

Multichannel Audio Technologies: Lecture 3.A

Mixing in 5.1 Surround Sound

Setup

Given that most people pay scant regard to the positioning of stereo speakers in a domestic environment, it's likely that the majority of consumers will have a less than optimum setup, but when you come to mix in surround, it's vital that you have five accurately matched loudspeakers set up in the right position in an acoustically suitable room. This means that your mixing position is likely to be closer to the centre of the room than with a stereo mixing system and that, of course, the centre speaker will probably sit right in between the left and right speakers behind the mixer. It is also much more important that the acoustic treatment of the room is distributed evenly around the space to control reflections from the rear speakers.

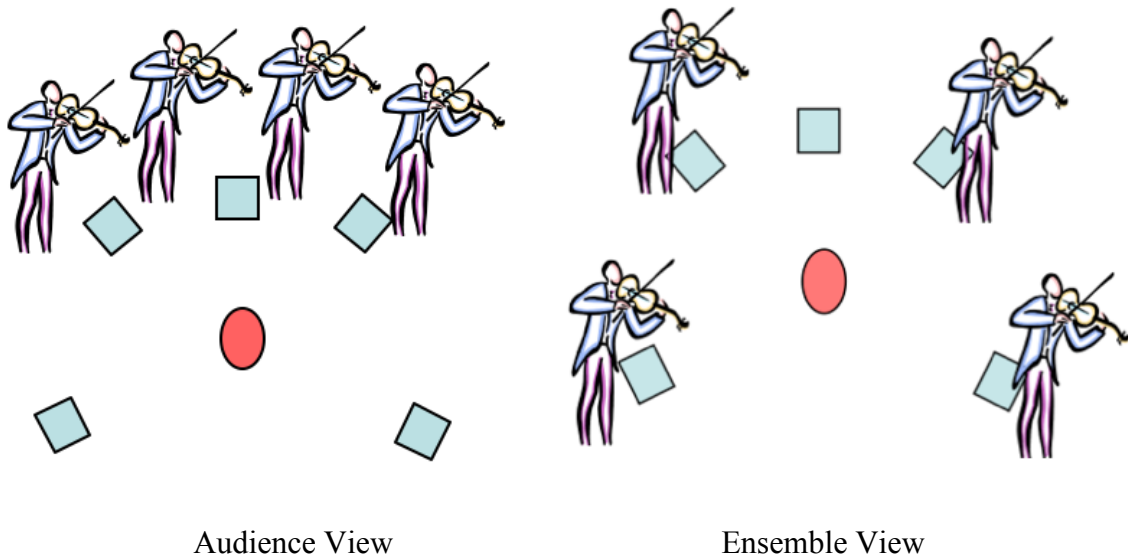
Panning

Sounds are positioned in surround in much the same way as they are in stereo mixes — by 'power panning' (the difference in level between the same signal in different channels), except that you are balancing across five speakers, rather than just a stereo pair. Very often this is setup on a regular mixer by using six separate channels for each source (representing the five surround channels plus the sub-bass) and feeding them to separate mix busses. These in turn feed the monitoring system and a multitrack recorder in order to capture the six separate signals that comprise the 5.1 mix. While this is not difficult to set up, it makes mixing difficult, and it makes dynamic panning extremely complicated as you have to adjust several different level controls at once. A better solution is to use a joystick or a similar surround pan controller, and this is how many professional sound mixers work. However, in the project studio environment, a piece of audio recording software with virtual joysticks is a much more cost-effective solution

The Surround Channels

The whole point of surround audio is to give the listener a more interesting and involving listening experience. Nobody has all the answers yet, as surround music is still a relatively new art form, but new mixing techniques are sure to evolve. In light of this, handling of the surrounds is a subject that causes the most heated discussions, because it's a matter of art rather than science. In classical or acoustic recordings, the room acoustics (or simulated room acoustics) can be used to provide the listener with a 'best seat in the house' listening experience — the music still comes from the front while the reverberant field (and audience noise, if a live event) come from all around. On the other hand, if you fancy yourself as a rival to Pink Floyd, or as a cutting-edge dance producer, you can put instruments all around the room. With some types of music this might be too distracting, so you may decide to play the game a little more conventionally while still moving some of the effects or incidental instrument parts out to the sides or even to the rear. The point is that there are no rules, so you can do whatever is most artistically

pleasing — keep in mind, though, that it may be prudent to help compensate for bad setup in consumer playback systems by keeping all the important elements of the mix near the front. Subtlety is the best approach, just as when mixing in stereo. Don't go mad by spinning sound sources around 360° all the time. Use special effects as exactly that — as special, and therefore rare, effects. That way they become far more powerful and effective.



The Centre Channel:

Then there's the centre channel. In film work, it makes sense to pin the dialogue to the centre of the screen, but in music we're used to hearing stereo with no centre speaker. Mixing with all the mono components coming from a centre speaker sounds different to what we're used to and, because of the axial response of the human ear, it also makes the signal sound tonally different. So some producers and engineers may put the voice in the centre channel while others may want to stick with the phantom image we've all got used to in two-speaker stereo. There is also the issue of incorrectly aligned domestic playback systems. If, on playback, the centre channel is a few dB adrift of its correct level balance, a carefully crafted mix could end up with the vocals, bass guitar, kick drum and any other centre-panned sounds either too high or low in the mix. This is another reason why an increasing number of engineers and producers are avoiding the centre speaker and creating conventional balances across the left/right pair, which not only sound more familiar, but are far more tolerant of system misalignment. The only drawback is that the image placement will not be as solid as with a true three-way discrete frontal format.

The LFE Channel:

The LFE channel is not mandatory in all formats and may not be implemented in some

home systems, so you cannot guarantee anything you create specifically for the LFE channel will be replayed. All five main channels are full-range and should carry bass in the normal way, though some consumer systems may use small satellite speakers and split off the lower frequencies to a separate bass speaker just to make a compact system practical. This is known as bass management (more later...). For mixing, though, it's probably safest to make your decisions based on a set of full-range speakers.

Also since we using full range speakers it is pertinent to ask, do we need to have the LFE crossover set to the ITU standard of 120Hz? THX actually recommend that it be set at 80Hz for compatibility with the full range speakers. Whatever the choice, it is important to not put anything into the LFE channel that you can't afford to lose. Monitor with and without the channel and make sure the mix sounds ok without it. Use it to add in that bottom octave to kick drum, bass and special effects.

Order of the tracks:

There are a couple of different standard track layouts, but the most common (and that consistent with the ITU/SMPTE recommendation) is: **L, R, C, LFE, LS, RS** on channels one to six respectively. One of the reasons this is recommended is because in the unlikely event that these three pairs are routed quite differently, perhaps incurring timing offsets due to loudspeaker calibration, pairs that clearly need to be coherent will remain so: L with R, and SL with SR. The LFE track can survive quite large timing errors without disturbing the image and, while the coherence of the centre channel to L and R remains a bit of an issue, at least any artifacts will be symmetrical.

Mixing Surround in Cubase 4 (Relevant extracts from the Cubase 4 manual)

We have already dealt with the setting up of the surround busses in Cubase/Nuendo. Here, we look at the functionalities available in Cubase 4 to aid in mixing for surround sound.

Child busses

Essentially a child bus is a bus within a (bigger) bus. Typically you may want stereo child busses within your surround bus – this allows you to route stereo tracks directly to a stereo speaker pair within the surround bus. You may also want to add child busses in other surround formats (with fewer channels than the “parent bus”). Once you have created a surround bus, you can add one or several child busses to it by right-clicking the bus and selecting “Add Child Bus”.

Routing channels directly to surround channels

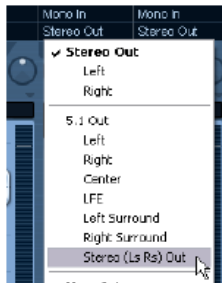
If you want to place an audio source in one separate speaker channel only, you can route it directly to that speaker channel. This is useful for pre-mixed material or multi-channel recordings that don't require panning.

1. Open the mixer and locate the channel you wish to route.

2. From the output routing pop-up menu, select the corresponding surround speaker channel. If a stereo audio channel is routed directly to a speaker channel, the left/right channels will be mixed to mono. The pan control for the audio channel governs the balance between the left and right channel in the resulting mono mix. Center pan will produce a mix of equal proportion.

Routing channels using child busses

Child busses provide a way to route stereo (or multi-channel) audio channels to specific speaker channels in a surround configuration. The most obvious application of a child bus is when you wish to add a stereo channel to two specific left/right surround speaker channels. If you have added a child bus within a surround bus (see above), it appears as a submenu item within the surround bus on the output routing pop-up menu. Select this to route a stereo audio channel directly to that stereo speaker pair in the surround bus.



Using the Surround Panner

Cubase has a special feature for graphically positioning a sound source in a surround field. This is actually a special plug-in which distributes the audio from the channel in various proportions to the surround channels.

1. Open the mixer and locate the channel you wish to position. This could be a mono or stereo channel.

2. From the output routing pop-up menu, select the “whole surround bus” option (not a specific speaker channel). A miniature graph of the surround plug-in interface appears above the fader in the channel strip.

When the “whole surround bus” is selected, the channel strip shows a miniature surround control.

3. You can click and drag directly in the miniature image to move the sound in the surround field. The horizontal red strip to the right controls the subbass (LFE) level (if available in the selected surround format).

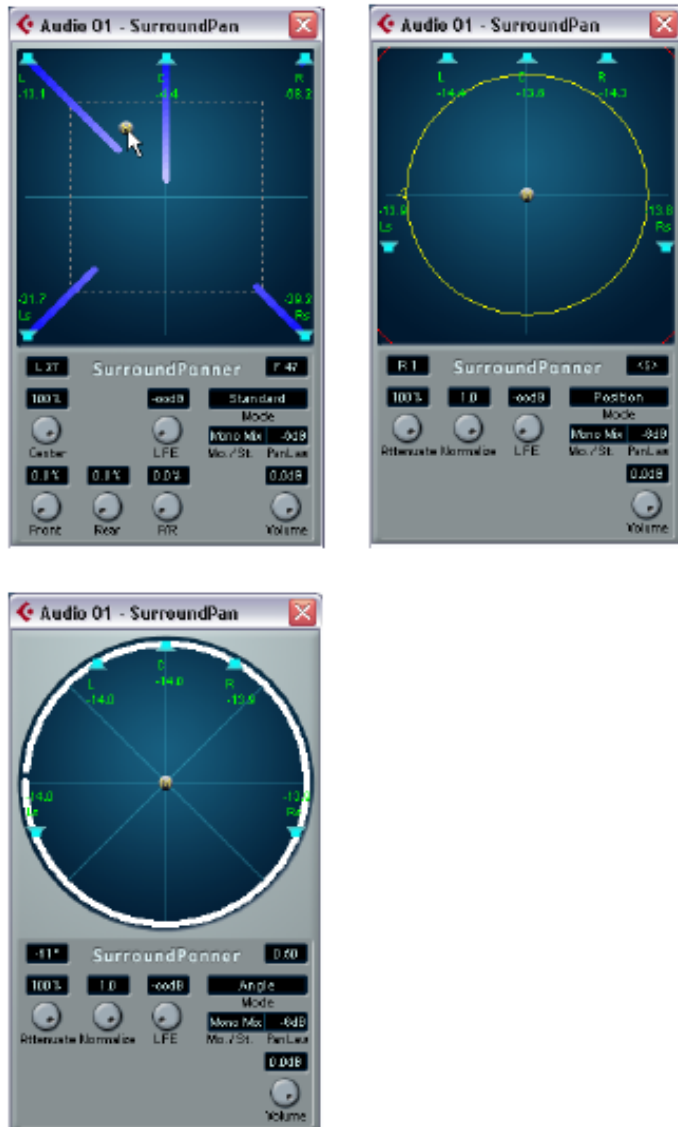
- You can also view a slightly larger version of this control by selecting “Panner” on the View options pop-up menu for the extended mixer panel. This mode offers click and drag-panning as well as numerical values for left/right balance, front/rear balance and LFE amount – enter the desired number or use the mouse wheel to adjust them.

- The SurroundPan can also be displayed in the Inspector for all audio channel track types. To display the Surround Pan tab in the Inspector, make sure the corresponding option is enabled in the Inspector context menu.
- For total control over surround panning, double-click on the miniature image to open the full Surround Panner interface in a separate window.



The SurroundPan controls

The SurroundPan plug-in allows you to position your audio in the surround field. It consists of an image of the speaker arrangement, as defined by the output bus selected on the output routing pop-up menu, with the sound source indicated as a grey ball.



The SurroundPan plug-in interface in Standard, Position and Angle mode, respectively.

Mode – Standard/Position/Angle

The Standard Mode/Position Mode/Angle Mode switch allows you to work in three modes:

- In both Standard and Position mode, the speakers in the front are aligned, as they would normally be in a cinema-type situation. This means that the front speakers are at a varying distance from the center. Standard mode (default) is the best mode for moving

sources between speakers without level attenuation.

- Angle Mode is the traditional surround sound mixing definition. Note that here the speakers are defined as being at equal distance from the center.

The speakers in the panel represent the chosen surround configuration.

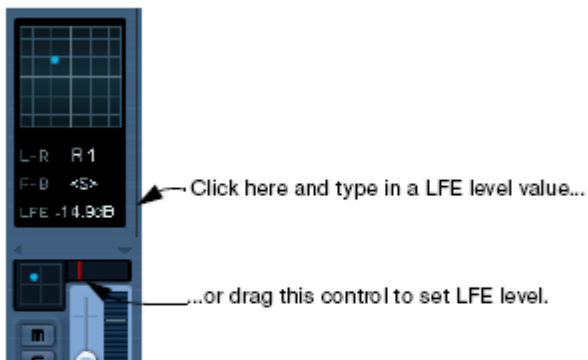
- You can turn speakers on and off by clicking them with [Alt]/[Option] pressed. When a speaker is turned off, no audio will be routed to that surround channel.

A sound source is positioned either by clicking or by dragging the grey “ball” around in the panel (or by using key commands, see below). By dragging during playback you can record automation,

The LFE dial (all modes)



If the selected surround setup includes an LFE (Low Frequency Effects) channel, a separate LFE level dial will be available in the SurroundPan window. Use this to set the signal amount sent to the LFE channel. You can also set this using the small red strip to the right of the Surround Panner in the mixer channel strip, or by typing in a number in the LFE value field in the larger Surround Panner that can be shown in the extended channel strip.



The Surround Panner in the channel strip (bottom) and in the extended panel of the mixer channel strip (“Panner” selected on the View options pop-up menu).

Mono/Stereo pop-up (All Modes)

If you have a mono channel the Mono/Stereo pop-up is by default set to Mono Mix. The panner will then behave as described above.

If you have a stereo channel, you have the option of using one of the three Mirror modes.

Two grey balls will then appear, one for each channel (L/R). This will allow you to move the two channels symmetrically, by dragging one of them. The three modes allow you to select which axis should be used for mirroring.

- The default mode for stereo channels is the Y-Mirror mode.
- If you run a stereo signal through the panner in Mono Mix mode, the two channels will be mixed together before entering the plug-in.
- If you run a mono signal through the plug-in in one of the stereo modes, the signal will be split before entering the plug-in.

Center Level

This determines how center source signals should be reproduced by the front speakers. With a value of 100%, the center speaker will provide the center source. With a value of 0%, the center source will be provided by the ghost image created by the left and right speakers. Other values will produce a mix between these two methods.

Using effects in surround configurations

Cubase introduces a special surround format for VST plug-ins, that is plug-ins that can process more than two channels.

Applying a Surround-aware plug-in:

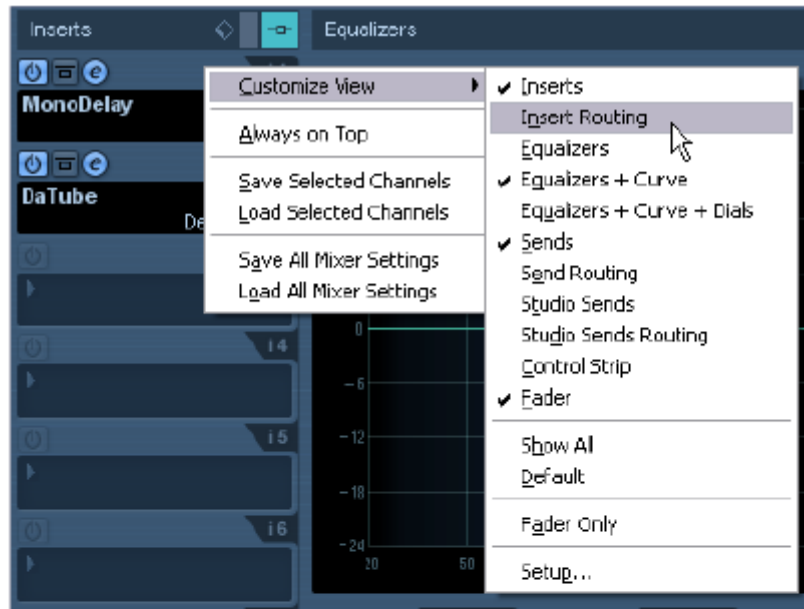
This is relatively the same as applying a regular plug-in. The only difference is that the plug-in panel may have controls for more than two channels.

Like ProTools, in Cubase you can apply a surround plugin in an FX (Aux) channel and SEND a portion of an audio channel signal to it. Alternatively, on a 5.1 channel you can apply an effect as an insert.

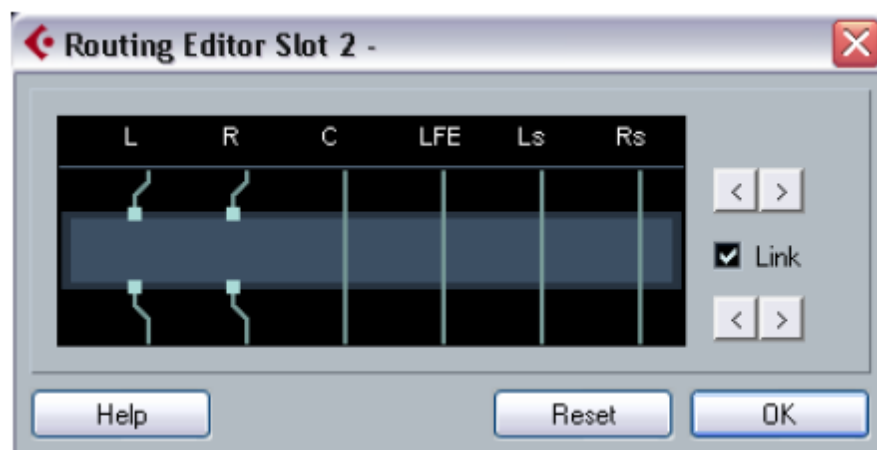
Using mono or stereo effects with a surround channel:

Normally, when you apply a mono or stereo insert effect to a surround (multi channel) track, the first speaker channel(s) of the track (often L and/or R) are routed through the effect's available channels, and the other channels of the track are left unprocessed. However, you may want to apply the effect to other speaker channels. This is done in the Channel Settings window:

1. Right-click somewhere in the Channel Settings window (except the EQ display) to open the Channel Settings context menu.
2. Select "Customize View" from the menu, and select "Insert Routing" from the submenu. The Inserts Routing appears to the left of the EQ display. It contains a row of small signal diagrams.

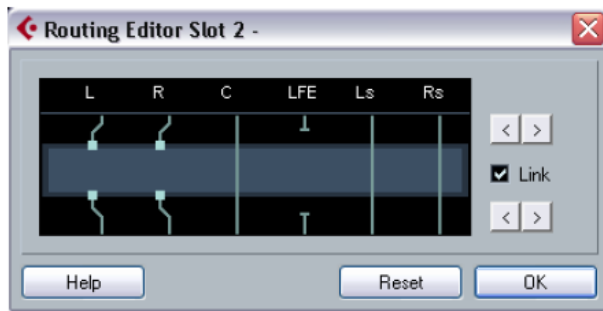


3. Double click on the small signal diagram for the effect to open up an editor window.



The columns in the diagram represent the channels in the current surround configuration, with signals passing from top to bottom. The grey field in the middle represents the actual effect plug-in.

- The squares above the effect represent inputs to the effect plug-in.
- The squares below the effect represent outputs from the effect plug-in.
- A line that passes through the effect (with no square input/output indicators) represent a bypass connection – the audio on that speaker channel passes the effect without being processed.
- A “broken” line indicates a broken connection – the audio on that speaker channel will not pass on to the output at all.



Here, the effect will process the L and R channels. The Ls, Rs and C channels will pass through unaffected, while the Lfe connection is broken.

You can move connections to the effect inputs and outputs sideways to route the audio to/from other inputs/outputs than the standard configuration. To do this, you click the arrow buttons to the right.

Surround Reverberation

WAVES R360 is a highly adjustable reverb plug-in for claiming realistic room ambience and reverb effects in stereo and surround formats. You can insert this plugin on an FX channel or a 5.1 audio channel in Cubase.



Alternatively you can use two stereo discrete reverbs (such as two instances of the Waves RVerb) for the front L and R pair and the surround pair. In this case, the surrounds usually employ a pre-delay to simulate a sense of spaciousness.

Exporting a Surround mix

When you have set up a surround mix you can choose to export it with the Export Audio Mixdown function. This function exports only the selected output bus – this means that all channels that you want to be part of the mix must be routed to the surround output bus. You have the following export options when doing surround work:

- Export to “split” format, resulting in one mono audio file for each surround channel. (This is the one we will be doing most)

- Export to interleaved format, resulting in a single multichannel audio file (e.g. a 5.1 file, containing all six surround channels).