SunVideo Plus for PCI User's
Guide

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Contents

Preface

This manual describes how to install and use the SunVideo™ Plus for PCI subsystem with your Sun™ computer system. It is intended for end users and system administrators.

How This Book Is Organized

Chapter 1 provides an overview of the SunVideo Plus product.

Chapter 2 lists installation requirements and describes how to install hardware and software for the SunVideo Plus card.

Chapter 3 describes SunVideo Plus and SunVideo compatibility mode.

Chapter 4 provides programming tools and XIL program examples.

Chapter 5 provides SunVideo Plus XIL programming attributes.

Glossary is a list of terms and phrases found in this book and their definitions.

Using UNIX Commands

This document may 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 2.x Handbook for SMCC Peripherals*
- AnswerBook™ online documentation for the Solaris™ 2.x software environment
- Other software documentation that you received with your system

Typographic Conventions

TABLE P–1   Typographic Conventions

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

Shell Prompts

TABLE P–2 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

Refer to documentation supplied with your platform system for specific hardware installation procedures.

Ordering Sun Documents

SunDocsSM is a distribution program for Sun Microsystems technical documentation. Contact SunExpress for easy ordering and quick delivery. You can find a listing of available Sun documentation on the World Wide Web.

TABLE P–3 SunExpress Contact Information

Country	Telephone	Fax
Belgium	02-720-09-09	02-725-88-50
Canada	1-800-873-7869	1-800-944-0661
France	0800-90-61-57	0800-90-61-58
Germany	01-30-81-61-91	01-30-81-61-92
Holland	06-022-34-45	06-022-34-46

TABLE P–3   SunExpress Contact Information   *(continued)*

Japan	0120-33-9096	0120-33-9097
Luxembourg	32-2-720-09-09	32-2-725-88-50
Sweden	020-79-57-26	020-79-57-27
Switzerland	0800-55-19-26	0800-55-19-27
United Kingdom	0800-89-88-88	0800-89-88-87
United States	1-800-873-7869	1-800-944-0661

World Wide Web: `http://www.sun.com/sunexpress/`

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- Email: smcc-docs@sun.com
- Fax: SMCC Document Feedback   1-650-786-6443

Introduction to SunVideo Plus

The SunVideo Plus subsystem provides audio and video processing engines for a broad range of multimedia applications for Sun Peripheral Component Interface (PCI) based workstations. The SunVideo Plus subsystem provides simultaneous video and audio compression *and* decompression for Sun application products such as ShowMe™ and ShowMe™ TV™. SunVideo Plus enables you to run SunVideo demonstration programs. The SunVideo Plus architecture enables you to easily integrate:

- Video cameras

- Microphones

- Headsets

- Software decoders

- Standard multimedia tools

The onboard video processor and audio digital signal processor (DSP) equip standard desktop computers, particularly those in networked environments, with the capability to run to audio/video-enabled applications for corporate training, security, authoring, telemedicine, and video conferencing.

SunVideo Plus Features

The video input to the SunVideo Plus card can be either National Television System Committee (NTSC) or Phase Alternation Line (PAL) format, and composite or S-Video video sources. Decompressed and local video can transfer across the PCI-bus to be displayed on your workstation. Audio compression is performed by the onboard DSP.

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A high-speed interface to the host bus provides multiple DMA/IO channels. These channels provide flow-through for:

- Output from a compressed video/audio bitstream

- Output from decompressed video

- Output from local uncompressed video

SunVideo Plus Specifications

TABLE 1–1 SunVideo Plus Specifications

Feature	Description
Video inputs/ outputs	Two (2) Composite IN, one (1) S-Video IN
Input formats	NTSC or PAL
Video sampling	YUV (4:2:2)
Audio inputs	Line In or Microphone In (shared jack)
Audio outputs	Headphone Out, Line Out
Video compression	CellB, H.261, JPEG, MPEG1(CIF I-Frame) - NTSC only
Uncompressed video formats	YUV, 8-bit RGB, 24-bit RGB, 8-bit Y
Audio codecs	G.711 (Alaw, mlaw), G.722, G.728, PCM (8- or 16-bit), Acoustic Echo Suppression (AES)
Audio sampling rates	Up to 44Khz (CD quality)
Audio output levels	4Vpp for Headphone
Hardware platforms	PCI-bus Sun system
Software platforms	Solaris 2.5.1 and higher

TABLE 1–1   SunVideo Plus Specifications   *(continued)*

Feature	Description
Bus slot type	Single slot, half length
SunVideo compatibility	Binary compatibility with all SunVideo card XIL-based applications
APIs	XIL Imaging library
	`libaudio` compatibility API
Demonstration applications	Video recording and playback
	TCP/IP video conferencing
	Audio recording and playback
	Sound monitor

Frame Rates

Depending on your computer system's application load and display window size, the SunVideo Plus subsystem can display video rates of up to 30 frames-per-second (fps). Video frame rates are application dependent. SunVideo Plus subsystem supports the following compressors and frame rates:

TABLE 1–2   Frame Rates

Compressor	Frame Rate
H.261	CIF - 20-28 fps, QCIF - 30 fps
CellB	12 fps
Direct capture and display	30 fps
JPEG	30 fps
MPEG1 I-frame	30 fps

SunVideo Plus Software Packages

Your SunVideo Plus card comes with the following software packages:

- `SUNWo1kpd` (Device Driver)
- `SUNWo1kpu` (Runtime Scripts)
- `SUNWo1kx` (XIL 1.2 Runtime libraries - Solaris 2.5.1 only)
- `SUNWo1kx` (XIL 1.3 Runtime libraries - Solaris 2.6 only)

See Chapter 2 for software installation procedures.

SunVideo Plus Hardware

The SunVideo Plus card is installed in a PCI-bus slot. The card contains two Composite IN ports, and one S-Video IN port. For audio signals, SunVideo Plus also contains one port for line level OUT, one port for headphone level OUT, and one input port that can be configured through the software as either line or microphone level IN.

The following figure shows the SunVideo Plus PCI card.
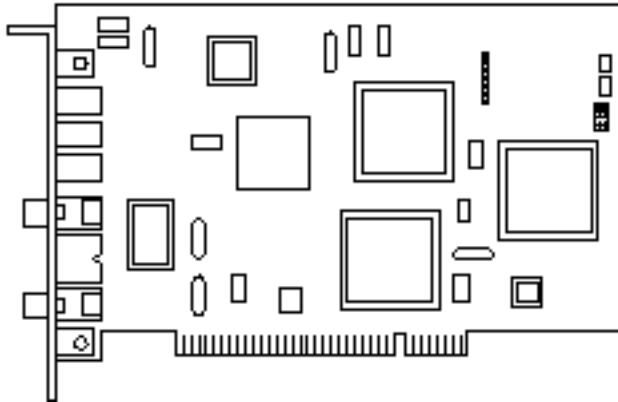
Figure 1–1　　SunVideo Plus PCI Card

The following figure shows the SunVideo Plus card backplate connection outlay.
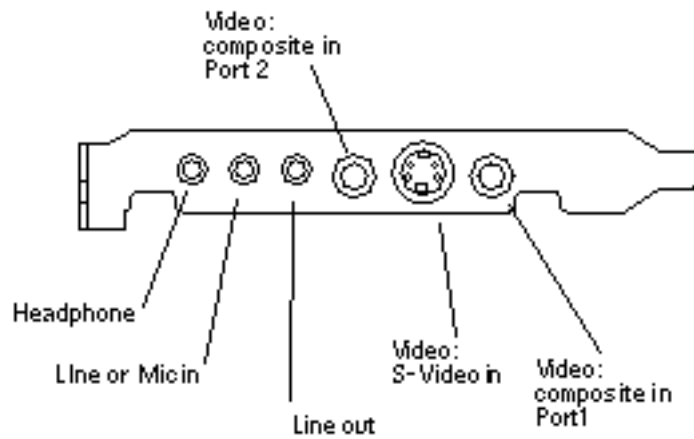
Figure 1–2   SunVideo Plus PCI Card Backplate

SunVideo Plus supports both Composite and S-Video inputs. S-Video can provide a much sharper image than Composite video, with better color separation. S-Video uses a four-pin, mini-DIN connector, which provides separate Y (luminance) and C (chrominance) signals.

See Chapter 2 for software installation procedures.

Installing SunVideo Plus

This chapter contains information for installing and setting environments for the SunVideo Plus hardware and software. It also describes how to connect video input devices to your Sun system through the SunVideo Plus board.

You must be able to become superuser to successfully install SunVideo Plus. If you do not know the root password of the system on which you are installing SunVideo Plus, contact your system administrator.

Installation Kit

The SunVideo Plus Installation Kit includes:

- SunVideo Plus PCI card
- SunVideo Plus CD
- Antistatic wriststrap
- *SunVideo Plus for PCI Installation Guide*

Installation Requirements

To successfully install SunVideo Plus, you need a SPARC™ system running Solaris 2.5.1 Hardware: 4/97 or later, Solaris 2.6 or Solaris 7.

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Unpacking the SunVideo Plus Card

The SunVideo Plus board is packaged and shipped in an antistatic envelope that protects it from static electricity. Be sure to save this envelope and all shipping package materials; these materials must be used if re-shipment is necessary. When handling the board, use extreme care and avoid touching delicate electronic components. When unpacking the board, do the following:

1. **Immediately inspect the shipping container for evidence of damage. If the carrier's agent is not present when the container is opened and the contents are found to be damaged, keep all contents packing materials for the agent's inspection.**

2. **If you find no evidence of damage, carefully remove the card from its container.**

Caution - Printed circuit boards, such asSunVideo Plus, are made of delicate electronic components that are extremely sensitive to static electricity. Ordinary amounts of static from your clothes or work environment can damage them. Handle these boards only by the non-conducting edges. Do not touch the components on the board or any metal parts. Wear a grounding strap when handling the board. Do not disconnect the power from your system power receptacle. This connection provides the ground path necessary so that you can safely remove and install the board and other components. Be sure that the system power is turned off.

Installing the SunVideo Plus Card

1. **Install the SunVideo Plus card according to the installation procedures for PCI-bus cards provided with your Sun system.**

2. **After installing the SunVideo Plus card and securing your system enclosure, boot your system by typing:**

```
hostname# reboot -- -r
```

SunVideo Plus Software Packages

Your SunVideo Plus subsystem includes software packages listed in the following table that you need to install:

TABLE 2–1   SunVideo Plus Software Packages

Package Name	Description	Solaris support
SUNWo1kpd.u	Device driver	Solaris 2.5.1 Hardware: 4/97, 8/97, 11/97, Solaris 2.6 and Solaris 7
SUNWo1kpu	Runtime scripts	
SUNWsvpab	SunVideo Plus AnswerBook	
SUNWvtsvp	Validation Test Suite for SunVideo Plus	
SUNWo1kpx	XIL1.2 Runtime pipeline for SunVideo Plus	Solaris 2.5.1
SUNWo1kpx	XIL1.3 Runtime pipeline for SunVideo Plus	Solaris 2.6 and Solaris 7

Once installed, the SunVideo Plus software resides in `/opt/SUNWo1kp`. The XIL Runtime pipeline software resides in `/usr/openwin`.

Removing Previous Software Releases

You must remove any previous releases of the SunVideo Plus software before installing any new software packages.

1. **Log in as superuser.**

2. **Uninstall the SunVideo Plus 1.0 or SunVideo Plus 1.1 software packages.**
   - Remove SunVideo Plus 1.0 by typing:

```
hostname# /usr/sbin/pkgrm SUNWo1kpd SUNWo1kpu SUNWvtsvp SUNWsvpab
```

■ Remove SunVideo Plus 1.1 by typing:

```
hostname# /usr/sbin/pkgrm SUNWo1kpd SUNWo1kpu SUNWvtsvp SUNWsvpab SUNWo1kpx
```

Installing the SunVideo Plus Software

The SunVideo Plus software is provided on the CD included with your SunVideo Plus installation kit.

1. **Become superuser (root).**

2. **Insert the SunVideo Plus 1.2 CD into the CD-ROM drive connected to your system.**
    ■ If your system is running Volume Manager, it should automatically mount the CD-ROM to the /cdrom/sunvideo_plus_1_2 directory.
    ■ If your system is not running Volume Manager, mount the CD-ROM as follows:

```
hostname# mkdir -p /cdrom/sunvideo_plus_1_2
   hostname# mount -F hsfs -r /dev/dsk/c0t6d0s2
   /cdrom/sunvideo_plus_1_2
```

3. **Install the SunVideo Plus 1.1 software using** swmtool**:**
    a. **For Solaris 2.5.1 Hardware: 4/97, 8/97 and 11/97 operating environment, type:**

```
hostname# /usr/sbin/swmtool -d
/cdrom/sunvideo_plus_1_2/Sol_2.5.1
```

    b. **For Solaris 2.6 operating environment, type:**

```
hostname# /usr/sbin/swmtool -d
/cdrom/sunvideo_plus_1_2/Sol_2.6
```

    c. **For Solaris 7 operating environment, type:**

```
hostname# /usr/sbin/swmtool -d
/cdrom/sunvideo_plus_1_2/Sol_7
```

The Add Software window is displayed (this example shows user in Solaris 7 operating environment):
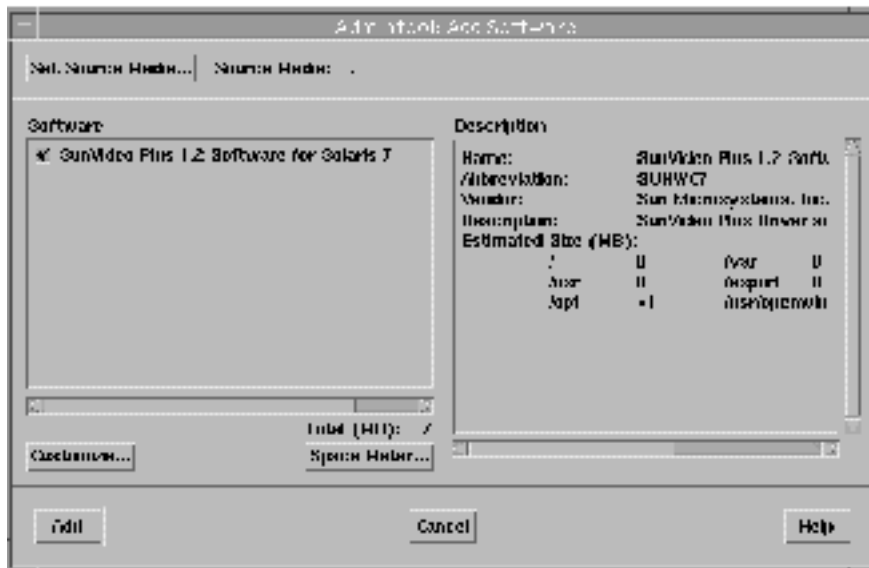
Figure 2–1   Add Software Window

1. **Select SunVideo Plus 1.2 software.**

2. **Click Customize... to choose the software options. The following window is displayed:**
   (This example shows user in Solaris 7 operating environment.)
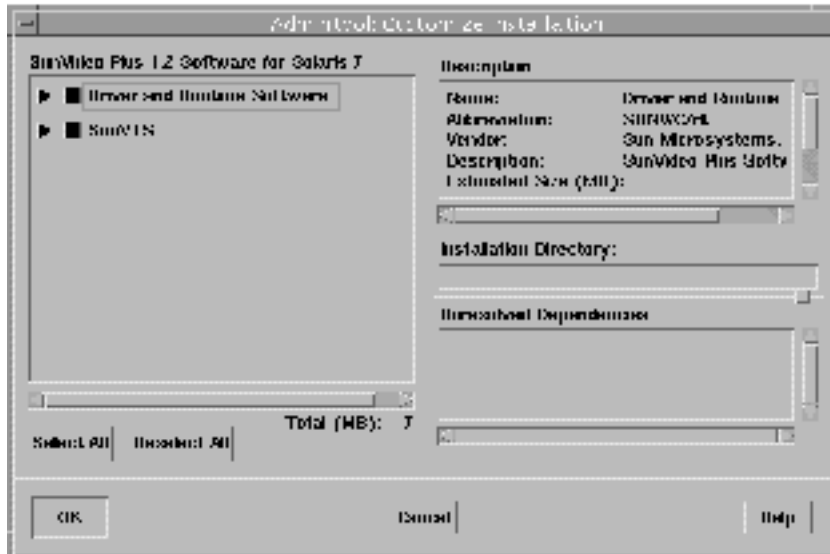
Figure 2–2   Customize Installation Window

3. **Click Select All to install SunVideo Plus driver runtime and Sun Validation Test Suite.**

4. **Click OK. The Add Software window is again displayed.**

5. **Click Add on the Add Software window, and answer y (yes) to all questions.**

6. **Run** pkgadd **to install SunVideo Plus 1.2 packages.**

   ■ To install the software for Solaris 2.5.1 Hardware: 4/97, 8/97 and 11/97 operating environment, enter the following:

   ```
   hostname# cd /cdrom/sunvideo_plus_1_2/Sol_2.5.1
      hostname# /usr/sbin/pkgadd -d . SUNWolkpd.u SUNWolkpu SUNWsvpab SUNWvtsvp SUNWolkpx
   ```

   ■ To install the software for Solaris 2.6 operating environment, enter the following:

   ```
   hostname# cd /cdrom/sunvideo_plus_1_2/Sol_2.6
      hostname# /usr/sbin/pkgadd -d . SUNWolkpd.u SUNWolkpx SUNWolkpu SUNWsvpab SUNWvtsvp
   ```

   ■ To install the software for Solaris 7 operating environment, enter the following:

```
hostname# cd /cdrom/sunvideo_plus_1_2/Sol_7
   hostname# /usr/sbin/pkgadd -d . SUNWo1kpd.u SUNWo1kpx SUNWo1kpu SUNWsvpab SUNWvtsvp
```

7. After the software has been installed, unmount and eject the CD-ROM:

```
hostname# cd /
   hostname# umount /cdrom/sunvideo_plus_1_2
   hostname# eject cdrom
```

8. Reboot your workstation:

```
hostname# reboot -- -r
```

This enables the operating system to recognize the SunVideo Plus card.

Setting Your Environment

The demonstration applications that are shipped with SunVideo Plus are designed to search the `/opt/SUNWo1kp/lib` directory for the SunVideo Plus libraries. If the SunVideo Plus software has been installed in a location other than `/opt/SUNWo1kp`, or if you are using other SunVideo Plus applications which do not automatically search this default directory, you must include the path to the SunVideo Plus libraries `libo1kusr` and `libotiaudio` in your `LD_LIBRARY_PATH` pathname.

To change the path with the `sh` or `ksh` shell environment, type:

```
hostname% LD_LIBRARY_PATH=/opt/SUNWo1kp/lib:$LD_LIBRARY_PATH
hostname% export LD_LIBRARY_PATH
```

If you are using `csh`, type:

```
hostname% setenv LD_LIBRARY_PATH /opt/SUNWo1kp/lib:$LD_LIBRARY_PATH
```

Setting `O1KHOME`

The environment variable `O1KHOME` must also be set to the installation subdirectory. The default installation is shown below. If the SunVideo Plus software was installed in a different subdirectory, the `O1KHOME` value must be set to the path of that subdirectory.

Using `sh` or `ksh` environments, type:

```
hostname% O1KHOME=/opt/SUNWo1kp
hostname% export O1KHOME
```

Using `csh` environment, type:

```
hostname% setenv O1KHOME /opt/SUNWo1kp
```

Modifying the `PATH` Variable

For ease of operation, you may want to include thef path to the SunVideo Plus applications in your `PATH` environmental variable.

Using `sh` or `ksh` environments, type:

```
hostname% PATH=/opt/SUNWo1kp/bin:$PATH
hostname% export PATH
```

Using `csh` environment, type:

```
hostname% setenv PATH /opt/SUNWo1kp/bin:$PATH
```

Setting XIL Environment Variables

Examples that use the Sun XIL™ library require that certain XIL environment variables are set. The following entries show how to set these variables assuming XIL was installed in the default location and that the variables are not already set.

To set variables using the `sh` or `ksh` environments, type:

```
hostname% LD_LIBRARY_PATH=/opt/SUNWits/Graphics-sw/xil/lib:$LD_LIBRARY_PATH
hostname% export LD_LIBRARY_PATH
hostname% XILHOME=/opt/SUNWits/Graphics-sw/xil
hostname% export XILHOME
```

Using `csh` environment, type:

```
hostname% setenv LD_LIBRARY_PATH /opt/SUNWits/Graphics-sw/xil/lib: $LD_LIBRARY_PATH
hostname% setenv XILHOME /opt/SUNWits/Graphics-sw/xil
```

Assigning Device Numbers

The operating system assigns device numbers for cards based on the card type, as well as the order that the cards were placed into the PCI-bus slots. When the first SunVideo Plus card is installed into an open slot, the operating system identifies the card as device `/dev/olk0`. If a second card is placed in an open slot, it is assigned device number `/dev/olk1`, and so on.

The operating system remembers the order of slots and SunVideo Plus device numbers, even if a card is removed and later replaced. So if the first SunVideo Plus card is moved to another slot, then the operating system will then identify that card as `/dev/olk2`. If a new SunVideo Plus card is then placed into the same slot that the first SunVideo Plus card originally occupied, this new card will now be known as `/dev/olk0`. Once a slot is named as a SunVideo Plus card slot, it retains that same address, regardless of which card actually occupies the slot.

Installation Quick Test

To verify proper installation and operation of the SunVideo Plus card and software, do the following:

1. **Complete the installation of the SunVideo Plus card and software, and ensure that the XIL environment variables are correctly set.**

2. **Connect a video source to the Composite Port 1 of the card.**

    Note - If your video source is an S-Video device, connect the S-Video cable to the SunVideo Plus S-Video connector.

    ---

3. **Run the** `xil_display` **program to test the video capabilities of the card.**

    To do this, type:

    ```
    hostname% xil_display
    ```

    This will display 99 frames, then it will exit.

    If your video source is an S-Video device, type the following to use the S-Video source:

    ```
    hostname% xil_display -I 0
    ```

4. **Connect an audio line input device to the audio input jack and connect speakers to the audio line output jack.**

5. **Run the olk_audloop program to test the audio capabilities of the card.**

    To do this, type:

    ```
    hostname% olk_audloop
    ```

    Press Control-c when finished.

SunVideo Compatibility Mode

This chapter describes how to use the SunVideo Plus subsystem with existing software applications that use the Sun Microsystems XIL library and the SBus SunVideo card. This enables you to use a SunVideo Plus card to run SunVideo demonstration programs and applications such as Sun's ShowMe desktop videoconferencing products and ShowMe TV audio/video broadcasting product.

For using your Sun applications, refer to the user's guide provided with your Sun application product. For example, refer to the *SunVideo User's Guide* for using the SunVideo Demonstration Programs, or *ShowMe TV User's Guide* for use of the ShowMe TV program.

System Requirements

- Software environment

  - Solaris 2.5.1 Hardware: 4/97 or later
  - Solaris 2.6

- Sun PCI desktop workstation
- XIL Imaging Library installed on your workstation

Limitations

- SunVideo Plus does not provide hardware-based MPEG1 I-B-P compression and XIL does not provide a software-based compressor, Therefore, programs relying on these capabilities will fail. Also, SunVideo Plus MPEG1 encodes non-square-pixel video, so applications expecting MPEG1 in square-pixel format will fail.

- Error messages for SunVideo Plus are slightly different from SunVideo, so a program relying on trapping a particular error may not work.

- SunVideo Plus's XIL compatibility is the same as that of the XIL library. Applications that make calls directly to the SunVideo driver may not work correctly.

- If SunVideo Plus does not provide hardware acceleration for a given XIL molecule, the operation may be performed partly in software. This is currently true for some compression/resolution combinations.

- SunVideo Plus supports the JPEG, CellB, and MPEG-1 (I frame) codes under compatibility mode. It also supports the uncompressed formats. SunVideo Plus does NOT support H.261 or MPEG1 (IPB frame) in compatibility mode.

Using SunVideo Compatibility Mode

In SunVideo Compatibility (SVC) mode, you can also use the record and playback features of the SunVideo Tool demonstration program that is included in Solaris 2.5.1 and Solaris 2.6.

To set the SunVideo Plus card into SunVideo Compatibility mode:

1. **Install the SunVideo Plus card in your workstation.**

   See "Unpacking the SunVideo Plus Card" on page 8.

2. **Install the SunVideo Plus software.**

   See "Unpacking the SunVideo Plus Card" on page 8.

3. **Run the SunVideo Plus Compatibility mode setup scripts.**

   See "Running SVC Mode Scripts" on page 19.

4. **For Solaris 2.5.1 only, set the** `XILHOME` **and** `LD_LIBRARY_PATH` **environment variables.**

   See "Setting SVC Environment Variables (Solaris 2.5.1 only)" on page 22.

Running SVC Mode Scripts

After installing the SunVideo Plus card and software, do the following to run SunVideo Compatibility (SVC) mode setup scripts:

1. **Log in as superuser.**

2. **Run the following scripts:**

```
hostname# svc_install
   hostname# svc_devices (install or remove)
```

The following table describes the setup scripts.

TABLE 3–1 SunVideo Plus Setup Scripts

Setup Script	Description
svc_install	This script creates the SunVideo Compatibility mode XIL pipeline hierarchy for the SunVideo Plus card.
svc_devices	This script creates (svc_devices install) or removes (svc_devices remove) SunVideo Compatibility mode pseudo devices. Pseudo devices are symbolic links from rtvc (SunVideo) devices to o1k (SunVideo Plus) devices. The script places the links into /dev.
svc_uninstall	Solaris 2.6 only. Use this script on Solaris 2.6 to remove the svc hierarchy.

The svc_install Script for Solaris 2.5.1

The svc_install script creates the XIL pipeline hierarchy. The default location for the svc_install script is /opt/SUNWo1kp/bin. The syntax is:

```
hostname% svc_install options
```

The following table lists and describes the svc_install options and defaults.

TABLE 3–2   `svc_install` Options and Defaults

svc_install **Options**	**Description**
`-s O1KHOME`	This is the location of the SunVideo Plus source directory. The default location is `/opt/SUNWo1kp`.
`-t DESTDIR`	This is the destination for the SunVideo Compatibility mode pipeline hierarchy. The default location is `/opt/SUNWo1kp/svc`. DESTDIR does not need to exist. The hierarchy requires approximately 360 Kbytes.
`-v`	This is Verbose mode which displays status information on `stdout`. The default does not display information.
`-x XILHOME`	This is the location of the XIL Imaging Library source directory. The default location is `/opt/SUNWits/Graphics-sw/xil`.

Typically, you can run the script without any options. You must be logged in as superuser if you do not have write permissions to the DESTDIR directory.

If the `svc` mode is already installed when `svc_install` is run, then the previous SVC hierarchy will be removed and then replaced.

You should re-run `svc_install` any time packages, patches, and so on, are applied to your system that change XIL components.

The `svc_install` Script for Solaris 2.6

In Solaris 2.5.1, the SVC hierarchy is a separate entity that is enabled/disabled by the user by setting environment variables. In Solaris 2.6, however, the SVC hierarchy is not a separate entity. Installing the SVC mode in Solaris 2.6 replaces the existing XIL 1.3 directory containing device handlers (XIL 1.3 libraries) with a SVC mode one. Therefore, once the `svc_install` script is run on Solaris 2.6, SVC mode is enabled and is not controlled by setting environment variables. To disable the SVC mode under Solaris 2.6, use the `svc_uninstall` script.

The syntax is:

```
hostname% svc_install options
```

The following table lists and describes the `svc_install` options and defaults.

TABLE 3–3 svc_install Options and Defaults

svc_install Options	Description
-v	This is Verbose mode which displays status information on stdout.

Typically, you run the script without any options. You must be logged in as superuser. The script modifies /usr/openwin/xil/lib. You should not run this script if this is an NFS mounted directory.

The svc_uninstall Script for Solaris 2.6

The svc_uninstall script removes the SVC mode installed by svc_install and puts back the original XIL device handler directory.

Caution - Since the SVC mode replaces the standard XIL 1.3 device handler directory, it is VERY important to run svc_uninstall before any updates (that is, patches, upgrades, or new package installations) are applied to your workstation which will change or add XIL components.

The syntax is:

hostname% **svc_uninstall** *options*

The following table lists and describes the svc_uninstall options and defaults.

TABLE 3–4 svc_install Options and Defaults

svc_install Options	Description
-v	This is Verbose mode which displays status information on stdout.

Typically, you run the script without any options. You must be logged in as superuser. The script modifies /usr/openwin/xil/lib. You should not run this script if this is an NFS mounted directory.

The `svc_devices` Script

The `svc_devices` script creates and removes SunVideo compatibility mode pseudo devices in `/dev`. The default location for the `svc_devices` script is `/opt/SUNWo1kp/bin`. The `install` script syntax is:

```
hostname% svc_devices install
```

The `remove` script syntax is:

```
hostname% svc_devices remove
```

Use `svc_devices install` to install SunVideo Compatibility mode pseudo devices. Use `svc_devices remove` to remove SunVideo pseudo devices from the `/dev` directory.

To select a SunVideo Plus card from a SunVideo application program, use the `rtvc` pseudo device name, typically `/dev/rtvc0`.

Note - If you use `pkgrm` to remove the SunVideo Plus software, you do not need to first run the `svc_devices remove` script. The `pkgrm` script removes all pseudo devices.

Note - If you move the SunVideo Plus card to a different slot, you must first run `svc_devices remove` and then run `svc_devices install`.

Setting SVC Environment Variables (Solaris 2.5.1 only)

Use the special XIL pipelines and SunVideo Plus compatibility features, you must set the `XILHOME` environment variable to `/opt/SUNWo1kp/svc`.

You must include *DESTDIR*`/lib` in the `LD_LIBRARY_PATH` environmental variable, where *DESTDIR* is the destination location for the SunVideo compatibility mode pipeline hierarchy. This is the location specified when the `svc_install` script was run. The default location for *DESTDIR* is `/opt/SUNWo1kp/svc`.

If the XIL library is already in your `LD_LIBRARY_PATH`, then either *DESTDIR*`/lib` must precede `LD_LIBRARY_PATH`, or the XIL library path must be removed from your `LD_LIBRARY_PATH` before you attach the new path to `LD_LIBRARY_PATH`.

The following is an example of attaching *DESTDIR*`/lib` using `csh` shell:

```
hostname% setenv OlKHOME /opt/SUNWolkp
hostname% setenv LD_LIBRARY_PATH /opt/SUNWolkp/lib:$LD_LIBRARY_PATH
hostname% setenv LD_LIBRARY_PATH /opt/SUNWits/Graphics-sw/lib:$LD_LIBRARY_PATH
hostname% setenv XILHOME /opt/SUNWolkp/svc
```

SunVideo Plus Example Programs

This chapter includes SunVideo Plus programming tools and XIL program examples. Included with the SunVideo Plus software is the source code for several example programs. The following table lists and briefly describes each of these. Detailed descriptions of each syntax and related options are then provided. These programs also help verify proper operation of the SunVideo Plus card.

TABLE 4–1   SunVideo Plus Example Programs

Example Program	Description
swmtool	A tool for installing SunVideo Plus through a GUI.
o1k_audrec	A tool for recording audio to file.
o1k_audplay	A tool for playing audio files.
o1k_audloop	A tool for looping audio IN to audio OUT.
soundtool	A GUI tool for recording, playing and modifying u-law audio files.
xil_compress	An XIL example which captures and compresses video and saves compressed data to a file.
xil_decompress	An XIL example that reads compressed data from file, decompresses it, and displays the decompressed video.
xil_display	An XIL example that captures and displays video.

TABLE 4–1   SunVideo Plus Example Programs   *(continued)*

Example Program	Description
`xil_video_broadcast/` `xil_video_receiver`	These are two XIL examples: *broadcast* transmits over TCP captured and compressed video; *receiver* receives this video stream, decompresses and displays it.
`xil_video_broadcast/` `xil_video_receiver`	This performs the same functions as the previous example, but adds H.261 protocol to the list of compressed formats.
`olk_conf`	A point-to-point audio/video conference example built using XIL and the SunVideo Plus audio library.
`olk_ctl`	A audio and video controller used to alter inputs to SunVideo Plus.

These programs also help verify proper operation of the SunVideo Plus card.

Audio Recording

The `olk_audrec` program is a command-line driven tool for recording audio to a file.

The following shows the command-line syntax for the `olk_audrec` example:

hostname% **olk_audrec** *options* **-o** *filename*

The following table describes command options and the default setting.

TABLE 4–2   `olk_audrec` Options

Options	Description and Values	Default
`-D` *device*	Device name	`/dev/olk0`
`-f` *format*	Encoding format (0=ULAW, 1=ALAW, 2=PCM8, 3=PCM16, 4=G722)	0

TABLE 4–2 olk_audrec Options *(continued)*

Options	Description and Values	Default
-r *rate*	Sample rate (8000, 11025, 16000, 22050)	8000
-c *channel*	Channels (1, 2)	1
-p *port*	Input port (0=LINE, 1=MIC)	0
-g *gain*	Input gain (0 .. 1.0)	.125
-m *mgain*	Monitor gain (0 .. 1.0)	0
-I *information*	Audio file string information	" "
-b *size*	Buffer size	1000
-h *amount*	Print hash marks after amount	0

Audio Playing

The olk_audplay program is a command-line driven tool for playing audio files.

The following shows the command-line syntax for the olk_audplay example:

hostname% **olk_audplay** *options* **-i** *filename*

The following table describes command options and the default setting.

TABLE 4–3   `o1k_audplay` Options

Options	Description and Values	Default
–D *device*	Device name	/dev/o1k0
–v *gain*	Output gain (0 .. 1.0)	1.0
–b *size*	Buffer size	1000

Audio Looping

The `o1k_audloop` program is a command-line driven tool used to loop audio IN to audio OUT.

The following shows the command-line syntax for the `o1k_audloop` example:

hostname% **o1k_audloop** *options*

The following table describes command options and the default setting.

TABLE 4–4   `o1k_audloop` Options

Options	Description and Values	Default
–D *device*	Device name	/dev/o1k0
–f *format*	Encoding format (0=ULAW, 1=ALAW, 2=PCM8, 3=PCM16, 4=G722)	0
–r *rate*	Sample rate (8000, 11025, 16000, 22050)	8000
–c *channel*	Channels (1, 2)	1
–p *port*	Input port (0=LINE, 1=MIC)	0
–g *gain*	Input gain (0 .. 1.0)	.125

TABLE 4–4   `olk_audloop` Options   *(continued)*

Options	Description and Values	Default
–v *gain*	Output gain (0 .. 1.0)	1.0
–b *size*	Buffer size	1000

The `soundtool` Program

The `soundtool` program is a GUI tool for recording, playing and modifying u-law audio files (compressed audio files).

The following shows the command-line syntax for the `soundtool` example:

```
hostname% soundtool [-D device]
```

The following figure shows the `soundtool` demonstration program display.
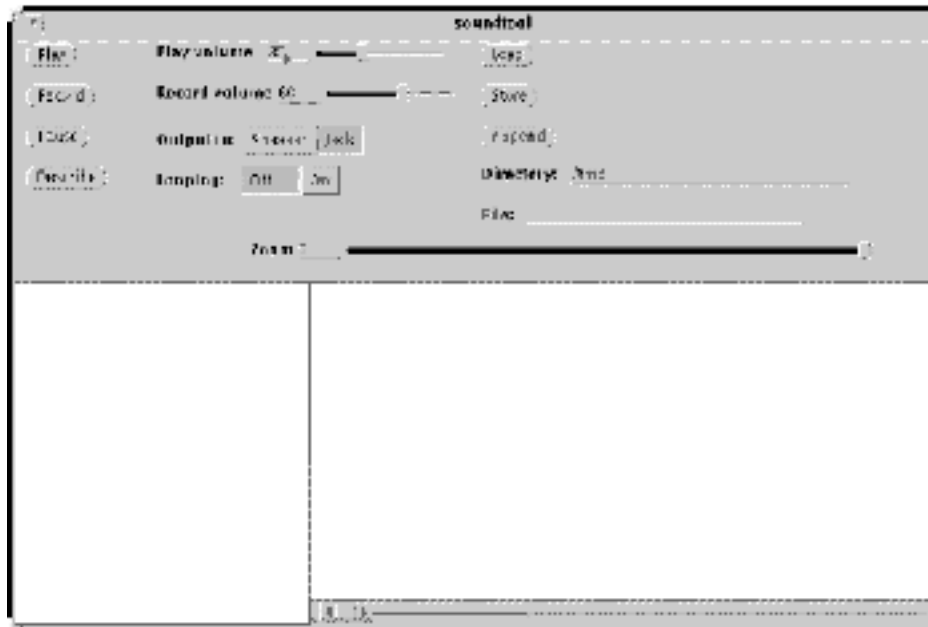
Figure 4–1   `soundtool` Display

`soundtool` is one of the demonstration programs that is distributed in the
`SUNWaudmo` package. It is typically installed into
`/usr/demo/SOUND/src/soundtool/`. `soundtool` uses the `libaudio` audio
library and a few system calls (such as open/close, read/write, `ioctl` and `fcntl`) to
operate on Sun standard hardware and audio devices. The source for the `soundtool`
demonstration distributed with SunVideo Plus software is installed in the example
subdirectory of O1KHOME (usually `/opt/SUNWolkp/examples/soundtool`).

Using the SunVideo Plus Control Panel

The SunVideo Plus control panel, `olk_ctl`, allows both static and dynamic changes
to various audio/video attributes (such as video/audio input selections, audio
volume/gain, video brightness, contrast, and so on) for each SunVideo Plus installed
in your system.

1. **Open the SunVideo Plus Control Panel:**

`hostname% `**`olk_ctl`**

The following figure shows the SunVideo Plus control panel.
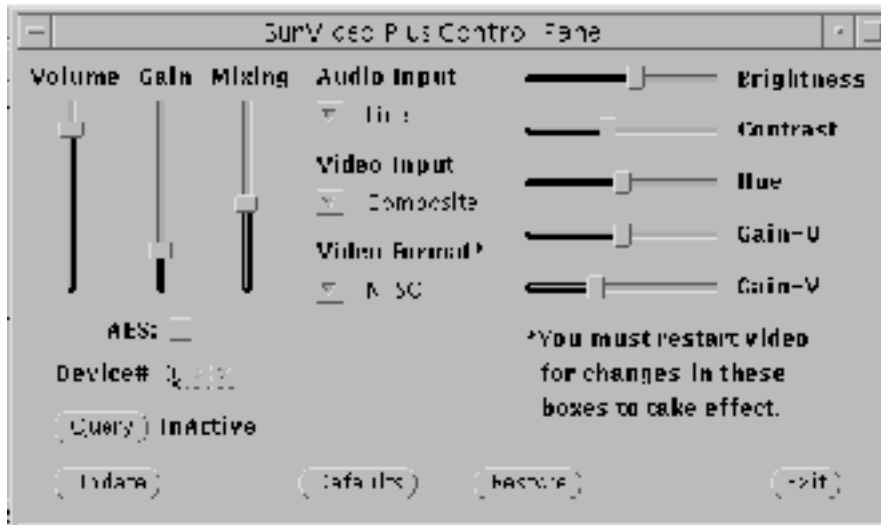
Figure 4–2   SunVideo Plus Control Panel

The settings for each SunVideo Plus device are kept in a database. When changes are made to the various attributes in the control panel, the database for the selected device is modified. Whenever a SunVideo Plus device is opened, the current settings in the database are used to configure the device. While a SunVideo Plus is opened, the control panel will also communicate with the process using the SunVideo Plus device to dynamically change settings.

There are a few settings in the control panel which cannot be dynamically changed and thus only take effect when a SunVideo Plus device is opened. These settings are marked with an asterisk (*) in the control panel.

The video format may be set to NTSC, PAL, or AUTO. If AUTO is selected, when the SunVideo Plus device is opened, the video format is auto detected. However, since this auto detection can take up to 1.5 seconds, if you know what video format you are using, it is best to set the video format manually.

The Query button is used to dynamically check if a selected SunVideo Plus device is currently opened by another process.

The various attributes on the control panel may also be changed programmatically by a user program. Since these changes can be made by another process while the control panel is opened, the attribute statuses may not always be correct. Clicking the Update button on the control panel updates the current status of the control panel settings.

Image Compression

This is a modified XIL example to which H.261 (video) compression was added. See source code notes for specific H.261 code changes. The SunVideo version of this demonstration program can be run under the SunVideo Binary Compatibility Mode without modification (the SunVideo version does not include H261). Note that the default shrink factor is 2 (-s 2) which results in CIF-sized image compression. To compress QCIF-sized images, use -s 4.

The following shows the command-line syntax for the `xil_compress` example:

```
hostname% xil_compress options -o filename
```

The following table describes command options and the default setting

TABLE 4–5 `xil_compress` Options

Legal Options	Description and Values	Default
-o %s	Save bitstream in file	NULL
-C %s	Compression type (CellB, JPEG, MPEG1, H261)	CellB
-s %d	Shrink factor	2
-I %d	Select input channel	1
-f %d	Frames to capture	100
-i %d	Frames to skip between capture	0
-D %s	Name of device	/dev/olk0
-B %d	H261 bitrate, kbits/sec	2000
-Q %d	H261 max quantity	10
-R %d	H261 rate control (0=variable, 1=fixed)	1

TABLE 4–5 `xil_compress` Options *(continued)*

Legal Options	Description and Values	Default
Legal Switches		
`-E`	Exit on first error	

.

Example Usage

To compress a CIF CellB bitstream, type:

```
hostname% xil_compress -C CellB -o /tmp/t.clb
```

To compress a CIF JPEG bitstream, type:

```
hostname% xil_compress -C Jpeg -o /tmp/t.jpeg
```

To compress a CIF H261 bitstream, type:

```
hostname% xil_compress -C H261 -o /tmp/t.h261
```

To compress a QCIF H261 bitstream, type:

```
hostname% xil_compress -C H261 -s 4 -o /tmp/t.h261
```

Image Decompression

This is a modified XIL example to which H.261 was added. For H.261 decompression, the SunVideo Plus XIL molecules will by default use the first SunVideo Plus card installed in your system for hardware accelerated decode of H.261. If you want to use another SunVideo Plus device for decode, you must explicitly use the -D option.

The following shows the command-line syntax for the `xil_decompress` example:

```
hostname% xil_decompress options -i filename
```

The following table describes command options and the default setting,

TABLE 4–6 `xil_decompress` Options

Options	Description and Values	Default
`-C`	Compression type (CellB, JPEG, H.261, Cell, MPEG1)	`CellB`
`-s` *%d %d*	CellB width and height	`320, 240`
`-r` *%d*	Playback frame rate (0 = fast as possible)	`0`
H261 Options		
`-D`	Name of SunVideo Plus device for h/w decompression	`NULL`

Example Usage

To decompress a CellB bitstream, type:

```
hostname% xil_decompress -C CellB -s 320 240 -i /tmp/t.clb
```

To decompress a JPEG bitstream, type:

```
hostname% xil_decompress -C Jpeg -i tmp/t.jpeg
```

To decompress an H261 bitstream, type:

```
hostname% xil_decompress -C H261 -i tmp/t.h261
```

To decompress a H261 bitstream using the second SunVideo Plus card in your system, type:

```
hostname% xil_decompress -C H261 -i tmp/t.h261 -D /dev/o1k1
```

Video Display

This is a modified example of an XIL that captures video and displays it.

Changes to video attributes that affect the color of the image (brightness, contrast, hue, and so on) are also made to the database used by the control panel. Thus, the defaults for these settings depend on how they were last set. If you run this application once and set the brightness to a particular value, this value will be the default setting when you next run a video application.

The following shows the command-line syntax for the `xil_display` example:

hostname% **xil_display** *options*

The following table describes command options and the default setting.

TABLE 4–7 `xil_display` Options

Legal Options	Description and Values	Default
-s *%d*	Shrink factor	2
-I *%d*	Select input channel	1
-f *%d*	Frames to capture	100
-w *%d*	Capture subimage width	640
-h *%d*	Capture subimage height	480
-i *%d*	Frames to skip between capture	0
-m *%d*	Maximum frames to buffer	2
-x *%d*	x window location	(random)
-y *%d*	y window location	(random)

TABLE 4–7 `xil_display` Options *(continued)*

Legal Options	Description and Values	Default
`-D` *%s*	Name of device	/dev/olk0

Legal Switches

`-g`	Enable grayscale mode	
`-E`	Exit on first error	
`-d`	Do not display result of capture	

Video Attributes

`-B` *%d*	Brightness	none
`-C` *%d*	Contrast	none
`-H` *%d*	Hue	none
`-U` *%d*	Saturation/gain U component	none
`-V` *%d*	Saturation/gain V component	none
`-c` *%d*	Colormap version (0=XIL std, 1=XIL gamma corrected)	1

The colormap version option does nothing if the current display depth is 24 bits. On 8-bit display depths, it affects which colormap is installed for the video window. The XIL versions cause the SunVideo Plus to capture 16-bit video data which is then dithered in software by the XIL molecules to 8 bits.

Example Usage

To display video, type:

```
hostname% xil_display
```

Video Broadcast and Video Receiver

These two programs, `xil_video_broadcast` and `xil_video_receiver`, are modified XIL examples which run on the SunVideo Plus card. The SunVideo version of these demonstrations can be run under the SunVideo Binary Compatibility Mode without modification.

The `xil_video_broadcast` Program

The following shows the command-line syntax for the `xil_video_broadcast` example:

hostname% **xil_video_broadcast** *options*

The following table describes command options and the default setting.

TABLE 4–8   `xil_video_broadcast` Options

Legal Options	Description and Values	Default
–C *%s*	Compression type (CellB, Jpeg, UYVY)	CellB
–H *%s*	Destination hostname	local subnet
–c *%d*	Broadcast channel (0-9)	0
–F *%s*	File of destination hostnames	none
–D *%s*	Name of SunVideo Plus device	/dev/olk0
–I *%d*	Select input channel	1
–P %d	Delay x ms per transmit	0
–d %s	Save bitstream in file	NULL
–f *%d*	Frames to broadcast	18000

TABLE 4–8 `xil_video_broadcast` Options *(continued)*

Legal Options	Description and Values	Default
-i *%d*	Frames to skip between capture	0
-m *%d*	Maximum frames to buffer	2
-s *%d*	Shrink factor	2
-w *%d*	Width of capture window	NTSC: 640
		PAL: 768
-h *%d*	Height of capture window	NTSC: 480
		PAL: 576
-x *%d*	x coordinate of display window	(random)
-y *%d*	y coordinate of display window	(random)

Legal Switches

-p	Disable preview	
-b	Enable display of partial CellB frames by receiver	
-t	Disable transmission	
-E	Exit on first error	
-v	Print verbose messages	

The `xil_video_receiver` Program

The following shows the command-line syntax for the
`xil_video_receiver` example:

hostname% **xil_video_receiver** *options*

The following table describes command options and the default setting.

TABLE 4–9 `xil_video_receiver` Options

Legal Options	Description and Values	Default
-C %s	Compression type (CellB, Jpeg, UYVY)	`CellB`
-c %d	Broadcast channel (0-9)	`0`
-f %*d*	Frames to broadcast	`18000`
-x %*d*	x coordinate of display window	(random)
-y %*d*	y coordinate of display window	(random)

Legal Switches		
-b	Enable display of partial CellB frames by receiver	
-E	Exit on first error	
-v	Print verbose messages	

Example Usage

To broadcast/receive video, type:

```
hostname% xil_video_receiver -C CellB
hostname% xil_video_broadcast -C CellB
```

Video Broadcast and Video Receiver for H.261

These two programs, `xilh_video_broadcast` and `xilh_video_receiver`, are modified XIL examples that run on the SunVideo Plus card and use H.261 compression.

The `xilh_video_broadcast` Program

The following shows the command-line syntax for the `xil_video_broadcast` example:

hostname% **xilh_video_broadcast** *options*

The following table describes command options and the default setting.

TABLE 4–10 `xilh_video_broadcast` Options

Legal Options	Description and Values	Default
-C %s	Compression type (CellB, Jpeg, H261, UYVY)	CellB
-H %s	Destination hostname	local subnet
-c %d	Broadcast channel (0-9)	0
-F %s	File of destination hostnames	none
-D %s	Name of SunVideo Plus device	/dev/olk0
-I %d	Select input channel	1
-P %d	Delay x ms per transmit	0
-d %s	Save bitstream in file	NULL
-f %d	Frames to broadcast	18000

TABLE 4–10 `xilh_video_broadcast` Options *(continued)*

Legal Options	Description and Values	Default
-i *%d*	Frames to skip between capture	0
-m *%d*	Maximum frames to buffer	2
-s *%d*	Shrink factor	2
-w *%d*	Width of capture window	NTSC: 640 PAL: 768
-h *%d*	Height of capture window	NTSC: 480 PAL: 576
-x *%d*	x coordinate of display window	(random)
-y *%d*	y coordinate of display window	(random)
-B *%d*	H261 bitrate	256
-Q *%d*	H261 maximum quantization	10

Legal Switches

-p	Disable preview	
-b	Enable display of partial CellB frames by receiver	
-t	Disable transmission	
-E	Exit on first error	
-v	Print verbose messages	

The `xilh_video_receiver` Program

The following shows the command-line syntax for the
`xil_video_receiver` example:

```
hostname% xilh_video_receiver options
```

The following table describes command options and the default setting.

TABLE 4–11 `xilh_video_receiver` Options

Legal Options	Description and Values	Default
-C *%s*	Compression type (CellB, Jpeg, H261, UYVY)	CellB
-c *%d*	Broadcast channel (0-9)	0
-f *%d*	Frames to broadcast	18000
-x *%d*	x coordinate of display window	(random)
-y *%d*	y coordinate of display window	(random)
Legal Switches		
-b	Enable display of partial CellB frames by receiver	
-E	Exit on first error	
-v	Print verbose messages	

Audio Video Conferencing

The example program `olk_conf` is a point-to-point audio and video conference
written in C++ using XIL and the SunVideo Plus audio API. It supports CellB, JPEG,
and H261 video formats and various audio formats.

The `olk_conf` Command

The following shows the command-line syntax for the `olk_conf` example:

```
hostname% olk_conf options
```

The following table describes command options and the default setting.

TABLE 4–12 `olk_conf` Options

Legal Options	Description and Values	Default
-u *%s*	user@host	NULL
-t	Disables XIL molex (Sol;airs 2.6 only)	
-p	For receiving PAL format.	
-D *%s*	Name of SunVideo Plus device	/dev/olk0

- XIL 1.2 in Solaris 2.5.1 is not multithreading safe. The conference example uses multiple threads that access XIL. The threads lock out each other before they make XIL calls. This is not efficient, but required due to XIL 1.2. In Solaris 2.6, XIL 1.3 is multithreading safe. The –t option is used to disable the locking used by the conference application.

- The -p option should be used if you know the call will be sent by PAL format. If you do not use this option if sending PAL formats, errors will occur.

The following figure shows the main conference panel:

Figure 4–3   `olk_conf` Main Conference Panel

This allows for configuration of audio/video parameters and provides an address book for storing information about users you want to connect.

To open the address book, click the Address button. The following figure shows the Address Book.

Figure 4–4   Address Book

A user is added by selecting the New button. The most important information is the User@Host field. This is used to contact another person when placing a conference call. The other information in the Address Book is optional. After filling in the user information, click on the Add button (which is only displayed after the new button is selected). To save your address book, select Save in File menu. To select a user for a conference, select the user in the list, and then click the Done button. This closes this pop-up window and places the User@Host name in the Main Conference Panel (Figure 4–3).

Only the user calling the conference needs to configure the Main Conference Panel because when a conference is called, the far end is told of the caller's configuration. The default configuration for `olk_conf` is

- Video: H261, QCIF, 10fps, 256 Kbits/sec

- Audio: *u*law, 8 KHz, mono

To change the conference configuration, click Setup, and proceed through the menus and pop-up window directions.

When called by an another user, a pop-up window opens that informs you who is calling and the parameters of the call (see figure below). You may then decide if you care to join the conference.

Figure 4–5　Being Called Window

During the conference, you can monitor status information, like audio and video bit rates and frame rates and network packet activity, by View from the Main Conference Panel. Then select A/V Panel for audio and video parameters that you can change in the audio/video panel.

During a conference call, you will have two windows on your display, a Local View and a Far View (the person you are conferencing). The figure below shows these two windows.

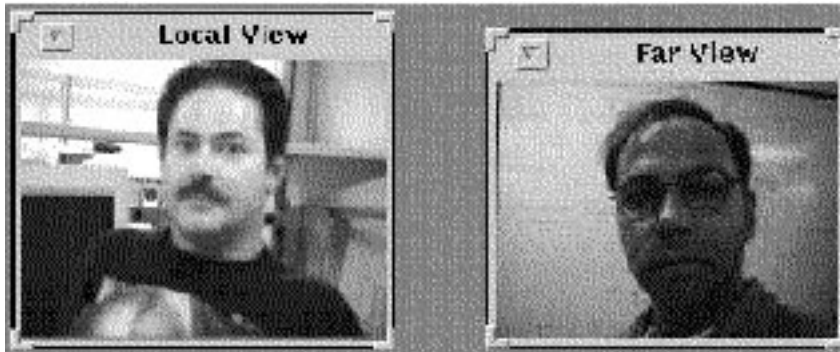*Figure 4–6*　Local View and Far View Windows

With H.261, a picture-in-a-picture is possible on the Far View window, with your view inlayed in the top-left corner. To reduce CPU use, you can switch your local view to an icon. This is advisable during an H261 conference.

When you have completed your conference call, click HangUp. The HangUp button is displayed on the Main Conference Panel after a call is placed.

XIL Attributes for SunVideo Plus

This chapter describes the XIL attributes that are specific to SunVideo Plus. This information assumes that you are familiar with the concepts of video compression and imaging and the related XIL functions that are described in the *XIL Programmer's Guide.*

XIL operates through a deferred execution scheme. Deferred execution looks for specific sequences of atomic operations that can be grouped into molecules to reduce execution time. The molecules that are accelerated are listed in the "Molecules" section in this chapter. Refer to the *Solaris XIL 1.0, Imaging Library Programmer's Guide* for more information on general XIL programming. Source code to various XIL examples are included as part of the developer kit. These examples give developers a good start in using XIL and the SunVideo Plus card.

MMACo1k is the XIL software driver for the SunVideo Plus card. The interface to MMACo1k is through the following XIL calls:

- xil_device_create(3)
- xil_device_set_value(3)
- xil_create_from_device(3)
- xil_get_device_attribute(3)
- xil_set_device_attrribute(3)

For xil_device_create(3), the device parameter should be MMACo1k. For xil_create_from_device(3), the devicename parameter should be MMACo1k, and the deviceObj parameter can be a NULL, in which case /dev/o1k0 is opened. To open another device such as /dev/o1k1, create a MMACo1k device, set the DEVICE_NAME attribute with xil_device_set_value(3) with this device. The image returned will be a 640x480 (NTSC) or 768x576 (PAL) 3-banded YUV image.

Attributes Overview

To support binary compatibility, some of the SunVideo attributes that do not have particular applicability for SunVideo Plus are supported on a limited basis.

There are two methods for setting device attributes. The first method is to call the `xil_device_create`(3) and `xil_device_set_value`(3) functions prior to creating the device image with the `xil_create_from_device`(3) function. The second method is to call `xil_device_set_value`(3) after calling `xil_create_from_device`(3). Certain attributes require that they be set with the first method (such as DEVICE_NAME) and are documented as such in the following sections. See "Important Attribute Information" on page 55 for addition information.

The following general device attributes are available with the `MMACo1k` device and are also supported by SunVideo:

- DEVICE_NAME
- FORMAT
- FRAME_NUMBER
- IMAGE_SKIP
- PORT_V
- MAX_BUFFERS
- PORT
- NUM_BUFFER
- FIRST_SCANLINE
- FULL_BUFFERS
- TIMESTAMP
- FLUSH_BUFFERS
- FORMAT_V

The following device attributes have no affect, but are either ignored or handled by SunVideo Plus in a reasonable way to support binary and source compatibility with SunVideo.

- MPEG_RATE_CONTROL
- MPEG_FIXED_QUANT
- MPEG_WEIGHTS
- FILE DESCRIPTOR

The following are SunVideo Plus video attributes:

- HUE

- H261_PIP
- CHROMA_GAIN_V
- CHROMA_GAIN_U
- BRIGHTNESS
- CONTRAST
- H261_BIT_RATE
- H261_MAX_QUANT
- H261_IBLOCK_REFRESH
- H261_FUR

The following sections describe the attributes in more detail. Note that some attributes are "set-only" and others are "get-only." This is noted under the ACCESS heading for each attribute. Some of these attributes are also parameters in the SunVideo Plus control panel. Although default values are given, the true default value is the value last made in either the control panel or by a previous XIL set attribute call. These attributes have an asterisk (*) before there DEFAULT entry. See "The SunVideo Plus Control Panel and XIL Attributes" on page 56 for more information.

General Attributes

DEVICE_NAME

This attribute sets the path name of the `o1k` (SunVideo Plus) device. You must set this attribute using the `xil_device_create`(3) and `xil_device_set_value`(3) functions prior to creating the device image.

*Access: set/get Type: char * Default: "/dev/o1k0"*

PORT_V

This attribute defines which of the three ports will capture the video signal.

0	S_VIDEO port
1	Composite Video #1 port
2	Composite Video #2 port

Access: set/get Type: int Default: 1

PORT

This attribute is a string interface to set the port.

S VIDEO	S_VIDEO port
COMPOSITE VIDEO 1	Composite Video #1 port
COMPOSITE VIDEO 2	Composite Video #2 port

*Access: set/get Type: char * * Default: "COMPOSITE VIDEO 1"*

FORMAT_V

This attribute returns 0 if the format is unknown, 1 if capturing from PAL, and 2 if capturing from NTSC. See "Video Ports, Formats, and Auto Format Detection" on page 55 for more information.

Access: get Type: int

FORMAT

This attribute returns the video format being captured (NTSC, PAL, or UNKNOWN). See "Video Ports, Formats, and Auto Format Detection" on page 55 for more information.

*Access: get Type: char **

FRAME_NUMBER

This attribute provides an ID (a timestamp) for the last captured frame. The timestamp is initially set to -1. After the first field or frame acquired, the timestamp (FRAME_NUMBER) increments to reflect the number of fields that have been captured by the SunVideo Plus hardware.

Access: get Type: int

TIMESTAMP

This attribute returns a pointer to a volatile `hrtime_t` that always contains the timestamp for the most recently captured frame Therefore, this attribute only needs to be retrieved once. The timestamp value is updated each time a capture operation occurs. This enables you to associate a timestamp with each captured frame.

The pointer points to an `hrtime_t`, which is an 8-byte timestamp. The units are expressed as "nanoseconds since boot." See the *gethrtime*(3C) manual page for information about `hrtime_t`.

*Access: get Type: hrtime_t * (defined in <sys/time.h>)*

IMAGE_SKIP

This attribute sets and returns the number of images to skip between captures. You can use the IMAGE_SKIP attribute to pace the flow of images. For example, an application that supports security cameras could use the attribute to provide images at 30-second intervals.

Another example is to use IMAGE_SKIP when you want to limit the frame rate to match a particular network bandwidth. To capture NTSC frames at a rate of approximately 10 fps, you would set the IMAGE_SKIP attribute to 2. This causes the SunVideo Plus card to capture every third frame.

*Access: set/get Type: int*Default: 0

MAX_BUFFERS

This attribute sets and returns the maximum number of compressed frames that the XIL SunVideo Plus driver will hold while waiting for an application to retrieve via a compress call. The value must be in the range between 1 and 10. See the figure below. The value is clipped to provide the number of buffers that fit in the available memory.
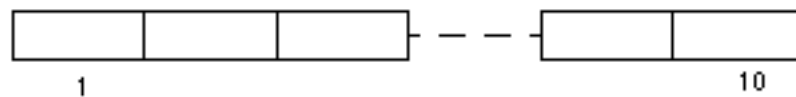

Figure 5–1   Maximum Number of Buffers

Access: set/get Type: integer Default: 2

NUM_BUFFERS

This attribute returns an integer that specifies the actual number of buffers that can be used to hold compressed frames. The NUM_BUFFERS value is less than or equal to the value of the MAX_BUFFERS attribute.

The NUM_BUFFERS attribute returns a valid value after the first capture (or capture/compress) operation has been performed.

Access: set Type: integer

FULL_BUFFERS

This attribute returns an integer that specifies the current number of buffers that contain valid data. The FULL_BUFFERS attribute returns a valid value after the first capture (or capture/compress) has been performed.

Access: get Type: integer

FLUSH_BUFFERS

If the FLUSH_BUFFERS attribute is set, then all saved buffers are flushed before the next image is captured. After the operation completes, the value of FULL_BUFFERS is set to zero. The input value of the set attribute call is ignored.

Access: set Type: void

Video Attributes

The following attributes affect various video characteristics. Note that these can be controlled programmatically through XIL or through the SunVideo Plus control panel described in "Using the SunVideo Plus Control Panel" on page 30. Although default values are given here, the true default value is the value last set by either the control panel or by XIL program control.

HUE

This attribute affects the color hue of the incoming video signal.

*Access: set/get Type: int (range -128 to +127) * Default: 0*

CHROMA_GAIN_U

This attribute affects color gain of the U component of the incoming video signal.

*Access: set/get Type: int (range -128 to +127) * Default: 0*

CHROMA_GAIN_V

This attribute affects color gain of the V component of the incoming video signal.

*Access: set/get Type: int (range 0 to 511) * Default: 180*

CONTRAST

This attribute affects the contrast of the luma portion of the incoming video signal.

*Access: set/get Type: int (range 0 to 511) * Default: 216*

LUMA_BRIGHTNESS

This attribute affects the overall brightness level of the luma portion of the incoming video signal.

*Access: set/get Type: int (range -128 to +127) * Default: 0*

H.261 Attributes

These attributes are specific to SunVideo Plus when used in conjunction with H.261 compression or decompression. They have no effect if not performing hardware-based compression or decompression.

H261_BIT_RATE

This attribute sets the desired maximum compression bit rate. The rate is in bits per second of units of 1000. For example, the default value of 256 produces a maximum bit rate of 256000 bits per second (32000 bytes/sec).

Access: set/get Type: int (in kbits/sec) Default: 256

H261_MAX_QUANT

This attribute sets the desired maximum quantization. As the quantization factor is lowered, the compressed image quality improves. Since a lower quantization generally results in an increase in bits-per-image, the frame rate for a given bit rate can decrease. The opposite is true for increasing quantization.

Access: set/get Type: int (range: 1 to 31) Default: 10

H261_IBLOCK_REFRESH

This attribute sets the desired period in milliseconds before the compressor should update a given H261 macroblock with an intra-encoded block. H261 requires that each macroblock be encoded as an intra-encoded block every 132 frames. If compressing at 10 fps, this implies that a given block may not be intra-encoded for up to 13 seconds. On a lossy network, a loss of a frame results visually in distorted blocks in the decompressed image. Waiting for up to 13 seconds for these bad blocks to refresh is probably not acceptable. The purpose of this attribute is to speed up the refresh of macroblocks during lossy transmission of H261 streams over networks.

Access: set/get Type: int Default: 1500 (msec)

H261_FUR

Setting this flag issues a fast update request to the H.261 compressor. The fast update is basically the request for an intra/key frame.

Access: set/get Type: XIL_boolean Default: FALSE

H261_PIP

This flag tells the H.261 decoder to inlay a picture of the local view in the top-left corner of the decompressed image. If not performing hardware compression, the pip image is gray.

Access: set/get Type: XIL_boolean Default: FALSE

HW_DECOMPRESS_CIS

This attribute selects which CIS hardware accelerated decompression should be performed on. The default value of NULL implies that the first CIS encountered by a decompression molecule is targeted for hardware accelerated decompression. Once a CIS has been selected, any other CIS encountered by hardware decompression

molecules will be rejected and the decompression will occur through the appropriate XIL software decoder. A value of -1 is a good value to use to disable hardware-based decompression.

Because XIL has no mechanism for informing the decompressor when a CIS is destroyed, this attribute must also be set in order to perform hardware accelerated decompression on a new CIS.

Access: set/get Type: XilCis Default: NULL

Important Attribute Information

Note - XIL 1.3 attributes do not support *get* attribute at this time.

Video Ports, Formats, and Auto Format Detection

The default behavior of the XIL drivers is to auto detect the video format on the selected video port during device image creation. This auto detect sequence can take up to 1.5 seconds to complete. If you know the video format, the video format in the SunVideo Plus control panel can be set from AUTO to the known format (NTSC or PAL). Auto format detection is not performed in this case.

The SunVideo Plus does not currently support having two different video formats (such as NTSC or PAL) on different video ports and switching between them dynamically. When the device image is created in an XIL application, the SunVideo Plus drivers will possibly auto detect the video format on the selected video port. For this reason, it is best to set the desired video port using *xil_device_set_value*(3) prior to creating the device image if you do have different video formats plugged into the various video input ports. You should also do this if you do not have video plugged into the default video port (port 1).

HW Decompression and CIS Selection

The HW_DECOMPRESS_CIS attribute can be used to selectively set which CIS should use hardware accelerated decompression. An application which is going to be decompressing multiple CIS should set this attribute to -1 before any XIL decompress molecules are performed. This keeps a decompress molecule on a CIS that you do not want to hardware decode from attaching itself to the hardware. Before performing a decompress molecule on the CIS that you do want to use hardware decompression on, set the HW_DECOMPRESS_CIS attribute.

HW Decompression and Creating an XIL Device

When performing hardware based decompression, the SunVideo Plus acts like an XIL compute device in that it is accelerating an XIL molecule. For applications that use decompression only, it is not necessary to create an `xil` device and device image as described in "Creating a Sample `MMACo1k` Device Image" on page 58. The exception to this is when an application wants to set a device specific attribute that affects decompression. There is no method in XIL of setting certain types of attribute on a compute device like the SunVideo Plus, short of opening the device explicitly and then setting the attribute. Thus, to use such attributes, you must create an xil device and image. See "XIL Source Examples" on page 59 for more information.

If a device and device image are not created directly by an application, the hardware-based SunVideo Plus XIL decompression molecules will do this implicitly. However, the molecules do not currently *hunt* for a available hardware device to use as an accelerator. They currently attempt to use the first device in a system (`/dev/o1k0`). Thus, if multiple SunVideo Plus cards are installed in your system, the only current way to use each as a hardware-accelerated decompression device is to explicitly create a device and device image in an application and use a different device name for each device creation. See "XIL Source Examples" on page 59 for more information.

Using Both HW Compression and HW Decompression

The previous section explained that the hardware decompression molecule of SunVideo Plus will implicitly create a device and device image if one has not already been created. Thus, if an application performed a decompress molecule and then created an MMACo1k device and device image, it would receive the device and image previously created implicitly by the decompress molecule. However, there is a problem in XIL with respect to deleting the device image. For this reason, if both hardware compression and decompression are to occur in an application, then the application is required to explicitly create a device and device image before the first hardware decompress molecule occurs.

The SunVideo Plus Control Panel and XIL Attributes

All of the video related parameters in the SunVideo Plus control panel have XIL attributes that enable an application developer to programmatically change these parameters. These attributes in XIL do not have default values because the default value is the current value set by the control panel. Thus, unless an application explicitly sets a given video attribute, the control panel value is used.

This is a feature of SunVideo Plus. It removes the responsibility of setting video parameters (such as brightness, contrast, and so on) out of an XIL application. Thus, end users can tune these video parameters for their video source once and not have to deal with making the same changes each time they run an XIL application.

Note that the source for both of these XIL attributes and the parameter in the control panel is the same. Therefore, making a change to one of these parameters through an XIL set attribute call will also change the value in the control panel. For example, if an XIL application sets the brightness to a given value and then exits, the next XIL application that is run will use this new brightness setting unless it also sets a new value.

Molecules

The following lists the color and grayscale molecules that the MMACo1k device currently supports.

- Color Molecules

  - capture > scale8nearest
  - capture > [scale8nearest >] colorconvert
  - capture > [rescale8>][scale8nearest>] ordereddither8_8
  - capture > scale8nearest > rescale8 > orderedditther8_8

- Compression Molecules

  - capture > [scale8nearest] compress_CellB
  - capture > [scale8nearest] compress_Jpeg
  - capture > [scale8nearest] compress_Mpeg1
  - capture > [scale8nearest] compress_H261
  - capture > [scale8nearest] compress_UYVY

- Grayscale Molecules

  - capture > scale8nearest
  - capture > [scale8nearest >[[addconst8 >] addconst8 >] addconst8
  - capture > [scale8nearest][threshold8 >] threshold8
  - capture > [scal8nearest][threshold8 >] threshold8 > addconst8

- Decompression Molecules

  - decompress_H261
  - decompress_H261 > [rescale8 >] ordereddither8_8

- decompress_H261 > colorconvert
- decompress_H261 > [rescale8 >] ordereddither8_8 > display_ioSUNWgx

Errors

The following table lists `MMACo1k` device driver error messages.

TABLE 5–1   `MMACo1k` Error Messages

Error Message	Description
`MMACo1k`-1	`MMACo1k`: invalid PORT specification
`MMACo1k`-4	`MMACo1k`: could not open `MMACo1k` device. The reason for the failure is printed in the default error handler. Possible causes include: - The device is being used by another program. - The device is not installed. - The program is referencing the wrong device number.
`MMACo1k`-5	`MMACo1k`: could not set video characteristics. The program is not able to set the port characteristics.

For a list of other XIL error messages, see Appendix B of the *XIL Programmer's Guide*.

Creating a Sample `MMACo1k` Device Image

Create a device image attached to a SunVideo Plus card, and set the video port to be COMPOSITE VIDEO 2. To do this, type:

```
# XilImage
image
# XilDevice image
```

where *image* = `xil_create_from_device`(state, "MMACo1k", device); *device* = `xil_device_create`(state, "MMACo1k") `xil_device_set_value`(device, "DEVICE_NAME", (**void** *) "/dev/o1k0"); `xil_device_set_value`(device, "PORT", (**void** *) "COMPOSITE VIDEO 2")

XIL Source Examples

The best source of information about programming using the XIL programming interface is within the XIL examples provided in the developer kit. The following table lists these examples.

TABLE 5–2 XIL Source Examples

XIL Source Example	Description
`xil_display`	A video capture and display example. This example could be easily modified to be a video recorder or player.
`xil_compress`	A video compression example. This example shows how to compress and save to disk various compression formats. It also illustrates setting device-specific attributes such as the bitrate setting for H.261.
`xil_decompress`	An example of how to perform video decompression. For the most part, this example does not require a hardware based entity to provide decompression since XIL software decoders will do the work implicitly. The example does show, however, how to use the SunVideo Plus hardware-based H261 decompression.
`xil_broadcast`	This example shows how to capture and compress video and a method for broadcasting this video over a network using UDP.
`xil_receive`	This example shows how to receive video from `xil_broadcast` and how to decompress and display it.
`xilh_broadcast`	Same as `xil_broadcast`, but adds H261.
`xilh_receive`	Same as `xil_receive`, but adds H261.
`o1k_conf`	A GUI point-to-point conference application that uses XIL and `libotiaudio`.

Glossary

acoustic echo suppression	For conferencing to be effective, systems must be able to mitigate the impact of echo caused by the loudspeaker audio feeding back into the microphone. The AES algorithm used in SunVideo Plus disables variations caused by double-talk creating consistent echo attenuation.
CellB	A non-proprietary video codec (compression-decompression) format that provides high quality, low bit-rate image compression that can be easily and efficiently decoded in software. CellB is based on Block Truncation Coding (BTC) encoding.
G.711	The G.711 standard, also called Pulse Code Modulation (PCM). A standard method of converting analog signals to digital signals. Typically used in public and private telephone networks, G.711 samples analog data and prepares it for transmission.
G.722	A wide-band (high quality) algorithm with a bandwidth of 50 Hz to 7 KHz. G.722 provides the audio encoding and decoding standardization needed at 48 Kbps, 58 Kbps, or 64 Kbps. Used when high-quality speech is necessary.
G.728	Another low-bitrate audio encoding algorithm. Using a standard analysis-by-synthesis CELP method, G.728 provides toll-quality speech at 16 Kbps.
H.261	The video component of the H.320 video conferencing standard intended for use on communication lines that have multiples of 64-Kbit capacity.
JPEG	The Joint Photographic Experts Group (JPEG) standard consisting of a host of algorithms for still image compression.
MPEG	The Moving Picture Experts Group.

MPEG-1   The first MPEG standard, MPEG-1 is geared for CD-ROM and T1
                    bit-rate transmission. At 1.5 Mbits/second, the algorithm uses both
                    interframe and intraframe coding to achieve quality video at a
                    lower bandwidth.

PCM   Pulse Code Modulation. See G.711.