OCTANE™ Channel Option Installation Guide

Document Number 007-3546-001

CONTRIBUTORS

Written by Charmaine Moyer and Wendy Ferguson
Illustrated Kwong Liew and Martha Levine
Production by Linda Rae Sande
Engineering contributions by Christopher Donham, Eric Kunze, David Laird, Wei Li, Michael Nagy, Todd Nordland, Nicole West
St. Peter's Basilica image courtesy of ENEL SpA and InfoByte SpA. Disk Thrower image courtesy of Xavier Berenguer, Animatica.

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Introduction

This guide explains how to install and configure the OCTANE™ Channel Option (OCO) board.

The OCTANE Channel Option board enables a single OCTANE workstation to provide different data to multiple displays simultaneously. The OCO formats include support for up to four simultaneous displays for both field parallel and field sequential formats.

The field parallel format allows your OCTANE workstation to support lower resolution formats than are available on the main monitor, including VGA, SVGA, and RS170 timing. The field sequential formats are suitable for use with many head mounted displays. OCO provides two channels of output for head mounted displays: one for the left eye, and one for the right eye.

- Chapter 1, “Installing the OCTANE Channel Option Board,” provides instructions for installing the OCTANE Channel Option board in an OCTANE workstation.
- Chapter 2, “Connecting to the Breakout Box,” provides information about the breakout box cable, which provides the interface between the OCTANE Channel Option board and the monitors or projection devices.
- Chapter 3, “Configuring the OCTANE Channel Option Board,” provides information about configuring the OCTANE Channel Option board.
- Chapter 4, “Removing the OCTANE Channel Option Board,” provides instructions for removing the OCTANE Channel Option board.
- Chapter 5, “Troubleshooting,” provides troubleshooting information.
- Appendix A provides illustrations of the OCTANE Channel Option Board and the OCTANE/SI, OCTANE/SI with texture memory option board, OCTANE/SSI, and OCTANE/MXI graphics board sets. An illustration of the back of the workstation showing module and ports is also included.

See Chapters 2 and 3 for information on monitors and monitor formats.

Read this guide once all the way through before you start to work. You will become familiar with the OCTANE system and the parts with which you will be working. If you find an unfamiliar term, check the glossary on page 97.

It's always a good idea to back up your system before installing a new board. If you have not backed up your system recently, do so now. For instructions on backing up your system, see the online *Personal System Administration Guide*.

Additional Hardware Information

OCTANE Hardware Central is an online resource that provides access to hardware movies and other information previously found only in your printed owner's guide, such as port pinout information, user tips, environmental information, and so on.

1. Choose Toolchest > Selected > File QuickFind.
2. When the window appears, type **`insight`** and press Enter.
3. When the IRIS InSight™ bookshelf appears, choose *OCTANE Hardware Central* from the SGI EndUser bookshelf.

Or, access it through your Web browser. In the location window, type **`file:/usr/share/Insight/library/SGI_bookshelves/SGI_EndUser/books/Octane_HWCntl/index.html`** and press Enter.

OCTANE Hardware Movies show OCTANE option boards being installed and removed. The hardware movies are found in *OCTANE Hardware Central*.

Hardware Configurations

A listing of configurations (upgrades and options) is available on the Web. In the locations window, type:

`http://www.sgi.com/Products/hardware/desktop/products/configurator/configurator.html`

Technical Publications Library

A copy of this manual, as well as other Silicon Graphics technical publications, is found in the Technical Publications Library. To access this library, open your Web browser and type: `http://techpubs.sgi.com/library/`

Software and System Administration Information

For complete information on installing software, see the online *Personal System Administration Guide*. It is located on your desktop in the Toolchest > Help > Online Books. For more advanced information, see the online *IRIX Admin: Software Installation & Licensing Guide*. For system administration information, see the SGI_Admin section of the online bookshelf.

Product Support

The OCTANE workstation is designed so that you can maintain and repair the workstation without the help of a trained technician. Contact your Silicon Graphics® subsidiary or authorized distributor for information about product support.

Silicon Graphics, Inc., provides a comprehensive range of product support for its products. If you are in North America and would like support for your Silicon Graphics supported products, contact the Technical Assistance Center at 1-800-800-4SGI or your authorized service provider. If you are outside North America, contact the Silicon Graphics subsidiary or authorized distributor in your country.

Chapter 1

Installing the OCTANE Channel Option Board

This chapter covers installing and removing the OCTANE Channel Option (OCO) board in your OCTANE workstation.

The following topics are covered in this chapter:

Installing a New Version of the IRIX Operating System

Before shutting down your system and installing the OCO board, be sure you have the current version of the IRIX™ operating system installed on your system. Install the operating system that came with your OCO board before installing the hardware.

Installing the Software

Read the flier on software that comes with this package. Also read any release notes and the notes in the CD booklet for detailed information about the software. To review release notes, choose Toolchest > Help > Release Notes. Release notes are available here after the software has been installed.

To display ASCII text in an IRIX shell, at the prompt, type **`cdrelnotes`**.

Checking the OCTANE Channel Option Board Package Components

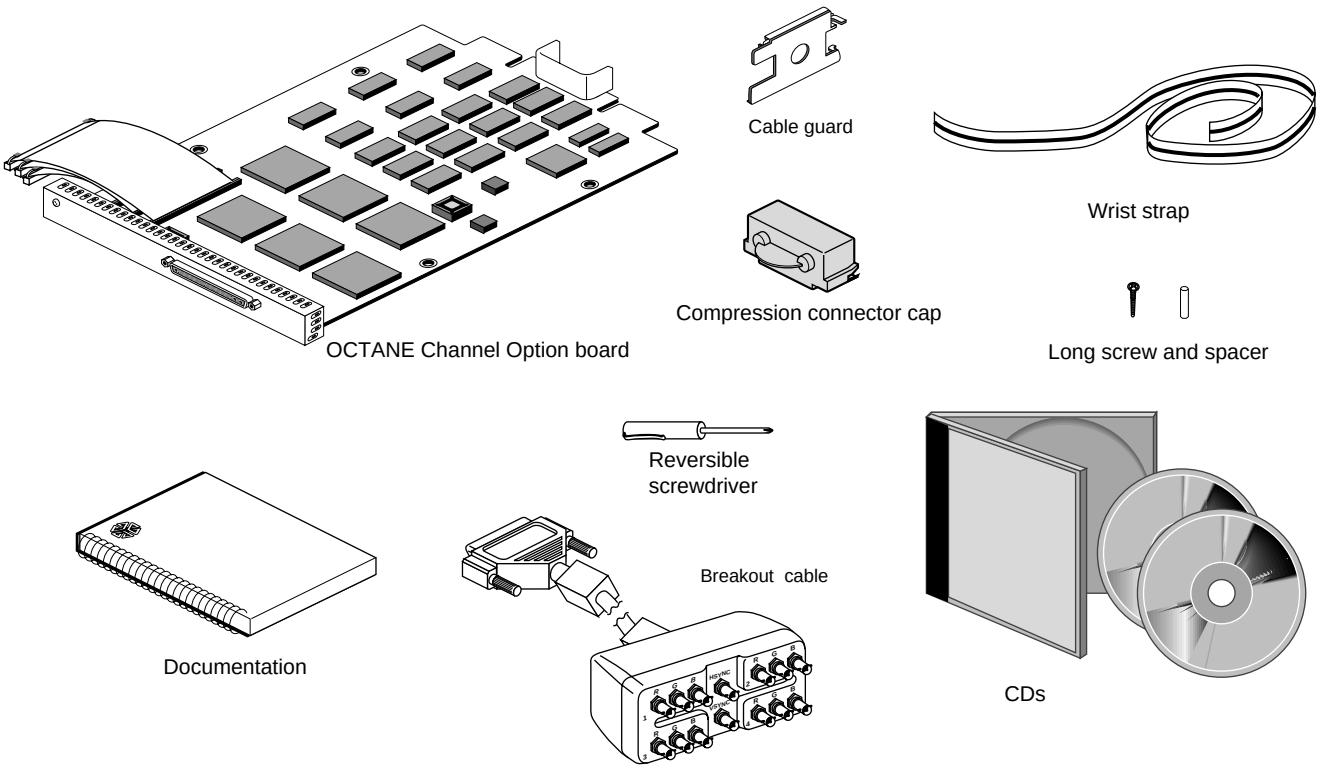

Figure 1-1 Checking the OCTANE Channel Option Shipment

It's a good idea to check your shipment when you receive it. You should receive the supplies shown in Figure 1-1.

Preparing the Workstation

This section contains instructions on installing the OCTANE Channel Option board.

Installing an OCTANE Channel Option board requires following a series of steps that lead up to the board installation, through the steps that complete the task. These detailed steps begin on the following page.

Tools and Parts Needed

- A wrist strap.
- Documentation.
- A reversible screwdriver.
- A cable guard.
- A spacer and long screw.
- The OCTANE Channel Option board with three flex cables attached.
- The breakout box cable.
- An XIO compression connector cap to protect the graphics board XIO compression connector when it is out of the workstation. (An extra cap comes with this shipment. Caps came with the OCTANE workstation.)
- A blank panel, if you are removing the OCTANE Channel Option board and are not replacing it. (A blank panel came with the workstation and was in the slot filled by the OCTANE Channel Option board.)

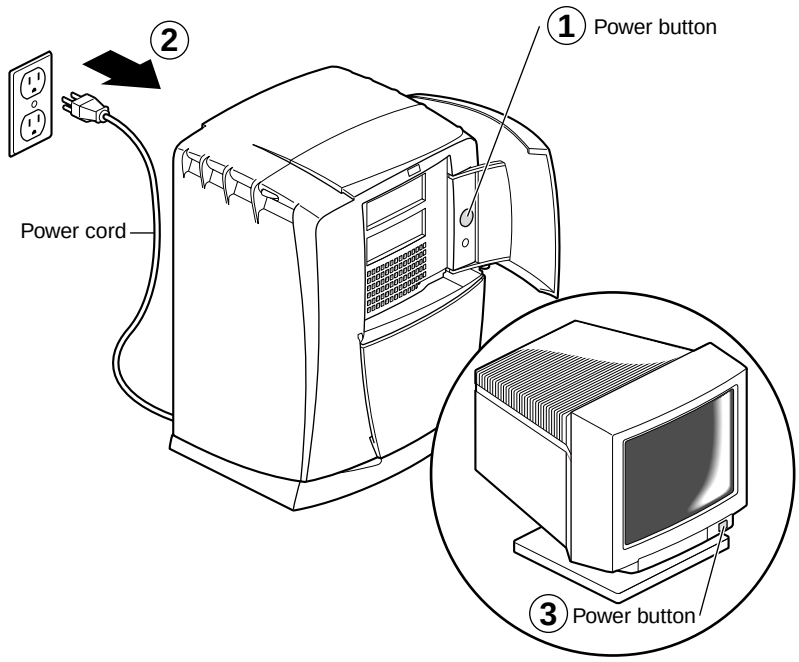

Figure 1-2 Powering Off the OCTANE Workstation

1. Open the cover and push the power button to power off the OCTANE workstation.
2. Unplug the power cord.
3. Push the power button on the monitor to power it off. Wait five minutes.
4. Face the rear of the workstation.

Warning: The heat sinks on the XIO boards become very hot. Wait 5 minutes after powering off the OCTANE workstation before you remove the XIO module. Test before touching any of the XIO boards.

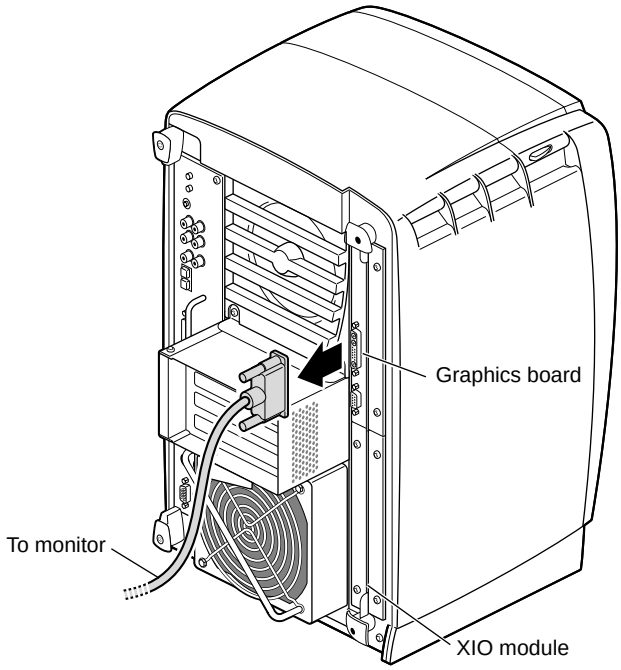

Figure 1-3 Removing the Monitor Cable

5. Remove the monitor cable or other cables from the XIO module. (For illustration purposes, only the monitor cable is shown in Figure 1-3.)

The XIO module can be thought of as a tray to which the XIO graphics boards and option boards are attached.

Note: The XIO module is always installed with the graphics board toward the top of the workstation, in the upper left quadrant. See Figure 1-3.

Attaching the Wrist Strap

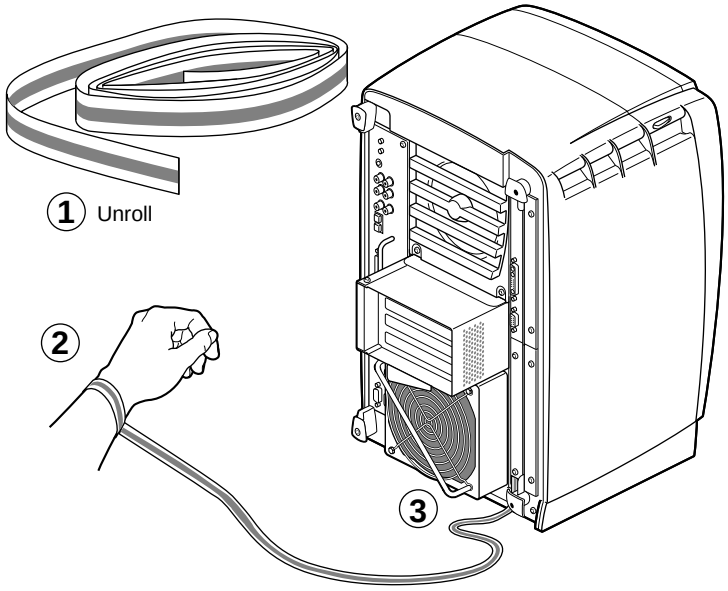

Figure 1-4 Attaching the Wrist Strap

Caution: The components inside the OCTANE workstation are extremely sensitive to static electricity; you must wear the wrist strap while replacing parts inside the workstation.

To attach the wrist strap, follow these steps:

1. Unwrap the first two folds of the band and wrap the exposed adhesive side firmly around your wrist.
2. Unroll the rest of the band and peel the liner from the copper foil at the opposite end.
3. Attach the copper foil to a convenient and exposed electrical ground, such as a metal part of the OCTANE workstation.

Removing the XIO Module

Before removing the XIO module, you must power off the OCTANE workstation, wait five minutes after powering off the workstation to allow the heat sinks to cool, and attach the wrist strap. If you have not already done this, go to “Preparing the Workstation” on page 3 and follow the instructions through attaching the wrist strap. Then return here and follow the directions on the next page.

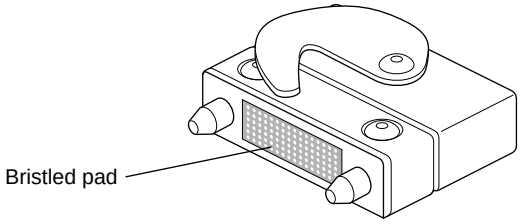

Figure 1-5 Identifying the Compression Connector

When you remove the XIO module, the compression connectors on the back of the XIO module (XIO boards) are accessible and easily damaged. All XIO graphics boards have compression connectors, and most XIO option boards do. The OCTANE Channel Option board does not.

Caution: The compression connectors on each XIO board are very delicate and easily damaged. Do not touch or bump the gold, bristled pad. For more information on care and cleaning of compression connectors, see the *OCTANE Workstation Owner’s Guide.*

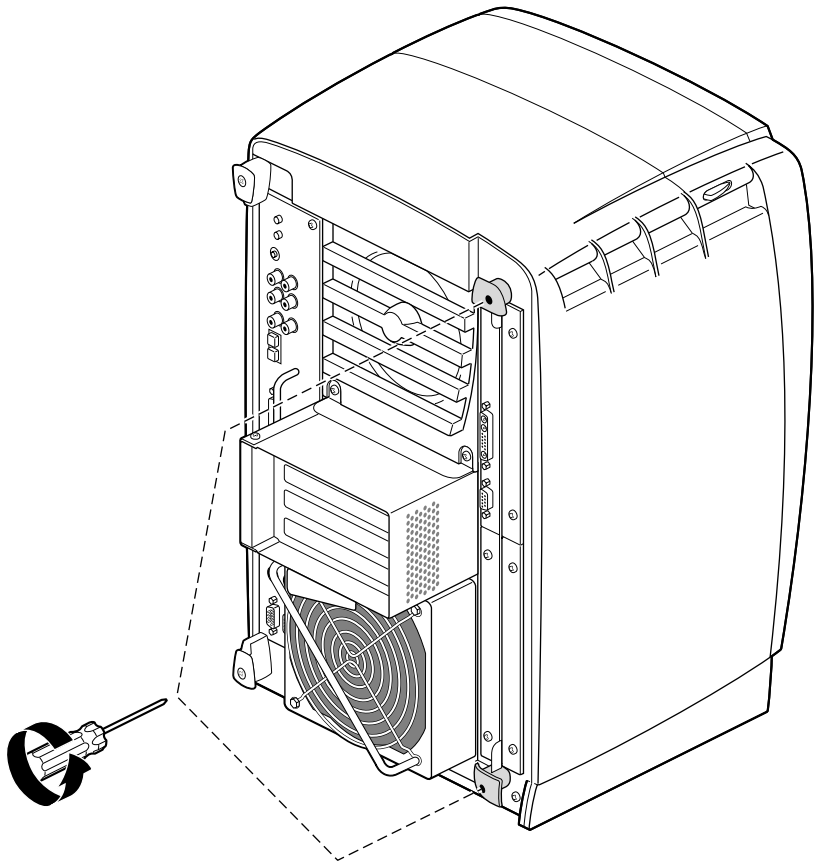

Figure 1-6 Removing the XIO Module Screws

Warning: The heat sinks on the XIO boards become very hot. Wait 5 minutes after powering off the OCTANE workstation before you remove the XIO module. Test before touching any of the XIO boards.

The XIO module is the holding mechanism for XIO graphics or XIO option boards and holds up to four boards. It can be thought of as a tray to which boards are attached.

1. Loosen the two captive screws in the XIO module handles until the handles move free from the workstation.

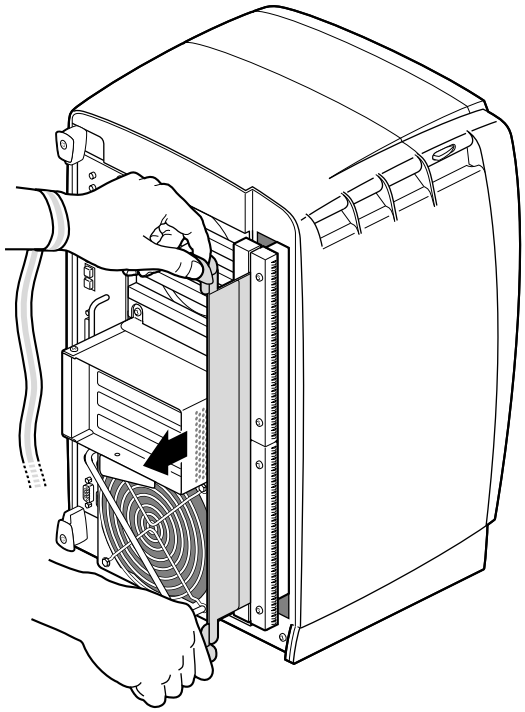

Figure 1-7 Removing the XIO Module

2. Grasp the handles and pull until the XIO module protrudes a few inches from the chassis.

   The handles and the XIO module move out about two inches before the I/O panels move.

3. Continue to pull on the handles until the XIO module releases from the workstation.

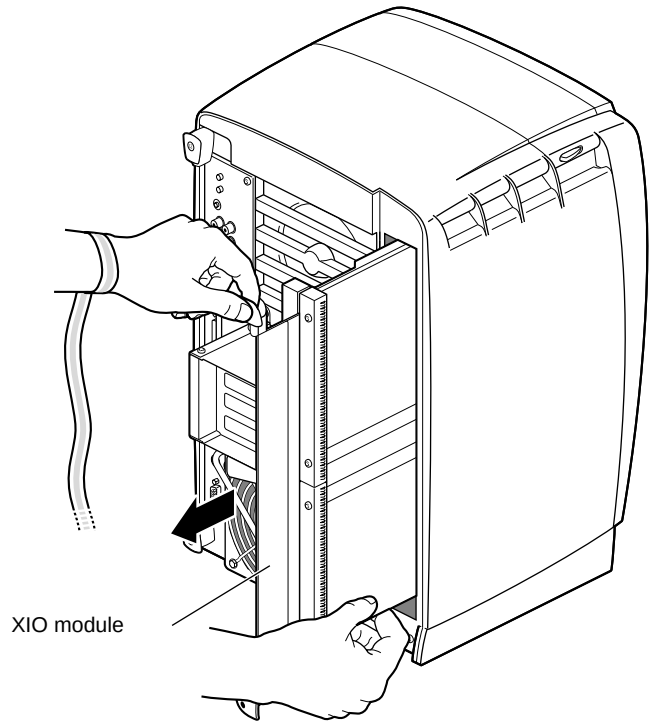

Figure 1-8 Supporting the XIO Module

4. Grasp the XIO module along its length, and support the module and XIO boards with your hands as you remove them from the chassis.

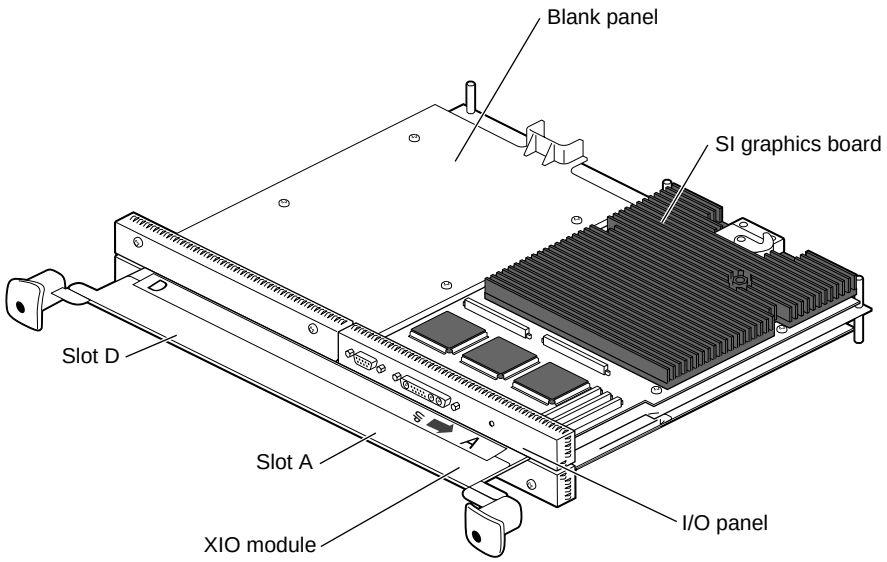

Figure 1-9 Placing the XIO Module on Its Side

The handles protrude from beneath the XIO boards when the XIO module is out of the chassis. When protruding, the identification slots for the XIO boards (D and A, B and C) are visible. Slots B and C are on the opposite side of the XIO module from slots D and A.

Note: Do not push on the handle area after you have removed the XIO module. The XIO module locks to the workstation only if the handle area is protruding.

5. Place the XIO module on a flat, antistatic surface. An empty antistatic bag on your desk works well.

Note: Figure 1-9 above shows an OCTANE/SI graphics board in slot A and a blank panel in slot D. OCTANE/SSI or /MXI graphics are twice the width of the OCTANE/SI board and reside in slots D and A. See Appendix A for illustrations of different graphics boards and the OCTANE Channel Option board.

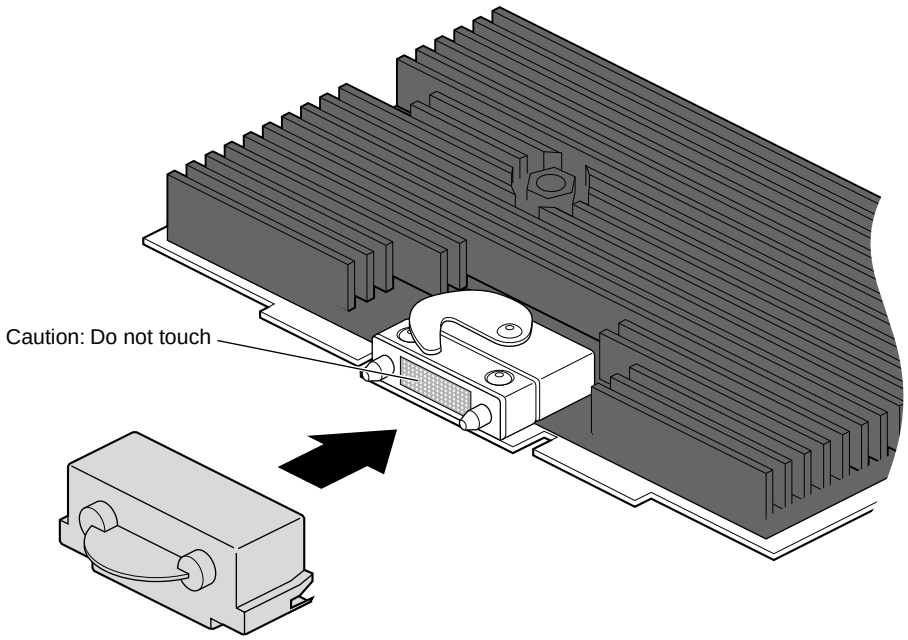

Figure 1-10 Placing a Protective Cap on the XIO Compression Connector

6. Place a cap on the XIO graphics board compression connector.

   Note: The cap prevents damage to the gold (front) surface when the XIO boards are removed from OCTANE. These caps are placed on any XIO compression connector as soon as the XIO module is removed from the chassis, and then removed before placing the XIO module back in the chassis.

About the XIO Module

The XIO module is the holding mechanism for XIO graphics or XIO option boards and holds up to four boards. It can be thought of as a tray to which boards are attached. The four quadrants of the XIO module are slots A, B, C, and D. Slots D and A are on one side, Slots B and C on the other. A graphics board, option board, or blank panel attaches to each slot on the XIO module.

- The XIO module must be placed so that the graphics board in slot A is in the upper left corner, or the graphics board may overheat and be damaged.
- The graphics board is always in slot A or slot A and (covering) slot D.
- Option boards occupy slots B and C and possibly D.
- The OCTANE Channel Option board only installs in slot B.
- Graphics and option boards may be linked by flex cables.
- Protective blank panels must be placed in unused slots.
- A baffle must be attached to two side-by-side blank panels to ensure proper air flow.
- The XIO compression connector is always covered by a protective cap when an XIO board is out of the OCTANE workstation.
- Extra caps for the compression connectors are shipped with the workstation.

Attaching the OCTANE Channel Option Board to the XIO Module

Attaching the OCTANE Channel Option board is a lengthy process. Here is a quick overview of the preliminary steps.

Before installing the OCTANE Channel Option board, you must follow a series of steps detailed in the preceding sections of this chapter, beginning on page 1. If you have not already done so, go to page 1 and follow the instructions through removing the XIO module. If you have already removed the XIO module, go to step 1 on the next page. (Be sure you also read “About the XIO Module and XIO Boards” before beginning your task.)

Caution: Do not touch the gold (front) surface of the XIO compression connector. Touching it could damage the connector. Place a protective cap on the XIO compression connector, to prevent damage when the XIO boards are removed from the OCTANE workstation.

Removing the Blank Panel or Option Board

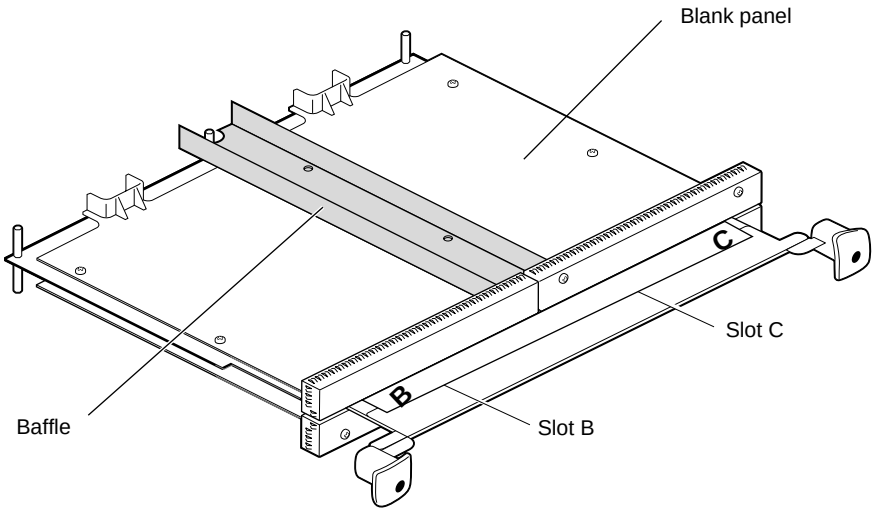

Figure 1-11 Removing the Baffle

1. Turn the XIO module so that slots B and C are facing you. Select your next step from Table 1-1.

Table 1-1 Choosing the Next Instruction

If You Have	Go to
An option board in slot B	The option board installation guide for instructions on removing the board
A blank panel in slot B and an option board in slot C	Step 3
Blank panels in slots B and C	Step 2

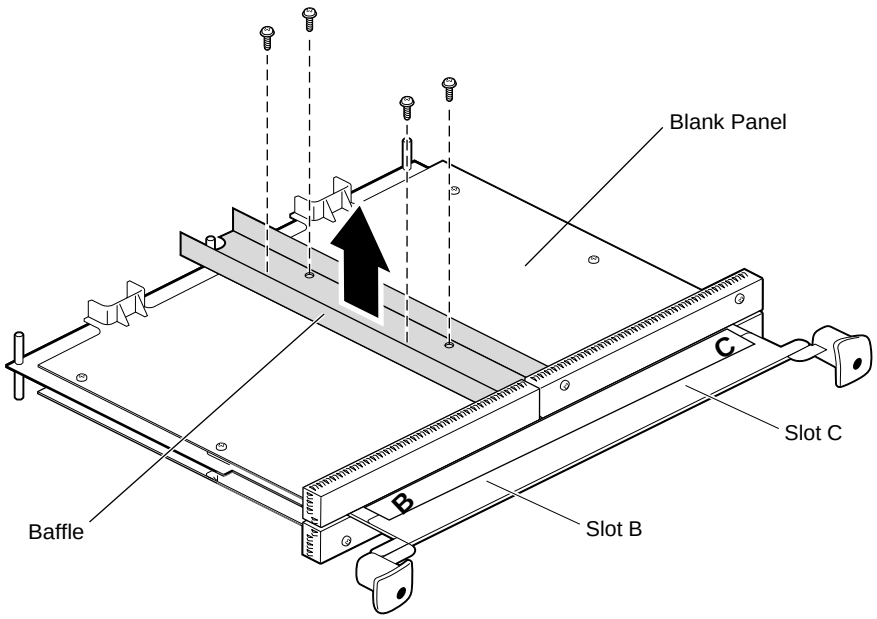

Figure 1-12 Removing the Baffle

2. Remove the baffle attached to the two blank panels:
   - Using a Phillips screwdriver, remove the four screws holding the baffle to the two blank panels.
   - Remove the baffle.
   - Replace the two screws into the blank panel in slot C.
3. Remove the remaining screws from the blank panel in slot B.
4. Remove the blank panel. Keep it in case you remove an option board. A blank panel or board must be in place in each slot on the XIO module.
5. Keep the baffle. The baffle must be in place over two blank panels to ensure proper air flow, if you ever replace the blank panels at a later date.

   Note: The baffle is never used with an option board, only with two side-by-side blank panels.

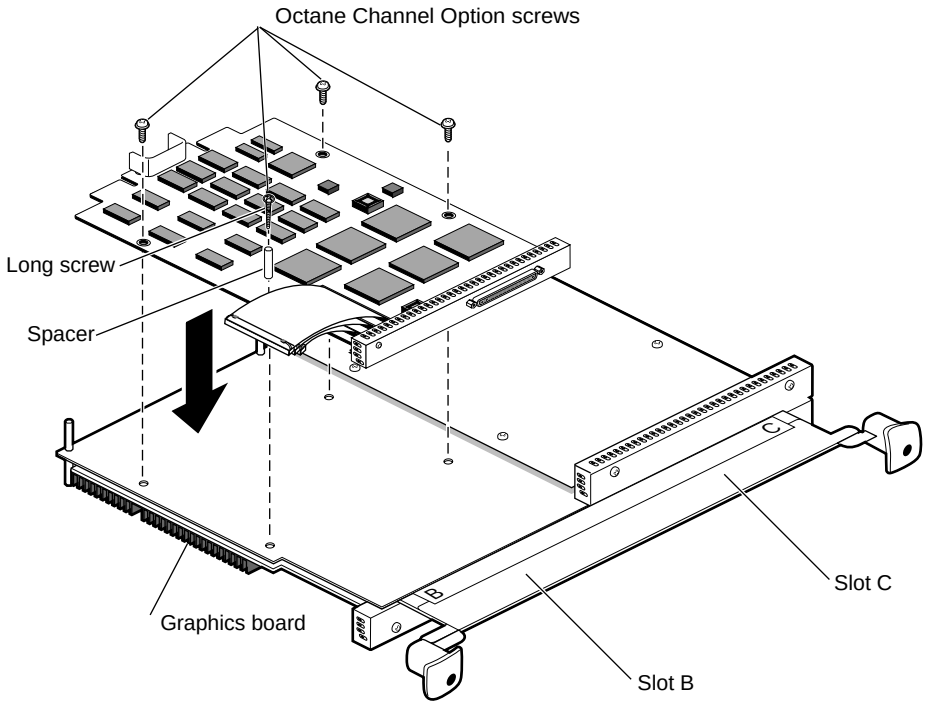

Figure 1-13 Attaching the OCTANE Channel Option Board to the XIO Module

6. Place the OCTANE Channel Option board in slot B on the XIO module, aligning the holes in the board to the standoffs on the XIO module.

   Note: The OCTANE Channel Option board can only be installed in slot B because it must attach to the graphics board in slot A.

7. Insert and tighten the four screws through the OCO board and into the standoffs on the XIO module.
8. Insert the long screw into spacer, through the hole on the OCO board, and into the standoff on the XIO module.

Caution: Do not install the baffle. The baffle is used only with two side-by-side blank panels.

Attaching the Flex Cables

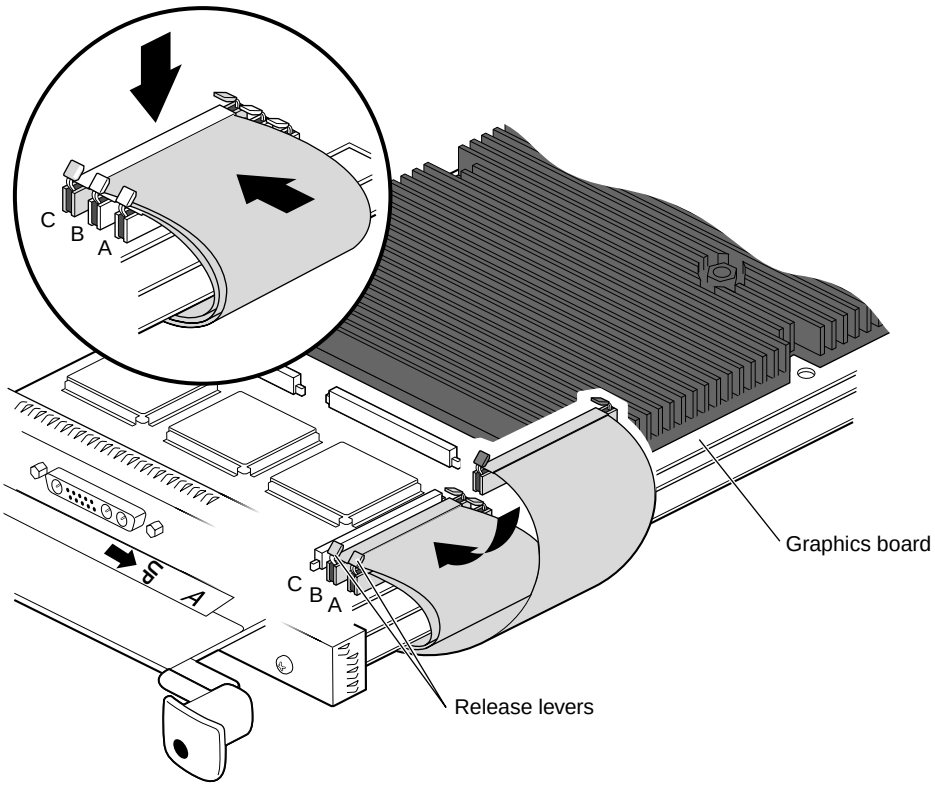

Figure 1-14 Attaching the Flex Cables From the OCTANE Channel Option Board to the Graphics Board

1. Turn over the XIO module so that you are facing the graphics board in slot A or A and D.
2. Attach the flex cables from the OCTANE Channel Option board in slot B to the graphics board in slot A.
   - Attach the connector with the shortest flex cable (from the OCTANE Channel Option board) to connector A on the graphics board. Press down on the middle of the connector to ensure proper seating.
   - Lay the middle flex cable through the release levers of connector A, then attach the connector. Press down on the middle of the connector to seat it.

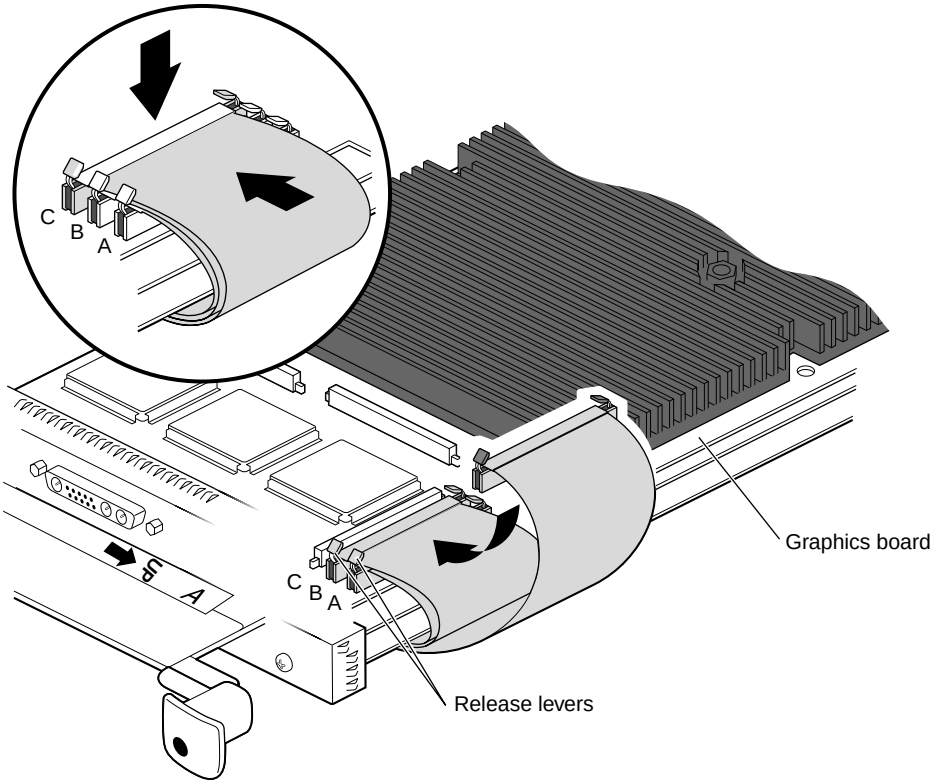

Figure 1-15 Attaching the Flex Cables to the Graphics Board

- Lay the longest flex cable through the release levers of connectors A and B. Attach the connector and press down on the middle of the connector to seat it.

Installing the Cable Guard

This section describes how to install the cable guard on the OCTANE Channel Option board.

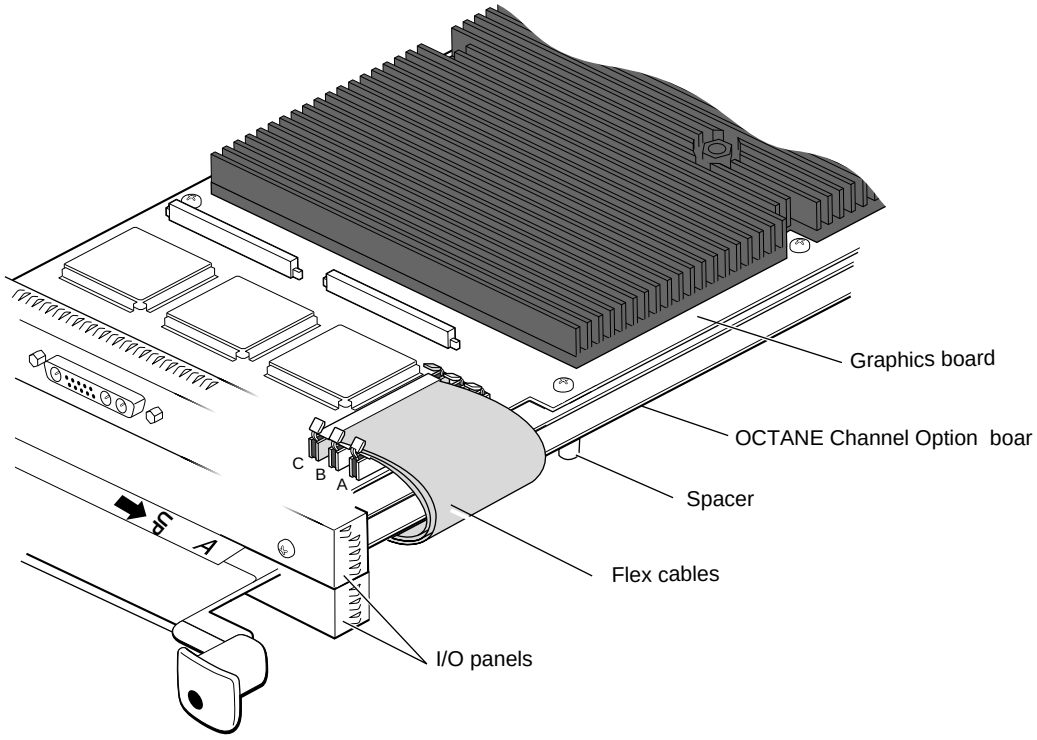

Figure 1-16 Attaching the Flex Cable Guard

The flex cable guard protects the flex cables from being scratched or caught on the chassis when the XIO module is inserted or removed from the workstation.

The flex cable guard slides under the I/O panels and attaches beneath the screw on the graphics board, and behind the spacer on the OCO board.

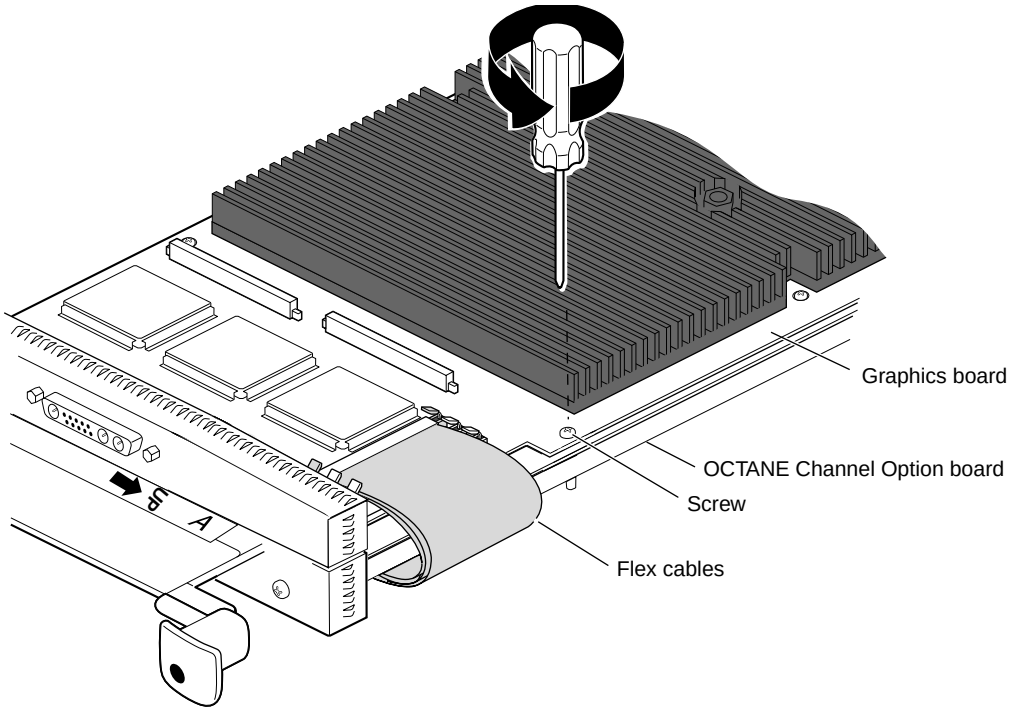

Figure 1-17 Removing the Screw From the Graphics Board

1. Remove the screw from the graphics board as shown in Figure 1-17.

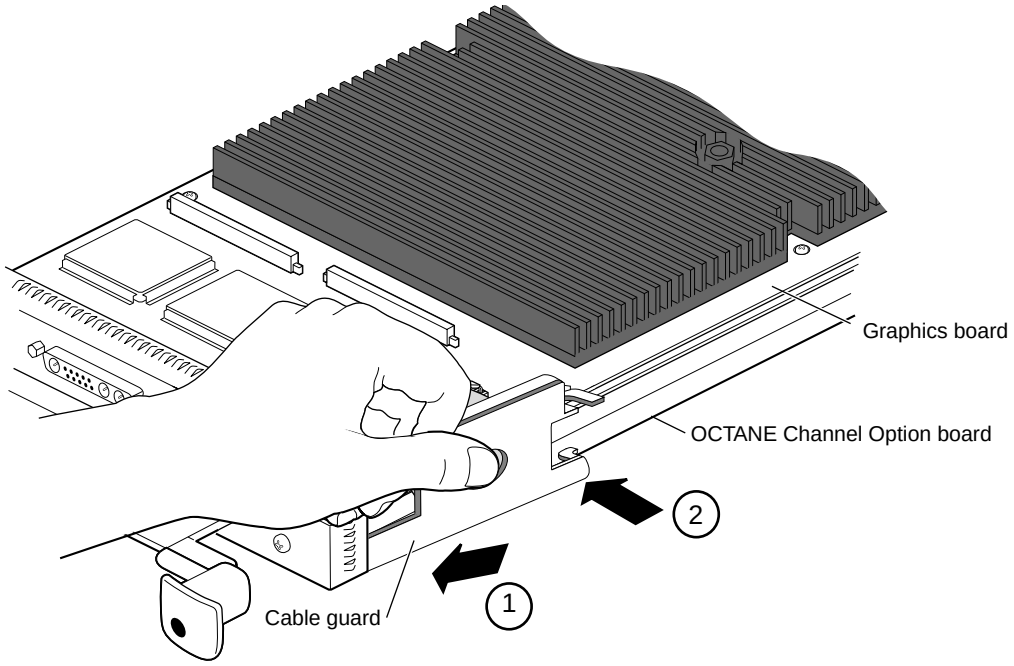

Figure 1-18 Sliding the Cable Guard Under the I/O Panels

2. Slide the two prongs under the I/O panels.
3. Push the cable protector toward the flex cables, laying the top hook on the top of the graphics board. Continue placing pressure on the flex cables.

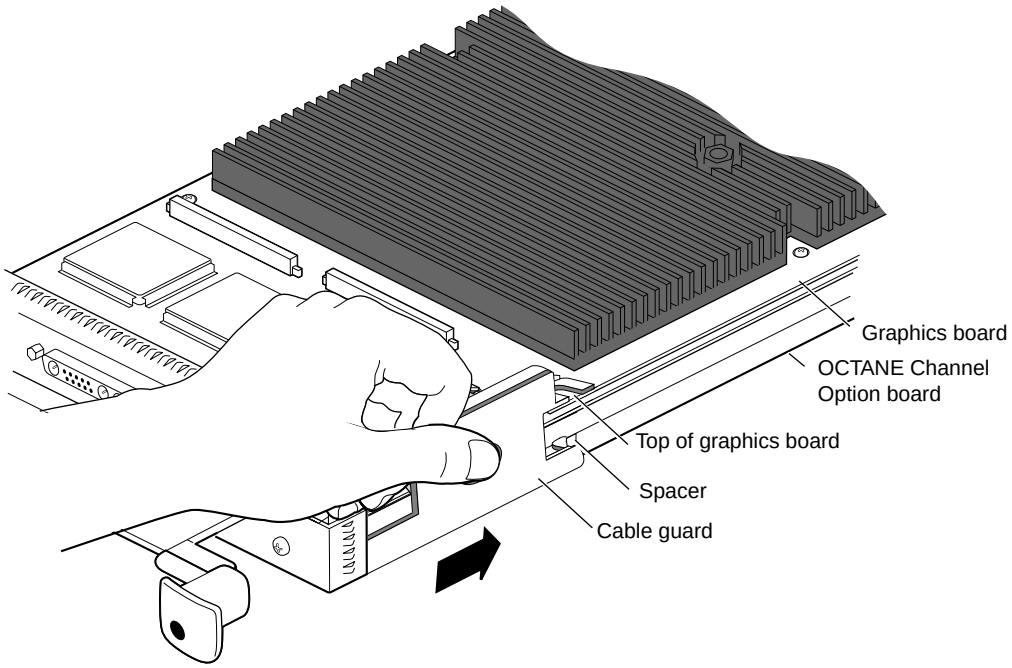

Figure 1-19 Sliding the Cable Guard Behind the Standoff

4. Press down on the center hole of the cable guard and slide it toward the back of the XIO module until its half-hook rests behind the spacer on the OCO board.

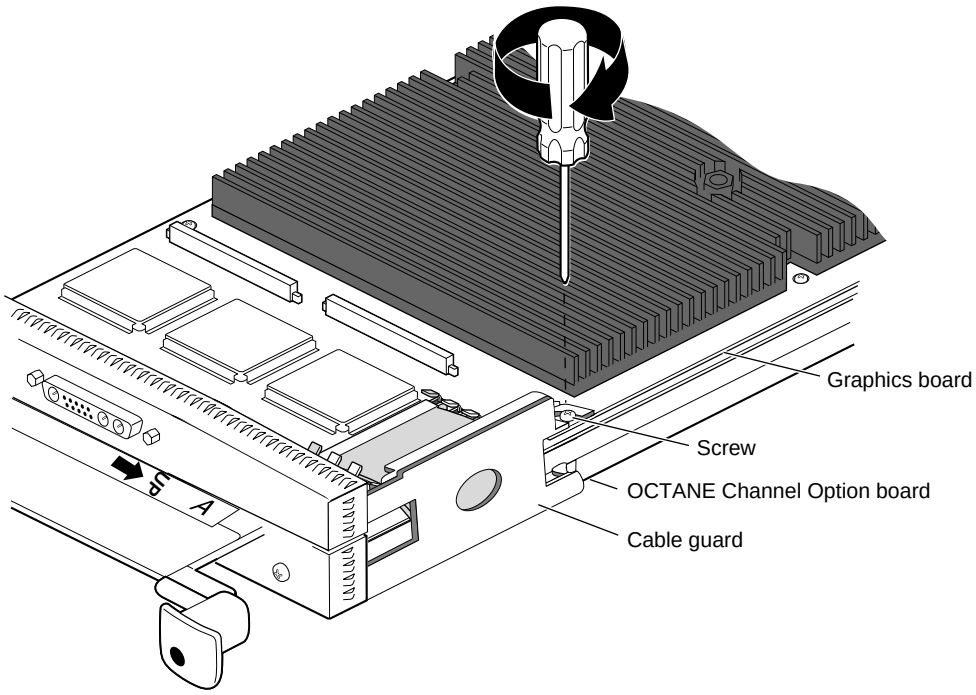

Figure 1-20 Attaching the Screw to Anchor the Cable Guard to the Graphics Board

5. Place the screw from the graphics board through the hook on the cable guard and the graphics board, and into the standoff on the XIO module.

   Note: If you receive a screw with the cable guard, use this longer screw instead of the screw you just removed from the graphics board.

   You have finished installing the flex cables and cable guard.

6. Remove the cap from the XIO compression connector on the graphics board. Keep the cap to protect the compression connector should you ever remove this board.

Go to page 24 for instructions on replacing the XIO module.

Replacing the XIO Module

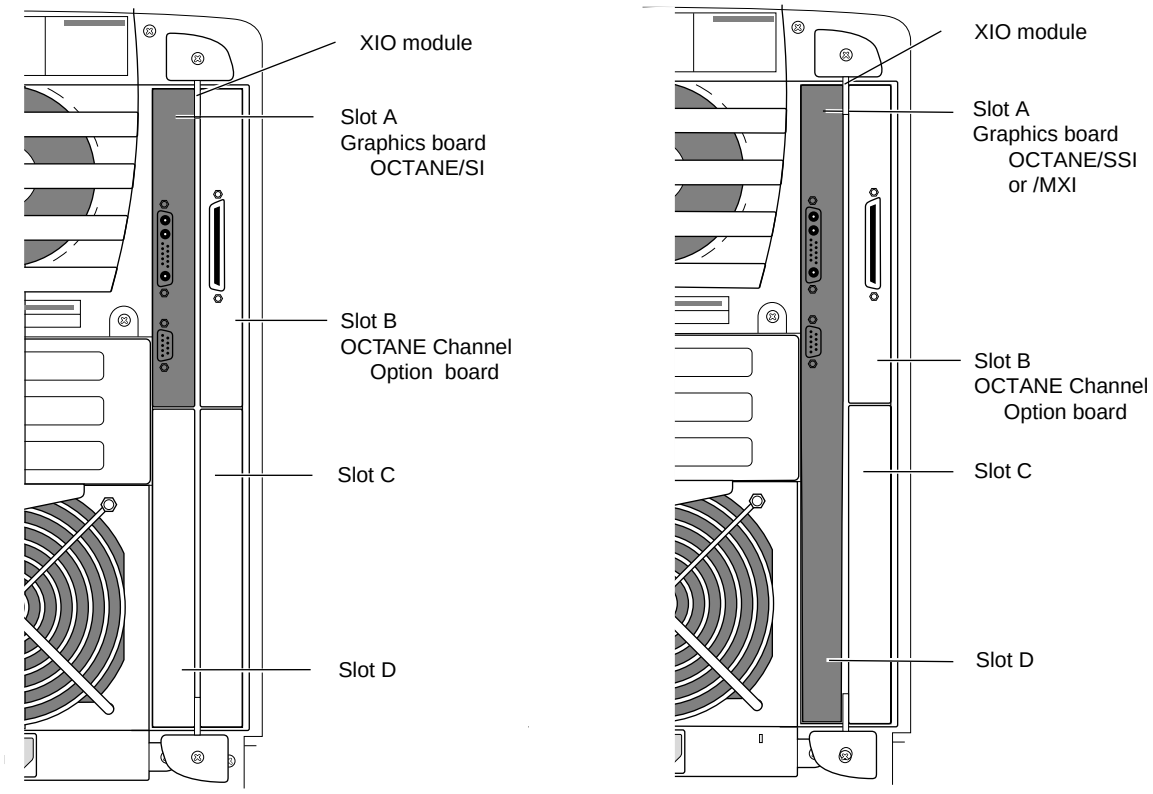

Figure 1-21 Installing Slots A and D Toward the Interior of the OCTANE Workstation

Caution: The XIO module must be replaced with the graphics board toward the interior of the workstation to prevent overheating and damage to the boards. If the XIO module with the OCTANE/SSI or OCTANE/MXI graphics board is inserted incorrectly, a notifier appears during power on telling you to insert the XIO module with the graphics boards toward the interior of the workstation, and power-on stops. Power off the system and correctly insert the XIO module as shown in Figure 1-21.

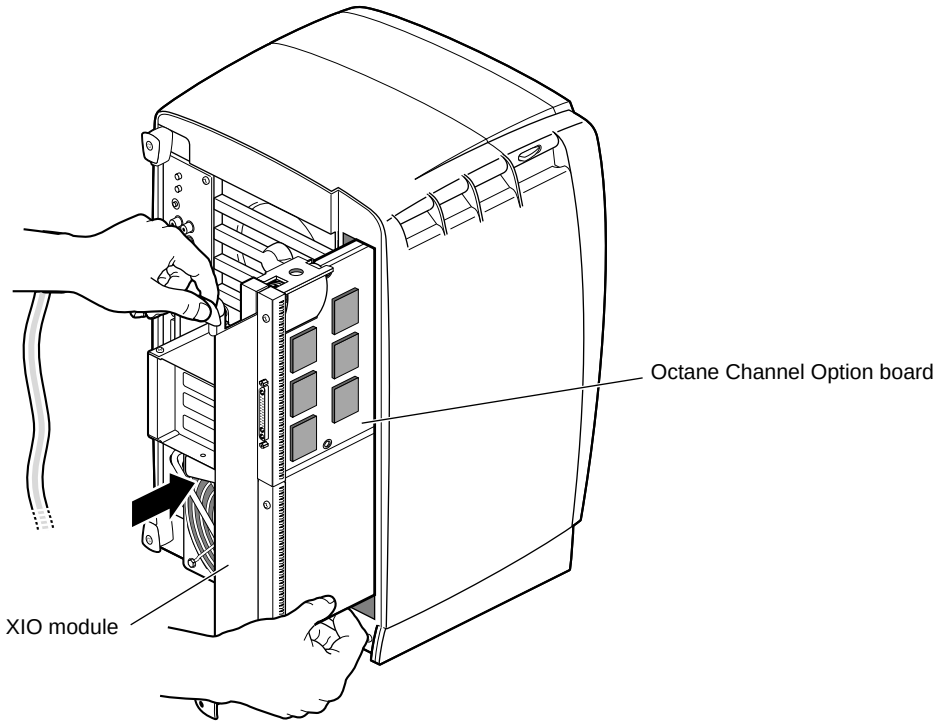

Figure 1-22 Replacing the XIO Module

Follow these steps to install the XIO module:

1. Replace the XIO module in the OCTANE workstation. Slide the XIO module into guides on the top and bottom of the workstation.
2. Before you insert the XIO module, make sure the handle portion protrudes in a locked position from the I/O panels, as shown in Figure 1-22.

   If the handles are flush with the I/O panels, the XIO module will stop during insertion. Pull out the handles until the sliding portion of the XIO module looks like that shown in Figure 1-22, and then continue inserting the XIO module into the chassis.
3. Use the handles to push the XIO module into a locked position.

   Note: The I/O panels are not completely flush with each other or the chassis; there is some slight variation in the depth of the individual boards.

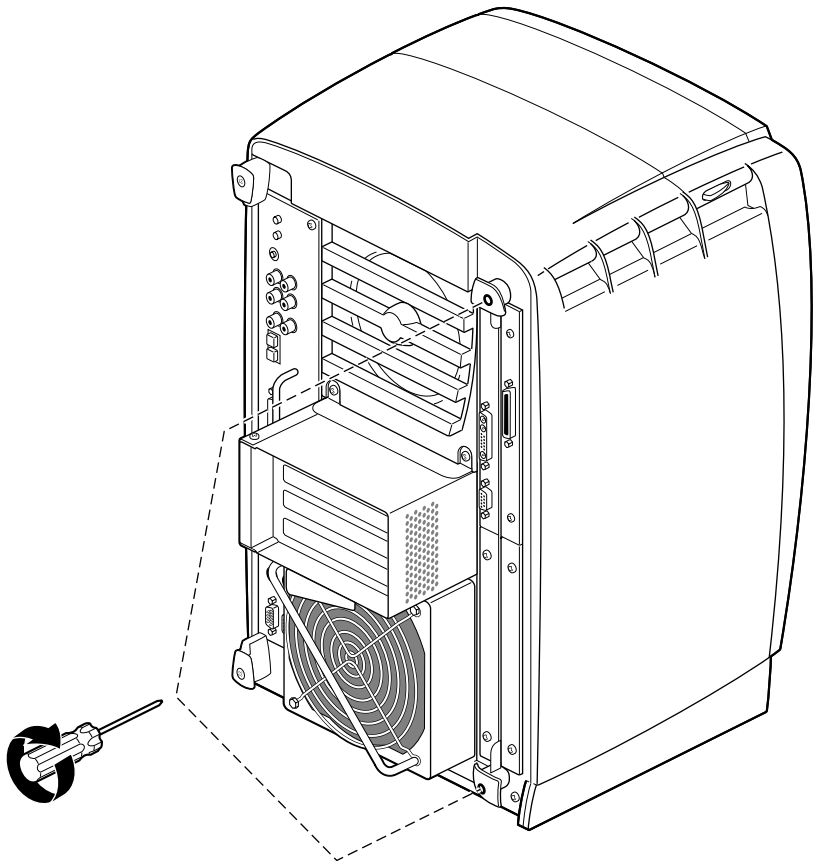

Figure 1-23 Replacing the XIO Module Screws

4. Tighten the screws in the handles so that the XIO module is attached to the chassis.
5. Remove the wrist strap.

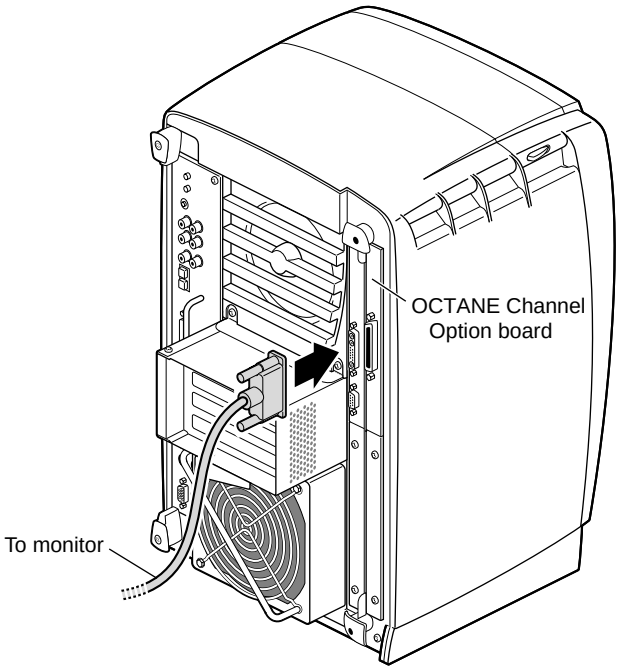

Figure 1-24 Replacing the Monitor Cable

6. Reattach the monitor cable to the I/O connector.
7. Attach any other option board cables.

You have finished replacing the XIO module and are ready for the next step. Go to “Powering On the OCTANE Workstation” on page 28.

Powering On the OCTANE Workstation

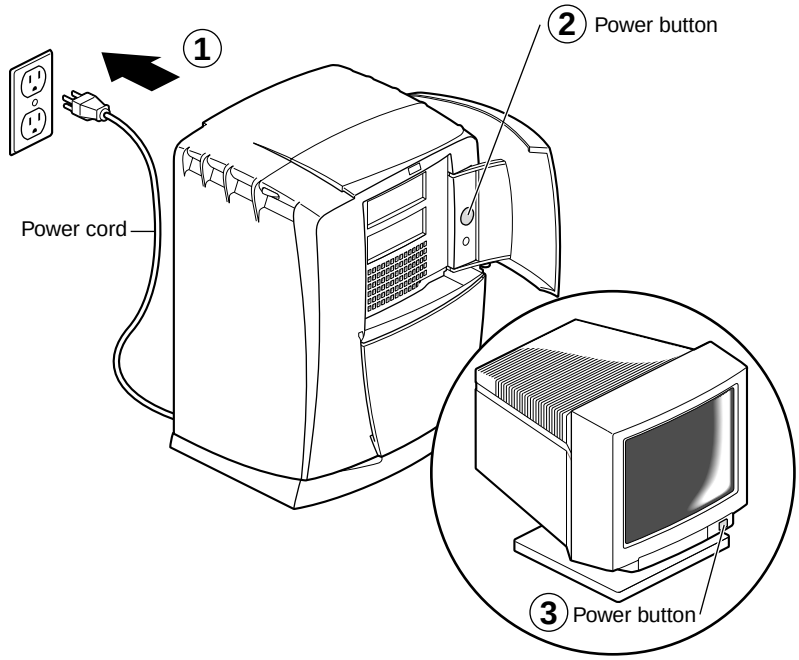

Figure 1-25 Powering On the OCTANE Workstation

1. Plug the power cord into an electrical outlet.
2. Push the power button on the front of the OCTANE workstation.
3. Push the power button on your monitor.

Go to the next section for instructions on placing any upgrade label, and then go to Chapter 2, “Connecting to the Breakout Box.”

Placing a Regulatory Label

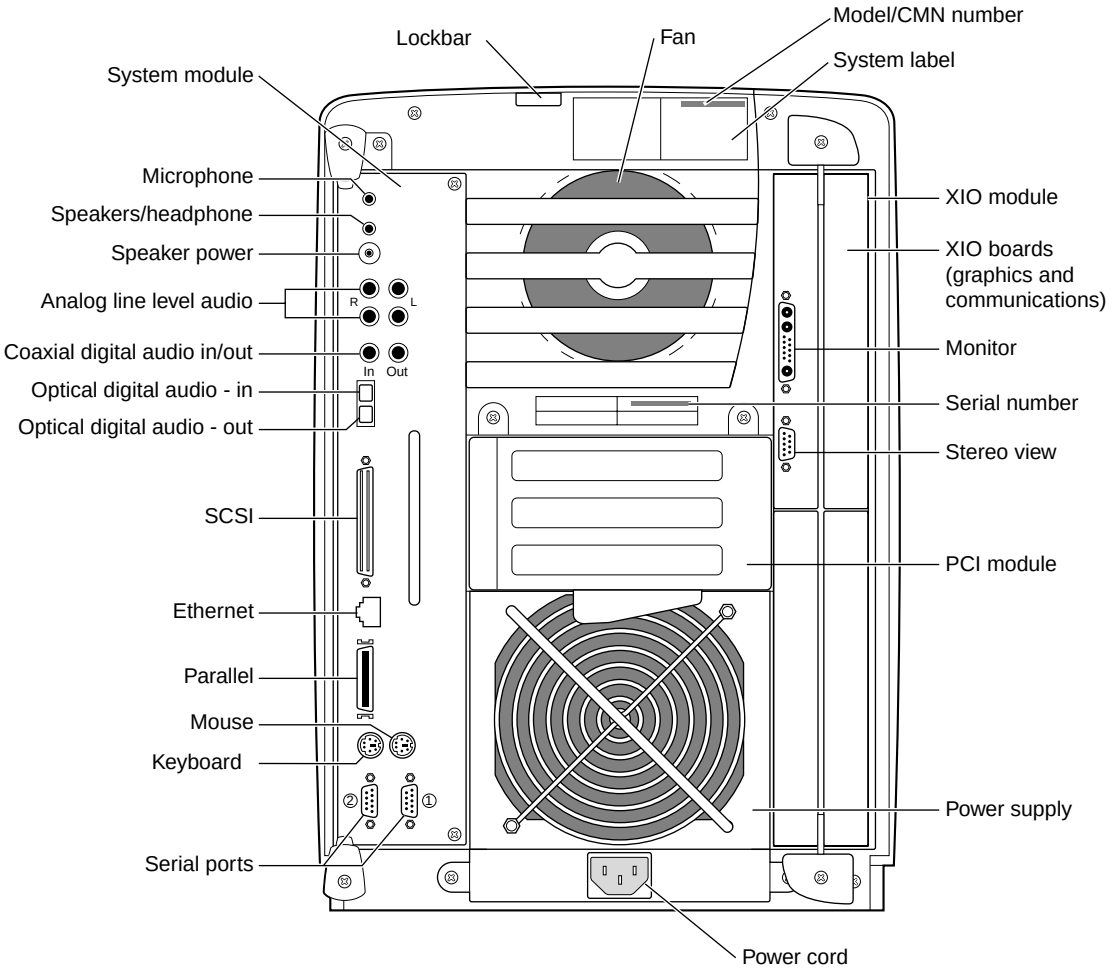

Figure 1-26 Rear View of the OCTANE Workstation

If you received a system upgrade label, place it on the system label (top of workstation).

1. Face the back of the OCTANE workstation. The system label (containing the model and CMN number) is located at the top center of the back of the workstation.
2. Place the label over the VCCI and CISPR 22 information.

Product Support

Silicon Graphics, Inc. provides a comprehensive range of product support for its products. If you are in North America and would like support for your Silicon Graphics supported products, contact the Technical Assistance Center at 1-800-800-4SGI or your authorized service provider. If you are outside North America, contact the Silicon Graphics subsidiary or authorized distributor in your country.

Returning Parts

To return any part, use the packaging materials and box that came with your replacement part.

Chapter 2

Connecting to the Breakout Box

This chapter provides information about connecting the breakout box to the monitors or head mounted display, placement of monitors, and cursor flow between monitors.

The following topics are covered in this chapter:

Connecting the Breakout Box Cable

To connect the breakout box cable to the OCTANE Channel Option board I/O connector, follow these steps:

1. Attach the breakout box cable connector to the connector on the OCO board. See Figure 2-1.
2. Tighten the thumbscrews on the side of the breakout box connector.

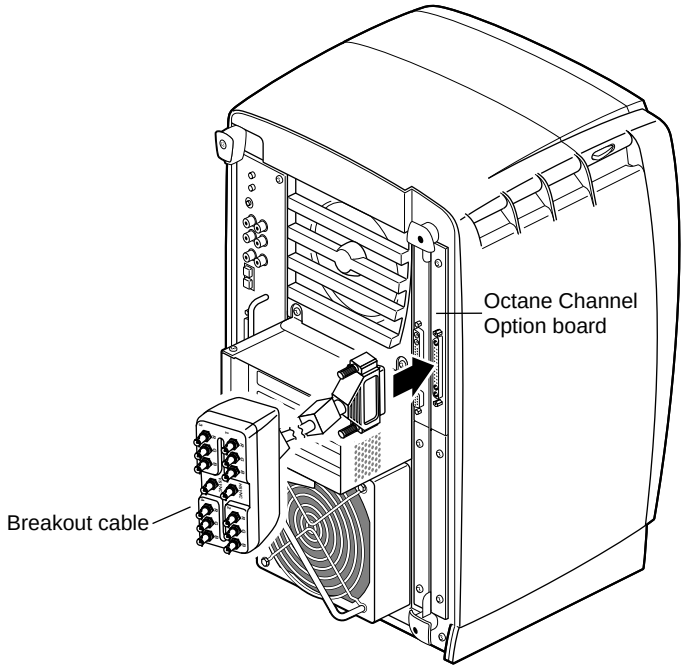

Figure 2-1 Attaching the Breakout Box Cable Connector to the OCO Board I/O Connector

Note: When the OCO board is active, the main monitor is blank. The main monitor cable does not have to be disconnected from the workstation when the breakout box cable is installed.

Connecting the Monitors or Head-Mounted Display

The breakout box allows multiple monitors or a head-mounted display to be connected to the OCO board.

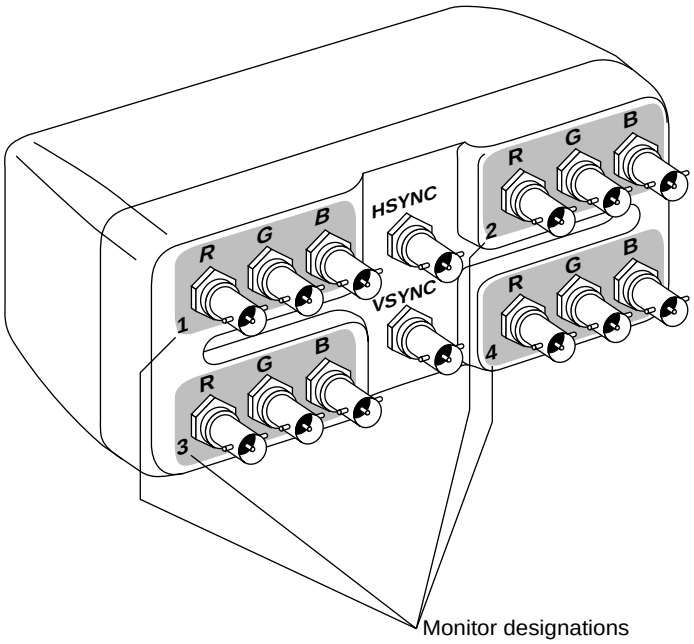

Figure 2-2 Connecting the Breakout Box to Four Monitors

The breakout box consists of four sections, each with three connectors. Typically, each set of connectors provides red (R), green (G), and blue (B) signals for the monitors. (The exception to this rule is the field sequential formats described in "Connecting the Head-Mounted Display" on page 44.) The section number (also the monitor designation) is in the bottom left corner of each section. When a monitor is connected to the pins in Section 1, the monitor is designated Monitor 1. The monitor connected to Section 2 becomes Monitor 2, and so on.

The shading around the RGB pins (or the shading of each section) tells you which group of pins to use for each configuration.

Using the Four-Screen Mode

The OCTANE frame buffer assumes that the monitors are stacked in a square-shaped configuration, and sends information to the monitors as indicated in Figure 2-3. However, the monitors may be set up in any alignment. See "Setting Up Four Monitors in a Stacked Configuration" on page 34 and "Setting Up Four Monitors in a Side-by-Side Configuration" on page 37.

Setting Up Four Monitors in a Stacked Configuration

To set up four monitors in a stacked configuration, follow these instructions:

1. Place the four monitors in a stacked, square-shaped configuration.

   Caution: Do not rest the upper two monitors on the lower two monitors. Place the upper monitors on a bookshelf or similar structure.

   - Connect the monitor in the upper left corner to Section 1 of the breakout box.
   - Connect the monitor in the upper right corner to Section 2 of the breakout box.
   - Connect the monitor in the lower left corner to Section 3 of the breakout box.
   - Connector the monitor in the lower right corner to Section 4 of the breakout box.

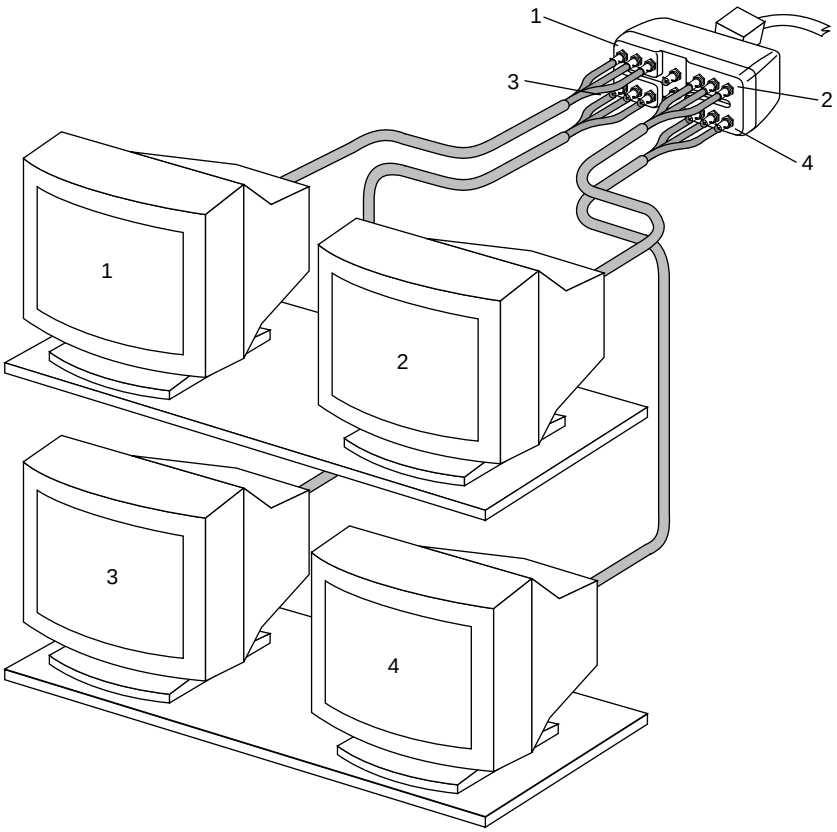

Figure 2-3 Connecting the Four Monitors to the Breakout Box

2. Connect the power cord of each monitor to an electrical outlet.
3. Connect the power cord of the OCTANE workstation to an electrical outlet.

You are finished setting up the monitors and are ready to power on the workstation.

To configure the OCO board, see "Using setmon to Configure the OCTANE Channel Option Board" on page 53.

Moving the Cursor Between Four Stacked Monitors

The cursor movement between stacked monitors is shown in Figure 2-4. The cursor from Monitor 1, for example, always exits and enters from the right side or from the bottom. Monitor 1 always receives the cursor from Monitor 2 from the right side of Monitor 1, and always receives the cursor from Monitor 3 from the bottom of its screen.

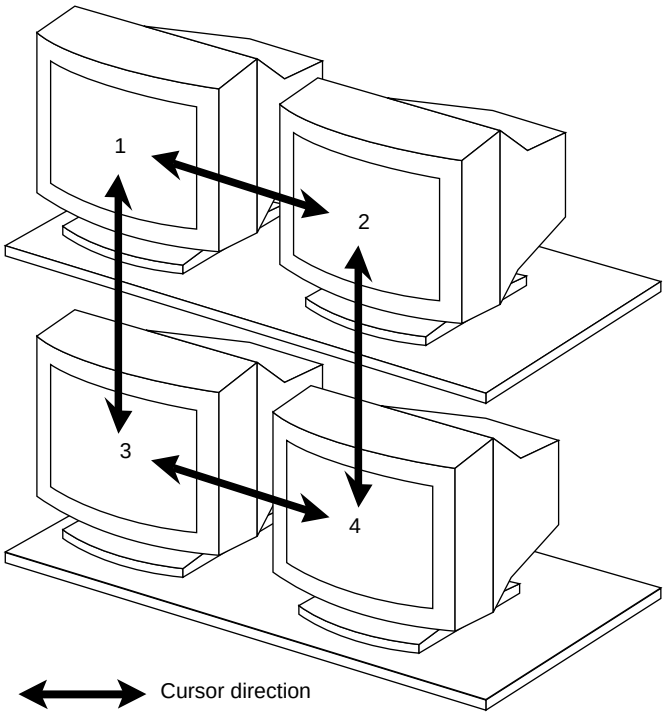

Figure 2-4 Moving the Cursor Between Monitors

Note: You cannot change the exit or entry points of a cursor.

Setting Up Four Monitors in a Side-by-Side Configuration

To set up four monitors in a side-by-side configuration, follow these instructions:

1. Arrange the monitors in the order you choose. A sample arrangement is shown in Figure 2-5.
2. Connect the monitors to the breakout box. The monitor attached to breakout box Section 1 is considered Monitor 1, and so on. See Figure 2-5.
3. Connect the power cord of each monitor to an electrical outlet.
4. Connect the power cord of the OCTANE workstation to an electrical outlet.

You are finished setting up the monitors and are ready to power on the workstation.

To configure the OCO board, see “Using setmon to Configure the OCTANE Channel Option Board” on page 53.

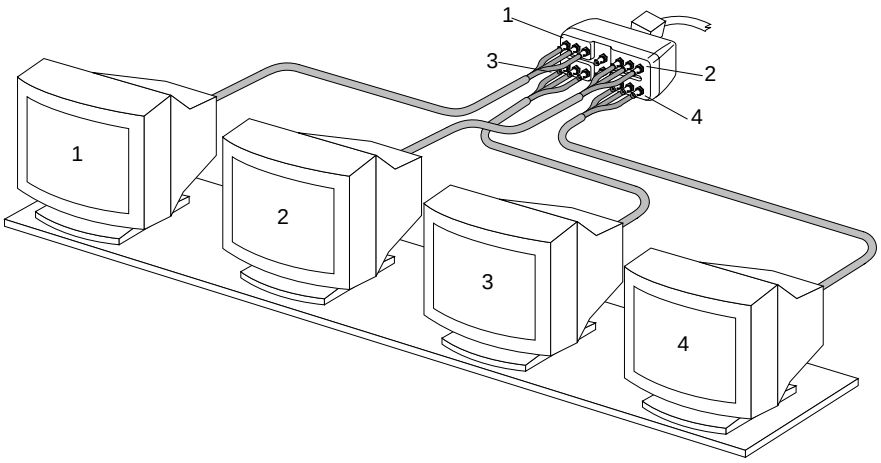

Figure 2-5 Arranging Four Monitors in a Side-by-Side Configuration

Note: If you have a dual head system, with another graphics board and monitor, reconnect any cables you may have disconnected for the OCO board installation.

Moving the Cursor Between Four Side-by-Side Monitors

The cursor movement between monitors is shown in Figure 2-6. The cursor from Monitor 1, for example, always exits and enters from the right side or from the bottom. Monitor 1 always receives the cursor from Monitor 2 from the right side of Monitor 1, and always receives the cursor from Monitor 3 from the bottom of its screen.

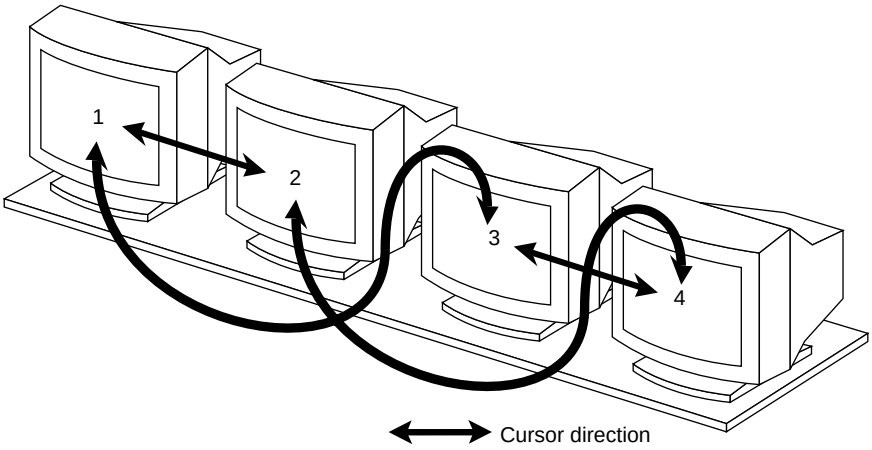

Figure 2-6 Moving the Cursor Between Four Side-by-Side Monitors

In the example in Figure 2-6, the cursor cannot directly move from Monitor 3 to Monitor 2. It must go through either Monitor 1 or Monitor 4 before entering Monitor 2.

Note: You cannot change the exit or entry points of the cursor.

Using the Two-Screen Mode

The frame buffer assumes the monitors are stacked one above the other, and sends information to the monitors in the pattern shown in Figure 2-7. Monitor 1 is always the monitor in the upper position.

Setting Up Two Monitors in a Stacked Configuration

To connect two stacked monitors to the breakout box, follow the steps below:

1. Place the two monitors in a stacked configuration.

   Caution: Do not rest the upper monitor on the lower monitor. Place the upper monitor on a bookshelf or similar structure.

   - Connect the upper monitor to Section 1 of the breakout box.
   - Connect the lower monitor to Section 2 of the breakout box.

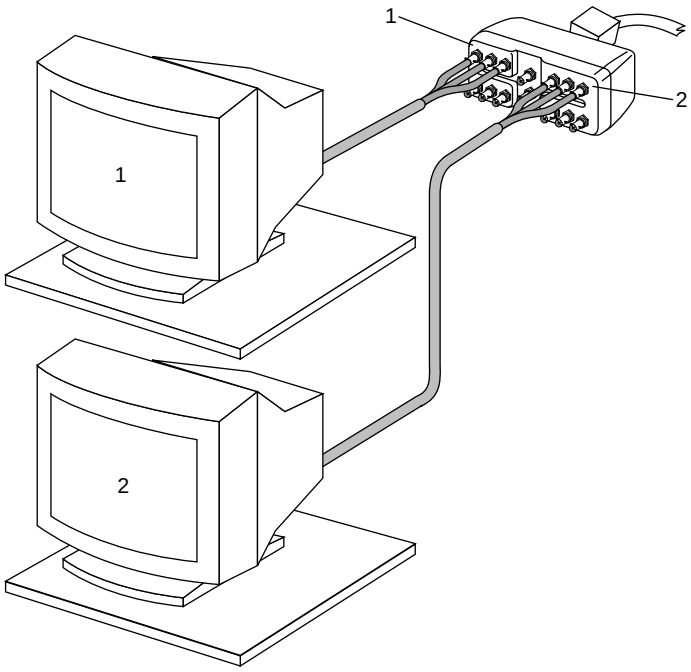

Figure 2-7 Connecting the Two Stacked Monitors to the Breakout Box

2. Connect the power cord of each monitor to an electrical outlet.
3. Connect the power cord of the OCTANE workstation to an electrical outlet.

You are finished setting up the monitors and are ready to power on the workstation.

To configure the OCO board, see "Using setmon to Configure the OCTANE Channel Option Board" on page 53.

Moving the Cursor Between Two Stacked Monitors

The cursor movement between monitors is shown in Figure 2-8. The cursor from Monitor 1 always exits and enters from the bottom. The cursor from Monitor 2 always exits and enters from the top.

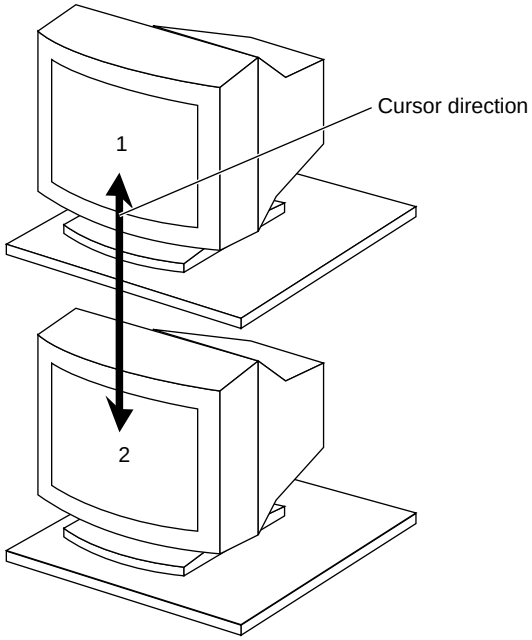

Figure 2-8 Moving the Cursor Between Two Stacked Monitors

Note: You cannot change the exit or entry points of a cursor.

Setting Up Two Monitors in a Side-by-Side Configuration

To set up two monitors in a side-by-side configuration, follow these instructions:

1. Arrange the monitors in the order you choose. A sample arrangement is shown in Figure 2-9.
2. Connect the monitors to the breakout box. The monitor attached to breakout box Section 1 is considered Monitor 1, etc. See Figure 2-9.
3. Connect the power cord of each monitor to an electrical outlet.
4. Connect the power cord of the OCTANE workstation to an electrical outlet.

You are finished setting up the monitors and are ready to power on the workstation.

To configure the OCO board, see "Using setmon to Configure the OCTANE Channel Option Board" on page 53.

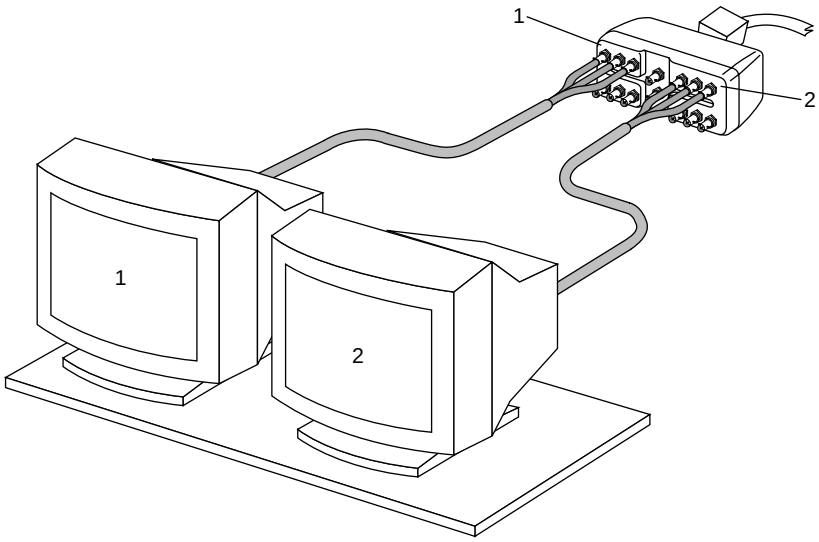

Figure 2-9 Arranging Two Monitors in a Side-by-Side Configuration

Moving the Cursor Between Two Side-by-Side Monitors

The cursor movement between monitors is shown in Figure 2-10. The cursor from Monitor 1 always exits and enters from the bottom. Monitor 2 always receives the cursor from Monitor 1 at the top.

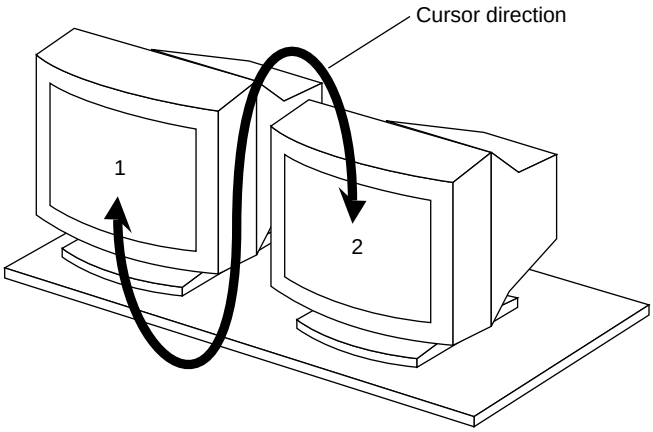

Figure 2-10 Moving the Cursor Between Two Side-by-Side Monitors

Note: You cannot change the exit or entry points of a cursor.

Connecting the Head-Mounted Display

In a typical video (field-parallel) format, the data is generated on three output wires, with the red data on one wire, the green data on another, and the blue data on a third. Many head-mounted displays require that the video data is given in a field-sequential format as opposed to a field-parallel format.

In a field sequential format, all image and timing information is output on a single wire. The red data for an image is output first, then the green data, and finally the blue data. OCO uses the red and green outputs from Channel 1 in the field-sequential format to output the information to the head-mounted display. The data for the right eye is present on Channel 1-Red, and the data for the left eye is present on Channel 1-Green.

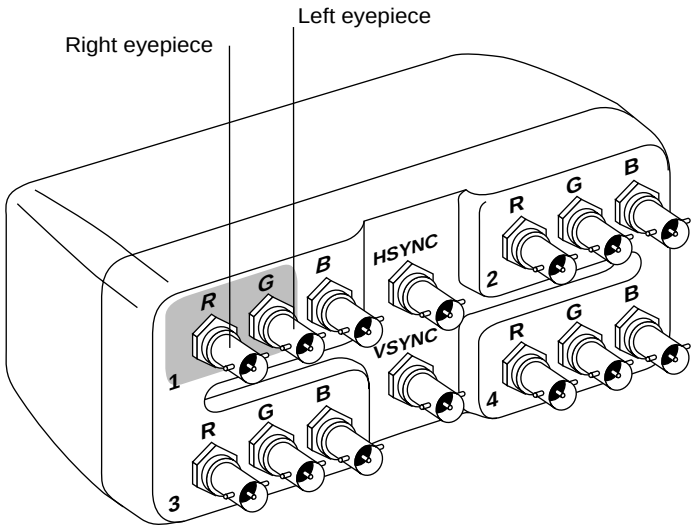

Figure 2-11 Identifying the Section for the Head-Mounted Display

To connect a Head-Mounted Display to the breakout box, follow the steps below:

1. Connect the cable for the right eyepiece to the **R** channel of Section 1.
2. Connect the cable for the left eyepiece to the **G** channel of Section 1.

Connecting to a Single Monitor: The Minify Mode

Using the minify mode allows an image to be reduced, resulting in a softened image. The reduced image is sent to a single monitor. The minify mode also prevents image shimmering or crawling.

To configure the OCO board, see “Using setmon to Configure the OCTANE Channel Option Board” on page 53.

Connect the single monitor used for the minify mode to the three channels in Section 4. See Figure 2-12.

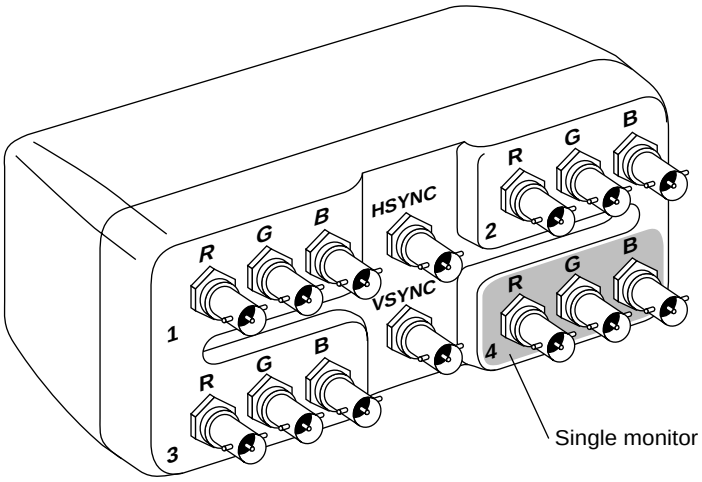

Figure 2-12 Identifying the Section for the Minify or Single Monitor Mode

Using the HSYNC or VSYNC Connectors

The HSYNC and VSYNC connectors provide external horizontal and vertical sync signals. These signals are locked to all active OCO outputs for a given mode, and can be used with monitors requiring separate sync inputs.

Note: Only one monitor can be connected to these outputs at a time.

Monitors should be used that have sync on green as a built-in feature rather than monitors that require external inputs. If more than one monitor requiring external inputs must be connected to the HSYNC and VSYNC connectors, a customer-supplied distribution amplifier should be used.

To use the HSYNC and VSYNC connectors, choose one of the following options:

- Connect a single monitor to the HSYNC and VSYNC connectors on the breakout box.
- Connect two or more monitors to a distribution amplifier that is connected to HSYNC and VSYNC.

To configure the OCO board, see "Using setmon to Configure the OCTANE Channel Option Board" on page 53.

Chapter 3

Configuring the OCTANE Channel Option Board

The OCTANE Channel Option (OCO) board allows you to transmit video output to multiple monitors from a single OCTANE system. Each monitor is assigned a different portion of the OCTANE frame buffer so that each monitor displays a unique image. You can use OCO to drive up to four monitors with RS170, VGA, or SVGA timing. Also, you can use the OCO board to produce timing formats not supported by OCTANE graphics alone. For example, while the standard field parallel formats, such as VGA, transmit data to a monitor on red, green, and blue wires, OCO can produce field-sequential formats that transmit all data on a single wire. These formats provide two channels of information needed to produce stereoscopic displays on many common head-mounted displays. Also, you can use OCO to "minify" a high resolution image, and produce a softened, lower resolution image.

Before continuing to configure the OCO, make sure that you also have installed the following:

- the OCO board (see "Checking the OCTANE Channel Option Board Package Components" on page 2 for installation information)
- the breakout box (see "Connecting the Breakout Box Cable" on page 32 for instructions)
- the monitor(s) to the breakout box (see "Connecting the Monitors or Head-Mounted Display" on page 33)

You can install one OCO board for each OCTANE system. The OCO board can drive up to four independent channels from a single workstation.

This chapter describes how to configure the video formats that the OCO outputs. Specifically, this chapter covers the following topics:

- "OCTANE Channel Option Board and the Graphics Subsystem" on page 48
- "Using the setmon Command" on page 52

If you have a dual-head system and want to move windows from one head to another, see the *OCTANE Dual Head Installation Guide*.

OCTANE Channel Option Board and the Graphics Subsystem

The OCO video output is easy to configure. Just specify the number of channels and the size of the video image. You can use the system command, *setmon*, to specify the output format (see "Using the setmon Command" on page 52 for more information). If you are writing code for an application, use **XSGIvc()** to control the video output formats.

This section explains the following topics:

OCO Graphics Integration

Figure 3-1 shows how the OCTANE Channel Option board is integrated into the graphics subsystem. The OCO subsystem interprets your video output specifications and converts the incoming digital information according to your specifications. Video comes in to the OCO subsystem where it is scaled and/or partitioned into the number and size of screens you have specified. Next, it goes to the framebuffer and then to the crossbar, which acts as a switch. Lastly, the crossbar routes the analog video signals to the appropriate monitors.

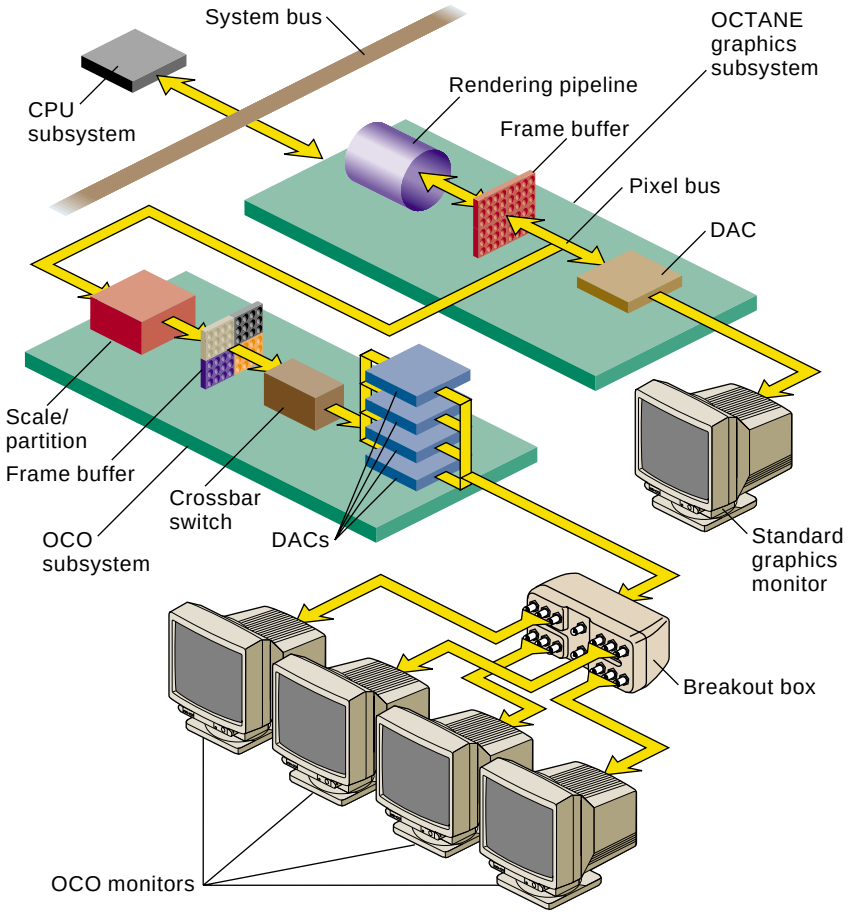

Figure 3-1 OCTANE Channel Option Board and Graphics Subsystem

The number of screens into which the OCTANE Channel Option board divides the display surface is determined by several factors, including the OCO configuration that you specify and the graphics bandwidth of the OCTANE graphics system.

OCO Video Output Formats

Table 3-1 lists the number of OCO channels, format resolution, and timing.

Table 3-1 OCO Video Output Channels, Format, and Timing

Number of Channels	Format	Timing	External Sync
4	640 x 486 Interlaced	RS-170 (NTSC RGB)	
4	640 x 480 Non-interlaced	VGA	Yes
4[a]	800 x 600 Non-interlaced	SVGA	Yes
2	640 x 480 Non-interlaced	Field sequential	
1	640 x 480 Non-interlaced	VGA (filtered minify mode)	Yes
2	800 x 486 Interlaced	RS-170 Field sequential	
2	800 x 486 Interlaced	RS-170 Field parallel component	
2[a]	800 x 600 Non-interlaced	SVGA	Yes
2[a]	880 x 808 Interlaced	Field sequential	
2[a]	1024 x 946 Interlaced	Field sequential	
2[a]	1160 x 960 Interlaced	Field sequential	

a. These modes are supported only on systems with OCTANE/MXI/SSI graphics.

Note: VGA-to-NTSC converters produce composite NTSC.

For information on external sync, see “Using OCO With External HSYNC or VSYNC Connectors” on page 54. For details on cable connections between the OCO board and OCO output monitors, see “Connecting the Monitors or Head-Mounted Display” on page 33. For information on the breakout box connection to a head-mounted device, see “Connecting the Head-Mounted Display” on page 44. For details on the breakout box connection for minify mode, see “Connecting to a Single Monitor: The Minify Mode” on page 45.

OCO Video Output Format Specifications

Video output format specifications are listed in Table 3-2.

Table 3-2 Video Output Format Specifications

Format Specification	Active Area
4@640x486_30i	Four screens, each 640 x 486, at 30 Hz, interlaced RS-170 (NTSC RGB)
4@640x480_60	Four screens, each 640 x 480, at 60 Hz, non-interlaced (VGA)
4@800x600_60[a]	Four screens, each 800 x 600, at 60 Hz, non-interlaced (SVGA)
2@640x480_60q	Two screens, each 640 x 480, at 60 Hz, non-interlaced, field sequential
1@640x480_60	One screen, 1281 x 961 minified to 640 x 480, at 60 Hz, non-interlaced (VGA)
2@800x486_30qi	Two screens, each 800 x 486, at 30 Hz, interlaced, field sequential
2@800x486_30i	Two screens, each 800 x 486, at 30 Hz, interlaced, field parallel
2@800x600_60[a]	Two screens, each 800 x 600, at 60 Hz, non-interlaced (SVGA)
2@880x808_30qi[a]	Two screens, each 880 x 808, at 30 Hz, interlaced, field sequential
2@1024x946_30qi[a]	Two screens, each 1024 x 946, at 30 Hz, interlaced, field sequential
2@1160x960_30qi[a]	Two screens, each 1160 x 960, at 30 Hz, interlaced, field sequential

a. These modes are supported only on systems with OCTANE/MXI/SSI graphics.

Note: OCO does not support an external genlock source. However, when OCO is in multi-screen mode, the outputs are synchronized with each other.

Table 3-3 lists where you can find information about OCO cable connections.

Table 3-3 Information on OCO Cable Connections

Connection Type	See This Section
Cable connections between the OCO board and the OCO output monitors	"Connecting the Breakout Box Cable" on page 32
Breakout box connection to a head-mounted display	"Connecting the Head-Mounted Display" on page 44
Breakout box connection for minify mode	"Connecting to a Single Monitor: The Minify Mode" on page 45
HSYNC AND VSYNC connectors	"Using OCO With External HSYNC or VSYNC Connectors" on page 54

Using the setmon Command

You can set the OCTANE Channel Option board's output video formats by using the *setmon* command, the same command you use to select the formats of OCTANE graphics.

This section covers the following topics:

- "Using setmon to Configure the OCTANE Channel Option Board" on page 53
- "Turning Off the OCO and Returning to the Standard OCTANE Monitor" on page 55
- "Using gfxinfo to List Graphics Information" on page 55

Note: Silicon Graphics recommends that you use the X extension, **XSGIvc**, when writing a program that controls the video output formats. Also, use a dumb terminal or remotely log in over the network to switch video modes between standard and OCO modes.

For information on moving the cursor from screen to screen, see "Using the Four-Screen Mode" on page 34.

Using setmon to Configure the OCTANE Channel Option Board

To configure and turn on the OCTANE Channel Option board, follow these steps:

1. If your Silicon Graphics system is powered off, follow the steps in the *OCTANE Owner's Guide* to plug in the system and power it on.
2. Log in to your account on the system.
3. Open a shell window, if necessary, by selecting "Unix Shell" from the Desktop Toolchest. Move the cursor inside the shell window.
4. Execute the *setmon* command and with the **–S** option. The format is

   `/usr/gfx/setmon -S` *format*

   The option **–S** is required; note that it is uppercase. The *format* is the specification of the desired video output format. For example, suppose you want two screens at an 800 x 486 resolution; the format specification is **`2@800x486_30i`**. So, to display this video format, enter

   ```
   /usr/gfx/setmon -S 2@800x486_30i
   ```

   This specification sets up OCO multichannel mode for two monitors, each at 800 x 486 pixels. The timing is 30 Hz and is interlaced (more than one vertical scan is used to reproduce a complete image).

To turn on OCO multichannel mode, see "Turning On the OCO" on page 54. Output formats are listed in "OCO Video Output Format Specifications" on page 51.

Note: OCO does not support an external genlock source. However, when OCO is in multi-screen mode, the outputs are synchronized with each other.

Using setmon to Delay the Loading of the Video Format

You can delay loading the video format by using the **–x** option to *setmon*. Note that you must be the superuser (**`su`**) to use the **–x** option. For example:

```
su
/usr/gfx/setmon -x -S 2@800x486_30i
```

The **–x** option saves the specified format to be used the next time the X server is started. This format does not take effect immediately; it is loaded the next time you restart graphics or reboot the system. For information on starting the X server and graphics mode, see "Turning On the OCO" on page 54.

For details on the *setmon* command and its options, see the setmon(3) reference page.

Turning On the OCO

Loggging in remotely over the network or use a dumb terminal allows you to switch the OCO video modes without logging out and logging in again.

To switch to OCO multichannel mode when remotely logged in or on a dumb terminal, stop and restart the graphics subsystem**:**

```
/usr/gfx/setmon -x -S format
((/usr/gfx/stopgfx ; /usr/gfx/startgfx) >& /dev/null &)
```

To switch to OCO multichannel mode when logged in on the graphics console, use *setmon* to select the format, and then log out and log in; you do not need to stop and restart the graphics.

Note: It may be possible to switch to or from OCO multichannel mode without stopping and restarting the graphics subsystem if the new framebuffer screen size is less than or equal to the old screen size.

If you wish, you can confirm that the OCO is active; for more information, refer to the section "Using gfxinfo to List Graphics Information" on page 55.

Note: When the OCO is active, OCTANE graphics do not output to the standard OCTANE monitor (1280 x 1024).

Using OCO With External HSYNC or VSYNC Connectors

The HSYNC and VSYNC connectors provide external horizontal and vertical sync signals. These signals are locked to all active OCO outputs for a given mode, and can be used with monitors requiring separate sync inputs. Connect only one monitor to these outputs at a time. Use monitors that have sync-on-green as a built-in feature rather than monitors that require external inputs. If you must connect more than one monitor

requiring external inputs to the HSYNC and VSYNC connectors, use a customer-supplied distribution amplifier. To use the HSYNC and VSYNC connectors, choose one of the following options:

- Connect a single monitor to the HSYNC and VSYNC connectors on the breakout box.
- Connect two or more monitors to a distribution amplifier that is connected to HSYNC and VSYNC connectors.

To enable the HSYNC and VSYNC connectors on the breakout box, you must use a video format combination that ends in **_ext**, for example, **4@460x480_60_ext**. Table 3-1 lists the video formats that have external sync capabilities.

Turning Off the OCO and Returning to the Standard OCTANE Monitor

After a power-off, system reset, or reboot, the system remains in multichannel mode. To turn off OCO and return to standard graphics mode, when logged in remotely or on a dumb terminal, enter

```
/usr/gfx/setmon -x format
((/usr/gfx/stopgfx ; /usr/gfx/startgfx) >& /dev/null &)
```

If you are logged in on the graphics console, run ***setmon***, and then log out and log in.

The *format* is the output format of the screen when not in multichannel mode, for example, **1280x1024_60**.

Using gfxinfo to List Graphics Information

You can use the *gfxinfo* command to display information about the graphics subsystems installed in your system. Enter the following:

```
setenv DISPLAY :0
/usr/gfx/gfxinfo -v
```

The first command sets up your environment so that the information is displayed on the screen from which you are typing the *gfxinfo* command. The **–v** option to *gfxinfo* specifies verbose output. An example of *gfxinfo* output for the format, **2@800x486_30i**, looks like this:

```
Graphics board 0 is “IMPACTSR” graphics.
        Managed (“:0.0”) 800x972
        Product ID 0x3, 2 GEs, 2 REs, 4 TRAMs
        MGRAS revision 1, RA revision 0
        HQ rev B, GE11 rev B, RE4 rev C, PP1 rev A,
        VC3 rev A, CMAP rev E, Heart rev D
        19” monitor (id 0x1)
        OCO board present (rev 2)

        Channel 1:
         Origin = (0,0)
         Video Output: 800 pixels, 486 lines, 30.00Hz (2@800x486_30i)
        Channel 2:
         Origin = (0,486)
         Video Output: 800 pixels, 486 lines, 30.00Hz (2@800x486_30i)
```

The output tells you that the OCO board is installed and what its revision number is: `OCO board present (rev 2)`. You also see statistics for each channel: the origin of each viewport (`0,0` for Channel 1 and `0,486` for Channel 2) and the video output size, timing, and format (`800 pixels, 486 lines, 30.00Hz (2@800x486_30i)`).

OCO Display Viewports

The X display surface for OCTANE Channel Option board video formats is determined by the mode in which OCO is operating. The OCO places the origin of the first viewport starting at 0,0 in the upper left corner of the window.

This section provides examples of the screen origins for various output formats:

- "2@1024x946_30qi, Field Sequential" on page 69
- "2@1160x960_30qi, Field Sequential" on page 70

Note: For more information on origins and display surface sizes, see "Using gfxinfo to List Graphics Information" on page 55 and the gfxinfo(3G) reference page. Consult the *gfxinfo* output before using any formats. Silicon Graphics reserves the right to change origins as needed.

For video output channels, formats, and timing information, see Table 3-1.

4@640x486_30i, Component NTSC/RS-170 (RGB)

Figure 3-2 shows the maximum single display surface and origins for the viewports for the output format 4@640x486_30i. The actual display surface is the largest rectangular area that encloses the viewports. Its size is 1280 x 972 pixels.

This format divides the frame buffer into four independent channels. The size and location of each channel are shown in the figure. Each channel is 640 x 486 pixels and is output on the R, G, and B connectors on the breakout box. The timing for these signals is compatible with RS-170. If you require a composite signal, you must use an external encoder.

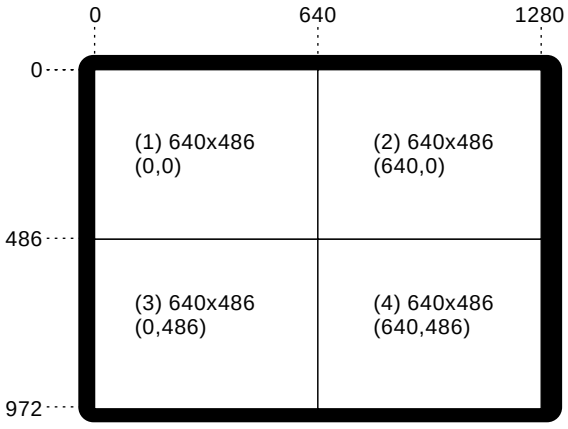

Figure 3-2 Display Surface for 4@640x486_30i Output Format

The output of **gfxinfo -v** for this format is

```
Graphics board 0 is “IMPACTSR” graphics.
        Managed (“:0.0”) 1280x972
        Product ID 0x3, 2 GEs, 2 REs, 4 TRAMs
        MGRAS revision 1, RA revision 0
        HQ rev B, GE11 rev B, RE4 rev C, PP1 rev A,
        VC3 rev A, CMAP rev E, Heart rev D
        19” monitor (id 0x1)
        OCO board present (rev 2)

        Channel 1:
         Origin = (0,0)
         Video Output: 640 pixels, 486 lines, 30.00Hz (4@640x486_30i)
        Channel 2:
         Origin = (640,0)
         Video Output: 640 pixels, 486 lines, 30.00Hz (4@640x486_30i)
        Channel 3:
         Origin = (0,486)
         Video Output: 640 pixels, 486 lines, 30.00Hz (4@640x486_30i)
        Channel 4:
         Origin = (640,486)
         Video Output: 640 pixels, 486 lines, 30.00Hz (4@640x486_30i)
```

4@640x480_60, VGA

Figure 3-3 shows the maximum single display surface and origins for the viewports for the output format 4@640x480_60. The actual display surface is the largest rectangular area that encloses the viewports. Its size is 1280 x 960 pixels.

This format divides the frame buffer into four independent channels. The size and location of each channel are shown in the figure. Each channel is 640 x 480 pixels and is output on the R, G, and B connectors on the breakout box. This format is non-interlaced with a 60 Hz frame update rate. The timing for these signals is compatible with VGA resolution. Typically, this mode is used with sync-on-green. The monitors that are used with this format must be able to accept sync-on-green rather than external H and V sync. OCO can produce one channel of separate H and V sync, which is timed correctly for any of the OCO channels. See Table 3-1 for a listing of formats that you can use with H and V sync and “Using OCO With External HSYNC or VSYNC Connectors” on page 54.

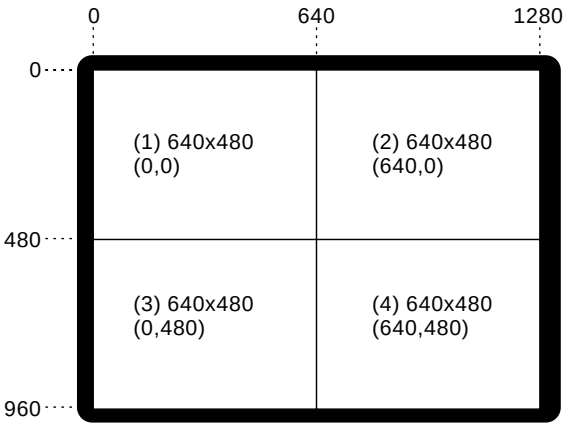

Figure 3-3 Display Surface for 4@640x480_60 Output Format

The output of **`gfxinfo -v`** for this format is

```
Graphics board 0 is “IMPACTSR” graphics.
        Managed (“:0.0”) 1280x960
        Product ID 0x3, 2 GEs, 2 REs, 4 TRAMs
        MGRAS revision 1, RA revision 0
        HQ rev B, GE11 rev B, RE4 rev C, PP1 rev A,
        VC3 rev A, CMAP rev E, Heart rev D
        19” monitor (id 0x1)
        OCO board present (rev 2)

        Channel 1:
         Origin = (0,0)
         Video Output: 640 pixels, 480 lines, 60.00Hz (4@640x480_60)
        Channel 2:
         Origin = (640,0)
         Video Output: 640 pixels, 480 lines, 60.00Hz (4@640x480_60)
        Channel 3:
         Origin = (0,480)
         Video Output: 640 pixels, 480 lines, 60.00Hz (4@640x480_60)
        Channel 4:
         Origin = (640,480)
         Video Output: 640 pixels, 480 lines, 60.00Hz (4@640x480_60)
```

Note: External sync is supported in this format; see “Using OCO With External HSYNC or VSYNC Connectors” on page 54 for more information.

4@800x600_60, SVGA

Figure 3-4 shows the maximum single display surface and origins for the viewports for the output format 4@800x600_60. The actual display surface is the largest rectangular area that encloses the viewports. Its size is 1600 x 1200 pixels.

This format divides the frame buffer into four independent channels. The size and location of each channel are shown in the figure. Each channel is 800 x 600 pixels and is output on the R, G, and B connectors on the breakout box. This non-interlaced format has a 60 Hz frame update rate. The timing for these signals is compatible with SVGA resolution. Typically, this mode is used with sync-on-green. The monitors that are used with this format must be able to accept sync-on-green rather than external H and V sync. OCO can produce one channel of separate H and V sync, which is timed correctly for any of the OCO channels.

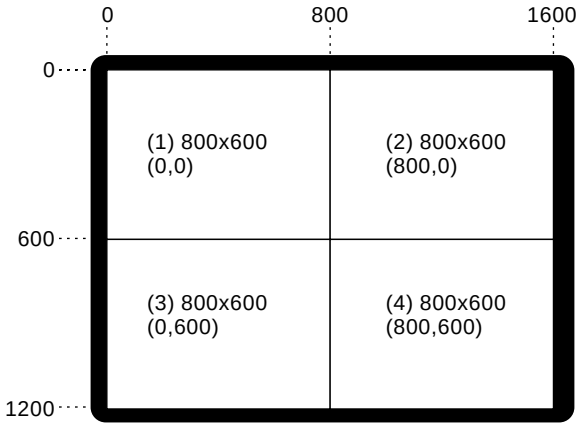

Figure 3-4 Display Surface for 4@800x600_60 Output Format

The output of **`gfxinfo -v`** for this format is

```
Graphics board 0 is “IMPACTSR” graphics.
        Managed (“:0.0”) 1600x1200
        Product ID 0x3, 2 GEs, 2 REs, 4 TRAMs
        MGRAS revision 1, RA revision 0
        HQ rev B, GE11 rev B, RE4 rev C, PP1 rev A,
        VC3 rev A, CMAP rev E, Heart rev D
        19” monitor (id 0x1)
        OCO board present (rev 2)

        Channel 1:
         Origin = (0,0)
         Video Output: 800 pixels, 600 lines, 60.10Hz (4@800x600_60)
        Channel 2:
         Origin = (800,0)
         Video Output: 800 pixels, 600 lines, 60.10Hz (4@800x600_60)
        Channel 3:
         Origin = (0,600)
         Video Output: 800 pixels, 600 lines, 60.00Hz (4@800x600_60)
        Channel 4:
         Origin = (800,600)
         Video Output: 800 pixels, 600 lines, 60.00Hz (4@800x600_60)
```

Note: External sync is supported in this format; see “Using OCO With External HSYNC or VSYNC Connectors” on page 54 for more information.

2@640x480_60q, Field Sequential

Figure 3-5 shows the maximum single display surface and origins for the viewports for the output format 2@640x480_60q. The actual display surface is the largest rectangular area that encloses the viewports. Its size is 640 x 960 pixels.

This format divides the frame buffer into two independent channels. The size and location of each channel are shown in the figure. Each channel is 640 x 480 pixels and is output on the R and G connectors for Channel 1 of the breakout box. This format is a non-interlaced, field-sequential format with a 60 Hz update rate.

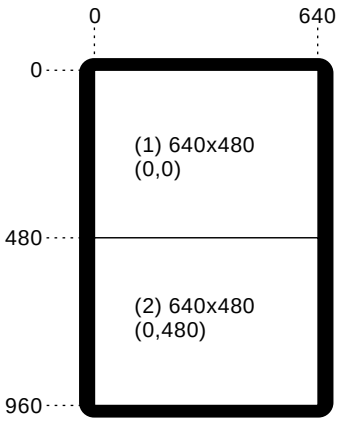

Figure 3-5 Display Surface for 2@640x480_60q Output Format

The output of **`gfxinfo -v`** for this format is

```
Graphics board 0 is “IMPACTSR” graphics.
        Managed (“:0.0”) 640x960
        Product ID 0x3, 2 GEs, 2 REs, 4 TRAMs
        MGRAS revision 1, RA revision 0
        HQ rev B, GE11 rev B, RE4 rev C, PP1 rev A,
        VC3 rev A, CMAP rev E, Heart rev D
        19” monitor (id 0x1)
        OCO board present (rev 2)

        Channel 1:
         Origin = (0,0)
         Video Output: 640 pixels, 480 lines, 60.00Hz (2@640x480_60q)
        Channel 2:
         Origin = (0,480)
         Video Output: 640 pixels, 480 lines, 60.00Hz (2@640x480_60q)
```

1@640x480_60, VGA Minify

Minify mode produces a smooth image, without jagged or broken surfaces. This mode uses a rendering technique that takes a portion of a group of pixels and “minifies” them to produce a clear, smooth representation of the original image. For example, a video game developer can create a video game on an OCTANE system and output the game in OCO minify mode to see what it looks like on a typical VGA or TV screen.

Figure 3-6 shows the maximum single display surface (shaded area, 1288 x 962) and origins for the viewport (unshaded area, 1281 x 962) for the output format 1@640x480_60. The OCTANE viewport (1281 x 961) displays as 640 x 480 on the OCO monitor. Note that seven pixels at the end of each line and the bottom line on the screen are not displayed (as shown in the shaded area in Figure 3-6).

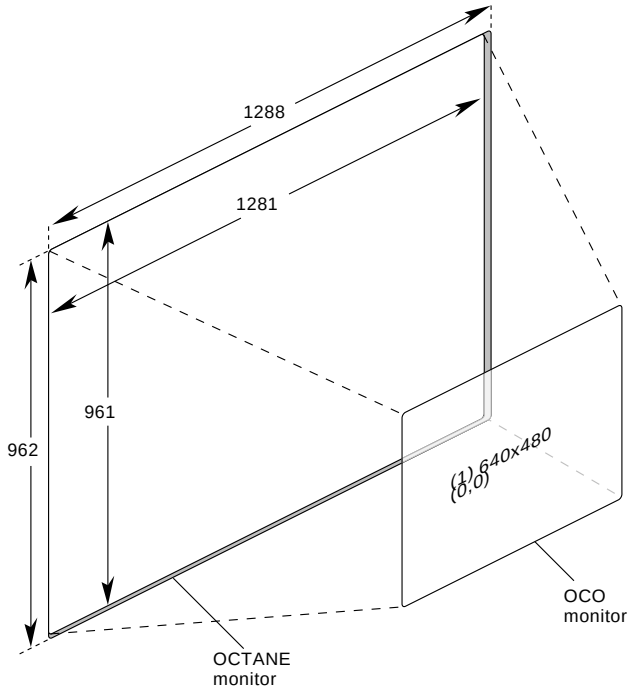

Figure 3-6 Display Surface for 1@640x480_60 Output Format

The output of **gfxinfo -v** for this format is

```
Graphics board 0 is “IMPACTSR” graphics.
        Managed (“:0.0”) 1288x962
        Product ID 0x3, 2 GEs, 2 REs, 4 TRAMs
        MGRAS revision 1, RA revision 0
        HQ rev B, GE11 rev B, RE4 rev C, PP1 rev A,
        VC3 rev A, CMAP rev E, Heart rev D
        19” monitor (id 0x1)
        OCO board present (rev 2)

        Channel 4:
         Origin = (0,0)
         Video Output: 640 pixels, 480 lines, 60.00Hz (1@640x480_60)
```

Note: External sync is supported in this format; see “Using OCO With External HSYNC or VSYNC Connectors” on page 54 for more information.

2@800x486_30qi, RS170-Field Sequential

Figure 3-7 shows the maximum single display surface and origins for the viewports for the output format 2@800x486_30qi. The actual display surface is the largest rectangular area that encloses the viewports. Its size is 800 x 972 pixels.

This format divides the frame buffer into two independent channels. The size and location of each channel are shown in the figure. Each channel is 800 x 486 pixels and is output on the R and G connectors for Channel 1 of the breakout box. This format is an interlaced, field-sequential format with a 30 Hz update rate.

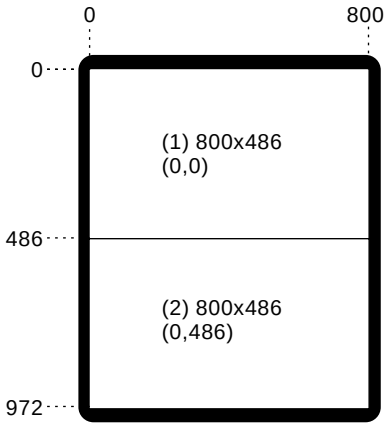

Figure 3-7 Display Surface for 2@800x486_30qi Output Format

The output of **`gfxinfo -v`** for this format is

```
Graphics board 0 is “IMPACTSR” graphics.
        Managed (“:0.0”) 800x968
        Product ID 0x3, 2 GEs, 2 REs, 4 TRAMs
        MGRAS revision 1, RA revision 0
        HQ rev B, GE11 rev B, RE4 rev C, PP1 rev A,
        VC3 rev A, CMAP rev E, Heart rev D
        19” monitor (id 0x1)
        OCO board present (rev 2)

        Channel 1:
         Origin = (0,0)
         Video Output: 800 pixels, 484 lines, 30.00Hz (2@800x486_30qi)
        Channel 2:
         Origin = (0,484)
         Video Output: 800 pixels, 484 lines, 30.00Hz (2@800x486_30qi)
```

2@800x600_60, SVGA

Figure 3-8 shows the maximum single display surface and origins for the viewports for the output format 2@800x600_60. The actual display surface is the largest rectangular area that encloses the viewports. Its size is 800 x 1200 pixels.

This format divides the frame buffer into two independent channels. The size and location of each channel are shown in the figure. Each channel is 800 x 600 pixels and is output on the R, G, and B connectors on the breakout box. This non-interlaced format has a 60 Hz frame update rate. The timing for these signals is compatible with SVGA resolution. Typically, this mode is used with sync-on-green. The monitors that are used with this format must be able to accept sync-on-green rather than external H and V sync.

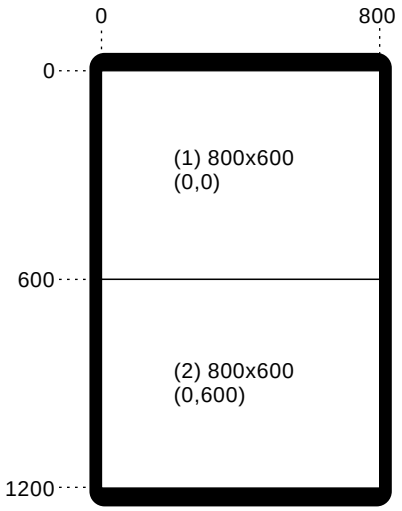

Figure 3-8 Display Surface for 2@800x600_60 Output Format

The output of **`gfxinfo -v`** for this format is

```
Graphics board 0 is “IMPACTSR” graphics.
        Managed (“:0.0”) 800x1200
        Product ID 0x3, 2 GEs, 2 REs, 4 TRAMs
        MGRAS revision 1, RA revision 0
        HQ rev B, GE11 rev B, RE4 rev C, PP1 rev A,
        VC3 rev A, CMAP rev E, Heart rev D
        19” monitor (id 0x1)
        OCO board present (rev 2)

        Channel 1:
         Origin = (0,0)
         Video Output: 800 pixels, 600 lines, 60.10Hz (2@800x600_60)
        Channel 2:
         Origin = (0,600)
         Video Output: 800 pixels, 600 lines, 60.10Hz (2@800x600_60)
```

Note: External sync is supported in this format; see “Using OCO With External HSYNC or VSYNC Connectors” on page 54 for more information.

2@880x808_30qi, Field Sequential

Figure 3-9 shows the maximum single display surface and origins for the viewports for the output format 2@880x808_30qi. The actual display surface is the largest rectangular area that encloses the viewports. Its size is 880 x 1616 pixels.

This format divides the frame buffer into two independent channels. The size and location of each channel are shown in the figure. Each channel is 880 x 808 pixels and is output on the R and G connectors for Channel 1 of the breakout box. This format is an interlaced, field-sequential format with a 30 Hz update rate.

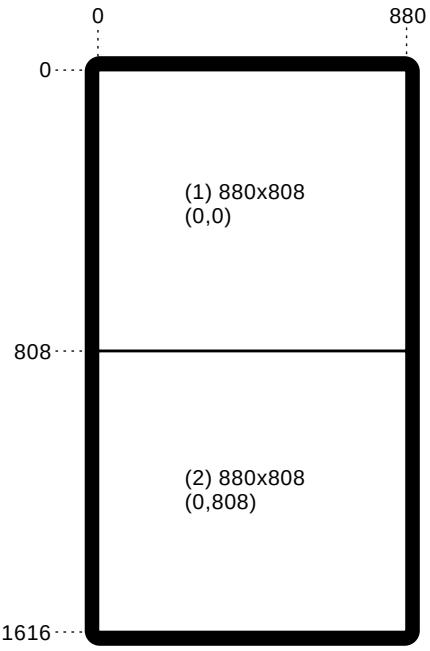

Figure 3-9 Display Surface for 2@880x808_30qi Output Format

The output of **`gfxinfo -v`** for this format is

```
Graphics board 0 is “IMPACTSR” graphics.
        Managed (“:0.0”) 880x1616
        Product ID 0x3, 2 GEs, 2 REs, 4 TRAMs
        MGRAS revision 1, RA revision 0
        HQ rev B, GE11 rev B, RE4 rev C, PP1 rev A,
        VC3 rev A, CMAP rev E, Heart rev D
        19” monitor (id 0x1)
        OCO board present (rev 2)

        Channel 1:
         Origin = (0,0)
         Video Output: 880 pixels, 808 lines, 30.00Hz (2@880x808_30qi)
        Channel 2:
         Origin = (0,808)
         Video Output: 880 pixels, 808 lines, 30.00Hz (2@880x808_30qi)
```

2@1024x946_30qi, Field Sequential

Figure 3-10 shows the maximum single display surface and origins for the viewports for the output format 2@1024x946_30qi. The actual display surface is the largest rectangular area that encloses the viewports. Its size is 1024 x 1892 pixels.

This format divides the frame buffer into two independent channels. The size and location of each channel are shown in the figure. Each channel is 1024 x 946 pixels and is output on the R and G connectors for Channel 1 of the breakout box. This format is an interlaced, field-sequential format with a 30 Hz update rate.

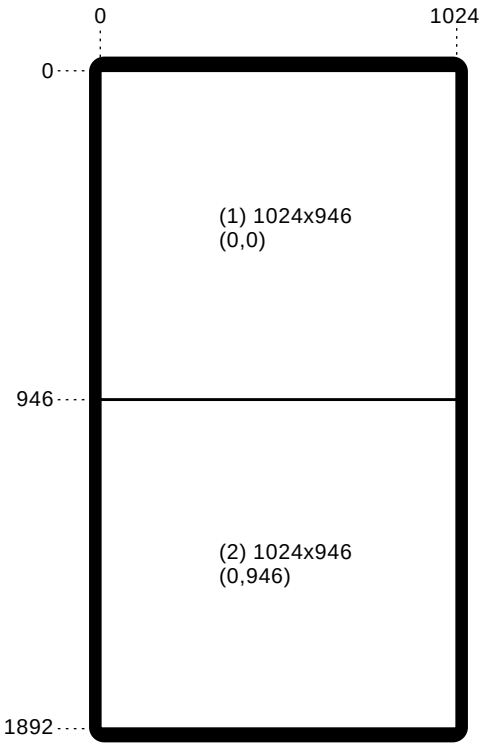

Figure 3-10 Display Surface for 2@1024x946_30qi Output Format

The output of **gfxinfo -v** for this format is

```
Graphics board 0 is “IMPACTSR” graphics.
      Managed (“:0.0”) 1024x1892
      Product ID 0x3, 2 GEs, 2 REs, 4 TRAMs
      MGRAS revision 1, RA revision 0
      HQ rev B, GE11 rev B, RE4 rev C, PP1 rev A,
      VC3 rev A, CMAP rev E, Heart rev D
      19” monitor (id 0x1)
      OCO board present (rev 2)

      Channel 1:
       Origin = (0,0)
       Video Output: 1024 pixels, 946 lines, 30.00Hz (2@1024x946_30qi)
      Channel 2:
       Origin = (0,946)
       Video Output: 1024 pixels, 946 lines, 30.00Hz (2@1024x946_30qi)
```

2@1160x960_30qi, Field Sequential

Figure 3-11 shows the maximum single display surface and origins for the viewports for the output format 2@1160x960_30qi. The actual display surface is the largest rectangular area that encloses the viewports. Its size is 1160 x 1920 pixels.

This format divides the frame buffer into two independent channels. The size and location of each channel are shown in the figure. Each channel is 1160 x 960 pixels and is output on the R and G connectors for Channel 1 of the breakout box. This format is an interlaced, field-sequential format with a 30 Hz update rate.

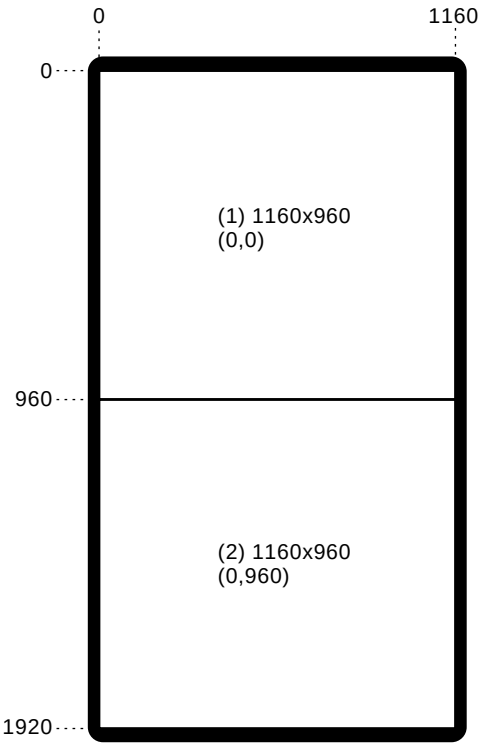

Figure 3-11 Display Surface for 2@1160x960_30qi Output Format

The output of **`gfxinfo -v`** for this format is

```
Graphics board 0 is “IMPACTSR” graphics.
      Managed (“:0.0”) 1160x1920
      Product ID 0x3, 2 GEs, 2 REs, 4 TRAMs
      MGRAS revision 1, RA revision 0
      HQ rev B, GE11 rev B, RE4 rev C, PP1 rev A,
      VC3 rev A, CMAP rev E, Heart rev D
      19” monitor (id 0x1)
      OCO board present (rev 2)

      Channel 1:
       Origin = (0,0)
       Video Output: 1160 pixels, 960 lines, 30.00Hz (2@1160x960_30qi)
      Channel 2:
       Origin = (0,960)
       Video Output: 1160 pixels, 960 lines, 30.00Hz (2@1160x960_30qi)
```

Chapter 4

Removing the OCTANE Channel Option Board

This chapter provides detailed information on removing the OCTANE Channel Option (OCO) board.

The following topics are included in this chapter:

Removing an OCTANE Channel Option board requires following a series of steps that lead up to the board removal, through the steps that complete the task. These detailed steps begin with the next step.

Follow the directions in this chapter to remove this board and to install anther board or blank panel in its place.

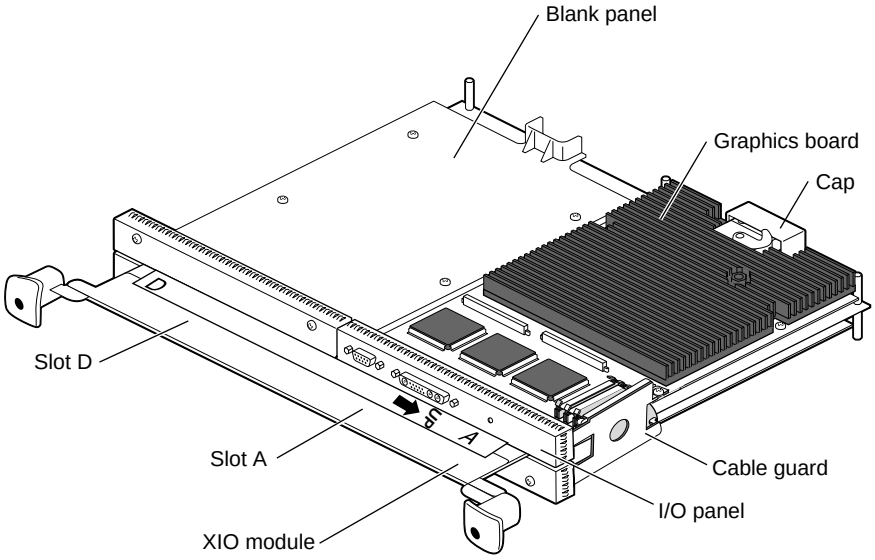

Figure 4-1 Orienting the XIO Module and Graphics Board

1. Go to Chapter 1, “Preparing the Workstation” on page 3, and follow the directions through removing the XIO module. Be sure you have placed a cap on the graphics board XIO compression connector. Then return to this section, and begin with step 2.
2. Position the XIO module so that slots D and A are facing you.

Removing the Cable Guard and Flex Cables

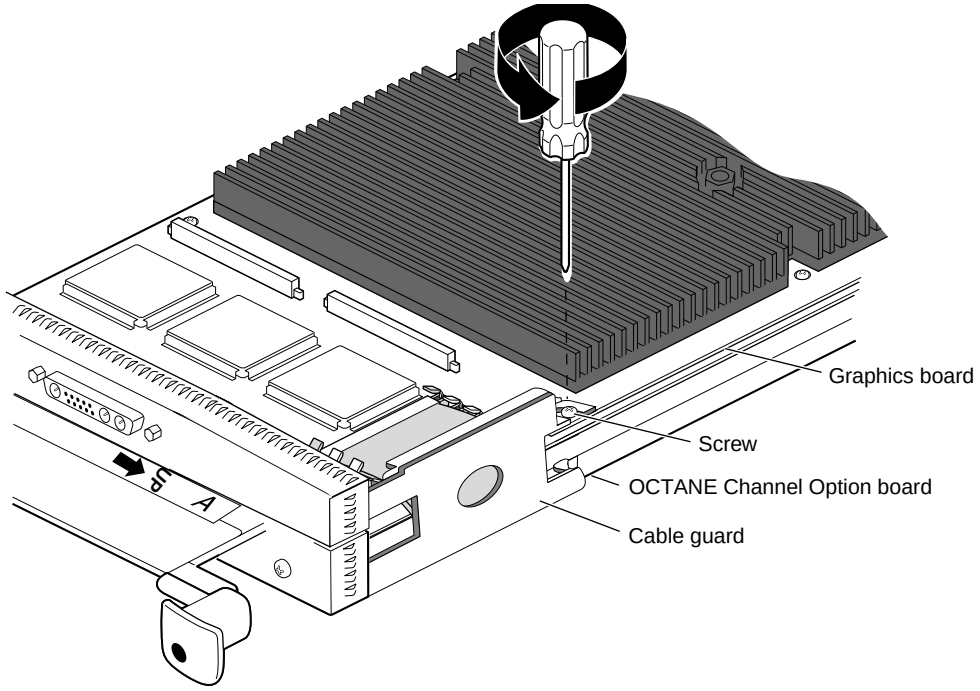

Figure 4-2 Removing the Cable Guard

1. Remove the cable guard by removing the screw that holds the cable guard to the graphics board and XIO module.

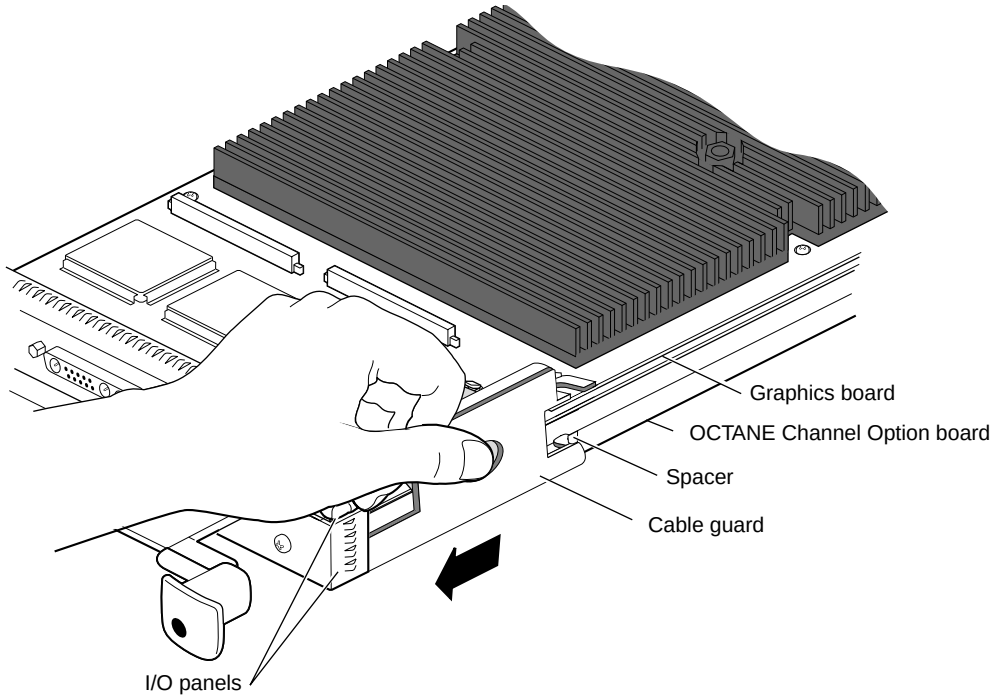

Figure 4-3 Sliding the Cable Guard Beneath the I/O Panels

2. Press down on the middle of the cable guard and slide it beneath the I/O panels. This action releases the cable guard half-hook from behind the spacer on the OCO board. You feel pressure from the flex cables.

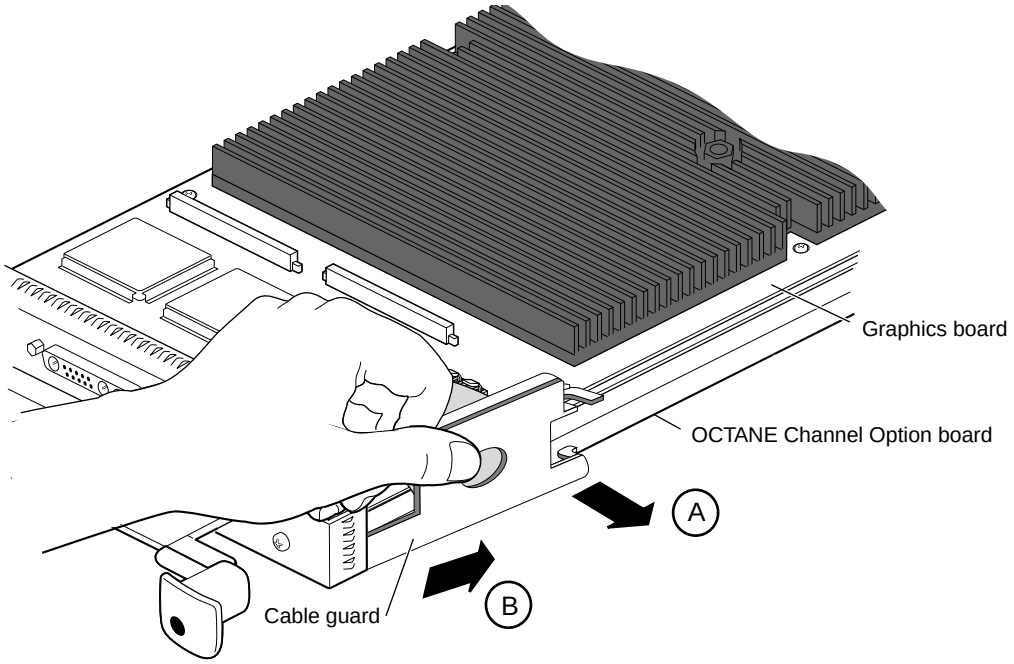

Figure 4-4 Sliding the Cable Guard From Beneath the I/O Panels

3. Slide the cable guard off the XIO module and boards.
   - Pull the cable guard away from the XIO module so that the hook and half-hook are free.
   - Slide the cable guard out from under the edges of the I/O panels.
4. Keep the cable guard. Use it whenever you are connecting an option board to the graphics board with flex cables.

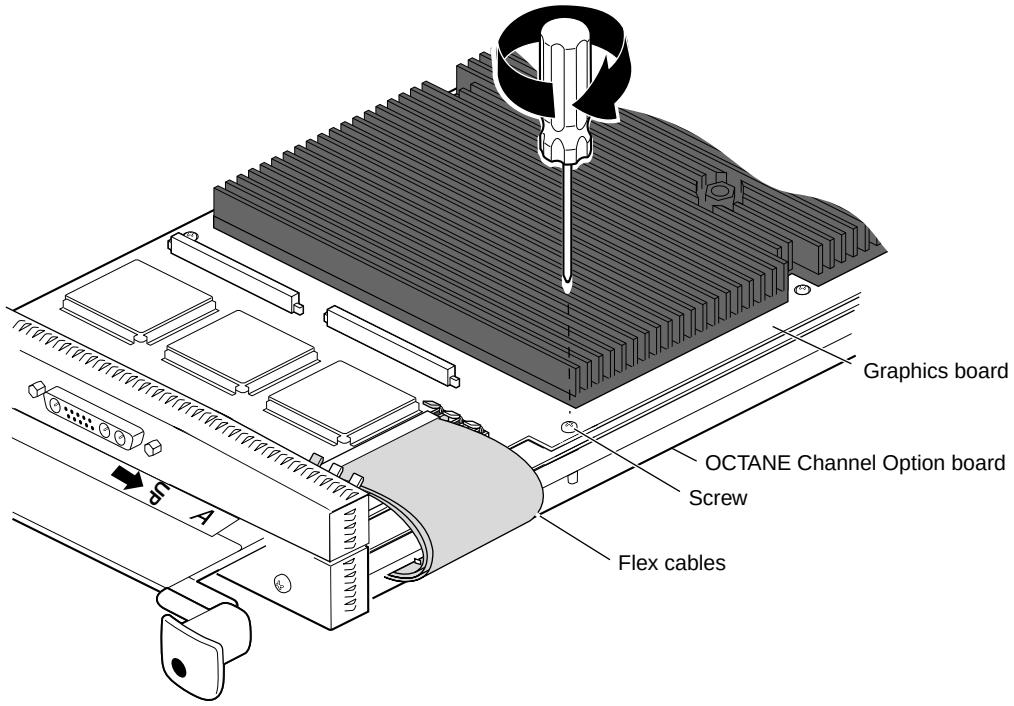

Figure 4-5 Replacing the Screw Holding the Graphics Board to the XIO Module

5. Replace the screw through the graphics board into the standoff on the XIO module.

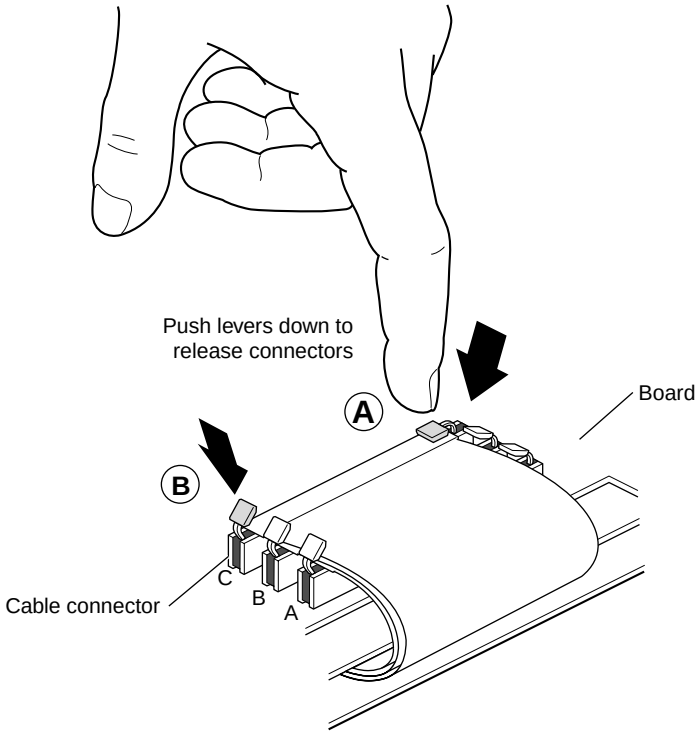

Figure 4-6 Releasing the Flex Cables From the Graphics Board

6. Detach the flex cables from the graphics board beginning with the cable labeled **C**.
7. Press down on one release lever on the end of the flex cable, then on the other.

   Note: Pressing both release levers at the same time usually results in the connector remaining seated.

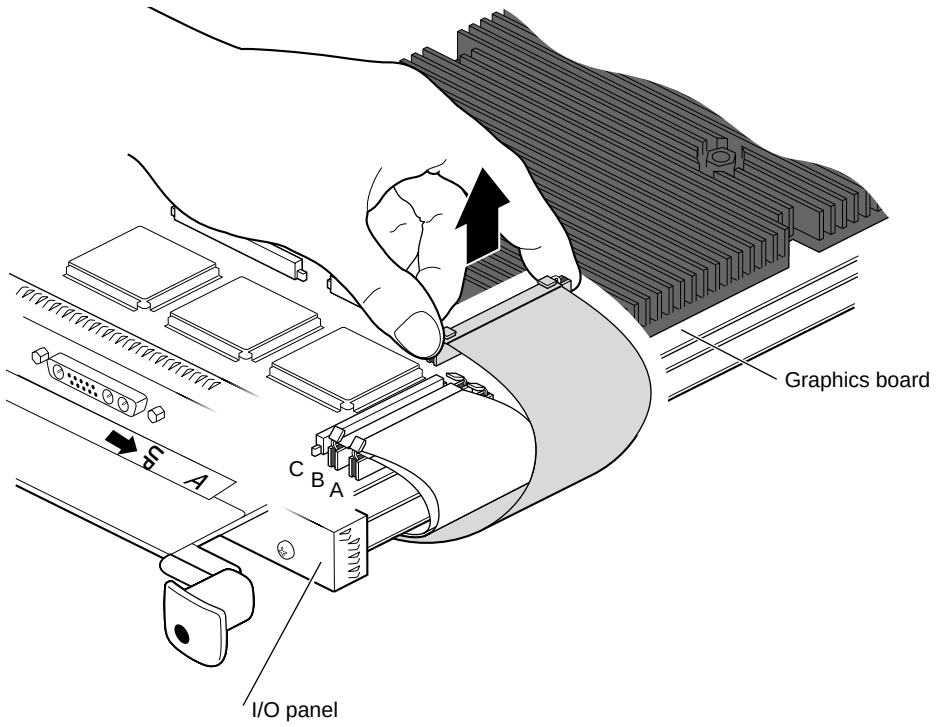

Figure 4-7 Removing the Flex Cables

8. Pull up on the connector until it releases.
9. Remove flex cable B, then flex cable A, following the instructions in steps 6 and 7.
10. Turn the XIO module over.

Detaching the OCTANE Channel Option Board From the XIO Module

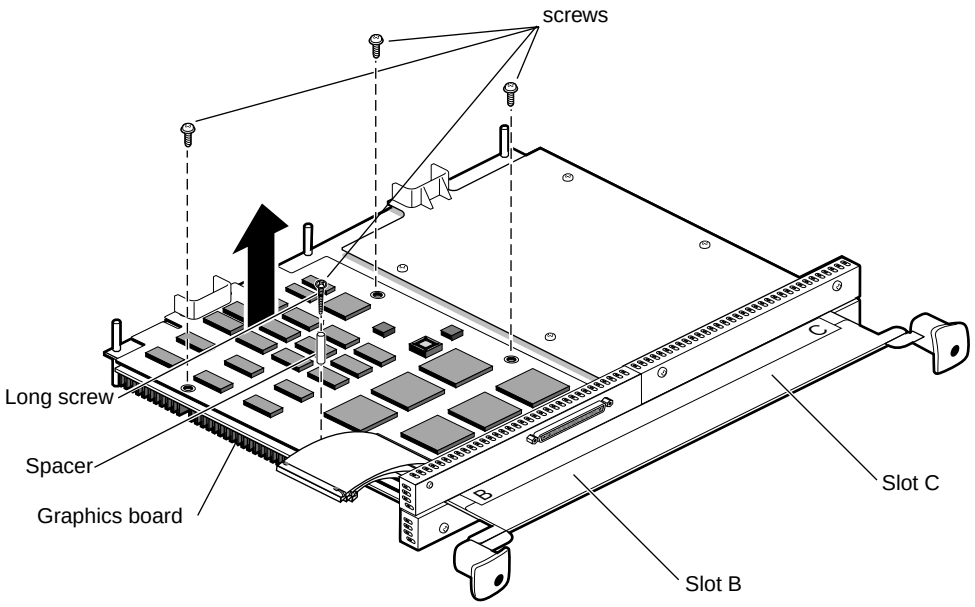

Figure 4-8 Removing the OCTANE Channel Option Board

If you have not already done so, go to "Removing the Cable Guard and Flex Cables" on page 75 and follow these steps before removing the OCO board.

1. Remove the four screws holding the OCO board to the XIO module.

   Note: The spacer used to hold the cable guard comes off with the screws.

2. Lift the OCO board from the XIO module. Place it on an antistatic bag on a clean, dry, surface such as your desktop.

   Note: Do not try to remove the flex cables from the OCO board. They are permanently attached.

Placing an Option Board or Blank Panel in Slot B

After you have removed the OCTANE Channel Option board, choose your next step from Table 4-1.

Table 4-1 Choosing the Next Instruction

Task	Go To
Installing a new OCO board	Chapter 1, "Attaching the OCTANE Channel Option Board to the XIO Module" on page 13
Installing a different option board	The installation guide for that option board
Installing a blank panel	The next step

A blank panel must be installed in slot B of the XIO module if no option board is installed in that slot. If a blank panel is also in slot C, a baffle must be placed over them to allow proper airflow in the workstation.

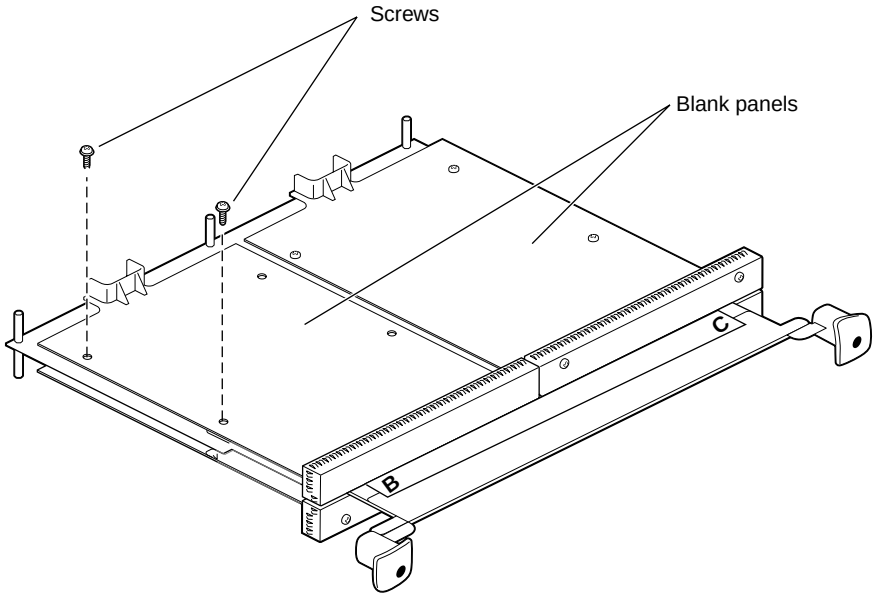

Figure 4-9 Placing a Blank Panel in Slot B

1. Place the blank panel on the standoffs in slot B.
2. Use two short screws to attach the blank panel (on the outside edge) to the XIO module if you are installing a baffle, as shown in Figure 4-9.
3. If you are not installing a baffle, use four short screws (in all four holes) to install the blank panel to the XIO module if you are not installing a baffle. Use an M3 x 8 mm screw for the fourth hole, if you cannot find the fourth short screw that came with the blank panel.

   Caution: Do not use the long screw that comes with the spacer to attach a blank panel to the XIO module. It will damage the XIO module standoffs.

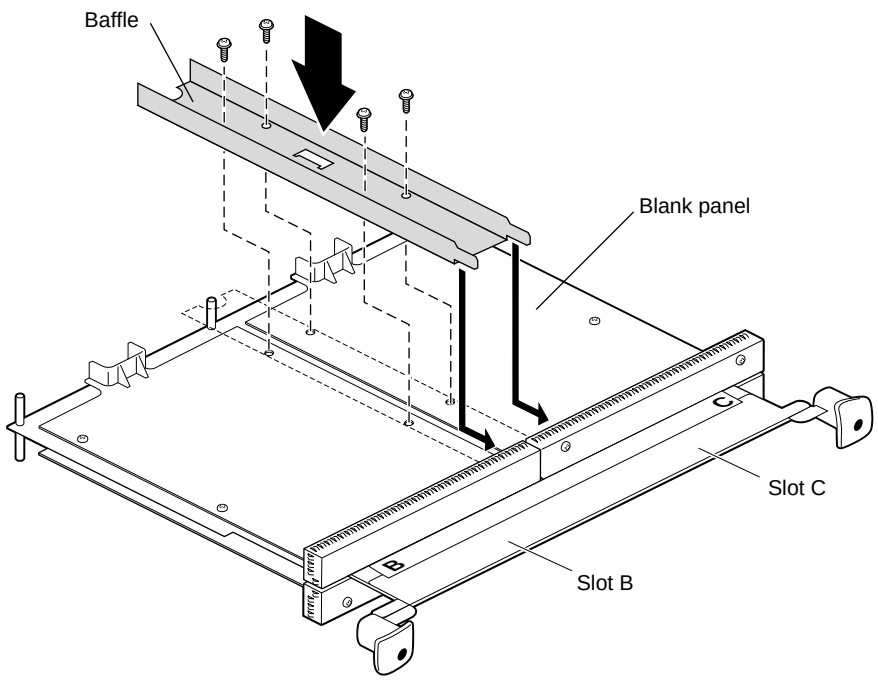

Figure 4-10 Placing the Baffle Over Two Blank Panels

4. If you have a blank panel in slot **C**, place a baffle over both blank panels.
   - First remove the two inside screws from the blank panel in slot **C**.
   - Place the baffle across the two blank panels.
   - Insert and tighten the four screws that hold the baffle to the blank panels and XIO module.

   Caution: You must replace the baffle for cooling purposes when you install two side-by-side blank panels. The baffle is only used with two side-by-side blank panels.
5. If you are sending the OCTANE Channel Option board to your authorized service representative, use the packing material and box in which you received your replacement part.
6. Go to "Replacing the XIO Module" on page 24.

Product Support

Silicon Graphics, Inc. provides a comprehensive range of product support for its products. If you are in North America and would like support for your Silicon Graphics supported products, contact the Technical Assistance Center at 1-800-800-4SGI or your authorized service provider. If you are outside North America, contact the Silicon Graphics subsidiary or authorized distributor in your country.

Returning Parts

To return any part, use the packaging materials and box that come with your replacement part.

Chapter 5

Troubleshooting

This chapter contains information on what to do if you experience problems with your system or installation. Each section describes a problem and provides instructions on how to solve the problem. Product support information is at the end of this chapter.

Accessing gfxinfo

Using the *gfxinfo* command accesses information about the number of channels and their configurations that exist in an OCTANE workstation with an OCO board installed.

Follow these steps to use *gfxinfo*:

1. Go to the Toolchest.
2. To open a shell, click "Desktop" and then "Unix Shell."
3. On the command line, enter **`/usr/gfx/gfxinfo`**

The listing provided by gfxinfo includes the following information:

- the confirmation (or lack) of the presence of an OCO board
- the recognition of a video format successfully loaded into the system
- the recognition of the number of screens to be used, and their size and position

For more information about the gfxinfo command, see Chapter 3, “Using gfxinfo to List Graphics Information” on page 55.

OCO Board Not Recognized

If the OCO board is not listed by gfxinfo, the problem may be that a flex connector between the OCO board and the graphics board is not properly seated. See Chapter 1 for instructions on installing the OCO board and seating the flex connectors.

Main Monitor Screen Blank

When the OCO board is active, the main monitor is deactivated. Information to the monitor(s) is sent through the breakout box cable.

Blank Screens or Faulty Images

If *gfxinfo* recognizes the OCO board, but either no images or faulty images appear on the screens, the problem might be that the double flex connectors between the OCO board and graphics board are not properly connected. See Chapter 1 for instructions on removing and installing the OCO board and seating the flex connectors.

If, in a multiple screen mode, one screen has blank or faulty images and *gfxinfo* recognizes the proper configurations, swap the screen cables and screens. If the problem stays with the swapped screen, the screen is faulty. If the problem stays with the channel, the problem is with the OCO board. Call your authorized service representative for help with ordering or replacing parts.

Check the monitor cables. If non-standard cables are used, faulty images may appear on the screen. Use a cable with 75 ohm impedance that is six feet or shorter.

Vertical Stripes

If vertical stripes, approximately four pixels apart, appear on all of the OCO monitors, but not the main monitor, check the OCO-graphics board double flex cable connector for a bent pin. If you find a bent pin, contact your service provider.

Checking Connections and Installation

Use the following troubleshooting checklist to determine an installation problem:

- Check that the power cables are connected to the workstation and the monitors or head-mounted display.
- Check that the breakout box cable connector at the chassis I/O panel is seated and the thumb screws are tightened.
- Check that the cable connections from the breakout box to the monitors or head-mounted display are connected.
- Open the chassis and check that the OCO board and graphics board set are properly seated in the chassis. Follow instructions in Chapter 1 for opening the chassis.
- Remove the OCO and graphics board set and check to be sure the flex cables connecting the OCO board and the graphics board set are properly seated.
- Check that the appropriate operating system and software have been installed. See the software CD and release notes that came with your shipment.
- Check your monitor specifications to ensure that you have installed the correct monitor.
- Make sure the graphics boards are inserted toward the interior of the workstation.
- Make sure the XIO module is seated and the I/O panel on the OCTANE Channel Option board is relatively flush with the chassis. If not, follow the instructions in Chapters 1 and 4 from powering off the workstation through removing the XIO module, and see if an XIO compression connector cap is on any XIO compression connector. If so, remove the cap, and follow the instructions in Chapter 1 for reinstalling the XIO module and powering on the workstation.
- Check the flex cable connections to the graphics board. They must be completely seated. Follow the directions earlier in Chapter 1 and Chapter 4 from powering off the workstation to connecting the flex cables from the OCTANE Channel Option board to the graphics board. Then follow the instructions to seat the flex cables through powering on the workstation.

Product Support

Silicon Graphics, Inc. provides a comprehensive product support and maintenance program for its products. If you are in North America and would like support for your Silicon Graphics supported products, contact the Technical Assistance Center at 1-800-800-4SGI or your authorized service provider. If you are outside North America, contact the Silicon Graphics subsidiary or authorized distributor in your country.

Appendix A

Identifying the OCTANE Channel Option and Graphics Boards

This appendix provides illustrations of the OCTANE Channel Option board, OCTANE/SI graphics board, OCTANE/SI graphics board with texture memory option board, OCTANE/SSI graphics board, and OCTANE/MXI graphics board.

OCTANE Channel Option Board

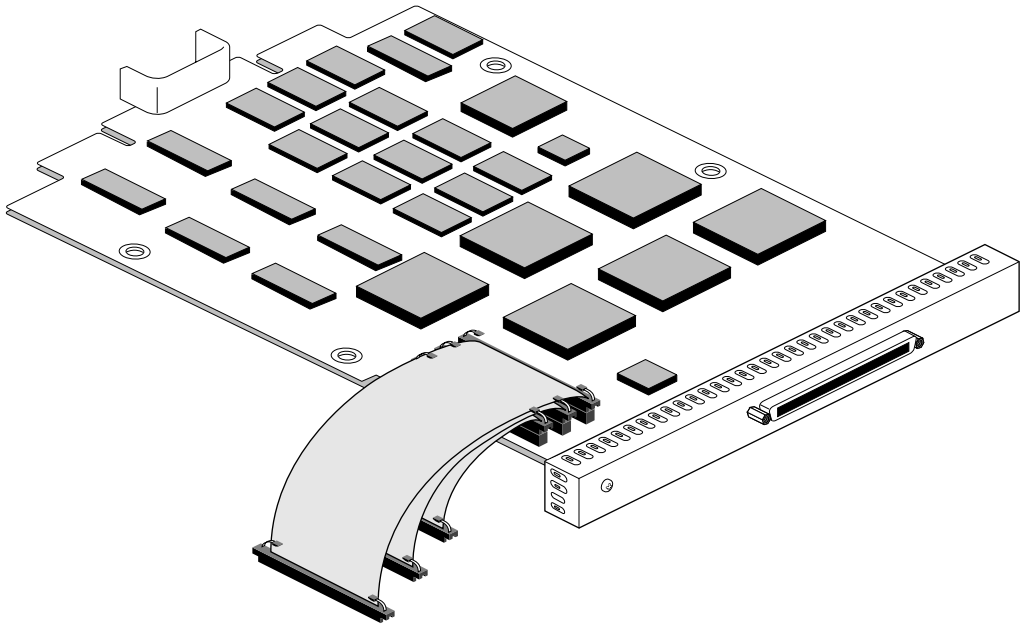

Figure A-1 OCTANE Channel Option Board

OCTANE/SI Graphics Board

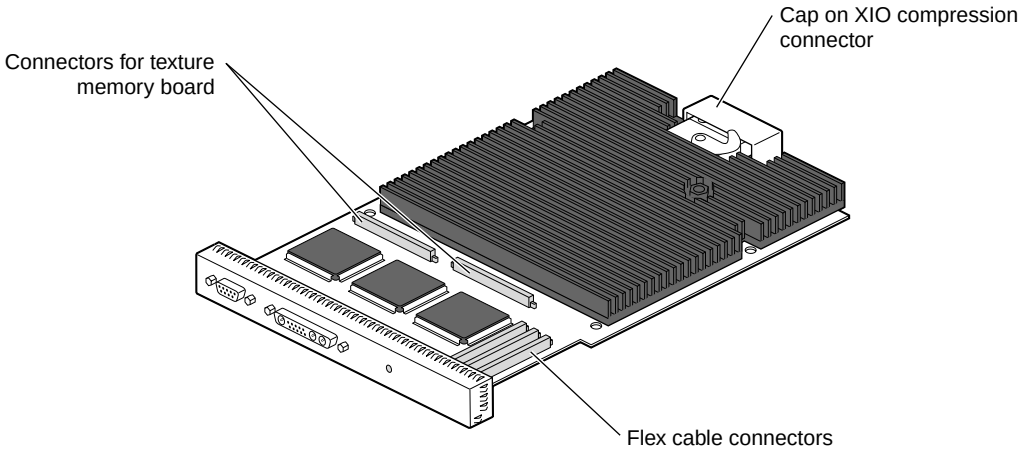

Figure A-2 OCTANE/SI Graphics Board

OCTANE/SI With Texture Memory Option Board

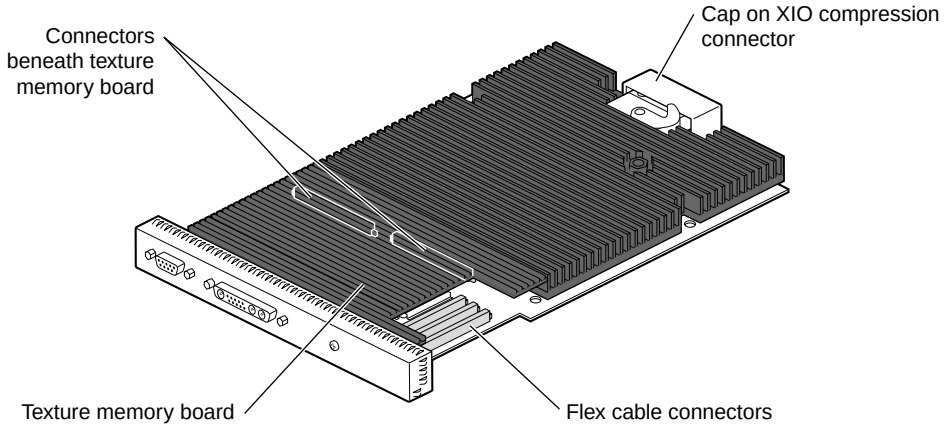

Figure A-3 OCTANE/SI With Texture Memory Option Board

OCTANE/SSI Graphics Board

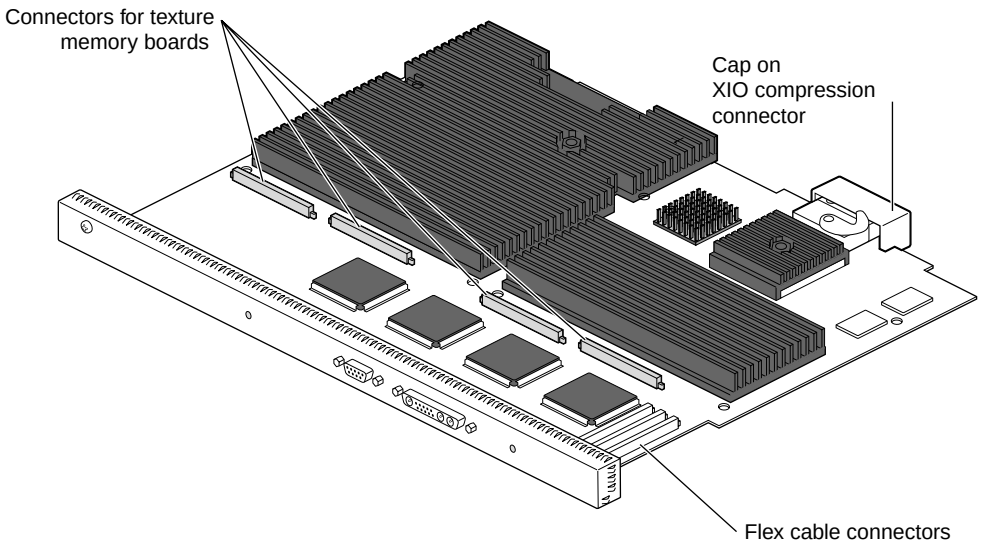

Figure A-4 OCTANE/SSI Graphics Board

OCTANE/MXI Graphics Board

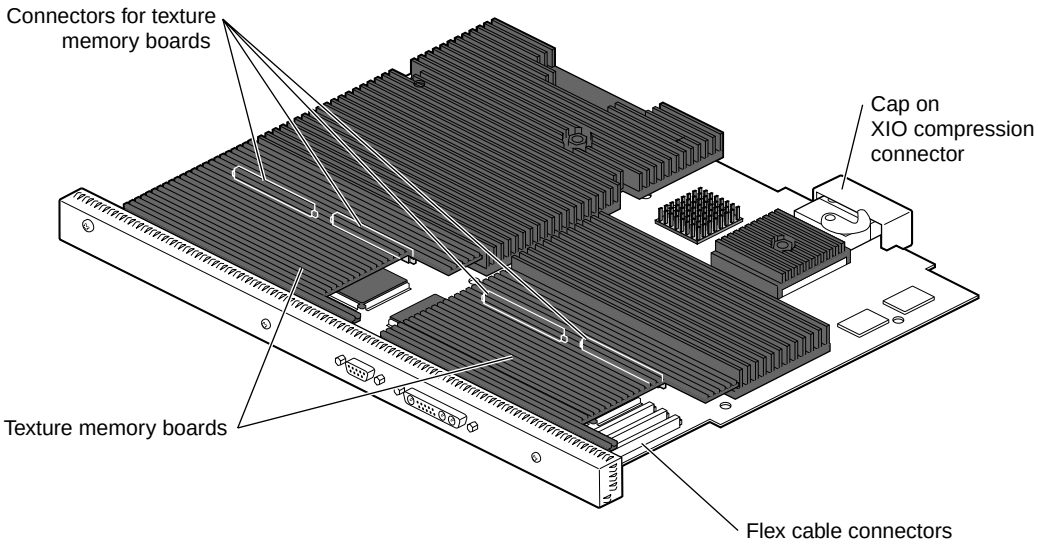

Figure A-5 OCTANE/MXI Graphics Board

Glossary

active video

The portion of the video signal having the chrominance or luminance information; also, all video lines not in the vertical blanking signal that contain the chrominance or luminance information. *See also* chrominance, composite video, horizontal blanking interval, luminance, and video waveform.

aliasing

A rendering technique that assigns to pixels the color of the primitive being rendered, regardless of whether that primitive covers all of the pixel's area or only a portion. This results in jagged edges, or "jaggies". In video systems, aliasing results when an image is sampled that contains frequency components above the Nyquist limit for the sampling rate. *See also* Nyquist limit.

antialiasing

A rendering technique that assigns pixel colors based on the fraction of the pixel's area that's covered by the primitive being rendered. Antialiased rendering reduces or eliminates the jaggies that result from aliased rendering.

artifact

In video systems, an unnatural or artificial effect that occurs when the system reproduces an image; examples are aliasing, pixellation, and contouring.

aspect ratio

The ratio of the width to the height of an image. For example, the standard aspect ratio for television is 4:3. Maintaining the original aspect ratio of an image prevents it from being distorted.

back porch

The portion of the horizontal pedestal that follows the horizontal synchronizing pulse. In a composite signal, the color burst is located on the back porch, but is absent on a YUV or GBR signal. *See also* blanking level and video waveform.

bit map

A region of memory that contains the pixels representing an image. The pixels are arranged in the sequence in which they are normally scanned to display the image.

bit plane

A rectangular array of bits mapped one-to-one with pixels. The framebuffer is a stack of bit planes.

black burst

Active video signal that has only black in it. It is the black portion of the video signal, containing color burst. *See also* color burst.

black level

In the active video portion of the video waveform, the voltage level that defines black. *See also* horizontal blanking interval and video waveform.

blanking level

The signal level at the beginning and end of the horizontal and vertical blanking intervals, typically representing zero output (0 IRE). *See also* video waveform and IRE units.

breezeway

In the horizontal blanking part of the video signal, the portion between the end of the horizontal sync pulse and the beginning of the color burst. *See also* horizontal blanking and video waveform.

buffer

See framebuffer.

chroma

See chrominance.

chrominance

In an image reproduction system, a separate signal that contains the color information. Black, white, and all shades of gray have no chrominance and contain only the luminance (brightness) portion of the signal. However, all colors have both chrominance and luminance.

Chrominance is derived from the I and Q signals in the NTSC television system and the U and V signals in the PAL television system. *See also* luminance.

color burst

The segment of the horizontal blanking portion of the video signal that is used as a reference for decoding color information in the active video part of the signal. The color burst is required for synchronizing the phase of the 3.58 MHz oscillator in the television receiver for correct hues in the chrominance signal.

In composite video, the image color is determined by the phase relationship of the color subcarrier to the color burst. The color burst sync is 8 to 11 cycles of 3.58 MHz color subcarrier transmitted on the back porch of every horizontal pulse. The hue of the color sync phase is yellow-green.

It is also called "burst" and "burst flag". *See also* color subcarrier and video waveform.

color space

A space defined by three color components, such as R, G, and B.

color subcarrier

A portion of the active portion of a composite video signal that carries color information, referenced to the color burst. The color subcarrier's amplitude determines saturation; its phase angle determines hue. Hue and saturation are derived with respect to the color burst. The color subcarrier's frequency is defined as 3.58 MHz in NTSC and 4.43 MHz in PAL. *See also* color burst.

component video

A color encoding method for the three color signals—R, G, and B; Y, I, and Q; or Y, U, and V—that make up a color image. *See also* RGB, YIQ, and YUV.

composite video

A color encoding method or a video signal that contains all of the color, brightness, and synchronizing information in one signal. The chief composite television standard signals are NTSC, PAL, and SECAM. *See also* NTSC, PAL, and SECAM.

field

One of two (or more) equal parts of information into which a frame is divided in interlace scanning; or a vertical scan of a frame carrying only its odd-numbered or its even-numbered lines. The odd field and even field make up the complete frame. *See also* frame and interlace.

field averaging

A filter that corrects flicker by averaging pixel values across successive fields. *See also* flicker.

field parallel

Typical video format data (Red, Green, and Blue) output in parallel through three wires.

field-sequential

Video format data (Red, Green, and Blue) output sequentially through a single wire. This format is used, for example, in head mounted displays.

flicker

The effect caused by a one-pixel-deep line in a high-resolution graphics frame that is output to a low-resolution monitor, because the line is in only one of the alternating fields that make up the frame. This effect can be filtered out by field averaging. *See also* field and frame.

frame

The result of a complete scanning of one image. In television, the odd field (all the odd lines of the frame) and the even field (all the even lines of the frame) make up the frame. In motion video, the image is scanned repeatedly, making a series of frames.

framebuffer

The individual pixel output of the raster subsystem is written to the framebuffer. Here the information associated with each pixel is stored in a form easily read by the display subsystem. Information associated with each pixel includes image planes, depth planes, stencil planes, overlay and/or underlay planes, and window clipping planes. The complexity of the graphics subsystem determines which of these planes are present in the system. *See also* pixel.

frequency

Signal cycles per second.

front porch

The portion of the video signal between the end of active video and the falling edge of sync. *See also* back porch, horizontal blanking interval, and video waveform.

gamma correction

A function applied to colors stored in the framebuffer to correct for the nonlinear response of the eye (and sometimes of the monitor) to linear changes in color-intensity values.

genlocking

Synchronizing with another video signal serving as a master timing source. The master timing source can be a composite video signal, a video signal with no active video (only sync information), or, for video studio, a device called house sync. When no master sync is available, VideoFramer, for example, can be set to "free run" (or standalone) mode, so that it becomes the master timing device to which other devices sync. *See also* line lock.

horizontal blanking interval

Also known as the horizontal retrace interval, the period when a scanning process is moving from the end of one horizontal line to the start of the next line. This portion of the signal is used to carry information other than video information. *See also* video waveform.

horizontal drive

The portion of the horizontal blanking part of the video signal composed of the sync pulse together with the front porch and breezeway; that is, horizontal blanking minus the color burst. *See also* video waveform.

horizontal sync

The lowest portion of the horizontal blanking part of the video signal; it provides a pulse for synchronizing video input with output. Also known as hsync. *See also* horizontal blanking interval and video waveform.

hue

The designation of a color in the spectrum, such as cyan, blue, or magenta. It is sometimes called tint on NTSC television receivers. The varying phase angles in the 3.58 MHz (NTSC) or 4.43 MHz (PAL) C signal indicate the different hues in the picture information.

hue-saturation-intensity

A tristimulus color system based on the parameters of hue, saturation, and intensity luminance). Also referred to as HSI or HSV.

image processing

Manipulating an image by changing its color, brightness, shape, or size.

interlace

A technique that uses more than one vertical scan to reproduce a complete image. In television, the 2:1 interlace used yields two vertical scans (fields) per frame: the first field consists of the odd lines of the frame; the other, the even lines. *See also* field and frame.

IRE units

A scale for measuring analog video signal levels, normally starting at the bottom of the horizontal sync pulse and extending to the top of peak white. Blanking level is 0 IRE units and peak white level is 100 IRE units (700 mV). An IRE unit equals 7.14 mV (+100 IRE to -40 IRE = 1 V). IRE stands for Institute of Radio Engineers, a forerunner of the IEEE.

leading edge of sync

The portion of the video waveform after active video, between the sync threshold and the sync pulse. *See also* video waveform.

level

Signal amplitude.

line

The result of a single pass of the sensor from left to right across the image.

line lock

Input timing derived from the horizontal sync signal and implying that the system clock (the clock being used to sample the incoming video) is an integer multiple of the horizontal frequency and that it is locked in phase with the horizontal sync signal. *See also* video waveform.

linear matrix transformation

The process of combining a group of signals through addition or subtraction; for example, RGB signals into luminance and chrominance signals.

luma

See luminance.

luminance

The perceived brightness of a surface. Typically refers to a weighted average of red, green, and blue color values that gives the perceived brightness of the combination. For video systems, luminance is the video signal that describes the amount of light in each pixel. *See also* chrominance and Y signal.

multiburst

A test pattern consisting of sets of vertical lines with closer and closer spacing; used for testing horizontal resolution of a video system.

NTSC

A color television standard or timing format encoding all of the color, brightness, and synchronizing information in one signal. Used in North America, most of South America, and most of the Far East, this standard is named after the National Television Systems Committee, the standardizing body that created this system in the U.S. in 1953. NTSC uses a total of 525 horizontal lines per frame, with two fields per frame of 262.5 lines each. Each field refreshes at 60 Hz (actually 59.94 Hz).

Nyquist limit

The highest frequency of input signal that can be correctly sampled without aliasing. The Nyquist limit is equal to half of the sampling frequency.

overscan

To scan a little beyond the display raster area of the monitor so that the edges of the raster are not visible. Television is overscanned; computer displays are underscanned.

PAL

A color television standard or timing format developed in West Germany and used by most countries in Europe (including the United Kingdom but excluding France) as well as Australia and parts of the Far East. PAL uses a total of 625 horizontal lines per frame, with two fields per frame of 312.5 lines per frame. Each field refreshes at 50 Hz. PAL encodes color differently from NTSC. PAL stands for Phase Alternation Line or Phase Alternated by Line. PAL attempts to correct some of the color inaccuracies in NTSC. *See also* NTSC and SECAM.

pedestal

See setup and video waveform.

pixel

Picture element. Either the smallest addressable spatial element of the computer screen, or the smallest reproducible element in analog video. A pixel can have red, blue, and green color values, an alpha component, and other information associated with it. (Pixels are referred to as having a color component even if they're gray-scale or monochrome.) The bits at location (*x, y*) of all the bit planes in the framebuffer constitute the single pixel (*x, y*). In OpenGL window coordinates, each pixel corresponds to a 1.0x1.0 screen area. The coordinates of the lower left corner of the pixel named *x,y* are (*x, y*), and of the upper right corner are (*x*+1, *y*+1). *See also* alpha value and component video.

pixel map

A two-dimensional piece of memory, any number of bits deep. *See also* bit map.

raster

The scanning pattern for television display; a series of horizontal lines, usually left to right, top to bottom. In NTSC and PAL systems, the first and last lines are half lines.

raster operation, raster op

A logical or arithmetic operation on a pixel value.

resolution

Number of horizontal lines in a television display standard; the higher the number, the greater a system's ability to reproduce fine detail.

RGB

Red, green, blue—the basic component set used by graphics systems and some video cameras in which a separate signal is used for each primary color.

sample

To read the value of a signal at evenly spaced points in time; to convert representational data to sampled data (that is, synthesizing and rendering).

sampling rate

The number of times per second (measured in kHz, where 1 kHz = 1000 times per second) the system reads the file when outputting audio. The greater the sampling rate, the larger the file and the better the quality of the audio output.

saturation

Color intensity; zero saturation is white (no color) and maximum saturation is the deepest or most intense color possible for that hue. In signal terms, saturation is determined by the ratio between luminance level and chrominance amplitude. *See also* hue.

scaling

Changing the size of an image.

scan

To convert an image to an electrical signal by moving a sensing point across the image, usually left to right, top to bottom.

SECAM

Sequentiel Couleur avec Memoire, the color television system developed in France and used there as well as in eastern Europe, the Near East and Middle East, and parts of Africa and the Caribbean.

setup

Also called pedestal. The difference between the blackest level displayed on the receiver and the blanking level. A black level that is elevated to 7.5 IRE instead of being left at 0.0 IRE is the same as the lowest level for active video. Because the video level is known, this part of the signal is used for black-level clamping circuit operation. Setup is typically used in the NTSC video format and is typically not used in the PAL video format; it was originally introduced to simplify the design of early television receivers, which had trouble distinguishing between video black levels and horizontal blanking. *See also* video waveform.

subcarrier

A portion of a video signal that carries a specific signal, such as color. *See also* color subcarrier.

subpixel

A unit derived from a pixel by using a filter for sizing and positioning.

sync information

The part of the television video signal that ensures that the display scanning is synchronized with the broadcast scanning. *See also* video waveform.

sync tip

The lowest part of the horizontal blanking interval, used for synchronization. *See also* video waveform.

threshold

In a digital circuit, the signal level that is specified as the division point between levels used to represent different digital values. For example, the sync threshold is the level at which the leading edge of sync begins. *See also* video waveform.

time-base errors

Analog artifacts caused by nonuniform motion of videotape or of the tape head drum. Time-base errors usually cause horizontal display problems, such as horizontal jitter.

time-delay equalization

Frame-by-frame alignment of all video inputs to one sync pulse, so that all frames start at the same time. This alignment is necessary because cable length differences cause unequal delays. *See* time-base errors.

transducer

A microphone, video camera, or other device that can convert sounds or images to electrical signals.

underscan

To scan a television screen so that the edges of the raster are visible. *See also* overscan.

vertical blanking interval

The blanking portion at the beginning of each field. It contains the equalizing pulses, the vertical sync pulses, and vertical interval test signals (VITS). Also the period when a scanning process is moving from the lowest horizontal line back to the top horizontal line.

video level

Video signal amplitude.

video signal

The signal from a video device, such as a camera, VCR, or other scanning image sensor.

video waveform

The main components of the video waveform are the active video portion and the horizontal blanking portion. Certain video waveforms carry information during the horizontal blanking interval.

white level

In the active video portion of the video waveform, the 1.0-Volt (100 IRE) level. *See also* video waveform.

YIQ

See also YUV and PAL. The NTSC color system uses YIQ as its color space. Y stands for the image's black and white portion (luminance component). The color portion is I and Q. They behave as a color wash laid over the black and white components.

YUV

See also, YIQ and PAL. The PAL system uses the YUV color space, which also may be used in the NTSC color system. The luminance (black and white) component is Y, and the color wash components U and V, overlay the Y component.

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