4511
PMC FDDI Adapter
Users Guide

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- 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 Support

United States:	Telephone:	(214) 654-5555
	Fax:	(214) 654-5500
	E-Mail:	intouch@iphase.com
United Kingdom:	Telephone:	+ 44 (0) 1869-321222
	Fax:	+ 44 (0) 1869-247720
France:	Telephone:	+ 33 (0) 1 41 15 44 00
	Fax:	+ 33 (0) 1 41 15 12 13
Asia/Pacific Rim:	Telephone:	+ 81 35423 6513
	Fax:	+ 81 3 5423 6511

World Wide Web

http://www.iphase.com

Anonymous FTP Server

ftp.iphase.com

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.

PB04511-000, PB04511-004
FCC Regulatory Compliance

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

PB04511-002 FCC Regulatory Compliance

Tested To Comply With FCC Standards

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

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

Radio Frequency Interference Statement

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

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

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

Modifications

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

Interphase Fiber Products' Compliance

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

Declaration of Conformity

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

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

declares, that the product:

Product Name: PMC FDDI UTP SAS

Model Number: 4511-0-E

conforms to the following Standards:

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

Supplementary Information:

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

Dallas, February 25, 1997

Mike Jobe, Quality Manager

European Contact:

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

Declaration of Conformity

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

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

declares, that the product:

Product Name: PMC FDDI DAS Fiber

Model Number: 4511-2-B, 4511-2-C

conforms to the following Standards:

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

Supplementary Information:

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

Dallas, October 3, 1997

Mike Jobe, Quality Manager

European Contact:

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

Declaration of Conformity

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

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

declares, that the product:

Product Name: PMC FDDI DAS UTP

Model Number: 4511-4-A, 4511-4-B

conforms to the following Standards:

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

Supplementary Information:

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

Dallas, November 5, 1997

Mike Jobe, Quality Manager

European Contact:

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

Contents

Preface

Icon Conventions

Icons draw your attention to especially important information:

NOTE

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

CAUTION

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

WARNING

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

Text Conventions

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

```
Computer-generated text example
```

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

```
cd /usr/tmp
```

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

```
/bin/su
```

is the same as:

```
/bin/su  ↵ Return
```

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

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

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

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

Introduction 1

Adapter Overview

NOTE

There are three types of 4511 adapters: PB04511-000, PB04511-002, and PB04511-004. One of these numbers is etched on your adapter.

The 4511 adapter is a single-width daughtercard for systems with PMC expansion sites for connectivity to FDDI networks. This adapter provides high-performance FDDI network connectivity for systems with embedded PMC sites. The PMC I/O module capitalizes on the speed and interoperability of the PCI bus standard. The 4511 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 X3T12 specifications for FDDI. Combined with a host software driver, the 4511 can be integrated beneath a variety of network protocols: TCP/IP, OSI, IPX, or any other protocol supported by the underlying driver.

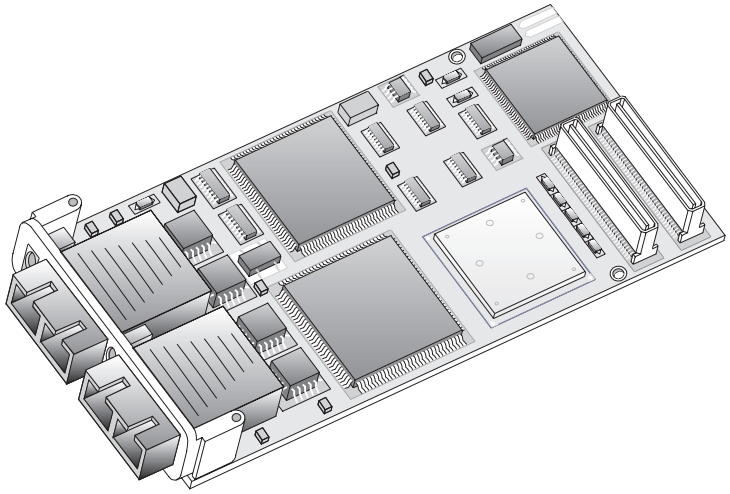


Figure 1-1. 4511 Dual Attachment Fiber Adapter (PB04511-002)

The 4511 supports both Single Attach Station (SAS) and Dual Attach Station (DAS) connectivity (for further details, see *Product Features* on page 3). 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 4511 adapter. All adapters offer 100 Mbps FDDI network connectivity with on-board SMT processing, as well as support for either fiber or UTP.

Product Features

- 32-bit, zero wait state PCI DMA master @ 33 MHz
- Supports optical fiber or UTP media
- Supports Dual Attachment and Single Attachment (**PB04511-002** and **PB04511-004**; **PB04511-000** supports Single Attachment only)
- 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 Memory Read Multiple, Memory Read Line, Memory Write and Invalidate, and Dual-Address Cycle 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 (**PB04511-002** and **PB04511-004** only)
- Drivers support multiple 4511s (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 endstation, enter `uname -a`

For information about required HP-UX 10.20 patches, see `http://www.iphase.com/Public/AppEng/prodsup/5511/questions`

- Host machine: HP 9000 (700 Series or 800 Series) with installed PCI bus and at least one PMC I/O slot
- 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 4511, you need an FDDI concentrator in order to connect your station to the ring. (A dual-attach 4511 can connect directly to the dual ring or to an FDDI concentrator.)

NetWare 3.x or 4.x

- An Intel x86 system
- One PCI I/O interface slot
- 16 MB total system memory
- A 3.5-inch diskette drive or a CD-ROM drive

Windows NT 3.5x, 4.0

NOTE

If you have a PowerPC, you must be running version 3.51 or later.

- 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

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

Compliance Information

- Compliant with *PCI Local Bus Specification Revision 2.1*
- Compliant with *Draft Standard for a Common Mezzanine Card Family: CMC (IEEE P1386)* and *Draft Standard Physical and Environmental Layers for PCI Mezzanine Cards: PMC (IEEE P1386.1)* except that DAS adapters' maximum operating power of 10.1 W exceeds the 7.5 W maximum power limit given in the CMC specification.
- Compliant with the ANSI X3T12 specifications for FDDI networks

4511 Adapter Hardware Installation

2

Overview

The 4511 is designed to be installed in PMC (PCI Mezzanine Card) expansion slots. This chapter explains how to install the 4511 hardware, and includes the following:

- Inspecting the adapter
- Installing the adapter in a host mezzanine slot
- Connecting the adapter to the network

For technical specifications for the 4511 adapters, see *Specifications* on page 55.

Tools Required

The only tools required are a grounding strap, a #1 Phillips head screwdriver, and a small, flat-head screwdriver.

NOTE

The 4511 is a plug-and-play device with systems that are compliant with the PCI Local Bus Revision 2.1 specification. Systems that are not compliant may require manual configuration via a PCI Device Configuration menu in the BIOS. Refer to your host system's documentation for PCI Device Configuration information.

Inspecting the Adapter

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

CAUTION

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

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

Installing the 4511 Adapter

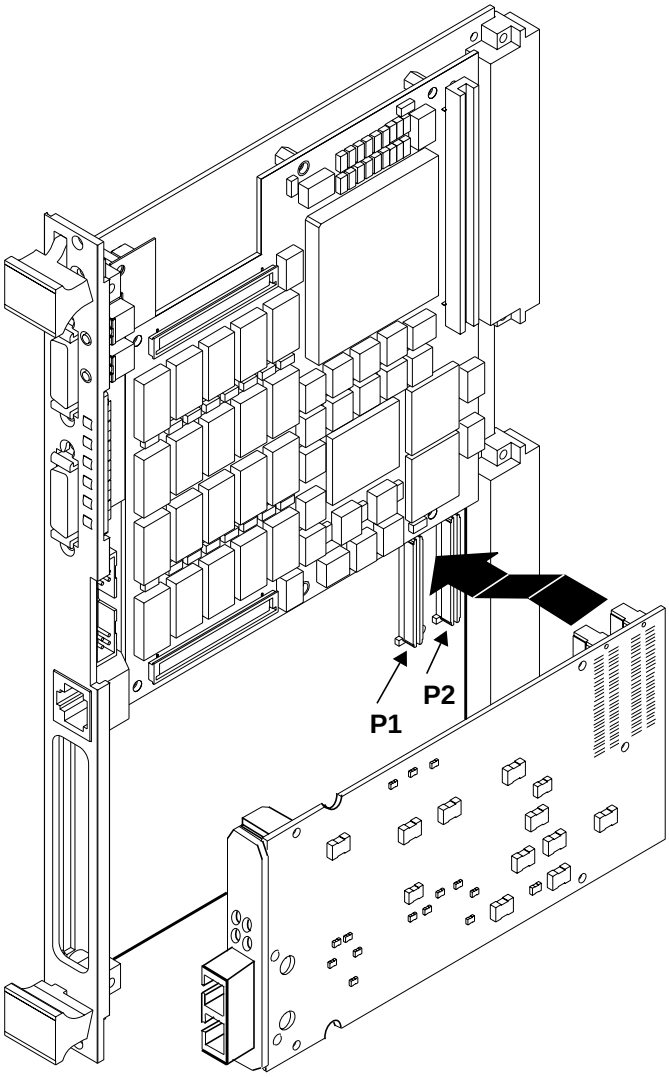


Figure 2-1. Installing a PB04511-000 PMC Adapter

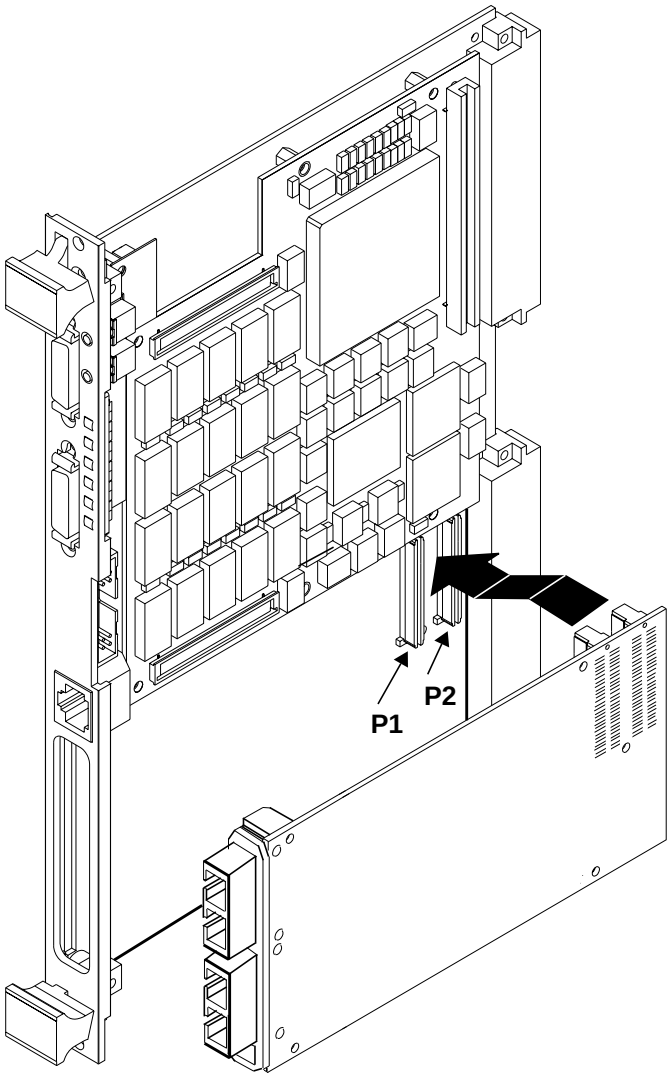


Figure 2-2. Installing a PB04511-002 PMC Adapter

WARNING

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

1. With power disconnected and the motherboard's faceplate screws unfastened, remove the motherboard from the system chassis.
2. Remove the spring metal clip covering the mezzanine aperture on the faceplate of the motherboard.
3. Attach a grounding strap to your wrist or ankle, and carefully remove the adapter from its antistatic bag.
4. If the target slot is dusty, remove any dust from the connector ports with dry, compressed air.
5. Install the adapter as follows (Figure 2-1 on page 9 and Figure 2-2 on page 10 illustrate the installation of a PMC adapter on a typical motherboard):
   a. Hold the 4511 at an angle and insert it through the rear of the faceplate of the motherboard while aligning the dual mating connectors on the motherboard with the dual connectors (P1 and P2) on the adapter.
   b. Carefully press the adapter into place. A metal standoff post on the motherboard and an alignment hole on the 4511 adapter facilitate alignment.
6. Fasten the cards together with screws.

7. Replace the assembly in the motherboard system chassis slot.
8. Connect the 4511 adapter to the network as directed in the next section.

Connecting the 4511 to the Network

You are now ready to connect the 4511 to the network.

NOTE

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

1. Attach the appropriate network connector to the 4511 adapter as follows:
   - If you have a fiber PB04511-000, see Figure 2-3 on page 13.
   - If you have a dual attach fiber PB04511-002, see Figure 2-4 on page 13.
   - If you have a single attach fiber PB04511-002, see Figure 2-5 on page 14.
   - If you have a dual attach UTP PB04511-004, see Figure 2-6 on page 14.
   - If you have a single attach UTP PB04511-004, see Figure 2-7 on page 15.

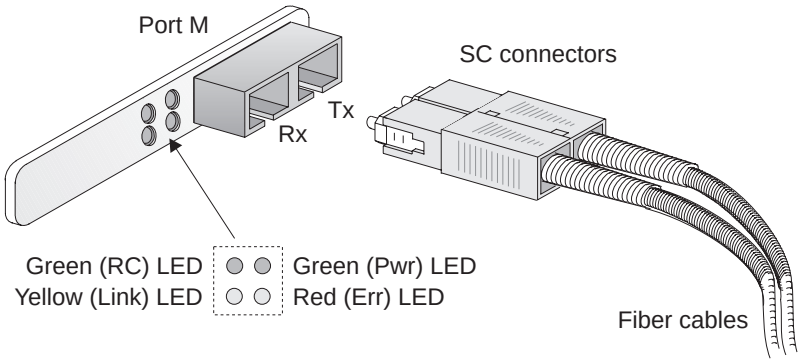


Figure 2-3. PB04511-000 SC Duplex Connection

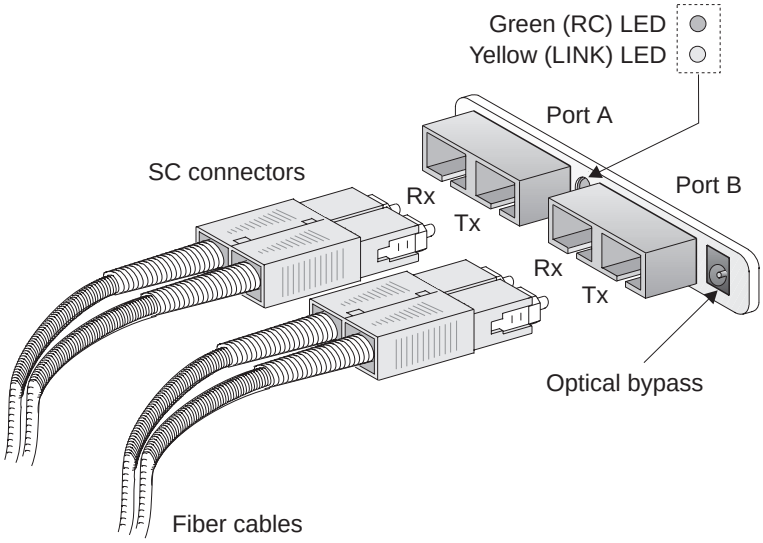


Figure 2-4. PB04511-002 Dual Attach SC Fiber Connection

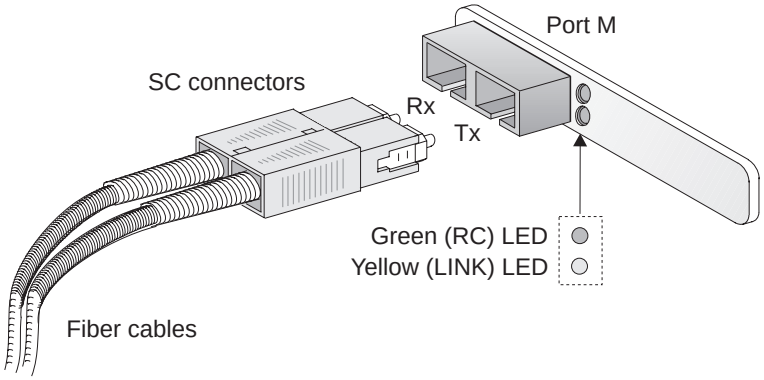


Figure 2-5. PB04511-002 Single Attach SC Fiber Connection

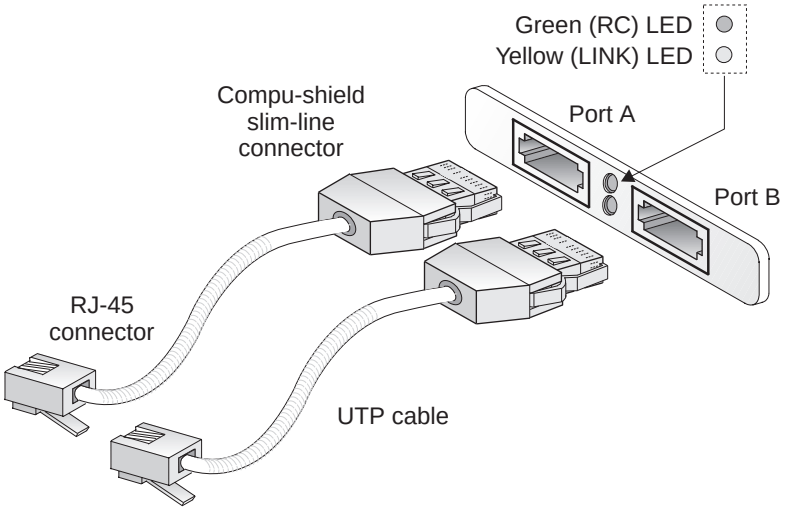


Figure 2-6. PB04511-004 Dual Attach Compu-shield Connection

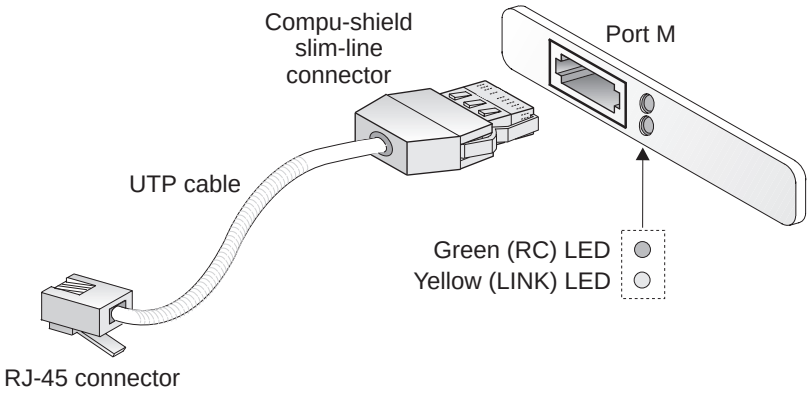


Figure 2-7. PB04511-004 Single Attach Compu-shield Connection

2. Turn on the power to the computer.
3. Check your adapter's LEDs to verify that the adapter is operating correctly. For more information about LEDs, see *Adapter LED Diagnostics* on page 50.

The installation of the 4511 hardware is complete. The next step is to install the network software driver. For instructions, see one of the following:

- *HP-UX 10.20 Driver Installation* on page 17
- *Windows NT Driver Installation* on page 27
- *AIX Driver and Diagnostics Installation* on page 33

HP-UX 10.20 Driver Installation

3

Overview

This chapter explains how to install this driver using the HP-UX 10.20 **swinstall** utility. You can use this driver on multiprocessor systems. This driver supports FDDI Station Management (SMT) versions 6.2 and 7.3.

The basic installation steps are:

1. Verify that your system meets minimum requirements.
2. Install the HP-UX 10.20 driver.
3. Configure the network interface.
4. Verify the network interface.

NOTE

The procedures in this chapter assume that the adapter is already installed in the endstation. If it is not, you need to install the adapter before installing this driver (for instructions, see *4511 Adapter Hardware Installation* on page 7).

Verifying Minimum Requirements

Before installing the HP-UX driver, verify that your system meets the minimum requirements described in *Minimum System Requirements* on page 4.

Installing the Software 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 20.
- Otherwise, continue with the next section to install the driver from a CD.

Installing the Driver from CD-ROM

The files on the CD are in ISO 9660 format. To install this 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 accordingly to a temporary mount location using SAM or **`mount`**

   For example:

   ```
   mount /dev/dsk/c1t2d0 /cdrom
   ```

NOTE

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

3. Use the **swinstall** command to begin the installation. At the prompt, enter **`/usr/sbin/swinstall`**

   The Source Depot Path defaults to **/var/spool/sw**. If this is not a valid path on your system, a pop-up appears explaining that.

4. If this pop-up appears, click **`OK`.**

   The `Specify Source` screen appears.

5. Set **`Source Depot Type`** to **`Local CDROM`.**

6. Select **`OK`.**

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

NOTE

The Interphase 5511 PCI FDDI Driver supports all Interphase PMC and PCI FDDI adapters.

Skip to *Sample swinstall Installation* on page 20 to continue the driver installation.

Installing the Driver from DDS Tape

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

1. With the end station up and running, log in as **root**.
2. Insert the software DDS tape in the appropriate drive.
3. At the prompt, enter **`/usr/sbin/swinstall`**

   The Source Depot Path defaults to **/var/spool/sw**. If this is not a valid path on your system, a pop-up appears explaining that.
4. If this pop-up appears, click **`OK.`**

   The `Specify Source` screen 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` screen 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.**

   A Confirmation prompt appears.
5. Select **Yes.**

   Another Confirmation prompt appears.
6. 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.

The adapter is now ready to be configured.

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

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

SAM configures the 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.

- 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]=ifi1
  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]=
  ```

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

  a. At the system prompt, enter **`/usr/sbin/lanscan`**

  A list of devices appears.

b. Locate the **ifi** or **ife** device followed by its instance number (for example, **ifi1**).

c. 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

The UP flag in Figure 3-1 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 what you expected for this adapter.

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

  Make sure that, for each interface, the information in the **Network** and **Address** columns is unique. If it is not, assign unique hostnames in `/etc/hosts`.

- To verify that the adapter can communicate with other hosts, use the **ping (1M)** command:
  `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 are pinging a station with an IP address of 111.222.33.130, the command would be:

  `ping 111.222.33.130`

Figure 3-2 shows sample console output:

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

Figure 3-2. Sample *ping* Output

Windows NT Driver Installation

4

Overview

This chapter describes the procedure for installing the PCI FDDI device driver for Microsoft Windows NT 3.5 or 3.51 workstations.

The Interphase Windows NT driver 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*.

Before installing this driver, verify that your system meets the *Minimum System Requirements* on page 4.

Installing the Windows NT Driver

To install the Windows NT driver, do the following:

1. From the **Main** group, double-click the **Control Panel** icon.

2. Double-click the **Network** icon to display the Network Settings dialog:

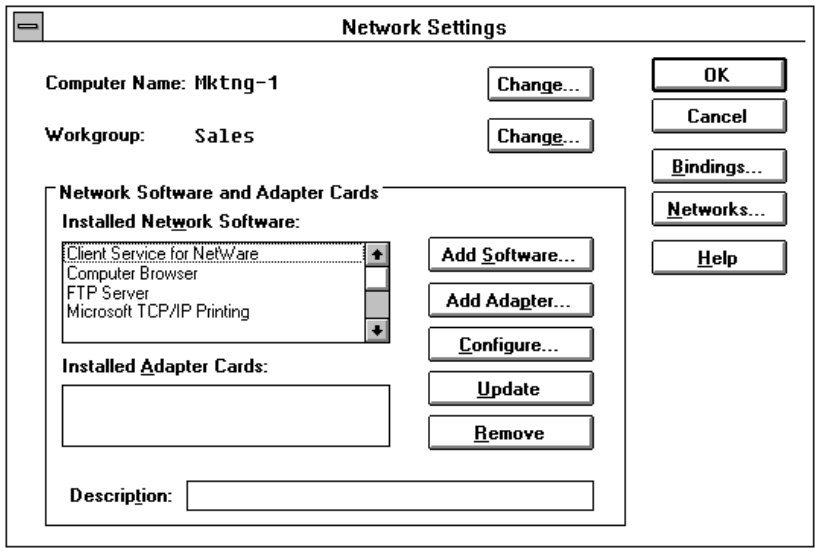


Figure 4-1. Network Settings

3. Click **Add Adapter** to display the dialog in Figure 4-2:

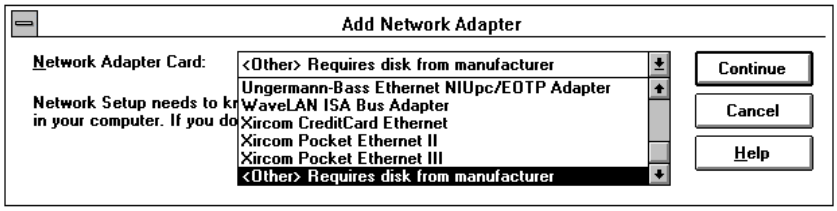


Figure 4-2. Add Network Adapter

4. Select **<Other> Requires disk from manufacturer,** and click **Continue**.

The dialog in Figure 4-3 appears:

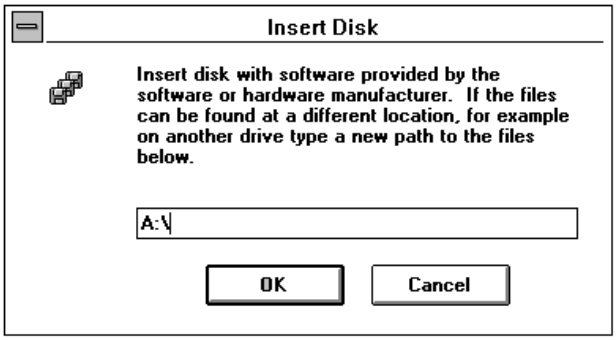


Figure 4-3. Selecting the Drive

5. Insert the diskette or CD-ROM containing the Windows NT driver software, enter the correct path (if need be) to the drive, and click **OK** to display the following dialog (Figure 4-4):

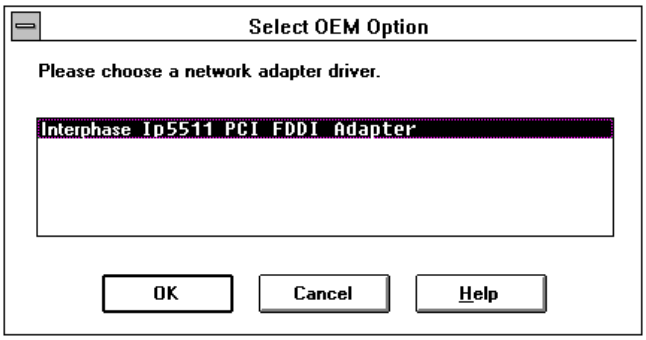


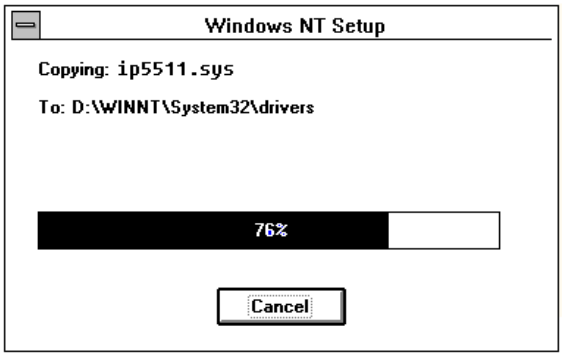
Figure 4-4. Select OEM Option Dialog

6. Select **Interphase Ip5511 PCI FDDI Adapter,** and click **OK**.

NOTE

The Interphase 5511 PCI FDDI Driver supports all Interphase PMC and PCI FDDI adapters.

A message dialog appears while the driver is being copied to your hard drive:



When the copying is complete (100%), the **Network Settings** dialog reappears.

7. Click **OK** to display the **TCP/IP Configuration** dialog for editing the network interface.
8. If more than one adapter is installed, select **Interphase Ip5511 PCI FDDI Adapter.**
9. For the local host to run and process TCP/IP communications, you must define and edit the items in the **TCP/IP Configuration** table. Contact your Network Administrator for the needed information. These items are:

- **IP Address:** The Internet address for your host machine. It is a unique 32-bit address that identifies the network and your particular machine on that network. The format is dotted decimal notation in the form *xxx.xxx.xxx.xxx* where *xxx* ranges from 0 to 255.
- **Subnet Mask:** Used to partition the IP address into two segments—one for the physical network, and one for the host. The left side of the address, or the most significant address bits, are common to all systems belonging to the same physical network. The least significant bits are unique for each host belonging to that group. The subnet mask used depends on the class of IP address assigned to your site and the number of different physical networks you want. For example, if a Class B address of 129.42.0.0 is assigned to your company, and no more than 256 hosts will be assigned to any physical segment, then an appropriate netmask might be 255.255.255.0. Thus all host systems sharing common address values in the first three octets would belong to the same sub-network (subnet), which is a physically connected network segment. Assuming this scheme is consistent throughout the company, up to 256 (0-255) different subnets are also possible, each identified by a unique third octet in the IP address.
- **Default Gateway:** If your local network has a gateway to other networks, you must enter your network's gateway address to communicate with machines on the other side. It is normally in the form of an IP address identifying your network's leg from a router.

– **Primary WINS Server:** This is the address of the primary name server used for looking up NetBIOS host names belonging to the local and connected networks. This field is not required, but having a name server is useful for managing a large network. See your operating system documentation for more detailed information.

– **Secondary WINS Server:** If the primary name server does not respond to requests for NetBIOS host information, the secondary server will be queried.

10. Select **OK** when the **TCP/IP Configuration** is complete.

The system prompts your to reboot in order to complete the driver installation:

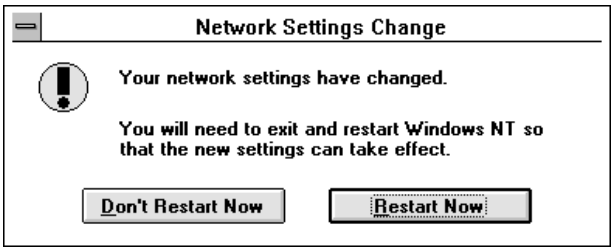


Figure 4-5. Restart Windows NT

11. Press **Restart Now**.

Installation of the driver is complete.

AIX Driver and Diagnostics Installation 5

Overview

This chapter explains how to install the 4511 AIX driver, and configure your 4511 adapter(s). It also explains how to use the 4511 AIX diagnostics utility.

The basic installation steps are:

1. Verify that your system meets minimum requirements.
2. Gather adapter configuration information.
3. Check file prerequisites.
4. Install the 4511 AIX driver.
5. Configure the FDDI interface.

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

Before installing the AIX driver, verify that your system meets the minimum requirements described in *Minimum System Requirements* on page 4.

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 4511 adapter(s) previously and you are reinstalling this driver, it's still a good idea to 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

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

If you plan to install…	This fileset must be installed…
The 4511 AIX driver	devices.mca.8ef4.com (Common FDDI Software)
The 4511 AIX diagnostics utility	bos.diag.rte (Hardware Diagnostics)

To check whether one of these filesets is installed, enter one of the following:

- **`lslpp -l devices.mca.8ef4.com`**
- **`lslpp -l bos.diag.rte`**

If a message appears indicating that the fileset you're checking for is not installed, skip to one of the following to install it:

- *Installing Common FDDI Software* on page 35
- *Installing Hardware Diagnostics* on page 37

When the prerequisite fileset(s) are installed, continue with *Installing the 4511 AIX Driver* on page 37.

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. Press **List** next to INPUT device / directory for software, and click your CD drive.

   The complete Install Additional Device Software screen appears, as shown in Figure 5-2 on page 39.

4. Press **List** next to SOFTWARE to install to list the software available on the CD.

   The Multi-select List pop-up appears.

5. Click on

   devices.mca.8ef4.com

   and then click **OK.**

   The Install Additional Device Software screen reappears.

6. Click the up arrow next to **DETAILED output?** 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 5-3 on page 40 appears. Once 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 4511 AIX Driver

To install this 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 5-2 on page 39.
4. Press **`List`** next to `SOFTWARE to install` to list the software available on the diskette.

The following pop-up appears:

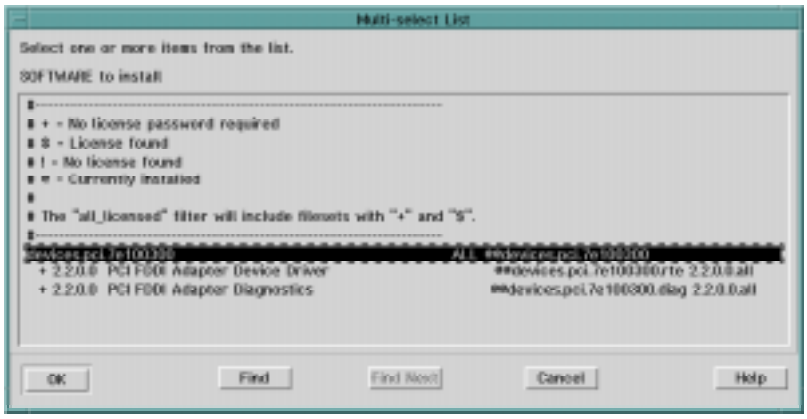


Figure 5-1. Multi-select List

5. Click on one of the following, and then click **OK**:

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.

- **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:

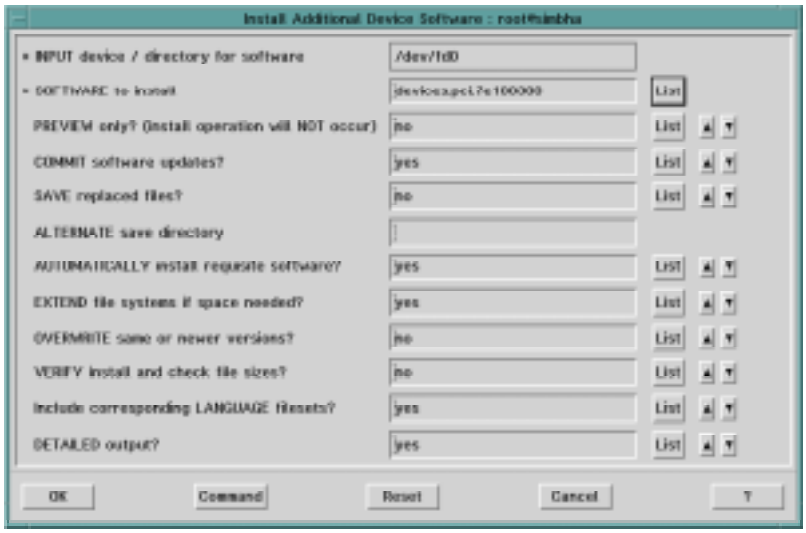


Figure 5-2. Install Additional Device Software Screen

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 **`OVERWRITE same or newer versions?`** to toggle its value to **`yes.`**

   b. Click the up arrow next to **`AUTOMATICALLY install requisite software?`** 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. Once the installation is complete, the message `OK` appears, as shown:

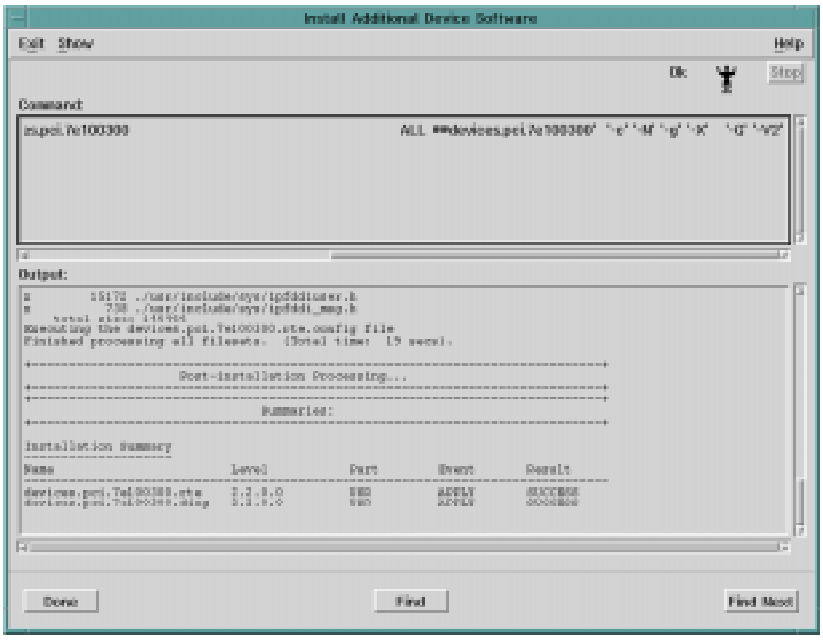


Figure 5-3. Successful Installation Output

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 configuration of the network interface.

AIX Network Configuration

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 **`Minimum Configuration & Startup.`**

   A `Single Select List` of the available network interfaces appears.

3. Click **`fi0 FDDI Network Interface.`**

   The `Minimum Configuration & Startup` screen appears:

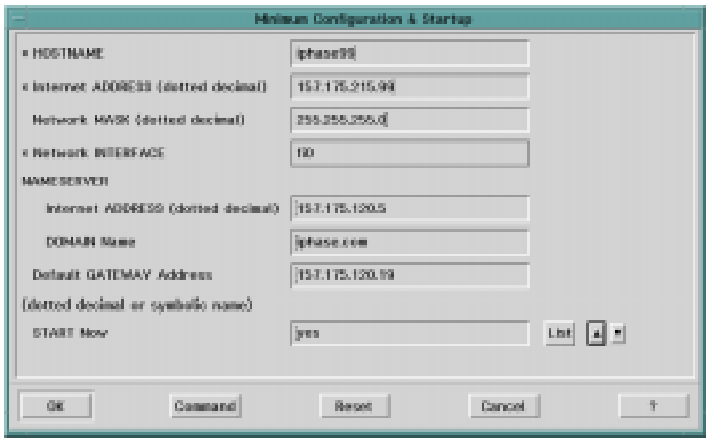


Figure 5-4. Minimum Configuration & Startup Screen

4. If any of the first 3 fields are blank, you must supply the values you gathered in *Gathering Configuration Information* on page 34:
   - `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, as shown:

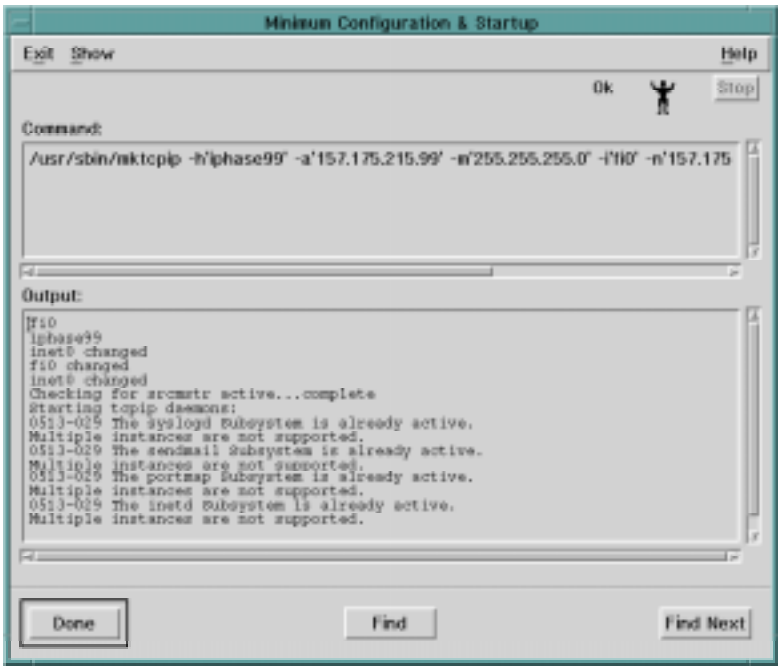


Figure 5-5. Successful Configuration Output

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 you determine that the configuration was successful, from the **`Exit`** pull-down, select **`Exit.`**

The FDDI network interface is now configured.

Using the 4511 AIX Diagnostics Utility

NOTE

You need to install and configure the 4511 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.

1. *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.

   If your system has a key on its front panel that allows you to boot in service mode, do the following:

   a. Shut the system down by entering at the AIX prompt **`shutdown -h now`**

   b. Boot the system up in service mode by changing the position of the key on your system's front panel.

The `Diagnostic Operating Instructions` screen appears.

If your system does *not* support service mode but *does* allow you to run `diag` in normal mode, do the following:

a. Shut the system down by entering at the AIX prompt **`shutdown -d now`**

b. At the AIX prompt, enter **`diag`**

The `Diagnostic Operating Instructions` screen appears.

2. To continue, press **`Enter.`**

The `Function Selection` menu appears.

3. 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.

4. 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.

5. 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.

6. If this 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.

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

   To exit the diagnostics utility, press **`F10`**, and then press **`F10`** again. Press **`F3`**, and then press **`Enter`** to shut down the system.

Troubleshooting 6

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

Problem	Possible Solution(s)
Computer does not start or come ON	**1.** Verify that the power-on LED on the computer is illuminated. **2.** Verify that the computer's power cord is intact and is plugged into a working AC power outlet. **3.** Check the power source by plugging a known good appliance or unit into the outlet. If the system does not operate when plugged into the outlet, plug the original unit's power cord into a different power source. 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.

Bootup

Problem	Possible Solution(s)
Computer does not boot up	**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 on the PMC bus expansion site. **4.** Try a different PMC site. **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.

Applications

Problem	Possible Solution(s)
A network application no longer works	If the application worked prior to the installation of the adapter, there is probably a hardware conflict. It is possible that 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.

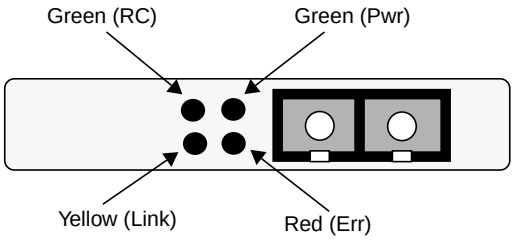
Adapter

Problem	Possible Solution(s)
Host adapter not found	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 bootup of your computer. **1.** Make sure the adapter is seated correctly in the bus expansion slot. Try another PMC site. Try another adapter known to operate correctly. **2.** Check for correct configurations of the FDDI cable into the adapter. Verify 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 *Adapter LED Diagnostics* on page 50. Reseat the card.
The card cannot communicate with other hosts on the network	**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 not successful, see *Adapter LED Diagnostics* on page 50. **3.** Check the interface configuration.
Cannot connect to ring	**1.** For DAS, check PHY A and PHY B to verify that they are in appropriate ports. **2.** Check the interface configuration. **3.** Check the FDDI cable. Make sure the FDDI media is correctly installed.
Network or ring is in detect state	For DAS, check PHY A and PHY B to verify that they are in appropriate ports.

Adapter LED Diagnostics

SAS PB04511-000 Adapter LEDs

Locations



Meanings

Table 6-1. LED States for SAS PB04511-000 Adapter

LEDs by Color				Card States
Green (Pwr)	Red (Err)	Green (RC)	Yellow (Link)	
On	Off	On	Flashing	Power-on Diagnostics
On	Off	Flashing	Off	Connecting to Ring
On	Off	Flashing	On	Ring Connect
On	On	Off	Off	Failure

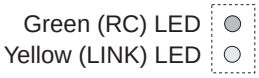
Verification

After you install your SAS PB04511-000 adapter, you can verify that it is operating correctly by checking the following LEDs (the other LEDs are not relevant until after the driver is installed):

- **Green (Pwr):** Indicates whether power is getting to the adapter or not. It should come ON (solid) when the power is turned on to the host, and remain ON until the power is turned off.
- **Red (Err):** Should momentarily light up when the host is being powered up, and then go OFF. If the Red LED remains ON (solid), there is a hardware problem in your system, or the adapter is not installed correctly. Shut down the computer and reinstall the adapter. If the problem persists, see the assistance information at the front of this manual.

PB04511-002, PB04511-004 Adapter LEDs

Location



Meanings

Yellow (Link)	Green (RC)	Meaning
On	Off	Onboard SMT processor has not successfully completed diagnostics (that is, the adapter is not operational).
Flashing	On	Onboard SMT processor is providing Common Boot (CB) interface to host system.
Off	Flashing	Onboard SMT processor is providing Report Command (RC) interface to host system.
On	Flashing	Onboard SMT processor has determined that a logical link to the FDDI network exists, and continues to provide RC interface to host system.

Verification

The 4511's SMT processor performs onboard diagnostics automatically when the 4511 is either first powered up or reset. When these tests complete successfully, the Yellow (Link) LED starts FLASHING. If the tests do not complete successfully, this LED remains ON. This means that the SMT

processor failed to initialize and that the adapter is not operational. See the assistance information at the front of this manual.

NOTE

The Yellow (Link) LED goes OFF when the host operating system begins running the 4511 driver, and ON again once a network link is established.

Specifications A

4511 Specifications

Item	Specification
Host Data Transfer	32-bit bus master DMA transfers to 132 MBps
PCI Signalling Environment	**PB04511-000:** 5.0 V **PB04511-002, PB04511-004:** Universal (5.0 V or 3.3 V)
Mechanical	Occupies a single-card PMC slot
Network Connections	Multimode Fiber (62.5/125): SC Duplex (**PB04511-000:** SAS only; **PB04511-002:** SAS and DAS) Category 5 UTP Copper: RJ-45 (**PB04511-004:** SAS and DAS)
Maximum Operating Power	**PB04511-000:** 5 VDC ±5% 6.0 W **PB04511-002 and PB04511-004:** 5 VDC ±5% Single Attach: 6.9 W Dual Attach: 10.1 W
Average Operating Power	**PB04511-000:** 5 VDC ±5% 5.7 W **PB04511-002 and PB04511-004:** 5 VDC ±5% Single Attach: 6.15 W Dual Attach: 9.2 W

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	-40–85° C / -42–185° 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.

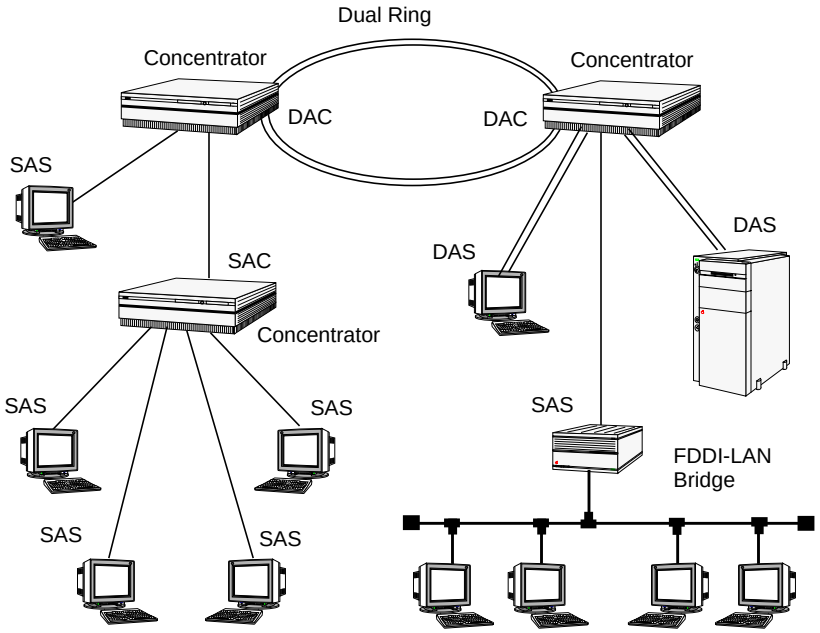


Figure C-1. FDDI Architecture

- **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.

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.

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

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

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

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

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

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

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

OBS (Optical Bypass Switch) ◆ 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.

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.

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.

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

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 sublayer entity, for use by a higher layer or sublayer entity or by management entities.

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

SIF (Station Information Frame) ◆ Special frames used by the SMT Frame Services within the Station Management (SMT) function of an FDDI station that contain more information about the station's configuration and characteristics than the associated Neighborhood Informa-

tion 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.

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