# M800 FDDI Concentrator with SMT 7.2/7.3 Users Guide

# M800 FDDI Concentrator with SMT 7.2/7.3 Users Guide

Document No. UG0M800-000, REVB

Release Date: May 23, 1997

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

*declares, that the product:*

**Product Name: FDDI Concentrator**

**Model Number: M800**

*conforms to the following Standards*:

| | |
|---|---|
| **Safety:** | EN 60950:1988 + A1, A2<br>IEC 825 -1 & -2 1993 |
| **EMC:** | EN 55022:1988 class A<br>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, March 4, 1996

Mike Jobe, Quality Manager

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# 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

## About the M800 FDDI Concentrator

The M800 facilitates high-speed FDDI networking among a variety of computing devices across different types of FDDI media. The M800 provides multi-port connectivity to an FDDI network.

The M800 is highly modularized for ease of service and expansion, with the following modules:

- Central Processing Unit (CPU)
- Media Access Controller (MAC)
- Physical Interface (PHY)

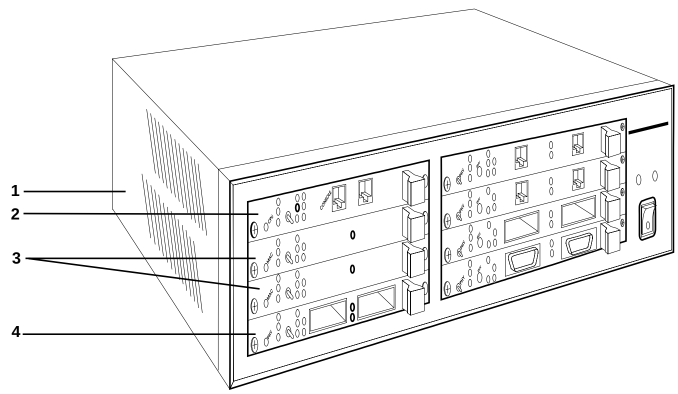
You can remove or add PHY and MAC modules without disconnecting the power source. The M800 can be configured in a variety of ways to accommodate the diverse wiring schemes at individual sites. This flexibility allows easy-to-implement and easy-to-manage FDDI network expansion.

The M800 permits the attachment of multiple single attach stations (SAS), dual attach stations (DAS), or other concentrators to the FDDI dual ring. The primary function of the M800 is to provide connectivity to the dual ring for large numbers of single attach stations. It permits network builders to create topologies, usually in the form of trees, to solve diverse network requirements. A dual ring of trees topology may be created by cascading concentrators from the dual ring. In contrast, a concentrator in a stand-alone configuration (with no MACs installed) acts as a *wiring hub.*

The basic architecture of an FDDI concentrator includes:

- Station Management (SMT) software

- A CPU module, which provides all SMT and application processing
- Optional MAC module(s)
- PHY module(s), which implement both Physical Layer Protocol and Physical Layer Medium Dependent (PMD) functionality, and provide connectivity with either 2 or 4 ports




| Index | Description |
|---|---|
| 1 | Unit Enclosure |
| 2 | CPU |
| 3 | MAC modules |
| 4 | PHY modules |

**Figure 1-1. Possible Concentrator Configuration**

The M800 can be configured to support multiple combinations of media, including multimode or single-mode FDDI optical fiber, plus Category 5 unshielded twisted-pair copper.

The M800 is designed to the ANSI X3T9 FDDI standard for full interoperability. It also features integrated Station Management (SMT) and a Simple Network Management Protocol (SNMP) response agent.

# Related Publications

| Publication ID | Description |
|---|---|
| **ANSI X3.229** | Information Systems FDDI Station Management (SMT) |
| **ANSI X3.139** | FDDI Token Ring Media Access Control (MAC) |
| **ANSI X3.148** | Token Ring FDDI Physical Layer Protocol (PHY) |
| **ANSI X3.166** | Token Ring FDDI Physical Layer Medium Dependent (PMD) |
| **TP-PMD/ANSI X3.263** | Twisted Pair Physical Layer Medium Dependent (TP-PMD) |
| **RFC 1213 Internet MIB II** | This RFC describes the content of the Internet MIB accessible via an SNMP manager. |
| **RFC 1512 FDDI MIB** | This RFC describes the content of the FDDI MIB accessible via an SNMP manager. |

For more information about these standards, see `http://sholeh.nswc.navy.mil/x3t12/overview.html`

You can order the listed FDDI specifications from either of the following:

Primary source:

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

Secondary source:

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

# Understanding Network Topologies

# 2

## FDDI Topology

An FDDI topology consists of two separate logical rings. Two transmission paths are formed by connecting pairs of physical links. A set of dual attach stations connected into a closed loop form two counter-rotating rings, or a *dual ring*. If a fault occurs, the dual ring design has the ability to isolate the fault by *wrapping* the primary ring to the secondary ring to maintain the transmission path.

A single concentrator may connect one or more (in the case of a dual attach concentrator, or DAC) trees into a logical ring. This allows the primary ring, the secondary ring, or both logical rings to be extended to include trees. When the ring is in a steady state and there are no faults, the primary ring carries user data and the secondary ring is idle.

Normally, *A* port types connect to *B* port types, and *S* port types connect to *M* port types. *A* or *B* port types can connect to *M* port types. Connecting both *A* and *B* ports of a DAS to *M* ports creates a *dual homing* topology.

## Dual Ring Topology

The dual ring topology is the typical connection method for FDDI. It allows the connection of a number of dual attach stations (DAS) to form a ring as shown in Figure 2-1. In an unfaulted network, a dual ring consists of two independent data paths: the primary ring and the secondary ring. If a fault occurs in the dual ring due to either a station failing (or maybe just being turned off) or a cable problem, the stations on both sides of the problem area *wrap*. This combines the primary and secondary rings to form one data path as shown in Figure 2-2.

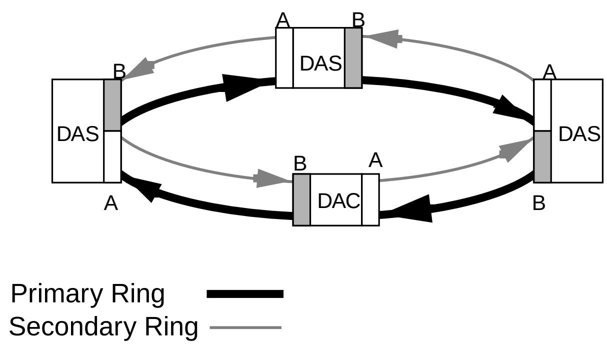



**Figure 2-1. Dual Ring Network Topology**

Paradoxically, this ability to *wrap* the dual ring to form one ring is both a strength and a weakness of FDDI. If a fault occurs and the ring wraps, all the remaining stations on the ring will be able to communicate just as they previously could. This is the fault-tolerance strength of FDDI. However, if an additional fault occurs somewhere in the remaining single ring, the stations on either side of the fault wrap again, thus segmenting the network into two sections that cannot communicate with each other. It is this possibility that makes concentrators so valuable in FDDI applications.

Consider a large workgroup where many stations are powered off regularly. If they are part of a dual ring network without a concentrator, each station that loses connectivity appears as a fault to neighboring stations. Thus the ring could be segmented in many places. However, if a concentrator is connected, acting as a central hub that is never powered down, it can be used to isolate inactive workstations from the dual ring. The concentrator can detect and bypass a fault on any of its individual ports without affecting the integrity of the dual ring.

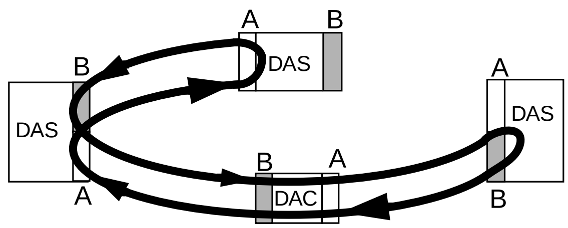



**Figure 2-2. Wrapped Dual Ring Network Topology**

# Cascaded Topology

If there are a number of devices that need to be connected to an FDDI network, or the existing cabling does not support a dual ring, a *cascaded* topology can be used. In a cascaded topology, a number of concentrators are connected, as shown in Figure 2-3, to create a *branch* of a tree. Cascaded concentrators extend the dual ring into a tree to simplify reconfiguration and expansion. The cascaded topology fits in well with most existing cabling schemes (multiple *stars* based at wiring closets).

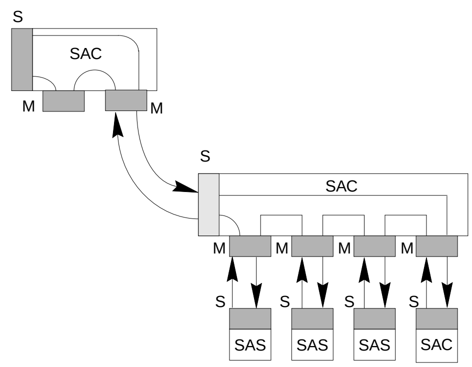



**Figure 2-3. Example of a Cascaded Topology**

In the cascaded topology shown above, there is no dual ring. Only one data path exists throughout the network. When a fault occurs that would interrupt this single data path, the concentrator preserves the path by not allowing the problem station(s) to join the network.

# Dual Ring of Trees Topology

A variation of the dual ring and cascaded topologies combines the two to form a *dual ring of trees*. This is the most powerful FDDI topology available and provides the reconfiguration capabilities of the cascaded topology while still supporting the fault tolerance of a dual ring. As shown in Figure 2-4, concentrators are used to build a dual ring of trees by connecting multiple cascaded topologies to the dual ring.

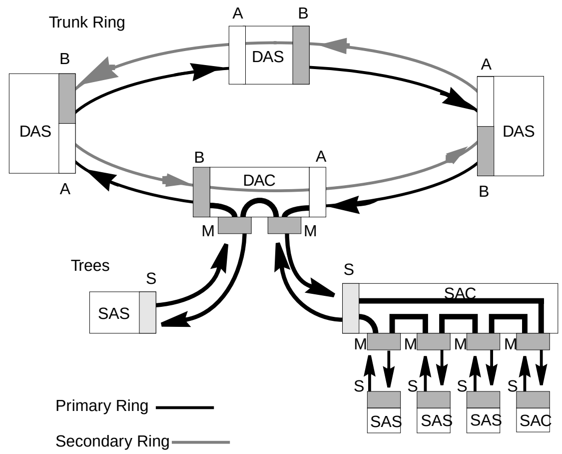



**Figure 2-4. Dual Ring of Trees Topology**

This topology is useful when connecting the stations in a number of buildings. For instance, the cabling within each building would form a cascaded topology, while the buildings would be connected by a dual ring. The dual ring could be formed by connecting a single *root* concentrator from each building. All of the other concentrators and systems in the building would be cabled to the building's *root* concentrator. The dual ring of trees is recommended for FDDI network installations because it combines features of the dual ring and the cascaded topologies.

A concentrator-based FDDI network supports an independent link to each attached station via the concentrator's M ports. If any station is powered down, or if there is a cable fault, the concentrator bypasses the problem. The dual ring is not wrapped in these cases, avoiding segmentation when multiple faults occur. However, if there is a fault between an M port and the S port of an attached concentrator, the second concentrator and all its attached stations would be isolated from the rest of the network (dual homing remedies this problem). By reducing the number of attachments to the dual ring and managing the connections to the stations attached to the ring, a concentrator provides greater network availability to the remaining stations when multiple faults occur.

## Dual Homing Topology

When a DAS or DAC is attached to a concentrator rather than being part of a dual ring, only one of its connections is active at a time. With dual homing, the other connection serves as a backup and activates automatically if the primary connection fails. A dual-homed configuration provides better fault tolerance than either a dual ring or a tree topology alone. A dual-homed configuration can tolerate multiple failures without segmenting the network. You can turn off or disconnect stations without affecting the rest of the network. Enabling and disabling connections at a concentrator gives you better control of the network structure.

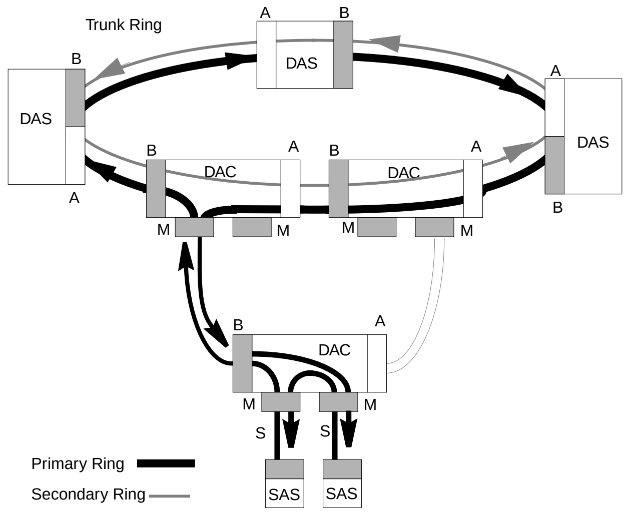



**Figure 2-5. Dual Homing Network Topology**

# Summary

FDDI offers a number of network topology options that meet a variety of reconfiguration and fault tolerance needs. The options range from the simple dual ring to the flexible dual ring of trees. As FDDI networks become more complex, concentrators support growth and expansion.

# Installing the M800 3

## Overview

The M800 FDDI concentrator is easy to install and operate. It can be installed in a standard, nineteen-inch rack or placed on a tabletop. The M800 can be configured to support a number of network configurations.

This chapter provides installation and cabling instructions for the M800 concentrator.

The M800 can be configured and connected in multiple ways. The basic steps are:

1. Unpack and inspect the M800 concentrator.
2. Mount the M800.
3. Apply power.
4. Connect a terminal to the console port.
5. Connect to the FDDI network.
6. Attach stations.

***NOTE***

**It is recommended that you read this users guide thoroughly before installing the M800.**

# Safety Precautions

Before performing the procedures outlined in this chapter, read and understand the following:

## WARNING

**Use the proper voltage and current rating to avoid a fire hazard. The M800 is equipped with an auto-switching power supply. It can accept voltages from 115VAC to 230VAC. Be sure your voltage supply is within this range before connecting power to the M800 to avoid damaging the concentrator.**

## ACHTUNG

**Zur Vermeidung von Feuergefahr, sollte das Gerät nur mit der angebrachten Amperezahl und Spannung verwendet werden. Der M800 ist mit einem automatischen Spannungswahlschalter ausgestattet, der im Bereich von 115 V bis 230 V Wechselstrom arbeitet. Vergewissern Sie sich, daß die Spannung sich in diesem Bereich befindet, bevor Sie den M800 anschließen, um eine Beschädigung des Konzentrators zu vermeiden.**

- Plug the power cord into a properly-wired receptacle to avoid electrical shock. The main power should be disconnected using the power On/Off switch located on the front panel of the concentrator.

  The M800 is designed to operate from a power source that does not apply more than 230 VAC between the conductors or between either supply conductor and ground.

### WARNING

**The M800 power cord is grounded. If the protective ground connection is broken or malfunctioning, any accessible conductive part (including controls that appear to be insulated) can render an electric shock. To avoid personal injury or damage to the unit, do not operate this instrument unless all covers and panels are secured in place.**

**This product is electrostatic discharge (ESD) sensitive. Before removing or reconfiguring any system component, attach a grounding device to the rear panel.**

### ACHTUNG

**Dieses Gerät ist über das Netzkabel geerdet. Bei unterbrochenem Schutzleiter ist die Berührungssicherheit nicht gewährleistet. Vor öffnen des Gehäuses Netzstecker ziehen!**

**Zur Vermeidung von Beschädigungen durch elektrostatische Entladung ist das Gerät bei Modulwechsel über die Rückwand zu erden.**

- If the concentrator experiences a CPU module or power supply failure, unplug the power cord.

Wenn ein CPU-Modulfehler auftritt, sollte der Storm adgeschaltet und das Stromkabel vom Gerät abgetrennt werden.

# Pre-Installation Considerations

Before installing the M800, several points must be considered. It is recommended that you consider and record decisions made about your configuration and network. Prepare the site for your unit and ensure that you have the proper cables and tools ready before installing the M800.

## Network Topologies

Determine the network topology in which the M800 is to be used. It is recommended that you use one of the following FDDI network topologies:

- Dual Ring
- Cascaded Concentrators
- Dual Ring of Trees
- Dual Homing

For detailed information about network topologies, see *Understanding Network Topologies* on page 5.

## FDDI Cabling Requirements

The following types of PHYs are available:

- multimode fiber
- single-mode fiber
- UTP

### Recommended Fiber Cable

| For this mode … | The recommended cable is … |
|---|---|
| **single-mode** | 9 micron fiber<br>14 kilometers maximum distance |
| **multimode** | 62.5 micron fiber<br>2 kilometers maximum distance |

### Recommended UTP Cable

Unshielded twisted pair (UTP) cable must be either EIA/TIA Category 5 cable or Underwriters Laboratories cable Level 5. Maximum cabling distance using UTP is 100 meters (330 feet).

## Tools Required

A #2 Phillips screwdriver is required for rack mount installation of the M800.

# Installing Your M800 Concentrator

***NOTE***

**M800 concentrators ship preconfigured. If you want to reconfigure your concentrator before installing it, see *Reconfiguring the M800* on page 41.**

To install the M800:

1. Choose a clean, dust-free location for the M800. Avoid placing it in direct sunlight, near heat sources, or near areas with high levels of electromagnetic interference (EMI).

   The front panels of the M800 PHY modules provide status indicators that you may wish to monitor. Place the concentrator in a visible location. It is recommended that your installation:

   – Be free of obstruction

   – Have sufficient clearance to operate the power switch

   – Allow 5 inches at the front of the M800 to compensate for the manufacturer's suggested bend radius of the fiber cable, 3 inches clearance from the rear, and half an inch on each side for ventilation (airflow).

2. Unpack and inspect the shipping containers and contents for damage.

   If damage occurred to the containers during shipping, please notify your carrier (for example, UPS). *Do not attempt to use damaged equipment* (for safety reasons).

3. Check for missing items. You should have the following:

   – M800 concentrator

   – *M800 FDDI Concentrator with SMT 7.2/7.3 Users Guide*

   – Rack mounting kit

   – power cord

   – 6-foot RJ45-to-DB25 cable for the console port

Report any missing parts and any damage not related to shipping (see the Assistance page at the front of this manual). Keep the packing materials.

**NOTE**

**All items returned under warranty must be packed in their original packing materials.**

**4.** Mount the M800.

The concentrator can be placed in a convenient location on a tabletop. The M800 operates at a very low noise level and is suitable for any tabletop environment.

The M800 can also be mounted in an open or closed nineteen-inch rack using the rack-mount bracket kit. The rack-mount bracket kit consists of two brackets and four screws.

**a.** If you want to mount the concentrator in a rack, install the brackets as shown:

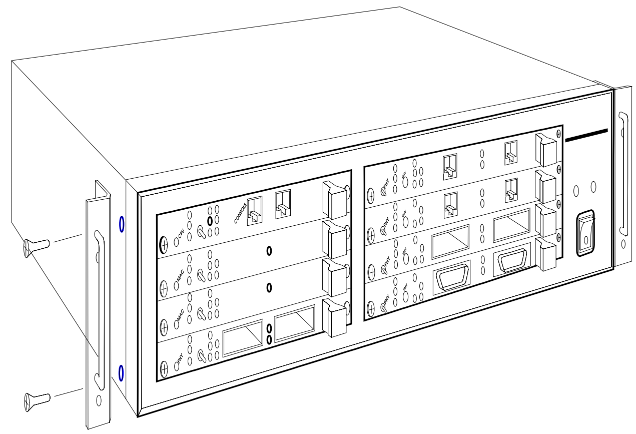


**Figure 3-1. Installing the Mounting Brackets**

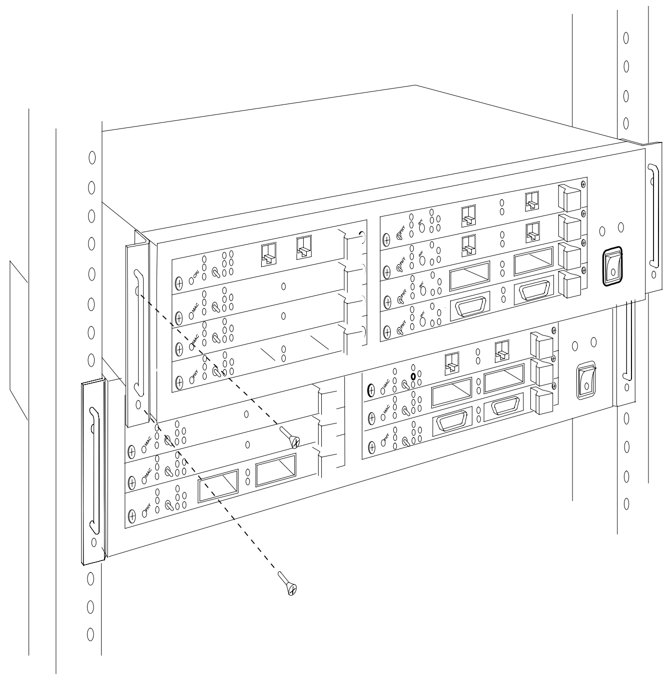


**Figure 3-2. Mounting the M800 Concentrator**

b. Mount the concentrator on the rack, ensuring that each of the four bolts is secure and tight.

5. Power on the concentrator as follows:

   a. Ensure that the power switch is OFF.

   b. Connect the power cord supplied with the M800 to the rear of the unit. See Figure 3-3.

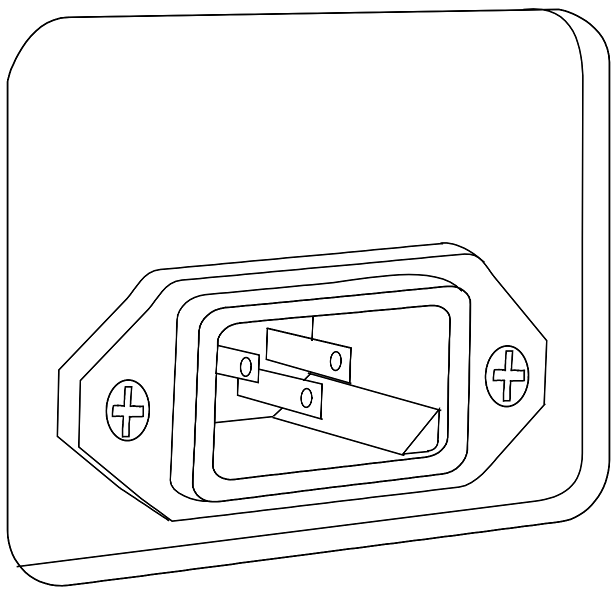


**Figure 3-3. Power Cord Connection**

**c.** Connect the M800's power cord to a properly grounded electrical outlet.

**d.** Flip the power switch ON.

## NOTE

**If the unit fails to power up after switching to the ON position, turn the switch OFF, disconnect the power cable, and repeat Step 5. If difficulties persist, see *Troubleshooting the M800* on page 65.**

## BEACHTEN SIE

**Wenn das Gerät nach dem Einschalten (Netzschalter auf EIN, Stellung 1) nicht betriebsbereit wird, schalten Sie den Netzschalter auf AUS (Stellung O) und ziehen Sie das Netzkabel ab. Bei Anhalten der Störung verfahren Sie bitte entsprechend den Angaben in *Troubleshooting the M800* on page 65.**

**6.** If you want to use a local console interface, or if you want to use an IP and/or SLIP address other than the default (for more information, see *Configuring the M800* on page 33), connect a terminal to the console port of the CPU module as follows. Otherwise, skip to Step 7.

   **a.** Connect the RJ45-to-DB25 cable to the console port of the CPU module. (For pinout information, see *Console Cable Pinouts* on page 75.)

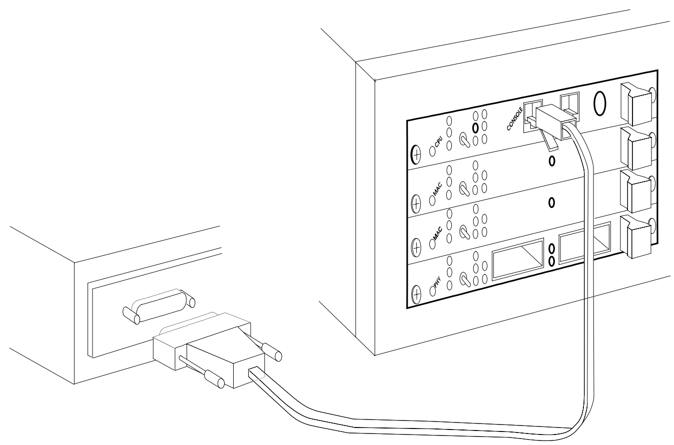


**Figure 3-4. Console to Terminal Interface**

**b.** Connect the cable to the terminal.

**c.** Configure the terminal as follows:

– 9600 baud
– 8-bit data
– No parity
– 1 stop bit

For detailed information about changing the terminal’s settings, see its users guide.

**7.** Connect the concentrator to the FDDI network.

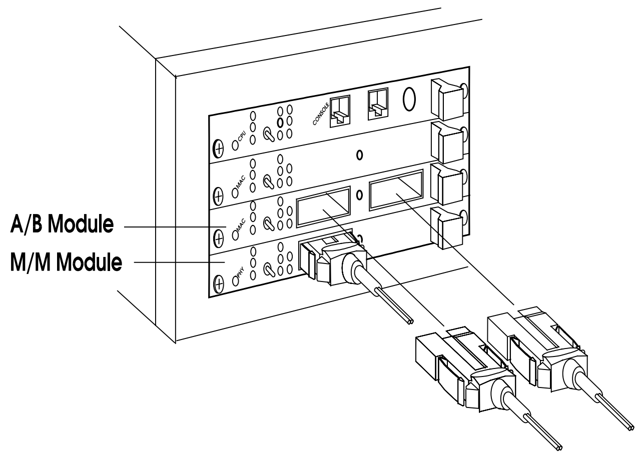



**Figure 3-5. Cabling Connectors into the PHY Ports**

The cabling and network-keying specifics are determined by network topology and media types. The M800 is shipped from the factory configured as you specified. The LEDs on the upper left PHY module indicate how your M800 is configured. A/B indicates a dual attach concentrator. M/S indicates a single attach concentrator. M/M indicates a null attach concentrator. Subsequent PHY modules are configured as M/M or M/M/M/M connections.

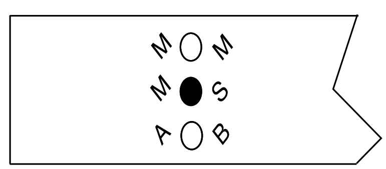



**Figure 3-6. PHY Module LEDs Indicating SAC**

If the LEDs indicate a configuration other than the one you want, see *Setting Your PHY Card's Jumpers* on page 56. For help in determining the type of configuration required, see the topology examples in *Understanding Network Topologies* on page 5.

FDDI Station Management allows connections between port types for attachment to a network:

| M800 Configuration | PHY Port Connections | Connecting PHY Port Type |
|---|---|---|
| Single Attach | S | M or S |
| | M | A, B or S |
| Dual Attach | A | B |
| | B | A |
| Null Attach | M | A, B, or S |
| | M | A, B, or S |
| Dual Homing | A or B | M |

A dual attach configuration allows you to connect the M800 to a number of dual attach stations to form a ring. A dual ring has two independent data paths: a primary path and a secondary path.

The following illustrates connecting an M800 to a dual ring:

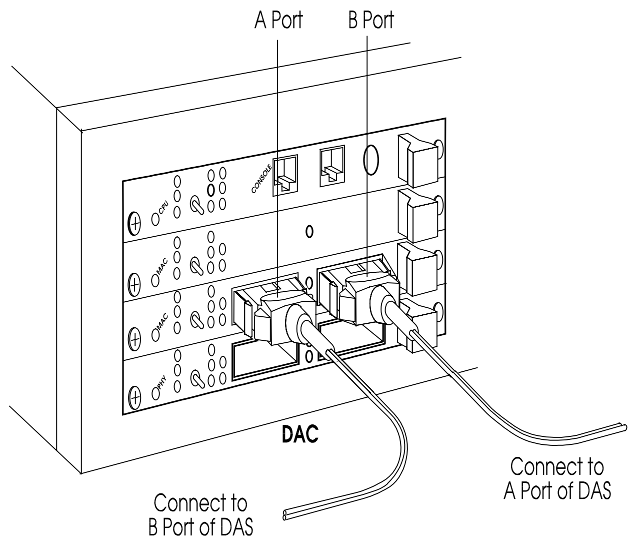



**Figure 3-7. Connecting the M800 to a Dual Ring**

In a cascaded arrangement, a number of concentrators or stations are connected to form a *branch of a tree*. If a number of devices need to be connected to a network or if the existing cabling scheme does not support a dual ring, a cascaded topology can be used.

The following illustration shows an example of M800s connected in a *dual ring of trees* topology. The M800 on the top is attached to the dual ring. The remaining concentrators form the branch of the tree:

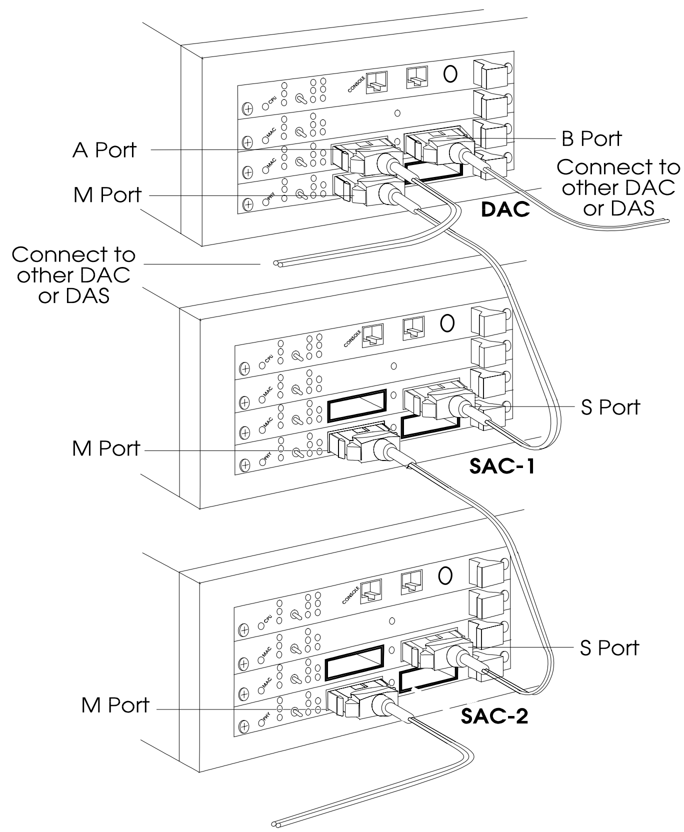



**Figure 3-8. Cascading Concentrators in a Dual Ring of Trees**

In a dual homing topology, the A and B ports of a dual attach station are connected to M ports on an M800. The SMT in the dual attach station allows only the B port to become active in the data path. The A port becomes active only if the B port fails or is disconnected. The A port then is switched into the data path.

The following illustrates an example of M800s connected in a dual homing topology:

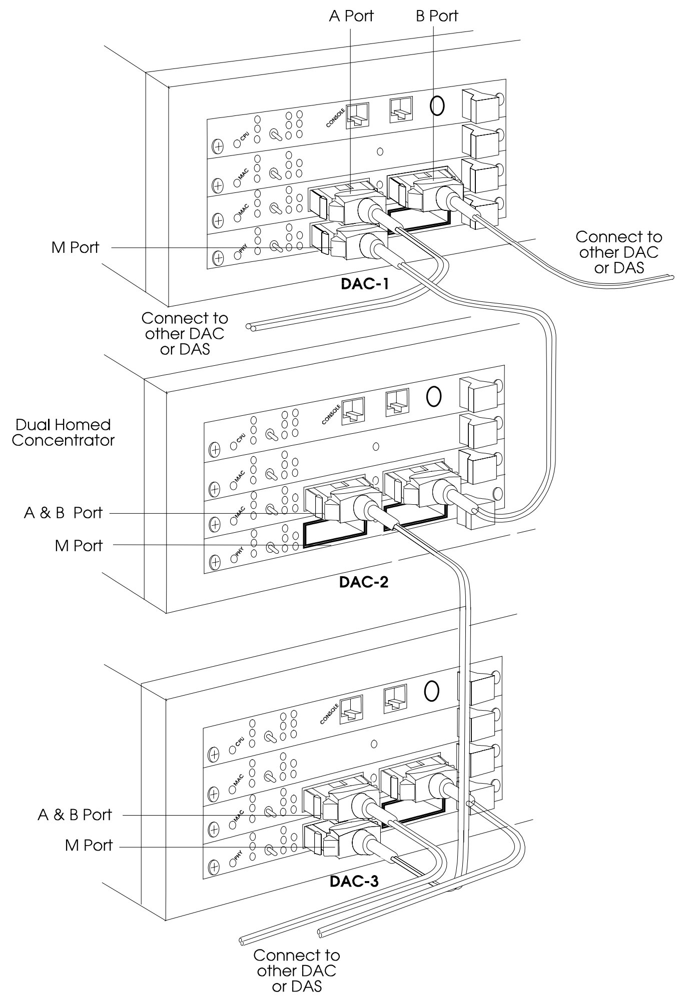



**Figure 3-9. Connecting Concentrators in a Dual Homed Topology**

**8.** Connect the stations to the M800. The PHY modules that are configured as M/M or M/M/M/M ports can be used to attach other single attach or dual homed stations.

To attach a single attach station, connect the S port of the station to an M port of the M800. To attach a dual attach station, connect either the A or B port of the station to an M port of the M800. To dual home a dual attach station, connect both the A and B ports of the station to M ports of separate M800s. As an alternative, the dual homed station can be connected to M ports of a single M800.

# Verifying Installation

When you power on or reset the concentrator, the SYS and FAN box LEDs (located above the power switch) light. If at any time the power is on, but the FAN LED is off, see *Box LED Symptom and Corrective Action* on page 68.

In addition, the software displays an Interphase banner and begins power-up diagnostics. After successful completion of the diagnostics, the software displays information about the configuration of the system. An example of the display screen following a reset or power-up sequence is shown in Figure 3-10:

```
Interphase FDDI Concentrator Bootrom...
serial chip diagnostics passed
ram diagnostics passed
flash image application launch...starting application


Interphase FDDI Concentrator Software Revision b03 at system reset #436:

cpu local interrupt test...passed

initial system configuration:
slot 1: mac 0
slot 2: phy 0 and 1
slot 3: phy 2 and 3
slot 4: phy 4 and 5
slot 5: phy 6 and 7
slot 6: phy 8 and 9
slot 7: phy 10 and 11
The second internal path will be used as the secondary path
frame memory (MAC 0)...passed
subrack interrupt test...passed
backplane path tests...Primary...Secondary...passed
BIST slots: 00000
MAC RingOp (mac 0)...passed
Configuring as Dual Attach...done
sbrk(): pMemTop = 9fb800, pImagesEnd = 8d56a0, 1204576 bytes available
Primary MAC address: 00-00-77-89-a4-04 (00:00:ee:91:25:20)
IP Address: 157.175.215.14 using gateway: 157.175.215.135
concen:
```

**Figure 3-10. Console Display at Power Up**

This display represents an M800 system configured as a dual attach concentrator with a single MAC (primary) and 10 master port attachments. The canonical MAC address is 00-00-77-89-a4-04 and the non-canonical MAC address is 00:00:ee:91:25:20. The IP address is 157.175.215.14 and the gateway address is 157.175.215.135. The software revision *b03* resides in the Flash EPROM, which is preferred for bootup. This is typical of a M800 that has had a software update. This example M800 has experienced 436 resets.

# Optical Bypass Switch (OBS) Support

The M800 provides an interface for an optional Optical Bypass Switch. A 6-pin DIN connector, labeled OBS, is located on the front panel of the CPU module. The CPU module can selectively enable or disable the OBS under control of the Ring Management portion of SMT. The system automatically senses the presence of an OBS. The Optical Bypass Switch (OBS) is not provided with the M800, but is available from Interphase Corporation.

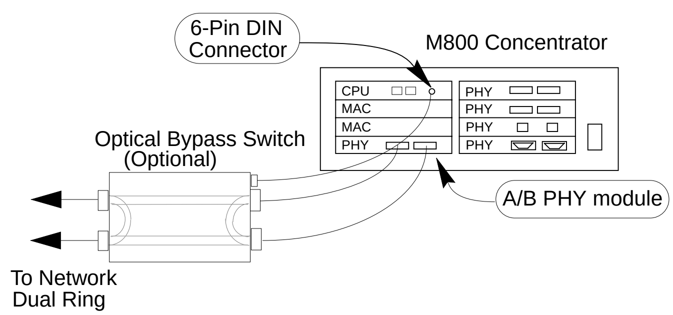



**Figure 3-11. Optical Bypass Switch**

# Configuring the M800 4

## Working with the M800 Console

### Console Commands

For reference information about console commands, see *Understanding Console Commands* on page 77.

### Understanding the Purpose of the Console

The M800 is preconfigured to begin operation immediately when it is turned on. It is designed to require minimal interaction with either the console or a management station once it has been configured with some basic information. To communicate with other stations on an FDDI ring in the simplest scenario, the M800 needs the following:

- IP Address
- IP Netmask
- IP Broadcast Address

However, IP addresses do not need to be configured if a MAC is not installed or you do not need to communicate with the M800. The concentrator performs the actions needed (using SMT) to allow connected stations to communicate among themselves. Some factory settings may need to be changed if you intend to:

- Operate the system with an SNMP manager
- Download software updates
- TELNET to the system
- Use SLIP

- Perform any of the above tasks from another network (through a router)

You can configure the M800 with the IP addresses of up to 8 SNMP Managers. You can enable the SNMP Response Agent in order to allow the system to be managed via SNMP. If the SNMP Response Agent is enabled, these IP addresses are sent SNMP Traps when necessary. The SMT-based management mechanisms are always available if a MAC is installed regardless of whether the SNMP Response Agent is enabled. To use SLIP with the system, the local and host SLIP addresses must be provided. The M800 may be configured with the IP address of a device acting as a gateway to communicate with a system from a different network.

Some of the policies implemented by the M800 (reaction to the attachment port(s) failing, and so on) are set to default values at the factory, but you can change them. These policies can be tailored to best support the networking environment in which the M800 is installed. For details, see *Set Commands* on page 97.

You can set a password. This allows the system to accept console commands only after a password is entered. A password is not initially set at the factory for either TELNET or the console port.

Setting the user-defined MIB attributes in the M800 may be desirable. These text strings in the MIB are intended to identify and locate the device when an SNMP manager asks for the information. They, like the other items discussed in this section, are stored in nonvolatile memory in the concentrator so that it is necessary to set them only once. You can, however, change them at any time.

You use the M800's console to

- Troubleshoot the concentrator

- Configure the concentrator
- Reconfigure the concentrator
- Diagnose and troubleshoot the concentrator if there's a problem
- Access performance information about the concentrator (SNMP Management)
- Update the concentrator's firmware

## Console Messages

When circumstances require that an important message be sent to the console, that message is also buffered internally. When this occurs, you can connect a terminal to the CPU Console serial port and press **Return** to retrieve the messages. The messages are then displayed on the console.

The text messages that are buffered internally are stored in chronological order. Only the first 20 messages are stored to avoid scrolling too many lines on the console and losing the first few. The mechanism was designed to work this way because the first few messages are usually the most important; later messages are often caused by earlier events.

## Choosing a Console Option

You can manage your M800 concentrator using either or both of the following:

- Local console interface
- TELNET console interface

### Local Console Interface

If it is convenient for you to connect a serial terminal to the M800's CPU Console port, use a local console interface.

### TELNET Console Interface

If you want to manage the M800 in-band, use a TELNET console interface. Operation of the TELNET interface requires that the IP attributes used by the concentrator software be programmed correctly.

All of the commands available via a terminal connected to the Console serial port on the CPU module can be executed from a *virtual console*. This virtual console is accessed by establishing a TELNET protocol session with the concentrator.

### Local and TELNET Console Interface

You can use both a local console interface and a TELNET console interface.

Anything displayed as a result of the command typed on the virtual console will also appear on the physical console, if one is connected. The converse is also true.

To log on to both console interfaces, you must enter your password (if any) on each. When you end the session on either, the system terminates both sessions.

## Setting Optional Parameters

You can change the following parameters to suit the intended application. If you customize any of these parameters, record the values you define on the following worksheet, and then store this manual with the M800. For detailed information about the commands associated with these parameters, see *Understanding Console Commands* on page 77.

| Parameter | Default | New Definition |
|---|---|---|
| IP Address | 157.175.215.19 | |
| IP Netmask | 255.255.255.0 | |
| IP Broadcast Address | 157.175.215.0 | |
| Local SLIP Address | 10.0.0.19 | |
| SLIP Netmask | 255.255.255.0 | |
| SLIP Host Address | 10.0.0.14 | |
| Route Table entries | n/a | |
| Gateway address (applicable if the M800 is in an FDDI network that utilizes routers) | 157.175.215.135 | |
| SNMP Manager Addresses (you can define up to 8) | n/a | |
| | n/a | |
| | n/a | |
| | n/a | |
| | n/a | |
| | n/a | |
| | n/a | |
| | n/a | |
| SMT UserData | n/a | |
| SNMP MIB Attribute SysContact | n/a | |
| SNMP MIB Attribute SysName | n/a | |
| SNMP MIB Attribute SysLocation | n/a | |
| SNMP Community String | “WriteMeReadMe” | |
| Attachment Policy (Options are break none, break all, break “tree’d” B connections. This is an advanced feature for use in certain dual homing applications.) | Break None | |
| Console Password | (None) | |

| Parameter | Default | New Definition |
|---|---|---|
| SNMP Agent Enable | Enabled | |
| T-notify (Time in seconds that the Neighbor Notification Process will occur. Range is 2 to 30 seconds, inclusive.) | 30 sec. | |
| T-request (Time in milliseconds that the Primary MAC—and Secondary MAC, if present—will provide as the station requested token rotation time during ring initialization, also known as the claim process. Range is 1 to 167 ms, inclusive.) | 167.7 ms | |

# Creating a SLIP Interface for SNMP Management

A Serial Line IP (SLIP) interface is available via the Host serial port on the CPU module to allow communication with the SNMP Agent in an *out-of-band* fashion. The SLIP interface operates at 9600 baud, 8-bit data, no parity, and 1 stop bit. Before operation of the SLIP interface is attempted, the local SLIP address, netmask, and SLIP host address should be programmed via console commands.

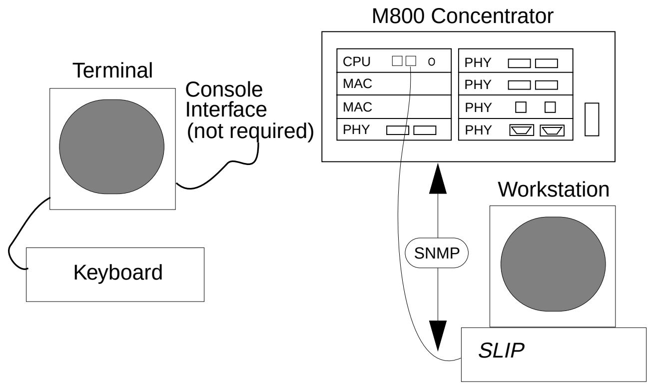



**Figure 4-1. SLIP Interface Connection**

m800.bk : config.doc 40 Fri May 23 15:31:33 1997

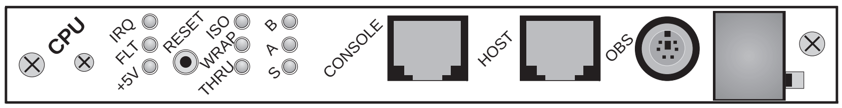
# Reconfiguring the M800 5

The M800 concentrator is designed to allow multiple configuration and redundancy options. The M800 architecture permits system configurations such as single attach, dual attach, or null attach; and up to 28 master ports. This variety of configuration is accomplished by partitioning the main functional blocks into separate modules:

- **CPU Module** — The Central Processing Unit governs system operation. This module is required.
- **MAC Module** — The Media Access Controller provides transmission and reception of frames. This module is optional.
- **PHY Module** — The Physical layer interface provides two (or four in the case of the QPHY) independent port attachments. One PHY module is required.

You can determine how the concentrator is functioning by looking at its indicators and controls. The LEDs on the front panels of the CPU, MAC, and PHY modules provide visual information about the DC voltage status, individual faults for each module, physical removal acknowledgment, and FDDI-specific indications.

# Understanding the Central Processing Unit (CPU)




The CPU module provides the microprocessor platform for executing the system software. It features a 512KB Flash EPROM circuit used for network downloading of software images. The CPU module also contains a configuration control element (CCE) to allow access to the concentrator's primary and secondary FDDI paths for backplane diagnostics and PHY port loopback testing.

The CPU module provides the bus master interface circuitry to communicate with the MAC and PHY modules. The bus interface is implemented as a 32-bit data, 24-bit address, asynchronous master/slave communication link. Bus arbitration is not required since the CPU module is the only bus master on the backplane.

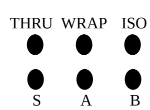
The CPU module controls the Optical Bypass Switch, if connected.

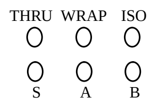
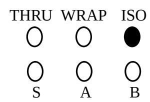
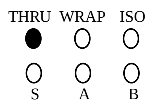
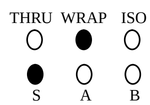
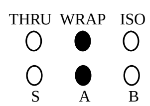
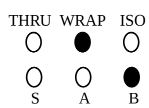
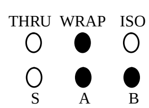
The CPU module's controls and indicators are:

| Control/ Indicators | Function |
|---|---|
| +5V | Green LED. 5 VDC is present. |
| FLT (Fault) | Amber LED. The CPU has either experienced a fault or an attention event has occurred in the concentrator. See the console for more information. |
| IRQ (Interrupt) | Green LED. CPU Interrupt processing is in progress. |

| Control/ Indicators | Function |
|---|---|
| RESET | Pressing the recessed push-button causes a total system reset of the concentrator. |
| THRU | Green LED. FDDI Station Configuration State is THRU. |
| WRAP | Green LED. The FDDI Station Configuration State is WRAP. Used with either the S, A, or B indicator. |
| ISO (Isolate) | Green LED. The FDDI Station Configuration State is ISOLATE. |
| S | Green LED. Concentrator configuration is Single Attach. Used with the WRAP indicator. |
| A | Green LED. Concentrator configuration is Dual Attach. Used with B, WRAP, and THRU indicators. |
| B | Green LED. Concentrator configuration is Dual Attach. Used with A, WRAP, and THRU indicators. |
| CONSOLE | RS232 port for connection to a terminal. |
| HOST | RS232 serial port connector provided for SLIP. |
| OBS | 6-Pin DIN connector for control of an optional external optical bypass switch. |

The Configuration Management (CFM) LEDs provide a visual indication of the concentrator's current CFM state. In the following table, black LEDs are lit:

| State of CFM LEDs | Description |
|---|---|
|   | Occurs when the system power is turned on or reset. |

| State of CFM LEDs | Description |
|---|---|
|   | CPU board malfunction. |
|   | The attachments are not inserted into any path. Applicable to SAC and DAC.<br>CFM State = ISOLATE |
|   | The primary path enters the A port and emerges from the B port. The secondary path enters the B port and emerges from the A port. Applicable to DAC.<br>CFM State = THRU |
|   | The primary path is wrapped to the S port. Applicable to SAC.<br>CFM State = WRAP_S or C_WRAP_S |
|   | The primary and secondary paths are joined internal to the station and wrapped to the A port.<br>CFM State = WRAP_A or C_WRAP_A |
|   | The primary and secondary paths are joined internal to the station and wrapped to the B port.<br>CFM State = WRAP_B or C_WRAP_B |
|   | The primary path is wrapped to the B port and the secondary path is wrapped to the A port. Applicable to DAC.<br>CFM State = WRAP_AB |

# Understanding the Media Access Controller (MAC)


The MAC module provides the Media Access Control and buffer memory for the purpose of providing fair and deterministic access to the medium, address recognition, and generation and verification of frame check sequences. Its primary function is the delivery of frames, including frame insertion, repetition, and removal.

The MAC module includes the memory management hardware for handling received frames and frames to be transmitted.

Most concentrators have at least one MAC module so that they can be managed using SNMP or SMT.

The MAC addresses are derived by a combination of the unique serial number of the CPU module and the Interphase Organizationally Unique Identifier (OUI) as assigned by IEEE. The MAC addresses do not reside on the MAC module. They are contained within the non-volatile memory on the CPU module. This means that MAC modules can be exchanged between concentrators without the possibility of having duplicate MAC addresses on the FDDI network. User-defined MAC addresses can be defined through the console interface.

Dual homing is possible only if a single MAC is installed.

The MAC module's controls and indicators are:

| Control/Indicator | Function |
|---|---|
| +5V | Green LED. 5 VDC is present. |
| FLT (Fault) | Amber LED. A MAC fault has occurred. This LED lights on any MAC modules beyond the 3 supported. |
| RMV (Remove) | Green LED. The MAC module may be removed. |
| REMOVE/NORM | Two position switch. Down position - normal operation. Up position (RMV LED is lit) - the MAC module may be removed. |
| PRI (Primary) | Green LED. The MAC is the Primary MAC. |
| SEC (Secondary) | Green LED. The MAC is the Secondary MAC. |
| ROV (Roving) | Green LED. The MAC is the Roving MAC. |
| RX (Receive) | Green LED. The MAC is receiving frames. |
| TX (Transmit) | Green LED. The MAC is transmitting frames. |
| RING OP (Ring Operation) | Green LED. The Ring is operational. |

## MAC Roles

A MAC can play several roles:

- Primary MAC, which provides media access for the M800 on the primary ring.
- Secondary MAC, which provides media access for the M800 on the redundant secondary ring (there is a token on the secondary ring).
- Roving MAC, which provides access to the local path and supports *graceful insertion* when the concentrator's

M ports are connected. For more detailed information, see *Graceful Insertion: The Purpose of the Roving MAC* on page 48.

- Spare MAC, which replaces the Primary (or Secondary/Roving MAC, if it is not also playing the Spare role) if necessary. This role takes precedence over other roles.
- Disabled/ignored MAC.

The M800 software assigns these roles to the MACs present at each reset or power-up as follows:

| If your M800 has … | Its MAC(s) play these roles … |
|---|---|
| **1 MAC** | Primary MAC |
| **2 MACs** | **First MAC:** Primary<br>**Second MAC:** Spare/either Secondary or Roving |
| **3 MACs** | **First MAC:** Primary<br>**Second MAC:** Secondary or Roving<br>**Third MAC:** Spare |
| **4 or more MACs** | **First MAC:** Primary<br>**Second MAC:** Secondary or Roving<br>**Third MAC:** Spare<br>**Fourth/Fifth/Sixth MACs:** Disabled and ignored (the M800 supports only 3 MACs) |

The concentrator's primary goal is to avoid losing Primary MAC functionality. Its secondary goal is to avoid losing Secondary or Roving functionality. (Because the M800 architecture supports only 2 physical paths, a second MAC can play only one role—Secondary or Roving. You can reconfigure this MAC to play the other role at any time. You configure the second physical path and therefore the role of the second MAC (if any) using the `s config path <secondary`

`| local>` command. For more detailed information, see *s config path <secondary | local>* on page 100.) Its tertiary goal is to avoid losing Spare functionality. The concentrator dynamically reshuffles the roles being played by its MACs in order to meet these goals.

## Graceful Insertion: The Purpose of the Roving MAC

Although not defined by FDDI standards, *graceful insertion* is a feature of the M800 that can be used when a second MAC card is installed and configured as a Roving MAC. Graceful insertion is intended to prevent ring initialization when a station enters the FDDI network. Although this saves the time it normally takes to purge the ring of old PDUs and go through the FDDI claim process, there are circumstances where graceful insertion will not be effective.

Before a station is inserted into the main ring, the Roving MAC is attached to the new station, temporarily forming an independent ring. During the claim process involving the inserting station, the Roving MAC requests a TTRT value (T_Reg) equal to that of the main ring. If it wins the claim process, the Roving MAC holds this token while the Primary MAC captures the token on the main ring. Then the new station is merged with the main ring, and one token is released.

***NOTE***

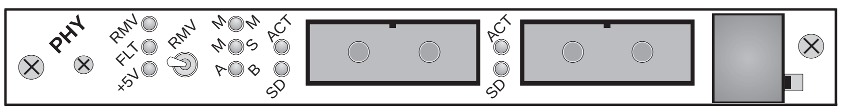
**There is no guarantee that there will not be a claim process with any graceful insertion mechanism.**

Conditions where graceful insertion does not work are:

- A station is removed from the ring.
- The local MAC does not win the claim process with the inserting station.
- Any token timer on the main ring expires during insertion.

Thus graceful insertion is effective in preventing the claim process in less than 50% of concentrator reconfigurations.

## Understanding the 2-Port Physical Interface Module (PHY)




The PHY module consists of two separate physical attachment interfaces to the FDDI network. Each PHY module is capable of functioning as two M (Master) ports, an M and S (Slave) attachment, or an A and B attachment. You determine how your PHY functions by settings its jumpers.

The following PHY modules are available:

- Multimode fiber with ST connectors
- Single-mode fiber with MIC connectors
- Multimode fiber with MIC connectors

The PHY module provides the necessary interface between the media and the data paths in the concentrator.

In most networks where a concentrator is used, it will be placed on the dual ring with other concentrators or dual attach stations. If this is the way you intend to use the M800, it needs to be configured as a dual attach concentrator (DAC). The A and B ports (used by the M800 to attach to the dual ring) need to be on the first PHY module in the system. If the A and B ports become disconnected, the stations connected to the remaining PHY modules (the M ports) can still communicate among themselves provided that the attachment port failure policy is set to the factory default.

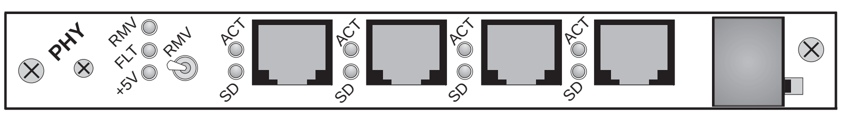
If your M800 is configured as a single attach concentrator (SAC), it has one S port and one M port on the first PHY module in the system. The S port is normally intended to connect to an M port on another concentrator. This puts your M800 in a cascaded topology and may be useful if you already have a fully loaded M800 and need to use your new M800 to increase the number of available M ports. If you leave the S port unconnected, the stations connected to the remaining PHY modules (the M ports) can still communicate among themselves provided that the attachment port failure policy is set to the factory default. In this configuration, the unit acts as a *null attach* concentrator. The system also behaves as a *null attach* concentrator if the first PHY module is configured as two (or four in the case of a QPHY module) M ports. There are a number of options for connecting A, B, and S ports to the remainder of the network.

The PHY module's controls and indicators are:

| Control/Indicator | Function |
|---|---|
| +5V | Green LED. 5 VDC is present. |
| FLT (Fault) | Amber LED. A PHY fault has occurred. |
| RMV (Remove) | Green LED. You can remove the PHY module. |
| REMOVE/ NORM | Two position switch. Down position: normal operation. Up position (RMV LED is lit): the PHY module can be removed. |
| A/B | Green LED. The upper port is type A. The lower port is type B. |

| Control/Indicator | Function |
|---|---|
| M/S | Green LED. The upper port is type M. The lower port is type S. |
| M/M | Green LED. Upper and lower ports are type M. |
| LEFT PORT (port 1) | This port can be configured as an A or M port type. |
| SD (Signal Detect) | Green LED. The upper port is receiving a signal from an attached FDDI port. |
| ACT (Active) | Green LED. The PCM has completed, and the upper port is inserted into a path. |
| RIGHT PORT (port 0) | This port can be configured as a B, S, or M port type. |
| SD | Green LED. The lower port is receiving a signal from an attached FDDI port. |
| ACT | Green LED. The PCM has completed and the lower port is inserted into a path. |
| +5V | Green LED. 5 VDC is present. |

# Understanding the 4-Port UTP PHY Module (QPHY)




The QPHY module consists of four separate physical attachment interfaces to the FDDI network and supports UTP media connectors.

The QPHY provides only M-Port attachments to the concentrator, but otherwise operates similarly to the 2-Port PHY modules.

All four ports are configured as master (M) port types.

The QPHY module's controls and indicators are:

| Control/Indicator | Function |
|---|---|
| +5V | Green LED. 5 VDC is present. |
| FLT (Fault) | Amber LED. A PHY fault has occurred. |
| RMV (Remove) | Green LED. The PHY module can be removed. |
| RMV Switch | Two position switch.<br>Down position: normal operation.<br>Up position (RMV LED is lit): the PHY module can be removed. |
| SD (Signal Detect) | Green LED. The port to the right is receiving a signal from an attached FDDI port. |
| ACT (Active) | Green LED. The PCM has completed, and the port to the right is inserted into a path. |
| Port 0 (at far right) | This port can be configured only as an M port. |
| Port 1 | This port can be configured only as an M port. |
| Port 2 | This port can be configured only as an M port. |
| Port 3 (at far left) | This port can be configured only as an M port. |

# Reconfiguring the Concentrator

After your M800 is installed, you may want to change its configuration. As your network grows and changes, you may need to install additional MACs or master port modules.

Although the concentrator is initially configured to your specifications, your unit can be expanded or reconfigured. You can add or reconfigure modules, and update firmware.

## Safety Precautions

### WARNING

**The concentrator power cord is grounded. If the protective-ground connection is broken or malfunctioning, any accessible conductive part (including controls that appear to be insulated) can render an electric shock. To avoid personal injury or damage to the unit, do not operate this instrument unless all covers and panels are secured in place.**

### ACHTUNG

**Dieses Gerät ist über das Netzkabel geerdet. Bei unterbrochenem Schutzleiter ist die Berührungssicherheit nicht gewährleistet. Vor öffnen des Gehäuses Netzstecker ziehen!**

**Zur Vermeidung von Beschädigungen durch elektrostatische Entladung ist das Gerät bei Modulwechsel über die Rückwand zu erden.**

### NOTE

**This product is sensitive to electrostatic discharge (ESD). Before removing or reconfiguring any system component, attach a grounding device to the rear panel.**

**CAUTION**

**Each spare card is packed in an antistatic bag to protect it during shipment. Keep the card in the protective antistatic bag until you are ready to install it in the concentrator. To prevent damage to the card due to electrostatic discharge, wear a grounding strap and handle the card only by its edges. Do not touch the components or any metal parts, except for the metal faceplate.**

## Understanding Available Concentrator Cards

The following cards are available for your M800 concentrator:

- CPU
- MAC
- PHY
  - Dual-port fiber (can be keyed/jumpered as A/B, M/S, or M/M)
  - Quad-port UTP

## Understanding Hot Swap

The concentrator software continually scans the backplane and makes any necessary adjustments dynamically. This allows you to *hot swap* MAC and PHY modules while the concentrator and the network continue to operate. When you insert a new module, the CPU module tests it. If all the tests are successful, the new module is incorporated. Otherwise, its fault LED illuminates, and it is disabled and ignored.

The concentrator resets whenever its attachment type changes. For example, if you remove the A/B PHY from a concentrator, the first remaining PHY would be an M port PHY. The concentrator resets because the attachment type has changed. If you then insert either an A/B or an M/S PHY in the vacant slot, the concentrator resets again, because the attachment type has changed again.

# Configuring Your PHY Card

## Keying Your MIC PHY Card

If you are installing a non-MIC card, skip to the next section.

If you are installing a MIC card, you need to key it A/B, M/S, or M/M, as follows (see Figure 5-1 on page 56):

| To key your MIC card as … | With the card's faceplate facing you, do this … |
| --- | --- |
| **A/B** | Insert the A key on the left, and the B key on the right. |
| **M/S** | Insert the M key on the left, and make sure there is no key inserted on the right. |
| **M/M** | Insert M keys on both the left and the right. |

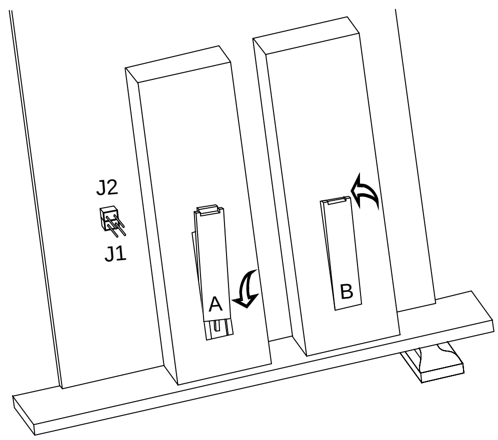



**Figure 5-1. MIC PHY Card Jumper Locations and Keying**

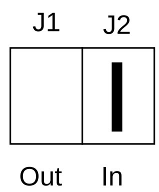
## Setting Your PHY Card's Jumpers

The PHY card's ports connect the concentrator to the dual ring or tree. The dual-port cards' J1 and J2 jumpers, whose locations are the same regardless of connector type, determine the port types. (All of the quad-port UTP card's ports are M ports.)

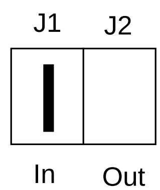
If you are installing a quad-port UTP card, continue with the next section.

If you are installing a dual-port card, you must set its jumpers as follows:

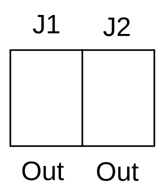
To configure the card to type A/B (dual attach connection), J1 is out and J2 is in:




To configure the card to type M/S (single attach), J1 is in and J2 is out:



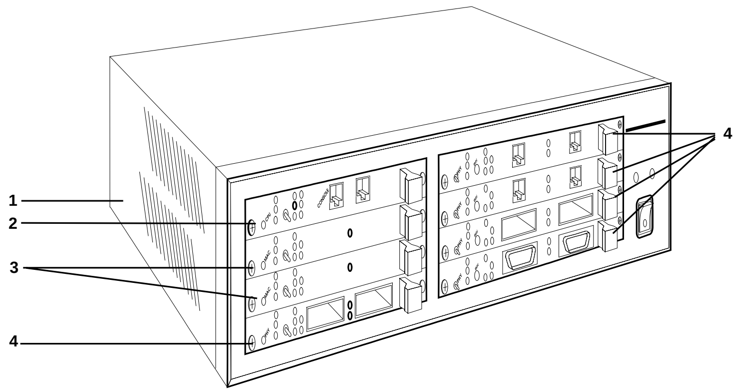

To configure the card to type M/M, make sure both J1 and J2 are out:




# Installing Your Card

## Choosing a Concentrator Slot

Choose a concentrator slot for the card you are installing with the following recommendations and requirements in mind.




| Index | Description |
|---|---|
| 1 | Unit Enclosure |
| 2 | CPU |
| 3 | MACs |
| 4 | PHYs |

**Figure 5-2. Possible M800 Concentrator Configuration**

The M800 backplane has a total of 8 slots and is U-shaped (that is, the first slot is the top left slot, the fourth slot is the bottom left slot, the fifth slot is the bottom right slot, and the eighth and last slot is the top right slot. It is recommended that you insert cards in this U shape, leaving no blank slots between cards.

## Card Installation Requirements

Card installation requirements are:

- You must install a CPU card in the first slot. You must not install any other CPU cards.

**WARNING**

**If you install more than one CPU module, damage to the backplane hardware interface can result.**

- If you are installing one or more MAC cards, they must follow the CPU card. (The software does not support more than three MACs. Any MACs beyond three are disabled and ignored.) If the concentrator is dual-attached, you must install at least one MAC.
- You must install at least one PHY of some type.
- You can install only one A/B or M/S PHY card.
  - If you are installing an A/B PHY, you must also install at least one MAC, and the A/B PHY must immediately follow the last MAC.
  - If you are installing an M/S PHY, it must immediately follow the last MAC, if any. If no MACs are installed, the M/S PHY must immediately follow the CPU card.

## Inserting Your Card in an M800 Slot

1. If you are installing a CPU card, power down the concentrator. Otherwise, you do *not* need to power down the concentrator.
2. Do one of the following:
   - If there is a blank faceplate on the slot you chose, unscrew the faceplate and remove it.
   - If there is a card in the slot you chose, unplug any cables and flip its switch to the RMV position. (If you remove a card without using the switch

correctly, the concentrator resets.) When the RMV LED re-illuminates, unscrew the card, and remove it.

## CAUTION

**If you remove a MAC or PHY card manufactured before May 16, 1997, from slot 4 or 5 (the two bottom slots) of an M800 concentrator while it is powered on, the concentrator resets during ejection of the card. To upgrade a MAC or PHY card manufactured before May 16, 1997, you can order upgrade kit CONC-MAC/PHY-HWU.**

3. If you are installing a card other than a CPU card, make sure the switch on the card you are installing is *not* in the RMV position.
4. Insert the card in the slot guides with the ejector on the right, component side up.
5. Slide the board all the way into the slot and press firmly on the ends of the faceplate until the faceplate is flush with the adjacent faceplate(s).
6. Tighten the screws.
7. Reinsert any cables.
8. If you installed a CPU card, power up the concentrator.

# M800 Maintenance 6

## Installing Software Updates

A software update can be installed on the concentrator via TFTP or by EPROM replacement. A TFTP download does not affect normal operation of the concentrator. The concentrator may be reset at a later time to activate changes. However, the concentrator must be powered off when replacing the EPROM.

## TFTP Download Procedure

A TFTP download requires that a binary TFTP Write Request be issued to the M800 concentrator, followed by subsequent data packets as the download progresses.

For example, to **tftp** a file:

**NOTE**

**tftp must be enabled. For more detailed information about this command, see *Download Enable Command* on page 96.**

1. From a working directory, extract the tar file from the distribution media as follows:

```
tar xvf <device>
```

where `<device>` is the name of a tape or floppy device on your system. For example, if you are using Solaris with a floppy device name of `/dev/rdiskette`, you

**a.** Stop the volume manager:

```
/etc/init.d/volmgt stop
```

**b.** Change to a working directory.

**c.** Insert the diskette in the drive and enter

```
tar xvf /dev/rdiskette
```

**2.** **tftp** from the networked system to the IP address of the concentrator. Indicate **binary** transfer and using the **put** command, copy the file. For example:

```
system# tftp 128.10.2.228
tftp> binary
tftp> put filename
```

When the download completes, the concentrator validates the image it received and then programs it into the Flash EPROM. Console messages indicate the steps of the download as it progresses. The protocol used is detailed in RFC783. Successful completion of a TFTP download and Flash programming automatically selects the Flash image for launch the next time the concentrator system is restarted. The concentrator is ***not*** restarted by the TFTP download in order to allow you to schedule an appropriate time for a system restart after the software image update.

## EPROM Removal/Replacement

**1.** Remove power from the concentrator.

**2.** Unscrew the left and right tapped screws. The screws should remain in the front panel.

3. Push right on the front panel ejector and pull to remove the CPU module.
4. Locate the EPROM and remove it from the socket with a screwdriver or appropriate IC extractor tool.

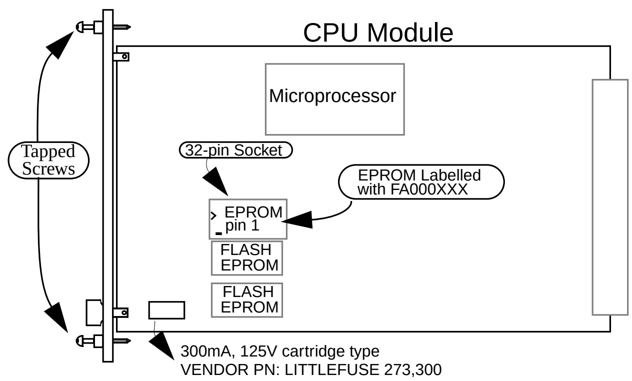



**Figure 6-1. Removing/Replacing an EPROM**

5. Replace the EPROM. Note the pin 1 position.
6. Return the CPU module to slot 1.
7. Screw and secure the left and right tapped screws.
8. Power on the concentrator.

# Troubleshooting the M800

# 7

## CPU Symptoms and Corrective Actions

| Symptom | Indicators | Cause | Action |
|---|---|---|---|
| No power to the CPU module. | The +5V LED (GREEN) on the CPU module does not illuminate. | 1) Concentrator power is not switched on.<br>2) The AC cord is not plugged in.<br>3) Blown AC protection fuse.<br>4) Faulty AC power source or concentrator power supply.<br>5) Faulty CPU module. | 1) Make sure power is ON.<br>2) Make sure the AC cord is attached to the concentrator and has been inserted in an acceptable AC power source.<br>3) Inspect or replace the fuse.<br>4) Check the power source and/or replace the concentrator power supply.<br>5) Replace the CPU module. |
| Apparent problems with system operation. | The FLT LED (AMBER) on the CPU module is illuminated. | 1) An event has occurred in the concentrator causing output and/or status that should be viewed on the console.<br>2) The M800 CPU has experienced a fault/abnormality.<br>3) Faulty CPU module. | 1) Check console messages.<br>2) Reset the CPU module.<br>3) Replace the CPU module. |
| Inconsistent system behavior. | The IRQ LED (GREEN) on the CPU module is on for an extended time. | 1) Incorrectly seated CPU, MAC, or PHY module(s).<br>2) Faulty CPU or MAC module. | 1) Ensure that all modules are firmly seated in the backplane.<br>2) Replace the defective CPU or MAC module. |
| The CPU module reset button has no visible effect. | Most or all of the LEDs remain illuminated. | 1) Faulty CPU module.<br>2) Faulty backplane.<br>3) Faulty software image. | 1) Observe the power-up diagnostics on the console.<br>2) Replace the CPU module. |

| Symptom | Indicators | Cause | Action |
|---|---|---|---|
| Nodes connected to the PHY modules are unable to communicate with hosts on the main FDDI dual ring or a level higher in the tree. | The CFM LEDs (GREEN) are incorrectly illuminated. | 1) The concentrator attachments are not cabled correctly.<br>2) The attachment PHY module is faulty. | 1) Check the attachment cabling.<br>2) Replace the faulty attachment PHY module. |

# MAC Symptoms and Corrective Actions

| Symptom | Indicators | Cause | Action |
|---|---|---|---|
| The MAC is not transmitting and/or receiving frames. | The Fault LED may be illuminated. | 1) Incorrectly seated MAC module.<br>2) Incorrect placement of the MAC module.<br>3) Faulty MAC module. | 1) Verify that you have followed the *Card Installation Requirements* on page 58.<br>2) Ensure that all modules are firmly seated in the backplane.<br>3) Replace the faulty MAC module. |
| No frame transmission. | The Transmit LED never flickers on the primary or secondary MAC. | 1) Incorrectly seated MAC module.<br>2) Faulty MAC module. | 1) Ensure that all modules are firmly seated in the backplane.<br>2) Replace the faulty MAC module. |
| The system does not get ring op. | The Ring OP LED is not illuminated. | There is a fault somewhere on the ring. | Check your ring configuration and cable connections. |

# PHY Symptoms and Corrective Actions

| Symptom | Indicators | Cause | Action |
|---|---|---|---|
| The PHY module appears inoperative. | The Fault LED may be illuminated. | 1) The PHY module is jumpered incorrectly.<br>2) Incorrectly seated PHY module.<br>3) Faulty PHY module. | 1) Make sure that only one PHY module is jumpered as A/B or M/S.<br>2) Ensure that all modules are firmly seated in the backplane.<br>3) Replace the faulty PHY module. |
| No signal is being received from the connected PHY. | SD LED is not illuminated. | 1) The cable is broken or inserted incorrectly.<br>2) The PHY on the concentrator or the neighboring PHY is faulty. | 1) Check the cables.<br>2) Check the connector keying and cable connection.<br>3) Try connecting a known active station to the port to see if the port is active.<br>4) Replace the PHY module. |
| The station connected to the port cannot communicate. | The ACTIVE LED is not illuminated. | 1) The cable is broken or inserted incorrectly.<br>2) The port type is incompatible with this PHY.<br>3) The PHY on the concentrator or the neighboring PHY is faulty. | 1) Check the cables.<br>2) Check the connector keying, cable connections, and neighboring port type.<br>3) Try connecting a known operating node to see if the port is active.<br>4) Replace the PHY module. |

# Box LED Symptom and Corrective Action

| Symptom | Indicators | Cause | Action |
|---|---|---|---|
| The concentrator is powered on, but the fan is not functioning. | FAN box LED is not illuminated. | The cause could be any of the following:<br>Fan might need to be cleaned.<br>The connector might be loose, in which case the fan does not have power.<br>Fan motor might have malfunctioned.<br>12V power supply might have malfunctioned.<br>FAN LED might have burned out. | Check for an obstruction to the fan from outside the chassis. If you cannot find an obstruction, you need to return the M800 for repair. For more information, see http://www.iphase.com/Public/AppEng/custsup/support.html, or the Assistance information at the front of this manual. |

# M800 Concentrator Specifications

A

The concentrator cabinet consists of the following:

## Size

### Concentrator

4.2 in (106.68mm) High x 17 in (431.8 mm) Wide x 18.75 in (476.25 mm) Deep

19 Inch Rack Mount Support (17.5 inches wide)

### Modules

144.45mm x 220mm (4U High x 220mm Deep)

## Power Supply

125 Watts at 5 Volts

72 Watts at 12 Volts

Auto-switching 115VAC to 230 VAC Input

## Fan

12 VDC

3.6-Inch Low-Noise

1 fan @ 52 CFM

# Weight

25 lbs. maximum (fully populated)

# Operating Environment

| | |
|---|---|
| Temperature | 10–50° C |
| Relative humidity | 5–90% noncondensing |

# Storage Environment

| | |
|---|---|
| Temperature | -40–70° C |
| Relative humidity | 5–95% noncondensing |

# Cabling B

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

***NOTE***

**If you need cabling information for older modules not included below, see the Assistance information at the front of this manual.**

## Twisted Pair

The transmission of 100 Mbps over twisted pair cable can be accomplished using TP-PMD. TP-PMD describes both unshielded twisted-pair (UTP) and shielded twisted pair (STP) cable types. However, only the UTP type is used with the M800 concentrator.

TP-PMD is made up of three components:

- **Data Scrambling** is a method of randomizing the NRZI data stream, which has the effect of spreading the frequencies which emit energy across the frequency band.
- **MLT-3 Encode/Decode** is a method of converting the scrambled NRZI (two-level signals) data into three-level signals. MLT-3 has the effect of reducing the fundamental frequency of NRZI to one-half of its unconverted value. With MLT-3 coding, 90 percent of the spectral energy lies below 40 MHz. See Figure B-1.

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

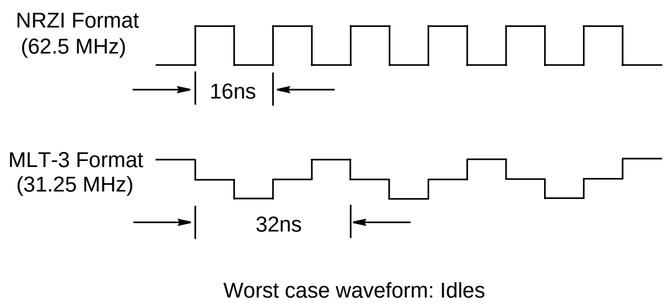



**Figure B-1. MLT-3 Encoding**

TP-PMD allows the use of a RJ-45 connector for transmission over UTP cable.

The connector pinout for TP-PMD does not provide any differentiation between an S port and an M port. It is the responsibility of the user to ensure that the appropriate *crossover* cables are installed. See Figure B-2.

### CAUTION

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

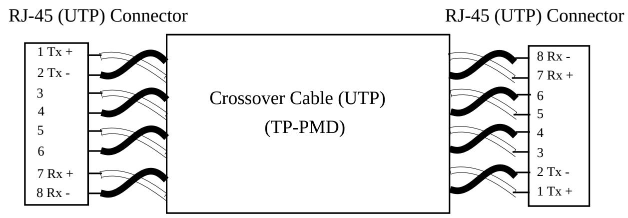
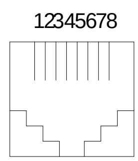



**Figure B-2. Crossover Cabling Diagram**

UTP uses an 8-pin modular RJ-45 style connector.




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

**Cable Requirements**

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

**Figure B-3. TP-PMD UTP Connections**

## UTP DOs

- RJ-45 modular jacks must be EIA/TIA type 568A or 568B to ensure compliance with ANSI/EIA/TIA-568 and EIA/TIA/TSB-40.
- Ensure the category 5 cable has 4-5 turns per inch and no portion of the cable has any untwisted lengths greater than 0.5 inches.
- It is a good practice to indicate the type of service at each wall jack and cross connect.
- Ensure modular jack pitch panels are category 5.
- Ensure patch cabling is category 5.
- Ensure that the appropriate crossover cable between UTP ports is used.
- All cables, punchdown blocks, patch panels, and wall plates ***must be*** Category 5.

## UTP DON'Ts

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

- Do not exceed 100 meters for Category 5 UTP cables. Failure to do this increases the possible data error rate and degrades the throughput of the link.

# Console Cable Pinouts

The pinouts for the RJ-45 to DB25 cable's connectors are:

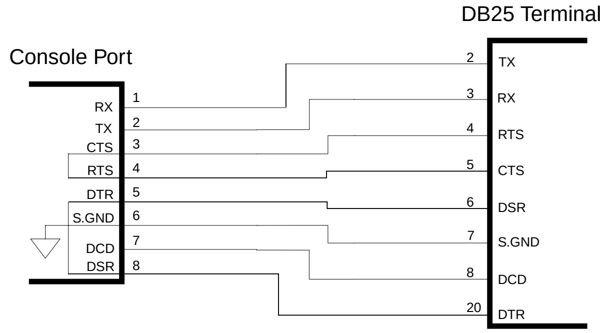



**Figure B-4. Console/Host Terminal Signal Flow**

**Table B-1. RJ-45 Electrical Pinout**

| Pin No. | Signal Name |
|---|---|
| 1 (Top) | Receive Data |
| 2 | Transmit Data |
| 3 | CTS |
| 4 | RTS |
| 5 | DTR |
| 6 | Signal Ground |
| 7 | DCD |
| 8 | DSR |

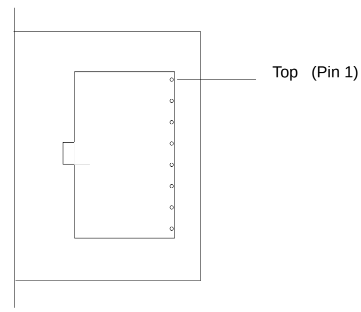



**Figure B-5. Diagram for RJ-45 Electrical Pinout**

**Table B-2. CPU Console/Host RJ-45 Electrical Pinout**

| Pin No. | Signal | Direction |
|---|---|---|
| 1 | Receive Data | IN |
| 2 | Transmit Data | OUT |
| 3 | Looped to 4 | IN |
| 4 | Looped to 3 | OUT |
| 5 | Looped to 8 | IN |
| 6 | Signal Ground | |
| 7 | Not Connected | |
| 8 | Looped to 5 | OUT |

# Understanding Console Commands

# C

You can enter only one console command per line, but there is a type-ahead feature limited only by the input buffer size.

## Command Conventions

Required fields are denoted by angle brackets, and variables are italicized. For example:

***<example>***

Optional fields are denoted by square brackets. For example:

[**example**]

When items in a command line have more than one option from which to choose, the choices are separated by the logical "OR" symbol ("|"). For example:

**enable** <**mac | phy**>

In this case, you would type either **enable mac** or **enable phy**.

## Initial Setup Commands

The M800 factory defaults are adequate for most applications. If you want to tailor the parameters to meet a specific network configuration, the following commands are useful:

## help

The **help** command displays a summary description of the commands that are available through the console interface. For additional detail about the commands, individual help menus are available by typing **<*command*> help**.

```
concen: help
Console commands:
----------------
 ? - display this stuff
 arp - set, delete, or dump arp table, "arp help" for usage
 bootp - enable or disable BOOTP Client
 connect - connect to ring
 d - display, "d help" for more info
 disable - disable a MAC or PHY board, "disable help" for usage
 disconnect - disconnect from ring
 enable - enable a MAC or PHY board, "enable help" for usage
 help - display this stuff
 lo - end console session
 ping - send echo packets, "ping help" for usage
 reset - reset the concentrator
 route - add/delete IP routes, "route help" for usage
 s - set, "s help" for more info
 snmp - enable or disable SNMP Response Agent
 tftp - enable or disable tftp
 trap - issue an SNMP trap, use "trap <number>"
 . - end console session
```

## d ip

The **d ip** command provides the current IP settings.

```
concen: d ip
IP: 157.175.215.180, netmask: 255.255.255.0, broadcast:
   157.175.215.0
concen:
```

## s ip help

The **s ip help** command provides a description of the command line syntax required to change the IP address, netmask, and broadcast address.

```
concen: s ip help
usage: set ip <IP address> <netmask> <broadcast address>
concen:
```

## s ip

The **s ip** command is used to change the current settings. To change the settings to an IP address of 123.456.789.10, netmask of 255.255.255.0, and broadcast address of 123.456.789.0, you would enter:

```
concen: s ip 123.456.789.10 255.255.255.0 123.456.789.0 <return>
concen:
```

***NOTE***

**You must reset the concentrator in order to initialize the software with the new parameter settings.**

## s config help

The **s config help** command lists the configuration parameters that you can change and the command line syntax. For more detailed information about these commands, see *Set Commands* on page 97.

```
concen: s config help
usage: set config attach <normal | b | all>
       set config launch <eprom | flash>
       set config gateway <IP address>
       set config slip <IP address> <netmask> <host address>
       set config password <up to 10 chars>
       set config path <secondary | local>
       set config <primary | secondary> <xx xx xx xx xx xx>
       set config syscontact <up to 128 chars>
       set config syslocation <up to 64 chars>
       set config sysname <up to 32 chars>
       set config userdata <up to 32 chars>
       set config community <up to 32 chars>

concen:
```

## bootp <enable | disable>

When **bootp** is enabled, the concentrator broadcasts bootp requests to a bootp server in order to discover its own IP address.

# Commonly Used Commands

The following commands are often used to monitor performance of the M800. Screen examples show typical command output.

## d ports

The **d ports** command shows the status of all concentrator ports. For more information about these values, see the glossary and the SMT specification (see *Related Publications* on page 3).

```
concen: d ports
PHY Type Status  Neigh  PCM      CFM | PHY Type Status  Neigh PCM
    CFM
------------------------------------------------------------------
------------
 0     B                             Active    M
PC8:ActiveC                          |         1        A
Connecting?                          PC3:ConnectI
 2     M                             Active    S
PC8:ActiveP                          |         3        MActiveA
PC8:ActiveP
```

Each output line gives you information about a pair of PHY ports. Port 0 is the rightmost port of the first PHY. If the first PHY is a 2-port PHY, port 1 is its left port, and port 2 is the rightmost port of the next PHY in the U-shaped subrack. The highest numbered port is the leftmost port of the last PHY.

The *Type* column refers to the port type. From the example, you can see that this M800 is a dual attach system with 10 M ports. The *Status* column gives the current port connection status and allows you to easily determine if the station attached to a port is in the FDDI ring. The *Neigh* column indicates the port type at the other end of the connection. If the other end is not active or has not completed PCM signaling, a **?** appears. The *PCM* column shows the state of the PCM state machine that is controlling the port. The *CFM* column shows the current state of the port's Configuration Management state machine. This information is useful if there is a question about the configuration of the system and the destination path of a port. The CFM states are:

| This CFM state … | Means … |
|---|---|
| **I** | The port is not inserted into any path. |
| **P** | Inserted on the primary path. |

| **This CFM state …** | **Means …** |
|---|---|
| **S** | Inserted on the secondary path. |
| **C, T** | Used only on Port A, B, or S attachments as a special CFM state. |
| **L** | The port is inserted in the local path. This is only used during graceful insertion. |

## d ring

The **d ring** console command displays the status of the primary and secondary rings. This information, drawn from the MIB, describes various output parameters of the MACs including: the RMT state, T-Requested, T-Negotiated, and TVX.

```
concen: d ring
 T-Notify is 20 seconds

 Primary MAC current RMT state: Ring_Op
 T-Requested for the Primary MAC is 165.7 mSec
 T-Negotiated for the Primary MAC is 7.987 mSec
 Tvx for the Primary MAC is 2.519 mSec
 Secondary/Roving MAC current RMT state: Ring_Op
 T-Requested for the Secondary/Roving MAC is 165.7 mSec
 T-Negotiated for the Secondary/Roving MAC is 165.7 mSec
 Tvx for the Secondary/Roving MAC is 2.519 mSec
concen:
```

## d mib counters

The **d mib counters** command is useful for examining some of the more basic statistics associated with the MAC(s) installed in the M800.

```
concen: d mib counters
Primary MAC:
 Total Frames 82440, Xmit Frames 8601, Copied Frames 37736
 Error Frames 0, Lost Frames 0, Not Copied 0
 Ring Ops 19, Tokens 1399836940

Secondary/Roving MAC:
 Total Frames 4875, Xmit Frames 0, Copied Frames 0
 Error Frames 0, Lost Frames 0, Not Copied 0
 Ring Ops 19, Tokens 1399836940, Tvx Expirations 7

concen:
```

The first two output lines for each MAC (after the name of the MAC) are frame-related and present information maintained in the SMT MIB by the software. The first number, *Total Frames*, indicates how many frames the MAC has seen on the FDDI ring. It does not necessarily count the frames transmitted or received by this MAC, just the frames that have gone past this point on the ring. The *Xmit Frames* value gives the total number of SMT and LLC (Logical Link Control) frames that have been transmitted by this MAC. *Copied Frames* counts the number of frames (SMT and LLC) that have been received by this MAC. All of the counters shown on the next line (Error Frames, Lost Frames, and Not Copied) are counters of erroneous conditions and should never be very large or increment quickly. The *Ring Ops* counter indicates how many times the FDDI ring has gone through a claim sequence and a token has been generated. The last counter, *Tokens*, indicates how many tokens this MAC has seen. In a small, lightly loaded ring, this counter increments very quickly. In larger, more heavily loaded rings, this counter increments more slowly because the MAC sees the token less often.

## d neigh

The **d neigh** command prints the non-canonical MAC address of both the upstream and downstream MACs in the FDDI ring.

```
concen: d neigh
Primary MAC upstream neighbor: 00:00:ee:48:09:80
Primary MAC downstream neighbor: 00:00:ee:68:c0:99
Secondary/Roving MAC upstream neighbor: 00:00:1f:00:00:00
Secondary/Roving MAC downstream neighbor: 00:00:1f:00:00:00

concen:
```

If the MAC immediately downstream of this concentrator's MAC does not respond to NIF requests, it is not possible (except in 2-MAC rings) for the concentrator to determine the downstream MAC's address. If this is the case, SMT's designated "unknown MAC address" (00:00:1f:00:00:00) displays as the MAC address. If the MAC upstream of this concentrator's MAC is not transmitting NIF announcements or requests, this concentrator's MAC cannot determine the upstream MAC's address.

## arp dump

The **arp dump** console command shows the IP address as well as the canonical and non-canonical MAC addresses for each station in the ARP cache.

```
concen: arp dump
157.175.215.84 at 08-00-20-17-f7-b1 (10:00:04:e8:ef:8d)
157.175.215.112 at 00-00-77-81-fb-d0 (00:00:ee:81:df:0b)
157.175.215.135 at 08-00-20-06-42-68 (10:00:04:60:42:16)
concen:
```

Even though the non-canonical address (00:00:ee:12:34:56 in the above example) is used by the FDDI network (and SMT), the protocol stack uses the canonical form internally.

## ping <*host_address*> [*size*] [*count*]

The **ping** command sends ICMP echo frames to a station on the network.

```
concen: ping 157.175.215.13 200 15
PING 157.175.215.13: 200 data bytes
concen: 208 bytes from 157.175.215.13: icmp_seq=0.
208 bytes from 157.175.215.13: icmp_seq=1.
208 bytes from 157.175.215.13: icmp_seq=2.
208 bytes from 157.175.215.13: icmp_seq=3.
208 bytes from 157.175.215.13: icmp_seq=4.
208 bytes from 157.175.215.13: icmp_seq=5.
208 bytes from 157.175.215.13: icmp_seq=6.
208 bytes from 157.175.215.13: icmp_seq=7.
208 bytes from 157.175.215.13: icmp_seq=8.
208 bytes from 157.175.215.13: icmp_seq=9.
208 bytes from 157.175.215.13: icmp_seq=10.
208 bytes from 157.175.215.13: icmp_seq=11.
208 bytes from 157.175.215.13: icmp_seq=12.
208 bytes from 157.175.215.13: icmp_seq=13.
208 bytes from 157.175.215.13: icmp_seq=14.

----157.175.215.13 PING Statistics----
15 packets transmitted, 15 packets received, 0% packet loss
```

The example above shows the output from a **ping** command intended to transmit ICMP Echo frames to the station on the network with the 157.175.215.13 IP address. A total of 15 ping frames were received from 157.175.215.13 and each frame was 200 bytes (plus 8 bytes of header) long.

## d config

The **d config** command prints out some of the information stored in the non-volatile memory on the CPU module. A number of the concentrator's operational parameters are maintained in this memory.

```
concen: d config

Software Revision: b3
The Flash image is preferred for boot
ram size: 2097152 bytes. 129 system resets.
User-defined Primary MAC address: 00:00:00:00:00:00
User-defined Secondary MAC address: 00:00:00:00:00:00
SNMP Response Agent is enabled.
SNMP Enterprise ID path vector: 1 3 6 1 4 1 185 1
IP Address: 157.175.215.19, SLIP Address: 10.0.0.19
IP Broadcast Address: 191.30.0.0
IP netmask: 255.255.255.0, SLIP netmask: 255.255.255.0
Gateway: 191.30.90.1, SLIP Host: 10.0.0.14
SMTUserData is "Interphase FDDI Concentrator "
SNMP SysContact is "System Administrator"
SNMP SysName is "m800 "
SNMP SysLocation is "DEMONSTRATION UNIT "
The user-programmable community string is "WriteMeReadMe".
The attachment fault policy is to break no M port connections.
The second internal path is used as a secondary path.

concen:
```

The display shows the current status of the parameters, most of which can be modified using other console commands. Some of this information may be very useful if it becomes necessary to contact Interphase for assistance with the system. The Software Revision level (shown on the first line) is important to note when calling for assistance. The IP-oriented parameters (about halfway down) are vital for correct operation of the SNMP Response Agent, TFTP download, TELNET, and SLIP. Whether the SNMP Response Agent is enabled or disabled is indicated on line 6. The *User Data* string, the SNMP strings, and the community string can be tailored (via console commands) to suit the needs of the network.

The attachment fault policy (on the next to last line) is responsible for determining how the M800 reacts to a failure (or disconnection) of the system's attachment port(s) (A and B, or S).

The last line indicates whether or not the system has been configured to provide graceful insertion using the second physical path. If graceful insertion is enabled (see *s config path <secondary | local>* on page 100), the concentrator uses its second physical path as a local path.

### d slots

The **d slots** command lists the modules in the system and their slot numbers. This mapping information shows the relationship between the CPU, MAC, and PHY modules and the subrack slots. In addition, internal mapping information displays for the MACs and the PHYs.

## Console Help Commands

### ? *or* he *or* help

These commands respond with a summary description of the commands available via the console. The **help**, **he**, and **?** commands are identical. Note that in the console display, not all of the commands are described in exhaustive detail due to space constraints. If you want additional help with the display, set, or various MIB commands, type **di help**, **s help**, or **di mib help** for additional information on those commands.

# ARP Table Commands

## arp del <*host_address*>

This command deletes an entry in the ARP table corresponding to **host_address**. If **host_address** is not found in the table, no changes are made to the ARP table and a message displays on the console.

## arp dump

This command responds with the contents of the ARP table as IP address/MAC address pairs. Both the canonical and non-canonical representation of the MAC address(es) are provided.

## arp help

This command responds with a summary of the commands used to manipulate or examine the ARP table. The same information is also available by typing **arp** alone.

## arp set *<host_address> <hardware_address>*

This command enters a new **host_address/ hardware_address** pair in the ARP table. If the table is full, no changes are made to it, and a message displays on the console.

# FDDI Ring Connection/Disconnection Commands

## connect

This command instructs the M800 to connect to the ring and allows connections to become active on the M ports. When the system is powered up, the M800 automatically attempts to connect.

## disconnect

This command instructs the M800 to disconnect from the ring and disallows connections to the M ports. Any active connections on all M800 PHY ports are broken.

# Display Commands

Note that the **d** and **di** commands are equivalent. The **di** style is used below, but the **d** style is also accepted for all display commands.

## di ? *or* di he *or* di help

This command responds with a summary of all the display commands available via the console.

## di b <*address*> [*count*]

This command displays a number (**count** = number of bytes to display) of 8-bit bytes of memory starting at the defined address.

## di config

This command responds with the contents of the Configuration RAM used by the M800 software.

## di fsi <*mac_number* | primary | secondary | \ roving> [regs]

This command responds with the contents of the selected MAC's controlling data structure. The FSI selected is the one associated with the MAC denoted by **mac_number**, or the keywords: **primary**, **secondary**, or **roving**. If the **regs** option is requested, some of the FSI's registers display on the console. Reading certain registers would alter the normal operation of the device, so these registers are not displayed. See the Motorola FSI (MC68839) Specification for more information.

## di fstats [*mac_number*]

This command responds with the raw frame reception and transmission statistics for the selected MAC in the M800. If the **mac_number** parameter is omitted, the statistics for the primary MAC display on the console.

## di ip

This command responds with the IP address, netmask, and broadcast address used by the M800.

## di m <*address*> [*count*]

This command displays a number of 32-bit words of memory starting at the defined address.

## di mac <*mac_number* | primary | secondary | \ roving> [regs]

This command responds with the contents of the selected MAC's controlling data structure. The MAC selected is the one associated with the MAC denoted by **mac_number**, or the keywords: **primary**, **secondary**, or **roving**. If the **regs** option is requested, some of the MAC's registers are displayed on the console. Reading certain registers would alter the normal operation of the device, so these registers are not displayed. See the Motorola FSI (MC68839) Specification for more information.

## di manager

This command displays all of the IP addresses that are designated to receive SNMP traps when they are issued.

## di mib ? *or* di mib he *or* di mib help

This command responds with a summary of all the MIB display commands available via the console.

## di mib cfm

This command responds with the current SMT CFM state using information drawn from the MIB. Note that the displayed CFM state depends on the configuration of the M800 (single, dual, or null attach) as well as the active status of the attachment ports.

## di mib counters

This command responds with some of the more interesting MIB counters for each of the MACs installed in the M800.

## di mib ler <*port_number*>

This command responds with link error information for the PHY selected by *port_number*. The information is drawn from the MIB.

## di mib rmt

This command responds with the status of the primary and secondary rings. The information is drawn from the MIB and actually indicates the state of the RMT state machines running with the primary and secondary MACs. This command is identical to **di ring**.

## di neigh

This command responds with the MAC addresses of the upstream and downstream neighbors of each MAC in the M800.

## di phy <*phy_number*> [regs]

This command responds with the contents of the selected ELM's controlling data structure. If the **regs** option is requested, some of the ELM's registers are displayed on the console. Reading certain registers would alter the normal operation of the device, so those registers are not accessed by this command.

## di ports

This command responds with information about all of the PHYs in the M800. The information is taken directly from the MIB and includes the PHY ID, operational status, type, neighbor type (if the port is active), PCM State, and CFM state.

## di ring

This command responds with the status of the primary and secondary rings. The information is drawn from the MIB and actually indicates the state of the RMT state machine running with the primary and secondary MACs. This command is identical to the **di mib rmt** command.

## di slots

This command responds with the mapping of slot numbers to device numbers (PHY and MAC) for all of the possible slots in the M800. In addition, internal mapping information is displayed for the MACs and the PHYs.

## di vitals

This command responds with statistics maintained for memory management, serial port buffer management, and time since reset.

## di w <*address*> [*count*]

This command displays a number of 16-bit words of memory starting at the defined address.

# Ping Commands

## ping <*host_address*> [*size*] [*count*]

This command causes the pinging mechanism to issue **count** ping frames of the length **size** to **host_address**. Response statistics are accumulated and displayed when all of the frames have been sent. The time-out for reception of a response frame from the node being pinged is approximately one second. While the ping mechanism is running, all other console commands are accepted by the M800 and any response text from a command will be intermixed with the ping response frame status text. Also, only one ping command to a single host is allowed at a time. If a ping command is typed while a ping is currently active, the console will respond with a warning message and continue with the original ping.

## ping stop

This command causes the ping mechanism to stop sending ping frames. You can achieve the same effect by pressing **Ctrl-D**. When the ping operation is terminated prematurely, the current frame transmission and reception statistics display.

# PHY and MAC Control Commands

## disable <mac | phy> <*device_number*>

This command causes the M800 to disable a MAC or PHY. Disabling a PHY that is currently maintaining an active connection will cause the PHY to break the connection before it is disabled. This will, of course, cause the node(s) that were on the ring due to the active connection to disappear. Disabling a MAC causes the ring to which it belongs to reinitialize as the MAC is removed from the token path. The keywords **mac** and **phy** select which device type is to be disabled while the **device_number** option selects the specific device. (Device numbers can be determined with the **d slots** command). A card must be physically present in the card cage to be disabled.

## enable <mac | phy> <*device_number*>

This command causes the M800 to enable a MAC or PHY that was previously disabled due to a diagnostic fault or the **disable** command. The keywords **mac** and **phy** select which device type is to be enabled while the **device_number** option selects the specific device. A card must be physically present in the card cage to be enabled.

### *CAUTION*

**There is risk associated with enabling a MAC or PHY that has been disabled due to a diagnostics fault. Doing this could affect the integrity and operational characteristics of the FDDI ring and the concentrator, because FDDI relies on the assumption that all devices in the ring are well-behaved. Malfunctioning PHYs and especially MACs are likely to trigger SMT fault recovery mechanisms, probably disrupting useful communication on the FDDI ring for some period of time.**

# Download Enable Command

## tftp <enable | disable>

This command resets the concentrator. For more detailed information about TFTP, see *TFTP Download Procedure* on page 61.

# M800 Concentrator Reset Command

## reset

This command resets the concentrator.

# IP Routing Table Commands

## route

This command responds with a summary of the commands available for manipulating or examining the IP routing tables.

## route add <*destination*> <*gateway*> <*metric*>

This command adds a new entry to an IP routing table if it is not already full. The **metric** entry indicates the number of hops to the destination. Zero (0) is used for a normal host. An entry with a metric of one (1) or greater represents a gateway. If you substitute the keyword **default** for a destination IP address, 0 is used for the routing table entry instead of an actual IP address.

### route del <*destination*> <*gateway*> <*metric*>

This command removes the entry associated with **destination** from the IP routing table.

### route dump <**net | host**>

This command responds with the contents of the network or host IP routing table. If neither the **net** nor the **host** options are provided, the command defaults to printing the contents of the network IP routing table.

## Set Commands

The **s** and **set** commands are equivalent.

### s ? *or* s he *or* s help

This command responds with a summary of all the **set** commands available.

### s b <*address*> <*value*>

This command sets a byte of memory at the defined address to a specific value.

**WARNING**

**This command allows direct access to the internal memory space of the system. Use only as instructed by Interphase customer support personnel.**

## s config ? *or* s config he *or* s config help

This command responds with a summary of all the **set config** commands available via the console. The **set config** commands affect the user-set configuration options stored internally.

## s config <primary | secondary> \ <*xx xx xx xx xx xx*>

This command changes the MAC address of the selected MAC by modifying the address stored in non-volatile memory in the concentrator. Specify the new canonical MAC address as a hexadecimal value with spaces between the hexadecimal character pairs `(xx xx xx xx xx xx).` The FDDI ring does not reinitialize when the MAC address is changed, as this command only affects the user-defined MAC address stored in non-volatile memory. If the MAC address entered is zero (all bytes zero), the concentrator (after it is reset) reverts to using the default MAC address programmed at the time of manufacture. The concentrator uses the new address only after it is reset.

## s config attach <normal | b | all>

This command tells the M800 how to react when the attachment port(s) (A/B or S) are disconnected or fail. The **normal** option directs the system to not break any of the connections that are active on the M ports of the M800. This is the mode of operation that the SMT specification intends and should be adequate for most FDDI topologies. To support special networking environments, the **b** option directs the M800 to break all active connections on the M ports which have B port neighbors. This might be useful in certain topologies to force dual homed stations to revert to their A ports to prevent false segmentation of those stations from the main ring. The **all** option directs the M800 to break all active M port connections if the attachment port(s) fail.

## s config community <*up to 32 characters*>

This command changes the community string used by the SNMP Response Agent in non-volatile memory. The community identified by this string has both read and write access to the MIB.

## s config gateway [*IP address*]

This command directs the M800 to store a gateway address to be used as the default entry in the IP network routing table at power-up or reset. The *IP address* argument must be in IP address dot notation. For example, the command `set config gateway 65.12.3.14` sets the gateway IP address to 0x410c030e. If an IP address is not provided, nothing happens. The concentrator uses this new value only after it is reset.

## s config launch <eprom | flash>

This command directs the M800 to prefer either the EPROM or Flash EPROM image for execution when the system is reset or powered up. If problems with the Flash image are suspected, usually the first course of action is to launch the EPROM image and look for a change in behavior.

## s config password <*up to 10 characters*>

This command changes the password required by the console before any commands are accepted. If no string follows **s config password,** the console does not expect a password when the system starts.

## s config path <secondary | local>

This command determines whether the concentrator attempts to effect graceful insertion of stations connecting to the M ports. If graceful insertion is selected (via the **local** option), the M800 uses the second MAC (must be installed in order to implement graceful insertion) as the Roving MAC and the second physical path to activate graceful insertion upon each insertion of a port. If the **secondary** option (the default) is selected and a second MAC is installed, the M800 uses the second physical path as the secondary path and the second MAC as the Secondary MAC. In this case, each insertion of a port generates a claim process.

## s config slip <*local address*> [*netmask*] \ [*destination address*]

***NOTE***

**The netmask parameter is required only if you are also entering a destination address.**

This command changes the IP address, netmask, and/or destination (host) address used by the M800 software for the SLIP interface using the Host serial port. All addresses must be entered in IP address dot notation (each byte of the 32-bit IP address entered in decimal, separated by a “.”). The concentrator uses the new value(s) only after it is reset.

## s config syscontact <*up to 128 characters*>

This command changes the SNMP system contact MIB attribute in non-volatile memory.

## s config syslocation <*up to 64 characters*>

This command changes the SNMP system location MIB attribute in non-volatile memory.

## s config sysname <*up to 32 characters*>

This command changes the SNMP system name MIB attribute in non-volatile memory.

## s config userdata <*up to 32 characters*>

This command changes the user data string in non-volatile memory for the SMTStationIDGrp MIB attribute.

## s ip <*IP address*> [*netmask*] [*broadcast | address*]

**NOTE**

**The netmask parameter is required only if you are also entering a broadcast address.**

This command changes the IP address, netmask, and broadcast address used by the concentrator software. All addresses must be entered in IP address dot notation (each byte of the 32-bit IP address entered in decimal, separated by a “.”). The concentrator uses the new value(s) only after it is reset.

## s m <*address*> <*value*>

This command sets a 32-bit longword of memory at the defined address to a specified value.

### WARNING

**This command allows direct access to the internal memory space of the system. Use only as instructed by Interphase customer support personnel.**

## s manager <*manager number*> <*IP | address*>

This command adds an IP address to the list of IP addresses used when transmitting SNMP traps.

## s tnotify <*seconds*>

This command changes the MIB attribute associated with T-notify used by the Primary MAC. The **seconds** argument represents the new value of T-notify in seconds. Possible values: 2–30 inclusive. This value is stored in non-volatile memory.

### s w <*address*> <*value*>

This command sets a 16-bit word of memory at the defined address to a specific value.

**WARNING**

**This command allows direct access to the internal memory space of the system. Use only as instructed by Interphase customer support personnel.**

## SNMP Response Agent Control

### snmp [on | enable | off | disable]

This command displays or modifies the current operational status of the SNMP response agent. The **snmp** command, when entered without any options, indicates whether the SNMP agent is active or not. If you enter **on** or **enable,** the concentrator enables operation of the SNMP Agent, and then resets the concentrator so that initialization of the SNMP response agent can occur correctly. If you enter **off** or **disable**, the concentrator disables the SNMP Agent, and then resets.

## SNMP Trap Command

### trap <*value*>

This command causes the concentrator to issue an SNMP trap using the argument **value** as the SNMP trap number in the transmitted frame.

# Password-Related Commands

## lo *or* “.”

This command ends the console session begun by entering the password. If there is no password, this command has no effect.

## s config password <*up to 10 characters*>

This command changes the password required by the console before any commands are accepted. If no string follows **s config password** the console does not expect a password when the system starts.

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

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

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

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

**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** ◆ A technique used to determine which station will initialize the FDDI ring.

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

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

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

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

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

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

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

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

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

**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)**

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

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

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

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

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

**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 a frame from the ring.

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

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

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

**host** ◆ Generally, any computer on a network.

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

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

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

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

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

**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.

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

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

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

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

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

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

**NIF (Neighborhood Information Frame)** ◆ Special frames used by the SMT Frame Services within the Station Management (SMT) function of an FDDI station that periodically announce their addresses to downstream neighbors. Each station in the ring makes such an announcement every 30 seconds by sending a NIF that uses Next Station Addressing (NSA), a special addressing mode that permits a station to send a frame to the next station on the token path without knowing the address of that station. This information can be used to create a logical ring map for the order in which each station appears within the ring.

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

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

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

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

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

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

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

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

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

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

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

**PDU (Protocol Data Unit)** ◆ The unit of data transfer between peer layer entities. It may contain control information, address information, and/or data (for example, a Service Data Unit from a higher layer entity). A valid PDU is at least 24 bits in length. The FDDI MAC PDUs are tokens and frames.

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

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

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

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

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

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

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

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

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

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

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

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

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

**ring** ◆ Connections between two or more stations that form a circular topology.

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

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

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

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

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

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

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

**single mode** ◆ A small-core (9 micron) optical fiber through which only one mode can propagate.

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

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

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

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

**station** ◆ An addressable node on the network capable of transmitting and receiving data. In an FDDI ring, the station can repeat data. A station has at least one instance of SMT, at least one instance of PHY and PMD, and an optional MAC entity.

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

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

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

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

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

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

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

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

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

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

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

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

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

**UTP (Unshielded Twisted Pair)** ◆ Type 3 cable with one or more twisted pairs where the wiring is not protected from electromagnetic and radio frequency, but covered with plastic or PVC.

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

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

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

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

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# Product Registration Card

Please take a minute to register your Interphase product. This will enable us to notify you about software updates and product enhancements.

Name ______________________________________________
Title ______________________________________________
Company Name ______________________________________
Company Address ____________________________________
City ______________________________________________
State ____________ Zip __________ Country ______________
Province ___________________________________________
Telephone (    ) _____________________________________
Fax (    ) __________________________________________
E-mail Address ______________________________________

Which product did you purchase? _________________________
Serial Number _______________________________________
Where did you purchase this product (company name)? ____________
Date Purchased ______________________________________

Number of client nodes at this site: _____________________
Operating System(s) being used with this product:

❑ Solaris ❑ SunOS ❑ AIX ❑ NetWare
❑ HP-UX ❑ IRIX ❑ Mac OS ❑ Windows NT
❑ PC NFS ❑ DEC Ultrix ❑ Other ____________________

Operating System Version: _____________________________
Network Protocol(s) in use:

❑ TCP/IP ❑ IPX ❑ AppleTalk ❑ Other ____________

We welcome your comments, ideas, and suggestions. You can fax additional comments to 214/654-5500, or send them to intouch@iphase.com

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