



neural audio™

Neural Loudness Control 5.1 Quick Start Guide



Introduction

Thank you for purchasing the Neural Loudness Control solution for 5.1 volume management. The Neural Loudness Control solution is a loudness leveling device which uses advanced psychoacoustic and signal processing techniques to accurately detect and regulate the perceived loudness of stereo and 5.1 sources, something that can't be accomplished with traditional energy-based volume management solutions.

With consideration of many prior loudness evaluation methods such as Leq(A), Leq (RLB), Zwicker / Fastl, or PPM, Neural Loudness Control incorporates the best of all worlds in this unique product to provide the most accurate real-time loudness control to date. By placing Neural Loudness Control in line with your program signal, rest assured your audio levels will be regulated without sounding 'squished' or compressed.

Input/Output

The Neural Loudness Control hardware comes in two I/O flavors: balanced 110 ohm AES/EBU through a D-Sub connection, and unbalanced 75 ohm BNC connectors. The input/output channel configurations for either hardware type are:

<i>Channel</i>	<i>Input/Output</i>
Left (stereo)	AES 1
Right (stereo)	AES 1
Center	AES 2
LFE	AES 2
Left Surr	AES 3
Right Surr	AES 3

Settings

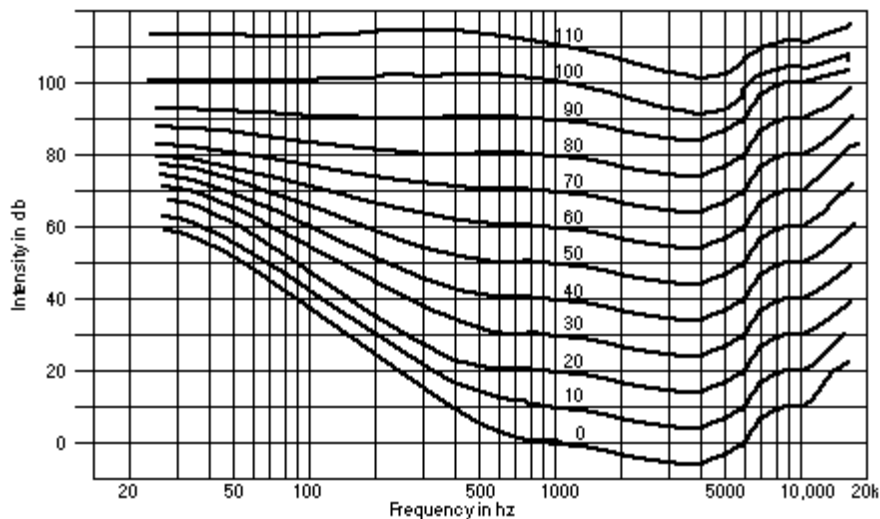
Below is a list of all of the process parameters available under the *General* menu:

Operation

The Volume Loudness Control box will be fully functioning when the operation parameter is set to In-Line. The processing of the box can be bypassed by setting the operation parameter to Bypass.

Freq Comp

Frequency Compensation. Loudness studies dating back to Fletcher /Munson in the 1930s have found that the human ear is more sensitive to different frequencies at different loudness levels. Frequency Compensation accounts for these differences by preserving the same perceptual frequency balance as the input signal while correcting the loudness to match a desired Target.



E.g. With Frequency Compensation enabled at a medium level, signals that fall below the Target level have more gain added to middle frequencies than higher or lower frequencies to preserve the original spectral balance. Conversely, signals that fall above the Target level will have middle frequencies attenuated more than higher or lower frequencies. Conveniently because Frequency Compensation applies less gain to high and low frequencies, high or low frequency *noise* does not become over-emphasized as in similar volume products.

Typical setting: Medium

Delay

The Neural Loudness Control solution has a latency of 64 msec. Further audio delay can be achieved by setting the delay parameter if desired.

Clk Src

Clock Source allows the DSP clock to be derived from any input including the external Sync BNC input which accepts AES Ref, or DARS. All inputs must reference the same clock source.

Below is a list of all of the process parameters available under the *Loudness* menu:

Target Level

The target perceived loudness level in dBFS. Typically this would be set similarly to the Dial Norm/Dialog Level setting as found in an AC-3/Dolby E stream.

Typical settings: -31 dBFS to -23 dBFS, depending on Dial Norm settings

Ratio

The ratio parameter controls the amount of gain or attenuation that is applied when loudness differences are measured. For example:

E.g. A setting of 1.00 indicates that for every dB of loudness difference measured between the input signal and the target level, 1 dB of gain or attenuation will be applied.

E.g. A setting of 0.50 indicates that for every dB of loudness difference measured between the input signal and the target level, 0.5 dB of gain or attenuation will be applied.

Upper Thresh

The Upper Threshold parameter represents the allowable distance above the Target Level the input signal can range before attenuation. If an input signal falls between the Upper Thresh and the Lower Thresh in reference to the Target Level, no correction will be applied. For example:

E.g. A setting of +4 dB indicates that audio content can range 4 dB above the Target Level before attenuation is applied. Content arriving louder than 4 dB above the Target will be appropriately attenuated.

-27 dBFS (Target) + 4 dBFS (Upper Thresh) = -23 dBFS (Upper Thresh Value)

E.g. A setting of 0 dB indicates that attenuation will be applied to any input signal exceeding the Target Level.

Lower Thresh

The Lower Threshold parameter represents the distance below the Target Level the input signal can range before gain is applied. If an input signal falls between the Upper Thresh and the Lower Thresh in reference to the Target Level, no correction will be applied. For example:

E.g. A setting of -5 dB indicates that audio content can range 5 dB below the target level before gain is applied. Content arriving quieter than 5 dB below the Target will be appropriately raised.

-27 dBFS (Target) + -5 dBFS (Lower Thresh) = -32 dBFS (Lower Thresh Value)

E.g. A setting of 0 indicates that gain will be applied to any input signal falling below the Target Level.

Freeze Window

The Freeze Window parameter sets the size of a window in dB where small loudness differences that fall within this window are deemed allowable. When loudness differences fall outside of this allowable window then appropriate gain or attenuation is applied to control loudness. The Freeze Window parameter can be effectively used to limit the amount of small range gain variability. For example:

E.g. A window setting of 4 dB indicates that when the loudness level is measuring within ± 2 dB of the target level that no further correction is required. When the loudness level becomes further than ± 2 dB from the target level then appropriate gain or attenuation is applied.

Typical settings: 2 dB to 4 dB

Noise Floor

The Noise Floor parameter controls the noise floor level. Input signals below the threshold are considered too low and are not managed by the loudness processing to avoid bringing up the noise level. Input signals above the Noise Floor are considered valid and are managed by the loudness processing.

Typical settings: -60 dBFS to -35 dBFS

Attack Time

The Attack Time parameter controls how quickly the processing will respond to sharp onsets in loudness level.

Note: A compressor is present after the attack time processing to catch any short-term loudness peaks which may pass through.

Typical settings: 20 msec to 80 msec

Release Time

The release time parameter controls how quickly the processing will respond to sharp drops in loudness level.

Typical settings: 100 msec to 200 msec

Below is a list of all of the process parameters available under the *Compressor* menu:

Compressor Thresh

A compressor is present to catch any short-term loudness peaks which aren't fully captured by the attack time processing. The compressor threshold parameter is set as the allowable short-term peak above the target level.

Typical settings: 2 dB to 8 dB

Compressor Ratio

The compressor ratio parameter controls the amount of attenuation that is applied when short-term peaks exceed the compressor threshold. See the Ratio parameter for further detail.

Typical settings: 0.40 to 0.80

Final Limiter Thresh

A final limiter is present to control the absolute waveform peak level. This parameter controls the output peak level in dBFS.

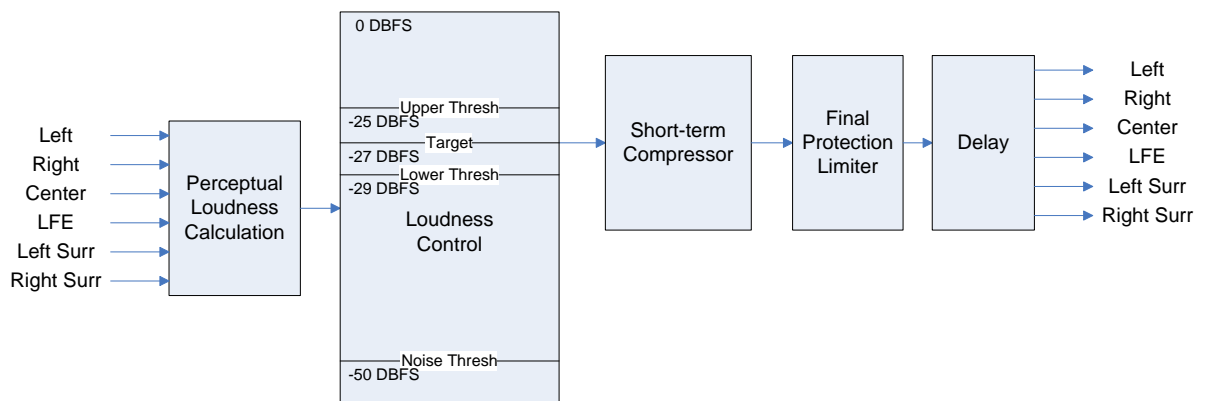
Typical settings: -10 dBFS to 0dBFS

Delay

The Neural Loudness Control solution has a latency of 64 msec.

Further audio delay can be achieved by setting the delay parameter if desired.

Signal Flow



Meters

The Neural Loudness Control solution offers a number of interesting and meaningful metering options under the *Meters* menu.

The LED ladder peak level meters to the left of the user screen can be configured to display input or output levels. By toggling the *Input* or *Output* parameter, the front-panel LED meter bars can display the Input or Output signal.

Loudness

The loudness meter displays the current perceptual loudness level being measured by the Volume Management process.

Peak

The peak meter displays the current short-term peak level being measured by the Volume Management process.

Correction

The correction meter displays the current gain or attenuation that is being applied by the Volume Management process.

Presets

The following is a list of factory presets. These presets were designed as starting points as you become comfortable with NLC. We recommend you start with one of these presets, then tailor it to your preferences. Once you have NLC set to your likings, save your settings to a new preset name.

Naming convention: Target Level + Nature of Processing + (with/ Dead-band)

**Dead-band refers to an area of the Loudness scale that is unaffected by NLC. This area is defined by the Target, Upper Thresh and Lower Thresh settings.

Factory Presets:

Mild - The Mild presets are designed for very subtle loudness correction over longer periods of time. They characteristically have lower Loudness Correction Ratios and slower Attack and Release times. The secondary Compressor is set further away from the Target as to allow more transients. The goal of these presets are to fine-tune long-term loudness levels while preserving a majority of the original signal's dynamic range.

**Preset name=-31 MILD or
Preset name=-27 MILD or
Preset name=-23 MILD**

Input L/R=0.0
Input C=0.0

**Preset name=-31 MILD w/DB or
Preset name=-27 MILD w/DB or
Preset name=-23 MILD w/DB**

Input L/R=0.0
Input C=0.0

Input Ls/Rs=0.0 Input LFE=0.0 Output L/R=0.0 Output C=0.0 Output Ls/Rs=0.0 Output DownMix L/R=0.0 Output LFE=0.0 Operation=InLine Target=-31.0 Ratio=0.650000 Upper Thresh=0.0 Lower Thresh=0.0 Freeze Window=2.0 Noise Floor=-50.0 Attack Time=30.0 Release Time=120.0 Compressor Thresh=5.0 Compressor Ratio=0.400000 Final Limiter Thresh=-1.0 Freq Compensation=Medium Delay=64.0 Meters=Output	Input Ls/Rs=0.0 Input LFE=0.0 Output L/R=0.0 Output C=0.0 Output Ls/Rs=0.0 Output DownMix L/R=0.0 Output LFE=0.0 Operation=InLine Target=-31.0 Ratio=0.650000 Upper Thresh=3.0 Lower Thresh=-3.0 Freeze Window=2.0 Noise Floor=-50.0 Attack Time=30.0 Release Time=120.0 Compressor Thresh=5.0 Compressor Ratio=0.400000 Final Limiter Thresh=-1.0 Freq Compensation=Medium Delay=64.0 Meters=Output
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Medium – Medium presets have higher Ratios but slower release times. This allows for full correction to be applied but overcomes a 'nervous' or 'jumpy' sound of fast processing. The secondary Compressor is set further away from the Target as to allow more transients. The goal of these presets are to achieve a consistent output while preserving some of the original dynamics of the input signal.

Preset name=-31 Medium or Preset name=-27 Medium or Preset name=-23 Medium Input L/R=0.0 Input C=0.0 Input Ls/Rs=0.0 Input LFE=0.0 Output L/R=0.0 Output C=0.0 Output Ls/Rs=0.0 Output DownMix L/R=0.0 Output LFE=0.0 Operation=InLine Target=-31.0 Ratio=0.950000 Upper Thresh=0.0 Lower Thresh=0.0 Freeze Window=1.0 Noise Floor=-50.0 Attack Time=20.0 Release Time=120.0 Compressor Thresh=5.0 Compressor Ratio=0.400000 Final Limiter Thresh=-1.0 Freq Compensation=Medium Delay=64.0 Meters=Output	Preset name=-31 Medium w/DB or Preset name=-27 Medium w/DB or Preset name=-23 Medium w/DB Input L/R=0.0 Input C=0.0 Input Ls/Rs=0.0 Input LFE=0.0 Output L/R=0.0 Output C=0.0 Output Ls/Rs=0.0 Output DownMix L/R=0.0 Output LFE=0.0 Operation=InLine Target=-31.0 Ratio=0.950000 Upper Thresh=3.0 Lower Thresh=-3.0 Freeze Window=1.0 Noise Floor=-50.0 Attack Time=20.0 Release Time=120.0 Compressor Thresh=5.0 Compressor Ratio=0.400000 Final Limiter Thresh=-1.0 Freq Compensation=Medium Delay=64.0 Meters=Output
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Aggressive – Aggressive presets have 1:1 Ratios and short Attack / Release times. The

secondary Compressor is set close to the target to reduce transients. Frequency compensation has been turned off to allow equal spectral gain to be applied to the lowest of input signals. The goal of these presets are to achieve very consistent outputs with limited dynamic range.

**Preset name=-31 AGGRESSIVE or
Preset name=-27 AGGRESSIVE or
Preset name=-23 AGGRESSIVE**

Input L/R=0.0
Input C=0.0
Input Ls/Rs=0.0
Input LFE=0.0
Output L/R=0.0
Output C=0.0
Output Ls/Rs=0.0
Output DownMix L/R=0.0
Output LFE=0.0
Operation=InLine
Target=-31.0
Ratio=1.0
Upper Thresh=0.0
Lower Thresh=0.0
Freeze Window=2.0
Noise Floor=-50.0
Attack Time=5.0
Release Time=60.0
Compressor Thresh=2.0
Compressor Ratio=1.0
Final Limiter Thresh=-1.0
Freq Compensation=Off
Delay=64.0
Meters=Output

**Preset name=-31 AGGRESSIVE w/DB or
Preset name=-27 AGGRESSIVE w/DB or
Preset name=-23 AGGRESSIVE w/DB**

Input L/R=0.0
Input C=0.0
Input Ls/Rs=0.0
Input LFE=0.0
Output L/R=0.0
Output C=0.0
Output Ls/Rs=0.0
Output DownMix L/R=0.0
Output LFE=0.0
Operation=InLine
Target=-31.0
Ratio=1.0
Upper Thresh=3.0
Lower Thresh=-3.0
Freeze Window=2.0
Noise Floor=-50.0
Attack Time=5.0
Release Time=60.0
Compressor Thresh=2.0
Compressor Ratio=1.0
Final Limiter Thresh=-1.0
Freq Compensation=Off
Delay=64.0
Meters=Output

Contact Info

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

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