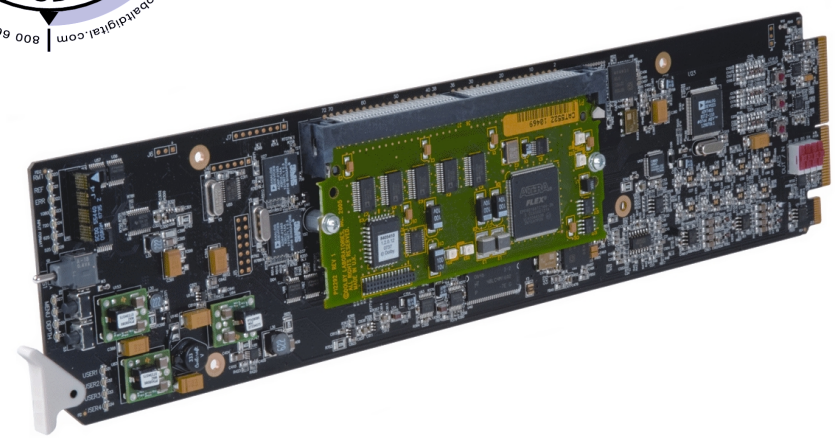
9083

With Dolby® Encoder Option +ENCD or +ENCE



HD/SD Frame Sync

with Audio Embedding/De-Embedding and Dolby® Encoder

9083+ENCD – with Dolby® Digital™Encoder Option
9083+ENCE – with Dolby® E™Encoder Option

Product Manual

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9083-ENC-OM (V4.4)

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Trademark Information

Congratulations on choosing the Cobalt® 9083 HD/SD Frame Sync with Audio Embedding/ De-Embedding and Dolby® Encoder. The 9083 is part of a full line of modular processing and conversion gear for broadcast TV environments. The Cobalt Digital Inc. line includes video decoders and encoders, audio embedders and de-embedders, distribution amplifiers, format converters, remote control systems and much more. Should you have questions pertaining to the installation or operation of your 9083, please contact us at the contact information on the front cover.

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Chapter 1

Introduction

Overview

This manual provides installation and operating instructions for the 9083 HD/SD Frame Sync with Audio Embedding/De-Embedding and Dolby Encoder card (also referred to herein as the 9083+ENCD, 9083+ENCE, or collectively as the "9083").

Note: This manual covers the 9083 card equipped with an optional Dolby® Digital™ encoder as an option (option **+ENCD**), and the 9083 card equipped with an optional Dolby® E encoder (option **+ENCE**). Where applicable, descriptions related exclusively to either the +ENCD or the +ENCE equipped cards are respectively denoted by **(+ENCD only)** or **(+ENCE only)**. In all other aspects, both cards function identically as described in this manual.

This manual consists of the following chapters:

- **Chapter 1, "Introduction"** – Provides information about this manual and what is covered. Also provides general information regarding the 9083.
- **Chapter 2, "Installation and Setup"** – Provides instructions for installing the 9083 in a frame, and optionally installing 9083 Rear I/O Modules.
- **Chapter 3, "Operating Instructions"** – Provides overviews of operating controls and instructions for using the 9083.

This chapter contains the following information:

- **9083 Card Software Versions and this Manual (p. 1-2)**
- **Manual Conventions (p. 1-3)**
- **Safety Summary (p. 1-4)**
- **9083 Functional Description (p. 1-5)**
- **Technical Specifications (p. 1-24)**
- **Warranty and Service Information (p. 1-28)**
- **Contact Cobalt Digital Inc. (p. 1-29)**

9083 Card Software Versions and this Manual

When applicable, Cobalt Digital Inc. provides for continual product enhancements through software updates. As such, functions described in this manual may pertain specifically to cards loaded with a particular software build.

The Software Version of your card can be checked by viewing the **Card Info** menu in DashBoard™. See Checking 9083 Card Information (p. 3-7) in Chapter 3, “Operating Instructions” for more information. You can then check our website for the latest software version currently released for the card as described below.

Check our website and proceed as follows if your card’s software does not match the latest version:

Card Software **earlier** than latest version	Card is not loaded with the latest software. Not all functions and/or specified performance described in this manual may be available. You can update your card with new Update software by going to the **Support>Firmware** link at www.cobaltdigital.com. Download “Firmware Update Guide”, which provides simple instructions for downloading the latest firmware for your card onto your computer, and then uploading it to your card through DashBoard™. **Software updates are field-installed without any need to remove the card from its frame.**
Card Software **newer** than version in manual	A new manual is expediently released whenever a card’s software is updated **and specifications and/or functionality have changed** as compared to an earlier version (a new manual is not necessarily released if specifications and/or functionality have not changed). A manual earlier than a card’s software version may not completely or accurately describe all functions available for your card. If your card shows features not described in this manual, you can check for the latest manual (if applicable) and download it by going to the **Support>Documents>Product Information and Manuals** link at www.cobaltdigital.com.

Cobalt Reference Guides

From the Cobalt® web home page, go to **Support>Documents>Reference Guides** for easy to use guides covering network remote control, card firmware updates, and other topics.

Manual Conventions

In this manual, display messages and connectors are shown using the exact name shown on the 9083 itself. Examples are provided below.

- Card-edge display messages are shown like this:

  Ch01

- Connector names are shown like this: **AES IN 1**

In this manual, the terms below are applicable as follows:

- **9083+ENCD** refers to the 9083 HD/SD Frame Sync with Audio Embedding/De-Embedding and Dolby® Digital™ (AC-3) Encoder card.
- **9083+ENCE** refers to the 9083 HD/SD Frame Sync with Audio Embedding/De-Embedding and Dolby® E Encoder card.
- **Frame** refers to the 8321 (or similar) frame that houses the Cobalt® COMPASS® cards.
- **Device** and/or **Card** refers to a COMPASS® card.
- **System** and/or **Video System** refers to the mix of interconnected production and terminal equipment in which the 9083 and other COMPASS® cards operate.
- Functions and/or features that are available only as an option are denoted in this manual like this:

  Option

Warnings, Cautions, and Notes

Certain items in this manual are highlighted by special messages. The definitions are provided below.

Warnings

Warning messages indicate a possible hazard which, if not avoided, could result in personal injury or death.

Cautions

Caution messages indicate a problem or incorrect practice which, if not avoided, could result in improper operation or damage to the product.

Notes

Notes provide supplemental information to the accompanying text. Notes typically precede the text to which they apply.

Labeling Symbol Definitions

	Attention, consult accompanying documents.
	Electronic device or assembly is susceptible to damage from an ESD event. Handle only using appropriate ESD prevention practices. If ESD wrist strap is not available, handle card only by edges and avoid contact with any connectors or components.
	Symbol (WEEE 2002/96/EC) For product disposal, ensure the following: • Do not dispose of this product as unsorted municipal waste. • Collect this product separately. • Use collection and return systems available to you.

Safety Summary

Warnings

! WARNING ! **To reduce risk of electric shock do not remove line voltage service barrier cover on frame equipment containing an AC power supply. NO USER SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.**

Cautions

CAUTION **This device is intended for environmentally controlled use only in appropriate video terminal equipment operating environments.**

CAUTION **This product is intended to be a component product of an openGear® frame. Refer to the openGear frame Owner's Manual for important safety instructions regarding the proper installation and safe operation of the frame as well as its component products.**

CAUTION **Heat and power distribution requirements within a frame may dictate specific slot placement of cards. Cards with many heat-producing components should be arranged to avoid areas of excess heat build-up, particularly in frames using only convection cooling. The 9083 has a moderate power dissipation (15 W max.). As such, avoiding placing the card adjacent to other cards with similar dissipation values if possible.**

CAUTION **If required, make certain Rear I/O Module(s) is installed before installing the 9083 into the frame slot. Damage to card and/or Rear I/O Module can occur if module installation is attempted with card already installed in slot.**

CAUTION **If card resists fully engaging in rear I/O module mating connector, check for alignment and proper insertion in slot tracks. Damage to card and/or rear I/O module may occur if improper card insertion is attempted.**

9083 Functional Description

Figure 1-1 shows a functional block diagram of the 9083. The 9083 frame synchronizer also includes a full 16-channel audio embedder/de-embedder, an 8-channel, and a 24-bit balanced analog-to-digital audio converter. The 9083 also handles AFD code detection/insertion. Additionally, the **+ENCD** option provides Dolby® Digital™ (AC-3) encoding using any of the audio sources supported by the 9083, and using either external or internally generated metadata. Similarly, the **+ENCE** option provides Dolby® E encoding using any of the audio sources supported by the 9083, and using either external or internally generated metadata.

Note: Some of the functions described below are available only when using the DashBoard™, or Cobalt® OGCP-9000 or OGCP-9000/CC Remote Control Panels user interfaces. Refer to User Control Interface (p. 1-19) for user interface descriptions.

9083 Input/Output Formats

The 9083 provides the following inputs and outputs:

- **Inputs:**
  - **HD/SD SDI IN** – dual-rate HD/SD-SDI input
  - **AES I/O (1-4)** – user-switchable as AES inputs or AES outputs
  - **AES IN (5-8)** – dedicated AES inputs
  - **AN-AUD IN (1-8)** – balanced analog audio inputs
  - **DOLBY META IN** – RS-485 external Dolby® metadata input
- **Outputs:**
  - **SDI OUT** – two dual-rate HD/SD-SDI buffered video outputs
  - **RCK OUT** – two reclocked HD/SD-SDI buffered input copies
  - **AES OUT (1-4)** – dedicated AES outputs
  - **AES I/O (1-4)** – user-switchable as AES inputs or AES outputs
  - **ENCD COPY (1-4)** – four Dolby® encoded pair copies (available on discrete AES output channels 9/10 thru 15/16 over the **AES OUT 5-8** BNC connectors)

Note: The input/output complement listed above represents the maximum capability of the 9083. The practical input/output complement is determined by the particular Rear I/O Module used with the 9083. Refer to 9083 Rear I/O Modules (p. 1-21) for more information.

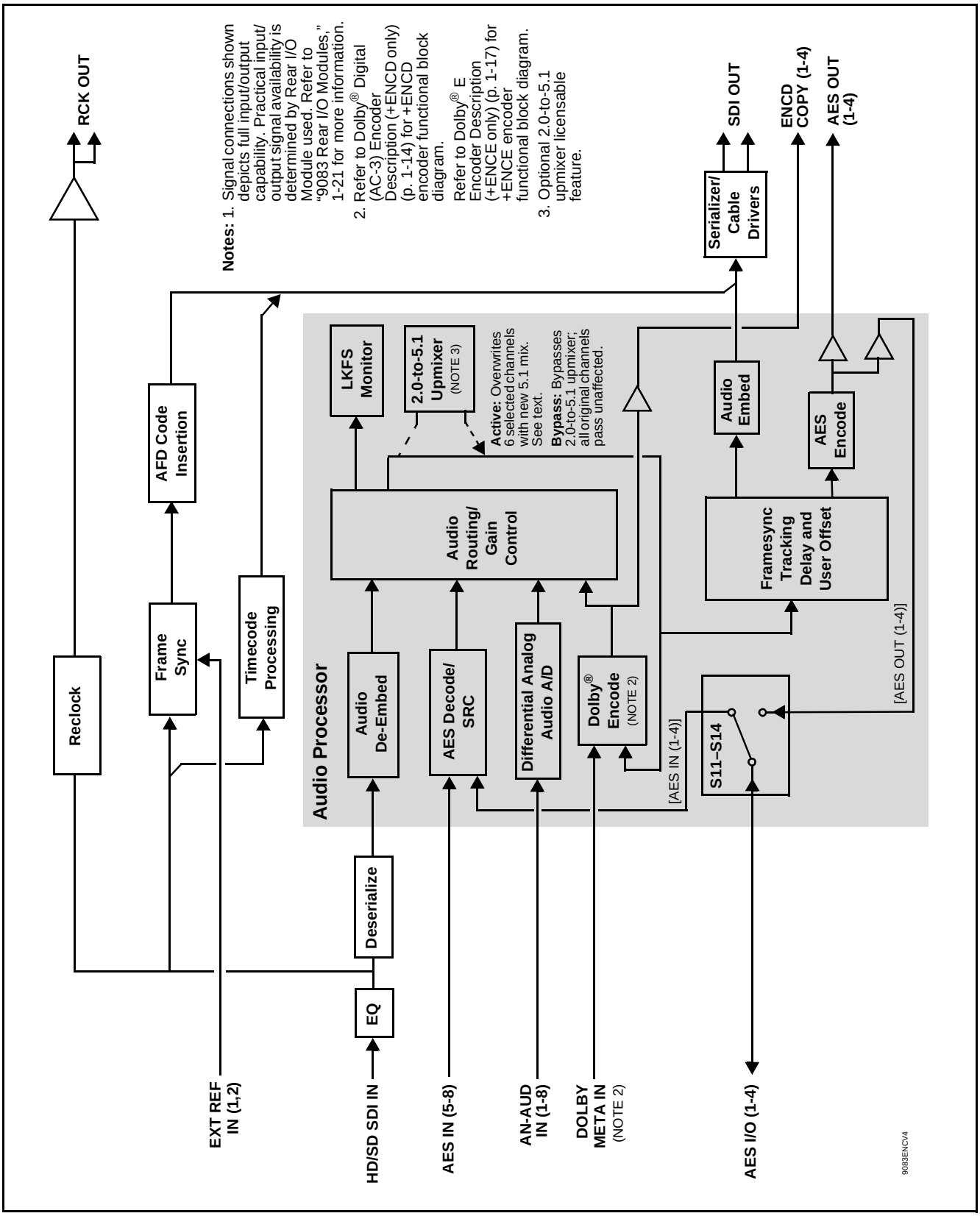

Figure 1-1 9083 Functional Block Diagram

Video Functions Description

Frame Sync Function

This function provides for frame sync control using either one of two external **EXT REF IN (1,2)** reference signals distributed with the card frame, or the input video as a frame sync reference.

This function also allows horizontal and/or vertical offset to be added between the output video and the frame sync reference.

A video/audio delay offset function allows adding or reducing audio delay from the matching video delay. This function is useful for correcting lip sync problems when video and audio paths in the chain experience differing overall delays. A Reset Framesync function resets the frame sync following any horizontal or vertical offset changes, clearing any buffered audio and video and re-establishing the frame sync. The 9083 re-establishes video/audio sync following framesync changes by applying an offset in small, progressive amounts to provide a seamless, glitch-free retiming. A user-selectable hard resync function allows setting a threshold at which hard resync is applied if audio-video offset exceeds the threshold. Hard resync provides fastest snyc-up suitable for off-air manipulation. Conversely, a threshold setting that avoids hard resync allows glitch-free on-air manipulation.

In the event of input video loss of signal, this function provides for disabling the video, going to a desired color raster, or freezing to the last intact frame (frame having valid SAV and EAV codes).

AFD Inserter

This function provides for assignment and insertion of AFD codes into the SDI output video. Using this function, AFD codes in accordance with the standard 4-bit AFD code designations can be applied to the output video.

This function checks for any existing AFD code within the received video input. If a code is present, the code is displayed. When used in conjunction with a separate downstream card capable of providing AFD-directed scaling, the image can in turn be scaled in accordance with the AFD coding embedded by this card.

The function also allows the selection/changing of the AFD code ancillary data line number for the outputted AFD code.

Timecode Processor

(See Figure 1-2.) This function provides for extraction of timecode data from the input video, and in turn re-insertion of timecode data into the output SDI. The function can monitor the SDI video input of the card for supported timecode formats, and then select and prioritize among SDI VITC, SDI ATC VITC, and SDI ATC LTC timecode sources. If the preferred format is detected, the preferred format is used by the card; if the preferred format is not detected, the card uses other formats (where available) as desired.

The function provides conversion between various timecode formats and provides independent insertion and line number controls for each SDI timecode output format.

Option Option +LTC allows bidirectional transfer and conversion between VBI formats over SDI and audio LTC, as well as RS-485 LTC. Audio LTC can be received or sent over a selected balanced analog audio input, or as digital audio over a selected embedded or AES input.

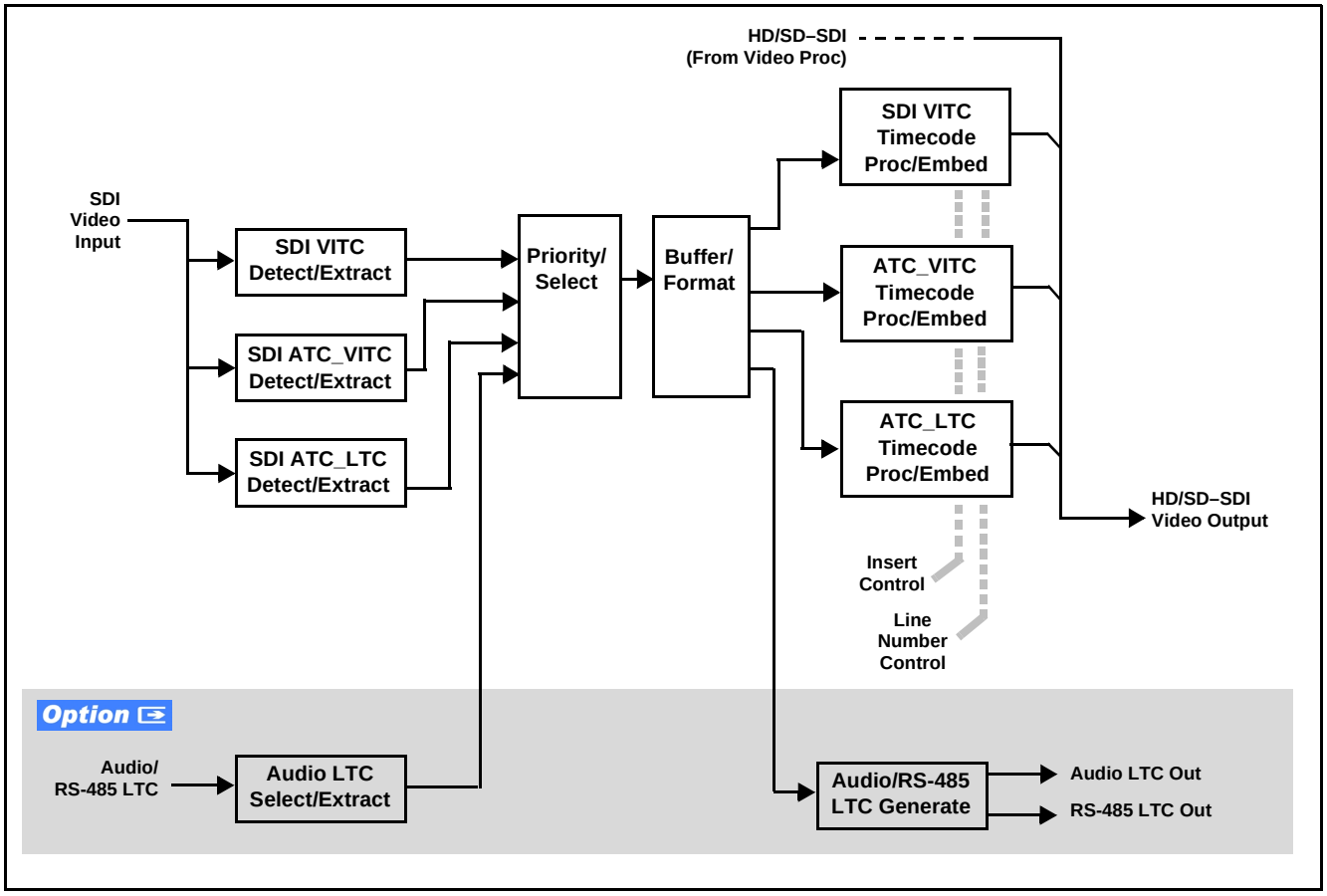

Figure 1-2 Timecode Processor

Audio Processor Description

The audio processor operates as an internal audio router. The router function chooses from the following inputs:

- 16 channels of embedded audio from the SDI video
- 16 channels (8 pairs) of discrete AES input
- 8 channels of balanced analog audio input
- Four independent internal tone generators (described below)
- Digital silence (mute) setting
- Internal Down Mix and Mono Mixer outputs (described below)
- **(+ENCD only)** Dolby® Digital (AC-3) encoded pair
- **(+ENCE only)** Dolby® E encoded pair

The router function provides the following audio outputs:

- 16 channels of embedded audio on the SDI output
- 8 channels of discrete AES output on four discrete AES pairs
- Dolby® encoded pair, which can be routed on embedded or discrete AES channels

The router acts as a full audio cross point. Each of the 24 output channels (16 embedded, 8 discrete AES) can receive signal from any one of the 40 (16 embedded, 16 discrete AES, 8 analog) input channels, four internal tone generators, or several mixer sources. Unused output channels can be mapped to a “Silence” source. Each output also provides gain adjustment and selectable polarity inversion.

Output audio rates are always 48 kHz, locked to output video, but discrete AES inputs can be set to use sample rate converters to align these inputs with the output timing. (AES must be nominally 48 kHz input; 32, 44.1, 96, and 192 kHz inputs are not compatible with the 9083.) The sample rate converters are disabled by default. Output AES is always precisely synchronized with the output video. The balanced analog audio input is sampled at 48 kHz with a +24 dBu clipping level (+24 dBu => 0 dBFS).

As set with the default settings, the routing between embedded audio channels **Embed Ch 1** thru **Embed Ch 16** and discrete AES audio channels **AES Ch1** thru **AES Ch 16** is as shown in Figure 1-3. In this mode, the routing is basic 1-to-1 embedding/de-embedding for the 16 embedded and AES discrete audio channels. Other sources and/or destinations (described below) for each channel are selected using the card edge controls or a remote control system.

Note: As shown in Figure 1-1, the 9083 equipped with either the **+ENCD** or **+ENCE** option provides eight discrete AES input pair ports and four discrete AES output pair ports. On Rear I/O Modules having limited AES I/O capabilities, switches S11 thru S14 allow available rear module BNC connectors to be allotted between AES inputs and outputs as desired. Buffered copies of **AES OUT (1-4)** are available as dedicated outputs and as respective outputs fed through S11 – S14 on the card.

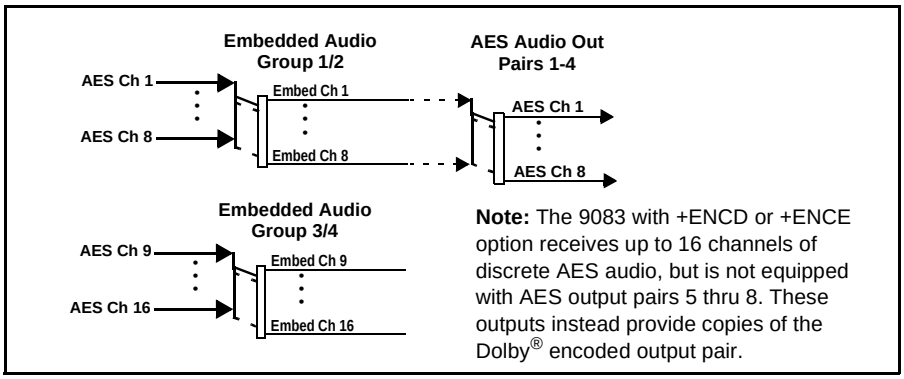

Figure 1-3 Default Embed/De-Embed Audio Routing

Audio Down Mixer and Mono Mixer Function

(See Figure 1-4.) The audio down mixer function provides for the selection of any five embedded, AES discrete, or analog audio sources serving as Left (**L**), Right (**R**), Center (**C**), Left Surround (**Ls**), and Right Surround (**Rs**) individual signals to be multiplexed into a stereo pair (Down Mix Left (**DM-L**) and Down Mix Right (**DM-R**)). The resulting stereo pair **DM-L** and **DM-R** can in turn be routed and processed just like any of the other audio sources described earlier.

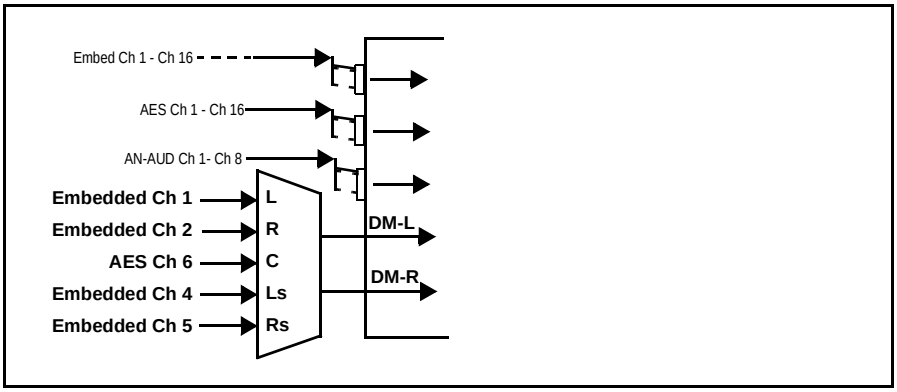

Figure 1-4 Audio Down Mix Functional Block Diagram with Example Sources

The mono mixer function (Figure 1-5) generates an additional mono-mixed channel from two selected embedded, AES discrete, or analog input channels serving as left and right inputs. The resulting mono mix channel **MONO** can in turn be routed and processed just like any of the other audio sources described earlier.

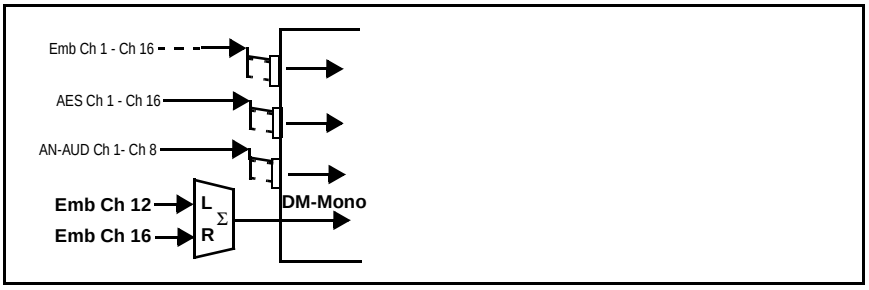

Figure 1-5 Audio Mono Mix Functional Block Diagram with Example Sources

2.0-to-5.1 Upmix Function Option

Note: Upmix function is an optional licensable feature. This function and its controls appear only when a license key is entered and activated. (This option (identified in Cobalt® price lists as **+UM**) can be purchased upon initial order, or field-activated using a key string which is sent to you when this option is purchased.)

The 2.0-to-5.1 upmixer function receives a normal PCM stereo pair from the Audio Routing/Gain Control function and upmixes the pair to provide 5.1 channels (Left (**L**), Right (**R**), Center (**C**), Low Frequency Effects (**LFE**), Left Surround (**Ls**), and Right Surround (**Rs**)). Whenever the upmixer is active, it overwrites the six selected channels with the new 5.1 upmix signals (including replacing the original source stereo **L** and **R** inputs with new **L** and **R** signals).

The 2.0-to-5.1 upmixer can be set to up mix in any of three modes: Always upmix, Bypass upmix, or Auto enable/bypass upmixing. The Auto upmixing mode looks at the signal levels on the selected channels and compares them to a selectable level threshold. It then determines whether or not to generate 5.1 upmixing from the stereo pair as follows:

- If the upmixer detects signal level **below** a selected threshold on **all four** of the selected channels designated as **C**, **LFE**, **Ls**, and **Rs**, this indicates to the upmixer that these channels are not carrying 5.1. In this case, the upmixer overwrites all six selected channels with the new 5.1 content.
- If the upmixer detects signal level **above** a selected threshold on **any** of the four selected channels designated as **C**, **LFE**, **Ls**, and **Rs**, this indicates to the upmixer that the channel(s) are already carrying viable 5.1 content. In this case, the upmixer is bypassed, allowing the original channels to pass unaffected.

The examples in Figure 1-6 show the automatic enable/disable up-mixing function applied to example selected channels **Emb Ch 1** thru **Emb Ch 6**. As shown and described, the processing is contingent upon the signal levels of the channels selected to carry the new 5.1 upmix relative to the selected threshold (in this example, -60 dBFS). Note also that this function is applied **after** the Audio Routing/Gain Control function. Because all audio inputs pass through the Audio Routing/Gain Control function before the up mixer, the up mixer can use embedded, AES discrete, and/or analog audio sources.

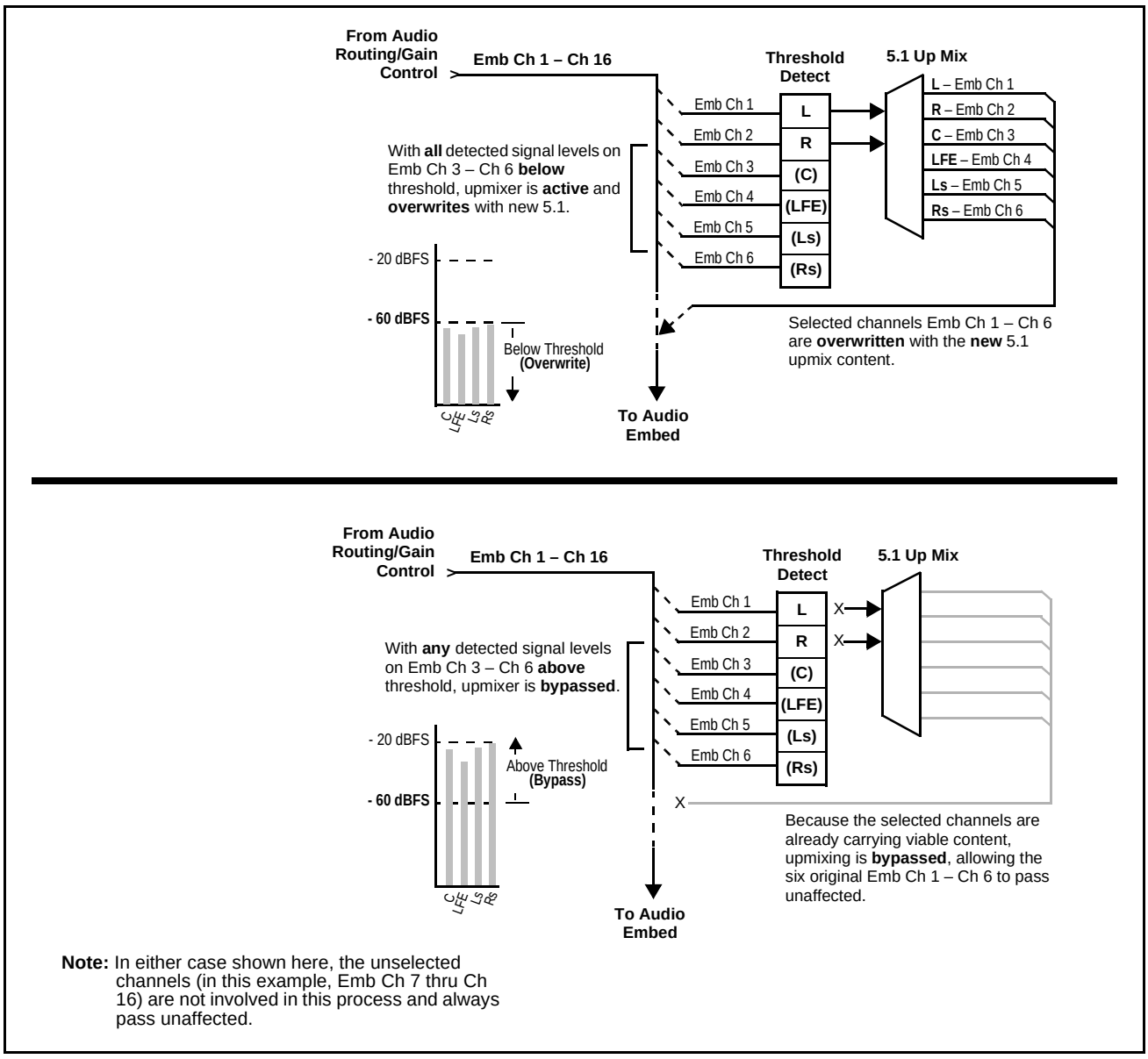

Figure 1-6 Up Mix Auto Enable/Bypass with Example Sources

Tone Generator Function

The 9083 contains four built-in tone generators (Tone Generator 1 thru Tone Generator 4). Each of the four tone generators can be set to a different frequency, and are available as audio sources for the embedded or AES audio outputs.

18 discrete sine wave frequencies are available, ranging from 50 Hz to 16 kHz (default frequency is 1.0 kHz).

AES Audio Input Advanced Features

AES Sample Rate Converter

The 9083 AES inputs have sample rate converters that can be independently enabled for each AES pair to allow the card to interface with asynchronous AES sources (sources in which AES timing does not match the video input timing). The sample rate converters are set to disabled (bypassed) by default; this is necessary when embedding undecoded, non-PCM audio such as Dolby® E or Dolby® Digital™ audio streams. When a valid Dolby® E or Dolby® Digital™ signal (in accordance with SMPTE 337M) is detected on an AES or embedded audio signal, SRC is automatically bypassed along with gain and polarity controls.

Zero-Delay Audio Embedding

In cases where additional delay must be avoided, it may be desirable to embed AES with minimum latency. Using zero-delay embedding, the video can then be delayed by one frame to account for any remaining audio delay. In this manner, any delay between video and audio can be cleanly contained and managed within one frame period.

When zero-delay audio embedding is enabled for a given AES pair, the pair is directly embedded into its corresponding group (for example, AES Pair 1 into embedded channels 1 and 2; AES Pair 2 into embedded channels 3 and 4, and so on) with the normal frame sync audio delay being bypassed.

This function overrides the audio routing system (for example, if AES Pair 1 is selected then the controls to route AES Pair 1 into other embedded channels will not apply). Gain and polarity control is not available when this option is selected. Zero-delay audio embedding is set to Off by default.

Low-Latency AES Passthrough

This function is similar to zero-delay audio embedding. If low-latency AES passthrough is selected for a given input pair, it causes the corresponding AES output pair to act as a bit-for-bit copy of the corresponding AES input pair.

This control overrides the normal audio routing and delay. Gain and polarity control is not available when this option is selected. Passthrough is set to Off by default.

Audio LKFS Monitor Description

Note: Refer to Appendix A, “Loudness Measurement Guidelines and Techniques” for more information about LKFS parameters and this function, as well as practical measurement techniques.

This function monitors selected output (“destination”) channels from the Audio Routing/Gain Control function and applies signal analysis based on ITU-R BS.1770-1 – ATSC A/85 criteria to produce an LKFS measurement and provide indications of under-threshold and over-threshold level conditions.

The function can monitor any combination of embedded, AES, or analog channels (or channels fed to the Dolby® encoder) selected as the L, R, C, Ls, and Rs ITU-R BS.1770-1 channels (note that the LFE and AUX channels are not included in any LKFS calculations). Because the LKFS monitor uses output (post-processed “destination”) channels, LKFS under/over conditions can be corrected using the Dashboard™ controls on this card for the monitored channels (Dolby® channel selections use the channels routed to the Dolby encoder inputs).

The functions provides a configurable moving average period for tailoring the measurement to suit various program material conditions, as well as configurable thresholds which provide an unambiguous alarm indication if the measured LKFS deviates from the thresholds. This function uses the encoder metadata dialnorm setting as the LKFS target reference.

Dolby® Digital (AC-3) Encoder Description (+ENCD only)

(See Figure 1-7.) The Dolby® Digital (AC-3) Encoder receives up to six different audio sources (**Input Audio IN 1** thru **IN 6**) from the card Audio Routing/Control and produces an encoded Dolby® pair using either received external metadata or internally generated metadata that can be user-defined using the encoder controls. The encoded pair can be sent from the card as embedded audio or over discrete AES-3id connections as a SMPTE 337M-formatted non-PCM signal.

Note: On cards equipped with a Rear I/O Module accommodating AES OUT pairs 5-8, the encoded pair is available as copies on AES channels 9 thru 16.

Input Audio Mapping

Any audio input supported by the card can serve as audio inputs for the Dolby® Digital (AC-3) Encoder. The six user-selected audio sources are mapped to **Encr Ch 1** thru **Encr Ch 6**, which are then fed to the Dolby® Audio Encode function.

Dolby® Metadata Selection/Control

When external metadata is being used for encoding, the Dolby® Digital (AC-3) Encoder allows user selection of the following external metadata sources:

- **Input Video** – De-muxed metadata extracted from SDI input video VBI portion in accordance with SMPTE 2020.
- **RS-485 Input Port** – Metadata received from external device/system using the card's **DOLBY META IN** RS-485 connector.

When an external source is selected, its status is displayed showing the following:

- Presence of data on selected source.
- Program configuration status (AC-3 modes for the various program configurations defined in the metadata).

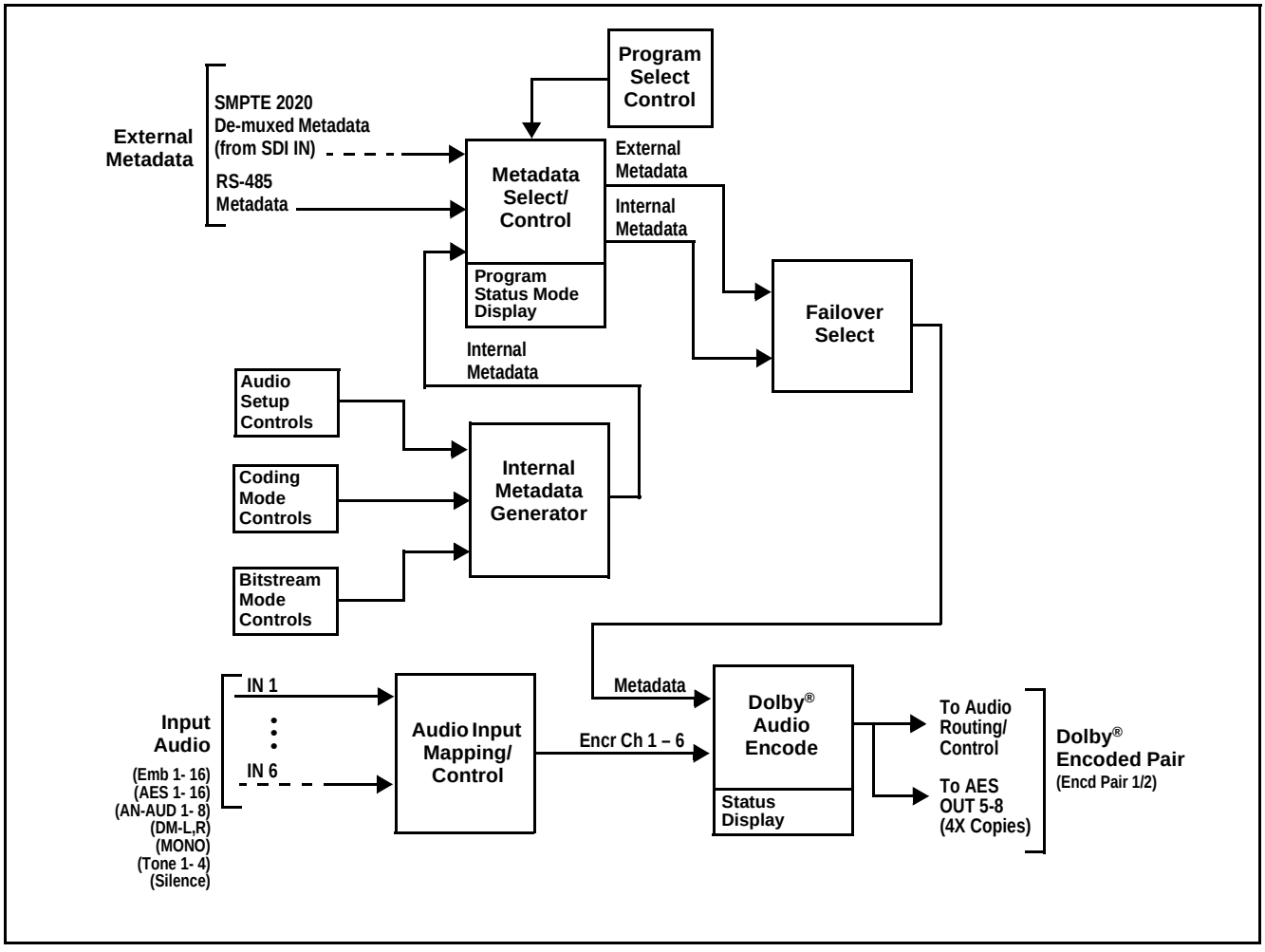

Figure 1-7 Dolby® Digital (AC-3) Encoder Functional Block Diagram

Where multiple external source programs are available (up to eight separate programs), the descriptions and audio settings for each program 1 thru 8 are displayed. This function in turn allows selection of the desired AC-3 external source program. The external metadata selected here is fed to Failover Select.

Failover Select allows user selection of the action to take in the event of loss of external metadata, with the choices being:

- Switch to internal metadata
- Use last received metadata
- Stop encoding

The available metadata following this function is fed to the Dolby® Audio Encode function.

Internal Metadata Generator

The Internal Metadata Generator provides full audio setup, program coding, and bitstream definition controls, allowing user-generated metadata for providing Dolby® Digital (AC-3) encoding without any external metatdata being required.

Full audio production controls are provided in general conformance with ATSC A/52B definitions, as well as extended bitstream controls. The Internal Metadata Generator can be used as a stable, known source of metadata/ encoding, or can be used as a failover in the event of loss of external metadata.

Dolby® Audio Encode

In accordance with the selected metadata, the Dolby® Audio Encode function receives the audio inputs **Encr Ch 1- Ch 6** from Audio Input Mapping/Control and provides the Dolby® Digital (AC-3) encoded SMPTE 337M pair **Encd Pair 1/2**. The pair is available as a source as an embedded channel pair (allowing the encoded pair to be embedded in the SDI output) and as a source for an AES output pair (allowing the encoded pair to be available over a discrete AES-3id port).

Note: On the encoder-equipped 9083, AES Audio Out pairs 5-8 serve as four dedicated copies of the encoded pair in addition to any other encoded pair routing.

The encoded AC-3 data rate can be selected from multiple choices with associated audio quality trade-offs.

Dolby® E Encoder Description (+ENCE only)

(See Figure 1-8.) The Dolby® E Encoder receives up to eight different audio sources (**Input Audio IN 1** thru **IN 8**) from the card Audio Routing/Control and produces an encoded Dolby® pair using either received external metadata or internally generated metadata that can be user-defined using the encoder controls. The encoded pair can be sent from the card as embedded audio or over discrete AES-3id connections as a SMPTE 337M-formatted non-PCM signal.

Note: On cards equipped with a Rear I/O Module accommodating AES OUT pairs 5-8, the encoded pair is available as copies on AES channels 9 thru 16.

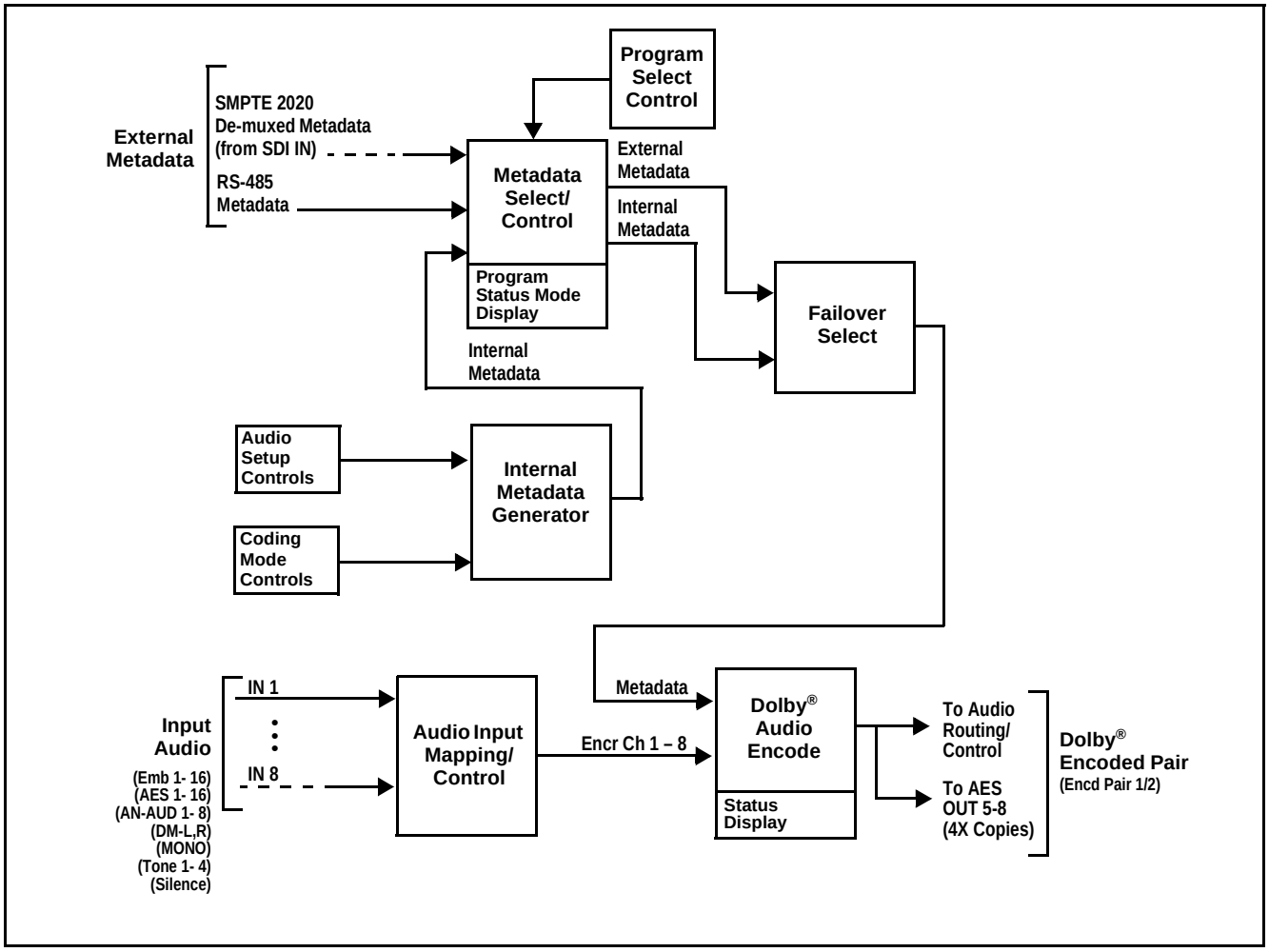

Figure 1-8 Dolby® E Encoder Functional Block Diagram

Input Audio Mapping

Any audio input supported by the card can serve as audio inputs for the Dolby® E Encoder. The eight user-selected audio sources are mapped to **Encr Ch 1** thru **Encr Ch 8**, which are then fed to the Dolby® Audio Encode function.

Dolby® Metadata Selection/Control

When external metadata is being used for encoding, the Dolby® E Encoder allows user selection of the following external metadata sources:

- **Input Video** – De-muxed metadata extracted from SDI input video VBI portion in accordance with SMPTE 2020.
- **RS-485 Input Port** – Metadata received from external device/system using the card's **DOLBY META IN** RS-485 connector.

When an external source is selected, its status is displayed showing the following:

- Presence of data on selected source.
- Program configuration status (program descriptions for the various program configurations defined in the metadata).

Where multiple external source programs are available (up to eight separate programs), the descriptions and audio settings for each program 1 thru 8 are displayed. The external metadata selected here is fed to Failover Select.

Failover Select allows user selection of the action to take in the event of loss of external metadata, with the choices being:

- Switch to internal metadata
- Use last received metadata
- Stop encoding

The available metadata following this function is fed to the Dolby® Audio Encode function.

Internal Metadata Generator

The Internal Metadata Generator provides full audio setup, program coding, and bitstream definition controls, allowing user-generated metadata for providing Dolby® E encoding without any external metatdata being required.

Full audio production controls are provided in general conformance with ATSC A/52B definitions. The Internal Metadata Generator can be used as a stable, known source of metadata/encoding, or can be used as a failover in the event of loss of external metadata.

Dolby® Audio Encode

In accordance with the selected metadata, the Dolby® Audio Encode function receives the audio inputs **Encr Ch 1- Ch 8** from Audio Input Mapping/Control and provides the Dolby® E encoded SMPTE 337M pair **Encd Pair 1/2.** The pair is available as a source as an embedded channel pair (allowing the encoded pair to be embedded in the SDI output) and as a source for an AES output pair (allowing the encoded pair to be available over a discrete AES-3id port).

Note: On the encoder-equipped 9083, AES Audio Out pairs 5-8 serve as four dedicated copies of the encoded pair in addition to any other encoded pair routing.

User Control Interface

Figure 1-9 shows the user control interface options for the 9083. These options are individually described below.

Note: All user control interfaces described here are cross-compatible and can operate together as desired. Where applicable, any control setting change made using a particular user interface is reflected on any other connected interface.

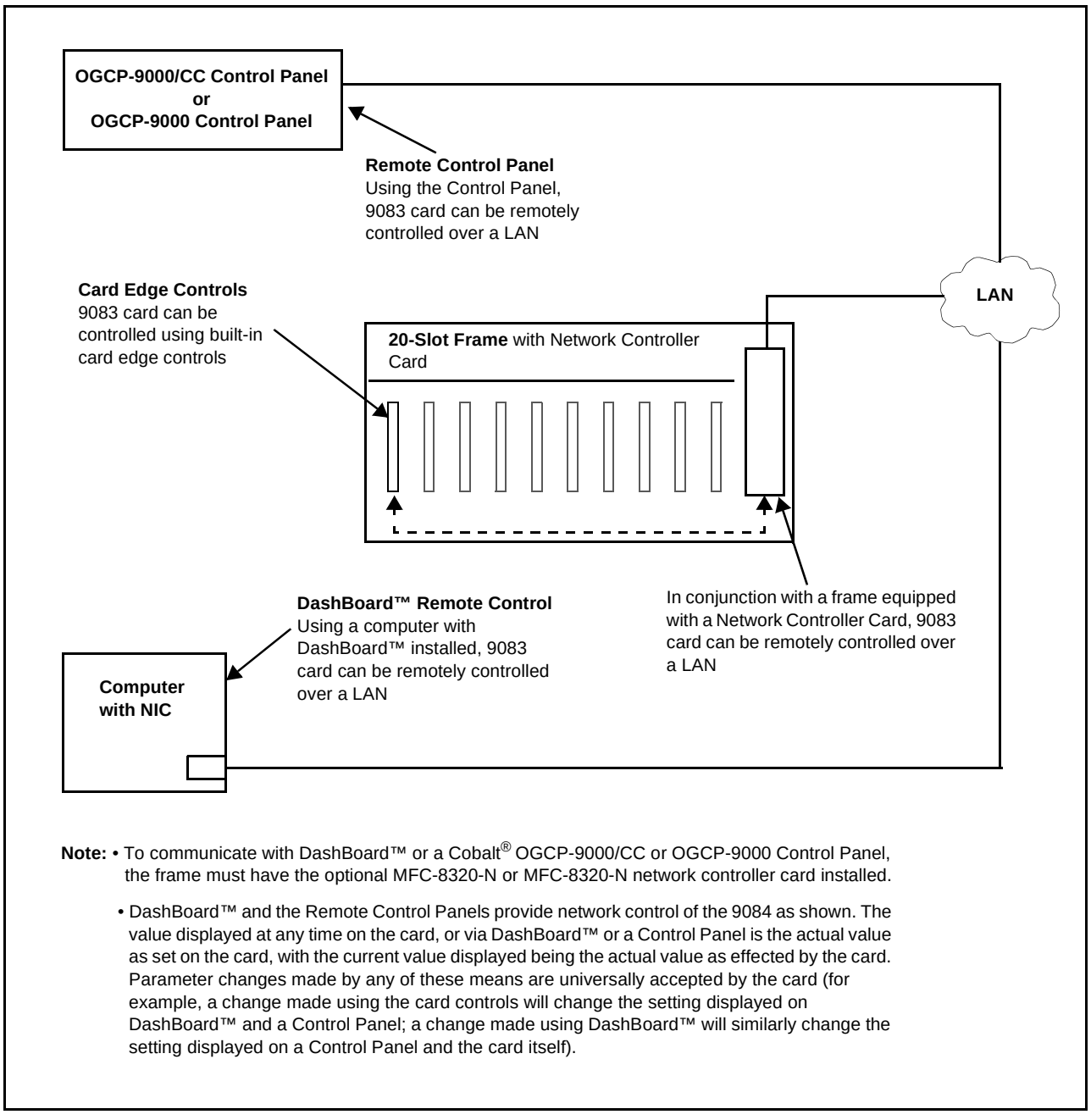

Figure 1-9 9083 User Control Interface

- **Built-in Card Edge User Interface** – Using the built-in card edge controls and display, card control settings can be set using a front panel menu.

Note: Some of the 9083 functions described in this manual are available only when using the DashBoard™, or Cobalt® OGCP-9000 or OGCP-9000/CC Remote Control Panels user interfaces.

- **DashBoard™ User Interface** – Using DashBoard™, the 9083 and other cards installed in openGear®[1] frames such as the Cobalt® 8321 or HPF-9000 frame can be controlled from a computer and monitor.

  DashBoard™ allows users to view all frames on a network with control and monitoring for all populated slots inside a frame. This simplifies the setup and use of numerous modules in a large installation and offers the ability to centralize monitoring. Cards define their controllable parameters to DashBoard™, so the control interface is always up to date.

  Download the free DashBoard™ software by going to www.cobaltdigital.com and selecting "DashBoard Control and Monitoring" on the home page. The DashBoard™ user interface is described in Chapter 3,"Operating Instructions".

Note: If network remote control is to be used for the frame and the frame has not yet been set up for remote control, Cobalt® reference guide **Remote Control User Guide (PN 9000RCS-RM)** provides thorough information and step-by-step instructions for setting up network remote control of COMPASS® cards using DashBoard™. (Cobalt® OGCP-9000 and OGCP-9000/CC Remote Control Panel product manuals have complete instructions for setting up remote control using a Remote Control Panel.)

Download a copy of this guide by clicking on the **Support>Documents> Reference Guides** link at www.cobaltdigital.com and then select DashBoard Remote Control Setup Guide as a download, or contact Cobalt® as listed in Contact Cobalt Digital Inc. (p. 1-29).

- **Cobalt® OGCP-9000, OGCP-9000/CC and WinOGCP Remote Control Panels** – The OGCP-9000, OGCP-9000/CC, and WinOGCP Remote Control Panels conveniently and intuitively provide parameter monitor and control of the cards within the 8321 or HPF-9000 frame.

  The remote control panels allow quick and intuitive access to hundreds of cards in a facility, and can monitor and allow adjustment of multiple parameters at one time.

  The remote control panels are totally compatible with the openGear® control software DashBoard™; any changes made with either system are reflected on the other.

1. openGear® is a registered trademark of Ross Video Limited. DashBoard™ is a trademark of Ross Video Limited.

9083 Rear I/O Modules

The 9083 physically interfaces to system video and audio connections using a Rear I/O Module. Figure 1-10 shows a typical 9083 Rear I/O Module.

All inputs and outputs shown in the 9083 Functional Block Diagram (Figure 1-1) enter and exit the card via the card edge backplane connector. The Rear I/O Module breaks out the 9083 card edge connections to industry standard connections that interface with other components and systems in the signal chain.

In this manner, the particular inputs and outputs required for a particular application can be accommodated using a Rear I/O Module that best suits the requirements. The required input and outputs are broken out to the industry standard connectors on the Rear I/O Module; the unused inputs and outputs remain unterminated and not available for use.

The full assortment of 9083 Rear I/O Modules is shown and described in 9083 Rear I/O Modules (p. 2-6) in Chapter 2, “Installation and Setup”.

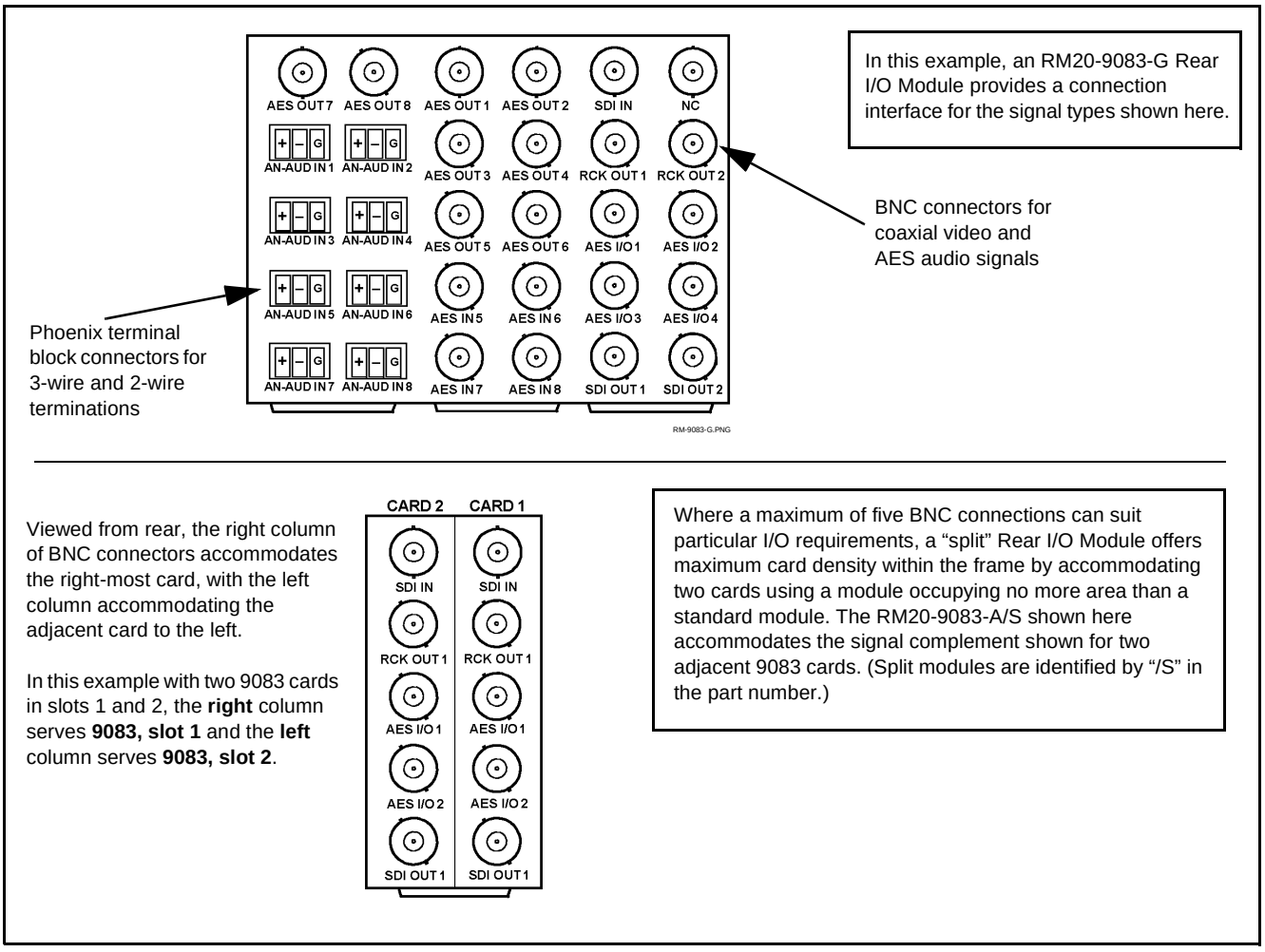

Figure 1-10 Typical 9083 Rear I/O Modules

Figure 1-11 shows a 9083 card using an RM20-9083-B Rear I/O Module. Using this Rear I/O Module, this module provides industry standard break-out connections for the following inputs and outputs required by this application:

- **Inputs:**
  - **HD/SD SDI IN** – dual-rate HD/SD-SDI input
  - **AN-AUD IN (1-6)** – balanced analog audio inputs (inputs 7-8 unused)
- **Outputs:**
  - **SDI OUT** – HD/SD-SDI buffered video outputs

The other 9083 inputs and outputs not accommodated by this Rear I/O Module (shown in gray in Figure 1-11) remain unterminated.

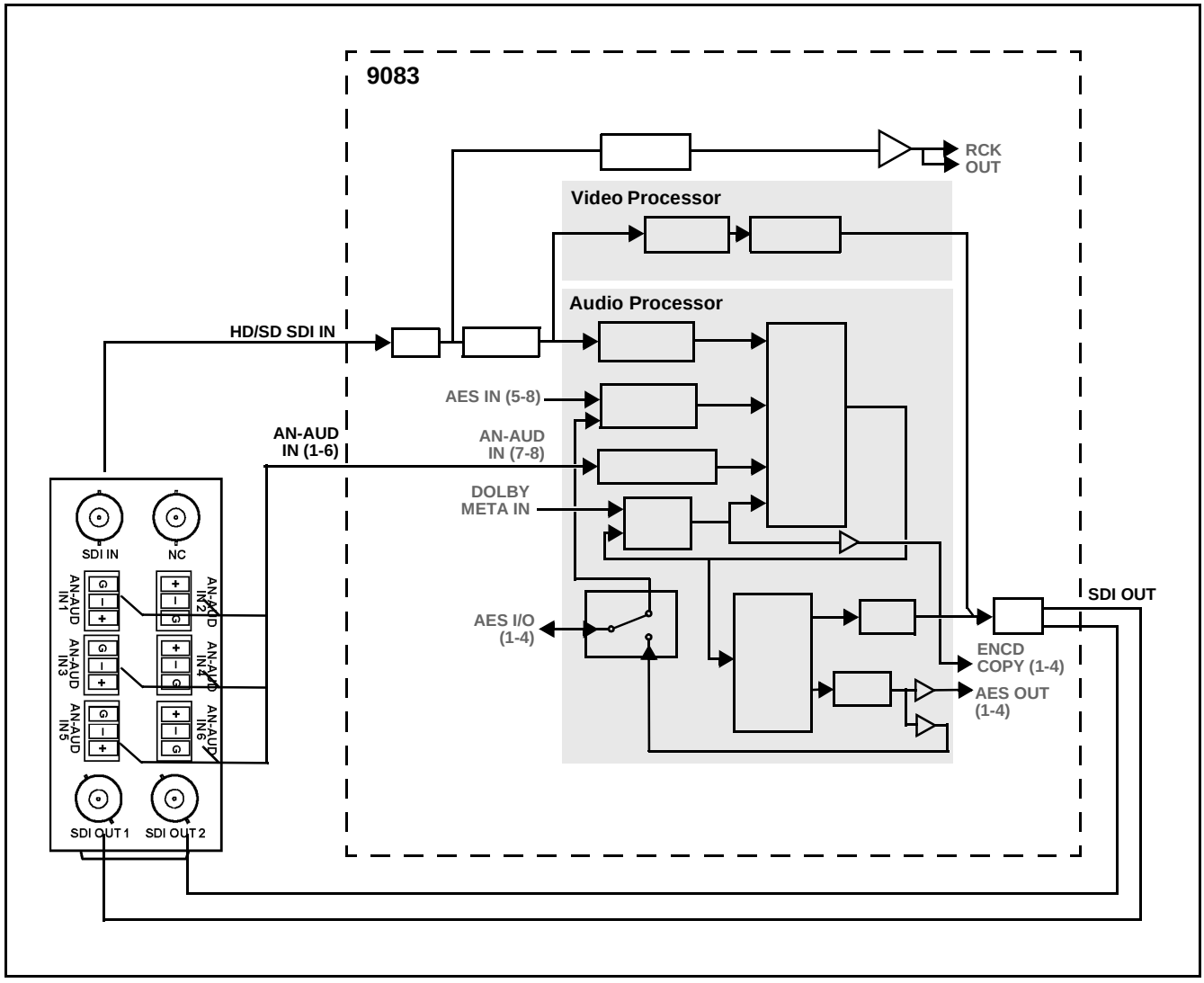

Figure 1-11 9083 with RM20-9083-B Rear I/O Module

Audio and Video Formats Supported by the 9083

The 9083 supports all current SMPTE standard SD and HD video formats. Table 1-1 lists and provides details regarding the audio and video formats supported by the 9083.

Table 1-1 Supported Audio and Video Formats

Item	Description/Specification	
Input / Output Video	Raster Structure:	Frame Rate:
	1080PsF	23.98; 24
	1080p	23.98; 24
	1080i (1)	25; 29.97; 30
	720p	23.98; 24; 25; 29.97; 30; 50; 59.94; 60
	486i (1)	29.97
	575i (1)	25
Embedded Audio	The 9083 supports all four groups (16 channels) of embedded audio at full 24-bit resolution in both SD (with extended data packets) and HD.	
Analog Audio	The 9083 supports 8 channels of balanced (differential) analog audio. The analog audio is encoded such that a +24 dBu input is equivalent to digital 0 dBFS.	
Discrete AES Audio Input	The 9083 can accept 16 channels (8 pairs) of discrete AES audio on 75Ω BNC connections. Sample rate conversion can be employed to account for minor clock rate differences in the AES stream and the input video stream. **Note:** The AES signal must have a nominal rate of approximately 48 kHz. The 9083 does not support AES input at 32 kHz, 44.1 kHz, 96 kHz or 192 kHz rates.	
Discrete AES Audio Output	The 9083 can provide 8 channels (AES pairs 1 thru 4) of discrete AES audio on 75Ω BNC connections.	
(1) All rates displayed as frame rates; interlaced (“i”) field rates are two times the rate value shown.		

Technical Specifications

Table 1-2 lists the technical specifications for the 9083 HD/SD Frame Sync with Audio Embedding/De-Embedding and Dolby® Encoder Option card.

Table 1-2 Technical Specifications

Item	Characteristic
Part number, nomenclature	• 9083+ENCD – HD/SD Frame Sync with Audio Embedding/ De-Embedding and Dolby® Digital™ (AC-3) Encoder Option • 9083+ENCE – HD/SD Frame Sync with Audio Embedding/ De-Embedding and Dolby® E Encoder Option
Installation/usage environment	Intended for installation and usage in frame meeting openGear® modular system definition.
Power consumption	< 15 Watts maximum
Environmental: Operating temperature: Relative humidity (operating or storage):	 32° – 104° F (0° – 40° C) < 95%, non-condensing
Frame communication	10/100 Mbps Ethernet with Auto-MDIX.
Indicators	Card edge display and indicators as follows: • 4-character alphanumeric display • Status/Error LED indicator • Input Format LED indicator
Controls	Card edge switches as follows: • Menu Enter pushbutton switch • Menu Exit pushbutton switch • Up/down selection toggle switch
Internal Tone Generators	Four built-in tone generators, each configurable for 18 discrete sine wave frequencies ranging from 50 Hz to 16 kHz. Generator source signal level is equivalent to -20 dBu.

Table 1-2 Technical Specifications — continued

Item	Characteristic
Serial Digital Video Input	Data Rates Supported: SMPTE 292 HD-SDI: 1.485 Gbps or 1.485/1.001 Gbps SMPTE 259M-C SD-SDI: 270 Mbps Impedance: 75 Ω terminating Equalization (HD): 328 ft (100 m) Belden 1694A Equalization (SD): 1000 ft (305 m) Belden 1694A Return Loss: > 15 dB at 5 MHz – 1.485 GHz
Serial Digital Video Outputs	Number of Outputs: Two processed HD/SD-SDI BNC per IEC 60169-8 Amendment 2 Two buffered reclocked input copies Impedance: 75 Ω Return Loss: > 15 dB at 5 MHz – 270 MHz > 12 dB at 270 MHz – 1.485 GHz Signal Level: 800 mV ± 10% DC Offset: 0 V ± 50 mV Jitter (HD): < 0.15 UI (all outputs) Jitter (SD): < 0.10 UI (all outputs) Overshoot: < 0.2% of amplitude
Pre-Processor (Reclocked) Serial Digital Video Outputs	Number of Outputs: Two HD/SD-SDI BNC per IEC 60169-8 Amendment 2 Impedance: 75 Ω

Table 1-2 Technical Specifications — continued

Item	Characteristic
AES Audio Input	Standard: SMPTE 276M Number of Inputs (maximum): 8 unbalanced Input Level: 0.1 to 2.5 Vp-p (5 Vp-p tolerant) Input Impedance: 75 Ω Return Loss: > 12 dB at 100 kHz to 6 MHz Resolution: 24-bit only Sample Rate: 48 kHz SRC: 32-channel; 142 dB S/N
AES Audio Output	Standard: SMPTE 276M Number of Outputs (maximum): • 4 unbalanced AES • 4 unbalanced Dolby® encoded pair output copies Output Impedance: 75 Ω Return Loss: > 30 dB 100 kHz to 6 MHz Sample Rate: 48 kHz
(+ENCD only) Dolby® Digital™ Audio Input Encode	Supports up to six audio inputs and provides Dolby® Digital™ (AC-3) encoded pair (available as embedded or discrete AES) per SMPTE 337M.
(+ENCE only) Dolby® E Audio Input Encode	Supports up to eight audio inputs and provides Dolby® E encoded pair (available as embedded or discrete AES) per SMPTE 337M.
RS-485 Metadata / LTC I/O	Metadata extracted from input video (per SMPTE 2020-1-2008) or input to Dolby® encoder, or LTC I/O on RS-485 interface; 3-wire balanced via Phoenix terminal block connector.

Table 1-2 Technical Specifications — continued

Item	Characteristic
Analog Audio Input	Number of Inputs (maximum): Eight, 3-wire balanced analog audio using Phoenix connectors with removable screw terminal blocks (Phoenix PN 1803581; Cobalt PN 5000-0013-000R) Sampling Rate: 48 kHz (locked to video input) Signal Level: +24 dBu => 0 dBFS A/D Frequency Response: 20 – 20 kHz ± 0.25 dB
Reference Video Input	Number of Inputs: Two non-terminating (looping) Frame Reference inputs Standards Supported (HD): 720p 24; 25; 29.97; 30; 50; 59.94 1080i 25; 29.97 1080p 23.98; 24; 25; 29.97; 30 1080p/sF 23.98; 24 Standards Supported (SD): 486i 29.97 (NTSC) 575i 25 (PAL) Signal Level: 1 Vp-p nominal Signal Type: Analog video sync (black burst or tri-level) Impedance: 75 Ω Return Loss: > 30 dB to 30 MHz Allowable Maximum DC on Ref Input: ±1.0 V

Warranty and Service Information

Cobalt Digital Inc. Limited Warranty

This product is warranted to be free from defects in material and workmanship for a period of five (5) years from the date of shipment to the original purchaser, except that 4000, 5000, 6000, 8000 series power supplies, and Dolby® modules (where applicable) are warranted to be free from defects in material and workmanship for a period of one (1) year.

Cobalt Digital Inc.'s ("Cobalt") sole obligation under this warranty shall be limited to, at its option, (i) the repair or (ii) replacement of the product, and the determination of whether a defect is covered under this limited warranty shall be made at the sole discretion of Cobalt.

This limited warranty applies only to the original end-purchaser of the product, and is not assignable or transferrable therefrom. This warranty is limited to defects in material and workmanship, and shall not apply to acts of God, accidents, or negligence on behalf of the purchaser, and shall be voided upon the misuse, abuse, alteration, or modification of the product. Only Cobalt authorized factory representatives are authorized to make repairs to the product, and any unauthorized attempt to repair this product shall immediately void the warranty. Please contact Cobalt Technical Support for more information.

To facilitate the resolution of warranty related issues, Cobalt recommends registering the product by completing and returning a product registration form. In the event of a warrantable defect, the purchaser shall notify Cobalt with a description of the problem, and Cobalt shall provide the purchaser with a Return Material Authorization ("RMA"). For return, defective products should be double boxed, and sufficiently protected, in the original packaging, or equivalent, and shipped to the Cobalt Factory Service Center, postage prepaid and insured for the purchase price. The purchaser should include the RMA number, description of the problem encountered, date purchased, name of dealer purchased from, and serial number with the shipment.

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Chapter 2

Installation and Setup

Overview

This chapter contains the following information:

- Setting I/O Switches for AES I/O (1-4) Ports (p. 2-1)
- Installing the 9083 Into a Frame Slot (p. 2-2)
- Installing a Rear I/O Module (p. 2-5)
- Setting Up 9083 Network Remote Control (p. 2-12)

Setting I/O Switches for AES I/O (1-4) Ports

Note: This procedure is applicable only if any of the four AES I/O (1-4) ports on the 9083 are to be used as **outputs** (the switches are set to input mode by factory default). The 9083 is equipped with a four-section red DIP switch that sets AES pairs 1 thru 4 as either inputs or outputs. The factory default position is the **input** position for each pair.

- If all of the AES I/O (1-4) ports are to be used as inputs (or not used at all), omit this procedure.
- If any of the AES I/O (1-4) ports are to be used as outputs, set the switches as described in this procedure.

Note switch S11 thru S14 settings for **AES I/O 1** thru **AES I/O 4** mode shown in Figure 2-1. For port to be used as an **output,** set switch to down position as shown in Figure 2-1.

Note: Regardless of S11 thru S14 settings for **AES I/O 1** thru **AES I/O 4**, outputs **AES OUT (1-4)** are still available on cards equipped with a Rear I/O Module having dedicated **AES OUT** BNC connectors.

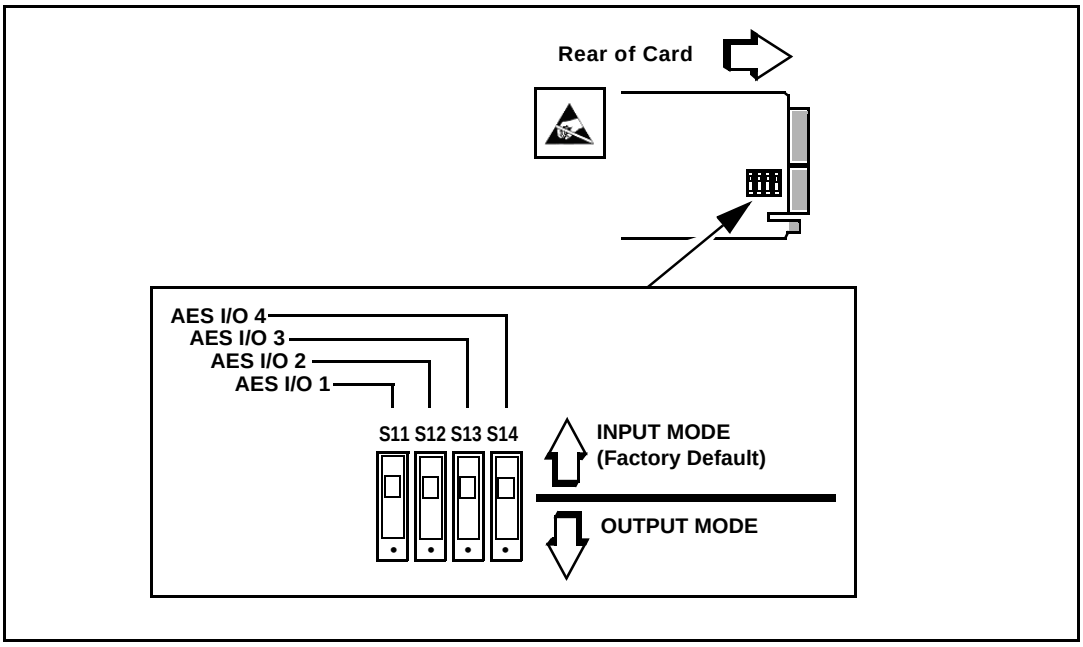


Figure 2-1 9083 AES I/O (1-4) Mode Switches

Installing the 9083 Into a Frame Slot

CAUTION

Heat and power distribution requirements within a frame may dictate specific slot placement of cards. Cards with many heat-producing components should be arranged to avoid areas of excess heat build-up, particularly in frames using only convection cooling. The 9083 has a moderate power dissipation (15 W max.). As such, avoiding placing the card adjacent to other cards with similar dissipation values if possible.

CAUTION

	This device contains semiconductor devices which are susceptible to serious damage from Electrostatic Discharge (ESD). ESD damage may not be immediately apparent and can affect the long-term reliability of the device. **Avoid handling circuit boards in high static environments such as carpeted areas, and when wearing synthetic fiber clothing. Always use proper ESD handling precautions and equipment when working on circuit boards and related equipment.**

Note:
- **If installing the 9083 in an 8310-C-BNC or 8310-BNC frame** (which is pre-equipped with a 100-BNC rear I/O module installed across the entire backplane) or a slot already equipped with a suitable I/O module, proceed to card installation steps below.
- **If installing the 9083 in a slot with no rear I/O module, a Rear I/O Module is required** before cabling can be connected. Refer to Installing a Rear I/O Module (p. 2-5) for rear I/O module installation procedure.

CAUTION

If required, make certain Rear I/O Module(s) is installed before installing the 9083 into the frame slot. Damage to card and/or Rear I/O Module can occur if module installation is attempted with card already installed in slot.

Note: Check the packaging in which the 9083 was shipped for any extra items such as a Rear I/O Module connection label. In some cases, this label is shipped with the card and should be installed on the Rear I/O connector bank corresponding to the slot location of the card.

Install the 9083 into a frame slot as follows:

1. Determine the slot in which the 9083 is to be installed.
2. Open the frame front access panel.
3. While holding the card by the card edges, align the card such that the plastic ejector tab is on the bottom.
4. Align the card with the top and bottom guides of the slot in which the card is being installed.
5. Gradually slide the card into the slot. When resistance is noticed, gently continue pushing the card until its rear printed circuit edge terminals engage fully into the rear I/O module mating connector.

CAUTION

If card resists fully engaging in rear I/O module mating connector, check for alignment and proper insertion in slot tracks. Damage to card and/or rear I/O module may occur if improper card insertion is attempted.

6. Verify that the card is fully engaged in rear I/O module mating connector.
7. Close the frame front access panel.
8. Connect the input and output cables as follows:
   - If the 9083 is being installed in a PN 8310-BNC or 8310-C-BNC frame, refer to the label on the connector bank corresponding to the card's slot location for connector designations.
   - If the 9083 is being installed in a frame using a specific 9083 Rear I/O Module, connect cabling in accordance with the appropriate diagram shown in Table 2-1, "9083 Rear I/O Modules" (p. 2-6).

9. Repeat steps 1 through 8 for other 9083 cards.

Note: The 9083 BNC inputs are internally 75-ohm terminated. It is not necessary to terminate unused BNC inputs or outputs.

Note: External frame sync reference signals are received by the card over a reference bus on the card frame, and not on any card rear I/O module connectors. The frame has BNC connectors labeled **REF 1** and **REF 2** which receive the reference signal from an external source such as a house distribution.

Note: To remove a card, press down on the ejector tab to unseat the card from the rear I/O module mating connector. Evenly draw the card from its slot.

10. If network remote control is to be used for the frame and the frame has not yet been set up for remote control, perform setup in accordance with Cobalt® reference guide "COMPASS™ Remote Control User Guide (PN 9000RCS-RM)".

Note: If installing a card in a frame already equipped for, and connected to DashBoard™, no network setup is required for the card. The card will be discovered by DashBoard™ and be ready for use.

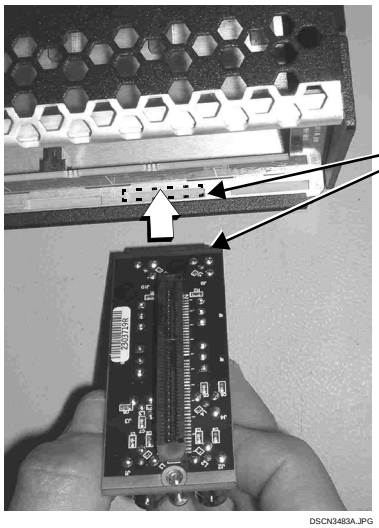
Installing a Rear I/O Module

Note: This procedure is applicable **only if a Rear I/O Module is not currently installed** in the slot where the 9083 is to be installed.

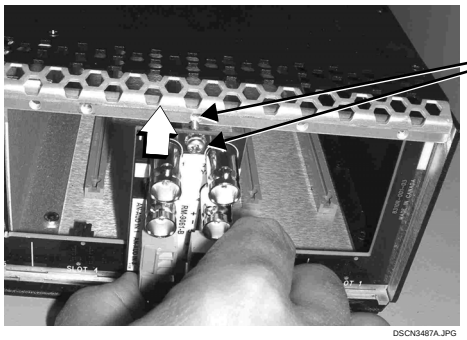
If installing the 9083 in a 8310-C-BNC or 8310-BNC frame (which is pre-equipped with a 100-BNC rear I/O module installed across the entire backplane) or a slot already equipped with a suitable I/O module, omit this procedure.

The full assortment of 9083 Rear I/O Modules is shown and described in 9083 Rear I/O Modules (p. 2-6). Install a Rear I/O Module as follows:

1. On the frame, determine the slot in which the 9083 is to be installed.
2. In the mounting area corresponding to the slot location, install Rear I/O Module as shown in Figure 2-2.



1 Align and engage mounting tab on Rear I/O Module with the module seating slot on rear of frame chassis.



2 Hold top of Rear I/O Module flush against frame chassis and start the captive screw. Lightly tighten captive screw.

Note: Rear I/O Modules RM-9083-C, -D, -E, and -H occupy two rear module slot mounting locations and use two captive screws.
Rear I/O Module RM-9083-G occupies three rear module slot mounting locations and uses three captive screws.

Figure 2-2 Rear I/O Module Installation

9083 Rear I/O Modules

Table 2-1 shows and describes the full assortment of Rear I/O Modules specifically for use with the 9083.

Notes:
- Rear I/O Modules equipped with 3-wire Phoenix connectors are supplied with removable screw terminal block adapters. For clarity, the adapters are omitted in the drawings below.
- Rear I/O Modules with **DOLBY META** port provide RS-485 port usable for Dolby metadata decoder output (where equipped with option **+DEC**) or serial LTC I/O (where licensed for option **+LTC**).
- RM20-x Rear I/O Modules compatible **only** with 20-slot frames.

Table 2-1 9083 Rear I/O Modules

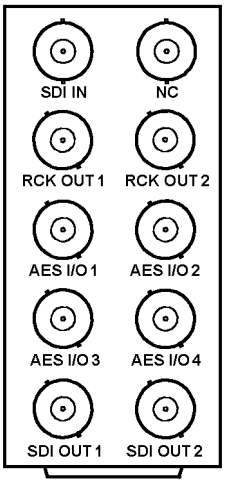
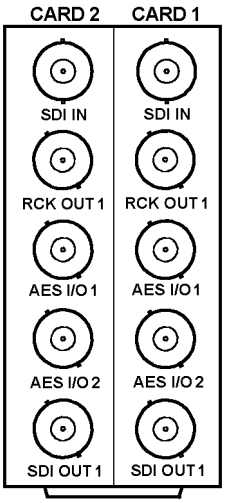
9083 Rear I/O Module	Description
RM20-9083-A 	Provides the following connections: • HD/SD-SDI coaxial input (**SDI IN**) • Two HD/SD-SDI reclocked input copies (**RCK OUT 1** and **RCK OUT 2**) • Four AES I/O coaxial input/outputs (**AES I/O 1** thru **AES I/O 4**; I/O function of each connection is user-configurable) • Two buffered SDI coaxial outputs (**SDI OUT 1** and **SDI OUT 2**)
RM20-9083-A/S 	Split Rear Module. Provides **each** of the following connections for two 9083 cards: • HD/SD-SDI coaxial input (**SDI IN**) • HD/SD-SDI reclocked input copy (**RCK OUT 1**) • Two AES I/O coaxial input/outputs (**AES I/O 1** and **AES I/O 2**; I/O function of each connection is user-configurable) • Buffered SDI coaxial output (**SDI OUT 1**) **Note:** For **AES I/O 1** and **AES I/O 2** on RM20-9083-A/S Rear I/O Module to function as inputs, AES I/O switches S11 – S12 must be set to Input (factory default). See Setting I/O Switches for AES I/O (1-4) Ports (p. 2-1) for more information.

Table 2-1 9083 Rear I/O Modules — continued

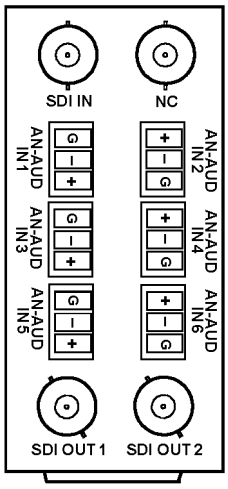
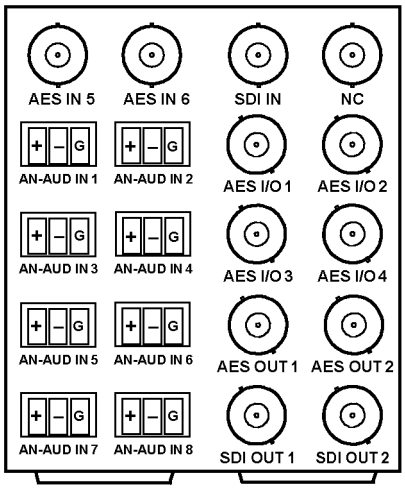
9083 Rear I/O Module	Description
RM20-9083-B 	Provides the following connections: • HD/SD-SDI coaxial input (**SDI IN**) • Six analog balanced audio inputs (**AN-AUD IN 1** thru **AN-AUD IN 6**) • Two buffered SDI coaxial outputs (**SDI OUT 1** and **SDI OUT 2**)
RM20-9083-C 	Provides the following connections: • HD/SD-SDI coaxial input (**SDI IN**) • Four AES I/O coaxial input/outputs (**AES I/O 1** thru **AES I/O 4**; I/O function of each connection is user-configurable) • Two dedicated AES coaxial audio inputs (**AES IN 5** and **AES IN 6**) • Two dedicated AES coaxial audio outputs (**AES OUT 1** and **AES OUT 2**) • Eight analog balanced audio inputs (**AN-AUD IN 1** thru **AN-AUD IN 8**) • Two buffered SDI coaxial outputs (**SDI OUT 1** and **SDI OUT 2**) **Note:** For **AES I/O 1** and **AES I/O 2** on RM20-9083-C Rear I/O Module to function as inputs, AES I/O switches S11 – S12 must be set to Input (factory default). See Setting I/O Switches for AES I/O (1-4) Ports (p. 2-1) for more information. **Note: AES OUT 1** and **AES OUT 2** on RM-9083-C Rear I/O Module always function as outputs regardless of whether **AES I/O 1** or **AES I/O 2** are used as inputs or outputs.

Table 2-1 9083 Rear I/O Modules — continued

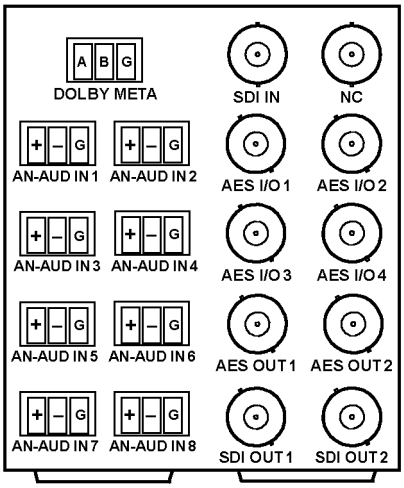
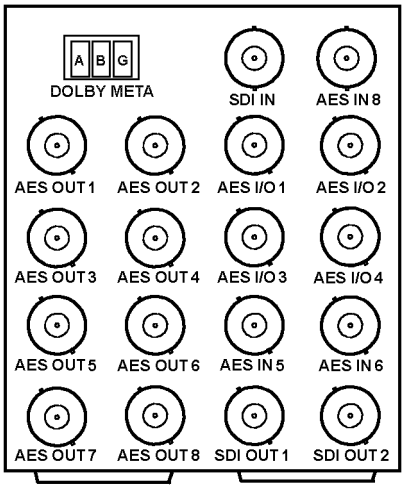
9083 Rear I/O Module	Description
RM20-9083-D 	Provides the following connections: • HD/SD-SDI coaxial input (**SDI IN**) • Four AES I/O coaxial input/outputs (**AES I/O 1** thru **AES I/O 4**; I/O function of each connection is user-configurable) • Two dedicated AES coaxial audio outputs (**AES OUT 1** and **AES OUT 2**) • Eight analog balanced audio inputs (**AN-AUD IN 1** thru **AN-AUD IN 8**) • RS-485 metadata/LTC I/O output (**DOLBY META**) • Two buffered SDI coaxial outputs (**SDI OUT 1** and **SDI OUT 2**) **Note:** For **AES I/O 1** thru **AES I/O 4** on RM20-9083-D Rear I/O Module to function as inputs, AES I/O switches S11 – S14 must be set to Input (factory default). See Setting I/O Switches for AES I/O (1-4) Ports (p. 2-1) for more information. **Note: AES OUT 1** and **AES OUT 2** on RM20-9083-D Rear I/O Module always function as outputs regardless of whether **AES I/O 1** or **AES I/O 2** are used as inputs or outputs.
RM20-9083-E 	Provides the following connections: • HD/SD-SDI coaxial input (**SDI IN**) • Four AES I/O coaxial input/outputs (**AES I/O 1** thru **AES I/O 4**; I/O function of each connection is user-configurable) • Two dedicated AES coaxial audio inputs (**AES IN 5** and **AES IN 6**) • Eight dedicated AES coaxial audio outputs (**AES OUT 1** thru **AES OUT 8**) • Dolby® RS-485 metadata output (**DOLBY META**) • Two buffered SDI coaxial outputs (**SDI OUT 1** and **SDI OUT 2**) **Note:** For **AES I/O 1** thru **AES I/O 4** on RM20-9083-E Rear I/O Module to function as inputs, AES I/O switches S11 – S14 must be set to Input (factory default). See Setting I/O Switches for AES I/O (1-4) Ports (p. 2-1) for more information. **Note: AES OUT 1** thru **AES OUT 4** on RM20-9083-E Rear I/O Module always function as outputs regardless of whether **AES I/O 1** thru **AES I/O 4** are used as inputs or outputs.

Table 2-1 9083 Rear I/O Modules — continued

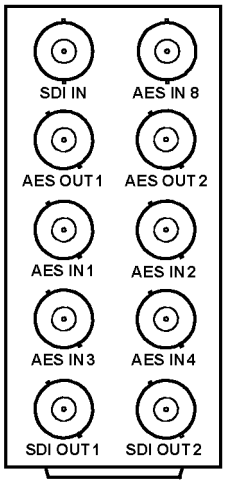
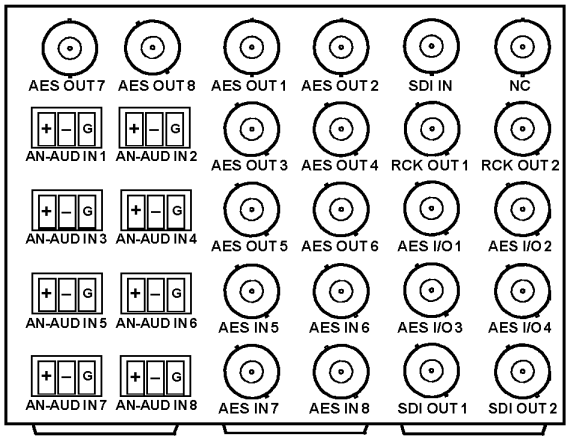
9083 Rear I/O Module	Description
RM20-9083-F  	Provides the following connections: • HD/SD-SDI coaxial input (**SDI IN**) • Five AES coaxial inputs (**AES IN 1** thru **AES IN 4**; **AES IN 8**) • Two dedicated AES coaxial audio outputs (**AES OUT 1** and **AES OUT 2**) • Two buffered SDI coaxial outputs (**SDI OUT 1** and **SDI OUT 2**) **Note:** For **AES IN 1** thru **AES IN 4** on RM20-9083-F Rear I/O Module to function as inputs, AES I/O switches S11 – S14 must be set to Input (factory default). See Setting I/O Switches for AES I/O (1-4) Ports (p. 2-1) for more information.
RM20-9083-G  	Provides the following connections: • HD/SD-SDI coaxial input (**SDI IN**) • Two HD/SD-SDI reclocked input copies (**RCK OUT 1** and **RCK OUT 2**) • Four dedicated AES coaxial audio inputs (**AES IN 5** thru **AES IN 8**) • Four AES I/O coaxial input/outputs (**AES I/O 1** thru **AES I/O 4**; I/O function of each connection is user-configurable) • Eight dedicated AES coaxial audio outputs (**AES OUT 1** thru **AES OUT 8**) • Eight analog balanced audio inputs (**AN-AUD IN 1** thru **AN-AUD IN 8**) • Two buffered SDI coaxial outputs (**SDI OUT 1** and **SDI OUT 2**) **Note:** For **AES I/O 1** thru **AES I/O 4** on RM20-9083-G Rear I/O Module to function as inputs, AES I/O switches S11 – S14 must be set to Input (factory default). See Setting I/O Switches for AES I/O (1-4) Ports (p. 2-1) for more information. **Note:** **AES OUT 1** thru **AES OUT 4** on RM20-9083-G Rear I/O Module always function as outputs regardless of whether **AES I/O 1** thru **AES I/O 4** are used as inputs or outputs.

Table 2-1 9083 Rear I/O Modules — continued

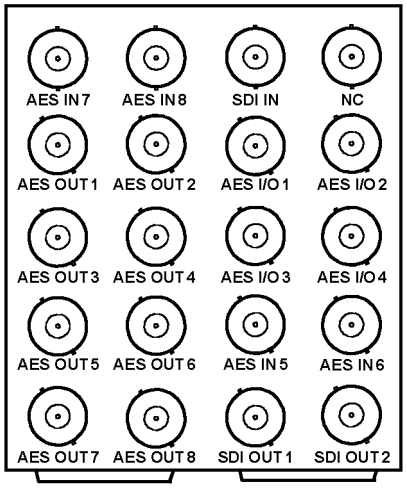
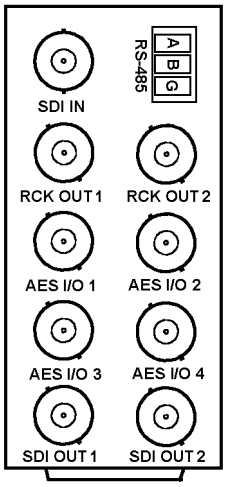
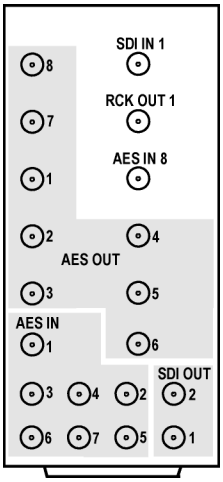
9083 Rear I/O Module	Description
RM20-9083-H 	Provides the following connections: • HD/SD-SDI coaxial input (**SDI IN**) • Four dedicated AES coaxial audio inputs (**AES IN 5** thru **AES IN 8**) • Eight dedicated AES coaxial audio outputs (**AES OUT 1** thru **AES OUT 8**) • Four AES I/O coaxial input/outputs (**AES I/O 1** thru **AES I/O 4**; I/O function of each connection is user-configurable) • Two buffered SDI coaxial outputs (**SDI OUT 1** and **SDI OUT 2**) **Note:** For **AES I/O 1** thru **AES I/O 4** on RM20-9083-H Rear I/O Module to function as inputs, AES I/O switches S11 – S14 must be set to Input (factory default). See Setting I/O Switches for AES I/O (1-4) Ports (p. 2-1) for more information. **Note: AES OUT 1** thru **AES OUT 4** on RM20-9083-H Rear I/O Module always function as outputs regardless of whether **AES I/O 1** thru **AES I/O 4** are used as inputs or outputs.
RM20-9083-J 	Provides the following connections: • HD/SD-SDI coaxial input (**SDI IN**) • Two HD/SD-SDI reclocked input copies (**RCK OUT 1** and **RCK OUT 2**) • Four AES I/O coaxial input/outputs (**AES I/O 1** thru **AES I/O 4**; I/O function of each connection is user-configurable) • RS-485 metadata/LTC I/O output (**DOLBY META**) • Two buffered SDI coaxial outputs (**SDI OUT 1** and **SDI OUT 2**) **Note:** For **AES I/O 1** thru **AES I/O 4** on RM-9083-J Rear I/O Module to function as inputs, AES I/O switches S11 – S14 must be set to Input (factory default). See Setting I/O Switches for AES I/O (1-4) Ports (p. 2-1) for more information.

Table 2-1 9083 Rear I/O Modules — continued

9083 Rear I/O Module	Description
RM20-9083-E-DIN-HDBNC 	High-density rear modules provides the following connections: • HD/SD-SDI coaxial input (**SDI IN**) • Eight AES coaxial inputs (**AES IN 1** thru **AES IN 8**) • Eight AES coaxial outputs (**AES OUT 1** thru **AES OUT 8**) • One HD/SD-SDI reclocked input copy (**RCK OUT 1**) • Two buffered SDI coaxial outputs (**SDI OUT**) **Note:** Available equipped with High-Density BNC (HDBNC) or DIN1.0/2.3 connectors as: RM20-9083-E-HDBNC or RM20-9083-E-DIN, respectively.

COBALT
RM20-9001-B/S-DIN

SAMPLE-NOT FOR USE

Due to the density of connector placement on Rear Modules using high-density connectors (e.g., RM20-9001-B/S-DIN), these modules use a QR barcode label instead a regular label. Simply scan the image with a smart phone and a link to the rear module label (as shown in our catalog) will appear. (Smart phone must have a QR reader app such as QuickMark QR Code Reader or equivalent.)

Not all devices may be able to acquire the image. If this occurs, use the device to access the web page for card/rear module to view the diagram.

Setting Up 9083 Network Remote Control

Perform remote control setup in accordance with Cobalt® reference guide "Remote Control User Guide" (PN 9000RCS-RM).

Note: • If network remote control is to be used for the frame and the frame has not yet been set up for remote control, Cobalt® reference guide **Remote Control User Guide (PN 9000RCS-RM)** provides thorough information and step-by-step instructions for setting up network remote control of COMPASS™ cards using DashBoard™. (Cobalt® OGCP-9000 and OGCP-9000/CC Remote Control Panel product manuals have complete instructions for setting up remote control using a Remote Control Panel.)

Download a copy of this guide by clicking on the **Support>Documents> Reference Guides** link at www.cobaltdigital.com and then select DashBoard Remote Control Setup Guide as a download, or contact Cobalt® as listed in Contact Cobalt Digital Inc. (p. 1-29).

• If installing a card in a frame already equipped for, and connected to DashBoard™, no network setup is required for the card. The card will be discovered by DashBoard™ and be ready for use.

Chapter 3

Operating Instructions

Overview

If you are already familiar with using DashBoard or a Cobalt Remote Control Panel to control Cobalt cards, please skip to 9083 Function Submenu List and Descriptions (p. 3-9).

This chapter contains the following information:

- Control and Display Descriptions (p. 3-1)
- Accessing the 9083 Card via Remote Control (p. 3-5)
- Checking 9083 Card Information (p. 3-7)
- Ancillary Data Line Number Locations and Ranges (p. 3-8)
- 9083 Function Submenu List and Descriptions (p. 3-9)
- Troubleshooting (p. 3-65)

Control and Display Descriptions

This section describes the user interface controls, indicators, and displays for using the 9083 card. The 9083 functions can be accessed and controlled using any of the user interfaces described here.

The format in which the 9083 functional controls, indicators, and displays appear and are used varies depending on the user interface being used. Regardless of the user interface being used, access to the 9083 functions (and the controls, indicators, and displays related to a particular function) follows a general arrangement of Function Submenus under which related controls can be accessed (as described in Function Submenu/Parameter Submenu Overview below).

Note: DashBoard™ and the Remote Control Panel provide greatly simplified user interfaces as compared to using the card edge controls. For this reason, **it is strongly recommended** that DashBoard™ or a Remote Control Panel be used for all card applications other than the most basic cases. Card edge control codes are not included in this manual. If card-edge control is to be used, obtain a copy of “Manual Supplement – Card-Edge Control Reference Master List and Instructions for Using Compass® Card-edge (Local) Control Codes” (989CEC-MS.pdf) at **www.cobaltdigital.com>Support>Documents>Reference Guides**.

Note: When a setting is changed, settings displayed on DashBoard™ (or a Remote Control Panel) are the settings as effected by the 9083 card itself and reported back to the remote control; the value displayed at any time is the actual value as set on the card.

Function Submenu/Parameter Submenu Overview

The functions and related parameters available on the 9083 card are organized into function **submenus**, which consist of parameter groups as shown below.

Figure 3-1 shows how the 9083 card and its submenus are organized, and also provides an overview of how navigation is performed between cards, function submenus, and parameters.

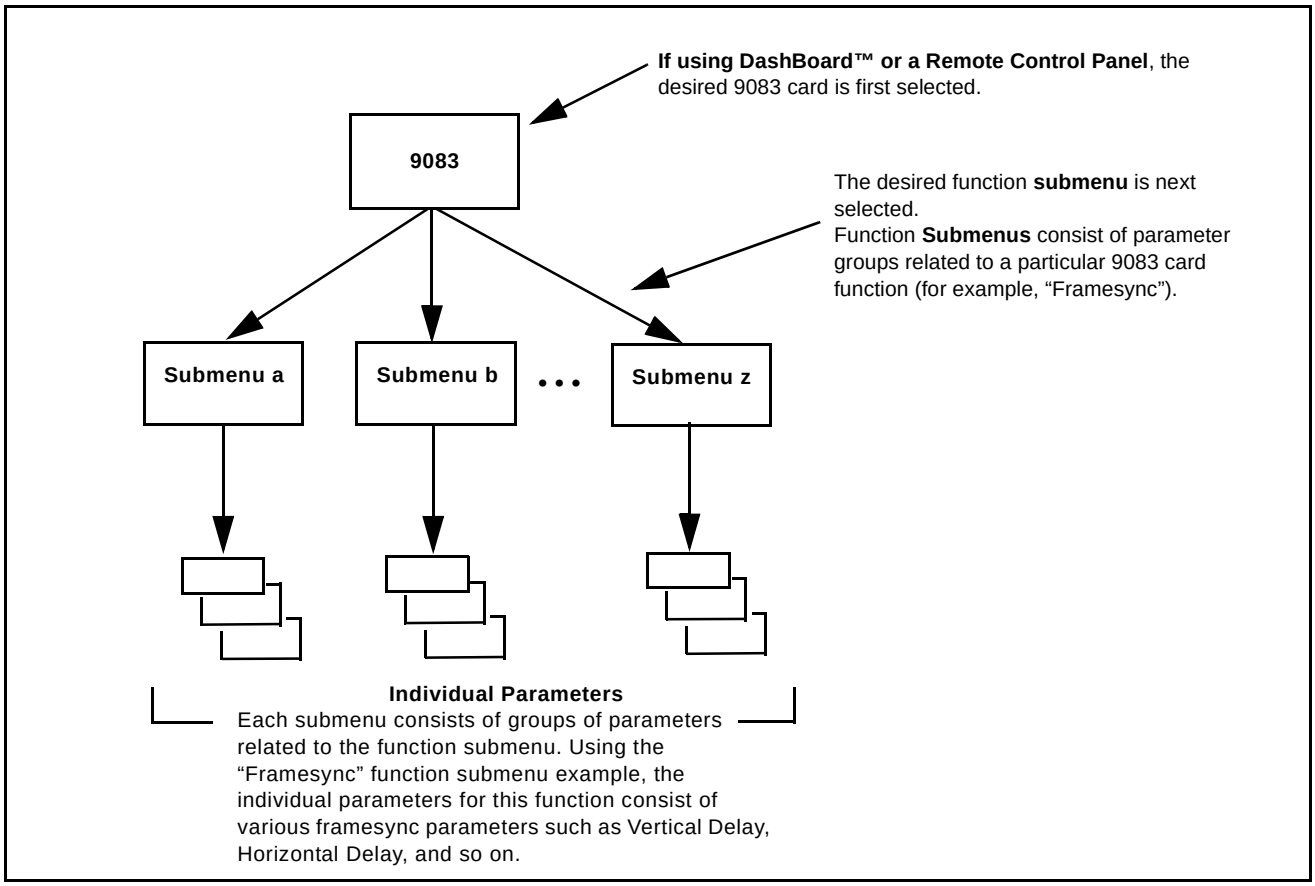


Figure 3-1 Function Submenu/Parameter Submenu Overview

DashBoard™ User Interface

(See Figure 3-2.) The 9083 function submenus are organized in DashBoard™ using tabs. When a tab is selected, each parametric control or selection list item associated with the function is displayed. Scalar (numeric) parametric values can then be adjusted as desired using the GUI slider controls. Items in a list can then be selected using GUI drop-down lists. (In this manner, the setting effected using controls and selection lists displayed in DashBoard™ are comparable to the submenu items accessed and committed using the 9083 card edge controls.)

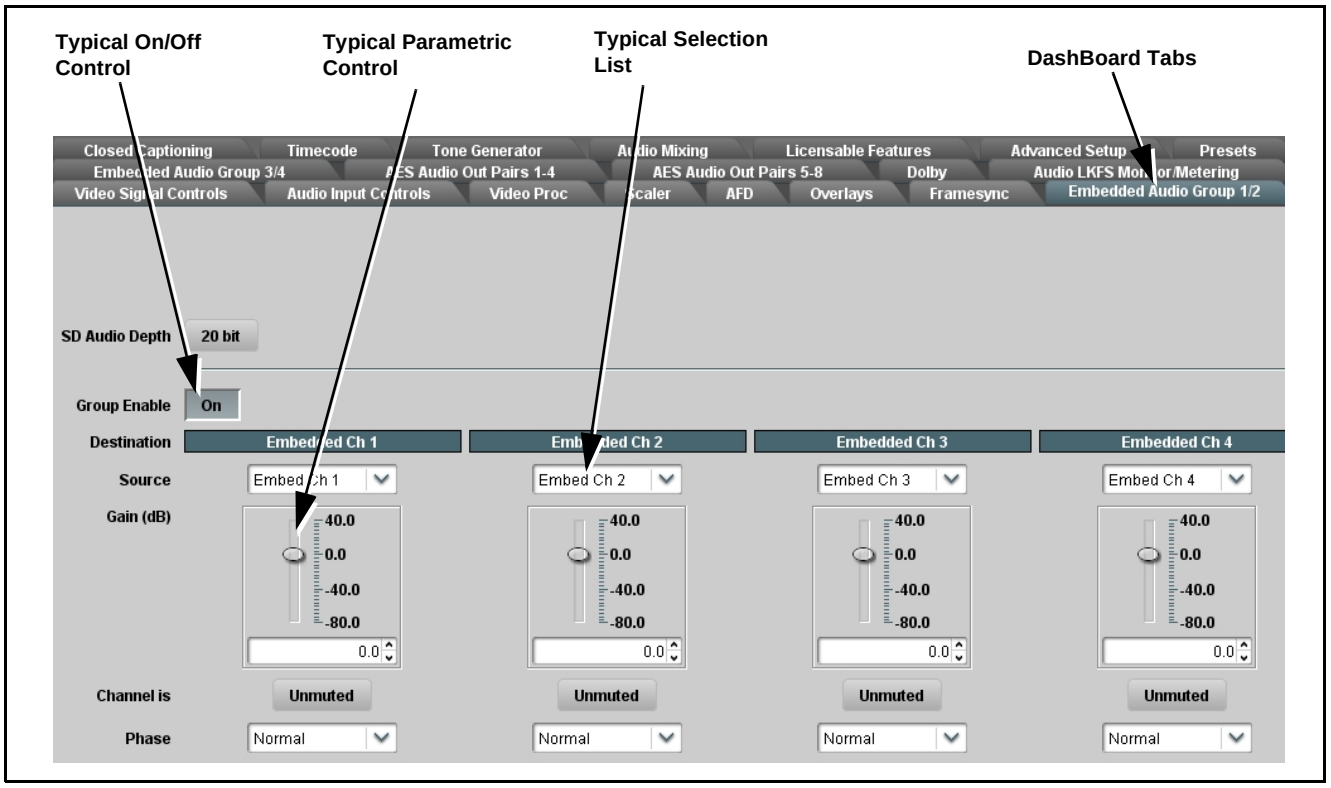


Figure 3-2 Typical DashBoard Tabs and Controls

Cobalt® Remote Control Panel User Interfaces

(See Figure 3-3.) Similar to the function submenu tabs using DashBoard™, the OGCP-9000 (and OGCP-9000/CC) Remote Control Panels have a Select Submenu key that is used to display a list of function submenus. From this list, a control knob on the Control Panel is used to select a function from the list of displayed function submenu items.

When the desired function submenu is selected, each parametric control or selection list item associated with the function is displayed. Scalar (numeric) parametric values can then be adjusted as desired using the control knobs, which act like potentiometers. Items in a list can then be selected using the control knobs which correspondingly act like rotary switches. (In this manner, the setting effected using controls and selection lists displayed on the Control Panel are comparable to the submenu items accessed and committed using the 9083 card edge controls.)

Figure 3-3 shows accessing a function submenu and its parameters (in this example, “Embedded Audio Output Group 1/2”) using the Control Panel as compared to using the card edge controls.

Note: Refer to “OGCP-9000 Remote Control Panel User Manual” (PN OGCP-9000-OM) or “OGCP-9000/CC Remote Control Panel User Manual” (PN OGCP-9000/CC-OM) for complete instructions on using the Control Panels.

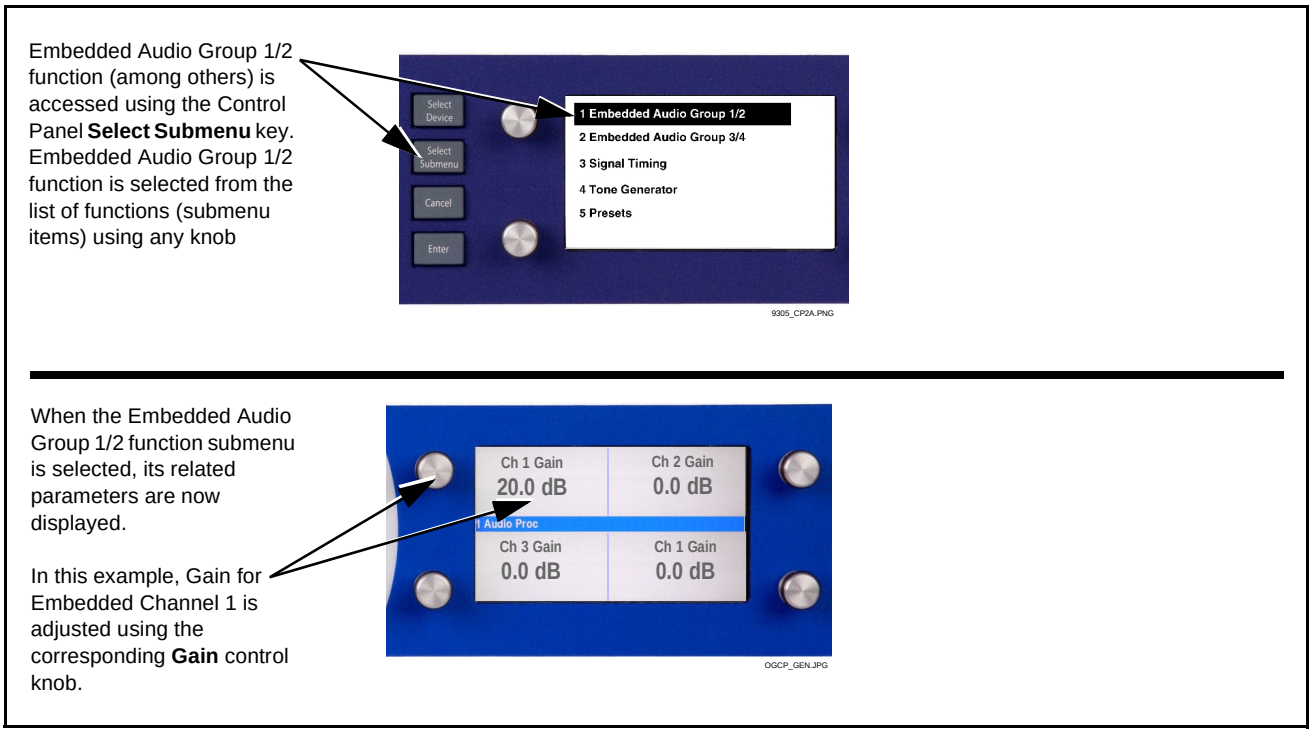


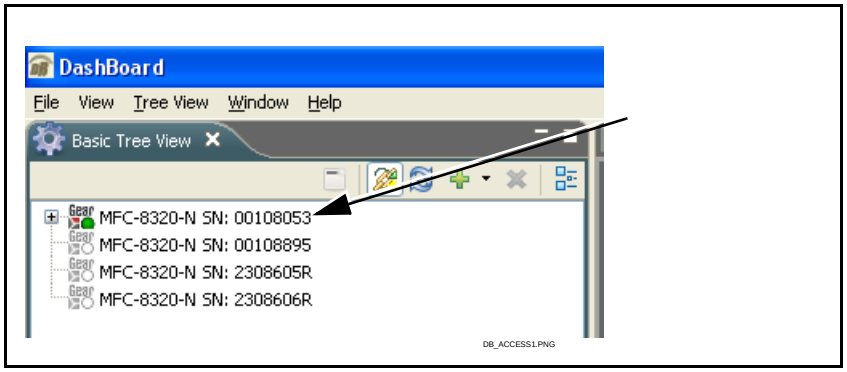
Figure 3-3 Control Panel Setup of Example Audio Control Function

Accessing the 9083 Card via Remote Control

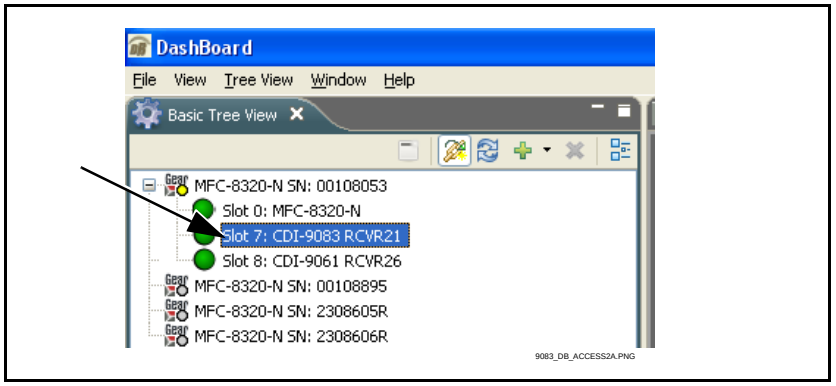
Access the 9083 card using DashBoard™ or Cobalt® Remote Control Panel as described below.

Accessing the 9083 Card Using DashBoard™

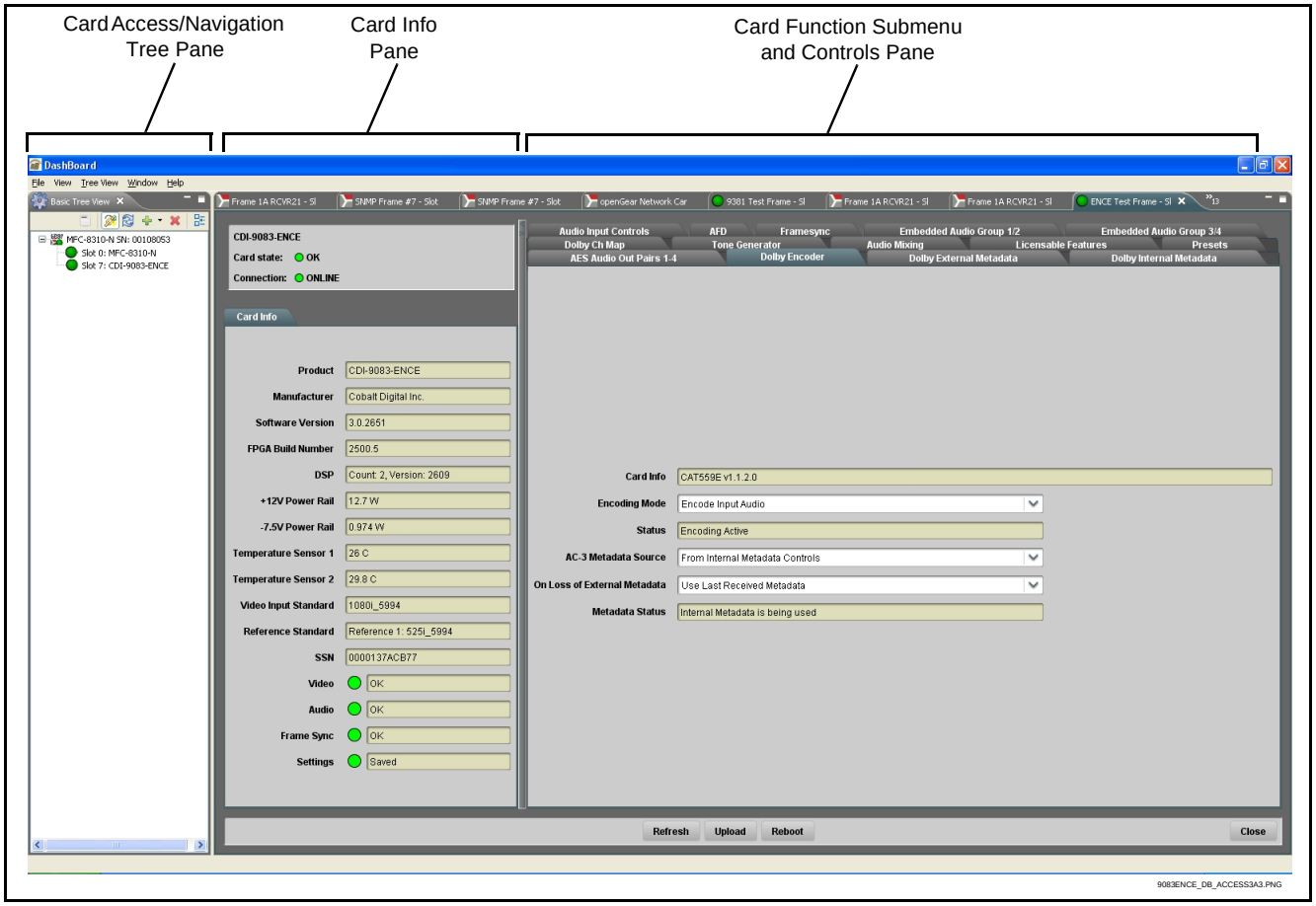
1. On the computer connected to the frame LAN, open DashBoard™.
2. As shown below, in the left side Basic View Tree locate the Network Controller Card associated with the frame containing the 9083 card to be accessed (in this example, “MFC-8320-N SN: 00108053”).



3. As shown below, expand the tree to access the cards within the frame. Click on the card to be accessed (in this example, “Slot 7: CDI-9083 RCVR21”).



As shown on the next page, when the card is accessed a DashBoard™ its function submenu screen showing tabs for each function is displayed. (The particular submenu screen displayed is the previously displayed screen from the last time the card was accessed by DashBoard™).



Accessing the 9083 Card Using a Cobalt® Remote Control Panel

Press the **Select Device** key and select a card as shown in the example below.

This display shows the list order number of the device that is ready for selection

This display shows the devices assigned to the Control Panel.

- Rotate any knob to select from the list of devices. The device selected using a knob is displayed with a reversed background (in this example, “1 9083 - Receiver 21 Input Processing”).
- Directly enter a device by entering its list number using the numeric keypad, and then pressing **Enter** or pressing in any knob).

Checking 9083 Card Information

The operating status and software version the card can be checked using DashBoard™ or the card edge control user interface. Figure 3-4 shows and describes the 9083 card information screen using DashBoard™ and accessing card information using the card edge control user interface.

Note: Proper operating status in DashBoard™ is denoted by green icons for the status indicators shown in Figure 3-4. Yellow or red icons respectively indicate an alert or failure condition. Refer to Troubleshooting (p. 3-65) for corrective action.

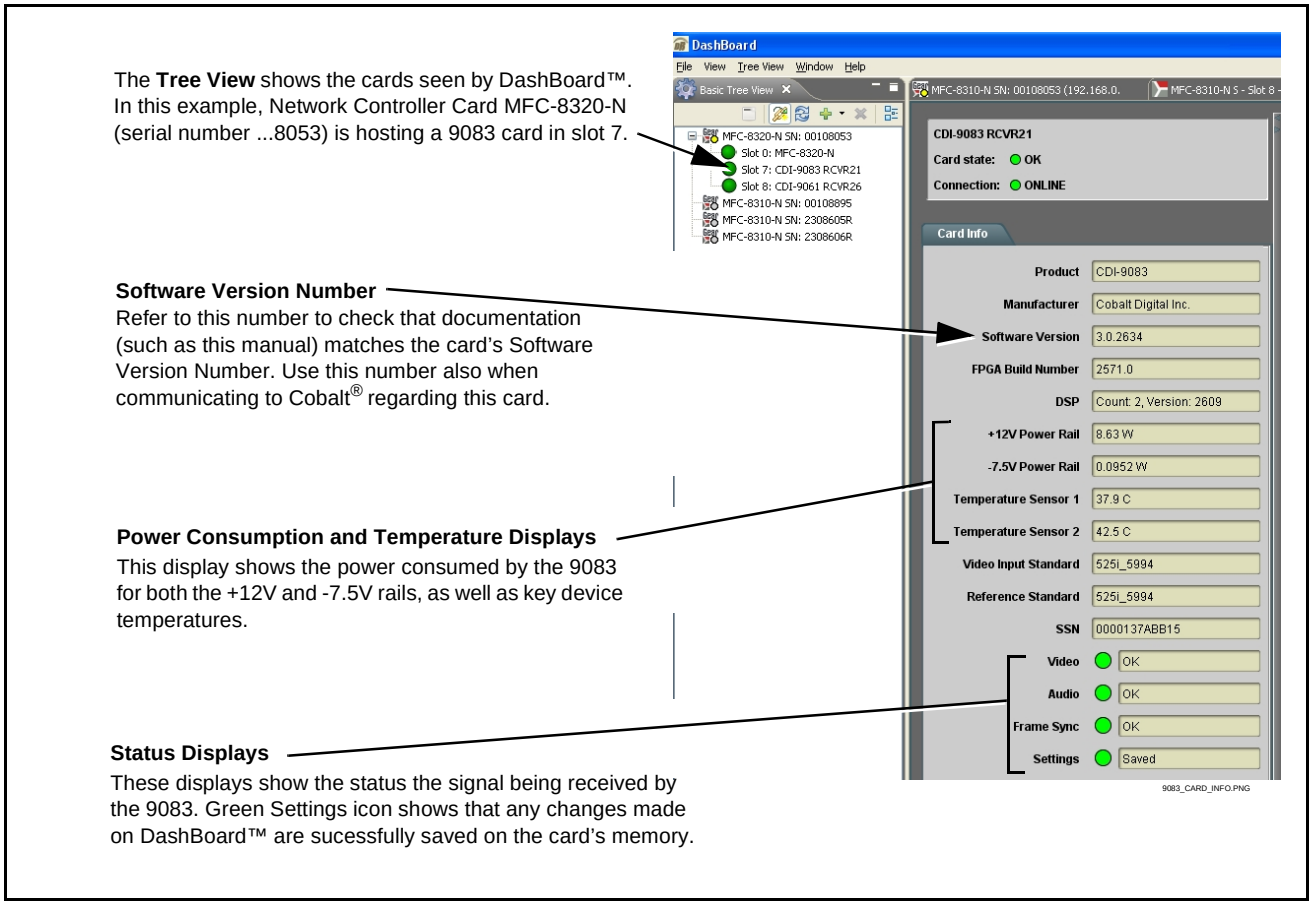


Figure 3-4 9083 Card Info Utility

Ancillary Data Line Number Locations and Ranges

Table 3-1 lists typical default output video VANC line number locations for various ancillary data items that may be passed or handled by the card.

Table 3-1 Typical Ancillary Data Line Number Locations/Ranges

Item	Default Line No. / Range	
	SD	HD
AFD	12 (Note 2)	9 (Note 2)
ATC_VITC	12 (locked)	9/8 (Note 2)
ATC_LTC	—	10 (Note 2)
Dolby® Metadata	13 (Note 2)	13 (Note 2)
SDI VITC Waveform	14/16 (Note 2)	—
Closed Captioning	21 (locked)	10 (Note 2)

Notes:

1. The card does not check for conflicts on a given line number. Make certain the selected line is available and carrying no other data.
2. While range indicated by drop-down list on GUI may allow a particular range of choices, the actual range is automatically clamped (limited) to certain ranges to prevent inadvertent conflict with active picture area depending on video format. Limiting ranges for various output formats are as follows:

Format	Line No. Limiting	Format	Line No. Limiting	Format	Line No. Limiting
525i	12-19	720p	9-25	1080p	9-41
625i	9-22	1080i	9-20		

Because line number allocation is not standardized for all ancillary items, consideration should be given to all items when performing set-ups. Figure 3-5 shows an example of improper and corrected VANC allocation within an HD-SDI stream.

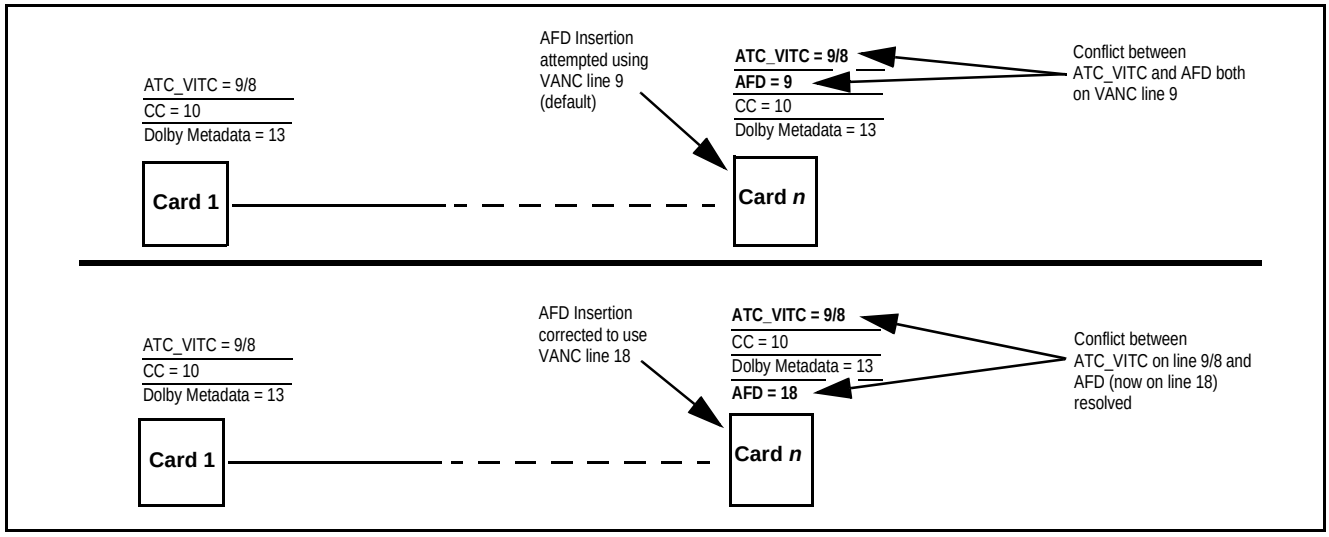


Figure 3-5 Example VANC Line Number Allocation Example

9083 Function Submenu List and Descriptions

Table 3-2 individually lists and describes each 9083 function submenu ("tab") and its related list selections, controls, and parameters. Where helpful, examples showing usage of a function are also provided. Table 3-2 is primarily based upon using DashBoard™ to access each function and its corresponding submenus and parameters.

Note: All numeric (scalar) parameters displayed on DashBoard™ can be changed using the slider controls, ⇕ arrows, or by numeric keypad entry in the corresponding numeric field. (When using numeric keypad entry, add a return after the entry to commit the entry.)

On DashBoard™ itself and in Table 3-2, the function submenu items are organized using tabs as shown below.

The table below provides a quick-reference to the page numbers where each function submenu item can be found.

Function Submenu Item	Page	Function Submenu Item	Page
Audio Input Controls	3-10	**Option +ENCD Dolby® Functions (Table 3-3)**	
AFD	3-13	Dolby Digital Encoder	3-43
Framesync	3-14	Dolby Digital External Metadata	3-46
Embedded Audio Group 1/2	3-18	Dolby Digital Internal Metadata	3-48
Embedded Audio Group 3/4	3-22	Dolby Digital Channel Mapping	3-49
Audio LKFS Monitor	3-24	**Option +ENCE Dolby® Functions (Table 3-4)**	
AES Audio Out Pairs 1-4	3-27	Dolby E Encoder	3-51
Audio Mixing	3-31	Dolby E External Metadata	3-52
Timecode	3-36	Dolby E Internal Metadata	3-55
Tone Generator	3-40	Dolby E Channel Mapping	3-56
Licensable Features	3-40		
Presets	3-41		

Table 3-2 9083 Function Submenu List

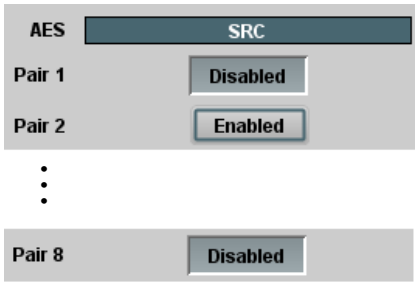
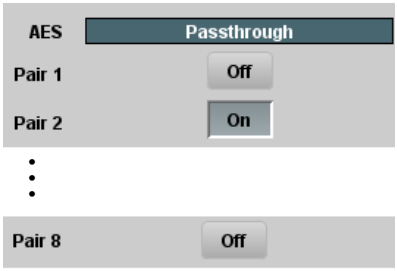
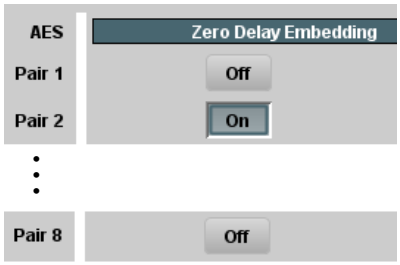
Audio Input Controls	Controls the AES Audio Input features for the eight AES input pairs, and displays signal status for the AES pairs and the 16 embedded audio channels. Also provides global unity routing/parameter control resets. **Note:** Also refer to AES Audio Input Advanced Features (p. 1-13) in Chapter 1,"Introduction" for detailed information regarding these functions.
• **AES SRC** 	Individual SRC **Disable** control for each AES pair (1 thru 8) disables or enables Sample Rate Conversion (SRC) bypass as follows: • **Disabled:** In this mode, AES SRC for the corresponding AES pair is **bypassed**. SRC is set to **Disabled** by default. This mode is preferred where the AES rate matches the input video rate. This mode is necessary when embedding non-PCM AES audio such a Dolby® E or Dolby Digital™ audio streams. **Note:** In this mode AES rate must match the input video rate or audio dropouts will occur. **Note:** AES audio must be nominally 48 kHz. • **Enabled:** In this mode, AES SRC for the corresponding AES input pair is **enabled**. SRC enabled allows the 9083 to interface with asynchronous AES sources (sources in which the AES timing does not match the video reference timing). SRC can be used to compensate for minor clock rate differences in the AES stream and the input video stream.
• **AES Passthrough** 	Individual AES Passthrough **On/Off** control for each AES pair (1 thru 8) disables or enables Passthrough as follows: • **Off:** Disables AES passthrough for the selected AES input pair. Passthrough is set to **Off** by default. • **On:** Passthrough is turned on, with the corresponding AES output pair to act as a bit-for-bit copy with zero delay of the corresponding AES input pair. **Note:** AES Passthrough set to **On** overrides normal audio routing. Gain and polarity control is not available when AES passthrough is enabled.
• **AES Zero Delay Embedding** 	Individual AES Zero-Delay Embedding **On/Off** control for each AES pair (1 thru 8) disables or enables Zero-Delay Embedding as follows: • **Off:** Disables Zero-Delay Embedding for the selected AES input pair. Zero-delay embedding is set to **Off** by default. • **On:** The selected pair directly embeds into its corresponding group (AES Pair 1 embeds into embedded channels 1 and 2; AES pair 2 embeds into embedded channels 3 and 4, and so on) with the normal frame sync audio delay being bypassed. **Note:** Zero Delay Embedding overrides the standard audio routing system. For example, if AES Pair 1 is selected, then the controls to route into embedded channels 1 and 2 will not apply. Gain and polarity control is not available when zero-delay embedding is enabled.

Table 3-2 9083 Function Submenu List — continued

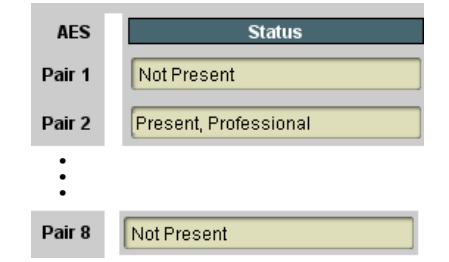
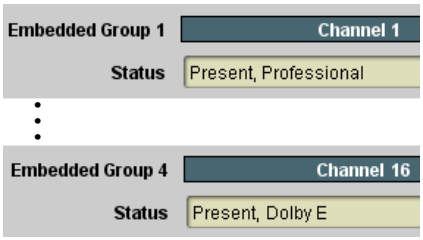
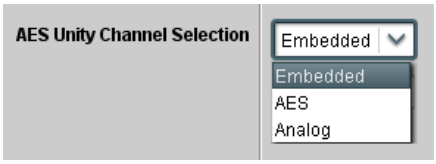
Audio Input Controls	**(continued)**
• Status Displays  	Individual signal status displays for AES pairs 1-8, and embedded audio channels 1-16 as follows: • **Not Present:** Indicates AES pair or embedded channel does not contain recognized audio PCM data. **Note:** Channel displaying Not Present may still carry usable audio data with **Not Present** being displayed due to invalid headers. • **Present, Professional:** Indicates AES pair or embedded channel contains recognized AES audio PCM data. • **Present, Consumer:** Indicates AES pair or embedded channel contains audio PCM data other than AES (for example, S/PDIF). • **Present, Dolby E:** Indicates AES pair or embedded channel contains Dolby® E encoded data. • **Present, Dolby Digital:** Indicates AES pair or embedded channel contains Dolby® Digital encoded data. **Note:** Dolby status displays shown to the left only occur for valid Dolby® signals meeting SMPTE 337M standard. The 9083 card does not perform Dolby® decoding on the signal. Although the 9083 controls will appear to be usable for this signal tag, the signal is passed with 1-to-1 routing and all related gain and polarity controls set to unity.
• Embedded Unity Channel Selection 	Selects unity reset of Embedded Audio Group 1/2 and 3/4 controls and re-establishes default 1-to-1 routing as follows: • **Embedded:** Routes Embedded Ch 1 thru Ch 16 as sources to destination channels Embedded Ch 1 thru Embedded Ch 16. • **AES:** Routes AES Ch 1 thru Ch 16 as sources to destination channels Embedded Ch 1 thru Embedded Ch 16. • **Analog:** Routes Analog Ch 1 thru Ch 8 as sources to destination channels Embedded Ch 1 thru Embedded Ch 8. Sets Embedded Ch 9 thru Ch 16 to Silence.
• AES Unity Channel Selection 	Selects unity reset of AES Outputs Pairs 1-4 and 5-8 controls and re-establishes default 1-to-1 routing as follows: • **Embedded:** Routes Embedded Ch 1 thru Ch 8 as sources to destination channels AES Ch 1 thru AES Ch 8. • **AES:** Routes AES Ch 1 thru Ch 8 as sources to destination channels AES Ch 1 thru AES Ch 8. • **Analog:** Routes Analog Ch 1 thru Ch 8 as sources to destination channels AES Ch 1 thru AES Ch 8.
• Dolby Encoder Unity Channel Selection 	Maps selected audio source as the encoder audio inputs and applies default unity parametric settings in **Dolby Channel Mapping** function tab as described below. **Note:** • **(Option +ENCD only)** Up to six channels can be sources for encoder inputs Encoder Ch1 thru Encoder Ch 6. • **(Option +ENCE only)** Up to eight channels can be sources for encoder inputs Encoder Ch1 thru Encoder Ch 8. • **Embedded:** Routes embedded channel sources as sources to encoder audio inputs. • **AES:** Routes AES channel sources to encoder audio inputs. • **Analog:** Routes analog channel sources to encoder audio inputs.

Table 3-2 9083 Function Submenu List — continued

Audio Input Controls	**(continued)**
	Applies embedded and AES unity channel selection (as set in the above drop-down lists). To apply the selections, click the **Confirm** button. When Confirm is clicked, a **Confirm?** pop-up appears, requesting confirmation. • Click **Yes** to proceed with the unity reset. • Click **No** to reject unity reset. For any selection following confirm, the destination channel controls are default reset as follows: • Gain is to unity • Phase control is set to Normal • Channel is set to Unmuted
• **Tie AES and Embedded Controls** 	When set to Enabled, gangs **Gain**, **Phase**, and **Mute** controls for same-numbered Embedded and AES channels 1 thru 8. Ganging is bilateral, with Embedded channel control settings affecting corresponding AES channel controls, and vice-versa.

Table 3-2 9083 Function Submenu List — continued

Allows assignment of AFD (Active Format Description) codes to the SDI output video.

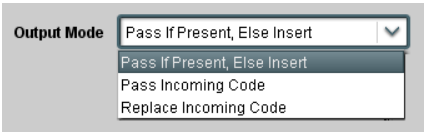
Note: • This function only marks the SDI output with an AFD code. Actual AFD processing must be performed by a downstream card or system that recognizes an AFD code assigned here.
• Framesync must be enabled for proper AFD insertion.

• Incoming AFD

Displays incoming AFD setting as follows:

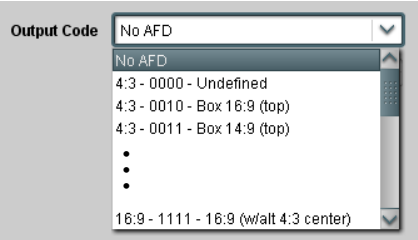
- If AFD code is present, one of the 11, four-bit AFD codes is displayed (as shown in the example to the left). Also displayed is the VANC line number of the incoming AFD code.
- If no AFD setting is present in the video signal, **No AFD Present** is displayed.

• Output Mode



Drop-down selection determines action to take in presence or absence of existing AFD code on input video.

• Output Code



Drop-down list assigns desired AFD to output SDI.

4:3 Coded Frame			
AFD Code(1)	**Description**	**AFD Code(1)**	**Description**
–	No code present	1001	Full frame
0000	Undefined	1010	16:9 (center)
0010	Box 16:9 (top)	1011	14:9 (center)
0011	Box 14:9 (top)	1101	4:3 (with alternate 14:9 center)
0100	Box > 16:9 (center)	1110	16:9 (with alternate 14:9 center)(2)
1000	Full frame	1111	16:9 (with alternate 4:3 center)(2)

16:9 Coded Frame			
AFD Code(1)	**Description**	**AFD Code(1)**	**Description**
–	No code present	1001	4:3 (center)
0000	Undefined	1010	16:9 (image protected)(2)
0010	Full frame	1011	14:9 (center)
0011	4:3 (center)	1101	4:3 (with alternate 14:9 center)
0100	Box > 16:9 (center)	1110	16:9 (with alternate 14:9 center)(2)
1000	Full frame	1111	16:9 (with alternate 4:3 center)(2)

1: AFD codes numbering and definitions conform to SMPTE 2016-1-2007.

2: Image Protected implies picture content that must not be cropped by conversion processes or display devices. Alternate center formats may have protected center areas, with areas outside of the protected area not containing mandatory content.

• Output Line

Allows selecting the line location of the AFD data within the video signal Ancillary Data space. (Range is 9 thru 41.)

Note: • Although the output line drop-down will allow any choice within the 9 thru 41 range, the actual range is automatically clamped (limited) to certain ranges to prevent inadvertent conflict with active picture area depending on video format. See Ancillary Data Line Number Locations and Ranges (p. 3-8) for more information.
• The card does not check for conflicts on a given line number. Make certain the selected line is available and carrying no other data.

Table 3-2 9083 Function Submenu List — continued

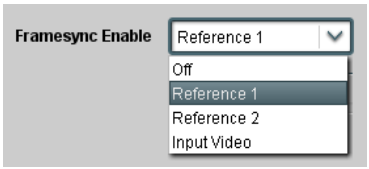
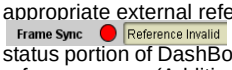
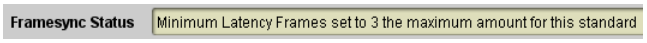
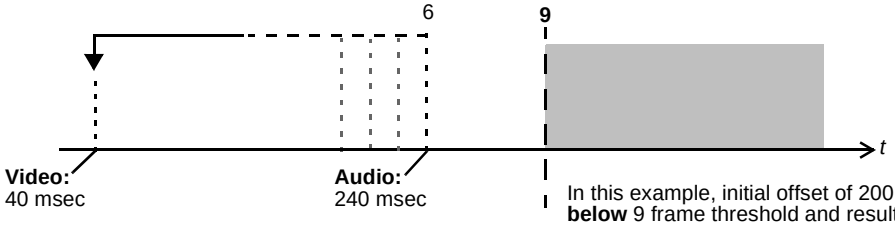
	Provides video Frame Sync offset and audio re-sync tools.
• **Framesync Enable** 	Disables the Frame Sync function, or selects from choices below. • **Off:** Video path bypasses frame sync entirely; output video timing tracks with input video timing. • **Reference 1:** Allows Frame Sync function to use external Reference 1 as the reference (“house”) standard. • **Reference 2:** Allows Frame Sync function to use external Reference 2 as the reference (“house”) standard. **Note:** If Reference 1 or Reference 2 is selected and an appropriate external reference is not received, the  indication appears in the Card Info status portion of DashBoard™, indicating invalid frame sync reference error. (Additionally, the card edge ERR indicator illuminates indicating the same.) External reference signals Reference 1 and Reference 2 are distributed to the card and other cards via a frame bus. • **Input Video:** Allows full framesync functionality (such as delay offset), but instead uses the input video signal as the reference standard. **Note:** If **Input Video** is used for framesync, any timing instability on the input video will result in corresponding instability on the output video. This setting should only be used where syncing to input video is known to be reliable.
• **Vertical Delay Control** 	When Framesync is enabled, sets vertical delay (in number of lines of **output video/format**) between the output video and the frame sync reference. (Range is -1124 thru 1124 lines.) **Note:** Lines refer to lines in the output video format, and not to the reference format.
• **Horizontal Delay Control** 	When Framesync is enabled, sets (in µsec of **output video timing**) horizontal delay between the output video and the frame sync reference. (Range is -64.000 thru 64.000 µsec) **Note:** When an external framesync reference is used, the card will not produce a framesync reset until the variance between framesync reference and output video exceeds ± 2 clock periods. Therefore, a framesync reset will not result if offsets within this window are applied. To apply an offset/framesync reset within this window, first apply a relatively large offset, then apply the target smaller offset. **Example:** To apply a 1-period offset, first apply a 10-period positive offset and then apply a 9-period negative offset. This results in the target 1-period offset being applied to the output video.
• **Input Video Mode Fixed Delay Control** 	When Framesync is enabled and set to **Input Video**, allows adding video delay. This is useful when compensating for processes which result in large audio delays. (Range is 0.0000 thru 300.0 msec.)
• **Framesync Audio SRC On/Off Control** 	When Framesync is enabled and set to **Input Video**, allows disabling audio SRC. This is required if the card is to pass non-PCM audio such as Dolby® audio to downstream devices.

Table 3-2 9083 Function Submenu List — continued

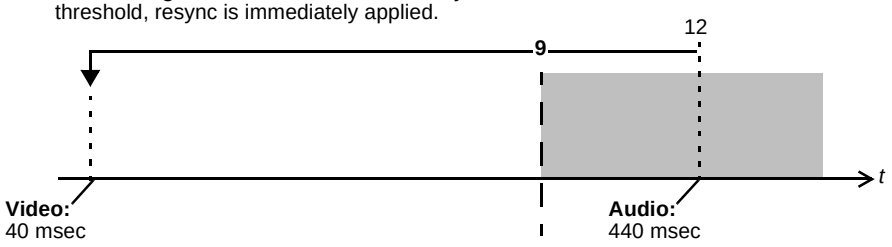
Framesync	**(continued)**
• **Minimum Latency Control** 	When Framesync is enabled, specifies the smallest amount of latency allowed by the frame sync (latency measurement in output video frames). The frame sync will not output a frame unless the specified number of frames are captured in the buffer. **The operational latency of the frame sync is always between the specified minimum latency and minimum latency plus one frame (not one field).** (Maximum range is 0 to 32.) **Note:** Due to card memory limits, the maximum available Minimum Latency Frames is related to the output video format selected. For example, with a 525i59.94 output, the practical maximum limit is 13. When using this control, be sure to check the **Framesync Status** display as follows:  • Latency frames selection within limits.  • Latency frames selection exceeds limits.
• **Audio Hard Resync Threshold Control** 	Sets threshold at which hard resync is applied if audio-video offset exceeds threshold (see below). Hard resync provides fastest snyc-up suitable for off-air manipulation. Conversely, a threshold setting that avoids hard resync allows glitch-free on-air manipulation. (Range is 1.5 to 13.0 frames in 0.1 frame increments)

With offset **less than** selected hard resync threshold, resync is progressively applied in many small steps to provide a seamless, glitch-free retiming. After the successive steps, the audio is synchronized with the video (in this example, 40 msec). (Progressive correction is applied at 1 msec/sec appr. rate.)



In this example, initial offset of 200 msec (appr. 6 frames) is **below** 9 frame threshold and results in soft resync being progressively applied.

With offset **greater than** selected hard resync threshold, resync is immediately applied.



In this example, initial offset of 400 msec (appr. 12 frames) is **above** 9 frame threshold and results in immediate hard resync.

Table 3-2 9083 Function Submenu List — continued

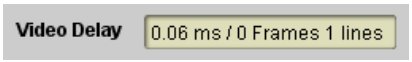
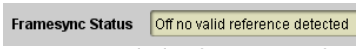
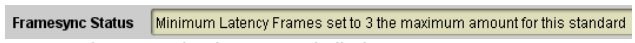
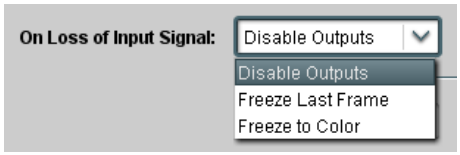
	**(continued)**
• **Audio Offset Control** 	Adds or reduces (offsets) audio delay from the matching video delay (audio delay offset setting adds or removes delay in addition to any delay included by other actions). This control is useful for correcting lip sync problems when video and audio paths in the chain experience differing overall delays. (-575.0 msec to 575.0 msec range; null = 0.0 msec) **Note:** Delay offset values of less than approximately 1 frame are progressively applied by the card to provide a seamless, glitch-free retiming. However, delay offset values exceeding 1-1/2 frames may result in a slight audio discontinuity at the moment when the offset is applied using this control if the **Audio Hard Resync Threshold** control is not at a setting greater than the delay offset. To prevent this condition during an on-air manipulation, it is recommended that the **Audio Hard Resync Threshold** control be set high enough such that expected delay offsets exceeding 1-1/2 frames are progressively applied. **Note:** If using Audio Offset control to perform off-air corrections, it is recommended to temporarily set the **Audio Hard Resync Threshold** control to its **minimum** setting, thereby allowing the offset to be assessed and corrected as fast as possible.
• **Current Audio Delay Display** 	Displays the current input-to-output audio delay (in msec units) as well as in terms of Frames/fractional frame (in number of lines).
• **Video Delay Display** 	Displays the current input-to-output video delay (in msec units) as well as in terms of Frames/fractional frame (in number of lines).
• **Framesync Status Display** 	Displays the current framesync status as follows:  • Framesync status OK.  • Framesync Enable set to **Off**.  • Improper or missing framesync reference.  • Latency frames selection exceeds limits. **Note:** See **Minimum Latency Frames Control** (p. 3-15) for more information about this message.
• **Loss of Input Signal Selection** 	In the event of input video Loss of Signal (LOS), determines action to be taken as follows: • **Disable Outputs:** Disable all outputs. • **Freeze Last Frame:** Freeze image to last good frame (last frame having valid SAV and EAV codes). • **Freeze to Color:** Freeze image to a color raster (as selected using Framesync LOS Freeze Color control).

Table 3-2 9083 Function Submenu List — continued

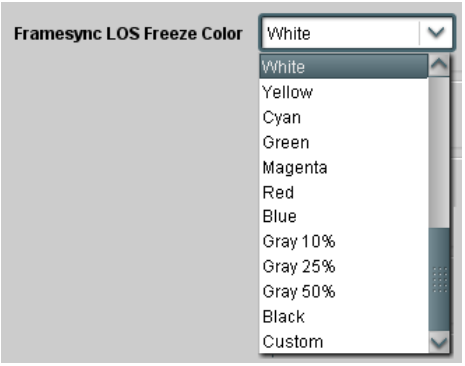
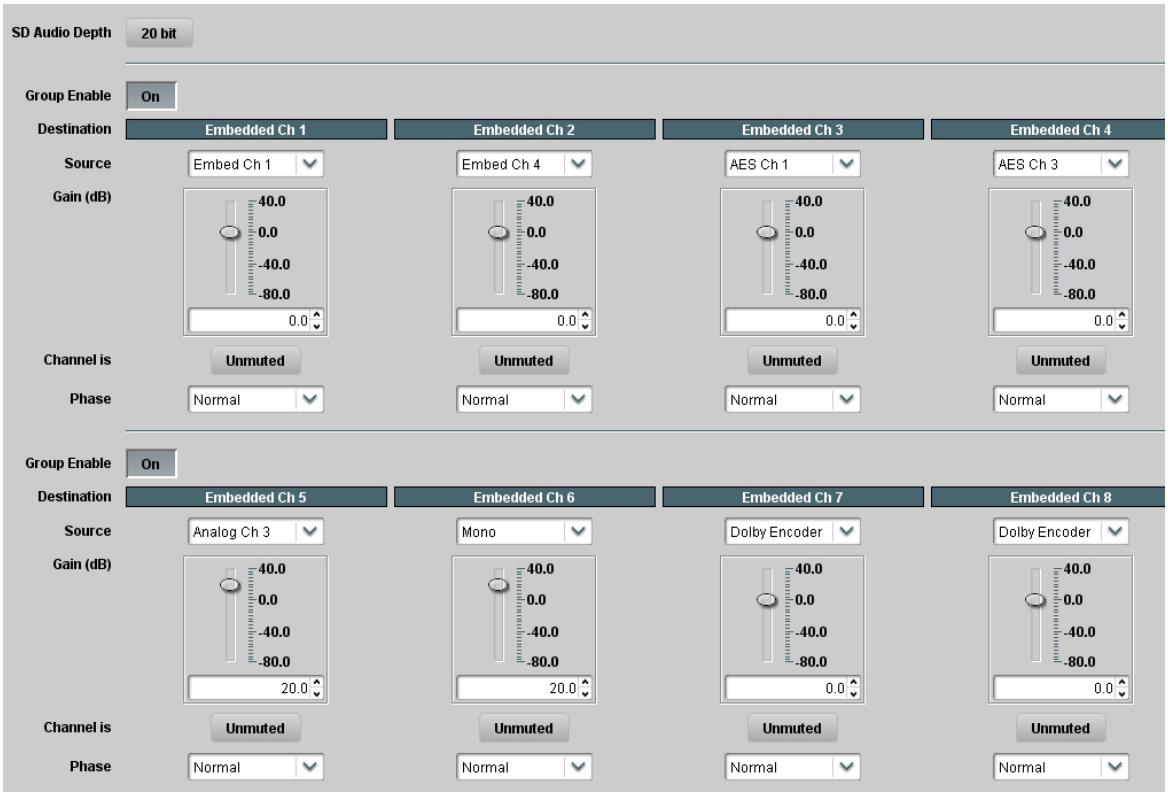
Framesync	**(continued)**
• **Framesync LOS Freeze Color** 	In the event of LOS with **Freeze to Color** enabled above, sets the image raster color from choices shown to the left.
• **Custom Color Hue** 	Adjusts raster hue (phase angle) for custom LOS color. (-360° to 360° range in 0.1° steps; null = 0°)
• **Custom Color Saturation** 	Adjusts raster saturation level for custom LOS color. (0% to 100% range in 0.1% steps)
• **Custom Color Y Level** 	Adjusts raster luma level for custom LOS color. (64 to 940 range)
• **Reset/Resync Framesync**  	**Reset Framesync** resets the frame sync, clearing any buffered audio and video. **Resync Video and Reference** resets the input processing paths for video and reference. When Confirm is clicked, a **Confirm?** pop-up appears, requesting confirmation. • Click **Yes** to reset the frame sync. • Click **No** to reject reset. **Note:** These controls are not normally used or required when the card is receiving a stable, continuous frame sync reference.

Table 3-2 9083 Function Submenu List — continued

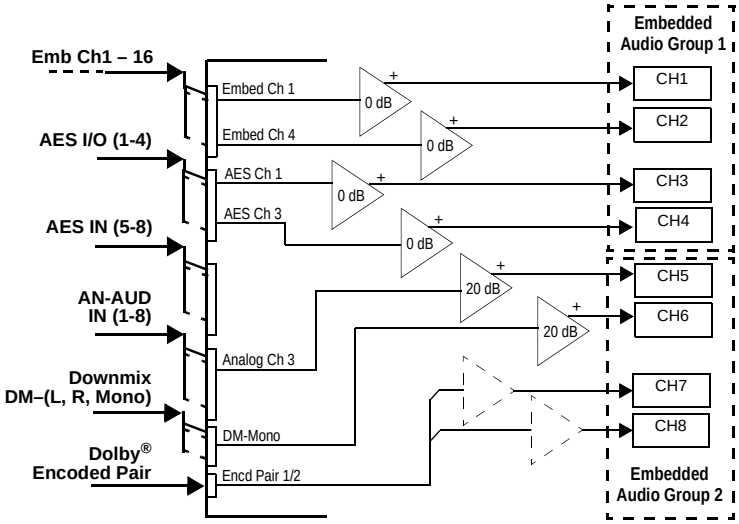
Embedded Audio Group 1/2	Selects the audio source for each embedded audio channel 1 thru 8 (Embedded Audio Groups 1 and 2). It also provides Gain, Mute, and Phase Invert controls for each channel.



The example above shows various Source selections and individual audio control settings for various audio sources fed to the Destination channels **Embedded Ch 1** thru **Embedded Ch 8** in Embedded Audio Groups 1 and 2, with the resulting setup (right).

The source-to-destination correlation shown here is only an example; **any** of the sources on the left can connect to **any** of the destinations on the right, or to Embedded Audio Groups 3 and 4 (not shown here). Additional sources not shown here are also available. These are described on the following pages.

The controls shown here are described in detail on the following pages. Refer to Audio Routing Example Using DashBoard™ (p. 3-58) for more examples of using these controls.



Note: After familiarizing yourself with the controls described in the audio routing/control sections that follow, see “Audio Routing Example Using DashBoard™” (p. 3-58) in “Example Setups Using The 9083 and DashBoard™” for a full example using these controls.

Table 3-2 9083 Function Submenu List — continued

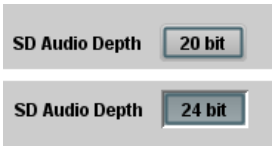
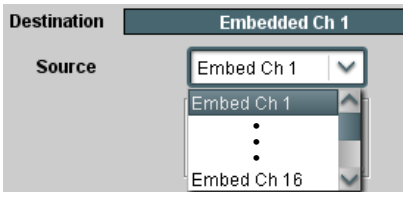
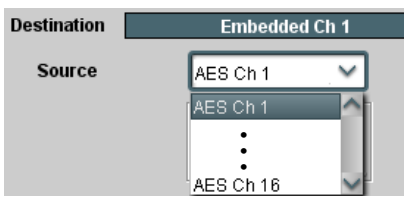
Embedded Audio Group 1/2	**(continued)**
• **SD Audio Depth** 	Allows option of using 24-bit audio data structure per SMPTE 272M, §3.10 (default is 20-bit per SMPTE 272M, §3.5). **Note:** • If 24-bit depth is desired, make certain downstream equipment is compatible with 24-bit SD audio data. • Depth control setting applied here affects both Embedded Audio Group 1/2 and 3/4.
• **Group Enable** 	When enabled (**On**), enables the embedding of the corresponding embedded audio group (Embedded Audio Group 1 or Embedded Audio Group 2). • Embedded Audio Group 1 consists of embedded channels 1 thru 4. • Embedded Audio Group 2 consists of embedded channels 5 thru 8. Two Group Enable buttons correspondingly enable or disable Embedded Audio Group 1 and Embedded Audio Group 2. Disabling a group removes the entire group of embedded audio channels while preserving the settings of the channels belonging to the group.
Note: • **Embedded Ch 2** thru **Embedded Ch 8** have controls identical to the **Source**, **Gain**, **Mute**, and **Phase** controls described here for **Embedded Ch 1**. Therefore, only the **Embedded Ch 1** controls are shown here. • For each channel, its source and destination should be considered and appropriately set. Unused destination channels should be set to the **Silence** selection.	
• **Embedded Channel Source** 	Using the **Source** drop-down list, selects the audio input source to be embedded in the corresponding embedded channel from the choices described below.
• **Embedded Ch 1 thru Ch 16 as Source** 	**Embed Ch 1** thru **Embed Ch 16** range in Source drop-down list enables an embedded channel (Ch 1 thru Ch 16) to be the source for the selected destination Embedded Audio Group channel. (In this example, Embed Ch 1 (embedded Ch 1) is the source for destination Embedded Ch 1)
• **AES Ch 1 thru AES Ch 16 as Source** 	**AES Ch 1** thru **AES Ch 16** range in Source drop-down list enables a discrete AES channel (Ch 1 thru Ch 16) to be the source for the selected destination Embedded Audio Group channel. (In this example, AES Ch 1 is the source for destination Embedded Ch 1)

Table 3-2 9083 Function Submenu List — continued

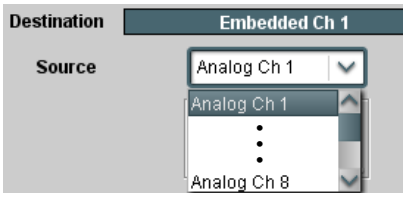
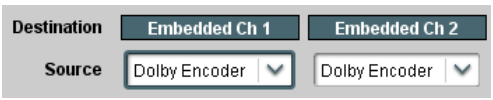
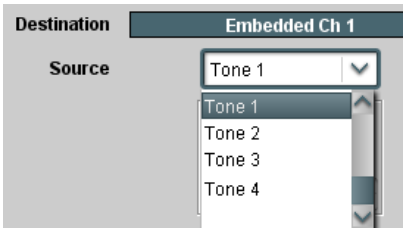
Embedded Audio Group 1/2	(continued)
• Analog Ch 1 thru Ch 8 as Source 	**Analog Ch 1** thru **Analog Ch 8** range in Source drop-down list enables a balanced-input analog channel (Ch 1 thru Ch 8) to be the source for the selected destination Embedded Audio Group channel. (In this example, Analog Ch1 is the source for destination Embedded Ch 1)
• Down Mix Left or Right as Source 	**Down Mix Left** and **Down Mix Right** selections in Source drop-down list allow either downmixer left or right channel to be the source for the selected destination Embedded Audio Group channel. (In this example, the Down Mix Left channel is the source for destination Embedded Ch 1) **Note:** Down Mix Left and Down Mix Right channels are a stereo pair derived from the L, R, C, Ls, and Rs channel inputs selected using the Audio Mixing function. The stereo pair consists of basic L/R PCM signals with no additional encoded information. Refer to **Audio Mixing** function description on page 3-31 for more information.
• Mono Mix as Source 	**Mono** selection in Source drop-down list allows mono mix content to be the source for the selected destination Embedded Audio Group channel. (In this example, the mono content is the source for destination Embedded Ch 1) **Note:** Mono mix content is set up using Mono Mixer Selection in the **Audio Mixing** function). Refer to **Audio Mixing** function description on page 3-31 for more information.
• Dolby® Encoded Pair as Source 	**Dolby Encoder** selection in Source drop-down list allows Dolby® Encoder encoded pair to be the source for the selected destination Embedded Audio Group channel pair. When either channel of a companion pair is sourced from the encoder, the companion channel is automatically similarly selected. (In this example, the encoder output is the source for destination Embedded channel pair 1/2) **Note:** Encoded channel pairs selected can only be applied to companion intact pairs (e.g., signals can be applied to embedded pair 1/2, or embedded pair 3/4 and so on, but not split to route through fabricated unrelated pairs such as embedded ch 2/ch 3). **Note:** Although the Gain, Muting, and Phase controls will appear to be usable when an encoded pair is selected, the controls are disabled.
• Tone Generator 1 thru 4 as Source 	**Tone Generator 1** thru **Tone Generator 4** range in Source drop-down list enables one of four tone generators (Tone 1 thru Tone 4) to be the source for the selected destination Embedded Audio Group channel. (In this example, Tone 1 (tone generator 1) is the source for destination Embedded Ch 1) **Note:** Tone generator frequencies can be independently set for the four tone generator sources. Refer to **Tone Generator** function description on page 3-40 for more information.

Table 3-2 9083 Function Submenu List — continued

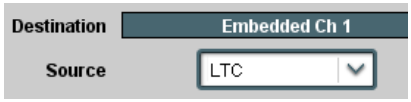
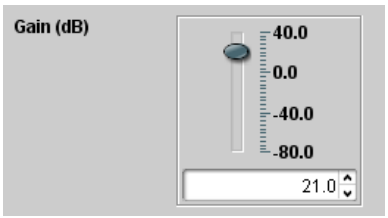
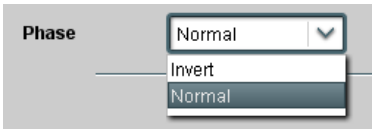
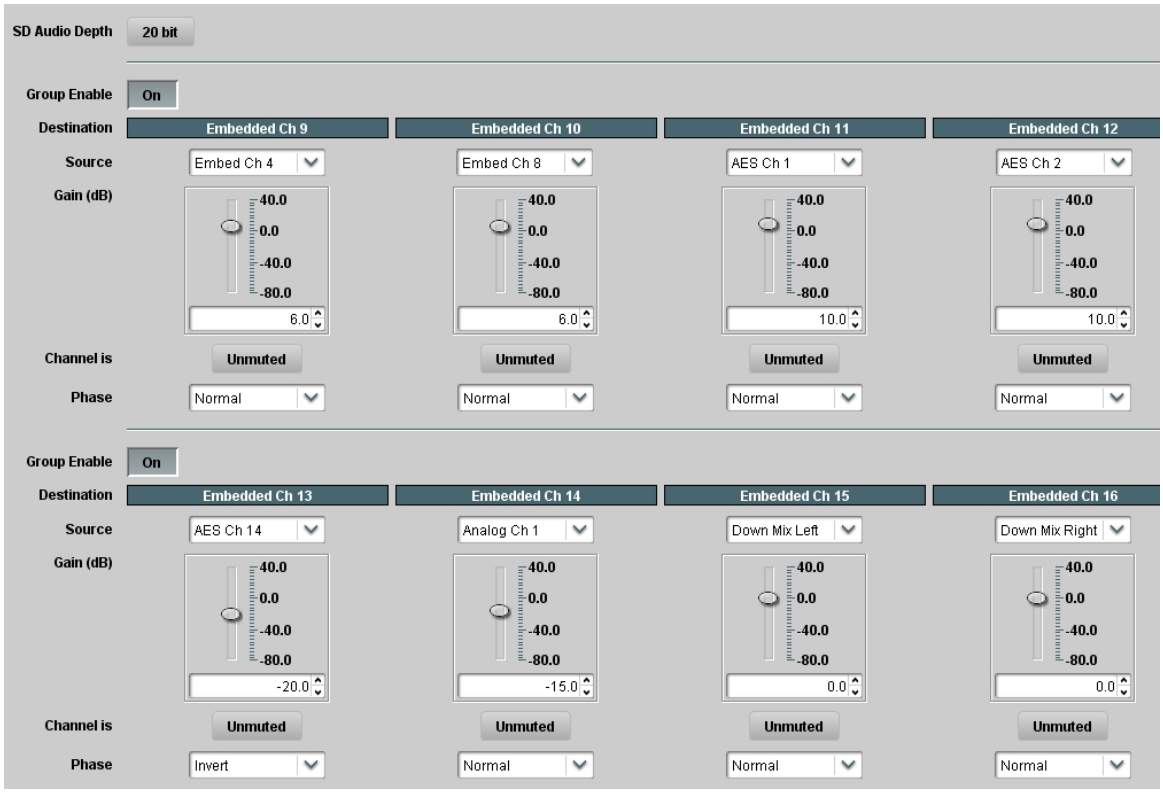
Embedded Audio Group 1/2	**(continued)**
• Audio LTC as Source  Option	**LTC** selection in Source drop-down list allows any timecode format received by the card to be outputted as audio LTC over an embedded audio output (destination) channel. (In this example, audio LTC is the source for destination Embedded Ch 1) **Note:** • When LTC is selected as source, **Gain** and **Mute** controls are disabled. • Refer to **Timecode** function description on page 3-36 for more information.
• Silence (Mute) as Source 	**Silence** selection in Source drop-down list mutes the selected destination Embedded Audio Group channel. **Use this setting for unused destination channels.** (In this example, silence (muting) is applied to Embedded Ch 1)
• Gain (dB) Control 	Adjusts relative gain (in dB) applied to the corresponding destination Embedded Audio Group channel. (-80 to +40 dB range in 0.1 dB steps; unity = 0.0 dB)
• Mute Control 	Allows pushbutton On/Off channel muting while saving all other settings.
• Phase Control 	Selects between **Normal** and **Invert** phase (relative to source original phase) for the destination Embedded Audio Group channel.

Table 3-2 9083 Function Submenu List — continued

Embedded Audio Group 3/4	Selects the audio source for each embedded audio channel 9 thru 16 (Embedded Audio Groups 3 and 4). It also provides Gain, Mute, and Phase Invert controls for each channel.



The example above shows various Source selections and individual audio control settings for various audio sources fed to the Destination channels **Embedded Ch 9** thru **Embedded Ch 16** in Embedded Audio Groups 3 and 4, with the resulting setup (right).

The source-to-destination correlation shown here is only an example; **any** of the sources on the left can connect to **any** of the destinations on the right, or to Embedded Audio Groups 1 and 2 (not shown here). Additional sources not shown here are also available.

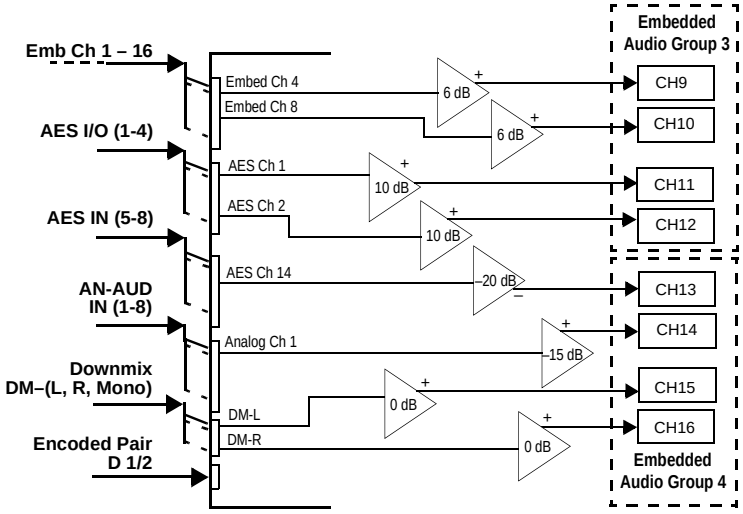


Table 3-2 9083 Function Submenu List — continued

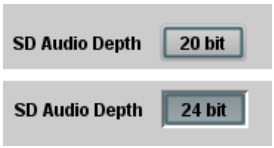
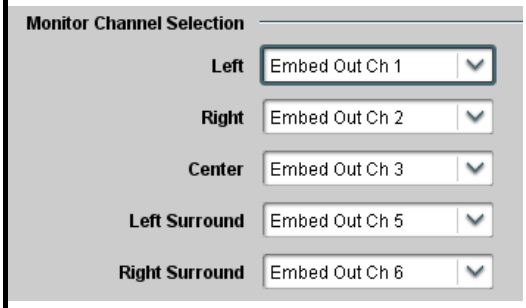
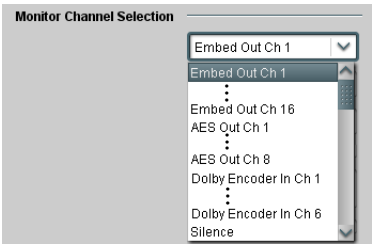
Embedded Audio Group 3/4	**(continued)**
• **SD Audio Depth** 	Allows option of using 24-bit audio data structure per SMPTE 272M, §3.10 (default is 20-bit per SMPTE 272M, §3.5). **Note:** • If 24-bit depth is desired, make certain downstream equipment is compatible with 24-bit SD audio data. • Depth control setting applied here affects both Embedded Audio Group 1/2 and 3/4.
• **Group Enable** 	When enabled (**On**), enables the embedding of the corresponding embedded audio group (Embedded Audio Group 1 or Embedded Audio Group 2). • Embedded Audio Group 1 consists of embedded channels 1 thru 4. • Embedded Audio Group 2 consists of embedded channels 5 thru 8. Two Group Enable buttons correspondingly enable or disable Embedded Audio Group 1 and Embedded Audio Group 2. Disabling a group removes the entire group of embedded audio channels while preserving the settings of the channels belonging to the group.
Note: • Embedded Ch 9 thru Embedded Ch 16 have controls that are identical to the **Source**, **Gain**, **Mute**, and **Phase** controls described for Embedded Ch 1. Refer to Embedded Audio Group 1/2 on page 3-18 for descriptions of these controls. • For each channel, its source and destination should be considered and appropriately set. Unused destination channels should be set to the **Silence** selection.	

Table 3-2 9083 Function Submenu List — continued

<table>
<tr><td>Audio LKFS Monitor</td><td>Provides an ITU-R BS.1770-1 / ATSC A/85 Audio Loudness (LKFS) measurement of selected channels comprising the L, R, C, Ls, and Rs channels of a 5.1-channel complement. Also provide a configurable alert if summation LKFS result exceeds configurable thresholds.</td></tr>
<tr><td colspan="2">Note: • This function provides only LKFS monitoring as described here; this function does not provide active LKFS correction. Selected channels are passed through the card unaffected by settings made for this function.
• The Audio LKFS Monitor target LKFS uses the Dialnorm value setting per the received selected external metadata (or per the internal metadata settings where used). See Appendix A, “Loudness Measurement Guidelines and Techniques” for more information about LKFS parameters and measurement techniques. Read and understand the information in this appendix before changing LKFS parameters from default values.</td></tr>
<tr><td>• Monitor Channel Selection
 
</td><td>Separate drop-down lists for Left, Right, Center, Left Surround (Ls), and Right Surround (Rs) for applying any combination of card audio outputs to each of the five LKFS monitor inputs as shown below.
Note: Set any unused LKFS monitor channel inputs to Silence.
 

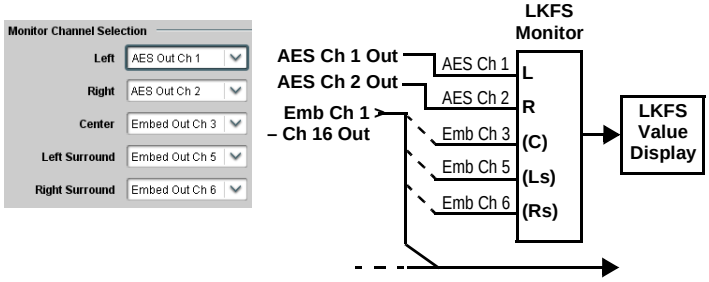
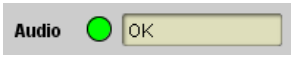
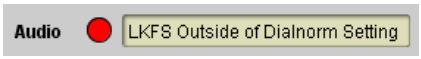
The example below shows selection from various channel sources applied to the LKFS monitor inputs. Because the LKFS monitor uses output (post-processed “destination”) channels, LKFS under/over conditions can be corrected using the Dashboard™ controls for the monitored channels. (Dolby® channel selections use the channels routed to the Dolby encoder inputs.).
 
</td></tr>
<tr><td>• Measured Loudness Display
 
</td><td>Displays the current aggregate ITU-R BS.1770-1 LKFS loudness for the selected monitored channels.
Note: -inf LKFS display indicates LKFS monitor is not receiving any input (for example, as in the case of intended channels not being “seen” by the LKFS monitor due to desired embedded channels being directed to AES output and not embedded output channels).</td></tr>
</table>

Table 3-2 9083 Function Submenu List — continued

<table>
<tr><td>Audio LKFS Monitor</td><td>(continued)</td></tr>
<tr><td>

• **LKFS/Dialnorm Deviation Alarm Control**

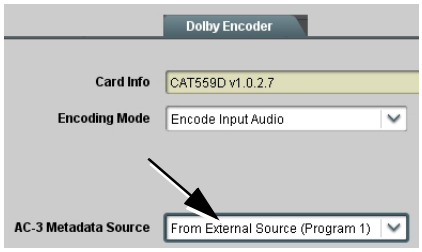


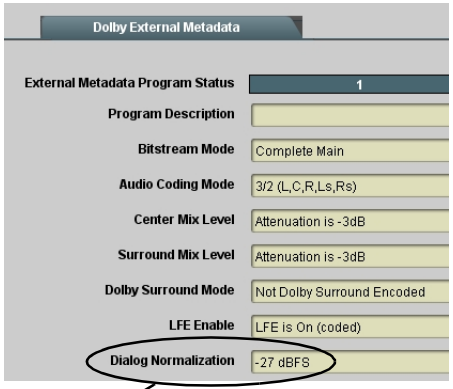


</td><td>When set to On, provides indication (in the Card Info pane) of LKFS compliance or violation vs. target LKFS/dialnorm as shown.
LKFS target value, averaging, and thresholds are set as described below.</td></tr>
<tr><td colspan="2">

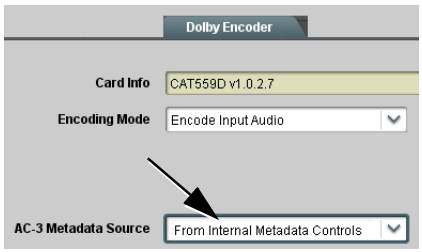
• **Target LKFS Setting**

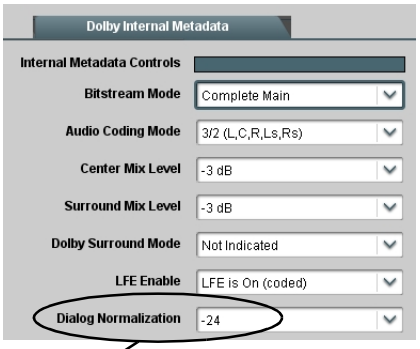
The Audio LKFS Monitor uses the currently selected Dolby® dialnorm setting as its target LKFS (see examples below).





If **External Metadata** is being used, reported dialnorm value of selected AC-3 program coding serves as target LKFS value (in this example, -27 LKFS)





If **Internal Metadata** is being used, dialnorm (as set using Dashboard-configurable internal metadata setting) serves as target LKFS value (in this example, -24 LKFS)

</td></tr>
</table>

Table 3-2 9083 Function Submenu List — continued

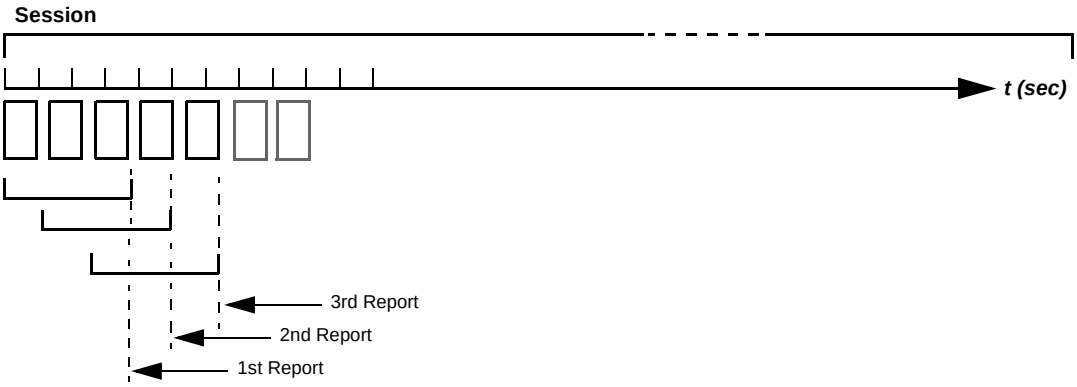
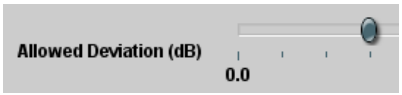
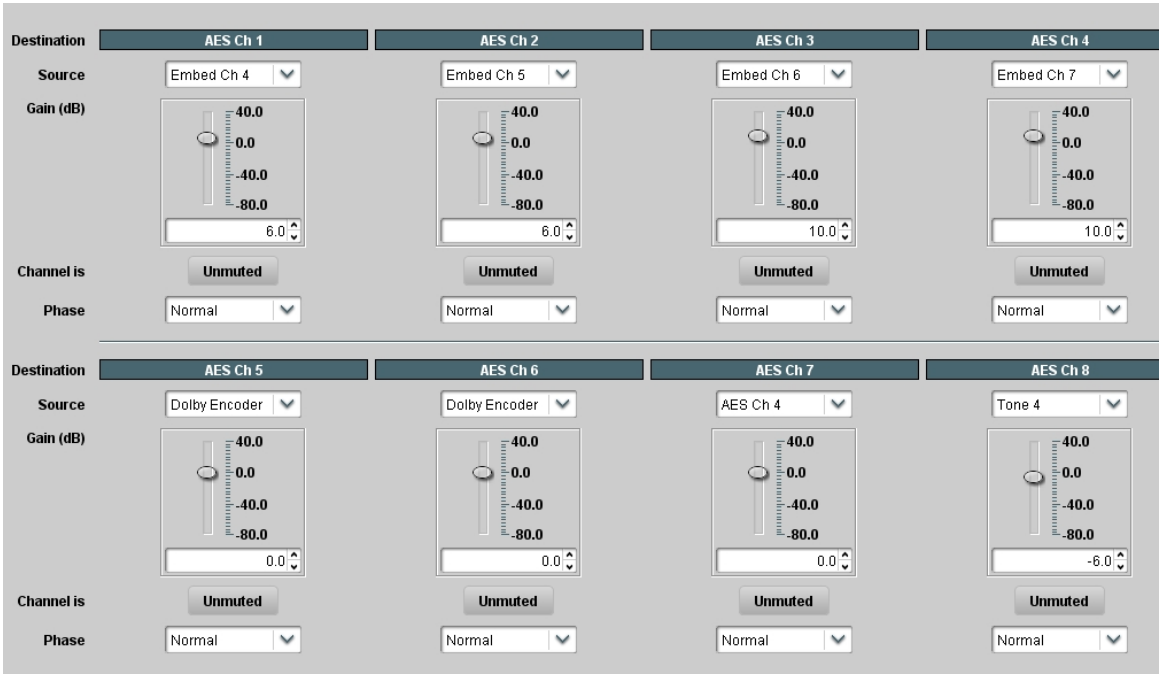
Audio LKFS Monitor	(continued)
• **Measurement Window Control** 	Sets the duration (in seconds) that sampling time accumulates before each averaging recalculation (see below) (0.1 to 30.0 seconds range in 0.1-second steps; default = 10.0 sec)
In this example, the last 3 measurement periods are averaged in each reported LKFS value. This cycle is continually repeated. The **Measurement Window** parameter sets the sampling time accumulated before each averaging recalculation. 	
• **Allowed Deviation (dB) Control** 	Sets the allowable deviation above or below dialnorm (LKFS) target level, at which where exceeded the measured LKFS is considered out of range. (0.0 to 40.0 dB (LKFS) range in 0.1 dB steps; default of ±4.0 dB (LKFS))
• **Deviation Alarm Time Control** 	Sets the allowable time an out of range measured LKFS (as set above) can loiter, after which results in an LKFS out of range alarm display. (0 to 30 sec range in 1-second steps; default = 1.0 sec)

Table 3-2 9083 Function Submenu List — continued

AES Audio Out Pairs 1-4	Routes audio sources to discrete AES output channels 1 thru 8 (AES Audio Out Pairs 1-4). Also provides Gain, Mute, and Phase Invert controls for each channel.



The example above shows various Source selections and individual audio control settings for various audio sources fed to the Destination channels **AES Ch 1** thru **AES Ch 8**, with the resulting setup (right).

The source-to-destination correlation shown here is only an example; **any** of the sources on the left can connect to **any** of the destinations on the right.

The controls shown here are described in detail on the following pages. Refer to Audio Routing Example Using DashBoard™ (p. 3-58) for more examples of using these controls.

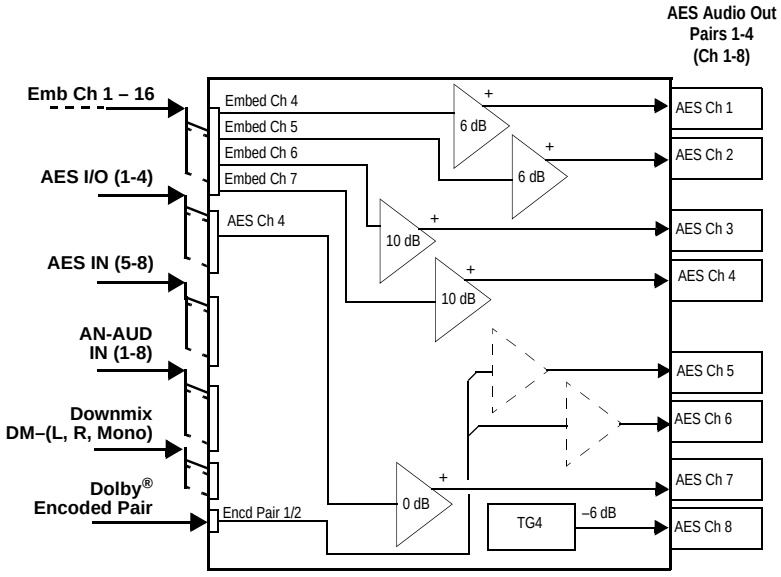


Table 3-2 9083 Function Submenu List — continued

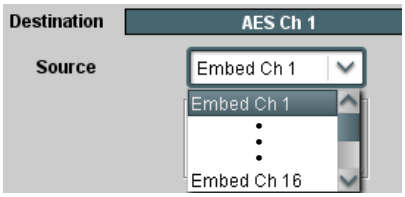
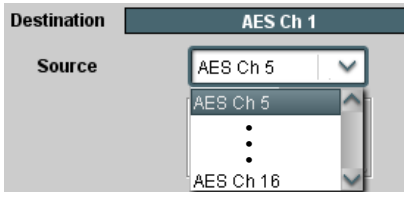
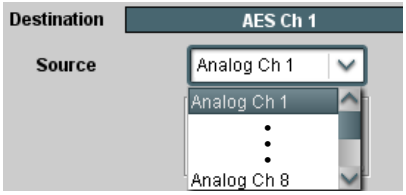
AES Audio Out Pairs 1-4	**(continued)**
Note: • **AES Ch 2** thru **AES Ch 8** have controls that are identical to the **Source**, **Gain**, **Mute**, and **Phase** controls described here for **AES Ch 1**. Therefore, only the **AES Ch 1** controls are shown here. • For each channel, its source and destination should be considered and appropriately set. Unused destination channels should be set to the **Silence** selection. • Option +ENCD and Option +ENCE do not have flexible routing/control for AES Audio Out pairs 5-8, therefore controls similar to these for AES Out 5-8 are not included. Instead, AES Audio Out Pairs 5-8 serve as four copies of the Dolby® encoded pair in addition to any other encoded pair routing.	
• AES Channel Source 	Using the **Source** drop-down list, selects the audio source to be routed to the corresponding AES output channel from the choices described below.
• Embedded Ch 1 thru Ch 16 as Source 	**Embed Ch 1** thru **Embed Ch 16** range in Source drop-down list enables an embedded channel (Ch 1 thru Ch 16) to be the source for the selected destination AES channel. (In this example, Embed Ch 1 (embedded Ch 1) is the source for destination AES Ch 1)
• AES Ch 1 thru AES Ch 16 as Source 	**AES Ch 1** thru **AES Ch 16** range in Source drop-down list enables a discrete AES channel (Ch 1 thru Ch 16) to be the source for the selected destination AES channel. (In this example, AES Ch 5 is the source for destination AES Ch 1)
• Analog Ch 1 thru Ch 8 as Source 	**Analog Ch 1** thru **Analog Ch 8** range in Source drop-down list enables a balanced-input analog channel (Ch 1 thru Ch 8) to be the source for the selected destination AES channel. (In this example, Analog Ch1 is the source for destination AES Ch 1)

Table 3-2 9083 Function Submenu List — continued

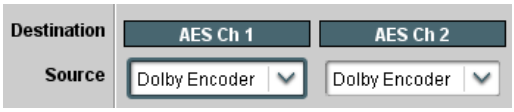
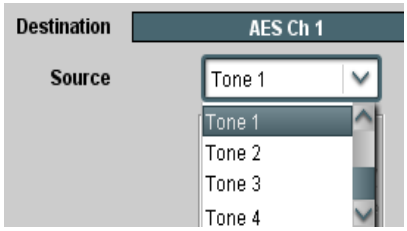
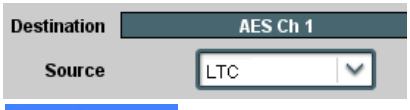
AES Audio Out Pairs 1-4	(continued)
• Down Mix Left or Right as Source 	**Down Mix Left** and **Down Mix Right** selections in Source drop-down list allow either downmix left or right channel to be the source for the selected destination AES channel. (In this example, the Down Mix Left channel is the source for destination AES Ch 1) **Note:** Down Mix Left and Down Mix Right channels are a stereo pair derived from the L, R, C, Ls, and Rs channel inputs selected using the Audio Mixing function. The stereo pair consists of basic L/R PCM signals with no additional encoded information. Refer to **Audio Mixing** function description on page 3-31 for more information.
• Mono Mix as Source 	**Mono** selection in Source drop-down list allows mono mix content to be the source for the selected destination AES channel. (In this example, the mono content is the source for destination AES Ch 1) **Note:** Mono mix content is set up using Mono Mixer Selection in the **Audio Mixing** function). Refer to **Audio Mixing** function description on page 3-31 for more information.
• Dolby® Encoded Pair as Source 	**Dolby Encoder** selection in Source drop-down list allows Dolby® Encoder encoded pair to be the source for the selected destination AES output channel pair. When either channel of a companion pair is sourced from the encoder, the companion channel is automatically similarly selected. (In this example, the encoder output is the source for destination AES channel pair 1/2) **Note:** Encoded channel pairs selected can only be applied to companion intact pairs (e.g., signals can be applied to AES pair 1/2, or AES pair 3/4 and so on, but not split to route through fabricated unrelated pairs such as AES ch 2/ch 3). **Note:** Although the Gain, Muting, and Phase controls will appear to be usable when an encoded pair is selected, the controls are disabled.
• Tone Generator 1 thru 4 as Source 	**Tone Generator 1** thru **Tone Generator 4** range in Source drop-down list enables one of four tone generators (Tone 1 thru Tone 4) to be the source for the selected destination AES channel. (In this example, Tone 1 (tone generator 1) is the source for destination AES Ch 1) **Note:** Tone generator frequencies can be independently set for the four tone generator sources. Refer to **Tone Generator** function description on page 3-40 for more information.
• Audio LTC as Source  Option	**LTC** selection in Source drop-down list allows any timecode format received by the card to be outputted as audio LTC over an AES audio output (destination) channel. (In this example, audio LTC is the source for destination AES Ch 1) **Note:** • When LTC is selected as source, **Gain** and **Mute** controls are disabled. • Refer to **Timecode** function description on page 3-36 for more information.

Table 3-2 9083 Function Submenu List — continued

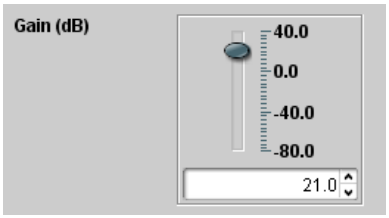
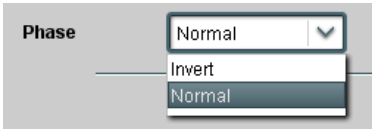
AES Audio Out Pairs 1-4	(continued)
• **Silence (Mute) as Source** 	**Silence** selection in Source drop-down list mutes the selected destination AES channel. **Use this setting for unused destination channels.** (In this example, silence (muting) is applied to AES Ch 1)
• **Gain (dB) Control** 	Adjusts relative gain (in dB) applied to the corresponding destination AES channel. (-80 to +40 dB range in 0.1 dB steps; unity = 0.0 dB)
• **Mute Control** 	Allows pushbutton On/Off channel muting while saving all other settings.
• **Phase Control** 	Selects between **Normal** and **Invert** phase (relative to source original phase) for the destination AES channel.

Table 3-2 9083 Function Submenu List — continued

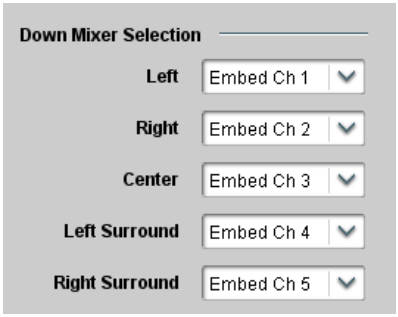
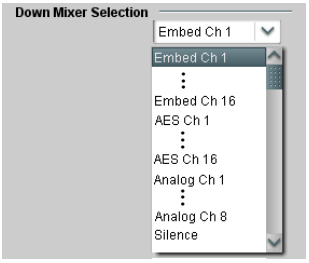
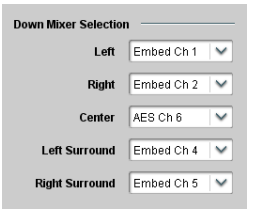
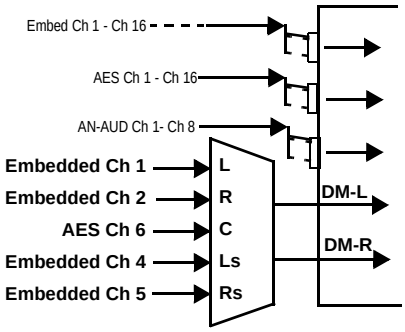
Audio Mixing	Provides down-mix audio routing selections that multiplexes any five embedded, AES, or analog audio channel sources into a stereo pair (Down Mix Left and Down Mix Right), or selection of any two audio sources to be mono-mixed to serve as a monaural source. With an optional upmixer licensable feature activated, any normal PCM stereo pair can be fed to the upmixer to generate 5.1 surround sound audio which in turn can be applied to six user-selectable channels.
• Down Mixer Selection 	Separate drop-down lists for **Left**, **Right**, **Center**, **Left Surround (Ls)**, and **Right Surround (Rs)** inputs allow embedded, AES, or analog channel audio source selection for each of the five inputs as shown below.  The example below shows selection from various sources and the resulting stereo pair DM-L and DM-R. The two signals comprising the pair can be routed and processed the same as any other audio input source.   **Note:** The stereo pair are basic L/R PCM signals with no additional encoded information.
• Center Mix Ratio Control 	Adjusts the attenuation ratio of center-channel content from 5-channel source that is re-applied as Lt and Rt content to the DM-L and DM-R stereo mix. • Minimum attenuation setting (-0.0 dB) applies no ratiometric reduction. Center channel content is restored as in-phase center-channel content with no attenuation, making center-channel content more predominate in the overall mix. • Maximum attenuation setting (-10.0 dB) applies a -10 dB ratiometric reduction of center-channel content. Center-channel content is restored as in-phase center-channel content at a -10 dB ratio relative to overall level, making center-channel content less predominate in the overall mix. (0.0 dB to -10.0 dB range in 0.1 dB steps; default = -3 dB) **Note:** Default setting of -3.0 dB is recommended to maintain center-channel predominance in downmix representative to that of the original source 5-channel mix.

Table 3-2 9083 Function Submenu List — continued

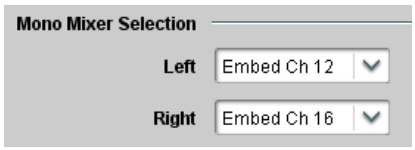
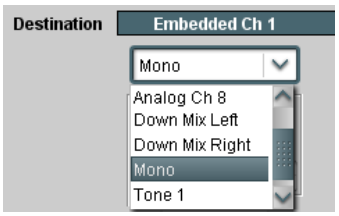
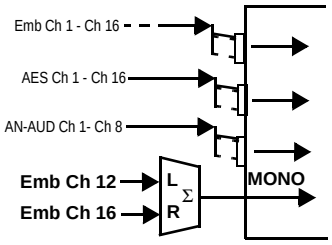
Audio Mixing	(continued)
• **Surround Mix Ratio Control** 	Adjusts the attenuation ratio of surround-channel content from 5-channel source that is re-applied as Lo and Ro content to the DM-L and DM-R stereo mix. • Minimum attenuation setting (-0.0 dB) applies no ratiometric reduction. Surround-channel content is restored with no attenuation, making Lo and Ro content more predominate in the overall mix. • Maximum attenuation setting (-10.0 dB) applies a -10 dB ratiometric reduction of surround-channel content. Surround-channel content is restored at a -10 dB ratio relative to overall level, making surround-channel content less predominate in the overall mix. (0.0 dB to -10.0 dB range in 0.1 dB steps; default = -3 dB) **Note:** Default setting of -3.0 dB is recommended to maintain surround-channel predominance in downmix representative to that of the original source 5-channel mix.
• **Mono Mixer Selection** 	Separate drop-down lists for **Left** and **Right** inputs allow selected embedded, AES, analog, or the DM-L / DM-R input channels to provide an additional mono-mixed channel. The resulting mono mix (**Mono**) is available as an audio source for any of the 32 destination embedded or AES output channels as shown below.   **Note:** Selection of any two channels for mono mixing in no way affects the source channels themselves.

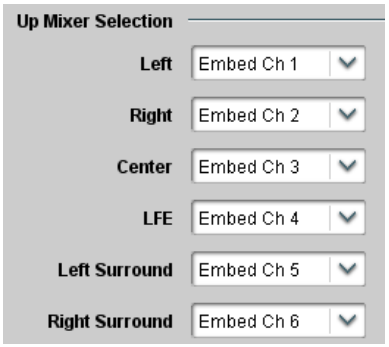
Table 3-2 9083 Function Submenu List — continued

Audio Mixing	**(continued)**

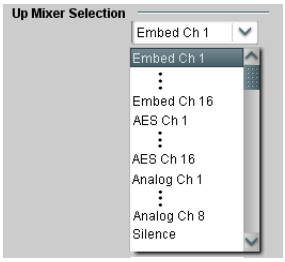
Option

Note:
- 2.0-to-5.1 upmixer function is an optional licensable feature. This function and its controls appear only when a license key is entered and activated. Refer to **Licensable Features** function description on page 3-40 for more information.
- Channel sources used by the upmixer are post-processed signals received from the Audio Routing/Gain Control function. When active, the channel selections made using this function are **directly embedded in the output SDI or AES discrete pairs**. Refer to 2.0-to-5.1 Upmix Function (p. 1-11) in Chapter 1, “Introduction” for detailed functional description and signal flow.
- For any six channels selected for this function, the **Left** and **Right** channel selections always serve as the stereo input pair.

• 2.0-to-5.1 Up Mixer Selection



Separate drop-down lists for **Left**, **Right**, **Center**, **LFE, Left Surround**, and **Right Surround** allow embedded, AES, or analog channel audio source selection, and embedded or AES discrete channel assignments for the six generated 5.1 channels.



The example below shows selection of embedded channels 1 and 2 as the received stereo source (Embed Ch1 and Ch 2 for **Left** and **Right** drop-down list selections in the Up Mixer Selection tool).

Using the setup shown in the example, when upmix is active the embedded channel 1/2 stereo pair is overwritten with the new stereo pair L/R on channels 1/2. As selected in the example, the additional 5.1 channels C, LFE, Left Surround (Ls), and Right Surround (Rs) overwrite Emb Ch 3 – Ch 6, respectively.

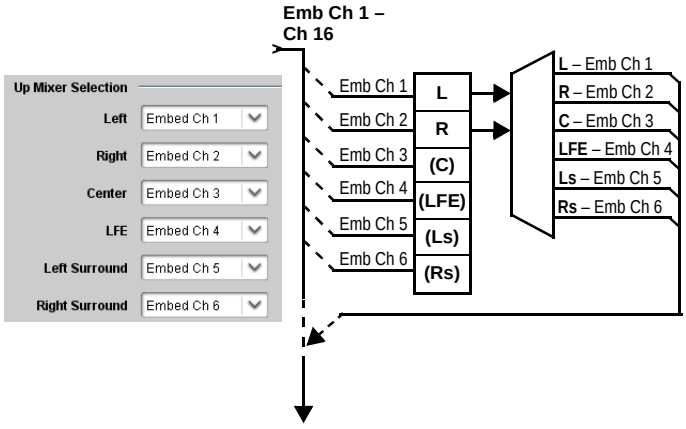
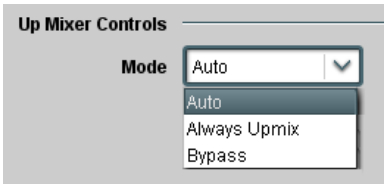


Table 3-2 9083 Function Submenu List — continued

Audio Mixing	(continued)

• Up Mixer Mode Control
 
	Enables or bypasses upmixer as follows:
	• **Auto:** Automatic enable/bypass of 5.1 upmix function as follows:
	  • If detected signal level on **all four** of the selected channels designated as **Center**, **LFE**, **Left Surround**, and **Right Surround** are **below** the level threshold set using the **5.1 Detection Threshold** control, upmixer overwrites all six selected channels with the new 5.1 content generated by the upmixer.
	  • If detected signal level on **any of the four** of the selected channels designated as **Center**, **LFE**, **Left Surround**, and **Right Surround** is **above** the level threshold set using the **5.1 Detection Threshold** control, upmixer is bypassed and the original channels pass unaffected.
	• **Always Upmix:** Manual enable turns on upmixer and overwrites content on all six selected channels with new 5.1 content generated by the upmixer regardless of original signal level or content.
	• **Bypass:** Manual disable bypasses the upmixer. When bypassed, the six embedded audio channels pass unaffected.

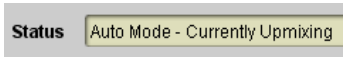
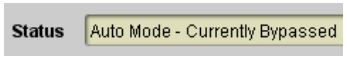
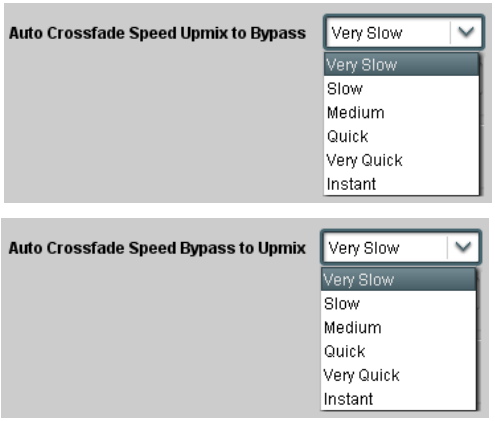
• Up Mixer Status Display    	Shows activity status of upmixer processing as follows: • **Auto Mode - Currently Upmixing:** With upmixer enable set to **Auto**, indicates selected channels designated as **Center**, **LFE**, **Left Surround**, and **Right Surround** are clear for use (as described above); upmixer is currently up-mixing received stereo pair and overwriting the six selected channels with new 5.1 upmix. • **Auto Mode - Currently Bypassed:** With upmixer enable set to **Auto**, indicates selected channels designated as **Center**, **LFE**, **Left Surround**, and **Right Surround** have content (such as existing original 5.1 or other content); upmixer is bypassed (disabled) and allows normal passage of six selected channels. • **Upmixing:** Indicates upmixer is manually enabled (set to Always Upmix) and is currently up-mixing received stereo pair and overwriting the six selected channels with new 5.1 upmix. • **Bypassed:** Indicates upmixer is manually disabled (set to Bypass) and is currently passing all selected channels unaffected.
• Auto Crossfade Speed Controls 	Individual controls select the relative crossfade transition speed between Upmix to Bypass (going to inactive; from 5.1 to 2.0) and Bypass to Upmix (going to active; from 2.0 to 5.1) when upmixer enable is set to **Auto** and the active threshold (as set by the **5.1 Detection Threshold** control) is crossed in either direction. To suit program material and production aesthetic preferences, several choices are available as shown to the left. Slower settings allow for a more gradual transition between modes, however with a longer interval before levels stabilize. Faster settings conversely allow for a smaller interval before levels stabilize, however with greater perceived abruptness.

Table 3-2 9083 Function Submenu List — continued

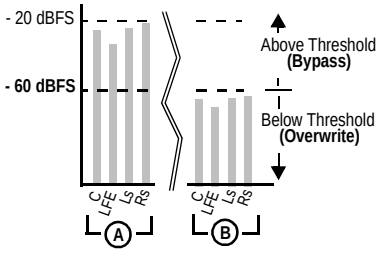
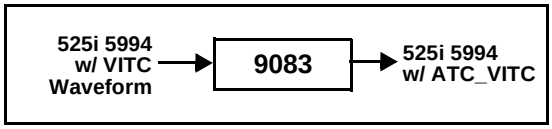
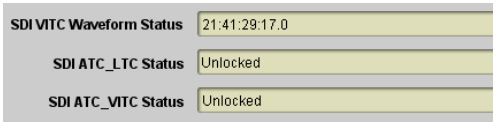
Audio Mixing	**(continued)**
• 5.1 Detection Threshold Control 	Adjusts the threshold at which selected channels designated as C, LFE, Ls, and Rs are considered to have viable content, or at which signal levels can be considered insignificant when upmixer enable is set to **Auto**. Setting affects automatic enable/bypass of 5.1 upmix function as follows: • If detected signal level on **all four** of the selected channels designated as Center, LFE, Left Surround, and Right Surround are **below** the level threshold set using the **5.1 Detection Threshold** control, upmixer allows **overwrite** of all six selected channels with the new 5.1 signal complement. • If detected signal level on **any of the four** of the selected channels designated as Center, LFE, Left Surround, and Right Surround is **above** the level threshold set using the **5.1 Detection Threshold** control, upmixer is **bypassed**, thereby releasing the selected six channels and allowing the original channels to pass unaffected. (Range is -150 dB to 0 dB in 0.1dB steps; 0 dB equivalent to +24 dBu=> 0 dBFS) Typically, the **5.1 Detection Threshold** control should be set to provide a usable threshold that maintains a threshold at which valid levels large enough over the threshold **disable** the auto upmix (Ⓐ, left), while nuisance levels considerably below the threshold (Ⓑ, left) are rejected, allowing the upmixer to stay locked in the enabled mode and **overwrite** these signals with the new signals.  Optimum setting is dependent on program material general overall levels. A -60 dB setting is recommended for material closely adhering to the SMPTE -20 dBFS Alignment level for normal material such as dialog.
• Center Width Control 	Adjusts center channel content (in terms of percentage) applied to L and R channels. • Minimum setting keeps all L+R (mono) content confined to center (C) channel, with any center channel content removed from L and R channels. • Higher settings progressively blend respective L and R mono content back into L and R channels, with 100% setting resulting in center channel level going to zero and L/R channels becoming normal L/R channels containing some mono content. (0% to 100% range in 0.1% steps; default = 0%)
• Surround Depth Control 	Adjusts surround channel content (in terms of percentage) applied to Ls and Rs channels. • Maximum setting results in greatest surround channel levels. • Lower settings progressively diminish surround channel levels, with 0% setting resulting in no Ls or Rs level, with Ls and Rs content progressively folded back into L and R, respectively. (0% to 100% range in 0.1% steps; default = 100%)

Table 3-2 9083 Function Submenu List — continued

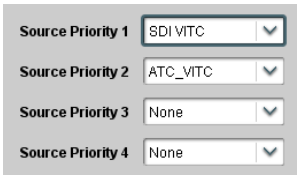
Timecode	Provides timecode data extraction from various sources, and provides formatting and re-insertion controls for inserting the timecode into the output video.

Shown below is an example in which received SDI video with SDI VITC waveform timecode is to be converted to SDI ATC_VITC timecode data. Each Timecode control is fully described on the pages that follow.



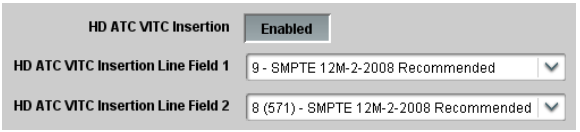


A Noting that the incoming video contains VITC waveform timecode data (as shown in the status display), set the Source Priority drop-down lists to include VITC Waveform timecode data (**SDI VITC**) as a choice. This extracts VITC Waveform timecode data from the incoming video.



B In this example, it is desired to provide SDI ATC_VITC timecode data in the output video. As such, set **HD ATC VITC Insertion Insertion** to **Enabled**.

In the example here, the line numbers are set to the default SMPTE 12M-2-2008 recommended values.



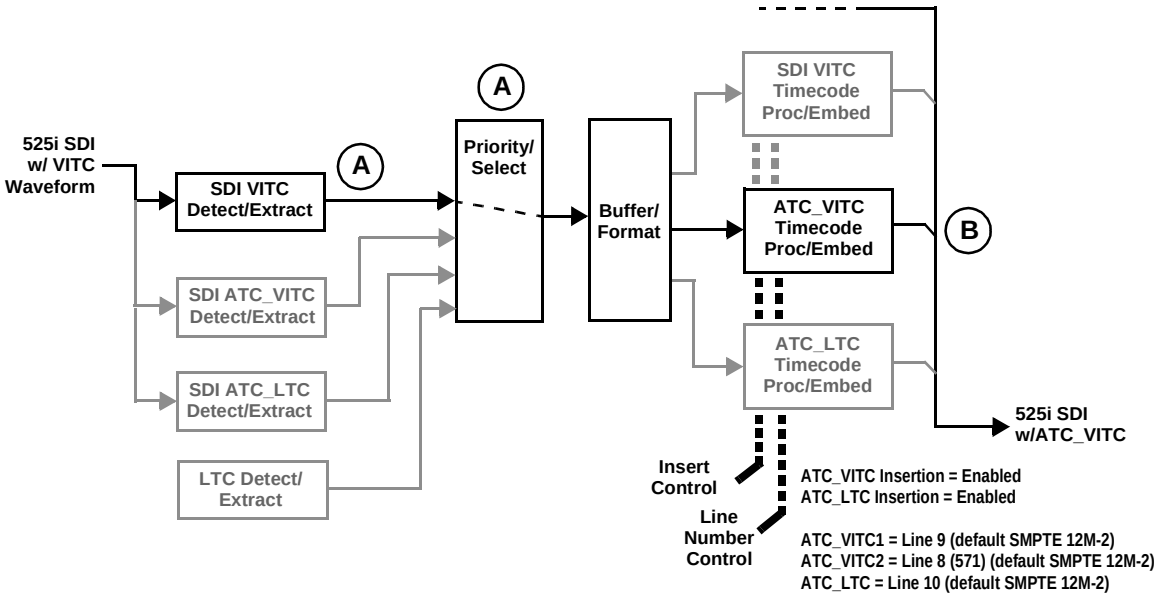
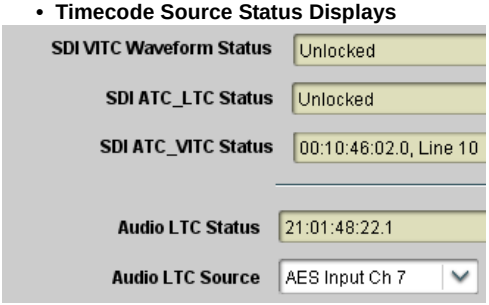


Table 3-2 9083 Function Submenu List — continued

Timecode	**(continued)**
Option **Audio LTC** and **RS-485 LTC** controls described below only appear on cards with +LTC licensed optional feature. This feature allows bidirectional conversion between VBI-based timecode and LTC timecode on audio and RS-485 interfaces.	

• **Timecode Source Status Displays**
 
	Displays the current status and contents of the supported timecode formats shown to the left.
	• If a format is receiving timecode data, the current content (timecode running count and line number) is displayed.
	• If a format is not receiving timecode data, Unlocked is displayed.
	• If Audio LTC is being received, the timecode running count is displayed.
	• **Audio LTC Source** selects audio source to be used by card audio LTC function as listed below.
	  • Emb Ch 1 thru Ch 16
	  • AES Ch 1 thru Ch 16
	  • Analog audio Ch 1 thru Ch 8
	Note: Audio LTC Source must be appropriately set for card to receive and process audio LTC.

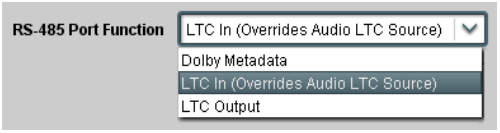
• **RS-485 Port LTC Control** 	Allows RS-485 port to be used to receive LTC, or send LTC over RS-485 port as follows: • If **RS-485 LTC** is to be **received** via the shared RS-485 port, set the **RS-485 Port Function** control to **LTC In**. • If **RS-485 LTC** is to be **outputted** via the shared RS-485 port, set the **RS-485 Port Function** control to **LTC Output**. The timecode string carried on the LTC output is that selected using the **Source Priority** controls described on the next page.
• **Incoming ATC Packet Removal Control** 	Enables or disables removal of existing input video ATC timecode packets from the output. This allows removal of undesired existing timecodes from the output, resulting in a “clean slate” where only desired timecodes are then re-inserted into the output. (For example, if both SD VITC Waveform and SD ATC_VITC timecode data are present on the input video, and only ATC_VITC is desired, using the Removal control will remove both timecodes from the output. The ATC_VITC timecode by itself can then be re-inserted on the output using the other controls discussed here.) **Note:** When the Scaler is enabled, ATC packets are automatically removed. The Timecode function must be used to re-insert the timecode data into the output video.

Table 3-2 9083 Function Submenu List — continued

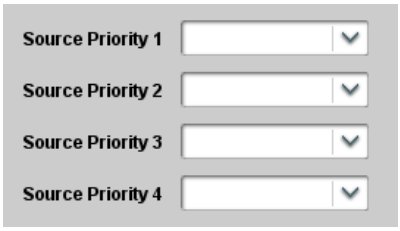
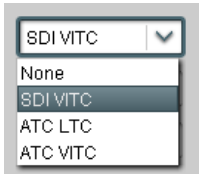
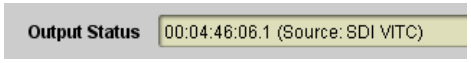
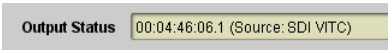
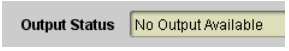
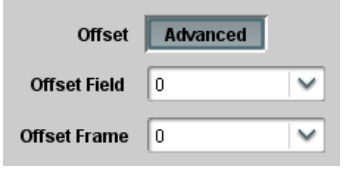
Timecode	(continued)
• **Source Priority** 	As described here, selects the priority assigned to each of the four supported formats in the event the preferred source is unavailable. Each of the four Source Priority selection lists allows assignment of source priority from the following choices:  **Source Priority 1** thru **Source Priority 4** select the preferred format to be used in descending order (i.e., Source Priority 2 selects the second-most preferred format, and so on.
• **Output Status Display** 	Displays the current content and source being used for the timecode data as follows:  • Output status OK (in this example, running SDI VITC timecode received and outputted).  • Timecode not available due to lack of appropriate input timecode data on enabled formats. **Note:** Timecode output requires that source and priority are appropriately selected (as described above in **Source Priority**). Also, video input must contain appropriate timecode data.  • **Timecode Insertion** button set to **Disabled**; output insertion disabled. **Note:** • If timecode is not available from Source Priority selections performed, timecode on output reverts to Free Run (internal count) mode. • Because the 1's digit of the display Frames counter goes from 0 to 29, the fractional digit (along with the 1's digit) indicates frame count as follows: 0.0 Frame 0 0.1 Frame 1 1.0 Frame 2 1.1 Frame 3 • • • 29.1 Frame 59
• **Offset Controls** 	Allows the current timecode count to be advanced or delayed on the output video. • **Offset Advance** or **Delay** selects offset advance or delay. • **Offset Field** delays or advances or delays timecode by one field. • **Offset Frame** delays or advances or delays timecode by up to 5 frames. **Note:** Default settings are null, with both controls set at zero as shown.

Table 3-2 9083 Function Submenu List — continued

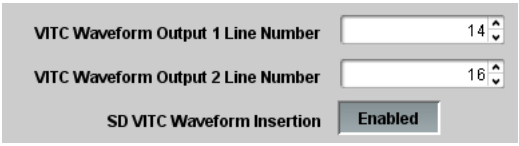
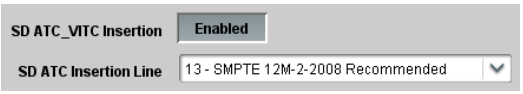
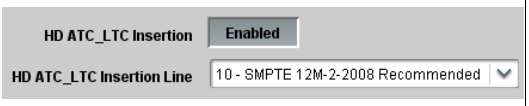
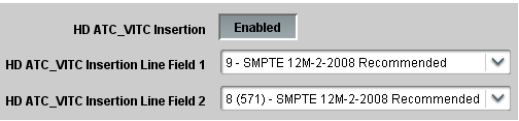
Timecode	**(continued)**
Note: • Although the output line drop-down on the controls described below will allow a particular range of choices, the actual range is automatically clamped (limited) to certain ranges to prevent inadvertent conflict with active picture area depending on video format. See Ancillary Data Line Number Locations and Ranges (p. 3-8) for more information. • The card does not check for conflicts on a given line number. Make certain the selected line is available and carrying no other data.	
• SD VITC Waveform Insertion Controls 	For SD output, enables or disables SD VITC waveform timecode insertion into the output video, and selects the VITC1 and VITC2 line numbers (6 thru 22) where the VITC waveform is inserted. **Note:** • If only one output line is to be used, set both controls for the same line number. • **SD VITC Waveform Insertion** control only affects VITC waveforms inserted (or copied to a new line number) by this function.
• SD ATC Insertion Control 	For SD output, enables or disables SD ATC_VITC timecode insertion into the output video, and selects the line number for ATC_VITC.
• HD ATC_LTC Insertion Control 	For HD output, enables or disables ATC_LTC timecode insertion into the output video, and selects the line number for ATC_LTC timecode data.
• HD ATC_VITC Insertion Control 	For HD output, enables or disables ATC_VITC timecode insertion into the output video, and selects the line number for ATC_VITC1 and ATC_VITC2. **Note:** If only one output line is to be used, set both controls for the same line number.
• ATC_VITC Legacy Support Control 	When enabled, accommodates equipment requiring ATC_VITC packet in both fields as a “field 1” packet (non-toggling). **Note:** Non-toggling VITC1 and VITC2 packets do not conform to SMPTE 12M-2-2008 preferences. As such, ATC_VITC Legacy Support should be enabled only if required by downstream equipment.

Table 3-2 9083 Function Submenu List — continued

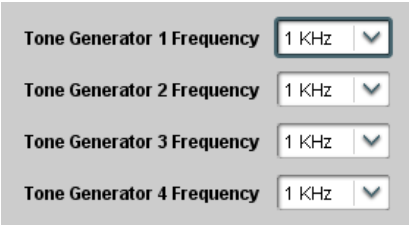
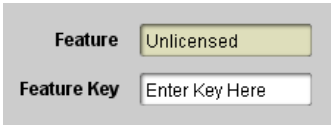
Tone Generator	Sets the test tone frequency for each of four tone generators (Tone Generator 1 thru 4).
• Frequency Selection Lists 	Selects the frequency for each of the four tone generators. 18 discrete sine wave frequencies are available, ranging from 50 Hz to 16 kHz (default frequency is 1.0 kHz). **Note:** Unity-gain signal level is equivalent to -20 dBu.
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 Contact Cobalt Digital Inc. in Chapter 1, “Introduction”. Please provide the “SSN” 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 the feature identification to be shown for the card product number (for example, “-UM” appearing after the card part number) and **Valid Key Entered** to be displayed. This indicates the key was correctly entered and recognized by the card. **Note:** If DashBoard™ card function submenu/control pane does not re-appear, close the card and re-open it. 3. Click and confirm **Reboot**. When the card function submenu/control pane appears again, the licensable feature will be available. **Note:** • Applying the licensable feature and its reboot has no effect on prior settings. All control settings and drop-down selections are retained. • A licensable feature can be de-activated using this entry box by entering the feature string[space]**revoke**[return].

Table 3-2 9083 Function Submenu List — continued

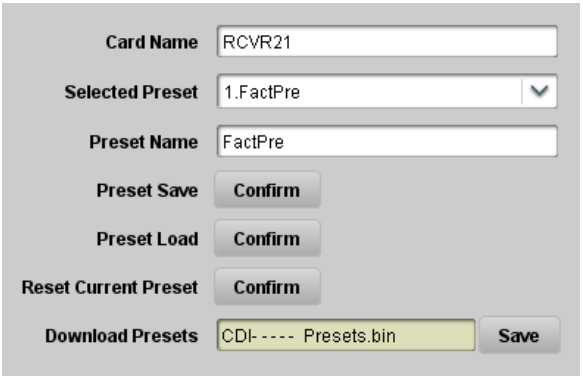
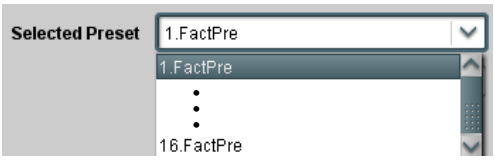
Presets	Allows up to 16 card user settings configuration presets to be saved in a Preset and then recalled (loaded) as desired. All current settings (including list selections and scalar (numeric) control settings such as Gain, etc.) are saved when a Preset Save is invoked.
	The **Preset Name** field and **Preset Save** button allow custom user setting configurations to be labeled and saved to a Preset for future use. The **Preset Load** button and the **Selected Preset** drop-down list allow saved presets to be selected and loaded as desired. When a preset is loaded, it immediately becomes active with all user settings now automatically set as directed by the preset. Saved presets can be uploaded to a computer for use with other same-model COMPASS™ cards. Each of the items to the left are described in detail on the following pages.
• **Preset Save and Load** 	• **Preset Save** stores all current card control settings to the currently selected preset. (For example, if Preset 1 is selected in the Selected Preset drop-down list, clicking and confirming Preset Save will then save all current card control settings to Preset 1) • **Preset Load** loads (applies) all card control settings defined by whatever preset (**Preset 1** thru **Preset 16**) is currently selected in the **Selected Preset** drop-down list. (For example, if Preset 3 is selected in the Selected Preset drop-down list, clicking and confirming Preset Load will then apply all card control settings defined in Preset 3) The above buttons have a **Confirm?** pop-up that appears, requesting confirmation. **Note:** Applying a change to a preset using the buttons described above **rewrites** the previous preset contents with the invoked contents. Make certain change is desired before confirming preset change.
• **Selected Preset** 	**Selected Preset 1** thru **Selected Preset 16** range in drop-down list selects one of 16 stored presets as ready for **Save** (being written to) or for **Load** (being applied to the card). **Note:** The preset names shown to the left are the default (unnamed) preset names. All 16 presets in this case are loaded identically with the factory default settings.
• **Card Name** 	Text entry field provides for optional entry of card name, function, etc. (as shown in this example). **Note:** Card name can be 31 ASCII characters maximum.

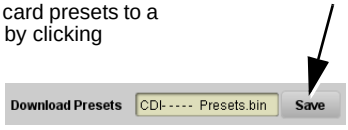
Table 3-2 9083 Function Submenu List — continued

Presets	(continued)
• **Reset Current Preset** 	• **Reset Current Preset** resets all parameters (including preset custom name entered) of the currently selected Preset (as displayed in the **Selected Preset** field) to factory default settings. The above button has a **Confirm?** pop-up that appears, requesting confirmation.
• **Preset Name** 	With one of 16 presets selected, provides for entry of custom name for the preset (as shown in example below).  Entering text in Preset Name field (in this example, “RCVR21”) applies custom name to selected Preset (in this example, Preset 2) **Note:** • Preset name can be seven ASCII characters maximum. • The Preset ID number does not need to be entered; it is added automatically.
• **Download Presets** 	Download Presets allows all 16 presets to be stored to a specified location on a network computer for use with other same-model COMPASS™ cards.

Download a presets file to a computer on the card’s DashBoard network to save presets. Preset files stored on a computer can then be uploaded back to the card.

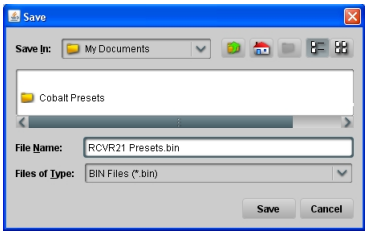
Note also that a presets file can **also be uploaded to other same-model COMPASS® cards**. In this manner, presets built up using a single card can be easily applied to other same-model cards without repeating the setup work on the other cards.

Download (save) card presets to a network computer by clicking **Download Presets – Save** at the bottom of the Presets page.

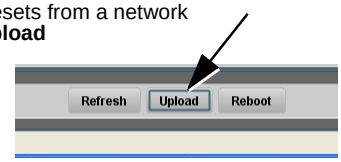


Browse to a desired save location (in this example, *My Documents\Cobalt Presets*).

The file can then be renamed if desired (*RCVR21 Presets* in this example) before saving.

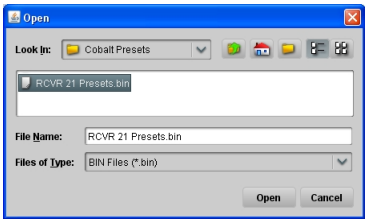


Upload (open) card presets from a network computer by clicking **Upload** at the bottom of DashBoard.



Browse to the location where the file was saved on the computer or drive (in this example, *My Documents\Cobalt Presets*).

Select the desired file and click **Open** to load the file to the card.



To upload presets saved from one card to another same-model card, simply click **Upload** on the other same-model card’s DashBoard page and repeat the same steps here.

Note: • Preset transfer between card download and file upload is on a **group** basis (i.e., individual presets cannot be downloaded or uploaded separately).

• After uploading a presets file, engagement of a desired preset is only assured by pressing the Preset Load button for a desired preset.

Dolby® Digital (Option +ENCD Only) Functions Submenu List

Table 3-3 Dolby® Digital Encoder (Option +ENCD only) Function Submenu List

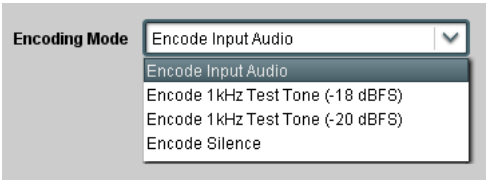
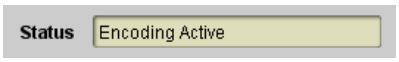
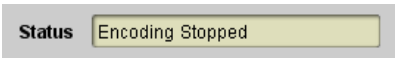
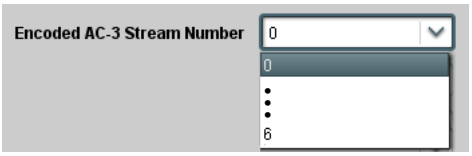
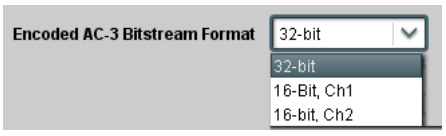
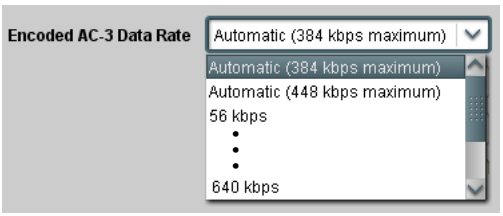
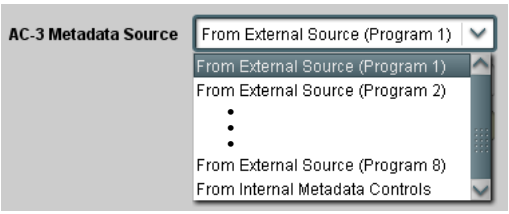
	Provides Dolby® metadata source selection/failover controls, AC-3 data handling controls, and metadata/ encoding status displays.
Note: After familiarizing yourself with the controls described in the Dolby® functions sections that follow, see "Dolby® Digital™ (AC-3) Setup and Routing Example" (p. 3-61) in "Example Setups Using The 9083 and DashBoard™" (p. 3-58) for a full example using these controls.	
• Encoding Mode 	Selects audio input fed to the encoder as shown to the left. **Encode Input Audio** selection routes program material audio as selected using the **Dolby Digital Channel Mapping** tab (p. 3-49).
• Encoding Status Display  	Displays encoding status as follows: • **Encoding Active:** Indicates encoder is receiving valid metadata (either from selected source or selected failover if desired source is not present), and encoded audio is being generated. • **Encoding Stopped:** Indicates encoder is not receiving valid metadata from selected source. **Note:** • If external metadata is selected as source, intended physical source (SMPTE 2020 de-mux from SDI or RS-485) must be appropriately selected. See **Dolby External Metadata** function for more information. • Encoding can be set to failover to internal metadata if desired (as described later).
• Encoded AC-3 Stream Controls	Basic controls for assigning bitstream numbers, format and rates as described below. **Note:** These controls is not required to produce the encoded output. These controls offer expanded functions, as desired, in conformance with Dolby® Digital (AC-3) encoding capabilities.
• Encoded AC-3 Stream Number 	Sets stream ID number (0 thru 6) to identify the current stream to subsequent downstream processes or devices.
• Encoded AC-3 Bitstream Format 	Sets AC-3 bitstream as full 32-bit, or channel-divided 16-bit bitstream.

Table 3-3 Dolby® Digital Encoder (Option +ENCD only) Function Submenu List — continued

Dolby Encoder	(continued)
• **Encoded AC-3 Data Rate** 	Where desired, allows selection of alternate AC-3 data rates. Lower settings (where appropriate when used in conjunction with compressed audio formatting) allows for more packet free space. (Output and AES stream always runs at 3.072 Mbps.)
• **AC-3 Metadata Source** 	Selects metadata source as follows: • **From External Source:** Allows encoding using selected metadata from external source and selects the desired AC-3 program (1 thru 8). **Note:** If external metadata is selected as source, intended physical source (SMPTE 2020 de-mux from SDI or RS-485) must be appropriately selected. See **Dolby External Metadata** function for more information. Encoding can be set to failover to internal metadata if desired (as described later). • **From Internal Metadata Controls:** Allows encoding using internal metadata generator.

Where external metadata is used, the details of each resulting AC-3 program can be checked by viewing the **External Metadata Program Status** displays in the **Dolby External Metadata** tab.
After observing the program status/description, the desired external source can be selected using the **AC-3 Metadata Source** drop-down list described above (**Program 1** as shown here and selected in the example above).

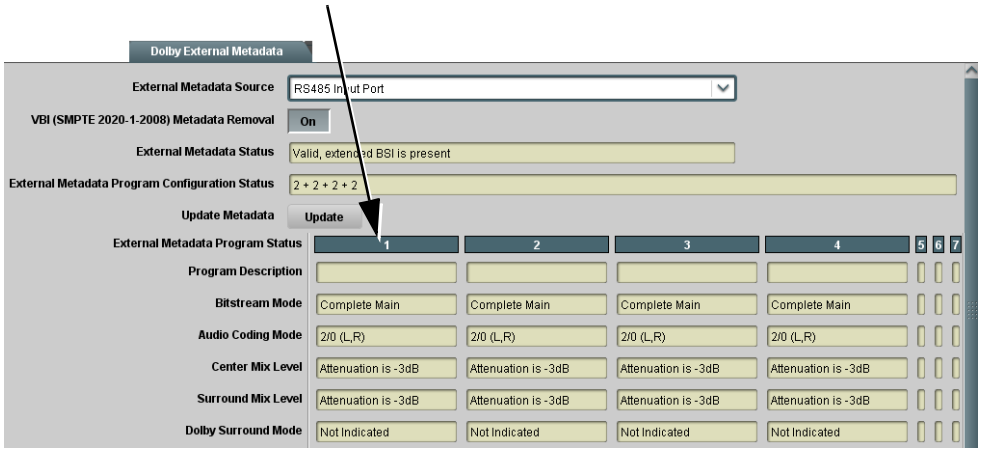


Table 3-3 Dolby® Digital Encoder (Option +ENCD only) Function Submenu List — continued

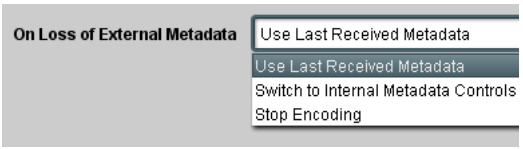
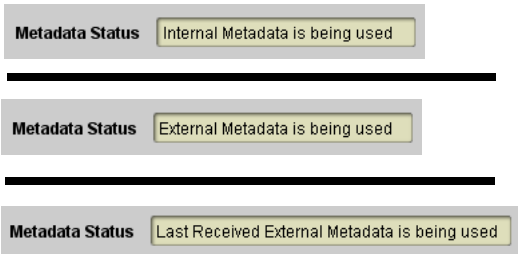
Dolby Encoder	**(continued)**
• On Loss of External Metadata 	Selects the action to take in the event of loss of external metadata as shown to the left.
• Metadata Status Display 	Displays the metadata source currently being used as follows: • **Internal Metadata is being used:** Indicates internal metadata usage (either by manual selection or failover). • **External Metadata is being used:** Indicates external metadata usage; external metadata selected and available. • **Last Received External Metadata is being used:** When enabled (as described above), indicates last received external metadata is being used as a failover in lieu of valid current external metadata.

Table 3-3 Dolby® Digital Encoder (Option +ENCD only) Function Submenu List — continued

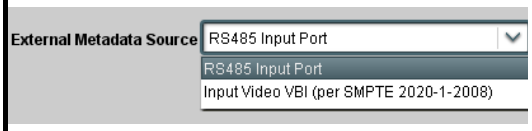
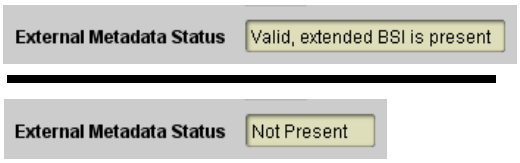
Dolby External Metadata	Provides selection of external metadata physical source and control, and provides status and audio programming detail displays for the external metadata.
• **External Metadata Source** 	Selects the physical source of external metadata to be used as shown to the left. **Note:** • RS-485 metadata is available only on cards equipped with appropriate Rear I/O Module having a **DOLBY META IN** port. • No failover exists to switch between loss of RS-485 metadata and Input Video SMPTE 2020 VBI metadata. If selected metadata is lost, the function reverts to failovers described for the On Loss of External Metadata control described on the previous page.
• **VBI Metadata Removal** 	**VBI Metadata Removal (On/Off)** controls SMPTE 2020-1 metadata removal from the SDI video output. • When set to **On**, metadata is removed from the SDI output. • When set to **Off**, metadata is allowed to pass on the SDI output. **Note:** When encoding is active, it is recommended to set Metadata Removal to **On**. Because the valid metadata for the newly encoded audio is now carried in the encoded audio stream, removal of previous SMPTE 2020 VBI metadata is recommended.
• **External Metadata Status Display** 	Displays the current external metadata source status as follows: • **Valid:** Indicates valid external metadata being received. If extended bitstream is present, this is also displayed. • **Not Present:** Indicates external metadata is not available from selected physical source.
• **External Metadata Program Configuration Status Display** 	Displays the program configuration of the currently received external metadata (5.1+2 in this example).
• **Update Metadata** 	Updates the external metadata status and program configuration display screen. The display always shows the last initiated metadata transaction; to refresh screen for any changes, click **Update**. **Note:** Metadata does not continuously report. Use this button to report new metadata. When clicked, the button stays in the “depressed” position while updating. When the button displays the “out” position, update is complete and all displays are current.

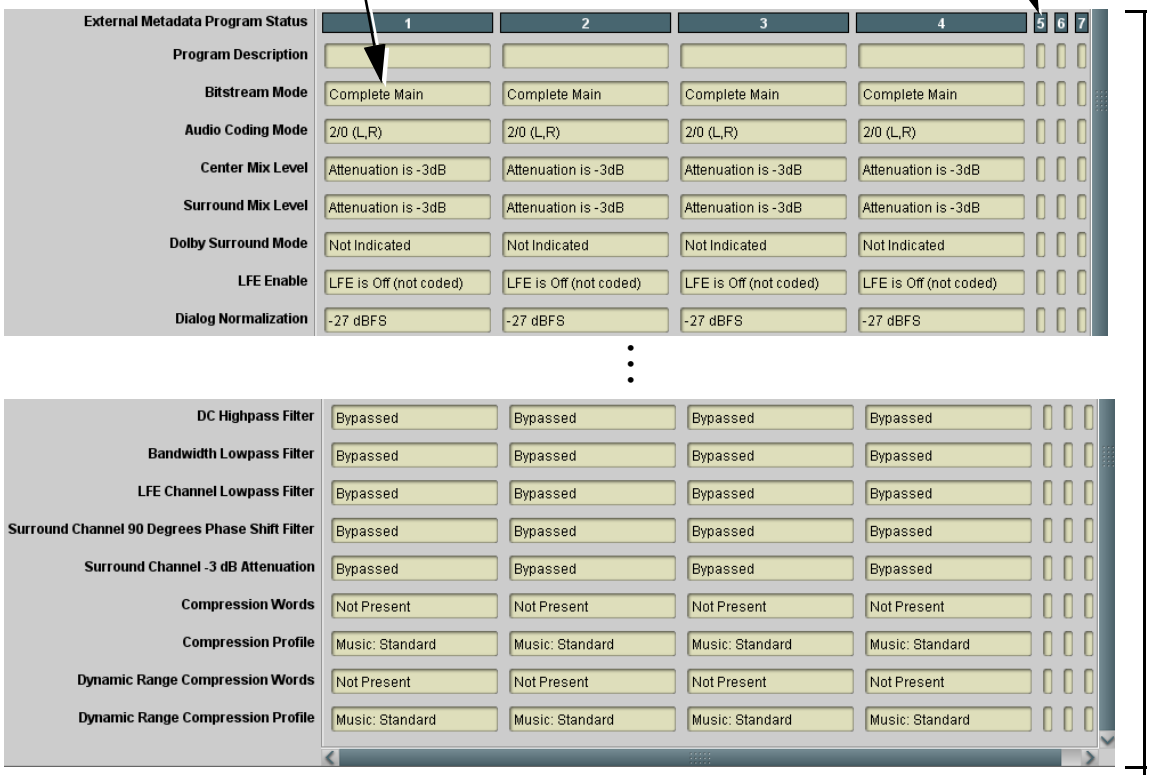
Table 3-3 Dolby® Digital Encoder (Option +ENCD only) Function Submenu List — continued

Dolby External Metadata	**(continued)**
• External Metadata Program Details	Displays the status and programming details for each AC-3 program dictated by the received external metadata. **Note:** • This display is read-only. No changes can be made to the settings. All displays are reports per the received metadata. • Information provided here is intended as an overview of the screen. Displayed parameters are per ATSC A/52B definitions. Refer to ATSC A/52B for detailed descriptions and background.

Status and programming details are displayed for up to eight Dolby® AC-3 programs in each column corresponding to an AC-3 program. (AC-3 programs are selected for the encoder using the **AC-3 Metadata Source** drop-down list in the **Audio Input Controls** tab described on page 3-44.)

Where AC-3 programs exist for the current metadata coding, the columns show the details for the individual AC-3 programs

Where AC-3 programs do not exist for the current metadata coding, the columns are collapsed

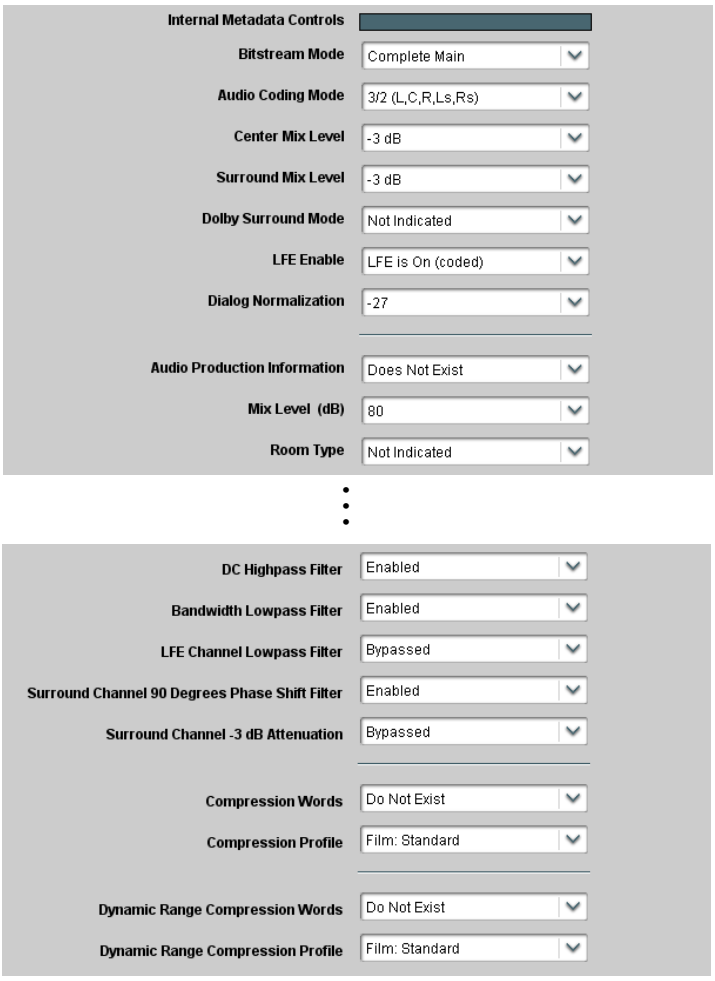


For each AC-3 program as applicable, individual audio production parametric settings and bitstream information is displayed in accordance with the programming inherent in the received metadata.

Table 3-3 Dolby® Digital Encoder (Option +ENCD only) Function Submenu List — continued

Dolby Internal Metadata	Provides the audio production/parametric controls and bitstream controls required for setting up and using internal metadata generation.
• **Internal Metadata Programming Controls**	Provides audio production and bitstream controls for internal metadata. **Note:** • Information provided here is intended as an overview of the screen. Displayed parameters are per ATSC A/52B definitions. Refer to ATSC A/52B for detailed descriptions and background. • When internal metadata is used, settings performed here have a profound effect on program material technical and aesthetic aspects. Setup should **only** be performed by authorized personnel.

Note: **(USA)** ATSC A/85 and the CALM Act (H.R. 1084/S. 2847) requires that when real-time loudness processing is applied using a fixed target loudness of -24 LKFS, downstream AC-3 encoding must correspondingly use a fixed dialnorm value of -24.



For an internally generated metadata, individual audio production parametric settings and bitstream information controls allow setup. Drop-down lists provide on/off settings or selection from a range of appropriate choices in general conformance with Dolby® Digital (AC-3) encoding and ATSC A/52B practices.

Table 3-3 Dolby® Digital Encoder (Option +ENCD only) Function Submenu List — continued

Dolby Ch Map	Provides mapping selection and basic parametric control of the up to six audio channels that comprise the audio channels carried by the Dolby® Digital (AC-3) encoded pair.

Note: • Encoder input channels shown in DashBoard™ (destination channels Encoder Ch 1 thru Encoder Ch 6) correlate to typical channel designations as shown below. Note that channel designations are a function of encoding. Based on encoding, actual channel designations may vary from the examples shown here.

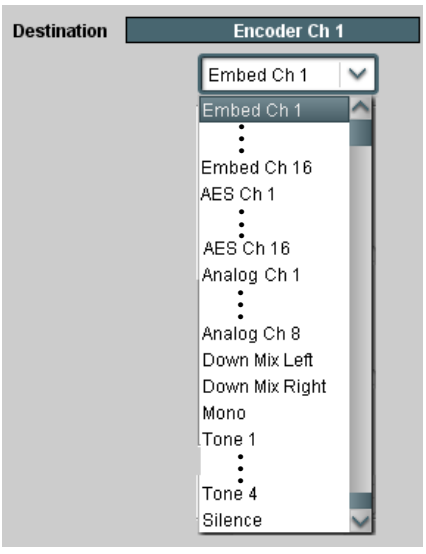
LS/RS = Left Surround/Right Surround LFE = Low-Frequency Effects
C = Center (or mono as applicable) S = Surround mono
— = Not available; do not use

• "L" modes (e.g., "3/0L") are LFE-enabled modes (**Internal Metadata** controls or external metadata coding set to produce an LFE channel).

Encoder Input Channel	1/0	2/0	3/0	2/1	3/1	2/2	3/2
Ch 1	—	L	L	L	L	L	L
Ch 2	—	R	R	R	R	R	R
Ch 3	C	—	C	—	C	—	C
Ch 4	—	—	—	—	—	—	—
Ch 5	—	—	—	S	S	LS	LS
Ch 6	—	—	—	—	—	RS	RS

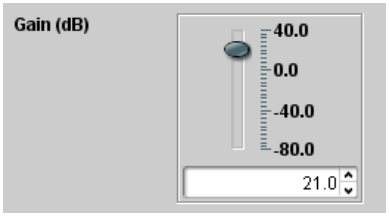
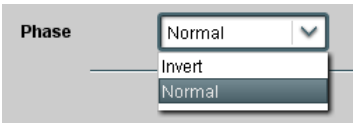
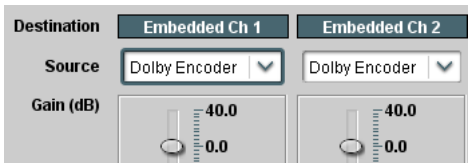
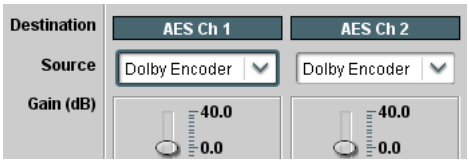
Encoder Input Channel	3/0L	2/1L	3/1L	2/2L	3/2L
Ch 1	L	L	L	L	L
Ch 2	R	R	R	R	R
Ch 3	C	—	C	—	C
Ch 4	LFE	LFE	LFE	LFE	LFE
Ch 5	—	S	S	LS	LS
Ch 6	—	—	—	RS	RS

• Audio Input Source Select



Selects the input channel mapping. Drop-down lists for encoder inputs Destination Encoder Ch 1 thru Encoder Ch 6 can be independently sourced from embedded, discrete AES, analog, downmix, mono, or tone generator audio source as shown to the left.

Table 3-3 Dolby® Digital Encoder (Option +ENCD only) Function Submenu List — continued

Dolby Ch Map	**(continued)**
• **Gain (dB) Control** 	Adjusts relative gain (in dB) applied to the corresponding encoder input. (-80 to +40 dB range in 0.1 dB steps; unity = 0.0 dB)
• **Muting Control** 	Allows pushbutton On/Off muting of the corresponding encoder input while saving all other settings.
• **Phase Control** 	Selects between **Normal** and **Invert** phase (relative to source original phase) for the corresponding encoder input.
Encoded Pair Output Routing	Routes encoded channel pair to SDI output and/or discrete AES outputs using the Embedded Audio Group and AES Audio Out Pair controls as described below.
• **Encoded Pair Carried By Embedded Channel Pair** 	Using the **Source** drop-down list in the **Embedded Audio Group 1/2** or **Embedded Audio Group 3/4** tab, selects the encoded pair using the drop-down list as shown to the left. When either channel of a companion pair is sourced from the Dolby® Encoder, the companion channel is automatically similarly selected. **Note:** Encoded channel pairs selected can only be applied to companion intact pairs (e.g., signals can be applied to embedded pair 1/2, or embedded pair 3/4 and so on, but not split to route through fabricated unrelated pairs such as embedded ch 2/ch 3). **Note:** Although the Gain, Muting, and Phase controls will appear to be usable when an encoded pair is selected, the controls are disabled.
• **Encoded Pair Carried By AES Output Channel Pair** 	Using the **Source** drop-down list in **AES Audio Out Pairs 1-4** tab, selects the encoded pair using the drop-down list as shown to the left. When either channel of a companion pair is sourced from the Dolby® Encoder, the companion channel is automatically similarly selected. **Note:** Encoded channel pairs selected can only be applied to companion intact pairs (e.g., signals can be applied to AES pair 1/2, or AES pair 3/4 and so on, but not split to route through fabricated unrelated pairs such as AES Ch 2/Ch 3). **Note:** Although the Gain, Muting, and Phase controls will appear to be usable when an encoded pair is selected, the controls are disabled. **Note:** The **AES Audio Out Pairs 5-8** tab is not available or displayed in DashBoard™for the 9083. Instead, the encoded pair (when active) is available as copies on AES Out pairs 5 thru 8 regardless of other output routing selections.

Dolby® E (Option +ENCE Only) Functions Submenu List

Table 3-4 Dolby® E Encoder (Option +ENCE only) Function Submenu List

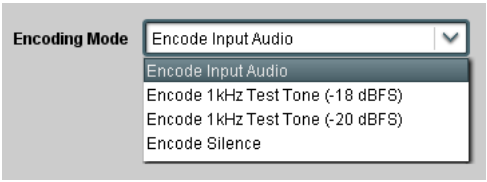
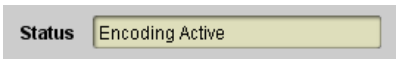
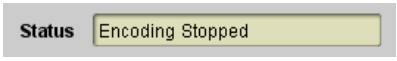
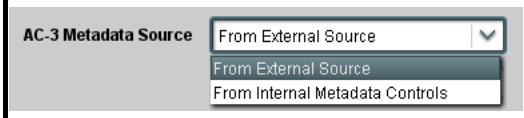
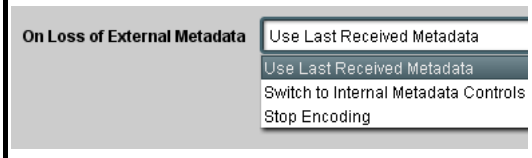
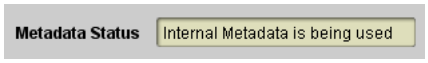
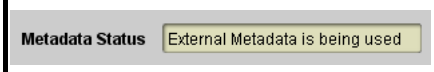
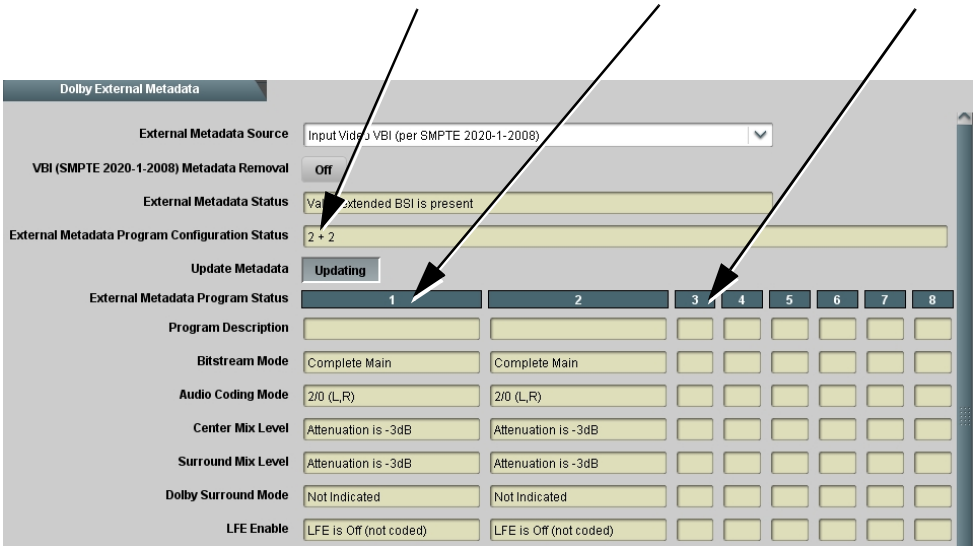
Dolby Encoder	Provides Dolby® metadata source selection/failover controls, AC-3 data handling controls, and metadata/ encoding status displays.
Note: After familiarizing yourself with the controls described in the Dolby® functions sections that follow, see "Dolby® E Setup and Routing Example" (p. 3-63) in "Example Setups Using The 9083 and DashBoard™" (p. 3-58) for a full example using these controls.	
• Encoding Mode 	Selects audio input fed to the encoder as shown to the left. **Encode Input Audio** selection routes program material audio as selected using the **Dolby E Channel Mapping** tab (p. 3-56).
• Encoding Status Display  	Displays encoding status as follows: • **Encoding Active:** Indicates encoder is receiving valid metadata (either from selected source or selected failover if desired source is not present), and encoded audio is being generated. • **Encoding Stopped:** Indicates encoder is not receiving valid metadata from selected source.
• AC-3 Metadata Source 	Selects metadata source as follows: • **From External Source:** Allows encoding using selected metadata from external source. **Note:** If external metadata is selected as source, intended physical source (SMPTE 2020 de-mux from SDI or RS-485) must be appropriately selected. See **Dolby External Metadata** function for more information. Encoding can be set to failover to internal metadata if desired (as described later). • **From Internal Metadata Controls:** Allows encoding using internal metadata generator.
• On Loss of External Metadata 	Selects the action to take in the event of loss of external metadata as shown to the left.
• Metadata Status Display   	Displays the metadata source currently being used as follows: • **Internal Metadata is being used:** Indicates internal metadata usage (either by manual selection or failover). • **External Metadata is being used:** Indicates external metadata usage; external metadata selected and available. • **Last Received External Metadata is being used:** When enabled (as described above), indicates last received external metadata is being used as a failover in lieu of valid current external metadata.

Table 3-4 Dolby® E Encoder (Option +ENCE only) Function Submenu List — continued

Dolby External Metadata	Provides selection of external metadata physical source and control, and provides status and audio programming detail displays for the external metadata.

Where external metadata is used, the details of each resulting AC-3 program can be checked by viewing the **External Metadata Program Status** displays in the **Dolby External Metadata** tab.
Where external metadata does not specify all eight available AC-3 programs, the columns for the unspecified programs are collapsed (as shown here when Dolby® E2+2 is specified by the external metadata).



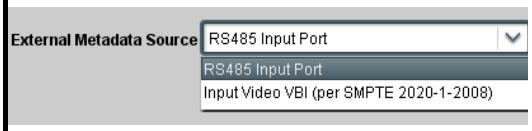
• **External Metadata Source** 	Selects the physical source of external metadata to be used as shown to the left. **Note:** • RS-485 metadata is available only on cards equipped with appropriate Rear I/O Module having a **DOLBY META IN** port. • No failover exists to switch between loss of RS-485 metadata and Input Video SMPTE 2020 VBI metadata. If selected metadata is lost, the function reverts to failovers described for the On Loss of External Metadata control described on the previous page.
• **VBI Metadata Removal** 	**VBI Metadata Removal (On/Off)** controls SMPTE 2020-1 metadata removal from the SDI video output. • When set to **On**, metadata is removed from the SDI output. • When set to **Off**, metadata is allowed to pass on the SDI output. **Note:** When encoding is active, it is recommended to set Metadata Removal to **On**. Because the valid metadata for the newly encoded audio is now carried in the encoded audio stream, removal of previous SMPTE 2020 VBI metadata is recommended.

Table 3-4 Dolby® E Encoder (Option +ENCE only) Function Submenu List — continued

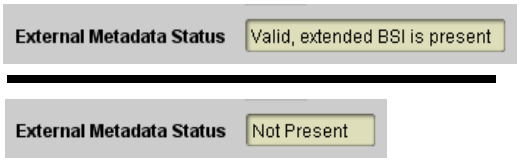
Dolby External Metadata	**(continued)**
• **External Metadata Status Display** 	Displays the current external metadata source status as follows: • **Valid:** Indicates valid external metadata being received. If extended bitstream is present, this is also displayed. • **Not Present:** Indicates external metadata is not available from selected physical source.
• **External Metadata Program Configuration Status Display** 	Displays the program configuration of the currently received external metadata (5.1+2 in this example).
• **Update Metadata** 	Updates the external metadata status and program configuration display screen. The display always shows the last initiated metadata transaction; to refresh screen for any changes, click **Update**. **Note:** Metadata does not continuously report. Use this button to report new metadata. When clicked, the button stays in the “depressed” position while updating. When the button displays the “out” position, update is complete and all displays are current.

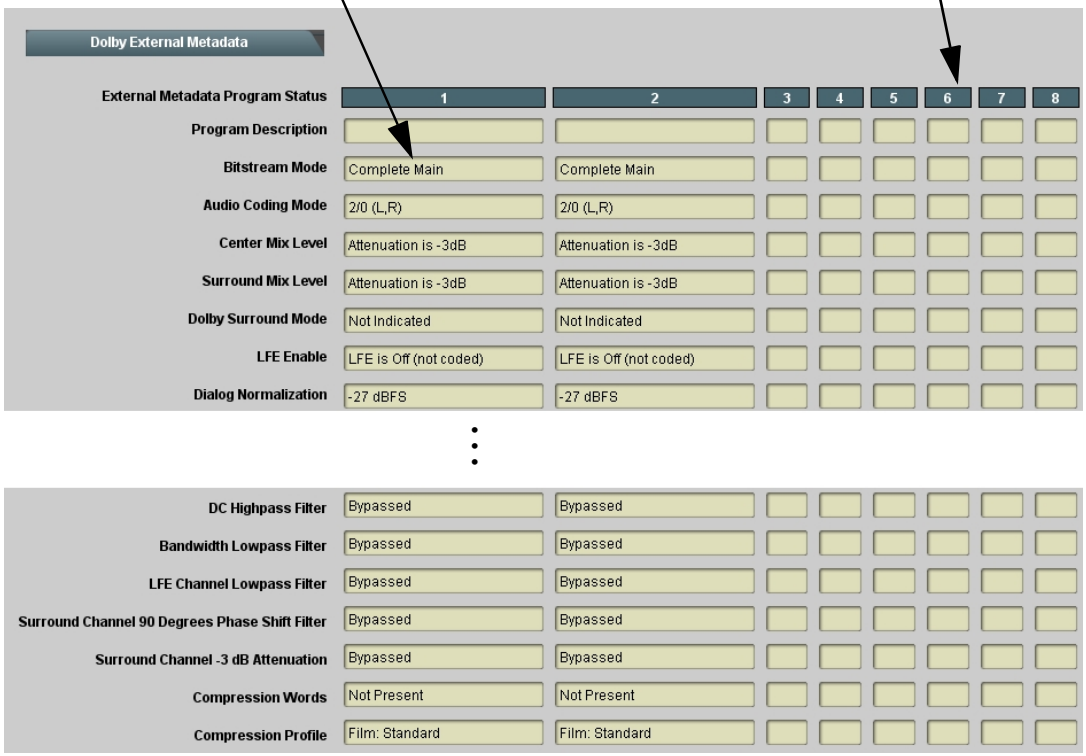
Table 3-4 Dolby® E Encoder (Option +ENCE only) Function Submenu List — continued

Dolby External Metadata	(continued)
• **External Metadata Program Details**	Displays the status and programming details for each AC-3 program dictated by the received external metadata. **Note:** • This display is read-only. No changes can be made to the settings. All displays are reports per the received metadata. • Information provided here is intended as an overview of the screen. Displayed parameters are per ATSC A/52B definitions. Refer to ATSC A/52B for detailed descriptions and background.

Status and programming details are displayed for up to eight Dolby® AC-3 programs in each column corresponding to an AC-3 program.

Where AC-3 programs exist for the current metadata coding, the columns show the details for the individual AC-3 programs

Where AC-3 programs do not exist for the current metadata coding, the columns are collapsed

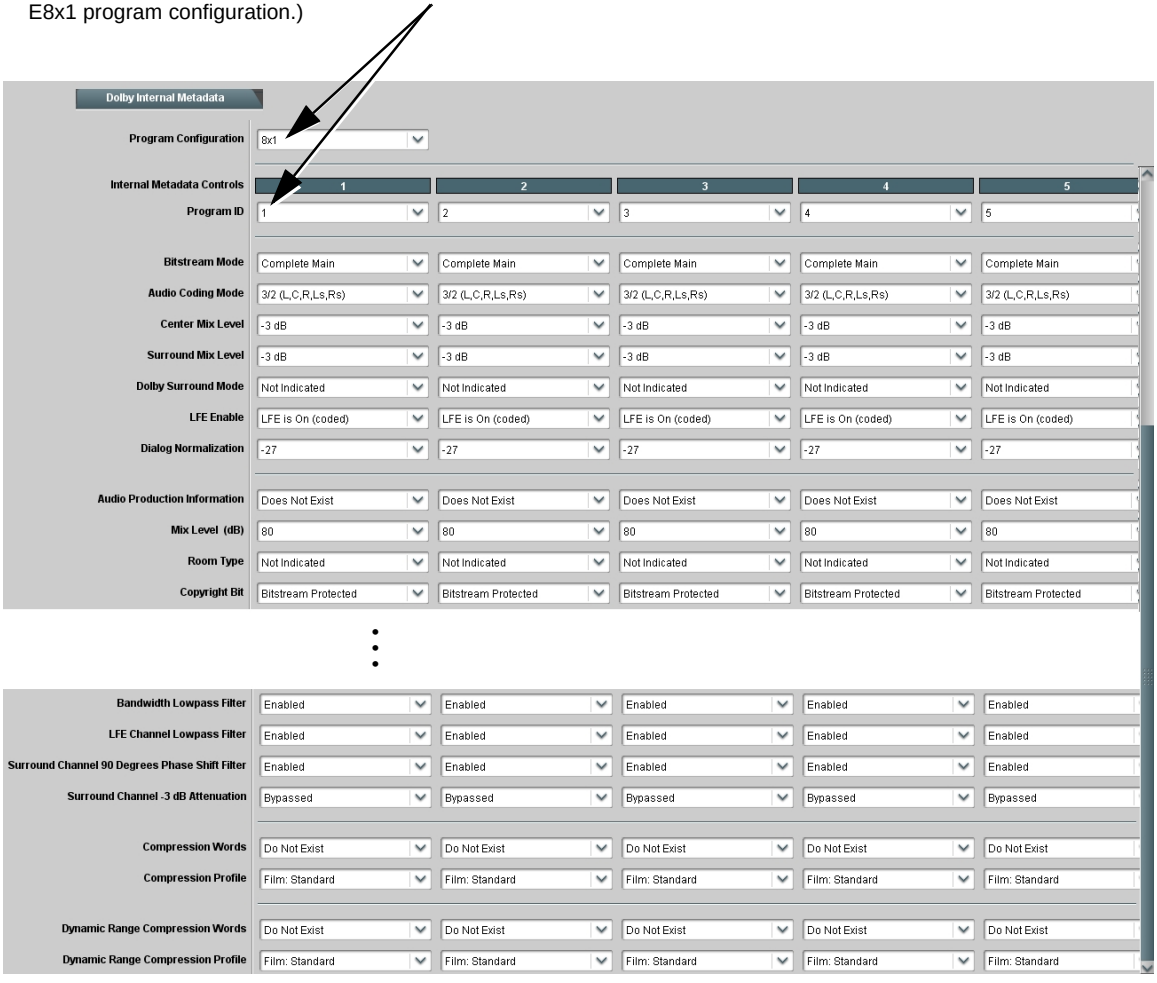


For each AC-3 program as applicable, individual audio production parametric settings and bitstream information is displayed in accordance with the programming inherent in the received metadata.

Table 3-4 Dolby® E Encoder (Option +ENCE only) Function Submenu List — continued

Dolby Internal Metadata	Provides the audio production/parametric controls and bitstream controls required for setting up and using internal metadata generation.
• **Internal Metadata Programming Controls**	Provides audio production and bitstream controls for internal metadata. **Note:** • Information provided here is intended as an overview of the screen. Displayed parameters are per ATSC A/52B definitions. Refer to ATSC A/52B for detailed descriptions and background. • When internal metadata is used, settings performed here have a profound effect on program material technical and aesthetic aspects. Setup should **only** be performed by authorized personnel.

Program Configuration drop-down list allows selection of various standard Dolby® E program configurations. For each individual program comprising the program configuration, individual drop-down list allow a **Program ID** number to be assigned. (In this example, each Program ID drop-down list has a range of 8, corresponding to the number of programs defined by example E8x1 program configuration.)



For an internally generated metadata, individual audio production parametric settings and bitstream mode controls allow setup. Drop-down lists provide on/off settings or selection from a range of appropriate choices in general conformance with Dolby® encoding and ATSC A/52B practices.

Table 3-4 Dolby® E Encoder (Option +ENCE only) Function Submenu List — continued

Dolby Ch Map

Provides mapping selection and basic parametric control of the up to eight audio channels that comprise the audio channels carried by the Dolby® encoded pair.

Note: • Encoder input channels shown in DashBoard™ (destination channels Encoder Ch 1 thru Encoder Ch 8) correlate to typical channel designations as shown below. Note that channel designations are a function of encoding. Based on encoding, actual channel designations may vary from the examples shown here.

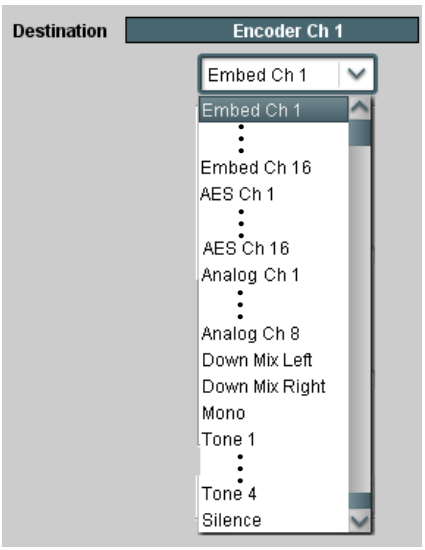
• Unnumbered channel designations imply channel 1 where multiple programs exist.

LF/RF = Left Front/Right Front
LFE = Low-Frequency Effects
S = Surround mono
LE/RE = Left Extra/Right Extra
LS/RS = Left Surround/Right Surround
C = Center (or mono as applicable)
BSL/BSR = Back-Surround Left/Back Surround Right
— = Not available; do not use

Encoder Input Channel	5.1 + 2	5.1 + 2 x 1	4 + 4	4 + 2 x 2	4 + 2 + 2 x 1	4 + 4 x 1	4 x 2	3 x 2 + 2 x 1	2 x 2 + 4 x 1	2 + 6 + 1	8 x 1	5.1
Ch 1	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	C	LF
Ch 2	RF	RF	RF	RF	RF	RF	RF	RF	RF	RF	2C	RF
Ch 3	C	C	C	C	C	C	3L	3L	3C	4C	3C	C
Ch 4	LFE	LFE	S	S	S	S	3R	3R	4C	5C	4C	LFE
Ch 5	LS	LS	2C	3L	3C	4C	4L	4C	5C	6C	5C	LS
Ch 6	RS	RS	2S	3R	4C	5C	4R	5C	6C	7C	6C	RS
Ch 7	2L	2C	2L	2L	2L	2C	2L	2L	2L	2C	7C	—
Ch 8	2R	3C	2R	2R	2R	3C	2R	2R	2R	3C	8C	—

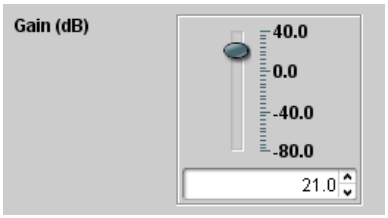
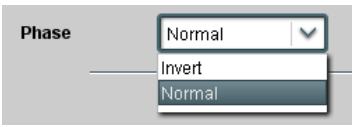
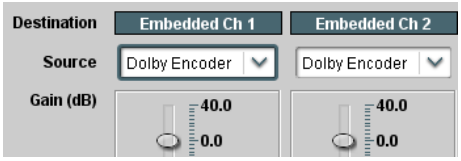
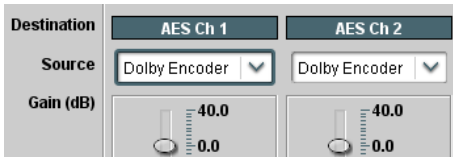
Encoder Input Channel	4 + 2	4 + 2 x 1	3 x 2	2 x 2 + 2 x 1	2 + 4 x 1	6 x 1	4	2 + 2	2 + 2 x 1	4 x 1	7.1	7.1 Screen
Ch 1	LF	LF	L	L	L	C	L	L	L	C	LF	LF
Ch 2	RF	RF	R	R	R	2C	R	R	R	2C	RF	RF
Ch 3	C	C	3L	3C	4C	3C	C	—	—	3C	C	C
Ch 4	S	S	3R	4C	5C	4C	S	—	—	4C	LFE	LFE
Ch 5	—	—	—	—	—	5C	—	—	—	—	LS	LS
Ch 6	—	—	—	—	—	6C	—	—	—	—	RS	RS
Ch 7	2L	2C	2L	2L	2C	—	—	2L	2C	—	BSL	LE
Ch 8	2R	3C	2R	2R	3C	—	—	2R	3C	—	BSR	RE

• Audio Input Source Select



Selects the input channel mapping. Drop-down lists for encoder inputs Destination Encoder Ch 1 thru Encoder Ch 8 can be independently sourced from embedded, discrete AES, analog, downmix, mono, or tone generator audio source as shown to the left.

Table 3-4 Dolby® E Encoder (Option +ENCE only) Function Submenu List — continued

Dolby Ch Map	**(continued)**
• **Gain (dB) Control** 	Adjusts relative gain (in dB) applied to the corresponding encoder input. (-80 to +40 dB range in 0.1 dB steps; unity = 0.0 dB)
• **Muting Control** 	Allows pushbutton On/Off muting of the corresponding encoder input while saving all other settings.
• **Phase Control** 	Selects between **Normal** and **Invert** phase (relative to source original phase) for the corresponding encoder input.
Encoded Pair Output Routing	Routes encoded channel pair to SDI output and/or discrete AES outputs using the Embedded Audio Group and AES Audio Out Pair controls as described below.
• **Encoded Pair Carried By Embedded Channel Pair** 	Using the **Source** drop-down list in the **Embedded Audio Group 1/2** or **Embedded Audio Group 3/4** tab, selects the encoded pair using the drop-down list as shown to the left. When either channel of a companion pair is sourced from the Dolby® Encoder, the companion channel is automatically similarly selected. **Note:** Encoded channel pairs selected can only be applied to companion intact pairs (e.g., signals can be applied to embedded pair 1/2, or embedded pair 3/4 and so on, but not split to route through fabricated unrelated pairs such as embedded ch 2/ch 3). **Note:** Although the Gain, Muting, and Phase controls will appear to be usable when an encoded pair is selected, the controls are disabled.
• **Encoded Pair Carried By AES Output Channel Pair** 	Using the **Source** drop-down list in **AES Audio Out Pairs 1-4** tab, selects the encoded pair using the drop-down list as shown to the left. When either channel of a companion pair is sourced from the Dolby® Encoder, the companion channel is automatically similarly selected. **Note:** Encoded channel pairs selected can only be applied to companion intact pairs (e.g., signals can be applied to AES pair 1/2, or AES pair 3/4 and so on, but not split to route through fabricated unrelated pairs such as AES Ch 2/Ch 3). **Note:** Although the Gain, Muting, and Phase controls will appear to be usable when an encoded pair is selected, the controls are disabled. **Note:** The **AES Audio Out Pairs 5-8** tab is not available or displayed in DashBoard™for the 9083. Instead, the encoded pair (when active) is available as copies on AES Out pairs 5 thru 8 regardless of other output routing selections.

Example Setups Using The 9083 and DashBoard™

Audio Routing Example Using DashBoard™

Figure 3-6 shows an example of using the 9083 Embedded Audio Group and AES Output Pairs functions to de-embed audio, route the audio to discrete outputs for post-production processing, and finally re-embed the audio into the SDI video output. Additionally, the example shows how external analog and internal tone generator sources can be embedded into the SDI output.

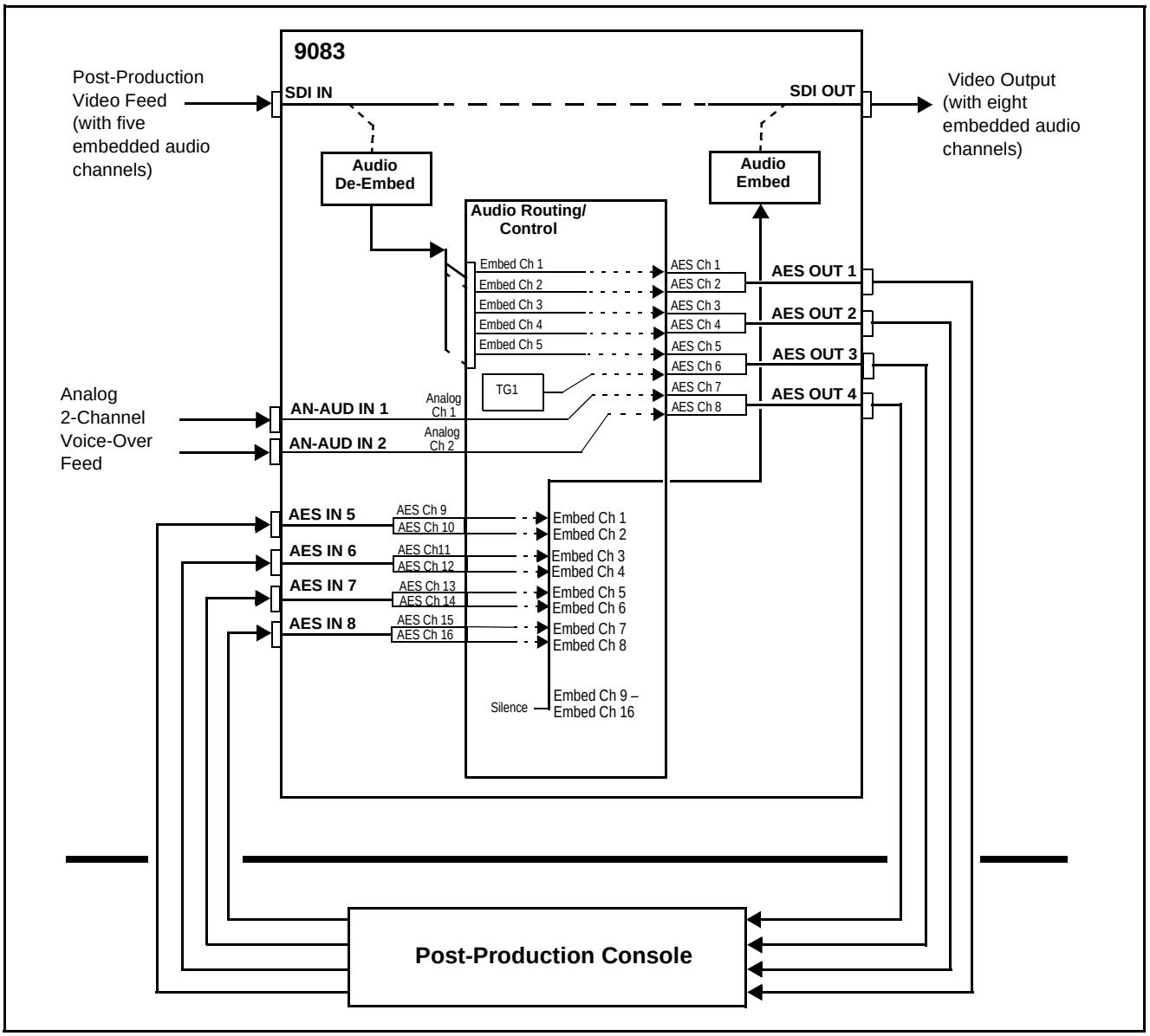


Figure 3-6 Audio Routing Example (Sheet 1 of 3)

In the example here, Embedded Channels 1 thru 5 are de-embedded from the input SDI data and routed to discrete AES channels 1 thru 5. Also, an internal tone generator (TG1) and two analog inputs are routed to AES channels 6 thru 8, respectively. Figure 3-6 (sheet 2) shows the 9083 control settings that result in this routing.

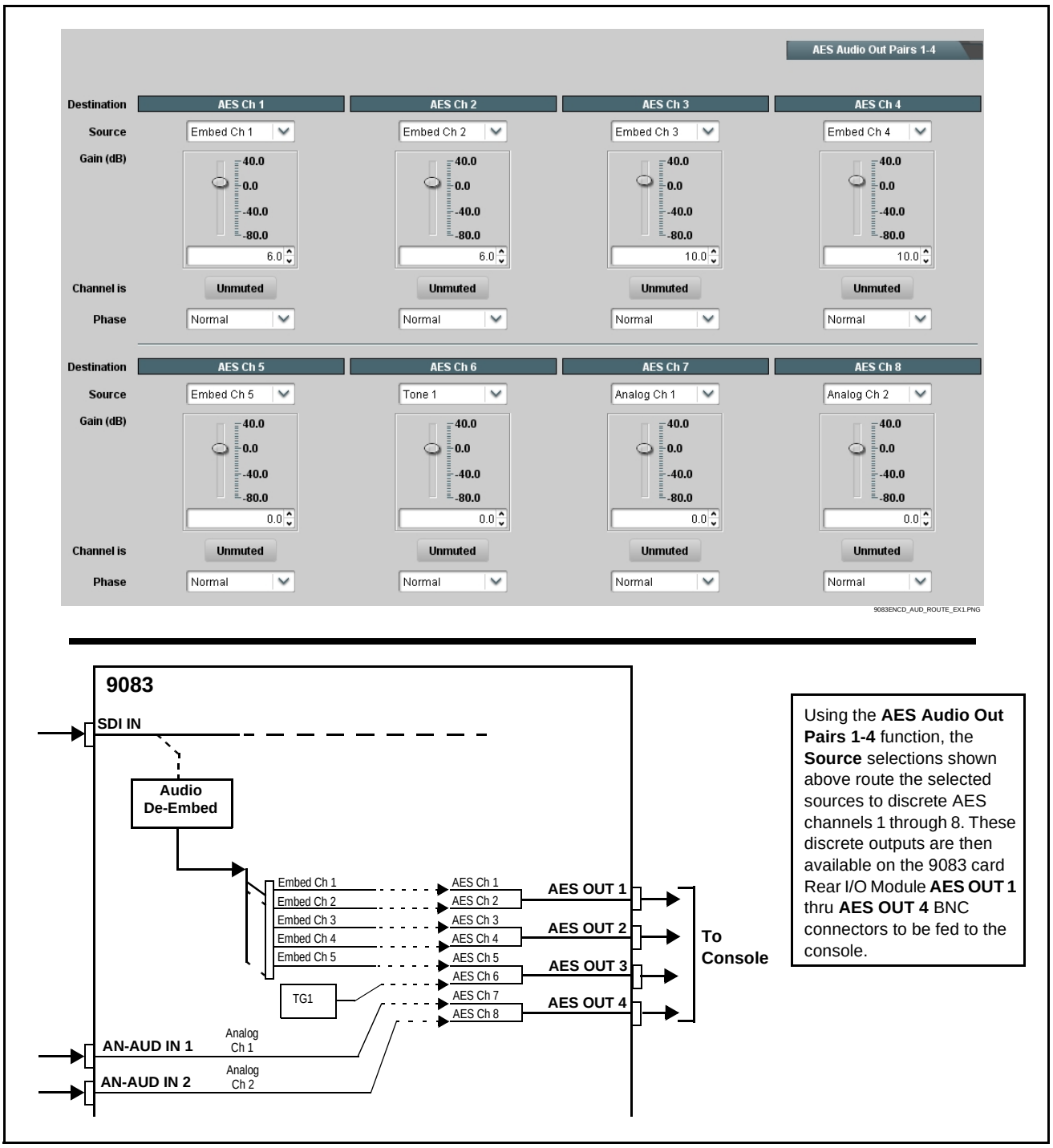
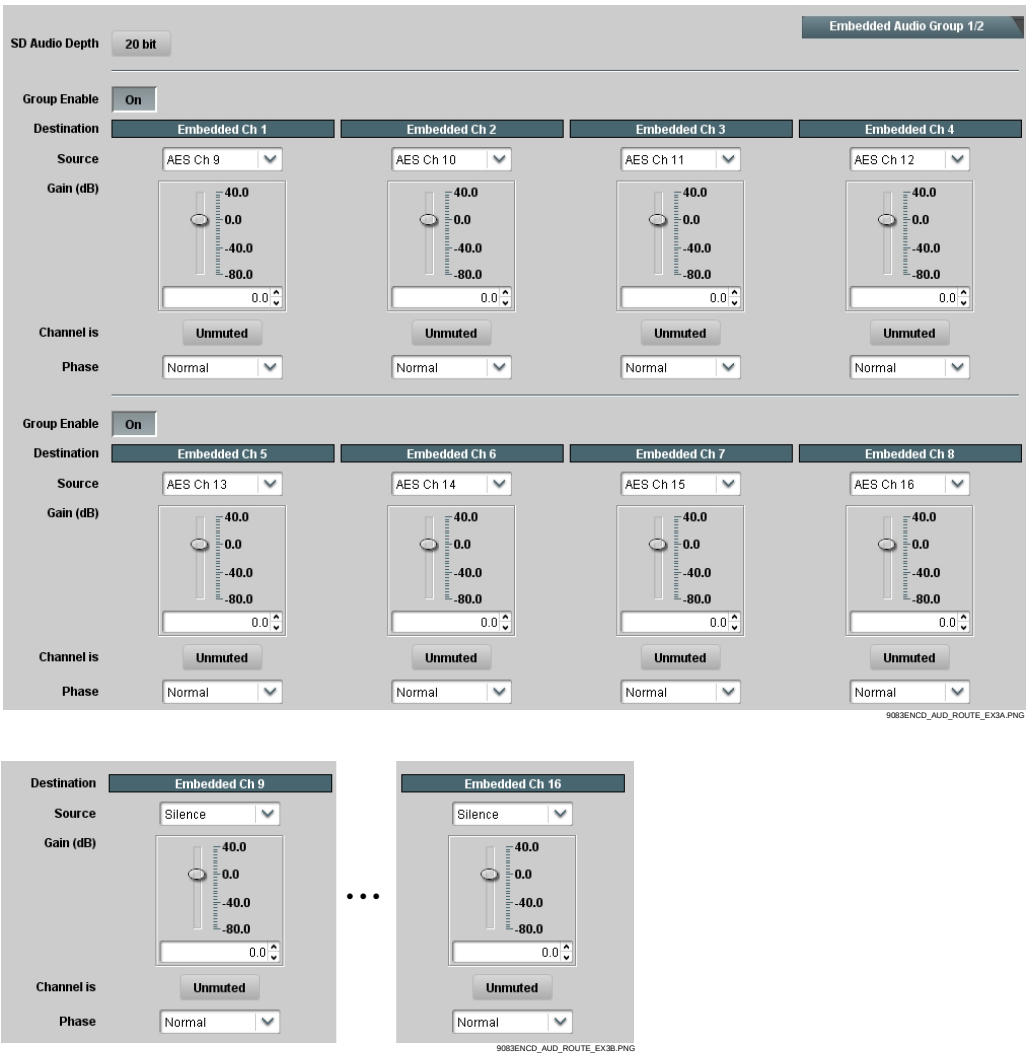
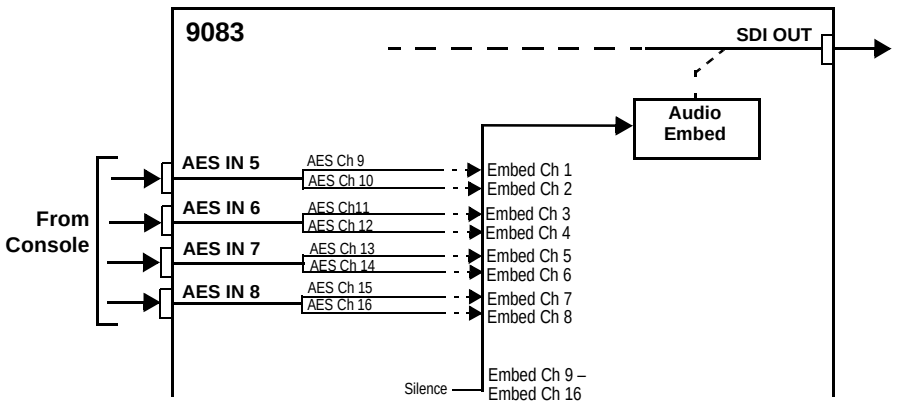


Figure 3-6 Audio Routing Example (Sheet 2 of 3)

The discrete AES audio on AES channels 9 thru 16 is now re-embedded using the 9083 control settings shown in Figure 3-6 (sheet 3).





Using the **Embedded Audio Group 1/2** and **3/4** functions, the **Source** selections shown above route the discrete AES audio signals received from the console on Rear I/O Module **AES IN 5** thru **AES IN 8** BNC connectors to **Embedded Audio Group 1/2** embedded channels 1 thru 8.

Unused **Embedded Audio Group 3/4** embedded channels 9 thru 16 are set to Silence (mute).

Figure 3-6 Audio Routing Example (Sheet 3 of 3)

Dolby® Digital™ (AC-3) Setup and Routing Example (Option +ENCD only)

Figure 3-7 shows an example setup of using the 9083 Dolby® controls and audio routing controls to perform the following:

- Encode AES channels 1 thru 6 into an AC-3 encoded pair.
- Use RS-485 external metadata received on **DOLBY META IN** port; remove the VBI metadata following encoding.
- Perform encoding using received AC-3 Program 1.
- Set the AC-3 data rate to 384 kbps max. automatic.
- Route the encoded pair to embedded channel pair 1/2.

Figure 3-7 (sheet 1) shows this setup consisting of steps Ⓐ through Ⓖ. Figure 3-7 (sheet 2) correspondingly shows the DashBoard™ function tabs and control settings that are used for this setup.

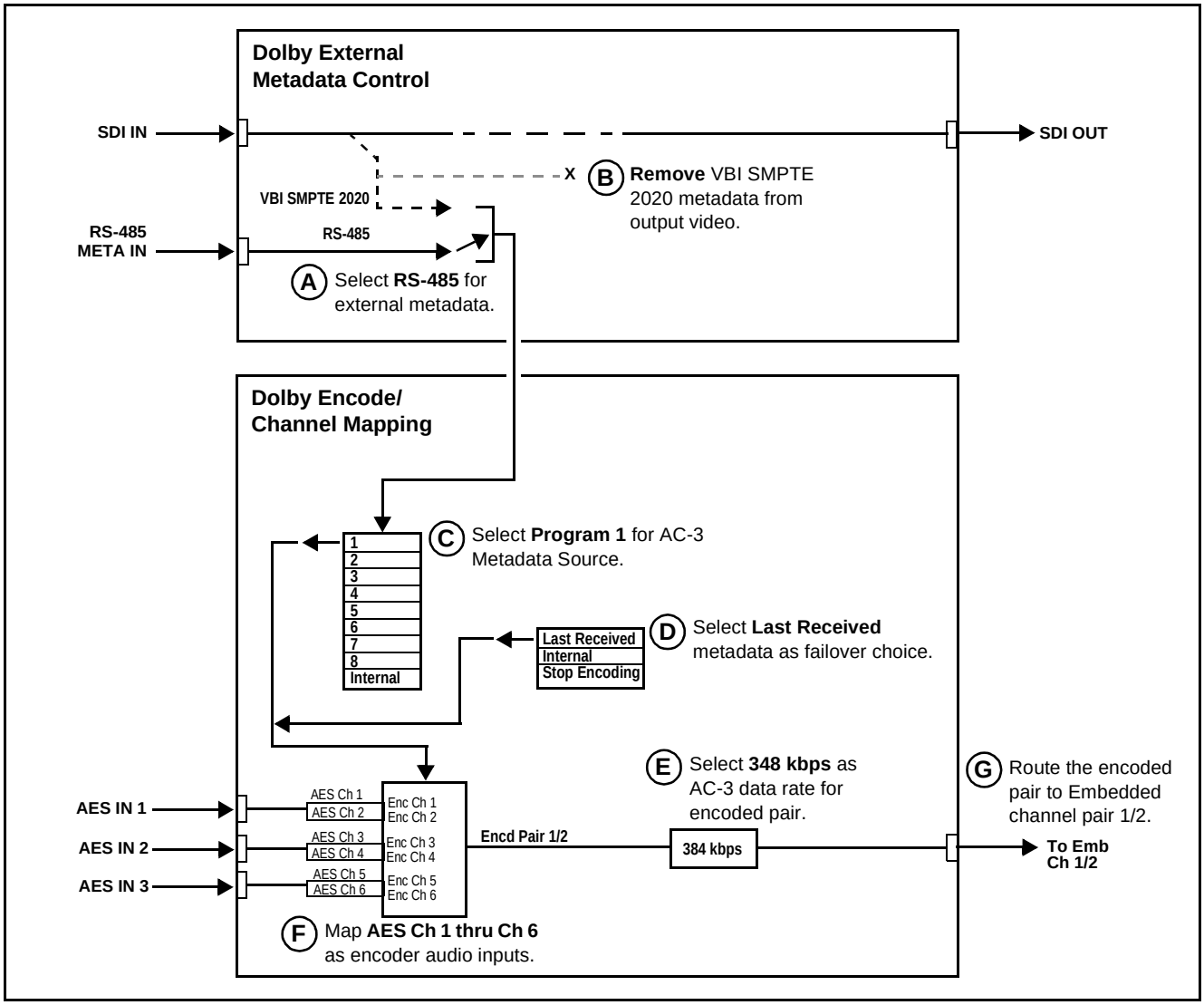


Figure 3-7 Dolby® Digital™ (AC-3) Setup Example (Sheet 1 of 2)

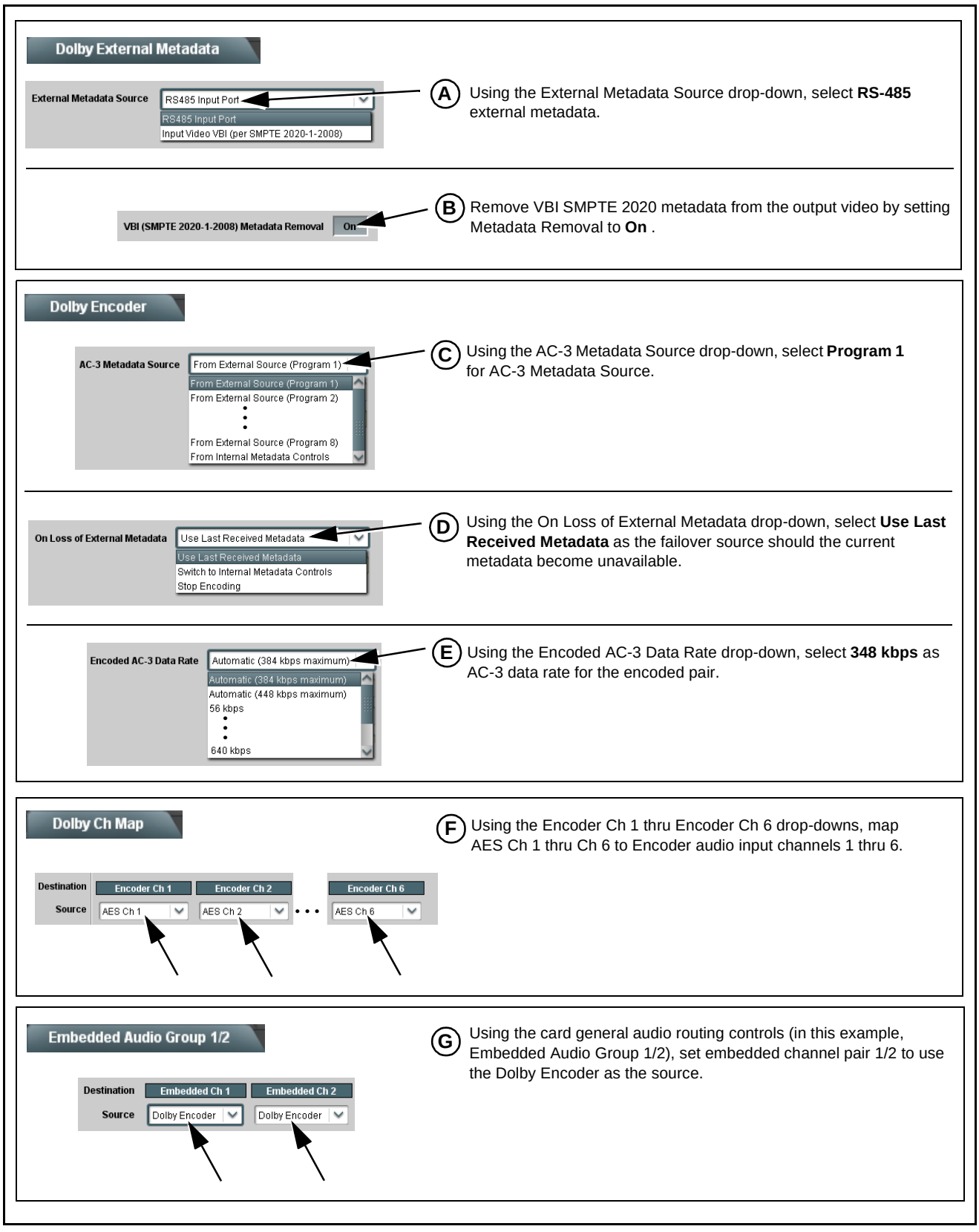


Figure 3-7 Dolby® Digital™ (AC-3) Setup Example (Sheet 2 of 2)

Dolby® E Setup and Routing Example (Option +ENCE only)

Figure 3-8 shows an example setup of using the 9083 Dolby® controls and audio routing controls to perform the following:

- Encode AES channels 1 thru 8 into a Dolby® E 5.1+2 encoded pair using input video VBI SMPTE 2020 external metadata; remove the VBI metadata following encoding.
- Perform encoding using received 5.1+2 Program Configuration per received metadata.
- Set failover to use internal metadata if loss of external metadata loss.
- Route the encoded pair to embedded channel pair 1/2.

Figure 3-8 (sheet 1) shows this setup consisting of steps Ⓐ through Ⓕ. Figure 3-8 (sheet 2) correspondingly shows the DashBoard™ function tabs and control settings that are used for this setup.

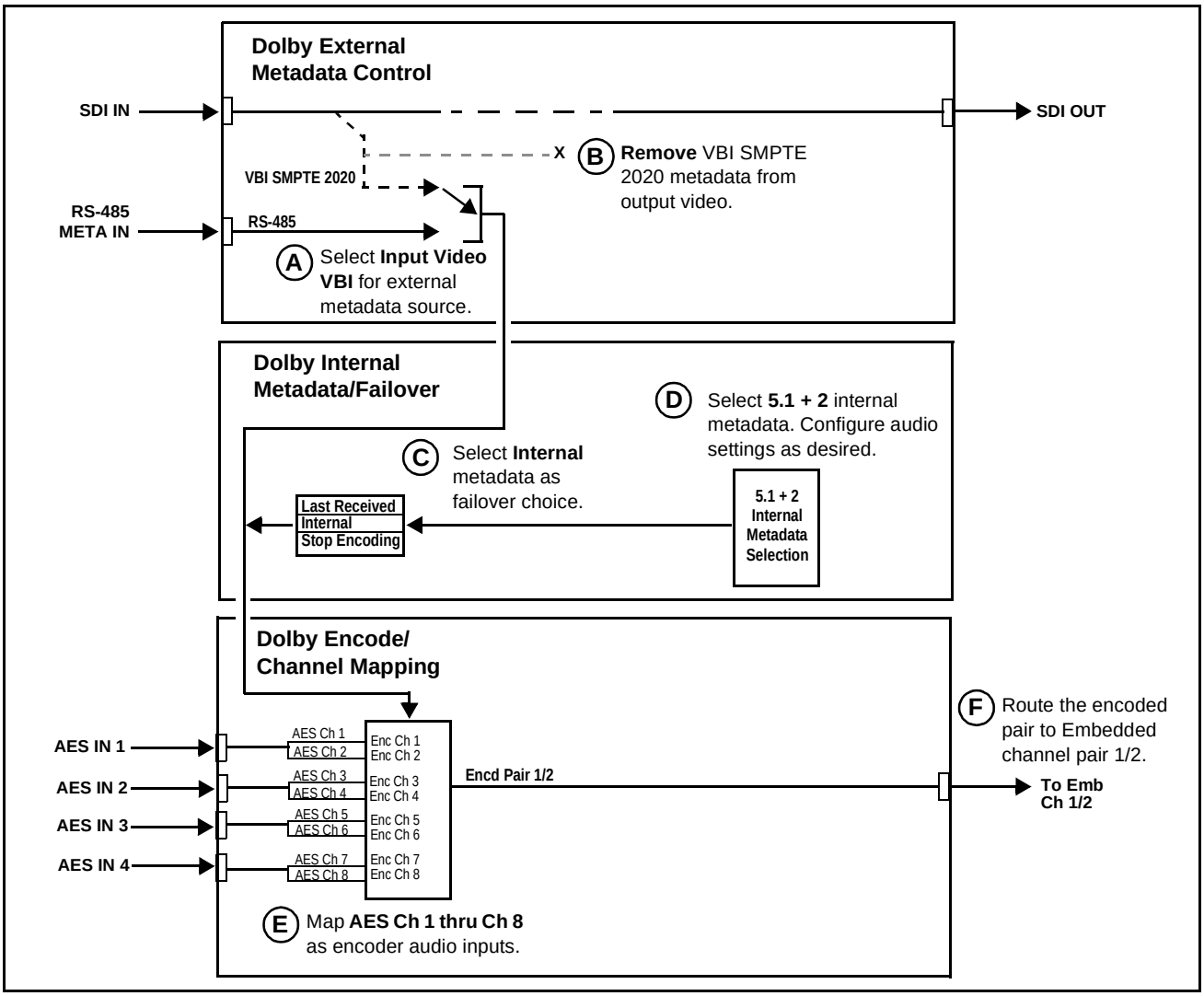


Figure 3-8 Dolby® E Setup Example (Sheet 1 of 2)

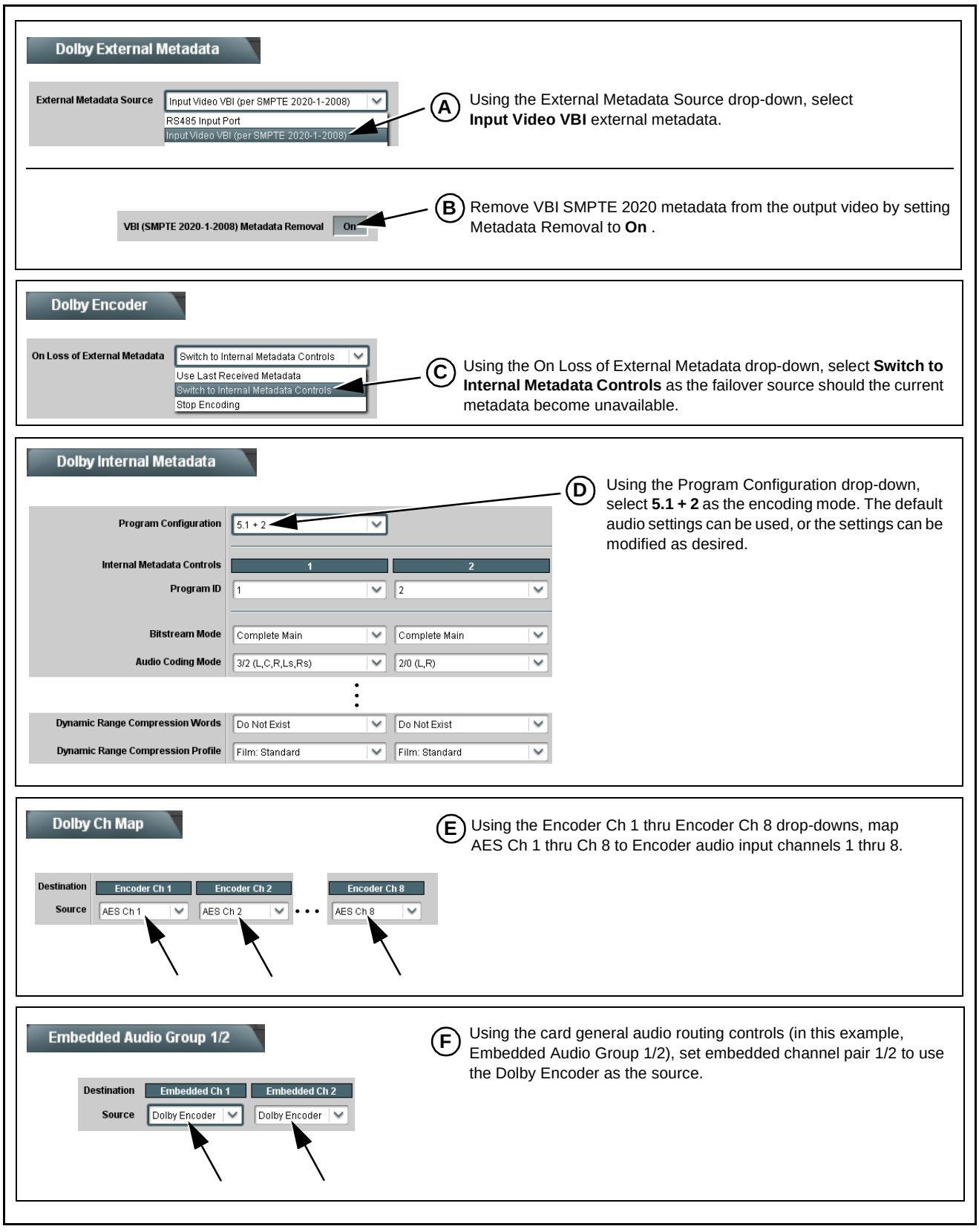


Figure 3-8 Dolby® E Setup Example (Sheet 2 of 2)

Troubleshooting

This section provides general troubleshooting information and specific symptom/corrective action for the 9083 card. The 9083 card requires no periodic maintenance in its normal operation; if any error indication (as described in this section) occurs, use this section to correct the condition.

Error and Failure Indicator Overview

The 9083 card itself and its remote control systems all (to varying degrees) provide error and failure indications. Depending on how the 9083 card is being used (i.e, standalone or network controlled through DashBoard™ or a Remote Control Panel), check all available indications in the event of an error or failure condition.

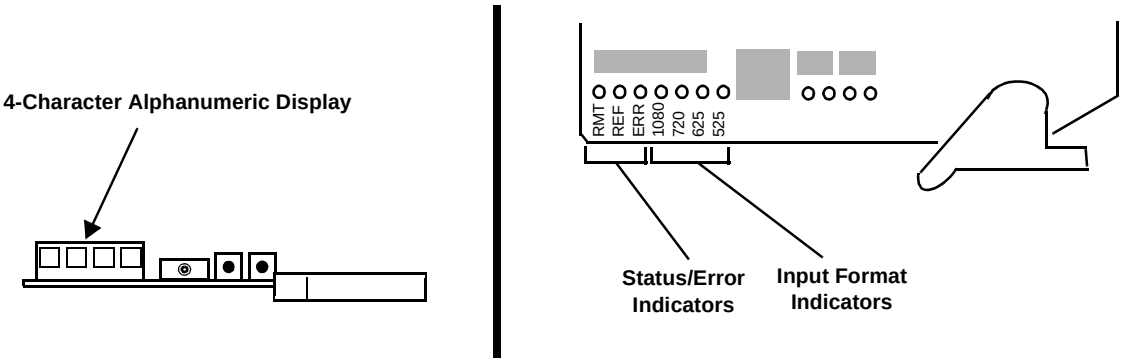
The various 9083 card and remote control error and failure indicators are individually described below.

Note: The descriptions below provide general information for the various status and error indicators. For specific failures, also use the appropriate subsection listed below.

- Basic Troubleshooting Checks (p. 3-69)
- 9083 Processing Error Troubleshooting (p. 3-70)
- Troubleshooting Network/Remote Control Errors (p. 3-74)

9083 Card Edge Status/Error Indicators and Display

Figure 3-9 shows and describes the 9083 card edge status indicators and display. These indicators and the display show status and error conditions relating to the card itself and remote (network) communications (where applicable). Because these indicators are part of the card itself and require no external interface, the indicators are particularly useful in the event of communications problems with external devices such as network remote control devices.



Item	Function
Alphanumeric Display	Displays 4-digit alphanumeric code indicating status or errors as follows: • **E0XX:** Video Errors • **E002:** Video Acquiring Lock • **E1XX:** Audio Errors • **E100:** Analog Input Clipping • **E2XX:** Frame Sync Errors • **E200:** Reference is Incompatible with Input Video • **E201:** Reference Standard is Invalid/No Reference Present • **E202:** Reference Standard is 720p2398 (a reference standard not supported by the framesync) • **E203:** Reference Standard is 720p2997 (a reference standard not supported by the framesync)
RMT LED	Blue LED flashes when 9083 is receiving control message from remote network control (e.g., DashBoard™ or Cobalt® Remote Control Panel)
REF LED	Blue LED illuminates indicating 9083 is receiving valid reference when set up for framesync operation.
ERR LED	Red LED illuminates when 9083 unable to lock to framesync, or unable to lock to input standard.
Input Format LEDs	Four blue LEDs indicate the input signal raster format being received and locked onto by the 9083 (1080, 720, 625, 525). Continuous cycling of the LEDs indicates the 9083 has not locked onto a particular format (as in the case of no signal input).

Figure 3-9 9083 Card Edge Status Indicators and Display

DashBoard™ Status/Error Indicators and Displays

Figure 3-10 shows and describes the DashBoard™ status indicators and displays. These indicator icons and displays show status and error conditions relating to the 9083 card itself and remote (network) communications.

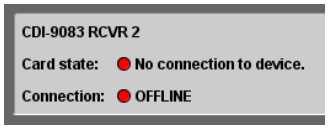
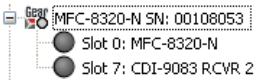
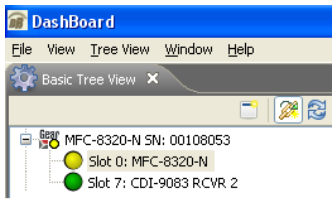
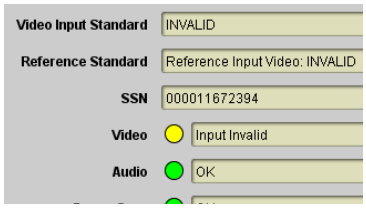
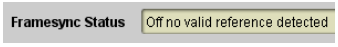
Indicator Icon or Display	Error Description
	Red indicator icon in Card Access/Navigation Tree pane shows card with Error condition (in this example, the Card Access/Navigation Tree pane shows a general error issued by the 9083 card in slot 7).
	Specific errors are displayed in the Card Info pane (in this example “No connection to device” indicating 9083 card is not connecting to frame/LAN).
	If the 9083 card is not connecting to the frame or LAN, all controls are grayed-out (as shown in the example here).
	Gray indicator icon in Card Access/Navigation Tree pane shows card(s) are not being seen by DashBoard™ due to lack of connection to frame LAN (in this example, both a 9083 card in slot 7 and the MFC-8320-N Network Controller Card for its frame in slot 0 are not being seen).
	Yellow indicator icon in Card Access/Navigation Tree pane shows card with Alert condition (in this example, the Card Access/Navigation Tree pane shows a general alert issued by the MFC-8320-N Network Controller Card).
	Clicking the card slot position in the Card Access/Navigation Tree (in this example Network Controller Card “Slot 0: MFC-8320-N”) opens the Card Info pane for the selected card. In this example, a “Fan Door Open” specific error is displayed.
	Yellow indicator icon in 9083 Card Info pane shows error alert, along with cause for alert (in this example, the 9083 is receiving no video input, or a video input that is invalid for the card and/or its current settings).
	Where available, error messages within a function submenu pane show highly specific information relating to detected errors (in this example, message shows an invalid or missing Framesync Enable reference selection).

Figure 3-10 DashBoard™ Status Indicator Icons and Displays

Access Card Info panes for specific cards by clicking the card slot position in the Card Access/Navigation Tree pane (as shown in the example in Figure 3-11).

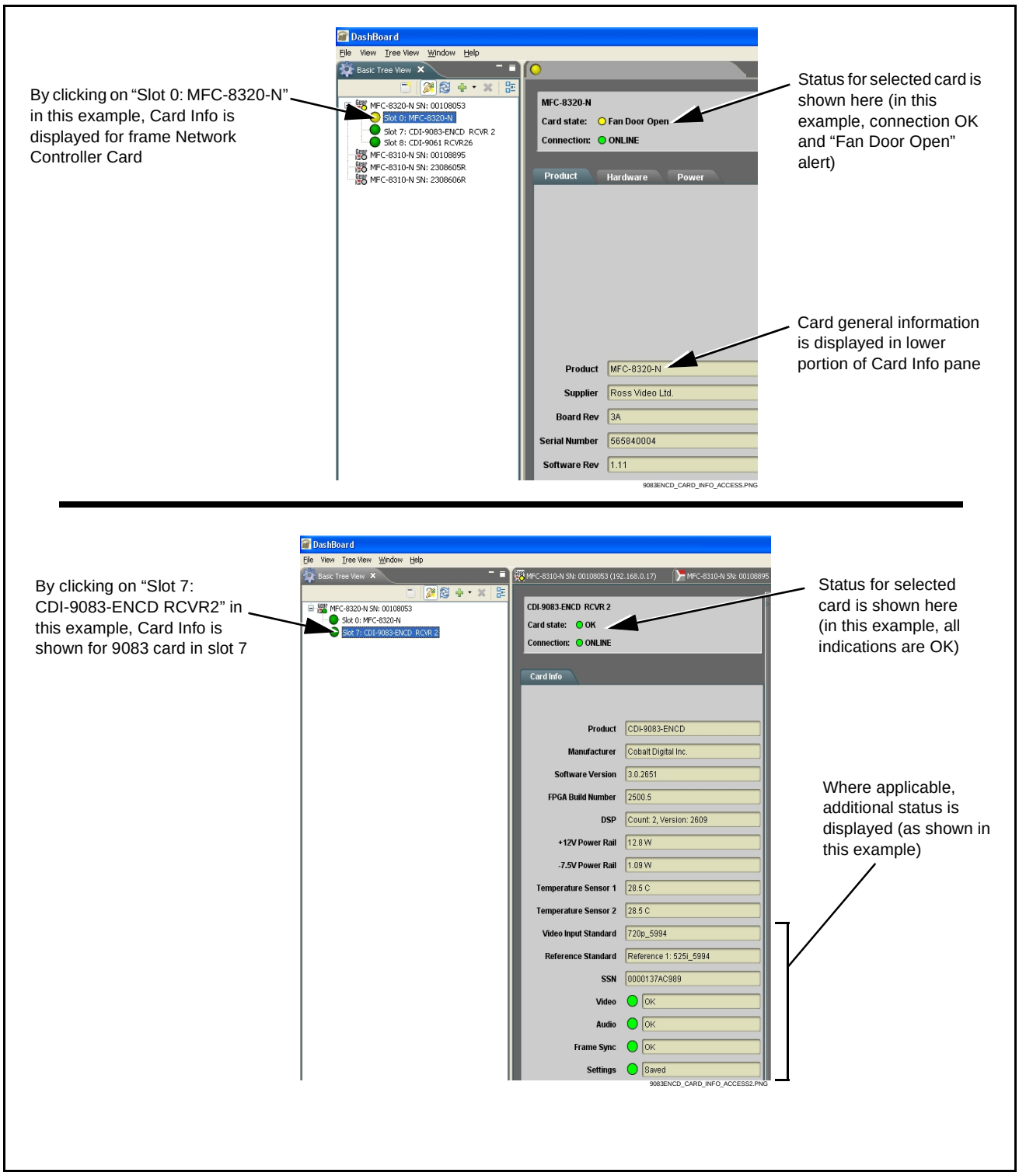


Figure 3-11 Selecting Specific Cards for Card Info Status Display

Basic Troubleshooting Checks

Failures of a general nature (affecting many cards and/or functions simultaneously), or gross inoperability errors are best addressed first by performing basic checks before proceeding further. Table 3-5 provides basic system checks that typically locate the source of most general problems. If required and applicable, perform further troubleshooting in accordance with the other troubleshooting tables in this section.

Table 3-5 Basic Troubleshooting Checks

Item	Checks

Verify power presence and characteristics	• On both the frame Network Controller Card and the 9083, in all cases when power is being properly supplied there is always at least one indicator illuminated. Any card showing no illuminated indicators should be cause for concern.
	• Check the Power Consumed indications for both the +12 V and -7.5 V supply rails for the 9083 card. This can be observed using the DashBoard™ Card Info pane, or using the card edge controls and indicators as shown in Figure 3-4 on page 3-7.
	  • If either of the rail supplies show **no** power being consumed, either the frame power supply, connections, or the 9083 card itself is defective.
	  • If either of the rail supplies show **excessive** power being consumed (see Technical Specifications (p. 1-24) in Chapter 1, “Introduction”), the 9083 card may be defective.

Check Cable connection secureness and connecting points	Make certain all cable connections are fully secure (including coaxial cable attachment to cable ferrules on BNC connectors). Also, make certain all connecting points are as intended. Make certain the selected connecting points correlate to the intended card inputs and/or outputs. Cabling mistakes are especially easy to make when working with large I/O modules.
Card seating within slots	Make certain all cards are properly seated within its frame slot. (It is best to assure proper seating by ejecting the card and reseating it again.)
Check status indicators and displays	On both DashBoard™ and the 9083 card edge indicators, red indications signify an error condition. If a status indicator signifies an error, proceed to the following tables in this section for further action.
Troubleshoot by substitution	All cards within the frame can be hot-swapped, replacing a suspect card or module with a known-good item.

9083 Processing Error Troubleshooting

Table 3-6 provides 9083 processing troubleshooting information. If the 9083 card exhibits any of the symptoms listed in Table 3-6, follow the troubleshooting instructions provided.

In the majority of cases, most errors are caused by simple errors where the 9083 is not appropriately set for the type of signal being received by the card.

Note: The error indications shown below are typical for the corresponding error conditions listed. Other error indications not specified here may also be displayed on DashBoard™ and/or the 9083 card edge status indicators.

Note: Where errors are displayed on both the 9083 card and network remote controls, the respective indicators and displays are individually described in this section.

Table 3-6 Troubleshooting Processing Errors by Symptom

Symptom	Error/Condition	Corrective Action
• **DashBoard™** shows **Video** yellow icon and Input Invalid message in 9083 Card Info pane.  • Card edge **Input Format** LEDs show continuous cycling.	No video input present	Make certain intended video source is connected to appropriate 9083 card video input. Make certain BNC cable connections between frame Rear I/O Module for the card and signal source are OK.
• **DashBoard™** shows **Frame Sync** red icon and Reference Invalid message in 9083 Card Info pane.  • Card edge red **ERR** indicator illuminated.	Frame sync reference not properly selected or not being received	• If external frame sync reference is not intended to be used, make certain the Framesync Enable selection list is set to **Off** or **Input Video** as desired. • If external frame sync reference is intended to be used, make certain selected external frame sync reference is active on frame sync frame bus. (External reference signals Reference 1 and Reference 2 are distributed to the 9083 and other cards via a frame bus.) Refer to **Framesync** function submenu tab on page 3-14 for more information.

Table 3-6 Troubleshooting Processing Errors by Symptom — continued

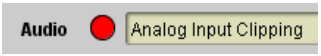
Symptom	Error/Condition	Corrective Action
DashBoard™ shows **Framesync Status** error message in 9083 Framesync function submenu screen. 	Specified Minimum Latency Frames setting exceeds 9083 card buffer space for the selected output video format	Reduce the Minimum Latency Frames setting as specified in the error message to correct the error. **Note:** Due to card memory limits, the maximum available Minimum Latency Frames is related to the output video format selected. For example, with a 1080i 5994 output, the maximum setting is 5. For a 1080i film (2398) output, the maximum setting is 3 (due to the increased buffer space needed for the slower frame rate). Conversely, greater maximum settings are allowed for SD formats such as 525i 5994, where the practical maximum limit is 13.
Video/audio synchronization or delay noted.	Source synchronization condition	Use the **Audio Offset from Video** control to compensate for video/audio delay. Refer to **Framesync** function submenu tab on page 3-14 for more information.
Ancillary data (closed captioning, timecode, Dolby® metadata, AFD) not transferred through 9083.	• Control(s) not enabled	• Make certain respective control is set to **On** or **Enabled** (as appropriate).
	• VANC line number conflict between two or more ancillary data items	• Make certain each ancillary data item to be passed is assigned a unique line number (see Ancillary Data Line Number Locations and Ranges on page 3-8).
• **DashBoard™** shows red **Audio** icon and Analog Input Clipping message in 9083 Card Info pane.  • Card edge display shows code `E101`.	Analog peak audio input on selected input exceeds +24 dBu level	Reduce analog audio level at the source. **Note:** 9083 audio gain controls cannot be used to correct analog input overload condition. The condition must be corrected at the source.

Table 3-6 Troubleshooting Processing Errors by Symptom — continued

Symptom	Error/Condition	Corrective Action
Audio signal(s) do not route as expected. Parameter control not available as expected.	• Embedded or AES audio contains Dolby® E or Dolby Digital encoded signal	• When a valid Dolby® E or Dolby Digital signal (in accordance with SMPTE 337M) is detected on an AES or embedded audio signal, SRC is automatically bypassed (disabled) along with gain and polarity controls being bypassed (even though controls may appear to be functional). Gain and polarity controls are not available for this signal type. Refer to Status displays in **Audio Input Controls** function submenu tab on page 3-10 for more information.
	• **Audio Input Controls** AES Passthrough or Zero Delay Embedding mode may inadvertently be enabled	• When either of these modes is enabled, flexible routing and parametric controls are not available. When either of these modes is not intended for use, make sure they are disabled. Refer to **Audio Input Controls** function submenu tab on page 3-10 for more information. **Note:** Routing and parametric controls may appear functional when either of these mode are enabled, although the controls will not be functional.
Audio not processed or passed through card.	• Input audio of type that cannot be locked by 9083 card	• AES discrete and embedded audio must be nominal 48 kHz input. **Note:** Although the Status Displays in **Audio Input Controls** function submenu tab will show audio formats other than “Present, Professional” as being locked (such as “Present, Consumer”), in any case the audio must be at nominal 48 kHz rate for lock and processing to occur.
	• Enable control not turned on	• **Group Enable** button for **Embedded Audio Group 1/2** or **Embedded Audio Group 3/4** function submenu must be turned on for sources to be embedded into respective embedded channels.

Table 3-6 Troubleshooting Processing Errors by Symptom — continued

Symptom	Error/Condition	Corrective Action
Audio not processed or passed through card (cont.).	• Upmixer inadvertently enabled (Upmixer Licensed Feature only)	• Make certain upmixer is set to **Bypass** if not intended for use. **Note:** When manually enabled or set for automatic enable with appropriate signal levels, upmixer overwrites selected embedded channels with new data; same-channel embedded output will no longer represent same-channel embedded inputs for selected channels.
	• AES pairs 1 thru 4 switch not set for Input (factory default) mode	• If any of **AES IN 1** thru **AES IN 4** are to be used as inputs, the respective DIP switch must be set to the default INPUT mode position. See Setting I/O Switches for AES I/O (1-4) Ports (p. 2-1) in Chapter 2,“Installation and Setup” for more information.
	• Dolby-encoded embedded pair passed through card (not generated by on-card encoder) not recognized by downstream devices/ systems	• If framesync is enabled and using Input Video as source, **Audio SRC** must be set to **Off** to maintain integrity of Dolby pair for downstream devices.
Dolby® encoded audio cannot be decoded on downstream monitor or device.	• Improper metadata source selection.	• If external metadata is to be used, make certain source as input video VBI or source as RS-485 is appropriately set. No failover exists to switch between loss of RS-485 metadata and Input Video SMPTE 2020 VBI metadata. (See Dolby Digital External Metadata (p. 3-46) or Dolby E External Metadata (p. 3-52) for more information.)
	• Failover improperly set.	• The card offers choices to revert to internal or last received metadata as failover choices for loss of external metadata. A choice to stop encoding upon metadata loss is also available. Make certain this choice is selected only if intended. (See Dolby Digital Encoder (p. 3-43) or Dolby E Encoder (p. 3-51) for more information.)

Troubleshooting Network/Remote Control Errors

Refer to Cobalt® reference guide “Remote Control User Guide (PN 9000RCS-RM)” for network/remote control troubleshooting information.

In Case of Problems

Should any problem arise with this product that was not solved by the information in this section, please contact the Cobalt Digital Inc. Technical Support Department.

If required, a Return Material Authorization number (RMA) will be issued to you, as well as specific shipping instructions. If required, a temporary replacement item will be made available at a nominal charge. Any shipping costs incurred are the customer’s responsibility. All products shipped to you from Cobalt Digital Inc. will be shipped collect.

The Cobalt Digital Inc. Technical Support Department will continue to provide advice on any product manufactured by Cobalt Digital Inc., beyond the warranty period without charge, for the life of the product.

See Contact Cobalt Digital Inc. (p. 1-29) in Chapter 1, “Introduction“ for contact information.

Appendix A

Loudness Measurement Guidelines and Techniques

This appendix provides a condensed guide to practical techniques for properly measuring and assessing 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 LKFS Monitor function 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. Basically, before an assessment is performed, two important initial facets must be considered:

- **Target LKFS Value** – This is the desired reading that is to be observed for a given segment or piece of program material. The Audio LKFS Monitor function uses the dialnorm value set in the material’s metadata as the LKFS target value.
- **Measurement Technique** – Consideration should be given in using techniques that result in the most meaningful or representative LKFS measurements. These techniques are described below, along with techniques suggestions suitable for various types of program material.

About 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 or programming announcements), care should be taken that the LKFS level of local content matches that specified by the metadata dialnorm.
- 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 dialnorm-specified network feed.

The Audio LKFS Monitor function provides a means to set a threshold above and below a target LKFS value in which an LKFS error is displayed in the Card Info pane. The function also has a threshold which sets the allowable time a high or low LKFS measurement can persist, after which an error is indicated. These configurable parameters are described in detail in the tab description for “Audio LKFS Monitor” in Chapter 3,“Operating Instructions”.

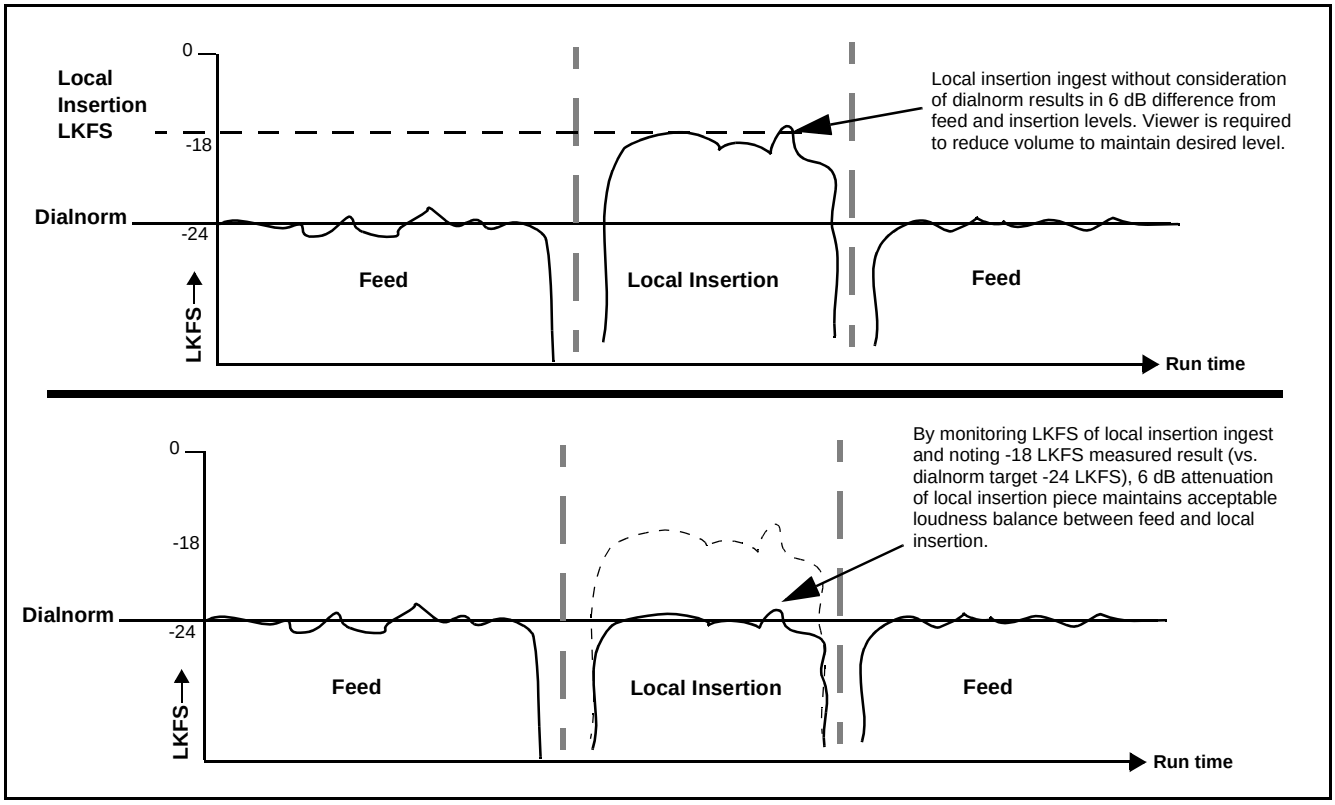


Figure A-1 Balancing LKFS Across Different Material Sources

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 measurements can be obtained. Currently, a fully automated means of accurately assessing 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

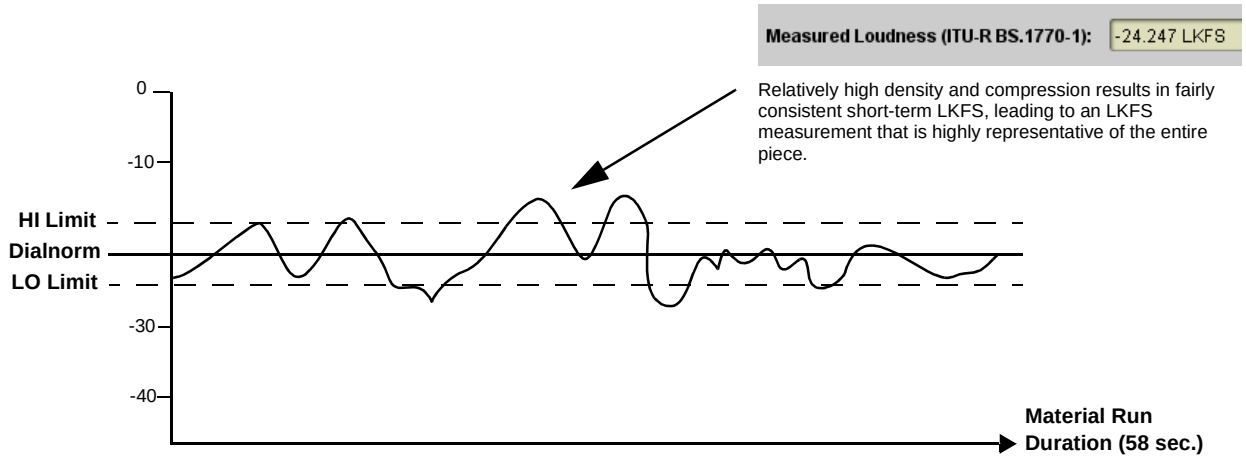
Again depending on the material form, meaningful LKFS measurement and assessment can be very straightforward or, conversely, require some techniques to help ensure a meaningful assessment is obtained. Very straightforward assessments can be obtained when the following are present and/or observed:

- 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, the less representative an assessment is of a given pice of ingest material. Where feasible, an observation 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 LKFS Monitor function can be used with its default settings.

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, a simple observation over the course of the material 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 LKFS observation, 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 ignore the quiet portion.

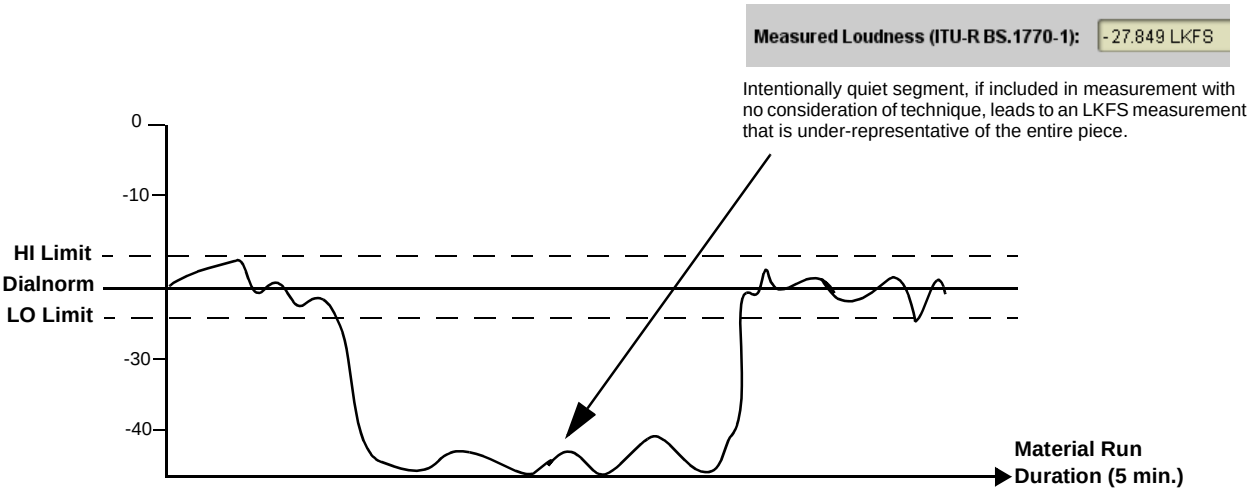


Figure A-2 LKFS Measurement/Assessment for Various Program Material Forms

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 LKFS Monitor function.

Live Production. The Audio LKFS Monitor function can be used in live production to guide the mixing operator to maintain audio level at an LKFS reasonably close to that specified by the dialnorm. Where aural activity is significant (i.e., some sort of anchor element clearly exists), the LKFS measurement provides a good baseline of target loudness compliance. Observing LKFS over a 10-second period (appr.) will typically suffice.

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 “high” 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 LKFS measurement should be observed for representative segments by cueing and rolling tape, thereby circumventing quiet segments from influencing the measurement.

Long-Form Finished Material. LKFS observation should be run for as long a segment as possible, however restricting the observation 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 the unrestricted length of the piece be observed and considered.

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 observation over the course of the material will typically provide a very reliable LKFS measurement.

Modifying LKFS Assessments Using Parametric Settings

Measurement Window Setting. (See Figure A-3.) The **Measurement Window** parameter 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 Measurement Window setting affects averaging that is used in measuring and calculating the LKFS measurement, changes in this setting will affect LKFS measurement.

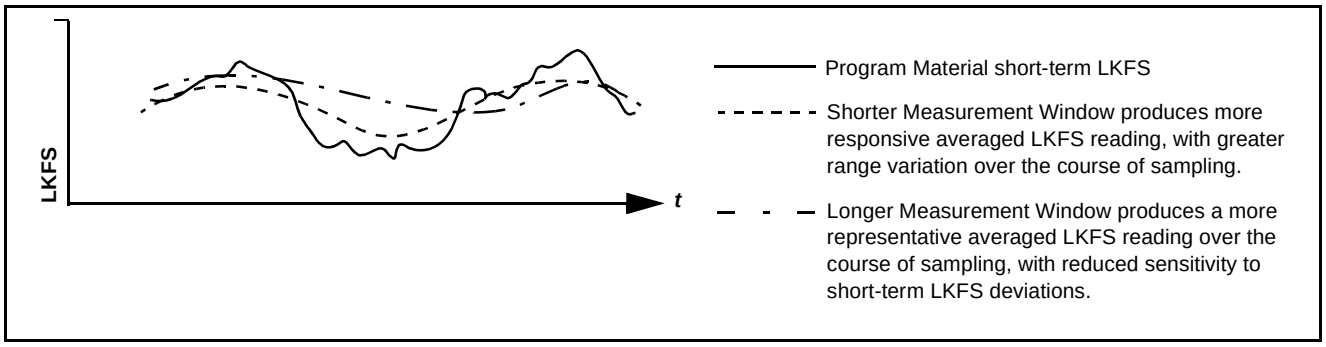


Figure A-3 Modifying the Measurement Window Parameter

Allowed Deviation Threshold. (See Figure A-4.) This parameter sets the LKFS high/low points at which the Audio LKFS Monitor function considers the measured LKFS an error. This threshold setting is wholly independent of the LKFS measurement function. As such, resulting LKFS measured values displayed are not in any way affected by this threshold setting. In most cases, the default settings will provide reasonable, representative indications of material compliance or rejection with the configured target LKFS.

Deviation Alarm Time Threshold. (See Figure A-4.) This parameter sets the amount of time a measured LKFS level exceeding the Allowed Deviation threshold can loiter at before an alarm display occurs.

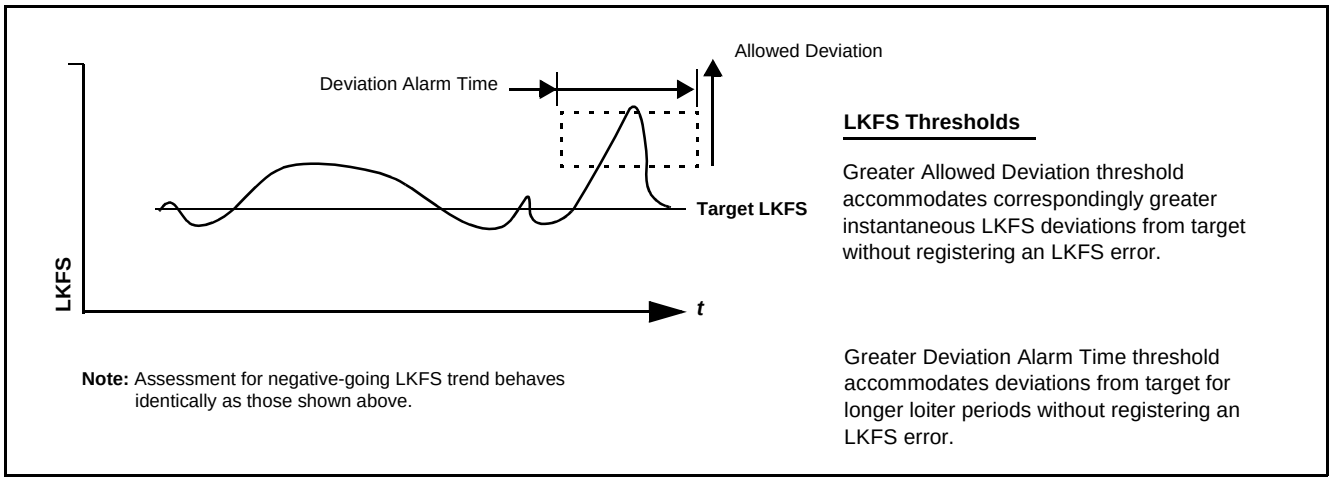


Figure A-4 Modifying LKFS Threshold Error Alert Parameters

Long-Form Simplified Measurement. (See Figure A-5.) Post-production long-form material can in many instances be easily assessed by applying a rather long **Measurement Window** (in this example, 10 seconds). In this manner, the typically brief loudness variations in professionally produced material (or breaks between material) will not result in nuisance errors. However, if the material exhibits a consistent gross deviation from the selected target LKFS or dialnorm (for example, due to level imbalance between a network feed and local insertion), the averaging period is conversely likely to be sufficiently short as to show a level-triggered error somewhere over the course of the offending material.

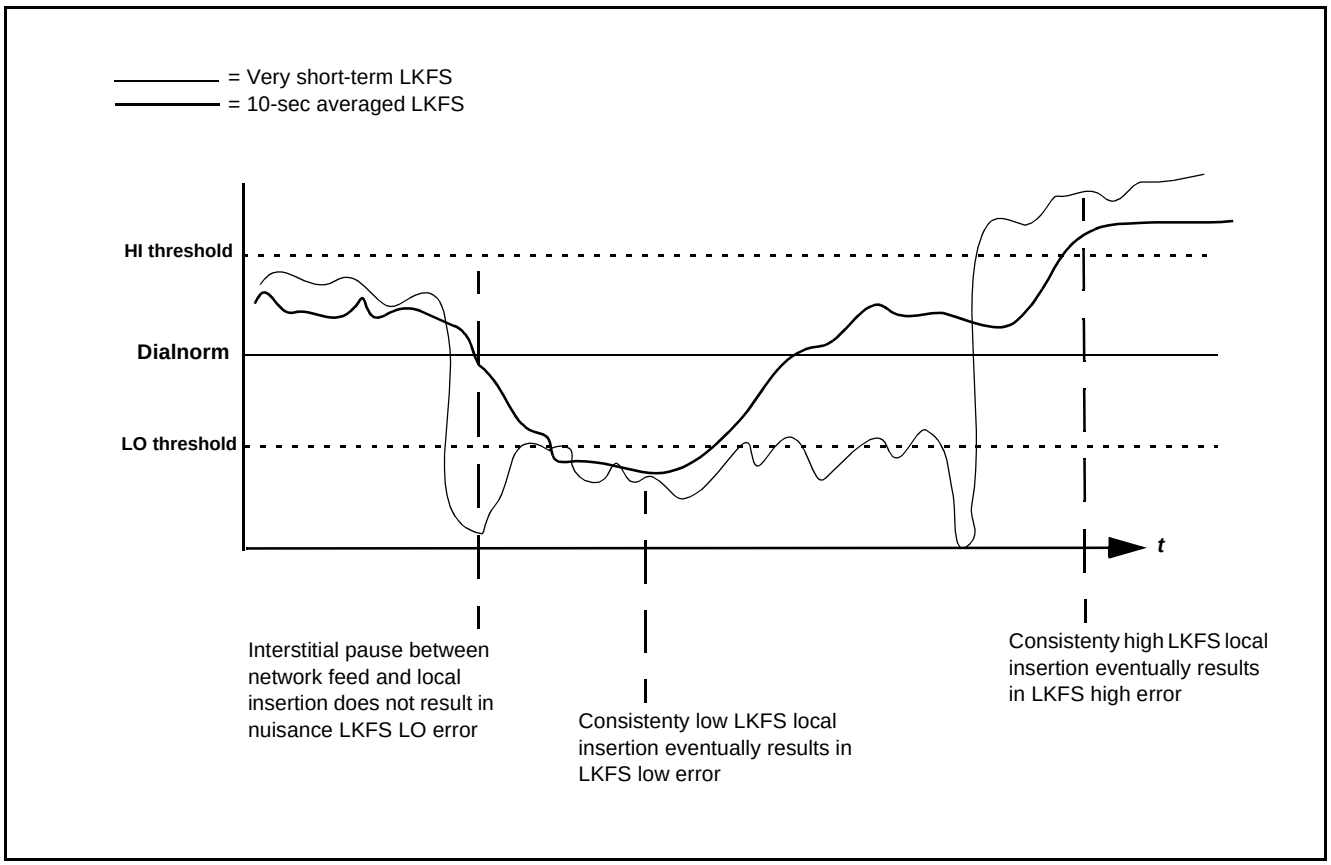


Figure A-5 Long-Form Simplified Measurement

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