

# Silicon Graphics DA1100™

## Digital Audio Card

Owner's Guide

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# Introduction

Welcome to Silicon Graphics Digital Audio sound production!

The Silicon Graphics DA1100 Digital Audio Card (referred to as “Digital Audio Card” throughout this owner’s guide) is a multichannel digital audio I/O card that supports professional audio/video equipment through industry-standard interfaces. With your Digital Audio Card, you can capture and play back up to ten channels of true 24-bit digital audio. Your Digital Audio Card supports Microsoft’s industry-standard WAVE audio interface, and is compatible with all audio applications that support Windows Multimedia. You can use your Digital Audio Card’s professional video synchronization features to produce audio-for-video content on your Silicon Graphics 320 or Silicon Graphics 540 visual workstation.

Following is a description of each of the sections in this owner’s guide:

- Chapter 1, “[Installing the Digital Audio Card](#),” explains how to install your Digital Audio Card in the Silicon Graphics 320 and Silicon Graphics 540 visual workstations.
- Chapter 2, “[Using the Digital Audio Card Control Panels](#),” defines the Digital Audio and Digital Audio Meters control panel settings, and shows you how to set up ADAT and AES input and output signal paths and video sync sources.
- Chapter 3, “[Configuring the Digital Audio Card](#),” shows you how to set up your Digital Audio Card for video soundtrack production in a number of studio configurations, and how to configure WAVE audio devices.
- [Appendix A](#) lists the Digital Audio Card specifications.
- [Appendix B](#) lists the supported WAVE audio sample formats.
- The [Glossary](#) defines digital audio related terms used in this owner’s guide.

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## Additional References

For related sources of information, refer to the following documents:

- *Silicon Graphics 320 Visual Workstation Owner's Guide*
- *Silicon Graphics 540 Visual Workstation Owner's Guide*
- *Digital Media Programming Guide for Silicon Graphics Visual Workstations*
- *Audio/Video User's Guide for Silicon Graphics 320 and Silicon Graphics 540 Visual Workstations*

**Note:** You can also find some of the above documents and driver upgrades in the Silicon Graphics Supportfolio on the Web at: <http://support.sgi.com/nt>

## Chapter 1

# Installing the Digital Audio Card

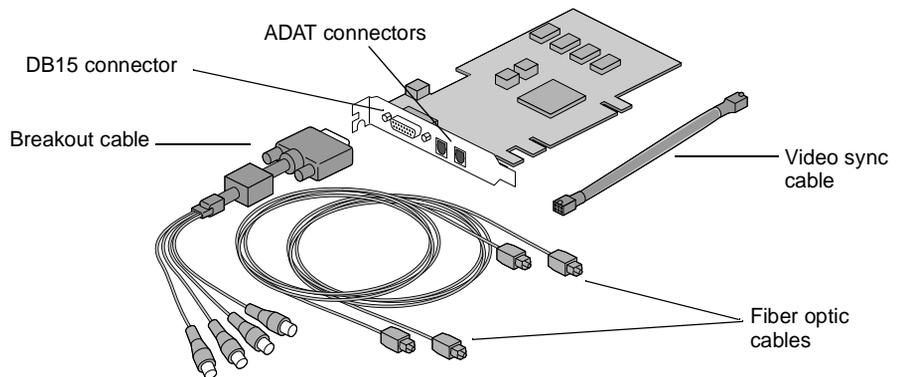
This chapter shows you how to install your Digital Audio Card in the Silicon Graphics 320 and Silicon Graphics 540 visual workstations.

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## Digital Audio Card Components

Your Digital Audio Card has one DB15 connector and two ADAT optical connectors (one input, one output), as shown in Figure 1-1. The card comes with one breakout cable, which connects to the DB15 connector, two fiber optic cables, which connect to the ADAT connectors, and one video sync cable, which connects to an internal video sync connector on your workstation's motherboard.



**Figure 1-1** Digital Audio Card and Cables

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## Installing the Digital Audio Card in the Silicon Graphics 320

Your Digital Audio Card is a 32-bit PCI card but you can install it in any of the three PCI slots in your Silicon Graphics 320. If you want to synchronize audio with video using the internal video sync feature in the Silicon Graphics 320, you must connect the card to the motherboard using the provided video sync cable. To install your Digital Audio Card, follow these steps:

1. Turn off the power to your system.
2. Remove your workstation's cover, as described in your *Silicon Graphics 320 Owner's Guide*.
3. Unwrap your Digital Audio Card in a clean environment, and leave the dust protectors on the ADAT connectors until you attach the fiber optic cables.

The two ADAT optical connectors on the Digital Audio Card are highly sensitive to dust contamination.

4. If you want to synchronize audio with video using a Silicon Graphics 320, follow these steps before inserting the Digital Audio Card in your system. If not, proceed to step 5.
  - Temporarily remove any other PCI cards installed in your system.

This provides access to the internal video sync connector located near the bottom edge of the Silicon Graphics 320 motherboard.

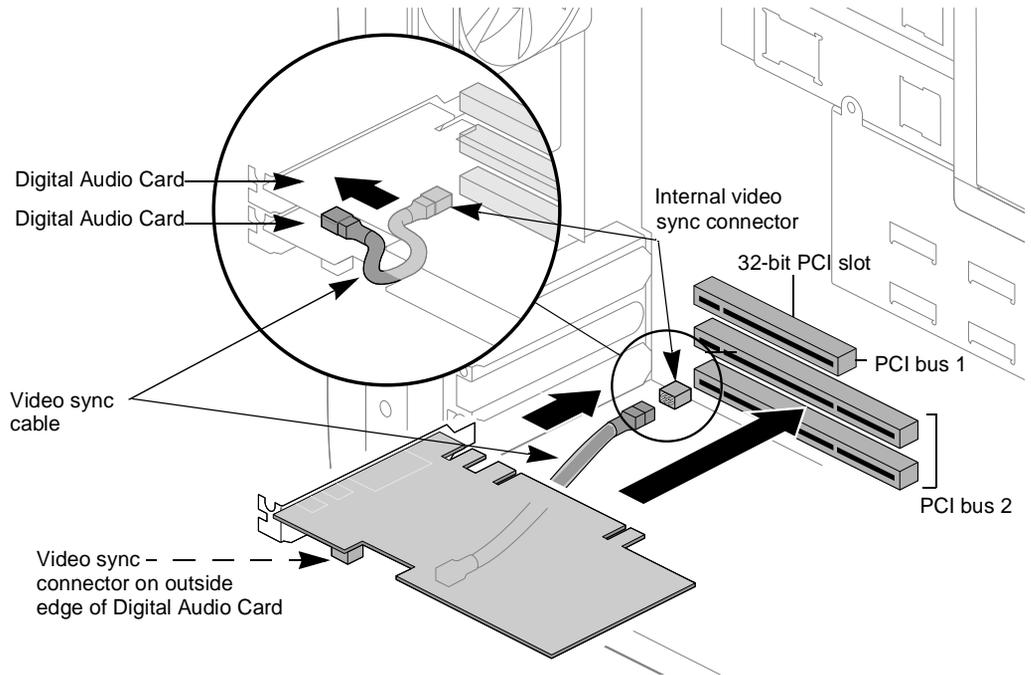
- Connect one end of the provided video sync cable to the internal video sync connector on your system's motherboard, as shown in Figure 1-2.

After you connect the video sync cable to the motherboard, you can reinstall any other PCI cards.

- Connect the other end of the video sync cable to the video sync connector on the outside edge of the Digital Audio Card.

5. Insert your Digital Audio Card (firmly but gently) into a PCI slot in your workstation as shown in Figure 1-2.

You should hear the card snap into place. Refer to your *Silicon Graphics 320 Owner's Guide* for specific PCI card installation instructions.



**Figure 1-2** Inserting the Digital Audio Card in the Silicon Graphics 320

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## Installing the Digital Audio Card in the Silicon Graphics 540

You can install your Digital Audio Card in any of the six PCI slots in your Silicon Graphics 540. There is a video sync connector next to each of the top five slots, as shown in Figure 1-3. You can use this connector to synchronize audio with video using your system's internal video sync capability. To install your Digital Audio Card, follow these steps:

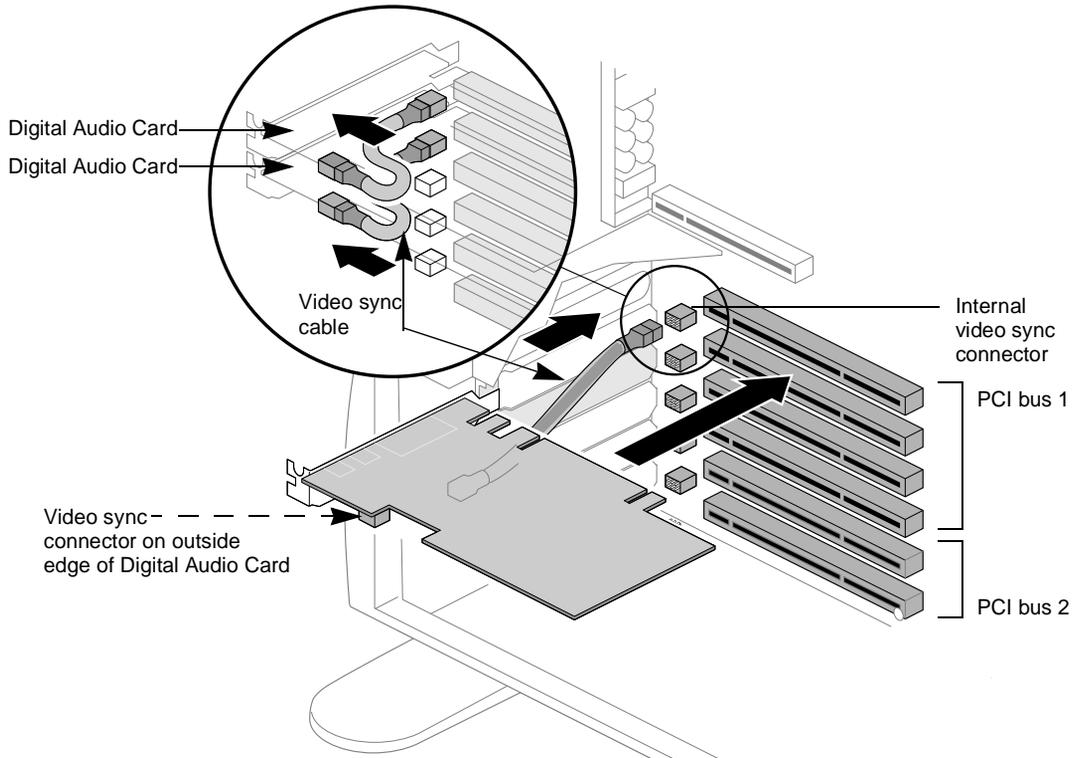
1. Turn off the power to your system.
2. Remove your workstation's cover, as described in your *Silicon Graphics 540 Owner's Guide*.
3. Unwrap your Digital Audio Card in a clean environment, and leave the dust protectors on the ADAT connectors until you attach the fiber optic cables.

The two ADAT optical connectors on the Digital Audio Card are highly sensitive to dust contamination.

4. If you want to synchronize audio with video using a Silicon Graphics 540, follow these steps. If not, proceed to step 5.
  - Connect one end of the provided video sync cable to the video sync connector below an empty PCI slot on your workstation's motherboard, as shown in Figure 1-3.
  - Connect the loose end of the video sync cable to the video sync connector on the outside edge of the Digital Audio Card.

5. Insert your Digital Audio Card (firmly but gently) into the appropriate PCI slot for your video sync connection.

You should hear the card snap into place. Refer to your *Silicon Graphics 540 Owner's Guide* for specific PCI card installation instructions.



**Figure 1-3** Inserting the Digital Audio Card in the Silicon Graphics 540

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## Digital Audio Card Software

After installing the Digital Audio Card in your system, use the Digital Audio Installation CD to install the following files in your system:

- *oemsetup.inf*  
The installation file
- *sgirad.dll*  
The user level driver
- *sgirad.sys*  
The kernel level driver
- *sgiradmp.exe*  
The Digital Audio Meter Panel
- *sgiradcp.exe*  
The Digital Audio Control Panel
- *sgiradpi.dll*  
Library shared by *sgiradcp.exe* and *sgiradmp.exe*
- *sgiradcp.cpl*  
The cpl file for the Digital Audio Control Panel
- *sgiradmp.cpl*  
The cpl file for the Digital Audio Meter Panel
- *Readme.rtf*  
The readme file containing the release notes

## Installing the Digital Audio Card Software

To install the Digital Audio Card software, follow these steps:

1. Insert the Digital Audio Installation CD.
2. Choose **Start > Settings > Control Panel**.
3. Double-click the **Multimedia** icon to open the Multimedia Properties control panel (shown in Figure 1-4 after installation).
4. Click the **Devices** tab in the Multimedia Properties control panel.
5. Click the **Add** button in the Devices window.

Make sure **Unlisted or Updated Driver** is selected in the list of drivers.

6. Click **OK** in the Add dialog box.

An Install Driver dialog box appears.

7. Enter the path for the Digital Audio Card driver files on your Digital Audio Installation CD.

You can use the **Browse** button to locate your Installation CD containing the driver files, for example, E:

8. Click **OK** in the Install Driver dialog box.

An Add Unlisted or Updated Driver dialog box appears, displaying **Silicon Graphics Digital Audio X.X** (1.1 for the first release).

9. Click **OK** in the Add Unlisted or Updated Driver dialog box.

Windows NT installs the Digital Audio software in your system folder and modifies the system registry as required.

The System Setting Change dialog box appears, which confirms that the SGI Digital Audio driver is installed in your system and tells you to restart.

10. Click **Restart Now** in the System Setting Change dialog box.

Your workstation restarts with the Digital Audio software installed.

## Upgrading the Digital Audio Card Software

Before installing a new version of the Digital Audio Card software, you have to remove the current driver and restart the system. To upgrade the Digital Audio Card software, follow these steps:

1. Choose **Start > Settings > Control Panel**.
2. Double-click the **Multimedia** icon to open the Multimedia Properties control panel, shown in Figure 1-4.
3. Click the **Devices** tab in the Multimedia Properties control panel.
4. Click the plus sign [+] next to the Audio Devices speaker icon to display the list of Audio drivers.
5. Click **Audio for SGI Digital Audio X.X** (X.X = currently installed version of the driver, e.g., 1.1).

6. Click the **Remove** button at the bottom of the Devices window.  
A dialog box asks if you want to remove the driver.

7. Click **Yes** in the dialog box.

The System Setting Change dialog box appears.

8. Click **Restart Now** in the System Setting Change dialog box.
9. Follow the Digital Audio Card software installation procedures described in the previous section “[Installing the Digital Audio Card Software.](#)”

Windows NT looks for any earlier versions of the driver.

A Driver Exists dialog box appears during the installation process and asks whether you want to use the current sgirad.dll driver or install a new driver.

10. Click **New**.

A dialog box asks if you want to replace the currently installed versions of the Digital Audio files with the new versions.

11. Click **Yes** to complete the installation.

**Note:** You can download software upgrades from the Silicon Graphics Supportfolio on the Web at:  
<http://support.sgi.com/nt>

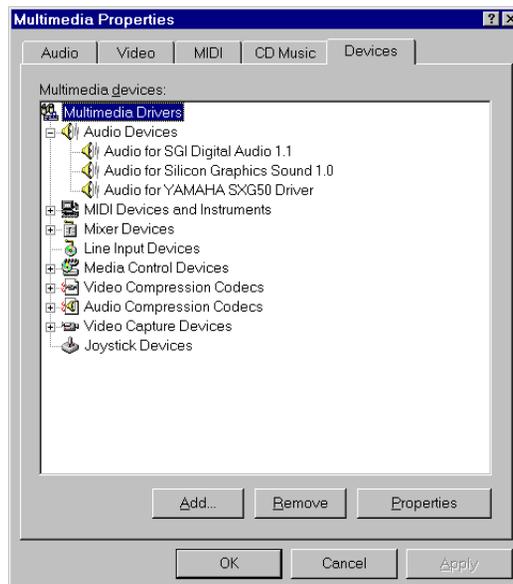
## Verifying the Digital Audio Card Software Installation

Follow these steps to verify successful installation of the Digital Audio Card software:

1. Choose **Start > Settings > Control Panel**.
2. Double-click the **Multimedia** icon to open the Multimedia Properties control panel, shown in Figure 1-4.
3. Click the **Devices** tab in the Multimedia Properties control panel.
4. Click the plus sign [+] next to the Audio Devices speaker icon.

A list of audio drivers installed in your system appears, and the Audio Devices speaker icon plus sign [+] changes to a minus sign [-], as shown in Figure 1-4.

5. Verify that **Audio for SGI Digital Audio X.X** appears in the list (X.X = currently installed version of the driver, e.g., 1.1).

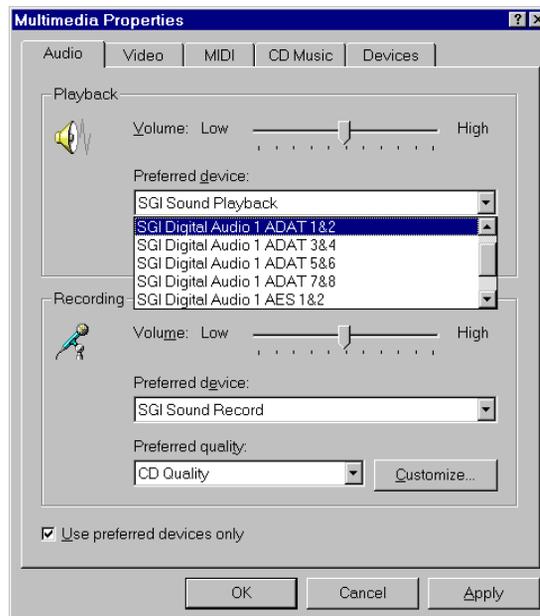


**Figure 1-4** Multimedia Properties Control Panel - Digital Audio Driver Installed

6. Click the **Audio** tab in the Multimedia Properties control panel, and then choose SGI Sound Playback in the Preferred device drop-down menu in the Playback area of the panel.

Five Digital Audio WAVE Playback devices should appear for each Digital Audio Card installed in your system, as shown in Figure 1-5 (you have to scroll through the list to display the WAVE playback devices for more than one card).

You can select a device from this list to play audio through the different physical output channels on the Digital Audio Card.



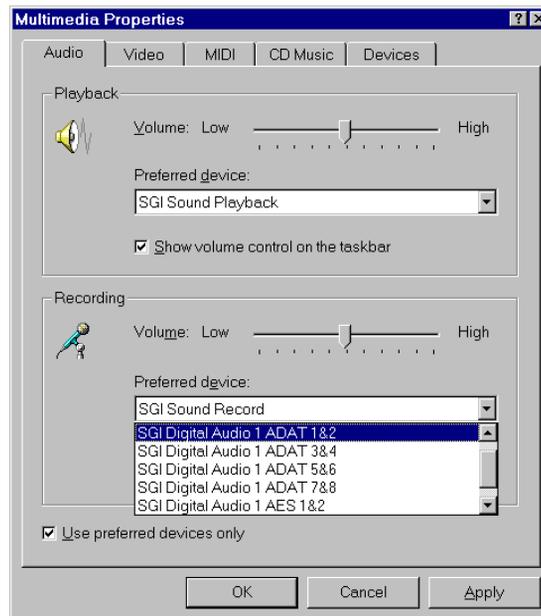
**Figure 1-5** WAVE Playback Devices

7. Choose **SGI Sound Record** in the Preferred device drop-down menu in the Recording area of the panel

Five Digital Audio WAVE Recording devices should appear for each Digital Audio Card installed in your system, as shown in Figure 1-6 (you have to scroll through the list to display the WAVE recording devices for more than one card).

You can select a device from this list to record audio from the different physical input channels on the Digital Audio Card.

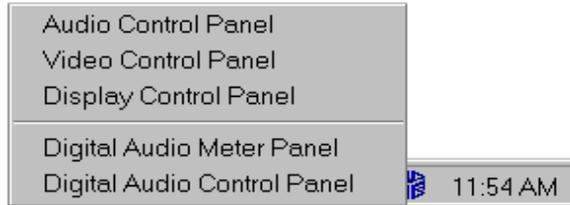
For more information on WAVE devices, see “[Configuring Wave Audio Devices](#)” in Chapter 3.



**Figure 1-6** WAVE Recording Devices

- Click the Silicon Graphics icon in the System Tray on the taskbar (near the clock).

The Silicon Graphics Control Panels Menu should appear, as shown in Figure 1-7.

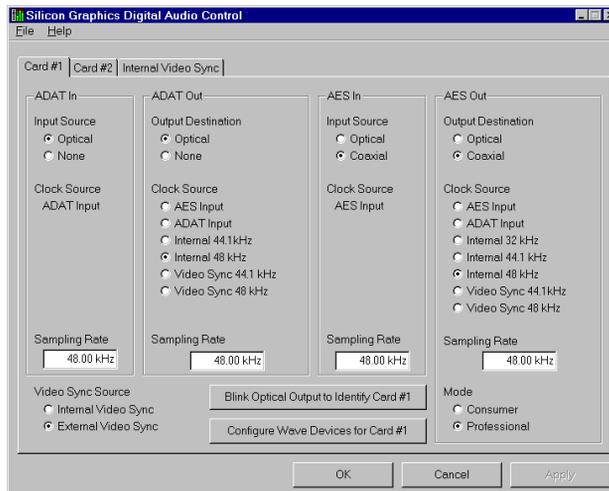


**Figure 1-7** Silicon Graphics Control Panels Menu

- Choose Digital Audio Control Panel.

The Digital Audio Control Panel should appear, as shown in the example in Figure 1-8 for a workstation with two Digital Audio Cards installed. You can also open this control panel by choosing **Start > Settings > Control Panel > SGI Digital Audio Control**.

In this control panel, you can set up your Digital Audio Card(s), as [described in detail in Chapters 2 and 3](#).



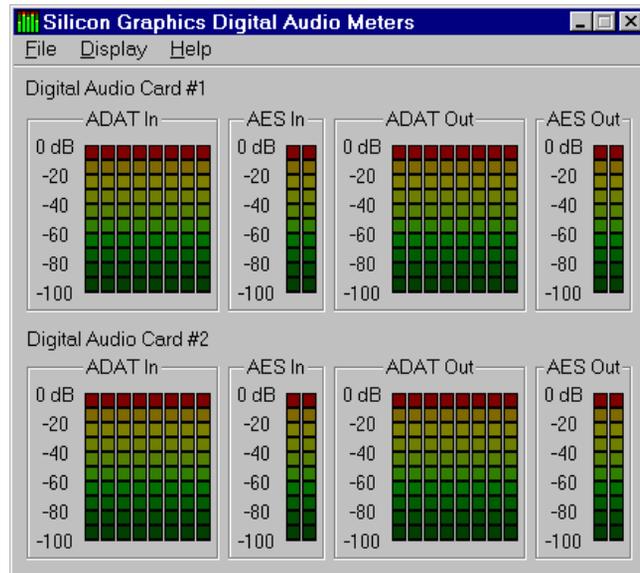
**Figure 1-8** Digital Audio Control Panel

## 10. Choose **Digital Audio Meter Panel**.

The Digital Audio Meters panel should appear, as shown in the example in Figure 1-9 for a workstation with two Digital Audio Cards installed.

You can also open this control panel by choosing **Start > Settings > Control Panel > SGI Digital Audio Meters**.

In this control panel, you can monitor the audio signal levels on your Digital Audio Card(s), as [described in detail in Chapter 2](#).



**Figure 1-9** Silicon Graphics Digital Audio Meters Panel

If you verified the preceding steps 1 through 10, your Digital Audio Card software is successfully installed in your system.

If you cannot verify steps 1-10, make sure your Digital Audio Card is properly connected to a PCI slot inside your workstation.

If your Digital Audio Card is properly connected and you still cannot verify steps 1 through 10, reinstall the Digital Audio Card software.

## Identifying Digital Audio Cards after Installation

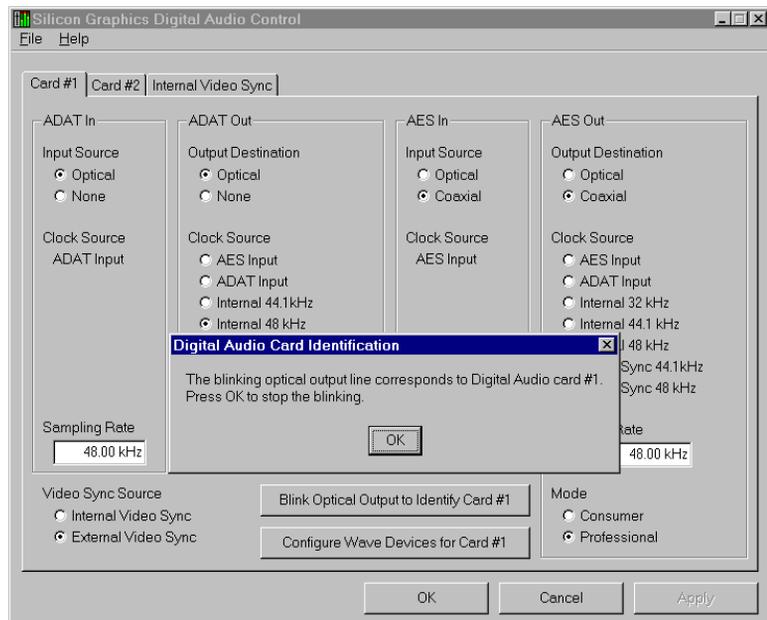
If you install more than one Digital Audio Card in your workstation, you can identify each card using the Digital Audio Control Panel. The control panel numbers the installed Digital Audio Cards either 1–3 for a Silicon Graphics 320 workstation, or 1–6 for a Silicon Graphics 540 workstation.

**Note:** If only one Digital Audio Card is installed in your workstation, you can skip this section.

To identify a card, follow these steps and make sure you can see the back of your workstation:

1. Click the Silicon Graphics icon in the System Tray on the taskbar (near the clock).
2. Choose **Digital Audio Control Panel**.
3. Choose one of the numbered Digital Audio Card tabs at the top of the Digital Audio Control Panel.
4. Click the **Blink Optical Output** button near the bottom of the Digital Audio Control Panel.

A dialog box tells you the identification number of the selected Digital Audio Card, and that the blinking optical output line corresponds to that card, as shown in the example in Figure 1-10.



**Figure 1-10** Digital Audio Card Identification

5. Look at the back of your workstation and determine which card has the blinking red light.

The card with the blinking light corresponds to the numbered Digital Audio Card tab you selected in the Digital Audio Control Panel.

- Note:** To see the blinking light, you have to remove the dust caps on your Digital Audio Card's ADAT optical output connectors.
6. Repeat the preceding steps for all Digital Audio Cards installed in your workstation.

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## Connecting Cables to the Digital Audio Card

Your Digital Audio Card comes with three external cables—a breakout cable and two fiber optic cables.

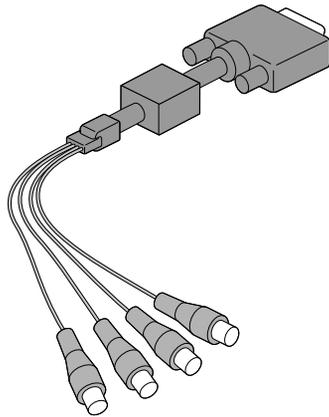
**Note:** The ADAT optical connectors on the Digital Audio Card are highly sensitive to dust. Leave the dust covers on these connectors until you connect the fiber optic cables.

---

### Connecting the Breakout Cable

The breakout cable allows you to connect video input and output devices to your Digital Audio Card so you can synchronize sound with video. This cable includes the following connectors, as shown in Figure 1-11.

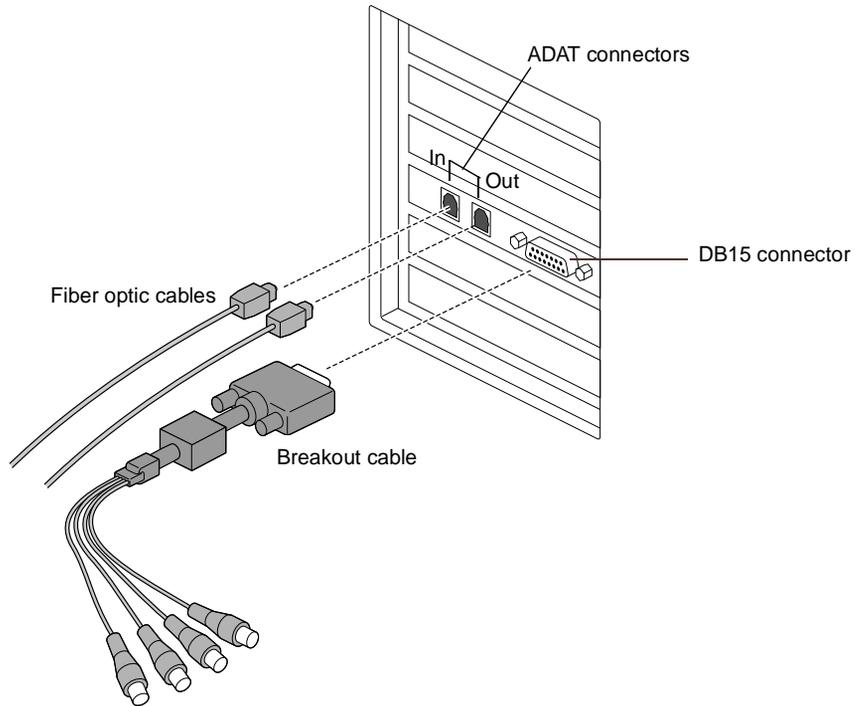
- A red coax digital input (AES/EBU)
- A blue coax digital output (AES/EBU)
- A black video reference loop-through
- A green video reference loop-through



**Figure 1-11** Breakout Cable

You connect the breakout cable to the DB15 connector on the Digital Audio Card, as shown in Figure 1-12. The breakout cable supports video synchronization and the AES-3id digital audio standard for transmitting AES/EBU digital audio over 75 ohm coaxial cable. The black and green video reference loop cables are interchangeable.

If you use only a video input and do not loop through to another device, terminate the unused video connector with a 75 ohm BNC terminator.



**Figure 1-12** Connecting the Breakout Cable and ADAT Optical Cables

---

## Connecting the Fiber Optic Cables

The ADAT optical connectors on your Digital Audio Card provide high bandwidth eight-channel digital audio fiber optic input and output. To attach the provided fiber optic cables to your Digital Audio Card, follow these steps:

1. Remove the dust caps from the ADAT optical connectors on your Digital Audio Card.
2. Connect one end of each fiber optic cable to each of the Digital Audio Card's ADAT connectors, as shown in Figure 1-12.
3. Connect the other end of each fiber optic cable to an ADAT connector on an ADAT optical compatible device.

Make sure you connect the output on a device to the input on the other device.

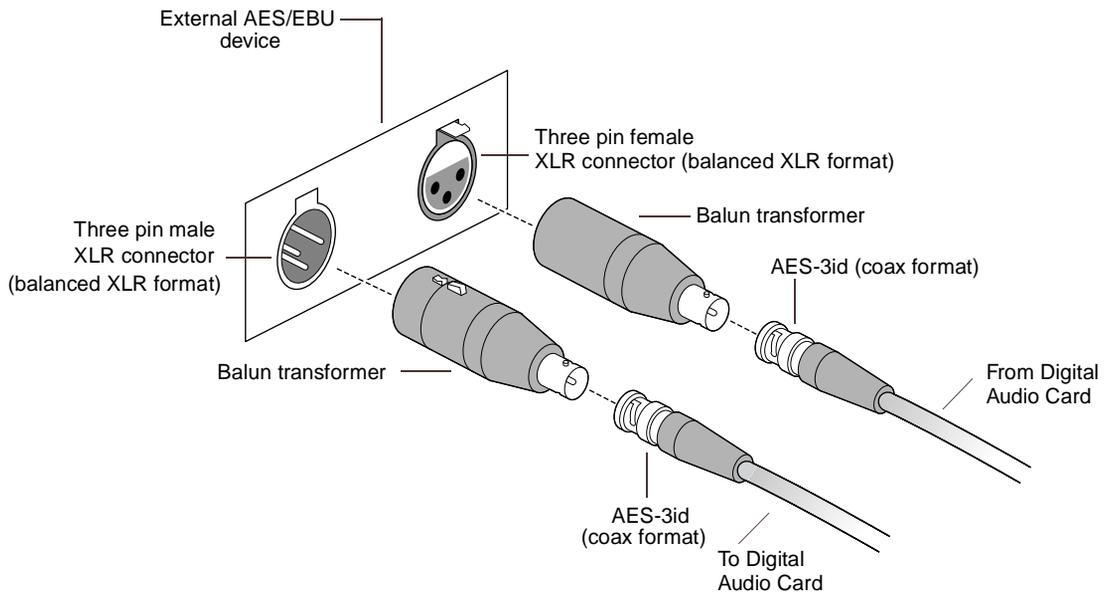
**Note:** Until you connect such a device, keep the dust caps on the Digital Audio Card's ADAT optical connectors. You can also use one of the fiber optic cables as an alternative dust protector by connecting it to both ADAT connectors.

Some ADAT optical compatible devices provide the option of clocking their inputs either externally or internally (internally is often the default). For proper output to such devices, you must configure external clocking. For external clocking configuration instructions, refer to the ADAT device's manual.

---

## Connecting External Devices to the Breakout Cable AES/EBU Connectors

If you want to connect the AES-3id input or output to an external AES/EBU device that uses 3 pin XLR connectors, you have to use balun (balanced/unbalanced) transformers to convert coax format to balanced XLR format, as shown in Figure 1-13. You should attach the balun transformers directly to the XLR connectors on the external device and run 75 ohm coaxial cable between the balun transformers and your Digital Audio Card.



**Figure 1-13** Connecting Balun Transformers



## Chapter 2

# Using the Digital Audio Card Control Panels

This chapter describes the Digital Audio Control Panel and Digital Audio Meters Panel. It defines each setting and shows you how to set up ADAT and AES input and output signal paths, video sync sources, and other Digital Audio Card parameters.

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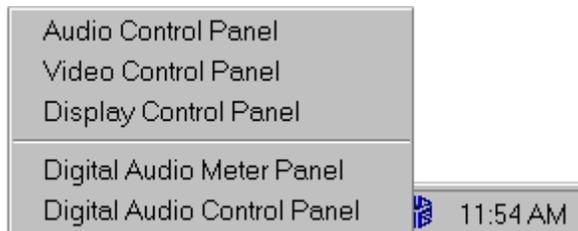
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## Digital Audio Control Panel

You use the Digital Audio Control Panel to set up your Digital Audio Card(s).

1. Click the Silicon Graphics icon in the System Tray on the taskbar (near the clock).

The Silicon Graphics Control Panels menu appears, as shown in Figure 2-1.



**Figure 2-1** Silicon Graphics Control Panels Menu

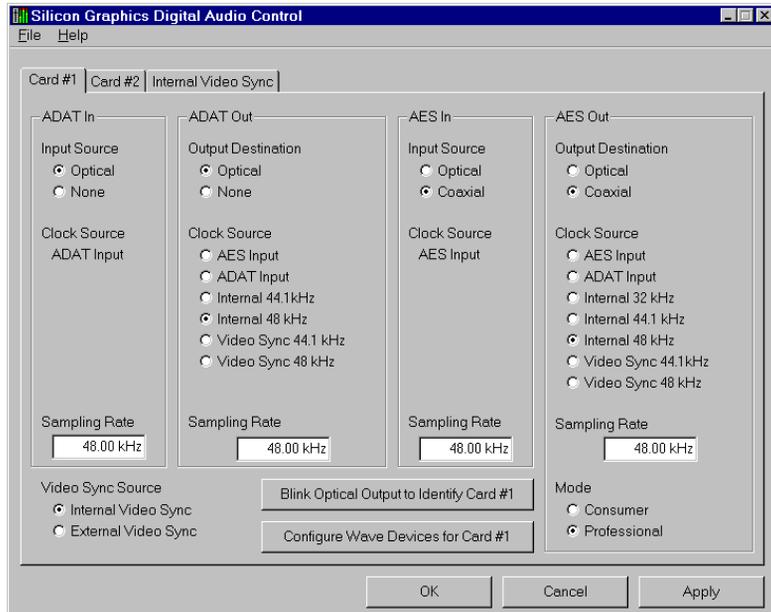
## 2. Choose **Digital Audio Control Panel**.

The Digital Audio Control Panel appears, as shown in Figure 2-2, for a workstation with two Digital Audio Cards installed.

You can also open the Digital Audio Control Panel by choosing **Start > Settings > Control Panel > SGI Digital Audio Control**.

Numbered tabs appear at the top of the control panel, which correspond to each Digital Audio Card installed in your system. If you have more than one card installed, you can select one of these tabs to display the control panel settings for the card you want to configure.

There is also an **Internal Video Sync** tab, which is [described later in this chapter](#).



**Figure 2-2** Silicon Graphics Digital Audio Control Panel

3. Click **File** in the menu bar.

The File menu displays two options, **Digital Audio Meters**, which opens that panel and **Exit** which closes the Digital Audio Control Panel.

4. Click **Help** in the menu bar.

The Help menu displays two options, **Contents**, which displays the *Silicon Graphics Audio/Video Help* book, and **About**, which displays the version number of the currently installed Digital Audio software.

---

## ADAT In

In the ADAT input section of the Digital Audio Control Panel, you can specify whether your Digital Audio Card uses an ADAT 8-channel optical input or an AES 2-channel optical input. This section of the control panel also displays the current sampling rate for the ADAT 8-channel input.

### Input Source

The ADAT input source default setting is **Optical**. If you specify an AES optical input source, for example, using an S/PDIF 2-channel input, the ADAT input source is automatically set to **None**, as illustrated in Figure 2-3.

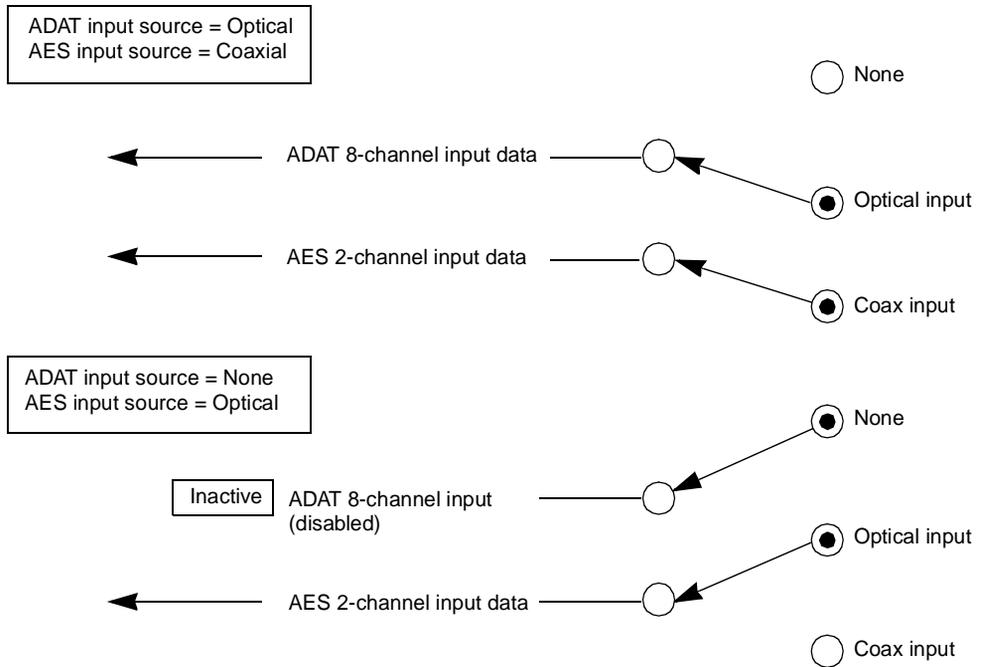
### Clock Source

The ADAT input always derives its clock from the corresponding input signal.

## Sampling Rate

The Sampling Rate field displays the current measured sampling rate for the ADAT input signal.

To activate a new ADAT Input Source and display its Sampling Rate, you must click the **Apply** button or the **OK** button at the bottom of the control panel. The **OK** button also closes the control panel.



**Figure 2-3** ADAT and AES Input Signal Paths

---

## ADAT Out

In the ADAT output section of the Digital Audio Control Panel, you can specify the clock source and sampling rate for the ADAT 8-channel output.

### Output Destination

The ADAT output destination default setting is **Optical**. If you specify an AES optical output source, for example, an S/PDIF 2-channel output, the ADAT output destination is automatically set to **None** and the **ADAT Out** channel is disabled, as illustrated in Figure 2-4.

### Clock Source

You can choose any of the following clock sources for the ADAT output:

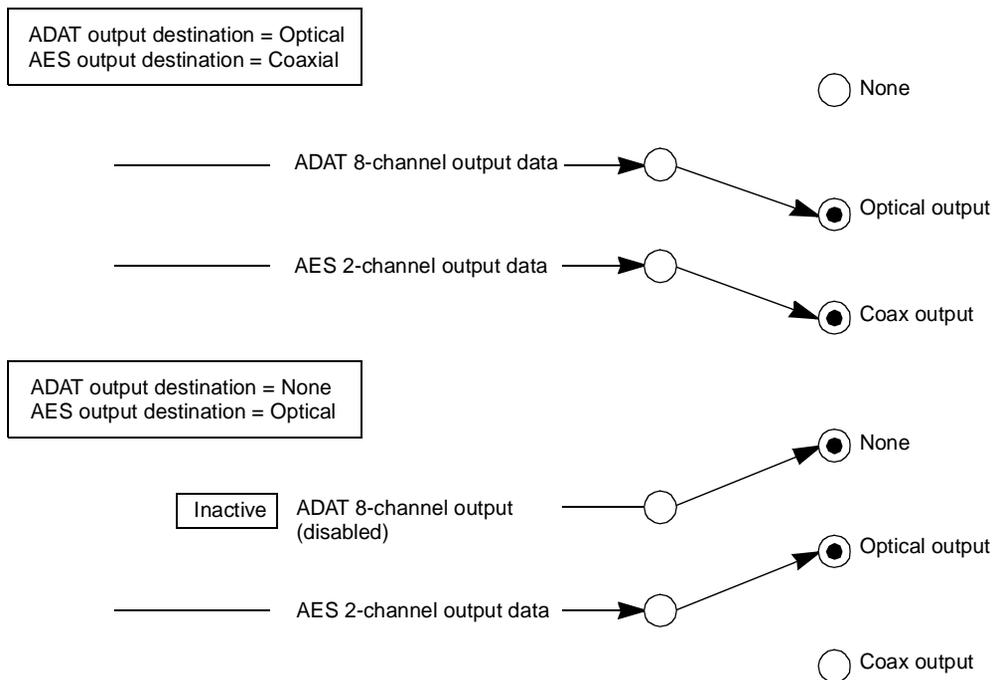
- AES Input
- ADAT Input
- Internal 44.1 kHz (oscillator)
- Internal 48 kHz (oscillator)
- Video Sync 44.1 kHz (derived from a reference video sync source)
- Video Sync 48 kHz (derived from a reference video sync source)

Use the **Video Sync Source** setting in the lower left corner of the control panel to specify whether the reference video clock is derived from the external video input on the Digital Audio Card or the internal video sync connection in your workstation. This setting is [described in detail later in this chapter](#).

## Sampling Rate

If you choose AES input or ADAT input as the clock source, the Sampling Rate field displays the current measured sampling rate for the corresponding AES or ADAT output signal. If you choose an internal oscillator or a reference video sync source as the clock source, the Sampling Rate field displays the nominal sample rate (48.00 kHz or 44.10 kHz).

To activate a new ADAT Out Clock Source and Sampling Rate, you must click the **Apply** button or the **OK** button at the bottom of the control panel (**OK** also closes the window).



**Figure 2-4** ADAT and AES Output Signal Paths

---

## AES In

In the AES input section of the Digital Audio Control Panel, you can specify the physical input connector (coaxial or optical) and display the current sampling rate for the 2-channel AES input on the selected Digital Audio Card.

### Input Source

The AES input source default setting is **Coaxial**. If you want to use the optical connector instead of the coax connector for AES/EBU or S/PDIF input, choose **Optical** as the AES input source. In this case, the coax AES input source is deactivated. The AES 2-channel data path uses the optical connector on your Digital Audio Card, and the ADAT 8-channel input is disabled, as illustrated in Figure 2-3.

### Clock Source

The AES input always derives its clock from the corresponding input signal.

### Sampling Rate

The Sampling Rate field displays the current measured sampling rate for the ADAT input signal.

To activate a new AES Input Source and/or Clock Source, and display the corresponding Sampling Rate, you must click the **Apply** button or the **OK** button at the bottom of the control panel (**OK** also closes the window).

---

## AES Out

In the AES output section of the Digital Audio Control Panel, you can specify the physical connector, clock source, sampling rate, and the data stream format (consumer or professional mode) for the AES 2-channel output on the selected Digital Audio Card.

### Output Destination

The AES output destination default setting is **Coaxial**. If you want to use an optical connector instead of a coax connector for AES/EBU or S/PDIF output, choose **Optical** as the AES output destination. In this case, the Coax AES output and the ADAT output data path are disabled, as illustrated in Figure 2-4.

### Clock Source

You can choose any of the following clock sources for the ADAT output:

- AES Input
- ADAT Input
- Internal 32 kHz clock
- Internal 44.1 (oscillator)
- Internal 48 kHz (oscillator)
- Video Sync 44.1 kHz (derived from reference video sync source)
- Video Sync 48 kHz (derived from reference video sync source)

Use the **Video Sync Source** setting in the lower left corner of the control panel to specify whether the reference video clock is derived from the external video input on the Digital Audio Card or the internal video sync connection in your workstation. This setting is [described in detail later in this chapter](#).

## Sampling Rate

If you choose AES input or ADAT input as the clock source, the Sampling Rate field displays the current measured sampling rate for the ADAT output signal. If you choose an internal oscillator or a reference video sync source as the clock source, the Sampling Rate field displays the nominal sample rate (32.00 kHz, 48.00 kHz, or 44.10 kHz).

## Mode

The mode setting allows you to select **Consumer** (IEC 958, S/PDIF) or **Professional** (AES3-1997) for the AES digital output stream. These two bitstream formats use different settings for some of the auxiliary (non audio) bits.

To activate a new Output Destination and/or Clock Source, display the corresponding Sampling Rate, and/or set a new Mode, you must click the **Apply** button or the **OK** button at the bottom of the control panel (**OK** also closes the window).

---

## Video Sync Source

The ADAT output signal and/or the AES output signal can derive their sampling clocks from a reference video clock. The **Video Sync Source** setting (at the lower left corner of the control panel) specifies whether the reference video clock is derived internally from one of the video inputs or outputs in your workstation, or externally from the reference video loop-through on the Digital Audio Card.

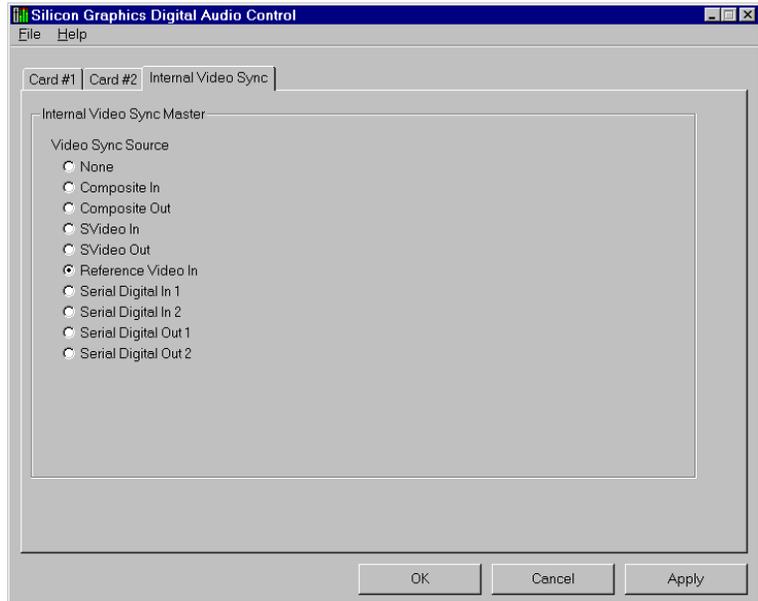
You can choose either **Internal Video Sync** or **External Video Sync** for each Digital Audio Card installed in your workstation. However, for each Digital Audio Card, the ADAT and AES outputs must use the same reference video source (either internal video sync or external video sync).

### Internal Video Sync Master

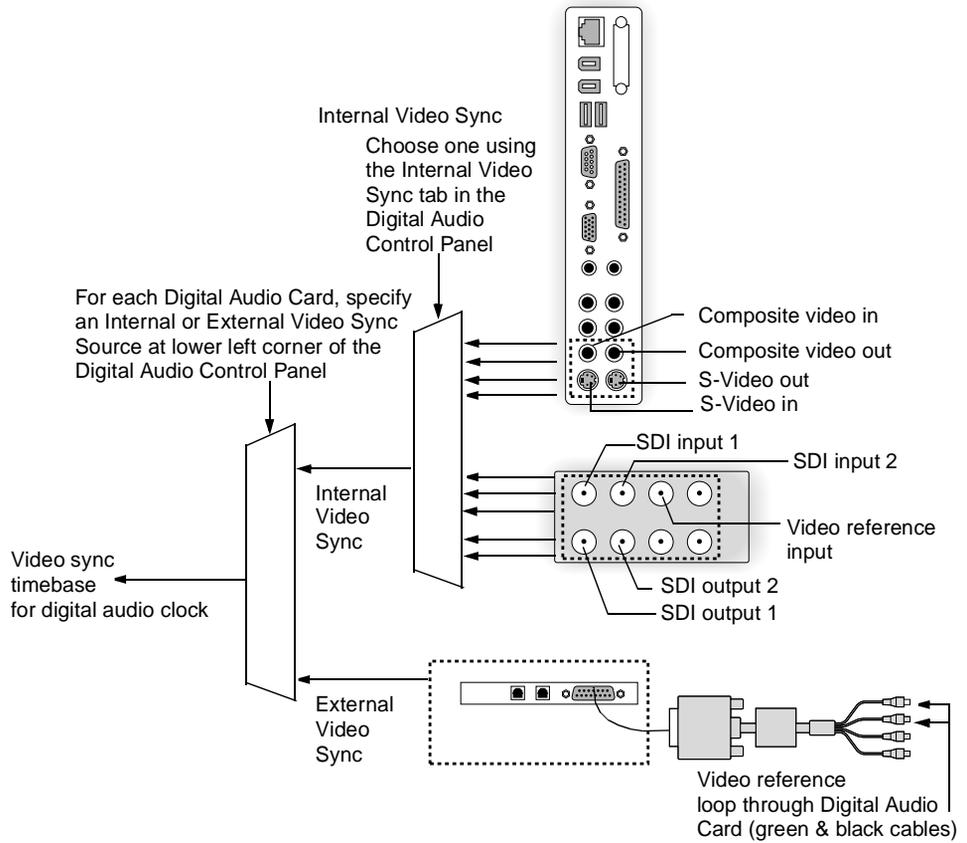
When you use an internal video sync source, you must specify which of your workstation's video inputs or outputs to use for the video timebase. You do this by clicking the **Internal Video Sync** tab at the top of the Digital Audio Control Panel to display the **Internal Video Sync Master** settings, as shown in the example in Figure 2-5 for a Silicon Graphics 540 with the Silicon Graphics serial digital video option installed.

For a Silicon Graphics 320 or Silicon Graphics 540, you can choose any one of the Composite or S-Video inputs and outputs as your internal video sync source. For a Silicon Graphics 540 with the serial digital video option installed, you can also choose the Reference Video input or any one of the serial digital inputs and outputs as your internal video sync source. On a Silicon Graphics 540 with no video sync connection, these settings are grayed out. On a Silicon Graphics 540 with no serial digital video option installed, these settings do not appear. On a Silicon Graphics 320, these settings are not available.

The Internal Video Sync Master settings are global for the system. You can select only one internal video sync master source. Each of the Digital Audio Cards installed in your system receives a reference video clock from the selected source. Figure 2-6 shows the relationship between the video sync source options.



**Figure 2-5** Internal Video Sync Master Settings (Silicon Graphics 540 with serial digital video option installed)



**Figure 2-6** Video Sync Sources

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## Blink Optical Output Button

For information on this control panel button, see [“Identifying Digital Audio Cards after Installation”](#) in Chapter 1.

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## Configure Wave Devices Button

For information on this control panel button, see [“Configuring Wave Audio Devices”](#) in Chapter 3.

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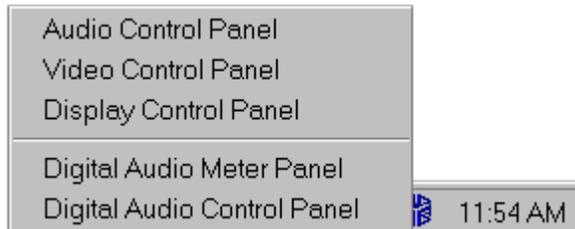
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## Digital Audio Meter Panel

You use the Digital Audio Meter Panel to monitor the audio signal levels on your Digital Audio Card(s).

1. Click the Silicon Graphics icon in the System Tray on the taskbar (near the clock).

The Silicon Graphics Control Panels menu appears, as shown in Figure 2-7.



**Figure 2-7** Silicon Graphics Control Panels Menu

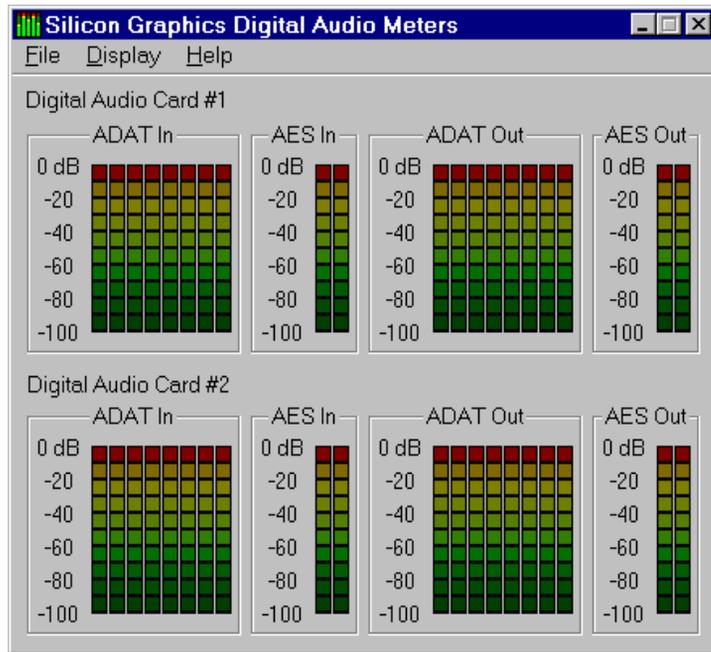
2. Choose **Digital Audio Meter Panel**.

The Digital Audio Meters Panel appears, as shown in the example in Figure 2-8, with two Digital Audio Cards installed.

You can also access the Digital Audio Meters Panel by choosing **Start > Settings > Control Panel > SGI Digital Audio Meters**.

0 dB always represents the peak absolute sample value ( $2^{15}$  for 16-bit,  $2^{19}$  for 20-bit,  $2^{23}$  for 24-bit).

The digital audio software implements the reduced meter ranges by truncation. When the audio level drops below the minimum signal level in the meter range, no audio signal appears.



**Figure 2-8** Digital Audio Meters Panel

3. Click **File** in the menu bar.

The File menu appears with two options, **Digital Audio Control**, which opens that control panel and **Exit**, which closes the Digital Audio Meters panel.

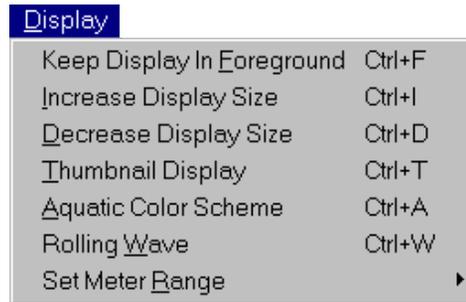
4. Click **Help** in the menu bar.

The Help menu appears with two options, **Contents**, which displays the *Silicon Graphics Audio/Video Help* book and **About**, which displays the version number of the currently installed digital audio software.

5. Click **Display** in the menu bar.

The Digital Audio Meters Display menu appears, as shown in Figure 2-9.

In this menu, you can select a display format for the Digital Audio Meters Panel.



**Figure 2-9** Digital Audio Meters Display Menu

Following is a description of each of these display formats.

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### **Keep Display In Foreground**

This option displays the panel in front of all other windows. If you choose this option, the panel is always visible and is not blocked by your current sound application. This option is especially useful in conjunction with the Thumbnail Display option.

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### **Increase Display Size**

This option increases the size of the panel.

---

### **Decrease Display Size**

This option decreases the size of the panel.

---

### **Thumbnail Display**

This option displays a minimal panel with no text or labels. It is useful for monitoring the input and output signals.

---

### **Aquatic Color Scheme**

This option displays the meters in a blue-green color.

---

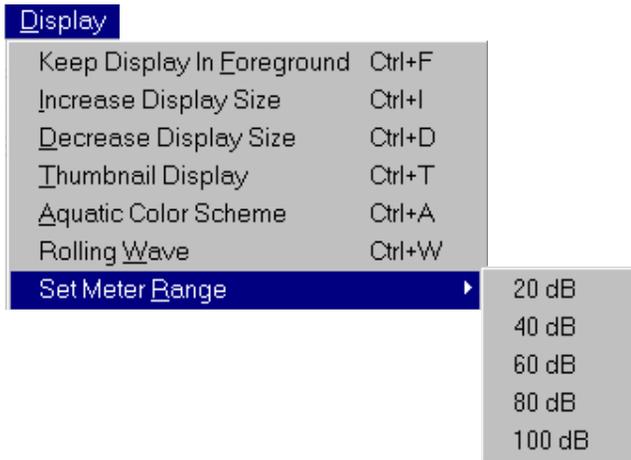
## Rolling Wave

This option displays a sine wave rolling across the meters (eye candy).

---

## Set Meter Range

This option displays the Set Meter Range popup menu. In this menu, you can select the meter range (in dB), as shown in Figure 2-10.



**Figure 2-10** Set Meter Range Popup Menu



## *Chapter 3*

# **Configuring the Digital Audio Card**

This chapter explains how to configure your Digital Audio Card. It shows you how to synchronize your card to external audio or video devices or to the internal subsystem in your Silicon Graphics 320 or Silicon Graphics 540 workstation. You will also learn how to configure the logical WAVE audio devices (stereo, mono, and so on) that correspond to the physical inputs and outputs on the Digital Audio Card. Windows NT applications use these logical devices to record and playback audio through the card.

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## **Synchronizing Digital Audio Cards for Audio/Video Soundtrack Production**

Depending on your studio configuration, you may want to synchronize your Digital Audio Card(s) to an external master clock source or your system's internal video subsystem. This section describes four example studio configurations and explains how to synchronize your Digital Audio Card(s) in each configuration.

## Example 1: Synchronizing One Digital Audio Card and a VCR using a Silicon Graphics 320

This example shows you how to configure audio synchronization with a VCR using a Silicon Graphics 320 visual workstation with one Digital Audio Card installed. In this example, the workstation's composite video input provides a master clock source for the Digital Audio Card through the system's internal sync connection. The Digital Audio Card's AES digital output then provides a master clock source for an external digital mixing console. The Digital Audio Card's AES output clock is synchronized with the composite video signal from the VCR. To set up this configuration, follow the step-by-step procedures that appear on the following pages.

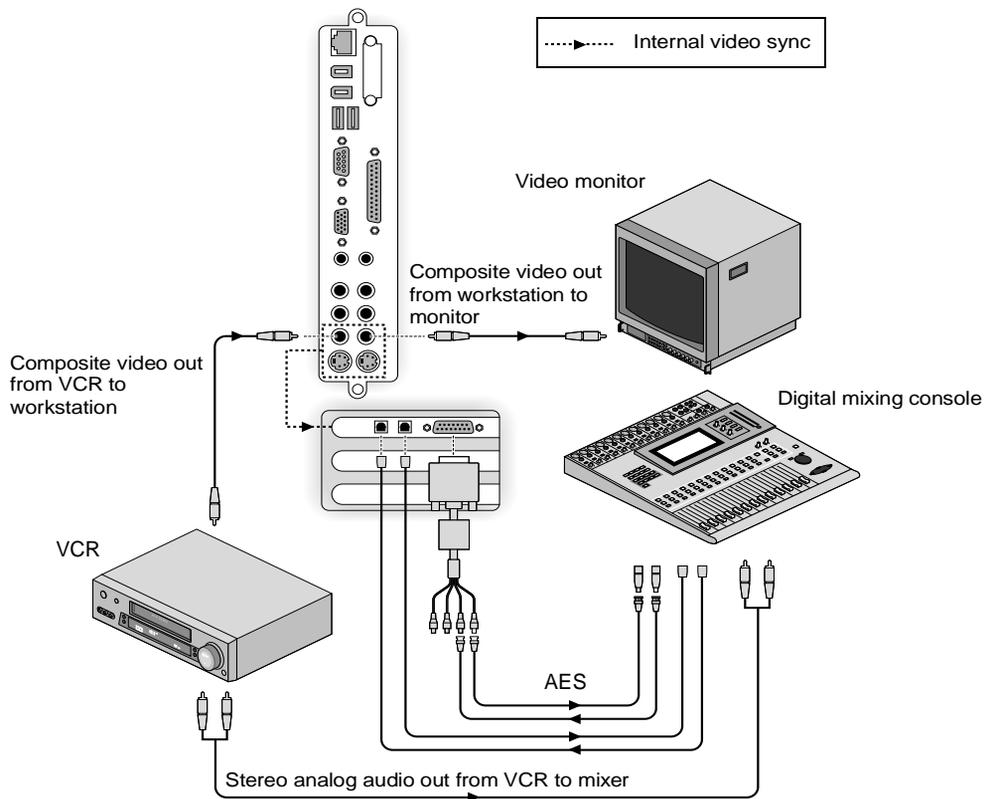


Figure 3-1 Digital Audio Card/VCR Sync - Silicon Graphics 320

## Setting Up the Configuration

1. Connect the Digital Audio Card's ADAT optical input and output cables to a small format digital mixing console.

The digital mixing console provides Analog-to-Digital and Digital-to-Analog conversion and outboard audio processing.

2. Connect the Digital Audio Card's AES/EBU connectors on the breakout cable to the 2-channel input on the digital mixing console.

3. Connect the composite video output from the VCR to the composite video input on the workstation.

4. Capture stereo audio from the VCR through the Digital Audio Card using the mixing console.

The mixing console digitizes stereo analog audio and transmits the digitized audio to the Digital Audio Card through the ADAT optical cable or the AES/EBU connectors on the breakout cable.

5. Connect the composite video output from the workstation to an external video monitor to preview the video content.

6. Click the Silicon Graphics icon on the right side of the taskbar.

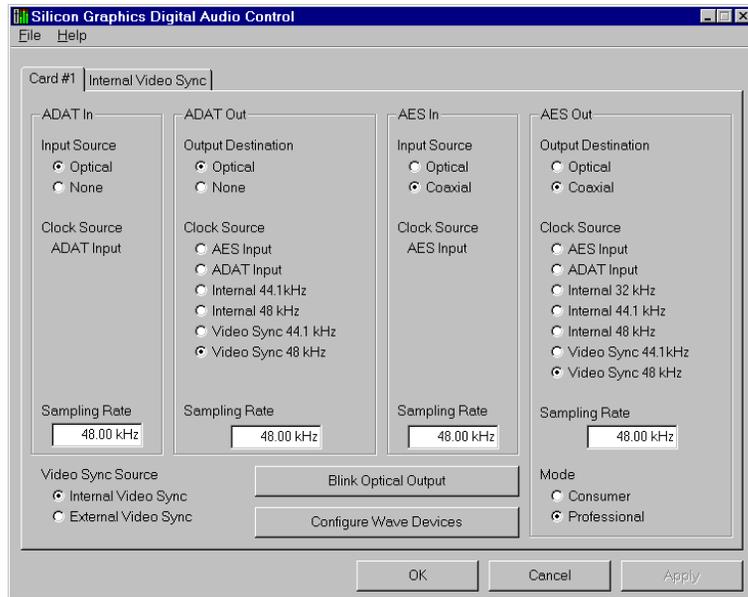
The Silicon Graphics Control Panels Menu appears, as shown in Figure 1-7.

7. Click **Digital Audio Control Panel**.

The Silicon Graphics Digital Audio Control Panel appears.

8. Set up the Digital Audio Control Panel, as shown in the example in Figure 3-2.

**Note:** Video sync provides the clock source for both AES/EBU output and ADAT output. For this configuration, you select **Internal Video Sync** as the Video Sync Source (in the lower left corner of the Digital Audio Control Panel), as shown in Figure 3-2.



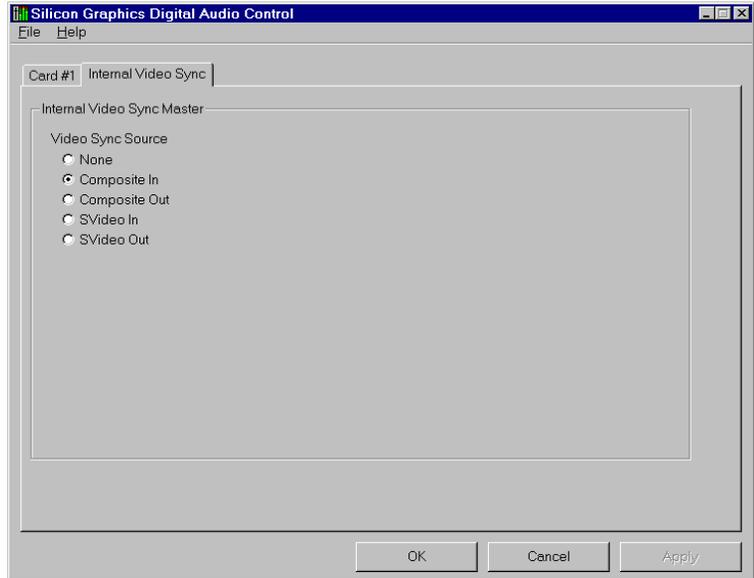
**Figure 3-2** Digital Audio Card/VCR Sync - Control Panel Settings

9. Select the **Internal Video Sync** tab in the Silicon Graphics Digital Audio Control Panel.

The Internal Video Sync Master settings appear, as shown in Figure 3-3 for a Silicon Graphics 320.

In this window, you can specify the desired video input or output that the system uses as the clock source for Internal Video Sync.

10. Select **Composite In** as the Internal Sync Source, as shown in Figure 3-3.
11. Select the **OK** button in the Silicon Graphics Digital Audio Control Panel.



**Figure 3-3** Digital Audio Card/VCR Sync - Internal Sync Source Settings (Silicon Graphics 320)

## Example 2: Synchronizing Two Digital Audio Cards and a Professional S-VHS VTR using a Silicon Graphics 320

This example shows you how to configure audio synchronization with a professional S-VHS video tape recorder using a Silicon Graphics 320 with two Digital Audio Cards installed. Three studio synchronization schemes are provided. To set up these configurations, use the step-by-step procedures that appear on the following pages.

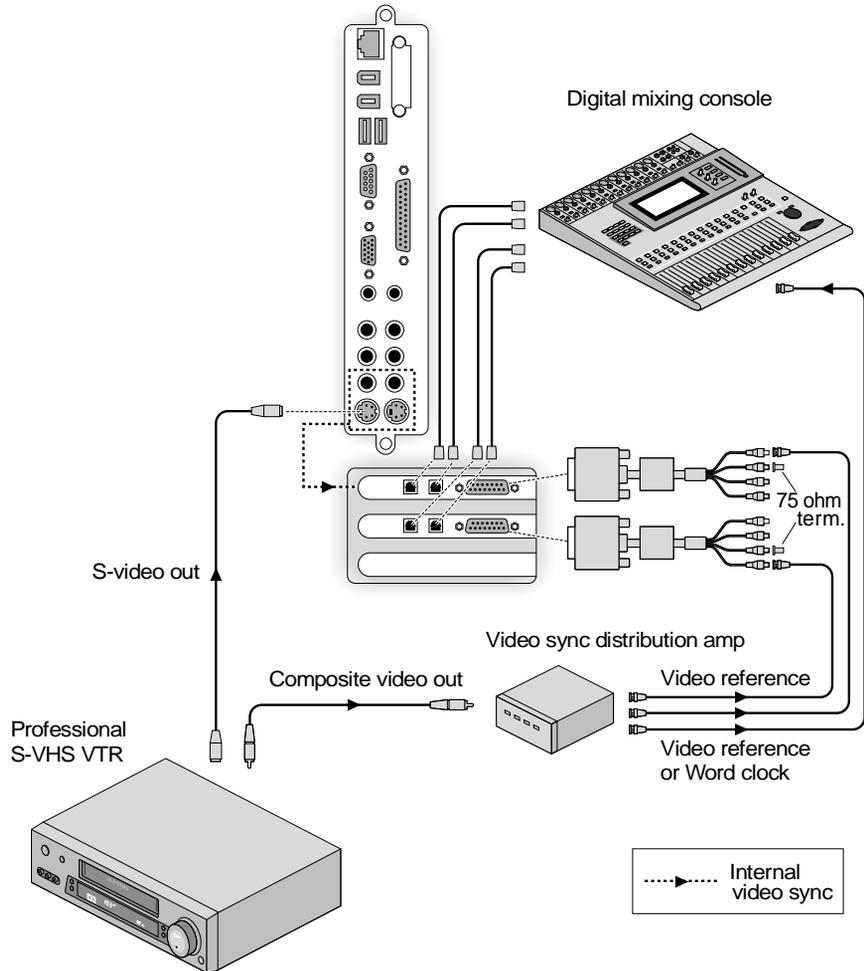


Figure 3-4 Two Digital Audio Cards/S-VHS Sync - Silicon Graphics 320

## Setting Up the Basic Configuration

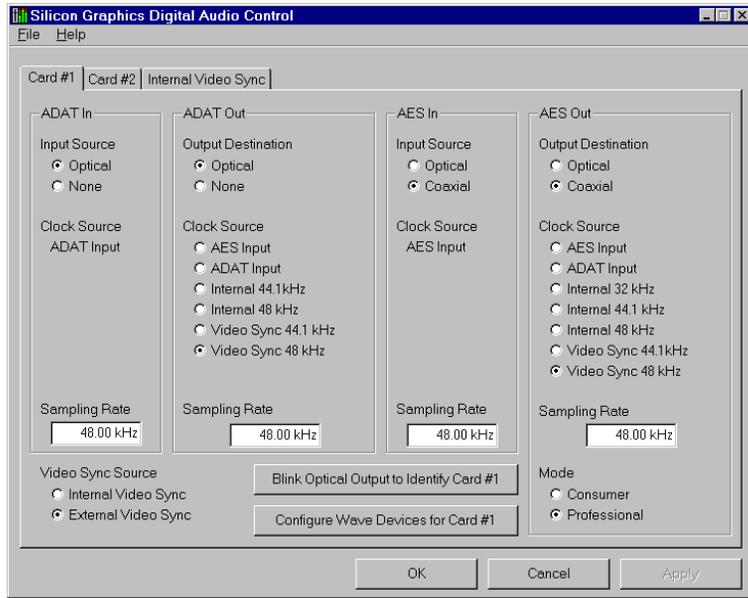
1. Connect the ADAT optical inputs and outputs on the two Digital Audio Cards to outboard equipment such as a digital mixing console or a pair of modular digital multitrack (MDM) tape recorders.
2. Connect an S-video output from the VTR to the S-video input on the workstation.

## Studio Synchronization Scheme 1: Provide External Video Reference Signal to Digital Audio Cards

In this scheme, the Digital Audio Cards use a video reference signal from the VTR as the master clock source. The VTR transfers the video reference signal to a video sync distribution amplifier, which transfers the signal to each of the Digital Audio Card's external video reference inputs (on the breakout cable), as shown in Figure 3-4.

1. Connect a composite video output from the VTR to a video distribution amplifier.
2. Connect the video reference signal outputs from the video sync distribution amplifier to the video reference inputs on each of the Digital Audio Cards.
3. Terminate the unused video loop-through connectors on each of the Digital Audio Cards using 75 ohm terminators.
4. Connect a video reference signal output (or word clock) from the video sync distribution amplifier to the digital mixing console.
5. Click the Silicon Graphics icon on the right side of the taskbar.  
The Silicon Graphics Control Panels Menu appears.
6. Click **Digital Audio Control Panel**.  
The Silicon Graphics Digital Audio Control Panel appears.
7. Click the **Card #1** tab.  
The Card #1 Control Panel appears.

8. Set up the Card #1 Control Panel, as shown in the example in Figure 3-5.



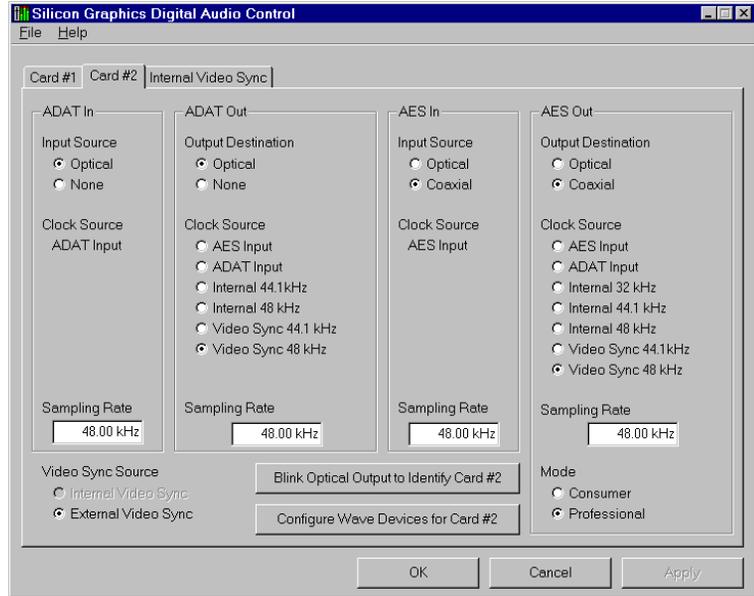
**Figure 3-5** Two Digital Audio Cards/S-VHS Sync - Card #1 Control Panel Settings

9. Click the **Card #2** tab.

The Card #2 Control Panel appears with Internal Video Sync grayed out under Video Sync Source, as shown in Figure 3-6. There is a single internal video sync connector on the Silicon Graphics 320 motherboard that is connected to Card #1 in this example.

10. Click the **OK** button in the Digital Audio Control Panel.

**Note:** If you connect any outboard digital audio equipment to the Digital Audio Cards, (for example, an external digital mixing console or a digital audio multitrack tape recorder) you should also synchronize this equipment to a common timebase (video reference, word clock, and so on) derived from the master video source (professional S-VHS recorder).



**Figure 3-6** Two Digital Audio Cards/S-VHS Sync - Card #2 Control Panel Settings

### **Studio Synchronization Scheme 2: Loop Video Reference Signal From Card to Card**

This alternate scheme shows you how to synchronize two Digital Audio Cards to a video reference signal by looping the signal from one card to the other card. This scheme is similar to scheme 1 but a video sync distribution amplifier is not used to transfer parallel video reference signals to the two cards.

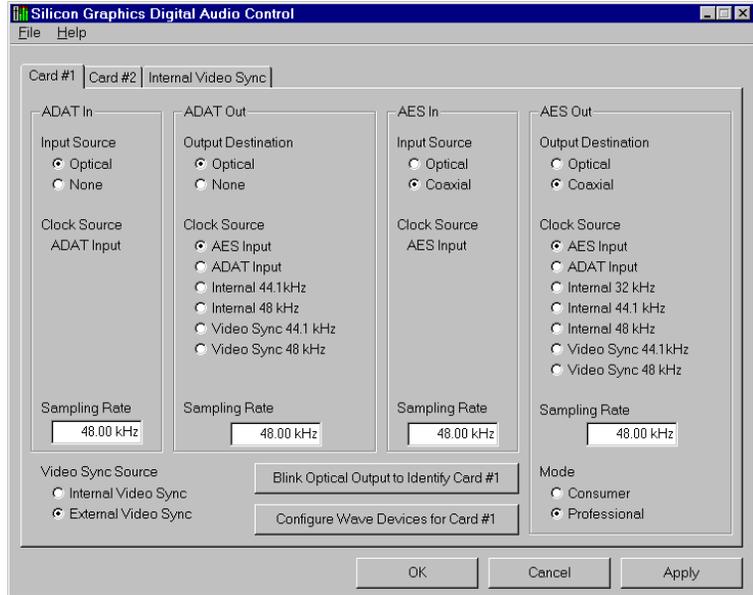
1. Loop the composite video output from the VTR through Digital Audio Card #1 to Digital Audio Card #2 by connecting a short coax cable between the video reference connectors on the two cards.
2. Terminate the unused loop-through connector on the second card using a 75 ohm terminator.
3. Use the same Digital Audio Control Panel settings as in Studio Synchronization Scheme 1.
4. Click the **OK** button in the Digital Audio Control Panel.

### **Studio Synchronization Scheme 3: Provide AES11 Reference Clocks**

This alternate scheme shows you how to synchronize two Digital Audio Cards by connecting AES11 reference inputs to each of the cards instead of video reference inputs. This example assumes you have a house sync generator that can generate synchronized AES11 reference outputs from the professional S-VHS recorder's video reference output.

1. Connect the composite video output from a VTR to a house sync generator.
2. Connect the AES sync outputs from the house sync generator to the AES input connectors on each breakout cable connected to each Digital Audio Card.

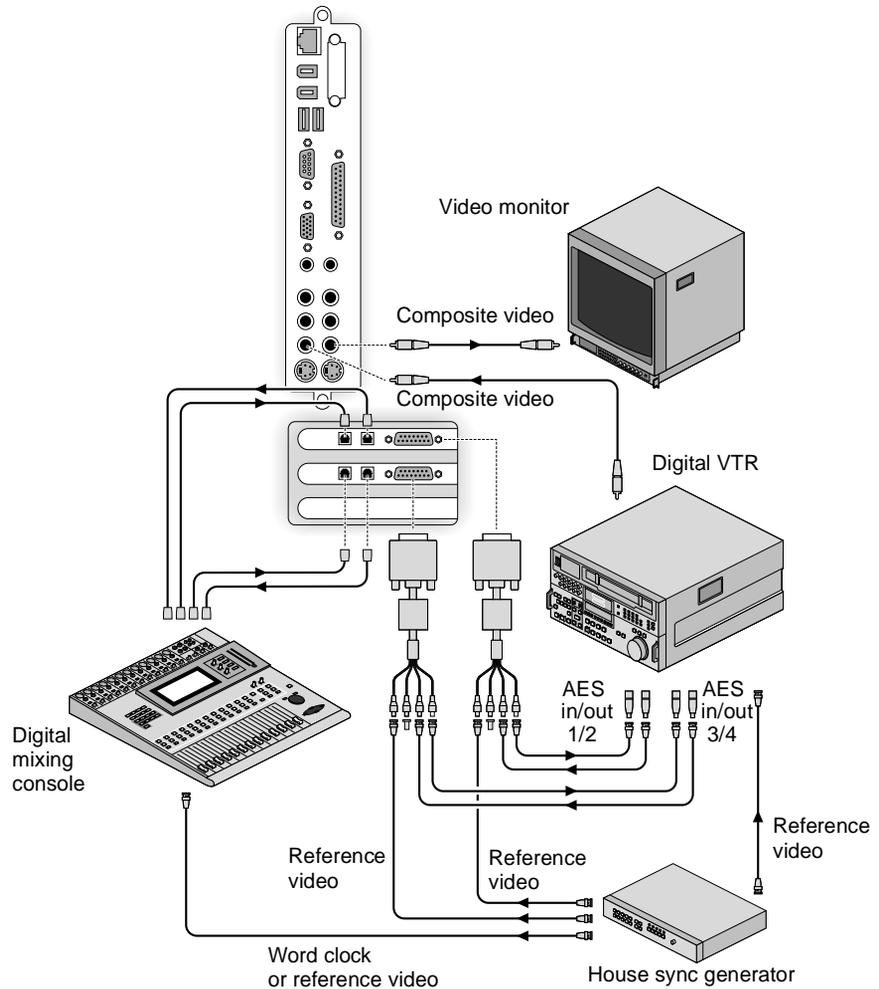
3. Set up the Digital Audio Control Panel, as shown in Figure 3-7.
4. Click the **OK** button in the Digital Audio Control Panel.



**Figure 3-7** Studio Synchronization Scheme 3 - Control Panel Settings

### Example 3: Synchronizing Two Digital Audio Cards and a Digital VTR using a Silicon Graphics 320

This example shows you how to configure a Silicon Graphics 320 for audio-for-video post production using a high-end digital VTR for source and layback to tape. To set up this configuration, use the step-by-step procedures that appear on the following pages.



**Figure 3-8** Two Digital Audio Cards/Digital VTR Sync-Silicon Graphics 320

## Setting Up the Configuration

1. Connect the ADAT optical inputs and outputs on the two Digital Audio Cards to an outboard digital mixing console.
2. Connect the AES inputs and outputs on the two Digital Audio Cards to a professional digital VTR to enable four channel AES/EBU audio transfers between the VTR and the workstation.
3. Connect the AES inputs and outputs for channels one and two on the VTR to Digital Audio Card #1.
4. Connect the AES inputs and outputs for channels three and four on the VTR to Digital Audio Card #2.
5. Connect a composite video output from the VTR to an analog video input on the Silicon Graphics 320 to synchronize video capture with the soundtrack.

You can preview video content using an external NTSC or PAL video monitor that is connected to an analog video output on the workstation.

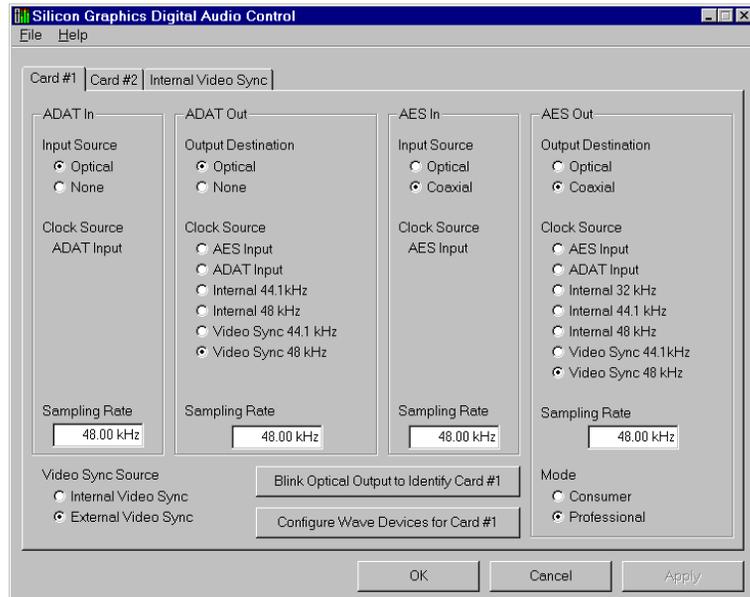
6. Connect the video reference signals from the house sync generator to provide master clock sources for the VTR and for the Digital Audio Cards.
7. Connect a video reference signal or word clock signal from the house sync generator to provide a master clock source for the digital mixing console.

All the studio devices are now synchronized to a house sync generator.

8. Place a 75 ohm terminator on the unused video loop through connector on each of the two Digital Audio Cards.
9. Click the Silicon Graphics logo on the right side of the taskbar.  
The Silicon Graphics Control Panels Menu appears.
10. Click **Digital Audio Control Panel**.

The Silicon Graphics Digital Audio Control Panel appears.

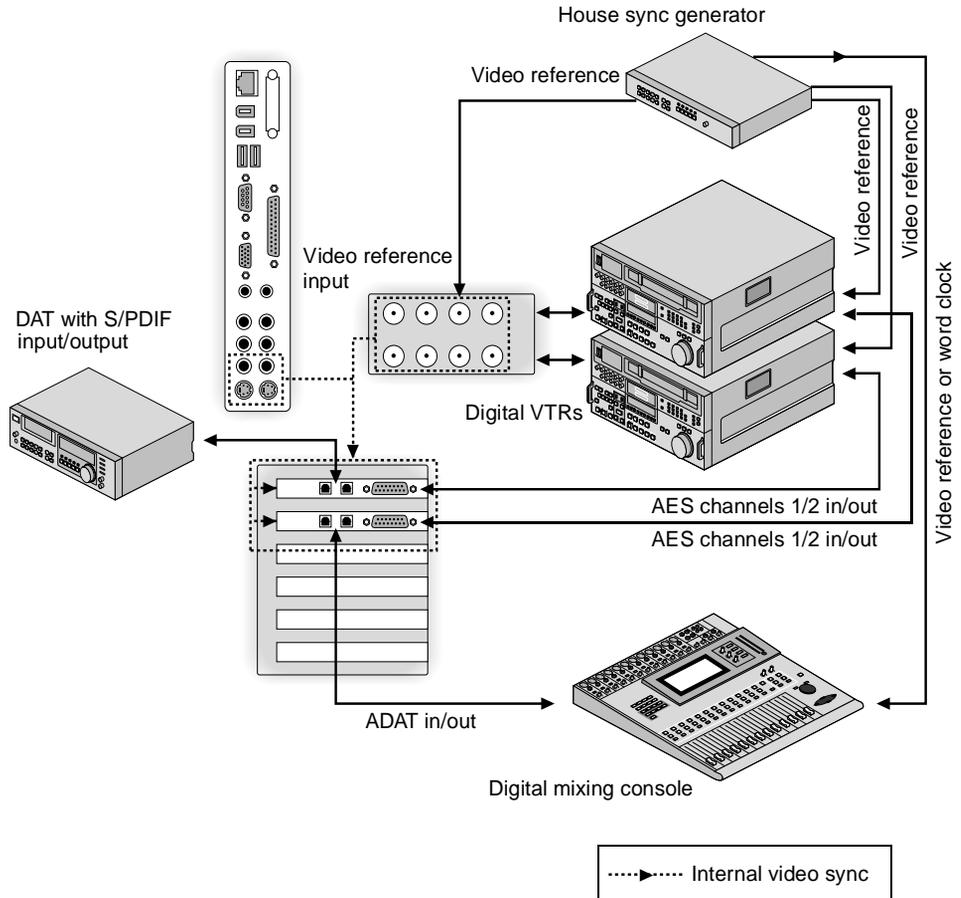
11. Set up Digital Audio Card #1 and Digital Audio Card # 2 as shown in Figure 3-9.
12. Click the **OK** button in the Silicon Graphics Digital Audio Control Panel.



**Figure 3-9** Two Digital Audio Cards/Digital VTR Sync - Card # 1 and Card #2 Control Panel Settings

## Example 4: Synchronizing Two Digital Audio Cards with the Silicon Graphics 540 Serial Digital Video Option

This example shows you how to configure a Silicon Graphics 540 for digital audio/video production. To set up this configuration, use the step-by-step procedures on the following pages.



**Figure 3-10** Two Digital Audio Cards/Serial Digital Video Option Sync - Silicon Graphics 540

## Setting Up the Configuration

1. Configure your workstation with the Silicon Graphics serial digital video option for serial digital video (SDI) input and output, and with two Digital Audio Cards for multichannel digital audio input and output.
2. Connect two digital VTRs to SDI input/outputs 1 and 2 respectively, on the serial digital video option.
3. Connect the AES digital audio inputs and outputs for the audio channels 1 and 2 on the two VTRs to AES inputs and outputs on the two Digital Audio Cards.

This allows the capture and playback of 2-channel digital audio, which is synchronized with the serial digital video option.

4. Connect the optical connectors on Digital Audio Card #1 to a consumer DAT machine to transfer 2-channel S/PDIF digital audio data to/from the DAT machine.
5. Connect the optical connectors on Digital Audio Card #2 to a small format digital mixing console to transfer 8-channel digital audio to/from the mixing console.
6. Connect each of the VTRs to a digital reference signal from the sync generator.
7. Connect the mixing console to a word clock.
8. Connect a digital reference signal to the video reference input on the serial digital video option.

This provides the master clock for the audio and video devices inside the workstation.

All the studio devices are now synchronized to a house sync generator.

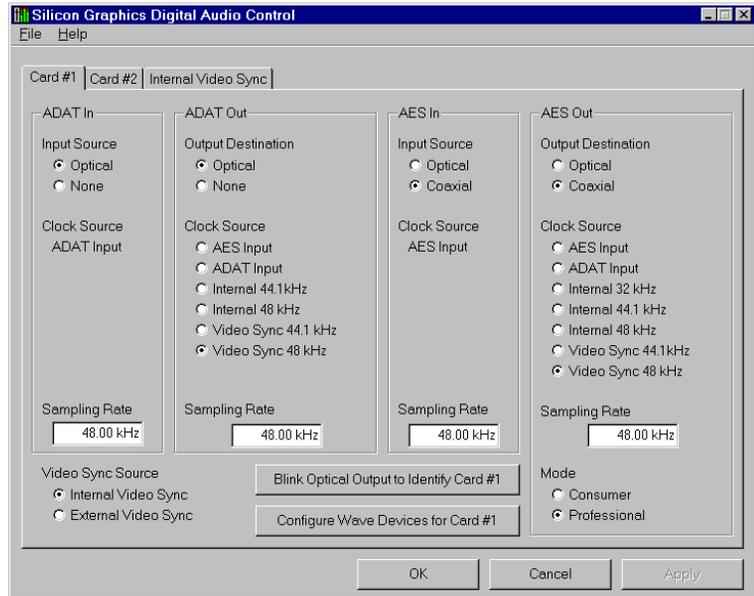
Each Digital Audio Card is synchronized with the serial digital video option's video sync input using your workstation's onboard internal video sync capture circuitry.

9. Click the Silicon Graphics icon on the right side of the taskbar. The Silicon Graphics Control Panels Menu appears.

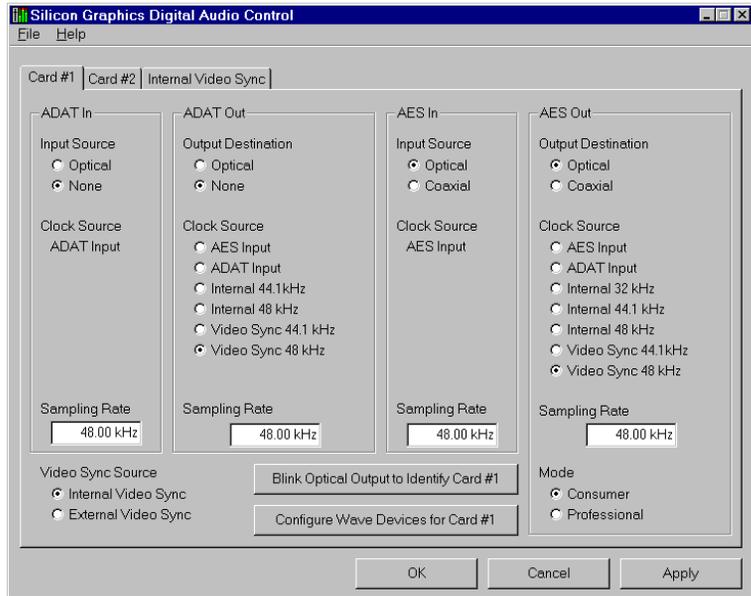
10. Click **Digital Audio Control Panel**.

The Silicon Graphics Digital Audio Control Panel appears.

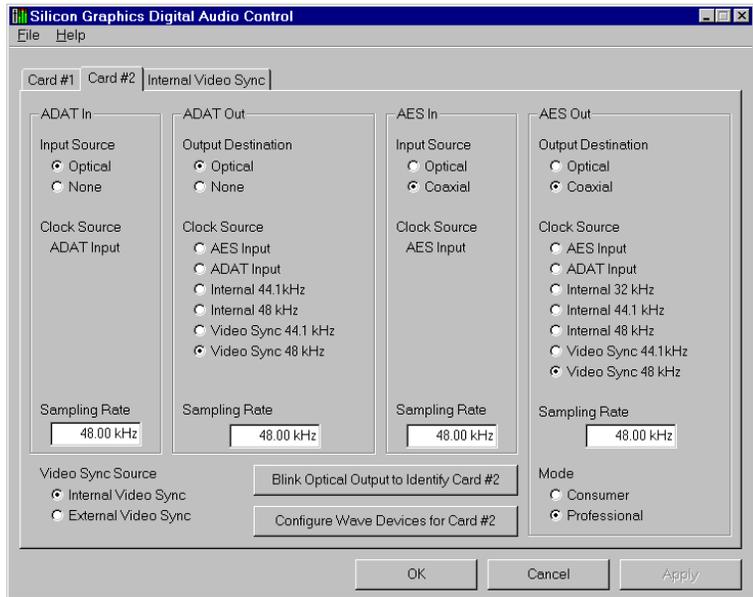
11. Set up the Digital Audio Control Panel as shown in the examples in Figures 3-11 through 3-14.



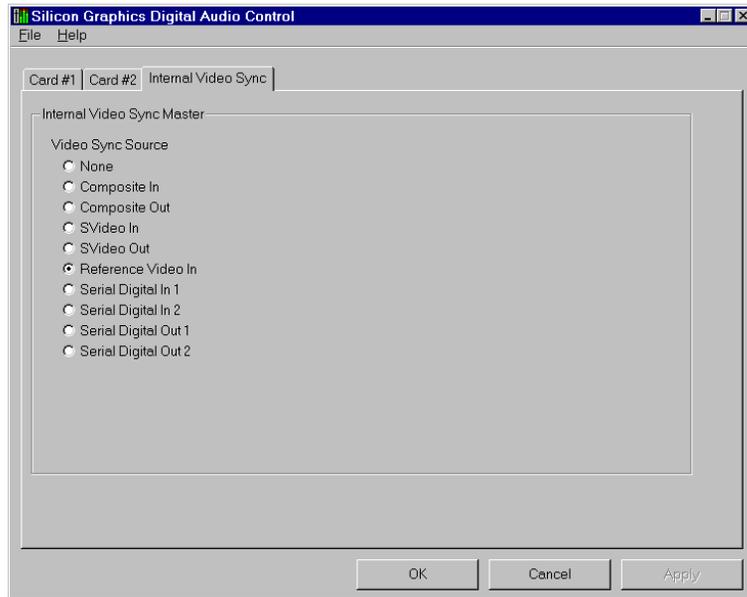
**Figure 3-11** Two Digital Audio Cards/Serial Digital Video Option Sync - Card #1 Control Panel Settings for AES/EBU Transfers to/from VTR



**Figure 3-12** Two Digital Audio Cards/Serial Digital Video Option Sync - Card #1 Control Panel Settings for S/PDIF Transfers to/from DAT Recorder



**Figure 3-13** Two Digital Audio Cards/Serial Digital Video Option Sync - Card #2 Control Panel Settings for AES/EBU Transfers to/from VTR



**Figure 3-14** Two Digital Audio Cards/Serial Digital Video Option Sync - Internal Video Sync Setting Using Sync Input on Serial Digital Video Option

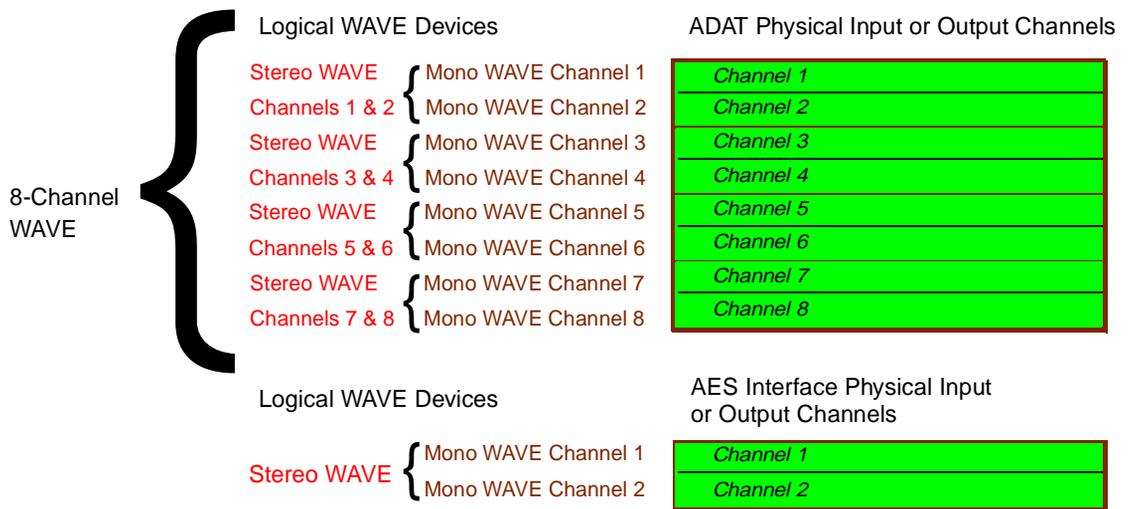
12. Click the **OK** button in the Silicon Graphics Digital Audio Control Panel.

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## Configuring Wave Audio Devices

Typically, Windows NT audio applications use stereo or mono WAVE input and output devices for recording and playback. Some audio editing applications allow a user to open multiple mono or stereo WAVE devices to enable multichannel audio recording and playback. Your Digital Audio Card uses logical WAVE devices to interface audio applications with the physical channels on the ADAT and AES/EBU inputs and outputs. For example, you can configure the Digital Audio Card driver to allow audio applications to address each of the eight individual ADAT input channels through eight separate logical mono WAVE input devices. For the ADAT input and output, you can also configure the driver to provide 8-channel logical WAVE devices. By default, the Digital Audio Card allows an application to address the eight channels through four logical stereo input devices. In addition, you can configure the driver to provide mono WAVE input devices for the AES and ADAT input and output ports. These configurations are shown in Figure 3-15.

**Note:** Currently, only a few audio applications support 8-channel logical WAVE devices.



**Figure 3-15** Configuring WAVE Audio Devices

You can use logical WAVE devices independently, except in the following cases:

- You cannot use audio devices simultaneously if they share any hardware channels.
- You can only set certain characteristics, including sampling rate and sync source on a hardware port, for example, ADAT input, AES input, ADAT output, or AES output.
- You cannot set these parameters differently for two WAVE devices that share the same physical hardware interface.

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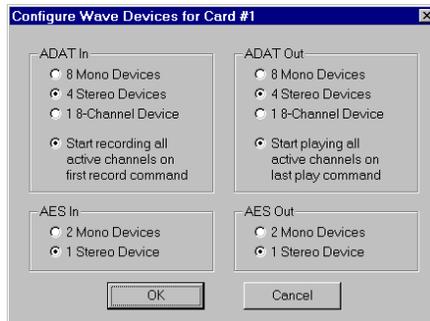
## Changing Logical WAVE Devices

You can change the Digital Audio Card's logical WAVE devices as follows:

1. Click the **Configure Wave Devices** button in the Digital Audio Control Panel.

The Configure Wave Devices pop-up menu appears, as shown in the example in Figure 3-16.

2. Select the desired devices.
3. Click the **OK** button.
4. Activate your new WAVE configuration by restarting your system, or by deactivating and then reactivating the Digital Audio Card driver in the Windows NT Devices Control Panel.



**Figure 3-16** Configure Wave Devices Pop-Up Menu

## Start Recording/Playing All Active Channels

Currently, Windows NT multimedia does not support sample accurate synchronization across multiple logical WAVE devices. This causes a problem when an application attempts to simultaneously begin audio recording or playback using several logical stereo or mono devices, for example, simultaneous record/playback using all eight ADAT interface channels. However, you can avoid this problem using an internal workaround in the digital audio driver by following these steps:

1. Click **Start recording all active channels on first record command** in the Configure Wave Devices pop-up menu.

The Digital Audio driver starts filling all queued input buffers for a given physical device (ADAT or AES/EBU input port) when it receives the first start record command for any corresponding logical mono or stereo WAVE output device.

2. Click **Start playing all active channels on last play command** in the Configure Wave Devices pop-up menu.

The Digital Audio driver starts playing all queued output buffers for a given physical device when it receives the last play command for any corresponding logical mono or stereo WAVE device.

**Note:** For example, this mode is useful if you are capturing audio from a multitrack tape recorder using the ADAT input port, or transferring audio back to the multitrack tape recorder using the ADAT output port.



## *Appendix A*

# Digital Audio Card Specifications

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### General Specifications

- PCI 32 bit option board - half-size
- Supports universal PCI voltage specifications
- System expansion by addition of multiple cards
- Supports standard Windows NT WAVE audio interface
- UST/MSC digital media synchronization support for applications utilizing the Silicon Graphics Digital Media SDK
- Locks to audio reference via external AES11 input
- Locks to video via external reference or internal video sync. Accepts video reference input, generates AES11-1992 grade 2 (10 ppm) clocks

---

## Sample Rates

- Generalized support of sample rates including the following rates:
- 32.00 kHz (AES only)
- 44.10 kHz including high quality VCXO jitter attenuation
- 48.00 kHz including high quality VCXO jitter attenuation

---

## Master Timebases

- Internal crystal oscillators
- Video reference (internal or external)
- AES11 input
- ADAT optical input

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## Video Reference Loop Through

- 75 ohm BNC connectors
- Black Burst NTSC or PAL

---

## Coaxial Digital Audio Input

- AES-3id 75 ohm BNC connector
- AES11-1992 synchronization input (for audio clock rates)
- AES3-1997 professional 2-channel 24-bit digital
- Compatible with IEC958, S/PDIF consumer 2-channel digital

---

### **Coaxial Digital Audio Output**

- AES-3id 75 ohm BNC connector
- AES11-1992 synchronization output
- AES3-1997 professional 2-channel 24-bit digital
- Compatible with IEC958, S/PDIF consumer 2-channel digital

---

### **ADAT Optical Digital Input**

- 12.8 Mbps EIAJ RCZ-6901 fiber optic connector, PCI I/O panel
- 8-channel, 24-bit
- Compatible with IEC958, S/PDIF consumer 2-channel digital

---

### **ADAT Optical Digital Output**

- 12.8 Mbps EIAJ RCZ-6901 fiber optic connector, PCI I/O panel
- 8-channel, 24-bit
- Compatible with IEC958, S/PDIF consumer 2-channel digital



## Appendix B

# Supported WAVE Audio Sample Formats

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### 20/24-bit PCM data stored using 4 bytes per sample

- Sample value left-justified within 4-byte word
- Low-order bits are zero-filled
- Two's-complement signed values: sample range is  $-2^{31}$  to  $2^{31} - 1$

To use this format, the application should specify the following fields in the WAVEFORMATEX structure:

- `wBitsPerSample` = 20 or 24
- `nBlockAlign` =  $4 * nChannels$
- `nChannels` = 1 if mono WAVE device, 2 if stereo WAVE device, 8 if 8-channel WAVE device

---

### 20/24-bit PCM data stored using 3 bytes per sample

- Low order bits are zero-filled in the case of 20-bit data
- Two's-complement signed values: sample range is  $-2^{23}$  to  $2^{23} - 1$

To use this format, the application should specify the following fields in the WAVEFORMATEX structure:

- `wBitsPerSample` = 20 or 24
- `nBlockAlign` =  $3 * nChannels$
- `nChannels` = 1 if mono WAVE device, 2 if stereo WAVE device, 8 if 8-channel WAVE device

---

### **16-bit data**

- Two's-complement signed values: sample range is  $-2^{15}$  to  $2^{15} - 1$

---

### **8-bit data**

- Conforms to Microsoft WAVE convention of presenting 8-bit PCM data using unsigned integer values
- Sample range is 0 to 255

# Glossary

## **ADAT optical interface**

An interface that provides a unidirectional point-to-point connection of eight tracks of 24-bit digital audio, with subcodes, at professional sampling rates, on a single consumer-grade optical fiber. Typically, this interface is used for data connections between multiple ADAT tape decks, for bouncing tracks between the decks.

## **AES3**

The AES-1992 digital audio data transmission format specification. This specification is also referred to as AES/EBU. See also ANSI S4.4-1992 and IEC958, Audio Engineering Society, Inc., Vol. 40, No. 3, 1992, New York, NY 10165. For more information on this specification on the Web, see <http://www.aes.org.publications/>

## **AES3-3id**

A document that describes the implementation of AES-1992 (see above) using 75 ohm coaxial cable with 1 volt peak-to-peak signal levels. For more information on this document on the Web, see <http://www.aes.org.publications/>

## **PCI**

Peripheral Component Interconnect - a bus specification. The PCI bus is a high-performance local bus used to connect computer peripherals to memory and a microprocessor. A wide range of vendors manufacture devices that plug into a PCI bus.

**S/PDIF**

A serial interconnect standard for consumer digital audio equipment. This interface can transfer stereo or single channel audio content at sample resolutions up to 20 bits (or 24 bits using an extension to the specification) and sample rates of 32 kHz, 44.1 kHz, and 48 kHz. Physical connectors are typically RCA jacks or optical connectors. For a complete description of S/PDIF, see the IEC 958 specification.

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