Developer Note

Apple AudioVision 14 Display

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Developer Press

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About This Note

The Apple AudioVision 14 Display Developer Note describes design features of the Apple AudioVision 14 Display, a new Apple monitor. The note provides hardware developers with an overview of the hardware design and interface needed to connect the display to current and future Macintosh computers. It provides software developers with an overview of the software architecture. It also supplies more detailed information about the new software panels used to interface between the application and system software to implement the display's sound and video functions. This note assumes that you are familiar with the functionality and programming requirements for Apple Macintosh computers.

The note consists of three chapters.

- Chapter 1, "Overview of the AudioVision 14 Display," describes the display's hardware and controls and provides a summary of its specifications. It also gives an overview of the software components.
- Chapter 2, "Hardware Interface," describes two basic display-CPU configurations and provides interface specifications for the main I/O cable and for the other video, audio, and ADB ports provided by the display.
- Chapter 3, "AudioVision Sound and Video Panels," describes the functions of the panels; how to create, reference, and manage panel components; and how to process panel events and manage panel settings.

Conventions Used In This Note

The following conventions are used throughout this note

Note
This type of note contains information of general interest. ◆

▲ **WARNING**
A warning like this directs your attention to something that could damage software or hardware, or that could result in loss of data. ▲

Terms in **boldface** type are defined in the glossary.

A special font, `Courier`, is used for characters that you type, or for lines of program code. `It looks like this`.

The AudioVision Display is referred to in the text as the display. However, certain interface signal names use the term monitor rather than display.

Other Reference Material

Related documentation includes:

- *Inside Macintosh: QuickTime*
- *Inside Macintosh: More Macintosh Toolbox*

For More Information

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CHAPTER 1

Overview of the AudioVision 14 Display

The AudioVision 14 Display is an integrated audio and visual display. It redefines the traditional display concept and provides customers with a straightforward and affordable step up to high-quality sound. With integrated stereo speakers and a microphone capable of handling voice recognition applications, the AudioVision 14 Display advances Apple's drive, and the drive of third-party developers, towards the integration of sound input and sound output with a desktop computer. The AudioVision 14 Display is designed to take advantage of today's sound-rich multimedia applications, as well as emerging voice technologies, such as voice control, telephony, video conferencing, and text-to-speech.

The display operates in two modes: Remote and Local. In Local mode, display parameters, such as volume, screen brightness, and so on, can only be controlled from the front-panel hardware controls. To put the display into Remote mode, the CPU must send a series of ADB messages to the display. At this point, all of the AudioVision 14 Display parameters (including some functions that are not accessible from the front panel controls) are under software control. This is the mode used by software, and the information provided in this note applies to the AudioVision 14 Display when it is operating in Remote mode.

Chapter 1 of this note provides an overview of the AudioVision 14 Display. It includes the following information:

- a general description of the AudioVision 14 Display hardware, including I/O connectors, controls, display specifications, and power requirements
- an overview of the AudioVision 14 Display software elements, including application software, sound and video panels, sound and video components, the ADB interrupt handler, and the ADB component

Hardware Overview

The AudioVision 14 Display is a new generation 14-inch RGB (red, green, blue) display, with built-in audio and video capabilities. It has

- an integrated HDI-45 I/O (input/output) cable
- a standard Macintosh power input cable
- an output port for headphones
- an input port for an external microphone or other sound source
- a built-in microphone, with PlainTalk capability and an LED indicator

- a built-in stereo speaker system
- two ADB (Apple Desktop Bus) ports to connect ADB devices such as keyboard and mouse
- easily accessible controls to change video brightness, contrast, and audio volume, and to enable the microphone
- a 7-pin camera input, which can also accommodate a 4-pin S-video connector

The AudioVision 14 Display is ergonomically designed with an integral tilt-and-swivel base. The display interfaces with existing Macintosh computers via an adapter cable. It is designed to connect directly to future computer products using a single cable interface. Chapter 2, "Hardware Interface," provides detailed information about interfacing to the AudioVision 14 Display. Figure 1-1 and Figure 1-2 show front and rear views of the display, respectively.

Figure 1-1 Front view of the AudioVision 14 Display

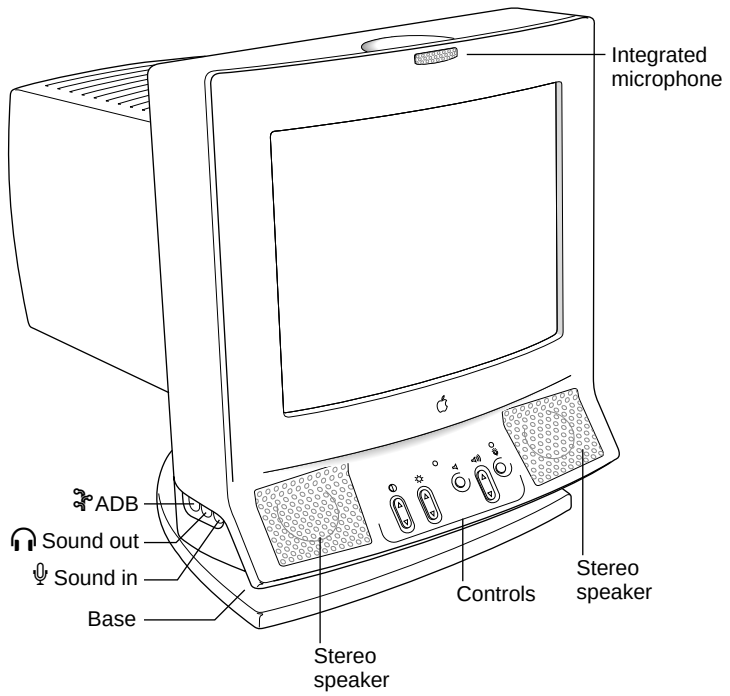
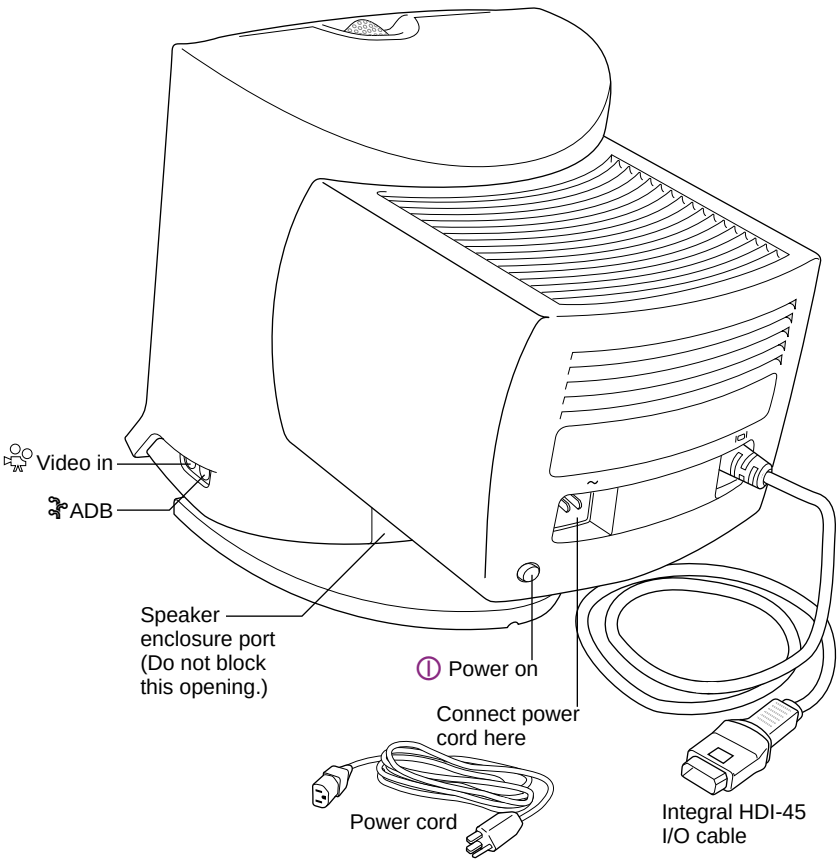


Figure 1-2 Right side and rear panel of the AudioVision 14 Display

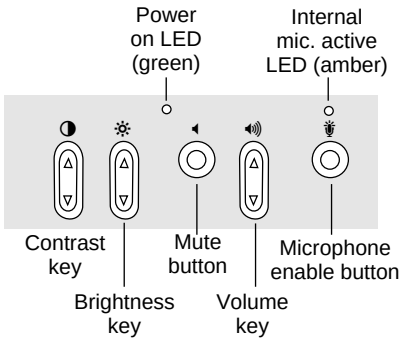


Controls

The audio and video controls are located on the front panel of the display, as shown in Figure 1-1. Figure 1-3 shows details of these controls.

The **keys** and buttons on the front panel control the various functions electronically, through the main processor and related software. In Local mode, screen brightness and contrast, audio volume, and the microphone are affected directly by these controls. When the AudioVision 14 Display is in Remote mode, pressing one of the controls does not directly affect the sound or video settings on the display, but instead generates ADB data which is read by the Macintosh computer to which the display is connected. The computer then instructs the display to adjust the sound or video settings. Chapter 3, "AudioVision Sound and Video Panels," describes how the various functions are implemented and controlled through the software.

Figure 1-3 Audio and video controls



The display's front panel controls initiate the following functions:

- Brightness key. This rocker switch controls brightness. When you press and hold down the top of the key brightness increases. When you hold down the bottom of the key brightness decreases. The control process is continuous, and you do not need to depress and release the key to increase or decrease brightness.
- Contrast key. This rocker switch controls screen contrast. It works in the same way as the brightness control key.
- Mute button. This control is a toggle switch. The first time you press it, the sound is muted, the second time, sound is turned on again. You can also turn on sound again by pressing the top of the volume control key.
- Volume key. This rocker switch works continuously to control the sound volume of the display. If you press and hold down the top of the key, you increase sound. If you press and hold down the bottom of the key, you lower sound.
- Microphone enable button. This button allows you to enable or disable the internal microphone.
- LEDs. There are two LEDs on the front panel of the AudioVision 14 Display. As shown in Figure 1-3, one comes on to indicate that power is on to the display, and the other comes on when the display is in recording mode using the internal microphone.

Note

If you are operating the display in Local mode (CPU off), only the volume control key and mute button are operative. ◆

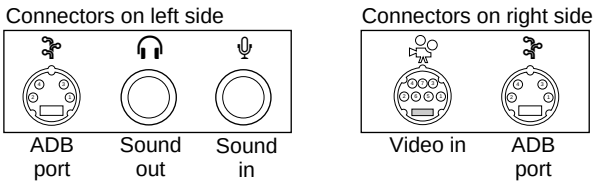
You may set the parameters for the different functions either manually or through the application software, using the sound and video panels. See Chapter 3, "AudioVision Sound and Video Panels," for details.

I/O Connections

The AudioVision 14 Display's main I/O cable is permanently attached to the rear panel of the display. You cannot remove this cable. The connector at the end of the cable is an HDI-45 connector, which connects the AudioVision 14 Display to a computer, or to an adapter cable. The other connector on the rear panel of the display is a standard power connector.

The display has five other I/O ports: three on the left side, and two on the right. The ADB port and the sound ports are standard Apple ports, and they accept standard connectors. The video port is used for camera or VCR inputs. These connectors are described in more detail in Chapter 2 of this developer note. Figure 1-4 shows the positions of these ports.

Figure 1-4 AudioVision 14 Display I/O ports



- ADB ports. The AudioVision 14 Display has two ADB ports, one on the left side and one on the right. This enables you to connect the mouse and keyboard to either side, or to connect the keyboard to one side, and the mouse to the other.

▲ **WARNING**
The ADB port and camera port are similar in appearance. The camera port accommodates a 7-pin connector, and the ADB port a 4-pin connector. Do not try to insert a camera connector plug into the ADB port, as it may damage the pins on the camera connector plug. An ADB connector will fit in the camera port. However, it will not function in that port. ▲

- Sound out. This is a line-level output that also supports headphones. Plugging in headphones does not automatically disable the built-in speakers. You may select an option from the Sound Panel that allows you to disable the speakers when the headphones are plugged in. (Refer to Table 3-3, in Chapter 3, for further information.)
- Sound in. This port allows you to connect an external microphone or other line-level sound source to the display.
- Camera input. This port allows you to connect a video camera or other video input, such as a VCR, to the display. It accommodates a 7-pin video connector, or a 4-pin S-video connector.

Chapter 2, "Hardware Interface," provides the interface specifications for these connectors.

Integrated Speakers and Microphone

The integral stereo speakers feature a ported chamber design. They have a response close to high fidelity, and deliver 80 dB SPL (sound pressure level) at 100 Hz, at 0.5 meters. The frequency range is 100Hz to 15kHz, +/-3dB.

The integral microphone is a directional microphone, optimized for use with speech recognition programs. It is particularly effective in noisy office environments.

Environmental Specifications

Table 1-1 lists the environmental specifications for the display.

Table 1-1 Environmental specifications

Item	Specification
Operating temperature	10° to 40° C (50° to 104° F)
Relative humidity	20-95%
Operating altitude	0 to 10,000 feet
Shipping altitude	0 to 50,000 feet

AC Power Requirements

Table 1-2 lists the AC power requirements for the display.

Table 1-2 AC power requirements

Category	Requirement
AC input range	90-270VRMS (root mean square)
Input surge voltage	3 kV
Input line transient immunity	RF level of 3 volts/meter, from 26 MHz to 1 GHz
Peak inrush current	40 amps peak, all load and line conditions
Input line frequency	47-63 Hz, single phase
Line drop out immunity	10 milliseconds (minimum), 90VRMS input, maximum load
Input power under maximum load	160 watts (maximum), all line and load conditions

continued

Table 1-2 AC power requirements (continued)

Category	Requirement
Minimum input/output power efficiency	75%, all line conditions, maximum load
Line voltage transient response	+/- 10% instantaneous variation in average input line voltage, applied for 100 ms, with no visible effects of transient in display
Load regulation	Adequate for proper operation of display-related circuitry under all conditions

Software Overview

The AudioVision 14 Display software elements consist of:

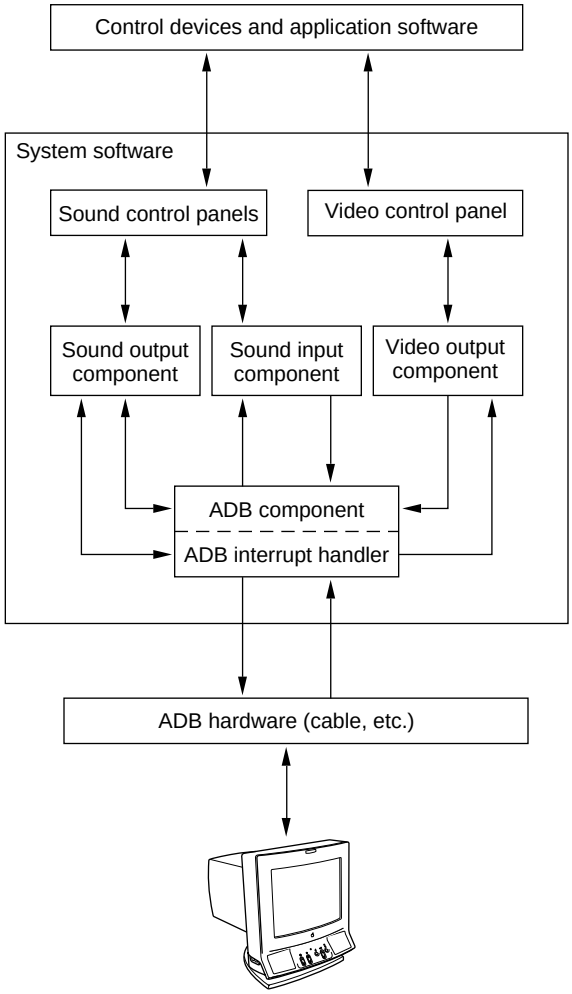
- sound and video control panels
- sound panels
- a video panel
- sound components
- video components
- ADB component
- ADB Interrupt Handler

Figure 1-5 shows a simplified block diagram of the software components. The sound and video panels provide the interface between the user, or application software, and the sound and video components of the AudioVision 14 Display. These panels are subsets of the Sound control panel and the Video control panel located in the Control Panels folder under the Apple menu. You may access them through application software, or by manually opening the related control panel. For example, if you choose the Control Panels folder under the Apple menu, you can open the Sound control panel. The resulting display on the screen is a sound panel. It includes a pop-up menu that allows you to select and display additional panels.

The software components and their interfaces operate the display. The sound out and sound in components handle the sound functions, and the video out component handles the video functions. These elements communicate with the display through the ADB port. An ADB component handles the communication between the display and the CPU. The ADB address is 7, and the handler ID 3.

The sound and video panels are described in Chapter 3, “AudioVision Sound and Video Panels.”

Figure 1-5 Block diagram of the AudioVision software components



CHAPTER 2

Hardware Interface

This chapter describes the hardware interface for the AudioVision 14 Display. It covers the following subjects:

- CPU interface configurations
- interface specifications for the main HDI-45 connector
- interface specifications for the adapter cable interface
- AudioVision 14 Display I/O ports for ADB, audio devices, camera, VCR, and S-video inputs

CPU Interface Configurations

This developer note deals with two basic CPU interface configurations. The first is a direct interface between the display and future CPUs which will have integrated HDI-45 connectors. Figure 2-1 shows a block diagram of this configuration. The second interface is between the display and CPUs that do not have integrated HDI-45 connectors. Figure 2-2 shows a block diagram of this configuration.

Figure 2-1 Block diagram showing direct interface to CPU

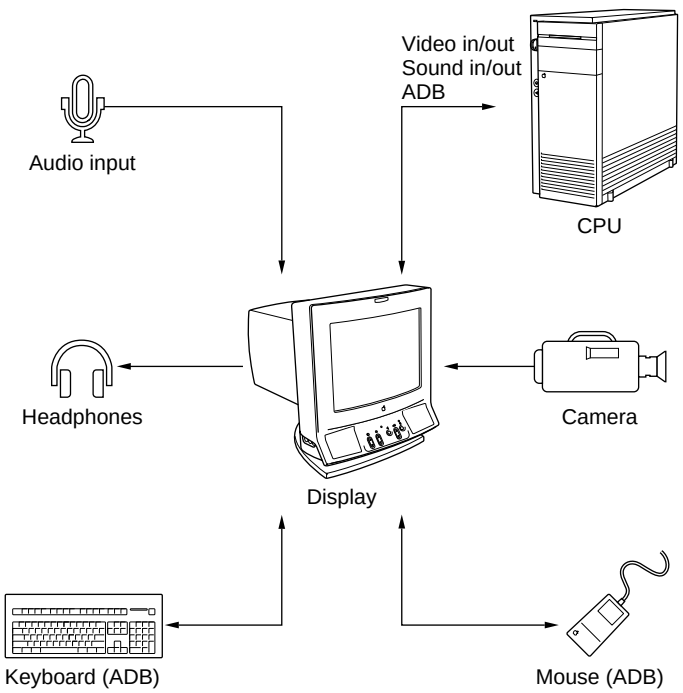
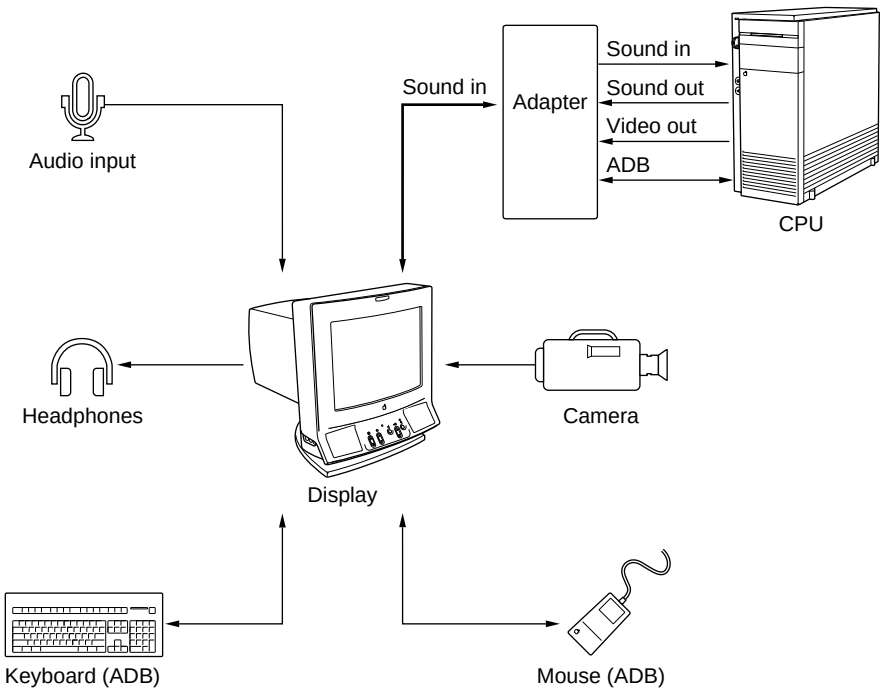


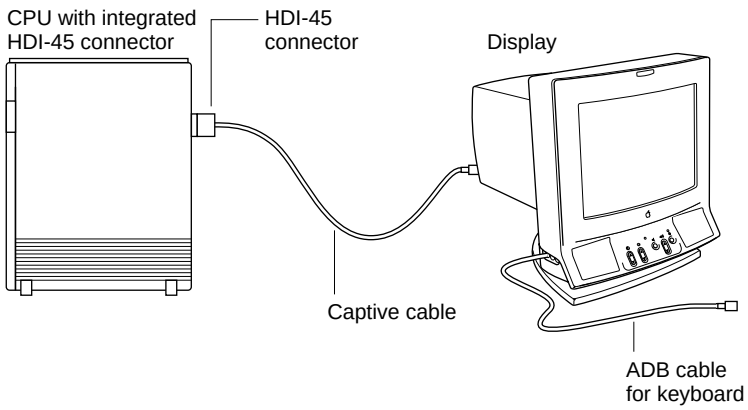
Figure 2-2 Block diagram showing adapter interface to CPU



Direct Display-to-CPU Interface

Figure 2-3 shows a physical representation of the first type of configuration where the integral captive cable, with its HDI-45 connector, plugs directly into a HDI-45 connector on the rear panel of the CPU.

Figure 2-3 CPU with integrated HDI-45 connector



Adapter Interface to the CPU

Figure 2-4 shows how the AudioVision 14 Display interfaces to a CPU that does not have an integrated HDI-45 connector. The HDI-45 connector on the captive display cable plugs into an adapter cable. The adapter cable has four cables that connect to the discrete video, sound, and ADB ports on the CPU's rear panel. Figure 2-5 shows details of the adapter cable and connectors.

Note

If you are connecting to a CPU that has only one ADB connector, use this connector for the adapter cable connection, and plug the keyboard and mouse into the ADB connectors on the left and right side-panels of the display. ◆

Figure 2-4 Adapter cable interface with CPU

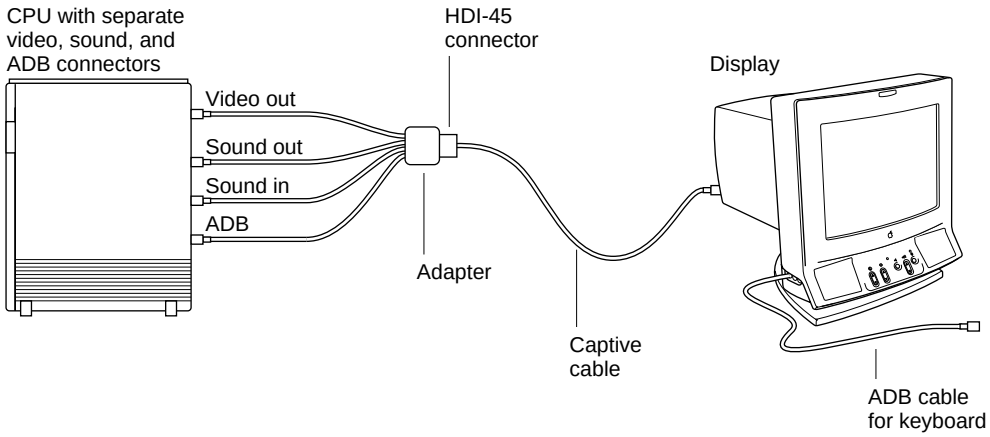
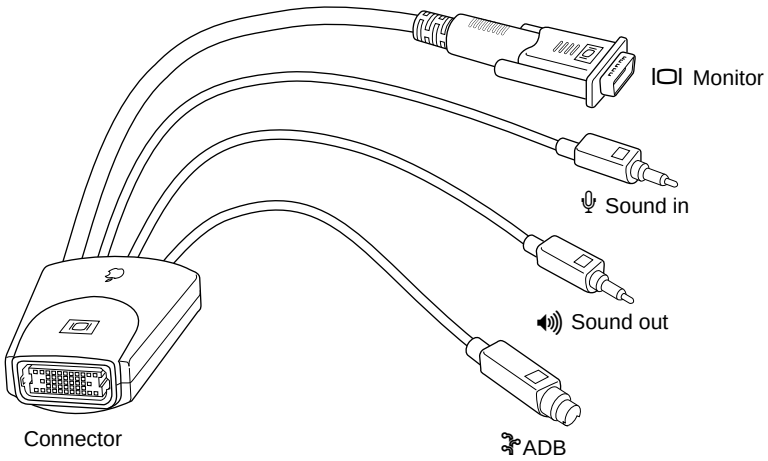


Figure 2-5 Detail of adapter cable and connectors



HDI-45 Interface Specifications

The AudioVision 14 Display's captive I/O cable with its HDI-45 interface connector provide all the basic Macintosh desktop functions for the display. The 45-pin connector will plug into a socket on the rear panel of future CPUs. It also plugs into the 45-pin socket on the end of the adapter cable. Figure 2-6 shows an outline of the socket with the pin designations. Table 2-1 lists and describes the signals.

Figure 2-6 HDI-45 connector socket pin designations

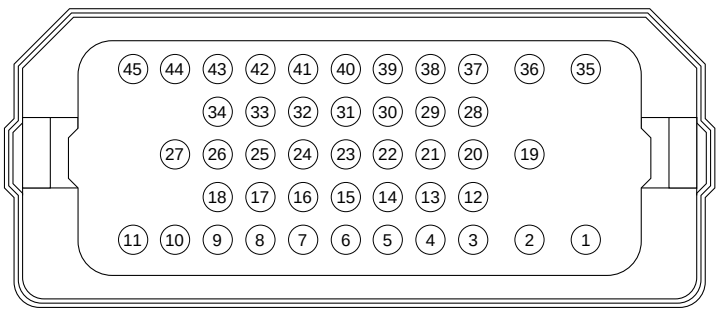


Table 2-1 HDI-45 connector signal assignments

Pin number	Signal name	Description
1	ANALOG AUDIO GROUND	Ground for analog audio
2	MIC SHIELD	Audio input shield
3	AUDIO LINE (MIC) IN L	Audio input signal (microphone), left
4	AUDIO LINE (MIC) IN R	Audio input signal (microphone), right
5	LINE/HEADPHONE OUT L	Audio output signal (headphone), left
6	LINE/HEADPHONE OUT R	Audio output signal (headphone), right
7	Reserved	Reserved for future use
8	MONITOR SENSE 1	Monitor sense bit 1
9	MONITOR SENSE 2	Monitor sense bit 2
10	VIDEO GREEN SHIELD	Green video signal shield
11	VIDEO GREEN	Green video signal
12	VIDEO IN PWR SUPPLY GND	Video power ground
13	VIDEO IN +ve SUPPLY	Video power supply; voltage required depends on the device connected to the camera/VCR connector

continued

Table 2-1 HDI-45 connector signal assignments (continued)

Pin number	Signal name	Description
14	Reserved	Reserved for future use
15	Reserved	Reserved for future use
16	Reserved	Reserved for future use
17	Reserved	Reserved for future use
18	MONITOR SENSE 3	Monitor sense bit 3
19	VIDEO IN SHIELD	Video input shield
20	VIDEO IN (LUMINANCE)	Video input **luminance** (black and white information—picture detail, shapes, shading)
21	VIDEO IN (CHROMINANCE)	Video input **chrominance** (color information)
22	Reserved	Reserved for future use
23	Reserved	Reserved for future use
24	Reserved	Reserved for future use
25	Reserved	Reserved for future use
26	VIDEO RED SHIELD	Red video signal shield
27	VIDEO RED	Red video signal
28	VIDEO IN CONTROL 1	Video input control 1
29	VIDEO IN CONTROL 2	Video input control 2
30	Reserved	Reserved for future use
31	Reserved	Reserved for future use
32	Reserved	Reserved for future use
33	VIDEO VSYNC	Vertical synchronization signal
34	VIDEO CSYNC	Composite video synchronization signal
35	+5VDC (ADB 3)	+5 VDC input for ADB interface
36	ADB GND (ADB 4)	Logic ground for ADB connection

continued

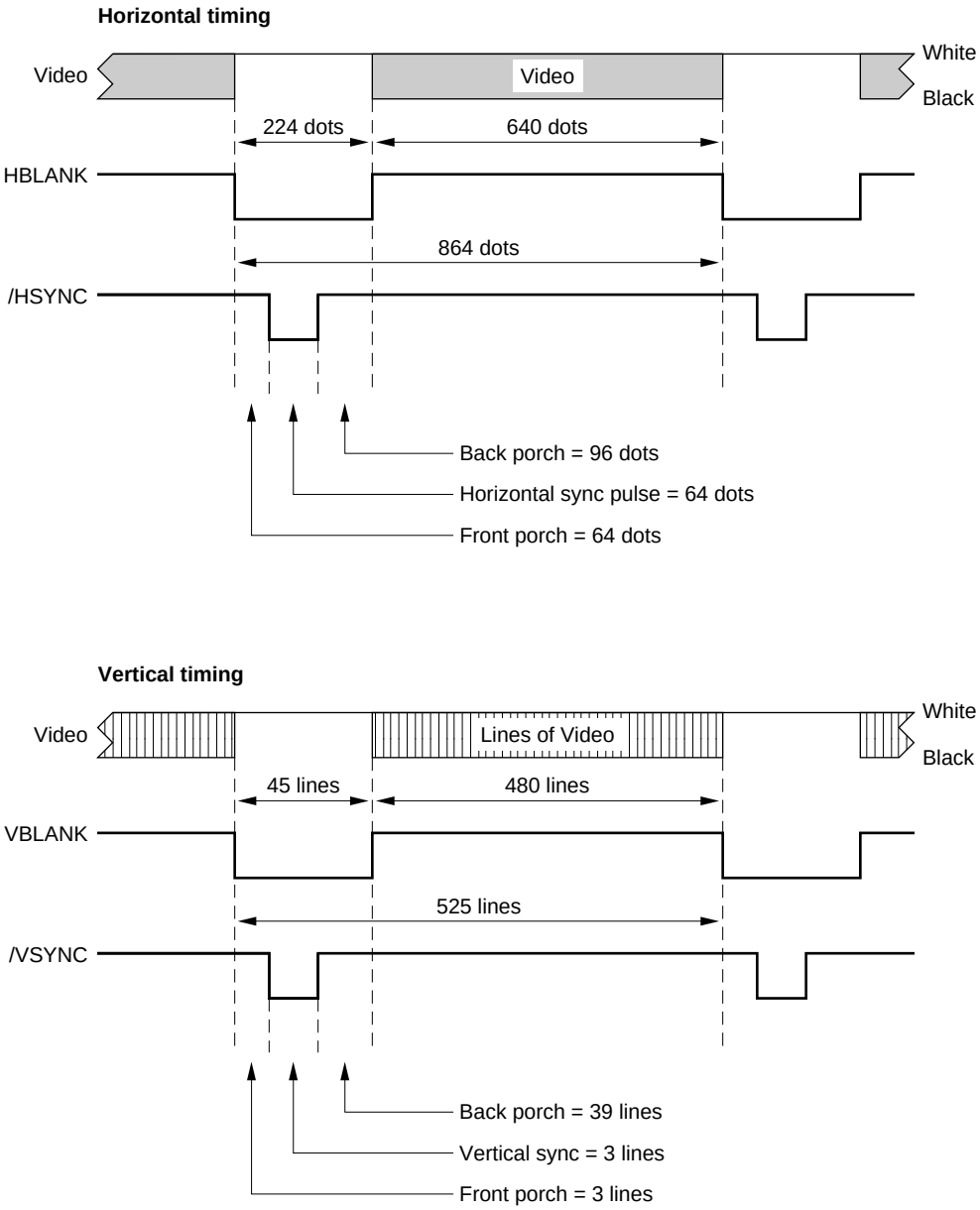
Table 2-1 HDI-45 connector signal assignments (continued)

Pin number	Signal name	Description
37	ADB 1	ADB pin 1—bidirectional data bus. Transfers audio and video control data between the CPU and the AudioVision 14 Display
38	ADB 2	ADB pin 2—power on. Enables computer to be turned on from the keyboard
39	Reserved	Reserved for future use
40	Reserved	Reserved for future use
41	Reserved	Reserved for future use
42	VIDEO HSYNC	Horizontal video synchronization signal
43	VIDEO SYNC RETURN	Video synchronization return
44	VIDEO BLUE SHIELD	Blue video signal shield
45	VIDEO BLUE	Blue video signal

Display Interface Timing

Figure 2-7 provides the horizontal and vertical interface timing for the AudioVision 14 Display. The timing is the same as for the Macintosh Color Display.

Figure 2-7 Display interface timing



Dot clock = 30.24 MHz
Dot time = 33.07 ns

Line time = 28.57 µs
Line rate = 35.00 kHz

Frame time = 15.00 ms
Frame rate = 66.67 Hz

Adapter Cable Interface

An adapter cable connects the AudioVision 14 Display to CPUs that have discrete ADB, audio, and video ports. This cable has a 45-pin socket at the display end, which connects to the HDI-45 connector on the display's captive cable. At the CPU end, the cable branches into four smaller cables, with one plug for the ADB port, one for the video port, and two for the audio ports. (See Figure 2-4 and Figure 2-5.)

ADB Connector

The ADB connector is a standard miniature DIN (MD-4) connector. It has four signal pins and an outer shield that functions as chassis ground. Figure 2-8 shows the pin designations for the ABD connector, and Table 2-2 lists the signal assignments.

Figure 2-8 ADB connector pin designations

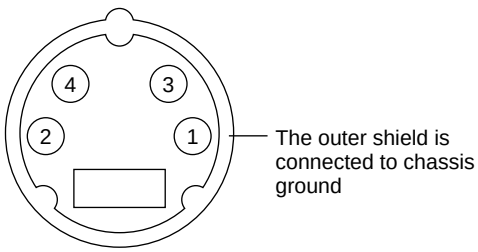


Table 2-2 ADB connector signal assignments

Pin number	Signal name	Description
1	ADB	Bidirectional data bus for input and output. Transfers audio and video control data between the CPU and the AudioVision 14 Display
2	POWER ON	Enables power to be turned on from the keyboard
3	+5VDC	+5 V power
4	GND	Logic ground
Outer shield	None	Chassis ground

Video Port

The video port connection is made through a standard DB-15 connector. Figure 2-9 shows the pin designations for the connector, and Table 2-3 lists the signal assignments.

Figure 2-9 Video connector pin designations

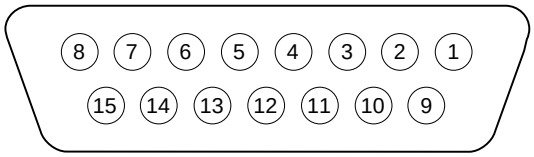


Table 2-3 Video connector signal assignments

Pin number	Signal name	Description
1	VIDEO RED GND	Red video ground
2	VIDEO RED	Red video signal
3	VIDEO CSYNC	Composite video synchronization signal
4	MONITOR SENSE 0	Monitor sense bit 0
5	VIDEO GREEN	Green video signal
6	VIDEO GRN GND	Green video ground
7	MONITOR SENSE 1	Monitor sense bit 1
8	Reserved	Reserved for future use
9	VIDEO BLUE	Blue video signal
10	MONITOR SENSE 2	Monitor sense bit 2
11	C&VSYNC GND	Ground for CSYNC and VSYNC
12	VIDEO VSYNC	Vertical video synchronization signal
13	BLU GND	Blue ground
14	HSYNC GND	HSYNC ground
15	VIDEO HSYNC	Horizontal video synchronization signal

Discrete Audio Ports

The adapter cable provides a connection to the standard audio I/O ports on the rear panel of most earlier model Macintosh computers.

Other Display I/O Ports

There are three connectors on the left side of the display:

- one ADB port
- two audio ports—output for headphones, input for external microphone, or other sound source

There are two connectors on the right side of the display:

- one port for camera, VCR, or S-video inputs
- one ADB port

ADB Port

The ADB port is a standard connector. For ADB port specifications see the previous section, "ADB Connector."

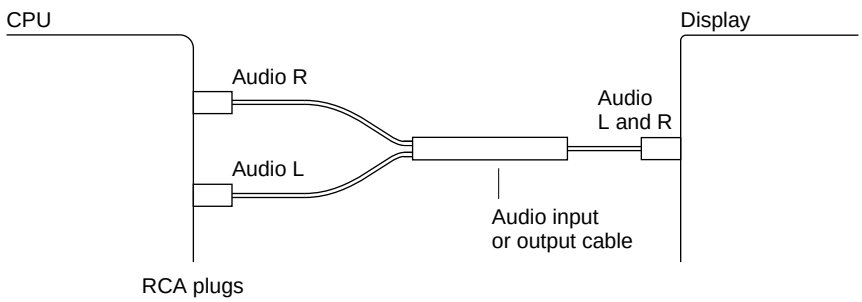
Note
The ADB ports on the side panels of the display are used to connect ADB devices, like the mouse and keyboard. The ADB data line in the main I/O cable is used to transfer audio and video control data between the CPU and the display. ◆

Audio Ports

The display's audio input and audio output ports are both stereo ports, but they use single mini-stereo audio connectors. You must make sure that the connector you use for audio input or output is compatible with your audio equipment. For example, if you are connecting to a device that uses dual (RCA type) connectors for stereo sound, use a "Y" adapter to connect each of the display's stereo audio ports to the CPU's audio ports. Figure 2-10 shows the audio adapter configuration.

The audio output port is used for headphones. The audio input port accepts sound inputs from any appropriate audio device.

Figure 2-10 Adapter for audio ports



Camera/VCR and S-Video Inputs

A 7-pin connector on the right side of the display enables you to provide a camera input, such as an Apple Video Camera input, to the AudioVision 14 Display. The camera input is routed to the CPU via the 45-pin HDI connector. Figure 2-11 shows the pin designations for the video connector, and Table 2-4 provides the signal descriptions.

Note

Existing Macintosh computers cannot support a camera interface without the addition of a third-party multi-media card. Future Apple computers will provide an integral camera interface connection. ◆

The display also supports a 4-pin **S-video** VCR connection using four pins on the same connector. S-video is the commonly used shortened form of Super-Video, which refers to superior video resolution. VCRs often have a connector marked S-VHS, and state-of-the-art television sets have 4-pin mini-DIN jacks marked S-video. S-video signifies that picture information is delivered as separate **luminance** and components, as opposed to the single-wire delivery used in regular video or composite video. Luminance is the part of the picture responsible for detail, shapes and shadings. Chrominance contains only the color sensation and no picture detail. By separating luminance and chrominance, higher picture bandwidths can be transmitted, and this results in a higher resolution picture.

Figure 2-11 Camera/VCR connector pin designations

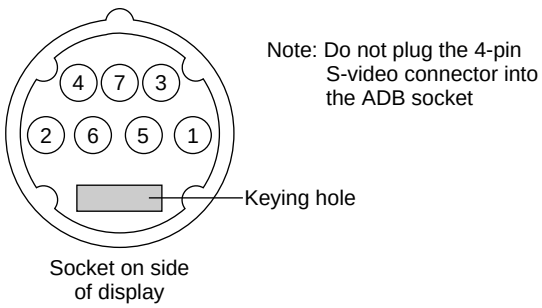


Table 2-4 Camera/VCR connector signal assignments

Pin number	Signal name		Description
	7-pin connector	4-pin connector	
1	AGND (SIGNAL)	AGND (SIGNAL)	Ground for the video signal
2	AGND(PWR)	AGND(PWR)	Ground for power
3	VIDEO-Y	VIDEO-Y	Luminance signal input for S-video, or composite video input
4	VIDEO-C	VIDEO-C	Chrominance signal input for S-video
5	SDA	Not available	Bus data line for the I^2C serial bus; the display is merely a pass-through for this signal
6	$+V_{CC}$	Not available	+12 V power output. Current draw ~100 mA
7	SCL	Not available	Bus clock line for the I^2C serial bus

AudioVision Sound and Video Panels

This chapter describes the AudioVision 14 Display's sound and video panels. It provides an overview of sound and video panels and explains how to

- create a panel
- reference a panel
- manage a panel
- process panel events
- manage panel settings

In most instances, the information provided in this chapter is common to both the sound and video panels. Any differences between the two types of panels are noted in the text.

The chapter is of primary interest to developers who

- are developing sound or video devices
- plan to give users access to sound and video controls

Overview of Sound and Video Panels

Sound and **video panels** provide the interface between the user, or application software, and the sound and video components of the AudioVision 14 Display. Figure 3-1 shows a simplified view of this interface. The Sound Manager controls the sound panels. It also provides the control function for the video panel. It creates panels, which include items such as sound input device selection and brightness control. The panels allow the Sound Manager to obtain configuration information from users about particular functions.

Figure 3-2 shows the panels that are currently available with the display. They include:

- Alert Sounds, which allows you to select, add, remove, and control the volume of the alert sound
- Sound In, which allows you to select a recording source
- AudioVision Sound, which allows you to mute the sound outputs from the internal speakers, to turn the internal microphone on or off, and to turn off the internal speakers when the headphones are plugged into the headphone jack; it also allows you to select AudioVision Sound Options
- AudioVision Volume, which allows you to set the volume levels of the speakers, headphones, built-in sound device, and the alert sounds
- Sound Out, which allows you to select the playback source and to define the playback parameters
- AudioVision Video, which allows you to control brightness and contrast

You can open the panels by first choosing the Control Panels folder from the Apple menu, and then double clicking the desired sound or video control panel icon. Once a panel is open, you can select another panel from the pop-up menu. You may also open the panels through your application. Applications never call panel components directly, but make use of the panel routines, as listed later in this chapter, in Table 3-8.

Figure 3-1 Sound and video panel interface

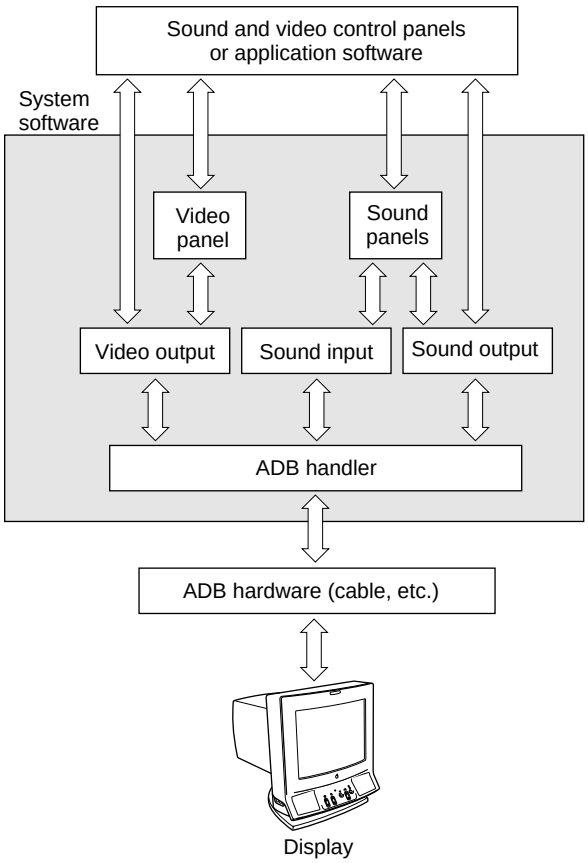
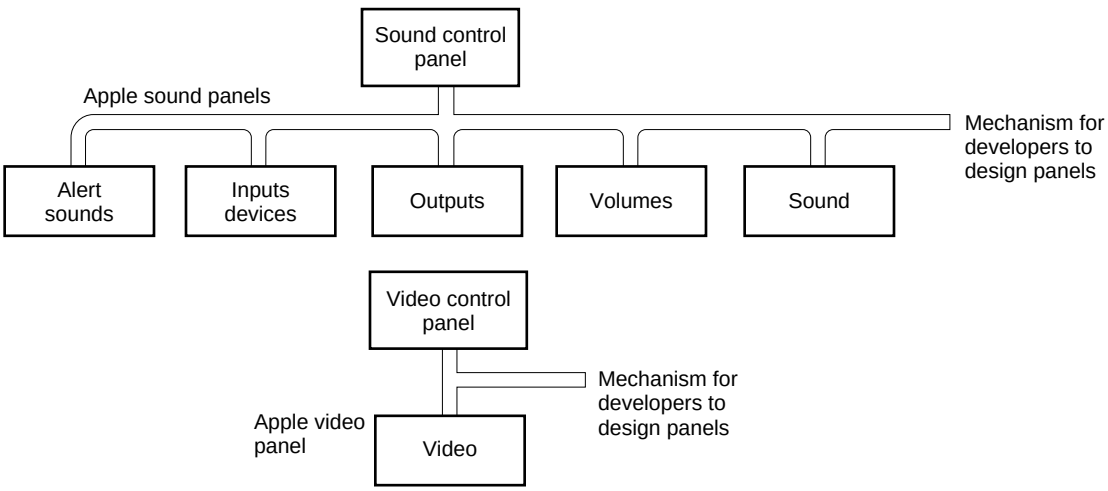


Figure 3-2 Sound and video panels



Panel components rely on the facilities of the Component Manager, so to use any component, your application must use the Component Manager. You will find detailed information on this subject in *Inside Macintosh: More Macintosh Toolbox*.

The sound and video panels are not responsible for saving the settings information. The Sound Manager manages this information on behalf of the panels, and may combine configuration information from several like panels in order to build up a complete configuration for an elaborate audio or video environment.

Sound and video panels store configuration data in sound and video preferences files. The Sound Manager provides functions that allow you to create and manage user preferences for the sound and video panels. You can do this by means of the AudioVision Preferences folder, which you will find under Preferences in the System folder.

Sound Panels

This section describes the AudioVision 14 Display sound panels currently available. They include:

- Alert Sounds (Figure 3-3)
- Sound In (Figure 3-4)
- AudioVision Sound (Figure 3-5)
- AudioVision Volume (Figure 3-7)
- Sound Out (Figure 3-8)

You can choose other sound panels from the pop-up menu on each sound panel. This pop-up menu is located in the upper-left corner of the panel, and it is active and available to you when any of the sound panels is accessed.

Alert Sounds Panel

When you open the Sound control panel by double clicking the Sound icon in the Macintosh Control Panels folder, or when you use your application to access a sound panel, the first panel that appears on your screen is the Alert Sounds panel. This panel allows you to select and add an alert sound, remove an alert sound, control the volume of the alert sound, and choose another sound panel. Figure 3-3 shows the Alert Sounds panel.

Figure 3-3 Alert Sounds panel

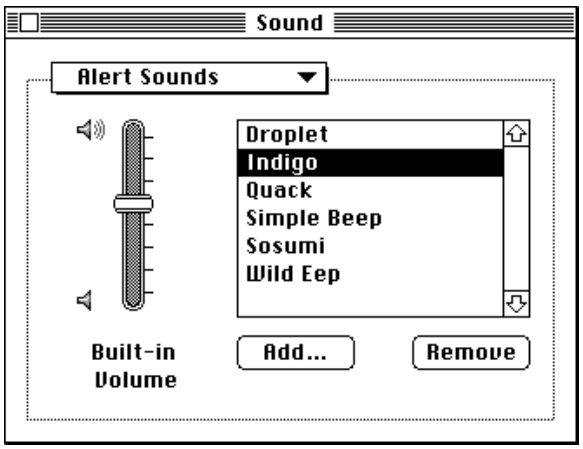


Table 3-1 describes the different features controlled by this panel.

Table 3-1 Alert Sounds features

Feature	Description
Alert Sounds menu	Enables you to select another sound panel.
Simple Beep, Sosumi, etc., scroll list	This scroll list allows you to select the type of alert sound you prefer by highlighting the item.
Add button	This button allows you to add an alert sound. If you click the button, a dialog box is displayed on the screen. It contains Record, Stop, Pause, and Play buttons. You may use these buttons to record up to 10 seconds of sound. You may then give this sound a name, which will appear in the Alert Sounds list. Note that this button may not appear if you do not have a sound input device. However, computers such as the Macintosh IIfx, which do not have a sound input device, allow you to install an external input device, such as a MacRecorder. If an external device is connected, the Add button appears in this panel.
Remove button	This button allows you to remove an alert sound. You highlight the sound to be removed, and then click the button.
Alert Volume slider	This slider allows you to control the volume of the alert sound. Move it up to increase volume, and down to decrease volume. The name of your sound output device will be inserted into the name of the volume control slider. In Figure 3-3 the default name “Built-in Volume” is shown.

Sound In Panel

If you choose Sound In from the pop-up menu, the sound panel shown in Figure 3-4 appears on the screen. This panel allows you to select the sound input device and to select another sound panel.

Sound may be input to the display from a variety of sources, including:

- the built-in microphone at the top of the display
- a sound input device, such as a CD player, plugged into the audio input jack on the rear panel of the CPU
- a sound input device plugged into the audio input plug on the side panel of the display

Figure 3-4 Sound In panel

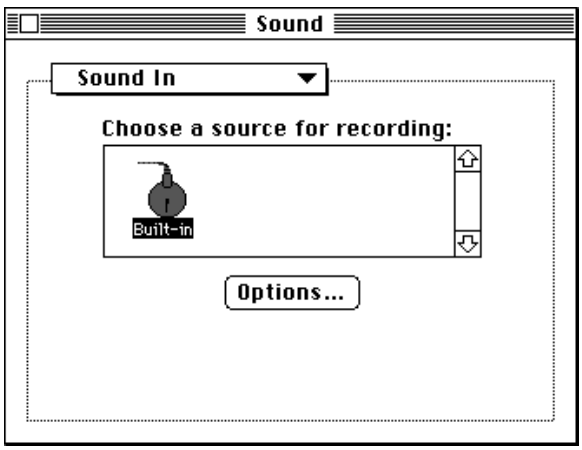


Table 3-2 summarizes the panel features.

Table 3-2 Sound In features

Feature	Description
Sound In menu	This menu allows you to choose another sound panel.
Choose a source for recording: Built-in icon	This feature allows you to select a recording source. The Built-in icon represents the built-in sound input port on the back of the Macintosh computer. Whatever you plug into this port will be the recording source. If you plug in the AudioVision 14 Display, then the display's built-in microphone on the front panel becomes the built-in sound source. This panel appears even if you have no input devices. The message "There is no source for recording" is displayed. If you attach another sound input device, the name of the device, and the device's icon appears in this list in the panel.
Options button	The Options button is available only on certain machines, for example the Macintosh Quadra 900/950. When options are available, this button is highlighted.

AudioVision Sound Panel

If you select AudioVision Sound from the pop-up menu, the AudioVision Sound panel shown in Figure 3-5 is displayed on the screen. This panel allows you to turn the internal microphone on and off, and to mute the output from the internal speakers when the headphones are plugged into the headphone jack.

Figure 3-5 AudioVision Sound panel

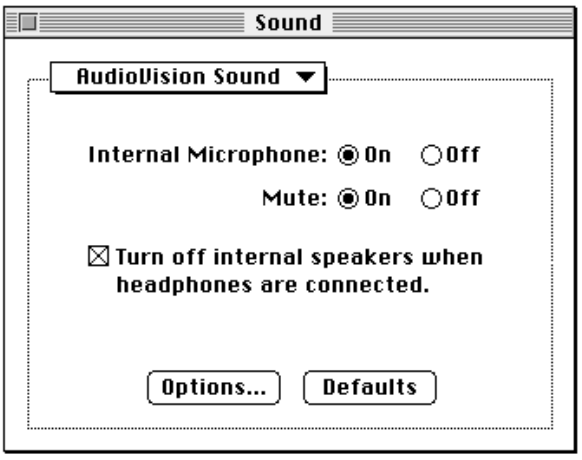


Table 3-3 describes the features of this panel.

Table 3-3 AudioVision Sound panel features

Feature	Description
AudioVision Sound menu	This pop-up menu allows you to choose another sound panel.
Internal Microphone buttons	These radio buttons allow you to turn the internal microphone on or off.
Mute buttons	These radio buttons allow you to mute the sound output from the internal speakers. The buttons control the muting state, and also track with the state of the mute keys on the front panel of the display. This means that if you mute the sound output using the mute key on the front panel of the display, the Mute On option in this panel will be selected.
Turn off internal speakers when headphones are connected	If you select this feature, sound from the display's speakers will be turned off when the headphones are plugged in to the headphone jack.
Defaults button	The Defaults button restores the display sound settings in this panel to the factory default setting. It also resets the settings in the AudioVision Sound Options dialog box to the factory default setting.
Options button	If you click the Options button, the AudioVision Sound Options dialog box will appear on the screen. See the following section "AudioVision Sound Options Dialog Box," for further information.

AudioVision Sound Options Dialog Box

If you select Options in the AudioVision Sound panel, the dialog box shown in Figure 3-6 appears on the screen.

Note

The controls in this dialog box are intended for power users. ◆

Note

When you select an option in this dialog box, it is effective immediately. ◆

Figure 3-6 AudioVision Sound Options dialog box

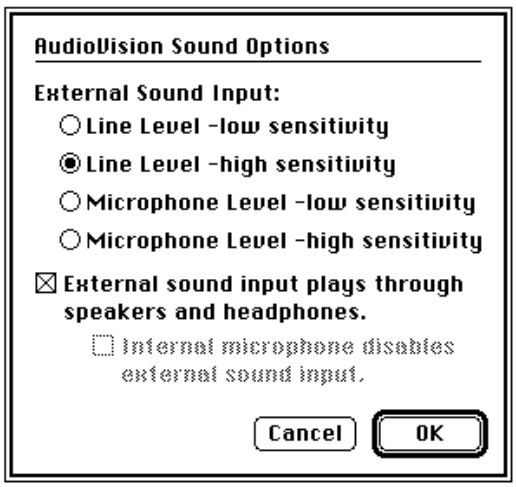


Table 3-4 describes the function of each optional feature.

Table 3-4 AudioVision Sound Options functions

Feature	Functions
External Sound Input buttons	These controls allows you to set the levels of the external sound input, specifically line level and microphone level. The AudioVision 14 Display accepts 2.0 V and 4.0 V peak-to-peak sound input signals. When you power up the display initially, the Line Level button with low sensitivity will be selected. This means that the display is set to accept the 4.0 V peak-to-peak input. If your sound input device provides a 2.0 V peak-to-peak signal, the sound output from the display will seem relatively quiet. To compensate for this, and boost the level of the sound output, you should select Microphone Level high sensitivity. Once you have done this, the Manager saves the setting, which becomes the default unless you change it. You should generally select Line Level low sensitivity for audio cassettes, audio CDs, and some Apple microphones. You should select Microphone Level (high or low sensitivity) for most other microphones.

continued

Table 3-4 AudioVision Sound Options functions (continued)

Feature	Functions
External sound input plays through speakers and headphones Internal microphone disables external sound input	During normal operation, you should select "External sound input plays through speakers and headphones." When this option is selected, the "Internal microphone disables external sound input" option is also available. You should select "Internal microphone disables external sound input" only when your sound input device is a CD player plugged into the audio input connector on the side panel of the display. Note that Internal microphone disables external sound input may only be selected when External sound input plays through speakers and headphones is selected. The CD player typically provides a 16-bit sound input, which is transferred through the display to the CPU, and then back from the CPU to be output from the display's speakers or headphone jack. Since the CPU supports only 8-bit sound I/O, the sound output provided in this way is distorted and inferior to the original input. If you select "Internal microphone disables external sound input," the sound input will be routed directly from the input port to the display's speakers and headphone outputs, without going through the CPU. This enables the display to function as a powered speaker system, and ensures that there is no loss in sound output quality. If you are recording from the CD (or other sound device) input, the sound input must be routed through the CPU, and you should select "External sound input plays through speakers and headphones."

Volumes Panel

If you select Volumes from the pop-up menu, the panel shown in Figure 3-7 appears on the screen. This panel allows you to set the volume of the alert sounds, and the outputs from the speakers and the headphones.

Figure 3-7 Volumes panel

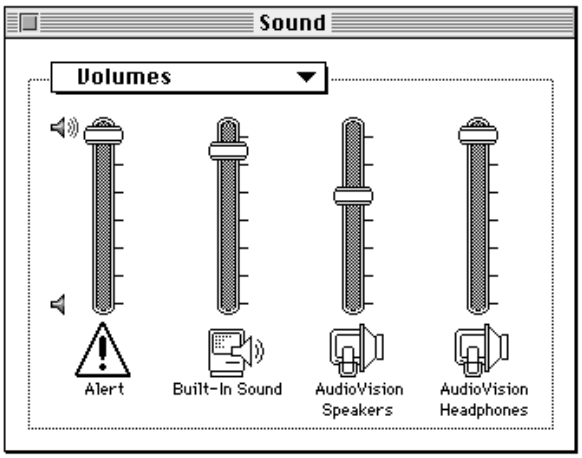


Table 3-5 describes the features of this panel.

Table 3-5 Volumes features

Feature	Description
Volumes menu	This menu allows you to select one of the other sound panels.
Alert slider	This slider allows you to change the volume of the alert sound.
Built-In Sound slider	This slider allows you to change the volume of the built-in sound device. This will generally be sound generated by applications running on the computer, such as QuickTime or Hypercard. This control is hot, which means that the volume changes as you move the slider.
AudioVision Speakers slider	This slider allows you to change the volume of the output from the speakers. This control is hot, which means that the volume changes as you move the slider.
AudioVision Headphones slider	This slider allows you to change the volume of the output from the headphones. This control is hot, which means that the volume changes as you move the slider.

Sound Out Panel

If you select Sound Out from one of the pop-up menus, the panel shown in Figure 3-8 appears on the screen. This panel allows you to select the source for playback, and to define the playback parameters.

Figure 3-8 Sound Out panel

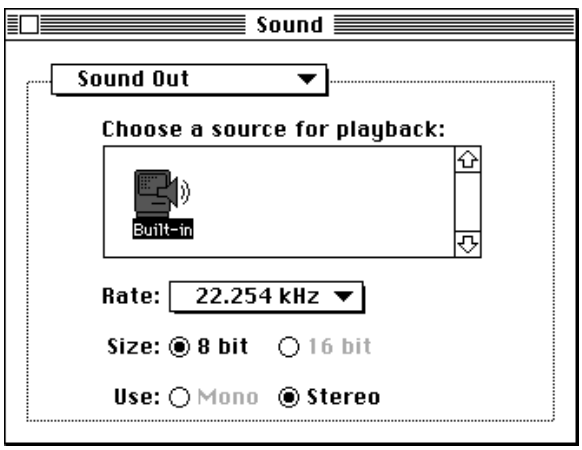


Table 3-6 summarizes the features this panel controls.

Table 3-6 Sound Out panel features

Function	Description
Sound Out menu	This menu allows you to select one of the other sound panels.
Choose a source for playback scroll list Built-in icon	This scroll list contains the available sound source icons. The Built-in sound input icon represents the built-in sound input port on the back of the Macintosh computer. Whatever you plug into this port will be the recording source. If you plug the AudioVision 14 Display into this port, then the display's built-in microphone on the front panel becomes the built-in sound source.
Rate pop-up menu	This pop-up menu allows you to choose the output frequency. The default, as shown in Figure 3-8, is 22.254 kHz. There are alternative frequencies, which are dependent upon the capabilities of the sound output device. Generally, higher sample rates produce higher fidelity sound output.

continued

Table 3-6 Sound Out panel features (continued)

Function	Description
Size buttons	These radio buttons allow you to select the size of the sound output device. Devices such as CD players are 16-bit devices. However, the CPU only supports 8-bit sound I/O, and this is the default for this function.
Use buttons	These radio buttons allow you to select mono or stereo output. Stereo output is the selected default.

NOTE Most CPUs support only stereo output in the hardware. In this case, only the Stereo option is available. If your CPU supports only monaural sound, the stereo choice is not available. Some CPUs, such as the Macintosh IIfx, may allow you to choose either mono or stereo output.

Video Panel

The only Apple video panel currently available is the AudioVision Video panel. To access this panel, choose the Control Panels folder from the Apple menu and open the video control panel. Figure 3-9 shows the panel that is displayed on the screen. This panel enables you to control the brightness and contrast of the AudioVision 14 Display. The controls in this panel duplicate the related controls on the front panel of the display.

Figure 3-9 AudioVision Video panel

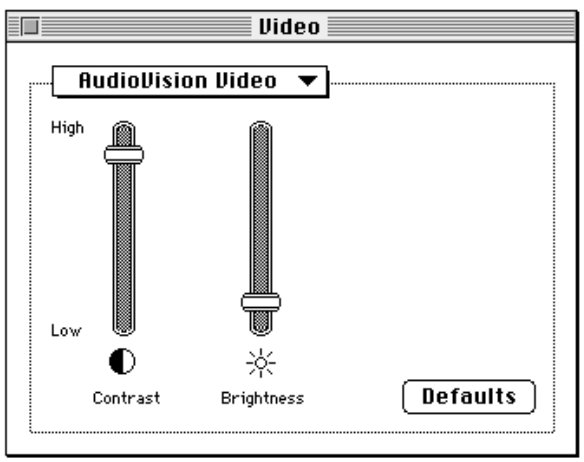


Table 3-7 describes the features the AudioVision Video panel controls.

Table 3-7 AudioVision Video panel features

Feature	Description
AudioVision Video menu	This pop-up menu allows you to choose other video panels. Currently the only video panel available is the AudioVision Video panel shown in Figure 3-9.
Brightness slider	This slider switch allows you to adjust the brightness of the screen. The slider switch is hot, which means that the brightness of the screen changes as you move the slider.
Contrast slider	This slider switch allows you to adjust the contrast of the screen. The slider switch is hot, which means that the contrast of the screen changes as you move the slider.
Defaults button	If you click this button, it returns the panel settings to the factory-default settings.

What the Sound Manager Does

The Sound Manager allows you to control sound and video panels. It creates the dialog boxes and pop-up menus, and manages the go-away buttons and pop-up menus. Only one panel is active at any given time.

When you select a specific panel, the Sound Manager works with the component for that panel to build the panel settings dialog area. It then presents the panel on the screen. The panel processes dialog events and mouse clicks as appropriate, and validates user settings.

For further information on Sound Manager functions refer to the section "Managing Panel Components," later in this chapter. The sections on routines, such as `PanelGetDITL`, and so on, also provide information about the Sound Manager .

Creating a Panel Component

This section provides the information you need to create a panel component. There are two circumstances under which you should consider creating a panel:

- If you want to support special audio or video equipment the panels provided may be sufficient. However, if you develop your own panel(s), users will be able to take advantage of your equipment's special capabilities.
- If you have created your own sound output device component, you must create an accompanying sound panel, so that users can configure your device's unique features.

Background Information

Apple Computer has defined a component type value for panels. You can use the following constants to specify this component type:

- sound panels:

```
#define SoundPanelComponentType 'sndP' //sound panel component type
```

- video panels:

```
#define VideoPanelComponentType  'vidP' //video panel component type
```

Panels use their component subtype and manufacturer values to indicate the type of configuration services they provide. For instance, the Alert Sounds panel described earlier in this chapter has the following component subtype:

```
#define kAlertSoundsPanel  alrt /*sound panel component sub-type*/
```

Third party developers may also develop their own panels to support special features of their hardware. These panels have a subtype value that indicates the output device supported by the panel. This value should correspond to the component subtype value of the sound or video device components that may be configured by the panel. In general, Apple has reserved all lower-case values of component subtypes and manufacturer's codes.

Apple has also defined a functional interface for panels. For information about the functions the component must support, see the section "References to Panel Components," later in this chapter. You may use the following constants to refer to the request codes for each of the routines the component must support:

```
/*sound panel request codes*/ or

/*video panel request codes*/

enum {
  kPanelGetDit1Select = 0
  kPanelGetTitleSelect,
  kPanelInstallSelect,
  kPanelEventSelect,
  kPanelItemSelect,
  kPanelRemoveSelect,
  kPanelValidateInputSelect,
  kPanelGetSettingsSelect,
  kPanelSetSettingsSelect,
};
```

Component Flags for Panel Components

The Component Manager allows you to provide specific information about the component's capabilities in the `componentsFlags` field of the component description record. These flags control how the Sound Manager manages your panel. Currently, the following flag is defined:

```
enum {
  channelFlagDontOpenResFile  =2   /* do not open res file */ };
```

The `channelFlagDontOpenResFile` bit instructs the Sound Manager whether or not to open the component's resource file. When bit 2 is cleared (set to zero), the Sound Manager opens the component's resource file for you and then provides you with the appropriate file reference number. In general this is convenient. However, if the component is linked with your application and does not have its own resource file, you may not want the Sound Manager to try to open the resource file. In that case, set this bit to 1.

References to Panel Components

This section describes the functions that panels may support. Some of the functions are optional. This section discusses

- loading, configuring, and unloading the panel
- receiving and processing events in the panel
- collecting and resetting the panel's settings

Managing Panel Components

The Sound Manager can load, configure, and unload the panel. As part of this process, it installs the panel's dialog items in the settings dialog box, and it may open the component's resource file. Panels provide a number of functions that allow the Sound Manager to manage its relationship with panels. They are:

- PanelGetDITL
- PanelGetTitle
- PanelInstall
- PanelRemove

When the Sound Manager prepares to add the panel component's items to the settings dialog box, it obtains the item list by calling the `PanelGetDITL` function. Once it has installed the items, it calls the `PanelInstall` function, giving you the opportunity to set default values. Before the Sound Manager removes your items from the settings dialog, it calls the `PanelRemove` function.

PanelGetDITL

This function allows the Sound Manager to determine which dialog items are managed by your panel. The Sound Manager uses this information to build the panel settings panel for users.

```
pascal ComponentResult PanelGetDITL (Handle globals, Handle ditl);
```

`globals`	The panel's `Handle` for global data.
`ditl`	Refers to a `Handle` that is to receive the component's item list. The component should resize this `Handle` as appropriate.

Description

The Sound Manager calls your `PanelGetDITL` function to obtain the list of dialog items supported by your panel. The panel then puts these items into the settings dialog box and presents the panel to users. When the panel builds the settings dialog, it puts your items in appropriate locations. You do not need to specify locations.

The component returns the item list in a `Handle` provided by the panel.

Note

The Sound Manager disposes of this `Handle` after retrieving the item, so make sure the item list is not stored in a resource. If your item list is already in a resource handle, you can use the Resource Manager's `DetachResource` function to convert that resource `Handle` into one that is suitable for use with the `PanelGetDITL` function. ◆

The Sound Manager will open your resource file before calling the function, unless you instructed the Sound Manager not to open your resource file by setting the `channelFlagDontOpenResFile` component flag to 1.

PanelGetTitle

The Sound Manager calls the `PanelGetTitle` routine if it wants to ask for a name to use as the window's title, or as a name in the pop-up menu. This is useful if the panel requires a name that is different from its registered component name.

```
pascal ComponentResult PanelGetTitle (Component Instance ti,
                                      StringPtr title);
```

Description

This routine is used to get the title of a panel. Typically, a panel's title, which appears in the pop-up menu is the name of the component. This is the name required by the Component Manager. A panel may prefer a different title to appear in the pop-up menu. This call allows the panel to return its name, and provides a better match for the QuickTime API (application program interface). The routine is an optional component method call, and is currently not in use. It may be used in the future.

PanelInstall

The Sound Manager calls the `PanelInstall` function after adding your items to the settings panel. It does this just before displaying the panel to users.

```
pascal ComponentResult PanelInstall (Handle globals, DialogPtr,
                                     short itemOffset);
```

`globals`	The panel's `Handle` for global data.
`dialog`	Contains a dialog pointer identifying the settings dialog box. Your component may use this value to manage its part of the dialog.
`itemOffset`	Specifies the offset to the panel's first item in the dialog box. Because the Sound Manager builds your dialog items into a larger box containing other items, this value may be different each time your panel is installed. Do not rely on it being the same.

Description

The Sound Manager calls your `PanelInstall` function just before displaying the panel to users. The Sound Manager provides you with the information that identifies the dialog, and the offset of the panel's items into the dialog. You may use this opportunity to set default dialog values, or initialize your control values.

The Sound control panel calls the `PanelRemove` function to tell it to remove any special dialog items such as a list or user item. This provides the chance to remove dialog related items that the Dialog Manager does not know about. Later, the Sound control panel will call `PanelClose`, which allows the component to remove any storage it has allocated related to the component.

PanelRemove

The Sound Manager calls the component's `PanelRemove` function before it removes the panel from the settings dialog box.

```
pascal ComponentResult PanelRemove (Handle globals, DialogPtr
                                    dialog, short itemOffset);
```

`globals`	The panel's `Handle` for global data.
`dialog`	Contains a dialog pointer identifying the settings dialog box.
`itemOffset`	Specifies the offset to the panel's first item in the dialog box.

Description

The Sound Manager calls your `PanelRemove` function just before removing your items from the settings dialog box. The Sound Manager provides you with the information that identifies the dialog, and the offset of the panel's items into the dialog. You may use this opportunity to save any changes you may have made to the dialog or to retrieve the contents of `TextEdit` items. If the Sound Manager opened your resource file, it will still be open when it calls this function.

The Sound Manager calls your `PanelInstall` function before displaying the settings dialog to users.

Processing Panel Events

When your control panel is loaded into the settings panel and is active, you may receive and process dialog events and mouse clicks. The Sound Manager calls the following functions to process sound panel events:

- PanelItem
- PanelEvent

PanelItem

The `PanelItem` function allows the component to receive and process mouse clicks in the settings dialog box. The Sound Manager calls your `PanelItem` function whenever users click a dialog item.

```
pascal ComponentResult PanelItem (Handle globals, DialogPtr
                                  dialog, short itemOffset, short
                                  itemNum);
```

`globals`	The panel's `Handle` for global data.
`dialog`	Contains a dialog pointer identifying the settings dialog box.
`itemOffset`	Specifies the offset to the panel's first item in the dialog box.
`itemNum`	Contains the item number of the dialog item selected by users. Note that this is an absolute item number. The Sound Manager does not adjust this value to account for the offset to your first dialog item.

Description

The Sound Manager calls your `PanelItem` function whenever a user clicks an item in the settings dialog box. The component may then perform whatever processing is appropriate, depending upon the item number. Since the Sound Manager provides an absolute item number, it is your responsibility to adjust this value to account for the offset to the panel's first item in the dialog box.

The component can filter all dialog events with your `PanelEvent` function (see the next section). The Sound Manager uses the component's `PanelValidateInput` function to validate the current input settings as a whole. This function is described in a later section.

PanelEvent

The `PanelEvent` function allows the component to receive and process individual dialog events. This function is similar to a modal dialog filter function.

```
pascal ComponentResult PanelEvent (Handle globals, DialogPtr
                                   dialog, short itemOffset,
                                   Event record *theEvent, short
                                   *itemHit, Boolean *handled);
```

`globals`	The panel's `Handle` for global data.
`dialog`	Contains a dialog pointer identifying the settings dialog box.
`itemOffset`	Specifies the offset to the panel's first item in the dialog box.
`theEvent`	Contains a pointer to an event record, which contains information identifying the nature of the event.
`itemHit`	Refers to a field that is to receive the item number in cases where the component handles the event.
`handled`	Refers to a Boolean value. Set this Boolean to indicate whether or not the component handles the event. Set it to `TRUE` if it handles the event, and to `FALSE` if it does not.

Description

The Sound Manager calls your `PanelEvent` function whenever an event occurs in the settings dialog box. The `PanelEvent` function is similar to a modal dialog filter function. The main difference is that rather than returning a Boolean value to indicate whether or not the event was handled, the `PanelEvent` function sets a Boolean that is provided by the calling function. If you handle the event, be sure to update the field referred to by the `itemHit` parameter. By default, this value will be initialized to `TRUE` by the Sound Manager , so you need only be concerned with setting it to `FALSE`. When you set `handled` to `FALSE`, you are asking the Sound Manager to call the panel's `PanelItem` function.

The component can process mouse clicks using the `PanelItem` function. See the description earlier in this chapter.

Managing the Panel Settings

When managing panel settings, the Sound Manager does the following:

- Stores panel configuration information in the preferences file. This configuration information includes settings for each of the panels and the sound and video output devices the Sound Manager uses.
- Calls the component whenever it wants to retrieve these settings. It may also use previously stored settings to restore the panel's settings.
- Calls the `PanelGetSettings` function to restore those settings to previous values.

To implement these processes, the Sound Manager calls the following functions:

- `PanelValidateInput`
- `PanelGetSettings`
- `PanelSetSettings`

PanelValidateInput

Whenever users click the go-away box within the control panel, the Sound Manager calls the `PanelValidateInput` function to validate user settings in the panel.

```
pascal ComponentResult PanelValidateInput (Handle globals,
                                           Boolean *ok);
```

`globals`	The panel's `Handle` for global data.
`ok`	Contains a pointer to a Boolean value. You set this Boolean to indicate whether user settings are acceptable. Set it to `TRUE` if the settings are correct, otherwise, set it to `FALSE`.

Description

The Sound Manager calls the `PanelValidateInput` function to allow you to validate the settings chosen by users. This is your opportunity to validate them in their entirety, including those for which you may not have received dialog events or mouse clicks. For example, if your panel uses a `TextEdit` box, you should validate its contents at this time. Be sure to give users some indication of how to fix the settings.

The Sound Manager calls this function when users click the go-away box.

You indicate whether the settings are acceptable by setting the Boolean referred to by the `ok` parameter. If you set this Boolean to `FALSE`, the Sound Manager ignores the OK button in the dialog box.

The component can process mouse clicks using the `PanelItem` function, discussed earlier in this chapter. The component can filter all dialog events with the `PanelEvent` function, discussed earlier in this chapter.

PanelGetSettings

The Sound Manager calls the component's `PanelGetSettings` function to retrieve the panel's current settings.

```
pascal ComponentResult PanelGetSettings (Handle globals,
                                         Hand *ud, long flags);
```

`globals`	The panel's `Handle` for global data.
`ud`	Contains a `Handle` to the panel's configuration data. The component is responsible for creating a new `Handle`, and returning it as `ud`. The component is not responsible for disposing of the `Handle`.
`flags`	Reserved for future use.

Description

The Sound Manager calls the `PanelGetSettings` function to obtain a copy of the panel's current settings. The Sound Manager stores these settings and may use them to restore the panel's settings by calling the `PanelSetSettings` function. The component should store whatever values are necessary to configure the associated panel component

properly. For example, standard Apple sound panels save such values as default sound output component type, default sound input device, volume levels, and alert beep sounds.

These settings may be stored as part of a larger panel configuration, and must remain valid across system restarts. Therefore, you should not store values that may change without your knowledge, such as a component ID. In addition, saving a file reference number or component instance is not valid. You are recommended to set the first field of your settings data with a version number, so that you can validate the data within the setting.

You are free to format the data in the `Handle` in any way you wish. Make sure you can retrieve the settings information from the user data item when the `PanelGetSettings` function is called. You may choose to format the data in such a way that other components can parse it easily, allowing the component to operate with other panels.

The Sound Manager uses the component's `PanelSetSettings` function to restore this configuration information. See the following section for more information.

PanelSetSettings

The Sound Manager calls the component's `PanelSetSettings` function to restore the panel's current settings.

```
pascal ComponentResult PanelSetSettings (Handle globals, Handle
                                         ud, long flags);
```

`globals`	The panel's `Handle` for global data.
`ud`	Identifies a `Handle` that contains new setting information for the panel. The component must not dispose of this `Handle`.
`flags`	Reserved for future use.

Description

The Sound Manager calls the `PanelSetSettings` function to restore the panel's settings. The Sound Manager may call this function when users cancel the settings dialog, or it may use it to set default values before displaying the panel to users.

The component originally creates the settings information when the Sound Manager calls the `PanelGetSettings` functions. The Sound Manager passes this configuration information back to you in the `ud` parameter to the `PanelGetSettings` function. The component should parse the configuration information and use it to establish the panel's current settings.

Note that the component may not be able to accommodate the original settings. For example, because settings may have been stored for some time, the hardware environment may not be able to support the values in the settings. You should try to make the new settings match the original settings as closely as possible. If you cannot make a perfect match, return an appropriate result code.

The Sound Manager uses the component's `PanelGetSettings` function to retrieve this configuration information.

Summary of Panel Components

Table 3-8 summarizes the panel components.

Table 3-8 Panel components

Component type	Component
Constants	

Sound constants	`/*component type value */`
	`#define SoundPanelType 'sndP' /* sound panel component type */`
	`/* component sub-type values defined by Apple */`
	`#define kAlertSoundsPanel 'alrt' /* sound panel component subtype*/`
	`#define kInputsPanel 'mics'`
	`#define kOutputsPanel 'spek'`
	`/*componentsFlags Values for sound panel components */`
	`enum {`
	`  channelFlagDOntOpenResFile = 2 /* do not open res file */`
	`};`
	`/* sound panel request codes */`

Sound and video constants	`enum {`
	`  kPanelGetDitlSelect = 0`
	`  kPanelGetTitelSelect`
	`  kPanelInstallSelect`
	`  kPanelEventSelect`
	`  kPanelItemSelect`
	`  kPanelRemoveSelect`
	`  kPanelValidateInputSelect`
	`  kPanelGetSettingsSelect`
	`  kPanelSetSettingsSelect`

Video constant	`#define VideoPanelType “vidP’ /* video panel component type */`
Functions	

Managing the panel components	`pascal ComponentResultPanelGet DITL (Handle globals, Handle *ditl);`
	`pascal ComponentResultPanelInstall (Handle globals, DialogPtr dialog, short itemOffset);`
	`pascal ComponentResultPanelRemove (Handle globals, DialogPtr dialog, short itemOffset);`

continued

Table 3-8 Panel components (continued)

Component type	Component
Processing panel events	`pascal ComponentResultPanelItem (Handle globals, DialogPtr dialog, short itemOffset, short ItemNum);`
	`pascal ComponentResultPanelEvent (Handle globals, DialogPtr dialog, short itemOffset, eventRecord *theEvent, short *itemHit, Boolean *handled);`
Managing panel settings	`pascal ComponentResultPanelInvalidateInput (Handle globals, Boolean *ok);`
	`pascal ComponentResultPanelGetSettings (Handle globals, UserData *ud, long flags);`
	`pascal ComponentResultPanelSetSettings (Handle globals, UserData *ud, long flags);`

Glossary

chrominance This component of the picture information contains only the color and no picture detail.

key Used in this developer note to describe the rocker-style control switches on the front panel of the AudioVision 14 Display.

luminance This component of the picture information is responsible for detail, shapes, and shadings.

root mean square (RMS) value The RMS value is the effective or virtual value. In the case of the sinusoidally varying AC input, the RMS value is derived from the peak value divided by √2.

sound panel Provides the interface beween the user or application software and the sound components of the AudioVision 14 Display.

S-video Commonly used shortened form of Super-Video, which refers to superior video resolution. Most state-of-the-art VCRs and television sets have S-video jacks. S-video signifies that the picture information is delivered as separate luminance and chrominance components, as opposed to the single-wire delivery used in regular video or composite video. By separating chrominance and luminance, higher picture bandwidths can be transmitted, resulting in a higher resolution picture. See also **chrominance** and **luminance.**

video panel Provides the interface beween the user or application software and the video components of the AudioVision 14 Display.

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