style.

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



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

Figure B-3. RJ-45 Pin Assignments

UTP Cable Maintenance

- RJ45 modular jacks must be EIA/TIA 568A or 568B type. This will ensure compliance with ANSI/EIA/TIA-568 and EIA/TIA/TSB-40.
- Ensure the category 5 cable has 4-5 turns per inch and no portion of the cable has any untwisted lengths greater than 0.5 inches.
- It is a good practice to indicate the type of service at each wall jack and cross connect.
- Ensure modular jack pitch panels are category 5.
- Ensure patch cabling is category 5.
- Ensure that the appropriate cross-over cable between UTP ports is used. Use only one cross-over per link to UNK connection.
- All cables, punch-down blocks, patch panels, and wall plates **must be** Category 5.

Avoid the following when using UTP cabling.

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

Caution

Failure to follow the above cable length will increase the possible data error rate and degrade the throughput of the link.

Glossary

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

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

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

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

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

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

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

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.

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.

Byte Lane ◆ One of the four possible bytes that comprise the 32-bit data path on the EISA bus. Each byte lane corresponds to one of the four byte enable signals BE* <3:0>.

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

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

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

claim process ◆ 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.

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

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

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

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

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.

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

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

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

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

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

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

EISA (Extended Industry Standard Architecture) ◆ A superset of the 8-bit/16-bit ISA bus architecture. By extending the capabilities of the ISA standard, EISA provides full compatibility with the ISA standard.

EISA Bus ◆ Includes all of the features and facilities provided by the industry standard architecture (ISA) bus plus an additional connector for new signals.

EISA Master ◆ Can request contol of the bus, and assume complete control of all signals when it is granted the bus.

EISA Slave ◆ An EISA slave does not initiate bus cycles.

ELM (Elasticity Buffer and Link Management)

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.

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

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.

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

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

host ◆ Generally, any computer on a network.

Host 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.

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.

ISA (Industry Standard Architecture) ◆ A well-known architecture for the buses in personal computers such as those used in IBM PCs and compatibles.

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

KB ◆ Kilobytes. 1024 bytes.

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

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

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

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

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

Master ◆ A device that uses EISA control signals to perform bus operations independent of the host CPU.

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.

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.

OBS (Optical Bypass Switch)

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

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

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

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

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

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.

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

RC Running ◆ State where the RC firmware is present and available. Indicated by a flashing LED.

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.

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. This fiber can carry data much further than multimode.

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.

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.

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

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

TP-PMD (Twisted Pair—Physical Media Dependent) trace ◆ A diagnostic process to recover from a stuck-beacon condition. The fault is localized to the beaconing MAC and its upstream neighbor MAC.

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

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

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

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

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

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

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

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

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

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

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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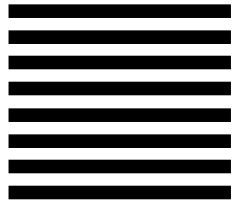

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