



**Neural Audio
Neural-THX® Surround
DownMix™
User's Manual**

**Neural Audio Confidential
Revision 3.0**



Revision History

<i>Revision</i>	<i>Date</i>	<i>Author</i>	<i>Description</i>
1.0	2004	Mike Matson, Dave Casey	Original Document
2.0	2006	Mike Matson, Dave Casey	Specifications Updated
3.0	09/19/2007	Dakx Turcotte	New Template Format for Neural-THX Surround
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Introduction

The Neural-THX Surround DownMix enables 5.1 surround sound to be transported through any stereo infrastructure. This process is based upon the principle that both natural stereo and 5.1 content are 2-Dimensional; both contain width and depth spatial attributes. The Neural-THX Surround DownMix can represent six channels of discreet audio sources in a stereo down mix by transforming the sources into pure intensity and coherence encoding. By correcting overlaps of the signal sources in intensity, time, coherence, polarity, and phase before the six channels are combined, the Neural-THX Surround DownMix accounts for the problems suffered in traditional matrix encode systems (comb filtering, spatial location distortion, etc).

This proprietary Neural Audio process, or “watermark process” guarantees that surround information is faithfully reproduced when later rendered by the Neural-THX Surround UpMix or any LtRt system. In brief, the Neural-THX Surround DownMix produces a stereo down mix that accurately represents the original content whether monitored in mono, stereo, matrix or Neural-THX 5.1 Surround Sound.

Product Picture



Figure 1. Picture of the Neural-THX Surround DownMix

Operational Diagram

Figure 1 below describes a DownMix taking a multi-channel audio source and creating a two-channel audio source using Neural Audio’s patent-pending approach of embedding a watermark signal within the stereo audio signal patch containing spatial and steering positioning information. The resulting stereo audio signal is also known as LwRw.

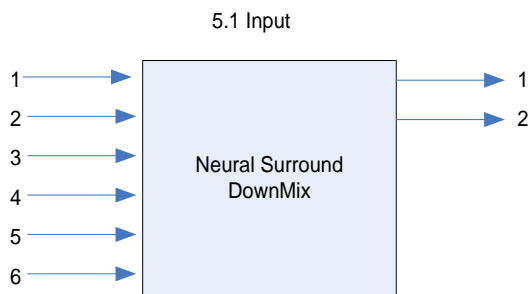


Figure 2. Operational block diagram of the Neural-THX Surround DownMix

Typical Applications

The examples below describe, but are not limited to, typical applications in which the Neural-THX Surround DownMix is used.

FM Radio Production Studio

A typical application of the Neural-THX Surround DownMix is to use this solution in an FM radio production studio to create a stereo signal out of multi-channel original content capable of being rendered back to the original multi-channel content.

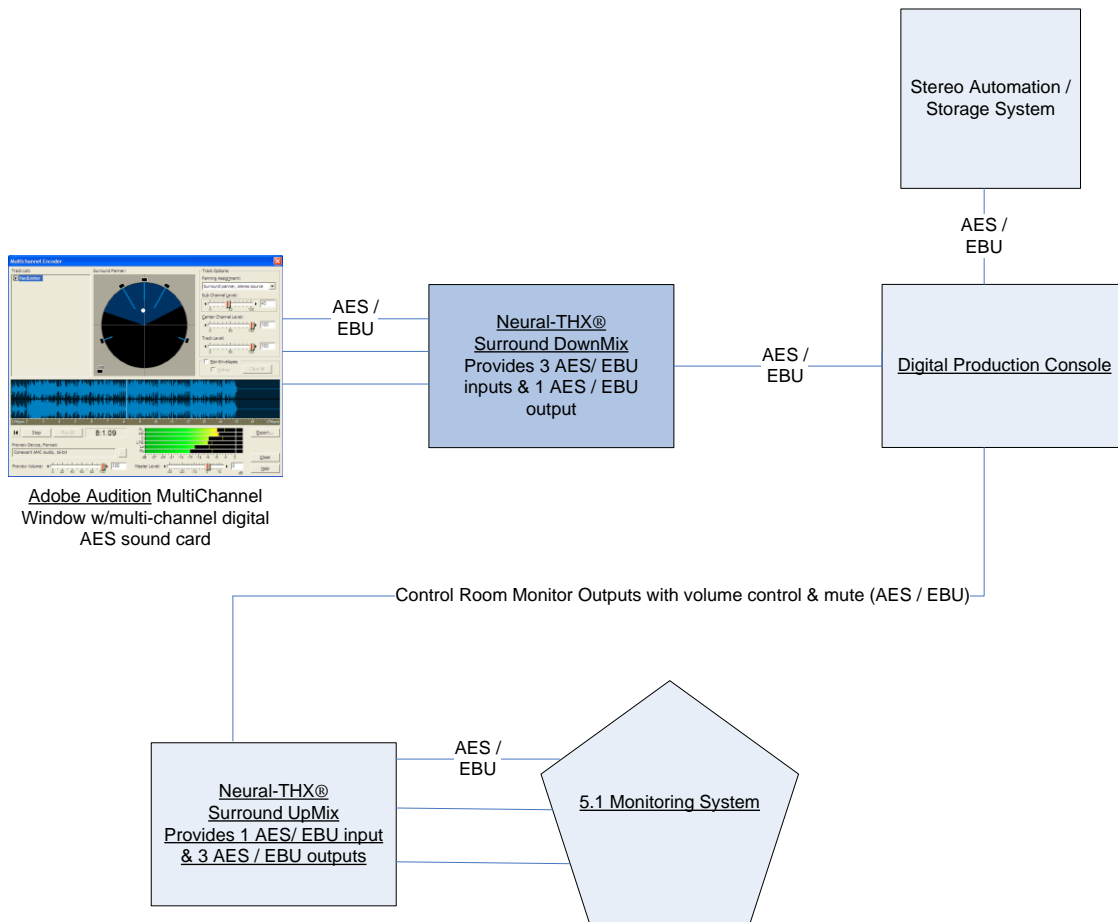


Figure 3. Neural-THX Surround DownMix used in an FM radio production studio

Stereo Television Master Control

Another application of the Neural-THX Surround DownMix is in a stereo television master control room setup. It allows encoding of original multi-channel content into a stereo audio signal that can be easily transported throughout a complete infrastructure and later rendered to the original multi-channel content if needed.

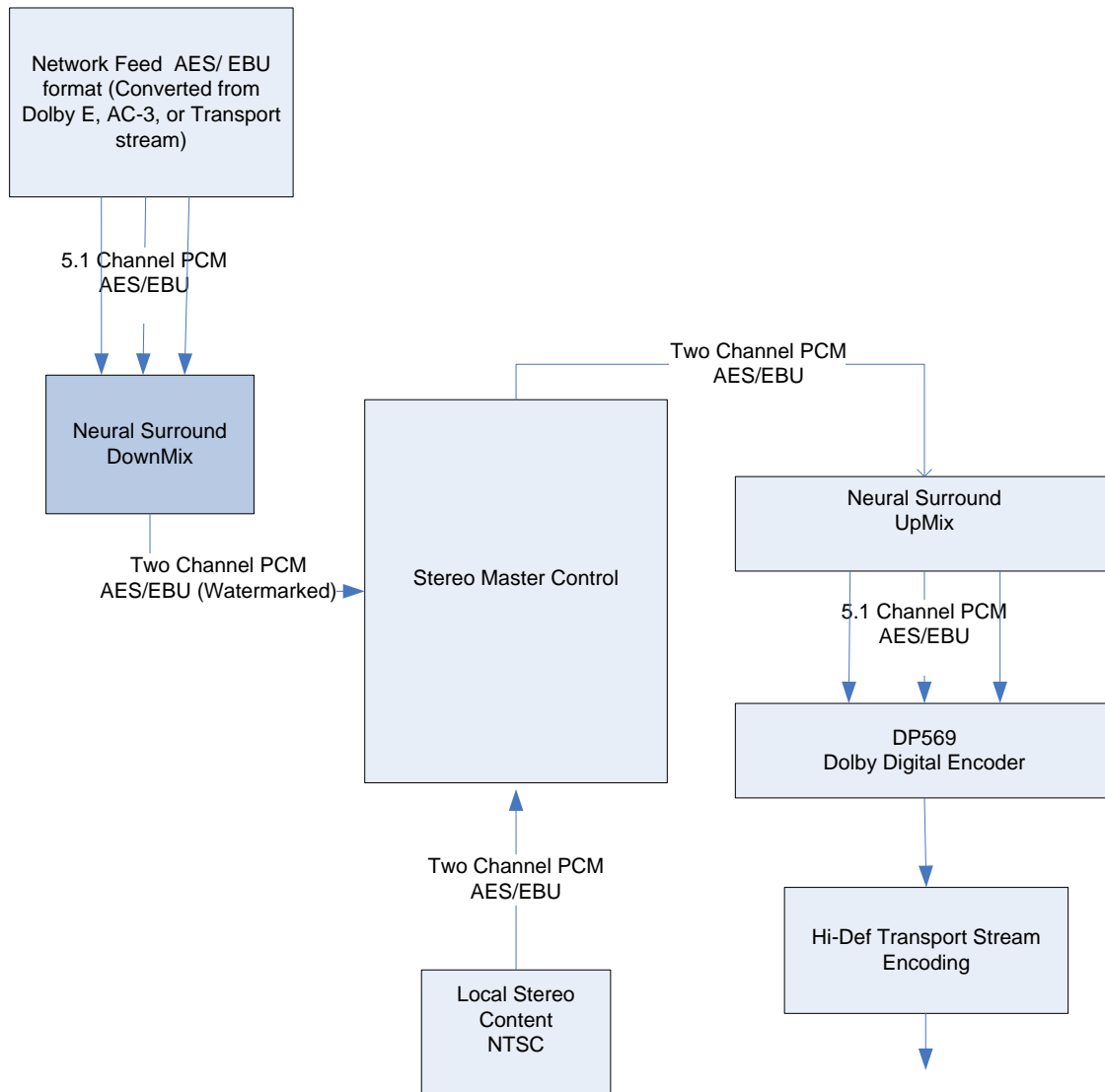


Figure 4. Neural-THX Surround DownMix used in a stereo television master control room facility

Technical Data

Setup

Make sure the DownMix is rack mounted and all audio cables are connected before powering up.

Metering

Multi-Channel (L,R,C,LFE,Ls,Rs)

Shows the level of the 5.1 Inputs. (BNC 1-3 or AES 1-6)

Stereo (L, R)

Shows the level of the stereo Outputs. (BNC 1 or AES 1&2).

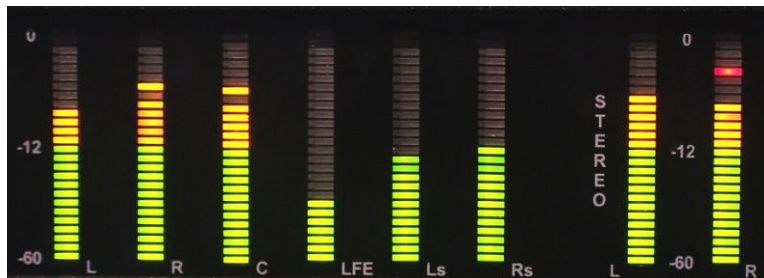


Figure 5. Metering display on the Neural-THX Surround DownMix

Menu

The menu allows navigation of various parameters by using the scroll wheel and Enter / Back buttons.



Figure 6. Menu first screen display on the Neural-THX Surround DownMix

Menu



Figure 7. Menu secondary screen display on the Neural-THX Surround DownMix

Settings



Figure 8. Settings menu display on the Neural-THX Surround DownMix

Below are the settings that can be controlled directly on the Neural-THX Surround DownMix:

1. Overload Protection: 6 (5.1) channels of audio can naturally represent more total energy than 2 (stereo) channels of audio. Because of this, content DownMixed from 5.1 to stereo will often have higher energy than any of the 5.1 channels individually. To prevent overload, basic Overload protection can be enabled to protect content from digital 0 clipping. This feature can be toggled on or off.
2. LFE Cutoff: Adjusts low-pass filter for summing LFE channel into DownMix (If set to PassThrough).
3. Sample Rate: Displays current sample rate (supports either 44.1k or 48k).
4. ClockSrc: Controls the source of the digital clock. When set to 'Ch 1', 'Ch 2', 'Ch 3', or 'Ch 4', sync is derived from the corresponding input. When set to 'External', sync is derived from the 'Sync' BNC input which accepts AES REF, or DARS.

Levels



Figure 9. Levels menu display on the Neural-THX Surround DownMix

1. Input L/R – Stereo Channels input level
2. Input C- Center channel input level
3. Input Ls/Rs- Surround channels input level
4. Input LFE- LFE channel input level
5. Input Aux L/R- Aux Stereo channels input level
6. Output L/ R – Stereo channels output level

About

About information used for diagnostics and future web control features.



Figure 10. About menu display on the Neural-THX Surround DownMix

Latency

The Neural-THX Surround DownMix latency is 65ms at 48k sampling rate.

I/O Configuration for BNC Output Systems

- Input
 - 1) Left / Right
 - 2) Center / LFE
 - 3) Left Surround / Right Surround
 - 4) N/A
- Output
 - 1) DownMixed Stereo Left / DownMixed Stereo Right
 - 2) N/A
 - 3) N/A
 - 4) N/A

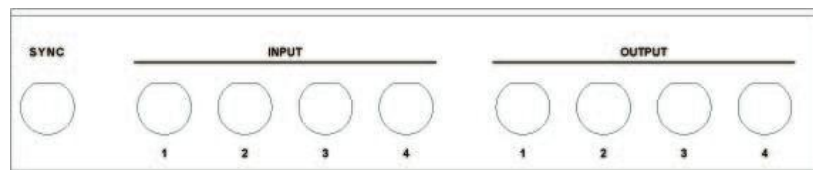


Figure 11. BNC I/Os on the Neural-THX Surround DownMix

I/O Configuration for D-Sub Pin Out Output Systems

The DownMix provides eight channels of I/O on a single female 25-pin D-sub connector. This connector is wired to the same pin-out as used by Yamaha for interfacing their AES digital devices. If you choose not to use the provided XLR breakout cable, the pin-out is as follows:

Table 1. DownMix (D-Sub version) Pin-Out

<i>1 In Hot</i>	<i>1-2</i>	<i>5 Out Hot</i>	<i>1-2</i>	<i>14 In Cold</i>	<i>1-2</i>	<i>18 Out Cold</i>	<i>1-2</i>
<i>2 In Hot</i>	<i>3-4</i>	<i>6 Out Hot</i>	<i>3-4</i>	<i>15 In Cold</i>	<i>3-4</i>	<i>19 Out Cold</i>	<i>3-4</i>
<i>3 In Hot</i>	<i>5-6</i>	<i>7 Out Hot</i>	<i>5-6</i>	<i>16 In Cold</i>	<i>5-6</i>	<i>19 Out Cold</i>	<i>3-4</i>
<i>4 In Hot</i>	<i>7-8</i>	<i>8 Out Hot</i>	<i>7-8</i>	<i>17 In Cold</i>	<i>7-8</i>	<i>21 Out Cold</i>	<i>7-8</i>

Pins 10, 12, 13, 22, 24, 25 are connected to ground.

Pins 9, 11, and 23 are not used.

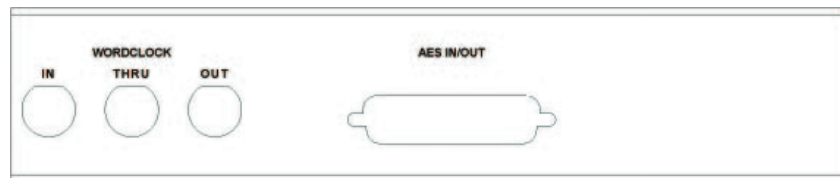


Figure 12. D-Sub I/O on the Neural-THX Surround DownMix

I/O Configuration for D-Sub Output Systems with XLR Breakout Cable

- Input
 - 1) 1&2: Left / Right
 - 2) 3&4: Center / LFE
 - 3) 5&6: Left Surround / Right Surround
 - 4) N/A
- Output
 - 1) 1&2: DownMixed Stereo Left / DownMixed Stereo Right
 - 2) N/A
 - 3) N/A
 - 4) N/A

Contact Information:

We're always interested in hearing from you. If you have a question or a suggestion for making our product better please contact:

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Contact information

More information can be obtained by contacting: Neural Audio 11410 NE 122nd Way Suite 100 Kirkland, WA 98034 (425-814-3200) www.neuralaudio.com weekdays between the hours of 9AM PST and 5PM PST excluding recognized holidays.