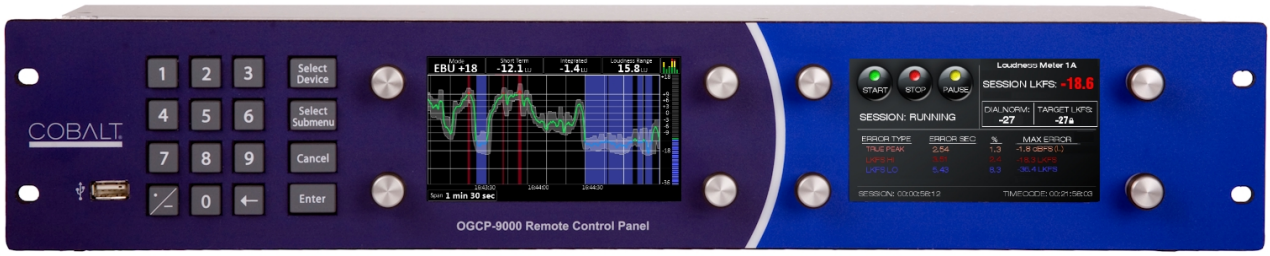

Audio Loudness Meter Option (+LM)

Option for Fusion3G® and COMPASS® Cards (+LM-C) and OGCP-9000 Remote Control Panel/WinOGCP (+LM-P)

Manual Supplement

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OPT-SW-LM-MS (V2.9)

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Chapter 1

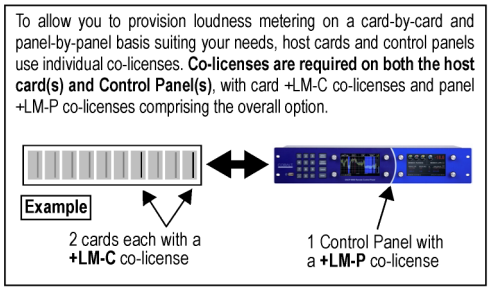
Introduction

Overview

Note: Unless otherwise noted in this manual, “Control Panel” equally applies to either the OGCP-9000 Remote Control Panel rack-mount unit or the Win-OGCP PC-based application.

This manual supplement provides descriptions and overviews, installation, setup, and operating instructions for the Audio Loudness Meter option (+LM). This option is installed as a software upgrade to any of several Fusion3G® or COMPASS® cards and the OGCP-9000 Remote Control Panel or WinOGCP. As such, with the option installed on a Fusion3G® or COMPASS® host card (hereinafter referred to as “host card”) and the Control Panel, the option provides an audio loudness meter function as described in this supplement. Note that the host card and Control Panel retain all of their normal functions; the Audio Loudness Meter functions are available as seamlessly added submenu selections on the Control Panel.

Note: Host card(s) and control panel(s) use separate option licensing as shown below.



This manual supplement consists of the following chapters:

- **Chapter 1, “Introduction”** – Provides information about this manual and what is covered. Also provides general information regarding the Audio Loudness Meter option.
- **Chapter 2, “Option Installation”** – Provides instructions for installing and configuring the Audio Loudness Meter option (“+LM”) on the Control Panel and host card(s).

- **Chapter 3, "Operating Instructions"** – Provides overviews of operating controls and instructions for using the Audio Loudness Meter option.

This chapter contains the following information:

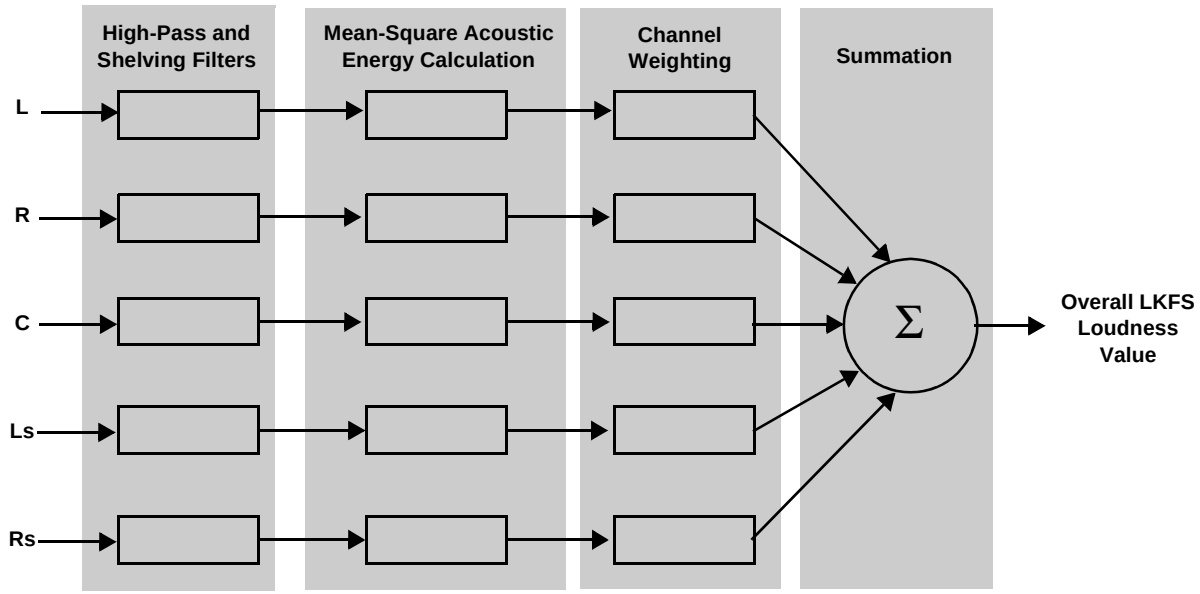
- **Loudness Measurement Overview (p. 1-2)**
- **Audio Loudness Meter Functional Description (p. 1-5)**
- **Technical Specifications (p. 1-10)**

Loudness Measurement Overview

ITU-R BS.1770-1 – ATSC A/85 Overview

Note: Refer to ITU-R BS.1770-1, "Algorithms to measure audio programme loudness and true-peak audio level" and ATSC A/85, "ATSC Recommended Practice: Techniques for Establishing and Maintaining Audio Loudness for Digital Television" for more information.

This option provides an Audio Loudness Meter that performs loudness measurement based on the methods described in ITU-R BS.1770-1 and ATSC A/85. This recommendation considers the L, R, C, Ls, and Rs audio inputs of a 5.1-channel complement and performs a measurement on each channel that sums the weighted acoustical energy present in each channel over a given sampling period (see Figure 1-1). These individual channel measurements are summed, resulting in a single, overall numerical quantity (called "LKFS"; as defined as loudness, K-weighted, relative to full scale) which can be used as a pass/fail value of the program material when assessed against a target LKFS value. Note that stereo and monaural sources can also be used; however, LFE and auxiliary channels are never included in an LKFS assessment.



Using the expression shown below, each channel's hi-pass filtered contribution (*y*) to relative acoustical energy is calculated for period *T*.

$$1/\mathrm{T}\int_0^T y_i^2\,dt$$

Noting the above, it becomes apparent that the resulting LKFS value for a given input is not exclusively related to maximum or instantaneous signal level (as per peak and/or VU values). Rather, for two audio segments of the same frequency, a segment with a lower peak amplitude (but greater duration) will in some cases result in greater acoustical energy than a higher-amplitude, same-frequency segment having a shorter duration due to the function's summation of "area under the curve" versus simple peak level.

Figure 1-1 ITU-R BS.1770-1 Basic Audio Loudness Measurement Model

When a piece of material is assessed from start to finish for LKFS compliance, this is called a **session**. The Audio Loudness Meter provides LKFS indications showing both short-term trends and an overall session LKFS. (The distinctions between these methods are described in detail later in this chapter.) LKFS measurements are expressed in decibels. As such, gain changes to program material have a direct effect on LKFS measurement.

The LKFS value for a given audio segment very closely mimics the perceived human psycho-acoustical loudness for the segment. This loudness measurement model tends to consider not only peak level, but more importantly the acoustical energy over a specific sampling period. In this manner, a high-amplitude, short-duration event may score a lower LKFS value than a lower-amplitude, long-duration event.

EBU R 128 Overview

Note: Refer to EBU – Tech 3343, “Practical guidelines for Production and Implementation in accordance with EBU R 128” for more information.

EBU R128 is based on ITU-R BS.1770-1 and therefore uses the same signal processing scheme. However, EBU R 128 is different from ITU-R BS.1770-1 as follows:

- EBU R 128 uses either of two scales (“EBU +9” and “EBU +18”) wherein 0 LU is equivalent to the absolute unit of -23 LUFS used in ITU-R BS.1770-1. As such, the EBU +9 scale is functional from a range of -18.0 LU to +9.0 LU (-41 LUFS to -14 LUFS), and the EBU +18 scale is functional from a range of -36.0 LU to +18.0 LU (-59 LUFS to -5 LUFS).
- EBU R 128 uses a gating scheme in which levels below the gating threshold (typically -8 LU below the target level) are **rejected** from the session measurement. As such, there is not a loudness “budget” where low levels can artificially influence the overall assessment in the measurement.
- EBU R 128 uses three distinct averaging periods, with measurement values provided for each simultaneously. The three periods are intended to help in better adjusting post-production loudness to best meet the overall desired performance.
  - **Momentary (M)** loudness uses a time window of 400 msec.
  - **Short-term (S)** loudness uses a time window of 3 seconds.

  The **M** and **S** measurements are suited for assessing immediate leveling of loudness, ideally bringing the anchor element of the material as close to the -23 LUFS Target Level as possible.

  - **Integrated (I)** loudness is the measurement performed over the course of the entire session. Following tailoring of basic leveling considering **M** and **S** as described above, properly produced material or material using automated loudness-processing (such as provided by option +LP51 or LP20) should conform to the -23 LUFS Target Level (or 0 LU in the normalized EBU R 128 method).

Audio Loudness Meter Functional Description

Audio Loudness Meter Option System Interface

Identical to the interface between the Control Panel and Fusion3G® or COMPASS® card in a network-controlled frame, the Audio Loudness Meter option is used in conjunction with a Cobalt® OGCP-9000 Remote Control Panel and/or WinOGCP (which provides all user interface functions), and a host card which serves to monitor the intended audio signals and provides LKFS data to the Control Panel. As such, the host card monitors selected audio channels and applies signal analysis based on ATSC A/85 or EBU R 128 criteria to produce an LKFS measurement and provide data indicating under-threshold and over-threshold level conditions. In turn, the card sends data packets to the Control Panel indicating the measurements performed by the card. Note that multiple host cards can be accommodated by a single Control Panel.

The Control Panel in turn displays the loudness information. The Control Panel also generates packets based on user control inputs which control operation of the host card(s), as well as dictates parametric user settings to the host card(s). The host card(s) and the Control Panel communicate over a 10/100-T LAN, with the host card(s) supported by a frame equipped with a Network Controller card.

Audio Loudness Meter Signal Processing

Note: Audio input format accommodation is a function of the host card. Discussion here describes all available audio inputs. On host card additionally equipped with an optional Dolby® decoder, the Audio Loudness Meter can perform measurements on decoded Dolby E or AC-3 data.

(See Figure 1-2.) The Audio Loudness Meter option uses measurement data sent by the host card representing loudness measurement and discrete signal levels of channels selected for metering on the host card. Where supported by a host card licensed for loudness processing (option +LP51 or +LP20), measurement data can include both pre-processed and post-processed Loudness Processor inputs (only Fusion3G® cards support pre-processed measurement). Note that the full 5.1 channel complement and assignable AUX channels are displayed as confidence monitors using PPM meters; however, the LFE and AUX channels are not included in any loudness measurement calculations or display.

The session monitored by the operator is time-stamped using NTP time (where configured) and material timecode (as selected from the timecode format outputted by the host card). Concurrently displayed is session elapsed time, with any errors logged using a session elapsed time stamp (which starts at 00:00:00:00 (hr:min:sec:tenths)).

The host card output timecode (as selected via the host card timecode controls) is used by the Audio Loudness Meter for additional time stamp purposes and for timecode-controlled session automation (session start/stop based on timecode range). The Audio Loudness Meter generates session reports (as both .html and .csv) that are available via the network-connected PC(s).

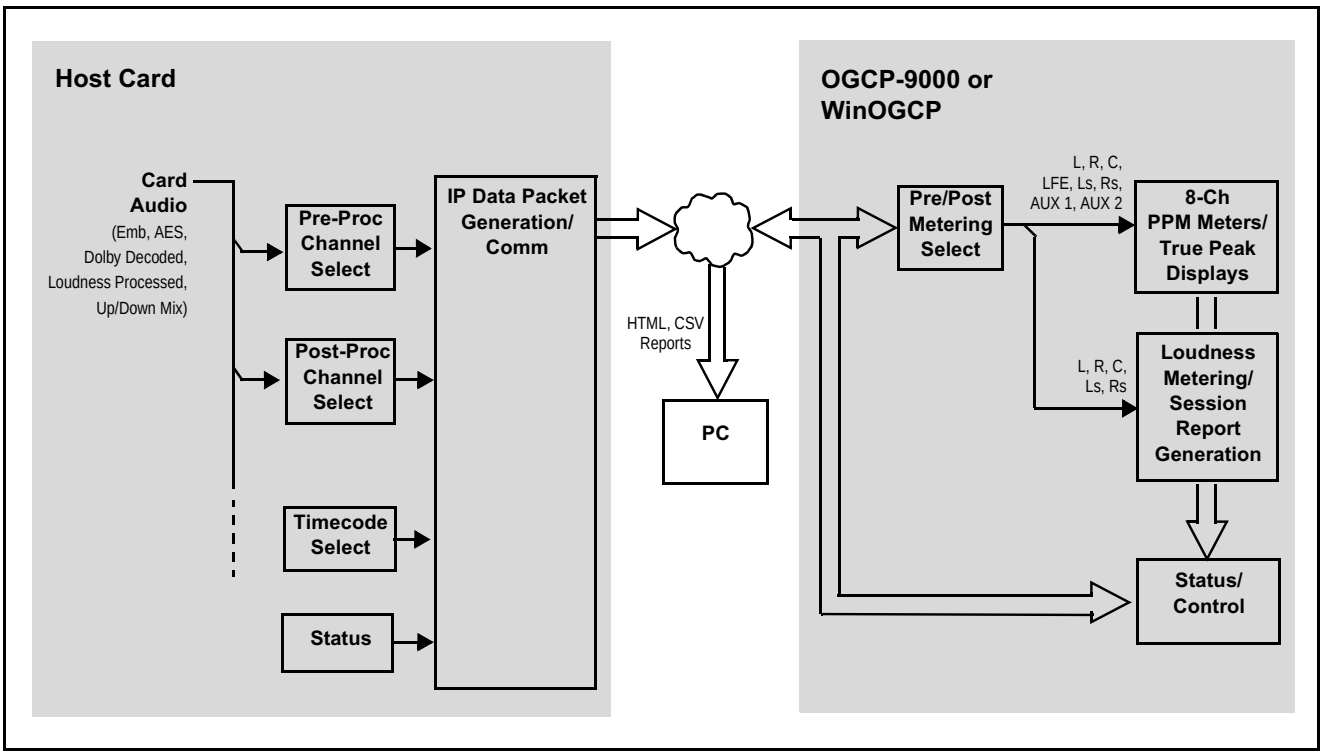


Figure 1-2 Audio Loudness Metering Host Card/Loudness Meter Interface Block Diagram

Aggregate LKFS Processing

Short-Term LKFS Calculation

(See Figure 1-3.) The LKFS values for the individual inputs comprising the LKFS monitor/measurement display channels are processed and summed as described in Loudness Measurement Overview (p. 1-2) for a given sampling period. This sampling is repeated, with each resulting value continuously re-averaged with previous values resulting in a **short-term moving average** LKFS value. This process is shown and described in Figure 1-3.

A dedicated bar graph with a 0 to -70 LKFS scale displays this constantly updating value. At any point where LKFS is under or over target by a configurable threshold, the display respectively changes either blue or red; measured LKFS values within the target thresholds are displayed in white.

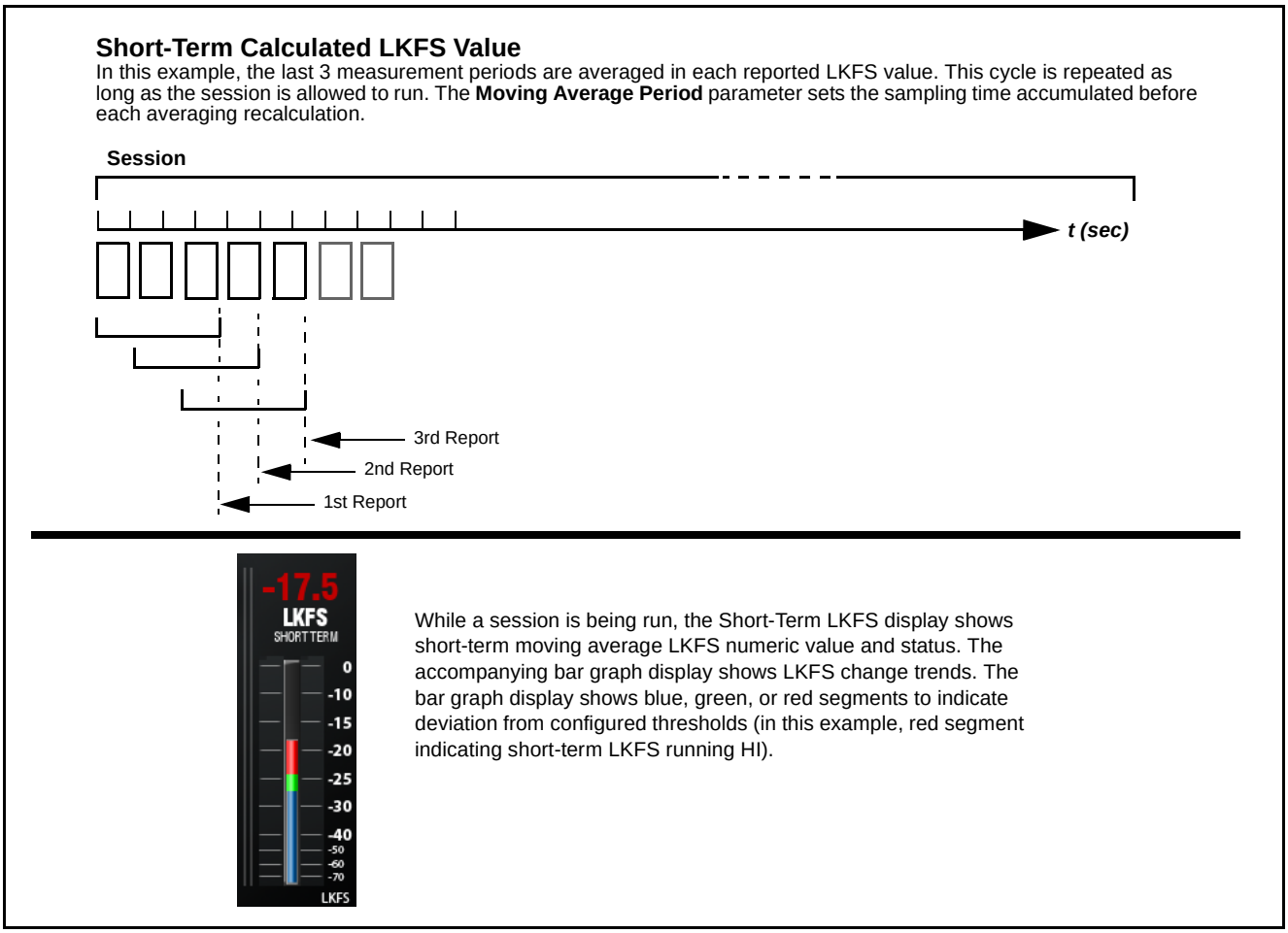


Figure 1-3 Short-Term LKFS Value Calculation and Typical Display

Session LKFS Calculation

(See Figure 1-4.) A session-duration calculation/display (sometimes referred to as “infinite-duration) is numerically displayed. This is defined by the averaged sum of all short-term samples in the session, concluding when the session is stopped.

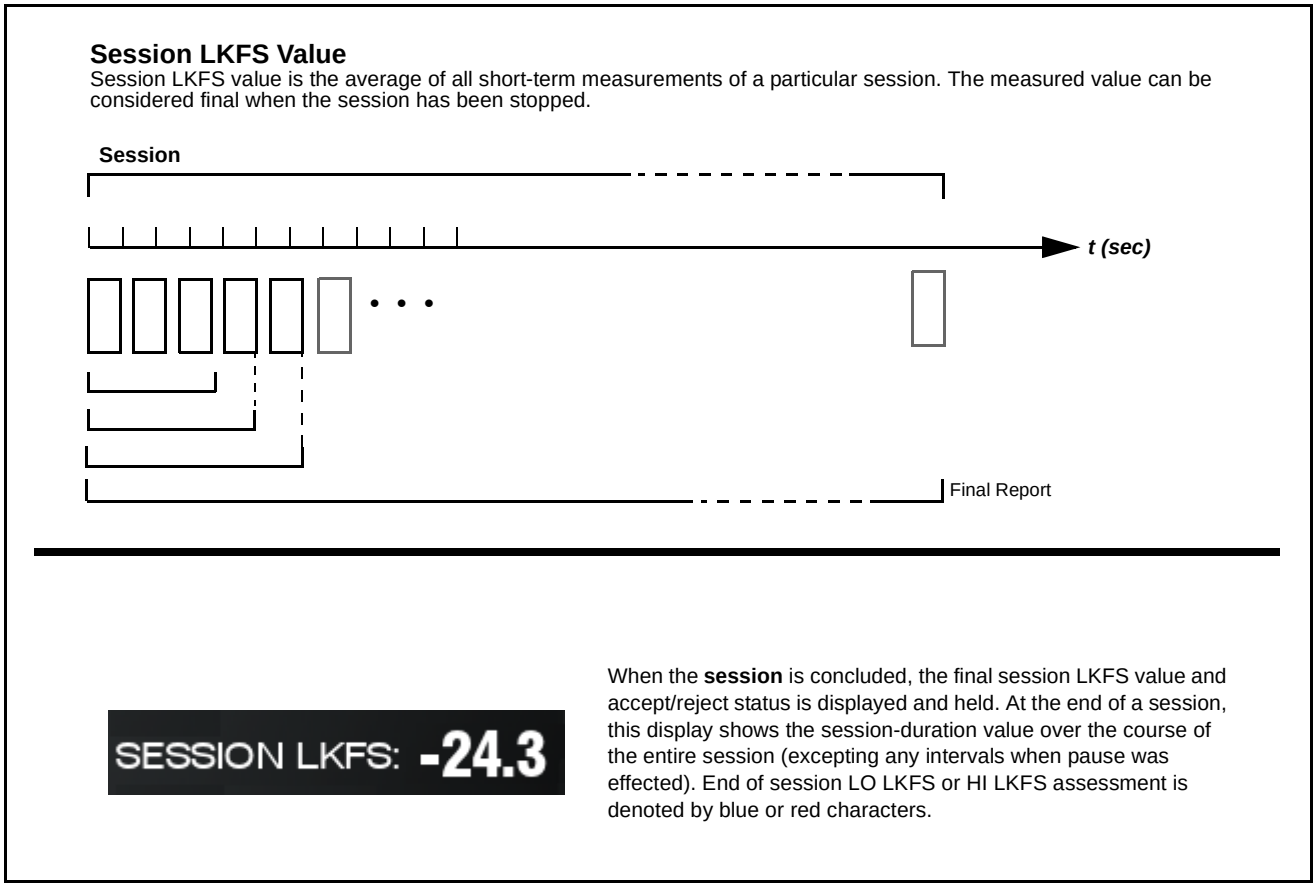


Figure 1-4 Session LKFS Value Calculation

Configurable LUFS/LKFS HI/LO Alert Parameters

The Audio Loudness Meter offers configurable alert thresholds at which a measured LUFS/LKFS result can be considered unacceptably above or below a target value. These alerts in turn can provide consistent and unambiguous go/no-go results for a loudness session with no interpretation of quantitative results required on the part of the QC operator. The Audio Loudness Meter uses the criteria described below for configuring limits and in turn displaying LUFS/LKFS errors within a session.

- **HI threshold** – This is the maximum level above the target level, where exceeded, results in a displayed LUFS/LKFS violation for the duration of the event. This condition results in a violation regardless of the duration of the event.
- **LO threshold** – This is the minimum level, where exceeded, results in a displayed LUFS/LKFS violation for the duration of the event. This condition results in a violation regardless of the duration of the event. **This parameter is optional and default set to disabled.**

Note: The error threshold settings described here affect only admin-configurable error flagging in displays and logs furnished by the Audio Loudness Meter (for example, **HI** and **LO** errors). These threshold settings are wholly independent of the LUFS/LKFS measurement function. As such, resulting numerical short-term and session LUFS/LKFS values displayed for a session are not in any way affected by these threshold settings.

Session Time Markers and Sources

The Audio Loudness Meter option correlates points between the start and stop of a session using session elapsed time (starting at 00:00:00) which is correlated to local time (from NTP server, for example) and timecode data extracted from the session program material. When used with an SDI input, the Audio Loudness Meter option extracts (where available) SDI VITC waveform, SDI ATC_VITC, and/or SDI ATC_LTC timecode streams from the SDI signal to identify locations within the monitored program material.

Session and local time is recorded and displayed in hrs:min:sec:tenths; material extracted timecode is recorded and displayed in hrs:min:sec:frames.

Log Reports

Log reports are saved after each session. HTML log reports can be accessed and displayed via a web browser pointing to the Control Panel. Similarly, .csv reports can also be accessed (WinOGCP only. The report can then be manipulated just as any other web page (i.e., used for copy/paste, printed, or saved as a file).

Audio and Video Formats Supported by the Audio Loudness Meter

Refer to the Product Manual for the host card for audio and video formats supported.

Technical Specifications

Note:
- Refer to the Product Manual for the host card for technical specifications of the audio and video formats supported.
- Refer to Product Manual “OGCP-9000 Remote Control Panel Product Manual” (PN OGCP-9000-OM) for technical specifications for the Control Panel.
- Refer to Product Manual “WinOGCP Desktop Virtual Control Panel Product Manual” (PN WINOGCP-OM) for technical specifications for the WinOGCP Control Panel.

Table 1-1 lists the technical specifications for the Audio Loudness Meter option.

Table 1-1 Technical Specifications

Item	Characteristic
Part number, nomenclature	Software option +LM
Host Card Compatibility	Suitable for use with Cobalt® Fusion3G® or COMPASS® cards equipped with +LM licensed feature that process and/or output embedded and/or AES digital audio
Loudness Metering Modes	• ITU-R BS.1770-1 / ATSC A/85; fixed target of -24 LKFS (ATSC -24) • EBU R 128 “+9 EBU” and “+18 EBU”; fixed target of -23 LUFS • Custom (configurable target LUFS/LKFS; configurable gating / no gating)
dBFS Scale Range	0 to -70 dBFS; absolute or configurable relative
LKFS Scale Range	0 to -70 LKFS
Averaging	Simultaneous session and short-term; configurable short-term moving averaging period
Audio Inputs	8-channel confidence monitoring; 5-channel (L, R, C, Ls, Rs) loudness assessment per ATSC A/85 or EBU R 128. Accommodates embedded, AES, analog, decoded Dolby® E/AC-3 audio (per host card capabilities).
Signal-Level Triggering	Configurable independent start and stop signal level thresholds; 0 to -60 dBFS
Timecode Triggering	Configurable independent start and stop timecode marks using timecode format being used by +LM option
Clock Sources	(OGCP-9000) Accommodates network time server or local (internal) sources. (WinOGCP) Uses PC clock.
Communication	10/100 Mbps Ethernet between Control Panel and host card in openGear™ frame

Chapter 2

Option Installation

Overview

Note: In this chapter, “Control Panel” means the instruction is applicable for either an OGCP-9000 Remote Control Panel rack-mounted unit, or the PC-based WinOGCP virtual control panel. Where instructions are different for the OGCP-9000 Remote Control Panel and WinOGCP, this is noted.

Typically, a Control Panel and host card(s) must be set up for this option using the instructions in this chapter. Please contact Cobalt Digital Inc. Technical Support with any questions.

Prior to using this option for loudness metering:

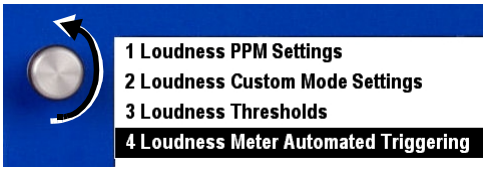
- The Control Panel and host card(s) must be visible to each other over the LAN, and
- Control Panel and host card(s) must have respective **+LM-P** and **+LM-C** option feature keys activated on each device (i.e., control panel and host card) to be used with the option.

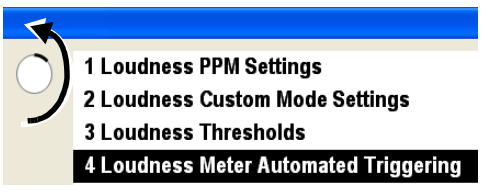
Note: Host card(s) must be installed in a frame equipped with the optional MFC-8310-N or MFC-8320-N network controller card installed.

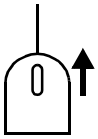
This chapter contains the following information for installing the +LM option on the Control Panel and host card(s):

- Connecting Control Panel to LAN and Host Card Frames (p. 2-2)
- Activating Audio Loudness Meter Feature Keys (p. 2-2)

Note: WinOGCP has a control layout largely identical to that of the OGCP-9000 Remote Control Panel rack-mount unit. The “knobs” on WinOGCP (as compared to the physical knobs on OGCP-9000) operate as described below.







To “rotate” a WinOGCP “knob” counter-clockwise (CCW), place the cursor over the desired knob and roll the mouse track wheel **up**.

Roll the mouse track wheel **down** for CW.

Connecting Control Panel to LAN and Host Card Frames

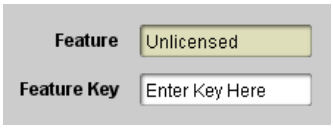
Instructions here assume that the Control Panel is connected to the LAN and host card frames. If this is not already done, refer to the OGCP-9000 or WinOGCP Product Manual as appropriate.

Activating Audio Loudness Meter Feature Keys

Feature keys must be activated on **both** the OGCP-9000 Remote Control Panel(s) and/or WinOGCP, and the host card(s) that are to be used for this option. Activate feature keys as described below.

Activating the Audio Loudness Meter Feature (+LM-C) on Host Card(s)

1. On the host card where the feature is to be activated, open the **Licensable Feature** tab in DashBoard™. Follow the instructions below to activate your licensable feature.

Licensable Features	Allows activation of optional licensed features.
Note: For card pre-ordered with licensed feature(s), the activation steps described below are not required; the feature will already be installed activated. To order features and obtain a license key, contact Cobalt® sales at sales@cobaltdigital.com or at the contact information in your product manual. Please provide the "SSN" number or Serial Number of your card (displayed in the Card Info pane) when contacting us for your key.	
• **License Feature and Key Entry window** 	Activate licensable feature as described below. 1. Enter the feature key string in the **Feature Key** box. Press return or click outside of the box to acknowledge entry. **Note:** Entry string is case sensitive. Do not enter any spaces. 2. In the DashBoard™ Card Info pane, wait for **Valid Key Entered** to be displayed. This indicates the key was correctly entered and recognized by the card. **Note:** If DashBoard™ card option submenu/control pane does not re-appear, close the card and re-open it. 3. Click and confirm **Reboot**. When the card option submenu/control pane appears again, the licensable feature will be available. (The Loudness Metering tab now appears in DashBoard along with other card menu tabs.) 4. **Note:** Applying the licensable feature and its reboot has no effect on prior settings. All control settings and drop-down selections are retained.

2. Repeat for any other host cards as required.

Activating +LM-P Audio Loudness Meter Option on OGCP-9000 Remote Control Panel

Each Control Panel running the Audio Loudness Meter option must have the Audio Loudness Meter licensable feature installed and activated. Install and activate the feature as described below.

Note: OGCP-9000 Remote Control Panels using the current version of option +LM-P require that the control panel has a software build that supports this option.

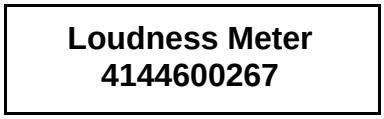
The control panel must be loaded with **Processor Version 1012** or greater before proceeding. From the Cobalt Digital Inc. web site, go to Support > Firmware to download the current firmware, as well as instructions.

Note: In performing this procedure, you will need to contact Cobalt Digital Inc. to receive the feature key string for your Control Panel if not already done. Each Control Panel has a unique feature key string. If it is not convenient to contact us at this time, this procedure can be deferred until convenient.

1. On the Control Panel keypad, press **Select Device** and select **0 This Control Panel**.
2. Using any knob or the **Select Submenu** key, select **Licensed Features**.
3. Note the **Hardware ID** now displayed on the Control Panel. Call Cobalt Digital and provide this number to receive your feature key. You will be given a 10-digit decimal string that is your feature key.

Note:
- If the string contains leading zeros, these must also be entered. String must be 10 digits.
- If the string is mis-entered, the entered string value appears in red. Press **Cancel** and re-enter the string.

4. Enter the 10-digit string using the Control Panel numeric keypad, and then press **Enter**. After pressing the Enter key, the correct entry and feature acknowledgement is displayed as shown in the example below.



5. Press **Select Device**. The Control Panel now saves the changes, restarts, and then displays the Audio Loudness Meter screen.
6. Repeat for additional Control Panels as required.

Activating +LM-P Audio Loudness Meter and Other Options on WinOGCP

Each instance of (or machine running) WinOGCP running the Audio Loudness Meter option must have the Audio Loudness Meter licensable feature installed and activated. Install and activate the feature as described below.

Note: WinOGCP using the current version of option +LM-P require that the application has a software build that supports this option.

WinOGCP must be loaded with **Application Build 1054** or greater before proceeding. From the Cobalt Digital Inc. web site, go to Support > Firmware to download the current firmware, as well as instructions.

Note: In performing this procedure, you will need to contact Cobalt Digital Inc. to receive the feature key string for your Control Panel if not already done. Each WinOGCP has a unique feature key string tied to the MAC address hosting WinOGCP. If it is not convenient to contact us at this time, this procedure can be deferred until convenient.

1. On WinOGCP, click on **Select Device** and select **0 This Control Panel**.
2. Using any knob or the **Select Submenu** key, select **Licensed Features**.
3. Note the **Hardware ID** now displayed on WinOGCP. Call Cobalt Digital and provide this number to receive your feature key. You will be given a 10-digit decimal string that is your feature key.

Note:
- If the string contains leading zeros, these must also be entered. String must be 10 digits.
- If the string is mis-entered, the entered string value appears in red. Press **Cancel** and re-enter the string.

4. Enter the 10-digit string using the WinOGCP numeric keypad, and then click **Enter**. After clicking **Enter**, the correct entry and feature acknowledgement is displayed as shown in the example below.

Loudness Meter
4144600267

5. Click **Select Device**. WinOGCP now saves the changes, restarts, and then displays the Audio Loudness Meter device choices (cards/slots hosting Loudness Metering as defined in configuration file).
6. Repeat for additional WinOGCP instances as required.

Chapter 3

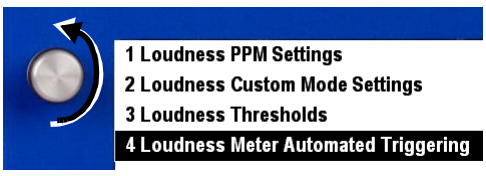
Operating Instructions

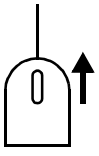
Overview

This chapter contains the following information:

- Audio Loudness Meter Measurement Modes (p. 3-2)
- Live Data Display (Left Display) and Display Formats (p. 3-3)
- Session Control (Right) Display (p. 3-5)
- Setting Up the Audio Loudness Meter (p. 3-6)
- Session Setup (p. 3-16)
- Post-Session Reports (p. 3-18)
- Troubleshooting (p. 3-22)

Note:
- In this chapter, “Control Panel” means the instruction is applicable for either an OGCP-9000 Remote Control Panel rack-mounted unit, or the PC-based WinOGCP virtual control panel application/host computer. Where instructions are different for the OGCP-9000 Remote Control Panel and WinOGCP, this is noted.
- Refer to “OGCP-9000 Remote Control Panel Product Manual” (PN OGCP-9000-OM) for general operating instructions on using the Control Panel keypad, knobs, and displays.
- WinOGCP has a control layout largely identical to that of the OGCP-9000 Remote Control Panel rack-mount unit. The “knobs” on WinOGCP (as compared to the physical knobs on OGCP-9000) operate as described below.





To “rotate” a WinOGCP “knob” counter-clockwise (CCW), place the cursor over the desired knob and roll the mouse track wheel **up**.

Roll the mouse track wheel **down** for CW.

Audio Loudness Meter Measurement Modes

Table 3-1 lists and describes the measurement modes available for the Audio Loudness Meter option. The **EBU +9**, **EBU +18**, and **ATSC -24** modes are factory configured with all parameters conforming to the respective standard and are ready for immediate use (requiring only input channel assignment for use).

Table 3-1 Audio Loudness Meter Measurement Modes

Mode	Description and Parametric Settings
Note: Refer to ATSC A/85, "ATSC Recommended Practice: Techniques for Establishing and Maintaining Audio Loudness for Digital Television" or EBU – Tech 3343, "Practical guidelines for Production and Implementation in accordance with EBU R 128", as applicable, for full details regarding audio loudness measurement and assessments using these standards.	
EBU +9 **EBU +18**	• EBU R 128 "+9 Scale" or EBU R 128 "+18 Scale" standards. • Normalized 0 LU ref. to -23 LUFS. • Usable range is +9.0 to -18.0 LU (EBU +9) and +18.0 to -36.0 LU (EBU +18). • Uses a fixed target value of -23 LUFS (0 LU). • Gating is applied in which levels below the gating threshold (-8 LU below the target level) are rejected from the session measurement. Measurement parameters include fixed Momentary (M) sampling over 400 msec intervals, Short-Term (S) sampling over 3 sec intervals, and Integrated (I) sampling over the entire session.
ATSC -24	• ITU-R BS.1770-1 – ATSC A/85 standard. • Normalized 0 LU ref. to -24 LKFS • Uses a fixed target value of -24 LKFS. • Gating is not used; all measured values are included in short-term and session LKFS.
Custom	Provides full parametric user configurability to be set as modified EBU R 128 or ATSC A/85 mode. **Note:** Custom mode configured with user settings may not be compliant with EBU R 128 or ATSC A/85 standards. Configurable parameters are as follows: • Target LUFS/LKFS • Units (LKFS/LUFS) • Units absolute or relative ref. configured target LUFS/LKFS • Moving average period (default= 3 sec) • EBU relative gating (disable/enable) and gating threshold • Viewable range

Audio Meter Displays

(See Figure 3-1) The Audio Loudness Meter option uses the two displays of the Control Panel as follows:

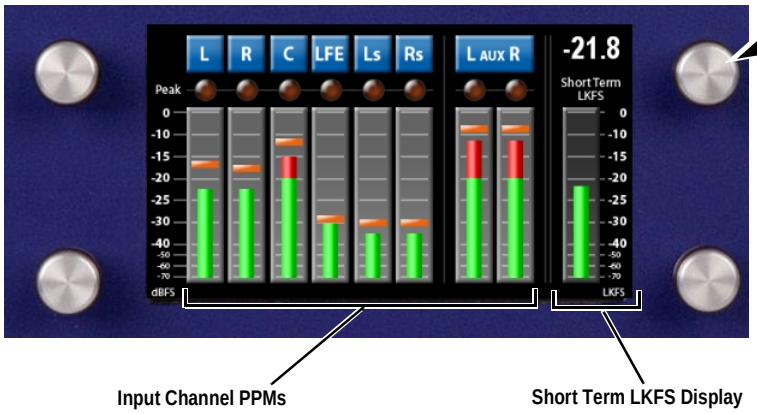
- **Left** display panel is live data display. Refer to Live Data Display (Left Display) and Display Formats (p. 3-3) for more information.
- **Right** display panel is session control display. Refer to Session Control (Right) Display (p. 3-5) for more information.

Figure 3-1 Audio Loudness Meter Left and Right Displays

Live Data Display (Left Display) and Display Formats

The Audio Loudness Meter has two user-selectable primary metering display formats for the live data (left) display:

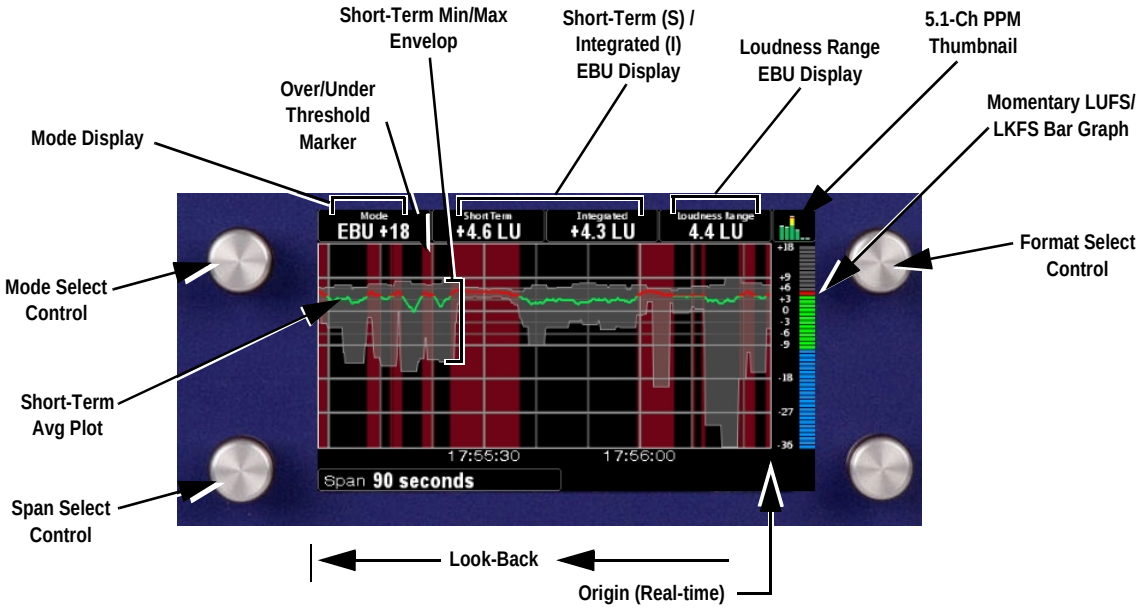
- Real-Time Bar Graph Format Left Display (Figure 3-2)
- Graphing Format Left Display (Figure 3-3).



Real-Time Bar Graph Format displays channel PPM in real time and short-term loudness. This is best suited where individual channel level analysis is of primary concern, with the loudness trend of secondary concern.

Item	Function
Format Select Control	Rotating this knob toggles the left display between Real-Time Bar Graph Format described here and Graphing Format described on the next page.
Input Channel PPMs (Peak Program Meters)	Shows input signal levels (with configurable channel level alert (yellow) and over-level (red) input level thresholds. A configurable true-peak over-level alert (orange circle icon) is provided for each channel, using a 1-second hold/refresh interval. Running peak level for each input channel is shown by orange bar. This pane is continuously shown and displays live signal levels regardless of whether or not a session is running, paused, or stopped.
Short Term LKFS Display	Shows short-term, running average LKFS value and status. The accompanying bar graph display assists in displaying LKFS change trends. The bar graph display changes to red, green, or blue bar to readily indicate deviation from configured thresholds (in this example, short-term LKFS running HI).

Figure 3-2 Real-Time Bar Graph Format Left Display



Graphing Format displays a running graph spanning from real-time to a selectable "look-back" interval showing a history of loudness.

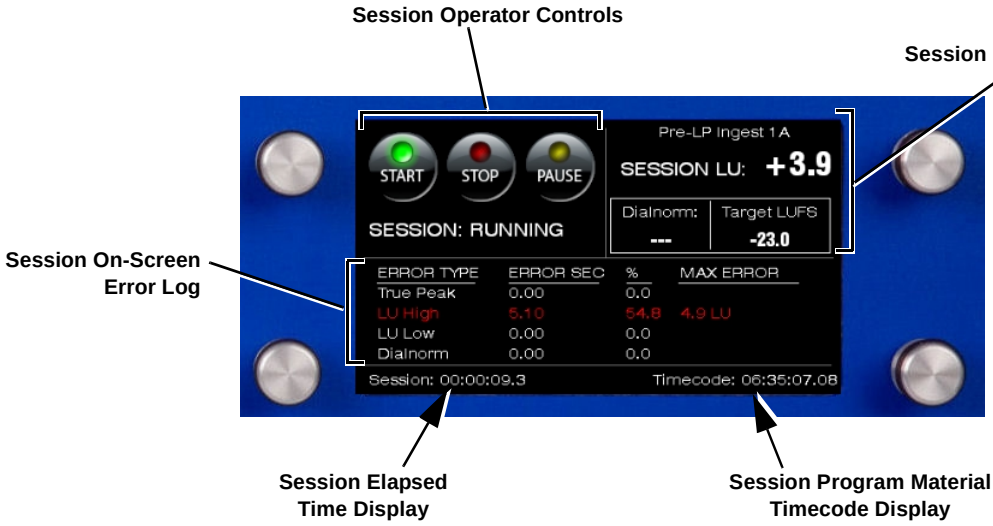
This format is unique in that it offers a detailed trend analysis of aggregate loudness over a selectable time span. When EBU R 128 measurement modes are selected, this format also displays full real-time EBU R 128 M (momentary) measurement values.

Item	Function
Format Select Control	Rotating this knob toggles the left display between Graphing Format described here and Real-Time Bar Graph Format described on previous page.
Mode Select Control/ Display	In graphing format, selects from the four following measurement standards: • EBU R 128 "+18 Scale" • EBU R 128 "+9 Scale" • ATSC A/85 (ATSC -24) • Custom (configurable target LKFS and measurement parameters) Refer to Audio Loudness Meter Measurement Modes (p. 3-2) for detailed mode descriptions and parametric settings. **Note: Mode Select** can only be performed in the Graphing display format described here.
Origin and Look-Back Span Select Control	Real-time plot starts at right side of window, with earlier data expanding to the left. Rotating **Span** control selects from multiple span window widths from 45 sec to 25 hr, 46 min.
Short-Term Avg (average) Plot	Solid trace shows EBU R 128 or ATSC A/85 short-term (3 sec) loudness value. This plot is continuously drawn regardless of whether or not a session is running, paused, or stopped.
Over/Under Threshold Marker	Vertical band width shows red for intervals where user-configured HI threshold has been exceeded. Band shows blue for intervals where user-when configured LO threshold has been exceeded.
Short-Term Min/Max LKFS Envelop	Gray envelop shows minimum and maximum short-term LKFS values occurring within consecutive 100 msec measurement sampling intervals.
Short-Term (S) and Integrated (I) EBU Display	**Short Term** displays running short-term (S; 3-sec) value regardless if session is in progress. **Integrated** displays the running session Integrated (I) value and functions only while session is in progress.
Loudness Range (LRA) Display	Displays EBU LRA value (with highest and lowest values dropped) updated for each 3-sec interval. This is active only while a session is in progress.
Momentary LUFS/ LKFS Bar Graph	Shows momentary (EBU R 128 "M" 400 msec value or A/85 400 msec value). Color-coded segments indicate over-threshold (red), within (green), and under-threshold (blue). Axis to left of display also correlates to plotted graph.
5.1-Channel PPM Confidence Thumbnail	Shows basic confidence display of dynamic levels on the 5.1-channel complement selected for audio metering.

Figure 3-3 Graphing Format Left Display

Session Control (Right) Display

(See Figure 3-4) The right display consists of the typical controls used to run a session, as well as displays related to a running session and post-session assessments.



Item	Function
Session Operator Controls	Session **START**, **STOP**, and **PAUSE** buttons. Individual button is highlighted when activated. After session is stopped, holding the **STOP** button for 3 seconds clears the session display.
Session Loudness Display	When the **STOP** button is pressed, the final session loudness value is displayed and held. At the end of a session, it shows the session-duration value over the course of the entire session (excepting any intervals when pause was effected). End of session assessment is denoted by white, blue, or red characters indicating **OK**, **LO**, or **HI**. **Note:** Units displayed are a function of selected mode.
Session Program Material Timecode Display	When received from the host card, displays running timecode of program material. Timecode data updates regardless of whether session is in progress. This can be used in cueing material directly using the Control Panel.
Session Elapsed Time Display	While session is in progress, displays session elapsed time in hr:min:sec:tenths. If **PAUSE** is pressed, this display freezes. All log entries for a particular session use session elapsed time values in flagging the occurrence of events (such as HI threshold events).
Session On-Screen Error Log	During the course of a session, a color-keyed error log is displayed which is updated per short-term sample intervals. If **PAUSE** is pressed, this display holds any statistics and is then is updated as required when the session resumes. ERROR TYPE / ERROR SEC / % / MAX ERROR True Peak 0.00 0.0 LU High 1.40 77.8 5.1 LU LU Low 0.00 0.0 Dialnorm 0.00 0.0 User-configured error thresholds determine error flagging for log. With **Show Max Error** selected, only maximum error during the course of a session is displayed and logged. ERROR TYPE / ERROR SEC / % / MAX VALUE True Peak 0.00 0.0 -8.6 dBFS (C) LU High 1.40 77.8 5.1 LU LU Low 0.00 0.0 3.9 LU Dialnorm 0.00 0.0 < -150 LUFS With **Show Max Value** selected, maximum values (including errors and valid conditions) during the course of a session are displayed and logged.

Figure 3-4 Session Control Right Display

Setting Up the Audio Loudness Meter

Setup of the loudness meter for most applications can be accomplished using the Basic Setup Using Default Modes instructions below. **Measurement conforming to current standards is accomplished as described in Basic Setup Using Default Modes below.**

For advanced features such as customized loudness measurement parameter settings and event-triggered automation (such as level and timecode triggered session start/stop), refer to Advanced Meter Setup (p. 3-8) after performing Basic Setup described below.

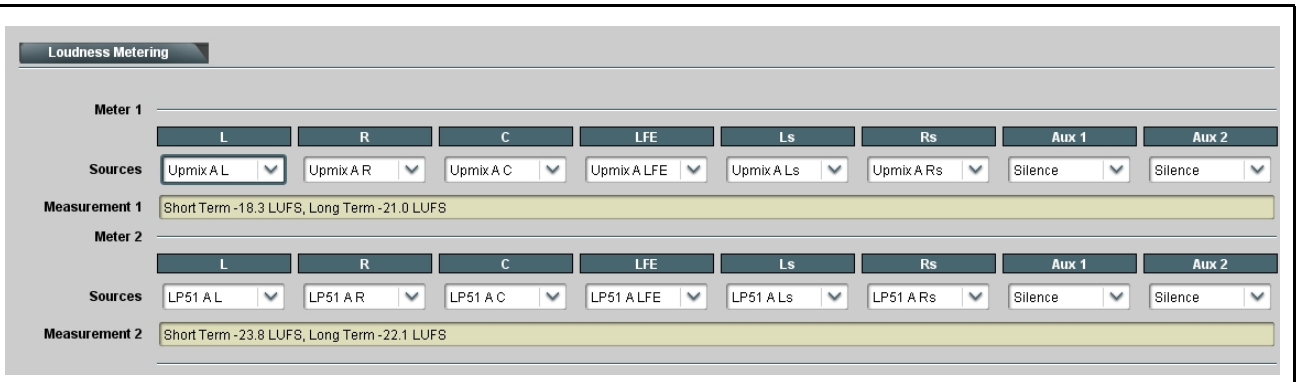
Basic Setup Using Default Modes

Basic setup using default modes means setting up the meter to measure loudness using any of the pre-defined measurement modes (**EBU +9**, **EBU +18**, or **ATSC -24**) to conduct measurements and sessions in accordance to standards EBU R 128 "+9 Scale", EBU R 128 "+18 Scale", or ATSC A/85, respectively. For these modes, perform the following in accordance with instructions provided:

- Assigning Input Channels to Meters
- Configuring Alert Thresholds and Display Units

Assigning Input Channels to Meters

(See Figure 3-5) Input channels assignment to the loudness meter inputs are done through DashBoard™.



In DashBoard, select the **Loudness Metering** tab and set drop-down selections to direct the desired channels to the loudness meter. Host cards that support pre/post loudness metering have a Meter 1 field (which correlates pre-processed channels assignments to the Pre-Processed loudness meter 1) and a Meter 2 field (which correlates post-processed channels assignments to the Post-Processed loudness meter 2).

In this example, upmixed 5.1-channel complement is directed to the Pre-Proc loudness meter 1, and upmixed>loudness processed 5.1-channel is directed to the Post-Proc loudness meter 2.

Figure 3-5 Assigning Input Channels to Meters

Note: Audio loudness meter may have a **Channel** selection submenu. This has been superseded with the DashBoard channel selection described above.

Configuring Alert Thresholds and Display Units

Note: The error threshold settings below affect only user configurable error flagging in displays and logs furnished by the Audio Loudness Meter (for example, LKFS HI and LKFS LO errors). These threshold settings are wholly independent of the LUFS/LKFS measurement function. In gated modes such as EBU R128, LO errors are largely immaterial in that these events are rejected from the integrated/session LUFS by the gating function.

1. Press the **Select Device** key and select **0 This Control Panel**.
2. Select submenu **1 Loudness PPM Settings**.
3. In the eight-segment control screen that appears, press on the adjacent knob to open selection dialogs and perform settings for the following:

Configuration Item	Description	Default Setting
• **Channel Meters**	Sets input channel dB PPM meters to display either: • Absolute (dBFS) • Relative dB units	Absolute
• **Level Scaling**	For Relative units display mode, sets dBFS level that correspondingly results in a 0 dB (rel) level displayed on PPM meters.	-20 dBFS
• **Peak Threshold**	Sets level (in dBFS) at which channel input level ≥ **Peak Threshold** setting results in Peak Error indication.	-1.0 dBFS
• **VU Red**	Sets the level at which channel input level ≥ **VU Red** setting results in red bar segment displayed on channel PPM meters.	-10 dBFS
• **VU Yellow**	Sets the level at which channel input level ≥ **VU Yellow** setting results in yellow bar segment displayed on channel PPM meters.	-20 dBFS
• **Short-term LUFS/ LKFS Bar Display Response**	Sets the response and measurement display interval of the **LKFS Short Term** bar graph display to either moving-average calculated response, or 1-second fast response mode. • **Moving Average** – Display response using user-configured **Moving Average Period** setting. • **1 Second Average** – Display response using 1-second response update.	Moving Average
• **Report Channels**	In generated reports, limits reporting of just L/R channels, or no limits and includes all channels	All channels
• **Max. Error/Max. Value Display**	Sets the on-screen event log to tabulate and display either **maximum error** or **maximum value** attained while a session is running. (See Figure 3-4 on page 3-5 for more information)	Shows Max Error

4. Press the **Select Submenu** key and select **3 Loudness Thresholds**.

5. In the eight-segment control screen that appears, press on the adjacent knob to open selection dialogs and perform settings for the following:

Configuration Item	Description	Default Setting
• **HI Error Threshold**	Sets maximum offset **above** LUFS/ LKFS target level, where exceeded, results in an LKFS violation for the duration of the event.	+4.0 LU above target
• **LO Error Threshold**	Sets minimum offset **below** LUFS/ LKFS target level, where exceeded, results in an LKFS violation for the duration of the event. This condition results in a violation regardless of the duration of the event.	Disabled

6. Press the **Select Device** key and select desired audio loudness meter.

7. Depending on whether or not advanced settings are desired, proceed as follows:
   - If advanced features such as custom loudness measurement parametric settings or automated start/stop are desired, go to Advanced Meter Setup (p. 3-8).
   - If sessions are now to be performed without advanced features, go to Session Setup (p. 3-16).

Advanced Meter Setup

Customizing Loudness Parametric Settings

Note: Custom mode configured with user settings may not be compliant with EBU R 128 or ATSC A/85 standards. Read and understand Appendix A, “Loudness Measurement Guidelines and Techniques” in this supplement and published standards before considering using customized settings.

Individual parameters related to multi-channel loudness measurement can be customized using the Loudness Custom Mode Settings submenu. When a session is then to be run, the **Custom** measurement can be selected to use the customized loudness measurement model.

1. Press the **Select Device** key and select **0 This Control Panel**.

2. Select submenu **2 Loudness Custom Mode Settings**.

3. In the eight-segment control screen that appears, press on the adjacent knob to open selection dialogs and perform settings for the following:

Configuration Item	Description	Default Setting
• **Target LKFS/LUFS**	Sets the user-configurable target LKFS/ LUFS value. (range = 0 to -60 LKFS) **Note:** In EBU modes, this setting sets the "0 LU" target value.	-24 LKFS/ LUFS
• **Absolute/Relative**	When set to Absolute, shows absolute units on short-term and session LKFS/ LUFS displays, as well as in reports. When set to Relative, shows units relative to configured Target LKFS/ LUFS value. Units on short-term and session LKFS/LUFS display as relative (LU), as well as in reports.	Absolute
• **Viewable Range**	For instantaneous bar graph display and accompanying plot in EBU/ATSC Graphing format, selects from: • **27 LU** – Sets bar graph/plot to EBU "+9 Scale" (+9 to -18 LU scale). • **54 LU** – Sets bar graph/plot to EBU "+18 Scale" (+18 to -36 LU scale).	27 LU
• **Moving Average Period**	Sets the duration (in seconds) that sampling time accumulates before each averaging recalculation of measured LKFS. (range = 1 to 60 sec)	3 sec
• **Use EBU Relative Gating**	Enables or disables low-level rejection gating	Disabled
• **Relative Gating Threshold**	When gating is enabled as per above, selects the threshold at which levels equal or below are rejected (gated from) measurement calculations. (range = -8 LU; -10 LU)	-8 LU
• **Units**	Select either LKFS or LUFS units.	LKFS

Signal-Level Triggering

Note: Signal-level triggering can be used with any of the standard measurement modes or the Custom mode.

(See Figure 3-6.) Signal-level triggering can be enabled and configured in which actual session start and stop is triggered by assessing input signal levels. In this mode, the Audio Loudness Meter does not start session measurements and calculations until at least one of the configured input channels exhibits a level exceeding a configurable minimum threshold. When a detected level exceeding the **Trigger Threshold** setting is received, the session starts. In this mode, when an operator presses the **START** button, **Waiting** is displayed until the threshold is crossed, and then **Running** is displayed, indicating level-triggered start. Session stop is also automatically activated using this mode.

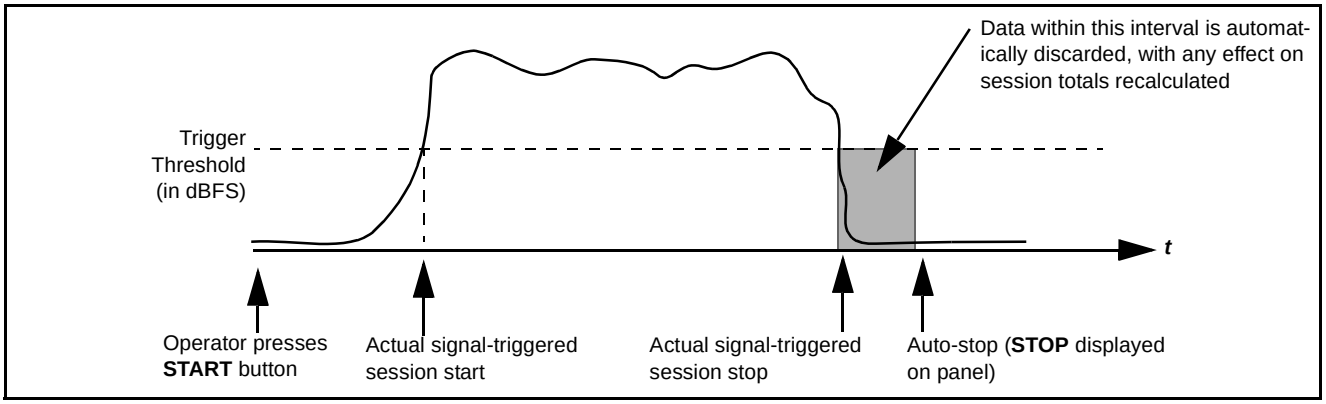


Figure 3-6 Signal-Level Triggering

Set up signal level triggering as described below.

1. Press the **Select Device** key and select **0 This Control Panel**.
2. Select submenu **4 Loudness Meter Automated Triggering**.
3. In **Automated Triggering** submenu, select **Signal**.
4. In the eight-segment control screen that appears, press on the adjacent knob to open selection dialogs and perform settings for the following:

Configuration Item	Description	Default Setting
• **Start Trigger Threshold**	With **signal**-based triggering enabled and **START** button pressed, session measurements and calculations do not start until at least one of the received channels exhibit a level exceeding the Start Trigger Threshold setting. (range = 0 to -60 dBFS)	-60 dBFS
• **Stop Trigger Threshold**	With **signal**-based triggering enabled and session running, when all of the received channels exhibit a level less than the Stop Trigger Threshold setting, the session stops automatically. (range = 0 to -60 dBFS)	-60 dBFS
• **Stop Trigger Duration**	Sets time following point where LKFS session automatically stops. Session LKFS numerical value is recalculated to discard any data after stop trigger threshold is crossed.	5 seconds

Timecode Triggering

Timecode triggering can be enabled and configured in which actual session start and stop is triggered using timecode values received and reported by the host card. In this mode, the Audio Loudness Meter does not start session measurements and calculations until the **Start Trigger Timecode** value is received. In this mode, when an operator presses the **START** button, **Waiting** is displayed until the timecode value is received, and then **Running** is displayed, indicating a triggered start. Session stop is also automatically activated using this mode.

Set up timecode triggering as described below.

1. Press the **Select Device** key and select **0 This Control Panel**.
2. Select submenu **4 Loudness Meter Automated Triggering**.
3. In **Automated Triggering** submenu, select **Timecode**.
4. In the eight-segment control screen that appears, press on the adjacent knob to open selection dialogs and perform settings for the following:

Configuration Item	Description	Default Setting
• **Start Trigger Timecode**	With **timecode**-based triggering enabled and **START** button pressed, session measurements and calculations do not start until entered **start** timecode value is received. (entered in hh:mm:ss)	No default setting
• **Stop Trigger Timecode**	With **timecode**-based triggering enabled and session running, when stop timecode value is received, the session stops automatically. (entered in hh:mm:ss)	No default setting
• **Stop Trigger Duration**	Sets time following point where LKFS session automatically stops. Session LKFS numerical value is recalculated to discard any data after stop trigger threshold is crossed.	5 seconds

Note: Audio loudness meter may have a **Control > Timecode** selection submenu. This has been superseded with the DashBoard outputted timecode. The audio loudness meter uses the timecode format displayed on the host card **Timecode > Output Status** display.

Automated Session Rollover (Daily Restart)

(See Figure 3-7.) Sessions can be set to stop (wrap-up and close session) and then immediately restart (start a new session) at a specified time within the 24-hour day. This allows for very orderly, consistent reports that are automatically generated on a daily basis, with each report subsequently having identical start /stop times and durations (see Post-Session Reports (p. 3-18) for more information about generated reports). The session rollover is fully automatic with no intervention required.

Figure 3-7 shows an example with rollover enabled for 11:30 PM (23:30:00) that will automatically produce daily (24-hour) reports at 11:30 PM.

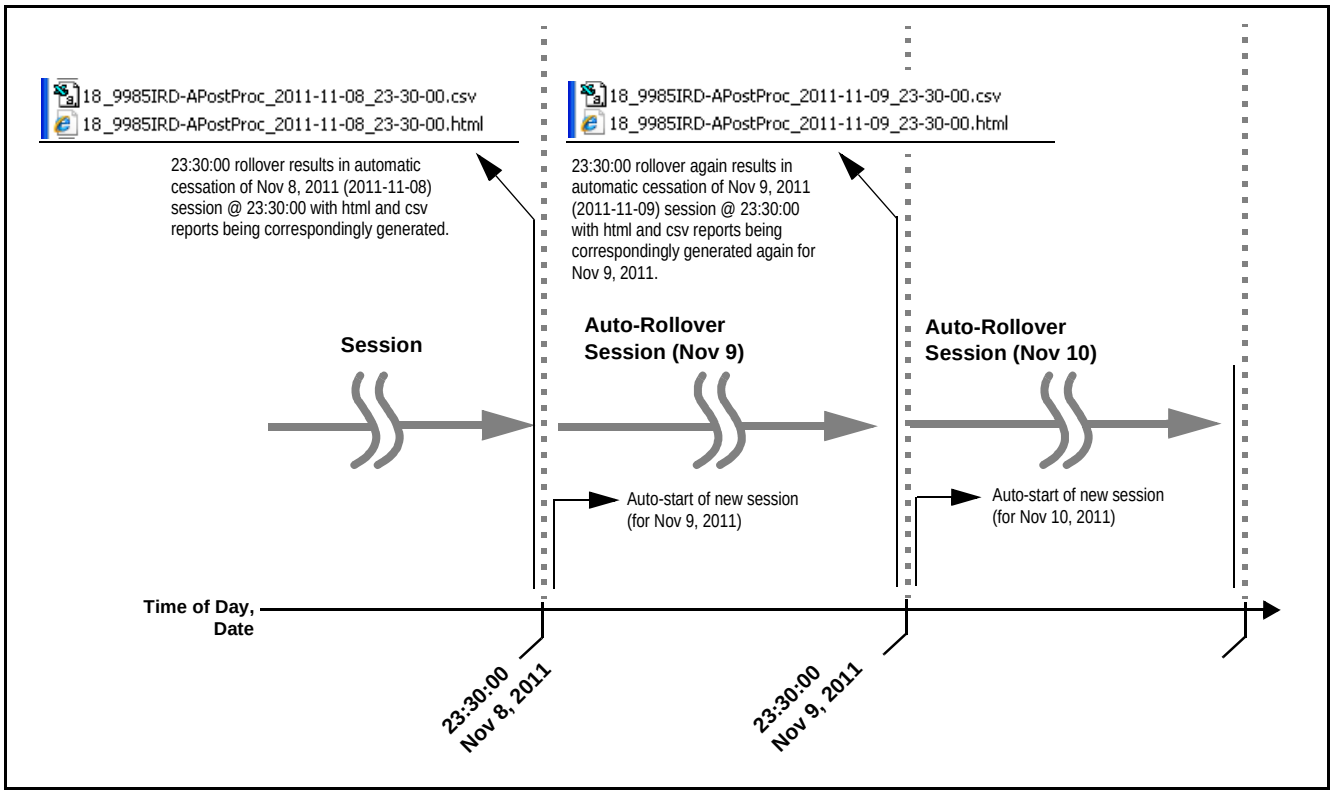


Figure 3-7 Session Rollover Function and Example Reports

Note: Rollover triggering requires that a session be in progress and running before a rollover stop and start can occur. If a session is in cue but waiting due to timecode or signal-level triggering enabled without conditions to start a session, rollover will not occur because there is no preceding session to rollover.

Use care when considering using rollover triggering in conjunction with timecode or signal-level triggering. It is recommended that timecode triggering not be used in conjunction with rollover triggering.

Set up session automatic rollover stop/start as described below.

1. Press the **Select Device** key and select **0 This Control Panel**.
2. Select submenu **4 Loudness Meter Automated Triggering**.

3. In the **Session Rollover time** field, enter the time of day (in military time) in which the rollover session start/stop should occur.
4. Set **Enable Session Rollover** to **Enabled**.
5. Start a session and let it run. When the entered session rollover time occurs, the running session will automatically stopped (with its report being generated upon cessation) and a new session will automatically start. This cycle will continue indefinitely unless the Enable Session Rollover control is set to disabled.

Note:
- OGCP-9000 has limited device memory (as compared to memory available on a computer). If daily rollover is used, it is recommended to save the session data off of the control panel, and then delete the on-device sessions to free-up memory. This should be performed at least weekly.
- .csv reports are available only on WinOGCP.

Multi-Segment Session Aggregate (Option +SESSION)

Option

Note: Option **+SESSION** is an option that is added to Loudness Metering **+LM** and is available only for WinOGCP.

Licensable feature **+SESSION** allows an Aggregate Session, in which a session is run in segments (for example several segments over several days), with each new segment joined with previous segments to comprise an aggregate session at the conclusion. Using this feature, when a session is run, it can be paused and its data saved in a .ses file. WinOGCP can be exited indefinitely. When ready to continue on with another session segment (for example again, on the next day), WinOGCP can be opened again and the saved .ses file then loaded. When loaded, WinOGCP will be ready to start a session again while taking in this data as part of a subsequent session.

After finally closing an aggregate session, a single file set of .html and .csv reports are generated showing:

- the total session run time of all unpaused segments, and
- the aggregate LKFS of all unpaused session segments.

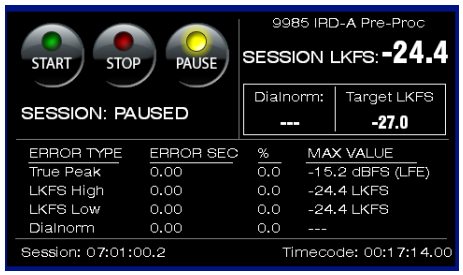
In this manner, a single report is availed that is identical as if all the segments were run in a continuous, uninterrupted session. Contact Cobalt Support to expedite obtaining a license key for WinOGCP. (As with all licensable features, the license is a purchased item and is applicable on a per-panel basis.)

Use this feature as described below and shown in the Figure 3-8 example.

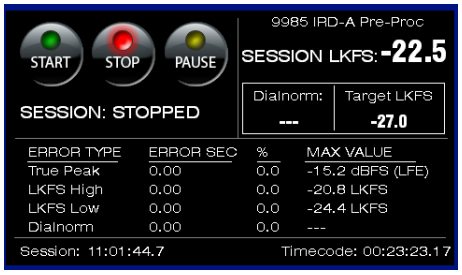
1. Run the first segment of a session by pressing **RUN**.
2. When the first segment is completed, press **PAUSE**.

3. At this point, WinOGCP is ready to download this segment's data.
   - In WinOGCP tool bar, click **Session** and select **Save Session State**.
   - In the browser that appears, save the .ses file and close WinOGCP.
4. When ready to resume with another session segment, open WinOGCP and upload the .ses file:
   - In WinOGCP tool bar, click **Session** and select **Load Session State**.
   - In the browser that appears, browse to and select the saved .ses file.
5. WinOGCP now displays **PAUSED**, along with the Session LKFS and session running time left over from the previous segment. Start a new segment by pressing **RUN**.
6. When this segment is done, depending on whether another segment will be run (or the overall session is to be concluded) proceed as follows:
   - **To set up to save for more segmented sessions** – Press **RUN** to run another segment and then press **PAUSE** at the end of segment. Repeat steps 3 thru 5 to save the session data. The .ses file now reflects data from this segment and any other aggregated segments using this feature. Press **RUN** again to perform another segment and repeat these steps.
   - **To conclude the overall aggregate session** – At end of last segment, simply press **STOP**. This wraps up the overall session. At this point, WinOGCP displays the final aggregate LKFS Session value and final session elapsed time. Also at this point just like a regular unsegmented session, both html and cvs reports are generated, with the reports reflecting aggregate LKFS and time stamps just like regular reports.

Note: +SESSION option generates intermediate .html and .csv files in the same folder where the .ses is saved. Do not use these report files; the consolidated aggregate reports are available as normal using the WinOGCP tool bar and going to **View** > **Report Directory**. (These intermediate files can be deleted after an aggregate session is concluded if desired.)



1 First segment of session is run and then **PAUSE** is pressed at end of segment (in this example, a 7-hour session yielding a session LKFS of -24.4).



6 Second segment is now run by pressing **RUN** and then stopped or paused at end of segment.

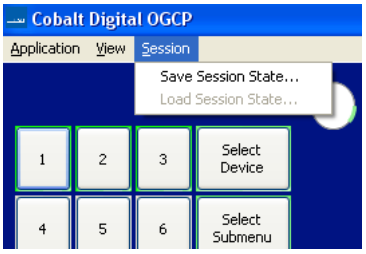
The aggregate for the overall session is reported on WinOGCP and in a single, consolidated report (in this example yielding an 11-hour aggregate session and a -22.5 LKFS aggregate LKFS).

First Segment

Second Segment

Session Pause

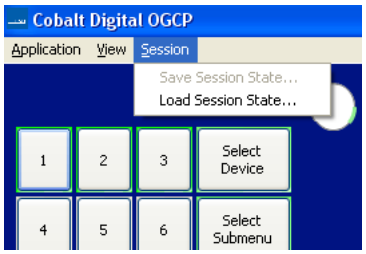
2 Session segment is downloaded to host PC by clicking **Session** > **Save Session State**. (In this example, "ses1-1-31-13.ses" is saved to My Documents.)



3 WinOGCP can now be closed. The previous segment's data is saved in "ses1-1-31-13.ses" in this example.

5 WinOGCP shows **PAUSE**, with session LKFS and time reflecting that from previous segment.

Press **RUN** to continue with aggregate session.



4 WinOGCP is opened on next day. WinOGCP data from previous day is uploaded by clicking **Session** > **Load Session State** and selecting the .ses file (in this example, "ses1-1-31-13.ses").

Figure 3-8 Example Flow Using +SESSION Multi-Segment Aggregate Session

Session Setup

Pre/Post Metering Shortcut

Just like other card control displays on the Control Panel, functions tied to specific cards are invoked by selecting a particular Device. Typically, a Control Panel set up for Loudness Metering has **Device 1** as the pre-loudness processed meter and **Device 2** as the post-loudness processed meter.

When the panel is set to display any of its devices, pressing the corresponding shortcut key on the keypad invokes the desired meter without having to go through the Select Device menu.

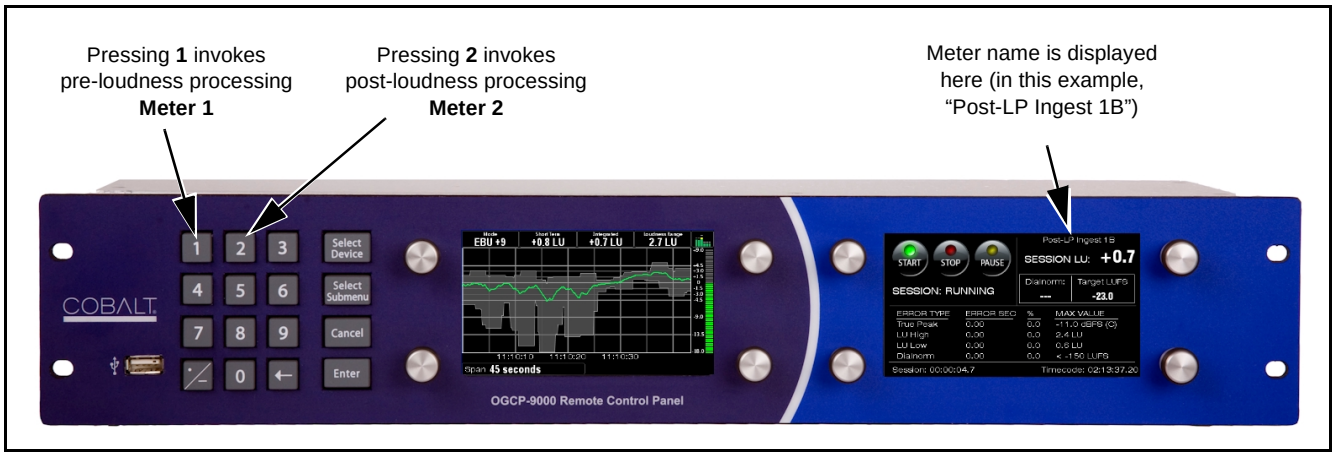


Figure 3-9 Loudness Meter Shortcuts

Note:
- Loudness meter(s) on your Control Panel may have different Device number(s) than shown in this example. The number entered on the shortcut is the same as the device number displayed under the **Select Device** menu.
- Only Fusion3G® cards support pre-loudness processing measurement

Running a Session

Table 3-2 lists and describes the typical steps and Audio Loudness Meter interaction performed by a QC operator in using the Audio Loudness Meter to assess program material.

Table 3-2 Typical Operator Workflow Using the Audio Loudness Meter

Task	Description
Select desired measurement mode	Before starting a session, make certain the intended measurement mode (EBU +9, EBU +18, ATSC -24, or Custom) is selected using **Mode Select Control** as shown in Figure 3-3 on page 3-4.
Cue program material before start of material	Cued before start of material content, the operator should cue the material and be ready to start the session using the meter.

Table 3-2 Typical Operator Workflow Using the Audio Loudness Meter — continued

Task	Description
Roll material and start session	With material rolling, immediately after cue tone or 0-count marker, session should be started by pressing the meter **START** button. **Note:** Enabling and configuring the Signal-Level or Timecode Triggering feature helps circumvent operator error for this step.
Observe meter input levels and error log displays	The operator should make certain all intended channels are reporting audio levels. The operator should also monitor the **ERROR TYPE** log on the Control Panel right-side display panel. With appropriate guidance, an operator can be trained to immediately detect and reject material logging excessive errors, thereby not unnecessarily spending time on a severely flawed piece. For LKFS input channels (L, R, C, Ls, Rs), whenever the Short-Term LKFS display shows a HI error, individual channel heading changes to red for channel(s) most likely contributing to the overall HI LKFS error (in this example, the Rs channel). **Note:** Individual channel errors displayed for an aggregate LKFS HI error are always the channels observed most likely to be contributing to the overall error. However, when considering correction for offending channel(s), make sure intended production aesthetics for the mix have been considered. (For example, if a channel containing dialog contributed to a HI error but requires its current level balance respective to other channels, consider proportional reduction of **all** channel levels.)
(ATSC -24 Mode Only) Use the PAUSE button to exclude dramatic silence in material from session	If the material contains significant amounts of intended silence or very low audio levels (for example, long periods without dialog or music), the **PAUSE** button allows rejection of these intervals from measurement, thereby resulting in a more representative assessment of actual LKFS.
Press the STOP button immediately after end of material content	Immediately after end of material content, session should be stopped by pressing the meter **STOP** button. **Note:** Enabling and configuring the Signal-Level or Timecode Triggering feature helps circumvent operator error for this step.
Expedite per meter assessment	The meter provides unambiguous assessment of program material per configured parameters when a session is performed noting the techniques described above. The assessment is shown in the **SESSION** display on the right display panel. Expediting passed or failed material should be handled per your procedures and practices.

Post-Session Reports

Session data can be reviewed and archived using a Session Report utility and by using the Loudness Meter Data .csv output utility as described below/

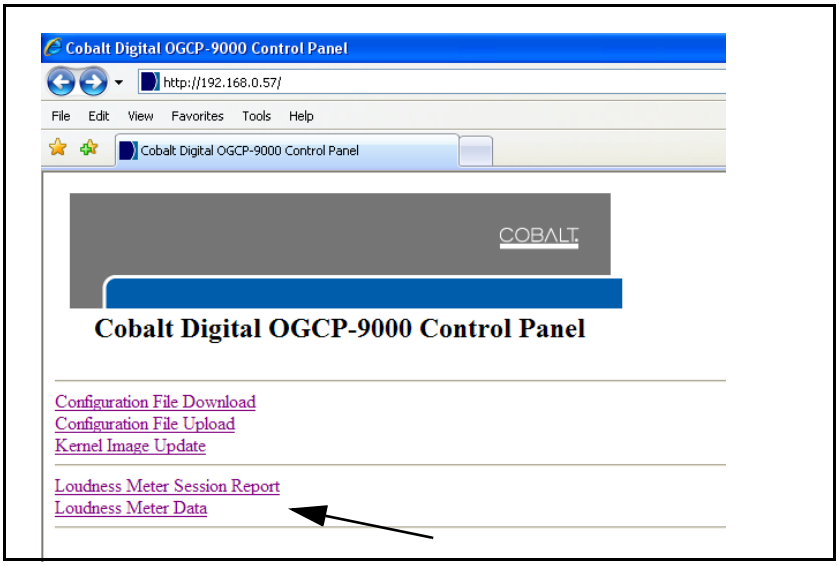
Loudness Meter Session Reports (OGCP-9000)

Figure 3-11 shows an example of a web post-session report, which can be accessed and displayed via a web browser pointing to the Control Panel IP address. The report can be manipulated just as any other web page (i.e., used for copy/paste, printed, or saved as a file).

Note:
- If a report for a session is to be saved, it should be performed before another session is run. Conducting another session without downloading the report will result in loss of present report.
- .csv reports are not available on OGCP-9000.

Access a session report as follows:

1. Open a browser window and enter the Control Panel IP address on a computer connected to the frame LAN ("192.168.0.57" in the example shown below).
2. When the screen shown below appears on the computer, click on Loudness Meter Session Report to display the web screen of the session.



Note: Some computers use web browsers that cache web content. Therefore, the displayed report web page may initially not be current. Check the displayed report **Session Duration** versus that displayed on Control Panel.

If the report appears not to be current, on the computer hold CNTRL key and press the refresh button to obtain current (non-cached) report.

Loudness Meter Session Reports (WinOGCP)

Figures 3-10 thru 3-12 show the WinOGCP Report Directory and examples of web and .csv post-session reports. The report can be manipulated just as any other web page (i.e., used for copy/paste, printed, or saved as a file).

Access a session report by clicking **View > Report Directory**. A browser opens as shown in the example below. Companion web and .csv reports are listed in chronological order.

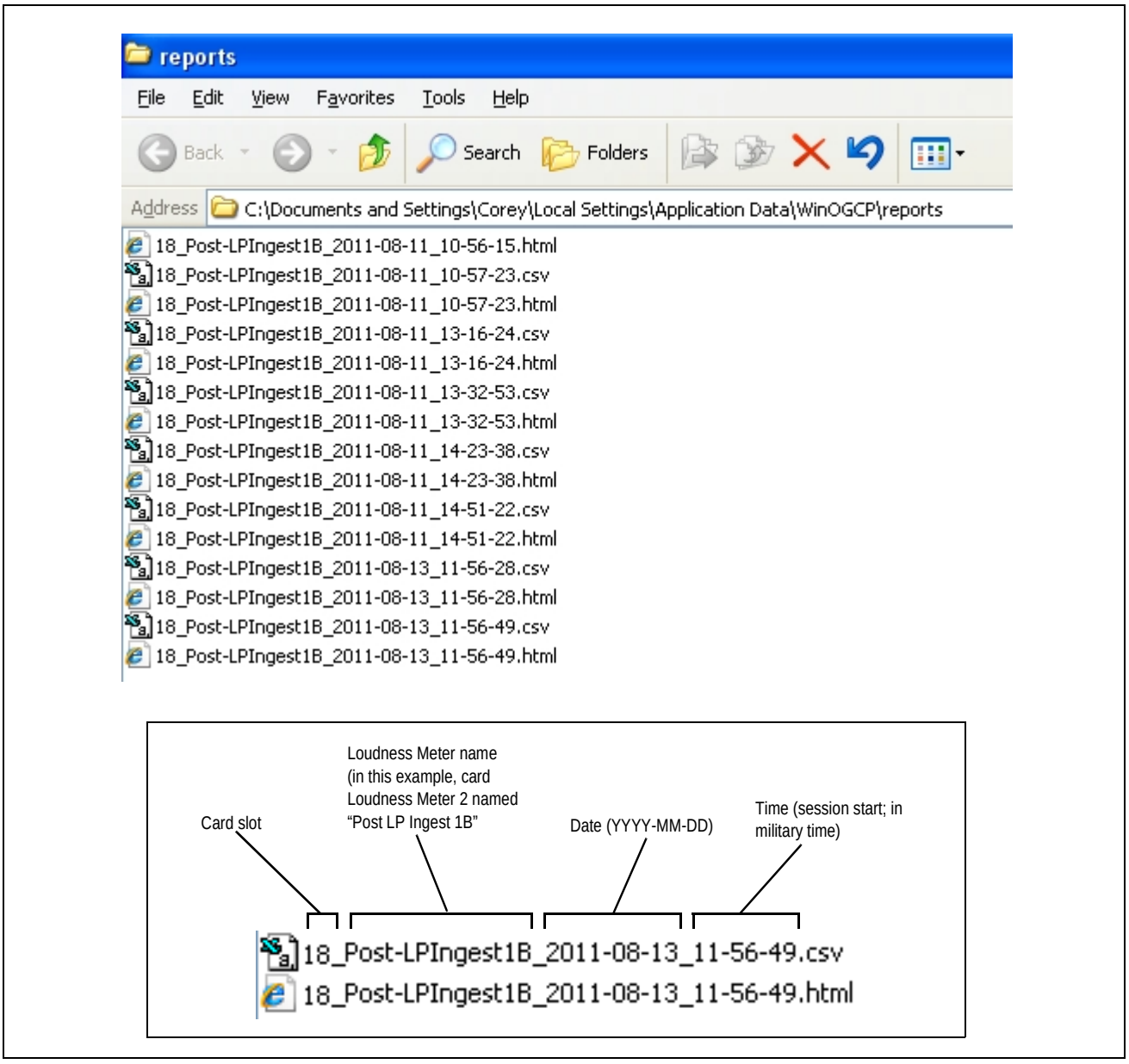


Figure 3-10 WinOGCP Report Directory

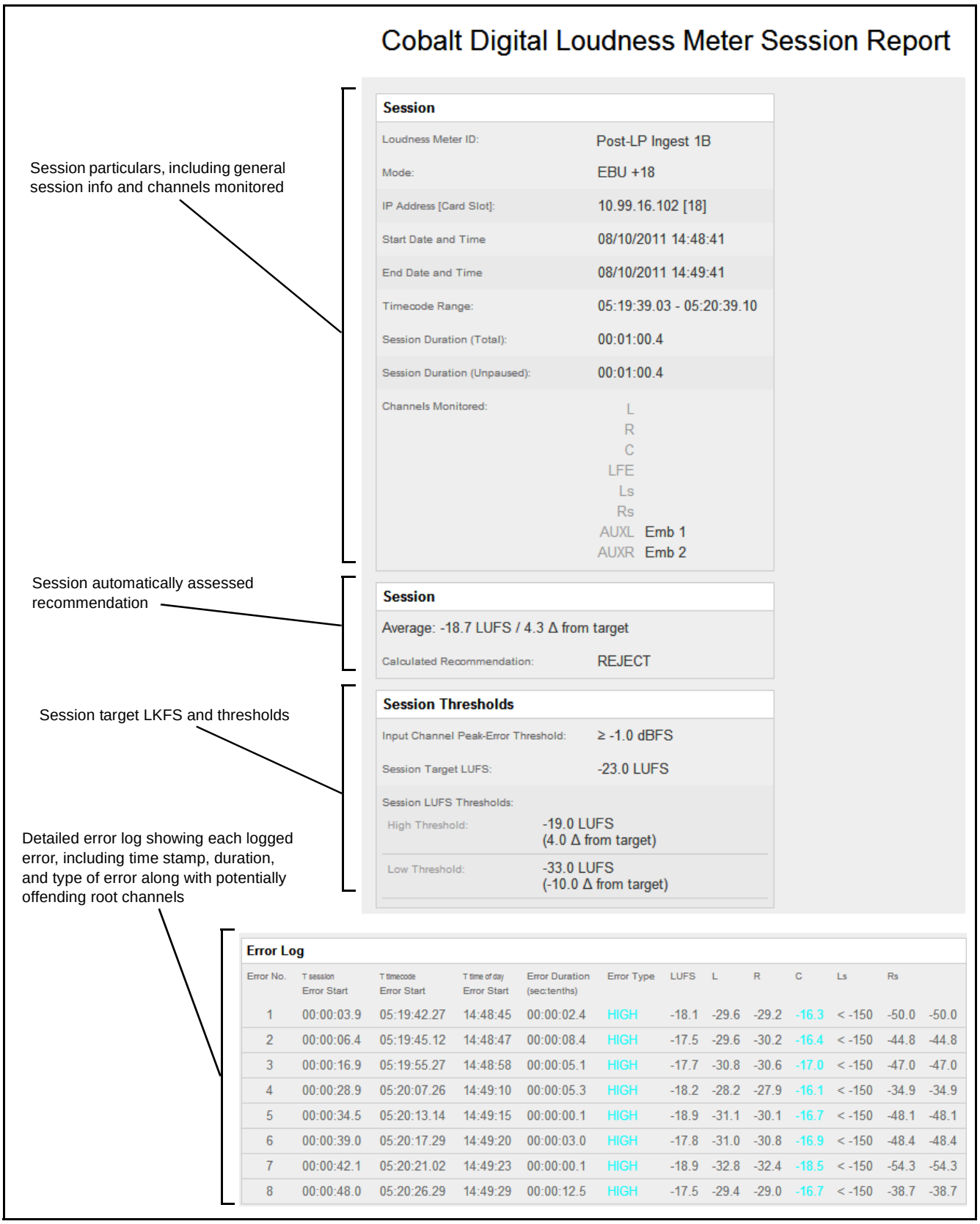


Figure 3-11 Example Post-Session html Report

Session particulars, including general session info, target/ threshold settings, and channels monitored

	A	B	C
1	Loudness Meter Session Raw Data		
2	Cobalt Digital, Inc.		
3			
4	Session Information		
5	Loudness Meter ID	Loudness Meter 1A	
6	IP Address [Card Slot]	192.168.0.27 [3]	
7	Session Started		
8	Session Ended		
9	Video Format	525i_5994 SDI	
10	Channels Monitored		
11	L	Emb 1	
12	R	Emb 2	
13	C	Emb 3	
14	LFE	Emb 4	
15	Ls	Emb 5	
16	Rs	Emb 5	
17	AUXL	Emb 7	
18	AUXR	Emb 8	
19			
20	Session Thresholds		
21	HI Short-term Threshold (HST)	-16.0 (8.0 from target)	
22	HI Long-term Threshold (HLT)	-20.0 (4.0 from target)	
23	HLT Max Time (THLT)	5	
24	LO Long-term Threshold (LLT)	-28.0 (-4.0 from target)	
25	LO Short-term Threshold (LST)	Disabled (Disabled from target)	
26	LLT Max Time (TLLT)	5	

0.5-second updated total short-term LKFS and individual channel LKFS levels (LKFS channels) and peak dBFS (all monitored channels)

28	Raw Session Data						
29	Session Time	Timecode	Time of Day	Total Loudness	Loudness (L)	Loudness (R)	Loudness (C)
30	00:00.1			-13.6	-27.4	-22.4	-19.4
31	00:01.6			< -150	-150	-150	-150
32	00:03.1			< -150	-150	-150	-150
33	00:04.6			< -150	-150	-150	-150
34	00:06.1			< -150	-150	-150	-150
35	00:07.6			-18	-23.4	-18.4	-15.4
36	00:09.1			-14.8	-23	-18	-15
37	00:10.6			-12.8	-23	-18	-15
38	00:12.1			-12.8	-23	-18	-15
39	00:13.6			-16.8	-150	-150	-150
40	00:15.1			-18	-150	-150	-150
41	00:16.6			< -150	-150	-150	-150
42	00:18.1			< -150	-150	-150	-150
43	00:19.6			< -150	-150	-150	-150
44	00:21.1			< -150	-150	-150	-150
45	00:22.6			< -150	-150	-150	-150
46	00:24.1			-21.8	-27.2	-22.2	-19.2
47	00:25.6			-13.8	-23	-18	-15
48	00:27.1			-12.8	-23	-18	-15
49	00:28.6			-12.8	-23	-18	-15
50							

• • •

Loudness (LS)	Loudness (RS)	Peak (L)	Peak (R)	Peak (C)	Peak (LFE)	Peak (LS)	Peak (RS)	Peak (AUXL)	Peak (AUXR)	Errors
-150	-150	-150	-150	-150	-150	-150	-150	-150	-150	H
-150	-150	-150	-150	-150	-150	-150	-150	-150	-150	
-150	-150	-150	-150	-150	-150	-150	-150	-150	-150	
-150	-150	-150	-150	-150	-150	-150	-150	-150	-150	
-150	-150	-150	-150	-150	-150	-150	-150	-150	-150	L
-150	-150	-20	-15	-12	-10	-150	-150	-150	-150	
-150	-150	-20	-15	-12	-10	-150	-150	-150	-150	H
-150	-150	-20	-15	-12	-10	-150	-150	-150	-150	H
-150	-150	-150	-150	-150	-150	-150	-150	-150	-150	H
-150	-150	-150	-150	-150	-150	-150	-150	-150	-150	H
-150	-150	-150	-150	-150	-150	-150	-150	-150	-150	H
-150	-150	-150	-150	-150	-150	-150	-150	-150	-150	
-150	-150	-150	-150	-150	-150	-150	-150	-150	-150	
-150	-150	-150	-150	-150	-150	-150	-150	-150	-150	
-150	-150	-150	-150	-150	-150	-150	-150	-150	-150	L
-150	-150	-150	-150	-150	-150	-150	-150	-150	-150	L
-150	-150	-20	-15	-12	-10	-150	-150	-150	-150	
-150	-150	-20	-15	-12	-10	-150	-150	-150	-150	H
-150	-150	-20	-15	-12	-10	-150	-150	-150	-150	H
-150	-150	-20	-15	-12	-10	-150	-150	-150	-150	H

Error flags for segments exceeding thresholds

Figure 3-12 Example Loudness Meter .csv Data Report

Troubleshooting

Because the Audio Loudness Meter option is installed on a currently up-and-running Control Panel and host card, installation is very straightforward with typically no changes being performed on the Control Panel and host card other than installation and configuration of this option. Therefore, common basic checks and general/network troubleshooting information referring specifically to the Control Panel and host card and its frame are not duplicated here; these items should be checked as applicable. If the Control Panel or functions in this option do not seem to be responding, always first check network connectivity of the host card frame and Control Panel in accordance with the Troubleshooting sections of the manuals listed below.

- Refer to Product Manual that came with your OGCP-9000 or WinOGCP Control Panel for Control Panel troubleshooting information (including network troubleshooting).
- Refer to Reference Guide “Remote Control User Guide” (PN 9000RCS-RM) for networked frame troubleshooting information.
- Refer to the Product Manual for the host card for card operating, signal validity checks, and network connectivity checks.

Errors or unusual operation of this option are typically related to one or more parameters not being set as expected or required. Information to help isolate these type of errors is provided below.

Table 3-3 Troubleshooting Processing Errors by Symptom

Symptom	Error/Condition	Corrective Action
Control does not respond to changed settings	Lock icon indicates changes cannot be made at this time. This is typically displayed if changes are attempted while a session is running.	Stop session, then change setting.
No Data displayed on Control Panel.	Host card associated with Control Panel/Audio Loudness Meter option not receiving intended video/audio signal.	Using the Control Panel, DashBoard™ or card edge indicators, make certain host card is receiving intended signal (for example, if embedded channels are being fed to the Audio Loudness Meter, make certain SDI input is present and card DashBoard Audio Input Controls tab shows audio present for intended channels).

Table 3-3 Troubleshooting Processing Errors by Symptom — continued

Symptom	Error/Condition	Corrective Action
No IP Connection displayed on Control Panel.	Frame with host card (target frame) not visible to Control Panel.	Make certain intended target frame is properly connected to network. **Note:** Host card frame must be set for static IP address. If set for DHCP, address change will not be recognized by Audio Loudness Meter configuration file.
No Card in Slot displayed on Control Panel.	Host card(s) not present or in wrong slot/frame.	Make certain host card(s) is in frame /slot location as specified in Control Panel Audio Loudness Meter option configuration file. **Note:** Host card frame must be set for static IP address. If set for DHCP, address change will not be recognized by Audio Loudness Meter configuration file.
Feature Missing displayed on Control Panel.	Audio Loudness Meter feature option is not activated on host card(s) selected by the Control Panel Audio Loudness Meter option configuration file.	The host card selected by the configuration file must have the Audio Loudness Meter feature activated in order for the card to report data to the Control Panel. Make certain designated card has this feature activated. Check for presence of the feature in DashBoard™ by going to the **Licensable Features** tab; the feature is indicated by **Audio Metering** appearing in this pane when the tab is selected. **Note:** Audio Loudness Meter feature resides in the host card. If the card is replaced (even with a same-model card), the feature requires reactivation in the replacement card before it can provide the feature.
Channel input level not being displayed on PPM meters.	Channels not routed on Control Panel as expected.	Check channel routing as described in Setting Up the Audio Loudness Meter (p. 3-6).
Session will not start	Automated triggering erroneously engaged	If automated triggering (signal-level or timecode based) is not intended, make certain **Automated Triggering** is set to **Disabled**. (menu): **0 This Control Panel** > (submenu): **4 Loudness Meter Automated Triggering** > - **Disabled**

Table 3-3 Troubleshooting Processing Errors by Symptom — continued

Symptom	Error/Condition	Corrective Action
Unusually high amount of channel level errors (overpeak or LKFS HI).	• Channel meter thresholds improperly set	• Make certain parameters are set as intended.
	• Unused inputs may have signal level present	• Make certain all meter input channels are either routed to intended channels or set to **Silence** for unused channels. **Note:** Do not use analog or Dolby input channel setting for unused channels. These inputs cannot be assured of full muting with an unused or open input.
	• Undecoded Dolby® E or AC-3 channels routed to Audio Loudness Meter input channel	• Encoded Dolby E or AC-3 data cannot be directly applied to an input channel. Encoded Dolby E or AC-3 data require a host card having the Dolby Decoder option (-DEC). Decoded channels can then be routed to the Audio Loudness Meter input channels.
Timecode not present (or shows **?** (question mark))	• Timecode selection on Audio Loudness Meter not compatible or not correctly set for timecode supported by host card.	• Make certain parameters are set as intended. Check as described in Timecode Triggering (p. 3-11).
	• Host card not receiving intended timecode format	• Using DashBoard, Control Panel or card edge controls, check host card **Timecode** display. Make certain intended timecode format is available and shown as **Locked**.

Appendix A

Loudness Measurement Guidelines and Techniques

Note: The EBU +9, EBU +18, and ATSC -24 modes are factory configured with all parameters conforming to the respective standards and are ready for immediate use. This information is supplemental and for general information only. Read and understand applicable standards and this appendix if intending to use the meter Custom mode.

This appendix provides a condensed guide to practical techniques for using the Audio Loudness Meter to properly measure and assess loudness in various types of program material.

The content here is in general accordance with ATSC A/85, "ATSC Recommended Practice: Techniques for Establishing and Maintaining Audio Loudness for Digital Television". This document is available free of charge and can be downloaded by going to:

http://www.atsc.org/standards/practices.php

About Loudness Measurement Applied to Program Material

A very useful aspect of the loudness measurement model is that a target and a measured end-assessment are based upon simple, single-value LKFS measurements that can be unambiguously displayed and assessed. (Additionally, the Audio Loudness Meter can provide a simple pass or fail result for the piece based on the target and thresholds configured for the target LKFS value.) When properly performed as described in this appendix, the LKFS measurement model accommodates reasonable short-term loudness variations in most types of professionally produced material without nuisance failure indications or ambiguous results.

The loudness measurement model specified in ATSC A/85 uses the LKFS loudness unit to provide the simple, single-unit value that can be used to assess program material loudness. This measurement is obtained by running a loudness **session** on the program material being assessed. Basically, before an assessment can be performed, two important initial facets must be considered:

- **Target LKFS Value** – Using the Audio Loudness Meter, this is the desired reading that is to be obtained following the session for a given segment or piece of program material. Determining the target LKFS value is described in detail below.

- **Measurement Technique** – Before running a session on the material, consideration should be given in using techniques that result in the most meaningful or representative LKFS value for the session. These techniques are described below, along with techniques suggestions suitable for various types of program material.

Determining Target LKFS Value

(See Figure A-1.) Adherence to a target LKFS value across various program material (typically from any number of individual, diverse sources) relieves viewers from having to constantly adjust program volume at their homes in order to maintain an overall comfortable, desired loudness level. General guidelines for determining a target LKFS value are as follows:

- Unless specified by a metadata dialnorm value or some other specified guidance, target LKFS should be at or about -24 ±2.0 LKFS (that of the typical dialnorm value) across any portion of program material containing any appreciable audio content (anything other than dramatically or aesthetically intentional silence).
- Because the LKFS unit of measure is directly derived from the decibel, a gain change of a given amount modifies measured LKFS by the same amount. For example, material exhibiting an LKFS of -12 LKFS can be made to match that of material exhibiting a -24 LKFS level by **reducing** the overall level at the source by 12 dB.
- Where local content is to be added to a network-supplied feed (e.g., local commercial insertion, PSA, etc.), care should be taken that the LKFS level of local content matches that of the LKFS level of network content.
- Dynamic Range Control (DRC) control/management systems by themselves cannot unconditionally be relied upon to assure proper LKFS compliance. Many DRC systems use measurement/control schemes that do not reflect perceived loudness. A system specified to use energy measurement/assessment models reflecting perceived loudness, such as the Cobalt® OPT-SW-LP Loudness Processing option (licensed from Linear Acoustic™), can reliably provide DRC to achieve LKFS compliance.

Figure A-1 shows an example of measuring LKFS for an ingest piece and using the result to assess and remedy the loudness variation between the piece and a network feed.

In addition to setting a target LKFS value, the Audio Loudness Meter provides means to set thresholds above and below a target LKFS value in which an **LKFS HI** or **LKFS LO** error is indicated to a QC operator. These configurable parameters are described in detail in “Post-Session Reports” in Chapter 3,“Operating Instructions”.

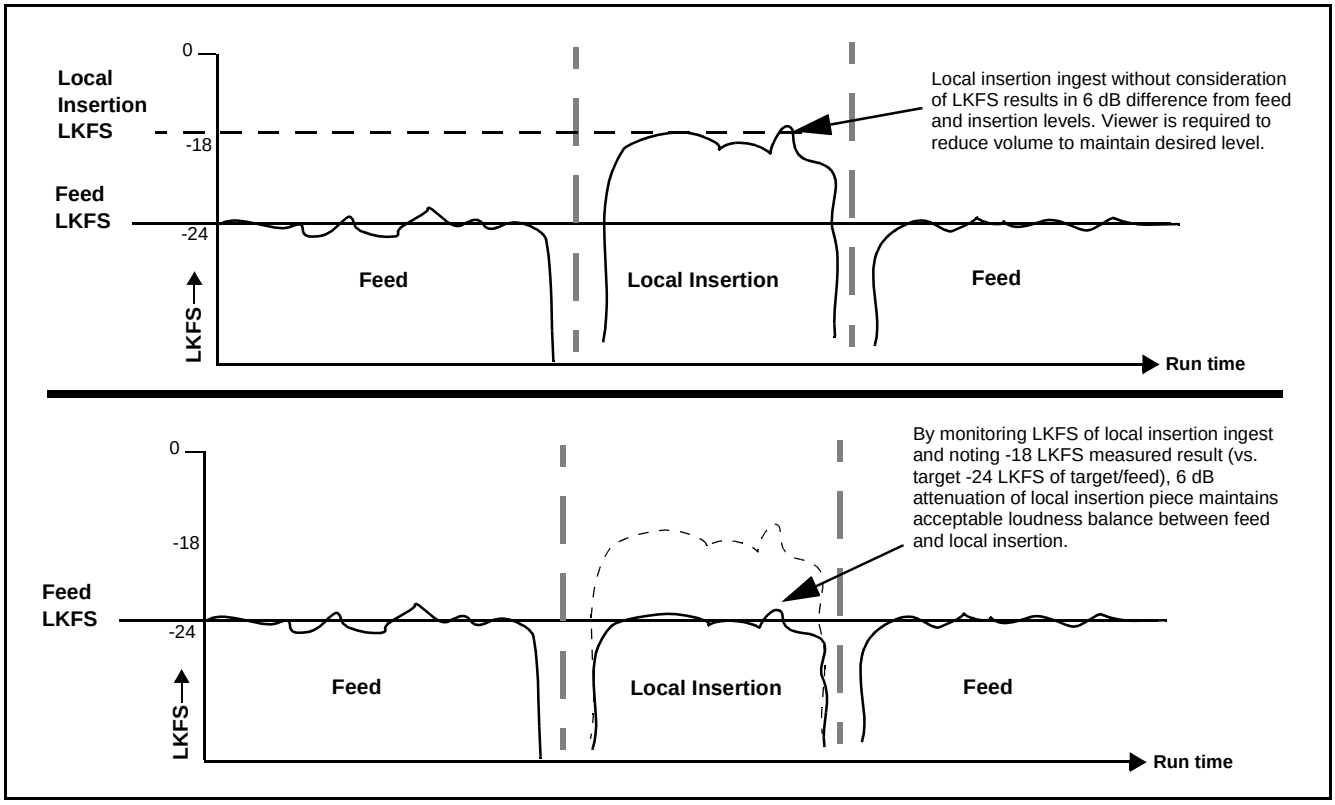


Figure A-1 Balancing LKFS Across Different Material Sources

Measurement Techniques For Various Program Material Forms

Because of the sometimes intentional broad variance of overall levels and audio density in various types of program material, consideration must be given in applying techniques that concentrate only on meaningful segments within a piece where representative LKFS results can be obtained. Currently, a fully automated means of accurately assessing session LKFS for all cases or forms of material has not been specified in ATSC A/85. Therefore, techniques appropriate for the material must be applied. This section provides guidance and examples of properly applied techniques for various cases and forms of typical program material.

Importance of an Anchor Element

ATSC A/85 defines an **anchor element** as the aural element in material that serves as the item within a group of sounds that assumes a dominant role and is the “center of attention”. For example, in a piece containing relatively constant dialog (such as a typical commercial), the mix and creative input would typically position this dialog as the predominate or “anchor” element in the mix (in terms of both relative level and channel placement). As such, all other elements would normally have levels that proportionally track and stay well below that of the anchor element. For example, in program material consisting of dialog and background sounds or music, the anchor element would be dialog with other sounds **substantially** lower in level.

Note that in a given piece, the anchor element can change assignment within the course of the material (for example, at the end of a commercial where score music or a jingle now may assume the role of creative dominance and correspondingly become the anchor element).

Assumptions and Conditions For Meaningful LKFS Measurements

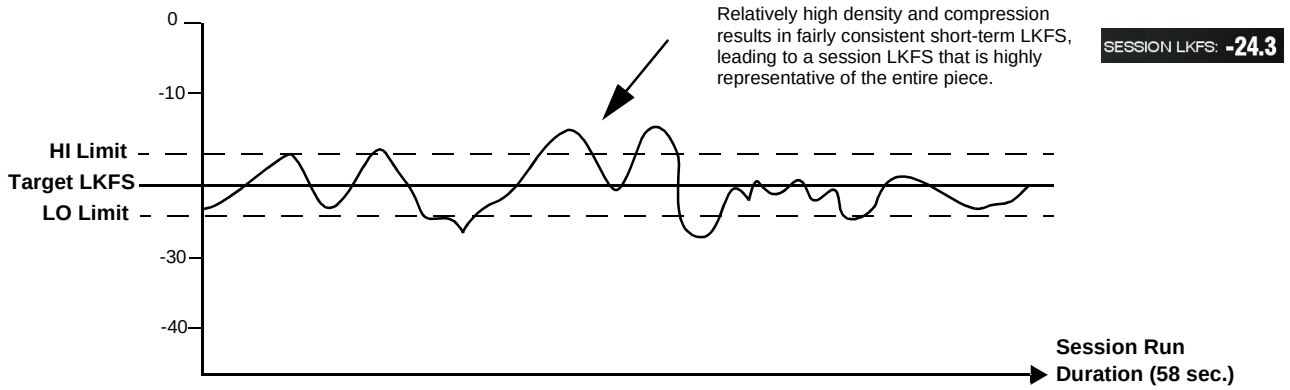
Again depending on the material form, meaningful LKFS measurement and assessment can be very straightforward or, conversely, require some techniques to help ensure a meaningful assessment is obtained. Very straightforward assessments can be obtained when the following are present and/or observed:

- Typical production aesthetics with typical post-production refinement using moderate, controlled compression and aural content density.
- Consistent audio levels in center channel throughout the piece (e.g., dialog or music score).
- Dialog (or equivalent) serving as an anchor element.
- Material containing no excessive periods of unusual loudness or silence.
- LKFS is intended as a long-term measurement. The shorter the averaging period or overall session, the less representative an assessment is of a given pice of ingest material. Where feasible, the session should run the entire length of the ingest material. If the material does not contain an anchor element, the predominate element (e.g., featured music or obvious effects) should serve as the anchor.

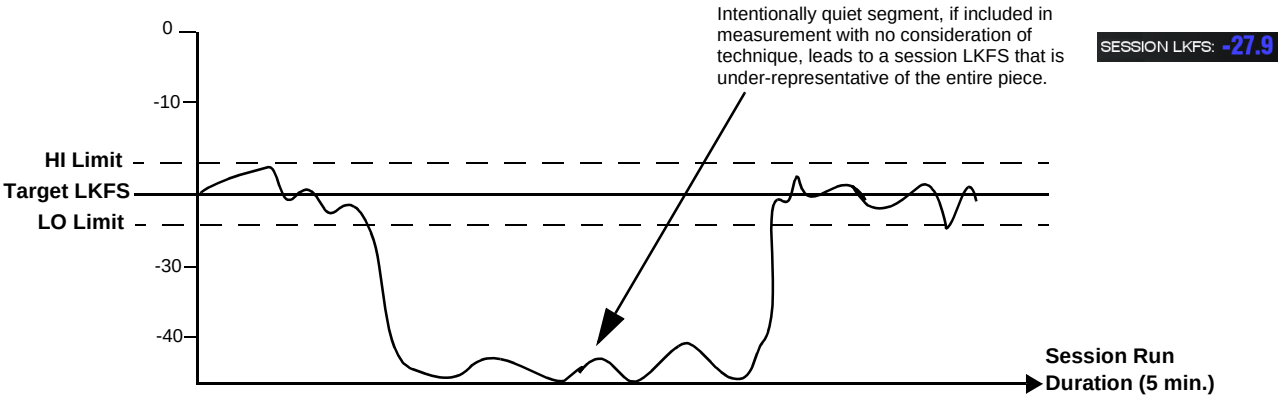
In these cases, the Audio Loudness Meter can be used with its default settings, with a session consisting of a simple session start and stop at the start and end of program material run.

Figure A-2 shows an example (using a target LKFS of -24.0) where these assumptions can be followed, and an example where certain techniques should be applied in order to obtain a meaningful LKFS assessment.

60-second Commercial with Dialog and Background Music. In this example, predominate dialog in the center channel serves as an anchor element. Because of the relatively compressed and dense audio content, an LKFS session can be started at the start of audio content, allowed to run unabated through the course of the material, and then stopped at cessation of audio. The session LKFS reading obtained can reliably be used to apply gain adjustment that correspondingly provides loudness correction.



5-minute Nature Show Act with Narrative/Background Music and Creative-Element Near Silence. In this example, predominate narrative dialog in the center channel serves as an anchor element, with subordinate elements being music score and ambient soundtrack. However, the piece also contains a significantly long segment containing only very low-level ambient soundtrack during a nature close-up sequence. This loudness change is creatively intentional and must be maintained. If this segment is included in the session LKFS measurement, it can result in an under-representation of overall perceived loudness. If the gain is increased to compensate for this under-represented LKFS, loudness during periods of narrative/music will be unacceptably high. As such, proper technique would be to pause the session during the quiet portion (or use a measurement mode that uses gating), and resume the session when the intended, representative anchor element re-appears.



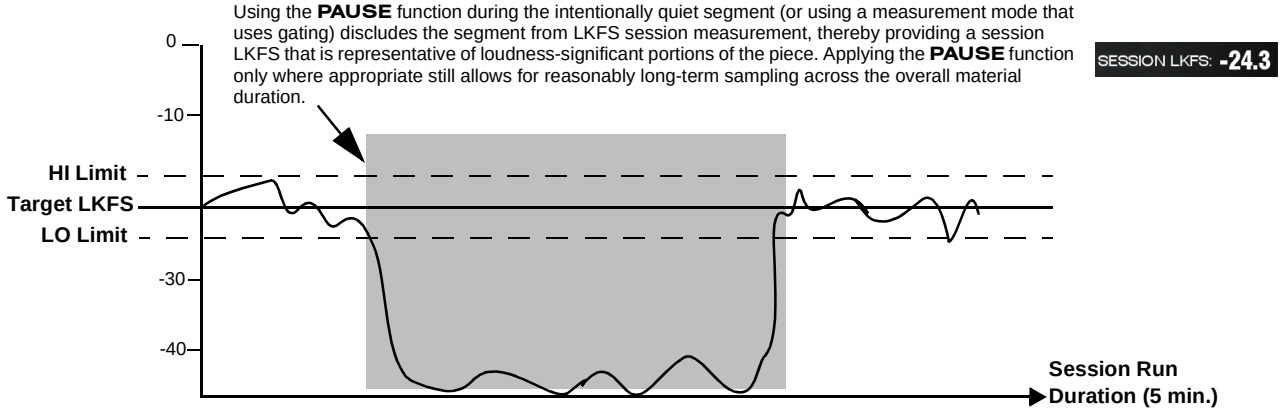


Figure A-2 LKFS Measurement/Assessment for Various Program Material Forms

Specific Measurement Techniques for Various Material Forms

Described below are specific techniques and suggestions for various settings and program material which can be assessed using the Audio Loudness Meter.

Live Production. The Audio Loudness Meter can be used in live production to guide the mixing operator to maintain audio level at an LKFS reasonably close to that of typical post-production LKFS. Where aural activity is significant (i.e., some sort of anchor element clearly exists), the short-term LKFS reading furnished by the meter provides a good baseline of target loudness compliance. Observing LKFS over a 10-second period (appr.) will typically suffice. If a sequence appears where an anchor element can be foreseen to start and stop at known points (i.e., scripted material), a session can be run to arrive at a session LKFS value (which is more representative than observing and assessing only short-term LKFS values).

Note that in this setting, audio may not be always be compressed/limited; very wide swings in dynamic range are possible. Again, only segments that are realistically viable in terms of content density, anchor element, and level amplitude/consistency should be considered for measurement. If continual or sustained **LKFS HI** violations are noted, it may be indicative of an overall "hot" level on the channel or overall mix.

Post-Production. The guidelines for this settings are similar to that used for live production, except that a session LKFS measurement (consisting of using the session **START** and **STOP** functions) can and should be utilized, since various segments can be started and stopped by cueing and rolling tape, and then stopping tape. Circumventing quiet segments from influencing the session can also be effected using the **PAUSE** function.

Long-Form Finished Material. An LKFS session should be run for as long a segment as possible, however restricting a session to representative portion(s) within an act. A representative segment should of course contain an anchor element or the next reasonable equivalent. Only absent a representative anchor element should a session run the unrestricted length of the piece (this should be avoided where possible).

Short-Form Finished Material (e.g., "Commercials"). Typically, this material will have a clearly discernible anchor element and relatively consistent loudness density. As long as the material does not have loudness pauses exceeding half the overall run time (which is typically unlikely), a simple session run over the course of the material without the pause techniques will typically provide a very reliable LKFS result.

Modifying LKFS Session Assessments Using Parametric Settings

Moving Average Period Setting. (See Figure A-3.) The **Moving Average Period** sets the sampling time accumulated in each averaging recalculation. As such, longer periods will include more short-term LKFS "look-back" values into the moving average. Because the Moving Average Period affects averaging that is used in measuring and calculating the session LKFS result, changes in this setting will affect session LKFS numerical results.

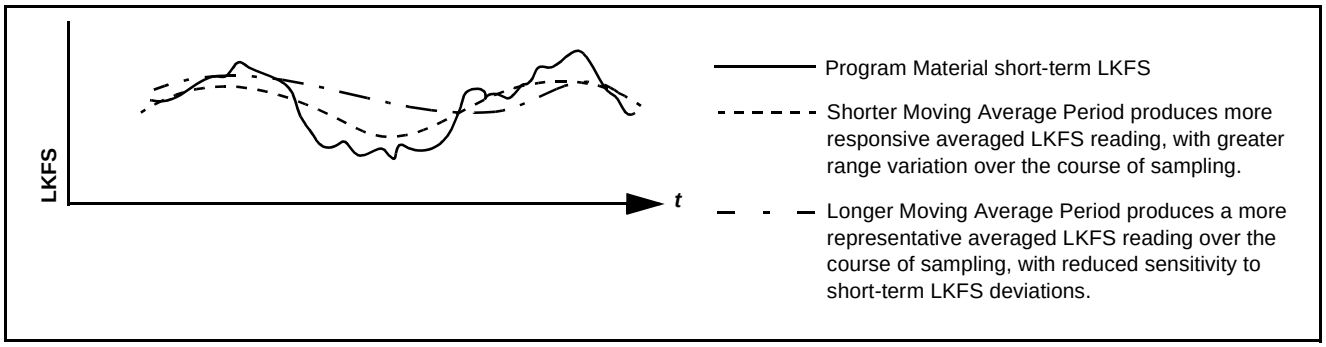


Figure A-3 Modifying the Moving Average Period Parameter

LKFS Alert Thresholds. These parameters set the LKFS HI and LO points at which the Audio Loudness Meter displays and logs indicate an LKFS error to the QC operator. These threshold settings are wholly independent of the LKFS measurement function. As such, resulting numerical short-term and session LKFS values displayed for a session are not in any way affected by these threshold settings. In most cases, the default settings will provide reasonable, representative indications of material compliance or rejection with the configured target LKFS.

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