

# **MPMC221 and MPMC222 FDDI Adapter Installation and Use**

PMC221A/IH1

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Motorola, Inc.  
Computer Group  
2900 South Diablo Way  
Tempe, Arizona 85282

## **Preface**

This manual is based in part on information contained in the *RNS 2200/2250 Series PCI Bus FDDI Adapter User's Guide*.

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## Related Documentation

The publications listed below provide additional information pertinent to this document.

<b>Document Title</b>	<b>Publication Number</b>
PCI Local Bus Specification Rev 2.0; PCI Special Interest Group	PCI Rev 2.0
Common Mezzanine Card Specification; IEEE	P1386 Draft 1.5
PCI Mezzanine Card Specification; IEEE	P1386.1 Draft 1.5
MC68840 IFDDI User's Manual	MC68840UM/AD

## **Acronyms and Terminology**

The following acronyms and terminology are often used in this manual instead of the complete title or name:

DAS	Dual Attachment Station
FDDI	Fiber Distributed Data Interface
IFDDI	Integrated FDDI
LAN	Local Area Network
MIC	Media Interface Connector
OBR	Optical Bypass Relay
PCI	Peripheral Component Interface
PHY	Physical Layer Protocol
PMC	PCI Mezzanine Card
SAS	Single Attachment Station
SC	Small Configuration

## Conventions

The following conventions are used in this document:

### **bold**

is used for user input, as well as for the names of programs, directories, files, commands, and options and arguments to commands.

### *italic*

is used for names of variables to which you assign values. Italic is also used for comments in screen displays and examples.

### `courier`

is used for system output (e.g., screen displays, reports), examples, and system prompts.

### **Enter**

represents the Enter or Return key.

### **CTRL**

represents the Control key. Execute control characters by pressing the **CTRL** key and the letter simultaneously, e.g., **CTRL-d**.

## **Safety Summary**

### **Safety Depends On You**

The following general safety precautions must be observed during all phases of operation, service, and repair of this equipment. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the equipment. Motorola, Inc. assumes no liability for the customer's failure to comply with these requirements.

The safety precautions listed below represent warnings of certain dangers of which Motorola is aware. You, as the user of the product, should follow these warnings and all other safety precautions necessary for the safe operation of the equipment in your operating environment.

#### **Ground the Instrument.**

To minimize shock hazard, the equipment chassis and enclosure must be connected to an electrical ground. The equipment is supplied with a three-conductor ac power cable. The power cable must be plugged into an approved three-contact electrical outlet. The power jack and mating plug of the power cable meet International Electrotechnical Commission (IEC) safety standards.

#### **Do Not Operate in an Explosive Atmosphere.**

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

#### **Keep Away From Live Circuits.**

Operating personnel must not remove equipment covers. Only Factory Authorized Service Personnel or other qualified maintenance personnel may remove equipment covers for internal subassembly or component replacement or any internal adjustment. Do not replace components with power cable connected. Under certain conditions, dangerous voltages may exist even with the power cable removed. To avoid injuries, always disconnect power and discharge circuits before touching them.

#### **Do Not Service or Adjust Alone.**

Do not attempt internal service or adjustment unless another person capable of rendering first aid and resuscitation is present.

#### **Use Caution When Exposing or Handling the CRT.**

Breakage of the Cathode-Ray Tube (CRT) causes a high-velocity scattering of glass fragments (implosion). To prevent CRT implosion, avoid rough handling or jarring of the equipment. Handling of the CRT should be done only by qualified maintenance personnel using approved safety mask and gloves.

#### **Do Not Substitute Parts or Modify Equipment.**

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

#### **Dangerous Procedure Warnings.**

Warnings, such as the example below, precede potentially dangerous procedures throughout this manual. Instructions contained in the warnings must be followed. You should also employ all other safety precautions which you deem necessary for the operation of the equipment in your operating environment.



Dangerous voltages, capable of causing death, are present in this equipment. Use extreme caution when handling, testing, and adjusting.

All Motorola printed wiring boards are manufactured by UL-recognized manufacturers, with a flammability rating of 94V-0.



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



European Notice: Board products with the CE marking comply with the EMC Directive (89/336/EEC). Compliance with this directive implies conformity to the following European Norms:

EN55022 (CISPR 22) Radio Frequency Interference

EN50082-1 (IEC801-2, IEC801-3, IEEC801-4) Electromagnetic Immunity

The product also fulfills EN60950 (product safety) which is essentially the requirement for the Low Voltage Directive (73/23/EEC).

This board product was tested in a representative system to show compliance with the above mentioned requirements. A proper installation in a CE-marked system will maintain the required EMC/safety performance.



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## Overview

The MPMC221 and MPMC222 Fiber Distributed Data Interface (FDDI) adapters provides high-performance communication between an FDDI local area network (LAN) and a carrier board equipped with PMC (PCI Mezzanine Card) connections.

The MPMC221 /MPMC222 support extended FDDI address detection and matching. The MPMC222 provides host software programmable control of an external Optical Bypass Relay (OBR) for dual-attached station (DAS) configurations.

The MPMC221 supports single-attached (SAS) workstation configurations with Small Configuration (SC) connectors supporting fiber optic media. This board connects to a single-ring FDDI network.

The MPMC222 supports dual-attached (DAS) workstation configurations with SC connectors supporting fiber optic media and optional optical bypass relay. This board connects to a dual-ring FDDI network. Each ring connection requires one optical transceiver.

## Product Features

The MPMC221 and MPMC222 FDDI adapters have the following capabilities:

- ❑ Single-wide PMC module
- ❑ 100 Mb/s FDDI
- ❑ Single and dual-attach connectivity
- ❑ Motorola MC68840 IFDDI chip set for network interface

- ❑ ANSI X3T12 standards compliant
- ❑ Station Management (SMT) 7.3
- ❑ Programmable, partitioned, 8KB local buffer memory
- ❑ FIFO buffering supports simultaneous, full speed, zero latency PCI and FDDI data transfers
- ❑ LED indicators to show attachment card and ring status
- ❑ Fiber connectivity
- ❑ Compliance to PCI local bus specification (Revision 2.0)

Figure 1-1 shows the MPMC221 component layout and front panel.  
Figure 1-2 shows the MPMC222 component layout and front panel.

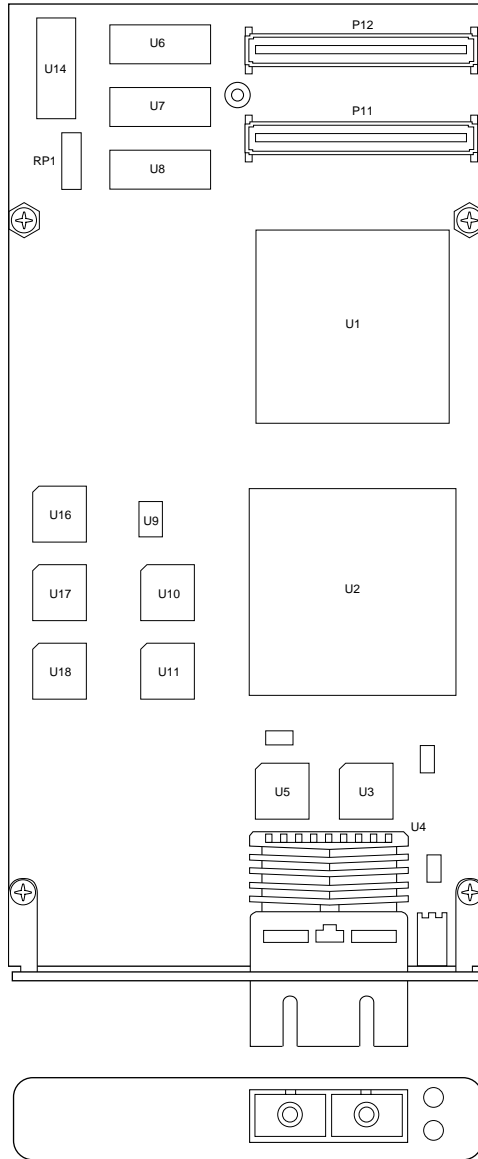
## AIX Driver

The device driver for the MC68840 Controller on the MPMC221/MPMC222 is supplied with AIX 4.1.4 R4 or later releases.

## System Requirements

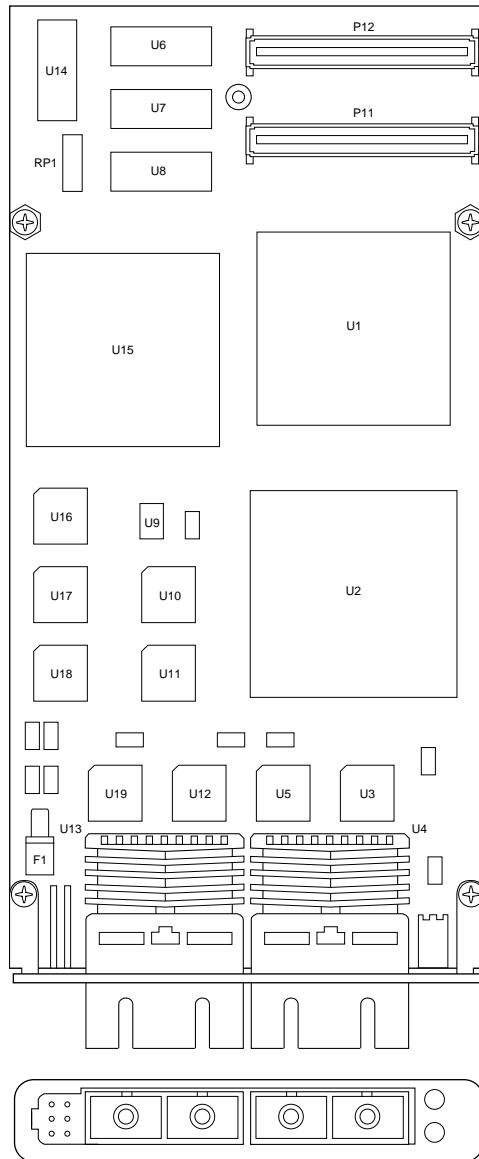
Minimum system requirements to operate the MPMC221/MPMC222 are as follows:

- ❑ Hardware:
  - Power PC systems operating under AIX 4.1.4 R4 or later
- ❑ Bus Architecture:
  - The I/O interface must comply to PCI Local Bus specification Revision 2.0 or greater
- ❑ 16MB total system memory



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Figure 1-1. MPMC221 Board Layout and Front Panel



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**Figure 1-2. MPMC222 Board Layout and Front Panel**

## Specifications

The MPMC221 /MPMC222 specifications are shown in the following table:

Form Factor	Single-wide PCI Mezzanine Card (PMC)
Dimensions	2.9 inches wide (74 mm) 5.9 inches long (149 mm)
Host Bus Interface	PCI Local Bus Specification, Rev 2.0
IEEE Compliance	IEEE P1386 Common Mezzanine Card and IEEE P1386.1 PCI Mezzanine Card
FDDI Controller	MC68840 IFDDI
Bus Structure	32-bit PCI Local Bus
Cable	Fiber Optic with Small Configuration (SC) connectors
Connectors	6-pin optical bypass relay (OBR) Small Configuration (SC) connectors (1 on MPMC221 SAS, 2 on MPMC222 DAS)
Operating Power (see Warning)	MPMC221: 1.6 A typical, 1.7 A maximum MPMC222: 2.1 A typical, 2.3 A maximum MPMC222 with OBR attached: 2.3 A typical, 2.4 A maximum
Reliability	190,509 hours mean time between failure; 107,681 hours at 95% confidence



The MPMC221 / MPMC222 exceed the maximum power dissipation as stated in the CMC Standard (IEEE P1386 Draft 2.0). The system designer should follow the recommendation as stated in the PMC Standard (IEEE P1386.1 Draft 2.0).

## Operating Environment

The MPMC221 / MPMC222 requires the following operating environment:

Operating temperature	0° to 55°C
Storage temperature	-40° to 85°C
Operating humidity, non-condensing	10 to 90%
Storage humidity, non-condensing	5 to 95%

Forced air cooling is not required when the ambient temperature is below 40 degrees C. Above 40 degrees C, forced air cooling is required.

## Characteristics of FDDI technology

FDDI technology connects data processing equipment in very high speed digital networks, using fiber-optic distributed cable.

An FDDI LAN can have up to 1000 physical connections, with a maximum connection separation of 2 kilometers, and a total fiber path length of approximately 200 kilometers. Benefits of fiber-optic FDDI LANs over current IEEE 802 Ethernet LANs include lighter, smaller, and more reliable media. Network data integrity is enhanced by a 32-bit cyclic redundancy check (CRC) as specified by FDDI standards.



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FDDI LANs offer high security and safety. The fiber-optic media does not emit or degrade from electromagnetic radiation. It does not corrode or present a shock hazard.

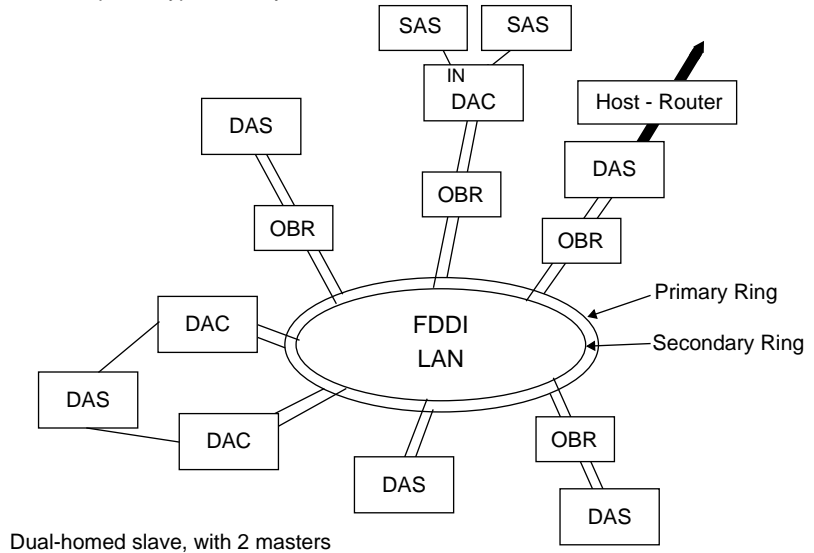
An FDDI LAN requires two independent data paths: the primary and secondary rings. In dual-attached stations (DAS), one optical transceiver services the primary ring output and secondary ring input. The second optical transceiver services the primary ring input and the secondary ring output. Using two rings and two optical transceivers allows the network to be rerouted whenever a station fails.

A single-attached station (SAS) can be connected to an FDDI LAN by using a concentrator. An SAS station has a lower cost than a DAS station, but does not provide the same network reliability.

The simple network in [Figure 1-3](#) illustrates the major components of an FDDI LAN. Network configuration will vary, depending upon the application.

SAS = Single-Attached Station  
 DAC = Dual-Attached Concentrator  
 DAS = Dual-Attached Station  
 OBR = Optical Bypass Relay Switch

An SAS device can be connected to either the Primary or Secondary ring.



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**Figure 1-3. FDDI LAN Components**

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# Fiber Optic Considerations

## Fiber Optic Cable Compatibility

Any standard small configuration (SC) cable assembly is compatible with the MPMC221 /MPMC222, if the station-connection terminal has two standard Media Interface Connectors (MIC) with a *fixed shroud enclosure*.

## Optical Bypass Relay

An external Optical Bypass Relay (OBR) is used for DAS fiber configurations with the MPMC222. The OBR is controlled by the host.

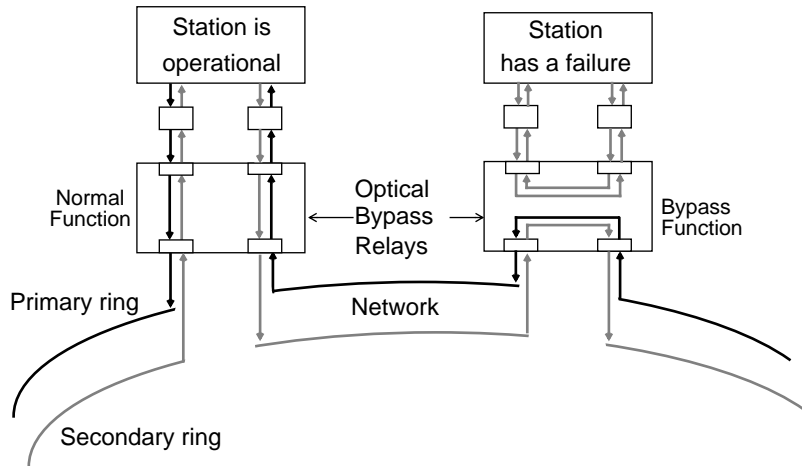
The OBR is installed between a MPMC222 and the FDDI network. The OBR protects the network from possible link failures due to station failures, by switching the network data stream to bypass the attached station after the OBR detects a power failure in that station. Without this bypass, the entire network will be affected by the failure, forcing the neighboring stations to reconfigure.

One two-by-two unit provides the FDDI LAN primary and secondary data ring with a fully-reversing optical bypass switch. Switching to bypass mode takes less than 10ms. The bypass relay and the MPMC222 join in three physical locations:

- ❑ one central optical bypass control cable drives the switching operation
- ❑ two standard SC cables, one for each transmit and receive pair, connect the fiber media

To allow bypass-to-network connection, two standard SC receptacles with bulkhead adapters are located on the network end of the unit. The receptacles accept two standard fixed shroud duplex optical fiber cables, one for each FDDI data ring.

Figure 1-4 shows the operation of the OBR.



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**Figure 1-4. Station Bypass Operation**

## Optical Transceivers

The MPMC222 uses two optical transceivers for connection to an FDDI dual ring. Each optical transceiver consists of one fiber optic receiver and one fiber optic transmitter. On the adapter, each transceiver typically connects to the FDDI LAN through an optical bypass relay. The MPMC221 has only one optical transceiver and therefore can not be used with an optical bypass relay.

### Fiber Optic Receiver

The fiber optic receiver consists of a PIN diode, amplifier, equalizer, automatic gain circuit, and comparator. The PIN diode receives an optical signal from the fiber and converts it to an electrical waveform. The signal is then amplified and conditioned. The conditioned waveform is then passed through a comparator which determines the logical output. The resulting bit stream is fed to the PHY with a pair of differential drivers.

**Fiber Optic Transmitter**

A fiber optic transmitter accepts a differential signal from the PHY and, using a light-emitting diode (LED), converts it into optical output for transmission through the fiber optic cable.



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## Introduction

This chapter contains instructions for installing the MPMC221 and MPMC222 FDDI adapters onto a carrier board.

## Installation and Configuration Tasks

Perform the following tasks to install and configure the MPMC221 / MPMC222:

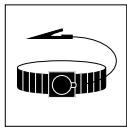
- ❑ Install the MPMC221 / MPMC222 on the carrier board per the instructions in *Installing the Adapter on the Carrier Board* on page 2-2.
- ❑ Connect the FDDI cables per the instructions in *Connecting to the FDDI Network* on page 2-5.
- ❑ Power-up the system per the instructions in the system chassis manual.
- ❑ Install the AIX MC68840 IFDDI controller device driver (if the MPMC221 / MPMC222 installation is a system upgrade) per the instruction in Chapter 3.
- ❑ Set the adapter characteristics and Configure TCP / IP per the guidelines in *Configuring the MPMC221 / MPMC222* on page 2-10.
- ❑ Reboot the system.

## Packaging

The MPMC221 / MPMC222 is packed in an anti-static package to protect it from any static discharge. Observe standard handling practices of static sensitive equipment.

## Electro-static Discharge Precautions

### Use ESD



**Wrist Strap**

Motorola strongly recommends that you use an antistatic wrist strap and a conductive foam pad when installing the MPMC221 / MPMC222. Electronic components can be extremely sensitive to electro-static discharge (ESD). After removing the board from the protective wrapper, place it component side up on a grounded, static-free surface. Do not slide the board over any surface.

## Installing the Adapter on the Carrier Board

Follow these steps to install the MPMC221 / MPMC222 on the carrier board:

1. Place an ESD strap on your wrist and attach the grounding line end of the ESD strap to the chassis as a ground. The ESD strap must be secured to your wrist and to ground throughout the procedure.
2. Remove the carrier board from the system chassis.
3. Lay the carrier board on a level surface with the PMC connectors facing you.
4. Remove the PMC slot filler panel from the carrier board's front panel.
5. Remove the screws from the stand-offs on the component side of the MPMC221 / MPMC222.



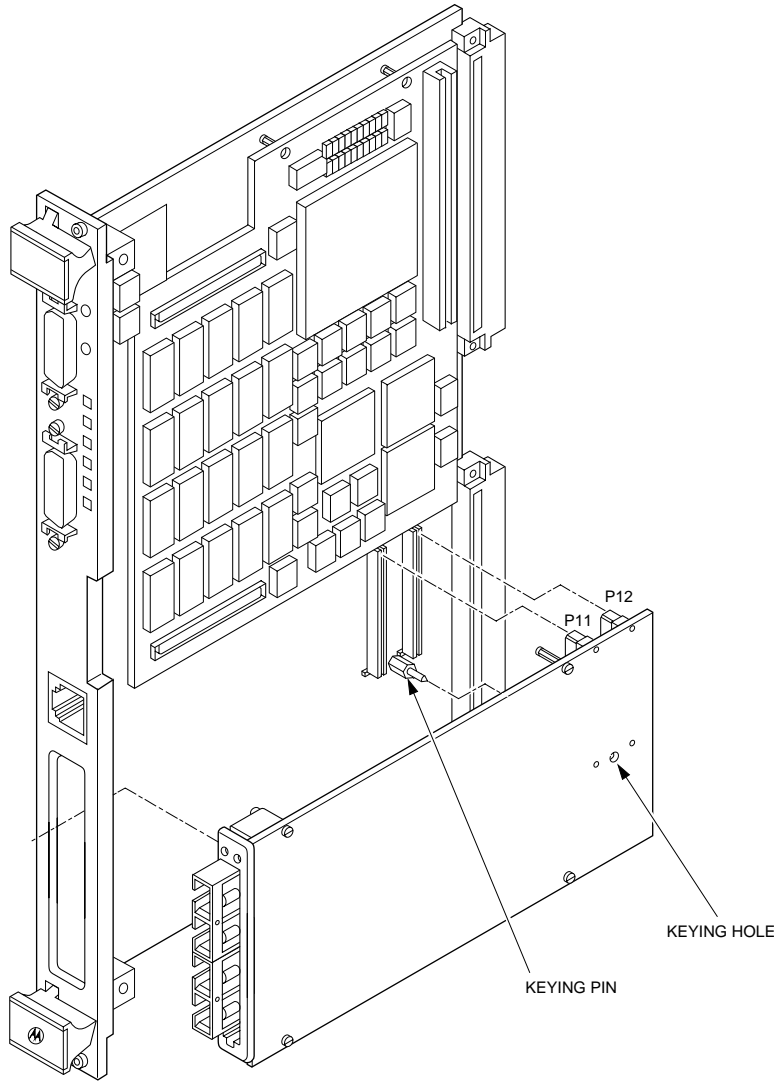
6. Turn the MPMC221/MPMC222 component-side down, and position it above the carrier board as shown in [Figure 2-1](#) (an MVME160x carrier board is shown).

**Caution**

Avoid touching areas of integrated circuitry; static discharge can damage these circuits.

**Note** Refer to [Figure 2-1](#) when performing steps 7, 8, and 9.

7. Insert the FDDI external connectors (U4 on the MPMC221, U4 and U13 on the MPMC222) through the PMC connector slot on the carrier board front panel.
8. Align the keying hole and connectors P11 and P12 on the MPMC221/MPMC222 over the keying pin and the PMC connectors on the carrier board.
9. Gently seat the MPMC221/MPMC222 onto the carrier board.
10. Turn the carrier board component-side down, and fasten the four screws through the carrier board into the stand-offs on the PMC.
11. Install the carrier board in the system chassis.



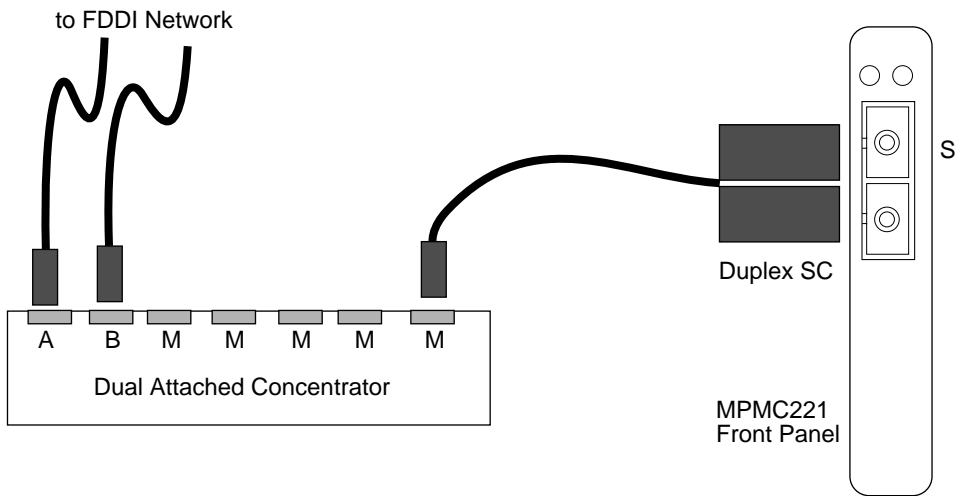
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**Figure 2-1. Installing the MPMC221/MPMC222 on the Carrier Board**

# Connecting to the FDDI Network

## MPMC221 SAS

For a SAS configuration, connect the S port on the MPMC221 directly to an M port of a concentrator. [Figure 2-2](#) shows a typical SAS cable configuration.



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**Figure 2-2. MPMC221 SAS Cabling**

## MPMC222 DAS with an OBR

To operate the MPMC222 with an OBR, connect the OBR cables to the MPMC222, and connect the fiber optic LAN cabling to the OBR.

An adapter cable may be required, depending upon the type of connector available on your OBR. The MPMC222 OBR connector is rectangular. Most OBRs use a round Mini-DIN connector. Use a **rectangular-to-round Mini-DIN** adapter cable to interface the MPMC222 to your existing OBR, or use a customized OBR from Amp/Kaptron, 209166-8.

### About the OBR

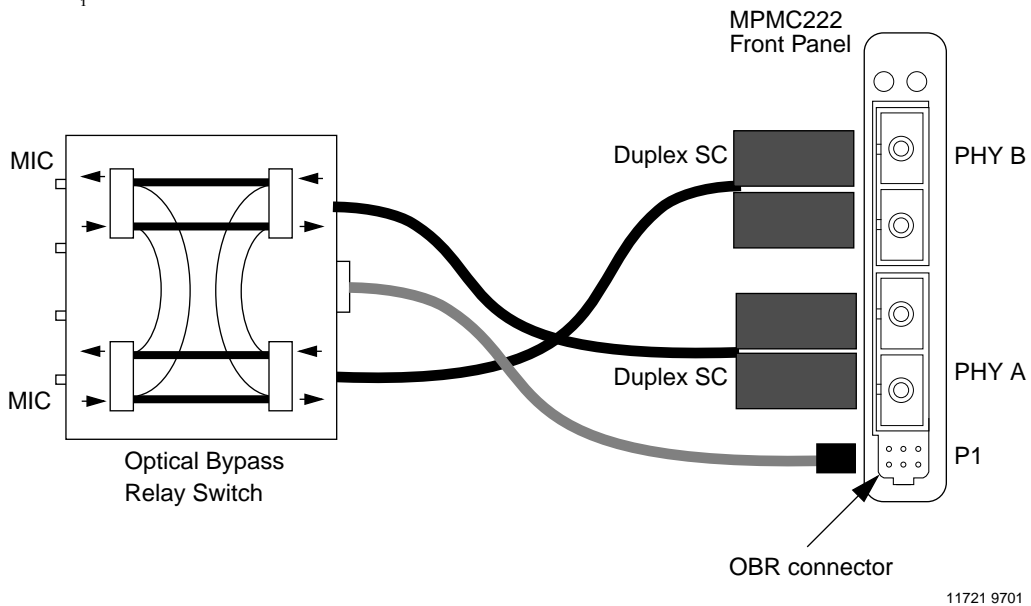
The bypass relay switch attaches to the PHY A and PHY B connectors and the OBR jack on the MPMC222 front panel, as shown in [Figure 2-3](#).

- ❑ Two duplex SC cables provide transmit and receive connections for the primary and secondary rings.
- ❑ One OBR switch-control cable drives the switching operation. This electrical cable comes from between the cables and ends in a 6-pin rectangular socket that matches the connector on the adapter.

### Connecting the MPMC222 FDDI adapter to the OBR

To attach the optical bypass relay switch (OBR), follow these steps:

1. Remove the protective plugs from the SC receptacles on the MPMC222. Save the plugs for later use.
2. Remove plastic protective caps from the ends of the SC connectors on the OBR module cables. Save the caps for later use.
3. Put each SC connector from the OBR into its matching SC receptacle on the MPMC222, as shown in [Figure 2-3](#).



**Figure 2-3. MPMC222 DAS Optical Bypass Relay Cabling**

4. Insert the switch-control cable plug into the OBR jack, P1, on the MPMC222, as shown in [Figure 2-3](#). Power must also be OFF when removing the cable connector.

When you disconnect the OBR from the adapter, replace the plastic caps on the connectors and receptacles to protect the optical components.

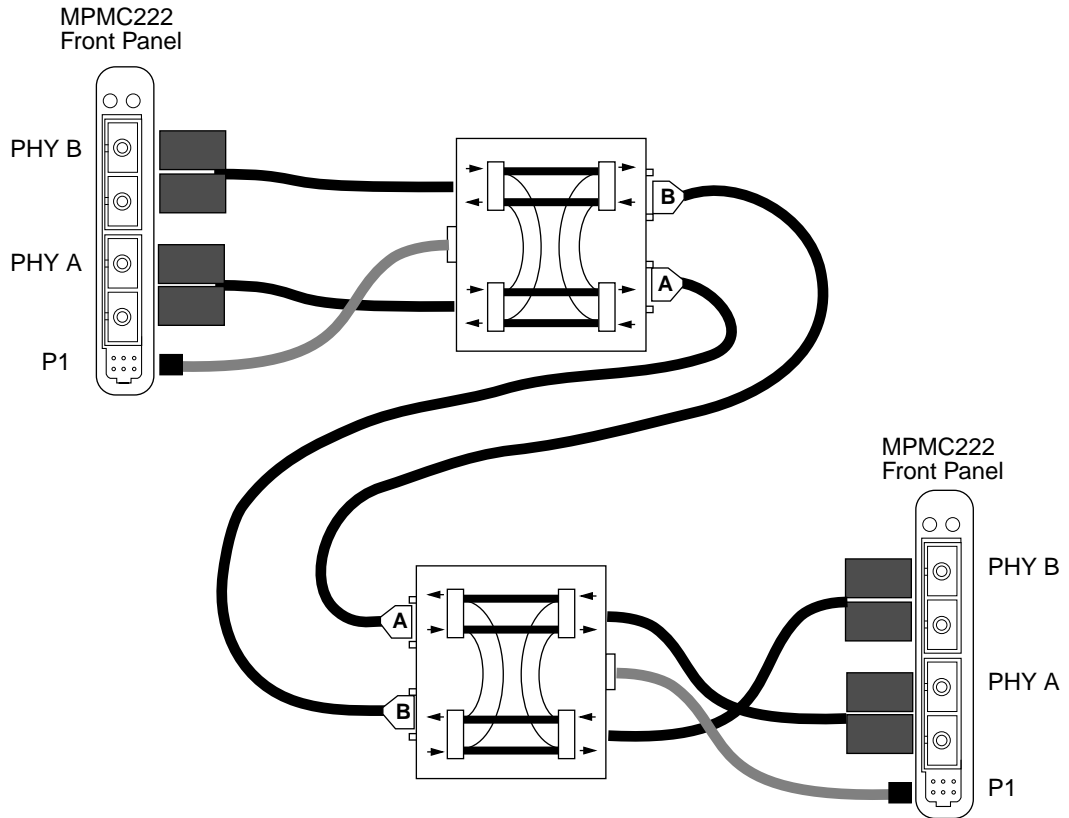
### Connecting the OBR to the Network

Connect the FDDI host optical bypass relay switch to an FDDI network with a pair of MIC-to-MIC cables. The two cables can connect two hosts into a two-host FDDI ring as shown in [Figure 2-4](#). If an OBR is not to be used, connect the MIC-to-MIC cables from the neighboring host to the SC receptacle on the FDDI adapter, using MIC-to-SC adapter cables.

If you are connecting to other hosts also using FDDI adapters, use SC-to-SC cables.

After everything is connected, verify that one host's port A is always connected to the other host's port B and vice versa.

To install the fiber optic cables, insert the **A** plug of one cable and the **B** plug of the other cable into their matching OBR module jacks, as shown in [Figure 2-4](#).

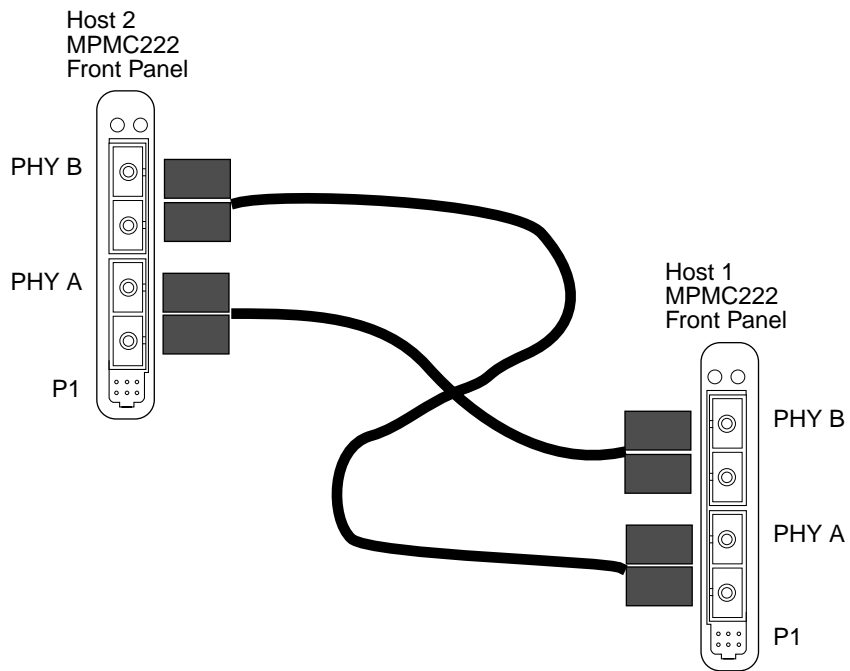


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**Figure 2-4. Fiber Optic Connections for MPMC222 with OBRs**

## MPMC222 DAS without an OBR

If an OBR is not to be used, connect PHY A of the first host to PHY B of the second host. On the second host, connect PHY A to the PHY B of the third host. On the third host, connect PHY A to the PHY B of the fourth host. Continue around the ring, connecting PHY A of one host to PHY B of the next host until all hosts are connected. Finally, connect the PHY A of the last host to the PHY B of the first host. For an example of a two adapter network, refer to [Figure 2-5](#).



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**Figure 2-5. Fiber Optic Connections for MPMC222 without OBRs**

## Starting the MPMC221/MPMC222

After installing the MPMC221 /MPMC222 and attaching the cables, turn the power on as directed in the system manual. The MPMC221 /MPMC222 should power-up automatically.

## Installing the AIX Driver

The MC68840 IFDDI controller requires an AIX driver. If you installed the MPMC221 /MPMC222 as an upgrade on the carrier board, install and configure the AIX driver per the instructions in Chapter 3.

You do not need to install the AIX driver if the MPMC221 /MPMC222 is installed in the system when AIX is installed and configured. The correct FDDI driver is installed automatically during Initial Program Load (IPL).

## Configuring the MPMC221/MPMC222

Set at least a minimum TCP/IP configuration (IP address, domain name, subnet mask, Router address, domain name server address) and start TCP/IP.



---

## Overview

This chapter describes installation of the AIX device driver.

Before installing the AIX device driver, install the MPMC221/MPMC222 on the carrier board per the instructions in Chapter 2, and install the carrier board into the system chassis.

## Installing the AIX Driver

Follow these steps to install the IFDDI device driver using the AIX System Management Integration Tool (SMIT):

1. Log into host system as **root**.
2. Insert the AIX Operating System CD-ROM into the CD-ROM drive on the host system.
3. Type the following at the command prompt and press **Enter**.  
**smit devices**  
The Devices menu appears.
4. From the Devices menu, select **Install Additional Device Software**.  
A fill-in form appears, prompting you for the installation input device.
5. Use List to select the installation CD-ROM drive that contains the AIX software CD-ROM (example: **/dev/cd0**).
6. Press **Enter**.  
A fill-in form appears, prompting you for the package you want to install.

7. Answer the following questions as shown:

```
SOFTWARE to install                {devices.pci.12110022}  
AUTOMATICALLY install requisite software?: [yes]
```

Leave the default values in the other fields.

8. Press **Enter**.

SMIT returns an ok command status message when the process is complete.

9. After the driver installation is complete, return to the **Devices** menu.

10. From the **Devices** menu, select **Install/Configure Devices Added After IPL**.

A fill-in form appears, prompting you for the input device.

11. Answer the following question as shown:

```
INPUT device/directory for software    [none]
```

Leave the default values in the other fields.

12. Press **Enter**.

SMIT returns an ok command status message when the process is complete.

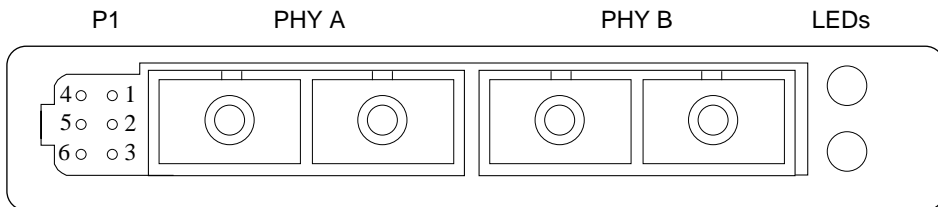
13. Exit SMIT.

The IFFDI device driver is now installed.

# Optical Bypass Relay Connector

A

The optical bypass relay is controlled through a cable that connects to the OBR jack, P1, on the MPMC222 front panel. [Figure A-1](#) shows the pins on the OBR jack. [Table A-1](#) shows the pin assignments for the OBR cable.



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**Figure A-1. MPMC222 Front Panel Detail**

**Table A-1. OBR Connector Pin Assignments (P1)**

Pin	Signal	Description
1, 2	VCC	+5V power (fused)
3	PRIEN*	PRIMARY ENABLE When low, enables primary ring insertion.
4	SECEN*	SECONDARY ENABLE When low, enables secondary ring insertion.
5	GND	GROUND Logic ground, +5V Return.
6	RELAY*	When low indicates that optical bypass relay is installed.



# Front Panel LEDs

# B

Use the green and yellow LEDs on the MPMC221 /MPMC222 to troubleshoot network problems. Use [Table B-1](#) to interpret the LEDs.

**Table B-1. Front Panel LEDs**

LED Status		Board Status	Control Register		Description
Yellow	Green		Bit 0	Bit 1	
Off	Off	Fail	0	0	Adapter is not functional, or driver is not installed
Off	On	Ring Op	0	1	Ring operation THRU B (MPMC222); wrap S (MPMC221)
On	Off	Cable Error	1	0	Adapter is not able to connect; could be a cable problem
On	On	Ring Op/ Wrapped	1	1	Ring operation; wrap A or B (MPMC222); not used for MPMC221



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