



Loudness Measurement

WFM6000/7000 & WVR6000/7000 Version 4.2.4 Software

What is Loudness?

Overall loudness of a program needs to be maintained within the listening environment. If there are significant variations between programs or between channels, the user will invariably have to reach for the remote control to change the volume to a suitable listening level. This can lead to user frustration as they have to constantly change the volume control between programs and between channels. The broadcast chain needs to maintain a suitable average loudness for the various programs they are transmitting.

Loudness is a subjective measurement and is primarily a psychological correlation with the physical intensity of the audio signal. Different people will perceive the loudness of the signal differently and therefore a variety of techniques have been used to characterize the overall loudness of the signal. The ITU-R BS.1770 standard (algorithms to measure audio program loudness and true-peak audio levels) is one method for measuring loudness within broadcast environments. This methodology use a RLB weighting curve which is a specific high pass filter defined within the standard. To configure this measurement within the waveform monitor the following steps are recommended.

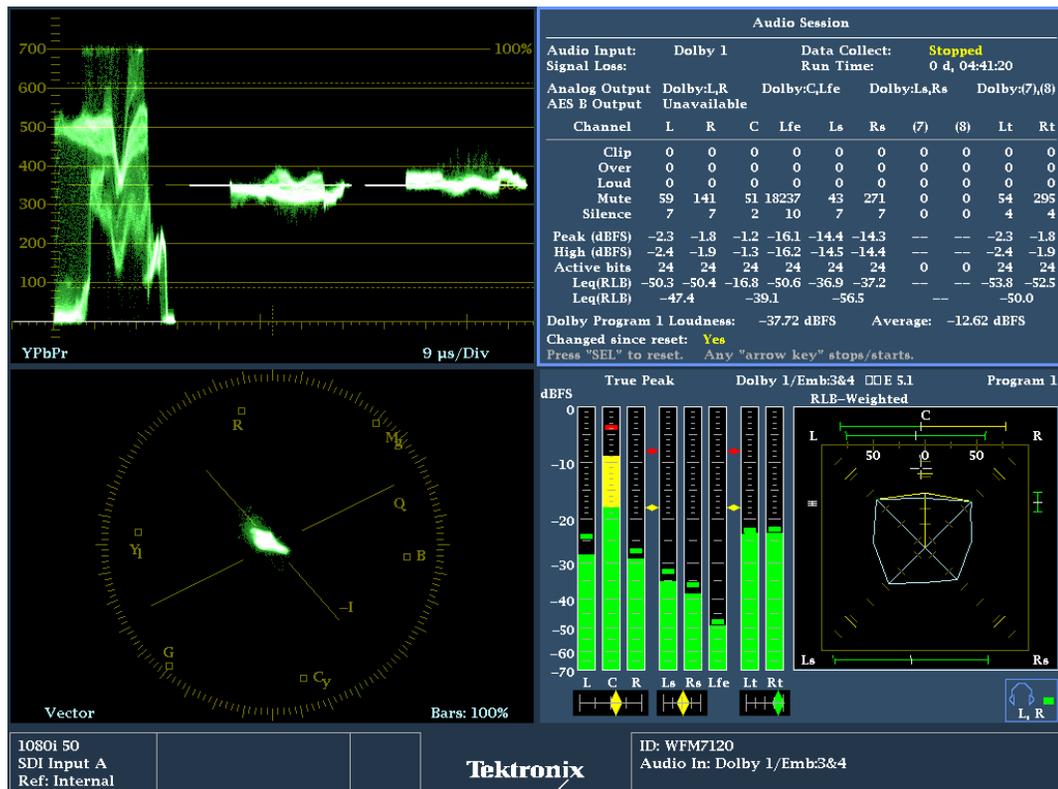


Figure 1. Audio Monitoring & Measurement.

How To Configure the Loudness Measurements

1. Select one of the tiles (1,2,3 or 4) and press the **AUDIO** button
2. Push and Hold the **AUDIO** button to enable the menu
3. Select the Audio input which you wish to use for the measurement and monitoring of the audio signal. Selection of AES A, AES B, Embedded, Dolby 1-4 (Option DDE required) are allowed depending on the audio options installed in the instrument.

4. To configure the loudness measurement the appropriate Loudness Filter should be selected from the **AUDIO** menu. To conform to ITU-R BS.1770 the RLB filter should be selected.
5. Select one of the tiles (1,2,3 or 4) to be used for the **Audio Session**. Press the **STATUS** button.
6. Push and Hold the **STATUS** button to bring up the menu scroll through the menu to select **Display Type** and select the **Audio Session** for the display. The loudness measurement can be made over a short duration (10 seconds) or a long duration which is based on the duration of the audio session. Typically the long duration is selected for the measurement from the **Audio Session** menu.
7. Within the **Audio Session** menu navigate to the **Loudness Avg** and select **Long**.

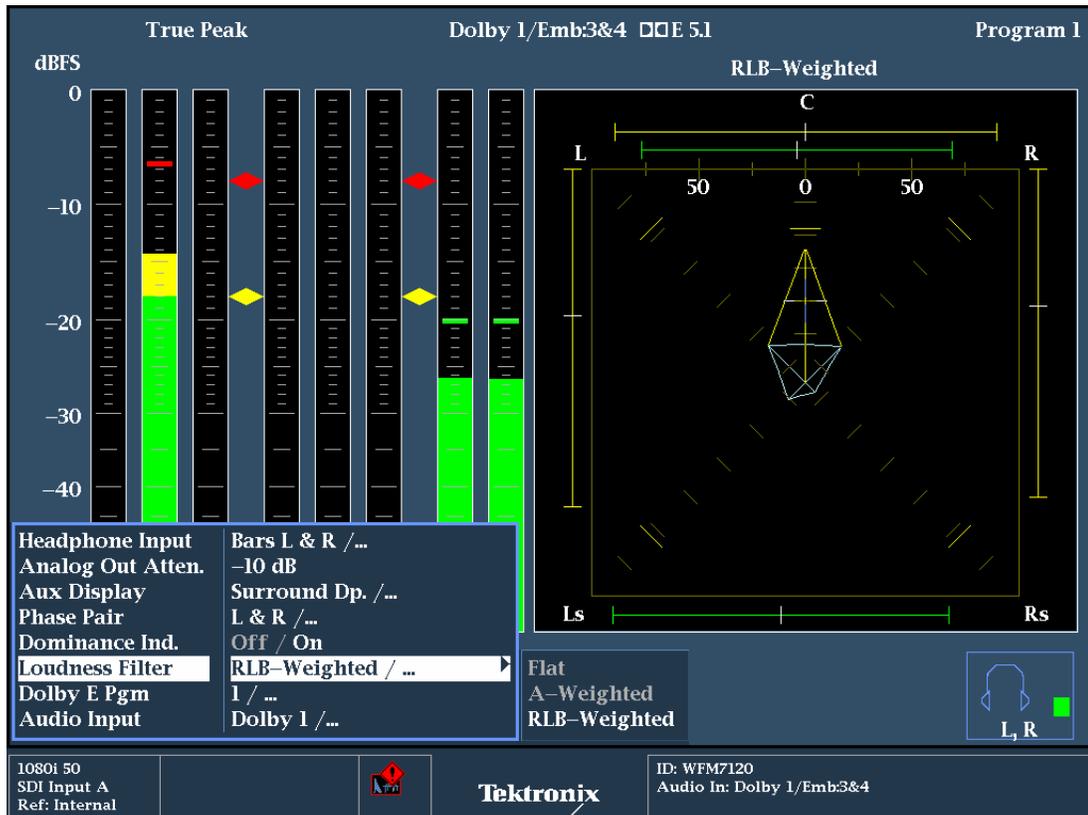


Figure 2. Audio Loudness Configuration.

QUICK TIP: While the Audio Session display is the active tile (tile with bright blue border) the **arrow keys** and **SEL** allow control of the audio session duration. Press the **Left** or **Right** arrow keys to stop or start the session duration. Press **SEL** to reset the session to zero.

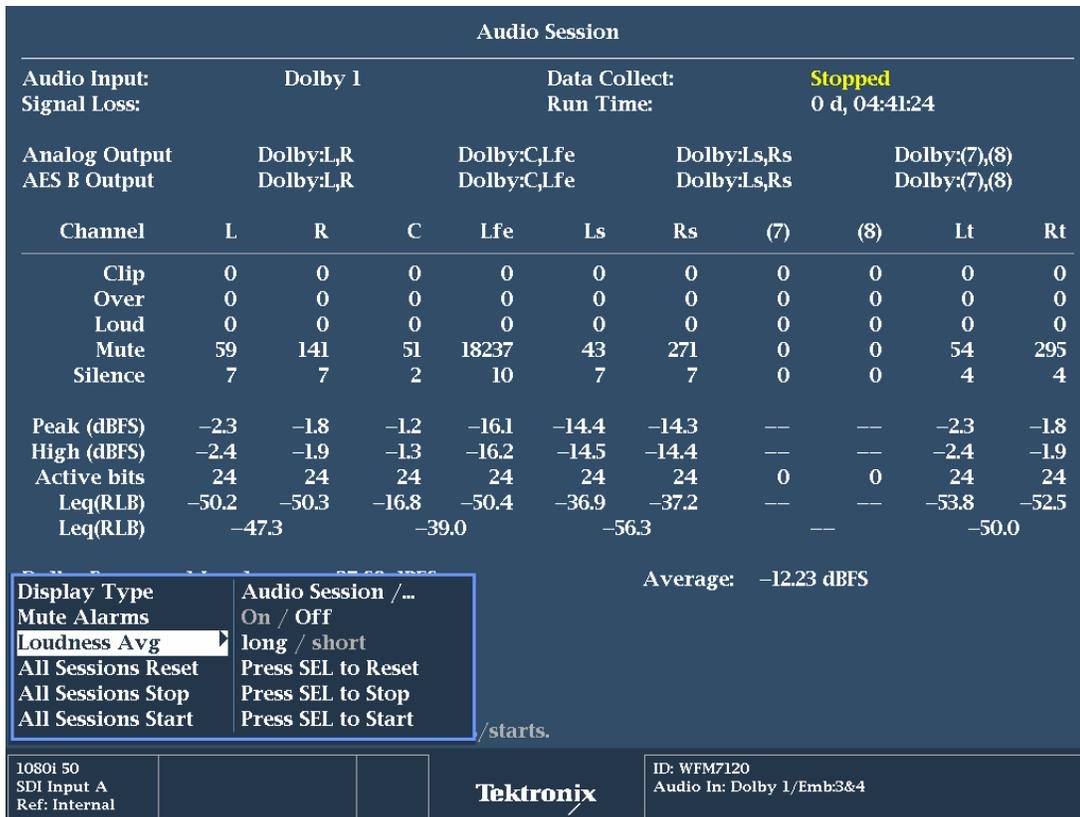


Figure 3. Audio Session Display showing Submenu

Understanding the Audio Session Display

The Audio Session display provides a summary of audio measurements made on the audio signals during the session. The display shows the selected audio input and the configuration of the mapping of the analog and AES outputs. A summary of statistics for number of Clips, Over, Mute, Silence and Loud that have occurred during the time of the audio session. During the session the maximum Peak and High audio levels are recorded for each channel that occurred for the duration of the audio session.

NOTE:

Peak (dBFS)—The True Peak signal level measured on the channel.

High (dBFS)—The highest signal level measured by the signal level meter. The level meter response is based on the Ballistics setting. If ballistics is set to True Peak, this readout will be the same as the Peak readout.

There are a series of Loudness measurements made over the duration of the audio session. These values may depend on the setting of the Loudness Avg between “long” averaged over the entire session and “short” averaged over a 10 second rolling interval. The loudness measurement also depends on the Loudness Filter setting set in the Audio menu. A setting of **Flat** is denoted by Leq, **A-Weighting** is denoted by Leq(A) and the **RLB** filter is denoted by Leq(RLB). A loudness measurement is recorded for each individual audio channel and loudness of each channel pair.

If a Dolby signal is selected then additionally Dolby Program (number) Loudness and Average loudness are also shown. These Dolby Loudness values are a summation of all the channels which are selected within the Configuration menu for the Audio Input / Outputs.

NOTE:

Dolby Program Loudness—Represents the running average loudness for selected channels from the current Dolby program. This value is derived over the entire session, so the sample period is infinite. It is also known as the "long" loudness average.

Average—Represents the running average loudness for selected channels from the current Dolby program. This value is derived from a 10-second rolling average. It is also known as the "short" loudness average or "Dolby average loudness".

Audio Session											
Audio Input: Signal Loss:	Dolby I				Data Collect: Run Time:	Stopped 0 d, 04:41:24					
Analog Output AES B Output	Dolby:L,R		Dolby:C,Lfe		Dolby:Ls,Rs		Dolby:(7),(8)				
	Dolby:L,R		Dolby:C,Lfe		Dolby:Ls,Rs		Dolby:(7),(8)				
Channel	L	R	C	Lfe	Ls	Rs	(7)	(8)	Lt	Rt	
Clip	0	0	0	0	0	0	0	0	0	0	
Over	0	0	0	0	0	0	0	0	0	0	
Loud	0	0	0	0	0	0	0	0	0	0	
Mute	59	141	51	18237	43	271	0	0	54	295	
Silence	7	7	2	10	7	7	0	0	4	4	
Peak (dBFS)	-2.3	-1.8	-1.2	-16.1	-14.4	-14.3	---	---	-2.3	-1.8	
High (dBFS)	-2.4	-1.9	-1.3	-16.2	-14.5	-14.4	---	---	-2.4	-1.9	
Active bits	0	0	24	0	0	0	0	0	24	24	
Leq(RLB)	-50.2	-50.3	-16.8	-50.4	-36.9	-37.2	---	---	-53.8	-52.5	
Leq(RLB)	-47.3		-39.0		-56.3		---		-50.0		
Dolby Program I Loudness:	-37.68 dBFS					Average: -12.23 dBFS					
Changed since reset: Yes											
Press "SEL" to reset. Any "arrow key" stops/starts.											
1080i 50 SDI Input A Ref: Internal					ID: WFM7120 Audio In: Dolby I/Emb:3&4						

Figure 4. Audio Session Display.

To view the channels which are currently used, select the **CONFIG** button and navigate to the Audio Inputs /Outputs menu and press the right arrow to enter the submenu. Scroll down to the Loudness channels menu and Press **SEL**. This will display a menu of the currently selected audio channels which comprise the summation of the Dolby Program and Average Loudness measurements.

QUICK TIP: Pressing the **HELP** button on the waveform monitor not only provides useful information on each feature within the waveform monitor, but also provides a wealth of technical information on various topics.

References

- WFM6000/7000 Series Waveform Monitors
- WVR6000/7000 Series Waveform Monitors

Data Sheets, Fact Sheets and additional product materials can be found at www.tektronix.com/video_test/signal_monitors.html

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