ISADORA®

User's Manual

By Mark Coniglio

V1.3 - PRELIMINARY

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Isadora – Overview

What is Isadora?

Isadora is a software program designed to allow interactive, real-time manipulation of digital media, including pre-recorded video, live video, sound, standard MIDI files and more. You create an Isadora program by linking together modules (called *actors* in Isadora parlance), each of which perform a specific function on the media. You make these programs interactive by linking actors to another type of module, called a *watcher*, which looks for information from the outside world (i.e. MIDI messages, mouse and keyboard actions, messages send over a Local Area Network). The results are presented via the computer's video displays, speakers, or MIDI interfaces.

The design of Isadora is the result of over a dozen years of experience of creating interactive works with my dance theater company Troika Ranch (http://www.troikaranch.org), as well as my experience teaching numerous workshops on integrating digital media into live performance. It reflects my own desire for a flexible, powerful and reliable tool with which to make my own pieces, and to create a friendly working environment for those who do not have extensive computer experience.

Perhaps the most difficult aspect of Isadora is that a new file is a blank slate – it won't do anything for you until you begin to bring actors into the program and link them together. For those just beginning, this can be a bit daunting. So, we have supplied a complete set of tutorials that lead you through the process of creating several Isadora programs. In addition, you will find several example files included with the application. Looking at these may be the best place to start, as it will give you a sense of what you can do with Isadora and how to begin using it.

On the other hand, those who have more experience with media manipulation software may want to head directly for the *Quick Start* section. It gives the essential information required to start using the program.

It is worth mentioning here that help is always available. Control clicking (on MacOS) or the right clicking (on Windows) on an Isadora module will display a pop-up menu. Choose "Actor Help…" to display help information for that module. To see help for an input or output, control or right click the name or value of an input or output and choose "Actor Input Help…" or "Actor Output Help…" as appropriate.

Enjoy,

Mark Coniglio

Quick Start

If you don’t like reading manuals, here are the essential things you need to know to use Isadora.

• It is rather important that you set up the preferences correctly for your system. At the very least, follow the instructions regarding “Setting Up Isadora Preferences” under the “Preparing Your Computer” section of this *Tutorials* chapter below.

• If you intend to use MIDI, you should specify the input and output routing to your MIDI interface by choosing **Communications > Midi Setup**. Note that you should plug your MIDI interface into your computer (and install its drivers) prior to starting up Isadora – otherwise Isadora won’t see the interface.

• An Isadora document has three main areas: the Toolbox (located along the left side), the Scene List (located along the bottom) and the Scene Editor, which takes up the remainder of the window. Each Isadora Scene is a complete program, made up of one or more modules (called an *actors* in Isadora parlance) that manipulate video, sound or data.

• The actors used to create a Scene are found in the Toolbox. There are several groups of actors within the Toolbox that can be selected by clicking the Toolbox Filter. Just click on the name of the group of actors you wish to display.

• To bring an actor into the Scene Editor, click on the module name in the Toolbox. The cursor will change into a plus sign to let you know you’re about to add an actor. Then, move the mouse into the Scene Editor area on the right. When the new module is positioned where you want it, click again to deposit it into the scene.

• To delete an actor, select it and then choose **Edit > Clear** or press the delete key. You may select multiple actors by holding down the shift key while clicking, or select a group of actors by clicking on the Scene Editor background and dragging – a selection rectangle will appear, and all actors under the rectangle will be selected when you release the mouse.

• To send data from the output of one module to the input of another, click the output port (the blue dot). A connection or *link* anchored to the output port will now track your mouse movements. Click on the input port (again, the blue dot) next to the input to which you want the data sent. When data flows through the link, its color will change from red to green. Note that video and sound outputs cannot be connected to number inputs or vice-versa.

• Read the section in the tutorials entitled “Understanding Value Scaling”. Understanding this feature will allow you to get the most out of Isadora.

• To delete a link, click on it and choose **Edit > Clear** or press the Delete key.

• Point the mouse at a link that is carrying video and a small window will appear, displaying the video moving through that connection. This is quite useful when you have a complicated video patch and you want to see the video as it moves from actor to actor.

• Contextual menus are available throughout the program. Control-click (MacOS) or right-click (Windows) to display a pop up menu with the currently available choices.

• To show help for an actor, or one if its inputs or outputs, control-click (MacOS) or the right click (Windows) to show a pop-up menu From that menu, choose “Actor Help…” to display help information for the actor, or “Actor Input Help…” or “Actor Output Help…” to show help for an input or output.

• To insert more scenes, click to the right of the last scene in the Scene List at the bottom of the window. When you see the blinking cursor, choose **Scenes > Insert Scene**. A new, empty scene will appear.

• To delete a scene, click on the scene and chose **Edit > Clear** or press the Delete key.

• To activate a different scene, click on it in the Scene List. The old scene will be deactivated and the new scene and its actors will be shown in the Scene Editor.

• You can jump from one scene to another using the Jump actor found in the “Control” section of the Toolbox Filter.

Registration Procedure

Before you will be able to save your work in Isadora® you must register Isadora® on your computer. This section outlines the registration procedure.

Step 1: Download

You should download the latest demonstration version from the TroikaTronix web site. The demonstration version becomes fully enabled (i.e. allows you to save) after you register it. You can always find the latest version on the *Downloads* page at http://www.troikatronix.com/izzydownload.html.

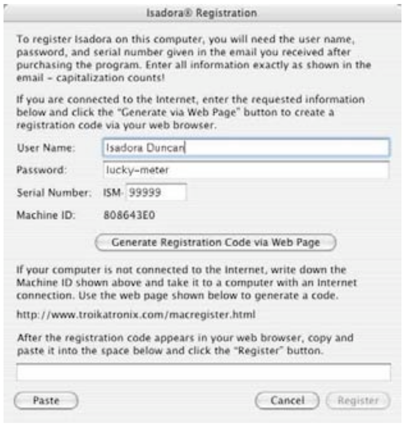
Step 2: Purchase

You need to purchase a license from the TroikaTronix web site. Follow the instructions at http://www.troikatronix.com/izzypurchase.html to obtain your license. Each licensee is entitled to generate up to three registration codes per year. This takes into account purchasing a new computer, reformatting your hard drive, etc. Once you register Isadora on a computer it will work on that machine forever, except if you reformat your hard drive.

After your order has been processed, you will receive an email with the information required to register your copy of Isadora. Keep this email in a safe place, as you will need it to generate future registrations. The information in the email will look like this:

User Name: Isadora Duncan
Serial Number: ISM-99999
Password: lucky-meter
Registrations Remaining: 3

Step 3: Register



Isadora® Registration

To register Isadora on this computer, you will need the user name, password, and serial number given in the email you received after purchasing the program. Enter all information exactly as shown in the email – capitalization counts!

If you are connected to the Internet, enter the requested information below and click the "Generate via Web Page" button to create a registration code via your web browser.

User Name: Isadora Duncan
Password: lucky-meter
Serial Number: ISM- 99999
Machine ID: 808643E0

If your computer is not connected to the Internet, write down the Machine ID shown above and take it to a computer with an Internet connection. Use the web page shown below to generate a code.

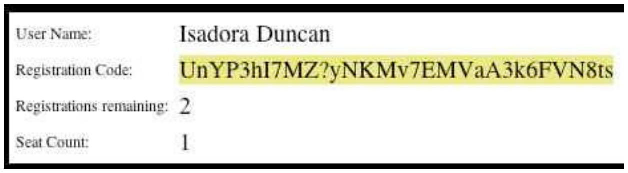
http://www.troikatronix.com/macregister.html

After the registration code appears in your web browser, copy and paste it into the space below and click the "Register" button.

Follow these steps to register your copy of Isadora:

- Run your copy of Isadora by double-clicking its icon.
- Choose **Edit > Register**. The dialog box shown above will appear.
- Enter the User Name, Password, and Serial Number, exactly as you received it in the email from TroikaTronix. (Capitalization counts!)
- Click the “Generate Registration Code via Web Page”

Your browser will automatically open and generate a new registration code. The code will appear near the bottom of the page:



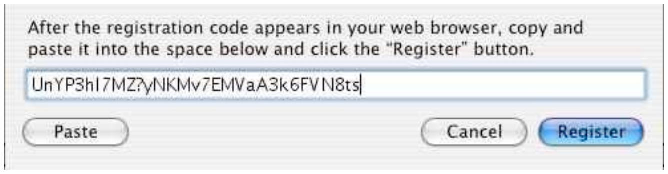
User Name: Isadora Duncan

Registration Code: UnYP3hI7MZ?yNKMv7EMVaA3k6FVN8ts

Registrations remaining: 2

Seat Count: 1

- Using the mouse, select the Registration code and choose **Edit > Copy.**
- Go back to Isadora, and paste the code into the field at the bottom of the Registration dialog, either by pressing Command-V (MacOS) or Control-V (Windows), or by clicking the **Paste** button.



After the registration code appears in your web browser, copy and paste it into the space below and click the “Register” button.

UnYP3hI7MZ?yNKMv7EMVaA3k6FVN8ts

- After you have correctly entered the registration code, the “Register” button will become enabled. Click it. Your copy of Isadora is now registered.

Tutorials

Preparing Your Computer

Download the Tutorials

Before you begin, you should download the tutorial files from the TroikaTronix web site. The address is

http://www.troikatronix.com/files/isadora-tutorials.zip

After decompressing this document, you will have an Isadora Tutorials folder, with six Isadora documents and seven media files.

You can now go to the *Help* menu of the Isadora program and find the new *Online Tutorials* menu. This will link you directly to 18 Isadora Tutorials. These can also be found on the Troika Tronix You Tube Channel: http://www.youtube.com/troikatronix

Basic System Requirements

Here are the basic system requirements needed to run Isadora:

Macintosh Requirements

- MacOS 10.4 or higher
- Intel Core Duo or better processor (1.83 GHz minimum recommended)
- 2 GB of RAM Minimum, 4 GB recommended

Windows Requirements

- Windows XP or better
- 1.5 MHz Processor or better
- 2 GB of RAM Minimum, 4 GB recommended

Optional

- Second Video Monitor. Most desktop computers will require a second video-output card to be installed for them to be able to output video to a second monitor. Most contemporary laptops support a second video output as a standard feature. If your laptop does not have this feature built-in, then it is difficult to add it at a later time.
- Video Digitizing Card or Fire Wire Digital Video Input for live-video capture. Note that if you want to use your computer's Fire Wire input to bring live

video into Isadora, you will need to have either a digital video camera with a Fire Wire output, or a analog video to Fire Wire converter such as the Sony DVMC-2 or Canopus DVAC-100.

- MIDI Interface and MIDI Input/Output Drivers – required if you plan to use MIDI input and/or output.

Installing MIDI Interface Hardware & Drivers

If you plan on using MIDI as a way of controlling Isadora, or if you need to send MIDI out of Isadora to control other programs, you will need a hardware MIDI interface and driver software. The sections below give general information on how to install the drivers for the various operating systems.

MacOS X

MIDI support is built into MacOS X. You will need to install OS X drivers for your particular MIDI interface before it will be recognized. These drivers are generally included on a CD-ROM that accompanies the interface.

Double-click the installer application and follow the instructions provided. You may need to restart your computer again after installing these drivers – the installer will ask you to do this if it is necessary. After installation is complete, plug your MIDI Interface into your computer using the supplied cable.

Once the drivers are installed and the MIDI interface is connected, its input and output ports should automatically show up in Isadora's MIDI Setup dialog. (See next section for information on setting up the MIDI Setup Dialog.)

Windows

MIDI support is built into Windows. You will need to install drivers for your MIDI interface before it will be recognized. These drivers are generally included on a CD-ROM that accompanies the interface.

Double-click the installer application and follow the instructions provided. (You may need to restart your computer again after installing these drivers – the installer will ask you to do this if it is necessary.) After installation is complete, plug your MIDI Interface into your computer using the supplied cable.

Once the drivers are installed and the MIDI interface is connected, its input and output ports should automatically show up in Isadora's MIDI Setup dialog. (See next section for information on setting up the MIDI Setup Dialog.)

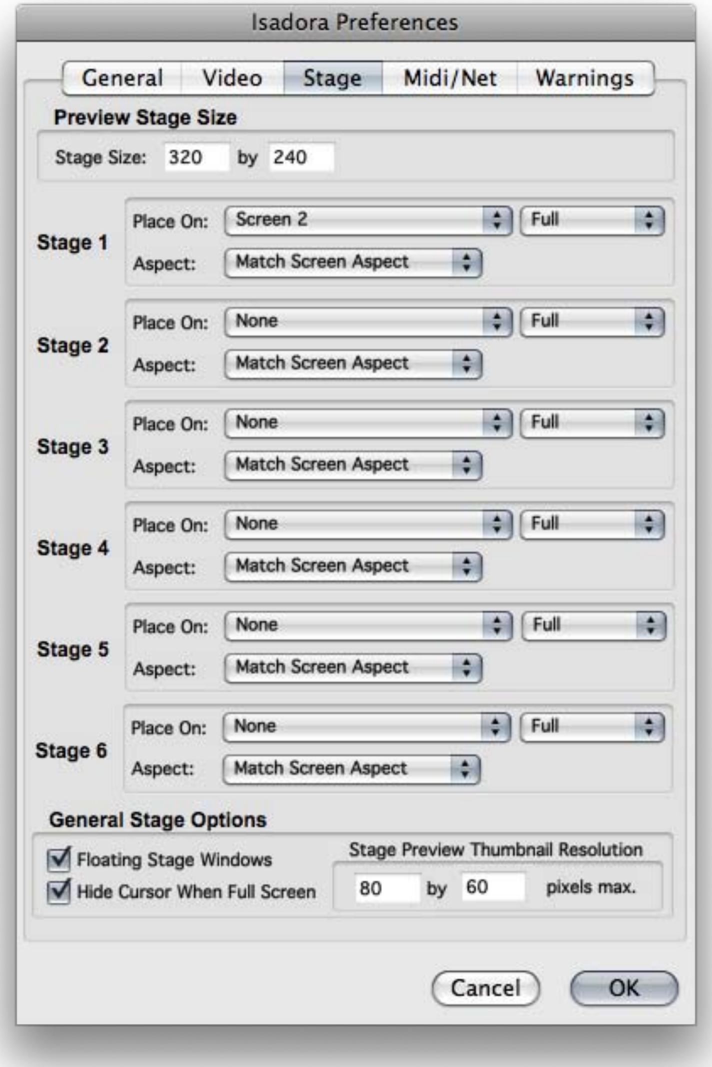
Setting Isadora Preferences

The first time you run Isadora, you should set up your preferences. To do this you must find your Isadora application and double click on it. Isadora will open up with a new file. From the menu along the top of your display choose **Edit > Preferences…** to set up your preferences.

Isadora supports up to six video output channels, called *Stages*. The *Stage* section of the Preferences window allows you to set the display on which a stage will appear when it is shown.

For now, set up the preferences as follows:

- Click the "Stage" tab at the top of the window to change the Stage settings.



Preview Stage Size

Stage Size: 320 by 240

Stage 1 Place On: Screen 2 | Full
Aspect: Match Screen Aspect

Stage 2 Place On: None | Full
Aspect: Match Screen Aspect

Stage 3 Place On: None | Full
Aspect: Match Screen Aspect

Stage 4 Place On: None | Full
Aspect: Match Screen Aspect

Stage 5 Place On: None | Full
Aspect: Match Screen Aspect

Stage 6 Place On: None | Full
Aspect: Match Screen Aspect

General Stage Options

☑ Floating Stage Windows
☑ Hide Cursor When Full Screen

Stage Preview Thumbnail Resolution
80 by 60 pixels max.

- Under the heading **Stage 1**, choose "Screen 2" in the popup menu labeled **Place On**. If you have a second monitor output on your computer, the resolution of the display will be shown in the pop-up menu text (i.e. Screen 2 (640x480)). If not, it will just say "Screen 2". Make sure that the popup to the right of the **Place On** popup in the Stage 1 section is set to "Full" And the **Aspect** popup is set to "Match Screen Aspect".

- Under the heading **Stage 2**, **Stage 3**, **Stage 4**, **Stage 5**, and **Stage 6**, choose "None" in the popup menu labeled **Place On**.
- Click "OK" to confirm the new preference settings.

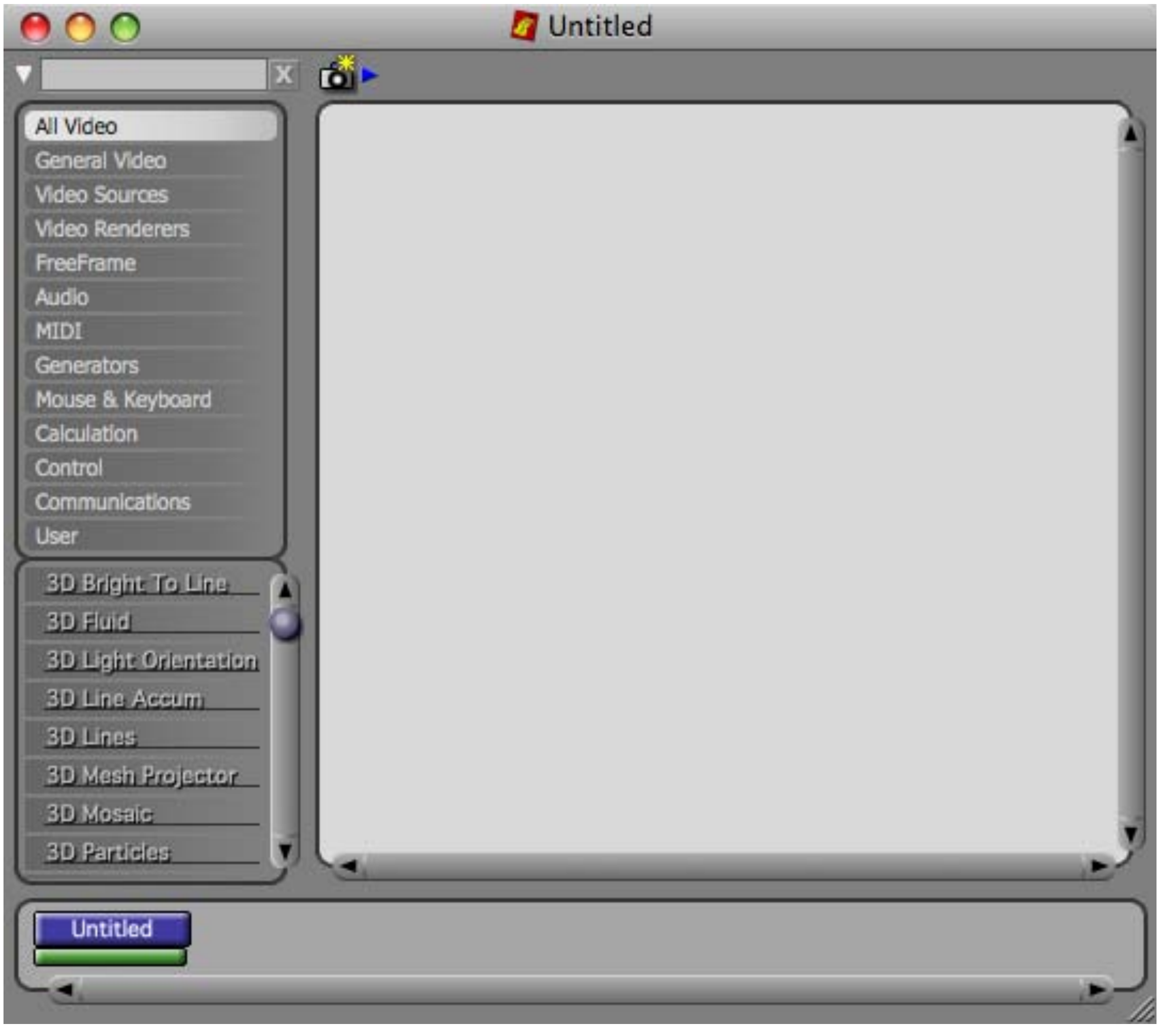
This setup will show one stage window on your second monitor output, if a second monitor output is available. If not, then a smaller window will appear on your main display.

You can find out more about showing stages, setting them to occupy an entire display, and other preference settings in the "Preferences" section of the *Isadora Reference* chapter of this manual.

Tutorial 1: Playing a Movie

Creating a New File

To create a new Isadora file, choose **File > New**. A new Isadora document that looks like this will appear:



There are four main areas to the Isadora document: The *Toolbox* and *Toolbox Filter*, found along the left; the *Scenes List* along the bottom; the *Snapshots* area across the top-right, and the *Scene Editor*, which takes up the rest of the window. A new Isadora document will have one untitled Scene already inserted into the Scenes list at the bottom of the window. Note the green bar below that first Scene – this indicates that the Scene has a Control Panel. (We will discuss control panels in a later tutorial.)

Scenes are where you create the "program" that defines how the media will be manipulated and controlled when that scene is active. You may have numerous

Scenes inside of one Isadora document, though, generally speaking, only one Scene is active at a time. (There is more about multiple scene activation in the Advanced Topics section of the manual.)

Creating Scenes

To insert a new scene into the Scene List:

- Click to the right of the last scene in the Scene List. If a scene is active, it will deactivate (go from blue to gray) and a blinking cursor will appear at the spot where you clicked. This indicates where the new scene will be inserted.
- Choose **Scenes > Insert Scene**.

A new scene called "Untitled-1" will appear where the blinking cursor was previously. You can see that it has been activated because the Scene Editor will be visible.

You can activate different scenes by clicking on that scene in the Scene List. To activate the first scene, simply click on it – you can try this now with the first scene in the list. It will highlight to indicate that it is active, and the other scene will deactivate. This will mean more when you have actually inserted some actors into the two scenes.

To rename your Untitled Scene choose **Scenes > Rename Scene** and type in your new scene name**.** You can find out more about cutting, copying, pasting and deleting scenes, in the "Scene List" section of the *Isadora Reference* chapter of this manual.

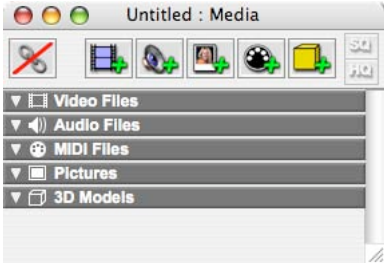
Importing Media

Isadora allows you to process both live and prerecorded images and sound. If you want to use prerecorded media, you will need to import it into Isadora.

Isadora can play and manipulate four types of files: Digital Video Files, Digital Audio Files (AIFF, WAVE or Sound Designer II), Pictures, Standard MIDI Files or 3D Object Files (3DS).

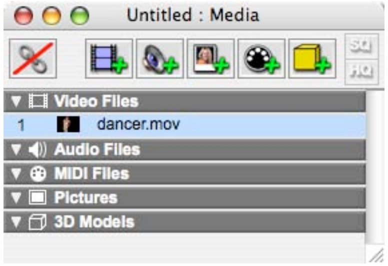
To import a media file into Isadora:

Choose **Windows > Show Media** to show the Media Window. It will look like this:



When you create a new Isadora document, it starts with five *bins*, one for each type of media file that can be loaded into the window. You can make new bins using the buttons at the top of the window.

Choose **File > Import Media**. A file selection dialog will appear. Find the “dancer.mov” QuickTime movie in the “Isadora Tutorials” folder. The movie will be imported into Isadora and appear in the Media window as shown below.



If you like, you can select multiple items in the file selection dialog by holding down he Shift key as you select multiple items and then click the “Open” button. All of the files you have selected will be imported into Isadora and appear in the proper bin in the Media window.

Also note that you can add files by dragging them into the media window from the Finder (MacOS) or Explorer (Windows).

Note the number to the left of the movie’s name. This number is important, as it is how you specify which media file to play or manipulate within an actor. Under each heading, the numbers start at one and count up from there. So, if you have three movies and three audio files in the Media window, the movies would be numbered 1,2, 3 and the Audio Files would be numbered 1, 2, and 3.

Using Isadora Actors

To define what a Scene does, you drag actors from the Toolbox on the left side of the window into the Scene Editor and connect them to each other in various ways. The Toolbox is where Isadora keeps all of the modules that are used to define a Scene. These modules can be divided into four basic types:

- Actors – Modules that act upon media or information
- Generators – Modules that create media or information
- Watchers – Modules that watch for information to come in from the outside world
- Senders – Modules that send information to the outside world

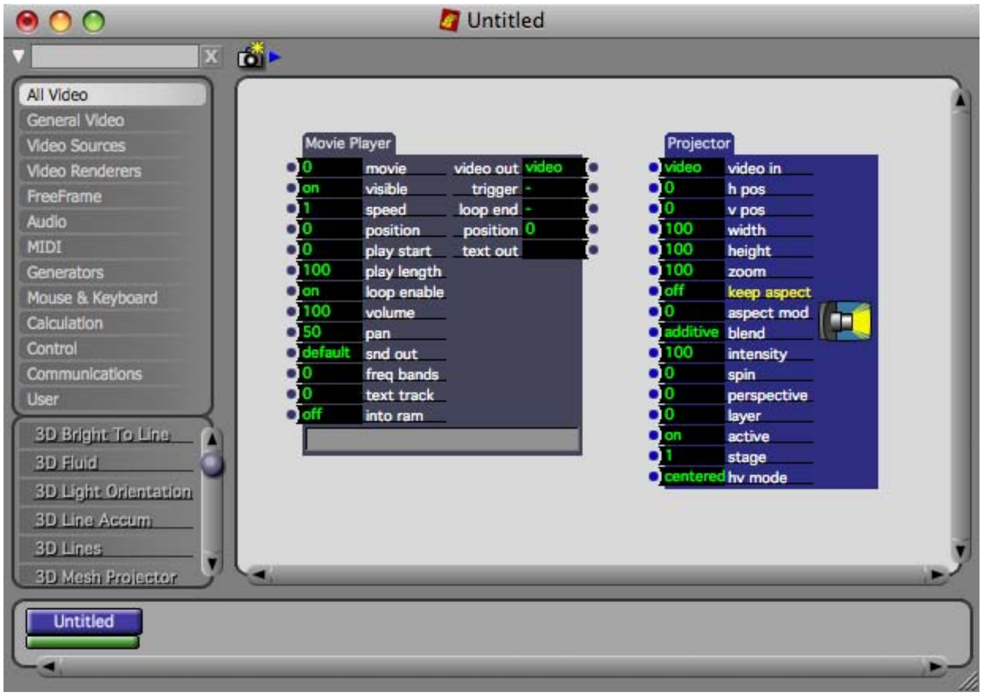
The modules contained in the Toolbox are divided into several categories, as seen in the Toolbox Filter. When you start up Isadora, the group “All Video” will be selected in the Toolbox Filter, so only video related actors will be seen in the Toolbox.

To make the modules under a different group available:

- Click on that group’s name in the Toolbox Filter.

Let’s create a scene that plays a movie. To do this:

- Click on the “All Video” in the Toolbox Filter to ensure that all video actors are visible.
- Click on the scene called “Untitled”. The scene should become selected (if it wasn’t already) and the empty Scene Editor should be visible in the top-right portion of the scene.
- Click on the module named “Movie Player.” The cursor will change to a plus sign to indicate that you are about to add a new module.
- Move the mouse into the Scene Editor.
- Click a second time to deposit the Movie Player actor into the Scene Editor. The Movie Player actor will appear in the Scene Editor.
- Follow the same procedure with the Projector actor (if it is not visible then use the scroll bar to the right of the list of modules to scroll through the list of modules). Place it to the right of the Movie Player actor. Your document should now look something like this:



Movie Player
0 movie
on visible
1 speed
0 position
0 play start
100 play length
on loop enable
100 volume
50 pan
default snd out
0 freq bands
0 text track
off into ram
video out video
trigger -
loop end -
position 0
text out

Projector
video video in
0 h pos
0 v pos
100 width
100 height
100 zoom
off keep aspect
0 aspect mod
additive blend
100 intensity
0 spin
0 perspective
0 layer
on active
1 stage
centered hv mode

You need to have both of these modules to play a movie because the movie player does not send the video image it produces directly to the stage. Instead, you need to route its video output to one of the stages by connecting it to the Projector module. The relationship between the Movie Player and Projector actors is the same as that between a videotape recorder and a television: the former handles the playback of the video tape, the latter allows you to see those images it produces. You can’t see the images on the television unless you connect it and the videotape player.

Note that both actors have dots next their input or output property values. These are the actor's input and output ports. Input ports are always on the left, output ports always on the right. You move information (video, audio, or numbers) through Isadora by linking the output ports of one module to the input ports of another. To be able to see the video we need to route the video data from the Movie Player to the Projector actor.

Let's complete our patch.

First, connect the "video out" output Movie Player actor to the "video in" input of the Projector actor. To do this:

- Click on dot to the right of video out output on the Movie Player actor. A red line will appear and follow the position of your mouse as you move it. (You don't have to hold the mouse button down while you do this – a single click will suffice.)
- Move the mouse to the dot to the left of the video in port on the Projector actor. The red line will become thicker to let you know that you are inside the input port.
- While the red line is thick, click to complete the link. Note that at this point the link between the actors is red, indicating that no data is flowing through it.

Now we need to tell the Movie Player actor which movie to play. Remember, we imported the movie called "dancer.mov" into the media window previously and it was number "1" in the list.

- Click in the box to the left of the movie input in the Movie Player actor. The number will disappear, and the black box will become blue to let you know that you can type a new value.
- Type the number 1, and then press *enter*. Once you do this, you will see the name of the movie (or at least part of it) to the right of the number "1", e.g., "dancer.mov". That is the movie we previously imported into the Media Window. Also, the link between the Movie Player and Projector will turn green, indicating that data is flowing through it. Finally, note the thin yellow line moving across the green bar along the bottom of the Movie Player actor. This shows you which frame of the movie is playing currently.

Finally, show the stage:

- Choose **Output > Show Stages**. The Stage window will appear. (If your display goes black, it is probably because you forgot to set the Preferences as described previously. To hide the stage again, hit the shortcut key for Show Stages (**Command-G** on MacOS, **Control-G** on Windows). The stage will disappear and you will be able to see your document again. Go back to the section above entitled "Setting Isadora Preferences", follow the instructions there, and then try this step again.)

After showing the stage, you should be able to see the movie playing inside of the stage window. Congratulations, you've made your first Isadora scene.

Take note of a few things before you quit this lesson:

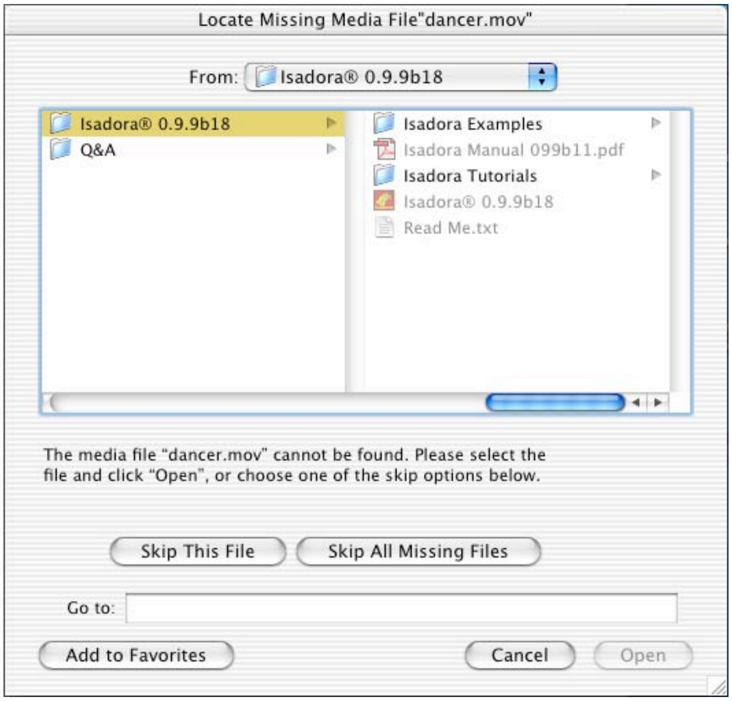
- When the movie gets to the end, it automatically jumps back to the beginning and continues playing from there. By default, the Movie Player actor loops movies in this way.
- As mentioned above, a link is red when no data is flowing through it, green when data is flowing through it. This color-coding helps you visualize when how data moves through an Isadora Scene.

Tutorial 2: Changing Actor Settings

As you can see, both the Movie Player and the Projector actors have a list of numbers and titles along both the left and right sides of the modules. The values along the left side are input properties – they determine what the actor does when its scene is activated or allow data to flow into the actor. The actor outputs information through the output properties along its right side.

There are two basic ways to change the setting of a property: either with the keyboard or the mouse. Let’s start by changing some input property values in the Movie Player using the keyboard.

- Close any currently open Isadora documents. Then choose **File > Open** and locate the file called “Tutorial 2” in the “Isadora Tutorials” folder.
- On your system, it may be that Isadora won’t automatically find the one media file in this document – dancer.mov. If so, a file selection dialog will appear that looks like this:



Locate Missing Media File"dancer.mov"

The media file “dancer.mov” cannot be found. Please select the file and click “Open”, or choose one of the skip options below.

The dialog shows you the name of the media file it is trying to locate in the title of the dialog box, as well in the text just below the file selector area of the window.

To help Isadora locate the file, select the movie "dancer.mov" in the "Isadora Tutorials" folder and double-click it.

- Make sure that the stage is visible. If it is not, choose **Output > Show Stages** to show the stage. You should see a movie of the dancer from Tutorial 1.
- Then, in the Movie Player actor, click inside the box to the left of the words play length (the property's title). The box will turn blue and the number will disappear to indicate that Isadora is waiting for you to type a value.
- Type the number "5" and press *enter*.

Look at the video output on the stage window. You will see the dancer "jitter" because we are now looping over a small portion of the movie. The bar at the bottom of the Movie Player gives a graphic representation of the new setting: the light green area is now a short portion at the left, while the rest of the bar is dark green. The light green portion indicates what part of the movie is playing. In this case, we are playing the first 5% of the movie. Watch the yellow playback indicator – when it reaches the end of the light green area, it jumps back to the start of the movie, showing how the movie loops.

- Now, click on the play start property value (the black box.)
- Type "50" and press *enter*.

The Movie Player is still playing 5% of the movie, but instead of starting at the beginning, it is starting halfway through the movie, i.e. it starts playing at 50%, and when it gets to 55%, it jumps back to 50%, etc. Look at the bar at the bottom for a graphic indication of the portion of the movie that is playing.

You can also change values using the mouse. Currently the speed property value is set to "1" which means, play forward at normal speed.

- To adjust this property using the mouse, click the speed property value (the black box to the left of the property title) and, while holding the mouse button down, drag slowly towards the bottom of the display. You will see the value get lower as you do.
- Continue dragging down until the speed says "0.5" and then release the mouse button.

The movie is now playing in slow motion, specifically, at 1/2 of its normal rate. You can also make the movie play backwards:

- Again click in the speed property value and, while holding the mouse button down, drag slowly towards the bottom of the display until the value reads "-1.0". Release the mouse button. The movie is now playing at "normal" speed, but backwards instead of forwards.

Finally, you can make the movie play at twice its normal rate:

- Using the mouse, click in the speed property value and drag up until the value reads "2". Release the mouse button.

Another interesting property in the Movie Player is position. Do the following:

- Change play start back to 0
- Change play length to 25
- Change the speed to 0.0
- Using the mouse to change the value, click in the position property value and drag the mouse up and down. As you movie the mouse you will "scrub" the movie back and forth. It is a bit like a DJ scratching a record, but instead you are scratching video with the mouse movements.

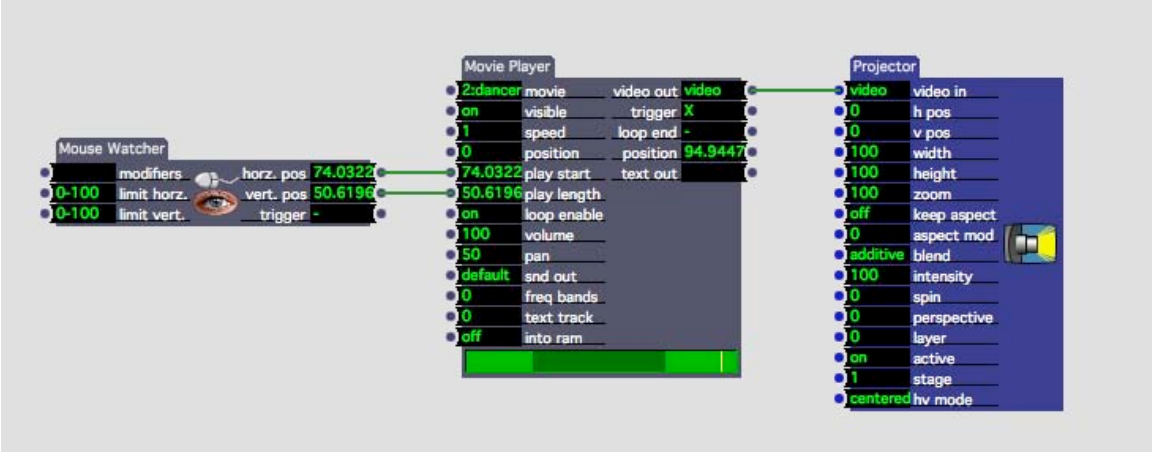
In this last example, each time you change the position property to a new value, the movie jumps to the specified position within its play duration. The movie doesn't continue playing because its speed is set to 0 (i.e. still.)

You can also try editing the other movie properties: try setting the loop enable property "off" to cause the movie to play only once without looping. Or, import a movie with a sound track and or change the volume property to change its playback volume.

Tutorial 3: Interactive Control

In the previous tutorial we used the Movie Player and Projector actor's to play a movie on the stage, and you used the mouse and the keyboard to change how the movie played. In this tutorial we will build on this setup to allow you to interactively control movie playback with the mouse.

- Close any currently open Isadora documents. Then choose **File > Open** and locate the file called "Tutorial 3" in the "Isadora Tutorials" folder, located in the same folder as your Isadora application.
- Click "Mouse & Keyboard" in the Toolbox Filter to show that group of actors.
- Drag the Mouse Watcher into the Scene Editor. After depositing it there, take a look at the horz pos. and vert pos. output property values. These outputs tell you the horizontal and vertical position of the mouse as a percentage of the total display size. Move the mouse all the way to the top/left corner of the display: the outputs will both read 0. Now move the mouse across the top of the display. You'll see the horz pos. value gradually increase until it reads 100.Then move the mouse down along the right side of the display. The vert pos. will gradually increase until it reads 100.
- Set the play length property to 5 by clicking on it and typing from the computer keyboard. Then, link the Mouse watcher's horz pos. output port to the Movie Player's play start input port. You can see how the horizontal mouse movements scrub through the movie as it's playing. Then connect vert pos. to the play length input port on the Movie Player. You'll remember from the previous tutorial that the Movie Player's play start and play length values are also expressed as a percentage, from 0 to 100 of the movie's total duration. Your patch should look something like this:



Mouse Watcher
modifiers
0-100 limit horz.
0-100 limit vert.
horz. pos 74.0322
vert. pos 50.6196
trigger -

Movie Player
2:dancer movie
on visible
1 speed
0 position
74.0322 play start
50.6196 play length
on loop enable
100 volume
50 pan
default snd out
0 freq bands
0 text track
off into ram
video out video
trigger X
loop end -
position 94.9447
text out

Projector
video video in
0 h pos
0 v pos
100 width
100 height
100 zoom
off keep aspect
0 aspect mod
additive blend
100 intensity
0 spin
0 perspective
0 layer
on active
1 stage
centered hv mode

- Show the stage and experiment by moving the mouse around on the screen. Try moving the mouse so that it is all the way to the left of the screen, and nearly all the way to the top. Take a look at the stage: the Movie Player actor should be looping on a small portion of the movie. Now gradually move the mouse across the screen to the right. The portion of the movie that is looping will change as you move. Look also at the indicator at the bottom of the movie player window to see how it changes as you move the mouse. It will give you a clear visual indication of what part of the movie you are playing.

This model of taking input from the outside world and linking it to an actor's input properties is the one on which all interactive programming in Isadora is based. Just remember that instead of the mouse position, it could be the computer keyboard, MIDI, or remote Network connection controlling the previously demonstrated variations of the play back of the movie. We'll illustrate these possibilities in later tutorials, but for now, try a couple of other interactive setups:

- Disconnect the links between the Mouse Watcher and Movie Player. You do this by clicking on the link to select it (the link changes to a brighter color to indicate that it is selected) and then choosing **Edit > Clear** or pressing the delete or backspace key. Note that you can select more than one link by shift clicking.
- Set the Movie Player's speed to 0. Set play start to 0, and play length to 100. Then connect the Mouse watcher's horz pos. to the Movie Player actor's position input. Move the mouse left and right to "scratch" the movie like a DJ would scratch a record.
- Now connect the vert pos. to the Projector actor's zoom input. You will be able to scratch the video by moving horizontally, and zoom the video by moving vertically.
- Disconnect all of the links except the one connecting the video out from the Movie Player to the video in on the Projector. Set the zoom input on the Projector to 100. Set the Movie Player actor's speed to "1" again. Set the Projector actor's width and height properties to 50. Then connect the horizontal and vertical mouse positions to the Projector actor's top and left properties. Move the mouse around to squeeze and stretch the video image on the stage.

You can also use the computer's keyboard to manipulate actors.

- Disconnect all of the links except the one connecting the video out from the Movie Player to the video in on the Projector. Set the Movie Player actor's speed to "1" again. Set the Projector actor's width and height properties back to 100.
- With the Mouse & Keyboard group selected in the Toolbox Filter, click on the Key Table actor and drag it into the Scene Editor.
- Click on the num. keys property value, type the number 4, and press *enter*. The actor will "grow" taller as three more inputs are added.
- Click on the key 1 property value, type **'a'** (i.e. single-quote, the letter a, and another single-quote). Then, press the Tab key to move to the key 2 property value and type **'s'**. Repeat this process for key 3 and key 4, entering **'d'** and **'f'** respectively and finish by pressing *enter*.
- Now connect the key num. output to the Movie Player's position input.
- Try pressing the a, s, d, and f keys on your computer keyboard. (Make sure the Caps Lock key is off!) Each time you do, the value at the key num. output will change to indicate which of the four keys you pressed, 1 through 4. This causes the movie to jump between 0%, 33%, 66%, and 100% its total play length. (How does 1 to 4 become 0 to 100? The output value of the Key Table actor is automatically being scaled to match the range of the Movie Player's position input, which can vary between 0 and 100. More on how Isadora automatically scales values in a later tutorial.)

The key thing here is to see that all Isadora parameters can be manipulated in real time by sensors (yes, the mouse and keyboard are sensors!) in the real world.

Tutorial 4: Live Video Input

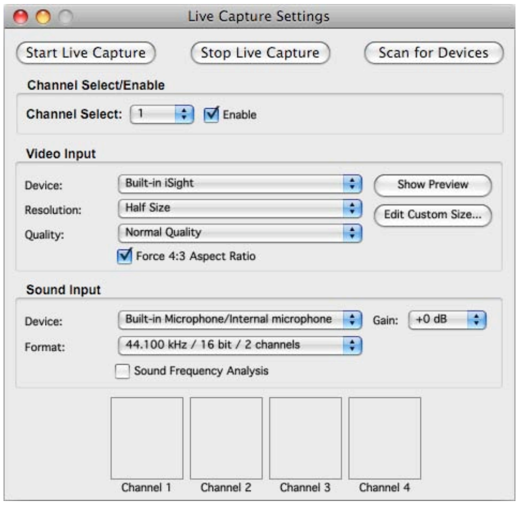
Isadora can just as easily process video from a live input as that from a prerecorded source. This tutorial shows you how to use live video with Isadora.

First, you must have capture hardware that allows Isadora to "see" the video coming into your computer. On contemporary Macintoshes the Fire Wire input is the most ubiquitous way to input video. (Fire Wire, aka iLink or IEEE1484, is also becoming common on Windows machines.) In addition, there are various capture boards, PC Cards (for laptops), USB video capture devices, etc. Any of these can be used with Isadora as long as you have installed drivers that allow them to be seen by QuickTime. On the Macintosh, this is pretty much a given. On Windows machines, it is may be somewhat more difficult to configure.

When using capture boards or other external video capture hardware, the installation procedure varies from vendor to vendor. Follow their instructions to install the video input hardware on your system.

Here's how to create a simple patch that will allow you to show live video on Isadora's stage.

- You should start by making sure that Isadora is not running. If it is, quit it before connecting your camera.
- First, connect your video camera or VCR to the video the video capture device on your computer. For computers with Fire Wire inputs, you would connect your digital video camera’s Fire Wire output to the computer’s Fire Wire input. Most other capture devices accept an analog video input. If this is the case, connect the analog output of your camera (often a yellow RCA phono plug) to the analog video input of your capture device.
- Now you need to enable video capture in Isadora – as it is not enabled by default. First, to select the video device from which you will capture, you need to choose **Input > Live Capture Settings**. The dialog shown above will appear.



Channel Select: 1 ☑ Enable

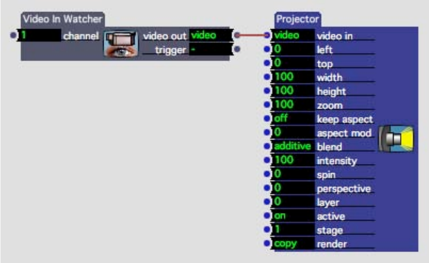
Device: Built-in iSight
Resolution: Half Size
Quality: Normal Quality
☑ Force 4:3 Aspect Ratio

Device: Built-in Microphone/Internal microphone Gain: +0 dB
Format: 44.100 kHz / 16 bit / 2 channels
□ Sound Frequency Analysis

- Ensure that the **Channel Select** popup menu shows “1”, and that the “Enable” checkbox is checked.
- Click the “Scan for Devices” button. (If you connect your video device *after* you start Isadora, it may not be recognized until you click this button.)
- Under the heading **Video Input**, select your capture device/camera from the popup menu labeled **Device**. (If your device is not in the menu, then the device is properly not connected to your computer properly. Check the connections and power, and click the Scan for Devices” again.)
- After selecting your device, click the “Start Live Capture” button. After doing this, a thumbnail preview of the live video stream should appear above the box labeled “Channel 1”.

  (If you don’t see live video in the Channel 1 box, it probably means that you are using a capture device with a composite video input, and that the camera is not connected properly. Ensure that the cable between to your camera iand the capture device is securely attached. Then click the “Stop Live Capture” button, followed by the “Start Live Capture Button” to try again.)

- If you see the video thumbnail, you've verified you have live input coming into Isadora. Then, create a new file by choosing **File > New.** Drag the Video In Watcher and Projector actors into the Scene Editor. Then connect the video out output of the Video In Watcher to the video in input of the Projector actor. You're patch should look something like this:



Video In Watcher
1 channel
video out video
trigger -

Projector
video video in
0 left
0 top
100 width
100 height
100 zoom
off keep aspect
0 aspect mod
additive blend
100 intensity
0 spin
0 perspective
0 layer
on active
1 stage
copy render

- The link between the modules should be green, indicating that video is flowing from one to the other. Now, choose **Output > Show Stages** to show the stage window. You should see the video from your camera or other video source on the stage.

In subsequent tutorials, we will use a movie as a video source because it is something that every Isadora user will be able to try. Just remember that "video is video is video" in Isadora regardless of its source – you can try using live input instead of prerecorded video in any tutorials where it seems appropriate or interesting.

Tutorial 5: Real Time Video Processing

Isadora offers a number of video processing actors that can manipulate a video image in real time. These can be found in the Toolbox if you choose "All Video" in the Toolbox Filter.

While the function of the video processing actors varies, the basic concept is the same: video comes into the actor, it manipulates the video image based on parameters that you set, and sends the result to its video output. Most video processing actors have just one video input, though some may have two or even three video sources. We'll focus on the single source actors in this tutorial.

We'll start with a simple setup that should illustrate the basic concept.

- As you did in Tutorial 1, insert the Movie Player and Projector actors into the Scene Editor window, and import the "dancer.mov" file in the "Isadora Tutorials" folder (located in the same folder as your Isadora application) into the Media Window.
- Now, click on the Colorizer actor in the Toolbox and drag it into the Scene Editor. Link the video out port of the Movie Player actor to video in port of the Colorizer actor. Then, connect the video out of the Colorizer actor to the video in of the Projector actor.

- Choose **Output > Show Stages** to show the stage.
- You should see the video image as you did in Tutorial 1. But now, click on the Colorizer's red property value and change the setting to –50. The image will change color. Try other values for the green and blue properties. You can also click, hold down the mouse and move it up or down to scroll through the values of these properties.

What's happening? Well, the red, green, and blue properties control the intensity of the red, green and blue pixels of the video image. Setting these properties to a negative value reduces the intensity of that color by the specified percentage, while setting them to positive values increases them by the specified percentage. If you were to set the green and blue values to –100, all of the green and blue would be removed from the image resulting in a red monochromatic image.

Let's try another actor.

- Select the Colorizer actor by clicking on it, and then delete it by choosing **Edit > Clear** or by pressing the delete or backspace keys.
- Now, click on the Dots actor in the Toolbox and drag it out to the Scene Editor. Connect its video inputs and outputs as you did previously with the Colorizer actor.
- The video image will look something like a picture printed in a newspaper – a series of dots that vary in size to represent the brightness of the image.
- Try experimenting with the dot size input property. Larger values produce larger dots. By the time you get to 25% or so, the image becomes fairly abstract.
- You can also change the mode property from "circle" to "square". The latter produces squares of varying sizes instead of circles.

There are several more actors that manipulate video. One quick way of seeing what the video processing actors can do is to open the "Isadora Examples.izz" file located in the "Isadora Examples" folder that was installed with your copy of Isadora. But, the best thing to do if you really want to understand these modules to create simple patches of your own. Don't forget that all of the input property values can be manipulated in real time – connect the Mouse Watcher's outputs to some of the your filter's inputs and experiment.

Below is a brief description of the single input video processing actors included with the Isadora, along with a description of what they do so that you can get started.

- **Colorizer** – Individual manipulation of the intensity of the red, green, and blue components of the source video image.
- **Desaturate** – Allows you to incrementally remove the color information from the source video.
- **Difference** – Compares the brightness of the current frame of video with the previous frame. The greater the difference in brightness between the two frames is, the brighter the resulting video. Can produce lovely, ghosting effects.

- **Dither** – Allows you to make grainier in various ways.
- **Dots** – Manipulates the incoming video so that it resembles a photograph printed in a newspaper. The dots vary in size to represent the brightness of the source image. You can vary the size of the dots from quite small to huge.
- **Flip** – Allows you to flip the video image horizontally, vertically, or both.
- **Freeze** – Allows you to freeze the incoming video stream.
- **Gaussian Blur** – Blurs the incoming video stream. Be cautious with the size parameter – values above 8 can cause Isadora to run very slowly, sometimes to the point where you might think that it has crashed.
- **HSL Adjust** – Adjusts the hue, saturation, and/or luminance (brightness) of the video image.
- **MultiVid** – Produces numerous copies of the source video – you can select the number of copies across and down independently.
- **Panner**– Allows you to pan up and down or left and right within the source vide stream. It does this by defining an area that is a subset of the source video, and then moving that area around. The actor gives visual feedback of what portion of the source video you are seeing.
- **Shimmer** – Produces dust like trails of pixels on moving imagery.
- **Slit Scan** – Copies a single line from the source image and scrolls that out, either horizontally or vertically. Named after the technique invented by Douglas Trumbull for the final sequence of *2001: A Space Odyssey*. Works best with slowing moving source imagery.
- **Spinner** – Allows you to rotate and zoom the source image.
- **The Edge** – Edge detection algorithm makes a highly digital look on high-contrast video imagery.
- **Video Delay** – Delays the incoming video image by passing it through a number of buffers, bucket-brigade style. Useful in a number of scenarios, but you can start by trying to mix the original and delayed video using the Video Mixer.
- **Video Fader** – Allows you to fade between the source video image and a solid color background.
- **Video Inverter** – The default behavior of this actor is to invert the video image, so that it looks like a photographic negative. For wilder results, change the “invert color” by using the color picker that appears when you clicking its ‘color’ input’s value box (which shows as a little block of color.)
- **Warp** – As each frame of video comes in, this actor copies one line to the destination, moving down one line each time. Works best with a stationary background and a slowly moving object in the foreground. (Try pointing a camera at your face and moving it slowly.)
- **Zoomer** – Allows you to zoom in or out on the source video stream, with the additional capability of dimming the image as it passes through the filter. This can be especially useful with the Luminance Keyer (more on that actor later) to create beautiful feedback effects.

The most important thing that you can do is to experiment wildly. Our experience with any software is that the most interesting things occur when you attempt to misuse it. We encourage you to do the same with Isadora.

Tutorial 6: Sound

Isadora allows you to play and manipulate digital audio files, though in a somewhat more limited fashion than video. Currently there are two ways to play sound: from a QuickTime movie or from a digital audio file (AIFF, WAVE, or Sound Designer II formats.)

Let's start by importing some media

- Create a new Isadora document. Choose **File > Import Media**. From the "Isadora Tutorials" folder import the files called "voice1.aif", "chords.aif" and "thunder.mov". Note that the first two are digital audio files in the AIFF format, while the second is a QuickTime movie that has audio only– no video. (You can identify a "sound-only" QuickTime movie in the Media Window because a speaker icon will replace what would normally be a thumbnail image.)

First we'll work with the QuickTime movie audio.

- Click "Video Sources" in the Toolbox Filter. Drag the Movie Player actor into the Scene Editor.
- Set the movie input property to 1 so that the Movie Player will play the "thunder.mov" you imported above. You should immediately hear the sound begin to play. Note that you don't have to connect the Video Player to any other modules to hear the sound play. Unlike video, sound within a movie is sent directly to your computer's sound output and doesn't need a Projector actor for you to hear it.
- Click "Mouse & Keyboard" in the Toolbox Filter and drag the Mouse Watcher actor from the Toolbox into the Scene Editor. Connect the horz pos. and vert pos. to the pan and volume inputs of the Movie Player actor. After doing so, move the mouse around on the screen. When the mouse is towards the top, the sound is soft, towards the bottom it is louder. Moving the mouse left and right will pan the sound to the left and right audio outputs on your computer. (You will only be able to hear the sound panning left and right if you have stereo speakers built-in or otherwise attached to your computer's audio output. Try some headphones if you'd really like to hear the effect.)
- You can also change the play start and play length parameters to play a portion of the sound. Set the play start to 10 and the play length to 5. You will hear a short loop of the sound. In fact, all of the movie player properties will work in the same way as when playing a video QuickTime movie.
- Turn off the Movie Player for now by setting is visible property to off.

Now, let's try the playing the AIFF file.

- Click “Audio” in the Toolbox Filter to display the actors in the Audio Group. Drag the Sound Player actor into the Scene Editor and set its sound input property to play the “voice1.aif” file – the number will be 1 or 2, depending on which number was given to the file when you imported it. Take a look in the Media Window to be sure.
- The sound does not immediately start playing like the Movie Player. That’s because you need to trigger its restart input for it to begin playing. Do that now by clicking in the restart input’s value box with the mouse. (Note that this is a trigger input, indicated by the dash. You can’t edit the value, but you can send a trigger when you click in the value edit box.) You should hear the sound of a solo voice singing a short phrase. Like the Movie Player actor, the Sound Player has a progress bar along the bottom that shows you how much of the sound is playing, and a yellow indicator line showing the part of the sound playing now.
- We can make a simple sampler by adding a watcher to look for keys to be pressed on the computer keyboard. Click “Mouse & Keyboard” the Toolbox Filter. Drag the Keyboard Watcher actor into the Scene Editor. This actor allows you to trigger other actors when a key on the computer keyboard is pressed.
- Click on the key range input value and type single-quote, the letter a, and then another single quote, and press *enter*. The key range value box should read **‘a’**. This causes the Key Watcher to look only for the key ‘a’. (Note that it will not see ‘A’, or a capital a – just a small letter a.) Each time you press ‘a’ on your computer keyboard, the Keyboard Watcher sends the letter ‘a’ out of the key output. Connecting the key output to the restart input of the Sound Player so that you can trigger the sound each time you press ‘a’.
- So now, press the letter “a” on your computer keyboard. Make sure your Caps Lock key is off so you’re not typing a capital “A”. When you type the letter, you should hear the sound begin to play. If you press the letter “a” again, the sound will start playing from the beginning. If you don’t press ‘a’ again, the sound will play to the end and stop.
- Note that the sound stops playing when it gets to the end. This is because the loop enable property is turned off. If you change the loop enable property to “on” and press the letter “a” again, the sound will play continuously.

So, what’s the difference between the Sound Player and Movie Player? The most important distinction is that Movie Player plays its sounds from your hard drive, while Sound Player loads all of the sound data into your computer’s RAM (Random Access Memory – much faster than your disk) when you tell it to play. This means that Sound Player can make seamless loops, start up instantly, and in general be more responsive than Movie Player when manipulating the play start and play length properties. The downside is that long sound files can consume much of your available RAM. (FYI: CD Quality Stereo Audio takes up about 10 megabytes per minute.)

Generally, if you are going to play a music track that is several minutes long, and you don't need to manipulate anything besides the volume and pan, you should convert your sound to a QuickTime movie. If, however, you want to instantly trigger short samples, or you need to manipulate those sounds using the play start/play lengths settings, or other settings available only within the Sound Player, then you should import your sounds as AIFF, wave or Sound Designer II files.

The properties that the Sound Player shares with the Movie Player, namely speed, volume, pan, play start, play length, and loop enable, work in exactly the same way for both actors. Sound Player includes two other properties that we will explore presently: play channel and crossfade.

- To try out the crossfade property, do the following: in the Sound Player actor, turn loop enable on, set play length to 5. Then connect the Mouse Watcher's horz pos. output to the Sound Player's play start input. Press the letter 'a' on your keyboard to start the sound. Now, as you move the mouse left and right, the portion of the sound that will play moves through the sound file.
- If you leave the mouse still and listen to the sound, you'll notice that you often will get a noticeable click when you reach the end of the play segment and Sound Player starts playing from the beginning again. Now set the crossfade property to 5000. This value is specified in samples, so 5000 is about 1/10 of a second for CD quality sound sampled at 44100 samples per second. The click should either be gone or much less noticeable. The higher the number, the longer the crossfade.

To begin our final experiment with Sound Channels, set the loop enable property of the Sound Player to off so that the sound stops playing. Then disconnect the Mouse Watcher, and restore the play start/play length values to 0 and 100 respectively. Then:

- Highlight both the Keyboard Watcher and Sound Player by shift clicking on them. The choose **Edit > Copy** and finally **Edit > Paste**. Drag the copied actors so that they don't overlap the originals.
- Working now with the copied actors, set the sound input property of the Sound Player so that it will play "chords.aif". Then, change the key range input property to **'b'**.
- Press the letters 'a' and then 'b' on your computer keyboard. Each time you do, 'a' should trigger the first Sound Player, and 'b' should trigger the second. Again, this is a bit like a mini-sampler in that you can trigger short portions of each sound.
- Now, press the letter 'a', and before the first sound is done playing, press the letter 'b'. Note that the first sound stops playing, and the second one starts.

Why does one sound interrupt the other? It's because both of the sounds are set to play on the same *Sound Channel*. Look at the Play Channel input of the two Sound Player actors – both are set to 1. Because a Sound Channel can play only one sound at a time, when a second one starts to play, it interrupts the first. You can, however, get both sounds to play by setting them to different sound channels.

Set the play channel of the second Sound Player to 2. Repeat the experiment above, pressing the letter ‘a’ followed quickly by letter ‘b’. Now you will hear both sounds playing at the same time.

Being able to interrupt a sound that is currently playing and being able to play two sounds simultaneously are both useful, depending on what you are trying to do. Just know that if you have a sound that is cutting out unexpectedly, it’s probably because you are playing two sounds on the same Sound Channel.

Tutorial 7: Using Scenes

Scenes are a powerful feature of Isadora. They allow you to create several complicated setups and instantly switch between them, either by manually clicking on the scenes or by using triggers from the outside world. This is useful when you are creating pieces with multiple sections that have different interactive setups. In this tutorial we will illustrate several methods of working with Scenes.

- Close any currently open Isadora documents. Then choose **File > Open** and locate the file called “Tutorial 7” in the “Isadora Tutorials” folder, located in the same folder as your Isadora application.
- Choose **Output > Show Stages** so that the stage is visible.
- In the Scene List you will see three scenes, label “one”, “two” and “three”. None of them are active because the default behavior is to start with all scenes deactivated when opening a file. Activate the scene labeled “one” by clicking on it.
- After you activate the first scene, you will see its actors appear in the Scene Editor. You should also see a movie being played in the Stage window.
- Press the space bar. You will see that scene “one” is deactivated, and scene “two” becomes active, and that the movie appearing in the Stage window changes.
- Press the space bar again. Now scene “two” is deactivated and scene “three” is activated. Again the movie shown in the Stage changes.
- Press the space bar one final time. Scene “three” is deactivated and scene “one” becomes active again.

How does this work? Take a look at the actors in scene “one”. You will see a Movie Player connected to a Projector Actor. Below that, you will see a Keyboard Watcher and a new actor we have not yet used called Jump.

The Jump actor has three input properties. The mode works in tandem with the jump to input to determine which Scene will be activated when the jump is triggered. When a value arrives at the trigger input, the current scene is deactivated and the scene specified by the mode and jump to properties is activated.

If mode is set to relative and the jump to property is set to “+1”, then the Jump actor will activate the next scene when triggered. If jump to is set to “-1”, then Jump will activate the previous scene. “+2” would advance two scenes; “-2” would go back two scenes, etc. Relative jumps are useful when you want to be able to cut and paste a group of scenes that work together, and have their jumps still work properly.

If mode is set to “absolute”, then the jump to property gives the number of the scene to jump to, where the first scene in the Isadora document would be “1”, the second scene would be “2”, etc. These jumps are generally less useful because cutting and pasting scenes would cause the absolute jumps to activate the wrong scene. However, there are situations that are useful, for instance, when you always want to jump to the first scene in the document.

As mentioned above, it is possible to cut, copy and paste, and rename scenes. Here are some quick examples of how to do this.

- Select scene “two” by clicking on it, and then choose **Edit > Cut**. Scene “two” will disappear from the scene list, and you will be left with a blinking insertion point between scenes “one” and “three”. Note that no scene is currently active, as both “one” and “three” are not highlighted (i.e. gray).
- Click the mouse to the left of scene “one”. The insertion point will be now be blinking to the left of scene “one”.
- Choose **Edit > Paste**. Scene “two” will appear where the insertion point was previously, and the other two scenes will move to the right.
- Click the mouse in between scenes “two” and “one”. Choose **Edit > Paste** again. You will now have another copy of scene “two”.
- With the copy of scene “two” still selected, choose **Scenes > Rename Scene**. The name “two” will turn into a text edit box. Type “four” into this scene and press *enter*.
- Activate scene “two” (the first scene) by clicking on it. Now press the space bar three times. Each time you do, the next scene in the list will be activated, ending up with scene “three”. Press the space bar again. Note that scene “four” becomes active, because scene “three” jumps backwards two scenes. Using only the space bar, you wouldn’t be able to get back to the first scene, which is called “two”. The only way to get there would be to click on it with the mouse.

You can select a group of scenes by clicking on the first one in the group, and then shift clicking on the last one in the group. Let’s fix the order of our scenes (so they go from “one” to “four”) and so that we can go through all of them using only the space bar.

- Click on scene “three”. Choose **Edit > Cut**. Click in between scenes “two” and “four” to show the insertion point there. Choose **Edit > Paste**.
- Now, click on scene “two”. Then, shift-click on scene “four”. This will select scenes “two” through “four”. Chose **Edit > Cut**.
- Click to the right of the only remaining scene, labeled “one”. The blinking cursor will be to the right of scene “one”. Choose **Edit > Paste**. Our scenes are now in order. Now we have to fix the Jump actors.

- Click on scene “three”. Click in the value box for the Jump actor’s jump to property, type the number 1, and press *enter*. Now scene “three” will jump to scene four when you press the space bar.
- Finally, click on scene “four”. Set the Jump actor’s jump to property to –3. This will jump backwards three scenes, which means we’ll end up at scene “one”.
- Now, press the space bar repeatedly. You’ll see that you are now able to loop through all the scenes.

Remember, we’re using the Keyboard Watcher as an easy way to illustrate how input from the outside world can be used to move from scene to scene. If you are interested in trying out an example that uses MIDI Note On messages to move from scene to scene, try the tutorial file “Tutorial 7 (Midi)”. If you’d like to try out this file, quit Isadora, make that your MIDI Drivers are installed and that your MIDI interface is plugged in. Then start Isadora again and load “Tutorial 7 (Midi)”. Set up your MIDI Input Ports by choosing **Communications > Midi Setup**. (See the tutorial on MIDI for more help.) If you connect a MIDI keyboard to your MIDI interface and press keys on the keyboard, the Note On messages will do what the space bar did in the example above.

As a final example, we’ll set up a document that automatically moves from one scene to another, without any user or performer intervention, as this is often useful for self-running museum installations.

- Close any currently open Isadora documents by repeatedly choosing **File > Close**. Then choose **File > New**. As usual, you begin with one scene called “Untitled.”
- Click “Control” in the Toolbox Filter. Drag a Jump actor into the Scene Editor from the Toolbox.
- Choose the “Generator Group” by clicking on the number 4. Drag the actor called Pulse Generator into the Scene Editor. This actor will send a trigger at a regular interval. It has four input properties and one output property. The freq input allows you to set the frequency of the pulses in pulses per second; the run property allows you to allow the pulse generator to pause by setting its value to off; the reset input allows you to start the timing cycle over again. We’ll only be modifying the freq input here, which you should set to 0.1 Hz. This means that the trigger output will pulse once every ten seconds.
- Connect the trigger output of the Pulse Generator to the trigger input of the Jump operator. At this point, even if the Pulse Generator sends a trigger, nothing will happen because there is only one scene.
- Select the Pulse Generator and Jump actors, and choose **Edit > Copy**. In the Scene List, click to the right of the one existing scene, and then choose **Scenes > Insert Scene**. Click on the Scene Editor to activate it, and then choose **Edit > Paste** to paste the two actors into the scene.
- Finally, change the jump to property of the Jump Actor to –1 and then wait. Then next time the Pulse Generator sends a trigger, you will jump to the first scene. If you then wait another ten seconds, you will jump to the second scene. This loop will continue indefinitely.

Of course, we didn't put any actors in these scenes that show movies or otherwise manipulate media. But the principal of how to automate the jump process would be the same regardless of the contents of the Scenes.

Tutorial 8: Fine Tuning Links and Actors

This chapter is vaguely mathematical because of the subject matter. Nevertheless, for those who dislike things mathematical, I strongly encourage you to take the time to understand this tutorial because understanding how property values work together that you can get the most out of Isadora.

Understanding Property Types

Before we talk about scaling values between inputs and outputs, we need to spend a moment talking about property *types*. We've mentioned some of them in passing in the previous tutorials: triggers, numbers, video, etc. Basically, each property is of one of the following types:

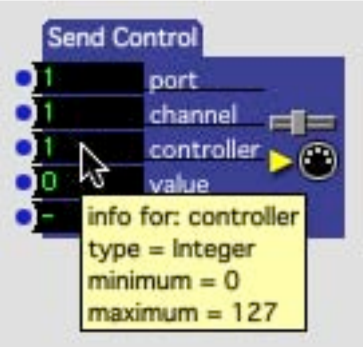
Integer	Number, without Decimal Points
Float	Number, with Decimal Points
Boolean	Number, only 0 or 1 (often displayed as off or on)
Range	A pair of integers, specifying a range of values
Trigger	A Boolean, but specifically looking for a "pulse"
Video	A video stream
Sound	An audio stream

All of the numeric types can be connected to one another, and will be scaled and converted (if needed). Video, however, can only be connected to video, and sound only connected to sound.

When you link different numeric types, the values may be converted. For instance, sending a Float value of 1.5 to an Integer input will yield a 1, because Integers don't allow numbers after the decimal point. (Note: the part after the decimal is simply discarded – values are never rounded up or down.) If you send an Integer value of 5 to a Range value, the Range will be set to 5-5 (i.e. from 5 to 5.) Hopefully these conversions are self-evident, except for the Trigger type, which constitutes a bit of a special case.

Triggers are numeric values (essentially 0 and 1, displayed as a dash or an X) but respond to incoming values in a special way. Whenever any new value arrives at a trigger input, the trigger "fires". You could illustrate this by linking horz pos. output of the Mouse Watcher to another actor's trigger input. Every time you move the mouse, new values are sent out of the horz pos. output and the trigger input to which it is connected will fire.

You can easily find out the type of a property. Just move the mouse cursor over the property's value edit box and then don't move it for a moment. An information box will appear, that shows you the property's name, type, and minimum and maximum values. It looks something like this:



info for: controller
type = Integer
minimum = 0
maximum = 127

Understanding Value Scaling

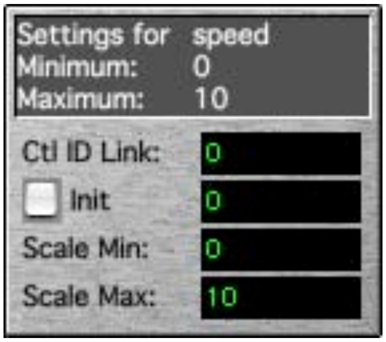
When connecting two numeric properties whose ranges of values are the same, you don't need to think too much about what happens to the values as they pass through the link: when a value is sent out of the output, that same value appears at the input to which it is connected. Even when both properties don't vary between 0 and 100, Isadora behaves in a consistent way by scaling the range of output values to match the range of inputs values. For example, when an output that varies between 0 and 127 (e.g., a MIDI value) is connected to an input that varies between 0 and 100, Isadora will scale the values proportionally so that as the output goes from 0 to 127, the input will go from 0 to 100.

Isadora's default behavior works great when you want an input property to vary over its entire range. But what if you want a finer degree of control over an effect, so that a value will vary between 20 and 40 instead of 0 to 100? Or if you need an input value to go down when the output value driving it goes up? This tutorial shows you how to accomplish this.

- Close any currently open Isadora documents. Then choose **File > Open** and locate the file called "Tutorial 8" in the "Isadora Tutorials" folder, located in the same folder as your Isadora application.
- This document has three scenes. Click on the Scene called "Tutorial 8". In it you will find a Sound Player actor, and a Mouse Watcher with its horz pos. output connected to the speed input of the Sound Player. Note that the sound started playing as sound as you clicked on the Scene, even though a Sound Player normally doesn't start playing unless you trigger its restart input. In this scene, we added an "Enter Scene Trigger" actor to start the sound. The Enter Scene Trigger sends a trigger whenever the Scene it is in is activated. Thus, activating the Scene starts the sound automatically.
- Now, move the mouse left and right. You will hear the sound go from a low pitch to a very high pitch, as its playback speed varies from 0 to 10 times normal speed. Note that Isadora is already scaling the values: as the Mouse Watcher's horz pos. varies between 0 and 100, the Sound Player's speed input ranges between 0 and 10. This is Isadora's default behavior when you link an input to an output, namely, scale the output value to match the input value.

This particular sound, the recording of the singer we used in Tutorial 6, seems a bit comical when playing at 10 times normal speed. Let's limit the range of speed so that it goes from 0.5 to 1.

- Click on the word speed in the Sound Player. An inspector window appear:



Settings for speed
Minimum: 0
Maximum: 10

Ctl ID Link: 0
☐ Init 0
Scale Min: 0
Scale Max: 10

At the top is the name of the input or output along with the absolute minimum and maximum values allowed for this property. Below are four value edit boxes: ***Ctl Link****,* ***Init****,* ***Scale Min.*** *and* ***Scale Max****.*

By changing Scale Min and Scale Max, you can change the minimum and maximum values of the input, and thus change the way Isadora scales the values.

Note that these fields work like any value edit box: you can use the mouse to scroll up or down through the values, or click in the box, type a new value and press enter.

- Click in the value edit box next to "Scale Min.", type 0.5, and press *enter*. Now enter 1.0 into the Scale Max. value edit box.
- Move the mouse left and right again. You see (and hear) that, as the horz pos. output of the Mouse Watcher varies between 0 and 100, the speed of the sound will go between 0.5 and 1.0.

It is important to know that Scale Min. doesn't have to be less than Scale Max. In fact, you can "invert" the scaling by setting the number in Scale Min to a higher value than Scale Max. Try this:

- Again, click on the word speed in the Sound Player. Now enter 1.0 in the Scale Min value edit box, and 0.5 into Scale Max.
- Move the mouse from the left side of the screen to the right. Now, the playback speed of the sound goes from 1.0 to 0.5 as you move from left to right. You've inverted the behavior of the mouse movement.

Initializing Property Values

Finally, we should take a moment here to note the "Init" checkbox and the value edit box that accompanies it. When you need to make sure that a property is preset to a specific value when its Scene is activated, check the "Init" checkbox and enter the desired value into the value edit box to its right.

Let's create an example that illustrates why this feature is important.

- Click on the Scene called "Initializing" in the Isadora file "Tutorial 8" you opened above. Inside is an Envelope Generator that will ramp from 0 to 100 over a period of two seconds. Its output is connected to the volume input of a Sound Player. There is also a Keyboard Watcher looking for the space bar – it will trigger a Jump actor to take us to the next Scene. Note that, though the sound is playing, the current volume of the Sound Player is 0 so you hear nothing.
- Now, click in the value edit box next to the trigger input property of the Envelope Generator. You will see the ramp run from 0 to 100. The volume of the Sound Player is now 100.
- Hit the space bar. You will be in the Scene called "Init Part II". This scene looks for the space bar to take you back to the previous scene. Hit the space bar again.

We return to the Scene called "Initializing", but unlike last time, we can hear the sound playing because the value of the volume was 100 when we *left* the Scene. Remember, when you leave a Scene, every Isadora value is remembered so that when you return to the Scene, things will function exactly as they did when you left. But what if you wanted to make sure that, upon returning to this scene, the sound always started off with a volume of 0 so that it would be silent until you clicked the Envelope Generator's trigger input. That's where the "Init" value comes in.

- Click on the word volume in the Sound Player. The inspector for that property will appear. Click the checkbox next to "Init" to check it. Enter the value 0 into the value edit box next to the word Init.
- Again, click the trigger input of the Envelope Generator and then hit the space bar to go to "Init Part II". Then hit the space bar again to return to "Initializing". You won't be able to hear the sound, as its volume has been initialized to 0.
- Now click the trigger input of the Envelope Generator. The sound will fade in, its volume going from 0 to 100.

Fully understanding how to scale and initialize values as they pass from one actor to another is the key to getting exactly what you want out of Isadora. Try more experiments with this feature in your patches to familiarize yourself with this important feature.

Tutorial 9: More Real Time Video Processing

In the previous chapter on real time video processing, we only looked at the Video Processing actors that have one video input and one video output. There are a handful of actors that take two or three video inputs. We'll take a look at several of them in this tutorial.

Video Mixer

- Close any currently open Isadora documents. Then choose **File > Open** and locate the file called “Tutorial 9” in the “Isadora Tutorials” folder, located in the same folder as your Isadora application.
- Activate the Scene called “Crossfade” by clicking on it. In it you will find two Movie Player actors, a Projector actor, and an actor we haven’t seen yet called Video Mixer. A Mouse Watcher is connected to the mix
- Choose **Output > Show Stages**. Note that you won’t see anything yet, as the input to Projector hasn’t been linked to anything yet.
- Move the up and down. As you do, the image on the Stage crossfades from one video to the other.

The Video Mixer actor fades between two video sources. When its mix amount property is 0, you see only the video stream arriving at its video in 1 input. As the value increases, you see more and more of video in 2 until you reach 100, when the video from that input is all that you see.

Luminance Key

- Activate the Scene called “Luminance” by clicking on it. In it you will find two Movie Player actors, a Projector actor, and an actor we haven’t seen yet called Luminance Key.
- So that you know what imagery you are dealing with, link the video out of the top Movie Player to the video in of the Projector. You should see a dancer moving on a black background. Choose **Edit > Undo** to undo the link. Do the same with the video out of the bottom Movie Player. You should see some bubbles floating on a blue background. Again choose **Edit > Undo** to remove the link.
- Now, connect the video out of the Luminance Key to the video in of the Projector. What you will see on the Stage is the dancer superimposed on the bubbles.

What the Luminance Key actor does is combine two images. You specify a range of brightness in its key top and key bottom properties. Where the foreground video stream is within this range of brightness, you see the foreground. Where it is outside this range, you see the background.

Currently the key top is set to 100% and the key bottom to 5%. (100 means as bright as possible, 0 means black.) The dancer’s body is fairly bright so it falls within the 100 to 5 range and you see the foreground, i.e. her dancing. But the black background is outside of the range 100 to 5, so the bubbles show through on that part of the image.

- Change the key top value to 5 and the key bottom value to 0.

Now you see a silhouette of the dancer, showing the bubbles inside of that outline. We’ve reversed the operation: we see the foreground image where that image is dark and the background image where it is bright.

You can experiment further by connecting the Mouse Watcher's horz pos. and vert pos. to the key top and key bottom properties and moving the mouse around the screen. Note that as you move the mouse around, the graphic in the center of the Luminance Key actor will give feedback regarding the range of brightness currently specified by the key top and key bottom properties.

Displace

- Activate the Scene called "Displace" by clicking on it. This time you will find a Movie Player, a Picture Player, a Projector, and yet another actor we haven't seen called Displace.
- So that you know what imagery you are dealing with, link the video out of the Movie Player to the video in of the Projector. You should see a dancer moving on a black background. Choose **Edit > Undo** to undo the link. Do the same with the video out of the Picture Player. You should see some bubbles floating on a blue background. Again choose **Edit > Undo** to remove the link. Now, connect the video out of Displace to the video in of the Projector.
- You should see the dancer on the black background. Now, use the mouse to adjust the displace amt property in the Displace actor. As you increase its value, the dancer's image will become more and more distorted.

Displace uses the brightness of the video stream at its displace input to shift the pixels of the video stream arriving at its source input. Where the displace video is 50% gray, the source video's pixels aren't moved at all; where it is dark, pixels are shifted to the left; where it is light, pixels are shifted to the right. How far the pixels are moved depends on the amount setting.

The angle property determines the angle at which pixels are shifted: when set to zero, they move left and right, when set to 25% (90 degrees) they move towards the top-left and bottom-right, etc. The offset parameter will shift the apparent brightness of the displace video – this is useful if the displace video is too bright or too dark overall. Experiment with these to see how they change the result.

It is hard to predict what exactly you will get out of Displace, but the results can be quite beautiful. Import your own movies and try using them with Displace. Remember, though we used a still picture as our displace source, you can use a moving video image or live video input just as easily.

Video Feedback

Video Feedback (pointing a video camera at the monitor that was displaying the image from that camera) was a staple technique of some early video artists. Here we'll use a pair of Isadora video processing modules to create our own digital version of this technique.

- Activate the Scene called "Feedback" by clicking on it. This time you will find Movie Player, Luminance Key, Zoomer, and Projector actors. Note how this patch is linked: the dancer video is the foreground input to the Luminance Key, and the key's video out goes to the projector. But that same output also goes to the video in of Zoomer whose output goes to the background input of the Luminance Key. In essence, we've created a loop with the Zoomer actor manipulating the Luminance Key's output and feeding it back into itself.

- Take a look at the resulting image. You will see a kind of "decay" around the dancers body as she moves. This decay is because the Zoomer module is scaling the image down by 1%, making it just a tiny bit smaller. By keying the original image with a scaled down version of itself, you get these lovely trails.
- Experiment with all five parameters of the Zoomer module. You will get a wide range of effects, from subtle to explosive. Also try adjusting the key top and key bottom properties of the Luminance Key module.

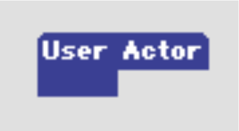
Tutorial 10: Making Your Own Actors

As you use Isadora, you will find that there are groupings of actors that you often use. This tutorial shows you how to use Isadora's *User Actors* and *Macros* to build your own actor from several Isadora actors.

User Actor and Macros work in precisely the same way, except for one: when you make changes to a User Actor, you have the option of updating every copy (also known as an *instance*) of the User Actor so they will all work in exactly the same way. This is very useful when you've have a User Actor in several scenes and you want the functionality of the other instances to stay in sync. A Macro, on the other hand, will not update copies of itself when you make changes. You would most often use a Macro when you simply wanted to logically group some actors or when you want to save screen "real estate" by embedding several actors into a smaller object.

In this example, we will focus on creating User Actors. Let's ay we wanted to turn two actors (Luminance Key and Zoomer) into our own actor called "Feedbacker".

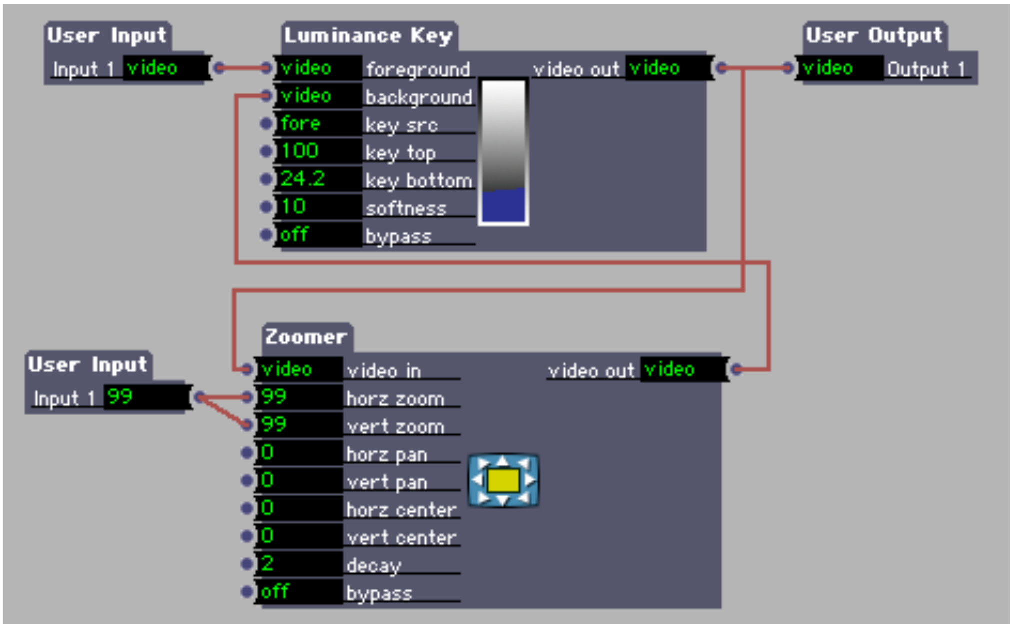
- Close any currently open Isadora documents. Then choose **File > Open** and locate the file called "Tutorial 10" in the "Isadora Tutorials" folder.
- Click on the Scene called "Feedback" to activate it. (This is the same Scene we looked at in Tutorial 9.)
- Click "User" in the Toolbox Filter. This is the User Actor Group.
- Bring a User Actor into the current Scene. Initially, the user actor will look like this



because it does not yet have any inputs or outputs.

- Select the Luminance Key and Zoomer actors and choose **Edit > Cut**.

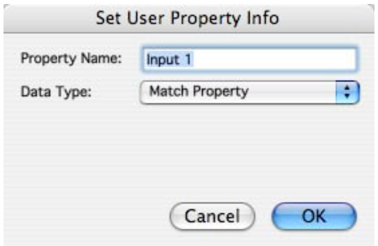
- Double-click the User Actor. A tab will in the current scene, showing the name of the User Actor. We will change the name of this user actor in a moment.
- Choose **Edit > Paste** to paste the Luminance Key and Zoomer actors inside of the User Actor.
- Click “User” in the Toolbox Filter. When you are inside a User Actor’s editor, the User Group has three more actors available: User Input, User Output, and User Actor On/Off.
- Bring two User Input actors and one User Output actor into the Scene.
- Make a link from the first User Input to the video input of the Luminance Key actor, and the from second to both the horizontal and vertical zoom inputs of the Zoomer actor. Then connect the User Output to the video output of the Zoomer actor. The User Actor’s editor now looks like this:



When you link a User Input or User Output to another actor, it will change to match the properties of the input or output to which they were connected. This includes the type, minimum and maximum, and the scale minimum and scale maximum, etc. In this case, both two of the actors changed to a type of video because they were connected to a video input or output. The third actor, connected to the zoom inputs of the Zoomer, changed to an Integer with a minimum of 0 and a maximum of 1000. You can change this behavior using the Set User Property Info dialog described next.

At this point your using actor is complete. But it is a good idea to rename your User Inputs and Outputs so that their function is more descriptive. Here’s how:

- Double-click on the first User Input. The Set Property dialog box will appear.



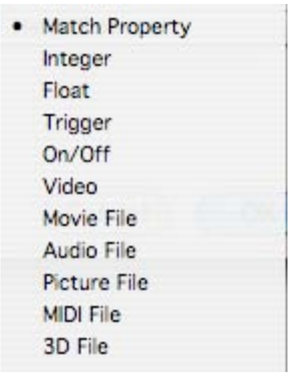
Set User Property Info

Property Name: Input 1

Data Type: Match Property

- Type “video in” into the Property Name field to give this input a name.
- Click OK
- Do the same for the User Output, calling it “video out”.
- And finally, change the name of the Second User Input to “Zoom”.

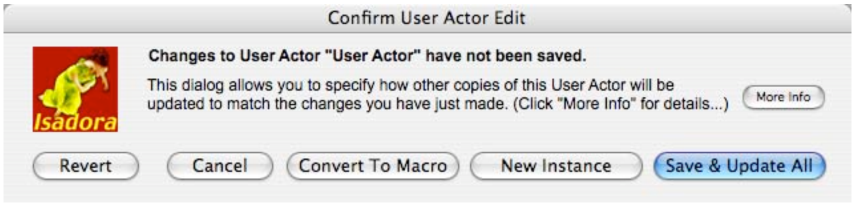
Note also the **Data Type** popup menu. By default, this popup is set to *Match Property*, which means that the User Input or Output will adapt to match the properties of whatever actor to which it is connected. If you want to force a User Input or Output to a particular type, you can select it in this menu. The other choices are:



- Integer: sends/receives an integer number (i.e. no digits after the decimal point.)
- Float: sends/receives a floating point number, i.e. a number that can have numbers after the decimal point.
- Trigger: sends/receives a trigger.
- On/Off: sends/receives an integer value that is either on (1) or off (0).
- Video: sends/receives video.
- Movie/Audio/Picture/MIDI/3D File: sends/receives an integer number that represents the number of an object in the Media Window. The name of the file is displayed with the number.

In this case, we don’t need to change the Data Type of our User Input and Output, so you can leave it set to Match Property.

To close the editor for your User Actor, choose **File > Close**. In version 1.3 and later, following dialog will appear:



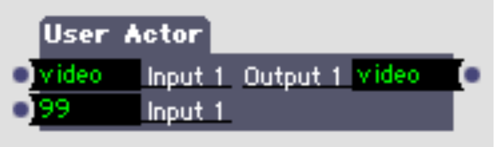
Confirm User Actor Edit

Changes to User Actor "User Actor" have not been saved.

This dialog allows you to specify how other copies of this User Actor will be updated to match the changes you have just made. (Click "More Info" for details...)

Choose “Save & Update All” to save this User Actor. Normally this would update all other copies of your User Actor to match the changes you’ve just made. In this tutorial, you have not yet made any copies of this User Actor, so making this choice has no real effect. But, if there were copies of this actor, either in the document, or in the Global or Local User Actor toolbox (more on those later), all of these would be automatically updated to match the changes you’ve just made.

The editor window will close, and you will now see your user actor in the Scene Editor of the main document.



The final step is to name the User Actor itself.

- Select the actor by clicking on it.
- Choose Actors > Rename Actor. A text edit box will appear above the actor.
- Type “Feedbacker” and press the return key.

Your actor is complete. You can freely copy and paste this actor into other Scenes, just like any other actor.

Adding Your User Actor to the Toolbox

You can add your User Actor to the Toolbox so that it will be available in other Isadora documents. This section shows you how.

But, before you can do so, you must choose a folder within which Isadora will save your User Actors. This is necessary so that Isadora will know where to look for your custom actors when it is opened. To choose this folder:

- Create a folder on your computer to hold your User Actors. Your “Documents” folder is a good place to put this, but you could also locate the folder in the same folder as the Isadora application.
- Choose **Actors > Set Global User Actor Folder**.
- Using the file dialog that appears, select your User Actor folder.
- Click OK.

Once your User Actor Folder is defined, you can save your new Actor to the toolbox.

- Select your User Actor by clicking on it.

- Choose **Actors > User Actor To Global Toolbox.**

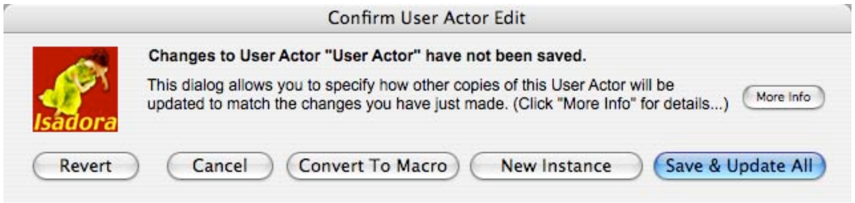
Now, whenever you create a start up Isadora, your User Actor will be available in the toolbox.

Using the Confirm User Actor Edit Dialog (v1.3)

Save & Update All Feature

As mentioned above you are able to able to update all instances of a User Actor when you finish editing it. To see this in action, try this:

- Click on "User" in the Toolbox Filter. Drag two copies of your newly created User Actor to the Scene Editor. Set the second input value (which we connected to the horz and vert zoom inputs of Zoomer) of each User Actor to two different values.
- Double-click one of the two actors, and change some aspect of it; for example, change the name of a User Input, move the actors within the Scene Editor, or edit the value of some input property that is not connected to a User Input.
- Then, choose **File > Close**. The following dialog will appear:



Confirm User Actor Edit

Changes to User Actor "User Actor" have not been saved.

This dialog allows you to specify how other copies of this User Actor will be updated to match the changes you have just made. (Click "More Info" for details...)

- Choose "Save & Update All"

Double-click at the User Actor you *didn't* edit. You will see that, inside the actor, it now exactly matches the modifications you just made. Close this editor, and take a look at the second input of the User Actor. *This value stays the same as it was previously*. When updating User Actors, Isadora attempts to maintain the existing value of all the inputs to the User Actor if possible. (There are situations where this can't be done, e.g., when you change a User Input from a number input to a video input.)

Now, drag another copy of the User Actor from the toolbox and examine it; you will see that it also matches the copy you just edited and saved.

The point here is, when you choose "Save & Update All", you ensure that all instances of a given User Actor stay in sync and will function in exactly the same manner.

Creating a New Instance

Sometimes you want to make a variation of a User Actor that is distinct from the other instances within your file or the toolbox. In this case, you should choose "New Instance". When you do, the User Actor you are editing will be assigned a new, unique identifier, which makes it distinct from the original User Actor. If you later edit copies of this variation and choose the "Save & Update All" button, then only the matching instances of this new instance will be updated; the original User Actor instances from which you made the variation, will not be changed.

Converting the User Actor to a Macro

If you no longer want this User Actor to update other instances like it, you can choose the "Convert to Macro" feature. This converts the User Actor into a Macro that will no longer attempt to update other copies of itself throughout the file or the toolbox. If you later want to convert this into a User Actor again, you can do so by selecting the actor and choosing **Actors > Convert to User Actor**.

Cancel & Revert

If you choose "Cancel" you will be returned to the User Actor editor. If you choose "Revert", all of the changes you've made since opening this User Actor editor will be discarded. (You can actually get the changes back, one step at a time, by choosing **Edit > Redo**.)

Sharing Your User Actors

If you would like to save a User Actor you've made so that you can share it friend, you can do so by using the **Save User Actor** command. You can also load another User's actor using the **Place User Actor** command.

To save your actor:

- Click on one User Actor so that it is selected.
- Choose **Actors > Save User Actor…**
- Use the file dialog that appears to choose a name and a place to save your actor.
- Click OK.

The actor will be saved to your hard disk with the extension ".iua" which stands for **I**sadora **U**ser **A**ctor.

Feedbacker.iua

To load an actor you've received from someone else:

- Choose Actors > Place User Actor…
- Use the file dialog that appears to choose the User Actor you want to load.
- Click OK.
- The User Actor will now be tracking your mouse, as if you had clicked on it in the Toolbox. Click once to deposit the actor into your scene.

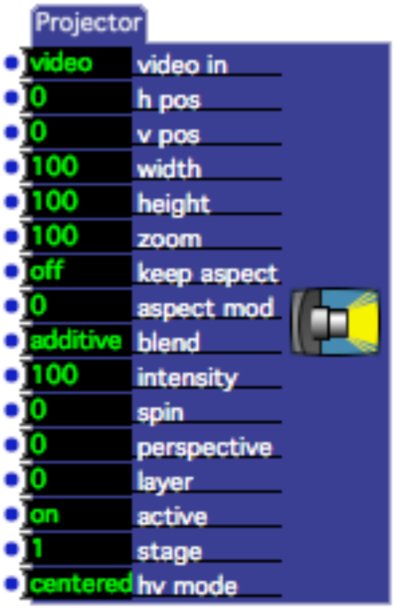
Alternatively, you can just drop the User Actor into your Global User Actors Folder (described in the previous section). If you do, it will appear in the User Group in the Toolbox the next time you run Isadora.

Tutorial 11: Getting the Most From the Projector (v1.3)

- Double click on the Isadora icon to launch the application. This will automatically open a new “Untitled” file.
- Choose **Output > Show Stages** to show the stage. If the (black) Stage fills the display, press Command-G (MacOS) or Control-G (Windows) to hide it. Then choose **Output > Force Stage Preview**, and again choose **Output > Show Stages** to show a smaller version of the stage.

Click on the scene labeled “Untitled”, go to File, Import Media and click on the “Examples” folder that you downloaded with this application, select all and click “Import”. Then click “All Video” in the Toolbox Filter and select the Movie Player and Projector actors. On the movie input of the Movie Player select the “eyezoom.mov”. Link the video out of the Movie Player to the video in of the Projector. You should now see the movie playing on the Stage.

Since V1.0 of Isadora, it has always been possible to position and shape the image within the frame using the Projector actor. This is accomplished using five parameters: horz pos, vert pos, width, height, and zoom.

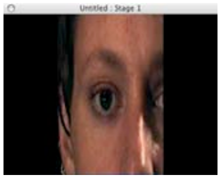


Projector

video video in
0 h pos
0 v pos
100 width
100 height
100 zoom
off keep aspect
0 aspect mod
additive blend
100 intensity
0 spin
0 perspective
0 layer
on active
1 stage
centered hv mode

horz pos and vert pos control where the image appears on the stage, from 0 to 100% of the Stage width and height, respectively. Width and height control how wide and tall the image is, again from 0 to 100% of the stage width and height. Zoom controls the size of the image, and can range from 0 (invisible) to 50% (half size) to 100% (normal size) all the way up to 1000% (i.e. 10 times the normal image size.)

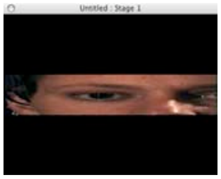
Below are some example settings:



Width 50% - Height 100%

horz pos 0% – vert pos 0%

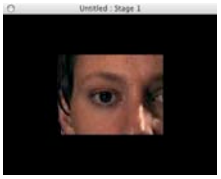
Zoom 100%



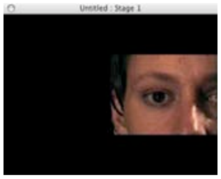
Width 100% - Height 50%

horz pos 0% – vert pos 0%

Zoom 100%



Width 100% - Height 100%



Width 100% - Height 100%

horz pos 0% – vert pos 0%

Zoom 50%

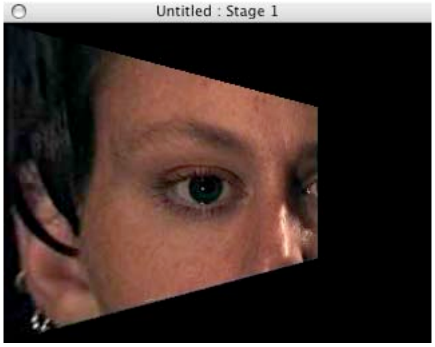
horz pos 25% – vert pos 0%

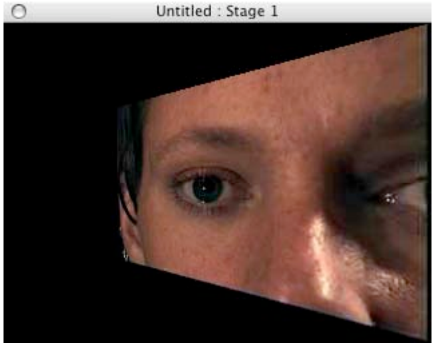
Zoom 50%

Note that when you change the Width and Height parameters, the image will be squeezed in one direction or another. By changing these parameters you can reshape the image and change its aspect ratio.

Experiment with these five settings to see how they affect the image. When you are done, restore the projector to its default values by selecting the Projector actor and choosing **Actors > Reset to Default Values**.

Three of the new features have to do with how the image is shaped. They are: spin, aspect mod, and perspective. Spin does exactly what its name implies: it rotates the image by a specified number of degrees. Aspect mod allows you to adjust the ratio of the image's width to height. Negative numbers reduce the height while positive numbers reduce the width. Perspective is a bit like the "keystone" control on a video projector, except that it adjusts the image horizontally instead of vertically. It is best explained by showing an example: the left image has it's perspective input set to –10, while setting it to +10 produces the right image.





Experiment with these three settings. Restore the projector to its default values by selecting the Projector actor and choosing **Actors > Reset to Default Values** when you are done.

In Isadora 1.1 it became possible to display two or more images on the same stage by using multiple Projector actors in the same scene. To take best advantage of this capability, it is essential to understand the blend, intensity, and layer input properties.

The layer input property controls the layering of the images. Higher numbers are closer to you; lower numbers are further away. So, if you have two Projector actors, in the same scene, and layer input of the first one is set to 5, and the layer of the second is set to 4, then the image from the second projector will be drawn behind that of the first.

There are three blend modes: additive, transparent and opaque. Additive means that the two images are literally "added together" – they will both be visible at the same time, even when one is on top of the other. When using this setting, the intensity parameter simply controls the brightness of the image. Transparent means that the transparency of the image can be adjusted using the intensity parameter. If intensity is set to 100, then the image will be opaque, and you won't be able to see the image behind it. As the intensity approaches zero, the image will become more and more transparent, allowing you to "see through" to the images below. The opaque blend mode means the image's rectangle is always opaque. So, as the intensity approaches zero, you will see a black rectangle on top of any images rendered behind it.

Optimizing for Speed

There are many factors that influence Isadora's video processing speed, including the speed and type of your processor, amount of RAM installed on your computer, hard disk speed, the format in which the video files are stored, and several other factors. This section details several tips to help you get the very fastest frame rates from Isadora.

Tip 1: CPU speed is a major factor for best performance in Isadora, but the graphics card speed of the internal hard drive is also crucial.

RAM is not the key factor for optimized performance, but the transfer speed between CPU and the graphics card is important.

Using eSata will result in significant speed increases when compared to USB 2, as will the use of Fire Wire 800.

As a general rule, internal hard drives in laptops are not that efficient.

Tip 2: Add as much RAM (Random Access Memory) to your computer as possible.

Modern MacOS and Windows computers use a feature called "virtual memory". When the computer senses that some data that resides in your computers RAM (i.e. the extremely fast internal memory linked to your processor) has not been used for a while, it will write it out to disk to make more RAM available to other applications. This is called "page swapping" and can adversely affect performance.

The best way to solve this problem is to add more RAM to your computer. As a general rule, 2 Gigabytes is a good amount. 4 Gigabytes is even better. Page swapping will often take place on machines with less memory than this.

Tip 3: Don't run other applications at the same time as Isadora

Every running application consumes system resources. So, especially when using Isadora for a live performance, don't run any other applications at the same time. Even if they aren't "doing anything" they get some of the processor's time, and thus slow down Isadora.

Tip 4: It is important to consider the resolution of your video when processing live input; bringing data in from a hard drive or camera.

As a general rule, if you are processing a video with loads of effects then the ideal resolution is 320 x 240. However, If you are just playing the movies, a higher resolution compression is fine.

A full sized frame of Digital Video has a resolution of 720 x 480 (NTSC), that's a total of 345,000 pixels that each video effect must process.

Remember, when you change your resolution from 320 x 240 to 640 x 480, there is 4 times as much data and therefore your system will run 4 times as slow!

When capturing live video, set the Video Capture Size to *Half* and make sure the *Force 4:3 Aspect Ratio* button is checked in the Live Capture Settings Window.

You can use a number of software tools to convert your 720x480 DV-NTSC files to a 320 x 240 format. But perhaps easiest is the Pro edition of Apple's QuickTime Player. See Tip 8 for instructions on how to use QuickTime Player to compress your video.

Tip 5: Keep all video resolution consistent

When Isadora has to combine two video streams of different resolutions (e.g., with the Video Mixer actor), it has to scale one stream to match the resolution of the other. (Which one gets scaled is determined by the "Video Image Processing" section of the Video tab in the Preferences.) Scaling is slow, and so you want to avoid it as much as possible. If all of the video streams you are processing are the same resolution, you will get the best possible performance.

Tip 6: In addition to changing the resolution of your files, choosing the correct *codec* for recompression is crucial (Photo JPEG, H264, DV, NTSC)

Photo JPEG is ideal for 320 x 240 resolution, it offers speed improvements when playing video from your hard drive and while the files will not be as small as with other codecs, the Photo JPEG compressor offers several advantages. The most important is that it requires less processor power to decompress the images when compared to many other codecs.

When compressing using Photo JPEG, we suggest using a quality setting of "high" or "medium" (75% or 50%). Using a quality setting of "best" produces very large files that are not significantly different in image quality.

For standard DV resolution, PAL is best for 720 x 576 and NTSC is best for 720 x 480. H264 is ok as long as you are only playing forward – when you play backward you will see the CPU usage increase significantly. Please note: If you intend to jump around in a movie, don't use H264 or mp4 as these codecs are not designed for this.

In the Photo JPEG and DV formats each frame is rendered individually and therefore it is *very* fast when jumping to an arbitrary location within the clip (i.e. when using the position input of the Movie Player) and it plays just as well backwards as forwards.

You can use a number of software tools to recompress your files, but perhaps easiest is the Pro edition of Apple's QuickTime Player. See Tip 8 for instructions on how to use QuickTime Player to compress your video.

Tip 7: Turn off the Video Capture when you're not using it.

The Capture Control actor allows you to turn live video on and off from within an Isadora scene. If you are not using live video in a section of your piece, then use this actor to turn it on and off at the appropriate moment.

Note, however, that turning on the live video capture can take as long as 1/3 of a second, and this may result in a visible glitch in your video output.

Tip 8: How to use Apple's QuickTime Player (Pro Edition) to recompress your movies.

Below are instructions on how to use the Apple's QuickTime Player to store your movies in this format.

NOTE: While QuickTime and QuickTime Player are free, the Pro edition required to recompress movies costs $29.99 at the time of this writing. You must have the Pro Edition to recompress movies using QuickTime Player.

1) Open QuickTime Player by double clicking on its icon. From the File menu select "Open Movie" to open the movie you want to recompress.
2) Choose **File->Export** or press **cmd-E** to call up the export dialog.
3) After the window appears, click the **Options** button to show the "Movie Settings" window.
4) Then click the **Settings** button.
5) Choose **your desired compression format** using the pop-up menu under the heading "Compressor".
6) Set the slider under "Quality" to the halfway point, which should be labeled "Medium." You can use "High" if you like – you're movies will be somewhat larger but the quality of the image will be better.
7) In the text box to the right of "Frame Rate" type 30, if it is not already set to 30. (Use 25 if you are compressing PAL movies.) Uncheck the other two boxes that say Key Frame and Limit Data Rate.
8) Press the **OK** button.
9) You're back at the Movie Settings window. Click on the **Size** button.
10) Click the "Use Custom Size" radio button. Two text boxes marked **Width** and **Height** will appear.
11) Type **your desired sizes** into the Width and Height text box.
12) Press the **OK** button.
13) You're back at the Movie Settings window. Press the OK button.
14) Choose a name for your movie (it should be different than the old name) and press the **Save** button.
15) This process can take a while, depending on how long your movie is. A progress dialog (a window with a little blue thermometer type display) will appear to show how things are going.
16) When the progress dialog disappears, your movie is done.
17) Open the new movie and play it to see how it looks now.

To see the difference in size between the original movie and the newly compressed one, do the following:

1) Bring the original movie to the front by clicking on its window.
2) Choose **Movie->Get Info** to show a window that gives information about the movie.
3) Choose “Movie” from the pop-up menu on the top left.
4) Choose “General” from the pop-up menu on the top right.
5) Look at the “Data Size” and “Data Rate” in that window. Take note of the values.
6) Close the window by clicking on its close box in the top left or by choosing **File->Close**.
7) Now bring the new movie to the front by clicking on its window.
8) Follow the same procedure starting at Step 2 to show its Data Size and Data Rate.
9) You’ll see how much smaller the movie is and how its data rate has been lowered through the resizing and compression process.

Isadora Reference

Importing & Managing Media

Media Window Basics

Isadora allows you play and manipulate movies, audio files, pictures, Standard MIDI Files, and 3D Object Meshes in the 3DS (3D Studio Max) format. To use these files, you must create references to them in the *Media Window*.

The Media Window can contain any number of bins, each of which is associated with a particular media type. Each bin can contain any number of media files. You can organize your files by creating new bins and dragging existing media references into them.

When you do import media, Isadora automatically places the media files in the first available bin of the matching type in the Media Window, i.e. movie files go into the first movie bin, sound files go into the first sound bin, etc.

It is important to understand that the Isadora document does *not* contain the actual media file data – just a pointer to its location on your hard drive or other storage device. If you later delete the file, Isadora won't be able to find it. It is a good idea to create a folder to hold your Isadora document and all of the media associated with it. This should make it easier to manage your data when you are working with many files.

Isadora can import and play several types of movie, sound, and picture file formats., namely:

Video Files
QuickTime Movies (.mov)
Digital Video Files
Shockwave Files (.swf)

Sound Files
Audio Interchange Format Files (.aif, .aiff)
Windows Wave (.wav, .wave)
Sound Designer II (.sd2)

MIDI Files
Standard MIDI Files (.mid)

Pictures
Macintosh Pictures (.pic)
QuickTime Image (.qtif)
Windows Bitmap (.bmp)
Photoshop Documents (.psd)

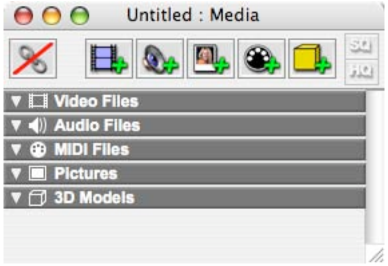
TIFF (.tif)
Graphics Interchange Format (.gif)
PNG (.png)
SGI Image Files (.sgi)
Mac Paint (PNTG)
Targa Image Files (TPIC)

3D Object Meshes
3D Studio Max (.3ds)

Importing Media

To import one or more media references using a File Selector dialog:

- Choose **Windows > Show Media** to show the Media Window. Initially, it will look like this:



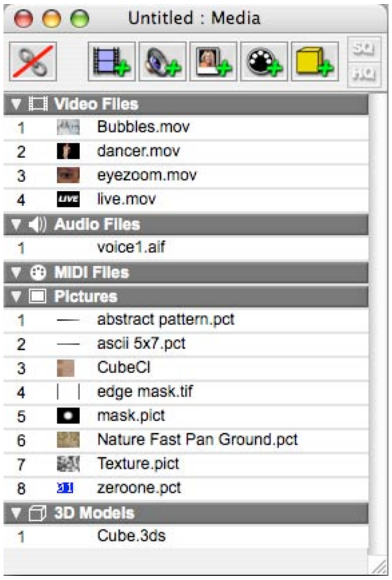
- Choose **File > Import Media…**. A file selection dialog will appear.
- Or, control-click (MacOS) or right-click (Windows) to show a pop up menu. From that menu, choose “Import Media…”.
- Select the file you want to open by clicking on it, and then click **Open**. If you like, you may shift-click to select several files (they can be of different types) and then click **Open**.

To import one or more media references using Drag and Drop:

- Select the file or files you want to import in the Finder (MacOS) or in from the Explorer (Windows).
- Drag the files over the Media Window. Its outline will highlight to indicate that it is ready to receive files. If the group of files you have selected contain a file type that Isadora cannot read (i.e. not a Movie, Sound File, MIDI file, or Picture) then no highlighting will appear.
- Release the mouse button to import the files.

All of the files you have selected will be imported into Isadora and appear as reference in the Media Window. The references will be stored in the first available bin of that matches the type of file you dragged.

Here is how the media window looked after we dragged in three movies, one sound file, and seven pictures and one 3D model:



Untitled : Media

Video Files

1	Bubbles.mov
2	dancer.mov
3	eyezoom.mov
4	live.mov

Audio Files

1	voice1.aif

MIDI Files

Pictures

1	abstract pattern.pct
2	ascii 5x7.pct
3	CubeCl
4	edge mask.tif
5	mask.pict
6	Nature Fast Pan Ground.pct
7	Texture.pict
8	zeroone.pct

3D Models

1	Cube.3ds

Note the number to the left of the each media reference. This number is used to identify the media when specifying which one you want to play inside an actor.

To replace the file associated with a media reference:

- Double-click the media reference (it is OK if the reference is currently <Unassigned>).
- Or, control-click (MacOS) or right-click (Windows) the media reference to choose “Replace Media…” from a pop-up menu.
- A file dialog will appear that allows you to select a different file to associate with that media reference.
- Select the new file and click **Open** to confirm the new file. The name of the reference in the Media Window will change to match that of the newly selected file.

Selecting Media References

To select an item or bin:

- Click on a media reference to select it. Clicking on a bin selects the bin and all media references inside that bin.

To select multiple media references

- Click on an unselected media reference to select it. Then hold down the shift key and click another item to select all items in between.
- Or, Click on an unselected media reference and drag to select several contiguous items.
- You can hold down the Command/Apple key (MacOS) or the Alt key (Windows) and click a media reference to toggle its selection state.

To select an multiple bins

- Click on an unselected bin to select it. (All media references within that bin will be selected too.) Then hold down the shift key and click another bin to select all items and bins in between.
- Or, Click on an unselected bin and drag to select several contiguous bins.
- You can hold down the Command/Apple key (MacOS) or the Alt key (Windows) and click a bin to toggle its selection state.

Managing Media

To add a new bin to the Media Window

- Click on the appropriate button at the top of the Media Window.

Add Movie Bin Button	Add Sound Bin Button	Add Picture Bin Button	Add Midi Bin Button	Add 3D Bin Button

- A new bin of the specified type will be added to the end of the Media Window.

Automatically Adjusting Media Numbers

When you delete or move a media object, the number of the media objects will change, and Scenes that reference a given media object will not play the same file they played before the change. Often this is the behavior you want, but it may be that you want to ensure that all the actors still play the same media after you have deleted or moved some object in the Media Window. To do this, you need to enable the "Auto Adjust Media" feature in the Media Window.

Auto Adjust Media Enabled	Auto Adjust Media Disabled

To enable or disable the Auto Adjust Media feature:

- To turn on the Auto Adjust Media feature, click the button in the top left of the Media Window.
- To turn off the feature, click the button again.

To delete a media reference or bin:

- Select the media references you want to clear.
- Choose **Edit > Cut** to remove the references from the Media Window. Or, control-click (MacOS) or right-click (Windows) the media reference to choose "Cut" from a pop-up menu.

To clear (unassign) a media reference:

- Select the media references you want to clear.
- Choose **Edit > Clear** to clear the references from the Media Window. Or, control-click (MacOS) or right-click (Windows) the media reference to choose “Clear” from a pop-up menu.
- After a reference is cleared, its title will read “<Unassigned>”. Attempting to play a media reference that has been unassigned has no effect – the media simply doesn’t play.

To hide the media references within a bin:

- Click on the downward pointing arrow to the left of the bin’s title. The items within the bin will be hidden.

To show the media references within a bin:

- Click on the sideways pointing arrow to the left of the bin’s title. The items within the bin will be shown.

To reorder media references within a bin, or to move them to a different bin:

- Select the media references you want to move. You should only select media references of the same type (i.e. only movies, only audio files, etc.)
- Click a second time on one of the selected items and drag the media references. As you do, an insertion point will appear between pairs of existing media references or below an existing bin. This let’s you know where the media references will be inserted when you release the mouse.
- Release the mouse button when the insertion point indicates the desired position of the media references. When you do, they will be moved to that position.

QuickTime movies and the *High Quality* Flag

Since version 1.1, Isadora has respected the ***high-quality*** flag setting for each movie. This flag is most important for movies that contain interlaced video (notable DV-NTSC and DV-PAL). When the high-quality is turned on, both fields of the video are rendered; when turned off, only one field will be rendered, and the other field will be interpolated. You can set the high-quality flag for a movie using QuickTime Player Pro or other applications.

In the Media Window, you can set a flag to force Isadora to render the movie at either high-quality or standard quality. Setting either of these flags overrides the high-quality flag stored with the movie.

To force high-quality playback of your movies:

- Select the movies references you want to play in high-quality mode.
- Click the **HQ** button at the top right of the Media Window. An HQ marker will appear to the right of each movie in that was selected.

- Or, you can right-click (or control-click on Mac OS) and choose **Set Force High Quality** from the popup menu.

To force standard-quality playback of your movies:

- Select the movies references you want to play in standard-quality mode.
- Click the **SQ** button at the top right of the Media Window. An SQ marker will appear to the right of each movie in that was selected.
- Or, you can right-click (or control-click on Mac OS) and choose **Set Force Standard Quality** from the popup menu.

Using the Scene List

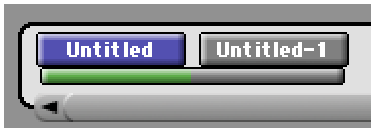
An Isadora document can have any number of Scenes, each of which is a collection of actors that manipulates one or more streams of digital media. Isadora scenes are like scenes in a play: each one may have a different set, different lighting, etc. Similarly, each Isadora Scene may manipulate media in a completely different way. Because you can jump almost instantly from one scene to another using the Jump actor or by clicking on Scenes in the Scene List, it is possible to move from one interactive setup to another as you move through sections of a performance.

When you manually activate a Scene in the Scene List by clicking on it with the mouse, its actors are displayed in the Scene Editor and they all begin communicating with each other. If the activated Scene generates video output, it will appear on the appropriate Stage, if it produces sound, the sound will be sent to the computer's audio output, etc.

It is important to understand that each Scene is completely independent from the other Scenes in the same document. Because of this you cannot pass data from one Scene to another. When you activate a new scene, all of the media output of the previously active scene stops.

Generally speaking, only one scene is active at a time. However, you can use the **Activate Scene** and **Deactivate Scene** actors to activate more than one scene at a time. See the documentation for these two actors for more information.

Each Scene is visually represented by rectangular shaped objects displayed in the Scene List at the bottom of an Isadora document.



Each Scene is associated with a Control Panel, indicated by the bar just below the Scene proper. (When the bar goes between two or more scenes, it indicates that those Scenes share the same Control Panel.) Control Panels allow you to create a user interface for your Scene consisting of one or more Isadora controls. See the section "Using Control Panels" on Page 98 for more information.

Activating & Deactivating Scenes

To activate a Scene manually:

- Click on the Scene you want to activate, which means that that Scene will be selected. The highlighting on the previously activated scene (if there was one) will be removed, the Scene you clicked on will be highlighted, the actors for the selected Scene will appear in the Scene Editor, and they will begin communicating with each other and the outside world.

To deactivate the currently active Scene, leaving no Scenes active:

- Click on the background area of the Scene List. If there was a scene activated, its highlighting will be removed and its actors will disappear from the Scene Editor indicating that no Scene is active currently. This will stop all output (video, sound, MIDI) that was being generated by the Scene that has been deactivated.

Selecting Scenes

To select a Scene:

- Click on the Scene you want to select, which means that that Scene will be activated. The highlighting on the previously activated scene (if there was one) will be removed, the Scene you clicked on will be highlighted, and the actors for the selected Scene will appear in the Scene Editor.

To select a range of scenes:

- Click on the first scene in the group you want to cut or copy. It will highlight to indicate that it is selected.
- Shift-click on the last scene in the group you want to select. Isadora will highlight the second scene you clicked, and all of the scenes in between. Note that the Scene Editor will disappear, because you cannot have more than one scene active at a time.

To make a discontinuous selection, or to deselect one or more selected scenes:

- Hold down the Command ( ) key (MacOS) or Alt key (Windows) and click on the scenes that you want to select. If it was not selected previously, it will be selected. If it was selected previously, it will be deselected.

Adding and Removing Scenes

To insert a new scene into the Scene List:

- Click to the left of the first scene, to the right of the last scene, or in between two scenes. A blinking cursor will appear at the spot where you clicked. This indicates where the new scene will be inserted.

- Choose **Scenes > Insert Scene**. A new scene will appear where the blinking cursor was previously. You can see that it has been activated because the new scene will be highlighted and the Scene Editor will be visible.

To activate a scene:

- Click on the scene you want to activate. It will highlight to indicate that it is selected, the Scene Editor will be shown (if it isn't already visible) and all of the modules in that scene will be visible inside the Scene Editor.

Note that you can activate a new scene from within a Scene by using the "Jump" actor.

To cut or copy a range of scenes:

- Select one or more scenes.
- Choose **Edit > Cut**. Isadora will cut the selected scenes.

To paste scenes:

- Click to the left of the first scene, to the right of the last scene, or in between two scenes. A blinking cursor will appear at the spot where you clicked. This indicates where the scenes will be pasted.
- Choose **Edit > Paste**. Isadora will insert scenes that you cut or copied previously at the point where the cursor was blinking.

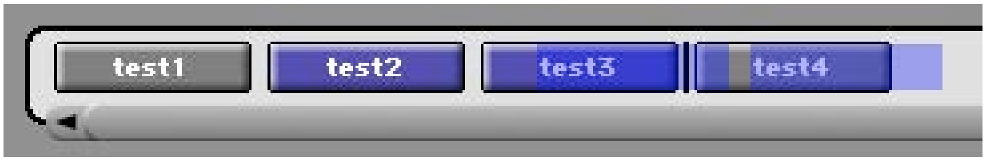
To delete scenes:

- Select one or more scenes.
- Choose **Edit > Clear** or press the **Delete** key. Isadora will delete the selected scenes.

Reordering Scenes

To change the order of the Scenes in the Scene List:

- Select one or more scenes.
- Click in one of the selected Scenes, and drag the mouse to the right or the left.
- As you drag, a black cursor will appear between the Scenes. This shows where the Scenes you are dragging will be inserted when you release the mouse. In the example below, the cursor is between scenes "test3" and "test4".



- When the cursor is displayed at the location where you would like the Scenes to be inserted, release the mouse button. The Scenes will be move to that location.

Renaming Scenes

To change the name of a scene:

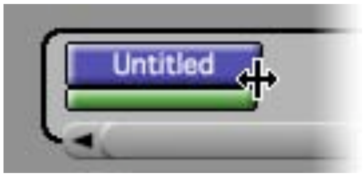
- Highlight the scene whose name you want to change. Then choose **Scenes > Rename Scene**. A text edit box will appear in place of the scene.
- Type the new name of the scene and press *enter*. The text edit box will disappear and the scene will be displayed with its new name.
- **Shortcut:** Control-clicking (MacOS) or right clicking (Windows) will show a popup menu. From that menu choose “Rename Scene” to open the text edit box for a Scene’s name.

Changing the Width of a Scene

Sometimes it is useful to change the width of a scene to better visually organize your Isadora document.

To change the width of a scene:

- Hold down the Command Key (MacOS) or the Control Key (Windows) and place the cursor at the right edge of the Scene you wish to modify. The cursor will change to indicate you are ready to change the width of the scene.



- Drag the mouse left or right to adjust the size of the scene.

Editing Scenes and Using Actors

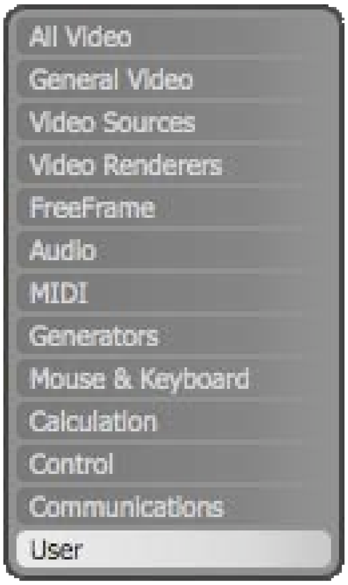
As described in the previous chapter, a Scene is a collection of actors that manipulates one or more streams of digital media. So, the Scene Editor is where you define the way in which those actors work together.

Using the Scene Editor, you place your actors and connect the outputs of one to the inputs of the other. In so doing, you define the how the media (whether it is video, sound, MIDI, etc.) is manipulated. You will also edit the property values associated with each actor here, allowing you to determine the specific way in which a given actor functions. Finally, you will edit how data is scaled as it moves through a link.

Most Scenes follow this model: a media stream arrives from a source, whether it be prerecorded media stored in the Media Window or media arriving in real time from the outside world; the media stream flows through one or more actors to change it in some way, and then the manipulated data is sent to an appropriate output. Interactive setups have an added component in that some information from the outside world is changing the way in which one or more actors manipulate their media streams in real time.

To understand what each of the actors do, take a look at the Tutorials or read the Isadora Actors Reference portion of this manual. This section describes how to add, remove, organize and connect actors within a Scene.

Adding New Actors to a Scene / Using the Toolbox



The actors available in Isadora can be found in the Toolbox, which is located along the left side of an Isadora document.

Near the top of the window is the Toolbox Filter, as seen here on the right. It gives several categories into which Isadora's actors have been grouped.

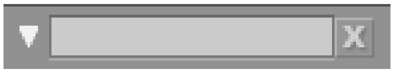
To make a actors from one group visible in the Toolbox:

- Click on the name of the group you wish to show in the Toolbox Filter. The name will highlight and only the actors in that group will appear in the Toolbox.

To hide or show the Toolbox Filter:

- Click the white "disclosure triangle" ▼ just above and to the left of the Toolbox Filter. Or choose "Toolbox Filter" in the Views menu.

To quickly locate an actor by name: (v1.3)



- Click in the textbox at the top of the toolbox and type any portion of the actors name. Any actor, from any of the eight groups, whose name contains the text you type will appear in the toolbox.
- You may also choose **Actors > Search for Actor** or Command-Shift-A (MacOS) or Control-Shift-A (Windows) to activate the search text box. (This feature added in v1.3)
- To clear the search text box, click the small "X" to the right of the text field.

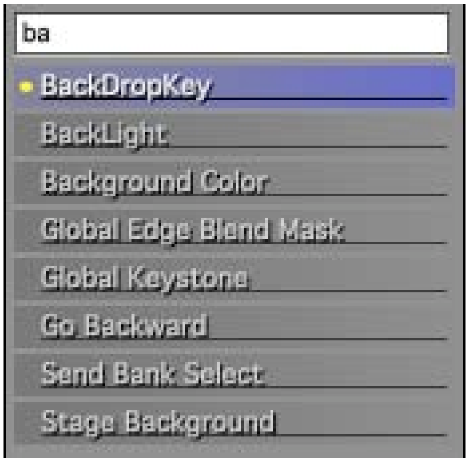
To add a new actor into a Scene:

- Click in actor you want to add in the Toolbox. The cursor will change into a plus sign to let you know you have selected an actor.
- Move the mouse into the Scene Editor. As you do, you will see the actor you selected following the movements of your mouse.
- Once you have the actor in the position you desire, click the mouse to confirm its addition to the Scene.

- Note: You can click again the Toolbox or hit the Escape (esc) key to cancel the addition of the actor.

To add a new actor into a Scene using the “Popup” Toolbox (v1.3)

- You can access a “popup” version of the Toolbox at any time by double-clicking in the grey area of the Scene Editor.



- After the Popup Toolbox appears, type all or part of the name in the text box at the top of the Popup Toolbox. Only actors with that text in their name will be displayed.
- Then, either click the desired actor with your mouse or use the up or down arrow keys to select the desired actor and press the enter or return key on your keyboard.
- The Popup Toolbox will disappear and the desired actor will be deposited into the scene.

Selecting and Deleting Actors

To select an actor:

- Click on the main portion of the actor with the mouse.

To select multiple actors:

- Hold down the shift key while clicking on the actors you want to select.

To select a group of actors:

- Click on the Scene Editor’s background, and drag the mouse. A selection rectangle will appear. When you release the mouse, any actors under the selection rectangle will be selected.
- If you hold down the shift key before you click, the actors under the selection rectangle will be added to the current selection.

Organizing Actors

To reposition actors within the Scene Editor:

- Select one or more actors.
- Click on the main body of the actor and drag. The selected actors will follow the movements of your mouse until you release the mouse button.

Editing Actors

To delete actors:

- Select one or more actors.
- Choose **Edit > Clear** or press the **Delete** key. Isadora will delete the selected actors.

To cut or copy a range of actors:

- Select one or more actors.
- Choose **Edit > Cut**. Isadora will cut the selected actors, or
- Choose **Edit > Copy**. Isadora will copy the selected actors.
- Note that when cutting or copying a group of actors, all of the links between actors in the group will be kept intact. When you paste these actors, the links that were in place at the time of the cut/copy will be restored.

To paste actors:

- Make sure that the Scene Editor is active by clicking on its background.
- Choose **Edit > Paste**. Isadora will paste the actors that you cut or copied previously.
- The newly pasted actors will all be selected, so you can click on any one of them and drag to move them to a new location.

Making Links Between Actors

For Isadora's actors to work together, you must define the way in which the data moves from one actor to another. You do this by making links between the output of one actor and the input of another.

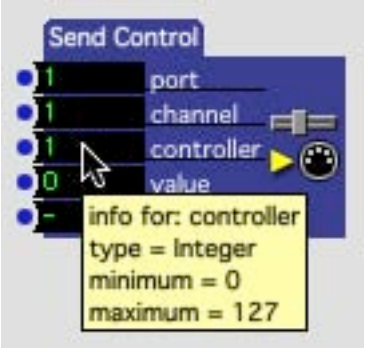
Property Types

Each property is of one of the following types:

Integer	Number, without Decimal Points
Float	Number, with Decimal Points
Boolean	Number, only 0 or 1 (often displayed as off or on)
Range	A pair of integers, specifying a range of values
Text	A string of text characters.
Trigger	Number, only 0 or 1 represented as a hyphen (–) and an X Whenever a new value arrives, the trigger "pulses".

Video	A video stream
Sound	An audio stream

You can find out the type of a property by placing the mouse cursor over a property's value edit box and then keeping it still for a moment. An information box will appear that shows the property's name, type, and its minimum and maximum values.



info for: controller
type = Integer
minimum = 0
maximum = 127

You can connect any numeric or trigger output to any other numeric or trigger input. Video outputs can only be connected to video inputs, sound outputs to sound inputs.

To connect one actor's output to another actor's input:

- Click in an output port (the blue dot on the right side of an actor). A red line, representing the link, will now follow the movements of your mouse.
- Move to another actor's input port (the blue dot on the *left* side of an actor). The link will thicken whenever you are inside of a valid input port. Note that you cannot connect video or sound outputs to numeric inputs, and vice-versa.
- Click the mouse to confirm the link.
- Note that the link is red when no data is flowing through the link, and that it is green when data is flowing.

To cancel a link in progress:

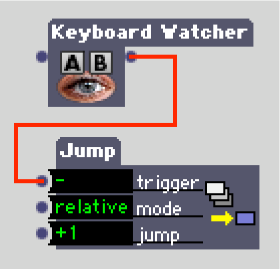
- Hit the *esc* key, or press Command-Period (MacOS) or Control-Period (Windows).
- Or, control-click (MacOS) or right-click (Windows) to choose "Cancel Link" from a popup menu.

To delete a link:

- Click on a link to select it. It will turn bright red or bright green (depending on whether or not there is data flowing through the link) to indicate that it has been selected. You can shift click to select more than one link at a time.
- Choose **Edit > Clear** to delete the link or press the *delete* key.

To segment Links for better visual organization:

You may want to organize your links visually so that you can better understand what your Scenes are doing when it contains several actors. You can do so by laying them out in segments. For example:



To create a link with segments:

- Start the process as before by clicking in an output port. The link will begin tracking your movements.
- As appropriate, click on the Scene Editor background. When you do, a new point will be added to the link. The red line now tracks from that point.
- Continue adding segments as desired. To finish the link, click in the input port of the target actor.

To move an existing Link segment:

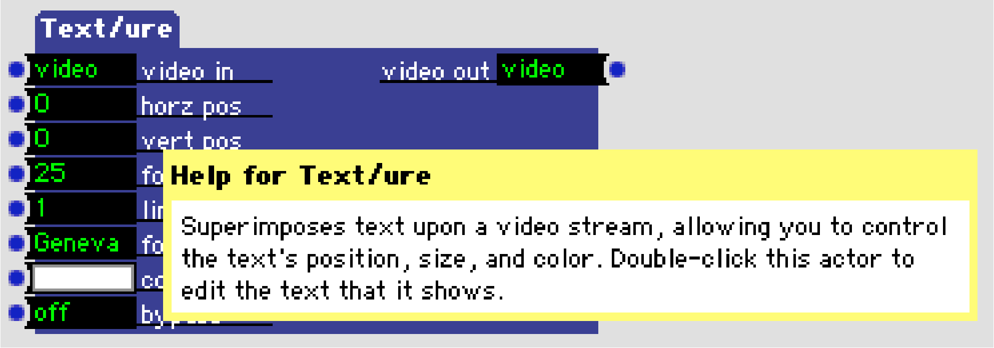
- Click in the link segment and drag. Horizontal segments can only be dragged up and down. Vertical segments can only be dragged horizontally.

Getting Help for an Actor

Each actor has built in help information. To display help for an actor, control-click (MacOS) or right-click (Windows) and choose “Actor Help…” from the popup menu. If you control or right click in an input or output, you can choose “Actor Input Help…” or “Actor Output Help…” to see specific information about that input or output.

To get help for an actor:

- Control-click (MacOS) or right-click (Windows) and choose “Actor Help…” from the popup menu. A small window will appear with the help information. Click anywhere to dismiss the help window.



Help for Text/ure

Superimposes text upon a video stream, allowing you to control the text's position, size, and color. Double-click this actor to edit the text that it shows.

To get help for an actor's property:

- Control-click (MacOS) or right-click (Windows) and choose "Actor Input Help…" or "Actor Output Help…" from the popup menu. A small window will appear with the help information. Click anywhere to dismiss the help window.

As a shortcut, you can also option click (MacOS) or alt click (Windows) an actor or its properties to show built in help information.

Navigating Inside the Scene Editor

In addition to using the scroll bars, you can use the mouse to drag the visible area of the Scene Editor up and down or left and right.

To scroll up or down, or left and right using the mouse:

- Hold down the command key (MacOS) or alt key (Windows) and click in the gray portion of the Scene Editor. The cursor will change into a "hand". While holding the mouse button down, drag the Scene Editor.

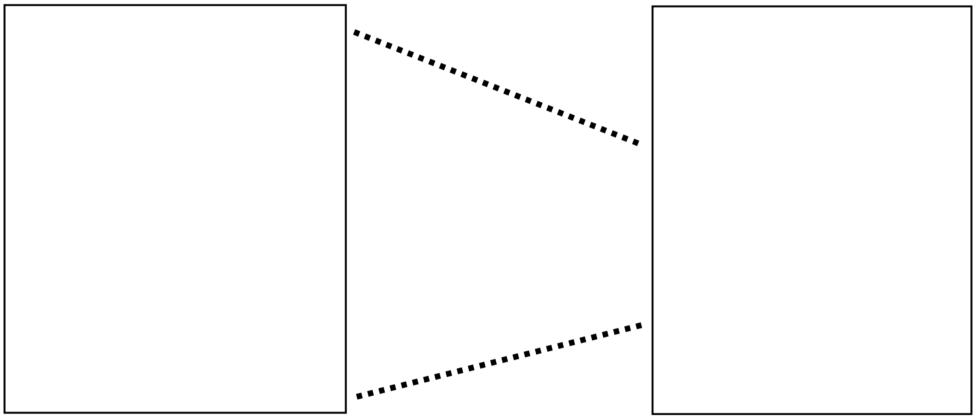
Scaling Values Between Outputs and Inputs

Whenever you link an actor's numeric output to another actor's numeric input, Isadora's default behavior is to scale the output's range of values so that they match the input's range of values.

Two pairs of values are used to calculate how values are scaled. Output properties have a *Limit Minimum* and *Limit Maximum* value that give the lowest and highest possible values that can be sent by that output property. Input properties have a *Scale Minimum* and *Scale Maximum* value that specifies the range to which any value arriving at that input will be scaled.

By changing these values for any pair of connected output and input properties, you can control the way that values are scaled as they move from output to input.

Here is an example:

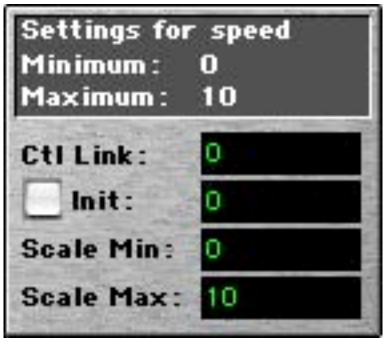


As the output property value on the left goes from 0 to 100, the input value will go from its Scale Minimum and Scale Maximum values, which have been set to 20 and 60 respectively. Thus, when the output property sends a value of 50 (halfway between 0 and 100) the value at the input will "see" the scaled of 40 (halfway between 20 and 60). You can also invert this relationship (e.g., Scale Minimum is 60 and Scale Maximum is 20) so that as the output value goes up, the input value will go down.

Whenever you add a new actor to a Scene, each input property's Scale Minimum and Scale Maximum values default to the absolute minimum and maximum value allowed by that property. Similarly, each output property's Limit Minimum and Limit Maximum also default to the absolute minimum and maximum.

To change the scaling of an input property:

- Click on the name of an input property, found just to the right of the input value box on the left side of an actor. The name will turn yellow to indicate that it is selected and an inspector with information about that property will appear.



Settings for speed
Minimum: 0
Maximum: 10

Ctl Link: 0
□ Init: 0
Scale Min: 0
Scale Max: 10

At the top is the name of the input along with the absolute minimum and maximum values allowed for this property. Below are four value edit boxes:

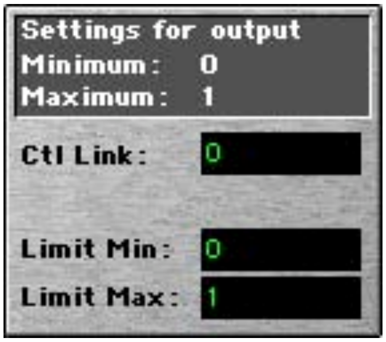
***Ctl Link**, **Init**, **Scale Min.** and **Scale Max**. (We'll discuss the "Init" box below, and the "Ctl Link" boxes in the section on Controls.)*

The values of "Scale Min." and "Scale Max" determine the range of values to which any incoming value will be scaled.

- Change Scale Minimum and Scale Maximum values to specify the range of values to which values arriving at this input will be scaled. These value edit boxes work like the ones inside any actor – you can use the mouse to scroll through the possible values, or you can enter a value into the box by clicking on it, typing the value, and pressing *enter* or *return*.

To specify the limits of an output property:

- Click on the name of an output property, found just to the left of the output value box on the left right of an actor. The name will turn yellow to indicate that it is selected and information about that property will appear just below the Scene Editor.



Settings for output
Minimum: 0
Maximum: 1

Ctl Link: 0

Limit Min: 0
Limit Max: 1

- At the top is the name of the output along with the absolute minimum and maximum values allowed for this property. Below are three value edit boxes: **Ctl Link**, **Scale Min.** and **Scale Max**. (We'll discuss the "Ctl Link" value in the section on Controls.)
- The values of "Limit Min." and "Limit Max" determine the minimum and maximum values that the output will send, and are used in combination with the Scale Minimum and Scale Maximum input property values to determine how values will be scaled from an output to an input.
- Change Limit Minimum and Limit Maximum values to specify the lower and upper limit of values that can be sent by this property. These value edit boxes work like the ones inside of any actor – you can use the mouse to scroll through the possible values, or you can enter a value into the box by clicking on it, typing the value, and pressing *enter* or *return*.

To invert the relationship between and output and an input:

- If you want to invert the relationship between the output and the input so that as the output goes up the input goes down, set Scale Minimum to a value greater than Scale Maximum.

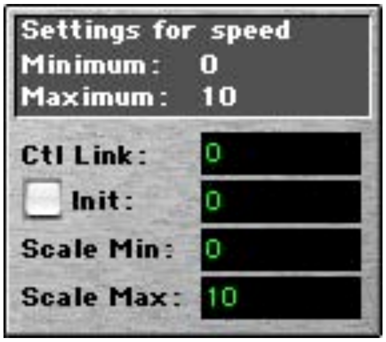
For example, if the output property ranges from 0 to 100, and its is connected to an input whose Scale Minimum is 100 and Scale Maximum is 0, then as the output property goes from 0 to 100 the input will go from 100 to 0.

Presetting a Property Value

There are situations when you may need to preset a property's value when its actor's Scene is activated. This is accomplished using the "Init" checkbox and value.

To mark a property value to be preset when its Scene is activated:

- Click on the name of an input property, found just to the right of the input value box on the left side of an actor. The name will turn yellow to indicate that it is selected and an inspector with information about that property will appear.



Settings for speed
Minimum: 0
Maximum: 10

Ctl Link: 0
□ Init: 0
Scale Min: 0
Scale Max: 10

- At the top is the name of the input along with the absolute minimum and maximum values allowed for this property.
- Click in the checkbox to the left of the word "Init" to enable initialization. Then enter the value to which the property will be initialized in the value edit box to the right.

Editing Property Values

To change the value of one of the actor's properties, do one of the following:

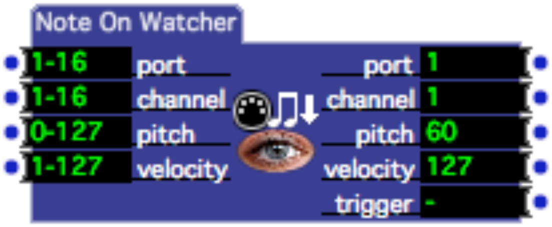
- Click on the value edit box (the black box next to the property's name) and drag the mouse up or down. The value will go up or down as you drag the mouse.
- Click in the value edit box. It will turn blue and the current value will disappear to indicate that you are about to type a value. Type the new value, and press *enter*.

Note that if the value you are editing is displayed as text (e.g., the wave type property of the Wave Generator, which can be set to sine, square, triangle, etc.) you can type the first few letters of the text and press enter. *Isadora will find the value that most closely matches what you typed and enter it for you. (It is possible that this feature may not be implemented on some third-party actors – if this is the case, you can always type a number, usually starting with 1 for the first item, to select the correct value.)*

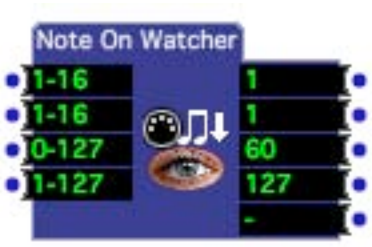
- Click in the input port (the blue dot) of a value. A combination slider/value edit box control will appear. You can edit the property's value by moving the slider's indicator up or down, or by typing into the value edit box. This feature is especially useful if you've collapsed the actor, as it is the only way you can change the value without first expanding the actor.

Collapsing/Expanding Actors

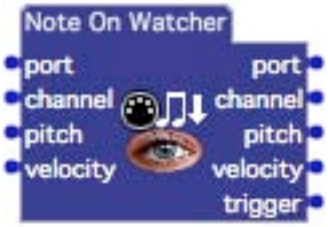
Each actor has three main components: the body (the rectangle on which the other elements sit), property value boxes, and the property value names. The latter two can be shown or hidden independently, allowing you to make an actor much smaller. Here is how the Note On Watcher actor looks in all of its possible states:



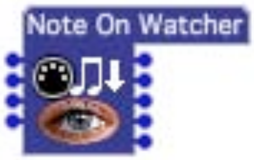
Standard



Property Names Hidden



Values Hidden



Collapsed

To make one or more actors as small as possible:

- Select the actors you wish to collapse.
- Choose **Actors > Collapse**. Isadora will hide both the value edit boxes and property titles, making the actor as small as possible.

To restore one or more actors to its standard state:

- Select the actors you wish to restore.
- Choose **Actors > Expand**. Isadora will show both the value edit boxes and property titles, returning the actor to its normal state.

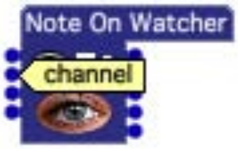
You may also hide or show the value edit boxes independently.

- To hide the value edit boxes of the currently selected actors, Choose **Actors > Hide Values**. Isadora will hide the value edit boxes of the selected actors. Choose **Actors > Show Values** to make the value edit boxes visible again.
- To hide the property titles of the currently selected actors, Choose **Actors > Hide Names**. Isadora will hide the property titles of the selected actors. Choose **Actors > Show Names** to make the property names visible again.

You can still edit any actor's input property value, even when its value edit boxes and property titles are no longer visible.

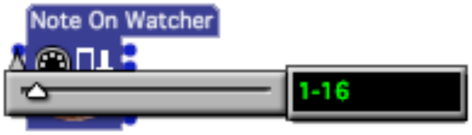
To see the title of a property when its actor is collapsed:

- Move the mouse over the input or output port (the blue dot.) The property's name will be displayed next to the mouse cursor:



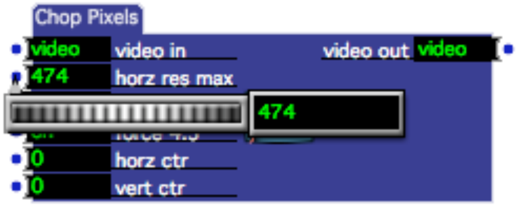
To edit the value of an input property when its value edit boxes are not visible:

- Click in the input port of an actor. A combination slider/value edit box will appear, like this:



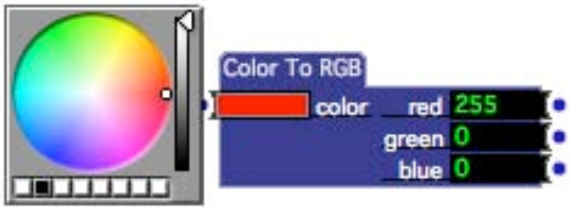
- You can edit the property's value by either dragging the slider indicator (the white triangle), clicking on the relevant input port and using the scroll on your mouse for more precise control, or, by clicking in the value edit box and typing a new value.

- If adjusting values for Actors with properties that do not have a scale min/max:



- You can edit the property's value by either dragging the wheel, clicking on the input port and using the scroll on your mouse for more precise control, or, by clicking in the value edit box and typing a new value.

- To adjust the color input of an actor, click on the color input port and select your color. Please note that to dismiss the color picker icon, click in the scene. When opened again the picker will have saved your last choice in the small square row below (the previous color selected in the example was black as can be seen by the black square).



To show or hide all actor names in a Scene:

- If the names are currently visible, choose **Actors > Hide Names** to hide them.
- If the names are currently hidden, choose **Actors > Show Names** to show them.

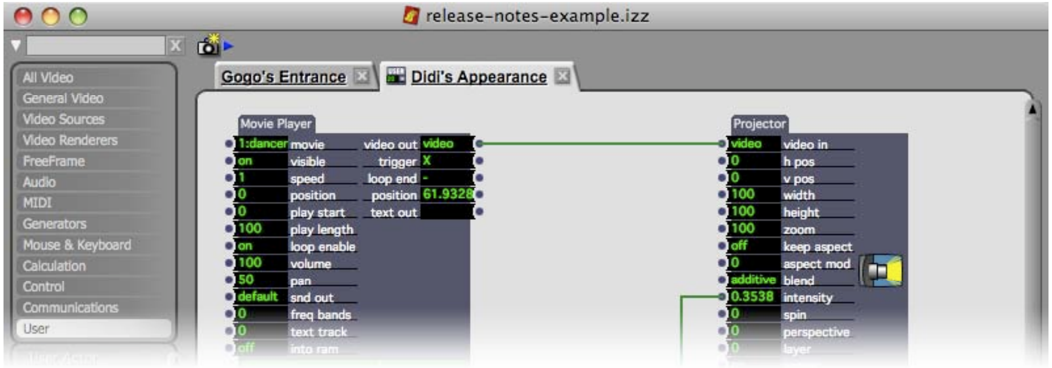
User Actors & Macros: Creating Your Own Actors

As you use Isadora, you will find that there are groups of actors that you often use together. Isadora's *User Actors* and *Macros* allow you to build your own actors from one or more Isadora actors.

User Actor and Macros work in precisely the same way, except for one: when you make changes to a User Actor, you have the option of updating every copy (also known as an *instance*) of the User Actor so they will all work in exactly the same way. This is very useful when you've have a User Actor in several scenes and you want the functionality of the other instances to stay in sync. A Macro, on the other hand, will not update copies of itself when you make changes. You would most often use a Macro when you simply wanted to logically group some actors or when you want to save screen "real estate" by embedding several actors into a smaller object.

Once you have identified a group of actors that you want to encapsulate into a User Actor or Macro, you can create one as follows: click “User” in the Toolbox Filter, drag the User Actor or Macro actor into the Scene Editor.

You then open its User Actor Editor tab by double clicking on it. The tabs look like this:



Movie Player
1:dancer movie
on visible
1 speed
0 position
0 play start
100 play length
on loop enable
100 volume
50 pan
default snd out
0 freq bands
0 text track
off into ram
video out video
trigger X
loop end -
position 61.9328
text out

Projector
video video in
0 h pos
0 v pos
100 width
100 height
100 zoom
off keep aspect
0 aspect mod
additive blend
0.3538 intensity
0 spin
0 perspective
0 layer

Inside the editor, you can add the Isadora actors that define the function of this particular User Actor. Finally, you will add User Inputs and/or Outputs to bring data into, and send data out of, the new actor. When the actor is complete, close its tab by clicking its close box and choose “Save & Update All” in the Confirm User Actor Edit dialog. (No dialog will appear for Macros, as they do not update copies of themselves.) The user actor now exists in your Scene, and can be copied, pasted and otherwise treated like any other Isadora actor.

Once a User Actor or Macro has been created, you can open its editor tab at any time and change its functionality without disturbing the way in which the owning Scene operates. Additionally for User Actors, you have the option of updating all other instances of this actor to match the changes you’ve just made, or to create a new, unique instance of the actor that is distinct from the previous versions.

User Actors are an advanced feature - you may want to review the User Actor tutorial in the Tutorials section to fully understand how they work.

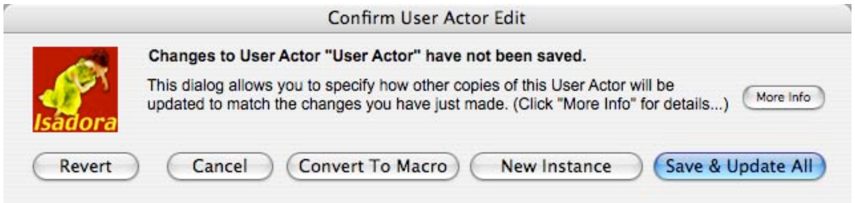
User Actor Synchronization Feature (v1.3)

As of version 1.3, you are able to automatically synchronize all copies of a given User Actor after you’ve made changes to it. This allows you to easily ensure the functionality a given User Actor is the same throughout an Isadora document.

Whenever a new User Actor is created, it is assigned a unique identifier. Each User Actor with the same identifier is called an ***instance***, in other words, a kind of “copy” of the master User Actor. This identifier is maintained for all instances of the User Actor, whether it is created by copying and pasting, or by dragging it into the Scene Editor from the Toolbox. Whenever you make a change to one instance of a given User Actor, you are given the opportunity to automatically update ***all*** instances (i.e. all copies with the same unique identifier) throughout document and in the toolboxes so that they match the newly edited version. Any existing links into or out of the User Actor are maintained, as long as the corresponding User Input or

Output was not deleted, and if the types are compatible. (If you change a User Input or Output from a number type to a video type, for instance, the link will be broken because these types are not compatible.)

When you close a User Actor editor tab, you are presented with a dialog that allows you to choose if you'd like to update all matching copies to reflect the recent changes, or to create a new instance of the actor.



Changes to User Actor "User Actor" have not been saved.

This dialog allows you to specify how other copies of this User Actor will be updated to match the changes you have just made. (Click "More Info" for details...)

The meaning of each of the choices is described below.

Save & Update All

Updates all instances of this User Actor (including any copies in the Global or Local User Actor Toolbox) so that they exactly match the changes you've just made.

New Instance

Create a new instance of this User Actor that is distinct from all previous instances. Existing instances are left unchanged.

Convert to Macro

The User Actor is assigned a new, unique identifier and is marked as being a Macro. This actor will no longer preset the "Confirm User Actor Edit" dialog or attempt to update other copies of itself throughout the file or the toolbox.

Cancel & Revert

You may also choose "Cancel", which will return you to the User Actor editor. If you choose "Revert", all of the changes you've made since opening this User Actor editor will be discarded. (You can actually get the changes back, one step at a time, by choosing **Edit > Redo**.)

Further details regarding all of these choices can be found in the section below entitled **Saving the User Actor after an Edit**.

Considerations for User Actors Created Before v1.3

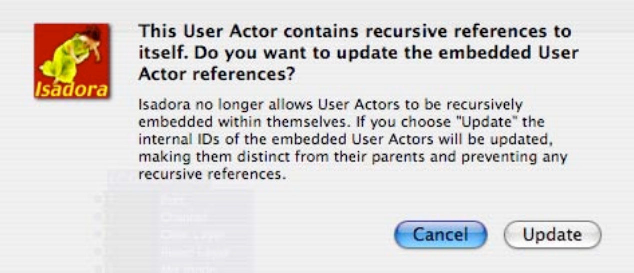
User Actors created prior to version 1.3 of Isadora do not have the unique identifier that allows the automatic User Actor synchronization described above. In essence, User Actors created before 1.3 function as what are now called Macros; when you close the editor for a pre v1.3 User Actor, you will notice that no dialog box will appear asking if you'd like to "Save & Update All", etc. This is because Isadora cannot identify which User Actors are instances of the User Actor you've just edited. In other words, you can continue to use and edit pre-v1.3 User Actors as you did in previous versions of the program.

But, you may want to update the User Actors in your document to make the new features available. To do this, simply select the User Actor and choose **Actors > Update User Actor to New Format.**

No Recursive References Allowed

Because pre v1.3 User Actors did not offer the "Save & Update All" feature, you were allowed to recursively reference those actors, i.e. a copy of a given User Actor could be placed inside itself. This is no longer allowed in v1.3 and later, because it would lead to an infinite loop when attempting to update the actors.

If you attempt to double-click a pre v1.3 User Actor that contains embedded references to itself, you will see the following dialog.



This User Actor contains recursive references to itself. Do you want to update the embedded User Actor references?

Isadora no longer allows User Actors to be recursively embedded within themselves. If you choose "Update" the internal IDs of the embedded User Actors will be updated, making them distinct from their parents and preventing any recursive references.

If you choose "Cancel", the User Actor Editor will not be opened. If you choose "Update" the embedded User Actors will be converted to the new format and assigned a new, unique identifier to ensure they are distinct from the "parent" User Actor.

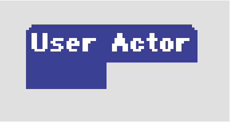
User Actors Files Before and After v1.3

Prior to version 1.3, Isadora User Actors files were saved with the extension "iza". The extension for 1.3 and later User Actors is "iua" (Isadora User Actor). Isadora will continue to load Global User Actors in the Global User Actor Folder with the "iza" extension. You can also use the "Place…" command to add "iza" files to your document. But all newly created User Actor files will have the extension "iua" to indicate that they are saved in the new format.

Creating and Editing a User Actor

To add a User Actor:

- Click "User" in the Toolbox Filter. Then, select the User actor by clicking on it, drag it into the Scene, and click again to deposit it. You will see an actor with no inputs and no outputs.



To edit a User Actor:

- To open a User Actor's editor tab, double-click the User Actor. A new tab will appear at the top of the Scene editor, displaying the name of your User Actor. In this editor you add Isadora actors, as well as User Input and User Output actors to define the functionality of your actor.

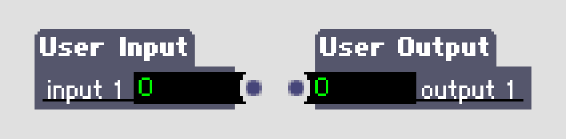
Adding Isadora Actors to a User Actor:

- To add an Isadora actor into a User Actor, click on the actor in the User Actor Editor's Toolbox, and deposit it into the User Actor's editor.

Creating and Editing User Inputs and Outputs

Adding inputs or outputs to a User Actor:

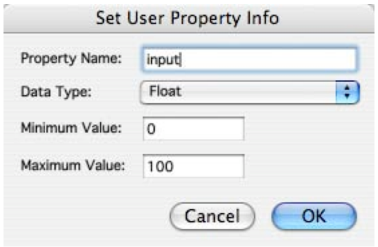
- Click on "User" in the Toolbox Filter. There you will find the User Input and User Output actors.
- Drag a User Input and/or User Output to the Scene Editor and deposit it by clicking. They will look like this initially:



- After adding a User Input or User Output actor inside of the User Actor Editor, a corresponding input or output will appear as part of the User Actor that you are modifying.
- Important Note: At the moment you connect a User Input or User Output to another actor, all of the properties of the User Input or Output mutate to match the properties of the actor to which it was connected. This includes the Property Type (integer, float, video, etc.), Minimum and Maximum values, and the Scale Min/Max or Limit Min/Max values.

Setting input and output properties:

- Double-click the User Input or User Output actor. A dialog box will appear that allows you to define its characteristics:



Set User Property Info

Property Name: input

Data Type: Float

Minimum Value: 0

Maximum Value: 100

- Set the name of this property, as it will appear in your User Actor, by typing the name into the “Property Name” text edit box.
- Set the data type using the “Data Type” pop-up menu. There are five possibilities:

  1. Match Property
  2. Integer – Whole numbers with no decimal point
  3. Float – Numbers with a decimal point
  4. Trigger – A trigger input
  5. On/Off – An on or off (1 or 0) only input
  6. Video – A video stream
  7. Movie – A movie file number from the Media Window
  8. Audio File – An audio file number from the Media Window
  9. Picture File – A picture file number from the Media Window
  10. MIDI File – A MIDI File number from the Media Window
  11. 3D File – A 3D File number from the Media Window

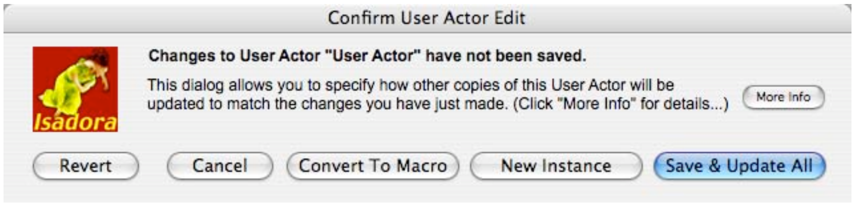
  The most common setting is Match Property. When this option is selected, the User Input or Output will automatically adapt itself to match the characteristics of the input or output property to which it is connected. (E.g., if you have a User Input, and you change the Scale Min or Scale Max of the property to which it is connected, the User Input’s Scale Min and Scale Max will automatically be updated to match the new settings.)

  When you choose Integer or Float you can set the absolute minimum and maximum values for this property using the “Minimum Value” and “Maximum Value” fields. (Note: to use the lowest possible value for the selected Data Type, type MIN into the Minimum Value field. To specify the highest possible value, type MAX into the Maximum Value field.)

  Like inputs and outputs on normal Isadora actors, the Minimum and Maximum Value fields determine the absolute minimum and maximum value that can be received by this input, or that can be sent out of this output. However, like any input or output, these limitations can be further constrained by using the inspector window to change the Scale Minimum, Scale Maximum, Limit Minimum and Limit Maximum values as needed.
- Click the OK button to confirm your settings.

Saving the User Actor After an Edit (v1.3)

After you've edited a User Actor and you choose **File > Close**, you will be presented with the following dialog box:


Confirm User Actor Edit

Changes to User Actor "User Actor" have not been saved.

This dialog allows you to specify how other copies of this User Actor will be updated to match the changes you have just made. (Click "More Info" for details...)

The five choices have the following meanings:

- **Save & Update All**: All instances of the User Actor you have just edited will be updated to reflect the changes you just made. This includes all User Actors in all currently open Isadora documents, as well as all instances in the Global or Local Actor Toolboxes.

  Any existing links into or out of the User Actor are preserved, as long as the corresponding User Input or Output was not deleted and if the types are compatible. (If you change a User Input or Output from a number type to a video type, for instance, all corresponding links will be broken.)

  Isadora also attempts to preserve the input values for the other instances, even though the internal structure of the actor will be updated to exactly match your recent edits. This behavior recognizes that not every input to a User Actor will be driven by some output value; sometimes the inputs are just edited manually, and such values should be preserved In some cases the input value cannot be maintained; for instance, when a numeric input type is changed to a text input type, the value cannot be preserved because the types are incompatible. Another case is when the range of a User Input was changed inside the User Actor; in this case, the old value is limited to the current possible values.
- **New Instance:** Choosing this option assigns a new unique identifier to this User Actor, making it distinct from any existing copies. Choose this option if you intend to make a variation of the User Actor and do not want to change the functionality or layout of other matching actors in the open documents or in the Global or Local Actor Toolboxes.
- **Convert to Macro:** Choosing this option assigns a new, unique identifier and is marked as being a Macro. This means that when you make changes to this actor, it will no longer attempt to update other copies of itself throughout the file or the toolbox. If you later want to convert this into a User Actor again, you can do so by selecting the actor and choosing **Actors > Convert to User Actor**.
- **Cancel:** The editor window is not closed, and nothing is updated.
- **Revert:** If you choose "Revert", all of the changes you've made since opening this User Actor editor will be discarded. (You can actually get the changes back, one step at a time, by choosing **Edit > Redo**.)

Note that if you are editing a User Actor saved prior to v1.3, this dialog box will not appear. This is because the User Actor does not have the unique identifier required to allow the automatic synchronization of User Actor instances. You can convert this User Actor to the new format by saving it to the Global User Actor toolbox.

Converting a Macro to a User Actor (v1.3)

You can choose to convert a Macro to a User Actor at any time. If you choose to do this, the actor will be assigned a new, unique identifier and marked as a User Actor. If you later edit this actor or copies of it, you will be presented with the "Confirm User Actor Edit" dialog as you would with any User Actor.

Converting a User Actor to Macro:

- Select the Actor
- Choose **Actors > Convert Macro to User Actor**.

Adding User Actors to the Toolbox

If you create a User Actor that you would like to use frequently, you can add it to the Global Toolbox. After you do so, the actor will appear in the User section of the Toolbox even after you quit and restart Isadora. You can drag this actor into the Scene Editor like you would any other.

You may also add an actor to the Local Toolbox. In this case, the user actor is stored along with your Isadora document. This feature may be useful if you create user actors that would only be needed within a particular file.

Choosing a Folder to Hold Your Global User Actors:

Before you can store any actors to the Global Toolbox, you must choose a folder to which they will be saved. This is the folder that Isadora will look in to find your user actors the next time it is started up.

- Choose **Actors > Set Global User Actor Folder**. A dialog will appear that allows you to select a folder.
- Click OK to confirm your selection.

To Add a User Actor to the Global Toolbox:

- Select the User Actor.
- Choose **Actors > User Actor To Global Toolbox**. The Toolbox will automatically switch to the User Actor Group and the new actor will be shown there.
- Note that if the User Actor you are saving was created prior to v1.3, it will be converted to the new format and saved with a new unique identifier.

You can only add a User Actor to the Global Toolbox if there is not an actor with that name already in the Toolbox. Isadora will warn you with an alert box if the name is already in use and you can choose to replace the actor or cancel. Otherwise, make sure actor names are visible, and then choose **Actors > Rename Actor**. A text edit box will appear. Type the new, unique name and press the Return key. Then follow the procedure above to add the User Actor.

To Add a User Actor to the Local Toolbox:

- Select the User Actor.
- Choose **Actors > User Actor To Local Toolbox**. The Toolbox will automatically switch to the User Actor Group and the new actor will appear be shown there.

You can only add a User Actor to the Local Toolbox if there is not an actor with that name already in the Toolbox. Isadora will warn you with an alert box if the name is already in use and you can choose to replace the actor or cancel. Otherwise, make sure actor names are visible, and then choose **Actors > Rename Actor**. A text edit box will appear. Type the new, unique name and press the Return key. Then follow the procedure above to add the User Actor.

To Remove a User Actor from the Toolbox:

- In the Toolbox, click on the User Actor you want to remove. Below the Toolbox, a small trashcan will appear.
- Move the cursor to the trash can – the cursor will change into a downward pointing arrow.
- Click on the trashcan. The User Actor will be removed from the Toolbox.

To Save an Individual User Actor to Disk:

You may want to share a User Actor with another Isadora user. To facilitate this, you can save an individual User Actor.

- Select the User Actor.
- Choose **Actors > Save User Actor..**. A save file dialog will appear.
- Using the file dialog, name your user actor and chose the place to which it will be saved. Then click OK.
- Note that if the User Actor you are saving was created prior to v1.3, it will be converted to the new format and saved with a new unique identifier.

To Bring a Saved User Actor into the Scene Editor:

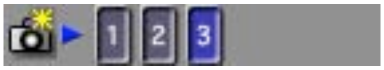
If you have received a User Actor file and you would like to bring it into your document, use the “Place User Actor” command.

- Choose **Actors > Place User Actor..**. An open file dialog will appear.
- Select the User Actor file in the dialog.
- Click OK.
- The actor will appear in the Scene Editor as if you had just clicked on it from the Toolbox. Position the actor within the Scene window and click to deposit it.

Storing and Recalling Scenes with Snapshots

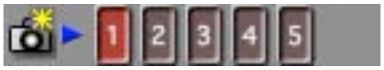
The Snapshots feature of Isadora allows you to memorize the current value of all of input ports of all of actors within a Scene. You can then use these snapshots to restore the actor's settings. This becomes useful when you want to create several variations of one scene and recall those settings later. The recall of Snapshots can be done either interactively or via operator input.

Taking a snapshot is as easy as clicking on the camera icon at the top left of the Scene Editor, or by choosing **Scenes > Take Snapshot**. As you take the snapshots, they appear to the right of the camera along the top edge of your Isadora document.



If you make changes to a scene and want to update the currently selected snapshot, you can do so by choosing **Scenes > Update Current Snapshot** or by holding down the control key and clicking the snapshot.

Note that once if you add more actors after you have taken one or more snapshots, the snapshots won't actually have enough information to restore the entire scene. To let you know that this is the case, if you add or paste actors into a Scene after taking one or more snapshots, a the snapshots will turn red indicate that they are only partially valid, i.e. they don't have a total picture of the current scene.

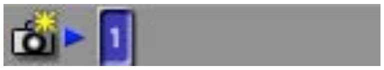


If you take more Snapshots after this point, they won't be red. You can choose to delete all of the invalid snapshots by choosing the **Scenes > Clear Invalid Snapshots**.

Storing and Recalling Snapshots

To take a Snapshot of a Scene:

- Click on the camera, at the top left of the Scene Editor, or choose **Scenes > Take Snapshot**. After you do, an indicator with an identifying number will appear to the right of the Camera.



To recall a Snapshot of a Scene:

- Click in the Snapshot (the numbered circle) you want to recall.

To update the contents of a Snapshot:

- Click on the snapshot that you want to update to make it active.

- Choose **Scenes > Update Current Snapshot** or by holding down the control key and clicking the snapshot. A new snapshot of the current Scene will replace the old.

To Delete a Snapshot:

- Click on the Snapshot you want to delete and drag it above or below the Snapshots area. When you do, the cursor will change into a Trash Can.
- Release to mouse to delete the Snapshot.

To Delete Invalid Snapshots in a Scene:

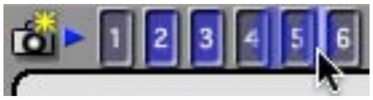
- Choose **Scenes > Clear Invalid Snapshots**. All of the Snapshots that are red will be deleted.

To Delete All Snapshots in a Scene:

- Choose **Scenes > Clear All Snapshots**. All of the Snapshots for the currently selected Scene will be deleted.

To Reorder Snapshots:

- Select one or more snapshots using the shift key.
- Click in one of the selected Snapshots, and drag the mouse to the right or to the left.
- As you drag, a white cursor will appear between the Snapshots. This shows where the Snapshots you are dragging will be inserted when you release the mouse. In the example below, the cursor is between scenes “5” and “6”.



- When the cursor is displayed at the location where you would like the Snapshots to be inserted, release the mouse button. The Snapshots will move to that location.

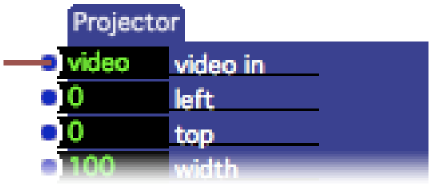
To Renumber Snapshots:

- Choose **Scenes > Renumber Snapshots**. All of the Snapshots will be renumbered starting from 1.

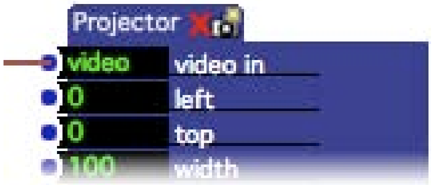
Disabling Snapshot Recall for Specific Actors (v1.3)

Sometimes it is useful to prevent an actor from having its input values changed when recalling a snapshot. You can control which actors respond when a snapshot is recalled using the **Enable Actor Snapshot** and **Disable Actor Snapshot** items in the **Actors** menu.

Initially an actor will respond if it was in the Scene when a Snapshot was taken. If, however, you select one or more actors and choose **Actors > Disable Actor Snapshot**, a special icon will be added to the actor’s title to indicate that it will not respond when a snapshot is recalled.



Before



After

Note that this setting has does not change the way a snapshot is *taken*. All of the input of all actors are always recorded when a snapshot is taken. Instead, the **Disable Actor Snapshot** features prevents the actor from responding to the stored values when a snapshot is recalled.

To Disable Snapshot Recall on Specific Actors.

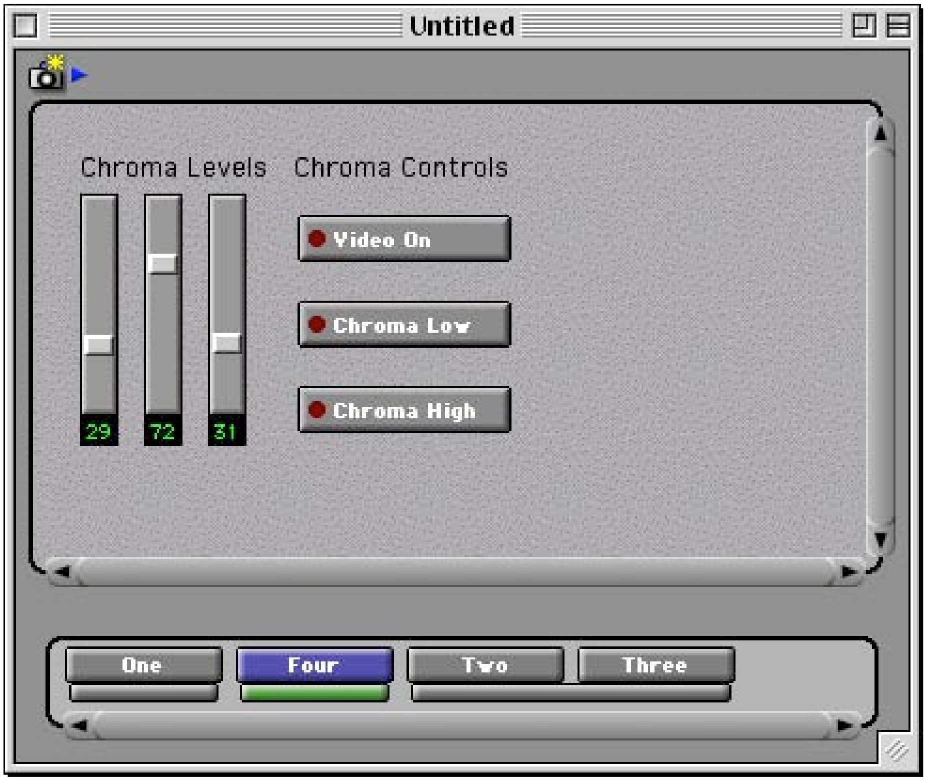
- Select the actors you will to disable in the Scene Editor.
- Choose **Actors > Disable Actor Snapshot**. If the actor names are visible, an icon will appear to the right of the actor's name to indicate it is not responding to snapshots.

To Enable Snapshot Recall on Specific Actors.

- Select the actors you will to enable in the Scene Editor.
- Choose **Actors > Enable Actor Snapshot**. If the actor names are visible, the Snapshot Disable icon shown to the right of the actor's name will disappear, indicating this actor is again responding to snapshots.

Using Control Panels

Overview



An Example Control Panel

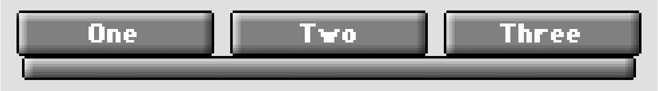
The Control Panels feature of Isadora allows you to create a user interface for a Scene or group of Scenes. Each Control Panel communicates with the Actors inside the Scene(s) with which it is associated via a variety of Isadora Controls including Sliders, Buttons, Dials, etc. The Control Panel Editor occupies the same area as the Scene Editor – you toggle between the two views using **Controls > Show Controls** and **Controls > Hide Controls** menu commands. You may also see the Control Panel and the actors in the current Scene by choosing **Controls > Show Actor/Control Split**.

You can choose to have one Control Panel for an entire document, or to have several Control Panels, each associated with a group of one or more Scenes. Whenever a Scene is activated, its associated Control Panel is also activated, which in turn makes the controls for that panel visible.

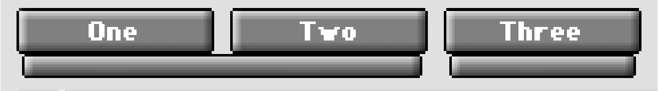
Each control has one or more “Control IDs”, numbers that uniquely identify that control. To have an actor input “listen” to a particular control, you will set the Control ID Link for that input (accessed via a pop-up window that is shown when you click on the *title* of an input in the Scene Editor). From that point on, whenever the control is adjusted the actor input(s) to which it is linked will “hear” the values coming from the control. Similarly, it is possible to link an actor output to a control.

This can sometimes be useful if you want to monitor a output changing value in the control panel, e.g., by connecting the position output of the Movie Player to a Slider control.

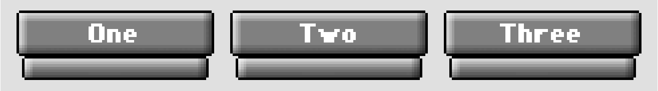
A horizontal bar drawn below Scenes in the Scene List represents control Panels visually. The bar indicates the Scene or Scenes with which the Control Panel is associated. If a Control Panel is associated with two or more Scenes, the bar below those scenes will be unbroken.



Same Control Panel for All Scenes



Control Panel for Scenes One & Two, different Control Panel for Scene Three



Different Control Panels for Each Scene

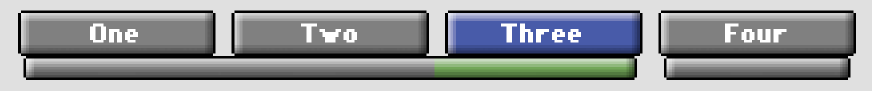
It is important you understand that when editing a Control Panel associated with more than one Scene, that you are changing the panel for all of those Scenes.

You can create a separate Control Panel for a group of Scenes using the Split Control Panels command from the menu. The inverse can be accomplished by the Join Control Panels command.

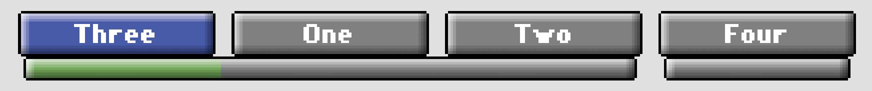
Editing Scenes and Their Control Panels

The Control Panel associated with a Scene travels with that Scene when it is copied or cut. After a paste, Isadora will group all Control Panels that are the same, indicating that group by an unbroken bar below the scenes. Otherwise a gap will appear to show that there is a separate Control Panel.

Take a look at the following examples.

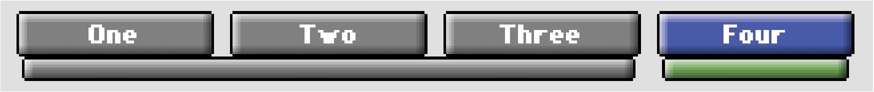


Select Scene Three and Cut

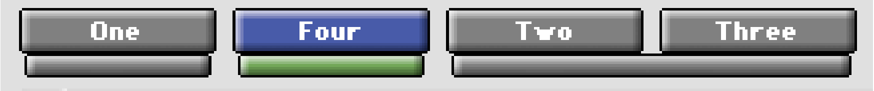


Paste Before Scene One

In the example above, Scene Three is cut and then pasted before Scene One. Since the Control Panel for Scene Three and Scene One were the same, the bar below the first three Scenes remains unbroken.



Select Scene Four and Cut



Paste After Scene One

Now, Scene Four is cut and then pasted after Scene One. Since the Control Panel for Scene Four is different than both Scene One and Scene Two, the bar is broken after Scene One and before Scene Two.

Communicating with Actors

The way in which a Control communicates with an Actor's property is through its Control ID. When you change a control's value, it sends its Control ID and value to the currently active Scene. Actor properties can be linked to a particular Control ID, so that if a message arrives from a controller the property will be set to the new value.

You can also choose to have the controller "listen" to the value of its linked property so that the controller always shows the current value of that property. This is useful if you need to have a controller show the current value of an input property, even though it is being changed by messages sent from another actor.

Creating/Deleting Control Panels using Split & Join

Since the Control Panels travel with the Scenes as you edit them, there are separate commands that allow you to create or delete a Control Panel. They are the Split Control Panel and Join Control Panel, respectively.

For both commands, you must first click in the space between two Scenes so that the blinking cursor appears.

If the Control Panel for the Scenes on either side of the blinking cursor is the same (i.e. an unbroken bar), the Split Control Panel command will be enabled. When you perform this command, the Control Panel for the Scenes to the left remains unchanged, while a new Control Panel is created for the Scenes to the right.

If the Control Panels for the Scenes on either side of the blinking cursor are different (i.e. a cursor is blinking between a broken bar) the Join Control Panels command will be enabled. When you perform this command, the Control Panel for the Scenes to the right are discarded, and the Control Panel for the Scene to the left now extends until the next Control Panel.

To create a new Control Panel for a group of Scenes:

- Click in the space just to the left of the Scene where you want the new Control Panel to appear. A blinking cursor will appear.
- Choose **Controls > Split Control Panels**. A new, empty control panel will be created and added to the Scene to the right. The bar between the two scenes will now be broken, indicating that they have two separate control panels. The Control Panel for the Scene to the left will be unchanged, while the Control Panel to the right will be empty.

To delete an existing Control Panel from a group of Scenes:

- Click in the space between Scenes where one Control Panel ends and the next begins (i.e. where the bar below the Scenes is broken.) A blinking cursor will appear.
- Choose **Controls > Join Control Panels**. The control panel to the right will be deleted. The bar between the two scenes will now be unbroken, indicating that they have one control panel. The Control Panel for the Scene to the left will be unchanged. The Control Panel to the right will has been deleted.

Showing/Hiding Control Panels

To see the currently active Control Panel:

- Choose **Controls > Show Controls**. The Control Toolbox and Control Panel Editor will appear, occupying the same area as the Actor Toolbox and Scene Editor.

Note that the Group Select buttons above the Actor Toolbox disappear, as there is only one group of controls. This gives you a clear indication that you are looking at a Control Panel editor, not a Scene Editor.

To see the currently active actors in the Scene Editor:

- Choose **Controls > Hide Controls**. The Control Toolbox and Control Panel Editor will reappear and the Scene Editor will replace the Control Panel Editor.

Using / Editing Control Panels

The Control Panels can be either in Edit Mode or Use Mode. When in edit mode, you can move the controls, change their size, and edit their settings. When in Use Mode, the controls are active and respond to mouse clicks as appropriate, i.e. clicking on a Slider control causes the indicator to move, changing the control's value. You can go between modes using the state with the **Edit Controls/Use Controls** menu item in the **Controls** Menu.

To Use Control Panels:

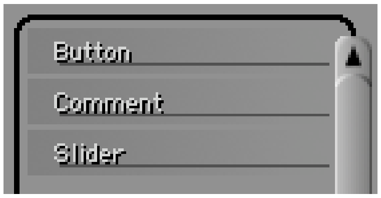
- Choose **Controls > Use Controls**. The Control Toolbox will disappear, and the Control Panel will expand to fill the entire Isadora document. The background of the Control Panel will change to give a further visual indication that it is in use.

To Edit Control Panels:

- Choose **Controls > Edit Controls**. The Control Panel's will move to the right, leaving enough room for the Control Toolbox, which will reappear to the left. The background of the Control Panel will change to give a further visual indication that it is in edit mode.

Adding New Controls to a Control Panel

The controls available in Isadora can be found in the Control Toolbox, which is located along the left side of an Isadora document.



To add a new control to a Control Panel:

- Click the control you want to add in the Toolbox. The cursor will change into a plus sign to let you know you have selected a control.
- Move the mouse into the Control Panel Editor. As you do, you will see the control you selected appear, following the movements of your mouse.
- Once you have the control in the position you desire, click the mouse to confirm its addition to the Control Panel.
- Note: You can click again the Toolbox or hit the Escape (esc) key to cancel the addition of the control.

Linking a Control to an Actor Input or Output

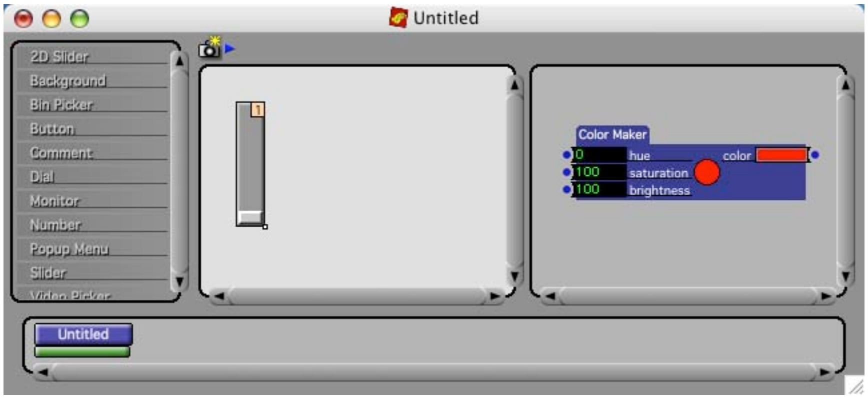
After laying out your controls, you will likely want to link those controls to properties of actors in the Scene(s) associated with your Control Panel. An actor property is linked to a control through its Control ID.

Whenever the value of a control changes, it broadcasts its Control ID and its new value to the currently active Scene. Any input properties linked to that control will change their value based on the new value of the control.

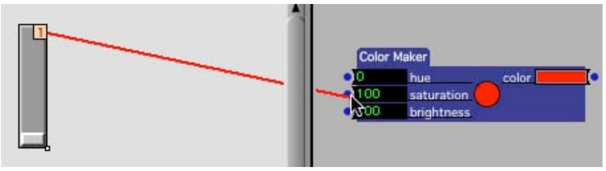
Conversely, whenever an output property is linked to a control and its value changes, the linked controls will change their value based on the output property's new value. This allows you to use controls as an output, displaying an output property's current value.

To link an Actor input property to a Control:

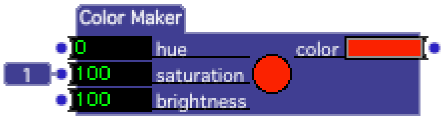
- Choose **Controls > Show Actor/Control Split**. When you do this, the Control Panel and the contents of the current Scene will both become visible as shown below.



- Click in the Control ID shown at the top right of the control, and drag the mouse. A red line will track your mouse as you do.



- Move the mouse to the input of the actor to which you want to link it and release the mouse.
- Once you have done this, a small "link indicator" will appear to the left of the input, showing the Control ID linked to that actor input.



Once you see the link indicator, you know that whenever a control with that Control ID changes value, this input property will "see" that change, and automatically set its value appropriately.

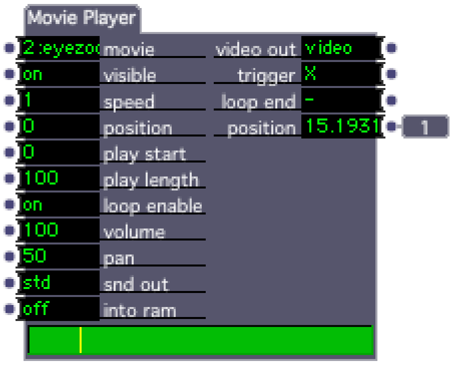
- Note that if you want the control to track the value of the input property when it is changed by another actors or when you change it manually, you will need to turn on the "Show Value of Linked Input Properties" checkbox in the Control's Settings Dialog.

Once you are done linking controls to actors, you can choose **Controls > Show Actor/Control Split** again to hide the actors and only show the Control Panel.

To link an Actor output property to a Control:

While controls are most commonly linked to actor inputs, sometimes you may want to link a control to an output, so that you can monitor some changing value in the Control Panel. To link a control to an actor output, do the following:

- If the Control Panel is not currently visible, choose **Controls > Show Controls**.
- Ensure that **Controls > Show Actor/Control Split** is turned on (has a checkmark.) If it does not, choose it now.
- Click in the Control ID shown at the top right of the control, and drag the mouse. A red line will track your mouse as you do.
- Move the mouse to the output of the actor to which you want to link it and release the mouse.
- Once you have done this, a small "link indicator" will appear to the right of the output, showing the Control ID linked to that output.



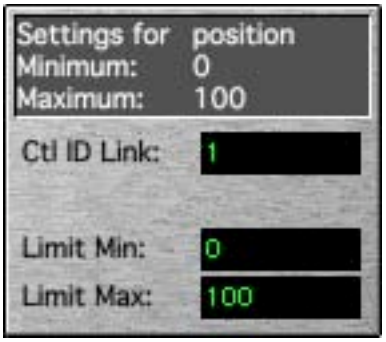
Once you see the link indicator, you know that whenever a control with that Control ID changes value, this input property will "see" that change, and automatically set its value appropriately.

- Note that if you want the control to track the value of the input property when it is changed by another actors or when you change it manually, you will need to turn on the "Show Value of Linked Input Properties" checkbox in the Control's Settings Dialog.

Unlinking a Control from an Actor Input or Output

To unlink an Actor input property to a Control:

- Click on the actor's input or output title. A small popup window will appear.



Settings for position
Minimum: 0
Maximum: 100

Ctl ID Link: 1

Limit Min: 0
Limit Max: 100

- Click on the value edit box to the right of Ctl ID Link. The edit box will turn blue to indicate that it is ready for you to type a number.
- Type the number 0 and hit return or enter. Once the Ctl ID Link is set to zero, it is no longer linked to any control.

Selecting and Deleting Controls

To select a control:

- Click on the control with the mouse.

To select multiple controls:

- Hold down the shift key while clicking on the controls you want to select.

To select a group of controls:

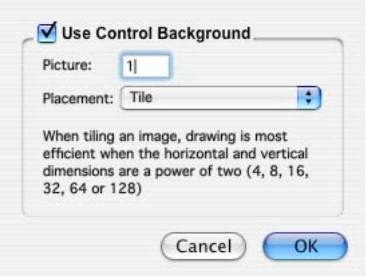
- Click on the Control Panel Editor’s background, and drag the mouse. A selection rectangle will appear. When you release the mouse, any controls under the selection rectangle will be selected.
- If you hold down the shift key before you click, the controls under the selection rectangle will be added to the current selection.

Using a Picture as a Background (v1.1)

You can choose to fill the background of the Control Panel with a Picture in the Media Window. You may either draw the picture as is, tile it so that a small image fills the entire Control Panel, or scale the image to fit the control panel

To choose a background for a control panel:

- Choose **Controls > Set Control Panel Background…** The following dialog will be shown:



☑ Use Control Background

Picture: 1

Placement: Tile

When tiling an image, drawing is most efficient when the horizontal and vertical dimensions are a power of two (4, 8, 16, 32, 64 or 128)

- Check the **Use Control Background** checkbox to use a Picture as a background.
- In the **Picture** field, type the media index of a Picture in the Media Window. If the picture doesn't exist, a solid gray background will be used.
- Use the **Placement** popup to determine how the picture is drawn. Choose **Tile** to repeat the image over and over to create a continuous background. Choose **Top Left** to draw the image once, aligned to the top left of the control panel. Choose **Scale To Fit** to scale the image to match the size of the control panel.

IMPORTANT NOTE: If you choose the Tile option, it is very important that you use an image whose horizontal and vertical dimensions match one of the following values: 4, 8, 16, 32, 64, or 128. (The horizontal and vertical dimensions don't have to match each other, e.g., 16 x 64 is OK.) When the horizontal and vertical dimensions match one of these sizes, optimized routines are used to tile the background. If either dimension is not one of these values, drawing can be ***very slow*** – especially for small images!

Positioning, Sizing and Aligning Controls

Isadora gives you several ways to organize and beautify your Control Panel. Beyond the normal dragging, you can

1) Use the arrow keys to precisely move or size your controls

2) Use the alignment commands to align and/or distribute your controls.

3) Lock controls in place so that they aren't moved accidentally during editing.

This section covers all of these editing features.

To move controls within the Control Panel Editor:

- Select one or more controls.
- Click on one of the selected controls and drag. The controls will follow the movements of your mouse until you release the mouse button, or
- You can also use the up, down, left or right arrow keys on your computer keyboard to move the controls. If grid snapping is on, they will move by one grid unit. Otherwise, they will move by one pixel.
- To move a control five units at a time, hold down the command key while pressing the arrow keys.

To change a control's size:

- Click in its size box (the small right rectangle drawn to the bottom-right of the Control) and drag. The Control will resize as you drag, following the movements of your mouse.
- If you hold down the shift key and press one of the arrow keys, all selected controls will also resize. Shift-right-arrow makes the control wider, shift-left-arrow makes is thinner. Shift-down-arrow makes it taller, shift-up-arrow less tall. If grid snapping is on, they will resize by one grid unit each time you press the arrow key. Otherwise, they will change size by one pixel.
- Release the mouse when the desired size is set.

To align a group of controls:

- Select two or more controls.
- Choose **Controls > Align Left**, **Align Horizontal Center**, **Align Right**, **Align Top**, **Align Vertical Center**, or **Align Bottom** to align all specified edge of the selected controls

To distribute a group of controls evenly:

- Select two or more controls.
- Choose **Controls > Distribute Horizontally** or **Controls > Distribute Vertically** to distribute the selected controls in the specified direction.

To place controls in front of other controls:

- Select one or more controls.
- Choose **Controls > Bring to Front** to place all of the selected controls in front of other controls in the panel

To place controls behind other controls:

- Select one or more controls.
- Choose **Controls > Send to Back** to place all of the selected controls in behind of other controls in the panel

Editing Controls

To delete controls:

- Select one or more controls.
- Choose **Edit > Clear** or press the **Delete** key. Isadora will delete the selected controls.

To cut or copy controls:

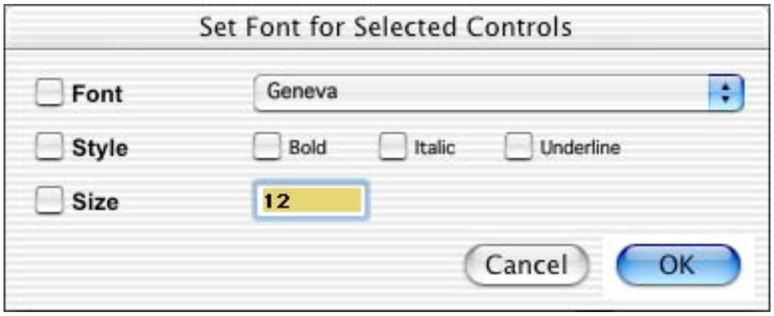
- Select one or more controls.
- Choose **Edit > Cut**. Isadora will cut the selected controls, or
- Choose **Edit > Copy**. Isadora will copy the selected controls.

To paste controls:

- Make sure that the Control Panel Editor is active by clicking on its background.
- Choose **Edit > Paste**. Isadora will paste the controls that you cut or copied previously, offsetting their position slightly from their original position. Note that normally the Control IDs for the pasted controls will automatically be updated to avoid conflicts with other controls in the Control Panel. You can disable this behavior by unchecking **Auto Renumber ID Conflicts** in the **Control** menu.
- The newly pasted controls will all be selected, so you can click on any one of them and drag to move them to a new location.
- You can choose **Edit > Paste Over** to paste the controls without offsetting them from their original position. This can be useful if you want to use the arrow keys to move the new controls into position. Note that normally the Control IDs for the pasted controls will automatically be updated to avoid conflicts with other controls in the Control Panel. You can disable this behavior by unchecking **Auto Renumber ID Conflicts** in the **Control** menu.

Setting the font, font style and font size for a group of controls:

- Select the controls
- Choose **Controls > Set Font for Selected Controls**. A dialog box will appear.



Set Font for Selected Controls

□ Font Geneva

□ Style □ Bold □ Italic □ Underline

□ Size 12

- To change the font, choose a new font from the pop up menu. When you do, the **Font** checkbox will automatically be checked.
- To change the typeface, check the **Bold**, **Italic**, or **Underline** checkboxes. When you do, the **Style** checkbox will automatically be checked.
- To change the size, type a number into the text box to the right of the **Size** checkbox. When you do, the **Size** checkbox will automatically be checked.
- If you decide you don't' want to change the font, style or size, uncheck the corresponding checkbox.
- Click OK. The font, style, and size of the selected controls will be changed as specified.

Locking Controls

You can also lock a control in place, so that they cannot be moved. This is especially useful when applied to the Background control, as you won't accidentally move the background as you place other controls on top of the background. Note however that you can still cut, copy, or paste locked controls.

To lock controls so they can't be moved:

- Select one or more controls.
- Choose **Controls > Lock Selected Controls**. Note that the selection indicator (the blue border around the control) now changes to red for all locked controls. This gives you a clear visual indication that they are locked.

To unlock controls so they can be moved:

- Select one or more controls.
- Choose **Controls > Unlock Selected Controls**. Note that the selection indicator (the blue border around the control) now changes to blue for all unlocked controls. This gives you a clear visual indication that they are no longer locked.

Using the Grid Snap Feature

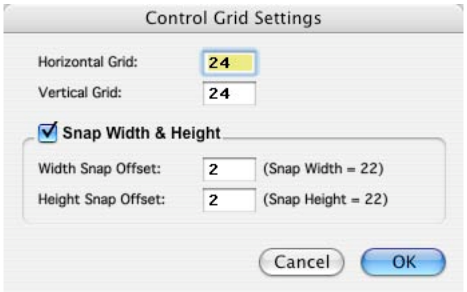
To help you organize your controls, the Control Panel Editor has a Grid Snap feature that allows you to define a grid to which controls will be aligned. You can tell if grid snapping is on or off by looking at the **Grid Snap On** item in the Controls menu – it will have a checkmark next to it if snapping is on.

To turn grid snapping on or off:

- Choose **Controls > Grid Snap On**. The grid snap feature will turn on if it was off or vice-versa.

To change the size of the grid:

- Choose **Controls > Edit Grid Settings**. The following dialog will appear:



Control Grid Settings

Horizontal Grid: 24

Vertical Grid: 24

☑ Snap Width & Height

Width Snap Offset: 2 (Snap Width = 22)

Height Snap Offset: 2 (Snap Height = 22)

The Horizontal Grid and Vertical Grid settings determine the grid to which the top-left corner of the control will be snapped.

If the Snap Width and Height checkbox is on, then the object's size will be snapped when you resize it. The Width Snap Offset and Height Snap Offset *values are subtracted from the Horizontal and Vertical Grid values to determine the width and height to which controls will be snapped. The resulting width and height will be shown next to the Width Snap Offset and Height Snap Offset, respectively.*

Changing a Control's Settings

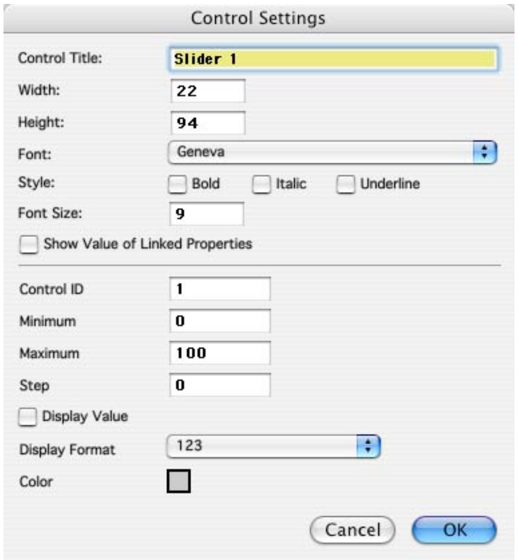
Each control has settings that determine its characteristics including its visual operation, mode of operation and, most importantly, its Control ID. The Control ID is used to identify the control when it broadcasts new values to actor properties to which it is linked.

The settings for each type of control vary. See the documentation in the Control Reference section for specific information about each control.

To edit a controller's settings:

- Select the control and choose **Controls > Edit Control Settings…** or
- Double-click a control, or
- Control-click (MacOS) or right-click (Windows) the control and choose "Edit Control Settings…" from the popup menu.

  The control's settings dialog will appear. Here is the Control Settings Dialog for the "Slider" control:



Control Settings

Control Title: Slider 1

Width: 22

Height: 94

Font: Geneva

Style: □ Bold □ Italic □ Underline

Font Size: 9

□ Show Value of Linked Properties

Control ID 1

Minimum 0

Maximum 100

Step 0

□ Display Value

Display Format 123

Color □

The items above the separator line (Control Title, Width, Height, Font Settings, and the Show Value of Linked Inputs check box) are common to all controls. Items below the separator are specific to the type of control whose settings are being edited.

The Control ID will be in the lower section. This number is important because its value is used to identify the controls to which they are linked. Most *controls have one Control ID. Some have more than one – a few (notably the Comment control) have none.*

- Once the settings are as you desire, click the OK button to confirm your changes.
- Note that, when clicking OK to confirm your settings, if the Control ID for this control conflicts with an existing control in this panel, you will be shown a warning dialog indicating there is a conflict. Click OK to accept the Control ID as you have set it, click Cancel to return to the Settings dialog, or click Don't Show Again to accept the Control ID and prevent this warning from being shown in the future.

Setting Control Specific Options

Some controls have options that cannot be edited in the Control Settings dialog (e.g., the Video Picker.) You can access these settings by choosing the Control Specific Options dialog. Each dialog is specific to the control, so you should refer to the specific documentation in the Controls Reference chapter for more information.

To edit a Control Specific Options:

- Select the control and choose **Controls > Control Specific Options…**

  The control's options dialog will appear. Please refer to the documentation for the specific control for more information.

Seeing the Control ID Associated with Controls

While editing, you can choose to show the Control IDs associated with the controls shown in the Control Panel Editor.

To show the Control IDs used by a control:

- Choose **Controls > Show Control IDs**. The Control ID will appear in a small rectangle located at the top right of the control.

To hide the Control IDs used by a control:

- Choose **Controls > Hide Control IDs**.

Using FreeFrame Plug-ins

Isadora supports FreeFrame, an evolving video plug-in standard for MacOS and Windows. (You can find out more about FreeFrame at their home page – http://freeframe.sourceforge.net/)

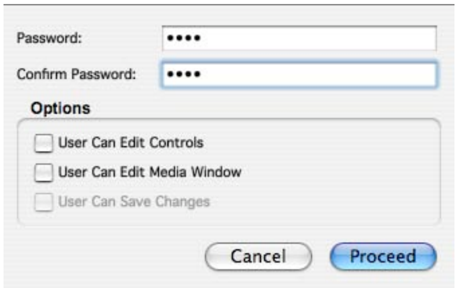
Isadora looks for FreeFrame plug-ins in a standard location. The FreeFrame development community has agreed upon standard locations where application programs should search for FreeFrame Plug-ins. On MacOS, you should place the plug-ins in /Library/Application Support/FreeFrame; on Windows you should place them in C:\Program Files\Common Files\FreeFrame. (You may need to create these folders – they don't normally exist by default.) You can however choose a different directory in the **Video** tab of the **Preferences** – see Page 118 for more information.

Saving Files as Run-Only (v1.1)

Isadora now allows you to save your files as "run-only", so that others can use the file but can modify in specific ways. One place this might be useful is when Isadora is used to create installations that will be maintained by others. Making a document run-only means that only you will be able to modify the file.

To save a file as Run-Only:

- Choose **File > Save As Read Only…** The following dialog will appear:



Password: ••••

Confirm Password: ••••

Options

□ User Can Edit Controls

□ User Can Edit Media Window

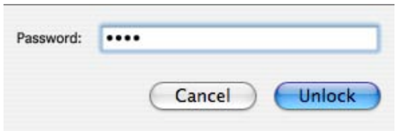
□ User Can Save Changes

- Type the password for this file into both the **Password** and **Confirm Password** fields.
- Choose what users opening this document may edit. Choosing **User Can Edit Controls** means that the user can modify the Control Panels of your document. Choosing **User Can Edit Media Window** means that the user will be able to import media into the Media Window. Finally, choosing **User Can Save Changes** means that the user can save any changes that they make if they have a registered version of Isadora.
- Click OK to confirm your choices.

At this point, Isadora will ask you to save the file, so that it will be saved on disk with the password protection enabled. Once you've done this, the document will open in the run-only mode you specified. To edit it, you will need to unlock it using the **File > Unlock Document…** command.

To unlock a Run-Only file so that you can edit it:

- Choose **File > Unlock Document…** The following dialog will appear:



Password: ••••

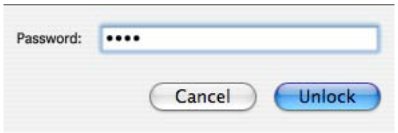
- Type the password into the **Password** field and click **Unlock** to unlock the document so that it can be edited.

To lock a previously unlocked document

- Choose **File > Lock Document…** The document will return to locked mode.

To remove the password from a Run-Only document

- Choose **File > Remove Password…** The following dialog will appear



Password: ••••

- Type the password into the **Password** field and click **Unlock** to unlock the document and remove the password protection from it.

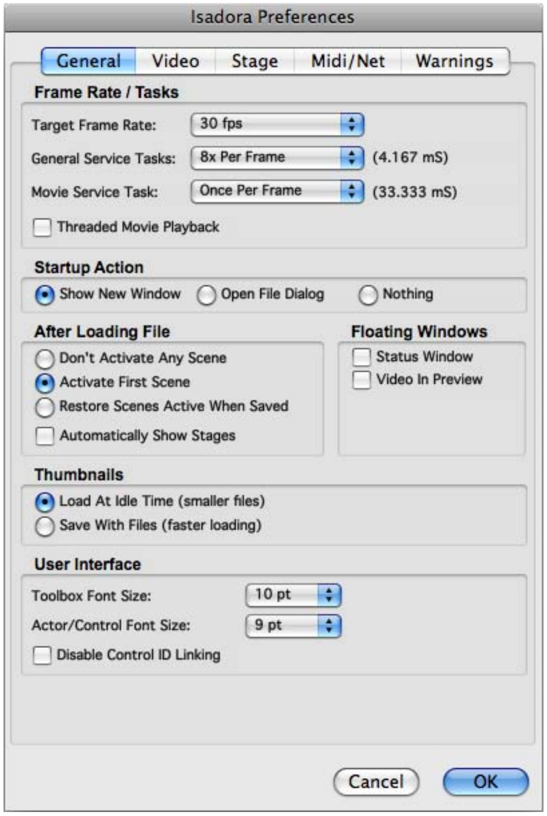
At this point, Isadora will ask you to save the file, so that it will be saved on disk with the password protection disabled. Once you've done this, the document will open without any restrictions on what other users can do with it.

Isadora Preferences

Isadora’s Preferences allows you to specify options that control performance and workflow. There are five sections in the Preferences window: **General**, **Video**, **Stage**, **MIDI/Net** and **Alerts**. Each section can be selected by clicking the appropriate tab at the top of the window.

To edit Isadora’s preferences, choose **Edit > Preferences…**

General Preferences



Frame Rate / Tasks

Target Frame Rate: 30 fps

General Service Tasks: 8x Per Frame (4.167 mS)

Movie Service Task: Once Per Frame (33.333 mS)

□ Threaded Movie Playback

Startup Action

● Show New Window ○ Open File Dialog ○ Nothing

After Loading File

○ Don't Activate Any Scene

● Activate First Scene

○ Restore Scenes Active When Saved

□ Automatically Show Stages

Floating Windows

□ Status Window

□ Video In Preview

Thumbnails

● Load At Idle Time (smaller files)

○ Save With Files (faster loading)

User Interface

Toolbox Font Size: 10 pt

Actor/Control Font Size: 9 pt

□ Disable Control ID Linking

Target Frame Rate (v1.1)

The **Target Frame Rate** popup allows you to specify the rate at which Isadora will attempt to render its video output. This value relates directly to the FPS display in the Status Window.

General Service Task (v1.3)

Refers to the frequency with which Isadora will try to service all actors except Movie related actors in all currently active scenes. Generally this setting relates to actors that have to do with time like the envelope generator, wave generator, pulse generator etc. The General Service Task is specified as a multiple of the Target

Frame Rate; the actual period between service tasks is shown to the right of the popup menu.

Movie Service Task (v1.2)

The Movie Service Task determines how often all of the currently playing movies are “serviced.” The default is setting is once per frame (the actual frequency depends on the Frame Rate setting described above.) You may find that increasing or decreasing this value improves frame rates on your machine. Generally speaking, if you can use a higher number, more time will be available for other tasks within Isadora.

Startup Action

You can choose what action Isadora will take when the program starts up. There are three options:

- Show New Window – Creates a new empty window on startup
- Open File Dialog – Shows the open file dialog and asks you to open a file on startup.
- Nothing – Does nothing on startup.

Click the radio button for the desired option.

After Loading File

You can choose whether or not Isadora will activate a Scene when a file is loaded. There are three options

- Don’t Activate Any Scene – After loading a file, no Scene is activated. You must activate the first scene manually.
- Activate First Scene – After loading a file, activate the first Scene in the Scene List.
- Restore Scene Active When File Was Saved – After loading a file, activate the Scene that was active at the time the file was saved.

Click the radio button for the desired option.

You can also choose to automatically show the Stage window(s) after loading the file. Check the “Automatically Show Stages”: checkbox to enable this feature.

Floating Windows

This selection allows you to specify which of windows will be “normal” windows, which go behind other windows when deactivated, and which will be “floating” windows, which always stay on top.

- Status Window: check this box to make the Status window a floating window.
- Video In Preview: check this box to make the Video In Preview window a floating window.

Thumbnails

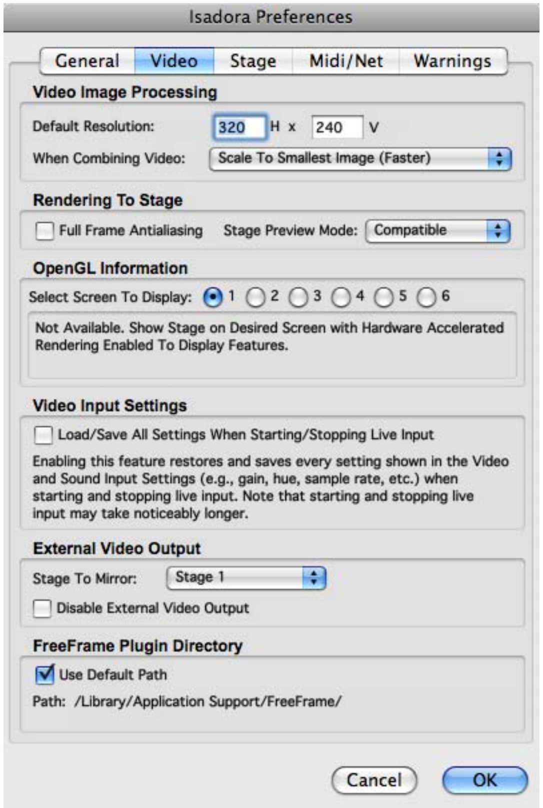
You can choose whether or not Isadora will store thumbnails for the movies and pictures imported in the Media Window with your Isadora documents. If you don't choose to store the thumbnails, Isadora creates them when the document is loaded, which can be time consuming if you have of lots of media. Choosing to store the thumbnails with the document results in larger files but ensures that Isadora won't spend time creating thumbnails after the file is loaded.

User Interface

These pop-up menus allow you to choose the font size for the Actor Toolbox and for the Actors displayed in the Scene Editor.

Here you can also enable or disable the Control ID Linking feature available when using the Control Panel / Scene Editor Split feature.

Video Preferences



Video Image Processing

Default Resolution: 320 H x 240 V

When Combining Video: Scale To Smallest Image (Faster)

Rendering To Stage

□ Full Frame Antialiasing Stage Preview Mode: Compatible

OpenGL Information

Select Screen To Display: ● 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6

Not Available. Show Stage on Desired Screen with Hardware Accelerated Rendering Enabled To Display Features.

Video Input Settings

□ Load/Save All Settings When Starting/Stopping Live Input

Enabling this feature restores and saves every setting shown in the Video and Sound Input Settings (e.g., gain, hue, sample rate, etc.) when starting and stopping live input. Note that starting and stopping live input may take noticeably longer.

External Video Output

Stage To Mirror: Stage 1

□ Disable External Video Output

FreeFrame Plugin Directory

☑ Use Default Path

Path: /Library/Application Support/FreeFrame/

Video Image Processing: Default Resolution (v1.1)

This specifies the default horizontal and vertical resolution used by Isadora when processing video streams.

Isadora won't change the resolution of two video images when their resolution and format are the same. In that case, this setting has no effect: the scaling of the **When**

Combining Video setting (described below) controls how the two video streams are scaled.

However, this setting is important when working with an actor whose video inputs provide a default, black video stream when left unconnected. (E.g., the Video Mixer actor.) In that case, the resolution of the black buffer is set to the default resolution. This can affect the resolution of an actor's final output.

Video Image Processing: When Combining Video

This setting how Isadora combines processes video as it flows through the program.

The **When Combining Video** setting determines how video images of differing sizes will be combined when two video streams are combined by a single actor.

- Scale To Largest Image – When this option is chosen Isadora will combine video images that are of different sizes by scaling the smaller images up to match the size of the largest image. This results in slower performance but better resolution.
- Scale To Smallest Image– When this option is chosen Isadora will combine video images that are of different sizes by scaling the larger image down to match the size of the smaller image. This results in faster performance but lower resolution.
- Scale To Default Resolution – When this option is chosen, Isadora will scale all video images to the default resolution specified above. If you want to speed up video processing, make this a smaller value (i.e. 160 x 120).

Rendering to Stage: Full Frame Antialiasing (v1.3)

Full Frame Antialiasing reduces aliasing (sometimes called "stair stepping") artifacts that can be seen along the edges of 3D objects rendered to the stage. (This may be especially noticeable when using the 3D Player actor and rendering 3D models with fine detail, for instance.)

Turning on this feature will smooth these rough edges, but may also reduce performance. If you rendering an image to the full stage or to a rectangular shape that is not rotated in any way, there is no advantage to enabling this feature. If however you are using the 3D actors, you may find that enabling this feature produces more pleasing results.

Rendering to Stage: Stage Preview Options (v1.3)

The Stage Preview Control allows you to see a preview image of any of Isadora's stages in the Control Panel. The **Stage Preview Mode** feature allows you to control how Isadora generates this preview. There are two choices:

- **Faster – Single Buffer**: This is the default option and should be used as long as no problems are encountered when using the Stage Preview control.
- **Faster – Double Buffer**: This is similar to the first option, except that the preview frames are "double buffered" as they're read from your graphic card. You may find a speed improvement on some cards with this option.

- **Compatible**: Choose this option if you experience crashes when using the Stage Preview Control. Some older OpenGL driver implementations crash when or incorrectly render the image when using the default option.

Open GL Information (v1.3)

Reports Open GL driver and feature information for the various stages. The stage must be visible for this information to be displayed.

Video Input Settings (v1.1)

Some video cameras, notably the iSight on MacOS, have a number of settings that are not normally remembered after you disable live video input in the Input menu. If you would like Isadora to retain all of the settings associated with the camera, you can enable the **Load/Save All Settings when Starting/Stopping Live Input** checkbox. Note that, if you do this, it is likely that starting up live input will take noticeably longer than when this option is not enabled. If you are using the Capture Control actor to enable/disable Live Input programmatically, this may cause notable freezes in the video output, sound drop outs, etc.

External Video Output (v1.1 – MacOS X Only)

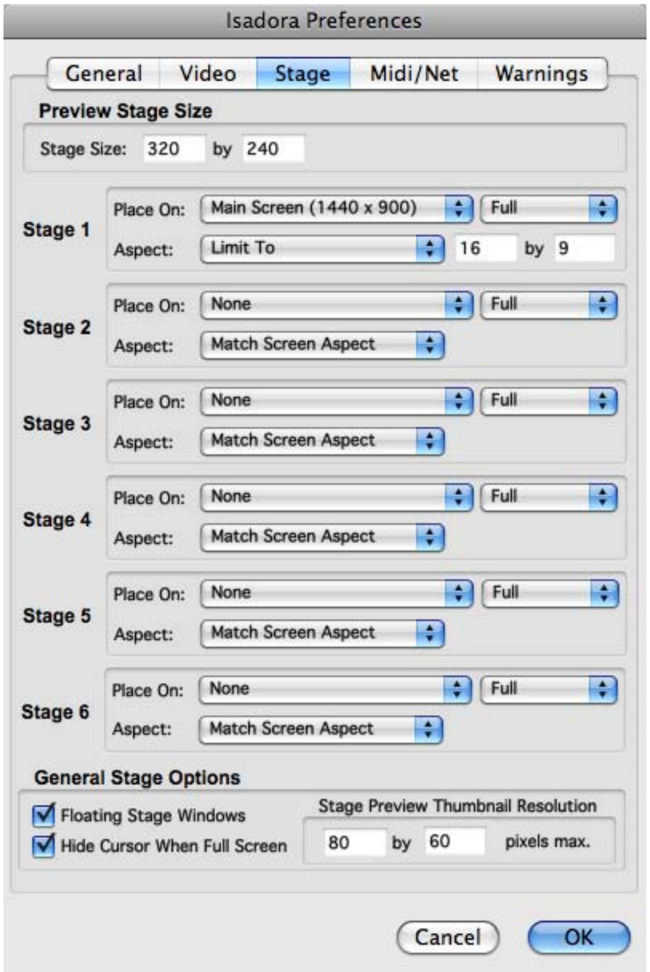
Isadora now has the capability to mirror one of its Stages to a FireWire camera or a video card. (See on Page 140 for more information on this feature.) Choose the stage that to be mirrored when External Output is enabled here. You can also choose to disable the external output feature entirely – this is important if you plan to use the DV Device Control actor, because this feature is disabled when the External Video Output is enabled.

FreeFrame Plug-in Directory (v1.1)

Isadora now looks for FreeFrame plug-ins in the /Library/Application Support/FreeFrame on MacOS, or the C:\Program Files\Common Files\FreeFrame on Windows. The FreeFrame development community has agreed upon these directories as the standard place for application programs to search for FreeFrame Plug-ins.

You can choose to have Isadora look in a different folder however. Choose **Isadora > Preferences** (MacOS) or **Edit > Preferences** (Windows) and click on the **Video** tab. In the section marked **FreeFrame Plug-in Directory**, uncheck the **Use Default Path** checkbox. When you do, a folder selection dialog box will appear. Choose the folder where you'd like Isadora to look for plug-ins, and click OK. The next time you start up Isadora, it will look in the specified folder for FreeFrame plug-ins.

Stage Preferences



Isadora Preferences

Preview Stage Size

Stage Size: 320 by 240

Stage 1 — Place On: Main Screen (1440 x 900) — Full; Aspect: Limit To 16 by 9

Stage 2 — Place On: None — Full; Aspect: Match Screen Aspect

Stage 3 — Place On: None — Full; Aspect: Match Screen Aspect

Stage 4 — Place On: None — Full; Aspect: Match Screen Aspect

Stage 5 — Place On: None — Full; Aspect: Match Screen Aspect

Stage 6 — Place On: None — Full; Aspect: Match Screen Aspect

General Stage Options

☑ Floating Stage Windows

☑ Hide Cursor When Full Screen

Stage Preview Thumbnail Resolution: 80 by 60 pixels max.

Isadora supports up to six video output channels, called *Stages*. The Stage Settings section of the Preferences window allows you to specify the display on which a stage will appear when it is shown, as well as other options relating to Stages.

Preview Stage Size

Preview Stage Size, seen at the top of the window, determines the size of the stage when it is in "preview" mode. A stage can appear in preview mode in two ways.

First, if the display associated with a particular Stage is not available when you choose **Output > Show Stages**, then the Stage will be shown on the Main Display at the resolution specified by the Preview Stage Size.

Second, when you explicitly choose **Output > Force Stage Preview**. If the Stage is at its full size, it will switch to "Preview Mode", moving to the Main Display and being shown the resolution specified by the Preview Stage Size. If it is already in Preview Mode, it will return to full size on the correct display.

Stage 1/2/3/4/5/6 Options: (v1.3)

For each of Isadora's six stages there are three settings:

- **Place On** allows you to specify the monitor on which the stage will be shown.
- **Aspect** allows you to force the stage to a specific aspect ratio
- **Split Screen** (seen to the right of the **Place On** popup) allows you to position the stage when working with the Matrox Dual- or TripleHead2Go. (To learn more about how these devices allow you to get additional video outputs from a single computer, see page 141.)

Stage Options: Place On (v1.3)

Use the **Place On** popup menu to specify the display on which the Stage will appear when it is visible. Here the word "display" refers to a video output that would typically be attached to a video projector or video monitor through a VGA or DVI output. (On Mac OS X, you can see the displays attached to your system by choosing "Displays" in the System Preferences; on Windows you would use the "Display Properties" control panel.)

This menu will contain at least one item for each display currently attached to your computer. For instance, if you had a desktop computer with two, dual-output video cards installed, there would be four displays active in the "Place On" popup menu.

If a display is currently available on the computer, its dimensions will appear next to the name in the "Place On" popup menu (e.g., "Display 2 (1024 x 768)"). You may also select "None" if you don't want a given Stage to be visible.

On computers with more than one display, you would generally set Stage 1 to appear on Display 2, Stage 2 to appear on Display 3, etc. That way, you can edit your Isadora document on the Main Display (i.e., Display 1) and show the output on the other displays. If you only have only one display, you would place Stage 1 on Display 1 and set the other "Place On" popup menus to "None." In this case, you can conveniently toggle between the full display and the preview stage size by choosing Output > Force Stage Preview.

Stage Options: Aspect (v1.3)

In the popup menu labeled **Aspect** you can choose **Match Display Aspect**, so that the stage will entirely fill the display, or you can choose **Limit To** to limit the stage to a custom aspect ratio defined by you, leaving the remainder of the display area black (sometimes referred to as "letterboxing.") When you choose the **Limit To** option, two text boxes will appear that allow you to specify the aspect ratio you would prefer, e.g. 4:3 or 16:9

Stage Options: Split-Screen (v1.3)

The **Split Screen** menu (just to the right of the "Place On" popup) is specifically designed to work with the Matrox Dual- or TripleHead2Go, and would, generally speaking, not be useful unless you were working with one of those two devices. (To learn more about how the Dual- and TripleHead2Go allow you to get more video outputs from a single computer, see page 141.)

There are six choices:

- Full
- Left Half
- Right Half
- Left Third
- Mid Third
- Right Third

Full is the default; when using this option, the stage fills the entire display.

Left Half and Right Half would be used with the DualHead2Go, to route the image to the first or second video projector, respectively.

Left Third, Mid Third, and Right Third would be used with the TripleHead2Go to route the image to the first, second or third projector, respectively.

Floating Stage Windows

If you would like your Stage windows to "float" (i.e. to always be in front of the Isadora document), check this box.

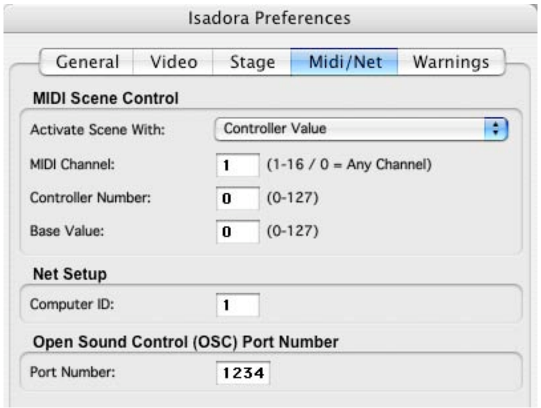
Hide Cursor When Full Screen

If you would like your cursor hidden when the stage fill the main display of your computer function is activated, check this box.

Stage Preview Thumbnail Resolution

Underneath this menu are two text boxes that allow you to customize the stage preview thumbnail size, which is used when generating the image for the Stage Preview Control in the Control Panel. For best performance set to a relatively small value like 80 by 60 pixels. Higher values will give greater resolution but may be noticeably slower.

MIDI/Net Preferences


Isadora Preferences

MIDI Scene Control

Activate Scene With: Controller Value

MIDI Channel: 1 (1-16 / 0 = Any Channel)

Controller Number: 0 (0-127)

Base Value: 0 (0-127)

Net Setup

Computer ID: 1

Open Sound Control (OSC) Port Number

Port Number: 1234

MIDI Scene Control

In this section, can choose to allow MIDI message to activate Scenes. When this option is turned on, and when the proper MIDI message arrives, it will cause one of a Scene to be activated in the same way it would be if you clicked on that Scene with the mouse.

You specify which MIDI message will activate the Scenes using the Activate Scene With popup. The choices are:

- None – Don't use MIDI commands to activate scenes
- Program Change.
- Continuous Control
- Note On
- Note Off

If you choose the Program Change, Note On, or Note Off choices, the area below the popup will have two settings: the MIDI Channel and Base Value.

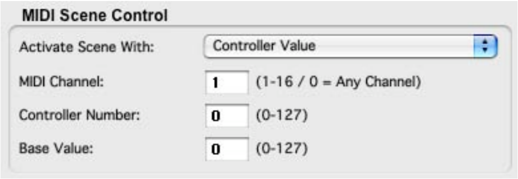
The MIDI Channel specifies what MIDI Channel the message must arrive on to cause the activation of a Scene. If a message arrives and its MIDI channel does not match the one specified here, it will not activate the Scene. You can choose 0 to allow messages on any channel to work.

The Base Value specifies message value that will activate the first Scene. This is interpreted differently for each message type:

Message Type	Message Value
Program Change	Program Change Number
Continuous Control	Controller Value
Note On	Pitch
Note Off	Pitch

If Isadora sees a MIDI message of the proper type on the specified MIDI Channel, and its value matches the one specified in the Base Value field, Isadora will activate the first Scene. If the value is greater than the Base Value, Isadora will activate a subsequent Scene if it is available. For example, if Isadora were looking for Program Change messages with a Base Value of 5, then MIDI program change 5 would activate the first scene; program change 6 would activate the second, etc.

If you choose to activate Scenes using the Continuous Controller messages, the MIDI Controller Number field will appear.



MIDI Scene Control

Activate Scene With: Controller Value

MIDI Channel: 1 (1-16 / 0 = Any Channel)

Controller Number: 0 (0-127)

Base Value: 0 (0-127)

For Continuous Control messages, Isadora checks the message's Controller Number in along with the MIDI Channel and Base Value. If the controller number does not match the one specified by the Controller Number field, the message is ignored.

Net Setup

Here you specify a number that identifies this computer when multiple copies of Isadora communicate with each other over a Local Area Network. The Net Broadcaster actor specifies which computer will receive a given message using this number – see the Net Broadcaster actor for more information.

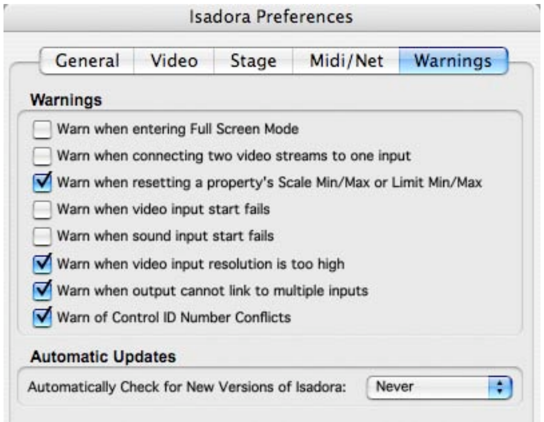
Open Sound Control (OSC) Port Number (v1.1)

If you are using Open Sound Control (OSC) to receive messages from another computer (or another program running on your computer), you may need to set the OSC port number. The other application needs to know two pieces of information when transmitting OSC messages to Isadora via UDP: your computer's IP address, and the port number. Normally, you can set the port number in the other application. But, in some cases, it may be necessary to change Isadora's port number to match the other application.

Once you change this value, you will need to quit and restart Isadora before the change will take affect.

For more information on Open Sound Control support, see Page 164.

Warnings



Warnings

☐ Warn when entering Full Screen Mode
☐ Warn when connecting two video streams to one input
☑ Warn when resetting a property's Scale Min/Max or Limit Min/Max
☐ Warn when video input start fails
☐ Warn when sound input start fails
☑ Warn when video input resolution is too high
☑ Warn when output cannot link to multiple inputs
☑ Warn of Control ID Number Conflicts

Automatic Updates

Automatically Check for New Versions of Isadora: Never

To help new users avoid common problems, Isadora shows warning messages when certain actions are taken. When these warnings appear, you have the option of continuing with the operation, canceling the operation, or choosing “Don’t Show Again” to continue with the operation and to prevent the warning from appearing again in the future. Choosing “Don’t’ Show Again” has the side effect of “unchecking” the corresponding checkbox in the Warnings section of the Preferences.

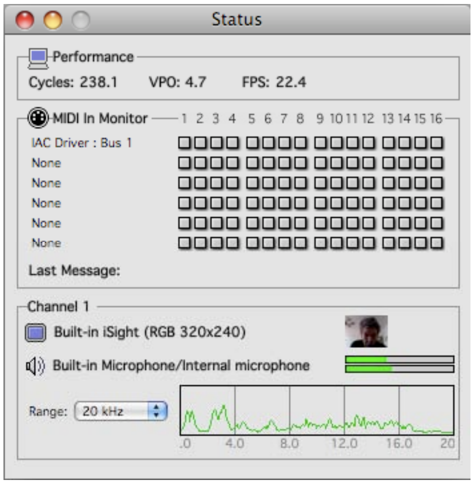
Note that the **Warn when video input start fails** and **Warn when sound input start fails** boxes are unchecked by default. This is to prevent these errors from stopping operation of a Scene, especially when using the Capture Control actor to enable live input programmatically.

You can enable the warnings again by checking the appropriate box in this section of the Preferences window.

Status Window: Monitoring Performance and External Input

The Status Window exists to give you information about data arriving into Isadora from the outside world, about external devices connected to Isadora, and about Isadora's performance.

To see the Status Window, choose **Windows > Show Status**. You will see a window that looks like this:



Cycles: 238.1 VPO: 4.7 FPS: 22.4

IAC Driver : Bus 1
None
None
None
None
None

Last Message:

Channel 1

Built-in iSight (RGB 320x240)

Built-in Microphone/Internal microphone

Range: 20 kHz

There are four sections: Performance, MIDI In Monitor, Live Input (one for each channel to a maximum of four) and DV Devices. The Performance and MIDI In Monitor sections are always visible. The other sections may or may not be visible if your computer does not have the appropriate hardware or drivers.

Performance

This section tells you Isadora's Cycle Rate, Video Processing Overhead, and Frame Rate

Cycles reports how many times per second Isadora can process all of the actors in the currently active Scene(s). The higher this number, the better Isadora's performance. This maximum value of this number is directly related to the **General Service Task** setting in the General tab of the Preferences – higher Service Task rates will yield a higher number of cycles per second.

VPO stands for Video Processing Overhead. This value, given as a percentage of total processor usage, indicates how much time is being used by the video processing actors in the active Scene. As this number gets larger, Isadora will run more slowly and your frame rates will go down.

FPS shows the current output frame rate of the stage. Isadora always attempts to render video frames at the rate set in the Target Frame Rate of the General tab of the Preferences. If the patch is complex and/or has numerous video effects, this value may not reach the target set in the Preferences.

Midi In Monitor

This section has a series of indicators for each MIDI Source Port (as set up using the MIDI Setup dialog.) Whenever a MIDI message arrives on a given Source Port, the indicator with the corresponding MIDI Channel will illuminate briefly. If the message is a System Exclusive message, then the indicator marked SX will illuminate.

In addition, each time a message is received, specific information about that message will appear in the area marked Last Message.

Live Input

The live input section gives you information and feedback about the video input device and sound input device, including the frequency content of the incoming audio stream.

Video Input

When you are capturing video (e.g., **Start Live Capture** has been chosen from the **Capture** menu), the Video Input panel displays the name of the video input device that is being captured, the resolution of the video and the format (RGB or YUV) that is being captured, and a thumbnail of the incoming video image.

Sound Input

When you are capturing audio (e.g,, **Start Live Capture** has been chosen from the **Capture** menu), the Sound Input panel displays the name of the audio device from which the sound is being captured along with a “VU” meter that allows you to monitor the current input volume. See the Sound Level Watcher actor to find out how to use the sound input volume to control other actors.

Frequency Display

If you are capturing audio *and* the “Sound Frequency Analysis” checkbox in the Live Capture Settings Window is turned on, you will also see the “Frequency Display” panel. Here you can see a real-time display of the frequency spectrum of the sound coming into the computer. If **Sound Frequency Analysis** is not enabled, you can enable it by 1) choosing **Input > Live Capture Settings** to show the Live Capture Settings Window, 2) selecting the desired live capture channel in the **Channel Select** popup, and 3) turning on the “Sound Frequency Analysis” checkbox.

There is also a pop-up menu that allows you to choose the maximum frequency of this display. This is particularly useful if you are trying to determine the frequency spectrum of a particular sound and need a finer resolution in the lower end of the spectrum.

See the **Sound Frequency Watcher** actor on Page 338 to find out how to use the frequency spectrum of the live sound input to control other actors.

DV Devices

If you connect digital video cameras or other devices that allows transport control via your computer's Fire Wire port, then those devices will appear here. It will report the device's unit ID, its name, its status and the current frame number of its media (if available.)

When you see a device here, you will be able to control it using the DV Device Control actor. Use the unit ID shown here to identify which device you wish to control with the DV Device Control actor.

Cue Sheets

Isadora has an integrated Cue Sheet feature that is useful when you are creating a performance that is linear, e.g., a play that goes from the one scene to the next. This feature allows you to trigger events in Isadora while simultaneously displaying text to an operator to prepare them to take the next cue.

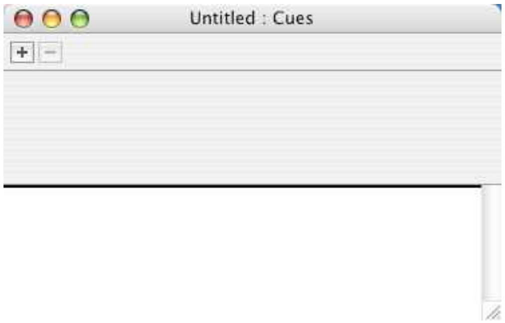
The cue sheet works by simulating key presses on the computer keyboard. Whenever the operator triggers a cue, the specified character is sent to all Keyboard Watcher actors in the current Scene. By setting the Keyboard Watcher to look for a specific key coming from the Cue Sheet, you can trigger actions in response to the operator executing a cue.

Creating The Cue Sheet

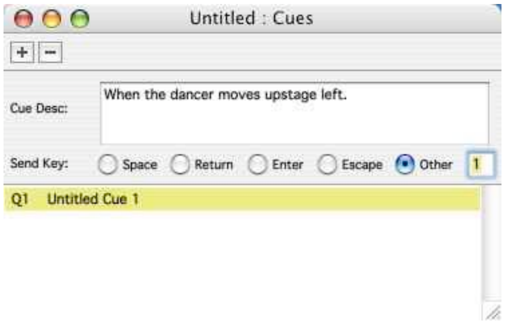
Each Scene has its own list of cues, numbered starting at Q1. You can access the cues for a particular scene by clicking on a Scene to activate it. Note that if you copy/paste or duplicate a scene, the cues associated with that scene will be also be duplicated.

To add a new cue:

- Activate the Scene whose cues you wish to edit.
- Choose **Windows > Show Cue Sheet Editor…** to show the Cue Editor window. Initially, it will look like this:



- Click the Plus Sign (+) to add a new cue. After you do, fields will appear that allow you to edit that cue.



Cue Desc: When the dancer moves upstage left.

Send Key: ○ Space ○ Return ○ Enter ○ Escape ● Other 1

Q1 Untitled Cue 1

- Next to the prompt you can type the text that will be shown to the operator. Generally this will describe something that is happening on stage, which will cause them to execute the cue.
- To the right of the "Send Key" prompt, you can choose the character that will be sent to Isadora Keyboard Watcher actor. Using the radio buttons, you may choose from the **Space Bar, Return Key**, **Enter Key**, **Escape Key**, or **Other**. If you choose **Other**, then you need to enter the character you want to be send to the keyboard watchers in the text field to the right of the **Other** radio button.

To edit an existing cue:

- Select the cue from the list located in the bottom portion of the Cue Editor window.
- Edit the **Cue Desc** field and **Send Key** radio buttons shown in the top portion of the Window.

To remove cues:

- Select the cue(s) in the list located in the bottom portion of the Cue Editor window.
- Click the minus button (-), or press the delete key, or choose **Edit > Clear** to delete the cue. Or choose **Edit > Cut** to cut the cue so that it can be pasted into another location the list.

To paste cues:

- Click between two cues to set the blinking insertion point. This is where the cue(s) will be inserted when you paste.
- Choose **Edit > Paste**

To change the order of cues:

- Select the cue(s) in the list located in the bottom portion of the Cue Editor window.
- Drag them to a new location – the blinking insertion point shows where the cues will be inserted.
- Release the mouse button.

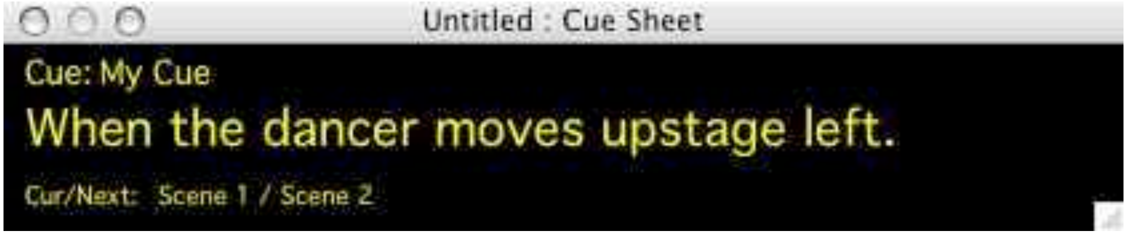
To change the name of the cue itself:

- Option-click (MacOS) or Alt-click (Windows) the cue in the list located in the bottom portion of the Cue Editor window.
- A text edit field will appear showing the current name of the cue.
- Type the new name of the cue
- Hit the return key to confirm the edit.

Using the Cue Sheet

Once the cue sheet has been created for each scene, you are ready to use the Cue Sheet feature. Start by activating the first scene in the Isadora document. Then do the following:

- Choose **Windows > Show Cue Sheet** to show the cue sheet to the operator. It will look like this:



Untitled : Cue Sheet

Cue: My Cue

When the dancer moves upstage left.

Cur/Next: Scene 1 / Scene 2

- To execute a cue, hold down the Control key and press the Space Bar. When you do, Isadora will simulate pressing a key on the computer keyboard, as defined for this particular cue in the Cue Editor window. It will then immediately show the next cue.

For example, for example the cue above (When the dancer moves upstage left) the **Other** radio button had been selected and the Send Key set to '1'. Upon holding down the Control key and pressing the Space Bar, Isadora would simulate pressing the number '1' on the computer keyboard. Any Keyboard Watcher actors in the current scene set to watch for the key '1' would send a trigger, thus allowing you to trigger a specific action when this cue is executed.

Pausing and Resuming the Isadora Engine

It is possible to create a patch that will never let you edit it again. For example, connecting the Enter Scene Trigger actor to the Jump actor would cause a jump to another scene as soon as the scene is activated.

The **Pause Engine** and **Resume Engine** commands in the Output menu can help you in just such a circumstance. To edit a scene, regardless of how it is programmed, choose **Output > Pause Engine** and then activate the scene by clicking on it. When in this mode, all of Isadora's internal timers and messaging are disabled. As such, actors like Enter Scene Trigger will never be activated, Movies will not play, and so on. Because of this, it is impossible to exit the scene because of the way in which it is programmed.

After you have edited the Scene to your satisfaction, choose **Output > Resume Engine** to return to normal use.

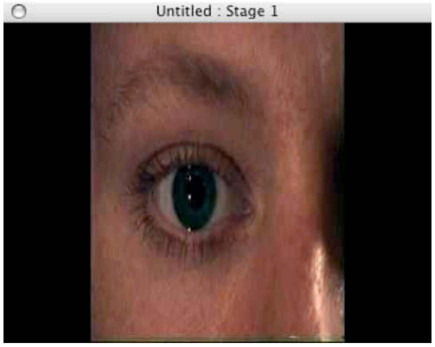
Video & Audio Output

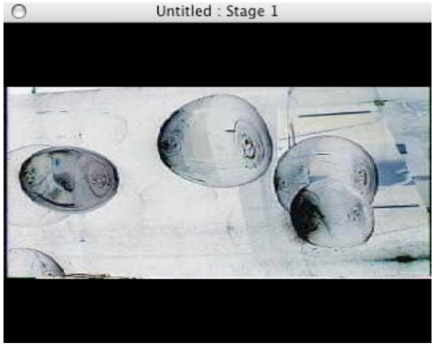
Compositing with the Projector (v1.3)

Layering & Blending

To help you understand these principals, you can follow along in the file called "Compositing.izz" which is included with the Isadora Examples folder included with the program.

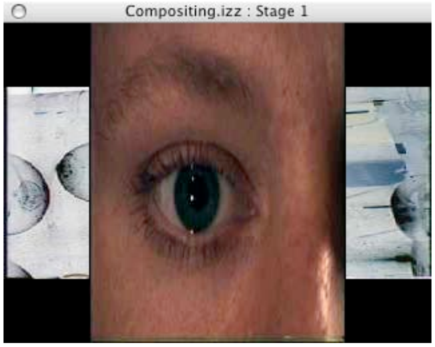
In the first scene, there are two Movie Players, each connected to their own projector. Individually, the movies are scaled so that the look like this:





Note that the Eye image has been scaled horizontally and moved to the right, and the Bubbles image has been scaled vertically and moved down. This has been accomplished using the vert pos, horz pos, height, and width inputs, in the Projector actor.

But, when both Projector actors are turned on, the result looks like this:



This kind of layering was not possible in the first version of the program.

Now, try the following experiments to see other features that are available in v1.3.

- Look at the layer input of both projectors: the top one (the Bubbles) is set to 0, while the lower one (the Eye) is set to 1. Try changing the layer input of the top Projector to 2. You will see that the Bubbles are now rendered on top of the Eye.
- Click on the dot to the left of the intensity input on of the top projector. Drag the slider down to the bottom. As you do, you'll notice that the top image eventually turns black. When the blend mode is set to opaque and you lower the intensity, the image eventually becomes a solid black square.
- Switch the blend mode on the top projector to transparent (click on the box to the left of the word blend and type 'transparent' and hit return). Now try the same experiment from the previous paragraph. Now, instead of fading to black, the intensity controls the transparency of the image. The lower the intensity, the more "see through" the top image becomes.

  IMPORTANT: When attempting to render a transparent image, it is essential that it is rendered last, otherwise the transparent image feature may not work. (Generally this will result in on of the lower images appearing opaque and "on top of" the transparent image.) To specify the order in which Projectors render their images, use the layer input. Higher layer numbers are drawn last, so you will want to use a higher layer number for Projectors whose blend input is set to transparent.
- Now, switch the blend mode on the top projector to additive (click on the box to the left of the word blend and type 'add' and hit return). Again, use the slider to adjust the intensity. The intensity fades the image in and out, but now the front most image is "added" to the image below – the Eye never totally disappears because the two images are added together.
- Finally, restore the intensity of the top projector to 100, and then its layer input to 0, so that the Bubbles are "under" the Eye again. Now, even though the blend mode of the Bubbles remains set to additive, the Eye isn't being added to the Bubbles. Why? Because the blend mode of the Eye is still opaque. Since it's now the one in front, it is "written over" the Bubbles, not added to it.

Just working with these the layer, blend and intensity parameters offers incredible flexibility with how you composite images. In previous versions of Isadora you needed to use a Video Fader to cross fade from one image to another. In version 1.1 it is possible to use two projectors and fade one in while the other fades out.

- Click on the Scene called Crossfade to see an example of this. Press the space bar to cross fade between the two videos using an Envelope Generator and two Projectors actors. Note that the mode of both actors is set to additive. This patch won't work as expected if they are set to other modes – try changing the blend input of the two projectors to see the results.

Distorting the Image

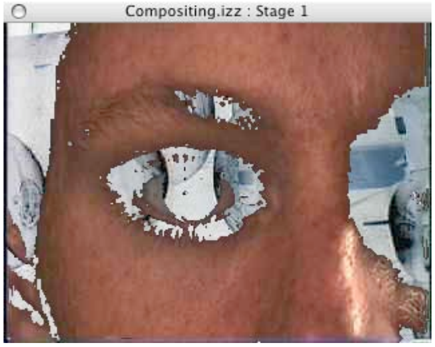
Click on the Scene called "Layering" and try the following:

- Click on the dot to the left of the spin, aspect ratio, and perspective inputs and drag the slider to observe the effect of these parameters on the image.

By rotating the image, changing its aspect mod, and introducing perspective shift, you can position an image quite precisely onto a specific object in the field of view of your video projector. This can be an effective way to use one video projector to project onto multiple surfaces simultaneously.

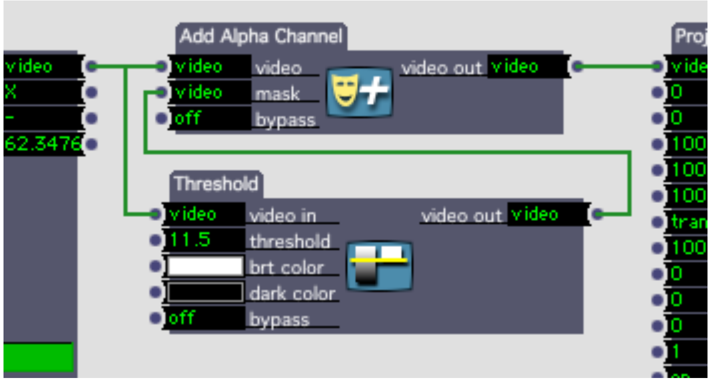
Alpha Channels

Click on the Scene called "Alpha Mask." The image shown on the stage looks like this:

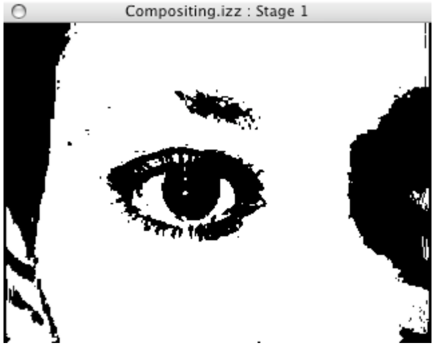


If you've used Isadora's Luminance Key actor before this image might look familiar – the darker portions of the foreground image (the Eye) are transparent, such that you can see the Bubble image below. But instead of using the Luminance Key actor, the Alpha Channels actor uses built in Alpha Masking features. Alpha Masks are used to blend two images. An alpha mask is usually a gray scale image; white means that the foreground image is opaque, black means it is fully transparent, and gray means that it is partially transparent. The projector will respect any alpha channel information that is with your video stream. Here's how it works.

- Of special importance in the "Alpha Mask" scene is the bit between the lower Movie Player and its Projector:



First is the Threshold actor: this creates a black and white image based on the brightness of the video stream coming from the lower projector. If you were to connect the output of Threshold directly to the projector, you would see something like this:



Instead, the output of Threshold goes to the mask *input of the Add Alpha Channel actor. Add Alpha Channel doesn't change the image arriving at its video input; instead, it adds the alpha information into that video stream so that it will travel along with it through the rest of the Scene.*

Because the Add Alpha Channel actor has added the alpha channel information to the video stream, and because the projector's blend *input is set to* transparent*, the alpha channel information is used when the Eye is rendered on top of the Bubbles. Where the image from the Threshold actor is white, you see the Eye; where it is black, you see the Bubbles.*

YUV Video Processing (v1.1)

Isadora v1.1 allows you to process video in the YUV format instead of the RGB format used by most video processing software. The advantages of YUV are 1) each YUV pixel occupies half of the memory needed for an RGB pixel, and 2) because many movie and picture files use YUV as their native format (e.g., Photo JPEG and DV.) Because YUV occupies half the memory as RGB, and because incoming video being does not need to be converted to RGB before Isadora can process it, using YUV mode can result in significant speed improvements.

IMPORTANT: The one thing you want to avoid when using YUV processing is horizontal resolutions that are odd, i.e. not divisible by two. Because each pair of pixels shares color information, using odd widths can cause various algorithms to produce unexpected results. Isadora helps to prevent this by forcing the horizontal resolution of Movies and Pictures to be an even number when using YUV mode.

Most actors in Isadora are optimized for to process YUV video. (Actors that require RGB video by inputs that say rgb in instead of video in.) For these actors, the video stream is automatically converted from YUV to RGB before processing but this conversion can be costly in terms of CPU usage. Note too that ***none*** of the plug-ins created under the FreeFrame Standard process YUV natively (For more information about FreeFrame plug-ins, see page 111.). So, YUV video input to FreeFrame plug-ins will be automatically converted from YUV to RGB.

YUV is not without its disadvantages however. Unlike RGB, where each pixel specifies color very precisely, every two YUV pixels *share* the same color information. That means that effects that tend to single pixels of widely varying color (e.g., Shimmer) will not look as pristine in YUV mode.

You can use the **YUV to RGB** and **RGB to YUV** actors to convert a video stream from one format to another. Note however that the conversion from RGB to YUV and vice-versa is a "lossy" algorithm – repeated conversions may be lead to a loss in image quality.

Working with YUV

To enable the YUV Processing:

- Choose **File > Enable YUV Mode**. The current document will then use YUV mode when playing back movies and when capturing live video. This setting is saved with the document.

To disable the YUV Processing:

- Choose **File > Disable YUV Mode**.

To determine if a video stream is RGB or YUV:

- Point the mouse cursor at a link between a video output and a video input. A small window will appear that shows a thumbnail of the video, along with its mode (RGB or YUV) and resolution.

To determine if an actor can process YUV video without conversion to RGB:

- Look at the video input: if it is called rgb in instead of video in then the actor cannot process YUV video natively. If you send YUV video into such an actor, it will automatically be converted to RGB. Note too that the output will be RGB – you may want to use the RGB to YUV actor to explicitly convert the output video stream to YUV if you will be passing the output on to actors that can process native YUV.

Recording the Stage Output

Isadora allows you to record the output of one of the Stages to a QuickTime movie. This is useful if you would like to use manipulate Isadora's video output in another program, or just if you'd like to make a record of the video you are creating.

Rendering Complicated/High-Resolution Scenes

Isadora's output will slow down when rendering Scenes that have high-resolution movies (i.e. 720x480 DV movies, etc.) or when it is processing video through many actors. To achieve full frame rates when recording in these situations, use the Render Speed setting in the Record Settings dialog.

Setting the Render Speed to a value below 100% slows down Isadora's internal clock. This means that all media, as well as actors that reference time (e.g., the Envelope Generator, Pulse Generator, etc.), run at a proportionally slower rate. It does not, however, slow down the processing of video. Using a low Render Speed ensures that very complicated, high-resolution video Scenes can be fully rendered before each frame needs to be stored in the output movie. It also means that Isadora will not run in real-time.

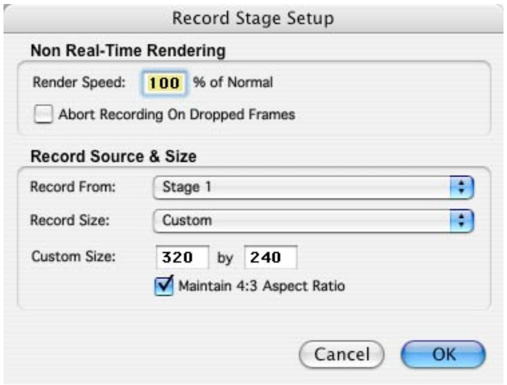
One way of determining the correct Render Speed setting is to watch the Status window as you record Isadora's output. The Cycles value should be greater than the frame rate of the movie to which you are recording. If it isn't, choose a lower rendering speed and try again.

You can also check the **Abort Recording On Dropped Frames** checkbox in the Record Settings dialog (see below.) If you do, recording will be aborted if Isadora can't keep up with the frame rate specified in the Compression Settings dialog. If Isadora aborts the recording process, set the Render Speed to a lower value and try again.

Adjusting the Recording Settings

To change the Recording Settings:

- Choose **Record > Record Settings…** to show the Record Settings dialog. Initially, it will look like this:



Record Stage Setup

Non Real-Time Rendering

Render Speed: 100 % of Normal

□ Abort Recording On Dropped Frames

Record Source & Size

Record From: Stage 1

Record Size: Custom

Custom Size: 320 by 240

☑ Maintain 4:3 Aspect Ratio

- Set the rendering speed by entering a value between 1 and 100 in the Render Speed edit text box. Lowering this value slows down Isadora's internal clock, giving it more time to finish all video processing before it has to store a frame to the output movie. This means that Isadora won't run in real time, but it allows you to generate output at the frame rate specified in the Compression Settings dialog without dropping frames. (See Rendering Complicated/High-Resolution Scenes above for more details on this feature.)
- If you want Isadora to abort the recording process if it cannot achieve the frame rate specified in the Compression Settings dialog, check the **Abort Recording On Dropped Frames** checkbox. Isadora will automatically stop recording and show an alert box if this box is checked and it drops a frame during recording.
- Select the Stage whose output you would like to record using the Record From pop-up menu.
- Select the size of the movie by selecting an option from the Record Size pop-up menu.

  *There are four options: **Full Stage Size**, **Half Stage Size**, **Quarter Stage Size** and **Custom**. If you choose one of the first three, the output size of the movie will be based on the size of the stage. If you choose Custom, two text edit boxes will appear allowing you to set the horizontal and vertical size of the movie output, respectively.*

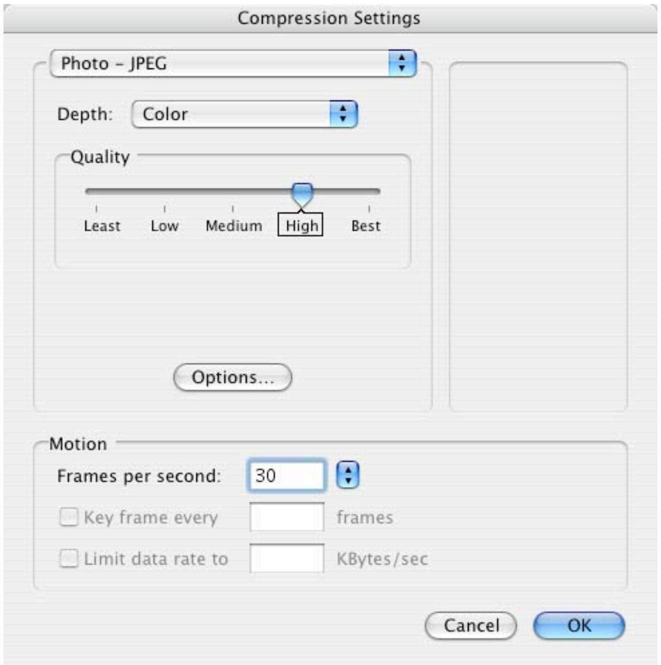
  *If you check the **Maintain 4:3 Aspect Ratio** checkbox, typing a number in the horizontal or vertical custom size will automatically update the other field so that the ratio of horizontal to vertical is 4 to 3.*

  Note that all of the settings you make here are remembered in the Preferences. They will be as you left them the next time you run Isadora.

Adjusting the Compression Settings

To set the compression settings for the movie:

- Choose **Record > Compressing Settings…** to show a standard QuickTime compression setup dialog. Initially, it will look like this:



Compression Settings

Photo – JPEG

Depth: Color

Quality: High

Motion

Frames per second: 30

□ Key frame every frames

□ Limit data rate to KBytes/sec

- Select the Compressor used to compress the video by selecting and option from the pop-up menu under the Compressor heading.

  The compressor you choose has a profound influence on the quality of the output image and the speed with which Isadora can compress the frames. For instance, Sorensen and Cinepak generate very small movies, but are extremely slow, leading to poor frame rates. We have found that using Photo JPEGA, Medium Quality, at 15 FPS provides workable results. You can also try the DV-NTSC or DV-PAL compressors – they look good and are fairly fast, though the size of the resulting movie can be quite large.

- Set the quality of the output by adjusting the slider under the Quality heading. The thing to know here is that the higher the quality, the larger the resulting movie will be. You may need to experiment with various settings to find the best compromise between quality and size of the resulting movie.
- Set the Frames Per Second. Isadora will do its best to output the movie at the rate you specify here. However, if a Scene is quite complicated and Isadora can't generate video frames at the rate you request, the true rate might be less than you specify. Remember, if you want to ensure full frame rates in the output movie, lower the Render Speed setting in the Record Settings dialog. (See Rendering Complicated/High-Resolution Scenes above for more details on this feature.)
- Click OK to confirm the settings you have made.
- The settings listed above are the most important. There are various other options depending upon which compressor you choose – check Apple's QuickTime documentation for more information about the various compressors and their settings.

Recording Isadora's Output

To record Isadora's output to a QuickTime movie:

- Make sure you have selected the Stage to be recorded and size of the output using the R**ecording Settings** dialog (see above.)
- Choose **Record > Start Recording**.

  If the compression settings have not yet been set (see above) the compression settings dialog will be shown. If the compression settings have already been set, then the previous settings will be used to compress the movie.
- Now, a standard file dialog will appear. Use it to specify the name of the new movie, and where you would like it saved. Click OK to confirm the dialog.
- Recording will begin immediately.

To stop recording the output:

- Choose **Record > Stop Recording**.
- The recorded output will appear with the name, and in the location you specified in the standard file dialog box that was shown when you started recording the output.

Mirroring Video to an External Device (v1.1)

Isadora now allows you to mirror one of its Stages to a FireWire camera or to other devices such as video output cards.

Start by installing the video card or connecting your FireWire device. Then, take the following steps:

- Choose the stage to be mirrored to the external video out. Do this by choosing **Isadora > Preferences** (MacOS) or **Edit > Preferences** (Windows) and clicking on the **Video** tab. There you can set the stage to be mirrored to the external output. The default setting is Stage 1.
- Choose the device to which the Stage will be mirrored by selecting it from the **External Video Output** submenu found in the **Output** menu. The default device will be FireWire, but if you have a hardware video output card, you will be able to choose it if QuickTime supports it as an output device.
- Once you've selected the video output device, you will need to choose the output mode from the **External Video Out Mode** submenu, also found in the **Output** menu. For FireWire cameras, you will choose the proper output mode for your camera: NTSC 29.97, PAL 25.0, etc. If you choose the wrong mode for your device (i.e. PAL for an NTSC camera) the output won't work. (Note: The DV-PRO options don't seem to work with a standard FireWire camera – you will want to choose "Apple FireWire NTSC" or "Apple FireWire PAL".
- Once you've made these choices, show the stage (**Output > Show Stages**) and then activate the output by choosing **Output > Start External Video Out**. You should now see the output of the stage appearing on your camera.

- You can stop mirroring to the external device by choosing **Output > Stop External Video Out.**

Note that the External Video Out feature only *mirrors* the output of the stage. No images will be sent to the camera if the stage is not visible.

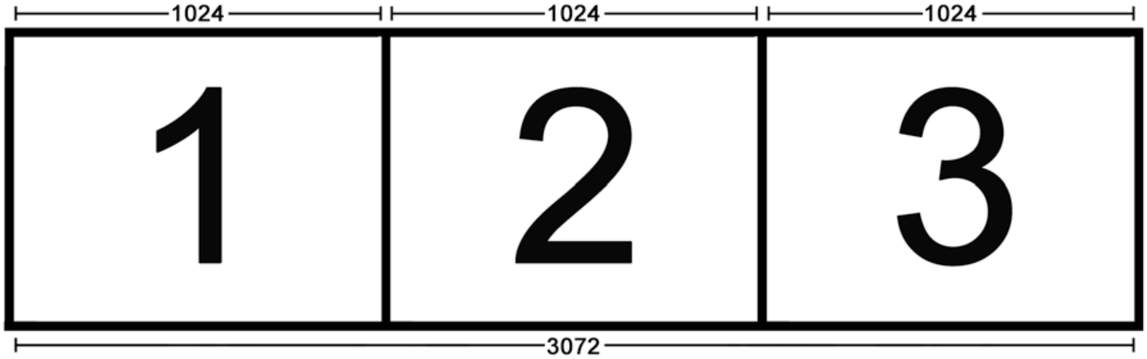
Using the Matrox Dual/TripleHead2Go

The Matrox Dual- and TripleHead2Go are external third-party devices that allow you to connect up to three separate video projectors or monitors to a single video output on your computer.

The Matrox TripleHead2Go, with XVGA video input on the bottom left, and three XVGA video outputs along the top

When you attach one of these devices to a video output on your computer, the computer thinks it is connected to a screen that is twice or three times as wide as normal, e.g., 3072x768, where 3072 = 1024 x 3. The Matrox hardware splits the extra wide image produced by your computer into two or three separate video outputs, each of which can be connected to a separate video projector or monitor.

TripleHead2Go splits image to three XVGA outputs



Computer sees a single, triple-wide resolution of 3072

To support this very useful device, Isadora offers the “Split Screen” feature in the Stage tab of the Preferences. By forcing a stage to use only the left or right half

(DualHead2Go), or the left, middle or right third (TripleHead2Go) of the display, the output of the Stage will end up visible on a single video output of the Matrox device. To learn more about using the Split Screen feature, please see page 120.

Using External Multi-Channel Sound Output

Isadora allows you to output sound to a variety of external, multi-channel sound output devices. This means that you can route the sound output of a Movie Player or Sound Player object to separate outputs, which can be very useful in performance situations where you want the various sounds to appear on separate channels of a mixing console.

To use this feature, you must have a multi-channel audio device connected to your computer. On Windows, Isadora uses ASIO (Audio Streaming Input Output) drivers to communicate with the external hardware. On MacOS X, it uses CoreAudio.

Installing Drivers

Before attempting to use multi-channel output in Isadora, you should ensure that the drivers for your device are installed and working properly. Here is what you should do for the various operating systems:

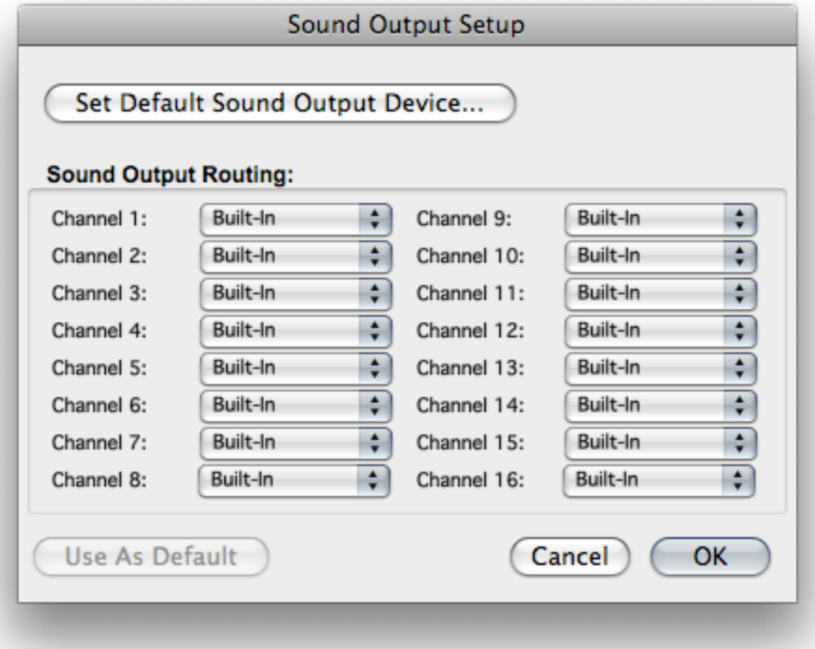
• On **MacOS X**, install the CoreAudio driver for your device using the installer program that came with the device.

• On **Windows**, install the ASIO driver for your device using the installer program that came with the device.

Setting Up Multi-Channel Sound With the Sound Player

Once you have installed your drivers, run Isadora. Then follow this set up procedure.

- Create a new document or open an existing document. You need to do this because Isadora stores the sound routings with each document, since it is likely that different documents will require different audio routing setups.
- Choose **Output > Sound Output Setup…** to display the Sound Output Setup Dialog. It looks like this:



Channel 1:	Built-In	Channel 9:	Built-In
Channel 2:	Built-In	Channel 10:	Built-In
Channel 3:	Built-In	Channel 11:	Built-In
Channel 4:	Built-In	Channel 12:	Built-In
Channel 5:	Built-In	Channel 13:	Built-In
Channel 6:	Built-In	Channel 14:	Built-In
Channel 7:	Built-In	Channel 15:	Built-In
Channel 8:	Built-In	Channel 16:	Built-In

*At the top you will see the **Set Default Output Device…** option. Select the device you would like to use for multi-channel output.*

If your device is not listed in the pop-up, quit Isadora and make sure that your drivers are properly installed, and repeat the above process.

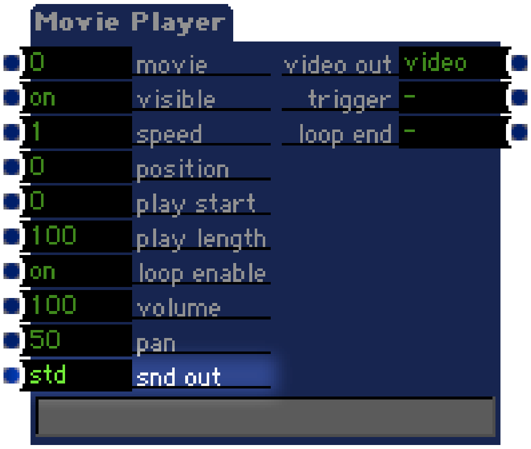
If you only need to route the sound of movies played by the Movie Player, you can skip this step. Otherwise, if you are using the Sound Player actor to play sound and want to route their output to various channels on the external device, you should set up the routing for Isadora's sixteen sound channels. These channels correspond to the sixteen channels available in the play channel *property of the Sound Player actor.*

*When you change the settings under the **Sound Output Routing** portion of this dialog, you are specifying the pair of outputs to which a particular sound channel should be sent. For instance, if you set Channel 1 to Ext. 1-2 and Channel 2 to Ext 3-4, then sounds played on Isadora's sound channel 1 would appear on channels 1 and 2 of your external device, while sounds played on channel 2 would appear at channels 3 and 4 of your device. Note that you cannot route Isadora's sound channels to only one channel of your output device – you must choose a pair. (You can, however, use the Pan property to send your sound only to one channel or the other.)*

- If you would like the current Sound Output settings to be the default when you next create a new document, click the "Use As Default" button. This stores the current routings in your preferences so that new documents will use these settings.
- Click OK to confirm your settings and dismiss the dialog.

Using Multi-Channel Sound with Movies

Isadora allows you to play the movie file's sound output to any pair of outputs on your external device. You can do this by simply choosing the desired output in the snd out property of the Movie Player, Movie Player Direct or Sound Movie Player actors.



Movie Player

0 movie
on visible
1 speed
0 position
0 play start
100 play length
on loop enable
100 volume
50 pan
std snd out

video out video
trigger -
loop end -

When the snd out property is set to std, the movie's sound will be sent to the default sound output device (usually this is your computer's speaker or sound output jack). To send the sound to a pair of outputs on your multi-channel sound output device, set the snd out property to one of the following values:

E1-2	Outputs 1 and 2
E3-4	Outputs 3 and 4
E5-6	Outputs 5 and 6
E7-8	Outputs 7 and 8
E9-10	Outputs 9 and 10
E11-12	Outputs 11 and 12
E13-14	Outputs 13 and 14
E15-16	Outputs 15 and 16
E17-18	Outputs 17 and 18
E19-20	Outputs 19 and 20
E21-22	Outputs 21 and 22
E23-24	Outputs 23 and 24
E25-26	Outputs 25 and 26
E27-28	Outputs 27 and 28
E29-30	Outputs 29 and 30
E31-32	Outputs 31 and 32

If you set the snd out property to a pair of outputs that does not exist on your external device, or if the device is not currently connected, then the sound will be sent to the built-in output.

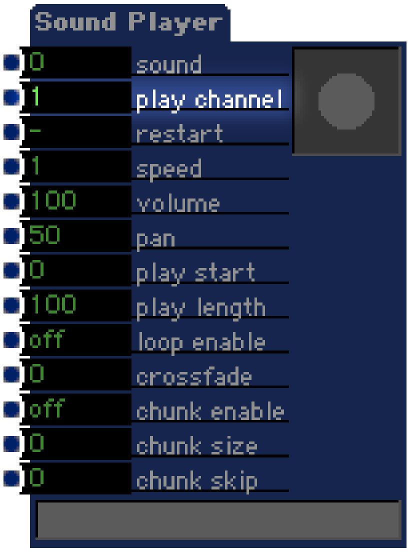
If the movie contains multiple sound tracks, the Movie Player and Movie Player Direct actors will route all sound to the output specified by the snd out property. If you would like to manipulate the volume, pan, and output routing of each track individually, use the Sound Movie Player actor.

Using Multi-Channel Sound with Sound Files

Sound files are sent to one of Isadora's sixteen Sound Channels. Each of these Sound Channels will play sound either on your computer's built-in sound output (i.e. its speaker or sound output jack) or on a pair of outputs on your external sound device.)

You associate a Sound Channel with a particular pair of outputs using in the Sound Output Routing section of the Sound Output Setup dialog. (See the explanation above under *Setting Up Multi-Channel Sound*.)

When you play sound using the Sound Player, you specify the Sound Channel on which it will play using the play channel property.

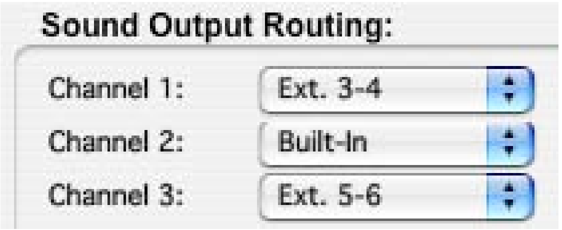


Sound Player

0	sound
1	play channel
-	restart
1	speed
100	volume
50	pan
0	play start
100	play length
off	loop enable
0	crossfade
off	chunk enable
0	chunk size
0	chunk skip

Since a Sound Channel is associated with a given pair of outputs, setting the play channel will determine where the sound will be heard.

For example, let's say that you set up the first three channels of the Sound Output Routing as follows:



Sound Output Routing:

Channel 1: Ext. 3-4

Channel 2: Built-In

Channel 3: Ext. 5-6

With this setup, sound files played on Sound Channel 1 will be heard on channels 3 and 4 of your external device; those played on Sound Channel 3 will be heard on channels 5 and 6. Sounds played on channel 2 will be heard on your computers built-in sound output.

Creating a Multi-Channel Audio Movie Using QuickTime Player Pro

QuickTime Player Pro allows you to create QuickTime Movies that have multiple audio tracks. If you import these movies into Isadora, you can use the Sound Movie Player actor to control the volume, panning, and output channel of the individual tracks.

Multi-channel audio movies can be created using the editing functions available in QuickTime Player Pro. (QuickTime Player comes and QuickTime is a free download from Apple. You can upgrade to the Pro version of QuickTime Player by visiting http://www.apple.com/quicktime.)

To create a multi-channel sound movie, follow these steps:

1) Run QuickTime Player Pro.
2) Choose "File > New Player" to create an empty file.
3) Open a sound file by choosing "File > Open File...". (QuickTime Player supports numerous sound formats, including AIFF, WAVE, MP3 and many others). Note, however, that it is probably a good idea to have all of your files stored in the same format at the same sample rate.
4) Choose "Edit > Select All"
5) Choose "Edit > Copy"
6) Then close the audio file by choosing "File > Close"
7) The file you created in Step 2 will now be in front. Click the "Rewind" button (the single triangle pointing left with the bar at the point.)
8) Choose "Edit > Add To Movie"

At this point, you have one sound track in the movie. You can add more tracks by repeating steps 3-8.

9) When you are done adding tracks, choose "File > Save" to save the new file with all of the audio tracks. Note the two options in the Save dialog: "Save as a self-contained movie" and "Save as a reference movie." Generally speaking, it is a good idea to choose "Save as a self-contained movie", as a new file with a copy of all of the audio data you pasted will be created. If you save as a reference movie, then the file only contains links to the original files -- if you delete or move the originals to another folder, you may not be able to open the reference movie.

Once you have created your multi-channel audio QuickTime Movie, you can use the Sound Movie Player actor to control the volume, panning, and sound routing of the individual tracks.

Isadora & CoreAudio (v1.2 - MacOS X Only)

Isadora integrates Apple’s CoreAudio architecture, making all of the CoreAudio plug-ins installed on your system available for use as plug-ins inside Isadora. (OS X comes with several CoreAudio plug-ins installed, and there are many more available from third parties.) For documentation on the individual plug-ins, you should contact the manufacturer of the plug-in. This section describes the basic architecture and how to manipulate the sound of both pre-recorded audio files and live input.

All of the CoreAudio plug-ins will appear in the toolbox group called “Audio”. They will be listed by the names given them by their manufacturers.

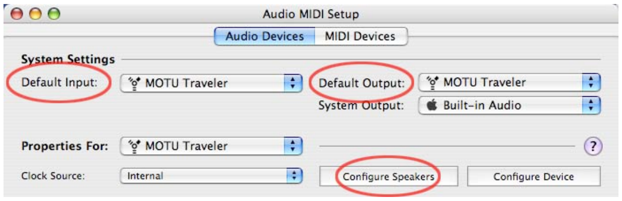
Setting Up for Multi-Channel Sound in Mac OS X

If you plan on accessing your multi-channel sound output device with CoreAudio plug-ins, you must ensure it is set as the default in the Audio MIDI Setup application.

• On **MacOS X**, install the CoreAudio driver for your device using the installer program that came with the device. Then, after connecting the device, follow these steps:

1) From the Applications folder, double click the Audio MIDI Setup application.

2) Click on the tab “Audio Devices” at the top. The top portion of the window looks like this

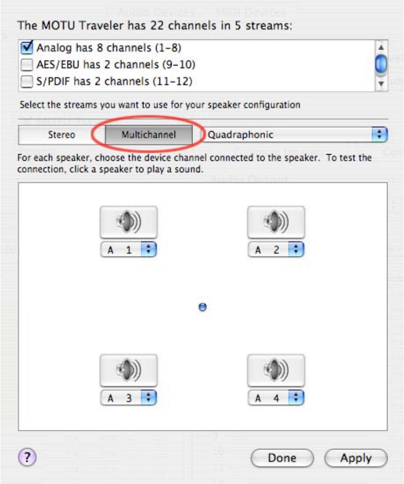


Default Input: MOTU Traveler
Default Output: MOTU Traveler
System Output: Built-in Audio
Properties For: MOTU Traveler
Clock Source: Internal

3) In the popup menu to the right of “Default Output”, select your multi-channel output device.

4) If you want to process live input, select your multi-channel output device in the popup to the left of “Default Input.”

5) If you would like to do sound spatialization, click the “Configure Speakers” button. In the dialog that appears, click the “Multichannel” button.



The MOTU Traveler has 22 channels in 5 streams:

☑ Analog has 8 channels (1–8)

□ AES/EBU has 2 channels (9–10)

□ S/PDIF has 2 channels (11–12)

Select the streams you want to use for your speaker configuration

For each speaker, choose the device channel connected to the speaker. To test the connection, click a speaker to play a sound.

6) You can then use the popup menu to the right of the "Multichannel" button to select the output mode. Choices include Quadraphonic, Hexagonal, Octagonal, 5.1 Surround, 6.1 Surround and 7.1 Surround. Click "Done" after you have chosen your setup.

7) Choose **Audio MIDI Setup > Quit**

Manipulating Pre-Recorded Sound - Tutorial

Like the Sound Player, all pre-recorded sounds to be manipulated in Isadora must first be imported into the Audio bin. Once you have some sounds in the Audio Bin, follow these steps for an example of manipulating pre-recorded sound.

1) Click on "Audio" in the Toolbox Filter to show the actors available in the audio group.

2) Add an AUAudioFilePlayer actor to the scene. Set the sound input to the number of the sound you want to manipulate.

   Note that its output says "audio". This is like the "video" inputs and outputs seen in Isadora's video processing actors. Audio is a special type of stream that transmits digital audio signals. You can only connect audio outputs to audio inputs, and vice versa.

3) To the right of the AUAudioFilePlayer, add an AULowpass actor. This is a low-pass filter, with adjustable resonance (i.e. "Q".)

4) To the right of the AULowpass actor, add an AUMixer actor. This actor allows the volume and panning of multiple sound streams to be manipulated and mixed together.

5) Note the inputs input on the AUMixer. You can add an arbitrary number of input channels to this mixer by changing this value. For our example, we will work with 2, so set the inputs input to 2.

6) To the right of the AUMixer actor, add an DefaultOpututUnit actor. This sends the mixed sound to the default audio output device.

7) Make a link between the AUAudioFilePlayer 's out 1 output and the AULowpass' in 1 input. Then connect the AULowpass' out 1 output to the AUMixer 's in 1 input. Finally, like the AUMixer's out 1 output to the DefaultOutputUnit's in 1 input. As soon as you make this last link, you will hear sound. Note that the AUAudioFilePlayer and DefaultOutputUnit both have properties called active. We will experiment with these momentarily, but suffice to say that because both of these active properties were set to on, connecting the last link caused sound to automatically start playing.

8) Add a Mouse Watcher to the scene. Connect the horz pos output to the cutoff frequency input of the AULowpass, and the vert pos output the resonance input.

9) Turn the volume of your sound system to a medium level – the low-pass filter can make very loud sounds when the resonance is high.

10) Finally, click the start input of the Default Output Unit. You should hear your sound playing. Moving the mouse will change the cutoff frequency and resonance of the low-pass filter, affecting the sound's timbre.

11) You can also experiment with changing the volume 1 and panning 1 inputs of the AUMixer actor.

12) To mix two sounds, add another AUSoundPlayer actor to the scene, and connect it's out 1 output to the in 2 input of the DefaultOutputUnit. Then click the start input of the DefaultOutputUnit. You will now hear both sounds, and can control the volume and panning of each using the volume and panning inputs of the AUMixer actor.

13) The DefaultOutputUnit's active property controls the entire change of audio actors connected to that output unit. Change this property to off you will see that all sound will stop. Change it back to on and both sound files will start playing again.

14) Now try changing the active property of both AUAudioFilePlayers. You will see that you can use this property to start or stop the sound file playback independently.

As you can see, using the CoreAudio filters to perform real-time manipulation of sound is very much like using the video filters that have been part of Isadora since the beginning.

Spatialized Sound - Tutorial

CoreAudio offers the ability to spatialize sound, that is, to move it in and around the space between your speakers. Using the previous tutorial as an example.

Note that if your default audio output (as specified in the Audio MIDI Setup application) is stereo (i.e. two speakers), the AUMixer3D will simulate movement of the sound in three dimensions – this is best experienced with headphones. If you have more than two outputs (e.g. a quadraphonic speaker setup), AUMixer3D will spatialize the sound within the field of that speaker configuration.

1) Click on "Audio" in the Toolbox Filter to show only audio actors in the Toolbox.
2) Add two AUAudioFilePlayer actors to the scene. Set the sound input of both actors to the number in the Audio Files Bin of the sounds you want to play.
3) To the right of the AUAudioFilePlayers, add an AUMixer3D actor, and set its inputs input to 2. This actor allows you to control the volume, azimuth, elevation and distance of each sound stream, measured relative to the central point in the current speaker configuration. (Which you selected in the Audio MIDI Setup application.)
4) To the right of the AUMixer3D , add an DefaultOpututUnit actor. This sends the mixed sound to the default audio output device.
5) Make links between the AUAudioFilePlayers' audio outputs and the AUMixer3D's audio inputs. Connect a link from the AUMixer3D's audio output to the DefaultOutputUnit's audio input. As soon as you make this last link, you will start to hear both sounds playing.
6) Try adjusting the various parameters on the AUMixer3D. Changing the azimuth should move the sound in a circle around the central point. Changing the elevation may give a sense of the sound going above or below you (not audible in certain speaker configurations.) Finally, the distance controls the apparent distance of the sound from the center point. Higher numbers make the sound get softer, i.e. it is moving away from you.
7) Set the active input of the DeafultOutputUnit to off the sound.

Setting Up for Multi-Channel Sound in Windows Vista

• In **Windows Vista**, install the audio driver for your device using the installer program that came with the device. Then, after connecting the device, follow these steps:

1) Go to the main menu (bottom left hand side) and open the *Control Panel* window.
2) Click on the QuickTime icon in the list. The QuickTime Preferences window will open. Click on the "Audio" tab.
3) Click the "Devices" popup menu to select your multi-channel output device.
4) In the "Play Audio Using" menu, select "Direct Sound",
5) In the "Sound Out" menu, select the output format (Rate and Size) supported by your audio hardware.

6) To create multi-channel sound, click on the “Channels” menu. Your choices include Mono, Stereo (L R), Quadraphonic, 5.0 (L R C Ls Rs), 5.1 (L R C LFE Ls Rs), 6.1 (L R C LFE Ls Rs Cs) and 7.1 (L R C LFE Ls Rs Lc Rc). Click “Apply” after you have chosen your setup.

Live Video & Audio Input

To bring live video into Isadora, you must have hardware that allows Isadora to "see" the video coming into your computer. On contemporary Macintoshes, and many Windows machines, the Fire Wire input is the most ubiquitous way to input video. In addition, there are various capture boards, PC Cards (for laptops), USB video capture devices, etc. Any of these can be used with Isadora as long as the operating system recognizes it as a valid video input device. Technically speaking, on MacOS X, the device must have a valid 'VDIG' driver so it will be recognized by QuickTime; on Windows, it must be recognized by the DirectShow sub-system.

When using capture boards or other external video capture hardware, the installation procedure varies from vendor to vendor. Follow their instructions to install the video input hardware on your system.

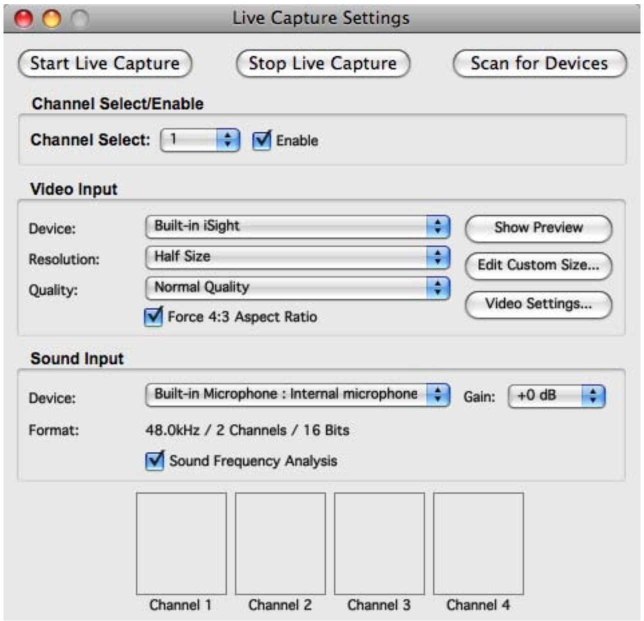
Once all of the necessary drivers and hardware are installed, perform the following steps to begin capturing live video.

- To capture live video, start by connecting your video camera to the video the video capture device on your computer. For computers with Fire Wire inputs, you would connect your digital video camera's Fire Wire output to the computer's Fire Wire input. Most other capture devices accept an analog video input, which may be either Composite (usually and RCA phono plug connector) or S-Video (a round 4-pin connector). If this is the case, connect the analog output of your camera to the analog video input of your capture device. If your video capture device has both Composite and S-Video inputs, you may need to choose the input that Isadora is seeing – more on that below. Make sure that your digital camera on to the "camera" setting (i.e. not VCR or Tape) if you want to see live video from the camera.
- To capture live audio, connect your external audio source (mixing console output, cassette player, etc.) the sound input of your computer. Generally speaking, this is a 1/8" mini-phone plug – this is the same size and type of plug seen on headphones that plug into a portable CD player. On computers without audio input, you will need to purchase an external sound input device. Often these connect to the USB port of your computer.

Live Capture Settings Window (v1.3)

As of version 1.3, Isadora can accept live input from up to four video and audio inputs simultaneously. Each of the four channels has it's own configuration. The settings for these channels are made using the **Live Capture Settings** window.

- To show the **Live Capture Settings** window, choose **Input > Live Capture Settings**. The window shown below will appear.



Live Capture Settings

Channel Select/Enable

Channel Select: 1 ☑ Enable

Video Input

Device: Built-in iSight

Resolution: Half Size

Quality: Normal Quality

☑ Force 4:3 Aspect Ratio

Sound Input

Device: Built-in Microphone : Internal microphone Gain: +0 dB

Format: 48.0kHz / 2 Channels / 16 Bits

☑ Sound Frequency Analysis

Follow the steps below to configure each channel.

Channel Select/Enable

- **Select and enable channel you wish to configure:** Use the **Channel Select** popup to select a channel, and then tick the **Enable** checkbox to enable that channel for live capture.

Video Input Section

- **Select the Video Device:** After connecting and turning on your video capture device, you should select it in the **Device** popup menu. If your device does not appear, try clicking the “Scan for Devices” button and try again. If that fails, check the other channels using the **Channel Select** popup – a device might be “busy” because it is in use by another enabled live input channel, or because it is being used by another application. If none of this works, it simply may be that your device is improperly connected to the computer, or that it is not recognized by the operating system.
- **Select the Video Resolution:** The **Resolution** popup offers several resolution options. **Full Size** will deliver the video input at the maximum resolution offered by the capture device. **Half** and **Quarter Size** will shrink the video to one-half or one-quarter of that maximum. There are also other NTSC and PAL resolutions, which scale the video to the specified size. If you are unsure, use the default setting of **Half Resolution**.
- **Select the Video Quality (MacOS X Only):** The quality setting will effect the quality of the image as well as the amount of CPU power required to acquire the image. Lower quality settings require less CPU power, but degrade the image. The best practice here is to look at the image once it’s being shown on the Stage, and find the quality setting that works best for you.

- **Enable/Disable the Force 4:3 Aspect Ratio Option:** Some video sources (notably NTSC-DV) are not delivered in a standard 4:3 aspect ratio. Ticking this checkbox will scale the video to to a 4:3 ratio.
- **Show Preview:** Clicking this button will show a full resolution preview for that video channel. Make sure to close this window after using it, as rendering the video there wastes valuable CPU resources.
- **Edit Custom Capture Size:** See the topic "Setting a Custom Capture Size" on page for more information on the Custom Capture Size Feature.

Audio Input Section

- **Select the Audio Device:** The **Audio Input** section allows you to configure the audio input device for that channel. To select a device, choose it from the **Device** popup menu. If you are using an external device, and it does not appear in the menu, ensure it is turned on and properly connected to computer. Then try clicking the "Scan for Devices" button and look for your device in the popup menu.
- **Audio Format:** Once you have selected a device, the default audio format for that device will be displayed here. If you want to make changes to the audio format for a particular device, please do so in the Audio/MIDI Setup utility in MacOS X, or the Sound Control Panel in Windows.
- **Enable/Disable Sound Frequency Analysis:** If you would like to use the Sound Frequency Watcher actor to manipulate other actors based on the Frequency Content of the live audio input, you will need to check the **Sound Frequency Analysis** checkbox. If you are not using the Sound Frequency Watcher, then you will want to leave this box unchecked to save CPU resources. Once this option is enabled, you can view the frequency content of the incoming audio using the Status Window, which is can be shown by choosing **Windows > Show Status**.
- **Select the Gain adjustment:** If the audio input is too loud or too soft, you can use the **Gain** popup to decrease or increase the volume of the incoming sound. (Positive values [e.g, +6 dB) increase the amplitude, negative values decrease it.) Refer to the "VU" meters at the bottom of the window to get a good range.

Starting/Stopping Live Capture

From the Live Capture Settings Window

- To start live capture from the Live Capture Settings window, click the "Start Live Capture" button.
- To stop live capture from the Live Capture Settings window, click the "Stop Live Capture" button.

From the Main Menu

- To start capturing video and audio, choose **Input > Start Live Capture**. When you do, Isadora will attempt to start capturing both video and audio on all enabled channels.
- To stop capturing video and audio, choose **Input > Stop Live Capture**.

Verifying Live Capture

After doing starting live capture, you will see a video thumbnail of the incoming video, and "VU" meters showing the incoming audio, in the corresponding "Channel" box. (Remember: if you did not enable the channel, it will not capture video or audio. Likewise, if you chose "None" for a video or audio device on a particular channel, no input from that device will be shown.)

If you don't see live video in the channel box at the bottom, it probably means that you are using a composite video input device, and that the camera is not connected properly. (If your device appeared in the **Device** popup menu, Isadora is seeing the capture device itself; but that does not mean that the connection from the camera is properly connected to the device.)

- Ensure that 1) your camera is turned on, 2) that you have installed the drivers for your external video capture device, 3) the cable between your camera and the capture device is securely attached.

If you don't see anything happening in the "VU", it probably means that you are using an external audio capture device, and that the audio source is not connected properly to that device.

- Ensure that 1) your audio source is producing sound, 2) that you have installed the drivers for your external audio capture device, 3) the cable between your audio source and capture device is securely attached

Interactively Starting or Stopping Capture & Recording Capture Input

You can interactively turn capture on and off using the Capture Control actor. This actor basically simulates the actions provided under the Capture menu: Start Live Capture, Start Video Only Input, Start Audio Only Input, and Stop Video/Audio Input. For video input drivers with more than one input (composite, s-video, etc.) you can also use this actor to the input that will be used to capture. For more info, see Capture Control in the Actors Reference section of this manual.

The Capture To Disk actor allows you to record whatever is being captured to disk, and to then have that newly recorded movie appear in the Media Window. See a full description below under the heading "Capturing Video and Audio To Disk" on Page 158.

Controlling Video Capture Performance

Setting Capture Resolution (v1.1)

You can control the resolution with which Isadora captures the live video. In North America, Digital Video cameras typically provide an image that is 720 pixels across and 480 pixels down. While the quality of such an image is very good, it contains so much data (about 40 megabytes per second) that Isadora can get bogged down attempting to process it all. You can improve up Isadora's performance by scaling the image down to a smaller size. In the **Resolution** popup in the **Live Capture Settings** window, you can choose from the following resolutions:

- **Full Size:** Leaves the captured video at original resolution..
- **Half Size:** Scales the captured video to one-half of its original resolution.
- **Quarter Size:** Scales the captured video to one-quarter of its original resolution.
- **640 x 480 (NTSC Full)** Scales the captured video to a resolution of 640 x 480.
- **320 x 240 (NTSC Half)** Scales the captured video to a resolution of 320 x 140.
- **160 x 120 (NTSC Quarter)** Scales the captured video to a resolution of 160 x 120.
- **768 x 576 (PAL Full)** Scales the captured video to a resolution of 768 x 576.
- **384 x 288 (PAL Half)** Scales the captured video to a resolution of 384 x 288.
- **192 x 144 (PAL Quarter)** Scales the captured video to a resolution of 192 x 144.
- **Custom Size:** Scales and crops the captured video using the settings in the "Set Custom Size" dialog – see below.

Setting a Custom Capture Size (v1.1)

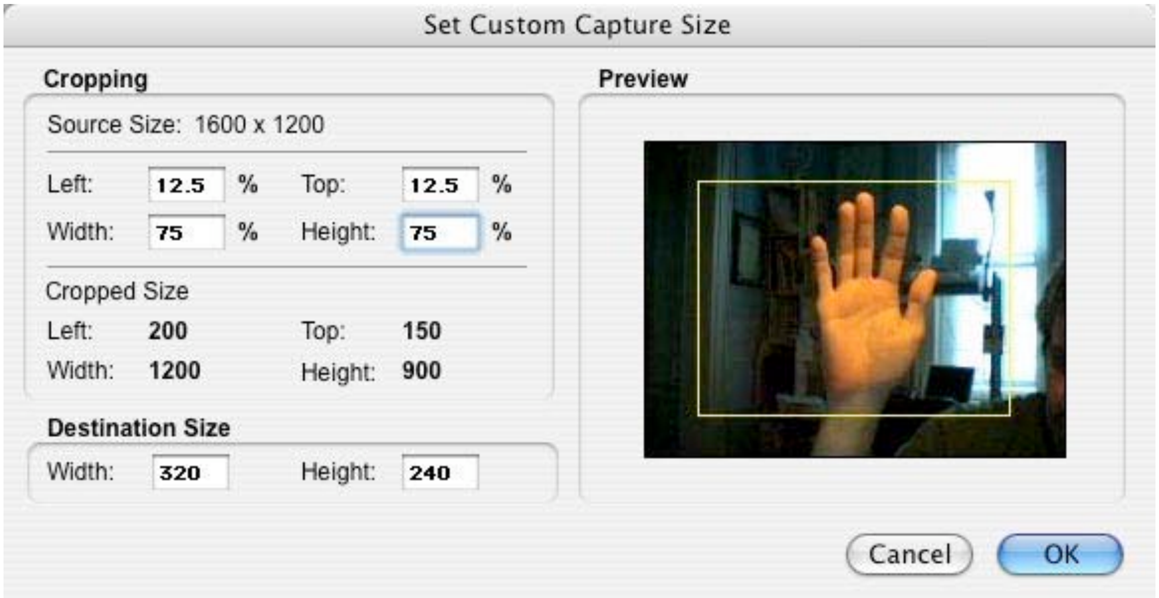
The Set Custom Capture Size dialog allows you to crop and scale the captured video. This is useful if you only want to "see" a portion of the incoming video stream.

To set the Custom Capture Size, do the following:

1) Start Video Capture using the **Input > Start Video + Sound**. This isn't absolutely necessary: you can set the custom capture size without live video coming into the computer. But if video capture is active, the dialog will provide a preview that will make help you visualize the portion of the image that is being captured.

2) Select the desired channel in the **Live Capture Settings** window, and then click the "Custom Size" button.

3) The following dialog will appear


Set Custom Capture Size

Cropping

Source Size: 1600 x 1200

Left: 12.5 % Top: 12.5 %

Width: 75 % Height: 75 %

Cropped Size

Left: 200 Top: 150

Width: 1200 Height: 900

Destination Size

Width: 320 Height: 240

4) The cropping of the image is set using the Left, Top, Width and Height boxes under the **Cropping** heading. These are specified as a percentage of the incoming video's native resolution, from 0 to 100%. As you change the values in these boxes, the size of the cropped image in pixels will be shown in the area just below. In addition, a yellow rectangle will appear over the live video preview to give you a sense of the cropped video image.

5) The final resolution of the video stream, as it will appear at the Video In Watcher actor's output, is set by the Width and Height values seen under the Destination Size heading. These are specified in pixels. If you don't want to scale the image, set these to match the Width and Height shown under "Cropped Size."

6) Once you are satisfied with the settings, click OK to save them.

To capture video with the custom cropping and size you've specified, choose the **Custom** option in the **Resolution** popup of the **Live Capture Settings** window.

Controlling Capture Quality

You can also control the quality of the capture. It is a bit hard to describe what effect this will have on the image, as each capture "codec" interprets the capture quality setting in a different way. Nevertheless, you can depend on the fact that capturing using at a lower quality will speed up the rate at which frames will be captured and processed.

- To change the quality with which Isadora is capturing video, choose a setting in the **Quality** popup menu in the **Live Capture Settings** window. The possible choices are **Maximum Quality**, **High Quality**, **Normal Quality**, **Low Quality**, **and Minimum Quality**.

Forcing a 4:3 Aspect Ratio

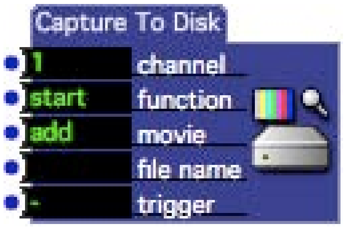
There is also a setting in the **Live Capture Settings** window called **Force 4:3 Aspect Ratio**. When this option is enabled, the captured video stream is scaled so that its aspect ratio (ratio of width to height) is 4 to 3.

Some capture cards capture at this ratio (e.g., 640x480 or 320x240) normally, and so turning on this setting will have no effect. However, forcing the 4:3 ratio is useful when capturing digital video (DV) streams via Fire Wire. For instance, a DV-NTSC stream has a resolution of 720x480 – an aspect ratio of 1.5 to 1.

Using this setting improves performance if, in your Isadora file, you are combining captured live video that does not have a 4:3 aspect ratio with movies that do. In addition, it makes the image a bit smaller, leaving fewer pixels to process.

Capturing Video and Audio To Disk

The Capture To Disk actor allows you to start or stop recording the current capture input to your computer's hard drive. After capture is completed the newly recorded movie will appear in the Media Window so that you can play it using any of the Movie Player actors. Note that if video and/or audio capturing must be active for this actor to have any effect. (You start live capture using the menu commands under the Capture menu or with the Capture Control actor.)



This function is useful in interactive setups where you want to record something that is happening live, and subsequently manipulate that recorded imagery in Isadora.

Starting Capture To Disk

To have the Capture To Disk actor start recording, you would set the function property to start and then send a trigger into the trigger input. The movie property determines where the recorded movie will appear in the Media Window when recording is stopped. If this property is set to add, then the newly recorded movie will be added after the last movie currently in the Media Window. If this property is set to a number, then the movie currently at that location in the Media Window will be replaced by the new movie.

In terms of organizing the Media Window when using the Capture To Disk actor, the best practice is to add some movies into the window and clear them (using **Edit**

> Clear) so that they appear as <Unassigned>. Then you can use these locations in the Media Window to hold your newly recorded movies.

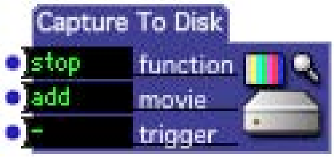
It is important to understand that if you specify a number in the movie property, there must be a movie at that location in the Media Window. Otherwise, the movie will not appear in the Media Window.

Furthermore, if you have a Movie Player in the same scene with the Capture To Disk actor, then its visible property must be off while you are recording. Otherwise, the movie is "busy" and cannot be replaced. If you want a Movie Player to play a newly recorded movie in the same scene in which it was recorded by the Record To Disk actor, take the following steps:

1) Make sure that the visible property of the Movie Player is off while you are recording.
2) Use the Record To Disk actor to start recording, specifying the place where the new movie will appear in the Media Window.
3) Use another Record To Disk actor to stop recording.
4) Set the movie property of the Movie Player to the location of the newly recorded movie in the Media Window.
5) Set the visible property of the Movie Player to on.

Stopping Capture To Disk

To have the Capture To Disk actor stop recording, you would set the function property to stop and then send a trigger into the trigger input. The movie property has no effect when the function property is set to stop – the movie will be stored in the location specified by the Capture To Disk actor that initiated the recording process, regardless of its setting here.



Capture To Disk
stop function
add movie
- trigger

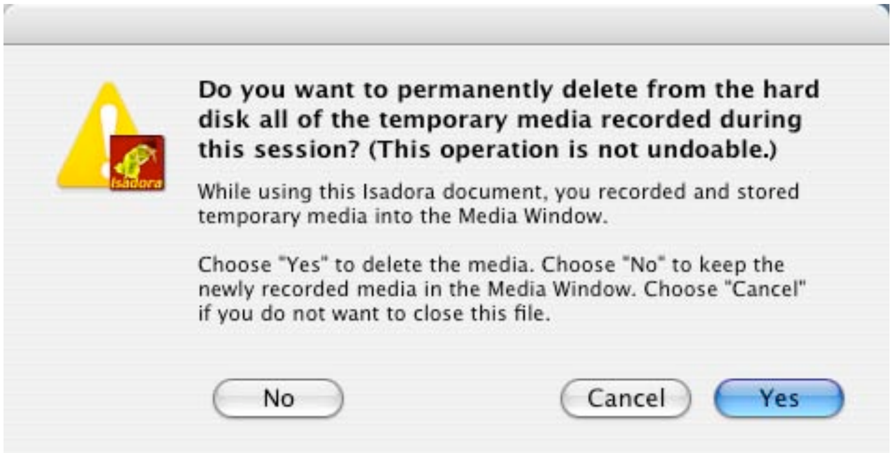
Once recording is stopped, the movie will appear in the Media Window at the location specified earlier. At this point, it can be played like any other movie that has been imported into the Media Window.

Specifying the Location on Disk for Captured Media

You can specify a folder into which movies recorded using the Capture To Disk will be placed. To do so, choose **Input > Set Captured Media Folder**. When you do, a file dialog will appear. Use this dialog to select the folder to which you would like your movies to be recorded, and then click the "Choose" button to confirm your choice.

Deleting Captured Media

If you have used the Capture To Disk actor to record one or more movies, and you then attempt to close the current document or quit Isadora, the following message box will appear:



Do you want to permanently delete from the hard disk all of the temporary media recorded during this session? (This operation is not undoable.)

While using this Isadora document, you recorded and stored temporary media into the Media Window.

Choose "Yes" to delete the media. Choose "No" to keep the newly recorded media in the Media Window. Choose "Cancel" if you do not want to close this file.

If you choose “Yes” to delete the media, then all of the movies you recorded will be deleted and their references in the Media Window set to <Unassigned>. If you choose “No”, then the movies will not be deleted and their references in the Media Window are unchanged. This latter option means that when you next load the Isadora document, you will be able to play the movies that you captured previously. You can choose “Cancel” if you do not want to close or quit.

Communicating with External Devices

MIDI Input and Output

Isadora has a full complement of actors that allow for interactive control via MIDI. But before you use the actors, you must configure Isadora for MIDI Input and Output.

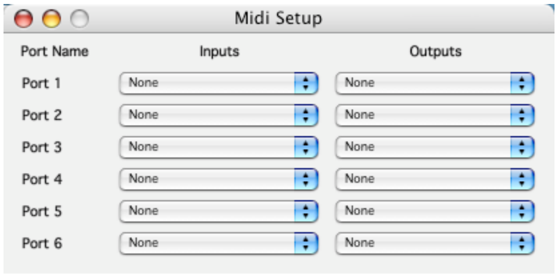
Hardware Interface & Drivers

Before you begin, you must have a hardware MIDI interface that allows you to connect MIDI devices to your computer. Before using this device with Isadora, you must install the hardware drivers for the interface. To do this, please follow the installation instructions in the interface's manual. Note: Isadora should not be running when you install the drivers, otherwise it may not see the interface.

After you've installed any required drivers, you should connect the MIDI interface to your computer. These interfaces are most often connected to a USB port with a standard USB cable. Once you've done this, you're ready to start up Isadora.

Midi Setup

Ensure that your hardware MIDI interface is connected to your computer. Then start Isadora and choose **Communications > Midi Setup**. A dialog will appear that looks like this:



Midi Setup

Port Name	Inputs	Outputs
Port 1	None	None
Port 2	None	None
Port 3	None	None
Port 4	None	None
Port 5	None	None
Port 6	None	None

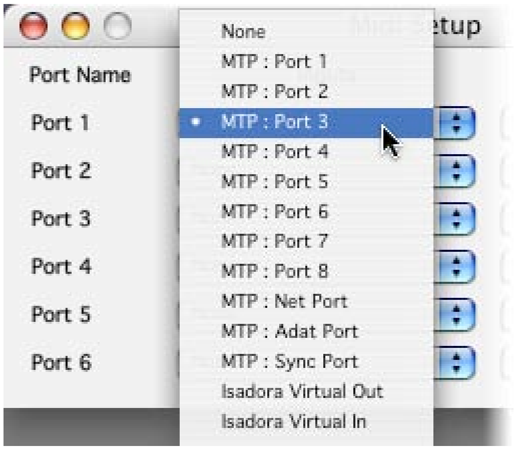
This window determines how the physical inputs on your MIDI interface will be associated with Isadora's MIDI input and output ports.

For sake of clarity, we will refer in this document to the MIDI ports on your MIDI interface as *Physical* ports to differentiate them from Isadora's MIDI Input and Output Ports.

Associating a Physical Input Port to an Isadora MIDI Input Port

If you want to receive MIDI input from a particular port on your MIDI interface, do the following:

1) Choose an unused Isadora MIDI Input port to receive the MIDI data – from Port 1 through Port 6.
2) Click on the popup menu to the right of that port name, under the heading **Inputs**.
3) In the popup menu, you will see a list of physical input ports available on your MIDI interface. Choose the physical input to which your MIDI device is connected and release the mouse.



4) Choose **Windows > Show Status** to show the Status Window. Have your MIDI device send data to the input port (e.g., if you have a MIDI keyboard, press keys on the keyboard.) If everything is working correctly, you should see one of the indicators associated with the port you chose in Step 1 blink as the MIDI data comes in.

If you are not receiving any MIDI data, check the following:

1) Ensure that you have connected the MIDI Out of your device to the MIDI In of your physical interface, and that the MIDI cable is in working order.
2) If your MIDI interface has an indicator that shows when MIDI data is being received, make sure this blinks when your device is sending MIDI data.
3) Check that the physical input you chose in the MIDI Setup dialog matches the input to which the MIDI cable is connected.

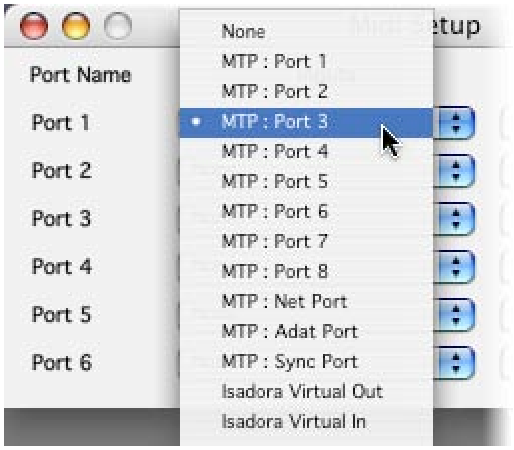
Associating an Isadora MIDI Output Port to a Physical Output Port

If you want to send MIDI output to a particular port on your MIDI interface, do the following:

1) Choose an unused Isadora MIDI Output port on which the MIDI data will be sent from one of the MIDI output actors – from Port 1 through Port 6.

2) Click on the popup menu to the right of that port name, under the heading **Outputs**.

3) In the popup menu, you will see a list of physical output ports available on your MIDI interface. Choose the physical output to which your MIDI device is connected and release the mouse.



4) If you haven't already, set up a MIDI output actor, e.g., the Send Note actor. Set its port input to match the port you chose in Step 1, e.g., for Port 2 you would set the port input to '2'. Then trigger the actor – you should hear/see your device respond. (If your device has a MIDI Status indicator – see if it blinks when you trigger the actor.)

If your device is not receiving any MIDI data, check the following:

1) Ensure that you have connected the MIDI Out of your interface to the MIDI In of your device (e.g., Keyboard, Synth, etc.), and that the MIDI cable is in working order.

2) If your MIDI interface has an indicator that shows when MIDI data is being sent, make sure this blinks when you trigger a MIDI output actor set to transmit on the correct port.

3) Check that the physical output you chose in the MIDI Setup dialog matches the output to which the MIDI cable is connected.

Isadora Virtual MIDI Inputs & Outputs (v1.1 MacOS)

Isadora on MacOS has both a virtual MIDI input and virtual MIDI output. These allow you to connect Isadora to another piece of MIDI software running on your computer. To use the virtual inputs or outputs, do the following:

Sending MIDI to another application on Isadora's Virtual MIDI Output

1) Start Isadora before you start up the other piece of software.

2) Start the other application.

3) Choose **Communications > Midi Setup**

4) Select an Isadora MIDI Output port on which to transmit to the other application. In the popup menu under the **Outputs** heading, choose “Isadora Virtual Out”.

5) Go to the MIDI setup for the other application. Chose “Isadora Virtual Out” as the input source.

Now when you send MIDI messages on the selected Isadora MIDI Output, they will be transmitted via Isadora’s Virtual MIDI Output and received by the other application.

Receiving MIDI from another application on Isadora’s Virtual MIDI Input

7) Start Isadora before you start up the other piece of software.

8) Start the other application.

9) Choose **Communications > Midi Setup**

10) Select an Isadora MIDI Input port on which to receive MIDI from the other application. In the popup menu under the **Inputs** heading, choose “Isadora Virtual In”.

11) Go to the MIDI setup for the other application. Chose “Isadora Virtual In” as an output for the program.

Now when you send MIDI messages from the other application, they will be received via Isadora’s Virtual Input on the selected Isadora MIDI Input Port.

Open Sound Control (OSC) (v1.1)

Isadora has support for Open Sound Control (OSC). This is a standard protocol that allows two pieces of software to communicate with each other, either on the same computer or on computers connected via a local area network.

How Open Sound Control Communicates

While Open Sound Control is not limited to any physical communications standard, the most common way to send messages is via UDP (User Datagram Protocol), a method used to send data over the Internet.

To send data to an application on another computer, you must know its TCP/IP address. In addition, an OSC application “listens” for messages on a specific UDP *port number* ranging from 1 to 65535. You must know both of these numbers before you can send OSC packets to another application on a remote computer. You must also know the OSC address to which the data will be sent – this information can usually be found in the documentation for the program.

If you are transmitting data between two programs running on the same computer, you can use the special address **localhost** (which translates to an IP address of 127.0.0.1) to indicate that the data will be transmitted locally. This should work even if you computer is not connected to a router or switch via a built-in Ethernet interface or via a wireless interface.

If you intend to send Open Sound Control packets between two computers, the first step is to ensure that both computers have been assigned a valid TCP/IP address.

On MacOS X, you can find the TCP/IP address of your computer by opening the System Preferences and clicking on Network. You will then see the active TCP/IP interfaces on your computer (e.g., built-in Ethernet, AirPort, etc.) and their IP Addresses. Any of these addresses may be used to receive data.

Receiving Open Sound Control Packets

Generally speaking, when sending messages from another computer, you will specify three pieces of information to define where the information will go: the target machine's IP address (i.e. an internet address like 123.234.555.121), a UDP port number between 1 and 65535, and the OSC address (i.e. /isadora/1). You also usually need able to specify whether or not to send "type tag" information with the OSC packet – **this must be turned on for Isadora to receive the packets and interpret them correctly**.

Isadora has 100 Open Sound Control addresses to which data may be sent. They range from **/isadora/1** through **/isadora/100**. Isadora expects receive either floating point or integer numbers on these inputs. The **type tag must be sent** with the data, or the message will be ignored. The OSC Listener actor will receive values sent to these channels based on the channel setting, e.g., a value sent to /isadora/5 will be received by the OSC Listener with its channel set to 5. (For more information on the OSC Listener, see Page 328).

In addition, there are four "multi" inputs – **/isadora-multi/1** through **/isadora-multi/4**. On these four ports, you can send a message with a list of multiple floats and/or integers. Again, the **type tag must be sent** with these messages, or the message will be ignored. The individual values will be sent sequentially to a range of OSC inputs. For example, if a message consisting of two integers and two floats

5 525 1.234 5.869 (type tags = iiff)

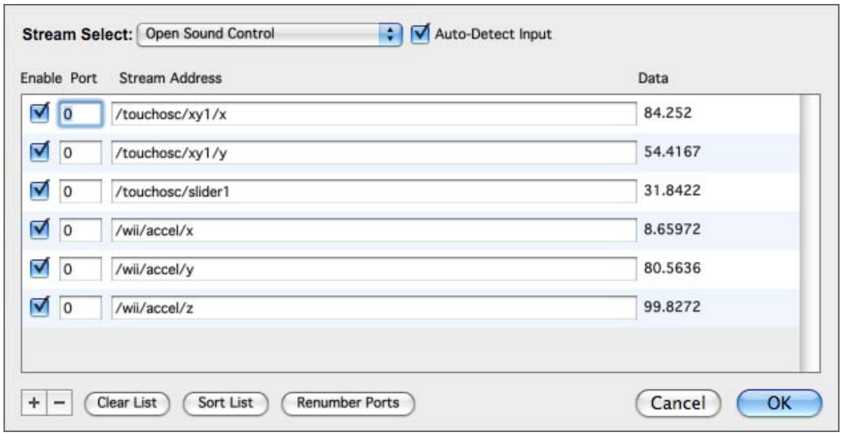
were sent to /isadora-multi/1, the OSC Listener actors with their channels set to 1, 2, 3 and 4 will receive 5, 525, 1.234, and 5.869 respectively. If the same message were sent to /isadora-multi/2, the values would appear on channels 100-103.

The TCP/IP "Port Number" used to receive OSC messages can be set in the Preferences. (See Page 123 for more information.) When receiving values from another application, the port number specified when transmitting the data must match the one set in Isadora's Preferences.

Adding Custom Open Sound Control (OSC) Addresses

Open Sound Control (OSC) is a protocol for communication among computers, sound synthesizers, and other multimedia devices that is optimized for modern networking technology. OSC's advantages include interoperability, accuracy, and flexibility. (To learn more about OSC, visit http://opensoundcontrol.org.)

The OSC section of the Stream Setup editor allows you to add OSC addresses to which other applications or hardware may send OSC messages to Isadora.



Stream Select: Open Sound Control ☑ Auto-Detect Input

Enable	Port	Stream Address	Data
☑	0	/touchosc/xy1/x	84.252
☑	0	/touchosc/xy1/y	54.4167
☑	0	/touchosc/slider1	31.8422
☑	0	/wii/accel/x	8.65972
☑	0	/wii/accel/y	80.5636
☑	0	/wii/accel/z	99.8272

The messages are routed to the OSC Listener actor by associating a port number with a particular OSC Address. The port number determines the OSC address that the OSC Listener will “hear.”

For example, one such OSC device is the TouchOSC app that runs on the iPhone. This app has an editor that allows you to define various buttons and sliders. If you were to add an XY Pad (similar to Isadora’s 2D Slider Control) it would have two default OSC outputs: “/1/xy1/x” for the horizontal value and “/1/xy1/y” for the vertical. To receive messages from this controller, you would add those two OSC addresses using OSC Stream section of the Stream Setup. If you use the **Auto-Detect Input** option, you don’t even have to know the OSC addresses that the external software or hardware is using; they will be automatically added to the list as soon as Isadora receives them.

Then you could set the port numbers for these two messages to 10 and 11, respectively. After closing the editor, you would add two OSC Listeners to your patch, one listening to port 10, the other listening to port 11. The information sent by the XY Pad would then be received by these two actors.

Manually Adding OSC Addresses

Isadora (v1.3) allows you to manually add Open Sound Control addresses in the OSC Stream Editor. To add an Open Sound Control address manually:

1) Choose **Communications > Stream Setup**

2) Click on the **Stream Select** popup menu and choose the OSC option.

3) Click the plus (**+**) symbol in the bottom left corner of the Stream Setup window. A new entry will appear in the list with the default name "/osc_address".

4) Click in the text box for the new entry and type in your OSC address. The address that you type must exactly match that used software or hardware sending messages to Isadora.

Automatically Adding OSC Addresses

Isadora also allows you to automatically add items to the list whenever an OSC message is received. To add an OSC address automatically:

1) Choose **Communications > Stream Setup**.

2) Click on the **Stream Select** popup menu and choose the OSC option.

3) To automatically add items to the list, check the **Auto-Detect Input** checkbox. When this option is turned on, Isadora will automatically add new items with the proper OSC address to the list whenever a message is received.

Sorting OSC Addresses and Renumbering Ports

Isadora allows you to automatically sort and renumber your OSC input list,

To sort and renumber your list:

1) Choose **Communications > Stream Setup**

2) Click on the **Stream Select** popup menu and choose the OSC option.

3) Click the **Sort List** button to order the address list alphabetically.

4) To manually number the port associated with an OSC address, click the **Port** text box to the left of the address and type a number. This port number will be used to uniquely identify this particular input. To use the OSC Listener actor to receive a message from this address, specify the matching port number.

5) To automatically renumber the ports, click the **Renumber Ports** button. Only port numbers that are currently not in use within this list (i.e., set to 0) will be renumbered. Any port that is set to a non-zero value when press the **Renumber Ports** button will not be changed.

Enabing/Disabling Input for a Particular OSC Address

You may selectively enable or disable an input from a particular OSC address using the **Enable** checkbox.

To enable or disable input from a particular address:

1) Check or uncheck the **Enable** checkbox to the left of the OSC address you wish to enable or disable.

Deleting Individual OSC Addresses

To delete individual inputs one-by-one from the OSC Stream Editor window:

1) Click in the **Port** or **Stream Address** text box for the address you wish to delete.
2) Click the minus (**-**) symbol at the bottom-left of the window. The item will be deleted.

Erasing the Entire List

The Clear List function will permanently delete all addresses from the Stream Setup window. This operation is not undoable!

To permanently clear the input list:

1) Click the **Clear List** button.
2) Isadora will show a dialog asking if you are sure you want to delete all the items. Click the OK button to confirm your choice and delete all items.

Transmitting Open Sound Control Packets

The OSC Transmit actor will transmit OSC packets consisting of a single floating-point value to another computer. You simply need to specify the IP address and port of the target computer (or **localhost** if transmitting to an application running on the same computer as Isadora), as well as the Open Sound Control address that will receive the packet.

See the documentation of the OSC Transmit actor on page 329 for for more information.

Transmitting/Receiving OSC Without a Router

IMPORTANT: DO NOT TRY THE PROCEDURE BELOW UNLESS YOU UNDERSTAND HOW TO RESTORE YOUR NETWORK SETTINGS! If you don’t restore the settings when you connect your computer to the Internet again, your Internet connectivity won’t work!

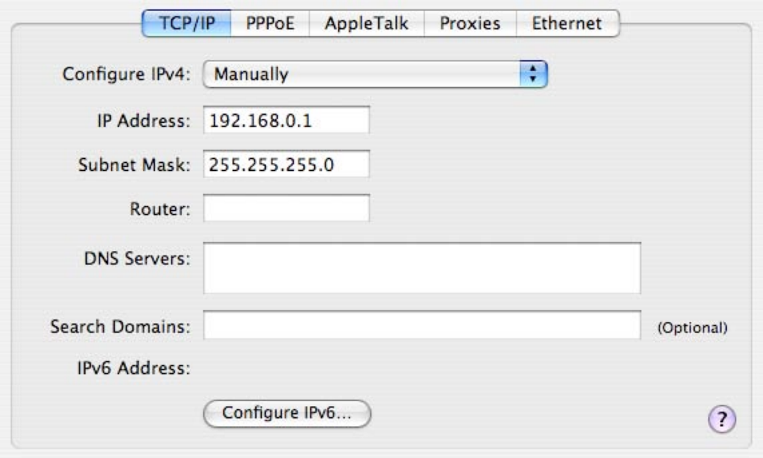
It may occur that you want to communicate between two computers that are connected directly to each other, i.e. an Ethernet cable is running between them. In this case it is often necessary to set both computers to a unique fixed IP address.

We often use the address 192.168.0.xx, where xx is 1 on one computer and 2 on the other. (Each IP address on a network must be unique.) We then set the subnet mask to 255.255.255.0.

You can specify a fixed IP address on both MacOS and Windows computers.

Setting a Fixed IP Address on Mac OS X:

- Open the System Preferences and click “Network”.
- Start by creating a new configuration. From the “Location” popup menu choose “New Location…”
- In the dialog box that appears, set the name of the configuration – i.e. OSC Fixed Address and click OK.
- From the “Show” menu choose “Network Port Configurations”
- Uncheck everything except “Built-in Ethernet”
- Now, from the “Show” menu choose “Built-in Ethernet”
- Click on the TCP/IP tab



Configure IPv4: Manually

IP Address: 192.168.0.1

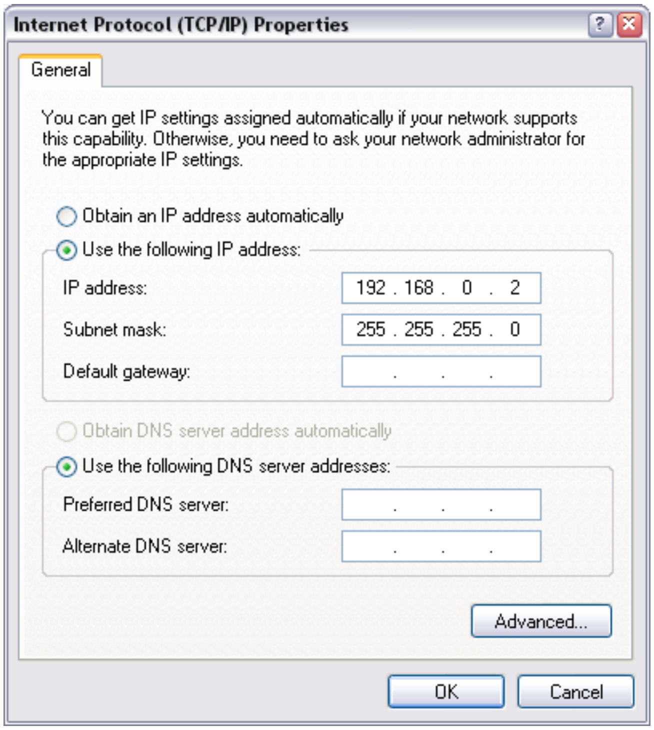
Subnet Mask: 255.255.255.0

- Next to the caption “Configure IPv4”, select Manually.
- Set the IP Address field 192.168.0.1
- Set the Subnet Mask field to 255.255.255.0
- Click the Apply button.

Setting a Fixed IP Address on Windows XP:

- From the Start menu, choose “Control Panel”
- If you are not in Category View, click “Switch to Category View” at the top left of the window.
- Click “Network and Internet Connections”.
- Click “Network Connections”
- In the window that appears, you should a document called “Local Area Connection” or something similar – this would be the connection used with your Ethernet cable to access the Internet. Double click this icon.
- Click the “Properties” button. A window labeled “Local Area Connection Properties” should appear.
- Click on the TCP/IP tab

- In the list in the middle of the window, is a list under the heading “This connection uses the following items.” Find an item that has TCP/IP in its name (you may have to scroll down) and double click this item. A window labeled “Internet Prototcol (TCP/IP) Properties” should appear.



Internet Protocol (TCP/IP) Properties

General

You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

○ Obtain an IP address automatically

● Use the following IP address:

IP address:	192 . 168 . 0 . 2
Subnet mask:	255 . 255 . 255 . 0
Default gateway:	. . .

○ Obtain DNS server address automatically

● Use the following DNS server addresses:

Preferred DNS server:	. . .
Alternate DNS server:	. . .

- Click the button that says “Use the following IP address:”
- Set the IP address 166.84.250.2
- Set the subnet mask to 255.255.255.0
- Click the OK to save your changes and dismiss this window.
- Click OK to save the changes to “Local Area Connection”
- Click “Close” to close the first window.

Human Interface Device Input (HID) (v1.3)

As of version 1.3, Isadora supports input from Human Interface Devices (HID). Human Interface Devices are generally hardware devices that you connect to your computer through a USB connection, though there are implementations in software as well. Common examples include keyboards, mice, joysticks, touchpads, graphics tablets, and gamepads.

Setting up an HID

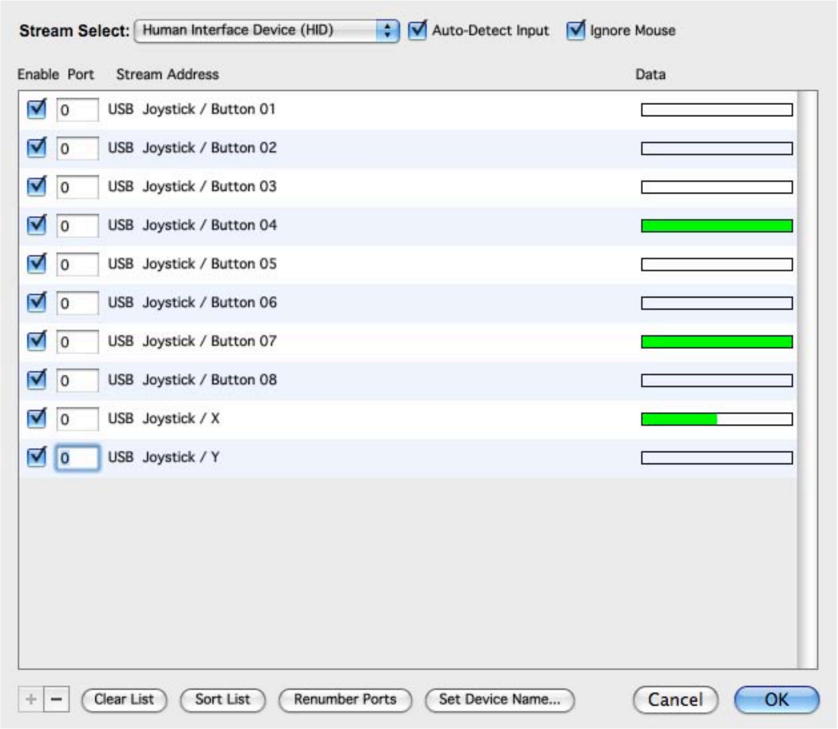
Before you begin, plug in connect the HID device to your computer.

Adding HID Inputs

Isadora adds items to the HID Input list whenever a message is received from the HID device. To add HID control inputs:

1) Choose **Communications > Stream Setup**.

2) Click on the **Stream Select** popup menu and choose the HID option.



Stream Select: Human Interface Device (HID) ☑ Auto-Detect Input ☑ Ignore Mouse

Enable	Port	Stream Address	Data
☑	0	USB Joystick / Button 01	□
☑	0	USB Joystick / Button 02	□
☑	0	USB Joystick / Button 03	□
☑	0	USB Joystick / Button 04	🟩
☑	0	USB Joystick / Button 05	□
☑	0	USB Joystick / Button 06	□
☑	0	USB Joystick / Button 07	🟩
☑	0	USB Joystick / Button 08	□
☑	0	USB Joystick / X	🟩
☑	0	USB Joystick / Y	□

3) Most often you will want to keep the **Ignore Mouse** option turned on, otherwise movements of your mouse will add items to the list. If you need to take input from the mouse, turn this option off.

4) Turn on the **Auto-Detect Input** option.

5) Touch the sensors or click the switches on the HID device from which you wish to receive input. As you do, a new item will appear in the list for each input on the device. Please note that all inputs register with a **Port** number of 0.

Sorting HID Inputs and Renumbering Ports

Isadora allows you to automatically sort and renumber your HID input list,

To sort and renumber your list:

1) Choose **Communications > Stream Setup.**

2) Click on the **Stream Select** popup menu and choose the HID option.

3) Click the **Sort List** button to order the HID input list alphabetically.

4) To manually number the port associated with an HID input, click the **Port** text box to the left of the HID input and type a number. This port number will be used to uniquely identify this particular input. To use the HID Listener actor to receive a message from this HID input, specify the matching port number.

5) To automatically renumber the ports, click the **Renumber Ports** button. Only port numbers that are currently not in use within this list (i.e., set to 0) will be renumbered. Any port that is set to a non-zero value when press the **Renumber Ports** button will not be changed.

Renaming the HID Device

Sometimes the name of the HID Devices can be quite long. For convenience, you can rename the device to any text of your choosing.

To rename the device:

1) Click in the **Port** text box for any input of the HID device you wish to rename.

2) Click the **Set Device Name** button. A dialog will appear where you can enter the new name.

3) Click OK to confirm the new name. The list will now show the name you entered.

Enabing/Disabling Input for a Particular Input

You may selectively enable or disable an input from a particular OSC address using the **Enable** checkbox.

To enable or disable input from a particular address:

1) Check or uncheck the **Enable** checkbox to the left of the HID input you wish to enable or disable.

Deleting Individual HID Inputs

To delete individual inputs one-by-one from the OSC Stream Editor window:

3) Click in the **Port** text box for the input you wish to delete.

4) Click the minus (**-**) symbol at the bottom-left of the window. The item will be deleted.

Erasing the Entire List

The Clear List function will permanently delete all addresses from the Stream Setup window. This operation is not undoable!

To permanently clear the input list:

3) Click the **Clear List** button.

4) Isadora will show a dialog asking if you are sure you want to delete all the items. Click the OK button to confirm your choice and delete all items.

Serial Input/Output (v1.1)

Isadora can transmit and receive data via standard serial (RS-232, RS-485) hardware installed on your computer using the Send Serial Data, Serial In Watcher – Binary and Serial In Watcher - Text actors.

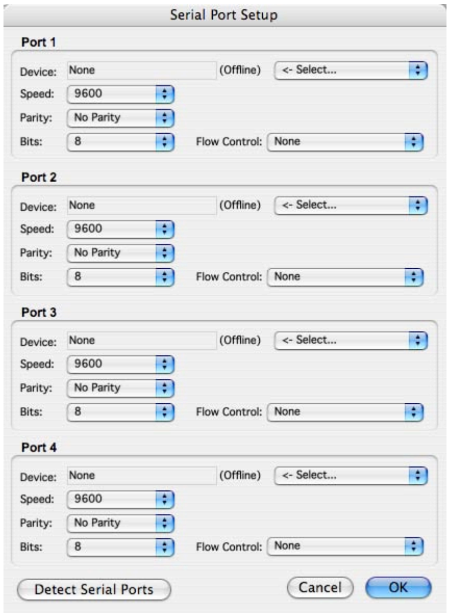
Hardware Interface & Drivers

Before you begin, you must have a hardware serial interface that allows you to connect serial devices to your computer. Before using the interface with Isadora, you must install its drivers. To do this, please follow the installation instructions in the interface's manual. Note: Isadora should not be running when you install the drivers, otherwise the interface may not be recognized.

After you've installed any required drivers, you should connect the install the serial device or connect it to your computer as appropriate.

Serial Port Setup

Ensure that your serial input/output interface is connected to/installed on your computer. Then start Isadora and choose **Communications > Serial Port Setup**. A dialog will appear that looks like this:



Serial Port Setup

Port 1
Device: None (Offline)
Speed: 9600
Parity: No Parity
Bits: 8
Flow Control: None

Port 2
Device: None (Offline)
Speed: 9600
Parity: No Parity
Bits: 8
Flow Control: None

Port 3
Device: None (Offline)
Speed: 9600
Parity: No Parity
Bits: 8
Flow Control: None

Port 4
Device: None (Offline)
Speed: 9600
Parity: No Parity
Bits: 8
Flow Control: None

This window determines communications settings of Isadora's two ports, and whether or not the port is enabled.

Preparing a Port for Serial Communications:

1) Select the desired output device from the popup menu at the right. After you do so, the name of the device will appear next to the caption **Device** on the left side. It will also indicate if the device is currently online.
2) Set the speed, parity, and number of bits to transmit.
3) If necessary, set the “Flow Control” popup to Hardware to enable hardware handshaking, or Xon/Xoff to enable software handshaking.
4) Repeat if necessary for Ports 2, 3 or 4.
5) Click OK to confirm your settings.

Enabling for Serial Communications:

To enable serial communications, choose **Communications > Enable Serial Ports**. Isadora will report an error if there are any problems initializing the serial ports. Otherwise you can assume that serial communications have been enabled. Note that this setting is saved with the Isadora document. If you save the document with the serial ports enabled, Isadora will attempt to open those ports automatically the next time the document is opened.

Disabling for Serial Communications:

To disable serial communications, choose **Communications > Enable Serial Ports**. Note that this setting is saved with the Isadora document. If you save the document with the serial ports disabled, Isadora will not attempt to open those ports automatically the next time the document is opened.

Receiving Serial Data: (v1.3)

For information on how to receive data from to the serial port, see the documentation for the text and binary versions of Serial In Watcher actor starting on page 360.

Sending Serial Data:

See the documentation for the Send Serial Data actor on Page 358 for information on how to send data to the serial port.

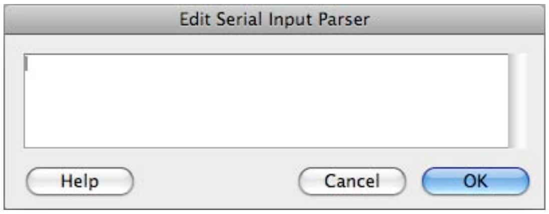
Input Data Parsing – Overview (v1.3)

Several actors allow you to parse incoming data streams from external sources like serial input devices or data acquired over the internet via a TCP/IP connection. All of these actors use a common system for being able to extract values and other meaningful data from within these streams. In Isadora 1.3, these actors include the Serial In Watcher- Binary, Serial In Watcher - Text, TCP InWatcher - Binary, TCP In Watcher - Text. This section explains the parsing system and how to use it.

The first step is to define a "pattern" – a special set of codes used by Isadora to specify the format of the data coming from the external device and how to extract parameters from it.

To do this, you must first get information about the format of the data that will be received by Isadora from your external device. For hardware devices, you can usually find this information in the device owner's manual, on the Internet, or by asking the device vendor. For data streams coming over the internet, you may need to seek online documentation or to examine the data stream itself.

Once you understand the incoming data stream, you can develop a pattern that matches data coming from the device, and tells the plugin what data to assign to what output parameters, if any. To enter or edit the pattern, double-click the actor to open the "input parser" dialog box and enter the pattern in the text field at the top.



The Input Parser Dialog for a Serial In Watcher Actor

Each time a block of data received, an attempt is made to match it against your pattern. If the match is successful, parameters are parsed out of data stream and sent to the output properties defined by the pattern.

For example, say you have a light level sensor attached to your serial port and it sends a continuous stream of messages reporting the light level. The message comes in the form of ASCII text: the "#" sign, followed by a two –digit hexadecimal followed by a carriage return character. The stream of data might look something like this in a terminal program:

```
#0A
#0F
#15
```

Because the data is text based, and because it ends with an "end of line" marker (the carriage return) you would choose the Serial In Watcher - Text actor to read and interpret the data. Within your pattern you would also define an output parameter (say, "light level") that will be added to the Serial In Watcher - Text actor, and that will output the light level whenever a valid message is received.

In addition to any output parameters you have defined, the "msg rcv" output parameter is always defined and sends a signal out every time a block of data matches your pattern.

Text vs. Binary Actors

There are actually two forms of each actor that pares input data: a "Text" one and a "Binary" one. The only difference between the two is the text actor reads input data until the some delimiter character is hit, and then matches that data with the pattern, while the binary actor reads input data in fixed size blocks. For both the text and binary actors, *the pattern syntax and matching rules described below are exactly the same*.

The text version of the actor has an input named "eom char". This is the delimiter character. Typically you would set this to a newline or a carriage return but any values are acceptable. The current default is 13 (carriage return).

The binary version of the actor has three inputs "msg len", "timeout", and "reset". The "msg len" parameter specifies the length of a block of data in bytes. Each time this many bytes is read from the input, the data is matched to your pattern. If no bytes arrive within the "timeout" period, then any partial input data is discarded, the pattern is not matched, and the actor continues to wait for new input. The "reset" input can be used to force a reset just as if the timeout period expired.

Data Parsing: Patterns

Patterns are composed of a series of one or more "elements", where an element defines the format of one part of the input data. Pattern elements can match, say, a word or a number in the input data, a sequence of bytes, etc.

There are two flavors of pattern elements: **text** and **binary** (indicated in the table below). **Text** elements are typically used when matching human-readable, text input data (for example, a video player that sends the string "FRAME 2482 SPEED 1.0"). **Binary** elements are used to match bytes of raw data (such as 2 byte integers, or bitfields). You can mix both text and binary elements together in a single pattern. *Text and binary elements can be used interchangeably in both the text and binary versions of the data input parsing actors!*. Again, the only difference between the "text" and "binary" actors is what defines a block of input data.

Between any two text type elements, any amount of whitespace (tabs, spaces, etc, but not the delimiter character) in the input data is ignored. Between any two binary type elements, or a text and binary type element, the pattern must match the input exactly. While this rule sounds a little convoluted, in the end it (hopefully) allows matching text data to be more convenient and intuitive (because you don't have to explicitly write rules to match whitespace between words in text data -- the actor takes care of that for you).

The value of any element can also be assigned to user-defined actor output parameters. The syntax for assigning values to output parameters is detailed below. You define the parameter name and type, and the value of the element is interpreted depending on the parameter type you define.

Data Parsing: Elements

Separate each element in your pattern string with whitespace. Here is the syntax and description for all of the pattern elements you can define. In the syntax column below, **bold** things are literal characters/words that you type, *italic* items are variables and parameters you make up, and square braces [] enclose optional items.

Syntax	Type	Example	Description
" *string* **"**	Text	"hello"	Case-insensitive string match (example also matched "HELLO", "HeLIO", etc). Question marks and backslashes have special meaning in these strings (see table below).
' *string* **'**	Text	'hello'	Case-sensitive string match. Question marks and backslashes have special meaning in these strings.
[*n*] [**.** [*m*]] **#** [*n*] [**.** [*m*]] **digits**	Text	8.2# 4 digits # .#	Matches a decimal number. Specifically, matches an optional +/- at the start of a number, and up to *n* digits to the left of the decimal point and *m* digits to the right. If you leave out *n* or *m*, any number of digits matches but keep in mind that if you leave out the period, then this element will **not** accept input with a decimal point in it (i.e. ".#" signifies a number with an optional decimal point, of any length, "#" specifies an integer only). The words "digit", "digits", and "#" all mean the same thing, "#" is just a shortcut.
[*n*] **X** [*n*] **hex**	Text	8X x 4 hex	Matches a hexadecimal number, up to *n* digits. If *n* not specified, then matches any number of digits (making the longest possible match). Both "x" and "hex" mean the same thing.
[*n*] **A** [*n*] **letters**	Text	8A 8 letters 4 hex	Matches up to *n* letters (depends on current locale but these are **letters in the alphabet only**, of any case). If *n* not specified, then makes the longest possible match. The keywords "a", "letter", and "letters" all mean the same thing.
[*n*] **C** [*n*] **chars**	Text	4c characters 4 hex	Matches up to *n* characters (any printable character; pretty much any character with a picture on your keyboard except for whitespace, this includes letters, numbers, and punctuation). If *n* not specified, then makes the

			longest possible match. The keywords "c", "char", "chars", "character", and "characters" all mean the same thing.
[*character_set* **]**	Text	[a-zA-Z] [^ 0-9] [abc 4\r\n]	Matches one or more characters in *character_set* (see below).
[[*character_set* **]]**	Text	[[a-zA-Z]] [[^ 0-9]]	Matches exactly one character in *character_set*.
eol	Text	eol	Matches any sequence of characters (possibly none at all) up to and including a CR/LF, then matches all following CR/LF characters. This can be used to match the remainder of a line of text. Please note that for the text versions of actors that parse input data, the use of the delimiter character makes this element a little bit ambiguous. You may want to avoid this with the text actor for the time being unless you are sure you want to use it... if all you want to do is say "this input data ends with a linebreak", consider using the text actor with the "eom char" input parameter instead.
[*n*] **?** [*n*] **bytes**	Binary	4? 17 bytes	Matches a sequence of *n* bytes of any value. If *n* is left out, 1 is assumed. "?", "byte", and "bytes" all mean the same thing.
{ *byte_set* **}**	Binary	{ 00-20 F0 F1 }	Matches one or more characters in *byte_set* (see below).

{{ *byte_set* **}}**	Binary	{{ 00, 01, 08 }}
		{{0A}}
			Matches exactly one character in *byte_set*.

(*bitfields* **)** [**:** *type*]	Binary	*See below.*	Matches some number of bytes in the input data, and extracts integer bitfields from the matched bytes. This can be used to read bitfields from binary integers. The *type* specifies the endianness of the matched integer, is optional, and is either "B" or "L". Default if not specified is "B". See below for more details.

Data Input Elements: String

Some characters or character sequences in a *string* (inside single or double quotes) have special meaning:

?	This matches any character in the input at all.
\?	Use this to match an actual question mark (since a lone question mark has a special meaning).
\"	A double quote.
\'	A single quote.
\n	A linefeed (ASCII 10).
\r	A carriage return (ASCII 13).
\t	A tab (ASCII 9).
\\	A backslash.

So the element **"?ack\?"** will match any of the following input data (for example): **back? HACK? pAcK?**

Data Input Elements: Character_set

A *character set* consists of a set of characters and character ranges. These are specified inside square braces. If you want to include a literal hyphen in a character set, specify that hyphen first. If you want to invert the character set (i.e. all characters not specified), put a caret (^) as the first character. Here are some examples (these examples are inside single square braces; [[]] double square braces use the same syntax). Note that spaces inside a character set are significant -- they match spaces in the input. Escape sequences like to the ones listed in the table above can be used in character sets to identify special characters (like tabs and newlines) (note that a ? is just a plain old ? in character sets, though, unlike in strings).

[ABCD]	The characters A, B, C, or D.
[A-D]	The characters A, B, C, or D.
[a-zA-Z]	Any lowercase or uppercase letter (English locale, ASCII).
[-xyz]	A hyphen, x, y, or z.
[-0-9]	A hyphen or a numeric digit.
[^a]	Any character except a lowercase a.
[^-0-9]	Any character except hyphens and numeric digits.
["ABCD\r\t]	A space, a double quote, an A, B, C, or D, a carriage return, or a tab.
[^-abc 24M-O]	Anything except a hyphen, a, b, c, space, 2, 4, M, N, O, or tab.

Data Input Elements: byte_set

A *byte_set* is similar in spirit to a character set except you specify 2-digit hexadecimal numbers instead of characters. You can separate individual values with spaces or commas (whichever you prefer, they are treated the same). These appear in curly braces. Here are some examples, in single curly braces (but double curly brace syntax also uses these). To invert the set, specify a caret (^) as the first character.

{ 00 01 }	The bytes 0 or 1.
{ 0A, 0D, 10 }	The bytes 0A, 0D, or 10 (hex).
{ 03-08 F0-FF }	The bytes 03 to 08 or F0 to FF.
{ ^ 30 - 39 }	Anything except the bytes 30 to 39 (hex).
{^30-39}	Same as above, just showing that you can leave out the spaces.

Data Input Elements: bitfields

Frequently, devices with binary formatted data pack multiple values into a single integer, covering only a few bytes. You can use bitfield elements to specify such bitfields and optionally assign the values of certain fields to output parameters. Bitfields are slightly different than the other elements in that the parameter assignment rules described in the following section do not apply. Instead, multiple parameters may be specified in a single bitfield element. For more information on how to define actor output parameters for the other element types, read "Parameter Assignment" below.

Bitfield syntax is like so:

([*name* **=**] *start* **-** *end* **,** [*name* **=**] *start* **-** *end* **,** ...) [**: B | L**]

The *name* is optional and defines an actor output parameter to assign the value of the bitfield to. The output parameter type will be an integer, and the rules for name are the same as described in "Parameter Assignment" below (must not start with number, etc). The *start* and *end* values specify the start and ending bit index into the integer, with 0 being the least-significant bit. The number of bytes of input matched is implied by the highest bit index here! So if the highest bit index is 15, then this actor assumes the integer size is 16 bits, and so matches 2 bytes of input data (1 byte is 8 bits). The "B" and "L" on the end are optional and specify the byte endianness of the binary integer: big-endian or little-endian, respectively. If neither is specified, "B" is assumed. The input bytes are read, converted to an integer value according to the specified endianness, and then bitfield values are extracted. Note that multiple fields may cover the same bits, if you want.

This syntax sounds complicated but it's not. Hopefully some examples will clear it up. Say you are using the Monome button box (see http://wiki.monome.org/view/SerialProtocol). The Monome button box has 2 output messages, each are 2 bytes long. To extract the values of "press" messages:

(address = 15-12 , state = 11-8 , x = 7-4 , y = 3-0)

If you don't care about "state", you can just leave it out entirely:

(address = 15-12 , x = 7-4 , y = 3-0)

In both cases, the maximum bit index is 15 so 2 bytes of input data are matched, and those 2 bytes are treated as a big-endian integer. Now let's say you don't care about "address" or "state". You're still going to want to leave a placeholder there so that Isadora knows you need 2 bytes:

(11-10 , x = 7-4 , y = 3-0)

The "11-10" is a silly value but illustrates a point: The number of bits required is rounded up to the nearest byte, and also it's OK if there are bits that aren't part of bitfields. 11 rounded up to the nearest byte is 16 bits. Bits 12-15 and 8-9 are unused. Here is a slightly more complex example that specifies a little-endian 64-bit (8 byte) integer (you are not limited to 32 bits -- the highest bit index you can use is unlimited, however if a single field spans more than 32 bits, you will likely encounter some problems). Note the overlapping bitfields and the 1-bit value "c":

(a=60-40, b=20-15, bb=18-15, c=14-14, d=13-2) : L

As mentioned below, this actor has no built-in support for filtering out certain values (such as only responding to Monome button messages with a certain "address"). You will have to use the techniques described below to accomplish this.

Data Input: Parameter Assignment

Pattern elements match specific portions of the input data. Sometimes you will want this actor to output the values that it matches. To do this, use the syntax **name:type=element** where **name** is any parameter name you define, **type** describes the parameter type and some details about the format of the matched data, and **element** is the pattern element as described above (can be any element except a bitfield). For example, **light_level:integer=8 digits** defines an actor output parameter named "light level" with an integer type, matches up to 8 digits in the input, and converts the matched digits to an integer, outputting the value from the actor.

Parameter names may consist of letters, numbers, and underscores, but must not start with a number ("_value" and "something2" are valid, "2cool" is not valid). The type specifies the type of the actor's output parameter, and for certain binary-flavor elements, describes how the binary data is interpreted. The following types are valid:

string	A text string.
float	A decimal number. Please note that binary floating-point numbers are not currently supported.
integer	An integer. For binary types, the same as "integer".
binteger	An integer. For binary types, input treated as big-endian

	integer.
linteger	An integer. For binary types, input treated as little-endian integer.

You do not need to specify the entire type, you only need to specify a unique prefix, so "str" is the same as string, "int" is the same as "integer", "f" is the same as "float", etc. Here are some examples:

value : integer = 3 digits	Matches up to 3 digits, assigns to integer "value".
mixlevel:float=.#	Matches a decimal number, assigns to float "mixlevel".
position:float=8.2#	Matches a decimal number, assigns to float "position".
word:string="hello"	Matches the string "hello" and assigns to string parameter "word".
id:string=3 digits	Matches up to 3 digits, assigns to *string* "id".
choice:string=[[a-z]]	Matches a single lowercase letter, assigns to string "choice".
color:int=?	Matches a single byte of any value, assigns to integer "color".
volume:bint=4 bytes	Matches 4 bytes of any value, treated as big-endian integer and assigned to "volume".
fname:string=letters	Matches a sequence of 1 or more letters, assigns to string "fname".

If you assign a text element to an integer parameter, the actor attempts to convert as much as possible to an integer. So if you have "a:int=characters", and the input is "123abc", **a** will be assigned a value of **123**. Similarly, if you have "b:int=letters", **b** will always have the value **0**.

Some technical info: You are not limited to standard machine sizes for binary integers. You can do "a:int=3?" to match 3 bytes, treat as a little-endian 3-byte integer, and assign the value to **a**. You can also do "b:int=15?" to match 15 bytes, but keep in mind that internally, the actor can't really represent values wider than 4 bytes, so the matched value will be truncated if it is too large.

Now, sometimes you will want to only respond to input matches if certain parameters you define have certain values. For example, say a text-mode device sends out a single character at the start of each line specifying the line type. This actor currently does not have built-in support for doing that kind of filtering. You have two options to do this. The first option is, if possible, to make sure that your pattern elements are specified in such a way that only the data you are interested in is matched (for example, if you are only interested in lines where the first word is "a", the specify an "a" element to take care of this). Another option is to combine this actor with other Isadora actors that filter out certain values; so you might take the first character at the start of each line and assign it to an output parameter, and then run that output parameter into a Comparator actor to check for the values you want to respond to.

Data Input: Examples

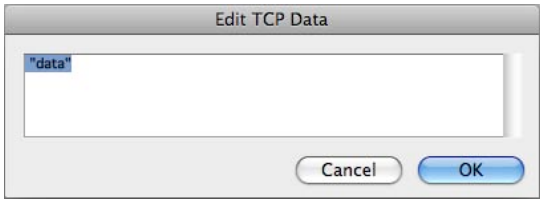
"?????"	Matches any 5 bytes.
[^*] "*"	Matches any string ending in an asterisk.
'Hello'	Matches the string "Hello", case-sensitive.
"moveto" x:float=.# y:float=.# z:float=.#	Matches strings like **MoveTo 6.8 -2.3 89** or **MOVETO +9 -13. +.1**.
a:int=2 digits [^|] "|" b:int=2 digits [^|] "|" c:int=2 digits	Matches a string such as **43 apples | 8 oranges | 98 monkeys**, assigning the values 43, 8, and 98 to the integer output parameters a, b, and c, respectively.
hue:int=2x "," sat:int=2x "," val:int=2x	Matches a string like **4F , 8B , 9A**, converting the hexadecimal values to integers and assigning to output parameters.
"#" r:int=2x g:int=2x b:int=2x	Match and parse the values of an HTML color such as **#FF0020**.

Formatting Data Output (v1.3)

Several actors allow you to format one or more input parameters into a resulting string of text characters. The system used to accomplish that formatting is the same for each of these actors. In Isadora 1.3, the actors include the Text Formatter, Send Serial Data, TCP Send Data.

First, you should set the params input on the actor, as this will add input parameters (param 1, param 2, etc.) that will be used when generating the final output. Up to nine parameters may be accepted by any one actor.

To edit the formatting specifier, double-click this actor's icon and an editor dialog will appear.



Edit TCP Data

"data"

In it's simplest form the editor will accept a text string enclosed in single quotes. In the example above, each time the actor was triggered to generate output, the four ASCII characters 'd', 'a', 't', 'a' would be generated.

You may also include two-digital hexadecimal values, *outside* the quotes to specify characters that cannot be represented on a keyboard. For instance, the formatting specifier “hello” 0D 0A

would send the ASCII characters “hello” followed by a Carriage Return (hex 0D, decimal 13) and a Line Feed character (hex 0A, decimal 10).

To format and include a values sent to one of the actor’s input properties, you would use the notation ***Px***, where x is a number from 1 to 9, indicating which parameter you wish to include. When using this notation for numeric parameters, there are a number of extra options

Px	Use the default formatting. For integer numbers, output the ASCII text of the number in decimal; for numbers with decimal points, output the ASCII text of the number and all the digits after the decimal point; for text inputs, output the text itself Examples: The integer 12 outputs the characters ‘1’, ‘2’ The floating point number 3.141 outputs the characters ‘3’, ‘.’, ‘1’, ‘4’, ‘1’ The text “hi!” outputs the characters ‘h’, ‘i', ‘!’.
Px:n.m	Output the number, with a maximum of ***n*** digits to the left of the decimal point and ***m*** digits to the right. If the input parameter is text, ignore ***n.m*** and just output the text.
Px:Zn.m	Same as above, but add leading zeros to ensure a total of ***n*** digits appear to the left of the decimal point.
Px:nX	Output the ASCII representation of the number as *n* hexadecimal digits. If the input parameter is a floating point number, the digits after the decimal are ignored. If the input parameter is text, ignore the ***nX*** and just output the text. Example: Px:2X applied to the decimal value 254 outputs ‘F’, E’
Px:ZnX	Same as above, but add leading zeros to ensure a total of *n* digits.
Px:C	Output the character as a single byte of data. Examples: The number 65 gives ‘A’ The number 13 gives a carriage return character

To send ASCII text, you must enclose the text in double-quotes, i.e. to send the word **hello** you would enter “**hello”**. When specifying ASCII text, you can send various control characters by using one of the special “escape” sequences shown below.

\a	0x07 (Bell)
\b	0x08 (Backspace)
\f	0x0C (Form Feed)
\n	0x0A (New Line)
\r	0x0D (Carriage Return)

\t	0x09 (Tab)
\\	Backslash
\”	Double-quote
\0	0x00 (Null)

Note that to include a double-quote or a backslash inside of ASCII text, you must precede it with a backslash as well.

Some further examples:

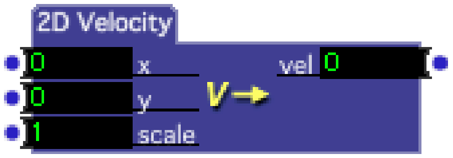
0E 11 C0 – sends the three hexadecimal bytes, 0E 11 C0, which are decimal 14, 17 and 192 respectively.

“pl\r” – sends the characters ‘p’ and ‘l’ followed by a carriage return (hex 0D, decimal 13)

05 “hello” 0A 0D – sends eight bytes, starting with 5, then the characters ‘h’, ‘e’, ‘l’, ‘l’, ‘o’, followed by hex 0A and 0D (which are 10 and 13 in decimal.)

FF “?” P1:C P2:C – sends four bytes, starting with hexadecimal FF (255 decimal) followed by the character “?”, and ending with two bytes that give the value input parameters 1 and 2 (*Param 1, Param 2*) respectively.

2D Velocity (v1.1)



Calculates the velocity of a point as it moves in 2D space.

This module calculates the velocity of a point in 2D space, as specified by its x and y coordinate. Each time a new value is received at the **y** input, the current x/y values and the previous x/y values are used to calculate the velocity.

The velocity is actually the result of the standard formula for the distance between two points, i.e. the square root of $((x2 – x1)^2 + (y2 – y1)^2)$, where x2 /y2 is the current point and x1/y1 is the previous point.

One possible use of this module is to measure the velocity of the movements of the mouse. Try connecting the Mouse Watcher's horizontal and vertical outputs to the **x** and **y** inputs of the 2D Velocity module for an example.

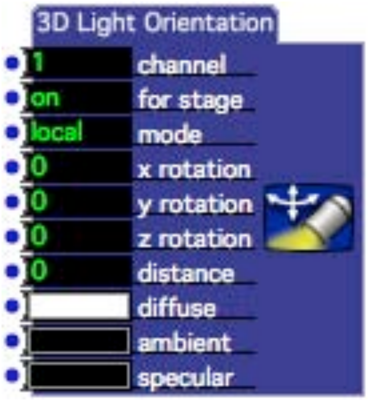
Input Properties

- **x:** The x coordinate of the point
- **y:** The y coordinate of the point. Receiving a value at this input triggers the calculation between the current x/y values and the previous x/y values.
- **scale:** The scaling factor. Each time a new velocity is calculated, it is multiplied by this number to determine the final velocity.

Output Properties

- **vel:** The velocity output.

3D Light Orientation (v1.1)



3D Light Orientation

1 channel

on for stage

local mode

0 x rotation

0 y rotation

0 z rotation

0 distance

diffuse

ambient

specular

Controls the orientation and color of the lighting applied to 3D models rendered by the 3D Player. (Note that the lighting will only take effect if the 3D Player's lighting input is turned on.) In addition to specifying the rotation of the lighting around the origin of the 3D world, you may specify the diffuse, ambient, and specular color of the lights.

The diffuse color is normally the color that is generally reflected by the surfaces of the 3D objects in the scene – this color is directional. The ambient color is a non-directional color that can be used to ensure that all of the object surfaces have some level of visibility. The specular color is used when rendering reflections.

Each surface of a 3D object is assigned a "material" that determines the responsiveness for each of these light sources. (E.g., shiny surface materials respond to the specular color, dull surfaces may not.) So the material assigned to a given surface will determine how it responds to the lighting.

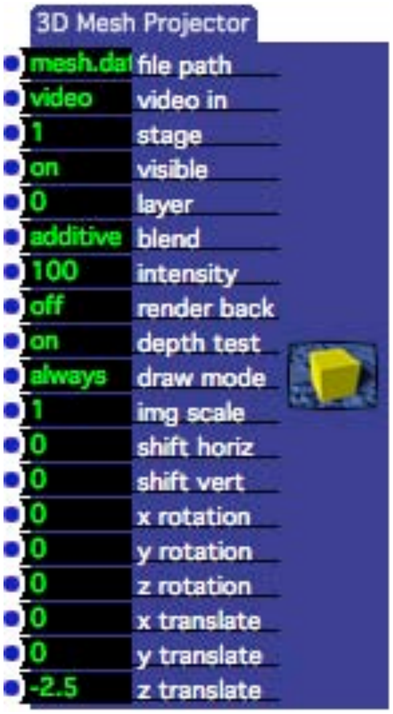
For more information about lighting 3D scenes, please refer to one of the many primers on 3D modeling/OpenGL that can be found on the internet.

Input Properties

- **channel:** This setting is used in combination with the stage input to determine which 3D models will be affected by the specified lighting. Only models being rendered by 3D Player actors whose for stage *and* channel setting match the settings here will be affected by the lighting specified in this actor.
- **stage:** This setting is used in combination with the channel input to determine which 3D models will be affected by the specified lighting. See the channel input for more information.

- **x/y/z rotation**: Specifies the rotation of the light around the origin of the 3D world.
- **distance:** when set to a non-zero value, determines the distance of the light from the origin of the 3D world. Normally this value should be set to 0.
- **diffuse:** Specifies the diffuse lighting color in the scene.
- **ambient:** Specifies the ambient lighting color in the scene.
- **specular:** Specifies the specular lighting color used for reflections on the object.

3D Mesh Projector (v1.3)



mesh.dat	file path
video	video in
1	stage
on	visible
0	layer
additive	blend
100	intensity
off	render back
on	depth test
always	draw mode
1	img scale
0	shift horiz
0	shift vert
0	x rotation
0	y rotation
0	z rotation
0	x translate
0	y translate
-2.5	z translate

Renders a video stream on a 3D mesh of an arbitrary shape, allowing you to create a “flat” projections on complex surfaces including domes, cylinders, and fisheye reflectors.

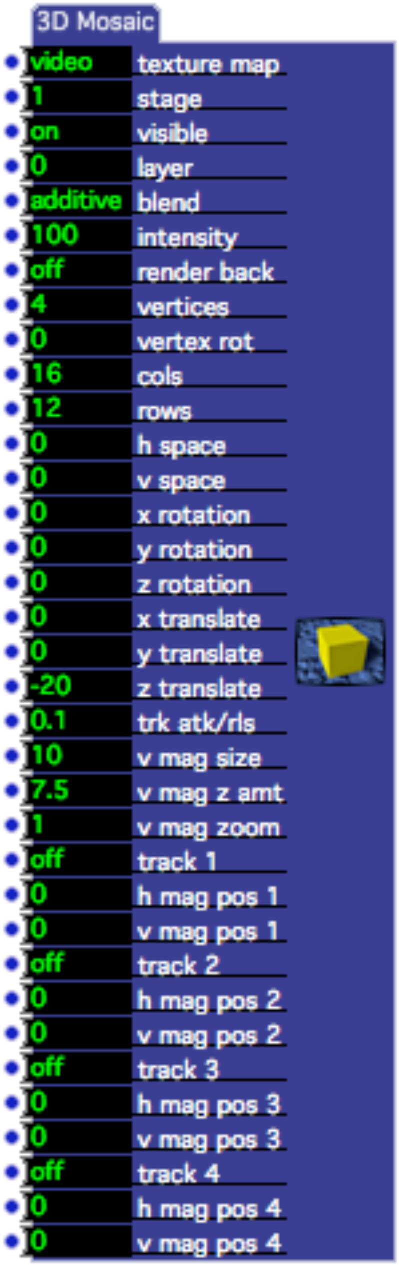
The 3D Mesh actor currently only works with the 3D Mesh file format saved by the meshmapper application developed by Paul Bourke in conjunction with his warpplayer application. Meshmapper allows you to interactively calibrate a mesh for projection on domes, cyclinders, fisheye reflectors and objects with strong perspective. Please visit his website for more information on how this actor can be used, and for information on obtaining meshmapper.

http://local.wasp.uwa.edu.au/~pbourke/miscellaneous/domemirror/warpplayer/

Input Properties

- **file path:** The full or partial path name to a mesh data file. Full path names will begin with a '/' under Mac OSX or a 'X:' under Windows (where X: is a drive letter). Paths that do not begin in this way are considered to be partial path names, specified relative to the location of the Isadora document that contains this actor.
- **video in:** The video stream that will be mapped on to the 3D mesh. If no video stream is connected to this input, the object will be rendered as a white rectangle.
- **stage:** The stage on which the image will be rendered.
- **visible:** Makes the image visible or invisible.
- **layer:** Determines the order in which layers will be drawn. Lower numbers are drawn first and higher numbers are drawn last. This means that a higher numbered actor will be drawn 'in front' of a lower numbered one.
- **blend:** The blend mode determines how the image will be rendered. When set to additive, the image is added to the background objects – lower intensity settings reduce the brightness of the image. When set to transparent, lower intensity values make the object more transparent, allowing you to see more of the objects underneath. When set to opaque, lower intensity values will fade the image to black, but the object always obscures background objects.
- **intensity:** Depending on the setting of the blend input, this functions determines the brightness or transparency of the objects, from 0 to 100%. Higher values are lighter or more opaque, lower values are darker or more transparent.
- **render back:** When turned on, both the front and back of the mesh will be rendered with the video mage. Otherwise, only the front side will be rendered.
- **depth test:** Enables or disables 'depth testing' when rendering this image. When turned on, the depth (z-coordinate) of this object/image is taken into account when rendering the object; other 3D objects/images that are in front of this object will obscure it. When turned off, the layer input is used to determine whether or not this object will be obscured by other objects in the scene.
- **draw mode:** Determines if drawing will occur when no video input is present. If the draw mode is set to always, then the object will be drawn whether or not there is a video stream connected to the video in input (if there is no video stream, the object will appear as a white rectangle). When set to vid-in, the object will only be drawn if there is a valid video stream.
- **img scale:** Scales the image on the mesh. Numbers less than 1 zoom in, numbers greater than 1 will generate multiple repeats of the image.
- **shift horiz**: Shifts the image left or right on the mesh.
- **shift vert**: Shifts the image up and down on the mesh.
- **x/y/z rotation:** Rotates the mesh around its x, y or z axis.
- **x/y/z translate:** Translates the mesh along the x, y or z axis.

3D Mosaic (v1.3)



3D Mosaic

video	texture map
1	stage
on	visible
0	layer
additive	blend
100	intensity
off	render back
4	vertices
0	vertex rot
16	cols
12	rows
0	h space
0	v space
0	x rotation
0	y rotation
0	z rotation
0	x translate
0	y translate
-20	z translate
0.1	trk atk/rls
10	v mag size
7.5	v mag z amt
1	v mag zoom
off	track 1
0	h mag pos 1
0	v mag pos 1
off	track 2
0	h mag pos 2
0	v mag pos 2
off	track 3
0	h mag pos 3
0	v mag pos 3
off	track 4
0	h mag pos 4
0	v mag pos 4

Creates a 3D Mosaic from an incoming video stream, allowing control over the number of tiles, number of vertexes per tile, and scaling and magnification of the tiles.

Input Properties

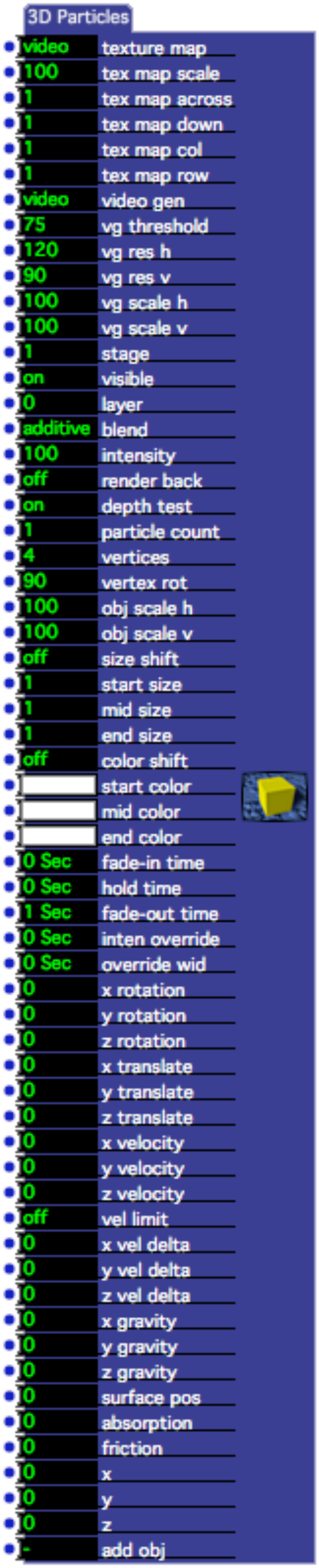
- **video in:** The video stream to used to create the mosaic.
- **stage:** The stage on which the mosaic will be rendered.

- **visible:** When turned on, the mosaic is rendered to the stage. When turned off, the system is not rendered (which also reduces the processor load).
- **layer:** Determines the order in which this actor will be rendered, in relation to any other 3D actors in the scene (other 3D Projectors, 3D Player, 3D Quad Distort, etc.) Higher numbered layers are “in front” of lowered numbered layers, i.e. they are drawn last.
- **blend:** Determines the opacity of the mosaic in conjunction with the intensity input. When set to additive, the image is added to the background image – lower intensity settings reduce the brightness of the image. When set to transparent, lower intensity values make the object more transparent, allowing you to see more of the mosaic (and or images) underneath. When set to opaque, lower intensity values will fade the image to a black background that obscures the background image.
- **intensity:** Sets the brightness or transparency of the image, from 0 to 100%. See blend input for a complete description.
- **render back:** When turned off, an image is rendered on the front side of each mosaic tile only. This means if you rotate the mosaic, the tiles will be invisible because you are viewing them from the back. When turned on, the image is rendered on both the front and back side, ensuring that it is visible from any viewing angle.
- **vertices:** The number of vertices in the object. A value of 3 draws a triangle, 4 draws a square, 5 draws a pentagon etc. Higher values will approximate a circle.
- **vertex rot:** The rotation of the object's vertices around the center of the mosaic - use this to spin the object.
- **cols:** The number of columns across in the mosaic.
- **rows**: The number of tiles down the mosaic.
- **h space:** The horizontal spacing between each tile.
- **v space:** The vertical spacing between each tile.
- **x/y/z rotation:** Rotates the image around its x, y or z axis.
- **x/y/z translate:** Translates the image along the x, y or z axis.
- **trk/atk/rls:** Determines how quickly the modulation level will rise or fall when a track input is turned on or off. Lower values are slower.
- **v mag size:** The size of the magnification area that will be influenced by a track coordinate.
- **v mag z amt:** The amount of translation along the z-axis at each track coordinate.
- **v mag zoom:** The zoom of magnification at each track coordinate.
- **track 1/2/3/4:** When 'true', the corresponding h mag pos and v mag pos are tracked.
- **h mag pos 1/2/3/4:** The horizontal coordinate that will be magnified and zoomed when the corresponding track input is turned on.

- **v mag pos 1/2/3/4:** The vertical coordinate that will be magnified and zoomed when the corresponding track input is turned on.

See “Feedback and Mosaic” example file contained in the Isadora Examples folder.

3D Particles (v1.3)



3D Particles

video	texture map
100	tex map scale
1	tex map across
1	tex map down
1	tex map col
1	tex map row
video	video gen
75	vg threshold
120	vg res h
90	vg res v
100	vg scale h
100	vg scale v
1	stage
on	visible
0	layer
additive	blend
100	intensity
off	render back
on	depth test
1	particle count
4	vertices
90	vertex rot
100	obj scale h
100	obj scale v
off	size shift
1	start size
1	mid size
1	end size
off	color shift
⬜	start color
⬜	mid color
⬜	end color
0 Sec	fade-in time
0 Sec	hold time
1 Sec	fade-out time
0 Sec	inten override
0 Sec	override wid
0	x rotation
0	y rotation
0	z rotation
0	x translate
0	y translate
0	z translate
0	x velocity
0	y velocity
0	z velocity
off	vel limit
0	x vel delta
0	y vel delta
0	z vel delta
0	x gravity
0	y gravity
0	z gravity
0	surface pos
0	absorption
0	friction
0	x
0	y
0	z
-	add obj

Creates a 3D Particle System. The initial position of the particle is controlled by the x/y/z inputs, while the movement of the particles is controlled by the velocity and gravity inputs.

The 3D Particle actor is an extremely rich tool for producing varied particle system animations; everything from fire to smoke to star fields and snow can be simulated, as well as more abstract systems. Experimentation with this actor is key to realizing its potential. As a starting point for your experiments, take a look at the 3D Particles.izz file included with the Isadora examples.

Input Properties

- **texture map** The video stream that will become the texture map for each particle. If no video stream is connected to this input, the particle will be rendered using the solid color specified at the color input.

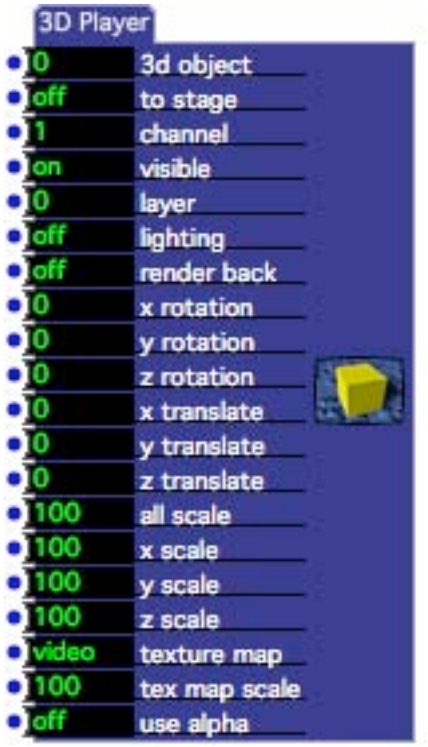
  In addition, you may use a texture map that is actually a grid of equally sized images by setting the tex map across and tex map down input properties to a value greater than 1. In this case, individual images from the grid will be applied as a texture map for each particle, as selected by the tex map col and tex map row inputs.
- **tex map scale:** Scaling of the texture map on the particle.
- **tex map across:** For texture maps that are composed of a grid of images, specifies the number of images across.
- **tex map down:** For texture maps that are composed of a grid of images, specifies the number of images down.
- **tex map col:** Selects which column to use when rendering the next particle. This number should be between 1 and the number of columns specified in the texture map across input.
- **tex map row:** Selects which row to use when rendering the next particle. This number should be between 1 and the number of rows specified in the texture map down input.
- **video gen:** Allows you to use a video stream to control the generation of particles. Each time a frame of video arrives at this input, Isadora looks for pixels brighter than the vg threshold input. For each pixel brighter than this threshold, a particle will be generated at a corresponding x/y coordinate.
- **vg threshold:** Specifies the brightness above which a particle will be generated when analyzing video arriving at the video gen input. Pixels brighter than this value will generate a particle. Pixels darker than this value will not.
- **vg res h/v:** Specifies the vertical and horizontal resolution at which the video gen input stream will be analyzed. The video stream/image will be scaled to the pixel value specified here before being analyzed.
- **vg scale h/v:** Specifies the horizontal and vertical spacing of the particles generated by the video gen input. Larger values create more space between particles.

- **stage:** The stage on which the particle system will be rendered.
- **visible:** When turned on, the particle system is rendered to the stage. When turned off, the system is not rendered (which also reduces the processor load).
- **layer:** Determines the order in which this actor will be rendered, in relation to any other 3D actors in the scene (other 3D Projectors, 3D Players, etc.) Higher numbered layers are "in front" of lowered numbered layers, i.e. they are drawn last.
- **blend:** Determines the opacity of the particles in conjunction with the intensity input. When set to additive, the image is added to the background image – lower intensity settings reduce the brightness of the image. When set to transparent, lower intensity values make the object more transparent, allowing you to see more of the particles (and or images) underneath. When set to opaque, lower intensity values will fade the image to a black background that obscures the background image.
- **intensity:** Sets the brightness or transparency of the image, from 0 to 100%. See blend input for a complete description.
- **render back:** When turned off, only the front side of the particle is rendered. This means that if you rotate the image, it will be invisible when viewed from the "back". When turned on, the both the front and back side of the particle is rendered, ensuring that it is visible from any viewing angle.
- **depth test:** When turned on, the depth (z-coordinate) of this taken into account when rendering this object; other 3D objects/images that are in front of this object will obscure it. When turned off, only the layer input is used to determine whether or not this object will be obscured by other 3D objects being rendered in the currently active Scenes.
- **particle count:** The maximum number of particles that can exist at any one time. If you attempt to generate more than this number of particles specified here, the oldest surviving particles will "die" before new ones are rendered.
- **vertices:** The number of vertices in the object. A value of 3 draws a triangle, 4 draws a square, 5 draws a pentagon, etc. Higher values will approximate a circle.
- **vertex rot:** The rotation of the object's vertices around the center of the particle -- use this to spin the object around its center.
- **obj scale h/v:** The scaling of the horizontal/vertical dimensions, of the object, specified as a percentage of the current size.
- **size shift:** If this input is 'off', only the start size is used to determine the size of the particle, if this input is 'on', then the size will shift from the start size to the mid size and then to the end size over the duration of the fade-in, hold and fade-out times.
- **start size:** Starting size of the object being drawn; defines the initial size of the object when its created. If the size shift input is 'on', the particle will change its size based on the start size, mid size and end size as well as the fade-in, hold and fade-out times.

- **mid size:** Defines the middle size of the object being drawn during its hold time; between the end of the fade-in and the beginning of the fade-out times. Only used if size shift input is 'on'.
- **end size:** Ending size of the object being drawn; defines the size of the object when it reaches the end of the fade-out time. Only used if size shift input is 'on'.
- **color shift:** If this input is 'off', only the start color is used to determine the color of the particle, if this input is 'on', then the color will shift from the start color to the mid color and then to the end color over the duration of the fade-in, hold and fade-out times.
- **start color:** Starting color of the object being drawn; defines the initial color of the object when its created. If the color shift input is 'on', the particle will change its color based on the start color, mid color and end color as well as the fade-in, hold and fade-out times.
- **mid color:** Defines the middle color of the object being drawn during its hold time; between the end of the fade-in and the beginning of the fade-out times. Only used if color shift input is 'on'.
- **end color:** Ending color of the object being drawn; defines the color of the object when it reaches the end of the fade-out time. Only used if color shift input is 'on'.
- **fade-in time:** Specifies the duration of the fade-in. The brightness or intensity of this object increases from zero to the value specified in the intensity input over the duration specified by this input.
- **hold time:** Specifies the duration of the hold time. After the fade-in time is complete, this input specifies how long the object will maintain its full intensity as specified by the intensity input.
- **fade-out time:** Specifies the duration of the fade-out. The intensity of this object decreases from the full intensity, specified by the intensity input, to zero, over the duration specified by this input.
- **inten override:** When the override width input is greater than 0, this value is used to override the intensity of a particle based on its age. For example, if this value is 3 seconds and the override wid is 1 second, then particles that are between 2.5 and 3.5 seconds old will be brightened.
- **override wid:** Used in conjunction with the inten override input, this value determines how far the intensity override will extend. Setting this to a higher value means that the brightness of more objects will be affected.
- **x/y/z rotation:** Rotates the particle system around its x, y or z axis.
- **x/y/z translate:** Translates the particle system along the x, y or z axis.
- **x/y/z velocity:** When creating new particles using the add img input, these values determine the initial velocity of the particle along each axis. Specified in units per second.
- **vel limit:** Turn this input 'on' if you want objects to stop moving when they reach a velocity of zero, as affected by the x/y/z vel delta inputs.

- **x/y/z vel delta:** The linear change of velocity over time along the x/y/z axis, in units per second. Negative values cause the particles to slow down over time, positive values cause the particles to speed up. When using a negative value, you can force the particles to stop moving when they reach a velocity of zero by turning the vel limit input 'on',
- **x/y/z gravity:** Specifies the force of along the x, y and z axis.
- **surface pos:** Position of the floor or ceiling surface. When set to zero, this parameter has no affect. When set to a negative number the surface acts as a floor, when set to positive number, the surface acts as a ceiling. The amount of bounce, is determined by the absorption parameter.
- **absorption:** Positive numbers decrease the energy of the particles when they touch the floor or ceiling surface. Negative numbers will increase the particle's energy.
- **friction:** Positive numbers decrease the velocity of the particles when they collide with the floor or ceiling surface. Negative numbers will increase the particle's velocity.
- **x/y/z :** The initial location in space of the next particle when then add obj input is triggered.
- **add obj:** Adds a new particle at coordinate (x,y,z) with an initial velocity specified by the velocity inputs.

3D Player



3D Player

0	3d object
off	to stage
1	channel
on	visible
0	layer
off	lighting
off	render back
0	x rotation
0	y rotation
0	z rotation
0	x translate
0	y translate
0	z translate
100	all scale
100	x scale
100	y scale
100	z scale
video	texture map
100	tex map scale
off	use alpha

Renders a 3D object onto the stage or into a channel being rendered as a video stream by a 3D Renderer actor.

The first step in displaying a 3D object is to import the object's model (which must be in the 3D Studio Max/3DS format) into the Media Window. If the 3DS files uses one or more texture maps, those image files must be in the same folder as the 3DS file that references it.

If you would like the 3D object to be rendered directly to the stage, then you must turn on the to stage input. If you would like to output the 3D model as a video stream that can be sent through Isadora's other video processing actors, you must also have a 3D Renderer actor in the same scene, and its channel number must match that specified in this actor.

Each 3D Player actor will show one object on a specified rendering channel or stage. If you have multiple 3D Player actors set to the same channel, then all of the 3D objects on that channel will appear together.

For example, let's say you have two files: Cube.3ds and Wedge.3ds. You import these into the Media Window. Then, you create a scene with two 3D Players, both of which have their channel input set to 1.

If the stage input of both 3D Players is turned on, then both objects will simply be rendered to Stage 1. If the stage inputs are both off, you would need a 3D Renderer actor in the same scene, and it's channel input would need to be set to 1. You could then connect the 3D Renderer's video output to a Projector and to show the rendered objects. You could also route the output of the 3D Renderer to an Isadora video processing actor to impose additional effects to the image.

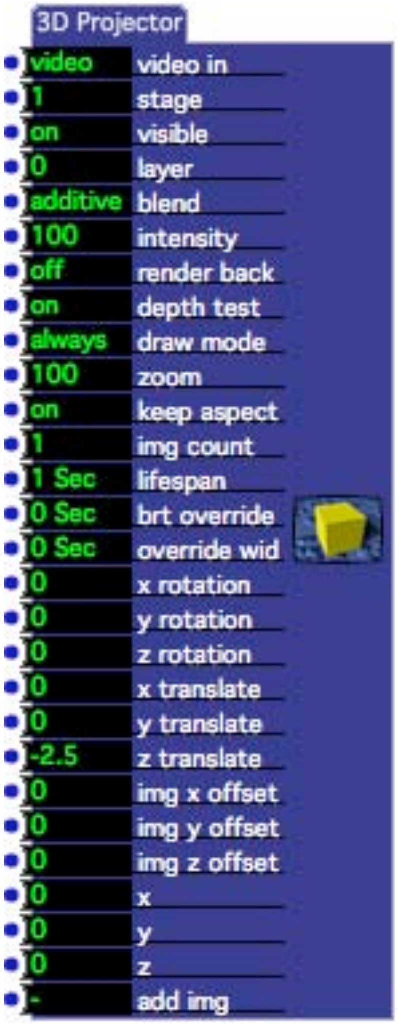
Note the texture map input: if you leave this input disconnected, then the object will be rendered with any texture maps referenced by the 3DS file. If you connect a video stream to this input, the video will be texture mapped on to the object in real time, but **only if the object had a texture map assigned to it when the 3DS model was created**. (When you assign a texture map to an object, the model's "texture coordinates" are generated. Without these coordinates, Isadora cannot apply the texture to the model.)

Input Properties

- **3D object:** Specifies the number of the 3D object file, as displayed in the Media Window.
- **stage: (v1.1)** When turned off, the 3D object will be rendered to the 3D Renderer actor rendering on the same channel as specified by the **channel** input. When turned off, the object is rendered directly to the stage specified by the **channel** input.
- **channel:** The channel on which the object will be rendered. When the **stage** input is set to off, the 3D object will be rendered to the 3D Renderer object in this scene whose **channel** matches the one specified here. When the **stage** input is on, the object will be rendered to the stage specified by this number; i.e. 1 = Stage 1, 2 = Stage 2, etc.
- **visible:** When on, the object is visible and will be drawn.. When off, it is invisible.
- **layer:** Determines the order in which this actor will be rendered, in relation to any other 3D actors in the scene (other 3D Projectors, 3D Player, 3D Quad Distort, etc.) Higher numbered layers are "in front" of lowered numbered layers, i.e. they are drawn last.
- **lighting:** When turned on, this object will be lit and shaded based on the setting of the currently active 3D Light Orientation actor. If there is no 3D Light Orientation active, then the default lighting orientation will be used. See the 3D Light Orientation actor for more information about lighting 3D objects.
- **render back:** When turned 'off', only the front side of the surfaces that comprise the model are rendered. Depending on the orientation and position of the camera, some surfaces may be invisible. When turned on, both sides of the surfaces comprising the model are rendered, ensuring that they are visible from any viewing angle.
- **x/y/z rotation**: Rotates the object around the x, y, or z axes by the number of degrees specified.
- **x/y/z translation**: Translates the object along the x, y, or z axes by the number of degrees specified.
- **all scale**: Scales the object in all three dimensions equally by the specified percentage of its original size.

- **x/y/z scale:** Scales the object in the x, y, or z dimension by the specified percentage.
- **texture map:** Texture maps the incoming video stream on to the model in real time, **but only if the model had a texture map assigned to it when it was saved**. If no texture map was defined for the model when it was created, video sent into this input will have no effect. If no video is sent to this input, the model will be rendered using it's default texture map and/or color materials.
- **tex map scale:** Scales the texture map by the specified percentage.
- **use alpha: (V1.1)** When turned on, the alpha channel information embedded in the video stream will be used when rendering the 3D object. (See the **Add Alpha Channel** actor for more information about alpha channels.)

3D Projector (v1.3)



3D Projector

video	video in
1	stage
on	visible
0	layer
additive	blend
100	intensity
off	render back
on	depth test
always	draw mode
100	zoom
on	keep aspect
1	img count
1 Sec	lifespan
0 Sec	brt override
0 Sec	override wid
0	x rotation
0	y rotation
0	z rotation
0	x translate
0	y translate
-2.5	z translate
0	img x offset
0	img y offset
0	img z offset
0	x
0	y
0	z
-	add img

Renders a video stream onto a rectangle that can be rotated and translated in three dimensions. This actor can also create multiple copies of the image that travel automatically through space.

This module share many input properties with the standard Projector actor, but has can do more manipulations of the image in 3D space.

Its other main feature is the ability to multiple copies of the image, and have them move through space. This is accomplished by setting the object count to a value higher than 1 and triggering the add img input. Once you do this, a copy of the current frame will drift away from its original location at a rate determined by the x/y/z offset inputs.

Input Properties

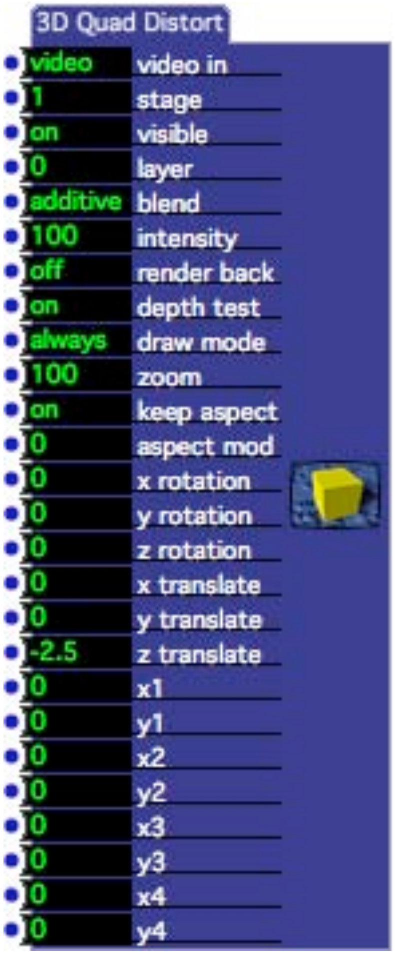
- **video in:** The video stream to be rendered
- **stage:** The stage to which the image will be rendered.

- **visible:** When turned on, the video is rendered to the stage. When turned off, the video is not rendered (which also reduces the processor load).
- **layer:** Determines the order in which this actor will be rendered, in relation to any other 3D actors in the scene (other 3D Projectors, 3D Player, 3D Quad Distort, etc.) Higher numbered layers are "in front" of lowered numbered layers, i.e. they are drawn last.
- **blend:** Determines the opacity of the video image in conjunction with the intensity input. When set to additive, the image is added to the background image – lower intensity settings reduce the brightness of the image. When set to transparent, lower intensity values make the object more transparent, allowing you to see more of the image underneath. When set to opaque, lower intensity values will fade the image to a black background that obscures the background image.
- **render back:** When turned off, the image is only rendered on the front side of the rectangle. This means that if you rotate the image, it will be invisible when viewed from the back. When turned on, the image is rendered on both the front and back side, ensuring that it is visible from any viewing angle.
- **depth test:** When turned on, the depth (z-coordinate) of this taken into account when rendering this object; other 3D objects/images that are in front of this object will obscure it. When turned off, only the layer input is used to determine whether or not this object will be obscured by other objects in the scene.
- **draw mode:** When set to always, a rectangle is always rendered regardless of whether or not there is a valid video input. When set to vid-in, the rectangle is only rendered if a valid video image is present at the video input.
- **intensity:** Sets the brightness or transparency of the image, from 0 to 100%. See blend input for a complete description.
- **zoom:** Scales the image, from 0 to 1000% of its normal size.
- **keep aspect: (v1.2)** When turned on, the aspect of the incoming video stream will be used to determine the aspect ratio of the rectangle into which the image is rendered. The resulting image will be letterboxed horizontally or vertically as needed. When turned off (or when no video input is present) the aspect ratio of the rectangle defaults to 4:3.
- **img count:** When creating multiple copies of the frame using the add img input, determines the maximum number of objects that can be created. How long each object will actually be visible is determined by the lifespan input.
- **lifespan:** Determines how long an object will live after it has been created by triggering the add img input. An object grows darker and/or more transparent (depending on the blend input) as it approaches the end of its lifespan.
- **brt override:** Used when created multiple copies of the image to override the brightness of objects as they grow older. For example, if the lifespan of the objects is two seconds, and a particular object is one second old, it would normally be 50% brightness. But, if you set the brt override to 1 sec, this object

would be rendered at 100% brightness. How many objects the override will affect is determined by the override wid input.

- **override wid:** Used in conjunction with brt override input, this value determines how far the brightness override will extend. Setting this to a higher value means that the brightness of more objects will be affected.
- **x/y/z rotation:** Rotates the image around its x, y or z axis.
- **x/y/z translate:** Translates the image along the x, y or z axis.
- **img x/y/z offset:** When creating multiple copies of the frame using the add img input, these values determine how far the new object will travel along each axis each second.
- **x/y/z :** The location in space of the center of the image.
- **add img :** Each time this input is trigger, a copy of the image is created. It will travel along the x/y/z axes at the speed set by the x/y/z offset inputs, and decay towards being black or fully transparent over the duration set by the lifespan input.

3D Quad Distort (v1.1)



3D Quad Distort

video	video in
1	stage
on	visible
0	layer
additive	blend
100	intensity
off	render back
on	depth test
always	draw mode
100	zoom
on	keep aspect
0	aspect mod
0	x rotation
0	y rotation
0	z rotation
0	x translate
0	y translate
-2.5	z translate
0	x1
0	y1
0	x2
0	y2
0	x3
0	y3
0	x4
0	y4

Renders a video stream onto a rectangle that can be rotated and translated in three dimensions; additionally all four corners of the image can be moved independently of each other allowing the image to adapt to complex keystoning situations.

This actor only works when **Hardware Accelerated Rendering** is turned on in the Preferences

Input Properties

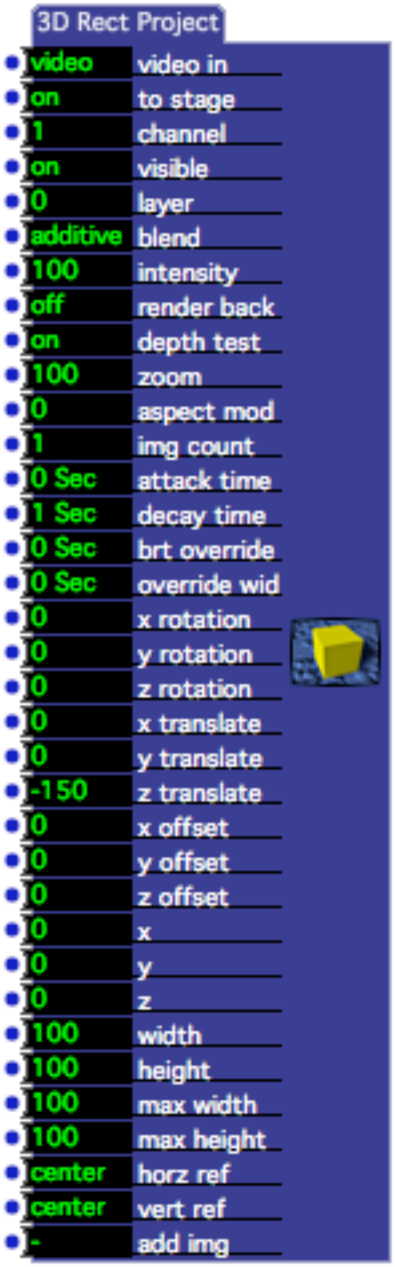
- **video in:** The video stream to be rendered
- **stage:** The stage to which the image will be rendered.
- **visible:** When turned on, the video is rendered to the stage. When turned off, the video is not rendered (which also reduces the processor load).
- **layer:** Determines the order in which this actor will be rendered, in relation to any other 3D actors in the scene (other 3D Projectors, 3D Player, 3D Quad

Distort, etc.) Higher numbered layers are “in front” of lowered numbered layers, i.e. they are drawn last.

- **blend:** Determines the opacity of the video image in conjunction with the intensity input. When set to additive, the image is added to the background image – lower intensity settings reduce the brightness of the image. When set to transparent, lower intensity values makes the object more transparent, allowing you to see more of the image underneath. When set to opaque, lower intensity values will fade the image to a black background that obscures the background image.
- **intensity:** Sets the brightness or transparency of the image, from 0 to 100%. See blend input for a complete description.
- **render back:** When turned off, the image is only rendered on the front side of the rectangle. This means that if you rotate the image, it will be invisible when viewed from the back. When turned on, the image is rendered on both the front and back side, ensuring that it is visible from any viewing angle.
- **depth test:** When turned on, the depth (z-coordinate) of this taken into account when rendering this object; other 3D objects/images that are in front of this object will obscure it. When turned off, only the layer input is used to determine whether or not this object will be obscured by other objects in the scene.
- **draw mode:** When set to always, a rectangle is always rendered regardless of whether or not there is a valid video input. When set to vid-in, the rectangle is only rendered if a valid video image is present at the video input.
- **zoom:** Scales the image, from 0 to 1000% of its normal size.
- **keep aspect: (v1.2)** When turned on, the aspect of the incoming video stream will be used to determine the aspect ratio of the rectangle into which the image is rendered. The resulting image will be letterboxed horizontally or vertically as needed. When turned off (or when no video input is present) the aspect ratio of the rectangle defaults to 4:3. Note that the inputs that manipulate the corners of the image will effect the final aspect ratio of the image.
- **aspect mod:** allows the aspect ratio of the image rectangle to be manipulated. Negative values will produce taller images, positive values will produce wider images.
- **x/y/z rotation:** Rotates the image around its x, y or z axis.
- **x/y/z translate:** Translates the image along the x, y or z axis.
- **x1/y1:** Offsets the top left corner of the image. Negative values make the corner move left (x) or up (y); positive values make the corner move right (x) or down (y).
- **x1/y1:** Offsets the top left corner of the image. Negative values make the corner towards the center, positive values move the corner away from the center
- **x2/y2:** Offsets the top right corner of the image.

- **x3/y3,** Offsets the bottom left corner of the image.
- **x4/y4:** Offsets the bottom right corner of the image.

3D Rect Project (v1.3)



3D Rect Project

```
video     video in
on        to stage
1         channel
on        visible
0         layer
additive  blend
100       intensity
off       render back
on        depth test
100       zoom
0         aspect mod
1         img count
0 Sec     attack time
1 Sec     decay time
0 Sec     brt override
0 Sec     override wid
0         x rotation
0         y rotation
0         z rotation
0         x translate
0         y translate
-150      z translate
0         x offset
0         y offset
0         z offset
0         x
0         y
0         z
100       width
100       height
100       max width
100       max height
center    horz ref
center    vert ref
-         add img
```

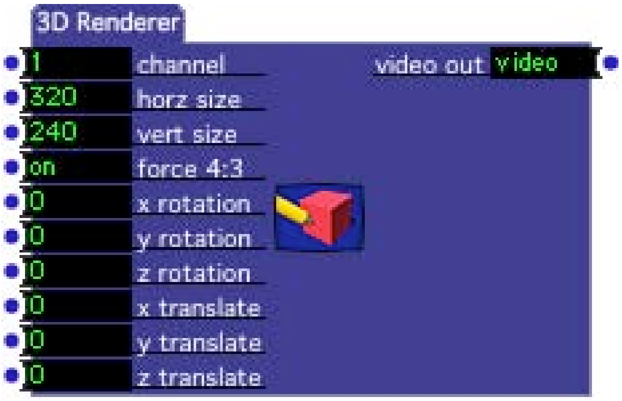
Expanding on the capabilities of the 3D Projector, this actor renders a video stream onto a rectangle that can be rotated and translated in three dimensions, and can create multiple copies of the image that travel automatically through space. In addition, you can control the height and width of the resulting image independently, as well as controlling which edge is referenced as the origin when rendering. (The latter feature is to control how the image is positioned if the source video's aspect ratio changes.)

Input Properties

- **video in:** The video stream to be rendered
- **to stage:** The stage to which the image will be rendered.
- **channel:** The channel or stage to which this object will be rendered. If the to stage input is on the object will be rendered directly to the specified stage. If the to stage input is off, then the object will be rendered by any 3D Renderer actors whose channel input matches the number specified here.
- **visible:** When turned on, the video is rendered to the stage. When turned off, the video is not rendered (which also reduces the processor load).
- **layer:** Determines the order in which this actor will be rendered, in relation to any other 3D actors in the scene (other 3D Projectors, 3D Player, 3D Quad Distort, etc.) Higher numbered layers are "in front" of lowered numbered layers, i.e. they are drawn last.
- **blend:** Determines the opacity of the video image in conjunction with the intensity input. When set to additive, the image is added to the background image – lower intensity settings reduce the brightness of the image. When set to transparent, lower intensity values make the object more transparent, allowing you to see more of the image underneath. When set to opaque, lower intensity values will fade the image to a black background that obscures the background image.
- **intensity:** Sets the brightness or transparency of the image, from 0 to 100%. See blend input for a complete description.
- **render back:** When turned off, the image is only rendered on the front side of the rectangle. This means that if you rotate the image, it will be invisible when viewed from the back. When turned on, the image is rendered on both the front and back side, ensuring that it is visible from any viewing angle.
- **depth test:** When turned on, the depth (z-coordinate) of this taken into account when rendering this object; other 3D objects/images that are in front of this object will obscure it. When turned off, only the layer input is used to determine whether or not this object will be obscured by other objects in the scene.
- **zoom:** Scales the image, from 0 to 100% of its normal size.
- **aspect mod:** allows the aspect ratio of the image rectangle to be manipulated. Negative values will produce taller images, positive values will produce wider images.
- **img count:** When creating multiple copies of the frame using the add img input, determines the maximum number of objects that can be created. How long each object will actually be visible is determined by the lifespan input.

- **attack time:** Fade in time of the objects in seconds, after it has been added using the add img input. The total lifespan of the copy is the sum of this input and the decay time input.
- **decay time:** Fade out time of the objects in seconds, after it has been added using the add img input. The total lifespan of the copy is the sum of this input and the attack time input."
- **brt override:** Used when created multiple copies of the image to override the brightness of objects as they grow older. For example, if the lifespan of the objects is two seconds, and a particular object is one second old, it would normally be 50% brightness. But, if you set the brt override to 1 sec, this object would be rendered at 100% brightness. How many objects the override will affect is determined by the override wid input.
- **override wid:** Used in conjunction with brt override input, this value determines how far the brightness override will extend. Setting this to a higher value means that the brightness of more objects will be affected.
- **x/y/z rotation:** Rotates the image around its x, y or z axis.
- **x/y/z translate:** Translates the image along the x, y or z axis.
- **img x/y/z offset:** When creating multiple copies of the frame using the add img input, these values determine how far the new object will travel along each axis each second.
- **x/y/z :** The location in space of the center of the image.
- **width :** The width of the object, expressed as a percentage of its normal width (i.e. 200 would be twice as wide as normal.)
- **height :** The height of the object, expressed as a percentage of its normal height (i.e. 200 would be twice as wide as normal.)
- **max width :** n/a
- **max height :** n/a
- **horz ref :** Determines from which “edge” the rectangle will be drawn as the width input is changed. When set to center, the image grows from the middle; when set to left the image grows to the right; when set to right the image grows to the left.
- **vert ref :** Determines from which “edge” the rectangle will be drawn as the height input is changed. When set to center, the image grows from the middle; when set to top the image grows down; when set to bottom the image grows up.
- **add img :** Each time this input is trigger, a copy of the image is created. It will travel along the x/y/z axes at the speed set by the x/y/z offset inputs, and decay towards being black or fully transparent over the duration set by the attack time and decay time inputs.

3D Renderer



Renders all 3D Objects on the specified rendering channel.

This actor controls both which objects it will render, and the position of the “camera” looking at those objects.

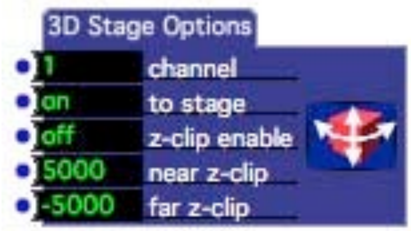
The channel input determines which objects will be rendered: only objects displayed on the same channel by a 3D Player actor will be seen by this renderer. The other parameters control the positioning of the camera in space and, thus, how the objects appear in the resulting rendered video output. You can theoretically have up to 4 separate 3D Renderers in the same scene, each set to a different channel. How many you can really run simultaneously will depend entirely on the speed of your computer and on the speed of your 3D rendering hardware (the computer’s video card).

See the discussion under the 3D Player object for more information on setting up and rendering 3D Objects in Isadora.

Properties

- **channel:** Determines which 3D Objects will be rendered by this actor. Only a 3D Players set to the same channel as specified here will have their objects drawn by this Renderer.
- **horz/very size:** Specifies the size of the rendering surface in pixels. 320 by 240 is a reasonable compromise between speed and detail. Depending on the speed of your computer, you may notice slower performance when using a setting like 640 by 480.
- **force 4:3:** When this parameter is on, changing the value of either the horz or vert size input will automatically adjust the other input so that the ratio between horizontal and vertical is 4:3.
- **x/y/z rotation**: Rotates the camera around the x, y or z axes by the number of degrees specified.
- **x/y/z translation**: Translates the camera along the x, y, or z axes by the number of degrees specified.

3D Stage Options


3D Stage Options

1 channel

on to stage

off z-clip enable

5000 near z-clip

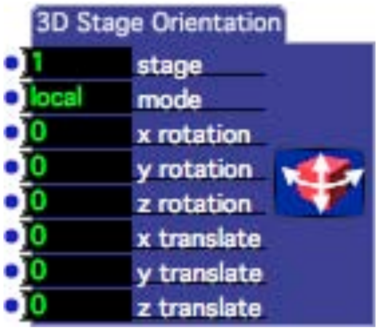
-5000 far z-clip

Allows you to control how 3D objects are rendered to the stage or by the 3D Player actor. Currently, you may only adjust the near and far z-clipping plane, allowing objects to be partially rendered when they move along the z-axis.

Input Properties

- **channel:** This setting is used in combination with the stage input to determine which 3D models will be affected by the specified clipping. Only models being rendered by 3D Player actors whose stage *and* channel settings match the settings here will be affected by the clipping specified in this actor.
- **to stage:** This setting is used in combination with the channel input to determine which 3D models will be affected by the specified clipping. See the channel input for more information.
- **z-clip enable:** If this property is turned on, then the near z-clip and far z-clip parameters are used to clip 3D objects when they are rendered. When this property is turned off, the near and far z-clip parameters are ignored.
- **near z-clip:** The near z-clip works in tandem with the far z-clip to determine if a 3D object will be rendered or not. If the z-coordinates of an object (or part of an object) is between the near z-clip and the far z-clip it will be rendered, otherwise it will not be rendered.
- **far z-clip:** The far z-clip works in tandem with the near z-clip to determine if a 3D object will be rendered or not. If the z-coordinates of an object (or part of an object) is between the near z-clip and the far z-clip it will be rendered, otherwise it will not be rendered.

3D Stage Orientation (v1.1)



3D Stage Orientation

1 stage
local mode
0 x rotation
0 y rotation
0 z rotation
0 x translate
0 y translate
0 z translate

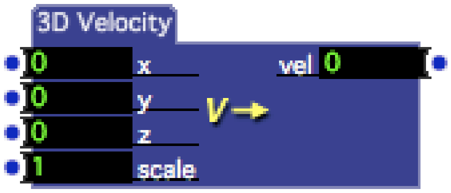
Determines the x/y/z rotation and translation of the camera for a specified stage.

This actor the position of the "camera" looking at all 3D Object being rendered to a particular stage. This is used in tandem with the 3D Player actor when its **stage** input is turned **on**.

Properties

- **stage**: the stage for whose rotation and translation will be set.
- **mode**: when set to local, orientation changes will affect this scene only. When set to global, changes affect all scenes.
- **x/y/z rotation**: Rotates the camera around the x, y or z axes by the number of degrees specified.
- **x/y/z translation**: Translates the camera along the x, y, or z axes by the number of degrees specified.
- **vel:** The velocity of the point as it moves.

3D Velocity (v1.3)



3D Velocity

0 x
0 y
0 z
1 scale
vel 0

Calculates the velocity of a point as it moves in 3D space.

This module calculates the velocity of a point in 3D space, as specified by its x, y and z coordinates. Each time a new value is received at the **z** input, the current x/y/z values and the previous x/y/z values are used to calculate the velocity.

The velocity is actually the result of the standard formula for the distance between two points, i.e. the square root of $((x2 – x1)^2 + (y2 – y1)^2 + (z2 – z1)^2)$, where x2 /y2/z2 is the current point and x1/y1/z1 is the previous point.

One possible use of this module is to measure the velocity of the movements of a 3D pointing device.

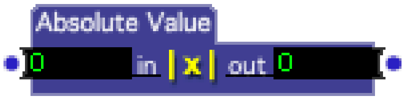
Input Properties

- **x:** The x coordinate of the point
- **y:** The y coordinate of the point.
- **y:** The z coordinate of the point. Receiving a value at this input triggers the calculation between the current x/y/z values and the previous x/y/z values.
- **scale:** The scaling factor. Each time a new velocity is calculated, it is multiplied by this number to determine the final velocity.

Output Properties

- **vel:** The velocity of the point as it moves.

Absolute Value (v1.1)



Outputs the absolute value of the number received at the input.

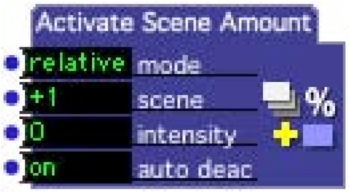
Input Properties

- **in:** The input value

Output Properties

- **out:** Outputs the absolute value of the input value.

Activate Scene Amount (v1.1)



Activates a secondary Scene at a specific intensity in addition to the primary Scene.

This actor is similar to the Activate Scene actor, except that it allows you set intensity of the Secondary Scene, i.e. the brightness of the video and the volume of the sound.

The setting of the intensity input determines whether or not the secondary Scene is active. When the intensity is 0, the secondary scene is not active. When intensity rises above 0, the secondary scene is activated, and its intensity set the appropriate value.

Please refer to the Activate Scene actor for a more complete description of Secondary Scenes.

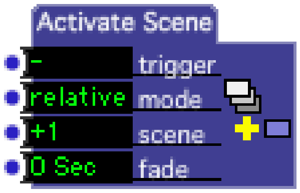
Properties

- **mode:** Determines how the number in the **scene** property is interpreted. When this property is set to *relative* the scene to be activated is relative to the position of the current scene in the Scene List. When this property is set to *absolute* the Scene to be activated is based on its position in the Scene List. See **scene** property above for more information.
- **scene**: Indicates which Scene to activate. This field works in tandem with the mode field. When mode is set to relative, the number in this field indicates the scene to activate relative to the current scene. +1 would be the scene after this scene, -1 would be the scene before this scene, +2 would be the second scene after this scene, etc. When mode is set to absolute, the number in this field indicates a Scene in the Scene List by its position, where 1 is the first scene in the list, two is the second scene, etc.

  When a valid scene has been specified in this property, its name will appear after the number.
- **intensity**: The setting of the intensity input determines whether or not the secondary Scene is active. When the intensity input is 0, the secondary scene is not active. When intensity rises above 0, the secondary scene is activated, and its intensity is set the appropriate value.
- **auto deac:** When this input is turned on, the Secondary Scene will automatically be deactivated when leaving the current scene. When turned off, the secondary Scene will remain active even after you leave this Scene – you must explicitly deactivate the scene by setting the intensity property of a

another Activate Scene Intensity actor to 0, or by using the Deactivate Scene actor.

Activate Scene

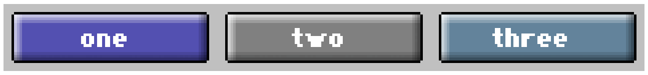


- trigger
relative mode
+1 scene
0 Sec fade

Activates a secondary Scene in addition to the primary active scene.

When you activate a secondary Scene, all of the actors in the currently active Scene and all of the actors in the newly activated secondary Scene will run at the same time. A Scene activated through the Activate Scene actor will remain active until 1) you deactivate it using the Deactivate Scene actor, 2) you make the secondary Scene primary by jumping into it using the Jump actor, or 3) if you make it primary by clicking on it in the Scene List with the mouse.

Secondary Scenes are indicated as active in the Scene List by being drawn in a light blue color, as opposed to the deeper blue used to indicate a primary active Scene. In the picture below, scene “one” is primary, and scene “three” is secondary.



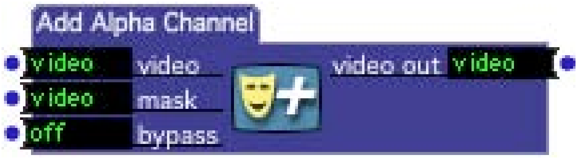
Properties

- **trigger**: When a trigger is received on this input port, the secondary Scene indicated by the **mode** and **scene** properties is activated.
- **scene**: Indicates which Scene to activate. This field works in tandem with the mode field. When mode is set to relative, the number in this field indicates the scene to activate relative to the current scene. +1 would be the scene after this scene, -1 would be the scene before this scene, +2 would be the second scene after this scene, etc. When mode is set to absolute, the number in this field indicates a Scene in the Scene List by its position, where 1 is the first scene in the list, two is the second scene, etc.

  When a valid scene has been specified in this property, its name will appear after the number.
- **mode:** Determines how the number in the **scene** property is interpreted. When this property is set to *relative* the scene to be activated is relative to the position of the current scene in the Scene List. When this property is set to *absolute* the Scene to be activated is based on its position in the Scene List. See **scene** property above for more information.
- **fade: (V1.1)** Specifies a fade time, over which the video and audio in the newly activated scene will be faded in. (Note: The visual aspect of the fade in

will only work if Hardware Accelerated Rendering is turned on in the Video tab of the Preferences.) The visual result of the fade in depends on a number of factors: what video is being rendered in the current scene, the setting of the blend and layer inputs in the Projector actors that become active, etc. See the section “Compositing with the Projector” on Page 132 for more information on taking advantage of multiple projectors.

Add Alpha Channel (v1.1)



Embeds an alpha channel into a video stream, which can be used by the Projector actor when rendering the video to a Stage.

By embedding an alpha channel into a video stream, you can control the transparency of each pixel as it is rendered to the stage.

When the Projector renders to the stage, it uses the embedded alpha mask information to determine the transparency of the video stream being rendered. Where the mask is white you will see the original video stream, where the mask is black you will see the anything that has been rendered to the stage previously (i.e. in a lower layer). When the brightness of the mask is a shade of gray you will see a mix of the original video stream and previously rendered images – how much of the background you will see is based on the mask’s brightness. When the mask is light, you will see more of the foreground; where it is dark, you will see more of the background. Below are examples foreground, background, and mask image, and the result of combining them through the alpha mask

See the section “Compositing with the Projector” on Page 132 for more information on taking advantage of these features.

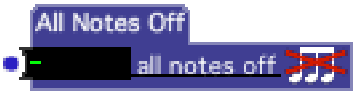
Input Properties

- **video**: the video stream into which the alpha channel will be embedded.
- **mask**: a video stream that will become the alpha mask. This stream does not have to be in grayscale, but it will be converted to a grayscale image before it is embedded into the source video stream.
- **bypass**: When turned off, this effect functions normally. When turned on, the effect is disabled and the video input is passed directly to the video output.

Output Properties

- **video out**: the video stream into which the alpha channel has been embedded.

All Notes Off



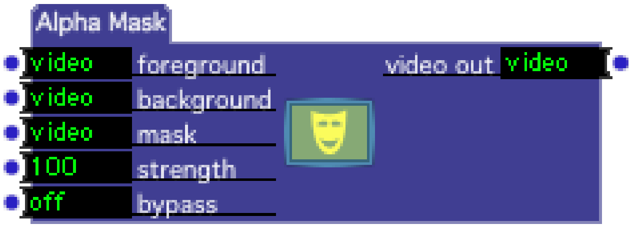
Sends a MIDI Note Off message to all currently sounding notes on all MIDI Output Ports.

Isadora keeps track of what how many Note On messages have been sent to each MIDI channel on each MIDI Output Port, so that it only sends the messages it needs to turn off all of the currently sounding notes. This is different than the MIDI Panic actor, which sends a Note Off messages for every possible MIDI Note on all of the ports.

Properties

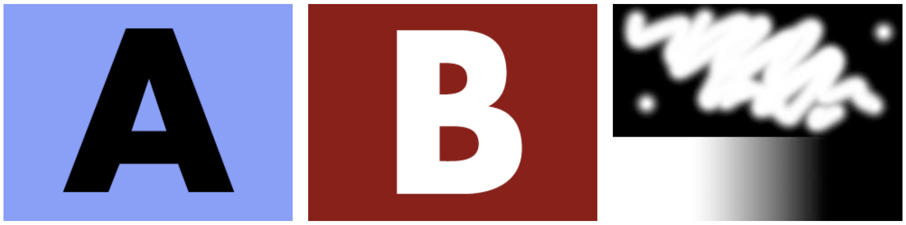
- **all notes off**: when a trigger is received on this input port, MIDI Note Off messages are sent to silence all currently sounding MIDI Notes.

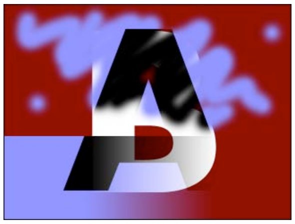
Alpha Mask



Mixes two video streams together using the brightness of a third video stream to determine whether you see the foreground or background or a mixture of the two.

Where the **mask** video stream is white you will see the foreground video stream, where it is black the background. When the brightness of the mask is a shade of gray you will see a mix of the foreground and background images based on the mask’s brightness. When the mask is light, you will see more of the foreground; where it is dark, you will see more of the background. Below are examples foreground, background, and mask image, and the result of combining them through the alpha mask





You can that where the mask is light you see the blue background and the dark letter A. Where it is dark, you see the red background and the light letter B. Look along the bottom of the mask – there is a gradation that goes gradually from white to black in the middle portion. In the resulting image, you can see how that part of the image "fades" from the foreground to the background.

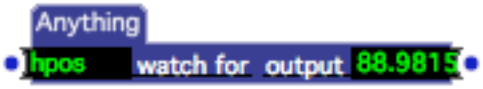
Input Properties

- **foreground:** a video stream that will become more visible as the corresponding area in the mask approaches white.
- **background:** a video stream that will become more visible as the corresponding area in the mask approaches black.
- **mask**: a video stream that determines whether you see the foreground or background image. Where the mask is white, you will see only the foreground image. Where it is black, you will see only the background. When the mask is a color or shade of gray, you will see a mixture of the foreground and background, showing more of the background as the mask approaches black.
- **strength**: when this value is set to 100%, the mask functions normally. When set to a lower value, you will see more of the foreground. (The internal effect is that the mask is lightened as the strength decreases.) By ramping this value from 0 to 100 you can fade in the mask, by ramping from 100 to 0 you can fade it out.
- **bypass**: When turned off, this effect functions normally. When turned on, the effect is disabled and the video input is passed directly to the video output.

Output Properties

- **video out:** the masked video stream.

Anything



"Watches for" any kind of Real World input, including mouse movement, keys being pressed on the keyboard and incoming MIDI events.

Input Properties

- **watch for:** the type of input that is being watched for is indicated by a shorthand notation displayed in the input value (see below).

mouse: *the value starts with either ‘hpos’ (for the horizontal movement) or ‘vpos’ (for the vertical movement.) After this, the modifier keys are used to manipulate what the watcher sees. Eg. ‘x cmd-opt’ means the watcher will see horizontal movement of the mouse when the command and option keys are held down.*

keyboard: *the value starts with ‘key’. This is followed by the key that will trigger the operator. When looking for keboard events the* output *changes to ‘trigger’*

midi: *the value will start with shorthand for that midi event followed by the Port Channel and one or two other values specific to the event. For the watcher to see an incoming midi event it must exactly match all of these parameters unless the value is set to “don’t care” (indicated by a dash).*

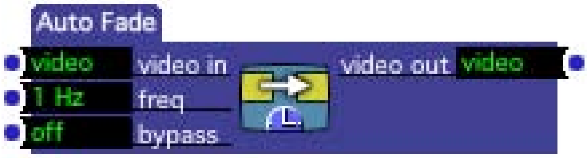
Here are the layouts for the various MIDI messages:

- note off = nof port chan pitch velocity
- note on = non port chan pitch velocity
- polyphonic pressure = pprs port chan pitch pressure
- control change = ctrl port chan ctl-number ctl-value
- program change = prg port chan prog-number
- monophonic pressure = mprs port chan pressure
- pitch bend = pbnd port chan value

Ouput Properties

- **output:** the value will either be a percentage value between 1 and 100, or ‘trigger’, depending on how the input is set up.

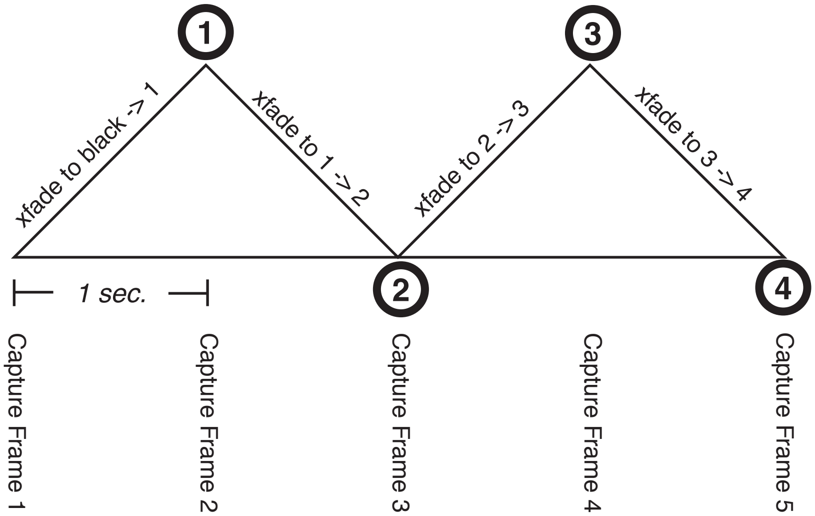
Auto Fade



Automatically crossfades between still images captured from a video stream.

Auto Fade works by capturing still images from the incoming video stream, and cross fading between them at a specified frequency. The result is a rather dreamlike stop-motion effect. Different settings of the 'freq' input produce very different results.

The diagram below shows how the process works. But probably, it is best to simply try the actor to see the results. The circled numbers show when those captured frames of video are fully visible.



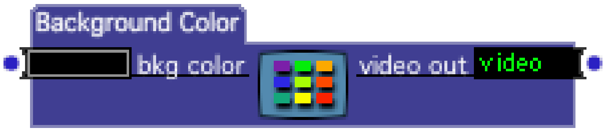
Input Properties

- **video in:** The video input stream.
- **freq**: Specifies the rate at which still frames will be captured from the incoming video stream, and the rate at which Auto Fade will cross fade between those images.
- **bypass**: When turned off, this effect functions normally. When turned on, the effect is disabled and the video input is passed directly to the video output.

Input Properties

- **video out:** The video input stream.

Background Color



Generates a video stream with a solid color.

The resolution of the output video is determined by the default pixel resolution specified in the Video Tab of the Preferences. If you want to generated a background color at a different horizontal and/or vertical resolution, use the Resizable Bkg actor.

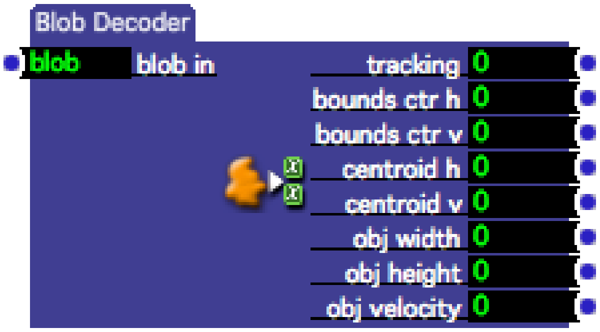
Input Properties

- **bkg color**: This determines the color of the output video stream. There are two ways to specify the color: first, if you click on the colored square to the left of the title bkg color, a standard color picker dialog will appear. Or, you may connect the output of the Color Maker actor to the bkg color input.

Output Properties

- **video out**: Outputs a video stream at the default resolution defined in the Video tab of the Preferences.

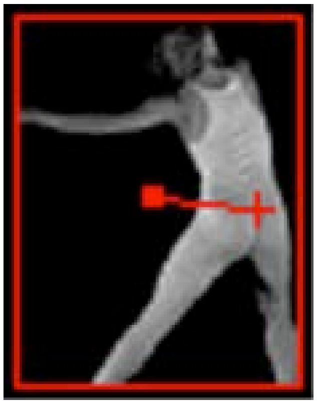
Blob Decoder (v1.1)



Reports the position, size and velocity of one of the blobs being tracked by the Eyes++ actor.

Please see the documentation of the Eyes++ actor on page 264 for more information about how the tracking works.

One concept that may need further explanation is the *centroid* of an object. Consider the blob and bounding box shown below:



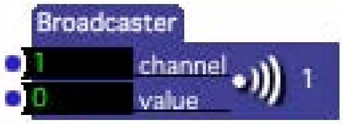
The bounding box correctly reports the extent of the blob. But the *true* center of the blob is actually to the right of the bounding box center.

Eyes++ calculates the centroid of each blob by measuring the brightness of the pixels, assuming that brighter pixels will indicate where the object truly is. In the example above, you can see the centroid marked by the cross, which is to the right and slightly below the bounding box center marked by the square. This measurement may or may not prove useful depending on your setup – you simply have to give it a try to see if it provides interesting results.

Output Properties

- **tracking**: Outputs a 1 when the blob is being tracked. Otherwise, it outputs a 0.
- **bounds ctr h**: Reports the horizontal center of the bounding box of the blob, specified as a percentage of the width of the frame. 50% is in the center, 0% is the left edge of the frame, 100% is the right edge.
- **bounds ctr v**: Reports the vertical center of the bounding box of the blob, specified as a percentage of the height of the frame. 50% is in the center, 0% is the top edge of the frame, 100% is the bottom edge.
- **centroid h**: Reports the horizontal centroid of the blob, specified as a percentage of the width of the frame. (See above for a description of the centroid.)
- **centroid ctr v**: Reports the vertical centroid of the blob, specified as a percentage of the width of the frame. (See above for a description of the centroid.)
- **obj width**: Reports the width of the bounding box, specified as a percentage of the width of the frame.
- **obj height**: Reports the width of the bounding box, specified as a percentage of the height of the frame.
- **obj velocity**: Reports the velocity of the center point of the bounding box, as specified as a percentage of the width of the frame. Higher values mean that the value is moving more quickly through the frame.

Broadcaster



Sends a value of any type to all active Listener actors listening on the specified channel.

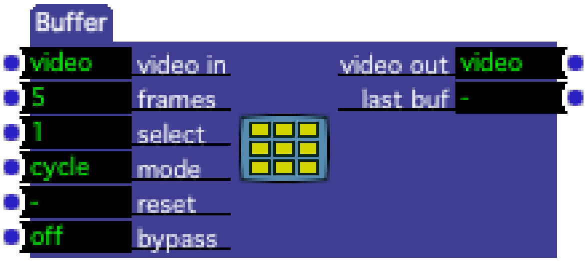
Broadcasters are primarily used to send values between the primary active Scene and a secondary active Scene. (See the Activate Scene actor for more information on secondary Scenes, or the Net Broadcaster to send values to other machines on a Local Area Network.) Whenever a new value is received at the value input, that value is "broadcast" to all active scenes on the channel specified by the channel input property. Any active Listener actor that is set to receive on the same channel will "hear" the value and send it out of its value output.

You can however use the Broadcaster/Listener pairs within the same scene if desired, since values are broadcast to *all* active scenes.

Properties

- **channel**: Specifies the channel on which this value will be broadcast. Only Listener actors whose channel input property are set to the same value as that specified by this property will "hear" the broadcast.
- **value**: Whenever a value is received at this input, it is broadcast on the channel specified by the channel input property. Note that his input is mutable, in that it will change its type (integer, float, video, etc.) to match that of the output property to which it is linked.

Buffer

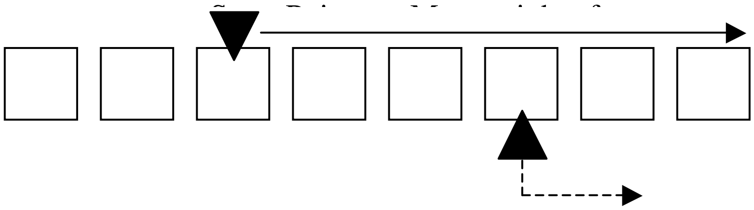


Captures an arbitrary number of frames of video, allowing them to be recalled in any order and at any rate.

You can visualize the buffer as an ordered list of video frame buffers and two pointers into that list: a store pointer and a recall pointer.

The store pointer (maintained internally) determines where the next frame of video will be stored – it automatically moves to the next buffer in the list each time a new frame of video arrives at the video in input.

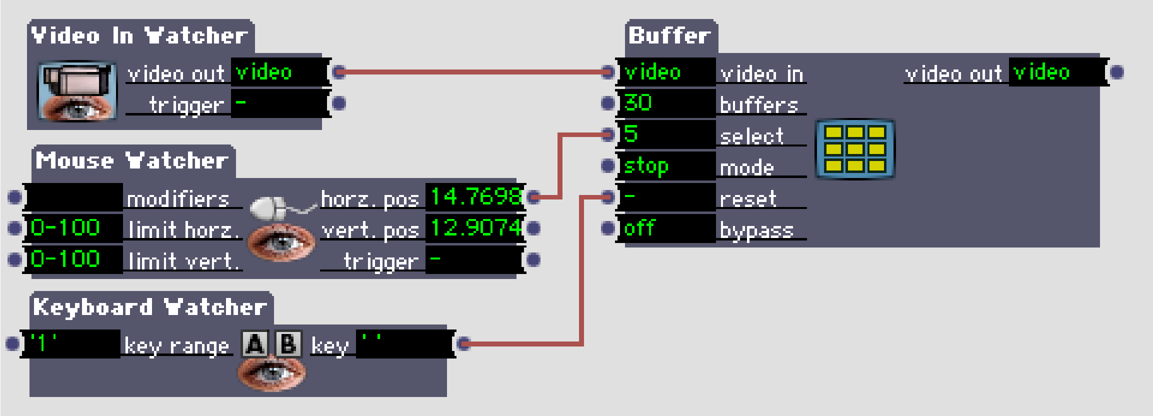
The recall pointer moves based on the values arriving at the select input. By sending a buffer number to the select input, you can send the contents of that buffer to the video output. Because each buffer stored in the computer's RAM and not on disk, recall is almost instantaneous.



Recall Pointer – Moves each time a

What the store pointer does when the last buffer in the list is reached depends on the setting of the mode input. If it is set to cycle, Buffer will continue to store incoming video, starting over with the first buffer (this erases that buffer's previous contents.) If set to stop, Buffer will stop after storing the last frame and wait until the reset input is triggered before starting again from the first buffer.

One interesting use comes when Buffer stores frames from a live video feed from the Video In Watcher, as you are able to manipulate images that occurred live just moments before. To see this in action, try the following patch:



Video In Watcher
video out video
trigger -

Mouse Watcher
modifiers
0-100 limit horz.
0-100 limit vert.
horz. pos 14.7698
vert. pos 12.9074
trigger -

Keyboard Watcher
'1' key range

key ' '

Buffer
video video in
30 buffers
5 select
stop mode
- reset
off bypass
video out video

Each time you press the number '1' on the computer keyboard, the buffer actor will capture 30 frames of video from the live input. Note that since the mode is set to stop, when all buffer frames have been stored, the Buffer actor will stop and wait for another trigger. You can then move the mouse horizontally to scrub through the stored images.

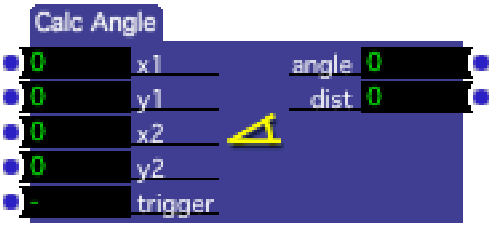
Input Properties

- **video in:** The video input stream.
- **buffers:** The number of buffers (i.e. frames of video) that this actor can store. Note that each frame requires a fair amount of memory, so setting this value to a high number will consume considerable free memory.
- **select**: Selects which buffer to send to the output, from 1 to the number of buffers specified by the buffers input property. When this value changes, the contents of the specified buffer are sent to the video output. If no video has been stored into the buffer you have selected, a black frame will be sent to the output.
- **mode**: Determines what happens when a frame of video is stored in the last buffer in the list. When set to cycle, the buffer continues storing frames, starting over with the first buffer. When set to stop, the buffer stops storing frames until a trigger is received at the reset input.
- **reset**: Resets the Buffer actor so that the next frame of video will be stored into the first buffer in the list. If the mode property is set to stop, triggering this input will cause Buffer to capture frames again until the last buffer is reached.
- **bypass**: When turned off, this effect functions normally. When turned on, the effect is disabled and the video input is passed directly to the video output.

Output Properties

- **video out:** Whenever the select input is changed, outputs the frame of video stored in the specified buffer.
- **last trig:** Sends a trigger when the last buffer in the list is stored. This is most useful when the mode input is set to stop, as it allows you to trigger an action when all frames in the buffer have been filled.

Calc Angle (v1.1)



Given a pair of x/y coordinates, outputs the angle between the two points.

Input Properties

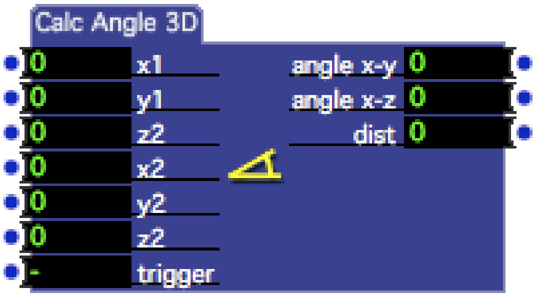
- **x1/y1**: The x/y coordinate of the first point.
- **x2/y2**: The x/y coordinate of the second point.
- **trigger:** triggers the calculation of the angle and sends the result to the angle and dist outputs.

Output Properties

angle x-y: Outputs the angle of rotation of the line defined by the two points x1/y1 and x2/y2

dist: Outputs the distance between the two points.

Calc Angle 3D (v1.3)



Given a pair of x/y/z coordinates, outputs the angle between the two points.

Input Properties

- **x1/y1/z1**: The x/y/z coordinate of the first point.
- **x2/y2/z1**: The x/y/z coordinate of the second point.
- **trigger:** Triggers the calculation of the angle and sends the result to the angle x-y, angle x-z, and dist outputs.

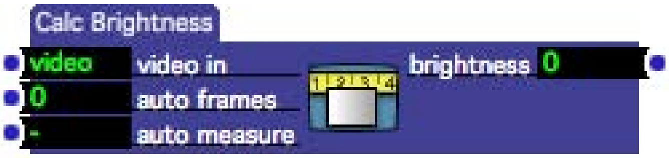
Output Properties

angle x-y: Outputs the angle of rotation of the line defined by the two points x1/y1 and x2/y2

angle x-z: Outputs the angle of rotation of the line defined by the two points x1/z1 and x2/z2

dist: Outputs the distance between the two points.

Calc Brightness (v1.1)

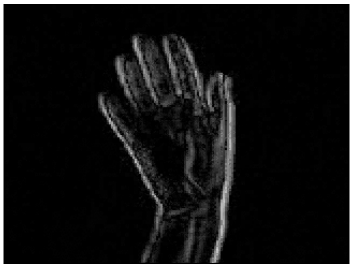


Calculates the brightness of a video stream, optionally measuring the minimum and maximum brightness to provide automatic scaling.

The Calc Brightness actor is especially useful if you want to determine how much movement is occurring in a live video feed, and to use the amount of movement to interactively control some parameter.

To accomplish this, you connect the Video In Watcher actor to the Difference actor's video in input, and then connect the difference actor's video output to the video in input of the Calc Brightness actor.

For instance, if the camera is looking at a hand, and the hand was moving slightly, the output of the Difference actor would look something like this.



When there is movement, the Difference actor makes more white pixels. When there is no movement, the output of the Difference actor is almost black. Thus, the more movement there is, the higher the value of the brightness output of Calc Brightness.

But even when there is a lot of movement using this technique, the output value will never reach 100 – as that would require a completely white frame. To help get a full range of output, you can use the *auto scaling* feature of Calc Brightness.

Set the auto frames input to the number of frames you want to analyze (e.g., 150 frames is five seconds of 30fps NTSC video.) Then trigger the auto measure input, and have the person or object seen in the video feed move both very slowly and very fast. The auto measure function keeps track of the lowest and highest brightness values measured, and once the measurement is complete, will start automatically scaling its measurements so that the output should go from 0 to 100%.

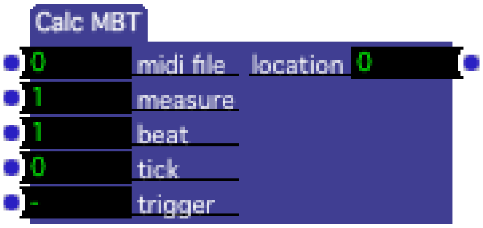
Input Properties

- **video in:** The source video stream.
- **auto frames**: Specifies how many frames to examine when using the auto measure function (see below)
- **auto measure:** when triggered, measures the brightness of the next *n* frames of video (with *n* being specified by the auto frames input.) The minimum and maximum brightness measured is then used to automatically scale the brightness output for subsequent frames.

Output Properties

brightness*: The brightness of the current frame of video, with a black frame yielding a brightness of 0, a white frame yielding a brightness of 100, etc.*

Calc MBT



Converts a measure, beat and tick specification into a percentage that can be used to set the play start or play duration parameters of a Midi Player.

The play start and play length properties in the Midi Player actor are specified as a percentage of the MIDI file's total length. There may be times, however, when you want to specify these values in measures, beats and ticks. This actor allows you to convert the time specified in measures, beats and ticks into a percentage appropriate for the Midi Player.

Because each MIDI file may have a different time signature, you need to specify the MIDI file.

Input Properties

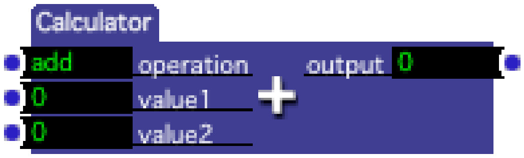
- **midi file**: The number of the MIDI file you want to play, as shown in the Media Window. When the number of a valid movie is entered here, its name will appear to the right of the number. It is important that the MIDI Play to which you are connecting this actor references the same MIDI file.
- **measure:** the measure number, starting with measure 1. If you want to calculate the play length parameter, use the add one to the measure number. I.e. if you want to specify a duration of 6 measures, set this value to 7, because the distance between measure 7 and measure 1 is 6 measures.)

- **beat:** the beat number, from 1 to the numerator of the MIDI file's time signature.
- **tick:** the tick within the beat. The range of this value is specific to the MIDI file that is being referenced.
- **trigger:** sends the resulting percentage to the output.

Output Properties

***location**: The location within the MIDI file, expressed as a percentage of its total length. You can connect this output to the Midi Player's play start or play length inputs.*

Calculator



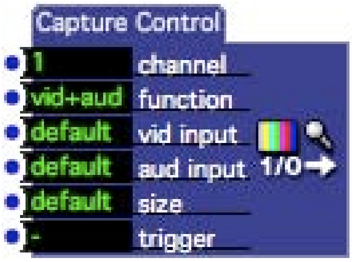
Performs mathematical calculations on two numeric values.

Properties

- **operation**: Determines the operation to be performed on the two numbers. You may choose *add*, *subtract*, *multiply*, *divide*, or *modulo*. The latter gives the integer remainder when dividing two numbers.
- **value1:** the first value for the operation
- **value2:** the second value for the operation
- **output:** the result of the calculation. For the five different operations, this value is calculated as follows:

add	*value1 + value2*
subtract	*value1 – value2*
multiply	*value1 x value2*
divide	*value1 / value2*
modulo	*integer remainder of value1 / value2*

Capture Control



Capture Control

1 channel
vid+aud function
default vid input
default aud input
default size
- trigger

Start or stop capturing video and/or audio.

The Capture Control actor allows you to start or stop live capture interactively. You may choose to start capture video and audio, just video or just audio, and may select the video input used to capture video.

Properties

- **channel:** determines which live capture channel will be affected by this actor. (See the Live Capture Settings window on Page 158 for more information on configuring live capture.)
- **function:** determines the action taken:

vid+aud	*start capturing video and audio*
vid	*start capturing video only*
aud	*start capturing audio only*
none	*stop capturing*

- **vid input**: Determines which video input will be used to capture.

default	*captures from the video driver's default input*
composite	*captures from the composite video input*
s-video	*captures from the s-video input*
component	*captures from the component video input*

- **aud input (V1.1)**: Determines which audio input will be used to capture.

default	*captures from the video driver's default input*
line in	*captures from the line input jack*
mic in	*captures from the built-in microphone*
1-4	*captures from the device with this index. (Used when you have multiple input devices connected to the system.)*

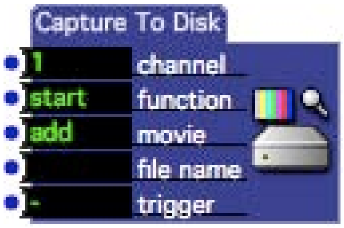
- **size: (V1.1)** Determines the resolution that will be used to capture.

default	*captures at the size currently chosen in the Video Capture Size menu.*
full	*captures at the camera's native resolution*
third	*captures at one third of the camera's native resolution*
half	*captures at one half of the camera's native resolution*
quarter	*captures at one quarter of the camera's native resolution*
640x480	*captures at one a resolution of 640x480*
320x240	*captures at one a resolution of 320x240*

384x288	*captures at one a resolution of 384x288*
192x144	*captures at one a resolution of 192x144*
custom	*captures at the size specified by the* ***Set Custom Capture Size*** *dialog. See page 156 for more information.*

- **trigger**: Starts or stops live capture, based on the setting of the **function** input property.

Capture To Disk



Capture To Disk

1	channel
start	function
add	movie
	file name
-	trigger

Start or stop recording the current live capture input (video and/or audio) to disk.

The Capture To Disk actor allows you to start or stop recording the current capture input to your computer's hard drive as a QuickTime movie. After capture is completed the newly recorded movie will appear in the Media Window so that you can play it using any of the Movie Player actors.

For more information on how to use this actor see the section "Capturing Video and Audio To Disk" on Page 158.

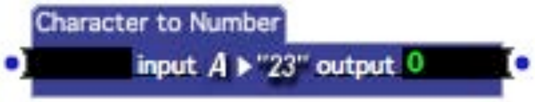
Properties

- **channel:** determines which live capture channel will be affected by this actor. (See the Live Capture Settings window on Page 158 for more information on configuring live capture.)
- **function:** Determines the action taken:

start	*start recording to disk*
stop	*stop recording to disk*

- **movie**: Determines where the recorded movie will appear in the Media Window. When this property is set to add, then the newly recorded movie will be added after the last movie currently in the Media Window. When this property is set to a number, then the movie currently at that location in the Media Window will be replaced by the new movie.
- **trigger**: Starts or stops recording, based on the setting of the **function** input property.

Character to Number



Converts the first character of the input text to it’s decimal equivalent.

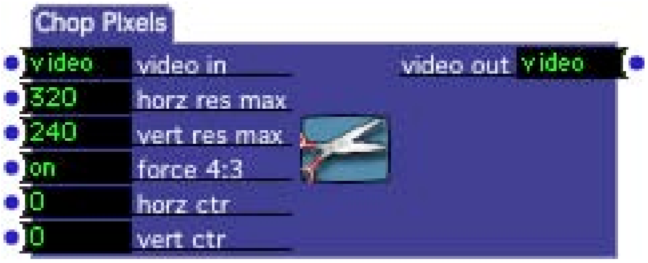
Input Property

- **input:** The text whose first character will be converted to a number.

Output Property

- **output:** Outputs the decimal value of the first character of the text received in the input.

Chop Pixels (v1.1)



Crops a video stream, outputting it at a new resolution.

Chop Pixels will take an incoming video stream, and crop it to s a specified horizontal and vertical resolution. This can be useful in a number of situations; perhaps most notably when you have a high-resolution still image (e.g., 1200x900), and you want to see only a portion of the image (e.g., 320x240). You may also pan within the larger image using the **horz ctr** and **vert ctr** inputs.

IMPORTANT: It is bad practice to use Chopper to scale images to a different size – instead use the Panner or Zoomer actor. The reason for the inefficiency stems from the fact that, when Isadora tries to combine two images of differing resolutions, it will scale one to match the other as specified by the "Video Image Processing" setting in the Video Tab of the Preferences. To get best efficiency when using Isadora, you want to keep all of the video streams the same resolution.

Input Properties

- **video in:** The source video stream.
- **horz res max**: Specifies the horizontal resolution of the output video stream. If this number is greater than the horizontal resolution of the incoming video stream, the resolution of the video stream will be used instead. Note that if the

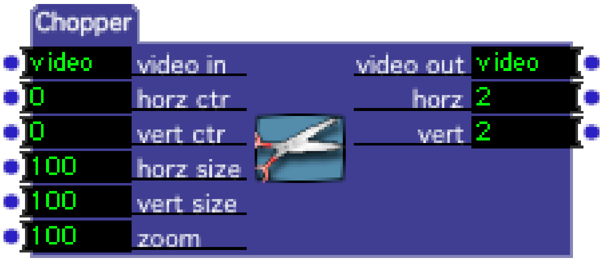
force 4:3 input is turned on, changing this value will automatically update the vert res max so that the horizontal and vertical resolution stays in a 4:3 ratio.

- **vert res max**: Specifies the vertical resolution of the output video stream. If this number is greater than the vertical resolution of the incoming video stream, the resolution of the video stream will be used instead. Note that if the **force 4:3** input is turned on, changing this value will automatically update the horz res max so that the horizontal and vertical resolution stays in a 4:3 ratio.
- **horz ctr**: In tandem with vert ctr, specifies what portion of the incoming image will be seen, from –100 to 100 percent. When set to 0, the cropped image is taken from the center of the incoming video stream. As this number goes negative, you will see more of the left side of the image. As it goes positive, you will see more of the right side of the image.
- **horz ctr**: In tandem with horz ctr, specifies what portion of the incoming image will be seen, from –100 to 100 percent. When set to 0, the cropped image is taken from the center of the incoming video stream. As this number goes negative, you will see more of the top side of the image. As it goes positive, you will see more of the bottom side of the image.

Input Properties

- **video out:** The cropped video stream.

Chopper (v1.1)



Crops a video stream, outputting it at a new resolution that is a percentage of the original resolution.

Chopper works in a manner very similar to **Chop Pixels** in that it allows you to crop an incoming video stream and output it at a new resolution. The difference between Chopper and Chop Pixels is that, instead of specifying a specific output resolution, the final output resolution is specified as a percentage of the incoming video stream's resolution and combined with a zoom factor.

For example, let's say the incoming video stream has a resolution of 320x240. If the horz size and vert size were set to 50%, and the zoom input was 100%, then the output resolution would be 160x120. If you were to change the zoom to 50%, then the resulting resolution would be 80x60 (i.e. 50% of 160x120.) If zoom was 200%, you would get a 320x240 output.

IMPORTANT: It is bad practice to use Chop Pixels to scale images to a different size – instead use the Panner or Zoomer actor. The reason for the inefficiency stems from the fact that, when Isadora tries to combine two images of differing resolutions, it will scale one to match the other as specified by the "Video Image Processing" setting in the Video Tab of the Preferences. To get best efficiency when using Isadora, you want to keep all of the video streams the same resolution.

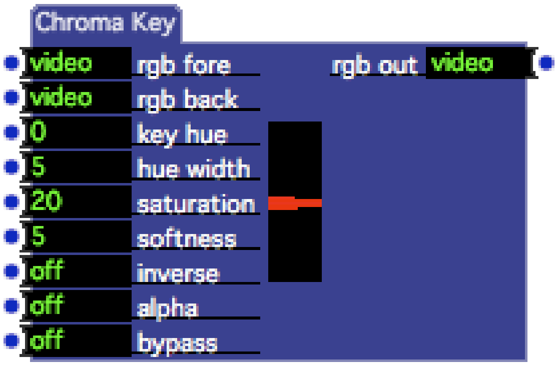
Input Properties

- **video in:** The source video stream.
- **horz ctr**: In tandem with vert ctr, specifies what portion of the incoming image will be seen, from –100 to 100 percent. When set to 0, the cropped image is taken from the center of the incoming video stream. As this number goes negative, you will see more of the left side of the image. As it goes positive, you will see more of the right side of the image.
- **horz ctr**: In tandem with horz ctr, specifies what portion of the incoming image will be seen, from –100 to 100 percent. When set to 0, the cropped image is taken from the center of the incoming video stream. As this number goes negative, you will see more of the top side of the image. As it goes positive, you will see more of the bottom side of the image.
- **horz size**: In tandem with the vert size and zoom inputs, determines the horizontal resolution of the output video stream as a percentage of the incoming video stream's resolution.
- **horz size**: In tandem with the horz size and zoom inputs, determines the vertical resolution of the output video stream as a percentage of the incoming video stream's resolution.
- **zoom**: In tandem with the horz size and vert size inputs, determines the horizontal and vertical resolution of the output video stream by zooming the cropped portion of the image by 0 to 1000%. Internally, the resolution of the incoming video stream that will be seen is determined by the horz size and vert size parameters. The result of this crop is then scaled by the zoom factor, which determines the final output resolution. (See description above for more examples.)

Input Properties

- **video out:** The cropped video stream.
- **horz:** The horizontal resolution of the output video stream.
- **vert:** The vertical resolution of the output video stream.

Chroma Key



Chroma Key

video rgb fore

video rgb back

0 key hue

5 hue width

20 saturation

5 softness

off inverse

off alpha

off bypass

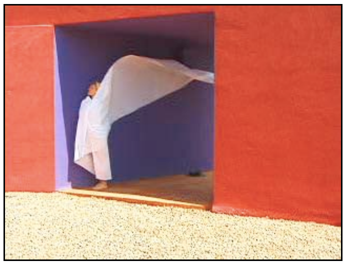
rgb out video

“Keys” two video streams together, allowing the background video stream to show through on the foreground wherever the foreground matches a specified color or range of colors.

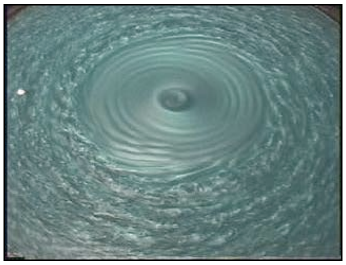
The Chroma Key module uses the color of the foreground image to determine whether you see the foreground or background video stream at the output. This can be commonly seen on television when the person delivering the weather appears to be standing in front of a giant weather map. The person is actually in front of a pure blue or green screen, and map is *keyed* into the blue or green area creating the illusion.

In the Chroma Key actor, you determine the color to match by adjusting the key hue property. The range of colors that will trigger the key is set by the hue width property, and how saturated or pure the color must be is specified by the saturation. The sharpness of the edge between the foreground and background image can be adjusted using the softness property.

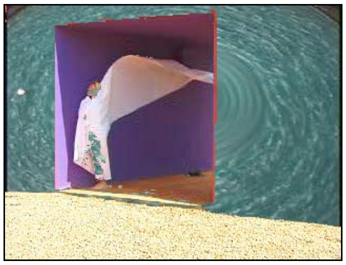
Here is an example.



Foreground



Background



Output

For this example the red background of the wall provides a good solid color that we can use to key the background image onto the foreground. Red translates to value of 0 in the key hue property. The hue width was set to 10, and the saturation was set to 66. Wherever the foreground image is red, the background image shows through in the result. The edges between the foreground and background images is softened somewhat because we set the softness property to 10.

To help you understand what these values mean as you are working, there is a diagram displayed in the center of the actor that represents the key hue, hue width and softness properties. (Saturation is not represented in the graph.) For the example actor at the top, you can see that the hue color is red and the width is fairly narrow. The slope at the top and the bottom represents the softness property.

Chroma Keys are tricky, and it can be difficult to get a clean key unless the key color in the foreground video stream is quite pure and evenly lit. On the other hand, you can get lovely effects by misusing this module, using setting the hue width and softness properties to very high values, such that you get a strange blend between the foreground and background images. The most important requirement to get the best results with this actor is a lot of experimentation with the property values.

Input Properties

- **rgb fore**: The foreground video stream. Areas of this stream will be seen when its color does not fall within the key color specified by the key hue, hue width, and saturation properties. If this stream is YUV, it will automatically be converted to RGB.
- **rgb back**: The background video stream. Areas of this stream will appear superimposed on the foreground when the foreground color matches the key color specified by the key hue, hue width, and saturation properties. If you do not connect any video stream to this input, it defaults to a black background. If this stream is YUV, it will automatically be converted to RGB.
- **key hue:** Specifies hue of the color that will trigger the key, from 0 to 360.
- **hue width:** Determines the range of hues that will that trigger the key. If you have a very clear, evenly lit color on which you want to key in the foreground, you should be able to set this value fairly low – in the range of 5 or so. Otherwise, you may have to increase this value to get a workable key.
- **saturation**: Specifies how saturated a color must be to trigger the key. Setting this to high values requires that the color on which you want to key in the foreground be almost pure, i.e. have very little white in it. Lowering this value allows less pure (i.e. more pastel) colors to trigger the key.
- **softness**: Determines how “hard” the edge between the foreground and background images is. Experiment to see what setting looks best.
- **inverse**: When turned off, the key functions normally. When on, the key is inverted, i.e. where the foreground matches the key hue and saturation, the foreground image is shown, where it doesn’t, the background image is shown. Turning this property on can be useful if you intend to use the Chroma Key module in coordination with the Eyes video tracking module, as only the object with the matching color will appear at the output.
- **alpha**: When turned off, the output is a standard RGB video image with no transparency. When turned on, the output image is encoded with an alpha channel (ARGB) based, causing the image to be transparent where the foreground color matches the key hue, hue width, and saturation inputs. (Or the inverse if the inverse input is turned on.) The Projector actor will respect this

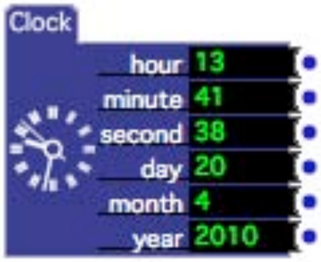
alpha mask when compositing images on the stage. For more information on this using alpha channels, see “Compositing with the Projector” on Page 132.

- **bypass**: When turned off, this effect functions normally. When turned on, the effect is disabled and the video input is passed directly to the video output.

Output Properties

- **rgb out**: The resulting keyed video image in RGB Format.

Clock

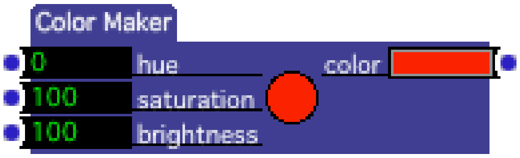


Outputs the local time and date, updated once every second.

Properties

- **hour:** The current hour from 0 to 23.
- **minute:** The current minute.
- **second:** The current second.
- **day:** The current day.
- **month:** The current month.
- **year:** The current year.

Color Maker



Creates a color by specifying its hue, saturation, and brightness.

The color output of this module can be connected to actors that have a color input, such as the **Video Fader** actor. As you adjust the input property values, the resulting color is displayed in the round area in the center of the actor.

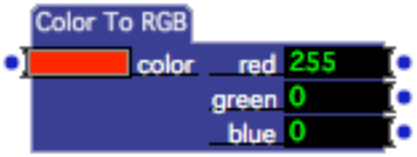
Properties

- **hue**: The hue of the color, ranging from 0 to 360 degrees. Values to achieve some of the primary colors are:

Red	*= 0*
Yellow	*= 60*
Green	*= 120*
Aqua	*= 180*
Blue	*= 240*
Purple	*= 300*
Red	*= 360*

- **saturation**: The purity of the color. 100 results in a pure color, lower values add more white to the color, moving it towards a pastel.
- **brightness:** The brightness of the color. 100 is as bright as possible. Lower values yield darker colors, with a value of 0 giving black.

Color to RGB



Color To RGB

color

red 255

green 0

blue 0

Converts a color input to its individual red, green and blue component values.

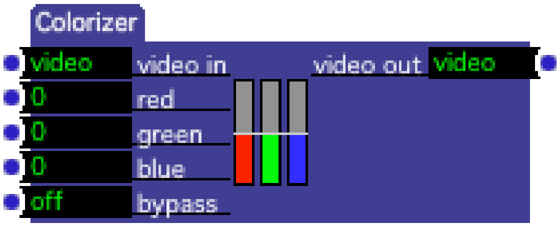
Input Properties

- **color:** Takes the color input from a color actor.

Output Properties

- **red:** outputs the red component value of the color received at the color input.
- **green:** outputs the green component value of the color received at the color input.
- **blue:** outputs the blue component value of the color received at the color input.

Colorizer



Colorizer

video — video in — video out — video

0 — red

0 — green

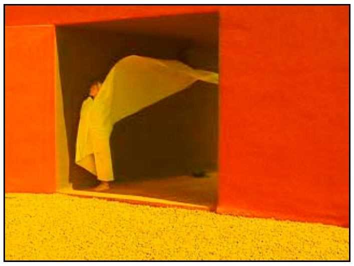
0 — blue

off — bypass

Adjusts a video stream's color by increasing or decreasing the red, green and/or blue components of that stream.

The **red**, **green**, and **blue** input properties can be individually adjusted from –100 to 100: a negative setting reduces the amount of that particular color; a positive setting increases it. Some examples:

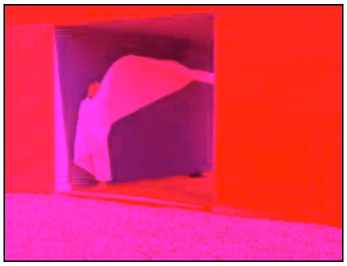
Original



Red = 0

Green = –25

Blue = –100



Red = 100

Green = –50

Blue = 0

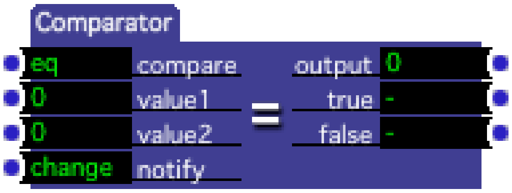
Properties

- **hue**: The hue of the color, ranging from 0 to 360 degrees. Values to achieve some of the primary colors are:

Red	*= 0*
Yellow	*= 60*
Green	*= 120*
Aqua	*= 180*
Blue	*= 240*
Purple	*= 300*
Red	*= 360*

- **saturation**: The purity of the color. 100 results in a pure color, lower values add more white to the color, moving it towards a pastel.
- **brightness:** The brightness of the color. 100 is as bright as possible. Lower values yield darker colors, with a value of 0 giving black.
- **bypass**: When turned off, this effect functions normally. When turned on, the effect is disabled and the video input is passed directly to the video output.

Comparator



Compares two numbers.

Input Properties

- **compare**: Determines the comparison to be performed on the two numbers. You may choose *eq*, *ne*, *lt*, *le*, *gt*, or *ge*, representing equal, not equal, less than, less than or equal, greater than, greater than or equal.
- **value1:** the first value for the comparison
- **value2:** the second value for the comparison
- **notify:** Specifies when a new output value should be sent. Set this property to change to output a new value only when it changes from 0 to 1 or vice-versa. Set to always to send the value each time a new value arrives at the value1 or value2 input. The change setting is useful when you want to connect the output to a trigger input, so that it triggers only when the comparison result changes.

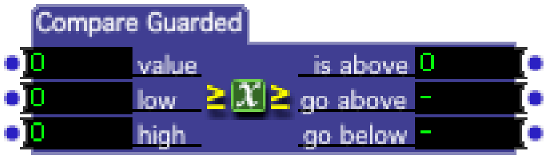
Output Properties

- **output:** the result of the comparison. For the six different comparisons, the result will be 1 when the comparison is true, 0 when it is false. Each of the comparisons is performed as follows:

eq	*output is 1 if value1 equals value2, 0 otherwise*
ne	*output is 1 if value1 does not equal value2, 0 otherwise*
lt	*output is 1 if value1 is less than value2, 0 otherwise*
le	*output is 1 if value1 is less than or equal to value2, 0 otherwise*
gt	*output is 1 if value1 is greater than value2, 0 otherwise*
ge	*output is 1 if value1 is greater than or equal to value2, 0 otherwise*

- **true:** sends a trigger whenever the output property changes from false to true (i.e. from 0 to 1).
- **false:** sends a trigger whenever the output property changes from true to false (i.e. from 1 to 0).

Compare Guarded (v1.1)



Reports when a value crosses a threshold, but prevents false triggers by using a 'guard band'.

When value goes above high, the above output will change to a 1 and the go above will send a trigger. When value goes below low, the above output will change to a 0 and the go below output will send a trigger. When value is between low and high (i.e. inside the 'guard' band'), nothing will happen.

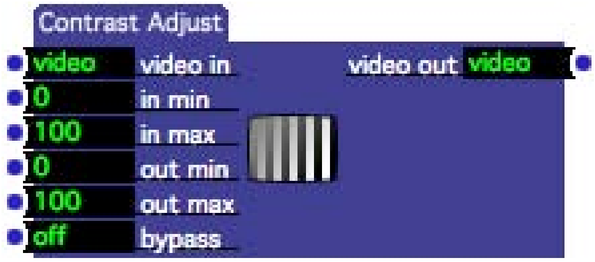
Input Properties

- **value**: the value to be compared to the low and high value inputs
- **low:** the low value to which the value input will be compared.
- **high:** the high value to which the value input will be compared

Output Properties

- **above:** Changes from a 0 to 1 when value goes above the high input. Changes from a 1 to 0 when value goes below the low input. When value is between low and high , this output does not change.
- **go above:** sends a trigger when value goes above the high input
- **go below:** sends a trigger when value goes below the low input

Contrast Adjust (v1.1)



Adjusts the contrast of a video stream.

Typically you will only adjust the in min and in max values to control the contrast. Increase the in min value to get rid of noise in the image, decrease the in max value to increase the contrast. Changing the out min and out max values will determine the brightness of the final image – increase the out min value to make the image lighter; decrease the out max value to make the image darker.

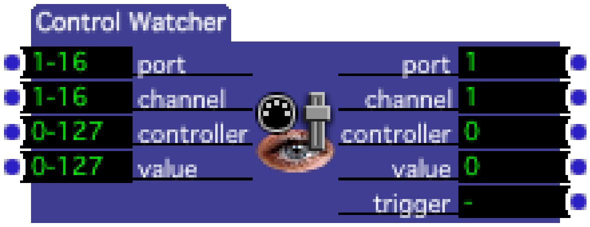
Input Properties

- **video in:** The source video stream.
- **in min**: The minimum brightness from 0 to 100% – if the brightness of the incoming video stream is below this value, it will be limited to this amount.
- **in max**: The maximum brightness from 0 to 100% – if the brightness of the incoming video stream is above this value, it will be limited to this amount.
- **out min**: The minimum brightness of the output video stream from 0 to 100%.
- **out max**: The maximum brightness of the output video stream from 0 to 100%.

Input Properties

- **video out:** The manipulated video stream.

Control Watcher



Watches for MIDI Control Change messages, outputting the values associated with that message and sending a trigger when one is seen.

The Control Watcher can look for a specific controller message or a range of messages depending on the setting of the input property values. When a message meeting all of the criterion specified by input properties is seen, the values associated with that message are sent out of the output ports and a trigger is sent out of the trigger output.

Input Properties

- **port**: Specifies the MIDI Port on which the message must arrive to be seen. These port numbers correspond to the ports shown in the MIDI Setup dialog. You may specify a single port or a range of ports.
- **channel**: Specifies the MIDI Channel on which the message must be received before it will seen by this watcher, from 1 to 16. You may specify a single port or a range of ports.
- **controller**: Specifies the controller number or range of controller numbers that will be seen, from 0 to 127.
- **value**: Specifies the controller value or range of values that will be seen, from 0 to 127.

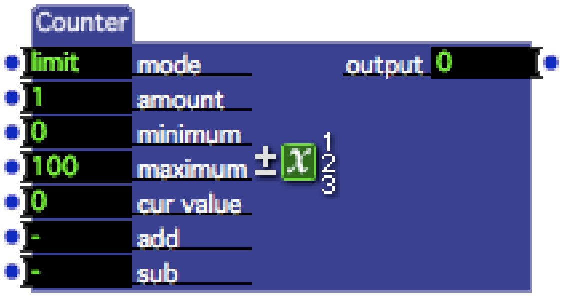
Note that for a Control Change message to be seen by this watcher, its values must fall within the range of values for specified by all four of the input properties.

Output Properties

When this watcher sees a Control Change message that falls within the range of values specified by all of the input properties, the following values are sent out of the outputs:

- **port**: The MIDI Port on which the message arrived.
- **channel**: the message's MIDI Channel.
- **controller**: the message's controller number.
- **value**: the message's controller value.
- **trigger**: sends a trigger each time a message is seen.

Counter



Counts up or down when a trigger is received. (This actor was called "Integer Counter" in versions prior to 1.3.)

The Counter (and its companion, Float Counter) allows you to count up or down each time a trigger is received by adding or subtracting a value to/from its output value. You have the option of limiting the output value to a range of values, or to let that value "wrap around" when it exceeds those limits. This actor uses integer numbers (i.e. values with no numbers after the decimal point), while the Float Counter uses floating-point numbers.

Input Properties

- **mode**: Determines how to constrain the output value when it exceeds minimum or maximum. When set to limit, and an addition or subtraction is made to the output value that would exceed minimum or maximum, the output value is limited to these values. When set to wrap and the calculated value is less than minimum or is greater than maximum, it "wraps around" to other extreme.

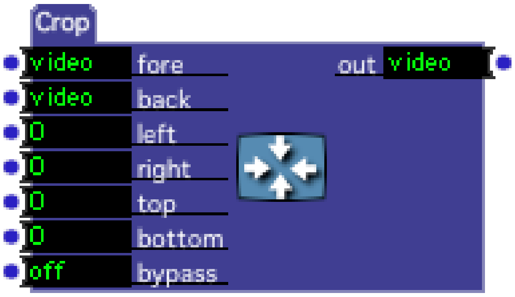
  For example, if the maximum is 100, the current output value is 85, and you trigger the add input while the amount property is set to 27, the new value *would be 112. Since this would exceed the maximum (100) the float counter subtracts the maximum value from the result and sets the output to the resulting value of 12.*

- **amount**: The amount to add or subtract the counter receives a trigger on the add or subtract trigger input.
- **minimum**: The minimum possible value, which can be set to any integer value. See mode for more information on how this value is used.
- **maximum**: The maximum possible value, which can be set to any integer value. See mode for more information on how this value is used.
- **cur value**: This is the value to which the 'amount' property is added to or subtracted from when calculating the output. It is an unusual input, in that it is automatically set to match the output value each whenever the 'add' or 'subtract' trigger inputs are pulsed. You can make use this property in two ways: first, you can click it's title, check the **Init** checkbox, and specify an initial value from which the counter will begin counting; second, you can send a value to it to preload the next value that will be added to or subtracted from.
- **add**: Adds the value specified by the amount input property to the current value at the output. The resulting value is limited by the minimum and maximum properties.
- **sub**: Subtracts the value specified by the amount input property from the current value at the output. The resulting value is limited by the minimum and maximum properties.

Output Properties

- **output**: The current output value of the counter.

Crop



Crops the foreground video stream, optionally superimposing it on a background video stream.

Input Properties

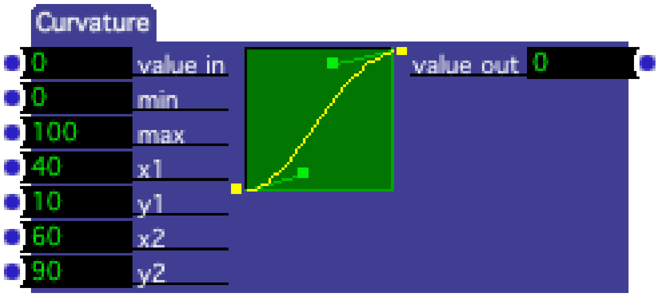
- **fore**: The video stream to be cropped

- **back**: The video stream on to which the cropped foreground stream will be superimposed. If no link is made to this property, the background is black.
- **left**: Specifies the inset of the crop from the left edge of the frame, expressed as a percentage from 0 to 100% of the stream's width.
- **right**: Specifies the inset of the crop from the right edge of the frame, expressed as a percentage from 0 to 100% of the stream's width.
- **top**: Specifies the inset of the crop from the top edge of the frame, expressed as a percentage from 0 to 100% of the stream's height.
- **bottom**: Specifies the inset of the crop from the bottom edge of the frame, expressed as a percentage from 0 to 100% of the stream's height.
- **bypass**: When turned off, this effect functions normally. When turned on, the effect is disabled and the video input is passed directly to the video output.

Output Properties

- **out**: The cropped output.

Curvature



Scales a numeric input value along a curve.

Sometimes the linear ramping provided by the Envelope Generator and other actors doesn't give just the right results because they only provide linear ramping. The Curvature actor can help you get the results you desire by scaling numeric values along a curve that you define.

NOTE that you can click on the small yellow and green boxes in the actor's icon to adjust the shape of the curve. It is probably easier to get what you're looking for this way, as opposed to typing values into the various input properties.

Input Properties

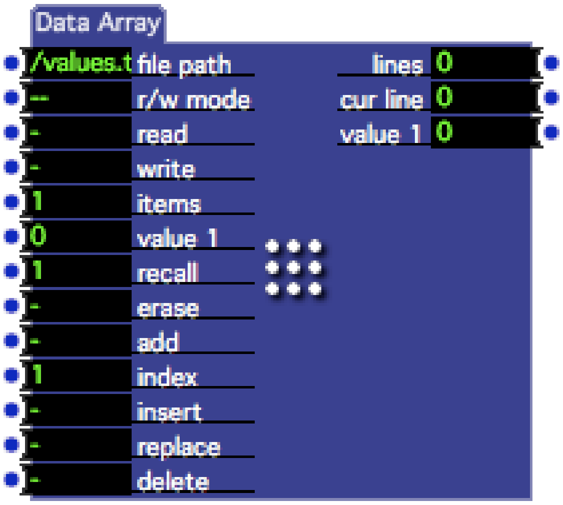
- **value in**: The value to be scaled.
- **min**: The minimum value of the scaled output.
- **max**: The maximum value of the scaled output.
- **X1**: the horizontal coordinate of the first control point.
- **Y1**: the vertical coordinate of the first control point.

- **X2**: the horizontal coordinate of the second control point.
- **Y2**: the vertical coordinate of the second control point.

Output Properties

- **value out**: The scaled value.

Data Array



The Data Array actor allows you to create a list of data, each line being composed of one or more numeric values. You may recall lines from the list, add or insert new items, or remove or recall existing lines. The data may be stored on disk in a standard, tab-separated text file that may be exported from, or imported into, other applications.

We refer to the vertical and horizontal dimensions of the list using the terms **lines** and **items**. For instance, this array

1.1	1.2	1.3	1.4
2.1	2.2	2.3	2.4
3.1	3.2	3.3	3.4

has 3 lines and 4 items. The number of items across is set using the items input; when you change this property, value inputs and outputs will be added or removed from this actor as appropriate. The number of lines is controlled using the add, insert, delete, and erase inputs, or by the number of lines in text file when its data is read.

Input Properties

- **file path**: The full or partial path name for a text file where data can be retrieved or stored. The file will be a standard text file, one line in the file for each line in the Data Array. Full path names will begin with a forward slash

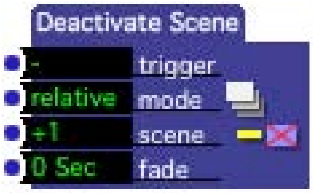
(/) under MacOS X or with **X:\** under windows (where **X:** is a drive letter; C:\, D:\, etc.) Paths that do not begin in this way are considered to be partial path names specified relative to the location of the Isadora document that contains this actor.

- **r/w mode** Determines if and when the text file specified by the file path property will be automatically read from or written to disk. **--** means do nothing on activate, do nothing on deactivate. **r-** means read on activate, do nothing on deactivate. **-w** means do nothing on activate, write on deactivate. **rw** means read on activate, write on deactivate.
- **read:** Triggering this input reads the contents of the file specified by the file path property. Note that the information in the text file will not affect the number of items in each line. If the text file contains more items per line than the items input, the extra values will be ignored.
- **write:** Triggering this input writes the contents of the Data Array to the file specified by the file path property.
- **items:** Specifies the number of items in each line of the list; increasing this number adds value inputs and outputs to this actor, decreasing it removes the corresponding inputs and outputs. When increasing this number, existing values in the list are preserved. When decreasing it, values at the end of each line will be lost permanently.
- **value 1, value 2…:** Input value corresponding an item within each line of the list; value 1 being the first value, value 2 being the second, etc. These values are stored in the table when a successful add, insert or replace trigger is executed. The actual number of value inputs is determined by the items input property.
- **recall:** Outputs the data at the specified index within the list whenever a number is received at this input. Use 1 to recall the first line, 2 to recall the second, etc. If the specified item does not exist, the outputs will not change.
- **erase:** Erases the entire list.
- **add:** Adds a new line to the end of the list using the values currently specified by the value inputs.
- **index:** Indicates line within the list where the next insert, delete, or replace operation will occur. See help for the insert, delete and replace inputs for details on how this number is used.
- **insert:** Creates a new line in the list using the current input values. The new line is inserted *after* the existing line specified by the index input. If the index is greater or equal to the total number of lines in the list, the intervening lines will automatically be inserted.
- **replace:** Replaces the data values on the line specified by the value of the one-based index input. If there is no line at this index, triggering this input has no-effect.
- **delete:** Deletes the data values on the line specified by the value of the one-based index input. If there is no line at this index, triggering this input has no-effect.

Output Properties

- **lines**: Outputs the current number of lines in the list. Sent whenever the size of the list changes.
- **cur line**: Whenever a new line is selected with the recall input, sends the index of the line being displayed.
- **value 1, value 2...**: Output value corresponding an item within each line of the list; value 1 being the first value, value 2 being the second, etc. These values are sent to the output whenever the recall input receives an index value corresponding to an existing line within the table. The actual number of value outputs is determined by the items input property.

Deactivate Scene



Deactivates a secondary Scene previously activated by the Activate Scene actor.

See the Activate Scene actor for more information on activating secondary Scenes.

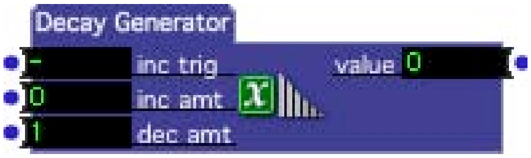
Input Properties

- **trigger**: when a trigger is received on this input port, the secondary Scene indicated by the mode and scene properties is deactivated.
- **scene:** indicates which Scene to deactivate. This field works in tandem with the mode field. When mode is set to *relative*, the number in this field indicates the scene to deactivate relative to the current scene. +1 would be the scene after this scene, -1 would be the scene before this scene, +2 would be the second scene after this scene, etc. When mode is set to *absolute*, the number in this field indicates a Scene in the Scene List by its position, where 1 is the first scene in the list, two is the second scene, etc.

  When a valid scene has been specified in this property, its name will appear after the number.
- **mode:** determines how the number in the scene property is interpreted. When this property is set to *relative* the scene to be deactivated is relative to the position of the current scene in the Scene List. When this property is set to *absolute* the Scene to be deactivated is based on its position in the Scene List. See scene property above for more information

- **fade: (V1.1)** Specifies a fade time, over which the video and audio in the scene being deactivated will be faded out. (Note: The visual aspect of the fade in will only work if **Hardware Accelerated Rendering** is turned on in the Video tab of the Preferences.) The visual result of the fade in depends on a number of factors: what video is being rendered in the current scene, the setting of the blend and layer inputs in the Projector actors that become active, etc. See the section “Compositing with the Projector” on Page 132 for more information on taking advantage of multiple projectors.

Decay Generator



Generates a value that decays smoothly over time, and that can be bumped up by specified amount each time the generator is triggered.

Input Properties

- **inc trigger**: when a trigger is received on this input, adds the value given in the **inc amt** input property to the current output value.
- **inc amt**: the number that will be added to the current output value each time the **inc trig** input is triggered, ranging from 0 to 100. Note that this amount is added all at once, so the output value will jump up by this amount each time a trigger is received.
- **dec amt**: the amount by which the output value is gradually decremented every second, ranging from 0 to 100. Note that this value isn’t subtracted once per second, but instead smaller amounts are subtracted at a much faster rate, resulting in a smooth change of values at the output.

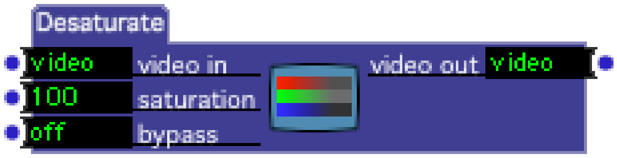
Output Properties

- **value:** the decaying output value, from 0 to 100.

There are two primary ways that you might use this generator. One is generate simple ramps by setting the inc amt property to 100 and triggering the inc trig input. Each time the Decay Generator receives a trigger, the output will jump to 100 and gradually decay to 0. The amount of time that it takes to get to 0 is determined by the dec amt property.

The other use for this generator is to generate a stream of values that stays high as when triggers are received quickly enough, but eventually decays to zero if no trigger is received for a long enough period of time. Try setting inc amt to 50 and dec amt to 33. Click the inc trig value edit box several times. As you do, you’ll see the output value jump up to 100. Then stop clicking. Over a period of three seconds, the output value will gradually go down to 0. Why does it take three seconds? Because the dec amt property determines how much is subtracted from the output value every second. If you are at 100, and 33 is being subtracted every second, it will take about three seconds to reach 0.

Desaturate



Desaturate

video video in
100 saturation
off bypass
video out video

Decreases the color saturation of a video stream.

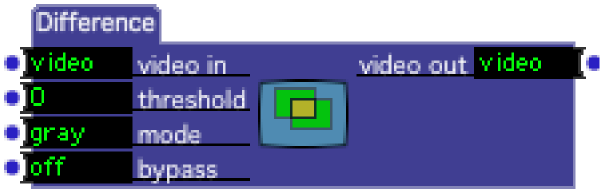
Input Properties

- **video in**: the video input stream
- **saturation**: determines the amount of color remaining in the output video stream. When this is set to 100, the actor has no effect. As this value approaches zero, the saturation of the output video stream will be reduced. When this value is 0, the output video stream is black and white.
- **bypass**: When turned off, this effect functions normally. When turned on, the effect is disabled and the video input is passed directly to the video output.

Output Properties

- **video out**: the desaturated video stream.

Difference



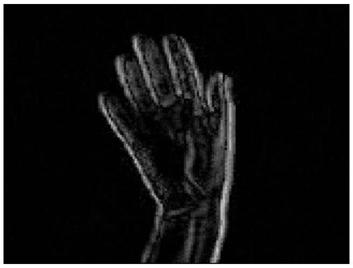
Difference

video video in
0 threshold
gray mode
off bypass
video out video

Compares the previous and current frame of the video input stream, generating a video stream that show areas that are different as a light color, and areas that are similar as dark.

Previous Frame

Current Frame



Difference

Above is an example. In the previous and current frames of video, the hand has moved just slightly to the right. The brightest part of the resulting difference is the edges, that is, where the image is most different. Parts that are similar (the palm for instance) are darker.

Input Properties

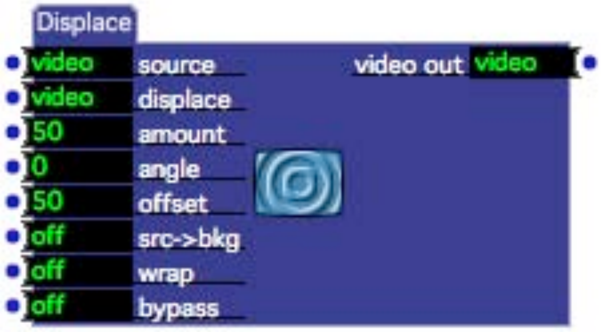
- **video in**: the video input stream
- **threshold**: determines how different the previous and current frames must be before you will see something in the video output stream. When set to higher values, the difference between the two frames must be more profound before a color will be appear in the video output stream.

  Setting this property to higher values is useful to get rid of video "noise" (seen as stray pixels at the output) that can be seen when the video input stream was shot at low light levels.
- **mode:** When set to gray, the difference output is based on the overall brightness of the current and previous video frames. In this mode, the output is shades of gray. When set to color, the difference is calculated on the individual red, green, and blue components that make up the video image. In this mode, the output will be in color.
- **bypass**: When turned off, this effect functions normally. When turned on, the effect is disabled and the video input is passed directly to the video output.

Output Properties

- **video out**: the difference between the current and previous frames of video.

Displace

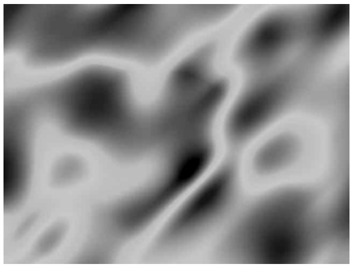


Displace
video source
video displace
50 amount
0 angle
50 offset
off src->bkg
off wrap
off bypass
video out video

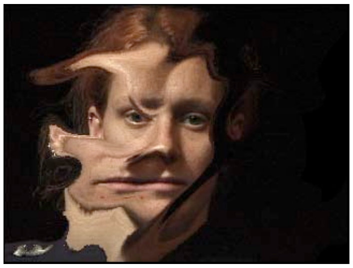
Offsets the pixels of a video stream based on the brightness of a second video stream.

Displace "warps" the source video stream by shifting its pixels around by using the brightness of the displaced video stream to determine how far to move the pixels. For example, assuming the displace angle is zero, when the displace video is gray (i.e. 50% brightness) the pixels of the source are not moved at all; as it approaches black the source video pixels are shifted more to the left; as it approaches white, the source video pixels are shifted more to the right.

Source Video



Displace Video



Displaced Video

Input Properties

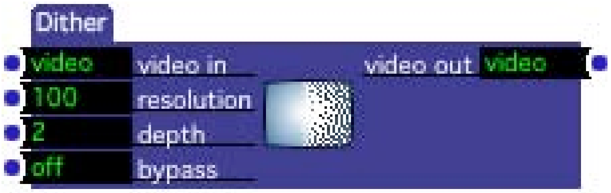
- **source**: The video input stream
- **displace**: Video stream whose brightness determines how far to shift the pixels of the source video.
- **amount:** The strength of the displace effect, from 0 to 100%. The higher the value, the more profoundly the pixels of the source video will be shifted.
- **displace angle:** Sets the angle of the line along which the pixels are shifted.
- **offset:** How far to offset the resulting image, from 0 to 100%. If the displace video stream is too bright or too dark, the resulting video may go off the edge of the stage. Adjust this value to bring the image back into view again.
- **src-bkg:** When turned on the source video is used as the background to the displace image. When turned off the background is black.

- **wrap:** When turned on, any pixels shifted outside of the frame are drawn on the opposite side of the image. When turned off, pixels shifted outside of the frame are lost.
- **bypass**: When turned off, this effect functions normally. When turned on, the effect is disabled and the video input is passed directly to the video output.

Output Properties

- **video out:** The resulting displaced video output.

Dither

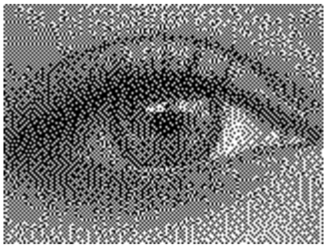


Dither

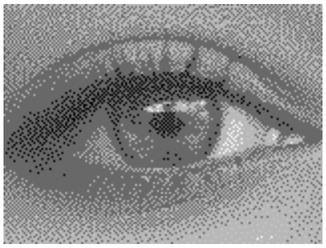
video | video in | video out | video
100 | resolution
2 | depth
off | bypass

Dithers the incoming video stream by copying to an intermediary buffer with a lower resolution and/or bit depth.

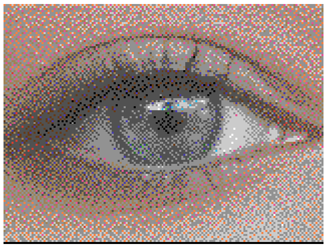
Original



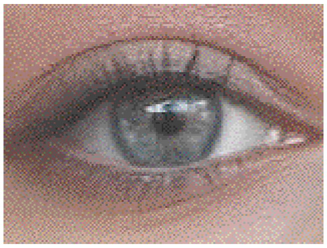
Colors = 2 – Res. = 100



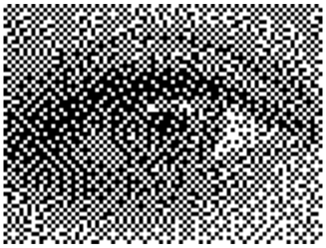
Colors = 4 – Res. = 100



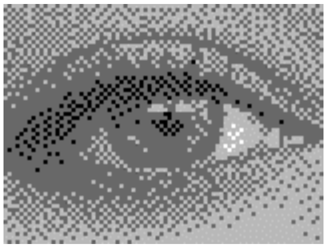
Colors = 16 – Res. = 100



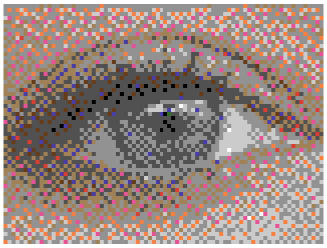
Colors = 256 – Res. = 100



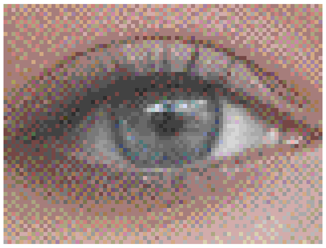
Colors = 2 – Res. = 50



Colors = 4 – Res. = 50



Colors = 16 – Res. = 50



Colors = 256 – Res. = 50

Input Properties

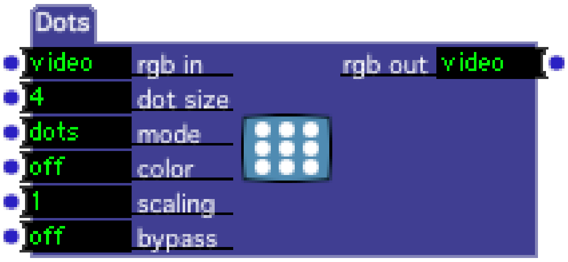
- **video in**: the video input stream

  ***resolution**: specifies the resolution of the intermediary buffer, from 0 to 100% of the incoming video stream's size. Lower values will pixelate the image more.*
- **color:** Specifies the number of colors in the intermediary buffer. Possible values are 2, 4, 16, 256, and Thousands.
- **bypass**: When turned off, this effect functions normally. When turned on, the effect is disabled and the video input is passed directly to the video output.

Output Properties

- **video out**: the dithered video output.

Dots



Dots

video rgb in — rgb out video

4 dot size

dots mode

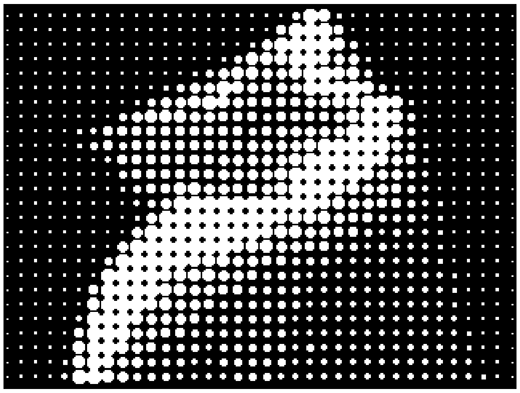
off color

1 scaling

off bypass

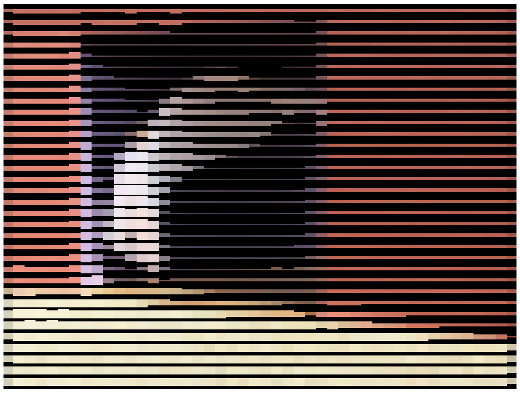
Makes a video stream look like a "screened" image in a newspaper, consisting of dots whose size varies depending on the brightness of the source image.

video in



size = 4, mode = dots, color = off

video in



size = 4, mode = boxes, color = on

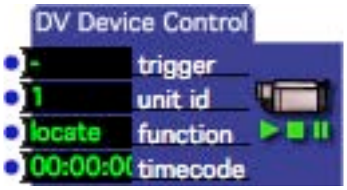
Input Properties

- **rgb in**: The video input stream. If this stream is YUV, it will be automatically converted to RGB.
- **dot size**: The size of the dots or boxes.
- **mode:** Either dots or boxes. When set to dots, the screen is circular. When set to boxes, the screen is rectangular.
- **color:** When turned off, the output video stream is black and white. When turned on, the color of the video input stream is preserved.
- **bypass**: When turned off, this effect functions normally. When turned on, the effect is disabled and the video input is passed directly to the video output.

Output Properties

- **rgb out:** The resulting video output in RGB format.

DV Device Control



DV Device Control

- trigger

1 unit id

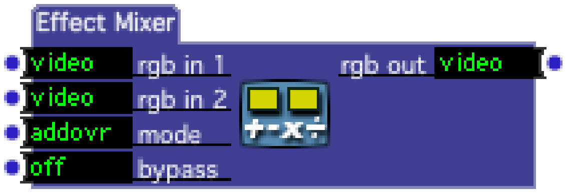
locate function

00:00:0(timecode

NOTE: MacOS X only at this time!

Allows you to control the playback transport of a DV camera or videotape player attached to your computer.

Effect Mixer

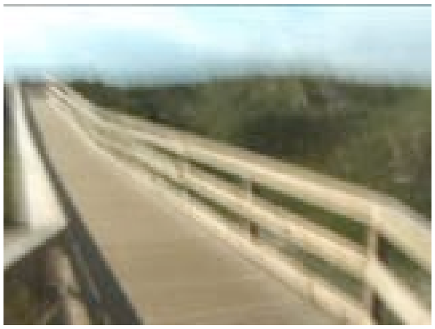


Combines two video streams using various mathematical operations.

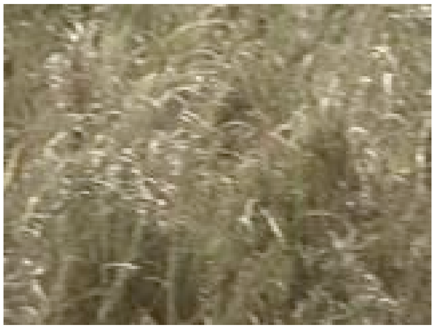
The operations available are:

- **addovr - add with overflow**. Adds the colors of both streams together without limiting the result.
- **addmax – add with limit maximum**. Adds the colors of both streams together, limiting the sum to 255.
- **subovr – subtract with overflow**. Subtracts the colors of the second stream from the first without limiting the result.
- **submin – subtract with limit minimum**. Subtracts the colors of the second stream from the first, limiting the minimum result to zero.
- **xor – logical exclusive or**. Performs an *exclusive or* operation on both streams.
- **and – logical and.** Performs an *and* operation on both streams.
- **or – logical or**. Performs an *or* operation on both streams.
- **mult – multiply**. **(V1.1)** Multiplies corresponding pixels of both streams and outputs the result.
- **min – minimum**. **(V1.1)** Compares corresponding pixels from both streams, and outputs the lesser of the two
- **max – maximum**. **(V1.1)** Compares corresponding pixels from both streams, and outputs the greater of the two.
- **diff – difference. (V1.1)** Subtracts corresponding pixels from both streams and outputs the difference between the two.

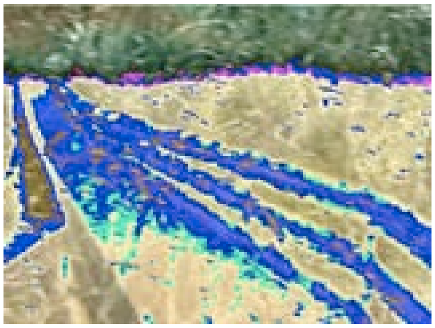
Below you will see some examples of the operations possible. Depending on the source material, the result can range from impressionistic to psychedelic. Experimentation is the key to generating interesting images with this actor.



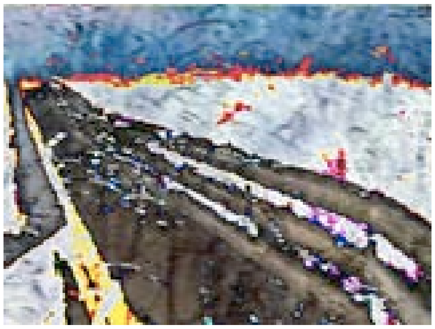
video in 1



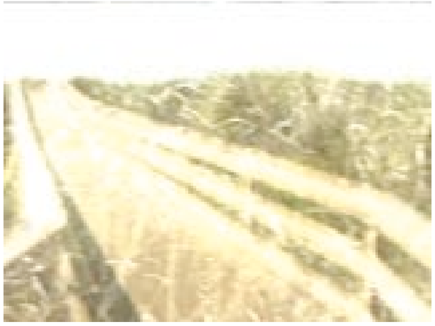
video in 2



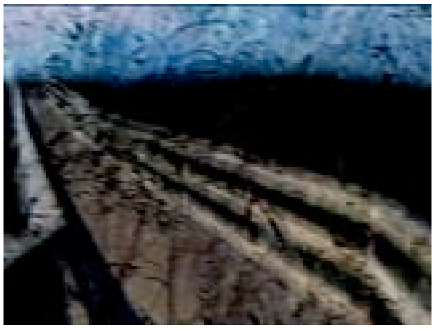
addovr



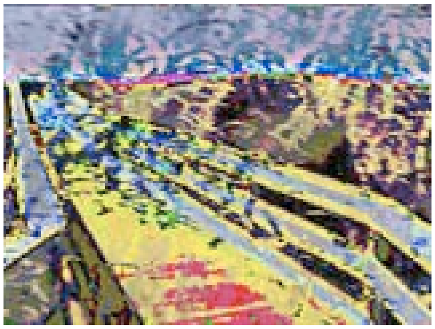
addmax



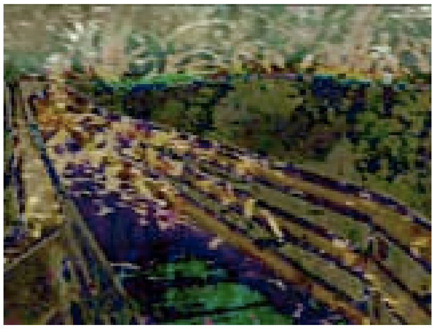
subovr



submin



xor



and

or

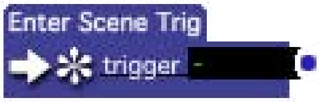
Input Properties

- **rgb in 1**: The first video input stream. If this stream is YUV, it will automatically be converted to RGB.
- **rgb in 2**: The first second input stream. If this stream is YUV, it will automatically be converted to RGB.
- **mode:** One of addovr, addmax, subovr, submin, xor, or, mult, min, max, or delta. More details of these operations are given above.
- **bypass**: When turned off, this effect functions normally. When turned on, the effect is disabled and the video input is passed directly to the video output.

Output Properties

- **rgb out:** The combined video output in RGB format.

Enter Scene Trigger



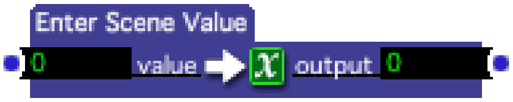
Sends a trigger when this actor's Scene is activated.

This actor is useful when you need to tell another actor to do something as soon as its Scene is activated.

Properties

- **trigger:** Sends a trigger as soon as this actor's Scene is activated.

Enter Scene Value



Enter Scene Value

0 value

output 0

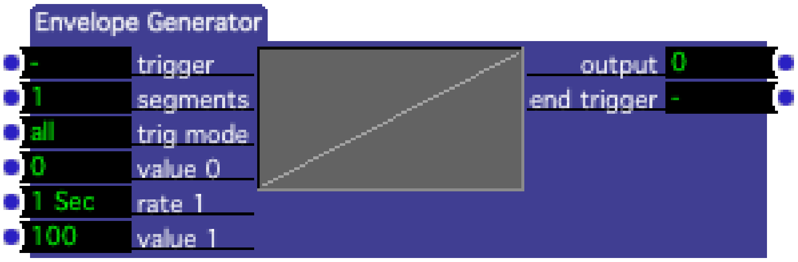
Sends a value when this actor’s Scene is activated.

This actor is useful when you need to preset the input property value of another actor when its Scene is activated.

Properties

- **value:** The value to be sent when this actor’s Scene is activated.
- **output:** Outputs the value specified by the value input property when this actor’s Scene is activated.

Envelope Generator



Envelope Generator

- trigger

1 segments

all trig mode

0 value 0

1 Sec rate 1

100 value 1

output 0

end trigger -

Generates values that ramp from one point to another over time. The range of values are limited to 0 to 100; to use any range of numbers see the Envelope Generator++ actor.

The envelope generator is useful in situations where you need a value that ramps from a starting point to an ending point over a specific amount of time. Because you can have up to nine segments in the ramp, each with their own starting value, ending value, and rate, you can create envelopes that are fairly complex.

Input Properties

- **trigger**: When trig mode is set to all, triggers starts ramping the envelope from the beginning. When trig mode is set to ind/one, starts ramping the next segment of the envelope. (See trig mode) for more info.
- **segments:** Specifies how many segments are in the envelope, from 1 to 9. This number determines how many pairs of rate and level input properties will be found along the left edge of the actor.
- **trig mode**: specifies what will happen when a trigger is received at the trigger input, and when triggers will be sent out of the end trigger output.

When this property is set to all and a trigger is received, the envelope starts ramping from the first segment each time a trigger is received and continues until the last segment is complete. At the completion of the last segment, a trigger is sent out of the end trigger output.

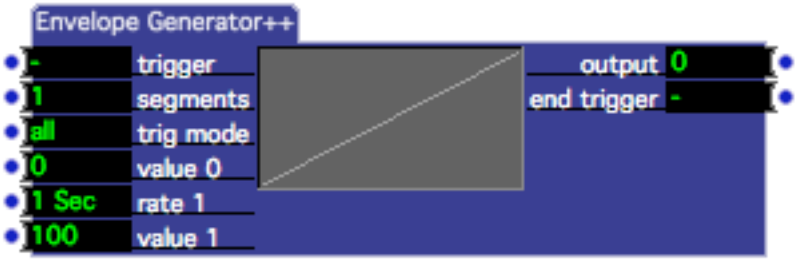
When set to ind/one or ind/end, each trigger ramps the next segment of the envelope. If no segments have been triggered yet, or if all the segments have been triggered, then the ramping begins at the first segment. The difference between ind/one and ind/end has to do with the end trigger output. When set to ind/one, a trigger is sent out of the end trigger output at the end of each segment. When set to ind/end the end trigger output is triggered at the completion of the last segment.

- **value 0**: the starting value for the first segment.
- **rate 1, rate 2, etc**.: Determines the number of seconds that it takes to get from the previous level to the next level. E.g., rate 1 specifies how long it takes to get from level 0 to level 1.
- **value 1, value 2, etc.**: The value at that point in the envelope, between 0 and 100. Together with the rate between them, a pair of subsequent levels (e.g., level 1, rate 2, level 2) defines a ramp segment.

Output Properties

- **output:** The value of the envelope as it moves through the segments, between 0 and 100.
- **end trigger:** sends a trigger at the end of the entire envelope, or at the end of a segment depending on the setting of the trig mode property. (See trig mode above for more information.)

Envelope Generator++



Generates values that ramp from one point to another over time. The only difference between this actor and the standard Envelope Generator is that the range of values is not limited to fall between 0 and 100.

The envelope generator++ is useful in situations where you need a value that ramps from a starting point to an ending point over a specific amount of time. Because you can have up to ninety-nine segments in the ramp, each with their own starting value, ending value, and rate, you can create envelopes that are very complex.

Input Properties

- **trigger**: When trig mode is set to all, triggers starts ramping the envelope from the beginning. When trig mode is set to ind/one, starts ramping the next segment of the envelope. (See trig mode) for more info.
- **segments:** Specifies how many segments are in the envelope, from 1 to 99. This number determines how many pairs of rate and level input properties will be found along the left edge of the actor.
- **trig mode**: specifies what will happen when a trigger is received at the trigger input, and when triggers will be sent out of the end trigger output.

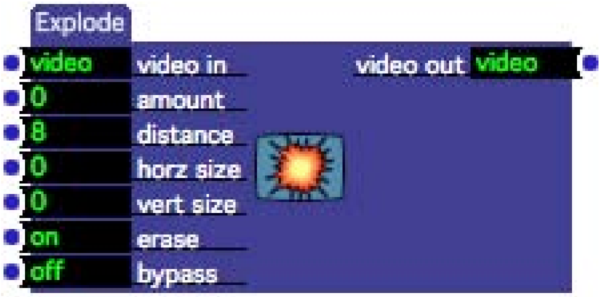
  When this property is set to all and a trigger is received, the envelope starts ramping from the first segment each time a trigger is received and continues until the last segment is complete. At the completion of the last segment, a trigger is sent out of the end trigger output.

  When set to ind/one or ind/end, each trigger ramps the next segment of the envelope. If no segments have been triggered yet, or if all the segments have been triggered, then the ramping begins at the first segment. The difference between ind/one and ind/end has to do with the end trigger output. When set to ind/one, a trigger is sent out of the end trigger output at the end of each segment. When set to ind/end the end trigger output is triggered at the completion of the last segment.
- **value 0**: the starting value for the first segment.
- **rate 1, rate 2, etc**.: Determines the number of seconds that it takes to get from the previous level to the next level. E.g., rate 1 specifies how long it takes to get from level 0 to level 1.
- **value 1, value 2, etc.**: The value at that point in the envelope. Together with the rate between them, a pair of subsequent levels (e.g. level 1, rate 2, level 2) defines a ramp segment.

Output Properties

- **output**: The value of the envelope as it moves through the segments.
- **end trigger**: sends a trigger at the end of the entire envelope, or at the end of a segment depending on the setting of the trig mode property. (See trig mode above for more information.)

Explode (v1.1)



Explode

video video in

0 amount

8 distance

0 horz size

0 vert size

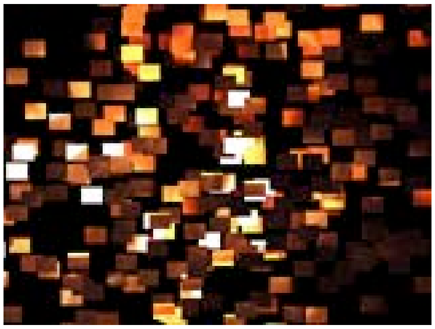
on erase

off bypass

video out video

“Explodes” a video stream by breaking the source image into a series of rectangles and shifting their position.

Before



After

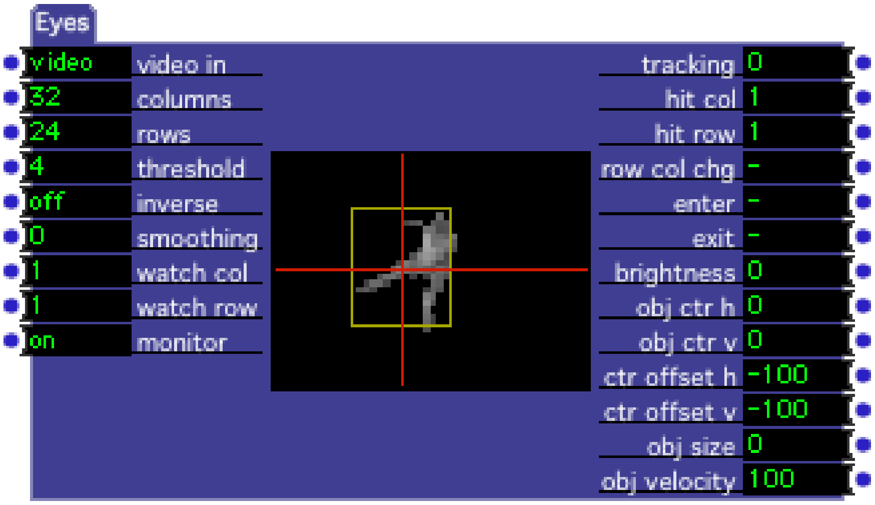
Input Properties

- **video in**: The video input stream.
- **amount**: Determines how “exploded” the image will be – higher numbers spread the rectangles further from their original location.
- **distance**: Specifies the maximum distance the rectangles will travel from their original location.
- **horiz size**: The horizontal size of the rectangles, from 0 to 100% of the width of the incoming video stream.
- **vert size**: The vertical size of the rectangles, from 0 to 100% of the height of the incoming video stream.
- **erase**: When this is turned on, the background is erased before the rectangles are drawn. When this is turned off, the background is not erased, leaving “trails” as you move the rectangles using the amount input.
- **bypass**: When turned off, this effect functions normally. When turned on, the effect is disabled and the video input is passed directly to the video output.

Output Properties

- **video out**: The exploded image.

Eyes



video in: video
columns: 32
rows: 24
threshold: 4
inverse: off
smoothing: 0
watch col: 1
watch row: 1
monitor: on

tracking: 0
hit col: 1
hit row: 1
row col chg: -
enter: -
exit: -
brightness: 0
obj ctr h: 0
obj ctr v: 0
ctr offset h: -100
ctr offset v: -100
obj size: 0
obj velocity: 100

Tracks the position of an object in a video stream based on its brightness.

The Eyes actor will report the location of the brightest object in the video stream, based on its location in a grid superimposed upon that video stream. It will also report the size of the object, and its velocity (i.e. speed of movement.)

The rows and columns inputs determine the size of a grid. As each frame arrives, Eyes analyzes the image looking for the grid coordinate that is brighter than all the others. It then reports the position of that object.

To help you configure the Eyes inputs, turn on the monitor input. When you do, a miniature monitor window will appear in the center of the actor. The red crosshairs show the center of the object, and the yellow rectangle shows the "bounding box" of the object as it is tracked.

Because displaying the monitor consumes some of your CPU speed, you should turn it off once you have configured eyes to your satisfaction.

You may optionally set a grid location to be watched using the watch col and watch row properties. When an object enters this grid location, the enter output will send a trigger; when the object disappears, the exit output sends a trigger.

Generally speaking, the higher contrast the incoming video image, the easier it will be for Eyes to track – placing a performer in a light colored costume on a black background is ideal. You can also improve tracking by filtering the video before you attempt to track it. The two actors that can be quite useful in this respect are Difference and Chroma Key.

If you connect the output of the Difference actor to Eyes' video input, you can track the location of an object that is moving in the frame, even in poor lighting conditions. You can track a colored object by using the setting the Chroma Key's key color to the color of the object you want to track, and feeding its output to the video input of Eyes.

Input Properties

- **video**: The source video input to be analyzed.
- **columns** and **rows**: Specifies the number of columns and rows in the grid used to determine the object's location. Higher numbers give finer resolution, but this does not necessarily mean that Eyes will track more accurately. Experimentation is the key to finding the right values for these inputs.
- **threshold**: The brightness threshold. An object's brightness must be above this value for Eyes to 'see' it. If the monitor is on, and the brightness is below this value, that gird point will be drawn as black.
- **inverse:** Turn this property on to track the darkest point in the frame, instead of the brightest.
- **smoothing:** When this property is greater than zero, the values sent out of the obj ctr h, obj ctr v,obj size and velocity outputs will be "smoothed", reducing the amount of jitter as the object is tracked. Higher values smooth the outputs more. Be cautious of setting this value too high, as the object center outputs will begin to lag behind the object being tracked by a noticeable amount.
- **watch col** and **watch row**: Specifies a specific grid location that will be watched. When an object enters this location, the enter output will send a trigger. When an object leaves this location, the exit output will send a trigger.
- **monitor**: Turn this property on to see a monitor window inside the actor. This will show you what the Eyes actor is seeing – this will help you to adjust the threshold input. The red crosshairs show the center of the object, and the yellow rectangle shows the "bounding box" of the object as it is tracked.

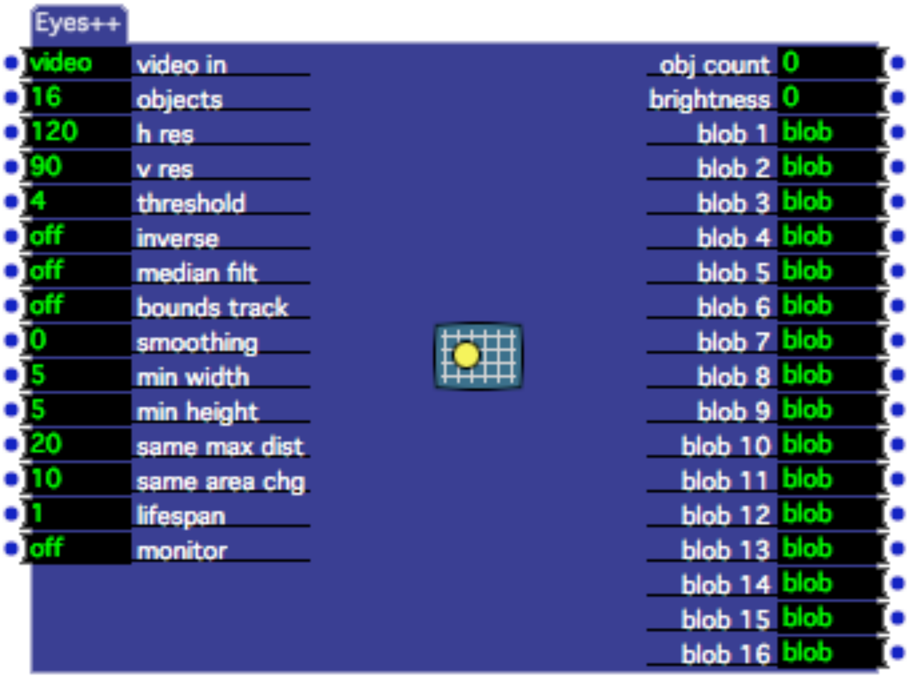
  Because displaying the monitor consumes some of your CPU speed, you should turn it off once you have configured eyes to your satisfaction.

Output Properties

- **tracking**: Outputs a 1 when an object is being tracked. Otherwise, it outputs a 0.
- **hit col**: Reports grid column within which the last object was seen.
- **hit row**: Reports grid row within which the last object was seen.
- **row /col chg**: Sends a trigger whenever the grid row or grid column changes.
- **enter**: Sends a trigger whenever an object appears in the grid row and column specified by the watch row and watch col inputs.
- **exit**: Sends a trigger whenever an object disappears from the grid row and column specified by the watch row and watch col inputs.

- **brightness**: reports the overall brightness of the incoming video stream. A completely black frame gives a value of 0, a completely white frame gives 100. This input can be quite useful if you connect the Difference actor to the input, as the more motion there is in the incoming video input the higher the output value will be.
- **obj ctr h** and **obj ctr v**: Reports the center of the bounding box of the object being tracked, from 0 to 100% of the frame width/height of the video frame. If the smoothing input is set to a value greater than zero, this output will be smoothed as it tracks the object, reducing the amount of jitter in this output.
- **ctr offset h** and **ctr offset v**: Reports the offset from obj ctr h and obj ctr v of the centroid of the object being tracked, as calculated by its brightness, from 0 to 100% of the frame width/height of the video frame. If the smoothing input is set to a value greater than zero, this output will be smoothed as it tracks the object, reducing the amount of jitter in this output.
- **obj size:** Reports the size of the object, relative to the size of the video frame, from 0 to 100%. This value is essentially the ratio of the area of the bounding box to the area of the video frame.
- **velocity:** Reports the velocity of the object being tracked. The faster the object moves, the higher this value.

Eyes++ (v1.3)



Eyes++

video video in
16 objects
120 h res
90 v res
4 threshold
off inverse
off median filt
off bounds track
0 smoothing
5 min width
5 min height
20 same max dist
10 same area chg
1 lifespan
off monitor

obj count 0
brightness 0
blob 1 blob
blob 2 blob
blob 3 blob
blob 4 blob
blob 5 blob
blob 6 blob
blob 7 blob
blob 8 blob
blob 9 blob
blob 10 blob
blob 11 blob
blob 12 blob
blob 13 blob
blob 14 blob
blob 15 blob
blob 16 blob

Tracks the position, velocity, size and other characteristics of up to sixteen objects within a video stream.

Eyes++ uses the standard computer vision technique of tracking *blobs* – with a blob being defined as any group of contiguous pixels of a similar color. Because Eyes++ typically tracks the brightness object in the frame, you could say that the similar color is anything that isn't black – e.g., the bright objects in the frame. (You can invert this behavior by turning on the inverse input, in which case Eyes++ tracks the dark objects in the frame.)

As each new frame of video arrives at the video input, Eyes++ looks for every blob it can find. Only the largest blobs of those found are tracked. You can use the objects input to determine how many objects will be tracked simultaneously – this can be set to as few as one, and as many as sixteen. So, if Eyes++ finds 15 blobs, and the objects input is set to 5, the smallest ten will be ignored.

Information about the blobs being tracked is routed to Eyes++'s sixteen blob outputs. These will be connected to a Blob Decoder actor (see page 220) to access the various characteristics of the blobs being tracked.

To help you configure the Eyes inputs, turn on the monitor input. When you do, a miniature monitor window will appear in the center of the actor. Each object being tracked will be surrounded by a colored rectangle – the color indicates which blob output will be used to report the characteristics of the blob. The table below shows the relationship between the bounding box color and the blob number.

Blob Color Table

Red	Blob 1
Green	Blob 2
Blue	Blob 3
Yellow	Blob 4
Aqua	Blob 5
Cyan	Blob 6
Orange	Blob 7
Lt. Green	Blob 8

Because displaying the monitor consumes some of your CPU speed, you should turn it off once you have configured eyes to your satisfaction.

Generally speaking, the higher contrast the incoming video image, the easier it will be for Eyes++ to track the objects – placing performers in a light colored costumes on a black background is ideal. If you instead wanted to track something dark that appeared on a light background, you could turn on the inverse input so that Eyes++ will track the darkest object in the frame.

Eyes++ does its best to consistently identify the blobs moving around the frame. When the blobs do not collide (i.e. overlap) each other it does a pretty good job. But, when two blobs touch, it is very difficult to determine which one is which after they separate again. You should experiment with the same max dist, same area chg, and lifespan parameters to improve tracking during blob collisions.

Input Properties

- **video**: The source video input to be analyzed.

- **objects**: The maximum number of blobs that will be tracked. For instance, if you this value to 3, Eyes++ will only track a maximum of three objects. In this case, you would only use the blob 1, blob 2, and blob 3 outputs – blobs 4 through 16 will never send any output since those blobs will never be used.
- **h res** and **v res**: Specifies the horizontal and vertical resolution of the image to be tracked. Incoming video streams will be scaled to this size before attempting to locate the blobs. Higher resolutions mean higher CPU usage, as hi-res images can require a large of amount of processing to isolate the blobs.
- **threshold**: The brightness threshold. An object's brightness must be above this value for Eyes++ to 'see' it. If the contrast between the objects being tracked and the background is not very high, you may see the bounding box extend beyond the actual edge of the object being tracked. In this case you would increase the threshold to improve tracking.
- **inverse:** Turn this property on to track the darkest objects in the frame instead of the brightest.
- **median filt:** Turn this property on to enable a median filter, which reduces noise in the image. This may improve tracking, but will also increase CPU usage.
- **bounds track: (EXPERIMENTAL!)** If you turn this property on, Eyes++ will only attempt to track one the biggest blob it finds. Instead of tracking multiple blobs, it will attempt to break down the biggest blob into several constituent parts. This may or may not yield useful results depending on your application. Experimentation with this setting is required.
- **smoothing:** When this property is greater than zero, all values sent out of the blob decoder will be "smoothed", reducing the amount of jitter as the object is tracked. Higher values smooth the outputs more. Be cautious of setting this value too high, as the values will begin to lag behind the object being tracked by a noticeable amount.
- **min width & min height**: Specifies the minimum size of an object to be tracked, specified as a percentage of the width and height of the frame, respectively. Setting this to higher values means that smaller blobs will be ignored.
- **same max dist**: Eyes++ does its best to ensure that, as a blob moves around and changes shape, it correctly identifies each blob. This setting, specified as a percentage of the frame width, specifies how far a blob may move before it is considered to be a "new" blob. For instance, if this input is set to 20, and an existing blob moves more than 20% of the width of the frame, then it cannot be one of the existing blobs. The idea here is that an object in real life cannot instantly jump from one part of the frame to the other.
- **same max area**: Like same max dist, this determines when an object must be considered "new". If the area of an object's bounding box changes by more than this percentage (positive or negative) then the object cannot be one of the existing blobs. The idea here is that an object in real life cannot instantly change size by more than a certain amount.

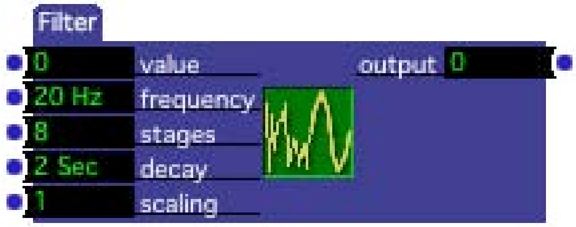
- **lifespan**: Determines how long a blob will live on after it is no longer recognized. This setting is an attempt to handle the situation that occurs when two blobs overlap. When this happens, the two blobs become one blob. Hopefully when this happens, the size of the new single blob will exceed the same area chg property – when this happens, the new combined blob is seen as a new blob. But, if the lifespan is greater than 1, the two existing blobs will continue to “live” – moving in the same direction as they were at the moment of the collision. If the two objects being tracked continue moving in the same direction, and don’t radically change velocity, then hopefully they will be correctly “reacquired” when they separate again. This setting may or may not help in your particular situation – we can only recommend that you give it a try and see if it improves tracking for you.
- **monitor**: Turn this property on to see a monitor window inside the actor. This will show you what the Eyes actor is seeing – this will help you to adjust the threshold input. The red crosshairs show the center of the object, and the yellow rectangle shows the “bounding box” of the object as it is tracked.

  Because displaying the monitor consumes some of your CPU speed, you should turn it off once you have configured eyes to your satisfaction.

Output Properties

- **img count:** outputs the number of objects currently being track.
- **brightness**: Reports the overall brightness of the frame. Can be useful when determining how close the objects are to the camera.
- **blob 1 – blob 16**: When connected to the Blob Decoder actor, reports the various characteristics measured for each blob.

Filter



Smoothes a jittery stream of values.

NOTE: This actor has been superceded by the Smoother actor. If you need to smooth out a stream of numbers, the Smother actor is now the recommended choice.

Sometimes you have a source of values where the numbers jump up and down. This actor uses a weighted averaging of the past values to provide a smoother version of the input value stream.

The key settings to adjust when attempting to smooth your values are the stages and decay input properties. The number of stages determines how many of the previous numbers the filter remembers. The decay determines how much influence those remembered numbers have on the current value. For instance, decay is set to one second, numbers that are 1/2 second old would have half the influence of a number that just arrived. Numbers older than one second would have no influence at all.

The frequency output determines how often a new output value is calculated. Higher values here produce a smoother output.

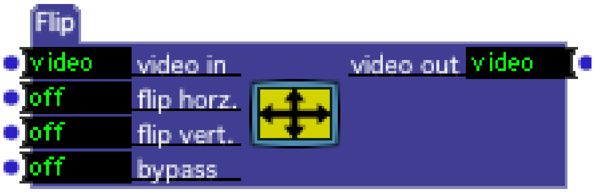
Input Properties

- **value**: The stream of incoming values
- **frequency**: The frequency with which new values will appear at the output
- **stages**: How many of the previous values will be remembered by the filter as it calculates the new value
- **decay**: How long a value's influence to decay to 0.
- **scaling**: Multiplies the output value by this number to provide a better range of output values.

Output Properties

- **output**: The smoothed values.

Flip



Flips a video stream horizontally, vertically, or both.

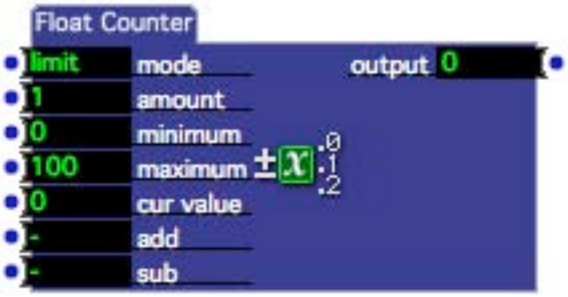
Input Properties

- **video in**: The video input stream
- **flip horz.**: When turned on, flips the video image horizontally
- **flip vert.**: When turned on, flips the video image vertically
- **bypass**: When turned off, this effect functions normally. When turned on, the effect is disabled and the video input is passed directly to the video output.

Output Properties

- **video out**: The flipped video output stream.

Float Counter (v1.3)



limit mode
1 amount
0 minimum
100 maximum
0 cur value
- add
- sub
output 0

Counts up or down when a trigger is received.

The Float Counter (and its companion, Counter) allows you to count up or down each time a trigger is received by adding or subtracting a value to/from its output value. You have the option of limiting the output value to a range of values, or to let that value “wrap around” when it exceeds those limits. This actor allows floating-point numbers (i.e. values with numbers after the decimal point), while the Counter uses integer numbers.

Input Properties

- **mode**: Determines how to constrain the output value when it exceeds minimum or maximum. When set to limit, and an addition or subtraction is made to the output value that would exceed minimum or maximum, the output value is limited to these values. When set to wrap and the calculated value is less than minimum or is greater than maximum, it “wraps around” to other extreme.

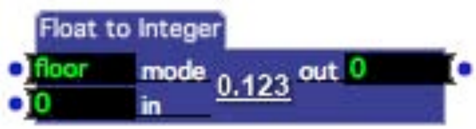
  For example, if the maximum is 100, the current output value is 95, and you trigger the add input while the amount property is set to 10.5, the new value would be 105.5. Since this would exceed the maximum (100) the float counter subtracts the maximum value from the result and sets the output to the resulting value of 5.5.
- **amount**: The amount to add or subtract the counter receives a trigger on the add or subtract trigger input.
- **minimum**: The minimum possible value. See mode for more information on how this value is used.
- **maximum**: The maximum possible value. See mode for more information on how this value is used.
- **cur value**: This is the value to which the 'amount' property is added to or subtracted from when calculating the output. It is an unusual input, in that it is automatically set to match the output value each time the 'add' or 'subtract' trigger inputs are pulsed. You can make use this property in two ways: first, you can click it's title, check the **Init** checkbox, and specify an initial value from which the counter will begin counting; second, you can send a value to it to preload the next value that will be added to or subtracted from.

- **add:** Adds the value specified by the amount input property to the current value at the output. The resulting value is limited by the minimum and maximum properties.
- **sub**: Subtracts the value specified by the amount input property to the current value at the output. The resulting value is limited by the minimum and maximum properties.

Output Properties

- **output**: The current output value of the counter.

Float to Integer (v1.3)



Converts a floating-point number to an integer, with specific rounding options.

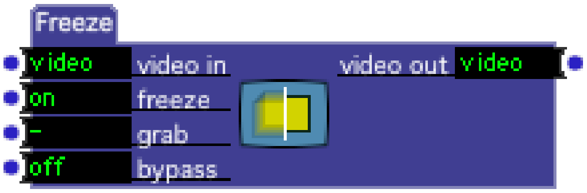
Input Properties

- **mode**: Determines how the floating point number is converted to an integer. floor rounds down to the next lowest integer, ceiling rounds up to the next highest integer, while round rounds up to the next highest integer only if the digits after the decimal point is 0.5 or greater.
- **in**: The floating point input value.

Output Properties

- **out**: The resulting integer value.

Freeze



Freezes a video input stream by grabbing the current frame when triggered.

Input Properties

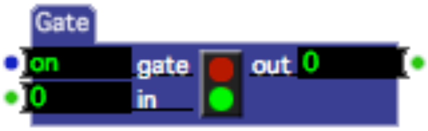
- **video in**: The video input stream.

- **freeze**: When turned off, the video input passes directly to the output. When turned on, the video output will freeze.
- **grab**: When triggered, grabs the video current frame of video, and sends that single frame of video to the frozen video output.
- **bypass**: When turned off, this effect functions normally. When turned on, the effect is disabled and the video input is passed directly to the video output.

Output Properties

- **video out**: The frozen video output stream.

Gate



Allows or prevents values from passing from the input to the output.

When the gate input property is set to on, any value sent to the input will be sent on to the output. When the gate property is set to off, values arriving at the input are blocked and not passed to the output.

Note that the in input and out output of this actor are mutable. This means they will *all* change their type (integer, float, video, etc.) to match the first link made to either of these properties. Once a link has been made to any of the mutable properties, their types will remain fixed, based on that first connection, until all have been disconnected. Then the properties become mutable again.

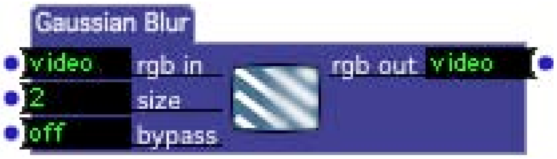
Input Properties

- **gate:** When the gate property is on, any value sent to the input will be echoed at the output. When the gate property is off, values arriving at the input are blocked and not passed to the output.
- **in:** Values that will be echoed to the output when the gate property is on.

Output Properties

- **out:** Echoes all values sent to the in input as long as the gate property is on.

Gaussian Blur



Performs a Gaussian blur on a video stream.

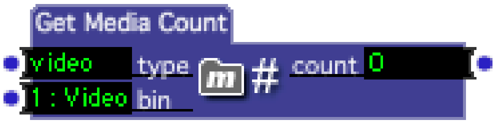
Input Properties

- **rgb in**: The video input stream.If this stream is YUV, it will automatically be converted to RGB.
- **size**: The diameter of the blur mask. The larger this value, the blurrier the resulting image.
- **bypass**: When turned off, this effect functions normally. When turned on, the effect is disabled and the video input is passed directly to the video output.

Output Properties

- **rgb out**: The blurred video output stream in RGB format.

Get Media Count



Returns the number of media objects within a specified bin.

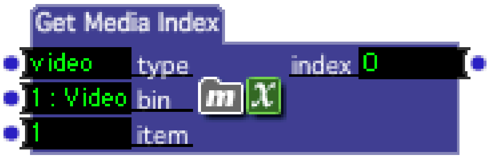
Input Properties

- **type**: The media type of the bin whose objects will be counted. Can be video, audio, midi, picture, or 3D.
- **bin**: The index of the bin whose objects will be counted. For example, if the type input is set to audio, and the bin input is set to 3, then the output would be the count of the audio files in the third audio bin.

Output Properties

- **count**: The number of media objects within the specified bin. If the bin doesn't exist, the output is zero.

Get Media Index (v1.1)



Returns the media index of a media object within a specified bin.

For example, if the type input is set to audio, the bin input is set to 3, and the item input is set to 5, then the output would be the media index of the fifth audio file within the third audio bin. The output value could then be passed a Sound Player actor to play the specified sound.

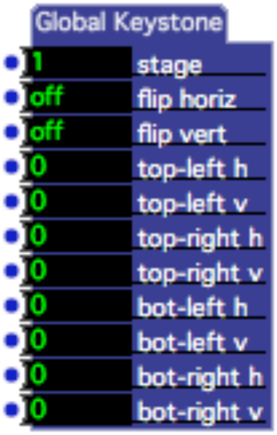
Input Properties

- **type**: The media type of the bin whose objects will be counted. Can be video, audio, midi, picture, or 3D.
- **bin**: The index of the bin within which the media object is located.
- **item**: The index of the bin within the specified bin.

Output Properties

- **count**: The absolute index of the specified media object, which can be passed to an appropriate player actor to play the specified media. If no media object can be found within the specified bin, the output value will be 0.

Global Keystone



Global Keystone

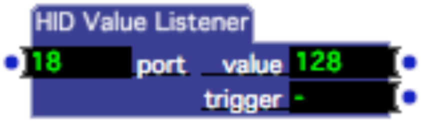
1 stage
off flip horiz
off flip vert
0 top-left h
0 top-left v
0 top-right h
0 top-right v
0 bot-left h
0 bot-left v
0 bot-right h
0 bot-right v

Advanced keystoning for a specified stage.

Input Properties

- **stage:** The stage for which the keystoning will be set.
- **flip horiz:** When turned on, flips the image horizontally.
- **flip vert:** When turned on, flips the image vertically.
- **top-left h:** The horizontal offset of the top left corner expressed as a percentage of the stage size.
- **top-left v:** The vertical offset of the top left corner expressed as a percentage of the stage size.
- **top-right h:** The horizontal offset of the top right corner expressed as a percentage of the stage size.
- **top-right v:** The vertical offset of the top right corner expressed as a percentage of the stage size.
- **bottom-left h:** The horizontal offset of the bottom left corner expressed as a percentage of the stage size.
- **bottom-left v:** The vertical offset of the bottom left corner expressed as a percentage of the stage size.
- **bottom-right h:** The horizontal offset of the bottom right corner expressed as a percentage of the stage size.
- **bottom-left v:** The vertical offset of the bottom left corner expressed as a percentage of the stage size.

HID Value Listener



Receives values from an HID input defines in the Stream Setup window.

An HID or Human Interface Device is a type of computer device that interacts directly with, takes input from, humans. The term HID most commonly refers to the USB-HID specification. Common HIDs are Keyboard, Mouse, Trackball, Touchpad, Pointing stick, Graphics tablet, Joystick, Gamepad, Analog stick, Webcam and Headset.

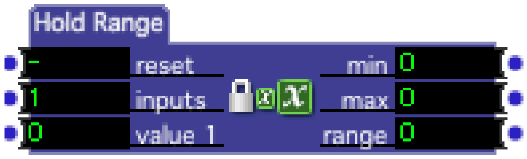
Input Properties

- **port**: Value corresponding to particular controller on a specific HID.

Output Properties

- **value**: Outputs a value received from an HID input device.
- **trigger**: Sends a trigger each time a new value arrives.

Hold Range



Outputs the minimum and maximum value ever received on any input, and the range between the two.

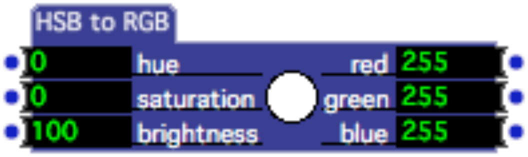
Input Properties

- **reset**: Resets the min, max and range outputs.
- **inputs**: Sets the number of value inputs, from 1 to 16.
- **value 1, value 2, etc.:** Whenever a value is received at any value input, it is compared to the current minimum and maximum values. If it is less than minimum or greater than maximum, the corresponding output is set and the range output is updated to reflect the new range between minimum and maximum.

Output Properties

- **min**: The minimum value ever received on any of the value inputs.
- **max**: The maximum value ever received on any of the value inputs.
- **range**: The range between minimum and maximum, i.e. maximum - minimum.

HSB to RGB



Converts a color, specified by a hue, saturation and brightness values, to its individual red, green and blue components.

Input Properties

- **hue**: The hue of the color, ranging from 0 to 360 degrees. Values to achieve some of the primary colors are:

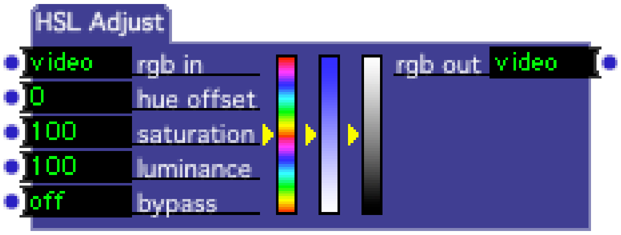
Red	*= 0*
Yellow	*= 60*
Green	*= 120*
Aqua	*= 180*
Blue	*= 240*
Purple	*= 300*
Red	*= 360*

- **saturation**: The purity of the color. 100 results in a pure color, lower values add more white to the color, moving it towards a pastel.
- **brightness:** The brightness of the color. 100 is as bright as possible. Lower values yield darker colors, with a value of 0 giving black.

Output Properties

- **red:** Outputs the red component value of the color specified by the hue, saturation and brightness input.
- **green:** Outputs the green component value of the color specified by the hue, saturation and brightness input.
- **blue:** Outputs the blue component value of the color specified by the hue, saturation and brightness input.

HSL Adjust



HSL Adjust

video rgb in

0 hue offset

100 saturation

100 luminance

off bypass

rgb out video

Manipulates the hue, saturation and luminance (brightness) of a video stream.

Input Properties

- **rgb in**: The input video stream. If this stream is YUV, it will automatically be converted to RGB.
- **hue offset**: How much to offset the hue, from –360 to +360 degrees.
- **saturation**: How much to change the saturation, from 0 to 200%. A value of 100 introduces no change. Values below 100 make the image less saturated, values above 100 make in more saturated.
- **Luminance:** How much to change the luminance (brightness), from 0 to 200%. A value of 100 introduces no change. Values below 100 make the image darker; values above 100 make the image brighter.
- **bypass**: When turned off, this effect functions normally. When turned on, the effect is disabled and the video input is passed directly to the video output.

Output Properties

- **video out**: The colorized video stream in RGB format.

Image Tile

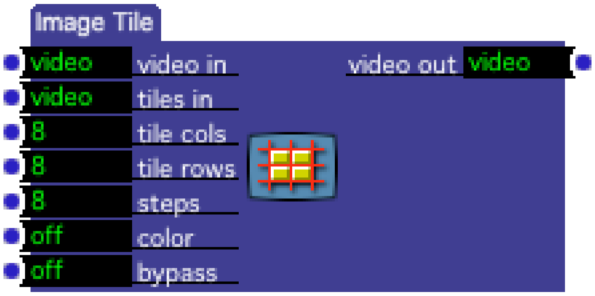


Image Tile

video video in

video tiles in

8 tile cols

8 tile rows

8 steps

off color

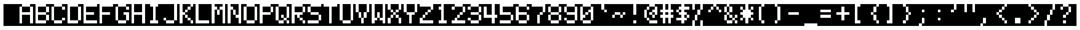
off bypass

video out video

Displays the incoming video stream in the form of 'tiles' of varying brightness that are created by from a second video stream.

Whenever a new frame of video arrives at the 'tiles in' input, it is broken into a series of tiles whose height and width are specified by the tile cols and tile rows inputs. Then, the brightness of each tile is analyzed and stored. When a new frame of video arrives at the video in input, it is reconstituted by creating a mosaic of tiles of the appropriate brightness.

For instance, consider the following tiles in input



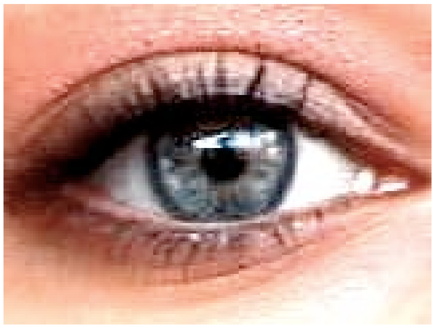
ABCDEFGHIJKLMNOPQRSTUVWXYZ1234567890`~!@#$%^&*()-_=+[{]};:'",<.>/?

which is the ASCII character set. Each character occupies 6 pixels across, and 8 pixels down. Because there are 67 characters across, the total size of this image is 67 x 6 = 402 pixels across by 8 pixels down.

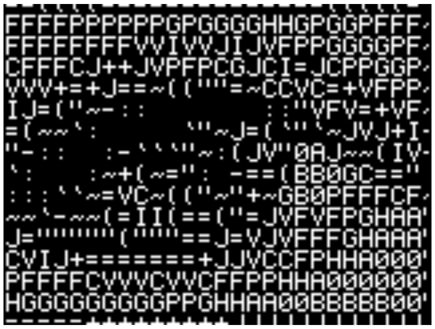
Using the Picture Player to supply this image as an input to the tiles in input, you would set tile cols to 67 and the tile rows to 1. Upon receiving this input, the Image Tile actor would analyze the each tile, determining its brightness.

Finally, as frames of video arrive at the video in input, they would be broken down into tiles of matching size (6 across, 8 down). Each of the tiles in the video in stream is replaced by the tile from the tile in input whose brightness most closely matches the original.

Using the ASCII character set example above, note the transformation of the image. (Because the image is small, you may need to blur your eyes a bit to appreciate the result – higher resolution images look better.)



before



after

While this example was made using a still image, you can just as easily supply a moving video to the tiles in input. The results in this case depend greatly on the content of that video stream, but it can lead to interesting effects.

Input Properties

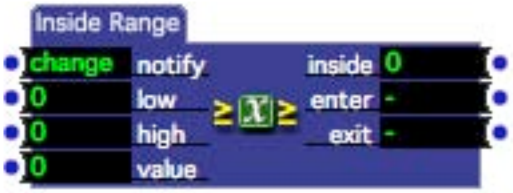
- **video in**: The video input stream to be tiled.
- **tiles in**: The video input that will be used to create the tiles. The height and width of each tile are given by the 'tile cols' and 'tile rows' inputs.
- **tiles across**: The number of tiles across in the 'tile in' video stream.
- **tiles down**: The number of tiles down in the 'tile in' video stream.
- **steps**: The number of brightness steps to use when creating the final image. Lower numbers produce a coarser resolution of brightness, higher numbers give finer resolution.

- **color**: "When off, the color of the tiles used to create the final output is the same as received at the 'tile in' input. When on, imposes the color of the source image on the tiles. Turning this setting on may produce unusual colorization effects when the 'tile in' image is not black and white.
- **bypass**: When turned off, this effect functions normally. When turned on, the effect is disabled and the video input is passed directly to the video output.

Output Properties

- **video out**: The tiled video output stream.

Inside Range (v1.1)



Reports whether or not a value is within a specified range.

Input Properties

- **notify:** Specifies when a new output value should be sent to the inside output. Set this property to change to output a new value only when inside changes from 0 to 1 or vice-versa. Set to always to send the value each time a new value arrives at the value input.
- **low**: The low value of the range to which the input value will be compared.
- **high**: The high value of the range to which the input value will be compared.
- **value**: The value to be compared to the range specified by the low and high input properties.

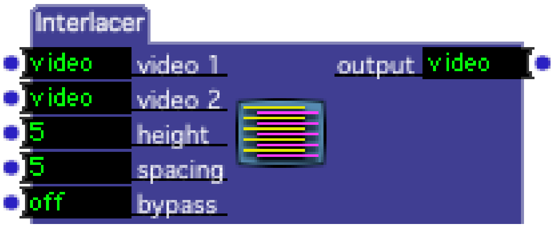
Output Properties

- **inside**: Outputs a 1 when value is within the range specified by low and high. Outputs a 0 otherwise.
- **enter**: Sends a trigger when the last value received at the value input was outside the range specified by low and high, and the new value is inside this range.
- **exit**: Sends a trigger when the last value received at the value input was inside the range specified by low and high, and the new value is outside this range.

Integer Counter

This actor was renamed to "Counter" in v1.3. Please refer to the documentation for that actor.

Interlacer


Interlacer

video 1: video

video 2: video

height: 5

spacing: 5

bypass: off

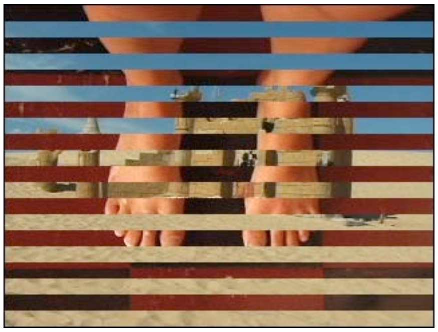
output: video

Interlaces two video images by alternating copying rows from the two incoming video streams.

Example input and output, with height and spacing parameters set to 5%

video 1

video 2


output

Example output, with no input connected to video 2, height set to 1.1 and spacing set to 0.8

output

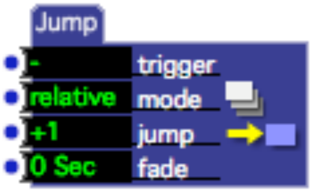
Input Properties

- **video 1**: A video stream to be interlaced with the stream arriving at the 'video 2' input. If no vide stream is linked to 'video 2', this stream will be interlaced with black.
- **video 2**: A video stream to be interlaced with the stream arriving at the 'video 1' input.. If this input is left disconnected, black is used for the background.
- **height**: The height of each row copied from the 'video 1' input, expressed as a percentage of the stream's height.
- **spacing**: The space between each row copied from the 'video 1' input, expressed as a percentage of the stream's height. This space is filled with the image appearing at the 'video 2' input, or black if no input is specified.
- **bypass**: When turned off, this effect functions normally. When turned on, the effect is disabled and the video input is passed directly to the video output.

Output Properties

- **output**: The interlaced video output stream.

Jump



Activates a new Scene after deactivating the current primary Scene.

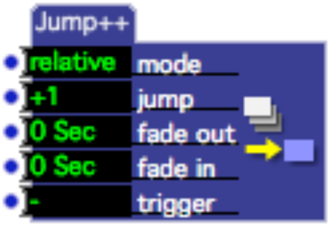
The jump actor allows you to move from one scene to another. When a trigger is received on the trigger input, the all of the actors in the current Scene are deactivated, and then all of the actors in the new Scene are activated.

Properties

- **trigger**: When a trigger is received on this input port, the current primary Scene is deactivated and the primary Scene indicated by the mode and jump properties is activated.
- **mode:** Determines how the number in the jump property is interpreted. When this mode is set to *relative* the scene to be activated is relative to the position of the current scene in the Scene List. When this property is set to *absolute* the scene to be activated is based on its position in the Scene List. See jump property below for more information.
- **jump:** Indicates which scene to activate. This field works in tandem with the mode field. When mode is set to *relative*, the number in the jump field indicates the scene to activate relative to the current scene. +1 would be the scene after this scene, -1 would be the scene before this scene, +2 would be the second scene after this scene, etc. When mode is set to *absolute*, the number in this field indicates a scene in the Scene List by its position, where 1 is the first scene in the list, two is the second scene, etc.
- **fade:** Specifies an optional visual and aural cross fade between the current scene and the scene that is the target of the jump

  The visual result of the fade in depends on a number of factors: what video is being rendered in the current scene, the setting of the blend and layer inputs in the Projector actors that become active, etc. See the section “Compositing with the Projector” on Page 132 for more information on taking advantage of multiple projectors.

Jump++



Activates a new Scene after deactivating the current primary Scene.

The Jump++ actor allows you to move from one scene to another. When a trigger is received on the trigger input, all of the actors in the current Scene are deactivated, and then all of the actors in the new Scene are activated. Different to the Jump actor, Jump++ allows for the control of both the scene's fade in and fade out properties.

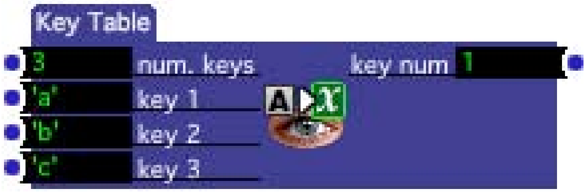
Properties

- **mode:** Determines how the number in the jump property is interpreted. When this mode is set to *relative* the scene to be activated is relative to the position of the current scene in the Scene List. When this property is set to *absolute* the scene to be activated is based on its position in the Scene List. See jump property below for more information.
- **jump:** Indicates which scene to activate. This field works in tandem with the mode field. When mode is set to *relative*, the number in the jump field indicates the scene to activate relative to the current scene. +1 would be the scene after this scene, -1 would be the scene before this scene, +2 would be the second scene after this scene, etc. When mode is set to *absolute*, the number in this field indicates a scene in the Scene List by its position, where 1 is the first scene in the list, two is the second scene, etc.
- **fade out/ fade in:** Specifies an optional visual and aural cross fade between the current scene and the scene that is the target of the jump.

  The fade out time specifies how long it will take the currently active scene to fade to black. The fade in time specifies how long it will take the new Scene to fade in from black.

  The visual result of the fade in depends on a number of factors: what video is being rendered in the current scene, the setting of the blend and layer inputs in the Projector actors that become active, etc. See the section "Compositing with the Projector" on Page 132 for more information on taking advantage of multiple projectors.
- **trigger**: When a trigger is received on this input port, the current primary Scene is deactivated and the primary Scene indicated by the mode and jump properties is activated.

Key Table Watcher



3 num. keys

'a' key 1

'b' key 2

'c' key 3

key num 1

Generates a number identifying which key on the computer keyboard, of a specific set, was pressed.

The Key Table is useful when you want a set of keys on the keyboard to control another actor. You specify the number of keys for which you want to look, and then enter the keys into the watcher. When one of those keys is pressed, Key Table outputs a value indicating the position of that key in the list.

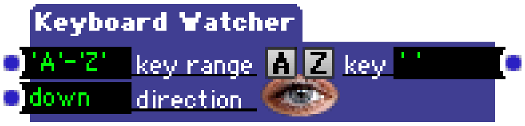
Input Properties

- **num keys**: Determines the number of keys that this watcher will see, from 1 to 32. Note that when you set this property, the Limit Min and Limit Max settings of the key num output property will be reset to 1 and the value you just entered.
- **key 1, key 2, etc.**: The list of keys that this watcher will see. When typing a key into this value edit box, you should enclose it in single quotes (‘), e.g., the letter B is entered as ‘B’.

Output Properties

- **key num**: When a key is pressed on the computer keyboard that matches one of the keys given in key 1, key 2, etc., outputs the position of that key in the list, starting with 1 for the first key, 2 for the second, etc.

Keyboard Watcher



'A'-'Z' key range

down direction

key ''

Watches for a key or range of keys on the computer keyboard to be pressed, released or both.

With the Keyboard Watcher you can specify a single key or range of keys that the watcher will see. When the watcher sees one of those keys, and it is going in the direction specified by the direction input, it will send that character associated with that key the output.

Input Properties

- **key range**: Specifies the key or range of keys that the watcher will see. Specify a single key by typing it into this value edit box enclosed by single quotes ('), e.g., the capital letter B is entered as 'B'. To specify a range of keys, type two keys separated by a hyphen, e.g., 'A'-'Z'.

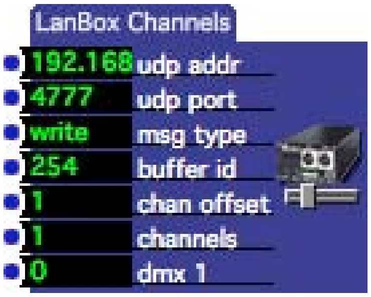
  Note that the key range is case sensitive *in that the keys Z and z are considered to be different.*
- **direction**: Determines whether the watcher will see keys that are pressed (down), released (up), or both.

Output Properties

- **key**: When a key is pressed on the computer keyboard that matches the key or range of keys specified in key range input, and it is traveling in a direction that matches the direction input, that character associated with that key is sent out of this output

  Remember that you can link the output of the key watcher to the input of a trigger, if you would simply like to trigger an event when the user presses a key.

LanBox Channels (v1.1)



Allows Isadora to control a LanBox LC connected to your computer via a local area network (i.e. Ethernet) connection.

The LanBox Channels actor allows you to set the level of a contiguous range of DMX channels on a LanBox LC lighting control unit. The meaning of some of the parameters are specific to the LanBox LC – please refer to the manual for more details.

Input Properties

- **udp addr**: Specifies the UDP address to which the messages will be sent. This should match the UDP address specified for your LanBox in the LCEdit program.

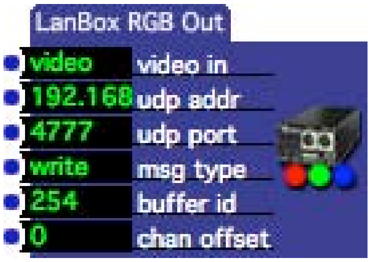
- **udp port**: Specifies the UDP port number to which the messages will be sent. This should match the UDP address specified for your LanBox in the LCEdit program.
- **msg type**: can be set to either write or publish. publish equates to the **buffer broadcast** command (hex C9), write equates to the **buffer write** command (hex CA). For more detailed information, please refer to the UDP documentation for the LanBox
- **buffer id**: specifies the LanBox buffer to which the channel data will be written.

  When msg type is set to publish, you can use the following values

  252 = DMX Input Buffer
  253 = Analog/Switch Inputs
  254 = Mixer Buffer
  255 = DMX Output Buffer

  When msg type is set to write you may specify a value of 1-64 to write directly into the LanBox's Layer Buffers (A through BK) or 254 to write directly into the Mixer Buffer.
- **chan offset**: determines the actual channels to be transmitted – essentially this number plus one. For example, when chan offset is set to 0, the dmx 1 input would send to channel 1, dmx 2 would send to channel 2, and so on. If the chan offset is 50, then dmx 1 would send to channel 51, dmx 2 to channel 52, etc.
- **channels**: determines the number of dmx channel inputs. Increasing this number will add more dmx n inputs, decreasing this number will remove them.
- **dmx 1, dmx 2, …** : Use these inputs to specify the DMX values for each channel. (The number of available inputs is specified by the channels input property.) The actual channel number is depends on the setting of the chan offset input. If the chan offset is 50, then then dmx 1 would control channel 51.

LanBox RGB Out (v1.1)



LanBox RGB Out

video	video in
192.168	udp addr
4777	udp port
write	msg type
254	buffer id
0	chan offset

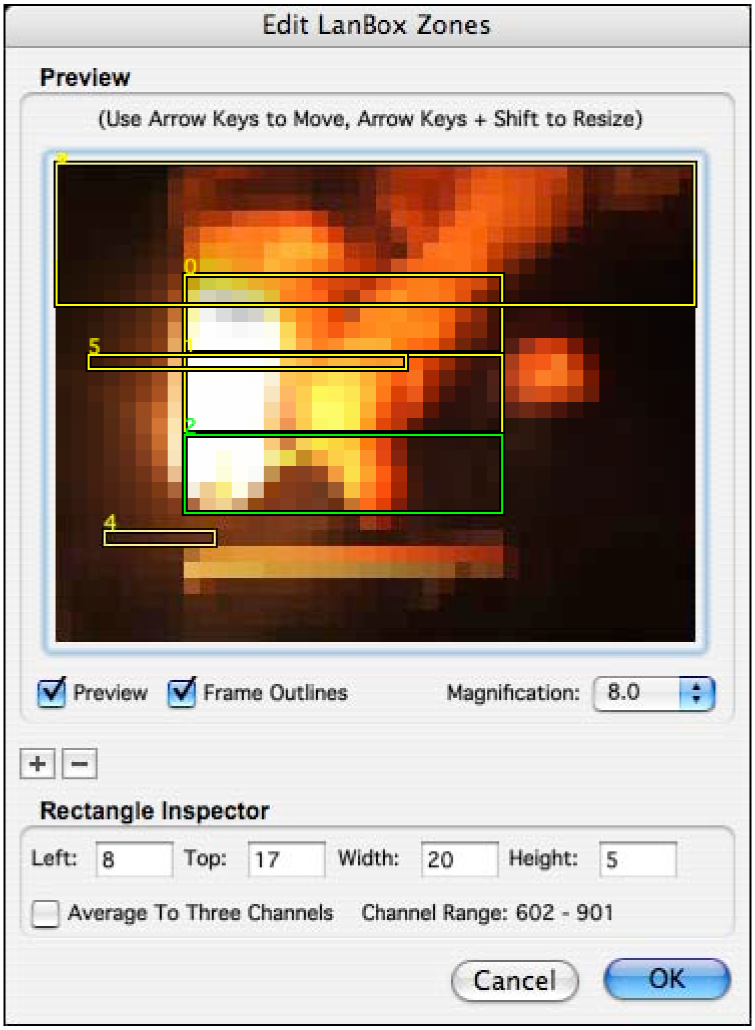
Allows you to map the colors of a video stream to channels of a LanBox LC.

The LanBox RGB Out actor is specially designed to take advantage of lighting instruments that can be produce RGB colors. This actor will map the color of specific areas within an incoming video stream to channels on a LanBox LC, allowing the colors of the video to control the color of the lighting. For each analyzed pixel, three channels will be sent to the LanBox, the first representing the red component of the pixel, the second the green component, and the third the blue component.

To use this actor, you must first specify which areas within the video stream will be analyzed and transmitted to the LanBox LC. To do this, begin by connecting a video stream to the video input of the LanBox RGB Out actor. It is a good idea to use a relatively low-resolution video – use the Scaler actor to reduce the size of the video clip if necessary.

It is very important that you establish the resolution of the video input for this actor before you start setting the position of the rectangles. Unlike most of Isadora, the position of the rectangles is specified using absolute pixels – not a percentage. So, if you specify the rectangle positions, and then change video resolution, you will most likely have to edit the rectangle sizes and locations again.

To edit the rectangles, double-click the LanBox RGB Actor. The following dialog will be shown.



Edit LanBox Zones

Preview

(Use Arrow Keys to Move, Arrow Keys + Shift to Resize)

☑ Preview ☑ Frame Outlines Magnification: 8.0

Rectangle Inspector

Left: 8 Top: 17 Width: 20 Height: 5

□ Average To Three Channels Channel Range: 602 - 901

To add a rectangle, click the “+” button

To remove a rectangle, click the “-” button

To select a rectangle, and show its inspector, click on the rectangle’s outline. A rectangle is green when it is selected, otherwise it is yellow.

After adding a new rectangle, or selecting an existing one, the “Rectangle Inspector” will appear at the bottom of the dialog. This allows you to adjust the size and position of the rectangle numerically. You can also move the currently selected rectangle using the arrow keys, or resize it by using the arrow keys while simultaneously holding down the shift key.

Note that, when a rectangle is selected, the DMX channels that will be sent to the LanBox are shown to the right of the Channel Range prompt at the bottom right of the inspector. The base channel is determined by the setting of the chan offset input property of the LanBox RGB Out actor. The total number of channels to be transmitted from a particular rectangle will equal the width times the height times 3 (W x H x 3). So, a 4 x 3 rectangle will send 36 channels total.

For example, let’s say we have two rectangles – one that is 4 x 3 pixels (36 channels total), another that is 10 x 1 (30 channels total), and that the chan offset input of the actor is set to 50. The first rectangle will broadcast its RGB values to LanBox channels 51-86. The second rectangle would broadcast to LanBox channels 87-116.

You may also choose average all of the pixels under a rectangle down to three channels (i.e. a single RGB value). To do this, check the “Average to Three Channels” check box when a rectangle is selected.

You can change the magnification of the image within the dialog box using the “Magnfication” popup. You may also turn off the video preview by unchecking the “Preview” checkbox.

Once you have set up all of the rectangles click the OK button to store the new settings, or click Cancel to exit the dialog without saving the edited rectangles.

Input Properties

- **video in**: receives the video stream to be analyzed.
- **udp addr**: Specifies the UDP address to which the messages will be sent. This should match the UDP address specified for your LanBox in the LCEdit program.
- **udp port**: Specifies the UDP port number to which the messages will be sent. This should match the UDP address specified for your LanBox in the LCEdit program.
- **msg type**: can be set to either write or publish. publish equates to the **buffer broadcast** command (hex C9), write equates to the **buffer write** command (hex CA). For more detailed information, please refer to the UDP documentation for the LanBox

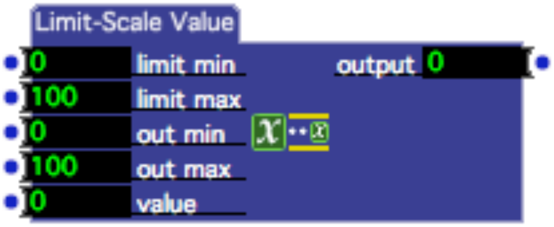
- **buffer id**: specifies the LanBox buffer to which the channel data will be written.

  When msg type is set to publish, you can use the following values

  252 = DMX Input Buffer
  253 = Analog/Switch Inputs
  254 = Mixer Buffer
  255 = DMX Output Buffer

  When msg type is set to write you may specify a value of 1-64 to write directly into the LanBox's Layer Buffers (A through BK) or 254 to write directly into the Mixer Buffer.
- **chan offset**: determines the actual channels to be transmitted. See the explanation of the rectangle editor above to understand how the chan offset is used when sending information to the LanBox LC.

Limit-Scale Value



Limits the incoming value to a specified range, and then scales the output to a different range.

The Limit-Scale Value actor performs the two actions implied by its name. First, it limits the incoming value to the range specified by the limit min and limit max inputs. It then scales the limited value to the range specified by the out min and out max inputs.

This actor can be especially useful when you have a value that does not reach its full range. By choosing a lower range of values for the limit min and limit max inputs, you can get a full range of output.

For instance, if you were using a Sound Level Watcher, but the sound input level only reached a maximum of 25 or so, you could set the limit max input of this actor to 25. The incoming values would then be scaled from a range of 0-25 to 0-100.

Input Properties

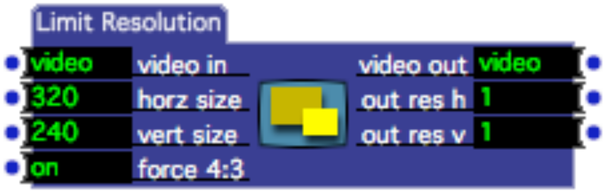
- **limit min:** The minimum input value. Values arriving at the value input less than this value will be set to this minimum.
- **limit max:** The maximum input value. Values arriving at the value input above this value will be set to this maximum

- **out min** and **out max:** Specifies the minimum output value. After incoming values are limited to the range given by the limit min and limit max inputs, the resulting value is scaled to the range specified by the out min and out max inputs.
- **value**: The value to be limited and then scaled.

Output Properties

- **output:** The limited and scaled output value. Note that the **limit min** and **limit max** settings for this output are automatically updated when you change the out min and out max input properties.

Limit Resolution



Scales the incoming video stream so that it does not exceed the specified maximum horizontal and vertical resolution.

If the incoming video does not exceed the specified maximum resolution, the video stream is unchanged. But if either the horizontal or vertical resolution is exceeded, then the video stream will be scaled so that its resolution does not exceed the limits in either dimension.

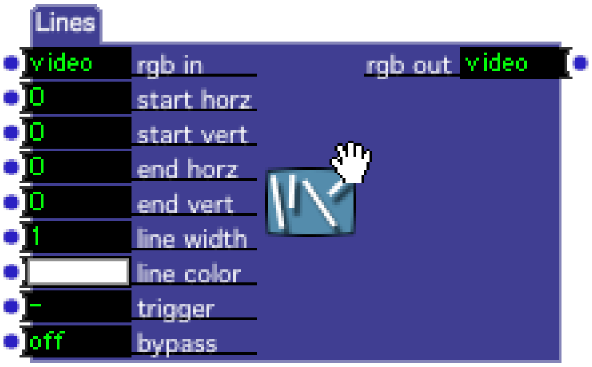
Input Properties

- **video in:** The source video **stream** whose resolution is to be limited.
- **horz size:** The maximum horizontal output resolution in pixels.
- **vert size:** The maximum vertical output resolution in pixels.
- **force 4:3:** When this parameter is on, changing the value of either the horz or vert size input will automatically adjust the other input so that the ratio between horizontal and vertical is 4:3.

Output Properties

- **video out:** The resulting video stream, scaled as required by maximum sizes specified in the horz size and vert size inputs.
- **out res h/v:** Limited resolution.

Lines



Superimposes a line of a specified color, size, and position on a video stream.

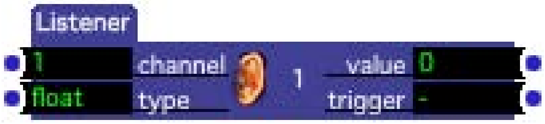
Input Properties

- **rgb in**: The source video stream on which the line will be superimposed. If you leave this input disconnected, the line will be drawn on a black background. If this stream is in the YUV format, it will automatically be converted to RGB.
- **start horz**: The horizontal coordinate for the starting point of the line, specified as a percentage of the incoming video stream's width. A vertical position of zero is halfway between the top and bottom edge.
- **start vert**: The vertical coordinate for the starting point of the line, specified as a percentage of the incoming video stream's height. A vertical position of zero is halfway between the top and bottom edge.
- **end horz**: The horizontal coordinate for the ending point of the line.
- **end vert**: The vertical coordinate for the ending point of the line.
- **line size**: The size of the shape's frame, expressed as a percentage of the incoming video stream's width.
- **line color**: The color of the line.
- **trigger**: The line is drawn when a trigger is received at this input. This is necessary so that you can set the starting and ending coordinate without seeing the line move.
- **bypass**: When turned off, this effect functions normally. When turned on, the effect is disabled and the video input is passed directly to the video output.

Output Properties

- **rgb out**: The line superimposed at on the input video stream in RGB format.

Listener



Receives a value from a Broadcaster actor.

Listeners are primarily used to receive values sent by Broadcasters in a secondary active Scene. (See the Activate Scene actor for more information on secondary Scenes.) Whenever a Broadcaster actor sends a new value, and the channel on which it was transmitted matches that specified by the channel property of this actor, the value will be echoed to the Listener's value output.

You can also use the Broadcaster/Listener pairs within the same scene if desired, since values are broadcast to *all* active scenes.

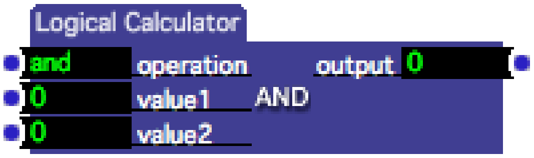
Input Properties

- **channel**: Specifies the channel on which this Listener will receive values. This actor will only "hear" values sent by Broadcaster actors who are broadcasting on a matching channel.
- **type**: Specifies the type of data that will be received by this actor. Setting this property controls the type of the value output property. Note that type conversion will still take place if possible, e.g., if a float is received and this property is set to integer, the floating-point value will be converted to an integer.

Output Properties

- **value**: Whenever a value is received from a Broadcaster, it is sent out of this output. Note that his input is mutable, in that it will change its type (integer, float, video, etc.) to match that specified by the type input property.
- **trigger**: Whenever a value is sent out of the value output property, this output trigger is pulsed.

Logical Calculator (v1.1)



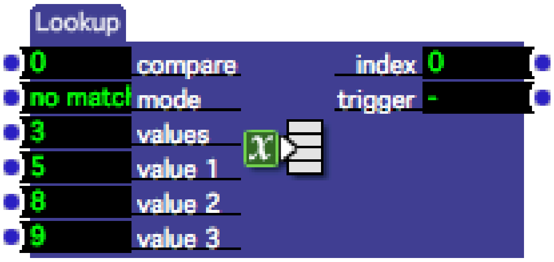
Performs logical, bitwise calculations on two numeric values.

Properties

- **operation**: Determines the operation to be performed on the two numbers. You may choose *and*, *or*, *xor*, *sl (for shit left)*, or *sr (for shift right)*.
- **value1:** the first value for the operation. This number will always be converted to an integer (i.e. the portion after the decimal point will be discarded.)
- **value2:** the second value for the operation. This number will always be converted to an integer (i.e. the portion after the decimal point will be discarded.)
- **output:** the result of the calculation. For the five different operations, this value is calculated as follows:

and	*bitwise logical and of value1 and value2*
or	*bitwise logical or of value1 and value2*
xor	*bitwise logical exclusive or of value1 and value2*
sl	*value1 is shifted left by the number of bits specified by value2*
sr	*value1 is shifted right by the number of bits specified by value2*

Lookup (v1.1)



Lookup

0 compare

no matc mode

3 values

5 value 1

8 value 2

9 value 3

index 0

trigger -

Looks up a value in a table of values, outputting the index of the matched value.

The Lookup actor shown above is configured to have three value inputs, which are set to 3, 5 and 8. If the value 3 was sent to the compare input, the index output would be set to 1 and the trigger output would send a trigger; if the value 5 was sent to the compare input, the index output would be set to 2, etc. If the value 22 was sent to the compare input, the index output would be set to 0, since no match was found. (You can prevent a value from being sent when there is no match using the mode input.)

Input Properties

- **compare**: Each time this value changes, it is compared to all values in the table. If a match is found, the index of that value is sent to the index output and the trigger output sends a trigger.
- **mode**: Determines what will happen if a value arriving at the compare input cannot be found in the list of values specified by the value inputs. When set to

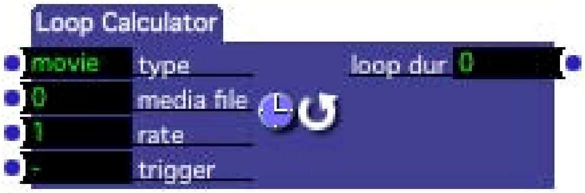
no match, the output index is set to 0 when a match cannot be found. When set to match, the output index will be set only when the compare input matches one of the values specified by the value inputs.

- **values**: Sets the number of values in the lookup table. Increase this value to add input values, decrease it to remove input values.
- **value 1, value 2, etc**: The values in the lookup table.

Output Properties

- **index**: When the compare input changes, and a match is found in one of the value inputs, sends the index of the value that was matched.
- **trigger**: When the compare input changes, and a match is found in one of the value inputs, sends a trigger.

Loop Calculator



Calculates a 'play length' percentage for a specific movie or sound based on the tempo measured at the trigger input

The Loop Calculator is useful when you want the 'play length' (i.e. loop length) of a Movie or Sound player to match the beat of music you are hearing. Typically, one would connect the output of a Keyboard Watcher to the trigger input, and tap the beat of the music using the computer keyboard.

Input Properties

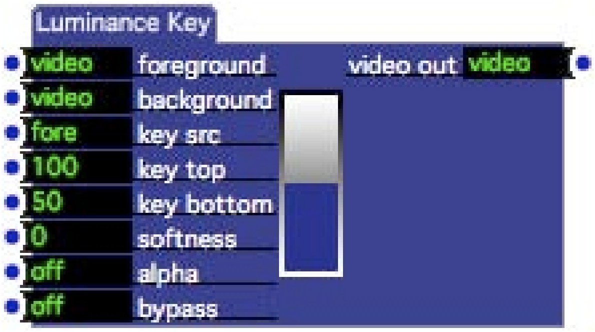
- **type**: Specifies the media type of the file to be controlled. Can be either 'movie' or 'sound'.
- **media file**: Specifies the number of the media file for which the loop will be calculated, as shown in the Media Window. When the type input is set to **movie**, then this is the number of a movie file; when set to **sound** it is the number of a sound file.
- **rate**: The playback rate of the media file. The default setting is 1.0. If the media file that you intend to loop plays at a rate other than 1.0, you should adjust this setting to match that found in the Movie or Sound Player actor. Otherwise, the duration of the loop will not be calculated correctly.
- **trigger**: Trigger this input to measure the tempo of the music being heard and calculate the loop duration. You can connect any trigger output to this input, but a typical usage would have this input connected to the output of a

Keyboard Watcher actor, so that the computer operator can tap the tempo using the computer keyboard.

Output Properties

loop dur*: Connect this output to the* play length *input of a Movie Player or Sound Player actor to adjust the length of the media's loop based on the tempo measured at the* trigger *input. Note that both the media file and rate specified in this actor must match the corresponding values in the Movie or Sound player that is being controlled for the loop duration value to be calculated correctly.*

Luminance Key

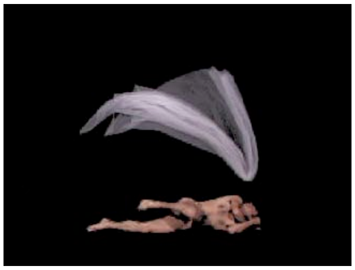


"Keys" two video streams together, allowing the background video stream to show through on the foreground wherever the brightness of the foreground is within a range of brightness.

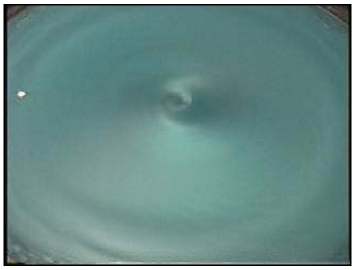
The Luminance Key module uses the brightness of the foreground image to determine whether you see the foreground video stream or background video stream at the output.

In the Luminance Key actor, you determine the range of brightness by adjusting the key top and key bottom properties. Where ever the brightness of the foreground image is between these two values (0 being black, 100 being white, 50 being gray) you will see the foreground image. When the brightness is outside this range, you will see the background. The sharpness of the edge between the foreground and background image can be adjusted using the softness property.

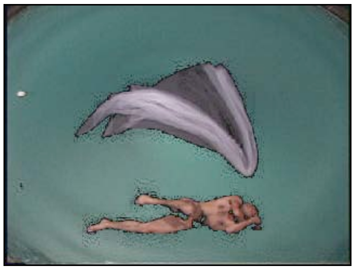
Here is an example.



Foreground



Background



Output

The dark background behind the dancer a good, consistent brightness (or *luminance*) that we can use to key the background image onto the foreground. In this example, the key top was set at 100, the key bottom was set at 5, and the softness was set to 5. Wherever the brightness of the foreground image is inside the range of 5% to 100% you see the foreground. Where it is outside this range (0% to 5%) the background image shows through. The edges between the foreground and background images is softened somewhat because we set the softness property to 5.

To help you understand what brightness you are specifying with the key top and key bottom values, there is a diagram displayed in the center of the actor that represents those properties. It gives you graphic feedback by showing the range of brightness that will allow you to see the foreground image. The slope at the top and the bottom represents the softness property.

Input Properties

- **foreground**: The foreground video stream. Areas of this stream will be seen when its brightness falls within the range specified by the key top and key bottom properties.
- **background**: The background video stream will appear superimposed on the foreground where the foreground brightness falls outside the range the key top and key bottom properties. If you do not connect any video stream to this input, the background defaults to black.
- **key src**: Specifies whether the foreground or background video stream will be compared to the key top/key bottom inputs to used to create the "mask" for the image.
- **key top**: Specifies the top of the range of brightness that will allow you to see the foreground image. Used in conjunction with the key src input.
- **key bottom**: Specifies the bottom of the range of brightness that will allow you to see the foreground image. Used in conjunction with the key src input.
- **softness**: Determines how "hard" the edge between the foreground and background images is. Experiment to see what setting looks best.
- **alpha**: When turned off, the output is a standard RGB video image with no transparency. When turned on, the output image is encoded with an alpha channel (ARGB) based causing the image to be transparent where the foreground brightness falls between the key top and key bottom inputs. (Or the

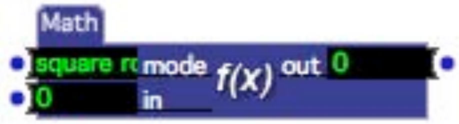
inverse of this if the inverse input is turned on.) The Projector actor will respect this alpha mask when compositing images on the stage. For more information on this using alpha channels, see “Compositing with the Projector” on Page 132.

- **bypass**: When turned off, this effect functions normally. When turned on, the effect is disabled and the video input is passed directly to the video output.

Output Properties

- **video out**: The resulting keyed video image.

Math



Allows you to perform higher math operations on a single floating point number.

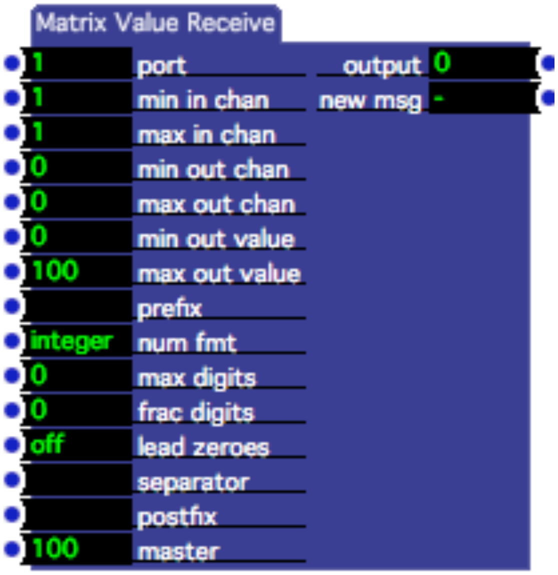
Input Properties

- **mode:** Indicates the math function to execute. Options include
  - Tangent = *tan(x)*
  - Square Root = $\sqrt{x}$
  - Squared = x^2
  - Sine = *sin(x)*
  - Reciprocal = *1/x*
  - pi = 3.141592… (note: ignores input value)
  - log(10) = $log_{10}(x)$
  - log(e) = $log_e(x)$
  - Hyperbolic Tangent = *tanh(x)*
  - Hyperbolic Sine = *sinh(x)*
  - Hyperbolic Cosine = *cosh(x)*
  - Exponent(e) = e^x
  - Cubed = x^3
  - Cosine = *cos(x)*
  - Arc Tangent = *atan(x)*
  - Arc Sine = *asin(x)*
  - Arc Cosine. = *acos(x)*
- **in:** Indicates the input value.

Output Properties

- **out:** Indicates the resulting value.

Matrix Value Receive



Matrix Value Receive

1 port

1 min in chan

1 max in chan

0 min out chan

0 max out chan

0 min out value

100 max out value

prefix

integer num fmt

0 max digits

0 frac digits

off lead zeroes

separator

postfix

100 master

output 0

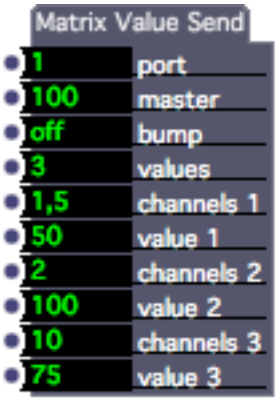
new msg -

Receives a list of values from one or more Matrix Value Send actors, mixes the values (taking into account the intensity of the source Scene) and outputs a text string representation of the result.

The Matrix Value Send and Receive actors together implement a flexible system to control devices that have a large number of values/intensities that need to be manipulated. Examples include DMX output devices, complex MIDI devices, audio mixing consoles, etc.

Generally you would place the Matrix Value Receive actor in a secondary Scene that is always active. (For more information on secondary Scenes, see the Activate Scene actor on page 214.) Then, you would broadcast values to it from one or Matrix Value Send actors in subsequent Scenes.

Each Matrix Value Send actor specifies a list of values, and each of these can be sent to one or more of the Matrix Value Receive actor's *input channels*. Consider the following Matrix Value Send actor.



Matrix Value Send

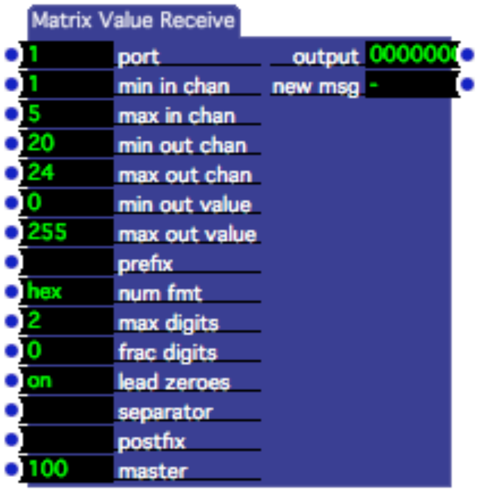
1	port
100	master
off	bump
3	values
1,5	channels 1
50	value 1
2	channels 2
100	value 2
10	channels 3
75	value 3

The values input has been set to 3, giving us three channel/value pairs. The first (channels 1/value 1) sends the value 50 to input channels 1 and 5 on the associated Matrix Value Receive actor listening on port 1. The second sends the value 100 to input channel 2, and the final one sends 75 to channel 10.

The Matrix Value Receive actor does the work of receiving the values on its input channels and mapping them to the output channels. One of the Matrix Value Receive actor's key features is that it will mix values coming from multiple Scenes based on the intensity of the source Scene.

To understand why this is important, consider the following scenario: In the first Scene we have a Matrix Value Send actor sending a value of 100 on channel 1. In the second, another MVS actor sends the value 25 to channel 2. Currently, the first scene is active, and so the output value for channel 1 is 100. Then we use a Jump actor to do a cross fade from the first scene to the second over 10 seconds. Because the Matrix Value Receive actor considers the intensity of the source scene, the output value for channel 1 will smoothly transition from 100 to 25 over the 10 second cross fade time. (Scene 1's intensity is lowering as it fades out, Scene 2's intensity is increasing while it fades in.)

The other key feature of the Matrix Value Receive actor is the ability to map input channels to output channels. Consider the following MVR actor:

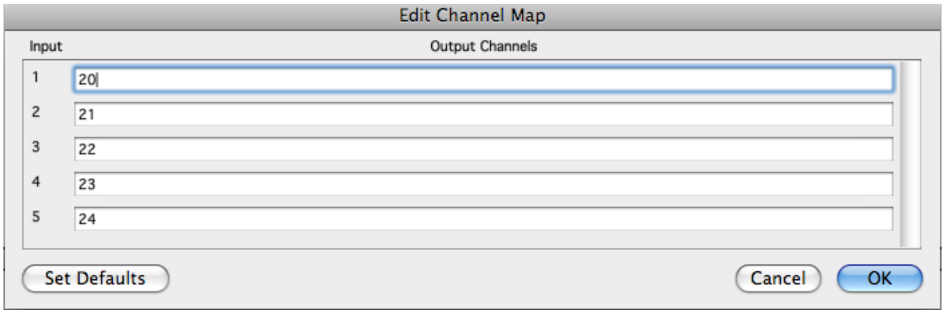


Matrix Value Receive

1	port
1	min in chan
5	max in chan
20	min out chan
24	max out chan
0	min out value
255	max out value
	prefix
hex	num fmt
2	max digits
0	frac digits
on	lead zeroes
	separator
	postfix
100	master

output	000000(
new msg	-

The min in chan and max in chan inputs specify the range of inputs channels to which this MVR actor will listen. In this example, they are set to 1 and 5, indicating that messages sent to other channels will be ignored. The min out chan and max out chan outputs define the range of output channels that will be generated by the actor; in this case output channels 20 through 24, five channels total. With this setup, double-click the body of the actor to open the Edit Channel Map dialog:



Input	Output Channels
1	20
2	21
3	22
4	23
5	24

When you first create the actor, the default settings define a one to one mapping: input 1 is output to channel 20, input 2 to channel 21, etc. Using this editor you can map any input channel to *any number of output channels*. For instance, if you enter 21-23,25 to the right of input channel 5, then values are received on input channel 5 will be output to channels 21, 22, 23 and 25.

This feature is especially useful when outputting to DMX devices, as it essentially implements a "soft patch" feature. This means, as you go from venue to venue and the DMX dimmer numbers change, you need only edit the Channel Map in the main Matrix Value Receive actor, and everything will work precisely as before.

Input Properties

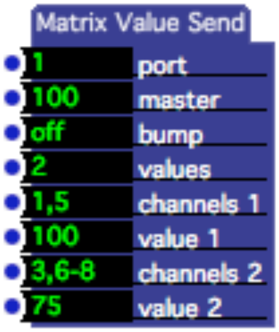
- **port**: The receive port for this Matrix Value Receive; only messages from a Matrix Value Send actor whose port is set to a matching number will be recognized.
- **min in chan:** The minimum input channel number to be received by this actor; any channel values sent by a Matrix Value Send actor that are less than this value are ignored.
- **max in chan:** The maximum input channel number to be received by this actor; any channel values sent by a Matrix Value Send actor that are greater than this value are ignored.
- **min out chan:** The minimum output channel number to be output by this actor. If you reference an output in the Channel Mapping Editor that is less than this number, it will be ignored.
- **max out chan:** The maximum output channel number to be output by this actor. If you reference an output in the Channel Mapping Editor that is less than this number, it will be ignored.
- **min out value:** The minimum value for the generated output values. Input channel values are always expressed as a percentage between 0 and 100%. This percentage is multiplied by the min out value and max out value to calculate the final output value.

- **max out value:** The maximum value for the generated output values. Input channel values are always expressed as a percentage between 0 and 100%. This percentage is multiplied by the min out value and max out value to calculate the final output value.
- **prefix:** Text to be inserted at the beginning of the output text.
- **num fmt:** The format used to generate the text output. integer generates a list of decimal numbers, float generates a list of floating point numbers, hex generates a list of hexadecimal numbers.
- **max digits:** Total number of characters to be occupied by the number, including the decimal point when num fmt is set to float. Extra space is filled with blanks unless the lead zeroes input is turned on.
- **frac digits:** Number of digits for the fractional portion of the number, when the num fmt is set to float. Leave this set to 0 to if you don't want to limit the number of digits.
- **lead zeroes:** When turned on, and max digits is not set to 0 (i.e, disabled), fills any extra space to the left of the integer portion of the number with zeroes. Otherwise, the extra space is filled with blanks.
- **separator:** Text to be inserted between each number when generating the output text. E.g., setting this to a comma (,) would insert a comma after each number.
- **postfix:** Text to be added to the end of the output text.
- **master:** The 'grand master' for output values generated by this actor, from to 0 to 100%. Set this to 100% to send the full output value, or to a lower value to reduce the intensity by the specified percentage.

Output Properties

- **output**: Text output in the form of a list of numbers generated each time a Value Matrix message is received. See the prefix, num fmt, max digits, frac digits, lead zeroes, separator, and postfix inputs for more information on controlling the way in which this text is generated. If the individual output values are desired, use the Text Parser actor to decode the output string.
- **new msg:** Sends a trigger each time a Value Matrix message is received and new output has been generated.

Matrix Value Send



Matrix Value Send

1	port
100	master
off	bump
2	values
1,5	channels 1
100	value 1
3,6-8	channels 2
75	value 2

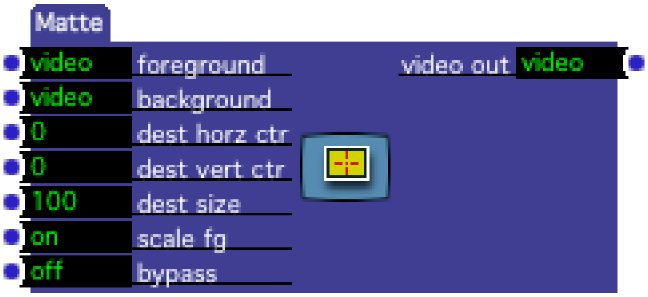
Broadcasts one or more values to input channels in a Matrix Value Receive actor whose 'port' input matches the port number specified in this actor.

The Matrix Value Send and Receive actors together implement a flexible system to control devices that have a large number of values/intensities that need to be manipulated. Examples include DMX output devices, complex MIDI devices, audio mixing consoles, etc. For a complete description, see the Matrix Value Receive actor on page 297.

Input Properties

- **port**: The port number to which Matrix Value messages will be broadcast. Only Matrix Value Receive actors with a port matching this number will receive data from this actor.
- **master:** The "master intensity" for values sent by this actor, from to 0 to 100%. Set this to 100% to send the full value, or to a lower value to reduce the intensity by the specified percentage.
- **bump:** When turned on, forces all values sent by this actor to 100 regardless of the value input setting.
- **values:** Specifies the number of channel and value pairs that will be available in this actor. Increasing this number will add more channel/value inputs; decreasing it will remove them.
- **channels 1, channels 2, etc.:** A list of Matrix Value Receive input channels to which values will be sent. For example, to send values to input channels 10, 11, 12, 15 and 17, you would enter 10-12,15,17. Values for these channels are sent whenever any value input changes.
- **value 1, value 2, etc.:** The value to be sent to the Matrix Value Receive input channels listed in the corresponding channels input. All values specified by this actor are sent whenever any value input changes.

Matte

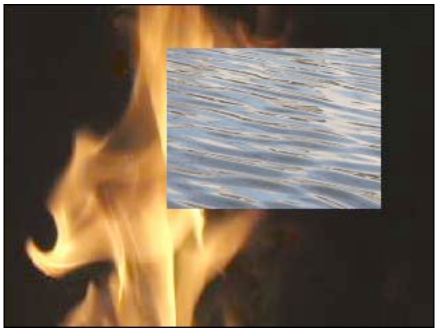


Overlays a scaled foreground video stream on a background video stream.

The entire foreground image is scaled to the size given by the dest size property, and matted on to the background image so that it's center is at the point specified by the horizontal and vertical center properties.

For a higher degree of control (e.g., to scale *part* of the source image onto the background) please see the Matte++ actor in the next section.

Here is an example.



Example Matte
Horz Center = 13%   Vertical Center = -12%   Size = 50%

Input Properties

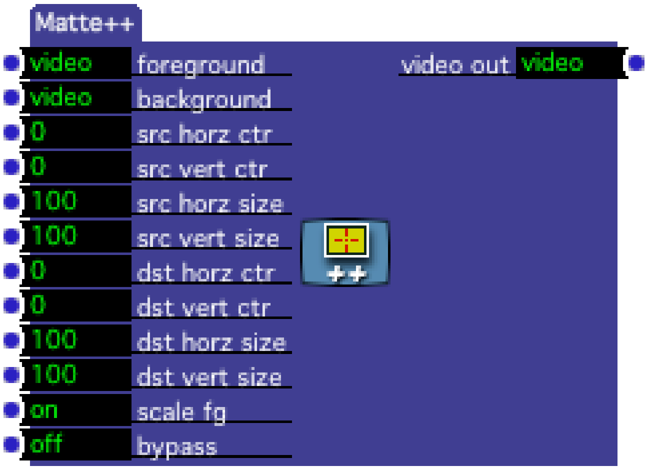
- **foreground**: The foreground video stream. After this stream will is scaled, it will be matted on to the background video stream.
- **background**: The background video stream. The scaled foreground will be matted on to this background.
- **dst horz ctr**: Sets the vertical center of the area within the background video into which the source will be matted, from -100 to 100 percent of the background video's width.
- **dst horz size**: Sets the horizontal size of the area within the background video into which the source will be matted, from 0 to 100 percent of the background video's width.

- **scale fg**: When turned off, prevents the foreground image from being scaled. Normally, if two incoming video streams to be combined are not the same size, Isadora will scale one of the two videos so that their sizes match, even if this were to distort the aspect ratio of one of the two streams. You can prevent the foreground image from being scaled (and thus preserve its aspect ratio relationship to the background) by turning this property off.
- **bypass**: When turned off, this effect functions normally. When turned on, the effect is disabled and the video input is passed directly to the video output.

Output Properties

- **video out**: The resulting matted video image.

Matte++



Overlays a scaled, zoomed and/or panned foreground video stream on a background video stream.

A portion of foreground image cropped according the four 'src' parameters. Then it is scaled to the size specified by the dest horz size and dest vert size properties, and placed at the point specified by the dst horz ctr and dst vert ctr properties.

The cropping of the foreground image is set by four properties. The amount of cropping is specified by src horz size and src vert size, which are specified as a percentage of the source image's size. When set to 100, all of the foreground video stream will be seen. Smaller values show less, which has the visual effect of zooming in. The src horz ctr and src vert ctr properties determine the center point of the crop. Lower values for src horz ctr move left, higher values move right. Lower values for src vert ctr move up, higher values move down.

Note that as the src horz size and src vert size parameters decrease in value, the effect of the src horz ctr and src vert ctr will become more profound. When the two source size parameters are set to their maximum (100%), changing the center parameters will have no effect because there is nowhere to move within the source video stream image.

Here is an example.

Matte++ Example

Input Properties

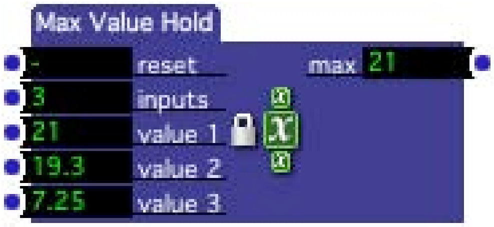
- **foreground**: The foreground video stream. After this stream will is cropped and scaled, it will be matted on to the background video stream.
- **background**: The background video stream. The cropped and scaled foreground will be matted on to this background.
- **src horz ctr**: When src horz size is less than 100%, determines which part of the image will be seen. Lower numbers move left within the source image, higher numbers to the right.
- **src horz ctr**: When src vert size is less than 100%, determines which part of the image will be seen. Lower numbers move up within the source image, higher numbers to the down.
- **src horz size**: Determines the horizontal cropping of the source video stream, from 0 to 100% of the source video stream's width. Lower numbers have the effect of zooming in horizontally.
- **src horz size**: Determines the vertical cropping of the source video stream, from 0 to 100% of the source video stream's height. Lower numbers have the effect of zooming in vertically,
- **dst horz ctr**: Sets the horizontal placement of the cropped source image specified as a percentage of the background video stream's width, from –100 to +100.
- **dst horz ctr**: Sets the vertical placement of the cropped source image specified as a percentage of the background video stream's height, from –100 to +100.
- **dst horz size**: Sets the vertical placement of the cropped source image specified as a percentage of the background video stream's height, from –100 to +100.

- **dst horz size**: Sets the vertical size of the cropped source image, specified as a percentage of the background video stream's height, from 0 to 100.
- **scale fg**: When turned off, prevents the foreground image from being scaled. Normally, if two incoming video streams to be combined are not the same size, Isadora will scale one of the two videos so that their sizes match, even if this were to distort the aspect ratio of one of the two streams. You can prevent the foreground image from being scaled (and thus preserve its aspect ratio relationship to the background) by turning this property off.
- **bypass**: When turned off, this effect functions normally. When turned on, the effect is disabled and the video input is passed directly to the video output.

Output Properties

- **video out**: The resulting matted video image.

Max Value Hold



Outputs the maximum value that has been received since the last reset.

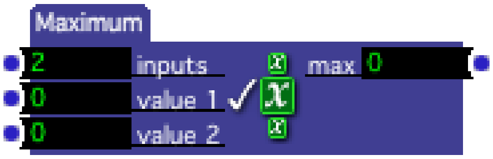
Input Properties

- **reset**: Resets the output to zero.
- **inputs**: Specifies the number of value inputs for this actor, from 1 to 16.
- **value 1, value 2, etc**.: When a value arrives at one of these inputs, it is compared to the output. If it is greater than the output, the new value is stored and sent out of the output port. If a value arrives that is less than the current value of the output, nothing happens.

Output Properties

- **max**: The maximum value that has been received since the last reset.

Maximum



Outputs the current maximum value of all of its inputs.

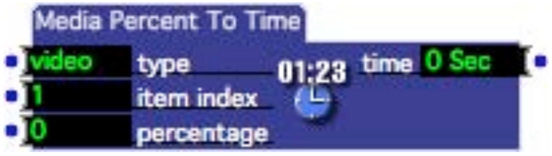
Input Properties

- **inputs**: Specifies the number of value inputs for this actor, from 1 to 16.
- **value 1, value 2, etc**.: When a value arrives at one of these inputs, it is compared to all of the other value inputs. If it is the greatest of all of these, the new value is sent out of the output port. If a value arrives that is less than or equal to any of the other input values, nothing happens.

Output Properties

- **max**: The current maximum value of all of the value inputs.

Media Percent to Time (v1.2)



Converts a duration percentage for a specific video or sound file into a real time value specified in seconds. The output of this actor can be connected into any other actor that has an input measured in seconds – e.g., the Envelope Generator, Trigger Delay, etc.

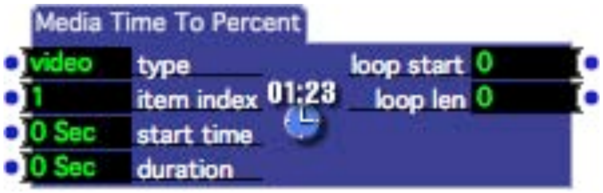
Input Properties

- **type:** Set to ‘video’ to reference a video file in the Media Window; set to ‘audio’ to reference a sound file.
- **item index**: The index of the video or sound file in the Media Window.
- **percentage**: The percentage of the duration that will be converted into a real time duration.

Output Properties

- **time:** For the specified video or sound file, the real time duration of the percentage specified at the percentage input.

Media Time to Percent (v1.2)



video type
1 item index
0 Sec start time
0 Sec duration
loop start 0
loop len 0

Converts a start time and duration, specified in seconds, to a loop start and loop length percentage for a specific video or sound file. Allows you to specify the loop start and loop length for a Movie or Sound Player actor using real-time values.

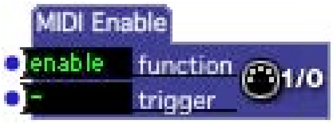
Input Properties

- **type:** Set to ‘video’ to reference a video file in the Media Window; set to ‘audio’ to reference a sound file.
- **item index**: The index of the video or sound file in the Media Window.
- **start time**: A start time, specified in seconds, to be converted into a loop start percentage.
- **duration**: A duration, specified in seconds, to be converted into a loop length percentage.

Output Properties

- **time:** For the specified video or sound file, the real time duration of the percentage specified at the percentage input.

Midi Enable



enable function
- trigger

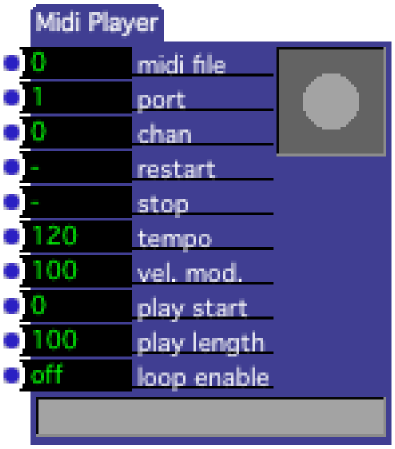
Enables or disables MIDI input.

There occasionally may be situations where you want to temporarily disable all MIDI input. The MIDI Enable actor allows you to accomplish this goal.

Input Properties

- **function:** When set to disable, a trigger a the trigger input will disable all MIDI input. When set to enable and a trigger is received, MIDI input is enabled.
- **trigger**: Enables or disables MIDI input when a trigger is received, depending on the setting of the function input.

Midi Player



Plays a standard MIDI file to the specified MIDI port.

There are three main things that you can control when manipulating the playback of a standard MIDI file: its speed, the portion of the file that will play and whether or not that portion will loop, and the velocity of its note on messages.

The portion of the sound that will play is called the *play segment*. The play segment is determined by the play start and play length properties, both of which are expressed as a percentage of the MIDI file's total length. The play length indicates how long the play segment will be, while the play start specifies where that chunk will start. For example, with a MIDI file that was 60 measures long, a play start of 50% and a play length of 10% would indicate that the play segment would start at measure 31 (30 measures from measure 1) and have a duration of 6 measures. You can choose to play this segment continuously by turning the loop enable property on.

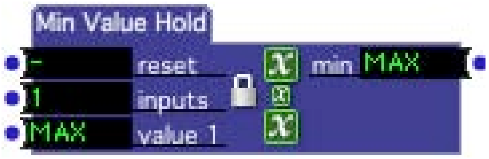
The green bar at the bottom of the actor shows the play segment in bright green. The thin yellow line that moves across that bright green bar indicates the current position.

Input Properties

- **midi file**: The number of the MIDI file you want to play, as shown in the Media Window. When the number of a valid movie is entered here, its name will appear to the right of the number.
- **port**: The MIDI port to which the file's MIDI data will be sent. These port numbers correspond to the Destinations shown in the MIDI Setup dialog.
- **channel**: When this value is set to 0, the channel given in the MIDI file itself is used. If this value is set to a number between 1 and 16, all MIDI messages in the file are forced to that channel.
- **restart**: When triggered, starts playing from the position specified by the play start parameter.
- **stop**: Stops playing the MIDI file, turning off any sounding notes.

- **velocity mod**: When set to 100, the Note On messages are sent with the velocity specified in the MIDI file. When set to values between 0 and 99, the Note On velocities are scaled by that percentage. For instance, if this property were set to 50%, and the note on in the file had a velocity of 64, it would be sent out with a velocity of 32.
- **play start**: Determines the starting point of the play segment (the portion of the MIDI file that will play) as a percentage of the file's total duration, ranging from 0 to 100.
- **play length**: Determines the length of the play segment (the portion of the MIDI file that will play) as a percentage of the file's total duration, ranging from 0 to 100.
- **loop enable**: When this property is turned off, the play segment will play once each time the restart input is triggered. When turned on, once the file starts playing it will continue to play by looping back to the start of the play segment each time the end of that segment is reached.

Min Value Hold



Outputs the minimum value that has been received since the last reset.

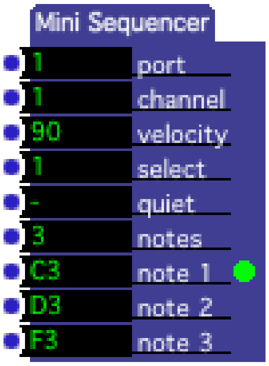
Input Properties

- **reset**: Resets the output to MAX.
- **inputs**: Specifies the number of value inputs for this actor, from 1 to 16.
- **value 1, value 2, etc**.: When a value arrives at one of these inputs, it is compared to the output. If it is less than the output, the new value is stored and sent out of the min output port. If a value arrives that is greater than the current value of the output, nothing happens.

Output Properties

- **min**: The minimum value that has been received since the last reset.

Mini Sequencer



Mini Sequencer

1	port
1	channel
90	velocity
1	select
-	quiet
3	notes
C3	note 1 ●
D3	note 2
F3	note 3

Sends a sequence of MIDI notes.

The Mini Sequencer is designed to allow you to trigger individual MIDI notes from a set you define. You specify the number of notes by setting the notes property, and then enter the pitches in properties labeled note 1, note 2, etc. Two things happen each time you send a value to the select input. First, a note off message is sent for any previously sounding notes. Then, the pitch associated with the selected note property will be sent to MIDI port and channel specified by the port and channel properties. The note continues to sound until you 1) send another note, 2) trigger the quiet input, or 3) leave the scene.

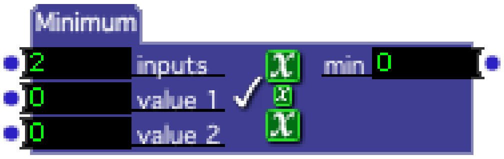
A green dot will appear next to the note that is currently sounding. If there is no currently sounding note, the green dot will not be shown.

You can use you can use the **Counter** to drive the select input and send the notes out in the order you have specified. Or use the **Random** actor to randomly select the notes to be played.

Input Properties

- **port**: The MIDI port on which the message will be sent. These port numbers correspond to the Destinations shown in the MIDI Setup dialog.
- **channel**: The MIDI Channel on which the message will be sent.
- **velocity**: The velocity for the next Note On message.
- **select**: When a new value arrives at this input, sends a MIDI Note On message with the pitch given by the corresponding note input, i.e. if you input the value 3 here, a Note On message will be sent with the pitch given by the note 3 input property
- **quiet**: Sends a note off message for any currently sounding notes.
- **note 1, note 2, note 3**: The pitches for the Note On messages to be sent, as chosen by the select input.

Minimum



Outputs the current minimum value of all of its inputs.

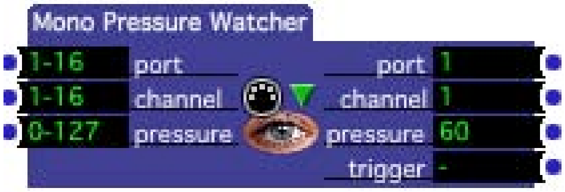
Input Properties

- **inputs**: Specifies the number of value inputs for this actor, from 1 to 16.
- **value 1, value 2, etc**.: When a value arrives at one of these inputs, it is compared to all of the other value inputs. If it is the least of all of these, the new value is sent out of the output port. If a value arrives that is greater than or equal to than the any of the other input values, nothing happens.

Output Properties

- **min**: The current minimum value of all of the value inputs.

Mono Pressure Watcher



Watches for MIDI Monophonic Pressure messages, outputting the values associated with that message and sending a trigger when one is seen.

The Mono Pressure Watcher can look for a message with a specific pressure value or a range of pressure values depending on the setting of the input properties. When a message meeting all of the criterion specified by input properties is seen, the values associated with that message are sent out of the output ports and a trigger is sent out of the trigger output.

Input Properties

- **port**: Specifies the MIDI Port on which the message must arrive to be seen. These port numbers correspond to the ports shown in the MIDI Setup dialog. You may specify a single port or a range of ports.
- **channel**: Specifies the MIDI Channel on which the message must be received before it will be seen by this watcher, from 1 to 16. You may specify a single port or a range of ports.

- **value**: Specifies the pressure value or range of values that will be seen, from 0 to 127.

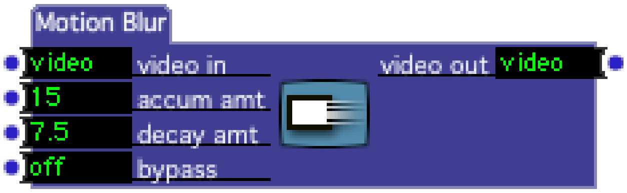
Note that for a Monophonic Pressure message to be seen by this watcher, its values must fall within the range of values for specified by all three of the input properties.

Output Properties

When this watcher sees a Control Change message that falls within the range of values specified by all of the input properties, the following values are sent out of the outputs:

- **port**: The MIDI Port on which the message arrived.
- **channel**: the message's MIDI Channel.
- **pressure**: the message's pressure value.
- **trigger**: sends a trigger each time a message is seen.

Motion Blur (v1.1)



Blurs a video stream by gradually adding in the input video stream while it simultaneously darkens the existing output.

The net effect of Motion Blur is that things that are still in the image (i.e. the background) look normal, but anything that is moving is blurred. Setting the accum amt and decay amt determines the amount of blurring. Higher values mean less blurring, lower values mean more. For best results, the accum amt and decay amt inputs should be set to the same value. However, interesting results can be achieved by setting them to two different values.

Technically, Motion Blur maintains an output buffer that is initially black. As each new frame of video arrives at the video in input, a percentage of it, specified by the accum amt input, is added to the buffer. Simultaneously, the output buffer is darkened by an amount specified by the decay amt input.

Input Properties

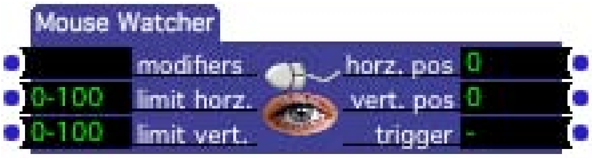
- **video in**: The video input stream
- **accum amt.**: How much of the incoming video stream will be added to the buffer, expressed as a percentage from 0 to 100%. Lower values mean that new frames of video will have less influence on the existing image.

- **decay amt**: How fast the output buffer will tend to darken, expressed as a percentage from 0 to 100%. Higher values mean that the buffer will decay to black faster.
- **bypass**: When turned off, this effect functions normally. When turned on, the effect is disabled and the video input is passed directly to the video output.

Output Properties

- **video out**: The blurred video output stream.

Mouse Watcher



Outputs the current position of the mouse, optionally choosing to see changes in position when specific modifier keys are held down.

Input Properties

- **modifiers**: Specifies the modifier keys that must be held down before mouse movement will be seen by this watcher. Options include:

MacOS	***Windows***
cmd = d = command key	*alt = a = alt key*
ctl = c = control key	*ctl = c = control key*
opt = o = option key	*win = w = windows key*
shf = s = shift key	*shf = s = shift key*

*Note that when you save a file on MacOS and read it under Windows the **cmd** modifier becomes the **alt** modifier, and **opt** becomes **win**. The reverse is true when you move from Windows to MacOS.*

To enter a new set of modifiers, click on the modifiers value edit box and type the codes for modifiers you desire separated by hyphens. (You can use either the three letter or single letter modifiers when typing the new modifiers.) If you wanted the watcher to only see the mouse move when the option and command keys were down, enter opt-cmd and press enter.

To remove all modifiers, click on the modifiers value edit box, press a space, and press enter.

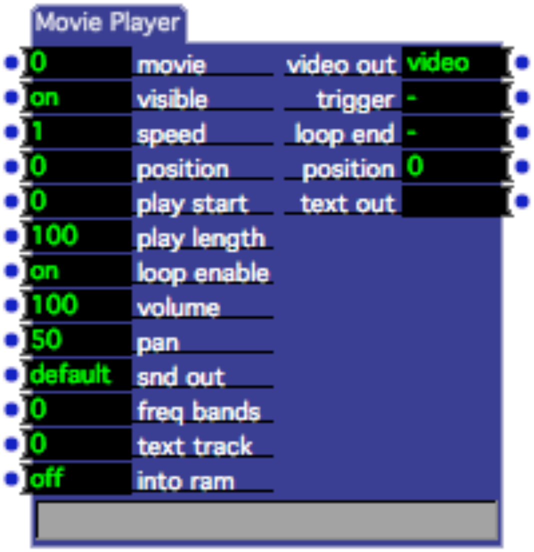
- **limit horz.**: Limits the range of horizontal movement that this watcher will see, specified as a percentage of the width of the main display. For example, if you set this range to 0-50, the mouse will only be seen moving when it is in the left half of the display.

- **limit vert.**: Limits the range of vertical movement that this watcher will see, specified as a percentage of the height of the main display. For example, if you set this range to 50-100, the mouse will only be seen moving when it is in bottom left half of the display.

Output Properties

- **horz. pos**: The horizontal position of the mouse, ranging between 0% and 100%. This percentage is measured within the range specified in the limit horz input property, not the entire width of the display. So, if the limit horz property was set to 0-50, and the mouse was 25% of the way across the main display (i.e. halfway between 0% and 50%) then horz pos. output would be set to 50.
- **vert. pos**: The vertical position of the mouse, ranging between 0% and 100%. This percentage is measured within the range specified in the limit vert input property, not the entire height of the display. So, if the limit vert property was set to 50-100, and the mouse was 75% of the way down the main display (i.e. halfway between 50% and 100%) then vert pos. output would be set to 50.
- **trigger**: Sends a trigger every time the horz. pos or vert. pos changes.

Movie Player



Movie Player

0 movie
on visible
1 speed
0 position
0 play start
100 play length
on loop enable
100 volume
50 pan
default snd out
0 freq bands
0 text track
off into ram

video out video
trigger -
loop end -
position 0
text out

Plays a movie to a video stream, allowing control over its playback characteristics

There are three main things that you can control when manipulating the playback of a movie: its speed, the portion of the movie that will play and whether or not that portion will loop, and is sound characteristics.

The portion of the sound that will play is called the *play segment*. The play segment is determined by the play start and play length properties, both of which are expressed as a percentage of the movie's total length. The play length indicates how long the play segment will be, while the play start specifies where that chunk will start. For example, with a movie that was 60 seconds long, a play start of 50% and a play length of 10% would indicate that the play segment would start 30 seconds into the movie and be 6 seconds long. You can choose to play this segment continuously by turning the loop enable property on.

The green bar at the bottom of the actor shows the play segment in bright green. The thin yellow line that moves across that bright green bar indicates the current movie position.

Note that the Movie Player actor does not output video to a Stage. Instead it produces a video stream that can be connected to other video manipulation actors, or that can be connected to the Projector actor to show the video on Stage.

Input Properties

- **movie**: The number of the movie you want to play, as shown in the Media Window. When the number of a valid movie is entered here, its name will appear to the right of the number.
- **visible**: When turned *on* the movie plays and the resulting video stream is sent out of the video out output. When turned *off*, the movie stops playing and is unloaded from memory.
- **speed**: The speed of the movie, from –10 to 10 times normal speed. The default setting is 1.0, which plays the movie forward at normal speed. 0.5 would play the movie forward at half speed. 2.0 plays the movie forward at twice normal speed. Negative values play the movie in reverse.
- **position**: Jumps to the specified position *within the play segment* whenever a new value is received on this input. (The play segment is defined by the play start and play length properties – see below.) This parameter is expressed as a percentage of the play length, from 0 to 100.
- **play start**: Determines the starting point of the play segment (the portion of the movie that will play) as a percentage of the movie's total length, ranging from 0 to 100.
- **play length**: Determines the length of the play segment (the portion of the movie that will play) as a percentage of the movie's total length, ranging from 0 to 100.
- **loop enable**: If this property is turned off, the play segment will play once each time the Movie Player's Scene is activated, or when its visible property is turned on. If this property is turned on, once the movie starts playing it will continue by looping back to the start of the play segment when the end of that segment is reached.
- **volume**: Sets the volume of the Movie's sound track, if one is present. Expressed as a percentage of the sound track's normal volume.

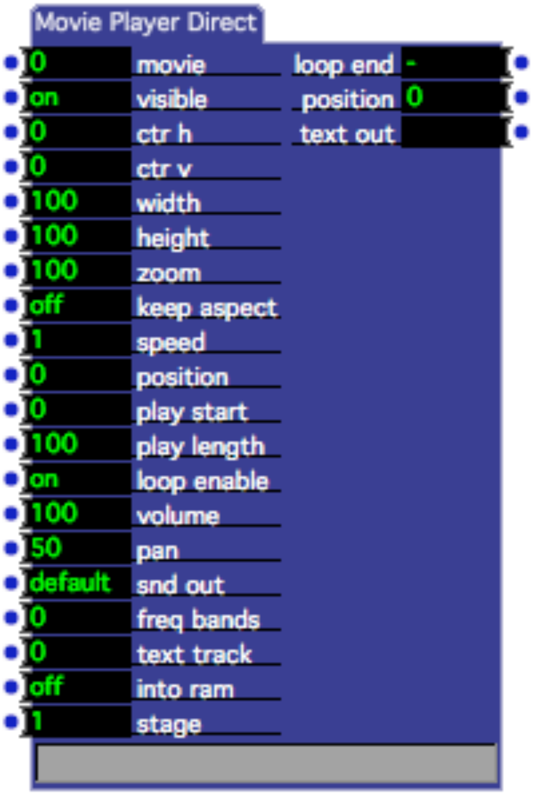
- **pan**: Controls the panning of the sound, from 0 to 100. 0 is left, 100 is right, 50 is center.
- **snd out**: The sound output routing for this movie's audio. std = built-in output, e1-2 = output on external sound device channels 1 and 2, e3-4 = output on external sound device channels 3 and 4, etc. If no external device is present when the movie is played, or if that device does not have the requested channels, the sound will be sent to the built-in interface.

  See the section "Using External Multi-Channel Sound Output" on Page 141 for more information.
- **freq bands:** Enables/disables monitoring of the audio level of this movie's soundtrack at specific frequencies. If set to zero, frequency monitoring is disabled. Setting the freq bands to a number greater than zero, will divide the audio frequency range into the specified number of bands adding an output for each one. These outputs will report the energy level for within that band. For example, if the movie's sampling rate is 48 Khz and you set this input to 5, the total output range is 24 Khz (half the sampling frequency) and each band represents a range of 4.8 Khz (24 divided by 5).
- **text track:** Specifies the text track whose text will be sent to the text out output. If a movie has one or more text tracks, set this value to the index of the track whose text is to be sent to the text out output, e.g, 1 for the first text track, 2 for the second, etc.
- **into ram**: When set to on, Isadora attempts to load the entire movie into RAM (Random Access Memory) for faster playback. NOTE: This can consume large amounts of your system's memory - be cautious when using this feature.

Output Properties

- **video out**: The video stream produced by playing the movie.
- **trigger**: Sends a trigger each time a new frame of video appears at the video out port.
- **loop end**: Sends a trigger each time a the end of the play segment is reached.
- **position**: Reports the current position within the play segment.
- **text out:** Output from a movie's text track. See the text track input property for more information.
- **freq 1, freq 2, etc.**: Output that reports the audio level within a specific frequencies range. These outputs will only appear when the freq bands input property is set to a value greater than zero. See freq bands input property for more information.

Movie Player Direct


Movie Player Direct

0 movie
on visible
0 ctr h
0 ctr v
100 width
100 height
100 zoom
off keep aspect
1 speed
0 position
0 play start
100 play length
on loop enable
100 volume
50 pan
default snd out
0 freq bands
0 text track
off into ram
1 stage

loop end -
position 0
text out

Plays a movie directly to the stage, allowing control over its scaling, position, and playback characteristics.

Movie Player Direct works in the same way as the more often used Movie Player/Projector actor combination, except that it bypasses Isadora's video processing engine and renders the video directly to the Stages. This means that it will give the highest possible frame rate when playing the movie, but that you won't be able to process the video stream with any other actors, nor will you be able to fade it in, composite it with other video streams, etc.

See Movie Player actor above for a definition of the play segment, and other characteristics that these two actors share.

Input Properties

- **movie**: The number of the movie you want to play, as shown in the Media Window. When the number of a valid movie is entered here, its name will appear to the right of the number.
- **visible**: When turned *on* the movie plays and the resulting video stream is sent out of the video out output. When turned *off*, the movie stops playing and is unloaded from memory.

- **ctr h**: The horizontal center of the image, expressed as a percentage of the stage width. Positive numbers move the video image to the right, negative numbers move it to the left.
- **ctr v**: The vertical center of the image, expressed as a percentage of the stage height. Positive numbers move the video image down, negative numbers move it up.
- **width**: The width of the rendered video image, expressed as a percentage of the stage width.
- **height**: The height of the rendered video image, expressed as a percentage of the stage height.
- **zoom**: The zoom factor of the projected video image, expressed as a percentage of the stage size. 100 percent will project an image that fills the stage. Lower zoom out (make the image smaller), higher numbers zoom in (make the image bigger).
- **keep aspect:** When turned on, the aspect of the incoming video stream will be used to determine the aspect ratio of the rectangle into which the image is rendered. The resulting image will be letterboxed horizontally or vertically as needed. When turned off the video image will be scaled to fill the entire stage. Note that the final aspect ratio is also affected by the width and height parameters.
- **speed**: The speed of the movie, from –10 to 10 times normal speed. The default setting is 1.0, which plays the movie forward at normal speed. 0.5 would play the movie forward at half speed. 2.0 plays the movie forward at twice normal speed. Negative values play the movie in reverse.
- **position**: Jumps to the specified position *within the play segment* whenever a new value is received on this input. (The play segment is defined by the play start and play length properties – see below.) This parameter is expressed as a percentage of the play length, from 0 to 100.
- **play start**: Determines the starting point of the play segment (the portion of the movie that will play) as a percentage of the movie's total length, ranging from 0 to 100.
- **play length**: Determines the length of the play segment (the portion of the movie that will play) as a percentage of the movie's total length, ranging from 0 to 100.
- **loop enable (v1.1)**: If this property is turned off, the play segment will play once each time the Movie Player's Scene is activated, or when its visible property is turned on. If this property is set to on, once the movie starts playing it will continue by looping back to the start of the play segment when the end of that segment is reached. When it is set to palindrome, the movie will play forward to the end of the play segment, then play backward to the start of the segment, and so forth.
- **volume**: Sets the volume of the Movie's sound track, if one is present. Expressed as a percentage of the sound track's normal volume.

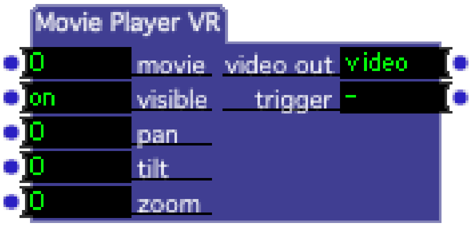
- **pan**: Controls the panning of the sound, from 0 to 100. 0 is left, 100 is right, 50 is center.
- **snd out**: The sound output routing for this movie's audio. std = built-in output, e1-2 = output on external sound device channels 1 and 2, e3-4 = output on external sound device channels 3 and 4, etc. If no external device is present when the movie is played, or if that device does not have the requested channels, the sound will be sent to the built-in interface.

  See the section "Using External Multi-Channel Sound Output" on Page 141 for more information.
- **freq bands:** Enables/disables monitoring of the audio level of this movie's soundtrack at specific frequencies. If set to zero, frequency monitoring is disabled. Setting the freq bands to a number greater than zero, will divide the audio frequency range into the specified number of bands adding an output for each one. These outputs will report the energy level for within that band. For example, if the movie's sampling rate is 48 Khz and you set this input to 5, the total output range is 24 Khz (half the sampling frequency) and each band represents a range of 4.8 Khz (24 divided by 5).
- **text track:** Specifies the text track whose text will be sent to the text out output. If a movie has one or more text tracks, set this value to the index of the track whose text is to be sent to the text out output, e.g, 1 for the first text track, 2 for the second, etc.
- **into ram**: When set to on, Isadora attempts to load the entire movie into RAM (Random Access Memory) for faster playback. NOTE: This can consume large amounts of your system's memory - be cautious when using this feature. Loading into RAM is no longer recommended - it has been kept only for compatibility with past versions of Isadora.
- **stage**: Specifies the stage upon which this movie's video will appear.

Output Properties

- **loop end:** Sends a trigger each time a the end of the play segment is reached.
- **position:** Reports the current position within the play segment.
- **text out:** Output from a movie's text track. See the text track input property for more information.
- **freq 1, freq 2, etc.**: Output that reports the audio level within a specific frequencies range. These outputs will only appear when the freq bands input property is set to a value greater than zero. See freq bands input property for more information.

Movie Player VR



Plays a QuickTime VR movie to the stage, allowing control over its pan, tilt, and zoom.

Movie Player VR only works with QuickTime VR movies. If you try to use it to play a movie that is not a QuickTime VR movie, you won’t see any output.

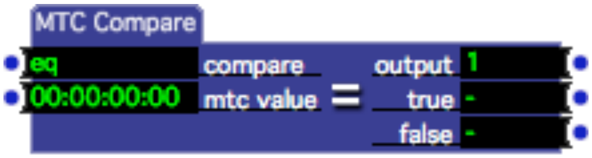
Input Properties

- **movie**: The number of the movie you want to play, as shown in the Media Window. When the number of a valid movie is entered here, its name will appear to the right of the number.
- **visible**: When turned *on* the movie plays and the resulting video stream is sent out of the video out output. When turned *off*, the movie stops playing and is unloaded from memory.
- **pan**: The pan (or rotation) of the movie, from 0 to 100 percent of its pan range.
- **tilt**: The tilt of the movie, from 0 to 100 percent of its tilt range
- **zoom**: The zoom (also known as field of view) of the movie, from 0 to 100 percent of its zoom range. Smaller numbers zoom out, larger numbers zoom in.

Output Properties

- **video out**: The video stream produced by playing the movie.
- **trigger**: Sends a trigger each time a new frame of video appears at the video out port.

MTC Compare



Allows you to trigger events based on incoming MIDI Time Code values.

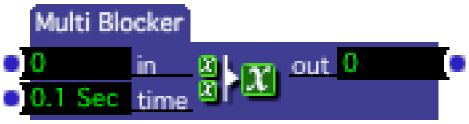
Input Properties

- **compare**: Determines the comparison to be performed on the between the incoming MIDI Time Code values and the value given in the mtc value input. You may choose *eq*, *ne*, *lt*, *le*, *gt*, or *ge*, representing equal, not equal, less than, less than or equal, greater than, greater than or equal.
- **mtc value**: The time code value to which the incoming time code will be compared using the operation specified at the compare input.

Output Properties

- **output**: 1 when the comparison is true; 0 otherwise. E.g., if the compare input is set to gt (greater than) and the incoming MIDI Time Code value is greater than the value specified at the mtc value input, this output would be a 1.
- **true**: Sends a trigger whenever the result of the comparison changes from false to true.
- **false**: Sends a trigger whenever the result of the comparison changes from true to false.

Multi Blocker



Filters out values that are too closely spaced in time.

Multi Blocker is useful in situations where you have a stream of input values that has so many values that it is overwhelming the input of another actor, or if you have a “noisy” input that generates multiple triggers or values and you only want to see the first of these. Multi Blocker solves this problem by ensuring that a specific amount of time has passed before it will pass the new value from the input to the output.

Note that the value in and value out properties are mutable. When you connect an output to the value in input, both value in and value out mutate their type (trigger, integer, float, video, etc.) and their minimum and maximum values to match those of the output property that was connected to value in. E.g., if you connect a video output to value in, the aforementioned properties change their type to video, if you connect a number output, they all change to numbers, etc.

Input Properties

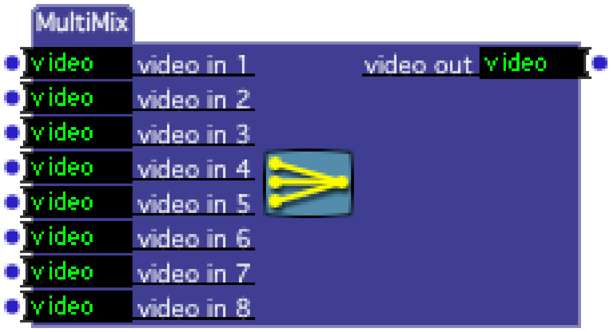
- **value in**: The incoming stream of values.

- **time**: The minimum amount of time that must pass between values, given in seconds. If two or more values arrive with less than this amount of time between them, only the first value is sent to the output.

Output Properties

- **value out**: The filtered stream of values from the input, with at least the amount of time specified by the time input property between them.

MultiMix (v1.1)



Sums up to eight video streams into one output.

MultiMix is a little bit like the Video Mixer – it allows you mix several video streams together. The difference (aside from the number of inputs) is that MultiMix "sums together" up to eight streams of video, literally adding their pixels together to each other to produce the output. With the Video Mixer's mix input set to 50%, each of the images is darkened before the two are added together, allowing you to produce crossfades. With MultMix, you can add together two or more video streams without reducing their brightness.

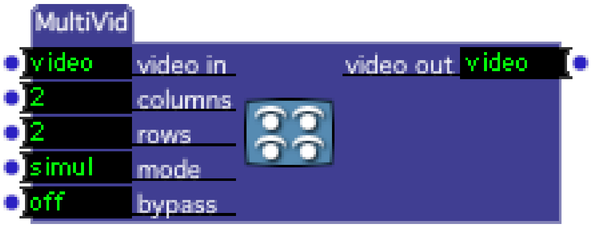
Input Properties

- **video in 1-8**: Video streams to be summed together.

Output Properties

- **video out**: The "summed" video output stream.

MultiVid



MultiVid

video video in

2 columns

2 rows

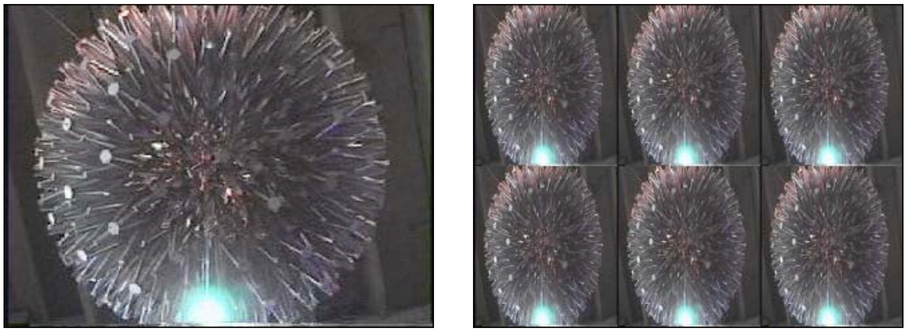
simul mode

off bypass

video out video

Makes multiple copies of the source video, arranged as a grid of images.

MultiVid allows you to “tile” an incoming video stream, creating a grid made up of multiple copies of the original. You can specify the number of rows and columns in the grid. You may optionally choose to copy the images sequentially, i.e. each time a new frame of video arrives, copy it to the next position in the grid. This option creates interesting delay effects as you see the sequential frames appear in the grid.



MultiVid – Original Image and Result (3 Columns, 2 Rows)

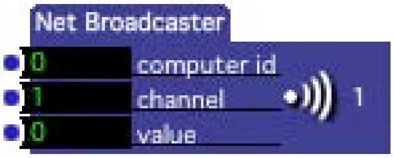
Input Properties

- **video in**: The incoming video stream.
- **columns**: The number of columns in the output grid, from 1 to 16.
- **rows**: The number of rows in the output grid, from 1 to 16.
- **mode**: When set to simul, the incoming video stream is copied to all of the grid positions simultaneously. When set to scan each new frame that arrives at the input is copied to the next position in the grid, moving from left to right and then top to bottom.
- **bypass**: When turned off, this effect functions normally. When turned on, the effect is disabled and the video input is passed directly to the video output.

Output Properties

- **video out**: The “tiled” video output stream.

Net Broadcaster



Sends a numeric value to other computers on a Local Area Network.

Net Broadcaster allows you to send values from one computer to another when they are connected via a local area network. Whenever a numeric value is received at the Net Broadcaster's value input, that value is "broadcast" to over the local area network on the channel specified by the channel input property. Any copy of Isadora on the LAN whose Net ID matches the specified target id, and who has an active Listener actor set to receive on a matching channel will "hear" the broadcast value and send that value to its value output. Note that if the Net Broadcater's target id is set to 0, then all machines on the network will receive the broadcast values, regardless of their Net ID.

Currently you can only send numeric values using the Net Broadcaster. You cannot send video or audio data.

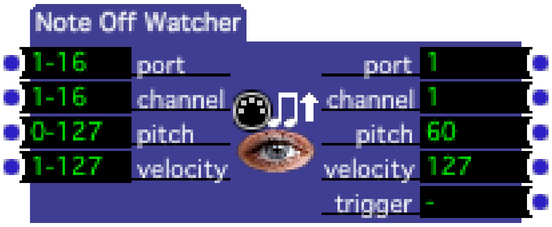
For this module to work, the following conditions must be true:

1) The computers are connected by a local area network. This network can be a physical, Ethernet connection, a wireless connection, or any other hardware that supports the TCP/IP protocol. The actual address doesn't matter, as Isadora uses a technique called "multi-casting" that does not require the sender to know the IP address of the target. What does matter is that your machine has a valid address.
2) The computers must have a valid TCP/IP address when Isadora is *started up*.

Input Properties

- **target id**: When this input is set to 0, the message will be received by every machine on the network. When it is non-zero, then only the machine whose Net ID matches the specified value will receive the message. The Net ID can be set in the Preferences under the "Net" tab.
- **channel**: Specifies the channel on which this value will be broadcast. Only Listener actors whose channel input property the value specified here will "hear" the broadcast.
- **value**: Whenever a numeric value is received at this input, it is broadcast over the LAN with the target id and channel specified. Note that his input is mutable, in that it will change its type (integer, float, etc.) to match that of the output property to which it is linked.

Note Off Watcher



Watches for MIDI Note Off messages, outputting the values associated with that message and sending a trigger when one is seen.

The Note Off Watcher can look for a specific Note Off message or a range of messages depending on the setting of the input property values. When a message meeting all of the criterion specified by input properties is seen, the values associated with that message are sent out of the output ports and a trigger is sent out of the trigger output.

Input Properties

- **port**: Specifies the MIDI Port on which the message must arrive to be seen. These port numbers correspond to the ports shown in the MIDI Setup dialog. You may specify a single port or a range of ports.
- **channel**: Specifies the MIDI Channel on which the message must be received before it will be seen by this watcher, from 1 to 16. You may specify a single port or a range of ports.
- **pitch**: Specifies the MIDI pitch or range of pitches that will be seen, from 0 to 127 or C-2 to G8. (You can choose to see the pitches using their note names by clicking on the title pitch next to the value edit box and choosing **Actors > Display > MIDI Note**.)
- **velocity**: Specifies the velocity or range of velocities that will be seen, from 1 to 127. (A velocity of 0 means that this is a Note Off message, per the MIDI Specification.)

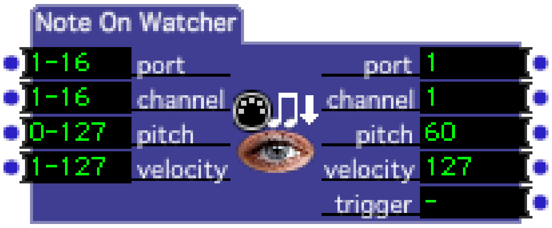
For a Note Off message to be seen by this watcher, its values must fall within the range of values for specified by all four of the input properties.

Output Properties

When this watcher sees a Note Off message that falls within the range of values specified by all four of the input properties, the following values are sent to the outputs:

- **port**: The MIDI Port on which the message arrived.
- **channel**: The Note Off message's MIDI Channel.
- **pitch**: The Note Off message's pitch.
- **velocity**: The Note Off message's velocity.
- **trigger**: Sends a trigger each time a message is seen.

Note On Watcher



Note On Watcher

1-16 port | port 1
1-16 channel | channel 1
0-127 pitch | pitch 60
1-127 velocity | velocity 127
trigger -

Watches for MIDI Note On messages, outputting the values associated with that message and sending a trigger when one is seen.

The Note On Watcher can look for a specific Note On message or a range of messages depending on the setting of the input property values. When a message meeting all of the criterion specified by input properties is seen, the values associated with that message are sent out of the output ports and a trigger is sent out of the trigger output.

Input Properties

- **port**: Specifies the MIDI Port on which the message must arrive to be seen. These port numbers correspond to the ports shown in the MIDI Setup dialog. You may specify a single port or a range of ports.
- **channel**: Specifies the MIDI Channel on which the message must be received before it will be seen by this watcher, from 1 to 16. You may specify a single port or a range of ports.
- **pitch**: Specifies the MIDI pitch or range of pitches that will be seen, from 0 to 127 or C-2 to G8. (You can choose to see the pitches using their note names by clicking on the title pitch next to the value edit box and choosing **Actors > Display > MIDI Note**.)
- **velocity**: Specifies the velocity or range of velocities that will be seen, from 1 to 127. (A velocity of 0 means that this is a Note Off message, per the MIDI Specification.)

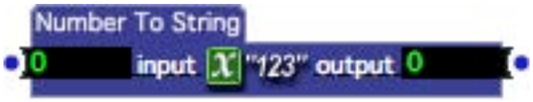
For a Note On message to be seen by this watcher, its values must fall within the range of values for specified by all four of the input properties.

Output Properties

When this watcher sees a Note On message that falls within the range of values specified by all four of the input properties, the following values are sent to the outputs:

- **port**: The MIDI Port on which the message arrived.
- **channel**: The Note On message's MIDI Channel.
- **pitch**: The Note On message's MIDI Pitch.
- **velocity**: The Note On message's velocity.
- **trigger**: Sends a trigger each time a message is seen.

Number To Text (v1.3)



Converts a number into text, which may be received by any actor with a text input, e.g., the Draw Text actor. (This actor was called "Number to String" prior to v1.3)

Input Properties

- **input**: A number to be converted to text.

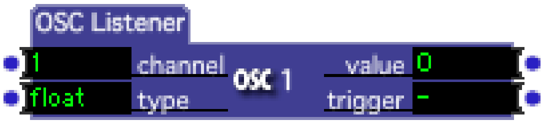
Output Properties

- **output**: The value specified by the input input property as text.

Number To String (v1.2)

This actor was renamed to "Number to Text" in v1.3. Please refer to the documentation for that actor.

OSC Listener (v1.3)



Receives Open Sound Control messages from another application, which may be running on the same computer as Isadora or which may be running on a computer connected to your computer via a local area network.

> Open Sound Control is a standardized way to send high-resolution data from one application to another. The OSC Receive actor allows Isadora to receive values from another application. For more information on Open Sound Control, please refer to "Open Sound Control Support" on Page 164.
>
> **Note: values sent to Isadora must include OSC "type tag" information – otherwise Isadora will not recognize the values.**

Input Properties

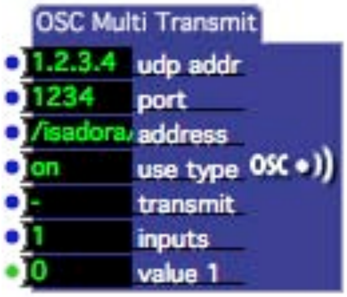
- **channel**: The channel on which messages will be received. Isadora has 32 input channels, with OSC addresses ranging from **/isadora/1** to **/isadora/32**. When sending data from the other computer, you must transmit to the correct address for the OSC Receive actor to see the data. For example, if channel is set to 5, then messages received on the **/isadora/5** OSC channel will be seen by this listener.

- **type**: This determines the type of the value output. When this is set to float, the output type will be a floating-point number. When this is set to integer, the output will be an integer. When this is set to text, the output will be text. Note that if you select an integer and the other application sends a floating-point number, the part after the decimal point will be discarded.

Output Properties

- **value**: When a value is received on the channel specified by the channel input, it will be sent out of this output.
- **trigger**: sends a trigger whenever a value is sent out of the value output.

OSC Multi Transmit



OSC Multi Transmit

1.2.3.4 udp addr
1234 port
/isadora/ address
on use type
- transmit
1 inputs
0 value 1

Sends Open Sound Control (OSC) messages to a specific OSC address at the specified UDP address and port number. Use ‘localhost’ to transmit messages to a program running on the same computer as Isadora.

Open Sound Control is an emerging standard used to send high-resolution data from one application to another. The OSC Multi Transmit actor allows Isadora to simultaneously send multiple values to another application, or even to Isadora itself. For more information on Open Sound Control, please refer to “Open Sound Control Support” on Page 164

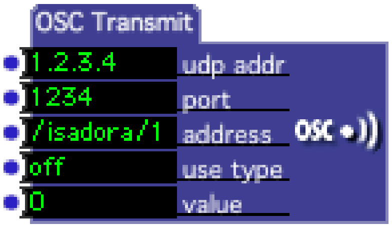
Note that the value input properties of this actor are mutable: each input property will adapt its data type the match the output to which it is linked when the first connection is made.

Input Properties

- **udp addr**: The IP address of the computer on which the target application is running. You can use the special address **localhost** (or 127.0.0.1) to send data to an application running on the same computer as Isadora, or you can use a domain name (e.g., troikatronix.com) if the computer is connected to the internet and a domain name server is available.

- **port**: The UDP port number on which the program is receiving data. Check the target application to see the UDP port on which it receives OSC messages.
- **address**: The OSC address to which the data will be sent. Check the documentation of the target application to find out the names of the OSC addresses it supports.
- **use type**: When turned on, the “type tag” information is sent along with the packet. Except in special cases for older software, this property should be left on. (Note: Isadora *requires* type tags; if you want to transmit message to another copy of Isadora, you must leave set this property on.)
- **transmit**: When triggered, send all of the ‘value’ inputs to the specified OSC address.
- **inputs**: The number of inputs. Increasing this number adds more value inputs, decreasing it removes them.
- **value 1, value 2, etc**: The values to transmit. Each time a trigger is received at the transmit input, an OSC packet with these values specified by these input properties is transmitted to the UDP address, port, and OSC address specified in the udp addr, port and addr inputs.

OSC Transmit (v1.1)



OSC Transmit

1.2.3.4 udp addr
1234 port
/isadora/1 address
off use type
0 value

Sends Open Sound Control messages to another application running on the same computer, or to one running on another computer connected via a local area network.

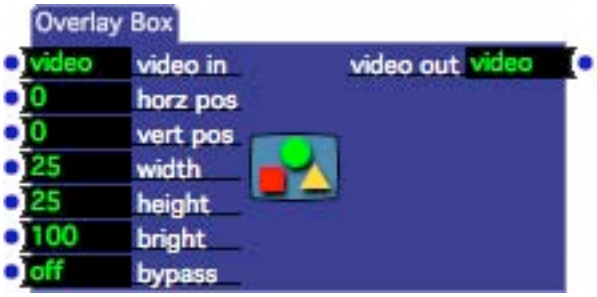
Open Sound Control is a standardized way to send high-resolution data from one application to another. The OSC Transmit actor allows Isadora to send values to another application. For more information on Open Sound Control, please refer to “Open Sound Control Support” on Page 164.

Input Properties

- **udp addr**: The IP address of the computer on which the target application is running. You can use the special address **localhost** to send data to an application running on the same computer as Isadora.

- **port**: The UDP port number on which the program is receiving data. Check the target application to see the UDP port on which it is received.
- **address**: The OSC address to which the data will be sent. Check the documentation for the target application to find out the names of the OSC addresses it supports.
- **use type**: When turned on, the “type tag” information is sent along with the packet. **If you are sending data to another copy of Isadora, this flag must be turned on** – otherwise the other copy of Isadora won’t receive the messages.
- **value**: The value to transmit. Each time a new value arrives at this input, an OSC packet with that value is transmitted to the UDP address, port, and OSC address specified in the udp addr, port and addr inputs.

Overlay Box



Superimposes a rectangle of a specified intensity, size, and position on a video stream.

Input Properties

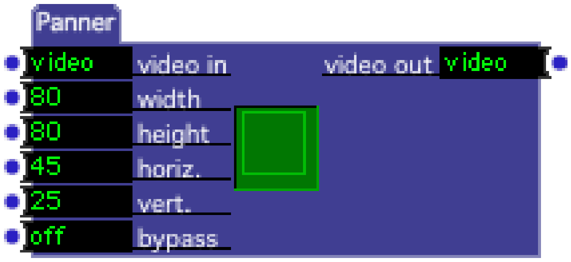
- **rgb in**: The source video stream on which the rectangle will be superimposed. If you leave this input disconnected, the rectangle will be drawn on a black background. If this stream is in YUV format, it will automatically be converted to RGB.
- **horz pos**: The horizontal center of the shape, specified as a percentage of the incoming video sream’s width. A horizontal position of zero is halfway between the left and right edge.
- **vert pos**: The vertical center of the shape, specified as a percentage of the incoming video stream’s height. A vertical position of zero is halfway between the top and bottom edge.
- **width**: The width of the shape, specified as a percentage of the incoming video stream’s width.
- **height**: The height the shape, specified as a percentage of the incoming video stream’s height.
- **bright**: The brightness of the rectangle from 0 to 100%.

- **bypass**: When turned off, this effect functions normally. When turned on, the effect is disabled and the video input is passed directly to the video output.

Output Properties

- **rgb out**: The rectangle superimposed at on the input video stream in RGB format.

Panner



Pans left and right and/or up and down within a source video image.

Panner is the cousin of the Zoomer actor – the results are similar, but the way in which you control the panning is slightly different. You start by giving the width and height of the "source rectangle", that is, the rectangle that determines how much of the source image you will see. You can visualize this by looking at the graphic in the center of the actor. The green area is the size of the frame, the light green rectangle is the portion that you can see.

You then control the panning by manipulating the horz and vert properties. This moves the source rectangle around within the source video image, controlling which part of the source image you see at the output. Note that the lower the values of the width and height properties, the more you will be able to pan. This is because more of the source image is "left over" – again use the graphic in the center of the actor to visualize this.

Input Properties

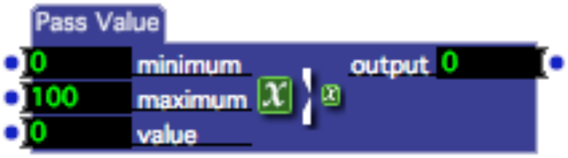
- **video in**: The video input stream.
- **width**: Specifies how much of the source image you will see horizontally, from 0 to 100 percent of the source image's width. The smaller this value, the more "zoomed in" you are horizontally.
- **height**: Specifies how much of the source image you will see vertically, from 0 to 100 percent of the source image's height. The smaller this value, the more "zoomed in" you are vertically.
- **horz**: Specifies the horizontal position of pan, from 0 to 100 percent. How much you can pan depends on the setting of the width property. When width is close to 100, you won't be able to pan much because there isn't much of the source image left over.

- **vert**: Specifies the vertical position of pan, from 0 to 100 percent. How much you can pan depends on the setting of the height property. When height is close to 100, you won't be able to pan much because there isn't much of the source image left over.
- **bypass**: When turned off, this effect functions normally. When turned on, the effect is disabled and the video input is passed directly to the video output.

Output Properties

- **video out**: The panned video output.

Pass Value (v1.1)



Only allows values to pass through to the output when they are within a specified range.

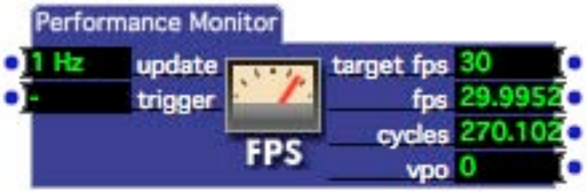
Input Properties

- **minimum:** The low value to which the value input will be compared.
- **maximum:** The high value to which the value input will be compared.
- **value**: The value to be compared to the low and high value inputs.

Output Properties

- **output:** When a value arrives a the value input, and it is within the range specified by minimum and maximum, the value is sent out of this output. If it is outside the specified range, the incoming value is discarded.

Performance Monitor



Performance Monitor gives statistics about Isadora's performance, including the current average frame rate and video processing overhead.

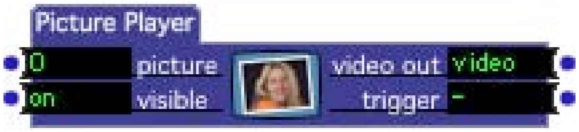
Input Properties

- **update:** Sets the frequency at which the outputs are updated in cycles per second (hertz). If you would prefer to trigger the outputs manually, you can set this frequency to zero and use the trigger input instead.
- **trigger:** When triggered, updates the outputs.

Output Properties

- **target fps:** The target frame rate as set in the Isadora Preferences expressed in frames per second (fps).
- **fps:** The average rate at which all stages are being updated, expressed in frames per second (fps).
- **cycles:** The current cycle rate; the frequency with which Isadora is able to process all active scenes, expressed in cycles per second.
- **vpo:** The current video processing overhead; this is the percentage of time that Isadora spends performing video processing related tasks as compared to the amount of time Isadora spends processing all tasks.

Picture Player



Generates a video stream from a picture imported into in the Media Window.

The output of the picture player can be connected to any actor that has a video input. Unlike the Movie Player, which sends a frame of video on a periodic basis when the movie is playing, the Picture Player only sends a new frame of video when 1) its Scene is activated, 2) its visible property goes from *off* to *on*, or 3) the picture property changes from one valid picture to another.

Input Properties

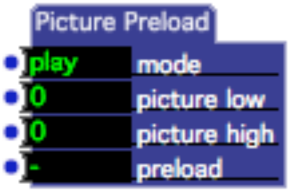
- **picture**: The number of the picture you want to play, as shown in the Media Window. When the number of a valid picture is entered here, its name will appear to the right of the number.
- **visible**: When set to *on*, generates a video stream from the picture specified by the picture input property. When set to *off*, no output is generated.

Output Properties

- **video out**: The picture, converted into a video stream.

- **trigger**: Sends a trigger whenever a new picture is selected, when the visible property goes from *off* to *on*, or when this actor's Scene is activated.

Picture Preload



Preloads a range of pictures so that loading with the Picture Player actor can start playback instantly.

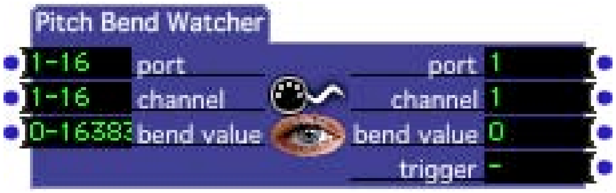
Input Properties

- **mode:** This property can be set to either *play* or *forever*.

  When set to play, the picture is kept in memory until a Picture Player actor starts and then stops playing it. Once that actor stops playing the picture, it is removed from memory.

  When set to forever, the picture is kept in memory until it is preloaded again with the mode set to play, or until Isadora quits. Use this option with caution! It is easy to fill up your RAM with pictures that you no longer need to play.
- **picture low:** The number of the first picture to preload, as shown in the Media Window. If you want to preload only one picture, set the number of the picture you want to preload and leave the picture high input set to 0. Otherwise, to specify a range of pictures to preload, set this to the number of the first picture you want to preload and the picture high input to the last sound. When the number of a valid picture is entered here, its name will appear to the right of the number.
- **picture high**: The last picture in a range of pictures you want to preload. Use this in conjunction with the picture low input to specify a range of pictures to be loaded when a trigger is received at the preload input.
- **preload:** When triggered, preloads the range of movies specified by the picture low and picture high inputs.

Pitch Bend Watcher



Watches for MIDI Pitch Bend messages, outputting the values associated with that message and sending a trigger when one is seen.

The Pitch Bend Watcher can look for a message with a specific pitch bend value or a range of bend values depending on the setting of the input properties. When a message meeting the criterion specified by all of the input properties is seen, the values associated with that message are sent out of the output ports and a trigger is sent out of the trigger output.

Input Properties

- **port**: Specifies the MIDI Port on which the message must arrive to be seen. These port numbers correspond to the ports shown in the MIDI Setup dialog. You may specify a single port or a range of ports.
- **channel**: Specifies the MIDI Channel on which the message must be received before it will be seen by this watcher, from 1 to 16. You may specify a single port or a range of ports.
- **bend value**: Specifies the pitch bend value or range of values that will be seen, from 0 to 16383. 8192 is the center position of the pitch bend.

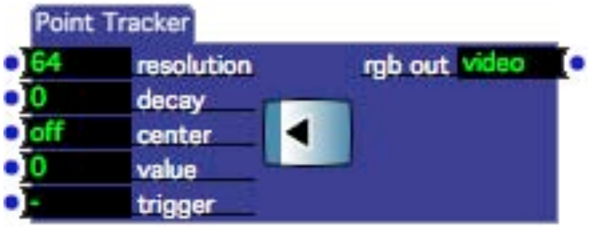
Note that for a Monophonic Pressure message to be seen by this watcher, its values must fall within the range of values for specified by all three of the input properties.

Output Properties

When this watcher sees a Control Change message that falls within the range of values specified by all of the input properties, the following values are sent out of the outputs:

- **port**: The MIDI Port on which the message arrived.
- **channel**: The Pitch Bend message's MIDI Channel.
- **bend value**: The Pitch Bend message's bend value.
- **trigger**: Sends a trigger each time a message is seen.

Point Tracker (v1.1)


Point Tracker

64 resolution

0 decay

off center

0 value

- trigger

rgb out video

Generates a vertical line that tracks a value.

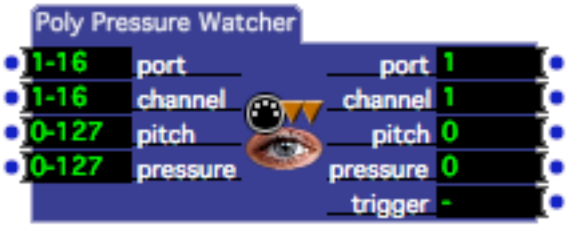
Input Properties

- **resolution**: The resolution of the tracking line.
- **decay**: The speed with which previously generated lines will decay. Lower numbers cause the lines to persist longer.
- **center**: When turned on, keeps the current value in the center by offsetting the previous lines
- **value**: That value being tracked from 0 to 100%
- **trigger**: Generates a new line each time a trigger is received at this input, as well as causing previous lines to decay.

Output Properties

- **rgb out**: The generated image in RGB format.

Poly Pressure Watcher


Poly Pressure Watcher

1-16 port

1-16 channel

0-127 pitch

0-127 pressure

port 1

channel 1

pitch 0

pressure 0

trigger -

Watches for MIDI Polyphonic Pressure messages, outputting the values associated with that message and sending a trigger when one is seen.

The Poly Pressure Watcher can look for a specific Polyphonic Pressure message or a range of messages depending on the setting of the input property values. When a message meeting all of the criterion specified by input properties is seen, the values associated with that message are sent out of the output ports and a trigger is sent out of the trigger output.

Input Properties

- **port**: Specifies the MIDI Port on which the message must arrive to be seen. These port numbers correspond to the ports shown in the MIDI Setup dialog. You may specify a single port or a range of ports.
- **channel**: Specifies the MIDI Channel on which the message must be received before it will be seen by this watcher, from 1 to 16. You may specify a single port or a range of ports.
- **pitch**: Specifies the MIDI pitch or range of pitches that will be seen, from 0 to 127 or C-2 to G8. (You can choose to see the pitches using their note names by clicking on the title pitch next to the value edit box and choosing **Value > MIDI Note**.)
- **pressure**: Specifies the pressure value or range of values that will be seen, from 0 to 127.

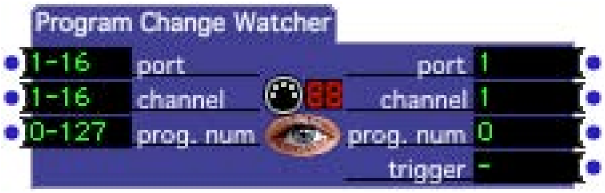
For a Polyphonic Pressure message to be seen by this watcher, its values must fall within the range of values for specified by all four of the input properties.

Output Properties

When this watcher sees a Polyphonic Pressure message that falls within the range of values specified by all four of the input properties, the following values are sent to the outputs:

- **port**: The MIDI Port on which the message arrived.
- **channel**: The Polyphonic Pressure message's MIDI Channel.
- **pitch**: The Polyphonic Pressure message's MIDI Pitch.
- **pressure**: The Polyphonic Pressure message's pressure.
- **trigger**: Sends a trigger each time a message is seen.

Program Change Watcher



Watches for MIDI Program Change messages, outputting the values associated with that message and sending a trigger when one is seen.

The Program Change Watcher can look for a message with a specific program change number or a range of numbers depending on the setting of the input properties. When a message meeting all of the criterion specified by input properties is seen, the values associated with that message are sent out of the output ports and a trigger is sent out of the trigger output.

Input Properties

- **port**: Specifies the MIDI Port on which the message must arrive to be seen. These port numbers correspond to the ports shown in the MIDI Setup dialog. You may specify a single port or a range of ports.
- **channel**: Specifies the MIDI Channel on which the message must be received before it will be seen by this watcher, from 1 to 16. You may specify a single port or a range of ports.
- **prog num**: Specifies the program number or range of numbers that will be seen, from 0 to 127.

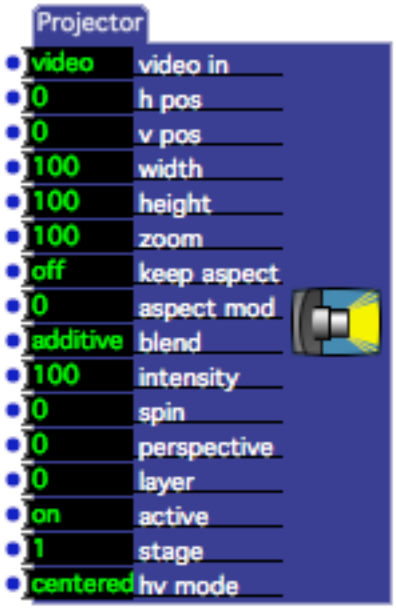
Note that for a Program Change message to be seen by this watcher, its values must fall within the range of values for specified by all three of the input properties.

Output Properties

When this watcher sees a Program Change message that falls within the range of values specified by all of the input properties, the following values are sent out of the outputs:

- **port**: The MIDI Port on which the message arrived.
- **channel**: The Program Change message's MIDI Channel.
- **prog num**: The Program Change message's program number.
- **trigger**: sends a trigger each time a message is seen.

Projector (v1.3)



Positions and scales a video stream to the specified stage.

To render a video stream on one of the Stages, you will need to use the Projector actor. It does the work of rendering the video stream to a Stage, and also allows you to scale the resulting video image and control its placement.

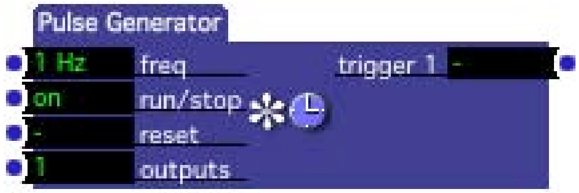
Input Properties

- **video in**: The video stream that will be shown on the stage.
- **horz pos**: Specifies the location of left edge of the image, expressed as a percentage of the stage width. A value of 0 aligns the left edge of the image with the left edge of the stage; positive numbers move the video image to the right and negative numbers move it to the left.
- **vert pos**: Specifies the location of the bottom edge of the image, expressed as a percentage of the stage height. A value of the 0 aligns the top edge with the top of the stage; positive numbers move the video image up and negative numbers move it down.
- **width**: The width of the rendered video image, expressed as a percentage of the stage width.
- **height**: The height of the rendered video image, expressed as a percentage of the stage height.
- **zoom**: The zoom factor of the projected video image, expressed as a percentage of the stage size. 100 percent will project an image that fills the stage. Lower zoom out (make the image smaller), higher numbers zoom in (make the image bigger).
- **keep aspect:** When turned on, the aspect of the incoming video stream will be used to determine the aspect ratio of the rectangle into which the image is rendered. The resulting image will be letterboxed horizontally or vertically as needed. When turned off the video image will be scaled to fill the entire stage. Note that the final aspect ratio is also affected by the width, height, and aspect mod parameters.
- **aspect mod:** Specifies the aspect ratio of the image from –100 to +100. Negative values make the image less tall, positive values make the image less wide.
- **blend:** Determines the opacity of the video image in conjunction with the intensity input. When set to additive, the image is added to the background image – lower intensity settings reduce the brightness of the image. When set to transparent, lower intensity values make the object more transparent, allowing you to see more of the image underneath. When set to opaque, lower intensity values will fade the image to a black background that obscures the background image.

  IMPORTANT: When attempting to render a transparent image, it is essential that it is rendered last, otherwise the transparent image feature may not work. (Generally this will result in on of the lower images appearing opaque and "on top of" the transparent image.) To specify the order in which Projectors render their images, use the layer input. Higher layer numbers are closer to *you (i.e. drawn last) so you will want to use a higher layer number for Projectors whose blend input is set to transparent.*

- **intensity:** Sets the brightness or transparency of the image, from 0 to 100%. See blend input for a complete description.
- **spin:** (Specifies the rotation of the image, from –360 to +360 degrees.
- **perspective:** Allows you to change the horizontal perspective of the image, from –200 to +200. Vales less than zero make the right edge less tall, values greater than zero make the left edge less tall.
- **layer:** This value determines the order in which the images will be rendered when using multiple projectors in the same scene. Lower numbers are further away from you – i.e. the Projector with the highest layer value will be seen "in front" of the other images.
- **active:** Determines whether or not the video stream is actually sent to the stage. When turned *on* new frames of video are sent to the Stage as they arrive. When turned *off* the frames of video are ignored. This means that the last frame of video received before this property was turned off will still be visible on the stage.
- **stage:** Specifies the stage upon which the video stream will be displayed.
- **hv mode:** Determines the meaning of the horz pos and vert pos inputs in relation to the width, height and zoom inputs. The default setting is centered which means that the image will grow/shrink from its center when adjusting the width, height or zoom. The left-top setting means that the left and top edges will stay fixed as the horz pos and vert pos are adjusted. "classic" is for compatibility with versions or Isadora prior to V1.3, "classic" is similar to "left – top" except that the zoom input influenced the position of the left and top edges.

Pulse Generator



1 Hz freq
on run/stop
- reset
1 outputs
trigger 1 -

Generates triggers that are evenly spaced in time.

The Pulse Generator will send a trigger out of its trigger output at the frequency specified by the freq input property. You can optionally specify more than one output. If you do so, the outputs will send triggers in sequentially, one after the other.

Input Properties

- **freq**: The frequency at which the triggers will be sent, from .0001 to 999 Hz (cycles per second.)
- **run/stop**: When set to *on*, the pulse generator runs normally. When set to *off* the pulse generator is paused. It will continue counting time at the point it left when the run/stop property is turned back on.
- **reset**: Resets the Pulse Generator's internal time counter to 0. This means that it will be at least one full cycle before the next trigger is sent.
- **outputs**: sets the number of output triggers on the right side of the actor. When this value is greater than 1, each output will send a trigger, one after the other (i.e. trigger 1, then trigger 2, etc.,) until the last output is triggered. Then the process begins again with trigger 1.

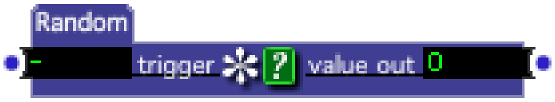
  When using multiple outputs, the actual frequency at a given output will be less than that specified by the freq input – each will pulse at a frequency of freq divided by outputs (E.g., with freq set to 1 Hz and outputs set to 3, each output will pulse at a rate of 1 Hz divided by 3, or 0.3333 Hz.)

  This feature is most useful when you want to trigger other Actors alternately or sequentially.

Output Properties

- **trigger 1, trigger 2, etc**.: Sends a trigger at a rate determined by the freq input property. If there is more than one output, each will be triggered sequentially, one after the other.

Random



Generates random numbers.

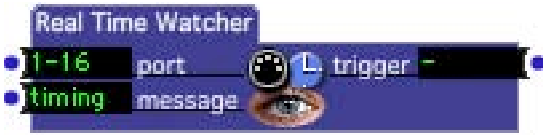
Input Properties

- **trigger**: Sends a new random number out of the value out property each time a trigger is received.

Output Properties

- **value out**: Outputs a new random number each time the trigger input receives a trigger.

Real Time Watcher (v1.1)



Looks for MIDI Real Time Messages on the specified port.

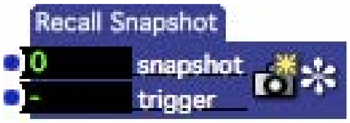
Input Properties

- **port**: Specifies the MIDI Port on which the message must arrive to be seen. These port numbers correspond to the ports shown in the MIDI Setup dialog. You may specify a single port or a range of ports.
- **message**: Specifies the MIDI Real Time message that will trigger this actor. Can be one of the following: timing, start, continue, stop, or reset.

Output Properties

- **trigger**: Sends a trigger when the message specified by the message input arrives on the specified MIDI port.

Recall Snapshot



Recalls a snapshot when triggered.

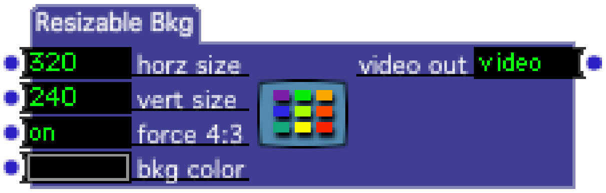
For more on Snapshots, see the section entitled “Storing and Recalling Scenes With Snapshots” on page 95.

Input Properties

- **snapshot**: The snapshot to recall when a trigger is received at the trigger input. If this snapshot exists, it is recalled. If it doesn’t exist, nothing happens.

  NOTE: The snapshot property is **not** *restored when a snapshot is recalled. This would change the value in this property when the actor recalled a snapshot, which ends up being quite confusing.*
- **trigger**: Recalls the snapshot specified by the snapshot property when a trigger is received on this input.

Resizable Bkg



Generates a video stream with a solid color at a specific horizontal and vertical resolution.

The Background Color actor generates a solid color video stream at the default resolution specified by in the Video Tab of the Preferences. This actor allows you to generate a video stream of any resolution.

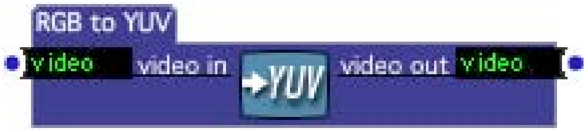
Input Properties

- **bkg color**: This determines the color of the output video stream. There are two ways to specify the color: first, if you click on the colored square to the left of the title bkg color, a standard color picker dialog will appear. Or, you may connect the output of the Color Maker actor to the bkg color input.
- **horz size**: The horizontal output resolution in pixels.
- **vert size**: The vertical output resolution in pixels.
- **force 4:3:** When this parameter is on, changing the value of either the horz or vert size input will automatically adjust the other input so that the ratio between horizontal and vertical is 4:3.

Output Properties

- **video out**: Outputs a solid color video stream at the specified resolution.

RGB to YUV (v1.1)



Converts a video stream from RGB to YUV.

This actor is used to explicitly convert an RGB video stream to YUV, usually to be fed to a video-processing actor that prefers RGB.

If the incoming stream is already YUV, then it is passed directly to the output.

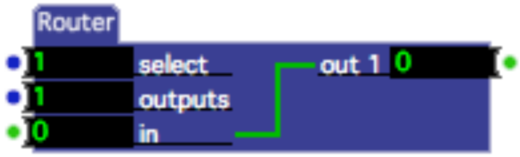
See “YUV Video Processing” on page 135 for more information about using YUV mode in Isadora.

Input Properties

- **video in**: The RGB video stream to be converted to YUV.

  video out*: The input video stream, converted to YUV format.*

Router



Routes data from a single input to one of several outputs.

The Router actor routes any type of data (numbers, video, sound, etc.) from the input to one of several outputs. You specify the number of outputs by setting the outputs input property to the desired number of outputs. Once this is done, you can select the output to which the data will be sent by changing the select input. Setting this property to 1 sends the data to out 1, setting it to 2 sends the data to out 2, etc.

Note that the in input and out 1, out 2, out 3, etc. outputs of this actor are mutable. This means they will *all* change their type (integer, float, video, etc.) to match the first link made to one of these properties. Once a link has been made to any of the mutable properties, their types will remain fixed, based on that first connection, until all have been disconnected. Then the properties become mutable again.

Router can be especially useful when you want to feed video streams to multiple effects. Typically, you would connect a video effect Actor to each output, and then connect all of their outputs to a Projector Actor. Since data only goes to one effect at a time, only one of the effects is actually processing video at any given moment, saving on processing power. And, because only one video effect at a time outputs video, this means that you can connect all of the effects' outputs to a single Projector without worrying output seeing interspersed frames of video on the stage.

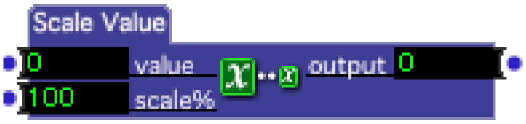
Input Properties

- **select**: Chooses the output to which data arriving at the in input will be routed.
- **outputs**: Specifies the number of outputs. Increasing this number adds more outputs, reducing it removes outputs.
- **in**: Receives the data to be routed to one of the outputs.

Output Properties

- **out 1, out 2, etc.**: The number of outputs is specified by the outputs input property. Data from the in input will be routed to the output number specified by the select input property.

Scale Value



Multiplies the input value by a specified percentage, limiting the output to a range of 0 to 100.

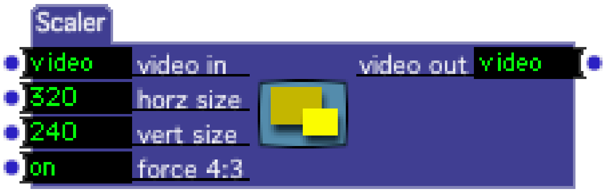
Input Properties

- **value**: The input value.
- **scale%**: The percentage by which the input value will be multiplied, from –1000 to +1000 percent.

Output Properties

- **output**: The scaled output value.

Scaler (v1.1)



Scales a video stream to an arbitrary resolution.

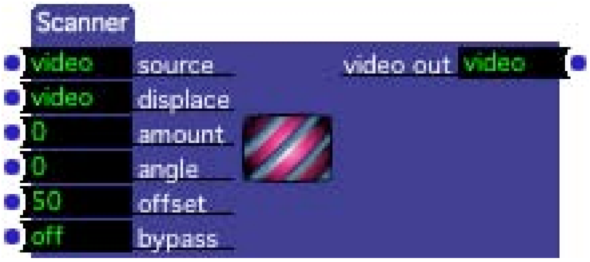
Input Properties

- **vide**: The incoming video stream.
- **horz size**: The horizontal output resolution in pixels.
- **vert size**: The vertical output resolution in pixels.
- **force 4:3:** When this parameter is on, changing the value of either the horz or vert size input will automatically adjust the other input so that the ratio between horizontal and vertical is 4:3.

Output Properties

- **output**: The video stream scaled to the specified horizontal and video resolution.

Scanner



Scanner

video source

video displace

0 amount

0 angle

50 offset

off bypass

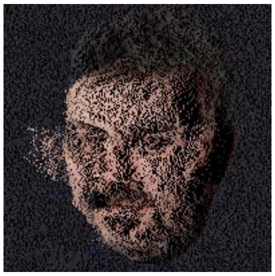
video out video

Offsets the pixels of a video stream based on the brightness of a second video stream.

Displace shifts the pixels the source video stream using the brightness of the displace stream to determine how far to move the pixels. For example, assuming the displace angle is zero, when the displace video is gray (i.e. 50% brightness) the pixels of the source are not moved at all; as it approaches black the source video pixels are shifted more to the left; as it approaches white, the source video pixels are shifted more to the right.

One useful technique is feed the same video into the both the source and offset video inputs. This results in three-dimensional effect that harkens back to some nice analog video synthesizers of the past.

Source & Displace Video



Output

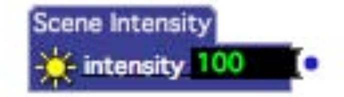
Input Properties

- **source video**: The video input stream
- **displace**: Video stream whose brightness determines how far to shift the pixels of the source video.
- **amount:** The strength of the displace effect, from 0 to 100%. The higher the value, the more profoundly the pixels of the source video will be shifted.
- **displace angle:** Sets the angle of the line along which the pixels are shifted.
- **offset:** How far to offset the resulting image, from 0 to 100%. If the displace video stream is too bright or too dark, the resulting video may go off the edge of the stage. Adjust this value to bring the image back into view again.
- **bypass**: When turned off, this effect functions normally. When turned on, the effect is disabled and the video input is passed directly to the video output.

Output Properties

- **video out:** The resulting displaced video output.

Scene Intensity (v1.3)



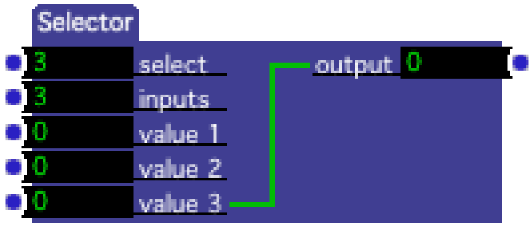
Reports the current intensity of a scene.

When a scene is fully active, the intensity output will always be 100. But during a jump with a cross fade, this value will vary as the scene fades in or out. When this actor is in a scene that is cross fading into another scene, the intensity will decrease towards zero. When this actor is in a scene that is being faded into, the intensity will increase towards 100 over the duration of the cross fade.

Input Properties

- **intensity:** Reports the current scene intensity from 0 to 100%

Selector



Routes multiple inputs of any type to one output.

The Selector actor will route data from one of several inputs to an output. When a particular value input is selected with the select parameter, any values that arrive on that input will immediately be sent to output. In addition, whenever the select input changes and a new input is routed to the output, the current value of the newly selected input is sent to the output.

Note that the value inputs and output of this actor are mutable. This means they will *all* change their type (integer, float, video, etc.) to match the first link made to one of these properties. Once a link has been made to any of the mutable properties, their types will remain fixed, based on that first connection, until all have been disconnected. Then the properties become mutable again.

This module is especially useful when you want to route multiple video outputs to one input.

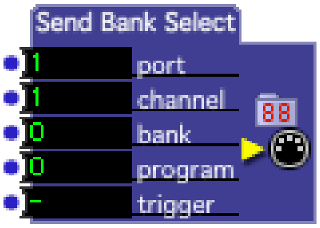
Input Properties

- **select**: Chooses which input will be routed to the output. This value can range between 1 and the number of inputs specified by the inputs property.
- **inputs**: The number of value inputs available to be routed to the output.
- **value 1, value 2, etc.**: The value inputs that will be routed to the output.

Output Properties

- **output**: Passes on any value arriving at the input to the output specified by the select input property.

Send Bank Select

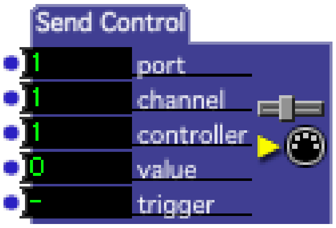


Sends a MIDI Bank Select message each time a trigger is received.

Input Properties

- **port**: The MIDI port on which the message will be sent. These port numbers correspond to the Destinations shown in the MIDI Setup dialog.
- **channel**: The MIDI Channel on which the message will be sent.
- **bank**: The MIDI bank number, from 0 to 127.
- **program**: The MIDI program change number, from 0 to 127.
- **trigger**: Sends a MIDI Bank Select message with the values specified by the other input properties each time a trigger is received on this input.

Send Control

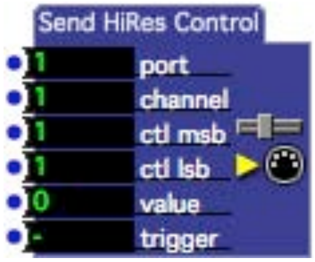


Sends a MIDI Control Change message each time a trigger is received.

Input Properties

- **port**: The MIDI port on which the message will be sent. These port numbers correspond to the Destinations shown in the MIDI Setup dialog.
- **channel**: The MIDI Channel on which the message will be sent.
- **controller**: The MIDI controller number, from 0 to 127.
- **value**: The MIDI controller value, from 0 to 127.
- **trigger**: Sends a MIDI Control Change message with the values specified by the other input properties each time a trigger is received on this input.

Send HiRes Control



Send HiRes Control

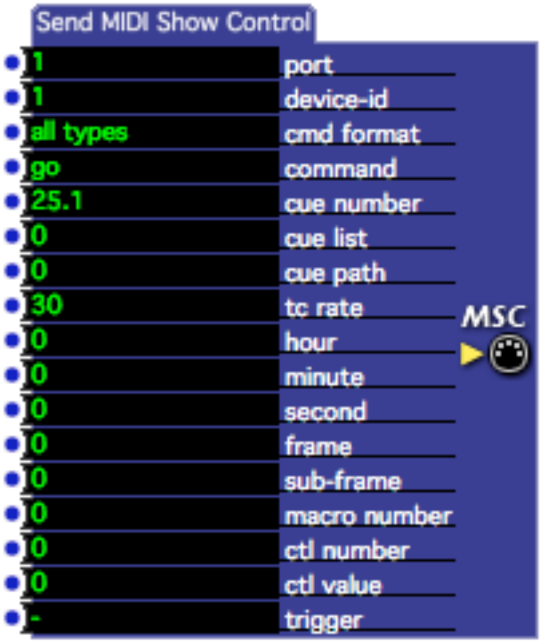
1 port
1 channel
1 ctl msb
1 ctl lsb
0 value
- trigger

Sends a MIDI High-Resolution Control Change message.

Input Properties

- **port**: The MIDI port on which the message will be sent. These port numbers correspond to the Destinations shown in the MIDI Setup dialog.
- **channel**: The MIDI Channel on which the message will be sent.
- **ctl msb**: The controller number on which to send the most significant byte, from 0 to 127.
- **ctl lsb**: The controller number on which to send the least significant byte, from 0 to 127.
- **value**: The value to be sent, from 0 to 16383.
- **trigger**: Sends the specified MIDI High-Resolution Control Change message.

Send MIDI Show Control



1	port
1	device-id
all types	cmd format
go	command
25.1	cue number
0	cue list
0	cue path
30	tc rate
0	hour
0	minute
0	second
0	frame
0	sub-frame
0	macro number
0	ctl number
0	ctl value
-	trigger

Sends a MIDI Show Control command to the specified MIDI port, optionally allowing you to add and format variable parameters within the message.

Because MIDI Show Control allows you to control a wide variety of devices, there are numerous command formats and parameter combinations. Not every command uses all of the parameters shown in this actor. At the end of this section, you can find a list of all MIDI Show Control commands and the parameters associated with those commands.

Input Properties

- **port:** The MIDI port to which to send the MIDI Show Control message will be sent when triggered, from 1 to 16.
- **device-id:** The device-id of the target device for this MIDI Show Control message.
- **cmd format:** The command format for this MIDI Show Control command.
- **command:** The command for the MIDI Show Control message. Changing this input will change the number the number and type of available inputs to those that are appropriate to the specified command.
- **cue number:** The cue number for the MIDI Show Control command.

- **cue list:** The cue list for the MIDI Show Control command. Set this to n/a (less than 0) if you do not want to send the cue list number.
- **cue path:** The cue path for the MIDI Show Control command.
- **tc rate:** The type of time code rate for the message, 24, 25, 30df, 30
- **hour:** The hour for the time code value of the MSC command.
- **minute:** The minute for the time code value of the MSC command.
- **second:** The second for the time code value of the MSC command.
- **frame:** The frame for the time code value of the MSC command.
- **sub-frame:** The sub-frame for the time code value of the MSC command.
- **macro number:** The macro number for this MSC command.
- **ctl number:** The controller number for this MSC command, from 1 to 16383.
- **ctl value:** The controller value for this MSC command, from 1 to 16383.
- **trigger:** Triggering this input sends the MIDI Show Control message to the specified MIDI port.

Specific MIDI Show Control commands and the input parameters used by those commands are listed below:

***go, stop, resume, load, go-off, go-jam*:** cue number, cue list, cue path

timed-go: tc rate, cue number, cue list, cue path

set: ctl number, ctl value, hour, minute, second, frame, sub frame

fire: macro number

all-off: no parameters

restore: no parameters

reset: no inputs

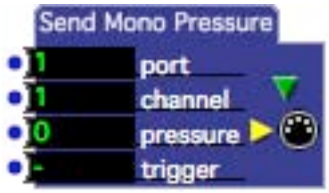
standby+/-, sequence+/-, start clock, stop clock, zero clock, mtc chase on/off, open/close cue list: cue list

set clock: hour, minute, second, frame, sub frame, cue list

open/close cue path: cue path

undefined: undefined inputs

Send Mono Pressure

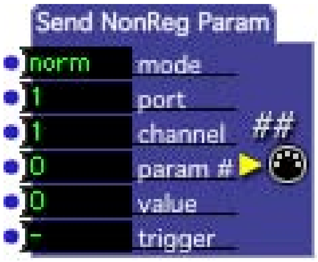


Sends a MIDI Monophonic Pressure message whenever a trigger is received on the trigger input.

Input Properties

- **port**: The MIDI port on which the message will be sent. These port numbers correspond to the Destinations shown in the MIDI Setup dialog.
- **channel**: The MIDI Channel on which the message will be sent.
- **pressure:** The pressure value of the Monophonic pressure message, from 0 to 127.
- **trigger**: Sends a MIDI Mono Pressure message with the values specified by the other input properties each time a trigger is received on this input.

Send NonReg Param



Sends a MIDI Non-Registered Parameter Change message each time a trigger is received.

According to the MIDI specification, a non-registered parameter value can range form 0 to 16383. Sometimes this is not the most useful representation when sending certain parameters to synthesizers and other MIDI gear, especially when the value is interpreted as a bipolar (+ and -) number. To address this issue, the Send NonReg Param actor has a **mode** property that allows you to map input values to the 0 to 16383 range in a several ways. A detailed description of the four modes can be found below.

Input Properties

- **mode**: The mode that determines how the parameter value will be specified, which can be one of the following:

norm: *The parameter value ranges between 0 and 100. In this mode the range of input value is scaled to the actual MIDI range of 0 to 16383. 0 yields 0, 50 yields 8192, 100 yields 16383.*

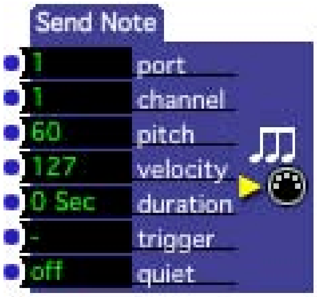
norm +/- *The parameter value ranges between –50 and +50. In this mode, the range of input value is scaled to the actual MIDI range of 0 to 16383. –50 yields 0, 0 yields 8192, and +50 yields 16383.*

direct *The parameter value ranges between 0 and 16383. This matches the actual MIDI range, so no scaling is necessary.*

direct +/- *The parameter value ranges between –8192 and 8191. In this mode, the input value is scaled to the actual MIDI range of 0 to 16383 by adding 8192. –8192 yields 0, 0 yields 8192, +8191 yields 16383.*

- **port**: The MIDI port on which the message will be sent. These port numbers correspond to the Destinations shown in the MIDI Setup dialog.
- **channel**: The MIDI Channel on which the message will be sent.
- **param #**: The MIDI parameter number, from 0 to 16383.
- **value**: The MIDI parameter value. The range of values depends on the setting of the **mode** property.
- **trigger**: Sends a MIDI Non-Registered Parameter message with the values specified by the other input properties each time a trigger is received on this input.

Send Note



Send Note

1 port
1 channel
60 pitch
127 velocity
0 Sec duration
- trigger
off quiet

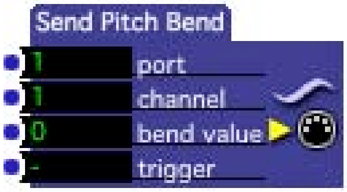
Sends a MIDI Note On message each time a trigger is received, optionally sending a MIDI Note Off message after a specified amount of time has elapsed.

Input Properties

- **port**: The MIDI port on which the message will be sent. These port numbers correspond to the Destinations shown in the MIDI Setup dialog.
- **channel**: The MIDI Channel on which the message will be sent.
- **pitch**: The Note On message's pitch, from 0 to 127 or C-2 to G8. (You can choose to see the pitches using their note names by clicking on the title pitch next to the value edit box and choosing **Actors > Display > MIDI Note**.)

- **velocity**: The Note On message's velocity, from 1 to 127. (Per the MIDI Specification, a Note On message with a velocity of 0 is a Note Off message.)
- **duration**: The amount of time to wait before a Note Off message corresponding to the previously sent Note On is sent. If this value is set to 0, then no Note Off message will be sent.
- **trigger**: Sends a MIDI Note On message with the values specified by the other input properties each time a trigger is received on this input. If the duration property is greater than zero, then a corresponding Note Off message will be sent after that duration has elapsed.
- **quiet**: When turned on, silences any previously sounding note before a new note on message is sent. This is useful when you want to make sure that notes don't overlap regardless of the speed with which this actor is triggered.

Send Pitch Bend

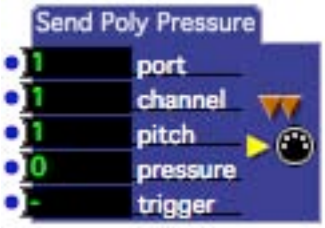


Sends a MIDI Pitch Bend message each time a trigger is received.

Input Properties

- **port**: The MIDI port on which the message will be sent. These port numbers correspond to the Destinations shown in the MIDI Setup dialog.
- **channel**: The MIDI Channel on which the message will be sent.
- **bend value**: The Pitch Bend message's bend value, from 0 to 16383.
- **trigger**: Sends a MIDI Pitch Bend message with the values specified by the other input properties each time a trigger is received on this input.

Send Poly Pressure

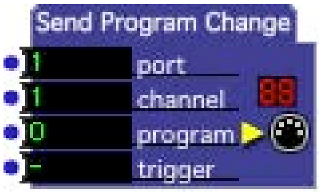


Sends a MIDI Polyphonic Pressure message whenever a trigger is received on the trigger input.

Input Properties

- **port**: The MIDI port on which the message will be sent. These port numbers correspond to the Destinations shown in the MIDI Setup dialog.
- **channel**: The MIDI Channel on which the message will be sent.
- **pitch:** The pitch value of the Polyphonic pressure message, from 0 to 127.
- **pressure:** The pressure value of the Polyphonic pressure message, from 0 to 127.
- **trigger**: Sends a MIDI Poly Pressure message with the values specified by the other input properties each time a trigger is received on this input.

Send Program Change

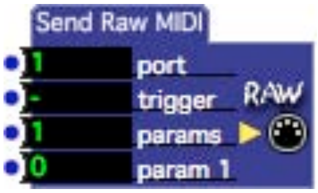


Sends a MIDI Program Change message each time a trigger is received.

Input Properties

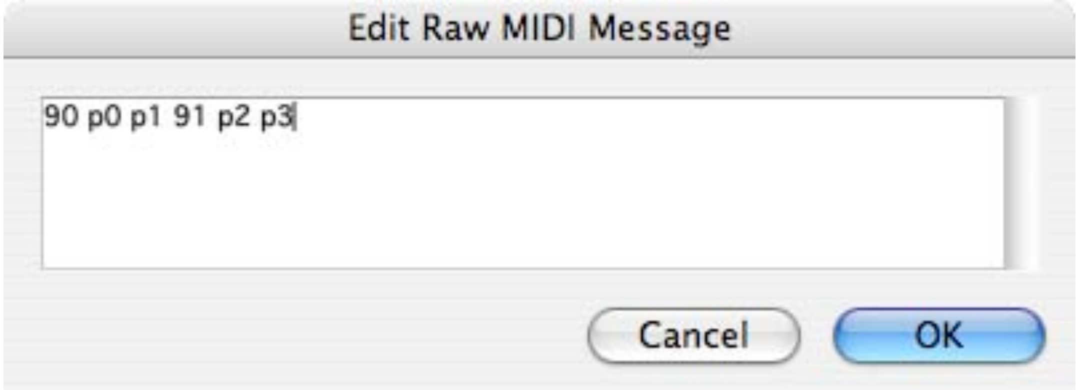
- **port**: The MIDI port on which the message will be sent. These port numbers correspond to the Destinations shown in the MIDI Setup dialog.
- **channel**: The MIDI Channel on which the message will be sent.
- **program**: The Program Change message’s program number, from 0 to 16383.
- **trigger**: Sends a MIDI Pitch Bend message with the values specified by the other input properties each time a trigger is received on this input.

Send Raw MIDI



Sends a MIDI message without any error checking for formatting each time a trigger is received. The message may contain variable values.

To specify the contents of the raw MIDI message, double-click this actor's icon. A dialog allowing you to edit the System Exclusive message will appear:



Edit Raw MIDI Message

90 p0 p1 91 p2 p3

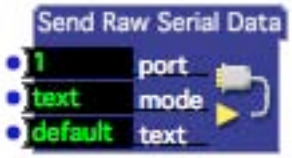
Message data must be entered in hexadecimal. **There is no error checking done on this data!** You should have a clear understanding of the MIDI specification if you intend to use this actor, as you MIDI devices may become confused or even freeze if they receive invalid data.

You can insert up to nine variable values in the message by using the codes P1 – P9 instead of a valid hexadecimal number. After you do this, you should then set the params input to the desired number of variable parameters, and the specified number of parameter value inputs will appear (e.g, param 1, param 2, etc.) When a message is sent, the codes P1 – P9 specified in the editor will be replaced with the current value of the matching parameter inputs (i.e. "P2" in the message above is replaced by the value of the param 2 input).

Input Properties

- **port**: The MIDI port on which the message will be sent. These port numbers correspond to the Destinations shown in the MIDI Setup dialog.
- **trigger**: Sends the raw MIDI message each time a trigger is received on this input.
- **params**: The number of variable parameter inputs. Increasing this number adds parameter inputs, decreasing it removes them.
- **param 1, param 2, etc:** variable value parameters that will be inserted into the message. See description above for more about using variable parameters.

Send Raw Serial Data (v1.3)

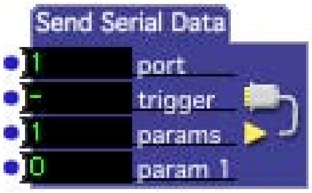


Sends raw data to the specified serial port. This actor has two modes: 'text' and 'hex'.

Input Properties

- **port**: Specifies the serial port to which the data will be sent when triggered, from 1 to 8. This port is configured using the Serial Port Setup dialog found in the Communications menu.
- **mode**: When set to ‘text’, the text received at the text input is sent directly to the serial port. When set to ‘hex’, the text must consist of hexidecimal characters (0-9, A-F). Each pair of characters is converted to its single byte equivalent and the result sent to the serial port. The latter option is essential if you need to send data that includes the value 0 within the block of data, as this is the marker for the end of a text string.
- **text**: The text to send to the serial port, interpreted according to the ‘mode’ setting.

Send Serial Data (v1.1)



Sends data to the currently specified serial port.

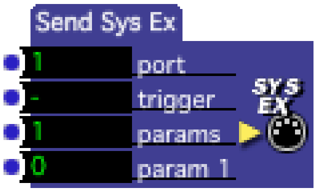
For more information on setting up serial communications, see “Serial Input/Output” on page 173 in the Isadora Reference section.

For information on formatting the input parameters, see the section “Output Data Formatting” on page 183.

Input Properties

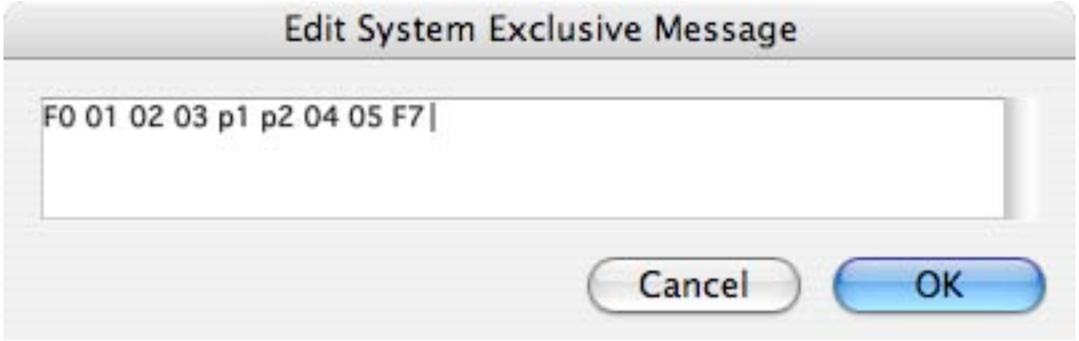
- **port**: Specifies the serial port to which the data will be sent. This port is configured using the Serial Port Setup dialog found in the Communications menu.
- **trigger**: When a trigger is received on this port, the data is sent to the specified port.
- **params**: The number of variable parameter inputs. Increasing this number adds parameter inputs, decreasing it removes them.
- **param 1, param 2, etc:** Variable value parameters that will be inserted into the serial data. See “Output Data Formatting” on page 183 for more information on how to format the data from these inputs.

Send Sys Ex



Sends a MIDI System Exclusive message, which may contain variable values, each time a trigger is received.

To specify the contents of the System Exclusive message, double-click this actor's icon. A dialog allowing you to edit the System Exclusive message will appear:



F0 01 02 03 p1 p2 04 05 F7

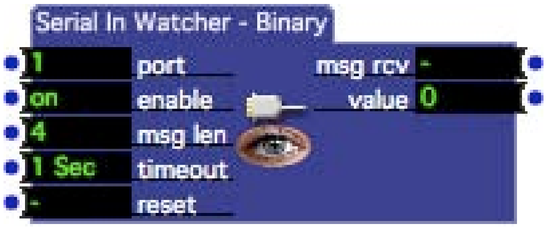
Messages must be entered in hexadecimal, starting with a hex F0 (start of exclusive) and ending with hex F7 (end of exclusive).

You can insert up to nine variable values in the message by using the codes P1 – P9 instead of a valid hexadecimal number. After you do this, you should then set the params input to the desired number of variable parameters, and the specified number of parameter value inputs will appear (e.g, param 1, param 2, etc.) When a message is sent, the codes P1 – P9 specified in the editor will be replaced with the current value of the matching parameter inputs (i.e. “P2” in the message above is replaced by the value of the param 2 input).

Input Properties

- **port**: The MIDI port on which the message will be sent. These port numbers correspond to the Destinations shown in the MIDI Setup dialog.
- **trigger**: Sends a MIDI System Exclusive message each time a trigger is received on this input.
- **params**: The number of variable parameter inputs. Increasing this number adds parameter inputs, decreasing it removes them.
- **param 1, param 2, etc:** variable value parameters that will be inserted into the System Exclusive message. See description above for more about using variable parameters.

Serial In Watcher Binary



Reads a fixed length binary data block from the specified serial port using a user-specified pattern matching specification.

(Note: To read data consisting of variable length messages marked by a delimiter, use the Serial In Watcher - Text actor.)

Values within the data are parsed and output from this actor according to a user-specified pattern-matching specifier. To edit this specifier, double-click this actor's icon, and the editor will open. For documentation on parsing input streams, see "Data Input Parsing" on page 174

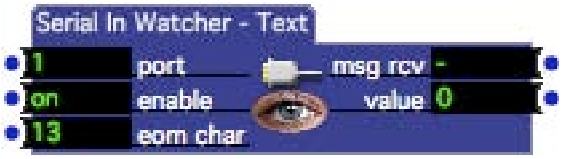
Input Properties

- **port**: Specifies the serial port from which to receive data.
- **enable**: When turned on, reads all data from the serial port and attempts to match the specified pattern. When turned off, ignores data from the serial port. This should be used with caution as enabling this input in the middle of a message may result in the data being read erroneously.
- **msg len**: The length of the data blocks to be received by this watcher. Each time the specified number of bytes arrives on the specified serial port, an attempt will be made to use the pattern matching specifier to decode the incoming data.
- **timeout:** Specifies a timeout for the input buffer. If more than this amount of time passes between receiving any two bytes, the input buffer will be cleared and the incoming message length count reset to zero.. This is to help avoid erroneous messages should the serial input cable be accidentally disconnected, etc.
- **reset:** Clears the input buffer when triggered and resets incoming message length count is reset to 0.

Output Properties

- **trigger**.: Sends a trigger when a valid message has been parsed and it matches the pattern specified by the pattern-matching specifier.
- **value outputs**.: The output for one of the parsed values. (The names and number of these outputs are based on the pattern-matching specifier.)

Serial In Watcher Text



Reads a variable length data block from the specified serial port using a user-specified pattern matching specification.

(Note: To read data consisting of fixed length messages with no delimiter, use the Serial In Watcher - Binary actor.)

Values within the data are parsed and output from this actor according to a user-specified pattern-matching specifier. To edit this specifier, double-click this actor's icon, and the editor will open. For documentation on parsing input streams, see "Data Input Parsing" on page 174

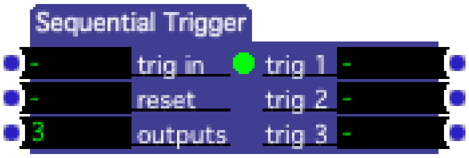
Input Properties

- **port**: Specifies the serial port from which to receive data.
- **enable**: When turned on, reads all data from the serial port and attempts to match the specified pattern. When turned off, ignores data from the serial port. This should be used with caution as enabling this input in the middle of a message may result in the data being read erroneously.
- **eom char**: The character that signifies the end of a message (i.e. eom = end of message.) Whenever this character is received, the data accumulated in the buffer is parsed using the pattern-matching specifier, and values are sent to the outputs if a match is successfully made.

Output Properties

- **trigger**.: Sends a trigger when a valid message has been parsed and it matches the pattern specified by the pattern-matching specifier.
- **value outputs**.: The output for one of the parsed values. (The names and number of these outputs are based on the pattern-matching specifier.)

Sequential Trigger



Sends triggers out of multiple outputs sequentially.

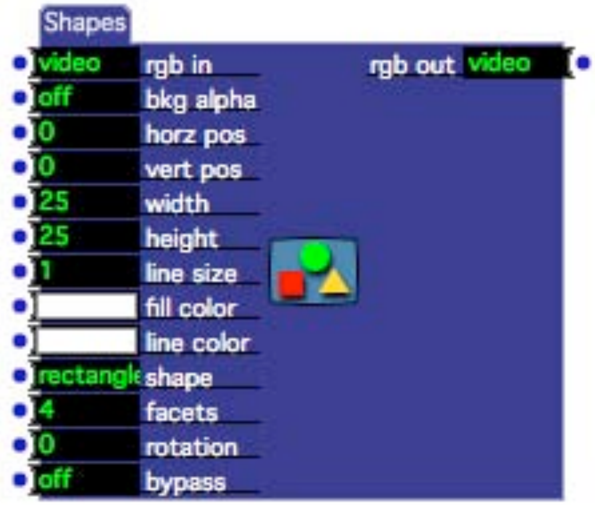
Input Properties

- **trig in**: Sends a trigger to the next trigger output. The first trigger that is received after the actor is activated will be sent to the trig 1 output. Each subsequent input trigger will send a trigger out of the next available output. When the last output has been triggered, the sequence starts over at the beginning.
- **reset**: Resets the sequence over so that the next trigger received at the trig in input will send a trigger to the trig 1 output.
- **outputs**: determines the number of trigger outputs. Setting this value to a higher number will add more trigger outputs to the actor, setting it lower will remove trigger outputs.

Output Properties

- **trig 1, trig 2, etc**.: The output triggers.

Shapes (v1.3)



Shapes

video rgb in

off bkg alpha

0 horz pos

0 vert pos

25 width

25 height

1 line size

fill color

line color

rectangle shape

4 facets

0 rotation

off bypass

rgb out video

Superimposes ovals, rectangles or polygons of a specified color, size, and position on a video stream.

Input Properties

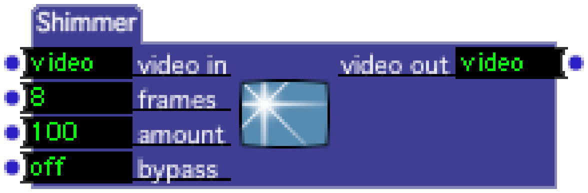
- **rgb in**: The source video stream on which the shapes will be superimposed. If you leave this input disconnected, the shapes will be drawn on a black background. If this stream is in YUV format, it will automatically be converted to RGB.

- **horz pos**: The horizontal center of the shape, specified as a percentage of the incoming video stream's width. A horizontal position of zero is halfway between the left and right edge.
- **vert pos**: The vertical center of the shape, specified as a percentage of the incoming video stream's height. A vertical position of zero is halfway between the top and bottom edge.
- **width**: The width of the shape, specified as a percentage of the incoming video stream's width.
- **height**: The height the shape, specified as a percentage of the incoming video stream's height.
- **line size**: The size of the shape's frame, expressed as a percentage of the incoming video stream's width.
- **fill color**: The color of the shape.
- **line color**: The color of the shape's frame.
- **shape**: The shape that will be drawn, either rectangle, oval or polygon.
- **facets**: When the shape input is set to polygon, determines the number of facets for the polygon. '3' draws a triangle, '4' a rectangle, '5' a pentagon and so on.
- **rotation**: When the shape input is set to polygon, determines the rotation of the polygon around its center. Expressed in degrees between -360 and +360.
- **bypass**: When turned off, this effect functions normally. When turned on, the effect is disabled and the video input is passed directly to the video output.

Output Properties

- **rgb out**: The shape superimposed at on the input video stream in RGB format.

Shimmer



Creates a shimmer effect by randomly choosing pixels from previous frames.

Input Properties

- **video in**: The source video stream that will be affected.
- **frames**: The maximum frames of video will be used to create the shimmer effect – note that the actual number of frames depends on the setting of the amount input (see below.) Note that each frame requires a fair amount of

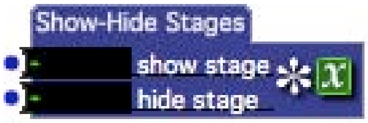
memory, so setting this value to a high number will consume considerable free memory.

- **amount (v1.1)**: Specifies how many frames of video will actually be used to created the shimmer effect, specified as a percentage of the total available frames show in the frames input.
- **bypass**: When turned off, this effect functions normally. When turned on, the effect is disabled and the video input is passed directly to the video output.

Output Properties

- **video out**: The shimmered video stream.

Show-Hide Stages



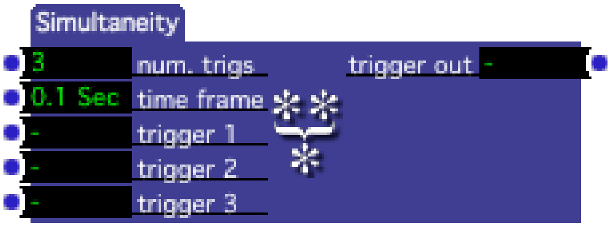
Allows you to programmatically show or hide the Stages.

Using this actor is essentially a simulation of the Show Stages / Hide Stages command in the Output menu.

Input Properties

- **show stages**: Trigger this input to show the stages.
- **hide stages**: Trigger this input to hide the stages.

Simultaneity



Sends a trigger when triggers from multiple inputs are all received within a specified amount of time.

Often it is useful to trigger an action when multiple things happen “at once.” The Simultaneity actor allows you to do this by sending a trigger if any only if a trigger is received on all of its trigger inputs within a specified amount of time. By adjusting the time frame property you can control how close the triggers must be before a trigger is generated at the output.

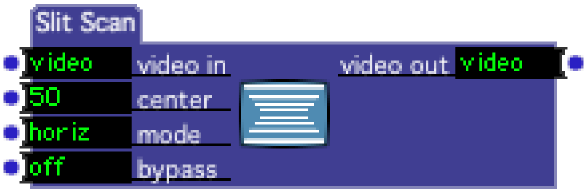
Input Properties

- **num trigs**: The number of triggers that this actor will be looking for.
- **time frame**: The time frame within which all of the triggers must be received before a trigger will be sent out of the trigger out output.
- **trigger 1, trigger 2, etc.**: The trigger inputs.

Output Properties

- **trigger out**: Sends a trigger when all of the trigger inputs have been triggered within the amount of time specified by the time frame input property.

Slit Scan



Scrolls one line or column of the source video from a vertical or horizontal center point, creating an effect reminiscent of Doug Trumbull's classic seen at the end of *2001: A Space Odyssey*.

This actor produces particularly interesting output when the source video stream has an object or objects that move somewhat slowly through the frame. (Try it with your face…)

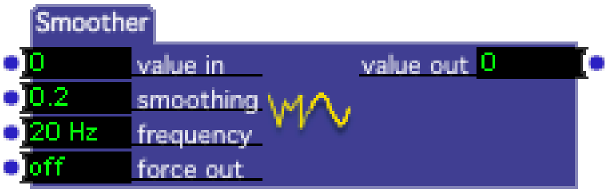
Input Properties

- **video in**: The source video stream.
- **center**: The center point from which the video will scroll outward (when mode is horizontal) or upward and downward (when mode is vertical), from 0% to 100%
- **mode.**: When set to *horiz*, the video scrolls out horizontally from the center point. When set to *vert*, the video scrolls vertically from the center point.
- **bypass**: When turned off, this effect functions normally. When turned on, the effect is disabled and the video input is passed directly to the video output.

Output Properties

- **video out**: The Slit Scanned video stream.

Smoother (v1.1)



Smoothes out noisy numeric values.

Sometimes when receiving a continuous stream of numeric values from an external sensor, the values will be noisy for one reason or another. Smoother addresses this problem by smoothing out the incoming values.

This actor is similar to the Filter actor, but uses a much better algorithm. In general, you should use the Smoother actor now instead of the Filter actor.

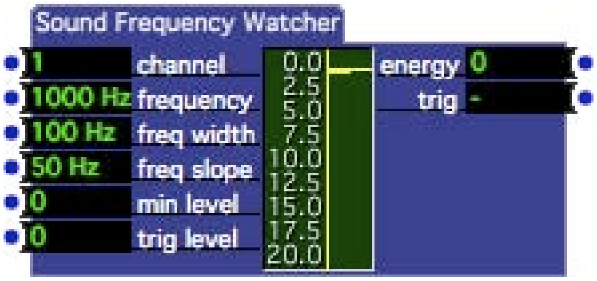
Input Properties

- **value in**: The numeric values to be smoothed.
- **smoothing**: The amount of smoothing, from 0 to 1. A value of 0 produces no smoothing at all, while a value of .99 produces extremely smooth output. Note however, that the higher this setting, the more the output values will lag behind the input value.
- **frequency**: Determines how often a value is sent of the value out output. This is specified in Hertz, i.e. cycles per second. The higher the frequency, the smoother the resolution at the output. Note, however, that if you are processing a lot of video and getting slow frame rates, the actually frequency may be lower than the value specified here.
- **force out**: When turned off, values are only sent out of the value out output when they change. When turned on, values are sent out at the rate specified in the frequency input, regardless of whether they have changed or not.

Output Properties

- **value out**: The smoothed values.

Sound Frequency Watcher



Measures the intensity, within a specific frequency band, of audio arriving on one of the Live Capture input channels.

The Sound Frequency Watcher allows you to manipulate parameters in relationship to the frequency content of the audio signal arriving at the Sound Capture input.

To use this actor, you must first enable Audio Capture by choosing **Input > Start Live Capture** and you must ensure the **Sound Frequency Analysis** item in the **Live Capture Settings** window is checked. See the section “Live Video & Audio Input” on Page 152 for more information on setting up live audio input.

To use this actor, you must start by specifying the frequency bands to be “watched” by setting the frequency and frequency width inputs (also known as the “pass band.”) All frequencies between frequency – frequency width and frequency + frequency width will be seen by this watcher. The final parameter is the slope input. This adds in more energy above and below the specified pass band, but with less influence as the frequency extends beyond the pass band. Once you have specified these parameters, the watcher will start reporting the total audio “energy” within the specified band. To help you visualize what frequencies the actor will “see”, a graph of the current pass band is drawn in the center of the actor.

The min level input property sets the level above which the Sound Frequency Watcher will “see” the audio input. Whenever the level is above min level values, the energy values will be sent to the energy output. You can use the energy output as continuous control input to other actors.

Note that when you set the min level property to a value greater than zero, the value at the output is scaled so that as the input level varies between the minimum level and 100, the output will vary between 0 and 100. E.g., if you set the minimum to 50, and the incoming audio level is 66.7 (one-third of the way between 50 and 100) the output value will be 33.4 (one-third of the way between 0 and 100).

The trig level input property determines when the trig output will send a trigger. Each time the output level goes above these minimums, a trigger will be sent out of the trig output. This allows you to trigger events based on the energy of the sound at the specified frequency.

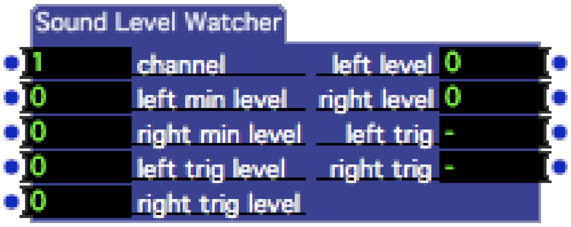
Input Properties

- **channel**: The live audio input channel that will be measured. (See the Live Capture Settings window on Page 158 for more information on configuring live capture.)
- **frequency**: The center frequency to be monitored, specified in Hz. Used in combination with the freq width and freq slope inputs.
- **freq width**: Specifies the width of the band of frequencies to monitor, centered around the frequency specified by the frequency input.
- **freq slope**: Specifies how sharply the frequency response will fall off from the center frequency to the width indicated by the freq width property.
- **min level**: The minimum level that must be exceeded before the energy level will be sent to the energy output, from 0 to 100 percent.
- **trig level**: Whenever the measured energy level level goes above this value, a trigger will be sent out of the trig output.

Output Properties

- **energy**: The amount of energy within the frequency band defined by the frequency, freq width and freq slope inputs.
- **trig**: Sends a trigger whenever the energy level goes above the value specified by the trig level input.

Sound Level Watcher



Measures the amplitude (volume) of audio arriving on one of the Live Capture input channels.

The Sound Level Watcher allows you to use the control other actors based on the amplitude of a live audio signal.

To use this actor, you must first enable Audio Capture by choosing **Input > Start Live Capture**. See the section entitled “Live Video & Audio Input” on Page 152 for more information on setting up live audio input.

To use this actor, start by setting the left min level and right min level input properties. These set the levels above, which the Sound Level Watcher will “see”, the audio input. Whenever the level is above the left min level or right min level values, values will be sent to the left level or right level outputs, respectively. You can use the left level and right level outputs as continuous control inputs to other actors.

Note that when you set the left min level and right min level properties to a value greater than zero, the value at the output is scaled so that as the input level varies between the minimum level and 100, the output will vary between 0 and 100. E.g., if you set the minimum to 50, and the incoming audio level is 66.7 (one-third of the way between 50 and 100) the output value will be 33.4 (one-third of the way between 0 and 100).

The left trig level and right trig level input properties also determine when the left trig and right trig outputs will send a trigger. Each time the output level goes above these minimums, a trigger will be sent out of the corresponding output. This allows you to trigger events based on the volume of the sound.

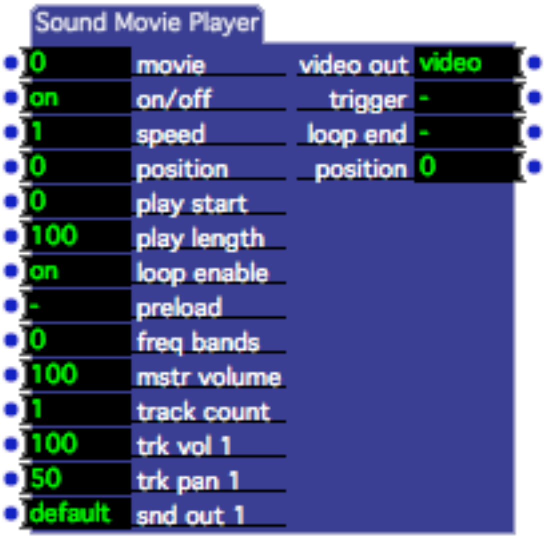
Input Properties

- **channel**: The live audio input channel that will be measured. (See the Live Capture Settings window on Page 158 for more information on configuring live capture.)
- **left min level**: The level that must be exceeded before the left volume level will be sent to the left output, from 0 to 100 percent.
- **right min level**: The level that must be exceeded before the right volume level will be sent to the left output, from 0 to 100 percent.
- **left trig level**: Whenever the left output level goes above this value, a trigger will be sent out of the left trig output.
- **right trig level**: Whenever the right output level goes above this value, a trigger will be sent out of the right trig output.

Output Properties

- **left level**: Sends the current volume level of the left sound input channel, from 0 to 100 percent. This output will change only when the level is above the value specified in the left min input property. Note that, if the left min level is greater than 0, this value is scaled – see above for details.
- **right level**: Sends the current volume level of the right sound input channel, from 0 to 100 percent. This output will change only when the level is above the value specified in the right min input property. Note that, if the right min level is greater than 0, this value is scaled – see above for details.
- **left trig**: Sends a trigger whenever the left volume level goes above the left trig level.
- **right trig**: Sends a trigger whenever the right volume level goes above the right trig level.

Sound Movie Player



Plays a QuickTime movie with multiple sound tracks, allowing you to control the volume, panning, and output routing of each track individually.

QuickTime Movies can have multiple tracks of sound embedded in each movie. The Sound Movie Player actor allows you to manipulate the volume and panning of each of these tracks individually, and to route each sound track to a separate output on a multi-channel output device if desired. (To find out how to create a multi-channel audio movie, see “Creating a Multi-Channel Audio Movie Using QuickTime Player Pro” on page 146.

The play start and play length parameters specify what portion of the movie will play. See Movie Player actor for a detailed explanation of these inputs.

This actor is useful for multi-channel sound installations or performances that require interactive control over multiple tracks of sound.

Input Properties

- **movie**: The number of the movie you want to play, as shown in the Media Window. When the number of a valid movie is entered here, its name will appear to the right of the number. Note that it is possible to choose a movie that also contains video, but you will not be able to access the video from this movie.
- **on/off**: When turned *on* the movie plays and the resulting video stream is sent out of the video out output. When turned *off*, the movie stops playing and is unloaded from memory.
- **speed**: The speed of the movie, from –10 to 10 times normal speed. The default setting is 1.0, which plays the movie forward at normal speed. 0.5 would play the movie forward at half speed. A setting of 2.0 plays the movie forward at twice normal speed. Negative values play the movie in reverse.

- **position**: Whenever a value arrives at this input, the Sound Player jumps to the specified position *within the play segment*. (The play segment is defined by the play start and play length properties – see below.) This parameter is expressed as a percentage of the play length, from 0 to 100.
- **play start**: Determines the starting point of the play segment (the portion of the movie that will play) as a percentage of the movie's total length, ranging from 0 to 100.
- **play length**: Determines the length of the play segment (the portion of the movie that will play) as a percentage of the movie's total length, ranging from 0 to 100.
- **loop enable**: If this property is turned off, the play segment will play once each time the Sound Movie Player's Scene is activated, or when its on/off property is turned on. If this property is on, once the movie starts playing it will continue by looping back to the start of the play segment when the end of that segment is reached.
- **preload**: When this input is triggered, the movie's sound data is "prerolled" so that you can achieve an instantaneous start when turning the on/off property on. Note that the on/off property must be off for preload to work. If the movie is playing, triggering this input has no effect.
- **freq bands:** Enables/disables monitoring of the audio level of this movie's soundtrack at specific frequencies. If set to zero, frequency monitoring is disabled. Setting the freq bands to a number greater than zero, will divide the audio frequency range into the specified number of bands adding an output for each one. These outputs will report the energy level for within that band. For example, if the movie's sampling rate is 48 Khz and you set this input to 5, the total output range is 24 Khz (half the sampling frequency) and each band represents a range of 4.8 Khz (24 divided by 5).
- **mstr volume**: Sets the master volume for all audio tracks in the movie being played by this actor.
- **track count**: Specifies the number of tracks in the QuickTime movie. When you increase this value, the actor will add a volume, pan, and sound output input for each track

  Note: you can find out the number of tracks in a movie by looking at the Media Window. If a movie has more than one sound track, you see (ST=x) after the name, where x is the number of sound tracks in the movie.
- **trk vol 1, trk vol 2, etc.**: Sets the volume of one of the Movie's sound tracks, expressed as a percentage of the sound track's normal volume. trk vol 1 sets the volume for track 1, trk vol 2 sets the volume for track 2, etc. A setting of 100% is normal volume, 0 produces silence, and 200 would amplify the sound to twice its normal level. Note that using values above 100 may produce distortion.
- **trk pan 1, trk pan 2, etc.**: Sets the panning of one of the Movie's sound tracks, from 0 to 100. 0 is left, 100 is right, 50 is center. trk pan 1 sets the panning for track 1, trk pan 2 sets the panning for track 2, etc.

- **snd out 1, snd out 2, etc.**: The sound output routing for the specified track. std = built-in output, e1-2 = output on external sound device channels 1 and 2, e3-4 = output on external sound device channels 3 and 4, etc. snd out 1 sets the panning for track 1, snd out 2 sets the panning for track 2, etc.

Output Properties

video out: The sound output routing for this track's audio.

'std' = built in output.

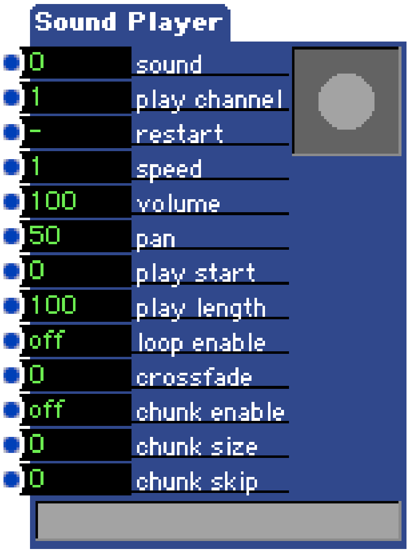
'e1-2' = output on external sound device channels 1 and 2.

'e3-4' = output on external sound device channels 3 and 4.

If no external device is present when the movie is played, or if that device does not have the requested channels, the sound will be sent to the built-in interface. See the section "Using External Multi-Channel Sound Output" on Page 141 for more information.

- **trigger:** Sends a trigger each time the loop end is reached.
- **loop end:** The current play back position, given a as a percentage of the movie's total duration from 0 to 100. The percentage is not affected by the loop start or loop length parameters.
- **position:** Monitors the audio level within specific frequencies range. See freq bands input for more info.
- **freq 1, freq 2, etc.**: Output that reports the audio level within a specific frequencies range. These outputs will only appear when the freq bands input property is set to a value greater than zero. See freq bands input property for more information.

Sound Player



Plays a sound to the computer's sound output, allowing control over its playback characteristics

There are four main things that you can control when manipulating the playback of a sound: its volume and panning, its speed, the portion of the sound that will play (and whether or not that portion will loop), and the channel on which it will play.

The portion of the sound that will play, is called the *play segment*. The play segment is determined by the play start and play length properties, both of which are expressed as a percentage of the sound's total length. The play length indicates how long the play segment will be, while the play start specifies where that chunk will start. For example, with a sound that was 60 seconds long, a play start of 50% and a play length of 10% would indicate that the play segment would start 30 seconds into the sound and be 6 seconds long. You can choose to play this segment continuously by turning the loop enable property on.

The green bar at the bottom of the actor shows the play segment in bright green. The thin yellow line that moves across that bright green bar indicates the current sound position.

The play channel determines the sound channel on which the sound will play. At any given moment, only one sound can play on a given sound channel. This means that if you start playing one sound on a given channel and then play a different sound on the same channel, the second sound will interrupt playback of the first. To be able to hear two sounds play simultaneously, you must send them to different channels.

IMPORTANT: When a sound is being played and manipulated by the Sound Player, it is loaded entirely in your computer's Random Access Memory (RAM.) The Sound Player is not the best choice when playing extremely long sound clips as it may cause you to run out of RAM and they can take a long time to load. A better method of playing long sounds is to save the sound as a sound only QuickTime movie and use the Movie Player to play it. Even though there won't be any video sent out of the Movie Player's output port, you will still be able to control the volume, pan, and even the play segment. The disadvantage of using the Movie Player is that it doesn't loop short play segments very well.

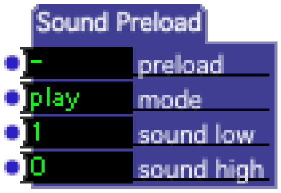
Input Properties

- **sound**: The number of the sound you want to play, as shown in the Media Window. When the number of a valid sound is entered here, its name will appear to the right of the number.
- **play channel**: The channel on which the sound will be played, from 1 to 16. Note that to play two sounds simultaneously, they must be on different channels.
- **restart**: Starts playing the sound from the beginning of the play segment.
- **speed**: The speed of the movie, from –10 to 10 times normal speed. The default setting is 1.0, which plays the movie forward at normal speed. 0.5 would play the movie forward at half speed. 2.0 plays the movie forward at twice normal speed. Negative values play the movie in reverse.
- **volume**: Sets the volume of the Movie's sound track, if one is present. Expressed as a percentage of the sound track's normal volume.
- **pan**: Controls the panning of the sound, from 0 to 100. 0 is left, 100 is right, 50 is center.
- **play start**: Determines the starting point of the play segment (the portion of the movie that will play) as a percentage of the movie's total length, ranging from 0 to 100.
- **play length**: Determines the length of the play segment (the portion of the movie that will play) as a percentage of the movie's total length, ranging from 0 to 100.
- **loop enable**: If this property is turned *off*, the play segment will play once each time the Sound Player's Scene is activated, or when its restart property receives a trigger. If this property is turned *on*, once the sound starts playing it will continue by looping back to the start of the play segment when the end of that segment is reached.
- **crossfade**: When set to a value greater than zero, and when the loop enable property is turned on, crossfades the audio when looping from the end of the play segment to the beginning.) Often there is a noticeable click when looping. By using a crossfade, the click can be reduced or even eliminated. This property is specified in audio samples. (At a sampling rate of 44100 Hz, a value of 4410 would be 1/10th of a second.
- **chunk enable**: Enables the "chunking" feature. When chunking is active, the sound player will play the number of samples specified by the chunk size property. Then, it will skip the number of samples specified by the chunk skip property, and start playing the next chunk. Depending on the settings of the size and skip properties, you will get sounds that vary from slightly distorted

to heavily grunged out. (To start experimenting, try a size setting of 100, and a skip value of –50. Then gradually decrease the skip value, heading towards -99.)

- **chunk size**: The size of the chunk in samples.
- **chunk skip**: The number of samples to skip upon reaching the end of the chunk.

Sound Preload



Sound Preload

- preload

play mode

1 sound low

0 sound high

Preloads a sound or range of sounds into memory so that the Sound Player can start playback instantly.

Sounds played by the sound player are loaded into your computer’s Random Access Memory (RAM) so that they can be efficiently manipulated. This is fine, except that when using the Sound Player to play a particularly long sound, there can be a noticeable delay from the time you trigger the restart property until you hear the sound. This is usually because of the time it takes to read the sound into RAM from disk.

The Sound Preload actor allows you to avoid this delay by loading sounds into RAM in anticipation of their later playback.

Input Properties

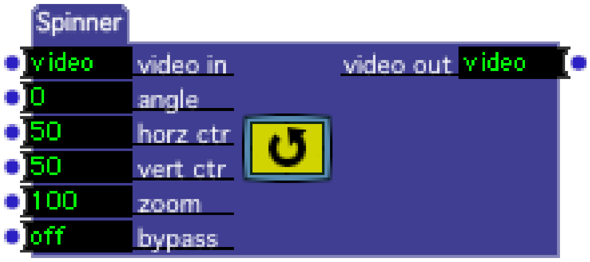
- **preload**: Preloads the specified sound when a trigger is received.
- **mode**: This property can be set to either *play* or *forever*.

  When set to play*, the sound is kept in memory until a Sound Player actor starts and then stops playing it. Once that actor stops playing the sound, it is removed from memory.*

  When set to forever, *the sound is kept in memory until it is preloaded again with the mode set to play, or until Isadora quits. Use this option with caution! It is easy to fill up your RAM with sounds that you no longer need to play.*
- **sound low**: The number of the first sound you want to preload, as shown in the Media Window. If you want to preload only one sound, set the number of the sound you want to preload and leave the sound high input set to 0. Otherwise, to specify a range of sounds to preload, set this to the number of the first sound you want to preload and the sound high input to the last sound. When the number of a valid sound is entered here, its name will appear to the right of the number.

- **sound high**: The last sound in a range of sounds you want to preload. Use this in conjunction with the sound low input to specify a range of sounds to be loaded when a trigger is received at the preload input.

Spinner



Rotates the incoming video stream around a moveable center point, optionally zooming it in the process.

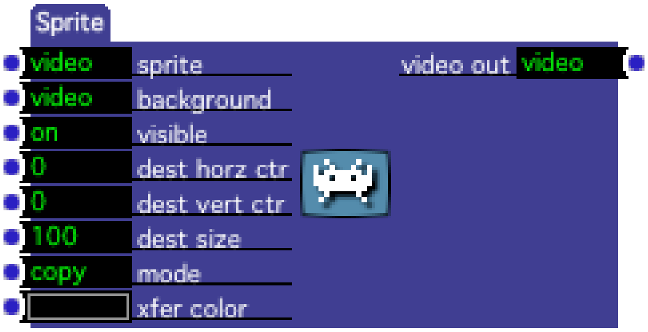
Input Properties

- **video in**: The source video stream.
- **angle**: The angle by which the source video stream will be rotated, specified in degrees from –720 to +720. Positive values rotate the image to the right, negative values to the left.
- **horz ctr**: The horizontal center point around which the source video stream will be rotated, from 0% to 100% of the source stream’s width. To rotate the incoming video stream around its center, use 50.
- **vert ctr**: The vertical center point around which the source video stream will be rotated, from 0% to 100% of the source stream’s width. To rotate the incoming video stream around its center, use 50.
- **zoom**: Sets the zoom factor for the incoming video stream, from 0 to 1000%. Setting this value to a number greater than 100 will make the image bigger, and so can prevent you from seeing the edge of the frame as the video image rotates.
- **bypass**: When turned off, this effect functions normally. When turned on, the effect is disabled and the video input is passed directly to the video output.

Output Properties

- **video out**: The rotated video stream.

Sprite



Overlays a video stream onto a background video stream, without scaling the "sprite" stream to match the size of the background, using a variety of transfer modes.

Normally, when an actor processes two video streams, they are scaled so that they match in size before they are combined. The Sprite actor does not scale the "sprite" video stream – it simply lays it on top of the background. This is similar to the setting Matte and Matte++ actor's scale fg input property to off.

The advantage of the Sprite actor over Matte and Matte++ is that there are several transfer modes available that determine how the sprite stream is rendered over the background.

Input Properties

- **sprite**: The source video stream that will be rendered on to the background stream.
- **background**: The video stream on to which the sprite will be rendered.
- **dst horz ctr**: Sets the horizontal center of the sprite within the background, from -100 to 100 percent of the background video's width. 0 is in the center of the image.
- **dst horz ctr**: Sets the vertical center of the sprite within the background, from -100 to 100 percent of the background video's height. 0 is in the center of the image.
- **dest size**: Allows you to scale the sprite, from 0 to 1000% of its original size. A value of 100 renders the sprite at its original size.
- **mode**: The transfer mode used to render the sprite on to the background image. The modes noted as being arithmetic (or, xor, bic) produce results that are somewhat unpredictable, but that can nevertheless prove interesting.

  The possible choices are:

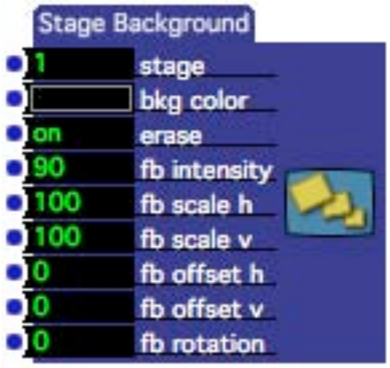
  - **copy** – copies the image on top of the background.
  - **or** – performs a mathematical "or" operation on the color bits in the sprite and the background

  - **xor** – performs a mathematical “xor” operation on the color bits in the sprite and the background.
  - **bic** – performs a mathematical “black is changed” operation on the color bits in the sprite and the background.
  - **blend** – uses the brightness xfer color to blend the sprite and the background. The brighter this color, the more of the sprite you see. If you were to use the Color Maker actor to fade from white to black, the sprite would appear to “fade out”. Note that the transfer color works on the sprite colors individually – a pure red xfer color would only allow you to see the red component of the sprite, with the green and blue being masked out.
  - **transparent** – uses the brightness xfer color to matte the sprite on to the background. Wherever the sprite color exactly matches the xfer color, you will see the background. Where it does not match, you will see the sprite. (For those of you who have used transparent GIFs on web sites, the transparent mode is same concept.) Note that in compressed images, what appears to be a solid color is actually a slight variation on that color, and so won’t work well when attempting to use the transparent mode. To get best results, you should use an uncompressed picture with a solid color that you can match.
  - **add over (add with overflow)**. Adds the colors of both streams together without limiting the result.
  - **add max (add with limit maximum)**. Adds the colors of both streams together, limiting the sum to the maximum possible (255 for each color component).
  - **sub over (subtract with overflow)**. Subtracts the colors of the second stream from the first without limiting the result.
  - **sub min (subtract with limit minimum)**. Subtracts the colors of the second stream from the first, limiting the result to a minimum of zero.
- **xfer color**: See the blend and transparent modes for information on how this color is used.

Output Properties

- **video out**: The background video stream with the “sprite” superimposed upon it.

Stage Background (v1.2)



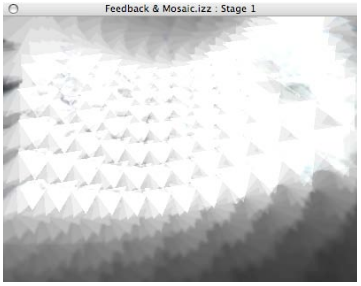
Stage Background

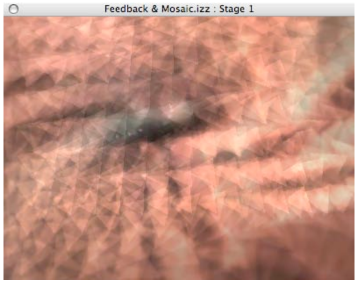
1 stage
bkg color
on erase
90 fb intensity
100 fb scale h
100 fb scale v
0 fb offset h
0 fb offset v
0 fb rotation

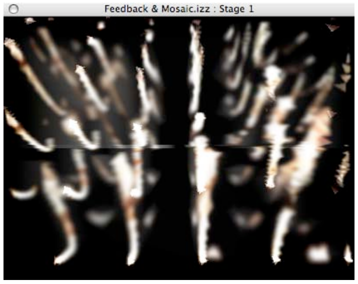
Changes the background color and/or enables powerful feedback effects for a specific stage.

The simplest use of this actor is to change the background color of a stage to something other than black. But you can also use the erase input and the feedback features to generate trails and feedback effects.

When feedback is enabled, the entire contents of the Stage are copied to the stage just prior to the start of each rendering cycle. You can control the scaling, offset, and rotation of the feedback using the various **fb** parameters. Many interesting and potentially psychedelic effects are possible depending on the setting of these parameters. Some example images, taken from the “Feedback and Mosaic” example provided in the Isadora Examples folder are shown below.







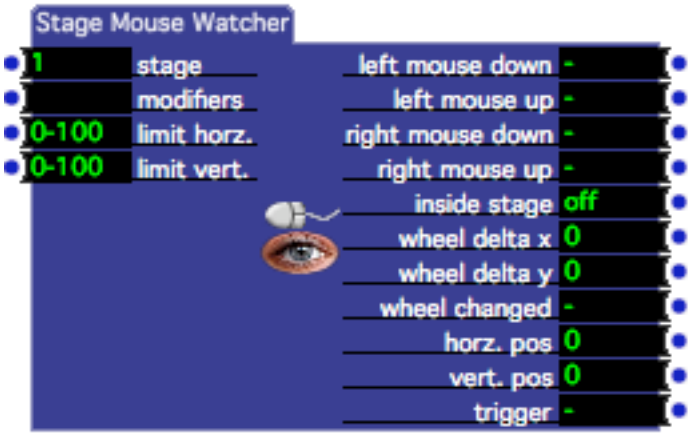
Note that this actor is local to the scene in which it is placed. For each scene that requires a background color, erase, or feedback feature will need one of these actors. When cross fading between scenes that both contain a Stage Background actor, Isadora will cross fade all of the parameter values to provide a meaningful transition.

Note also that if you use the Activate Scene actor or Activate Scene Amount actor to activate a secondary Scene that contains a Stage Background actor, Isadora will average the values of the both based on the intensity of each scene. This may lead to unexpected results – but can also be used to your advantage, as the xfade input of the Activate Scene actor and the amount input of the Activate Scene Amount actor will be used when calculating the average between the two scenes.

Input Properties

- **stage**: Specifies which stage will be affected by this actor.
- **bkg color**: Specifies the background color that will be used when rendering the specified Stage.
- **erase**: When turned on, the stage erases itself before each rendering cycle. When turned off, the stage is not erased, and any moving imagery will generate trails over time.
- **fb intensity:** When greater than zero, the contents of the specified Stage will be "fed back" to itself using the other feedback parameters described below to scale, offset and rotate the image. When this input is set to zero, feedback is disabled.
- **fb scale h:** determines how much the image is zoomed horizontally on each feedback cycle. Values greater than 100 make the image look like it is moving towards you; values less than 100 make it look like it is moving away.
- **fb scale v:** determines how much the image is zoomed vertically on each feedback cycle. Values greater than 100 make the image look like it is moving towards you; values less than 100 make it look like it is moving away.
- **fb offset h:** determines how much the image is offset horizontally on each feedback cycle. Values less than zero move to the left; values greater than zero move to the right.
- **fb offset v:** determines how much the image is offset vertically on each feedback cycle. Values less than zero move up; values greater than zero move down.
- **fb rotation:** determines how much the image is rotated on each feedback cycle. Values less than zero rotate counter clockwise; values greater than zero rotate clockwise.

Stage Mouse Watcher (v1.3)



Stage Mouse Watcher

1 stage
modifiers
0-100 limit horz.
0-100 limit vert.

left mouse down -
left mouse up -
right mouse down -
right mouse up -
inside stage off
wheel delta x 0
wheel delta y 0
wheel changed -
horz. pos 0
vert. pos 0
trigger -

Outputs the current position of the mouse within one of Isadora's six stages, optionally choosing to see changes in position only when specific modifier keys are held down. It may also be used to sense left and right clicks on the stage, and horizontal or vertical changes in the mouse wheel.

Input Properties

- **stage**: Specifies which stage the mouse must be over for this watcher to see mouse movements.
- **modifiers**: Specifies the modifier keys that must be held down before mouse movement will be seen by this watcher. Options include:

MacOS	***Windows***
cmd = d = command key	*alt = a = alt key*
ctl = c = control key	*ctl = c = control key*
opt = o = option key	*win = w = windows key*
shf = s = shift key	*shf = s = shift key*

*Note that when you save a file on MacOS and read it under Windows the **cmd** modifier becomes the **alt** modifier, and **opt** becomes **win**. The reverse is true when you move from Windows to MacOS.*

To enter a new set of modifiers, click on the modifiers value edit box and type the codes for modifiers you desire separated by hyphens. (You can use either the three letter or single letter modifiers when typing the new modifiers.) If you wanted the watcher to only see the mouse move when the option and command keys were down, enter opt-cmd *and press* enter.

To remove all modifiers, click on the modifiers value edit box, press a space, and press enter.

- **limit horz.**: Limits the range of horizontal movement that this watcher will see, specified as a percentage of the width of the stage specified by the stage input property. For example, if you set this range to 0-50, the mouse will only be seen moving when it is in the left half of the stage.

- **limit vert.**: Limits the range of vertical movement that this watcher will see, specified as a percentage of the height of the stage specified by the stage input property. For example, if you set this range to 50-100, the mouse will only be seen moving when it is in bottom left half of the stage.

Output Properties

- **left mouse down**: Sends a trigger when the left mouse button is clicked within the stage specified by the stage input property.
- **left mouse up**: Sends a trigger when the left mouse button is released after it was clicked within the stage specified by the stage input property.
- **right mouse down (v1.3)**: Sends a trigger when the right mouse button is clicked within the stage specified by the stage input property.
- **right mouse up (v1.3)**:: Sends a trigger when the right mouse button is released after it was clicked within the stage specified by the stage input property.
- **inside stage**: Sends on when the mouse is inside the specified stage or off when it is outside the stage.
- **wheel delta x (v1.3)**: Sends a value whenever the mouse wheel or scroller is moved in the horizontal direction. Simultaneously, the wheel changed output will send a trigger.
- **wheel delta y (v1.3)**:: Sends a value whenever the mouse wheel or scroller is moved in the vertical direction. Simultaneously, the wheel changed output will send a trigger.
- **wheel changed (v1.3)**: Sends a trigger whenever the wheel delta x or wheel delta y values change.
- **horz. pos**: The horizontal position of the mouse, ranging between 0% and 100%. This percentage is measured within the range specified in the limit horz input property, not the entire width of the stage. So, if the limit horz property was set to 0-50, and the mouse was 25% of the way across the stage (i.e. halfway between 0% and 50%) then horz pos. output would be set to 50.
- **vert. pos**: The vertical position of the mouse, ranging between 0% and 100%. This percentage is measured within the range specified in the limit vert input property, not the entire height of the stage. So, if the limit vert property was set to 50-100, and the mouse was 75% of the way down the stage (i.e. halfway between 50% and 100%) then vert pos. output would be set to 50.
- **trigger**: Sends a trigger every time the horz. pos or vert. pos changes.

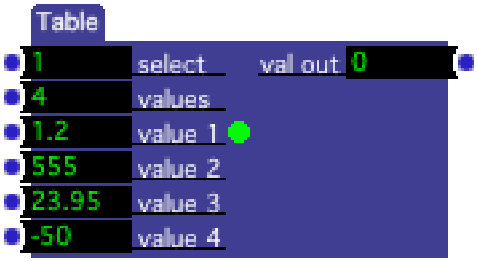
String Formatter (v1.2)

This actor was renamed “Text Formatter” in v1.3. Please refer to the documentation for that actor.

String (v1.1)

This actor was renamed “Text” in v1.3. Please refer to the documentation for that actor.

Table



Sends values, from a list of several inputs, to the output.

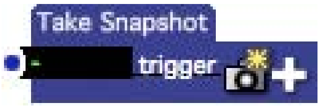
Input Properties

- **select**: Each time this value changes, the value at the corresponding input property (value 1, value 2, etc.) is sent to the output.
- **values**: Sets the number of values in the list. Increase this value to add input values, decrease it to remove input values.
- **value 1, value 2, etc**: Specifies values in the table. Each time that a new value is arrives to the select input, the corresponding input value (value 1, value 2, etc.) is sent to the value out output.

Output Properties

- **value out**: The value from the table as chosen by the select input.

Take Snapshot



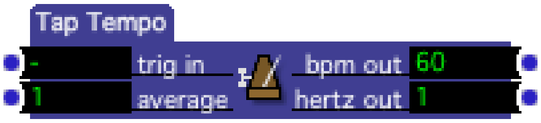
Store a new snapshot of the input values of all actors in the current scene when triggered.

This actor simulates choosing **Take Snapshot** command from the **Scenes** menu. For more on Snapshots, see the section entitled "Storing and Recalling Scenes With Snapshots" on page 95.

Input Properties

- **trigger**: A new snapshot of the input values of all actors in the current scene is taken when this input is triggered. The new snapshot will appear at the end of the snapshot list at the top of the Scene Editor window.

Tap Tempo



Measures the tempo of incoming triggers.

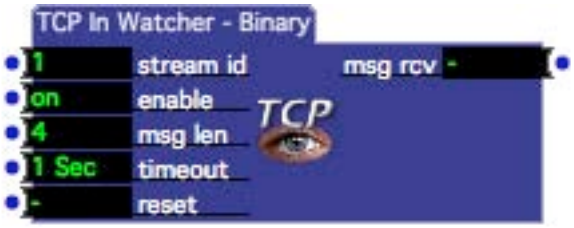
Input Properties

- **trig in**: Each time this input is triggered, the rate is calculated in Beats Per Minute (bpm) and Hertz (cycles per second) and sent to the corresponding outputs.
- **average**: Determines how many previous tempos will be averaged together. If this value is 1, then the reported tempo is calculated every time the trig in input is triggered. Higher values report the average tempo for the specified number of measurements, i.e. a value of 4 would average the tempo of the last four measurements.

Output Properties

- **bpm out**: The tempo in beats per minute.
- **hertz out**: The tempo in Hertz, or cycles per second.

TCP In Watcher - Binary



Reads a fixed length binary data block from the specified stream id using a user-specified pattern matching specification.

(Note: To read data consisting of variable length messages marked by a delimiter, use the TCP In Watcher - Text actor.)

Values within the data are parsed and output from this actor according to a user-specified pattern-matching system. To edit this parsing specifier, double-click this actor's icon, and the editor will open. For documentation on parsing input streams, see "Data Input Parsing" on page 174

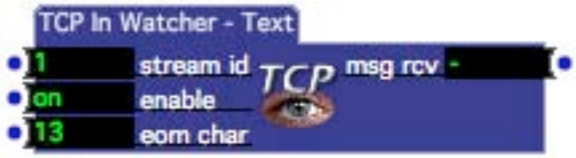
Input Properties

- **stream id**: Specifies the TCP stream from which to receive data.
- **enable**: When turned on, reads all data from the TCP stream and attempts to match the specified pattern. When turned off, ignores data from the TCP stream. This should be used with caution as enabling this input in the middle of a message may result in the data being read erroneously.
- **msg len**: The length of the data blocks to be received by this watcher. Each time the specified number of bytes arrives on the specified TCP stream, an attempt will be made to use the pattern matching specifier to decode the incoming data.
- **timeout:** Specifies a timeout for the input buffer. If more than this amount of time passes between receiving any two bytes, the input buffer will be cleared and the incoming message length count reset to zero.
- **reset:** Clears the input buffer when triggered and resets incoming message length count is reset to 0.

Output Properties

- **msg rcv:** Sends a trigger when a valid message has been parsed and it matches the pattern specified by the parsing string.
- **value outputs**.: The output for one of the parsed values. (The names and number of these outputs are based on the pattern-matching specifier.)

TCP In Watcher - Text



Reads text based data from the specified TCP stream using a specified parsing string.

(Note: To read data consisting of fixed length messages with no delimiter, use the TCP In Watcher - Binary actor.)

Values within the data are parsed and output from this actor according to a user-specified pattern-matching specifier. To edit this parsing specifier, double-click this actor's icon, and the editor will open. For documentation on parsing input streams, see "Data Input Parsing" on page 174

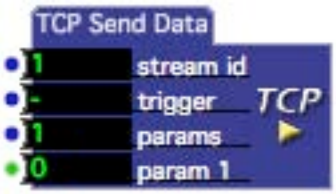
Input Properties

- **stream id**: Specifies the TCP stream from which to receive data.
- **enable**: When turned on, reads all data from the serial port and attempts to match the specified pattern. When turned off, ignores data from the TCP stream. This should be used with caution as enabling this input in the middle of a message may result in the data being read erroneously.
- **eom char**: The character that signifies the end of a message (i.e. eom = end of message.) Whenever this character is received, the data accumulated in the buffer is parsed using the pattern-matching specifier, and values are sent to the outputs if a match is successfully made.

Output Properties

- **msg rcv:** Sends a trigger when a valid message has been parsed and it matches the pattern specified by the parsing string.
- **value outputs:** The output for one of the parsed values. (The names and number of these outputs are based on the pattern-matching specifier.)

TCP Send Data



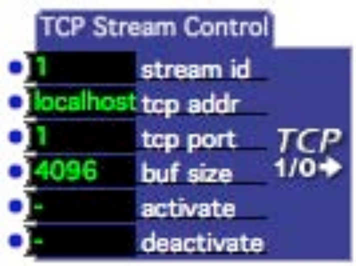
Sends formatted data to the specified TCP stream.

For information on formatting the input parameters, see the section “Output Data Formatting” on page 183.

Input Properties

- **stream id**: Specifies the TCP stream to which the data will be sent.
- **trigger**: When a trigger is received on this port, the data is sent to the specified port.
- **params**: The number of variable parameter inputs. Increasing this number adds parameter inputs, decreasing it removes them.
- **param 1, param 2, etc:** variable value parameters that will be inserted into the TCP output data. See “Output Data Formatting” on page 183 for more information on how to format the data from these inputs.

TCP Stream Control



TCP Stream Control

1 stream id

localhost tcp addr

1 tcp port

4096 buf size

- activate

- deactivate

Activates or deactivates a TCP stream by establishing a connection to the specified to the specified TCP address and port.

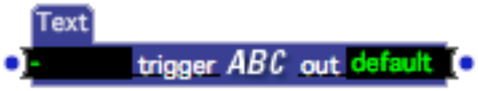
Input Properties

- **stream id**: The identifier of TCP stream to be activated or deactivated. This number is referenced by other TCP actors when sending data to, or receiving data from, this stream.
- **tcp addr:** Together with the tcp port input, specifies the TCP address to which a connection should be established when this stream is activated. This address may be specified as a numeric IP (e.g, 192.168.0.1) or as domain name (troikatronix.com) if you are online and a domain name server is available.
- **tcp port:** Specifies the tcp port to which a connection should be established when this stream is activated. (The full address is determined by the combination of this input and the tcp addr input property.)
- **buf size:** The size in bytes of the stream’s input buffer. Messages longer than this value will be truncated to the buffer size.
- **activate:** When a trigger is received at this input, the specified TCP stream is activated. If a successful connection is made to the IP address and port specified by the tcp addr and tcp port inputs, communications may then be carried out using the TCP Send Data and TCP In Watcher actors. Note that

establishing a connection with remote locations, especially when using a domain name, may take a few moments.

- **deactivate:** When a trigger is received at this input, the connection to the TCP stream specified by the stream id input property is closed.

Text (v1.3)



Outputs text of arbitrary length when triggered. (This actor was called “String” prior to v1.3.)

To define the text that will be sent by this actor, double-click it. The Text Entry dialog will open, allowing you to type or paste as much text as you like into the actor. You can also generate text that includes formatted input parameters using the Text Formatter actor found on page 390.

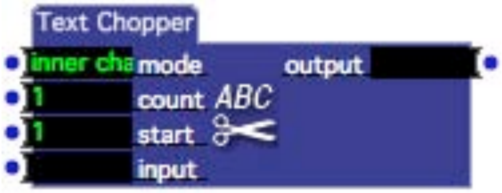
Input Properties

- **trigger**: Sends the text specified in the Text Entry dialog to the output.

Output Properties

- **out**: When a trigger is received at the input, sends the text defined in the Text Entry dialog to the output.

Text Chopper



Copies a specified number of characters or lines from the input text and sends the result to the output. The mode input determines which portion of the text will be copied.

Input Properties

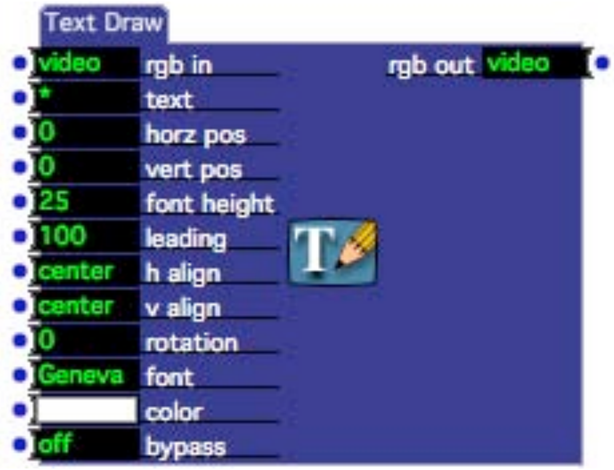
- **mode:** The mode can either be first char, last char, inner char, first line, last line or inner line. When using first or last modes the number of characters or lines as specified by the count input, will be chopped from the beginning or the end of the text respectively. When using ‘inner’ the specified number of characters or lines will be copied from the starting position specified by the start input.

- **count:** The number of characters or lines to chop from the input text. See the mode input for more information about which portion of the input text will be chopped.
- **start:** When the mode is set to inner char or inner line, specifies the starting character or line within the input text where chopping will occur. Other modes ignore this parameter.
- **input:** The position from which characters or lines will be copied, based on the mode, count and start inputs.

Output Properties

- **output:** Outputs the ‘chopped’ text whenever the input changes.

Text Draw (v1.1)



Text Draw

video rgb in

* text

0 horz pos

0 vert pos

25 font height

100 leading

center h align

center v align

0 rotation

Geneva font

color

off bypass

rgb out video

Superimposes text on a video stream.

Draw Text allows you to superimpose text received at the text input on a video stream, controlling its font, size, leading, alignment position and color.

Input Properties

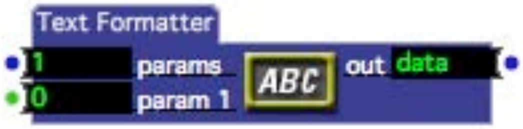
- **rgb in**: The video stream on which the text will be superimposed. You can leave this input disconnected if you would like the text to appear on a black background. If this stream is in the YUV format, it will automatically be converted to RGB.
- **text**: The text to be display. This can be received from any actor that outputs text.
- **horz pos**: The horizontal center of the text, specified as a percentage of the width of the frame, from –100 to 100 percent.

- **vert pos**: The vertical center of the text, specified as a percentage of the height of the frame, from –100 to 100 percent.
- **font height**: This is given as a percentage of the output stage height, from 0 to 1000. Theoretically, a value of 100 would produce text whose capital letters are the same height as the stage. In practice, because of the need for descenders (like the letter “j”) and other factors, the text won’t be quite as tall as the stage when set to 100.
- **leading**: The vertical spacing between lines of text
- **h align:** The horizontal alignment of the text: left, center or right.
- **v align:** The vertical alignment of the text: top, center or bottom.
- **rotation**: Rotates the text around its center point; specified in degrees, from –360 to +360.
- **font**: To set the font, click on this property’s value edit box; a menu with all of the fonts available on the system will appear. After choosing a font, its name will be displayed in the value edit box.
- **color**: The color with which the font will be drawn.
- **bypass**: When turned off, this effect functions normally. When turned on, the effect is disabled and the video input is passed directly to the video output.

Output Properties

- **rgb out**: The text, drawn using the specified font, size, alignment, leading and color, superimposed upon the video stream connected to the video in port. Output in RGB format.

Text Formatter (v1.3)



Generates formatted text with variable parameters. (This actor was called “String Formatter” prior to v1.3)

For more information on formatting input parameter values, see “Output Data Formatting” on page 183.

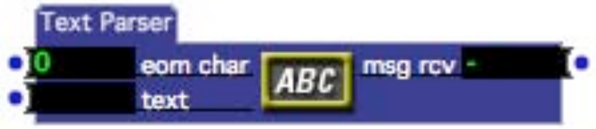
Input Properties

- **params**: The number of variable parameter inputs. Increasing this number adds parameter inputs, decreasing it removes them.
- **param 1, param 2, etc:** variable value parameters that will be inserted into the text. See “Output Data Formatting” on page 183 for more information on how to format the data from these inputs.

Output Properties

- **out**: When a trigger is received at the input, sends the formatted text, as determined by the formatting information in the Text Entry dialog, to the output.

Text Parser (v1.3)



The Text Parser actor parses the ‘text’ input using a user specified parsing string. To edit the parsing string, double click this actor’s icon and edit the values in the dialog that appears. For documentation on the parsing string format, click the “Help” button at the bottom of the dialog.

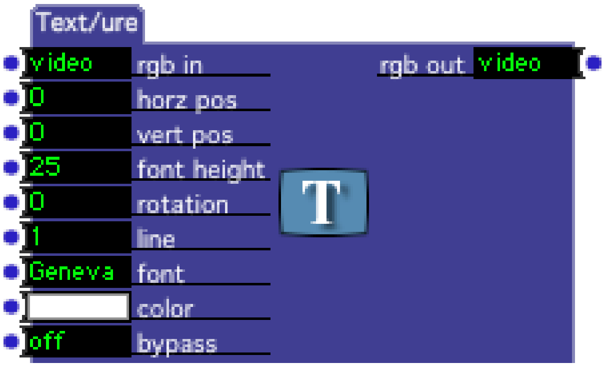
Input Properties

- **eom char:** The character that signifies the end of a line. Whenever this character is received, the data accumulated in the buffer is parsed using the parsing string, and the resulting output is provided if a match is successfully made. Use 0 to parse to the end of the input text.
- **text:** The text to be parsed. Each time new data is sent to this input, it will be parsed according to the user specified parsing string.

Output Properties

- **msg rcv:** Sends a trigger when a valid message has been parsed and it matches the pattern specified by the parsing string.

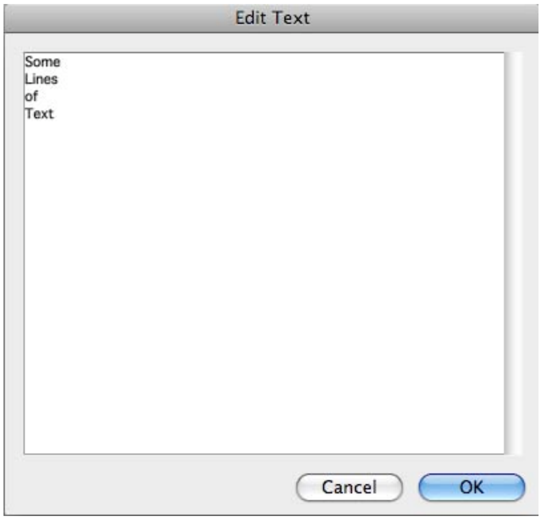
Text/ure



Superimposes text on a video stream.

Text/ure allows you to superimpose text on a video stream, controlling its font, size, position and color. In addition, you can choose to enter several lines of text and choose which line to show.

The first step is to enter the text you want to display. To do this, double-click the Text/ure actor. A window will appear that allows you to edit the text:



Some
Lines
of
Text

If you just want to show one word or phrase, type it and click OK. If you would like to have multiple words or phrases that you can choose on the fly, put them on separate lines by hitting the Return key. In the example above, the four words Some, Lines, Of, Text will be able to be recalled individually using the line input.

Click OK when to confirm the new text.

Then, choose the font by clicking on the value edit box for the font property. A pop-up menu will appear that allows you to select the font from all of the fonts available on your computer.

After these steps are done, you can use the size input to set the size, position, and color of the font. The size is based on the height of the video frame; if you set it to

100%, the font will be as tall as the video output is high. The horizontal and vertical position inputs determine the position of the text within the frame. 0 is centered, negative numbers move the text to the left, positive numbers to the right. Finally, you can click on the value edit box for the color property to set the text color.

If you have entered multiple lines of text, you can select which line you will see by sending the number of that line to the line input. When you do, the text for the Text/ure actor will display that line.

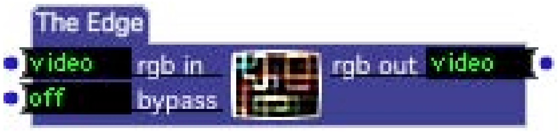
Input Properties

- **rgb in**: The video stream on which the text will be superimposed. You can leave this input disconnected if you would like the text to appear on a black background. If this stream is in the YUV format, it will automatically be converted to RGB.
- **horz pos**: The horizontal center of the text, specified as a percentage of the width of the frame, from –100 to 100 percent.
- **vert pos**: The vertical center of the text, specified as a percentage of the height of the frame, from –100 to 100 percent.
- **font height**: This is given as a percentage of the output stage height, from 0 to 1000. Theoretically, a value of 100 would produce text whose capital letters are the same height as the stage. In practice, because of the need for descenders (like the letter "j") and other factors, the text won't be quite as tall as the stage when set to 100.
- **rotation**: Rotates the text around its center point; specified in degrees, from – 360 to +360.
- **line**: If you have entered multiple lines of text (i.e. words or phrases followed by a carriage return) you can use this property to select which line of text will be shown.
- **font**: To set the font, click on this property's value edit box; a menu with all of the fonts available on the system will appear. After choosing a font, its name will be displayed in the value edit box.
- **color**: The color with which the font will be drawn.
- **bypass**: When turned off, this effect functions normally. When turned on, the effect is disabled and the video input is passed directly to the video output.

Output Properties

- **rgb out**: The text, drawn using the specified font and color, superimposed upon the video stream connected to the video in port. Output in RGB format.

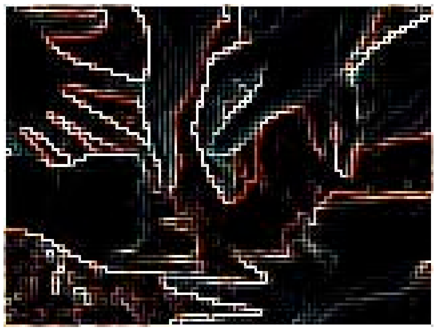
The Edge



Performs “edge detection” on a video stream, which results in light, colored lines wherever an edge between two objects is found.

The Edge works by looking at the source image, and detecting the areas on the image where there is an “edge”, that is a significant change in color or brightness. In the resulting image, the edges appear as bright colored lines, while other areas remain dark. See below for an example:

Before



After

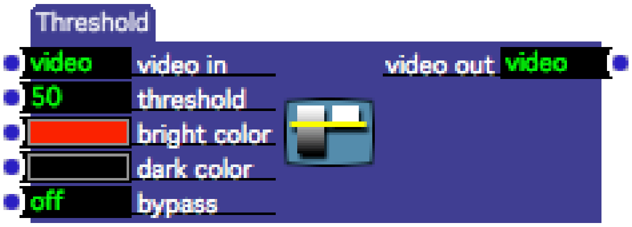
Input Properties

- **rgb in**: The video input stream. If this stream is in the YUV format, it will automatically be converted to RGB.
- **bypass**: When turned off, this effect functions normally. When turned on, the effect is disabled and the video input is passed directly to the video output.

Output Properties

- **rgb out**: The edge-detected video output stream output in RGB format.

Threshold (v1.1)



Threshold

video — video in

50 — threshold

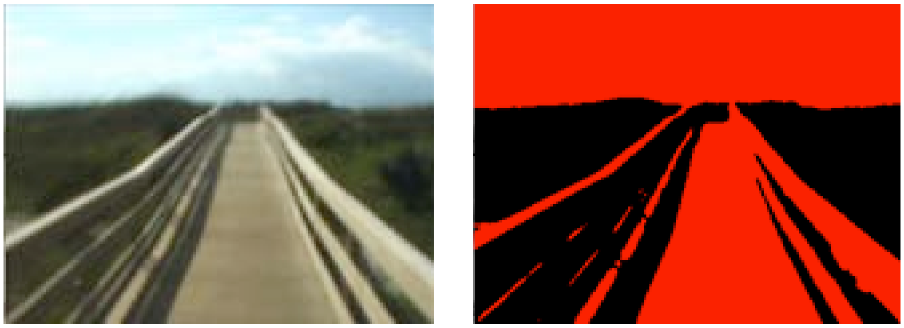
bright color

dark color

off — bypass

video out — video

Converts a video stream to a two-color image, with one color being used when the brightness is above a specified level, and the other color being used otherwise.



Before

After

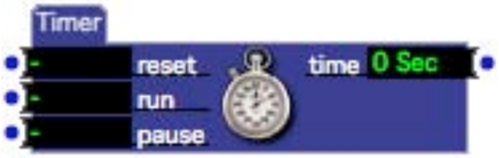
Input Properties

- **video in**: The video input stream.
- **threshold**: The threshold of brightness, from to 0 to 100%, that determines whether the bright color or dark color will be used when color the image. Portions of the video image whose brightness is above this value will be set to the bright color. Portions that are below this level will be set to the dark color.
- **bright color**: The color used to replace portions of the video stream that are above the threshold level.
- **drak color**: The color used to replace portions of the video stream that are below the threshold level.
- **bypass**: When turned off, this effect functions normally. When turned on, the effect is disabled and the video input is passed directly to the video output.

Output Properties

- **rgb out**: The edge-detected video output stream output in RGB format.

Timer



Measures elapsed time.

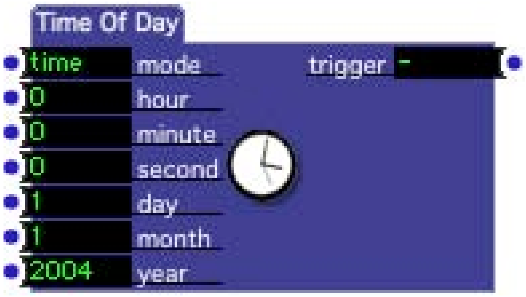
Input Properties

- **reset:** Resets the time output to zero.
- **run:** Starts the timer.
- **pause:** Pauses the timer.

Output Properties

- **time:** Continuously outputs the elapsed time since the run input property was triggered.

Time of Day (v1.1)



Sends a trigger at a specific time, at a specific time on a particular day, or at a periodic rate based on wall clock time.

Input Properties

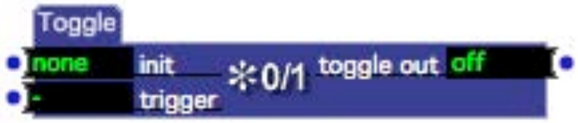
- **mode**: When the mode is set to periodic, the hours, minutes and seconds specifies the frequency of the output trigger. When the mode is set to time, they specify a specific time of day when the trigger will be sent (i.e. once every 24 hours at the specified hour, minute and second.)

  If the mode is set to date/time, then the day, month, and year inputs will also be used allowing the user to specify a trigger that will occur on a particular date at a specific time (i.e. once in the history of the world.)
- **hour/minutes/second**: The time of day that will trigger this actor.
- **day/month/year**: The particular day on which the trigger will occur if the mode is set to date/time.

Output Properties

- **trigger**: Sends a trigger when at time of day matches that specified by the input properties.

Toggle



Toggles between on and off each time a trigger is received.

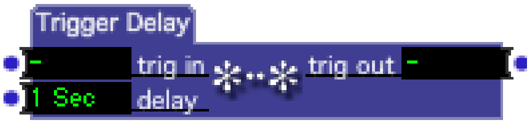
Input Properties

- **init:** Allows you to specify the initial on/off state of the toggle out output. You may choose on, off or none; if you choose none the toggle off will not be initialized, but will instead simply remember its previous state, which is saved with the document. If you choose on or off this value will automatically be sent from the toggle out output when the owning scene is activated.
- **trigger:** When a trigger is received, turns the toggle out on if it is currently off; turns it off if it is currently on.

Output Properties

- **toggle out:** Changes from off to on, or from on to off each time a trigger is received.

Trigger Delay



Delays a trigger by the specified amount of time. Can also be used to determine if something hasn't happened for a period of time.

Upon receiving a trigger at the trig in input, the Trigger Delay actor will wait for a specified period of time before sending a trigger to the trig out output.

If an initial trigger is received at the trig in input, and then a second trigger is received before the delay has elapsed, the Trigger Delay actor starts counting time over at the second trigger. In other words, because incoming trigger resets the internal time counter, if the triggers come often enough, no trigger will be sent to the output. This can be useful when you want to find out when something *hasn't* happened for a period of time.

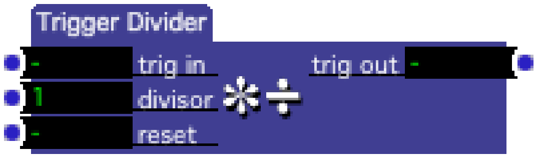
Input Properties

- **trig in**: The input trigger.
- **delay**: Upon receiving a trigger at the trig in input, the amount of time that will elapse before a trigger is sent to the trig out output.

Output Properties

- **trig out**: Sends a trigger after the specified delay has elapsed.

Trigger Divider



Sends one output trigger after a specified number of input triggers have been received.

Trigger Divider counts the number of triggers received at the trig in input. When the number of triggers received matches the value of the divisor input, then a trigger is sent to the trig out output, and the process begins again. This effectively divides the number of input triggers by the divisor value, i.e. if divisor is set to three, then an output trigger will be sent after every third input trigger.

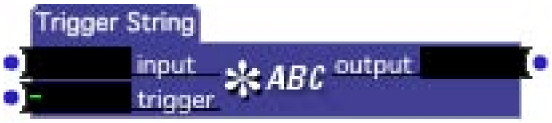
Input Properties

- **trig in**: The input trigger.
- **divisor**: Determines how often a trigger will be sent to the output. Each time a trigger arrives at the trig in input, an internal counter is incremented by one. When this counter matches the value specified by the divisor input, a trigger is sent to the output.
- **reset**: starts the counting sequence over again.

Output Properties

- **trig out**: Sends a trigger after the specified number of triggers have been received at the trig in input.

Trigger Text (v1.3)



Sends text of arbitrary length to an actor with a text input when triggered. (Prior to version 1.3, this actor was called “Trigger String”.)

Input Properties

- **input**: The text to send to the output property each time a trigger is received at the trigger input.
- **trigger**: Sends the text to the output when a trigger is received.

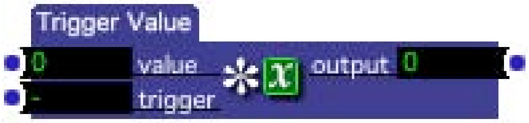
Output Properties

- **output**: Sends the text shown at the input input each time the trigger input receives a trigger.

Trigger String (v1.1)

This actor was renamed “Trigger Text” in v1.3; please refer to the documentation for that actor.

Trigger Value



Sends a value each time a trigger is received.

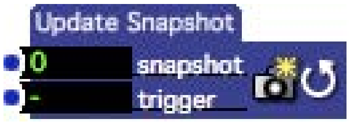
Input Properties

- **value**: The value to send to the value out property each time a trigger is received at the trigger input.
- **trigger**: Sends the value to the output when a trigger is received.

Output Properties

- **value out**: Sends the value shown at the value input each time the trigger input receives a trigger.

Update Snapshot



Update Snapshot

0 snapshot

- trigger

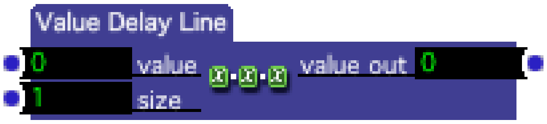
Updates an existing snapshot by re-recording the input values of all actors in the current scene.

This actor simulates choosing **Update Current Snapshot** command from the **Scenes** Menu. For more on Snapshots, see the section entitled “Storing and Recalling Scenes With Snapshots” on page 95.

Input Properties

- **snapshot**: The number of the snapshot that will be updated when this actor is triggered.
- **trigger**: When this input is triggered, the input values of all actors in the current scene are re-recorded into the specified snapshot. If the specified snapshot does not exist, then triggering this actor will have no effect.

Value Delay Line



Value Delay Line

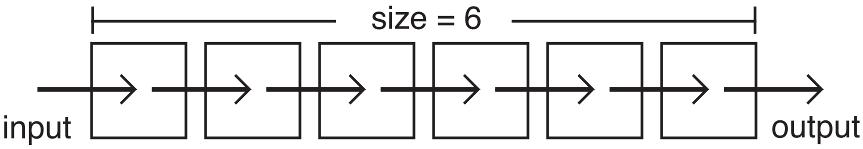
0 value

1 size

value out 0

Delays a value by passing it through a specified number of stages.

You can imagine the delay line as a series of numbers in a pipe. Each time a new value arrives, the number at the end of the pipe is sent to the output, the values remaining in the pipe are shifted one to the right, and the new value is placed at the beginning of the pipe. The number of items in the pipe is determined by the size parameter.



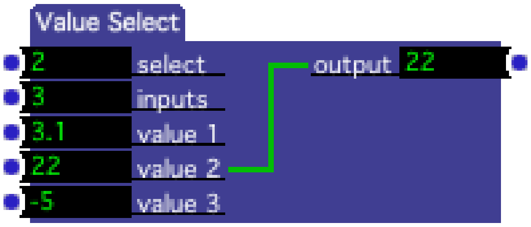
Input Properties

- **value**: Each time a new value arrives here, the values in the delay line are shifted one to the right. The value at the end of list is sent to the output.
- **size**: The number of stages in the delay.

Output Properties

- **value out**.: Each time a new value arrives at the value input, the values in the delay line are shifted one to the right. The value at the end of list is sent to this output.

Value Select



2 select
3 inputs
3.1 value 1
22 value 2
-5 value 3
output 22

Route multiple numeric inputs to one output.

The Value Select actor will route data from one of several inputs to an output. When a particular value input is selected with the select parameter, any values that arrive on that input will immediately be sent to the output. In addition, whenever the select input changes and a new input is routed to the output, the current value of the newly selected input is sent to the output.

Note that the value inputs and output output of this actor are mutable. This means they will *all* change their type (integer, float, video, etc.) to match the first link made to one of these properties. Once a link has been made to any of the mutable properties, their types will remain fixed, based on that first connection, until all have been disconnected. Then the properties become mutable again.

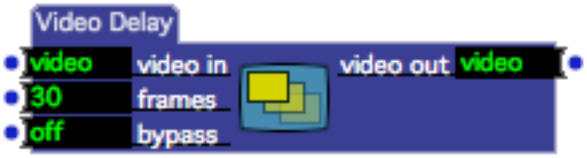
Input Properties

- **select**: Chooses which input will be routed to the output. This value can range between 1 and the number of inputs specified by the inputs property.
- **inputs**: The number of value inputs available to be routed to the output.
- **value 1, value 2, etc**.: The value inputs that will be routed to the output.

Output Properties

- **output**: Passes on any value arriving at the input to the output specified by the select input property.

Video Delay


Video Delay

video — video in

30 — frames

off — bypass

video out — video

Delays a video stream.

The Video Delay works by passing frames of video through a chain of video buffers called stages – the more stages, the longer the delay. Each time a new frame of video is received, it is stored at the front of the chain after all the other buffers are shifted to the right and the last buffer is sent to the video output.

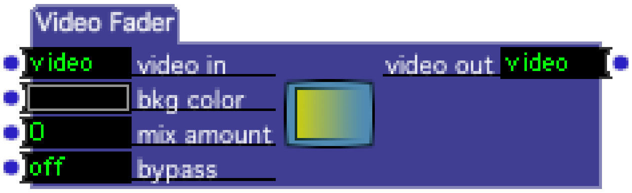
Input Properties

- **video in**: The video input stream.
- **frames:** The number of frames of video used in the delay. The greater this number, the longer the delay. Note that each frame requires enough memory to hold one full frame of video. Setting this value to a high number will consume a large amount of memory and may lead to performance problems.
- **bypass**: When turned off, this effect functions normally. When turned on, the effect is disabled and the video input is passed directly to the video output.

Output Properties

- **video out**: The delayed video stream.

Video Fader


Video Fader

video — video in

bkg color

0 — mix amount

off — bypass

video out — video

Fades between a video stream and a solid color.

Input Properties

- **video in**: The video input stream.
- **bkg color**: The color with which the video input stream will be faded. You can set this color by linking the Color Maker actor to this input property, or

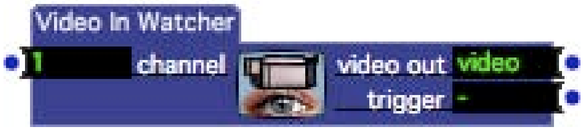
you can click on the value edit box and choose the color from within a Color Picker dialog box.

- **mix amount**.: Determines the mixture between the video input stream and the background color, from 0% to 100%. When set to 0, you see only the video input stream. As the value moves towards 100, you will see more of the background color.
- **bypass**: When turned off, this effect functions normally. When turned on, the effect is disabled and the video input is passed directly to the video output.

Output Properties

- **video out**: The mixed video stream.

Video In Watcher



Outputs a video stream captured from a live video source.

The Video In Watcher will deliver a video stream captured from a live source. To use this actor, you must have hardware that allows you to connect an external video camera to your computer, either in the form of a digital FireWire connection or a with standard composite video input. To get live video coming into *Isadora*, do the following:

- Connect the video camera to the input hardware, either your computer's FireWire port or the composite video input of your video capture hardware.
- Make sure you can actually see an image on the camera (i.e. look through the viewfinder.)
- Choose **Input > Start Live Capture** to start capturing.

Note that you must choose **Input > Start Live Capture** each time you start Isadora before any video input will be available to the Video In Watcher.

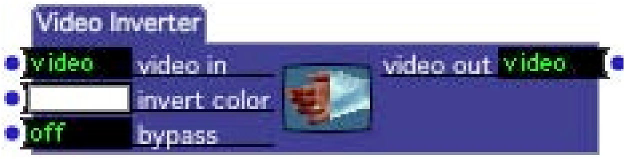
Input Properties

- **channel**: The live video input channel that will be sent to the output. (See the Live Capture Settings window on Page 158 for more information on configuring live capture.)

Output Properties

- **video out**: The video input stream captured from the live input.
- **trigger**: Sends a trigger each time a new frame of video arrives.

Video Inverter



Inverts the color of a video stream.

The default behavior of the Video Inverter is to generate a negative image, i.e. like a photographic negative, of the video input stream. However, by changing the invert color, a wide range of bizarre (though unpredictable) colorization effects can be achieved. Connect the Color Maker actor to the invert color input to experiment with inversion colors other than white.

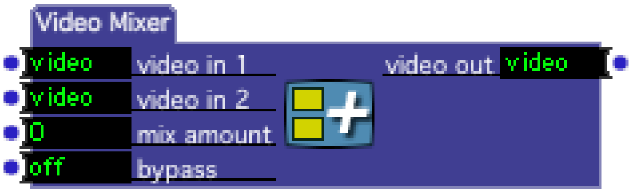
Input Properties

- **video in**: The video input stream.
- **invert color**: The color used to invert the video input stream. When set to white, the output is the photographic negative of the input. Other colors produce unpredictable though interesting results. You can set this color by linking the Color Maker actor to this property, or you can click on the value edit box and choose the color from within a Color Picker dialog box.
- **bypass**: When turned off, this effect functions normally. When turned on, the effect is disabled and the video input is passed directly to the video output.

Output Properties

- **video out**: The inverted video stream.

Video Mixer



Mixes two streams of video, allowing a crossfade between the two.

Input Properties

- **video in 1**: The first video input stream.
- **video in 2**: The second video input stream.
- **mix amount**.: Determines the mixture between the two video input streams, from 0% to 100%. When set to 0, you see only the first video input stream. As

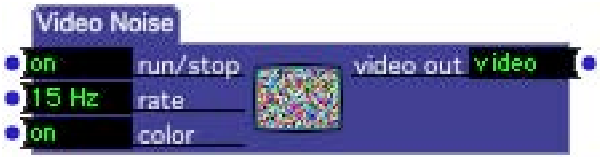
the value moves towards 100, you will see more of the second stream. When the mix amount reaches 100, you will see only the second stream.

- **bypass**: When turned off, this effect functions normally. When turned on, the effect is disabled and the video input is passed directly to the video output.

Output Properties

- **video out**: The mixed video stream.

Video Noise



on run/stop
15 Hz rate
on color
video out video

Generates video noise.

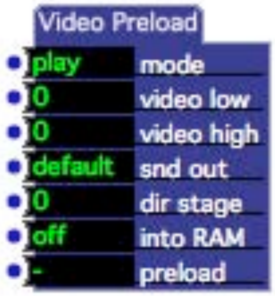
Input Properties

- **run/stop**: When turned on, this actor produces frames of video noise at the rate specified. When set to off, the actor does nothing.
- **rate**.: Determines the frequency with which new frames of video noise will be generated. Specified in Hertz (i.e. cycles per second.)
- **color**: When turned off, black and white video noise is produced. When turned on, the video noise is in color.

Output Properties

- **video out**: The video noise output.

Video Preload



play mode
0 video low
0 video high
default snd out
0 dir stage
off into RAM
- preload

Preloads a video or range of videos into memory so that the Video Player can start playback instantly.

Some video formats can take a noticeable fraction of a second to start play; The Video Preload actor helps you to avoid that delay by "preloading" a small chunk of the specified movie or movies into your computer's main memory, thus reducing as much as possible the delay in starting playback. Note however that the preload function will only work if snd out, dir stage, and into RAM parameters exactly match the equivalent settings in the Movie Player used to play the movie.

Input Properties

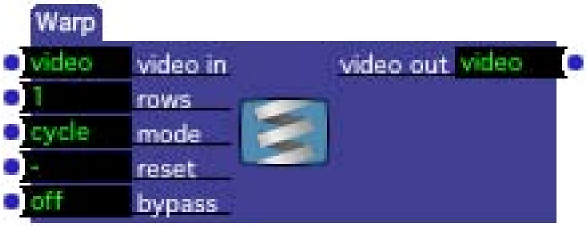
- **mode**: This property can be set to either *play* or *forever*.

  When set to play, the video is kept in memory until a Movie Player actor starts and then stops playing it. Once that actor stops playing the video, it is removed from memory.

  When set to forever, the video is kept in memory until it is preloaded again with the mode set to play, or until Isadora quits. Use this option with caution! It is easy to fill up your RAM with videos that you no longer need to play.
- **video low**: The number of the first video you want to preload, as shown in the Media Window. If you want to preload only one video, set the number of the video you want to preload and leave the video high input set to 0. Otherwise, to specify a range of videos to preload, set this to the number of the first video you want to preload and the video high input to the last video. When the number of a valid video is entered here, its name will appear to the right of the number.
- **video high**: The last video in a range of videos you want to preload. Use this in conjunction with the video low input to specify a range of videos to be loaded when a trigger is received at the preload input.
- **snd out**: The sound output routing for this movie's audio. std = built-in output, e1-2 = output on external sound device channels 1 and 2, e3-4 = output on external sound device channels 3 and 4, etc. If no external device is present when the movie is played, or if that device does not have the requested channels, the sound will be sent to the built-in interface.

  See the section “Using External Multi-Channel Sound Output” on Page 141 for more information.
- **dir stage**: Specifies the stage to which the video will be played when using the Movie Player Direct actor. For normal Movie Player actors, set this input to 0. However, when preloading for playback within a Movie Player Direct actor, set this value to the number of the stage on which the video will be played. The specified stage window must be visible at the time that this actor is triggered for the preload to work properly.
- **into ram**: When set to true, Isadora attempts to load the entire movie into RAM (Random Access Memory) for faster playback. NOTE: This can consume large amounts of your system’s memory - be cautious when using this feature.
- **preload**: Preloads the specified video when a trigger is received.

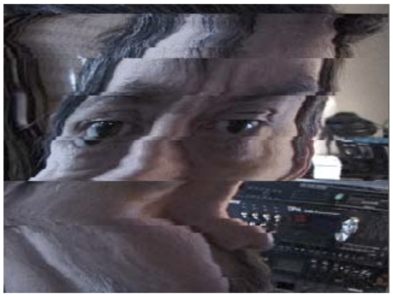
Warp



Warps the input video stream.

It is easier to see the results of warp than to describe it. Warp works by copying one horizontal chunk of video from each new frame that arrives at the input. It starts the copying at the top, and moves down one chunk each time a new frame of video arrives. When it gets to the bottom, it starts over again.

Here is the result produced when moving the camera horizontally across this author's face and routing the video input into Warp:



I rotated my head 90 degrees about 2/3 of the way through one cycle, so there is a bit of profile after that.

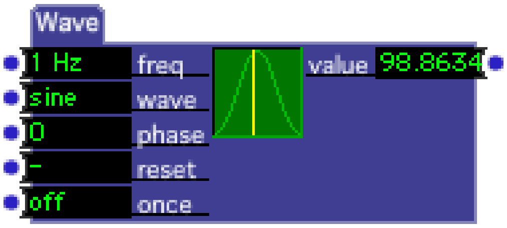
Input Properties

- **video in**: The video input stream.
- **rows**.: Determines the number of rows of video that will be copied each time a new frame of video arrives. Lower numbers look better, but are slower. Higher values are chunkier, but faster. Experiment for best results.
- **mode**.: When set to cycle, each time Warp gets to the bottom of the frame, it automatically jumps to the top and continues scanning continuously. When set to once, it stops upon reaching the bottom, and waits for a trigger at the reset input before it will return to the top and start scanning again.
- **reset**: When mode is set to once, a trigger sent to this input will start Warp scanning again after it has reached the bottom of the frame. (See mode property above for more details.)
- **bypass**: When turned off, this effect functions normally. When turned on, the effect is disabled and the video input is passed directly to the video output.

Output Properties

- **video out**: The warped video output.

Wave Generator



Generates waves of various shapes.

The Wave Generator generates numeric output over time that represents one of five possible wave shapes: sine, square, triangle, sawtooth and random. For those who have worked with music synthesizers, this would be Isadora's equivalent to a Low Frequency Oscillator (LFO).

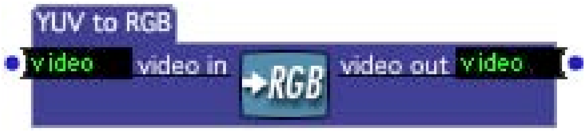
There numerous times that the Wave Generator comes in handy, but it is primarily used when parameter to cycle repeatedly over time.

- **freq**: The frequency of the wave, from 0.0001 to 999 Hz (or cycles per second).
- **wave**: One of five possible wave shapes: sine, square, triangle, sawtooth or random. When you choose a new wave, a diagram of it will appear inside the actor to help you visualize its shape. Random is a little different than the other waves, in that it will only output a new value each time it comes to the start of its cycle. The other waves output new values continuously during their cycle.
- **phase**: Normally, all waves start at the zero point of their cycle. You can change this by adjusting the phase of the wave. The diagram of the wave will slide as you change this value, so that you can see the wave's new starting point.
- **reset**: Starts generating the wave from its starting point, which is controlled by the **phase** input property. This input is also to restart the wave when its once property is turned on.
- **once**: If this property is turned *on* then the wave will go through only one cycle each time it receives a trigger on the reset input.

Output Properties

- **value**: The current value of the wave.

YUV to RGB (v1.1)



Converts a video stream from YUV to RGB.

This actor is used to explicitly convert a YUV video stream to RGB, usually to be fed to a video-processing actor that prefers RGB.

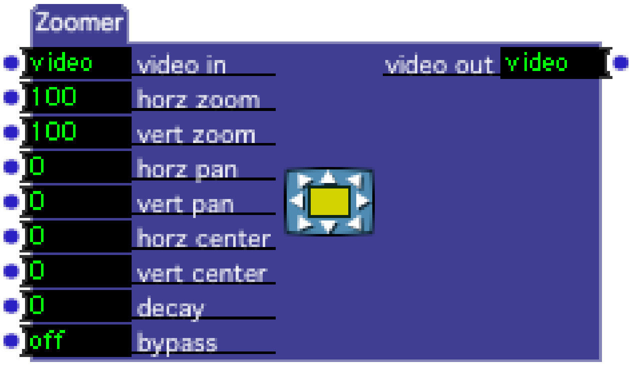
If the incoming stream is already RGB, then it is passed directly to the output.

See “YUV Video Processing” on page 135 for more information about using YUV mode in Isadora.

Input Properties

- **video in**: The YUV video stream to be converted to RGB.
- **video out**: The input video stream after conversion to RGB format.

Zoomer



Zooms in or out on source video stream, allowing you to pan left and right or up and down within the zoomed image, and to control the position of the resulting image within the output video stream.

Note that the two panning properties only have an effect when their corresponding zoom factors are “zoomed in” (i.e. greater than 100.) This is because, when the zoom factor is less than 100, you are seeing the entire source video image, so there is no place left to pan. When you zoom in you are using only a portion of the source video image, so there is some extra image left over. This remaining area is used to pan the image.

Input Properties

- **video in**: The video input stream.

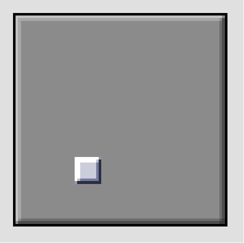
- **horz zoom**: The horizontal zoom factor, from 0 to 1000 percent. 100% is normal, lower numbers zoom out, higher numbers zoom in.
- **vert zoom**: The vertical zoom factor, from 0 to 1000 percent. 100% is normal, lower numbers zoom out, higher numbers zoom in.
- **horz pan**: When zoomed in horizontally, pans left or right within the zoomed image. Values range from –100 to +100 – negative numbers pan left, positive numbers pan right. Note that this property has no effect when the horz zoom property is 100 or less.
- **vert pan**: When zoomed in vertically, pans up or down within the zoomed image. Values range from –100 to +100 – negative numbers pan up, positive numbers pan down. Note that this property has no effect when the vert zoom property is 100 or less.
- **horz center**: Determines the horizontal position of the zoomed image within the output video stream, with values ranging from –100% to +100% of the output frame width. Negative numbers move the image to the left, positive to the right.
- **vert center**: Determines the vertical position of the zoomed image within the output video stream, with values ranging from –100% to +100% of the output frame height. Negative numbers move the image to the left, positive to the right.
- **decay**: Darkens the image as it passes it through to the output, from 0 to 100 percent. When set to 0, this property has no effect. As you increase the value, the image will become darker. This property is most often used when Zoomer is combined with the Luminance Key actor to create video feedback effects.
- **bypass**: When turned off, this effect functions normally. When turned on, the effect is disabled and the video input is passed directly to the video output.

Output Properties

- **video out**: The zoomed video output.

Controls Reference

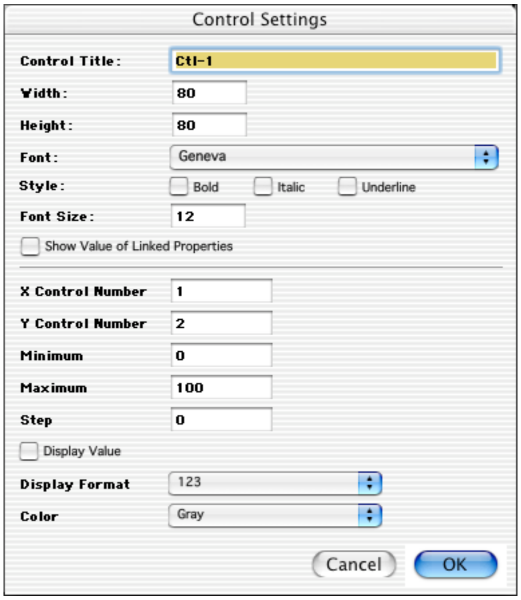
2D Slider



Displays a two dimensional slider that can manipulate two parameters at once.

Sliders are most useful when you want to vary an actor’s property over a range of possible values. The horizontal and vertical output can be linked to two different properties, and the output value can be displayed if desired.

Settings Dialog



Control Settings

Control Title:	Ctl-1
Width:	80
Height:	80
Font:	Geneva
Style:	□ Bold □ Italic □ Underline
Font Size:	12

□ Show Value of Linked Properties

X Control Number	1
Y Control Number	2
Minimum	0
Maximum	100
Step	0

□ Display Value

Display Format	123
Color	Gray

Control Properties

- **Control Title**: The title used to identify this control.
- **Width**: The width of the slider.
- **Height**: The height of the slider.
- **Font**: Popup menu selects the font used to draw text for this control.

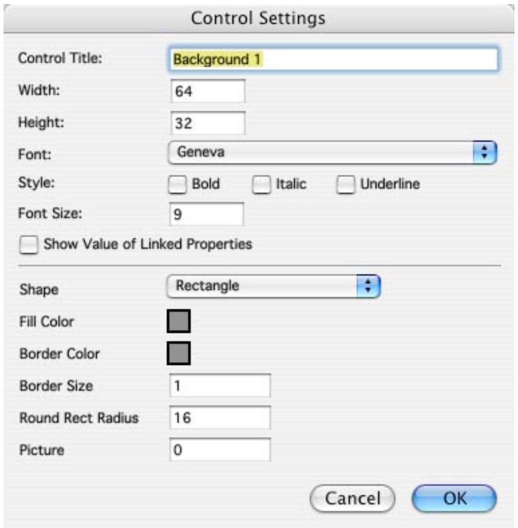
- **Bold/Italic/Underline**: When checked, uses the bold, italic, or underline variations of the specified font.
- **Font Size**: Sets the size font used to draw text for this control.
- **Show Value of Linked Properties**: When an actor input property is linked to this control and this box is checked, the control's value will be set to match the property's value. This causes the control to display the property's current value at all times.
- **X Control ID**: This number is used to identify the control when linking it to actor properties. When this control's value changes because a user moves the indicator horizontally, a message giving the Control ID and the control's value is broadcast to the active Scene. Any actor properties that are linked to this Control ID will have their value set appropriately. Generally speaking, you will want this number to be unique within a given Control Panel.
- **Y Control ID**: Same as the X Control ID, except that it broadcasts the vertical movement of the indicator.
- **Minimum Value**: The minimum possible value for this slider. Can be any number. (It is permissible for the minimum value to be greater than the maximum. In this case the slider value will *decrease* as you move it from left to right or from bottom to top.)
- **Maximum Value**: The maximum possible value for this slider. Can be any number. (It is permissible for the maximum value to be less than the minimum. In this case the slider value will *decrease* as you move it from left to right or from bottom to top.)
- **Step**: Determines the minimum of the step between values. When *Step* is set to zero, this setting has no effect. When set to a value greater than zero, the control value will step by this amount as it goes from the *Minimum Value* to the *Maximum Value*. For example, if the minimum is set to 1, maximum is set to 10, and step is set to 1, the slider will have 10 discrete steps (1, 2, 3, … 8, 9, 10). Setting step to 1 may be the most common setting, as it allows you to send only integer values (i.e. no numbers after the decimal point) if desired. Note however that counting starts at the value given by the *Minimum Value* setting. If you set minimum to 1.5 and maximum to 10.5 in the example just given, the 10 steps would be 1.5, 2.5, 3.5…10.5.
- **Display Value**: When this box is checked, the slider will display its value as a number. Vertical sliders display this number at the bottom; Horizontal sliders display the number to the right.
- **Display Format**: Determines how the number is formatted when the *Display Value* parameter is turned on. There are three choices: *123*, *123.4*, or *123.45*. The first displays no decimal point, the second one number after the decimal point, and the third displays two. If *Display Value* is turned off, this setting has no effect.
- **Color**: The color of the control's background.

Background

Draws a solid background with a specified color and shape, optionally using a picture to draw the background.

The background color is used to visually organize your Isadora Control Panel. By placing other Isadora controls on these rectangular or oval areas of color, you can create an appealing look and feel for your

Settings Dialog



Control Settings

Control Title: Background 1

Width: 64

Height: 32

Font: Geneva

Style: □ Bold □ Italic □ Underline

Font Size: 9

□ Show Value of Linked Properties

Shape: Rectangle

Fill Color

Border Color

Border Size: 1

Round Rect Radius: 16

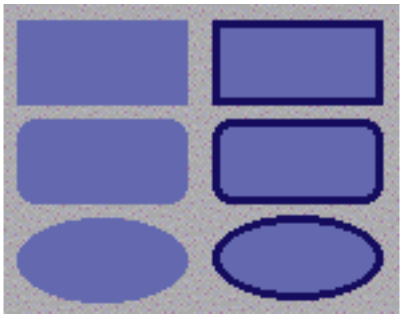
Picture: 0

Control Properties

- **Control Title**: The title used to identify this control.
- **Width**: The width of the slider.
- **Height**: The height of the slider.
- **Font**: Popup menu selects the font used to draw text for this control.
- **Bold/Italic/Underline**: When checked, uses the bold, italic, or underline variations of the specified font.
- **Font Size**: Sets the size font used to draw text for this control.
- **Show Value of Linked Properties**: When an actor input property is linked to this control and this box is checked, the control's value will be set to match the property's value. This causes the control to display the property's current value at all times.
- **Shape (v1.1)**: Specifies the shape of the background from among seven possible options: Rectangle, Rounded Rectangle, Oval, the bordered versions of

those shapes, or a Picture – the latter allowing you to use a Picture from the Media Window to draw the background.

Here is a summary of the various shapes that are possible:

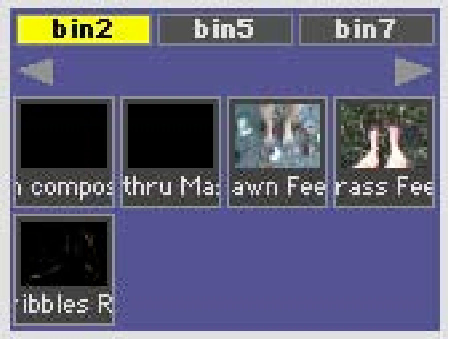


Rectangle/Border Rectangle
Round Rectangle, Border Round Rectangle
Oval, Border Oval

If you choose Picture, then the value of the Picture input determines the

- **Fill Color**: Determines the color of the background. To change the color, click on the colored box – a Color Picker dialog will appear. (If the Shape is set to Picture, this setting has no effect – v1.1)
- **Border Color**: Determines the color of the line around the border. This color is only used if you have chosen one of the bordered variations of the background shape. To change the color, click on the colored box – a Color Picker dialog will appear. (If the Shape is set to Picture, this setting has no effect – v1.1)
- **Border Size**: The size of the border in pixels. The border is only used if you have chosen one of the bordered variations of the background shape. (If the Shape is set to Picture, this setting has no effect – v1.1)
- **Round Rect Radius**: When the shape is either Round Rectangle or Border Round Rectangle, specifies the radius of the rounded corners in pixels. (If the Shape is set to Picture, this setting has no effect – v1.1)
- **Picture (v1.1)**: Set this to the media index of a Picture in the Media Window to use that image to draw this background. The picture will be scaled to fit the rectangle that encloses the background – to prevent scaling, set the Width and Height inputs to match the size of the picture. Note that any alpha channel information encoded into the picture is used when drawing the image, allowing you to create unusual shapes, drop shadows, etc.

Bin Picker



Picks media files grouped by bin.

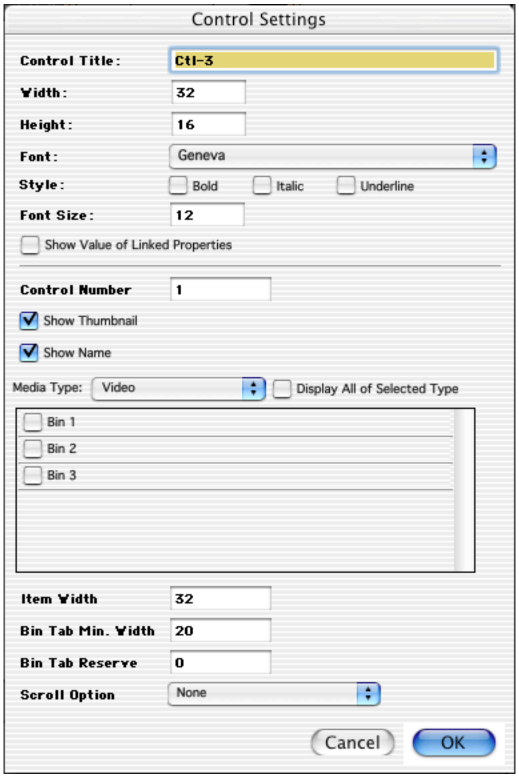
The Bin Picker works in conjunction with the one of the actors that allows you to play a media file (Movie Player, Sound Player, Picture Player, Midi Player, etc.). When you click on an item in the picker, the number of that file in the Media Window is sent to any input that is listening to this control.

The files seen in the picker are organized by bin. You choose which bins can be displayed by this control by editing the control's settings. Once you have done so, the names of the bins you selected will appear at the top of the control as buttons. The picker will only show the media files within one of the selected bins. You can quickly switch from one bin to another by clicking the bin buttons at the top of the control.

For movies and pictures, you have the option of showing a thumbnail, the movie's title, or both in the Bin Picker. For sounds and MIDI files, you can only display the name.

If all of the files that you have chosen for the picker cannot fit within the control's area, then you may optionally display scroll arrows, tabs, or both so that you can navigate through all of the possible movies.

Settings Dialog



Control Title: Ctl-3

Width: 32

Height: 16

Font: Geneva

Style: □ Bold □ Italic □ Underline

Font Size: 12

□ Show Value of Linked Properties

Control Number 1

☑ Show Thumbnail

☑ Show Name

Media Type: Video □ Display All of Selected Type

□ Bin 1

□ Bin 2

□ Bin 3

Item Width 32

Bin Tab Min. Width 20

Bin Tab Reserve 0

Scroll Option None

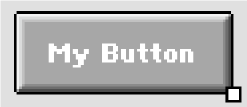
Control Properties

- **Control Title**: The title used to identify this control.
- **Width**: The width of the picker.
- **Height**: The height of the picker.
- **Font**: Popup menu selects the font used to draw text for this control.
- **Bold/Italic/Underline**: When checked, uses the bold, italic, or underline variations of the specified font.
- **Font Size**: Sets the size font used to draw text for this control.
- **Show Value of Linked Properties**: When an actor input property is linked to this control and this box is checked, the control's value will be set to match the property's value. This causes the control to display the property's current value at all times.
- **Control ID**: This number is used to identify the control when linking it to actor properties. When this control's value changes because a user clicked in the control, a message giving the Control ID and the control's value is broadcast to the active Scene. Any actor properties that are linked to this Control ID will have their value set appropriately. Generally speaking, you will want this number to be unique within a given Control Panel.
- **Show Thumbnail**: If this checkbox is selected, a thumbnail of the media file will be drawn in the control if one is available.

- **Show Name**: If this checkbox is selected, the media file's name will be drawn in the control.
- **Media Type**: Determines which type of media file the picker will display: Video, Audio, Pictures or MIDI Files.
- **Show All of Selected Type**: If this option is enabled, the picker will display all bins of the selected type, as chosen by the Media Type popup. When this option is on, the Bin Selector below will be gray to show it is disabled.
- **Bin Selector**: Once you have chosen the type of media file you want to display in the Media Type popup menu, all available bins of that type will appear in this area. To allow a bin to be chosen, check the box to the left of its name.
- **Item Width**: Set the width of each item within the picker in pixels. The minimum width is 16.
- **Bin Tab Min. Width**: Sets the minimum width for a bin selector tab at the top of the picker.
- **Bin Tab Reserve**: Setting this to a non-zero value will ensure that the specified number of pixels are always available for the bin tabs at the top of the picker. This option is most useful when the Show All of Selected Type option is on, because you can ensure that there is always enough vertical space for the bin tabs as you add more bins.
- **Scroll Option**: There are five possible options: **None**, **Tabs/Top**, **Tabs/Bottom**, **Tabs+Arrows/Top**, and **Tabs+Arrows/Bottom**. The top and bottom versions determine if the tabs and/or arrows appear at the top or bottom of the control. The **Tabs** only versions does not display left and right scroll arrows, the **Tabs+Arrows** version display both.

  The number of movies that you can see at once and the number of tabs will update dynamically as you resize your control – adjust the picker's size for the orientation/arrangement that suits you best. Note that if there is not enough room horizontally, all of the possible tabs might not be displayed.

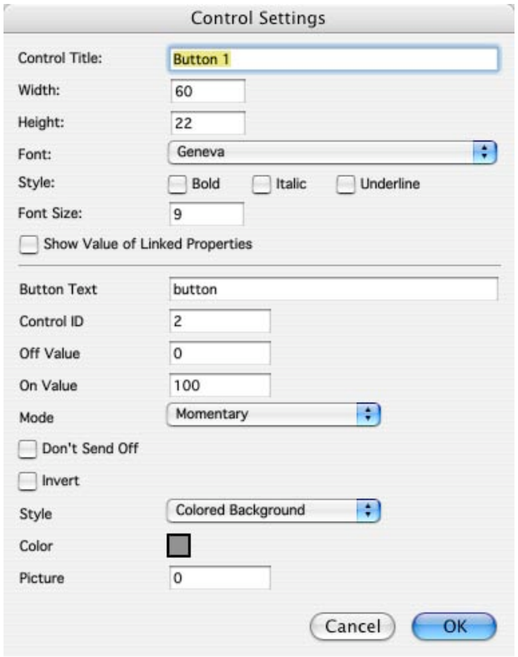
Button



Displays an on/off button that sends one value when turned on, and another when turned off.

The button control is most useful when you need to trigger actors to do something, or toggle their state between two values. You can choose to display the buttons in a number of colors and styles to help organize your interface.

Settings Dialog



Control Settings

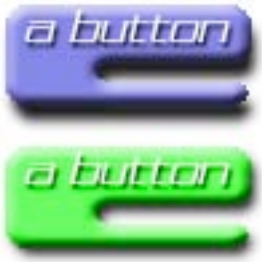
Control Title: Button 1
Width: 60
Height: 22
Font: Geneva
Style: □ Bold □ Italic □ Underline
Font Size: 9
□ Show Value of Linked Properties

Button Text: button
Control ID: 2
Off Value: 0
On Value: 100
Mode: Momentary
□ Don't Send Off
□ Invert
Style: Colored Background
Color: ■
Picture: 0

Control Properties

- **Control Title**: The title used to identify this control. This text appears inside the button.
- **Width**: The width of the button.
- **Height**: The height of the button.
- **Font**: Popup menu selects the font used to draw text for this control.
- **Bold/Italic/Underline**: When checked, uses the bold, italic, or underline variations of the specified font.
- **Font Size**: Sets the size font used to draw text for this control.

- **Show Value of Linked Properties**: When an actor input property is linked to this control and this box is checked, the control's value will be set to match the property's value. This causes the control to display the property's current value at all times.
- **Control ID**: This number is used to identify the control when linking it to actor properties. When this control's value changes because a user clicked in the control, a message giving the Control ID and the control's value is broadcast to the active Scene. Any actor properties that are linked to this Control ID will have their value set appropriately. Generally speaking, you will want this number to be unique within a given Control Panel.
- **Off Value**: The value that is broadcast to the currently active Scene when the button is turned off.
- **On Value**: The value that is broadcast to the currently active Scene when the button is turned on.
- **Mode**: When set to *Momentary*, the button goes to the on state when you click it, and back to the off state when the mouse is released. When set to *Toggle*, the button goes between on and off each time it is clicked.
- **Don't Send Off**: When this box is set, the off value is never sent. This is useful when you want a link this button to an actor property that expects a trigger input, as it prevents a trigger when the button turns off.
- **Style**: When set to *Colored Background*, the color specified by the **Color** drop-down menu determines the background color of the control. When set to *Colored Indicator* the background is always gray and the **Color** drop-down menu determines the color of the on/off indicator in the control.
- **Color**: The color of the control's background or its indicator, depending on the *Style* setting– see *Style* above for more information. To change the color, click on the colored box. A Color Picker control will appear, allowing you to select the color. Note: if you are using a Picture to draw your button (see below) this setting has no effect (v1.1).
- **Picture (v1.1):** Set this to the media index of a Picture in the Media window to provide a custom image for your button. The image should is divided into two parts when drawing the button: the top half is used to draw the button in its up state, while the bottom half is used to draw the button in its down state. For example, consider the image below which is 100 pixels across and 100 pixels high. The top 50 pixels will be used to draw the button in its up state, the lower 50 pixels used to draw it in its down state.

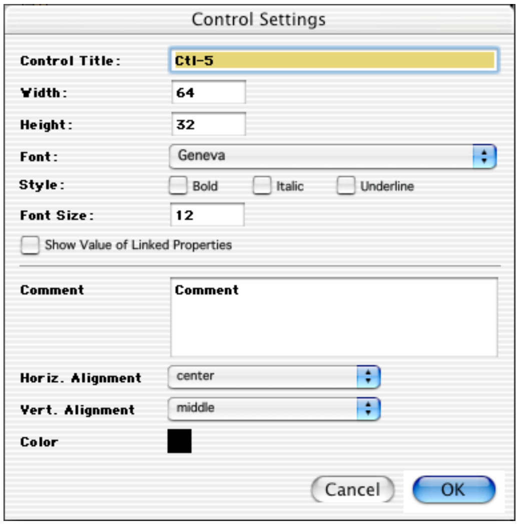


The picture will be scaled to fit the rectangle that encloses the slider. To prevent scaling, set the width to match the width of the picture, and the height to one-half the height of the picture. Note that any alpha channel information encoded into the picture is used when drawing the image on its background. This means that you can create unusually shaped buttons with drop shadows, etc.

Comment

Displays comments or titles in your user interface.

Settings Dialog


Control Settings

Control Title: Ctl-5
Width: 64
Height: 32
Font: Geneva
Style: □ Bold □ Italic □ Underline
Font Size: 12
□ Show Value of Linked Properties

Comment: Comment
Horiz. Alignment: center
Vert. Alignment: middle
Color: ■

Control Properties

- **Control Title**: The title used to reference this control.
- **Width**: The width of the box enclosing the comment text.
- **Height**: The height of the box enclosing the comment text.
- **Font**: Popup menu selects the font used to draw text for this control.
- **Bold/Italic/Underline**: When checked, uses the bold, italic, or underline variations of the specified font.
- **Font Size**: Sets the size font used to draw text for this control.
- **Show Value of Linked Properties**: Not applicable
- **Font Size**: This size of the font used to draw the comment, in points.
- **Comment**: The comment text that will appear inside the control.

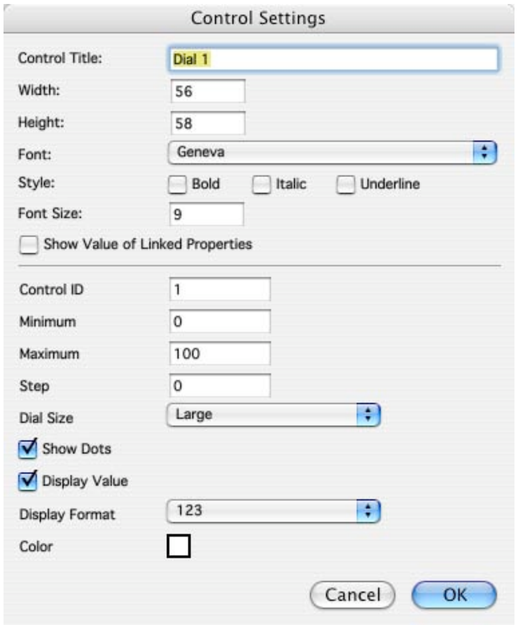
- **Horiz. Alignment**: The horizontal alignment of the text within its bounding box. Choices are left, middle and right.
- **Vert. Alignment**: The vertical alignment of the text within its bounding box. Choices are top, middle and bottom.
- **Color**: The color of the text. To change the color, click on the colored box. A Color Picker control will appear, allowing you to choose a new color.

Dial (v1.1)

Displays a dial that sends a continuous range of values.

Dials are most useful when you want to vary an actor's property over a range of possible values.

Settings Dialog



Control Settings

Control Title: Dial 1

Width: 56

Height: 58

Font: Geneva

Style: □ Bold □ Italic □ Underline

Font Size: 9

□ Show Value of Linked Properties

Control ID 1

Minimum 0

Maximum 100

Step 0

Dial Size Large

☑ Show Dots

☑ Display Value

Display Format 123

Color □

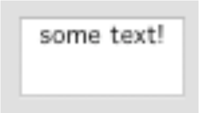
Control Properties

- **Control Title**: The title used to identify this control.
- **Width**: The width of the slider. Note that if the slider is wider than it is tall, the slider is horizontal and its indicator will move from left to right. If the slider is taller than it is wide, it is vertical and its indicator will move up and down.

- **Height**: The height of the slider.
- **Font**: Popup menu selects the font used to draw text for this control.
- **Bold/Italic/Underline**: When checked, uses the bold, italic, or underline variations of the specified font.
- **Font Size**: Sets the size font used to draw text for this control.
- **Show Value of Linked Properties**: When an actor input property is linked to this control and this box is checked, the control's value will be set to match the property's value. This causes the control to display the property's current value at all times.
- **Control ID**: This number is used to identify the control when linking it to actor properties. When this control's value changes because a user clicked in the control, a message giving the Control ID and the control's value is broadcast to the active Scene. Any actor properties that are linked to this Control ID will have their value set appropriately. Generally speaking, you will want this number to be unique within a given Control Panel.
- **Minimum**: The minimum possible value for this dial. Can be any number. (It is permissible for the minimum value to be greater than the maximum. In this case the slider value will *decrease* as you move it from left to right or from bottom to top.)
- **Maximum** : The maximum possible value for this dial. Can be any number. (It is permissible for the maximum value to be less than the minimum. In this case the slider value will *decrease* as you move it from left to right or from bottom to top.)
- **Step**: Determines the minimum of the step between values. When *Step* is set to zero, this setting has no effect. When set to a value greater than zero, the control value will step by this amount as it goes from the *Minimum Value* to the *Maximum Value*. For example, if the minimum is set to 1, maximum is set to 10, and step is set to 1, the slider will have 10 discrete steps (1, 2, 3, … 8, 9, 10). Setting step to 1 may be the most common setting, as it allows you to send only integer values (i.e. no numbers after the decimal point) if desired. Note however that counting starts at the value given by the *Minimum Value* setting. If you set minimum to 1.5 and maximum to 10.5 in the example just given, the 10 steps would be 1.5, 2.5, 3.5…10.5.
- **Dial Size**: The graphic of the dial comes in four sizes: tiny, small, medium and large.
- **Show Dots**: When checked, small white dots will outline the range of the dial.
- **Display Value**: When this box is checked, the slider will display its value as a number. Vertical sliders display this number at the bottom; Horizontal sliders display the number to the right.
- **Display Format**: Determines how the number is formatted when the *Display Value* parameter is turned on. There are three choices: *123*, *123.4*, or *123.45*. The first displays no decimal point, the second one number after the decimal point, and the third displays two. If *Display Value* is turned off, this setting has no effect.

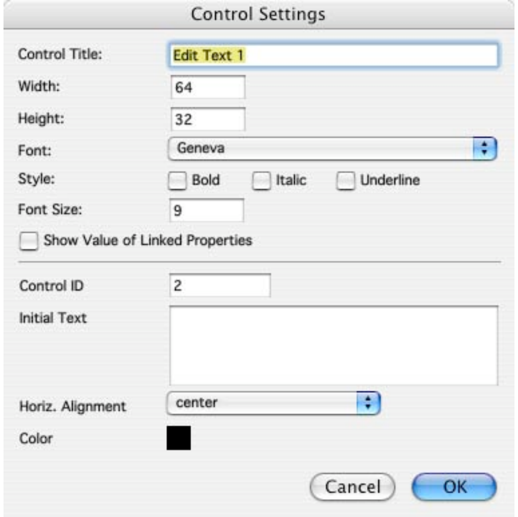
- **Color**: Sets color of the dial. When you click the color box, a Color Picker control will appear, allowing you to choose the new color.

Edit Text (v1.1)



Allows the user to enter text, which can be sent to any property input that accepts text.

Settings Dialog


Control Settings

Control Title: Edit Text 1

Width: 64

Height: 32

Font: Geneva

Style: □ Bold □ Italic □ Underline

Font Size: 9

□ Show Value of Linked Properties

Control ID 2

Initial Text

Horiz. Alignment center

Color ■

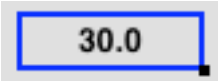
Control Properties

- **Control Title**: The title used to identify this control.
- **Width**: The width of the number control.
- **Height**: The height of the number control.
- **Font**: Popup menu selects the font used to draw text for this control.
- **Bold/Italic/Underline**: When checked, uses the bold, italic, or underline variations of the specified font.
- **Font Size**: Sets the size font used to draw text for this control.
- **Show Value of Linked Properties**: This setting has no effect for the Monitor Actor.
- **Control ID**: This number is used to identify the control when linking it to actor properties. When this control's value changes because a user clicked in the control, a message giving the Control ID and the control's value is broadcast to the active Scene. Any actor properties that are linked to this

Control ID will have their value set appropriately. Generally speaking, you will want this number to be unique within a given Control Panel.

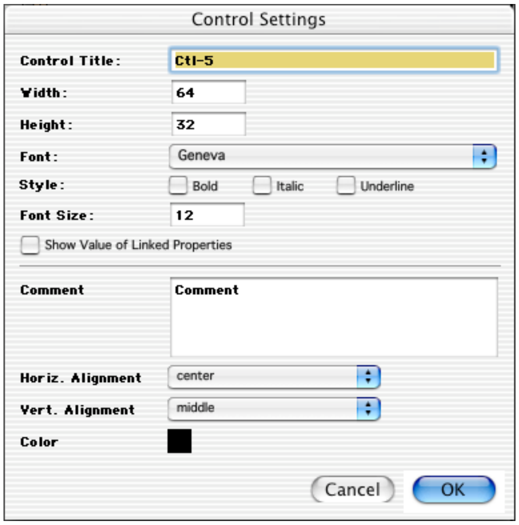
- **Initial Text**: The text field will be initialized to this text when the Control Panel is first loaded.
- **Color**: Sets color of the text. When you click the color box, a Color Picker control will appear, allowing you to choose the new color.

FPS



Displays the current rendering speed in Frames Per Second.

Settings Dialog



Control Settings

Control Title:	Ctl-5
Width:	64
Height:	32
Font:	Geneva
Style:	□ Bold □ Italic □ Underline
Font Size:	12

□ Show Value of Linked Properties

Comment	Comment
Horiz. Alignment	center
Vert. Alignment	middle
Color	■

Control Properties

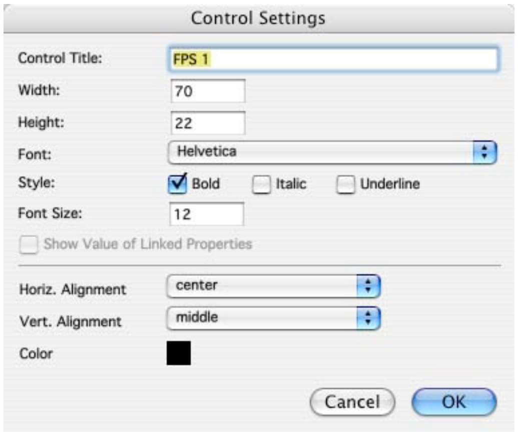
- **Horiz. Alignment**: The horizontal alignment of the text within its bounding box. Choices are left, middle and right.
- **Vert. Alignment**: The vertical alignment of the text within its bounding box. Choices are top, middle and bottom.
- **Color**: The color of the text. To change the color, click on the colored box. A Color Picker control will appear, allowing you to choose a new color.

Monitor

Provides monitoring of video streams in the control panel.

By linking this control to a video out port of an actor, you can monitor the video at that point in the Scene.

Settings Dialog



Control Settings

Control Title: FPS 1

Width: 70

Height: 22

Font: Helvetica

Style: ☑ Bold ☐ Italic ☐ Underline

Font Size: 12

☐ Show Value of Linked Properties

Horiz. Alignment center

Vert. Alignment middle

Color ■

Control Properties

- **Control Title**: The title used to identify this control.
- **Width**: The width of the monitor.
- **Height**: The height of the monitor.
- **Font**: This setting has no effect for the Monitor control.
- **Bold/Italic/Underline**: These settings have no effect for the Monitor control.
- **Font Size**: This setting has no effect for the Monitor control.
- **Show Value of Linked Properties**: This setting has no effect for the control Actor.
- **Control ID**: To see the video coming out of a particular actor, set its Control Link to match the Control ID specified here. Note that if more than one actor's video output is linked to this Monitor, you may get unpredictable, flashing images.
- **Border Size**: The width of the border around the monitor display, specified in pixels.
- **Refresh FPS**: Determines how fast the Monitor image is updated. It takes a certain amount of processor power to scale the video image to fit into the

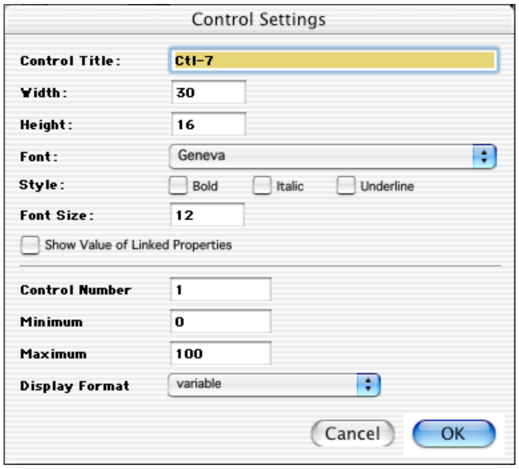
Monitor control. To reduce the amount of processor power consumed by this control, set this number to a value less than 30.

Number

Allows the user to enter a numeric value

By linking this control to a video out port of an actor, you can monitor the video at that point in the Scene.

Settings Dialog



Control Title: Ctl-7

Width: 30

Height: 16

Font: Geneva

Style: □ Bold □ Italic □ Underline

Font Size: 12

□ Show Value of Linked Properties

Control Number 1

Minimum 0

Maximum 100

Display Format variable

Control Properties

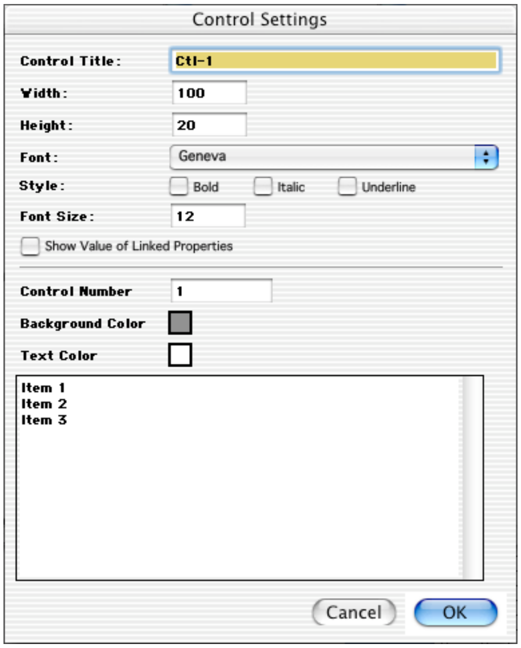
- **Control Title**: The title used to identify this control.
- **Width**: The width of the number control.
- **Height**: The height of the number control.
- **Font**: Popup menu selects the font used to draw text for this control.
- **Bold/Italic/Underline**: When checked, uses the bold, italic, or underline variations of the specified font.
- **Font Size**: Sets the size font used to draw text for this control.
- **Show Value of Linked Properties**: This setting has no effect for the Monitor Actor.
- **Control ID**: This number is used to identify the control when linking it to actor properties. When this control's value changes because a user clicked in the control, a message giving the Control ID and the control's value is broadcast to the active Scene. Any actor properties that are linked to this Control ID will have their value set appropriately. Generally speaking, you will want this number to be unique within a given Control Panel.

- **Minimum Value**: The minimum possible value for this number. Can be any number.
- **Maximum Value**: The maximum possible value for this slider. Can be any number.
- **Display Format**: There are four choices: *variable*, *123*, *123.4*, or *123.45*: *various* will display as many decimal points as needed, *123* displays no decimal point, *123.4* shows one number after the decimal point, and *123.45* shows two numbers after the decimal.

Popup Menu

Allows the user to select an item from a list contained in a pop up menu.

Settings Dialog


Control Settings

Control Title: Ctl-1

Width: 100

Height: 20

Font: Geneva

Style: □ Bold □ Italic □ Underline

Font Size: 12

□ Show Value of Linked Properties

Control Number 1

Background Color ▨

Text Color □

Item 1
Item 2
Item 3

Control Properties

- **Control Title**: The title used to identify this control.
- **Width**: The width of the number control.
- **Height**: The height of the number control.
- **Font**: Popup menu selects the font used to draw text for this control.
- **Bold/Italic/Underline**: When checked, uses the bold, italic, or underline variations of the specified font.
- **Font Size**: Sets the size font used to draw text for this control.

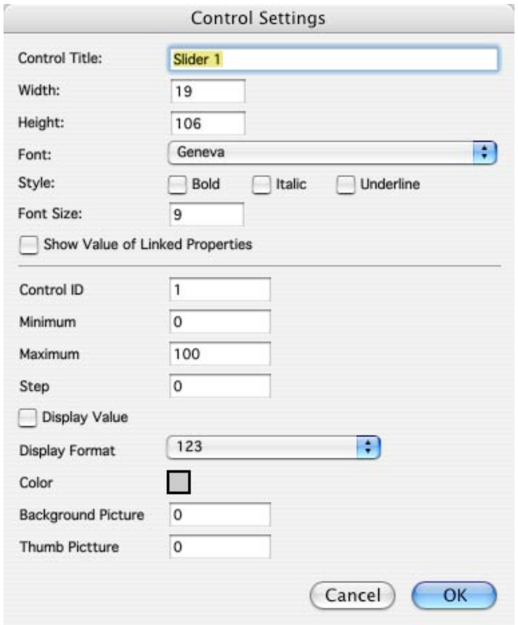
- **Show Value of Linked Properties**: This setting has no effect for the Monitor Actor.
- **Control ID**: This number is used to identify the control when linking it to actor properties. When this control's value changes because a user clicked in the control, a message giving the Control ID and the control's value is broadcast to the active Scene. Any actor properties that are linked to this Control ID will have their value set appropriately. Generally speaking, you will want this number to be unique within a given Control Panel.
- **Background Color**: The background color of the popup menu.
- **Text Color**: The color of the text drawn inside the popup menu.
- **Items**: The items that will be displayed in the pop up menu. Enter one line for each item you want to display. The example above will show three items labeled Item 1, Item 2 and Item 3.

Slider

Displays a horizontal or vertical slider that sends a continuous range of values.

Sliders are most useful when you want to vary an actor's property over a range of possible values. The sliders can be either horizontal or vertical, and can display their current value as a number if desired.

Settings Dialog



Control Settings

Control Title: Slider 1

Width: 19

Height: 106

Font: Geneva

Style: □ Bold □ Italic □ Underline

Font Size: 9

□ Show Value of Linked Properties

Control ID 1

Minimum 0

Maximum 100

Step 0

□ Display Value

Display Format 123

Color □

Background Picture 0

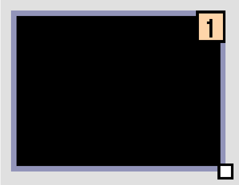
Thumb Pictture 0

Control Properties

- **Control Title**: The title used to identify this control.
- **Width**: The width of the slider. Note that if the slider is wider than it is tall, the slider is horizontal and its indicator will move from left to right. If the slider is taller than it is wide, it is vertical and its indicator will move up and down.
- **Height**: The height of the slider.
- **Font**: Popup menu selects the font used to draw text for this control.
- **Bold/Italic/Underline**: When checked, uses the bold, italic, or underline variations of the specified font.
- **Font Size**: Sets the size font used to draw text for this control.
- **Show Value of Linked Properties**: When an actor input property is linked to this control and this box is checked, the control's value will be set to match the property's value. This causes the control to display the property's current value at all times.
- **Control ID**: This number is used to identify the control when linking it to actor properties. When this control's value changes because a user clicked in the control, a message giving the Control ID and the control's value is broadcast to the active Scene. Any actor properties that are linked to this Control ID will have their value set appropriately. Generally speaking, you will want this number to be unique within a given Control Panel.
- **Minimum Value**: The minimum possible value for this slider. Can be any number. (It is permissible for the minimum value to be greater than the maximum. In this case the slider value will *decrease* as you move it from left to right or from bottom to top.)

- **Maximum Value**: The maximum possible value for this slider. Can be any number. (It is permissible for the maximum value to be less than the minimum. In this case the slider value will *decrease* as you move it from left to right or from bottom to top.)
- **Step**: Determines the minimum of the step between values. When *Step* is set to zero, this setting has no effect. When set to a value greater than zero, the control value will step by this amount as it goes from the *Minimum Value* to the *Maximum Value*. For example, if the minimum is set to 1, maximum is set to 10, and step is set to 1, the slider will have 10 discrete steps (1, 2, 3, … 8, 9, 10). Setting step to 1 may be the most common setting, as it allows you to send only integer values (i.e. no numbers after the decimal point) if desired. Note however that counting starts at the value given by the *Minimum Value* setting. If you set minimum to 1.5 and maximum to 10.5 in the example just given, the 10 steps would be 1.5, 2.5, 3.5…10.5.
- **Display Value**: When this box is checked, the slider will display its value as a number. Vertical sliders display this number at the bottom; Horizontal sliders display the number to the right.
- **Display Format**: Determines how the number is formatted when the *Display Value* parameter is turned on. There are three choices: *123*, *123.4*, or *123.45*. The first displays no decimal point, the second one number after the decimal point, and the third displays two. If *Display Value* is turned off, this setting has no effect.
- **Color**: Sets color of the slider. The color you choose will be the color of the indicator – the background of the slider will be a darker shade of the same color. To change the color, click on the colored box. A Color Picker control will appear, allowing you to choose a new color. Note: if you are using a Picture to draw your button (see below) this setting has no effect (v1.1).
- **Background Picture (v1.1):** Set this to the media index of a Picture in the Media window to provide a custom background for your slider. The picture will be scaled to fit the rectangle that encloses the slider – to prevent scaling, set the width and height inputs to match the size of the picture. Note that any alpha channel information encoded into the picture is used when drawing the image on its background, allowing you to create unusual shapes, drop shadows, etc.
- **Thumb Picture (v1.1):** Set this to the media index of a Picture in the Media window to provide a custom "thumb" (the moving indicator) for your slider. If the slider is horizontal, the thumb will be scaled vertically to match the height of the slider, but the width will remain unchanged. If the slider is vertical, the thumb will be scaled horizontally to match the width of the slider, but the height will not be changed. Note that any alpha channel information encoded into the picture is used when drawing the image on its background, allowing you to create unusual shapes, drop shadows, etc.

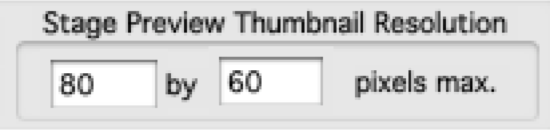
Stage Preview



Displays a thumbnail image of the current output to a Stage.

The Stage Preview control shows you a thumbnail of what is appearing on any of Isadora's Stage outputs. Some important points:

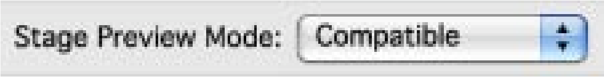
Speed: The Stage Preview Control must read data back from your graphics card using OpenGL. The performance impact of using this control can vary greatly depending on the video card you are using.



Stage Preview Thumbnail Resolution

80 by 60 pixels max.

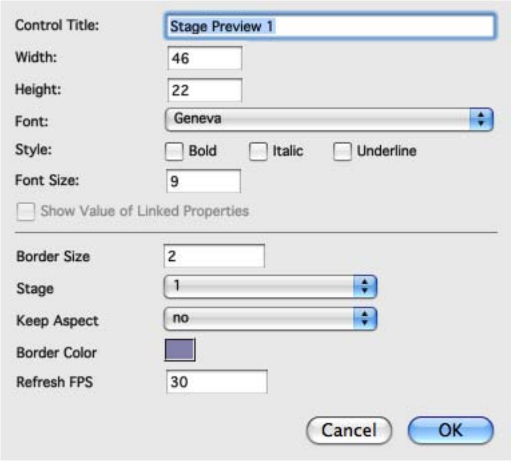
Resolution: The resolution of the Stage Preview image is set in the Stage tab of the Preferences. Here you determine the actual resolution of the image that is shown in the Stage Preview. By default the resolution is low, to ensure that computers with older graphics cards don't experience performance problems. But on more recent computers you can increase this value to something like 320x240 without a significant performance hit.



Stage Preview Mode: Compatible

Compatibility: We have seen issues when testing with some older graphics cards because of their OpenGL driver implementation. If you experience crashes when using the Stage Preview control, then switch the Stage Preview Mode in the Video tab of the Preferences to Compatible. This mode is slower than the Faster modes, but should work on almost any card.

Settings Dialog



Control Title: Stage Preview 1

Width: 46

Height: 22

Font: Geneva

Style: □ Bold □ Italic □ Underline

Font Size: 9

□ Show Value of Linked Properties

Border Size 2

Stage 1

Keep Aspect no

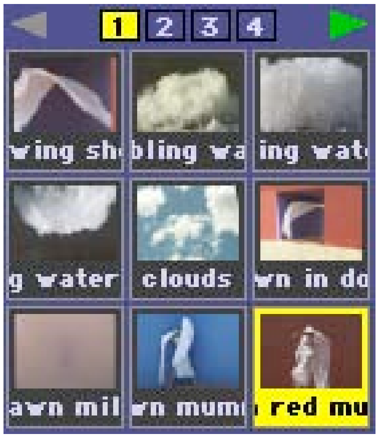
Border Color ▨

Refresh FPS 30

Control Properties

- **Control Title**: The title used to identify this control.
- **Width**: The width of the monitor.
- **Height**: The height of the monitor.
- **Font**: This setting has no effect for the Monitor control.
- **Bold/Italic/Underline**: These settings have no effect for the Monitor control.
- **Font Size**: This setting has no effect for the Monitor control.
- **Show Value of Linked Properties**: This setting has no effect for the control Actor.
- **Border Size**: The width of the border around the monitor display, specified in pixels.
- **Stage**: Specifies which stage will be shown in this control.
- **Keep Aspect**: When turned on, ensures that the aspect ratio of the image is maintained. Otherwise, the image will be scaled to fill the monitor.
- **Refresh FPS**: Determines how fast the Stage Preview image is updated. To reduce the amount of processor power consumed by this control, set this number to a value less than 30.

Video Picker



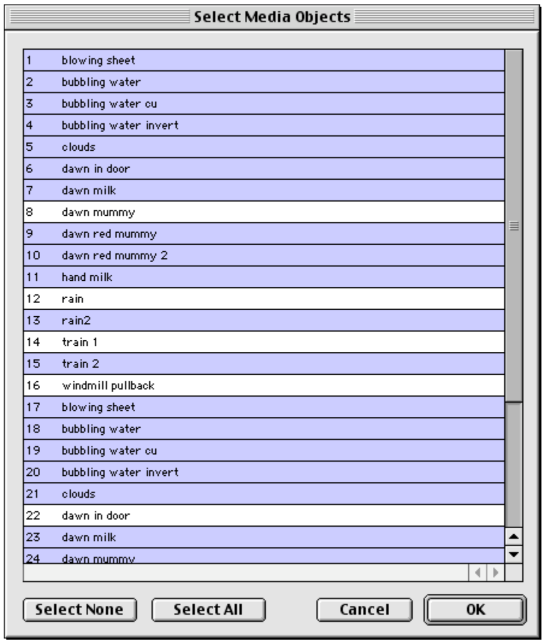
Allows the user to pick a movie from a group of movies that you select.

NOTE: The functionality of the Video Picker has been superseded by the more powerful Bin Picker control. We recommend that you use the Bin Picker for any newly created files.

The Movie Picker works in conjunction with the **movie** input of the Movie Player, Movie Player Direct or Movie Player VR actors. When you click on a movie in the picker, the number of that movie in the Media Window is sent to any input that is listening to this control.

You have the option of showing a thumbnail, the movie's title, or both in the Movie Picker. If all of the files that you have chosen for the picker cannot fit within the control's area, then you may optionally display scroll arrows, tabs, or both so that you can navigate through all of the possible movies.

To prepare this control to be used, you must first select the movies that it will display. To do this, select the control and choose **Controls > Control Specific Options…** The following dialog will appear:

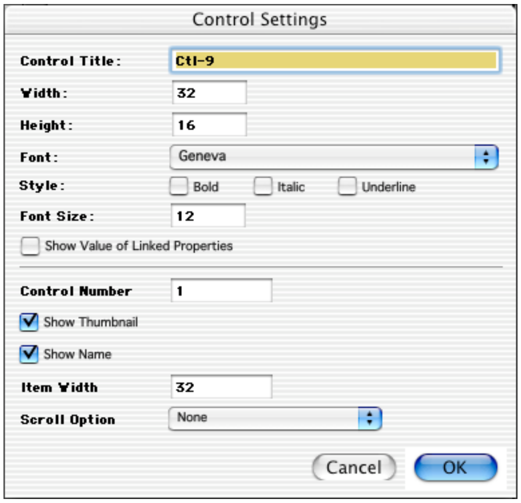


1	blowing sheet
2	bubbling water
3	bubbling water cu
4	bubbling water invert
5	clouds
6	dawn in door
7	dawn milk
8	dawn mummy
9	dawn red mummy
10	dawn red mummy 2
11	hand milk
12	rain
13	rain2
14	train 1
15	train 2
16	windmill pullback
17	blowing sheet
18	bubbling water
19	bubbling water cu
20	bubbling water invert
21	clouds
22	dawn in door
23	dawn milk
24	dawn mummy

In it you will find listed all of the movies currently in the Media Window. To include a movie in the picker, click on it to select it. Use shift-click to select a group of movies, or cmd-click to toggle the selection of an individual movie. You may also click the "Select All" button to select all of the movies, or "Select None" to deselect all of them.

Once you the movies that you want the picker to display are selected, click OK.

Settings Dialog



Control Title: Ctl-9
Width: 32
Height: 16
Font: Geneva
Style: □ Bold □ Italic □ Underline
Font Size: 12
□ Show Value of Linked Properties
Control Number 1
☑ Show Thumbnail
☑ Show Name
Item Width 32
Scroll Option None

Control Properties

- **Control Title**: The title used to identify this control.
- **Width**: The width of the picker.
- **Height**: The height of the picker.
- **Font**: Popup menu selects the font used to draw text for this control.

- **Bold/Italic/Underline**: When checked, uses the bold, italic, or underline variations of the specified font.
- **Font Size**: Sets the size font used to draw text for this control.
- **Show Value of Linked Properties**: When an actor input property is linked to this control and this box is checked, the control's value will be set to match the property's value. This causes the control to display the property's current value at all times.
- **Control ID**: This number is used to identify the control when linking it to actor properties. When this control's value changes because a user clicked in the control, a message giving the Control ID and the control's value is broadcast to the active Scene. Any actor properties that are linked to this Control ID will have their value set appropriately. Generally speaking, you will want this number to be unique within a given Control Panel.
- **Show Thumbnail**: If this checkbox is selected, a thumbnail of the Movie file will be drawn in the control.
- **Show Title**: If this checkbox is selected, the Movie's title will be drawn in the control.
- **Item Width**: Set the width of each item within the picker in pixels. The minimum width is 16.
- **Scroll Option**: There are five possible options: **None**, **Tabs/Top**, **Tabs/Bottom**, **Tabs+Arrows/Top**, and **Tabs+Arrows/Bottom**. The top and bottom versions determine if the tabs and/or arrows appear at the top or bottom of the control. The **Tabs** only versions does not display left and right scroll arrows, the **Tabs+Arrows** version display both.

The number of movies that you can see at once and the number of tabs will update dynamically as you resize your control – adjust the picker's size for the orientation/arrangement that suits you best. Note that if there is not enough room horizontally, all of the possible tabs might not be displayed.