HEWLETT® PACKARD

Exemplar
S-Class and
X-Class Servers

PCI Dual Attached FDDI Installation and Service Guide

First Edition

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PCI Dual Attach FDDI Installation and Service Guide

Exemplar S-Class and X-Class Servers

A4716-90012

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January 1997

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Contents

Figures

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Preface

Purpose and audience

The *PCI Dual Attach FDDI Installation and Service Guide* provides information for installing, maintaining, and removing a PCI Dual Attach FDDI controller in Hewlett-Packard Exemplar S-Class and X-Class Technical Servers. It is intended for anyone installing or servicing the PCI Dual Attach FDDI controller, including:

- Hewlett-Packard customers
- Hewlett-Packard Customer Engineers
- Hewlett-Packard CXD TAC

Notational conventions

This section discusses notational conventions used in this book.

`Bold monospace`

In command examples, text shown in **`bold monospace`** identifies user input that must be typed exactly as shown.

`Monospace`

In paragraph text, `monospace` identifies command names.

In command examples, `monospace` identifies command output, including error messages.

In command syntax diagrams, text shown in `monospace` must be typed exactly as shown.

Italic

In paragraph text, *italic* identifies new and important terms and titles of documents.

In command syntax diagrams, *italic* identifies variables that must be supplied by the user.

Notes, cautions, and warnings

This document presents notes, cautions, and warnings in the following formats.

Note

A Note highlights supplemental information.

Caution

A Caution highlights information necessary to avoid damage to the system.

Warning

A warning highlights information necessary to avoid injury to personnel.

Associated documents

For more information on network configuration or Exemplar S-Class and X-Class Technical Servers, you can order these books from Hewlett-Packard:

- *Exemplar Networking Guide: S-Class Servers* (B5655-90004). This book provides general information on networks and network devices, and detailed instructions on configuring network interfaces.
- *Exemplar Site Preparation Guide: S-Class Servers* (A4716-90005). This book provides technical information needed to prepare a site for the installation of an Exemplar S-Class Server.
- *Exemplar Installation Guide: S-Class Servers* (A4716-90003). This book provides technical information and detailed procedures needed to install an Exemplar S-Class Server.
- *Exemplar Diagnostics Guide: S-Class and X-Class Servers* (A4716-90002). This book provides a roadmap to all diagnostic programs. It also provides the user with definitive descriptions of the purpose of each test and defines minimum hardware configurations required for testing.
- *Exemplar Maintenance Guide: S-Class and X-Class Servers* (A4716-90004). This book is intended as a reference for system support engineers and manufacturing test personnel, as well as those customers that perform their own system maintenance.

Ordering documents

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If you have questions that are not answered in this book, contact the Hewlett-Packard Convex Technical Assistance Center (TAC) at the following locations:

Within the continental U.S., call 1 (800) 952-0379.

From Canada, call 1 (800) 345-2384.

All other locations, contact your local Hewlett-Packard office.

You can also use the `contact` utility, if you would like to report any problems you may have with the PCI Dual Attach FDDI controller or its associated documentation.

FCC notice

This equipment generates, uses, and can radiate radio frequency energy. If the equipment is not installed and used in strict accordance with the instruction manual, it may cause interference to radio communications.

This equipment has been tested and found to comply with limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when equipment is operated in a commercial environment.

When this equipment is operated in a residential area, it is likely to cause interference. In this case, the interference must be corrected at the operator's expense.

Do not connect external equipment to the utility outlets in the Hewlett-Packard Exemplar S-Class and X-Class Technical Server. Unauthorized connection voids all agencies' emissions certification.

Description and specifications

1

Product type: **PCI Dual Attach FDDI controller**
Marketing number: **FDDI2000**
Part number: **220-000050-201**

This chapter introduces the PCI Dual Attach FDDI controller and describes the components and characteristics of the board. Physical and environmental specifications are also included.

Description

The PCI Dual Attach FDDI controller is a single-slot, short card that provides a direct connection from an Exemplar S-Class or X-Class Technical Server to a 100Mb/s FDDI network. It uses a direct interface to the 32-bit PCI local bus and fully supports the Station Management (SMT) standard for managing FDDI nodes.

The controller uses multimode optics and provides 2 SC-Duplex connectors for connecting the controller as a Dual Attached Station (DAS). SC-Duplex to MIC cable converters are supplied with the controller for compatibility with existing cable plants.

Features

The PCI Dual Attach FDDI controller features are summarized below:

- Connection for Dual Attached Station (DAS) or Single Attached Station (SAS)
- Multimode optics
- SC-Duplex connectors with MIC cable adapter
- DMA engine that supports high throughput and low CPU utilization

- One Mbyte buffer RAM
- Onboard CPU that supports diagnostics and Station Management (SMT)
- Onboard, nonvolatile memory for firmware storage

Connectors and LEDs

The controller has two multimode fiber optic ports that accept SC-Duplex fiber connections. There is an RJ-12 modular port for inserting an optional third party optical bypass relay (OBR). This relay maintains connectivity of the FDDI ring in the absence of power or during fault conditions in the node. (OBR devices are not available from Hewlett-Packard.)

Warning

Do not insert telecommunications cabling into the optical bypass relay connector.

Two LEDs on the controller faceplate, labeled "B" and "A" indicate status of the B and A ports respectively.

Figure 1 shows the connector and LEDs on the PCI Dual Attach FDDI controller and Table 1 summarizes the possible LED states.

Figure 1 Connector and LED location

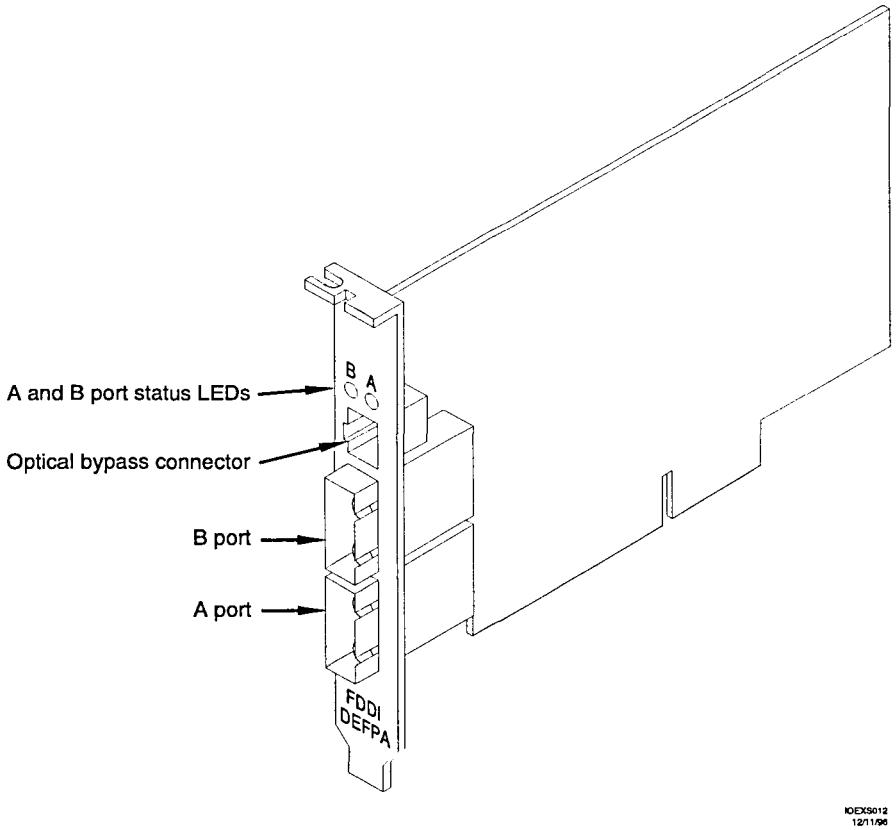


Table 1 LED states

LED	Color	Description
A port	Green	PHY connection complete
	Green flashing	PHY connection in progress (or no cable attached)
	Amber	If on after system boots, indicates broken port or Link Confidence Test (LCT) failure If on before system boots, indicates self-test failure
	Amber flashing	Illegal topology
	Alternating green and amber	Standby mode when connected to a concentrator in a dual-homed configuration
	None (off)	Port disabled by management or LED or controller broken
B port	Green	PHY connection complete
	Green flashing	PHY connection in progress (or no cable attached)
	Amber	If on after system boots, indicates broken port or Link Confidence Test (LCT) failure If on before system boots, indicates self-test failure
	Amber flashing	Illegal topology
	None (off)	Port disabled by management or LED or controller broken

Specifications

This section provides electrical, operating, and cable specifications for the PCI Dual Attach FDDI controller.

Electrical specifications

The table below shows the maximum power and current for the PCI Dual Attach FDDI controller.

Table 2 Electrical specifications

Connection	dc Amps (+5.0 V) maximum	dc Amps (+12.0 V) maximum
Dual Attached Station	1.6 amps	0.1 amps
Single Attached Station	1.2 amps	0.1 amps

Operating environment

Table 3 lists the recommended operating environment for the PCI Dual Attach FDDI controller.

Table 3 Operating environment

Condition	Value
Operating temperature (at sea level)	10° to 40° C (50° to 104° F)
Nonoperating temperature	-40° to 85° C (-40° to 185° F)
Relative humidity	8% to 80% (noncondensing)

Cable specifications

Cable specifications for the PCI Dual Attach FDDI controller are described below.

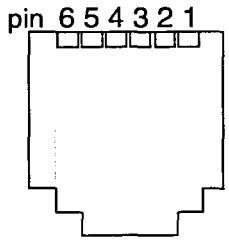
A and B port connections

The A and B ports on the controller require one (SAS) or two (DAS) standard 62.5/125 multimode fiber optic cable(s) with an SC-Duplex connector. These cables are not provided and must be furnished by the customer. For existing installations that use cables with MIC (Media Interface Connector) connectors, SC-Duplex to MIC adapter cables (part number 606-000007-001) are provided with the controller.

Optical Bypass Relay connection

The OBR connector is an RJ-12 modular jack connector. The pin assignments for the OBR connector are shown in Figure 2 and described in Table 4. The Optical Bypass Relay (OBR) connector allows an OBR device to maintain integrity of the dual FDDI rings if the controller fails or if system power is removed.

Figure 2 OBR RJ-12 connector



6-pin RJ-12 connector

Table 4 OBR RJ-12 connector pin assignments

Pin	Assignment
1, 2	Relay drive: +5.0 V dc
3, 4	Bypass_enable
5	Bypass_present
6	Return: grounded internally

Unpacking and inspection 2

This chapter describes how to inspect and unpack the PCI Dual Attach FDDI controller from its shipping container and what to do if equipment is damaged.

Inspection

All shipping containers are designed to protect their components under normal shipping conditions. Carefully inspect each carton for signs of shipping damage *before* it is unpacked. If damage is found after visual inspection, document the damage with photographs and contact the transport carrier immediately.

Unpacking

Your bill of materials lists all equipment shipped from Hewlett-Packard. Use it as a checklist to ensure that all equipment has arrived.

Use the following procedure to unpack the shipping container:

Step 1 Remove each item from its shipping container.

Step 2 Inspect each item as it is unpacked for any signs of shipping damage.

Step 3 If equipment damage is found, document the damage, and proceed to the next section.

Save all packing material until after operational checkout of the equipment. This enables equipment to be returned safely to Hewlett-Packard if required.

Damage claims

If the equipment is damaged, complete a damage claim form and give it to the shipping representative. Claim forms are normally obtained from the shipping representative.

Installation

3

This section describes how to install the PCI Dual Attach FDDI controller, connect it to the network, and integrate it in the system.

Precautions

Protect personnel and equipment when installing any Hewlett-Packard product by always taking proper precautions.

Electrostatic discharge (ESD)

The PCI Dual Attach FDDI controller, as well as all other circuit boards, is highly susceptible to damage by electrostatic discharge during installation and routine maintenance procedures.

Caution

Do not handle circuit boards without a grounded wrist strap fastened to a good earth ground or to the system chassis.

Antistatic packaging

Circuit boards arrive in a specially designed bag that dissipates static electricity and serves as a shield against electrostatic fields while the board is in transit. Retain this bag and use it to store the circuit board if you remove it from the system for any reason.

The bag is not designed for use as a static dissipating mat. Do not use the antistatic bag for any other purpose than to enclose a circuit board. Holes in the bag render it useless as an antistatic measure. Therefore, it should always be completely closed and sealed when it contains a circuit board. Immediately discard and replace any bag that shows damage or wear.

Preparation

Prepare an ESD safe work surface large enough to accommodate the EIOB assembly.

Preinstallation requirements

Before beginning the installation, make sure there is an Exemplar I/O Board (EIOB) with an available PCI slot in the system. You can determine how many PCI slots are occupied and unoccupied by observing the Power On Self Test (POST) messages during the boot process. You can install the PCI Dual Attach FDDI controller in any available PCI slot, within any available EIOB.

You need to supply one or two multimode fiber-optic network cables with MIC or SC-Duplex connectors to connect the controller to the network. Cable requirements are listed in the "Cable specifications" section in Chapter 1.

To install the PCI Dual Attach FDDI controller, you need a #2 Phillips screwdriver.

Overview of installation

Installing a PCI Dual Attach FDDI controller involves some minor disassembly of system assemblies. The following list provides a summary of the steps involved in the installation process.

Note

This list is intended for summary purposes only; detailed installation instructions are presented in the sections that follow.

Step 1 Shut down the system.

Step 2 Remove side skins and Electromagnetic Interference (EMI) panels.

Step 3 Unplug EIOB power cable.

Step 4 Disconnect all SCSI and network cables attached to controllers in this EIOB. Mark or chart the connections for easy connection later.

Step 5 Remove EIOB.

Step 6 Remove the bracket on top of the PCI card cage.

Step 7 Install the controller.

Step 8 Reinstall the bracket on top of the PCI card cage.

Step 9 Reinstall EIOB.

Step 10 Plug in the EIOB power cable.

Step 11 Reattach all SCSI and network cables to the proper controller.

Step 12 Attach the new network cable(s) and route through the cable channel.

Step 13 Reboot system and check controller for valid link indication.

Step 14 Reinstall EMI panels and side skins.

Step 15 Define the SPP-UX logical-unit to physical-unit mapping using `mkmap`.

Detailed installation instructions

The following sections provide detailed instructions on installing the PCI Dual Attach FDDI controller.

Removing the EIOB

To remove the EIOB, perform the following steps:

Step 1 Shut down the system with the `/etc/shutdown` command.

```
/etc/shutdown -h <time>
```

The *time* argument can be used to schedule a timed shutdown or the keyword "`now`" can be used to shut down the system immediately. Refer to the *SPP UX System Administrator's Guide* or the `shutdown` man page for more information on `/etc/shutdown`.

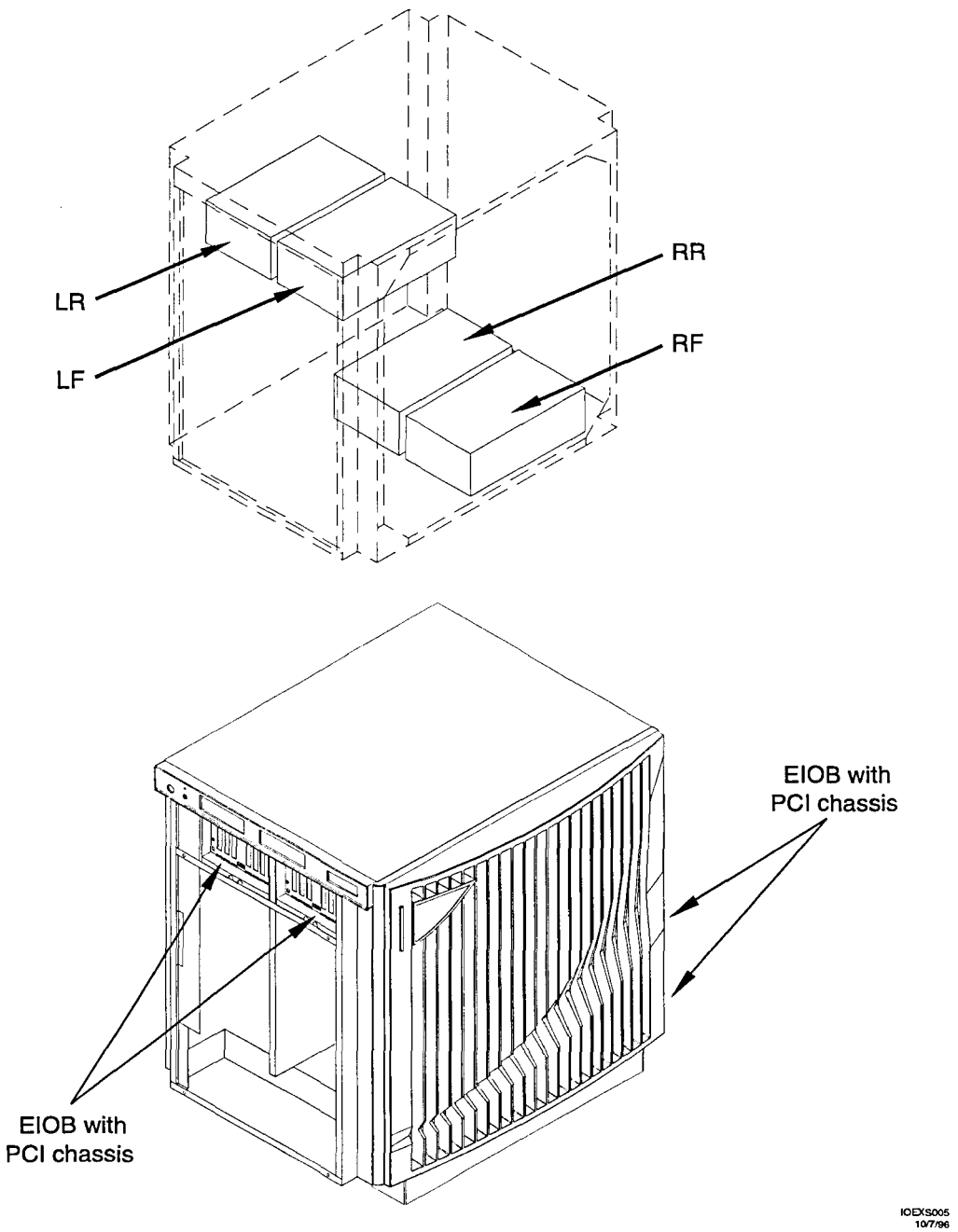
Step 2 Terminate power to the system by turning the keyswitch on the operator panel to the OFF position.

Caution

Do not remove the EIOB without first removing power to the system. Failure to remove power before removing the EIOB will damage electronic components on the board assembly.

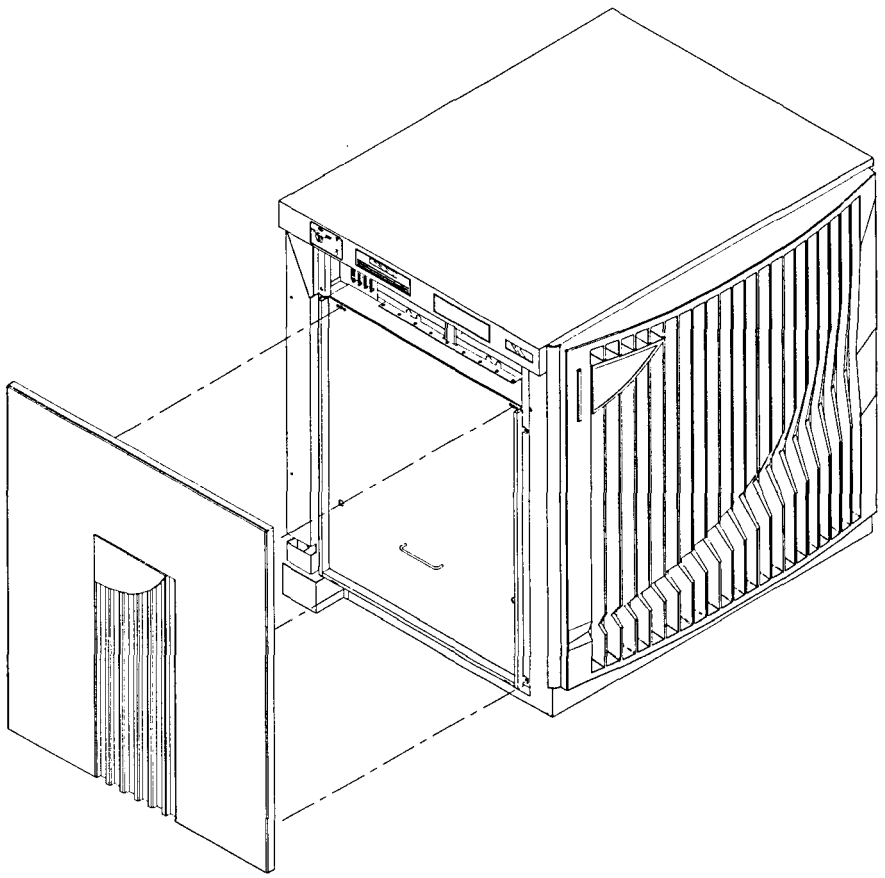
Step 3 Select the EIOB where you intend to install the controller. The chassis can contain from one to four EIOBs, depending on your system configuration. You can install the PCI Dual Attach FDDI controller in any EIOB. However, the EIOB you are targeting for installation determines which side skin you need to remove in Step 4. Figure 3 shows the four possible locations of an EIOB in the chassis.

Figure 3 EIOB locations



Step 4 Remove the left or right side cabinet skin by pulling from the top and bottom of the skin until it pops out. Each skin has a set of four catch pins that secure it to the chassis as shown in Figure 4.

Figure 4 Removing side skins



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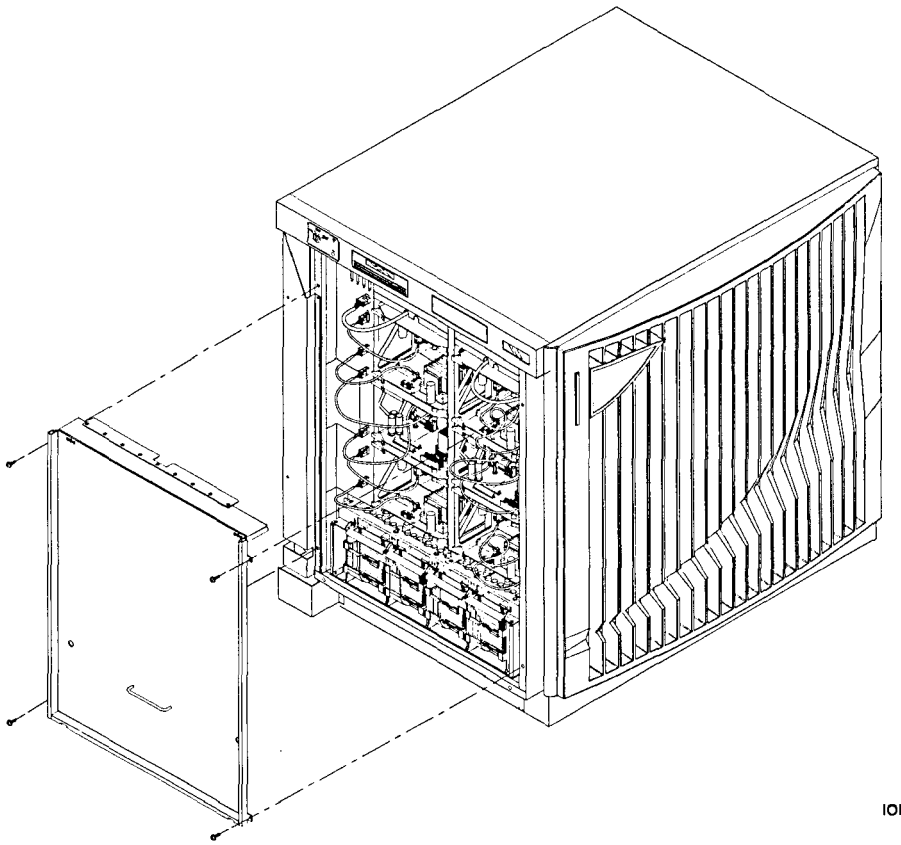
Step 5 Remove the EMI panel by removing the four screws that fasten the panel to the chassis as shown in Figure 5.

Figure 5 Removing EMI panels



Step 6 Unplug the power cable on the front of the target EIOB. The power connections are labeled on the chassis and are designated as follows:

IOLF I/O Left Front

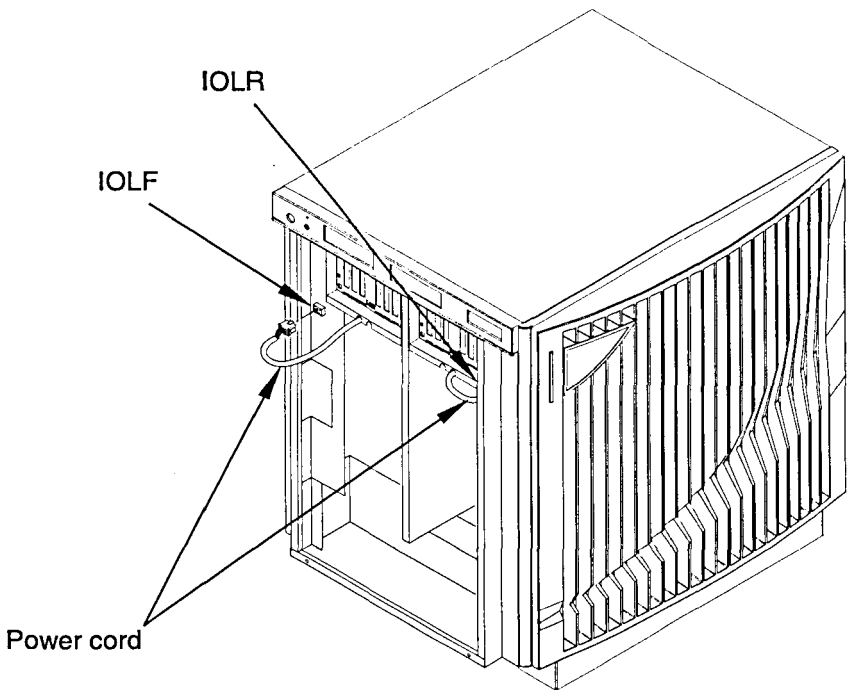
IOLR I/O Left Rear

IORF I/O Right Front

IORR I/O Right Rear

Figure 6 shows the location of the IOLF and IOLR EIOB power connections. The IORF and IORR connectors are on the opposite side of the chassis near the bottom.

Figure 6 Unplugging the EIOB power cable

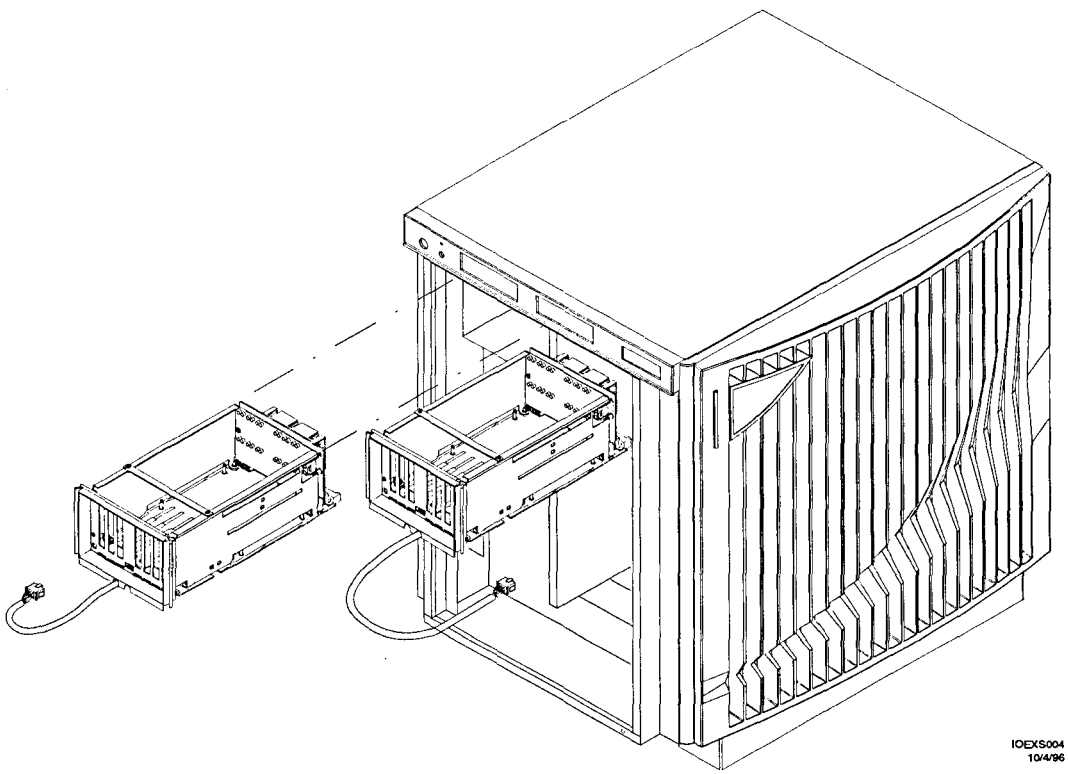


Step 7 Disconnect all SCSI and network cables attached to controllers in this EIOB. Mark or chart the connections for easy connection later.

Step 8 Remove the EIOB from the chassis by pulling the two extractor levers on the front of the EIOB toward you until the EIOB is unseated from the Exemplar Node Routing Board (ENRB). Continue sliding the EIOB all the way out, taking care to support it with one hand underneath (see Figure 7).

Step 9 Place the EIOB on a level work surface that contains a grounded static dissipating mat.

Figure 7 Removing the EIOB

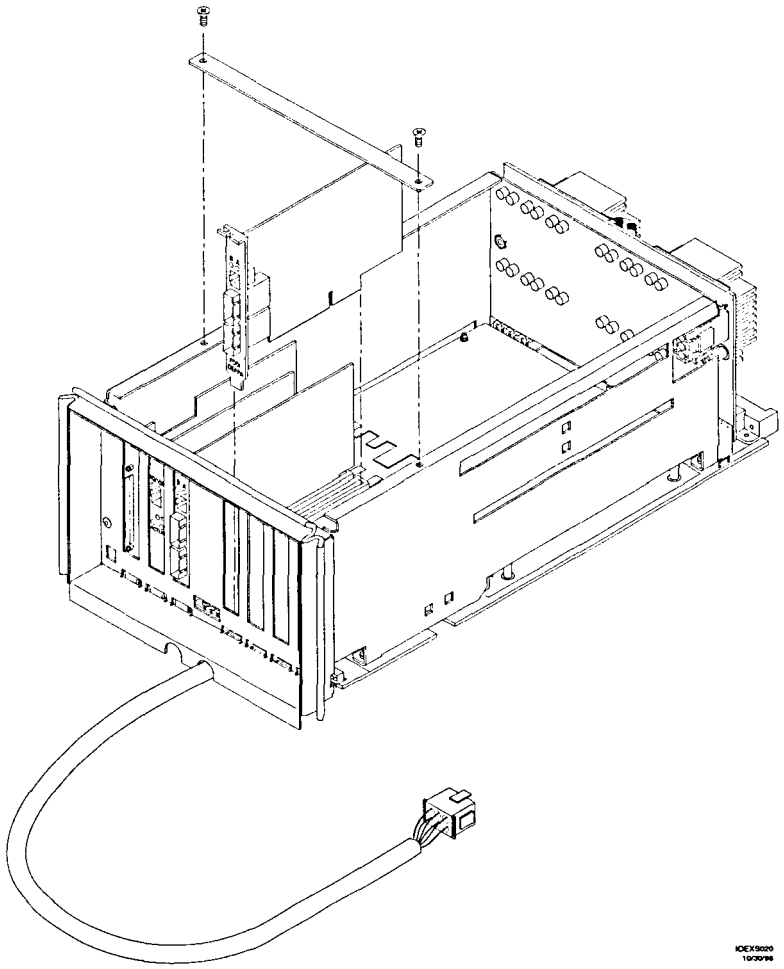


Installing the controller

To install the PCI Dual Attach FDDI controller, perform the following steps:

Step 1 Using a #2 Phillips screwdriver, remove the two screws that secure the bracket across the top of the PCI card cage. Refer to Figure 8 for the location of the bracket.

Figure 8 Installing the controller



Step 2 Select an available PCI slot and remove the PCI slot cover plate. Retain the screw for later use.

Step 3 Insert the controller into the PCI slot as shown in Figure 8. Make sure the board is fully seated.

Step 4 Secure the controller faceplate to the PCI card cage using the screw from the PCI slot cover plate.

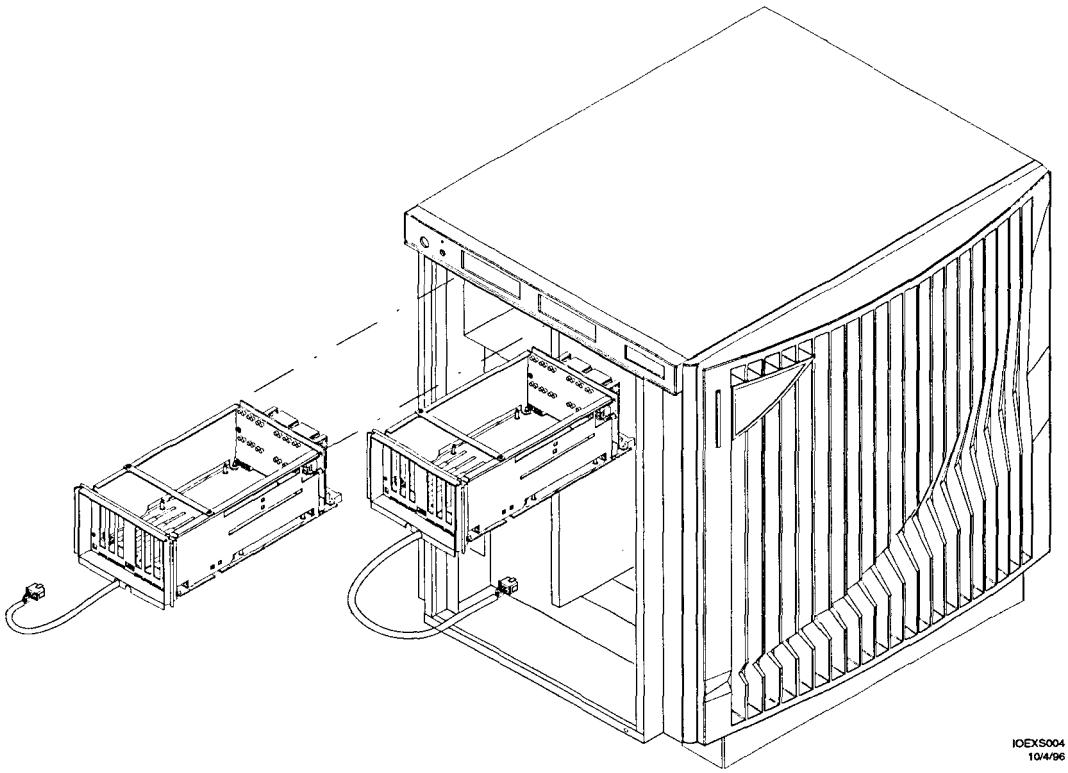
Step 5 Reinstall the bracket on top of the PCI card cage.

Reinstalling the EIOB

To reinstall the EIOB, use the following procedure:

Step 1 Reinstall the EIOB into the system chassis by lining up the EIOB card edges with the guide rails as shown in Figure 9. Continue sliding the EIOB into the chassis and secure it using the two extractor levers.

Figure 9 Reinstalling the EIOB



Step 2 Reattach the power cable on the front of the EIOB (refer to Figure 6 for the location of the EIOB power connector).

Step 3 Once you have installed the controller and EIOB, reattach any cables previously removed to their proper location.

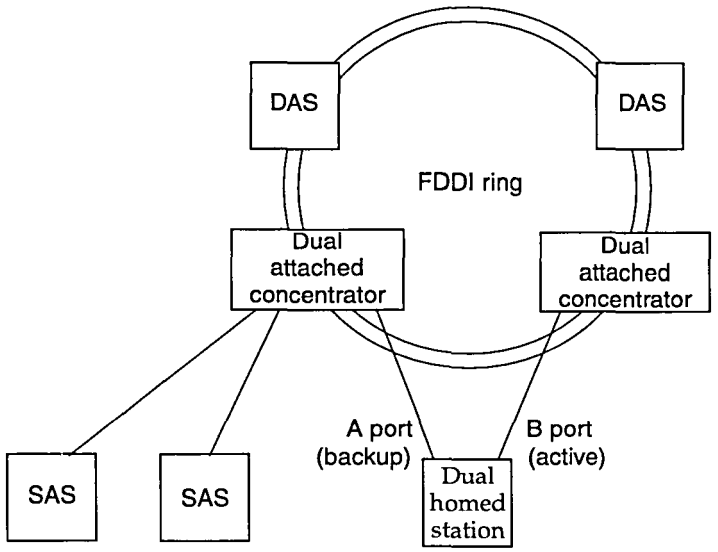
Connecting to the network

You can connect the PCI Dual Attach FDDI controller to the network in the following ways:

- As a Dual Attached Station (DAS). DAS connections use both ports to connect the controller to both of the dual counter-rotating FDDI rings. DAS connections require 2 pairs of multimode fiber optic cables. The two ports on a DAS node are called A and B ports.
- As a Single Attached Station (SAS) to a concentrator, hub, or FDDI switch. SAS connections use only one pair of multimode fiber optic cables. The single port used in a SAS connection is called an S (slave) port and is attached to an M (master port) on a concentrator, hub, or switch. On the PCI Dual Attach FDDI controller, either the A or B port can be used as an S port.
- Dual-homed, that is, connected to an FDDI dual ring backbone through two independent concentrators, hubs, or switches, using two pairs of multimode fiber optic cables. In this configuration, the controller's A port is connected to an M port on one of the network devices, and the controller's B port is connected to an M port on the other device. In a normal situation, the B port is active and the A port acts as a backup connection. If the B port connection fails, the A port will become active to maintain ring integrity. Dual-homing provides all of the benefits of a DAS connection along with the simplicity of SAS end-station management.

Figure 10 illustrates all three connections described above.

Figure 10 SAS, DAS, and dual-homed connection example



Connection rules

The FDDI standard imposes certain restrictions on port connections. Some of these restrictions are necessary to prevent more than two rings from being formed (for example, an M port connected to another M port). Others are imposed to prevent the ring from becoming permanently wrapped.

For example, different stations on the network may have a different view of which is a primary ring and which is a secondary ring. This can happen if an A port is connected to another A port. Table 5 describes the connection rules for an FDDI network.

Table 5 FDDI connection rules

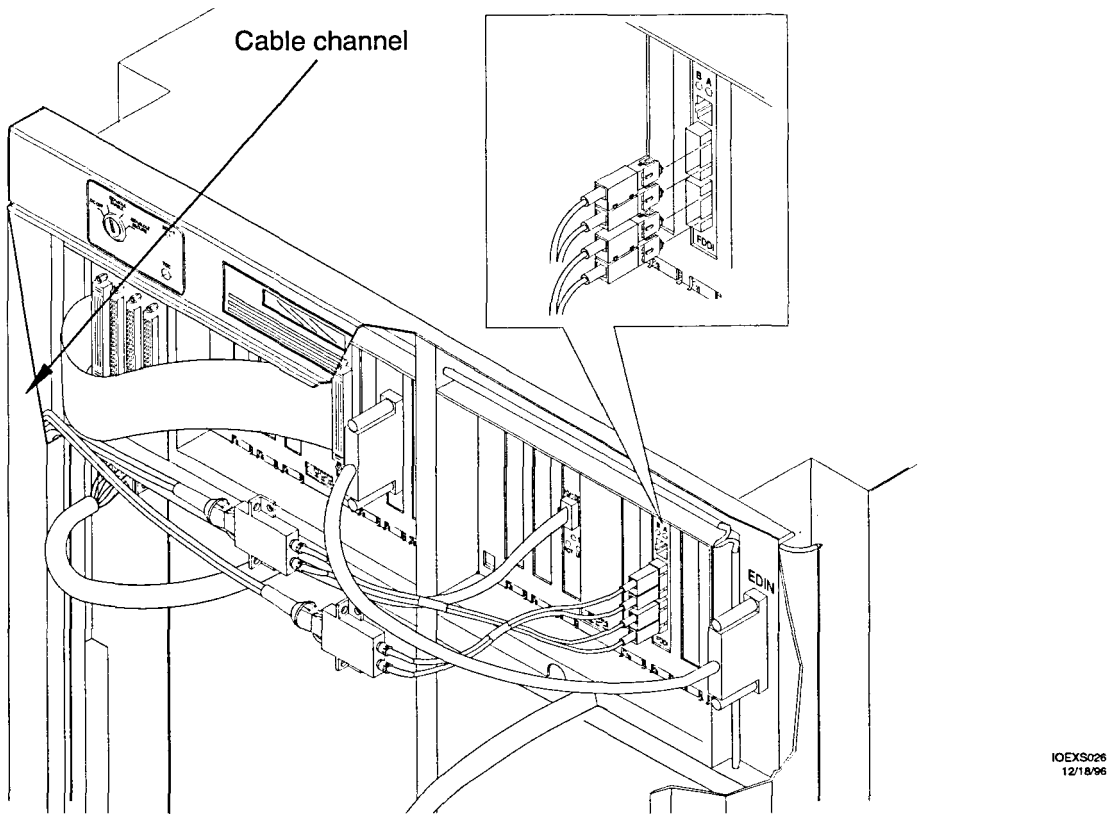
This port	Other port			
	A	B	S	M
A	Invalid	Valid	Valid, undesired	Valid
B	Valid	Invalid	Valid, undesired	Valid
S	Valid, undesired	Valid, undesired	Valid	Valid
M	Valid	Valid	Valid	Invalid

DAS connection

To connect the controller as a dual attached station, use two multimode fiber optic cables as follows:

Step 1 Connect the SC-Duplex connectors (transmit and receive) of one cable to the B port (the top port) of the controller as shown in Figure 11. You can use SC-Duplex cables that you provide or you can use the SC-Duplex to MIC adapter cables provided with the controller with MIC cables that you provide.

Figure 11 DAS connection



Step 2 Connect the SC-Duplex connectors on the second cable to the A port of the controller (see Figure 11).

Step 3 If you are using the SC-Duplex to MIC adapter cables, connect each adapter cable to a corresponding cable with a MIC connector.

Step 4 Route the cables into the cable channel (see Figure 11) and feed them down through the channel to the cable opening at the bottom of the chassis. Pull the cable through so that it exits the system.

Caution

Do not bend or crease the cable sharply to avoid breaking the fiber. Fiber optic cable is somewhat durable, but not unbreakable. When routing cables, take extra care not to pull the cables too hard to avoid separating the cable from the connector.

Step 5 Connect each cable to the network device (or devices if you are using a dual-homed connection). Be sure that you connect A ports to B ports and B ports to A ports and that you connect the transmit side of one controller to the receive side of the other network device.

Warning

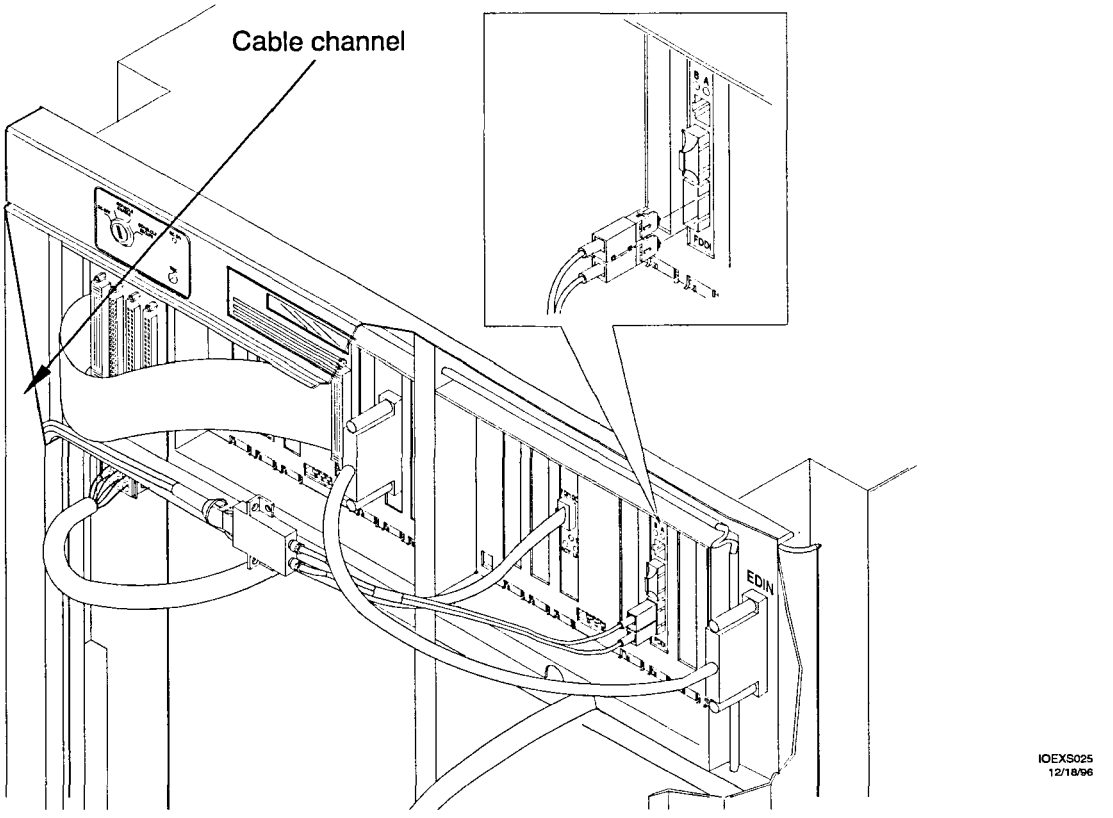
Never look directly into an optical fiber port. While not used or supported by this controller, some fiber optic equipment can emit laser light that can injure your eyes. Always assume the cable is connected to a light source.

SAS connection

To connect the controller as a single attached station, follow these steps:

Step 1 Connect the SC-Duplex connectors (transmit and receive) of one cable to the A port (the bottom port) of the controller as shown in Figure 12. You can use an SC-Duplex cable that you provide or you can use one of the SC-Duplex to MIC adapter cables provided with the controller along with a MIC cable that you provide.

Figure 12 SAS connection



Step 2 If you are using an SC-Duplex to MIC adapter cable, connect the adapter cable to a cable with a MIC connector.

Step 3 Route the cable into the cable channel (see Figure 12) and feed it down through the channel to the cable opening at the bottom of the chassis. Pull the cable through and connect it to the network device. If you are using SC-Duplex cables exclusively, be sure that you connect the transmit side of the controller to the receive side of the other network device and vice-versa.

Caution

Do not bend or crease the cable sharply to avoid breaking the fiber. Fiber optic cable is somewhat durable, but not unbreakable. When routing cables, take extra care not to pull the cables too hard to avoid separating the cable from the connector.

Warning

Never look directly into an optical fiber port. While not used or supported by this controller, some fiber optic equipment can emit laser light that can injure your eyes. Always assume the cable is connected to a light source.

Completing the installation

To complete the installation, follow these steps:

Step 1 Restart the system by turning on the keyswitch on the operator panel.

Step 2 After the system has booted to OBP, observe the A and B port status LEDs on the controller faceplate. If the port is connected and operating properly, the LED should be a steady green color. If you connected the controller in a dual-homed configuration, the A port LED should be flashing alternating green and amber. If you observe any other indication, refer to "Troubleshooting" in Chapter 5 to isolate and correct the problem.

Step 3 Reinstall the EMI panels and side skins.

Software integration

When you add a device to your system or change characteristics of an existing one, you must integrate the device into SPP-UX.

Before booting the nodes of your Exemplar system to the OS level, you must specify a logical unit number for the PCI Dual Attach FDDI controller to OpenBoot. Steps 1 through 5 detail this process.

Perform the following steps to define the controller:

Step 1 In the Exemplar System Console window, determine the full device name with the `show-devs` command. Enter

```
# show-devs
```

at the OpenBoot `ok` prompt. `show-devs` with no argument displays all devices known on the specified node.

Step 2 Determine if an FDDI device entry already exists. If an FDDI device is already specified, you need to define the new controller as logical-unit number 1 (0 is default). If an entry does not exist, define the new controller as logical-unit 0. An example FDDI controller entry from the output of the show-devs command would look like:

```
/pci@fe,10000/pci1011,f@0,0
```

Step 3 Define the SPP-UX logical-unit to physical-unit mapping using the `mkmap` command. `mkmap` defines an SPP-UX logical-unit to physical-unit mapping. This mapping is a label for tape and network devices that cannot be labeled like disks. `mkmap` has the following syntax:

`mkmap -n` *logical_unit_number obp_path*

where:

`-n`

Creates a logical-unit property with no physical unit information; this option should only be used with network controllers.

logical_unit_number

Designates the logical-unit number of each device. If this is the first FDDI controller, the logical-unit number would be 0.

obp_path

Represents the full device name.

An example for specifying the first FDDI controller would be:

```
mkmap -n 0 /pci@fe,10000/pci1011,f@0,0
```

Step 4 Use the show-map command to verify the logical unit is correct.

```
ok show-map

Flag  Unit  Device  Pathname
      0     /pci@fe,10000/pci1011,f@0,0
```

Step 5 Reset OBP so that the device tree is probed and built with the new logical unit number in place.

```
ok reset
```

Removal

4

Precautions

Protect personnel and equipment when removing any Hewlett-Packard product by always taking proper precautions.

Electrostatic discharge (ESD)

The PCI Dual Attach FDDI controller, as well as all other circuit boards, is highly susceptible to damage by electrostatic discharge during installation and routine maintenance procedures.

Caution

Do not handle circuit boards without a grounded wrist strap fastened to a good earth ground or to the system chassis.

Antistatic packaging

Circuit boards arrive in a specially designed bag that dissipates static electricity and serves as a shield against electrostatic fields while the board is in transit. Retain this bag and use it to store the circuit board if you remove it from the system for any reason.

The bag is not designed for use as a static dissipating mat. Do not use the antistatic bag for any other purpose than to enclose a circuit board. Holes in the bag render it useless as an antistatic measure. Therefore, it should always be completely closed and sealed when it contains a circuit board. Immediately discard and replace any bag that shows damage or wear.

Preparation

Prepare an ESD safe work surface large enough to accommodate the EIOB assembly.

Tools required

To remove the PCI Dual Attach FDDI controller, you need a #2 Phillips screwdriver.

Summary of removal procedure

Removing a PCI Dual Attach FDDI controller involves some minor disassembly of system assemblies. The following list provides a summary of the steps involved in the removal process.

Note

This list is intended for summary purposes only; detailed instructions for removal are presented in the sections that follow.

Step 1 Shut down the system.

Step 2 Remove side skins and Electromagnetic Interference (EMI) panels.

Step 3 Unplug EIOB power cable.

Step 4 Disconnect all SCSI and network cables attached to controllers in this EIOB. Mark or chart the connections for easy connection later.

Step 5 Remove EIOB.

Step 6 Remove the bracket on top of the PCI card cage.

Step 7 Remove the controller.

Step 8 If you are replacing the controller, install the new controller in an available PCI slot.

Step 9 Reinstall the bracket on top of the PCI card cage.

Step 10 Reinstall EIOB.

Step 11 Plug in the EIOB power cable.

Step 12 Reattach all SCSI and network cables to the proper controller.

Step 13 If you installed a new controller, attach the network cable(s) and route the cable(s) through the cable channel if necessary.

Step 14 Reboot system.

Step 15 Check controller for valid link indication (if applicable).

Step 16 Reinstall EMI panels and side skins.

Detailed removal instructions

The following sections provide detailed instructions on removing the PCI Dual Attach FDDI controller.

Removing the EIOB

To remove the EIOB, perform the following steps:

Step 1 Shut down the system with the `/etc/shutdown` command.

```
/etc/shutdown -h <time>
```

The *time* argument can be used to schedule a timed shutdown or the keyword "`now`" can be used to shut down the system immediately. Refer to the *SPP UX System Administrator's Guide* or the `shutdown` man page for more information on `/etc/shutdown`.

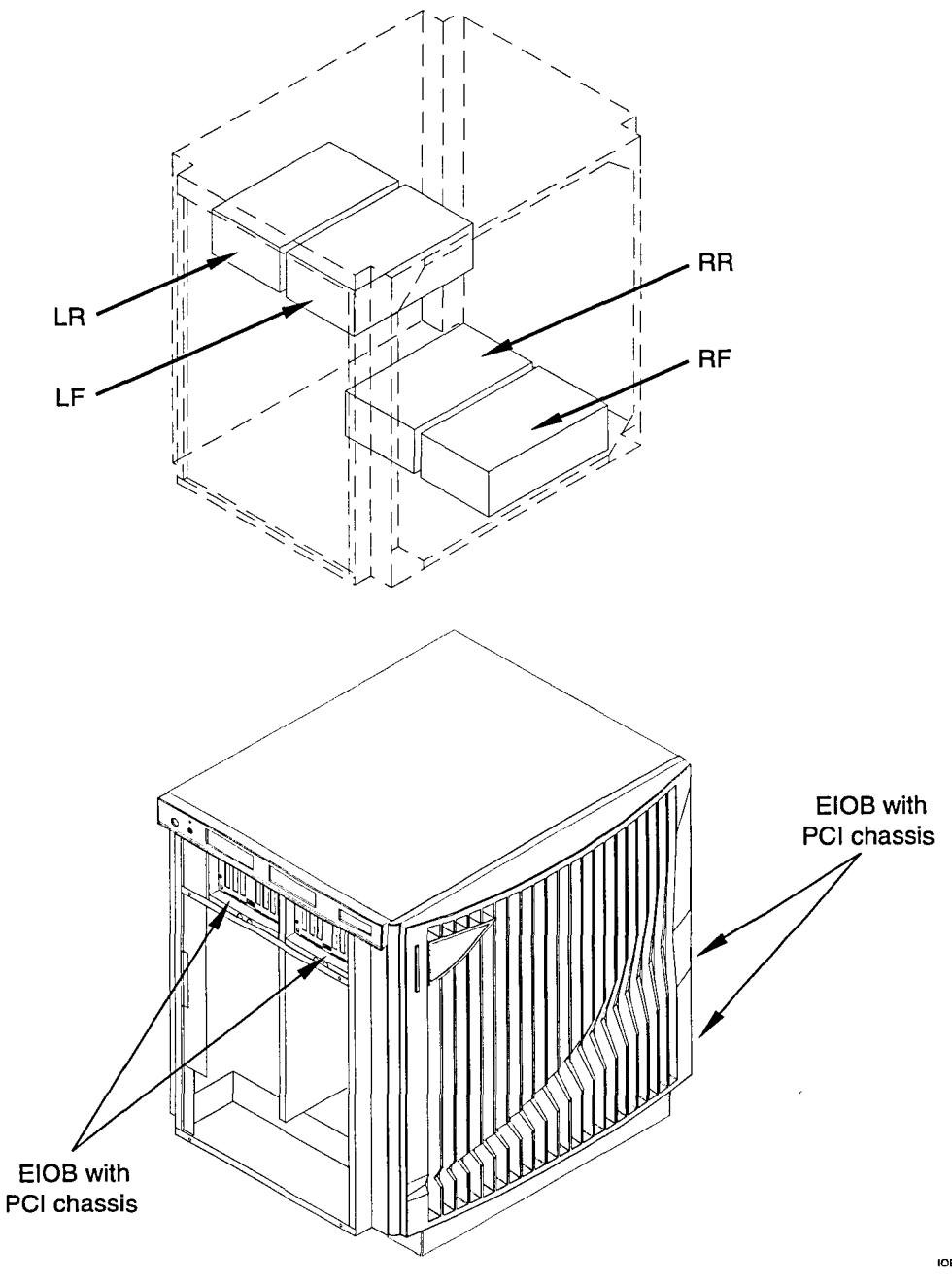
Step 2 Terminate power to the system by turning the keyswitch on the operator panel to the OFF position.

Caution

Do not remove the EIOB without first removing power to the system. Failure to remove power before removing the EIOB will damage electronic components on the board assembly.

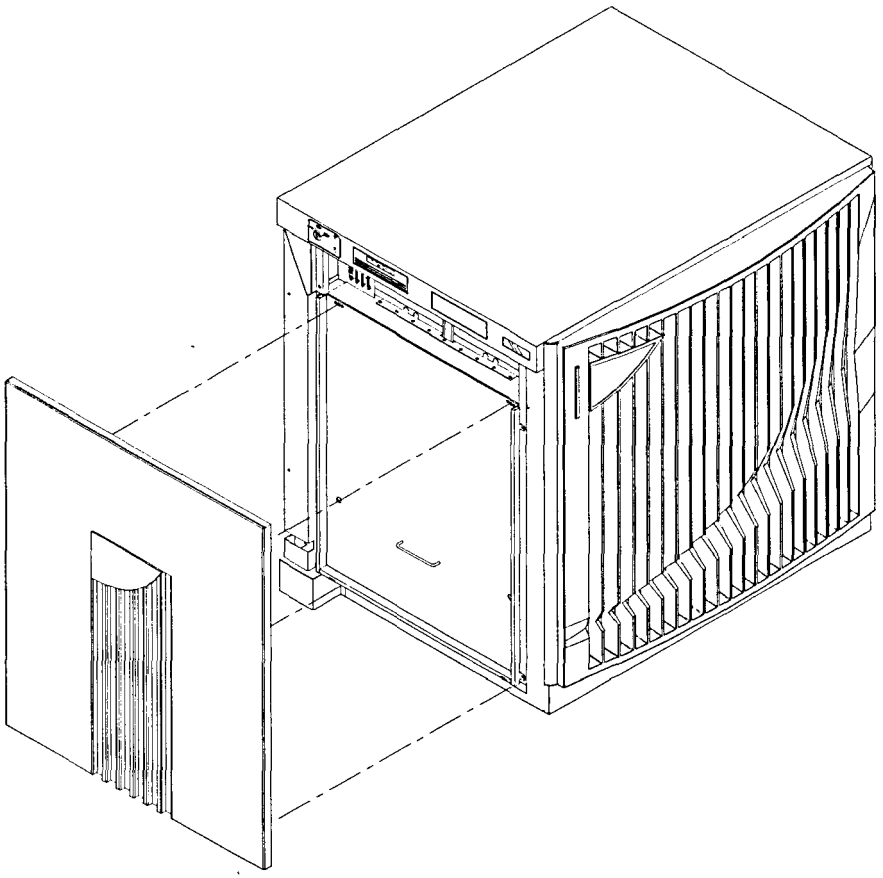
Step 3 Select the EIOB where you intend to remove the controller. The chassis can contain from one to four EIOBs, depending on your system configuration. The EIOB you are targeting determines which side skin you need to remove in Step 4. Figure 13 shows the four possible locations of an EIOB in the chassis.

Figure 13 EIOB locations



Step 4 Remove the left or right side cabinet skin by pulling from the top and bottom of the skin until it pops out. Each skin has a set of four catch pins that secure it to the chassis as shown in Figure 14.

Figure 14 Removing side skins



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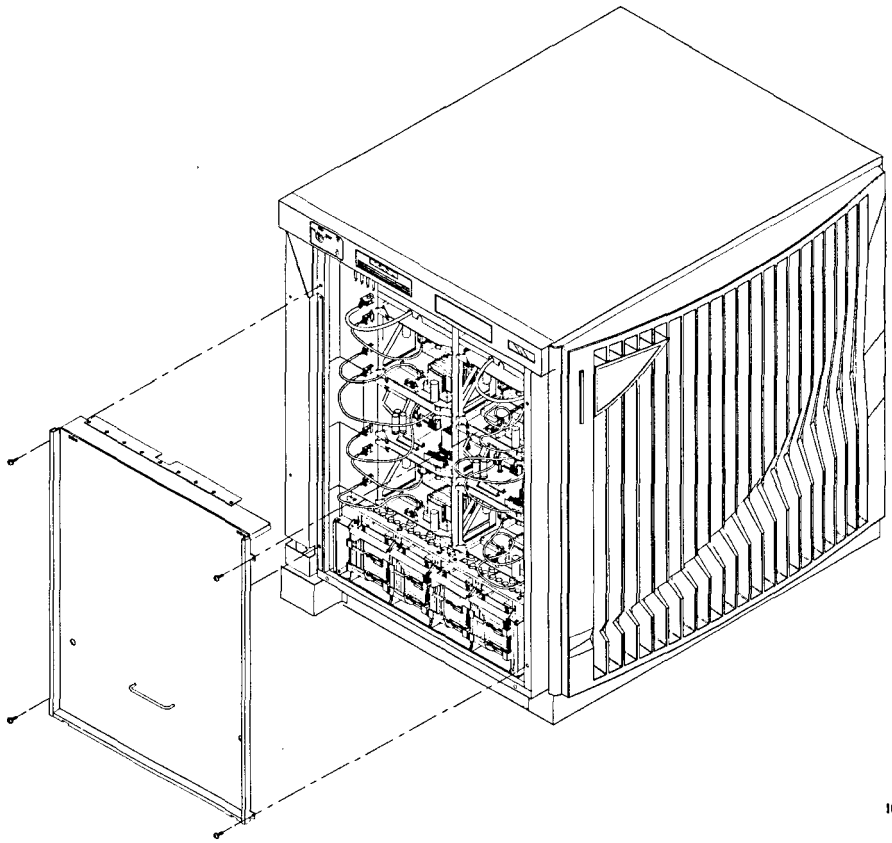
Step 5 Remove the EMI panel by removing the four screws that fasten the panel to the chassis as shown in Figure 15.

Figure 15 Removing EMI panels



Step 6 Unplug the power cable on the front of the target EIOB. The power connections are labeled on the chassis and are designated as follows:

IOLF I/O Left Front

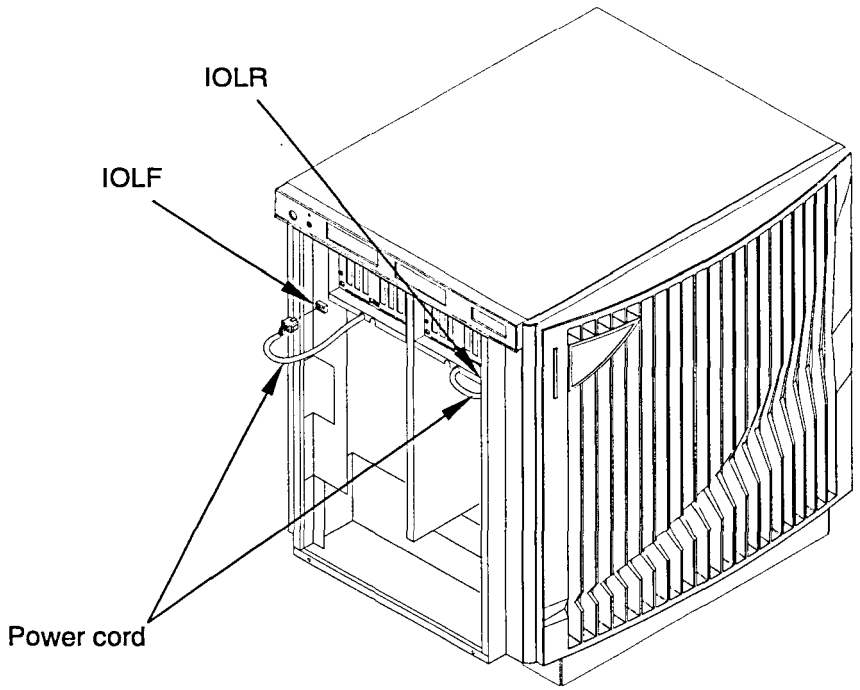
IOLR I/O Left Rear

IORF I/O Right Front

IORR I/O Right Rear

Figure 16 shows the location of the IOLF and IOLR EIOB power connections. The IORF and IORR connectors are on the opposite side of the chassis near the bottom.

Figure 16 Unplugging the EIOB power cable

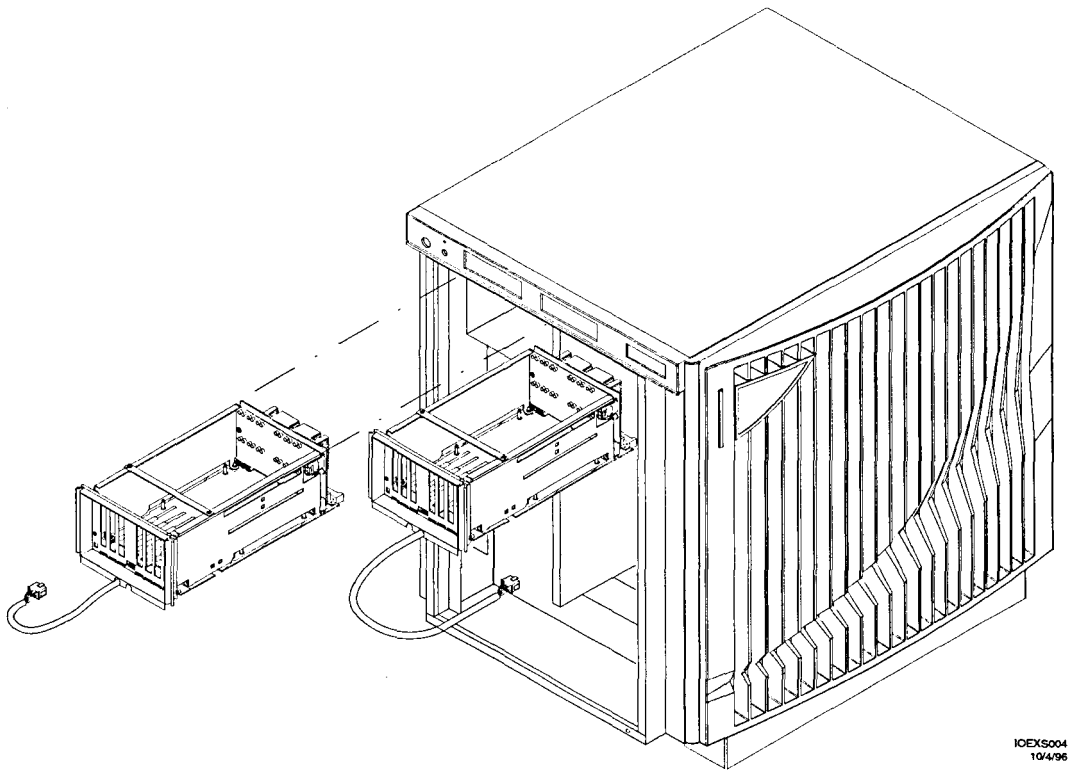


Step 7 Disconnect all SCSI and network cables attached to controllers in this EIOB. Mark or chart the connections for easy connection later.

Step 8 Remove the EIOB from the chassis by pulling the two extractor levers on the front of the EIOB toward you until the EIOB is unseated from the Exemplar Node Routing Board (ENRB). Continue sliding the EIOB all the way out, taking care to support it with one hand underneath (see Figure 17).

Step 9 Place the EIOB on a level work surface that contains a grounded static dissipating mat.

Figure 17 Removing the EIOB

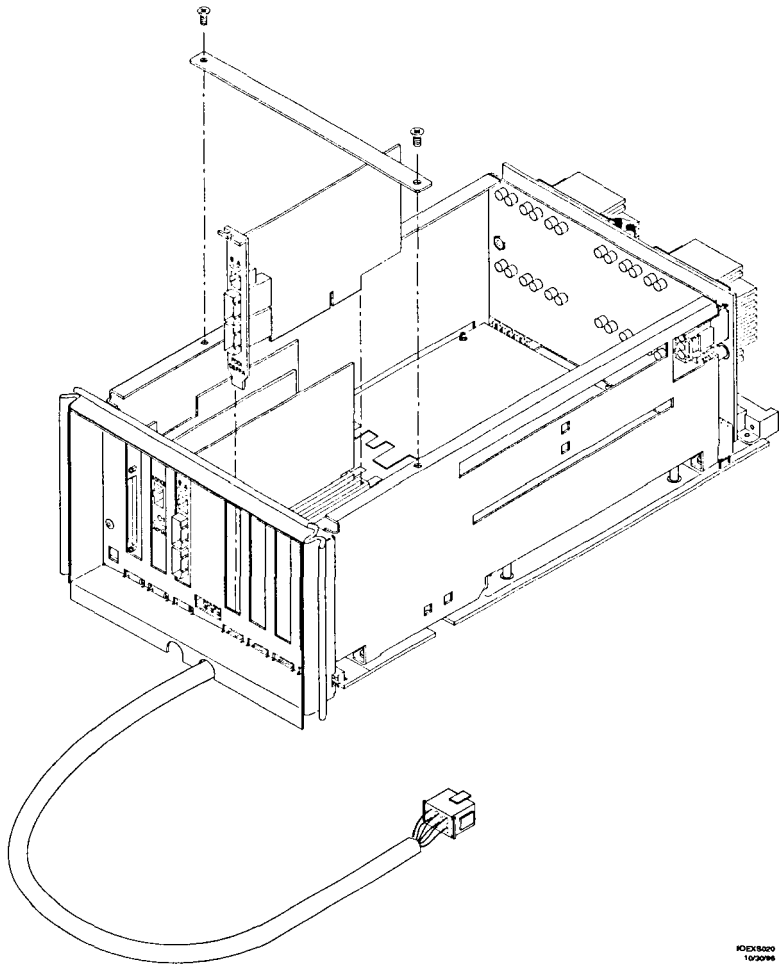


Removing the controller

To remove a PCI Dual Attach FDDI controller, perform the following steps:

Step 1 Using a #2 Phillips screwdriver, remove the two screws that secure the bracket across the top of the PCI card cage. Refer to Figure 18 for the location of the bracket.

Figure 18 Removing the controller



Step 2 Remove the screw on the faceplate of the PCI Dual Attach FDDI controller. Retain the screw for later use.

Step 3 Remove the controller by grabbing the edges of the board and pulling upward until the controller is free from the PCI connector.

Step 4 If you are replacing the controller, install the new controller at this time. If you are not replacing the controller, install a PCI slot cover plate over the space where the controller was removed. Secure the cover with the screw you removed in Step 2.

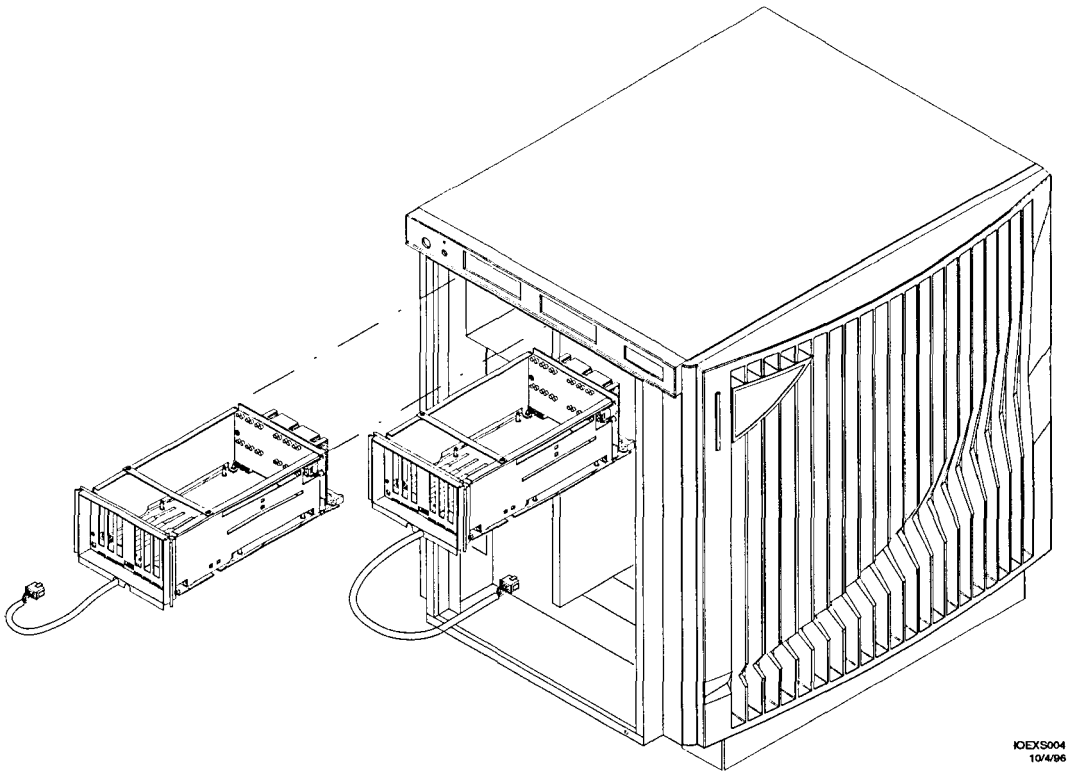
Step 5 Reinstall the bracket on top of the PCI card cage.

Reinstalling the EIOB

To reinstall the EIOB, use the following procedure:

Step 1 Reinstall the EIOB into the system chassis by lining up the EIOB card edges with the guide rails as shown in Figure 19. Continue sliding the EIOB into the chassis and secure it using the two extractor levers.

Figure 19 Reinstalling the EIOB



Step 2 Reattach the power cable on the front of the EIOB (refer to Figure 16 for the location of the EIOB power connector).

Step 3 Once you have installed the EIOB, reattach any cables previously removed to their proper location.

Completing the removal procedure

To complete the removal procedure, follow these steps:

Step 1 Restart the system by turning on the keyswitch on the operator panel.

Step 2 If you installed a replacement PCI Dual Attach FDDI controller, once the system has booted, observe the A and B port Status LEDs on the controller faceplate. Make sure there is a valid link.

Step 3 Reinstall the EMI panels and side skins.

Maintenance

5

This chapter provides information on troubleshooting, testing, and diagnosing problems with the PCI Dual Attach FDDI controller.

Troubleshooting

The PCI Dual Attach FDDI controller is a single Field Replaceable Unit (FRU) and does not contain any field-serviceable parts. Troubleshooting procedures described in this section are limited to verifying that the controller is operational and a valid connection is established. For information on interface configuration and operation refer to the *Exemplar Networking Guide.*

Check the controller

Perform a visible inspection to make sure the controller is seated properly in the PCI bus slot. If necessary, power down the system, reseat the controller, and restart the system.

Check the connection

Check to see if the correct cable is used and that the cable is connected and operating properly. The A and B port status LEDs are a steady green color if a valid link is established. Use the following table to isolate controller and connection problems.

Table 6 Isolating controller and connection problems

Symptom	Probable cause	Action
LED is amber	With a cable attached, a network problem is likely	Disconnect the cable. If the LED flashes green, the controller is functional. Reconnect the cable, try a new cable, or connect to a different concentrator port.
	With no FDDI cable attached, the controller is suspect	Reboot the system. If the problem persists, contact the Technical Assistance Center.
LED sequentially cycles to solid amber (for 50 seconds), then solid green, then back to solid amber (repeatedly)	Invalid topology	Use a valid topology configuration.
LED flashes green continually and does not change to solid green when cable is attached	Faulty cable or connection	Verify the cable and replace it if defective. Make sure the cable is connected properly (transmit ports are connected to receive ports).
	Faulty concentrator	Verify the integrity of the concentrator.
LED remains off	Controller is disabled via management	Enable the port using local network management software.

Run diagnostics

If you have verified the cables, connections, and other network devices, and you suspect that the controller is faulty, you may want to run diagnostics to determine whether the controller can communicate and respond to PCI bus instructions. Diagnostics are described in the next section.

If diagnostics determine that the controller is defective, you need to replace it. Contact your local Hewlett-Packard customer representative or call the Technical Assistance Center at one of the following locations for information on replacing and repairing the controller:

- Within the continental U.S., call 1 (800) 952-0379.
- From Canada, call 1 (800) 345-2384.
- All others, contact your local Hewlett-Packard sales office.

Diagnostics

If you are experiencing problems with your network connection and suspect that the controller may be malfunctioning, you can perform a diagnostic check of the controller to determine whether it is operational. To run these diagnostics, you need to reboot the system to the system Test Controller in standalone mode and run the `cxtest` utility.

Overview

The `cxtest` utility provides a graphical interface to the diagnostic environment. Diagnostic tests for the PCI Dual Attach FDDI controller are located in the io3000 suite of diagnostics. The io3000 diagnostic suite is organized into *classes*. Within each class there are one or more diagnostic *subtests*. The PCI Dual Attach FDDI controller diagnostic class is called Class 10 - EPIC PCI Access Test (FDDI).

The Class 10 EPIC PCI Access Test (FDDI) diagnostic consists of two subtests:

- 900 EPIC Configuration Space Test
- 905 EPIC I/O and Memory Space Test

The EPIC Configuration Space Test determines whether the EPIC (Exemplar PCI Interface Chip) can talk to the PCI Dual Attach FDDI controller by using PCI config space cycles to read the vendor ID and device ID of the controller. If this test fails, it indicates that the EPIC is unable to talk to the controller.

The EPIC I/O and Memory Space Test then maps the controller into I/O and memory space by setting the I/O Base Address Register and Memory Base Address Register on the controller. If this test fails, it indicates that the EPIC can communicate with the controller, but it is unable to read and write the Control and Status Registers (CSRs) via I/O and/or memory cycles.

These two diagnostic subtests are designed to test whether the controller can be recognized and initialized by the PCI config, I/O, and memory cycles. They do not test the network functionality of the board. Instructions for running these tests are provided in the next section.

For a complete description of `cxtest` and the Test Controller diagnostic environment, refer to the *Exemplar Diagnostics Guide*. For specific information on the io3000 diagnostics suite, refer to the io3000 man page.

Running FDDI diagnostics

To run the PCI Dual Attach FDDI controller diagnostics, perform the following steps:

Step 1 From the Test Station, reboot the system so that it boots the Test Controller in standalone mode instead of OBP. For specific instructions on booting the system to the Test Controller and operating in the diagnostic environment, refer to the *Exemplar Diagnostics Guide.*

Step 2 Execute `cxtest`:

```
/spp/bin/cxtest -d
```

Step 3 In the Tests menu, select io3000 to display the io3000 Class Menu dialog.

Step 4 In the Class Menu dialog, select Class 10 - EPIC PCI Access Test (FDDI). When you select a class, you select all the subtests within that class. You can, however, select specific subtests within a class by selecting the subtest button.

Step 5 From the Class Menu dialog, select the Parameters button to specify the parameters of the test(s). The parameters are as follows:

Epic

This parameter identifies the EPIC where the FDDI controller resides. Valid entries can be any of the values from the first column in Table 7.

Table 7 EPIC and PCI slot numbering

Parameter to enter	EPIC	PCI slots	Description
IOLF_B	0 (rear)	0, 1, 2	Left front EIOB, rear EPIC
IOLF_A	4 (front)	0, 1, 2	Left front EIOB, front EPIC
IOLR_B	1 (rear)	0, 1, 2	Left rear EIOB, rear EPIC
IOLR_A	5 (front)	0, 1, 2	Left rear EIOB, front EPIC
IORF_B	3 (rear)	0, 1, 2	Right front EIOB, rear EPIC
IORF_A	7 (front)	0, 1, 2	Right front EIOB, front EPIC
IORR_B	2 (rear)	0, 1, 2	Right rear EIOB, rear EPIC
IORR_A	6 (front)	0, 1, 2	Right rear EIOB, front EPIC

Controller

This parameter identifies the PCI slot number of the controller. The value can be 0, 1, 2, or 0xf. An entry of 0xf indicates that this device specification is unused.

Target device number

The target device number of the device (SCSI ID), expressed in hexadecimal. For FDDI, this parameter is ignored.

Logical Unit Number

The logical unit number of the device, expressed in hexadecimal. For FDDI, this parameter is ignored.

Step 6 Click the Done button to close the Class Menu dialog.

Step 7 Select Go from the `cxtest` Command menu to execute the tests. You will see the following in the Console window:

```
Execution Starting.
.......
```

Step 8 When the test terminates (successfully or unsuccessfully), the console window displays the following message:

```
Execution Completed.
```

The results of the test are displayed in the `cxtest` window.

If the test fails, an error message is displayed. For a complete description of error messages, refer to the io3000 man page and the *Exemplar Diagnostics Guide.*

Upgrading firmware

You can upgrade firmware on the PCI Dual Attach FDDI controller using the `futil` utility. `futil` asks you for the firmware filename and revision level and then prompts you to verify that the information is correct. Once it verifies the filename and revision level, it begins uploading firmware to the controller.

Step 1 Bring down the FDDI interface you intend to upgrade with the `ifconfig` command. For example, to bring down the fddi0 interface, type:

```
# ifconfig fddi0 down
```

Step 2 Run the `futil` utility with the `-u` option (firmware upgrade). If you have more than one FDDI controller, you need to specify which controller you want to upgrade.

```
# /usr/sbin/futil -u 0
```

Step 3 Determine whether you want to continue. Since firmware upgrades are an irreversible process, `futil` forces you to verify that you really want to upgrade the firmware. Enter `y` to continue or `n` to abort.

```
You have chosen to upgrade the adapter firmware
Do you wish to continue (y/n) :y
```

Step 4 Enter the name of the file containing the new firmware and the revision number of the new firmware when prompted.

```
Enter Firmware file name :/spp/firmware/DFXAA.310
Enter firmware rev number :3.10
```

The `futil` utility reports back what you have entered.

```
You have specified :
firmware file : /spp/firmware/DFXAA.310
firmware rev : 3.10

Do you wish to continue (y/n) :y
Adapter firmware revision : 2.46
New firmware revision : 3.10

Do you wish to continue (y/n) :y
```

At this point, `futil` begins uploading firmware to the controller. A message showing the percentage complete repeats until the firmware has been completely loaded.

```
filesize = 694318
Loaded 10 percent.
Loaded 20 percent.
Loaded 30 percent.
Loaded 40 percent.
Loaded 50 percent.
Loaded 60 percent.
Loaded 70 percent.
Loaded 80 percent.
Loaded 90 percent.
Loaded 100 percent.
Firmware upgrade succeeded
#
```

Step 5 Verify the firmware upgrade with the `futil -a` command.

```
# /usr/sbin/futil -a
AUXILIARY INFORMATION FOR FDDI ADAPTER FOR UNIT 0:

Vendor ID : 0x1011
Device Id : 0xf
Firmware Rev : 3.10
Adapter State = DMA_UNAVAILABLE
phys_addr = 00:00:f8:4a:1a:5d

#
```

FRU list

The following table lists the Hewlett-Packard part numbers for the PCI Dual Attach FDDI controller Field Replaceable Units (FRUs).

Table 8 PCI Dual Attach FDDI controller FRU list

Description	Part number
PCI Dual Attach FDDI controller	220-000050-201
SC-Duplex to MIC adapter cable	606-000007-001

PCI overview

A

This appendix provides a brief introduction and overview to the PCI Local Bus. For a complete description of the bus, refer to the PCI Local Bus Specification, Revision 2.1. You can obtain a copy of the specification by contacting the PCI Special Interest Group:

PCI Special Interest Group
P.O. Box 14070
Portland, OR
USA 97214

In the US call (800) 433-5177
International call 1 (503) 797-4207
Fax 1 (503) 234-6762

PCI bus description

The Peripheral Component Interconnect (PCI) Local Bus is an industry standard, high-performance, 32-bit or 64-bit synchronous bus with multiplexed address and data lines. It is capable of data rates up to 132 MBytes/second using a 32-bit wide data path and 264 MBytes/second using a 64-bit data path. The bus provides a complete set of multiprocessing and high performance features, including:

- Multiple bus master
- Overlapped (hidden) bus arbitration
- Burst-mode data transfers
- Multiprocessing support (resource locking)
- Cache coherency support
- 64-bit addressing capability
- Interrupts
- Configuration space

The PCI Local Bus is intended to be an interconnect mechanism between highly integrated peripheral controller components, peripheral expansion cards, and processor/memory systems. The processor and memory are connected through a *bridge* that provides a low latency path by which a processor can access PCI devices mapped anywhere in memory or I/O address space. It also provides a high bandwidth path allowing a PCI master direct access to main memory. The bridge may also include functions such as data buffering and posting, and PCI central functions such as arbitration.

The Exemplar S-Class and X-Class Technical Servers support the 32-bit PCI Local Bus. There can be from one to eight independent busses in a node, with three expansion slots in each bus.

PCI terminology

The PCI specification defines several terms and acronyms. Some of these terms are described below.

PCI Local Bus

The Peripheral Component Interconnect bus. PCI was originally developed by Intel as a local bus for high-end PC systems. It now falls under the jurisdiction of the PCI Special Interest Group (PCI-SIG).

controller

A PCI expansion card.

PCI interface

The whole block of logic that implements the PCI bus.

PMC

PCI Mezzanine Card. A small form factor expansion card based on the PCI specification.

agent

An entity that operates on a computer bus.

arbitration boundary

A point at which bus mastership may be assumed by another master.

transaction

An atomic transfer of one or more bytes on the PCI bus. A transaction defines an arbitration boundary.

master

A master is a PCI module which can initiate a PCI transaction.

target

A PCI target is a module which responds to a PCI transaction.

DAC

Dual Address Cycle. A PCI transaction where a 64-bit address is transferred across a 32-bit data path in two clock cycles.

SAC

Single Address Cycle. A PCI transaction where a 32-bit address is transferred across a 32-bit data path in a single clock cycle.

bus device

General term that refers to either a bus master or target.

burst transfer

The basic bus transfer mechanism of PCI. A burst is comprised of an address phase and one or more data phases.

configuration cycle

Bus cycles used for system initialization and configuration via the configuration address space.

Configuration Address Space

A set of 64 registers (DWORDS) used for configuration, initialization, and catastrophic error handling. This address space consists of two regions: a header region and a device-dependent region.

PCI bus commands

Bus commands indicate to a target agent the type of transaction the bus master is requesting. All bus commands are encoded on the Bus Command and Byte Enable pins (C/BE[3::0]#) during the address phase. A brief description of the PCI bus commands is given below.

Interrupt Acknowledge

Acknowledges an interrupt. The Interrupt Acknowledge command is a read that is implicitly addressed to the interrupt controller.

Special Cycle

Simple message broadcast mechanism. Used as an alternative to physical signals when sideband communication is required.

I/O Read.

Reads data from an agent mapped in I/O address space.

I/O Write

Writes data to an agent that is mapped in I/O address space.

Reserved

Reserved for future use.

Memory Read

Reads data from an agent mapped in memory address space.

Memory Write

Writes data to an agent mapped in memory address space.

Configuration Read

Reads the configuration space of an agent.

Configuration Write

Transfers data to the configuration space of an agent.

Memory Read Multiple

Similar to the Memory Read Command. Indicates that the master may want to fetch more than one cacheline before disconnecting.

Dual Address Cycle

Transfers a 64-bit address to devices that support 64-bit addressing when the address is not in the low 4 GB address space. Targets that support only 32-bit addressing treat this command as Reserved.

Memory Read Line

Similar to the Memory Read Command. Indicates that the master intends to fetch a complete cacheline. It is typically used with bulk sequential data transfers to increase performance.

Memory Write and Invalidate

Similar to the Memory Write Command. Guarantees a minimum of one complete cacheline.

PCI physical characteristics

PCI defines two expansion card connectors: 5 volt signaling connectors and 3.3 volt signaling connectors. To accommodate both voltages and to provide a smooth migration path between voltages, three electrical types are defined for expansion cards:

- *5 volt boards,* which plug into a 5 volt connector
- *3.3 volt boards,* which only plug into 3.3 volt connectors
- *universal boards,* which plug into either 5 volt or 3.3 volt connectors

Additionally, PCI specifies two form factors for expansion cards. One type is known as PMC (PCI Mezzanine Card), based on CMC IEEE P1386. Mezzanine cards have a form factor similar to an SBUS card. The other type is similar to an EISA bus card and is common in most PCs. PCI defines three sizes of these cards:

- long
- short
- variable short length

It is not a requirement for any system to support all three sizes.

Two types of backplates are currently defined: ISA/EISA and Micro-Channel compatible.

PCI bus signals

The PCI bus requires a minimum of 47 pins for a target-only device and 49 pins for a master to handle data and addressing, interface control, arbitration, and system functions. Table 9 and Table 10 list required and optional signals.

Table 9 PCI bus signals (required pins)

Functional group	Signal name	Description
Address and data	AD[31::00]	Address and Data (multiplexed on same pins)
	C/BE[3::0]#	Bus Command (address phase) and Byte Enables (data phase) (multiplexed on same pins)
	PAR	Parity (even)—required by all PCI agents
Interface control	FRAME#	Cycle Frame—used by master to indicate the start and duration of an access
	TRDY#	Initiator Ready—initiating agent is ready to complete current data phase of the transaction
	IRDY#	Target Ready—target agent is ready to complete current data phase of the transaction
	STOP#	Stop—used by target to request that master stop the current transaction
	DEVSEL#	Device Select—when asserted, indicates driving device has decoded its address as the target of the current access
	IDSEL	Initialization Device Select—chip select during config and R/W transactions
Error reporting	PERR#	Parity Error—used to report data parity errors during PCI transactions (except Special Cycle)
	SERR#	System Error—used to report address parity errors, data parity errors on Special Cycle command, and all other catastrophic errors
Arbitration (masters only)	REQ#	Request—request the use of the bus
	GNT#	Grant—access to bus is granted
System	CLK	Clock—provides timing for all transactions
	RST#	Reset—sets PCI-specific registers, sequencers, and signals to a consistent state

Table 10 PCI bus signals (optional pins)

Functional group	Signal name	Description
64-bit extension (optional)	AD[63::32]	Address and Data (multiplexed on same pins)
	C/BE[7::4]#	Bus Command (address phase) and Byte Enables (data phase) (multiplexed on same pins)
	PAR64	Parity Upper DWORD—even parity that protects AD[63::32] and C/BE[7::4]#
	REQ64#	Request 64-bit Transfer—indicates that the master wishes to transfer data using 64 bits
	ACK64#	Acknowledge 64-bit transfer—indicates the target is ready to transfer data using 64 bits
Interface control (optional)	LOCK#	Lock—indicates an atomic operation that may require more than one transaction
Interrupts (optional)	INTA#	Interrupt A—request an interrupt
	INTB#	Interrupt B—request an interrupt (only meaningful on a multi-function device)
	INTC#	Interrupt C—request an interrupt (only meaningful on a multi-function device)
	INTD#	Interrupt D—request an interrupt (only meaningful on a multi-function device)
Cache support (optional)	SBO#	Snoop Backoff—when asserted, indicates a hit to a modified line
	SDONE	Snoop Done—indicates status of snoop for current access
JTAG/Boundary Scan pins. IEEE Standard 1149.1, Test Access Port and Boundary Scan Architecture (optional).	TDI	Test Data Input
	TDO	Test Output
	TCK	Test Clock
	TMS	Test Mode Select
	TRST#	Test Reset

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Symbols

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