FDDIXPress™ Mezzanine Board for CHALLENGE™ and Onyx™ Installation Instructions

Document Number 108-0116-002

Contributors

Written by M. Schwenden and Carlin Otto
Illustrated by Dan Young and Carlin Otto
Edited by Christina Cary
Production by Derrald Vogt
Engineering contributions by Roger Hu, Vernon Schryver, David North, and Marty Castilla.

FCC Warning

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

Attention

This product requires the use of external shielded cables in order to maintain compliance pursuant to Part 15 of the FCC Rules.

FDDIXPress Mezzanine Board for Challenge and Onyx Installation Instructions
Document Number 108-0116-002

Silicon Graphics, Inc.
Mountain View, California

Contents

Figures

Tables

About This Book

The FDDIXPress™ mezzanine board is an optional network connection product (board and software) that provides high-speed Fiber Distributed Data Interface (FDDI) network connections for Silicon Graphics® CHALLENGE™, POWER CHALLENGE™, Onyx™, and POWER Onyx™ deskside and rackmount systems. This manual provides instructions for installing the FDDIXPress mezzanine board onto one of the short mezzanine slots of an IO4 board in the following Silicon Graphics platforms:

- Onyx Deskside and POWER Onyx Deskside: instructions in Chapter 2
- Onyx Rackmount and POWER Onyx Rackmount: instructions in Chapter 3
- CHALLENGE L (also referred to as, CHALLENGE Deskside) and POWER CHALLENGE L: instructions in Chapter 2
- CHALLENGE XL (also referred to as, CHALLENGE Rackmount) and POWER CHALLENGE XL: instructions in Chapter 3

The manual is organized as follows:

Chapter 1 "Introduction and Installation Preparation" describes the FDDIXPress mezzanine products, discusses important installation preparation considerations, and provides a technical overview of the products. Configuration issues are covered, and a list of applicable parts is provided.

Chapter 2 "Installing the FDDIXPress Mezzanine in Deskside Systems" covers how to install the FDDI mezzanine controller board into deskside Challenge and Onyx systems.

Chapter 3 "Installing the FDDIXPress Mezzanine in Rackmount Systems" details the installation of FDDI mezzanine products in Challenge and Onyx rackmount systems.

Chapter 4 "Cabling Connections and Completing the Installation" explains how to properly connect the internal FDDI cables and gives general site cabling information.

Chapter 5 "FDDIXPress Mezzanine LEDs and Troubleshooting" describes the behavior of the board's LEDs.

Start at the beginning to familiarize yourself with the features and overview of the hardware option. Then, proceed to the chapter covering installation for your type of system.

Chapter 1

Introduction and Installation Preparation

This chapter discusses important preparations to make before installing the FDDIXPress mezzanine board for Challenge and Onyx deskside and rackmount products.

Discussion of the FDDIXPress mezzanine board's general operational characteristics and hardware is also included.

Warning: Installing this equipment requires specific training and technical knowledge. These instructions are provided for use only by Silicon Graphics system support engineers (SSEs) or other service personnel trained or authorized by Silicon Graphics. This equipment uses internal electrical power that is hazardous if the equipment is improperly handled.

1.1 Check the FDDIXPress Mezzanine Option for Completeness

Verify that the FDDIXPress mezzanine option package is complete. For the single-attachment station product (SAS), the package should contain the items listed in Table 1-1 and illustrated in Figure 1-1. For a dual-attachment station product (DAS), it should contain the items listed in Table 1-2 and shown in Figure 1-2. If anything is missing, and you cannot properly complete the installation, notify the customer or the customer's salesperson.

Table 1-1 SAS FDDIXPress Mezzanine Package Contents

Item	Part Number	Quantity
FDDIXPress short mezzanine board with two SC™-duplex connectors	013-0963-00v[a]	1
Internal fiber optic cable assembly (terminated in two S-key connectors)	013-0967-00v	1
Hardware set to attach the FDDIXPress mezzanine board to the IO4 board	026-0997-00v	1
FDDIXPress mezzanine label sheets	024-0844-00v	1
FDDIXPress Mezzanine Board for Challenge and Onyx Installation Instructions	108-0116-002	1
FDDIXPress Administration Guide	007-0813-0vv	1
FDDIVisualyzer User's Guide	007-0814-0vv	1

a. The version numbers (v) change from release to release.

print/sas-kit.ai 100%

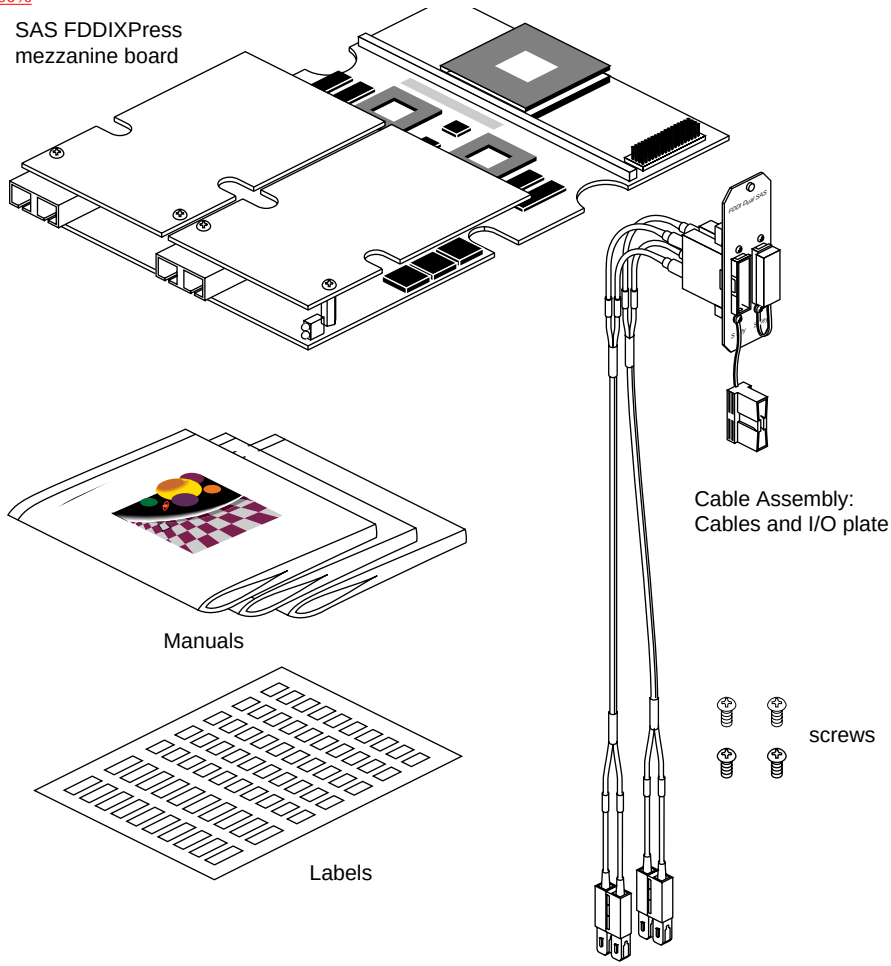


Figure 1-1 SAS FDDIXPress Mezzanine Package Parts

Table 1-2 DAS FDDIXPress Mezzanine Package Contents

Item	Part Number	Quantity
FDDIXPress short mezzanine board with four SC-duplex connectors	013-0964-00v[a]	1
Internal fiber optic cable assembly (terminated in A- and B-key connectors)	013-0968-00v	2
Hardware set to attach the FDDIXPress mezzanine board to the IO4 board	026-0997-00v	1
Optical bypass switch power harness	015-0231-00v	1
FDDIXPress mezzanine label sheets	024-0844-00v	2
FDDIXPress Mezzanine Board for Challenge and Onyx Installation Instructions	108-0116-002	1
FDDIXPress Administration Guide	007-0813-0vv	1
FDDIVisualyzer User's Guide	007-0814-0vv	1

a. The version numbers (v) change from release to release.

print/das-kit.ai 100%

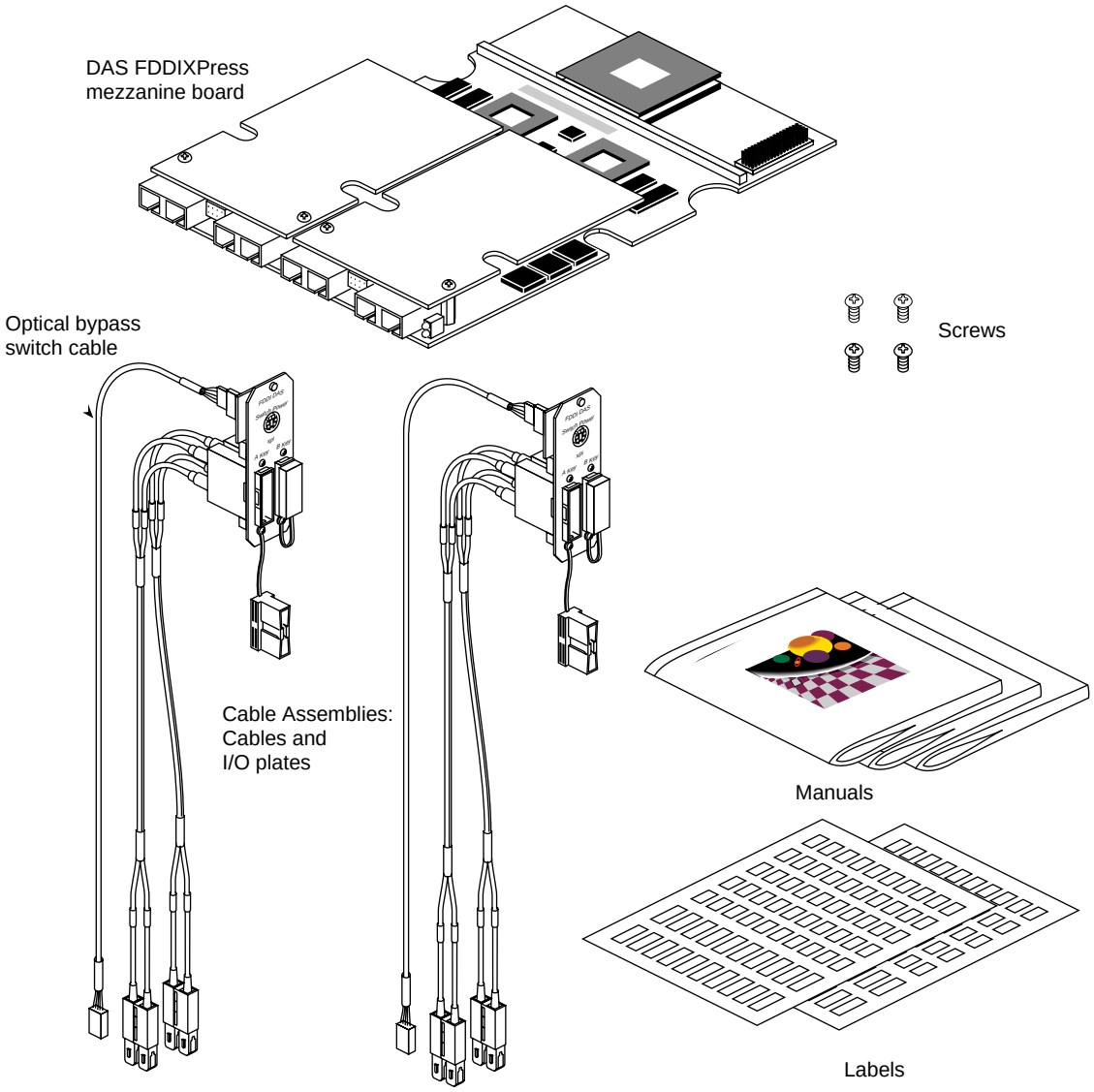


Figure 1-2 DAS FDDIXPress Mezzanine Package Parts

1.2 General System Preparation

Before starting the installation, prepare yourself and the equipment by following the instructions in this section.

Caution: This equipment is extremely sensitive and susceptible to damage by electrostatic discharge (ESD), a spark caused by the buildup of electrical static potential on clothing and other material. You must use proper ESD preventive measures.

Use the following steps to confirm that the system is running the proper software releases, and that files are properly backed up before bringing down the system. Some releases of FDDIXPress software are compatible only with specific versions of the operating system (IRIX™), and most FDDIXPress hardware operates only with versions of the FDDIXPress software that equal or post-date a particular version.

1. Use the *versions* command to check if the system into which you are installing the FDDIXPress mezzanine board is already running FDDIXPress software. If FDDIXPress is not installed, install it now.

   ```
   % versions FDDIXPress
   I FDDIXPress date FDDIXPress, version
   ```

   Note: Software for IRIX and FDDIXPress is normally located on the same CDROM.

2. Read the online FDDIXPress release notes to verify that this version of FDDIXPress supports the mezzanine board for Challenge and Onyx.

   ```
   % grelnotes FDDIXPress
   ```

   If the release notes do not mention the mezzanine board for Challenge and Onyx, you need to locate and install an appropriate version of FDDIXPress software, and possibly a new IRIX operating system. See the *IRIX Software Installation Guide* for complete instructions for installing new software.

   Note: FDDIXPress 3.6 and IRIX 5.3 are the first releases to support the FDDIXPress mezzanine board for CHALLENGE and Onyx.

3. Confirm that the installed IRIX operating system is compatible with this version of FDDIXPress software. The FDDIXPress release notes contain information about version compatibility. If necessary, install a new version of the IRIX operating system. Complete instructions for this procedure are provided in the *IRIX Software Installation Guide*.

   ```
   % versions eoe1
   I eoe1 date IRIX Execution Environment 1, version
   ```

4. Verify that the file systems are backed up.

5. Configure the two (or more) new FDDIXPress network interfaces (*xpi0*, *xpi1*, and so on) that upon boot up will be associated with the hardware you are about to install. Instructions for this configuration task are provided in the *FDDIXPress Administration Guide* that is included in the FDDIXPress package.

   Note: If you do not configure the FDDIXPress network interfaces now, the configuration can be done immediately after powering on the system (following the hardware installation).

1.3 Cautions About This Installation

Observe the following precautions whenever handling or installing FDDI equipment:

- Fiber optic cable is made of glass and is, therefore, breakable. Do not overly bend, flex, or tug on a fiber cable. The smallest recommended bend radius of a cable is 2 inches. Do not allow the cable to be struck sharply or by heavy objects.

- The connector tips for fiber optic cabling are extremely sensitive to oil, dirt, and dust. Never touch the inside tip of an FDDI connector, and do not leave FDDI connectors uncapped when they are not connected.
- The FDDIXPress mezzanine board and the computer equipment are extremely sensitive and susceptible to damage caused by electrostatic discharge (ESD). ESD is a spark caused by the build-up of electrical static potential on clothing and other materials. You must use proper ESD preventive measures and also the precautions listed below:
  - Connect a ground strap to your wrist when connecting or disconnecting peripherals.
  - Be sure that you and all the electrical equipment that you handle during this installation are at ground potential.
  - Keep the boards in the antistatic bags provided, and remove a board from its antistatic bag only when you are properly grounded to the chassis with a ground strap.

1.4 Connectors

Table 1-3 describes the connectors on FDDIXPress mezzanine boards. Table 1-4 describes the connections provided at the I/O panel plate (bulkhead).

Table 1-3 FDDIXPress Board Connector Descriptions

Connector's Name	Count per Board	Function
DAS Board:		
A/S-key	2	Provides a duplex-wire connection to an A port at the bulk head (panel plate). This connector is an SC-duplex type.
B-key	2	Provides a duplex-wire connection to a B port at the bulk head (panel plate). This connector is an SC-duplex type.
OBS	2	Provides control line and power to the optical bypass switch (OBS) connector at the bulkhead (panel plate).
SAS Board:		
A/S-key	2	Provides a duplex-wire connection to an S port at the bulk head (panel plate). This connector is an SC-duplex type.

Table 1-4 FDDIXPress Panel Plate Connector Descriptions

Connector's Name	Count per Panel Plate	Function
DAS Panel Plates:		

Table 1-4 FDDIXPress Panel Plate Connector Descriptions

Connector's Name	Count per Panel Plate	Function
A-key	1	Provides an A or S connection to the FDDI local area network. This connector is a MIC type. For a dual-attached station (port connected to a site cable A-key), the port consists of the primary ring input and secondary ring output. For a single-attached station (port connected to a site cable S-key), the port consists of the input and output lines between the station and the concentrator's M port. If both the A and B ports are attached to concentrators (dual-homed), the connection at the A-key port acts as the backup.
B-key	1	Provides a B or S connection to the FDDI local area network. This connector is a MIC type. For a dual-attached station (port connected to a site cable B-key), the port consists of the primary ring output and secondary ring input. For a single-attached station (port connected to a site cable S-key), the port consists of the input and output lines between the station and the concentrator's M port. If both the A and B ports are attached to concentrators (dual-homed), the connection at the B-key port acts as the main connection to the ring.
OBS	1	Provides control line and power to the optical bypass switch (OBS). The OBS is available with DAS only, and is optional.
SAS Panel Plate:		
S-key	2	Provides an S connection to the fiber optic cable between the SAS station and a concentrator's M port. This connector is a MIC type. The port consists of the input and output.

1.5 Assignment of Network Interfaces to FDDIXPress Mezzanine Hardware

As you install the FDDIXPress mezzanine hardware, you need to anticipate the network interface that will be assigned (by the software) to each FDDI connection during the subsequent boot procedure. The guidelines below describe the algorithm used by the software:

1. Each IO4 board is probed for the presence of an FDDIXPress board. The IO4 boards are probed in the following order:
   - Main IO4, lower mezzanine slot (adapter 5)
   - Main IO4, upper mezzanine slot (adapter 6)
   - Second IO4 board, lower mezzanine slot (adapter 5), then upper slot (adapter 6)
   - The probe continues in this fashion, until all IO4 boards have been probed

2. The located FDDIXPress boards are assigned interfaces in the order that the boards were found. Each board is assigned two network interfaces. That is, the first FDDIXPress board found is assigned *xpi0* and *xpi1*, and the second board is assigned *xpi2* and *xpi3*.

3. The FDDI connection located on the daughter card nearest the bottom edge of the FDDIXPress mezzanine board (as the board appears when installed in the card cage) is assigned the lower-numbered interface of the assigned pair (for example, *xpi0* or *xpi2*).

   The FDDI connection located on the daughter card nearest the top edge of the FDDIXPress mezzanine board (as the board appears when installed in the card cage) is assigned the higher-numbered interface of the assigned pair (for example, *xpi1* or *xpi3*).

SC-duplex connectors on the board, I/O panel plates, and cables can be labeled for easier identification, using the labels that are included in the option kit. Figure 1-3 illustrates a sheet of labels. These labels indicate the software network interface that you expect to be associated with each item. For example, the small-sized labels **xpi0** and **xpi1** are designed for labeling the two panel plates on a system with one DAS board or the two S-key ports on the single panel plate of an SAS board. Section 4.2, “Labeling the Hardware,” describes where to install these labels.

print/label.set.ai 95%

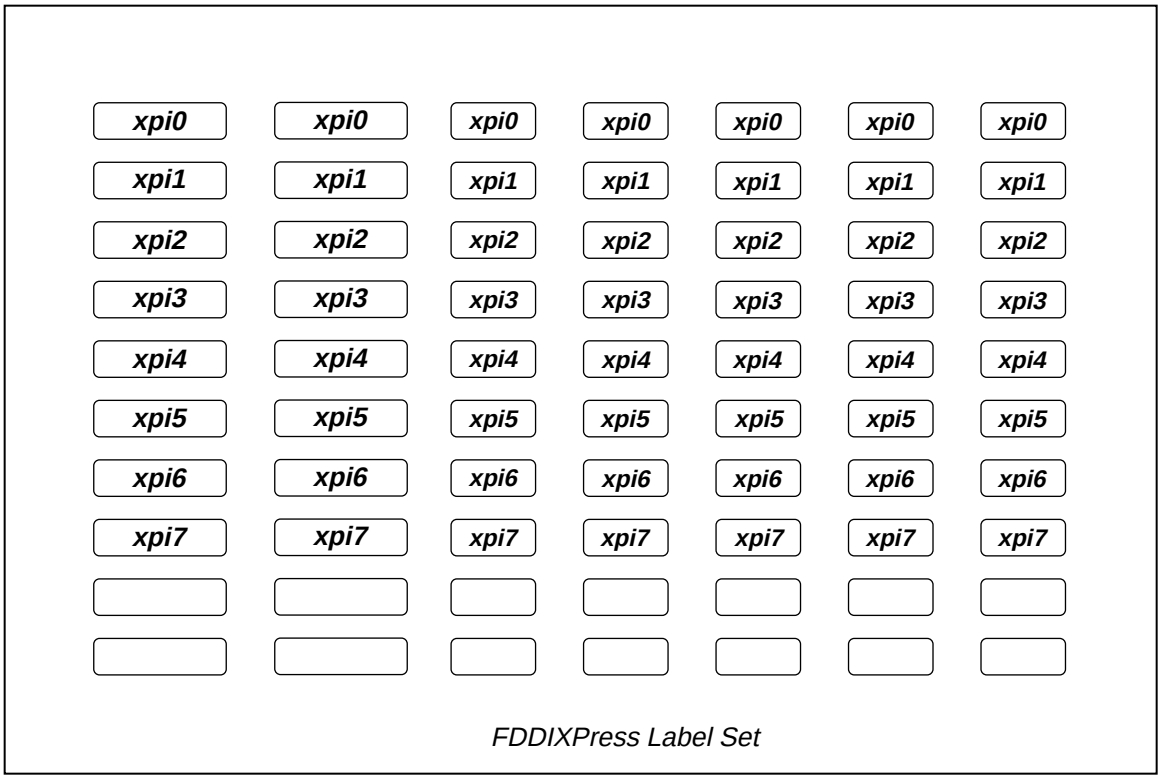


Figure 1-3 Illustration of the Labels for FDDIXPress Mezzanine Product

1.6 Technical Information

This section describes the architecture, the main features, and the physical characteristics of the FDDIXPress mezzanine product.

1.6.1 Architecture and Operation

The FDDIXPress mezzanine board processes the transmission and reception of data packets (frames) across two independent 100-megabit-per-second FDDI networks. The board occupies one short mezzanine slot on any IO4 board. The board can be ordered as a single-attachment (SAS) or dual-attachment (DAS) FDDI board.

For detailed information on the FDDI standard and its operation, see the *FDDIXPress Administration Guide*, included in the FDDIXPress package.

Each FDDIXPress mezzanine board consists of a motherboard and two daughter boards. The daughter board determines whether the physical network connection supports single-attachment (SAS) or dual-attachment (DAS). Figure 1-4 shows the daughter board configurations for both the SAS and DAS products.

print/sas+das.ai 100%

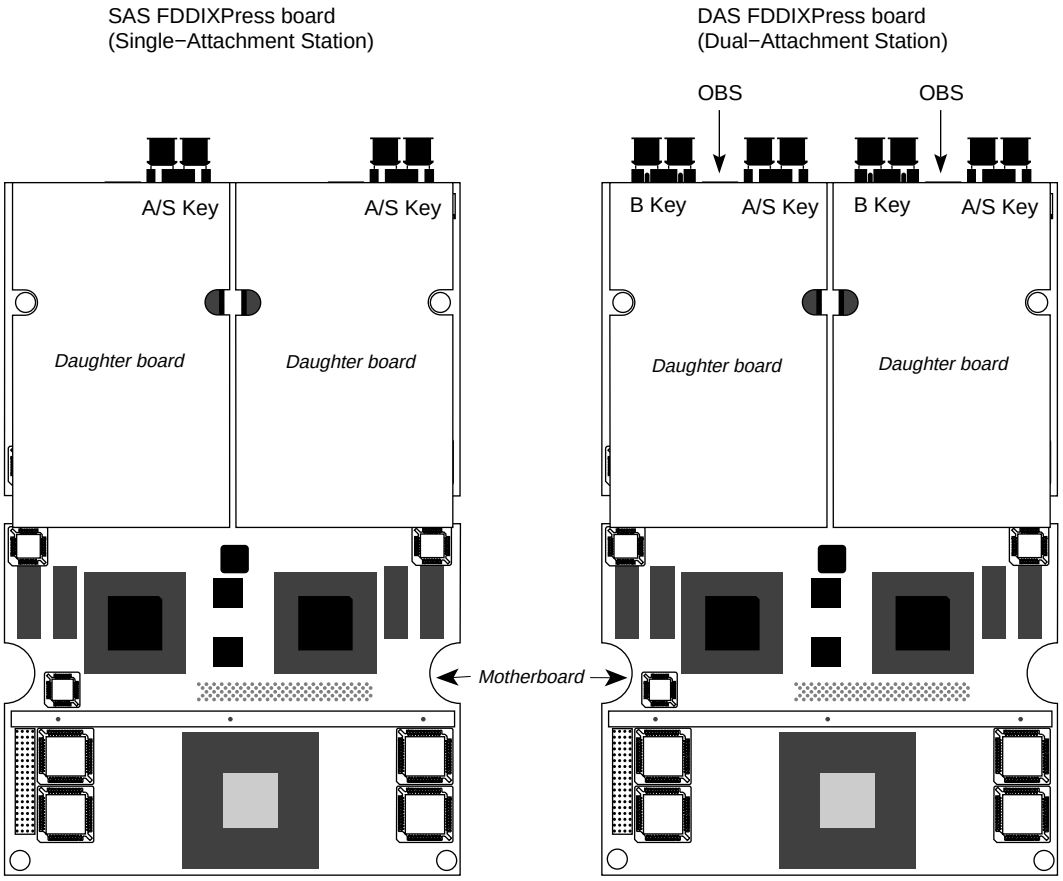


Figure 1-4 FDDIXPress Boards Showing SAS and DAS Configurations

Each FDDIXPress mezzanine board (SAS or DAS) provides two independent network connections (two Media Access Control [MAC] addresses and two software interfaces) that can access two different FDDI local area networks (rings) or can provide two independent connections to the same FDDI ring. The single-attachment board accesses its ring(s) through concentrators. The dual-attachment board connects directly to the ring(s), and each interface is capable of wrapping in order to maintain communication in the event of a break (as illustrated in Figure 1-5 and Figure 1-6). On a dual-attachment board, either one or both of the FDDI interfaces can be used as a single-attachment connection, a dual-homed single-attachment connection, or a dual-attachment connection.

Note: A dual-homed FDDI connection attaches port A to one concentrator on the FDDI ring and port B to a different concentrator on the same FDDI ring. The port B connection functions as the main connection, while port A is the backup (inactive until the port B connection fails).

The motherboard communicates with the host (local system) through the IBus™ (also known as HIO) of any standard IO4 board. The Silicon Graphics DANG™ ASIC, on the motherboard, interfaces between the Challenge or Onyx system's IBus (on the IO4 board) and the FDDIXPress mezzanine board's GIO Bus™.

The architecture of the FDDIXPress mezzanine board focuses on the efficient sharing of the central 256-kilobyte high-speed SRAM resource. The SRAM resources are shared by three local bus masters: GIO Bus, on-board microprocessor, and FDDI interface chip set.

The on-board processor initializes and controls registers within the FDDI chip set and the DANG chip (host system), as well as manipulates and inspects data in the SRAM. The GIO Bus interface, either as the master or the slave, has the ability to request information and give commands to the processor. The GIO Bus can also transfer data between the SRAM and system memory. The FDDI chip set, as a local bus master only, requires data transfers between the SRAM and the chip set's own internal buffers.

1.6.2 Features

The main features of the FDDIXPress mezzanine board are listed below:

- Provides two completely independent, single-MAC FDDI interfaces
- Comprises an AMD® 29030 RISC processor and the Motorola® FDDI chip set
- Includes 256 kilobytes of on-board, custom buffer memory
- Provides full FDDI performance on each FDDI interface, simultaneously*
- Offers dual-attachment (DAS) and single-attachment (SAS) versions of the product
- The DAS FDDIXPress board supports an optional external optical bypass switch at each FDDI interface

* Single TCP connection per interface, using the **ttcp -t -s -l32768 -b256000** command line.

1.6.3 Components on the FDDIXPress Boards

The motherboard has the following components:

- AMD 29030 RISC processor
- GIO Bus logic, supporting both master and slave operations
- DANG chip to interface between mezzanine board's GIO Bus and IO4 board's IBus
- 128 kilobytes of EEPROM and 256 kilobytes of fast static RAM
- Two sets of FDDI logic, supporting two independent FDDI interfaces. Each set includes the following items:
  - A connector to attach one of the daughter boards
  - A portion of the FDDI interface, implemented using the Motorola® MC6883x FDDI chip set. The components that reside on the mother board are the following:

    MC68838 MAC chip
    MC68839 FSI chip

Each daughter board supports one FDDI interface with the following components and supporting logic:

- The remaining portions of the FDDI interface, implemented with the Motorola MC6883x FDDI chip set. The Motorola components that reside on the daughter board are the following:
  - MC68837 ELM chip: one for SAS; two for DAS
  - MC68836 FCG chip: one for SAS; two for DAS
- The direct fiber connection, provided by integrated fiber optic transmission and receive devices, referred to as ODLs: one ODL for SAS, two ODLs for DAS.

1.6.4 Physical Specifications

The physical characteristics and specifications for the FDDIXPress mezzanine board are summarized in Table 1-5.

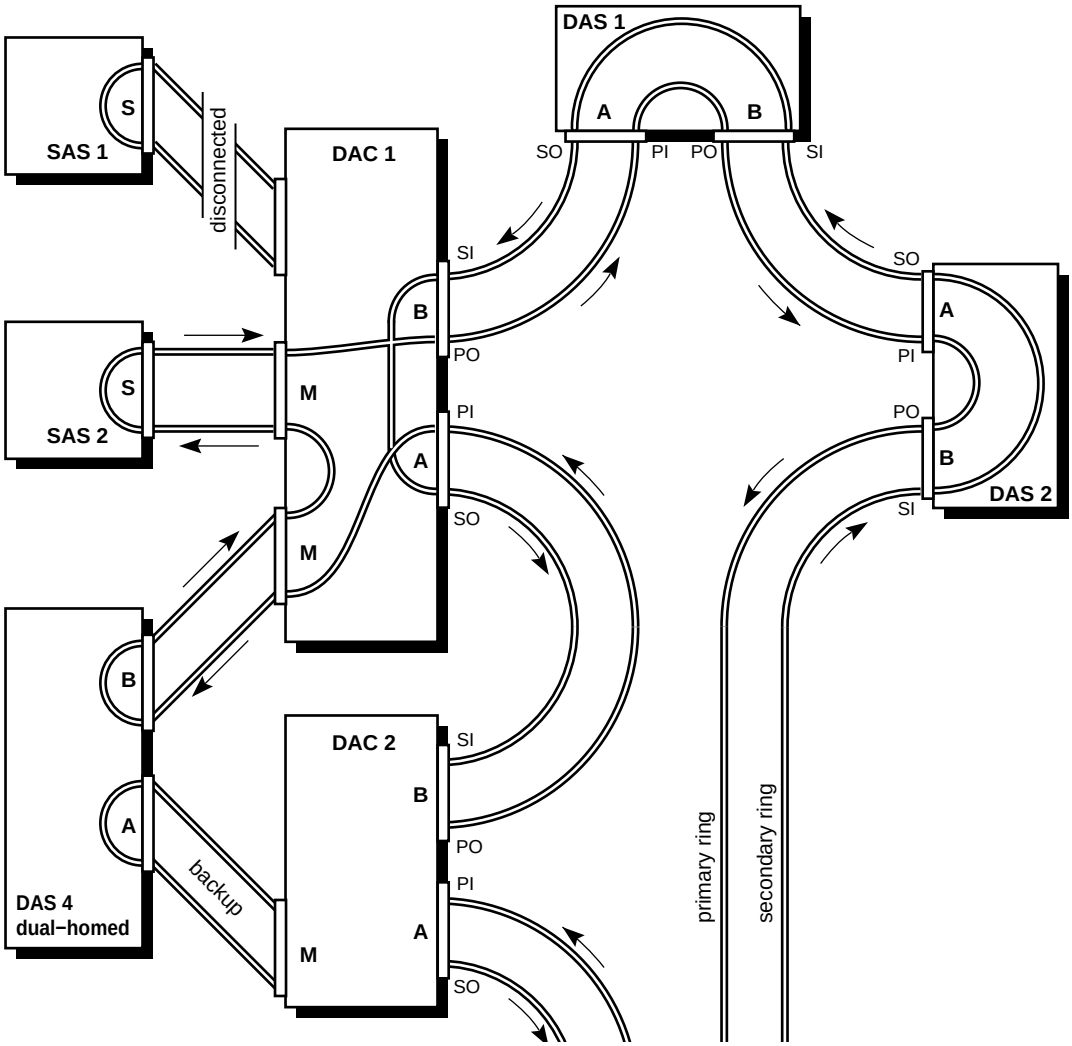
Table 1-5 Board Specifications

Specifications	Value
Mechanical	Mezzanine board mounted to IO4
Maximum number of FDDIXPress mezzanine boards per system	Two [a]
Power consumption	7.0 amps of +5 VDC
System operating temperature	0-35 degrees centigrade
Operating humidity	0-90% (noncondensing)

a. This may change in future releases. The online FDDIXPress release notes contain current information.

1.7 FDDI Terminology

This section illustrates some of the more important FDDI terms and concepts. Figure 1-5 illustrates an FDDI dual ring with a variety of types of stations: dual-attachment, single-attachment, dual-homed, and concentrators. Figure 1-6 shows a how a ring wraps when there is a break.


DAS 1
A
B
SO
PI
PO
SI
SAS 1
S
disconnected
DAC 1
SI
B
PO
SO
A
PI
PO
B
DAS 2
SI
SAS 2
S
M
PI
A
SO
M
B
DAC 2
SI
B
PO
PI
A
SO
A
backup
M
DAS 4
dual−homed
primary ring
secondary ring

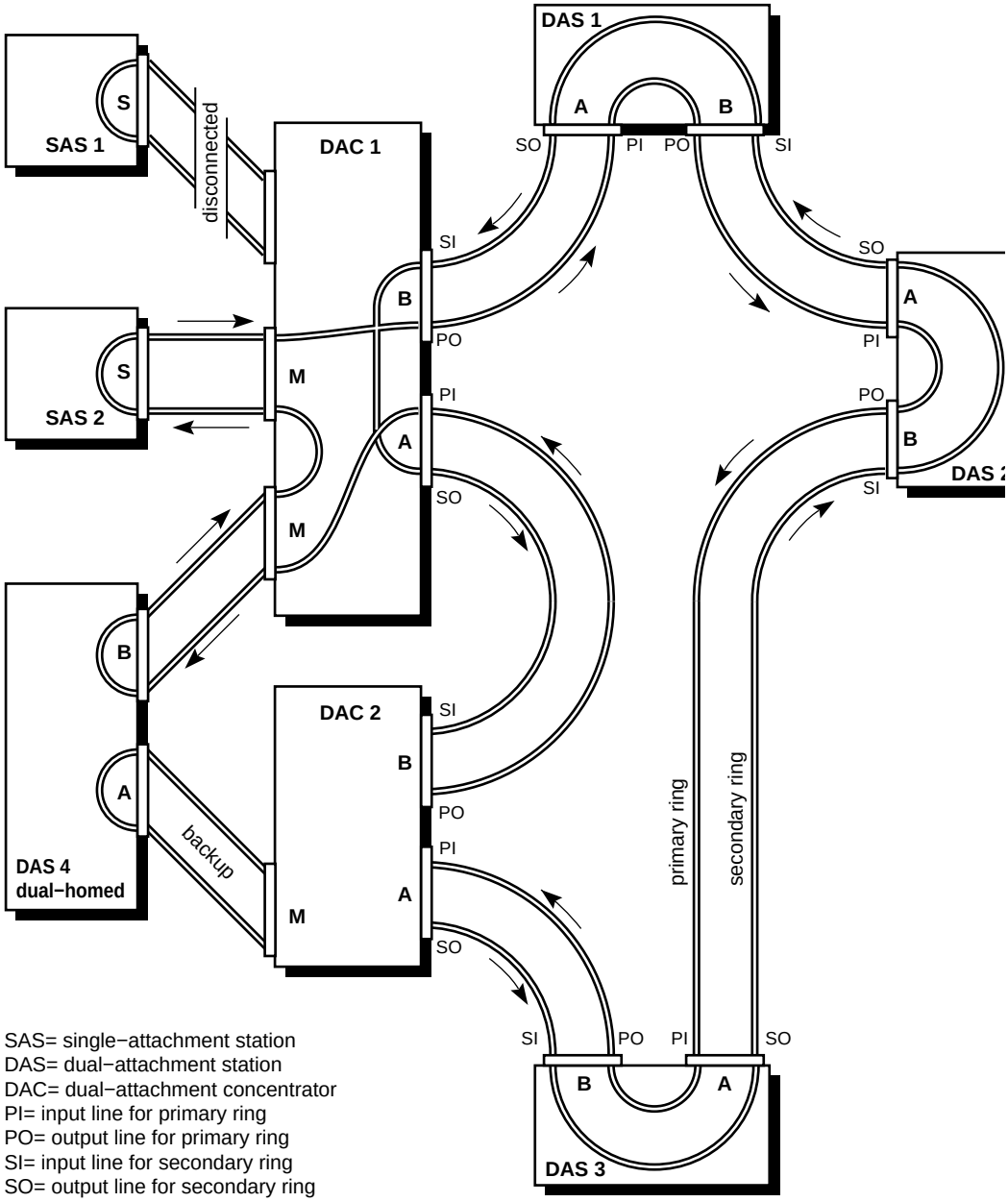
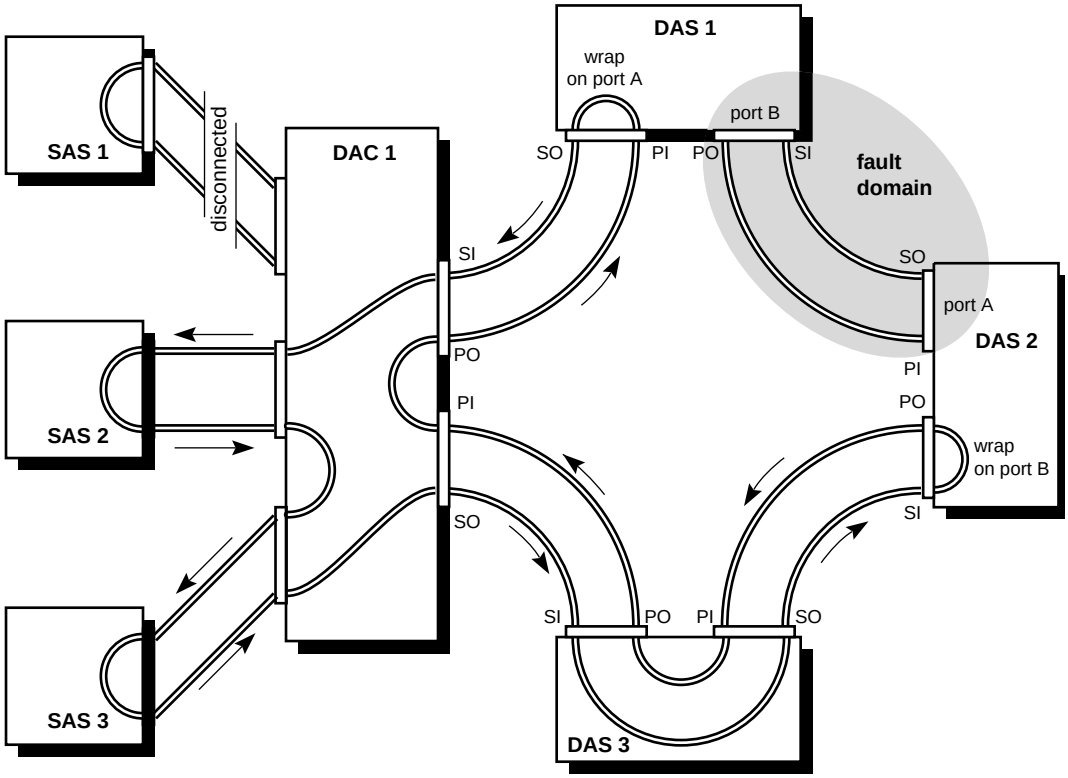


Figure 1-5 FDDI Ring Topology: Normal Operation



SAS= single−attachment station
DAS= dual−attachment station
DAC= dual−attachment concentrator
PI= input line for primary ring

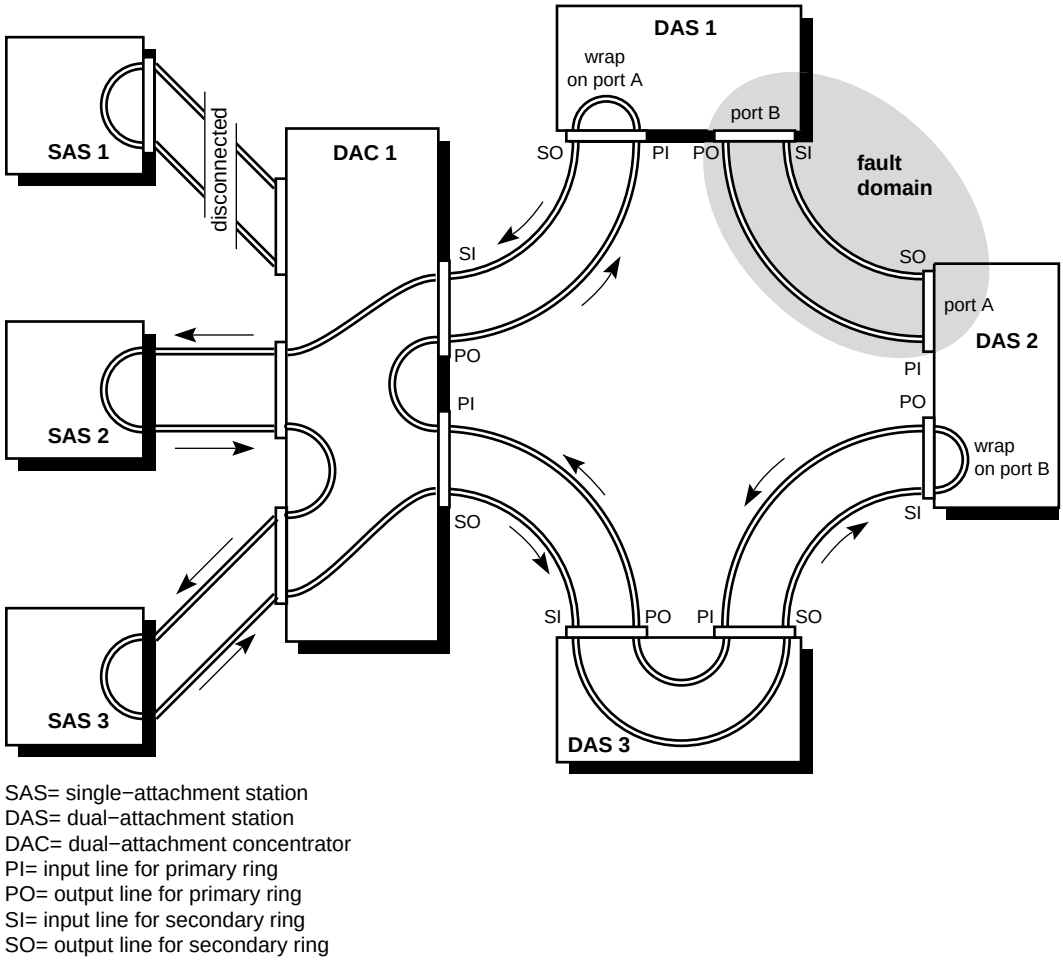


Figure 1-6 FDDI Ring Topology: Wrapped Ring Showing Fault Domain

The break that is causing the fault domain illustrated in Figure 1-6 could be a dysfunction of any of the following:

- the cable lying between DAS1 and DAS2
- the output connector for the primary ring (PO, one line of port B) at DAS1
- the input connector for the primary ring (PI, one line of port A) at DAS2
- a component on the FDDI controller board for transmitting at DAS1 or for receiving at DAS2 on the primary ring

Notice that a dysfunctional SAS (illustrated by SAS1 in both Figure 1-5 and Figure 1-6) does not cause the ring to wrap.

Chapter 2

Installing the FDDIXPress Mezzanine in Deskside Systems

This chapter describes how to install the FDDIXPress mezzanine network controller board into a deskside Challenge or Onyx system. A separate section is dedicated to each type of platform. If you have not already checked and prepared the board, cables, and system software, read Chapter 1.

Caution: This product is not customer installable. Installation of this product requires specific training and technical knowledge. These instructions have been provided for use by Silicon Graphics system support engineers or other Silicon Graphics trained or authorized personnel only. This installation requires the installer to handle internal electrical power that is hazardous if the equipment is improperly disassembled or reassembled.

2.1 FDDIXPress Mezzanine Board Placement

The FDDIXPress mezzanine board is installed onto one of the short mezzanine slots of any IO4 board. Each IO4 board has two mezzanine slots (an upper and a lower), as illustrated in Figure 2-1. The FDDIXPress board may be installed on any available short mezzanine slot.

print/io4.with.2shmezz.ai 100%

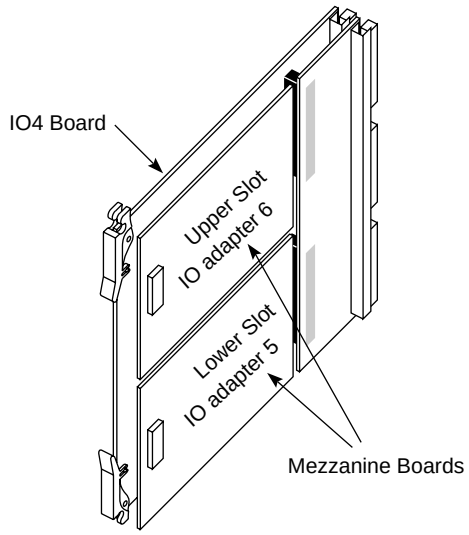


Figure 2-1 Upper and Lower Mezzanine Slots on IO4 Boards

When a system is running Extreme™ Graphics, a GCAM board covers the area on the main IO4 board called the lower mezzanine slot. In this configuration, only one mezzanine slot is available on the main IO4 board, as illustrated in Figure 2-2, which shows the difference between a main IO4 board equipped (as normal) with a VCAM and one that has a GCAM.

Note: In a deskside Onyx equipped with Extreme Graphics, only one optional mezzanine board can be installed.

print/VCAM+GCAM.ai 100%

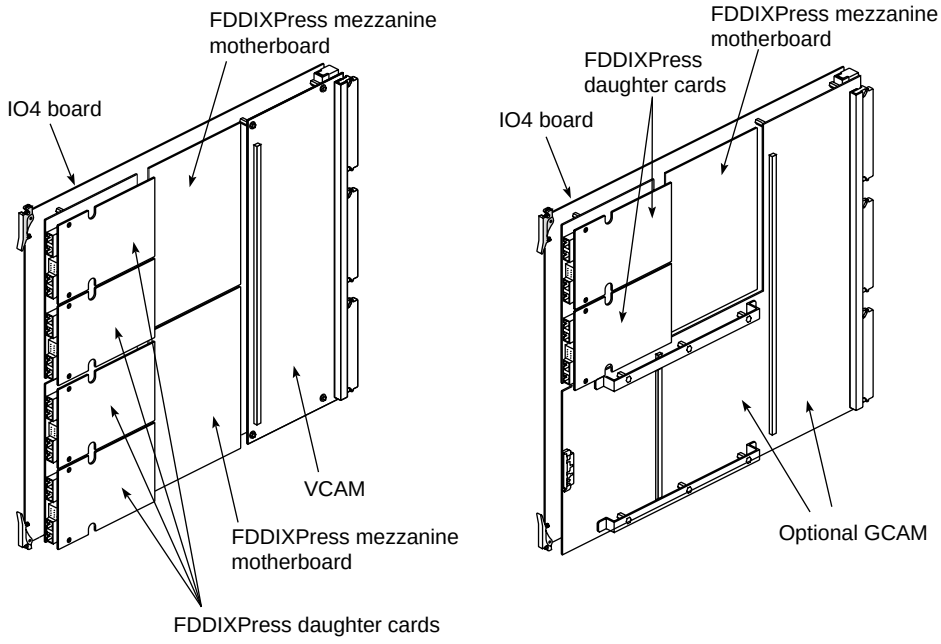


Figure 2-2 Main IO4 With VCAM and Optional GCAM

Use the following guidelines to help determine the best location for installing the FDDIXPress mezzanine board:

- If the system has only one IO4 board, this is the location for the FDDIXPress board. When both mezzanine locations are available, it is recommended that you use the lower position first.

  In all non-Extreme Graphics systems, mezzanine boards may be installed in either the upper or lower position on the main IO4 board, as illustrated in Figure 2-2.

- If the system has more than one IO4 board, you may select any unoccupied mezzanine slot. It is recommended that you use the lower mezzanine slot of the primary IO4 when it is available.

  When installing additional FDDIXPress mezzanine boards to a system that already has one or more FDDIXPress mezzanine boards, it is advisable to select a mezzanine slot that is downstream from FDDIXPress mezzanine boards that are already installed. If a new board is installed upstream, the external cables must be moved or the software network interfaces must be reconfigured for the network connections located downstream from the newly installed FDDIXPress mezzanine board.

- If there are no unoccupied mezzanine slots, you must install another IO4 board. Figure 2-3 and Figure 2-5 illustrate the maximum number and location of IO4 boards in a deskside chassis.

  Contact the sales representative to order one. The installation cannot be continued until a mezzanine slot is available.

Keeping these guidelines in mind, continue to the next section for Challenge L installation information, or go to the section "Installation Procedures for Onyx Deskside Systems."

2.2 Installation Procedure for Challenge L Deskside Systems

This section describes the steps for installing FDDIXPress into either a POWER Challenge L or Challenge L deskside server. The term Challenge is used generically in this section to describe both types of systems.

Note: To verify the maximum number of FDDIXPress mezzanine boards supported in a single system, see the FDDIXPress release notes or contact a Silicon Graphics sales office.

1. Shut down the system by turning the key on the System Controller panel (located at the front) to **OFF**.
2. Wait a minute for the system to shut down, then switch the circuit breaker on the back to **OFF**.

Warning: **Failure to turn off the circuit breaker may result in electrical shock. Failure to wait for the system to shut down may cause irreparable damage to system components or data.**

3. Open the front door and pull down the I/O panel in the front of the chassis to expose the IO4 boards.

4. Verify that you are wearing an electrostatic discharge wriststrap and that you are properly grounded.
5. Locate the IO4 boards that are currently installed. Slot 5 always has an IO4 board. (See Figure 2-3 for an illustration of the slots.)

   Note: In addition, slots 3, or 4, or both, may contain IO4 boards. A Challenge L deskside server may have one to three IO4 boards installed.

6. Carefully remove the IO4 board chosen to hold the FDDIXPress board, and position it on a flat antistatic work surface, as illustrated in Figure 2-4.
7. Place the FDDIXPress mezzanine board onto the selected IO4 mezzanine position so that the connector on the bottom of the motherboard matches the receptacle on the IO4 board and the standoffs match the holes on the FDDIXPress board (see Figure 2-4).
8. Press down on the mezzanine board so that its connector seats into the IO4 board connector.
9. Use the screws from the FDDIXPress kit to fasten the board. (Common pan-head mezzanine screws do not work for this installation.) The IO4 board's standoffs have a "float" feature, so the mezzanine board's position is somewhat adjustable even after the screws are tightened.
10. Remove the dust caps from the fiber optic receptacles (ODLs) on the FDDIXPress mezzanine board.

    Note: The connector tips for fiber optic cabling are extremely sensitive to oil, dirt, and dust. Never touch the inside tip of an FDDI connector, and do not leave FDDI connectors uncapped when they are not connected.

11. Reinstall the IO4 board into the chassis. Push the board firmly into the backplane.

    Note: If you removed board lock bars in order to install this product, do not reinstall them. Board lock bars cannot be used with the product.

12. Install air baffles across any unoccupied slots located to the left of the main IO4 board. If there is more than one empty slot, the baffles do not have to be installed separately; a group of baffles (still connected to each other) can be installed as one large baffle.
13. Go to Chapter 4 for internal and external cabling instructions.

print/server.dsk.slots.ai 100%

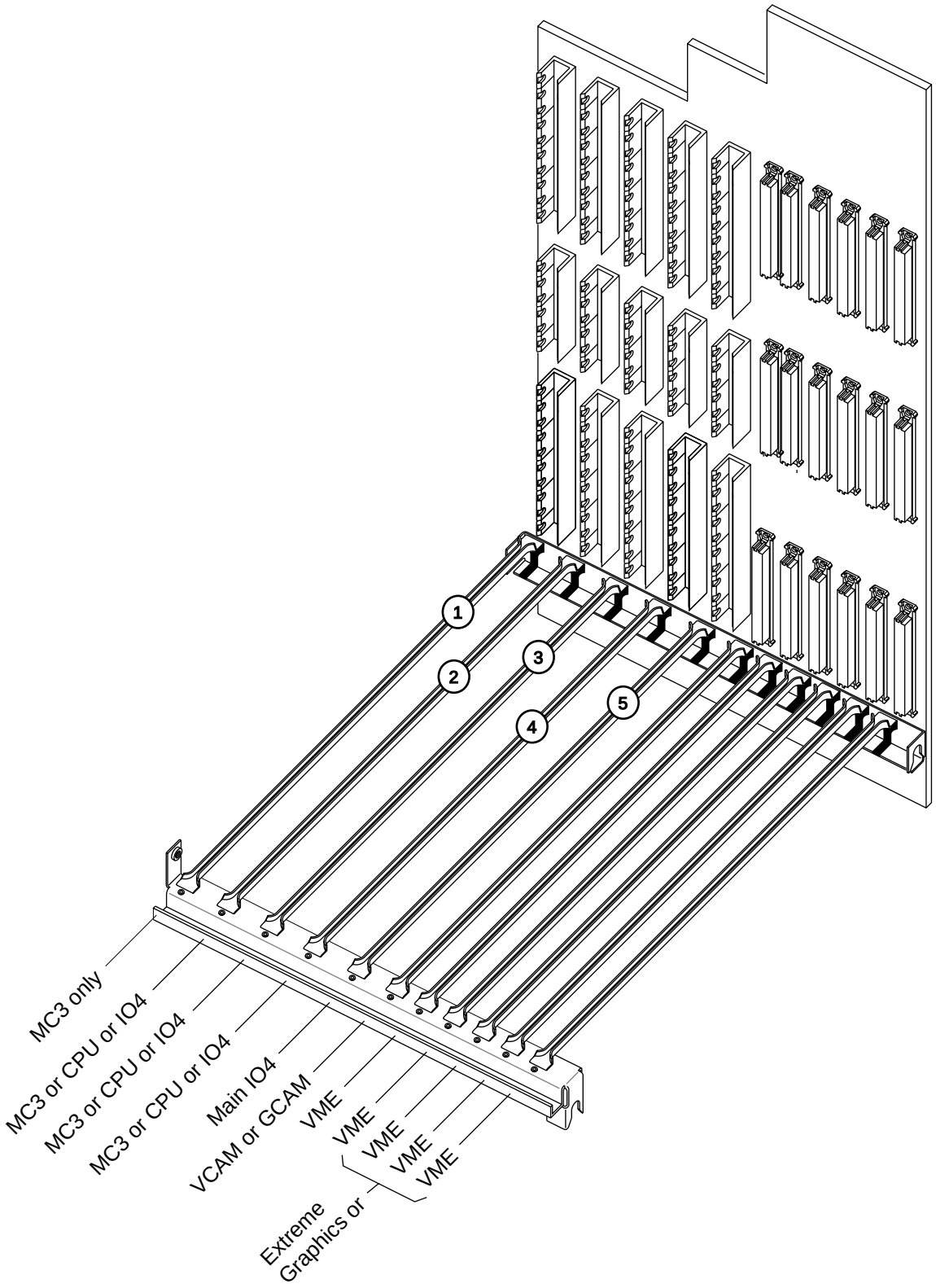


Figure 2-3 CHALLENGE Deskside Slot Assignments

print/2-4.and.3-4.ai 100%

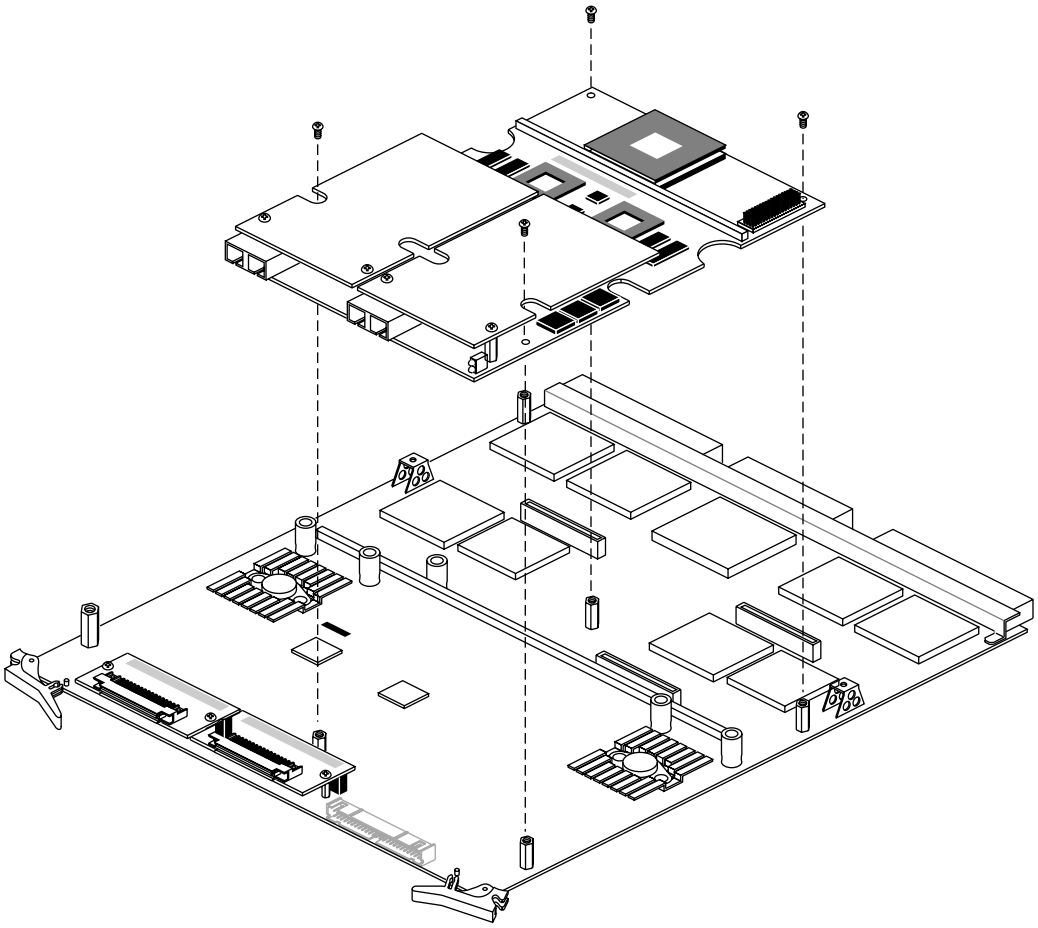


Figure 2-4 Connecting FDDIXPress Mezzanine to the IO4 (SAS Board Shown)

2.3 Installation Procedure for Onyx Deskside Systems

This section describes the steps for installing FDDIXPress into either a POWER Onyx or Onyx deskside server. The term deskside Onyx is used generically in this section to describe both types of systems.

A maximum of one IO4 board with two mezzanine slots are supported in Onyx deskside systems that are running VTX™ or RealityEngine^{2}™ graphics. Systems using ExtremeGraphics and a GCAM (instead of a VCAM) have only one mezzanine slot available.

Note: To verify the maximum number of FDDIXPress mezzanine boards supported in a single Onyx system, see the FDDIXPress release notes or contact a Silicon Graphics sales office.

1. Shut down the system by turning the key on the System Controller panel (located at the front) to **OFF**.
2. Wait a minute for the system to shut down, then switch the circuit breaker on the back to **OFF**.

Warning: **Failure to turn off the circuit breaker may result in electrical shock. Failure to wait for the system to shut down may cause irreparable damage to system components or data.**

3. Open the front door and pull down the I/O panel in the front of the chassis to access the IO4 board. The board slots should be visible, as illustrated in Figure 2-5.
4. Verify that you are wearing an electrostatic discharge wriststrap and that you are properly grounded.
5. Locate the IO4 board that is installed in Slot 3.
6. Carefully, remove the IO4 board and position it on a flat antistatic work surface, as illustrated in Figure 2-4.
7. Place the FDDIXPress mezzanine board onto the selected IO4 mezzanine position so that the connector on the bottom of the motherboard matches the receptacle on the IO4 board and the standoffs match the holes on the FDDIXPress board (see Figure 2-4).
8. Press down on the mezzanine board so that its connector seats into the IO4 board connector.
9. Use the screws from the FDDIXPress kit to fasten the board. (Common pan-head mezzanine screws do not work for this installation.) The IO4 board's standoffs have a "float" feature, so the mezzanine board's position is somewhat adjustable even after the screws are tightened.
10. Remove the dust caps from the fiber optic receptacles (ODLs) on the FDDIXPress mezzanine board.

    Note: The connector tips for fiber optic cabling are extremely sensitive to oil, dirt, and dust. Never touch the inside tip of an FDDI connector, and do not leave FDDI connectors uncapped when they are not connected.

11. Reinstall the IO4 board into the chassis. Push the board firmly into the backplane.

    Note: If you removed board lock bars in order to install this product, do not reinstall them.Board lock bars cannot be used with the product.

12. Install air baffles across any unoccupied slots located to the left of the main IO4 board. If there is more than one empty slot, the baffles do not have to be installed separately; a group of baffles (still connected to each other) can be installed as one large baffle.
13. Go to Chapter 4 for internal and external cabling instructions.

print/onyx.dsk.slots.ai 100%

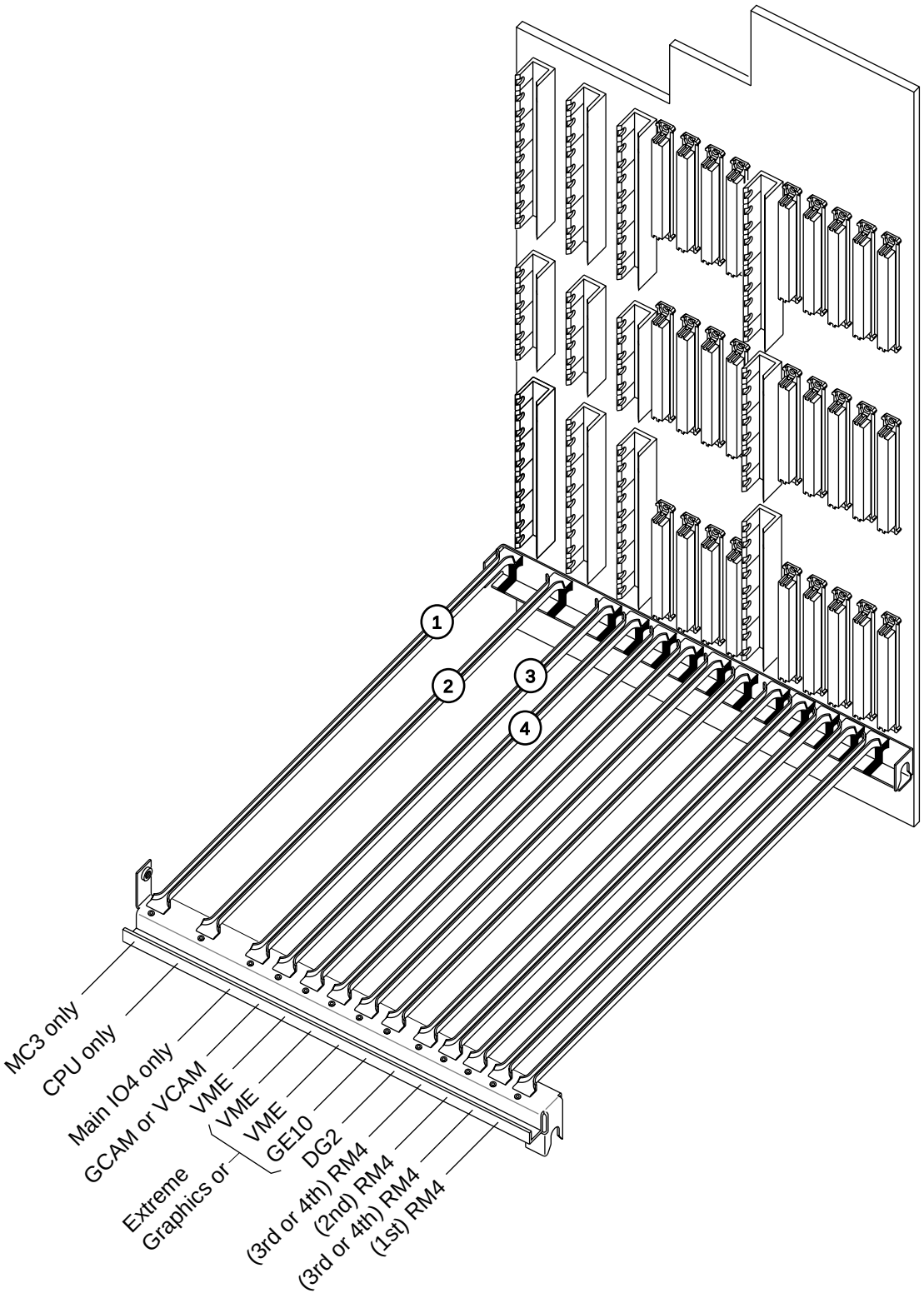


Figure 2-5 Onyx Deskside Slot Assignments

2.4 Connecting an Optical Bypass Switch

The optional optical bypass switch (OBS) maintains the integrity of the ring in the event that the attached system becomes dysfunctional or is powered down. To install an OBS, see the installation instructions that accompany the OBS. Note that only an FDDIXPress mezzanine board with dual-attachment (DAS) connections can use an optical bypass switch.

The optional optical bypass switch is ordered as a separate kit. Contact the customer's Silicon Graphics salesperson for details.

Chapter 3

Installing the FDDIXPress Mezzanine in Rackmount Systems

This chapter describes how to install the FDDIXPress mezzanine network controller board into a rackmount Challenge or Onyx system. A separate section is dedicated to each type of platform. If you have not already checked and prepared the board, cables, and system software, read Chapter 1.

Caution: This product is not customer installable. Installation of this product requires specific training and technical knowledge. These instructions have been provided for use by Silicon Graphics system support engineers or other Silicon Graphics trained or authorized personnel only. This installation requires the installer to handle internal electrical power that is hazardous if the equipment is improperly disassembled or reassembled.

3.1 FDDIXPress Mezzanine Board Placement

The FDDIXPress mezzanine board is installed onto one of the short mezzanine slots of any IO4 board. Each IO4 board has two mezzanine slots (an upper and a lower), as illustrated in Figure 3-1. The FDDIXPress mezzanine board may be installed on any available short mezzanine slot.

print/io4.with.2shmezz.ai 100%

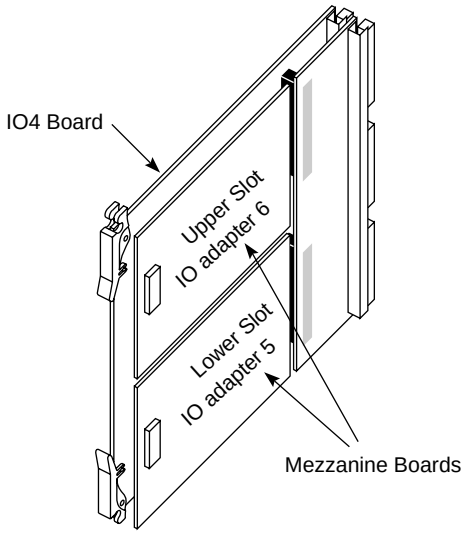


Figure 3-1 Upper and Lower Mezzanine Slots on IO4 Boards

When a system is running Extreme™ Graphics, a GCAM board covers the area on the main IO4 board called the lower mezzanine slot. In this configuration, only one mezzanine slot is available on the main IO4 board. Figure 3-2 shows the difference between a main IO4 board equipped (as normal) with a VCAM and one that has a GCAM.

print/VCAM+GCAM.ai 100%

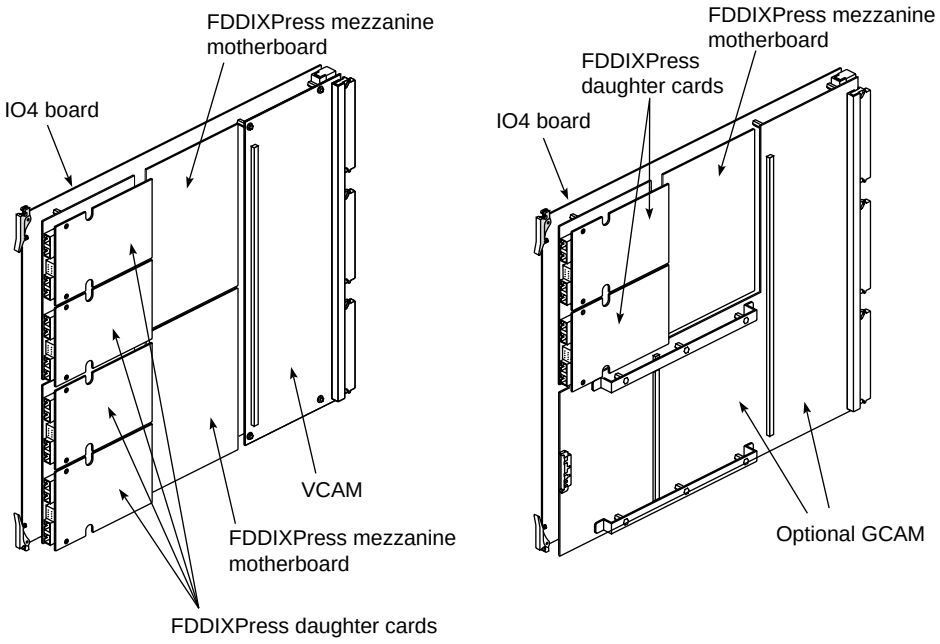


Figure 3-2 Primary IO4 With VCAM and Optional GCAM

Use the following guidelines to help determine the best location to physically place the FDDIXPress mezzanine board:

- If the system has only one IO4 board, this is the location for the FDDIXPress board.

  In all non-Extreme Graphics systems, mezzanine boards may be installed in either the upper or lower position on the IO4 board, as illustrated in Figure 3-2. When both mezzanine locations are available, it is recommended that you use the lower position first.

- If the system has more than one IO4 board, you may select any unoccupied mezzanine slot. It is recommended that you use the lower mezzanine slot of the primary IO4 when it is available.

  When installing additional FDDIXPress mezzanine boards to a system that already has one or more FDDIXPress mezzanine boards, it is advisable to select a mezzanine slot that is downstream from FDDIXPress mezzanine boards that are already installed. If a new board is installed upstream, the external cables must be moved or the software network interfaces must be reconfigured for the network connections located downstream from the newly installed FDDIXPress mezzanine board.

- If there are no unoccupied mezzanine slots, you must install another IO4 board. Figure 3-3 and Figure 3-5 illustrate the maximum number and locations for IO4 boards in rackmount chassis.

  Contact the sales representative to order one. The installation cannot be continued until a mezzanine slot is available.

Keeping these guidelines in mind, continue to the next section for Challenge XL installation information, or go to the section "Installation Procedures for Onyx Rackmount Systems."

3.2 Installation Procedure for Challenge Rackmount Systems

This section describes the steps for installing FDDIXPress into either a POWER Challenge XL or Challenge XL server. The term Challenge is used generically in this section to describe both types of systems.

Note: To verify the maximum number of FDDIXPress mezzanine boards supported in a single system, see the FDDIXPress release notes or contact a Silicon Graphics sales office.

1. Shut down the system by turning the key on the System Controller panel (located at the front) to **OFF**.
2. Wait a minute for the system to shut down, then switch the circuit breaker on the back to **OFF**.

Warning: **Failure to turn off the circuit breaker may result in electrical shock. Failure to wait for the system to shut down may cause irreparable damage to system components or data.**

3. Open the rear door and pull down the top I/O panel (cardcage 2) at the rear of the chassis to expose the IO4 boards. The board slots should be visible as illustrated in Figure 3-3.

4. Verify that you are wearing an electrostatic discharge wriststrap and that you are properly grounded.
5. Locate the IO4 boards that are currently installed. Slot 15 always has an IO4 board.

   Note: In addition, slots 9, 11, or 13, may contain IO4 boards. A Challenge XL server may have one to four IO4 boards installed.

6. Carefully remove the IO4 board chosen to hold the FDDIXPress mezzanine board, and position it on a flat antistatic work surface, as illustrated in Figure 3-4.
7. Place the FDDIXPress mezzanine board onto the selected IO4 mezzanine position so that the connector on the bottom of the motherboard matches the receptacle on the IO4 board and the standoffs match the holes in the FDDIXPress board (see Figure 3-4).
8. Press down on the mezzanine board so that its connector seats into the IO4 board connector.
9. Use the screws from the FDDIXPress kit to fasten the board. (Common pan-head mezzanine screws do not work for this installation.) The IO4 board's standoffs have a "float" feature, so the mezzanine board's position is somewhat adjustable even after the screws are tightened.
10. Remove the dust caps from the fiber optic receptacles (ODLs) on the FDDIXPress mezzanine board.

    Note: The connector tips for fiber optic cabling are extremely sensitive to oil, dirt, and dust. Never touch the inside tip of an FDDI connector, and do not leave FDDI connectors uncapped when they are not connected.

11. Reinstall the IO4 board into the chassis. Push the board firmly into the backplane.

    Note: If you removed board lock bars in order to install this product, do not reinstall them.Board lock bars cannot be used with the product.

12. Go to Chapter 4 for internal and external cabling instructions.

print/server.rkm.slots.ai 80%

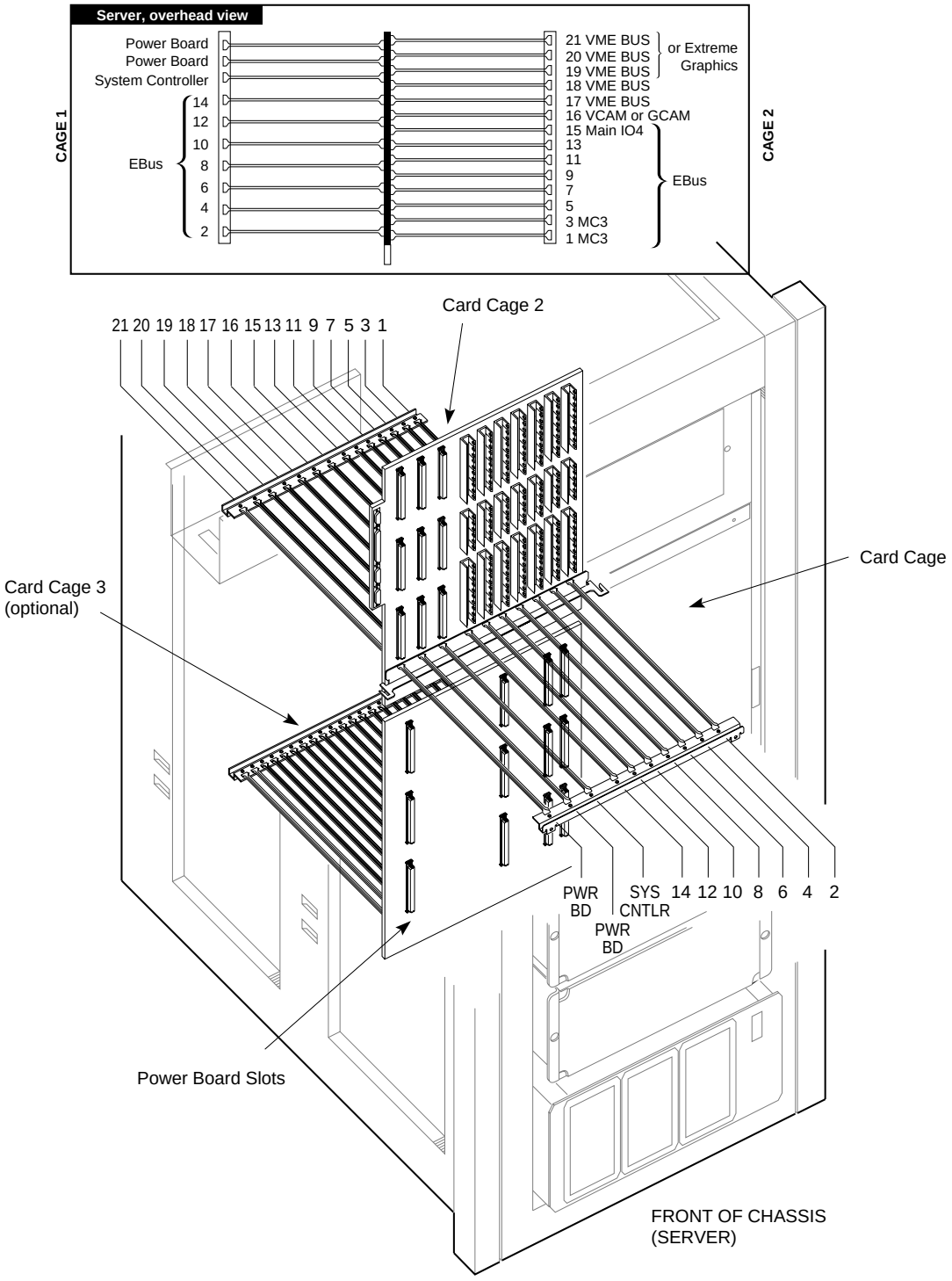


Figure 3-3 Challenge XL Slot Assignments

print/2-4.and.3-4.ai 100%

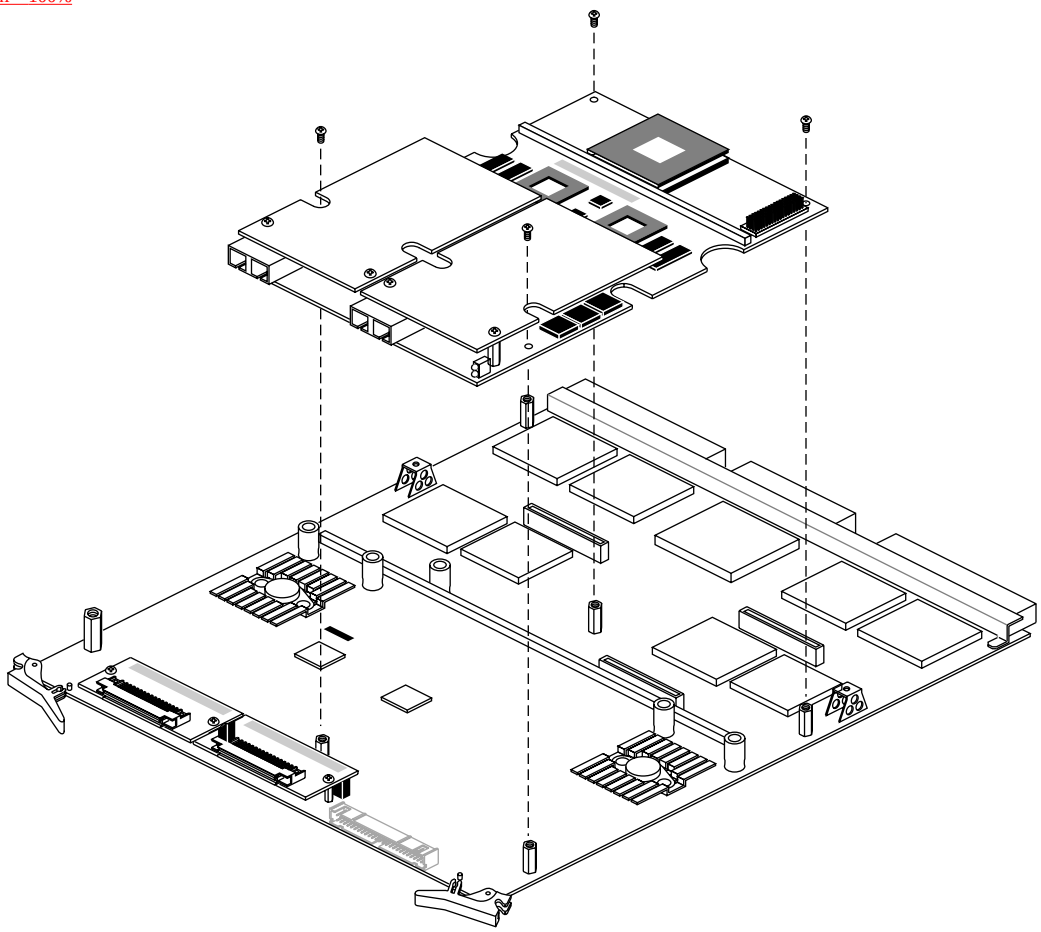


Figure 3-4 Connecting FDDIXPress Mezzanine to the IO4 (SAS Board Shown)

3.3 Installation Procedure for Onyx Rackmount Systems

This section describes the steps for installing FDDIXPress into either a POWER Onyx or Onyx rackmount system. The term rackmount Onyx is used generically in this section to describe both types of systems.

Note: To verify the maximum number of FDDIXPress mezzanine boards supported in a single system, see the FDDIXPress release notes or contact a Silicon Graphics sales office.

1. Shut down the system by turning the key on the System Controller panel (located at the front) to **OFF**.

2. Wait a minute for the system to shut down, then switch the circuit breaker on the back to **OFF**.

Warning: Failure to turn off the circuit breaker may result in electrical shock. Failure to wait for the system to shut down may cause irreparable damage to system components or data.

3. Open the front door and pull down the I/O panel in the front of the chassis to access the IO4 board. The board slots should be visible, as illustrated in Figure 3-5.
4. Verify that you are wearing an electrostatic discharge wriststrap and that you are properly grounded.
5. Locate the IO4 boards that are currently installed. Slot 11 (in cardcage 2) always holds the primary (main) IO4 board in a rackmount Onyx system.
6. Carefully remove the IO4 board chosen to hold the FDDIXPress mezzanine board, and position it on a flat antistatic work surface, as illustrated in Figure 3-4.
7. Place the FDDIXPress mezzanine board onto the selected IO4 mezzanine position so that the connector on the bottom of the motherboard matches the receptacle on the IO4 board and the standoffs match the holes in the FDDIXPress board, as illustrated in Figure 3-4.
8. Press down on the mezzanine board so that its connector seats into the IO4 board connector.
9. Use the screws from the FDDIXPress kit to fasten the board. (Common pan-head mezzanine screws do not work for this installation.) The IO4 board's standoffs have a "float" feature, so the mezzanine board's position is somewhat adjustable even after the screws are tightened.
10. Remove the dust caps from the fiber optic receptacles (ODLs) on the FDDIXPress mezzanine board.

    Note: The connector tips for fiber optic cabling are extremely sensitive to oil, dirt, and dust. Never touch the inside tip of an FDDI connector, and do not leave FDDI connectors uncapped when they are not connected.

11. Reinstall the IO4 board into the chassis. Push the board firmly into the backplane.

    Note: If you removed board lock bars in order to install this product, do not reinstall them.Board lock bars cannot be used with the product.

12. Go to Chapter 4 for internal and external cabling instructions.

print/onyx.rkm.slots.ai 82%

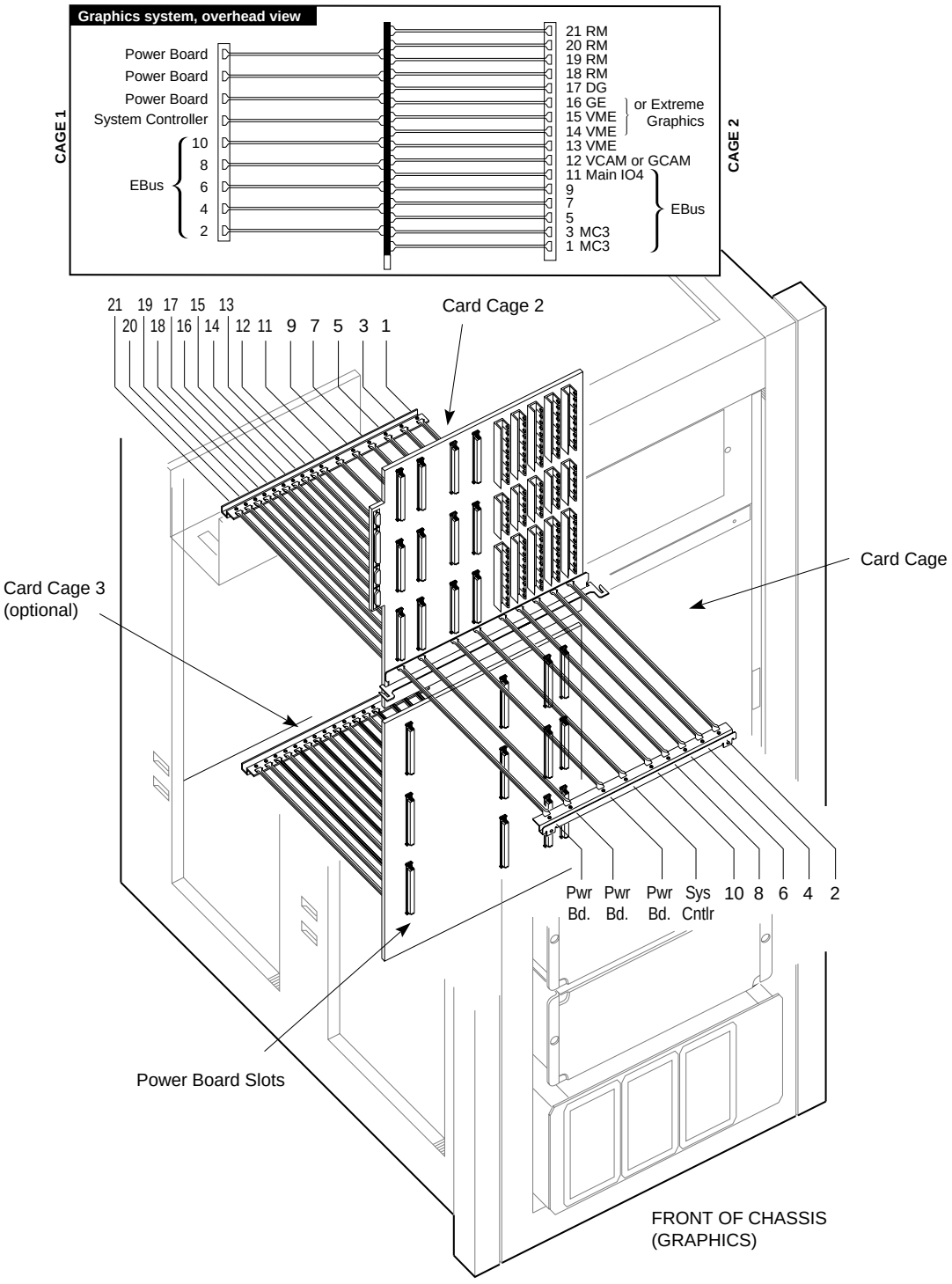


Figure 3-5 Onyx Rackmount Slot Assignments

3.4 Connecting the Optical Bypass Switch

The optional optical bypass switch (OBS) maintains the integrity of the ring in the event that the attached system becomes dysfunctional or is powered down. To install an OBS, see the installation instructions that accompany the OBS. Note that only an FDDIXPress mezzanine board with dual-attachment (DAS) connections can use an optical bypass switch.

The optional optical bypass switch is ordered as a separate kit. Contact the customer's Silicon Graphics salesperson for details.

Chapter 4

Cabling Connections and Completing the Installation

This chapter explains how to connect the internal cabling connections from the FDDI mezzanine board to the system's I/O panel. General site cabling information is offered following the system-specific information.

4.1 Connecting the Internal FDDI Cables

Follow the steps in the appropriate subsection to attach the internal FDDI cables to the board and the panel plates (illustrated in Figure 4-1) to the card cage's I/O panel.

Caution: Do not touch the fiber optic material exposed at the ends of the cable. Do not leave the cable ends uncapped. Performance of the fiber optic cable can seriously degrade due to grease or dust.

print/panelplate.labels.ai 100%

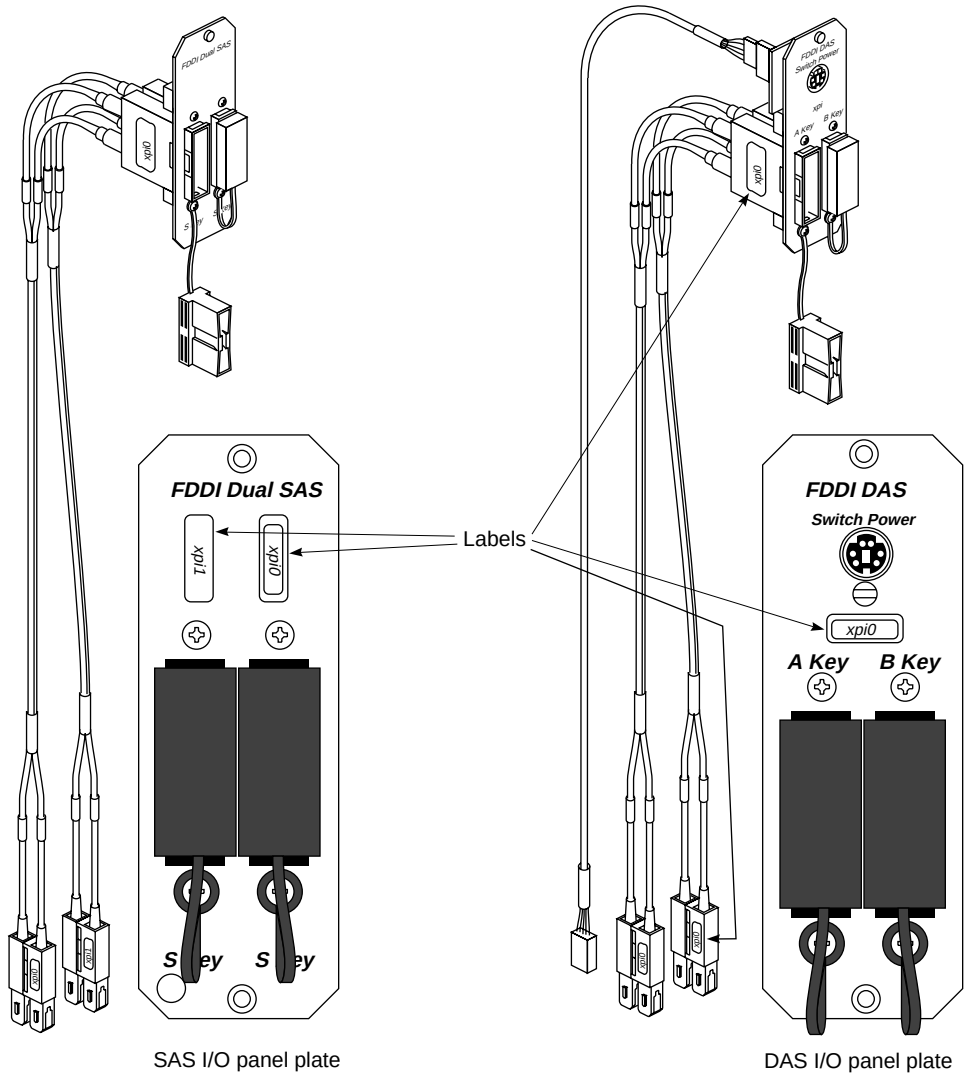


Figure 4-1 Internal FDDIXPress Cables and Panel Plates

4.1.1 For SAS

1. Locate the internal cable assembly. It consists of four fiber optic lines terminated inside two SC-duplex connectors at one end and two MIC receptacles attached to the I/O panel plate at the other end. See Figure 4-1 for an example of the assembly.

   Note: For an SAS FDDIXPress installation, the two network interfaces share a single I/O panel plate; each S-key serves a different network connection (interface).

2. Remove one blank panel plate from the system's I/O panel. It is recommended that you do not use the openings nearest the bottom of the I/O door, because the MIC connectors on the FDDIXPress panel plate can make removal of boards difficult.

The panel plates for a board in an upper mezzanine slot (adapter 6) should be positioned below the panel plates for a board installed in a lower (adapter 5) slot, as illustrated in Figure 4-4 and Figure 4-5. This positioning evens out the distances over which the internal cables must stretch.

3. Install the FDDIXPress panel plate. See Figure 4-4 for a deskside example and Figure 4-5 for a rackmount example.
4. Remove the protective caps from the SC-duplex connectors on the FDDIXPress mezzanine board, if you haven't already done so.
5. Remove the protective caps from the SC-duplex plugs on the cable assembly.
6. Connect the internal cable assembly to the board's SC-duplex connectors, as illustrated in Figure 4-2. Take care to connect the cable from the left-hand side of the panel plate to the SC-duplex connector that is closest to the top edge of the installed FDDIXPress board; connect the cable from the right-hand side of the panel plate to the bottom-most SC-duplex connector.

   To ensure proper orientation, the SC-duplex plug on the cable assembly has guide ridges that must slide into slots in each receptacle.
7. Go to Section 4.2, "Labeling the Hardware."

print/sas_cable.connections.ai 90%

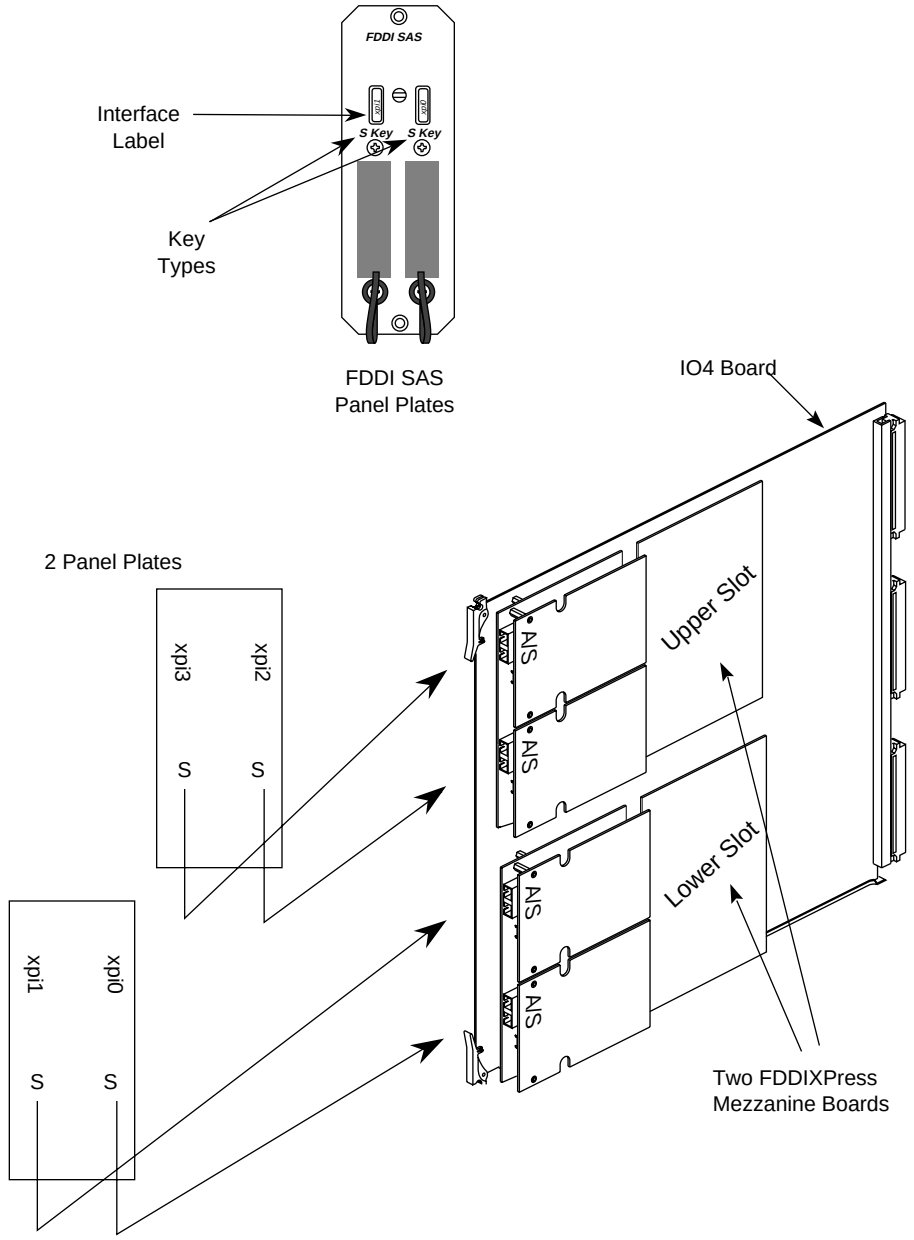


Figure 4-2 Connecting SAS Internal Cable Assemblies to Board

4.1.2 For DAS

1. Locate the two internal cable assemblies. Each assembly consists of four fiber optic lines terminated inside two SC-duplex plugs at one end and two MIC receptacles attached to the I/O panel plate at the other end. See Figure 4-1 for an example.

   Note: For DAS FDDIXPress boards, each panel plate serves one network connection (interface).

2. Remove two blank panel plates from the system's I/O panel. It is recommended that you do not use the openings nearest the bottom of the I/O door, because the MIC connectors on the FDDIXPress panel plate can make removal of boards difficult.

   The panel plates for a board in an upper mezzanine slot (adapter 6) should be positioned below the panel plates for a board installed in a lower (adapter 5) slot. as illustrated in Figure 4-4 and Figure 4-5. This positioning evens out the distances over which the internal cables must stretch.

3. Install the two FDDIXPress panel plates in the I/O door. See Figure 4-4 for a deskside example and Figure 4-5 for a rackmount example.

4. Remove the protective caps from the SC-duplex connectors on the FDDIXPress mezzanine board, if you haven't already.

5. Remove the protective caps from the SC-duplex plugs on the cable assemblies.

6. Connect each internal cable assembly to a pair of SC-duplex connectors on the board. To ensure proper orientation, the SC-duplex plug on the cable assembly has guide ridges that must slide into slots in each receptacle.

   Connect the cable from the left-hand side of each panel plate (**A-key**) to a connector labeled **A/S-key** on the board; connect the cable from the right-hand side of each panel plate to a **B-key** connector on the board. The two cables from each panel plate must attach to the same daughter card. These connections are illustrated in Figure 4-3.

7. Connect the two optical bypass switch harnesses to the board and to the panel plates. Take care to attach each OBS harness to the same daughter card as the other cables from that panel plate.

8. Go to Section 4.2, "Labeling the Hardware."

print/das_cable.connections.ai 90%

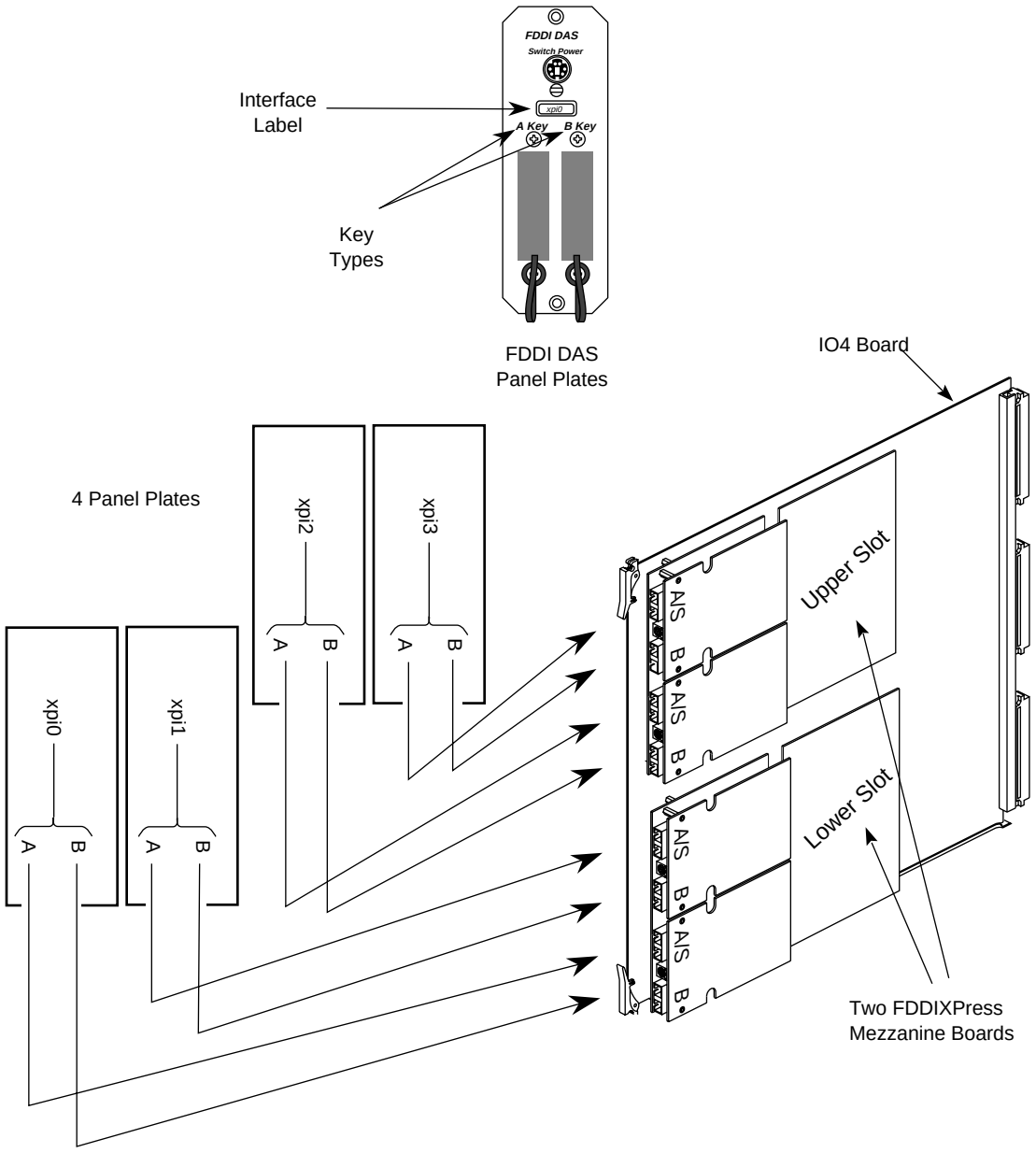


Figure 4-3 Connecting DAS Internal Cable Assemblies to Boards

4.2 Labeling the Hardware

The sheets of labels provide numerous labels for each FDDIXPress mezzanine network interface. Each FDDIXPress mezzanine board services two network interfaces (for

example, *xpi0* and *xpi1*, or *xpi2* and *xpi3*). The labels are intended for identifying the hardware items described in Table 4-1.

Table 4-1 Labels for the Hardware

Hardware Item to Label	Count per Board	Label Description
For SAS:		
SC-duplex connectors on board	2	2 large-sized labels for different interfaces (e.g., *xpi0* and *xpi1*). Use one label on each SC-duplex connector.
SC-duplex plugs on cable assembly	2	2 large-sized labels for different interfaces. Use one label on each SC-duplex plug.
MIC connectors attached to internal face of I/O panel plate	2	2 small-sized labels for different interfaces. Use one label on each MIC.
Network connection ports on external face of I/O panel plate	2	2 small-sized labels for different interfaces. Use one label above each S-key port.
For DAS:		
SC-duplex connectors on board	4	2 large-sized labels for each interface (e.g., two for *xpi0* and two for *xpi1*). Use one pair of identical labels for each daughter card.
SC-duplex plugs on cable assembly	4	2 large-sized labels for each interface (4 labels in total). Use one pair of identical labels for each cable assembly.
MIC connectors attached to internal face of I/O panel plates	4	2 small-sized labels for each interface (4 labels in total). Use one pair of identical labels for each panel plate.
Network connection on external face of I/O panel plates	2	2 small-sized labels for different interfaces (e.g., one for *xpi0* and one for *xpi1*). Use one label on each panel plate.

Follow the instructions below to label the hardware for each FDDIXPress mezzanine board:

1. Use the information in Section 1.5, “Assignment of Network Interfaces to FDDIXPress Mezzanine Hardware,” to determine the two network interfaces (for example, *xpi0* and *xpi1*) that the software will assign to each installed FDDIXPress board.
2. Locate the sheets of labels from the option kit. Identify the two adjacent rows of labels that specify the two network interfaces identified in the previous step.

3. Remove two sequentially-numbered, large-sized labels to tag the **S-key** or **A/S-key** SC-duplex receptacles on the FDDIXPress mezzanine board.

   - For SAS installations, place the lower-numbered label on the SC-duplex connector nearest the bottom edge of the installed FDDIXPress board, and place the higher-numbered label on the top-most connector.
   - For DAS installations, place the lower-numbered label on the SC-duplex connector (labeled **A/S-key**) that is nearest the bottom edge of the installed FDDIXPress board; place the higher-numbered label on the SC-duplex connector labeled **A/S-key** that is nearer the top edge of the installed FDDIXPress board.

     On each daughter card, place a label on the **B-key** connector that matches the one on the daughter card's **A/S-key** connector.

4. Use large-sized labels to tag the cable assembly's SC-duplex plugs that are plugged into the FDDIXPress mezzanine board. Make sure that the labels on the SC-duplex plugs match those on the board's receptacles.

   - For SAS installations, this step uses two labels.
   - For DAS installations, this step requires four labels.

5. Use two small-sized labels to identify the two network interfaces on the outside of the I/O panel plate(s), as illustrated in Figure 4-1.

   - For SAS installations, place the lower-numbered label (for example, **xpi0**) above the S-key on the right, and place the higher-numbered label (for example, **xpi1**) above the key on the left side of the panel plate.
   - For DAS installations, place the lower-numbered label on the panel plate whose cable is attached to the daughter card nearest the bottom edge of the installed FDDIXPress board; place the higher-numbered label on the panel plate that is attached to the daughter card near the top edge of the installed FDDIXPress board.

6. Use small-sized labels to identify the MIC connectors that are attached on the internal face of the I/O panel plate.

   - For SAS installations, this step uses two labels, each identifying a different interface. Make sure the labels on the MICs match those used for that connection on the front of the panel plate.
   - For DAS installations, this step uses four labels: two labels, identifying the same network interface, for each panel plate. Make sure the two labels on the MICs match the one used on the front of the panel plate.

7. For each network connection, verify that the lettering (for example, **xpi0**) on all the installed labels matches. Start at each SC-duplex connector on the FDDIXPress mezzanine board and follow the cabling out to the external face of the I/O panel plate, checking each label along the way. All the labels along each path must have the same lettering.
8. Additional items, such as external MIC connectors on site cabling, can be labeled also.
9. Close the I/O door and the chassis door.
10. Go to Section 4.3, "Connecting External and Site Cabling."

print/dsk.cabling.ai 100%

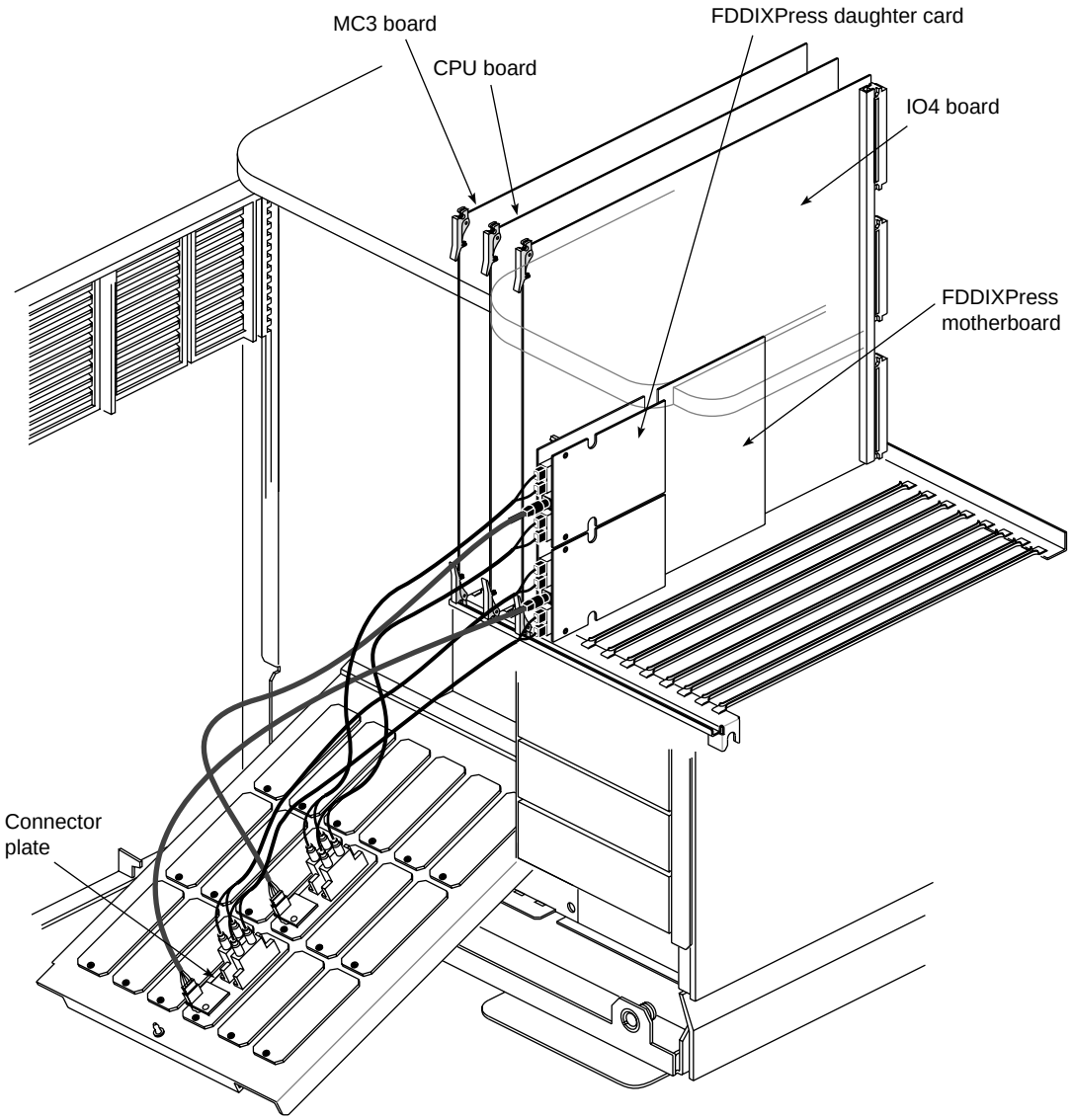


Figure 4-4 Onyx Deskside Internal Cabling Example

print/rkm.cabling.ai 95%

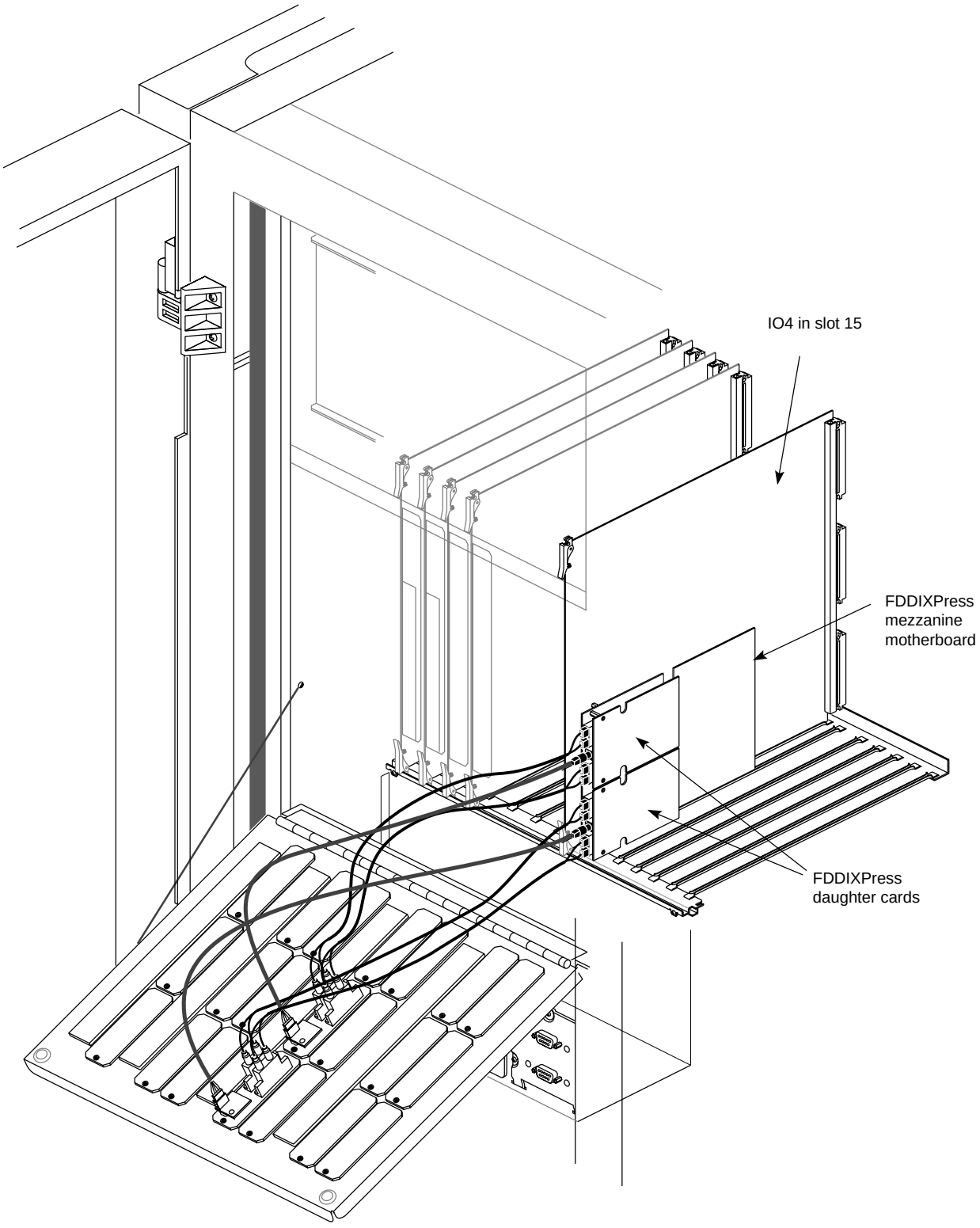


Figure 4-5 Challenge XL Rackmount Internal Cabling Example

4.3 Connecting External and Site Cabling

It is recommended that the installation of site (that is, local area network) cabling be performed by a Silicon Graphics approved vendor. Adapter cables, station loopback testers, and other required accessories can also be obtained from these approved vendors. For additional information on approved vendors, contact your Silicon Graphics sales office.

The FDDI connector provided at the FDDIXPress I/O panel plate is a female media interface connector (MIC). For SAS boards, each MIC is an S-key; for DAS installations, each panel plate has an A-key and a B-key. The site's FDDI cables for these ports must be terminated with an appropriate male MIC connector. For SAS installations, a male S-key is appropriate; for DAS FDDIXPress installations, S-, A-, and B-keys are all appropriate).

FDDI MICs each contain two fiber optic lines (an input and an output line). MICs are constructed so that invalid connections are very difficult to make. The connector ridge or cavity (as viewed from the front of the MIC) designates the connector type and mates only with a MIC that results in a valid connection.

Follow these instructions to attach the workstation or server to the FDDI ring:

1. Remove the protective caps from the MICs on the I/O panel plate.
2. For each FDDI network interface at the system's I/O panel, identify a site FDDI cable for the correct local area network. Be careful to match the interfaces and the local area networks. For example, if you configured (or plan to configure) interface *xpi0* with IP address 199.87.5.1, be sure you attach the cable that services the LAN with network address 199.87.5.

   Note: Network interfaces do not function if the network portion of the interface's IP address does not match the network address used on the LAN that is physically attached at the I/O panel plate.

   For DAS installations, you need to identify two MIC connectors for each local area network: an A (or red color-coded) one and a B (or blue color-coded) one.
3. Attach the site's fiber optic cable. Figure 4-6 illustrates a DAS panel plate; the SAS panel plate, although labeled differently, has a similar layout. The connection should snap (or click) into place.

   For DAS installations, connect the site's **A** MIC to the **A-key** port on the I/O panel plate and the site's **B** MIC to the **B-key** port.

   Note: MIC connectors are "keyed" so that they snap into place only when appropriate types are being connected and correct positioning is being used. If the connection does not snap into place, try a different rotation. If that does not solve the problem, verify that the male MIC on the site's cable is the same (or an appropriate) key for the MIC on the panel plate (for example, an I/O panel plate's **A-key** port can be connected to a male **A** or **S** MIC).
4. Go to Section 4.4, "Completing the Installation."

print/site.cabling.ai 100%

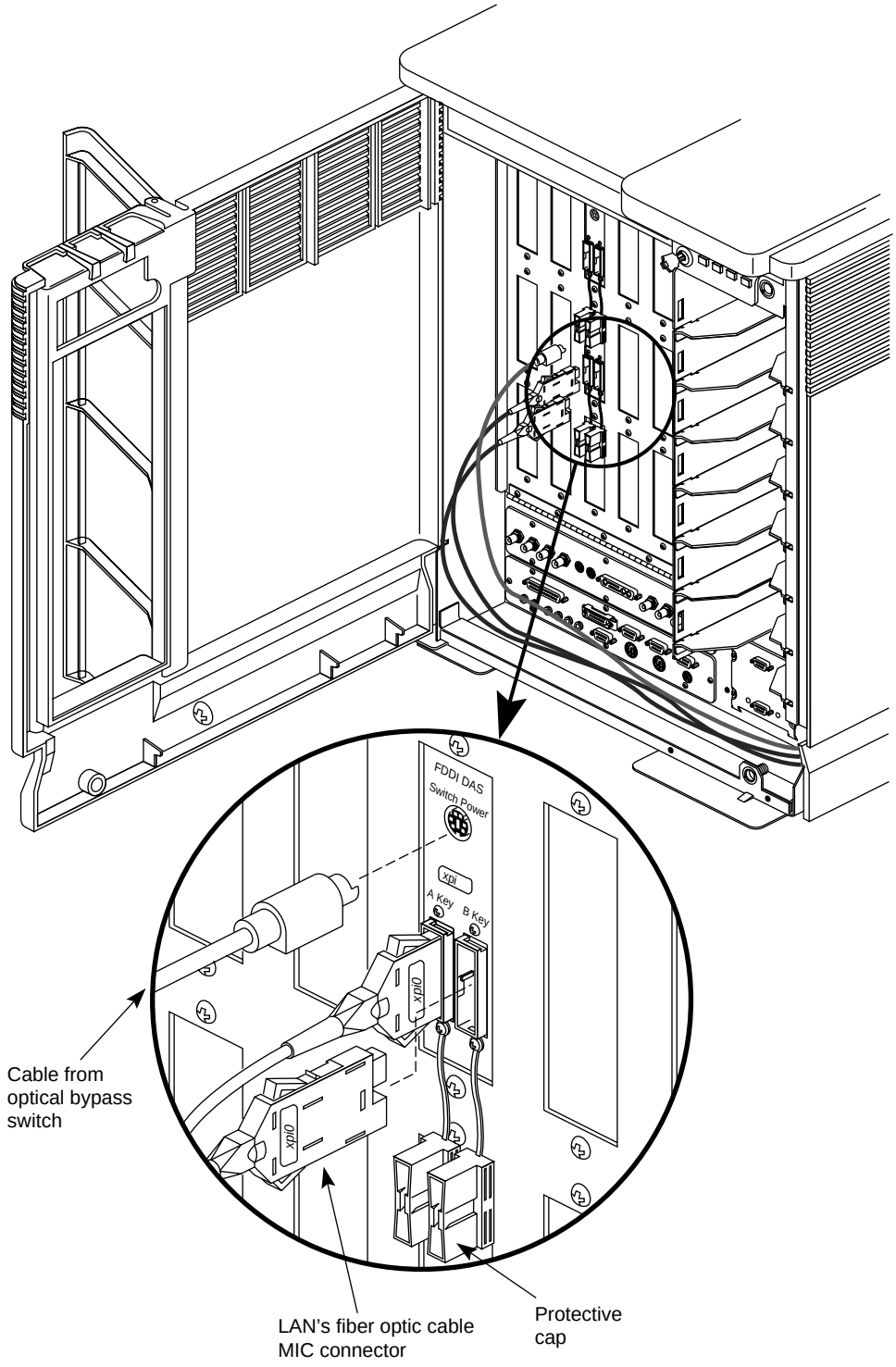


Figure 4-6 Connecting a Site's Fiber Optic Cables to the I/O Panel Plate

4.4 Completing the Installation

To finish the installation, do the following:

1. Flip the circuit breaker to **ON**, then turn the key switch to **ON**.
2. When the console prompts you with the question `Rebuild the operating system?`, answer **yes** or **y** in order to build a new operating system (kernel).

   Note: If this prompt does not appear, you probably have not installed the FDDIXPress software or a compatible version of the IRIX operating system. Instead of proceeding with the steps below, follow the instructions in the *FDDIXPress Release Notes* to install and configure the software.
3. If the FDDIXPress network interfaces have not been configured, configure them now. Configuration instructions are provided in the *FDDIXPress Administration Guide*.

   If the *xpi* network interfaces are already configured, continue to the next step.
4. Logon and reboot (this is the second time this system is being started) to begin using the newly built operating system. The command lines below can be used to accomplish this step:

   ```
   % su
   Password: thepassword
   # reboot
   ```
5. Logon and invoke *hinv* to verify that the FDDIXPress hardware has been recognized by the software:

   ```
   % /sbin/hinv
   . . .
   XPI FDDI controller: xpi#, slot#, adapter#, firmware version#, das/sas
   ```

   Note: If the FDDIXPress mezzanine board is not listed, any of the following may be the cause: (1) the currently running IRIX does not support this product; (2) the installation has not been done correctly (for example, some board is loose); or (3) the FDDIXPress mezzanine board is dysfunctional.
6. Use the command line below to verify that the *xpi* network interfaces are configured and enabled:

   ```
   % /usr/etc/netstat -in
   . . .
   NAME  Mtu   Network   Address
   xpi0  4500  netaddress  IPaddress  ...
   xpi1  4500  netaddress  IPaddress  ...
   ```

   Note: If either of the *xpi* interfaces has an asterisk after its name or if an address column indicates none, there is something wrong with the configuration. Follow the instructions in the *FDDIXPress Administration Guide* to reconfigure the FDDIXPress network interfaces.
7. Follow the instructions in Chapter 2 of the *FDDIXPress Administration Guide* to verify that the FDDI network connections are functioning.

4.5 Calculating Signal Decibel (dB) Loss

Insertion loss, interconnection loss, and link loss are all factors that must be calculated to determine signal decibel loss within an FDDI local area network.

Note: The maximum allowable total signal loss is 11 dB between two stations.

Table 4-2 shows an example of the how to calculate the total signal (power) loss between two DAS stations by summing all the losses from the various sources. On actual installations, the loss values will be different, so it is highly recommended that actual measurements be taken.

The example margin factor shown in the last row of Table 4-2 is derived by subtracting the total calculated signal loss (9.5) from the maximum amount allowed (11 dB). A remainder of 1.5 dB indicates that the signal loss is safely within the limit. Remember, this example shows only possible loss values. To ensure accuracy, you must make actual measurements.

Table 4-2 Example of Power Loss Calculation Between Two DAS Stations

Item	Estimated Power Loss per Item	Number of Instances Between 2 Stations	Example Loss	Example Margin
Fiber Loss	2.5 dB/km	1 km	2.5 dB	n.a.
Splice Loss	0.2 to 0.5 dB each	2 (one at each station)	1.0 dB	n.a.
Connector Loss	0.3 to 0.7 dB each	4 (2 at each DAS station)	2.8 dB	n.a.
Bypass Control Switch Loss	2.5 to 3.2 dB each	1 (only one station has this option)	3.2 dB	n.a.
Total Signal Loss			9.5 dB	n.a.
Maximum Signal Loss Allowed			11 dB	n.a.
Margin Factor				1.5 dB

Chapter 5

FDDIXPress Mezzanine LEDs and Troubleshooting

This chapter describes the behavior of the FDDIXPress mezzanine board's light-emitting diodes (LEDs), and provides suggestions for troubleshooting.

5.1 Summary of LEDs

The FDDIXPress mezzanine board has 4 LEDs: a pair, one green and one amber, for each FDDI device (connection). Their behavior is described in Table 5-1.

Table 5-1 FDDIXPress Mezzanine LED Behavior

LED	Controlled By	Description
green	firmware	Transmittal / reception: Blinks (changes state) each time the MAC component on the board transmits or receives a packet.
amber	firmware	Problem: Blinks (changes state) each time the ring transitions from operational (RINGOP) to nonoperational.

See Section 5.2, "Troubleshooting with LEDs" for in-context combinations of these LEDs.

5.2 Troubleshooting with LEDs

This section describes procedures for troubleshooting the FDDIXPress mezzanine board.

5.2.1 Troubleshooting Equipment

A fiber optic loopback mechanism can be used for troubleshooting a station while it is off the ring. For a single-attachment station (SAS), the mechanism can be either a low-loss loopback station test connector or a loopback cable assembly. Figure 5-1 illustrates a loopback cable assembly designed for a single-attachment station (SAS). The station test connector is the simplest device to use and is sold as an "FDDI station tester." For a

dual-attachment station (DAS), the loopback mechanism consists of a section of FDDI cable that terminates in a male A-key and a male B-key MIC connectors.

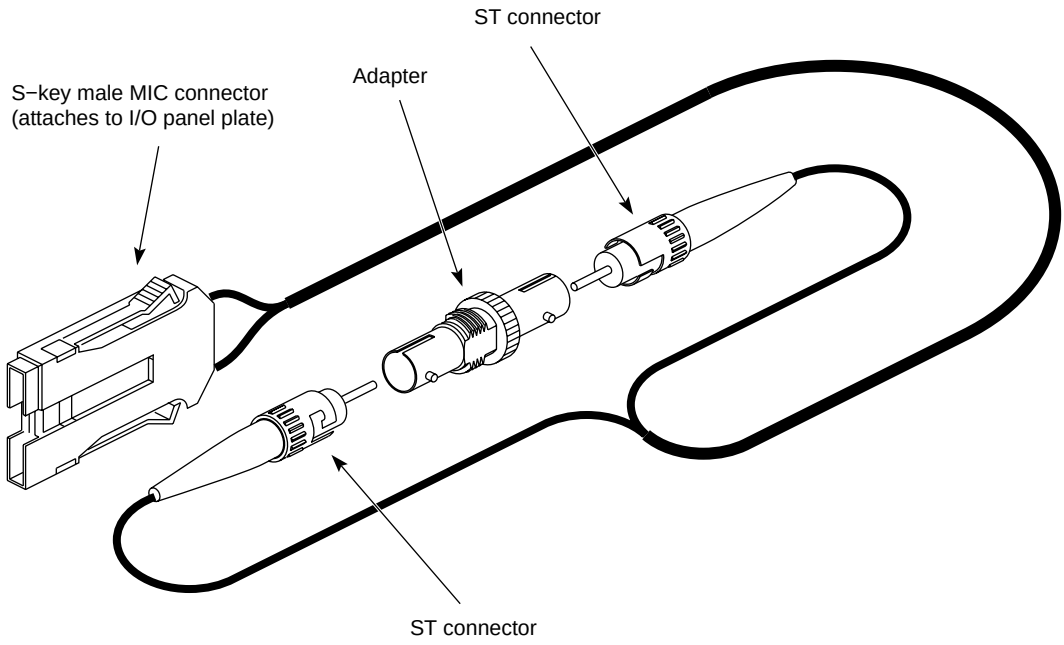


Figure 5-1 Loopback Cable Assembly for an SAS: MIC-to-ST

5.2.2 Troubleshooting Procedures

The LEDs use the following signalling sequences to communicate status information:

GREEN: Blinking, from on to off to on to off.
AMBER: Steady off.

GREEN: Blinking, from on to off to on to off.
AMBER: Steady off.

Normal operation. The rate of the blinking indicates packet activity (transmission and reception).

GREEN: Steady on.
AMBER: Steady on.

GREEN: Steady on.
AMBER: Steady on.

The firmware is not functioning. This is normal for the first few seconds after power on or board reset, before the firmware has started to execute. At any other time, this signal indicates that the board is not operational. Perform the following steps to remedy the problem:

1. Reboot the system to allow the driver to download new firmware onto the board.
2. As the system starts, look at the messages displayed at the terminal. If any "xpi" messages appear, look them up in the *FDDIXPress Administration Guide*. As soon as you log on, look in the *Syslog* file for "xpi" messages.
3. If the problem persists, reinstall the FDDIXPress software. This step installs a new copy of the file containing the firmware. Use */etc/autoconfig* to rebuild the operating system to include the new driver. Then, reboot the system to download the new firmware.
4. If the problem continues, contact Silicon Graphics Technical Assistance Center.

The ring is transitioning from operational to nonoperational. While the amber LED is on, the ring is not operational. The problem may be located at a different station or concentrator. The FDDI ring needs to be verified. If you suspect this station or if you want to verify this station, disconnect it from the ring and verify each FDDI connection, one by one, using the following procedures:

1. Attach a loopback mechanism to one of the FDDI connections at the FDDIXPress I/O panel plate.
2. Follow all the instructions in the section "Verifying the FDDI Connection" of the *FDDIXPress Administration Guide* except those that require the presence of neighbor stations.
3. Repeat the steps above for each FDDI connection.

The ring is not operational (that is, the ring's state is not RINGOP). This may indicate that the *xpi* network interface for this FDDI connection is not enabled, or it may indicate a faulty or disconnected cable connection. Perform the following steps:

1. Stop and restart the *xpi* network interface associated with this FDDI connection:

   # **/usr/etc/smtconfig xpi# down up**

2. Use *netstat -ina* to verify that the *xpi* network interface is UP and is configured properly. If an asterisk appears next to the interface, it is disabled. Do not proceed until the *xpi* network interface is configured and enabled.

   # **/usr/etc/netstat -ina**

3. If the green LED is not blinking, attach a loopback mechanism to isolate the problem. If the green LED blinks when the loopback mechanism is attached, the problem lies with the site's equipment. If the green LED does not blink when the loopback mechanism is attached, the problem is within the FDDIXPress subsystem.
4. If the problem is isolated to the FDDIXPress subsystem, verify all the cable connections, starting at the board and ending loopback mechanism. Replace any suspect cables with known functional ones.
5. If the green LED still does not blink, contact Silicon Graphics Technical Assistance Center.

○ GREEN: Steady off.
○ AMBER: Steady off.

○ GREEN: Steady off.
○ AMBER: Steady off.

There is no power to the board. Assuming that the rest of the system is functional, this signal may indicate that the FDDIXPress mezzanine board is not firmly seated into the connector on the IO4 board, or that the IO4 board is not seated firmly into the backplane. This signal may also indicate that the FDDIXPress or IO4 board is dysfunctional. Reinstall the hardware, taking extra precautions to seat everything firmly. If the problem persists, contact Silicon Graphics Technical Assistance Center.

Index

P

S

U

W

X