# Sun Fire™ V880z Server and Sun™ XVR-4000 Graphics Accelerator Installation and User's Guide

Please
Recycle

Adobe PostScript™

# Contents

# Figures

# Tables

# Preface

This guide describes how to install the Sun™ XVR-4000 graphics accelerator and associated software in a Sun Fire™ V880z server. It also includes the procedure for upgrading a Sun Fire V880 server to a Sun Fire V880z server.

**Note –** The Sun Fire XVR-4000 graphics accelerator and Sun Fire V880z server *must* be administered and serviced by qualified service personnel.

# How This Book Is Organized

Chapter 1 provides an overview of the Sun XVR-4000 graphics accelerator installation processes.

Chapter 2 provides an overview of the Sun XVR-4000 graphics accelerator and includes product features and supported video formats.

Chapter 3 describes how to install Sun XVR-4000 graphics accelerator software.

Chapter 4 describes how to install Sun XVR-4000 graphics accelerator hardware.

Chapter 5 describes how to modify the Xservers configuration file for running more than one frame buffer.

Chapter 6 provides information on using Sun XVR-4000 graphics accelerator features, including configuration through fbconfig, multistreaming and multisample antialiasing.

Chapter 7 describes how to framelock multiple Sun XVR-4000 graphics accelerators.

Chapter 8 describes how to genlock multiple Sun XVR-4000 graphics accelerators.

Appendix A describes how to set the Sun XVR-4000 graphics accelerator as the default monitor console display.

Appendix B provides information for setting up S-video (NTSC and PAL video formats) on the Sun XVR-4000 graphics accelerator.

Appendix C describes how to install the OpenBoot PROM 4.7.0 upgrade.

Appendix D provides information for upgrading your Sun Fire V880 server to a Sun Fire V880z server configured with the Sun XVR-4000 graphics accelerator.

Appendix E provides information about use of the Sun Fire V880z Operating Environment Installation DVD.

Appendix F provides I/O port specifications for the Sun XVR-4000 graphics accelerator.

# Using UNIX Commands

This document might not contain information on basic UNIX® commands and procedures such as shutting down the system, booting the system, and configuring devices.

See one or more of the following for this information:

- *Solaris Handbook for Sun Peripherals*
- AnswerBook2™ online documentation for the Solaris™ software environment
- Other software documentation that you received with your system

# Typographic Conventions

| Typeface or Symbol | Meaning | Examples |
|---|---|---|
| AaBbCc123 | The names of commands, files, and directories; on-screen computer output | Edit your `.login` file.<br>Use `ls -a` to list all files.<br>`% You have mail.` |
| **AaBbCc123** | What you type, when contrasted with on-screen computer output | `% `**`su`**<br>`Password:` |
| *AaBbCc123* | Book titles, new words or terms, words to be emphasized. Replace command-line variables with real names or values. | Read Chapter 6 in the *User's Guide*.<br>These are called *class* options.<br>To delete a file, type **rm** *filename*. |

# Shell Prompts

| Shell | Prompt |
|---|---|
| C shell | *machine-name*% |
| C shell superuser | *machine-name*# |
| Bourne shell and Korn shell | $ |
| Bourne shell and Korn shell superuser | # |

# Related Documentation

| Application | Title | Part Number |
|---|---|---|
| Service | *Sun Fire V880 Server Service Manual* | 806-6597 |
| System Options | *Sun Fire V880 Server Owner's Manual* | 806-6592 |

# Accessing Sun Documentation

You can view, print, or purchase a broad selection of Sun documentation, including localized versions, at:

`http://www.sun.com/documentation`

# Contacting Sun Technical Support

If you have technical questions about this product that are not answered in this document, go to:

`http://www.sun.com/service/contacting`

# Sun Welcomes Your Comments

Sun is interested in improving its documentation and welcomes your comments and suggestions. You can submit your comments by going to:

`http://www.sun.com/hwdocs/feedback`

Please include the title and part number of your document with your feedback:

*Sun Fire V880z Server and Sun XVR-4000 Graphics Accelerator Installation and User's Guide*, part number 817-2400-10

# Sun XVR-4000 Graphics Accelerator Installation Overview

This chapter provides the installation process for the Sun XVR-4000 graphics accelerator. For an overview of the Sun XVR-4000 graphics accelerator, Sun Fire V880z server, and installation kit contents, see Chapter 2.

**Note –** The Sun Fire XVR-4000 graphics accelerator and Sun Fire V880z server should be administered and serviced by qualified service personnel.

- "Installation Process Overview" on page 1
- "Software Patches" on page 3

# Installation Process Overview

There are three alternative installation situations. Follow the one installation process that is applicable.

## Installing Sun XVR-4000 Graphics Accelerator Software on a Sun Fire V880z Server

For the Solaris 8 2/02 operating environment only, you *must* first install the Sun Fire V880z Operating Environment Installation DVD and Solaris CDs.

1. Insert the Sun Fire V880z Operating Environment Installation DVD and boot your system from it (Chapter 3).

2. Install the Solaris 8 2/02 software (Chapter 3).

3. Insert the Solaris CD(s) when prompted. After installing Solaris, the system reboots. Continue to Step 4.

If you are installing the Solaris 9 4/03 operating environment, it already has the software needed for the Sun Fire V880z server including the Sun XVR-4000 graphics accelerator. After installing that Solaris release (or a subsequent release), continue to Step 4 to install OpenGL 1.3, Sun XVR-4000 graphics accelerator patches, and extra value software from the Sun XVR-4000 Graphics Accelerator CD.

4. Insert the Sun XVR-4000 Graphics Accelerator CD into the DVD-ROM drive (Chapter 3) and type:

```
# cd /cdrom/cdrom0/
# ./install
```

5. Install the second Sun XVR-4000 graphics accelerator hardware, if required (Chapter 4). Sun Fire V880z already contains one Sun XVR-4000 graphics accelerator.

6. Configure the software through the Xservers file (Chapter 5), if necessary, and through fbconfig (Chapter 6).

## Upgrading From One to Two Sun XVR-4000 Graphics Accelerators

1. Edit the Xservers configuration file for two Sun XVR-4000 graphics accelerators (Chapter 5).

2. Install the second Sun XVR-4000 graphics accelerator hardware (Chapter 4).

## Upgrading a Sun Fire V880 Server to a Sun Fire V880z Server

This upgrade includes installation of hardware, software, front doors, and front bezel.

1. OpenBoot PROM version 4.7.0 or later is required. If the OpenBoot PROM version is less than version 4.7.0, install the OpenBoot PROM upgrade (Appendix C).

2. Perform the Sun Fire V880z server upgrade (Appendix D).

3. Configure the software through the Xservers file (Chapter 5), if necessary, and through fbconfig (Chapter 6).

# Software Patches

Be sure that you have the proper patches for your installation. Chapter 3 lists the product software packages and patches.

Always check, however, for the latest software patches at:
`http://sunsolve.sun.com/`

# Sun XVR-4000 Graphics Accelerator Overview

This chapter provides an overview of the Sun XVR-4000 graphics accelerator for the Sun Fire V880z server.

- "Installation Kit" on page 5
- "Sun XVR-4000 Graphics Accelerator Overview" on page 6
- "Screen Resolutions" on page 10
- "Accessing Field Replaceable Unit Information" on page 13
- "Technical Support" on page 14

Refer to the Sun Fire V880 server documentation for detailed information for the Sun Fire V880z server. Go to `http://www.sun.com/documentation`.

- *Sun Fire V880 Server Service Manual* (806-6597)
- *Sun Fire V880 Server Owner's Manual* (806-6592)

# Installation Kit

The Sun XVR-4000 graphics accelerator installation kit includes:

- Sun XVR-4000 graphics accelerator
- Sun XVR-4000 graphics accelerator software CD
- Sun Fire V880z Operating Environment Installation DVD
- 13W3 to HD15 monitor cable adapter
- Antistatic wrist strap
- *Sun Fire V880z Server and Sun XVR-4000 Graphics Accelerator Installation and User's Guide,* this document

See "Sun XVR-4000 Graphics Accelerator Cables" on page 32 for additional cable information.

# Sun XVR-4000 Graphics Accelerator Overview

The Sun XVR-4000 graphics accelerator is a high-performance, photorealistic 3D graphics accelerator that runs over the Sun™ Fireplane interconnect bus on the Sun Fire V880z server (FIGURE 2-1). Application Program interfaces include Sun OpenGL® 1.3 for Solaris and Java3D™. Imaging is supported through the Java™ Advanced Imaging API. The Sun XVR-4000 graphics accelerator produces visual realism by providing extremely high-performance rendering, and providing full-scene antialiasing "on-the-fly" such that high-quality antialiased rendering becomes expected.
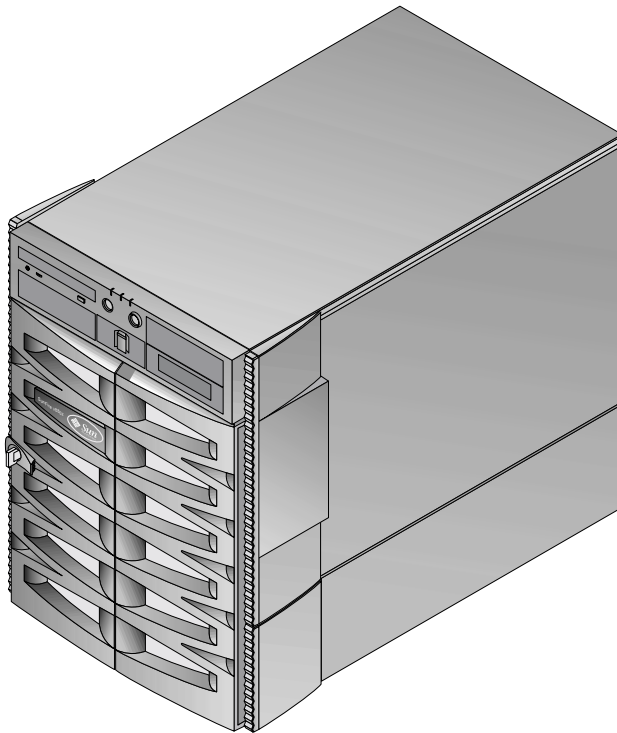


**FIGURE 2-1**  Sun Fire V880z Server

FIGURE 2-2 and FIGURE 2-3 shows the Sun XVR-4000 graphics accelerator with and without the air guide cover, respectively. Appendix F describes the back panel I/O ports.
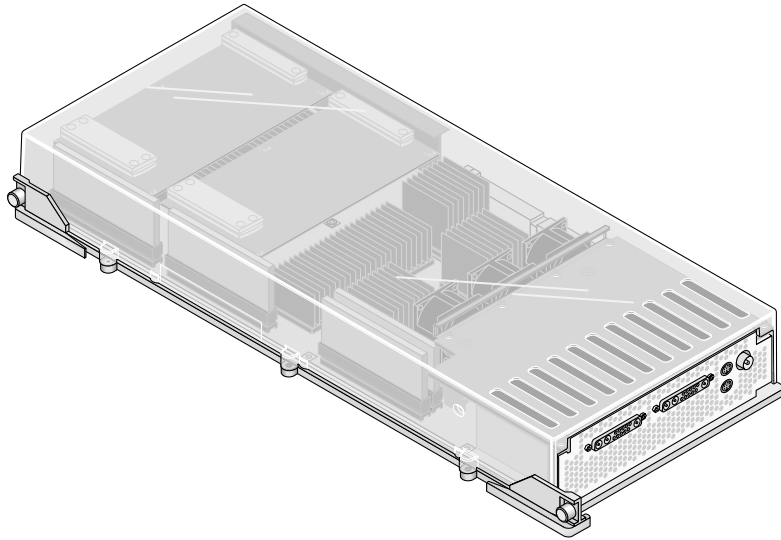


**FIGURE 2-2**   Sun XVR-4000 Graphics Accelerator With Air Guide Cover
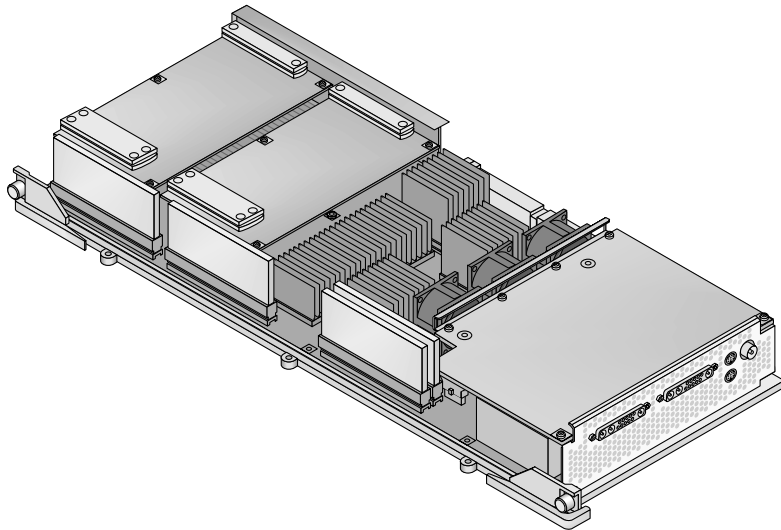


**FIGURE 2-3**   Sun XVR-4000 Graphics Accelerator Without Air Guide Cover

# Sun XVR-4000 Graphics Accelerator Features

## Quality

- Industry-leading antialiasing quality through video-rate $5 \times 5$ pixel processing array
- Supports 30-bit color precision for a wider, more precise color gamut
- 12-bit effective linear light (pre-gamma) color precision
- 26-bit floating-point Z-buffer for more effective depth resolution than with a 32-bit integer Z-buffer

## Performance

- Geometry processing rate up to 65 Mbytes hardware-textured triangles per second
- 256 Mbytes of texture memory at full geometry rate, or 1 Gigabyte of texture memory (using targeted texture OpenGL extension) at reduced geometry rate
- High-performance DMA over the Sun Fireplane interconnect bus

## Flexibility

- Supports two asynchronous video streams with two 10-bit video DACs and 13W3 output ports capable of running different resolutions simultaneously
- 144 Mbytes high resolution sample buffer (holds up to 10 M image sample values, not pixel values), optimized for supersampling; allows users to trade off screen resolution versus samples per pixel; implemented by 32 3DRAM64 frame buffer memory chips
- Continuously programmable resolution within frame buffer capacity and Convolve bandwidth limits
- Support for nonfiltered X-windows pixels on the same screen with filtered, antialiased pixels

## Scalability

- Hardware geometry acceleration using four parallel graphics processing engines (four Cafe processors and four FBC3 ASICs)

## Standards (X-Windows, OpenGL)

- Viewport clipping
- Window ID (WID) clipping. Auxiliary clipping hardware for over eight overlapping windows
- 64 primary X Windows window IDs, 15 overlay window IDs
- Four $3 \times 256$ 10-bit color maps (pseudo or direct color) in each video stream
- One $3 \times 4096$ 10-bit adjustable gamma correction table (for true color) for each video stream. Separate red, green, and blue gamma

# Video Operations

The Sun XVR-4000 graphics accelerator supports the following video outputs and capabilities. The default video port can be either the 13W3A or 13W3B video port, as selected through fbconfig (see Chapter 6)

## Video Output

The Sun XVR-4000 graphics accelerator supports two simultaneous video streams. These may be used for a variety of purposes, for example, two sides of a shared frame buffer region on two high-resolution monitors or projectors, two independent high-resolution X-window system screens displayed on two display devices, or display of a high-resolution image on a monitor and simultaneous NTSC resolution display of the contents of the high-resolution monitor.

---

**Note –** If the scene content is shared between the two video streams (that is, it comes from a shared frame and not from independent frame buffers) the vertical rates must be identical to get correct display on both video outputs.

---

## S-Video Capabilities

For S-video output (NTSC or PAL), any subregion of the primary display, up to the full display, may be resized to NTSC or PAL for video taping.

- Provide a secondary video output stream for NTSC video format at $640 \times 480$ at 60 Hz or PAL video format at $640 \times 480$ at 50 Hz, from a portion of the primary video desktop to a TV/VCR video output port.
- TV/VCR video output is S-video, with the appropriate mechanical connections.
- If the S-video output is not in use, the second 13W3 output is available for a high-resolution display.

# Screen Resolutions

Sun XVR-4000 graphics accelerator supports full 30-bit 3D (double/z-buffered) graphics at all supported resolutions. TABLE 2-1 lists the supported screen resolutions for the Sun XVR-4000 graphics accelerator.

- **To get a list of all graphics devices, type:**

```
host% fbconfig -list
```

- **To get a list of available resolutions for your display device, type:**

```
host% fbconfig -dev zulu0 -res \?
```

**TABLE 2-1**    Sun XVR-4000 Graphics Accelerator Screen Resolutions

| Display resolution | Refresh rate (Hz) | Standard | Aspect format | Output port | Video format |
|---|---|---|---|---|---|
| 1920 × 1200 | 60d | Sun | 16:10 | 13W3 | SUNW_DIG_1920x1200x60 |
| 1920 × 1200 | 70 <br> 75 | Sun | 16:10 | 13W3 | SUNW_STD_1920x1200x70 <br> SUNW_STD_1920x1200x75 |
| 1920 × 1080 | 60d | Sun | 16:9 | 13W3 | SUNW_DIG_1920x1080x60 |
| 1920 × 1080 | 72 | Sun | 16:9 | 13W3 | SUNW_STD_1920x1080x72 |
| 1792 × 1344 | 60 | VESA | 4:3 | 13W3 | VESA_STD_1792x1344x60 |
| 1600 × 1280 | 76 | Sun | 5:4 | 13W3 | SUNW_STD_1600x1280x76 |
| 1600 × 1200 | 60d | Sun | 4:3 | 13W3 | SUNW_DIG_1600x1200x60 |
| 1600 × 1200 | 60 <br> 75 | VESA | 4:3 | 13W3 | VESA_STD_1600x1200x60 <br> VESA_STD_1600x1200x75 |
| 1600 × 1024 | 60 | Sun | 16:10 | 13W3 | SUNW_DIG_1600x1024x60 or <br> SUNW_STD_1600x1024x60 |
| 1600 × 1000 | 66 <br> 76 | Sun | 16:10 | 13W3 | SUNW_STD_1600x1000x66 <br> SUNW_STD_1600x1000x76 |
| 1440 × 900 | 76 | Sun | 16:10 | 13W3 | SUNW_STD_1440x900x76 |
| 1280 × 1024 | 96 <br> 112 | Sun stereo | 5:4 | 13W3 | SUNW_STEREO_1280x1024x96 <br> SUNW_STEREO_1280x1024x112 |

**TABLE 2-1** Sun XVR-4000 Graphics Accelerator Screen Resolutions *(Continued)*

| Display resolution | Refresh rate (Hz) | Standard | Aspect format | Output port | Video format |
|---|---|---|---|---|---|
| 1280 × 1024 | 108d | Sun stereo | 5:4 | 13W3 | SUNW_STEREO-DIG_1280x1024x108 |
| 1280 × 1024 | 60<br>75<br>85 | VESA | 5:4 | 13W3 | VESA_STD_1280x1024x60<br>VESA_STD_1280x1024x75<br>VESA_STD_1280x1024x85 |
| 1280 × 1024 | 67<br>76 | Sun | 5:4 | 13W3 | SUNW_STD_1280x1024x67<br>SUNW_STD_1280x1024x76 |
| 1280 × 800 | 112 | Sun stereo | 16:10 | 13W3 | SUNW_STEREO_1280x800x112 |
| 1280 × 800 | 76 | Sun | 16:10 | 13W3 | SUNW_STD_1280x800x76 |
| 1280 × 768 | 56 | Sun | 5:3 | 13W3 | SUNW_STD_1280x768x56 |
| 1152 × 900 | 120 | Sun stereo | 5:4 | 13W3 | SUNW_STEREO_1152x900x120 |
| 1152 × 900 | 66<br>76 | Sun | 5:4 | 13W3 | SUNW_STD_1152x900x66<br>SUNW_STD_1152x900x76 |
| 1024 × 692 | 100 | Sun stereo | 4:3 | 13W3 | SUNW_STEREO_1024x692x100 |
| 1024 × 800 | 84 | Sun | 4:3 | 13W3 | SUNW_STD_1024x800x84 |
| 1024 × 768 | 96 | Sun stereo | 4:3 | 13W3 | SUNW_STEREO_1024x768x96 |
| 1024 × 768 | 77 | Sun | 4:3 | 13W3 | SUNW_STD_1024x768x77 |
| 1024 × 768 | 60<br>70<br>75 | VESA | 4:3 | 13W3 | VESA_STD_1024x768x60<br>VESA_STD_1024x768x70<br>VESA_STD_1024x768x75 |
| 960 × 680 | 108<br>112 | Sun stereo | 14:10 | 13W3 | SUNW_STEREO_960x680x108<br>SUNW_STEREO_960x680x112 |
| 800 × 600 | 75 | VESA | 4:3 | 13W3 | VESA_STD_800x600x75 |
| 768 × 575 | 50i | PAL (RGB) | 4:3 | 13W3 | SUNW_PAL_768x575x50 |
| 768 × 575 | 50i | Sun | 4:3 | 13W3 | SUNW_INT_768x575x50 |
| 640 × 480 | 60fsc | Sun | 4:3 | 13W3 | SUNW_FSC_640x480x60 |
| 640 × 480 | 60<br>72<br>75 | VESA | 4:3 | 13W3 | VESA_STD_640x480x60<br>VESA_STD_640x480x72<br>VESA_STD_640x480x75 |
| 640 × 480 | 60i | Sun<br>NTSC (RGB) | 4:3 | 13W3 | SUNW_INT_640x480x60 |
| 640 × 480 | 60i | NTSC (Composite) | 4:3 | S-video | SUNW_NTSC_640x480x60 |
| 640 × 480 | 50i | PAL (Composite) | 4:3 | S-video | SUNW_PAL_640x480x50 |

**Note –** Video formats with refresh rates marked "d" are only suitable for LCDs and other digital devices. These refresh rates have reduced blanking times that are unsuitable for CRTs and other analog devices.

Video formats with refresh rates marked "i" are interlaced.

Video formats with refresh rates marked "fsc" are only used for special "field sequential color" displays.

NTSC and PAL composite video formats use the S-video output port only.

While the Sun XVR-4000 graphics accelerator supports both tethered and wireless stereo glasses, wireless stereo glasses *without* an external power supply are *not* supported. See "Connecting the Framelock Cable" on page 56.

# Accessing Field Replaceable Unit Information

You can obtain Sun XVR-4000 graphics accelerator subcomponent version numbers and other data using fbconfig.

- **To obtain FRU ID (field replaceable unit identifier) information, type:**

```
host% fbconfig -dev zulu0 -prconf

--- Hardware Configuration for /dev/fbs/zulu0 ---
Type:   XVR-4000 Graphics Accelerator
Part:   501-5588

Memory:
        MAJC:           128MB
        Texture:        1GB total
        3DRAM64:        10.0M samples

Versions:
        Fcode 1.18    MCode 1.4       MAJC 2.1
         FBC3 3.0     Master 1.0   Convolve 0.0
        Sched 1.0       I/O 0.0        FPGA 1.0

Power Level:
        Monitor Power:  On
        Board Power:    On

Video Streams:
   Stream A:
        Current resolution setting:
        Flags:  Default Primary
        Monitor/EDID data (13W3)
                Monitor Manufacturer: SUN
                EDID:  Version 1, Revision 3

   Stream B:
        Current resolution setting:
        Flags:  None
        Monitor/EDID data (13W3)
                EDID Data: Not Available
```

# Technical Support

For assistance and other information not found in this document concerning the Sun XVR-4000 graphics accelerator, see Support Services at:
`http://www.sun.com/service/online/`

For the most up-to-date version of the installation and user's guide, go to:
`http://www.sun.com/documentation`

# Installing the Sun XVR-4000 Graphics Accelerator Software

This chapter provides Sun XVR-4000 graphics accelerator software installation information.

- "Software Requirements" on page 15
- "Sun XVR-4000 Graphics Accelerator Software Packages" on page 16
- "Installing the Software" on page 18

## Software Requirements

- The Solaris 8 2/02 operating environment or a subsequent compatible version of the operating environment

  For the Solaris 8 2/02 operating environment, you *must* first install the Sun Fire V880z Operating Environment Installation DVD, accompanying this Sun XVR-4000 graphics accelerator installation kit. See Appendix E for this procedure.

- The Solaris 9 4/03 operating environment or a subsequent compatible version of the operating environment

  If you are installing the Solaris 9 4/03 operating environment, it already has the software needed for the Sun Fire V880z server including the Sun XVR-4000 graphics accelerator. After installing that Solaris release (or a subsequent release), install OpenGL 1.3, Sun XVR-4000 graphics accelerator patches, and extra value software from the Sun XVR-4000 Graphics Accelerator CD.

See TABLE 3-5 for the list of patches. Always check for the latest software patches at: `http://sunsolve.sun.com/`

Updated versions of Sun OpenGL® for Solaris are available at: `http://www.sun.com/software/graphics/OpenGL/`

# Sun XVR-4000 Graphics Accelerator Software Packages

TABLE 3-1 lists the Sun XVR-4000 graphics accelerator CD directories. The packages are located in the directory path `/cdrom/cdrom0/`:

**TABLE 3-1**    Sun XVR-4000 Graphics Accelerator CD Directories

| Directory name | Description |
| --- | --- |
| `License` | Binary Code License |
| `XVR-4000/Solaris_8/Packages/` | Solaris 8 graphics accelerator software packages |
| `XVR-4000/Solaris_9/Packages/` | Solaris 9 graphics accelerator software packages |
| `Docs/` | Sun XVR-4000 graphics accelerator documentation |
| `Copyright` | U.S. version of copyright |
| `FR_Copyright` | French version of copyright |
| `install` | Product installation script |
| `remove` | Product removal script |
| `OpenGL/1.3/Packages/` | OpenGL 1.3 packages |
| `OBP/` | OpenBoot PROM update utility |
| `README` | File of important installation information |

## Software Package Locations

The Sun XVR-4000 graphics accelerator software packages are located in the directories listed in TABLE 3-2.

**TABLE 3-2**    Location of Sun XVR-4000 Graphics Accelerator Software Packages

| Software packages | Directory location |
| --- | --- |
| Solaris 8 software | `/cdrom/cdrom0/XVR-4000/Solaris_8/Packages` |
| Solaris 9 software | `/cdrom/cdrom0/XVR-4000/Solaris_9/Packages` |

# Software Packages

TABLE 3-3 lists the Sun XVR-4000 graphics accelerator software package names and descriptions.

**TABLE 3-3**    Sun XVR-4000 Graphics Accelerator Software Package Names

| Package name | Description |
| --- | --- |
| SUNWzuluc | Configuration utility for the Sun XVR-4000 graphics accelerator |
| SUNWzulur | Boot-time device initialization support for the Sun XVR-4000 graphics accelerator |
| SUNWzuluw | X Windows system loadable module for the Sun XVR-4000 graphics accelerator |
| SUNWzulux.u | Device driver for the Sun XVR-4000 graphics accelerator (64-bit) |
| SUNWzulum | Manual pages for the Sun XVR-4000 graphics accelerator |
| SUNWvid | Generic video timing information |
| SUNWgldp | Sun OpenGL 1.3 for Solaris device pipelines |
| SUNWgldpx | Sun OpenGL 1.3 for Solaris device pipelines, 64-bit |

# Software Patches

TABLE 3-4 lists the directories containing patches applicable for the Solaris operating environment.

**TABLE 3-4**    Sun XVR-4000 Graphics Accelerator Patch Directories

| Solaris Release | Location |
| --- | --- |
| Solaris 8 software | /cdrom/cdrom0/XVR-4000/Solaris_8/Patches |
| Solaris 9 software | /cdrom/cdrom0/XVR-4000/Solaris_9/Patches |

TABLE 3-5 lists the patches required for software installation.

**TABLE 3-5**    Sun XVR-4000 Graphics Accelerator Patches

| Patch Number | Description |
| --- | --- |
| 114469 | Sun XVR-4000 graphics accelerator software in Solaris 8 |
| 114470 | Sun XVR-4000 graphics accelerator software in Solaris 9 |
| 113886 | OpenGL 1.3 32-bit libraries, any Solaris |
| 113887 | OpenGL 1.3 64-bit libraries, any Solaris |

# Installing the Software

**Note –** For the Solaris 8 2/02 operating environment, you *must* first install the DVD titled Operating Environment Installation DVD. See Appendix E for this procedure.

If you are installing the Solaris 9 4/03 operating environment, it already has the software needed for the Sun Fire V880z server including the Sun XVR-4000 graphics accelerator. After installing that Solaris release (or a subsequent release), install OpenGL 1.3, Sun XVR-4000 graphics accelerator patches, and extra value software from the Sun XVR-4000 Graphics Accelerator CD..

For the Solaris 8 2/02 operating environment, here is an overview of the software installation process:

1. **Insert the Sun Fire V880z Operating Environment Installation DVD into the DVD-ROM drive, and boot your system off of it, as described in Appendix E, Installing Solaris 8 2/02 Software on the Sun Fire V880z Server.**

2. **Install the Solaris DVD when prompted.**

   After installing Solaris, the system reboots.

3. **Insert the Sun XVR-4000 graphics accelerator CD into the DVD-ROM drive, become superuser, and go to the following directory:**

   ```
   # cd /cdrom/cdrom0/
   ```

4. **Start the** install **script. Type:**

   ```
   # ./install
   ```

   Respond to the installation prompts.

5. **Install the Sun XVR-4000 graphics accelerator hardware, if not already present.**

6. **Configure the software through the** Xservers **file (Chapter 5), if necessary, and through** fbconfig **(Chapter 6).**

   To remove the software, use the ./remove command, and respond to the remove prompts.

# Installing the Sun XVR-4000 Graphics Accelerator Hardware

This chapter provides Sun XVR-4000 graphics accelerator hardware installation information for the Sun Fire V880z server.

■ "Before Installation" on page 19
■ "Installing the Hardware in the Sun Fire V880z Server" on page 20
■ "Removing the Hardware From the Sun Fire V880z Server" on page 29
■ "Sun XVR-4000 Graphics Accelerator Cables" on page 32
■ "Changing the Monitor Screen Resolution" on page 32

# Before Installation

Refer to the *Sun Fire V880 Server Service Manual* for proper procedures on how to shut down the system safely before installing or removing any internal boards and how to reboot the system after installation. A complete set of documentation is located at: `http://www.sun.com/documentation`

Refer to the following hardware documentation for detailed service information for the Sun Fire V880z server:

■ *Sun Fire V880 Server Service Manual* (806-6597)
■ *Sun Fire V880 Server Owner's Manual* (806-6592)

# Installing the Hardware in the Sun Fire V880z Server

The Sun Fire V880z server supports up to two Sun XVR-4000 graphics accelerators. With two Sun XVR-4000 graphics accelerators installed, the system supports up to four video display devices. The Sun XVR-4000 graphics accelerators are installed in the Sun Fire V880z CPU slots (B and C). A Sun Fire V880z server with one Sun XVR-4000 graphics accelerator may have up to six CPUs. A Sun Fire V880z with two Sun XVR-4000 graphics accelerators may have up to four CPUs.

**Caution –** The Sun XVR-4000 graphics accelerator is *not* hot-swappable.

1. **Turn off the power to your system.**

2. **Disconnect the monitor cabling on the system back panel.**

**Caution –** The chassis AC power cord must remain connected to ensure a proper ground. Leave at least one power cord connected.

3. **Remove the system back panel covers for the slots to be used for the Sun XVR-4000 graphics accelerator (**FIGURE 4-1**).**

   The back panel filler slot covers are secured by four Phillips screws. Remove them and retain them for later use.
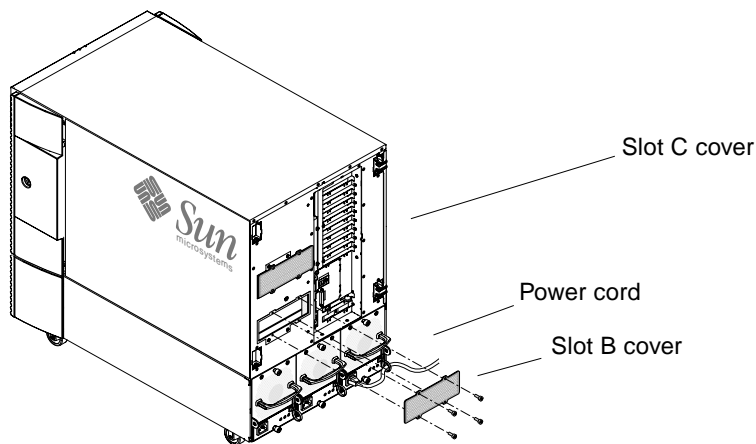


**FIGURE 4-1**   Sun Fire V880z Server Back Panel Covers for Slots B and C

4. **Open the Sun Fire V880z server enclosure door (**FIGURE 4-2**).**

   a. **Unlock the side door using the system key.**

   b. **Swing the side door open.**

   c. **To remove the door from the chassis, open the door 90 degrees and pull it up until its mounting pins clear the brackets on the rear panel.**
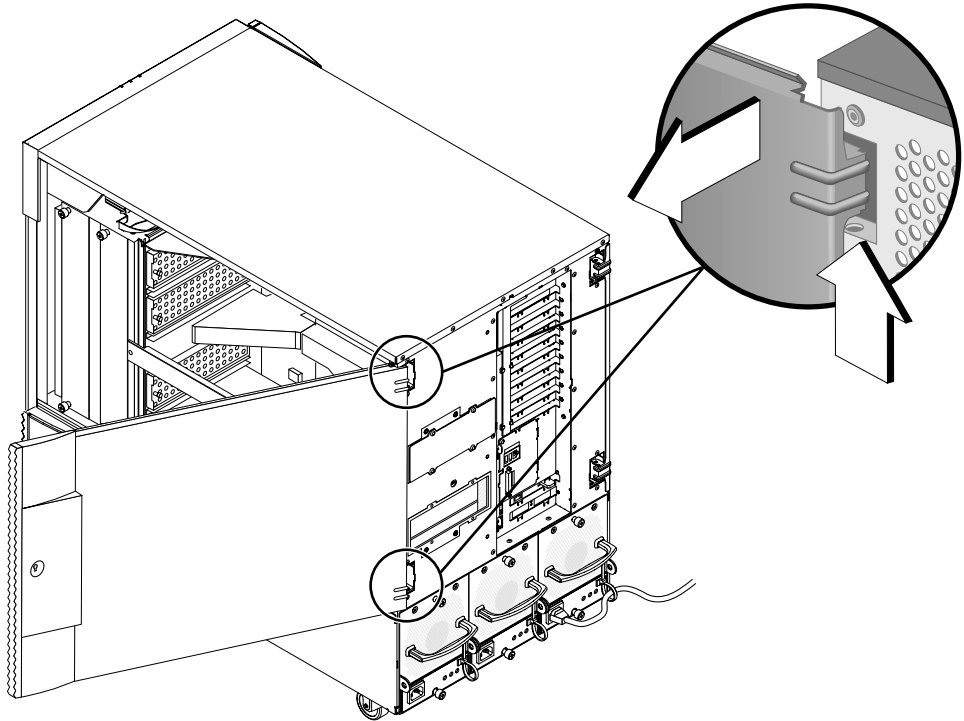


**FIGURE 4-2** Opening the Sun Fire V880z Server Enclosure Door

5. **Locate slots B and C (**FIGURE 4-4**).**

   If you are installing a single Sun XVR-4000 graphics accelerator, you can use either slot B or C. The Sun Fire V880z server motherboard slots are identified from A to D, from bottom to top.



Slot C
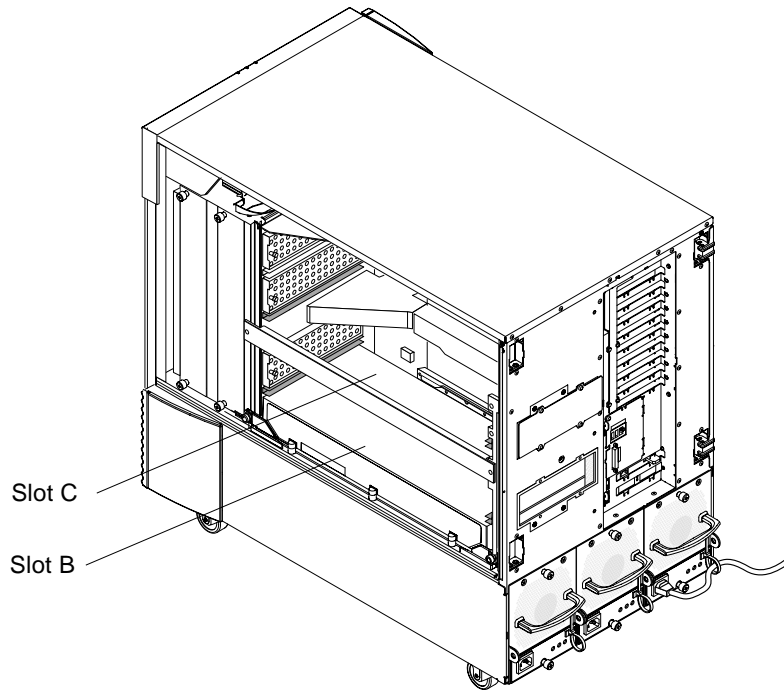
Slot B

**FIGURE 4-3**   Locating Slots B and C of the Sun Fire V880z Server

6. **Remove the air baffle from the CPU bracket and remove the dust cover from the motherboard VHDM connector (slot B for one Sun XVR-4000 graphics accelerator, slots B and C for two graphics accelerators). (**FIGURE 4-4**).**



Air baffle
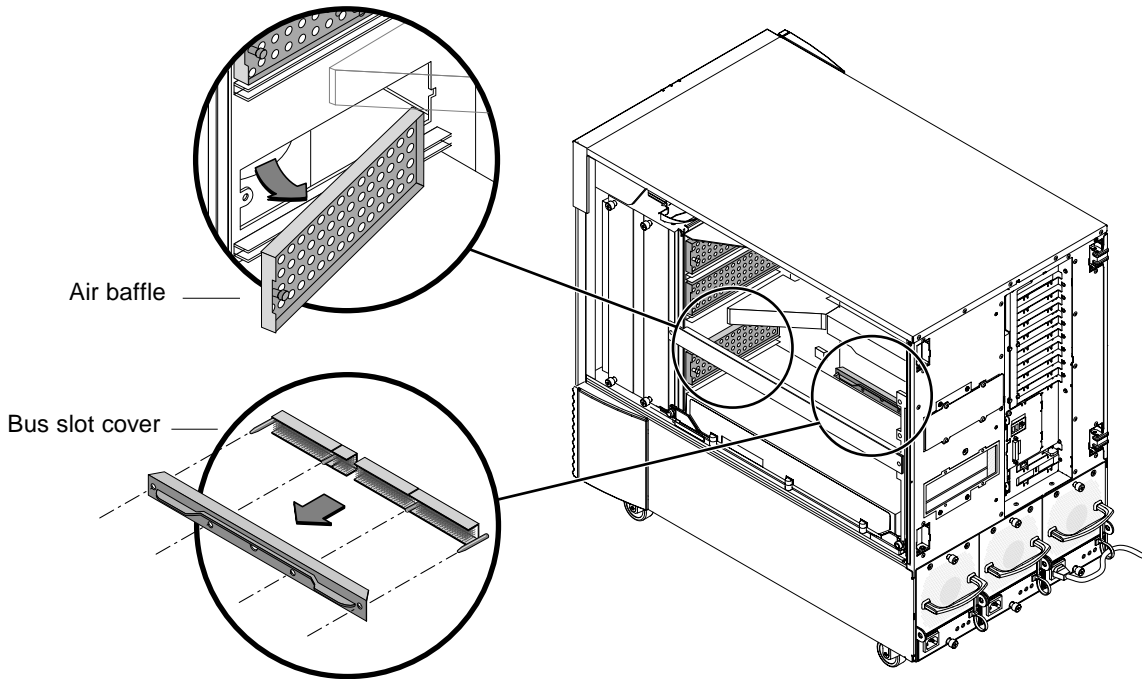
Bus slot cover

**FIGURE 4-4**    Removing the Sun Fire V880z Motherboard Bus Slot Cover From Slot B

7. **Store the air baffle by sliding it under the metal storage slot located on the enclosure interior ceiling.**

   When the air baffle is properly aligned in the storage slot, the air baffle black pin will easily insert into the metal slot hole to lock it in place. (If you are replacing the air baffle for the chassis board slot, properly align the air baffle in the slot and the black pin will easily insert into the hole to lock the air baffle in place.)

8. **Be sure to attach the antistatic wriststrap provided with the Installation Kit.**

   Refer to section "How to Avoid Electrostatic Discharge" in the *Sun Fire 880 Server Owner's Guide.*

9. **Position the Sun XVR-4000 graphics accelerator into the chassis guide rails for the selected slot (B or C).**

10. **Make sure that the Sun XVR-4000 graphics accelerator ejector levers are rotated out to 90 degrees (**FIGURE 4-5**)**

11. **Holding the two ends of the graphics board, slide the Sun XVR-4000 graphics accelerator into the card guide frame.**

   Use slot B for one Sun XVR-4000 graphics accelerator, slots B and C for two graphics accelerators.

   Stop once the Sun XVR-4000 graphics accelerator ejector levers begin to contact the frame.

---

**Note –** If the ejectors are unable to contact the metal card guide frame, do not try and force the board into place. Damage to the Sun XVR-4000 graphics accelerator or motherboard may occur.

---
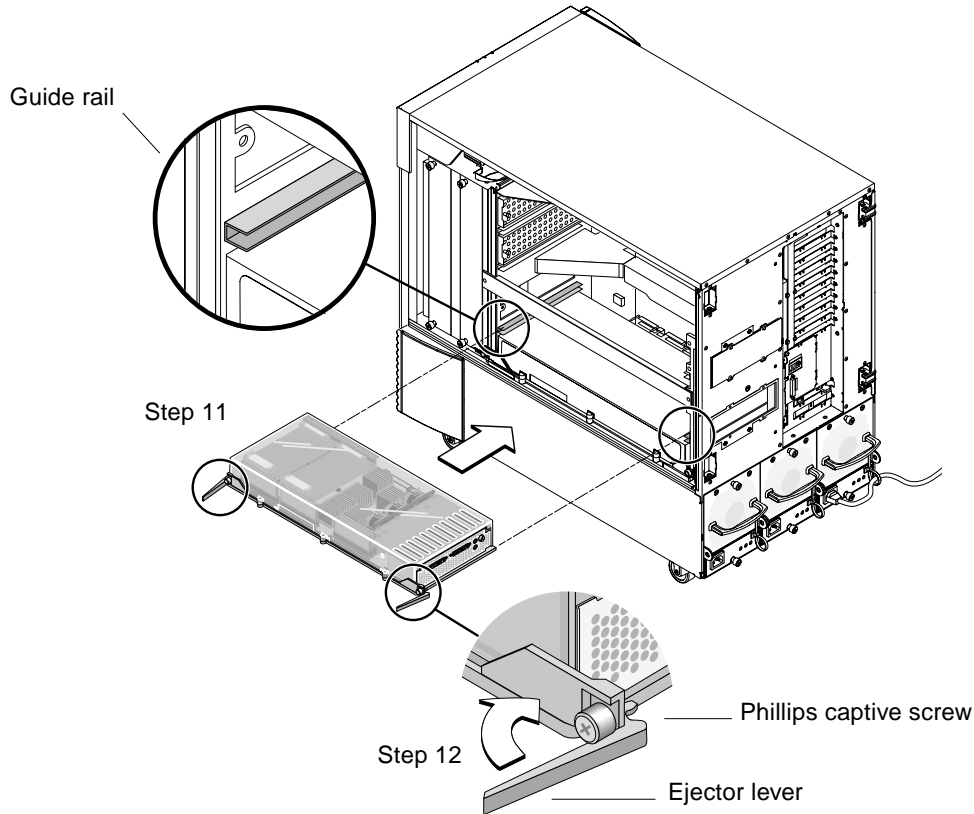


**FIGURE 4-5**   Installing the Sun XVR-4000 Graphics Accelerator Into Slot B Connectors

12. **Grasp both ejector levers and rotate them inward simultaneously.**

    Avoid rocking the board in the card guides. The board has a tendency to pull to the left (front) side of the chassis (as viewed from the CPU module/Sun XVR-4000 graphics accelerator side). Installation should be smooth and uniform.

13. **Once the ejector levers are fully rotated in, hand tighten both captive screws.**

    ---
    **Note –** It is important to try to hand tighten prior to using a torque driver.

    ---

14. **Using a No. 2 Phillips screwdriver or torque driver, tighten the right-side captive screw and then the left-side captive screw.**

    If using a torque driver, fully seat the right-side captive screw first to 8 in-lbs (0.90 meter-newtons), then repeat for the left-side captive screw.

15. **Secure the back panel I/O slot EMI adapter to the slot now containing the Sun XVR-4000 graphics accelerator (**FIGURE 4-6**).**

    Secure the EMI adapter with the four Phillips screws used for the back panel filler cover.



Back panel
EMI adapter
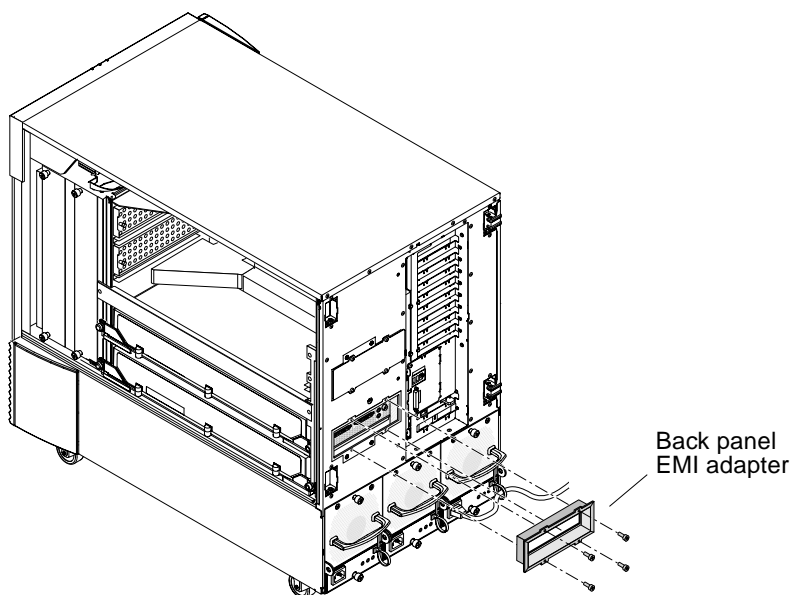
FIGURE 4-6   Installing the Back Panel EMI Adapter on the Server Back Panel I/O Slot B

16. **Attach the appropriate monitor cables to the Sun XVR-4000 graphics accelerator backplate on the system back panel.**

17. **Reconnect the remaining power cords.**

18. **Power on the system.**

19. **After the Sun XVR-4000 graphics accelerator has been installed and power is applied to the system, look at the green LEDs on the Sun XVR-4000 graphics accelerator and the appropriate centerplane CPU slot indicator (**FIGURE 4-7**).**

    The green LED power indicators on each Sun XVR-4000 graphics accelerator are a positive indication of the power state of each Sun XVR-4000 graphics accelerator.

    The Sun XVR-4000 graphics accelerator has two LED indicators: the left LED is a green power indicator, the right LED is an amber temperature indicator (FIGURE 4-7). When the amber LED is lit, it indicates an over-temperature-induced power-down of the Sun XVR-4000 graphics accelerator module. Normally, the Sun Fire V880z server software should take corrective action to power-down the slot in over-temperature situations before the emergency back-up power-down indicated by the amber LED. Thus, it should be quite rare to see the amber LED lit.



Power LED
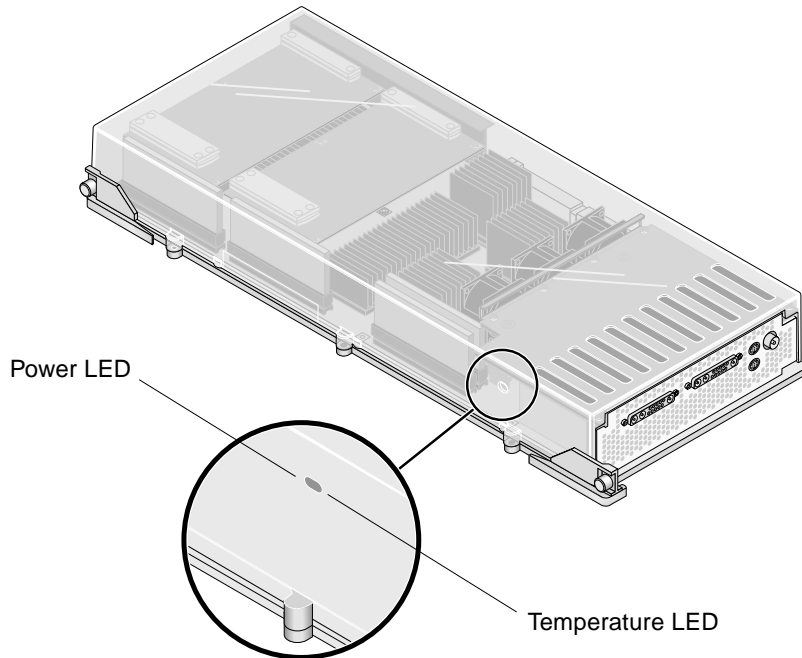
Temperature LED

**FIGURE 4-7**   Sun XVR-4000 Graphics Accelerator Power and Temperature LEDs

After you install the Sun XVR-4000 graphics accelerator and power on the system, confirm that the board is properly installed by verifying that the power LED indicator is lit; that is, the green power LED indicator on each Sun XVR-4000 graphics accelerator and the chassis centerplane CPU slot indicator.

The CPU indicator LEDs are located on the centerplane bar between slots B and C of the system (FIGURE 4-8). On the centerplane bar, you will see icons to the left of the LEDs that indicate that slot "D" is the topmost slot.

CPU power LED

Icons indicate slot D is topmost slot
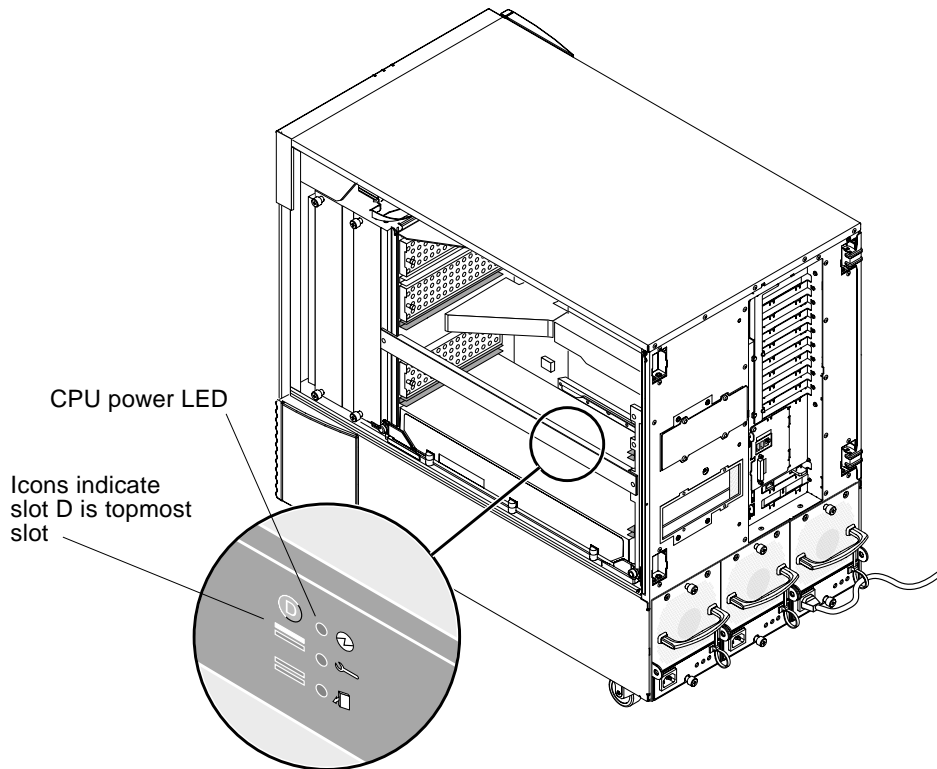


**FIGURE 4-8**   Sun XVR-4000 Graphics Accelerator Power LED Indicator

If there is a CPU module/Sun XVR-4000 graphics accelerator in any slot, ensure that the corresponding green LED is lit. The green power LEDs of both the CPU and Sun XVR-4000 graphics accelerator should always be in agreement, but the one on the Sun XVR-4000 graphics accelerator is the most positive indicator that the board is in fact powered up.

If any of the green power indicator LEDs on installed Sun XVR-4000 graphics accelerators are not illuminated after attempting to power-up the system, power off the system and apply thumb pressure to the center of any Sun XVR-4000 graphics accelerator whose green LED failed to light. Note if any additional board travel is experienced. If the board is not completed seated, push the board fully into place. Then you may recheck the right-hand and left-hand captive screw torques with the torque driver to ensure the screws are tightened to 8 in-lbs (0.90 meter-newtons).

**Note –** Only do this with Sun XVR-4000 graphics accelerators where the green LED fails to illuminate.

20. **Close the Sun Fire V880z server enclosure door.**

    a. **If you removed the side door, remount it to the chassis.**

       Position the side door mounting pins over the corresponding holes in the chassis rear panel and lower the side door into place.

    b. **Close the side door.**

       Make sure that the door is firmly seated in its frame.

    c. **Lock the side door with the system key.**

21. **Boot the system to the** ok **prompt and see if the Sun Fire V880z server detects the Sun XVR-4000 graphics accelerator.**

    For example, to list your system graphics, type:

    ```
    ok show-displays
    a) /SUNW,zulu@4,0
    b) /SUNW,zulu@1,0
    c) /pci@9,600000/TSI,gfxp@1
    q) NO SELECTION
    Enter Selection, q to quit: q
    ```

    If the Sun XVR-4000 graphics accelerator is not detected, power down the system and apply thumb pressure to the center of the Sun XVR-4000 graphics accelerator board and note if any additional board travel is experienced.

    **Note –** Never attempt to re-seat a Sun XVR-4000 graphics accelerator with power applied to the system.

    If the board is not completed seated, push the board fully into place.

    **Note –** *Only* do this with Sun XVR-4000 graphics accelerators that are not detected at the ok prompt.

    If errors, note the serial number and revision level of the Sun Fire V880 enclosure and that of the motherboard. Report information to Sun Support Services at:
    http://www.sun.com/service/online/

# Removing the Hardware From the Sun Fire V880z Server

> ⚠ **Caution –** The Sun XVR-4000 graphics accelerator is *not* hot-swappable.

1. **Turn off the power to your system and disconnect the system back panel monitor cabling.**

   Leave one power cord connected.

2. **Remove the back panel I/O slot EMI adapter from the selected slot containing the Sun XVR-4000 graphics accelerator (**FIGURE 4-6**).**

   Four Phillips screws secure the EMI adapter.

> ⚠ **Caution –** If the EMI adapter is *not* removed, the Sun XVR-4000 graphics accelerator video connectors could be damaged when you attempt to slide the graphics board out of the card guide rails.

3. **Open the Sun Fire V880z server enclosure door (**FIGURE 4-2**).**

   a. **Unlock the side door using the system key.**

   b. **Swing the side door open.**

   c. **To remove the door from the chassis, open the door 90 degrees and pull it up until its mounting pins clear the brackets on the rear panel.**

4. **Using a No. 2 Phillips screwdriver, loosen the right-side captive screw and then the left-side captive screw (**FIGURE 4-9**).**

5. **Hand-loosen the two captive screws on the graphics board.**

6. **Pull the graphics board ejector levers until they are rotated out to 90 degrees (**FIGURE 4-9**).**

7. **Holding the two ends of the graphics board, carefully pull the board straight out of the connector slot.**



Guide rail

Step 7

Step 6

Phillips captive screw

Ejector lever
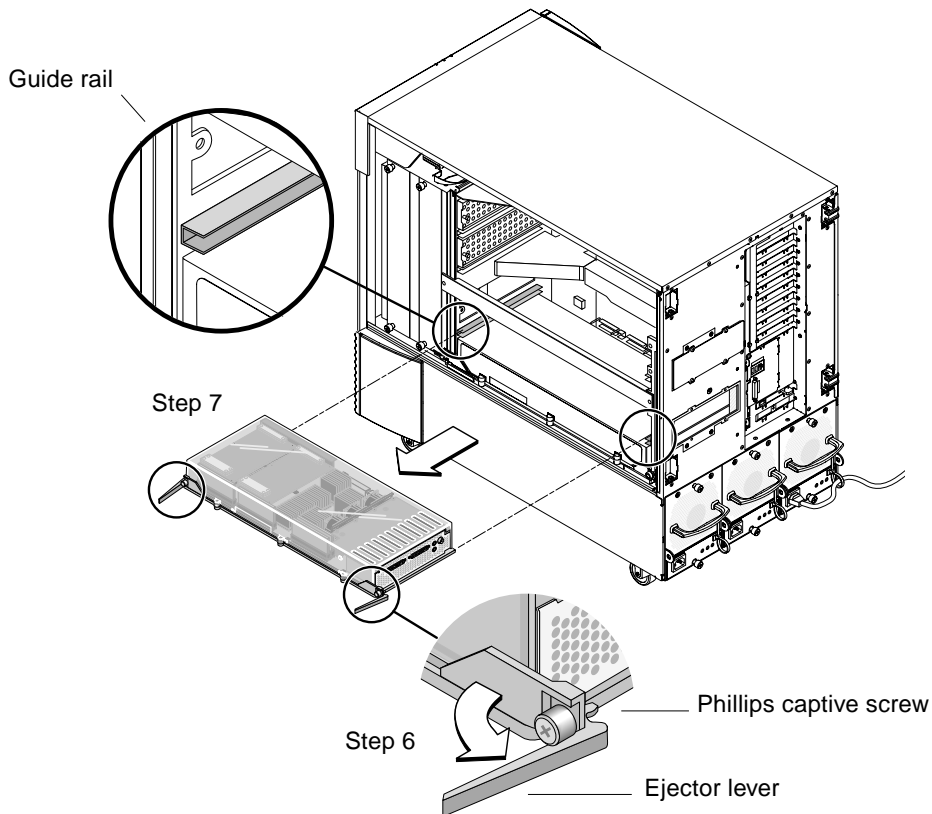
**FIGURE 4-9**   Removing the Sun XVR-4000 Graphics Accelerator

8. **Remove the air baffle from under the metal storage slot located on the enclosure interior ceiling.**

**Caution –** Whenever the system is turned on, each CPU/Memory slot *must* contain either a CPU/memory board, a Sun XVR-4000 graphics accelerator, or an air baffle. After removing a Sun XVR-4000 graphics accelerator, you must install a replacement board or an air baffle immediately to avoid an automatic thermal shutdown. For more information, see "Environmental Monitoring and Control" in the *Sun Fire V880 Server Owner's Guide.*

9. **Replace the air baffles on the chassis slots, and replace the bus slot covers on the motherboard bus connectors.**



**Air baffle**
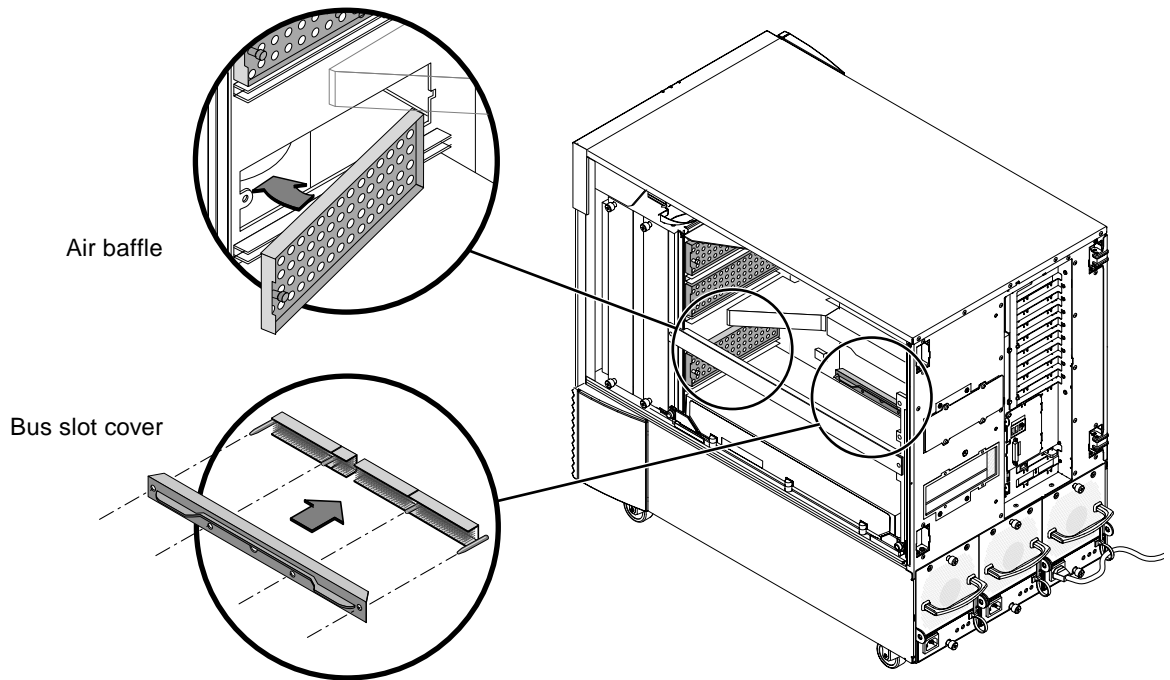
**Bus slot cover**

**FIGURE 4-10** Replacing the Sun Fire V880z Motherboard Bus Slot Cover

10. **Close the Sun Fire V880z server enclosure door.**

11. **Replace the system back panel covers for the slots used for the Sun XVR-4000 graphics accelerator (**FIGURE 4-1**).**

   The back panel filler slot covers are secured by four Phillips screws.

12. **Reconnect the remaining power cords and turn the power on.**

13. **Boot your system at the** ok **prompt.**

   Refer to the section "How to Initiate a Reconfiguration Boot" in the *Sun Fire V880 Server Owner's Guide.*

# Sun XVR-4000 Graphics Accelerator Cables

The following lists cables available for use with the Sun XVR-4000 graphics accelerator.

- 13W3-to-HD15 cable adaptor, Sun part number 130-3034, for connecting Sun XVR-4000 graphics accelerator to a monitor or projector which accepts PC-style HD15 input (This cable is included in the Sun XVR-4000 graphics accelerator installation kit.)
- Framelock cable, Sun part number 530-2754 (see Chapter 7)
- 13W3-BNC cable, BNC-T connector, BNC-BNC cables, and a BNC 75-ohm terminator for genlock cabling (see Chapter 8)
- 9-pin standard micro-DIN cable, used to extend the framelock cable
- S-video cable, for connecting the Sun XVR-4000 graphics accelerator S-video output (for example, VCR)

You can order these cables through the Sun store (`http://store.sun.com`).

# Changing the Monitor Screen Resolution

The Sun XVR-4000 graphics accelerator device automatically configures itself to a single video stream of 1280 × 1024 at 76Hz, using the maximum sample density support (8) at that resolution. To change the screen resolution, use the `fbconfig` utility which is used for configuring all Sun graphics accelerators. `SUNWzulu_config(1M)` contains Sun XVR-4000 device-specific configuration information.

- **To access the** `SUNWzulu_config` **man page, type:**

```
# man SUNWzulu_config
```

# Configuring Multiple Frame Buffers

This chapter describes procedures for setting up multiple frame buffers.

- "Configuring Multiple Frame Buffers Through the `Xservers` File" on page 33
- "Xinerama" on page 35

## Configuring Multiple Frame Buffers Through the `Xservers` File

To run more than one frame buffer, you must modify your `/etc/dt/config/Xservers` file. The Sun XVR-4000 graphics accelerator device name is `zulu` (for example, `zulu0` and `zulu1` for two Sun XVR-4000 graphics accelerator devices). To do this:

1. **Become superuser and open the** `/etc/dt/config/Xservers` **file.**

```
# cd /etc/dt/config
# vi + Xservers
```

If the `/etc/dt/config/Xservers` file does not exist, create the `/etc/dt/config` directory and copy the `Xservers` file from `/usr/dt/config/Xservers` to `/etc/dt/config`.

```
# mkdir -p /etc/dt/config
# cp /usr/dt/config/Xservers /etc/dt/config
# cd /etc/dt/config
# vi + Xservers
```

2. **Modify the file by adding the device locations for the applicable frame buffers being used.**

   Enter the Xservers file content in one long line. See the following examples.

   This example shows the Xservers configuration file modified for one Sun XVR-500 graphics accelerator and one Sun XVR-4000 graphics accelerator:

```
:0 Local local_uid@console root /usr/openwin/bin/Xsun -dev /dev/fbs/ifb0
-dev /dev/fbs/zulu0
```

   This example shows how to remove two Sun XVR-500 graphics accelerators and add one Sun XVR-4000 graphics accelerator in the Xservers configuration file.

   ■ Old Xservers configuration file with two Sun XVR-500 graphics accelerators:

```
:0 Local local_uid@console root /usr/openwin/bin/Xsun -dev /dev/fbs/ifb0
defdepth 24 -dev /dev/fbs/ifb1 defdepth 24
```

   ■ New Xservers configuration file with one Sun XVR-4000 graphics accelerator:

```
:0 Local local_uid@console root /usr/openwin/bin/Xsun -dev /dev/fbs/zulu0
```

   Note that the defdepth 24 was removed from the Xservers file so that the X Window system server does not take performance away from applications.

3. **Reboot your system.**

   ■ If you have not completed the reconfiguration reboot (boot -r) since installing the Sun XVR-4000 graphics accelerator hardware, do so now.

     Also, refer to the section "How to Initiate a Reconfiguration Boot" in Chapter 2, "Setting Up the System," of the *Sun Fire V880 Server Owner's Guide*

   ■ If you edited the Xservers file after completing all the installation steps outlined in Chapter 1, including the reconfiguration reboot (boot -r), simply reboot your system. Type:

```
host# reboot
```

   See the reboot(1) and shutdown(1M) man pages for more information.

   ---

   **Note –** Refer to the proper Xservers(1) man page for more Xservers information.

# Xinerama

Xinerama is an X Window system feature available in Solaris 8 system software and subsequent compatible releases for Sun graphics boards including the Sun XVR-4000 graphics accelerator.

## Using Xinerama

When the window system is started in Xinerama mode, all windows can be seamlessly moved across screen boundaries, thus creating one large, super high-resolution, virtual display. With Sun OpenGL 1.3 for Solaris or subsequent compatible releases, this functionality is extended to OpenGL applications. No recompilation is necessary for a legacy application to work with Xinerama mode across multiple screens, even if the application was compiled with an older version of Sun OpenGL for Solaris.

1. **To enable Xinerama mode (single logical screen) on multiscreen displays, add** `+xinerama` **to the** `Xsun` **command line in the** `/usr/dt/config/Xservers` **file.**

   As superuser, type:

   ```
   # cd /etc/dt/config
   # vi + Xservers
   ```

2. **Modify the** `Xservers` **file.**

   Enter the `Xservers` file content in one long line:

   ```
   :0  Local local_uid@console root /usr/openwin/bin/Xsun +xinerama
   -dev /dev/fbs/zulu0 -dev /dev/fbs/zulu1
   ```

   ---

   **Note –** Do *not* use `zulu0a` or `zulu0b` in Xservers while using Xinerama. Xinerama is only supported on the master display device, `zulu0`. `-doublewide` or `-doublehigh` on `zulu0` is the preferred method for enabling both screens on one graphics accelerator.

   ---

   You can run Xinerama on `zulu0` and `zulu1` and have both in `-doublewide` (or `-doublehigh`) mode to display on four screens.

Sun OpenGL 1.3 for Solaris is part of the installation script when the Sun XVR-4000 graphics accelerator software is installed.

There is some performance degradation when using Xinerama. "Two Video Streams Sharing a Large Frame Buffer" on page 40, in Chapter 6, describes an alternative to Xinerama, useful in some cases, that does not incur this performance penalty.

## Restrictions When Using Xinerama

- Sample density is irrelevant to Xinerama. Therefore, screens of different sample density can be combined using Xinerama.
- Two screens must have the same visuals to be combined using Xinerama. In practice, this means they must be the same device (family).
- Two screens that the X Window system thinks are side by side must have the same height to be combined using Xinerama.
- Two screens that the X Window system thinks are above and below must have the same width to be combined using Xinerama.

# Using Sun XVR-4000 Graphics Accelerator Features

This chapter provides Sun XVR-4000 graphics accelerator feature information.

- "Man Pages" on page 37
- "`-outputs` Port Mapping" on page 38
- "Streaming Methods" on page 40
- "Setting Up Streaming Methods" on page 42
- "Multicard Setup" on page 44
- "Multisample Antialiasing" on page 45
- "Controlling Jitter and Filtering" on page 49
- "Checking Device Configuration" on page 51

# Man Pages

The Sun XVR-4000 graphics accelerator man pages describe how you can query and set frame buffer attributes such as screen resolutions and visual configurations.

Use the fbconfig(1M) man page for configuring all Sun graphics accelerators. SUNWzulu_config(1M) contains Sun XVR-4000 device-specific configuration information.

Use the fbconfig -help option to display the attributes and parameters information of the man page.

```
host% fbconfig -dev zulu0 -help
```

● **To access the** `fbconfig` **man page, type:**

```
host% man fbconfig
```

● **To access the** `SUNWzulu_config` **man page, type:**

```
host% man SUNWzulu_config
```

# `-outputs` Port Mapping

The Sun XVR-4000 graphics accelerator contains two 13W3 output port connectors. The `-outputs` port mapping options correspond to the 13W3A and 13W3B ports as designed on the Sun XVR-4000 graphics accelerator back panel (FIGURE 6-1). The 13W3B output port is to the left of the 13W3A output port.
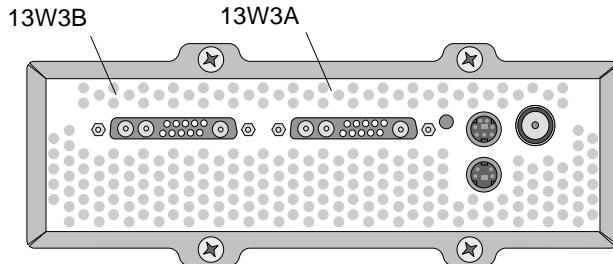


**FIGURE 6-1**    Sun XVR-4000 Graphics Accelerator Back Panel

FIGURE 6-2 shows the four `-outputs` options: direct, swapped, Stream A, and Stream B.

-outputs direct (default)

Direct

Stream B (if any)          Stream A

13W3B  13W3A


-outputs swapped

Swapped

Stream A          Stream B (if any)

13W3B   13W3A


-outputs streamA

Stream A

Stream A

13W3B    13W3A


-outputs streamB

Stream B

Stream B

13W3B   13W3A
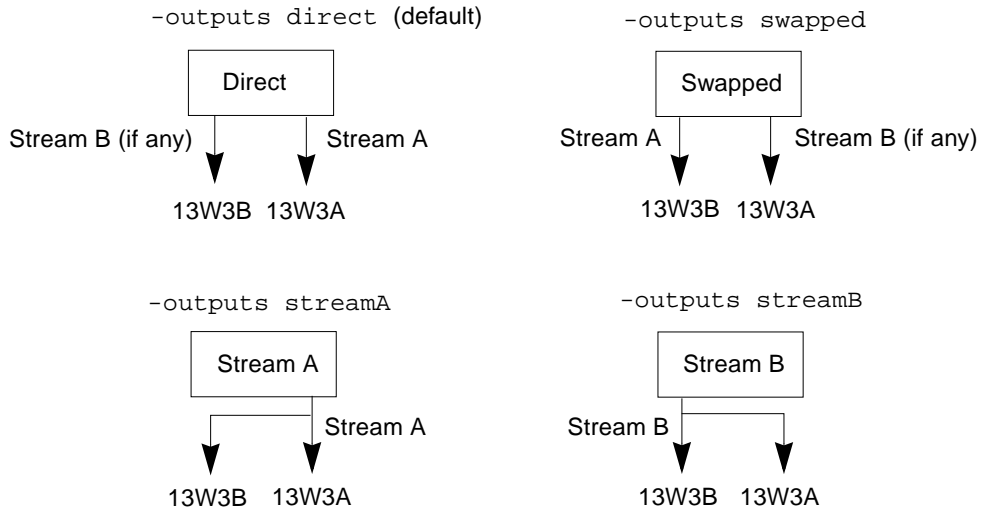
**FIGURE 6-2**   Output Port Mapping (-outputs)

The X Window system screen locations determine the side of the monitor the cursor must be moved to in order to cause it to appear on a second monitor. The X Window system screen locations do not change when fbconfig sets -outputs. -outputs determines the output display devices while the X Window system states the graphics accelerator frame buffer managed areas (X Window screens). When you set or change fbconfig -outputs, the graphics accelerator frame buffer X Window screens remain the same for the new devices.

**Note –** The -outputs option is overridden when one stream is an S-video stream. See Appendix B for S-video information.

The SUNWzulu_config(1M) man page contains information regarding the -outputs options.

# Streaming Methods

There are three methods described in this section for streaming video from which to choose with the Sun XVR-4000 graphics accelerator. All are subject to `-outputs` port mapping (see "`-outputs` Port Mapping" on page 38). The following section, "Setting Up Streaming Methods" on page 42, describes how to set up these streaming methods.

## Single Video Output Stream

- Benefits – Maximum resolution (1920 × 1200) and/or sample density
- Drawbacks – None

```
┌─────────────────────────────────────┐
│                                      │
│            Frame buffer              │
│                                      │
└─────────────────────────────────────┘
                    │    Stream A
                    │
                    ▼
          Selected -outputs
```
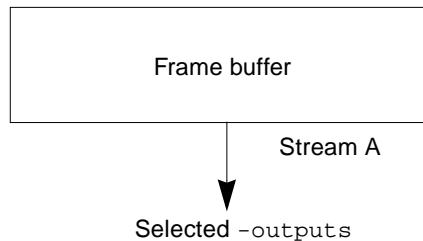
Use the `fbconfig -outputs` option to choose the 13W3 output port for receiving the video stream, or to enable the same video stream to flow out of both 13W3 output ports.

## Two Video Streams Sharing a Large Frame Buffer

Two outputs are active where one large frame buffer is displayed across both display devices.

- Benefits – Two monitor support without the use of Xinerama software.
  Can move windows between screens or span a window across screens.
- Drawbacks – Fewer samples per pixel are available when the frame buffer memory is used to support twice as many pixels.
  Both resolutions and sample densities must be identical.

```
                  ┌─────────────────────────────────┐
                  │                                 │
                  │          Frame buffer           │
                  │                                 │
                  └─────────────────────────────────┘
                        │                   │
                     Stream A            Stream B
                        │                   │
                        ▼                   ▼
                        Selected -outputs
```
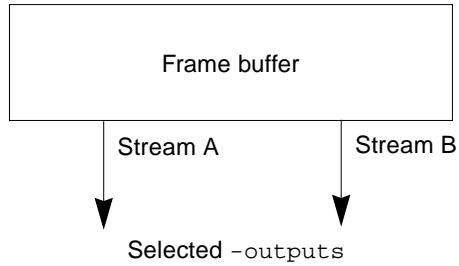
## Two Independent Video Streams

Two outputs are active and independent.

- Benefits – Support for two monitors.
  The resolutions and sample densities need not be identical.
  Each stream has 64 dedicated window IDs (WIDs) and four color maps.
- Drawbacks – Cannot move windows between displays (no Xinerama mode).
  Slowest mode of operation.

```
        ┌─────────────────┐     ┌─────────────────┐
        │                 │     │                 │
        │   Frame buffer  │     │   Frame buffer  │
        │                 │     │                 │
        └─────────────────┘     └─────────────────┘
                 │                       │
              Stream A                Stream B
                 │                       │
                 ▼                       ▼
                  Selected -outputs
```
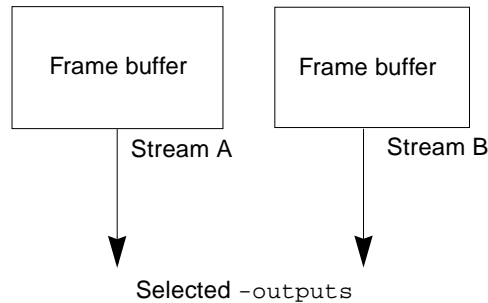
# Setting Up Streaming Methods

## Setting Up Single Video Output (Default)

This procedure enables a single video stream to come out of the selected -outputs.

To set up single video output, do the following:

1. **If enabled, disable doublewide mode and re-enable maximizing sample density by using** -samples max **or** -defaults**:**

```
host% fbconfig -dev zulu0 -defaults
```

2. **Set the desired screen resolution:**

```
host% fbconfig -dev zulu0 -res SUNW_STD_1280x1024x76
```

To find all possible Sun XVR-4000 graphics accelerator resolutions, type:

```
host% fbconfig -res \?
```

## Setting Up Two Video Streams Over One Large Frame Buffer

This procedure enables two-monitor support without the use of Xinerama software. This means that the Sun XVR-4000 graphics accelerator creates one wide (or tall) frame buffer, displayed across two screens.

1. **Enable both streams, sharing a single frame buffer, and set the sample density**:

```
host% fbconfig -dev zulu0 -doublewide enable -samples max
```

Use the -doublehigh option for displays that are set one above the other (rather than side-by-side as for the -doublewide option).

2. **Set the desired screen resolution:**

```
host% fbconfig -dev zulu0 -res SUNW_STD_1280x1024x76
```

# Setting Up Two Independent Video Streams

This procedure enables independent resolution and sample density for each stream.

**Note –** This streaming method is not supported in Xinerama. X Window system and Sun OpenGL for Solaris performance might be noticeably degraded in this mode. Many resources (for example, color LUTs and WID entries) are managed independently and the two streams compete with each other.

Set up two video streams over one large frame buffer whenever possible for a dual stream configuration.

1. **Select an independent screen resolution (and sample density, if desired) for each frame buffer:**

```
host% fbconfig -dev zulu0a -res SUNW_STD_1280x1024x76
host% fbconfig -dev zulu0b -res SUNW_STD_1152x900x66
```

You can mix any resolutions (TABLE 2-1 on page 10) at appropriate sample densities (see "Multisample Antialiasing" on page 45).

2. **To enable both streams, both devices** /dev/fbs/zulu0a **and** /dev/fbs/zulu0b **must appear in the** /etc/dt/config/Xservers **file.**

As superuser, type:

```
# cd /etc/dt/config
# vi + Xservers
```

3. **Modify the** Xservers **file.**

Enter the Xservers file content in one long line.

```
:0 Local local_uid@console root /usr/openwin/bin/Xsun –dev
/dev/fbs/zulu0a –dev /dev/fbs/zulu0b
```

If both devices are configured to use maximum sample density (the default), the first stream will use many more samples than the second stream. These may be made equal by limiting the first stream (or both) using the `fbconfig -samples` option.

# Multicard Setup

To use three (or four) video streams (monitors), you need to use two graphics boards. You may link those boards with Xinerama.

With three streams, one would be doublewide (or doublehigh) and one would be "normal." For four streams, both would be doublewide. For example, here are the steps to create the following monitor setup:

`zulu0` left (13W3A) to monitor 1
`zulu0` right (13W3B) to monitor 2
`zulu1` left (13W3A) to monitor 3
`zulu1` right (13W3B) to monitor 4

1. **Configure each Sun XVR-4000 graphics accelerator as follows:**

```
host% fbconfig -dev zulu0 -doublewide enable
host% fbconfig -dev zulu1 -doublewide enable
```

2. **Put both devices in the** `Xservers` **file.**

   As superuser, type:

```
# cd /etc/dt/config
# vi + Xservers
```

3. **Modify the** `Xservers` **file.**

   Enter the `Xservers` file content in one long line. You may link the two graphics boards together with Xinerama by adding the `+xinerama` option, as shown.

```
:0   Local local_uid@console root /usr/openwin/bin/Xsun +xinerama
-dev /dev/fbs/zulu0 -dev /dev/fbs/zulu1 top
```

In this example, you need to include `top` to indicate that `zulu1` is above `zulu0`, as shown in FIGURE 6-3 on the left. Without `top` included, the X Window system arranges the monitors linearly, left to right, as shown below on the right:

| Monitors arranged above each other | | |
|---|---|---|
| zulu1 | zulu1 left | zulu1 right |
| zulu0 | zulu0 left | zulu0 right |

| Monitors arranged linearly | | | | |
|---|---|---|---|
| zulu0 left | zulu0 right | zulu1 left | zulu1 right |
| zulu0 | | zulu1 | |
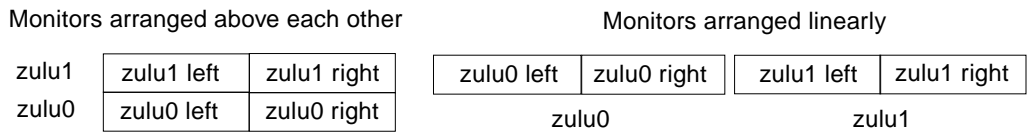
**FIGURE 6-3**   Multicard Setup Example

# Multisample Antialiasing

Multisampling (full-scene multisample antialiasing) removes the jagged edges on 3D data. An image is sampled at a higher resolution than the screen's resolution, typically four to 16 samples per pixel. This method yields improved images, but at the price of possible increased render time.

The Sun XVR-4000 graphics accelerator has 144 Mbytes of memory for the frame buffer so that the image can be multisampled at up to 16 samples per pixel in a single pass, depending on the resolution. The higher number of samples per pixel, the better the image quality but the longer the rendering time (and the more memory is consumed). Depending on the screen resolution (TABLE 6-2), the number of samples per pixel can be increased to improve image quality.

To invoke multisampling, use the `fbconfig` command `-multisample` and `-samples` options and, if necessary, environment variables. You can enable multisample mode for a particular OpenGL application or for all OpenGL applications.

`fbconfig` controls frame buffer memory consumption (at the time the X Window system starts). Environment variables can control whether an OpenGL application renders to all samples or only to pixels.

When multisampling is enabled and sample density is 1, OpenGL filtering and jitter can be applied although jitter is not recommended at low sample densities (see "Controlling Jitter and Filtering" on page 49). When multisampling is disabled, filtering and jitter are disabled. For non-OpenGL windows, multisampling is always disabled.

# Multisampling

Multisample allocation occurs at startup/configuration load time. The configuration samples-per-pixel parameter specifies the depth that is pre-allocated. TABLE 6-1 describes the `fbconfig -multisample` options.

```
-multisample [forceon | available | disable]
```

**TABLE 6-1**  Multisample Option Descriptions

| Option | Description |
| --- | --- |
| forceon | All Sun OpenGL for Solaris applications are rendered using multisampling. `forceon` is the default. (`force` is an acceptable abbreviation for this option.) `auto` is an alias for `forceon`. |
| available | Multisample is possible but is selected on a per application basis. `enable` is an alias for `available`. |
| disable | No multisample is possible. Filter and jitter are also disabled. This option, therefore, differs from `-samples 1` option. |

# Sample Sizes

`-samples` specifies the number of samples per pixel to allocate when multisample is not set to `disable`. The maximum sample size is 16 samples per pixel. Using `fbconfig -samples max`, sample size is automatically allocated based on the frame buffer memory and video resources available to the stream as the window system starts up. Allowable choices are 1 to 16 or `max`, but a very high sample density can be allocated only at low resolution. Setting sample density to 1 is not equivalent to disabling multisampling; samples will still be subject to filtering and jitter. See "Disabling Multisampling" on page 48.

TABLE 6-2 lists how many samples per pixel are supported at various resolutions:

**TABLE 6-2**  Representative Multisampling Support

| Resolution | Single Display | Dual Display | Stereo | Stereo (Dual) |
| --- | --- | --- | --- | --- |
| 1920 × 1200 | 4 | 2 | | |
| 1600 × 1200 | 5 | 2 and 3<br>(2 at 75 hz) | | |
| 1600 × 1000 | 6 | 3 | | |
| 1280 × 1024 | 8<br>(7 at 85 hz) | 4<br>(3 at 85 Hz) | 4 | 2 |

**TABLE 6-2**    Representative Multisampling Support *(Continued)*

| Resolution | Single Display | Dual Display | Stereo | Stereo (Dual) |
|---|---|---|---|---|
| $1152 \times 900$ | 9 | 5 and 4 | 4 | 2 |
| $1024 \times 768$ | 11 | 5 | 6 | 3 |
| $960 \times 680$ | | | 7 | 4 and 3 |
| $800 \times 600$ | 15 | 7 | | |
| $640 \times 480$ | 16 | 9 | | |

# Enabling Multisampling for All OpenGL Applications

1. **Use** `fbconfig` **to enable all OpenGL application windows for multisampling.**

   ```
   host% fbconfig -dev zulu0 -multisample forceon -samples max
   ```

   This option enables multisampling for all OpenGL applications. This is also the default, you can select by typing:

   ```
   host% fbconfig -dev zulu0 -defaults
   ```

2. **Log out, then log back in to restart the X Window system for the changes to take effect.**

# Enabling Multisampling for a Specific OpenGL Application

This section describes interfaces to control multisampling when `fbconfig` multisampling is set to `available` (see TABLE 6-1). While multisampling is set to `forceon` or `disable`, these interfaces will be ignored.

To enable multisampling in an OpenGL program when `fbconfig` multisampling is set to `available`, use `glXChooseVisual` to select a multisampled visual. Then the application can use `GL_ARB_multisample` to switch its use of multisampling on and off. See `http://www.opengl.org` for information on OpenGL programming.

For applications that do not perform these calls, multisampling can be controlled using environment variables.

1. **Use** `fbconfig` **to enable multisampling.**

```
host% fbconfig -dev zulu0 -multisample available -samples max
```

2. **Log out, then log back in to restart the X Window system for the changes to take effect.**

3. **Start your application.**

   The Sun OpenGL for Solaris displays a message such as the following

```
ogl_zfb: Auto multisample buffer mode
```

   If multisampling is not needed at this time, it is more efficient to select a single-sampled (non-multisampling) visual than to disable multisampling using `GL_ARB_multisample`.

## Disabling Multisampling

When you disable multisampling, no multisample rendering is possible. Only one sample per pixel is allocated, despite any `-samples` option value. Display filtering and jitter is also disabled, as discussed in the next section.

1. **To disable multisampling, type:**

```
host% fbconfig -dev zulu0 -multisample disable
```

---

**Note –** Setting sample density to 1 is *not* equivalent to disabling multisampling; setting sample density to 1 is still subject to filtering and jitter, where disabling multisampling is not.

---

2. **Log out, then log back in to restart the X Window system for the changes to take effect.**

# Controlling Jitter and Filtering

The following briefly describes jitter and filtering, which are set through `fbconfig`. See the `SUNWzulu_config(1M)` man page for more details.

## Jitter

Jitter indirectly determines the subpixel (X,Y) locations of the samples stored in the sample buffer. The sample density also affects the sample locations. TABLE 6-3 describes the `fbconfig -jitter` options.

```
-jitter [regular | random | permuted | auto]
```

**TABLE 6-3**    `-jitter` Options

| Option | Description |
|---|---|
| regular | Samples are regularly-spaced both vertically and horizontally. However, the sample locations may differ between even and odd pixels (repeating every 2 pixels in X and Y). |
| random | Samples are pseudo-randomly spaced within the pixel. The sample locations repeat every 2 pixels in X and Y. |
| permuted | Samples are pseudo-randomly spaced within the pixel, and also permuted (stirred) in hardware so that the sample locations repeat every 128 pixels in X and Y. At *moderate to high sample density,* this choice can improve visual quality. At *low sample densities,* straight lines or edges might appear jagged. |
| auto | Automatically selects the best jitter option for the current sample density. This is the default. |

Because the subpixel locations of samples within pixels varies from pixel to pixel, windows containing multisampled graphics should be redrawn after they are moved. Until the application redraws the window, the window displays a crude approximation of the original contents; straight lines or edges may appear jagged.

3D applications started after changing the `-jitter` option parameters will look correct. Any 3D applications running when jitter is changed should be restarted. You do not need to restart the window system.

# Filtering

Filtering accesses samples from a buffer segment (A or B) of a sample buffer and generates video pixels for display. You may select from the predefined `fbconfig` `-filter` options listed in TABLE 6-4.

```
-filter [cylinder | gaussian | mitchell | catmull]
-filter_file filter_filename
```

**TABLE 6-4**    `-filter` Options

| Option | Description |
| --- | --- |
| `cylindrical` | Poorest visual quality, most like a box filter. |
| `gaussian` | Blurriest. Suitable for users who wish to forego detail to avoid all visible sampling artifacts. |
| `mitchell` | The best photo-realistic compromise between sharp detail and noticeable blurriness. This filter is the default. |
| `catmull` | The Catmull-Rom filter produces images a little sharper than Mitchell, but the images are more likely to have visible sampling artifacts, widely known as "jaggies". |

The `-filter_file` option enables users to provide their own filter by producing a filter file and copying or linking it into directory
`/etc/openwin/server/etc/filters`
or
`/usr/openwin/server/etc/filters`
(Both directories are writable only by superuser by default.)

The `filter_filename` must not start with "/" or "../" nor contain the substring "/../", but may contain subdirectory components.

Filters with negative weights (often called "negative lobes") cause a video pixel to be the result of subtracting a portion of nearby samples. Negative lobe filters provide antialiasing while still preserving details such as edges. However, they can produce artifacts near the edges of light and very dark colors (for example, light objects on a black background). Negatively weighting a color component can lead to a video pixel component less than 0, which must be clamped to black; there is no color blacker than black. The clamping leads to visual artifacts. When using filters with negative lobes, the background color components should be greater than the filter's negative lobes. The Mitchell filter has negative lobes less than 3.7%; Catmull, less than 7.5%. (For the Catmull example, if the maximum color component used in the scene is 1.0, no significant area should have a color component less than .075.)

# Checking Device Configuration

Use `fbconfig` to check the X Window system (`-propt`) and the Sun XVR-4000 graphics accelerator (`-prconf`) device configuration values. The `fbconfig -propt` option displays the values of all options (for the specified device) saved in the `OWconfig` file. These are the values the X Window system uses the next time it starts on that device.

```
host% fbconfig -dev zulu0 -propt

--- OpenWindows Configuration for /dev/fbs/zulu0 ---

OWconfig File: machine

Card:
        Double(wide/high):      disable
        Stream to Port Mapping: direct (Stream A to Port A; B to B)
        Clearpixel Value:       255

Managed Area:
        Resolution:             SUNW_NTSC_640x480x60
        Samples Per Pixel:      max
        Multisample Mode:       forceon
        Jitter Table:           auto

Video Streams:
   Stream A:
        Offset (x,y):           (0, 0)
        Gamma Correction Value: 2.22
        Filter Type:            mitchell

   Stream B:
        Offset (x,y):           (0, 0)
        Gamma Correction Value: 2.22
        Filter Type:            mitchell

Framelock:
        Framelock/Stereo Port:  Output from Stream A
        Stream A Sync:          Free Run (no frame sync)
        Stream B Sync:          Free Run (no frame sync)
```

The fbconfig -prconf option displays the current Sun XVR-4000 graphics accelerator device configuration, including version numbers of each class of chip and the actual sample density. (When the sample density is max, -prconf output tells what density was achieved.) If certain values differ from those displayed in -propt, it is because those values have been configured since the X Window system started.

```
host% fbconfig -dev zulu0 -prconf

--- Hardware Configuration for /dev/fbs/zulu0 ---
Type:   XVR-4000 Graphics Accelerator
Part:   501-5588

Memory:
        MAJC:           128MB
        Texture:        1GB total
        3DRAM64:        10.0M samples

Versions:
        Fcode 1.18    MCode 1.4       MAJC 2.1
         FBC3 3.0     Master 1.0   Convolve 0.0
        Sched 1.0       I/O 0.0       FPGA 1.0

Power Level:
        Monitor Power:  On
        Board Power:    On

Video Streams:
   Stream A:
        Current resolution setting:
        Flags:  Default Primary
        Monitor/EDID data (13W3)
                Monitor Manufacturer: SUN
                EDID:  Version 1, Revision 3

   Stream B:
        Current resolution setting:
        Flags:  None
        Monitor/EDID data (13W3)
                EDID Data: Not Available
```

# Framelocking Sun XVR-4000 Graphics Accelerators

This chapter describes framelocking multiple Sun XVR-4000 graphics accelerators and buffer swap synchronization.

# Sun XVR-4000 Graphics Accelerator Framelock System

The framelock synchronization feature enables vertical retracing to occur simultaneously on each Sun XVR-4000 graphics accelerator subsystem. The framelock cable is used to daisy-chain two or more Sun graphics accelerator subsystems, such as Sun XVR-500, Sun XVR-1000, and Sun XVR-4000 graphics accelerators. Vertical retrace synchronization eliminates flicker between multiscreen displays. You can framelock two or more Sun XVR-500, Sun XVR-1000, and Sun XVR-4000 graphics accelerator subsystems across one or more computer systems.

Framelocking is often necessary when running multiple stereo displays for the same observer. All the displays must be synchronized so that the left and right views can be seen correctly through one set of LCD stereo glasses.

When using framelock with genlock (Chapter 7), the vertical reset is always received on the same video line. The slave cannot gain or drop a line of video with respect to the master display device when genlocked. Use framelock and genlock together for optimal synchronization performance.

When frame buffers are framelocked, make sure they are all running at the exact same vertical retrace rate. This is normally achieved by selecting the same video format (resolution and refresh rate) (see `fbconfig -help` for details). See "Enabling Framelocking on Graphics Accelerators" on page 59.

To use the framelock features, the framelock cable is required. See "Framelock Cable" on page 61.

To order the framelock cable, call Sun telesales at 1-800-786-0404 and request spare part number 530-2754. You can also order the framelock cable through the Sun store (`http://store.sun.com`) by ordering this part number under spare parts.

By default, two video streams from separate Sun XVR-4000 graphics accelerators are *not* framelocked. The only exception is two streams from `doublewide` or `doublehigh` mode, on a single Sun XVR-4000 graphics accelerator; these are inherently framelocked.

# Buffer Swap Synchronization

Buffer swap synchronization enables a simultaneous swap of buffer memory contents on all Sun XVR-4000 graphics accelerator subsystems, no matter which of the accelerators finishes rendering its scene content last. This maintains continuity between scenes on all displays linked together by the framelock cable. The display can be a monitor or a large wall screen image displayed by a projector. See "Creating a Multiscreen Application" on page 55 in this section for an outline for creating a multiscreen application.

The software Buffer Swap Synchronization algorithm shown on page 55 is implemented by Sun's Xinerama support. Applications opening a window on a Xinerama virtual frame buffer need not be concerned with this synchronization.

# Creating a Multiscreen Application

The following is a programming example of how to create a Buffer Swap Synchronization (multiscreen) application.

## ▼ Creating the Main Program

1. **Create *n* full screen windows, one per screen.**

2. **Create *n* rendering threads and associate one thread per screen.**

3. **Create a master thread to synchronize rendering threads.**

4. **Execute the main window system event loop.**

## ▼ Using the Master Thread Run Method

Do the following in a loop:

1. **Notify all rendering threads to render a frame (possibly in response to an event).**
   Wait for all rendering threads to finish rendering.

2. **Notify all rendering threads to swap buffers.**
   Wait for all rendering threads to finish swapping.

## ▼ Using the Render Thread(s) Run Method

1. **Create OpenGL context for this thread's window.**

2. **Make context current to this thread.**

3. **Initialize OpenGL context state.**

4. **Do the following in a loop:**

   a. **Wait for master thread notification.**

   b. **Render image to back buffer for this screen.**

   c. **Notify master thread that this thread is done rendering.**

   d. **Wait for master thread notification.**

   e. **Swap buffers.**

   f. **Notify master thread that this thread is done swapping.**

# Connecting the Framelock Cable

Cable the Sun graphics accelerators to be framelocked before configuring your system for framelock (described in "Enabling Framelocking on Graphics Accelerators" on page 59).

1. **Locate the master Sun XVR-4000 graphics accelerator I/O back panel on the rear of your Sun Fire V880z server and its stereo/framelock DIN7 connector (**FIGURE 7-1**).**



13W3B       13W3A           Stereo/framelock (DIN7)
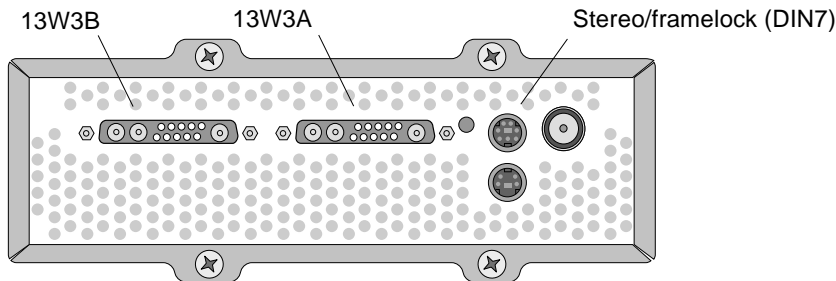
**FIGURE 7-1**    Sun XVR-4000 Graphics Accelerator Stereo∕Framelock Connectors

2. **Connect the framelock cable master connector to the stereo/framelock DIN7 connector (**FIGURE 7-2**).**

3. **Connect the slave cable connector to a slave Sun XVR-4000 graphics accelerator stereo/framelock DIN7 connector.**

   If the framelock cable is not long enough, you can use a standard 7-pin DIN extender cable between the slave connector of the framelock cable and the DIN7 connector on the slave system.

4. **(Optional) If you are synchronizing additional Sun XVR-4000 graphics accelerators:**

   a. **Connect an additional framelock cable master connector to the framelock cable daisy-chain/stereo connector (**FIGURE 7-2**).**

   b. **Connect the new slave cable connector to the next graphics board to be framelocked. Stereo glasses may be attached to the final daisy-chain/stereo connector.**

---

**Note –** While the Sun XVR-4000 graphics accelerator supports both tethered and wireless stereo glasses, wireless stereo glasses *without* an external power supply are *not* supported. Connect the transmitter DIN7 connector to the framelock cable daisy-chain/stereo connector (FIGURE 7-2).

---

FIGURE 7-2 shows the master Sun XVR-4000 graphics accelerator in slot B of the Sun Fire V880z server. The first slave Sun XVR-4000 graphics accelerator is in slot C. The second slave is in Slot B of another Sun Fire V880z server
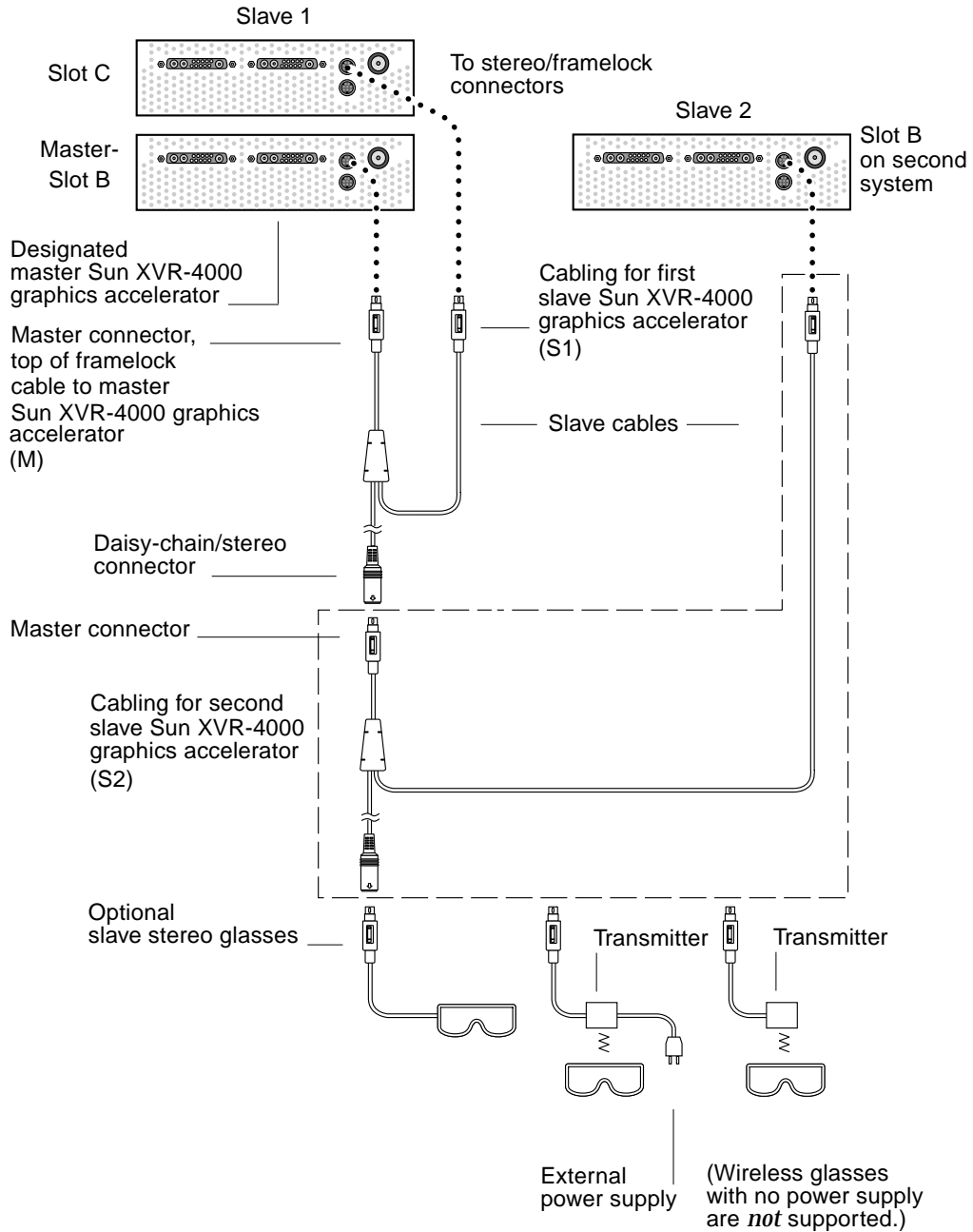
**FIGURE 7-2**   Sun XVR-4000 Graphics Accelerator and Framelock Cable

# Enabling Framelocking on Graphics Accelerators

This example uses the Sun XVR-4000 graphics accelerator and the device names `zulu0` and `zulu1`. When framelocking with other graphics accelerators such as Sun XVR-500 and/or Sun XVR-1000 graphics accelerators, use the appropriate device names.

1. **Designate a Sun XVR-4000 graphics accelerator as the master display device.**

   You may use the Sun XVR-4000 graphics accelerator that serves as the boot/console head for that system.

   You may select any device (that is, `zulu0`, `zulu1`, ... and so on) to be the master Sun XVR-4000 graphics accelerator device.

   ---
   **Note –** `zulu0` is likely to be in slot B, the lower of the two slots that can contain a Sun XVR-4000 graphics accelerator. Be sure that you are aware of the devices in the I/O back panel slot.

   ---

2. **Make sure that each Sun XVR-4000 graphics accelerator installed is running a video format with an identical frame refresh rate to the video format running on the Sun XVR-4000 accelerator in master mode.**

   a. **Check the resolution of a Sun XVR-4000 graphics accelerator by using the `fbconfig` command.**

   ```
   host% fbconfig -dev zulu0 -prconf
   ```

   You must repeat this command for each Sun XVR-4000 graphics accelerator in the system or systems.

b. **Change the resolution of a Sun XVR-4000 graphics accelerator using the** `fbconfig` **command.**

If the resolution on each Sun XVR-4000 graphics accelerator is not the same, you must change it to match the Sun XVR-4000 graphics accelerator in master mode. You must configure each board separately (that is, for `zulu0`, `zulu1`, and so on). The resolution shown below is an example only, you can use different video formats such as `SUNW_STD_1600x1000x66` (TABLE 2-1).

```
host% fbconfig -dev zulu0 -res SUNW_STD_1280x1024x76
host% fbconfig -dev zulu1 -res SUNW_STD_1280x1024x76
```

Log out of the X Window system, and then log back in for the resolutions to take effect. If you do *not* wish the framelock synchronization to be repeated when the X Window system restarts, simply exit the window/desktop session instead of logging out, or disable framelock (see "Disabling Framelock" on page 61).

3. **Connect the framelock cables to each Sun graphics accelerator to be framelocked, if you have not already done so.**

**Note –** Do not enable any stream to be a slave without the framelock cable connected. Be sure the framelock cable slave connector is attached to the graphics board configured as a slave.

See the previous section "Connecting the Framelock Cable" on page 56.

Make sure to first connect the framelock cable master mode connector to the master graphics accelerator.

4. **Configure the master and slave devices for framelocking.**

In this example, `zulu0` is the framelock master device, and `zulu1` is the slave device.

```
host% fbconfig -dev zulu0 -master a -stream a -slave disable
host% fbconfig -dev zulu1 -stream a -slave enable external framelock
```

On the Sun XVR-4000 graphics accelerator system, you do *not* need to run these last two commands, setting each master and slave graphics board, each time you log into your X Window system.

The video output from `zulu1` might glitch when framelock is enabled. `zulu1` output will then be framelocked. It will start frames when the framelock master does.

# Disabling Framelock

---

**Note –** Disable framelock on all slave devices *before* removing the framelock cables.

---

● **To disable framelock, type:**

```
host% fbconfig -dev zulu1 -stream a -slave disable
```

# Framelock Cable

The framelock cable, FIGURE 7-3, is a Y-shaped cable with three connectors. Use this cable to daisy-chain multiple Sun XVR-4000 graphics accelerators within a computer system.
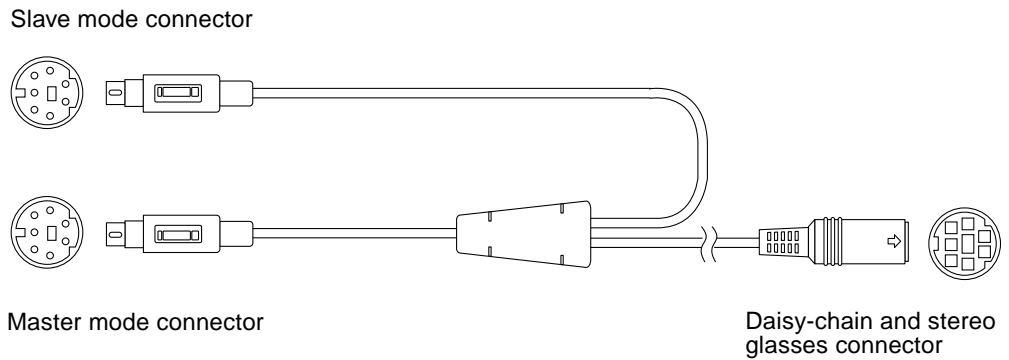
Slave mode connector



Master mode connector

Daisy-chain and stereo glasses connector

**FIGURE 7-3**    Framelock Cable

**TABLE 7-1**    Framelock Cable Connections

| Framelock Connector | Description |
| --- | --- |
| Master connector (shortest male cable) | Connects into the stereo connector located on the Sun XVR-4000 graphics accelerator that is designated as the master display device. Also plugs into the daisy-chain connector for slave Sun XVR-4000 graphics accelerators. |
| Slave connector (longest male cable) | Connects into the stereo connector located on the Sun XVR-4000 graphics accelerator that is designated as a slave device. |
| Daisy-chain/stereo glasses connector (female connector) | Can connect a pair of stereo glasses directly into this connector. Or the connector can be used to daisy-chain to other framelock cables for additional slave Sun XVR-4000 graphics accelerator devices. |

**Note –** There can only be one master Sun XVR-4000 graphics accelerator device. You must configure all other Sun XVR-4000 graphics accelerator devices as slaves. See the section "Enabling Framelocking on Graphics Accelerators" on page 59.

# Genlocking Sun XVR-4000 Graphics Accelerators

This chapter describes genlocking multiple Sun XVR-4000 graphics accelerators.

# Sun XVR-4000 Graphics Accelerator Genlock

Genlock and framelock are different methods of accomplishing synchronization of video timing between two computer graphics systems. Framelock synchronizes two video streams by asynchronously resetting the slave device is vertical timing, and does not guarantee that pixels are aligned in the two streams. This situation could result in dropped video lines.

Genlock, on the other hand, generates its pixel clock from the master video timing signals, using phase locked loop (PLL) techniques, so they each produce pixels at precisely the same rate, even if the master timing changes over time. Genlock currently requires the video formats to be identical in resolution and frame rate.

When using genlock with framelock (Chapter 7), the vertical reset is always received on the same video line. The slave cannot gain or drop a line of video with respect to the master display device when genlocked.

Sun XVR-4000 graphics accelerators in different systems may be genlocked. Be sure to issue the appropriate commands, video formats, and so on, to each system graphics accelerator to be genlocked.

You may obtain a standard 13W3-BNC cable, BNC-BNC cables, BNC-T connectors, and 76-ohm terminators at your local computer or video supply store.

# Connecting the Genlock Cable

Cable the Sun XVR-4000 graphics accelerators to be genlocked before configuring your system for genlock (described in "Enabling Genlocking for Graphics Accelerators" on page 67). It is best to have the Sun XVR-4000 graphics accelerators cabled for both framelock (Chapter 7) and genlock for circumstances where both may be required. If framelock is not in use, it does no harm to keep the framelock cables installed.

To genlock your master Sun XVR-4000 graphics accelerator to a slave graphics accelerator, you need a 13W3-BNC cable, BNC-T connector, BNC-BNC cables (for genlocking more than one slave device), and a BNC 75-ohm terminator. The 75-ohm terminator is required even when genlocking a single slave device.

1. **Locate the Sun XVR-4000 graphics accelerator I/O back panel on the rear of your Sun Fire V880z server and the 13W3 connector you will use as genlock master** (FIGURE 8-1).

You may use either the 13W3A or 13W3B connector for genlocking slave graphics boards. Use one for the master display device (for example, projector or monitor) and the other for genlocking slave display devices.
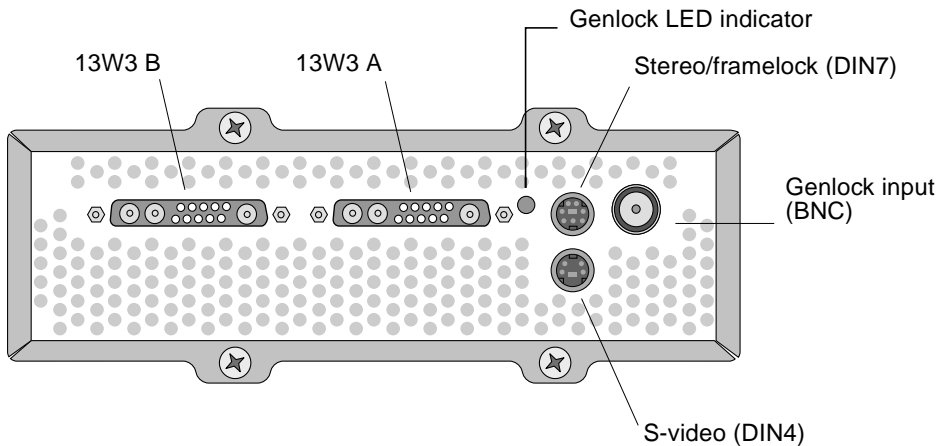


FIGURE 8-1    Sun XVR-4000 Graphics Accelerator 13W3 and Genlock Connectors

2. **Connect the 13W3 connector end of the genlock cable to the Sun XVR-4000 graphics accelerator 13W3 monitor connector selected for genlocking** (FIGURE 8-2**).**

3. **Attach a BNC-T connector to the slave back panel genlock/BNC connector of the Sun XVR-4000 graphics accelerator** (FIGURE 8-2**).**

   Repeat for each additional slave device to be genlocked.

4. **Connect the proper BNC connector end of the genlock cable to one end of the BNC-T connector** (FIGURE 8-2**).**

   The composite (or horizontal) synchronization signal is normally used for genlock and is typically the BNC connector on the black wire. If the synchronization signal of the master video format uses the `sync on green` option, use the BNC connector on the green wire. (The genlock 13W3-BNC cable also has red, green, blue or white BNC wires.) See TABLE 8-1 on page 70.

5. **For multiple slave devices, connect a BNC-BNC cable from the open end of the BNC-T connector on one graphics accelerator to the BNC-T connector of the next slave device.**

6. **Attach the 75-ohm terminator to the open BNC-T connector of the last slave device.**

FIGURE 8-2 shows the master Sun XVR-4000 graphics accelerator in Slot B of the Sun Fire V880z server. The first slave Sun XVR-4000 graphics accelerator is in Slot C. The second and third slaves are on two additional Sun Fire V880z servers.
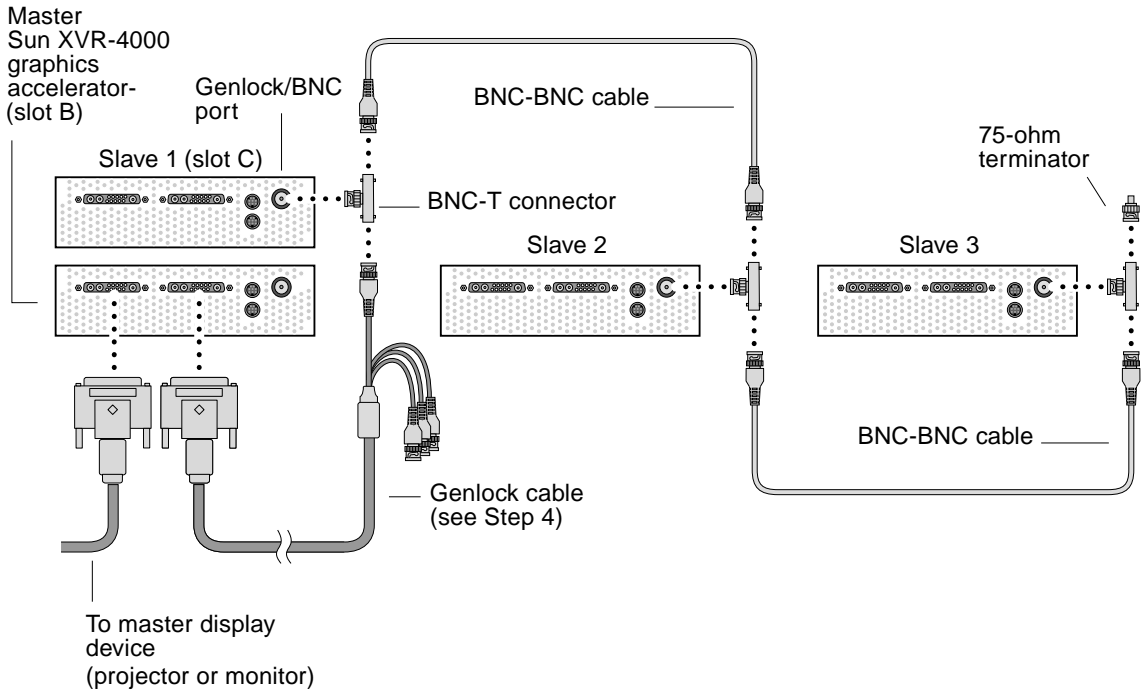


**FIGURE 8-2**   Sun XVR-4000 Graphics Accelerator Genlock Cabling

# Enabling Genlocking for Graphics Accelerators

This example uses the Sun XVR-4000 graphics accelerator and the device names `zulu0` and `zulu1`. When genlocking with other graphics accelerators, use the appropriated device names.

1. **Designate a Sun XVR-4000 graphics accelerator as the master.**

   You may use the Sun XVR-4000 graphics accelerator that serves as the boot/console head for that system.

   You may select any device (that is, `zulu0`, `zulu1`, ... and so on) to be the master Sun XVR-4000 graphics accelerator device. If both framelock and genlock are enabled, you must cable the same device to be master for both.

2. **Make sure that each Sun XVR-4000 graphics accelerator installed is running a video format with frame refresh rate identical to the video format running on the Sun XVR-4000 accelerator in master mode.**

   a. **Check the resolution of a Sun XVR-4000 graphics accelerator by using the `fbconfig` command.**

   ```
   host% fbconfig -dev zulu0 -prconf
   ```

   You must repeat this command for each Sun XVR-4000 graphics accelerator in the system or systems to be genlocked.

   b. **Change the resolution of a Sun XVR-4000 graphics accelerator using the `fbconfig` command.**

   If the resolution on each Sun XVR-4000 graphics accelerator is not the same, you must change it to match the Sun XVR-4000 graphics accelerator in master mode. You must configure each board separately (that is, for `zulu0`, `zulu1`, and so on). The resolution shown below is an example only, you can use different video formats such as SUNW_STD_1600x1000x66 (TABLE 8-1):

   ```
   host% fbconfig -dev zulu0 -res SUNW_STD_1280x1024x76
   host% fbconfig -dev zulu1 -res SUNW_STD_1280x1024x76
   ```

   Log out of the X Window system, and then log back in for the resolutions to take effect. If you do *not* wish the genlock or bothlock synchronization to be repeated when the X Window system restarts, simply `exit` the window/desktop session instead of logging out or disable genlock (see "Disabling Genlock" on page 72).

3. **Set the master and slave graphics boards.**

   You can enable genlock while the X Window system is running, however, you should first verify that the master device is initialized. (see Step 4).

   In this example, `zulu0` is the genlock master device, and `zulu1` is the slave device.

```
host% fbconfig -dev zulu0 -master a -stream a -slave disable -outputs streamA
host% fbconfig -dev zulu1 -stream a -slave enable genlock
```

   The `-outputs streamA` option directs the same video stream through both 13W3 device ports, sending the same stream simultaneously to a display device and to a slave graphics accelerator for genlocking. See Chapter 6, "`-outputs` Port Mapping" on page 38 for more information.

4. **Verify that the master device is initialized before the slave device is initialized.**

   If both devices are in the same system, the master device should appear before the slave device in the `Xservers` file. Where `zulu0` is the master device in this example, you can verify that `zulu0` is the first entry in the `Xservers` file `Xsun` command-line entry.

```
:0  Local local_uid@console root /usr/openwin/bin/Xsun -dev
/dev/fbs/zulu0 -dev /dev/fbs/zulu1
```

   If the master device is *not* initialized prior to the slave device in the `Xservers` file, then when the X Window system restarts on the slave device, the slave device genlock input connector will not recognize the master device. Therefore, the slave device attempt to genlock with the master device will fail.

   If the slave device is initialized first, the slave device will start up but without enabling genlock. You can then enable genlock for the slave device through the `fbconfig` command:

```
host% fbconfig -dev zulu1 -stream a -slave enable genlock
```

## Genlock Options

`fbconfig -genlock hphase` and `vphase` suboptions enable relative or absolute setting of horizontal and vertical phase, respectively. The horizontal phase allows a pixel offset between the external video format and the stream output. The vertical phase allows a scanline offset between the external video format and the stream output.

Refer to "Man Pages" on page 37 to access detailed descriptions of the –genlock suboptions through the SUNWzulu_config man page. This section also describes how to invoke fbconfig –dev zulu0 –help. You can use other –genlock suboptions to adapt genlocking to special (non Sun) video formats whose timing exactly matches that of a Sun video format.

# Genlock Limitations

Using only genlock (rather than bothlock) enables vertical synchronization with the genlock master source only for composite synchronization video formats, with serrations, for pixel clocks less than 150 Mhz. (All Sun video formats with composite synchronization include serrations.) For other video formats, genlock alone synchronizes the pixel frequency and horizontal phase, but not the vertical phase. Using bothlock instead of genlock achieves both horizontal and vertical types of alignment.

# Bothlock

Use bothlock to enable both genlock and framelock. Bothlock uses both genlock and framelock techniques and requires cabling for both (see Chapter 7 for framelocking).

## Bothlock Advantages

Bothlock is the only way to achieve both vertical and horizontal synchronization for a high-speed video format (pixel clock at or above 150 Mhz), or for a video format with separate synchronization (see TABLE 8-1). Bothlock is also recommended for other video formats whenever a framelock signal is available (that is, when the source is a Sun graphics accelerator with a Sun framelock/stereo connector).

## Setting Up Bothlock

● **To use** `bothlock`**, type:**

```
host% fbconfig -dev zulu0 -master a -stream a -slave disable -outputs streamA
host% fbconfig -dev zulu1 -stream a -slave enable external bothlock
```

On the Sun XVR-4000 graphics accelerator system, you do *not* need to run these last two commands, that is, setting each master and slave graphics board, each time you log into your X Window system.

# Screen Resolution Synchronization Attributes

TABLE 8-1 lists the proper synchronization attribute for each screen resolution. The table also lists the speed of the pixel clock for each resolution. For pixel clocks under 150 Mhz (indicated by "Slow" in the Pixel Clock Speed column of TABLE 8-1), genlock is sufficient for composite synchronization. For pixel clocks over 150 Mhz (indicated by "Fast" in TABLE 8-1), bothlock is recommended (see "Bothlock" on page 69). All Sun video formats with composite synchronization include serrations.

**TABLE 8-1**    Screen Resolution Synchronization Attributes

| Display resolution | Refresh rate (Hz) | Pixel Clock Speed | Synchronization Attribute | Acceptable for Genlock Alone | Video Format |
|---|---|---|---|---|---|
| 1920 × 1200 | 60d | Fast | Separate | No | SUNW_DIG_1920x1200x60 |
| 1920 × 1200 | 70, 75 | Fast | Composite | No | SUNW_STD_1920x1200x70 SUNW_STD_1920x1200x75 |
| 1920 × 1080 | 60d | Slow | Separate | No | SUNW_DIG_1920x1080x60 |
| 1920 × 1080 | 72 | Fast | Composite | No | SUNW_STD_1920x1080x72 |
| 1792 × 1344 | 60 | Fast | Separate | No | VESA_STD_1792x1344x60 |
| 1600 × 1280 | 76 | Fast | Composite | No | SUNW_STD_1600x1280x76 |
| 1600 × 1200 | 60d | Slow | Separate | No | SUNW_DIG_1600x1200x60 |
| 1600 × 1200 | 60, 75 | Fast | Separate | No | VESA_STD_1600x1200x60 VESA_STD_1600x1200x75 |
| 1600 × 1024 | 60 | Slow | Separate | No | SUNW_DIG_1600x1024x60 SUNW_DIG_1600x1024x60 |
| 1600 × 1000 | 76 | Fast | Composite | No | SUNW_STD_1600x1000x76 |
| 1600 × 1000 | 66 | Slow | Composite | Yes | SUNW_STD_1600x1000x66f |

**TABLE 8-1**    Screen Resolution Synchronization Attributes *(Continued)*

| Display resolution | Refresh rate (Hz) | Pixel Clock Speed | Synchronization Attribute | Acceptable for Genlock Alone | Video Format |
|---|---|---|---|---|---|
| 1440 × 900 | 76 | Slow | Composite | Yes | SUNW_STD_1440x900x76 |
| 1280 × 1024 | 96, 108d, 112 | Fast | Separate | No | SUNW_STEREO_1280x1024x96<br>SUNW_STEREO-DIG_1280x1024x108<br>SUNW_STEREO_1280x1024x112 |
| 1280 × 1024 | 85 | Fast | Separate | No | VESA_STD_1280x1024x85 |
| 1280 × 1024 | 60, 75 | Slow | Separate | No | VESA_STD_1280x1024x60<br>VESA_STD_1280x1024x75 |
| 1280 × 1024 | 67, 76 | Slow | Composite | Yes | SUNW_STD_1280x1024x67<br>SUNW_STD_1280x1024x76 |
| 1280 × 800 | 112 | Fast | Separate | No | SUNW_STEREO_1280x800x112 |
| 1280 × 800 | 76 | Slow | Composite | Yes | SUNW_STD_1280x800x76 |
| 1280 × 768 | 56 | Slow | Separate | No | SUNW_STD_1280x768x56 |
| 1152 × 900 | 120 | Fast | Separate | No | SUNW_STEREO_1152x900x120 |
| 1152 × 900 | 66, 76 | Slow | Composite | Yes | SUNW_STD_1152x900x66<br>SUNW_STD_1152x900x76 |
| 1024 × 692 | 100 | Slow | Separate | No | SUNW_STEREO_1024x692x100 |
| 1024 × 800 | 84 | Slow | Composite | Yes | SUNW_STD_1024x800x84 |
| 1024 × 768 | 96 | Slow | Separate | No | SUNW_STEREO_1024x768x96 |
| 1024 × 768 | 77 | Slow | Composite | Yes | SUNW_STD_1024x768x77 |
| 1024 × 768 | 60, 70, 75 | Slow | Separate | No | VESA_STD_1024x768x60<br>VESA_STD_1024x768x70<br>VESA_STD_1024x768x75 |
| 960 × 680 | 108, 112 | Slow | Composite | No † | SUNW_STEREO_960x680x108<br>SUNW_STEREO_960x680x112 |
| 800 × 600 | 75 | Slow | Separate | No | VESA_STD_800x600x75 |
| 768 × 575 | 50i | Slow | Composite | Yes | SUNW_INT_768x575x50 |
| 640 × 480 | 60fsc | Slow | Composite | No | SUNW_FSC_640x480x60 |
| 640 × 480 | 60, 72, 75 | Slow | Separate | No | VESA_STD_640x480x60<br>VESA_STD_640x480x72<br>VESA_STD_640x480x75 |
| 640 × 480 | 60i | Slow | Composite | Yes | SUNW_INT_640x480x60 |
| 640 × 480 | 50i | Slow | Separate | No | SUNW_PAL_640x480x50 |

† Master and slave devices may not display to the same eye simultaneously using genlock alone because the $960 \times 680$ video formats do not use a feature called "vertical sync elongation" to enable the fields to be distinguished. Using framelock as well as genlock solves this limitation.

## Genlock LED Indicator

The genlock LED indicator is located between the 13W3A and stereo connectors. The LED illuminates when the genlock input is present and matches the expected horizontal rate.
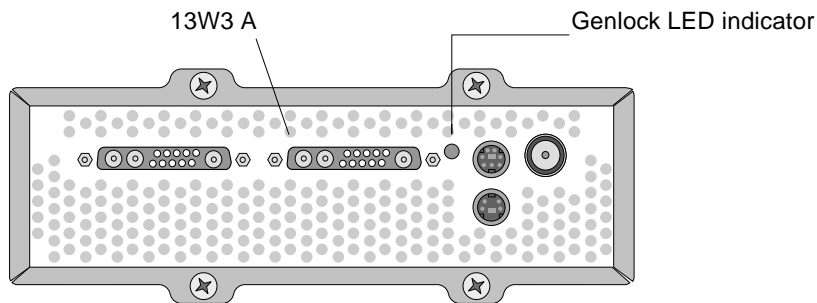


**FIGURE 8-3**    Sun XVR-4000 Graphics Accelerator Genlock LED

## Disabling Genlock

**Note –** You *must* disable genlock on *all* slave devices *before* doing any of the following:
• Removing the genlock cables
• Ceasing video on the master device (for example, rebooting or halting the master device system if the master device is in a different system than the slave device)
• Changing the video format for either the master or slave devices

● **To disable genlock (and framelock, if using** `bothlock`**) from a device, type:**

```
host% fbconfig -dev zulu1 -stream a -slave disable
```

# Setting the Default Console Display

These instructions describe how to set the Sun XVR-4000 graphics accelerator as the default monitor console display:

1. **At the** ok **prompt, type:**

```
ok show-displays
```

Information similar to the text below is displayed:

```
a) /pci@1f,0/SUNW,m64B@13
b) /pci@1f,0/pci@5/SUNW,XVR-4000@1
q) NO SELECTION
Enter Selection, q to quit: b
/pci@1f,0/pci@5/SUNW,XVR-4000@1 has been selected.
Type ^Y ( Control-Y ) to insert it in the command line.
e.g. ok nvalias mydev ^Y
    for creating devalias mydev for
/pci@1f,0/pci@5/SUNW,XVR-4000@1
ok nvalias mydev /pci@1f,0/pci@5/SUNW,XVR-4000@1
ok setenv output-device mydev
output-device = mydev
```

2. **Select the graphics board you want to be the default console display.**

   In the above example, you type **b** for the Sun XVR-4000 graphics accelerator.

3. **Create an alias name for the Sun XVR-4000 device:**

   This step is optional for all other systems. Creating the alias, however, simplifies future OpenBoot PROM commands.

   a. **Select the Sun XVR-4000 graphics accelerator device from the** show-displays **menu.**

**b. Name the Sun XVR-4000 graphics accelerator device.**

    **i. Use `nvalias` to name the device.**

    This example shows `mydev` as the device.

```
ok nvalias mydev
```

    **ii. Press Control-Y on your keyboard and then Enter.**

**c. Verify the alias.**

```
ok devalias
```

    The selected alias is then displayed.

You can now refer to `mydev` for the Sun XVR-4000 graphics accelerator device. For example:

```
ok setenv output-device mydev
```

**4. Reset the output-device environment:**

```
ok reset-all
```

**5. Connect your monitor cable to the Sun XVR-4000 graphics accelerator on your system back panel.**

6. **To set a resolution (for example, 1600 × 1000 × 76), type:**

```
ok setenv output-device mydev:r1600x1000x76
output-device=mydev:r1600x1000x76
```

Reset the system:

```
ok reset-all
```

You can get a list of available resolutions for your display device by typing the following:

```
ok cd /SUNW,zulu@1,0
ok .screen-resolutions
```

The following lists the supported resolutions:

| | | |
|---|---|---|
| r640x480x60 | r1280x1024x60 | r1920x1200x70 |
| r640x480x60i | r1280x1024x67 | r1920x1200x75 |
| r640x480x72 | r1280x1024x75 | |
| r640x480x75 | r1280x1024x76 | |
| r768x575x50i | r1280x1024x85 | |
| r800x600x75 | r1280x1024x112s | |
| r960x680x108s | r1440x900x76 | |
| r960x680x112s | r1600x1000x66 | |
| r1024x768x60 | r1600x1000x76 | |
| r1024x768x70 | r1600x1200x60 | |
| r1024x768x75 | r1600x1200x60d | |
| r1024x768x77 | r1600x1200x75 | |
| r1024x800x84 | r1600x1280x76 | |
| r1152x900x66 | r1792x1344x60 | |
| r1152x900x76 | r1856x1392x60 | |
| r1152x900x120s | r1856x1392x75 | |
| r1280x768x56 | r1920x1080x60d | |
| r1280x800x76 | r1920x1080x72 | |
| r1280x800x112s | r1920x1200x60d | |

**Note –** The S-video port cannot be used as the console.

# Setting Up S-Video

This appendix provides information for setting up S-video (NTSC and PAL video formats) on the Sun XVR-4000 graphics accelerator.

- "S-Video Graphical User Interface" on page 77
- "S-Video Output Only" on page 78
- "S-Video Along With Normal Video" on page 79
- "S-Video Overrides Output Port Mapping" on page 80
- "Using Two Sun XVR-4000 Graphics Accelerators" on page 81

## S-Video Graphical User Interface

This option allows the S-video port to capture any subregion of the normal video Stream A, after the window system is already running.

● **Use the** `svideotool` **GUI application to set up and select this subregion:**

```
host% /opt/SUNWvidtools/bin/svideotool
```

**Note –** Ensure that Stream B is not in use when you activate `svideotool.`

# S-Video Output Only

This option produces S-video only, and no display video on either 13W3 output port. FIGURE B-1 shows the location of the S-video DIN4 port.
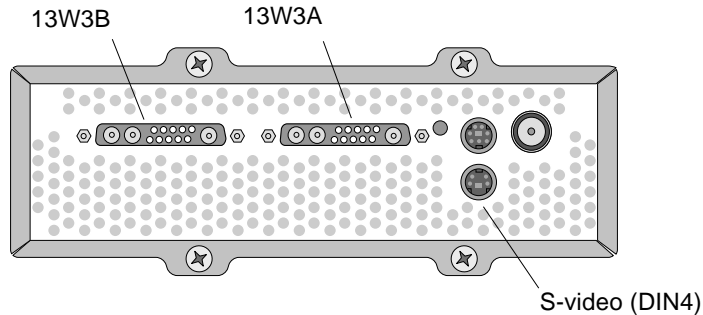


**FIGURE B-1**   Sun XVR-4000 Graphics Accelerator S-Video DIN4 Connector

This setup dedicates all memory and video resources of the graphics board to the S-video port. This approach is required to reach the maximum multisampling depth of 16 samples per pixel. Another board may be used if a large workspace is required for other purposes beyond the one $640 \times 480$ window.

---

**Note –** This procedure assumes that you are setting up the first board, named `zulu0`.

---

1. **Set the resolution on the second stream.**

   ■ For NTSC, type:

```
host% fbconfig -dev zulu0 -res SUNW_NTSC_640x480x60 -doublewide disable -samples
max
```

   ■ For PAL, type:

```
host% fbconfig -dev zulu0 -res SUNW_PAL_640x480x50 -doublewide disable -samples max
```

2. **Log out to restart the X Window system and verify the configuration data.**

# S-Video Along With Normal Video

This option allows S-video on one video data stream and a normal screen on the other stream.

There can only be two active video outputs at any given time: Either two 13W3 outputs, or one 13W3A output and one S-video output with 13W3B unused.

This setup shares the memory and video resources between the two streams. Multisample depth could be reduced.

1. **Set the resolution and sample density for the first (normal) stream.**

   For example, type:

   ```
   host% fbconfig -dev zulu0b -res SUNW_STD_1280x1024x76 -samples 1
   ```

   **Note –** Notice the `0b` above. This is *not* the same resolution that is used for the default subdevice (`zulu0`). This resolution needs to be set up independently of `zulu0`.

   **Note –** Any valid resolution can be used for `zulu0b`. The larger the resolution is, and higher its sample density, however, the less memory is available for multisampling in the S-video channel.

2. **Set the resolution and sample density for the second stream.**

   - For NTSC, type:

   ```
   host% fbconfig -dev zulu0a -res SUNW_NTSC_640x480x60 -samples max
   ```

   - For PAL, type:

   ```
   host% fbconfig -dev zulu0a -res SUNW_PAL_640x480x50 -samples max
   ```

   In the preceding command lines, more memory is allocated for the S-video stream.

You can also control the sample density in the following ways:

- Use `-samples max` for the normal stream and `-samples 1` for S-video

  or

- Achieve a more balanced allocation of samples. Because the resolution of the S-video format is smaller, the same number of samples per pixel consumes less video memory for an S-video format than a normal (larger) format.

3. **Add or change the** `Xservers` **file to include these devices.**

You need to add device entries for `/dev/fbs/zulu0a` and `/dev/fbs/zulu0b` to the `/etc/dt/config/Xservers` file. If an entry for `/dev/fbs/zulu0` exists already, delete it and add a `-dev` option for each of the two described devices, `zulu0a` and `zulu0b`. Any other devices should remain the same.

---

**Note –** Refer to Chapter 5, "Configuring Multiple Frame Buffers," for further information.

---

4. **Log out to restart the X Window system and verify the configuration data.**

# S-Video Overrides Output Port Mapping

When an S-video mode is selected, it temporarily changes the routing set up by `-outputs` for as long as that video mode is selected.

The S-video resolution (both NTSC and PAL) is always routed to both the 13W3 port B (13W3B) and the S-video DIN4 connector.

If another video stream is active, it is routed to the 13W3A connector. The only `-outputs` routing that is not altered by S-video is sending the other (high-resolution, non-S-video) stream to both 13W3 connectors. In this case, the S-video DIN4 port is turned off.

The video that comes out of the 13W3B during S-video mode is a non-standard resolution that has an odd aspect ratio. This format is required by the S-video encoder. Unfortunately, this cannot be disabled. Any display device attached to 13W3B could be turned off.

# Using Two Sun XVR-4000 Graphics Accelerators

In this example, the first board (`zulu0`) is used for S-video exclusively and the second board (`zulu1`) is used normally.

1. **As superuser, create the** `/etc/dt/config/Xservers` **file:**

```
# cd /etc/dt/config
# vi + Xservers
```

2. **Modify the** `Xservers` **file.**

Enter the `Xservers` file content in one long line.

```
:0 Local local_uid@console root /usr/openwin/bin/Xsun -dev
/dev/fbs/zulu1 -dev /dev/fbs/zulu0
```

---

**Note –** By default, the first board in `Xservers` is the monitor on the left, and then they are laid out left to right. `Xsun` options can be added to the `Xserver` file's Xsun invocation to override this default.

---

3. **Specify resolutions for each board:**

```
host% fbconfig -dev zulu1 -res SUNW_STD_1280x1024x76
host% fbconfig -dev zulu0 -res SUNW_NTSC_640x480x60
host% fbconfig -dev zulu0 -doublewide disable -samples max
```

**4. Check the configuration status of the** `zulu1` **device:**

```
host% fbconfig -dev zulu1 -propt

--- OpenWindows Configuration for /dev/fbs/zulu1 ---

OWconfig File: machine

Card:
        Double(wide/high):     disable
        Stream to Port Mapping: direct (Stream A to Port A; B to B)
        Clearpixel Value:      255

Managed Area:
        Resolution:                SUNW_STD_1280x1024x76
        Samples Per Pixel:     max
        Multisample Mode:      forceon
        Jitter Table:          auto

Video Streams:
   Stream A:
        Offset (x,y):          (0, 0)
        Gamma Correction Value: 2.22
        Filter Type:           mitchell

   Stream B:
        Offset (x,y):          (0, 0)
        Gamma Correction Value: 2.22
        Filter Type:           mitchell

Framelock:
        Framelock/Stereo Port: Output from Stream A
        Stream A Sync:         Free Run (no frame sync)
        Stream B Sync:         Free Run (no frame sync)
```

**5. Check the configuration status of the** `zulu0` **device:**

```
host% fbconfig -dev zulu0 -propt

--- OpenWindows Configuration for /dev/fbs/zulu0 ---

OWconfig File: machine

Card:
        Double(wide/high):      disable
        Stream to Port Mapping: direct (Stream A to Port A; B to B)
        Clearpixel Value:       255

Managed Area:
        Resolution:             SUNW_NTSC_640x480x60
        Samples Per Pixel:      max
        Multisample Mode:       forceon
        Jitter Table:           auto

Video Streams:
   Stream A:
        Offset (x,y):           (0, 0)
        Gamma Correction Value: 2.22
        Filter Type:            mitchell

   Stream B:
        Offset (x,y):           (0, 0)
        Gamma Correction Value: 2.22
        Filter Type:            mitchell

Framelock:
        Framelock/Stereo Port:  Output from Stream A
        Stream A Sync:          Free Run (no frame sync)
        Stream B Sync:          Free Run (no frame sync)
```

The video mode SUNW_NTSC_640×480×60 is used to initialize the NTSC video
format.

# Installing the OpenBoot PROM Upgrade

This appendix describes how to install the OpenBoot PROM 4.7.0 upgrade.

1. **Log in as superuser.**

2. **Insert the Sun XVR-4000 graphics accelerator CD into the DVD-ROM drive and go to the following directory:**

```
# cd /cdrom/cdrom0/
```

3. **Go to the OpenBoot PROM (OBP) directory and initialize the upgrade:**

```
# cd OBP
# ./upgrade_obp.sh
```

**Note –** OpenBoot PROM version 4.7.0 or later is required.

The following is displayed:

```
Flash Update 2.4: Program and system initialization in progress...
Current System Flash PROM Revision:
-----------------------------------
OBP 4.7.0 2002/02/13 13:09
Available System Flash PROM Revision:
-------------------------------------
OBP 4.7.0 2002/07/30 04:35
NOTE: The system will be rebooted (reset) after the firmware has been updated.
However, if an error occurs then the system will NOT be rebooted.
Do you wish to update the firmware in the system Flash PROM? yes/no : yes
```

**4. If the** `Current System Flash PROM Revision` **is 4.7.0 or later, simply type** `no`. **Otherwise, type** `yes` **to update the firmware in the system flash PROM.**

Various programming and verifying messages are displayed, ending with:

```
The system's Flash PROM firmware has been updated.
```

**Note –** System power off, and power on, is required for the OpenBoot PROM upgrade to take effect. Rebooting alone is not sufficient.

# Sun Fire V880z Server Upgrade

This chapter provides information for upgrading your Sun Fire V880 server to a Sun Fire V880z server configured with the Sun XVR-4000 graphics accelerator.

- "Upgrade Kit" on page 87
- "Upgrade Process" on page 88
- "Upgrade Configuration Requirements" on page 88
- "Installing the Sun Fire V880z Server Panel Doors and RME Bezel" on page 89
- "Upgrade Technical Support" on page 91

# Upgrade Kit

The Sun Fire V880z server upgrade kit includes:

- Sun XVR-4000 graphics accelerator
- Sun XVR-4000 graphics accelerator EMI adapter
- Sun XVR-4000 graphics accelerator CD
- Sun Fire V880z Operating Environment Installation DVD
- Sun Fire V880z server front panel doors
- Removable Media (RME) console bezel
- Sun XVR-4000 graphics accelerator installation label
- Framelock cable

# Upgrade Configuration Requirements

This upgrade is supported on $2 \times 900$ MHz (one CPU/Memory board with two CPUs at 900 Mhz), $4 \times 900$ MHz, and $6 \times 900$ MHz Sun Fire V880 servers. This upgrade kit is not supported on an 8 UltraSPARC III CPU Sun Fire V880 server because there is no available CPU slot to plug in the Sun XVR-4000 graphics accelerator.

If you have a Sun Fire V880 server with 750 MHz UltraSPARC III CPUs, you need to upgrade it to 900 MHz UltraSPARC III CPUs, before ordering this upgrade kit. Use the existing Sun Fire V880 part numbers to upgrade to a $2 \times 900$ Mhz Sun Fire V880 server.

A USB keyboard and mouse are required for the Sun Fire V880z server.

# Upgrade Process

1. Install the OpenBoot PROM upgrade software if the OpenBoot PROM installed is an earlier version than 4.7.0 (Appendix C). Appendix C describes how to check the OpenBoot PROM version.

2. Perform one of the following for the required Solaris operating environments:

   a. The system is already running the Solaris 9 4/03 operating environment (or later). Go to step 3.

   b. Upgrade the system to Solaris 9 4/03 operating environment (or later). Go to step 3.

   c. The system is already running the Solaris 8 2/02 operating environment. Install the Sun XVR-4000 graphics accelerator software ("Sun XVR-4000 Graphics Accelerator Software Tools" on page 102). Go to step 3.

   d. Upgrade the system to the Solaris 8 2/02 operating environment (Chapter 3). Then install the Sun XVR-4000 graphics accelerator software ("Sun XVR-4000 Graphics Accelerator Software Tools" on page 102). Go to step 3.

3. Install the Sun XVR-4000 graphics accelerator hardware (Chapter 4).

4. Install the Sun Fire V880z front panel doors and RME bezel (page 89).

5. Repower the system, and reboot (`boot -r`) for reconfiguration (page 91).

# Installing the Sun Fire V880z Server Panel Doors and RME Bezel

After installing the Sun XVR-4000 graphics accelerator hardware according to Chapter 4, install the Sun Fire V880z server panel doors and RME bezel.

1. **Remove the Sun Fire V880 server Removable Media (RME) console bezel (**FIGURE D-1**).**

   Remove the two Phillips screws that secures the RME bezel to the chassis (one on each side of the system chassis) and slide the console insertion tabs out of the chassis slots.

2. **Open the Sun Fire V880 server left front panel door (**FIGURE D-1**).**

3. **Locate the five Phillips screws on the center post that secures the front panel door assembly to the system chassis. Remove and retain the five screws (**FIGURE D-1**).**
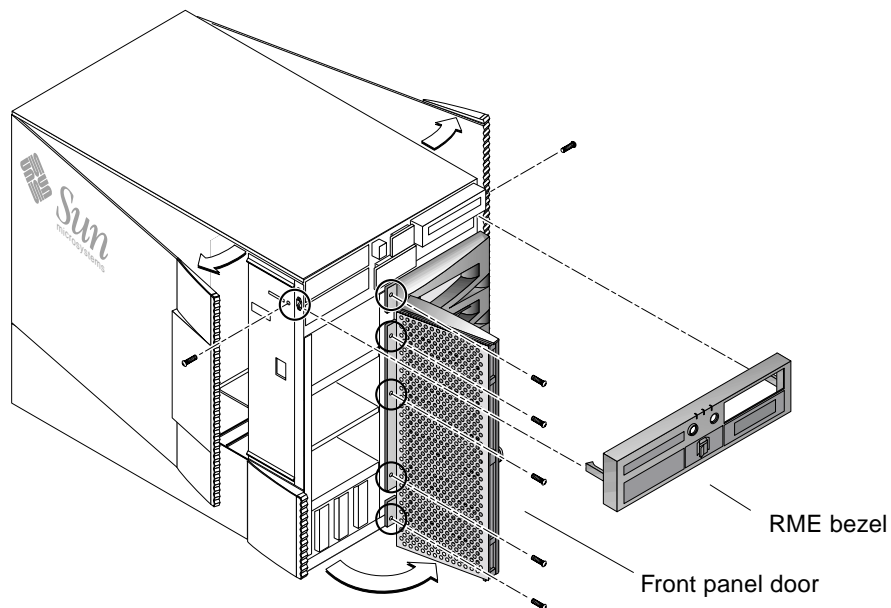


**FIGURE D-1**   Removing the Sun Fire V880 Server Front Bezel

4. **Slide the Sun Fire V880 server front panel door out of the system chassis and set aside.**

5. **Position and slide the new Sun Fire V880z server front panel door into the chassis (**FIGURE D-2**).**

6. **Secure the panel door to the chassis center post by replacing the five Phillips screws (**FIGURE D-2**).**

7. **Replace the system RME console bezel (**FIGURE D-2**).**

   Secure the RME bezel with the two Phillips screws (one on each side of system chassis). Replace any filler panels for the RME console bezel, if necessary.
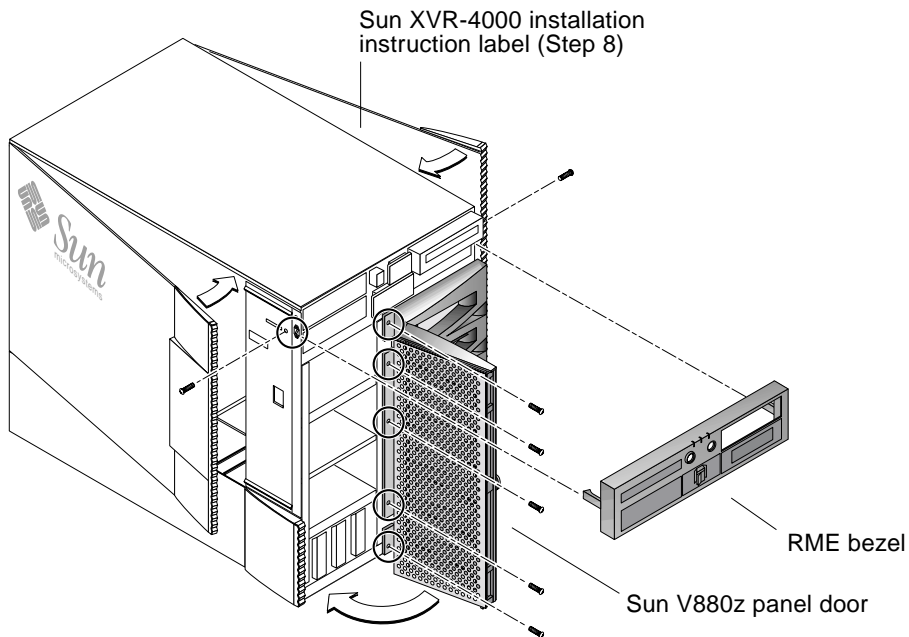


**FIGURE D-2**   Installing the Sun Fire V880z Server Front Bezel

8. **Place the Sun XVR-4000 installation label provided with the upgrade kit on the lower portion of the interior of the right enclosure door (**FIGURE D-2**).**

   Place the label to the right of the "CPU/Memory Board Configuration" label.

9. **Close the Sun Fire V880z server enclosure door.**

   a. **If you removed the side door, remount it to the chassis.**

      Position the side door mounting pins over the corresponding holes in the chassis rear panel and lower the side door into place.

   b. **Close the side door.**

      Make sure that the door is firmly seated in its frame.

   c. **Lock the side door with the system key.**

10. **Attach the appropriate monitor cables to the Sun XVR-4000 graphics accelerator backplate on the Sun Fire V880z back panel.**

11. **Power on the Sun Fire V880z server.**

12. **Perform a reconfiguration reboot:**

    Halt (Stop-A) your system for the ok prompt.

    ```
    ok boot -r
    ```

    Refer to the section "How to Initiate a Reconfiguration Boot" in the *Sun Fire V880 Server Owner's Guide.*

    ---

    **Note –** Verify the OpenBoot PROM version level. OpenBoot PROM version 4.7.0 or later is required. If the OpenBoot PROM version is less than version 4.7.0, install the OpenBoot PROM upgrade (Appendix C).

    ---

# Upgrade Technical Support

You may have Sun service technicians perform your server upgrade. For assistance and other information, see Sun Support Services at:
http://www.sun.com/service/online/

Refer to the following hardware documentation for detailed service information for the Sun Fire V880z server:

- *Sun Fire V880 Server Service Manual* (806-6597)
- *Sun Fire V880 Server Owner's Manual* (806-6592)

# Installing Solaris 8 2/02 Software on the Sun Fire V880z Server

This appendix provides information about using the DVD titled Operating Environment Installation DVD. This DVD is *only* required for the Solaris 8 2/02 operating environment (for a Sun Fire V880z server with a Sun XVR-4000 graphics accelerator).

- "Who Should Use This Software" on page 93
- "About the Installation DVD That Shipped With Your System" on page 94
- "When To Use The DVD" on page 94
- "How to Use This DVD" on page 95
- "Sun XVR-4000 Graphics Accelerator Software Tools" on page 102

# Who Should Use This Software

This DVD for Solaris 8 2/02 installation should only be performed by highly skilled systems administrators, engineers, and persons trained to perform installations.

# About the Installation DVD That Shipped With Your System

- The Sun Fire V880z Operating Environment Installation DVD for use with Solaris 8 2/02 Operating Environment accompanies this document.

This Sun Fire V880z Operating Environment Installation DVD is hereafter referred to as DVD0.

---

**Caution –** Do *not* use this DVD0 to install Solaris releases on any other platforms.

---

**Note –** The Solaris 8 2/02 Media Kit must be used with this DVD0. Other Solaris versions, either earlier or later, will not work.

---

**Note –** The Solaris 2 of 2 CD is not required for every type of installation.

---

For more specific details about installing Solaris software over the network, refer to the Advanced Installation Guide that shipped in your Solaris media kit.

# When To Use The DVD

This DVD0 must be used to initiate installation of Sun Fire V880z servers, which require support for Sun XVR-4000 graphics accelerators. This procedure *only* applies to systems running Solaris 8 2/02 operating environment (it is not required for systems running Solaris 9 4/03 operating environment or later).

Do not use the Solaris 8 Installation CD that shipped with the Solaris 8 2/02 release. Also, do not attempt to install directly from a Solaris 8 Software 1 of 2 CD or the Solaris 8 2/02 DVD.

By initiating installation with this DVD0, the Solaris Operating Environment is installed along with the packages and patches to enable Sun XVR-4000 Graphics Accelerator support.

**Note –** OpenBoot PROM version 4.7.0 or later is required before installing Solaris 8 2/02 using the DVD0. Files to update the firmware are provided on the Sun XVR-4000 Graphics Accelerator CD.

# How to Use This DVD

There are two ways to install the Solaris software:

- Install the software directly on the system starting from the DVD0.
- Install an image from the Media Kit of the Solaris release on an installation server, patch the image using the binary images from the DVD0, and then use the patched image to install Solaris on the systems.

This Solaris release can be installed, by either of the above methods, on systems that do not have a frame buffer and monitor. This installation DVD0 also provides a direct installation method by means of a command-line interface that can operate through a `tip(1)` line connected to the "headless" system.

**Note –** To set up a `tip` connection, see the detailed instructions in the owner's guide or service manual for your system. General information about `tip` operations is in the OpenBoot command reference manuals. The `tip` connection must be established before you use the DVD0.

**Note –** OpenBoot PROM version 4.7.0 is required on the Sun Fire V880z server before installing Solaris 8 2/02 using the DVD0. If you need to perform an upgrade, appropriate firmware is provided on the Sun XVR-4000 Graphics Accelerator CD.

## How to Install Solaris 8 2/02 With the DVD0

Ensure that you have the following before you start this procedure:

- The Solaris Media kit for Solaris 8 2/02
- Answers to the installation questions for which you are prompted
- This Sun Fire V880z Operating Environment Installation DVD0

⚠️ **Caution –** This procedure overwrites existing contents on the hard drive(s). Before beginning Solaris installation, back up all vital data and software.

## ▼ Installing Solaris 8 2/02 With the DVD0

1. **Place the Operating Environment Installation DVD0 in the DVD-ROM drive of the system.**

2. **Halt the system in one of the following ways:**

   - For new installs:

     Power on and wait for OpenBoot PROM to start. At the `ok` prompt, skip to Step 3

   - For systems running Solaris:

     - If you are upgrading Solaris, halt the system gracefully in order to leave existing file systems in a consistent state. An orderly shutdown may be performed by becoming the superuser (also known as root) and executing the `halt`, `init  0` or `shutdown` command. See `halt(1M)`, `init(1M)`, and `shutdown(1M)` for details.

     - On a USB keyboard, press Stop-A or Control-Break.

     - On a `tip` connection, press ~ followed by #.

     - In a terminal server using the `telnet` command, press the break key or type:

   ```
   # send brk
   ```

   This brings you to the PROM-level `ok` prompt

3. **At the `ok` prompt, enter this command:**

   ```
   ok boot cdrom
   ```

4. **When you are asked to select the language you want to use while running the installer, enter the appropriate number for your choice of language.**

   **Note –** For installations through a command line rather than a graphical user interface, the installation process is in English only.

5. **Answer the installation questions when prompted.**

The installation DVD0 loads installation mini-os software (mini-root) temporarily on one of the disk partitions (usually the swap partition). In the first part of the installation process, answer questions through a series of menus to select the disk where the mini-root software will be loaded.

![warning triangle icon] **Caution –** The installer overwrites existing contents on the hard disk. Before beginning Solaris installation, back up all needed data and software.

The length of time that it takes for the mini-root to load depends on what you specified in the menus and on the speed of your system. When the mini-root installation is complete, the system automatically boots from the mini-root and displays the first installation panel entitled, *Welcome*.

6. **Enter information about the system in response to questions in the Installation panels.**

   System information you may be asked to supply includes the following:

   - Network connectivity (standalone)
   - DHCP
   - Host name
   - IP address
   - Net mask (255.255.255.0 is the default)
   - IPv6
   - Default router
   - Kerberos
   - Time zone
   - Name service (NIS+, NIS, DNS, LDAP, or None)
   - Domain name
   - Name server
   - Date and time
   - Root password
   - Proxy server configuration

   **Note –** Refer to the Solaris 8 2/02 installation documentation for more information about making these System Identification choices.

7. **Review the Confirm Information panel to make sure that all the installation information is correct.**

- If you are using the GUI to install the Solaris operating environment, use the Back and Next buttons to correct information. Once all the information is correct, select Confirm.

- If you are making changes through the dumb terminal interface, use the arrow buttons to select your choice. Press the Return button to place a mark in your chosen field. Pressing the F2 key confirms your choices.

The Solaris Web Start installation interface begins.

8. **In the Solaris Web Start Welcome panel, select Next.**

The Operating Environment Installation DVD0 is ejected from the DVD-ROM drive.

9. **When prompted, insert the Solaris 8 2/02 DVD or Solaris 8 2/02 Software 1 of 2 CD into your drive, and select OK.**

These discs comes from the standard Solaris 8 2/02 media kit.

10. **Respond to questions presented by the Solaris installation process.**

The questions may cover the following areas:

- Upgrade or initial installation
- Default or custom installation
- Language and locale of the software to be installed (this can be different from the language choice you might have made earlier in Step 5)
- Choose to install additional CDs from the media kit (Select Products panel)
- Choose to install additional software from another product CD or DVD, a Kiosk download, or over the net (Additional Products panel)
- 64-bit selection (Only the Solaris 64-bit kernel is supported on Sun Fire V800z servers, that is, you may not choose to only install the 32-bit kernel.)
- Solaris cluster configuration information
- Disk selection
- Preserve data

---

**Note –** The procedures described in this document should only be used with the Solaris 8 2/02 operating environment. Do *not* use any other release of the Solaris operating environment.

---

11. **Verify that the information listed in the Ready to Install panel is correct and select Install Now.**

12. **Wait for the Solaris 8 2/02 DVD or Solaris 8 2/02 Software 1 of 2 CD to complete the installation.**

    This could take an hour or more, depending on the software you chose to install and the speed of your system.

    When complete, select Next in the Installation Summary panel. The system reboots.

    The DVD or CD is ejected. Web Start comes up.

13. **Load additional Solaris software from CDs as required.**

    Refer to the installation manuals for the Solaris 8 2/02 operating environment for further information on optional software.

14. **When the last CD is finished, select Reboot Now.**

    The system boots using the Solaris release that you installed.

# How to Patch a Network Installation Image for the Solaris 8 2/02 Release

The patched network installation image can be set up using either the Solaris DVD or the Solaris Software CDs contained in the media kit. The procedures are different depending on the media you plan to use. If the server already has an installation image available and you plan to patch it now, use the first procedure no matter which type of media (DVD or CD) was used to create the unpatched image.

## ▼ Creating a Patched Network Installation Image Using the Solaris 8 2/02 DVD

**Note –** If the installation server is already set up with an image of the Solaris 8 2/02 operating environment release, skip to Step 7.

1. **Become superuser.**

2. **Insert the Solaris 8 2/02 DVD in a DVD-ROM drive used by the installation server.**

3. **Type this command:**

```
# cd /cdrom/cdrom0/s0/Solaris_8/Tools
```

4. **Create the install image by running this script:**

```
# ./setup_install_server image_directory
```

5. **Return to the home directory by entering this command:**

```
# cd /
```

6. **Eject the Solaris 8 2/02 DVD.**

7. **Insert the DVD0 that came with these instructions.**

8. **Type this command:**

```
# cd /cdrom/cdrom0/s0
```

9. **Patch the install image by running this script:**

```
# ./modify_install_server.xvr4000 -d image_directory
```

10. **Continue to perform the standard network installation procedure for this release:**

   For more information, see the "Preparing to Install Solaris Software Over the Network" chapter in the *Solaris Advanced Installation Guide* that is in your Solaris media kit.

## ▼ Creating a Patched Network Installation Image Using the Solaris 8 2/02 CD 1 of 2

1. **Become super user.**

2. **Insert the Solaris 8 2/02 Software 1 of 2 CD in a CD-ROM drive used by the installation server.**

3. **Type this command:**

```
# cd /cdrom/cdrom0/s0/Solaris_8/Tools
```

4. **Create the install image by running this script:**

```
# ./setup_install_server image_directory
```

5. **Return to the home directory by entering this command:**

```
# cd /
```

6. **Eject the Solaris 8 2/02 Software 1 of 2 CD.**

```
# eject
```

7. **Insert the Solaris 8 Software 2 of 2 CD in a DVD-ROM drive used by the installation server.**

8. **Enter this command:**

```
# cd /cdrom/cdrom0/Solaris_8/Tools
```

9. **Continue to build the install image on the server by running this script:**

```
# ./add_to_install_server image_directory
```

10. **Return to the home directory by entering this command:**

```
# cd /
```

11. **Eject the Solaris 8 2/02 Software 2 of 2 CD.**

```
# eject
```

12. **Insert the DVD0 that came with these instructions.**

13. **Type this command:**

```
# cd /cdrom/cdrom0/s0
```

14. **Patch the install image by running this script:**

```
# ./modify_install_server.xvr4000 -d image_directory
```

15. **Continue to perform the standard network installation procedure for this release:**

For more information, see the "Preparing to Install Solaris Software Over the Network" chapter in the *Solaris Advanced Installation Guide* that is in your media kit.

# Sun XVR-4000 Graphics Accelerator Software Tools

To assure that all Sun XVR-4000 graphics accelerator software tools are installed, you need to install the tools from the Operating Environment Installation DVD0.

1. **Become superuser.**

2. **Go to the** cdrom **subdirectory and run the** install **script. Type:**

```
# cd /cdrom/cdrom0/
# ./install
```

3. **Reboot your system.**

4. **Set** auto-boot **to** TRUE**. To do this, at the** ok **prompt type:**

```
ok setenv auto-boot? = TRUE
```

Press Return.

5. **Boot your system at the** ok **prompt. Type:**

```
ok boot
```

Press Return.

# Sun XVR-4000 Graphics Accelerator I/O Port Specifications

This appendix provides I/O port pinout specifications for the Sun XVR-4000 graphics accelerator.

- "Pinout for the 13W3 Connector" on page 104
- "Pinout for Stereo/Framelock DIN7 Connector" on page 105
- "Pinout for S-Video Connector" on page 106
- "Pinout for Genlock BNC Connector" on page 107

The connectors on the I/O back panel include:

- 13W3 analog video connector, marked B
- 13W3 analog video connector, marked A
- Stereo/framelock connector (7-pin micro-DIN)
- S-video connector (4-pin micro-DIN)
- Genlock In BNC connector

FIGURE F-1 shows the connector locations on the board back panel.
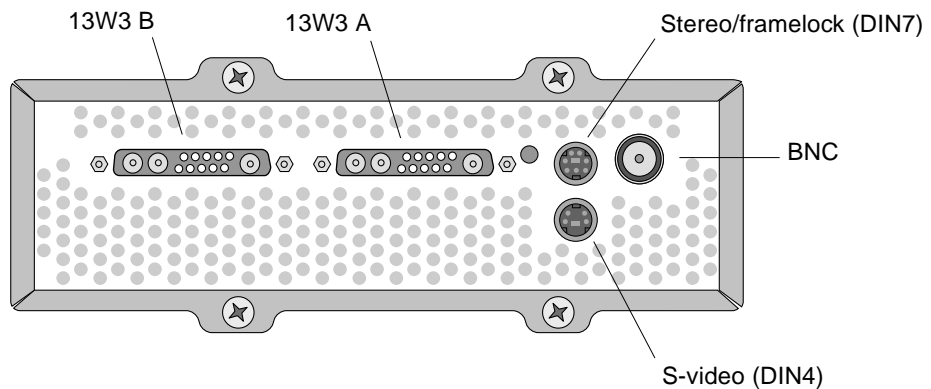


**FIGURE F-1**   Sun XVR-4000 Graphics Accelerator Back Panel I/O Ports

# Pinout for the 13W3 Connector

FIGURE F-2 and TABLE F-2 shows the Sun XVR-4000 graphics accelerator 13W3 connector and lists the pinout signals.
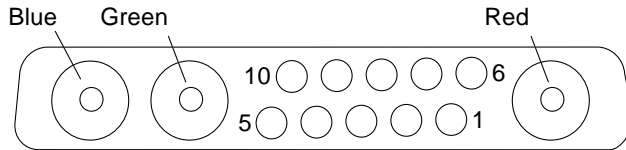


**FIGURE F-2**    Sun XVR-4000 Graphics Accelerator Back Panel 13W3 Connector

**TABLE F-1**    Sun XVR-4000 Graphics Accelerator 13W3 Connector Pinout

| Pin Number | Signal | Description |
|---|---|---|
| 1 | I2C_SCL | Clock input for DDC1/2B |
| 2 | DDC_+5V | +5V from DDC frame buffer |
| 3 | Unused | |
| 4 | Ground | Ground return for serial data (pins 1 and 5) (not ground on monitor) |
| 5 | H/CSYNC | Combined H/V sync, TTL twisted pair (see pin 10), terminated by 75 Ω resister. |
| 6 | I2C_SDA | Bi-directional DDC serial data line |
| 7 | VSYNC | Vsync |
| 8 | Unused | |
| 9 | Unused | |
| 10 | Ground | H/Csync return (return for pin 5) |
| Blue | Blue | 75 Ω coax receptacle |
| Green | Green | 75 Ω coax receptacle |
| Red | Red | 75 Ω coax receptacle |

# Pinout for Stereo/Framelock DIN7 Connector

FIGURE F-3 and TABLE F-2 show the Sun XVR-4000 graphics accelerator stereo/framelock DIN7 connector and pinout signals.
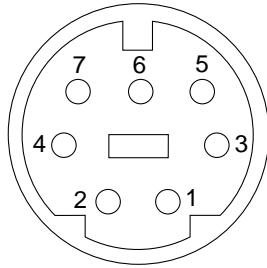


**FIGURE F-3**  Sun XVR-4000 Graphics Accelerator Back Panel Stereo/Framelock DIN7 Connector

**TABLE F-2**  Sun XVR-4000 Graphics Accelerator Stereo/Framelock Connector Pinout

| Pin Number | Signal |
|:---:|---|
| 1 | Ground |
| 2 | Ground |
| 3 | STEREO_PWR (see Note) |
| 4 | STEREO_SYNC |
| 5 | FIELD_IN |
| 6 | DRAWING_L |
| 7 | FRAME_OUT |

**Note –** Several wireless stereo glasses transmitters require external power to work properly. See "Connecting the Framelock Cable" on page 56.

# Pinout for S-Video Connector

FIGURE F-4 and TABLE F-3 show the Sun XVR-4000 graphics accelerator S-video connector and pinout signals.
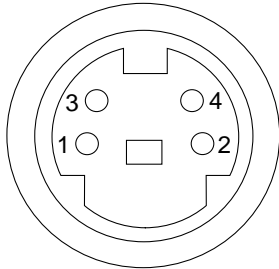


**FIGURE F-4**   Sun XVR-4000 Graphics Accelerator Back Panel S-Video Connector

**TABLE F-3**   Sun XVR-4000 Graphics Accelerator S-Video Connector Pinout

| Pin Number | Signal | Description |
|---|---|---|
| 1 | Y_GROUND | Twisted-pair return for Y signal (pin 3) |
| 2 | C_GROUND | Twisted-pair return for C signal (pin 4) |
| 3 | Luminance Y signal | Twisted pair |
| 4 | Chrominance C signal | Twisted pair |
| Shell | Chassis ground | |

# Pinout for Genlock BNC Connector

FIGURE F-5 and TABLE F-4 show the Sun XVR-4000 graphics accelerator BNC connector and pinout signals.



GENLOCK_IN

GENLOCK_RETURN
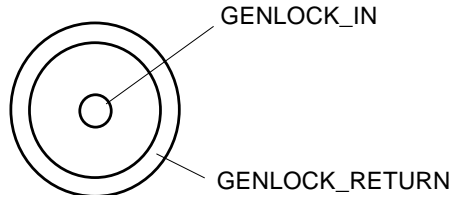
**FIGURE F-5**    Sun XVR-4000 Graphics Accelerator Back Panel BNC Connector

**TABLE F-4**    Sun XVR-4000 Graphics Accelerator BNC Connector Pinout

| Pin Number | Signal | Description |
| --- | --- | --- |
| Center pin | GENLOCK_IN | 75 Ω genlock input video (RS- 170 sync source), or 4V TTL () level. |
| Shell | GENLOCK_RETURN | Nominally ground. The ground is not directly connected to the Sun XVR-4000 graphics accelerator chassis or logic ground. You may ground at external equipment. |

# Index