Onyx2™ Deskside Workstation Owner's Guide

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Onyx2™ Deskside Workstation Owner's Guide
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About This Guide

This guide is designed to help you use, manage, troubleshoot, and upgrade your Onyx2™ deskside graphics workstation. This document is organized as follows:

Chapter 1   "Introducing the Onyx2 Deskside Workstation" describes the system and its capabilities and contrasts them with other workstation technology. A brief overview of the workstation's compute and interface capabilities is provided.

Chapter 2   "Chassis Tour" describes all of the system components and reviews all of the controls, indicators, and connectors. A brief overview of the workstation's compute and graphics capabilities is provided.

Chapter 3   "Getting Started" reviews hardware-specific operating procedures. The chapter covers booting the system, graceful shutdown and proper use of monitors and video peripherals. Keyboard and mouse installation are covered and an introduction to the video format combiner is given.

Chapter 4   "Onyx2 Deskside I/O Interfaces and Cabling" covers the use of optional CPUs and graphics boards. The graphics BaseIO board assembly and its Ethernet, serial, and fiber-based interfaces is discussed.

Chapter 5   "Installing and Replacing Customer-Replaceable Units" describes installation and replacement procedures for the CD-ROM, System Controller, system disk, and data disks.

Chapter 6   "Using the System Controller" describes the basic System Controller functions and the interface panel used with the deskside Onyx2.

Chapter 7   "Basic Troubleshooting" offers information on tracking down and fixing simple problems, and using diagnostics.

Appendix A   "Video Format Combiner Introduction and Tutorial" provides example exercises that demonstrate tasks you can perform using the Video Format Combiner

Start at the beginning of this guide to familiarize yourself with the features of your new system, or proceed directly to the information you need using the table of contents as your guide.

Additional software-specific information is found in the following software guides:

- *Personal System Administration Guide*

- *IRIX Admin: System Configuration and Operation*

- *IRIX Admin: Software Installation and Licensing*

Finding Additional Information

The *Onyx2 Deskside Workstation Owner's Guide* (this book) covers many basic and useful topics related to setting up, operating, and maintaining your deskside graphics workstation (see Figure i). This section describes various sources of information that you may find helpful or vital to your work with the deskside Onyx2 workstation.

Read the *Onyx2 Deskside Workstation Owner's Guide* whenever you need help with the basic hardware aspects of your system. The procedures in this guide are designed to show you how to maintain 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 maintenance provider to have an authorized service provider work with the hardware instead.
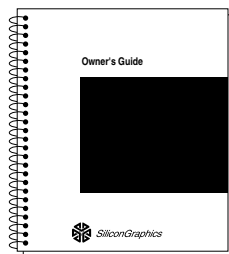
Figure i   Onyx2 Deskside Workstation Owner's Guide

Figure ii illustrates various sources of information available for using the Onyx2 deskside graphics workstation.

Hardcopy

Owner's Guide

Owner's Guide

Optional

IRIX Admin: Software Installation and Licensing

IRIX Admin: Selected Reference Pages

IRIX Admin Manual Set

IRIX 6.X Systems

Online

CDs (InSight Books)

Reference (Man) Pages

World Wide Web

http://www.sgi.com/
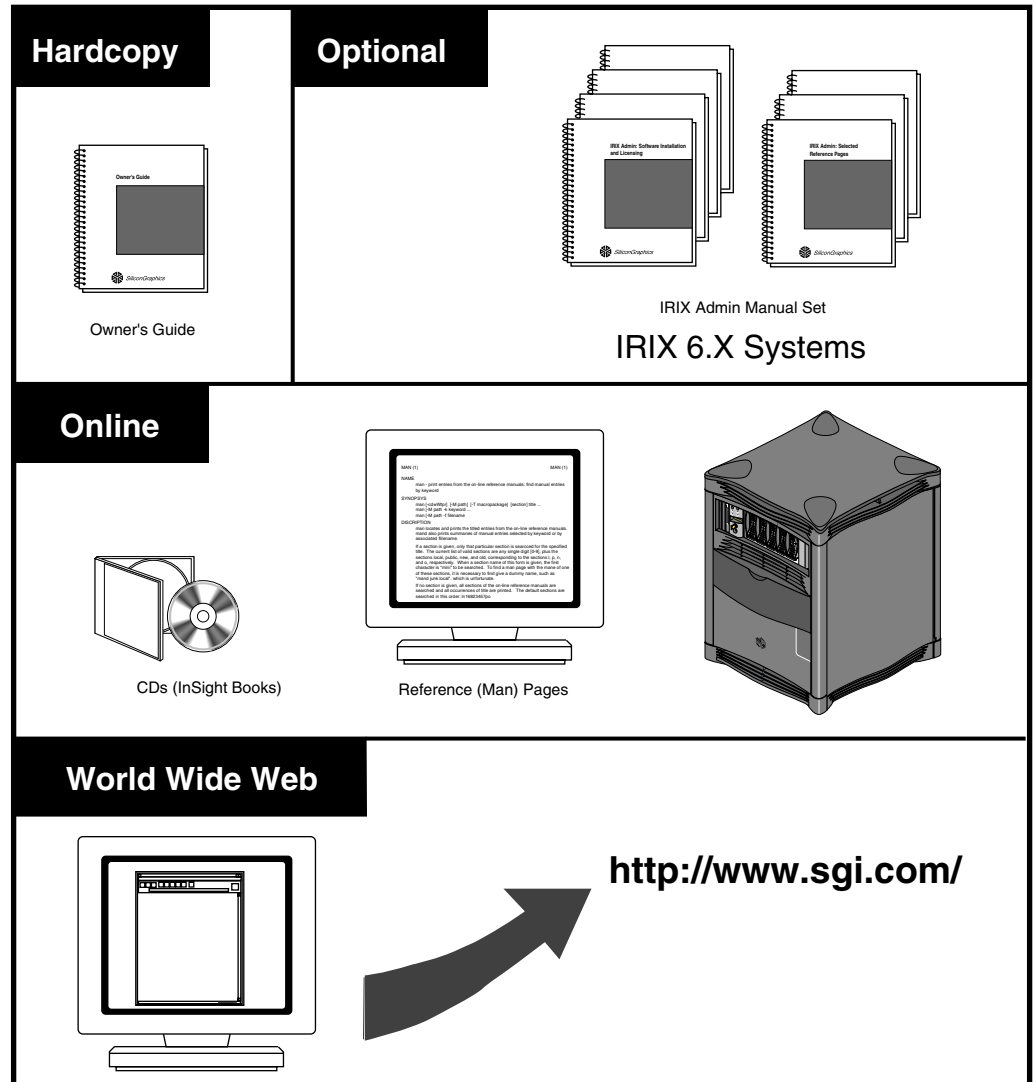
Figure ii   Information Sources for the Deskside Workstation

Online Reference (Manual) Pages

Your deskside 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 reference 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 describe 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   Graphical viewer for online release notes.

To see a list of available Release Notes, enter the following at a shell prompt:

```
relnotes
```

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

World Wide Web-Accessible Documentation

If you don't have printed manuals available and you can access the Internet, Silicon Graphics makes its manuals available in a variety of formats via the World Wide Web (WWW). Using your Web browser, open the Technical Publications Library at the following URL:

http://techpubs.sgi.com/library/

Once you are in the Library, select Catalogs> Hardware Catalog > and look under the product name for the document you need.

Typographical Conventions

The *Onyx2 Deskside Workstation Owner's Guide* uses these conventions:

- Document titles 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 filenames.

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

Introducing the Onyx2 Deskside Workstation

The Onyx2 deskside system, model CMN A015, is a scalable, high-performance workstation in a compact deskside enclosure. This guide contains information for end users about the deskside system hardware.

Onyx2 System Features

The Onyx2 deskside workstation (shown in Figure 1-1) comes with one or two combined CPU and memory boards called "Node boards." Each Node board uses one or two 64-bit CPU microprocessors. The entry-level Onyx2 deskside system uses one 64-bit microprocessor. The system can use up to four when fully configured.

The following standard features come with the Onyx2 deskside workstation:

- One (CPU and memory) Node board with one or two 64-bit microprocessors.

- A graphics BaseIO (also known as the IO6G) XIO board. It provides digital and analog audio, serial ports, a parallel port, two keyboard and mouse connectors, and a single-ended SCSI-2 port.

- A color graphics monitor, a keyboard, and a pair of speakers.

- One graphics board set (pipe). The board set can be either the Onyx2Reality, or the high performance InfiniteReality or InfiniteReality2, (see Figure 1-1).

- Slots for up to four optional XIO I/O boards. Note that the deskside workstation does not come with any VME™ slots. For information on optional VME products, see the *Origin2000 and Onyx2 VME Option Owner's Guide* (p/n 007-3618-*xxx*).

- An independent system status monitor (module System Controller) that records error information during any unplanned shutdown.

- Spaces for up to five half-height single-connector assembly (SCA) SCSI disk drives, plus a 5.25-inch internal drive bay with a standard CD-ROM drive installed.

- A minimum of 64 MB of RAM on each system Node board installed.

Available options include

- an additional Node board (each workstation can hold two)

- additional hard disk drives

- a system console ASCII terminal

- CPU and memory upgrades

- graphics board upgrades

- optional XIO boards that provide Ethernet, ATM, HIPPI, fibre channel, and other connections

- a three-board PCI module that connects to the second XIO slot (each of the PCI slots supports a 25-watt PCI board)

Rear

Front
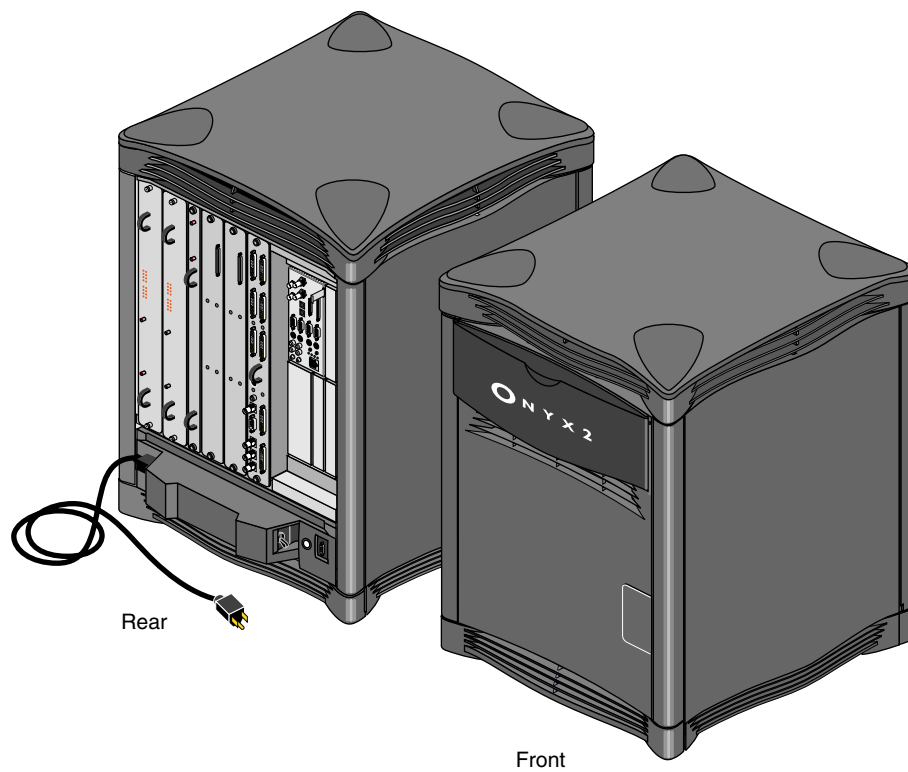
Figure 1-1　　Onyx2 Deskside Workstation

The Onyx2 deskside workstation is similar in size to previous Silicon Graphics deskside systems. However, all of its internal features are completely different in design.

Onyx2 Deskside Functional Overview

The Onyx2 deskside workstation uses a new concept in symmetric multiprocessing systems; it has a distributed shared-memory architecture called S2MP™ Architecture. This is a revolutionary (rather than evolutionary) technology step for Silicon Graphics workstations.

Linked Microprocessors

The Node boards within the Onyx2 system use links that differ from bus technology. While a bus is a resource that can be used by only one processor at a time, the communications "fabric" in the Onyx2 makes connections from processor to processor as they are needed. Each Node board contains either one or two processors, a portion of main memory, a directory to maintain cache coherence, and two interfaces:

- The first interface connects to multiple I/O devices.

- The second interface connects to the second Node board through the S2MP interconnect.

This web of connections differs from a bus in the same way that multiple dimensions differ from a single dimension. You could describe a bus as a one-dimensional line while the Onyx2 uses a multi-dimensional mesh.

The multiple data paths used are constructed as they are needed by router ASICs, which act as switches. When you add a second Node board, you add to and scale the system bandwidth.

S2MP Architecture and Memory

Main memory on each Node board in the system can be distributed and shared amongst the system microprocessors. This shared memory is accessible to all processors through the S2MP interconnection architecture and can be accessed with low latency.

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Each Node board in the deskside system is an independent memory source and is capable of optionally supporting up to 4 GB of memory. A directory memory keeps track of information necessary for hardware coherency and protection.

Each Node board uses a "Hub" ASIC that is the distributed shared-memory controller. It is responsible for providing all of the processors and I/O devices with transparent access to all of distributed memory in a cache-coherent manner. (Cache coherence is the ability to keep data consistent throughout a system.) In the Onyx2 system, data can be copied and shared amongst 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 system's cache coherence protocol is designed to keep data consistent and to disperse the most-recent version of data to wherever it is being used.

Although memory is physically dispersed across the system Node boards, special page migration hardware moves data into memory closer to a processor that frequently uses it. This page migration scheme reduces memory latency, which is the time it takes to retrieve data from memory. Although main memory is distributed, it is universally accessible and shared between all the processors in the system. Similarly, I/O devices are distributed among the Nodes, and each device is accessible to every processor in the system.

Node Boards

The Onyx2 deskside's microprocessor "brains" and primary memory are located on a processor board called a Node board. Each Node board (up to two per system) in the Onyx2 deskside can house one or two 64-bit microprocessors. Each microprocessor uses a customized two-way interleaved data cache, and has dedicated second-level cache support. A high-performance bus interface links the CPU directly with supporting SRAM.

The Node board's main memory slots can be populated with 32 MB or 64 MB memory modules. See Figure 1-2 for an example Node board illustration.

Note that directory memory is used only in large-scale rackmounted systems; there is no reason to use directory memory in a deskside system.

Main memory DIMM

Main memory
DIMM slots (16)

Power/
ground

Directory memory
DIMM slots (8)

HUB chip with
heat sink

300-pin
compression
connector

Power/
ground

Processors and secondary
cache (HIMM) with heat sink
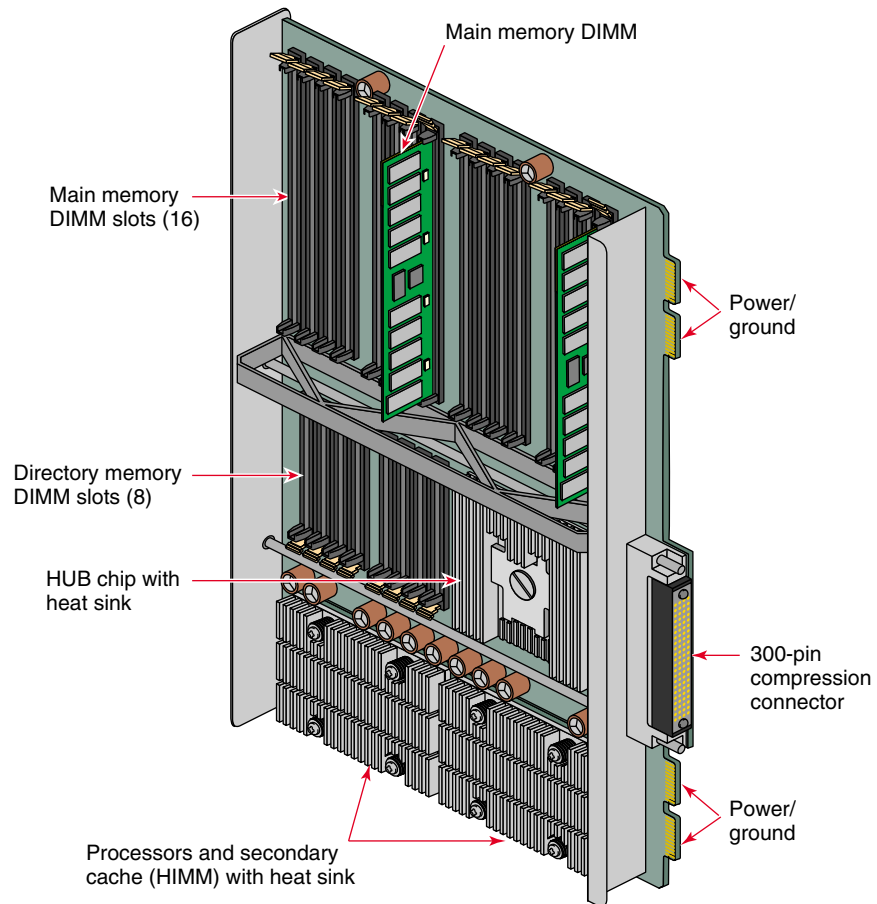
Figure 1-2   Node Board Example

Graphics Boards

The Onyx2 deskside graphics workstation is available with different graphics boards: Onyx2Reality, InfiniteReality or InfiniteReality2. The Onyx2Reality, InfiniteReality, and InfiniteReality2 are graphics board sets that include a GE board, one or two RM assemblies, and a DG board (see Figure 1-3). The graphics board set (also known as a graphics "pipe") provides all the system video interfaces to peripheral products. These products include multisync color monitors, video mixers, VCRs, StereoView™ glasses, composite tape decks, etc. Note that all audio connections are made to the BaseIO panel.

5

Reserved
(not a SCSI
connector)

GE

RM/TM

RM/TM

DG5-8
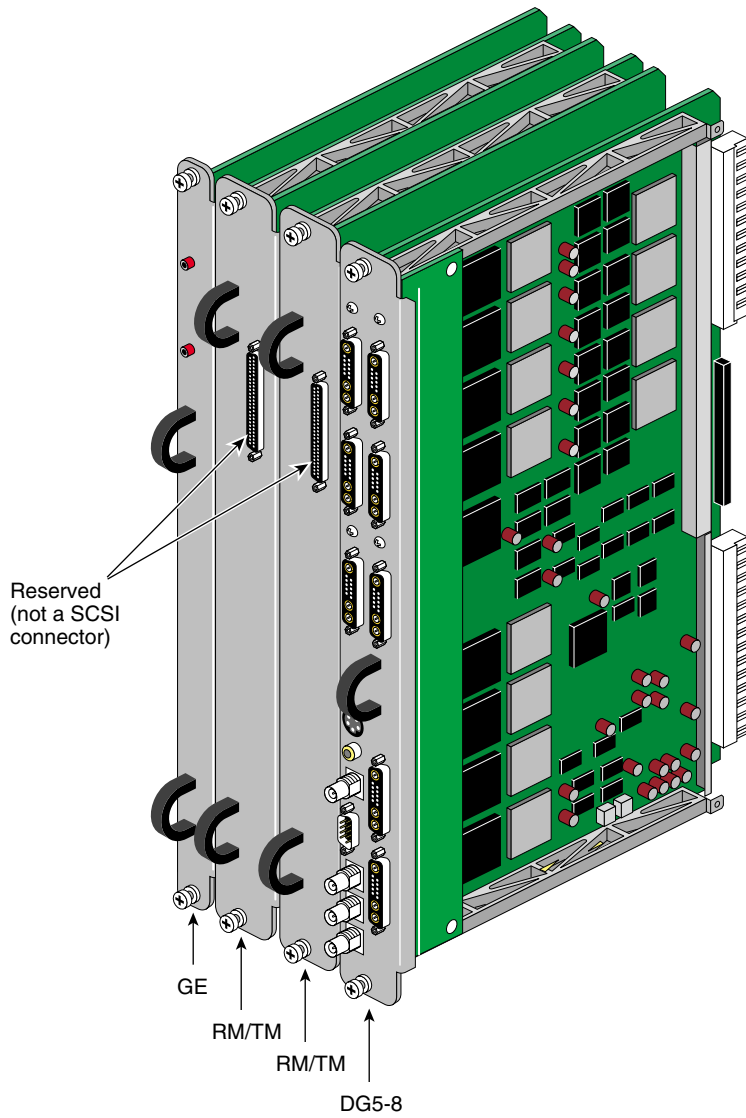
Figure 1-3   Onyx2Reality, InfiniteReality, orInfiniteReality2 Graphics Board Set

Note: The Onyx2Reality, InfiniteReality, or InfiniteReality2 graphics board sets are compatible only with Onyx2 product midplanes. They may not be transferred to or installed in any other type of Silicon Graphics system. The 68-pin connector at the top of the RM board is reserved for use with caligraphics lights support. It is not a SCSI connector and should not be connected to any SCSI drives.

110 V Onyx2 deskside graphics systems are available only in North America and only in limited configurations (see Table 3-1 in Chapter 3). Each graphics board set can have one or two RM assemblies and the DG board optionally supports up to eight monitors.

Graphics BaseIO Assembly

The standard I/O subsystem consists of a BaseIO board assembly (also known as the IO6G) that supports

- one 36-pin IEEE 1284-C compatible parallel port

- four nine-pin serial ports (each port software selects for RS-232 or RS-422 operation)

- one single-ended 68-pin ultra SCSI and SCSI-2 compatible connector

- two six-pin mini DIN mouse connectors

- two six-pin mini DIN keyboard connectors

- a 10/100 Mb per second Ethernet connection (10 Base-T or 100 Base-T is automatically selected)

- two analog stereo input 2.5 mm RCA type jacks

- two analog stereo output 2.5 mm RCA type jacks

- powered speaker 2.5 mm power jack

- stereo headphone or powered speaker output 3.5 mm stereo jack

- analog mono microphone input 3.5 mm jack

- digital audio stereo input (AES-3id-1995) 75 ohm BNC jack

- digital audio stereo output (AES-3id-1995) 75 ohm BNC jack

- optical digital stereo input connector (eight-channel ADAT®)

- optical digital stereo output connector (eight-channel ADAT)

- two loop-through video sync 75-ohm BNC inputs

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Additional I/O connection capabilities are available with optional XIO boards.

About the XIO Boards

XIO boards give the deskside system a wide range of optional interfaces in a manner similar to VME interfaces. Optional XIO boards can support communication interfaces such as

- FDDI

- fibre channel

- HIPPI

- multiport ultra (FAST-20) SCSI and SCSI-2

- ATM

- multiport Ethernet

Check with your Silicon Graphics sales or support representative for information on these or other optional interfaces available on XIO boards. Figure 1-4 shows the Onyx2Reality, InfiniteReality or InfiniteReality2 XIO slot number assignments in relation to other system boards. Note that XIO4 is used by the graphics board set. There is no functional XIO connection below XIO slot 3.
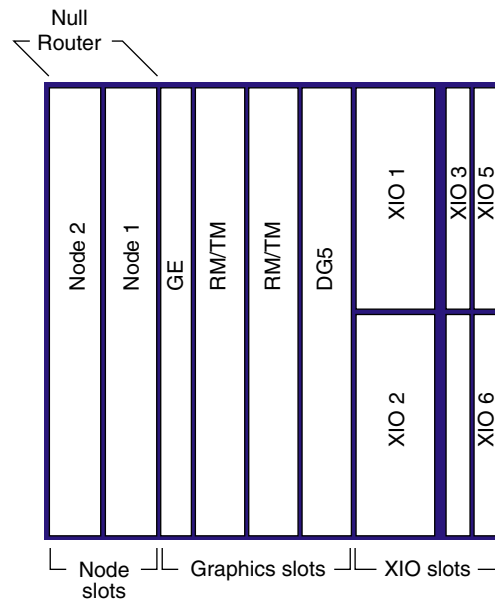
Figure 1-4   Onyx2Reality, InfiniteReality, or InfiniteReality2 Board Locations

Module System Controller

Located between the disk drive slots and the CD-ROM drive bay is the module System Controller (MSC). The MSC is a microprocessor-controlled subsystem that is mounted directly to the system midplane by way of an extender board. It monitors various system operations, including chassis temperature, system fan speed, midplane voltage levels, and the system clock.

When any operating parameter exceeds or drops past a specified limit, the MSC can execute a controlled shutdown of the deskside system. During such a shutdown procedure, the controller maintains a log with the last error message(s) received before the shutdown.

For information on using the MSC, see Chapter 7 in this document.

System Location and Environment

This section covers the basic requirements for physical location to ensure proper chassis operation.

The Onyx2 deskside chassis is designed to fit into an office work environment. Take care to maintain the following operating conditions:

- The chassis should ideally have a six-inch (15 cm) minimum air clearance above the top. The first line of Table 1-1 shows the side clearances required if the chassis is positioned under a desk or other equipment and the top air clearance is less than six inches (15 cm). The side air clearances should always be at least as great as those listed on the second line of Table 1-1.

Table 1-1   Air Clearance Requirements for the Deskside System

Top Clearance	Left Side	Right Side	Front	Back
6″ (15 cm) or less	6″ (15 cm)	6″ (25 cm)	8″ (20 cm)	8″ (20 cm)
More than 6″ (15 cm)	1″ (2.5 cm)	1″ (2.5 cm)	6″ (15 cm)	6″ (15 cm)

- The chassis should be protected from harsh environments that produce excessive vibration and heat.

- The chassis should be kept in a clean, dust-free location to reduce maintenance problems.

- Available power must be rated for computer operation (20 amps at 110 V or 16 amps at 220 V).

Table 1-2 provides the basic physical specifications for the deskside system.

If you have additional questions concerning physical location or site preparation, see the *Site Preparation for Origin Family and Onyx2* manual (part number 007-3452-*xxx*). If you are unable to find the information you need, contact your Silicon Graphics System Support Engineer (SSE) or other authorized support organization representative.

Table 1-2   Deskside System Physical Specifications

Dimensions		
installed:	height	26.5″ (67.3 cm)
	width	20″ (50.8 cm)
	length	24″ (61 cm)
Weight:	minimum	120 lbs (54.5 kg)
	maximum	170 lbs (77.3 kg)
	shipping (max.)	190 lbs (86.4 kg)
Floor Loading:	minimum	36 lb/ft² (175 kg/m²)
	maximum	51 lb/ft² (250 kg/m²)
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)
Altitude:	operating	10,000 ft (3,048 m) MSL, maximum
	non-operating	40,000 ft (12,192 m) MSL, maximum
Humidity:	operating	10% - 90% (non-condensing)
	non-operating	10% - 95% (non-condensing)
Acoustics:	typical	50 dBa

Chassis Tour

This chapter is intended to familiarize you with the physical, electrical, and mechanical aspects of the Onyx2 deskside workstation. Standard controls and connectors are described and illustrated along with major components that go in the Onyx2 deskside chassis. The deskside workstation houses all boards, drives, and other components in a single, upright enclosure. With its small physical dimensions and quiet operation, the system fits into a lab, server room, or a normal office environment.

Commonly used optional components are also shown and discussed in this chapter.

Deskside System Physical Description

The Onyx2 deskside system is a compact high-performance graphics workstation that easily fits in most office environments.

The unit weighs a minimum of 120 pounds (54.5 kg) but is easily moved about on its four rollers. When fully loaded the system could weigh as much as 170 pounds (77.3 kg). Never attempt to lift the unit without the assistance of other people.

See the *Site Preparation for Origin Family and Onyx2* manual (part number 007-3452-*xxx*) for additional physical planning information.

Figure 2-1 shows the deskside chassis and some of its major components.

Left side panel
assembly

Cap

Upper plenum

AC cover

Module
system
controller

CD-ROM

System disk

Blank drive panels

Front door

Onyx2

SiliconGraphics

Front panel

Right side panel
assembly
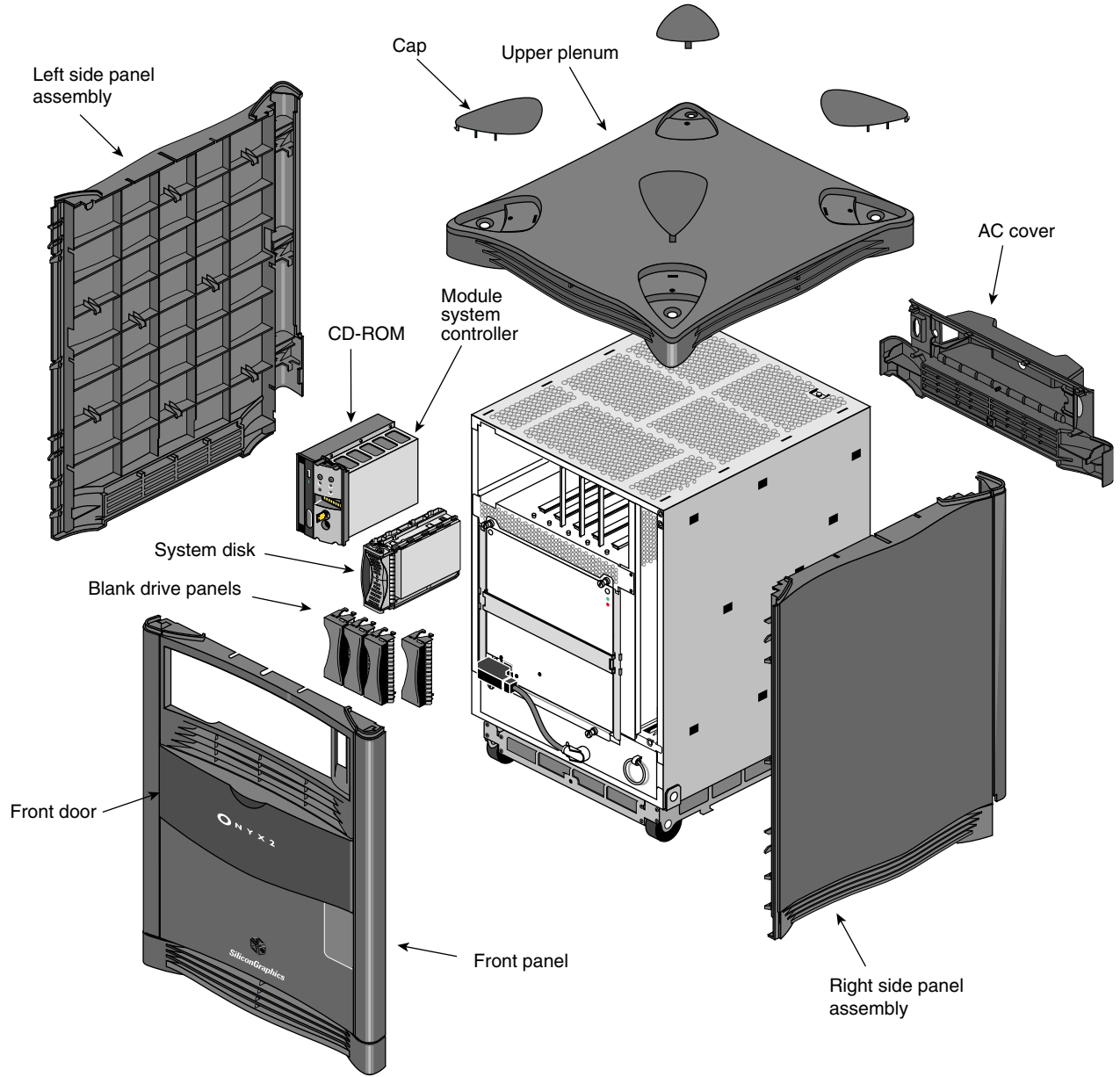
Figure 2-1   Deskside System Components

System Midplane

The Onyx2 deskside enclosure uses a midplane rather than a backplane like those used in previous Silicon Graphics deskside systems. This configuration allows boards, disk drives, and other devices to plug into both sides of the system, which provides maximum functionality and expansion in a compact deskside unit (see Figure 2-2).

Ultra SCSI and SCSI-2 disk and CD-ROM drives are the only devices internally supported by the Onyx2 deskside systems.

Midplane

Null router

Module
system controller

CD-ROM

Node 1

Node 2

GE

RM

RM

DG5

BaseIO

XIO
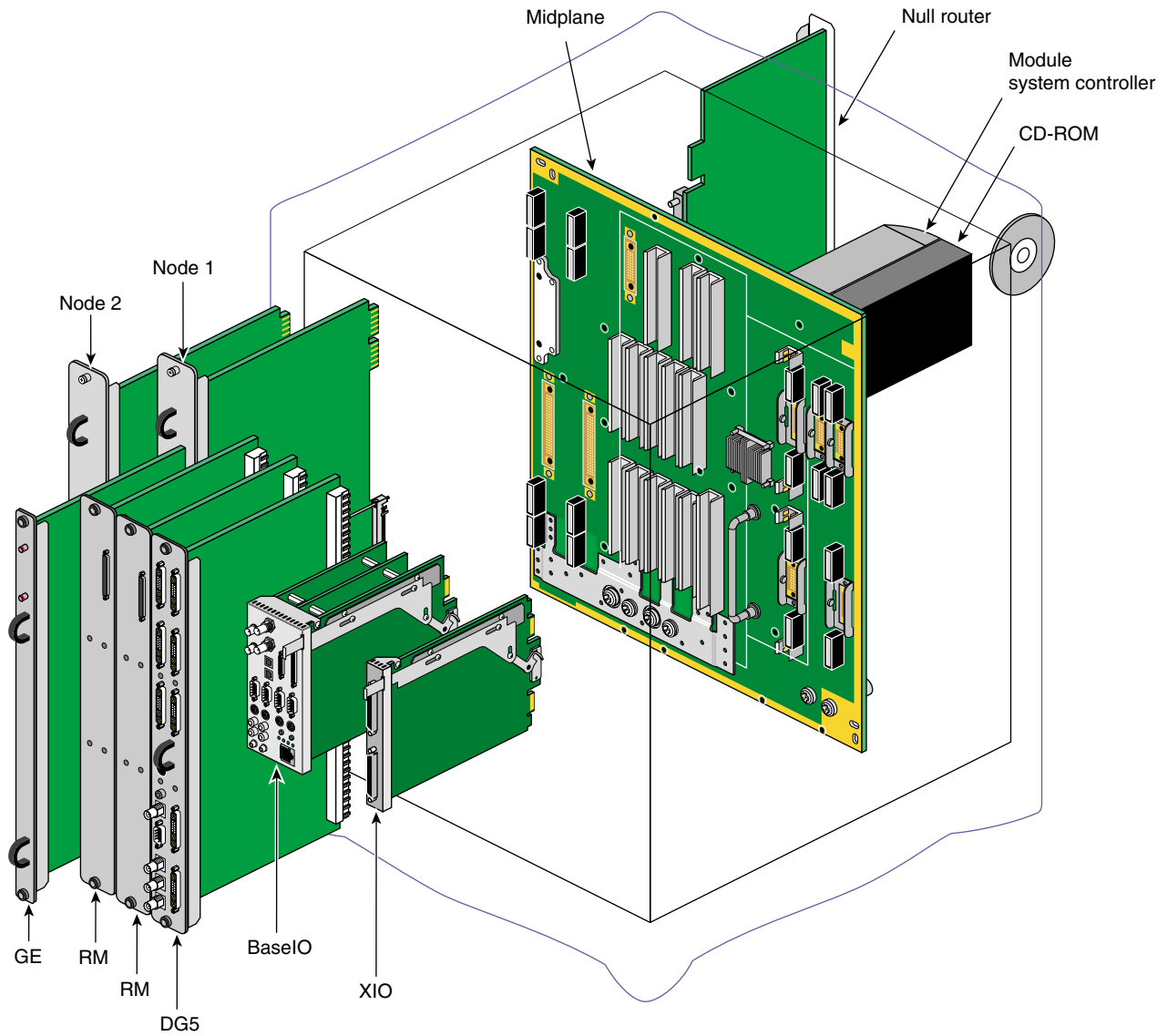
Figure 2-2   Rear View of Onyx2Reality, InfiniteReality, or InfiniteReality2 System Midplane

Components and Controls on the Front of the System

The front of your Onyx2 deskside system has a number of controls and components that you should be familiar with. The system's removable media CD-ROM drive, module System Controller (MSC), and disk drives are all accessible by opening the front plastic sliding door. As a general rule, you should always leave the front sliding door panel open while the system is operating.

Caution: If you eject the CD-ROM disc while the front panel is closed you may jam the panel and make it difficult to slide the door downward. If this happens, remove the entire plastic front panel using the instructions in "Removing the System's Plastic Covers" in Chapter 3.

Open the front sliding door panel by pushing it down until it catches (see Figure 2-3). You can close it by pushing down and releasing it. It slides back up into its original position.
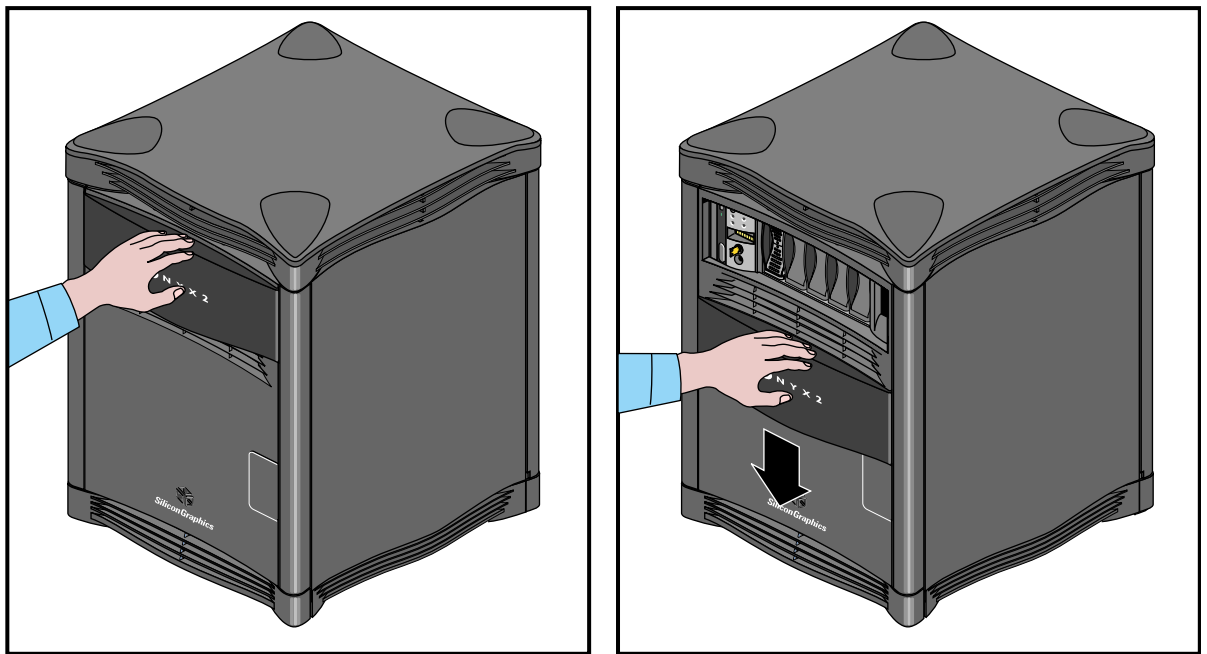
Figure 2-3   Opening the Front of the Onyx2 Deskside System

The CD-ROM drive and MSC front panel are next to each other in the upper left corner of the deskside system. Figure 2-4 shows the location of each of these units. The MSC is a microprocessor-controlled subsystem that is mounted directly to the system midplane by way of an "extender" board. It monitors various system operations, including ambient temperature, system fan speed, midplane voltage levels, and the system clock.

For detailed information on using the MSC, see Chapter 6.
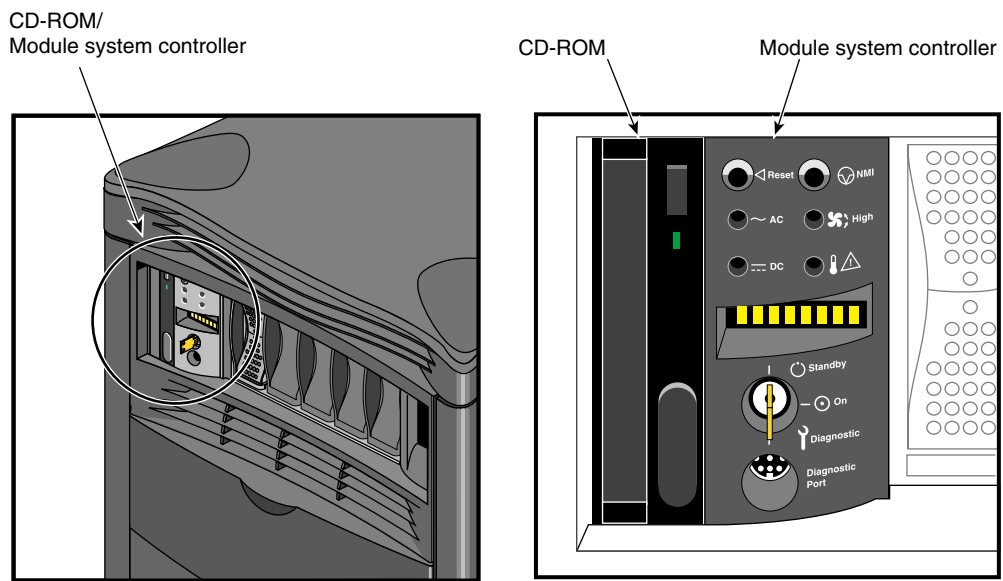
Figure 2-4   CD-ROM and MSC

There are five disk drive bays. The Onyx2 system always comes with a system disk using SCSI ID 1 and is installed only in the bay adjacent to the MSC. Figure 2-5 shows the disk bay locations on the front of the system.

System disk   Blank

Optional drive bays
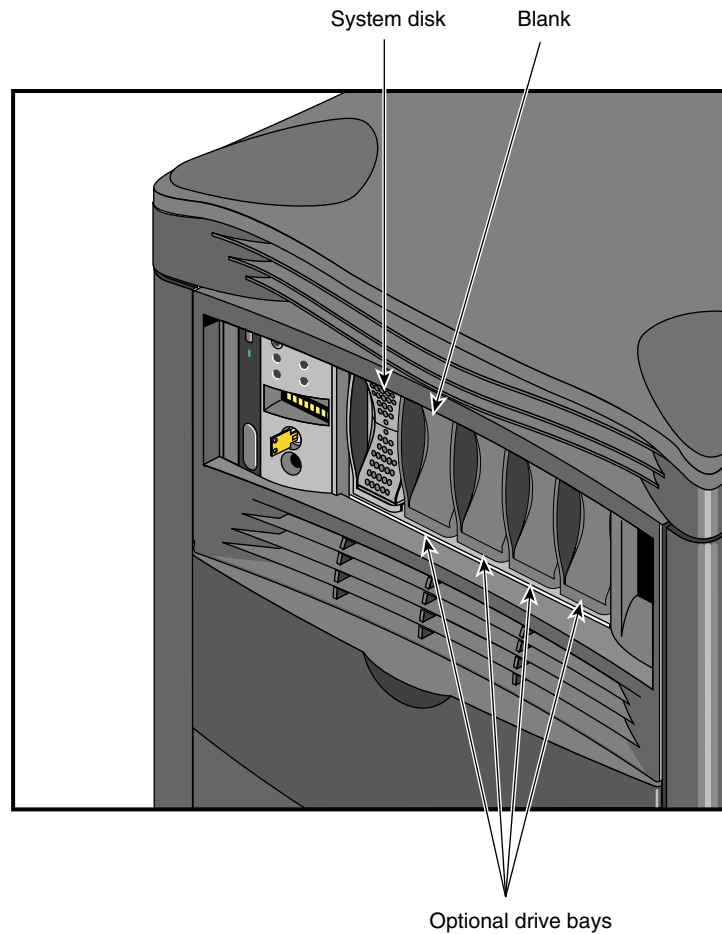
Figure 2-5   System Disk and Optional Drive Bays

The Null-Router board that provides high-speed communication between Node boards
in the system also is positioned at the front of the chassis. The Null-Router board is not a
customer replaceable component. It should be replaced only by a Silicon Graphics
trained or certified service person. See Figure 2-6 for the location of the Null-Router.
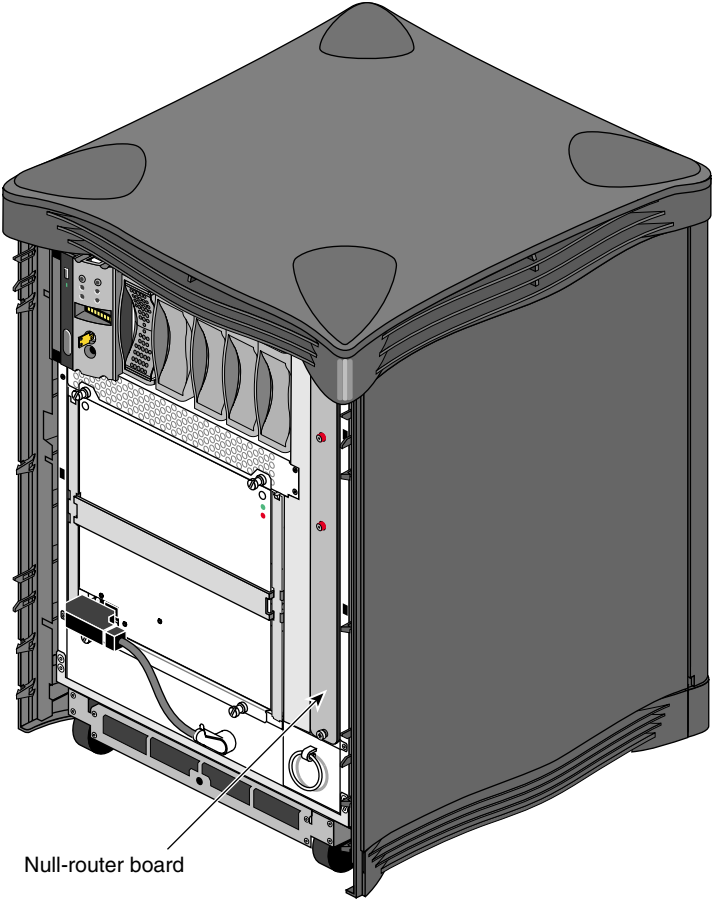
Null-router board

Figure 2-6   Null-Router Board Location

Components and Controls on the Rear of the System

The rear of the system houses the following components:

- system Node board(s)
- power connector and system power switch (circuit breaker)
- slots for optional PCI and XIO interface boards
- BaseIO (IO6G) system interface panel
- graphics boards and connectors

System Node Board Locations

The system Node board slots are located in the left side on the rear of the chassis. The first Node board is always installed in the right-hand slot.

Node Board LEDs

A total of 18 LEDs are on the outer panel of each Node board (see Figure 2-7). Two red LEDs are located near the top of the board and a set of 16 yellow ones are located near the middle of the board.

The two LEDs near the top of the board should light only when there is a voltage inconsistency or problem on the Node board. If these LEDs light up frequently, the board may need service. If all the top LEDs on all the Node boards in the system light up, it indicates a system-wide power problem. In this case, call your service representative for assistance.

The LEDs grouped near the middle of the board are divided into two vertical sets of eight LEDs (16 total). Each vertical set of eight LEDs represents one of the 64-bit microprocessors installed on the Node board. When only one microprocessor is installed, you can expect to see LED activity on only one vertical set of LEDs.

As a general rule, the bottom LEDs should always show some activity while the system is powered on. The bottom LEDs serve as a kind of "heartbeat" that indicates when a microprocessor is alive, even if the system is not generally active.

21

The other seven LEDs light up as the processes that the 64-bit microprocessor runs increase. The more work the microprocessor is doing, the more LED activity you see on the Node board.
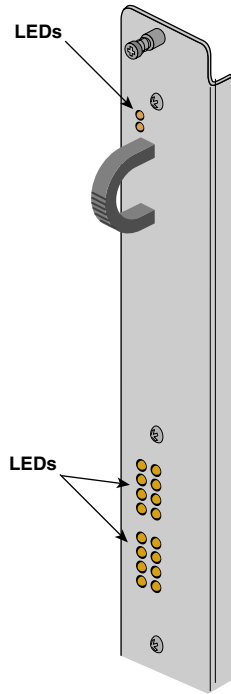
Figure 2-7 Node Board LEDs

Power Connector and Switch

The system's main power connector is located on the lower left side of the chassis. The main system power switch is located opposite it on the lower right side. System power is on when the switch is up and off when it is down (see Figure 2-8).

Note: The system's power cord can be loosened or disconnected easily. Do not route the cord through a foot traffic area or a location where it is moved frequently.

BaseIO

Node 1

Node 2

AC input

Module power
switch
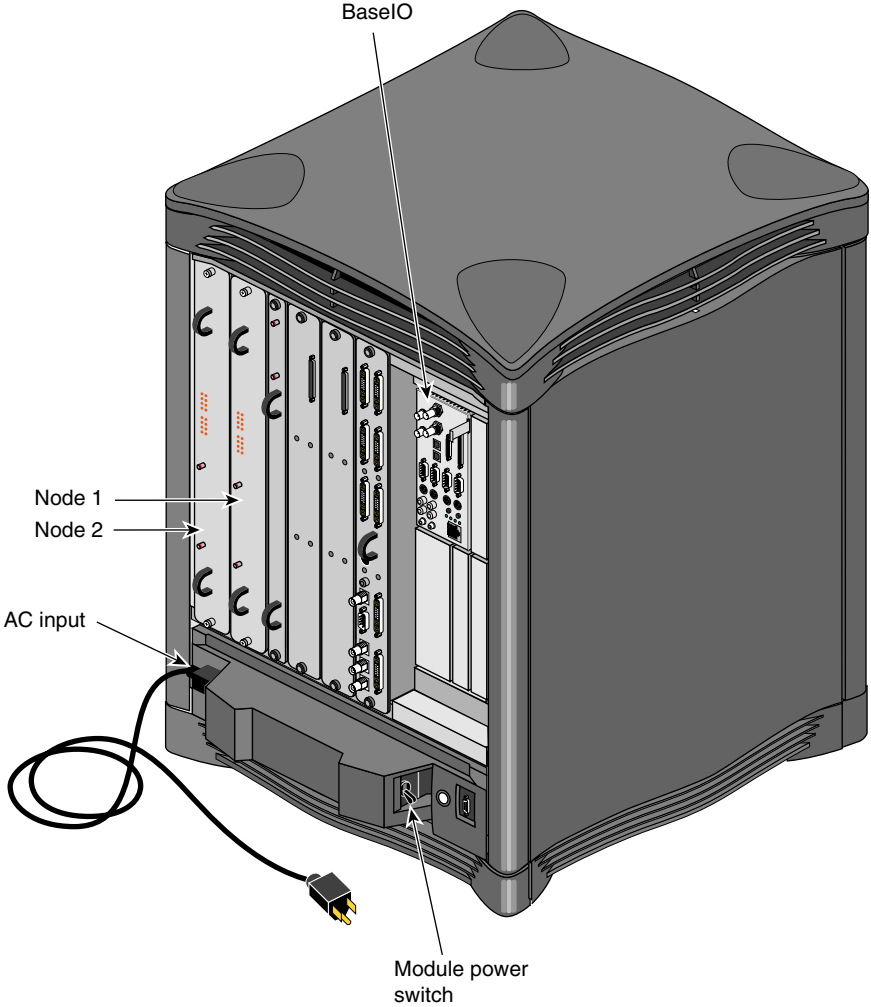
Figure 2-8   Components and Controls on the Back

XIO Board Slots

Each Onyx2 deskside system comes with five XIO board slots (see Figure 2-9). Note that the graphics BaseIO interface board assembly always uses XIO slot one. Various types of optional interface boards are supported in the XIO slots. These may include the following options:

- fibre data distributed interface (FDDI)

- high-performance point-to-point interface (HIPPI)

- multiple Ethernet board

- multiple SCSI port board

- digital I/O video option (DIVO) interface board

- fibre channel controller board

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 ensure that these XIO rules are followed:

- Keep the graphics BaseIO (IO6G) board assembly installed in XIO slot 1.

- Fill the top XIO slots first (XIO slots 3 and 5).

- Have the optional PCI module installed in XIO slot 2.

- Onyx2 MXI graphics board is installed in XIO slot 3.

Never allow any of these configurations:

- Moving the BaseIO (IO6G) board assembly to a slot other than XIO 1.

- Having a SCSI board installed in XIO slot 2.

- Having an XIO board installed in an unsupported slot.

Midplane

Upper
board
guide

Compression
connector

Middle
board guide

Lower
board guide

BaseIO

Filler panels

Rear of deskside
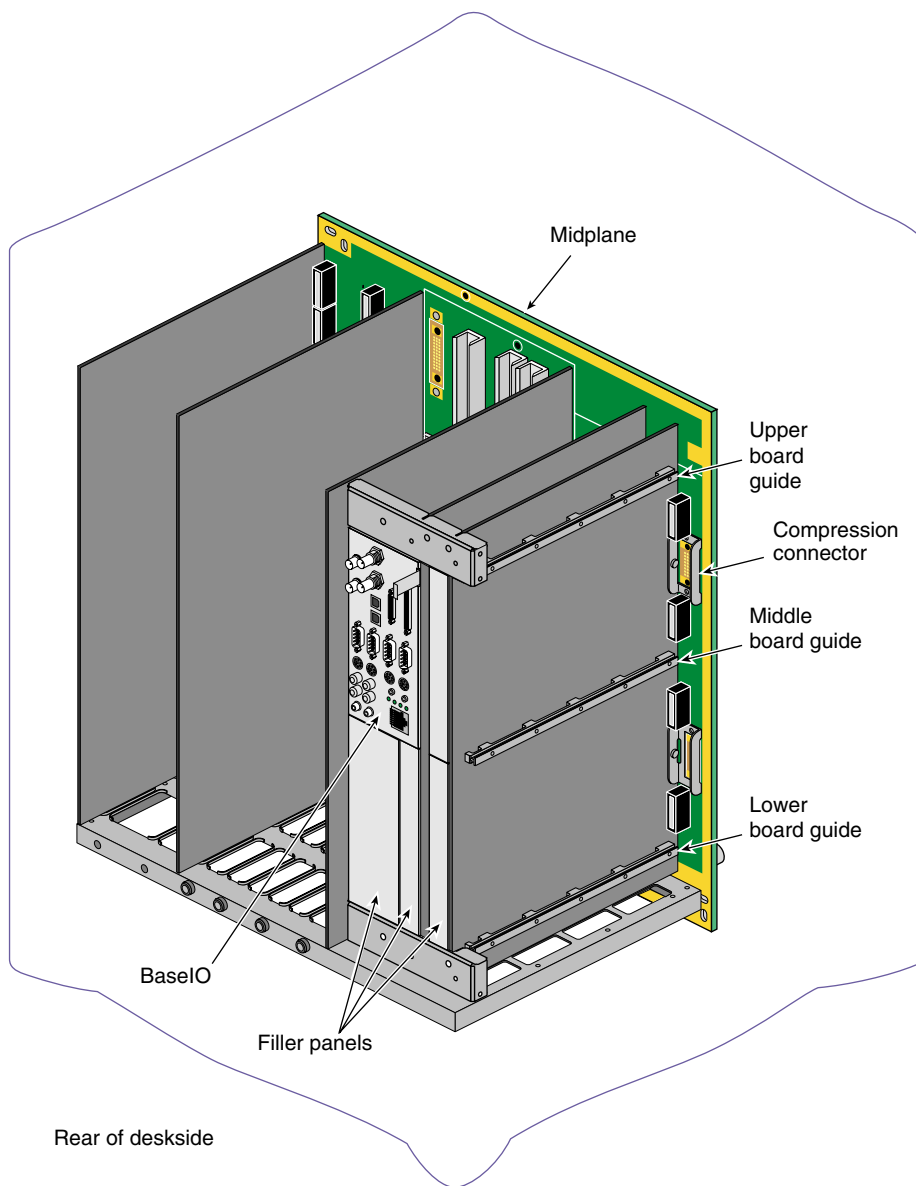
Figure 2-9   XIO Board Slots

Graphics BaseIO Panel

The BaseIO panel assembly (also known as the IO6G) is used to connect external devices to the system. These devices include keyboards, mice, SCSI devices, audio devices, ASCII terminals, printers, and modems. The I/O panel configuration for Onyx2 deskside systems is shown in Figure 2-10. See Table 2-1 for a descriptive list of the BaseIO connector types and functions.

Note: If you disconnect a cable from a peripheral device, you should also disconnect it from the I/O connector on the I/O panel. This helps prevent the system from picking up external electrical noise.
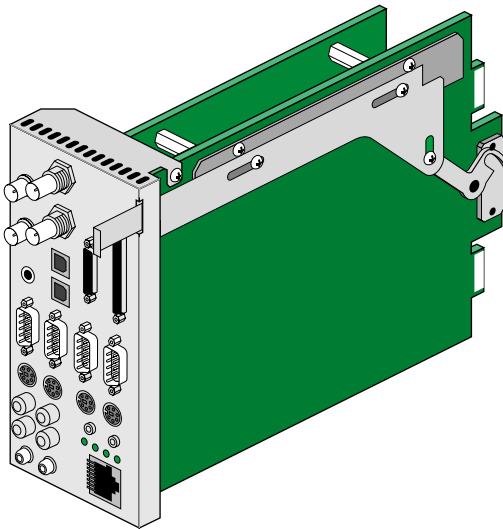
Figure 2-10   Graphics BaseIO Assembly (IO6G) Panel

Table 2-1   BaseIO Panel Connectors

Connector Type	Connector Description	Connector Function
BNC 75 ohm	Digital audio out (DO)	Audio output to digital recorder
BNC 75 ohm	Digital audio input (DI)	Input to deskside from digital audio device
BNC 75 ohm	Video sync loopthrough	Video sync in/loopthrough
BNC 75 ohm	Video sync loopthrough	Video sync in/loopthrough
36-Pin IEEE 1284-C	Parallel port	Parallel printer signals to and from external device
68-Pin SCSI single-ended	Ultra (FAST-20) or SCSI-2	Single-ended SCSI
2.5 mm tip-sleeve speaker power jack	Single +10 V jack	Power for Silicon Graphics supplied speakers
Optical	24-bit digital stereo input	Eight-channel ADAT input
Optical	24-bit digital stereo output	Eight-channel ADAT output
9-Pin sub-D (1-4)	PC-compatible male serial ports	Serial RS-232 or 422 data transfer and receipt
6-Pin mini-DIN (1-2)	Mouse connectors	Connectors support mouse signals
6-Pin mini-DIN (1-2)	Keyboard connectors	Supports keyboard signals
2.5 mm RCA-type (L & R)	Audio line in plugs	Supports analog stereo inputs
2.5 mm RCA-type (L & R)	Audio line out plugs	Supports analog stereo outputs
3.5 mm tip-ring-sleeve jack	Single jack	Interrupt in
3.5 mm tip-ring-sleeve jack	Single jack	Interrupt out
3.5 mm tip-ring-sleeve jack	Single jack audio output	Analog headphone or Silicon Graphics supplied speakers
3.5 mm tip-ring-sleeve jack	Single jack audio input	Analog microphone input

Graphics Boards and Connectors

Your Onyx2 deskside workstation houses a set of graphics boards that provide high-resolution color graphics for one or more monitors.

The Onyx2Reality, InfiniteReality, and InfiniteReality2 graphics subsystems are made up of the following boards:

- the Geometry Engine® (GE) board

- the Raster and Texture Memory (RM) board assembly (up to two per system); Onyx2Reality board sets use the RM8 board

- the Display Generator (DG) board assembly

The following sections describe the general technical features of all the Onyx2 system graphics boards.

GE Board

The GE board comes equipped with geometry engine ASICs in either a basic (Onyx2Reality) or more powerful (InfiniteReality or InfiniteReality2) version. The GE board's host interface processor (HIP) ASIC communicates with the host system through an XIO-to-graphics interface (XG ASIC).

RM Board Assembly

The Raster and Texture Memory (RM) board assembly scan-converts triangle data from the triangle bus (Tbus) into pixel data. The RM then organizes the data into a series of spans (vertical strips of pixels) and transfers it to the frame buffer.

Note: There is a 68-pin connector located near the top of each RM/TM board assembly. This connector is reserved for caligraphics lights support, and is *not* a SCSI connector. Do not connect any SCSI drive or other device to this connector.

The Onyx2Reality board set uses an RM8 board(s). The InfiniteReality and InfiniteReality2 board sets use an assembly called the RM/TM.

Caution: Installing both an RM8 and an RM/TM in the same system will cause graphics malfunction.

DG5 Board Assembly

The DG5 board is available in two basic configurations, DG5-2 (two high-resolution video channels) and DG5-8 (eight high-resolution video channels). The DG5-8 is implemented by using the VIO5H video option connector panel board, which mounts on the DG5.

See Chapter 4 for more information on the standard and optional graphics interface connectors on the DG5 board assembly.

Getting Started

This chapter describes all the basic procedures needed to operate your Onyx2 deskside. For more detailed information about specific components, refer to the table of contents or index.

The following listed components must be serviced or replaced *only* by Silicon Graphics trained and approved system support personnel:

- the system midplane

- the system fan tray

- the Node board(s)

- the XIO boards

- the system graphics boards

- the system router board

- the power supply

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

System Operation Guidelines

The operating procedures described in this section are designed to ensure your safety and the integrity of your new system.

Operating Voltages

In North America, the Onyx2 deskside chassis can be configured for either 110 VAC or 220–240 VAC operation. Systems shipped to all other geographical locations are configured for 200-240 VAC operation. The system requires alternating current (AC) service at a specified voltage and current ratings for proper operation. The power supply is "auto ranging" and automatically adjusts for operation with either voltage range.

Table 3-1 lists the 110 VAC (20-amp) North American configurations.

Table 3-1   110 V North American Configurations

Onyx2 Graphics Type	Number of Node Boards	Number of RM/TM Boards	Disk and XIO Options
Onyx2Reality	1	1 or 2 RM8	Any
Onyx2Reality	2	1 RM8	Any
InfiniteReality	1	1	Any
InfiniteReality2	1	1	Any

Caution: North American deskside systems require use of a 220-240 Volt (16 amp) electrical source whenever they exceed the specifications listed in Table 3-1. Other factors may also apply; contact your service provider before upgrading a 110 VAC deskside system.

Verify that the correct AC line voltages are selected for each peripheral you use with your system.

Before connecting or disconnecting any terminal, peripheral, or front-loading drive, be sure the system is powered off and the system circuit breaker located on the back of the chassis is in the Off position.

Safety Precautions

Read the following safety statements carefully before you install or remove any standard or optional components.

Warning: **Read these safety statements carefully before you install or remove standard or optional components. To avoid electric shock and/or a fire hazard, do not disassemble the deskside chassis. No user-serviceable parts are located inside.**

- This equipment is sensitive to damage from electrostatic discharge (ESD) caused by the buildup of electrical potential on clothing and other materials.

- Before connecting or disconnecting any terminal, peripheral, or front-loading drive, be sure the system is powered off and the primary power source is disconnected.

- Attach a ground strap to your wrist when working on the system.

Sliding Open the Front Door Panel

To access the drives and module System Controller (MSC), you must open the front access panel on the deskside system.

Complete the following steps to open or close the deskside system's front sliding door panel:

1. Push down on the rectangular panel near the top on the front of the system.

2. Slide it downward until it locks in position. You should have clear access to the drives and the MSC interface panel. See Figure 3-1 for an example.

3. Close the panel by pushing down until you feel it release.

4. Let it slide back up into its original closed position.
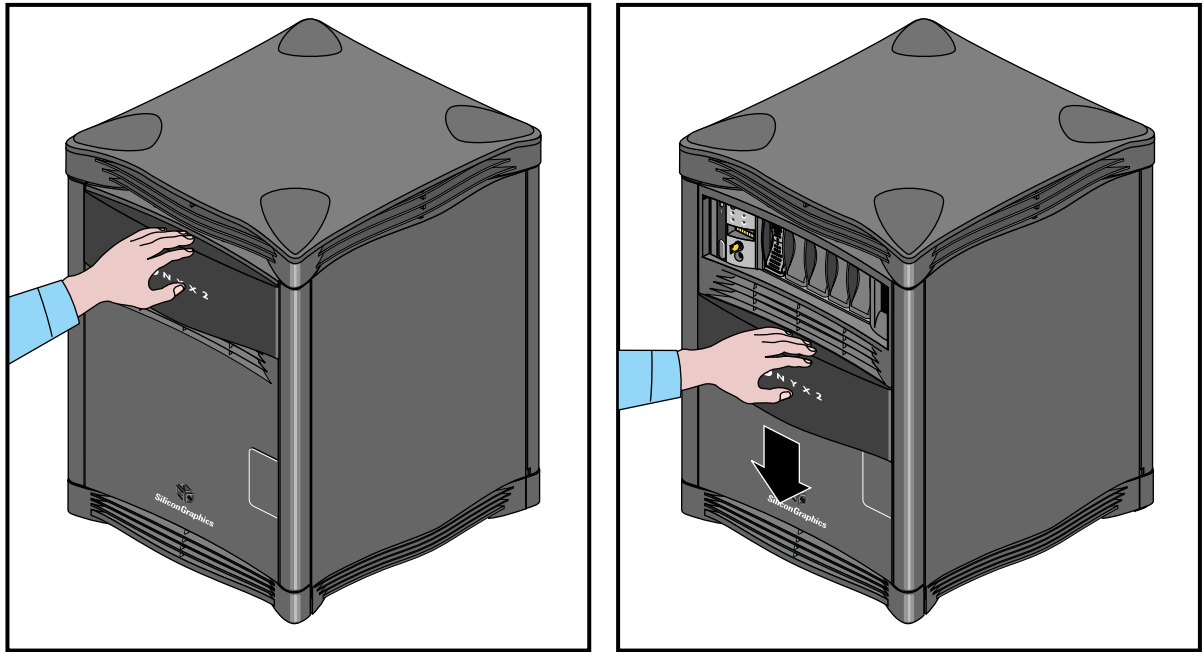
Figure 3-1   Opening and Closing the Sliding Front Panel

Removing the System's Plastic Covers

Under certain circumstances you may wish to remove some of the plastic covers from the deskside chassis. See "Sliding Open the Front Door Panel" on page 33 if you only need to access the drives or the MSC front panel.

Note: Do not operate the deskside system with the plastic covers removed. Disruption to normal air flow patterns may cause system overheating and shutdown.

Complete the following steps to remove the plastic covers from the deskside system:

1. Be sure that the system power is turned off, according to the procedures in the previous sections.

2. Remove the plastic front panel cover by undoing the captive Phillips-head retaining screw located near the center of the bottom grill (see Figure 3-2).

3. Lower the panel approximately 0.15 inches (4 mm) and pull it forward off the chassis.

4. Remove the top cover by first removing the four corner-positioned cover "caps." Use a screwdriver to release the latch for each one (see Figure 3-3).

5. Push the screwdriver through the upper grill and unlatch a cap by gently moving the latch toward the center of the system.

6. Lift the cap off. If you have trouble lifting the cap, press down on the outside corner of the cap until it pops up.

7. Remove the top plastic panel by undoing the captive screw under each cap and then lifting the cover straight up off the chassis. There are arrows molded into the plastic top pointing toward the front of the deskside system. They help orient the top panel when you reinstall it.

    Note: It is highly unlikely that you will need to remove the rear plastic "bumper" cover or side panels. These three plastic covers are interconnected and somewhat difficult to remove. If you find it necessary, contact your service provider for assistance.

Key in Standby
position

Captive screw
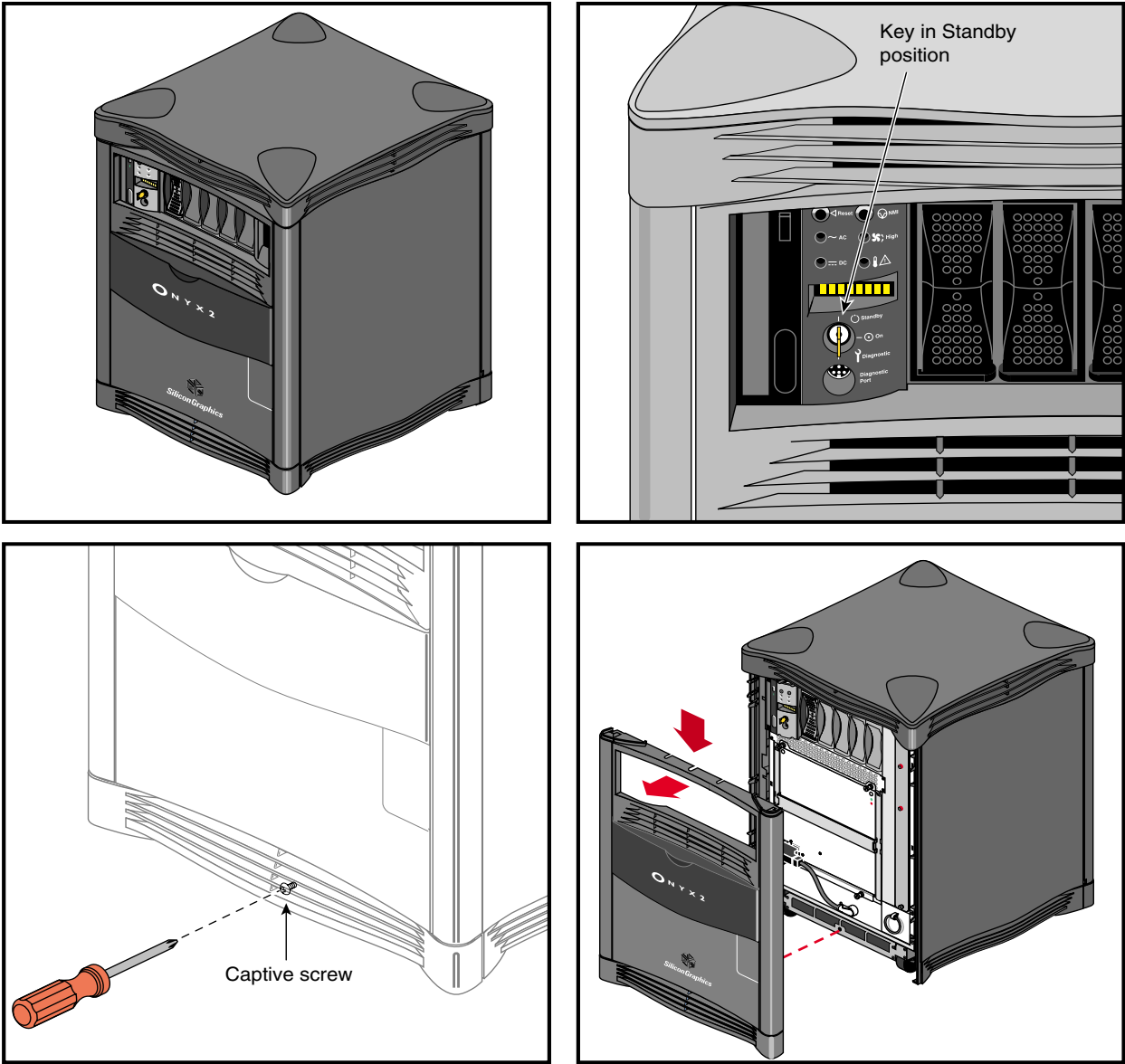
Figure 3-2   Removing the Front Cover

1 Top panel

Cap   Plenum

2 Cap securing latches
visible through top plenum

3 Cap

Cap securing latch

4 Insert screwdriver through
plenum. Gently pry latches
loose.

5 Cap securing latch

6 Remove caps

Captive
screw

7 Loosen
captive screws

8

9 Arrows point toward
front of chassis
when installing
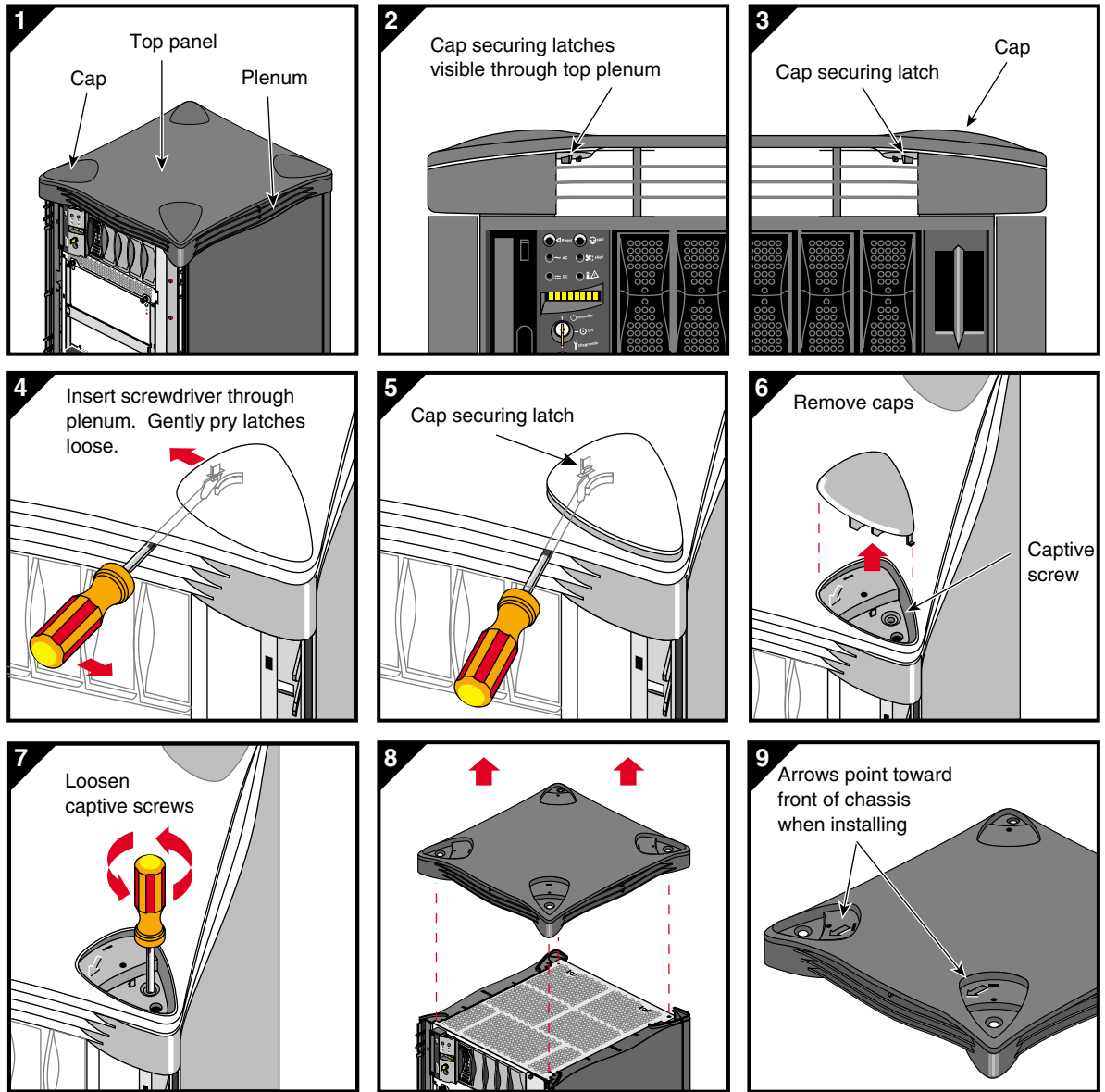
Figure 3-3   Removing the Top Plastic Panel

System Drives

The deskside system comes standard with six drive bays. The first is located in the upper left sector on the front of the system and holds one 5.25-inch half-height device. Your system should come with a CD-ROM drive in this location. The drive in this bay is always SCSI ID 6. To the right of this bay is the MSC and then a bank of five 3.5-inch disk bays (see Figure 3-4).

Caution: Use proper handling and storage procedures to avoid the loss of data and equipment. Do not remove disk drives while they are operating. Always power off the system before installing or removing a drive.

The system disk is always SCSI ID 1 and is installed in the left-hand disk bay adjacent to the MSC. The optional drives install to the right of the system disk and are numbered sequentially, two through five. Each disk drive bay is covered by a blank panel until a drive is installed. Each of the five disk drive bays is "hard wired" on the backplane to a single SCSI ID number (1-5). This prevents ever assigning the same SCSI ID to more than one drive installed in the deskside chassis.

Caution: When you remove a drive, be sure that you always put it back in the same bay that you removed it from. Placing the system disk in the wrong bay results in the system being unable to boot. Replacing a data disk in a different bay may cause file corruption, data loss, or other malfunction.

Be sure to use standard electrostatic discharge prevention precautions when removing, storing, transporting, or replacing drives.

All hard disk drives installed in the system must be ultra SCSI or SCSI-2 compatible and use 80-pin single-connector assembly (SCA) drive sleds.

Use of external SCSI devices is supported through the BaseIO and optional XIO boards that install in the back of the system.

See the information in "Installing or Removing the System Disk and Optional Hard Drives" in Chapter 5 for details on removing, replacing, configuring, or installing drives in the deskside chassis.

System disk   Blank

Optional drive bays
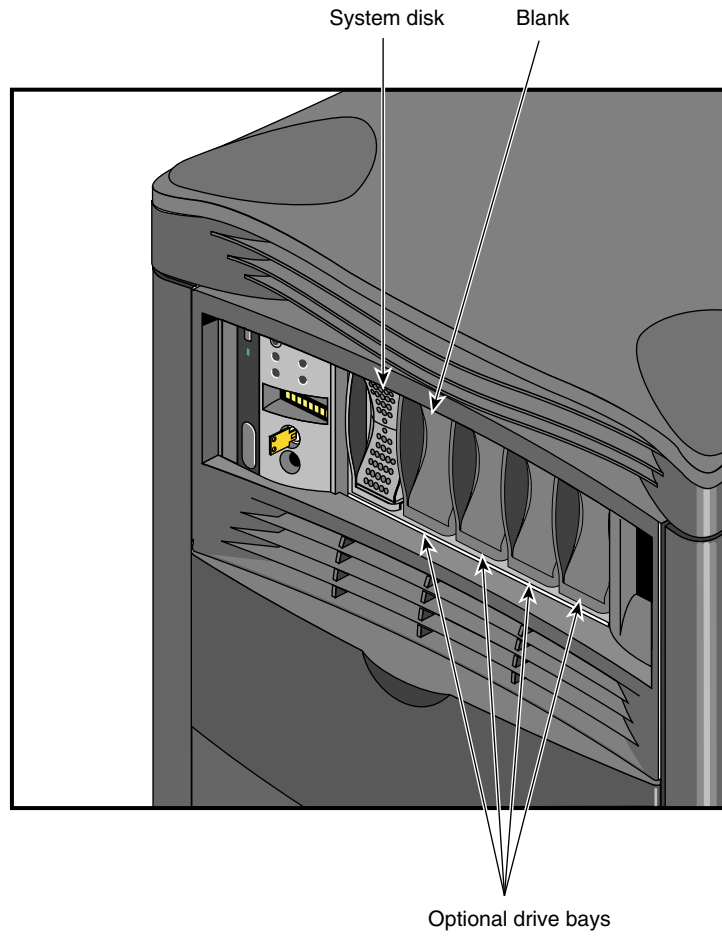
Figure 3-4   Deskside System Internal Drive Bays

Connecting to an Ethernet Connector

Your Onyx2 deskside system comes standard with an 8-pin 10 Mb or 100 Mb-per-second (10 BASE-T/100 BASE-T) Ethernet connector. See Figure 3-5 for an Ethernet installation example. The interface adjusts automatically for either transmission mode.

Note: Always verify the type of signal being transmitted over your network cable before plugging in the connector. Some networks use a twisted-pair cabling system that carries AUI signals. These networks use an RJ-45 connector that is meant to be plugged into an IEEE 802.3 Transceiver unit.

You can order optional boards for additional Ethernet connections.

Observe the following procedures when making Ethernet connections:

1. Turn off the system.

2. Identify the Ethernet drop intended for your deskside system, and route it to the rear of the chassis. Repeat for any additional connections.

3. Plug in the Ethernet connector (make sure it is plugged all the way in and clicks into place).

4. Continue with any additional peripheral connections or installations.

5. Restart the system.

Ethernet
connector
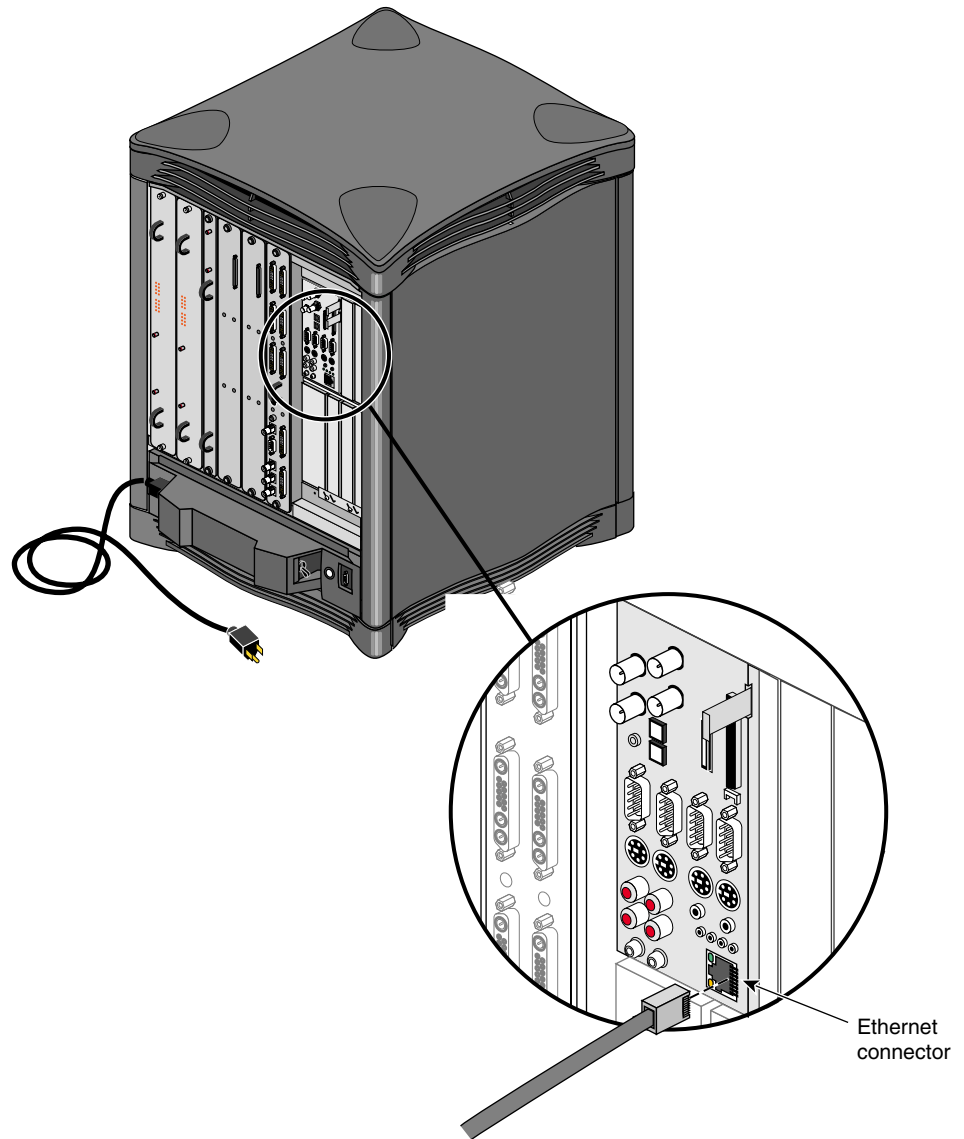
Figure 3-5   Connecting an Ethernet Cable

Module System Controller

The MSC front panel interfaces directly with the system midplane board. It acts as the primary power switch for bringing the system up or down. Figure 3-6 shows the MSC front panel and keyswitch.

Note: Turning the key on the MSC to Off does not cut off all power to the midplane board. Use the breaker switch on the back of the deskside to turn off all power to the chassis when installing or removing chassis components.

See Chapter 7 for an extensive review of the MSC functions and error messages.

Powering On the Onyx2 Deskside System

Complete the following procedures to power on your new deskside system:

1. Make sure the power switches on all of the equipment are turned off.

2. Plug the power cord into each component. Make sure to connect the cords to grounded outlets only.

3. Turn on the power switches in the following order:

    ■   breaker switch located on the power-in panel on the back of the chassis

    ■   monitors, terminals, or other video output devices

    ■   printer (if installed)

    ■   MSC key switch

4. After you turn the MSC's switch to the On position, you can watch the LED panel for the SYS OK message. See Figure 3-6 for the keyswitch and other front-panel switch locations.

The MSC begins the system boot sequence.

To better monitor and understand the MSC's front panel functions, see Chapter 6, "Using the Module System Controller," for details.

Module
reset switch

Module
NMI
switch

AC OK LED

Fan high-speed
indicator
LED

DC OK LED

Ambient
over-
temperature
LED

8-digit
LED display

Reset

NMI

~ AC

High

DC

Standby

On

Diagnostic

Diagnostic
Port

Security
key switch

8-pin mini DIN
diagnostic
port

Standby

On

Diagnostic
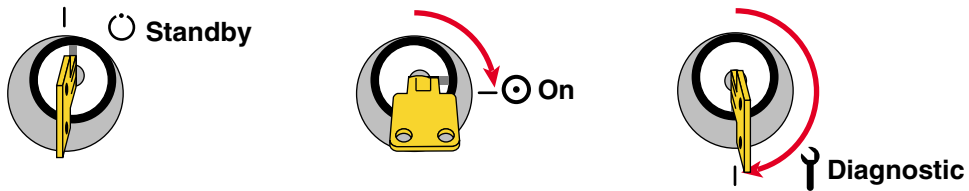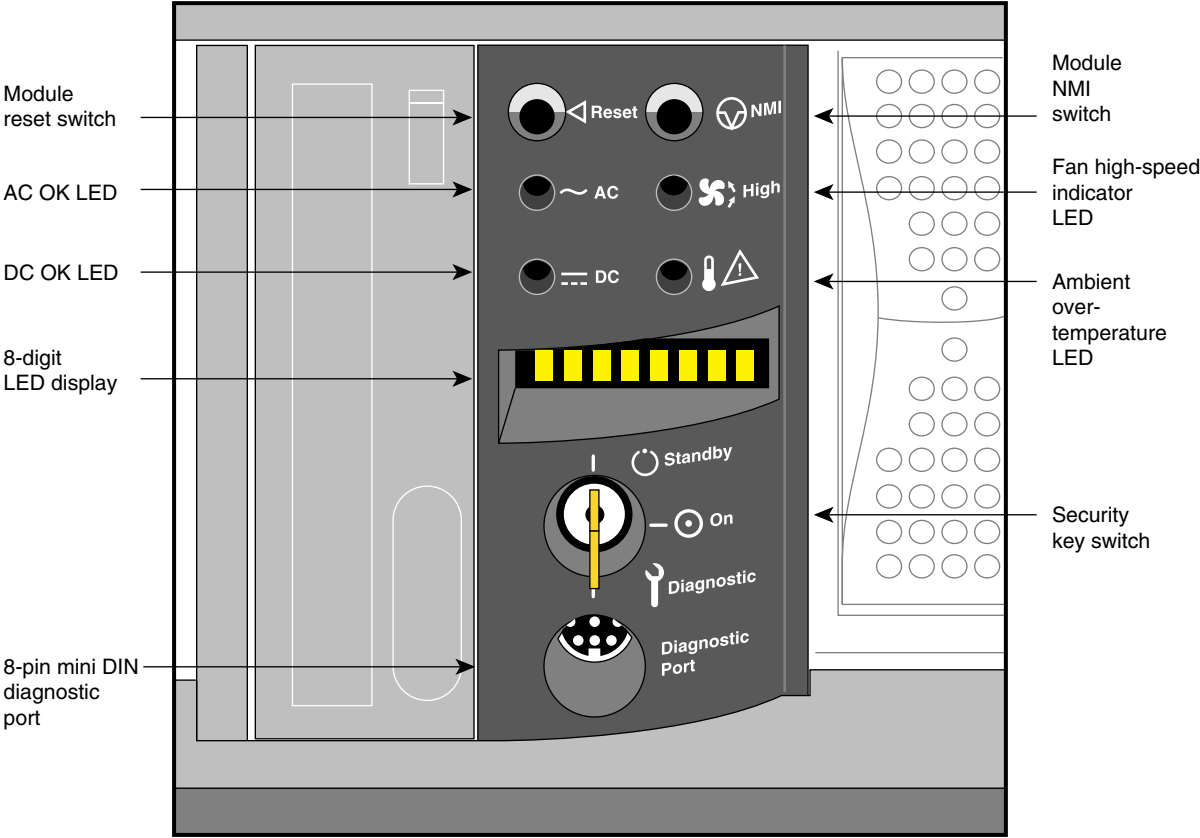
Figure 3-6   MSC Keyswitch and Front-Panel Controls

Powering Off the Onyx2 Deskside System

The deskside system should be completely powered off only for relocation, routine maintenance, or repair. Before beginning this procedure, log out and shut down the software using the software instructions that follow:

1. To halt operating system activity and prepare the system for power off, select System Shutdown from the Toolchest menus and follow the prompts. Alternately, become superuser and enter **/etc/halt** in a functional IRIX window. The */etc/halt* command gracefully shuts down the system software and leaves you at the PROM monitor level. If you are remotely logged in to the system, you will be prompted before the shutdown procedure is executed.

2. Turn the MSC key switch to the standby position to eliminate all power to the boards and drives.

3. Switch the system circuit breaker to the off position to eliminate all power to the MSC, midplane, and power supply.

Unplug the power cord from the socket to ensure that you have cut off all electrical power to the system.

Onyx2 Deskside I/O Interfaces and Cabling

The Onyx2 deskside system is designed to be a fully functional standalone workstation. When your deskside system is initially set up in the work area, a trained system support engineering (SSE) technician should configure and connect it. Any standard or optional interconnect technologies ordered from Silicon Graphics may be connected at this time.

System interface connectors and cabling options are covered in the following sections in this chapter.

Graphics Interface Panels

This section describes the DG5 main display board, VIO5H video option connector panel board, and the Serial Digital Video Output from Graphics (GVO) option board. The information is mainly concerned with the DG5 board and options.

Table 4-1 summarizes DG5 configurations.

Table 4-1   DG5 Configurations

DG5	VIO5H	GVO	Description
DG5-2	Not required	Not required	Basic configuration: two high-resolution video outputs
DG5-8	Required	Not required	Eight high-resolution video outputs
DG5-2	Not required	Required	Two high-resolution video outputs with two CCIR601 outputs

Figure 4-1 shows connectors on the DG5-8 option board with the VIO5H daughterboard.
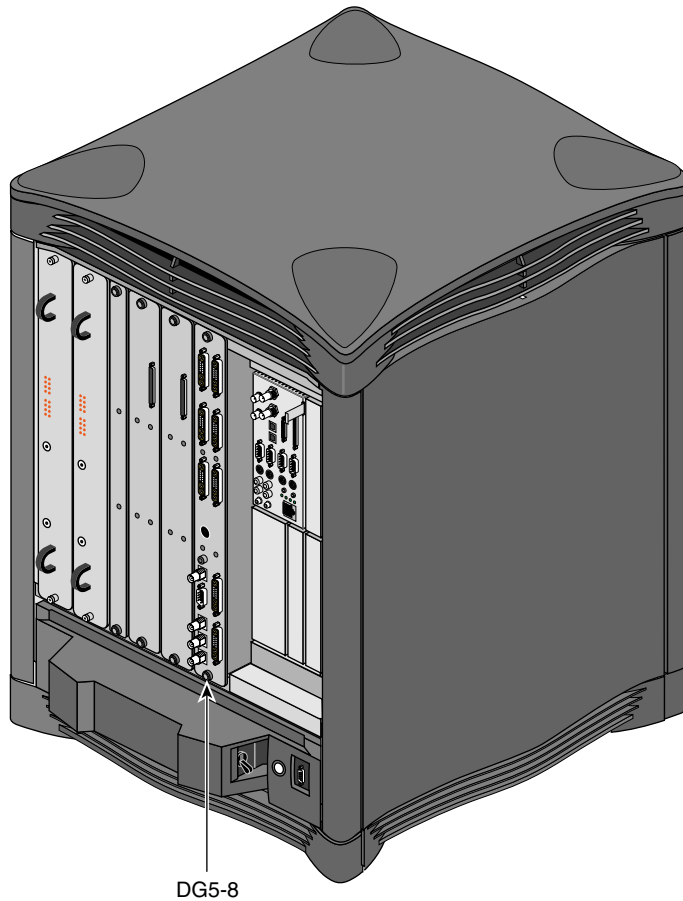
DG5-8

Figure 4-1   DG5-8 Board Location

Note that the DG5-8 option requires the VIO5H board. Notice also that the DG5 board always goes in the rightmost graphics board slot in the Onyx2 deskside graphics system, next to the graphics BaseIO board assembly.

DG5 Board Operation

The display generator subsystem requests and receives digital frame buffer pixel data from the RM/TM board. The DG5 board processes the pixel data and streams it onto the video packet bus. The DG5 board also handles all pixel clocking and genlocking and cursor display functions, and performs the role of the functional manager.

From the packet bus, processed video can be sent to one of the video output channels, or to the NTSC or PAL encoder (VTR channel). The video output controller supplies data to a 3-DAC array that feeds the analog RGB signals out. NTSC or PAL circuitry signals come from the VOC through encoder and field buffer RAMs.

The default monitor resolution supported by the InfiniteReality or InfiniteReality2 board set and SuperWide monitor is 1920 x 1200 at 66 Hz. The maximum output bandwidth is about 300 Mpix/sec. With two monitors, each 1920 x 1200 at 66 Hz, speed is about 188 Mpix/sec. If you connect more than two monitors, you must use a combination of lower and higher resolution monitors that is within the limit of 300 Mpix/sec.

Table 4-2 summarizes DG5-8/VIO5H connectors.

Table 4-2   DG5-8/VIO5H Connectors

Label	Type	Function
Monitor 0 through 7	13W3	Variable high-resolution monitor outputs
S-Video	4-pin mini-DIN	Interface to SVHS VCR or monitor
CMPST 1	RCA jack; BNC	Interface to composite monitor or VCR
Stereoview	9-pin sub-D	Interface to stereoview device
Genlock In	BNC	Interface to video mixer
Genlock Out	BNC	Loopthrough connection
Swap Ready	BNC	Interface to other graphics systems

Connectors on the DG5 Board

The DG5 board always goes in the rightmost graphics board slot in the Onyx2Reality and InfinteReality deskside graphics system. Figure 4-2 shows the DG5 board without options (DG5-2).

Monitor 0

Monitor 1

S-Video

CMPST 1: RCA

CMPST 2: BNC

StereoView

Swap Ready

Genlock In

Genlock Loop Through
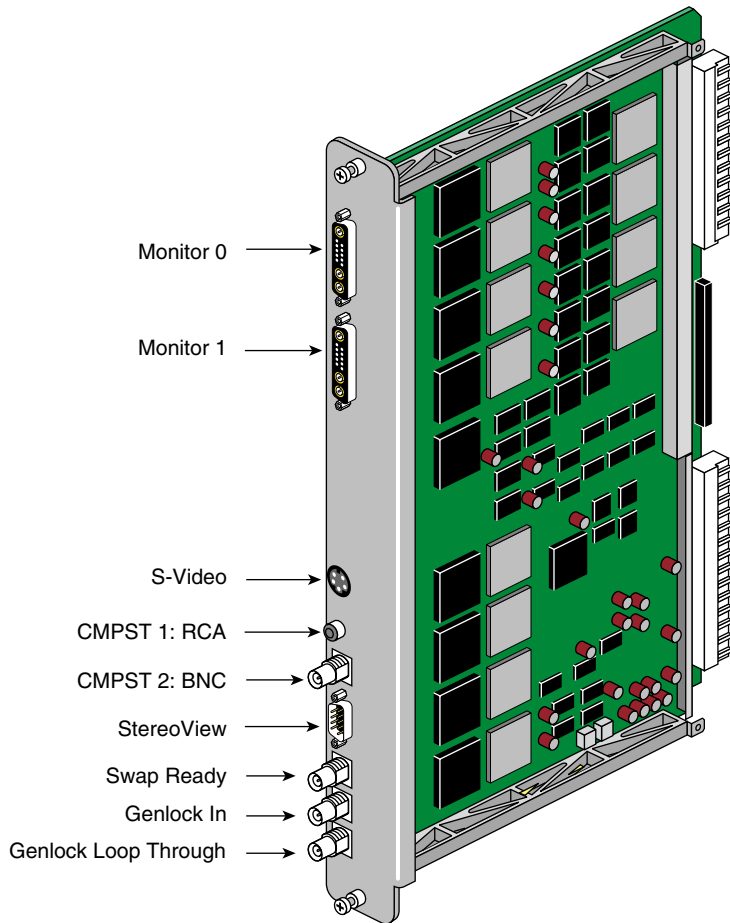
Figure 4-2   DG5 Graphics Panel Connections (Without Options)

The VIO5H video option connector panel board mounts on the DG5-8 and outputs five high-resolution video channels. Figure 4-3 shows connectors on the panel for the DG5-8 option board with the VIO5H daughterboard.
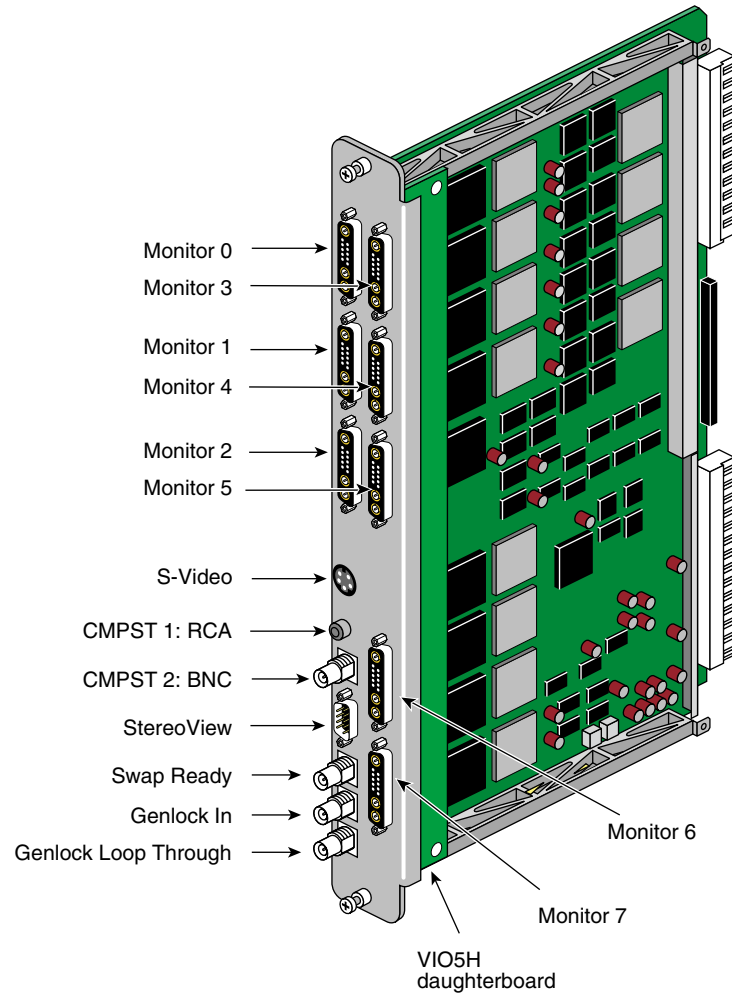
Figure 4-3   DG5-8 Board With Optional VIO5H

Figure 4-4 shows the 13W3 pinouts for the monitor connectors on the DG5/VIO2 I/O panel. Each 13W3 uses the same pinout pattern.
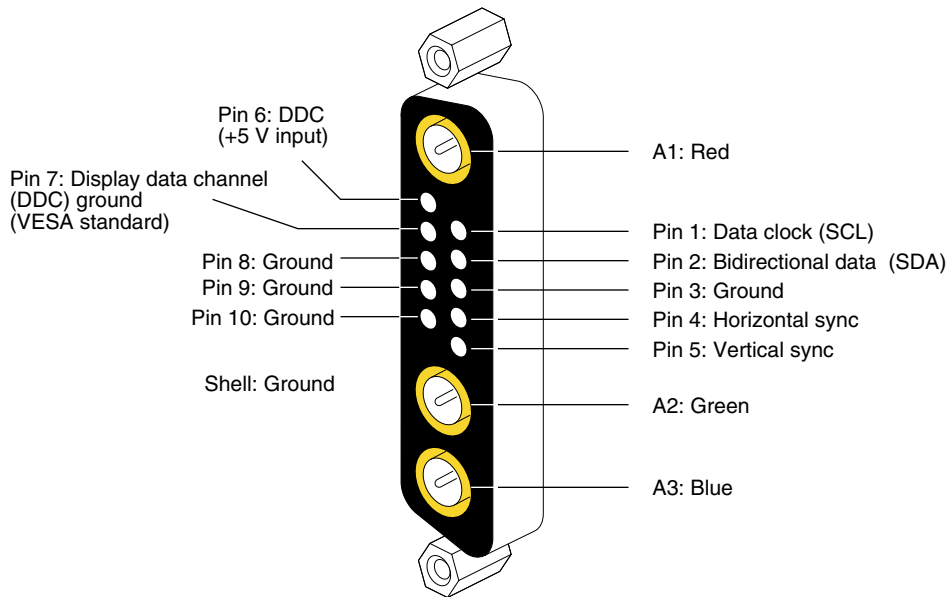
Figure 4-4   DG5/VIO5H 13W3 Connector Pinout

In the A1, A2, and A3 connectors, the center conductor carries the video signals. The outer conductors of the A1, A2, and A3 connectors are their video returns, which are tied to the monitor's grounded chassis.

Connectors on the Optional GVO Daughterboard

The graphics-to-video option (GVO) daughterboard comes assembled with the DG5 and is designed to provide direct output from graphics to video in real time.

The GVO daughter board has two CCIR601 connectors implemented as BNCs. Figure 4-5 shows connectors on the panel for the DG5-2 board with an optional GVO daughterboard combination.
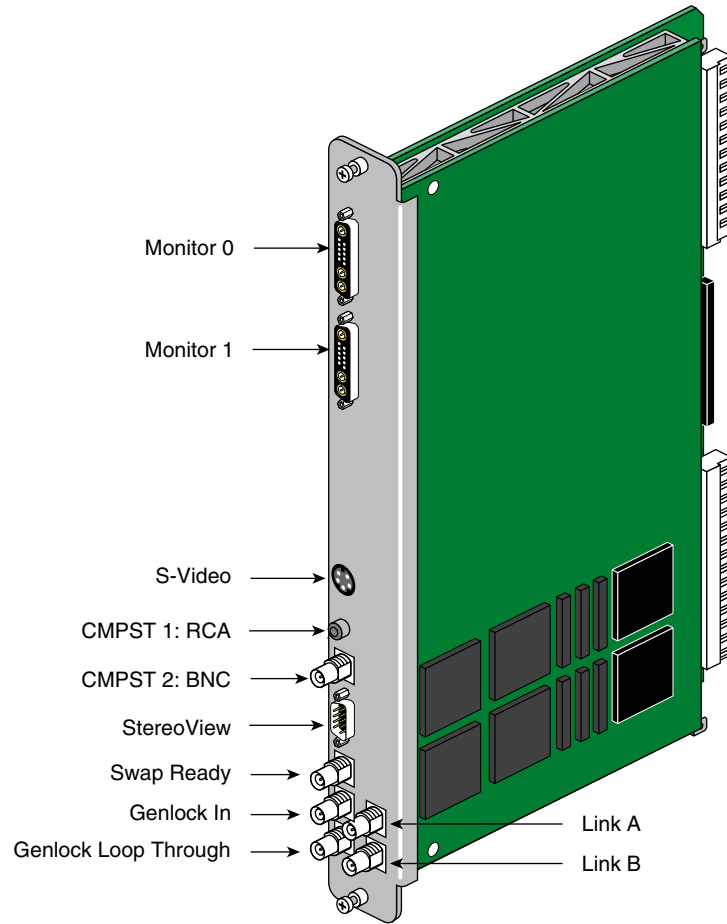
Figure 4-5   DG5 and Optional GVO Connectors

Cabling Options for the DG5 Board

Three cable options are offered for the DG5:

- 13W3-13W3: For use with the Silicon Graphics 24-inch (SuperWide) monitor and other compatible monitors; see Figure 4-6.

- 13W3-five BNCs: Separate connectors for R, G, B, horizontal sync, and vertical sync (for monitors that require these separate connectors).

- 13W3-13W3HV: Separate connectors for horizontal and vertical sync; for example, for synchronizing video out (genlocking).
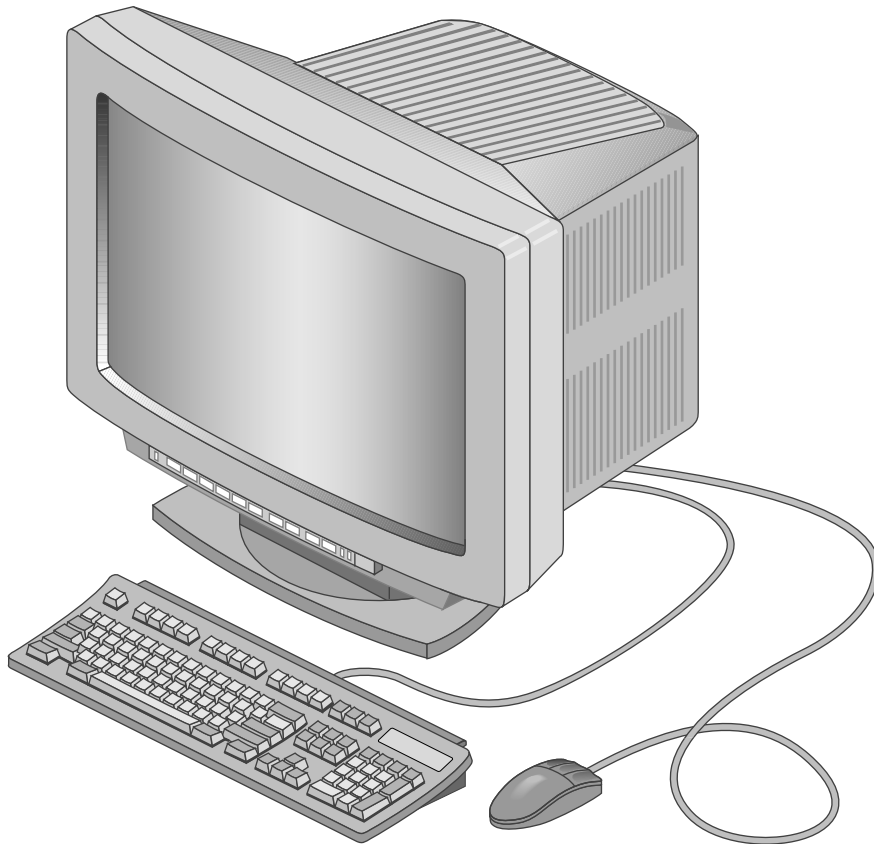
Figure 4-6   SuperWide Monitor

Figure 4-7 shows the standard cable and adapters.

13W3 m

DG5 board

13W3 m

30'

Adaptor for 30' cable

1'

13W3 f

2 BNC

13W3 m

Connects to system DG5

Adaptor for 30' cable

1'

5 BNC

13W3 f

Connects to 13W3 m
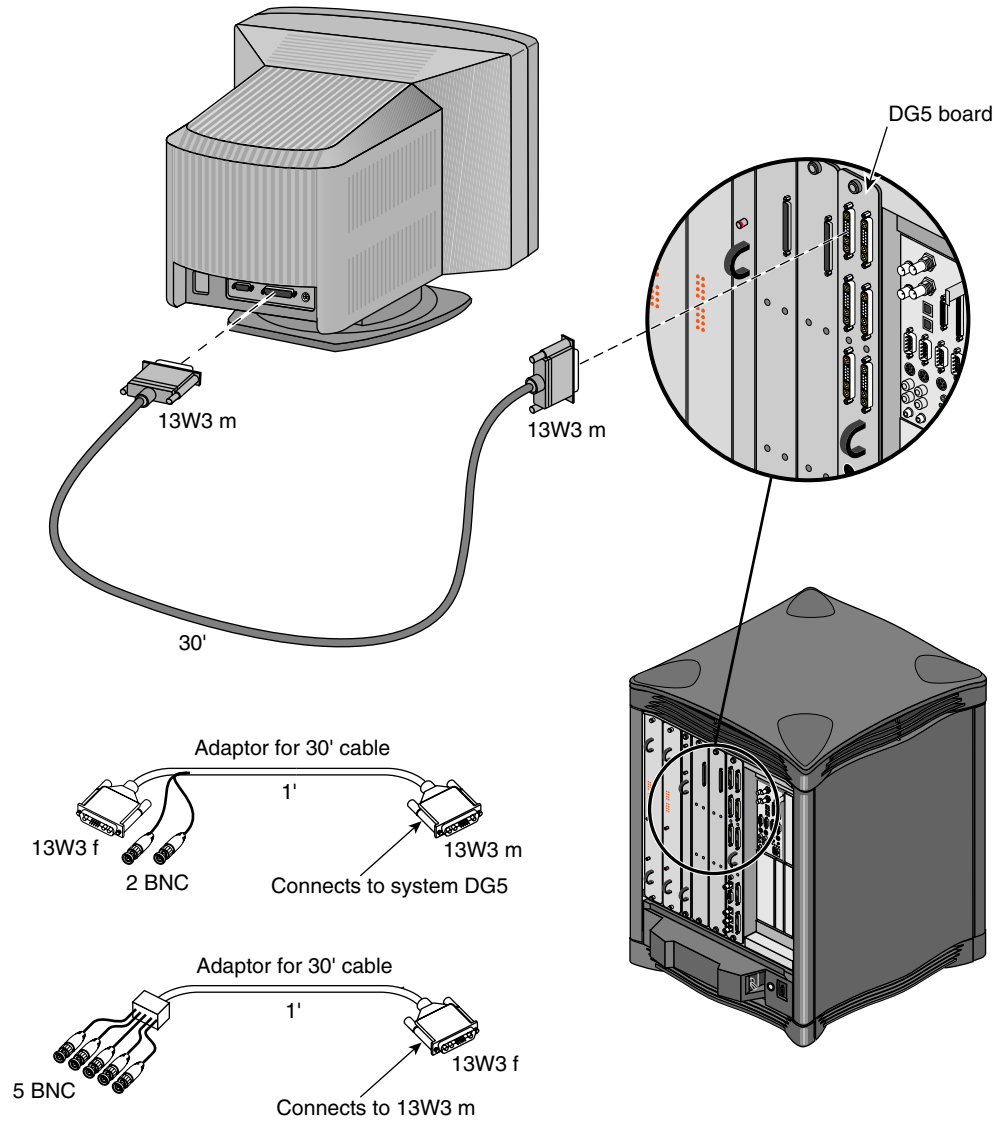
Figure 4-7   13W3 Cable Options

Graphics BaseIO Interface Panel

The graphics BaseIO assembly (IO6G) is a graphics-oriented set of interface connectors that comes standard with each Onyx2 deskside system. The connectors on the BaseIO include support for Ethernet, two keyboards, analog and digital audio, serial and parallel connectors, and others. The following sections provide location and pinout information for these connectors.

Figure 4-8 identifies all the connectors on the graphics BaseIO panel.
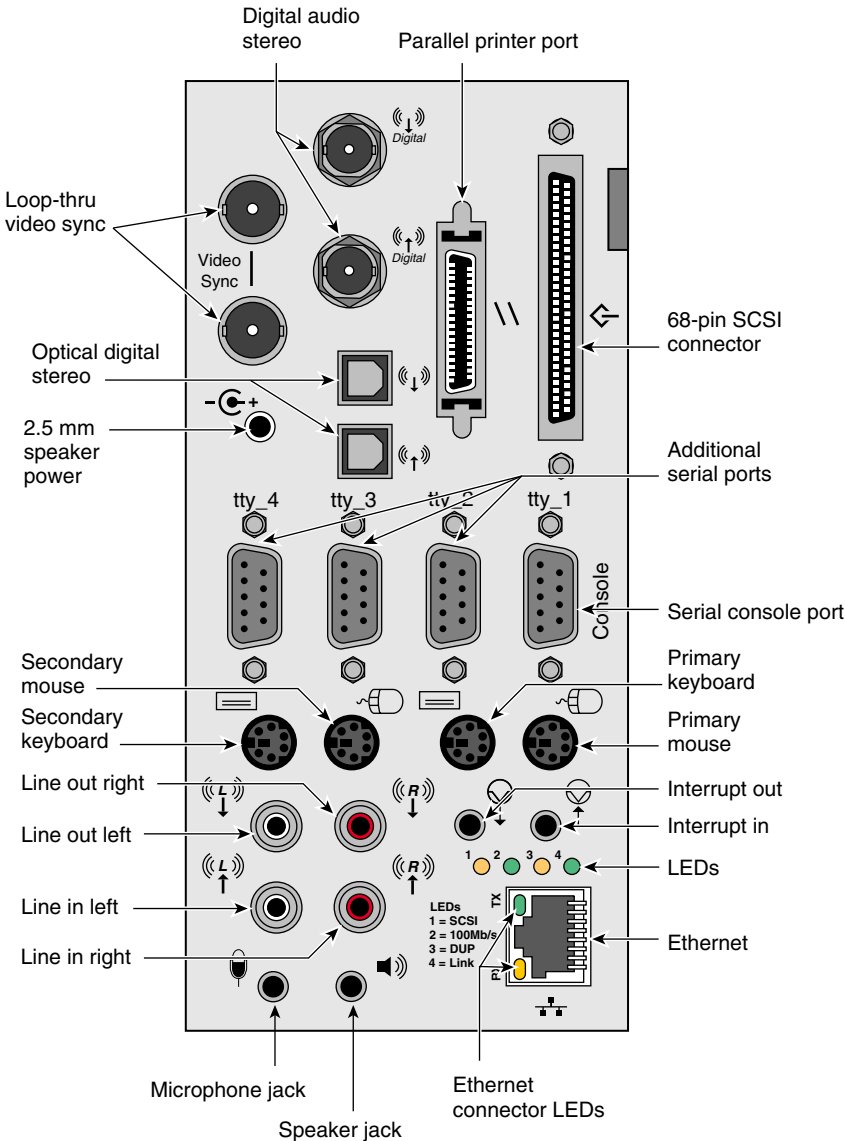
Figure 4-8   BaseIO (IO6G) Panel and Connectors

10/100 Base-T Ethernet Port

A single 10/100 Base-T Ethernet connection is provided on the BaseIO panel. Figure 4-9 shows the location and pinouts of the connector.

Use of additional 10/100 Base-T Ethernet connectors is possible with an optional XIO board.

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. This includes packets not destined for your system.

Just above the RJ-45 Ethernet connector is a set of four LEDs. They have the following functions:

- The yellow LED on the far left (LED 1) lights to indicate SCSI activity on the BaseIO single-ended SCSI 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 rightmost green LED (LED 4) shows the Ethernet link test. It lights when linkstate is valid.

1   2   3   4

Pin 1   Transmit +
Pin 2   Transmit -
Pin 3   Receive +
Pin 4   Reserved
Pin 5   Reserved
Pin 6   Receive -
Pin 7   Reserved
Pin 8   Reserved

100 Base-T connector
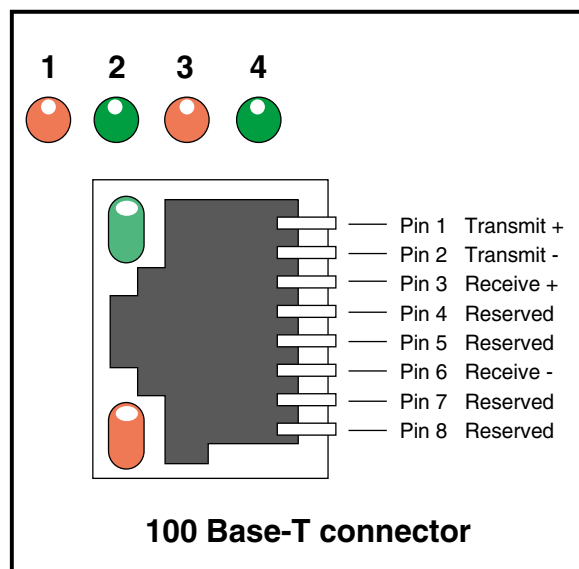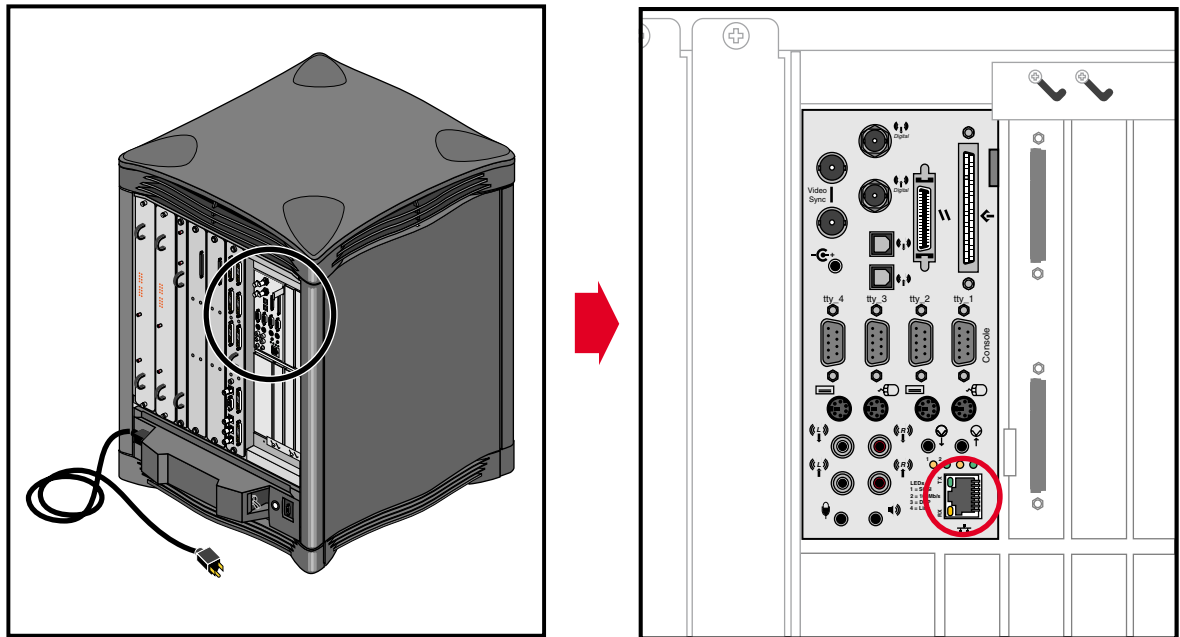
Figure 4-9   10/100 Base-T Ethernet Connector

Table 4-3 shows the cable pinout assignments for the Ethernet 100-BASE T Ethernet port.

Table 4-3   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)

Parallel Port Connector

The BaseIO board supports one IEEE 1284-C 36-pin parallel port connector. The location of this connector is shown in Figure 4-10. Pinouts for the parallel port connector are listed in Table 4-4.

Suitable cables for use with this port should be marked "IEEE 1284-compliant." For most parallel printers, you can use a cable with an IEEE 1284-C connector at the Onyx2 end and an IEEE 1284-B connector (also known as a Centronics style) at the printer end.

36-Pin parallel port

Pin 1 → ← Pin 19

Pin 18 → ← Pin 36

IEEE 1284-C
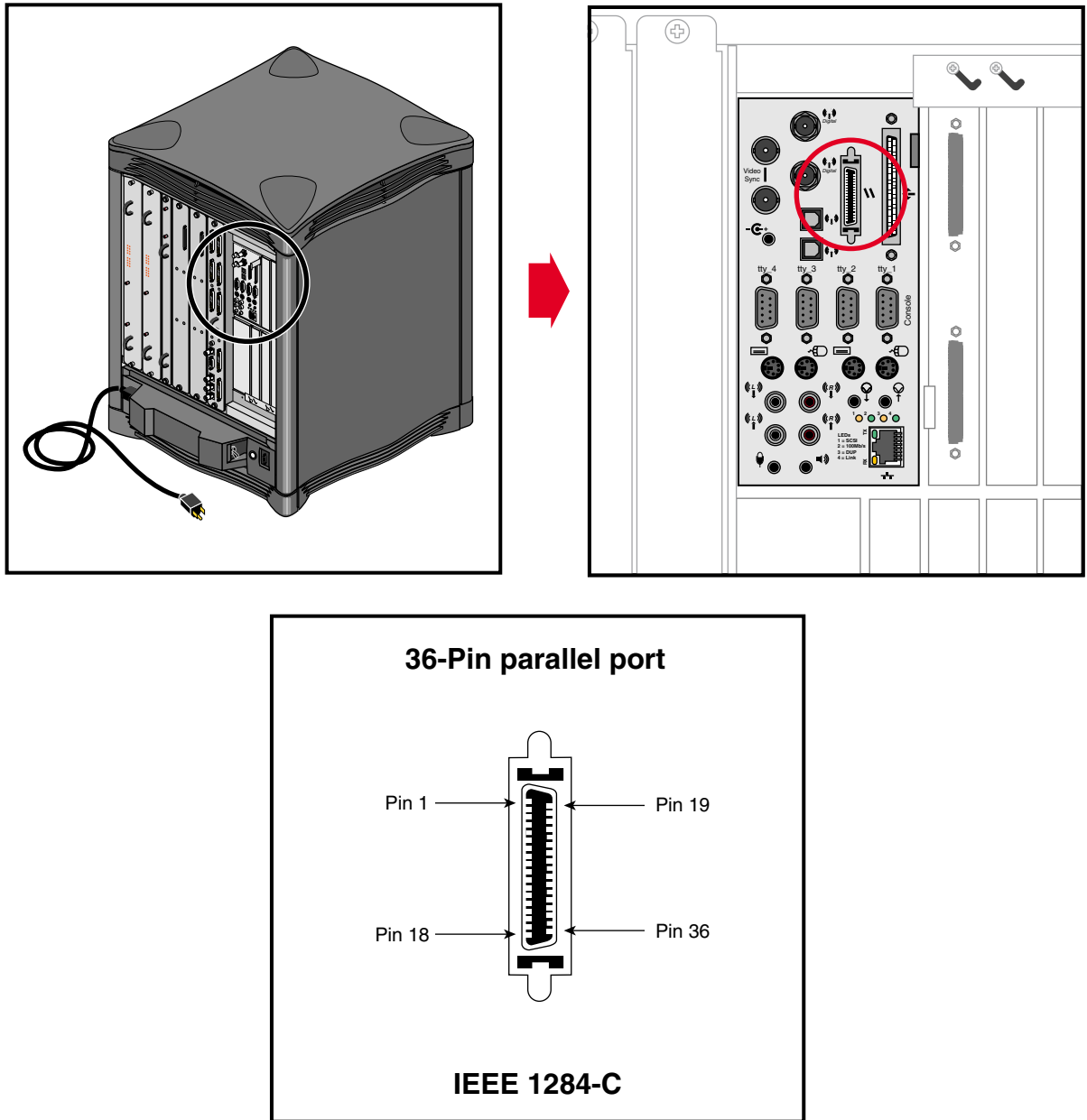
Figure 4-10   Parallel Printer Port Location

Table 4-4   Pinouts for the 36-Pin Parallel Port Connector

Pin	Signal	Source
1	Busy	Printer
2	Select	Printer
3	nAck	Printer
4	nFault	Printer
5	PError	Printer
6	Data 1 (LSB)	Bi-directional
7	Data 2	Bi-directional
8	Data 3	Bi-directional
9	Data 4	Bi-directional
10	Data 5	Bi-directional
11	Data 6	Bi-directional
12	Data 7	Bi-directional
13	Data 8 (MSB)	Bi-directional
14	nInit	Host
15	nStrobe	Host
16	nSelectIn	Host
17	nAutoFd	Host
18	Host Logic High	N/A
19	Signal ground (Busy)	N/A
20	Signal ground (Select)	N/A
21	Signal ground (nAck)	N/A
22	Signal ground (nFault)	N/A
23	Signal ground (pError)	N/A

Table 4-4 (continued)   Pinouts for the 36-Pin Parallel Port Connector

Pin	Signal	Source
24	Signal ground (Data 1)	N/A
25	Signal ground (Data 2)	N/A
26	Signal ground (Data 3)	N/A
27	Signal ground (Data 4)	N/A
28	Signal ground (Data 5)	N/A
29	Signal ground (Data 6)	N/A
30	Signal ground (Data 7)	N/A
31	Signal ground (Data 8)	N/A
32	Signal ground (nInit)	N/A
33	Signal ground (nStrobe)	N/A
34	Signal ground (nSelectIn)	N/A
35	Signal ground (nAutoFd)	N/A
36	Peripheral logic high	Printer

Mouse and Keyboard Ports

Each Onyx2 deskside workstation comes with two keyboard and mouse connectors.

Figure 4-11 shows the location of the connectors and their pinouts.

There are two sets of keyboard and mouse connectors on the rear of the graphics BaseIO panel provided with each Onyx2 system. If your system uses one keyboard and mouse, attach them to the primary keyboard and mouse connector ports. These primary ports are located on the right side of the BaseIO panel.

You can plug the keyboard and mouse cables directly into the BaseIO panel. However, in cases where your monitor, keyboard, and mouse are located away from the system, use the included extension cable. Each system comes with a 24-foot (7.3 m) keyboard and mouse extension cable.
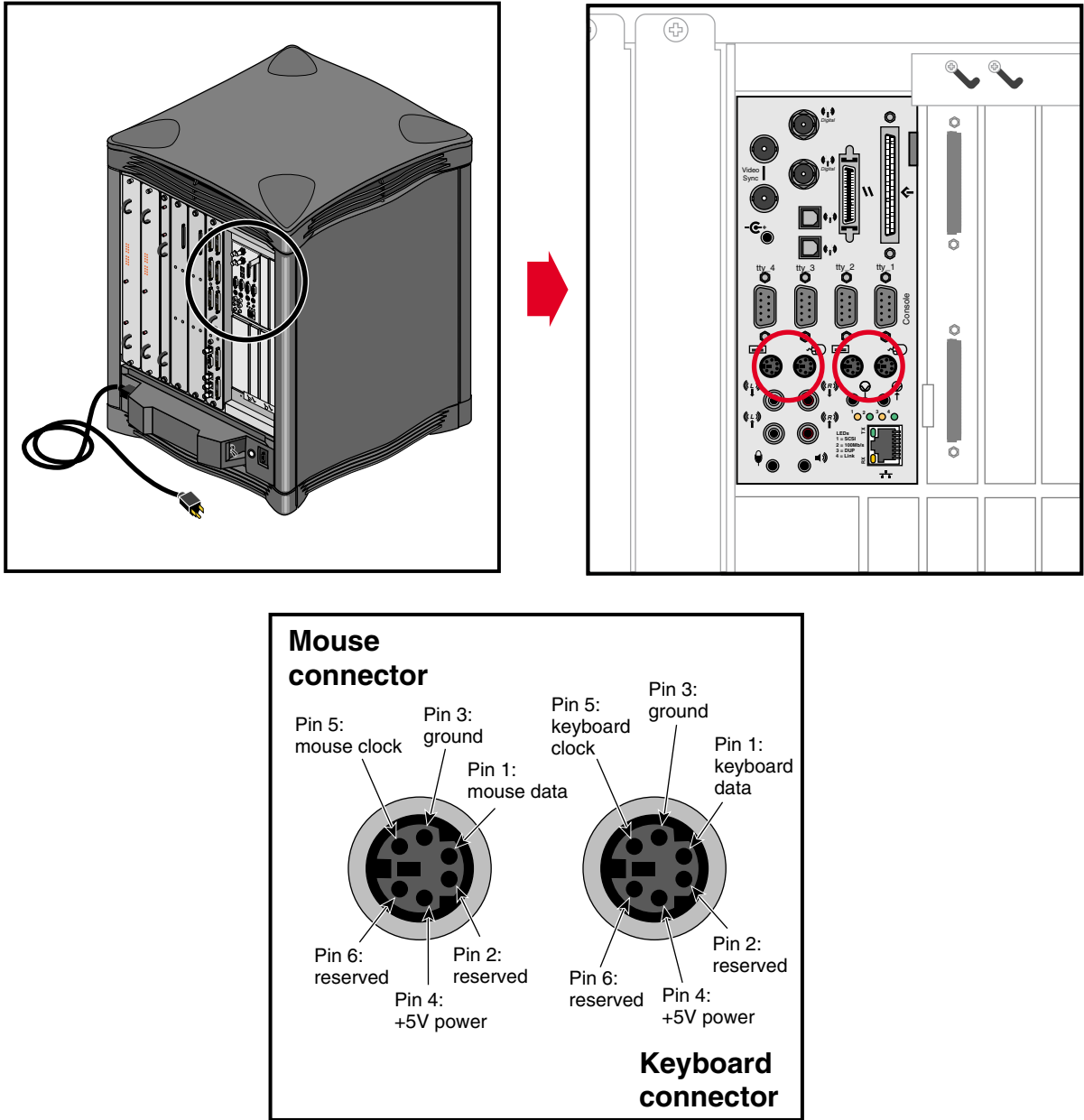
Figure 4-11   Keyboard and Mouse Locations and Pinouts

Table 4-5 shows the cable pinout assignments for the keyboard port.

Table 4-5   Keyboard Port (6-Pin MINIDIN) Pin Assignments

Pin	Assignment
1	KEYBOARD DATA
2	(Reserved)
3	GROUND
4	KEYBOARD POWER (+5 V)
5	KEYBOARD CLOCK
6	(Reserved)

Table 4-6 shows the cable pinout assignments for the mouse port.

Table 4-6   Mouse Port (6-Pin MINIDIN) Pin Assignments

Pin	Assignment
1	MOUSE DATA
2	(Reserved)
3	GROUND
4	MOUSE POWER (+5 V)
5	MOUSE CLOCK
6	(Reserved)

Analog Stereo In and Out (RCA-Type) Ports

Table 4-7 shows the cable pinout assignments for the line-level audio (RCA-type) ports.

Table 4-7   Analog Composite Video Port Pin Assignments

Pin	Assignment
(sleeve)	GROUND
(tip)	Line level audio

You may connect audio equipment to the line-level inputs and outputs using standard shielded RCA type connectors (see Figure 4-12). For best results, always route these analog signal cables away from power cords.

The right channel is color-coded red, and the left channel is white.

Line in and Line out

Tip: Line level audio

Sleeve: Ground
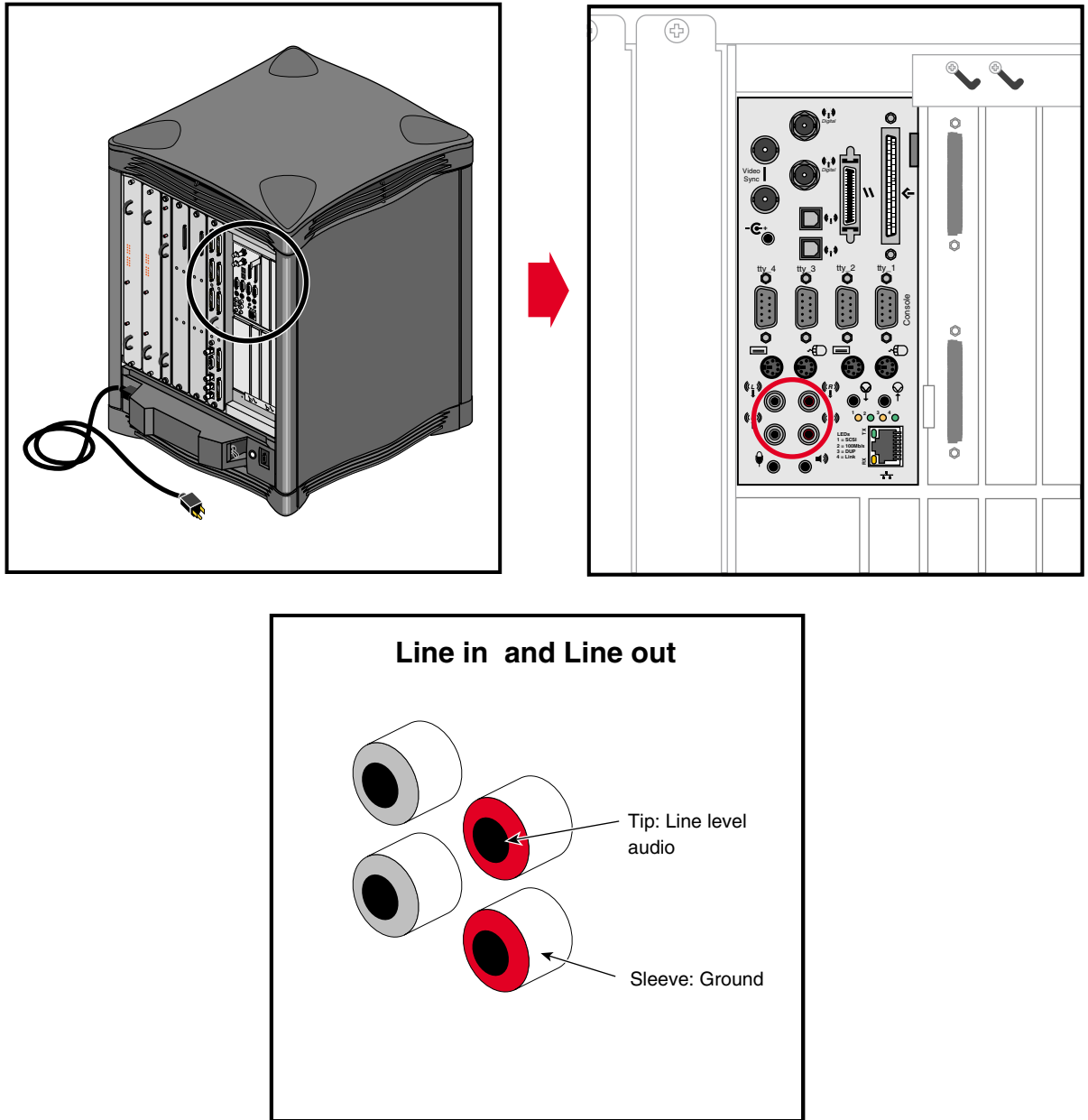
Figure 4-12   Analog Stereo Port Locations

Serial Connectors

The Onyx2 deskside system comes with four standard 9-pin serial connectors. The connectors are all male and use a PC-compatible signal assignment. Figure 4-13 shows the connector locations and pin assignments.

The RS-232 standard recommends the use of cables no longer than 50 feet (15.2 meters). This standard should also be applied to RS-422 serial use. Longer runs introduce a greater possibility of line noise occurring. This 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 areas where large electric motors, welding apparatus, or X-ray machines operate. Bury outside wiring in conduit to prevent lighting strikes from damaging the system.

Console
serial port

Serial port

Pin 5 Ground

Pin 4 Data
Terminal
Ready (DTR)

Pin 3 Transmit
Data (TD)

Pin 2 Receive
Data (RD)

Pin 1 Data Carrier
Detect (DCD)

Pin 9 No connect

Pin 8 Clear
to Send (CTS)

Pin 7 Request to
Send (RTS)

Pin 6 Data Set
Ready (DSR)
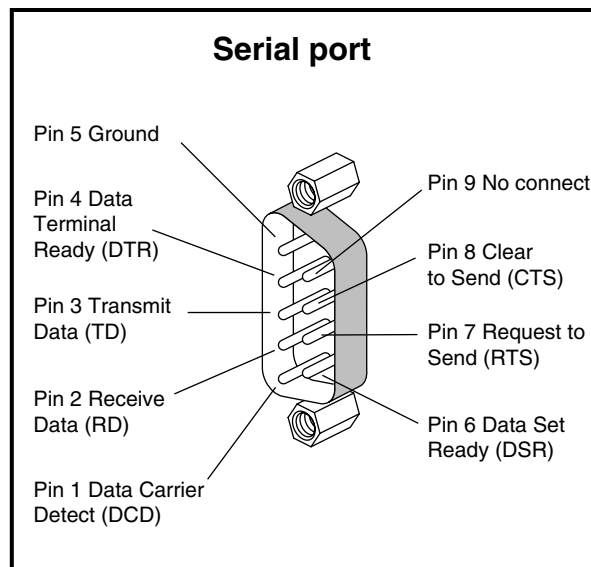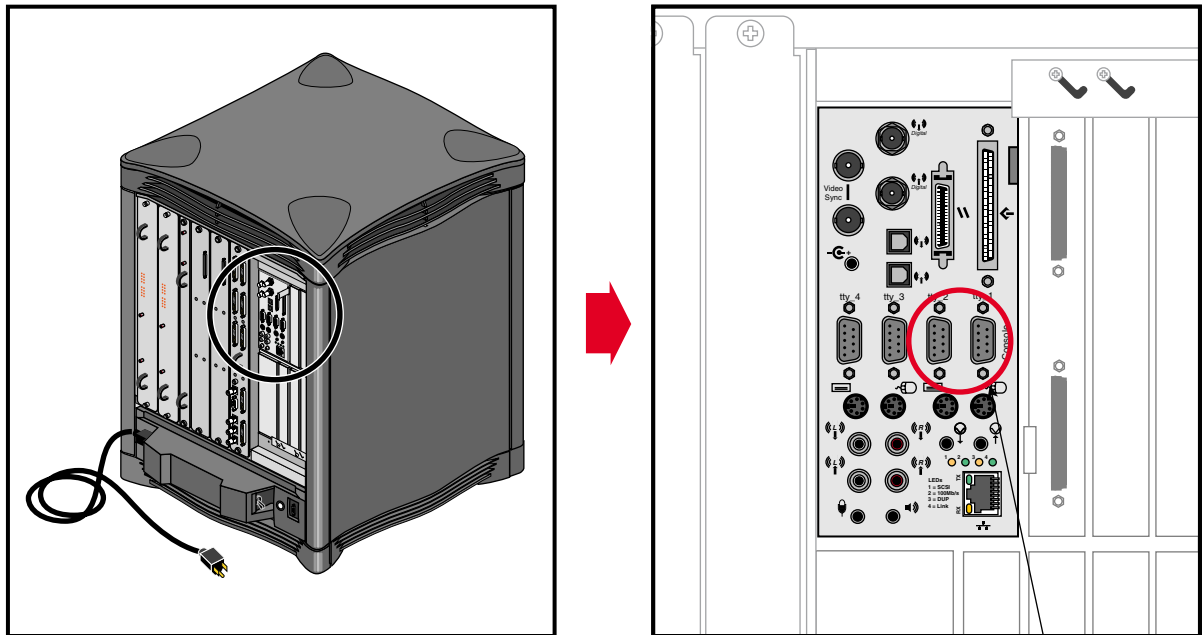
Figure 4-13   RS-232/RS-422 Serial Connectors

Optical Digital Audio Interface Connectors

Just above serial port two are the single-jack ADAT optical connectors (see Figure 4-14). These ports can be used with multi-track digital audio recording input and output devices.

These connections support optical input and output of eight channels at up to 24 bits and up to 48 Hz sample rates.

Use standard plastic fiber interconnecting cables. You will need two cables; one for input and one for output. The Onyx2 system ships with connector cover plugs over the input and output ports. These must be removed before using the optical connectors. Retain these dust covers for use when shipping or if you discontinue ADAT use.

Optical digital stereo connectors

Optical digital output

Optical digital input
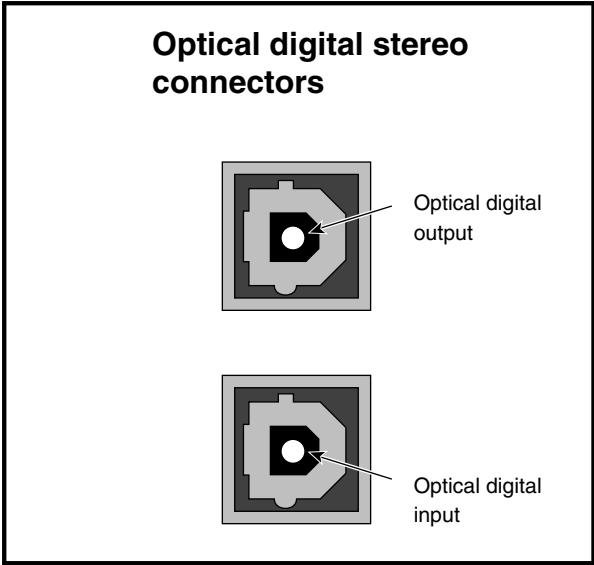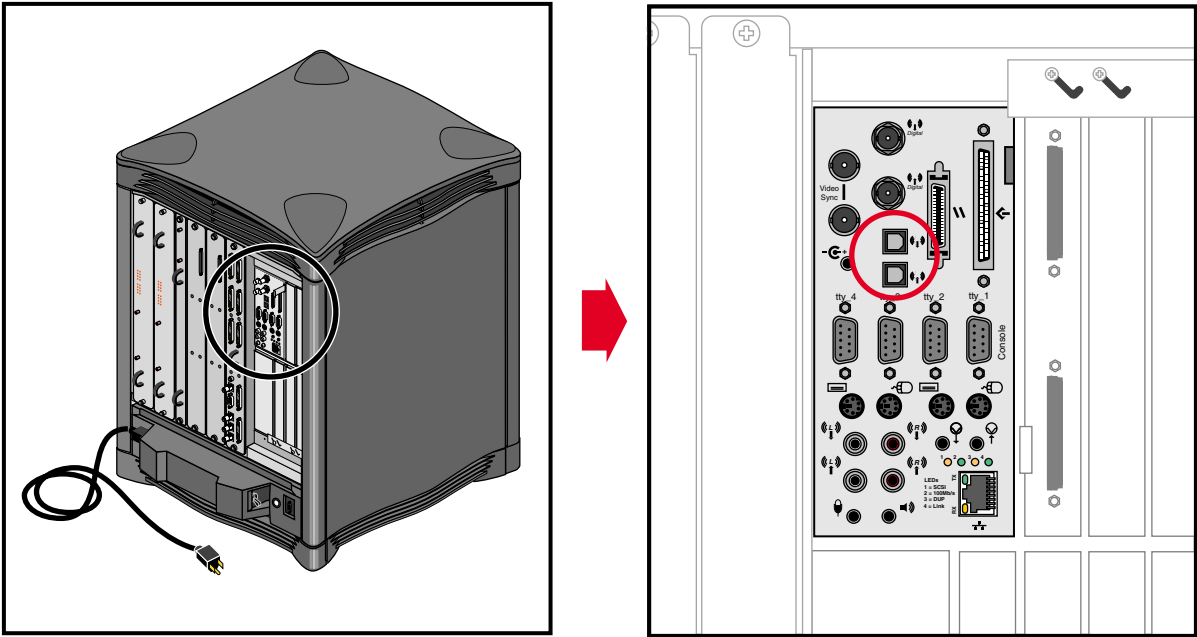
Figure 4-14   Optical Digital Audio Interface

Loopthrough and Digital Audio Connectors

Figure 4-15 shows the loopthrough and digital audio connectors.

The AES and EBU digital audio connectors support 75-ohm signals at a nominal 1.0 volts (peak-to-peak) signal level. You should use 75-ohm coaxial cable with standard BNC connectors for interconnections (such as with digital video recorders).

Some equipment supporting AES and EBU digital audio signals uses 3-pin XLR connectors that support balanced 110-ohm signals. To successfully interconnect with equipment of this type, install a digital audio "BALUN" adapter at the equipment's XLR connector points. The BALUN adapter connects the 3-pin XLR to a 75-ohm BNC connection. The 75-ohm coaxial cable then connects between the Onyx2 system and the BALUN adapter.

Note: 110-to 75-ohm digital audio BALUN adapters come in male and female versions. You need one of each type when using both the input and output AES and EBU connectors.
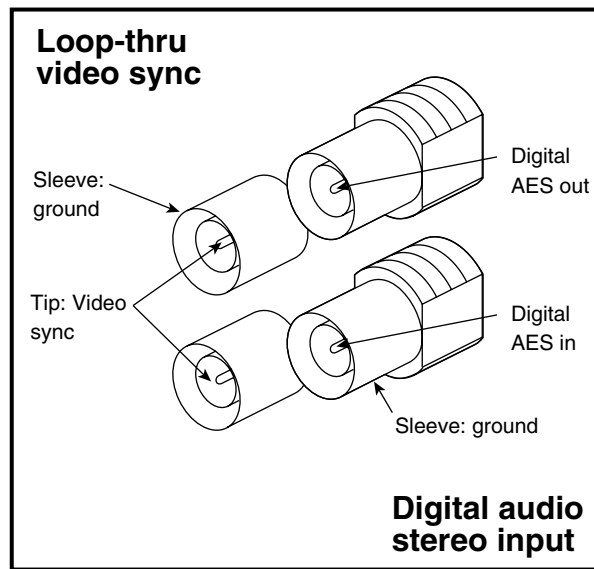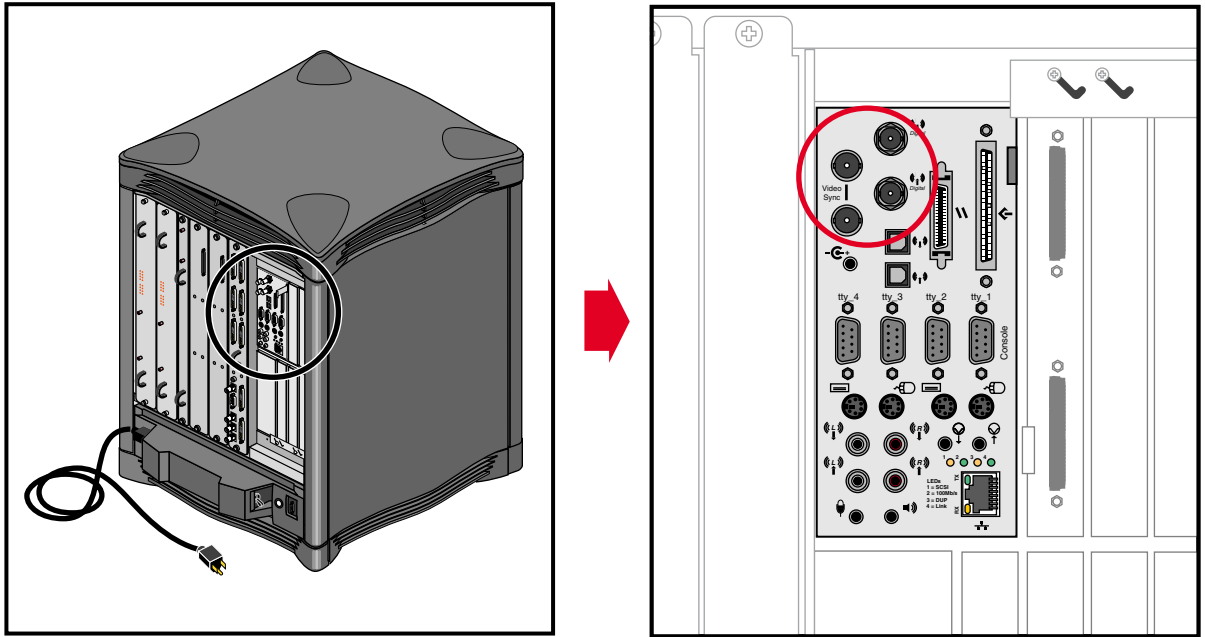
Figure 4-15   Loopthrough and Digital Audio Connectors

Standard SCSI Connector

A single-ended external 68-pin SCSI connector is provided on the BaseIO panel (see Figure 4-16). This connector supports both Ultra SCSI and SCSI-2 devices. The connector is always single-ended.

Optional additional SCSI ports can be implemented using XIO option boards. See the section "Optional Interfaces" on page 77 for additional information.

The hyphen preceding a signal name indicates that the signal is low. Note that 8-bit devices that connect to the P-cable leave these 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 4-8.

Table 4-8   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 4-8 (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
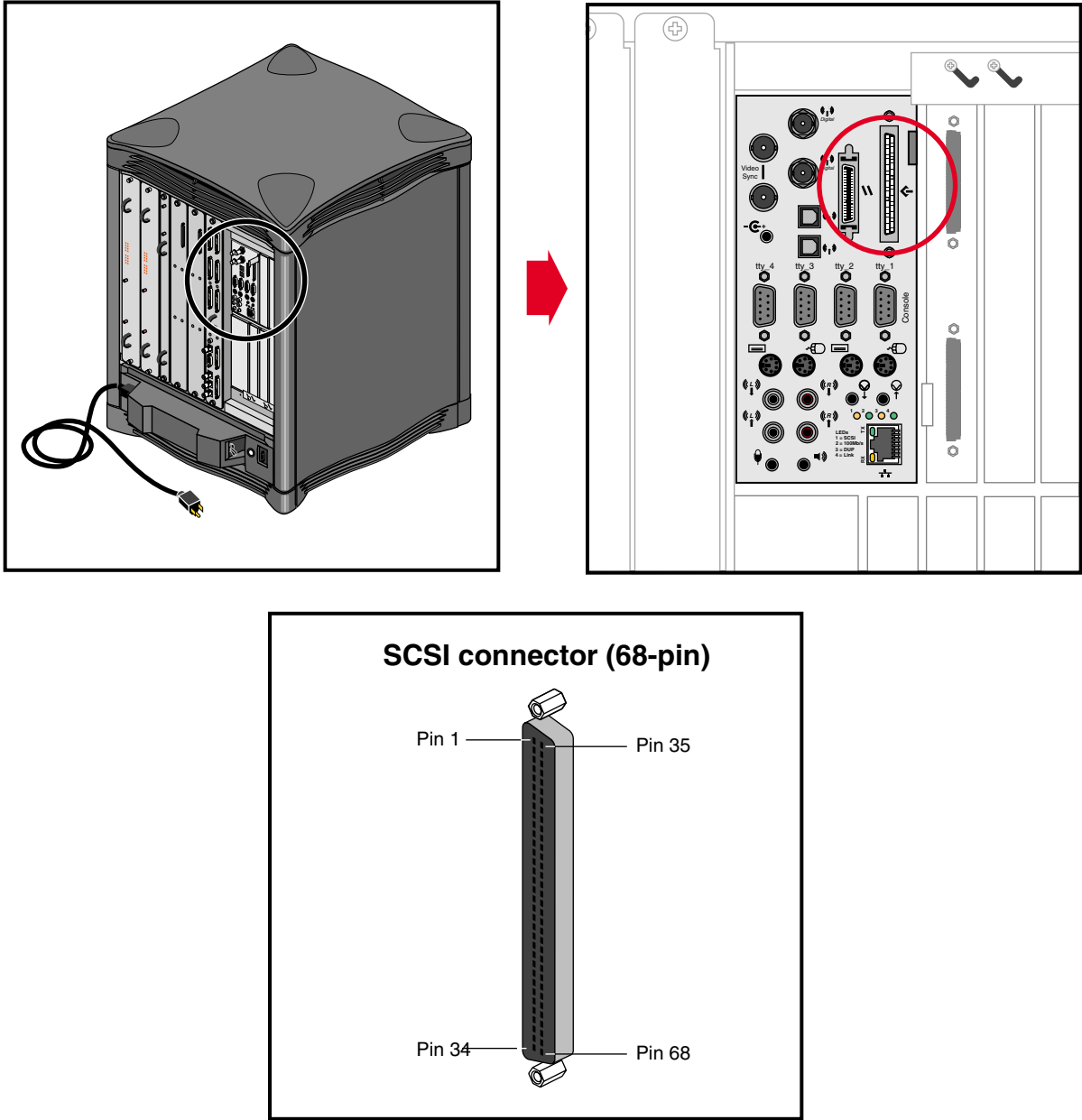
Figure 4-16   68-Pin Single-Ended SCSI Connector

Speaker and Microphone Connections

The Onyx2 BaseIO panel uses a 30-foot (9.1 m), three-connector bundled cable to connect a microphone and a pair of speakers (included with your Onyx2 system).

Figure 4-17 shows the connection points on the rear of the speakers.

Battery compartment (not used)

Analog speaker in

Speaker power

Connection to left speaker
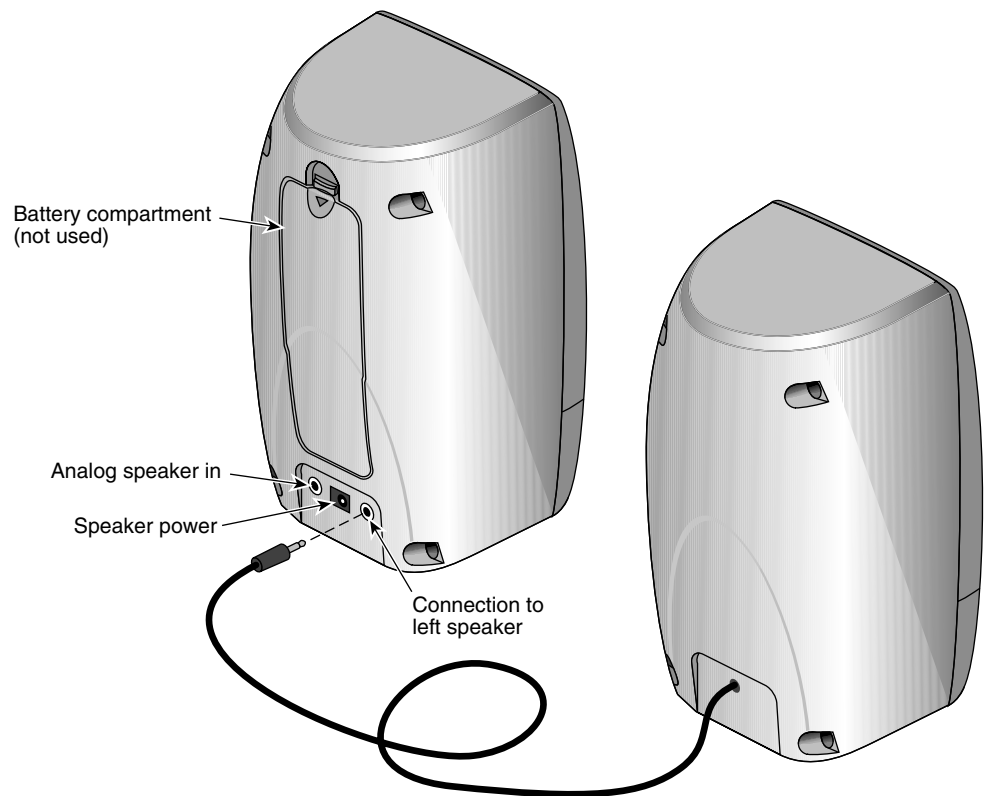
Figure 4-17   Cable Connection Locations on the Speakers

The analog speaker connector plugs into the BaseIO board and the other end goes to the analog speaker plug. The analog speaker power connector goes from the BaseIO to the middle plug on the back of the right speaker (see Figure 4-18).

The microphone connector goes from the BaseIO panel and you plug in your (included) microphone at the other end (look for the microphone logo on the connector). Note that

75

there is also a 10-foot (2 m) "speaker only" cable included with your Onyx2 system. This
10-foot cable does not supply a microphone plug and limits where you may place the
speaker set.
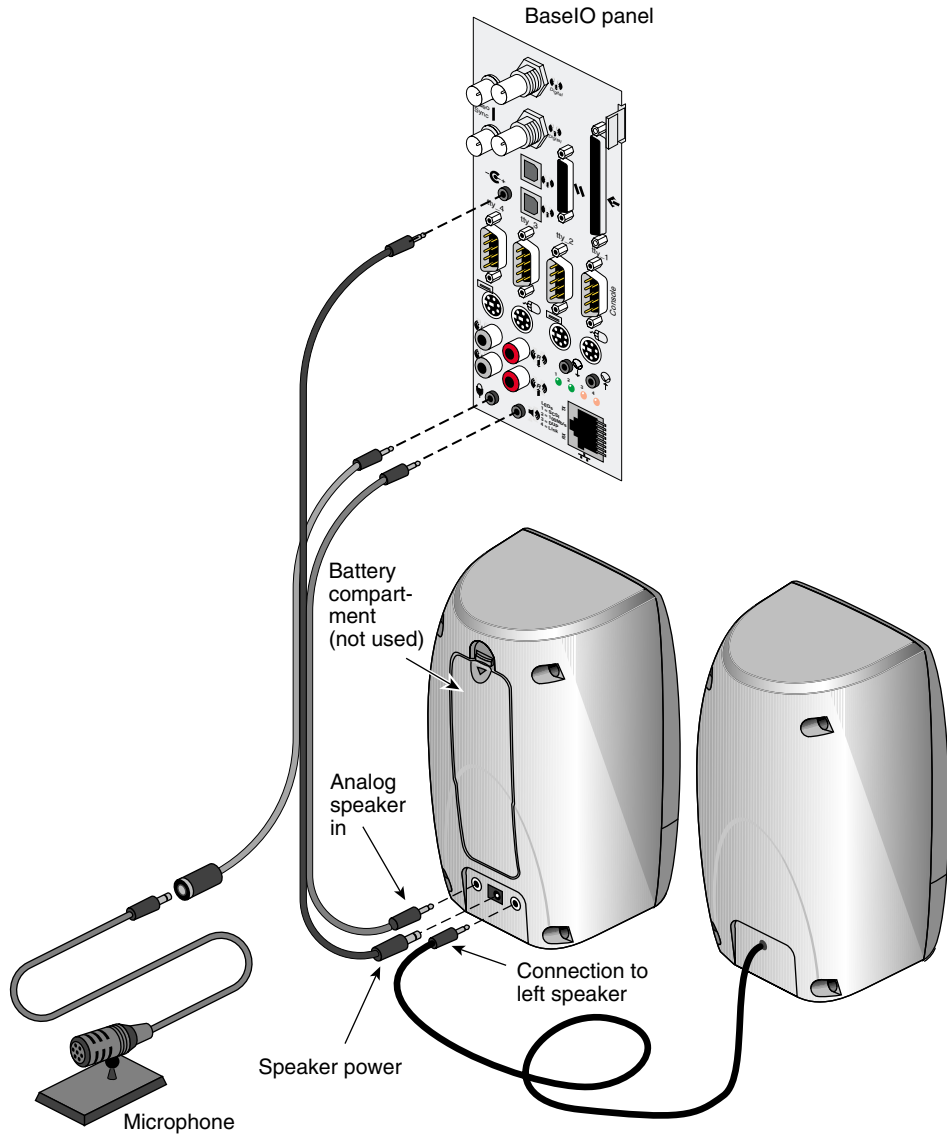
Figure 4-18   Speaker and Microphone Connections to the BaseIO

Optional Interfaces

Optional interfaces you may wish to use could include

- multiple SCSI

- ATM

- HIPPI

- multiple Ethernet

Every deskside system comes ready to be plugged into a standard Ethernet network using an 8-pin RJ-45 style connector.

Optional XIO interface boards install in the rear of the system. You may have up to four optional XIO boards in the Onyx2 deskside.

Installing and Replacing Customer-Replaceable Units

This chapter explains how to remove, replace, or add the system disk, data disk(s), CD-ROM drive, or module System Controller (MSC) in the Onyx2 deskside chassis.

Only trained installers certified by Silicon Graphics should remove or replace the system midplane, router board, fan tray, Node boards, power supply, or XIO boards. Other components can be removed or replaced by owners as well as by trained and certified personnel.

Note: If your system is under warranty, or if you have a full service maintenance contract, call your service provider before removing or replacing any parts.

Be sure to carefully read and follow all the safety information regarding power and static discharge in Chapter 3 before performing any of the installation or replacement procedures in this chapter.

Installing or Removing the System Disk and Optional Hard Drives

The main system disk (disk one, SCSI ID 1) always goes in the drive bay immediately to the right of the MSC. The front of the system has five 3.5-inch disk bays that use 80-pin single-connector assembly (SCA) installation sleds.

Note: You must use an SCA-ready disk drive and drive sled mount on all drives being installed in these five bays. Non-SCA drives and sleds from older Silicon Graphics systems will not fit or function in the Onyx2 deskside drive bays.

The CD-ROM bay at the upper left section of the system uses a different mounting scheme.

Disk drive modules are aligned vertically at the front of the chassis, as shown in Figure 2-1. In the server chassis, note that the left-most disk drive—the system drive—is oriented differently from the others.

Caution: Do not remove disk drives while they are operating. Always power off the system before installing or removing a drive. When you remove a drive, be sure that you always put it back in the same bay that you removed it from. Placing the system disk in the wrong bay results in the system being unable to boot.

To remove the system disk drive module:

1. Power off the system.

2. Unlock the handle by moving it to the right (the handle is centered and in the open position, as shown in Figure 5-1). Note that the handle opens to the left in bays two through five; see the next section "Removing or Inserting a Data Disk."

3. Pull the disk and sled assembly straight out of the bay.

To insert a hard disk assembly, follow these steps:

1. If necessary, snap the handle to the open position so that it is centered.

2. Align the disk module with the drive guide.

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

4. When the system disk assembly is in all the way, snap the handle leftward to the closed position.

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

Handle in
closed position

Handle in
open position

System disk

Drive bracket guide
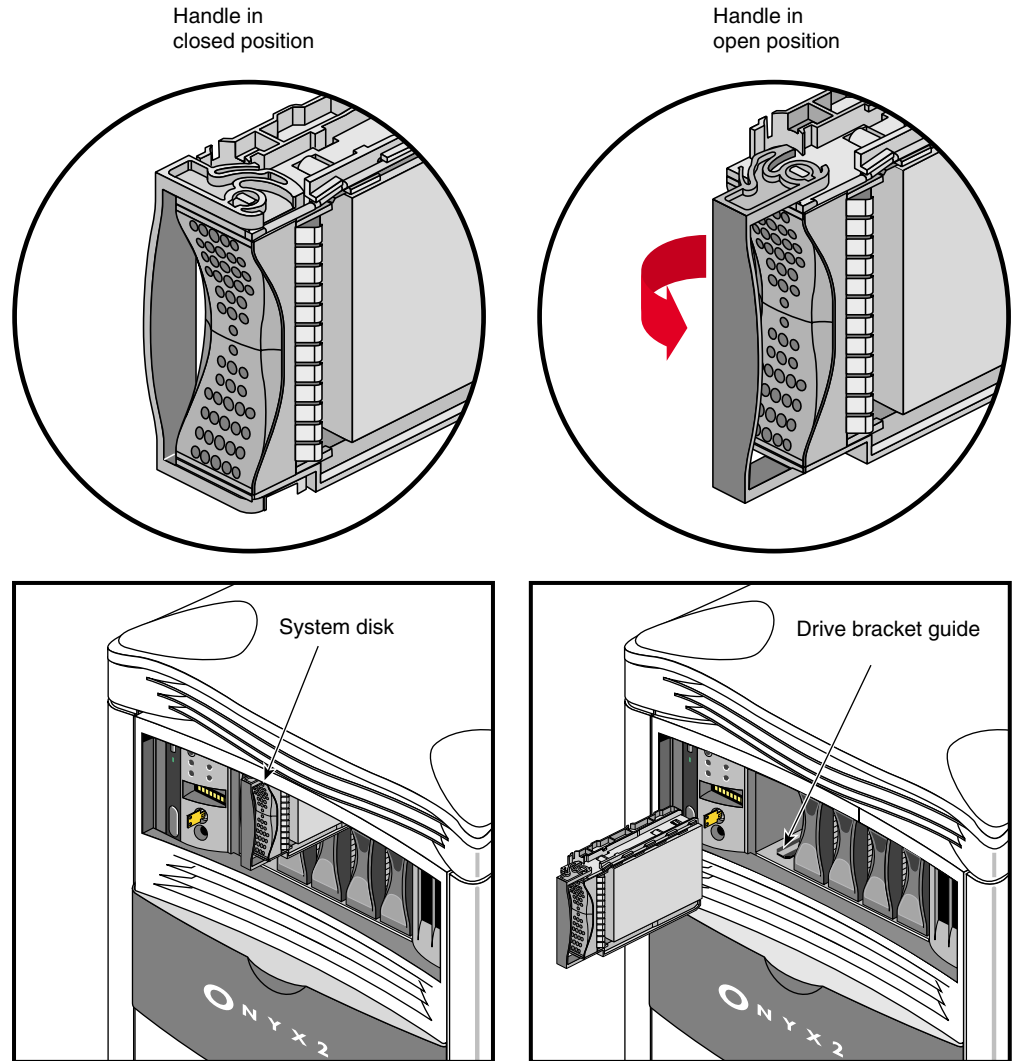
Figure 5-1   Installing or Removing the System Disk

Removing or Inserting a Data Disk

Caution: Use proper handling and storage procedures to avoid the loss of data and equipment. Do not remove disk drives while they are operating. Always power off the system before installing or removing a drive. When you remove a drive(s) be sure that you always put it back in the same bay that you removed it from. Replacing a data disk in a different bay may cause file corruption, data loss, or other malfunction.

Complete the following steps to remove a data disk drive module:

1. Snap the handle to the left to the open position.

2. Center the handle, as shown in Figure 5-2.

3. Pull the disk module straight out.

To insert a data disk drive module, follow these steps:

1. If necessary, snap the handle to the open position so that it is centered.

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.

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

5. When the disk module is in all the way, snap the handle rightward to the closed position.

6. If you have replaced a data disk module, repackage it for shipment back to Silicon Graphics, following instructions included with the replacement shipment.

Handle in
closed position

Handle in
open position

Optional disk

Drive bracket guide
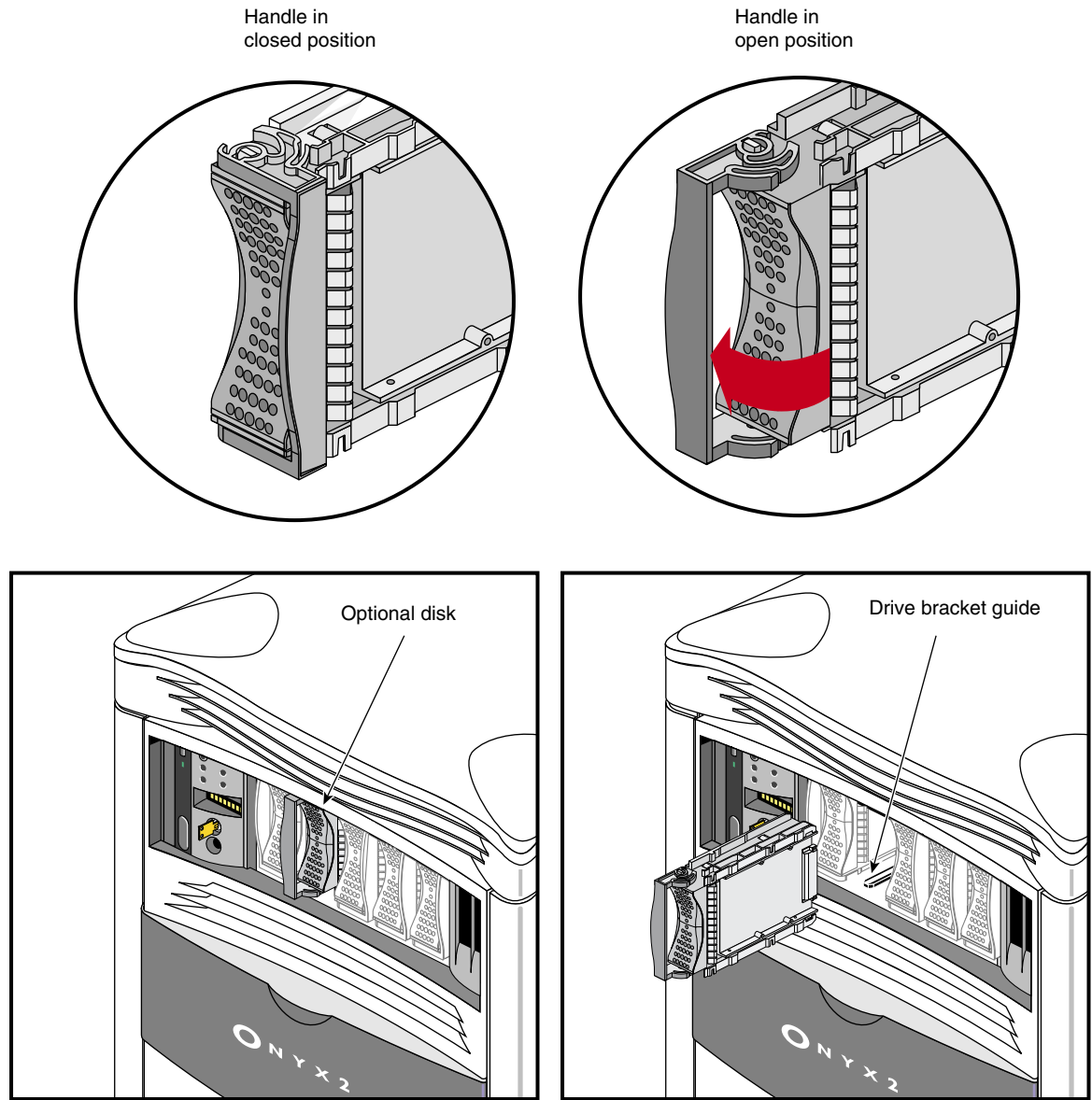
Figure 5-2   Removing a Data Disk Drive Module

Replacing the Module System Controller or CD-ROM Drive

The MSC and CD-ROM drive are packaged together in one assembly. To replace either unit, you must remove the entire assembly and then replace the faulty component.

Complete the following steps to replace the MSC or CD-ROM drive:

1. Notify all users to log off, turn the MSC key to Standby, and push down the system power switch on the back to the off position. See "Powering Off the Onyx2 Deskside System" in Chapter 3 if you need more information.

2. Remove the front cover. See "Removing the System's Plastic Covers" in Chapter 3 if you are unfamiliar with the procedure.

3. Ground yourself to the system chassis using an ESD ground strap.

4. Use a #1 Phillips-head screwdriver to loosen and remove the four screws that hold the assembly in place on the chassis, as shown in Figure 5-3.

5. Grasp the assembly with both hands and gently tug the connectors loose from the midplane. There is an indentation near the upper right sector that provides a good finger grip.

6. Pull the assembly all the way out of the chassis and set it carefully on an anti-static work surface.

7. Remove the four screws that connect the CD drive or MSC (whichever you are replacing) to the sheet-metal assembly frame.

8. Install the new unit using the screws from the last step.

9. Slide the assembly into the chassis carefully until the two connectors are perfectly aligned with the connectors on the system midplane.

10. Seat the connectors firmly into the midplane, then screw in and tighten the four screws that fasten the assembly to the deskside chassis.

11. Reinstall the front cover and power on the system.
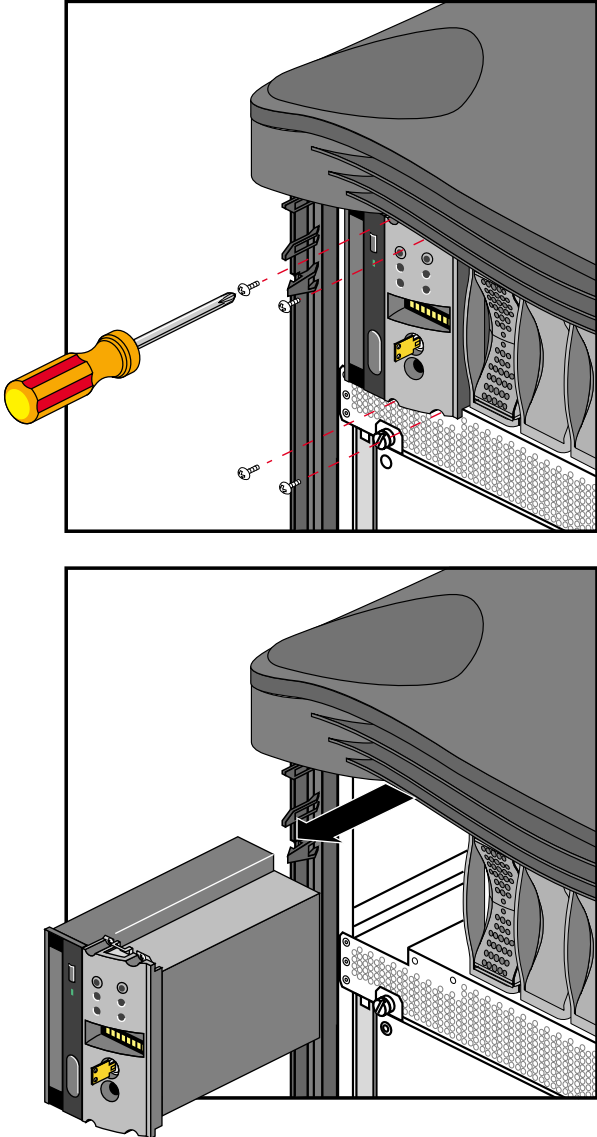
Figure 5-3   Install or Replace the MSC or CD-ROM Drive

Installing External Drives

There are a number of optional peripheral devices that can be used with your Onyx2 deskside system. Figure 5-4 shows an example of an Origin™ Vault drive expansion box connected to the deskside workstation.

Note: Always use the shortest possible SCSI cable when connecting to a single-ended SCSI device or Origin Vault.
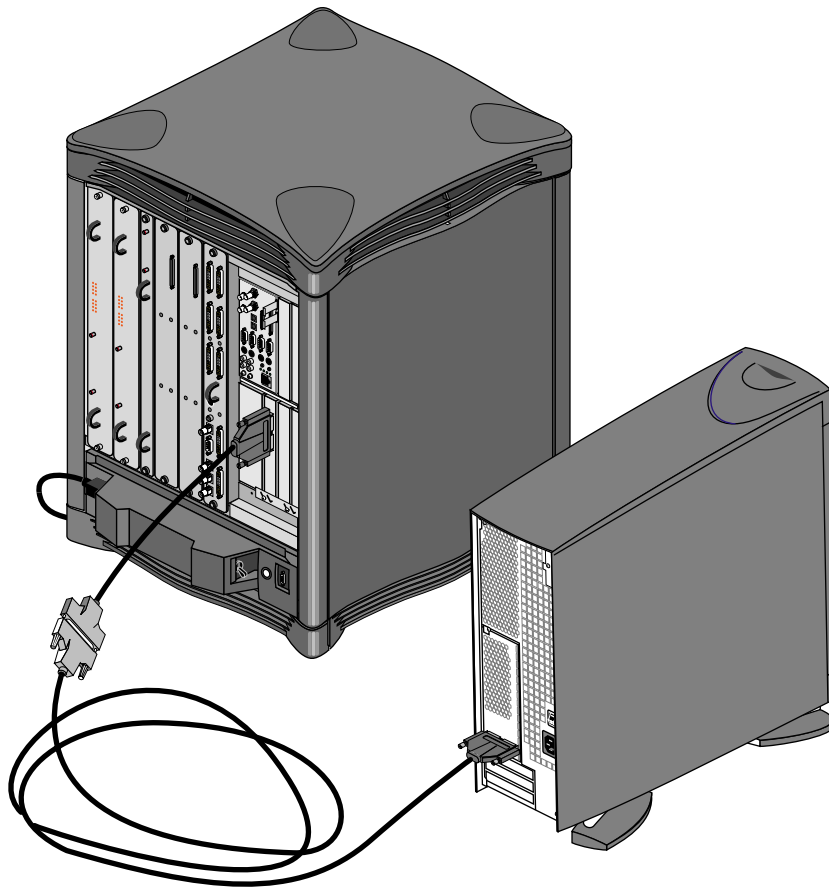
Figure 5-4   External Origin Vault Drive Expansion Box

Using the Module System Controller

This chapter describes the functionality of the deskside module System Controller (MSC). The MSC interacts with the power supply, fan tray module, midplane, Node board, and other boards that have on-board regulators in a deskside system.

Deskside MSCs do not have the same functional abilities as the full-featured multimodule System Controller (MMSC) that mounts in a rack.

The MSC is located in the upper left section on the front of the deskside system (see Figure 6-1). It is between the CD-ROM drive and the hard disk bays.

CD-ROM/
Module system controller   CD-ROM   Module system controller
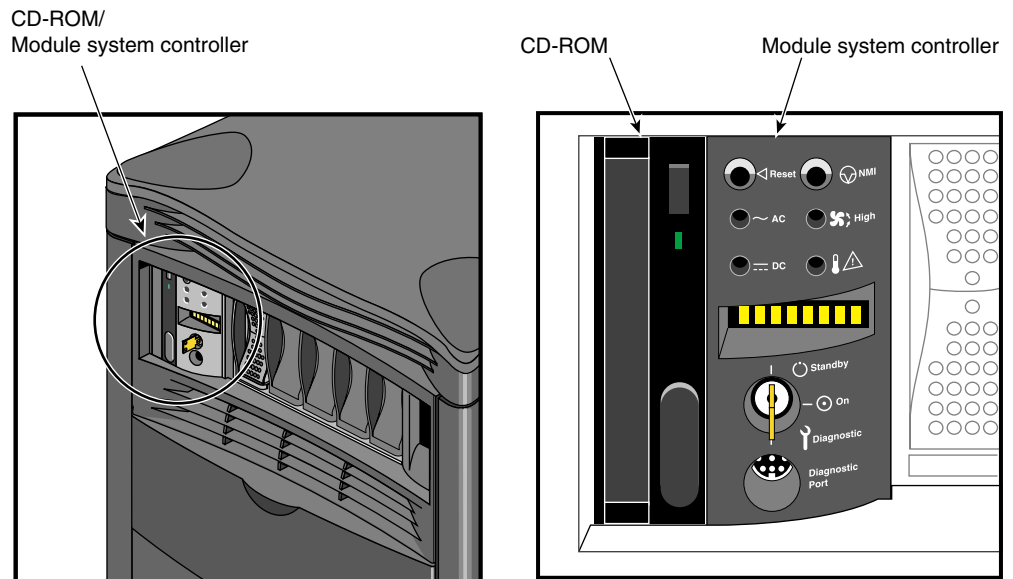
Figure 6-1   MSC Interface Location

The MSC provides environmental monitoring for safe operation of the deskside system. The controller connects to the system midplane through an extender board and provides easy user access to switches and displays at the front of the deskside system (see Figure 6-2).

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 high-speed
indicator
LED

Ambient
over-
temperature
LED

Security
key switch

Standby

On

Diagnostic
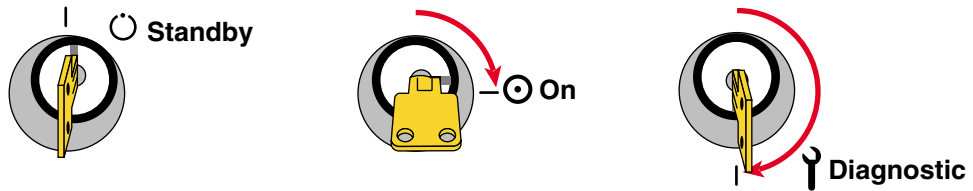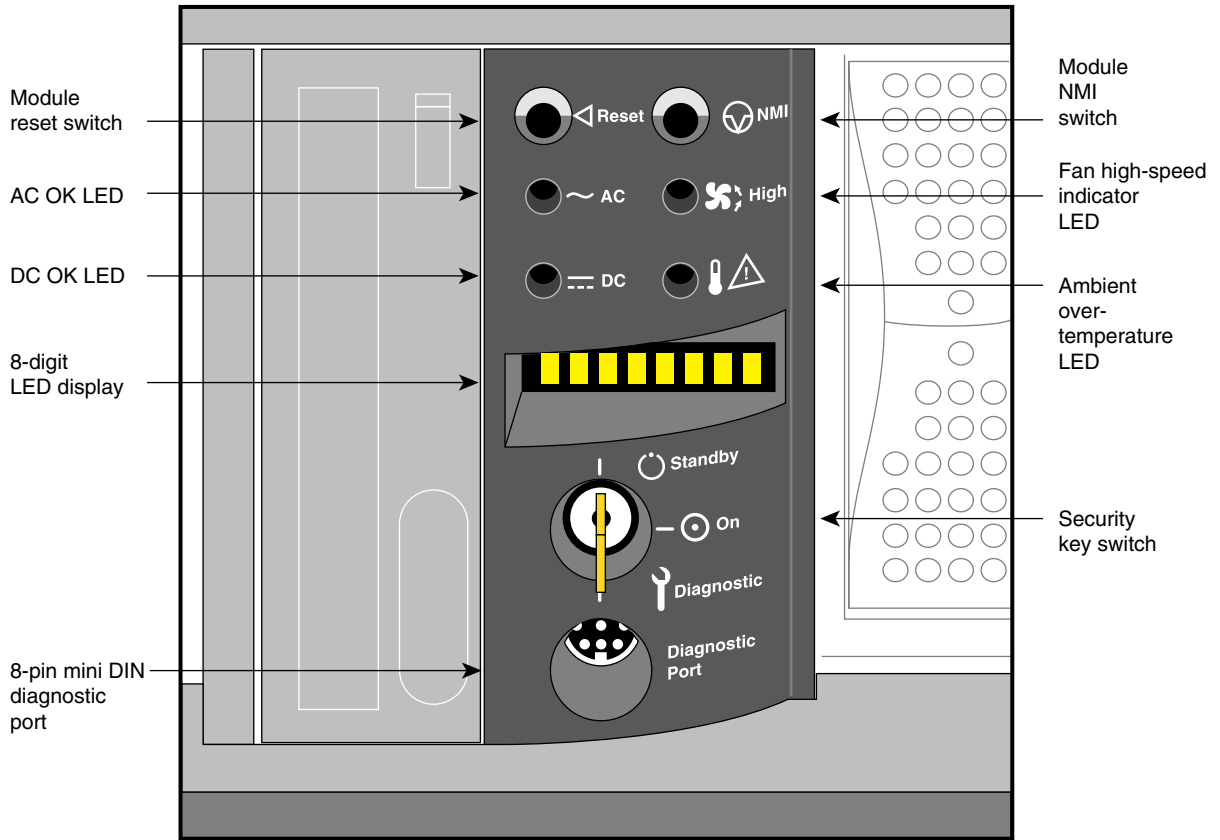
Figure 6-2   MSC Status Panel and Switches

In the lower right section on the back of the deskside system is a 9-pin serial console connector that is a direct mirror of the 8-pin Din connector on the front panel. Figure 6-3 shows the location and pinouts of the 9-pin rear-mounted MSC connector.

Note: You may not connect serial devices to both the front and rear MSC serial connectors 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.

Diagnostic 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 Received Data (RD)

Pin 3 Transmitted Data (TD)

Pin 4 Data Terminal Ready (DTR)

Pin 5 Ground

System Controller diagnostic serial port

Figure 6-3   MSC Rear Serial Console Connector

Understanding the Module System Controller's LEDs and Switches

The MSC has one keyswitch, two pushbuttons, and four LED indicators. The messages listed below are displayed on the 8-digit LED panel (see Table 6-1). 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** pushbutton initiates a system-wide reset of the module. 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 compute module. The keyswitch must be in the diagnostic position to use this button.

- The **AC** Power OK green LED lights up 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.

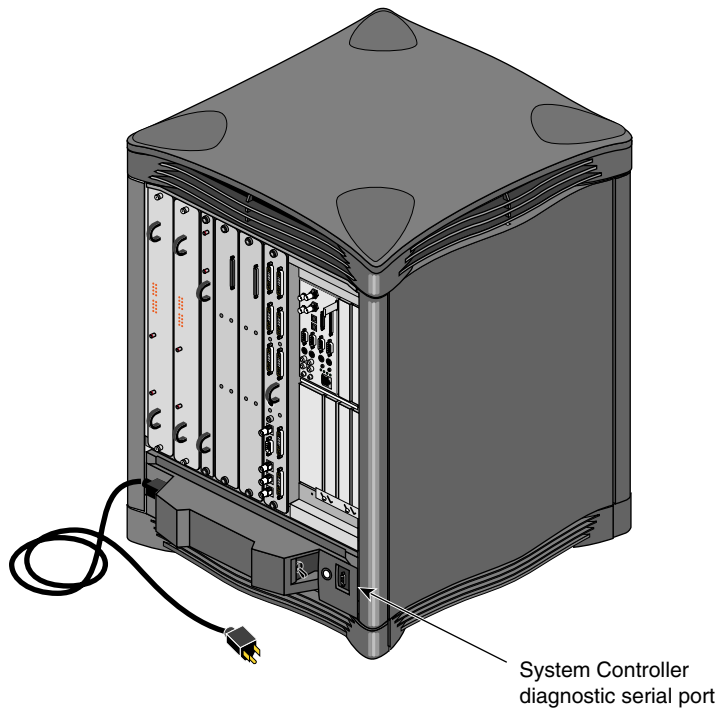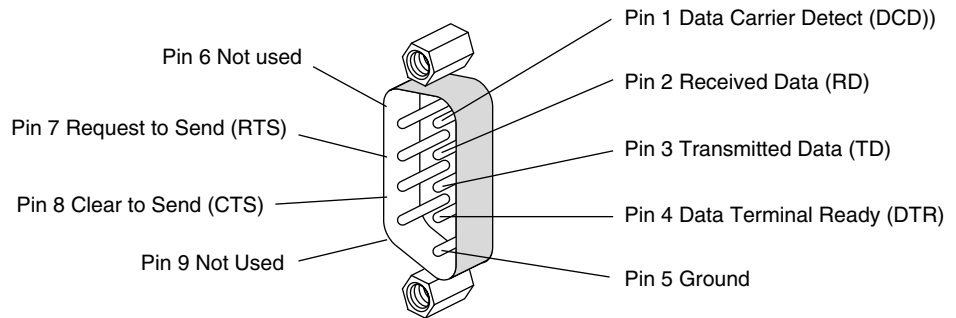- The **DC** Power OK green LED lights up approximately 3.5 seconds after the keyswitch is turned to the On position. This indicates that the module's power supply is enabled and operating properly.

- The Fan Speed **High** amber warning LED lights up as an indication that the environmental temperature is higher than optimal, or that a noncritical fan has failed. When a noncritical fan fails, the remaining fans are set at full speed to compensate. When a critical fan fails, the system shuts down. In this case, you see the message MFANFL or FANFAIL on the controller's LED panel. A service call should be placed immediately after confirming that a fan has failed.

- The **Over-Temperature Fault** amber warning LED lights up 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.

Module System Controller Features and Functions

The controller provides the following basic features and functions:

- It issues a reset signal at power-on.

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

- A front-panel mounted pushbutton on the controller works as a system reset switch.

- A front-panel mounted non-maskable interrupt (NMI) pushbutton switch on the controller resets Node boards only.

- The controller can sense ambient incoming air temperature into a system and adjust fan speed based on that temperature (two speeds). Soft power-off of the system results when ambient temperature is too high for safe operation.

- The controller lights an LED display after sensing ambient over-temperature conditions.

- The controller has an NVRAM for storing configuration information (1024 x 8 bits).

- The controller monitors fan rotation and automatically increases to high speed operation when a fan fails. It also signals an impending shutdown when a single critical fan fails, or two or more noncritical fans fail.

- The controller has an LED display for high fan speed or fan tray failure (fan high-speed LED).

- The controller has an LED display indicator for power supply operations. The AC OK LED indicates AC voltage applied to the system. The 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, and 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.

- The controller provides a 100 Kbps bidirectional communication path between the MSC, mid-plane, and HUB ASIC IO space on each Node board in the system. This communication path allows the MSC to receive system status messages from all Node boards in a system, and to provide status messages from the MSC and all Nodes in a system. This communication path is referred to as the I2C interface.

- The controller can request the system serial number and configuration information via the I2C interface.

- The controller has an eight-digit alphanumeric status display. This display is updated by the MSC or the Node board(s) in the system via the I2C Interface.

- The controller provides a seven-wire, 9600-Baud, alternate console diagnostic port for offline configuration and troubleshooting. This port can also be used to communicate with the Node board(s) when the IO console port or graphics console is not functional. This interface also supports the minimum requirements for modem support.

- Software reset, NMI, and soft power-off commands are provided through the alternate console port.

- The controller supports alternate console 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 affect remote regulated termination voltages (1.6 V, 2.4 V, router 3.3 V).

- The controller has alternate console port command-line regulated termination voltage margining for the termination voltages 1.6 V, 2.4V, 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.

- The controller sends early warning, high-priority interrupt (Panic Interrupt) to all Node boards warning of an impending shutdown due to an AC power failure, an ambient over-temperature, or the keyswitch being turned to the standby position.

- The interlock (removable keyswitch) prevents unauthorized personnel from turning the system on or off, and limits operation of the System Reset and NMI functions. The software password allows access and permissions through the alternate console port.

Module System Controller Status Messages

The MSC front panel has an eight-character LED readout that supplies information about system status or problems.

Table 6-1 lists status messages and provides an explanation of what the impacts may be.

Table 6-1   MSC Messages

Error Message	Meaning of Message
Mod 1 C	May be seen at power-on (boot) and means module system controller one is the system console. This message is not applicable to deskside systems.
SYS OK	The system is operating normally.
R PWR UP	The system is being powered on remotely via the MSC'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 MSC'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 has been 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.
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.

Basic Troubleshooting

This chapter contains hardware-specific information that can be helpful if you are having trouble with your Onyx2 deskside system. This information is provided in addition to the module System Controller (MSC) information in the previous chapter.

This chapter is intended to give you some basic guidelines to help keep your hardware and the software that runs on it in good working order.

General Guidelines for System Care

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 the system.

- Do not connect cables or add other hardware components while the system is turned on.

- Do not leave the front panel key switch in the diagnostic position.

    Note: Clearance is provided for the front panel to close while a key is inserted into the MSC. However, the door can snag on any additional keys you may have attached to the MSC's main key.

- Do not lay the system on its side.

- Do not power off the system frequently; leave it running over nights and weekends, if possible. If a system console terminal is installed, it can be powered off when it is not being used.

- Do not place liquids, food, or extremely heavy objects on the system or keyboard.

- Ensure that all cables are plugged in completely.

- Ensure that the system has power surge protection.

Operating Guidelines

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

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

- 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.

- Keep two sets of backup tapes to ensure the integrity of one set while doing the next backup.

- Protect the root account with a password.

- Check for root UID = 0 accounts (for example, diag) and set passwords for these accounts.

- Consider giving passwords to courtesy accounts such as guest and lp.

- Look for empty password fields in the */etc/passwd* file.

If the behavior of your system is marginal or faulty, first do a physical inspection using the checklist below. If all of the connections seem solid, go to Chapter 6 and use the MSC to try and isolate the problem. If the problem persists, run the diagnostic tests from the System Maintenance menu or PROM Monitor. See the *IRIX Admin: System Configuration and Operation* manual for more information about diagnostic tests.

If this does not help, contact your system administrator or service provider.

Check every item on this list:

- The terminal and MSC power switches are turned on.

- The circuit breaker next to the main power cord is not tripped.

- The fans are running and the fan inlet and outlets are not blocked.

- The MSC is not displaying a fault message or warning.

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

Check all of the following cable connections:

- The monitor power cable is securely connected to the terminal at one end and the power source at the other end. Also check the video cable connections between the monitor and the system.

- The deskside system power cable is securely connected to the main unit at one end and plugged into the proper AC outlet at the other end.

- The Ethernet cable is connected to the connector port labeled Ethernet.

- Serial port cables are plugged in securely to their corresponding connectors.

- All cable routing is safe from foot traffic.

Note: The deskside system's power cable has no retainer clip or restraint and can be easily kicked loose by foot traffic.

If you find any problems with hardware connections, have them corrected and turn on the power to the main unit. The MSC may help to determine if internal system problems exist.

Power Supply Problems

The power supply in your deskside system is not considered an end-user replaceable component. There are certain basic checks you can make to determine if a system problem is related directly to the power supply.

If the system will not power on at all, check the following:

- The system circuit breaker is up (in the On position).

- The power cable is firmly plugged in at both the system connector and the wall socket.

- The cable connecting the power supply to the fan tray is secure. (Remove the front cover to confirm this.)

In some cases the power supply may be unable to supply enough voltage to meet system requirements. When the MSC indicates a power-supply-related problem, you can remove the front cover and check the status of the three LEDs on the front of the power supply. For help on properly removing the front cover, see "Removing the System's Plastic Covers" in Chapter 3.

Amber (Yellow) LED

The amber LED on the power supply (also known as the AC_OK indicator) lights up when the AC input voltage is applied and the system circuit breaker is in the On position.

If the amber LED is not lit, you should check the following:

• the AC outlet

• the system power cord and power switch

• the cable connecting the fan tray to the power supply

If none of these items is a problem, check the other LEDs on the power supply for any indications.

Green LED

The green LED indicator (also known as the Power Good indicator) lights up when power supply outputs are within specification.

If this LED starts to blink on and off, it is a warning that the supply is overloaded. This may indicate a condition such as a 110-volt system that is overloaded with too many boards or other options. In this case, contact your service provider for information and assistance.

Red LED

The red LED (also known as the Fault indicator) lights up whenever the power supply shuts off because of insufficient air flow, or when a shutdown occurs because the system overheated.

A blinking condition on this LED indicates that an undervoltage condition exists. It means that the supply has dropped below acceptable limits in either the +3.45-, +5-, or +12-volt ranges. The supply can be reset by power-cycling the system. Note that this could be a symptom of other problems; contact your service provider for additional information.

Crash Recovery

To minimize data loss from a system crash, back up your system daily and verify the backups. Often a graceful recovery from a crash depends upon good backups.

Your system may 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—your system fails to accept any commands from the keyboard. Sometimes when a system crashes, data is damaged or lost.

Before going through a crash recovery process, check your terminal configuration and cable connections. If everything is in order, try accessing the system remotely from another workstation or from the system console terminal (if present).

If none of the solutions in the previous paragraphs is successful, you can fix most problems that occur when a system crashes by using the methods described in the following sections. You can prevent additional problems by recovering your system properly after a crash.

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

- "Rebooting the System"
- "Restoring System Software"
- "Restoring from Backup Tapes"
- "Restoring a Filesystem from the System Maintenance Menu"

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. Read the next section for information on file restoration.

Restoring a Filesystem from the System Maintenance Menu

If your root filesystem is damaged and your system cannot boot, you can restore your system from the Recover System option on the System Maintenance Menu. This is the menu that appears when you interrupt the boot sequence before the operating system takes over the system. To perform this recovery, you need two things:

- Access to a CD that contains the IRIX release on your system.

- A full system backup tape (beginning in the root directory (/) and containing all the files and directories on your system) created using the Backup and Restore Manager.

If you do not have a full system backup made with the *Backup* command or Backup and Restore window—and your *root* or *usr* filesystems are so badly damaged that the operating system cannot boot—you have to reinstall your system software and then read your backup tapes (made with any backup tool you prefer) over the freshly installed software.

You may also be able to restore filesystems from the miniroot. For example, if your root filesystem has been corrupted, you may be able to boot the miniroot, unmount the root filesystem, and then use the miniroot versions of *restore*, *xfs_restore*, *Restore*, *bru*, *cpio*, or *tar* to restore your root filesystem.

To recover from system corruption using the Recover System option on the System Maintenance Menu, follow these steps:

1. When you first start up your machine or press the Reset button on the system, this message appears:

   ```
   Starting up the system...
   ```

   Click the *Stop for Maintenance* button or press **Esc** to bring up the System Maintenance menu.

2. Click the Recover System icon in the System Maintenance menu, or enter **4.**

   This System Recovery menu appears or you see a graphical equivalent:

   ```
                           System Recovery...

                   Press <Esc> to return to the menu.

   1) Remote Tape  2) Remote Directory  3) Local CD-ROM  4) Local Tape

   Enter 1-4 to select source type, <esc> to quit,
   or <enter> to start:
   ```

3. Enter the menu item number or click the appropriate drive icon for the IRIX release CD or software distribution directory you plan to use.

   Note: As of IRIX 6.2, the Remote Tape and Local Tape options on the System Recovery window are no longer usable because bootable (miniroot) software distribution tapes are no longer supported.

   ■ If you have a CD-ROM drive connected to your system, enter **3** or click the *Local CD-ROM* icon, then click *Accept* to start.

     You see a notifier prompting you to insert the media into the drive. Insert the IRIX CD that came with your system, then click *Continue*.

   ■ You can use a drive that is connected to another system on the network. At the System Recovery menu, enter **2** or click the *Remote Directory* icon.

     When a notifier appears asking you for the remote hostname, type the system's name, a colon (**:**), and the full pathname of the CD-ROM drive, followed by **/dist**. For example, to access a CD-ROM drive on the system *mars*, you would enter:

     mars:/CDROM/dist

Click *Accept* on the notifier window, then click *Accept* on the System Recovery window.

On systems without graphics, you are prompted for the host as above, then you see this menu:

```
1) Remote Tape 2)[Remote Directory] 3) Local CD-ROM 4) Local Tape
     *a) Remote directory /CDROM/dist from server mars.

Enter 1-4 to select source type, a to select the source, <esc>
to quit,
or <enter> to start:
```

Press **Enter**.

■   If you are using a remote software distribution directory, enter **2** or click the *Remote Directory* icon.

When a notifier appears that asks you to enter the name of the remote host, type the system's name, a colon (**:**), and the full pathname of the software distribution directory. For example:

mars:/dist/6.2

Click *Accept* on the notifier window, then click *Accept* on the System Recovery window.

On systems without graphics, you are prompted for the host as above, then you see this menu:

```
1) Remote Tape 2)[Remote Directory] 3) Local CD-ROM 4) Local Tape
     *a) Remote directory /dist/6.2 from server mars.

Enter 1-4 to select source type, a to select the source, <esc>
to quit,
or <enter> to start:
```

Press **Enter**.

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4. The system begins reading recovery and installation from the CD. It takes approximately five minutes to copy the information that it needs. After everything is copied from the CD or remote directory to the system disk, you see messages including the following:

```
************************************************************
*                                                          *
*                      CRASH     RECOVERY                   *
*                                                          *
************************************************************

You may type  sh  to get a shell prompt at most questions

Checking for tape devices
```

The next message asks for the location of the tape drive that you will use to read a system backup tape you created before the system crash using the Backup and Restore tool on the System menu of the System Toolchest or using the Backup(1) script.

5. If you have a local tape device, you see this message:

```
Restore will be from tapename.  OK? ([y]es, [n]o): [y]
```

tapename is the name of the local tape device. Answer **y** if this is the correct tape drive and **n** if is not.

6. If you have a remote (network) tape device, no tape device was found, or you answered "no" to the question in the previous step, you see this message:

```
Remote or local restore ([r]emote, [l]ocal): [l]
```

■ If you answer "remote," you have chosen to restore from the network, and you are then asked to enter the following information: the hostname of the remote system, the name of the tape device on the remote system, the IP address of the remote system, and the IP address of your system. The IP address must consist of two to four numbers, separated by periods, such as 192.0.2.1.

■ If you answer "local," you have chosen a tape device that is connected to your system, and you are then asked to enter the name of the tape device.

7. When you see the following message, insert your most recent full backup tape, then press **Enter**.

```
Insert the first Backup tape in the drive, then
press (<enter>, [q]uit (from recovery), [r]estart):
```

8. There is a pause while the program identifies the filesystems on the tape and attempts to mount those filesystems under */root*. Then you see this message:

   ```
   Erase all old filesystems and make new ones (y, n, sh): [n]
   ```

   You have three choices:

   - Answer **n** for no. After additional prompts confirming the filesystems to be read, the files on the tape are extracted. The version of each file on the tape replaces the version, if any, on the disk even if the version on the disk is newer.

   - Answer **y** for yes. After additional confirming prompts and prompts about filesystem types, the system erases all of the filesystems and copies everything from your backup tape to the disk.

   - Answer **sh** to escape to a shell. You are now in the miniroot environment and can investigate the damage to the system or attempt to save files that have been created or modified since the backup tape was created. After exiting the shell, you have the opportunity to remake filesystems and/or read the backup tape.

9. After reading the full backup tape, this prompt gives you the opportunity to read incremental backup tapes:

   ```
   Do you have incremental backup tapes to restore ([y]es, [n]o
   (none)): [n]
   ```

   Insert another tape and answer **y** if you have additional tape. if not answer **n**.

10. This prompt gives you the opportunity to reboot your system if recovery is complete, begin the crash recovery process again at the beginning, or re-read your first backup tape:

    ```
    Reboot, start over, or first tape again? ([r]eboot, [s]tart,
    [f]irst) [r]
    ```

    If you are ready to reboot, answer **r**. If not, choose **start** or **first**.

From time to time you may experience a system crash due to file corruption. Systems cease operating ("crash") for a variety of reasons. Most common are software crashes, followed by power failures of some sort, and least common are actual hardware failures. Regardless of the type of system crash, if your system files are lost or corrupted, you may need to recover your system from backups to its pre-crash configuration.

Once you repair or replace any damaged hardware, you are ready to recover the system. Regardless of the nature of your crash, you should refer to the information in the section "Restoring a Filesystem from the System Maintenance Menu" in the *IRIX Admin: Backup, Security, and Accounting* manual.

The System Maintenance Menu recovery command is designed for use as a full backup system recovery. After you have done a full restore from your last complete backup, you may restore newer files from incremental backups at your convenience. This command is designed to be used with archives made using the *Backup* utility or through the System Manager. The System Manager is described in detail in the *Personal System Administration Guide*. System recovery from the System Maintenance Menu is not intended for use with the *tar*, *cpio*, *dd*, or *dump* utilities. You can use these other utilities after you have recovered your system.

You may also be able to restore filesystems from the miniroot. For example, if your root filesystem has been corrupted, you may be able to boot the miniroot, unmount the root filesystem, and then use the miniroot version of *restore*, *xfs_restore*, *bru*, *cpio*, or *tar* to restore your root filesystem. Refer to the reference (man) pages on these commands for details on their application.

Refer to the *IRIX Admin: System Configuration and Operation* manual for instructions on good general system administration practices.

Module System Controller Shutdown

Under specific circumstances the MSC may shut down the deskside system. Usually this occurs when the operating environment becomes too warm due to high ambient temperatures or fan failure.

Video Format Combiner Tutorial

This appendix consists of example exercises designed to demonstrate tasks that you can perform using the video combiner utility with your InfiniteReality graphics system. It includes the following sections:

- reinitializing graphics

- modifying video formats

- saving video format combinations to the GE board's EEPROM

- resizing a single-channel combination

- using ircombine with GVO

- redisplaying graphics

- combiner interface summary

This appendix also includes instructions for redisplaying graphics if the monitor stops displaying video during one of the examples (or at any other time).

The information in this appendix is intended only as an introductory overview of the Combiner. For more detailed information on using the Combiner with your Onyx2 graphics system, see the *InfiniteReality Video Format Combiner User's Guide* (part number 007-3279-*xxx*).

Reinitializing Graphics

The example exercises in this appendix are based on the assumption that a Silicon Graphics multisync monitor is connected to Channel 0. If the monitor attached to Channel 0 is unable to sync to any of the formats used in the example, it ceases displaying video.

The first time InfiniteReality graphics was initialized, or during the first power-on of the system with InfiniteReality graphics installed, the video output was defined for the channels available on the workstation. To reinitialize graphics, enter

```
(/usr/gfx/stopgfx; /usr/gfx/startgfx) &
```

at the IRIX prompt. Note that the parentheses are necessary.

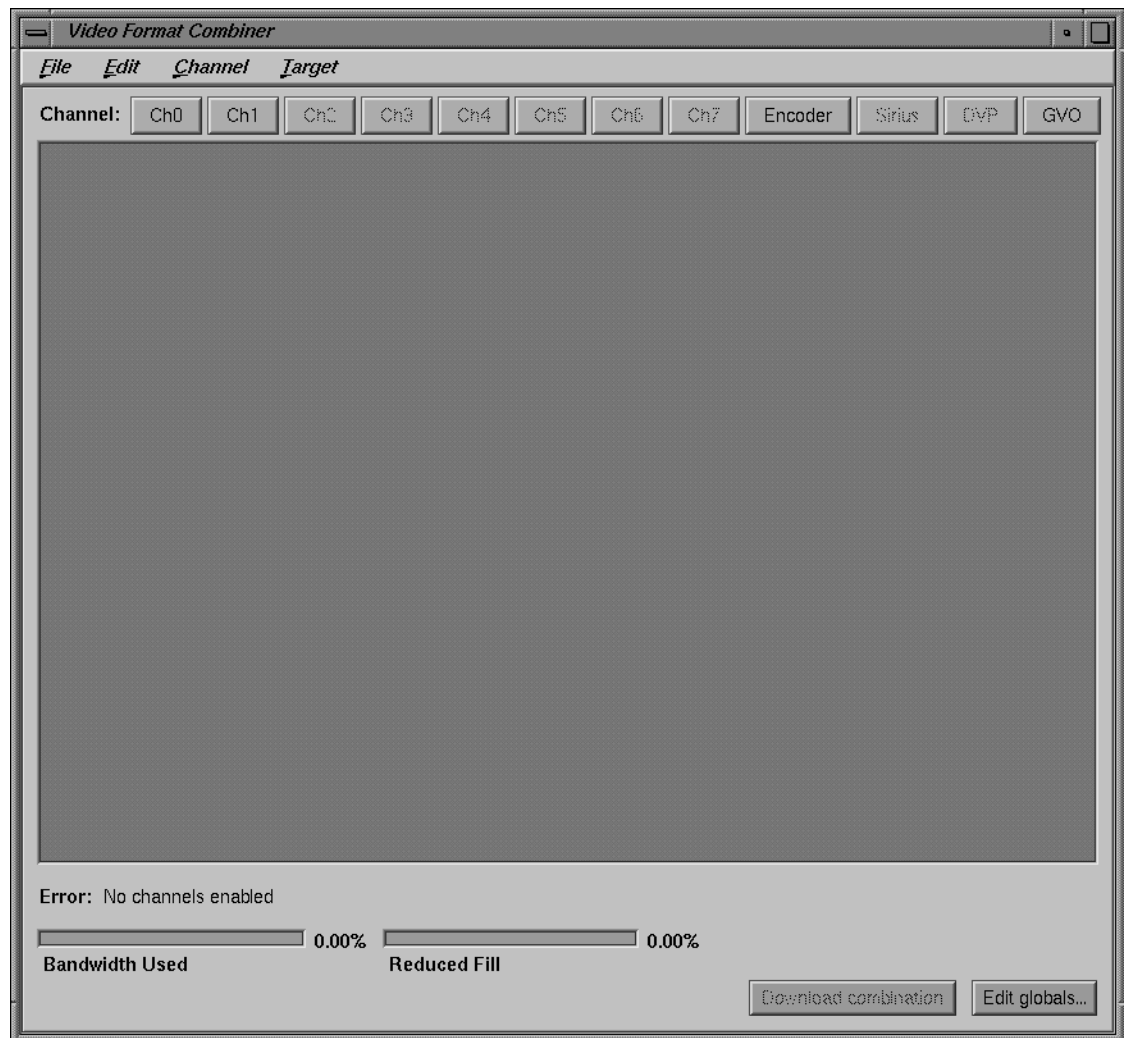Figure A-1 shows an example of the main window interface.

Figure A-1　　Combiner Main Window

Each example starts from the Combiner's main window.

Modifying Video Formats

This exercise consists of

- performing steps to avoid a reboot
- selecting a video format for Channel 0
- selecting a video format for Channel 1

Each procedure is explained in a separate section.

Performing Steps to Avoid a Reboot

Before modifying and downloading new video format combinations, you can avoid having to reboot the graphics system if you select a combination of window sizes that do not encompass the Combiner main window controls or an IRIX shell window.

Complete the following steps to perform this operation:

1. Bring up an IRIX shell window and reduce it to 80 x 24 using the size option on the pulldown menu from mouse button three.

2. Drag the IRIX shell to the lower left corner of the screen.

3. Launch the Combiner main window (if you have not already done so).

4. Position the Combiner's main window in the upper left corner of the screen.

5. Resize the Combiner's main window so that none of the IRIX shell window is covered: click the lower right corner of the Combiner main window and move it upward.

Figure A-2 shows the main window with Channels 0 and 1 in the managed area.
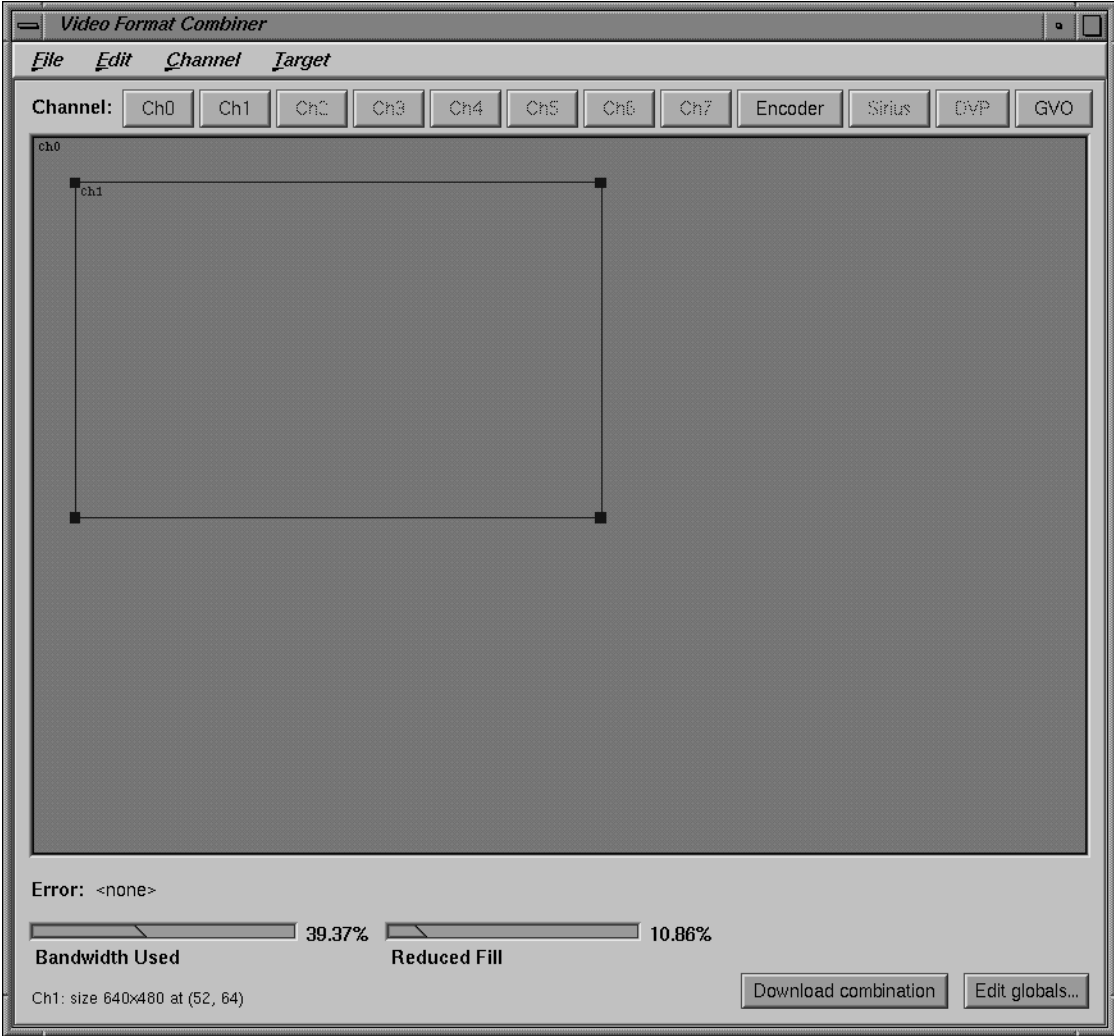
Figure A-2   Combiner Main Window With Channels Selected

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Selecting a Video Format for Channel 0

Complete the following steps to select the first channel to modify (Channel 0):

1. Click *Ch0* in the Combiner main window. This selection corresponds to **Chan0** connections on the InfiniteReality system's I/O panel.

2. In the Files window that appears, select the *640x480_60.vfo* file as the video format for that channel; see Figure A-3.

Figure A-3   Selecting a Channel Format

3. Click *OK*. The Ch0 rectangle appears in the Combiner's main window.

   Do not close the Files window.

4. Click the bottom line (not the corner) of the rectangle and drag it to the bottom left corner of the main window.

Selecting a Video Format for Channel 1

Complete the following steps to select and modify Channel 1:

1. Click *Ch1* on the main window.

2. Move the cursor to the Files window and click the *640x480_60.vfo* file option.

3. Click *OK*. A Channel 1 (Ch1) rectangle appears in the upper left portion of the Combiner main window.

   Note: In this example, you set the origin of Channel 1 precisely to (4,10). You could do this by clicking the line of the rectangle and dragging it, as you did for Channel 0. However, in this exercise you specify the Ch1 origin numerically by editing the Ch1 attributes in the following steps.

4. Bring up the Attributes window by double-clicking the *Ch1* button in the Combiner main window. The Channel 1 Attributes window appears, as shown in Figure A-4.
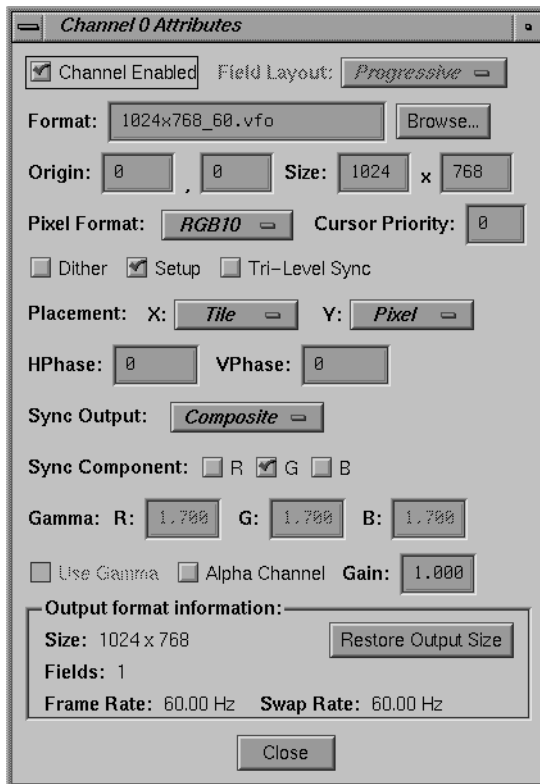
Figure A-4   Channel Attributes Window

5. Click the cursor in the first (far left) Origin box.

6. Replace the value in the left Origin box (the x-origin box) with **4**; press **Enter**.

7. Move to the right Origin box (the y-origin box) and replace the value with **10**; press **Enter**. See Figure A-4 for an example.

8. Click *Close* in the Attributes window.

9. Move the cursor to the Combiner main window and click *Download combination*.

At this point, the video system is displaying the configuration specified in the exercise just completed:

- Channel 0 is displaying the lower left portion of the frame buffer where you originally placed the IRIX shell window.

- Channel 1 is displaying the upper left portion of the frame buffer where the InfiniteReality Combiner's main window was placed.

To return to a 1280 x 1024 video output, enter **`/usr/gfx/setmon -n 1280x1024_72`** in the IRIX shell window.

Proceed to the next example or close the Combiner's main window.

Saving Video Format Combinations to the GE Board's EEPROM

Before starting this exercise, read the information in "Reinitializing Graphics."

This example assumes that the Combiner main window is open. If it is not, follow the instructions at the beginning of this appendix.

In the Combiner main window, select New from the File pulldown menu. Then click *OK* in the warning box. You are now ready to create and save a new video format combination to the GE board's EEPROM. The video format consists of two channels; each one is a *960x680_60.vfo* format. Use the following steps to make and save all the changes:

1. Click *Edit globals* in the main window's bottom right corner. The Combination Attributes window appears, as shown in Figure A-5.
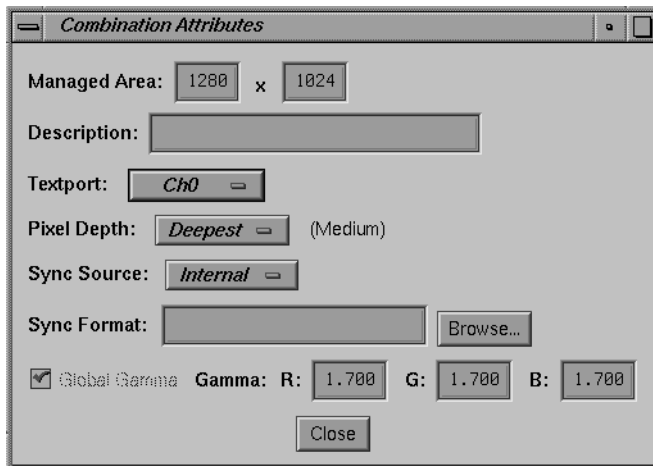
Figure A-5   Combination Attributes Window

2. Change the Managed Area fields to read 1000 in the left-hand box and 680 in the right-hand box.

3. Click the *Close* button.

4. Click *Ch1* in the Combiner's main window. The Select Format box appears.

5. Find and double-click the *960x680_60.vfo* file format. An error message appears at the lower left corner of the window, as shown in Figure A-6: "Textport channel Ch0 invalid."
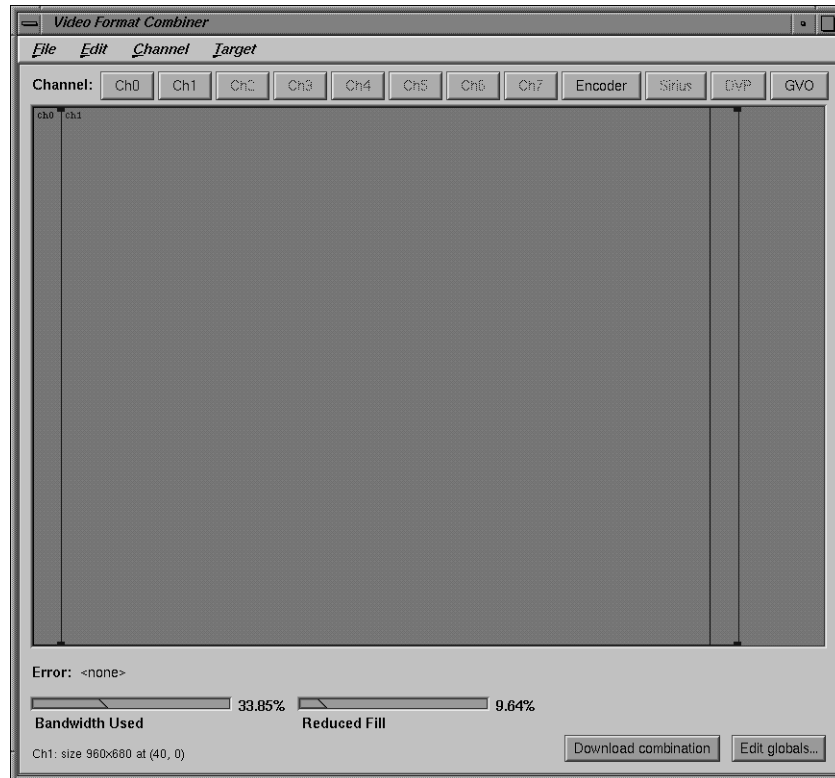
Figure A-6   Textport Error Message on the Main Window

When this or any other error message appears in the main window, you cannot use the "Download combination" or "Save to EEPROM" functions. In this example, the error condition goes away after you define Ch0.

6. Click and drag the Channel 1 (Ch1) box on the main window to the right until it is blocked by the red vertical line.

The red line represents the right-hand boundary of the specified Managed Area (1000) that you entered in step 2. The excess space to the right of the red line represents an unusable area. The Combiner does not permit you to position channels in that area.

7. Click *Ch0*.

8. In the Select Formats box that appears, find and double-click the *960x680_60.vfo* file format.

   At this point, you have specified a video format combination with two video formats that are both equal to 960x680_60. The two channels are slightly offset but mostly overlapping, as shown in Figure A-7.
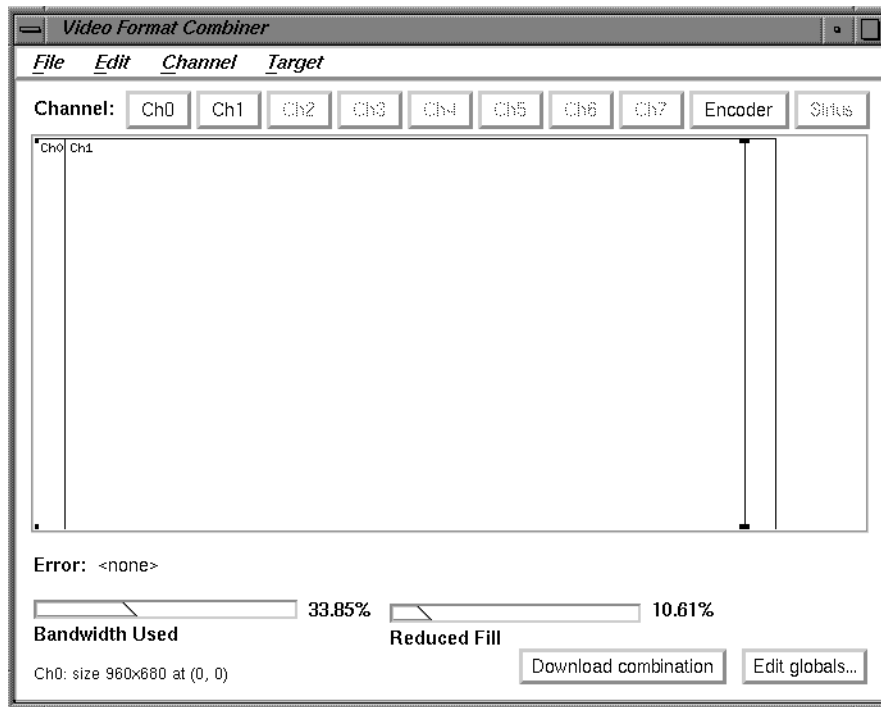
Figure A-7   Combiner Main Window With Overlapping Channels

9. In the File pulldown menu, select Save to EEPROM.

10. In the "Saving to hardware" dialog box that appears, click *Download* (see Figure A-8).
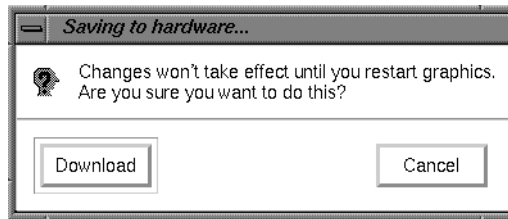
Figure A-8   Saving to Hardware Dialog Box

The format combination is now loaded in the GE board's EEPROM, but it does not take effect until the graphics subsystem is restarted.

11. In the File pulldown menu in the main window, select Exit.

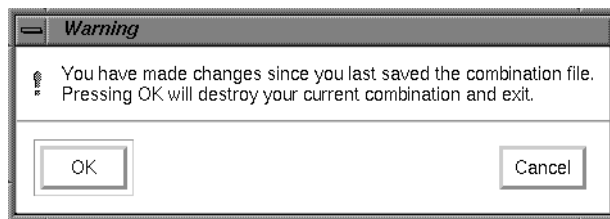12. Click *OK* when the Warning dialog box appears (see Figure A-9).

Figure A-9   Exit Warning Dialog Box

13. Enter the following in the IRIX shell window to restart system graphics:

    (/usr/gfx/stopgfx; /usr/gfx/startgfx) &.

14. When the Login window appears, log in as root (superuser). The video system is now outputting a 960x680_60 format on Channels 0 and 1.

    The video system retains this configuration even after rebooting because the 960x680_60 Video Format Combination is saved in the GE board's EEPROM.

To reset the EEPROM to the standard 1280 x 1024 format combination, enter **/usr/gfx/setmon -n 1280x1024_72** at the IRIX prompt. Then restart the graphics system (as in step 13) to activate the format combination reset. When the Login window appears, log in as root.

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Resizing a Single-Channel Combination

Before starting this exercise, read the information in "Reinitializing Graphics."

Note: Do not move the IRIX shell window until you complete this exercise.

In this example, you create a single-channel combination that is "static resized" and is saved to and loaded from a combination file. Complete the following steps to perform this operation:

1. Open an IRIX shell window, click the third mouse button, and use the Size pulldown menu to change the shell to 80 x 24.

2. Place the 80 x 24 shell window behind the Video Format Combiner main window, but make sure the command-line prompt is visible.

3. Click *Ch0* on the Combiner's main window. The Select Format window appears.

4. Find and double-click the *1280x1024_72.vfo* file. The Channel 0 (Ch0) rectangle fills the entire 1280 x 1024 managed area in the main window.

5. In the Channel pulldown menu, select Grab Window. The cursor turns into a cross.

6. Move the cross (cursor) into the IRIX shell window and click the mouse button. The rectangle in the Combiner's main window representing Ch0 now represents the area of the framebuffer covered by the 80 x 24 IRIX shell that you clicked in. See Figure A-10 for a screen example.

    Note: This area becomes resized to fit the entire Channel 0 output when the combination is loaded. You can resize a channel's input area by clicking and dragging any of the four corners of its main window rectangle. That resizing method is not covered in this exercise.
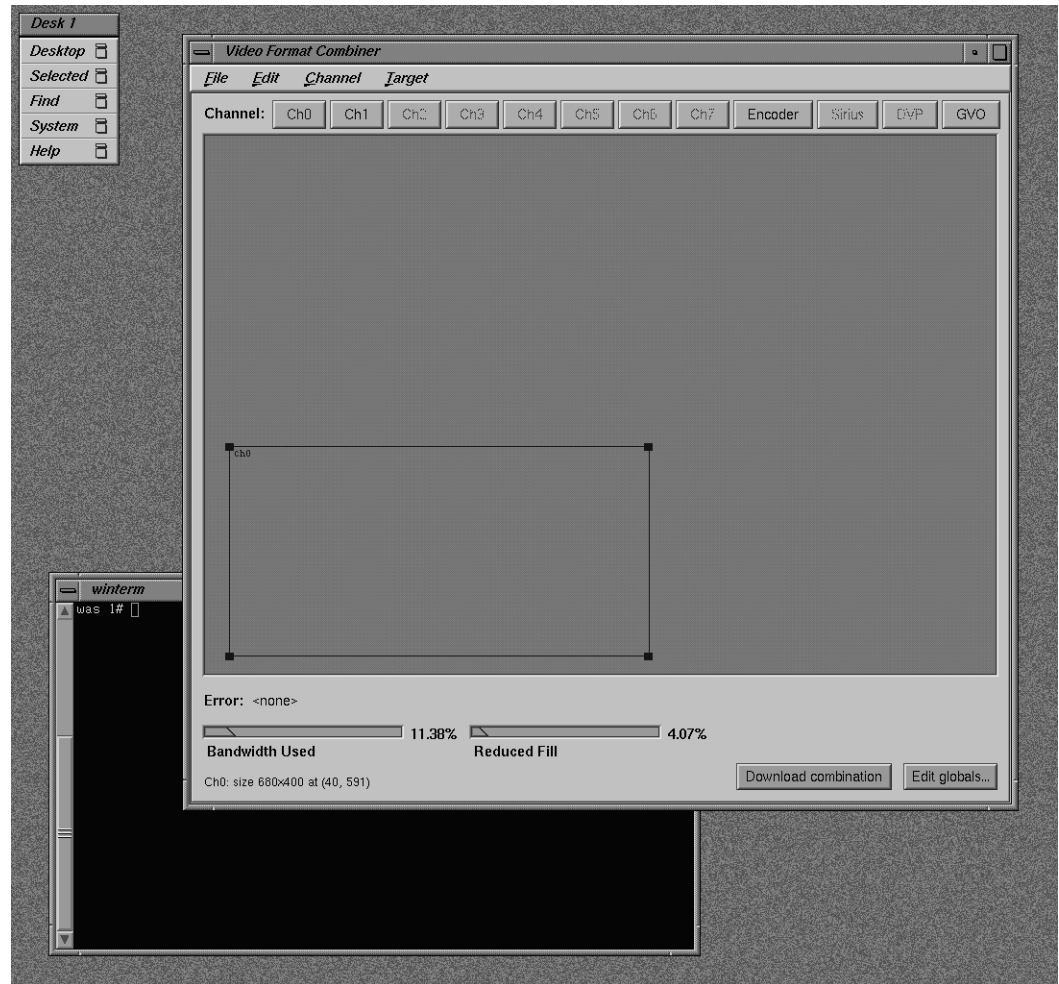
Figure A-10   Combiner Window During Resizing

7. From the File pulldown menu in the Combiner main window, select Save As. The
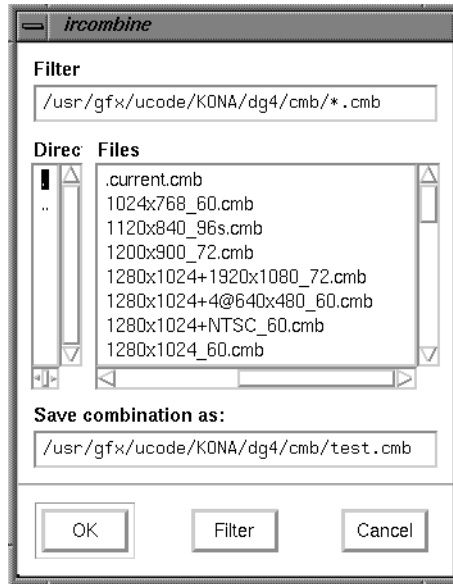   *ircombine* window appears (see Figure A-11).

Figure A-11   ircombine Window

8. In the "Save combination as" field, type `test.cmb` at the end of the path and click *OK*.

9. Select Exit from the File pulldown menu in the Combiner's main window.

10. In the shell window you clicked in step 6, enter

    `/usr/gfx/setmon -n test`

    The screen blanks momentarily and then displays the IRIX shell window resized to 1280 x 1024 (the entire screen display).

    Note: If no usable window appears, you can recover the default video display combination following the instructions in "Redisplaying Graphics."

11. Revert to the previous display configuration by entering `/usr/gfx/setmon -n 1280x1024_72`. The entire screen should reappear in the 1280 x 1024 format.

12. Select Exit from the File pulldown menu on the Combiner's main window to conclude the exercise.

Using ircombine with GVO

The Graphics to Video Option (GVO) provides direct graphics output to broadcast-component digital video devices. If you have this option installed in your system, the GVO button on the main panel of ircombine will be enabled, and you will have an additional channel available under ircombine.

Defining a Video Format Combination using GVO

To define a combination using GVO in genlocked mode, complete the following steps:

1. Click CH0 in the combiner window. Select 1280x1024_60.vfo from the files window. Click OK. A large Ch0 rectangle appears in the combiner window.

2. Click GVO in the combiner window. A small GVO rectangle appears in the upper-left corner of the combiner window.

3. Bring up the Attributes window by double-clicking the GVO button in the Combiner window, or by selecting Edit Attributes from the Channel menu. The GVO attributes window appears (see Figure A-12). From this panel you can select a number of options for the GVO output channel. You should pay particular attention to the Output Format, Source Channel, Pixel Format, Data Format and Gamma settings on this panel. When you have selected the values you want, click the Close button.

4. GVO is normally used with the graphics subsystem genlocked to an external video source connected to the genlock input of the DG5 board. To enable this functionality, complete the following steps:

    • Click the Edit Globals button on the main combiner window.

    • Click on the pop-up menu for Sync Source and select External as the value.

    • Click the Browse button next to the Sync Format text box.

    • Select 646x486_30i.vfo as the sync format and click OK.

5. You may now save or download this combination as usual. If you are working in a 50 Hz environment, use 1280 x 1024_50.vfo on channel 0 and 768x576_25i.vfo as the external sync format.

Redisplaying Graphics

If the monitor stops displaying video during one of the examples or during any other type of Combiner use, the following steps should provide a solution:

1. Connect a monitor to Channel 0 that can display the required format(s). If video is still not visible, go on to step 2.

2. Log in to the system remotely or connect an ASCII terminal to serial port tty_1, if possible. Become superuser (root) and enter the command

   `/usr/gfx/setmon -n 72`

   If this does not work, enter

   `/usr/gfx/setmon -x 72`

   Restart the graphics by entering

   `(/usr/gfx/stopgfx; /usr/gfx/startgfx) &`.

3. Reboot the system using the System Controller if steps 1 and 2 do not work. If, after rebooting, the video still does not display, wait for several minutes and go to the next step for an additional process.

4. Enter `1`; attempt to reboot the system to single user by entering `/usr/gfx/setmon -x 72` (even though you are unable to see any screen display of your inputs). When you believe you have succeeded, reboot again.

Call your Onyx2 service provider for additional information and assistance if these steps do not restore your system's video output.

Combiner Interface Summary

The Combiner interface has many functions besides those listed in the previous examples. You can use the Combiner to

- define a channel using an on-screen window as input

- copy an existing channel format and content to a new channel

- align one channel with another

- change the video format for a channel (or delete it entirely)

- edit the attributes (size, pixel format, and so on) of a channel

- select the "field layout" order in which data is scanned from the framebuffer

- select and copy a video format stored in a different file

- choose an output pixel format for a particular channel

- control cursor behavior in overlapping rectangles by setting the cursor priority

- allocate pixel width and depth for framebuffer fields

- set horizontal and vertical phase for a given channel

- specify whether sync components have sync enabled by default

- modify the brightness characteristics of the monitor

- change the default output video gain value for a channel

- save a combination of all the channels present in the Combiner's main window and make global changes to them

- arrange the pixels (set pixel depth) in the framebuffer to optimize framebuffer output speeds

- select the InfiniteReality internal sync (or use an external source that is connected to the "Genlock In" port)

- save a video format combination as a default and write it to EEPROM

- run a user-defined hardware configuration simulating more RM/TM boards than you have installed (used when an application is too large)

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