Origin2000™ Rackmount Owner's Guide

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Origin2000™ Rackmount Owner's Guide
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This product requires the use of external shielded cables in order to maintain compliance with Part 15 of the FCC rules.

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CSA Symbol

CE Insignia

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防止を目的とした情報処理装置等電波障害自主規制協
議会（VCCI）基準に適合しております。
　従って、住宅地域またはその隣接した地域で使用す
ると、ラジオ、テレビジョン受信機等に受信障害を与
えることがあります。
　取扱説明書に従って正しい取り扱いをして下さい。

VCCI Information

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Manufacturer's Regulatory Declarations

This workstation conforms to several national and international specifications and European directives as listed on the "Manufacturer's Declaration of Conformity," which is included with each computer system and peripheral. The CE insignia displayed on each device is an indication of conformity to the European requirements.

Your workstation has several governmental and third-party approvals, licenses, and permits. Do not modify this product in any way that is not expressly approved by Silicon Graphics, Inc. If you do, you may lose these approvals and your governmental agency authority to operate this device.

TUV Symbol

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About This Guide

Welcome to the Origin2000 Rackmount system. The *Origin2000 Rackmount Owner's Guide* is your complete guide to operating your Origin2000 rackmount system. Specifically, it tells you how to

- set up your Origin2000 rackmount system and turn it on
- install peripherals
- install and remove software
- diagnose hardware problems
- replace faulty parts
- correctly maintain your system

Refer to this guide to set up the system, install hardware options, or find a solution when you suspect there is a hardware problem. Basic information on installing software is also included. For more advanced information on installing software, refer to the *IRIX Admin: Software Installation and Licensing Guide.*

The system and the procedures in this guide are designed so that you may maintain and repair part of the system without the help of a trained technician. However, do not feel that you *must* work with the hardware yourself; you can always contact your service provider to have an authorized service provider work with the hardware.

Finding the Information You Need

The Origin2000 ships with the following sources of information, as shown in Figure i.

- *IRIX Admin: Software Installation and Licensing Guide*
- IRIX™ *Release Notes* (on the CD)
- *IRIS InSight*™ online documentation and help
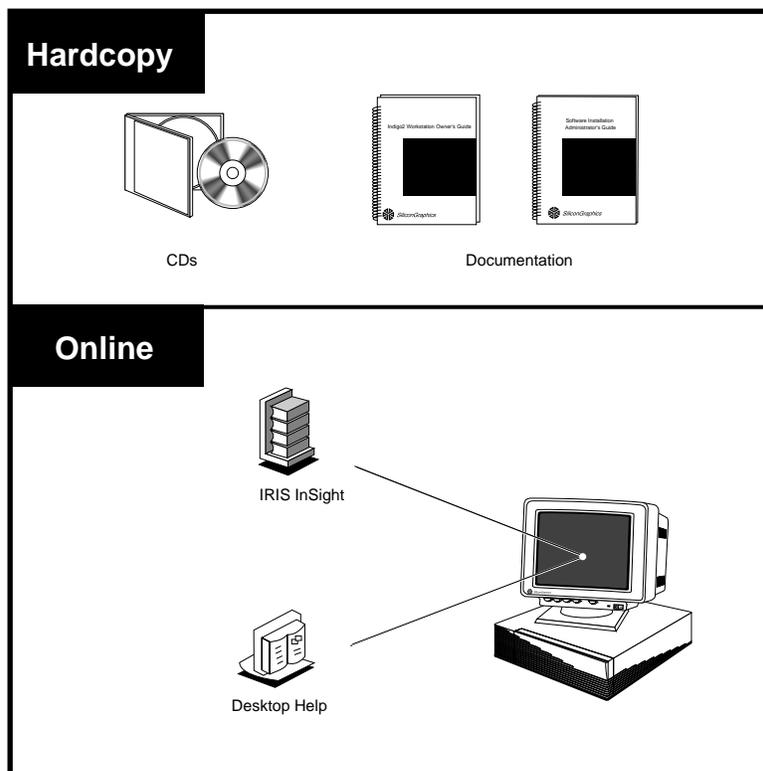
Figure i   Sources of Information for the Origin2000 Rackmount System

The following sections contain information on options that can help you get your system up and running and help you become productive as soon as possible.
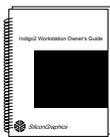
Figure ii
System Owner's Guide

Figure iii
IRIX Admin:
Software Guide

Figure iv
IRIS InSight Icon

Origin2000 Rackmount Owner's Guide

Refer to this manual (shown in Figure ii) to set up the system and install hardware options, or find solutions when you suspect there is a hardware problem. In addition, it contains basic information on installing and removing optional software.

IRIX Admin: Software Installation and Licensing Guide

The *IRIX Admin: Software Installation and Licensing Guide* is the complete reference guide on using the installation program, *inst*, to install software. For information on using the Software Manager to install software, refer to the online *Personal System Administration Guide.*

IRIS InSight Online Documentation and Help

The online documentation package is called IRIS InSight. The InSight icon is shown in Figure iv. To view the manuals, go to the Help toolchest and choose "Online Books." You see bookshelves for end-user, developer, and administration manuals that ship online with the system. Double-click on a book to open it.

For a description of the manuals and a listing of manuals that are available to purchase in hard copy, double-click on the *Documentation Catalog*.

Online Reference (Manual) Pages

Your system comes with a set of IRIX™ reference (manual) pages, formatted in the standard UNIX "man page" style. These are found online on the internal system disk (or CD-ROM) and are displayed using the *man* command. For example, to display the reference page for the *Add_disk* command, enter the following command at a shell prompt:

```
man Add_disk
```

Important system configuration files as well as commands are documented on reference pages. References in the documentation to these pages include the name of the command and the section number in which the command is found. For example, "Add_disk(1)" refers to the *Add_disk* command and indicates that it is found in section 1 of the IRIX reference.

For additional information about displaying reference pages using the *man* command, see man(1).

In addition, the *apropos* command locates reference pages based on keywords. For example, to display a list of reference pages that describes disks, enter the following command at a shell prompt:

```
apropos disk
```

For information about setting up and using *apropos*, see apropos(1) and makewhatis(1M).

Release Notes

You can view the release notes for a variety of Silicon Graphics® products and software subsystems using one of two utilities:

relnotes   Text-based viewer for online release notes.

grelnotes   Graphics viewer for online release notes.

To see a list of available release notes, type the following at a shell prompt:

```
relnotes
```

For more information, see the relnotes(1) and grelnotes(1) reference pages.

World Wide Web Accessible Documentation

Silicon Graphics makes its manuals available in a variety of formats via the World Wide Web (WWW). Using your Web browser, open the following URL:

```
http://www.sgi.com/
```

Look in the category "Customer Support" for the Technical Publications library listing. Click on the Technical Publications title to open up the following URL:

```
http://www.sgi.com/Technology/TechPubs
```

Conventions

The *Origin2000 Rackmount Owner's Guide* uses these conventions:

- References to documents are in *italics*.

- References to other chapters and sections within this guide are in quotation marks.

- Names of IRIX reference (manual) pages or commands that you type at the shell prompt are in *italics* as are IRIX file names.

- Steps to perform tasks are in numbered sentences. When a numbered step needs more explanation, the explanation follows the step.

Introducing the Origin2000 Rackmount System

The Origin2000 rackmount system provides a highly configurable system architecture that is available in a single rackmount or multirack setup. The rackmount consists of 2 to 16 CPUs, 64 MB to 32 GB of main memory and can provide a wide variety of I/O interfaces (see Figure 1-1). The Origin2000 multiple rack (or *multirack*) configuration has up to 128 processors and up to 256 GB of main memory (see Figure 1-2 and Figure 1-3).

System Features

The Origin2000 is ideal for evolving applications requiring expansion capability as requirements grow. Some of the Origin2000 features include:

- significantly lower entry system costs (with pay-as-you grow expandability)
- support of a large number of processors (up to 128)
- high bandwidth I/O connectivity
- higher total memory capacity (up to 256 GB of main memory)
- optional connectivity to third-party peripheral connector interface (PCI) boards
- superscalar R10000 CPU (in the IP27 Node board) supports advanced memory latency tolerance features such as out-of-order execution and advanced branch prediction to address real-world application demands
- large variety of peripheral connectivity options

1
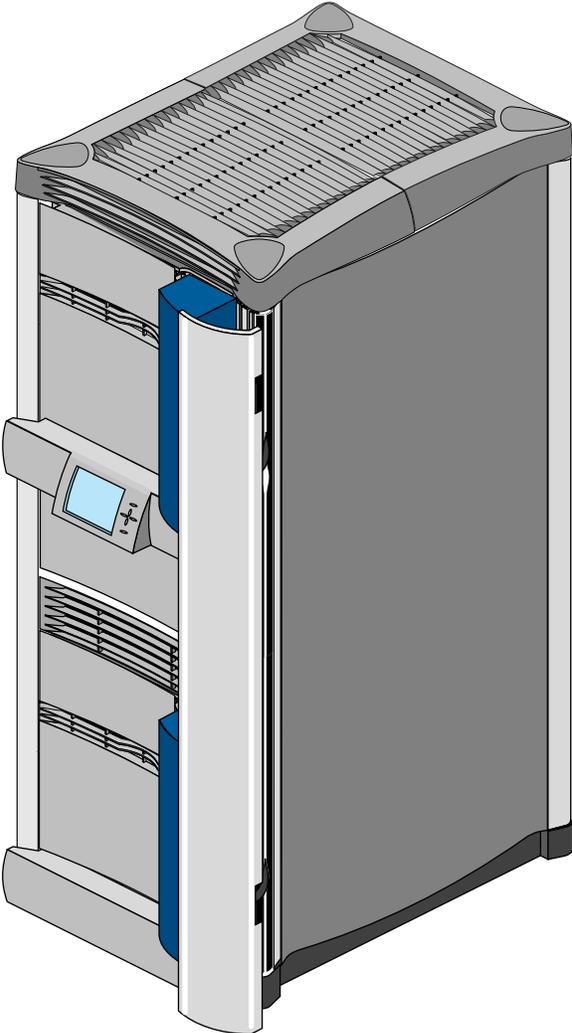
Figure 1-1   Origin2000 Rackmount Server System
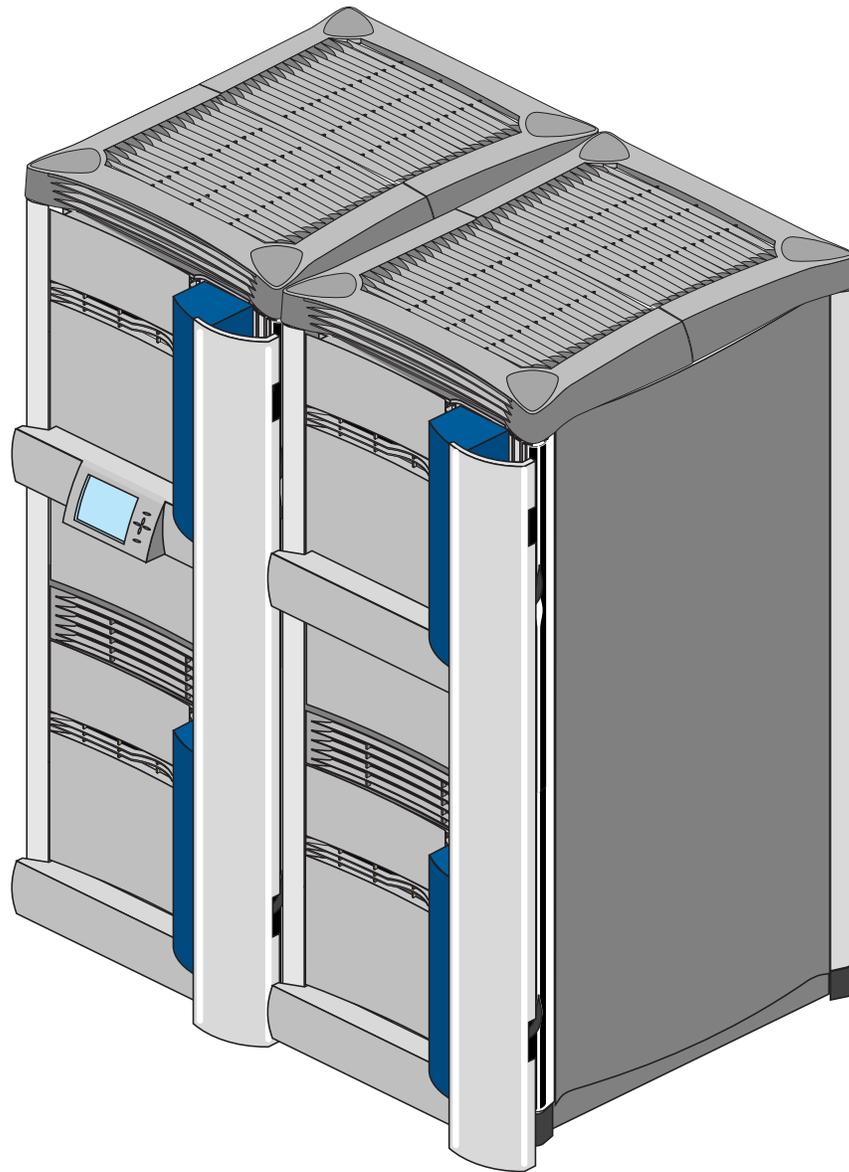
Figure 1-2   Multirack System Configuration (Two Rackmount Systems)
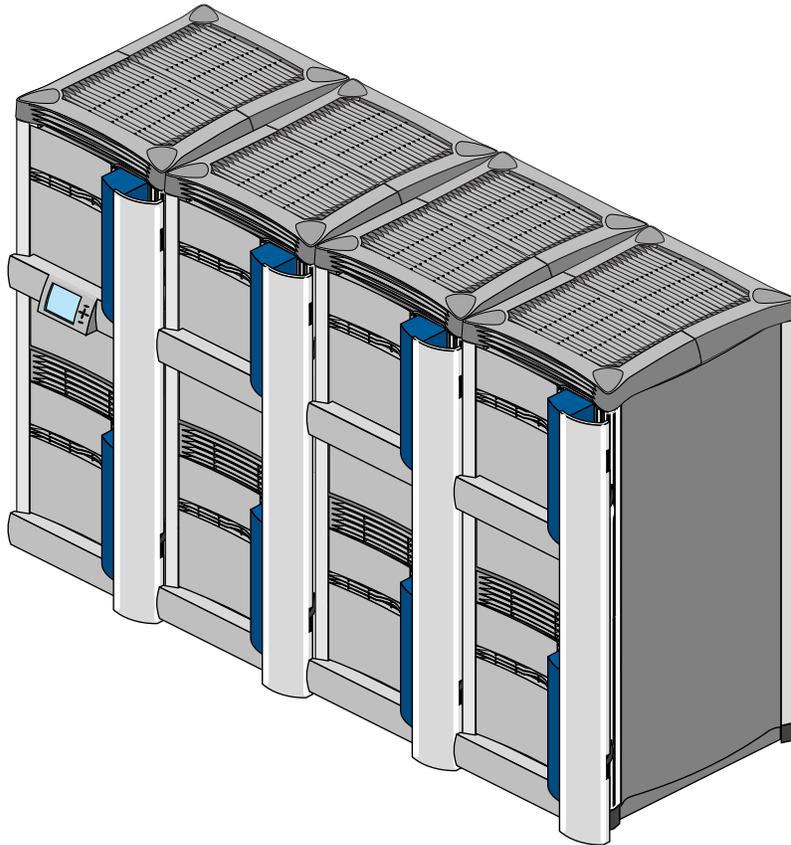
Figure 1-3   Another Example of a Multirack Configuration (Four Racks Shown)

Hardware Overview

As shown in Figure 1-4, a single Origin2000 rackmount system can consist of two fully integrated and independent subsystems—Module A and Module B. Each of the modules in Figure 1-4 has a dedicated System Controller, which monitors module status. Each module can also have a separate set of hard disks, CPUs, I/O connections, memory, as well as a separate operating system, and a separate set of applications.

The modules communicate using the high-speed (800 MB/sec) *CrayLink Interconnect* link. The CrayLink Interconnect (also known as the interconnection fabric) link consists of a set of high-speed routing switches and cabling that enables multiple connections to take place simultaneously. Using the CrayLink Interconnect, hardware resources (including main memory) can be shared and accessed by other modules in the configuration.For more information on the CrayLink Interconnect see"CrayLink Interconnect" on page 11.

Note: Not all rack system have two fully self-contained modules; some may have only one; some configurations may have as many as 16 modules. For more information on the different rack configurations, see Chapter 4, "System Configurations."

Figure 1-5 provides an overall block diagram of an Origin2000 rack system. The major hardware components include the:

- IP27 Node board

- Router board

- BaseIO board

- XIO slots

For a description of these components, see Chapter 2, "Chassis Tour."

The rear module diagram shown in the top portion of Figure 1-5 appears in the back of the chassis in between the Node boards and fan tray. This diagram provides a map that tells system installers where to install Node boards and XIO boards into the system.Use this diagram to help correspond the Node boards and XIO blocks in the block diagram to their actual physical location in the chassis. For more information on how to read this diagram, see "Board Configuration and Layout" on page 20 in Chapter 2.

Figure 1-6 shows how some of the major hardware components connect inside a system module. All these components interface using a common midplane board with connections made to both the front and the back of this board.
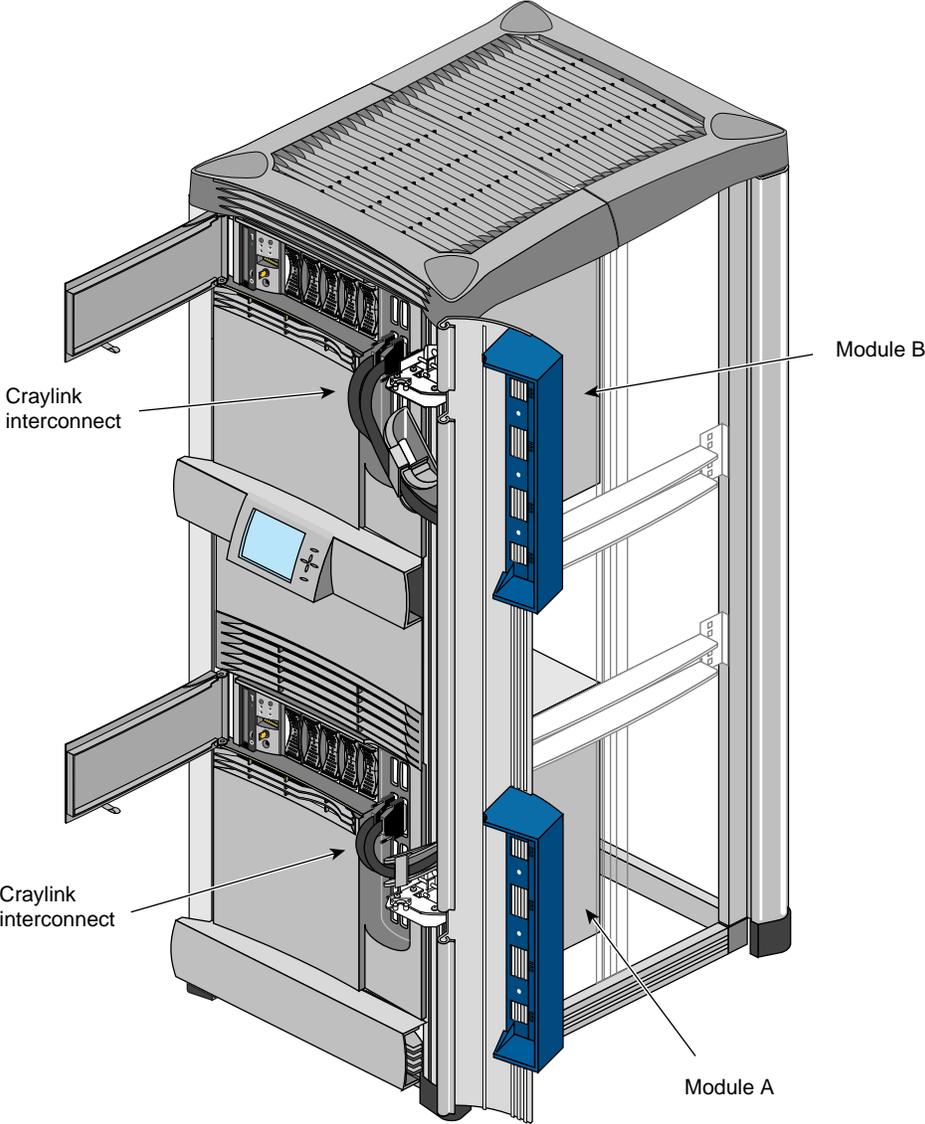
Figure 1-4   Origin2000 Rackmount Chassis (Side Panel Removed)

Rear Module Diagram
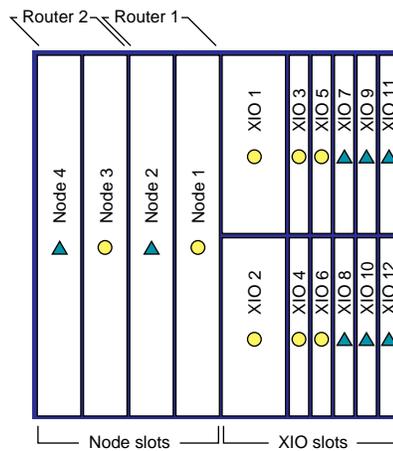
Block Diagram
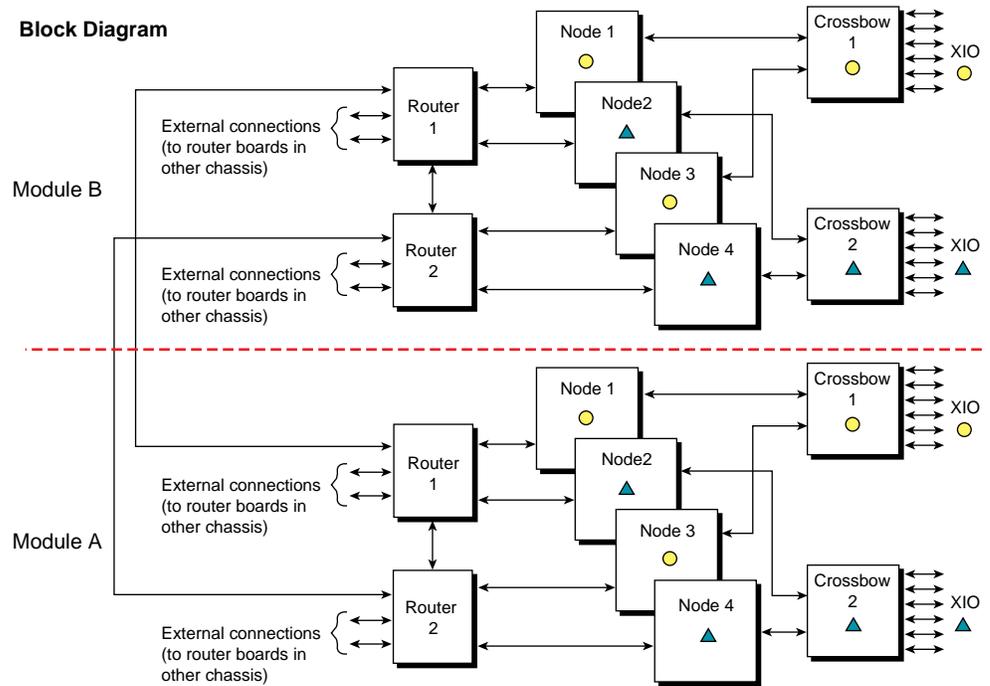
Figure 1-5 Origin2000 Overall Rackmount Block Diagram

Routers

Module System
Controller

CD–ROM

Node 4

Node 3

Node 2

Node 1

Hub

Xbow
ASICs

R10000
processors

Midplane

I/O board

Rear of module
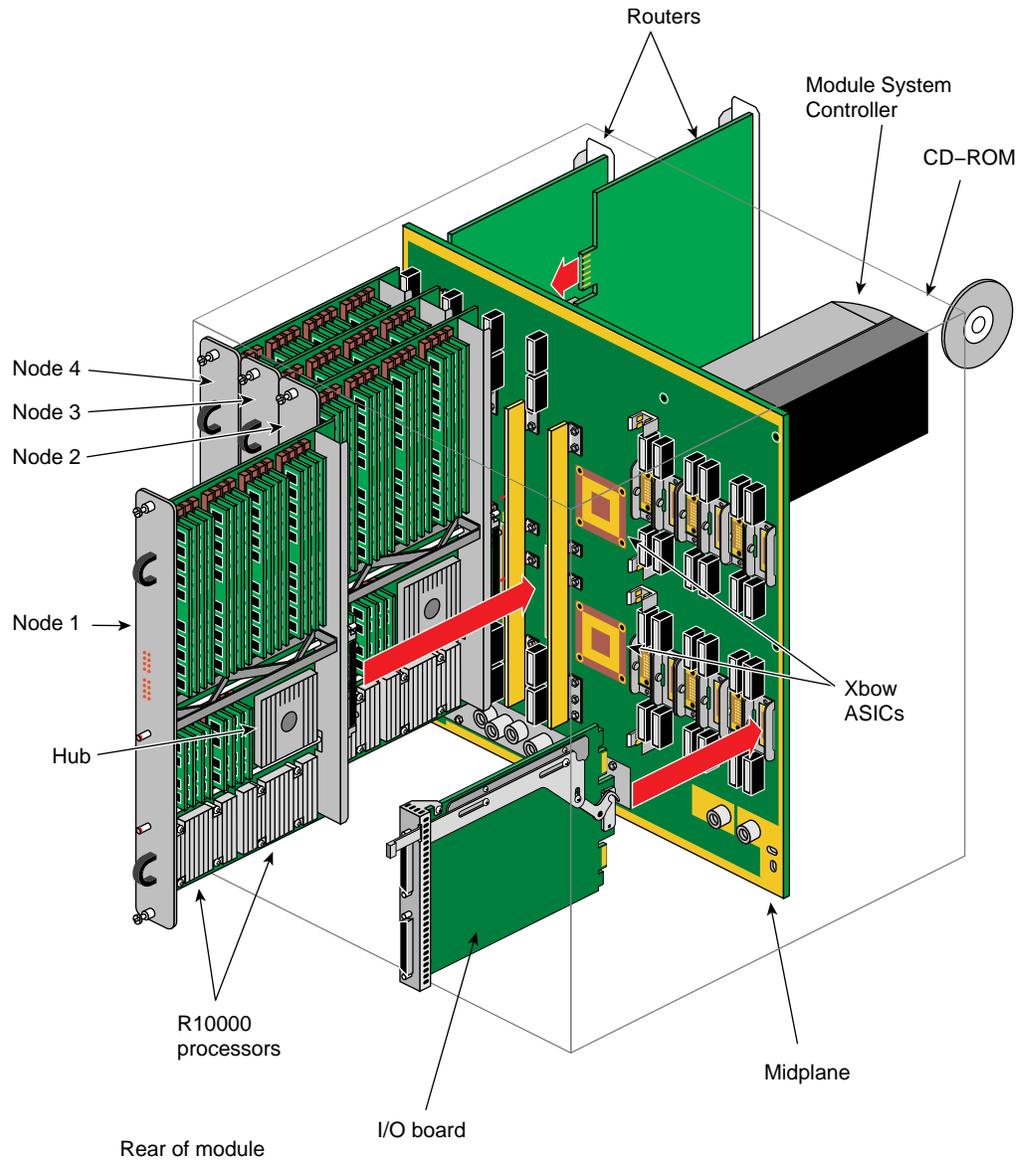
Figure 1-6   A Look Inside the Module Chassis

What the Origin2000 Is

As illustrated in Figure 1-7, the Origin2000 is a number of processing modules linked together by the CrayLink Interconnect. Each processing module contains either one or two processors, a portion of main memory, a directory to maintain cache coherence, and two interfaces: one that connects to I/O devices and another that links system nodes through the CrayLink Interconnect.

Cache coherence is the ability to keep data consistent throughout a system. In the symmetrical multiprocessor (SMP) Origin2000 system, data can be copied and shared among all the processors and their caches. Moving data into a cache may cause the cached copy to become inconsistent with the same data stored elsewhere. The Origin2000 cache coherence protocol is designed to keep data consistent and to disperse the most recent version of the data to wherever it is being used.
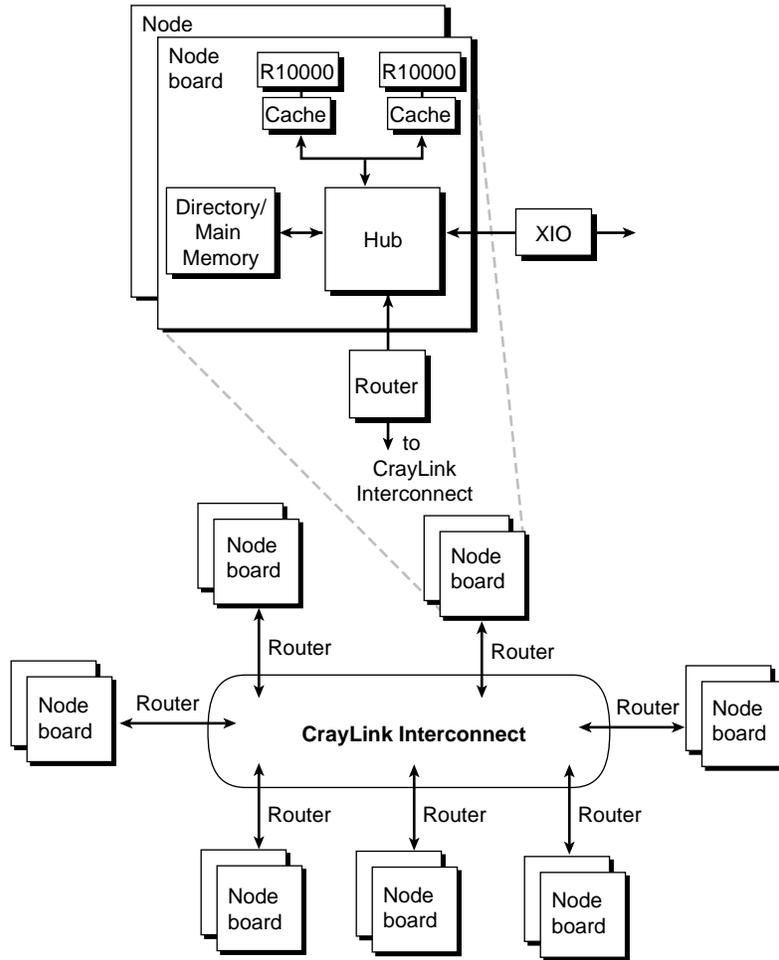
Figure 1-7   Modules in an Origin2000 System

The CrayLink Interconnect links modules to one another. The CrayLink Interconnect may appear to be a type of super data bus, but it differs from a bus in several important ways. A bus is a resource that can only be used by one processor at a time. The CrayLink Interconnect is a mesh of multiple, simultaneous, dynamically allocable connections that are made from processor to processor as they are needed. This web of connections differs from a bus in the same way that multiple dimensions differ from a single dimension: if a bus is a *one*-dimensional line, then the CrayLink Interconnect is a *multi*dimensional mesh.

The Origin2000 is said to be scalable because it can range in size from 2 to 128 processors. As you add modules, you add to and scale the system bandwidth. The Origin2000 is also modular, in that it can be increased in size by adding standard modules to the CrayLink Interconnect.

The Origin2000 architecture achieves this scalable processing power primarily by using the following technology:

- CrayLink Interconnect
- XIO slots
- Distributed shared memory
- new IRIX operating system

CrayLink Interconnect

The Origin2000 modules are connected by the CrayLink Interconnect (also known as the interconnection fabric). The CrayLink Interconnect is a set of switches, called *routers*, that are linked by cables in various configurations, or *topologies*. Here are some key features that define the Origin 2000 interconnection fabric:

- The CrayLink Interconnect is a mesh of multiple point-to-point links connected by the routing switches. These links and switches allow multiple transactions to occur simultaneously.
- The links permit extremely fast switching (a peak rate of 1600 MB/sec bidirectionally, 800 MB/sec in each direction).
- The CrayLink Interconnect does not require arbitration, nor is it limited by contention.
- More routers and links are added as nodes are added, increasing the CrayLink Interconnect's bandwidth.

The CrayLink Interconnect provides a minimum of two separate paths to every pair of Origin2000 modules. This redundancy allows the system to bypass failing routers or broken fabric links. Each fabric link is additionally protected by a CRC code and a link-level protocol, which retry any corrupted transmissions and provide fault tolerance for transient errors.

XIO Slots

The XIO cardcage allows you to install additional I/O type boards (such as M SCSI, fibre channel, and FDDI) into the Origin2000 chassis. In addition, an optional PCI carrier assembly allows users to install up to three PCI boards into the Origin2000 base module. XIO uses the same physical link technology as the CrayLink Interconnect, but uses a protocol optimized for I/O traffic.

The XIO features are:

- high bandwidth—800 MB/sec (peak)
- concurrent transfers
- real-time performance
- future expandability

Distributed Shared Address Space (Memory and I/O)

The Origin2000 employs a *distributed shared memory* system architecture where main memory is split among the Node boards. Rather than appearing as one fast memory, main memory is "distributed" over the configuration, with a little piece of the memory nearby each processor. Thus the name "distributed shared memory". A directory memory keeps track of information necessary for hardware coherency and protection.

This differs from previous-generation Silicon Graphic systems, in which memory is centrally located on and only accessible over a single shared bus. By distributing the Origin2000 memory among processors, memory latency is reduced. Accessing memory near to a processor take less time than accessing remote memory. Although physically distributed, main memory is available to all processors.

The Origin2000 memory is located in a single shared address space. Memory within this space is distributed amongst all the processors, and is accessible over the CrayLink Interconnect. I/O devices are also distributed within a shared address space; every I/O device is universally accessible throughout the system.

IRIX

The new 64-bit IRIX operating system is based on UNIX System V, Release 4 technology, distributed software. IRIX supports modular computing, providing availability and throughput on small, one-to-four processor systems and scalability, performance, resilience, and throughput on large systems with tens or hundreds of processors and hundreds of gigabytes of memory.

Chassis Tour

This chapter provides an overview of the chassis rackmount system and a description of the controls, connectors, and indicators.

Overview

Figure 2-1 and Figure 2-2 show the major parts of the Origin2000 rackmount system. These parts are briefly described in Table 2-1.
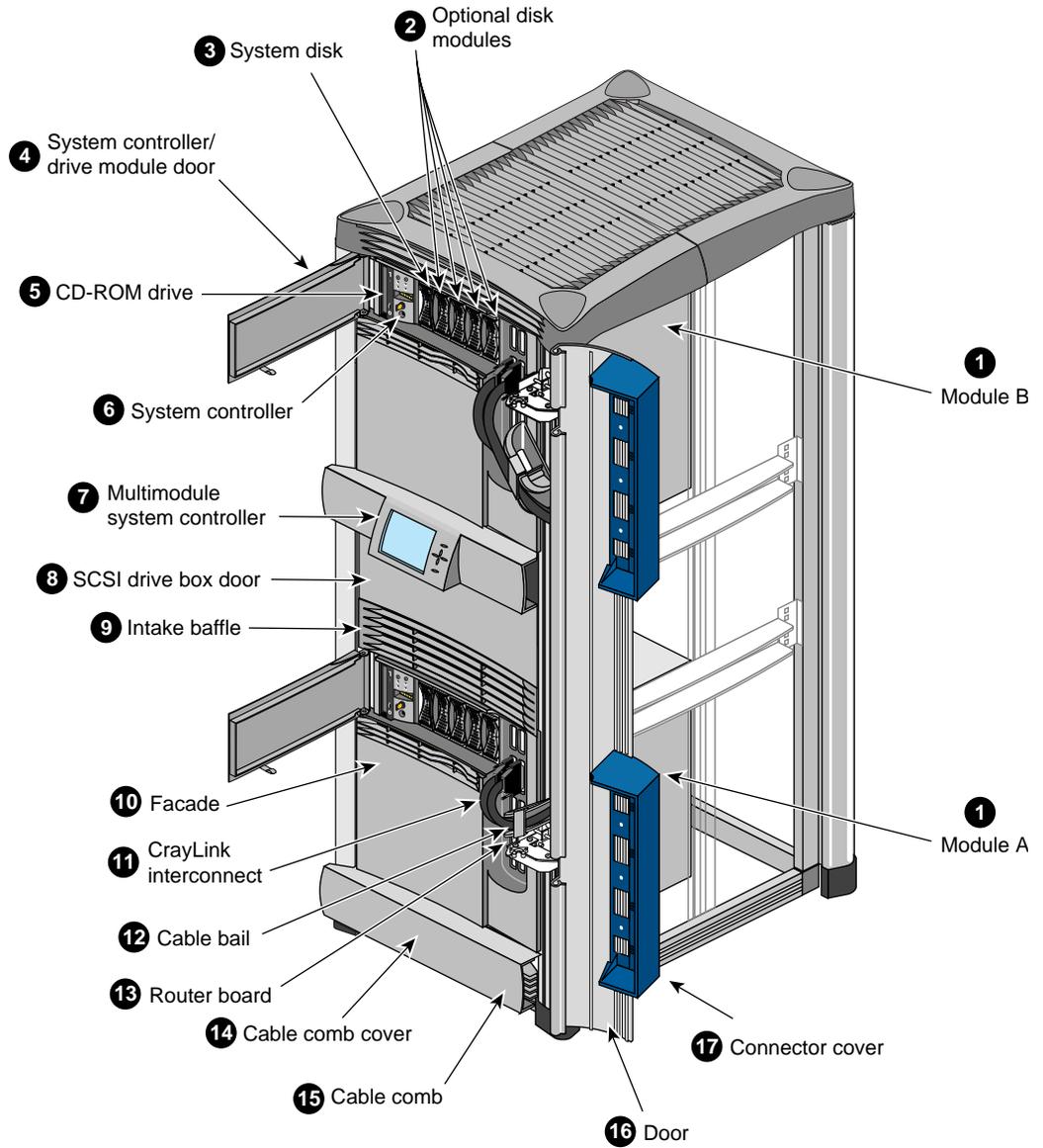
Figure 2-1   Origin2000 Rackmount System (Front View)

Note: In Figure 2-1, the side panel is removed for clarity.
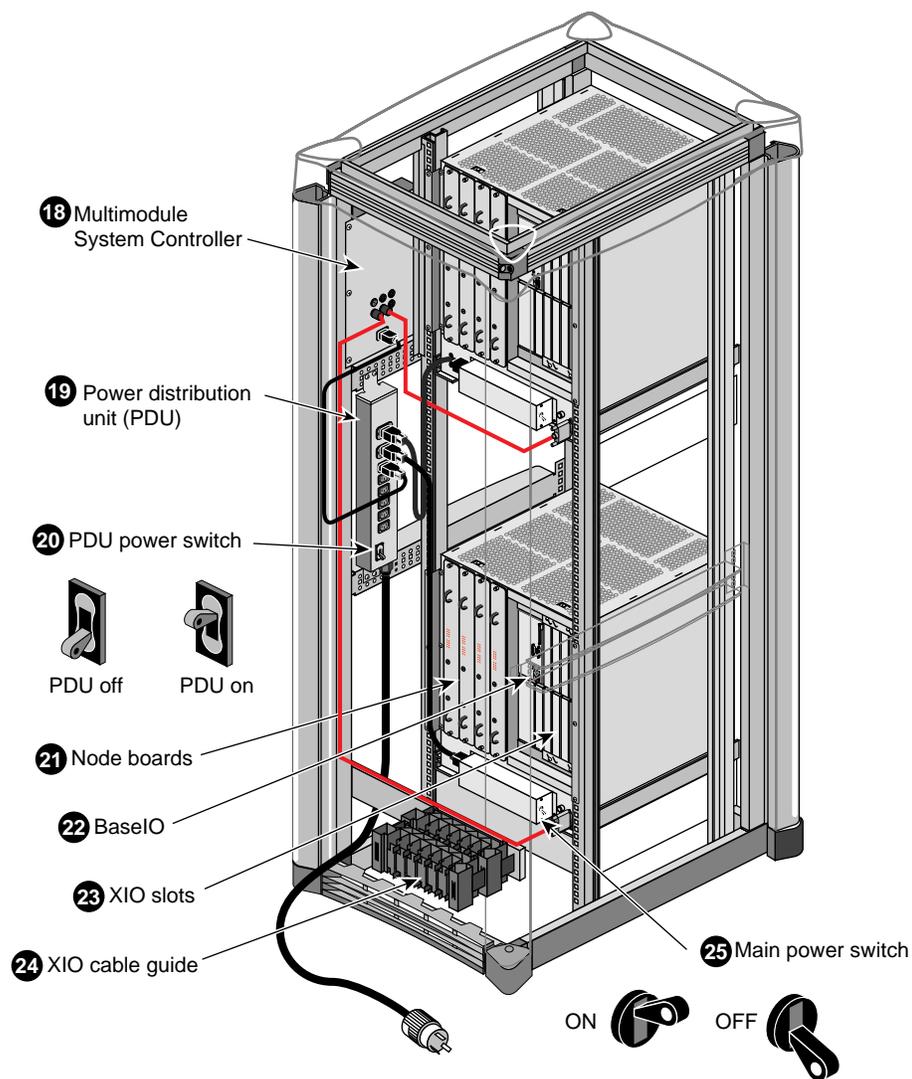
Figure 2-2   Origin2000 Rackmount Rear View

Note: In Figure 2-2, the side panel is removed for clarity.

Table 2-1   Origin2000 Major Components

Component	Description
1. Module A/Module B	The modules shown in Figure 2-1 are independent computing subsystems with a separate set of CPUs (central processing units) disks, System Controller, and I/O connections. There can be up to two modules in a rack and up to sixteen modules in a multirack configuration.
2. Optional SCA drives	Each module can house up to five SCA (single connector attachment) drives (including the system disk). The disks are single-ended, ultra SCSI drives with a transfer rate of 40 MB/sec.
3. System disk	The system disk contains the operating system and other key software directories. The system disk must be installed in the drive position shown in Figure 2-1. Note that the system disk is oriented differently than the other drives in the system. See "Loading the Single Connector Assembly (SCA) Drives Into the System" on page 63 for additional information.
4. System controller/drive module door	This door should be kept closed to prevent dust and other possible contaminants from affecting the drive performance.
5. CD-ROM	The CD-ROM is standard with each system and is used to load the operating system and software applications.
6. Module System Controller (MSC)	The module System Controller is an independent, microprocessor-controlled device that powers on and helps boot the system. The module System Controller (also known as the entry-level System Controller—ELSC) also contains a key switch for turning on and turning off the module.
7. Multimodule System Controller (MMSC) display	The MMSC display is an intelligent keypad interface that can control all the system modules in a rack. The multimodule System Controller display (also known as the full-feature System Controller—FFSC) has greater functionality the module System Controller display. There can only be one display per rack configuration.
8. Origin Vault SCSI drive box	This drive box enclosure provides six half-height and two full-height, 5-1/4 inch drive slots for single-ended and differential SCSI or fibre channel drives.

Table 2-1 (continued)   Origin2000 Major Components

Component	Description
9. Intake baffle	This baffle helps enable proper airflow through the rack. Note that the top of the rack has a vent as well. Airflow is generally pulled in from the top and middle of the rack and exhausted through the back and bottom of the rack.
10. Facade	The removable facade covers the power supply and router boards for a module chassis.
11. CrayLink Interconnect cabling	This is the physical link that enables the different modules in a rack to communicate and share resources. The CrayLink Interconnect cable is made up delicate copper strands. Be careful when handling this cable.
12. Cable bale	The cable bales hold the CrayLink Interconnect cable in place to prevent the cable from excessive bending, which can cause damage.
13. Router board	The router board ports provide high-speed (800 MB/sec) connectivity between Node boards. There are three types of Router boards: a Null Router, a Star Router, and an Rack Router board. These router boards are described in "Router Boards" on page 30.
14. Cable comb cover	This aesthetical, removable cover hides the CrayLink Interconnect cable inside the rack chassis.
15. Cable comb	The comb holds the CrayLink Interconnect in place when the cable is tucked into the grooves
16. Cable door	The cable door aesthetically hides the CrayLink Interconnect routing between modules.
17. Connector cover	The connector cover protects the router board ports and cabling.
18. Multimodule System Controller	The MMSC located in the rear of the chassis is a separate microprocessor-controlled unit that interfaces the individual MSCs and MMSCs from other systems.
19. Power distribution unit (PDU)	The PDU is the central power source for the rack. All the modules and peripherals connect to the PDU. Note that the PDU has a separate power switch.

Table 2-1 (continued)   Origin2000 Major Components

Component	Description
20. PDU switch	The PDU switch is the main circuit breaker for the entire rack assembly.
21. Node board	The Node board is the main processing board in the Origin2000 system. It contains one or two R10000 CPUs, the hub (which provides an interface to the I/O subsystem and the CrayLink Interconnect), a portion of main memory, as well as directory memory. Each node board can support from 64 MB to 4 GB of memory. A single-rack system can have one to eight Node boards. A multiple-rack system can have up to 64 Node boards.
22. BaseIO board	This board provides basic I/O functions for the system such as serial ports, (fast) Ethernet, and single-ended wide SCSI. A dedicated slot in the XIO cardcage houses the BaseIO board. This board cannot be installed in any of the other XIO expansion slots.
23. XIO slot cardcage	The XIO cardcage allows you to install additional I/O boards into the Origin2000 chassis.
24. XIO cable guide	The XIO cable guide management helps to ensure proper laying out of cables in the rear of the chassis.
25. Module power switch	This switch powers on and off the individual modules.

Board Configuration and Layout

There is a direct correlation between the number of Node boards that are installed and the number of XIO slots that can be activated.

If a system module has only one Node board, then only six of the twelve XIO slots are activated. When two Node boards are installed, all twelve of the XIO slots can be activated, *if* the Node boards are positioned in the correct slots.

Figure 2-3 diagrams the Node board-to XIO board correlation. The Node boards and their corresponding XIO board slots are indicated with either a circle or triangle. When Node 1 is present, IO slots 1 through 6 (designated by a circle) are activated. When Node 2 is also present, then IO slots 7 through 12 (designated by a triangle) are activated.

Node boards 3 and 4 also have corresponding XIO slots indicated by a circle or a triangle. For example, if Node boards are installed in slots 1 and slot 3, then only the corresponding XIO slots (1 through 6) are activated.
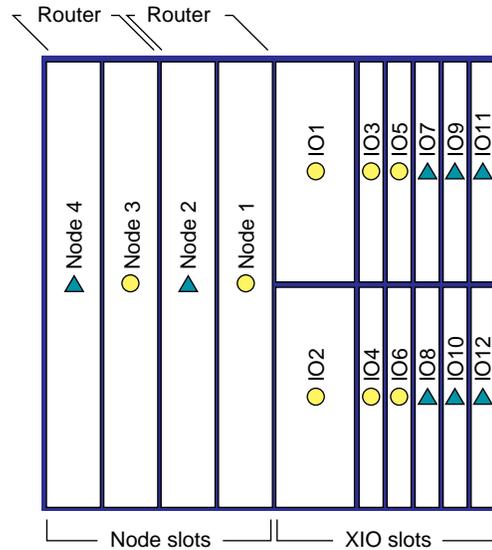
Figure 2-3 Board Configuration and Layout for System Module

Major Components

This section describes major hardware components for the Origin2000 rack, which includes the following:

- System Controller
- BaseIO board
- IP27 Node board
- Router board
- Power distribution unit (PDU)
- CrayLink Interconnect cable
- PCI carrier assembly

System Controller

There are be two types of System Controllers for the Origin2000 rack—a single module System Controller (MSC) and a multimodule System Controller (MMSC) and display. The single module System Controller does not have the same functional abilities as the multimodule controller. For detailed information on operating the System Controller, see Chapter 7, "Using the System Controller."

Single Module Controller and Display

The single module controller and display provide environmental and status monitoring for an individual system module.

Multimodule System Controller and Display

The Multimodule System Controller and display (see Figure 2-5) are the single-point administration interface for the rackmount configuration. The individual module controllers are tied to the multimodule controller through a eight-pin serial connection from the module to the multimodule controller board in the rack.

The MMSC and display are two separate units as shown in Figure 2-1 and Figure 2-2.

There should only be one multimodule display per configuration to act as the single-point administration for the rack configuration. In addition, in a multirack configuration, the rack with the multimodule System Controller and display should always be placed in the leftmost position (see Figure 1-2 and Figure 1-3 in Chapter 1).

Caution: The front panel display provides a convenient method to power on, shutdown, reset, and to issue a nonmaskable interrupt (NMI) to the *entire* rack configuration. Use extreme care when issuing these commands from the display. Make sure that all affected users are notified before a system-wide command is executed.

Module
reset switch

AC OK LED

DC OK LED

8-digit
LED display

8-pin mini DIN
diagnostic
port

Reset   NMI

AC   High

DC

Standby

On

Diagnostic

Diagnostic
Port

Module
NMI
switch

Fan hi-speed
indicator
LED

Ambient
over-
temperature
LED

Security
key switch

Standby

On

Diagnostic
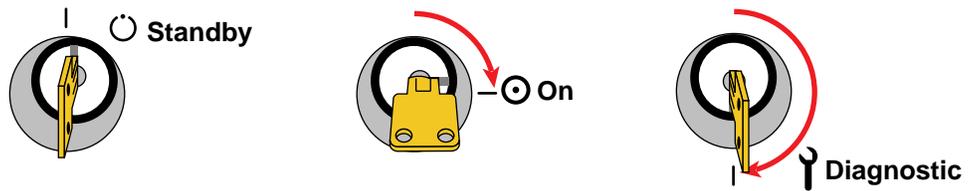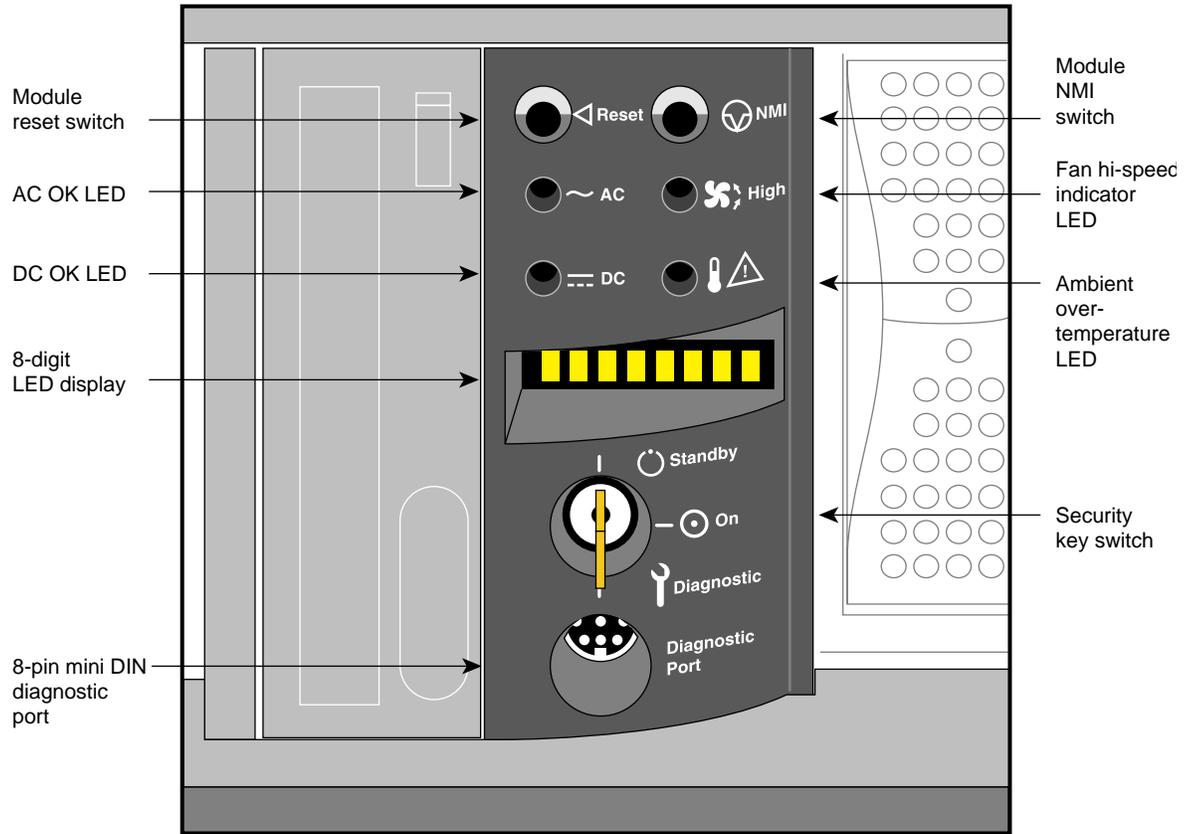
Figure 2-4   Module System Controller and Display
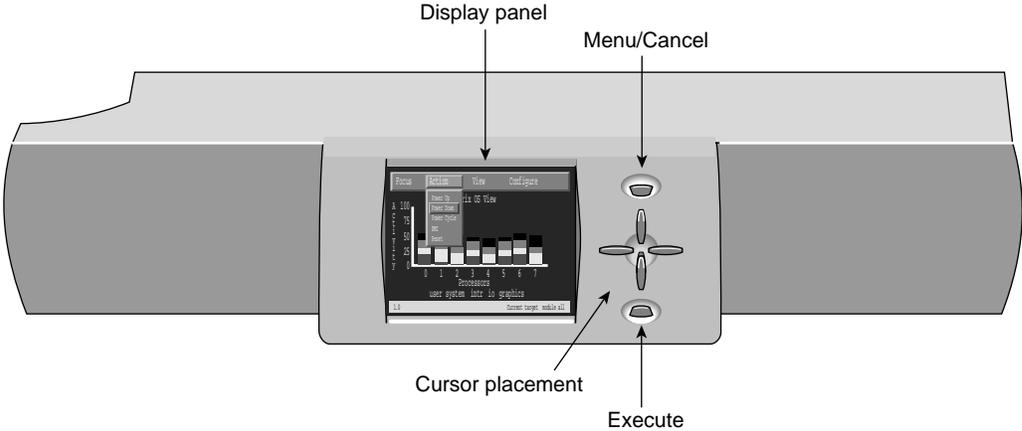
Figure 2-5   Multimodule System Controller Display (for Entire Rack)

BaseIO Board

The BaseIO board provides the basic I/O connections for the system. Figure 2-6 shows the BaseIO board and Table 2-2 describes the connector functions.
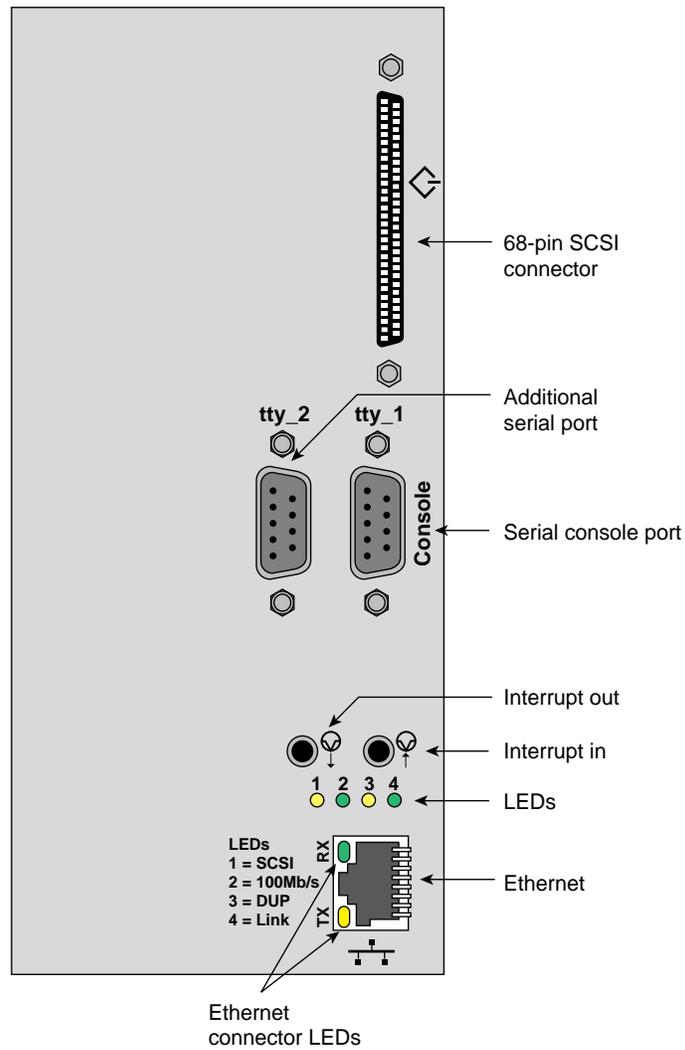
Figure 2-6   BaseIO Board

Table 2-2 lists a description of the connectors on the BaseIO.

Table 2-2   BaseIO Connectors

Connector Type	Connector Description	Connector Function
100-Base T	8-pin Jack	100-Mb per second Ethernet
Serial	9-pin DIN	RS-232 and 422 Serial
SCSI	68-pin (FAST-20)	Ultra SCSI (Single-ended)

IP27 Node Board

Figure 2-7 shows the location of the IP27 Node board in the chassis. The Node board is the main processing board in the Origin2000 system. An individual system module may have up to four Node boards. Figure 2-7 also shows the required Node board slot positions in a module. The first Node board must be installed in the rightmost slot (as you face the rear of the chassis). Additional Node boards are added sequentially to the left.

The Node board consists of these major components:

•   R10000 CPU

•   sixteen slots of main memory

•   eight slots of optional directory memory

•   one or two R10000 processors

•   one Hub chip

R10000

The 200-MHz superscalar R10000 CPU is the main processor for the Origin2000 system. There can be one or two R10000 CPUs on each IP27 Node board. You may hear a module or rack referred to as an 8"P" or 16"P" system. The *P* stands for R10000 *p*rocessor. An 8P system has eight R10000 processors.

Main Memory

The Origin2000 uses SDRAMs mounted on dual inline memory modules (DIMMs) for main memory. An IP27 Node board can have from 64 MB to 4 GB of main memory. Memory upgrades are available in 64, 128, and 512 MB increments.

Premium Directory Memory

The optional premium directory DIMMs are required only for configurations with more than 16 Node boards. These directory memory DIMMs maintain cache coherence in large system configurations. Cache coherency helps provide data consistency when multiple processors need to access the same piece of memory.

Hub

The Hub on the Node board is the primary communication link between the R10000 processor, the I/O subsystem, the main memory, and the CrayLink Interconnect. The Hub also interfaces with directory memory, which is responsible for maintaining cache coherency

Status LEDs

Figure 2-8 shows the bulkhead on the front of the Node board. The LEDs provide status information for the individual boards.

Node 3   Node 2

Node 4   Node 1
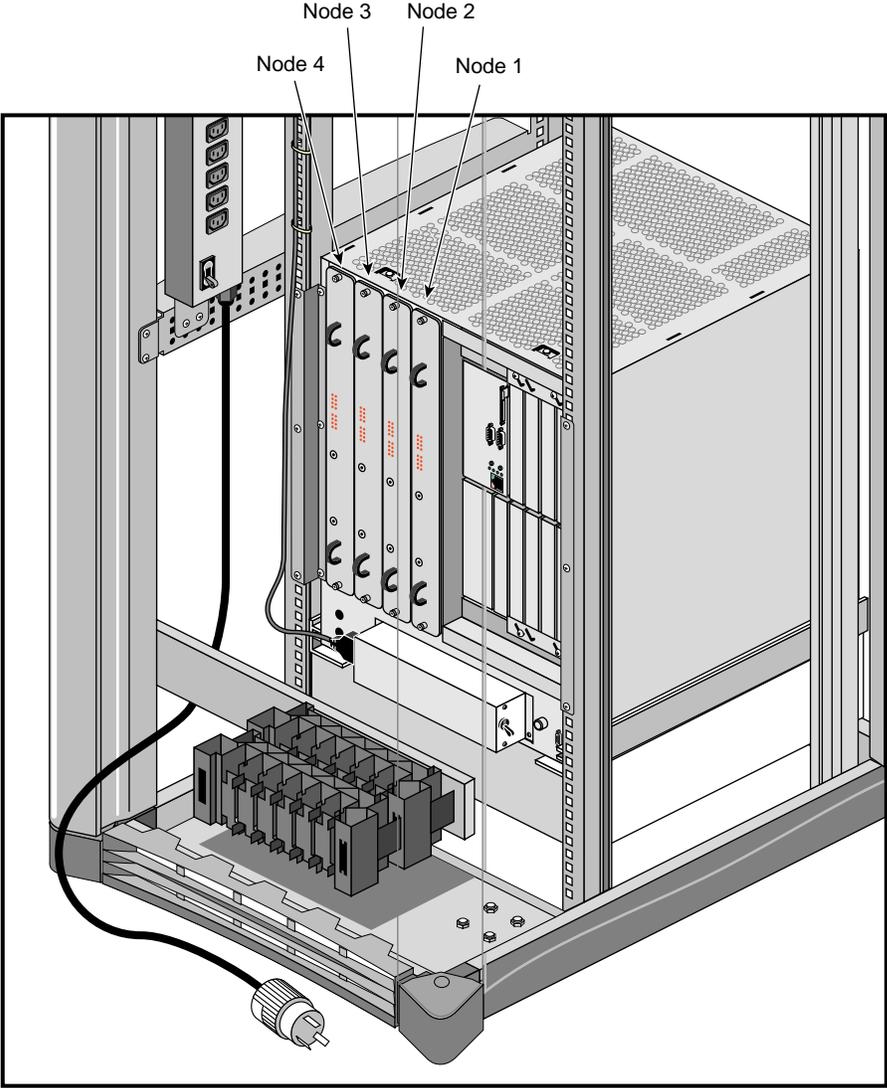
Figure 2-7   Node Board Positioning in the Chassis
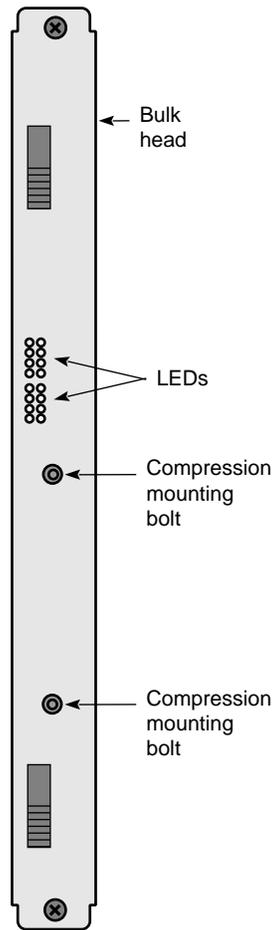
Figure 2-8   Front View of Node Board Showing Bulkhead

Router Boards

The Router board (see Figure 2-9) is a multiported, bidirectional data packet controller that can transport up to 800 MB/sec per port (in each direction). Each system module can have one, two, or no Router boards (depending on the number of Node boards that are present).The router interfaces with the hubs on Node boards and allows the R10000 processors on one Node board to directly access the main memory located on another Node board. There are four types of Router boards:

- Null Router

- Star Router

- Rack Router

- Cray Router

If a module has only one Node board, no Router is required. A Router board is required only when there are two or more Node boards.

Note: The Null and Star Router boards are primarily used in Origin2000 deskside systems only. The deskside is equivalent to an individual module in a rackmount system.

One external
port that
connects
only to companion
rack Router
board port

Three external
Router ports for
interconnection
fabric

Null Router Board   Star Router Board   Rack Router Board
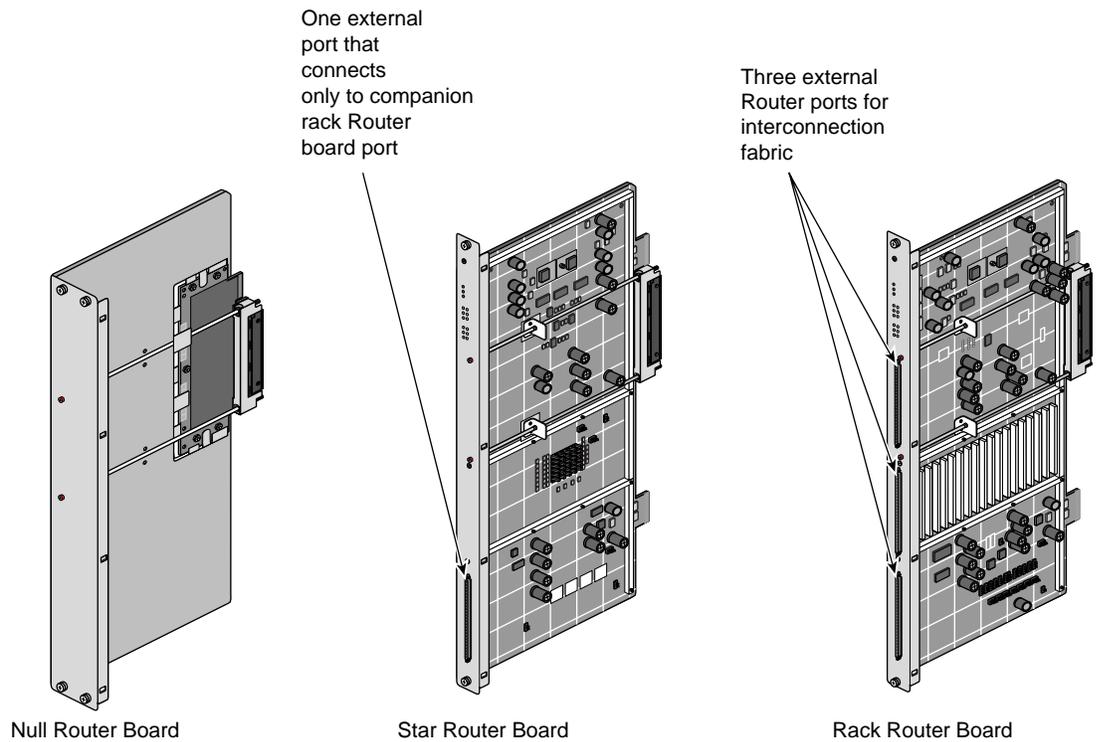
Figure 2-9   Origin2000 Router Boards

Null Router Board

The Null router board is used in deskside systems with only two Node boards. The Null
router provides a low-cost method to connect two Node boards. The Null Router board
cannot be used for CrayLink Interconnect linking, and it does not have any external
router connectors.

Star Router Board

The Star Router board is used in deskside systems that have three or four Node boards.
The Star Router is always paired with a Rack Router board for proper operation. This
cost-effective router board provides connections with all the Node boards in a module
but cannot be used for CrayLink Interconnect linking. The Star Router has one external
connector which connects to a port on the companion CrayLink Interconnect router
board through a jumper.

Rack Router

The Rack Router boards provide CrayLink Interconnection in a rack system. This router
board can support configurations with up to 64 processors (see Chapter 4, "System
Configurations"). The Rack Router has six ports that route data at up to 800 MB/sec (per
port). Three of the ports connect internally. The fourth, fifth, and sixth ports can connect
external routers ports on different modules.

Cray Router

The Cray Router chassis (not shown) is used for CrayLink connectivity for configurations
with up to 128 processors. The Cray Router comes in two modules that house additional
router boards to provide interconnection fabric support for systems with more than 64
processors.

Power Distribution Unit (PDU)

The PDU supplies 220 volts for the rack and provides a common AC connection source
for all the modules and other peripheral devices.

Note: The power supply in the system module is auto-ranging from 110 to 220 volts.

CrayLink Interconnect

The CrayLink Interconnect and the Xpress link s are the cabled interface that runs
between Rack Routers boards (see Figure 2-10). These cables provide a high speed (800
MB/sec), scalable interconnection between different modules. These cables also supply
physical link redundancy so that if a link fails, another link can take its place.

Crosstown cable   CrayLink Interconnect and Xpress Links cable
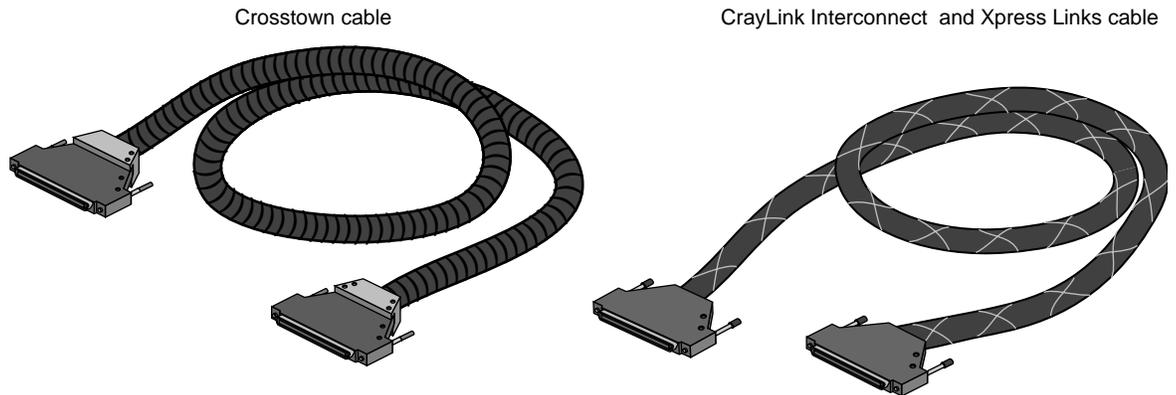
Figure 2-10   CrayLink Interconnect, Xpress Link, and Crosstown Cables

Cautionary Guidelines

You generally should not handle the sensitive CrayLink Interconnect and Xpress link cables; they are very delicate. Observe the following guidelines if you need to move these cables:

*   Avoid bending the cables more than a 1.25-inch radius.

*   Avoid stepping on the cables.

*   Avoid "hot plugging" in or removing cables while both Origin2000 modules are up and running. This can *hang* or *crash* the entire Origin2000 configuration.

Caution: Additional router cable connections should be performed only by Silicon Graphics-certified personnel.

Xpress Links

The Xpress links provide greater system bandwidth, as they supply additional 800 MB/sec routing paths. The Xpress links connect to Router board ports that are not being used by the CrayLink Interconnect cables. For additional information on the use of Xpress links, see Chapter 4, "System Configurations."

Crosstown Cable

The crosstown cables are similar to the CrayLink Interconnect and Xpress cables, so the same cautionary guidelines apply. The crosstown cables are encased in a plastic-ribbed coating and are slightly more ruggedized. The cables are used to connect to external peripherals and provide the same I/O performance as the CrayLink Interconnects and Xpress link cables.

PCI Carrier Assembly

The peripheral connector interface carrier assembly can house up to three third-party PCI boards (see Figure 2-11). Two of the PCI boards can be full-size boards. The third PCI slot accepts only half-size boards. The PCI carrier assembly provides up to 75 watts of power.
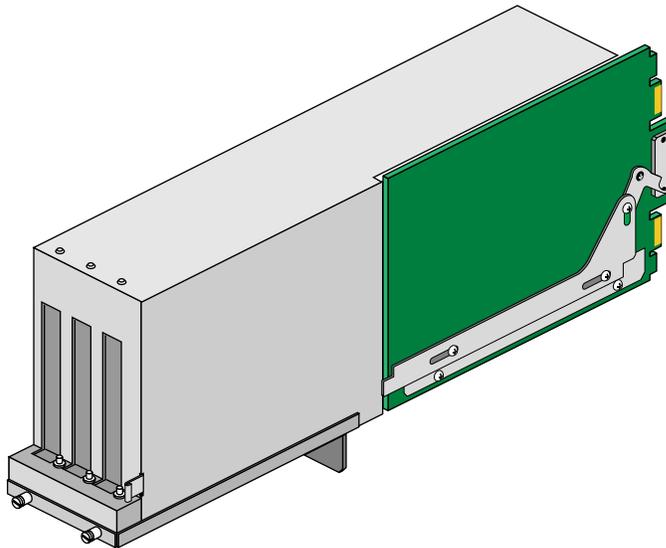
Figure 2-11   Optional PCI Carrier Assembly

Origin2000 Interface and Cabling Information

When your Origin2000 rackmount system is initially set up in the work area, a trained system support engineering (SSE) technician should configure and connect it.

Your Origin2000 rackmount system is fully functional as a standalone server using Ethernet, modem, optional ATM, HIPPI, or other interconnect technologies.

Proper configuration and interconnection of any optional XIO interconnect cables or hardware can be accomplished by the SSE at initial system installation or when an upgrade is ordered.

The Ethernet Interface Connection

The system comes with a single 100 Base-T 8-pin Ethernet connector. Optional boards supporting additional Ethernet connectors are available.

Table 3-1 shows the cable pinout assignments for the Ethernet 100-BASE T Ethernet port.

Table 3-1   Ethernet 100-BASE T Ethernet Port Pin assignments

Pin	Assignment
1	TRANSMIT+
2	TRANSMIT–
3	RECEIVE+
4	(Reserved)
5	(Reserved)
6	RECEIVE–
7	(Reserved)
8	(Reserved)

Figure 3-1 shows the location of the standard Ethernet connector on the rackmount system.

There are two LEDs on the RJ-45 Ethernet. The top (green) LED lights only when the system is transmitting. The bottom (yellow) LED lights whenever it sees any packet on the wire, including packets not destined for your system.

The four LEDS Above the RJ-45 Ethernet connector have the following functions:

- The yellow LED on the far left (LED 1) lights to indicate SCSI activity on the BaseIO single-ended SCSCI connector.

- The green LED (LED 2) lights to indicate 100 MB-per-second packet activity.

- The yellow LED on the right (LED 3) indicates when the Ethernet is operating at full duplex rates of transfer or receive.

- The green LED on the far right (LED 4) shows the Ethernet link test. It lights when link state is valid.

1   2   3   4

100 Base-T connector

Pin 1   Transmit +
Pin 2   Transmit -
Pin 3   Receive +
Pin 4   Reserved
Pin 5   Reserved
Pin 6   Receive -
Pin 7   Reserved
Pin 8   Reserved
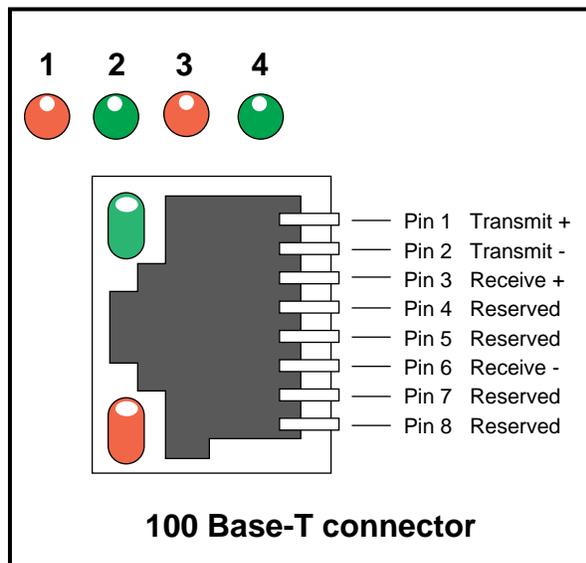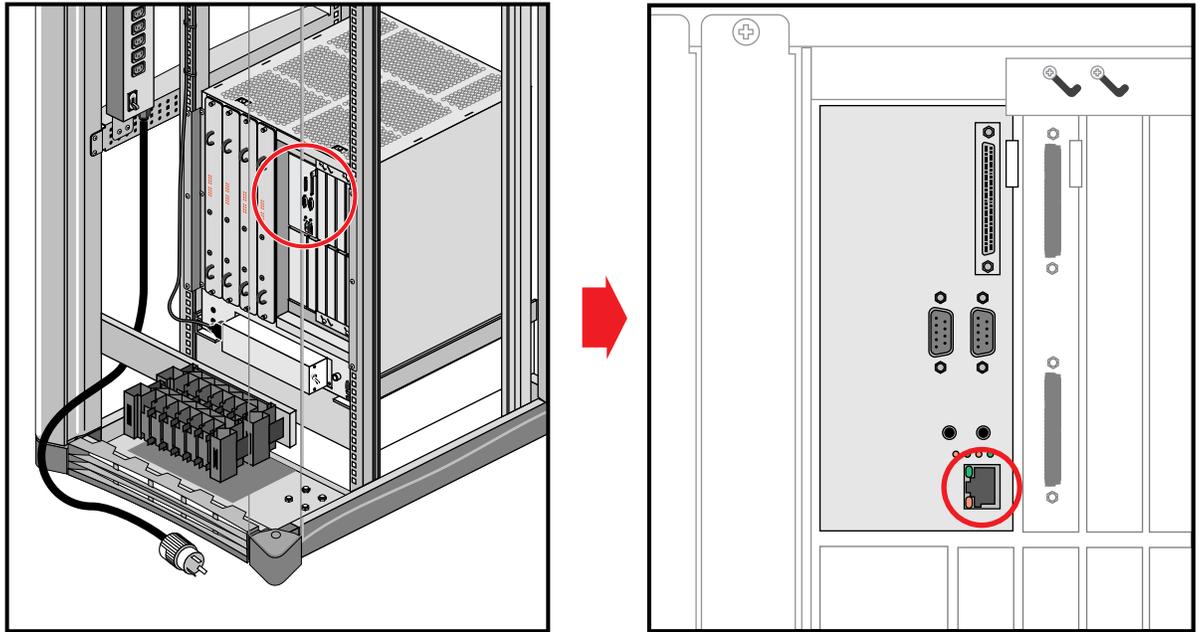
Figure 3-1   Standard Ethernet on Origin2000 Rackmount

Standard Serial Ports

Each Origin2000 rackmount system comes with two standard 9-pin serial ports. These ports can support either RS-232 or RS-422 interface devices. Figure 3-2 shows the location and pinouts for a serial port. Optional additional serial ports are also available.

The RS-232 standard recommends the use of cables no longer than 50 feet (15.2 meters). This standard should also be applied to the RS-422 connector. Longer runs increases the possibility of line noise which can affect data transmission and cause errors. For cable runs longer than 50 feet (15.2 meters), use an appropriate extender device.

Note: Do not run cables through areas that are electrically noisy, such as paces s where large electric motors, welding apparatus, or X-ray machines operate. Bury outside wiring in conduit, as lighting strikes can damage the system.

Serial port

Pin 1 Data Carrier
Detect (DCD)

Pin 2 Receive
Data (RD)

Pin3 Transmit
Data (TD)

Pin4 Data
Terminal
Ready (DTR)

Pin 5 Ground

Pin 6 Data Set
Ready (DSR)

Pin 7 Request to
Send (RTS)

Pin 8 Clear
to Send (CTS)

Pin 9 No connect

Console
serial port
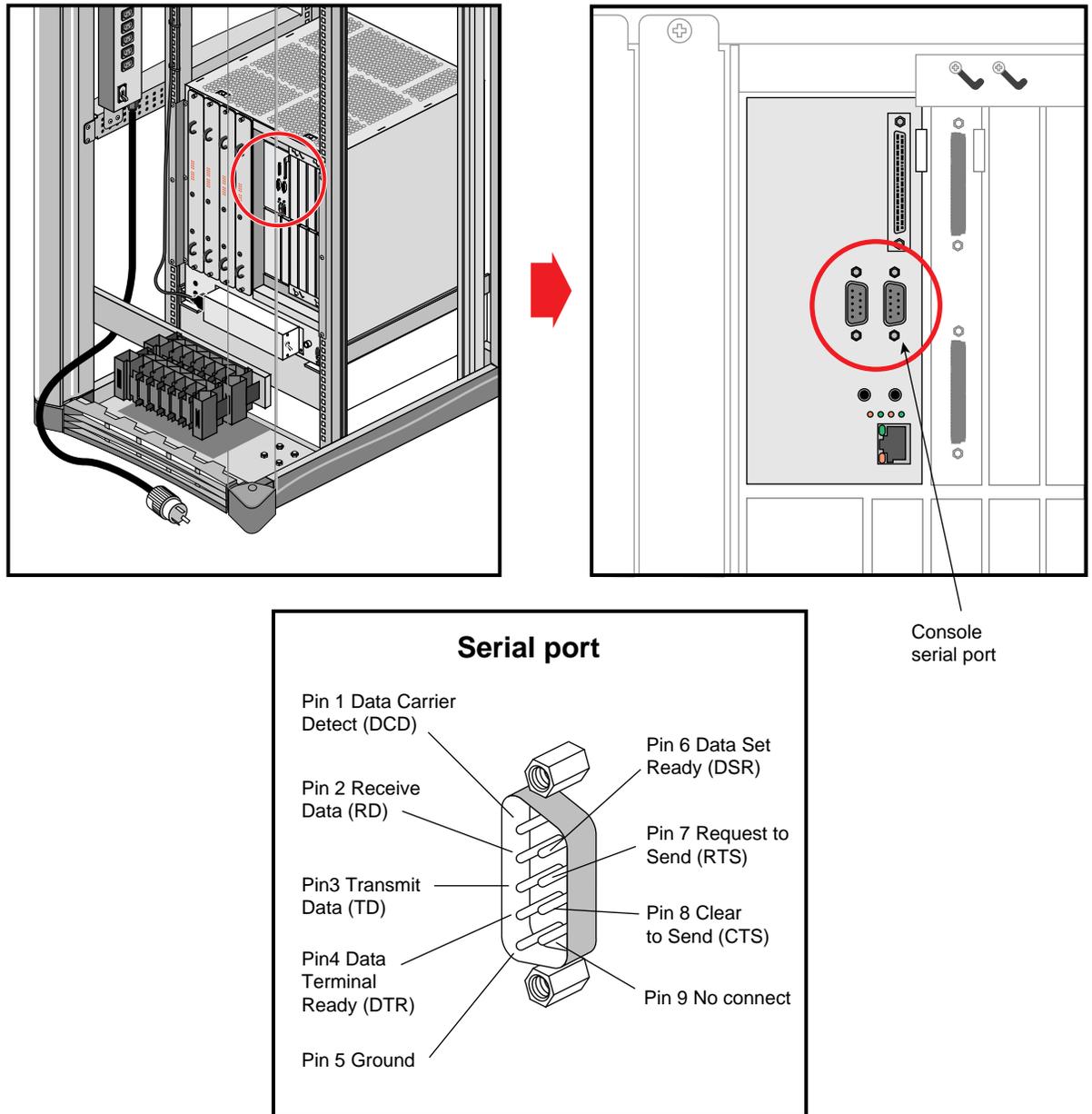
Figure 3-2   Serial Port Location and Pinouts

The Standard SCSI Connector

A single, external 68-pin SCSI connector is provided on the BaseIO panel (see Figure 3-3). This connector supports both Ultra SCSI and SCSI-2 devices. The connector sends single-ended SCSI signals only.

Optional additional SCSI ports can be implemented using XIO option boards.

The hyphen preceding a signal name indicates that the signal is low. Note that 8-bit devices that connect to the P cable leave the following signals open: -DB(8), -DB(9), -DB(10), -DB(11), -DB(12), -DB(13), -DB(14), -DB(15), -DB(P1). All other signals are connected as shown in Table 3-2.

Table 3-2   68-Pin Single-Ended, High-Density SCSI Pinouts

Signal Name	Pin Number	Pin Number	Signal Name
Ground	1	35	-DB(12)
Ground	2	36	-DB(13)
Ground	3	37	-DB(14)
Ground	4	38	-DB(15)
Ground	5	39	-DB(P1)
Ground	6	40	-DB(0)
Ground	7	41	-DB(1)
Ground	8	42	-DB(2)
Ground	9	43	-DB(3)
Ground	10	44	-DB(4)
Ground	11	45	-DB(5)
Ground	12	46	-DB(6)
Ground	13	47	-DB(7)
Ground	14	48	-DB(P)
Ground	15	49	Ground

Table 3-2 (continued)   68-Pin Single-Ended, High-Density SCSI Pinouts

Signal Name	Pin Number	Pin Number	Signal Name
Ground	16	50	Ground
TERMPWR	17	51	TERMPWR
TERMPWR	18	52	TERMPWR
Reserved	19	53	Reserved
Ground	20	54	Ground
Ground	21	55	-ATN
Ground	22	56	Ground
Ground	23	57	-BSY
Ground	24	58	-ACK
Ground	25	59	-RST
Ground	26	60	-MSG
Ground	27	61	-SEL
Ground	28	62	-C/D
Ground	29	63	-REQ
Ground	30	64	-I/O
Ground	31	65	-DB(8)
Ground	32	66	-DB(9)
Ground	33	67	-DB(10)
Ground	34	68	-DB(11)

SCSI connector (68-pin)

Pin 1 ——————— Pin 35

Pin 34 ——————— Pin 68
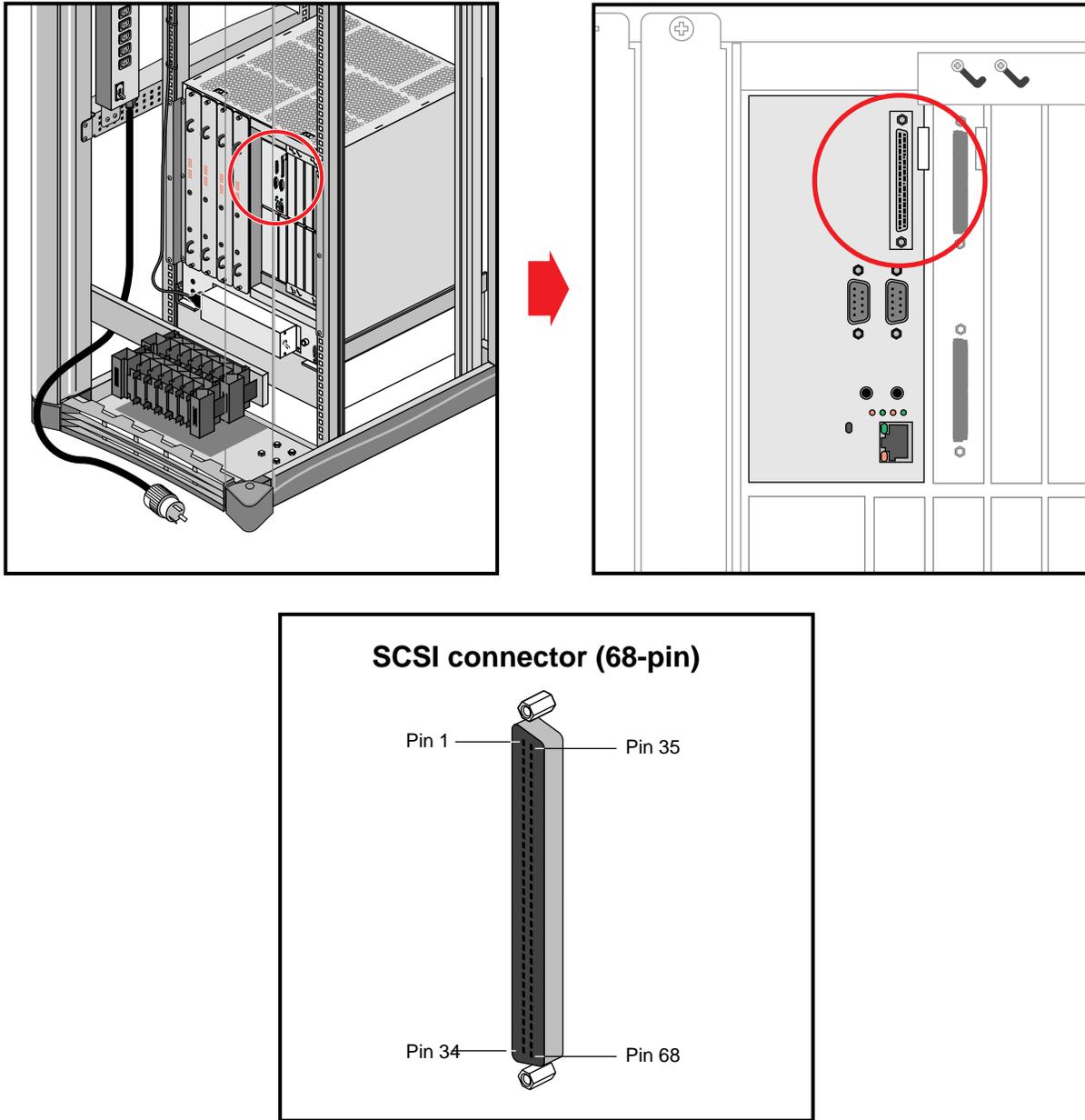
Figure 3-3   68-Pin SCSI Connector

System Configurations

This chapter briefly describes some of the many configurations that are possible with the highly modular and scalable Origin2000 single-rack system and the multirack systems.

Overview

No matter which Origin2000 system you have, each configuration contains the following major hardware:

- IP27 Node board with one or two R10000 processors

- main memory (which is located on the Node board)

- a Router board(s)

- an BaseIO board (which provides the system I/O ports such as serial, Ethernet, and SCSI interfaces)

- a single-connector assembly (SCA) drive bay for single-ended, ultra SCSI drive installation

- an Origin Vault drive box

The Origin2000 chassis is a standard 19-inch rack system that comes with a multimodule System Controller (MMSC) and display and also provides cable management hardware for CrayLink Interconnect and XIO cables.

Note: Additional system modules or individual hardware components can be added to suit growing computational and I/O requirements.

Basic System Configurations

Figure 4-1 and Figure 4-2 shows various system configurations based on the number of processors in the system. These figures provide information on the type of Router board(s) that are required to support that configuration. The diagrams also show how the Origin2000 system expands from a basic building block module to a multimodule, multirack configuration.

As Figure 4-1 shows, a base module also known as the Origin2000 *deskside chassis* supports 1 to 8 processors. To go beyond eight processors, a rackmount system is needed. Figure 4-2 shows a configurations with more than 16 processors or 8 Node boards requiring at least two rack systems. Larger configurations with 32 processors or 16 Node boards require four racks. The largest configurations with greater than 64 processors (up to 128) not only require even more racks, but also a different type of Router hardware called a *Cray Router* (see Figure 4-2). For additional information on routers, see Chapter 2, "Chassis Tour."

Schematic	Number of Node Boards	Router Board Types	Configuration
R10K Processor R10K Processor — N	1 Node board (up to 2 processors)	None	
N N—NR	2 Node boards (up to 4 processors)	Null Router board	
N N N—R—SR IR1 jumper	3 Node Boards (up to 6 processors)	Router board Star Router Board	IR1 jumper
N N N—R—SR—N IR1 jumper	4 Node Boards (up to 8 processors)	Router board Star Router board	IR1 jumper
N N N—R—R—N N—R—R—N N N with express links	8 Node boards rackmount system (up to 16 processors)	Router board Router board Router board Router board	
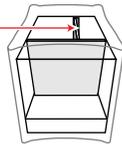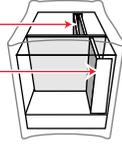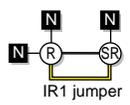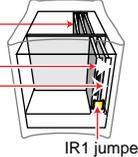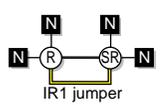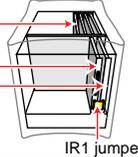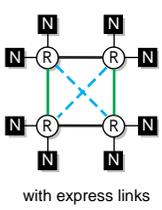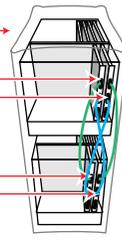
N = Node board
NR = Null Router board
SR = Star Router board
R = Router board

Figure 4-1   Basic Module Configurations

Schematic	Number of Node Boards	Configuration
with express links	8 Node boards (up to 16 processors) rackmount system	
with express links	16 Node boards (up to 32 processors) multi–rackmount system	
	32 Node boards (up to 64 processors) multi–rackmount system	
Note: Every vertex connects to meta router	64 Node boards (up to 128 processors) Multi–rackmount system with a meta router	Cray router — Only Cray router connections shown
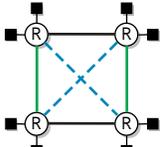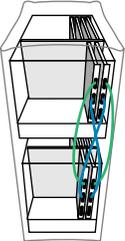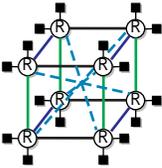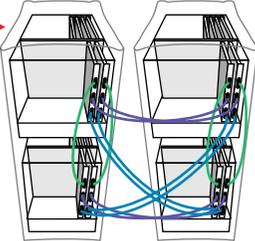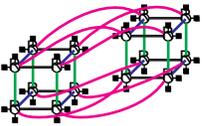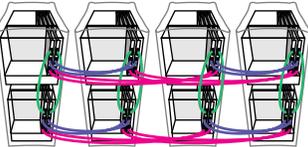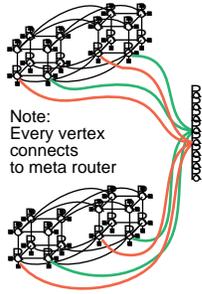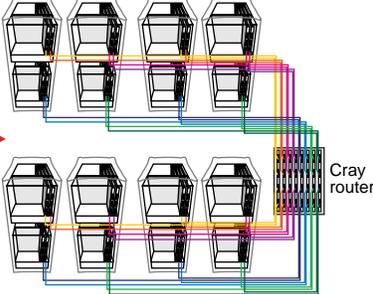
Figure 4-2   Basic Rackmount Configurations

Rackmount Configurations

Figure 4-3 through Figure 4-5 show different single rackmount Origin2000 configurations. The single rackmount has either one or two module systems. Table 4-1 and Table 4-2 summarizes the range of hardware components that can be supported by either a one or two-module configuration.

Table 4-1   Single Module Chassis Configurations

Hardware Component	Number Range
IP27 Node boards	1 to 4
R10000 CPUs	2 to 8
Main memory per Node board	64 MB to 4 GB (using 256 MB memory DIMMs)
Main memory per chassis	64 MB to 16 GB (using four Node boards)
Number of internal SCA drives	1 to 5
Number of XIO slots	6 or 12 for a single-module chassis;
Number of Origin Vaults	1 to 4 (one Vault comes standard with the rack).
I/O interfaces	- One (single-ended) SCSI connector - Two 9-pin D-sub RS-232 or RS-422 serial connectors - Two hardware interrupt lines - One 10/100Base-T Ethernet connector

Table 4-2   Dual Module Chassis Configuration

Hardware Component	Number Range
IP27 Node boards	2 to 8
R10000 CPUs	2 to 16
Main memory per Node board	64 MB to 4 GB (using 256 MB memory DIMMs)
Main memory per chassis	128 MB to 32 GB (using eight Node boards)
Number of internal SCA drives	2 to 10
Number of XIO slots	18 or 24 for a dual-module chassis
Number of Origin Vaults	1 only
I/O interfaces	- One to two (single-ended SCSI connector - Two or four 9-pin D-sub RS-232 or RS-422 serial connectors - Two or four hardware interrupt lines - One to two 10/100Base-T Ethernet connector

Figure 4-3 shows a single-module Origin2000 rackmount system. This configuration can house up to four Origin Vault drive boxes and two to eight CPUs. If desired, this rack can be cabled to other racks using the CrayLink Interconnect. This allows the other Origin2000 systems in the configuration to have high-speed access to those drives.

Drive
enclosure
door

Drive
enclosures

Single
Origin2000
module
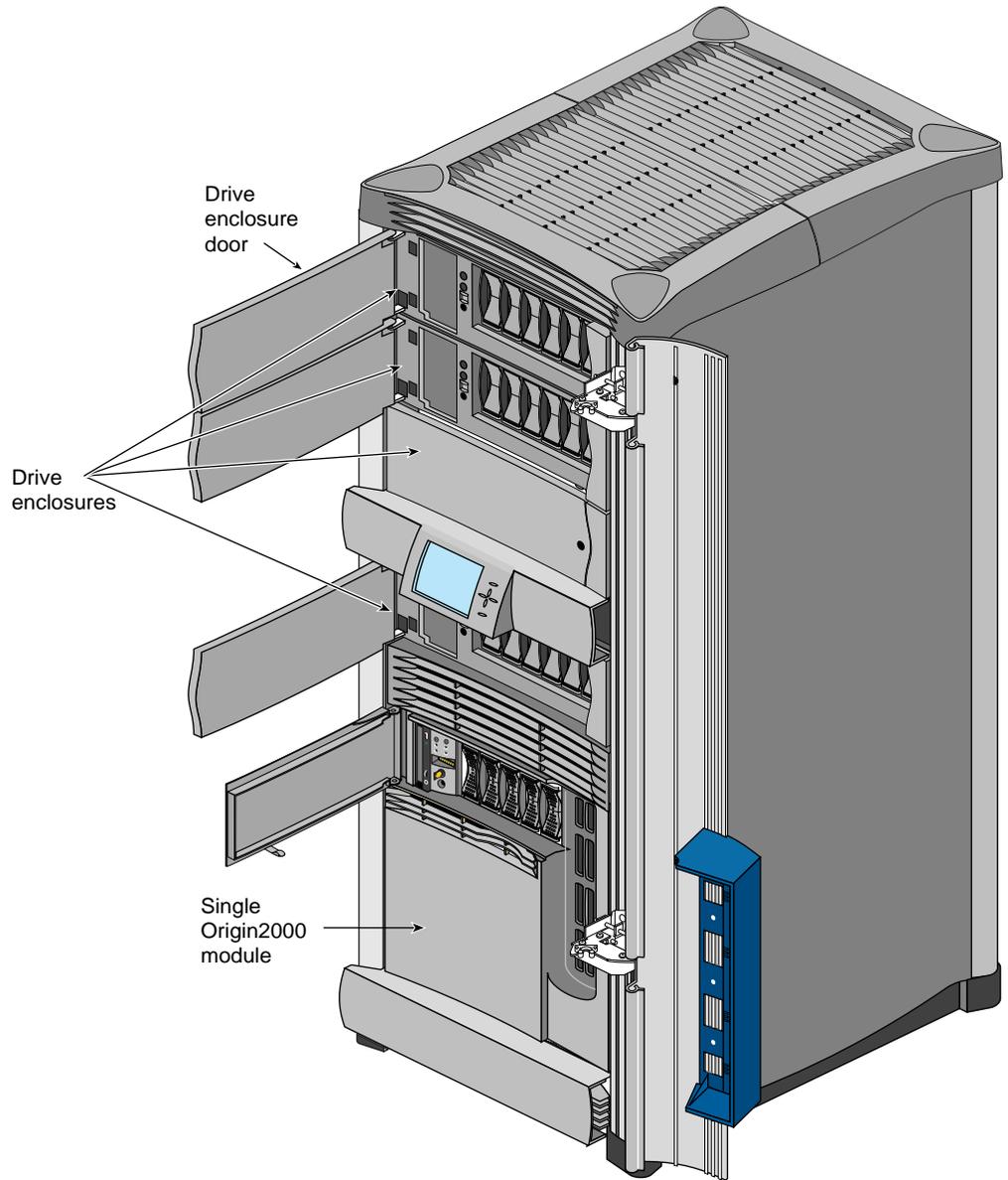
Figure 4-3   Single Origin2000 Module in a Rack with Four Origin Vault Drive Boxes

Figure 4-4 shows a 16"P" (or 16 CPU) rackmount system attached with CrayLink Interconnect cabling. This configuration requires two Rack Router boards and supports a maximum of sixteen CPUs. In this system setup, the hardware resources (such as main memory and disk storage capacity) from one module can be quickly and efficiently accessed by the other system module.

Note: It is possible to have a 16P configuration without CrayLink Interconnect cabling; however, the modules cannot share resources or communicate using the fast 800-MB/sec transmission link. This type of configuration normally uses a different router board, either a Null Router or Star Router. For more information on the different types of router boards, see Chapter 2, "Chassis Tour."

Figure 4-5 shows a 16P configuration using a combination of CrayLink Interconnect cabling and Xpress links. The Xpress links can effectively double the interconnect bandwidth within a rack by providing additional 800-MB/sec routing paths.

Node
board

Router
board
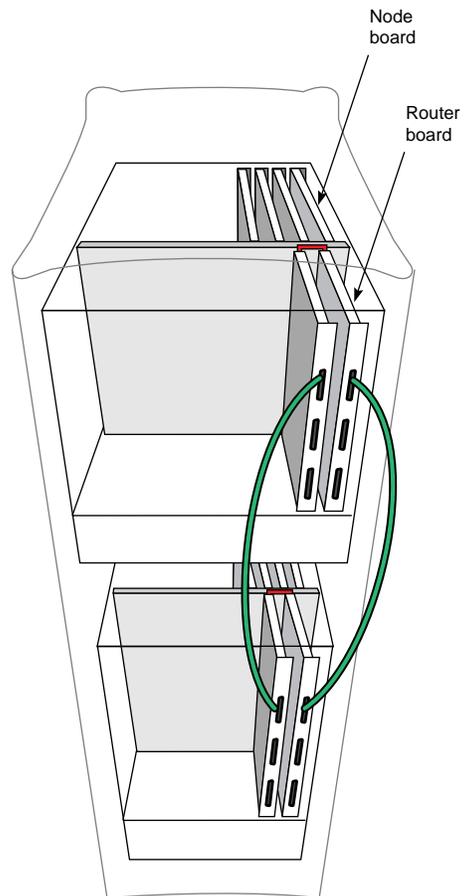
Figure 4-4   16P Origin2000 Rackmount

Node
board

Router
board
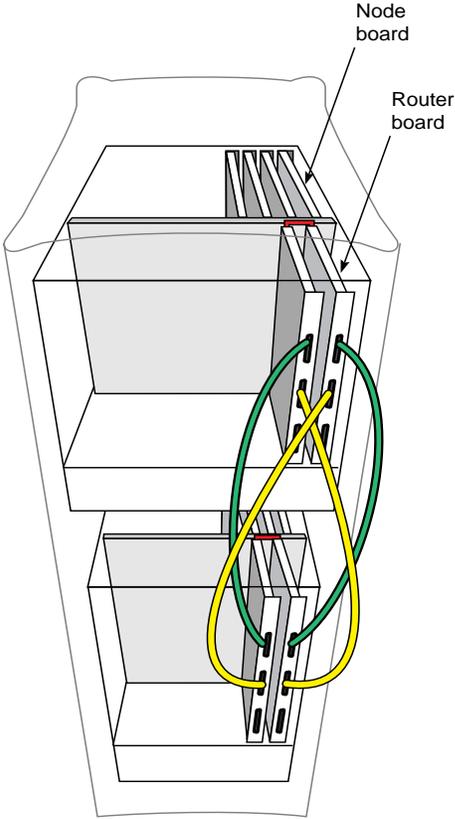
Figure 4-5   16POrigin2000 Rackmount with Xpress Links

Note: Xpress links can double interconnect bandwidth in single rack systems.

Multirack Configurations

Sample Origin2000 multirack configurations are shown in Figure 4-6 through Figure 4-9. These can be large system configurations requiring a significant amount of floor space, along with special power and cooling considerations. The multirack configuration can have between 4 and 128 processors, up to 256 GB of main memory, and up to 192 XIO slots through 16 separate system modules. If you are considering expanding your current configuration, be sure to consult the *Origin2000 Site Preparation Guide* (p/n 007-3452-001), along with your facilities engineer, a reputable electrician, and your Silicon Graphics system support engineer (SSE).

Table 4-3 lists the number of various hardware components that can be supported through a multirack configuration.

Table 4-3   Multiple-Rack Configurations

Hardware Component	Number Range
Number of racks	2 to 8
IP27 Node boards	2 to 64
R10000 CPUs	2 to 128
Main memory per Node board	64 MB to 4 GB (using 256-MB memory DIMMs)
Main memory per chassis	128 MB to 32 GB (using eight Node boards)
Main memory (entire configuration)	128 MB to 256 GB
Number of internal SCA drives	5 to 80
Number of XIO slots	24 to 192

Figure 4-6 and Figure 4-7 show two examples of 32P (or processor) configurations. These systems require two racks, along with the necessary CrayLink Interconnect cabling. Each of the racks has two modules, and each module has four Node boards and two Router boards. This configuration simply doubles the 16P configuration by adding a second (16P) rack.

Note: It is possible for a configuration to have any number of processors between4 and 32P. The 16P and 32P configurations are used because they represent the maximum number of processors for a one- or two-rack systems.

The configuration shown in Figure 4-7 uses Xpress links to increase the transmission throughput between modules and racks. The Xpress links provide additional data routing, which reduces potential transmission latency.

In Figure 4-7, all the available router ports are used. To go beyond a 32 processor configuration, the Xpress links must be removed and more CrayLink Interconnect cables must be installed. Figure 4-8 represents a 64P configuration which is simply a double of the previous 32P system.
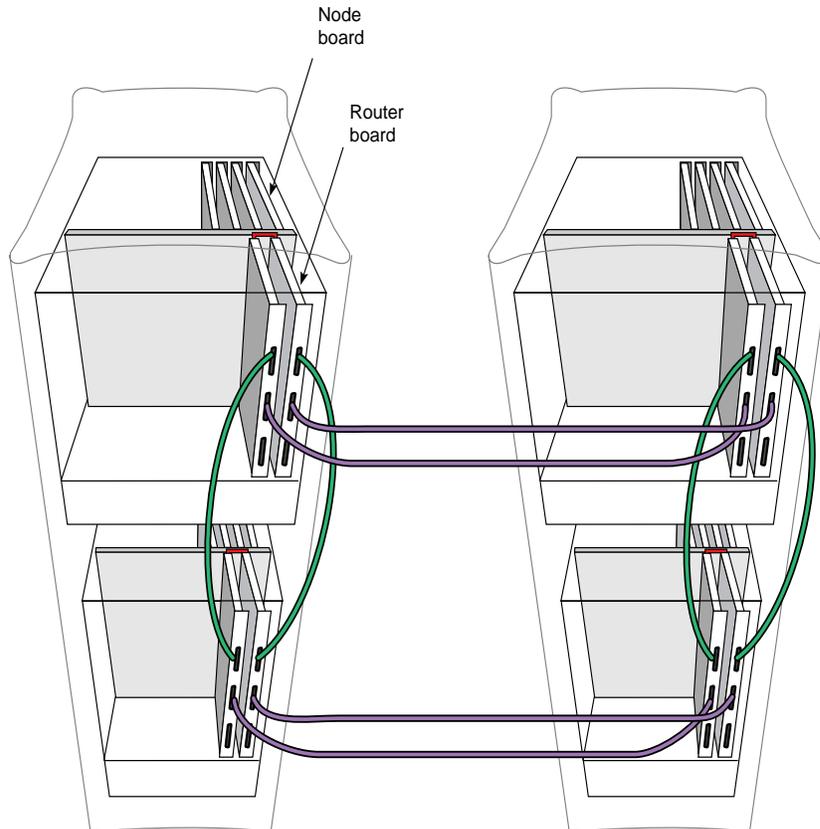
Figure 4-6   32 P Configuration

Node
board
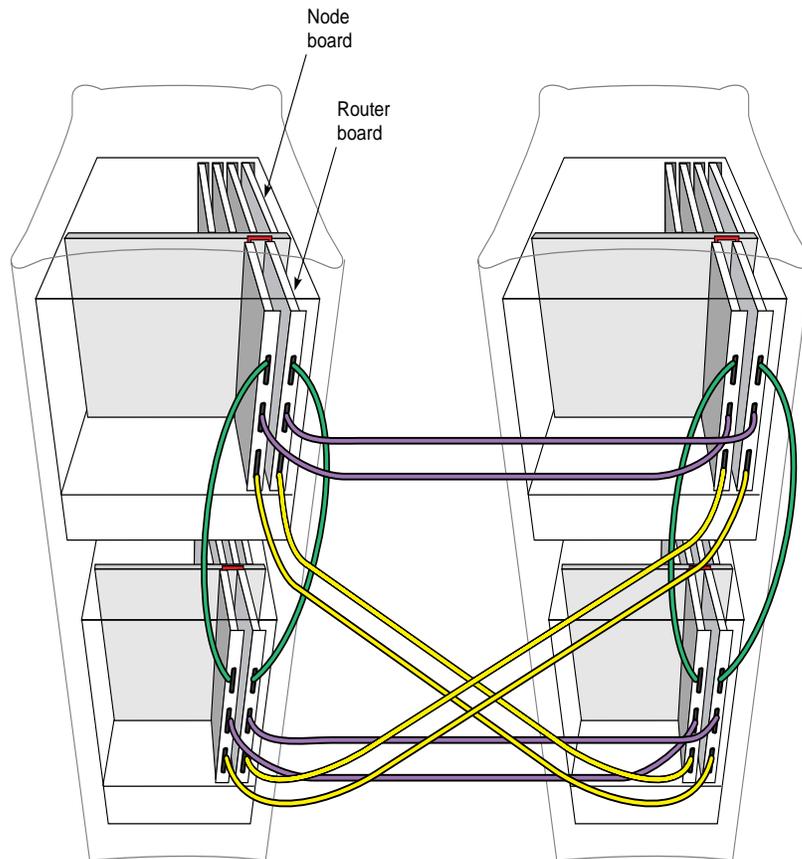
Router
board

Figure 4-7   32 P with Express Links

This configuration consists of four racks, eight system modules, and 32 Node boards. As Figure 4-8 shows, all of the available Router points are now in use. The 64P configuration is the largest one that can be supported using the Rack Router board. To go beyond 64 P, requires the use of a meta router chassis. With a meta router, configurations of up to 128 P are possible (see Figure 4-9).
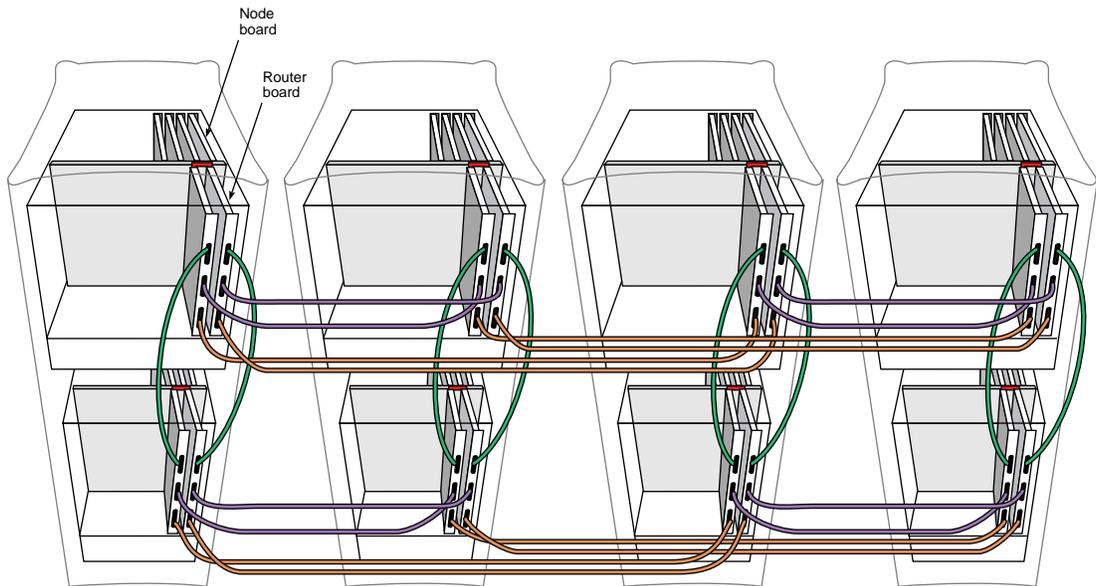
Figure 4-8   64P Configuration
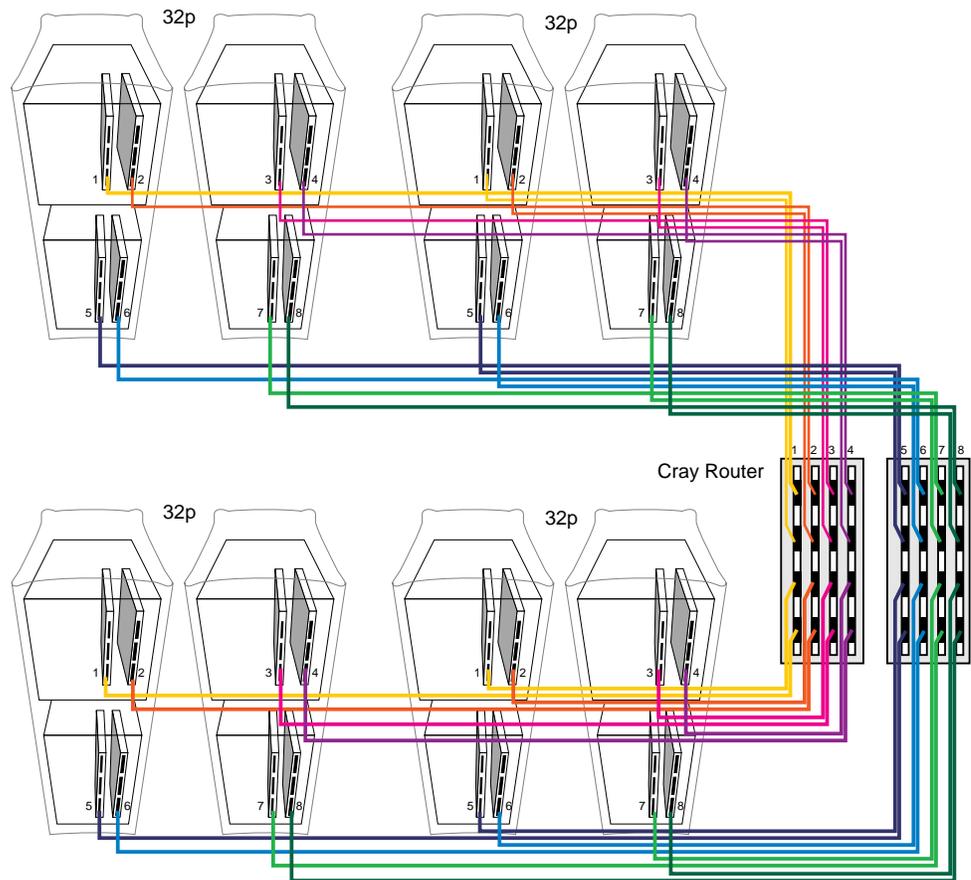
Figure 4-9   128P Configuration

Getting Started

This chapter describes how to configure and operate your system correctly.

Warning: **The rackmount graphics workstation operates on 220 VAC. Use extreme caution when working around this voltage. Never install or remove power cords without first turning off the equipment.**

Caution: The rackmount system can weigh more than 750 pounds when fully configured. Use at least two people to move the system chassis and take care that the system does not tip or become unbalanced. Also use at least two people to move the monitors. Be sure to practice proper lifting techniques.

Customer maintenance is limited to the outside of the chassis, which contains the peripherals. No user-serviceable parts are found within the chassis.

Note: This product requires the use of external shielded cables in order to maintain compliance with Part 15 of the FCC rules.

Connecting Your Terminal

The Origin2000 rackmount server requires a customer-supplied American Standard Code for Information Interchange (ASCII) terminal. Note the following caution before attempting to connect your terminal.

Caution: Before plugging the terminal into either a 120 VAC or a 250 VAC outlet, be sure that the electrical rating on the UL-CSA label is in either the 100 to 120 VAC or the 200 to 240 VAC range, whichever applies.

Note: When using a terminal in locations that do not have either a 120 VAC or a 250 VAC outlet, contact your Silicon Graphics system support engineer before plugging in the terminal power cable. Use only the specified cable to connect the terminal to the system chassis.

The Origin2000 uses PC-style serial cables. You cannot use earlier Silicon Graphics serial cables. See "Standard Serial Ports" on page 38 for cable pinout information.

Note: This product requires the use of external shielded cables in order to maintain compliance with Part 15 of the FCC rules. Serial cables from different vendors are not compatible. Verify the pinout of your cable before making the connection.

Use the following procedure to connect the ASCII terminal to your system:

1. Go to the back of the system chassis and verify that the system power switch, located in the lower right corner, is off (see Figure 5-7 as required).

2. Make sure that the power switch on the terminal is turned off and that the power cord is not connected to an outlet.

3. Attach the end of the terminal cable with the 25-pin connector to the corresponding connector at the rear of the terminal.

4. Locate the main module I/O panel at the rear of the chassis.

5. Attach the end of the cable with the 9-pin D-subconnector to the serial connector labeled "Console Port" on the module I/O panel, as shown in Figure 5-1.

6. Attach the terminal power cord to the rear of the terminal and to the appropriate power source.

Refer to the *IRIX Admin: System Configuration and Operation* for more information about configuring your terminal.
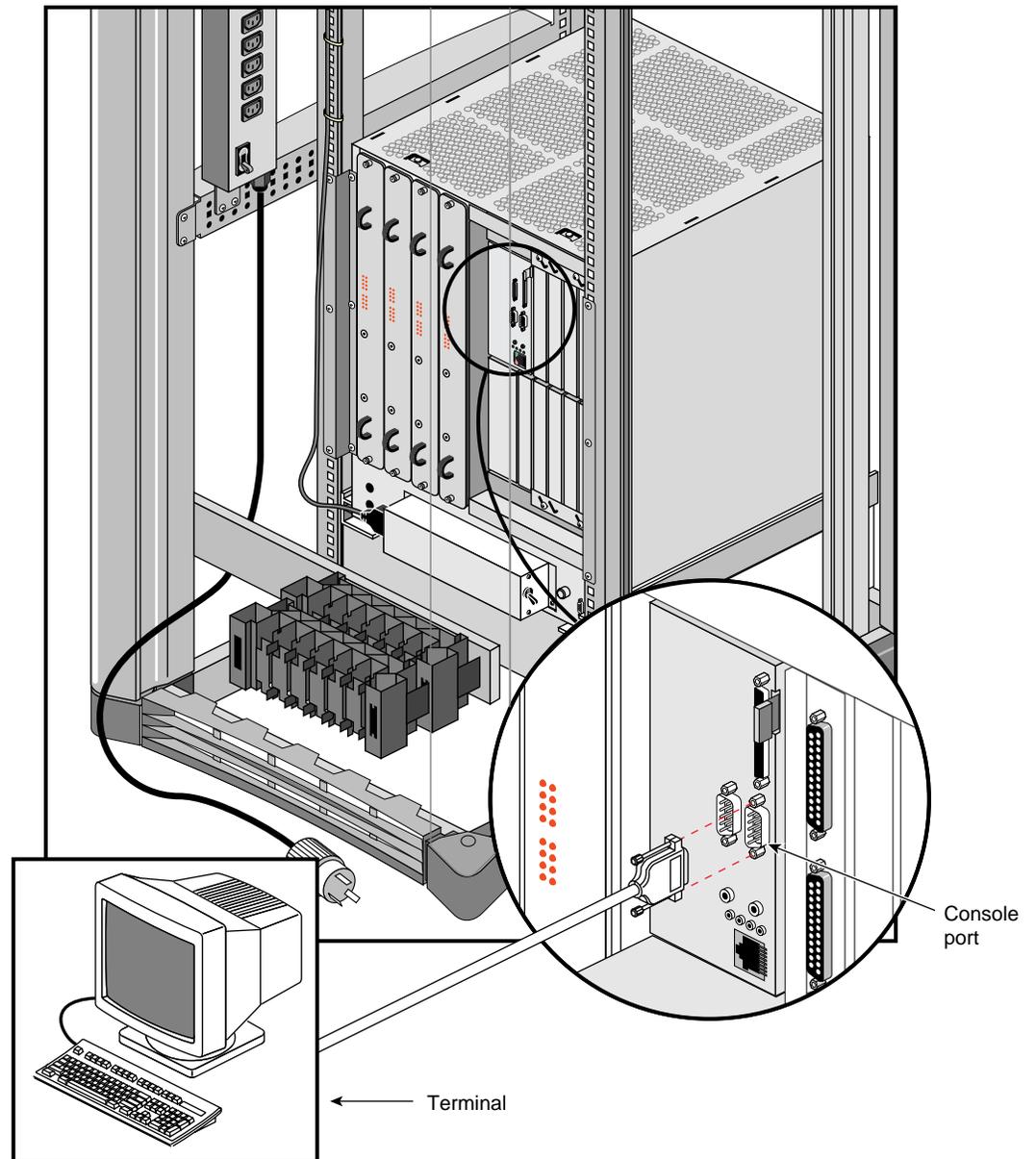
Figure 5-1   Connecting a Terminal

SCSI Requirements and Configurations

All Origin2000 rackmount systems are configured with one or two internal SCSI drive bays using single-attachment connector (SCA) drives (see Figure 5-2). These drives must all be single-ended, Ultra SCSI. These Ultra SCSI drives are capable of transmitting up to 40 MB/sec. In addition, the rackmount can house from one to four optional drive box enclosures (Origin Vault) to support other types of drives such as differential or single-ended SCSI drives (see Chapter 2, "Chassis Tour," for additional information).

Note: The difference between single-ended and differential SCSI channels is defined as follows: a single-ended SCSI channel pairs each signal line with a ground line. Differential SCSI channels pair each signal line with a second signal that is the balanced inverse of the first. This configuration makes differential SCSI less susceptible to signal degradation due to noise and more suitable for remote (longer) cabling.

The maximum allowable length for single-ended (standard) SCSI cabling is 19.6 feet (6 meters). This maximum length reflects the combined lengths of both the internal and the external cables. A single-ended SCSI bus can support a maximum of eight SCSI devices (including the IO6 board).

The maximum allowable length for differential SCSI is 80 feet (25 meters). As with single-ended SCSI, this length is the sum of both the internal and the external cables. The differential SCSI bus supports a maximum of 16 devices (including the M SCSI controller board).

Note: The most common reason for SCSI device failure are insufficient noise margins due to exceeding the maximum cable length, cable impedance mismatches, or a combination of both. If you are having trouble with certain devices, particularly external devices, be sure that you have not exceeded the maximum SCSI cable length.

Always use the shortest cable possible. Route external cables away from the potential damage of foot traffic, cleaning, and so on.

If you have additional questions about SCSI connections and cable lengths, contact your Silicon Graphics representative.

Note: To operate multiple external SCSI devices, you must order SCSI XIO boards that plug into the XIO cardcage.

Loading the Single Connector Assembly (SCA) Drives Into the System

The Origin2000 uses an SCA sled assembly for mounting into the drive bay. Disk drive modules are aligned vertically at the front of the chassis, as shown in Figure 5-2. Note that the leftmost disk drive—the system drive—is oriented differently from the others.

The drive bays in the Origin2000 modules use single-ended, ultra SCSI drives only. The Origin Vault SCSI drive box enclosure can support other types of drives, depending on how the box is configured.

To insert a disk module, follow these steps:

1. If necessary, snap the handle to the open position so that it is centered, as shown in Figure 5-2.

2. If you are adding a drive, remove the drive filler plate that covers the drive slot you want to use.

3. Align the new disk module with the drive guide, as shown in Figure 5-2.

4. Gently but firmly slide the disk module on the guides over the pin.

5. When the disk module is all the way in, snap the handle right to the closed position, as shown in Figure 5-2. In the case of the system disk module, which is upside down relative to the other drives, snap the handle left.

Blank

SCA drive

Handle in
closed position
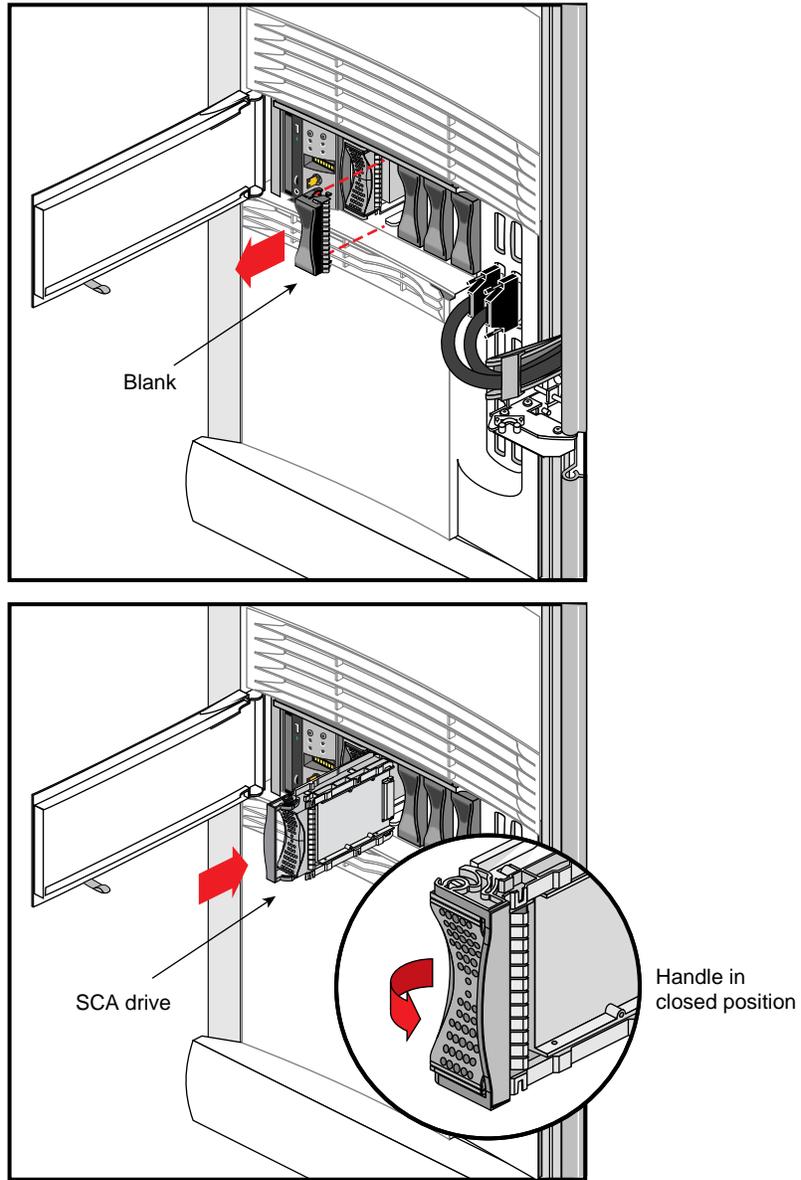
Figure 5-2   Installing an SCA Drive

The SCSI IDs for the SCA drives are hardwired into the Origin2000 midplane. Figure 5-3 shows the assigned addresses. The SCSI drives are also terminated directly on the midplane.
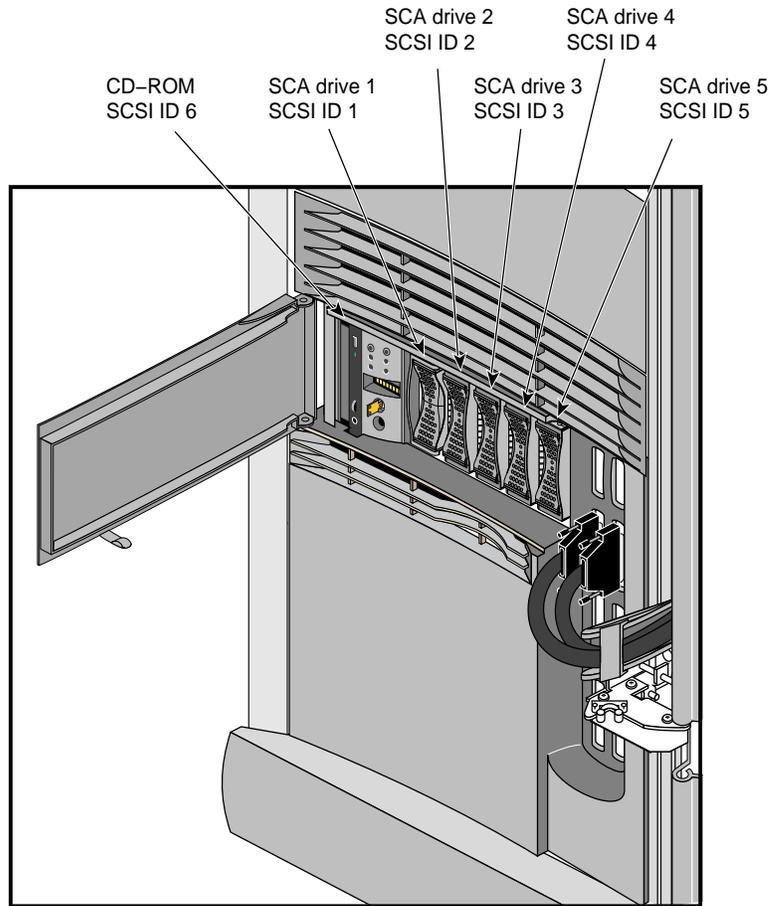
Figure 5-3   SCSI Hardwire Addresses for the Origin2000 Chassis

Loading the CD-ROM

The CD-ROM installs vertically into the chassis. Follow these instructions to load the CD-ROM into the drive:

1. Press the eject button to release the CD-ROM carrier (see Figure 5-4).

2. Hold the CD-ROM diskette by the edges and place it into the holder clips as shown in Figure 5-4.

3. Insert the CD-ROM carrier into the drive.
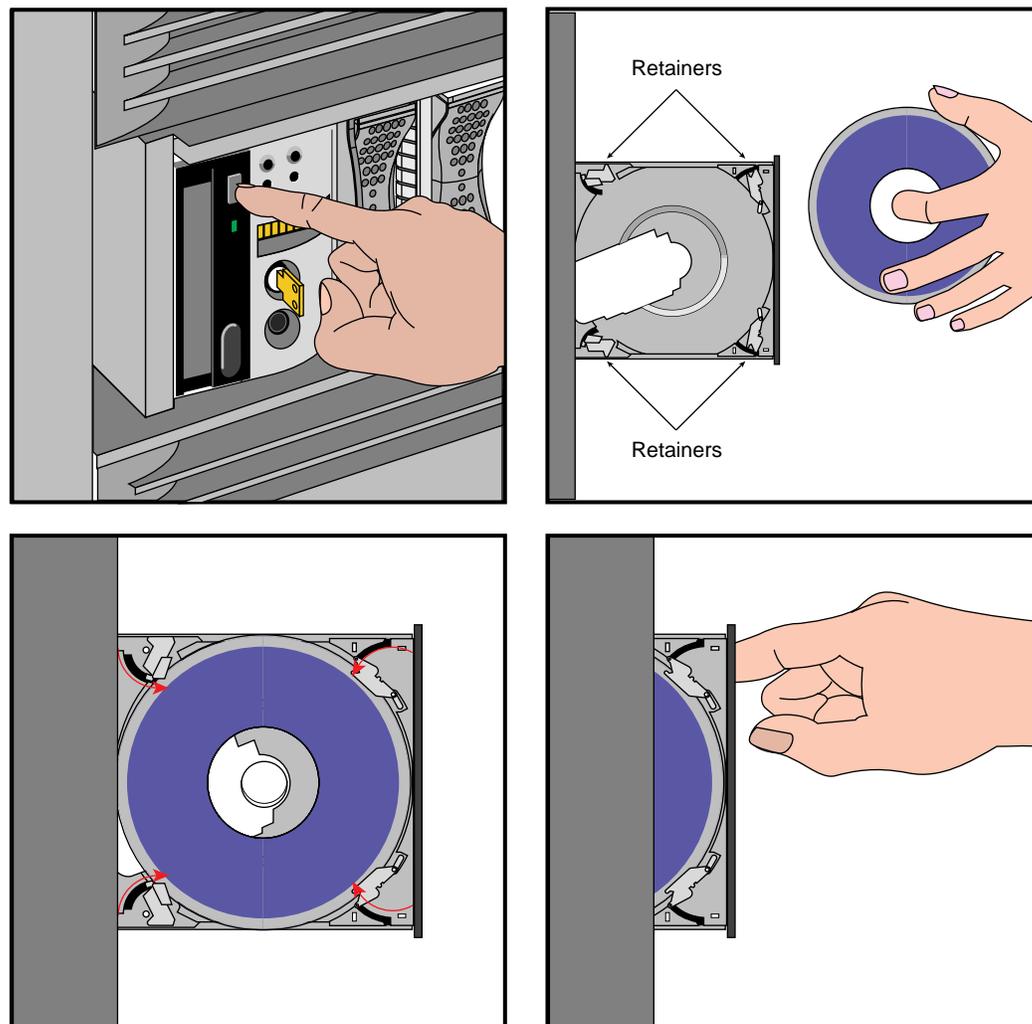
Figure 5-4   Installing a CD-ROM Into an Origin2000 Chassis

Connecting Your System to an Ethernet

The Origin2000 system comes with a 100 Base-T Ethernet connector on each rack. Some racks may have two Ethernet connector ports (one on each system module). Follow these instructions to connect an Ethernet drop to your system.

1. Locate the Ethernet line, then route it to the rear of the chassis.

2. Plug the cable into the applicable connector (see Figure 5-5).
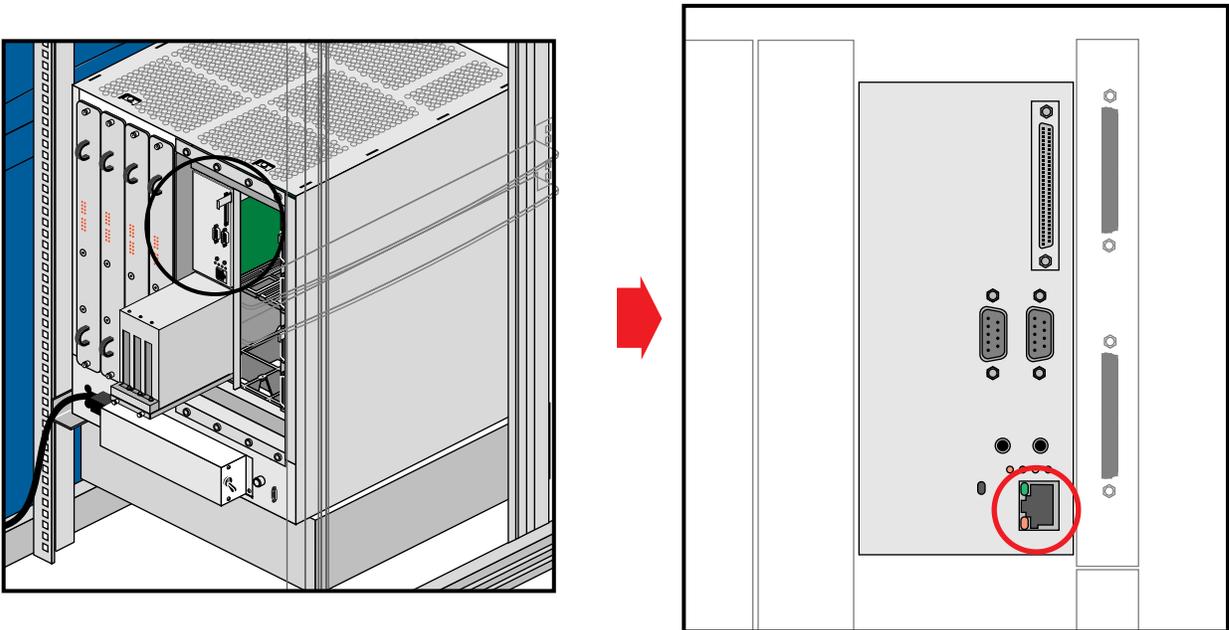
Figure 5-5   Connecting Ethernet to the Origin2000

Initially Powering On the System

If you are powering on the system for the first time, or if the system is completely shutdown, use these procedures to power on the Origin2000 rackmount system.

The multimodule System Controller display can be used thereafter to power on and power off the entire rack configuration after initial power on (see Chapter 7, "Using the System Controller").

1. Verify that the system power switch, located in the lower rear of the system chassis, is turned off.

2. Insert the PDU system power cable into the 220 VAC wall receptacle (see Figure 5-6).

Warning: **The Origin2000 rackmount system operates on 220 VAC. Use extreme caution when working around this voltage. Never install or remove power cords without first turning off the equipment.**

3. Connect the power cord(s) of the system module(s) into either of the top two (20-amp) receptacles of the PDU (see Figure 5-6).

   Caution: The system modules *must* be plugged into the PDU that is supplied with the rack. *Do not* use a power source outside of the chassis. The CrayLink Interconnect cabling scheme requires that the system modules share a common AC ground. This helps prevent possible damage to internal hardware components.

4. Connect the multimodule System Controller power cord to the PDU.

5. If the monitors and peripherals are equipped with voltage select switches, verify that they are set for the appropriate AC voltage.

6. Connect the power cords from the monitor(s) and additional peripherals to the appropriate three-pronged grounded outlets.

7. Turn on the system power switch (see Figure 5-7).

8. Turn on the system modules (see Figure 5-8).

9. Turn on the monitors, followed by any attached peripherals.

   Note: All internal storage devices are automatically powered on by the System Controller.

10. Boot the system as described in "Booting Your System" on page 73.

PDU power cable plug

220 Volt
power source
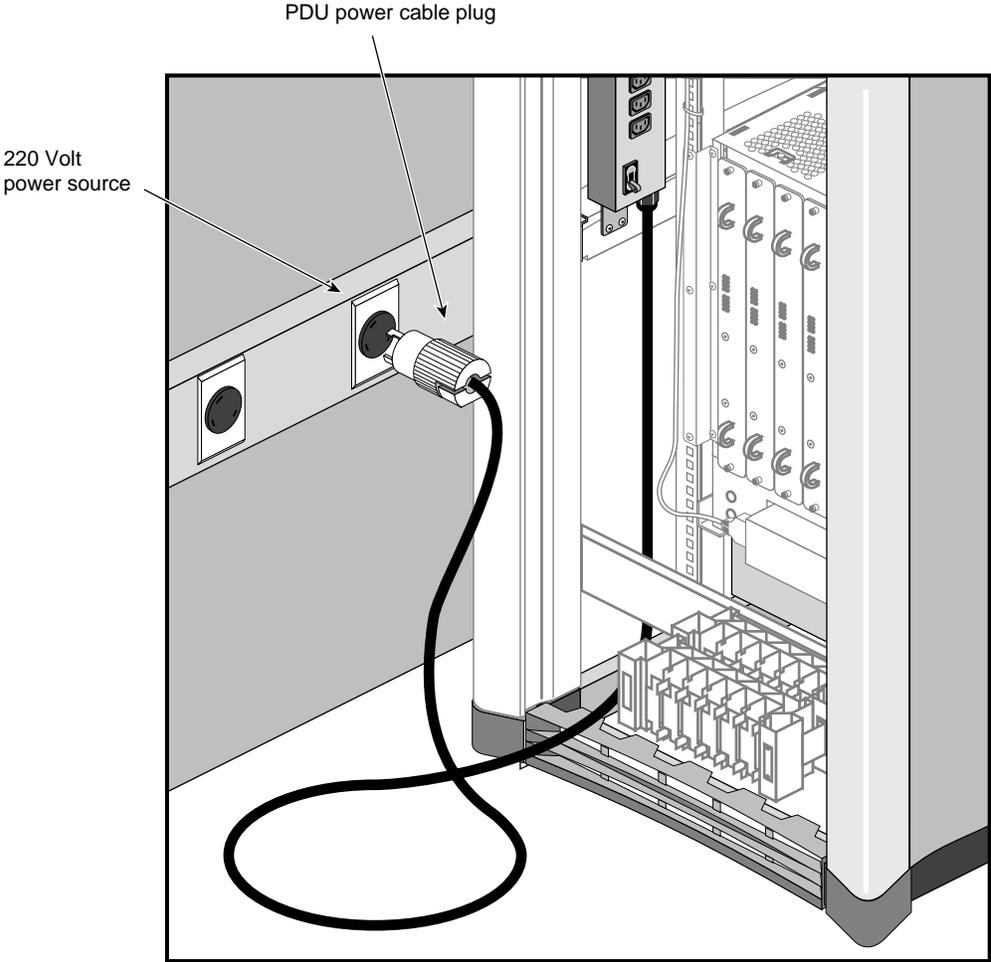
Figure 5-6   Connecting the System Power Cable
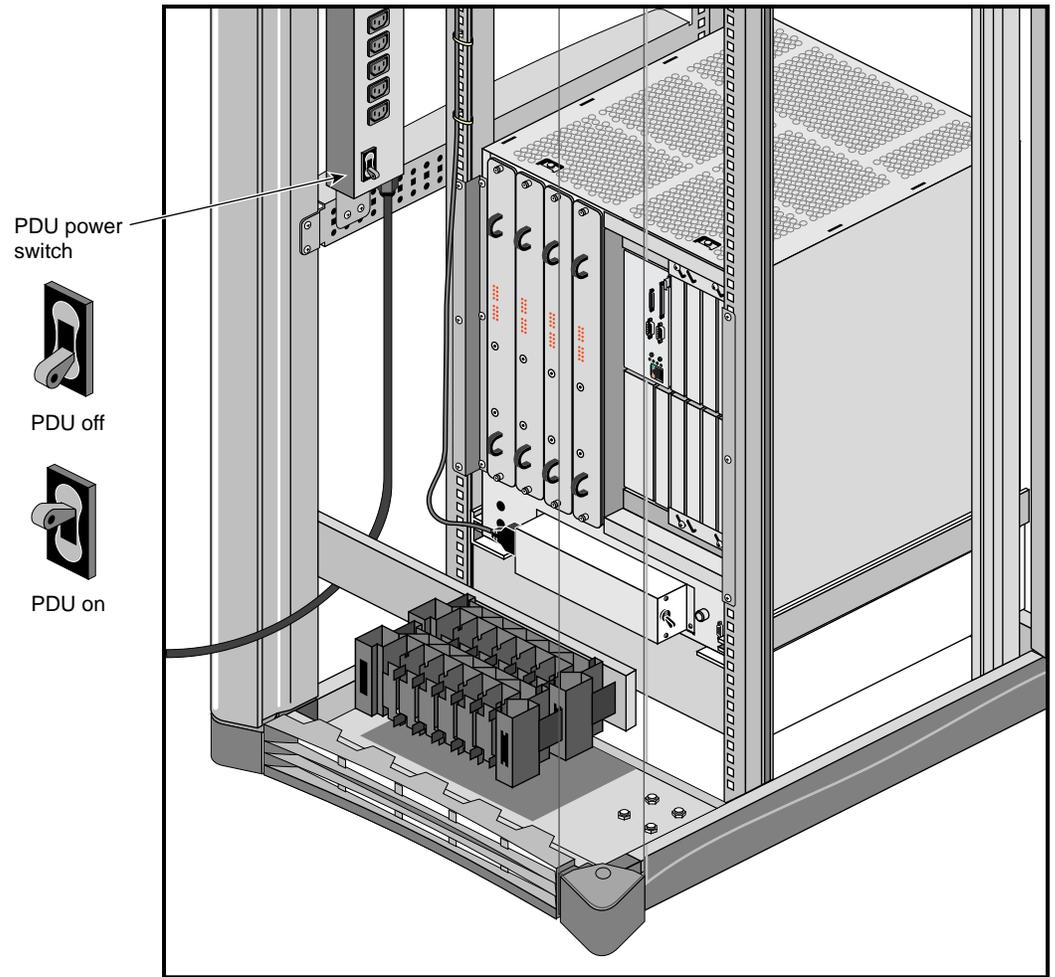
Figure 5-7 Turning On the PDU

Module power switch

ON   OFF
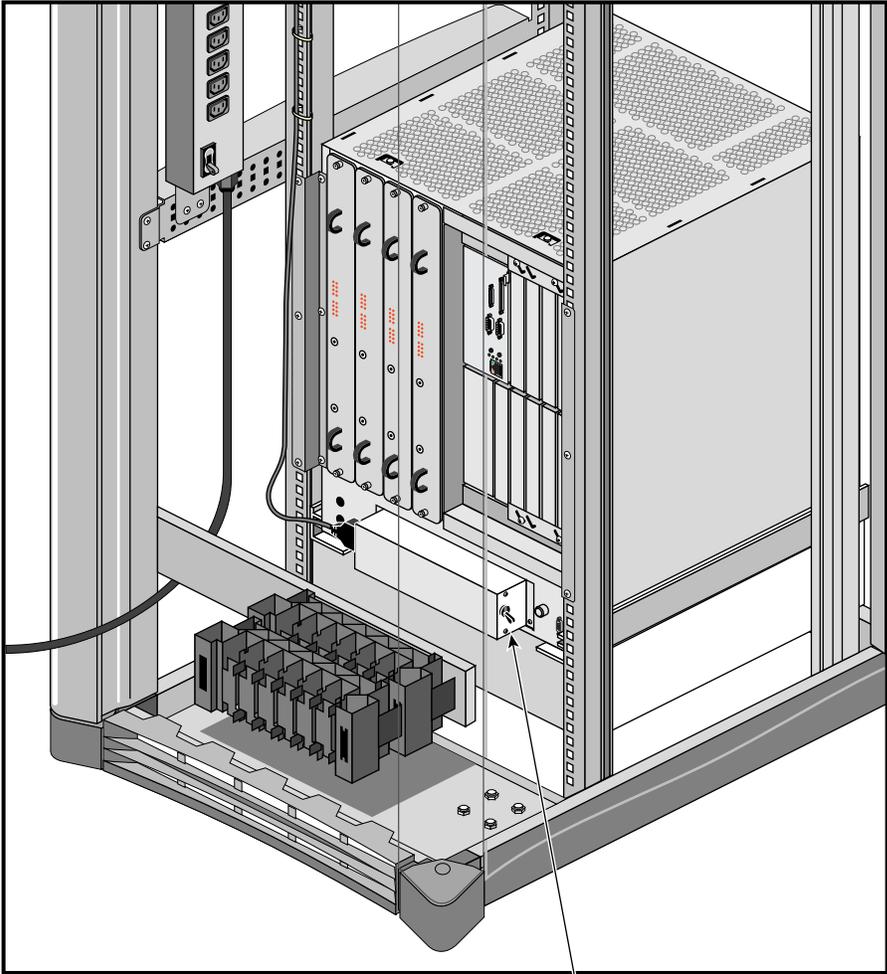
Figure 5-8   Powering On the System (Rear View of Chassis)

Booting Your System

Boot your system by performing the following steps:

1. Power on the system, as described in the preceding section, "Powering On the System."

2. Go the front the chassis module and insert the system key into the key switch, located to the right of the System Controller's display. Turn the key switch to the On position (see Figure 5-9).

   Note: The System Controller begins the power-on sequence. The green power-on LED, located above the function buttons, lights to indicate that power has been applied to the system midplane. The amber fault LED then lights to indicate that power has been supplied to the System Controller. The fault LED goes out when the System Controller has successfully initialized and the power-on tests have completed.

3. Repeat this process with additional modules as required.

Module
reset switch

AC OK LED

DC OK LED

8-digit
LED display

8-pin mini DIN
diagnostic
port

Reset

NMI

AC

High

DC

Module
NMI
switch

Fan hi-speed
indicator
LED

Ambient
over-
temperature
LED

Standby

On

Diagnostic

Diagnostic
Port

Security
key switch

Standby

On

Diagnostic
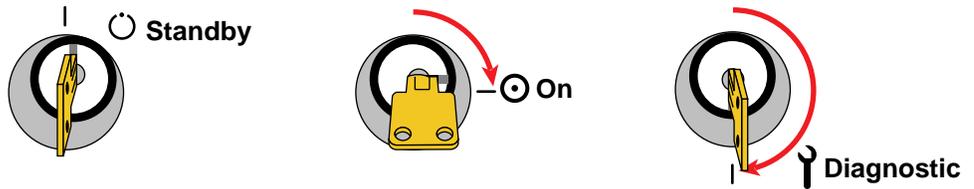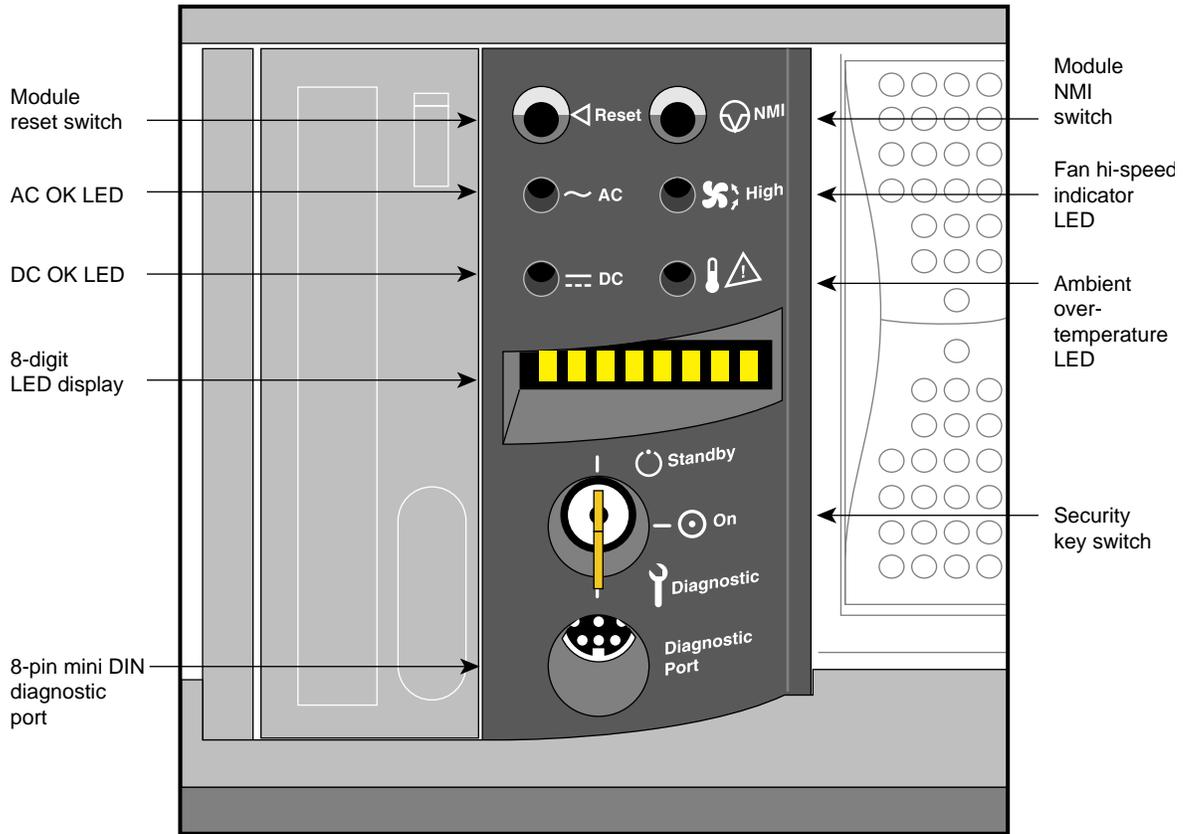
Figure 5-9   Entry-Level System Controller Key Positions

The system's progress can be monitored on the module System Controller's display. As the module powering on, you should see the messages similar to the following:

`POWER ON`

`VERS` **x.xx** (PROM version number)

`MOD` (module number, such as MOD 1, etc).

Note: Do not press any of the front panel buttons while the system is booting. Pressing the buttons during this process will abort the boot arbitration sequence.

When the power-on tests have completed, you see this message on the system console:

```
Starting up the system...
To perform System Maintenance instead, press <Esc>.
```

4. To reconfigure your system or to list your system's hardware, press **<Esc>** within five seconds.

   Note: If you do not press **<Esc>** within five seconds, the system will come up and display the desktop. If this happens, log in, shut down the system using the "System Shutdown" command from the System Maintenance menu, and then restart it when prompted.

   When the System Maintenance menu appears, type **5** to select "Enter Command Monitor."

5. When the `>>` prompt appears, type **hinv** then press **<Enter>** to display the hardware inventory of your system.

   Note: See the *IRIX Admin: System Configuration and Operation* manual for information on reconfiguring your system.

6. Quit the Command Monitor by typing **Exit** at the `>>` prompt.

7. The System Maintenance menu reappears. Type **1** to select the "Start System" command. The system comes up and displays the desktop.

Installing the Operating System

The basic IRIX operating system is factory installed on your system disk. No software installation is required. If additional software is desired, it must be downloaded either locally (using a CD-ROM drive) or remotely over the network. See the *IRIX Admin: Disks and Filesystems* manual for additional information about mounting and configuring drives. Refer to the *IRIX Admin: Software Installation and Licensing* manual for the detailed steps required to download the software.

Note: A copy of the IRIX operating system is supplied with the system on a compact disc. Place the CD in a secure place in case you need to reinstall the operating system.

Powering Off the System

The system should be powered off only for routine maintenance or repair. You can power your rack system off in a number of ways.

- Choose "System Shutdown" from the System menu.

- Bring the system down from a shell.

  - Become superuser by typing **/bin/su** and pressing **<Enter>**.

  - Enter your superuser password, if prompted.

  - When you see the superuser prompt (#), type **/etc/shutdown** and press **<Enter>**.

  - A message similar to the following appears on the screen:

  ```
  Okay to power off the system now.
  Press any key to restart.
  ```

- Use the multimodule System Controller display to shutdown the rack (see Chapter 7, "Using the System Controller").

Turn off the power switches for the system and the peripherals in the following order:

- printer (if installed)
- terminals
- system modules
- Origin2000 PDU

Resetting Your System

You can reset the system using the multimodule System Controller display (see Chapter 7, "Using the System Controller").

You can also reset your individual system modules by turning the key switch on the System Controller to the Diagnostics position. Use the scroll buttons to bring up the Reset menu. Press the Menu button to activate the menu, then press the Execute button to reset the system. If the system is completely unresponsive, use only the Reset function, not the main power switch, to reboot your system. If your system responds to input, use the shutdown option in the System Maintenance menu or the *halt* command.

Removing and Replacing Customer Replaceable Units

This chapter describes the installation and removal procedures for customer-replaceable units (CRUs) in the Origin2000 rackmount system. The CRUs are hardware components that can be safely removed by an end user without undue exposure to high electrical power potentials. CRUs are limited to the following major components (see Figure 6-1):

- drive modules
- module System Controller

Warning: **Do not attempt to remove or remove or replace hardware components (such as boards) that are not listed above. This system uses internal electrical power that is hazardous if the equipment is improperly disassembled.Failure to heed this warning may not only void the system warranty but could cause bodily harm.**

System disk

Optional drives

System
controller

CD–ROM

Blank drive panels

Facade
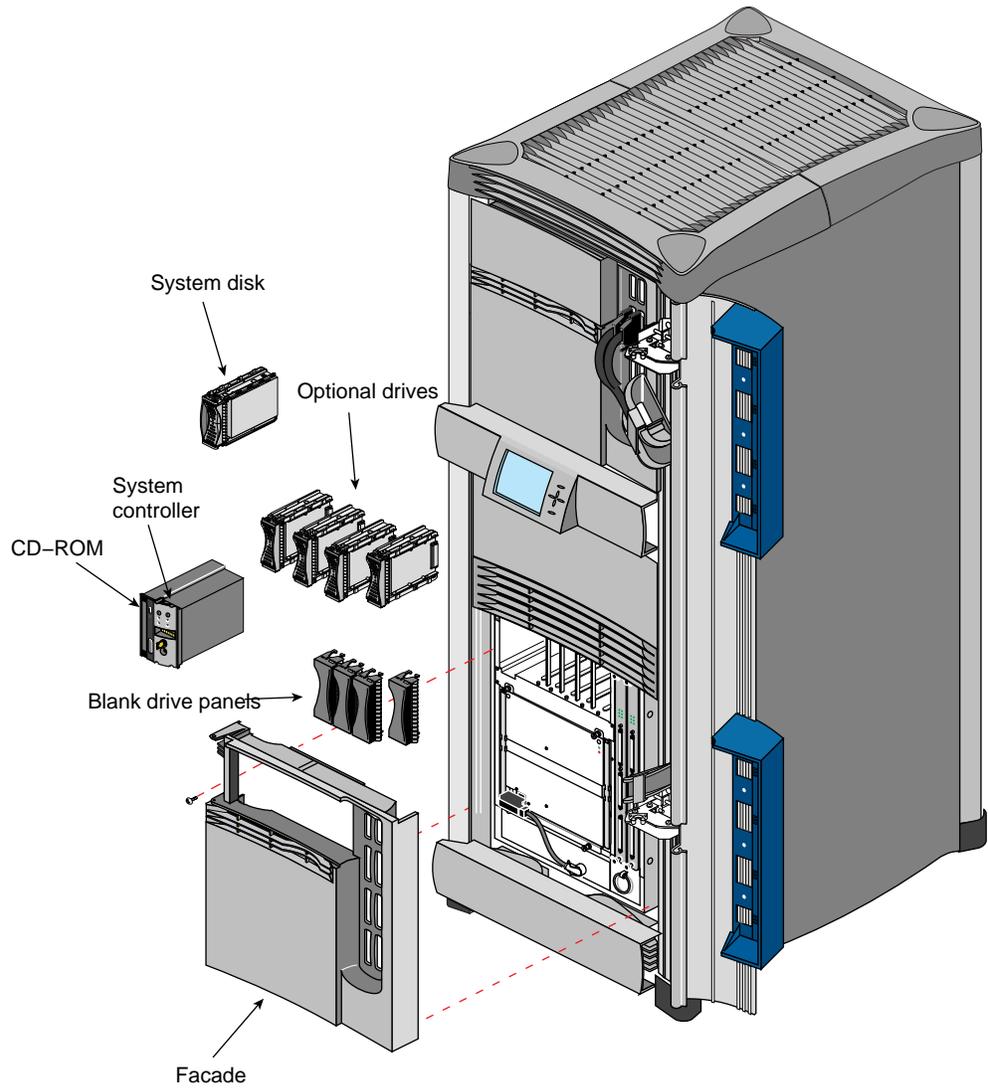
Figure 6-1   Customer-Replaceable Units (CRUs) for the Origin2000 Rackmount System

General Information

Read the following subsections for additional safety information and required tools.

Safety Information

Before beginning the replacement procedures, observe these precautions.

Warning: **This equipment uses electrical power internally that is hazardous if the equipment is improperly disassembled. Board removal and replacement should be performed only by Silicon Graphics-certified personnel.**

Caution: Do not attempt to move CrayLink Interconnect cables. These cables are made of sensitive copper strands and insulation material that can be damaged if they are excessively bent, stretched, or stepped on.

This equipment is extremely sensitive and susceptible to damage by electrostatic discharge (ESD) which is caused by the buildup of electrical static potential on clothing and other materials. Use proper ESD preventive measures and observe these precautions:

- Wear a properly grounded wrist strap when connecting and disconnecting peripherals.

- Be sure that you and all the electrical equipment you handle are at ground potential to avoid damage from ESD. Do not rely on the power source ground; the ground is lost when the system is disconnected from the power source.

- Keep boards in their antistatic bags until you are properly grounded to the chassis ground with a ground strap.

- Do not use an ohmmeter or a digital voltmeter on a board.

General Procedures

This section describes related activities that are common to most CRU installation and removal procedures for the Origin2000 rackmount chassis.

Powering Off a Rackmount System

You can either power off an individual module or power off the entire rack configuration using the multimodule System Controller. If you power off an individual module, the other module(s) in the configuration can still operate fully.

Powering Off an Individual Module System

Use these procedures to power off a module in a rack:

1. Ensure and verify that the desired filesystems are backed up and make sure that all users are off the target system.

2. Become superuser, then shut down the system software as follows:

   ```
   # shutdown -y g0
   ```

3. Turn the module controller key switch to the Standby position (see Figure 6-2).

Security key switch
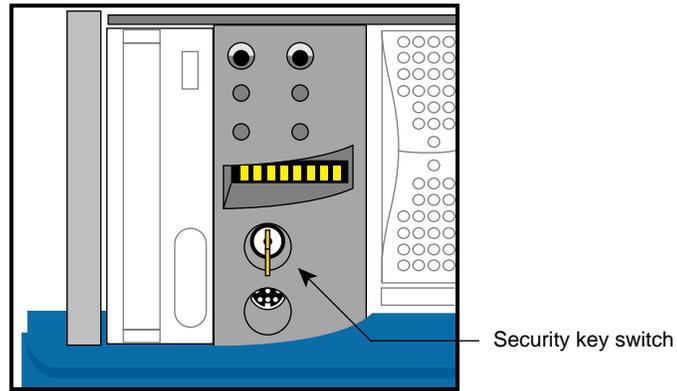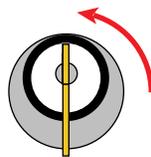
Standby (Off)

Figure 6-2   Turning Off the Module Controller

Caution: The "Standby" mode does not turn power completely off to the module. Voltage is still present in the system.

4. Power off the module. The switch is located in the rear of the chassis, near the AC power cord receptacle (see Figure 6-3). Disconnect the system from the power source.
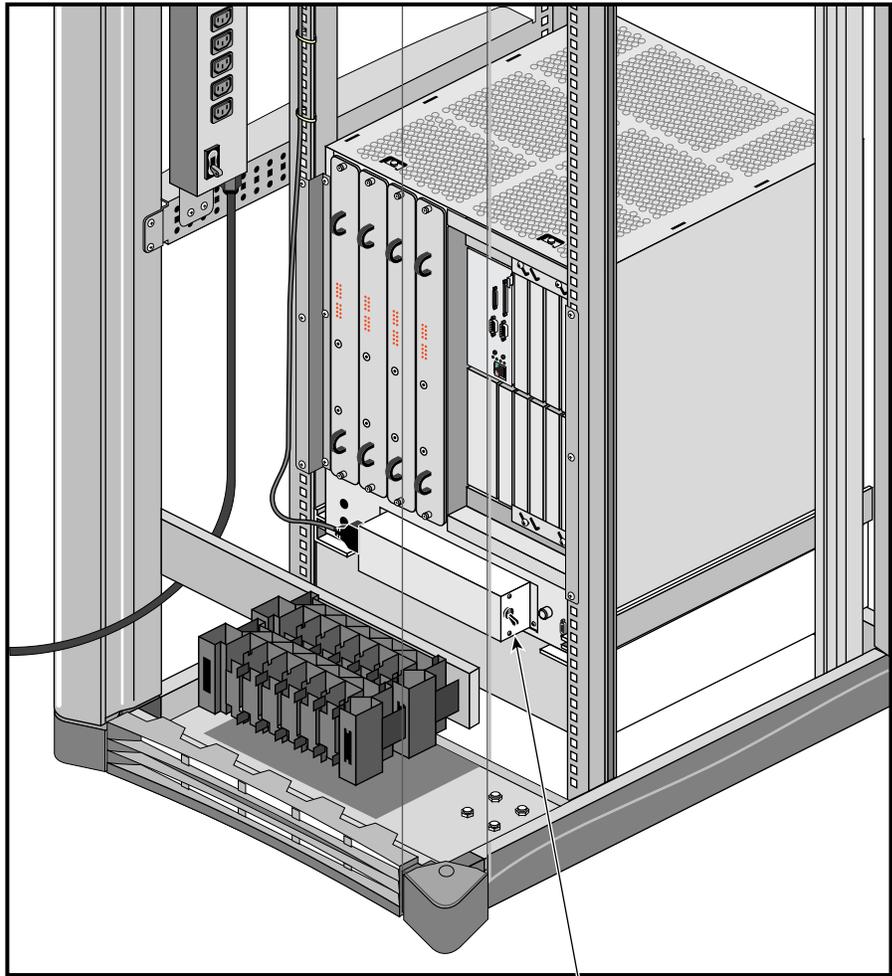
Module power switch

ON   OFF

Figure 6-3   Powering Off a Rackmount Module

Powering Off a Single Rack Configuration

Use these procedures to power off a single-rack system.

1.   Power off the individual system modules, see "Powering Off an Individual Module System" on page 82.

2.   Power off the multimodule System Controller display (see Chapter 7, "Using the System Controller" for additional information.
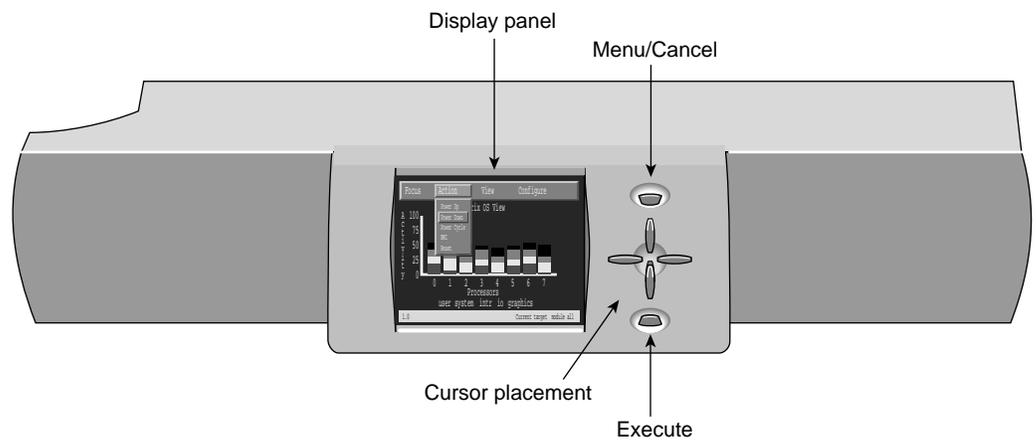
Figure 6-4   Powering Off the Multimodule Controller

3.   Turn off power to the power distribution unit (PDU), see Figure 6-5.

Powering Off a Multi-Module Rack Configuration

See Chapter 7, "Using the System Controller" then use these procedures to completely power down an entire multi-rack configuration.

1. Power down the individual system modules (see "Powering Off an Individual Module System" on page 82).

2. Power off the individual racks. It is recommended that you start from the rightmost rack and then continue with the rack to the left. This helps ensure a cleaner and more efficient shutdown process.

3. Turn off the rack with the multi-module System Controller last (see Figure 6-6).

4. Turn off the PDU on the last rack (see Figure 6-5).

PDU power
switch

PDU off

PDU on
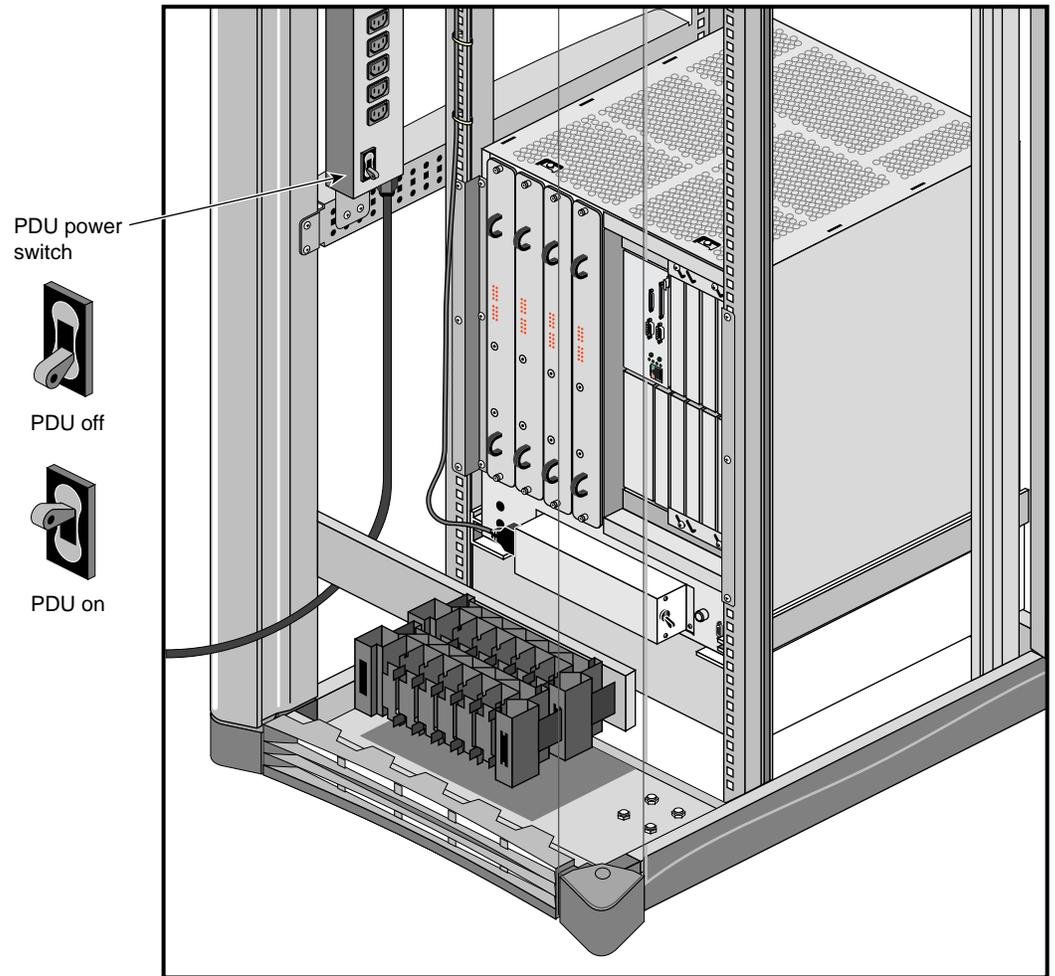
Figure 6-5   Turning Off the PDU

Turn off the rack
with the multi-module
display LAST!!!!
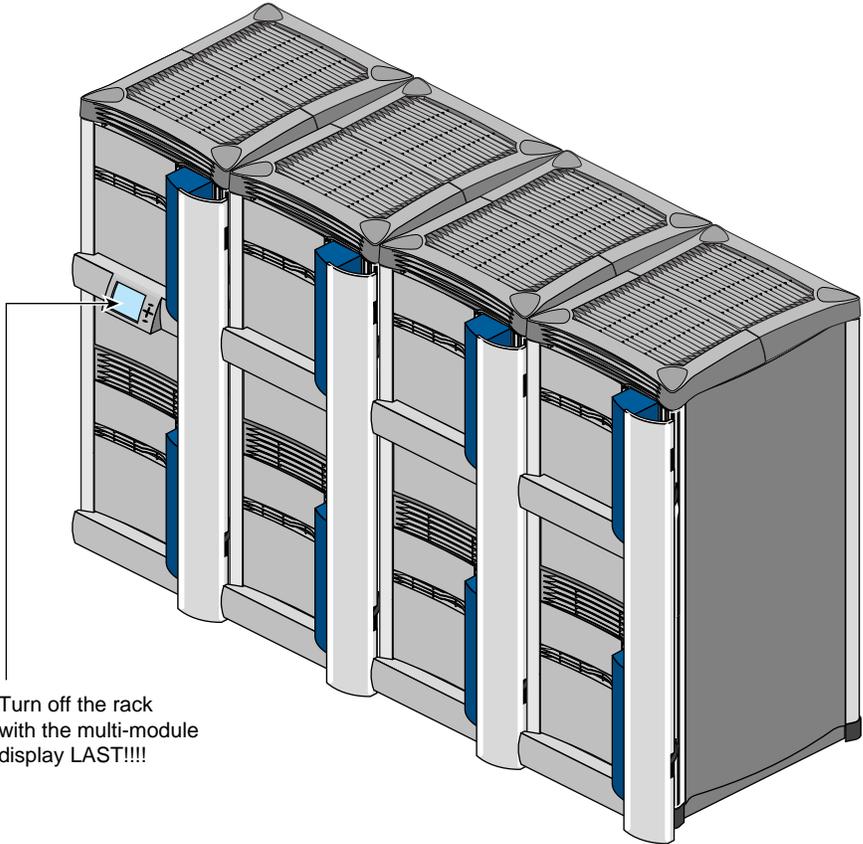
Figure 6-6   Turning Off a Multirack Configuration

Opening the Drive Door

Use these procedures to open the drive door on a rackmount system:

1. Swing open the drive door as shown in Figure 6-7. When closing the door, push it all the way in to engage the plastic tab on the drive bottom of the door.

   Note: The door should normally be in the closed position to help keep away dust and other possible contaminants from the drives and System Controller.
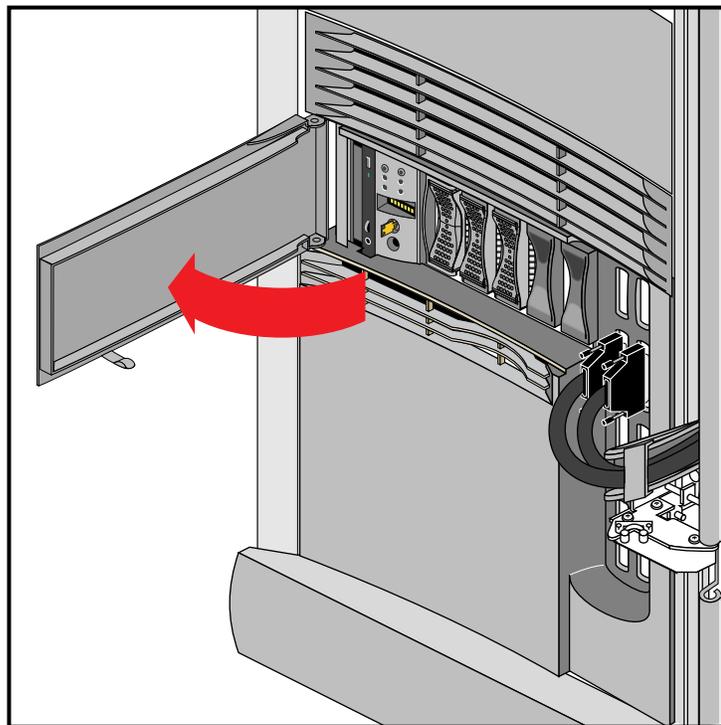
Figure 6-7   Opening the Drive Front Door on a Rackmount System

Opening the Cable Cover Door

The cable cover door (see Figure 6-8) provides aesthetic shielding for the CrayLink Interconnect cabling on the rackmount chassis and between side-by-side rackmount systems.
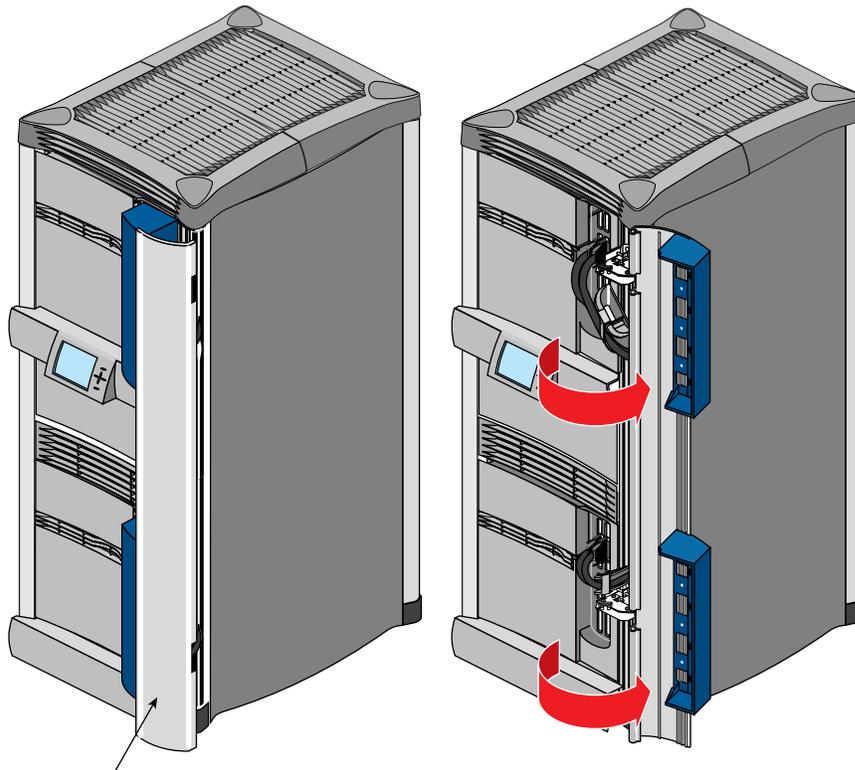
Cable cover door for
Craylink interconnect

Figure 6-8   Opening the Cable Cover Door

Specific Procedures

The following section provides instructions for replacing the customer-replaceable units (CRUs). To replace an CRU, use Figure 6-1 to identify the appropriate unit and its position in the chassis. Then proceed to the appropriate section and perform the steps.

Removing a Drive Module

Disk drive modules are aligned vertically at the front of the chassis. Note that the leftmost disk drive—the system drive—is oriented differently from the others as shown in Figure 6-9.

Optional Disk   Handle in
closed position

Handle in
open position

System Disk   Handle in
closed position

Handle in
open position
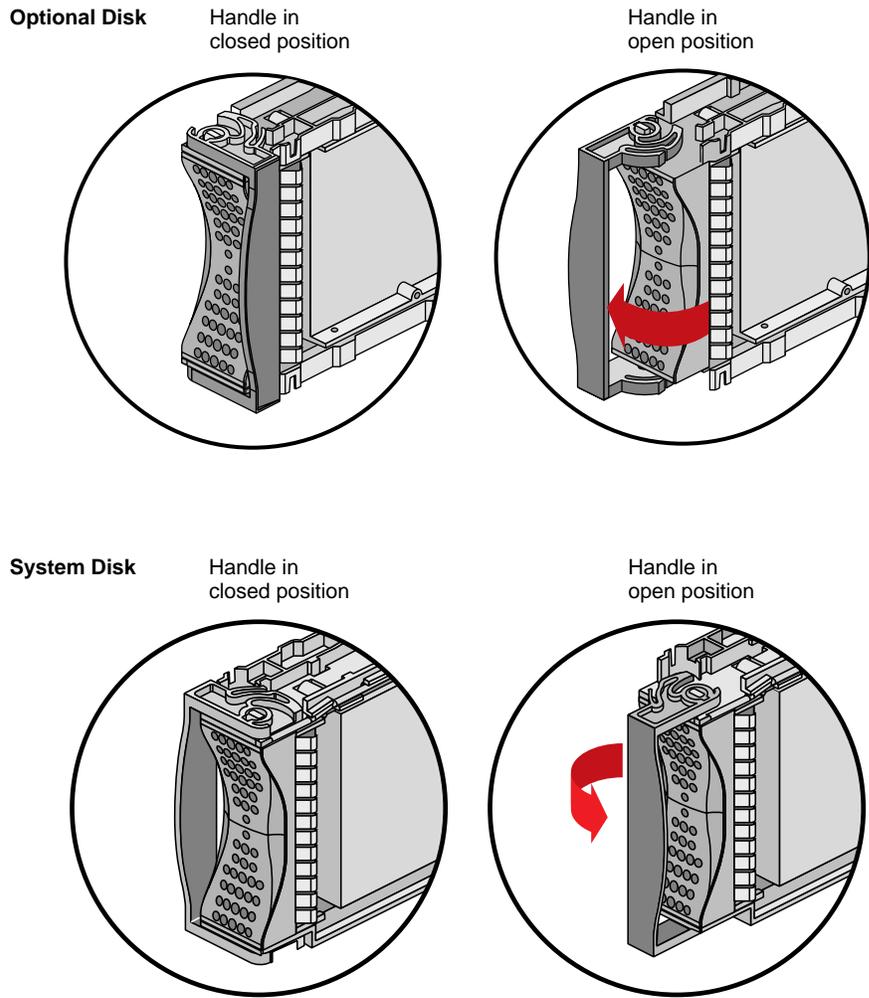
Figure 6-9   Opening the Disk Drive Unit Module

1. To remove a disk drive module, snap the handle to the right or left (depending on the drive orientation) to the open position. The handle is centered, as shown in Figure 6-9.

2. Pull the disk straight out (see Figure 6-10).
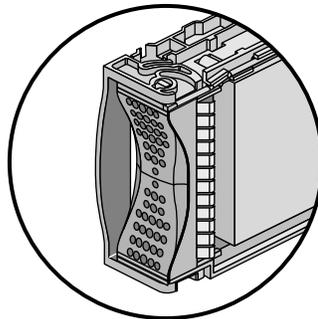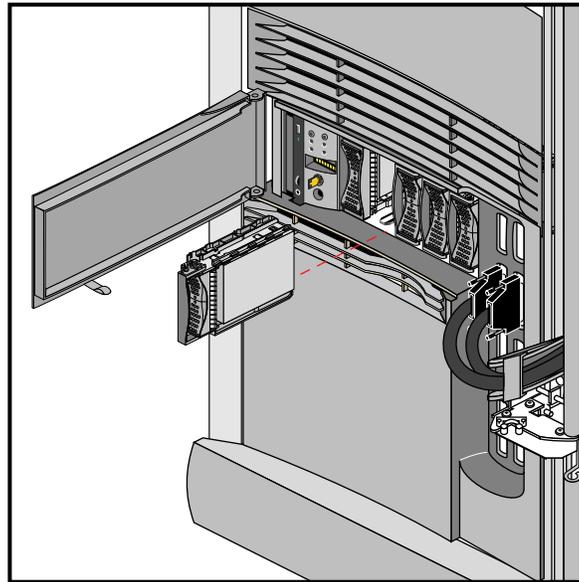
Handle in
closed position
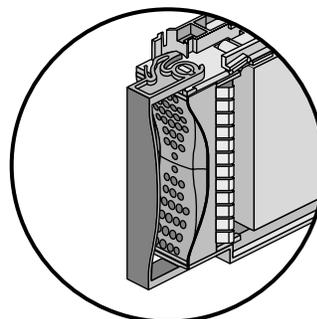
Handle in
open position

Figure 6-10   Removing the Drive

To insert a disk module, follow these steps:

1. If necessary, snap the handle to the open position so that it is centered, as shown in Figure 6-10.

2. If you are adding a drive, remove the drive filler plate that covers the drive slot you want to use.

3. Align the new disk module with the drive guide, as shown in Figure 6-9.

4. Gently but firmly slide the disk module on the guides over the pin. When the disk module is all the way in, it snaps.

5. When the disk module is in all the way, snap the handle right to the closed position, as shown in Figure 6-10. In the case of the system disk module, which is upside down relative to the other drives, snap the handle left.

6. Use the packaging for the new disk module to repackage the old disk module.

Removing the Facade

The facade must be taken off before you can remove the System Controller and CD-ROM assembly. Use these procedures to remove the facade:

1. Lift off the cable bales that hold the CrayLink and Xpress link cables in place.

2. Remove the CrayLink Interconnect and Xpress link connectors from the Rack Router board ports (as required).

   Caution: Be sure that the connectors are labeled before you remove them, so that you know where to replug them afterwards.

3. Remove the screw that secure the facade to the chassis (see Figure 6-11).

4. Lift up to disengage the facade from the chassis; then pull it straight out.

5. Reverse these steps to install the facade.
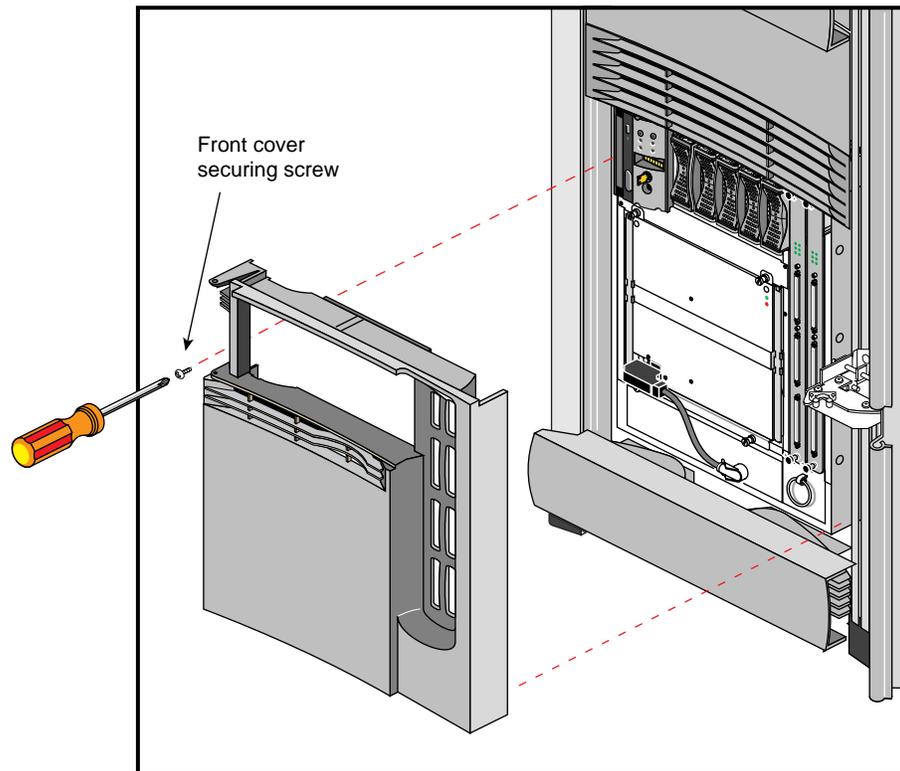
Figure 6-11   Removing the Facade from a System Module

Removing the System Controller and CD-ROM Module

The System Controller and CD-ROM drive are packaged together in one assembly. To replace either component, you must remove and insert an entire new assembly.

Caution: Do not attempt to remove the multimodule System Controller and display. This procedure should only be performed by Silicon Graphics-certified personnel.

1. Power off the system (see "Powering Off a Rackmount System" on page 82).

2. Remove the facade (see "Removing the Facade" on page 94

3. Remove and reserve the screws that hold the assembly in place, as shown in Figure 6-12.

4. Insert the new assembly, using the reserved screws.

5. Repackage the old assembly.
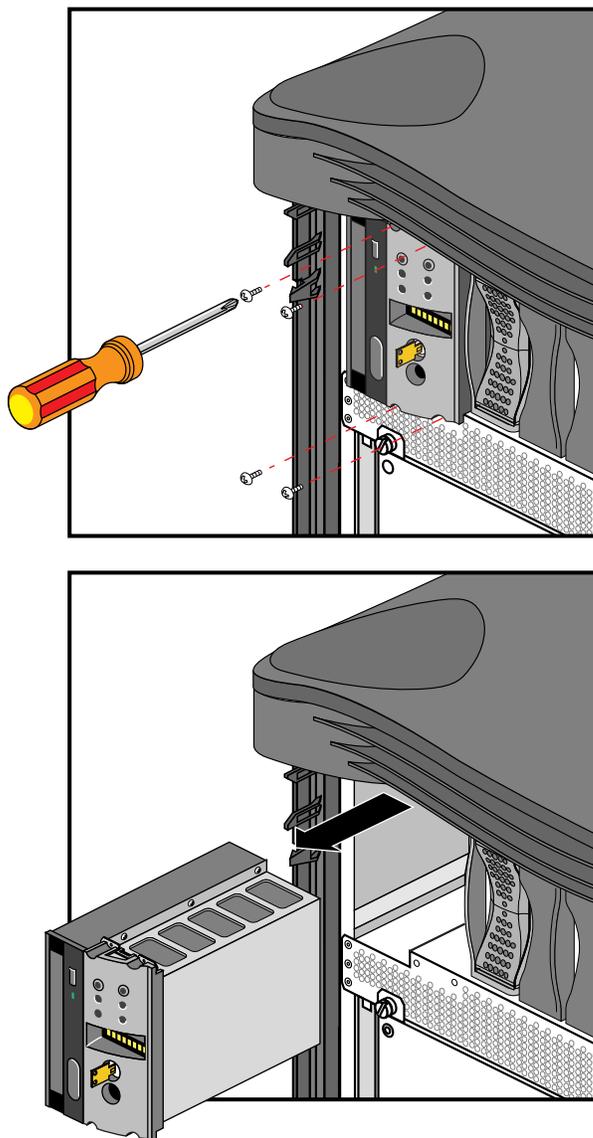
Figure 6-12 Removing the System Controller and CD-ROM

XIO Board Slots

There are certain installation restrictions that must be followed when XIO boards are installed or removed. Failure to follow these configuration rules may result in system or peripheral malfunction.

Always

- Keep the BaseIO (IO6) board installed in XIO slot 1.
- Fill the top XIO slots first (XIO slots 3 and 5 should be filled first).
- Have the PCI module installed in XIO slot 2.

Never

- Move the BaseIO (IO6) board to a slot other than XIO 1.
- Have a SCSI board installed in XIO slot 2.
- Have an XIO board installed in an unsupported slot (see "Board Configuration and Layout" on page 20).

Using the System Controller

This chapter describes how to use the two system controller types in a rackmount system.

- multimodule System Controller (MMSC) and display
- module System Controller (MSC) and display

The multimodule controller is an intelligent rackmounted interface that can monitor one or more system "modules" within a rack. The unit is also known as the full-feature System Controller (FFSC).

The System Controller mounted in a deskside system or a rackmounted system "module" is less sophisticated than the multimodule system controller. Each MSC in a rack reports to and can be controlled by the MMSC. The module System Controller is also known as the entry-level System Controller (ELSC).

Multimodule System Controller (MMSC)

The multimodule System Controller is composed of two main components:

- the front display and input panel
- the processor assembly module

The multimodule controller's front panel interface is only necessary in the primary rack of a fabric-interconnected multiple-rack system.

A processor assembly module must be installed in each rack in a fabric-interconnected multiple-rack system.

Figure 7-1 shows a functional block diagram of the Multisystem Controller.
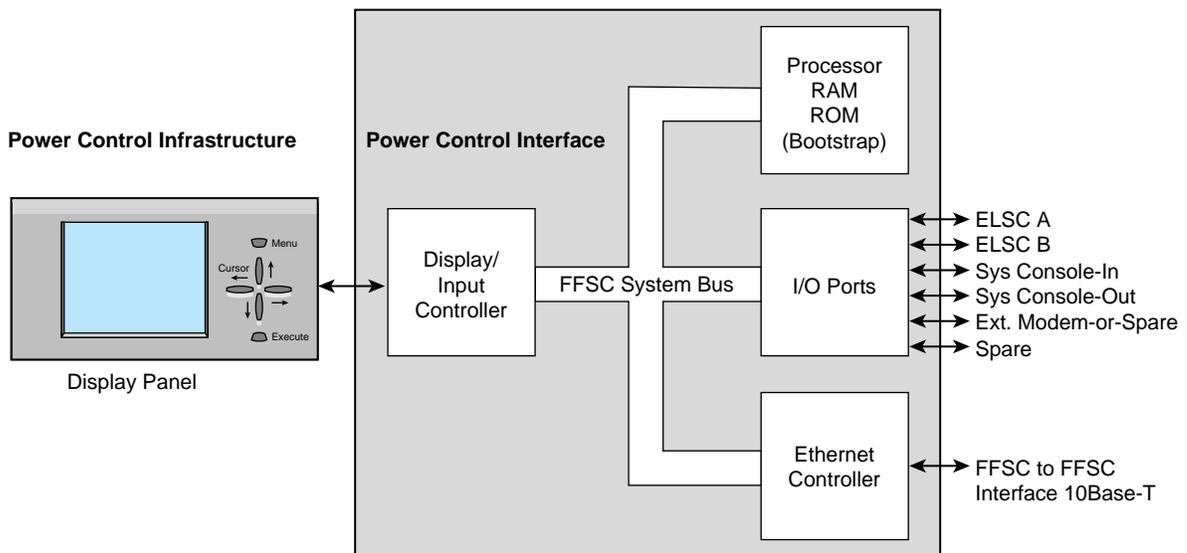
Figure 7-1   Multimodule Controller Functional Block Diagram

The Front Panel Display

The multimodule System Controller assembly in each rack interfaces with the local System Controller RS-232 interface on each system installed in that rack (see Figure 7-2). The "satellite" processor assembly(s) interfaces to the master MMSC (with the front panel display). The processor assemblies in multirack configurations communicate directly via a 10-Base T Ethernet connection. This scheme provides access to every MMSC and MSC in a fabric-interconnected multirack system.

Note that the processor assembly Ethernet is a closed Ethernet system used by the System Controllers only.

Multimodule
System
Controller

To other
Multimodule
System
Controllers

Multimodule
System
Controller
display
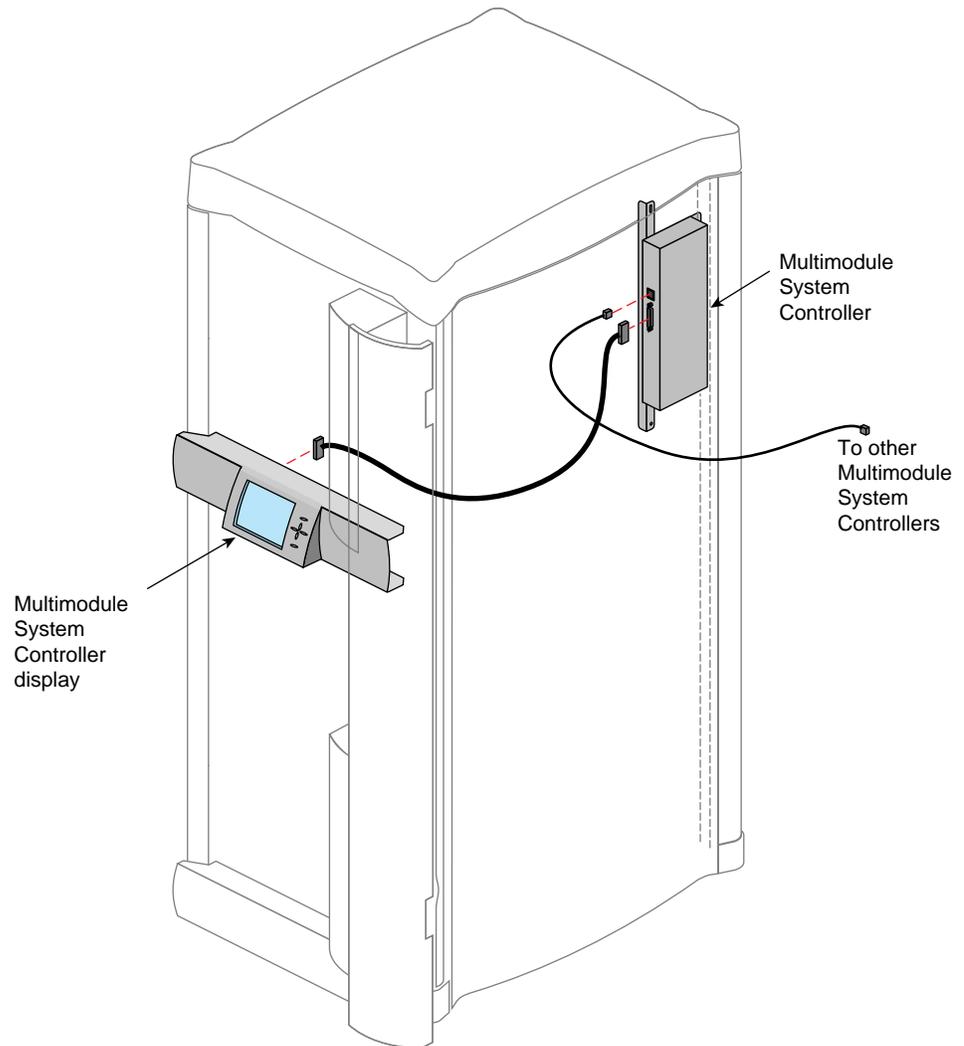
Figure 7-2   The MMSC and Front Panel

The front display and input panel mounts on a cross section piece above the lower front air intake baffle (see Figure 7-3). The front display panel's color TFP (totally flat-panel) screen measures approximately 4 inches high and 5-1/2 inches wide (10.2 cm x 14 cm).

The panel's input device consists of six push button switches:

- one to control menu selection
- one to execute selections
- four to position the cursor (up, down, right, and left)
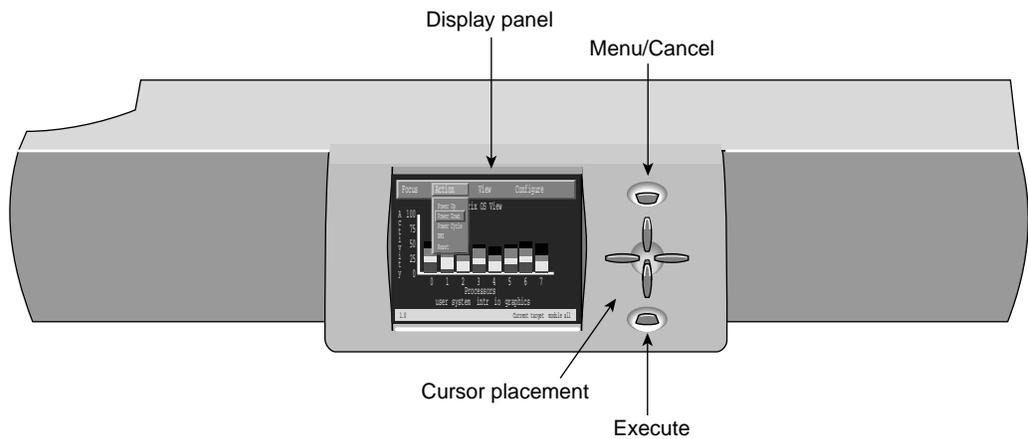
Figure 7-3   MMSC Display

With these buttons you can navigate and execute menu options listed on the display. Communication between multiple fabric-linked rack systems is accomplished with a 10-Base T Ethernet connection. This allows you to communicate with and control system modules (via their MSC) in other racks from a single location.

Caution: The front panel display provides a convenient method to power on, shutdown, reset, and to issue a nonmaskable interrupt (NMI) to the *entire* rack configuration. Use extreme care when issuing these commands from the display. Make sure that all affected users are notified before a system-wide command is executed.

Powering On a Rack

Follow these instructions to power on an entire rack configuration through the MMSC display.

1. Select the Focus menu on the display using the direction keys, then press the Enter key.

    Make sure that the All option is highlighted

2. Go to the "Action" menu on the display using the direction keys (see Figure 7-4).

3. Select the Power Up option and press the Enter key.

Figure 7-4   Action Menu Selection for MMSC Display

Resetting the Rack System

Follow these instructions to reset an entire rack configuration through the MMSC display.

1. Select the Focus menu on the display using the direction keys, then press the Enter key.

    Make sure that the All option is highlighted

2. Go to the "Action" menu on the display using the direction keys (see Figure 7-4).

3. Select the Reset option and press the Enter key.

Powering Down the Rack

Follow these instructions to power down an entire rack configuration through the MMSC display.

1. Select the Focus menu on the display using the direction keys, then press the Enter key.

    Make sure that the All option is highlighted

2. Go to the "Action" menu on the display using the direction keys (see Figure 7-4).

3. Select the Power Down option and press the Enter key.

The Processor Assembly

The processor assembly mounts internally in the rack without removing any boards in the system. Figure 7-5 shows the location of the processor assembly in relation to other components in the rack system. The processor assembly can interconnect directly to

*   the RS-232 System Controller interface on the back of each system module installed in the rack

*   the front display and input panel

*   additional Multisystem Controller processor assembly modules in adjacent racks via 10-Base-T Ethernet

The processor assembly interfaces listed above are augmented by system console in-and-out RS-232 connectors and a modem connector. Note that when the processor assembly is connected to the RS-232 interface on a system mounted in the rack, you may not use the eight-pin DIN connector on the front of a module's System Controller.

Multimodule
System
Controller
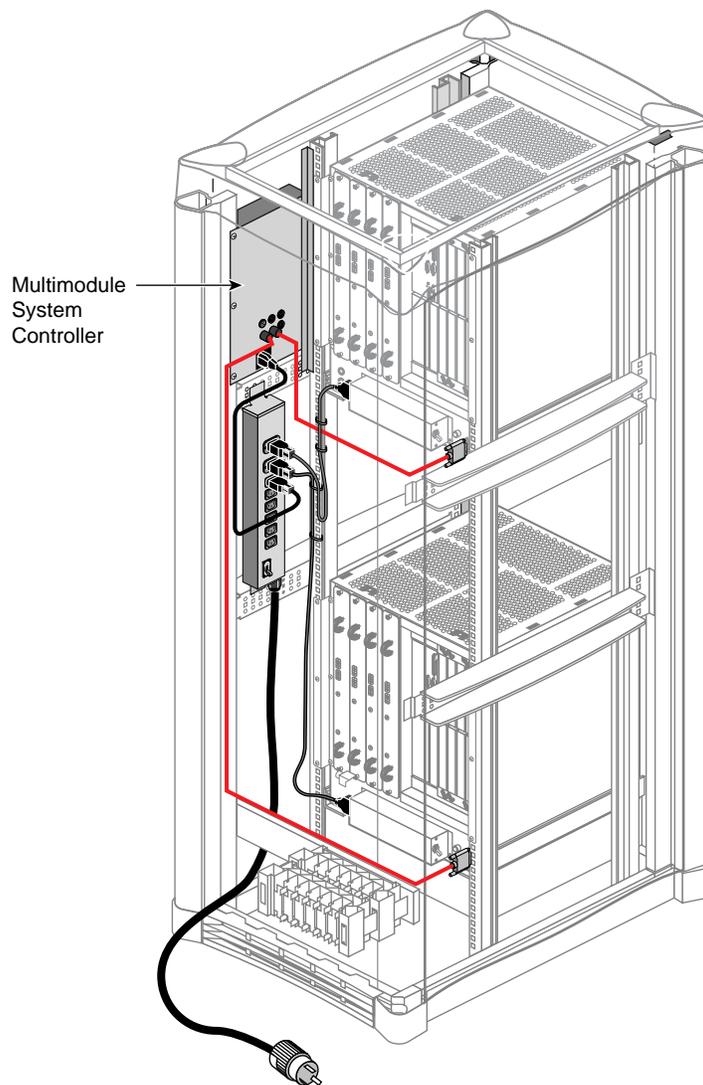
Figure 7-5   Processor Assembly Location in Rack

The System Controller Front Panel

The System Controller front panel is shown in Figure 7-6.
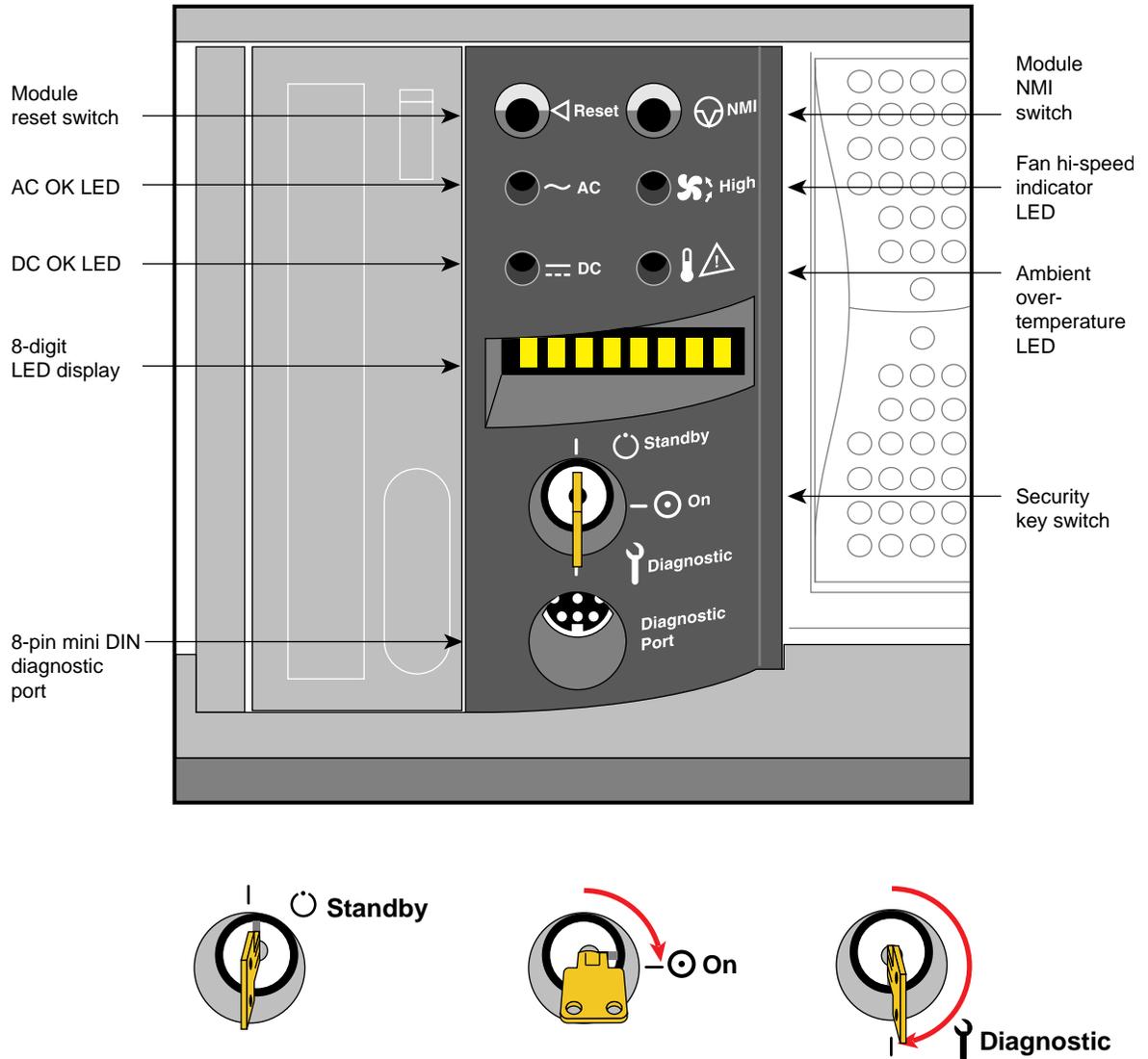
Figure 7-6   Controller Status Panel, Serial Connector, and Switches

The System Controller provides environmental monitoring for safe operation of the deskside system. The controller connects to the system midplane via a transition or "bridge" board and provides easy user access to switches and displays at the front of the deskside system.

In the lower right section on the back of the deskside system is a 9-pin alternate console diagnostic serial connector that is a direct mirror of the 8-pin diagnostic connector on the front panel. Figure 7-7 shows the location and pinouts of the 9-pin rear-mounted System Controller diagnostic connector.

Note: You may not connect serial devices to both the front diagnostic port and rear System Controller diagnostic serial connector at the same time. The connectors are wired through the same circuitry and cannot accept or send signals through both ports at the same time.

System Controller
serial port

**System Controller
Serial Port (DB-9)**

Pin 6 Not used

Pin 7 Request to Send (RTS)

Pin 8 Clear to Send (CTS)

Pin 9 Not Used

Pin 1 Data Carrier Detect (DCD))

Pin 2 Request Data (RXD)

Pin 3 Transmit Data (TXD)

Pin 4 Data Terminal Ready (DTR)

Pin 5 Ground
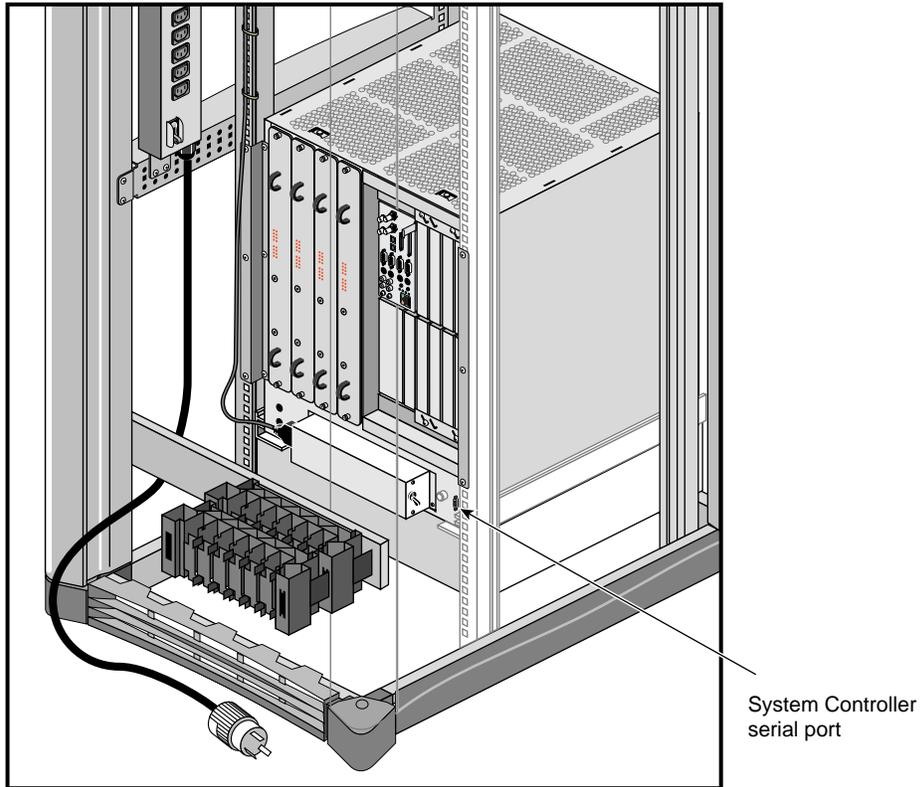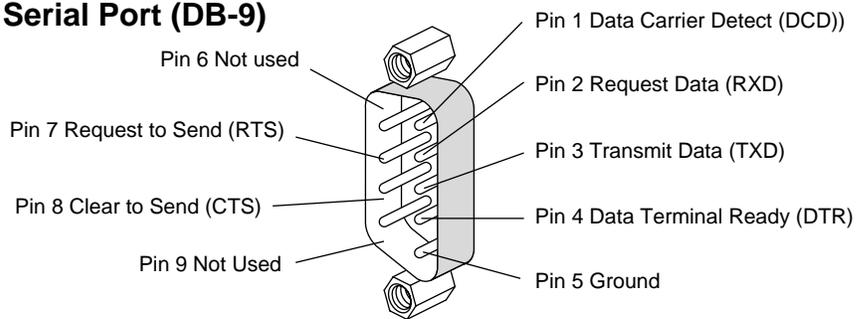
Figure 7-7   System Controller Rear Serial Connector

Understanding the Controller's LEDs and Switches

The System Controller has one keyswitch, two push buttons, and four LED indicators. The following paragraphs provide information on the use or significance of each control or indicator.

The **Front Panel Keyswitch** selects Standby, On, or Diagnostic status for the system.

The **System Reset** push button initiates a system-wide reset of the deskside. The keyswitch must be in the diagnostic position to use this button.

The **Non-Maskable Interrupt** (NMI) switch issues a reset signal to all Node boards in the system. The keyswitch must be in the diagnostic position to use this button.

The **AC Power OK** green LED lights when the system is plugged into an outlet and the AC circuit breaker is turned on. The Controller is receiving DC voltage (V_5 Aux) through the midplane, as are other boards that require it.

The **DC Power OK** green LED lights three and one-half seconds after the keyswitch is turned to the On position. This indicates the system power supply is enabled and operating properly.

The **Fan Speed High** amber warning LED lights as an indication that the ambient temperature is higher than optimal, or a non-critical fan has failed. When a non-critical fan fails, the remaining fans are set at full speed to compensate. In this case, a service call should be placed immediately.

The **Over Temperature Fault** amber warning LED lights when the controller's incoming air temperature or fan failure detection causes a shutdown of the system. If the environmental temperature exceeds the system's tolerance, or if a critical fan fails, the controller shuts down the system. In some cases, a service call should be placed immediately. See the section "System Controller Shutdown" in Chapter 8 for tips on how to troubleshoot this problem area.

Controller Features and Functions

The controller has the following basic features and functions:

- Issues a reset signal at power-on.

- The front-panel mounted keyswitch provides a soft power-off to standby condition.

- A front-panel mounted push-button system reset switch.

- A front-panel mounted push-button non-maskable interrupt (NMI) switch.

- Monitors ambient incoming air temperature into the system and adjusts fan speed accordingly (two speeds). A soft power-off of the system results when ambient temperature becomes too high for safe operation.

- LED display of ambient over-temperature conditions.

- NVRAM for storing configuration information (1024 x 8 bits).

- Monitors fan rotation and automatically increases to high speed fan operation when a fan fails. Signals an impending shutdown when a single critical fan fails, or two or more non-critical fans fail.

- LED display of high fan speed and possible fan tray failure (fan high-speed LED).

- LED display of power supply operation. AC OK LED indicates AC voltage applied to system. DC OK indicates all Power Supply DC voltages (+12 V, +5 V, +3.45 V), and remote DC voltages (3.3 V, 2.4 V, 1.6 V) are present with no error conditions in the system. The DC OK LED does not indicate regulation or accuracy of the DC voltages present.

- Provides a 100-Kbps bidirectional communication path between the System Controller, mid-plane, and Hub ASIC IO space on each Node board in the system. This communication path allows the System Controller to receive system status messages from all Node boards in a system, and to provide status messages from the System Controller and all Node boards in a system. This communication path is referred to as the I2C interface.

- Provides ability to request the system serial number and configuration information via the I2C Interface.

- Eight-digit alphanumeric status display. This display is updated by the System Controller or the Node cards in the system via the I2C interface.

- Provides a seven-wire 9600 BAUD alternate console diagnostic port for off-line configuration and troubleshooting. Also communicates with the Node board(s) when the IO console port or a system console is not available or functional. This interface also supports the minimum requirements for modem support.

- Software Reset, NMI, and soft power-off commands through the alternate console diagnostic port.

- Supports alternate console diagnostic port command line power supply voltage margining. Margining allows the 3.45-V or 5-V outputs of the power supply to be moved 5% higher or lower independently. This does not effect remote regulated termination voltages (1.6 V, 2.4 V, router 3.3 V).

- Supports alternate console diagnostic port command-line regulated termination voltage margining for the termination voltages 1.6 V, 2.4 V, and 3.3 V, (all termination voltages will be margined 5% higher or lower together, not independently). This does not affect the power supply voltages.

- Sends early warning high priority interrupt (Panic Interrupt) to all Node boards warning of impending shutdown due to AC power fail, ambient over-temperature or the switch being placed in the standby position.

- Provides an interlock (removable keyswitch) to prevent unauthorized personnel from turning the system to on or standby, and to limit operation of the System Reset and NMI functions. The software password allows access and permissions through the alternate diagnostic console port.

System Controller Status Messages

The System Controller front panel has an eight-character LED readout that supplies information about system status. Table 7-1 gives a list of System Controller messages and an explanation of what the impacts may be.

Table 7-1   System Controller Messages

Error Message	Meaning of Message
SYS OK	The system is operating normally.
R PWR UP	The system is being powered on remotely via the System Controller's serial connection.
POWER UP	The system is being powered on from the front panel switch.
PFW FAIL	The power supplied to the system has failed or dropped below acceptable parameters. The system has shut down.
PS OT FL	The system's power supply temperature has exceeded safety limits and the system has shut down.
PS FAIL	The internal power supply has failed and the system has shut down.
OVR TEMP	The system's temperature has exceeded acceptable limits and the system has shut down.
KEY OFF	The System Controller's switch has been turned to standby.
RESET	The controller's switch has been turned to the diagnostic position, and the reset has been button pushed.
NMI	The controller's switch has been turned to the diagnostic position, and the non-maskable interrupt (NMI) button pushed.
M FAN FL	More than one fan has failed and the system has shut down.
R PWR DN	The system has been powered off from a remote location.
PWR CYCL	The system has received the command to power cycle from the console or a remote user.
HBT TO	The system has registered a heart beat time-out. A non-maskable interrupt is generated, followed by a system reset.

Table 7-1 (continued)   System Controller Messages

Error Message	Meaning of Message
FAN FAIL	A system fan has failed. If it is fan 1, 2, or 3, the system shuts down. A service call should be placed as soon as possible.
POK FAIL	A power OK failure occurred on an unidentified board.

Having Trouble?

This chapter contains hardware-specific information that can be helpful if you are having trouble with your Origin2000 rackmount server.

Maintaining Your Hardware and Software

This section gives you some basic guidelines to follow to keep your hardware and software in good working order.

Hardware Dos and Don'ts

To keep your system in good running order, follow these guidelines:

- Do not enclose the system in a small, poorly ventilated area (such as a closet), crowd other large objects around it, or drape anything (such as a jacket or blanket) over it.
- Do not place terminals on top of the system chassis.
- Do not connect cables or add other hardware components while the system is turned on.
- Do not power off the system frequently; leave it running overnight and on weekends, if possible.
- Do not leave the key switch in the Diagnostics position.
- Do not place liquids, food, or heavy objects on the system, terminal, or keyboard.
- Ensure that all cables are plugged in completely.
- Ensure that the system has power surge protection.
- Route all external cables away from foot traffic.

Software Dos and Don'ts

When your system is up and running, follow these guidelines:

- Do not turn off power to a system that is currently running software.

- Do not use the root account unless you are performing administrative tasks.

- Make regular backups (weekly for the whole system, nightly for individual users) of all information.

- Protect all accounts with a password. Refer to the *IRIX Admin: Backup, Security, and Accounting Manual* for information about installing a root password.

System Behavior

The behavior of a system that is not working correctly falls into three broad categories:

Operational   You are able to log in to the system, but it does not respond as usual.

Marginal   You are not able to start up the system fully, but you can reach the System Maintenance menu or PROM monitor.

Faulty   You cannot reach the System Maintenance menu or PROM monitor.

If the behavior of your system is operational or marginal, first check for error messages on the System Controller display, then perform a physical inspection using the checklist in the following section. If all the connections seem solid, restart the system. If the problem persists, run the diagnostic tests from the System Maintenance menu or PROM Monitor. See your *IRIX Admin: System Configuration and Operation Manual* for more information about diagnostic tests.

If your system is faulty, turn the power to the main unit off and on. If this does not help, contact your system administrator.

XIO Board Slots Not Functioning

If not all the XIO board slots are functioning, verify your system module has the required number of IP27 Node boards and that the boards are installed in the appropriate slot. See Chapter 2, "Chassis Tour" for additional information

Physical Inspection Checklist

Check every item on this list:

- Make sure the terminal and main unit power switches are turned on.

- If the system has power, check the System Controller display for any messages, then reset the system.

Before you continue, shut down the system and turn off the power.

Verify these connections:

- The terminal cable is connected securely to the rear of the terminal and to the appropriate connector on the BaseIO panel.

- The power cable is securely connected to the terminal at one end and to the power source at the other end.

- The keyboard cable is securely connected to the keyboard at one end and to the terminal at the other end.

- The system power cable is securely installed in the receptacle in the system chassis and in the proper AC outlet.

- The network cable is connected to the appropriate port ant that the key or lock used to secure the network connection is engaged.

- Serial port cables are securely installed in their corresponding connectors.

When you finish checking the hardware connections, turn on the power to the main unit and then to the terminal; then reboot the system. If your system continues to fail, restore the system software and files using the procedures described in the *IRIX Admin: Backup, Security, and Accounting Manual.* If the system fails to respond at all, call your service organization.

System Controller Shutdown

Under specific circumstances the System Controller may shut down the system. Usually this occurs when the operating environment becomes too warm because of fan failure, high ambient temperatures, or a combination of the two.

The System Controller will automatically shut down the system and light the "Over Temperature Fault" LED if any of the following situations occur:

- failure of two or more of the system's nine fans

- failure of one fan plus a high ambient temperature

- failure of any (critical) fan directly responsible for cooling the power supply or a router board

- an unacceptably high ambient temperature

Only the last situation can be dealt with completely by the end user. The first three require a service call by a qualified support technician.

Fixing the System Controller Shutdown

If you determine that a critical fan or fans have failed, you should immediately place a service call. The system is not usable until the faulty fan(s) are replaced.

If the problem involves the combined failure of a single noncritical fan and a high ambient temperature, you should place a service call. You may be able to keep the system running by lowering the ambient temperature of the operating environment while waiting for service.

You could

- lower the air conditioning temperature

- move the system to a cooler environment

- use a portable fan(s) to circulate more air around the system

- use a portable air-conditioner to lower the temperature of the system

If the problem is simply a high ambient temperature, you will need to either lower the work environment temperature or move the system to an area with a lower ambient temperature.

Recovering from a System Crash

Your system might have crashed if it fails to boot or respond normally to input devices such as the keyboard. The most common form of system crash is terminal lockup—a situation where your system fails to accept any commands from the keyboard. Sometimes when a system crashes, data may be damaged or lost.

Using the methods described in the following paragraphs, you can fix most problems that occur when a system crashes. You can prevent additional problems by recovering your system properly after a crash.

The following list presents a number of ways to recover your system from a crash. The simplest method, rebooting the system, is presented first. If it fails, go on to the next method, and so on. Here is an overview of the different crash recovery methods:

- rebooting the system

  Rebooting usually fixes problems associated with a simple system crash.

- restoring system software

  If you do not find a simple hardware connection problem and you cannot reboot the system, a system file might be damaged or missing. In this case, you need to copy system files from the installation tapes to your hard disk. Some site-specific information might be lost.

- restoring from backup tapes

  If restoring system software fails to recover your system fully, you must restore from backup tapes. Complete and recent backup tapes contain copies of important files. Some user- and site-specific information might be lost.

Refer to your *IRIX Admin: Backup, Security, and Accounting Manual* for instructions for each of the recovery methods listed above.

System Specifications

Table A-1 and Table A-2 provide technical specifications for the Origin2000 rack system.

Table A-1   Physical and Environmental Specifications

Dimensions		
Installed:	length	39" (99 cm)
	width	29" (74 cm)
	height	73" (185 cm)
Shipping:	length	81" (206 cm)
	width	47" (120 cm)
	height	49" (125 cm)
Weight:	minimum (empty rack)	300 lbs (136 kg)
	maximum (full rack)	750 lbs (340 kg)
	shipping (maximum)	900 lbs (408 kg)
Floor Loading:	minimum	38 lb/ft^2 (185 kg/m^2)
	maximum	95 lb/ft^2 (466 kg/m^2)
Air Temperature:	operating (< 5000 ft)	41° to 95° F (5° to 35° C)
	operating (> 5000 ft)	41° to 86° F (5° to 30° C)
	non-operating	−4° to 140° F (−20° to 60° C)
Thermal Gradient:	maximum	18° F (10° C) per hour
Altitude:	operating	10,000 ft (3,048 m) MSL, maximum
	non-operating	40,000 ft (12,192 m) MSL, maximum

Table A-2   Electrical and Cooling Specifications

Voltage:		187-264 Volts, 1-phase
Watts (from-the-wall):	maximum	5750 watts
Power Factor		0.98
Inrush Current	maximum	400
Frequency		47-63 Hertz
Heat Output:		19,550 Btu/hr (1.63 ton AC load)

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