

**Digital Audio Option PCI Board
Installation Instructions
for Origin2000™ and Onyx2™**

Document Number 108-0181-001

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**Digital Audio Option PCI Board Installation Instructions for Origin2000 and Onyx2
Document Number 108-0181-001**

**Silicon Graphics, Inc.
Mountain View, California**

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About This Guide

The Digital Audio Option PCI board is a half-size PCI expansion board that provides multichannel digital audio expansion via the PCI bus for various Silicon Graphics® Origin™ family workstations and servers, including Onyx2™ and Origin2000™ systems. It connects to consumer and professional audio and video equipment using industry-standard interfaces.



Warning: The Onyx2 and Origin2000 systems use electrical power internally that is hazardous if the equipment is improperly handled. The procedures in this guide require specific training and technical knowledge and are for use only by Silicon Graphics System Support Engineers or other personnel trained by Silicon Graphics.

Structure of This Document

This guide contains the following chapters and appendix:

- Chapter 1, “Kit Contents,” describes the contents of the Digital Audio Option PCI board package.
- Chapter 2, “Installing the Digital Audio Option Board in the PCI Module,” gives instructions for installing the board, checking installation, installing its software, and cabling the board.
- Appendix A, “Technical Specifications,” gives technical details of board features and specifications, along with pinouts for the DB-15 connector.

In addition to this guide, bring the *Origin2000 and Onyx2 Deskside and Rackmount Installation Instructions* (108-0155-002 or later) to the site, particularly if you are installing a new PCI module (PCI adapter) in the chassis.

Note: Many current installation guides are available in PostScript® form from guest@comrade.wpd:/usr/people/guest/docdist. On the Web, you can access the Technical Publications library at <http://techpubs.sgi.com/library/> (outside the firewall) or <http://techpubs.engr.sgi.com/library/> (inside the firewall).

Conventions

These type conventions and symbols are used in this guide:

Helvetica Bold Hardware labels

Italics Executable names, filenames, IRIX™ commands, manual or book titles, new terms, program variables, tools, utilities, variable command-line arguments, variable coordinates, and variables to be supplied by the user in examples, code, and syntax statements

Fixed-width type

Error messages, prompts, and onscreen text

Bold fixed-width type

User input, including keyboard keys (printing and nonprinting); literals supplied by the user in examples, code, and syntax statements

“”

(Double quotation marks) Onscreen menu items and references in text to document section titles

Chapter 1

Kit Contents

The Digital Audio Option PCI board package includes these items:

- Digital Audio Option PCI board (030-0950-001*)
- breakout cable assembly (018-0648-001)
- fiber optic ADAT® cable assembly (018-0695-001)
- disposable antistatic wrist strap, included for customer installation of board in chassis other than Origin2000 or Onyx2 systems
- labels: upgrade label for OCTANE workstation; thermal transfer label; caution label
- CD-ROMs:
 - quarterly patches (813-0601-003)
 - Digital Audio Option CD 1.0 (813-0621-001)
- clear polycarbonate adhesive insulator (about 1 inch x 4 inches) to insulate the circuitry on PCI cards from the PCI module wall
- two 4-40 x 3/16-inch screws (one is a spare) for attaching the PCI board to the PCI module I/O panel
- owner documentation: *PCI Digital Audio Board Installation Guide* and flier

Note: If parts are missing, or if incorrect parts are included, please log a call with the Technical Assistance Center (TAC).

Figure 1-1 shows features of the board.

* All ten-digit part numbers are the latest versions as of this writing; your kit may include later versions.

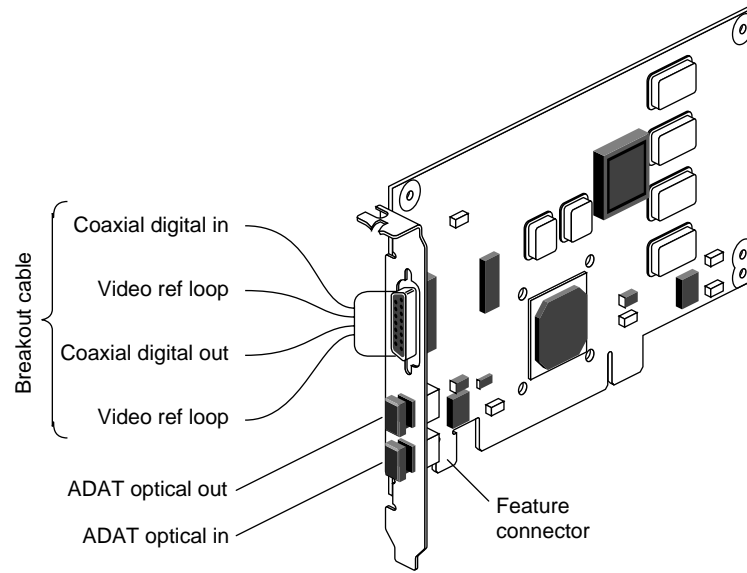


Figure 1-1 Digital Audio Option PCI Board

Figure 1-2 diagrams the cables included in the option.

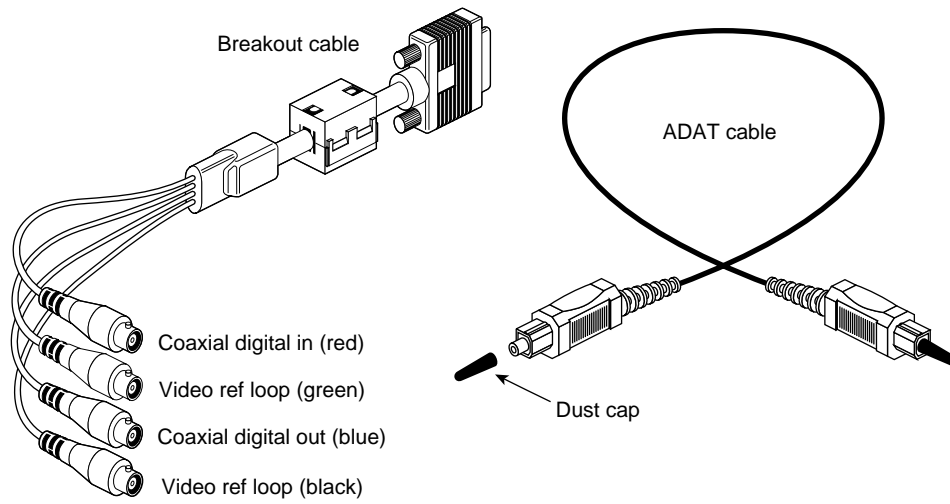


Figure 1-2 Cables

Chapter 2

Installing the Digital Audio Option Board in the PCI Module

This chapter consists of these sections:

- Section 2.1, “Removing the PCI Module From the Chassis”
- Section 2.2, “Inserting a Digital Audio Option Board in the PCI Module”
- Section 2.3, “Preparing the Chassis for a New PCI Module”
- Section 2.4, “Inserting the PCI Module in the Chassis”
- Section 2.5, “Installing the Software”
- Section 2.6, “Verifying the Hardware Installation”
- Section 2.7, “Connecting the Breakout Cable”
- Section 2.8, “Connecting ADAT Optical Devices”

For procedures in this chapter, you need a #2 Phillips-head screwdriver.

If you are installing a new PCI module in a system that does not currently have one, you must have a 7/64-inch hex driver. Also, a right-angle #2 Phillips or a stubby #2 Phillips screwdriver is required for an Onyx2 chassis and is highly recommended for an Origin2000 chassis.



Warning: This equipment uses electrical power internally that is hazardous if the equipment is improperly handled. The procedures in this manual require specific training and technical knowledge and are for use only by Silicon Graphics System Support Engineers or other personnel trained by Silicon Graphics.

Caution: Follow all safety procedures for the Origin2000 or Onyx2 system as explained in the *Origin2000 and Onyx2 Deskside and Rackmount Installation Instructions*. Leave the Digital Audio Option board in its antistatic bag until you are properly grounded to the chassis ground with a ground strap.

2.1 Removing the PCI Module From the Chassis

To remove the PCI module (also known as the PCI adapter or shoebox) from the Origin2000 or Onyx2 chassis, follow the steps in this section.

If the chassis has no PCI module and you are installing a new one at this time, remove the PCI module from its protective packaging and gently place it upside down on a flat nonstatic surface. Proceed to Section 2.2, "Inserting a Digital Audio Option Board in the PCI Module."

Caution: Do not touch or bump the gold area of the compression connector, which is easily damaged and extremely sensitive; see Figure 2-2 later in this section.

1. Working with the customer, make sure all users are off the system. Shut down the Origin2000 system or Onyx2 workstation and any peripherals to which it is attached, following proper shutdown procedures, and power it off. See Chapter 10 of the *Origin2000 and Onyx2 Deskside and Rackmount Installation Instructions* if you are not sure of the procedures.



Warning: Wait at least 2 minutes after you power off a rackmount system before you work on any part of the power supply or midplane/backplane. Because of the large amount of capacitance in the system, a significant amount of the operating voltage remains on the midplane/backplane for up to 2 minutes after the system is powered off.

2. Attach an ESD wrist strap to a grounding point at the rear of the system chassis.
3. If necessary, loosen the screws for the lower holding bracket (containment plate) that keeps the PCI module and XIO boards in place. Slide this bracket diagonally so that you can remove the PCI module.
4. At the rear of the chassis, loosen the screw that secures the PCI module to the mounting bracket beneath the unit, as shown in Figure 2-1.
5. Pull out the hook actuator handle to release the compression connection, as shown in Figure 2-1.

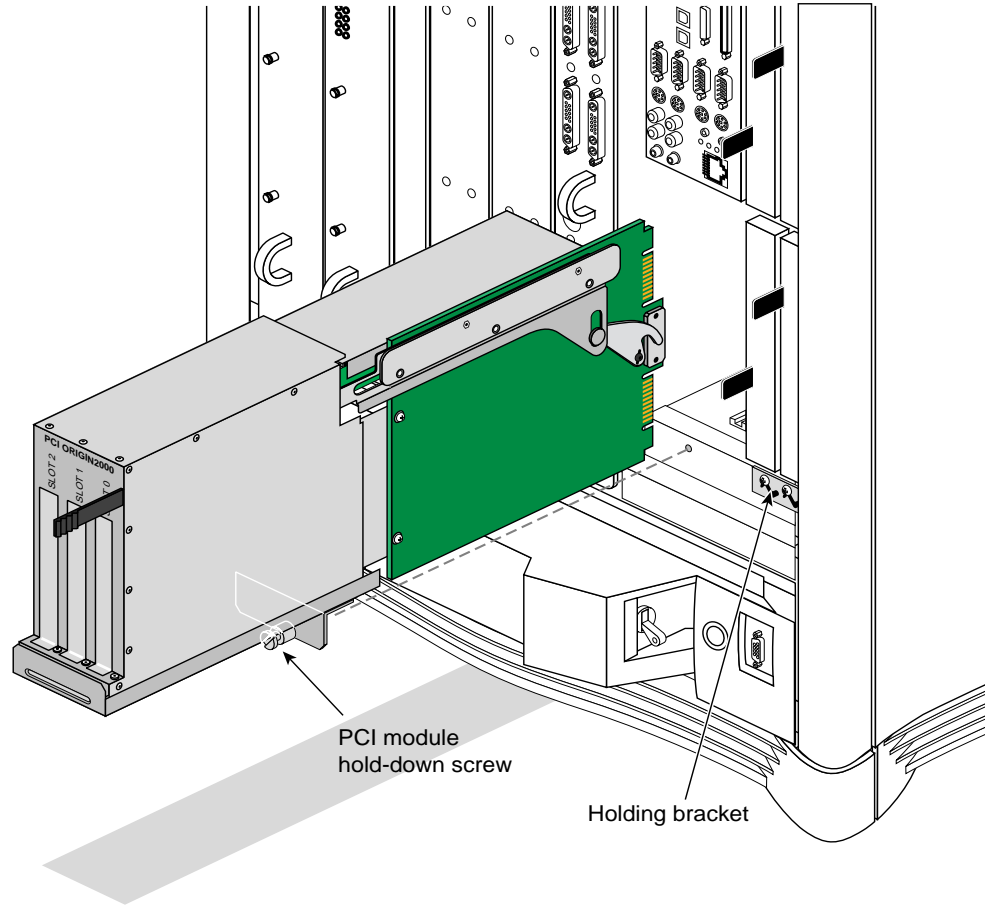


Figure 2-1 Removing the PCI Module (Adapter) From the Chassis

6. Remove the PCI module from the IO2 slot and gently place it upside down on a flat nonstatic surface.

Caution: Do not touch or bump the gold area of the compression connector, which is easily damaged and extremely sensitive; see Figure 2-2.

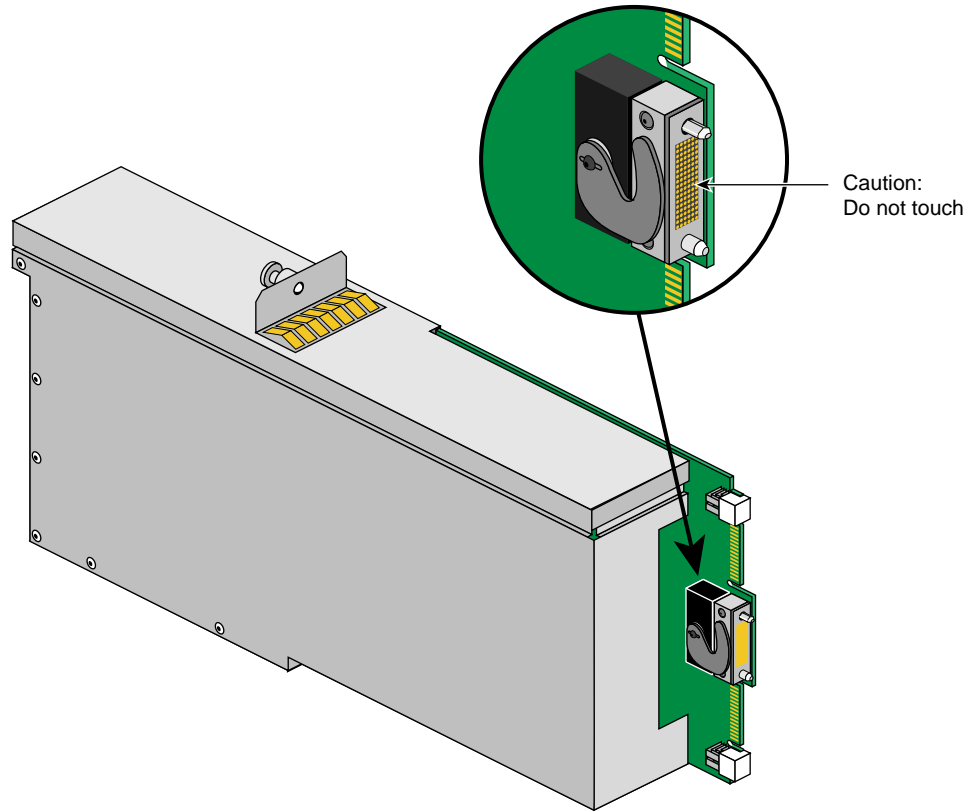


Figure 2-2 PCI Module Compression Connector

7. Detach the wrist strap from the chassis.

2.2 Inserting a Digital Audio Option Board in the PCI Module

To insert a Digital Audio Option board in the PCI module, follow these steps:

1. Attach the wrist strap to the PCI module.
2. Lift off the PCI module lid, as shown in Figure 2-3.

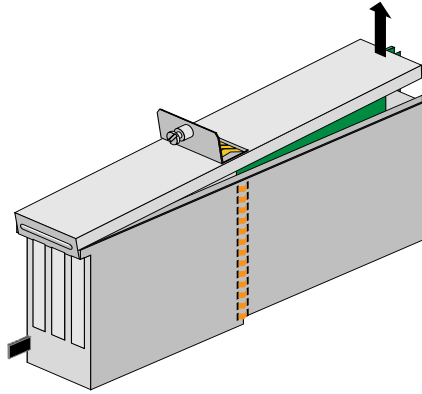


Figure 2-3 Opening the PCI Module

3. Check the indented part in the middle of the left inside wall the PCI module. If no insulator strip is attached, locate the clear, stiff polycarbonate adhesive insulator strip (about 1 inch x 4 inches) included in the shipment.

Peel the backing off the insulator strip and align it carefully with the left edge of the indented portion of the PCI module wall and attach it. (The insulator can overhang the edge slightly.) See Figure 2-4.

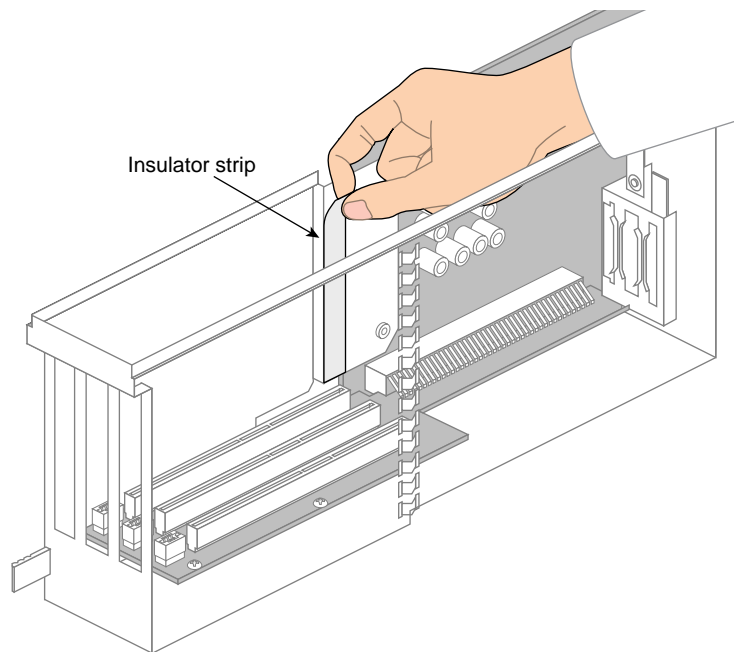


Figure 2-4 Attaching Insulator Strip to the PCI Module Wall

4. Select a slot into which to install the board(s); the slots are numbered on the outside of the PCI module. Slots need not be filled sequentially.

Note the thin metal EMI shield; tabs at its bottom fit into slots at the base of the module I/O panel, holding it loosely against the panel. See Figure 2-5.

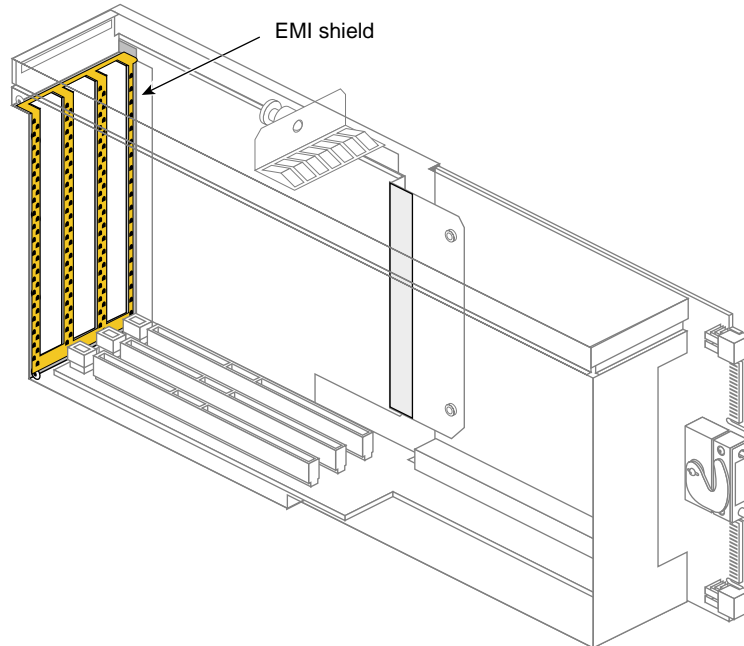


Figure 2-5 EMI Shield

5. For the slot(s) you have selected, remove and reserve the blank panel (slot cover) screw(s) and remove the blank panel(s), as shown in Figure 2-6.
In the process of removing a blank panel, the EMI shield might become detached.

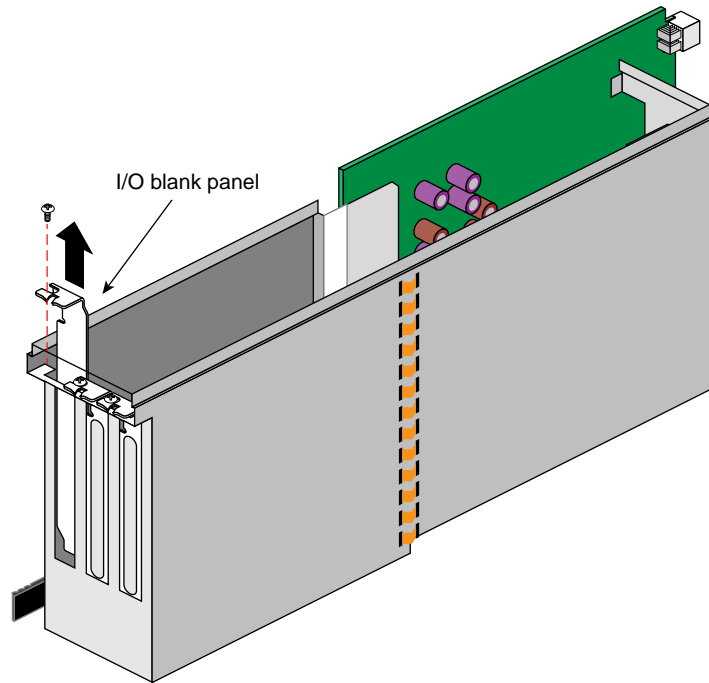


Figure 2-6 Removing the Blank Panel

Give the panel(s) to the customer to store; if the option boards are ever removed from the PCI module, these panels must be replaced in the module.

6. Remove the Digital Audio Option board from its protective packaging and insert the board straight into the slot you have selected, as shown in Figure 2-7.

If necessary, reinsert the EMI shield past the rivets on the side of the I/O panel into its tab slots; a ballpoint pen can help with this process. Hold the EMI shield in place against the PCI module I/O panel.

Push gently but firmly until the PCI board snaps into place.

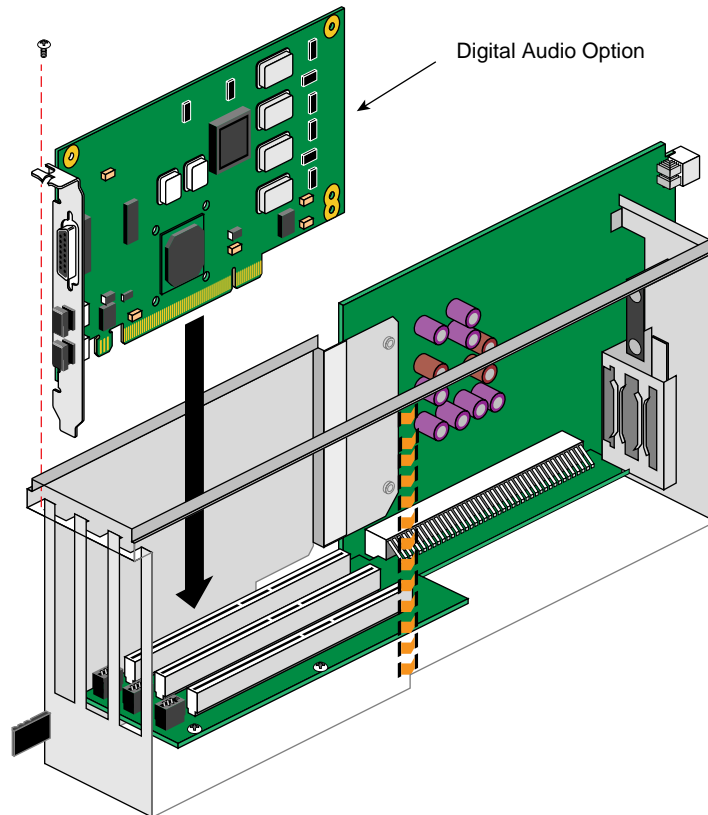


Figure 2-7 Inserting the Audio Option Board Into the PCI Module

7. Insert other Digital Audio Option boards the customer has ordered.
8. Screw in the I/O panel(s) for the board(s) you have installed, using the original screws from the blank panels. If the screw for a panel is missing, use a replacement screw included with the Digital Audio Option board.
9. Resecure the PCI module lid.

If you are installing a new PCI module in a chassis that does not currently have one, proceed to the next section, Section 2.3, “Preparing the Chassis for a New PCI Module.” Otherwise, skip that section and proceed to Section 2.4, “Inserting the PCI Module in the Chassis.”

2.3 Preparing the Chassis for a New PCI Module

If you are installing a new PCI module in a system that does not currently have one, you must remove the cover plate in the IO2 slot and the board adjacent to it.

The large IO2 cover plate is held in place by an external captive screw and by two internal screws that are accessible only by removing boards to its left. In the Onyx2 chassis, these are the entire graphics board set. In the Origin2000 chassis, these are node board N1 and probably at least the node board or blank node board next to it. You must have a 7/64-inch hex driver to remove node boards and certain boards in the graphics board set.

To access the internal screws of the IO2 cover plate, a right-angle #2 Phillips screwdriver or a stubby #2 Phillips screwdriver is highly recommended for the Origin2000 chassis and is required for the Onyx2 chassis, which has sheet metal separating the graphics board set from the node board area of the cardcage.

The PCI module requires the space to the right of the IO2 cover plate, which can be occupied by a functioning XIO board or by a blank board:

- A functioning XIO board must be moved to another XIO slot acceptable for the board.
- A blank I/O board must be removed; the customer should store it.

This section describes how to prepare an Origin2000 or Onyx2 chassis that does not currently have a PCI module installed:

- Section 2.3.1, “Positioning the Holding Bracket for the PCI Module”
- Section 2.3.2, “Removing Boards to Access the IO2 Cover Plate”
- Section 2.3.3, “Removing the IO2 Cover Plate”
- Section 2.3.4, “Replacing the Node Boards or Graphics Board Set in the Chassis”

2.3.1 Positioning the Holding Bracket for the PCI Module

Follow these steps:

1. If necessary, make sure all users are off the system. Shut down the Origin2000 system or Onyx2 workstation and any peripherals to which it is attached, following proper shutdown procedures, and power it off. See Chapter 10 of the *Origin2000 and Onyx2 Deskside and Rackmount Installation Instructions* if you are not sure of the procedures.
2. On the chassis, check that the lower holding bracket (containment plate) that holds XIO boards in place is positioned to accommodate the PCI module:
 - For an Origin2000 chassis, the screws should be in holes 2 and 4. If the screws are in holes 1 and 3, remove them, and screw the screws through slots 2 and 4 into holes 2 and 4, as shown in Figure 2-8.

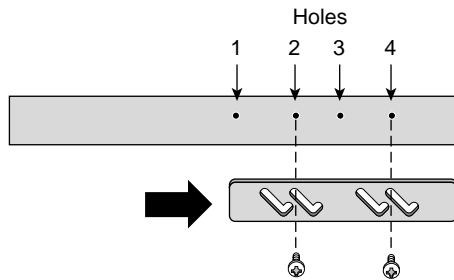


Figure 2-8 Holding Bracket Holes: Origin2000 Chassis

Position the bracket so that you can remove the I/O board or blank in the leftmost bottom slot, adjacent to the IO2 cover plate location. See Figure 2-9.

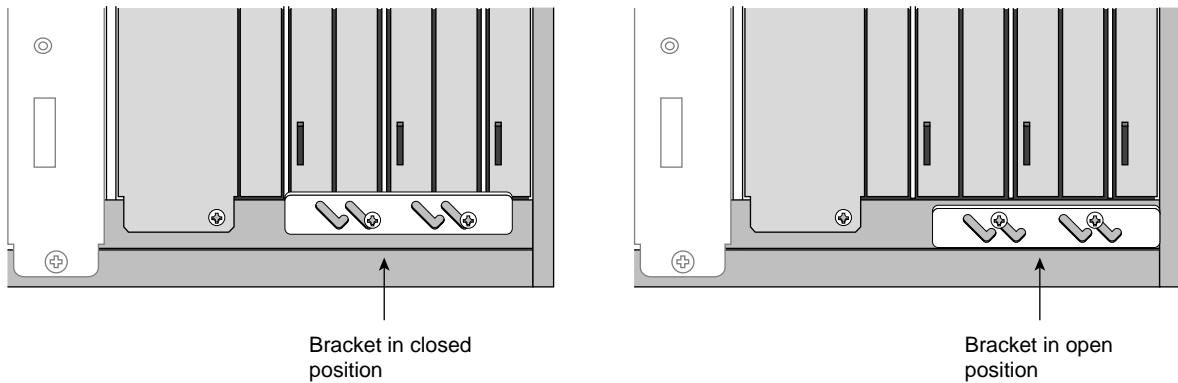


Figure 2-9 Repositioning the Holding Bracket: Origin2000 Chassis

- For an Onyx2 chassis, loosen the two screws and slide the holding bracket to the open position, as shown in Figure 2-10.

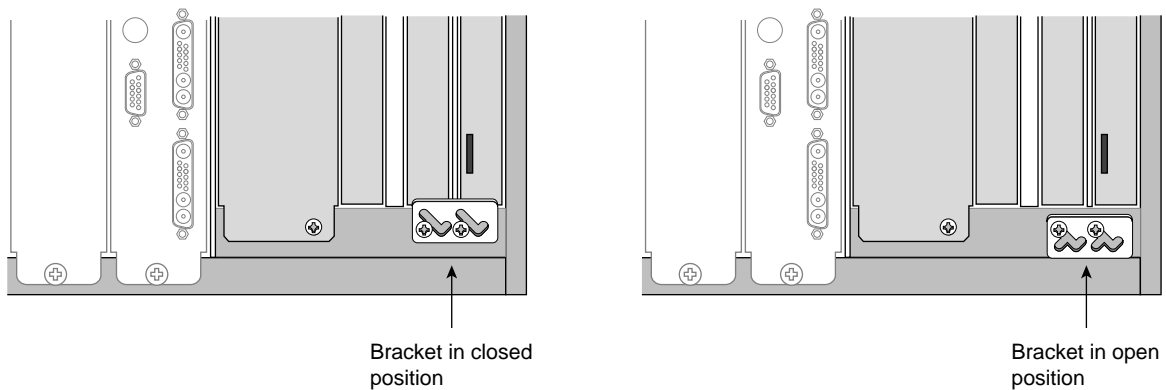


Figure 2-10 Repositioning the Holding Bracket: Onyx2 Chassis

2.3.2 Removing Boards to Access the IO2 Cover Plate

To access the screws on the IO2 panel, you must remove node boards or blanks or the graphics board set, depending on the chassis type. If the slot to the right of the IO2 panel is occupied by a functioning XIO board, you must move it to a new slot. (See Section 2.3.2, “Removing Boards to Access the IO2 Cover Plate,” if necessary.)

Follow these steps:

1. Prepare an antistatic surface where you can place the node boards or graphics boards. Do not plan on stacking them, which can damage components on both sides. Prepare enough space to accommodate all boards you must remove.
2. If the board to the right of the IO2 cover plate is a blank board, pull on the tab to remove it, and set it aside.

If the board to the right of the IO2 cover plate is a functioning XIO board:

- Select a new XIO slot for it, noting the board orientation required for that slot.
- Detach any I/O cables, keeping track of the connectors to which they are attached.
- Pull out the hook actuator handle to release the compression connection, remove the board, and insert it in the new slot.
- Push in the hook actuator handle and reattach board cables.

3. For an Origin2000 chassis, remove node boards and blanks, starting with N1:
 - Carefully loosen the node board's compression connector screws using the 7/64-inch hex driver, as shown in Figure 2-11. To avoid damaging the compression connector, alternate between the hex screws as you unscrew them. (The screws are captive.)
 - Loosen the Phillips-head screws at the top and bottom of the node board. Figure 2-11 shows removal of N1.

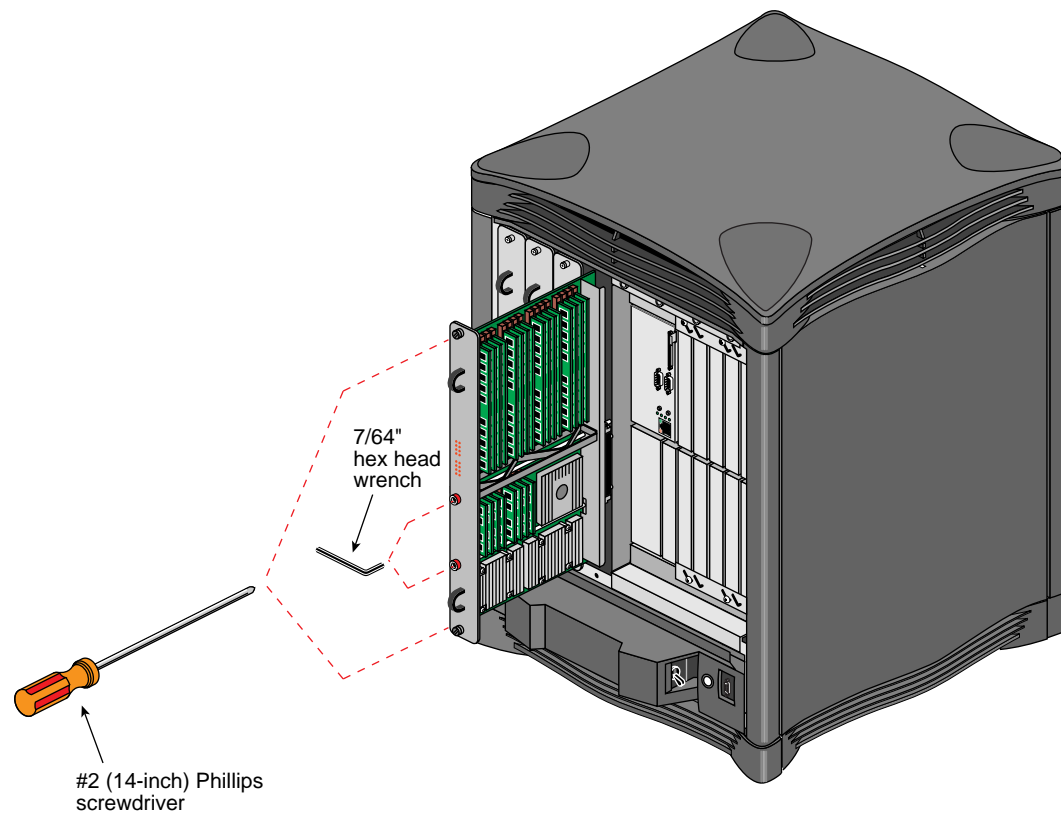


Figure 2-11 Removing Node Board N1

- Slide out the node board and carefully set it on an antistatic surface, component side down.

Caution: Node boards are both heavy and delicate, with many easily damaged components on both sides and along edges. Handle them with extreme care. In addition, do not touch or bump the gold area of a node board's compression connector, which is easily damaged and extremely sensitive.
- Remove as many node boards as necessary for you to access the IO2 cover plate screws. Keep track of the order in which you remove boards so that you can replace them in the correct slots.

4. For an Onyx2 chassis, remove the graphics board set.

Caution: Graphics boards are both heavy and delicate, with many easily damaged components on both sides and along edges. Handle them with extreme care. In addition, do not touch or bump the gold area of a board's compression connector, which is easily damaged and extremely sensitive.

- DG5 board:

Make a diagram or label the cables that are attached to the DG5 I/O panel, and disconnect the cables.

Use a #2 Phillips screwdriver to loosen the captive screws at the top and bottom of the board. Slide the board out and carefully lay it on the antistatic surface.

- RM boards: Loosen their captive screws, pull each one out by its handles, and lay each one on the antistatic surface.

- GE-14 board:

Use the 7/64-inch hex driver to loosen the compression connector screws. To avoid damaging the compression connector, alternate between the hex screws as you unscrew them. (The screws are captive.)

Use a #2 Phillips screwdriver to loosen the captive screws at the top and bottom of the board. Pull the board out by its handles and lay it on the antistatic surface.

- Crosstown (Ktown, Xtown) board in a rackmount Onyx2:

Detach cables (diagram them first if necessary) from the board.

Loosen the four compression connector screws and the top and bottom captive screws as for the GE-14 board; alternate loosening the screws in each pair of compression connector screws.

Pull the crosstown board out by its handle and lay it on the antistatic surface.

2.3.3 Removing the IO2 Cover Plate

Follow these steps:

1. Locate the internal screws on the left inside edge of the IO2 cover plate and remove them, as shown in Figure 2-12.

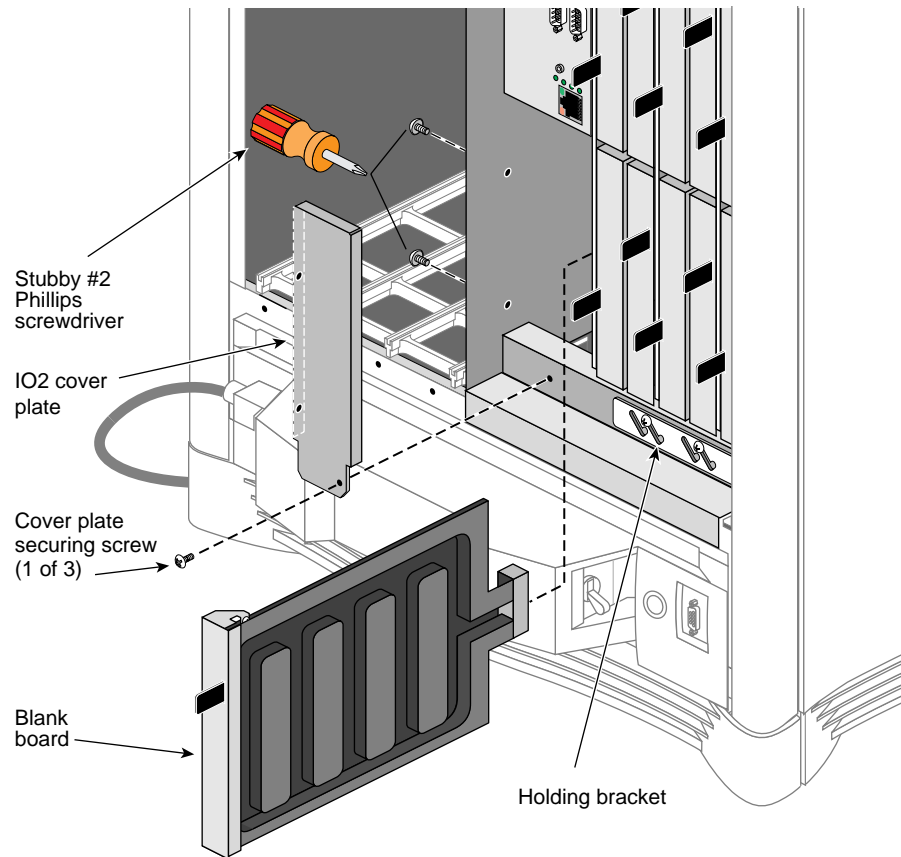


Figure 2-12 Removing the IO2 Cover Plate

2. Remove the external screw on the IO2 cover plate, as shown in Figure 2-12. Push out the cover plate.
3. Give the blank I/O board (if used), IO2 cover plate, and its screws to the customer to store; if the PCI module is ever removed from the chassis, these items must be replaced in the chassis.

2.3.4 Replacing the Node Boards or Graphics Board Set in the Chassis

Replace each board or blank in its original slot. Follow these steps for each board:

1. Align the board or blank with the card guide at the bottom of its original slot.
2. Gently but firmly slide the board all the way into the slot.

Note: Ensure that the board does not contact the EMI wipes (finger stock) of an adjacent board and pull the wipes loose. To prevent this, apply slight pressure away from the wipes as you install the board.

3. To help prevent cross-threading for compression connector screws, start them by hand. Insert each screw until it contacts the midplane, turn the screw counterclockwise until you hear the threads engage, and then partially tighten the screw.

Caution: You can damage the midplane if you cross-thread the hex screws. If you feel resistance, remove the screws and the node board, examine the hardware, and start over.

4. Using a 7/64-inch hex driver and alternating between the top and bottom screws in each pair of compression connector screws, gently tighten the hex screws until they are finger tight.

Some boards have colored rings on the hex screws and black rings on the cutouts for the screws; on these boards, tighten the screws until the colored rings align with the black rings.

Caution: Do not overtighten the screws; the torque specification for them is 6 inch-ounces.

5. Using a Phillips screwdriver, secure the retaining screws at the top and bottom of the board.
6. Reconnect applicable cables, following the diagrams you made earlier.

2.4 Inserting the PCI Module in the Chassis

The PCI module goes only in the IO2 slot, which is the extra-wide bottom leftmost slot in the cardcage. See Figure 2-13.

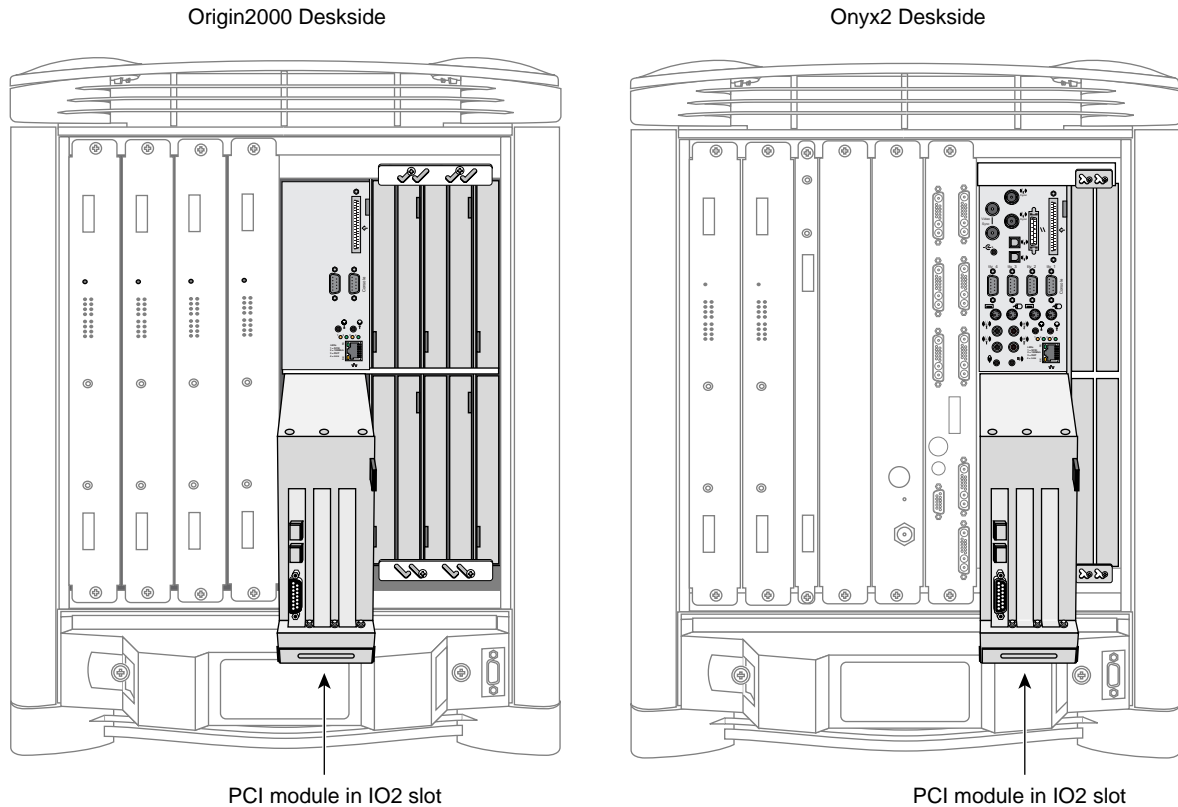


Figure 2-13 IO2 Slot for PCI Module

Caution: Insert the PCI module only in the IO2 slot. Inserting it in the IO1 slot permanently damages the midplane.

Follow these steps:

1. Attach an ESD wrist strap to a grounding point at the rear of the system chassis.
2. If necessary, loosen screws on the bottom holding bracket (see Figure 2-12) and slide it diagonally so that it does not interfere with the IO2 slot opening.
3. Turn the PCI module so that the lid is down and the hook actuator handle is up. Make sure the PCI module's hook actuator handle is extended.
4. Insert the PCI module into the IO2 slot, as shown in Figure 2-13.
5. Push in the hook actuator to engage the compression connection.
6. Secure the PCI module to the chassis by screwing the screw at the base of the module into the mounting bracket beneath the unit.

7. Slide up the holding bracket that secures the XIO boards diagonally, and tighten the screws. This step is required for safety compliance. Figure 2-13 shows the bracket correctly positioned.
8. Detach the wrist strap.

2.5 Installing the Software

To install the software, follow directions in the booklet enclosed with the software CD.

2.6 Verifying the Hardware Installation

Once you have installed the audio option board and installed the software, verify that the system recognizes the new hardware. Open an IRIX shell; at the prompt, enter

```
hinv
```

Look for a line similar to this:

```
Iris Audio Processor: version RAD revision 12.0, number 1
```

Each PCI audio option board installed is listed. If you do not see the listing, turn off the workstation and go over each step of the installation instructions again. Make sure the board is fully seated in the slot.

2.7 Connecting the Breakout Cable

Connect the breakout cable to the Digital Audio Option board's DB-15 connector. Figure 2-14 diagrams the breakout cable included with the option.

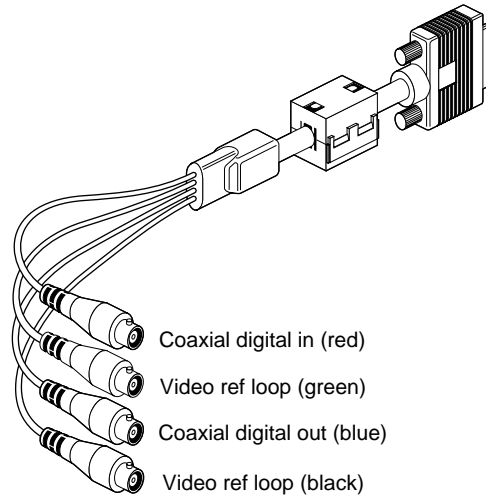


Figure 2-14 Breakout Cable

The breakout cable supports video synchronization and the AES-3id digital audio standard. The black and green video reference loop cables can be used interchangeably.

Note: If the customer is using only one video input (black or green) and not looping through to another device, the unused video connector must be terminated with a 75-ohm BNC terminator.

2.8 Connecting ADAT Optical Devices

The optical input or output connectors on the Digital Audio Option PCI board can be cabled to ADAT optical interface-compatible devices. Follow these steps:

1. Remove the dust cap from the ADAT optical out connector, which is the one nearest the DB-15 connector. You can see the red LED inside this connector.
2. Attach one end of the provided fiber optic cable to the ADAT optical out connector, as shown in Figure 2-15.

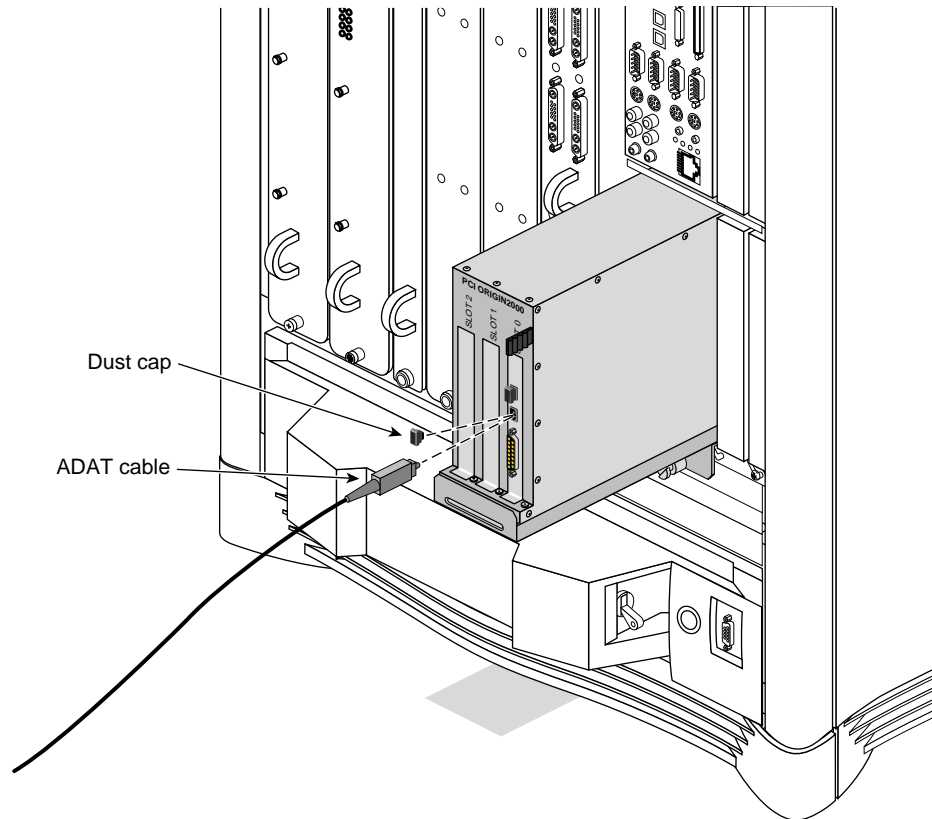


Figure 2-15 Cabling the ADAT Connector

3. Connect the other end to the ADAT optical in connector of the customer's ADAT device.

Some of these devices provide the option of clocking their inputs either externally or internally. Often the default is set to internal clocking. For output to these devices to work properly, the customer must configure them to use external clocking. Refer the customer to the manual that comes with the device for instructions.

Appendix A

Technical Specifications

This appendix gives specifications and technical details of board features, along with pinouts for the DB-15 connector.

Table A-1 lists the PCI audio option board's features and specifications.

Table A-1 PCI Audio Board Specifications

Feature	Use
Synchronization	Locks to professional video (via video sync) and audio equipment with professional jitter attenuation Accepts video reference input, generates AES11 grade 2 (10 ppm) clocks
Sample rates	Continuous between 32 kHz and 48 kHz
Jitter attenuation	For 44.1 kHz or 48 kHz sample rates
Video reference loopthrough	75-ohm BNC connectors, breakout cable
Coaxial digital audio input	AES-3id 75-ohm BNC connector, breakout cable AES11 synchronization input (for audio clock rates) AES3 professional 2-channel 24-bit digital Compatible with IEC958, S/PDIF consumer 2-channel digital
Coaxial digital audio outputs	AES-3id 75-ohm BNC connector, breakout cable AES11 synchronization output AES3 professional 2-channel 24-bit digital Compatible with IEC958, S/PDIF consumer 2-channel digital
Optical digital input	12.8 Mbps SHARP multimode plastic fiber optic connector, PCII/O panel 8-channel, 24-bit ADAT Optical interface Compatible with IEC958, S/PDIF consumer 2-channel digital
Optical digital output	12.8 Mbps SHARP multimode plastic fiber optic connector, PCII/O panel 8-channel, 24-bit ADAT optical Compatible with IEC958, S/PDIF consumer 2-channel digital)

Table A-2 shows the pinouts for the DB-15 connector for video synchronization and AES-3id digital audio through the breakout cable.

Table A-2 DB-15 Connector Pinout Assignments

Pin	Assignment
1	COAXIAL DIGITAL_IN GND
2	COAXIAL DIGITAL_IN
3	VID_REF
4	VID_REF GND
5	VID_REF
6	VID_REF GND
7	NOT CONNECTED
8	CHASSIS GND
9	COAXIAL DIGITAL_OUT
10	NOT CONNECTED
11	COAXIAL DIGITAL_OUT GND
12	NOT CONNECTED
13	CHASSIS GND
14	CHASSIS GND
15	NOT CONNECTED