MultiMonitor

Multiple Stream Audio Monitoring Solution

v1.2

NUGEN Audio

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Introduction

The NUGEN Audio MultiMonitor is a stand-alone application designed for monitoring the loudness of multiple audio streams in real time in multiple configurations. Up to 96 audio channels may be simultaneously monitored on up to 16 individual meters, in mono, stereo and 5.1 configurations.

The metering system is fully compliant with the ITU-R BS.1770/1771 metering standard, CALM Act legislation, EBU R128, ATSC A/85 and several other region specific loudness standards.

Each meter offers Integrated Program, Short-term and Momentary loudness; LRA and correlation; along side individual audio channel True-Peak metering and TPmax read outs. Alerts may also be configured.

Each meter may be configured to individual specifications, configured in groups or set globally.

Main Interface

The main MultiMonitor interface is divided into three sections, which allow rapid configuration of up to 16 individual loudness meters and the saving/recall of specific set-ups.

1. **Menu Bar.** Contains the file menu for saving/loading configurations and the Settings menu for global audio input/start up options etc.

2. **Utility Bar.** Undo/redo controls and global reset. The NUGEN Audio logo can also be clicked to show the version dialog, licensing details, access this manual and credits dialog.

3. **Metering Zone.** This area shows up to 16 individually configurable meters.

1. Menu Bar

File Menu

The file menu contains options for saving and loading MultiMonitor configurations as a .nmm file (NUGEN Audio MultiMonitor configuration file).

Save　　　　Save current configuration
Save As　　　Save current configuration with option to edit file name
Load　　　　Load saved configuration file
Quit　　　　Quit MultiMonitor and return to OS environment

Settings Menu

The settings menu contains global initialisation options for configuring initial load behaviour and audio input.

Change audio device settings　　Opens Audio Settings dialog

The stand-alone application is designed to monitor the available Audio Input/s.

Please note: Within Windows and OSX, there is no option to route the *Audio Output* directly into a secondary application, however, depending upon the driver, it may be possible to soft-thru the audio back out to the audio interface output.

Audio device type　　Choose from installed audio driver types. MultiMonitor supports ASIO, Windows Audio, Direct Sound and Core Audio for OSX.

Device　　Select from installed drivers in the above category.

Active Output Channels　　Check to activate/deactivate desired I/O
Active Input Channels

Sample Rate　　Sets the sample rate for selected audio device

Audio Buffer Size　　Sets the audio buffer size for the selected audio device.

Open on System Startup　　Causes MultiMonitor to open automatically as part of initialisation of the operating system. Toggle checked/unchecked

About...　　Opens the 'About' screen.

Credits and Options　　Opens credit screen & de-authorisation option

Open Manual　　Opens manual if installed in default directory

2. Utility Bar

Reset   Global reset of all loudness parameters including true-peak
                         and true-peak hold levels

Undo   Session undo (previous 30, 000 events stored)

Redo   Session redo

**'NUGEN Audio'**   Click to open 'About' screen (see above)

3. Metering Zone

This area is where the metering is displayed. Up to 16 individual meters may be displayed accessing up to 96 individual audio inputs.

Upon initialization, there are no meters present in the metering zone. Meters are assigned to sequential audio inputs and are added sequentially from left to right, row by row.

To add a new meter, click the Assign button and choose a configuration (mono, stereo, LCR, 5.0 or 5.1). A new meter will be added and automatically assigned input channels.

The new meter will be created using the settings of the last meter assigned. This may then be edited using the meter options dialog box (see below).
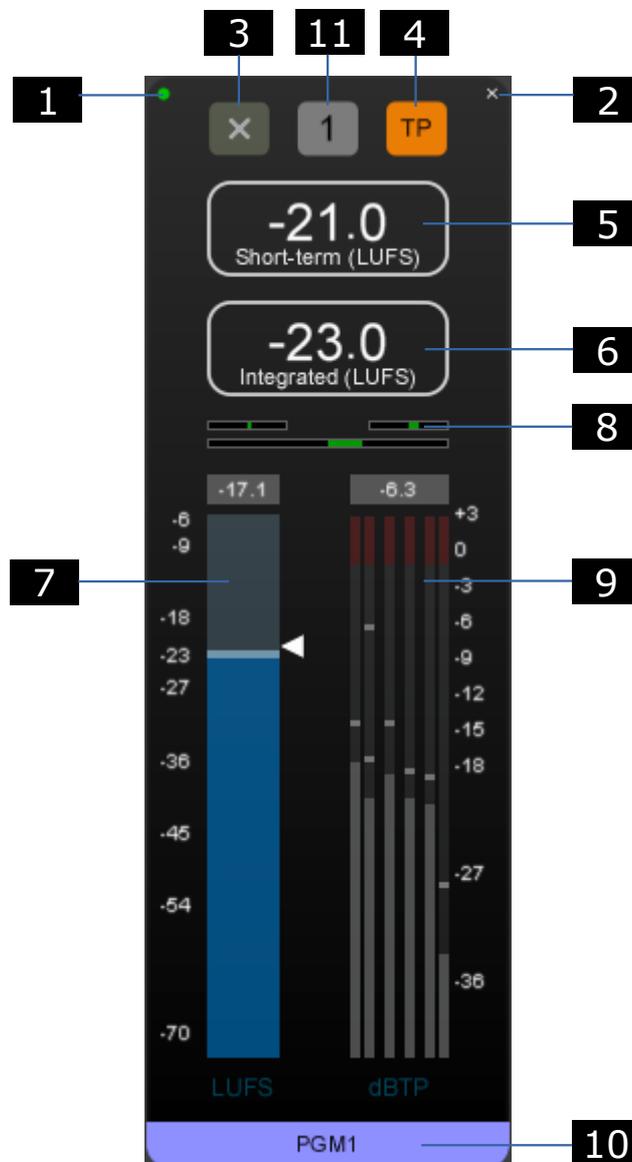
1. **Activate/Deactivate meter.** Click to toggle meter on/off.

2. **Remove last meter.** The last meter to be added can be removed by clicking the 'x'. To restore a deleted meter use the Undo facility on the utility bar.

3. **Reset meter.** Clicking this button resets all the values in this meter, including peak-hold and maximum level read-outs.

4. **True Peak On/off.** Toggles the True-peak read-out on/off for individual meters.

5. **Short-term (S) loudness.** Displays the Short-term loudness value as defined in ITU-R BS. 1770. This value is also indicated on the momentary meter using the white arrow marker.

6. **Integrated Program Loudness (I).** This value displays integrated loudness using gating as described in ITU-R BS.1770.

7. **Momentary Loudness (M) meter.** Shows the level of the current audio input in Loudness Units (LU/LUFS) as defined by ITU-R BS.1770 for momentary loudness. Various colour splits can be established using the parameters available in the Loudness Meter options panel. The short-term loudness value is also indicated on this meter as a white arrow marker and the maximum momentary value reached is indicated numerically at the top of the meter.

8. **Correlation meter.** Shows the correlation between LC (top left), LR (middle/mid-bottom), RC (top right) for the channels that are set for the current strip. Correlation is measured from less correlated in red, to more correlated in green. Alerts are available for this meter.

9. **True Peak (TP) Meter.** Shows true-peak audio levels on available input channels from single (mono) input, through to 5.1 surround. A permanent peak hold bar marks the highest level achieved. Click the meter to reset.

10. **Meter Name.** Click to edit.

11. **Meter options panel.** Click to open up the detailed meter settings panel.

Meter Options

The meter options panel allows for in-depth configuration of the various meter parameters. It is possible configure the meter in a number of different ways to suit the intended application.

The meter options panel can also be used to transfer setting from one meter to another, to a group or to all other meters for rapid re-configuration of previously assigned meters.

The options panel is organized with several tabs, grouping similar functionality together for convenience. Making changes to the settings on some tabs will require the changes to be applied or canceled before it is possible to move to a different tab.

Global Settings

Global settings affect all meters simultaneously, configuring the general look and feel of the meters.
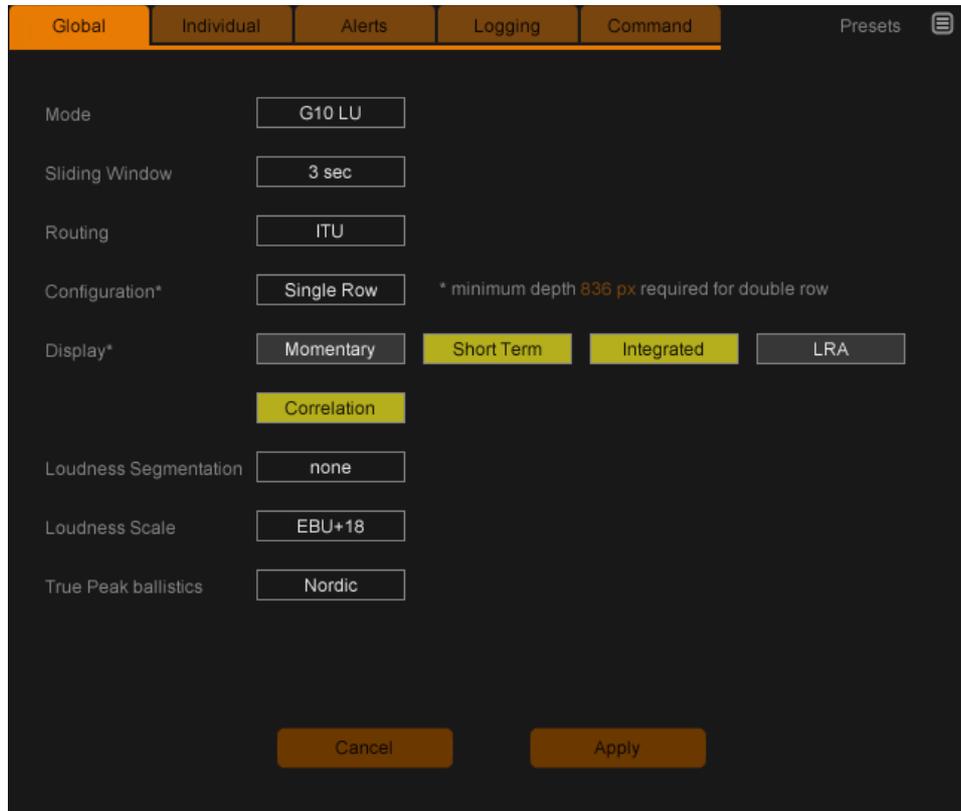
Mode
This setting defines the underlying mode of operation for the Loudness Meter. Different standards and recommendations define slightly differing algorithms. The mode selector can be used to determine which the Loudness Meter uses to calculate the loudness value.

Sliding window
This value is usually set to 3 seconds, as defined by most standards, however there are recommendations which choose a different value, which can be set here if required.

Routing (global)
This control (Click and drag up and down to change settings) determines the routing for multi-channel audio up-to 5.1

It is important to choose the correct routing, as the Loudness Meter Measurement weights individual channels differently.

There are three routings available:

DTS: L R Ls Rs C LFE

ITU: L R C LFE Ls Rs

Film: L C R Ls Rs LFE

Configuration   Determines whether MultiMonitor will attempt to show the meters side by side in a single row or in two rows (potentially facilitating all 16 meters on view simultaneously). If there is not enough vertical space to present two rows of meters, a single row will be shown irrespective of this setting.

Display   These buttons can be used to switch on/off the numeric displays for the various loudness parameters.

Loudness Segmentation   Determines the number of loudness units represented by each segment of the momentary loudness meter.

Loudness Scale   Choose from defined scales EBU +9, EBU +18 and ITU-R BS.1170

True Peak Ballistics   Sets meter ballistics to recognised standards. The update rate and time window is as defined in EBU R128, this parameter determines the decay time only.

Individual Settings

Individual settings are applied to meters individually (or in groups) and can be used to transfer the settings from one meter to another.
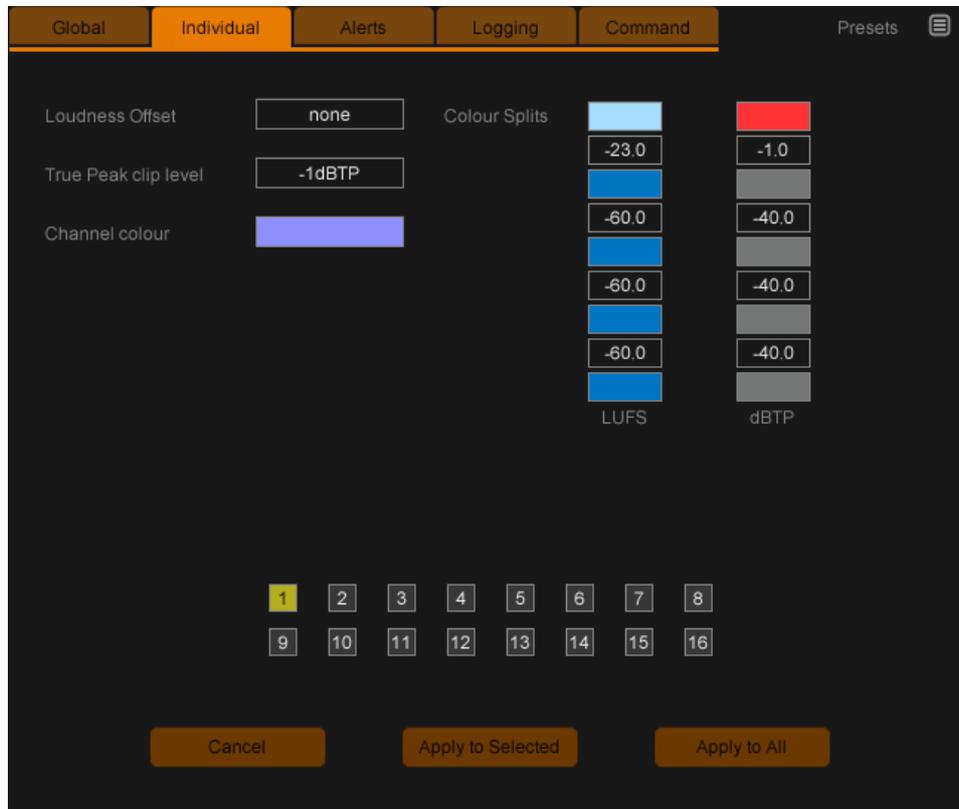
| **Loudness Offset**	This value allows for absolute scale mapping (Full Scale) or mapping of the zero point to some other value, such as target loudness (as in BS. 1771). The EBU target loudness is defined as −23 LUFS = 0 LU, ATSC gives − 24 LKFS = 0 LK, although other values can be defined.
True Peak clip level	Sets the value at which the true-peak overload indicator lights.
Channel Colour	Determines the colour of the meter flash behind the meter name.

Alerts

Alerts can be set to give a warning if Short-term, silence or correlation fall outside a given value for a specified length of time.
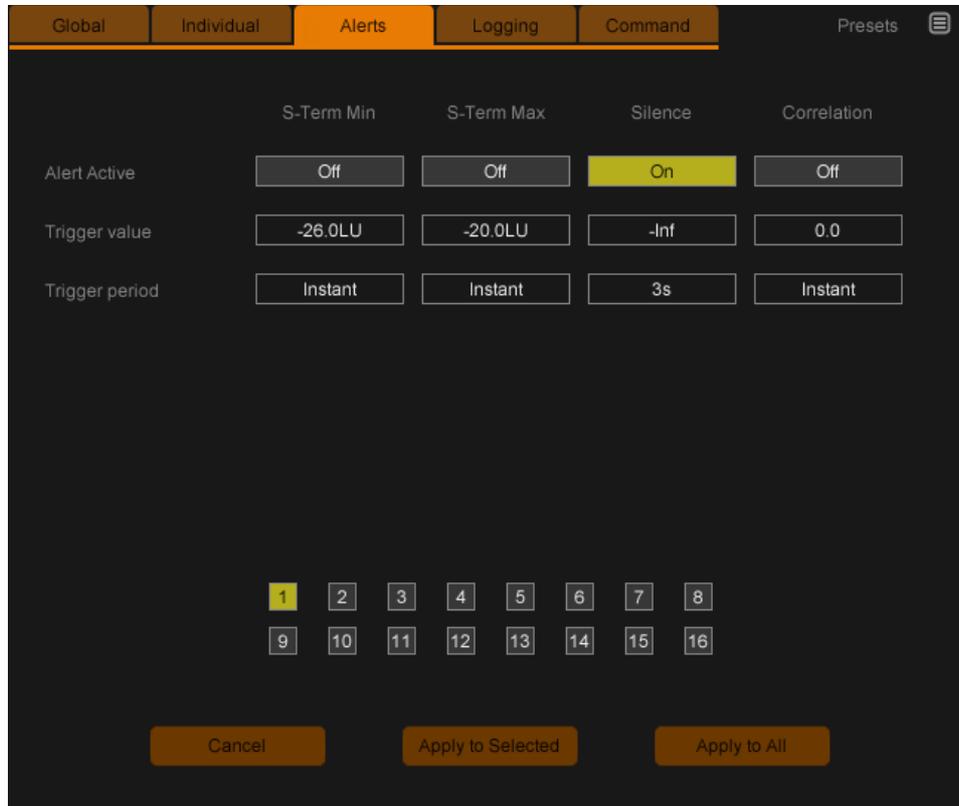
Short-term (Min and Max)

Either maximum and or minimum values can be set using the Max/Min buttons. Activation of the functionality is achieved by using the On/Off control. The alert value is is defined in the 'alert' box, and the 'period' control determines how long the short-term loudness can fall beyond this value before an alert is given. The value given by the short-term loudness output on the loudness meter will change colour to indicate an alert has been triggered. Click the short-term loudness value to reset the alerts.

Silence

If this alert is turned on using the On/Off control then the level of input will be measured. If the input falls below the specified level then an alert will be indicated as a flashing orange segment at the bottom of the True-peak meters. If the value of trigger value is set to '-inf' then an alert will only be indicated if the input is 0 for at least the length of time set in the trigger period setting.

Correlation

As above, if the meter reads less than the value specified for an alert, then the alert will show by highlighting the correlation meter with an orange border.

Logging

MultiMonitor is capable of logging all loudness parameters to a constantly updated text file at the frequency determined on the logging tab.

Individual parameters to be logged are selected using the log toggle buttons and logging is activated for each meter individually.

Command

It is possible to reset the MultiMonitor loudness meters using serial and TCP data. This functionality is defined on the Command tab of the settings panel.

The serial reset functionality assumes that a DLP-IO8 device is attached to a USB port on the computer, and that a reset button is correctly configured to drive pin 8 high when a reset is required. You can choose which serial port is used from the list. The TCP reset functionality is accessed by connecting to MultiMonitor via a TCP connection. By default, port 23 is used but this can be configured in the options. Commands are accepted as a single string of ASCII characters terminated by a carriage-return, line-feed combination. All commands result in a single-line response that is also terminated by a carriage-return, line-feed pair.

The available commands are:

RESET   Resets all channels
      Returns OK:<CR-LF>
RESETnn   Resets channel nn (where nn ranges from 01 to 16)
      Returns the readings of the specific channel prior to reset in the following format:
      OK:CHAN=nn,INT=iii.i,LRA=lll.l<CR-LF>
READnn   Read the current values from nn (where nn ranges from 01 to 16)
      Returns the reading in the same format as RESETnn but doesn't reset the values

If there was an error, the return string will be of the format ERR:Error description<CR-LF>

To test from a Windows machine, open a DOS box and type: telnet <hostname>
Where <hostname> is the name of the computer on which MultiMonitor is running. Depending on which version of Windows you have installed, telnet may not be present by default. It is an optional feature that can be added through the control panel.

Calibration

Where external audio paths are used to transfer audio to the host machine, it can be useful to check that the signal path is transmitting the data without accidental filtering or attenuation (using a digital connection is recommended to reduce/eliminate these potential complications).

Both the ITU and EBU provide test tone specifications for checking meter compliance, calibration and set-up and these are listed below.

ITU-R BS. 1770/1 Test Tone
If a 0 dB FS 1 kHz sine wave is input to the left, centre, or right channel input, the indicated loudness will equal −3.01 LKFS

EBU Tech Doc 3341 (EBU R128 meter)		
Test Case	Test signal	Expected response and accepted tolerances
1	Stereo sine wave, 1000 Hz, -23.0 dBFS (per-channel peak level); signal applied in phase to both channels simultaneous; 20 s duration	M, S, I = -23.0 ±0.1 LUFS M, S, I = 0.0 ±0.1 LU
2	As #1 at -33.0 dBFS	M, S, I = -33.0 ±0.1 LUFS M, S, I = -10.0 ±0.1 LU
3	As #1, preceded by 20 s of -40 dBFS stereo sine wave, and followed by 20 s of -40 dBFS stereo sine wave	I = -23.0 ±0.1 LUFS I = 0.0 ±0.1 LU
4	As #3, preceded by 20 s of -75 dBFS stereo sine wave, and followed by 20 s of -75 dBFS stereo sine wave	I = -23.0 ±0.1 LUFS I = 0.0 ±0.1 LU
5	As #3, but with the levels of the 3 tones at -26 dBFS, -20 dBFS and -26 dBFS, respectively	I = -23.0 ±0.1 LUFS I = 0.0 ±0.1 LU
6	5.0 channel sine wave, 1000 Hz, 20 s duration, with per-channel peak levels as follows: -28.0 dBFS in L and R −24.0 dBFS in C -30.0 dBFS in Ls and Rs	I = -23.0 ±0.1 LUFS I = 0.0 ±0.1 LU

Reporting a problem

If you encounter a problem with any of NUGEN Audio's products, please let us know.

Email NUGEN Audio at support@nugenaudio.com giving a clear explanation of the problem. Please state how frequently you've experienced the problem. If there are any particular steps you need to go through to see the problem, detail these and give details of the Plug-in Host you are using, including version number (e.g.- Pro Tools 10.0.1), your operating system and the rough specs for your machine (e.g.- CPU speed, RAM).

Please be patient with any problems you may experience, particularly with products at a beta stage of release. At NUGEN Audio we take problems with our software seriously and will endeavour to correct them as quickly as possible.

Version History

1.0   Initial release

1.1   Options panel updated to include
　　　　　- Parameter grouping into tabs
　　　　　- Reset via TCP command
　　　　　- Individual meter text logs
　　　　　- Double/single meter rows
　　　　　- LRA parameter read out

1.2   Addition of correlation meters for each strip
　　　　Alerts and logging for correlation
　　　　Silence detection with alerts and logging
　　　　Silence and correlation network output
　　　　GUI updates and fixes
　　　　General bugs and fixes