

5511
PCI FDDI Adapter
Users Guide

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Document No. UG05511-000, REVD

Print Date: February 1999

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Product Purchased from Reseller

Contact the reseller or distributor if

- You need ordering, service or any technical assistance.
- You received a damaged, incomplete or incorrect product.

Product Purchased Directly from Interphase Corporation

Contact Interphase Corporation directly for assistance with this, or any other Interphase Corporation product. Please have your purchase order and serial numbers ready.

Customer Service

United States: Telephone: (214) 654-5555
Fax: (214) 654-5500
E-Mail: intouch@iphase.com

Europe: Telephone: + 33 (0) 1 41 15 44 00
Fax: + 33 (0) 1 41 15 12 13

World Wide Web

<http://www.iphase.com>

Anonymous FTP Server

[ftp.iphase.com](ftp://www.iphase.com)

5511 FCC Part 15 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.

Tested to Comply with Canadian Standards

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

Interphase Fiber Products' Compliance

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



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

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

declares, that the product:

Product Name: PCI FDDI Fiber

Model Number: 5511F

conforms to the following Standards:

Safety: EN 60950:1988 + A1, A2
IEC 825 -1 & -2 1993

EMC: EN 55022:1988 class A
EN 50082-1 Part 1 1992

Supplementary Information:

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

Dallas, June 14, 1996



Mike Jobe, Quality Manager

European Contact:

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Phone: + 33 (0) 1 41 15 44 00; Fax: + 33 (0) 1 41 15 12 13

Declaration of Conformity

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

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**Manufacturer's Address and
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U.S.A.
214/654-5000

declares, that the product:

Product Name: PCI FDDI UTP

Model Number: 5511F

conforms to the following Standards:

Safety: EN 60950:1988 + A1, A2
IEC 825 -1 & -2 1993

EMC: EN 55022:1988 class A
EN 50082-1 Part 1 1992

Supplementary Information:

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Dallas, October 15, 1996



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U.S.A.
214/654-5000

declares, that the product:

Product Name: PCI FDDI UTP DAS

Model Number: 5511-2-B

conforms to the following Standards:

Safety: EN 60950:1988 + A1, A2
IEC 825 -1 & -2 1993

EMC: EN 55022:1988 class A
EN 50082-1 Part 1 1992

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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: PCI FDDI Fiber DAS

Model Number: 5511-2-B

conforms to the following Standards:

Safety: EN 60950:1988 + A1, A2
IEC 825 -1 & -2 1993

EMC: EN 55022:1988 class A
EN 50082-1 Part 1 1992

Supplementary Information:

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

Dallas, June 17, 1997



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Using This Guide

Audience

This manual assumes that its audience has a general understanding of computing and networking terminology. If you need more information about this terminology (in addition to what this manual provides), see the following web sites:

- FDDI and other networking tutorials:
<http://www.iol.unh.edu/>
- Networking glossary:
<http://www.ctcnet.com/tips/glossary.htm>
- Computing dictionary:
<http://wfn-shop.Princeton.EDU/foldoc/>

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.

Overview

The 5511 adapter is a single-slot short card for PCI-based personal computers, servers, and workstations on FDDI networks. 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 host software driver, the 5511 adapter can be integrated beneath a variety of network protocols: TCP/IP, OSI, IPX, or any other protocol supported by the underlying driver.

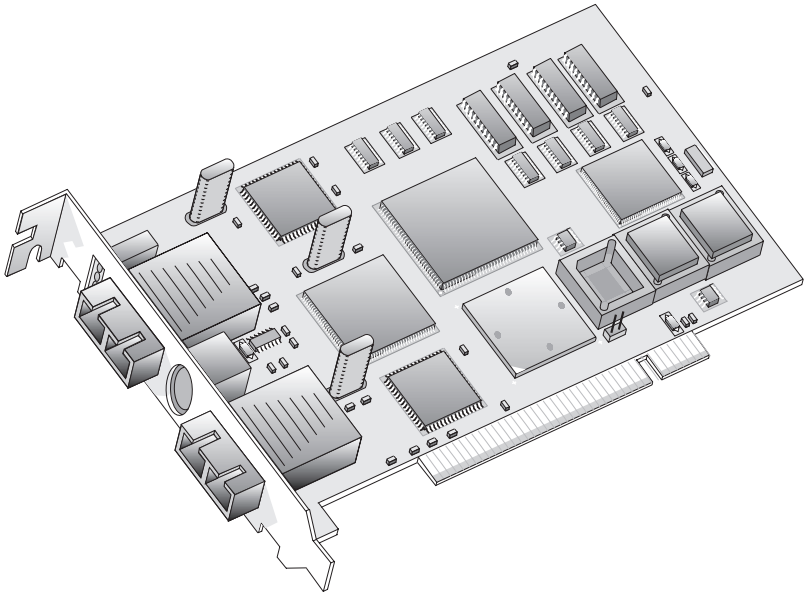


Figure 1-1. 5511 Dual Attachment Adapter

The 5511 supports both Single Attach Station (SAS) and Dual Attach Station (DAS) connectivity. The Single Attach version allows the host system to connect to the ring through a concentrator. Workstations and servers connecting directly to the ring require the use of a Dual Attach 5511 adapter. All adapters offer 100 Mbps FDDI network connectivity with on-board SMT processing, as well as support for either Optical Fiber or Twisted Pair physical media.

Product Features

- Compliant with *PCI Local Bus Specification Revision 2.1*
- 32-bit, zero wait state PCI DMA master @ 33 MHz
- Supports optical fiber or UTP media
- Supports Dual Attachment and Single Attachment
- Motorola MC68840 FDDI chipset
- Software-controllable optical bypass switch
- 256-byte Receive FIFO and 128-byte Transmit FIFO for DMA master operation
- DMA master capable of burst sizes of 8, 16, 32, 64, or 128 bytes with zero wait states, achieving transfer rates of up to 132 MBps
- Master has software configurable support for MRM, MRL, MWI, and DAC bus cycles for efficient use of cache lines
- Optional 64 KB PCI Expansion ROM (implemented using flash memory)
- Onboard CPU offloads FDDI Station Management (SMT) processing from the host processor
- 256 KB flash memory for firmware
- 128 KB onboard buffer SRAM

- Status LEDs
- Universal PCI interface that allows the adapter to operate in either 5.0 V or 3.3 V PCI signalling environments
- Drivers support multiple 5511s (the maximum number is limited only by the available system resources, such as memory and bus bandwidth).

Minimum System Requirements

Minimum system requirements to operate this adapter are as follows:

HP-UX 10.20



NOTE

If you are not sure of the version of the operating system installed on the end station, enter `uname -a`

- Host machine: HP 9000 (700 Series or 800 Series) with installed PCI bus
- Approximately 1 MB 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 5511, you need an FDDI concentrator to connect your station to the ring. (A dual-attach adapter can connect directly to the dual ring or to an FDDI concentrator.)

Windows NT 4.0

- An Intel x86, Pentium, or PowerPC system on the Microsoft Windows NT hardware compatibility list
- One PCI I/O interface slot
- 16 MB total system memory
- A 3.5-inch diskette drive or a CD-ROM drive

NetWare 3.12 or 4.10 or later

- Intel x86 CPU file server running Novell NetWare version 3.12 or 4.10 or later
- One PCI I/O interface slot
- A 3.5-inch diskette drive or a CD-ROM drive
- 2 MB of free space on the hard disk
- System memory
 - 20 MB minimum
 - up to 32 MB with multiple clients and servers enabled
- TCP/IP interface (if applicable)
 - IP address for each enabled client
 - IP mask

AIX Version 4.x or Apple AIX Version 4.1.4.1 or later

- An RS6000-PowerPC system
- One PCI I/O interface slot
- 16 MB total system memory
- A 3.5-inch diskette drive

Overview

You can install your adapter in any PCI expansion slot that supports DMA functionality. The basic steps for installing the adapter are:

1. Verify that the system meets minimum requirements.
2. Review safety precautions.
3. Inspect the adapter.
4. Install the adapter in a host expansion slot.
5. Connect the adapter to the network.

Verifying Minimum Requirements

Before installing this adapter, verify that your system meets the minimum requirements described in *Minimum System Requirements* on page 3.

Understanding 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.

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're 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. If your adapter is a fiber adapter, do not remove the connector cap(s) until you're ready to install the adapter.

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.

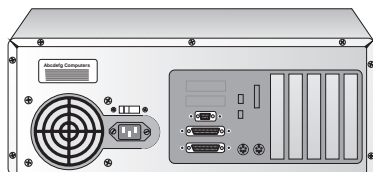
Installing the Adapter



NOTE

The 5511 is a plug-and-play device with systems that comply with the PCI Local Bus Revision 2.1 specification. Non-compliant systems might require manual configuration via a PCI Device Configuration menu in the BIOS. See your host system's documentation for PCI Device Configuration information.

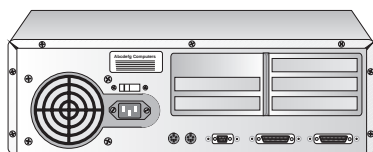
The backplane of your PCI-based computer probably looks similar to one of the following backplanes:



Desktop PC



Tower PC



Mini-Desktop PC

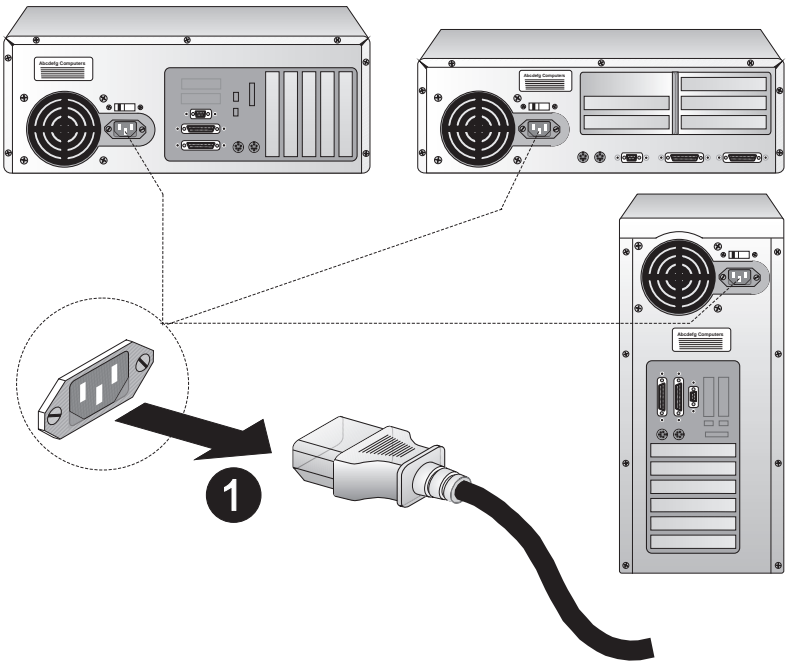


WARNING

Your computer operates at voltages that can be lethal. Follow all cautions and warnings in this installation procedure, both to protect yourself and prevent damage to your computer. Use only tools with nonconductive handles, or tools coated with, covered with, or constructed of nonconductive materials. Nonconductive materials are materials that do not conduct electric current, such as plastic, rubber, and fiberglass.

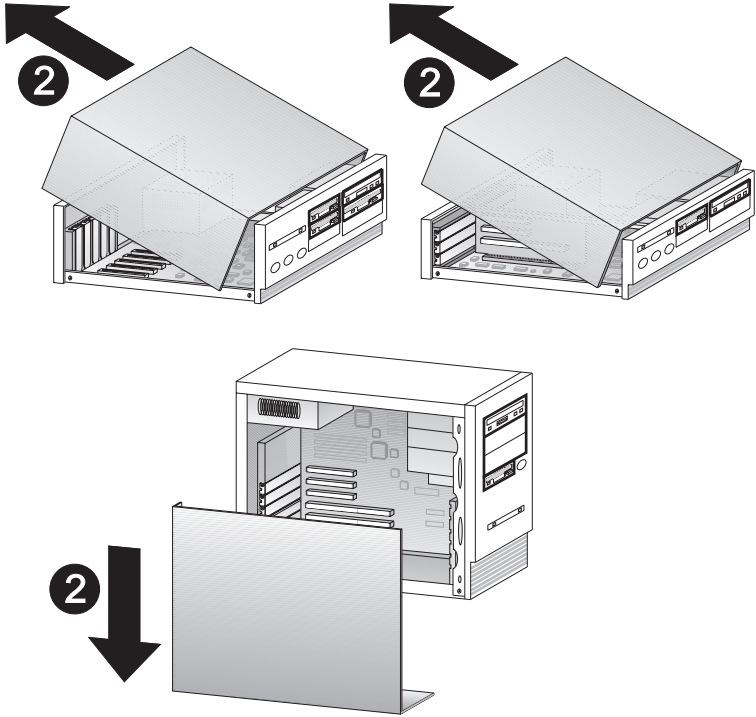
With a grounding strap connected to your wrist or ankle, do the following to install the adapter:

1. Turn off the computer's power switch, and unplug the unit from its power source.

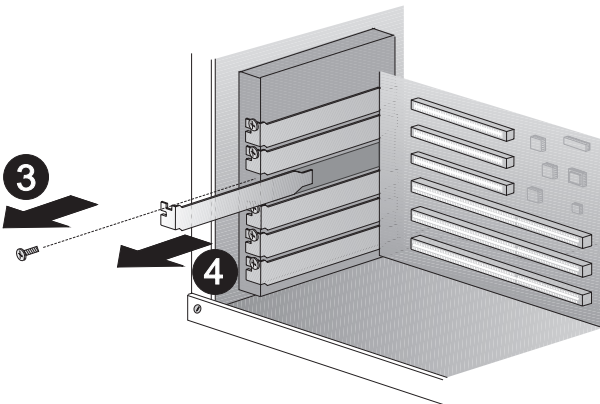
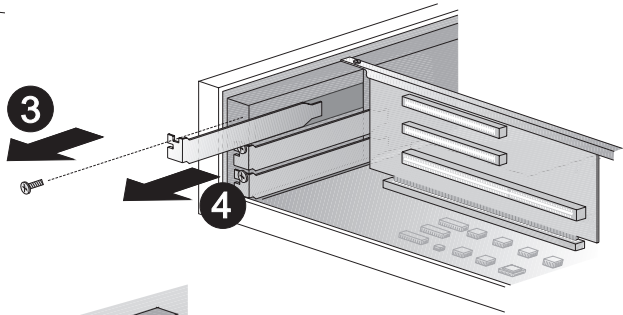
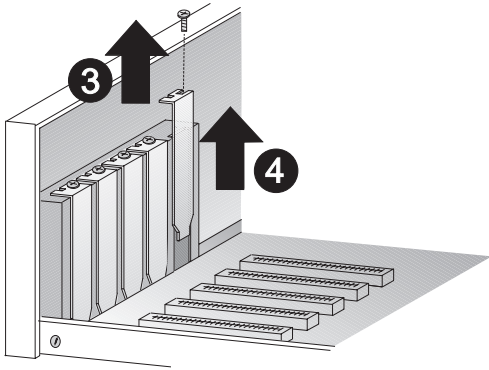


- 2. Disconnect all cables connected to the main system unit, and remove the computer's cover.

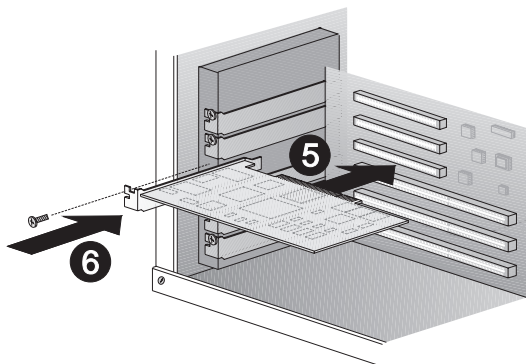
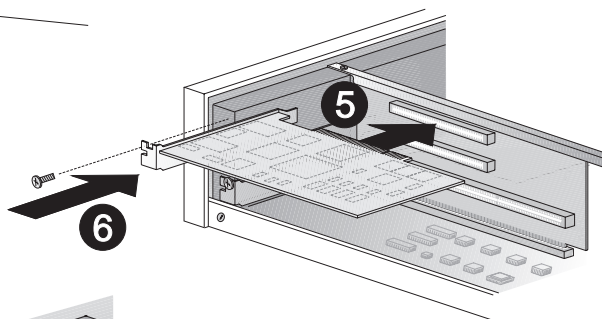
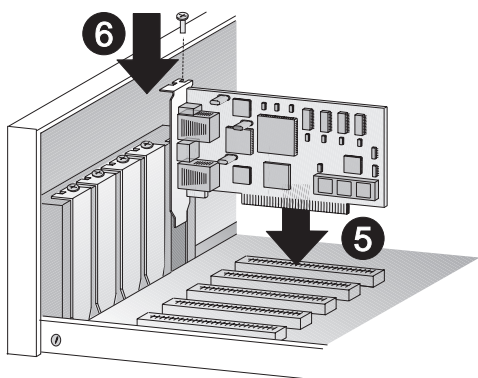
The following illustration shows typical cover designs for desktop, mini-desktop, and tower PCs. See your computer's users manual for detailed instructions.



3. Locate a suitable PCI expansion slot; then remove the screw that attaches the expansion plate to the computer. Save the screw for step 6.
4. Remove the expansion plate.



5. Position the adapter in the PCI expansion slot. Align the adapter's connector pins with the slot's receptacle; then press gently but firmly on the board to seat it in the slot.
6. Attach the adapter with the screw removed in step 3.



7. Take note of the slot position. You might need the slot number when installing the software.

Connecting the Adapter to the Network

With the adapter installed as discussed in the previous section, you are now ready to connect the adapter to the network. The following table identifies the cables and connectors required for the adapter:

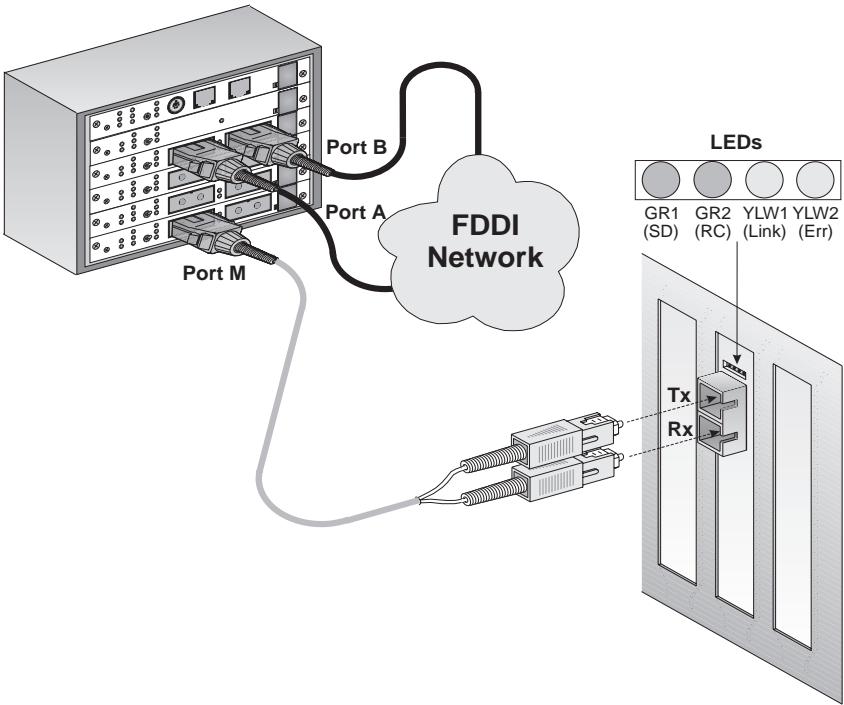
Connector	Medium	Configuration
SC Duplex	Single-mode fiber (SAS or DAS)	8.5/125 micron
	Multimode fiber (SAS or DAS)	62.5/125 micron
RJ-45	Cat 5 copper (SAS or DAS)	Unshielded twisted pair (UTP)

To connect the adapter to the network, do the following:

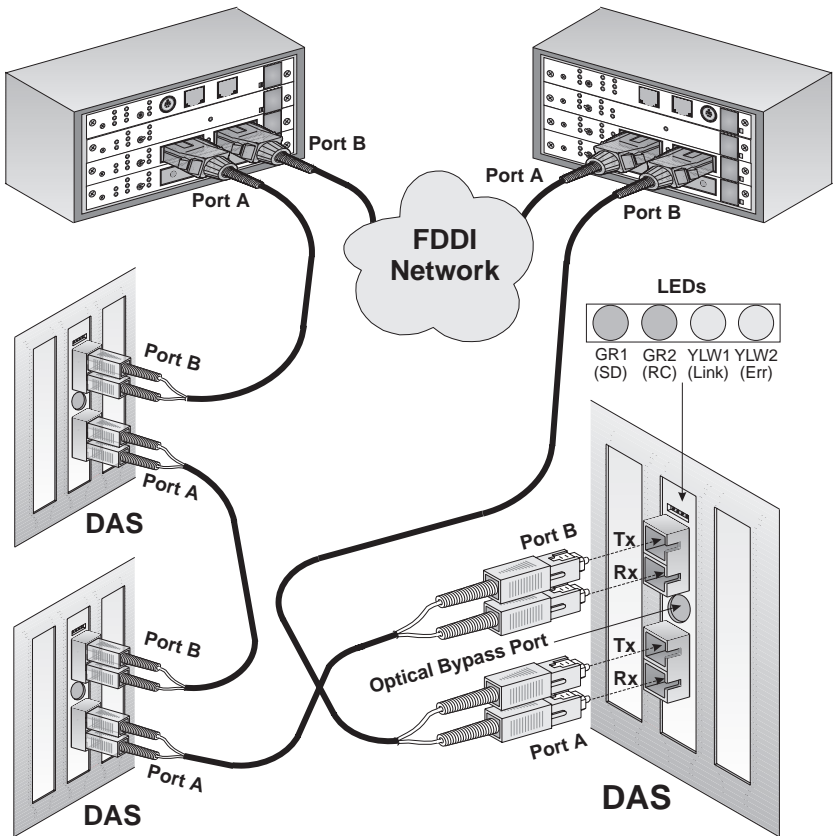
1. Attach the appropriate SC-duplex or RJ-45 network connector to your adapter.

The SC-duplex and RJ-45 SAS and DAS connections are shown in the following illustrations.

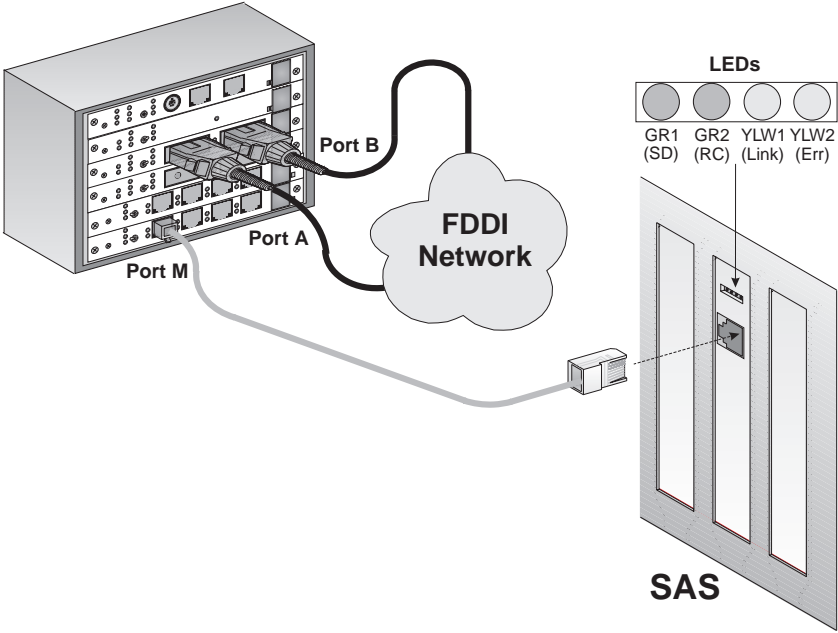
For the SC Duplex fiber SAS connection, connect the cable to the adapter and to any free master (M) port on the concentrator, or to any A, B, or M port on another adapter.



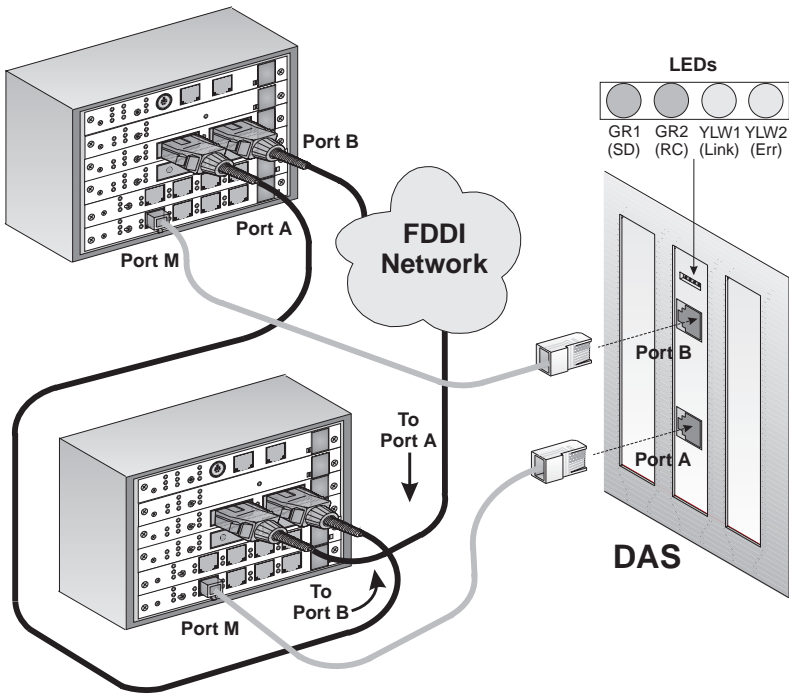
For the SC Duplex fiber DAS connection, connect your cables to the appropriate ports on both the adapter and the device(s) you are connecting to. A common configuration is to connect the A and B ports on adapters and concentrators in a ring, as shown in the following illustration. (The concentrator has one set of A and B ports, for fiber connections only.) You can also connect one port on an adapter to an M port on a concentrator.



For the RJ-45 copper SAS connection, connect the cable to the adapter and to any free master (M) port on a concentrator, or to any A, B, or M port on another adapter.



For each RJ-45 copper DAS connection, connect the cable to the appropriate A or B port on the adapter and to a free M port on the concentrator. (You connect the adapter to only one M port on a single concentrator.) A common configuration is to connect the adapter's A and B ports to M ports on two separate concentrators in a dual-homed configuration. You can also connect one port on an adapter to an M port on a concentrator



2. Reconnect the power cable and turn on the computer.
3. If your adapter has LEDs, check them to verify that the adapter is operating correctly. For more information about LEDs, see *Adapter LED Diagnostics* on page 66.

Next, install the appropriate adapter driver for your system.

Installing the HP-UX 10.20 Driver

3

Overview

This chapter describes the procedures for installing your adapter's driver on HP-UX 10.20 systems. You can use this driver on multiprocessor systems. The driver supports FDDI Station Management (SMT) versions 6.2 and 7.3.

The basic steps for installing the driver are:

1. Verify that your system meets minimum requirements.
2. Gather IP address information.
3. Install the driver.
4. Configure the network interface.
5. Verify the network interface.



NOTE

The procedures in this chapter assume the adapter is already installed in the end station. If it is not, you need to install the adapter before installing this driver (for instructions, see *Installing Hardware* on page 7).

If you are not thoroughly familiar with FDDI networking, see *Introduction to FDDI* on page 73.

Verifying Minimum Requirements

If you haven't already done so, verify that your system meets the minimum requirements described in *Minimum System Requirements* on page 3.

Gathering IP Address Information

So that you can specify a TCP/IP address when you configure the driver, gather the following information:

- An assigned **IP Address** for the adapter
- A **Subnet Mask**

If you don't have this information, you can get it from your network administrator.

Installing the Driver



NOTE

Use *swremove* to remove any previous versions of this driver before installing the current version. See your HP-UX documentation for information about adding and removing drivers from a kernel.

There are two types of distribution media for the HP-UX 10.20 driver: CD-ROM and DDS tape.

Do one of the following:

- If you are installing the driver from DDS tape, skip to *Installing the Driver from DDS Tape* on page 24.
- If you are installing the driver from CD-ROM, continue to the next section.

Installing the Driver from CD-ROM

The driver files on the CD-ROM are in ISO 9660 format. To install the driver, do the following:

1. With the end station up and running, log in as **root**
2. Insert the installation CD-ROM in the appropriate drive and mount it to a temporary location using the HP System Administrator Manager (SAM) or the `mount` command.

For example: `mount /dev/dsk/c1t2d0 /cdrom`



NOTE

This procedure refers to the mount point as `/cdrom`

3. At the prompt, enter `/usr/sbin/swinstall`
The Source Depot Path defaults to `/var/spool/sw`.
4. If a pop-up appears informing you that the Depot Path is invalid, click **OK**.
The Specify Source dialog appears.
5. Set Source Depot Type to **Local CDROM**.
6. Select **OK**.

The SD Install—Software Selection dialog appears, listing the contents of the CD (Interphase 5511 PCI FDDI Driver).

Skip to *Sample swinstall Installation* on page 25 to continue the driver installation.

Installing the Driver from DDS Tape

To install the driver from DDS tape, do the following:

1. With the end station up and running, log in as `root`
2. Insert the installation DDS tape in the appropriate drive.
3. At the prompt, enter `/usr/sbin/swinstall`
The Source Depot Path defaults to `/var/spool/sw`.
4. If a pop-up appears informing you that the Depot Path is invalid, click **OK**.
The Specify Source dialog appears.
5. Set Source Depot Type to **Local Tape**.
6. Change Source Depot Path... to point to your tape drive (for example, `/dev/rmt/0m`).
7. Select **OK**.

The SD Install—Software Selection dialog appears, listing the contents of the tape (Interphase 5511 PCI FDDI Driver).

Continue with the instructions in the next section.

Sample *swinstall* Installation

This section is a continuation from either of the previous sections, *Installing the Driver from CD-ROM* or *Installing the Driver from DDS Tape*. If you experience any problems during the installation, look at the logfile and take appropriate corrective action.

To continue the installation, do the following:

1. Highlight the driver fileset(s) you want to install.
2. From the **Actions** pull-down, select **Mark for Install**.
3. From the **Actions** pull-down, select **Install (analysis)...**
4. When the analysis completes successfully (Status is Ready), select **OK**.
5. When the confirmation prompt appears, select **Yes**.
6. When the next confirmation prompt appears, select **Yes**.



NOTE

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

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

Continue to the next section to configure the adapter's network interface.

Configuring the Network Interface

Before the adapter can communicate with other hosts on the network, its interface must be configured. This section explains how to use the HP System Administration Manager (SAM) 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 explained in the previous section, do the following:

1. To invoke SAM, at the HP-UX prompt, enter
`/usr/sbin/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 new interface, do the following:
 - a. Highlight the line that describes your adapter and has 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 new 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 new interface, do the following:
 - a. Highlight the entry corresponding to the adapter you are configuring.
 - 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 new 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.

Verifying New File Settings

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

```
INTERFACE_NAME[1]=if11
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 adapter should be similar to the following:

```
INTERFACE_NAME[2]=ifi2
IP_ADDRESS[2]="111.222.34.15"
SUBNET_MASK[2]="255.255.255.0"
BROADCAST_ADDRESS[2]="111.222.34.255"
LANCONFIG_ARGS[2]=
```

Verifying Correct Configuration

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

1. At the system prompt, enter `/usr/sbin/lanscan`
A list of devices appears.
2. Locate the **ifi** or **ife** device followed by its instance number (for example, **ifi1**).
3. Enter the `ifconfig` command followed by the device number you located. For example,
`ifconfig ifi1`

Console output similar to the following appears:

```
ifi1: flags=63<UP,BROADCAST,NOTRAILERS,RUNNING>
      inet 111.222.33.12 netmask 255.255.255.0 broadcast
      111.222.33.255
```

Figure 3-1. Sample *ifconfig* Output

Verifying Unique IP Address

The UP flag in the first line means that you successfully assigned an IP address to the adapter. Verify that the console output for the IP address, netmask, and broadcast settings are correct 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. If it is not, assign unique hostnames in `/etc/hosts`.

Verifying Communications Ability

To verify that the adapter can communicate with other hosts, use the `ping (1M)` command. Enter

```
ping <remote_host>
```

where `<remote host>` is the network name or the IP address of the currently running and network-attached end station you want to ping.

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

```
ping 111.222.33.130
```

Following is sample console output for this command:

```
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

Installing the Windows NT Driver

4

Overview

This chapter describes the procedures for installing your adapter's driver on Microsoft Windows NT 4.0 workstations. This driver can be installed as part of the Custom setup procedure or from the Windows NT environment.

This driver supports FDDI Station Management (SMT) versions 6.2 and 7.3. It is an NDIS adapter driver, and is therefore designed to operate transparently beneath the operating system protocol stack. For additional instructions on installing and configuring network adapters with this operating system, see your *Microsoft Windows NT System Guide*.

The basic installation steps for installing the driver are:

1. Verify that your system meets minimum requirements.
2. Gather IP address information.
3. Install the driver.
4. Configure network protocols.
5. Install the FDDI SMT 7.3 Monitor and the Driver Statistics Monitor utilities

This chapter also explains how to remove the driver, if needed.

If *Read Me First* documentation is in your installation kit, review it before installing the driver. It may contain changes and updates made to this users guide after the print date. Also, check for a README file in the `x86_winNT` directory or the `PPC_WinNt` directory of the installation CD-ROM.

In addition, if you are not thoroughly familiar with FDDI networking, see *FDDI Technology Overview* on page 73.

Verifying Minimum Requirements

If you haven't already done so, verify that your system meets the minimum requirements described in *Minimum System Requirements* on page 3.

Gathering IP Address Information

Before you begin, decide which of the following IP address options you want to use for this adapter:

- Obtain an IP address from a DHCP server
- Specify an IP address

If you plan to specify an IP address, gather the following information:

- An assigned IP Address for the adapter
- A Subnet Mask
- A Default Gateway IP address (optional)

If you don't have this information, you can get it from your network administrator.

Installing the Driver

Before you start, make sure the adapter is installed in your machine, and that you are logged on with administrator rights to the Windows NT 4.0 system.

To install the Windows NT driver, do the following:

1. From the **Start** menu, select **Settings**, and then select **Control Panel**.
2. Double-click the **Network** icon, and then select the **Adapters** tab to display the Adapters dialog:

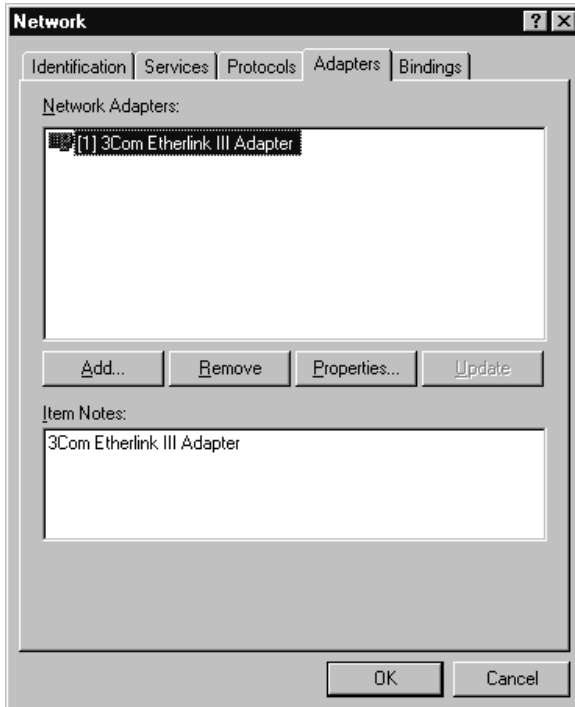


Figure 4-1. Adapters Dialog

3. Click Add.

The system creates a driver list in the Select Network Adapter dialog.

4. Click Have Disk.

5. When the Insert Disk dialog appears, insert the diskette or CD-ROM containing the Windows NT driver software. Then enter the correct path to the drive (if needed), and click **OK**.

6. When the Select OEM Option dialog appears, select **Interphase Ip5511 PCI FDDI Adapter**, and click **OK**.

A status message appears while the driver is being copied to your hard drive. When the copying is complete (100%), the Adapters dialog reappears, with the Interphase Ip5511 driver listed.

7. Click Close.

After the system updates bindings, the IP Address dialog appears.

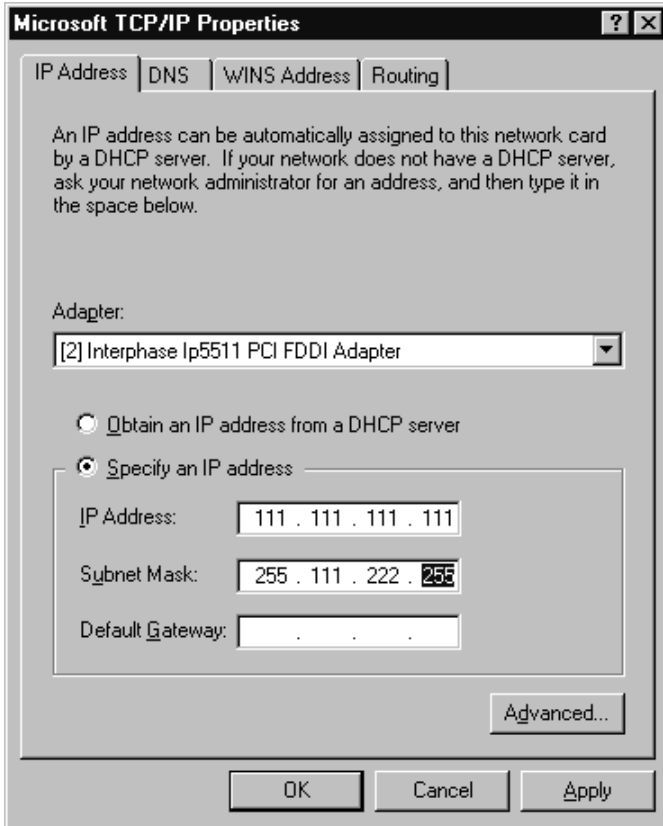


Figure 4-2. TCP/IP Dialog

8. Do the following:
 - a. In the Adapter list box, make sure the **Interphase Ip5511 PCI FDDI Adapter** is selected.
 - b. Select one of the IP address options.
 - c. If you select **Specify an IP address**, supply an assigned **IP Address** and a **Subnet Mask**.

The IP address is the Internet address for your host machine. The format is decimal notation in the form *xxx.xxx.xxx.xxx*, where *xxx* ranges from 0 to 254.

The subnet mask is used to partition the IP address into subnets at the local company level.

- d. If you are specifying an IP address, and your local network has a gateway to other networks, supply your network's **Default Gateway** address to enable the host machine to communicate with machines on the other side.
 - e. When TCP/IP configuration is complete, click **OK**. The NetWork Settings Change pop-up appears, explaining that you must restart your computer for the new settings to take effect.
9. Remove the installation diskette and click **Yes** to restart your computer.

Removing the Driver

To remove this driver, do the following:

1. Be sure you are logged on with administrator rights to the Windows NT 4.0 system.
2. From the **Start** menu, select **Settings**, and then **Control Panel**. Then double-click the **Network** icon, and select the **Adapters** tab to display the Adapters dialog.
3. Select **Interphase Ip5511 PCI FDDI Adapter** and click **Remove**.
4. When you are prompted to confirm removal of the driver, click **Yes**.

5. When the Adapters dialog reappears, click **Close**.

After the system adjusts the bindings to exclude the 5511 adapter, the Network Settings Change pop-up appears, explaining that you must restart your computer for the new settings to take effect.

6. Click **Yes** to restart your computer.

5511 Monitoring Utilities

Two monitoring utilities are supplied on the installation diskette or CD-ROM in the `\tools` directory. These utilities are the FDDI SMT 7.3 Monitor (the `fddimon73.exe` file) and the Driver Statistics Monitor (the `drvmon.exe` file). The `\tools` directory also includes the library file `ntlcs.dll`, which is required to run both of these utilities.

Both utilities can display statistics for multiple instances of 5511 boards in a single system.

The FDDI SMT 7.3 Monitor works on adapters with SMT 7.3. It does not support SMT 6.2. This utility provides the following host station information:

- Station ID (MAC address)
- Neighboring stations
- Ring configuration
- Number of frames received/transmitted
- Configuration data for MAC, PHY ports (A, B or S), and PATHS

The Driver Statistics Monitor utility displays the following adapter information:

- Number of total packets received and transmitted

- Classification of packets as multicast, loopback, broadcast, or other classes
- Error statistics for CRC, underrun, overrun, parity, and other errors
- Number of packets dropped due to lack of buffers
- Number of interrupts

Installing the Monitoring Utilities

To install the FDDI SMT 7.3 Monitor and/or the Driver Statistics Monitor, do the following:

1. Open the Windows NT Explorer.
2. Copy the utility and library files to the desired location using either of the following methods:
 - Copy the `\tools` folder
 - Copy the individual `fddimon73.exe` and/or `drvmon.exe` file, along with the required `ntlcs.dll` file

Using the Monitoring Utilities

To start the appropriate monitoring utility, double-click the utility filename in the Windows NT Explorer.

- Double-click `fddimon73.exe` to start the SMT 7.3 Monitor.
- Double-click `drvmon.exe` to start the Driver Statistics Monitor.

To use utility features, press the numeric keys and spacebar. Information about the keyboard commands appears at the bottom of the screen.

To exit the utility, press the **Escape** key or the character **0** (zero) key.

Installing the NetWare Driver

5

Overview

This chapter describes the procedures for installing your adapter's driver on file servers running Novell NetWare.

The basic steps for installing the driver are:

1. Verify that your system meets minimum requirements.
2. Gather IP address information.
3. Install the driver.
4. Configure network protocols and parameters.

This chapter also explains how to remove the driver, if needed.

If any *Read Me First* documentation is in your installation kit, read it before installing the driver. It contains any changes and updates to this users guide since the printing date. Also, check for a `README` file in the `NetWare` directory on the installation CD-ROM.

In addition, if you are not thoroughly familiar with FDDI networking, see *FDDI Technology Overview* on page 73.

Verifying Minimum Requirements

If you haven't already done so, verify that your system meets the minimum requirements described in *Minimum System Requirements* on page 3.

Gathering IP Address Information

Before you begin, decide which of the following Protocol options (if either) to use for this adapter:

- AppleTalk
- TCP/IP

If you plan to use a TCP/IP address, gather the following information:

- An assigned IP Address for the adapter
- A Subnet Mask

If you don't have this information, you can get it from your network administrator.

Installing the Driver

The driver can be installed prior to installing the adapter(s). Where feasible, however, it is recommended that you install the adapter(s) first.



CAUTION

If an earlier version of an Interphase PCI ATM adapter driver is installed on the server, remove it before proceeding with the new driver. See *Removing the Driver* on page 47 for instructions.

To install the driver, do the following:

1. With the file server up and running, enter `load install`

2. When the Installation Options dialog appears, select **Driver Options**, and then select **Configure network drivers**.
3. In the Additional Driver Actions dialog, select **Select a driver**.

The Select a Driver dialog appears. If this is your first installation of the driver, it is not listed.
4. If the driver you want to install does not appear, press **Insert**.

A dialog informs you that the default path `a:\` will be scanned for drivers to install, and prompts you to insert the appropriate diskette or CD-ROM.
5. Insert the Interphase installation diskette or CD-ROM.

NetWare 4.x drivers are located in the default `a:\` path.
6. If you need to install a driver for a different NetWare version, press **F3** and change the path to
`<drv>:\<NetWare version>`
(where `<drv>` is the drive letter of the diskette or CD-ROM and `<NetWare version>` is the NetWare Version directory).
7. Press **Enter** to accept the default or changed driver path.

The following dialog appears, listing drivers in the specified path:

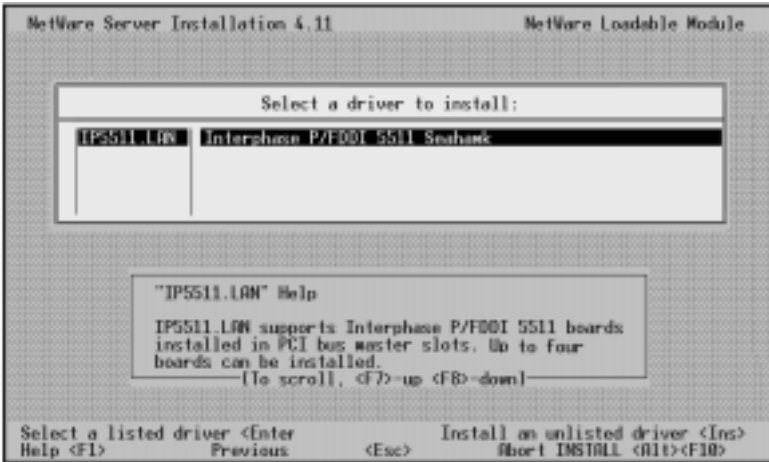


Figure 5-1. Selecting a Driver

8. Select **Ip5511.LAN**.
9. When prompted, confirm the driver name and select **Yes** to copy the driver files to the NetWare server.

Configuring Protocols and Parameters

After the driver files are copied to the NetWare server, as instructed in the previous section, the following dialog appears:



Figure 5-2. Protocols/Parameters ~Configuration

The driver name, located in the box titles, contains the increment of the client being configured. For example, if this is the second installation of the driver, the name in the box titles reads IP5511_2 for Client 2.

To configure the network protocols and parameters:

1. Select **Select/Modify driver parameters and protocols** at the bottom of the dialog.
 - TCP/IP in the Protocols box is highlighted.
2. If you need to add TCP/IP or AppleTalk, do the following:
 - a. Select the protocol you want to enable.

If you select the TCP/IP option, a dialog appears for entering the IP interface.

IP Address: The Internet address for the client is entered in decimal notation of the form *xxx.xxx.xxx.xxx*, where *xxx* ranges from 0 to 254.

IP Mask: The most commonly used mask is *ff.ff.ff.0* (hex) or *255.255.255.0* (decimal notation).

- b.** Press **F10** to save and exit the TCP/IP dialog.
- 3.** Use the arrow keys to highlight **Slot Number** in the Parameters box, and enter the number of the slot where the adapter is installed.
- 4.** If you want to specify a MAC address different from the hardware-specified MAC address, highlight **Node Address** and enter the address number.



CAUTION

To prevent problems with duplicate MAC addresses, it is recommended that the node address not be changed.

- 5.** After you finish configuring protocols and parameters, press **Esc** to move the highlight to the bottom box and select **Save parameters and load driver**.
A dialog appears containing a random network number for binding the IPX protocol to the driver.
- 6.** Press **Enter** to accept the binding number.
After the binding number is accepted, a prompt appears for selecting an additional network driver. The maximum is four adapters.

7. If you do *not* want to load the driver for another adapter, select **No** to complete the installation.
If you *do* want to load the driver for another adapter:
 - a. Select **Yes**. The dialog shown in *Selecting a Driver* on page 44 reappears. This time the driver is obtained from your hard disk.
 - b. Select the same driver you installed for the first adapter. Then repeat the configuration procedures beginning with step **1** on page 45.
8. When the Selected Network Drivers window informs you that the IP5511 driver is loaded, exit the NetWare `install` utility and reboot the server.

Removing the Driver

To remove the driver, do the following:

1. At the system prompt, enter **load install**
2. When the Installation Options dialog appears, select **Driver Options**, then select **Configure Network Drivers**.
3. Select **Unload a selected driver**.
4. Select the driver to remove.
5. Exit the NetWare `install` utility and reboot the server.



NOTE

Do not attempt to reinstall the drivers before rebooting the NetWare server.

Installing the AIX Driver and Diagnostics

6

Overview

This chapter describes the procedures for installing your adapter's driver for AIX systems. It also explains how to use the AIX diagnostics utility.

The basic steps for installing the driver are:

1. Verify that your system meets minimum requirements.
2. Gather configuration information.
3. Check file prerequisites.
4. Install the driver.
5. Configure the FDDI network interface.

This chapter also explains how to use the 5511 AIX Diagnostics utility.



NOTE

The installation and configuration procedures in this chapter assume you are working in a graphical environment; some details differ in an ASCII environment.

To install this driver in an ASCII environment, use the command `smitty devinst`

To configure your adapter in an ASCII environment, use the command `smitty tcpip`



NOTE

You must be logged in as `root` in order to complete the installation procedures in this chapter.

Verifying Minimum Requirements

If you haven't already done so, verify that your system meets the minimum requirements described in *Minimum System Requirements* on page 3.

Gathering Configuration Information

It's a good idea to gather the information you'll need to configure your adapter(s) before you start. If you have configured your adapter(s) previously and are reinstalling this driver, note the following information in case you need to reconfigure your adapter(s):

- Hostname
- Internet address
- Network mask
- Domain name (optional)
- Domain name server's IP address (optional)
- Default gateway (optional)

If you don't have this information, you can get it from your network administrator.

Checking File Prerequisites

For the driver to operate properly, common FDDI software must be installed on your system. For the AIX diagnostics utility to work properly, hardware diagnostics must be installed on your system.

Make sure that the prerequisite fileset(s) are installed as follows:

Application	Prerequisite Fileset
5511 AIX driver	<code>devices.mca.8ef4.com</code> (common FDDI software)
5511 AIX diagnostics utility	<code>bos.diag.rte</code> (hardware diagnostics)

Check to see if these filesets are installed as follows:

- To check for the driver prerequisite, enter `lslpp -l devices.mca.8ef4.com`
- To check for the diagnostics utility prerequisite, enter `lslpp -l bos.diag.rte`

If a message appears indicating that the fileset you're checking for is not installed, do the following:

- To install the driver prerequisite, continue to the next section, *Installing Common FDDI Software*.
- To install the AIX diagnostics prerequisite, skip to *Installing Hardware Diagnostics* on page 53.

When the prerequisite fileset(s) are installed, continue with *Installing the Driver* on page 53.

Installing Common FDDI Software

To install the Common FDDI Software package, do the following:

1. Insert your AIX installation CD in your CD drive.
2. At the AIX prompt, enter `smit devinst`
The Install Additional Device Software screen appears, with only a single field at first.
3. Click **List** next to the **INPUT device / directory for software** field, and click your CD drive.
The complete Install Additional Device Software screen appears, as shown in Figure 6-2 on page 55.
4. Click **List** next to the **SOFTWARE to install** field to list the software available on the CD.
The Multi-select List pop-up appears.
5. Click **devices.mca.8ef4.com**, and then click **OK**.
The Install Additional Device Software screen reappears.
6. Click the up arrow next to the **DETAILED output?** field to toggle its value to **yes**.
7. Click **OK**, and then click **OK** again to confirm that you want to start the installation.
A screen similar to the one in Figure 6-3 on page 56 appears. When the installation is complete, the message `OK` appears, as shown.
8. To verify that the installation completed successfully, scroll (if necessary) to the end of the messages in the **Output** box and check for the word `SUCCESS` in the **Result** column for the component you installed.

If the installation was unsuccessful, read the messages in the **Output** box, correct the problem(s), and reinstall the software.

9. When you determine that the installation was successful, from the **Exit** pull-down, select **Exit**.

Installing Hardware Diagnostics

For information about installing Hardware Diagnostics, see your AIX documentation. You'll need your AIX installation or software update CD.

Installing the Driver

To install the driver, do the following:

1. Insert the *4511/5511 FDDI Driver for AIX* installation diskette.
2. At the AIX prompt, enter `smit devinst`
The Install Additional Device Software screen appears, with only a single field at first.
3. In the **INPUT device / directory for software** field, enter `/dev/fd0` and click **OK**.
The complete Install Additional Device Software screen appears, as shown in Figure 6-2 on page 55.
4. Click **List** next to the **SOFTWARE to install** field to list the software available on the diskette.

The following pop-up appears:

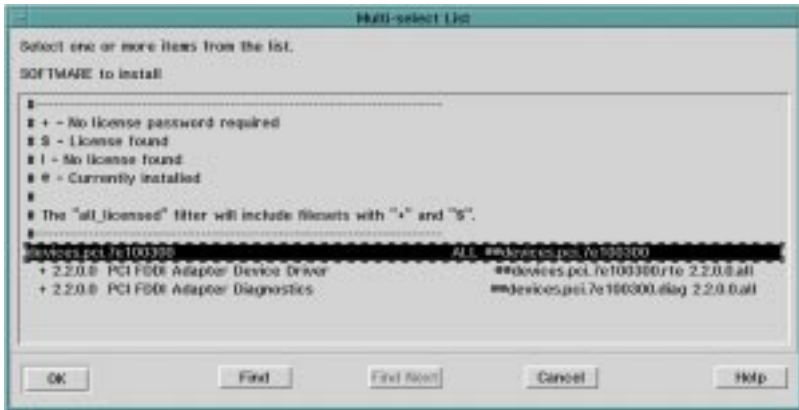


Figure 6-1. Multi-select List



NOTE

The number preceding the fileset (for example, 2.2.0.0) represents the current version of the driver (Version, Release, Modification, and Fix numbers). The number that appears depends on the version of the driver you are installing.

-
5. Click one of the following selections, and then click **OK**:
 - **2.2.0.0 devices.pci.7e100300** (both driver and diagnostics utility)
 - **2.2.0.0 PCI FDDI Adapter Device Driver** (driver only)
 - **2.2.0.0 PCI FDDI Adapter Diagnostics** (diagnostics utility only)

If you are installing both the driver and the diagnostics utility, your screen now looks like the following:

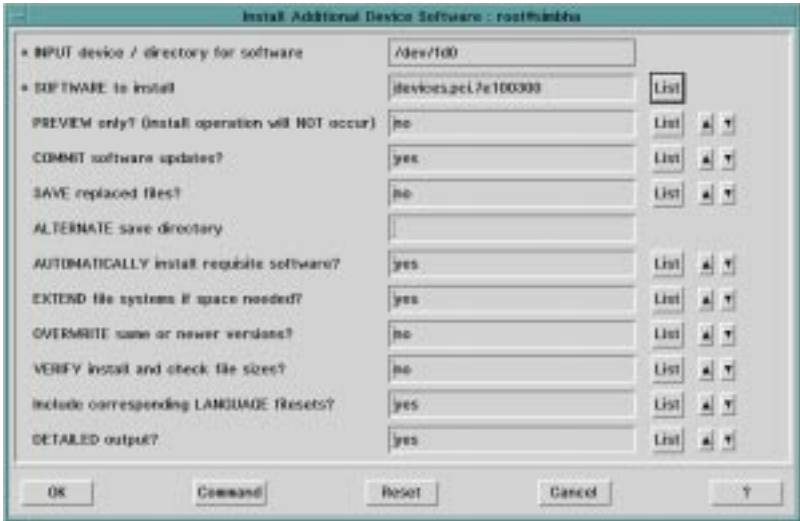


Figure 6-2. Install Additional Device Software Screen

6. If you are *not* installing this driver over an earlier version of the same driver, skip to step 7.

If you *are* installing this driver over an earlier version of the same driver *and* the fields mentioned in the following substeps appear, do the following. (If you are running a version of AIX that does not include these fields, this happens automatically.)

- a. Click the up arrow next to the **OVERWRITE same or newer versions?** field to toggle its value to **yes**.
 - b. Click the up arrow next to the **AUTOMATICALLY install requisite software?** field to toggle its value to **no**.
7. Click **OK**, and then click **OK** again to confirm that you want to start the installation.

The following screen appears. When the installation is complete, the message **OK** appears at the top, as shown:

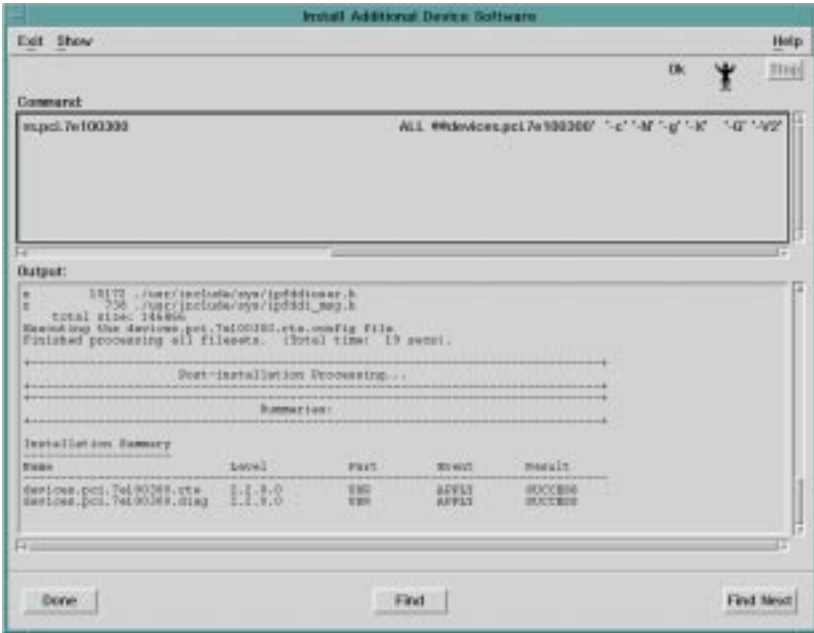


Figure 6-3. Successful Installation Output

8. To verify that the installation completed successfully, scroll (if necessary) to the end of the messages in the **Output** box and check for the word **SUCCESS** in the **Result** column for each component you installed.

If the installation was unsuccessful, read the messages in the **Output** box, correct the problem(s), and reinstall the driver. If you need assistance, see the assistance information at the front of this manual.

9. When you determine that the installation was successful, from the **Exit** pull-down, select **Exit**.

10. Reboot the system before continuing with the network interface configuration.

Configuring the Network Interface

To configure the FDDI interface:

1. At the AIX prompt, enter `smit tcpip`
The System Management Interface Tool screen appears.
2. Click the box next to the **Minimum Configuration & Startup** field.
A **Single Select List** of the available network interfaces appears.
3. Click **fi0 FDDI Network Interface**.

The Minimum Configuration & Startup screen appears:

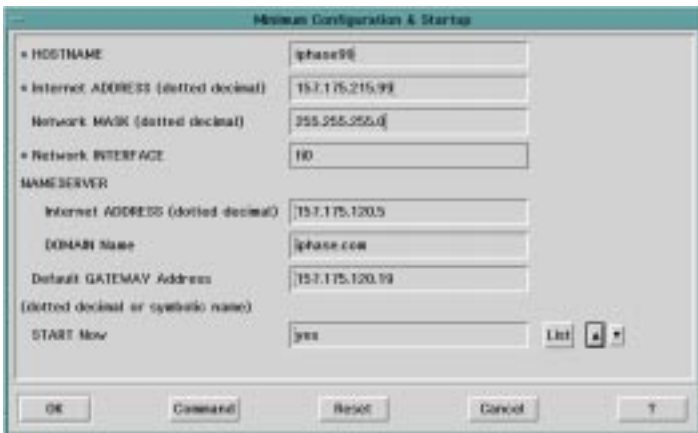


Figure 6-4. Minimum Configuration & Startup Screen

4. If any of the following fields are blank, you must supply the values you gathered in *Gathering Configuration Information* on page 50:

- **HOSTNAME**
- **Internet ADDRESS (dotted decimal)**
- **Network MASK (dotted decimal)**

Enter any optional values that you want to supply, and then click **OK**.

When the configuration completes successfully, the message **OK** appears at the top of the screen, as shown:

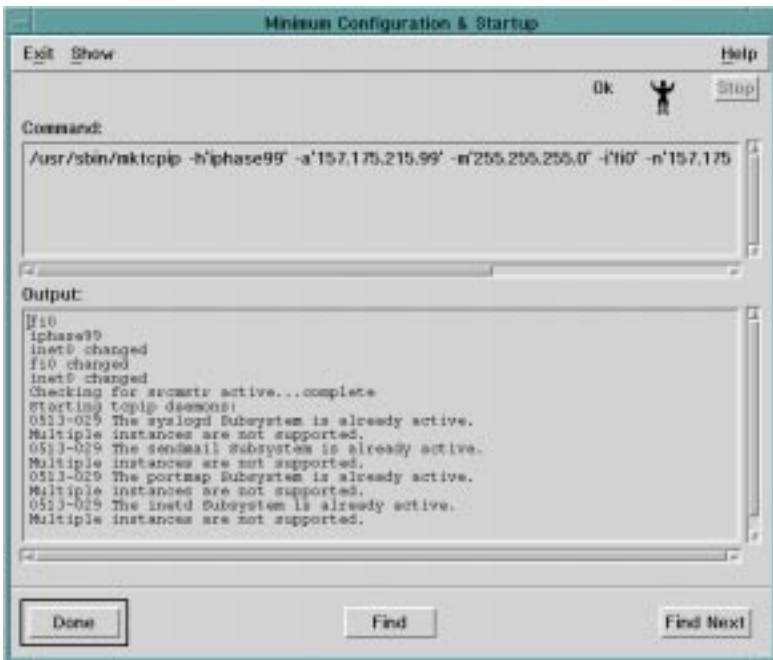


Figure 6-5. Successful Configuration Output

If the configuration is unsuccessful, the message `Failed` appears instead. If this happens, read the messages in the **Output** box, and correct the problem(s). If you need assistance, see the assistance information at the front of this manual.

5. When the configuration is successful, from the **Exit** pull-down, select **Exit**.

The FDDI network interface is now configured.

Using the 5511 AIX Diagnostics Utility



NOTE

You need to install and configure the 5511 and its driver before running this utility.

The following procedures sever all network connections. You may want to ensure that there are no active network connections before using this procedure.

It is strongly recommended that you run this utility with your system booted in service mode.

If your system does *not* support service mode and does *not* allow you to run `diag` in normal mode, you cannot run this utility on your system.

Starting the Utility

To start the 5511 AIX diagnostics utility, do one of the following, depending on whether the system can boot in service mode:

If your system...	Start the utility as follows
Allows you to boot in service mode (using a key on its front panel)	<ol style="list-style-type: none"> 1. Shut down the system by entering at the AIX prompt <code>shutdown -h now</code> 2. Boot up the system in service mode by changing the position of the key on your system's front panel. The Diagnostic Operating Instructions screen appears.
Does <i>not</i> support service mode but <i>does</i> allow you to run <code>diag</code> in normal mode:	<ol style="list-style-type: none"> 1. Shut down the system by entering at the AIX prompt <code>shutdown -d now</code> 2. At the AIX prompt, enter <code>diag</code> The Diagnostic Operating Instructions screen appears.

Using the Utility

To use the utility after accessing the Diagnostic Operating Instructions screen:

1. Press **Enter** to display the Function Selection menu appears.
2. Select one of the following:
 - **Diagnostic Routines** (tests once)
 - **Advanced Diagnostics Routines** (in service mode, optionally tests multiple times)

If this is the first selection you've made from this menu during the current session, a message appears. For

example, in service mode, the following message appears: The system will now continue the boot process. Please wait...

Next, the Diagnostic Mode Selection screen appears.

3. Select one of the following:

- **System Verification**
- **Problem Determination**

The Diagnostic Selection or Advanced Diagnostic Selection screen appears, listing all the devices in the system on which you can run diagnostics.

4. Select **PCI FDDI Adapter**.

If you chose **Advanced Diagnostics Routines**, and you are running this utility in service mode, the Test Method Selection screen appears.

5. If Test Method Selection screen appears, select one of the following:

- **Run Test Once**
- **Run Test Multiple Times** (in normal mode, *Advanced Diagnostics Routines* runs each test only once)

When the test(s) are complete, the results appear.

6. To run another test, press **Enter**, and then press **F3**.

Exiting the Utility

To exit the diagnostics utility:

1. Press **F10**, and then press **F10** again.
2. Press **F3**, and then press **Enter** to shut down the system.

Overview

This chapter provides possible solutions for common problems encountered while installing and operating this adapter. If the information in this chapter does not resolve the problem you are experiencing, call Interphase Customer Service.

Problems and Solutions

Startup Problems

Problem	Possible Solution
Computer does not start or come ON.	<ol style="list-style-type: none"><li data-bbox="386 886 949 946">1. Verify that the power-on LED on the computer is illuminated.<li data-bbox="386 963 949 1023">2. Verify that the computer's power cord is intact and is plugged into a working AC power outlet.<li data-bbox="386 1039 949 1099">3. Check the power source by plugging a known good appliance or unit into the outlet. <p data-bbox="386 1107 949 1198">If the system does not operate when plugged into the outlet, plug the original unit's power cord into a different power source.</p> <p data-bbox="386 1206 949 1304">If the computer still does not operate when plugged into a known working power source, troubleshoot the computer or install the adapter in a different unit.</p>

Bootup Problems

Problem	Possible Solution
Computer does not boot up.	<ol style="list-style-type: none">1. Check to see whether the system is plugged in.2. Check to see whether your monitor is plugged into your video adapter.3. Check to see whether the adapter is properly seated in the PCI bus expansion slot.4. Try a different PCI slot.5. Remove the adapter and see if the system boots up and returns to a normal state of operation.6. Try a known good adapter in your system. If this adapter also fails, check the Read Me item in the Main program group for information about reconfiguring network adapters.

Application Problems

Problem	Possible Solution
A network application no longer works.	<p>If the application worked before adapter installation, there is probably a hardware conflict.</p> <p>Some programs that access the hardware can cause a conflict at some point. This is typically associated with hardware such as printers and modems. If you suspect a hardware conflict, check the PCI configuration that came with your system to resolve the problem.</p>

Adapter Problems

Problem	Possible Solution
Host adapter is not found.	<p>The PCI system in your computer is supposed to automatically configure the bus address locations. An address conflict is probably not the problem. If the driver is correctly installed, a driver message should appear on the screen during computer bootup.</p> <ol style="list-style-type: none"> 1. Make sure the adapter is seated correctly in the bus expansion slot. Try another PCI slot. Try another adapter known to operate correctly. 2. Check for correct configurations of the FDDI cable into the adapter. Verify that the cable is properly connected at both ends. Ping the failed system from another host on the network. 3. For adapters with LEDs, inspect the LEDs on the adapter's faceplate. See <i>Adapter LED Diagnostics</i> on page 66. Reseat the card.
Adapter cannot communicate with other hosts on the network.	<ol style="list-style-type: none"> 1. Check the FDDI cable. Make sure the FDDI media is correctly installed. 2. Try to ping other hosts on the network from your host computer. If this is unsuccessful, see <i>Adapter LED Diagnostics</i> on page 66. 3. Check the interface configuration. For HP-UX, see <i>Verifying the Network Interface</i> on page 27.
Adapter cannot connect to the ring.	<p>For DAS adapters, check PHY A and PHY B to verify that the connectors are in appropriate ports.</p>
Network or ring is in detect state.	<p>For DAS adapters, check PHY A and PHY B to verify that the connectors are in appropriate ports.</p>

Adapter LED Diagnostics

Location

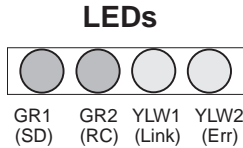


Figure 7-1. 5511 LEDs

Meanings

The signal detection LED indicates the following conditions:

GR1 (Signal Detect)	Meaning
On	The adapter's FDDI chipset detects a LAN signal, which means that the adapter is physically connected to the network.
Off	The adapter's FDDI chipset does not detect a LAN signal, which means that the adapter is not physically connected to the network.

The Report Command, link, and error LEDs work together as follows:

GR2 (Report Command)	YLW1 (Link)	YLW2 (Error)	Meaning
Off	Off	On	Onboard SMT processor has not successfully completed diagnostics (that is, the adapter is not operational).

GR2 (Report Command)	YLW1 (Link)	YLW2 (Error)	Meaning
On	Flashing	Off	Onboard SMT processor is providing Common Boot (CB) interface to host system.
Flashing	Off	Off	Onboard SMT processor is providing Report Command (RC) interface to host system.
Flashing	On	Off	Onboard SMT processor has determined that a logical link to the network exists, and continues to provide RC interface to host system.

Verification

The 5511's SMT processor performs onboard diagnostics automatically when the 5511 is either first powered up or reset. When these tests complete successfully, the YLW2 (Error) LED goes OFF.

If the tests do not complete successfully, YLW2 LED remains ON. This means that the SMT processor failed to initialize and that the adapter is not operational. If this happens, see the assistance information at the front of this manual.

Specifications

A

5511 Adapter Specifications

Item	Specification
Host Bus Interface	PCI Local Bus Revision 2.1 or later
Network Interface	ANSI X3T9.5 for FDDI @ 100 Mbps
Host Data Transfer	32-bit bus master DMA transfers to 132 MBps
Mechanical	Occupies a short card PCI slot
Maximum Operating Power	Single Attach: 1.10A @ 5V \pm 5% Dual Attach: 2.0A @ 5V \pm 5%
Network Connections	Dual Mode Fiber (62.5/125): SC Duplex (SAS and DAS) Category 5 UTP Copper: RJ-45 (SAS and DAS)

Operating Environment

Temperature	0–55° C / 32–131° F
Relative humidity	10–95% noncondensing
Altitude	0–15,000 feet

Storage Environment

This section assumes the adapter is stored in its original anti-static bag and box.

Temperature	-20–85° C / -4–185° F
Relative humidity	10–95% noncondensing
Altitude	0–50,000 feet

PCI/PMC Technology Overview

B

PCI/PMC Technology

Intel® Corporation's Architecture Lab, along with leading computer vendors (the PCI SIG), designed the Peripheral Component Interconnect (PCI) bus as the next generation I/O expansion bus. Its predecessors were the ISA, EISA, and MCA buses. The PCI bus is a high-performance bus found in systems ranging from low-end PCs to high-end servers.

PCI was developed to overcome the bottlenecks associated with traditional 16-bit expansion slots, operating at 8 MHz, or essentially 5 megabytes per second. The result was a local bus system capable of transferring 32 bits of data at 33 MHz for a maximum data transfer rate of 132 MBps. The PCI Local Bus takes peripherals off the I/O bus and connects them together with the CPU and the memory subsystem. This provides a wider, faster pathway for data, which is especially important for servers, graphic-intensive software, high-speed networks, and other high-performance peripherals.

Features of the PCI Local Bus architecture include:

- Processor-independent bridge between the CPU and high-speed peripherals that serves as a traffic controller between buses
- 32-bit memory addressing for CPU, Direct Memory Access (DMA) devices, and bus masters
- 32-bit data transfers at 33 MHz for CPU, DMA, and bus master devices
- 132 MBps maximum data transfer rate
- Data is written and read from the peripherals in linear bursts at every clock cycle

- Buffers located between the peripherals and the CPU that allow multiple, high-speed peripherals to be attached to the same PCI local bus
- Automatic configuration of system and expansion boards

Three sizes of PCI add-in boards are defined: long, short, and variable short length. Systems are not required to support all board types. To accommodate the 5V and 3.3V signalling environments and to facilitate a smooth migration path between the voltages, three add-in board electrical types are specified: a “5 volt” board which plugs into only 5V connectors, a “universal” board which plugs into both 5V and 3.3V connectors, and a “3.3 volt” board which plugs into only 3.3V connectors.

The PMC bus was designed for embedded environments. It implements PCI bus logic in a daughtercard (mezzanine) form factor.

CompactPCI is another PCI form factor which implements PCI bus logic in a Eurocard 3U or 6U format with a high-density connector. This form factor is used in environments similar to the more traditional VME bus. The PCI Industrial Computer Manufacturers Group (PICMG®) is developing the CompactPCI standard.

FDDI Technology Overview

C

Introduction to FDDI

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

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

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

hubs for connecting subgroups of stations to the primary ring. They also allow stations to be added and removed from the ring with minimal interruption of network traffic.

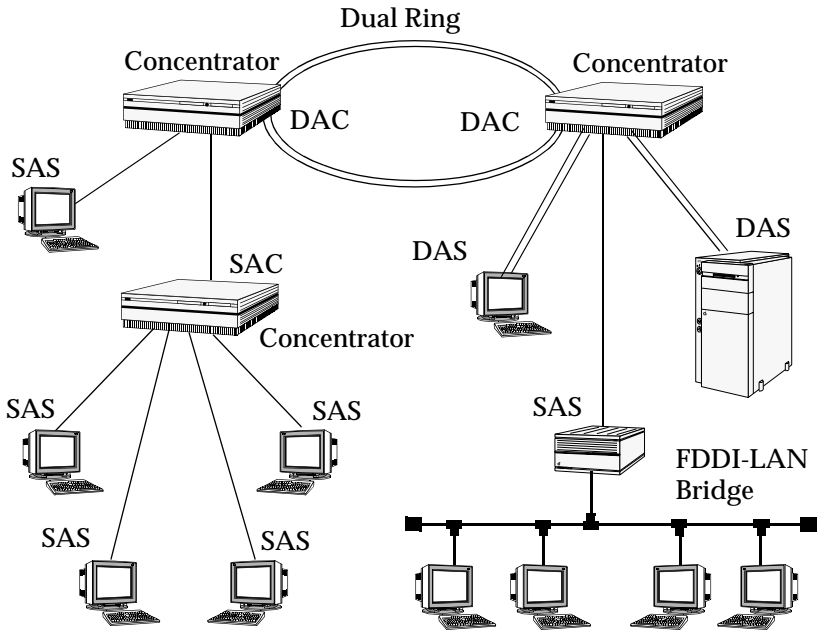


Figure C-1. FDDI Architecture

- **Dual Attachment Concentrator (DAC):** connects to the dual ring and serves as a hub for single or dual attachment devices.
- **Single Attachment Concentrator (SAC):** connects to the primary ring through a DAC and serves as a single ring hub. SACs can be stacked to form a sophisticated *span of trees* topology.
- **Dual Attachment Station (DAS):** an addressable node, connected to the primary and secondary rings.

- **Single Attachment Station (SAS):** an addressable node connected only to the primary ring through a concentrator.



NOTE

DACs and DASs connect directly to the FDDI dual ring, while SACs and SASs connect only 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 such as the Interphase M800 FDDI concentrator in order to connect to an existing network. However, the DAS configuration can be connected to any dual-attachment 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 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's range of FDDI adapters and concentrators, contact the Interphase Sales Department.

FDDI Glossary

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Differential Manchester encoding ♦ A signaling method that encodes clock and data information into bit symbols. Each bit symbol is divided into two halves, where the second half is the inverse of the first

half. A zero is represented by a polarity change at the start of the bit time; a one is represented by no polarity change at the start of the bit time.

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

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

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

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

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

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

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

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

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

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

FDDI (Fiber Distributed Data Interface) ♦ An ANSI standard (X3T12) for 100 Mbps LANs based on the token-passing protocol.

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

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

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

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

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

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

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

host ♦ Generally, any computer on a network.

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

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

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

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

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

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

KB ♦ Kilobytes. 1024 bytes.

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

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

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

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

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

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

MBps ♦ Megabytes (1,048,576 bytes) per second.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

X3T12 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. Prior to 1994, the ANSI X3T12 workgroup's designation was X3T9.5.

PCI & PMC Glossary

configuration cycle ♦ A type of I/O cycle provided on the PCI bus to facilitate system configuration.

PCI (Peripheral Component Interconnect) bus ♦ A high-performance multiplexed address and data bus. Supporting 32-bit with optional 64-bit data transfers, the PCI bus is intended to be an interconnect between peripheral controllers, peripheral add-in boards, and processor/memory systems. The PCI bus operates at up to 66 MHz, providing burst transfer rates up to 264 MBps 32 bits wide, or up to 528 MBps 64 bits wide.

PMC (PCI Mezzanine Card) ♦ A daughtercard form factor implementation of the PCI bus specification.

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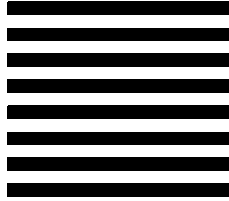
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