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TUTORIAL

Loudness Tutorial for Videotek® TVM/VTM Test Instruments

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Loudness Terms

Loudness or Short-Term Loudness: Loudness value integrated over a fixed interval. Integration interval is defined according to ATSC A/85 or EBU R 128 standards. A custom interval is also selectable. Integration intervals are 10 seconds (default) for ATSC A/85, 3 seconds fixed for EBU R 128, and adjustable from 1 to 60 seconds for custom and ATSC A/85 modes.

Momentary Loudness: Loudness value integrated over 400 milliseconds.

Program Loudness: Integrated loudness for user-defined time interval. Program loudness is usually used to define the loudness for a program segment (for example, a 30-second commercial). Program loudness integration time is generally from a reset of the loudness display until the display is paused.

Loudness Range: The program loudness range over the measurement period, measured in LU (Loudness Units).

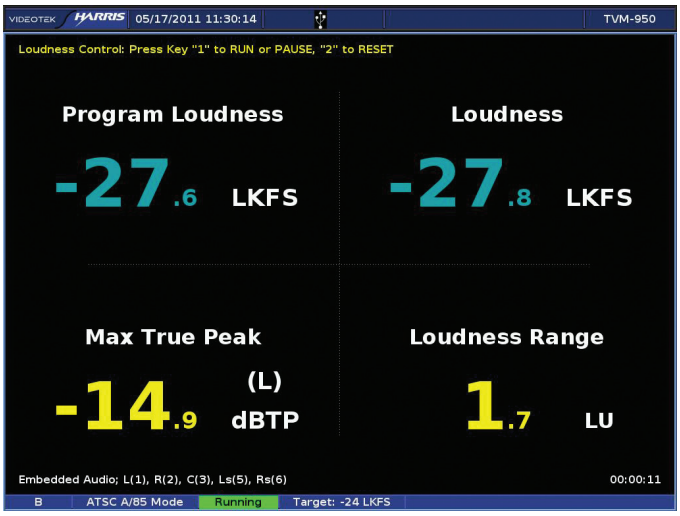
Max TP (dBTP): The maximum true peak value detected across either the 5.1 or Aux channels

LKFS: Loudness, K weighted, relative to nominal full scale. The LKFS unit is equivalent to a decibel, in that an increase in the level of a signal by 1 dB will cause the loudness reading to increase by 1 LKFS. If a 0 dB, full-scale 1 kHz sine wave is input applied to the left, center, or right channel input, the indicated loudness will equal -3.01 LKFS. The weighting coefficients are different for each channel.

LU: Loudness Unit. The loudness unit is the scale unit of the loudness meter. The value of the program in loudness units represents the loss or gain (dB) that is required to bring the program to 0 LU; e.g., a program that reads -10 LU will require 10 dB of gain to bring that program up to a reading of 0 LU. (From BS.1771). Zero LU indicates when a signal has reached the target loudness level (e.g., -24 LKFS).

Loudness Displays

Numeric Display

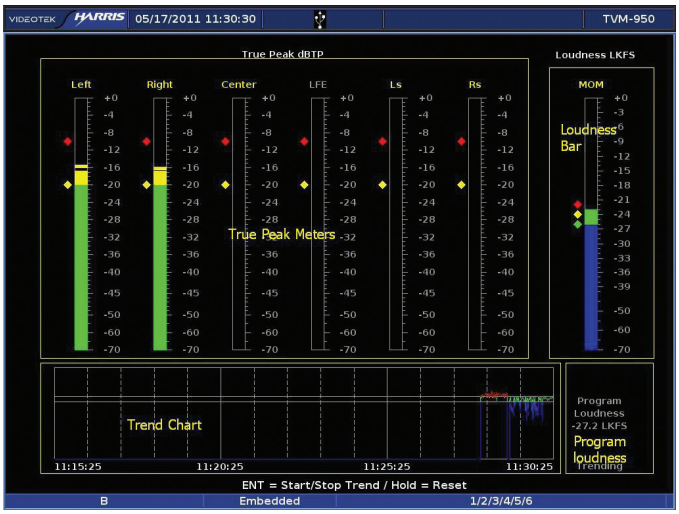


The numeric loudness display is enabled when loudness is selected in the audio setup menus. If the audio pane is selected, then pressing the Audio button will toggle between the loudness bar display and the loudness numeric display. The numeric loudness display and the loudness bar display can be visible at the same time by selecting a non-audio pane and pressing the Audio button.

The numeric loudness display can be paused and reset using the "1" (run/pause) and "2" (reset) buttons in the preset button group. The status line of display will show "Running" (green highlight) or "Paused" (yellow highlight) to indicate the status of program loudness calculations. When the display is paused, Program(me) loudness, Max True Peak and Loudness Range readouts are frozen. The loudness value is not frozen when the display is paused.

Program loudness, Max True Peak and Loudness Range provide indications of the signal over a period defined from last reset of the display until it is paused.

Bar Display



The loudness bar display has four distinct sections: true peak meters, loudness bar, trend chart and program loudness value.

The true peak meters show the input audio signal with a true peak ballistic and units of dBTP.

The loudness bar displays loudness in units of LKFS or LU. Loudness data can be displayed as momentary loudness (MOM) or short-term loudness (STL), as selected in the setup menu.

The trend chart plots short-term loudness values. Colors plotted on the trend chart correspond to the colors of the loudness bar. There are two horizontal lines that indicate the range of loudness above and below the target loudness value. Loudness values will be plotted blue if below the range, green if within the range, and red if above the range.

The program loudness value is derived from the numeric loudness display. Note: This value is reset by resetting the numeric loudness display and not by clearing the trend chart.

Loudness Modes and Parameters

There are three loudness modes available for calculating the loudness values: ATSC A/85, EBU R 128 and Custom. The ATSC A/85 mode sets the default values to ATSC A/85-recommended values. The ATSC A/85 parameter values are adjustable in the setup menus. The EBU R 128 mode sets the default values to values defined by the EBU standard and are not user adjustable. The Custom mode allows the user to define all measurement parameters.

Loudness parameters that can be adjusted are as follows: Program Relative Gating enable and value; Short-Term Integration Time; Max Hold Time for meters; Range Gating enable and value; Target Loudness Value and Range; and Absolute Gating value.

When enabled, Program Relative Gating uses the gate value to determine when loudness values are used in the program loudness calculation. If loudness values fall below the gate threshold, the program loudness calculations will stop. Once the loudness values are above the gate threshold, loudness calculations will resume. Program gating is disabled by default for ATSC A/85 mode and enabled with a gating value of -8 for EBU R 128 (fixed) and Custom (variable) modes.

Short-term Integration Time sets the integration time for short-term loudness displays. Default values are 10 seconds (variable) for ATSC A/85, 3 seconds (fixed) for EBU R 128, and 3 seconds (variable) for Custom mode.

Max Hold Time sets the amount of time that the peak hold indicators on the meter bars display the peak value. Time is adjustable from 1 to 60 seconds or infinite. The default value is infinite in all modes.

When enabled, Range Gating controls the calculation of loudness range. Range gating is enabled by default for all modes with a default of -20 fixed (ATSC A/85, EBU R 128) or -20 variable (Custom).

Target Loudness Value and Range set the target value for the loudness measurement. The range sets the upper and lower alarm thresholds for the loudness alarm. The default target values for loudness are -24 LKFS variable (ATSC A/85), -23 LKFS fixed (EBU R 128) and -23 LKFS variable (Custom). Upper and lower thresholds are 2 LU for ATSC A/85 and 1 LU for EBU R 128 and Custom modes. Upper and lower thresholds can be adjusted in all loudness modes.

Absolute Gating is always enabled for all loudness modes. Gating threshold default value is -70 LKFS variable (ATSC A/85, Custom) and -70 LKFS fixed for EBU mode. Program loudness calculations will stop when the short-term loudness values fall below the threshold and resume after it rises above the threshold.

How Do I Make Loudness Measurements?

Example: 30-Second Commercial

Task is to QC a 30-second spot before it is placed in a playout queue.

- Select the numeric loudness display.
- Press the "1" button to pause the display, if not already paused.
- Press the "2" button to reset the numeric display.
- Press "1" to start the loudness display running. Start the video stream.
- Press "1" when video is complete to pause the loudness display.
- The loudness value for the spot can be read from the program loudness section of the display.

For more information, please visit www.broadcast.harris.com.

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