

## ArtsSync User Documentation Overview

### What is ArtsSync?

*ArtsSync* is an attempt to make a relatively easy-to-use program for real-time multimedia projects employing a high degree of synchronicity between audio and visual components. These synchronicities can be achieved in several ways with ArtsSync. Immediate, moment-to-moment excitation/generation of images can be achieved by analyzing the audio input (by playing a prerecorded soundfile or with adc input via a microphone) and mapping the data generated to various aspects of video rendering and/or processing. There are also timeline (key frame) controls that use breakpoint curves to map parameters used for the entire duration of a piece or sections within a piece. These two approaches can be combined such that, for example, the amplitude attack of an instrument may minimally effect the video image in some places, but in others (perhaps structurally important ones) it may have a much greater effect. Parameters that are used in the processing of audio in the Audio Processing modules (delays, reverb, filtering etc. ) can also act upon video parameters. Lastly the 'Timer' sub window can trigger any give preset at any moment of the duration of a soundfile, which may change as radically as you like. Thus different levels of musical structure, surface and background, can be mapped to many aspects of image generation and processing.

### What kind of images?

Currently there are ArtsSync modules for generating abstract images, manipulating still pictures, working with QuickTime movies, or for work with live input from a QuickTime compatible camera.

### How is ArtsSync organized?

Realized in Max/MSP/Jitter, the structure of the program itself is very open and extendable with modules, which work like plug-ins, for image and audio generation and processing. There are 3 basic types of modules; modules that generate images, modules that affect images, and audio modules that effect audio and video simultaneously (these are still under development). With this structure it is relatively simple to add your own modules, which is one of the primary objectives, to ensure flexibility and longevity (see **templates and instructions on the gen\_module.mxb and fx\_module.mxb patches to make your own modules**). The *ArtsSync* architecture also automatically adapts itself to a user-definable image resolution, seen in the lower right-hand corner, so that the software can take advantage of future advancements in computer architecture and CPU/GPU clock speeds to create arbitrarily high resolution output images.

### Frame rates and system requirements:

The minimum requirements are a PC under Windows XP or Mac under OSX (Intel or PPC) with a 800Mhz CPU or higher. Like Max/MSP/Jitter itself, the amount of audio and video processing and generation depends largely on the speed of your computer (including graphics card). At present only a fraction of the various modules and controllers can be used at one time, even on the fastest personal computers available. A conscience attempt has been made to allow greater flexibility in anticipation of faster computers. You can use the 'fps' (frames per second) readout at the bottom of the screen (under "Video Out") to see how your system is doing. Clicking and dragging the

'Max fps' number box will set the highest possible frame count. Raising this to an arbitrarily high number and reading the actual frame rate you are achieving will tell you how much more computational headroom you have available on your machine, if any.

### Ways to achieve higher frame rates:

When not in use, modules are not loaded in the program and thus do not effect CPU/ GPU load. Many other effects and controllers have on/off check boxes that also do not effect CPU load when unchecked. Thus to achieve higher frame rates:

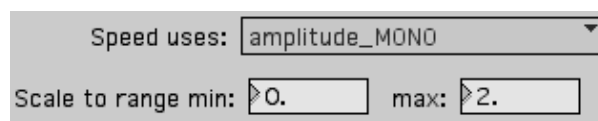
- Turn off any module, preview, effect, feedback node, data generator, audio processor etc. that are not being used.
- Try a smaller source dimension.
- Close all windows which show continuous data, such as MIDI and bus monitors, envelopes and graphic user interface (GUI) objects. The updating of the color swatch can be especially cpu demanding.

### How is the main window organized?

**ON THE LEFT SIDE** of the main window are various controllers and 'data generators' which act on images generated on the right side of the main window. Each type of data generator ultimately sends data to image and effects modules with values normalized between '0' and '1' via a system bus. This is important because when they are applied to generating/manipulating images they must use the same bus numbers and the values (between '0' and '1') need to be scaled to values that make sense for that specific modules (see below). Some details are as follows:

**-Audio Input:** the playing of *uncompressed* sound files from your hard drive or audio directly from your sound card using MSP's [adc~] object.

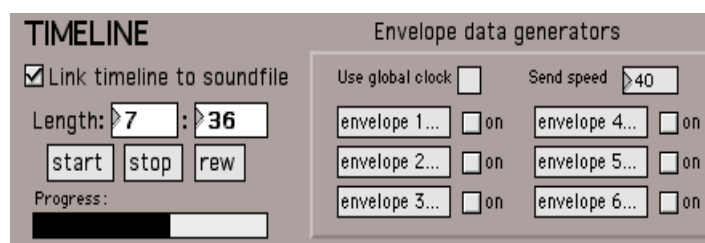
**-Audio analysis:** these are largely envelope/peak followers. They will take audio from either a mono or stereo soundfile being played, or by up to 2 channels of audio coming into the adc's depending on the 'Source' selected in the Audio Input section to the left. Note that their default is 'off' unless you assign one or both channels of audio to analyze. The resulting data, normalized to between 0 and 1 can then be used elsewhere in the patch by choosing it from various pull-down menus. You can click the 'settings' tab to see the data generated and use to control various parameters.



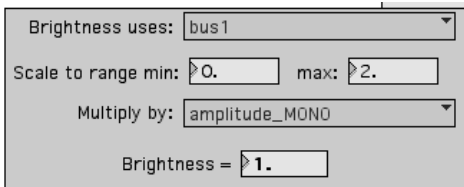
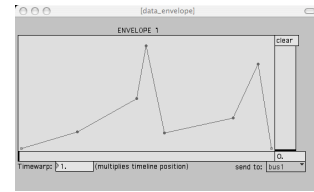
**-Audio processing:** most parameters used for processing audio can also be used to process images when assigned to a system bus. There are also modules that generate audio, including a granular cloud generator and a sampler (note currently there are plans to offload all of these to a separate patch).

**-MIDI input:** which can be any kind of MIDI data. The 'MIDI' monitor can tell you what MIDI data is being detected.

**-Timeline :** this consists of a master timeline and several envelopes. The duration of timeline is either input into the

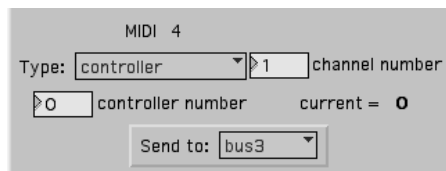
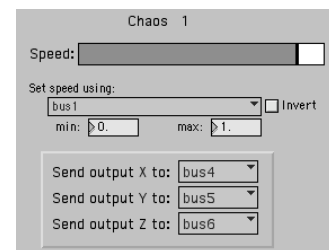


two 'length' boxes (minutes and seconds, useful if your piece is played live and there is no prerecorded material) or linked to the soundfile loaded in the 'Audio Input' section. Once started the time-line reads the various envelopes if checked. Clicking on an envelope opens a window containing a breakpoint curve which can be tailored to the various structures/durations of a piece or sections. Click any space to insert a new breakpoint or shift/click to remove one. Note the 'clear' and 'Time warp' messages. For rehearsal purposes you can type in a duration that is very short to step through the changes 'fast

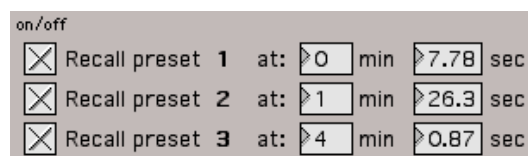


forward' that will happen over much longer durations. Notice on the lower right-hand corner the 'send to:' menu reads 'bus1'. By default it reads 'nowhere'. Sending it to 'bus 1' allows that data to effect any Video Input or Effects module which is assigned to bus 1.

**Data Generators:** these are various controllers based on math functions (Randomness, Chaos, Pulse generation, Oscillators) which can be used to control various aspects of video parameters or combined with the envelope or other controllers, including audio analysis data (see 'Modules' and 'Effects' below). Note again that if unchecked they will not function nor contribute to CPU load. Note also that like the timeline function above, data from these modules must be explicitly sent to a bus in order for the data to be usable by any other module. The same is true for using **MIDI** in messages as controllers; they must be assigned to a bus in order to be useful.



**Presets:** When you have parameters that you'd like to save and/or share with others you save store them as a preset from 1-12 and recall them in that session. When you are done with your session and would like to use those presets next time you must use the 'write' tab to write them to a file on your hard disk, and then use the 'read' tab to load them in after you start *ArtsSync* again. These are written as text files so you can also send them to friends. If you want a particular preset or presets to be triggered at a particular time (corresponding to a point in a soundfile or into a performance) you can use the 'Preset Timer' panel.



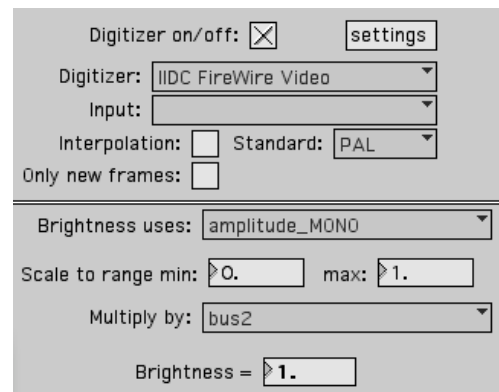
**ON THE RIGHT SIDE** of the main window are three main sections, image generation and mixing, effects and feedback nodes, and video out controls.

**-Image Generation and Mixing modules:** The 3 modules on the top do just that, which allows you 3 layers of video material at the



same time (if your computer has the processing power for all three). What each layer will consist of depends on what generator you choose from the pull-down menu.

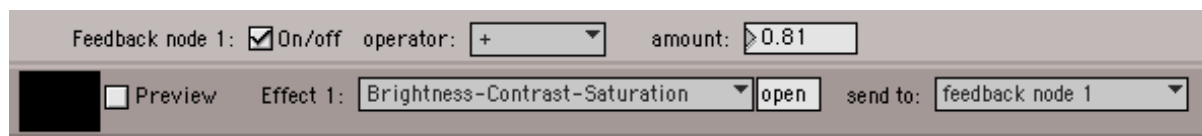
Once you choose a module you can click on the 'open' message for various controls specific to that module. These will include pull-down menus for '<something> uses' with a series of buses or audio analysis input (amplitude\_MONO in this case) as choices. What data the buses contain are determined by the data generators on the left side of the main window you assigned to that particular bus number. Next you will find '<something> scale to range' which, as mentioned above, will be



different values that make sense for that particular module (or effect). Scaling values (which are always from '0' to '1') from 0 to 360 might make sense for rotating an image from 0 to 360 degrees. Scaling the values from 0 to 255 might make sense for color and other video parameters which typically use these values. For other parameters leaving them from 0 to 1 may also make sense.

How a particular module will combine with the other 2 modules (if used) depends on where it is sent it. By default it is sent to the **mixer** and added to the previous image. You can also choose to subtract it from the previous image or use various other math operators from the 'Op' menu. You can also send it to a feedback node and if the node is turned on, it will be added to the previous image (see 'Routing' below). Either way you can use the 'fade' slider to determine the amount of the images present. Note that when the fader is all the way to the left it will be turned off and thus not contribute to CPU/GPU load. At present there are generators for inputting quick-time movies or still pictures (movie/image in), generating waveforms (similar to itunes), capturing video-in (from a quick-time compatible camera), using solid colors, and responding to MIDI input.

**-Video Processing:** Below the image generators are 'effects' (and 'feedback nodes' explained below). What effect it applies is again determined by what effect is chosen in the pull-down menu. Each effect will have controls and pull-down menus quite similar to the image generator modules mentioned above including the use of busses for controllers. In fact a particular bus, say bus #5, may determine how fast a quick-time movie is played, its rotation as well as its brightness or position in the window.



**-Routing and Feedback:** To allow maximum flexibility, routing in ArtsSync is done with a series of 'nodes' and 'sends'. If you wish to allow feedback of a particular effect you need to do 2 things: a) use the pull-down menu for 'send to' to send it to a particular node, and b) Turn the node 'on'. You can then adjust the amount of feedback with the number box (default 0.8) and, similar to the mixer above, use the pull-down menu to determine what operation combines the feedback to the input.

By default all images are sent through all the effects sequentially. If you want a particular image from one of the 3 modules to bypass all or some effects you can accomplish this using the 'send to' options in the module window. If module #1 (say a movie) is sent to 'feedback node 5' and 'effect 5' is on and bypassed, the image will pass through without modification. If at the same time the output of module #2 is sent to 'feedback node 1' and 'effect 1' is set to 'sprinkle', that effect will be applied to the output from module #2 but not to output from module #1 etc.

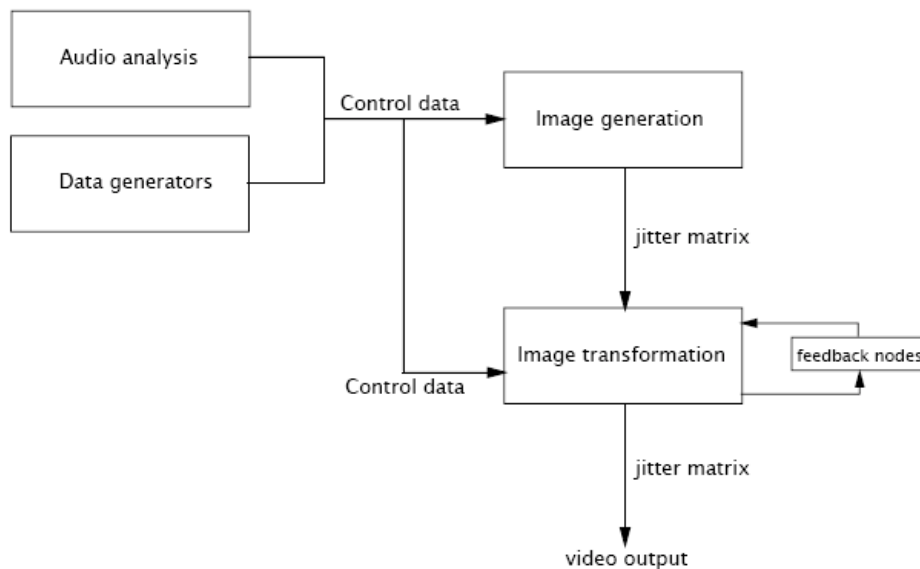


Diagram of the structure and routing

**Video Out:** This last section controls various aspects of your output image. Max. fps (frames per second) is useful if you would like to limit the load put on your machine when using patches that are not very CPU intensive. 25 frames per second is the standard used in the PAL format and works well for most things. In order to view the output window you must check the 'Visible' box on by default. If you see that it is checked but don't see a window try unchecking and re-checking it. A 'Floating' window will always remain visible (on top of other window) and if it has a 'Title' bar you can move it around. The 'Filename' box will show the title of the soundfile being played if desired.

The 'Source dimension' is largely responsible for the definition of your video image. The default 320 x 240 will generate 76,800 pixels for each frame; a lot of data already. A source dimension of 640 x 480 (Standard Definition) will generate 307,200 pixels per frame. Other standard source dimensions are available from the pull-down menus or you can enter your own in the box on the right, and then hitting the return key. Note large values may seriously effect the load on your computer and if they are too large it may simply freeze. Thus using a slightly smaller Source dimension and interpolating (the other check box) to a larger dimension is often a good strategy, and is used by default.

**How do I save my settings?** See 'Presets' above.

**How do I record what I have done?** Real-time recording is accomplished from the Video Out panel in the lower right corner of the main window. At present you can't record audio and video simultaneously in the same format. If you intend to make a movie its best to put an audio click at the beginning of your sound source and have that activate something in the video, just like in movies. That way you can line them up later using a movie application such as Apple's iMovie.

**Exiting ArtsSync** is done with the **Exit ArtsSync** tab in the upper right hand corner. Using this (as opposed to simply closing the window or quitting the application) will turn many things off in the right order.

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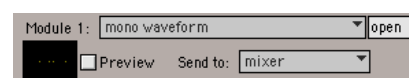
### Quick Tutorial

The best way to get to know *ArtsSync* is to load the presents included in the distribution and try them out. To get an idea of what *ArtsSync* can do (and how to do it) there are a series of Demo Presets and Tutorial Presents to load.

**To play a soundfile:** *ArtsSync* must be running and turned 'On' in the upper left hand corner. You first need to load a soundfile with the 'open' message in the soundfile controls region under the Audio Input section, upper left-hand corner. The soundfile can be in almost any format so long as it is UNCOMPRESSED (not MP3 or jpeg formats). Then check (or re-check) Play/Stop and you should hear your soundfile playing and see the LEDs moving. Alternatively you can select 'adc' (analog to digital converter) under 'Source' to hear/see input from a microphone or other signal from your computer's sound card(s). Input channels can be selected from the pull-down menu below the soundfile control region. If you have more than 2 channels in and out they may be selected by clicking the 'open audio input & output window' message.



**To see a soundfile's waveform:** On the upper right side of the window, under Video Input... choose 'mono waveform' from the pull-down menu of Module 1. To open an output window to see the waveform go to the lower right side of the window and under 'Video Out' check (re-check) 'Visible'. You should then see a black window with a yellow waveform. If you hit the <esc> key on your keyboard you will see it in full-screen mode.



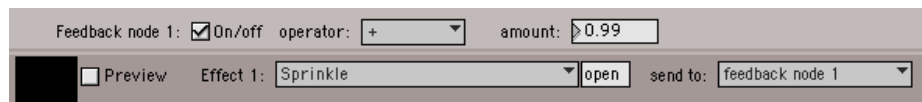
**To change attributes of the waveform:** go back up to the Video Input section and beside the menu where you chose 'mono waveform' click the 'open' button. You will

now see all sort of controls for the background color, RGB (Red Green Blue) values for the color, etc. Along with manually changing the values you can begin to use audio analysis and data generators from the left side of the patch. Try setting the 'Green uses' parameter to 'amplitude\_MONO'. Nothing will happen immediately because the mono envelope/peak follower is (by default) turned off. So go to the left side of the main window under 'Audio Analysis' and turn on the mono envelope/peak follower by assigning either the left, right, or both (mono sum) audio channels to it. Now you should see that when the music you chose gets louder the waveform gets 'greener' (or at least less red). Alternately choose 'Green uses: bus 1'. Nothing again happens immediately because nothing is assigned to Bus 1. To assign something to bus 1, go (again) to the left side of the main window and choose, for example, 'oscil 1' a basic oscillator by clicking on the name. In the panel that opens assign the X axis values (Send output X) to 'bus 1' and then go back to the main window and check the 'on' box next to oscil 1. You should now see the waveform changing colors according to those values. To see a representation of the oscil 1's values check the 'display' box on the pop-up window. While you're there try the other control values for the oscillator. You'll note that the 'Deviation' values multiply the main frequency by a low frequency oscillator to the values aren't as predictable to watch. Try assigning the Y values to another bus, say bus 2, and go back to the mono waveform window and assign something there to bus 2 and note the results.



**To further modify the waveform:** On the right side of the main window under 'Effect 1' choose 'Sprinkle'. To adjust parameters of the sprinkles click the 'open' message by the pull-down menu. Note here too there are pull-down menus for assigning values to the busses or to the audio analyzers.

**Adding feedback:** Lastly add some feedback to the image by sending the output of sprinkle to 'feedback node 1' from the 'send to' pull-down menu. Here again nothing will happen until you turn Feedback Node 1 'on', which is just above effect 1. You can experiment with different values of feedback up to the maximum of '1' chosen to the right. The 'operator' will determine if you want the effect 'added' to the incoming video



'signal', or subtracted etc. What works well for some images may not work at all for others so don't be surprised if you see nothing after some selections. The same is true for all of the effects as well.

## Using Presets

To view the preset go down to the lower left-hand region and under 'Presets' select 'read' which opens a dialog box, and select 'Demo1 presets'. The 'Recall' preset '1'. Lastly on the lower right-hand of the patch under 'Video Out' check (or re-check) 'Visible' and you should see a window with a waveform in it. If you don't (and ArtsSync is 'On') try checking the 'Floating' box in the Video Out section to bring the window on top the ArtsSync window and, in OSX, click on the ArtsSync window (not the document window that you may be reading).

Preset 1:

These images will no doubt be familiar; waves forms. Note actually the result of 2 modules; Stereo poke waveform and 'mono waveform'. Use the faders to the right and you can see which is which. Open the 'mono waveform' controls with the 'open' message. Color changes over the length of the soundfile you chose.