

**External I/O Expansion Unit
for SPARC Enterprise
M4000/M5000/M8000/M9000 Servers**

Installation and Service Manual



ORACLE



SPARC

Part No.: E22742-01,
Manual Code: C120-E329-07EN
April 2011

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Preface

This manual provides installation and service procedures for the External I/O Expansion Unit from Oracle and Fujitsu.

This document is written for technicians, system administrators, authorized service providers, and users who have advanced experience troubleshooting and replacing hardware.

This chapter includes the following sections:

- “External I/O Expansion Unit Documents” on page xi
- “Text Conventions” on page xii
- “Notes on Safety” on page xiii
- “Documentation Feedback” on page xiii

External I/O Expansion Unit Documents

All documents for your External I/O Expansion Unit are available online at the following locations:

- Oracle documents:

<http://download.oracle.com/docs/cd/E19322-01/index.html>

- Fujitsu documents:

<http://www.fujitsu.com/sparcenterprise/manual/>

- Sun Oracle software-related manuals (Oracle Solaris OS, and so on):

<http://www.oracle.com/technetwork/documentation/index.html>

External I/O Expansion Unit Documents
External I/O Expansion Unit Installation and Service Manual
External I/O Expansion Unit Product Notes
External I/O Expansion Unit Safety and Compliance Guide

Text Conventions

This manual uses the following fonts and symbols to express specific types of information.

Fonts/symbols	Meaning	Example
AaBbCc123	What you type, when contrasted with on-screen computer output. This font represents the example of command input in the frame.	XSCF> adduser jsmith
AaBbCc123	The names of commands, files, and directories; on-screen computer output. This font represents the example of command input in the frame.	XSCF> showuser -P User Name: jsmith Privileges: useradm auditadm
<i>Italic</i>	Indicates the name of a reference manual	See the <i>SPARC Enterprise M3000/M4000/M5000/M8000/M9000 Servers XSCF User's Guide</i> .
" "	Indicates names of chapters, sections, items, buttons, or menus	See Chapter 2, "System Features."

Notes on Safety

Read the following documents thoroughly before using or handling any External I/O Expansion Unit.

- *External I/O Expansion Unit Safety and Compliance Guide.*
- *SPARC Enterprise M3000/M4000/M5000/M8000/M9000 Servers Important Legal and Safety Information*

Documentation Feedback

If you have any comments or requests regarding this document, go to the following web sites.

- For Oracle users:

<http://www.oraclesurveys.com/se.ashx?s=25113745587BE578>

- For Fujitsu users:

http://www.fujitsu.com/global/contact/computing/sparce_index.html

Overview

The External I/O Expansion Unit provides a host server with additional slots for PCI cards.

- The single I/O boat configuration provides six slots for I/O cards.
- The optional two I/O boat configuration ([FIGURE 1-1](#)) provides twelve slots.

This chapter contains the following topics:

- [Section 1.1, “General Description” on page 1-2](#)
- [Section 1.2, “Card Slots” on page 1-9](#)
- [Section 1.3, “Carriers” on page 1-17](#)
- [Section 1.4, “External I/O Expansion Unit Configurations” on page 1-34](#)
- [Section 1.5, “LEDs” on page 1-36](#)
- [Section 1.6, “System Management” on page 1-38](#)
- [Section 1.7, “Site Preparation” on page 1-39](#)
- [Section 1.8, “Service Information” on page 1-41](#)
- [Section 1.9, “Electrostatic Discharge Precautions” on page 1-43](#)

FIGURE 1-1 External I/O Expansion Unit, Front and Rear Views

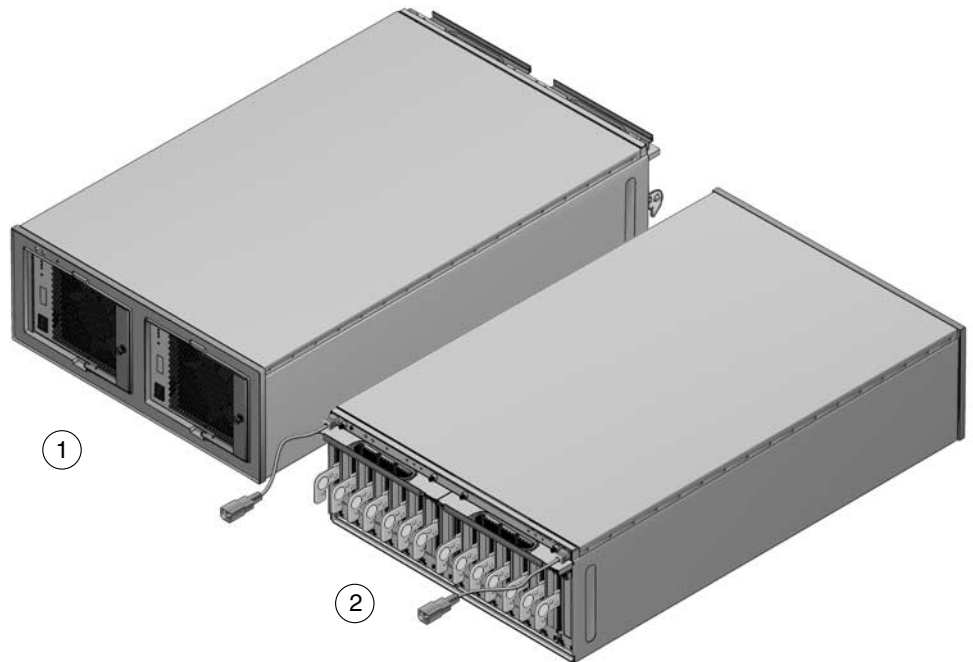


Figure Legend

- | | |
|---|------------|
| 1 | Front view |
| 2 | Rear view |

1.1 General Description

FIGURE 1-2 shows the major units for the External I/O Expansion Unit, which are described separately in this chapter.

Note – All slot numbers run from left to right, regardless of whether you are viewing the front or the back of the External I/O Expansion Unit. At the front of the External I/O Expansion Unit, the power supplies are numbered from left to right. I/O boats at the rear of the External I/O Expansion Unit are also numbered from left to right.

FIGURE 1-2 Major Units for the External I/O Expansion Unit, Top View

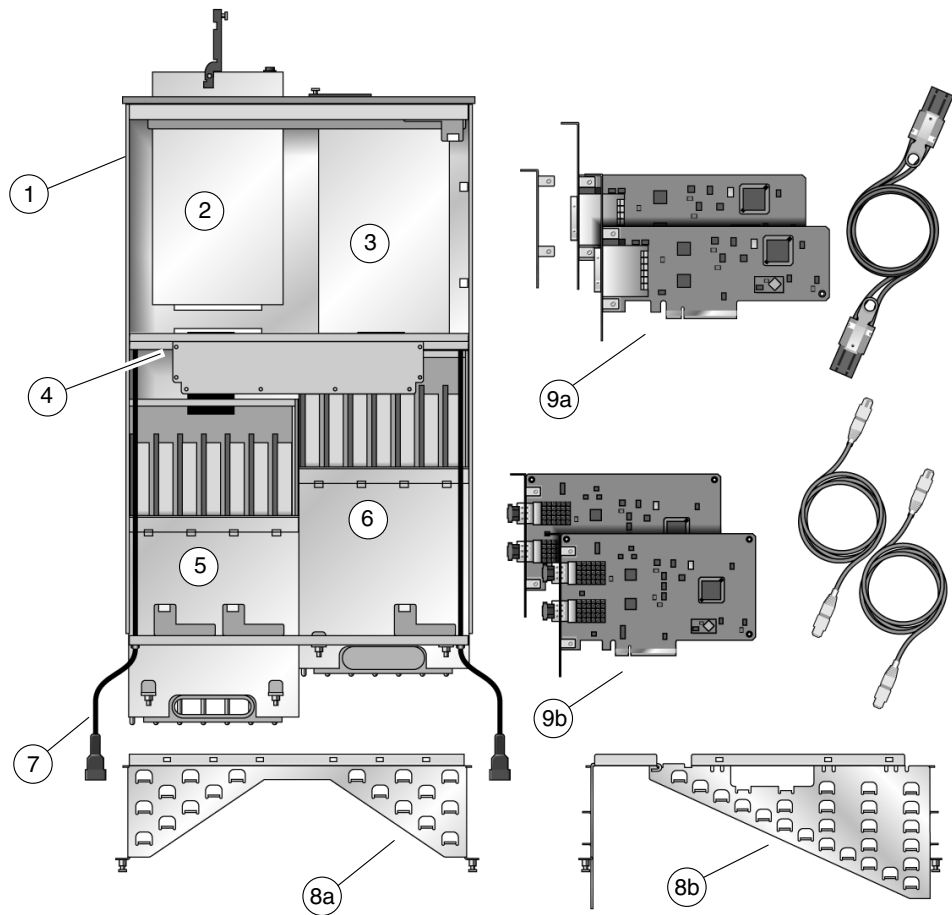


Figure Legend

1	Chassis	6	I/O boat 1
2	Power Supply Unit 1	7	Internal AC cable
3	Power Supply Unit 0	8	Cable management unit (One of two types is included. Type 8a routes cables to both sides of a rack. Type 8b routes cables only the right side of a rack.)
4	Centerplane	9	Link kit (One of two types is included. 9a is the copper link kit. 9b is the optical link kit.)
5	I/O boat 0		

1.1.1 Chassis

The External I/O Expansion Unit chassis includes the centerplane (item 4 in [FIGURE 1-2](#)) and two non-removable internal AC cables (item 7 in [FIGURE 1-2](#)).

There are no serviceable components inside the chassis. If the centerplane or the internal AC cables are damaged, the chassis must be replaced.

Note – A replacement chassis does not include power supply units (PSUs) or I/O boats. Transfer the PSUs and I/O boats from the damaged chassis to the replacement chassis.

Each internal AC cable supplies only one PSU. To ensure redundant power, use the two AC cords supplied with the External I/O Expansion Unit to connect the internal AC cables to separate AC sources.



Caution – Do not connect the internal AC cables directly to a power strip. Use the AC power cords supplied with the External I/O Expansion Unit to connect the internal AC cables to electrical power.



Caution – Do not substitute other AC power cords for the AC power cords supplied with the External I/O Expansion Unit. The substitute AC power cords might not have the same power rating.

1.1.2 Power Supply Units

The External I/O Expansion Unit has two power supply units (PSUs) for redundancy. See [FIGURE 1-3](#).

Each PSU includes an integral fan.

FIGURE 1-3 Power Supply Unit

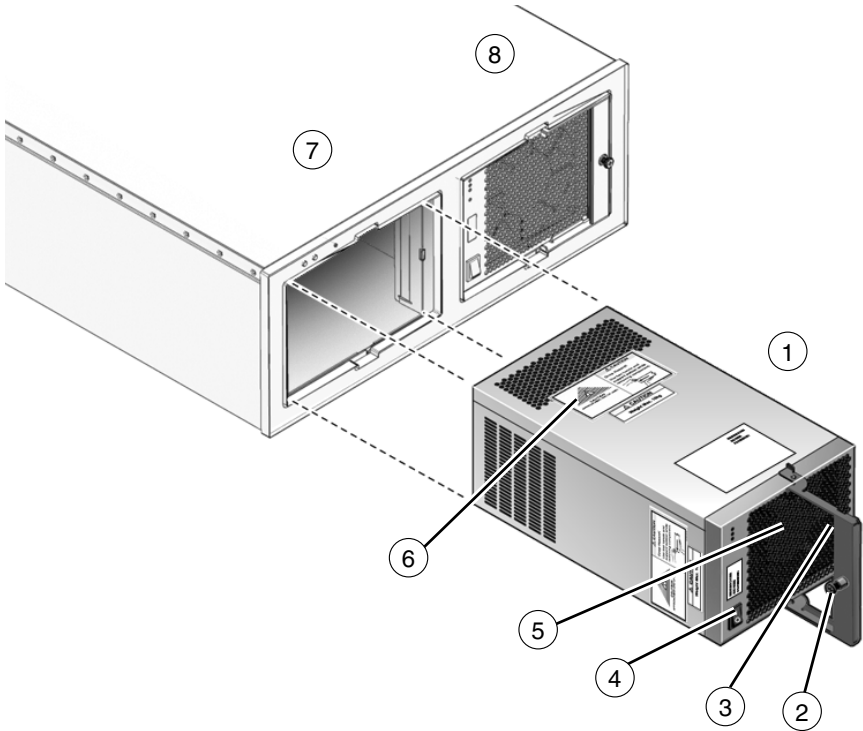


Figure Legend

1	PSU	5	Fan
2	Handle locking screw	6	Caution labels
3	Handle	7	PSU slot 0
4	AC switch	8	PSU slot 1

1.1.2.1 AC Power

The PSU slots are powered through internal AC cables that extend out of the rear of the chassis (item 7 in [FIGURE 1-2](#)).

The PSUs do not share AC current. Connect both internal AC cables to AC power.

The internal AC cable for a PSU is the cable terminating nearest that PSU slot.

The PSUs should be connected to two independent external AC power sources so that service will not be interrupted if one AC power source fails.

1.1.2.2 Fans

A fan is located in the front of each PSU. If one fan fails, the remaining fan supplies enough air to cool two I/O boats.

Note – The fan might turn on when you insert a PSU into the External I/O Expansion Unit. This is normal behavior if you are installing a second PSU while the first PSU is powered on. The fan receives DC power through the centerplane.

1.1.3 I/O Boats

The External I/O Expansion Unit can contain up to two I/O boats (FIGURE 1-4).

FIGURE 1-4 I/O Boat

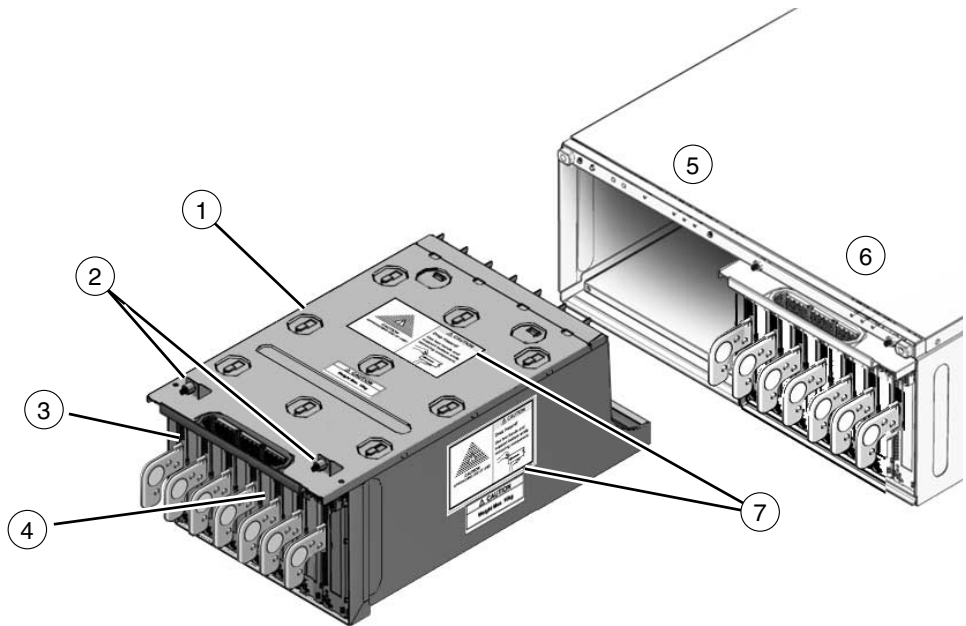


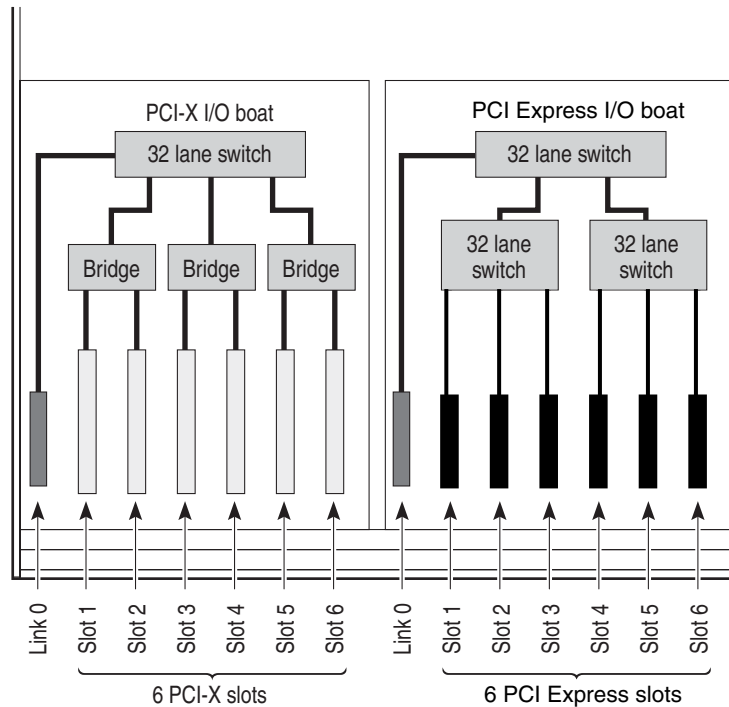
Figure Legend

1 I/O boat	5 Boat slot 0
2 Captive screws	6 Boat slot 1
3 Link card carrier (slot 0)	7 Caution labels
4 PCI card carriers (slots 1-6)	

There are two types of I/O boat, PCI-X and PCI Express. PCI cards are not interchangeable between the two types of boats.

- The PCI-X I/O boat accepts PCI-X cards and some older types of PCI cards.
- The PCI Express I/O boat accepts PCI Express cards up to x8 lanes wide. PCI Express x16 cards do not fit in this boat.

FIGURE 1-5 PCI-X and PCI Express I/O Boat Layouts, Compared



A PCI-X I/O boat is shown on the left side of [FIGURE 1-5](#). This boat has six PCI-X sockets and one link socket.

A PCI Express I/O boat is shown on the right side. There are six PCI Express sockets and one link socket.

All PCI card data passes through the link card in the I/O boat.

A boat slot accepts either type of I/O boat.

When you run system diagnostics, the switches and bridges are displayed in the output of OpenBoot PROM probing. However, the link cards themselves never appear during OpenBoot PROM probing. For examples of OpenBoot PROM output, see [Appendix C](#).

Note – A bridge is a device that converts PCI Express and PCI-X signal formats and connects multiple busses to a single bus. A switch is a device that connects multiple busses to a single bus, without converting the signals to another format.

1.2 Card Slots

The card slots have the following characteristics:

- An I/O boat has seven card slots. Slot numbers 0 through 6 are counted from left to right.
- Slot 0 is reserved for the link card. Slot 0 is the first slot in the left side of the I/O boat. For information about link cards, see [Section 1.2.2, “Link Kits” on page 1-12](#).
- Slots 1-6 are for PCI cards. (PCI cards are sometimes known as host adapters or host bus adapters.)
- PCI card slots are hot-pluggable.
- PCI-X and PCI Express sockets ([FIGURE 1-5](#)) are incompatible in length and height. Installing a PCI-X or PCI Express card in the wrong type of I/O boat will damage the card and the connector in the carrier slot.
- The PCI Express I/O boat supports up to x8 card sockets. PCI Express x16 cards are not supported in the PCI Express I/O boat.

Note – Graphics cards are not supported.



Caution – Do not insert a x16 PCI Express card in an I/O boat. The x16 card connector is too large for the x8 card socket and will damage the socket.

1.2.1 Carriers

All PCI cards in the External I/O Expansion Unit are mounted on carriers ([FIGURE 1-25](#)). Carriers control RFI emissions and maintain the proper flow of air through the External I/O Expansion Unit.

The front of each carrier is labelled with its slot number (PCIX 1 or PCIE 1, and so forth).

Note – Slot 0 is reserved for the link card. This slot is marked LINK 0.

There is only one type of carrier design used in the External I/O Expansion Unit. The same carrier fits all slots in both types of PCI-X and PCI Express boats. Carriers are physically keyed to fit only specific slot numbers. The keys can be adjusted for other slots as needed.



Caution – If you install a PCI card when the External I/O Expansion Unit is running, be prepared to complete the installation within two minutes or so. If you leave a carrier slot empty, the External I/O Expansion Unit might overheat.

New carriers include dummy cards. The dummy cards help the carriers to stay in place and to control the passage of air through the I/O boat. For information about dummy cards, see [Section 1.2.1.2, “Dummy Cards” on page 1-11](#).

1.2.1.1 Carrier Slots

There are seven carriers in each I/O boat ([FIGURE 1-6](#)). Carriers can be adjusted to fit various sizes and shapes of PCI cards. Link cards use the same type of carrier.

- Carrier slot 0 is always used for the link card.
- Carrier slots 1 through 6 are used for PCI cards.

FIGURE 1-6 PCI Carrier

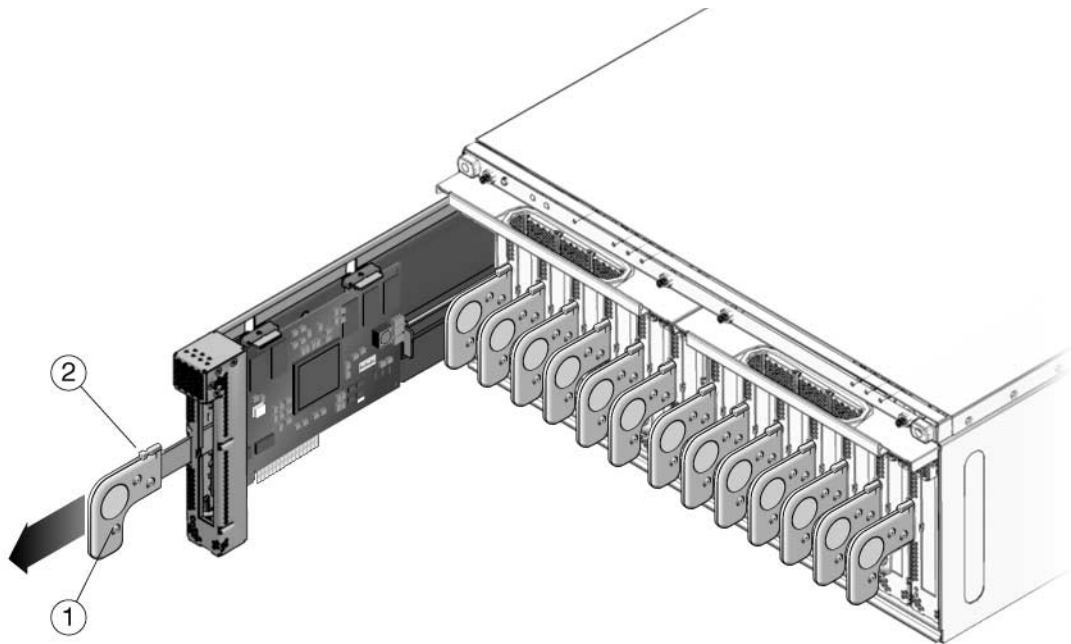


Figure Legend

-
- | | |
|---|-----------------------|
| 1 | Carrier handle |
| 2 | Carrier locking screw |
-

1.2.1.2 Dummy Cards

New carriers are shipped with dummy cards (FIGURE 1-7).

There are two types of dummy card, PCI-X and PCI Express. (The PCI Express card might be labelled “PCI-E”.) Note that there are differences in their edge connectors.

FIGURE 1-7 Dummy Cards

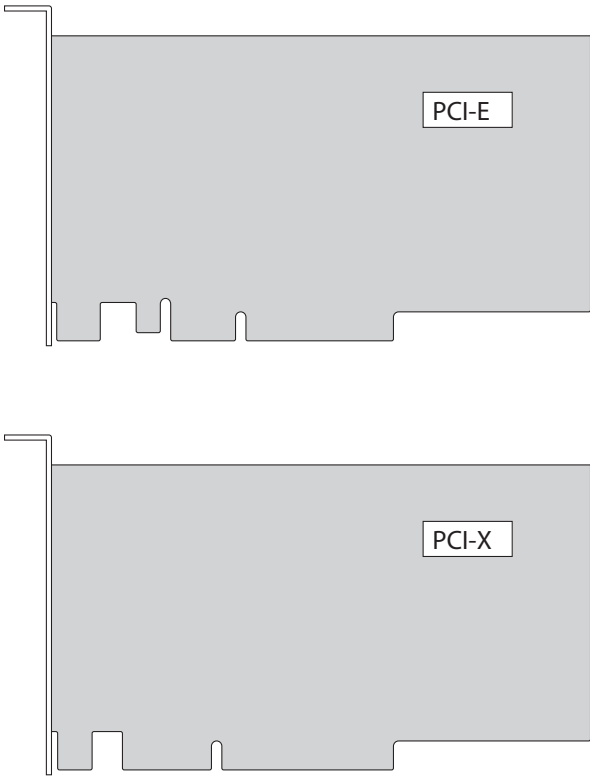


Figure Legend

-
- 1 PCI Express version
 - 2 PCI-X version
-

Note – Be certain that the dummy cards are fully seated. This action minimizes the vibration of unused carriers in the I/O boat slots.

The service labels (not shown in FIGURE 1-7) on the dummy cards include simplified instructions for removing and installing PCI cards.



Caution – The two types of dummy cards are not interchangeable. If you replace a PCI card with a dummy card, be sure that you use the right type of dummy card. The differences in edge connectors on the dummy cards (FIGURE 1-7) are enough to damage the PCI card socket on the I/O boat.

1.2.2 Link Kits

One link kit is required for each I/O boat.

A link kit includes two link cards. One link card goes into the host server. The other link card goes into the I/O boat. The link cards are physically identical.

Two link options are available, a copper link kit and an optical link kit (FIGURE 1-8).

- The copper link kit has one bidirectional cable. A low-profile bracket is included so a link card can be used in a host that has low-profile I/O card slots.
- The optical link kit has two unidirectional cables.

FIGURE 1-8 Link Kits

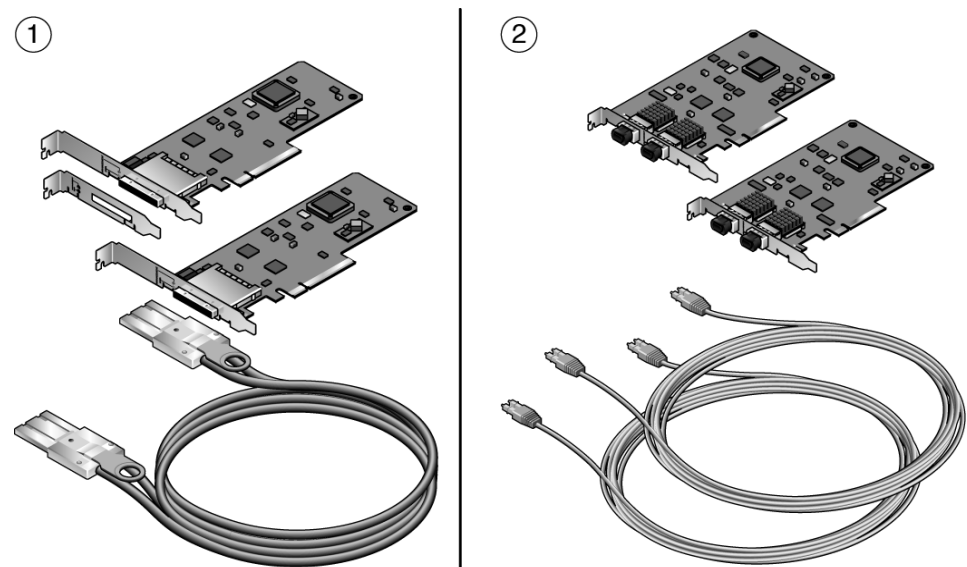


Figure Legend

-
- 1 Copper link kit
 - 2 Optical link kit
-

Slot 0 in each I/O boat is the dedicated link card slot. Use slot 0 only for the link card.

1.2.3 Cable Management

A cable management unit attaches to the rear of the system rack. There are two types of cable management units.

- Some racks allow the routing of cables along both sides of the rack. The type A cable plate ([FIGURE 1-9](#)) supports cable routing along both the left and right sides of the rack.
- Some racks allow routing of cables only along the right side of the rack. The type B cable plate ([FIGURE 1-10](#)) is optimized for cable routing along the right side of the rack.

FIGURE 1-9 Cable Management Unit (Type A) for Routing Cables to Both Sides of the Rack

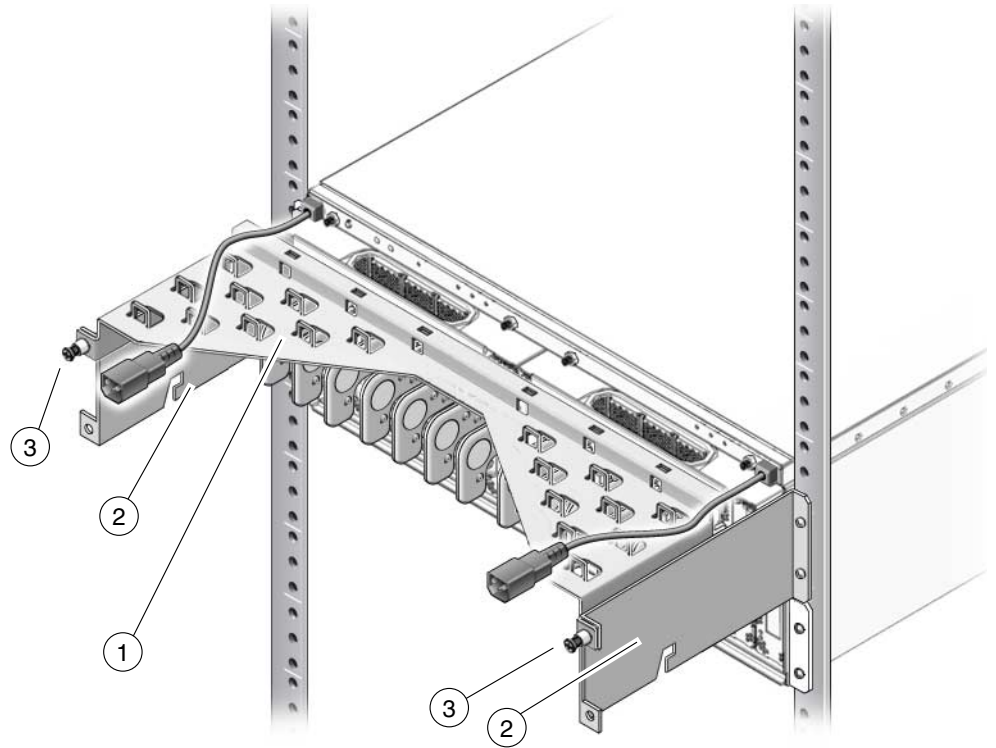


Figure Legend

-
- | | |
|---|----------------------------|
| 1 | Type A cable plate |
| 2 | Support brackets |
| 3 | Cable plate locking screws |
-

FIGURE 1-10 Cable Management Unit (Type B) for Routing Cables Only to the Right Side of a Rack

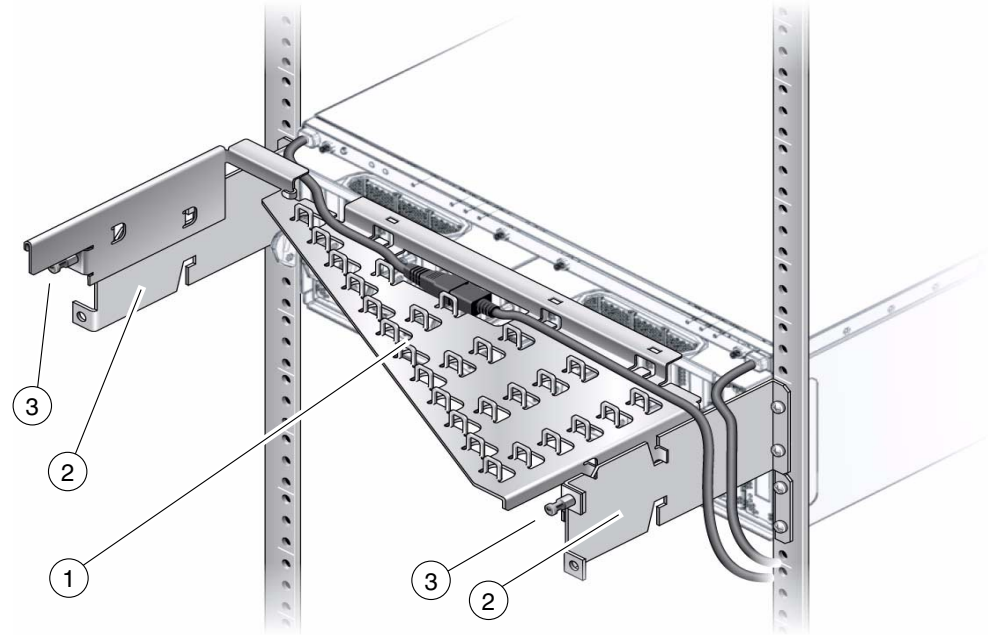


Figure Legend

-
- | | |
|---|----------------------------|
| 1 | Type B cable plate |
| 2 | Support brackets |
| 3 | Cable plate locking screws |
-

Note – If the PSU1 power cable does not reach the rack power distribution unit, route the cable on the left side of the rack.

1.2.3.1 Minimum Bend Radius for Link Cables

The link cables might be damaged if they are coiled too tightly.

- The minimum bend radius for the copper link cable is 1.85 in./47 mm.
- The minimum bend radius for optical link cables is 1.8 in./46 mm.



Caution – Coiling the link cables with a smaller bend radius than listed above will break the cables.

1.2.3.2 Cable Management Unit

The cable management unit contains two support brackets and a cable plate.

The support brackets attach with screws to the rear of the system rack. The cable plate rests on the support brackets.

The cable plate has two positions ([FIGURE 1-11](#)).

- In the normal position, the cable plate rests on the support brackets.
- In the raised position, the cable plate rests slightly above the support brackets. This position provides clearance for you to remove and replace an I/O boat.

FIGURE 1-11 Cable Plate (Side Views of Normal and Service Positions)

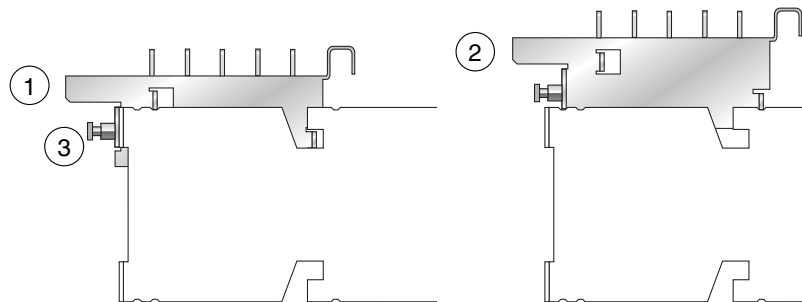


Figure Legend

-
- | | |
|---|--|
| 1 | Cable plate in the normal position (lowered) |
| 2 | Cable plate in the service position (raised) |
| 3 | Cable plate locking screw |
-

1.3 Carriers

In the I/O boat, all PCI cards are mounted on carriers. When you insert the carrier and card into the boat and push the carrier handle into the closed position, the carrier mechanism automatically seats the PCI card.

[FIGURE 1-12](#) shows a carrier with an attached PCI card.

Note – The service life of a carrier is at least 100 PCI card insertions. To avoid premature failure of the carrier, do not repeatedly open and close the carrier more than is necessary to familiarize yourself with its operation.

FIGURE 1-12 Carrier

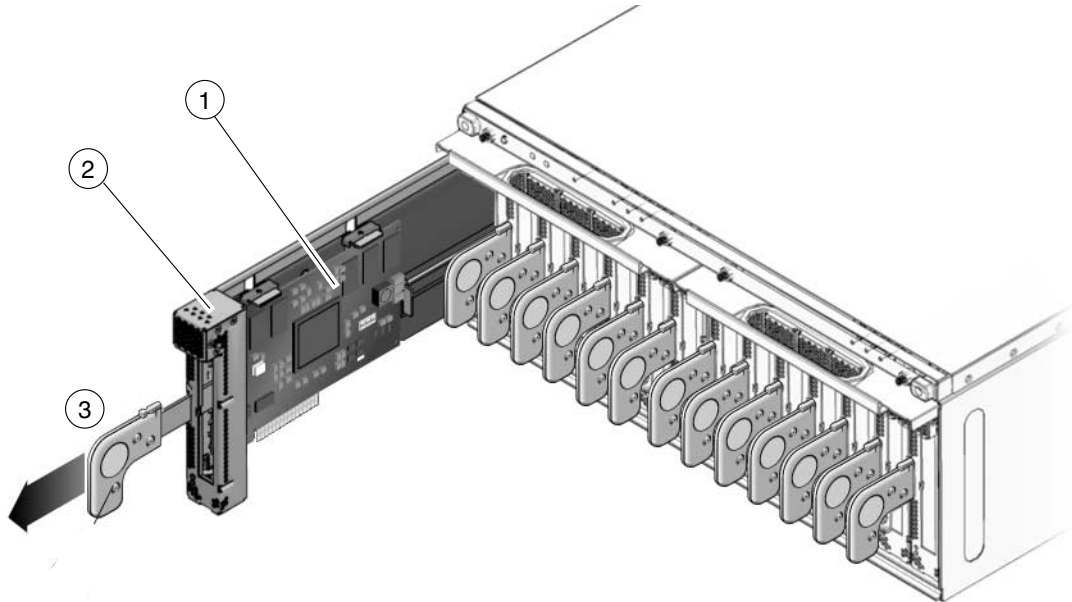


Figure Legend

-
- 1 PCI card
 - 2 Carrier
 - 3 Carrier handle in unlocked position
-

[FIGURE 1-13](#) shows the details of a typical carrier.

FIGURE 1-13 Carrier Features

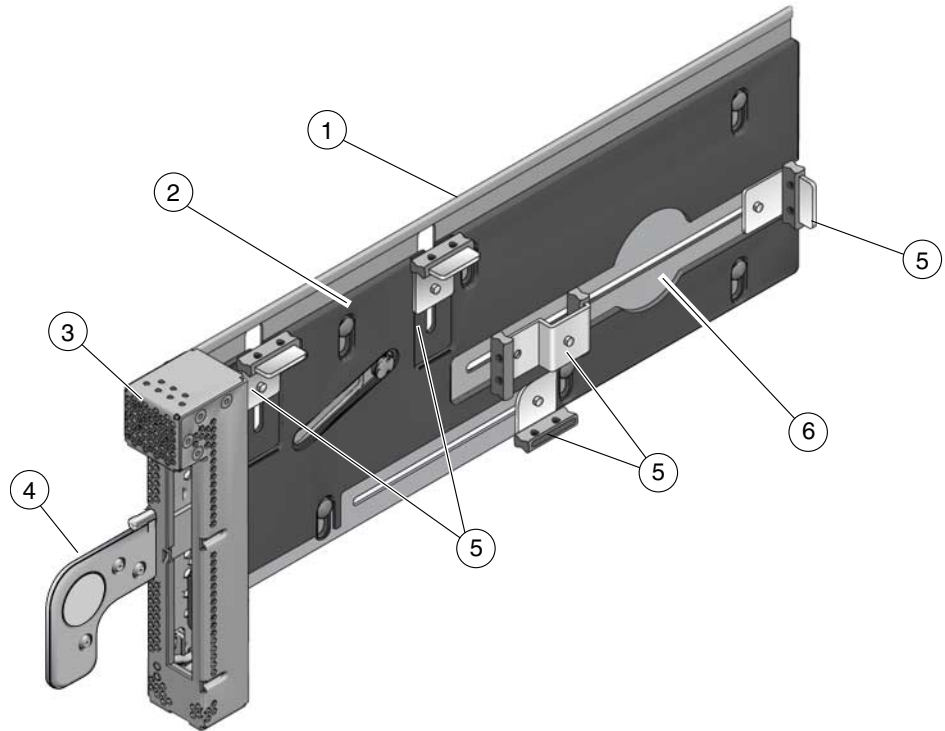


Figure Legend

1	Carrier main body (metal)	4	Carrier handle
2	Carrier plate (plastic)	5	Card locks (see Section 1.3.2, “Card Locks” on page 1-20)
3	Carrier slot keyholes	6	Turnaround area for card lock

1.3.1 Carrier Removal and Insertion

A carrier operates by raising or lowering a PCI card into or out of a card socket. The vertical movement is approximately 0.4 in./10 mm.

A small metal latch (item 3 in [FIGURE 1-14](#)) is located at the front of the carrier. The latch locks the carrier handle in the extended position. This action prevents the carrier plate and PCI card from falling and damaging the PCI slot connector as you pull the carrier unit out of the carrier slot.

After the carrier is out of the I/O boat, you can unlock the carrier handle by pushing in the metal latch while pushing the carrier handle into its closed position. Note that the closed position provides more vertical clearance for a PCI card when you install or remove the PCI card.

When you insert the carrier into the I/O boat, the latch automatically unlocks itself.

FIGURE 1-14 Carriers

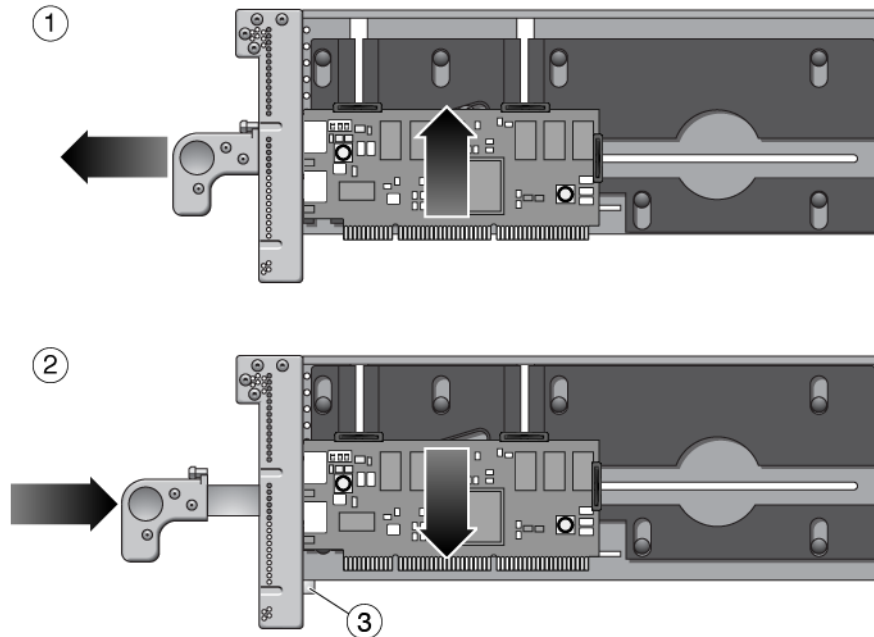


Figure Legend

-
- | | |
|---|---|
| 1 | Pull carrier handle to raise PCI card out of PCI slot socket |
| 2 | Push carrier handle and latch (3) to lower PCI card into socket |
| 3 | Latch |
-



Caution – All carriers must contain either a PCI card or a dummy card to avoid loss of cooling air.

1.3.2 Card Locks

A PCI card is attached to the carrier with screw-mounted locks or retainers (FIGURE 1-15). Card locks hold a PCI card to its carrier and prevent the PCI card from shifting or tilting. The PCI card must be securely mounted in order for the carrier to correctly seat the PCI card in the card socket in the I/O boat.

FIGURE 1-15 Card Locks

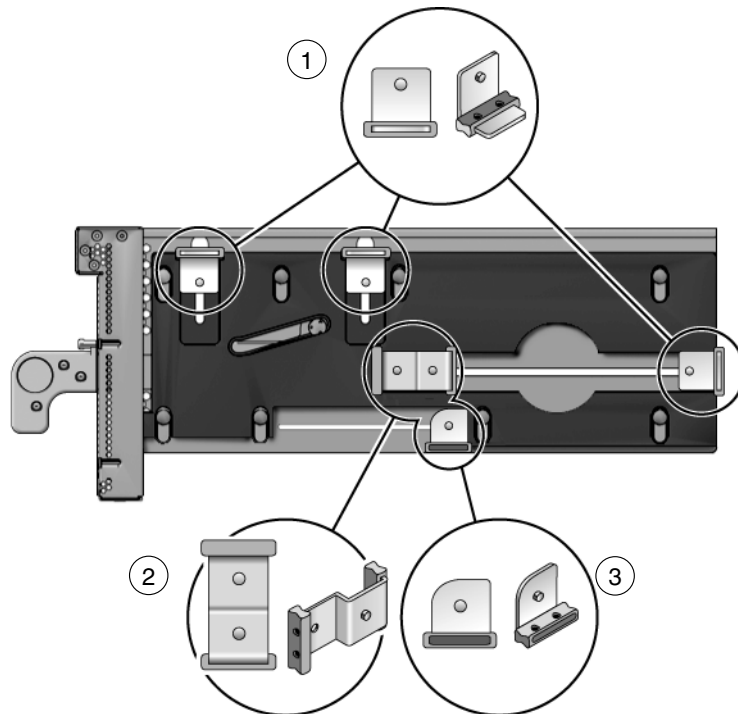


Figure Legend

-
- | | |
|---|--|
| 1 | Type A (Square). There are three of these. |
| 2 | Type B (S-shaped) |
| 3 | Type C (Small) |
-

There are three types of locks:

- Type A is a square-shaped lock. Three of these are supplied with each carrier.
- Type B is an oblong lock that has an S-shaped profile. It provides a longer extension (0.75 in./19 mm) than type A. Type B can be used as a top or side mount, wherever a longer reach is needed. One of this type is included with each carrier.

- Type C is a small quarter-round lock. It can support the bottom edge of a wide PCI card, but only when the lock is at the far right side of its slot (the side farthest from the front of the carrier). For a narrow width card, use this lock only to support the side of the card. Do not use this lock to support the bottom edge of a narrow width card because the lock might interfere with the card socket in the I/O boat. This lock fits only the bottom slot on the carrier. One of this type is supplied with each carrier.

One function of the locks is to secure the PCI card to the carrier. Another is to apply a downward force to the top of the card to seat the card in the card socket when the carrier is inserted into the I/O boat. In addition, the locks help prevent the card from tilting so that card edge pins line up properly with the pins in the socket.

Because PCI card types are available in various sizes and shapes, you should choose a combination of card locks that is best suited to the size and shape of the PCI card.

1.3.3 Tightening Sequence for Card Locks

To fasten a PCI card to a carrier so that the card will seat reliably, tighten the card locks in the sequence shown in [FIGURE 1-16](#) or [FIGURE 1-17](#).

PCI card shapes and sizes can vary, so use the following instructions as suggestions, not as strict requirements.

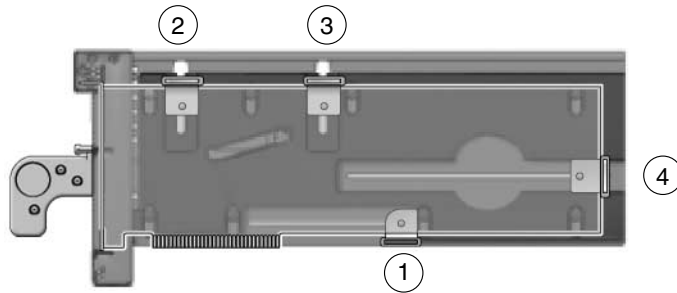
- If the PCI card is wide, use the tightening sequence shown in [FIGURE 1-16](#). A wide card is one that can rest on the type C card lock (item 1 in [FIGURE 1-16](#)) when the card lock is in its extreme right position.
- If the PCI card is narrow, use the tightening sequence shown in [FIGURE 1-17](#). A narrow card is one that is too short to rest on the type C card lock when the card lock is in its extreme right position.



Caution – If you move the type C card lock out of the extreme right position while the plastic part of the card lock is facing down, the PCI card will not seat properly, and the bottom of the card lock can damage the PCI card socket in the I/O boat. If you move the type C card lock to the left at any time, always rotate the card lock so that the plastic part faces either left or right.

1.3.3.1 Tightening Sequence for Wide Cards

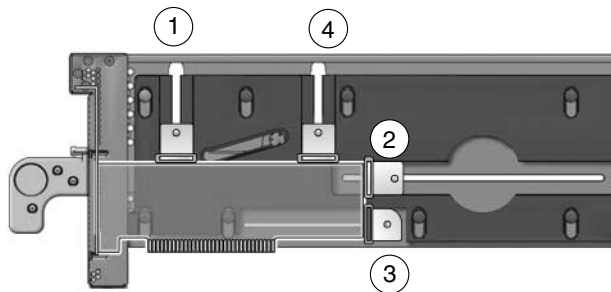
FIGURE 1-16 Card Lock Sequence for Wide Cards



- Rest the bottom edge of the PCI card on the type C card lock (number 1 in [FIGURE 1-16](#)) to ensure that the bottom of the PCI card is perfectly horizontal, then tighten the remaining card locks in the sequence shown.

1.3.3.2 Tightening Sequence for Narrow Cards

FIGURE 1-17 Card Lock Sequence for Narrow Cards



- Tighten the upper left card lock (number 1 in [FIGURE 1-17](#)), while ensuring that the card is perfectly horizontal. Then tighten the remaining card locks in the sequence shown, as applicable.

1.3.4 Examples of PCI Card Installation

[FIGURE 1-15](#) shows the locks for a typical PCI card.

However, cards can be much wider or narrower, or taller or shorter. [FIGURE 1-18](#), [FIGURE 1-19](#), and [FIGURE 1-20](#) show how cards can vary in height, width, and shape.

Note – The lock arrangements shown in these figures are suggestions and are not intended as requirements.

When installing a card, it might be necessary to swap locks from slot to slot in order to find the best way to secure a PCI card to its carrier. Use [TABLE 1-1](#) to select locks that are best suited to your PCI card.

TABLE 1-1 Card and Lock Styles

PCI Card Shape	Suggested Lock Type			Example
	Top Lock/Card Height	Side Lock/Card Width	Bottom Lock	
Wide	Type A (x2)	Type A 12 in./304 mm maximum card width	Type C*	FIGURE 1-18
Average width	Type A (x2)	Type A 5.75 in./146 mm minimum card width Type B 5.0 in./127 mm minimum card width	Type C†	FIGURE 1-18
Narrow width	Type A (1 or 2)	Type A 5.75 in./146 mm minimum card width Type B 5.0 in./127 mm minimum card width Type C 3.0 in./76 mm minimum card width		FIGURE 1-18
Very narrow width	Type A (1 or 2)	Type B 5.0 in./127 mm minimum card width Type C 3.0 in./76 mm minimum card width		FIGURE 1-18
Tall	Type A	Type A or B	Type C‡	FIGURE 1-18

TABLE 1-1 Card and Lock Styles (*Continued*)

PCI Card Shape	Suggested Lock Type			Example
	Top Lock/Card Height	Side Lock/Card Width	Bottom Lock	
Low height	Type A 2.0 in./51 mm minimum card height or Type B 1.25 in./31 mm minimum card height	Type A 5.75 in./146 mm minimum card width Type B 5.0 in./127 mm minimum card width Type C 3.0 in./76 mm minimum card width		FIGURE 1-19
Very low height and narrow	Type B 1.25 in./31 mm minimum	Type C 3.0 in./76 mm minimum		FIGURE 1-20
Irregular shape	As needed	As needed	As needed**	FIGURE 1-20

* Do not use the type C lock to support the bottom of a card if the lock will be in a location that causes the lock to interfere with the PCI card connector in the I/O boat.

† Do not use the type C lock to support the bottom of a card if the lock will be in a location that causes the lock to interfere with the PCI card connector in the I/O boat.

‡ Do not use the type C lock to support the bottom of a card if the lock will be in a location that causes the lock to interfere with the PCI card connector in the I/O boat.

** Do not use the type C lock to support the bottom of a card if the lock will be in a location that causes the lock to interfere with the card connector.

1.3.4.1 Using Card Locks With Tall PCI Cards

FIGURE 1-18 Lock Arrangements for Wide and Narrow PCI cards

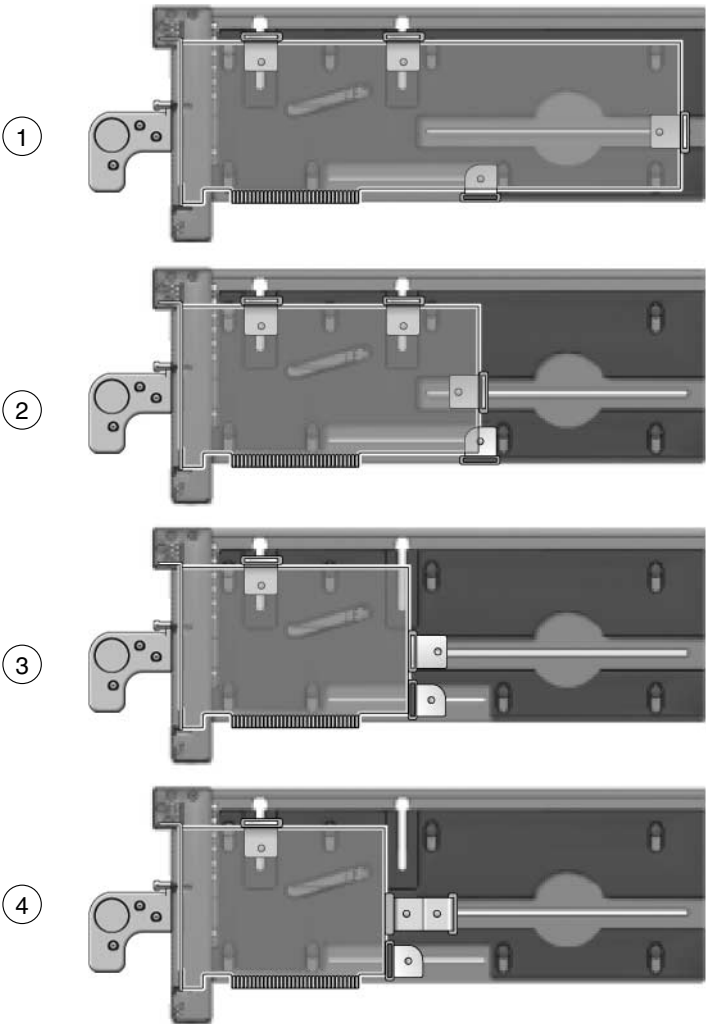


Figure Legend

1 Tall and wide card	2 type A on top, 1 type A on right, 1 type C on bottom of the PCI card
2 Tall and average width card	2 type A on top, 1 type A on right, 1 type C on bottom of the PCI card
3 Tall and narrow card	1 type A on top, 1 type A on right, 1 type C on lower right side of the PCI card
4 Tall and very narrow card	1 type A on top, 1 type B on right, 1 type C on lower right side of the PCI card

1.3.4.2 Using Card Locks With Low and Very Low Height PCI Cards

FIGURE 1-19 Lock Arrangements for Low and Very Low Height PCI cards

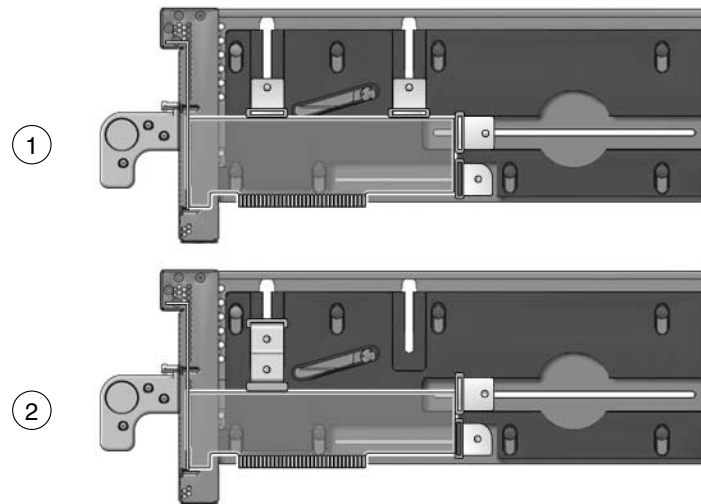


Figure Legend

1 Low height card	2 type A on top, 1 type A on right side, 1 type C on lower right side of the PCI card
2 Very low height card	1 type B on top, 1 type A on right edge, 1 type C on lower right side of the PCI card

1.3.4.3 Using Card Locks With Unusual PCI Card Shapes

FIGURE 1-20 Lock Arrangements for Unusually-Shaped Cards

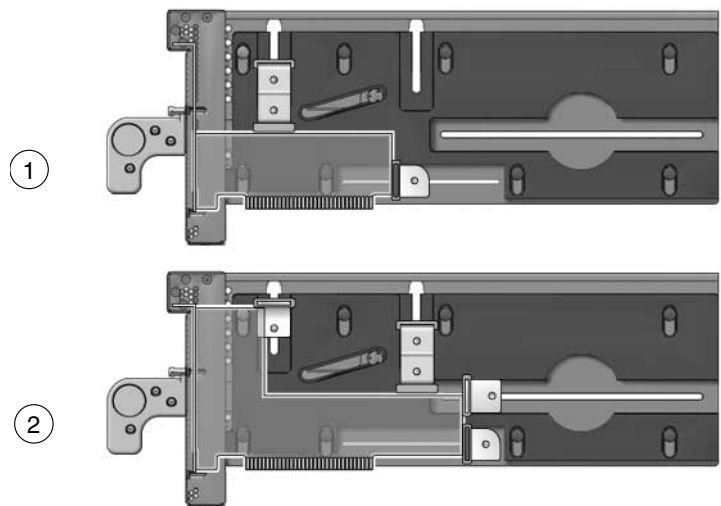


Figure Legend

1	Very low height and narrow width card	1 type B on top, 1 type C on right side of the PCI card
2	Irregularly-shaped card	1 type A and 1 type B on top, 1 type A on right side, 1 type C on lower right side of the PCI card

1.3.5 PCI Card Mounting Problems

1.3.5.1 Tilted Cards

There are two common problems that involve PCI cards that turn at an angle when mounted in PCI carriers.

- The most common problem is that a PCI card can slip and tilt during seating when you do not apply enough pressure on a PCI carrier card lock when mounting the card on the carrier.
- A less common problem is that the bracket of a PCI card will bend when you apply too much pressure on a PCI carrier card lock when mounting the card on a carrier.

FIGURE 1-21 Excessive Force on a Lock Can Bend or Break the PCI Card

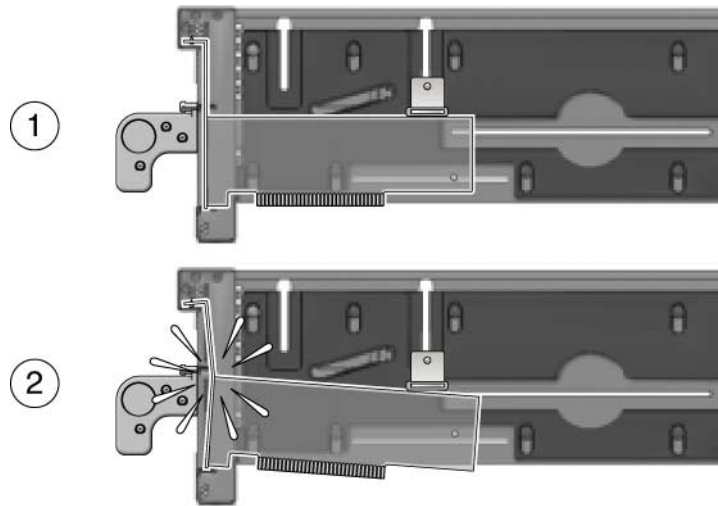


Figure Legend

-
- | | |
|---|-----------|
| 1 | Correct |
| 2 | Incorrect |
-

Here are some rules to avoid the tilting of PCI cards:

1. You must have at least one lock on top of the card. If the top of the card is too low to accept a lock, the card cannot be used.
2. Find a lock to fit the top of the card and provide side support to prevent the card from tilting. A tilted card (FIGURE 1-21) will not seat properly.
3. Support of the bottom of the card is not a major priority because the carrier plate itself provides some support for the bottom of the card.
4. Use only enough pressure to hold the lock against the PCI card. The bottom of the PCI card should stay parallel with the bottom of the carrier.

1.3.5.2 Hidden Problems

The following features are located inside the front housing of the carrier. Because they are difficult to see, they can complicate the mounting of cards on carriers.

- Card alignment post (FIGURE 1-22 and FIGURE 1-23)
- Card alignment tab (FIGURE 1-22)
- Internal RFI gasket (FIGURE 1-24)

Alignment Post and Alignment Tab

The card alignment post and the card alignment tab help to keep the front of the PCI card in the correct vertical orientation, with support from properly-installed card locks.

FIGURE 1-22 Card Alignment Post and Card Alignment Tab

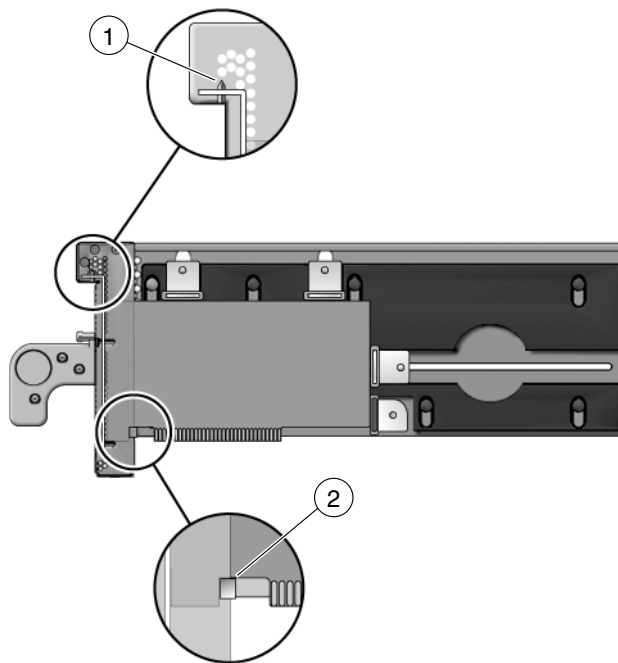


Figure Legend

-
- | | |
|---|---------------------|
| 1 | Card alignment post |
| 2 | Card alignment tab |
-

The post fits in a notch in the metal bracket of the PCI card (item 1 in [FIGURE 1-22](#)). If you do not position the post in the notch, the card mounting bracket might bend, so that the card lies at an angle on the carrier. The angle prevents the card from making proper electrical contact with the socket in the I/O boat.

The tab (item 2 in [FIGURE 1-22](#)) fits in a notch at the bottom of the PCI card. The tab helps to align the card when you install it in the carrier. (Note that some card types might not have the notch).

Note – The tab lifts the front of the card out of the card connector when you remove the carrier from the I/O boat. If you cannot use a type C lock ([FIGURE 1-15](#)) to support the bottom of the PCI card, the card alignment tab is the only point that can provide support to lift the card out of the socket.

[FIGURE 1-23](#) shows how the bracket fits over the card alignment post.

FIGURE 1-23 Card Alignment Post (Detail)

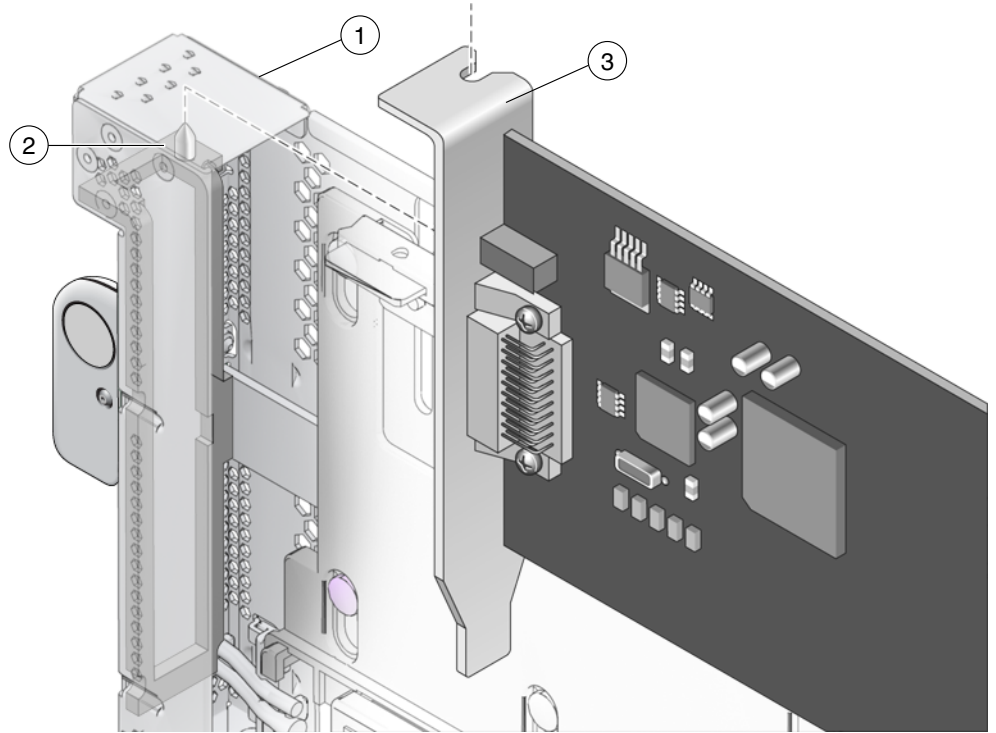


Figure Legend

-
- | | |
|---|-----------------------|
| 1 | Carrier front housing |
| 2 | Card alignment post |
| 3 | PCI card bracket |
-

Internal RFI Gasket

An RFI gasket is located inside the carrier housing, next to the card alignment post. (A smaller RFI gasket is located on the outside of the carrier housing.) When you insert the PCI card into the carrier, be sure that the bottom of the metal card bracket does not scrape or loosen the bottom of the gasket ([FIGURE 1-24](#)).

The gasket material is flexible enough that you might not notice that the bracket has dislodged the gasket. Remember to inspect the condition of this gasket before you install the carrier in the I/O boat.

FIGURE 1-24 Internal RFI Gasket

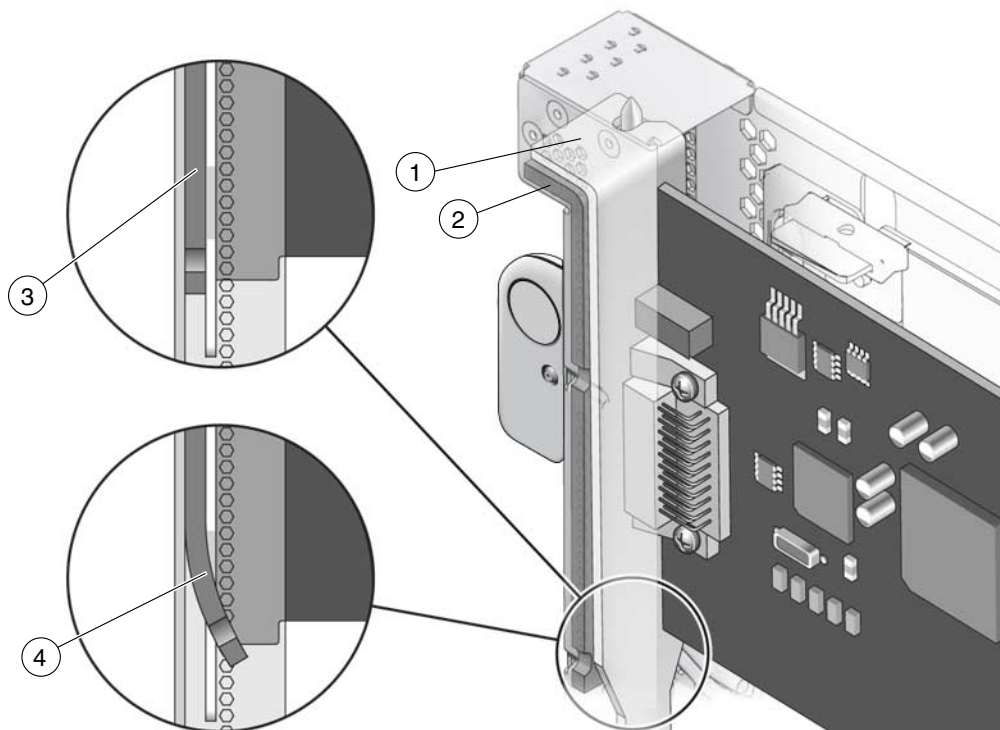


Figure Legend

-
- 1 PCI card
 - 2 RFI gasket (extends to the bottom front of the PCI carrier)
 - 3 Correct example: the RFI gasket lies flat
 - 4 Incorrect example: the card bracket has hooked behind the RFI gasket
-

1.3.6 Carrier Keys

Each carrier is keyed to a specific slot ([FIGURE 1-25](#)) in the I/O boat. The key is an M2 screw on the top of each carrier. Each carrier slot (0 through 6) will accept only a carrier that has a key in the hole location for that slot.

FIGURE 1-25 Screw Hole Locations for the Carrier Slot Key

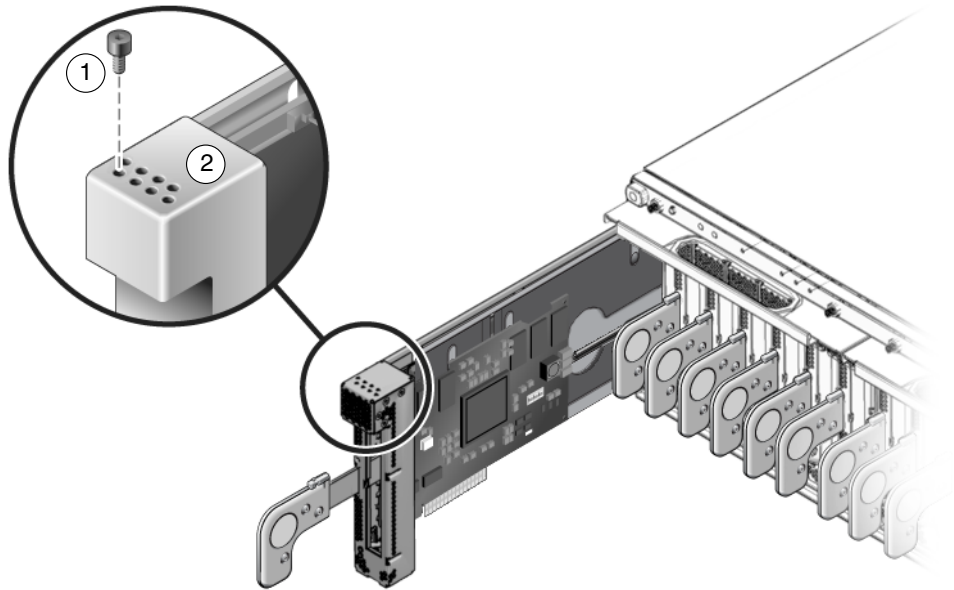


Figure Legend

-
- | | |
|---|--|
| 1 | Key (M2 screw) |
| 2 | Hole locations for carrier slots 0, 1, 2, 3 (front row)* |
| | Hole locations for carrier slots 4, 5, 6, 7 (rear row)† |
-

* Hole 0 and slot 0 are for the link card only.

† Hole 7 is reserved for future configurations.

If you replace a carrier, install the key in the keyhole that corresponds to the slot that you use. A replacement carrier includes one key. It also includes an assortment of labels. Affix the appropriate label (LINK 0, PCIE *n*, or PCIX *n*) to the front of the replacement carrier for easy identification.

1.4 External I/O Expansion Unit Configurations

The External I/O Expansion Unit is available with one or two I/O boats. Two types of link kits (copper and optical) are also available.

1.4.1 Single Boat Configuration

The base configuration for an External I/O Expansion Unit has a single boat, with a filler panel in the second boat bay. [FIGURE 1-26](#) shows a host server and a base External I/O Expansion Unit in the same rack.

A link card in the host server connects to a link card in the External I/O Expansion Unit. One or two link cables connect the two link cards. (The cables are not shown to scale.)

The copper link kit includes a single 13 ft/4 m link cable.

The optical link kit includes two link cables. The link cables are either 33 ft/10 m or 80 ft/25 m cables. Note that in [FIGURE 1-26](#), the link cables are crossed so that the Transmit port (TX) of one link card connects to the Receive port (RX) of the other link card.

FIGURE 1-26 Optical Cables Connect TX Sockets to RX Sockets

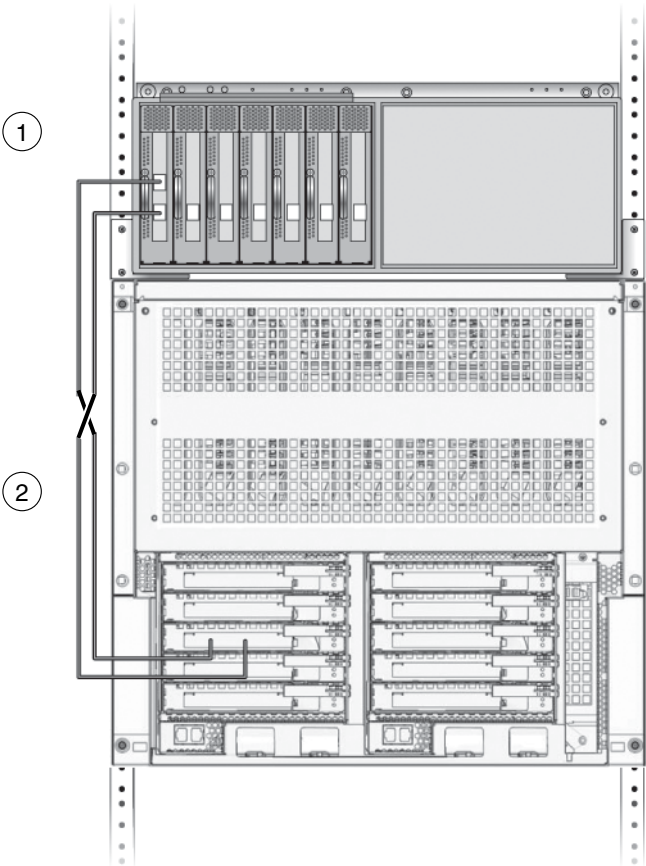


Figure Legend

- 1 External I/O Expansion Unit
- 2 Host server

1.4.2 Dual Boat Configuration

The dual boat configuration provides twelve I/O slots. Each of the I/O boats requires its own link kit, so the host server must have two I/O slots available for this purpose.

Note – If you are installing a second boat in the External I/O Expansion Unit, both boats must be connected to the same host server. Do not connect the second boat to a different server. The second boat can be connected to a different domain on the same server, but not to a domain on a different server.

Note – Do not daisy-chain two boats (connect a boat to another boat through link cards). Daisy-chain configurations are not allowed.

1.5 LEDs

LEDs are located on the front (FIGURE 1-27) and rear (FIGURE 1-28) of the chassis and on individual PSUs.

See [Appendix B](#) for information about interpreting LED states.

FIGURE 1-27 LEDs on the Front of the Chassis

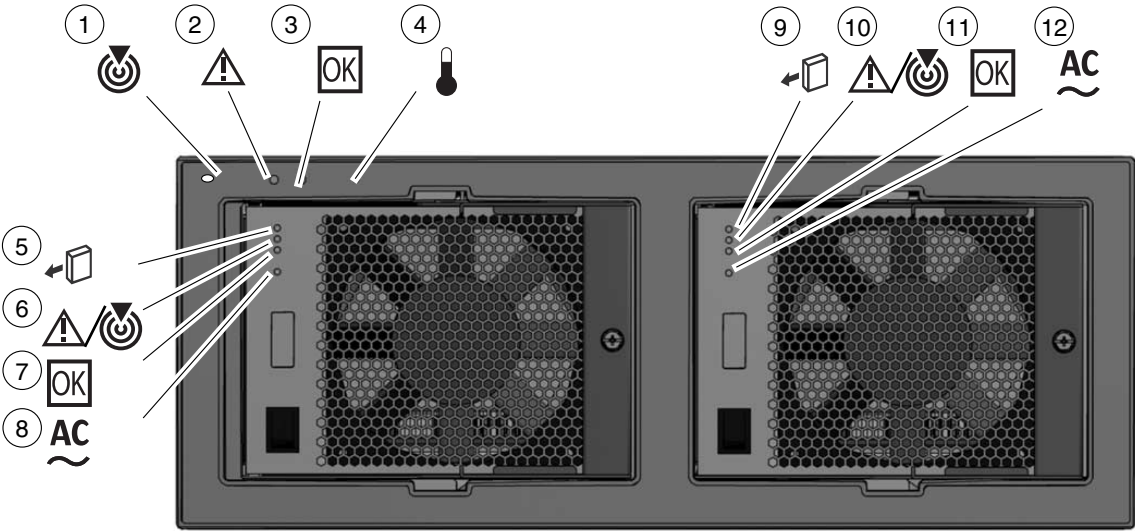


Figure Legend

1	Chassis locate (LED and switch)	7	PSU0 DC power
2	Chassis fault/service required	8	PSU0 AC power
3	Chassis power	9	PSU1 ready to remove

Figure Legend

4	Chassis overtemp	10	PSU1 fault/locate
5	PSU0 ready to remove	11	PSU1 DC power
6	PSU0 fault/locate	12	PSU1 AC power

Note – The Locate LED is a lighted push-button switch. When the flashing of its LED has helped you to locate the External I/O Expansion Unit, turn off the LED by pressing the switch. Note that the LED does not turn off if you press less than 0.5 seconds. You can also manually turn on the LED by pressing the button.

FIGURE 1-28 LEDs on the Rear of the Chassis

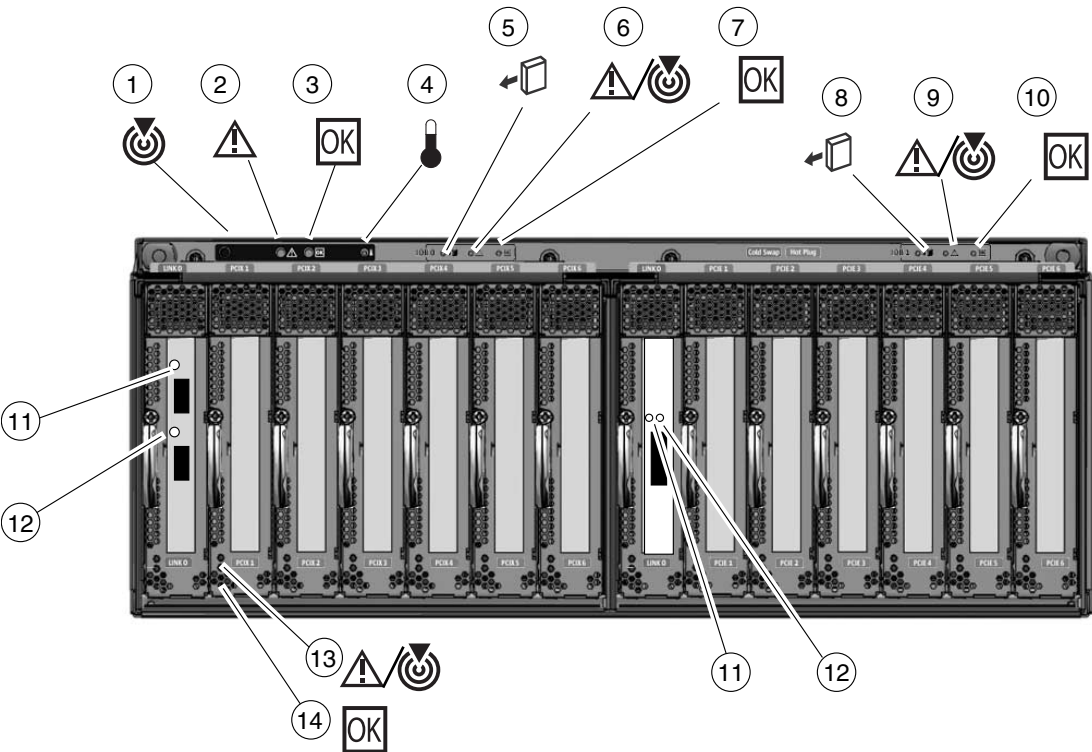


Figure Legend

1	Chassis locate (LED and switch)	8	I/O boat 1 ready to remove
2	Chassis fault/service required	9	I/O boat 1 fault/locate
3	Chassis power	10	I/O boat 1 DC power
4	Chassis overtemp	11	Link card data

Figure Legend

5	I/O boat 0 ready to remove	12	Link card management
6	I/O boat 0 fault/locate	13	Slot attention/locate (all PCI carriers)
7	I/O boat 0 DC power	14	Slot power (all PCI carriers)

Note – On the optical link card, the LEDs for link card data and link card management are located next to the optical cable sockets. Although the LEDs are near the sockets, they do not have any direct relationship to the sockets and are not intended to indicate the activity of the optical cable sockets.

1.6 System Management

The PSUs contain temperature sensors. The PSUs can shut down automatically if they detect an extreme temperature. The PSUs also have sensors for voltage and current levels.

Temperature sensors are also located inside the I/O boats. FRU ID circuits are located on the link cards, the PSUs, the I/O boats, and on the chassis centerplane. Temperature data and FRU ID information is available on an I2C bus (Inter-IC bus) in the External I/O Expansion Unit and the link cards.

The service processor in the host system can monitor the I2C bus in the External I/O Expansion Unit. The service processor can power down the External I/O Expansion Unit if parameters exceed maximum limits.

There is no service processor in the External I/O Expansion Unit itself.

The `ioxadm` command is available on the host system to display External I/O Expansion Unit sensor information and LED states. You can also use `ioxadm` to control the Locate LEDs in the External I/O Expansion Unit and to power on or off FRUs in the External I/O Expansion Unit. Refer to the `ioxadm` (8) man page for more information.

For examples of software commands, see [Appendix C](#).

1.6.1 Maximum Temperatures in the External I/O Expansion Unit

TABLE 1-1 summarizes the maximum temperatures for the External I/O Expansion Unit. The table also includes error messages that the host might display if these temperatures exceed the maximum values. Two types of error messages might be displayed on the host console, Ereport (error report) and FMA (Fault Management Architecture) messages.

TABLE 1-2 Maximum Temperatures

Temperature	Where Measured	Comments
38°C (100°F)	At the intake of the PSU	Ereport: <code>ereport.chassis.env.temp.otw</code> FMA: <code>fault.chassis.iox.env.temp.over-warn</code>
54°C (130°F)	Inside the PSU	Ereport: <code>ereport.chassis.env.temp.otf</code> FMA: <code>fault.chassis.iox.power.fail</code> Note: The PSU can turn itself off if its internal temperature exceeds this value.
60°C (140°F)	Inside the I/O boat	Ereport: <code>ereport.chassis.env.temp.otw</code> FMA: <code>fault.chassis.iox.env.temp.over-warn</code>
65°C (150°F)	Inside the I/O boat	Ereport: <code>ereport.chassis.env.temp.otf</code> FMA: <code>fault.chassis.iox.power.fail</code>

1.7 Site Preparation

The following information summarizes installation requirements for the External I/O Expansion Unit.

For additional specifications and compliance information, see [Appendix A](#).

1.7.1 Physical Requirements

- The External I/O Expansion Unit with the cable management unit attached is 17.3 in./440 mm wide and 39.4 in./1000 mm deep.
- The movement of air through the External I/O Expansion Unit chassis is from front to back.
- The External I/O Expansion Unit is four rack units tall (6.9 in./175 mm).

- Service access to the External I/O Expansion Unit is from the front or rear. The mounting rails do not slide.
- The choice of mounting location in a rack can be limited by the length of the link cable:
 - The optical link kit includes either 33 ft/10 m or 80 ft/25 m cables. The External I/O Expansion Unit can be located some distance from the host server rack.
 - The copper link kit includes a 13 ft/4 m cable.
- The maximum weight of the External I/O Expansion Unit is approximately 81 pounds (36.8 kg).



Caution – Mount the heaviest subassemblies at the lowest available opening in a rack to minimize the precarious effects of a top-heavy system.

Note – Do not install another product between two External I/O Expansion Units if the product is short in height and shorter in depth than the External I/O Expansion Units. If there is little space between the upper and lower External I/O Expansion Units, there might not be enough space for your hands and arms to connect cables on the rear of the product.

1.7.2 Electrical Requirements

- The maximum wattage per PCI card is 25 watts.
- Two AC cords (supplied) must be used with the internal AC cables ([FIGURE 1-2](#)).
- The supply voltage is 100 VAC to 240 VAC, 50-60 Hz.
- The maximum power rating of External I/O Expansion Unit is 600 watts.

1.8 Service Information

Service and installation information is also available on service labels that are located on the External I/O Expansion Unit top cover and on the dummy cards that are shipped with new carriers.

TABLE 1-3 Service Information Summary

Topic	Comments
Access	<ul style="list-style-type: none">• Service access to the External I/O Expansion Unit is from the front or rear of the unit.• The top cover is removable.
Air flow	<ul style="list-style-type: none">• Air flow in the External I/O Expansion Unit is from front to back.• Fans are located in the power supply units. There are no separate fans or fan trays.• The PSU and I/O boat slots have pivoting metal flaps that drop down to close the slots when a PSU or I/O boat is removed. This prevents the loss of cooling air.
Mounting brackets	The External I/O Expansion Unit is mounted on fixed brackets. Sliding brackets are not available for this product.
PCI card installation	<ul style="list-style-type: none">• To avoid overheating of the External I/O Expansion Unit, cards should be installed as quickly as possible.• To prepare yourself to install a card within one or two minutes, see Section 1.3, “Carriers” on page 1-17.
PCI cable removal	<ul style="list-style-type: none">• When removing cables such as LAN cables, if you have difficulty unlatching the connector, press the latch with a flathead screwdriver to remove the cable.
AC cables and cords	<ul style="list-style-type: none">• The internal AC cables (FIGURE 1-2) are not removable. If they are damaged, replace the chassis.• Each internal AC cable connects to only one PSU. Connect both AC cables to AC power to ensure that both PSUs are operational.• The internal AC cables are not connected directly to AC voltage. Use the AC power cords to connect the internal AC cables to AC voltage.• Do not use AC cables designed for other products with the External I/O Expansion Unit.

TABLE 1-3 Service Information Summary (*Continued*)

Topic	Comments
Link cables	<ul style="list-style-type: none">• The optical version of the link kit includes two unidirectional cables. The ends of the cables are marked TX and RX (transmit and receive, respectively).• The copper link kit has one cable. The connector is designed in a way such that it cannot be connected upside down.
Jumpers	<ul style="list-style-type: none">• The External I/O Expansion Unit does not have jumper pins.• For information about any jumper pins that might be present on a specific PCI card, see the instructions that came with the card.
System serial number	<ul style="list-style-type: none">• For a new system, the system serial number is located on labels on the chassis bezel and inside the right I/O boat bay.• For a FRU chassis, the system serial number is located inside the left I/O boat bay. Two additional serial number labels are included to be placed on the chassis bezel.

1.9

Electrostatic Discharge Precautions



Caution – Circuit board components are vulnerable to damage by electrostatic discharge (ESD). An electrostatic charge can build up on the human body and then discharge when you touch a board. Such discharge can be produced by walking across a carpet and touching a board, or by other similar cause. Before handling any board, ensure that you dissipate your body's charge. Touch a conductive surface of the chassis or other element connected to common earth ground to discharge the static electricity present in your body.

To minimize risk of ESD damage:

- Handle the board by the edges only.
- Store the board in an antistatic bag.
- Use a grounding strap and an ESD mat whenever you work on a board.

Installing the External I/O Expansion Unit in a Rack

The following topics are in this chapter:

- [Section 2.1, “Tools” on page 2-1](#)
- [Section 2.2, “Installing the Mounting Brackets in a Rack” on page 2-2](#)
- [Section 2.3, “Installing the External I/O Expansion Unit in the Rack” on page 2-7](#)
- [Section 2.4, “Installing the Cable Management Unit” on page 2-9](#)
- [Section 2.5, “Installing the AC Cords” on page 2-13](#)
- [Section 2.6, “Installing the Link Kit” on page 2-16](#)

2.1 Tools

You need the following tools for this installation:

- Phillips No. 1 screwdriver
- Phillips No. 2 screwdriver
- ESD-protected mat and a grounding strap
- (Suggested) digital voltmeter to verify correct grounding

2.2 Installing the Mounting Brackets in a Rack

The External I/O Expansion Unit can be installed in either an equipment rack or the rack space in the SPARC Enterprise M8000 server.

The External I/O Expansion Unit mounting kit (FIGURE 2-1) includes a right-side mounting bracket and a left-side mounting bracket. The mounting brackets are adjustable for length and are shipped unassembled. The mounting kit includes two chassis lock brackets.

FIGURE 2-1 Mounting Kit

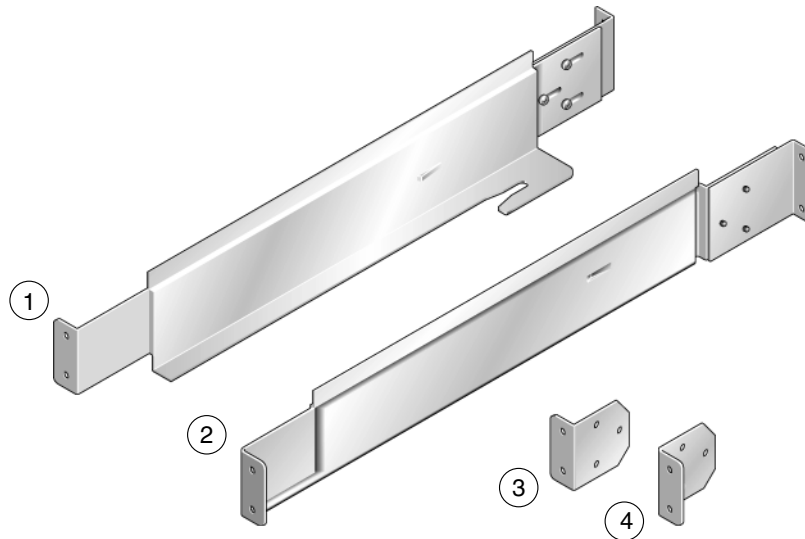


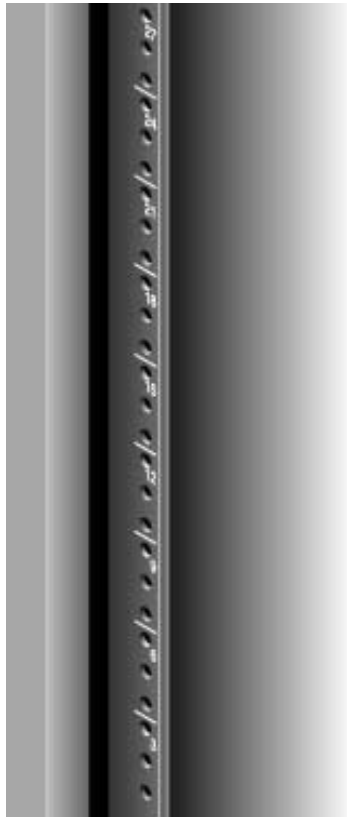
Figure Legend

-
- | | |
|----------|----------------------------|
| 1 | Left mounting bracket |
| 2 | Right mounting bracket |
| 3 | Left chassis lock bracket |
| 4 | Right chassis lock bracket |
-

- 1. Use an antistatic strap for this procedure.**
- 2. Locate a suitable mounting location in the rack.**

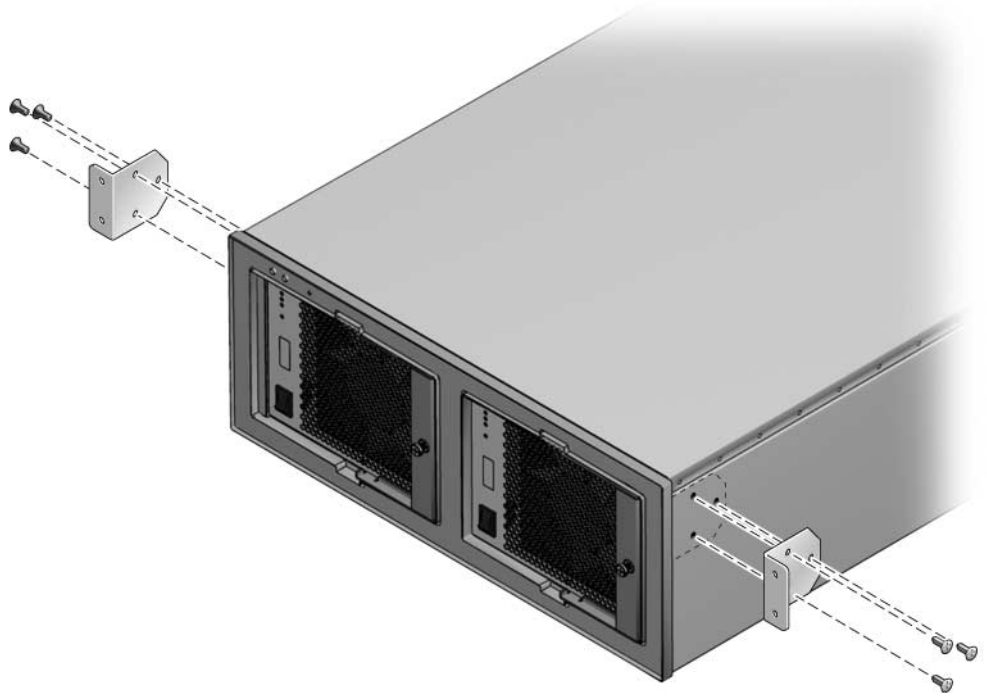
- The External I/O Expansion Unit occupies a height of four rack units (6.9 in./175 mm).
- Mount the heaviest subassemblies at the lowest available opening to minimize the precarious effects of a top-heavy system.
- If you are installing more than one External I/O Expansion Unit, install them together. Do not install a shorter subassembly between External I/O Expansion Unit where the rear of the shorter subassembly might difficult to reach.
- If the rack is marked with rack units, place the mounting bracket so that the lower screw hole on the bracket is one hole above an RU mark ([FIGURE 2-2](#)). This aligns the mounting bracket with the lower RU mark.

FIGURE 2-2 Typical Rack Unit Marks



3. Using No. 2 Phillips screws, attach the chassis lock brackets to the sides of the External I/O Expansion Unit ([FIGURE 2-3](#)).

FIGURE 2-3 Installing the Chassis Lock Brackets



4. Loosen the screws (FIGURE 2-4) that hold the sliding flanges to the mounting brackets.

This action allows the rear flanges to adjust to fit different rack depths.

FIGURE 2-4 Sliding Flange

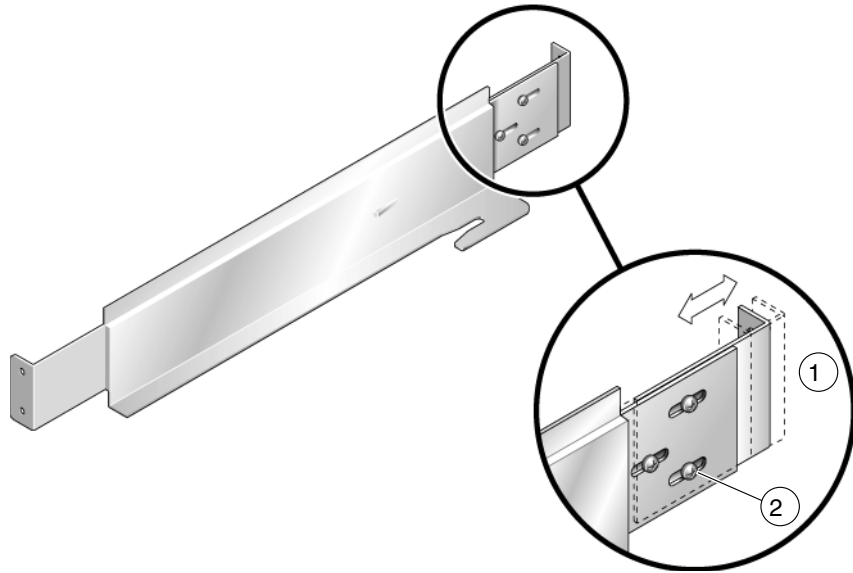


Figure Legend

-
- | | |
|---|----------------|
| 1 | Sliding flange |
| 2 | Flange crews |
-

5. If your rack has threaded holes, continue at [Step 7](#).

6. If your rack has square holes, install cage nuts in the rack pillars.

[TABLE 2-1](#) lists the locations for the cage nuts. Note that these are relative locations. Adjust the actual hole locations as needed to leave space for a power distribution unit, additional External I/O Expansion Units, or other rack-mounted equipment.

TABLE 2-1 Cage Nut Locations

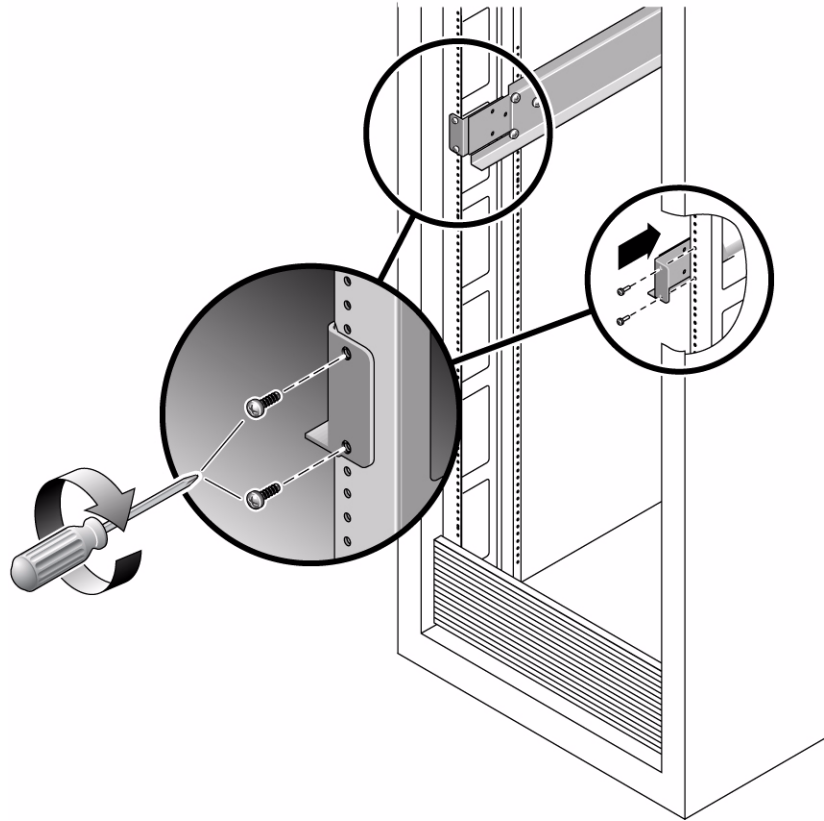
Rack Unit	Hole No.	Front	Rear
4	12		
	11		
	10	cage nut	cage nut
3	9		
	8		
	7		
2	6	cage nut	cage nut
	5	cage nut	cage nut
	4		
1	3		
	2	cage nut	cage nut
	1		

7. Attach the mounting brackets to the rack (FIGURE 2-5):

- a. At the front of the rack, orient the hooked portion of the mounting bracket away from you.
- b. Loosely attach the front of the mounting bracket to the rack.
Install and tighten the screws, then loosen each screw approximately one-half turn.
- c. Repeat [Step a](#) and [Step b](#) for the second mounting bracket.
- d. At the rear of the rack, slide the end of each mounting bracket to fit the depth of the rack.
- e. Loosely attach the rear ends of the mounting brackets to the rack.
- f. Narrow the space between the rear ends of the mounting brackets by sliding the ends of the brackets toward each other.

Note – At the front of the rack, the space between the brackets should be equal to or slightly wider than the width of the External I/O Expansion Unit chassis. At the rear of the rack, the space between the brackets should be slightly narrower than the width of the External I/O Expansion Unit chassis. This arrangement allows the correct fitting of the brackets to the sides of the External I/O Expansion Unit. See [Section 2.3, “Installing the External I/O Expansion Unit in the Rack”](#) on page 2-7.

FIGURE 2-5 Installing the Mounting Brackets in a Rack



8. Tighten the screws at the front of the rack.
9. Verify that the brackets at the rear of the rack can still slide slightly to the left and right.

2.3 Installing the External I/O Expansion Unit in the Rack

The External I/O Expansion Unit can be installed in either an expansion rack or the 19-inch rack space in the SPARC Enterprise M8000 server.

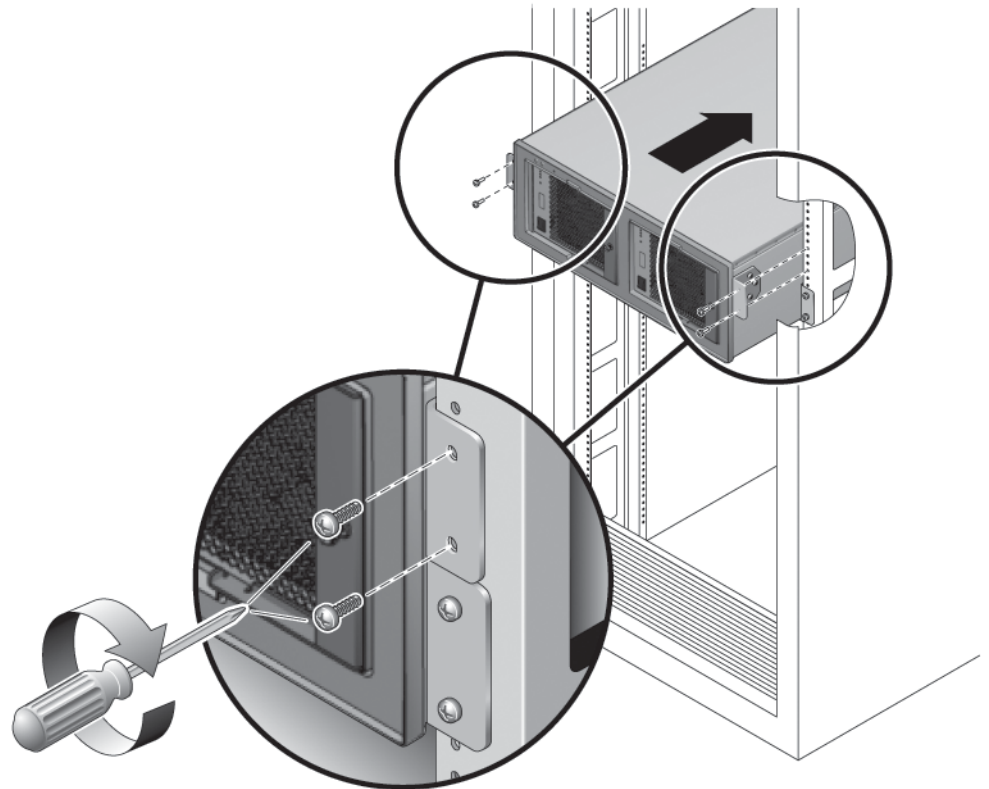
1. Use an antistatic strap for this procedure.

2. **Place the External I/O Expansion Unit on the front of the mounting brackets and slide the External I/O Expansion Unit into the rack.**

As you slide the External I/O Expansion Unit into the rack, the sides of the External I/O Expansion Unit chassis push the ends of the brackets apart from each other. When the chassis is almost completely in the rack, bulges on the underside of the chassis contact hooks that are located on the mounting brackets, wedging the mounting brackets tightly against the sides of the chassis. This wedging action stabilizes the External I/O Expansion Unit and is necessary to reduce the amount of vibration that occurs when the system is running.

3. **Tighten the screws at the rear of the mounting brackets.**
4. **Lock the front of the External I/O Expansion Unit in place with two screws on each side (FIGURE 2-6).**

FIGURE 2-6 Installing the External I/O Expansion Unit in the Rack



2.4 Installing the Cable Management Unit

At the rear of the rack, install the cable management support brackets:

1. **Use an antistatic strap for this procedure.**
2. **Place the support brackets just above the chassis mounting brackets (FIGURE 2-7) and loosely attach the support brackets to the rack with two screws each.**
Do not tighten the screws yet.

Note – The cable management unit includes one cable plate, either type A (FIGURE 2-8) or type B (FIGURE 2-9).

- Use the type A cable plate in racks that allow the routing of cables along both sides of the rack.
- Use the type B cable plate in racks that allow the routing of cables only along the right side of the rack.

FIGURE 2-7 Installing the Support Brackets

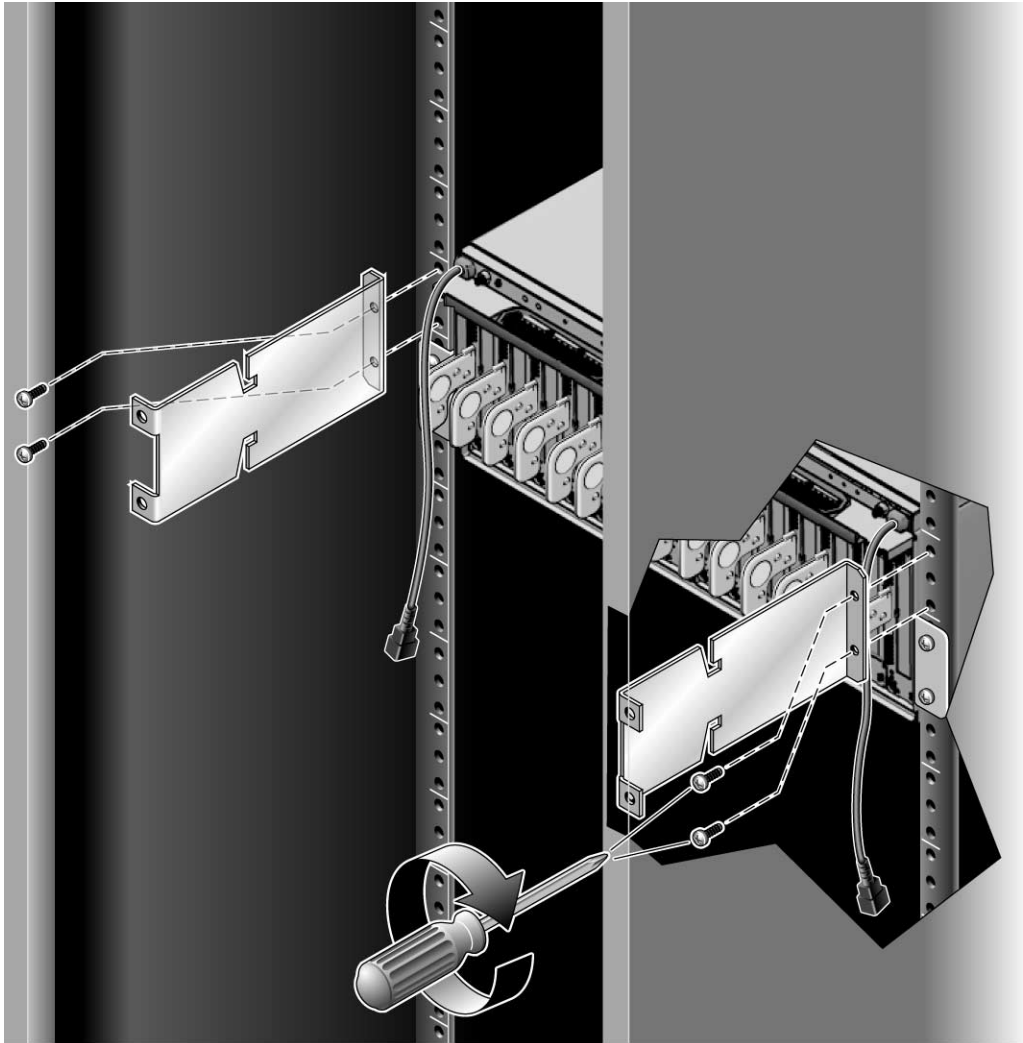


FIGURE 2-8 Type A Cable Plate

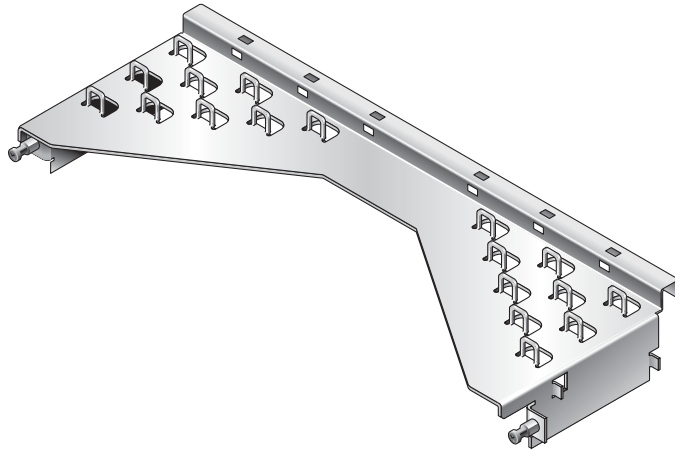
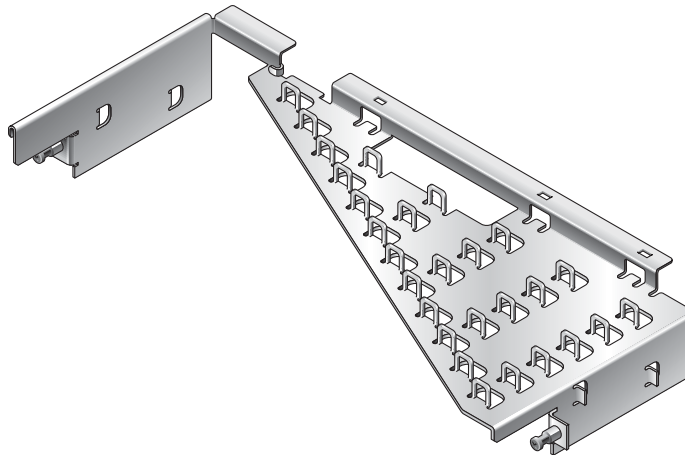


FIGURE 2-9 Type B Cable Plate



3. Place the cable plate between the support brackets (FIGURE 2-10).

On each side of the cable plate, the forward tab rests on the bottom of the large cutout in the support bracket. The rear tab rests in a small depression in the top of the support bracket. This is the normal operating position for the cable plate.

FIGURE 2-10 Cable Plate and Support Bracket, Side View

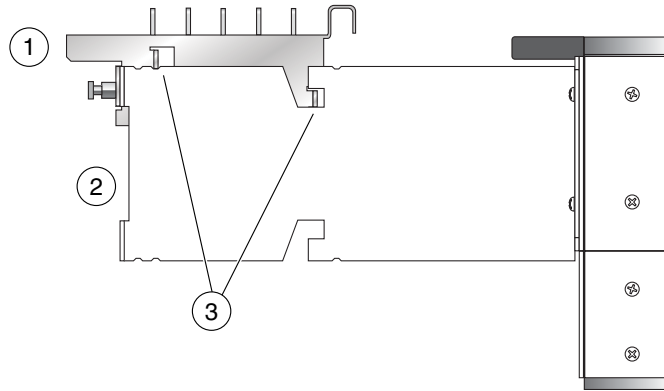


Figure Legend

-
- | | |
|---|------------------------------------|
| 1 | Cable plate |
| 2 | Support bracket |
| 3 | Supporting tabs on the cable plate |
-

4. Tighten the green cable plate locking screws at each side of the cable plate.

5. Tighten the mounting screws on the support brackets.

2.5 Installing the AC Cords

1. Use an antistatic strap for this procedure.
2. Attach an AC cord to an internal AC cable at the rear of the External I/O Expansion Unit, then connect the AC cord to an AC outlet.
 - The PSUs should be connected to two independent external AC power sources so that service will not be interrupted if one AC power source fails.
 - For the type A cable plate (FIGURE 2-8), route each AC cord along the nearest side of the rack.
 - For the type B cable plate (FIGURE 2-9), route the left AC cord over the top of the cable plate to the right side of the rack. Place the connector of the left AC internal cable in the rectangular opening in the top of the type B cable plate to save space. See FIGURE 2-12.

Note – If the PSU1 power cable does not reach the rack power distribution unit, route the cable on left side of the rack.

Note – Do not connect the internal AC cable directly to an AC socket (power distribution unit or power strip). You must use the AC cords supplied with the External I/O Expansion Unit.

3. Attach an AC cord to the remaining internal AC cable as in [Step 2](#).

Note – The fan might turn on when you insert a power supply into the External I/O Expansion Unit. This is normal behavior if you are replacing a PSU while the other PSU is powered up.

FIGURE 2-11 AC Cables for Type A Cable Management Plate

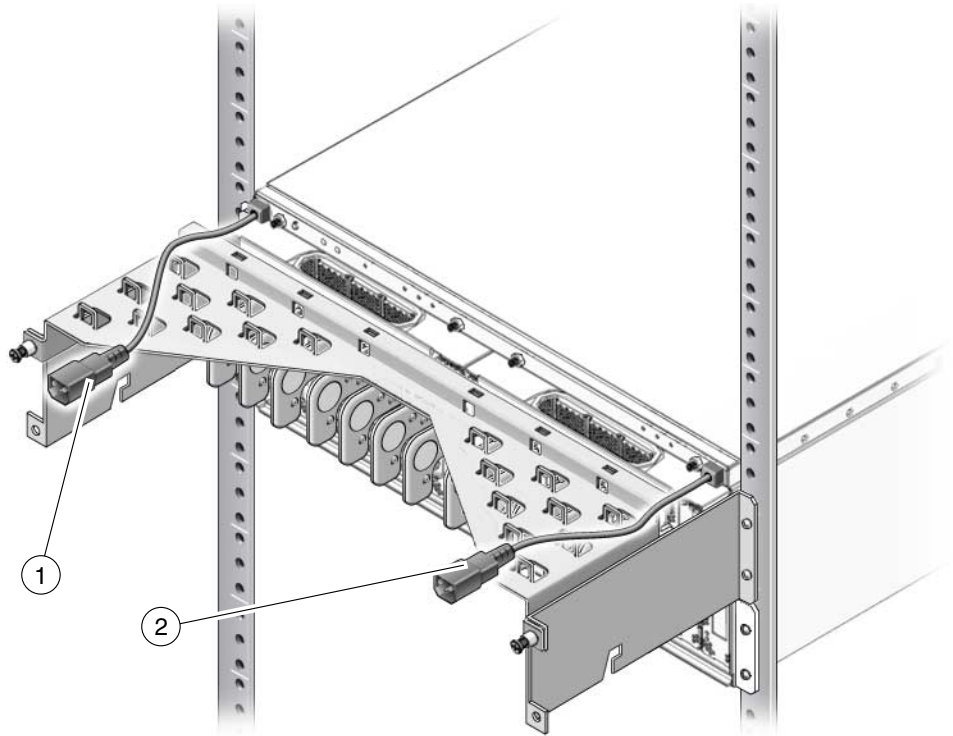


Figure Legend

-
- | | |
|---|--------------------------|
| 1 | Internal AC cable, left |
| 2 | Internal AC cable, right |
-

FIGURE 2-12 AC Cables and Cords for Type B Cable Management Plate

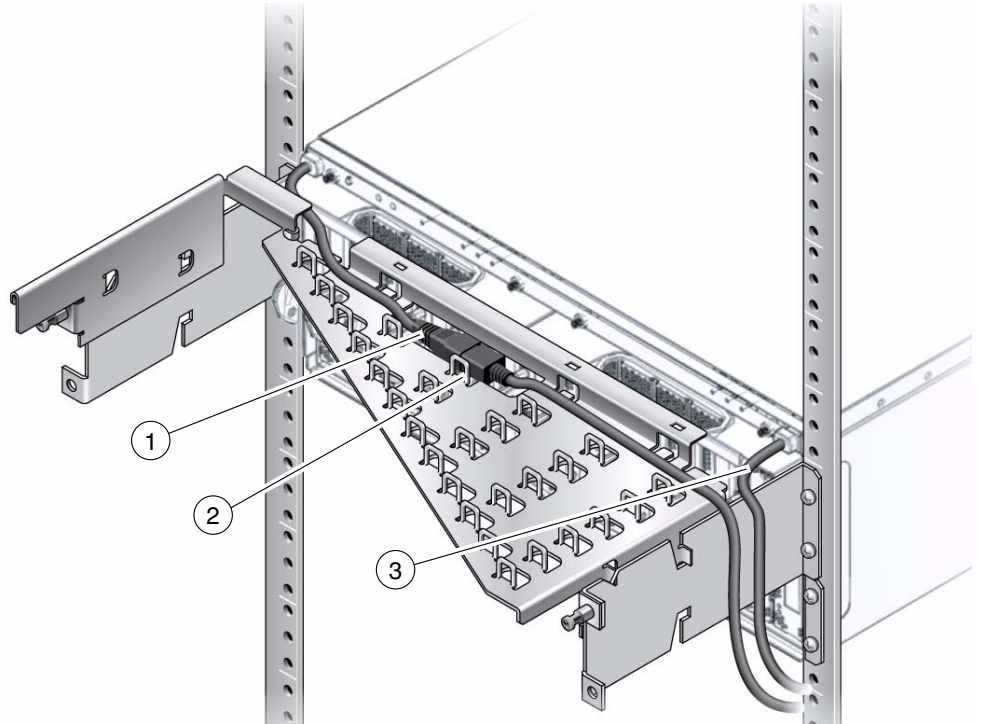


Figure Legend

-
- | | |
|---|---|
| 1 | Internal AC cable, left |
| 2 | AC cord (connectors are placed in rectangular opening to reduce height) |
| 3 | Internal AC cable, right |
-



4. If you wish to test the External I/O Expansion Unit for basic electrical functionality, do the following:

a. Turn on the PSU AC switches.

The switches are located on the front of the power supplies.

The LEDs on the power supplies should display the following indications after a short initialization period.

TABLE 2-2 Normal PSU Indications

LED	Indication
 AC Power	On (green LED)
 DC Power	On (green LED)

For other LED combinations, see [TABLE B-4](#).

b. Turn off the PSU AC switches.

The LEDs on the PSUs continue glowing until DC current in the PSUs is depleted. This can take approximately five to ten seconds.

2.6 Installing the Link Kit

A link kit includes two identical link cards, one for the host server and one for the I/O boat. You can install either card in either location.

The link card in the I/O boat is always installed in boat slot 0. If your External I/O Expansion Unit has two I/O boats, then link cards must be located in slot 0 of both boats.

Note – If you are installing a second boat in the External I/O Expansion Unit, both boats must be connected to the same host server. Do not connect the second boat to a different server. The second boat can be connected to a different domain on the same server, but not to a domain on a different server.

Note – Do not daisy-chain two boats (connect a boat to another boat through link cards). Daisy-chain configurations are not allowed.

Your link kit is one of two types:

- Optical interface and two cables — see [Section 2.6.1, “Installing the Optical Link Kit”](#) on page 2-17
- Copper interface and one cable — see [Section 2.6.2, “Installing the Copper Link Kit”](#) on page 2-18

2.6.1 Installing the Optical Link Kit

Note – The minimum bend radius for optical link cables is 1.8 in./46 mm.

1. **Use an antistatic strap for this procedure.**

2. **Install a link card in the host server.**

See the service manual for your host server for instructions for installing an PCI card.

3. **If a link card is not already installed in the I/O boat, install it now.**

Slot 0 is used for the link card. It is the leftmost slot in the boat. For details about card removal and replacement, see [Section 3.1, “Installing a PCI Card”](#) on page 3-1.



Caution – The carrier can be damaged during removal and during insertion. For safe handling of the carrier, read the cautions in [Section 3.1, “Installing a PCI Card”](#) on page 3-1.

4. **Install the link cables.**

Note – The two optical link cables are identical. One end of a cable is marked TX. The other end is marked RX ([FIGURE 2-13](#)). When you route the cables, ensure that the TX plug of one cable is paired with the RX plug of the other cable.

- At the I/O boat, connect a plug marked TX into the TX port on the link card. Connect the RX plug of the second cable into the RX port.**
- At the host server, connect a plug marked TX to the TX port on the link card. Connect the RX plug of the remaining cable into the RX port.**

FIGURE 2-13 TX and RX Labels on the Optical Link Cable

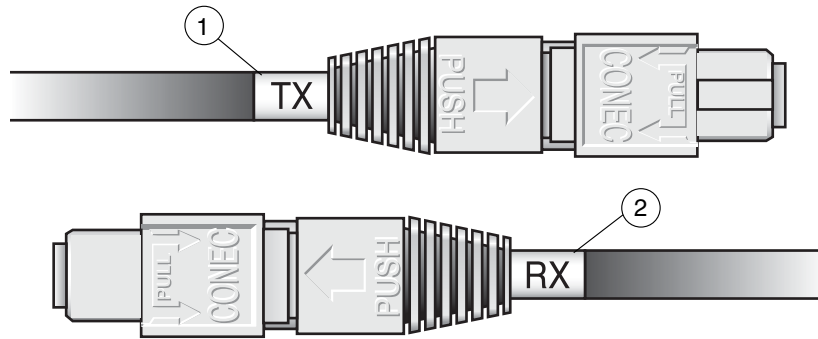


Figure Legend

- | | |
|---|----------|
| 1 | TX label |
| 2 | RX label |

Note – Check the labels to verify that each plug is connected to the correct port. The TX and RX plugs are identically shaped, so it is easy to incorrectly connect a plug to the wrong port.

2.6.2 Installing the Copper Link Kit

Note – The minimum bend radius for the copper link cable is 1.85 in./47 mm.

1. Use an antistatic strap for this procedure.

2. Install a link card in the host server.

See the service manual for your host server for instructions for installing a PCI card in a host slot.

Note – Low profile brackets that are included in some copper link kits are not used for SPARC Enterprise M4000/M5000/M8000/M9000 servers.

3. If a link card is not already installed in the I/O boat, install it now.

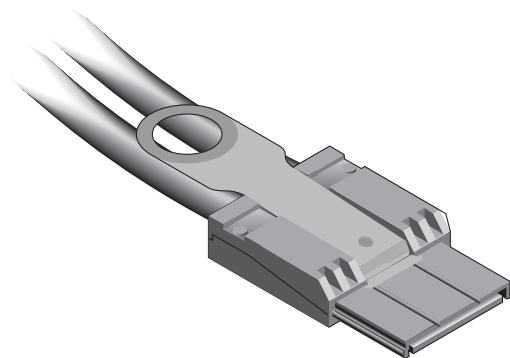
Slot 0 is used for the link card. It is the leftmost slot in the boat. For details about card removal and replacement, see [Section 3.1, “Installing a PCI Card” on page 3-1](#).



Caution – The carrier can be damaged during removal and during insertion. For safe handling of the carrier, read the cautions in [Section 3.1, “Installing a PCI Card”](#) on page 3-1.

4. Connect the link cable to both link cards.

FIGURE 2-14 Copper Link Cable Plug

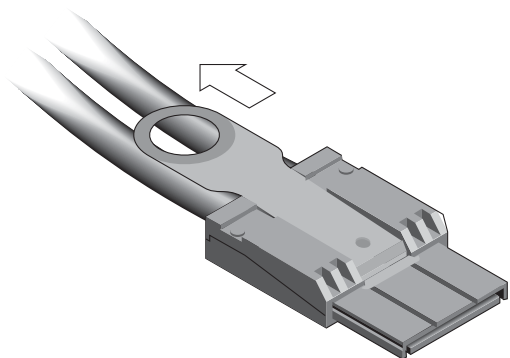


Note – If it is necessary to disconnect a link cable, pull the ring-shaped tab approximately 0.15 in./2 mm in the direction shown by the arrow in [FIGURE 2-15](#).



Caution – Do not pull the ring tab more than 0.15 in./2 mm, or it will break. When disconnecting the cable from a link card, pull the cable plug while pulling carefully on the ring tab.

FIGURE 2-15 Copper Link Cable Ring Tab



Working With PCI Cards

This chapter gives procedures for installing PCI and link cards, and related cables.

- [Section 3.1, “Installing a PCI Card” on page 3-1](#)
- [Section 3.2, “Replacing a PCI Card” on page 3-9](#)
- [Section 3.3, “Installing Cables for PCI Cards” on page 3-16](#)

3.1 Installing a PCI Card

1. **Determine which card locks you will use to mount your PCI card on a carrier.**

The size and shape of the PCI card affect the quantity and type of card locks you use. Before you start this procedure, you must decide which locks you will use for the PCI card. See [Section 1.3.2, “Card Locks” on page 1-20](#)



Caution – If you install a PCI card when the External I/O Expansion Unit is running, be prepared to complete the installation within two minutes or so. If you leave a carrier slot empty, the External I/O Expansion Unit might overheat.

2. **Use an antistatic strap for this procedure.**
3. **Unscrew the carrier locking screw (item 2 in [FIGURE 3-1](#)) on the carrier handle.**

FIGURE 3-1 Unlocking and Removing a Carrier

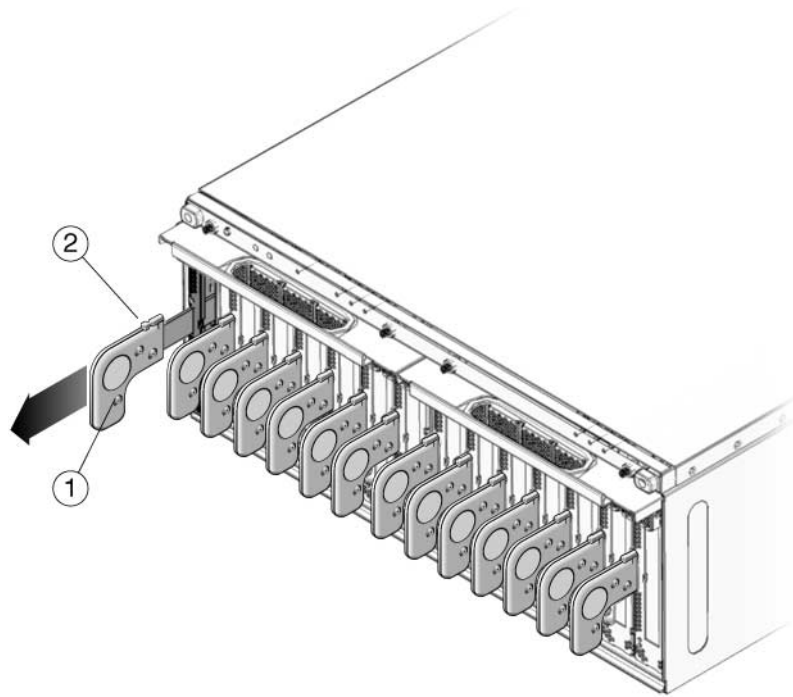


Figure Legend

-
- | | |
|---|-----------------------|
| 1 | Carrier handle |
| 2 | Carrier locking screw |
-

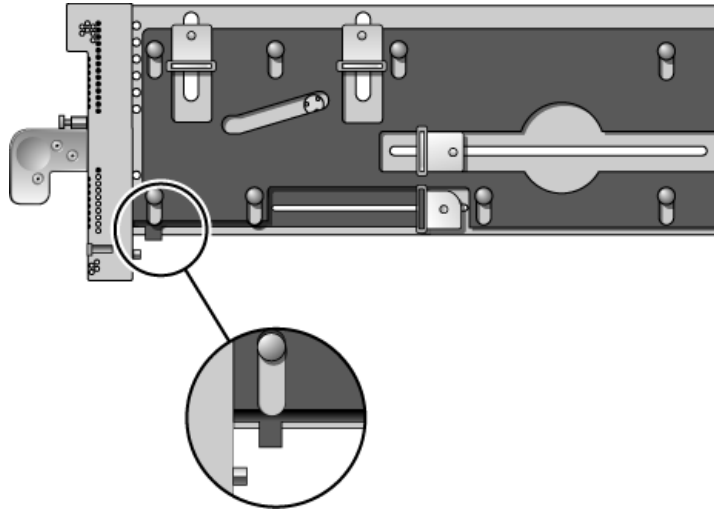
4. Press lightly on the front of the carrier, and pull out the carrier handle until it clicks into the open position (approximately 1.5 in./38 mm).

Pressing the front of the carrier prevents movement of the carrier when you pull the carrier handle.



Caution – Pulling the carrier handle raises the carrier plate. If the carrier moves forward before the carrier plate is completely raised, the plastic locator bar (FIGURE 3-2) might be damaged by hitting the lower front edge of the I/O boat.

FIGURE 3-2 Locator Bar on Carrier



5. Pull the carrier out of the slot and place it on an antistatic work surface.
6. Press the locking latch (FIGURE 3-3) while you push the carrier handle into the closed position.

This action lowers the carrier plate, giving you more room to move the PCI card into place on the carrier.

FIGURE 3-3 Closing the Carrier Handle

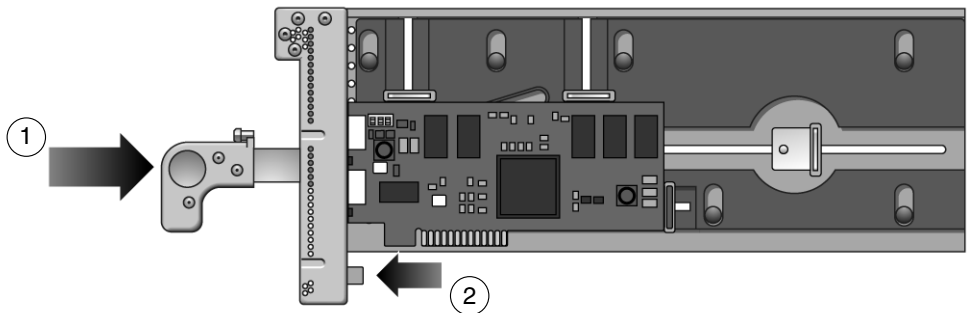


Figure Legend

- 1 Push carrier handle to the right
- 2 Push locking latch to the left

7. Place the carrier on a padded static-safe surface and loosen the card lock screws. The screws are on the back of the carrier (FIGURE 3-4).

FIGURE 3-4 Screws for Card Locks

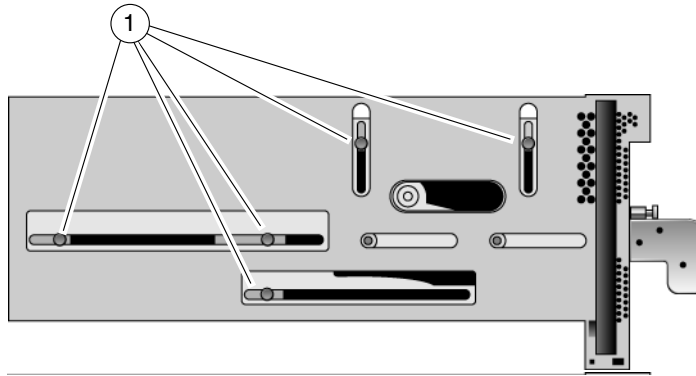


Figure Legend

1 Card lock screws

8. Turn the carrier over and remove the dummy card or PCI card.
9. For very small PCI cards (1.25 in./31 mm tall or 3.0 in./76 mm wide), it is necessary to do one or both of the following:
 - Move the long card lock (type B lock) from the horizontal slider slot to the front vertical slider slot, then slide it down to reach the top of the PCI card. See
 - Rotate the small card lock (type C lock) and slide it to the rear edge of the PCI card.See [FIGURE 1-19](#) and [FIGURE 1-20](#) for examples.
10. Place the PCI card on the carrier.
 - a. Place the front of the card inside the housing ([FIGURE 3-5](#)).

FIGURE 3-5 Inserting the PCI Card

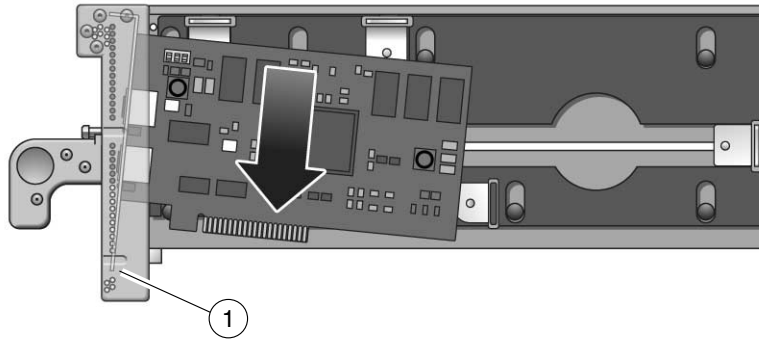


Figure Legend

-
- 1 See the following caution.
-



Caution – Do not allow the bottom edge of the PCI card bracket to tear the RFI gasket in the front of the carrier ([FIGURE 3-5](#)).

- b. A rectangular notch is located on the bottom front of the PCI card. Fit the notch over the card alignment tab (item 1 in [FIGURE 3-6](#)), then fit the top of the card bracket over the card alignment post (item 2 in [FIGURE 3-6](#)).

FIGURE 3-6 Placing the PCI Card on the Carrier

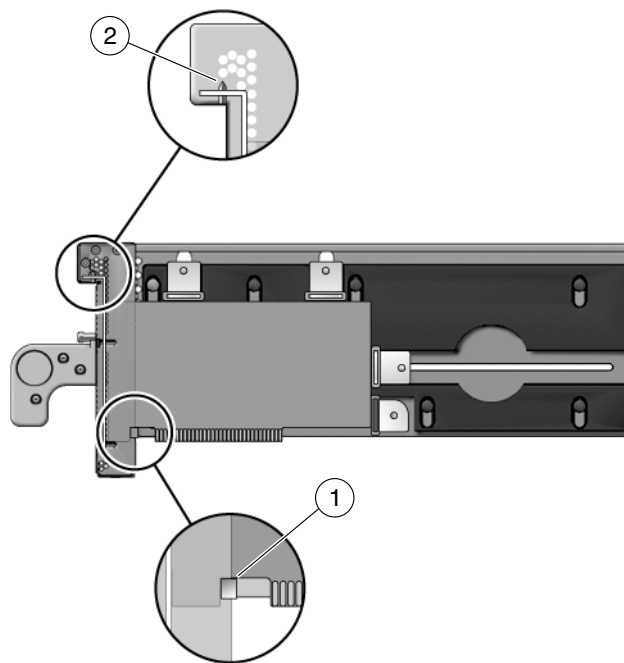


Figure Legend

-
- | | |
|---|---------------------|
| 1 | Card alignment tab |
| 2 | Card alignment post |
-

11. Attach the PCI card to the carrier with one card lock:

a. Slide a card lock to the right edge of the PCI card.

b. Hold the card in place and partially tighten the card lock screw.

Push the card lock against the card with sufficient pressure to slightly compress the RFI gasket.

c. Verify that the PCI card is not tilted, then tighten the card lock screw.

FIGURE 3-7 Using Card Lock to Hold the PCI Card

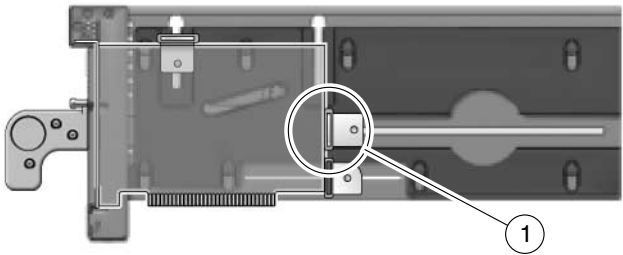


Figure Legend

1 Card lock

12. Slide the remaining card locks to the edges of the PCI card and tighten the screws.

The shape of a PCI card might prevent the use of some card locks. The minimum requirement is one card lock on the side of the PCI card and one card lock on the top.

Note – If the card lock screws are loose, the card locks will slip. The PCI card will not seat properly.



Caution – If the bottom card lock (Type C) is not used, leave it at the far right side of the slot ([FIGURE 3-8](#)). The PCI card will not seat properly if the bottom of the card lock touches the card socket.

FIGURE 3-8 Correct Location for an Unused Type C Card Lock

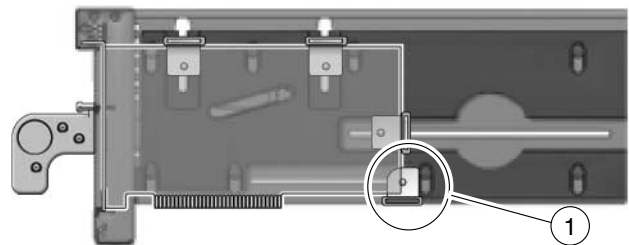


Figure Legend

1 Location of type C card lock when not in use



Caution – Do not apply excessive pressure on the upper card locks. Too much pressure will bend the PCI card bracket. See [FIGURE 3-9](#).

FIGURE 3-9 Excessive Pressure Bends the PCI Card Bracket

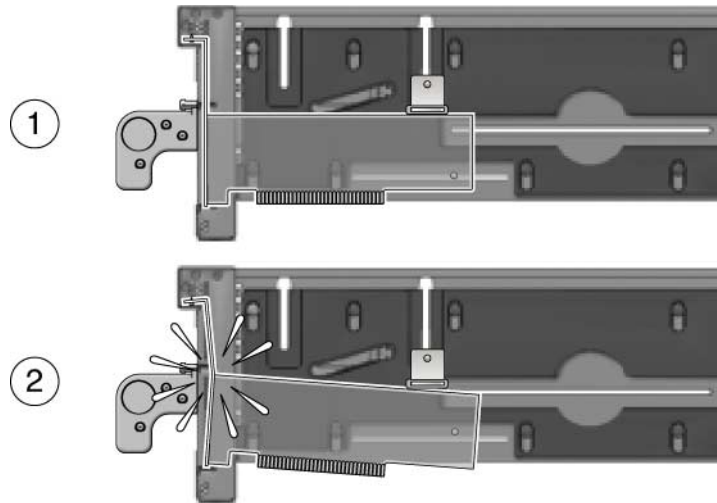


Figure Legend

-
- | | |
|---|--|
| 1 | Moderate pressure on an upper card lock holds the PCI card in a horizontal position. |
| 2 | Excessive pressure bends the PCI card bracket. |
-

13. Pull the carrier handle into the fully open position to raise the carrier plate.

If the carrier plate is not completely raised, the bottom edge will hit the card socket in the I/O boat in [Step 14](#) and [Step 15](#).

14. Carefully place the replacement carrier in the card guides at the top and bottom of the carrier slot in the I/O boat.

15. Push the carrier into the carrier slot.



Caution – Do not press the carrier handle while you push the carrier into the slot. Push only the front of the carrier when seating the carrier in the slot. Pushing the carrier handle might damage the carrier plate by causing it to drop down before the carrier is fully seated in the slot.

16. Push the carrier handle into the closed position ([FIGURE 3-10](#)).

This action seats the PCI card in the card socket.



Caution – If the carrier handle does not close easily, the PCI card might not be seating properly in the card socket in the I/O boat. Remove the carrier and inspect the PCI card. If the bottom of the PCI card is not perfectly horizontal, loosen the card locks and realign the card on the carrier. For troubleshooting information, see [Appendix D](#).

FIGURE 3-10 PCI Card and Carrier

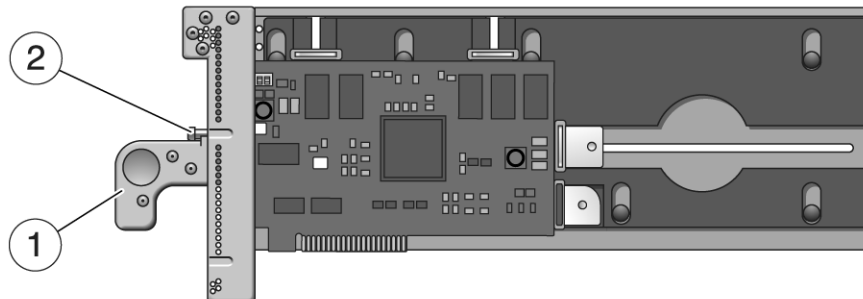


Figure Legend

-
- | | |
|---|-------------------------------------|
| 1 | Carrier handle (in closed position) |
| 2 | Carrier locking screw |
-

17. Use the carrier locking screw located on the top of the handle to lock the carrier handle in place.
18. Add the PCI card to an Oracle Solaris domain.
For details, refer to the service manual for your host server.



3.2 Replacing a PCI Card



Caution – If you install a PCI card while the External I/O Expansion Unit is running, be prepared to complete the installation in approximately two minutes. If you leave a carrier slot empty, the External I/O Expansion Unit might overheat.

1. Use an antistatic strap for this procedure.
2. Remove the PCI card from the Oracle Solaris domain.
For details, refer to the service manual for your host server.

3. Remove the carrier from the carrier slot in the I/O boat.
 - a. Loosen the carrier locking screw on the carrier handle.
 - b. Press lightly on the front of the carrier, and pull the carrier handle out fully.



Caution – Pulling the carrier handle raises the carrier plate. If the carrier moves forward before the carrier plate is completely raised, the plastic locator bar (FIGURE 3-2) might be damaged by hitting the lower front edge of the I/O boat.

- c. Pull the carrier out of the carrier slot and place on an antistatic surface.
4. Press the locking latch (FIGURE 3-11) while you push the carrier handle into the closed position.

This action lowers the PCI card, facilitating the replacement of the card.

FIGURE 3-11 Closing the Carrier Handle

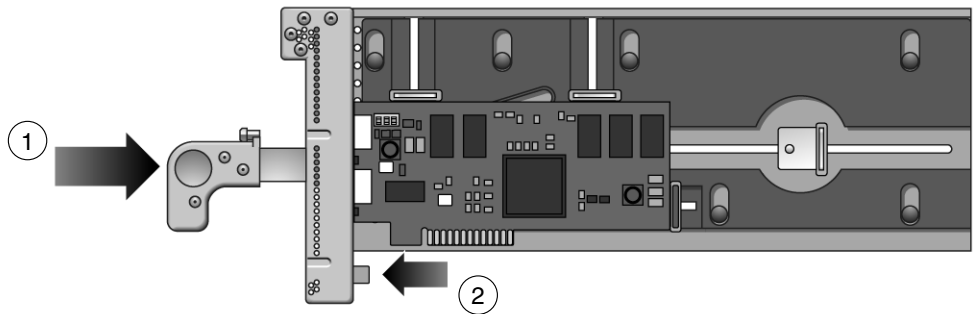


Figure Legend

- | | |
|---|----------------------------------|
| 1 | Push carrier handle to the right |
| 2 | Push locking latch to the left |

5. Remove the existing card from the carrier.
6. If you are installing an exact replacement, go to [Step 8](#).
7. For very small PCI cards (1.25 in./31 mm tall or 3.0 in./76 mm wide), it is necessary to do one or both of the following:
 - Move the long card lock (type B lock) from the horizontal slider slot to the front vertical slider slot, then slide it down to reach the top of the PCI card.
 - Rotate the small card lock (type C lock) and slide it to the rear edge of the PCI card.

See [FIGURE 1-19](#) and [FIGURE 1-20](#) for examples.

8. Place the PCI card on the carrier.
 - a. Place the front of the card inside the housing (FIGURE 3-12).

FIGURE 3-12 Inserting the PCI Card

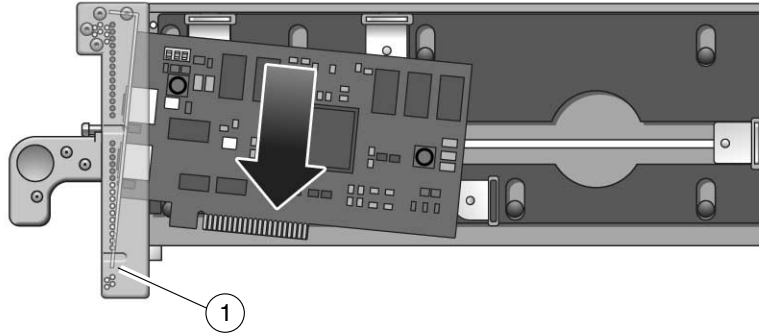


Figure Legend

-
- | | |
|---|----------------------------|
| 1 | See the following caution. |
|---|----------------------------|
-



Caution – Do not allow the bottom edge of the PCI card bracket to tear the RFI gasket in the front of the carrier (FIGURE 3-5).

- b. A rectangular notch is located on the bottom front of the PCI card. Fit the notch over the card alignment tab (item 1 in FIGURE 3-6), then fit the top of the card bracket over the card alignment post (item 2 in FIGURE 3-6).

FIGURE 3-13 Placing the PCI Card on the Carrier

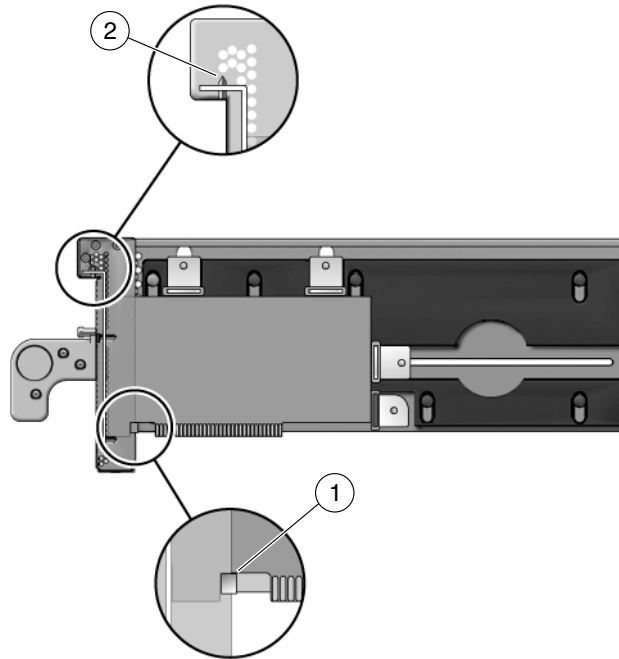


Figure Legend

-
- | | |
|---|---------------------|
| 1 | Card alignment tab |
| 2 | Card alignment post |
-

9. Attach the PCI card to the carrier with one card lock:
 - a. Slide a card lock to the right edge of the PCI card.
 - b. Hold the card in place and partially tighten the card lock screw.
 - c. Verify that the PCI card is not tilted, then tighten the card lock screw.

FIGURE 3-14 Using Card Lock to Hold the PCI Card

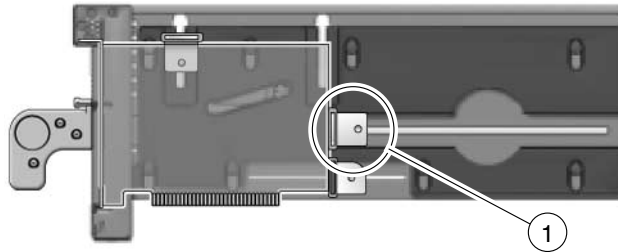


Figure Legend

1 Card lock

10. Slide the remaining card locks to the edges of the PCI card and tighten the screws.

The shape of a PCI card might prevent the use of some card locks. The minimum requirement is one card lock on the side of the PCI card and one card lock on the top.

Note – If the card lock screws are loose, the card locks will slip and the PCI card will not seat properly.



Caution – If the bottom card lock (type C) is not used, leave it at the far right side of the slot ([FIGURE 3-15](#)). The PCI card will not seat properly if the bottom of the card lock touches the card socket.

FIGURE 3-15 Location for an Unused Type C Card Lock

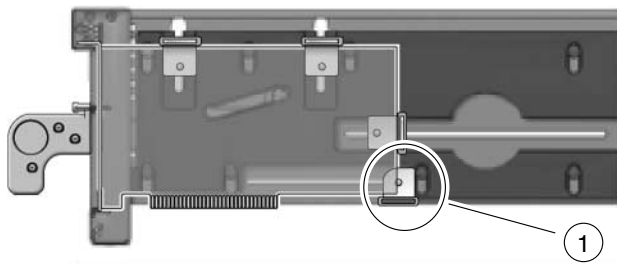


Figure Legend

1 Correct location and orientation for an unused type C card lock



Caution – Do not apply excessive pressure on the upper card locks. Too much vertical pressure will bend the PCI card bracket. See [FIGURE 3-16](#).

FIGURE 3-16 Excessive Pressure Bends the PCI Card Bracket

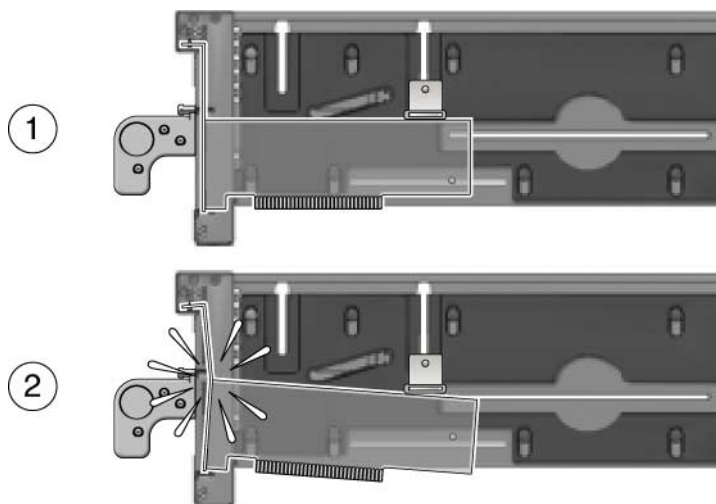


Figure Legend

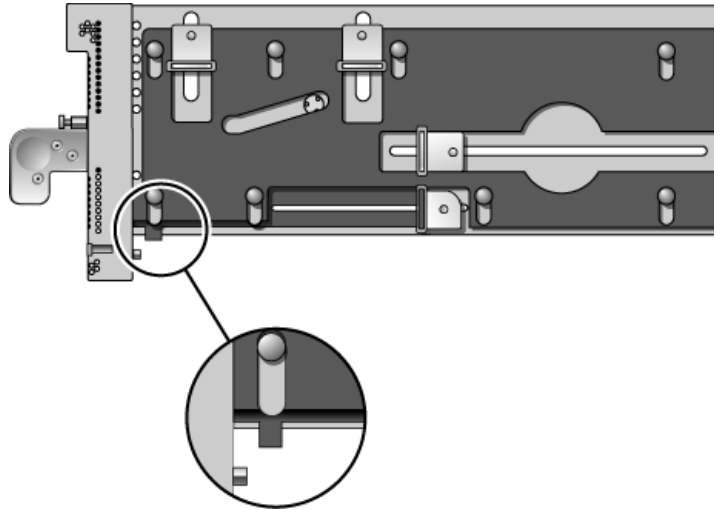
-
- | | |
|---|--|
| 1 | Moderate pressure on an upper card lock holds the PCI card in a horizontal position. |
| 2 | Excessive pressure on an upper card lock can bend the PCI card bracket. |
-

11. Pull the carrier handle into the fully open position to raise the carrier plate.



Caution – If the carrier plate is not completely raised when you insert the carrier in [Step 13](#), the plastic locator bar ([FIGURE 3-17](#)) might break by hitting the lower front edge of the I/O boat.

FIGURE 3-17 Locator Bar on Carrier (Carrier Handle Shown in the Closed Position)



12. Carefully place the carrier in the card guides at the top and bottom of the carrier slot in the I/O boat.
13. Press on the metal front panel of the carrier to push the carrier fully into the carrier slot.



Caution – Do not press the plastic carrier handle during [Step 13](#). If you press the handle, the PCI card and the sliding carrier plate might suddenly fall, breaking the plastic locator bar ([FIGURE 3-17](#)) by hitting it against the lower edge of the I/O boat.

14. Push the carrier handle into the closed position.

This action seats the PCI card in the card socket.



Caution – If the carrier handle does not close easily, the PCI card might not be seating properly in the card socket in the I/O boat. Remove the carrier and inspect the PCI card. If the bottom of the PCI card is not perfectly horizontal, loosen the card locks and realign the card on the carrier. For troubleshooting information, see [Appendix D](#).

FIGURE 3-18 PCI Card and Carrier

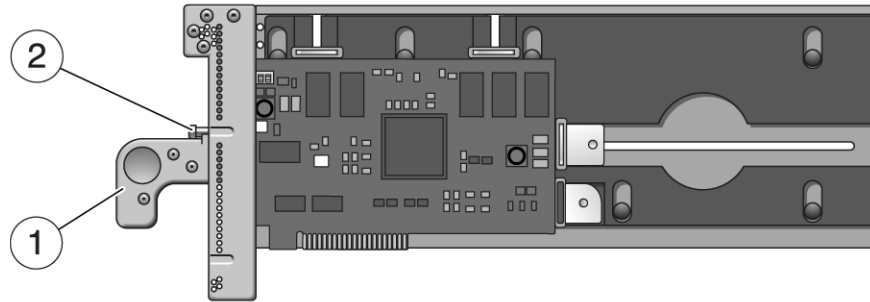


Figure Legend

-
- | | |
|---|-------------------------------------|
| 1 | Carrier handle (in closed position) |
| 2 | Carrier locking screw |
-

15. Use the carrier locking screw located on the top of the handle to lock the carrier handle in place.
16. Add the PCI card to an Oracle Solaris domain.
For details, refer to the service manual for your host server.

3.3 Installing Cables for PCI Cards

1. Use an antistatic strap for this procedure.
2. Route the cables across the top of the cable management unit as shown in [FIGURE 3-19](#) or [FIGURE 3-20](#).
 - a. Route the cables in the rack:
 - For the type A cable plate, route the cables along the both sides of the rack.
 - For the type B cable plate, route the cables along the right side of the rack.
 - b. Place the ends of the cables on the top of the cable plate, then curve the cables down to the corresponding PCI cards.
 - c. Use cable ties to hold the cables in place on the top of the cable management unit.

Note – Before tightening the cable ties, ensure that each cable has a service loop (freedom of movement) of at least 2 in./50 mm. This allows the cable plate and cables to be moved from the normal position ([FIGURE 4-4](#)) to the service position without the need to untie the cables.

FIGURE 3-19 Example of Cable Management for the Type A Cable Plate

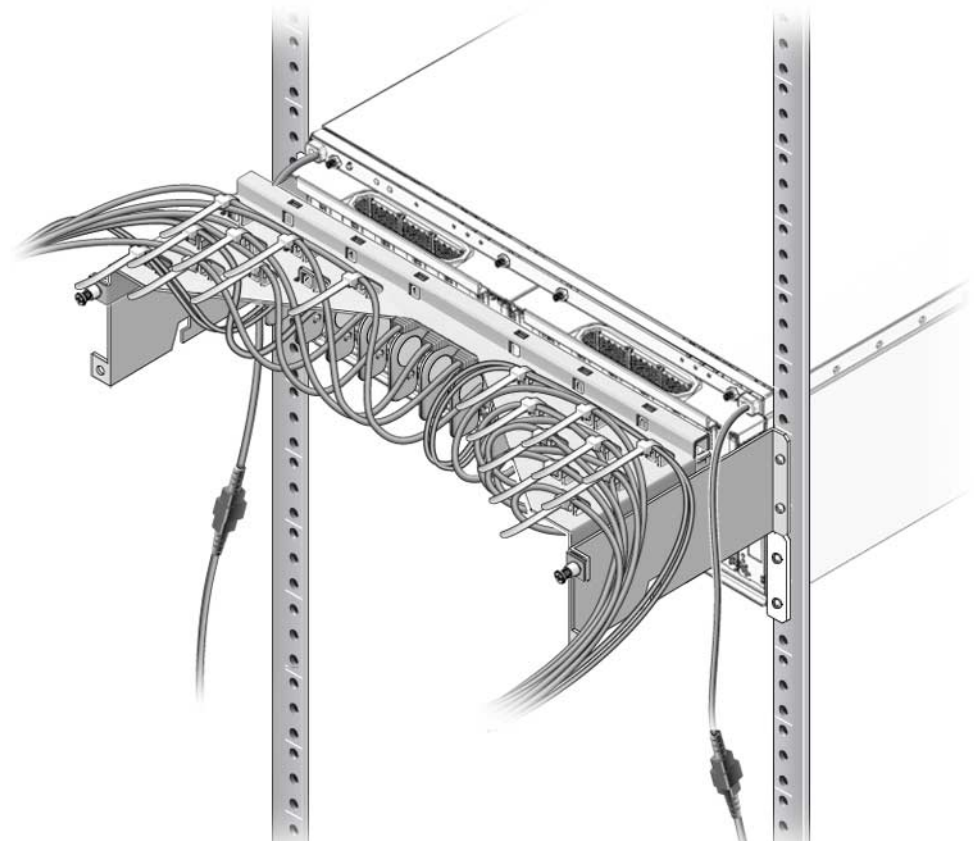
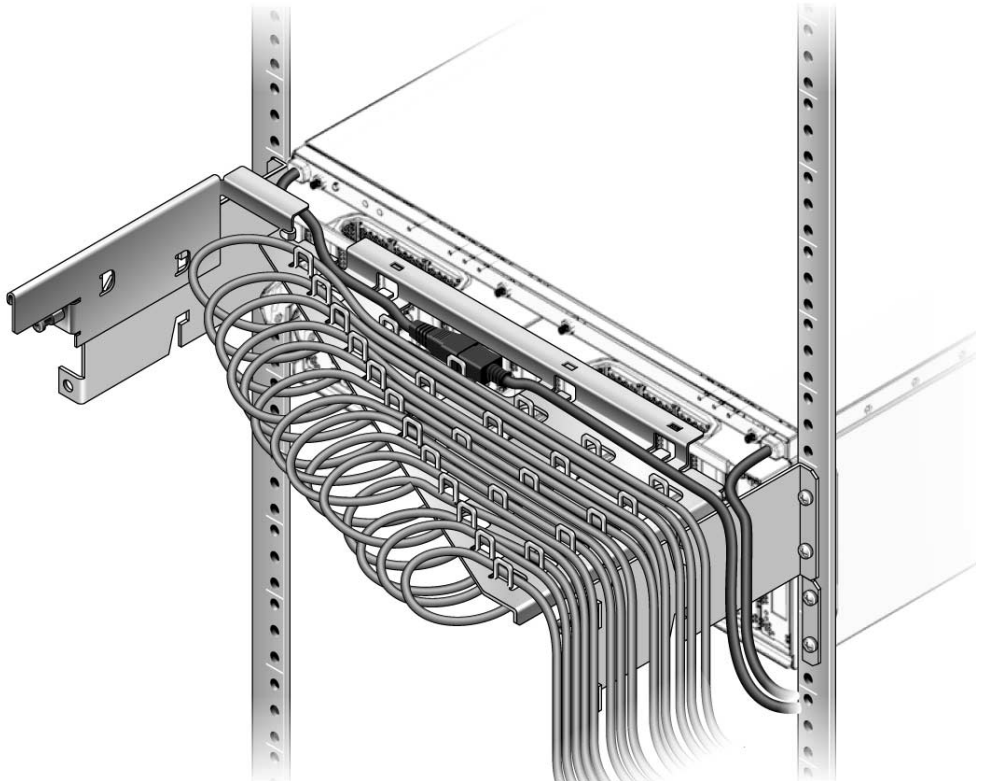


FIGURE 3-20 Example of Cable Management for the Type B Cable Plate



3. Attach I/O cables from the PCI cards and their respective devices or network ports.

Servicing and Replacing Components

This chapter includes the service procedures for replacing field-replaceable units and installing optional assemblies.

This chapter includes the following topics:

- [Section 4.1, “Service Procedures Task Map” on page 4-2](#)
- [Section 4.2, “Identifying Firmware Versions” on page 4-3](#)
- [Section 4.3, “Replacing a Power Supply Unit” on page 4-4](#)
- [Section 4.4, “Powering Down a Link Before Service” on page 4-6](#)
- [Section 4.5, “Preparing the Cable Plate for Service” on page 4-7](#)
- [Section 4.6, “Replacing a Carrier” on page 4-9](#)
- [Section 4.7, “Replacing a Link Cable” on page 4-13](#)
- [Section 4.8, “Replacing a Link Card in the Host Server” on page 4-13](#)
- [Section 4.9, “Replacing a Link Card in an I/O Boat” on page 4-14](#)
- [Section 4.10, “Installing a Second I/O Boat” on page 4-16](#)
- [Section 4.11, “Replacing an I/O Boat” on page 4-19](#)
- [Section 4.12, “Replacing the External I/O Expansion Unit Chassis” on page 4-24](#)
- [Section 4.13, “Powering Up a Link After Service” on page 4-33](#)

4.1 Service Procedures Task Map

TABLE 4-1 Service Task Map

FRU	Task	Comments
PCI card	• Install a new PCI card	Section 3.1, “Installing a PCI Card” on page 3-1
	• Replace an existing PCI card	Section 3.2, “Replacing a PCI Card” on page 3-9
PSU	• Replace a PSU	Section 4.3, “Replacing a Power Supply Unit” on page 4-4
Cable Management	• Prepare the cable plate for I/O boat service	Section 4.5, “Preparing the Cable Plate for Service” on page 4-7
Carrier	• Replace a carrier	Section 4.6, “Replacing a Carrier” on page 4-9
Link	• Replace a link cable	Section 4.7, “Replacing a Link Cable” on page 4-13
	• Replace a link card	<ul style="list-style-type: none">• Section 4.4, “Powering Down a Link Before Service” on page 4-6• Section 4.8, “Replacing a Link Card in the Host Server” on page 4-13• Section 4.9, “Replacing a Link Card in an I/O Boat” on page 4-14• Section 4.13, “Powering Up a Link After Service” on page 4-33
I/O boat	• Install a second I/O boat	Section 4.10, “Installing a Second I/O Boat” on page 4-16
	• Replace an I/O boat	<ul style="list-style-type: none">• Section 4.11.1, “Replacing a Boat in a Single Boat Configuration” on page 4-19• Section 4.11.2, “Replacing a Boat in a Dual Boat Configuration” on page 4-21
Chassis	Replace the External I/O Expansion Unit chassis	Section 4.12, “Replacing the External I/O Expansion Unit Chassis” on page 4-24.

4.2 Identifying Firmware Versions

It might be helpful to identify firmware versions in the External I/O Expansion Unit when troubleshooting problems. Firmware is located on the motherboard and on each link card.

To identify versions of firmware, use the `ioxadm -v list` command. In the output, firmware versions are listed in the column marked "FW Ver".

```
XSCF> ioxadm -v list
```

Location	Type	FW Ver	Serial Num	Part Num	State
IOX@X04E	IOX	2.4	XCX04E	5016937-03	On
IOX@X04E/PS0	A195	-	T01180	3001701-03	On
IOX@X04E/PS1	A195	-	T01097	3001701-03	On
IOX@X04E/IOB0	PCIX	-	XX00EL	CF005016938/5016938-05	On
IOX@X04E/IOB0/LINK	OP	2.4	XF01D3	CF005017040/5017040-03	On
IOU#0-PCI#3	OP	2.4	XF014C	5017040-03	On
IOX@X04E/IOB1	PCIE	-	XE00C1	CF005016939/5016939-04	On
IOX@X04E/IOB1/LINK	OP	2.4	XF00W2	5017040-03	On
IOU#0-PCI#1	OP	2.4	XF01AX	CF005017040/5017040-03	On

```
XSCF>
```

This example shows five instances of firmware in an External I/O Expansion Unit that is configured with two I/O boats:

- IOX in the Type column identifies the chassis, where the fan controller firmware is located.
- OP in the Type column identifies the link cards, where the bridge controller firmware is located. A link consists of two link cards, and there are two links in this example (one link for each I/O boat), for a total of four link cards:
 - LINK in the Location column identifies a link card in an I/O boat.
 - IOU#*n*-PCI#*n* in the Location column identifies a link card in a server.

Refer to the `ioxadm(8)` man page for more information.

4.3 Replacing a Power Supply Unit

This is a hot replacement procedure, meaning that the PSU can be replaced while the system is still running, provided that a second PSU is working properly.

1. Use an antistatic strap for this procedure.
2. Unpack the new power supply unit and set it flat on an antistatic surface.




Caution – Do not rest a PSU vertically. The plastic electrical connector on the back is breakable.

3. If the system is running, power down the PSU with the `ioxadm` command:

```
XSCF> ioxadm poweroff target
```

Refer to the `ioxadm (8)` man page for more information.

4. At the front of the defective PSU, turn off the PSU AC switch and verify that the DC Power LED () turns off.
5. Loosen the handle locking screw on the PSU handle.
6. Unlock the PSU by swinging the handle out 90 degrees into the fully open position. (FIGURE 4-1).
7. Place a hand under the PSU to prevent it from falling, then pull the PSU out of the External I/O Expansion Unit.



Caution – The PSU is heavy (7.5 lb/3.4 kg).

When you can see the warning label on the top of the PSU, the PSU is almost fully out of the PSU slot.



Caution – Do not allow the rear of the PSU to drop. The connector at the rear of the PSU can be damaged if it strikes the edge of the slot.

A pivoting flap behind the PSU drops down to prevent loss of cooling air.

FIGURE 4-1 PSU

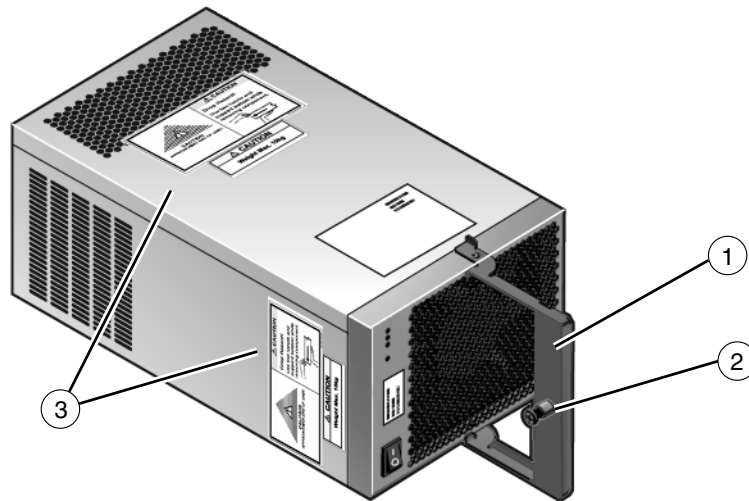


Figure Legend

-
- | | |
|---|----------------------|
| 1 | Handle |
| 2 | Handle locking screw |
| 3 | Warning labels |
-

8. Set the PSU flat on an antistatic surface.

9. Insert the new PSU into the External I/O Expansion Unit.




The pivoting flap automatically swings up and out of the way.

Note – The fan in the new PSU turns on immediately if the External I/O Expansion Unit is running.

10. Turn the PSU handle 90 degrees into the closed position.

11. Secure the handle locking screw on the PSU handle.

12. Turn on the AC switch on the PSU.

The Fault/Locate LED () on the PSU lights up momentarily during the initialization then turns off. You should see the AC power () and DC power () LEDs turn on after the initialization.

For other LED indications, see [Appendix B](#).

4.4 Powering Down a Link Before Service

Before you repair or replace any parts of a link, use this procedure to power down the link. The link between a server and an I/O boat in the External I/O Expansion Unit includes these parts:

- The server IOU slot that contains a link card
- The link card in the IOU slot
- The link card in the I/O boat
- The link cable or cables that connect the two link cards
- The I/O boat

4.4.1 The `cfgadm -c disconnect` Command

- Power down the link by disconnecting the server IOU slot:

```
# cfgadm -c disconnect ap_id
```

Where *ap_id* is the server IOU slot that contains a link card.

For examples of *ap_id* IOU slot names in SPARC Enterprise M4000/M5000/M8000/M9000 servers, see [TABLE C-1](#) and [TABLE C-2](#) in [Appendix C](#).

4.4.2 Example of the `cfgadm -c disconnect` Command

The following examples are for an External I/O Expansion Unit with one I/O boat connected to a SPARC Enterprise M4000 server. In the examples, `iou#0-pci#1` is the *ap_id* for the server IOU slot to which the I/O boat is connected.

The following example shows the server IOU configuration while the I/O boat is still connected. The I/O boat serial number is displayed (`iobE02EF`), as are the six PCI slots in the I/O boat.

```
# cfgadm
iou#0-pci#0                scsi/hp      connected   configured  ok
iou#0-pci#1                pci-pci/hp   connected   configured  ok
iou#0-pci#1:iobE02EF.pcie1  fibre/hp     connected   configured  ok
iou#0-pci#1:iobE02EF.pcie2  etherne/hp   connected   configured  ok
iou#0-pci#1:iobE02EF.pcie3  fibre/hp     connected   configured  ok
```

iou#0-pci#1:iobE02EF.pcie4	unknown	empty	unconfigured	unknown
iou#0-pci#1:iobE02EF.pcie5	fibre/hp	connected	configured	ok
iou#0-pci#1:iobE02EF.pcie6	unknown	empty	unconfigured	unknown
iou#0-pci#2	unknown	empty	unconfigured	unknown
iou#0-pci#3	etherne/hp	connected	configured	ok
iou#0-pci#4	pci-pci/hp	connected	configured	ok

The next example shows the command that powers down (disconnects) the link, followed by a command that displays the results.

# cfgadm -c disconnect iou#0-pci#1				
# cfgadm				
iou#0-pci#0	scsi/hp	connected	configured	ok
iou#0-pci#1	unknown	disconnected	unconfigured	unknown
iou#0-pci#2	unknown	empty	unconfigured	unknown
iou#0-pci#3	etherne/hp	connected	configured	ok
iou#0-pci#4	pci-pci/hp	connected	configured	ok

Note that iou#0-pci#1 is disconnected, and the six slots in the I/O boat have disappeared.

4.5 Preparing the Cable Plate for Service

On the cable management unit, raise the cable plate ([FIGURE 4-2](#) or [FIGURE 4-3](#)) to provide easier removal of a PCI carrier or I/O boat.

1. Use an antistatic strap for this procedure.
2. Loosen two cable plate locking screws (item 3 in [FIGURE 4-4](#)).
3. Pull the cable plate toward you approximately 0.5 in./13 mm, then raise it approximately 0.75 in./20 mm, until the bottom of the plate is above the tops of the support brackets.
4. Push the cable plate forward to its service position ([FIGURE 4-4](#)) so that the cable plate rests on the support brackets.

The tabs on the sides of the cable plate should lie in the small notches on the tops of the support brackets.

FIGURE 4-2 Type A Cable Plate

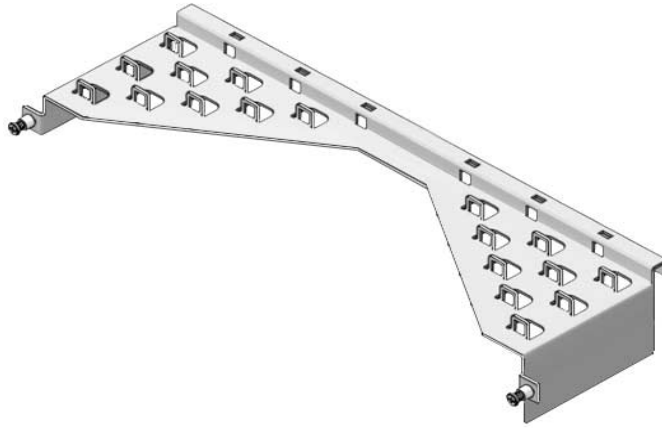
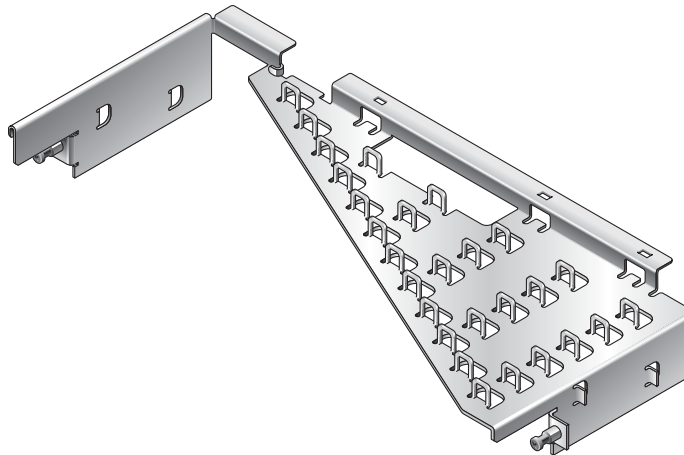


FIGURE 4-3 Type B Cable Plate



The left side of [FIGURE 4-4](#) shows the cable plate in its normal position. The right side of the illustration shows the service position.

FIGURE 4-4 Cable Plate (Side Views of Normal and Service Positions)

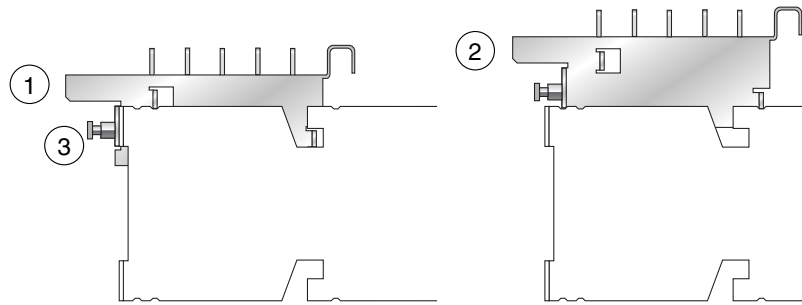


Figure Legend

-
- | | |
|---|--|
| 1 | Cable plate in the normal position (lowered) |
| 2 | Cable plate in the service position (raised) |
| 3 | Cable plate locking screw (two places) |
-

5. After the carrier or I/O boat has been replaced, move the cable plate down into its normal position and tighten the cable plate locking screws.

4.6 Replacing a Carrier

1. If necessary, power down the link.
 - If the carrier is in slot 0 (LINK 0), first power down the link. See [Section 4.4, “Powering Down a Link Before Service”](#) on page 4-6.
 - If the carrier is in slots 1 through 6 (PCIE 1-6 or PCIX 1-6), it is not necessary to power off the External I/O Expansion Unit.
2. Use an antistatic strap for this procedure.
3. Move the cable plate to the service position:
 - a. Loosen the cable plate locking screw(s) (item 3 in [FIGURE 4-4](#)).
 - b. Pull the cable plate toward you approximately 0.5 in./13 mm, then raise it approximately 0.75 in./20 mm, until the bottom of the plate is above the tops of the support brackets.
 - c. Push the cable plate forward to its service position ([FIGURE 4-4](#)) so that the cable plate rests on the support brackets.

The tabs on the sides of the cable plate should lie in the small notches on the tops of the support brackets.

4. Disconnect the I/O cable(s) from the PCI card in the carrier.
5. Remove the carrier from the I/O boat:
 - a. Loosen the carrier locking screw on the carrier handle.
 - b. Pull the carrier handle out fully.



Caution – Pulling the carrier handle raises the carrier plate. If the carrier moves forward before the carrier plate is completely raised, the plastic locator bar (FIGURE 3-2) might be damaged by hitting the lower front edge of the I/O boat.

- c. Pull the carrier out of the carrier slot and place it on an antistatic surface.
 - d. Press the locking latch (FIGURE 3-3) while you push the carrier handle into the closed position.

This action lowers the carrier plate, giving you more room to move the PCI card into place on the carrier.
6. Install an M2 screw on the replacement carrier, in the key hole (FIGURE 4-5) that corresponds to the slot number of the defective carrier.

Carriers are keyed to specific slots in an I/O boat. If a carrier does not fit in a slot, verify that the M2 screw is in the hole that corresponds to that slot.

FIGURE 4-5 Screw Hole Locations for the Carrier Slot Key

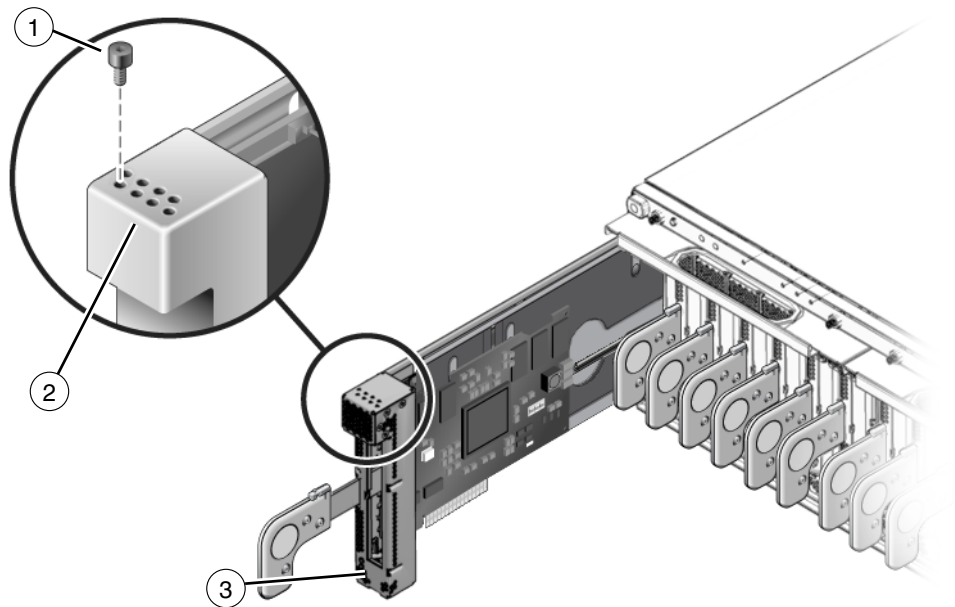


Figure Legend

-
- | | |
|---|---------------|
| 1 | Key |
| 2 | Keyholes 0-7* |
| 3 | Carrier label |
-

* Keyhole 7 is reserved for future use.

7. Attach a label with the slot name and number to the carrier.

The replacement carrier includes an assortment of adhesive labels including LINK 0, PCIX 1, PCIE 1, and so forth. Use the replacement label that corresponds to the label on the defective carrier. Place the label just below the opening in the front of the carrier ([FIGURE 4-5](#)).

8. Transfer the PCI card from the defective carrier to the replacement carrier:

- Remove the dummy card from the replacement carrier by loosening the Phillips screws on the card locks.**
- Examine the defective carrier and determine which card locks on the replacement carrier will be used. Move the card locks on the replacement carrier to approximately the same locations as on the defective carrier.**

One or more card locks on the replacement carrier might not be needed. Move the unused card locks out of the way or else remove them entirely from the carrier.

- c. Unlock the PCI card from the defective carrier and install the card on the replacement carrier.
 - d. If the type C lock is used, ensure that it is not located where it will hit the card socket in the I/O boat.
9. Install the carrier in the I/O boat:
- a. Pull the carrier handle into the fully open position to raise the carrier plate.
 - b. Carefully place the carrier in the card guides at the top and bottom of the carrier slot in the I/O boat.
 - c. Press on the metal front panel of the carrier to push the carrier fully into the carrier slot.



Caution – Do not press the plastic carrier handle during [Step c](#). If you press the handle, the PCI card and the sliding carrier plate might suddenly fall, breaking the plastic locator bar ([FIGURE 3-17](#)) by hitting it against the lower edge of the I/O boat.

- d. Push the carrier handle into the closed position.

This action seats the PCI card in the card socket.



Caution – If the carrier handle does not close easily, the PCI card might not be seating properly in the card socket in the I/O boat. Remove the carrier and inspect the PCI card. If the bottom of the PCI card is not perfectly horizontal, loosen the card locks and realign the card on the carrier. For troubleshooting information, see [Appendix D](#).

- e. Lock the carrier handle into place with the carrier locking screw located on the top of the handle.
 - f. Connect the I/O cable(s) to the PCI card.
10. Move the cable plate back into the normal position ([FIGURE 4-4](#)) and tighten the cable plate locking screw(s).
11. If this is a link card, power up the link.
- See [Section 4.13, “Powering Up a Link After Service”](#) on page 4-33.

4.7 Replacing a Link Cable

This is not a hot replacement procedure. Link operations will be interrupted.

Note – Ordering a complete set of replacements at one time can shorten the troubleshooting process. If you cannot determine if a link problem is caused by a link card or a link cable, order replacement link cards for the host and the I/O boat, along with a copper link cable or two optical link cables, as appropriate.

1. Power down the link.

See [Section 4.4, “Powering Down a Link Before Service”](#) on page 4-6.

2. Use an antistatic strap for this procedure.

3. Replace the link cable or cables.

If you are replacing a copper link cable, there is one cable. Both ends of the cable are identical.

If you are replacing one or both cables in an optical link, note that the ends of each cable have either a TX label (Transmit) or an RX (Receive) label. It is possible to plug a connector into the wrong socket on a link card, so ensure that you plug each connector into the appropriately marked TX or RX socket on the link cards.

4. Power up the link.

See [Section 4.13, “Powering Up a Link After Service”](#) on page 4-33.

4.8 Replacing a Link Card in the Host Server

This is not a hot replacement procedure. Link operations will be interrupted.

Note – Ordering a complete set of replacements at one time can shorten the troubleshooting process. If you cannot determine if a link problem is caused by a link card or a link cable, order replacement link cards for the host and the I/O boat, along with a copper link cable or two optical link cables, as appropriate.

1. Power down the link.

See [Section 4.4, “Powering Down a Link Before Service”](#) on page 4-6.

2. Use an antistatic strap for this procedure.

3. **Disconnect the link cable or cables from the link card in the host server.**
A copper link has one cable. An optical link has two cables.
4. **Replace the link card in the host server.**
Refer to the service manual for your host server for instructions on replacing PCI cards.
5. **Connect the link cable to the replacement link card.**
6. **Power up the link.**
See [Section 4.13, “Powering Up a Link After Service”](#) on page 4-33.

4.9 Replacing a Link Card in an I/O Boat

This is not a hot replacement procedure. Link operations will be interrupted.

Note – Ordering a complete set of replacements at one time can shorten the troubleshooting process. If you cannot determine if a link problem is caused by a link card or a link cable, order replacement link cards for the host and the I/O boat, along with a copper link cable or two optical link cables, as appropriate.

1. **Power down the link.**
See [Section 4.4, “Powering Down a Link Before Service”](#) on page 4-6.
2. **Use an antistatic strap for this procedure.**
3. **Move the cable plate to the service position:**
 - a. **Loosen the cable plate locking screw(s)** (item 3 in [FIGURE 4-4](#)).
 - b. **Pull the cable plate toward you approximately 0.5 in./13 mm, then raise it approximately 0.75 in./20 mm, until the bottom of the plate is above the tops of the support brackets.**
 - c. **Push the cable plate forward to its service position** ([FIGURE 4-4](#)) so that the cable plate rests on the support brackets.
The tabs on the sides of the cable plate should lie in the small notches on the tops of the support brackets.
4. **Disconnect the link cable from the defective link card in the I/O boat.**
5. **Remove the defective link card and carrier from slot 0 in the I/O boat.**
 - a. **Loosen the carrier locking screw on the carrier handle.**

- b. Pull the carrier handle out fully.



Caution – Pulling the carrier handle raises the carrier plate. If the carrier moves forward before the carrier plate is completely raised, the plastic locator bar (FIGURE 3-2) might be damaged by hitting the lower front edge of the I/O boat.

- c. Pull the carrier out of the carrier slot and place it on an antistatic surface.
- d. Press the locking latch (FIGURE 3-3) while you push the carrier handle into the closed position.

This action lowers the carrier plate, giving you more room to move the PCI card into place on the carrier.

6. Remove the defective link card from the carrier.
7. Install the replacement link card in the carrier.
8. Install the carrier in slot 0 of the I/O boat:
 - a. Pull the carrier handle into the fully open position to raise the carrier plate.
 - b. Carefully place the carrier in the card guides at the top and bottom of the carrier slot in the I/O boat.
 - c. Press on the metal front panel of the carrier to push the carrier fully into the carrier slot.



Caution – Do not press the plastic carrier handle during Step c. If you press the handle, the PCI card and the sliding carrier plate might suddenly fall, breaking the plastic locator bar (FIGURE 3-17) by hitting it against the lower edge of the I/O boat.

- d. Push the carrier handle into the closed position.

This action seats the PCI card in the card socket.



Caution – If the carrier handle does not close easily, the PCI card might not be seating properly in the card socket in the I/O boat. Remove the carrier and inspect the PCI card. If the bottom of the PCI card is not perfectly horizontal, loosen the card locks and realign the card on the carrier. For troubleshooting information, see [Appendix D](#).

- e. Lock the carrier handle into place with the carrier locking screw located on the top of the handle.
9. Attach the link cable to the link card.

Note – If the External I/O Expansion Unit has two I/O boats, both boats must be connected to the same host server. Do not connect the second boat to a different server. Also, do not connect the second boat to the first boat; a daisy-chain configuration is not allowed.

10. Move the cable plate back into the normal position ([FIGURE 4-4](#)) and tighten the cable plate locking screw(s).
11. Power up the link.
See [Section 4.13, “Powering Up a Link After Service”](#) on page 4-33.

4.10 Installing a Second I/O Boat

The following procedures apply to both types of I/O boat (PCI-X or PCI Express).

1. Use an antistatic strap for this procedure.
2. Unpack the new I/O boat and set it flat on an antistatic surface.



Caution – Do not rest an I/O boat vertically. The plastic electrical connector on the back is breakable.

3. If a link card and carrier are already installed in the new I/O boat, go to [Step 6](#).
4. If a link card and carrier are not already installed in the new I/O boat:
Slot 0 is used for the link card. The carrier is labelled `Link 0`.
 - a. Loosen the carrier locking screw on the carrier handle.
 - b. Pull the carrier handle out fully.



Caution – Pulling the carrier handle raises the carrier plate. If the carrier moves forward before the carrier plate is completely raised, the plastic locator bar ([FIGURE 3-2](#)) might be damaged by hitting the lower front edge of the I/O boat.

- c. Pull the carrier out of the carrier slot and place it on an antistatic surface.

- d. **Press the locking latch (FIGURE 3-1) while you push the carrier handle into the closed position.**

This action lowers the carrier plate, giving you more room to move the PCI card into place on the carrier.

- e. **Remove the dummy card from the carrier.**

One side of the dummy card provides instructions for removal from the carrier. The other side of the dummy card provides instructions for installing a PCI card.

- f. **Install the link card on the carrier.**

For help in choosing the correct card locks to install a PCI card, see [Section 1.3.2, “Card Locks” on page 1-20](#).

5. **Install the carrier in the I/O boat:**

- a. **Pull the carrier handle into the fully open position to raise the carrier plate.**
- b. **Carefully place the carrier in the card guides at the top and bottom of the carrier slot in the I/O boat.**
- c. **Press on the metal front panel of the carrier to push the carrier fully into the carrier slot.**



Caution – Do not press the plastic carrier handle during [Step c](#). If you press the handle, the PCI card and the sliding carrier plate might suddenly fall, breaking the plastic locator bar ([FIGURE 3-17](#)) by hitting it against the lower edge of the I/O boat.

- d. **Push the carrier handle into the closed position.**

This action seats the PCI card in the card socket.



Caution – If the carrier handle does not close easily, the PCI card might not be seating properly in the card socket in the I/O boat. Remove the carrier and inspect the PCI card. If the bottom of the PCI card is not perfectly horizontal, loosen the card locks and realign the card on the carrier. For troubleshooting information, see [Appendix D](#).

- e. **Lock the carrier handle into place with the carrier locking screw located on the top of the handle.**

6. **Install PCI cards in the I/O boat.**

See [Step 4](#) and [Step 5](#) above for instructions to safely remove and insert carriers.

7. **In the rack, move the cable plate to the service position:**

- a. Loosen the cable plate locking screw(s) (item 3 in [FIGURE 4-4](#)).
 - b. Pull the cable plate toward you approximately 0.5 in./13 mm, then raise it approximately 0.75 in./20 mm, until the bottom of the plate is above the tops of the support brackets.
 - c. Push the cable plate forward to its service position ([FIGURE 4-4](#)) so that the cable plate rests on the support brackets.

The tabs on the sides of the cable plate should lie in the small notches on the tops of the support brackets.
8. Remove the filler panel from the unused I/O boat slot by loosening the two captive screws at the top of the filler panel.

A pivoting flap behind the filler panel drops down to prevent loss of cooling air.
 9. Insert the I/O boat into the I/O boat slot.

The pivoting flap automatically swings up and out of the way.
 10. Lock the I/O boat in place with the two captive screws at the top of the boat.
 11. Move the cable plate back into the normal position ([FIGURE 4-4](#)) and tighten the cable plate locking screws.
 12. Install the remaining link card in the host server.

Refer to documentation for your host server for instructions.
 13. Connect the link cable or cables between the link card in the server and the link card in the I/O boat.
 14. Attach the I/O cables to the PCI cards.
 15. Attach the I/O cables to the cable management unit on the External I/O Expansion Unit.

Allow approximately 2 in./50 mm of cable movement. This permits movement of the cable plate from its normal location to its service position.
 16. Power up the link.

See [Section 4.13, "Powering Up a Link After Service"](#) on page 4-33.

4.11 Replacing an I/O Boat

4.11.1 Replacing a Boat in a Single Boat Configuration

This is a cold service procedure.

1. **If the link is still running, power down the link.**
See [Section 4.4, “Powering Down a Link Before Service”](#) on page 4-6.
2. **Use an antistatic strap for this procedure.**
3. **At the front of the External I/O Expansion Unit, turn off the AC switches located on the PSUs.**
4. **Move the cable plate to the service position:**
 - a. **Loosen the cable plate locking screw(s)** (item 3 in [FIGURE 4-4](#)).
 - b. **Pull the cable plate toward you approximately 0.5 in./13 mm, then raise it approximately 0.75 in./20 mm, until the bottom of the plate is above the tops of the support brackets.**
 - c. **Push the cable plate forward to its service position ([FIGURE 4-4](#)) so that the cable plate rests on the support brackets.**
The tabs on the sides of the cable plate should lie in the small notches on the tops of the support brackets.
5. **Label all I/O cables.**
6. **Disconnect the link cable from the link card in slot 0 in the I/O boat.**
7. **Disconnect the I/O cables from the PCI cards in the I/O boat.**
8. **Remove the I/O boat from the I/O boat slot and set it flat on an antistatic surface.**

When you can see the warning label on the top of the I/O boat, the boat is almost fully out of the boat slot.



Caution – Do not allow the rear of the I/O boat to drop. The connector at the rear of the boat can be damaged if it strikes the edge of the slot.

Do not rest an I/O boat vertically. The plastic electrical connector on the back is breakable.

A pivoting flap behind the I/O boat drops down to prevent loss of cooling air.

9. Insert the replacement I/O boat into the I/O boat slot.

The pivoting flap automatically swings up and out of the way.

10. Lock the I/O boat in place with the two captive screws at the top of the boat.

11. Remove the link carrier from slot 0 in the old I/O boat.

The link carrier is labelled `Link 0`.

a. Loosen the carrier locking screw on the carrier handle.

b. Pull the carrier handle out fully.



Caution – Pulling the carrier handle raises the carrier plate. If the carrier moves forward before the carrier plate is completely raised, the plastic locator bar ([FIGURE 3-2](#)) might be damaged by hitting the lower front edge of the I/O boat.

c. Pull the carrier out of the carrier slot.

12. Install the link carrier in the slot marked `Link 0` in the new I/O boat:

a. Pull the carrier handle into the fully open position to raise the carrier plate.

b. Carefully place the carrier in the card guides at the top and bottom of the carrier slot in the I/O boat.

c. Press on the metal front panel of the carrier to push the carrier fully into the carrier slot.





Caution – Do not press the plastic carrier handle during [Step c](#). If you press the handle, the PCI card and the sliding carrier plate might suddenly fall, breaking the plastic locator bar ([FIGURE 3-17](#)) by hitting it against the lower edge of the I/O boat.

d. Push the carrier handle into the closed position.

This action seats the PCI card in the card socket.



Caution – If the carrier handle does not close easily, the PCI card might not be seating properly in the card socket in the I/O boat. Remove the carrier and inspect the PCI card. If the bottom of the PCI card is not perfectly horizontal, loosen the card locks and realign the card on the carrier. For troubleshooting information, see [Appendix D](#).

- e. Lock the carrier handle into place with the carrier locking screw located on the top of the handle.
13. Move PCI cards and carriers from slots 1 through 6 in the old I/O boat to the new I/O boat.
See [Step 11](#) and [Step 12](#) above for instructions to safely remove and insert carriers.
14. Attach the I/O cables to the PCI cards.
15. Move the cable plate back into the normal position ([FIGURE 4-4](#)) and tighten the cable plate locking screw(s).
16. Connect the link cable or cables between the link card in the host server and the link card in the I/O boat.
17. Turn on the AC switches on the External I/O Expansion Unit PSUs.
On the PSUs the AC power () and DC power () LEDs should light.
For other LED indications, see [Appendix B](#).
18. Power up the link.
See [Section 4.13, “Powering Up a Link After Service”](#) on page 4-33.

4.11.2 Replacing a Boat in a Dual Boat Configuration

1. If the I/O boat is still operating, power down the link.
See [Section 4.4, “Powering Down a Link Before Service”](#) on page 4-6.
2. Use an antistatic strap for this procedure.
3. Move the cable plate to the service position:
 - a. Loosen the cable plate locking screw(s) (item 3 in [FIGURE 4-4](#)).
 - b. Pull the cable plate toward you approximately 0.5 in./13 mm, then raise it approximately 0.75 in./20 mm, until the bottom of the plate is above the tops of the support brackets.

- c. Push the cable plate forward to its service position (FIGURE 4-4) so that the cable plate rests on the support brackets.

The tabs on the sides of the cable plate should lie in the small notches on the tops of the support brackets.

4. Label all I/O cables.

5. Replace the defective I/O boat:

- a. Disconnect the link cable from the link card in slot 0 in the I/O boat.
- b. Disconnect the I/O cables from the PCI cards in the I/O boat.
- c. Loosen the captive screws (item 2 in FIGURE 1-4) at the top of the I/O boat.
- d. Remove the I/O boat and set it flat on an antistatic surface.

When you can see the warning label on the top of the I/O boat, the boat is almost fully out of the boat slot.



Caution – Do not allow the rear of the I/O boat to drop. The connector at the rear of the boat can be damaged if it strikes the edge of the slot.

Do not rest an I/O boat vertically. The plastic electrical connector on the back is breakable.

A pivoting flap behind the I/O boat drops down to prevent loss of cooling air.

- e. Insert the replacement I/O boat into the I/O boat slot.

The pivoting flap automatically swings up and out of the way.

- f. Tighten the captive screws at the top of the I/O boat.

6. Install a link card and carrier in the I/O boat, if not already installed.

Slot 0 is used for the link card. It is the farthest left slot in the boat.

- a. Remove the carrier from the I/O boat.

Each carrier is keyed to fit in a specific slot. (The key is an M2 screw located at the top front of the carrier.) A label on the front of the carrier shows the slot number.



Caution – The carrier can be damaged during removal and during insertion. For safe handling of the carrier, read the cautions in [Section 3.1, “Installing a PCI Card” on page 3-1](#).

b. Remove the dummy card from a carrier.

One side of the dummy card provides instructions for removal from the carrier. The other side of the dummy card provides instructions for installing a PCI card.

c. Install a link card on the carrier.

For help in choosing the correct card locks to install a PCI card, see [Section 1.3.2, “Card Locks” on page 1-20](#).

7. Install the carrier in the I/O boat:

- a. Pull the carrier handle into the fully open position to raise the carrier plate.**
- b. Carefully place the carrier in the card guides at the top and bottom of the carrier slot in the I/O boat.**
- c. Press on the metal front panel of the carrier to push the carrier fully into the carrier slot.**



Caution – Do not press the plastic carrier handle during [Step c](#). If you press the handle, the PCI card and the sliding carrier plate might suddenly fall, breaking the plastic locator bar ([FIGURE 3-17](#)) by hitting it against the lower edge of the I/O boat.

d. Push the carrier handle into the closed position.

This action seats the PCI card in the card socket.



Caution – If the carrier handle does not close easily, the PCI card might not be seating properly in the card socket in the I/O boat. Remove the carrier and inspect the PCI card. If the bottom of the PCI card is not perfectly horizontal, loosen the card locks and realign the card on the carrier. For troubleshooting information, see [Appendix D](#).

e. Lock the carrier handle into place with the carrier locking screw located on the top of the handle.

8. Move PCI cards and carriers from slots 1 through 6 in the old I/O boat to the new I/O boat.

See [Step 6](#) and [Step 7](#) above for instructions to safely remove and insert carriers.

9. Attach the I/O cables to the PCI cards.

10. Move the cable plate back into the normal position ([Step 4-4](#)) and tighten the cable plate locking screw(s).

11. Connect the link cable between the link card in the host server and the link card in the I/O boat.

12. Power up the link.

See [Section 4.13, “Powering Up a Link After Service”](#) on page 4-33.

4.12 Replacing the External I/O Expansion Unit Chassis

In this procedure, the following parts are moved from the old chassis to the replacement chassis:

- Front bezel
- I/O boat(s)
- PSUs

4.12.1 Locating the New System Serial Number Label

The replacement chassis has a new system serial number. This serial number label is located inside the left I/O boat bay.

In the following procedure, new serial number labels will be attached to the old bezel, and the old bezel will be used with the new chassis.

New system serial number labels are not provided for the top cover. The old top cover will not be used on the new chassis.

4.12.2 Preparing the External I/O Expansion Unit

1. **Use an antistatic strap for this procedure.**
2. **Unpack the replacement chassis and place it on an antistatic work space.**

Note – Use an antistatic work space that is wide enough to accommodate two External I/O Expansion Units side by side (40 in./1000 mm).

3. Power down the link.

See [Section 4.4, “Powering Down a Link Before Service”](#) on page 4-6.

4. **Turn off the AC switches on both PSUs at the front of the External I/O Expansion Unit.**

5. At the rear of the External I/O Expansion Unit, disconnect the AC cords from the internal AC cables.
6. Move the cable plate to the service position:
 - a. Loosen the cable plate locking screw(s) (item 3 in [FIGURE 4-4](#)).
 - b. Pull the cable plate toward you approximately 0.5 in./13 mm, then raise it approximately 0.75 in./20 mm, until the bottom of the plate is above the tops of the support brackets.
 - c. Push the cable plate forward to its service position ([FIGURE 4-4](#)) so that the cable plate rests on the support brackets.

The tabs on the sides of the cable plate should lie in the small notches on the tops of the support brackets.
7. Label all I/O cables.
8. Disconnect the link cable from the link card in slot 0 in each I/O boat
9. Disconnect all I/O cables from the PCI cards in the External I/O Expansion Unit.
10. Remove the I/O boat(s) from the original External I/O Expansion Unit:
 - a. Loosen the two captive screws located at the top of the I/O boat.
 - b. Pull the I/O boat out of the chassis approximately 6 in./150 mm.
 - c. Support the bottom of the I/O boat with one hand, then pull the boat out of the slot.
 - d. Set the I/O boat flat on an antistatic surface.



Caution – Do not rest an I/O boat vertically. The plastic electrical connector on the back is breakable.

- e. Note which boat is boat 0 and which is boat 1 so that they will go in the same slots in the replacement chassis.

Label the boats.
11. Remove the PSUs from the front of the External I/O Expansion Unit:
 - a. Loosen the handle locking screw on the PSU handle.
 - b. Unlock the PSU by pulling it out 90 degrees.
 - c. Pull the PSU out approximately 6 in./150 mm and stop.



Caution – The PSU is heavy (7.5 lb/3.4 kg).

When you can see the warning label on the top of the PSU, the PSU is almost fully out of the PSU slot.



Caution – Do not allow the rear of the PSU to drop. The connector at the rear of the PSU can be damaged if it strikes the edge of the slot.

- d. **Support the bottom of the PSU with one hand, and pull the PSU out of the External I/O Expansion Unit.**
- e. **Set the PSU flat on an antistatic surface.**



Caution – Do not rest a PSU vertically. The plastic electrical connector on the back is breakable.

12. Remove the External I/O Expansion Unit chassis from the rack.

- a. **Use a No. 2 Phillips screwdriver to remove the four mounting screws from the front of the chassis (FIGURE 2-6).**
- b. **Pull the chassis out of the rack and place it on an antistatic workbench.**
The empty chassis weighs 30 lb (13.6 kg).

4.12.3 Moving the Bezel to the New Chassis

- 1. **Use an antistatic strap for this procedure.**
- 2. **Remove the bezel from the old chassis:**
 - a. **Use a No. 1 Phillips screwdriver to remove the top cover (FIGURE 4-6).**
There are 14 screws on the cover:
 - 2 screws on the right side
 - 2 screws on the left side
 - 10 screws on the topNote that the top cover of the old chassis can be identified by the presence of service labels. The top cover of the new chassis does not have service labels.

FIGURE 4-6 Removing the Chassis Top Cover

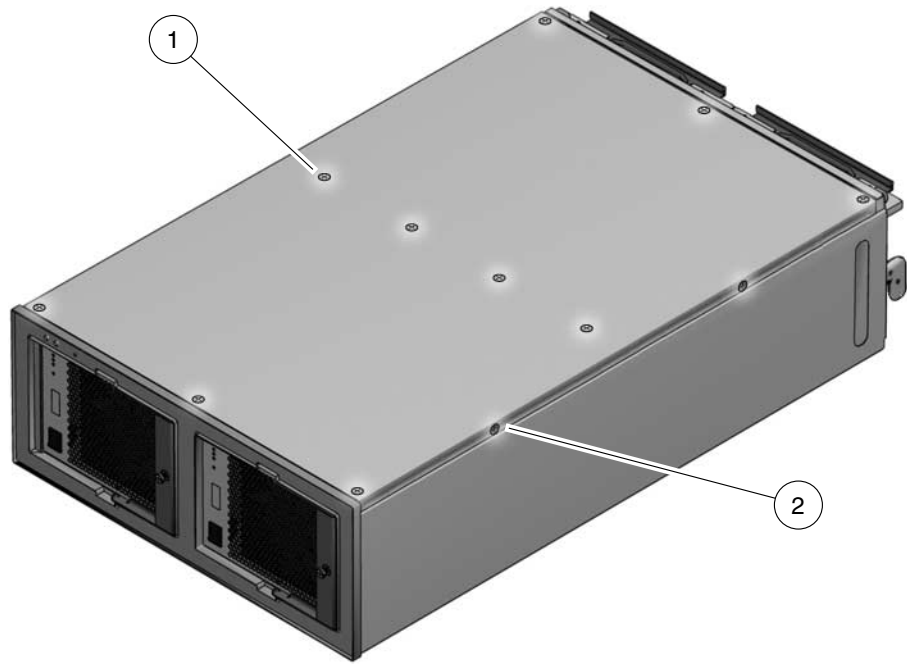


Figure Legend

-
- | | |
|---|--------------------------------|
| 1 | Top screw locations (10 total) |
| 2 | Side screw locations (4 total) |
-

- b. Set the cover aside.
- c. Use a No. 1 Phillips screwdriver to remove 4 screws from the top of the bezel (FIGURE 4-7), then tilt the top of the bezel away from the External I/O Expansion Unit and lift it off.

FIGURE 4-7 Bezel Screws

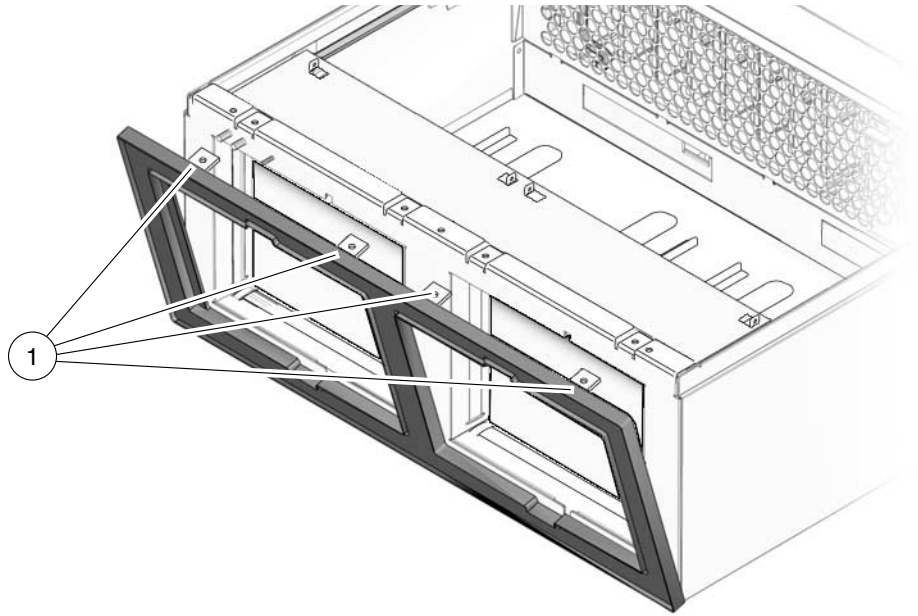


Figure Legend

1	Bezel screws
---	--------------

3. Install new serial number labels on the bezel.

The current serial number labels are located at the left PSU opening of the bezel ([FIGURE 4-8](#)).

FIGURE 4-8 Serial Number Labels

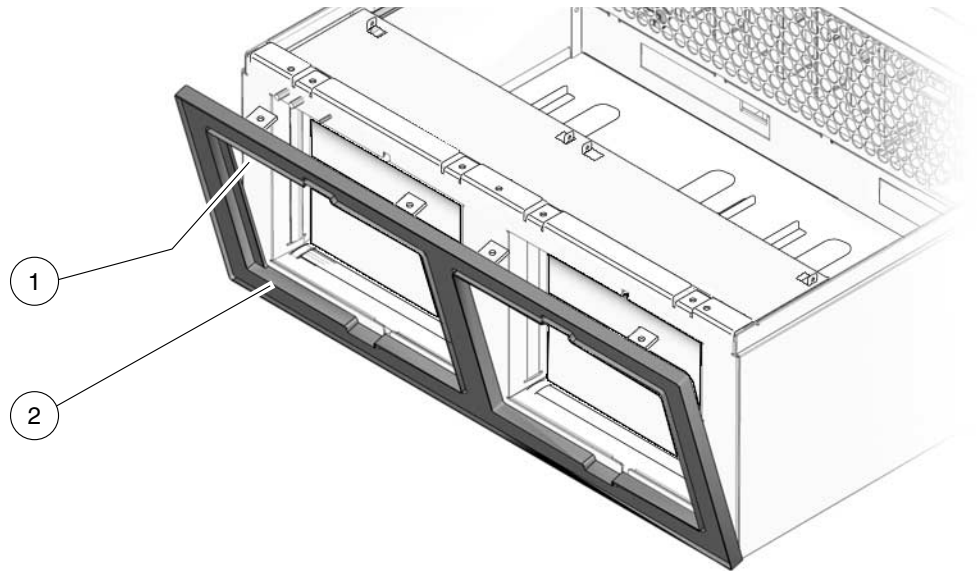


Figure Legend

-
- | | |
|---|---------------------------|
| 1 | Upper serial number label |
| 2 | Lower serial number label |
-

4. Use a No. 1 Phillips screwdriver to remove the top cover (FIGURE 4-6) from the new chassis.

5. Set the cover aside.

This cover will be used with the new chassis.

Note – Do not attempt to move the service labels from the old cover to the new cover. The new cover will be used without service labels.

6. Install the bezel on the replacement External I/O Expansion Unit chassis:

a. Tilt the bezel away from the External I/O Expansion Unit approximately 10 degrees.

b. Place the bottom edge of the bezel under the front of the chassis.

The lugs on the bottom of the chassis front fit into the slots in the bezel.

c. Tilt the bezel upright and use 4 No. 1 Phillips screws to attach the top of the bezel to the replacement chassis.

7. Install the new top cover on the replacement External I/O Expansion Unit chassis.

Note – The new top cover does not have system serial number label. The new system serial number is located only on labels on the bezel ([FIGURE 4-8](#)) and inside the left I/O boat bay of the FRU chassis.

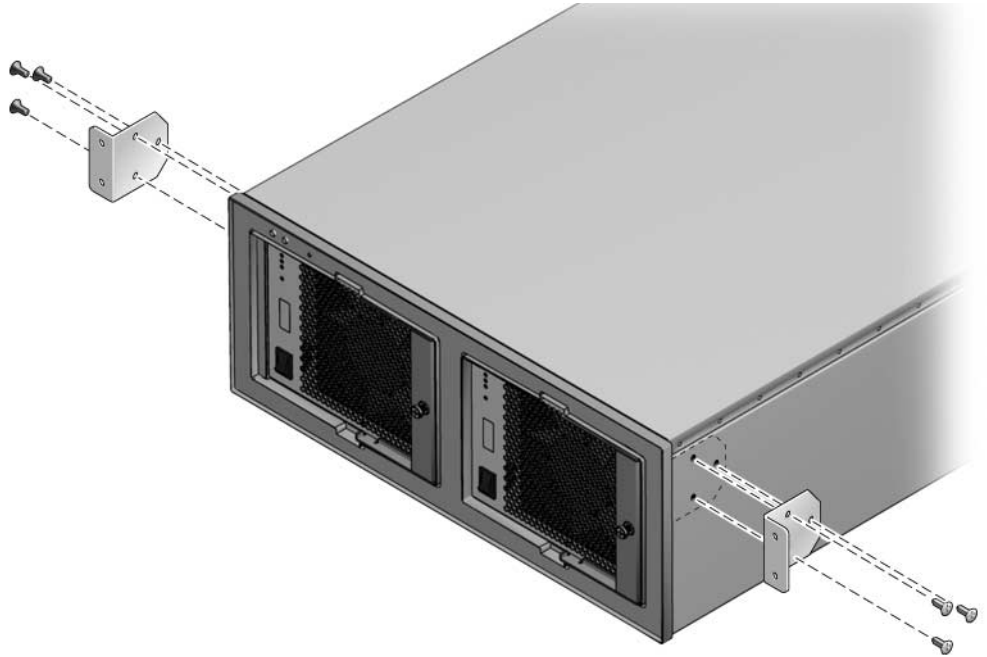
Install 10 No. 1 Phillips screws on the top. Install 2 No. 1 Phillips screws on each side.

8. Install the old top cover on the old chassis.

4.12.4 Installing the External I/O Expansion Unit in the Rack

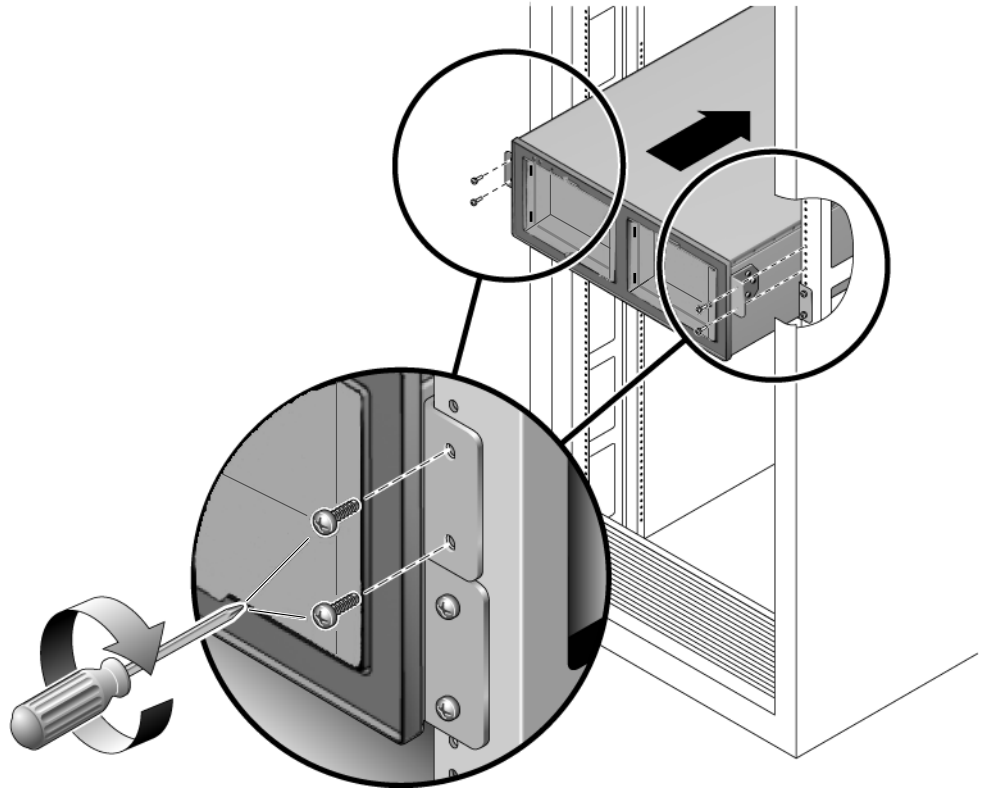
1. Use an antistatic strap for this procedure.
2. Use a No. 2 Phillips screwdriver to remove the left and right chassis lock brackets from the sides of the old chassis ([FIGURE 4-9](#)).

FIGURE 4-9 Uninstalling the Chassis Lock Brackets



3. Set the old chassis aside for return or proper disposal.
4. Install the chassis lock brackets on the sides of the replacement chassis.
5. Slide the replacement chassis into the rack and lock the chassis in place, using two No. 2 Phillips screws for each of the chassis lock brackets ([FIGURE 4-10](#)).

FIGURE 4-10 Installing the External I/O Expansion Unit in the Rack



6. At the front of the chassis, install the PSUs:
 - a. Pull the PSU handle to the unlocked position.
 - b. Slide the PSU into the slot until the rear of the PSU contacts the centerplane.
 - c. Turn the PSU handle into the locked position.
 - d. Tighten the handle locking screw on the handle.
 - e. Verify that the AC switches are in the Off position.
7. At the rear of the chassis, install the I/O boats.
 - a. Carefully slide I/O boat 0 into slot 0.
Lift the I/O cables out of the way as necessary.
 - b. Lock the I/O boat in place by tightening the two screws at the top corners of the I/O boat.

- c. Install I/O boat 1 in the same manner.
8. Lower the cable plate from the service position to the normal position (FIGURE 4-4).
9. Attach the I/O cables to the PCI cards.
10. For each I/O boat, attach the link cable(s) to the link card in the boat.
For an optical link card, there are two connections. Insert the TX cable into the link card port marked "TX" and insert the RX cable into the port marked "RX".
For a copper link card, there is a single connection.
11. Connect AC cords to the internal AC cables on the External I/O Expansion Unit.
12. Turn on the AC switches on the External I/O Expansion Unit PSUs.
On the PSUs the AC power (**AC**) and DC power (**OK**) LEDs should light.
For other LED indications, see [Appendix B](#).
13. Add the PCI card to an Oracle Solaris domain.

```
# cfgadm -c configure ap_id
```

For details, refer to the service manual for your host server.

4.13 Powering Up a Link After Service

4.13.1 The `cfgadm -c configure` Command

- After repairing a link, power up the link by typing:

```
# cfgadm -c configure ap_id
```

Where *ap_id* is the IOU slot in the host server to which the I/O boat is connected. For examples of IOU slot names in SPARC Enterprise M4000/M5000/M8000/M9000 servers, see [TABLE C-1](#) and [TABLE C-2](#) in [Appendix C](#).

4.13.2 Example of the `cfgadm -c configure` Command

The following examples are for an External I/O Expansion Unit with one I/O boat connected to a SPARC Enterprise M4000 server. In the examples, the *ap_id* for the server IOU slot to which the I/O boat is connected is `iou#0-pci#1`.

The following command shows the server I/O configuration before the link is powered up.

```
# cfgadm
iou#0-pci#0          scsi/hp      connected   configured  ok
iou#0-pci#1          unknown    disconnected unconfigured unknown
iou#0-pci#2          unknown    empty       unconfigured unknown
iou#0-pci#3          etherne/hp  connected   configured  ok
iou#0-pci#4          pci-pci/hp  connected   configured  ok
```

Note that in the configuration this IOU slot is shown as disconnected, which means that the link is powered down.

The two commands in the following example power up the link and display the new configuration.

```
# cfgadm -c configure iou#0-pci#1
# cfgadm
iou#0-pci#0          scsi/hp      connected   configured  ok
iou#0-pci#1          pci-pci/hp    connected   configured  ok
iou#0-pci#1:iobE02EF.pcie1  fibre/hp    connected   configured  ok
iou#0-pci#1:iobE02EF.pcie2  etherne/hp  connected   configured  ok
iou#0-pci#1:iobE02EF.pcie3  fibre/hp    connected   configured  ok
iou#0-pci#1:iobE02EF.pcie4  unknown     empty       unconfigured unknown
iou#0-pci#1:iobE02EF.pcie5  fibre/hp    connected   configured  ok
iou#0-pci#1:iobE02EF.pcie6  unknown     empty       unconfigured unknown
iou#0-pci#2          unknown     empty       unconfigured unknown
iou#0-pci#3          etherne/hp  connected   configured  ok
iou#0-pci#4          pci-pci/hp  connected   configured  ok
```

Note that the output now shows that IOU slot `iou#0-pci#1` is connected and configured. The output also lists the I/O boat serial number (`iobE02EF`) and the six PCI slots in the I/O boat.

Specifications

This guide provides the specifications and site requirements you need when planning for the installation of an External I/O Expansion Unit.

Topics in this appendix include:

- [Section A.1, “Physical Specifications” on page A-2](#)
- [Section A.2, “Clearance for Service Access” on page A-2](#)
- [Section A.3, “Environmental Specifications” on page A-3](#)
- [Section A.4, “Power Source Requirements” on page A-4](#)
- [Section A.5, “Acoustic Noise Emissions” on page A-4](#)
- [Section A.6, “Agency Compliance Specifications” on page A-5](#)

A.1 Physical Specifications

Measure	U.S.	Metric
Width	17.3 in.	440 mm
Depth	29 in.	730 mm
Depth with cable management unit	39 in.	1000 mm
Height (4 rack units)	6.9 in.	175 mm
Weight with 1 I/O boat and 2 PSUs	63 lb	28.6 kg
Weight with 2 I/O boats and 2 PSUs	81 lb	36.8 kg

A.2 Clearance for Service Access

These are the minimum clearances needed for External I/O Expansion Unit maintenance.

Description	U.S.	Metric
Clearance, front of system	36 in.	915 mm
Clearance, rear of system	36 in.	915 mm

A.3 Environmental Specifications

Environmental Factor	Operating Range	Nonoperating Range	Optimum
Ambient temperature	5°C to 35°C (41°F to 95°F)	Unpacked: 0°C to 50°C (32°F to 122°F) Packed: -20°C to 60°C‡ (-4°F to 140°F)	21°C to 23°C (70°F to 74°F)
Relative humidity *	20% RH to 80% RH, noncondensing	Up to 93% RH, noncondensing	45% RH to 50% RH, noncondensing
Altitude restriction†	3,000m (10,000 ft)	12,000m (39,370 ft)	
Temperature conditions	5°C to 35°C (41°F to 95°F) 0 to 499m (1,637 ft) 5°C to 33°C (41°F to 91.4°F) 500m to 999m (1,640 ft to 3,278 ft) 5°C to 31°C (41°F to 87.8°F) 1,000m to 1,499m (3,281 ft to 4,918 ft) 5°C to 29°C (41°F to 84.2°F) 1,500 to 3,000m (4,921 ft to 9,843 ft)		
Vibration	0.2 GS, swept sine 5-500-5Hz, 1 octave/min, all axes, IEC 60068-2-13	1.0 GS, swept sine 5-500-5Hz, 1 octave/min, all axes, IEC 60068-2-13	
Shock	5 GS peak 11 milliseconds, half-sine pulse, IEC 60068-2-27	30 GS peak 11 milliseconds, half- sine pulse, IEC 60068-2-27	

* There is no condensation regardless of the temperature and humidity.

† All altitudes are above sea level.

‡ Derated 2°C for every 1 km up to 3 km.

A.4 Power Source Requirements

Description	Specification
Input voltage range	100 VAC to 240 VAC, 50-60 Hz
Maximum input current	8.0 A at 100 VAC 4.0 A at 220 VAC
Rush current, per AC cord	30 A (peak)
Maximum input power	600 W
Phases	Single
Leakage current, per AC cord	1.5 mA or less

Note – To ensure redundant operation of the power supplies, the two power cords should be connected to separate AC circuits.

A.5 Acoustic Noise Emissions

Description	Mode	Specification
LwAd (1 B = 10 dB)	Operating acoustic noise	6.7 B
	Idling acoustic noise	6.7 B
LpAm (bystander positions)	Operating acoustic noise	59 dBA
	Idling acoustic noise	59 dBA

Note – Declared noise emissions are in accordance with ISO 9296 standards.

A.6 Agency Compliance Specifications

The External I/O Expansion Unit complies with the following specifications.

Category	Relevant Standards
Safety Standards	UL/CSA60950-1, EN60950-1, IEC60950-1, IEC825, and CB Scheme with all national differences
Emissions	FCC, EN55022/CISPR22(All Class A) & EN61000-3-2 & -3-3
Immunity	EN55024, EN61000-4-2, -4-3, -4-5, -4-6, -4-8, -4-11, EN300-386
Regulatory markings system level	CE, UL, BSMI, FCC, VCCI, ICES, C-tick, GOST-R, MIC, WEEE, & China RoHS
Regulatory markings power supply level	CE, UL, BSMI, GOST-R, MIC, CCC, S-mark
Radiated Emissions Report formats	FCC, VCCI, BSMI, & CISPR22

External I/O Expansion Unit LED Status Indicators

The following tables list the status states for the LEDs on the front ([FIGURE B-1](#)) and rear ([FIGURE B-2](#)) of the External I/O Expansion Unit.

Topics in this appendix include:

- [Section B.1, “LED Locations” on page B-2](#)
- [Section B.2, “LED States” on page B-4](#)

B.1 LED Locations

FIGURE B-1 LEDs on the Front of the Chassis

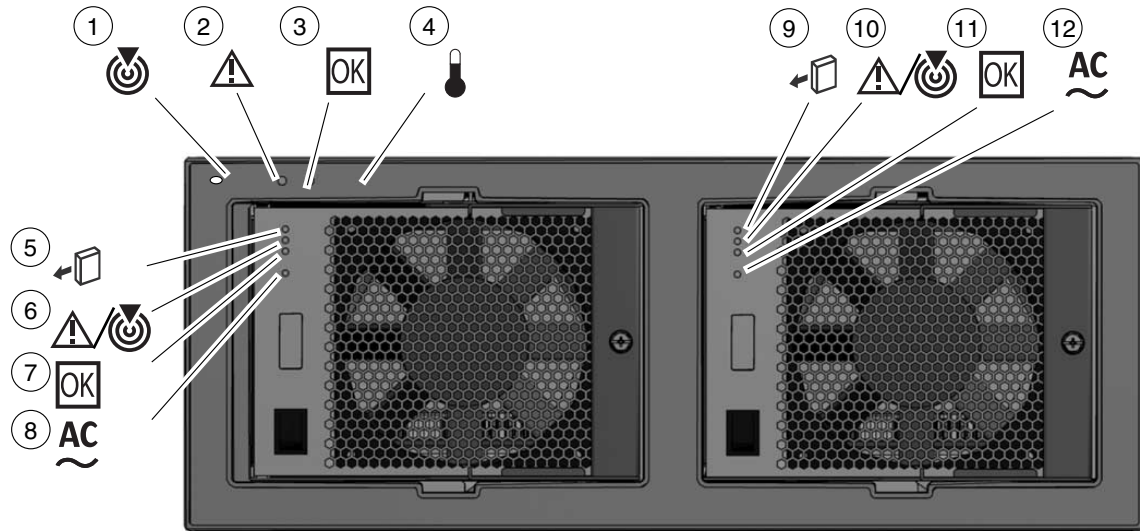


Figure Legend

1	Chassis locate (LED and switch)	7	PSU0 DC power
2	Chassis fault/service required	8	PSU0 AC power
3	Chassis power	9	PSU1 ready to remove
4	Chassis overtemp	10	PSU1 fault/locate
5	PSU0 ready to remove	11	PSU1 DC power
6	PSU0 fault/locate	12	PSU1 AC power

FIGURE B-2 LEDs on the Rear of the Chassis

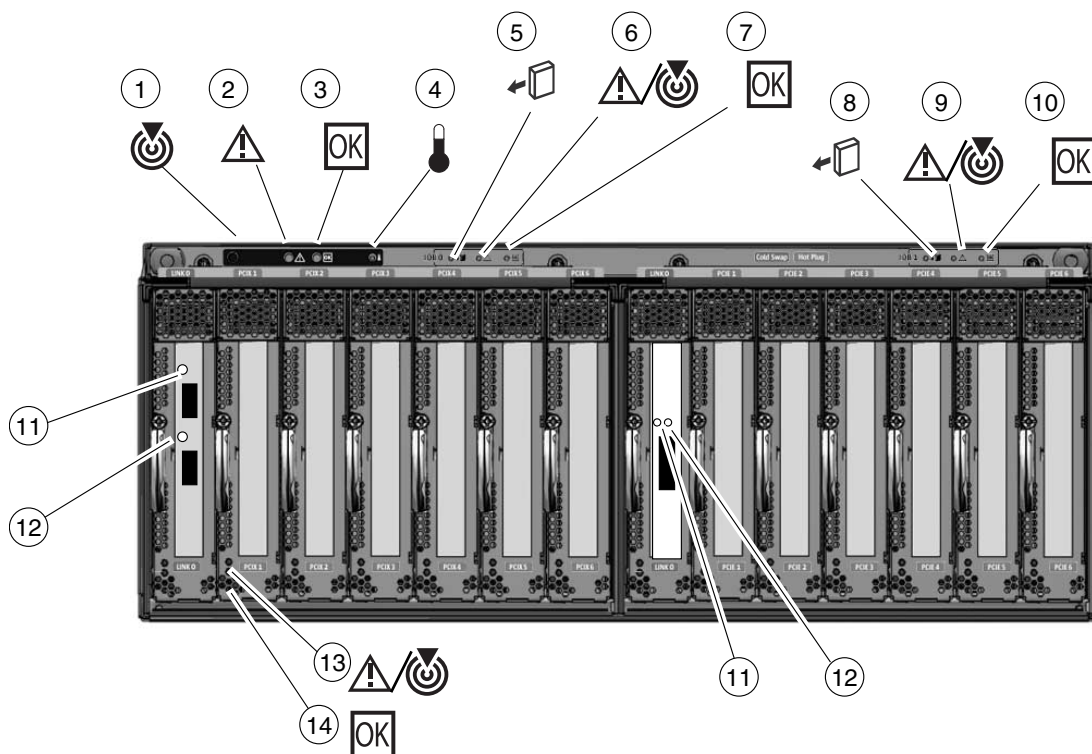


Figure Legend

1	Chassis locate (LED and switch)	8	I/O boat 1 ready to remove
2	Chassis fault/service required	9	I/O boat 1 fault/locate
3	Chassis power	10	I/O boat 1 DC power
4	Chassis overtemp	11	Link card data
5	I/O boat 0 ready to remove	12	Link card management
6	I/O boat 0 fault/locate	13	Slot attention/locate (all PCI carriers)
7	I/O boat 0 DC power	14	Slot power (all PCI carriers)

Note – The Locate LED is a lighted push-button switch. When the flashing of its LED has helped you to locate the External I/O Expansion Unit, turn off the LED by pressing the switch. Note that the LED will not turn off if you press less than 0.5 seconds. You can also manually turn on the LED by pressing the button.

B.2 LED States

Note – Text shown in bold font indicates the normal operating state for each LED.

TABLE B-1 External I/O Expansion Unit Chassis (Front)





LED Name	Color	State	Meaning
 Locate	White	Off Flash	The unit is located here. (4 Hz) To turn off the flashing LED, press the button for 0.5 second or longer.
 Fault/service required	Amber	Off On	No fault. Fault present.
 Power	Green	On Off Flash	Chassis power on, one or both boats on. Chassis power off. Chassis power on, all boats off (0.3 Hz)
 Overtemp	Amber	Off On	Temperature okay. Unit needs attention.

TABLE B-2 External I/O Expansion Unit Chassis (Rear)





LED Name	Color	State	Meaning
 Locate	White	Off Flash	The unit is located here. (4 Hz) To turn off the flashing LED, press the button for 0.5 second or longer.
 Fault/service required	Amber	Off On	No fault. Fault present.
 OK	Green	On Off Flash	Chassis power on, one or both boats on. Chassis power off. Chassis power on, all boats off (0.3 Hz)
 Overtemp	Amber	Off On	Temperature okay. Unit needs attention.

TABLE B-3 I/O Boat




LED Name	Color	State	Meaning
 Power	Green	On Off Flash	Boat power on, and boat is managed. Boat power off. Boat power on, and boat is not managed.
 Fault/Locate	Amber	Off On Flash	No fault. Fault present. Locate on.
 Ready to remove	Blue	Off On	Not ready to remove. Ready to remove.

TABLE B-4 Power Supply Unit (PSU0 and PSU1)







LED Name	Color	State	Meaning
 Ready to remove	Blue	Off On	Not ready to remove. Ready to remove.
 Fault/Locate	Amber	Off On Flash	No fault. Fault present. Locate on.
 AC Power	Green	On Off	AC input. No AC input.
 DC Power	Green	On Off	DC output. No DC output.

TABLE B-5 Carriers 1-6

LED Name	Color	State	Meaning
 Power*	Green	On	Card in slot.
		Off	Slot empty.
		Flash	Power transition in progress.
 Attention/Locate	Amber	Off	No fault.
		On	Fault present.
		Flash	Locate on. (1 Hz)

* When the External I/O Expansion Unit is first powered on, a lighted Power LED means the slot has power. An unlighted Power LED means the slot is not powered.

TABLE B-6 Link Card (Optical Version)

LED Name	Color	State	Meaning
Data (upper LED)	Green	On	x8 PCI Express links.
		Off	Link is down.
		Flash	x1 or x4 PCI Express link (degraded state). (1 Hz slow flash)
Management (lower LED)	Green	On	Management link is up. (Flashes in time with data traffic)
		Flash	Management link is down. (0.3 Hz very slow flash)
		Off	Link card power is off.

Note – On the optical link card, the LEDs for link card data and link card management are located next to the optical cable sockets. The LEDs do not have any direct relationship to the sockets and are not intended to indicate the activity of the optical cable sockets.

TABLE B-7 Link Card (Copper Version)

LED Name	Color	State	Meaning
Data (right LED)	Green	On	x8 PCI Express links.
		Off	Link is down.
		Flash	x1 or x4 PCI Express link (degraded state). (1 Hz slow flash)
Management (left LED)	Green	On	Management link is up. (Flashes in time with data traffic)
		Flash	Management link is down. (0.3 Hz very slow flash)
		Off	Link card power is off.

PCI Cards and Device Mapping

This appendix shows examples of device maps (device paths) for PCI cards in an External I/O Expansion Unit attached to a host system. Use this information to identify and locate PCI cards in the External I/O Expansion Unit I/O boats.

Topics in this appendix include:

- [Section C.1, “Device Mapping” on page C-1](#)
- [Section C.2, “Device Map Examples” on page C-3](#)
- [Section C.3, “Software Commands for the External I/O Expansion Unit” on page C-6](#)

C.1 Device Mapping

When the host server is booted, the OpenBoot PROM creates a map of devices internal and external to the host server. When mapping the external devices, the OpenBoot PROM starts from the host's I/O Unit (IOU) slots. For the External I/O Expansion Unit, the device map includes circuitry in the I/O boats, the PCI cards in the I/O boats, and the external devices that are connected to the PCI cards.

Note – The External I/O Expansion Unit's link cards and link cable do not appear in the device map. When you install a link card in the host server, the OpenBoot PROM will not detect that card. After you connect the link cable(s) between the link card in the host server and the link card in an I/O boat, the OpenBoot PROM can detect circuitry and any PCI cards in the I/O Boat.

The host server's IOU slots are identified by various device path names such as `/pci@x0,600000`, `/pci@x1,700000`, `/pci@x2,600000`, and so forth. These names vary according to the location of the I/O unit (IOU) in the host, and by the slot location in the I/O unit. For the IOU slot names, see [TABLE C-1](#) and [TABLE C-2](#).

TABLE C-1 lists the IOU slots in the SPARC Enterprise M4000/M5000 servers. For more information about IOU slot names, refer to the discussions of I/O device mapping in the *SPARC Enterprise M4000/M5000/M8000/M9000 Servers Administration Guide*.

TABLE C-1 IOU Slots in SPARC Enterprise M4000/M5000 Servers

IOU Slot	OpenBoot PROM Device Path Name
IOU Slot 0*	/pci@x0,600000/pci@0/pci@8/pci@0,1
IOU Slot 1	/pci@x0,600000/pci@0/pci@9
IOU Slot 2	/pci@x1,700000
IOU Slot 3	/pci@x2,600000
IOU Slot 4	/pci@x3,700000

* Slot 0 is a PCI-X slot. The External I/O Expansion Unit link card cannot be used in this slot.

TABLE C-2 lists the IOU slots in the SPARC Enterprise M8000/M9000 servers. For more information about IOU slot names, refer to the discussions of I/O device mapping in the *SPARC Enterprise M4000/M5000/M8000/M9000 Servers Administration Guide*.

TABLE C-2 IOU Slots in SPARC Enterprise M8000/M9000 Servers

IOU Slot	OpenBoot PROM Device Path Name
IOU Slot 0	pci@x0,600000
IOU Slot 1	pci@x1,700000
IOU Slot 2	pci@x2,600000
IOU Slot 3	pci@x3,700000
IOU Slot 4	pci@x4,600000
IOU Slot 5	pci@x5,700000
IOU Slot 6	pci@x6,600000
IOU Slot 7	pci@x7,700000

The OpenBoot PROM maps several types of connecting devices inside the I/O boats in the External I/O Expansion Unit. These connecting devices generally have multiple I/O ports which appear in the OpenBoot PROM report as pci@0, pci@1, pci@0,1, and so forth. These connecting devices are switching circuits which switch between multiple inputs, and bridge circuits, which connect PCI-X buses to PCI Express buses.

C.2 Device Map Examples

As shown in the diagrams below, the OpenBoot PROM displays the following parts in sequence for each PCI card in an External I/O Expansion Unit:

- The I/O Unit (IOU) slot in the server
- Multiple devices inside the I/O boat
- The PCI card in the I/O boat
- Disk drives, SCSI ports, or networks that connect to the PCI card

C.2.1 Device Map for PCI Express Cards

This is an example of a complete device path for a PCI Express (PCIe) card in a PCI Express boat:

```
/IOU_slot/pci@0/pci@9/pci@0/pci@9/abc@n
```

IOU_slot is the IOU slot to which the link card for a External I/O Expansion Unit is connected. See [TABLE C-1](#) and [TABLE C-2](#).

[FIGURE C-1](#) shows the device path for a PCI Express card. The device path is the accumulation of ports from the host data bus (item 1) to the PCI card (item 6).

FIGURE C-1 Device Path for PCI Express (PCIe) PCI Cards

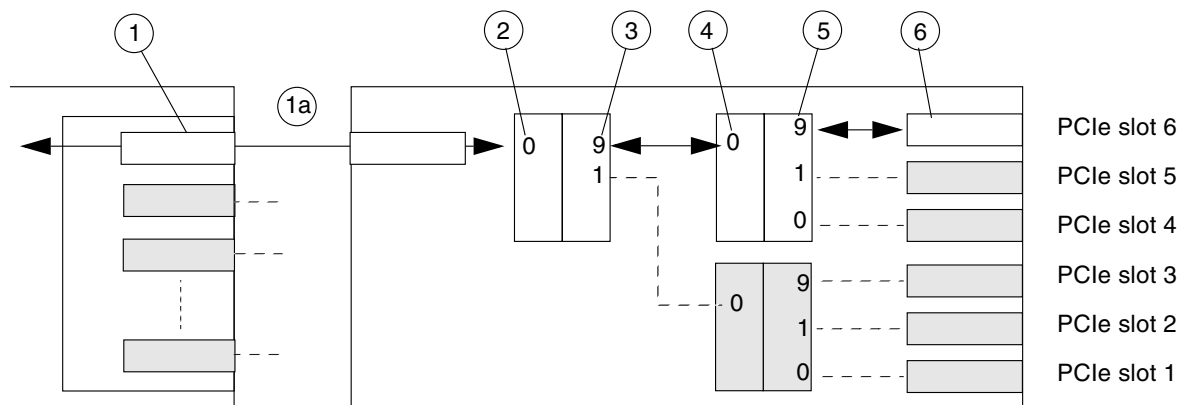


TABLE C-3 Parts of a Device Path for a PCI Express I/O Boat

Item	Description	Device Tree Path Example
1	IOU slot	/pci@xy,700000
1a	link cards	(Nothing is displayed for link cards. This is normal behavior. They are not visible to the OpenBoot PROM.)
2	/pci@0	/pci@xy,700000/pci@0
3	/pci@9	/pci@xy,700000/pci@0/pci@9
4	/pci@0	/pci@xy,700000/pci@0/pci@9/pci@0
5	/pci@9	/pci@xy,700000/pci@0/pci@9/pci@0/pci@9
6	PCI card	/pci@xy,700000/pci@0/pci@9/pci@0/pci@9/abc@n

C.2.2 Device Map for PCI-X Cards

This is an example of a complete device path for a PCI-X card in a PCI-X boat:

/IOU_slot/pci@0/pci@8/pci@0/abc@n

IOU_slot is the IOU slot to which the link card for a External I/O Expansion Unit is connected. See [TABLE C-1](#) and [TABLE C-2](#).

[FIGURE C-2](#) shows the device path for a PCI-X card. The device path is the accumulation of ports from the IOU slot (item 1) to the PCI card (item 5).

FIGURE C-2 Device Path for PCI-X PCI Cards

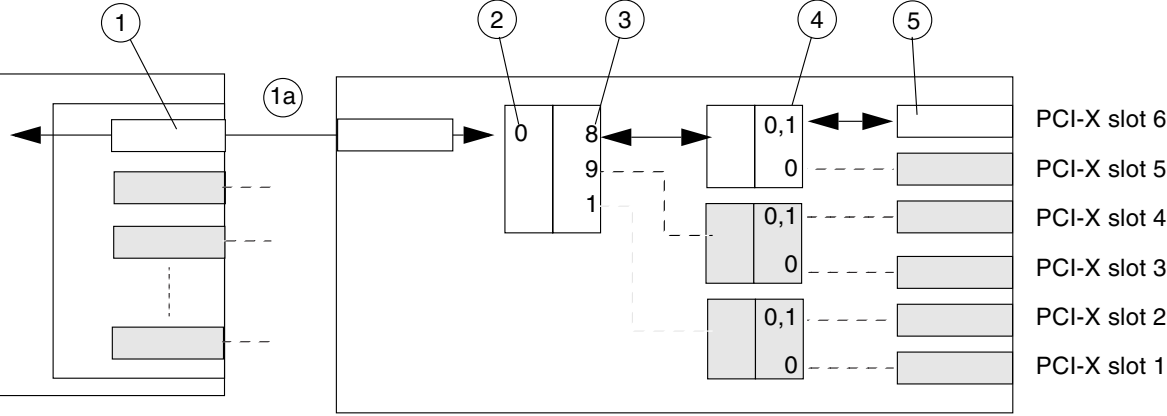


TABLE C-4 Parts of a Device Path for a PCI-X I/O Boat

Item	Description	Device Tree Path Example
1	IOU slot	<code>/pci@xy,700000</code>
1a	link cards	(Nothing is displayed for link cards. This is normal behavior. They are not visible to the OpenBoot PROM.)
2	<code>/pci@0</code>	<code>/pci@xy,700000/pci@0</code>
3	<code>/pci@8</code>	<code>/pci@xy,700000/pci@0/pci@8</code>
4	<code>/pci@0</code>	<code>/pci@xy,700000/pci@0/pci@8/pci@0</code>
5	PCI card	<code>/pci@xy,700000/pci@0/pci@8/pci@0,1/abc@n</code>

C.3 Software Commands for the External I/O Expansion Unit

From the host server, you can use the following commands to identify and locate the PCI cards in the I/O boats:

TABLE C-5 Diagnostic and Maintenance Commands

Command	Comments	Reference
<code>ioxadm (8)</code>	The <code>ioxadm (8)</code> command displays information about the External I/O Expansion Unit. System administrators and service personnel can use <code>ioxadm</code> to manage External I/O Expansion Unit functions.	TABLE C-7
<code>show-devs</code>	Displays device tree information for PCI cards and other devices attached to the host. Run this command from the OpenBoot prompt.	EXAMPLE C-1
<code>cfgadm (1M)</code>	The <code>cfgadm (1M)</code> command displays dynamic reconfiguration information for a system. Run this command from the Oracle Solaris superuser prompt.	EXAMPLE C-2
<code>prtdiag (1M)</code>	The <code>prtdiag (1M)</code> command displays system configuration and any failed field replaceable units (FRUs). Run this command from the Oracle Solaris superuser prompt.	EXAMPLE C-3

For the following examples of program output, assume an External I/O Expansion Unit has one PCI Express boat and one PCI-X boat. The boats contain six PCI cards each:

TABLE C-6 PCI Cards in a Typical External I/O Expansion Unit

Boat	Slot	PCI Card
PCI Express boat	1	Dual gigabit Ethernet
	2	Dual gigabit Ethernet
	3	Dual gigabit Ethernet
	4	4 gigabit fibre channel
	5	Dual 4 gigabit fibre channel
	6	Dual 4 gigabit fibre channel
PCI-X boat	1	Quad gigabit Ethernet
	2	4 gigabit fibre channel
	3	Gigaswift gigabit Ethernet

TABLE C-6 PCI Cards in a Typical External I/O Expansion Unit (*Continued*)

Boat	Slot	PCI Card
	4	Dual Ultra320 SCSI adapter
	5	Dual gigabit Ethernet
	6	4 gigabit fibre channel

C.3.1 The `ioxadm` Command

Use the `ioxadm` (8) command to display information about the External I/O Expansion Unit and to manage External I/O Expansion Unit functions. The `ioxadm` command is executed on the service processor of the host system.

The `ioxadm` command has three levels of user privileges: `platop` (platform operator or user), `platadm` (platform administrator), `fieldeng` (service or field engineer) The user's privilege level is set through the `setprivileges` (8) command.

TABLE C-7 `ioxadm` Privileges and Commands

Required Privilege	Command	Description
<code>fieldeng</code> , <code>platadm</code> , <code>platop</code>	<code>ioxadm env</code>	Display the environmental state of the External I/O Expansion Unit or link card.
<code>fieldeng</code> , <code>platadm</code> , <code>platop</code>	<code>ioxadm list</code>	List information about the External I/O Expansion Unit, links, and External I/O Expansion Unit FRUs.
<code>fieldeng</code> , <code>platadm</code>	<code>ioxadm locator</code>	Display and set the status of the locator LED.
<code>fieldeng</code> , <code>platadm</code>	<code>ioxadm poweroff</code>	Power down External I/O Expansion Unit FRUs for replacement.
<code>fieldeng</code> , <code>platadm</code>	<code>ioxadm poweron</code>	Return an External I/O Expansion Unit FRU to normal operation after being powered off.
<code>fieldeng</code>	<code>ioxadm reset</code>	Reinitialize External I/O Expansion Unit FRUs.
<code>fieldeng</code>	<code>ioxadm settled</code>	Set the state of External I/O Expansion Unit LEDs.

Refer to the `ioxadm` (8) man page for more information.

C.3.2 The show-devs Command

The show-devs command displays the paths from the host system to the PCI cards in the I/O boat.

EXAMPLE C-1 Typical Output of the show-devs Command (1 of 3)

```
{0} ok show-devs
/pci@3,700000
/pci@2,600000
/pci@1,700000
/pci@0,600000
/pci@8,4000
/cmp@408,0
/cmp@400,0
/pseudo-mc@200,200
/nvram
/pseudo-console
/virtual-memory
/memory@m3c000000000
/aliases
/options
/openprom
/chosen
/packages
/pci@3,700000/pci@0
/pci@3,700000/pci@0/pci@9
/pci@3,700000/pci@0/pci@8
/pci@3,700000/pci@0/pci@1
/pci@3,700000/pci@0/pci@9/pci@0,1
/pci@3,700000/pci@0/pci@9/pci@0
/pci@3,700000/pci@0/pci@9/pci@0,1/scsi@4,1
/pci@3,700000/pci@0/pci@9/pci@0,1/scsi@4
/pci@3,700000/pci@0/pci@9/pci@0/network@4
/pci@3,700000/pci@0/pci@8/pci@0,1
/pci@3,700000/pci@0/pci@8/pci@0
/pci@3,700000/pci@0/pci@8/pci@0,1/SUNW,qlc@4,1
/pci@3,700000/pci@0/pci@8/pci@0,1/SUNW,qlc@4
/pci@3,700000/pci@0/pci@8/pci@0,1/SUNW,qlc@4,1/fp@0,0
/pci@3,700000/pci@0/pci@8/pci@0,1/SUNW,qlc@4,1/fp@0,0/disk
/pci@3,700000/pci@0/pci@8/pci@0,1/SUNW,qlc@4/fp@0,0
/pci@3,700000/pci@0/pci@8/pci@0,1/SUNW,qlc@4/fp@0,0/disk
/pci@3,700000/pci@0/pci@8/pci@0/pci@4
/pci@3,700000/pci@0/pci@8/pci@0/pci@4/scsi@2,1
/pci@3,700000/pci@0/pci@8/pci@0/pci@4/scsi@2
```

EXAMPLE C-1 Typical Output of the show-devs Command (2 of 3)

```
/pci@3,700000/pci@0/pci@8/pci@0/pci@4/network@1
/pci@3,700000/pci@0/pci@8/pci@0/pci@4/network@0
/pci@3,700000/pci@0/pci@8/pci@0/pci@4/scsi@2,1/tape
/pci@3,700000/pci@0/pci@8/pci@0/pci@4/scsi@2,1/disk
/pci@3,700000/pci@0/pci@8/pci@0/pci@4/scsi@2/tape
/pci@3,700000/pci@0/pci@8/pci@0/pci@4/scsi@2/disk
/pci@3,700000/pci@0/pci@1/pci@0,1
/pci@3,700000/pci@0/pci@1/pci@0
/pci@3,700000/pci@0/pci@1/pci@0,1/SUNW,qlc@4,1
/pci@3,700000/pci@0/pci@1/pci@0,1/SUNW,qlc@4
/pci@3,700000/pci@0/pci@1/pci@0,1/SUNW,qlc@4,1/fp@0,0
/pci@3,700000/pci@0/pci@1/pci@0,1/SUNW,qlc@4,1/fp@0,0/disk
/pci@3,700000/pci@0/pci@1/pci@0,1/SUNW,qlc@4/fp@0,0
/pci@3,700000/pci@0/pci@1/pci@0,1/SUNW,qlc@4/fp@0,0/disk
/pci@3,700000/pci@0/pci@1/pci@0/pci@4
/pci@3,700000/pci@0/pci@1/pci@0/pci@4/pci@4
/pci@3,700000/pci@0/pci@1/pci@0/pci@4/pci@0
/pci@3,700000/pci@0/pci@1/pci@0/pci@4/pci@4/network@3
/pci@3,700000/pci@0/pci@1/pci@0/pci@4/pci@4/network@2
/pci@3,700000/pci@0/pci@1/pci@0/pci@4/pci@0/network@1
/pci@3,700000/pci@0/pci@1/pci@0/pci@4/pci@0/network@0
/pci@2,600000/pci@0
/pci@2,600000/pci@0/pci@9
/pci@2,600000/pci@0/pci@8
/pci@2,600000/pci@0/pci@1
/pci@2,600000/pci@0/pci@9/pci@0
/pci@2,600000/pci@0/pci@9/pci@0/pci@9
/pci@2,600000/pci@0/pci@9/pci@0/pci@1
/pci@2,600000/pci@0/pci@9/pci@0/pci@0
/pci@2,600000/pci@0/pci@9/pci@0/pci@9/fibre-channel@0,1
/pci@2,600000/pci@0/pci@9/pci@0/pci@9/fibre-channel@0
/pci@2,600000/pci@0/pci@9/pci@0/pci@1/fibre-channel@0,1
/pci@2,600000/pci@0/pci@9/pci@0/pci@1/fibre-channel@0
/pci@2,600000/pci@0/pci@9/pci@0/pci@0/QLGC,qlc@0,1
/pci@2,600000/pci@0/pci@9/pci@0/pci@0/QLGC,qlc@0
/pci@2,600000/pci@0/pci@9/pci@0/pci@0/QLGC,qlc@0,1/fp@0,0
/pci@2,600000/pci@0/pci@9/pci@0/pci@0/QLGC,qlc@0,1/fp@0,0/disk
/pci@2,600000/pci@0/pci@9/pci@0/pci@0/QLGC,qlc@0/fp@0,0
/pci@2,600000/pci@0/pci@9/pci@0/pci@0/QLGC,qlc@0/fp@0,0/disk
/pci@2,600000/pci@0/pci@1/pci@0
/pci@2,600000/pci@0/pci@1/pci@0/pci@9
/pci@2,600000/pci@0/pci@1/pci@0/pci@1
/pci@2,600000/pci@0/pci@1/pci@0/pci@0
```

EXAMPLE C-1 Typical Output of the show-devs Command (3 of 3)

```
/pci@2,600000/pci@0/pci@1/pci@0/pci@9/network@0,1
/pci@2,600000/pci@0/pci@1/pci@0/pci@9/network@0
/pci@2,600000/pci@0/pci@1/pci@0/pci@1/network@0,1
/pci@2,600000/pci@0/pci@1/pci@0/pci@1/network@0
/pci@2,600000/pci@0/pci@1/pci@0/pci@0/network@0,1
/pci@2,600000/pci@0/pci@1/pci@0/pci@0/network@0
/pci@0,600000/pci@0
/pci@0,600000/pci@0/pci@9
/pci@0,600000/pci@0/pci@8
/pci@0,600000/pci@0/pci@1
/pci@0,600000/pci@0/pci@8/pci@0,1
/pci@0,600000/pci@0/pci@8/pci@0
/pci@0,600000/pci@0/pci@8/pci@0/pci@0,0@7
/pci@0,600000/pci@0/pci@8/pci@0/network@2,1
/pci@0,600000/pci@0/pci@8/pci@0/network@2
/pci@0,600000/pci@0/pci@8/pci@0/scsi@1
/pci@0,600000/pci@0/pci@8/pci@0/scsi@1/disk
/pci@0,600000/pci@0/pci@8/pci@0/scsi@1/tape
/pci@8,4000/ebus@1
/pci@8,4000/ebus@1/panel@14,280030
/pci@8,4000/ebus@1/scfc@14,200000
/pci@8,4000/ebus@1/serial@14,400000
/pci@8,4000/ebus@1/flashprom@10,0
/cmp@408,0/core@1
/cmp@408,0/core@0
/cmp@408,0/core@1/cpu@1
/cmp@408,0/core@1/cpu@0
/cmp@408,0/core@0/cpu@1
/cmp@408,0/core@0/cpu@0
/cmp@400,0/core@1
/cmp@400,0/core@0
/cmp@400,0/core@1/cpu@1
/cmp@400,0/core@1/cpu@0
/cmp@400,0/core@0/cpu@1
/cmp@400,0/core@0/cpu@0      /openprom/client-services
/packages/obp-tftp
/packages/terminal-emulator
/packages/disk-label
/packages/deblocker
/packages/SUNW,builtin-drivers
{0} ok
```


C.3.3 The cfigadm Command

The `cfigadm` command displays devices connected to the main server bus. To use this command, refer to the `cfigadm (1M)` man page.

This is typical output of the `cfigadm` command;

EXAMPLE C-2 Typical Output of the `cfigadm` Command (1 of 2)

# <code>cfigadm -la</code>				
Ap_Id	Type	Receptacle	Occupant	Condition
SB0	System_Brd	connected	configured	ok
SB0::cpu0	cpu	connected	configured	ok
SB0::cpu1	cpu	connected	configured	ok
SB0::memory	memory	connected	configured	ok
SB0::pci0	io	connected	configured	ok
SB0::pci1	io	connected	configured	ok
SB0::pci2	io	connected	configured	ok
SB0::pci3	io	connected	configured	ok
SB0::pci8	io	connected	configured	ok
SB1		disconnected	unconfigured	unknown
SB2		disconnected	unconfigured	unknown
...				
SB14		disconnected	unconfigured	unknown
SB15		disconnected	unconfigured	unknown
c0	scsi-bus	connected	configured	unknown
c0::dsk/c0t0d0	disk	connected	configured	unknown
c0::dsk/c0t1d0	disk	connected	configured	unknown
c0::dsk/c0t3d0	CD-ROM	connected	configured	unknown
c0::rmt/0	tape	connected	configured	unknown
c1	fc-fabric	connected	configured	unknown
c1::2100000c5062606a	disk	connected	configured	unknown
c2	fc-fabric	connected	configured	unknown
c2::2100000c50628015	disk	connected	configured	unknown
...				
c14::dsk/c14t11d0	disk	connected	configured	unknown
c14::es/ses1	processor	connected	configured	unknown
iou#0-pci#1	unknown	empty	unconfigured	unknown
iou#0-pci#2	unknown	empty	unconfigured	unknown
iou#0-pci#3	pci-pci/hp	connected	configured	ok
iou#0-pci#4	pci-pci/hp	connected	configured	ok
pci1	pci-pci/hp	connected	configured	ok
pci2	fibre/hp	connected	configured	ok
pci3	etherne/hp	connected	configured	ok
pci4	scsi/hp	connected	configured	ok
pci5	pci-pci/hp	connected	configured	ok
pci6	fibre/hp	connected	configured	ok
pcie1	etherne/hp	connected	configured	ok
pcie2	etherne/hp	connected	configured	ok

EXAMPLE C-2 Typical Output of the `cfgadm` Command (2 of 2)

pcie3	etherne/hp	connected	configured	ok
pcie4	fibre/hp	connected	configured	ok
pcie5	fibre/hp	connected	configured	ok
pcie6	fibre/hp	connected	configured	ok

C.3.4 The `prtdiag` Command

The `prtdiag` command displays information about the server, including basic details about the PCI cards in the External I/O Expansion Unit. To use this command, refer to the `prtdiag (1M)` man page.

This is typical output of the `prtdiag` command

EXAMPLE C-3 Typical `prtdiag` Output

```
# prtdiag
System Configuration: Sun Microsystems sun4u Sun SPARC Enterprise (FF2) Server
System clock frequency: 1012 MHz
Memory size: 8192 Megabytes

===== CPUs =====

LSB      CPU      CPU      Run      L2$      CPU      CPU
Chip      ID      MHz      MB      Impl.    Mask
-----
00        0          0, 1, 2, 3 2150      4.0          6      129
00        1          8, 9, 10, 11 2150      4.0          6      129

===== Memory Configuration =====

LSB      Memory  Available  Memory      DIMM      Number of
Group    Size      Status      Size      DIMMs
-----
00      A      4096MB      okay      1024MB      4
00      B      4096MB      okay      1024MB      4

===== IO Cards =====

LSB      Name      Model
-----
00      scsi      LSI,1064
00      network   N/A
00      network   N/A
00      pci0,0     N/A
00      network   SUNW,pcie-no
00      network   SUNW,pcie-no
```

EXAMPLE C-3 Typical prtdiag Output

00	network	SUNW,pcie-no
00	network	SUNW,pcie-no
00	network	SUNW,pcie-no
00	network	SUNW,pcie-no
00	fp	N/A
00	network	SUNW,pcie-no
00	network	SUNW,pcie-no
00	network	SUNW,pcie-no
00	network	SUNW,pcie-no
00	network	SUNW,pcie-no
00	network	SUNW,pcie-no
00	fp	N/A
00	network	SUNW,pci-qge
00	network	SUNW,pci-qge
00	network	SUNW,pci-qge
00	network	SUNW,pci-qge
00	fp	N/A

Troubleshooting

This appendix includes these topics for the External I/O Expansion Unit from Oracle and Fujitsu:

- [Section D.1, “Using Hardware Symptoms to Troubleshoot Problems” on page D-2](#)
- [Section D.2, “Using Manual Techniques of Fault Isolation to Diagnose Error Messages” on page D-4](#)

D.1 Using Hardware Symptoms to Troubleshoot Problems

TABLE D-1 Troubleshooting (1 of 3)

Area	Symptom	Comments
Carrier	Carrier does not seat.	<ul style="list-style-type: none">• Pull the carrier handle out fully before inserting the carrier in the I/O boat slot. The PCI card and carrier plate will strike the card socket if the handle is not fully retracted.• The carrier is not correctly seated in the upper or lower card guide.• A type C lock is in the wrong location and is hitting the card socket.
	Carrier handle requires excessive pressure to close.	<ul style="list-style-type: none">• The PCI card is not mounted correctly on the carrier. If the PCI card is tilted by even a small angle on the carrier, it might not seat correctly.• The PCI card does not fit the socket. The card might be the incorrect type for the I/O boat. (Note that the PCI-X card socket is approximately twice the length of a PCI Express socket.)• The PCI Express boat does not accept x16 PCI Express cards. This boat accepts only x8 PCI Express cards or smaller.
Link	A link problem is suspected.	<ul style="list-style-type: none">• Ordering a complete set of replacements at one time can shorten the troubleshooting process. If you cannot determine if a link problem is caused by a link card or a link cable, order replacement link cards for the host and the I/O boat, along with a copper link cable or two optical link cables, as appropriate.
	Service processor does not detect External I/O Expansion Unit.	<ul style="list-style-type: none">• The host PCI Express slot containing the link card must be powered on. The host service processor communicates with I²C devices in the External I/O Expansion Unit through the link cards and cable. Verify that the domain is powered on and that the link card in the host slot is fully seated.• If the host link card is added to a running domain, see Section 4.13, “Powering Up a Link After Service” on page 4-32 to power on the PCI Express slot.

TABLE D-1 Troubleshooting (2 of 3)

Area	Symptom	Comments
Host	Host or service processor does not recognize PCI card or cards.	<ul style="list-style-type: none"> • If PCI Express data path failures are detected during initial Power-On Self Test (POST), POST will turn off power to the link card slot in the host. FRUs in the External I/O Expansion Unit are detected by the host service processor during POST but disappear when power to the slot is removed. Reseat the link cards in the host and External I/O Expansion Unit, check cables, or try a different PCI Express slot in the host.
		<ul style="list-style-type: none"> • For the optical link kit, the link cables might be reversed. The TX socket on each link card should connect to the RX socket on the other link card. Note that each optical cable connects a TX socket to an RX socket. • The PCI card might not be seated completely. Remove the card and carrier and verify that the card is properly attached to the carrier. See PCI card in this table.
LEDs		<ul style="list-style-type: none"> • See Appendix B for LED information.
PSU	Fan does not turn on, LEDs do not light.	<ul style="list-style-type: none"> • The PSU is not receiving DC current from the second PSU. Note: The PSUs share DC current, so the fan and LEDs should operate if the second PSU is running normally. • Verify that the PSU is seated. Close the PSU handle and tighten the handle locking screw.
	The fan operates, but the PSU does not come on line.	<ul style="list-style-type: none"> • The PSU might not have AC input. Note: The PSUs share DC current, but do not share AC current. Verify that both of the internal AC cables are connected to AC voltage through the AC cords supplied with the External I/O Expansion Unit (FIGURE 2-11). • Check external circuit breakers. • PSU AC switches must be in the on position.
PCI card	PCI card or carrier is difficult to seat in the boat, or the card moves out of position on carrier.	<ul style="list-style-type: none"> • The card locks might be loose, allowing the card to tilt. Reposition the card and tighten the card locks. It is most important that the card lock(s) at the back* of the card press tightly against the back of the card. • Excessive pressure on the card locks might have bent the card bracket (FIGURE 1-21). • If PCI Express data path failures are detected during initial Power-On Self Test (POST), POST will turn off power to the link card slot in the host. FRUs in the External I/O Expansion Unit are detected by the host service processor during POST but disappear when power to the slot is removed. Reseat the link cards in the host and External I/O Expansion Unit, check cables, or try a different PCI Express slot in the host.

TABLE D-1 Troubleshooting (3 of 3)

Area	Symptom	Comments
		<ul style="list-style-type: none">• The card might not fit the socket in the boat. The card might be the wrong type for the PCI Express or PCI-X socket.• Verify that there is no broken plastic lying inside the socket.
	PCI card is difficult to install on the carrier.	<ul style="list-style-type: none">• The top of the card bracket must fit over the alignment post inside the carrier front housing (FIGURE 1-23).• The bottom of the card bracket might be hooked behind the RFI gasket inside the carrier front housing (FIGURE 1-24).• The bottom of the card may be hitting the alignment tab at the bottom front of the carrier (lower detail in FIGURE 1-22).

* This refers to the horizontally-sliding card lock(s). The fitting of the vertically-sliding card lock(s) are less critical.

D.2 Using Manual Techniques of Fault Isolation to Diagnose Error Messages

Some faults cannot be isolated to a single FRU without performing manual steps to help isolate the problem. For these types of failures, the fault diagnosis includes multiple FRUs in the fault list.

The following sections provide additional details and suggested steps to locate the problem FRU.

D.2.1 Error Messages and Fault Managed Resource Identifiers

When a fault is diagnosed, a message is displayed on the console log. For example:

```
Sep 15 13:05:53 burl-m4000-0 fmd: SOURCE: sde, REV: 1.16, CSN:
0000000000 EVENT-ID: 1a56dc98-aa6d-4128-adaf-428d45fcb024 Refer
to URL/msg/IOXSCF-8000-CQ for detailed information.
```

The `fmdump` utility can be used to retrieve fault diagnosis details associated with a fault event:

```
XSCF> fmdump -v -u event-id
```


where *event-id* is the event ID displayed in the fault message.

Each diagnosis lists one or more fault suspects represented by fault managed resource identifiers (FMRI). The FMRI may represent a component in a FRU, the FRU itself, or a bus segment within a FRU.

Note – The letters *hc* in an error message usually refer to a *hardware component*. Look for the string *hc:///* to identify a suspected hardware component.

The following example shows the fault diagnosis for an I²C access failure for the LED controller for PSU 1:

```
XSCF> fmdump -v -u 1a56dc98-aa6d-4128-adaf-428d45fcb024
TIME          UUID          MSG-ID
Sep 15 13:05:53.8069 1a56dc98-aa6d-4128-adaf-428d45fcb024 IOXSCF-8000-CQ
    25% fault.chassis.iox.i2c.device

    Problem in: hc:///iox=983555/ps=1/ledctrl=0
    Affects: hc:///iox=983555/ps=1/ledctrl=0
    FRU: hc:///product-id=SPARC Enterprise M4000 :chassis-id=
0000000000:server-id=burl-m4000-0:serial=DD0566:part=CF003001701\
3001701:revision=04/component=IOX@X084/PS1
    Location: IOX@X084/PS1

    25% fault.chassis.iox.i2c.bus

    Problem in: hc:///iox=983555/iob=0/i2c_local=0
    Affects: hc:///iox=983555/iob=0/i2c_local=0
    FRU: hc:///product-id=SPARC Enterprise M4000 :chassis-id=
0000000000:server-id=burl-m4000-0:serial=1E0041:part=5016939:revision=
03/component=IOX@X084/IOB0
    Location: IOX@X084/IOB0

    25% fault.chassis.iox.i2c.bus

    Problem in: hc:///iox=983555/ps=1/i2c_local=0
    Affects: hc:///iox=983555/ps=1/i2c_local=0
    FRU: hc:///product-id=SPARC Enterprise M4000 :chassis-id=
0000000000:server-id=burl-m4000-0:serial=DD0566:part=CF003001701\
3001701:revision=04/component=IOX@X084/PS1
    Location: IOX@X084/PS1

    25% fault.chassis.iox.i2c.bus

    Problem in: hc:///iox=983555/i2c_a=0
```

```
Affects: hc:///iox=983555/i2c_a=0
FRU: hc//:product-id=SPARC Enterprise M4000 :chassis-id=
0000000000:server-id=burl-m4000-0:serial=XCX084:part=CF005016937\
5016937:revision=03/component=IOX@X084
Location: IOX@X084
```

In the example above, the MSG-ID is IOXSCF-8000-CQ.

The FMRI's are:

- `hc:///iox=983555/ps=1/ledctrl=0`
(the I²C device in PSU IOX@X084/PS1)
- `hc:///iox=983555/iob=0/i2c_local=0`
(the I²C bus segment in boat IOX@X084/IOB0)
- `hc:///iox=983555/ps=1/i2c_local=0`
(the I²C bus segment in PSU IOX@X084/PS1)
- `hc:///iox=983555/i2c_a=0`
(the I²C bus segment in centerplane IOX@X084)

The following sections provide additional details and suggested steps to locate the problem FRU.

If you must replace the FRU to solve the problem:

1. **Refer to the *SPARC Enterprise M3000/M4000/M5000/M8000/M9000 Servers XSCF User's Guide* for details on using the `poweron(8)` and `poweroff(8)` commands to power domains on and off.**
2. **Refer to [Chapter 4](#) of this document for details on removing and replacing specific FRUs within the External I/O Expansion Unit.**

D.2.2 I²C Failures

```
MSGID IOXSCF-8000-DE fault.chassis.iox.i2c.bus
MSGID IOXSCF-8000-CQ fault.chassis.iox.i2c.bus
                        fault.chassis.iox.i2c.device
```

There are multiple I²C bus topologies in the External I/O Expansion Unit. Some I²C buses are contained within a single FRU, while other I²C buses span multiple FRUs.

If the failure is on a bus contained within a single FRU, the identified FRU is faulty and must be replaced. See [Section D.2.2.1, "I²C Fault Isolated to a Single FRU"](#) on page D-7

If the failure is on a bus that spans multiple FRUs, follow the suggested steps in [Section D.2.2.2, “I²C Fault Spanning Multiple FRUs”](#) on page D-7 to isolate the problem FRU.

If the failure is in the host, see [Section D.2.2.3, “I²C Fault When Accessing the Link Card Installed in the Host”](#) on page D-11.

D.2.2.1 I²C Fault Isolated to a Single FRU

If the fault list shows a single FRU as suspect, replace the FRU. The centerplane in the chassis and the link cards each contain an I²C bus fully contained within the FRU.

Possible Causes

Faulty centerplane or link card.

Solutions

- If the problem is in `hc:///iox=box_instance/i2c_c=0`, then replace the chassis (IOX@nnnn).
- If the problem is in `hc:///iox=box_instance/iob=x/link=0/i2c_local=0`, then replace this link card (IOX@nnnn/IOBx/LINK).
- If the problem is in `hc:///chassis=0/iou=x/pcislot=y/link=0/i2c_local=0`, then replace this link card (IOU#x-PCI#y).

D.2.2.2 I²C Fault Spanning Multiple FRUs

There are three I²C bus trees in the External I/O Expansion Unit that span multiple FRUs. They are identified on the centerplane as described in the following table.

TABLE D-1 Multiple FRUs Covered in I²C Buses

I ² C Bus Tree	FRUs Covered in I ² C Bus
<code>hc:///iox=box_instance/i2c_a=0</code>	Spans the centerplane, PSU 1, and boat 0
<code>hc:///iox=box_instance/i2c_b=0</code>	Spans the centerplane, PSU 0, and boat 1
<code>hc:///iox=box_instance/i2c_main=0</code>	Spans all the FRUs: the centerplane, both PSUs, both boats, and the link cards installed in the boats

Possible Causes

- There is a power design issue where an I²C hot-swap buffer may prevent communication to I²C devices in a PSU.
- A FRU is not fully seated.
- A FRU is faulty.

Resolution

Contact a certified service technician for assistance in selecting one of the following alternative methods for testing the I²C power design issue in the External I/O Expansion Unit.

- PSU method: go to [Step 1](#). This method can be performed while domains are running.
- Power cord method: go to [Step 2](#). This method cannot be performed while domains are running.

1. Use the PSU method to determine if the I²C buffer power design issue is at fault:



Caution – Do not power down more than one PSU at a time for this test, or data might be lost.

a. Prepare the PSU for removal:

```
XSCF> ioxadm poweroff IOX@xxx/PSy
```

The blue PSU Ready to Remove LED lights to show the PSU status and to help you find the PSU.

b. Power off the PSU at the External I/O Expansion Unit.

c. When the PSU DC Power LED turns off, unlock the PSU handle and pull the PSU partway out of the slot.

Approximately 2 in./50 mm is a safe distance.

d. Wait 10 seconds.

e. Plug the PSU back into the slot and lock the PSU handle.

f. Power on the PSU.

If the problem has been corrected, the fault messages will not appear.

g. If this workaround corrects the problem, you do not have to do anything more to resolve this issue.

- -
 -
 -
 -
 -
 -
 -
 - If this workaround does not correct the problem, repeat Step a through Step f for the remaining PSU.
 - If fault messages continue to appear, go to Step 3.
- Use the power cord method to determine if the I²C buffer power design issue is at fault:
 - a. Power off the affected domains.
 - b. Power off both PSUs on the External I/O Expansion Unit.
 - c. When the DC Power LEDs on both PSUs turn off, disconnect both AC cords.
 - d. After 10 seconds or more, reconnect the AC cords.
 - e. Power on the PSUs in the External I/O Expansion Unit.
 - f. Power on the affected domains.

If the problem has been corrected, the fault messages will not appear.
 - g. If this workaround corrects the problem, you do not have to do anything more to resolve this issue.
 - h. If this workaround does not correct the problem, go to Step 3.
- Determine if a FRU is not fully seated in the External I/O Expansion Unit:
 - a. Power off the affected domains.
 - b. Power off both PSUs.
 - c. Reseat all FRUs.

Remove and reinsert the following:

 - i. Both PSUs
 - ii. Both I/O boards
 - iii. Link cards in the I/O boards
 - d. Power on the PSUs.
 - e. Power on the affected domains.

If the problem has been corrected, the fault messages will not appear.
 - f. If reseating the FRUs corrects the problem, you do not have to do anything more to resolve this issue.
 - g. If reseating the FRUs does not correct the problem, go to Step 4.

4. If the fault list in the error message includes `i2c_a` or `i2c_b`, use the following steps to find the faulty FRU.

If the fault list does not include `i2c_a` or `i2c_b`, go to [Step 5](#).

a. Power off the affected domains.

b. Power off both PSUs.

c. Swap the two PSUs with each other.

d. Power on the affected domains.

- If the problem follows the PSU, replace the PSU. This should correct the problem.
- If the problem does not follow the PSU (if the same fault list is diagnosed), go to [Step e](#) to test the I/O boats.

e. Power off the affected domains.

f. Swap the I/O boats with each other.

If there is only one I/O boat, move it to the unused I/O boat slot.

g. Power on the affected domains.

- If the problem follows the I/O boat, replace the I/O boat. This should correct the problem.
- If the problem does not follow the I/O boat (if the same fault list is diagnosed after swapping the PSUs and the I/O boats), go to [Step h](#).

h. If the fault continues after you have replaced the PSUs and I/O boat(s), replace the chassis.

5. If the fault list in the error message includes `iox=box_instance/i2c_main=0`, find the faulty FRU:

a. Power off the domains that use the FRUs and remove one FRU.

i. Power off the affected domains.

ii. Power off both PSUs.

iii. Remove a single FRU.

Following is the list of FRUs to remove for this procedure. Remove only one FRU from this list each time you go through this procedure. If the problem persists, remove a different FRU from the list below using this same procedure:

- PSU 0
- PSU 1
- I/O boat 0

-- I/O boat 1

Test the FRUs listed above before suspecting the following:

-- Link card (see [Step b](#))

-- Chassis (see [Step c](#))

iv. Power on both PSUs.

v. Power on the affected domains.

If the problem has been corrected, the fault messages will not appear.

vi. If this does not correct the problem, reinsert the FRU you removed in [Step iii](#), then repeat [Step i](#) through [Step v](#) for a different FRU.

vii. If this corrects the problem, go to [Step b](#).

viii. If this does not correct the problem, go to [Step c](#).

b. Determine which FRU is causing the problem.

- If the I²C problems are resolved by the removal of a PSU, assume the PSU is faulty.
- If the problems are resolved by removing an I/O boat, determine whether the problem is with the I/O boat itself or the link card in the I/O boat. Swap the link card from the failed I/O boat to a known good I/O boat to determine if the problem follows the link card.

c. If the errors continue to appear, either the chassis is faulty or multiple FRUs have I²C problems.

Contact a technical support engineer for advanced assistance.

D.2.2.3 I²C Fault When Accessing the Link Card Installed in the Host

The host manages the External I/O Expansion Unit through I²C commands sent to the link card installed in a host PCI Express add-in card slot. If the fault list includes the `i2c_main` bus for the link card installed in a host add-in slot `hc:///chassis=0/iou=x/pcislot=y/link=0/i2c_main=0`, a problem exists between the External I/O Expansion Unit and the link card.

Possible Causes

- The host link card is not fully seated.
- The host PCI Express slot is faulty.
- The host link card is faulty.

Resolution

1. Reseat the host link card.

- If this step corrects the problem, you do not have to do anything more to resolve this issue.
- If this step does not correct the problem, and an empty slot is available in the server IOU, go to [Step 2](#).
- If an empty slot is not available, go to [Step 3](#).

2. Move the host link card to a different slot.

- If the problem follows the card, replace the card.
- If the problem does not recur, the IOU slot is faulty. Replace the IOU.

3. If no vacant slot is available in the host, swap the link card in the host with the link card in the I/O boat.

- If the error information changes, replace the link card that you moved from the server IOU to the I/O boat.
- If the error information continues unchanged, go to [Step 4](#).

4. Install a known good link card in the host.

- If the error information continues unchanged, replace the IOU in the host.

D.2.3 Management Bus Failures

MSGID	IOXSCF-8000-6H	fault.chassis.iox.device.com
MSGID	IOXSCF-8000-7D	fault.chassis.iox.device.com
		fault.chassis.iox.device.fail

A low-speed serial bus known as the management bus is used to send and receive I²C commands to devices in the External I/O Expansion Unit. The bus uses side-band signals in the PCI Express cable and consists of a pair of link cards and the cable.

If there is a failure in the management bus, the system will not be able to discover FRUs, gather environmental readings, or process alarm conditions and hardware state-changes for the devices accessed through the management bus.

Possible Causes

- The Bridge Controller is timing out.
- The link cable has failed or is unplugged.

- A link card has failed.

Resolution

1. See [Section D.2.7.4, “Bridge Controller Timeout”](#) on page D-21 for details on Bridge Controller timeouts.
2. Replace the link cable.
3. Replace the link card in the I/O boat.
4. Replace the link card in the host.

D.2.4 Cable Removed or Power Loss

`MSGID IOXSCF-8000-84 fault.chassis.iox.device.missing`

The service processor detects loss of both the management bus and PCI Express data path to an External I/O Expansion Unit. This failure occurs only if the host was already managing External I/O Expansion Unit. See [Section D.2.6, “FRU Discovery Failures”](#) on page D-15 for details on FRU discovery failures.

Possible Causes

- The PCI Express cable is unplugged.
- There is a loss of input power to the External I/O Expansion Unit.
- The I/O boat was removed while in use.
- The cable is faulty.
- The link card in the host is faulty.
- The link card in the I/O boat is faulty.

Resolution

1. **Check the cable connection.**
If cable had been unplugged, make sure the link cables are reconnected correctly.
2. **Check input power to the External I/O Expansion Unit.**
3. **Try a different cable to determine if a similar failure occurs.**

4. Swap link cards with known good link cards to determine if a similar failure occurs.

D.2.5 Interrupt Signal Failures

MSGID IOXSCF-8000-2S fault.chassis.iox.device.intr
--

I²C components in the FRUs generate interrupts to report hardware state changes and alarm events. Interrupt failures are reported if a problem is discovered during an interrupt signal test or if an interrupt cannot be cleared during normal interrupt processing.

Possible Causes

- This could be a side effect of other fault conditions present in the system.
- A connector has failed if the interrupt signal spans multiple FRUs.
- The FRU has failed.

Resolution

1. **Some fault conditions or component failures will result in interrupts that cannot be cleared.**

First resolve all other failure conditions, then check if interrupt failures are still reported. For example:

- I²C component access failures often cause interrupt failures since I²C commands are used to clear interrupt conditions in the hardware.
- Voltage rail failures in an I/O boat can result in interrupt failures for `hc:///iox=box_instance/iob=x/vseq=0`.
- Some types of PSU failures will cause the fan controller on the centerplane to post excessive interrupts so interrupt failures could occur for `hc:///iox=box_instance/fanctrl=0`

2. **If no other fault conditions are present, the following interrupt failures indicate a component failure in an I/O boat:**

- `hc:///iox=box_instance/iob=x/ecb=0`
- `hc:///iox=box_instance/iob=x/intconc=0`
- `hc:///iox=box_instance/iob=x/vseq=0`

3. If no other fault conditions are present, the following interrupt failures indicate a component or connector failure.

You will have to swap out FRUs to determine which FRU contains the faulty signal.

- `hc:///iox=box_instance/iob=x`

This indicates a DEMUX port interrupt failure. The signal spans the chassis and the I/O boat. Swap the I/O boat and/or chassis to determine the location of the failure.

- `hc:///iox=box_instance/iob=x/link=0`

This indicates a failure between the interrupt concentrator in the I/O boat and the microcontroller in the link card. Swap the link card and/or the I/O boat to determine the location of the failure.

- `hc:///chassis=0/iou=x/pcislot=y/link=0`

This indicates a failure between the link card and the host PCI Express slot. Swap link cards and/or try a different host PCI Express slot to determine the location of the failure.

D.2.6 FRU Discovery Failures

The following faults are diagnosed during FRU discovery.

D.2.6.1 Signal Failure

MSGID IOXSCF-8000-35 fault.chassis.iox.device.signal
--

Possible Cause

- There is a signal failure in an I/O boat or chassis.

Resolution

1. The following FMRI's indicate failure of boat presence signal:

- `hc:///iox=box_instance/boat_pres=x`
- `hc:///iox=box_instance/iob=x/pres_sig=0`

The fan controller on the centerplane did not detect presence of an I/O boat. Try the I/O boat in an alternate bay to see if the problem follows the I/O boat and/or try the I/O boat in a chassis that you know is working and valid to determine the location of the failure.

2. The following FMRIIs indicate failure of a boat location signal:

- `hc:///iox=box_instance/boat_loc=x`
- `hc:///iox=box_instance/iob=x/loc_sig=0`

Two I/O boats were reported to be in the same location in a chassis. Try testing each I/O boat separately and examine if the reported location of the I/O boat is correct. Try an I/O boat that is valid and working in each bay of a chassis to determine if failure is contained in the chassis.

D.2.6.2 Boat Not Monitored

`MSGID IOXSCF-8000-U4 fault.chassis.iox.env.config`

Possible Causes

- The I/O boats are connected to two different systems.
- I²C component access errors prevent detection of both I/O boats.
- Corrupted FRUID contents in the centerplane chassis prevent the firmware from identifying the correct External I/O Expansion Unit chassis.

Resolution

1. Verify that both I/O boats are connected to the same server.

The I/O boats can be configured into different domains on the same server, but the boats must be managed by the same service processor (XSCF). Otherwise, both systems might attempt to update the same FRUID data causing data corruption of FRUID records in the centerplane and PSUs.

2. Inspect the host system to see which add-in slots contain link cards.

Verify that software correctly detects the link cards. If a link card is present and powered on, but it is not seen by software, there might be problems with the I²C bus going to this slot. Replace the link card or move the link card to a different slot.

Note – If an I/O boat is present, but the External I/O Expansion Unit is not displayed as a 4-character value when listed by `ioxadm`, the software could not read the serial number from the centerplane.

The box identifier would look something like `IOX@?0`.

3. If no other I²C errors are present, replace the chassis.

D.2.6.3 Link Card Mode Failure

```
MSGID IOXSCF-8001-9Y fault.chassis.iox.ulc-wrong-mode
```

The link card installed in an External I/O Expansion Unit I/O boat is operating as if it were installed in a host PCI Express add-in slot. The link card included in the FMRI is not faulty. The problem link card is manually discovered by tracing the cable to find the attached External I/O Expansion Unit.

Possible Cause

- There is a failure in the location signal in a link card or I/O boat.

Resolution

1. **Use the FMRI included in the fault report to locate the link card installed in the host:**

```
hc:///chassis=0/iou=x/pcislot=y/link=0/cable=0
```

2. **Trace the cable to find the attached External I/O Expansion Unit.**
3. **Replace the link card in the I/O boat to see if the problem was with the link card.**
4. **If the problem is still present, replace the I/O boat.**

D.2.6.4 Boat Location Failure

```
MSGID IOXSCF-8001-AD fault.chassis.iox.boat-access
```

The server link card can successfully communicate with an I/O boat link card over the management bus, indicating that a chassis, I/O boat, and I/O boat link card are present. However, the software cannot identify the chassis or the location of the I/O boat.

Possible Causes

There are I²C device communication failures within the External I/O Expansion Unit. Since the main I²C bus spans all FRUs, any FRU in this list could be faulty:

- PSU 0
- PSU 1

- I/O boat 0
- I/O boat 1
- Chassis
- Link card

Resolution

1. Trace the cable identified with the fault to find the attached External I/O Expansion Unit:

```
hc:///chassis=0/iou=x/pcislot=y/link=0/cable=0
```

a. Power off the domains that use the FRUs and remove one FRU.

i. Power off the affected domains.

ii. Power off both PSUs.

iii. Remove a single FRU.

Following is the list of FRUs to remove for this procedure. Remove only one FRU from this list each time you go through this procedure. If the problem persists, remove a different FRU from the list below using this same procedure:

- PSU 0
- PSU 1
- I/O boat 0
- I/O boat 1

Test the FRUs listed above before suspecting the following:

- Link card (see [Step b](#))
- Chassis (see [Step c](#))

iv. Power on both PSUs.

v. Power on the affected domains.

If the problem has been corrected, the fault messages will not appear.

vi. If this does not correct the problem, reinsert the FRU you removed in [Step iii](#), then repeat [Step i](#) through [Step v](#) for a different FRU.

vii. If this corrects the problem, go to [Step b](#).

viii. If this does not correct the problem, go to [Step c](#).

b. Determine which FRU was causing the problem.

- If the I²C problems are resolved by removal of a PSU, assume the PSU is faulty.
 - If the I²C problems are resolved by removing an I/O boat, determine whether the problem is with the I/O boat itself or the link card in the I/O boat. Swap the link card from the failed I/O boat to a known good I/O boat to determine if the problem follows the link card.
- c. **If the errors continue to appear, either the chassis is faulty or multiple FRUs have I²C problems. Contact a technical support engineer for advanced assistance.**

D.2.7 Reported Failures on the Microcontroller

```
MSGID IOXSCF-8000-1A fault.chassis.iox.device.fail
```

Most reported device failures indicate a problem with a specific device. There are some microcontroller reported failures that are side-effects caused by other system problems.

D.2.7.1 Fan Controller Reset

The fan controller on the centerplane is not normally reset during regular operation. If too many resets occur within a specific time, a device failure is reported for `hc:///iox=box_instance/fanctrl=0`.

Possible Causes

- You attempted to hot-plug an I/O boat.
- The power circuitry failed on the centerplane.
- There is a faulty reset signal coming from a link card in an I/O boat.
- There is a faulty reset signal coming from an I/O boat.

Resolution

1. **If an I/O boat was inserted, reinitialize the fan controller by resetting the management devices in the chassis:**

```
XSCF> ioxadm reset IOX@nnnn
```

2. If the fan controller resets still occur, try to discover the faulty FRU by replacing the link cards in the I/O boats. If the problem still occurs, replace the I/O boats. If the problem still occurs, replace the chassis.

D.2.7.2 Fan Controller Timeout

The fan controller continuously monitors sensors in the PSUs and I/O boats. If the fan controller is too busy handling some types of error conditions, it may not respond to system commands within expected time limits causing the microcontroller to time out. This might cause a device failure reported for `hc://iox=box_instance/fanctrl=0`.

Possible Causes

- A hardware reset of the fan controller may cause it to not respond within the expected time limit.
- The fan controller might not respond to commands received on the main I²C bus if it is waiting to complete failed commands on a different I²C bus.

Resolution

1. Fix the fan controller resets, then see if the fan controller timeouts still occur.
See [Section D.2.7.1, “Fan Controller Reset”](#) on page D-19.

2. Resolve the I²C errors and avoid hot-plugging the I/O boats.

Reseat and/or swap the PSUs to determine if communication problems exist on the I²C buses.

D.2.7.3 Bridge Controller Reset

There is no external reset signal routed to the bridge controller on the link card.

Possible Causes

- The link card is faulty.

Resolution

- Replace the link card.

D.2.7.4 Bridge Controller Timeout

If commands are not serviced within the expected time frame, timeout errors are detected. This may cause a device failure reported for:

```
hc:///chassis=0/iou=x/pcislot=y/link=0/controller=0
```

Possible Causes

- The I2C_LOCAL bus within the link card is faulty.
- If the PCI Express link does not train, the bridge controller may not service the command request buffer.

Resolution

1. **If the PCI Express errors are detected by the domain, resolve the link training errors and see if timeouts still occur.**

The PCI Express fabric includes the host platform, the pair of link cards with connecting cable, and the External I/O Expansion Unit I/O boat. Failures within any of these FRUs or connections between them can cause PCI Express link-training failures.

Follow these steps to try to resolve this problem:

- a. **Reseat both link cards.**
- b. **Move the host link card to a different host slot.**
- c. **Replace the cable.**
- d. **Try a different External I/O Expansion Unit I/O boat.**
- e. **Try a different host I/O unit (IOU#).**
2. **If no PCI Express errors are present, try to resolve the problem by following these steps:**
 - a. **Replace the cable.**
 - b. **Replace the link card in the host slot.**
 - c. **Replace the link card in the boat.**

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