IRIS® HIPPI-Serial XIO Board Installation Instructions for Origin2000™ and Onyx2™

Document Number 108-0160-002

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Document Number 108-0160-002

Silicon Graphics, Inc.
Mountain View, California

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About This Document

This guide provides instructions for installing the IRIS® HIPPI-Serial XIO Board. Each chapter describes the installation steps for a different Silicon Graphics® chassis: Origin2000™ Deskside, Onyx2™ Deskside, and Origin2000 and Onyx2 Rackmount.

Note: These instructions are written for system service engineers (SSEs) who have been trained by Silicon Graphics (SGI). The information in this document should not be copied. The information should not be shown to people who do not work for SGI.

The IRIS HIPPI-Serial XIO board provides a native, serial High Performance Parallel Interface (HIPPI-Serial) connection for a Silicon Graphics host based on the S2MP™ architecture. Each data flow (direction) of the dual-simplex connection operates at 800 megabits per second over fiber-optic cable using short-wavelength optics. The IRIS HIPPI software that accompanies this board is described in the online *IRIS HIPPI Administrator's Guide*. Applications can use the services of the IRIS HIPPI-Serial board via the standard IP network-layer interface or through the board's application programming interface (API), which is described in the online *IRIS HIPPI API Programmer's Guide*. The IRIS HIPPI API provides raw data exchange (direct access to and control of the HIPPI physical layer) or packetized data exchange (access at the HIPPI framing protocol layer).

In order to function, the IRIS HIPPI-Serial XIO Board must be connected to a port on either a HIPPI switch or an endpoint that supports HIPPI-Serial and appropriate multi-mode fiber-optic cabling. The end of the cable for the IRIS HIPPI-Serial board's I/O panel plate must be terminated with a dual-SC connector. Cabling and switches are not included with the product and are the customer's responsibility. Site cabling requirements are described in "Site Cabling" in Chapter 1 of this document.

Chapter 1

Overview and Care of the Board

1.1 Introduction to XIO Boards

1.1.1 General Overview of XIO Boards

XIO boards are optional products for Silicon Graphics platforms based on the scalable shared-memory multi-processing (S2MP™) architecture. XIO boards install into the XIO slots of Origin2000 and Onyx2 systems. Each active XIO slot provides up to 1600 megabytes per second of bi-directional bandwidth (that is, 800 megabytes in each direction) through a crossbar switch that is located on the system's midplane or frontplane. Specific XIO products may use a portion or all of this available bandwidth. All the XIO slots in a system can be active simultaneously. For more details on how XIO slots fit into the rest of the system, see *Origin2000 Deskside and Rackmount Installation Instructions* and *Onyx2 Deskside and Rackmount Installation Instructions*.

Every XIO board has the following items (illustrated in Figure 1-1):

Item	Description
Compression connector	Connector that provides communication between the board and the system via the midplane or frontplane.
Hooks on connector	Hooks hold the compression connector securely to midplane or frontplane. There is one hook on each side of the compression connector.
Hook actuator	Device for moving compression connector hooks into and out of their locked position on the midplane.
Screw holes	Holes for attaching a hook actuator to the board.
Panel plate	External surface that provides cutouts for external cables and light-emitting diodes (LEDs).
Tall-component side	Surface of the board that has the compression connector and the tallest components.
Short-component side	Side of the board with only low-profile components.

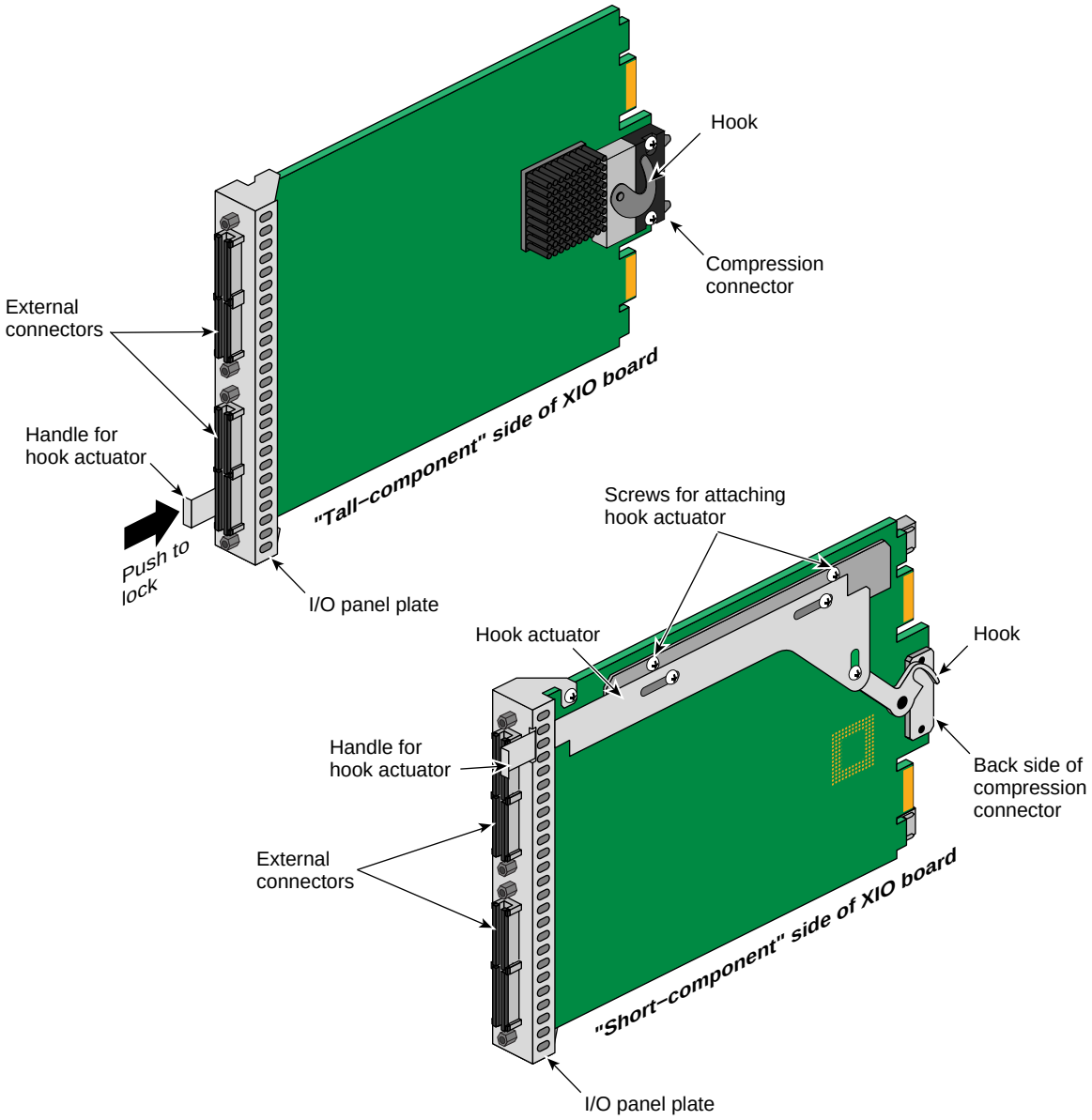


Figure 1-1 Generic XIO Board

1.1.2 Hook Actuator

For an XIO board to function, its compression connector must be locked tightly to a mate (other half) on the midplane or frontplane, inside the chassis. The hook actuator is designed to do this.

Each XIO board has two hooks (one on each side of the compression connector). A hook actuator presses against one of the hooks, thus moving both the hooks into and out of their locked position. The design of the hook actuator is different for different platforms.

For the Origin2000 and Onyx2 platforms, the hook actuator consists of a horizontally sliding lever and a handle; each type of XIO board may have a unique design for its lever and handle. Figure 1-1 shows one design. These hook actuators are screwed onto the XIO board and attached to one of the hooks, as illustrated in Figure 1-1.

The method of operation is the same for all lever-and-handle designs, as described below:

- Pushing the handle locks the hooks and seats the compression connector to the midplane.
- Pulling the handle releases the hooks, in preparation for removing the board.

1.1.3 Caring for the Compression Connector

This compression connector used for XIO boards has 2 parts: one is physically located on the XIO board (illustrated in Figure 1-2); the other is on the midplane of the chassis. The compression connector has 96 pads that enable passage of signals between the system (via the midplane) and the XIO board. Each pad on a midplane connector is a flat, gold-plated surface. Each pad on an XIO board connector is composed of hundreds of tiny bristles (dendrites). When a bristled pad is pressed into a gold-plated pad, a connection is created for one signal.

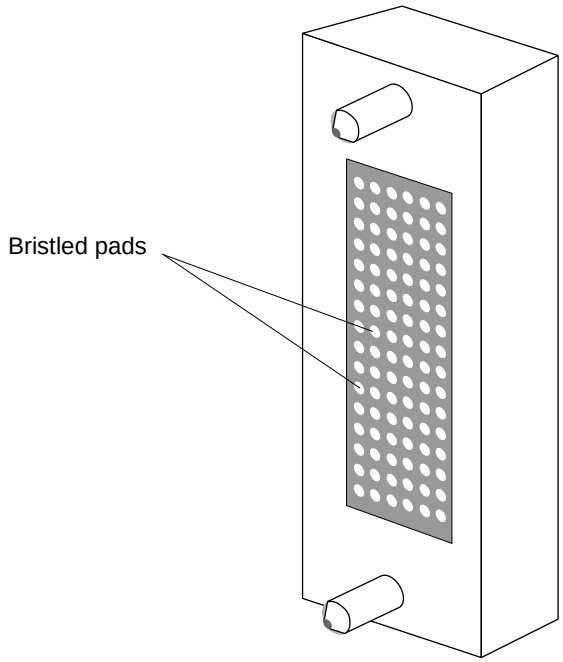


Figure 1-2 The Compression Connector Used on XIO Boards

The bristled pads can attract and hold dust, lint, grease, powder, and dirt. These substances clog and damage the bristles, and prevent them from making proper contact with the gold-plated pads on the system's midplane. It is important to prevent this from occurring. "Guidelines for Storing and Handling the Compression Connector on an XIO Board," explains how to keep the compression connector bristles clean; "Guidelines for Cleaning the Compression Connector on an XIO Board," explains how to clean them, in the event they become dirty.

1.1.3.1 Guidelines for Storing and Handling the Compression Connector on an XIO Board

To avoid damaging an XIO board's compression connector and to keep it in optimal working condition, follow these guidelines whenever the board is not installed:

Caution: Failure to follow these instructions can result in irreparable damage to the surface of the connector's pads, which may result in intermittent or complete failure of the product.

- Do not wipe or touch the pads of the compression connector with anything (no human fingers, no brushes, no cloth, no probes), except as specified in the cleaning instructions. The bristles might be damaged.
- Whenever the board is not in an XIO slot, put the protective cap over the compression connector and store the board in an antistatic bag. Make sure to close (fold over) the open end of the bag in order to minimize exposure to dust and atmospheric gases.
- Do not put anything (not even water) onto the pads, except as specified in the cleaning instructions.
- Before laying the board down on a surface, make sure that the surface is free of dust, lint, powder, metal filings, oil, water, and similar materials.
- Do not blow dust, dirt, or powder anywhere near the board when it is not inside its protective bag.

1.1.3.2 Guidelines for Cleaning the Compression Connector on an XIO Board

A compression connector should never need cleaning, if you keep the protective cover on whenever the XIO board is not installed. However, if the connector becomes dirty, follow these instructions for removing pollutants.

Note: Some pollutants can irreversibly damage (corrode or chemically alter) the pad surfaces. Although cleaning may remove the pollutant, it does not repair damage incurred by this contact.

To remove pollutants, follow these instructions:

1. Obtain a can of dry, compressed air or inert gas. The Envi-ro-tech™ Duster 1671 product, manufactured by *TECHSPRAY*™ (telephone 806-372-8523), is the only product that SGI currently recommends for this application.

   Caution: Do not use a cleaning product that contains any of the following ingredients: halogenated hydrocarbons, aromatic hydrocarbons, ethers, sulphur, ketones, or solvents of any kind. These substances will cause irreparable damage to the connector's surface.

2. Prepare the can for use, as instructed on the can. For example, if provided, attach the applicator tube to the can's dispensing mechanism.
3. Hold the can in a vertical position. During subsequent steps, it is important to maintain this vertical position because this helps prevent the non-inert material (expeller gases) from being expelled.

   Caution: Tipping or shaking the can while spraying can result in damage to the compression connector from the product's expeller gases.

4. Place or hold the XIO board so that the rounded edge of the compression connector faces up. Note that the rounded edge is completely closed, so that air cannot flow into the connector, whereas the squared edge has an opening.

   Caution: Spraying into the squared (open) edge of the connector can destroy it.

5. Position the XIO board at an angle to the can, so that the tip of the can's applicator is 1 to 2 inches away from the first (topmost) row of pads (as illustrated in Figure 1-3). When you spray, the air hits each pad and flows downward. Do not allow the applicator to touch the pads.

Figure 1-3 Position for Compressed Air Can When Cleaning Compression Connector

6. Start spraying. As you spray, move the can along the length of the connector until the entire length has been sprayed. Move down a few rows and again spray along the entire length.

Note: Do not shake the can. Stop spraying and switch to a new can if any visible material (for example, foam) appears on the applicator or on the connector. This foam will blow away once you resume spraying just air.

7. Repeat until all the pads have been sprayed.
8. When you finish, cover the compression connector with its cap or immediately install the board in an XIO slot.

1.2 Overview of HIPPI-Serial XIO Board

This section describes the IRIS HIPPI-Serial XIO board.

1.2.1 Block Diagram of IRIS HIPPI-Serial Board

This board implements 32-bit, fiber optic based HIPPI-Serial, providing bandwidth of 800 megabits per second in each direction. Each data path (destination and source) has its own logic that includes FLASH EEPROM, LEDs, a CPU for handling host-board direct memory accesses (DMA), a HIPPI protocol processor, memory, a component for serializing / deserializing the data, and an optical data link (ODL). The Bridge Chip translates between the system's Crosstalk™ protocol and the onboard PCI bus. Figure 1-4 illustrates a rough block diagram of the board, while Figure 1-5 points out the locations of major components. This board has logic and memory components on both its sides.

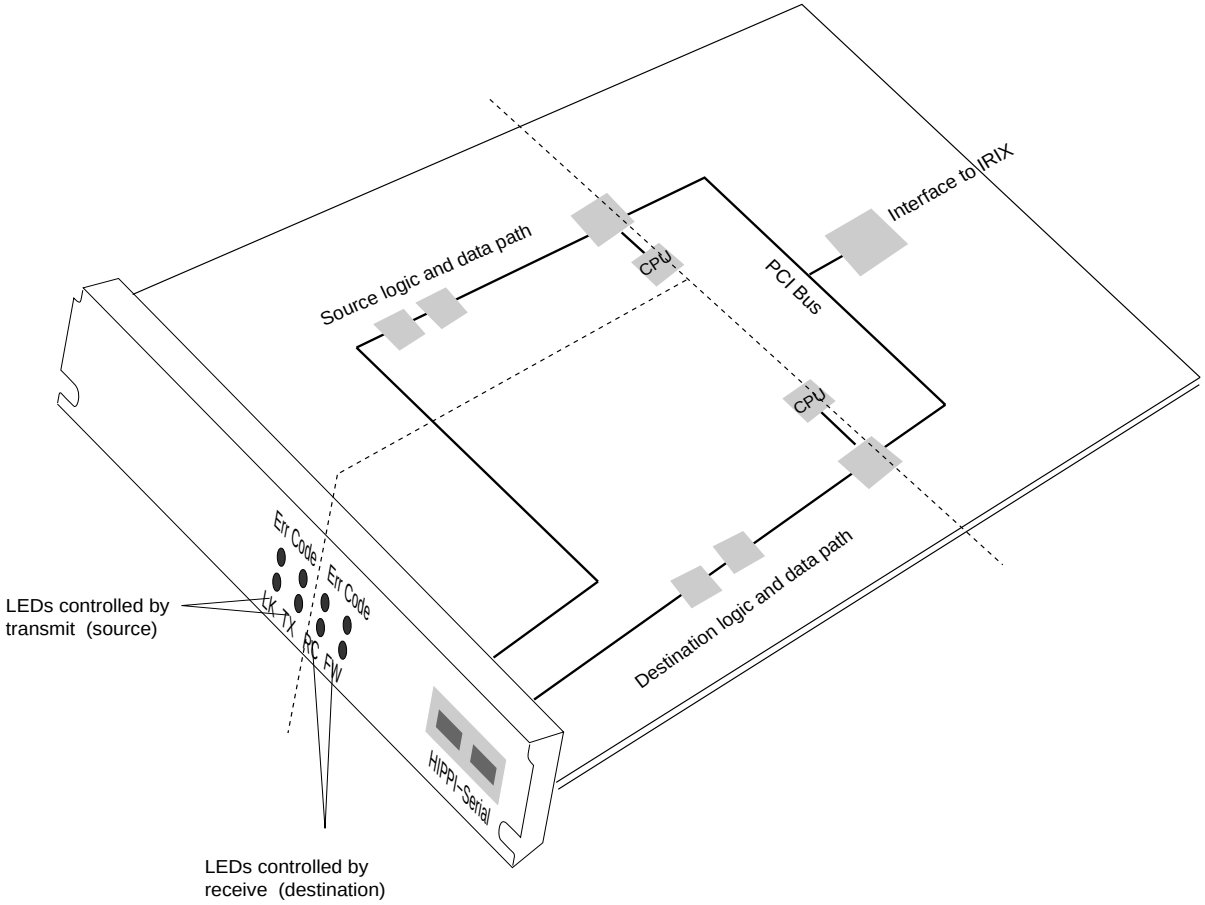


Figure 1-4 Block Diagram of HIPPI-Serial XIO Board

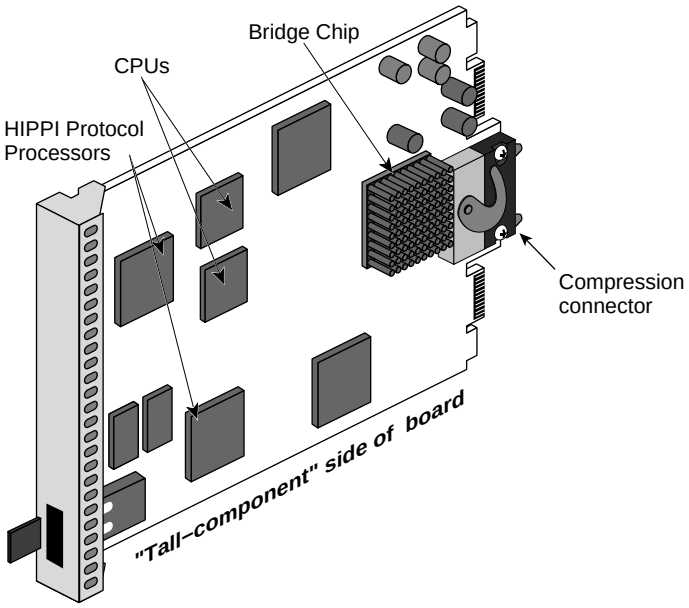


Figure 1-5 Components on HIPPI-Serial XIO Board

1.2.2 Electrostatic Discharge

The IRIS HIPPI-Serial XIO board is extremely sensitive to damage from electrostatic discharge (ESD) caused by the buildup of electrical potential on clothing and other materials.

Caution: Exposure to ESD may irreparably damage the IRIS HIPPI-Serial XIO board.

Follow these standard ESD preventive measures:

- Attach a ground strap to your wrist and to a grounded connection when installing, removing, or handling this board.
- Ensure that you and all electrical equipment that you handle during this installation are at ground potential to avoid damage from ESD.
- Until you need the board, keep it in its antistatic bag.
- Remove the board from its antistatic bag only when you are properly grounded to the chassis ground with a ground strap.
- Place the board only on an antistatic surface. For example, you may place it on top of the antistatic bag in which the board is shipped.
- When installing / removing this board, do not disconnect the power cord from the chassis. You will lose the system ground and could damage the equipment.

Follow these board-specific ESD preventive measures:

- Avoid touching the SRAM, CPU, and HIPPI protocol-processing components on this board. They are highly sensitive to damage from ESD.
- Do not use an ohmmeter or digital voltmeter on this board.

1.2.3 Site Cabling

This section covers the description, the care, and the cleaning of external cables for the IRIS HIPPI-Serial XIO board.

1.2.3.1 Cable Requirements

To activate HIPPI functionality, the IRIS HIPPI port must be connected to a HIPPI switch, to a HIPPI-Serial endpoint (another host), or have a loopback device installed. For attachment to a HIPPI switch or endpoint, the IRIS HIPPI-Serial XIO board provides one dual-SC receptacle at the board's I/O panel plate. The board uses short wavelength optics (770-860 nm) and supports multimode cable of either 50 micron core (up to 500 meters in length) or 62.5 micron core (up to 200 meters). Figure 1-6 illustrates the data direction used in the board's dual-SC receptacle. The site's connectors, splices, cabling, and installation of the cabling must conform to and should follow the guidelines specified in the physical layer specification for HIPPI-Serial, as described in the *High-Performance Parallel Interface - Serial Specification*, version 2.6, especially annex B "Additional Optical Information" and section 8, "Serial Optical Interface." Table 1-1 and Table 1-2 summarize some of the relevant guidelines from this specification. To meet these specifications you should use high quality connectors rated at 0.5 or 0.4 dB maximum insertion loss with ≥20 dB discrete return loss.

Table 1-1 Major and Minor Error Codes for Operational Firmware

Item	Value for 50 micron cable	Value for 62.5 micron cable
Cable		
minimum bandwidth at 780 nm	500 MHz•km	160 MHz•km
maximum loss	4 dB/km	4 dB/km
Connectors		
maximum number between 2 nodes	8	8
mean loss per unit	≤0.11 dB	≤0.11 dB
standard deviation loss per unit	0.15 dB	0.15 dB
minimum optical return loss	20 dB	20 dB
Splices		
maximum number between 2 nodes	6	6
mean loss per unit	≤0.08 dB	≤0.08 dB
standard deviation loss per unit	0.05 dB	0.05 dB

Table 1-2 Fiber Plant's Optical Power Budget for HIPPI-Serial

Math	Item	Value for 50 micron cable	Value for 62.5 micron cable
start with	minimum laser launch power	- 10 dBm	- 10 dBm
subtract	maximum optical fiber loss for maximum length cable at 4 dB / km	+ 2.0 dB	+ 0.8 dB
subtract	mean connector loss (8 * 0.11)	n.a.	+ 0.9 dB
subtract	mean splice loss (6 * 0.08)	n.a.	+ 0.5 dB
subtract	3σ loss	n.a.	+ 1.4 dB
subtract	mean and 3σ loss available for splices and connectors	+ 2.0 Db	n.a.
subtract	optical receiver sensitivity	- 16 dBm	- 16 dBm
result	minimum unallocated for margin and penalties	= +2.0dB	= +2.4 dB

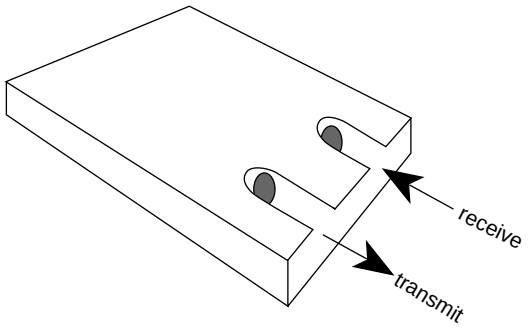


Figure 1-6 Data Direction Used in Dual-SC Receptacle on IRIS HIPPI-Serial XIO Board

External 62.5 micron fiber-optic cables, in various lengths, for the ports on the IRIS HIPPI-Serial XIO board can be ordered directly from Silicon Graphics, using the part numbers listed below. Except for the loopback test cable assembly, these cable assemblies are terminated with dual-SC connectors on both ends. Have the customer contact their local sales representative. Alternatively, cables can be purchased from any reputable fiber-optic cable vendor.

Part #	Assembly	Description
018-0656-001	X-F-OPT-3M	3-Meter Fiber-Optic Cable Assembly
018-0656-101	X-F-OPT-10M	10-Meter Fiber-Optic Cable Assembly
018-0656-201	X-F-OPT-25M	25-Meter Fiber-Optic Cable Assembly
018-0656-301	X-F-OPT-100M	100-Meter Fiber-Optic Cable Assembly
018-0664-001	X-F-OPT-LOOP	Optic Loopback Cable Assembly

1.2.3.2 Cable Care and Cleaning

When handling or cleaning fiber-optic cables, follow these guidelines:

1. Do not bend fiber-optic cable into any shape that involves a radius less than 4 inches. The material can fracture or break.
2. Do not step on, strike, or drop anything onto fiber-optic cables. The material inside can fracture or break.
3. Do not expose the cable ends to pollutants, such as dust, lint, grease, or liquids that leave residue (such as rubbing alcohol). Performance of the fiber-optic cable degrades seriously due to pollutants.
   - Do not touch the fiber-optic material that is exposed at the ends of cables with fingers, paper tissues, cloth that can leave lint, or anything abrasive.
   - Do not leave cable ends or panel-plate receptacles uncapped or unattached.
   - Do not try to clean fiber-optic material except as described below.
   - Do not blow on the fiber-optic material with anything except dry, compressed air or inert gas.
4. To clean a fiber-optic cable, gently rub the tip of the fiber-optic material with a soft, lint-free cloth that has been moistened with reagent grade isopropyl alcohol (isopropanol 92%), then let the tip dry completely.

   Note: Do not use prepared cleaning compounds, such as tape-head cleaner or denatured (rubbing) alcohol.

   To dry the liquid from fiber-optic material, you can fan ambient air over the end of the cable or blow it with a can of dry, compressed inert gas (for example, 100% pure nitrogen).

   Note: Do not blow on the fibers with your mouth.

1.2.3.3 Cable Verification

If you suspect that a fiber-optic cable is faulty, you need an optical time domain reflectometer (OTDR) to accurately measure whether the optical signal that passes through a section of optical fiber is strong enough and clear enough to be interpreted accurately by the receiver.

1.2.4 Maximum Number of IRIS HIPPI-Serial Boards

The maximum number of IRIS HIPPI-Serial XIO boards that can be installed into the different chassis and systems is summarized in Table 1-3. For installations that require full utilization of throughput on each HIPPI-Serial port, no more than 3 HIPPI-Serial boards can be installed within each set (that is, 1-6 or 7-12) of XIO slots. For configurations other than those described here, contact Silicon Graphics for details.

Table 1-3 Maximum Number of Boards That Can Be Installed

Chassis Type	Maximum Boards Per Chassis	Per Fabric of Two or More Interconnected Chassis
Origin2000 Deskside:		interconnection is not supported
220 V, node boards in at least N1 and N2	6 (3 in slots 1-6, 3 in slots 7-12)	
220 V, node board in N1 only	3	
110 V, node boards in N1 and N2 only	3 (in any slots)	
110 V, node board in N1 only	3	
Onyx2 Deskside	3	interconnection is not supported
Origin2000 Rackmount	12 (6 in each module)	16
Onyx2 Rackmount	6	16

Note: A "fabric" is two or more modules that are interconnected with CrayLink™ Interconnect cables to form a single memory space.

1.2.5 Power Requirements

Table 1-4 summarizes the HIPPI-Serial XIO board's power consumption.

Table 1-4 Power and Current Specification for IRIS HIPPI-Serial XIO Board

Usage	Specification
Nominal power usage	33 watts
Maximum power usage	38 watts
Maximum current consumption	5 volts at 4.0 amps; 3.45 volts at 4.4 amps

1.2.6 Panel Plate and LED Behavior

The panel plate has one HIPPI-Serial port labeled with the optic wavelengths supported. For systems with multiple HIPPI boards, sticky labels can be placed on the panels to indicate the network interface that has been assigned to each port.

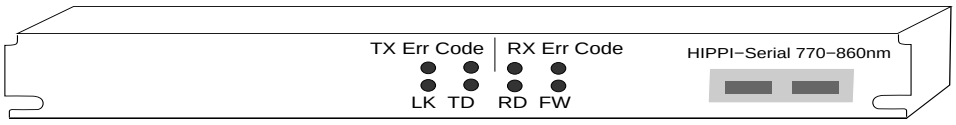


Figure 1-7 Panel Plate and LEDs for IRIS HIPPI-Serial XIO Board

The LEDs are labeled by the text above and below:

- green LEDs: **LK** (link), **TD** (transmit data), **RD** (receive data), and **FW** (firmware)
- yellow LEDs: **TX Error Code** and **RX Error Code**

The behavior of the LEDs is controlled by firmware in the R4640 processors. (This firmware is sometimes called "LINC firmware.") The firmware can be either the power-on (boot) code or the operational code. You can tell which firmware is currently running by looking at the LEDs, illustrated in Figure 1-8.

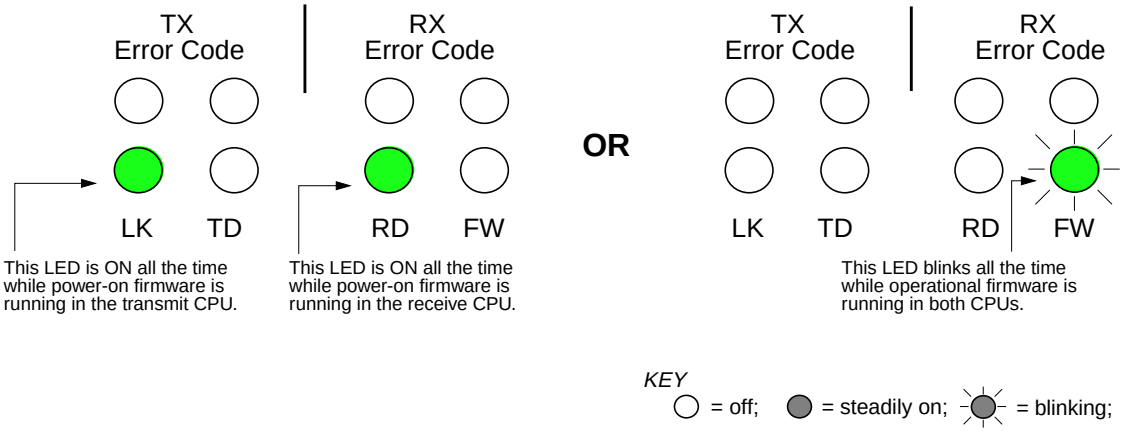


Figure 1-8 How LEDs Indicate Which Firmware is Running

Figure 1-9 illustrates the normal LED behavior when operational firmware is running. The behavior of each LED during operation (both normal and error conditions) is described in "LED Behavior When Operational Firmware is Running."

Figure 1-11 illustrates normal LED behavior during power-on. The behavior of each LED during power-on (both normal and error conditions) is described in "LED Behavior When Power-On Code is Running."

1.2.7 LED Behavior When Operational Firmware is Running

During operation, the green LEDs provide information about the state of the fiber-optic connection (LK), the traffic (RD and RD), and the state of the firmware (FW). Table 1-5 describes the normal LED behavior; Figure 1-9 illustrates this behavior. If one or more of the yellow (error code) LEDs is ON or BLINKING, the board is experiencing an error. When an error occurs, the LEDs behave as illustrated in Figure 1-10 and described in Table 1-6.

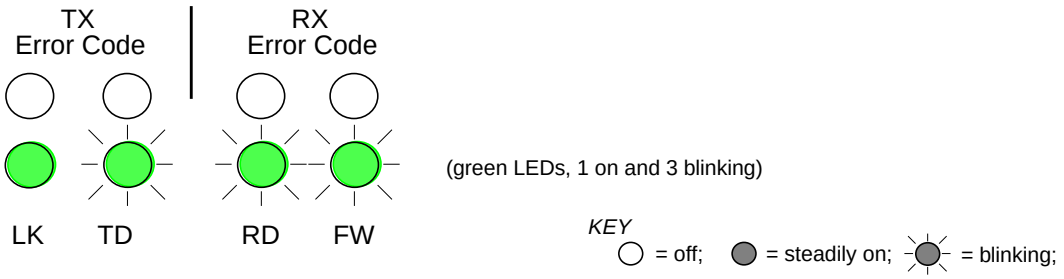


Figure 1-9 LED Behavior During Normal Operation

Table 1-5 Normal LED Behavior When Operational Firmware is Running

LED	Name / Color	Description
LK	LINK present / gr	1. LK = steadily ON: board's destination logic is able to lock (synchronize) with and correctly interpret all of the following inbound signals: fiber signal is detected (LINK is present), the HIPPI logic is in its operational state (in link state 2), the alternating Flag bit within the data frame is correct, and the OH8 (framing) overhead bit from the data stream is correct. 2. LK = OFF: one or more of the above-listed incoming signals cannot be detected or interpreted correctly. A connection may be loose, one of the fiber-optic cable ends may be dirty, or the remote system may be dysfunctional.
TD	Data transmitted / gr	Whenever TD BLINKS: one or more bytes have been transmitted.
RD	Data received / gr	Whenever RD BLINKS: one or more bytes have been received.
FW	Firmware state / gr	1. FW = BLINKING slowly: all firmware is running properly. 2. FW = BLINKING very fast: firmware is running properly, but board is operating in internal loopback mode. Do *hipcntl shutdown; hipcntl startup* to return board to non-loopback mode. 3. FW = steadily ON or OFF: firmware is not running. To restart firmware, do *hipcntl shutdown; hipcntl startup*.
TX Err Code	SRC error code / 2 yellow	1. Both = OFF: no error. 2. Both = ON: error in Receive logic. Observe RX Err Code LEDs. 3. One or both = BLINKING: error in Transmit logic. See Table 1-6.
RX Err Code	DST error code / 2 yellow	1. Both = OFF: no error. 2. Both = ON: error in Transmit logic. Observe TX Err Code LEDs. 3. One or both = BLINKING: error in Receive logic. See Table 1-6.

When operational firmware encounters an unrecoverable error, it halts the firmware (in both directions), categorizes the error, and communicates it through an error code. Each error code consists of two parts: a major code that identifies the type of error, and a minor code that indicates the specific problem, as summarized in Table 1-6. The codes are communicated in the *SYSLOG* file as well as through the yellow LEDs (illustrated in Figure 1-10).

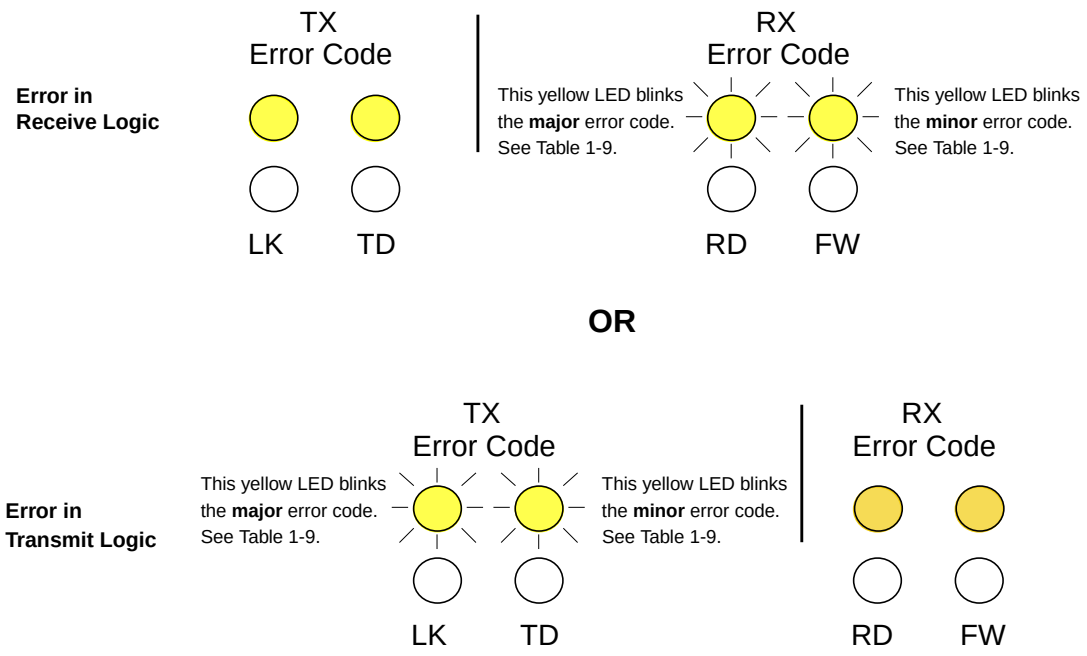


Figure 1-10 LED Behavior When Operational Firmware Encounters an Error

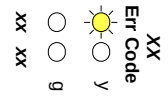
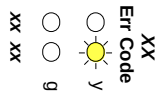
One Error Code (yellow) LED blinks the major code while the other one blinks the minor code. The two codes are blinked simultaneously. For example, to indicate that the firmware on the transmit HIPPI hardware did not boot (major_code=2, minor_code=4) the following behavior occurs:

- both yellow TX Error Code LEDs blink twice simultaneously
- the major code LED does not blink anymore
- the minor code LED continues to blink two more times

Table 1-6 Major and Minor Error Codes for Operational Firmware

Major Code	Minor Code	Description
1	1: vendor / device code does not match 2: built-in self-test (BIST) for this hardware's PCI bus failed 3: test for window size of configuration space failed 4: hardware failed to halt at boot time	Initialization of configuration memory space for HIPPI hardware interface (i.e., RoadRunner™ chip) failed.

Table 1-6 (continued) Major and Minor Error Codes for Operational Firmware

Major Code 	Minor Code 	Description
2	1: SSRAM test failed on first data pattern 2: SSRAM test failed on second data pattern 3: SSRAM test failed on address lines 4: firmware on this hardware did not boot 5: firmware on this hardware did not clear watchdog bit	Error occurred on HIPPI interface hardware (i.e., RoadRunner chip).
3	1: error on PPCI bus (between LINC chip and Bridge chip) 2: error on CPCI bus (between LINC chip and RoadRunner chip) 3: error in LINC chip's SDRAM 4: error on byte bus (between LINC chip and FLASH EEPROM) 5: error on SYSAD bus (between LINC chip and SDRAM) 6: error on DMA Engine 0 7: error on DMA Engine 1 8: error that cannot be categorized	Received an error interrupt
4 (LED is steady ON; does not blink)	0: none (LED is steady ON. Yes, ON.)	The firmware has stopped because of a major failure in the other direction's firmware. For example, when this pattern appears on the TX LEDs, the receive firmware is hung.
5	0: none (LED is OFF; no blinks)	Assertion (software) failure.

To capture the error codes in the *SYSLOG* file, invoke *hipcntl status*. The code for each set of LEDs is displayed as a hexadecimal numeral (*hexvalue*) in the following format:

hostname `unix: WARNING: hippi#:` *error_message*
`unix: hippi src error code =` *hexvalue*`; dst error code =` *hexvalue*

where the possible values for *hexvalue* are summarized in Table 1-7.

Table 1-7 Error Codes for SYSLOG File

hexvalue	Description
0bead000	SDRAM tests have completed successfully.
0bead100	Driver has started functioning.
0bead301	Testing has started of HIPPI hardware's (i.e., RoadRunner chip's) device / vendor identification.
0bead302	Testing has started of HIPPI hardware's (i.e., RoadRunner chip's) built-in self-test (BIST).
0bead303	Testing has started of HIPPI hardware's (i.e., RoadRunner chip's) window size.
0bead304	Testing has started of HIPPI hardware's (i.e., RoadRunner chip's) memory.
0bead400	Loading / booting the firmware for HIPPI hardware (i.e., RoadRunner chip) has started.
AceFace	Power-on (boot process) has completed successfully.
0a<*24-bit_errorcode*>	The operational firmware encountered an assertion failure. The error code is useful if you contact the Silicon Graphics Technical Assistance Center.
0d<*8-bit_major*><*16-bit_minor*>	The operational firmware encountered a failure. The exact error is described by the major and minor codes, as explained in Table 1-6.
0b<*8-bit_major*><*16-bit_minor*>	The power-on firmware died. The exact error is described by the major and minor codes, as explained in Table 1-9.

For example, when the firmware on the transmit HIPPI hardware does not boot (major_code=2, minor_code=4) the following message is placed in the *SYSLOG* file:

```
hostname unix: WARNING: hippi#:   dst 4650 asleep at cmd id=8
unix: hippi src error code = d020004; dst error code = d050000
```

1.2.8 LED Behavior When Power-On Code is Running

When the IRIS HIPPI-Serial XIO board is powering on, special power-on (boot) code initializes and tests the hardware. When the power-on code is running, the four TX LEDs (2 green and 2 yellow, as illustrated in Figure 1-11) and the four RX LEDs are driven separately to reflect the progress of the tests through the transmit and receive sections of the hardware. Within each set of four LEDs, one is ON to indicate that power-on firmware is running, two indicate the specific test that is currently in progress or that was in progress when an error was encountered, and one blinks only when an error is encountered. Table 1-8 summarize the LED patterns that represent each test (that is, the major codes). If an error occurs during a test, the fourth LED (indicated in Figure 1-11) blinks the minor code that provides more specific information about the error while the others continue to indicate which test was in progress. The minor error codes are summarized in Table 1-9. Once an error is encountered, the testing halts and all four LEDs display repeatedly the

pattern indicating the test and error. This behavior continues until the board is shutdown (e.g., *hipcntl shutdown*).

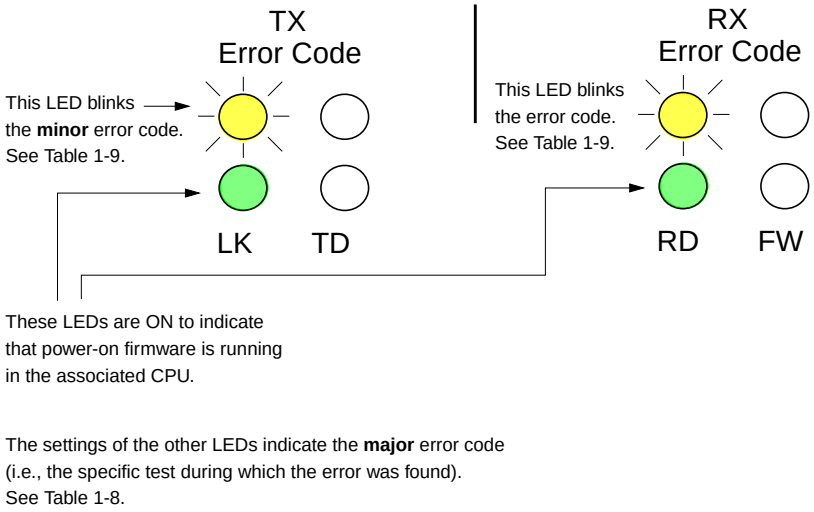
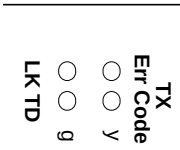
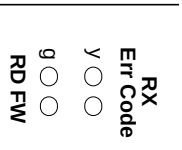
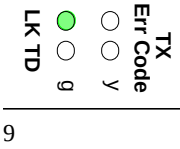
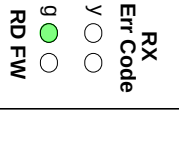
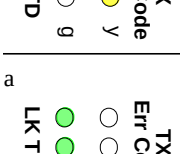
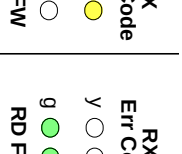
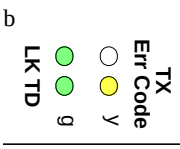
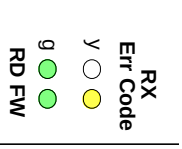
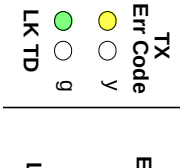
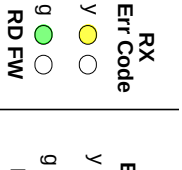
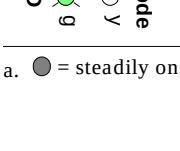
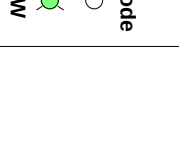


Figure 1-11 LED Behavior During Power-On

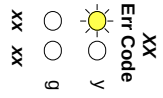
Table 1-8 Major Error Codes and LED Behavior for Power-On Firmware

Major Code (hexadecimal) and Pattern for TX Hardware	Description	Major Code (hexadecimal) and Pattern for RX Hardware
	All LEDs OFF.[a] Hardware is being reset. Reset turns the LEDs off.	
8 	Power-on code has entered the reset vector and is initializing the LINC and CPU.	8 
9 	Power-on code is configuring the Buffer Memory (SDRAM).	9 
a 	Power-on code is initializing the cache memory.	a 
b 	Power-on code is testing the Buffer Memory (SDRAM).	b 
c 	Power-on code has completed all memory tests and is preparing the operational firmware for execution.	c 
	Power-on code completed its diagnostics and initialization successfully. Waiting for initialization of firmware (i.e., *hipcntl startup*).	

a. ● = steadily on; ✳ = blinking; ○ = off.

Table 1-9 summarizes the meaning of the blinking codes displayed by the “Error Code” LED (illustrated in Figure 1-11) whenever a power-on test encounters an error.

Table 1-9 Minor Error Codes for Power-On Firmware

Minor Code 	Error Description
1 blink *code*=**2** (initial ON + 1 blink)	SDRAM failed its memory test.
2 blinks *code*=**3**	Cache exception was called.
3 blinks *code*=**4**	Code on FLASH EEPROM had incorrect checksum.
4 blinks *code*=**5**	FLASH EEPROM received an unexpected non-maskable interrupt (NMI).
5 blinks *code*=**6**	Unexpected exception was encountered.
6 blinks *code*=**7**	The power-on code did not find any operational firmware to run. It is spin-looping, waiting for a communication from the host operating system.

Chapter 2

Installation Instructions for Origin2000 Deskside Chassis

This chapter describes the steps for installing an IRIS HIPPI-Serial XIO board into an Origin2000 Deskside chassis.

2.1 Verify All Parts Are Available

Before starting the installation, open the IRIS HIPPI-Serial XIO Board box and verify that all the components are included. Table 2-1 lists the components.

Table 2-1 Component List for IRIS HIPPI-Serial XIO Board

Item	Quantity
IRIS HIPPI-Serial XIO Board in antistatic bag	1
IRIS HIPPI software on CD-ROM	1
Sheet of sticky labels for panel plate	1

2.2 Know How to Avoid Damaging the Board

Before starting the installation of the XIO board, do the following:

1. Know how to care for the compression connector on the board, as described in "Guidelines for Storing and Handling the Compression Connector on an XIO Board" in Chapter 1.
2. Understand the electrostatic discharge avoidance guidelines, as summarized in "Electrostatic Discharge" in Chapter 1.

   Caution: The IRIS HIPPI-Serial XIO board has components that are very sensitive to static electricity. This caution is real; it is not just a standard precaution.
3. Know how to safely handle fiber-optic cable, as described in "Cable Care and Cleaning" in Chapter 1.

2.3 Install and Configure IRIS HIPPI Software

If your system is currently up and running, save yourself time and extra system reboots, by installing and configuring the IRIS HIPPI software before you install the new board. Follow the instructions below:

1. Verify that the IRIS HIPPI software is installed:

   ```
   % versions hippi
   I   hippi   01/31/97   HIPPI Software, version
   ```

   If the IRIS HIPPI software is not installed or if the displayed *version* is earlier than 3.1, install it from the CD (or other source).

2. Follow the instructions in Chapter 2 of the *IRIS HIPPI Adminstrator's Guide* to configure (a) the IRIS HIPPI software (driver and daemons), and optionally, (b) the IP network interfaces for IRIS HIPPI (*hip#*).

2.4 Make System Safe

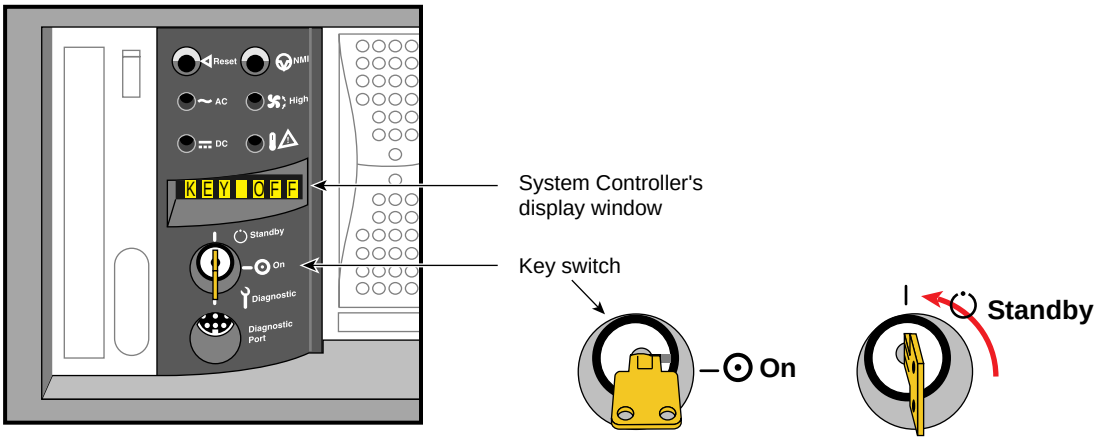
Before starting the installation, follow the instructions in this section to make the system and its surroundings physically safe for you.

Warning: **Failure to follow the instructions in this section can cause serious physical injury or death.**

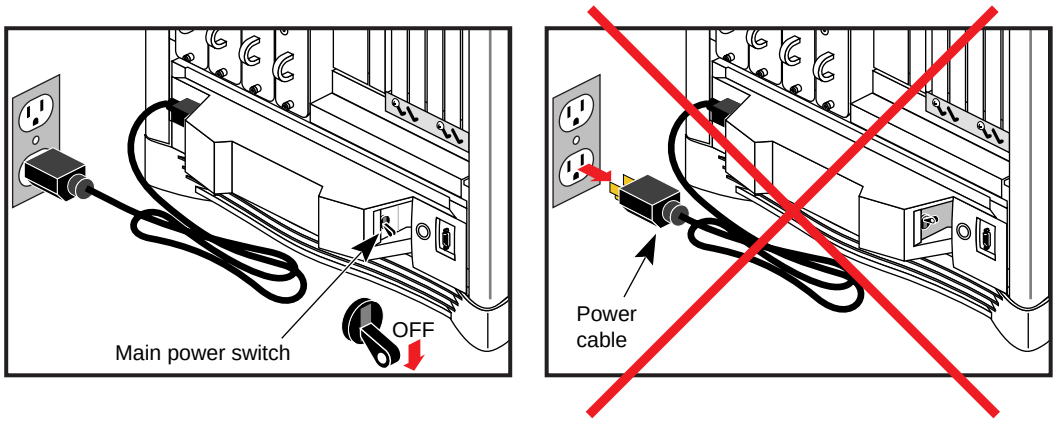
1. Shut down the software:

   ```
   % su
   Password: the_password
   # /etc/halt
   ```

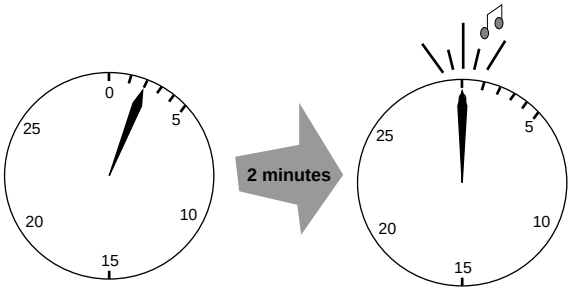
2. When the message appears indicating that it is safe to power off the system, turn the key switch on the System Controller to the STANDBY position.



3. At the rear of the system, flip the power switch (circuit breaker) OFF (down). Do not disconnect the power plug.



4. Wait 2 full minutes (after turning off the power) to allow the system's stored electrical charge to dissipate.



Warning: **Failure to wait may cause serious injury or death due to electrocution from power stored within the system components.**

2.5 Select and Prepare Slot

Follow the instructions in this section to select an appropriate XIO slot and prepare it for the installation.

1. Determine which XIO slots on the system are usable.

   Depending on the power supplied to the system (110 or 220 volts), the number of Node boards, and the number of processors in the system, the number of usable XIO slots can be 6 or 12. The *Origin2000 Deskside Owner's Guide*, and the *Origin2000 Deskside and Rackmount Installation Instructions* provide information that can help you determine which of the slots are activated and which can be used.

   Note: In general, if an Origin2000 Deskside system (illustrated in Figure 2-1) has a Node board in slot *N1* or *N3*, then XIO slots 1-6 are available. If it has a Node board in slot *N2* or *N4*, XIO slots 7-12 are available. If a chassis has at least two Node boards, one in *N1* or *N3* and one in *N2* or *N4*, then all 12 XIO slots are available.

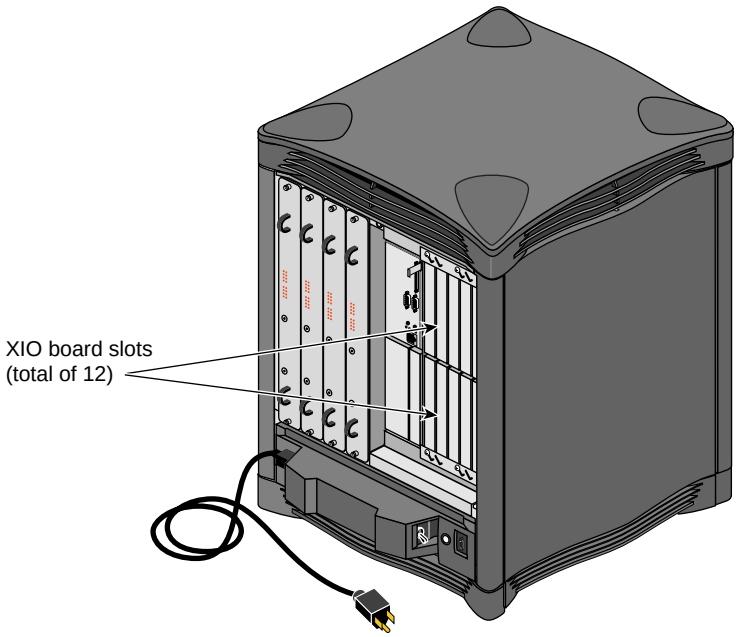


Figure 2-1 Rear of Origin2000 Deskside

2. Select a slot for the IRIS HIPPI-Serial XIO board.

   The IRIS HIPPI-Serial XIO board can be installed into any of the XIO slots (illustrated in Figure 2-2) including slots 1 and 2 that are designed to accommodate the BaseIO and Internal PCI Adapter options.

   In selecting a slot for the IRIS HIPPI-Serial board, it is recommended that you fill available odd-numbered slots before filling even-numbered ones, and that you fill lower-numbered slots before higher-numbered ones. For example, fill slot 3 before filling either slot 2 or slot 5, and fill slot 7 before slot 2.

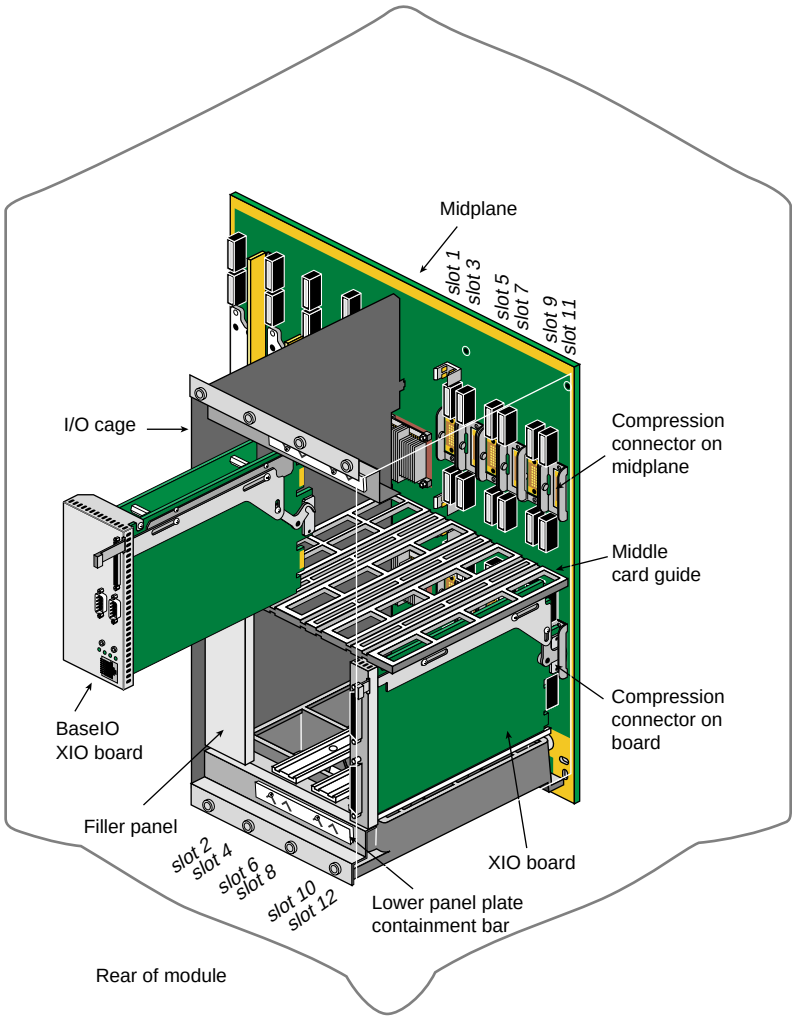


Figure 2-2 I/O Items in the Origin2000 Deskside Chassis

3. Ground yourself.

   Caution: Failure to ground yourself may result in irreparable damage to or malfunction of the IRIS HIPPI-Serial XIO board.

4. Locate the panel plate containment bar (illustrated in Figure 2-2) for the selected slot. For odd-numbered slots, the bar is above the panel plates. For even-numbered slots, the bar is below them.

5. Use 4-6 turns to loosen each of the bar's screws.

6. Pop the bar outwards (pull towards you), then slide it away (up or down) from the panel plates. You need to slide the bar over some rivets. The bar snaps into a holding position so that it stays out of the way.

7. For the selected slot, pull the knob of the blank panel plate to remove the blank XIO board. Store the blank board.

8. Proceed to the next section, "Install IRIS HIPPI-Serial XIO Board."

2.6 Install IRIS HIPPI-Serial XIO Board

This section describes how to install the IRIS HIPPI-Serial board into its XIO slot. You should still be grounded.

Caution: Exposure to electrostatic discharge may irreparably damage the IRIS HIPPI-Serial XIO board.

1. Remove the board from its anti-static bag and place it on top of the bag or on your antistatic work surface.
2. Remove the protective cap from the board's compression connector, as illustrated in Figure 2-3. Save this cap. You will need it to cover the compression connector if you remove the board for any reason.

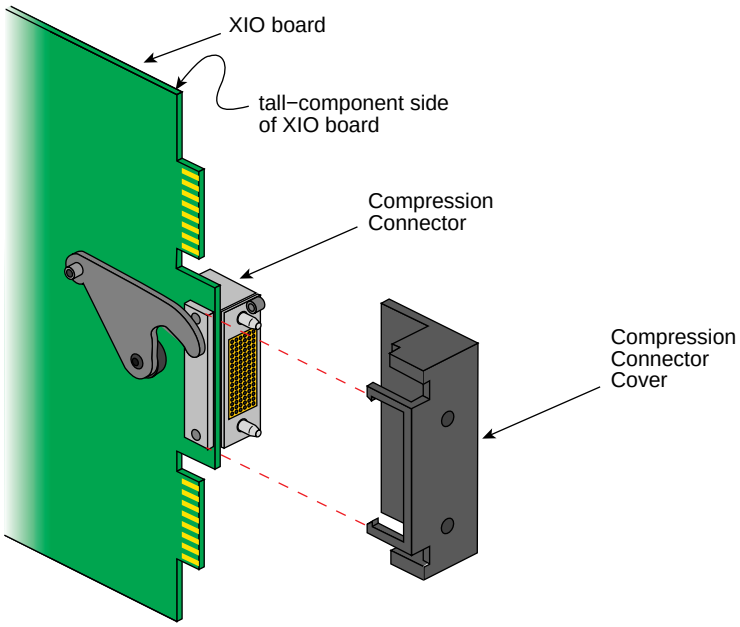


Figure 2-3 Removing the Protective Cap From the Compression Connector

3. Identify the tall-component side of the IRIS HIPPI-Serial XIO board. The tall-component side of the board is the side with the compression connector and the dual-SC receptacle.
4. Hold the board so that it is vertical and correctly oriented for the selected slot, as illustrated in Figure 2-4.

   For slots 1, 2, 5, 6, 9, and 10:
   the external HIPPI connector on the panel plate is at the top, as illustrated in Figure 2-4.

   For slots 3, 4, 7, 8, 11, and 12:
   the external HIPPI connector on the panel plate is at the bottom.

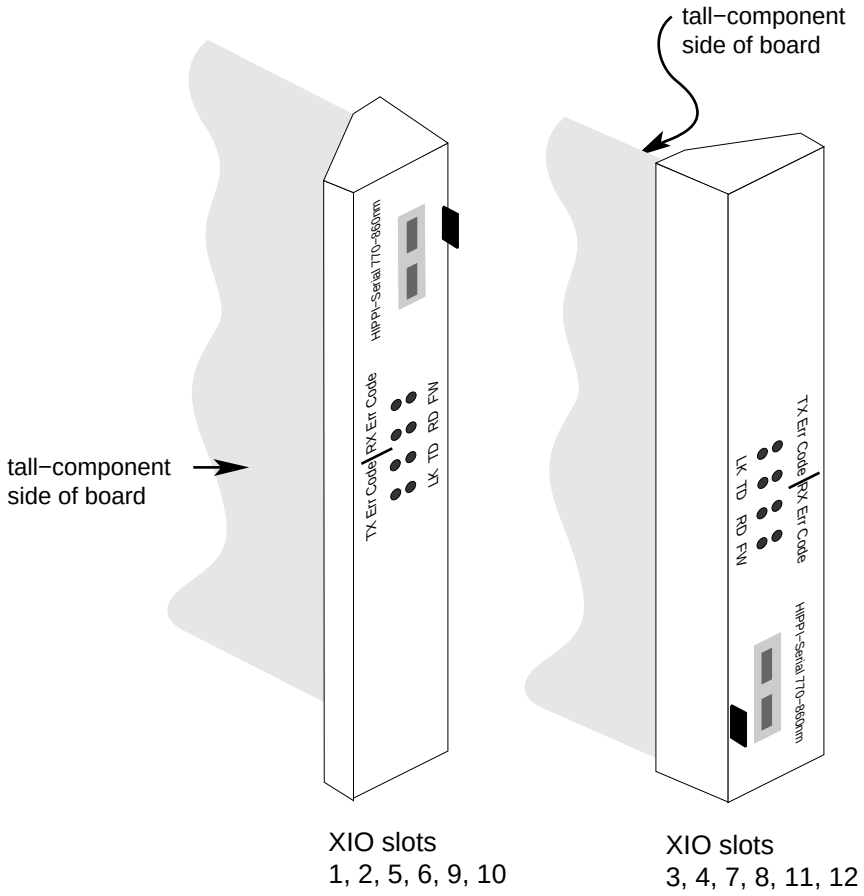


Figure 2-4 Proper Orientation for XIO Boards in Origin2000 Deskside Slots

5. Pull the actuator handle to open the compression connector hooks.
6. Position the board between the card guides and slide it into the chassis.

   Caution: Take care that no board components are damaged as you slide the board past other XIO boards in the chassis.

7. Verify that the board's panel plate is flush with the other panel plates. If it is not flush, check that the board is properly positioned between the card guides, then press gently until it is flush.
8. Push the hook actuator handle to lock the board to the midplane.

   Firmly push the handle of the actuator until it stops. Pushing on this handle engages the compression connector's hook with its lock on the midplane.

9. Slide the containment bar back into place so that it holds the panel plates. Tighten its screws.
10. Remove your wrist strap and proceed to "Attach HIPPI Cables."

2.7 Attach HIPPI Cables

This section describes the attachment of external HIPPI cables.

1. Locate the site's HIPPI-Serial fiber optic cable for this HIPPI connection.

   Note: This external cable is supplied by the customer. External cables and all cabling for the site's HIPPI switch fabric must conform to the HIPPI-Serial specification. See "Site Cabling" in Chapter 1 for complete details.

2. Optional: Put labels on the panel plate and cables.
3. Remove the protective cap from the cable's connector.

   Note: Do not touch the fiber-optic material.

4. Clean and dry the tip of each fiber within the cable, following the instructions in "Cable Care and Cleaning" in Chapter 1, by gently rubbing the tip with a soft, lint-free cloth that has been moistened with reagent grade isopropyl alcohol. If you do not have the proper equipment, skip this step.

   Note: Do not use prepared cleaning compounds, such as tape-head cleaner or denatured (rubbing) alcohol.

5. Remove (pull out) the protective plugs from the board's receptacle.
6. Attach the external HIPPI cable to the IRIS HIPPI port.

   Orient the cable's connector with the dual-SC receptacle on the board's panel plate. The receptacle is keyed to ensure proper orientation. Insert the connector until the 2 parts snap together.

7. Proceed to "Finish."

2.8 Finish

When the board is installed and connected, follow these instructions to start operation:

1. Flip the power switch ON.
2. Restart the system by turning the key on the module's System Controller to ON.
3. Log in.
4. If you have not installed and configured the IRIS HIPPI software, do so now by following the instructions in the *IRIS HIPPI Administrator's Guide*. The IRIS HIPPI connection cannot function until the software has been configured.

   Note: After you finish configuring the software, you must reboot the system (or run the *autoconfig* command) to build a new operating system (kernel) that includes the new driver. Then, you must again reboot the system to start running this new operating system.

5. Verify that the board has been located by the operating system during the bootup, with either of the following commands:

```
% hinv -d hippi
HIPPI-Serial adapter: unit#, in module# I/O slot#
```

```
% find /hw/module -name hippi
/hw/module/#/slot/io#/hippi_serial/pci/0/hippi
```

   where the pound signs (#) after module and slot should correctly identify the chassis and XIO slot into which you installed the board.

6. Verify that the board's LEDs indicate normal operation, as illustrated by Figure 1-9.

   If the LEDs indicate an error, use the following sequence of commands to verify the hardware's functionality while in internal loopback mode. If the commands below succeed, the IRIS HIPPI hardware is functional; follow the instructions in Table 1-5 to locate the cause of the abnormal LED behavior. If these commands fail, re-install the IRIS HIPPI product. If the problem persists, contact the Silicon Graphics Technical Assistance Center.

```
# hipcntl hippi# shutdown
# hipcntl hippi# loopback
# hipcntl hippi# startup
# hiptest -D /dev/hippi# 16 10
sending 10 packets, size range [16], to I-field 0x01000001
. . . . . .
<when finished>
# hipcntl hippi# shutdown
# hipcntl hippi# startup
```

7. Verify that the board is operational by following the verification tests described in Chapter 3 of the *IRIS HIPPI Administrator's Guide*.

Chapter 3

Installation Instructions for Onyx2 Deskside Chassis

This chapter describes the steps for installing an IRIS HIPPI-Serial XIO board into an Onyx2 Deskside chassis.

3.1 Verify All Parts Are Available

Before starting the installation, open the IRIS HIPPI-Serial XIO Board box and verify that all the components are included. Table 3-1 lists the components.

Table 3-1 Component List for IRIS HIPPI-Serial XIO Board

Item	Quantity
IRIS HIPPI-Serial XIO Board in antistatic bag	1
IRIS HIPPI software on CD-ROM	1
Sheet of sticky labels for panel plate	1

3.2 Know How to Avoid Damaging the Board

Before starting the installation of the XIO board, do the following:

1. Know how to care for the compression connector on the board, as described in "Guidelines for Storing and Handling the Compression Connector on an XIO Board" in Chapter 1.
2. Understand the electrostatic discharge avoidance guidelines, as summarized in "Electrostatic Discharge" in Chapter 1.

   Caution: The IRIS HIPPI-Serial XIO board has components that are very sensitive to static electricity. This caution is real; it is not just a standard precaution.
3. Know how to safely handle fiber-optic cable, as described in "Cable Care and Cleaning" in Chapter 1.

3.3 Install and Configure IRIS HIPPI Software

If your system is currently up and running, save yourself time and extra system reboots by installing and configuring the IRIS HIPPI software before you install the new board. Follow the instructions below:

1. Verify that the IRIS HIPPI software is installed:

   ```
   % versions hippi
   I   hippi   01/31/97   HIPPI Software, version
   ```

   If the IRIS HIPPI software is not installed or if the displayed *version* is earlier than 3.1, install it from the CD (or other source).

2. Follow the instructions in Chapter 2 of the *IRIS HIPPI Adminstrator's Guide* to configure (a) the IRIS HIPPI software (driver and daemons), and optionally, (b) the IP network interfaces for IRIS HIPPI (*hip#*).

3.4 Make System Safe

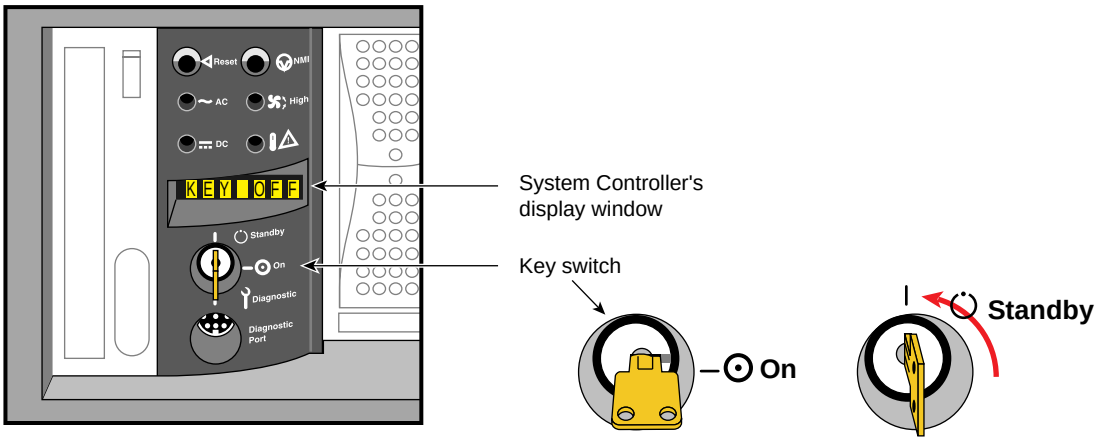
Before starting the installation, follow the instructions in this section to make the system and its surroundings physically safe for you.

Warning: **Failure to follow the instructions in this section can cause serious physical injury or death.**

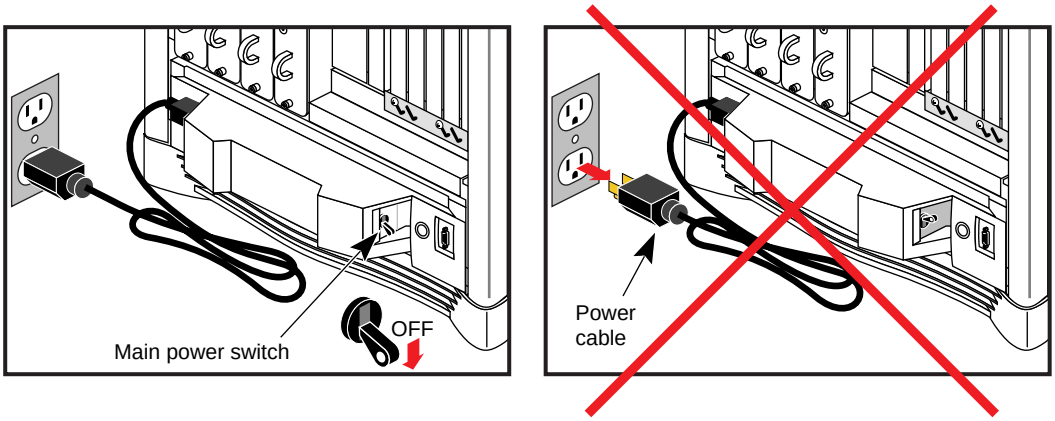
1. Shut down the software:

   ```
   % su
   Password: the_password
   # /etc/halt
   ```

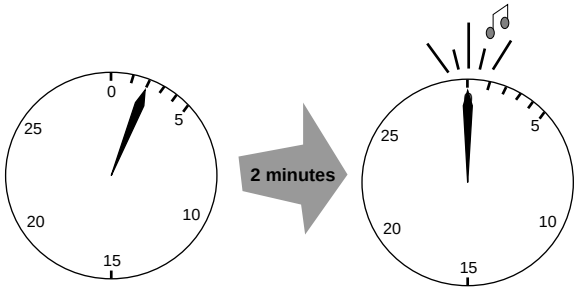
2. When the message appears indicating that it is safe to power off the system, turn the key switch on the System Controller to the STANDBY position.



3. At the rear of the system, flip the power switch (circuit breaker) OFF (down). Do not disconnect the power plug.



4. Wait 2 full minutes after turning off the power to allow the system's stored electrical charge to dissipate.



Warning: **Failure to wait may cause serious injury or death due to electrocution from power stored within the system components.**

3.5 Select and Prepare Slot

Follow the instructions in this section to select an appropriate XIO slot and prepare it for the installation.

1. Determine which XIO slots on the system are usable.

   The Onyx2 Deskside (illustrated in Figure 3-1) chassis has 6 XIO slots, of which 4 are available for optional XIO boards: 2, 3, 5, and 6.

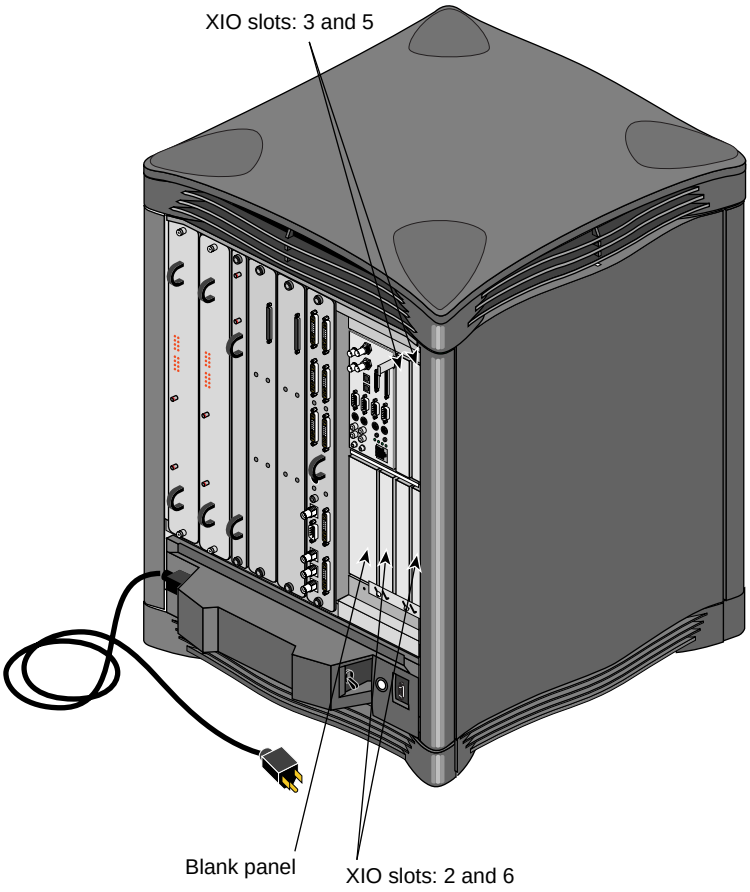


Figure 3-1 Rear of Onyx2 Deskside Chassis

2. Select a slot for the IRIS HIPPI-Serial XIO board.

   The IRIS HIPPI-Serial XIO board can be installed into XIO slot 2, 3, 5, or 6 (illustrated in Figure 3-2). Slot 2 can accommodate either the IRIS HIPPI-Serial or the Internal PCI Adapter (box) option.

   Note: Slot 4 cannot be used for the IRIS HIPPI-Serial board.

   In selecting a slot, it is recommended that you fill available odd-numbered slots before filling even-numbered ones, and that you fill lower numbered slots before higher numbered ones. For example, fill slot 3 before filling either slot 2 or slot 5.

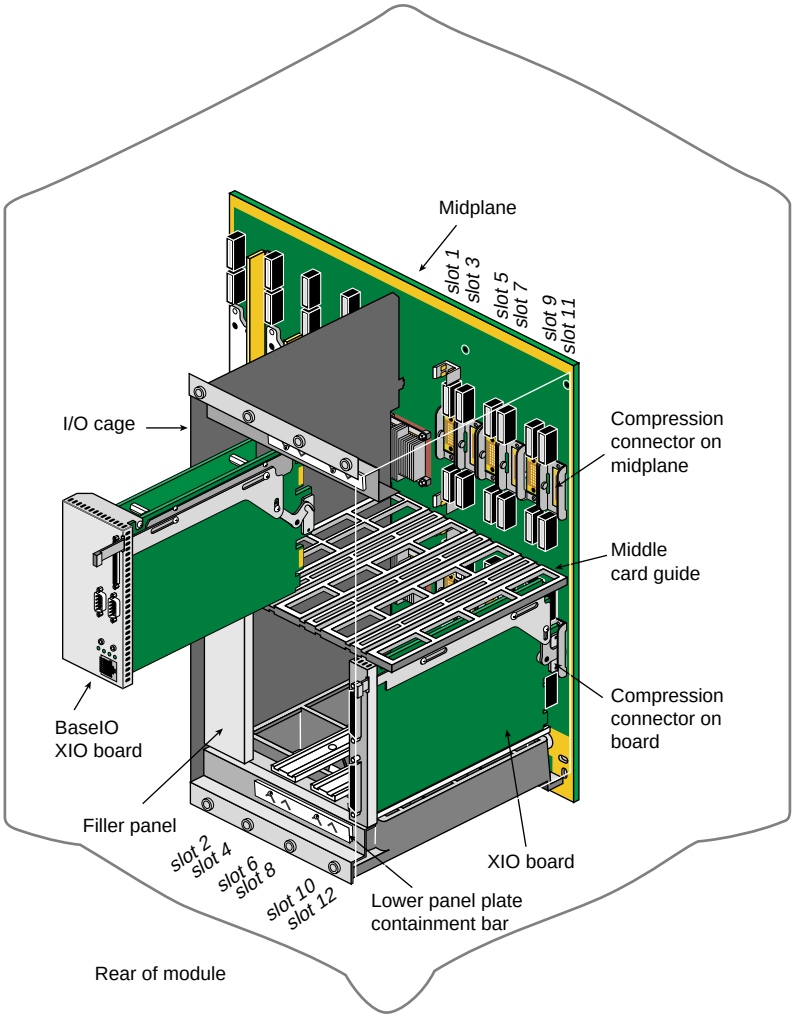


Figure 3-2 XIO Items in Onyx2 Deskside Chassis

3. Ground yourself.

   Caution: Failure to ground yourself may result in irreparable damage to or malfunction of the IRIS HIPPI-Serial XIO board.

4. Locate the panel plate containment bar (illustrated in Figure 3-2) for the selected slot. For odd-numbered slots, the bar is above the panel plates. For even-numbered slots, the bar is below them.
5. Use 4-6 turns to loosen each screw along the bar.
6. Pop the bar outwards (pull towards you), then slide it away (up or down) from the panel plates. You need to slide the bar over some rivets. The bar snaps into a holding position so that it stays out of the way.
7. For the selected slot, remove the blank XIO board. Store it away.
8. Proceed to “Install IRIS HIPPI-Serial XIO Board.”

3.6 Install IRIS HIPPI-Serial XIO Board

This section describes how to install the IRIS HIPPI-Serial board into its XIO slot. You should still be grounded.

Caution: Exposure to electrostatic discharge may irreparably damage the IRIS HIPPI-Serial XIO board.

1. Remove the board from its anti-static bag and place it on top of the bag or on your antistatic work surface.
2. Remove the protective cap from the board's compression connector, as illustrated in Figure 3-3. Save this cap. You will need it to cover the compression connector if you remove the board for any reason.

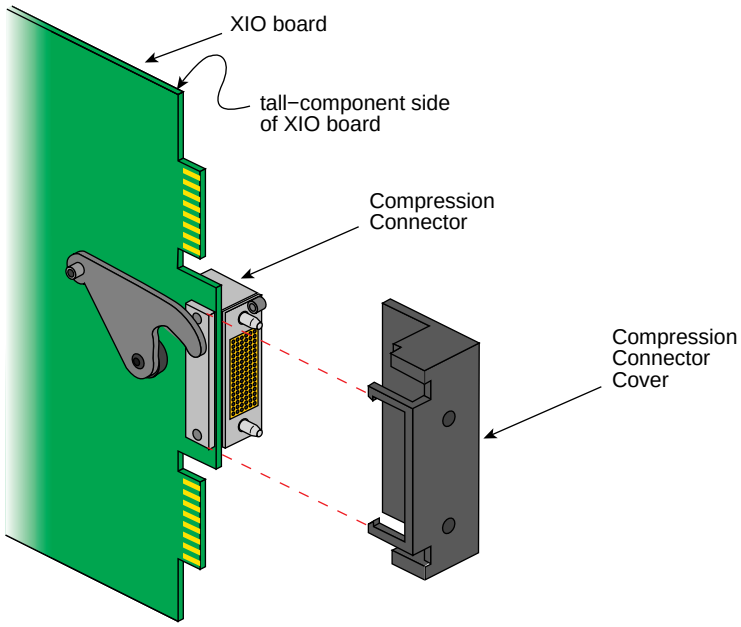


Figure 3-3 Removing the Protective Cap From the Compression Connector

3. Identify the tall-component side of the IRIS HIPPI-Serial XIO board. The tall-component side of the board has the compression connector and the dual-SC receptacle.
4. Hold the board so that it is vertical and correctly oriented for the selected slot, as illustrated in Figure 3-4.

   For slots 2, 5, and 6:
   the external HIPPI connector on the panel plate is at the top.

   For slot 3:
   the external HIPPI connector on the panel plate is at the bottom.

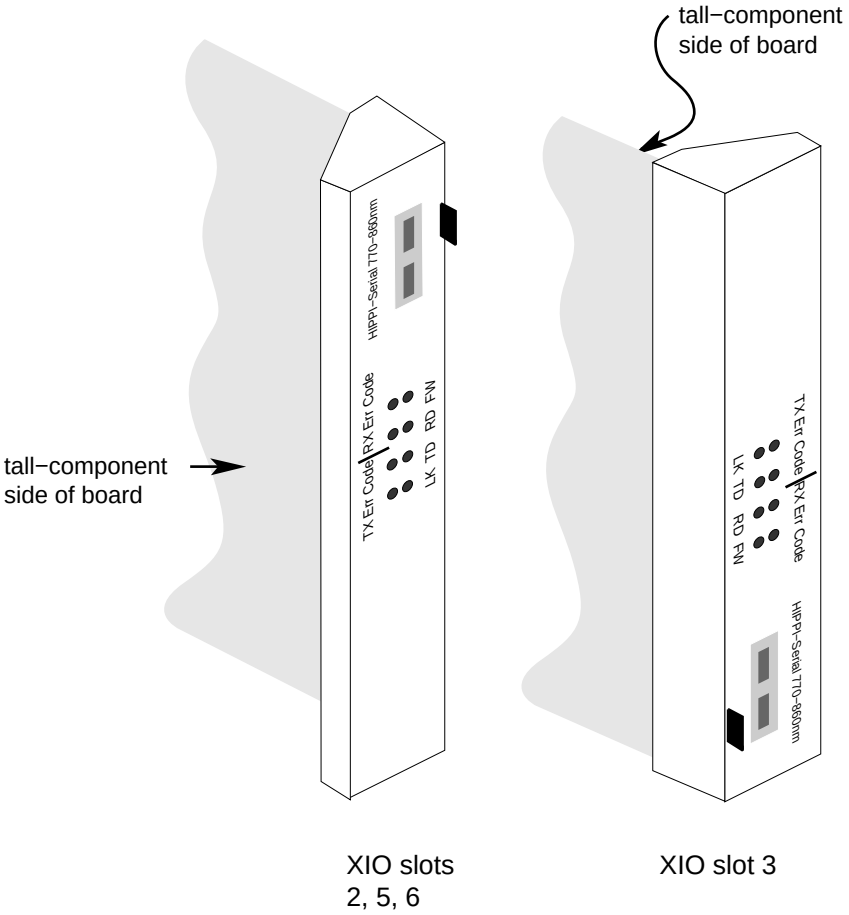


Figure 3-4 Proper Orientation for XIO Boards in Onyx2 Deskside Slots

5. Pull the actuator handle to open the compression connector hooks.
6. Position the board between the card guides and slide it into the chassis.

   Caution: Take care that no board components are damaged as you slide the board past other XIO boards in the chassis.

7. Verify that the board's panel plate is flush with the other panel plates. If it is not flush, check that the board is properly positioned between the card guides, then press gently until it is flush.
8. Push the hook actuator handle to lock the board to the midplane.

   Firmly push the handle of the actuator until it stops. Pushing on this handle engages the compression connector's hook with its lock on the midplane.

9. Slide the containment bar back into place so that it holds the panel plates. Tighten its screws.
10. Remove your wrist strap and proceed to "Attach HIPPI Cables."

3.7 Attach HIPPI Cables

This section describes the attachment of external HIPPI cables.

1. Locate the site's HIPPI-Serial fiber optic cable for this HIPPI connection.

   Note: This external cable is supplied by the customer. External cables and all cabling for the site's HIPPI switch fabric must conform to the HIPPI-Serial specification. See "Site Cabling" in Chapter 1 for complete details.

2. Optional: Put labels on the panel plate and cables.
3. Remove the protective cap from the cable's connector.

   Note: Do not touch the fiber-optic material.

4. Clean and dry the tip of each fiber within the cable, following the instructions in "Cable Care and Cleaning" in Chapter 1, by gently rubbing the tip with a soft, lint-free cloth that has been moistened with reagent grade isopropyl alcohol. If you do not have the proper equipment, skip this step.

   Note: Do not use prepared cleaning compounds, such as tape-head cleaner or denatured (rubbing) alcohol.

5. Remove (pull out) the protective plugs from the board's receptacle.
6. Attach the external HIPPI cable to the IRIS HIPPI port.

   Orient the cable's connector with the dual-SC receptacle on the board's panel plate. The receptacle is keyed to ensure proper orientation. Insert the connector until the two parts snap together.

7. Proceed to "Finish."

3.8 Finish

When the board is installed and connected, follow these instructions to start operation:

1. Flip the power switch ON.
2. Restart the system by turning the key on the module's System Controller to ON.
3. Log in.
4. If you have not installed and configured the IRIS HIPPI software, do so now by following the instructions in the *IRIS HIPPI Administrator's Guide*. The IRIS HIPPI connection cannot function until the software has been configured.

   Note: After you finish configuring the software, you must reboot the system (or run the *autoconfig* command) to build a new operating system (kernel) that includes the new driver. Then, you must again reboot the system to start running this new operating system.

5. Verify that the board has been located by the operating system during the bootup, with either of the following commands:

```
% hinv -d hippi
HIPPI-Serial adapter: unit#, in module# I/O slot#
```

```
% find /hw/module -name hippi
/hw/module/#/slot/io#/hippi_serial/pci/0/hippi
```

   where the pound signs (#) after module and slot should correctly identify the chassis and XIO slot into which you installed the board.

6. Verify that the board's LEDs indicate normal operation, as illustrated by Figure 1-9.

   If the LEDs indicate an error, use the following sequence of commands to verify the hardware's functionality while in internal loopback mode. If the commands below succeed, the IRIS HIPPI hardware is functional; follow the instructions in Table 1-5 to locate the cause of the abnormal LED behavior. If these commands fail, re-install the IRIS HIPPI product. If the problem persists, contact the Silicon Graphics Technical Assistance Center.

```
# hipcntl hippi# shutdown
# hipcntl hippi# loopback
# hipcntl hippi# startup
# hiptest -D /dev/hippi# 16 10
sending 10 packets, size range [16], to I-field 0x01000001
. . . . . .
<when finished>
# hipcntl hippi# shutdown
# hipcntl hippi# startup
```

7. Verify that the board is operational by following the verification tests described in Chapter 3 of the *IRIS HIPPI Administrator's Guide*.

Chapter 4

Installation Instructions for Origin2000 and Onyx2 Rackmount Chassis

This chapter describes the steps for installing an IRIS HIPPI-Serial XIO board into an Origin2000 or Onyx2 Rackmount chassis.

4.1 Verify All Parts Are Available

Before starting the installation, open the IRIS HIPPI-Serial XIO Board box and verify that all the components are included. Table 4-1 lists the components.

Table 4-1 Component List for IRIS HIPPI-Serial XIO Board

Item	Quantity
IRIS HIPPI-Serial XIO Board in antistatic bag	1
IRIS HIPPI software on CD-ROM	1
Sheet of sticky labels for panel plate	1

4.2 Know How to Avoid Damaging the Board

Before starting the installation of the XIO board, do the following:

1. Know how to care for the compression connector on the board, as described in "Guidelines for Storing and Handling the Compression Connector on an XIO Board" in Chapter 1.
2. Understand the electrostatic discharge avoidance guidelines, as summarized in "Electrostatic Discharge" in Chapter 1.

   Caution: The IRIS HIPPI-Serial XIO board has components that are very sensitive to static electricity. This caution is real; it is not just a standard precaution.
3. Know how to safely handle fiber-optic cable, as described in "Cable Care and Cleaning" in Chapter 1.

4.3 Install and Configure IRIS HIPPI Software

If your system is currently up and running, save yourself time and extra system reboots by installing and configuring the IRIS HIPPI software before you install the new board. Follow the instructions below:

1. Verify that the IRIS HIPPI software is installed:

   ```
   % versions hippi
   I   hippi   01/31/97   HIPPI Software, version
   ```

   If the IRIS HIPPI software is not installed or if the displayed *version* is earlier than 3.1, install it from the CD (or other source).

2. Follow the instructions in Chapter 2 of the *IRIS HIPPI Adminstrator's Guide* to configure (a) the IRIS HIPPI software (driver and daemons), and optionally, (b) the IP network interface for IRIS HIPPI (*hip#*).

4.4 Select a Slot for the Board

Follow the instructions in this section to select an appropriate XIO slot. Table 4-2 summarizes the rules that must be followed during this selection process.

Table 4-2 Rackmount Slot Selection Rules for the IRIS HIPPI-Serial XIO Board

Description of Rule	Restriction
XIO slots that are physically compatible for installation of an IRIS HIPPI-Serial XIO board	all slots (that is, slots 1-12 in each module[a])
Absolute maximum number of IRIS HIPPI-Serial XIO boards in one interconnected system of shared memory	16 boards
Absolute maximum number of IRIS HIPPI-Serial XIO boards in one Origin2000 Rackmount chassis (i.e., two modules in the rack)	12
Absolute maximum number of IRIS HIPPI-Serial XIO boards in one Onyx2 Rackmount chassis	6
Absolute maximum number of IRIS HIPPI-Serial XIO boards in one module	6 boards
Recommended maximum number of IRIS HIPPI-Serial XIO boards in slots 1-6 or in slots 7-12	3 boards

a. Each Origin2000 Rackmount chassis contains 2 modules (one upper and one lower) that both provide XIO slots. Each Onyx2 Rackmount chassis has 1 module that provides XIO slots.

1. If installing the board into a system of interconnected racks, determine the rack into which you are going to install the board.
2. Within the selected rack, determine which module (that is, the upper or the lower module) you are going to work on.

   Note: In an Onyx2 Rackmount, the graphics module cannot accommodate any XIO boards; only the processor module has XIO slots.

3. Determine which XIO slots in the selected module are usable. Figure 4-1 illustrates the XIO slots in a processor module.

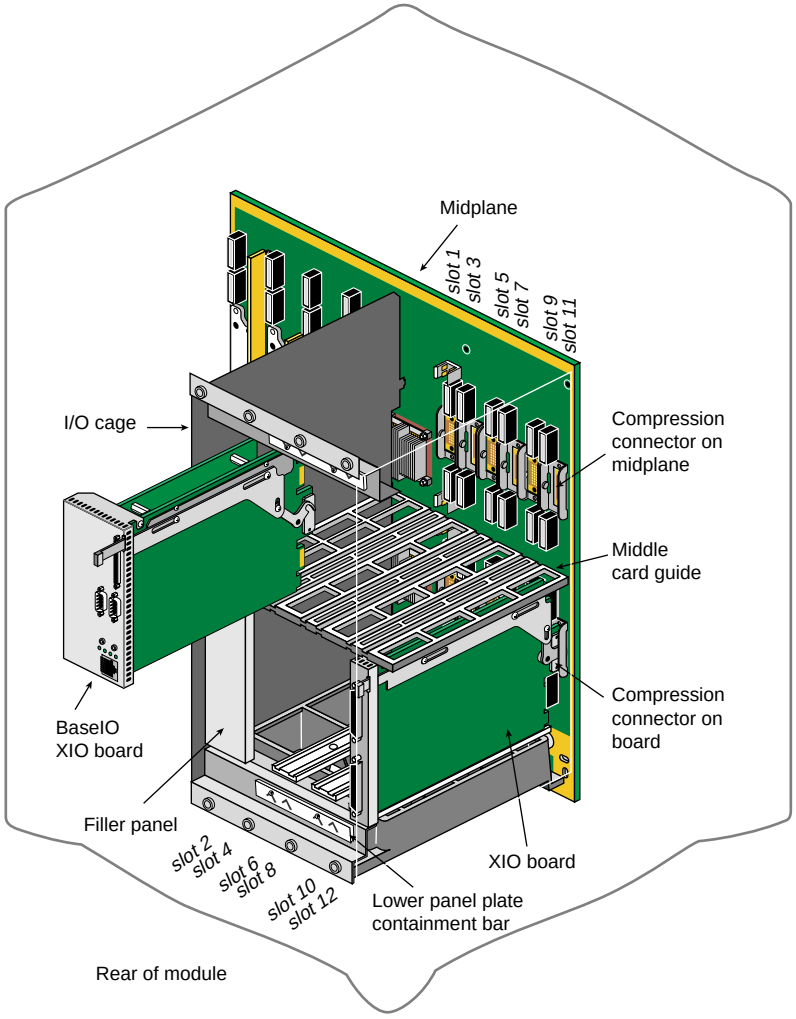


Figure 4-1 I/O Items in One Processor Module of an Origin2000 or Onyx2 Rackmount Chassis

Depending on the number of Node boards, the count of usable XIO slots in a module can be 6 or 12. The *Origin2000 Deskside and Rackmount Installation Instructions* or the *Onyx2 Rackmount Installation Instructions* provide information that can help you determine which of the slots are activated and which can be used.

Note: In general, if a module has a Node board in slot *N1* or *N3*, then XIO slots 1-6 are available. If it has a Node board in slot *N2* or *N4*, XIO slots 7-12 are available. If a module has at least two Node boards, one in *N1* or *N3* and one in *N2* or *N4*, then all 12 XIO slots are available.

4. Select a slot for the IRIS HIPPI-Serial XIO board.

   The IRIS HIPPI-Serial XIO board can be installed into any of the XIO slots, including slots 1 and 2 (illustrated in Figure 4-1) that are designed to accommodate the BaseIO and Internal PCI Adapter options.

   In selecting a slot for the IRIS HIPPI-Serial board, it is recommended that you fill available odd-numbered slots before filling even-numbered ones, and that you fill lower-numbered slots before higher-numbered ones. For example, fill slot 3 before filling either slot 2 or slot 5, and fill slot 7 before slot 2.

4.5 Make System Safe and Prepare for the Installation

Follow the instructions in this section to make the system and its surroundings physically safe for you and to prepare the slot for installation. Figure 4-2 and Figure 4-3 illustrate the features on a rackmounted system that are most relevant to this task.

Warning: **Failure to follow the instructions in this section can cause serious physical injury or death.**

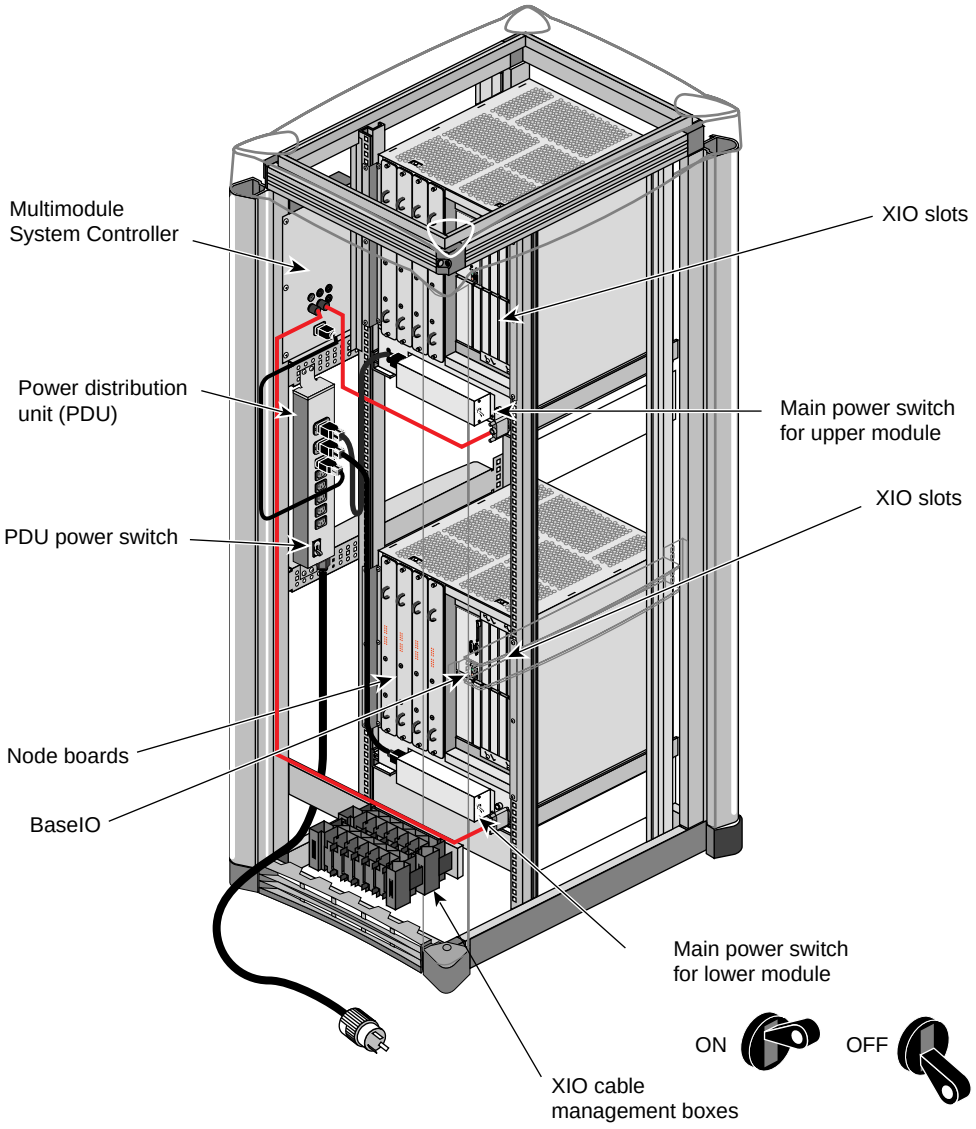


Figure 4-2 Rear of an Origin2000 Rackmount Chassis

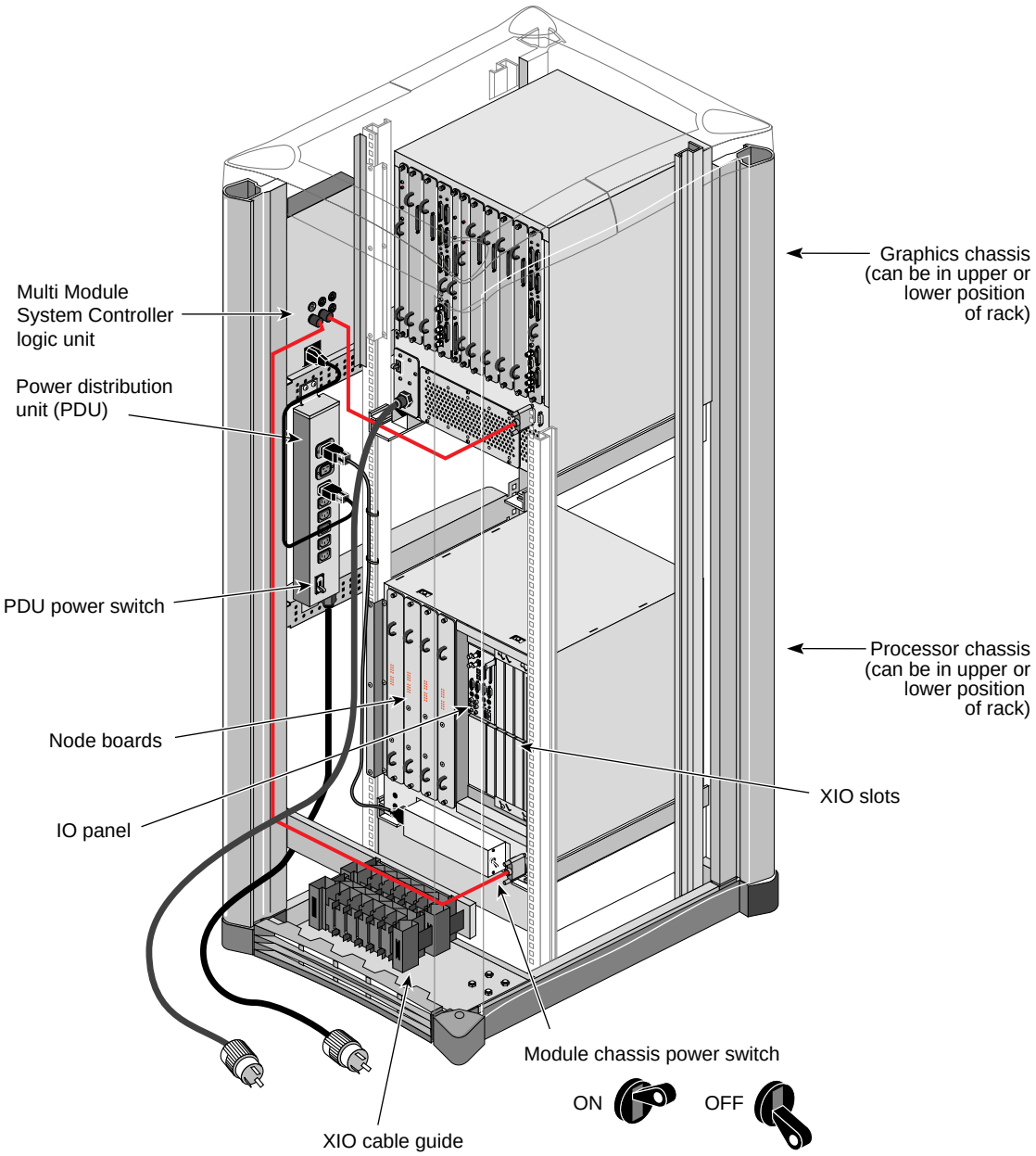


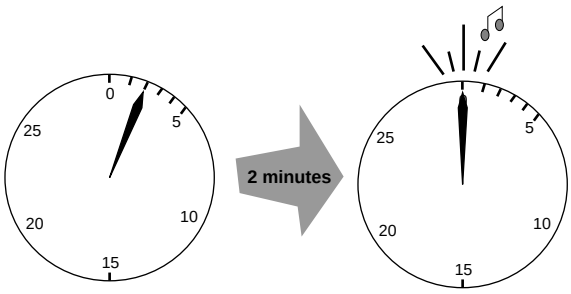
Figure 4-3 Rear of an Onyx2 Rackmount Chassis

1. Shut down the software for the system:

```
% su
Password: the_password
# /etc/halt
```

2. When the message appears indicating that it is safe to power off the system, follow the appropriate set of power off instructions for the system configuration. These instructions are located in chapter 10 of the *Origin2000 and Onyx2 Deskside and Rackmount Installation Instructions.*

   Caution: Make sure that you have flipped the module's power switch OFF (down) and waited 2 full minutes (after turning off the power) to allow the chassis' stored electrical charge to dissipate.



   Warning: Failure to wait may cause serious injury or death due to electrocution from power stored within the system components.

3. Locate the panel plate containment bar (illustrated in Figure 4-1) for the selected slot. For odd-numbered slots, the bar is above the panel plates. For even-numbered slots, the bar is below them.
4. Use 4-6 turns to loosen each of the bar's screws.
5. Pop the bar outwards (pull towards you), then slide it diagonally away (up or down) from the panel plates. You need to slide the bar over some rivets. The bar snaps into a holding position so that it stays out of the way.
6. For the selected slot, use the knob on the blank panel plate to pull the blank XIO board out of the slot. Store the blank board away.
7. Proceed to the next section, "Install IRIS HIPPI-Serial XIO Board."

4.6 Install IRIS HIPPI-Serial XIO Board

This section describes how to install the IRIS HIPPI-Serial board into its XIO slot.

1. Ground yourself.

   Caution: Failure to ground yourself may result in irreparable damage to or malfunction of the IRIS HIPPI-Serial XIO board.

2. Remove the board from its anti-static bag and place it on top of the bag or on your antistatic work surface.
3. Remove the protective cap from the board's compression connector, as illustrated in Figure 4-4. Save this cap. You will need it to cover the compression connector if you remove the board for any reason.

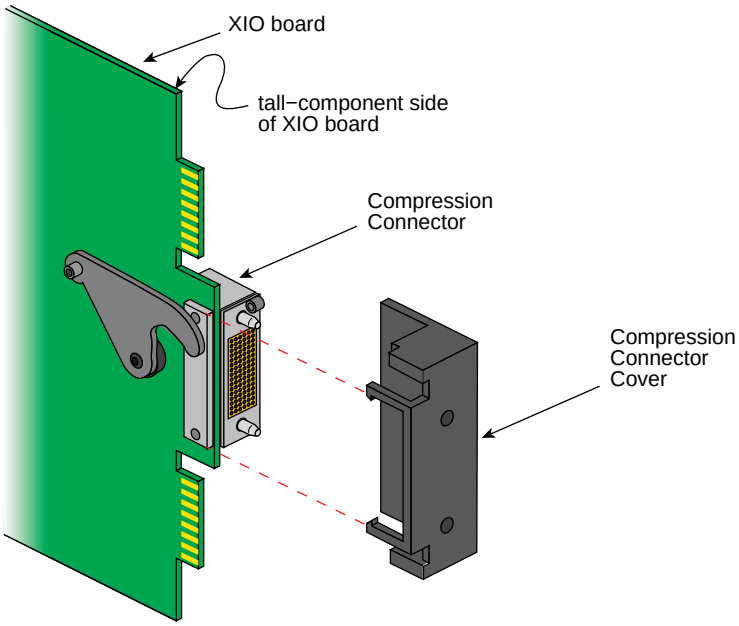


Figure 4-4 Removing the Protective Cap From the Compression Connector

4. Identify the tall-component side of the IRIS HIPPI-Serial XIO board. The tall-component side of the board has the compression connector and the dual-SC receptacle.
5. Hold the board so that it is vertical and correctly oriented for the selected slot, as illustrated in Figure 4-5.

   For slots 1, 2, 5, 6, 9, and 10:
   the external HIPPI connector on the panel plate is at the top.

   For slots 3, 4, 7, 8, 11, and 12:
   the external HIPPI connector on the panel plate is at the bottom.

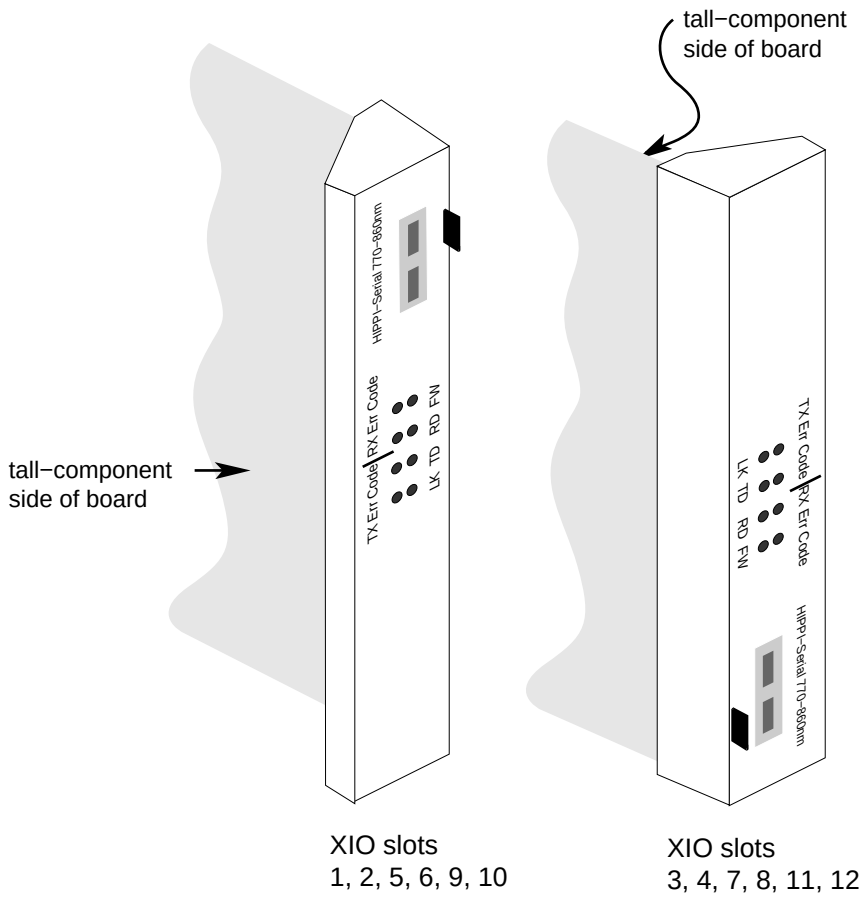


Figure 4-5 Proper Orientation for XIO Boards in Slots

6. Pull the actuator handle to open the compression connector hooks.
7. Position the board between the card guides. Slide it into the chassis.

   Caution: Take care not to damage components on other XIO boards as you slide the board into the chassis.

8. Verify that the board's panel plate is flush with the other panel plates. If it is not flush, check that the board is properly positioned between the card guides, then press gently until it is flush.

   Caution: Be firm, but gentle. Do not jiggle or rock the board. Do not apply excessive pressure.The compression connector (either on the board or on the midplane) could be irreparably damaged. If necessary, remove the board and start over.

9. Push the hook actuator handle to lock the board to the midplane.

   Firmly push the handle of the actuator until it stops. Pushing on this handle engages the compression connector's hook with its lock on the midplane.

10. Reposition the containment bar and tighten its screws.
11. Remove your wrist strap and proceed to the next section, "Attach HIPPI Cables."

4.7 Attach HIPPI Cables

This section describes the attachment and placement of external HIPPI cables into XIO cable management boxes. Figure 4-2 and Figure 4-3 illustrate all the cable management boxes available in a rack; Figure 4-6 illustrates upper module XIO cables arranged in one of the boxes.

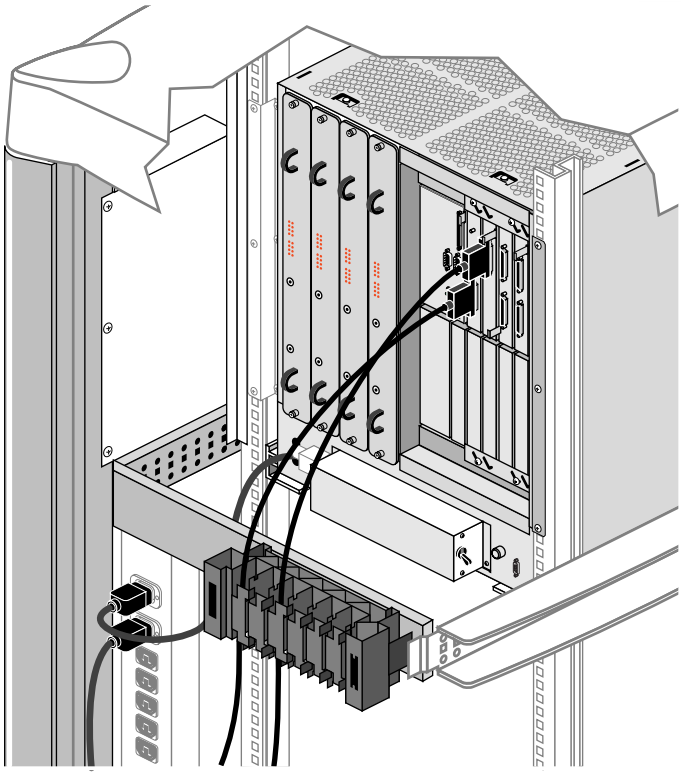


Figure 4-6 XIO Cable Management Box

1. Locate the site's HIPPI-Serial fiber optic cable for this HIPPI connection.

   Note: This external cable is supplied by the customer. External cables and all cabling for the site's HIPPI switch fabric must conform to the HIPPI-Serial specification. See "Site Cabling" in Chapter 1 for complete details.

2. Optional: Put labels on the panel plate and cables.

3. Remove the protective cap from the cable's connector.

   Note: Do not touch the fiber-optic material.

4. Clean and dry the tip of each fiber within the cable, following the instructions in "Cable Care and Cleaning" in Chapter 1, by gently rubbing the tip with a soft, lint-free cloth that has been moistened with reagent grade isopropyl alcohol (isopropanol 92%). If you do not have the proper equipment, skip this step.

   Note: Do not use prepared cleaning compounds, such as tape-head cleaner or denatured (rubbing) alcohol.

5. Remove (pull out) the protective plugs from the board's receptacle.

6. Attach the external HIPPI cable to the IRIS HIPPI port.

   Orient the cable's connector with the dual-SC receptacle on the board's panel plate. The receptacle is keyed to ensure proper orientation. Insert the connector until the two parts snap together.

7. Arrange the cable in the appropriate cable management box.

   Open one stable by flipping the looped ends of the securing band (o-ring) out of the slots on the stable dividers, and swinging the door outward, as illustrated in Figure 4-7.

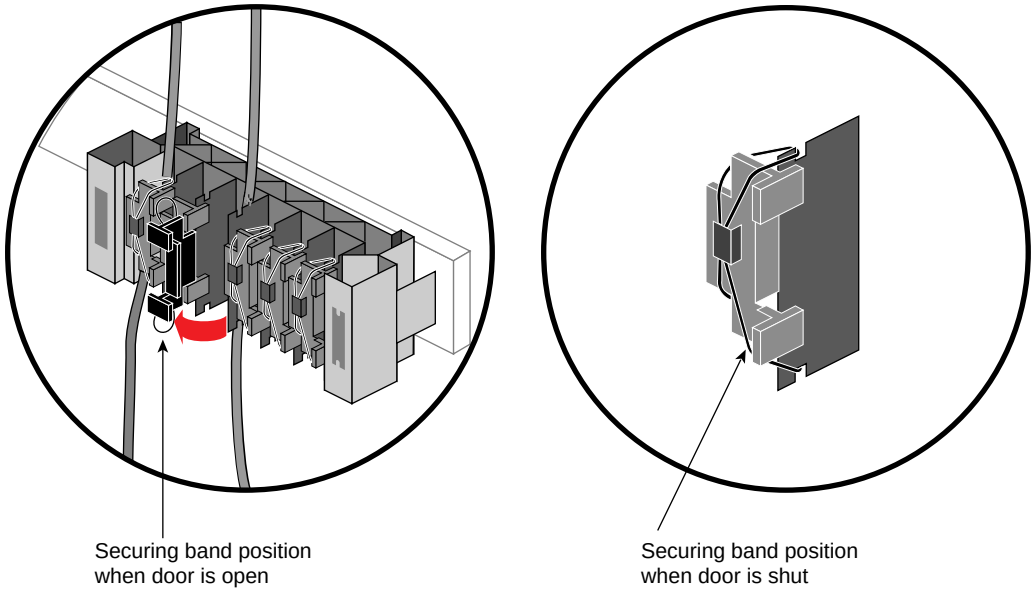


Figure 4-7 Door Operation for XIO Cable Management Box

   For cables coming from the upper module, the cable should be placed into two stables: one in the upper box and one in the outward-facing lower box.

   For cables from the lower module, the cable should be placed in the interior-facing bottom box. (To access this box, pop the exterior box off and push it aside.)

8. Close the stable door.

   Press and hold the plastic door shut. Slip the looped ends of the band into the upper and lower slots of the dividers, as illustrated in Figure 4-7.

9. Proceed to "Finish."

4.8 Finish

When the board is installed and connected, follow the instructions in this section to start operation.

Note: The IRIS HIPPI connection cannot function unless the software and hardware have been configured, as described in the *IRIS HIPPI Administrator's Guide*.

1. Power on the system. Follow the appropriate power on instructions for the system's configuration. These instructions are located in "Installation" chapter of the *Origin2000 and Onyx2 Deskside and Rackmount Installation Instructions*.
2. Log in.
3. If you have not installed and configured the IRIS HIPPI software, do so now by following the instructions in the *IRIS HIPPI Administrator's Guide*. The IRIS HIPPI connection cannot function until the software has been configured.

   Note: After you finish configuring the software, you must reboot the system (or run the *autoconfig* command) to build a new operating system (kernel) that includes the new driver. Then, you must again reboot the system to start running this new operating system.
4. Verify that the board has been located by the operating system during the bootup, with either of the following commands:

   ```
   % hinv -d hippi
   HIPPI-Serial adapter: unit#, in module# I/O slot#
   ```

   ```
   % find /hw/module -name hippi
   /hw/module/#/slot/io#/hippi_serial/pci/0/hippi
   ```

   where the pound signs (#) after module and slot should correctly identify the module and XIO slot into which you installed the board.
5. Verify that the board's LEDs indicate normal operation, as illustrated by Figure 1-9.

   If the LEDs indicate an error, use the following sequence of commands to verify the hardware's functionality while in internal loopback mode. If the commands below succeed, the IRIS HIPPI hardware is functional; follow the instructions in Table 1-5 or Table 1-6 to locate the cause of the abnormal LED behavior. If these commands fail, re-install the IRIS HIPPI product. If the problem persists, contact the Silicon Graphics Technical Assistance Center.

   ```
   # hipcntl hippi# shutdown
   # hipcntl hippi# loopback
   # hipcntl hippi# startup
   # hiptest -D /dev/hippi# 16 10
   sending 10 packets, size range [16], to I-field 0x01000001
   . . . . . .
   <when finished>
   # hipcntl hippi# shutdown
   # hipcntl hippi# startup
   ```
6. Verify that the connection is operational by following the verification tests described in Chapter 3 of the *IRIS HIPPI Administrator's Guide*.