



# **ARL Pan ARL X-Over**

**suite of plug-Ins  
for  
Pro Tools TDM  
Mac OSX**

## **Manual and Users Guide**

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## 1 Introduction

Welcome to the ARL Sound Stage multi-channel plug-ins. Our design team of DSP scientists and audio engineers has created these plug-ins to give mix engineers new ways to craft realistic surround images from non-surround sources such as mono, stereo, LCR, Quad and multi-mono 5.0 sources. Our multi-channel tools include a virtual sound stage and a bass management crossover plug-ins.

Our plug-ins are designed to enhance imaging for surround mixing environments. If we simply put isolated mono sources into a given speaker channel, the listener is very aware of the speaker and its placement. In the early days of stereo mixing, this technique was used to give a dual-mono, pseudo stereo mix. In order to get a realistic stereo image or surround image, some correlated and de-correlated information must exist in all channels. With the use of variable level, delay and equalization we are able achieve a realistic 360 degree sound field from mono sources.

## 2 Minimum Requirements

The ARL Sound Stage suite of plug-ins requires at least the following:

- 867 MHz Apple Macintosh PowerPC G4
  - OSX 10.3 or 10.4
  - 512 MB of memory
- Pro Tools HD 6.7 or 7.x TDM system with
  - HD 1. The ARL Sound Stage plug-ins can run on the HD core board or the HD Accel board.
- iLok Smart Key. The ARL Sound Stage plug-ins require an iLok authorization license (see [www.ilok.com](http://www.ilok.com)).

## 3 System Usage and Limits

### ARL Pan I/O limits

The following table gives the maximum input channels that can be processed for the indicated sampling frequency. Note that Pro Tools has available two hardware platforms: HD | Core and HD | Accel. The latter has the higher-performance “321” DSP chips and hence can support more channels at higher sampling frequencies. Further note that every purchase of ARL-Pan contains two versions of the Pan plug-in: *ARL Pan* and *ARL Pan Accel*. The former runs on all Pro Tools DSP platforms, while the latter is specifically optimized for the HD | Accel platform.

Sampling Frequency	<i>ARL Pan</i> on HD   Core	<i>ARL Pan Accel</i> on HD   Accel
48 kHz	5.1	5.1
96 kHz	Stereo	Quad
192	Not Available	Not Available

## ARL X-Over I/O limits

The following table gives the maximum input channels that can be processed for the indicated sampling frequency. Note that Pro Tools has available two hardware platforms: HD | Core and HD | Accel. The latter has the higher-performance “321” DSP chips and hence supports more channels at higher sampling frequencies.

Sampling Frequency	<i>ARL X-Over</i> on HD   Core	<i>ARL X-Over</i> on HD   Accel
48 kHz	6.1	7.1
96 kHz	Stereo	6.1
192	Not Available	Not Available

## 4 Installing the plug-ins

As a first step, go to [soundstage.audioresearchlabs.com](http://soundstage.audioresearchlabs.com) to download the plug-in software. The “demo” and “purchased” plug-in software is actually identical, with the only difference being the iLok authorization (10 days for demo, and unlimited for purchase).

As part of the download process, you will be asked to register on the ARL Sound Stage web site, and provide your contact E-mail address and iLok user name. You will receive a confirmation E-mail indicating that an authorization license is available for your iLok at iLoc.com, after which you must go to iLok.com and load the license into your iLok key.

The downloaded software is a zip archive file. In the zip archive is a directory containing two Macintosh installation packages, one for Pro Tools 6.x, the other for Pro Tools 7.x. Select the package that matches your Pro Tools version: first double-click the zip archive file, and then double-click the appropriate package. Then, simply follow the installation instructions, which will result in the ARL Sound Stage plug-ins being added to your Pro Tools plug-in directory.

Note that authorization for use of ARL Sound Stage plug-ins is contained in your iLok key. Hence you can download the ARL Sound Stage plug-ins onto multiple machines and use the ARL Sound Stage plug-ins on any one of them as long as your iLok key is inserted into that machine.

Finally, note that there are terms for use of ARL Sound Stage, as specified in the “license” document that can be viewed during the ARL Sound Stage installation process. ARL advises that users run the free demo to both inspect the license terms and to insure that the target machine meets the minimum requirements for running ARL Sound Stage.

## 5 ARL Pan Plug-in

### 5.1 Overview

A conventional panning system simply provides level difference to each channel. In stereo, this method is effective providing hard left, hard right and phantom imaging in-

between left and right. For surround mixing, a more complex processing method is needed for total emersion into a 360° sound field. The ARL Pan module adds dynamic processing including phase and equalization to deliver an enhanced, more realistic image.

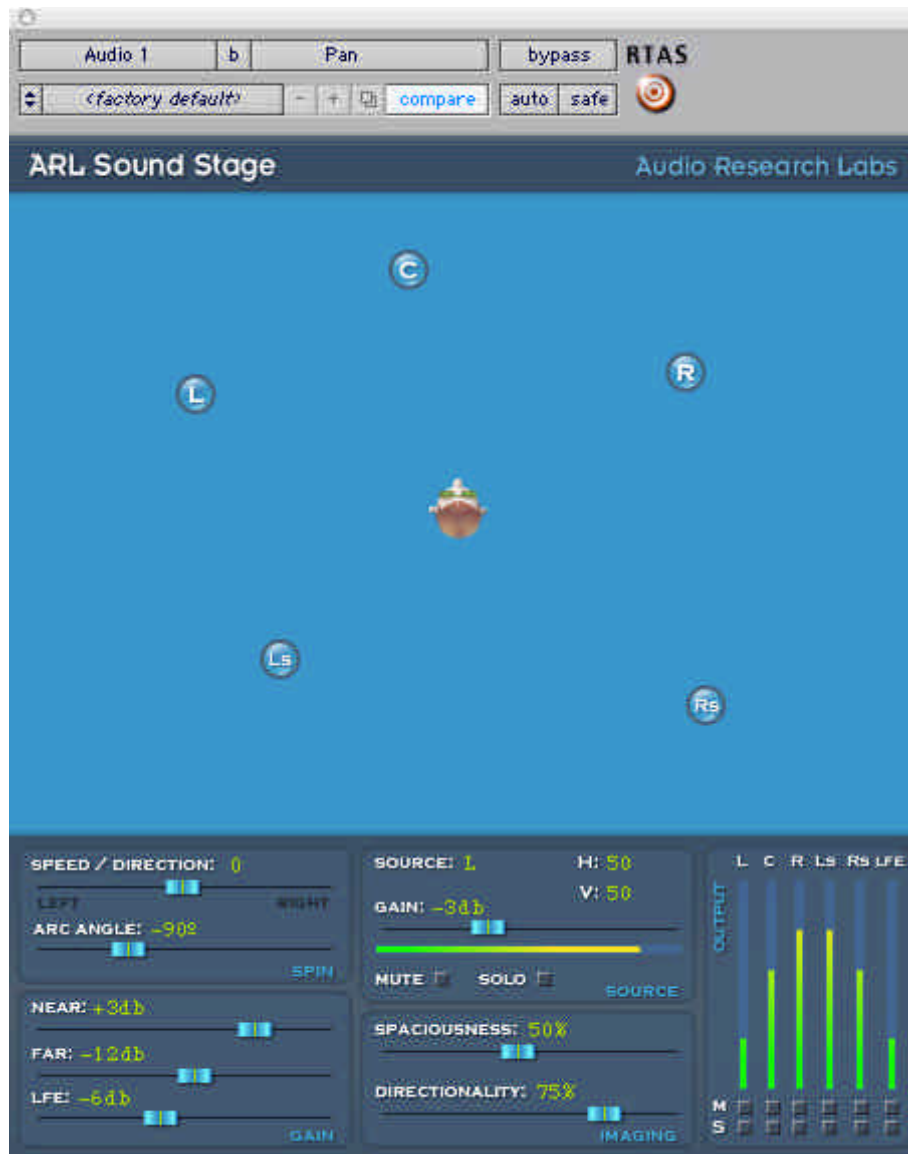
Our concept for mixing is based on a listener's perspective of a virtual sound stage. You (the virtual listener) are initially at the center of the surround image. The sound sources may represent musicians on a stage or ambient sounds for the sweetening of a film/video sound mix. The location of your sources may be placed, and moved, anywhere on the sound stage. Your listener is free to move about the sound stage as well and change his or her orientation (virtual head turning).

## **5.2 I/O Options**

- mono, stereo, LCR, Quad or 5.0 to 5.0
- 5.1 to 5.1

## **5.3 Using ARL Pan**

The following is a screen-shot of the ARL Pan plug-in.



The blue field is your virtual sound stage. In the center of the sound stage is the virtual listener. The ARL Pan control panel is located below the sound stage.

The plug-in lets you place from 1 to 5 sources on a single sound stage. This is based on the Pro Tools mono, stereo, LCR, quad and 5.0 track options. Multiple ARL Pan sound stages can exist in a single session. When a session is initialized, all sources are in the “Neutral Position.” When in the neutral position, a source has a gain of 0 dB (although subject to additional directionality gains – see Section 5.4.7). The neutral position defines a circle centered on the virtual listener.

The ARL Pan plug-in mixes to 5.0 or 5.1 output channels, which are assumed to be on the circle defined by the neutral position and placed such that there is equal angle between all speakers.

### 5.3.1 Working with multiple sources

When working with multi-mono sources, you must group them into a maximum of five mono files and drag them into a 5.0 audio track. From top to bottom they will appear as sound sources L, C, R, Ls, Rs on the ARL Pan's sound stage display. For example, these five sources could be sax, bass, guitar, piano and drums from a close microphone recording session. With the use of ARL Pan, you can arrange them in the surround sound field as you wish.

### 5.3.2 Selecting a sound source

The sound sources will appear labeled L (left), R (right), C (center), Ls (left surround), and Rs (right surround). When you click on a source, you have selected it. In the Source section of the control panel, located below the sound stage, you will see information about that source including its horizontal and vertical coordinates, gain and mute/solo status.

### 5.3.3 Moving a sound source or the virtual listener

Sound sources and the virtual listener can be re-located by a simple click and drag process. They can also be moved in real-time by adding automation parameters. Please refer to the Pro Tools user guide on how to initiate and use plug-in automation.

The angular orientation of the virtual listener's head can be changed by clicking and dragging anywhere on the blue sound stage field. A simple "click" makes the virtual listener face the mouse position. A "select" (click and hold) and subsequent sweep makes the virtual listener's focus follow the mouse position.

### 5.3.4 Source Section

Select a sound source by clicking on it (see Section 5.3.2). Variables associated with the selected sound source can now be inspected or adjusted:

**Source** – indicates which source you have selected.

**Gain slider** – changes input volume pre-pan.

**Meter** – indicates the source level post-fader.

**Source Mute** – an alternate-action control button that mutes sound source.

**Source Solo** – an alternate-action control button that solos sound source post-fader.

### 5.3.5 Output meters

The meters show the mixed output level of the selected pan module on the L, R, C, Ls, and Rs busses. Output channel Mute (M) and Solo (S) alternate-action control buttons are below their respective meter.

## 5.4 Controls

### 5.4.1 Speed/Direction

The virtual listener can spin or rotate back and forth through an arc. This control sets the rotation speed and direction of the virtual listener.

**Default position** (middle, 0%) - no spin  
**Full left** – spin full speed counter clockwise  
**Full right** – spin full speed clockwise

### 5.4.2 Arc Angle

This sets the arc of the spin.

**Default position** (full left, 0%) – continuous rotation, either clockwise or counter clockwise, depending on the setting of the Speed/Direction control.

**Moving to the right** – sets the limits for the arc of head rotation. Moving further to the right increases the arc. Full right is an arc of 360 degrees. Note that the center of the arc is relative to wherever the virtual listener is looking at the instant that the Arc Angle control is moved away from the full left default position.

### 5.4.3 Near Gain

This sets the amount of gain effect as the sound source approaches the virtual listener from the neutral position (the neutral position is the position of source when the plug-in initialized). The default position is 6.0 dB of gain. Moving to the right increased the gain.

### 5.4.4 Far Gain

This sets the amount of attenuation effect as you move away from the virtual listener from the neutral position (the neutral position is the position of source when the plug-in initialized). The default is 12.0 dB of attenuation. Moving to the left increases the attenuation.

Note that the Near and Far Gain controls are “ganged,” such that the Near Gain can never be less than the Far Gain, and the Far Gain can never be greater than the Near Gain. This results in the Near Gain control “dragging” the Far Gain control with it as it is moved to the left. Similarly, the Far Gain drags along the Near Gain control as the Far Gain is moved to the right.

### 5.4.5 LFE Gain

This fader is only available in the 5.1 to 5.1 version of the ARL Pan. In this case, the LFE level can be adjusted as it passes through the plug-in.

### 5.4.6 Spaciousness

The ARL Pan module uses multiple delay times based on the location of the virtual listener’s head and its relation to the sound sources. To exaggerate the delays, increasing the perceived spaciousness, you can set this variable greater than 50%. To reduce the delays, thus putting all channels in phase, reduce the setting to 0%.

### 5.4.7 Directionality

This setting adjusts the amount of localization on the 360 degree surround mixing plane. It is effective in spreading the image of mono sources by decreasing the directionality (i.e. increasing the cross-talk).

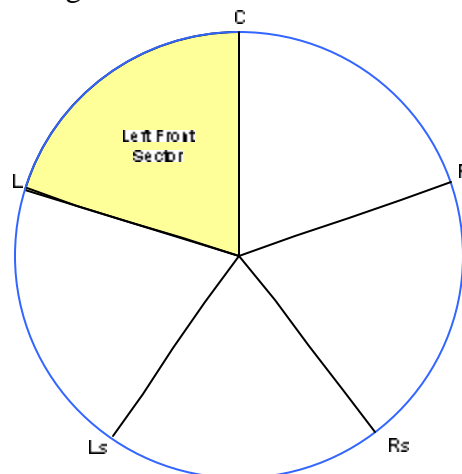
**Default position** (middle, 0%) – Cardioid mode (most realistic)

**Full Left** – Omni-directional mode

**Full Right** – Most Directional (No cross-talk between front and rear speakers)

In the default and full left positions, this control is based on microphone polar patterns. Even the most directional microphone patterns have some cross-talk due to rear-facing lobe patterns. This control provides an additional mode in which the sound stage is divided into sectors, where a sector is the “slice of pie” defined by the two lines from the virtual listener to adjacent virtual speaker locations, as show in the figure below. In the full right position, any sound source in a sector is mixed only to the two speakers that define the sector. For example, if the sector is defined by the left and center speakers, a source anywhere on the line from the virtual listener through the left speaker will be mixed only to the left speaker. Moving the source halfway towards the center speaker will result in the source being mixed equally into left and center.

Note that, when setting this control to the full right position, users may also wish to set the Spaciousness control to the full left position, thus eliminating any phase differences when doing sector-based mixing.

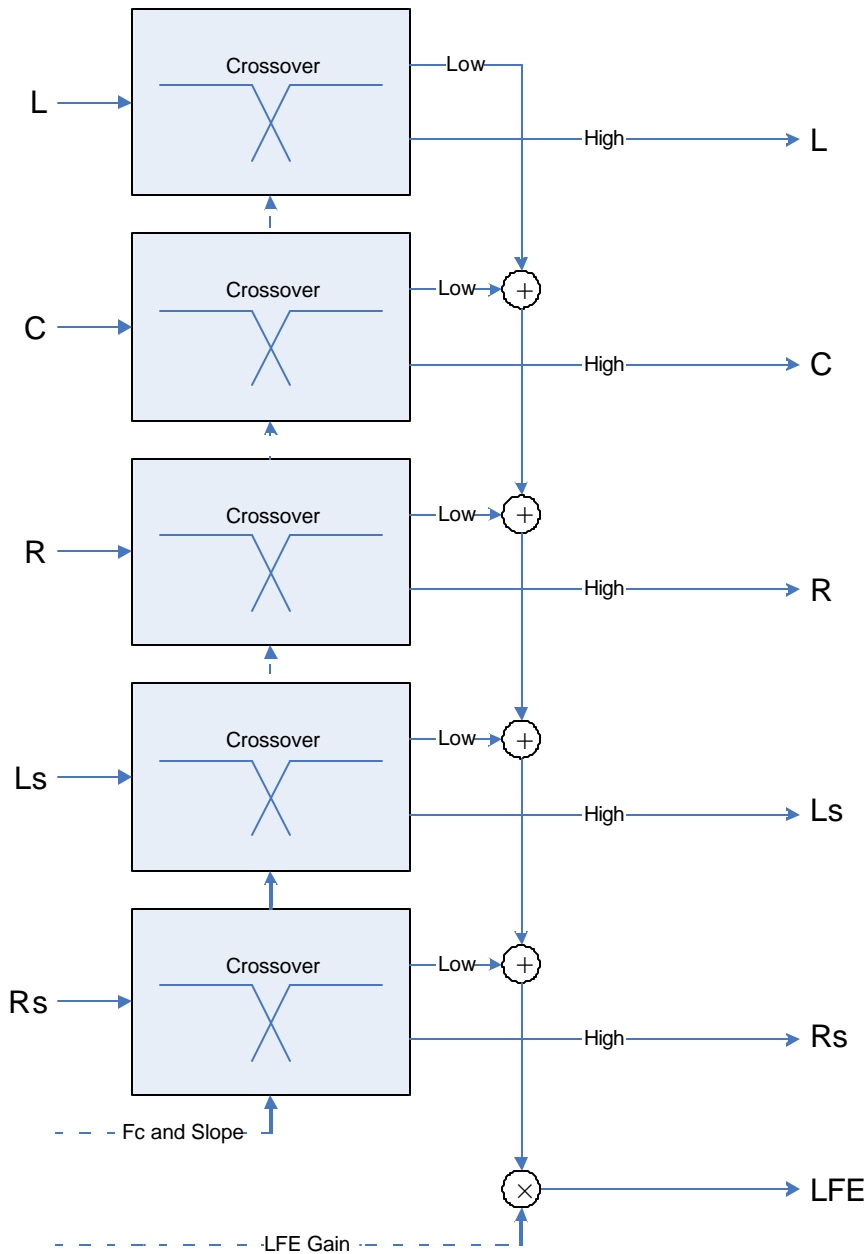


## 6 ARL X-Over Plug-in

### 6.1 Overview

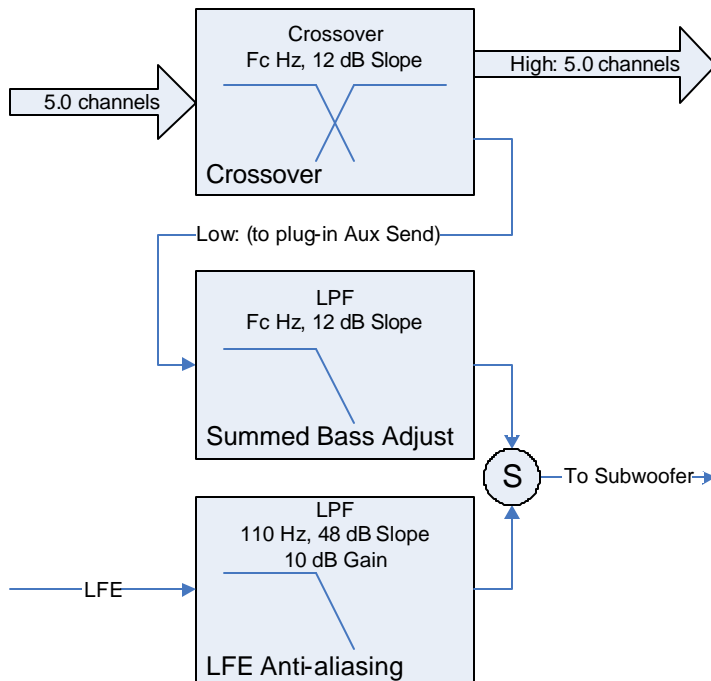
The ARL X-Over is a filter plug-in that can function either as a cross-over or a generic low-pass filter. In cross-over mode, it is a high-fidelity multi-slope low pass and high pass filter combination with a common cut-off frequency and unity gain across the frequency spectrum. In low-pass filter mode, the plug-in passes the low frequencies up to the cutoff  $F_c$ , and eliminated higher frequency components (subject to the selected filter slope).

In cross-over mode, high frequencies pass and the bass frequencies are summed and sent out a plug-in aux send (a new feature for Pro Tools) or sent to the LFE buss. The following figure is a functional block diagram of the ARL X-Over plug-in when processing a 5.0 channel signal in crossover mode. The dotted arrows indicate that the user can control the crossover frequency ( $F_c$ ) and crossover Slope, and also adjust the level of the LFE output signal.



## 6.2 Bass Management

Many home audio systems have a cross-over system with small satellite speakers and a single subwoofer to handle the summed bass frequencies. ARL X-Over can be used either to prepare mixes for systems with a subwoofer or to simulate how a mix would sound on a system with a given subwoofer crossover frequency. To correctly simulate an active bass management system, several ARL X-Over plug-ins can be cascaded, as shown in the following figure. Note that the first block is in crossover mode, while the next two blocks are in low pass filter mode. The operating mode, break frequency and slope for each block are indicated at the top of the block.



### 6.3 ARL X-Over filter description

The ARL X-Over crossover is a very high-quality, extremely stable crossover. For odd orders (i.e. slopes of 6, 18, 30 and 42 dB/octave) it uses Butterworth filters and for even orders (i.e. slopes of 12, 24, 26 and 48 dB/octave) it uses Linkwitz-Riley filters. An intrinsic characteristic of a Butterworth filter is that it is “maximally flat,” meaning that it has no passband ripple, and hence does not alter the equalization of the input signal. A Linkwitz-Riley filter is simply the cascade of two Butterworth filters, so it also has no passband ripple. Both filters roll off at the selected slope, are 3 dB down at the crossover frequency, and continue to attenuate at that slope. For example, selecting a crossover frequency of 200 Hz and a slope of 48 dB/octave for the LFE channel low-pass filter results in an attenuation of 3 dB at the crossover frequency, 48 dB at 400 Hz and 160 dB and 6 KHz.

Strictly speaking, Butterworth filters are defined in the analog domain, so the ARL X-Over uses the bilinear transform to convert them into digital filters that run on Pro Tools TDM systems. The ARL X-Over factors these filters into second-order Modified Chamberlin sections for maximum numerical stability. This is especially important for very narrow-band low-pass filters, such as a LFE crossover. Both the low-pass and the high-pass components are derived from a single filter structure, insuring accurate crossover alignment. The result is a crossover that achieves absolutely flat response across the frequency spectrum, with low pass and high pass outputs that are everywhere in phase.

### 6.4 I/O Options and functionality

- mono to mono (plus low frequency aux buss send)

- stereo to stereo (plus summed low frequency aux buss send)
- LCR to LCR (plus summed low frequency aux buss send)
- Quad to Quad (plus summed low frequency aux buss send)
- 5.0 to 5.0 (plus summed low frequency aux buss send)
- 5.0 to 5.1 (summed low frequency send out the LFE buss plus an aux buss send)

## 6.5 Using ARL X-Over

The following is a screen-shot of the ARL X-Over plug-in.



When inserted into a mono, stereo, LCR, Quad or 5.0 track, the crossover passes the high frequencies (frequencies above the user set cross over frequency  $F_c$ ) and sends the low frequency out an aux send. In the case of multi-channel tracks, the low frequencies are summed. If stereo, LCR, Quad or 5.0 low frequency channels are desired, you can use multiple mono tracks. The plug-in aux send can then be routed as the user desires using a Pro Tools aux track. When inserted into a 5.0 track you have two options, 5.0 or 5.1 outputs. The 5.0 option passes the high frequencies through, and sums the low frequency output to a plug-in aux send. When the 5.0 to 5.1 option is used, the high frequency passes and the low frequency is sent out the Pro Tools LFE bus.

## 6.6 Controls

### 6.6.1 Cross over frequency

The cross over frequency  $F_c$  can be set by using the slider or typing in a value between 1 and 10Khz. This determines what frequencies will be considered “high” or “low”.

### 6.6.2 Mode

“Cross Over Mode” is the normal operating mode. This mode passes high frequencies above the cutoff  $F_c$  and sums the frequencies below  $F_c$  and sends out the plug-in aux buss.

“Low Pass Filter Mode” passes the low frequency through and eliminates high frequency components above the cutoff  $F_c$ .

### **6.6.3 Filter Slope**

X-Over offers eight pre-set slopes. The available slopes, specified in decibels per octave, are:

6, 12, 18, 24, 30, 36, 42, 48 dB/Octave

### **6.6.4 Low Pass Gain**

This slider controls the level of the summed low frequencies being sent out an aux send or the LFE buss. The gain should be set to prevent overload that may occur when summing the bass signal with multi-channel sources.