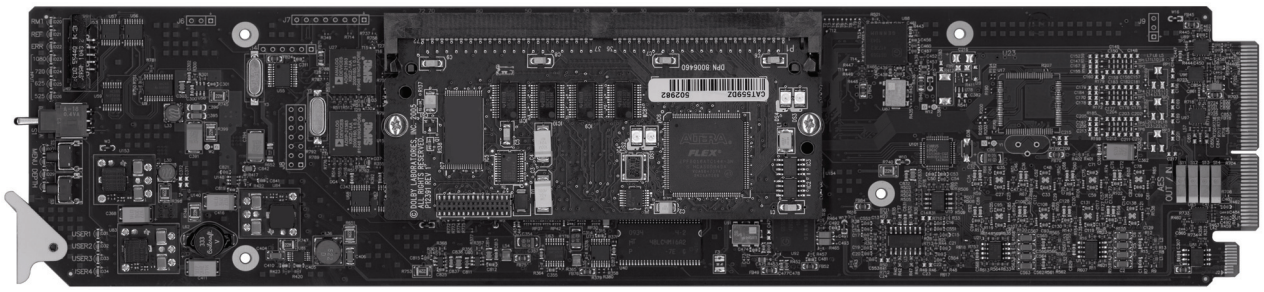
Ross Video Limited

FSE-8241-D, FSE-8241-E
HD/SD-SDI Frame Synchronizer with Dolby® Encoding
User Manual



ROSS
Live Production Technology

openGear

HD/SD-SDI Frame Synchronizer with Dolby® Encoding User Manual

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Routine maintenance to this openGear product is not required. This product contains no user serviceable parts. If the module does not appear to be working properly, please contact Technical Support using the numbers listed under the "Contact Us" section on the last page of this manual. All openGear products are covered by a generous 5-year warranty and will be repaired without charge for materials or labor within this period. See the "Warranty and Repair Policy" section in this manual for details.

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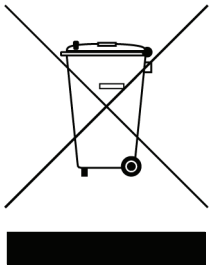
- Collect this product separately.
- Use collection and return systems available to you.

The crossed-out wheeled bin symbol invites you to use these systems.



If you need more information on the collection, reuse, and recycling systems, please contact your local or regional waste administration. You can also contact Ross Video for more information on the environmental performances of our products.

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Introduction

In This Chapter

This chapter contains the following sections:

- Overview
- Functional Block Diagram
- Functional Summary
- FSE-8241-D Overview
- FSE-8241-E Overview
- User Control Overview
- Manual Overview
- Documentation Terms and Conventions

A Word of Thanks

Congratulations on choosing an openGear FSE-8241 series HD/SD-SDI Frame Synchronizer with Dolby® Encoding. Your FSE-8241 series is part of a full line of Digital Products within the openGear Terminal Equipment family of products, backed by Ross Video's experience in engineering and design expertise since 1974.

You will be pleased at how easily your new FSE-8241 series fits into your overall working environment. Equally pleasing is the product quality, reliability and functionality. Thank you for joining the group of worldwide satisfied Ross Video customers!

Should you have a question pertaining to the installation or operation of your FSE-8241 series, please contact us at the numbers listed on the back cover of this manual. Our technical support staff is always available for consultation, training, or service.

Overview

This section provides a general overview of the FSE-8241-D and FSE-8241-E.

FSE-8241-D

The FSE-8241-D is an HD/SD-SDI frame sync and Dolby® Digital Encoder with 16 channels of audio embedding or de-embedding. The Dolby® Digital (AC-3) encoder receives up to six different audio sources, from either embedded or discrete inputs 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.

The FSE-8241-D offers glitch-free handling of embedded audio during frame synchronization, and a user-adjustable offset to the frame sync to align the Dolby® delay. Video and audio processing controls as well as flexible timecode processing, closed captioning support and AFD code insertion, provide complete signal management for all incoming signals.

Features

The FSE-8241-D includes the following features:

- Handles all popular formats of SD (270Mbps) and HD (1.485Gbps) signals
- Glitch-free handling of embedded audio when a frame is dropped or duplicated
- Dolby® Digital encoding with optional metadata output
- 16 channels of discrete audio embedding or de-embedding
- User offset to frame sync to align Dolby® delay
- AFD code insertion
- HD/SD closed captioning and flexible timecode support
- Frame Sync with up to 13 frames of user-adjustable delay
- 4 internal tone generators
- Reports status and configuration remotely via the DashBoard Control System™
- 5-year transferable warranty

FSE-8241-E

The FSE-8241-E is an HD/SD-SDI frame sync and Dolby® E Encoder with 16 channels of audio embedding or de-embedding. The Dolby® E Encoder receives up to different audio sources, from either embedded or discrete inputs 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.

The FSE-8241-E offers glitch-free handling of embedded audio during frame synchronization, and a user-adjustable offset to the frame sync to align the Dolby® delay. Video and audio processing controls as well as flexible timecode processing, closed captioning support and AFD code insertion, provide complete signal management for all incoming signals.

Features

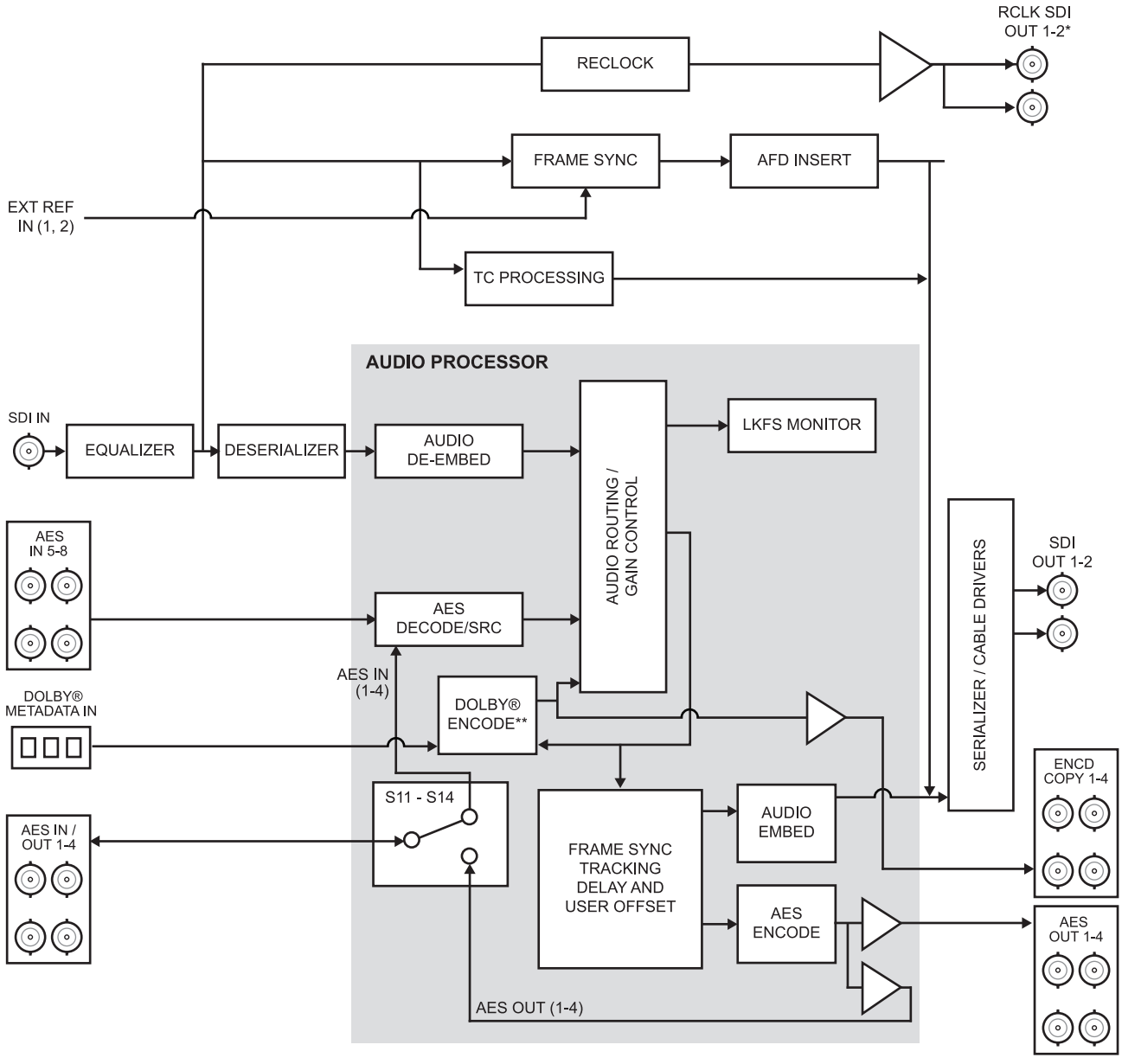
The FSE-8241-E includes the following features:

- Handles all popular formats of SD (270Mbps) and HD (1.485Gbps) signals

- Glitch-free handling of embedded audio when a frame is dropped or duplicated
- Dolby® E encoding with optional metadata output
- 16 channels of discrete audio embedding or de-embedding
- User offset to frame sync to align Dolby® delay • AFD code insertion
- HD/SD closed captioning and flexible timecode support
- Frame Sync with up to 13 frames of user-adjustable delay
- 4 internal tone generators
- Reports status and configuration remotely via the DashBoard Control System™
- 5-year transferable warranty

Functional Block Diagram

This section provides a functional block diagram that outlines the workflow of the FSE-8241 series. Note that signal connections shown depicts full input/output capability. Practical input/output signal availability is determined by the rear module used.



*Available on the R2-8241 rear modules only

**Refer to the sections “FSE-8241-D Overview” and “FSE-8241-E Overview” for details.

Figure 1.1 *Simplified Block Diagram*

Functional Summary

Figure 1.1 shows a functional block diagram of the FSE-8241 series. The card frame synchronizer also includes a full 16-channel audio embedder/de-embedder, and an 8-channel. The cards also handles AFD code detection/insertion. Additionally, the FSE-8241-D provides Dolby® Digital™ (AC-3) encoding using any of the audio sources supported by the card, and using either external or internally generated metadata. Similarly, the FSE-8241-E provides Dolby® E encoding using any of the audio sources supported by the card, and using either external or internally generated metadata.

Note — *Some of the functions described below are available only when using DashBoard. Refer to the section "**User Control Overview**" on page 1-16 for user interface descriptions.*

Input and Output Formats

The FSE-8241 series provides the following 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
- **DOLBY META IN** — RS-485 external Dolby® metadata input

The FSE-8241 series provides the following 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)

The input/output complement listed above represents the maximum capability of the FSE-8241 series. The practical input/output complement is determined by the particular Rear Module used with the card.

For More Information...

- on the user interfaces, refer to the section "**User Control Overview**" on page 1-16.
- on the required rear modules, refer to the section "**Rear Modules Overview**" on page 1-10.

Video Functions Description

This section provides an overview of the frame synchronizer, AFD inserter, and timecode processor functions of the FSE-8241 series.

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 FSE-8241 series 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

This function provides for extraction of timecode data from the input video, and in turn re-insertion of timecode data into the output SDI. (**Figure 1.2**) 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.

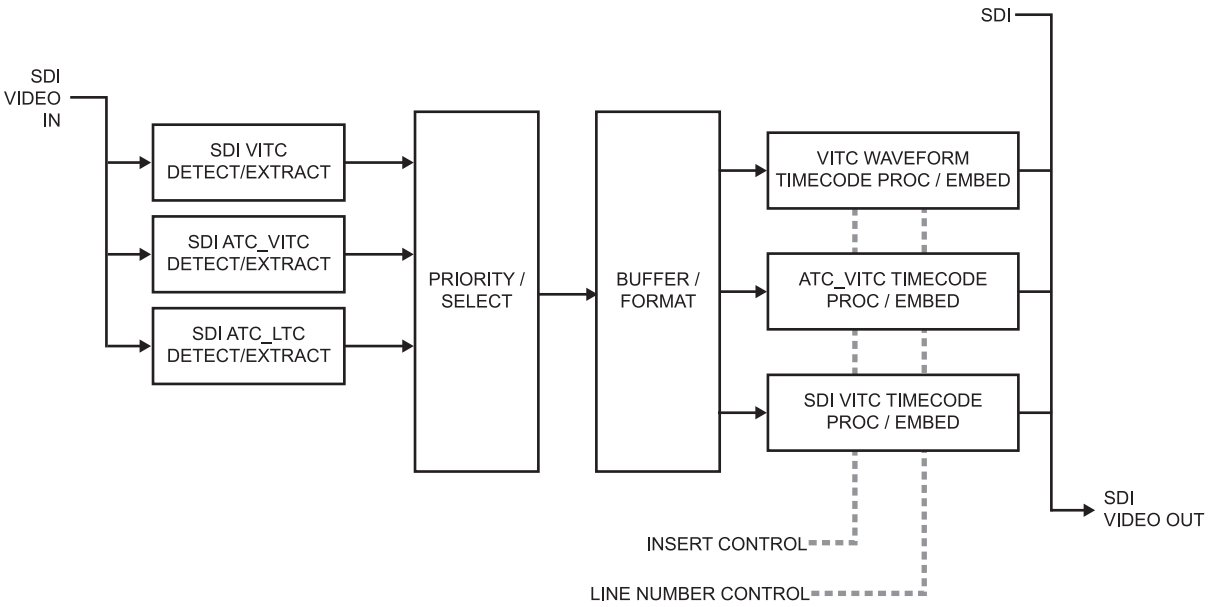


***Figure 1.2** Timecode Processor*

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
- Four independent internal tone generators (described below)
- Digital silence (mute) setting
- Internal Down Mix and Mono Mixer outputs (described below)
- Dolby® Digital (AC-3) encoded pair (*FSE-8241-D only*)
- Dolby® E encoded pair (*FSE-8241-E only*)

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) 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 FSE-8241 series card.) The sample rate converters are disabled by default. Output AES is always precisely synchronized with the output video.

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.

As shown in **Figure 1.1**, the FSE-8241 series card provides eight discrete AES input pair ports and four discrete AES output pair ports. On Rear 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. Note that the FSE-8241 series receives up to 16 channels of discrete AES audio, but are not equipped with AES output pairs 5 thru 8. These outputs instead provide copies of the Dolby® encoded output pair.

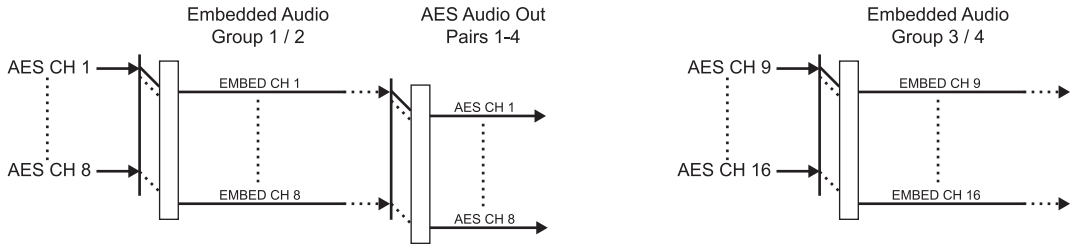


Figure 1.3 *Default Embed/De-Embed Audio Routing*

Audio Down Mixer and Mono Mixer Function

The audio down mixer function provides for the selection of any five embedded, or AES discrete 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**)

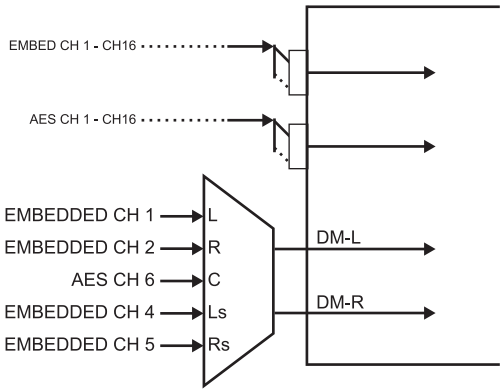


Figure 1.4 *Audio Down Mix Functional Block Diagram with Example Sources*

The mono mixer function generates an additional mono-mixed channel from two selected embedded, or AES discrete input channels serving as left and right inputs.(**Figure 1.5**) The resulting mono mix channel **MONO** can in turn be routed and processed just like any of the other audio sources described earlier.

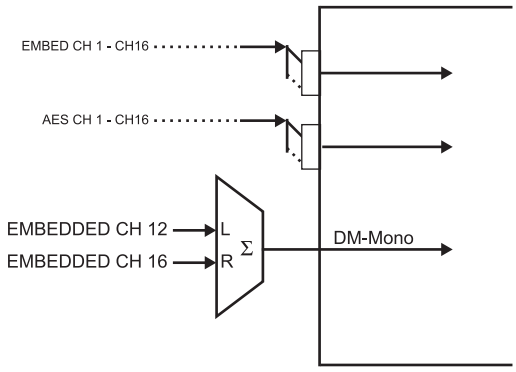


Figure 1.5 *Audio Mono Mix Functional Block Diagram with Example Sources*

Tone Generator Function

The FSE-8241 series 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 FSE-8241 series 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

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, or AES 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.

For More Information...

- about LKFS parameters and this function, as well as practical measurement techniques, refer to the section "**About Target LKFS Value**" on page 4-3.

Rear Modules Overview

The FSE-8241 series interfaces to system video and audio connections using a Rear Module.

All inputs and outputs shown in the **Figure 1.1** enter and exit the card via the card edge backplane connector. The Rear Module breaks out the FSE-8241 series 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 Module that suits the requirements. The required input and outputs are broken out to the industry standard connectors on the Rear Module; the unused inputs and outputs remain unterminated and not available for use.

The full assortment of Rear Modules is shown and described in the section "**Cabling for the FSE-8241 Series**" on page 2-6.

Supported Audio and Video Formats

The FSE-8241 series 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 FSE-8241 series.

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 FSE-8241 series supports all four groups (16 channels) of embedded audio at full 24-bit resolution in both SD (with extended data packets) and HD.	
Discrete AES Audio Input	The FSE-8241 series 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 FSE-8241 series card does not support AES input at 32 kHz, 44.1 kHz, 96 kHz or 192 kHz rates.	
Discrete AES Audio Output	The FSE-8241 series 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.		

FSE-8241-D Overview

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. (**Figure 1.6**) 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 Module accommodating AES OUT pairs 5-8, the encoded pair is available as copies on AES channels 9 thru 16.*

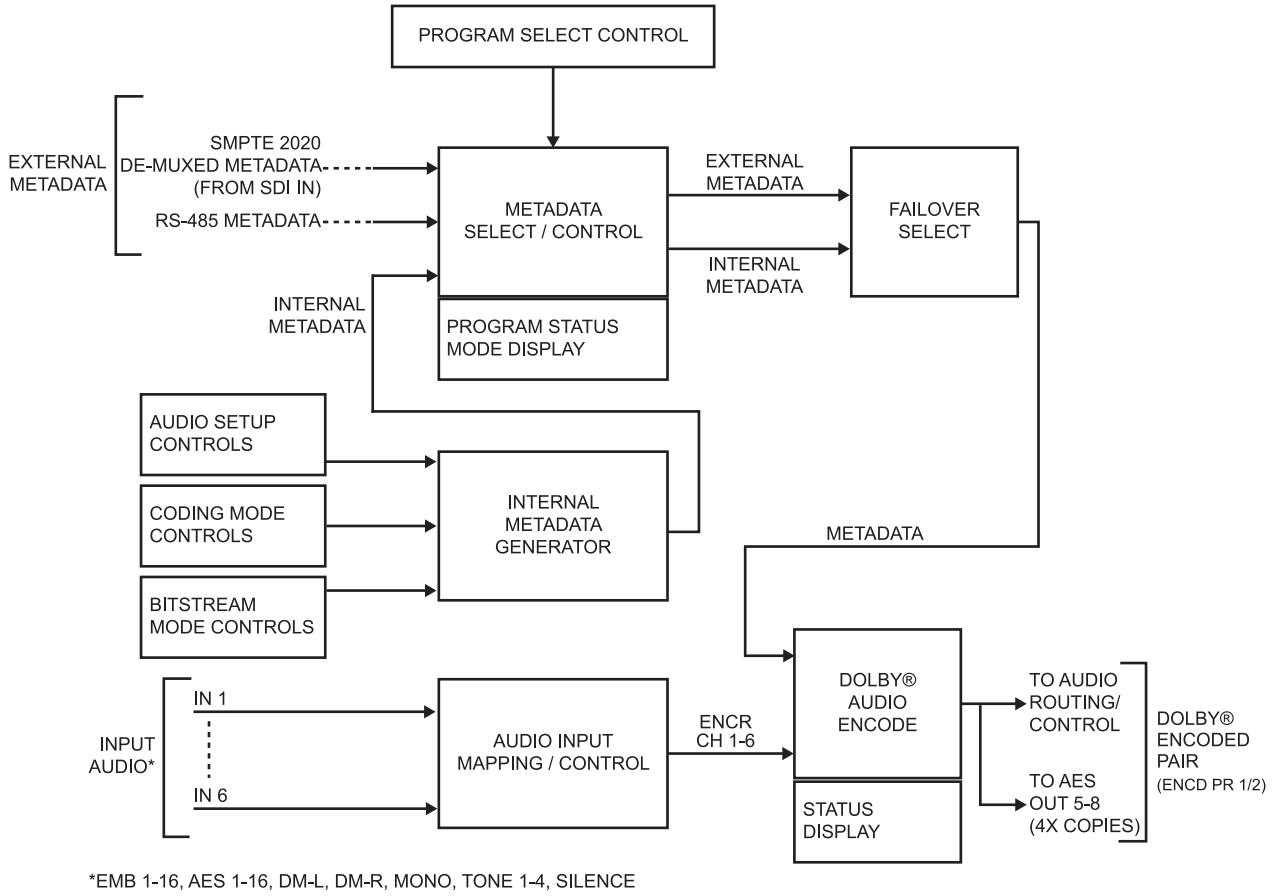


Figure 1.6 *Functional Block Diagram — FSE-8241-D*

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).

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 FSE-8241-D, 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.

FSE-8241-E Overview

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. (**Figure 1.7**) 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 Module accommodating AES OUT pairs 5-8, the encoded pair is available as copies on AES channels 9 thru 16.*

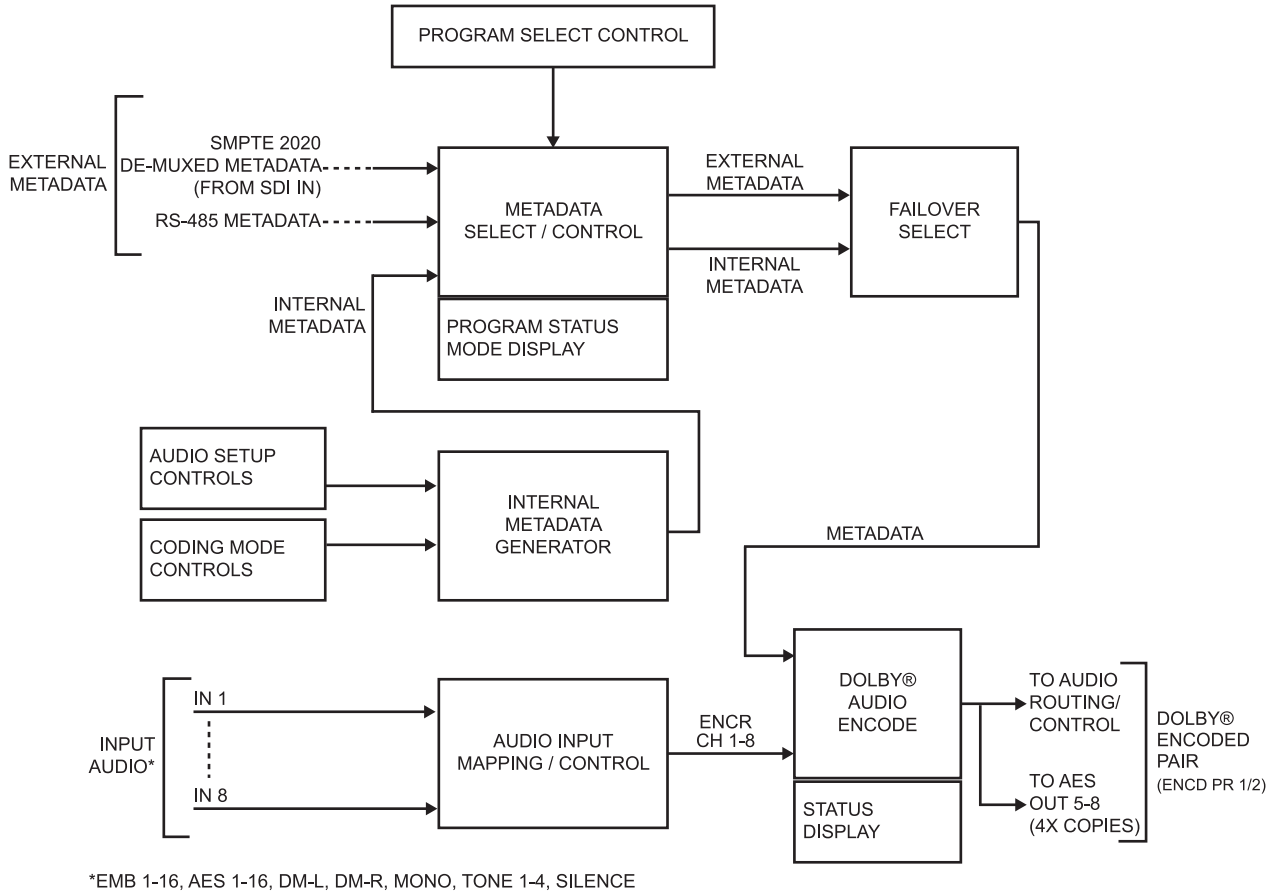


Figure 1.7 *Functional Block Diagram — FSE-8241-E*

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 FSE-8241-E, 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 Overview

Figure 1.8 shows the user control interface options for the FSE-8241 series. These options are individually described below. 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.

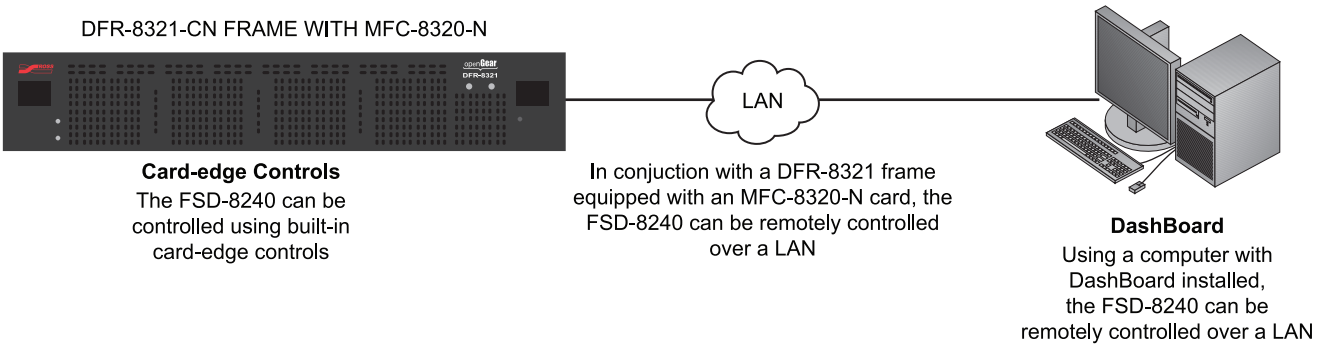


***Figure 1.8** User Control Interface*

Card-edge User Interface

Using the built-in card edge controls and display, card control settings can be set using a front panel menu which is described in the section "**Card-edge Controls, Indicators, and Display**" on page 3-3.

Note — *Some of the FSE-8241 series functions described in this manual are available only when using DashBoard.*

DashBoard User Interface

Using DashBoard, the FSE-8241 series card and other cards installed in a DFR-8321 series 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 the Ross Video website. The DashBoard user interface is described in the section "**DashBoard User Interface**" on page 3-9.

If network remote control is to be used for the frame and the frame has not yet been set up for remote control, the ***MFC-8300 Series User Manual*** provides thorough information and step-by-step instructions for setting up network remote control of openGear cards using DashBoard.

Manual Overview

This manual covers the FSE-8241 series cards equipped with a Dolby® Digital™ encoder (FSE-8241-D), and the FSE-8241 series card equipped with an optional Dolby® E encoder (FSE-8241-E). Where applicable, descriptions related exclusively to either cards are respectively denoted by (FSE-8241-D only) or (FSE-8241-E only). In all other aspects, both cards function identically as described in this manual.

This manual consists of the following chapters:

- **Introduction** — Provides information about this manual and what is covered. Also provides general information regarding the FSE-8241 series.
- **Installation** — Provides instructions for installing the FSE-8241 series in a DFR-8321 series frame, and optionally installing the rear modules.
- **Operating Instructions** — Provides overviews of operating controls and instructions for using the FSE-8241 series.
- **Loudness Measurement Guidelines and Techniques** — Provides a condensed guide to practical techniques for properly measuring and assessing loudness in various types of program material.
- **Specifications** — Provides the technical specifications for the FSE-8241 series.
- **Service Information** — Provides troubleshooting solutions and warranty information.

Card Software Versions and this Manual

When applicable, Ross Video provides for continual openGear product enhancements through software updates. As such, functions described in this manual may pertain specifically to cards loaded with a particular software build. If you received your FSE-8241 series card and this manual at the same time, this manual reflects all facets of your card.

The software version of your card can be checked by viewing the **Info** submenu on the card-edge display, or by checking the **Card Info** menu in DashBoard. Refer to the section "**Checking Card Information**" on page 3-13 for more information. This section provides guidance when your card software does not match this manual.

Card software is an earlier 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 by:

1. Contacting Ross Technical Support.
2. Downloading the latest firmware and/or software for your card onto your computer.
3. Uploading the new firmware and/or software to your card through DashBoard.

Card software is a newer version

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 our website.

Documentation Terms and Conventions

In this manual, display messages and connectors are shown using the exact name shown on the FSE-8241 series 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:

- All references to the **DFR-8321 series frame** also includes all versions of the 20-slot frames and any available options unless otherwise noted.
- "**FSE-8241 series**" refers to both the FSE-8241-D and FSE-8241-E unless otherwise noted.
- "**FSE-8241-D"** refers to the HD/SD Frame Sync with Audio Embedding/De-Embedding and Dolby® Digital™ (AC-3) Encoder card.
- "**FSE-8241-E"** refers to the HD/SD Frame Sync with Audio Embedding/De-Embedding and Dolby® E Encoder card.
- "**Board**" and "**Card**" refer to openGear terminal devices within openGear frames, including all components and switches.
- "**System**" and "**Video System**" refers to the mix of interconnected production and terminal equipment in your environment.
- "**Operating Tip**" and "**Note**" boxes are used throughout this manual to provide additional user information.

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.

Installation

In This Chapter

This chapter provides instructions for installing the FSE-8241 series, installing the card into the frame, and cabling details.

This chapter contains the following information:

- Before You Begin
- Setting I/O Switches for AES I/O (1-4) Ports
- Installing a Rear Module
- Installing a Card
- Cabling for the FSE-8241 Series
- Setting up Network Remote Control

Before You Begin

Before proceeding with the instructions in this chapter, ensure that your DFR-8321 series frame is properly installed according to the instructions in the ***DFR-8300 Series User Manual***.

Static Discharge

Throughout this chapter, please heed the following cautionary note:

ESD Susceptibility — *Static discharge can cause serious damage to sensitive semiconductor devices. Avoid handling circuit boards in high static environments such as carpeted areas and when synthetic fiber clothing is worn. Always exercise proper grounding precautions when working on circuit boards and related equipment.*

This card 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.

Unpacking

Unpack each card you received from the shipping container and ensure that all items are included. If any items are missing or damaged, contact your sales representative or Ross Video directly.

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

This procedure is applicable only if any of the four **AES I/O (1-4)** ports on the FSE-8241 series are to be used as outputs (the switches are set to input mode by factory default). The FSE-8241 series 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.

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**.

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 Module having dedicated **AES OUT** BNC connectors.

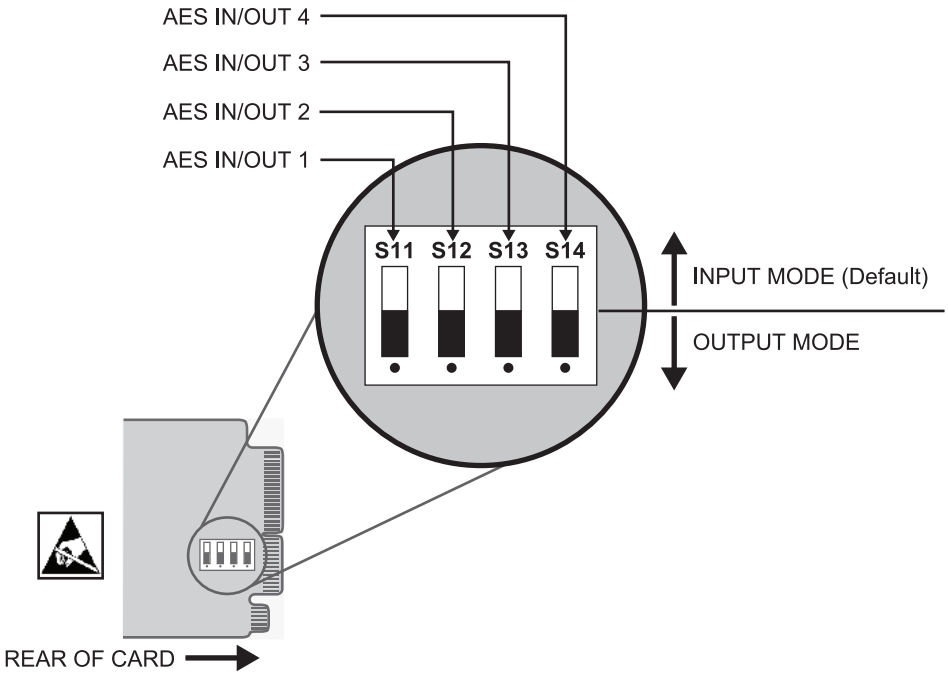


Figure 2.1 *AES I/O (1-4) Mode Switches*

Installing a Rear Module

This procedure is applicable only if a rear module is not currently installed in the slot where the FSE-8241 series is to be installed. The full assortment of FSE-8241 series rear modules is shown and described in the section "**Cabling for the FSE-8241 Series**" on page 2-6.

Installing a Rear Module

Use the following procedure to install a rear module in a DFR-8321 series frame:

1. Locate the card frame slots on the rear of the DFR-8321 series frame.
2. Remove the Blank Plate from the slot you have chosen for the FSE-8241 series installation. If there is no Blank Plate installed, proceed to the next step.
3. Install the bottom of the rear module in the **Module Seating Slot** at the base of the frame's back plane. (**Figure 2.2**)

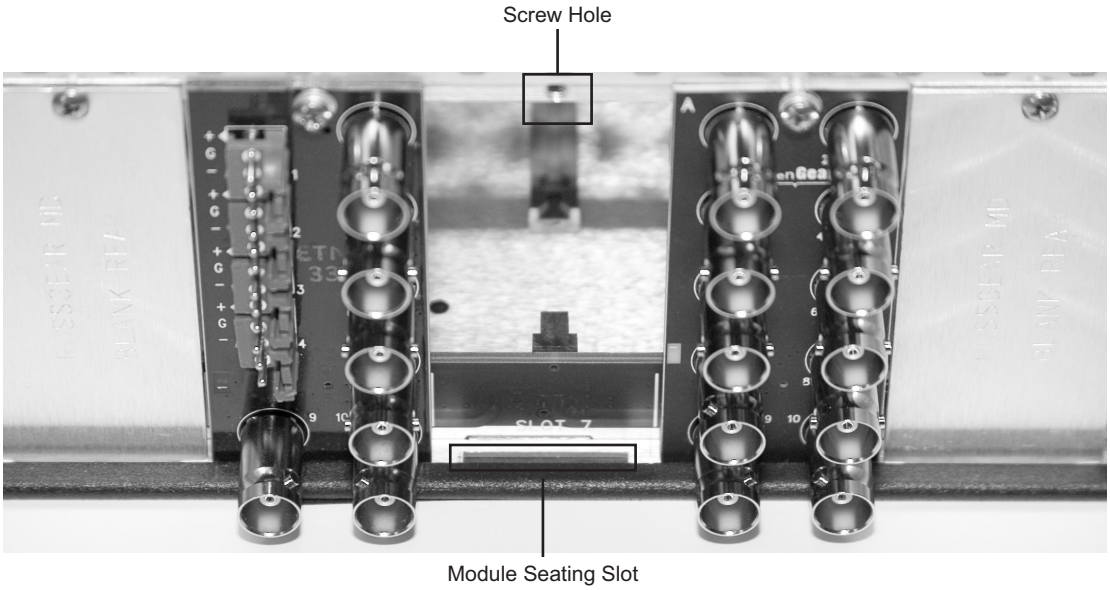


Figure 2.2 *Rear Module Installation (FSE-8241 series not shown)*

4. Align the top hole of the rear module with the screw on the top-edge of the frame back plane.
5. Using a Phillips screwdriver and the supplied screw, fasten the rear module to the back plane of the frame. Do not over tighten.
6. Ensure proper frame cooling and ventilation by having all rear frame slots covered with rear modules or Blank Plates.

This completes the procedure for installing a rear module in a DFR-8321 series frame.

Installing a Card

This section outlines how to install a FSE-8241 series card when the Rear Module is already installed in a DFR-8321 series frame. If you are installing the FSE-8241 series card in a slot with no rear module, a rear module is required before cabling can be connected. Refer to the section "**Installing a Rear Module**" on page 2-4 for rear module installation procedure.

Caution — *If required, make certain the rear module(s) is installed before installing the FSE-8241 series card into the frame slot. Damage to card and/or rear module can occur if module installation is attempted with card already installed in the slot.*

Installing the FSE-8241 series

Use the following procedure to install the FSE-8241 series card into a frame slot:

1. Check the packaging in which the card was shipped for any extra items such as a rear module 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.
2. Determine the slot in which the card is to be installed.

Notice — *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.*

3. Open the frame front access panel.
4. While holding the card by the card-edges, align the card such that the plastic ejector tab is on the bottom.
5. Align the card with the top and bottom guides of the slot in which the card is being installed.
6. 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 module mating connector.

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

7. Verify that the card is fully engaged in rear module mating connector.
8. Close the frame front access panel.
9. Connect the input and output cables as outlined in the section "**Cabling for the FSE-8241 Series**" on page 2-6.
10. Repeat steps 1 through 9 for other cards.

Operating Tip — *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.*

This completes the procedure for installing a card in a DFR-8321 series frame.

Cabling for the FSE-8241 Series

This section provides information for connecting cables to the installed rear modules in the DFR-8321 series frame. Note that the FSE-8241 series card BNC inputs are internally 75-ohm terminated. It is not necessary to terminate unused BNC inputs or outputs.

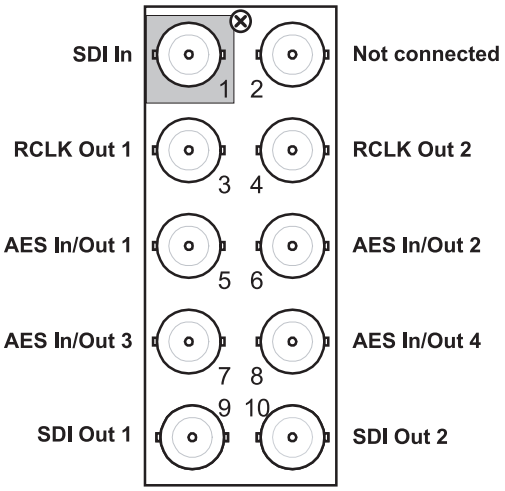


Figure 2.3 *Cable Connections for the R2-8241 Rear Module*

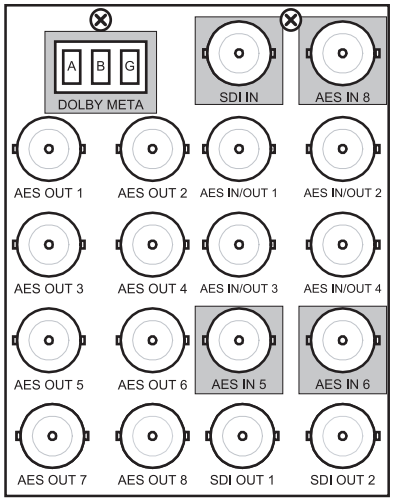


Figure 2.4 *Cable Connections for the R2M-8241 Rear Module*

R2-8241 Full Rear Module

Each card occupies two slots and provides the following connections:

- One 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**)

R2M-8241 Full Rear Module

Each card occupies four slots and provides the following connections:

- One 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**)
- Four dedicated AES coaxial audio outputs (**AES OUT 1** thru **AES OUT 4**). Note: **AES OUT 1** thru **AES OUT 4** always function as outputs regardless of whether **AES I/O 1** thru **AES I/O 4** are used as inputs or outputs. **AES OUT 5** thru **AES OUT 8** always function as Dolby® encoded pair copies.
- One Dolby® RS-485 metadata input (**DOLBY META**)
- Two buffered SDI coaxial outputs (**SDI OUT 1** and **SDI OUT 2**)

Setting up Network Remote Control

If network remote control is to be used for the frame and the frame has not yet been set up for remote control, refer to the ***MFC-8300 Series User Manual*** for information.

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.

Operating Instructions

In This Chapter

This section describes the user interface controls, indicators, and displays (both on-card and remote controls) for using the FSE-8241 series cards. The functions can be accessed and controlled using any of the user interfaces described in this chapter.

The following topics are discussed:

- Control and Display Descriptions
- Accessing the Card via DashBoard
- Checking Card Information
- Ancillary Data Line Number Locations and Ranges
- Function Submenu List and Descriptions
- Troubleshooting

Control and Display Descriptions

The format in which the FSE-8241 series card 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 card functions (and the controls, indicators, and displays related to a particular function) follows a general arrangement of Function Submenus under which related parameters can be accessed (as described in Function Submenu/Parameter Submenu Overview below).

After familiarizing yourself with the arrangement described in Function Submenu/Parameter Submenu Overview, proceed to the subsection for the particular user interface being used. Descriptions and general instructions for using each of the three user interfaces are individually described in the following subsections:

- "**Card-edge Controls, Indicators, and Display**" on page 3-3
- "**DashBoard User Interface**" on page 3-9

Instructions provided here are applicable for all available user control methods. However, DashBoard provides greatly simplified user interfaces as compared to using the card-edge controls. For this reason, **it is strongly recommended** that DashBoard be used for all card applications other than the most basic cases.

Not all functions available using DashBoard are available using the card edge controls.

When a setting is changed, settings displayed on DashBoard are the settings as effected by the 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 card are organized into function **submenus**, which consist of parameter groups as shown below.

Figure 3.1 shows how the card and its submenus are organized, and also provides an overview of how navigation is performed between cards, function submenus, and parameters.

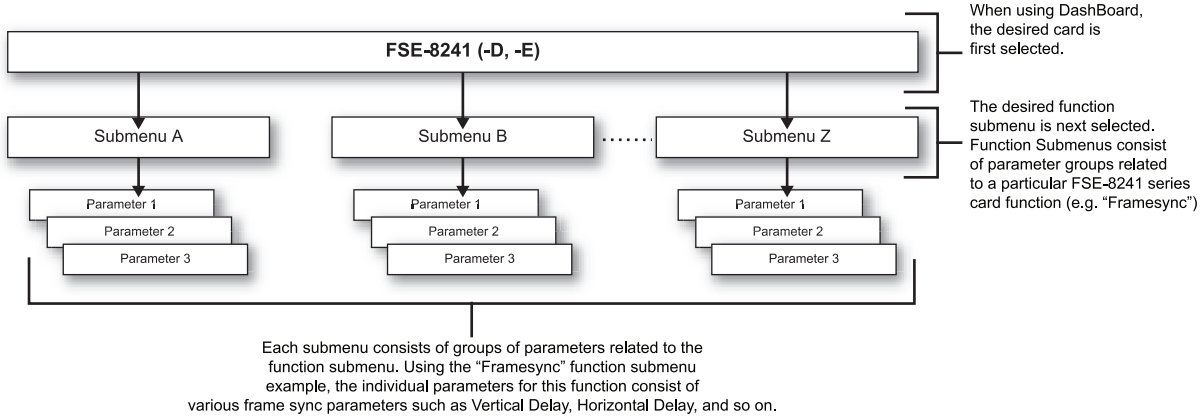


***Figure 3.1** Function Submenu/Parameter Submenu Overview*

Card-edge Controls, Indicators, and Display

Figure 3.2 shows and describes the FSE-8241 series card-edge controls, indicators, and display.

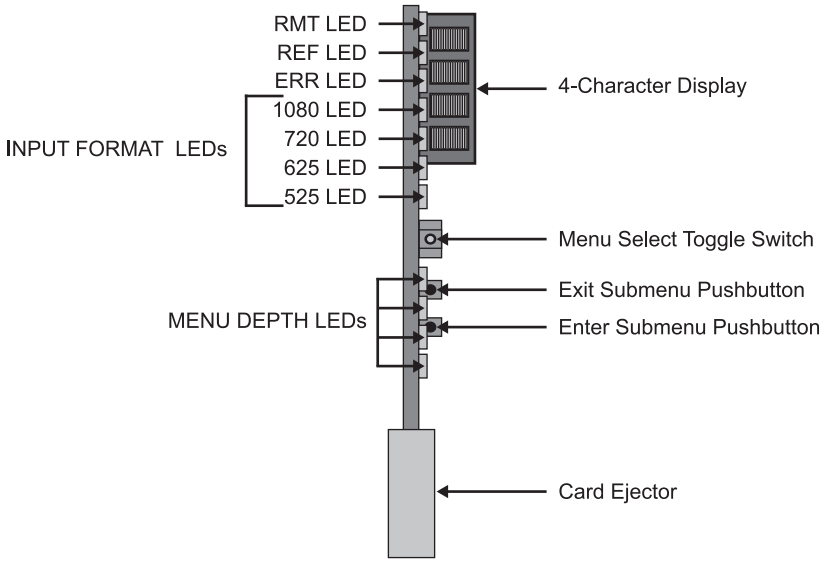


***Figure 3.2** Controls, Indicators, and Display*

Card-edge Controls

This section provides a general overview of the components used for navigating the menu system on the card-edge.

4-Character Display

Displays 4-digit abbreviated code showing menu and submenu selections. When in a menu displaying a parameter setting, the display shows parametric scalar value (and +/- sign where applicable).

Menu Selection Toggle Switch

When in a menu or submenu selection mode, moving the switch up or down toggles up and down through the menu or submenu item choices.

When in a mode where a parameter setting is displayed, moving the switch up or down increase or decreases the parametric value.

Enter Menu Pushbutton

When pressed, selects and opens the current mode shown on the display. At this point, submenu choices within the selected menu are now displayed. Pressing the pushbutton again goes deeper into the submenu, now opening items subordinate to the selected submenu. In this manner, pressing the **Enter Menu** pushbutton navigates into a menu and its submenus.

Exit Menu Pushbutton

When pressed, moves in the opposite direction of the **Enter Menu** pushbutton. It closes the currently selected submenu and moves to the next higher menu, eventually moving completely out of the item's submenus. In this manner, pressing the **Exit Menu** pushbutton navigates out of a menu and its submenus.

Status and Selection LEDs on the Card-edge

The front-edge of the FSE-8241 series has LED indicators for communication activity. Basic LED displays and descriptions are provided in **Table 3.1**.

Table 3.1 LEDs on the FSE-8241 series

LED	Color	Display and Description
RMT	Blue	When flashing, this LED indicates when the card is receiving control messages from DashBoard.
REF	Blue	When lit, this LED indicates when the card is receiving valid frame sync enable when set up for reference frame sync.
ERR	Red	When lit, this LED indicates when the card is unable to lock to frame sync, or unable to lock to the input standard.
INPUT FORMAT	Blue	Four blue LEDs indicate the input signal raster format being received and locked onto by the card (1080, 720, 625, 525). Continuous cycling of the LEDs indicates the card has not locked onto a particular format (as in the case of no signal input)
MENU DEPTH	Green	Four green LEDs show the currently selected menu/submenu depth navigation. • No LEDs indicate top-level menu items are now ready for selection. • One LED indicates first submenu items (items subordinate to currently selected menu item) are now ready for selection. • Two LEDs indicates second submenu items (items subordinate to currently selected submenu item) are now ready for selection. • Three LEDs indicates third submenu items (items subordinate to currently selected submenu item) are now ready for selection. Typically, this is the level where values can now be adjusted for a specific parameter. • Four LEDs indicate fourth submenu items are now ready for selection. (This depth is not applicable to most items.)

Card-edge Control Menu/Submenu Structure

Using the menu system of group menus and submenus described earlier, the FSE-8241 series parameters/controls are organized into menus and submenus. (**Table 3.2**) As appropriate, a submenu similarly may have its own further additional subordinate submenus.

Table 3.2 Card-edge Control Menu Structure

	Menu Depth	Menu Depth as indicated by LEDs
Menu Group Item		none
Submenu 1 Submenu 1 selection items	1	● ○ ○ ○
Submenu 2 Submenu 2 selection items	2	● ● ○ ○
Submenu 3 Submenu 3 selection items and/or parameter values	3	● ● ● ○
Submenu 4 Submenu 4 selection items and/or parameter values	4	● ● ● ●

Table 3.3 shows an example of using the card edge controls to access the Embedded Audio processing group menu (along with some of its submenus) to set the routing and signal processing parameters for an embedded audio channel. **A** through **S** in **Table 3.3** denote the discrete tasks required in performing the example setup using the card-edge controls.

In this example, the following input processing is being performed:

- Embedded Channel 3 is selected as the source for Embedded Channel 1 within Embedded Audio Group 1.
- Gain is increased over unity default by 12.1.
- Phase is inverted.

In this example, the following output processing is being performed:

- The embedded Channel 1 path has been directed to AES Output Channel 1.
- Gain is increased over unity output default by 18.5.
- Phase is normal (non-inverted).

Due to the limited control available when using the built-in card edge control user interface, the navigation into and out of submenus shown in **Table 3.3** is required to perform the setup described above.

Table 3.3 Card-edge Controls Setup of Example Embedded Audio Function Setup

	Submenu Depth				Description
	1	2	3	4	
A	**Embd** AES Tone				Press **Enter Menu** and in this example, select **Embd** (Embedded Audio Groups). This selects the embedded audio function of the Audio processor.

Table 3.3 Card-edge Controls Setup of Example Embedded Audio Function Setup

	Submenu Depth				Description
	1	2	3	4	
B		**Grp1** Grp2 Grp3 Grp4			Press **Enter Menu** again and in this example, select **Grp1** (Embedded Audio Group 1). This selects the embedded audio group to be accessed.
C			**Enbl**		Press **Enter Menu** again and in this example, select **Enbl** (Enable).
D				**On** Off	Press **Enter Menu** again and in this example, select **On**. This sets the selected embedded audio group to **Enabled**.
E			**Ch01** Ch02 Ch03 Ch04		Press **Exit Menu** and in this example, select **Ch01**. (Destination: Embedded Channel 1). This selects the embedded channel to be accessed.
F				**Src** Gain Pol	Press **Enter Menu** and select in this example, **Src** (source for Embedded Channel 1). This selects the source for the embedded channel.
G				Em01 Em02 **Em03** ...	Press **Enter Menu** again and in this example, select **Em03** (Embedded Channel 3 as source for Embedded Channel 1).
H				Src **Gain** Pol	Press **Exit Menu** and in this example, select **Gain** (gain adjustment field for selected embedded audio channel).
I				(gain value)	Press **Enter Menu** again and in this example, select a gain value of **12.1** for this channel.
J				Src Gain **Pol**	Press **Exit Menu** and in this example, select **Pol** (phase for Embedded Channel 1).
K				Norm **Inv**	Press **Enter Menu** again and in this example, select **Inv** (invert polarity for Embedded Channel 1).
L	Embd **AES** Tone				Go to submenu 1 and in this example, select **AES** (AES output channel selection). This selects an AES output channel as the output for this group.
M		**Ch01** Ch02 Ch03 ...			Press **Enter Menu** and in this example, select **Ch01** (AES Output Channel 1).
N			**Src** Gain Pol		Press **Enter Menu** again and select in this example, **Src** (source for AES Output Channel 1).
O				**Em01** Em02 Em03 ...	Press **Enter Menu** again and in this example, select **Em01** (Embedded Channel 1 as source for AES Output Channel 1).

Table 3.3 Card-edge Controls Setup of Example Embedded Audio Function Setup

Submenu Depth					Description
	1	2	3	4	
P			Src **Gain** Pol		Press **Exit Menu** and in this example, select **Gain** (gain adjustment field for the selected AES output channel).
Q				(gain value)	Press **Enter Menu** and in this example, select a gain value of **18.5** for this channel.
R			Src Gain **Pol**		Press **Exit Menu** and in this example, select **Pol** (polarity for Embedded Channel 1).
S				**Norm** Inv	Press **Enter Menu** and in this example, select **Norm** (no invert for AES Output Channel 1).

Card-edge Display Orientation, Brightness, and Timeout Adjust

The card-edge includes an 4-Character Alphanumeric Display can be changed between vertical or horizontal character orientation to suit the mounting position of the card as shown and described below.

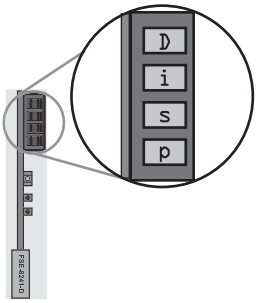


***Figure 3.3** Vertical Orientation*

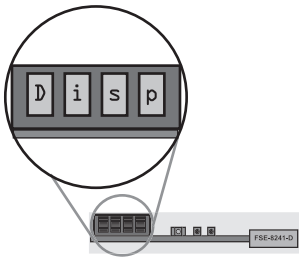


***Figure 3.4** Horizontal Orientation*

Vertical orientation displays characters as show in **Figure 3.3** (in this example, "**Disp**"). Use this orientation when a frame has cards positioned vertically.

Horizontal orientation displays characters as show in **Figure 3.4** (in this example "**Disp**"). Use this orientation when a frame has cards positioned horizontally.

1. Access the **Displ** (Display) menu.
2. Select between Horizontal or Vertical as shown below.

Card-edge Control Menu: **Disp**		
1	**2**	
H/V		
	Horz	Horizontal orientation
	Vert	Vertical orientation

Use the following procedure to adjust the display brightness:

1. Access the **Displ** (Display) menu.
2. Select from the relative brightness levels as shown below.

Card-edge Control Menu: **Disp**		
1	**2**	
BRGT		
	100%	
	53%	
	40%	
	27%	
	20%	
	13%	
	6.6%	

The timeout period from when a menu is entered to when the display times outs (reverts to the default card model display) can be adjusted from 5 to 9999 seconds (166.7 minutes) as described below.

1. Access the **Displ** (Display) menu.
2. Use the **Menu Selection Toggle** switch to enter the desired timeout value as shown below.

Card-edge Control Menu: **Disp**		
1	**2**	
TOUT		
	(value)	Timeout value (in seconds)

DashBoard User Interface

The FSE-8241 series function submenus are organized in DashBoard using tabs (for example, “Embedded Audio Group 1/2” in **Figure 3.5**). 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 card-edge controls.)

Figure 3.5 shows the same setup described in **Table 3.3** as performed using DashBoard. Note how this setup is greatly simplified using DashBoard with most of the discrete tasks (**A** through **S** in **Table 3.3**) performed with the card-edge controls now rolled into simple actions using DashBoard.

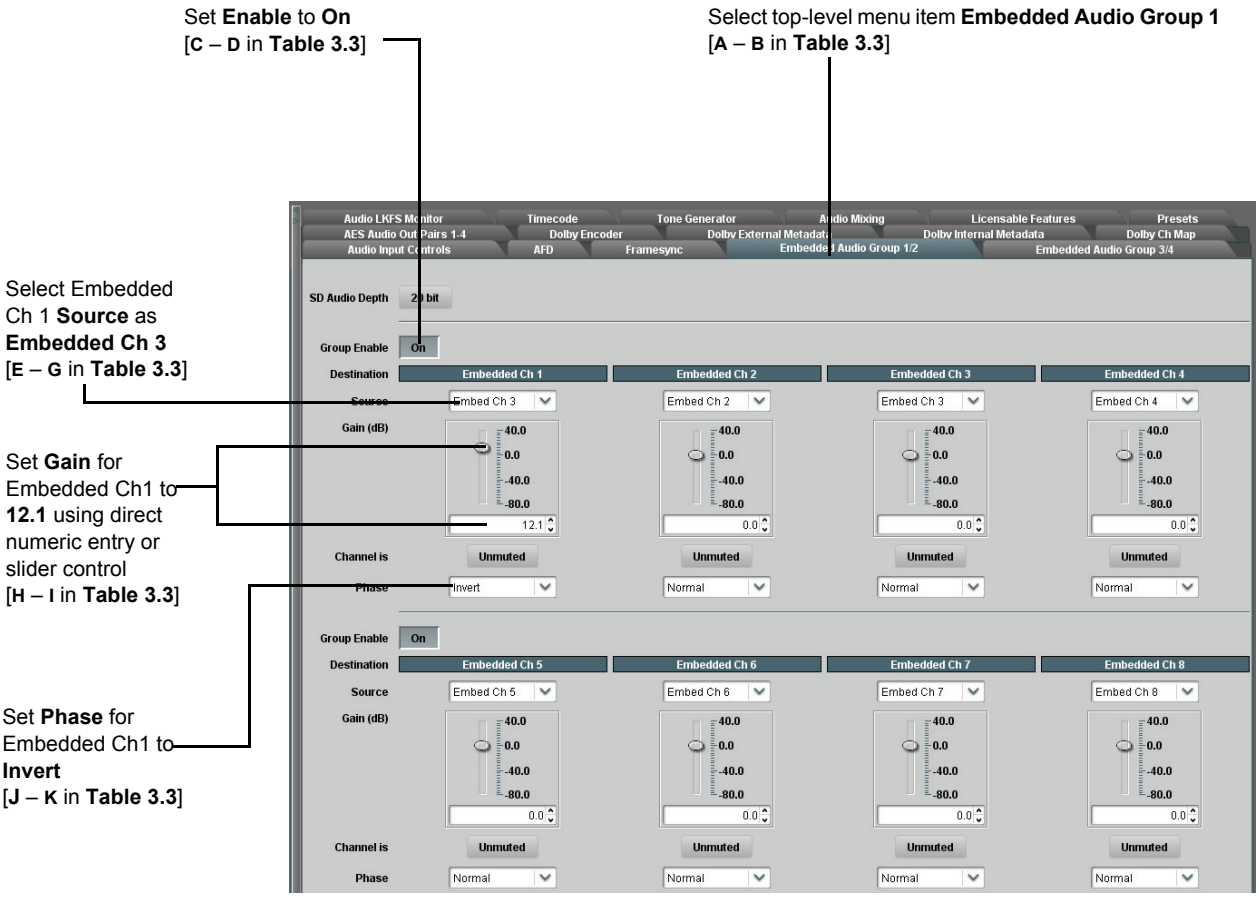


Figure 3.5 *DashBoard Setup of Example Embedded Audio Function Setup (1 of 2)*

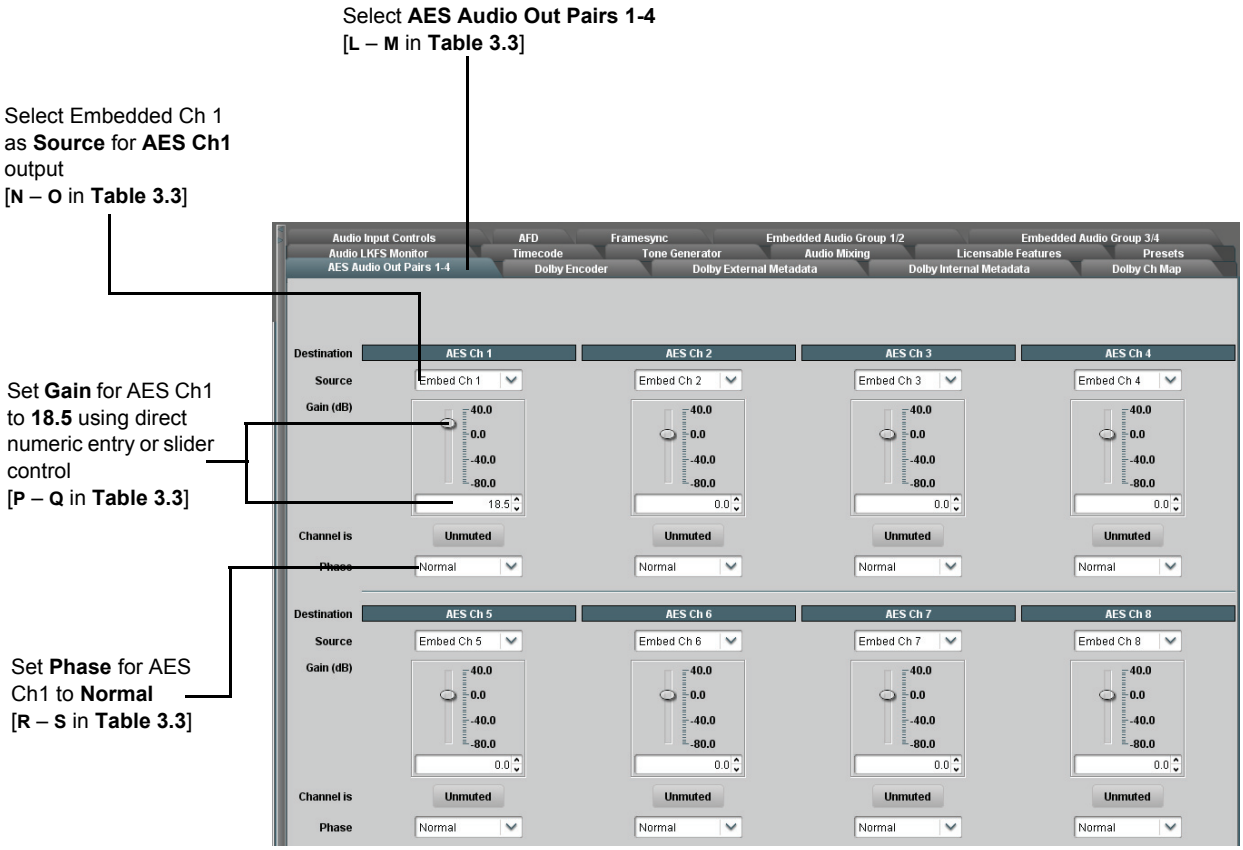


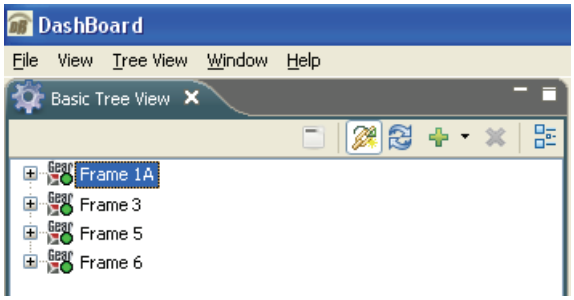
Figure 3.6 *DashBoard Setup of Example Embedded Audio Function Setup (2 of 2)*

Accessing the Card via DashBoard

Access the FSE-8241 series card using DashBoard as described below.

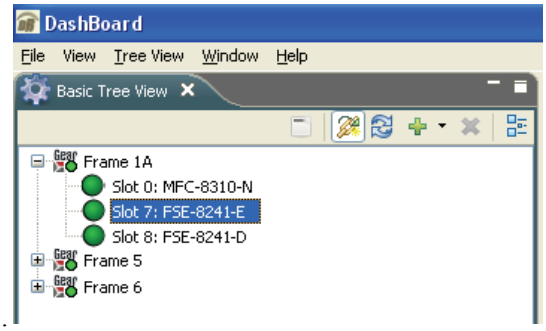
Accessing the Card via DashBoard

1. On the computer connected to the frame LAN, open DashBoard.
2. As shown below, in the left side Basic View Tree, locate the frame containing the FSE-8241 series card to be accessed (in this example, Frame 1A).



Basic Tree View — Selecting the Frame

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: FSE-8241-E”).



Basic Tree View — Selecting the FSE-8241-E

As shown in **Figure 3.7**, 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).

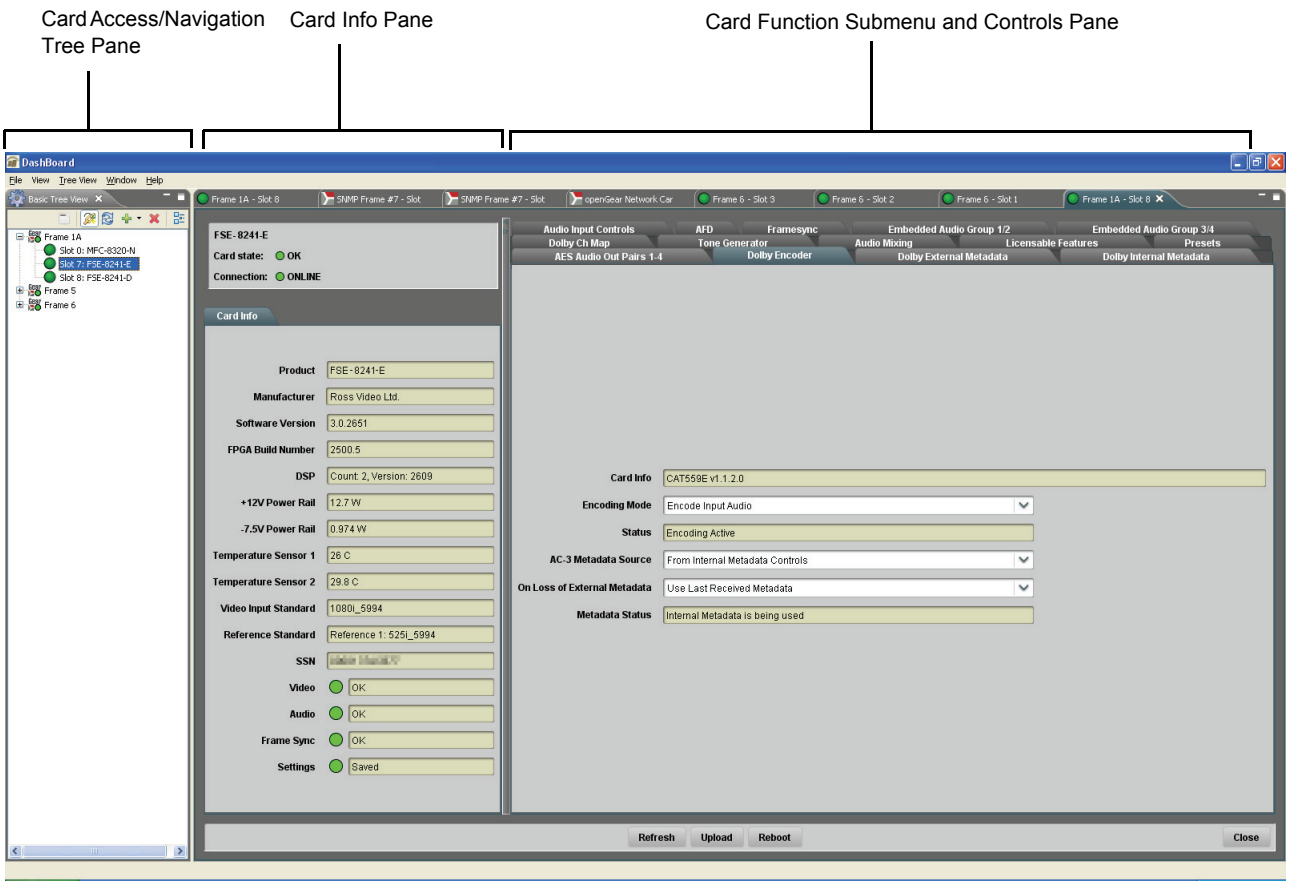


Figure 3.7 *FSE-8241-E Tabs in DashBoard*

Checking Card Information

The operating status and software version the card can be checked using DashBoard or the card edge control user interface. **Figure 3.8** shows and describes the card information screen using DashBoard and accessing card information using the card edge control user interface.

Proper operating status in DashBoard is denoted by green icons for the status indicators shown in **Figure 3.8**. Yellow or red icons respectively indicate an alert or failure condition. Refer to the section "**Troubleshooting**" on page 3-74 for corrective action.

The **Tree View** shows the cards seen by DashBoard. In this example, Frame 1A is hosting a FSE-8241-E card in slot 7.

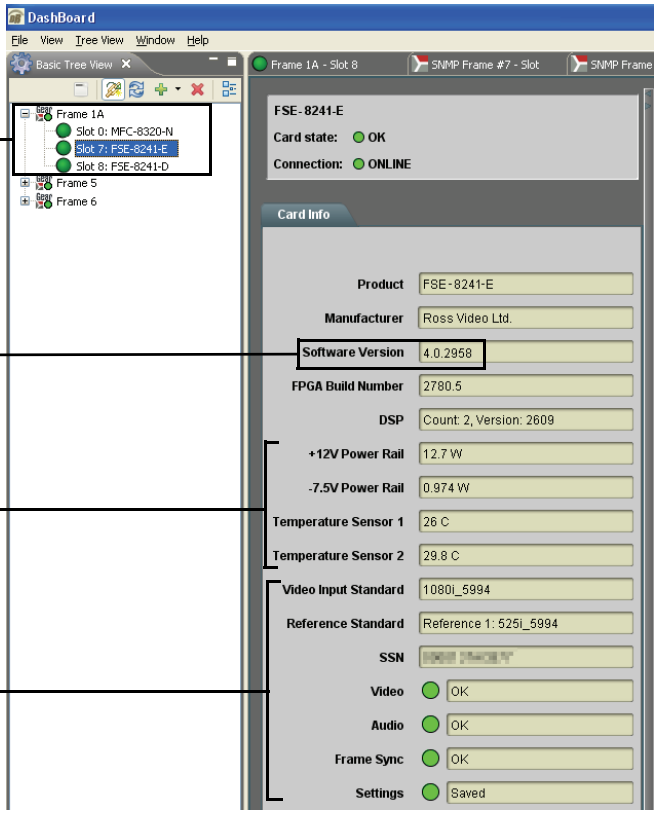
Software Version Number
Refer to this number to check that documentation (such as this manual) matches the card's Software Version Number. Use this number also when communicating to Ross Video regarding this card.

Power Consumption and Temperature Displays

This display shows the power consumed by the card for both the +12V and -7.5V rails, as well as key device temperatures.

Status Displays

These displays show the status the signal being received by the card. Green Settings icon shows that any changes made on DashBoard are successfully saved on the card's memory.



Checking Card Using Card-edge Controls

Info

1	2	
+POW		
	(value)	+12V Watts consumed
-POW		
	(value)	-7.5V Watts consumed
SWR#		
	(value)	Software Release Number
SWB#		
	(value)	Software Build Number
FPG#		
	(value)	FPGA Build Number

***Figure 3.8** Card Info Utility*

Ancillary Data Line Number Locations and Ranges

Table 3.4 lists typical default output video VANC line number locations for various ancillary data items that may be passed or handled by the card.

Table 3.4 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 3.9** and **Figure 3.10** show an example of conflicted and resolved VANC allocation within an HD-SDI stream.

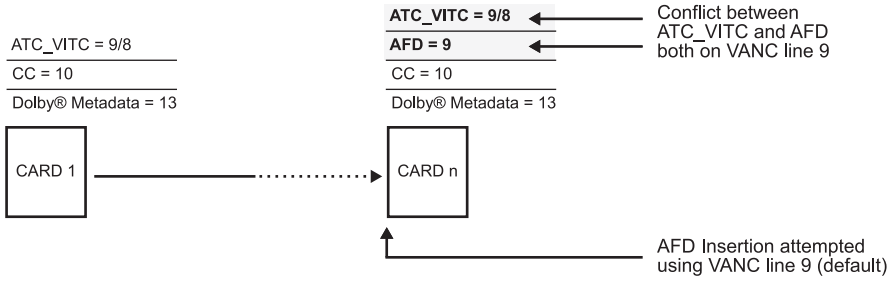


***Figure 3.9** Example VANC Line Number Allocation — Conflict*

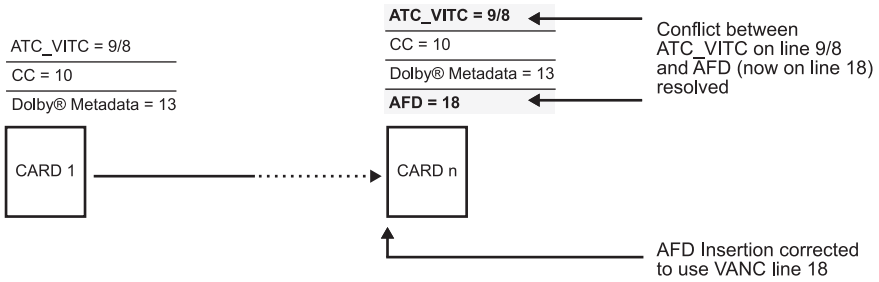


Figure 3.10 *Example VANC Line Number Allocation — Resolved*

Function Submenu List and Descriptions

This section individually lists and describes each FSE-8241 series function submenu (“tab”) and its related list selections, controls, and parameters. Where helpful, examples showing usage of a function are also provided. This section is primarily based upon using DashBoard to access each function and its corresponding submenus and parameters.

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.)

This section also provides abbreviated menu structure charts showing the menu structure for accessing the function/parameter using the card edge controls. If using card-edge controls, refer to the section “**Card-edge Control Menu/Submenu Structure**” on page 3-5 and **Table 3.3** for an explanation and an example of card-edge control menu structure navigation. Where a card-edge menu is not shown for a particular control, this indicates the control is **not** available using card-edge controls.

On DashBoard itself and in this section, 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.

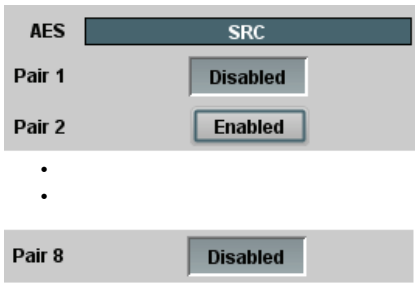
Function Submenu Item	Page	Function Submenu Item	Page
Audio Input Controls	3-17	FSE-8241-D Dolby® Functions	3-53
AFD	3-20	Dolby Digital Encoder	3-53
Framesync	3-21	Dolby Digital External Metadata	3-56
Embedded Audio Group 1/2	3-27	Dolby Digital Internal Metadata	3-58
Embedded Audio Group 3/4	3-33	Dolby Digital Channel Mapping	3-59
Audio LKFS Monitor	3-35	FSE-8241-E Dolby® Functions	3-61
AES Audio Out Pairs 1-4	3-38	Dolby E Encoder	3-61
Audio Mixing	3-43	Dolby E External Metadata	3-62
Timecode	3-46	Dolby E Internal Metadata	3-64
Tone Generator	3-50	Dolby E Channel Mapping	3-65
Presets	3-50		

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 the section "**AES Audio Input Advanced Features**" on page 1-9 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.

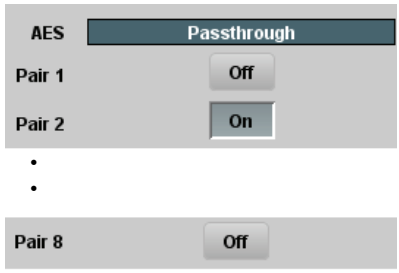
  Note: In this mode AES rate must match the input video rate or audio dropouts will occur.

  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 FSE-8241 series card 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.

Card-edge Control Menu: **Aud**

1	2	3	4	
AES				
	SBYP			
		AES #		Apply to AES pair (1-8)
			On	SRC Bypass is on
			Off	SRC Enabled (bypass is off)

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.

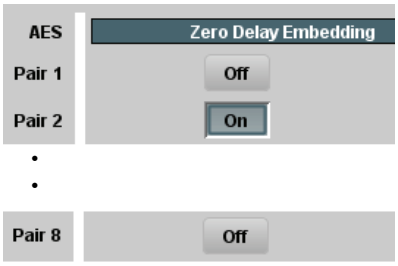
Card-edge Control Menu: **Aud**

1	2	3	4	
AES				
	PASS			
		AES #		Apply to AES pair (1-8)
			Off	Passthrough disabled
			On	Passthrough enabled

Audio Input Controls

(continued)

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:

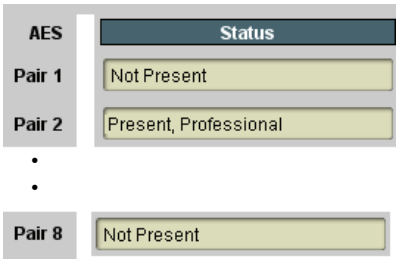
- **Off:** Disables Zero-Delay Embedding for the selected AES input pair. Zero-delay embedding is set to **Off** by default.
- **On:** The selected pair directly embeds into its corresponding group (AES Pair 1 embeds into embedded channels 1 and 2; AES pair 2 embeds into embedded channels 3 and 4, and so on) with the normal frame sync audio delay being bypassed.

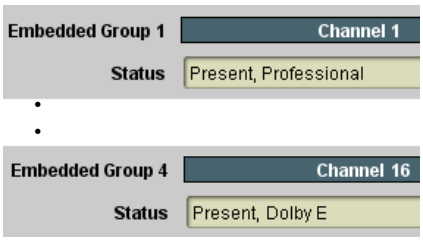
  Note: Zero Delay Embedding overrides the standard audio routing system. For example, if AES Pair 1 is selected, then the controls to route into embedded channels 1 and 2 will not apply. Gain and polarity control is not available when zero-delay embedding is enabled.

Card-edge Control Menu: **Aud**

1	2	3	4	
AES				
	0DLY			
		AES #		Apply to AES pair (1-8)
			Off	Zero-Delay embedding is disabled
			On	Zero-Delay Embedding enabled

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 card does not perform Dolby® decoding on the signal. Although the card 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.

Audio Input Controls	(continued)
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.
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.
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. *FSE-8241-D only* — Up to six channels can be sources for encoder inputs Encoder Ch1 thru Encoder Ch 6. *FSE-8241-E 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.
	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.

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.

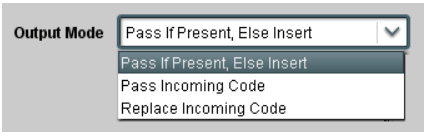
Framesync must be enabled for proper AFD insertion.

Incoming AFD

Displays incoming AFD setting as follows:

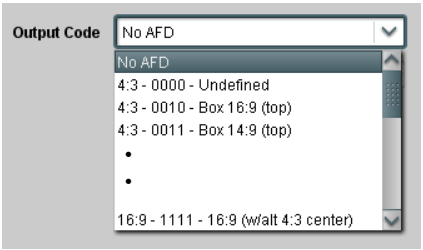
- If AFD code is present, one of the 11, four-bit AFD codes is displayed (as shown in the example to the left). Also displayed is the VANC line number of the incoming AFD code.
- If no AFD setting is present in the video signal, **No AFD Present** is displayed.

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.

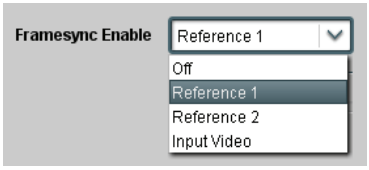
2: Image Protected implies picture content that must not be cropped by conversion processes or display devices. Alternate center formats may have protected center areas, with areas outside of the protected area not containing mandatory content.

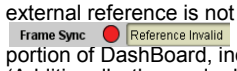
Output Line

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

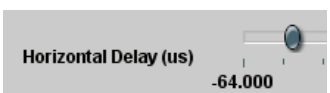
Note: Although the output line drop-down will allow any choice within the 9 thru 41 range, the actual range is automatically clamped (limited) to certain ranges to prevent inadvertent conflict with active picture area depending on video format. Refer to the section "**Ancillary Data Line Number Locations and Ranges**" on page 3-14 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>
<tr><td>
</td><td>Provides video Frame Sync offset and audio re-sync tools.</td></tr>
<tr><td>Framesync Enable
 

Card-edge Control Menu: FS
<table><tr><th>1</th><th>2</th><th></th></tr><tr><td>Enbl</td><td></td><td></td></tr><tr><td></td><td>Off</td><td>Frame Sync Off (disabled)</td></tr><tr><td></td><td>Ref1</td><td>Reference 1 selected</td></tr><tr><td></td><td>Ref2</td><td>Reference 2 selected</td></tr><tr><td></td><td>V-In</td><td>Input Video reference</td></tr></table></td><td>Disables the Frame Sync function, or selects from choices below.
• Off: Disables Frame Sync function; output video timing matches the input video timing.
• Reference 1: Allows Frame Sync function to use external Reference 1 as the reference standard.
• Reference 2: Allows Frame Sync function to use external Reference 2 as the reference 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 FSE-8241 series card and other cards via an DFR-8321 frame bus.
• Input Video: 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.</td></tr>
<tr><td>Vertical Delay Control

Card-edge Control Menu: FS
<table><tr><th>1</th><th>2</th><th></th></tr><tr><td>VOS</td><td></td><td></td></tr><tr><td></td><td>(value)</td><td>Vertical delay value (in number of lines)</td></tr></table></td><td>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.</td></tr>
<tr><td>Horizontal Delay Control
 

Card-edge Control Menu: FS
<table><tr><th>1</th><th>2</th><th></th></tr><tr><td>HOS</td><td></td><td></td></tr><tr><td></td><td>(value)</td><td>Horizontal delay value</td></tr></table></td><td>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.</td></tr>
</table>

Framesync

(continued)

Minimum Latency Control

Card-edge Control Menu: **FS**		
1 LATF	**2** (value)	Min. Latency (in frames)

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).**

(0 to 13 frame range; default = 1 frame)

Note: Due to card memory limits, the maximum available Minimum Latency Frames is related to the output video format. For example, with a 1080i59.94 output, the maximum allowed setting is 5. For a 1080i film (23.98) output, the maximum allowed setting is 3. Conversely, greater maximum settings are allowed for SD formats such as 525i59.94, where 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.

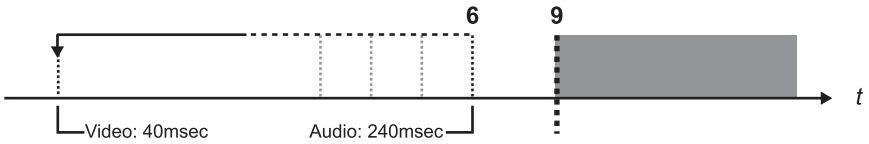
- Latency frames selection exceeds limits.

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.

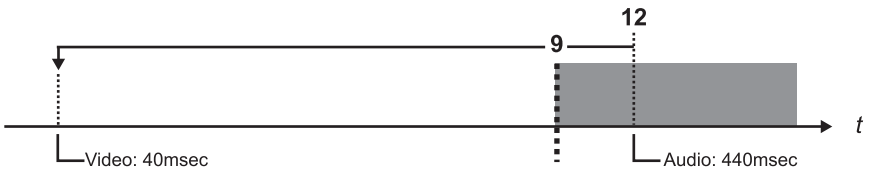
(Range is 1.5 to 13.0 frames in 0.1 frame increments)

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.)

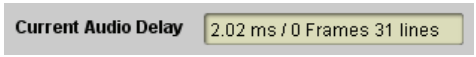
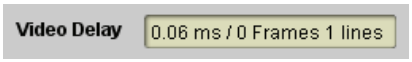


In this example, initial offset of 200 msec (appr. 6 frames) is **below** 9 frame threshold and results in soft resync being progressively applied.

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

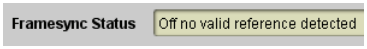
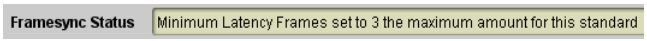
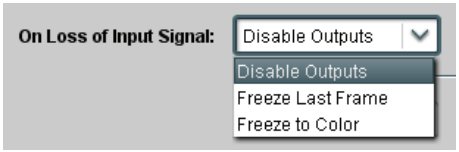


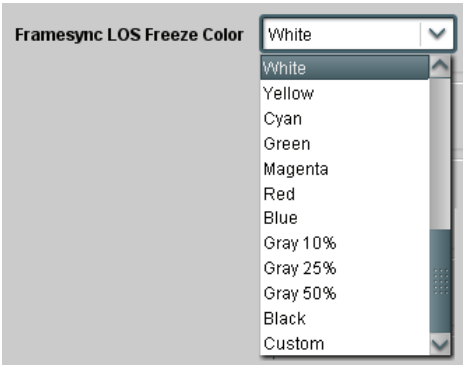
In this example, initial offset of 400 msec (appr. 12 frames) is **above** 9 frame threshold and results in immediate hard resync.

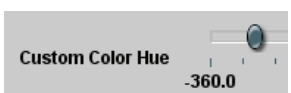
Framesync	(continued)
Audio Offset Control Card-edge Control Menu: **FS** **1** ADLY **2** ADJ **3** (value) Delay value	When Framesync is enabled, adds or reduces (offsets) audio delay from the matching video delay (audio delay offset setting adds or removes delay in addition to any delay included by 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  Card-edge Control Menu: **FS** **1** ADLY **2** DVAL **3** (value) Delay value (in msec)	Displays the current input-to-output audio delay (in msec units) as well as in terms of Frames/fractional frame (in number of lines). **Note**: Value shown in column 3 is displayed value only. No control is available in this mode.
Video Delay Display  Card-edge Control Menu: **FS** **1** VDLY **2** (value) Delay value (in msec)	Displays the current input-to-output video delay (in msec units) as well as in terms of Frames/fractional frame (in number of lines). **Note**: Value shown in column 2 is displayed value only. No control is available in this mode.

<table>
<tr><td>Framesync</td><td>(continued)</td></tr>
<tr><td>Framesync Status Display
 </td><td>Displays the current framesync status as follows:

Framesync status OK.

Framesync source off or not connected.
 
Improper or missing framesync reference.
 
Latency frames selection exceeds limits.
Note: See Minimum Latency Frames Control above for more information about this message.</td></tr>
<tr><td>Loss of Input Signal Selection
 
Card-edge Control Menu: FS
<table><tr><th>1
LOS</th><th>2</th><th></th></tr><tr><td></td><td>DIS</td><td>Disables outputs</td></tr><tr><td></td><td>FRFR</td><td>Freeze to last frame</td></tr><tr><td></td><td>FRCL</td><td>Freeze to selected color</td></tr></table></td><td>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).</td></tr>
</table>

<table>
<tr><td>
</td><td>(continued)</td></tr>
<tr><td>Framesync LOS Freeze Color
 

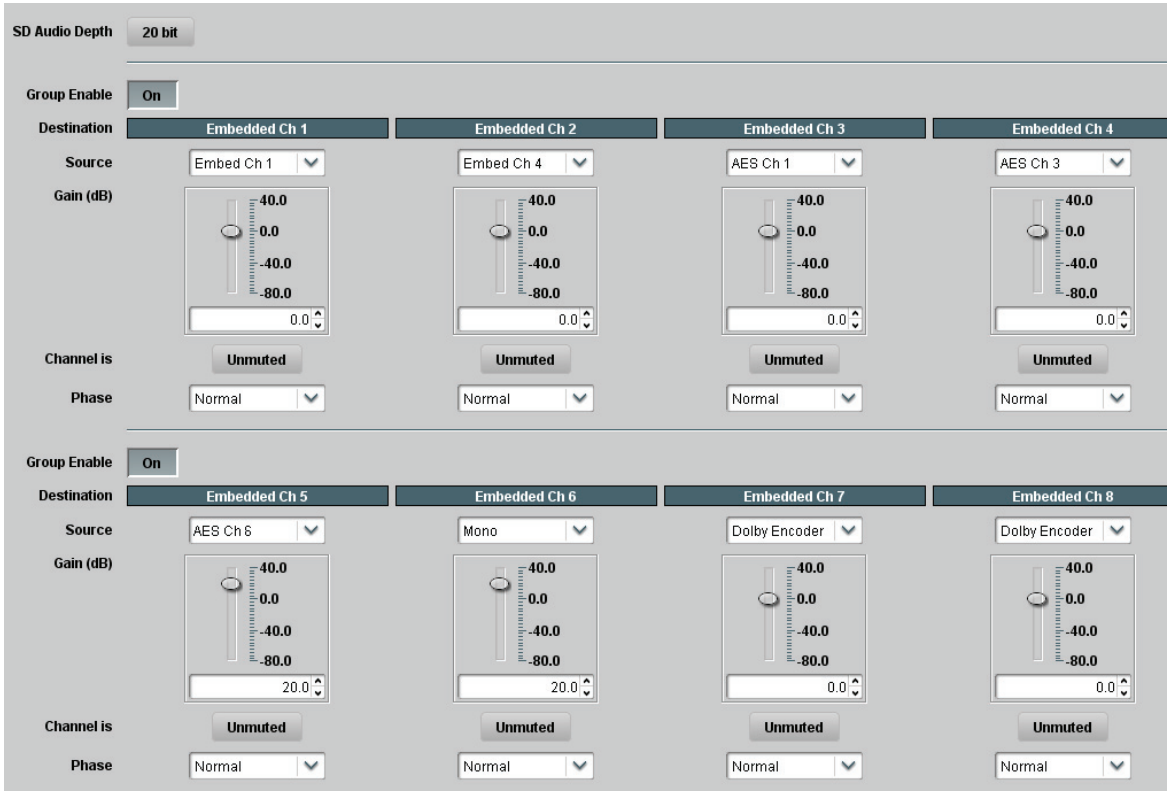
Card-edge Control Menu: FS
<table><tr><th>1</th><th>2</th><th></th></tr><tr><td>LOSC</td><td></td><td></td></tr><tr><td></td><td>WHT</td><td>White</td></tr><tr><td></td><td>YELO</td><td>Yellow</td></tr><tr><td></td><td>CYAN</td><td>Cyan</td></tr><tr><td></td><td>GRN</td><td>Green</td></tr><tr><td></td><td>MAGE</td><td>Magenta</td></tr><tr><td></td><td>RED</td><td>Red</td></tr><tr><td></td><td>BLUE</td><td>Blue</td></tr><tr><td></td><td>GR10</td><td>Gray 10%</td></tr><tr><td></td><td>GR25</td><td>Gray 25%</td></tr><tr><td></td><td>GR50</td><td>Gray 50%</td></tr><tr><td></td><td>BLK</td><td>Black</td></tr><tr><td></td><td>CSTM</td><td>Custom</td></tr></table></td><td>In the event of LOS with Freeze to Color enabled above, sets the image raster color from choices shown to the left.</td></tr>
<tr><td>Custom Color Hue
 

Card-edge Control Menu: FS
<table><tr><th>1</th><th>2</th><th></th></tr><tr><td>CHUE</td><td></td><td></td></tr><tr><td></td><td>(value)</td><td>Custom freeze color hue (in degrees)</td></tr></table></td><td>Adjusts raster hue (phase angle) for custom LOS color.
(-360° to 360° range in 0.1° steps; null = 0°)</td></tr>
</table>

	(continued)
Custom Color Saturation Card-edge Control Menu: **FS** **1** CSAT, **2** (value) — Color saturation level (in percent)	Adjusts raster saturation level for custom LOS color. (0% to 100% range in 0.1% steps)
Custom Color Y Level Card-edge Control Menu: **FS** **1** CVAL, **2** (value) — Luma level	Adjusts raster luma level for custom LOS color. (64 to 940 range)
Reset Framesync Card-edge Control Menu: **FS** **1** RSET, **2** Y? — Move toggle switch left (or up) to confirm reset. Reject reset by pressing Exit Menu pushbutton.	Resets the frame sync, clearing any buffered audio and video. When Confirm is clicked, a **Confirm?** pop-up appears, requesting confirmation. • Click **Yes** to reset the frame sync. • Click **No** to reject reset.

Embedded Audio Group 1/2

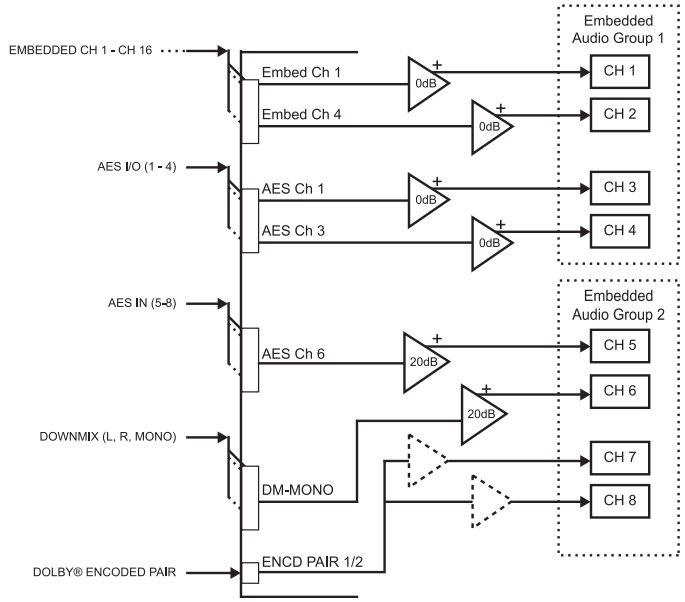
Selects the audio source for each embedded audio channel 1 thru 8 (Embedded Audio Groups 1 and 2). It also provides Gain, Mute, and Phase Invert controls for each channel.



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 the section "**Audio Routing Example Using DashBoard**" on page 3-67 for more examples of using these controls.

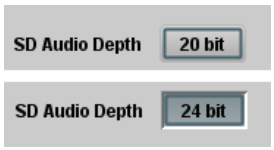


Note: After familiarizing yourself with the controls described in the audio routing/control sections that follow, refer to the section "**Audio Routing Example Using DashBoard**" on page 3-67 for a full example using these controls.

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.

Card-edge Control Menu: **Aud**

1	2	3	4	
Embd				
	Grp1			Group 1 selected
		Enbl		
			On	Enabled
			Off	Disabled

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.

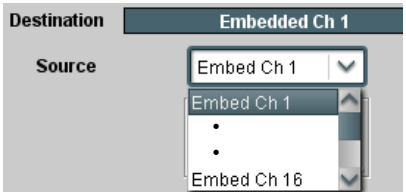
Card-edge Control Menu: **Aud**

1	2	3	4	
Embd				
	Grp			
		Ch#		Destination channel
			Src	Set up to select Source

Embedded Audio Group 1/2

(continued)

Embedded Ch 1 thru Ch 16 as Source



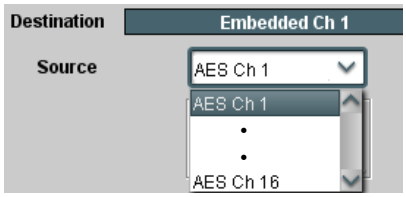
Embed Ch 1 thru **Embed Ch 16** range in Source drop-down list enables an embedded channel (Ch 1 thru Ch 16) to be the source for the selected destination Embedded Audio Group channel.

(In this example, Embed Ch 1 (embedded Ch 1) is the source for destination Embedded Ch 1)

Card-edge Control Menu: **Aud**

1	2	3	4	
Embd				
	Grp			
		Ch#		
			Src	
			Em#	Source; Embedded Channel (1 -16)

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)

Card-edge Control Menu: **Aud**

1	2	3	4	
Embd				
	Grp			
		Ch#		
			Src	
			Ae#	Source; AES Channel (1 -16)

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 3-43 for more information.

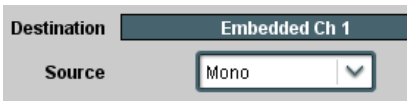
Card-edge Control Menu: **Aud**

1	2	3	4	
Embd				
	Grp			
		Ch#		
			Src	
			DM L	Downmix L channel
			DM R	Downmix R channel

Embedded Audio Group 1/2

(continued)

Mono Mix as Source



Card-edge Control Menu: **Aud**

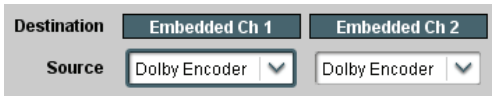
1	2	3	4	
Embd				
	Grp			
		Ch#		
			Src	
			Mono	Mono mix selection as source

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 3-43 for more information.

Dolby® Encoded Pair as Source



Card-edge Control Menu: **Aud**

1	2	3	4	
Embd				
	Grp			
		Ch#		
			Src	
			DENC	Dolby encoder selection as source

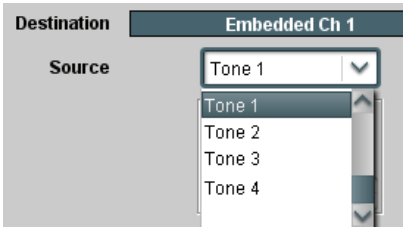
Dolby Encoder selection in Source drop-down list allows Dolby® Encoder encoded pair to be the source for the selected destination Embedded Audio Group channel pair. When either channel of a companion pair is sourced from the encoder, the companion channel is automatically similarly selected.

(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



Card-edge Control Menu: **Aud**

1	2	3	4	
Embd				
	Grp			
		Ch#		
			Src	
			TG#	Source; TG 1-4

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 3-50 for more information.

Embedded Audio Group 1/2

(continued)

Silence (Mute) as Source

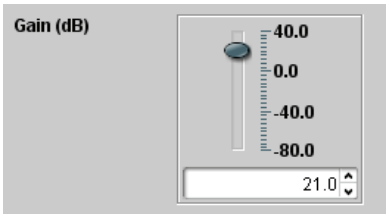
Silence selection in Source drop-down list mutes the selected destination Embedded Audio Group channel. **Use this setting for unused destination channels.**

(In this example, silence (muting) is applied to Embedded Ch 1)

Card-edge Control Menu: **Aud**

1	2	3	4	
Embd				
	Grp			
		Ch#		
			Src	
			Off	Channel Silence

Gain (dB) Control



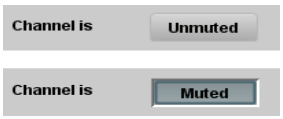
Adjusts relative gain (in dB) applied to the corresponding destination Embedded Audio Group channel.

(-80 to +40 dB range in 0.1 dB steps; unity = 0.0 dB)

Card-edge Control Menu: **Aud**

1	2	3	4	
Embd				
	Grp			
		Ch#		
			Gain	
			(value)	Gain value (in dB)

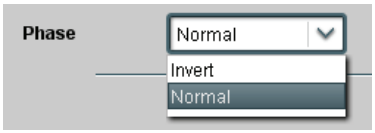
Mute Control



Allows pushbutton On/Off channel muting while saving all other settings.

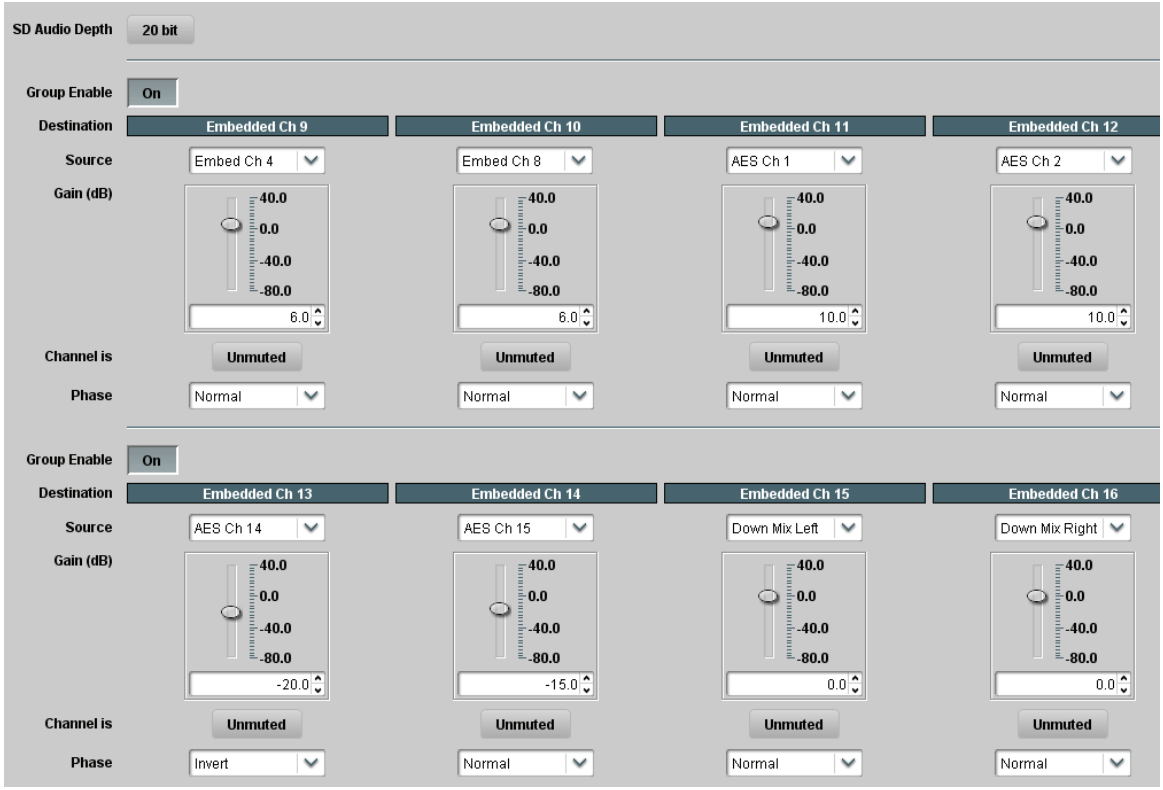
Card-edge Control Menu: **Aud**

1	2	3	4	
Embd				
	Grp			
		Ch#		
			Mute	
			Off	Unmuted
			On	Muted

Embedded Audio Group 1/2	(continued)
Phase Control  Card-edge Control Menu: **Aud** **1** Embd **2** Grp **3** Ch# **4** Pol Norm Non-inverted Inv Inverted	Selects between **Normal** and **Invert** phase (relative to source original phase) for the destination Embedded Audio Group channel.

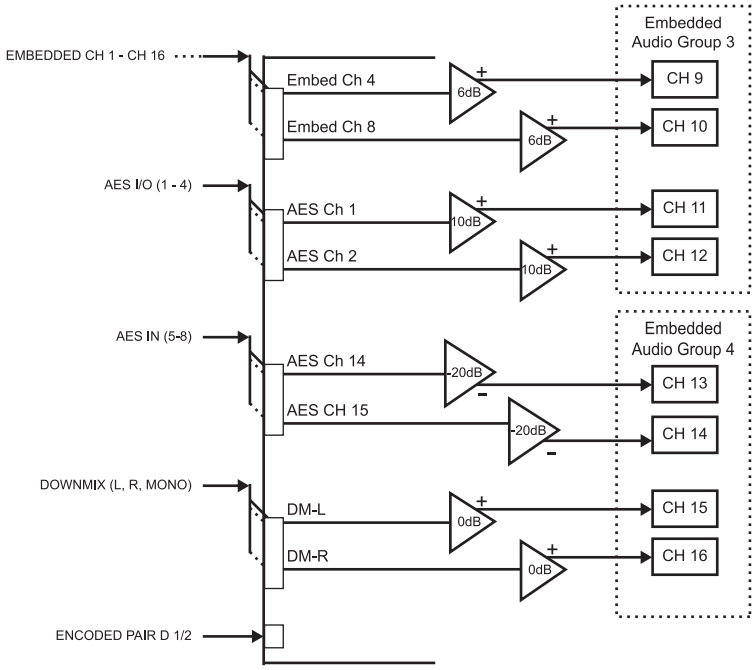
Embedded Audio Group 3/4

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).

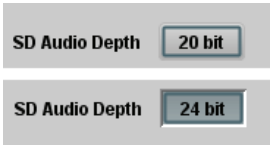
The source-to-destination correlation shown here is only an example; **any** of the sources on the left can connect to **any** of the destinations on the right, or to Embedded Audio Groups 1 and 2 (not shown here). Additional sources not shown here are also available.



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.

Card-edge Control Menu: **Aud**

1	2	3	4	
Embd				
	Grp1			Group 1 select
		Enbl		(range is Group 1-4)
			On	Enabled
			Off	Disabled

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 3-27 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.

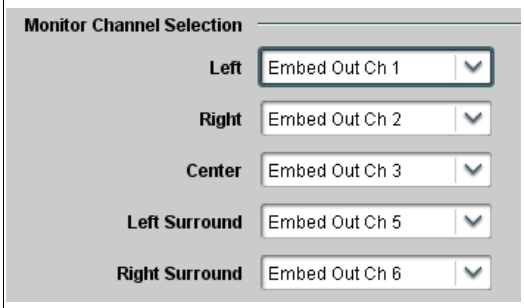
Audio LKFS Monitor

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.

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.

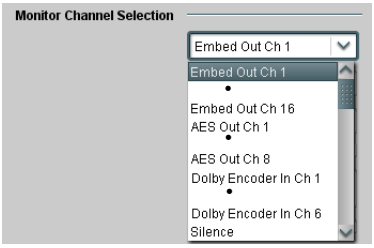
The Audio LKFS Monitor target LKFS uses the Dialnorm value setting per the received selected external metadata (or per the internal metadata settings where used). Refer to the chapter "**Loudness Measurement Guidelines and Techniques**" for more information about LKFS parameters and measurement techniques. **Read and understand the information in this appendix before changing LKFS parameters from default values.**

Monitor Channel Selection

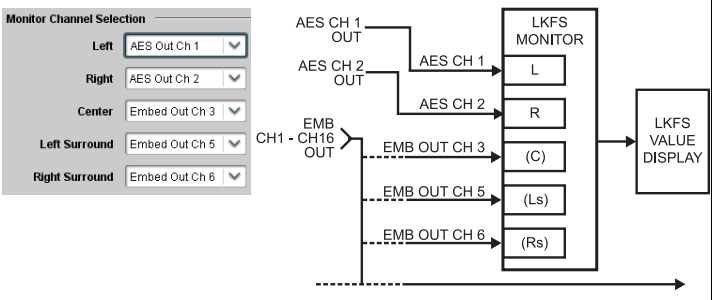


Separate drop-down lists for **Left**, **Right**, **Center**, **Left Surround (Ls)**, and **Right Surround (Rs)** for applying any combination of card audio outputs to each of the five LKFS monitor inputs as shown below.

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**.).



Measured Loudness Display

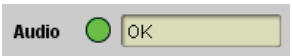
Displays the current aggregate ITU-R BS.1770-1 LKFS loudness for the selected monitored channels.

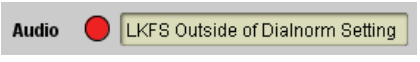
Note: -inf LKFS display indicates LKFS monitor is not receiving any input (for example, as in the case of intended channels not being "seen" by the LKFS monitor due to desired embedded channels being directed to AES output and not embedded output channels).

LKFS/Dialnorm Deviation Alarm Control

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 in the following section "**Target LKFS Setting**".



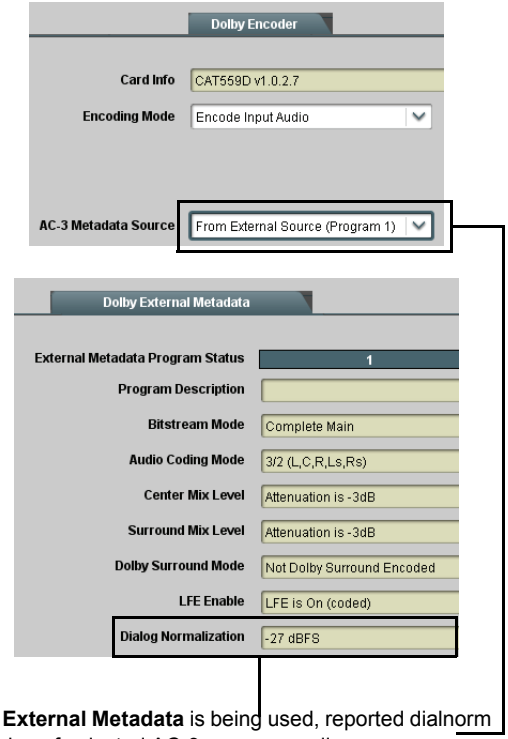


Audio LKFS Monitor

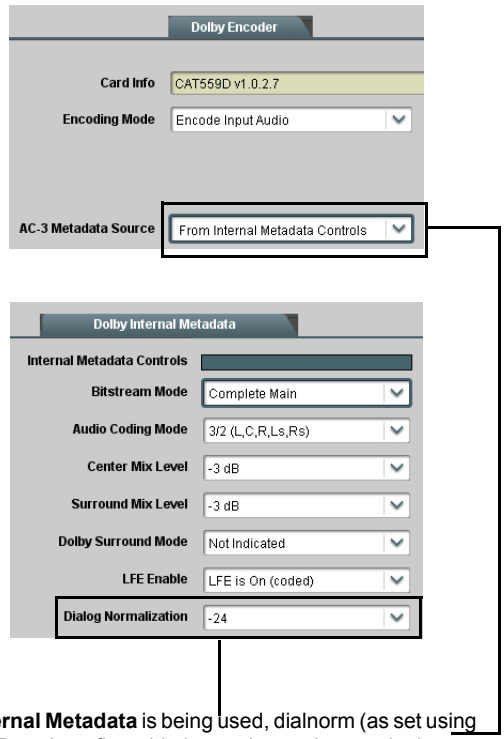
(continued)

Target LKFS Setting

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



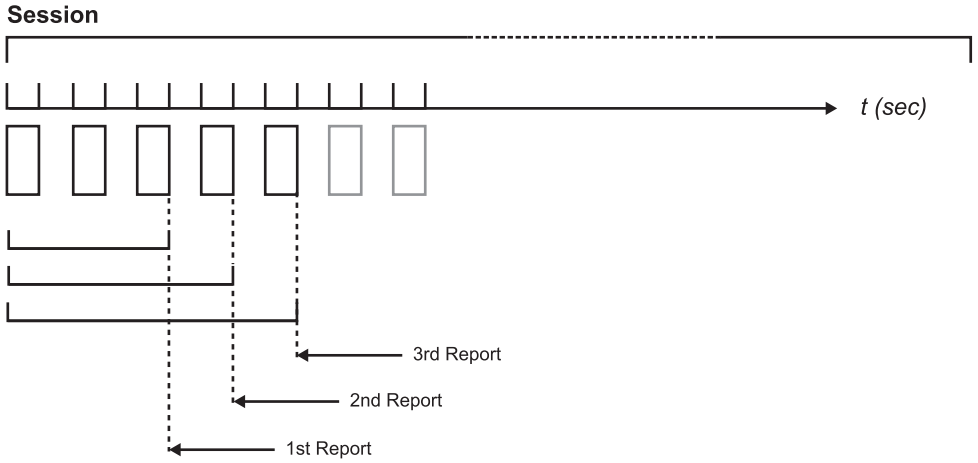
If **External Metadata** is being used, reported dialnorm value of selected AC-3 program coding serves as target LKFS value (in this example, -27 LKFS)

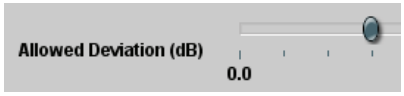


If **Internal Metadata** is being used, dialnorm (as set using DashBoard-configurable internal metadata setting) serves as target LKFS value (in this example, -24 LKFS)

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)

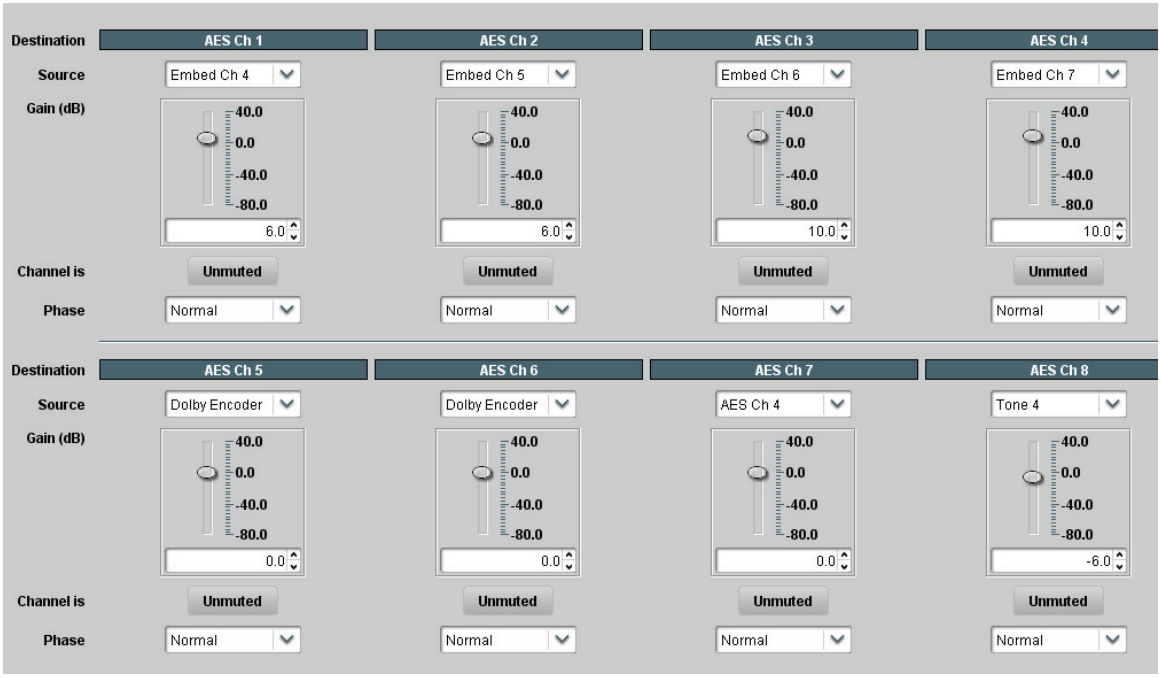
In this example, the last 3 measurement periods are averaged in each reported LKFS value. This cycle is continually repeated. The **Measurement Window** parameter sets the sampling time accumulated before each averaging recalculation.

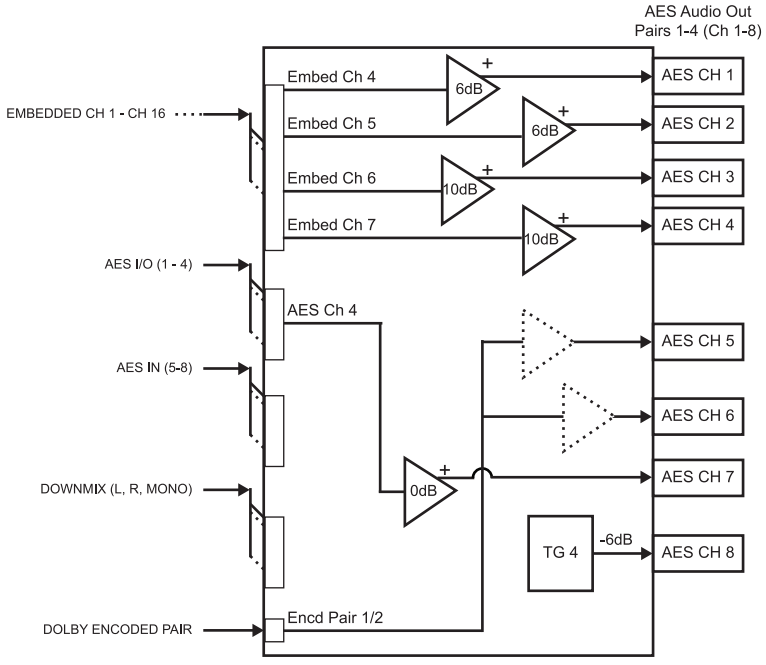


Allowed Deviation (dB) Control 	Sets the allowable deviation above or below dialnorm (LKFS) target level, at which where exceeded the measured LKFS is considered out of range. (0.0 to 40.0 dB (LKFS) range in 0.1 dB steps; default of ±4.0 dB (LKFS))
Deviation Alarm Time Control 	Sets the allowable time 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)

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**" on page 3-67 for more examples of using these controls.

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.

The FSE-8241 series 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.

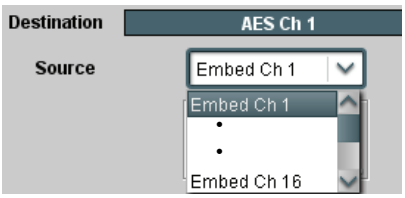
AES Channel Source

Card-edge Control Menu: **Aud**

1	2	3	
AES	Ch#	Src	Destination channel number set up to select 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



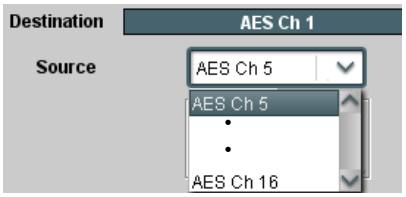
Card-edge Control Menu: **Aud**

1	2	3	4	
AES	Ch#	Src	Em#	Source; Embedded Channel (1-16)

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



Card-edge Control Menu: **Aud**

1	2	3	4	
AES	Ch#	Src	Ae#	Source; AES Channel (1-16)

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)

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 3-43 for more information.

Card-edge Control Menu: **Aud**

1	2	3	4	
AES				
	Ch#			
		Src		
			DML	Downmix L channel
			DMR	Downmix R channel

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.

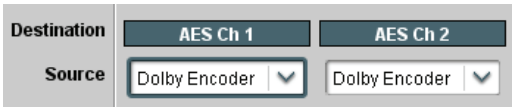
(In this example, the mono content is the source for destination AES Ch 1)

Note: Mono mix content is set up using Mono Mixer Selection in the Audio Mixing function). Refer to Audio Mixing function description on page 3-43 for more information.

Card-edge Control Menu: **Aud**

1	2	3	4	
AES				
	Ch#			
		Src		
			Mono	Mono mix selection as source

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.

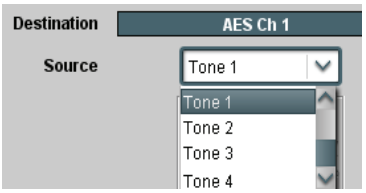
Card-edge Control Menu: **Aud**

1	2	3	4	
AES				
	Ch#			
		Src		
			DENC	Dolby encoder selection as source

AES Audio Out Pairs 1-4

(continued)

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 3-50 for more information.

Card-edge Control Menu: **Aud**

1	2	3	4	
AES	Ch#	Src	TG#	Source; Tone Generator (1-4)

Silence (Mute) as Source

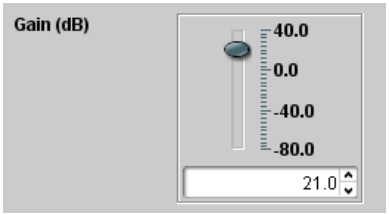
Silence selection in Source drop-down list mutes the selected destination AES channel. **Use this setting for unused destination channels.**

(In this example, silence (muting) is applied to AES Ch 1)

Card-edge Control Menu: **Aud**

1	2	3	4	
AES	Ch#	Src	Off	Channel Silence

Gain (dB) Control

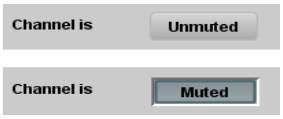


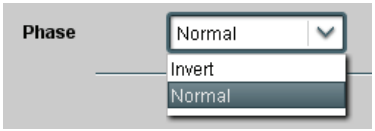
Adjusts relative gain (in dB) applied to the corresponding destination AES channel.

(-80 to +40 dB range in 0.1 dB steps; unity = 0.0 dB)

Card-edge Control Menu: **Aud**

1	2	3	4	
AES	Ch#	Gain	(value)	Gain value (in dB)

<table>
<tr><td>AES Audio Out Pairs 1-4</td><td>(continued)</td></tr>
<tr><td>Mute Control
 

Card-edge Control Menu: Aud
<table>
<tr><th>1</th><th>2</th><th>3</th><th>4</th><th></th></tr>
<tr><td>AES</td><td>Ch#</td><td>Mute</td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td>Off</td><td>Unmuted</td></tr>
<tr><td></td><td></td><td></td><td>On</td><td>Muted</td></tr>
</table></td><td>Allows pushbutton On/Off channel muting while saving all other settings.</td></tr>
<tr><td>Phase Control
 

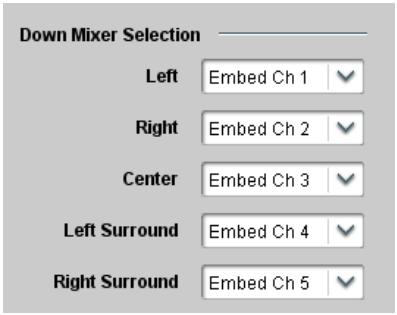
Card-edge Control Menu: Aud
<table>
<tr><th>1</th><th>2</th><th>3</th><th>4</th><th></th></tr>
<tr><td>AES</td><td>Ch#</td><td>Pol</td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td>Norm</td><td>Non-invert</td></tr>
<tr><td></td><td></td><td></td><td>Inv</td><td>Inverted</td></tr>
</table></td><td>Selects between Normal and Invert phase (relative to source original phase) for the destination AES channel.</td></tr>
</table>

Audio Mixing

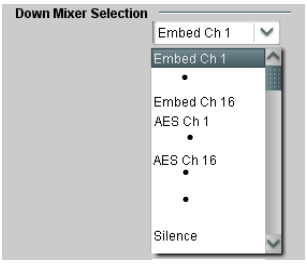
Provides down-mix audio routing selections that multiplexes any five embedded, or AES, channel sources into a stereo pair (Down Mix Left and Down Mix Right), or selection of any two audio sources to be mono-mixed to serve as a monaural source.

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.

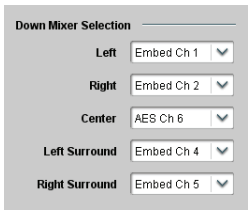
Down Mixer Selection

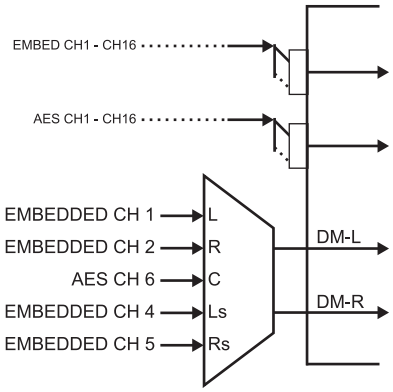


Separate drop-down lists for **Left**, **Right**, **Center**, **Left Surround (Ls)**, and **Right Surround (Rs)** inputs allow embedded, or AES channel audio source selection for each of the five inputs as shown below.



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.

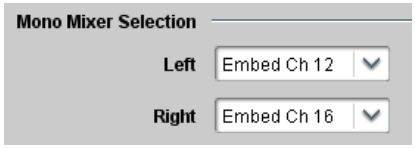
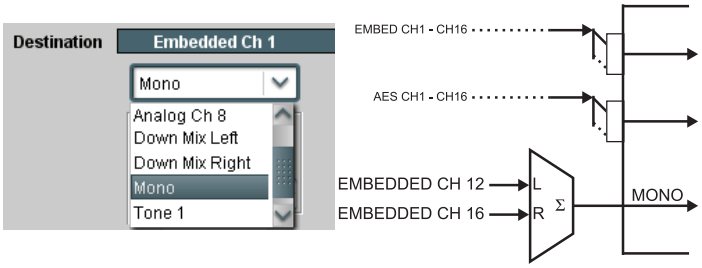
Center Mix Ratio Control

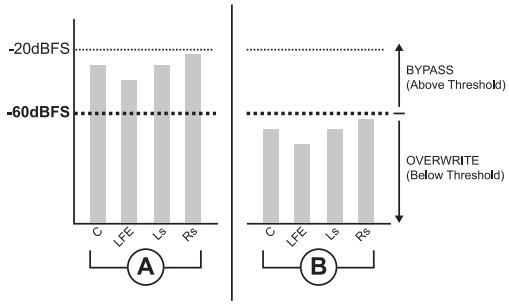
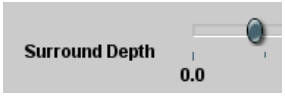
Adjusts the attenuation ratio of center-channel content from 5-channel source that is re-applied as Lt and Rt content to the DM-L and DM-R stereo mix.

- 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.

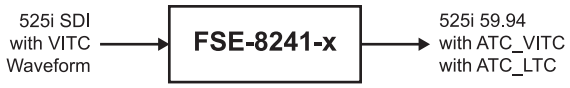
Audio Mixing	(continued)
Surround Mix Ratio Control 	Adjusts the attenuation ratio of surround-channel content from 5-channel source that is re-applied as Lo and Ro content to the DM-L and DM-R stereo mix. • Minimum attenuation setting (**-0.0 dB**) applies no ratiometric reduction. Surround-channel 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, 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.

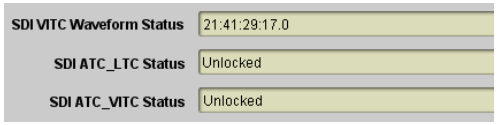
Audio Mixing	(continued)
5.1 Detection Threshold Control 	Adjusts the threshold at which selected channels designated as C, LFE, Ls, and Rs are considered to have viable content, or at which signal levels can be considered insignificant when upmixer enable is set to **Auto**. Setting affects automatic 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 (**A**), while nuisance levels considerably below the threshold (**B**) 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%)

Timecode

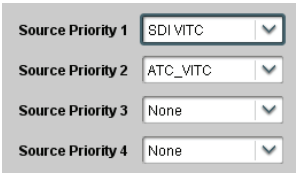
Provides timecode data extraction from various sources, and provides formatting and re-insertion controls for inserting the timecode into the output video.

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



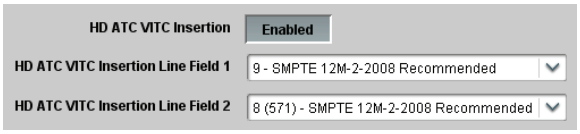


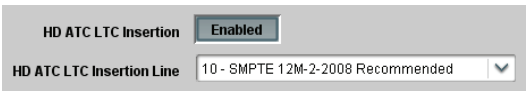
A Noting that the incoming video contains VITC waveform timecode data (as shown in the status display), set the Source Priority drop-down lists to include VITC Waveform timecode data (**SDI VITC**) as a choice. This extracts VITC Waveform timecode data from the incoming video.

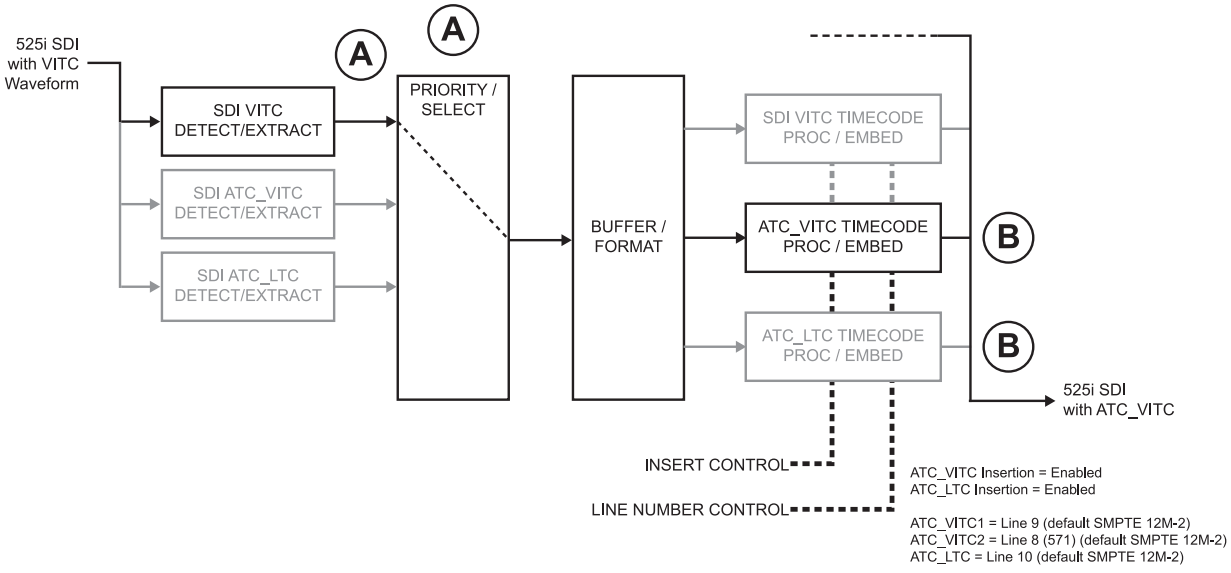


B In this example, it is desired to provide both SDI ATC_VITC and ATC_LTC timecode data in the converted HD output video. As such, set both **HD ATC VITC Insertion** and **HD ATC LTC Insertion** to **Enabled**.

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

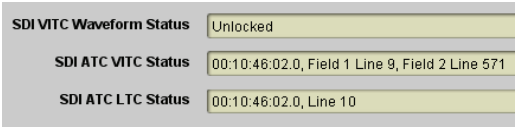






(continued)

Timecode Source Status Displays



Displays the current status and contents of the three 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.

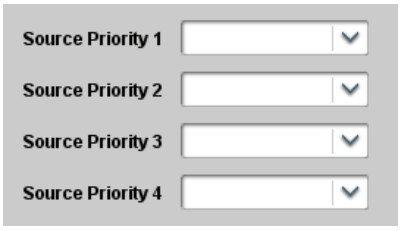
Incoming ATC Packet Removal Control

Card-edge Control Menu: **TC**

1	2	
Rmvl		
	Off	Packet removal disabled
	On	Packet removal enabled

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.)

Source Priority

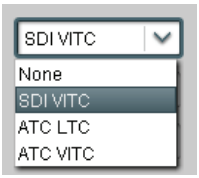


Card-edge Control Menu: **TC**

1	2	
PRI (#)		Priority (1 thru 4)
	None	No source selected
	SVIT	SDI VITC
	ATCL	ATC_LTC
	ATCV	ATC_VITC

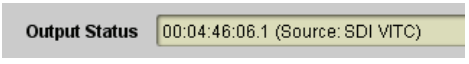
As described here, selects the priority assigned to each of the four supported formats in the event the preferred source is unavailable.

Each of the four Source Priority selection lists allows assignment of source priority from the following choices:

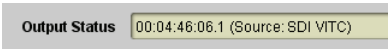


Source Priority 1 thru **Source Priority 4** select the preferred format to be used in descending order (i.e., Source Priority 2 selects the second-most preferred format, and so on.

Output Status Display



Displays the current content and source being used for the timecode data as follows:

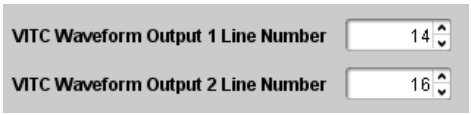


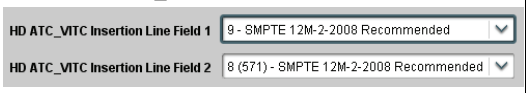
- Output status OK (in this example, running SDI VITC timecode received and outputted).

- 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.

Timecode	(continued)
VITC Waveform Output Line  Card-edge Control Menu: **TC** **1** VITO: (#) — VITC output 1 line number only (6 thru 22) **2**	Selects the VITC1 and VITC2 line numbers (6 thru 22) where the VITC data is inserted when the output is SD. **Note**: Although the output line drop-down will allow any choice within the 6 thru 22 range, the actual range is automatically clamped (limited) to certain ranges to prevent inadvertent conflict with active picture area depending on video format. Refer to the section "**Ancillary Data Line Number Locations and Ranges**" on page 3-14 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. If only one output line is to be used, set both controls for the same line number.
SD VITC Waveform Insertion Control Card-edge Control Menu: **TC** **1** SDVC: Off — SD VITC TC insertion disabled; On — SD VITC TC insertion enabled **2**	Enables or disables VITC waveform timecode insertion into the SD-SDI output stream. **Note: SD VITC Waveform Insertion** control only affects VITC waveforms inserted (or copied to a new line number) by this function. An existing VITC waveform on the SDI input is not affected by this control and in all cases is passes on the SDI output.
SD ATC Insertion Control Card-edge Control Menu: **TC** **1** SDAT: Off — SD ATC TC insertion disabled; On — SD ATC TC insertion enabled **2**	For SD output, enables or disables SD ATC_VITC timecode insertion into the video stream. **Note:** SD ATC_VITC is locked to line 12. The card does not check for conflicts on a given line number. Make certain this line is available if SD ATC_VITC is to be used. Refer to the section "**Ancillary Data Line Number Locations and Ranges**" on page 3-14 for more information.
HD ATC_VITC Insertion Control Card-edge Control Menu: **TC** **1** HFVC: Off — HD ATC_VITC TC insertion disabled; On — HD ATC_VITC TC insertion enabled **2**	For HD output, enables or disables SD ATC_VITC timecode insertion into the video stream.

<table>
<tr><td>
</td><td>(continued)</td></tr>
<tr><td>HD ATC_VITC Line Insertion Controls
 
</td><td>For HD ATC_VITC timecode output, selects the line number for ATC_VITC1 and ATC_VITC2.

Note: Although the output line drop-down will allow any choice within the 8 thru 20 range, the actual range is automatically clamped (limited) to certain ranges to prevent inadvertent conflict with active picture area depending on video format. Refer to the section "Ancillary Data Line Number Locations and Ranges" on page 3-14 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.

If only one output line is to be used, set both controls for the same line number.</td></tr>
<tr><td>HD ATC_LTC Insertion Control

Card-edge Control Menu: TC
<table><tr><th>1</th><th>2</th><th></th></tr><tr><td>HDLT</td><td></td><td></td></tr><tr><td></td><td>Off</td><td>HD ATC LTC timecode insertion disabled</td></tr><tr><td></td><td>On</td><td>HD ATC LTC timecode insertion enabled</td></tr></table></td><td>For HD output, enables or disables ATC_LTC timecode insertion into the video stream.</td></tr>
<tr><td>HD ATC_LTC Line Insertion Control
</td><td>For HD timecode output, selects the line number for ATC_LTC timecode data.

Note: Although the output line drop-down will allow any choice within the 9 thru 20 range, the actual range is automatically clamped (limited) to certain ranges to prevent inadvertent conflict with active picture area depending on video format. Refer to the section "Ancillary Data Line Number Locations and Ranges" on page 3-14 for more information.

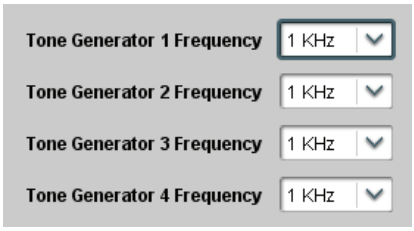
The card does not check for conflicts on a given line number. Make certain the selected line is available and carrying no other data.</td></tr>
<tr><td>ATC_VITC Legacy Support Control

Card-edge Control Menu: TC
<table><tr><th>1</th><th>2</th><th></th></tr><tr><td>AVLS</td><td></td><td></td></tr><tr><td></td><td>Off</td><td>ATC VITC legacy support disabled</td></tr><tr><td></td><td>On</td><td>ATC VITC legacy support enabled</td></tr></table></td><td>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.</td></tr>
</table>

Sets the test tone frequency for each of four tone generators (Tone Generator 1 thru 4).

Frequency Selection Lists



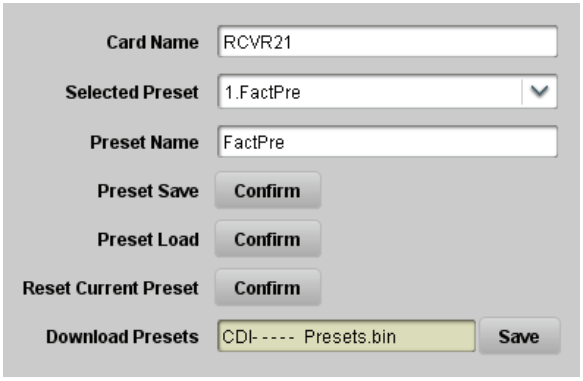
Card-edge Control Menu: **Aud**

1	2	3	
Tone			
	TG1		Select Tone
	...		Generator (1-4)
	TG4		
		50	Select frequency for selected tone generator (in Hz)
		...	
		16K	

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.

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.

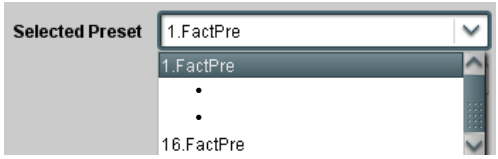


The **Preset Name** field and **Preset Save** button allow custom user setting configurations to be labeled and saved to a Preset for future use.

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 openGear cards.

Each of the items to the left are described in detail on the following pages.

	(continued)
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.

(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.

The factory default settings are as follows:

Function	Parameter/Setting
Audio Mapping (**Embedded Audio Group 1/2** and **Embedded Audio Group 3/4**)	Audio mapping reset for simultaneous embedding and de-embedding: • Discrete AES input channels 1-16 are mapped to embedded audio output channels 1-16. • Embedded audio input channels 1-16 are mapped to discrete AES output channels 1-16.
Audio Input Controls	**AES SRC**, **Passthrough**, and **Zero Delay Embedding** are all disabled.
Audio controls (all audio functions)	All **Gain** and **Phase** (polarity) controls are set to unity and normal, respectively.
Framesync	**Framesync** is disabled; Reference 1 or 2 must be selected to enable the frame sync.
Audio Mixing Up Mixer Selection (Licensable Feature activated only)	Upmixer set to Always Enabled, with upmix function using embedded channels 1 thru 6. • Center width set to 0%. • Surround Depth set to 100%. • 5.1 Detection Threshold set to -150 dB.
Audio LKFS Monitor	**LKFS/Dialnorm Deviation Alarm** set to disabled.

Preset Name

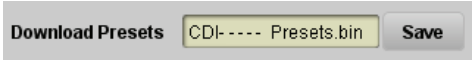
With one of 16 presets selected, provides for entry of custom name for the preset (as shown in example below).

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.

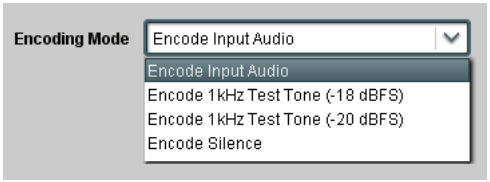
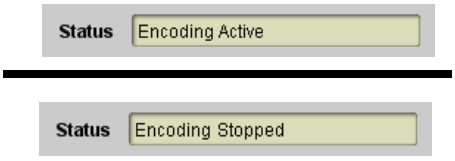
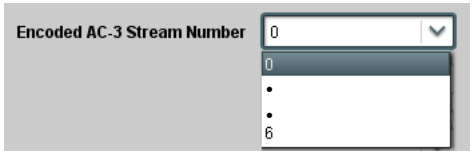
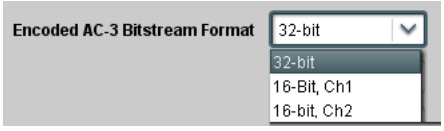
The Preset ID number does not need to be entered; it is added automatically.

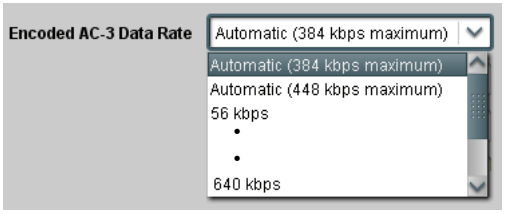
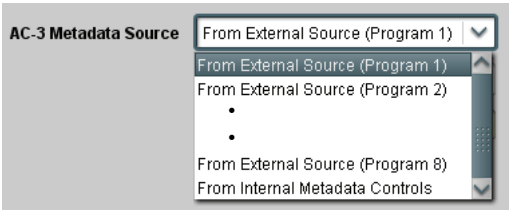
Download Presets



Download Presets allows all 16 presets to be stored to a specified location on a network computer for use with other same-model openGear cards.

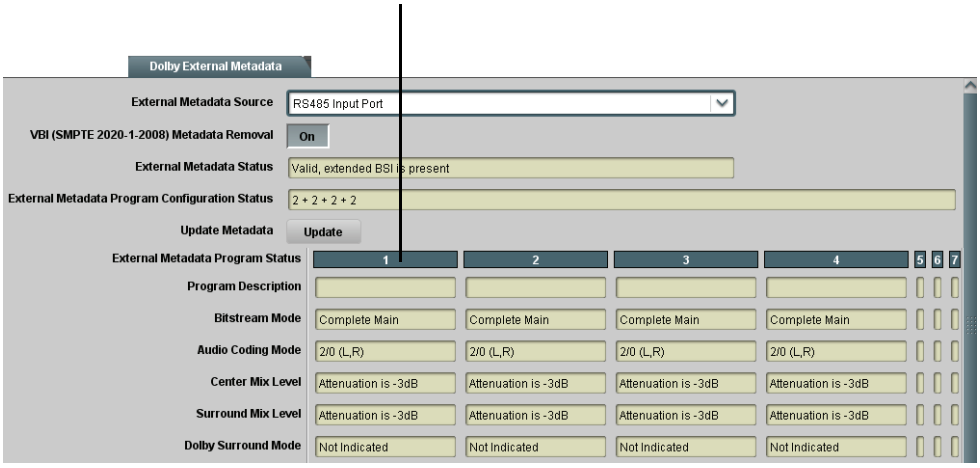
Dolby® Digital (FSE-8241-D only) Functions Submenu List

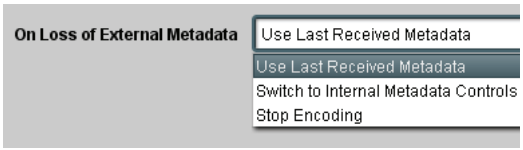
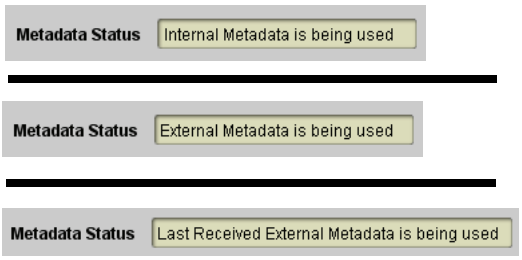
Dolby Encoder	Provides Dolby® metadata source selection/failover controls, AC-3 data handling controls, and metadata/encoding status displays.
Note: After familiarizing yourself with the controls described in the Dolby® functions sections that follow, refer to the section "**Dolby® Digital™ (AC-3) Setup and Routing Example (FSE-8241-D only)**" on page 3-70 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 (page 3-59).
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.

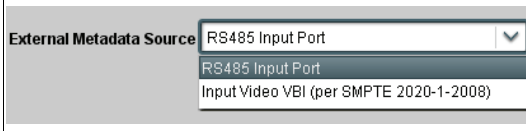
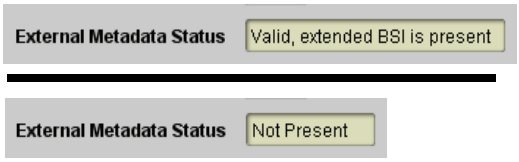
	(continued)
Encoded AC-3 Data Rate 	Where desired, allows selection of alternate AC-3 data rates. Lower settings (where appropriate when used in conjunction with compressed audio formatting) allows for more packet free space. (Output and AES stream always runs at 3.072 Mbps.)
AC-3 Metadata Source 	Selects 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).



	(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.

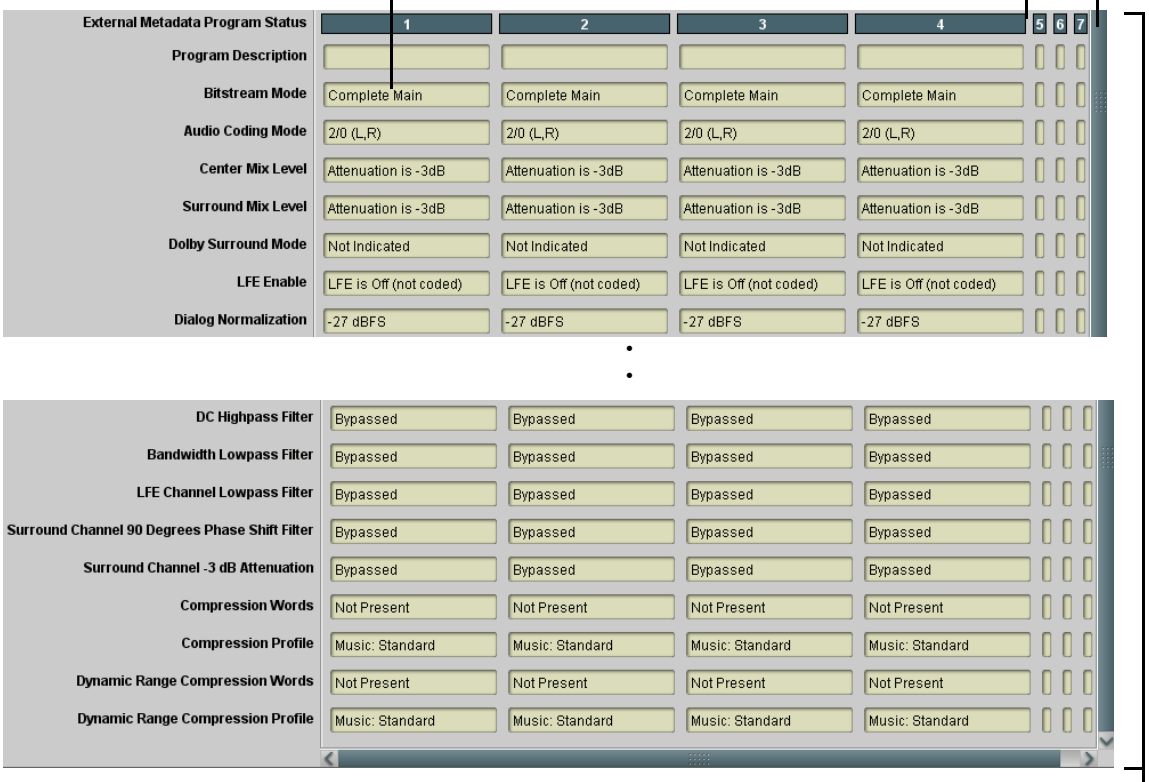
Dolby External Metadata	Provides selection of external metadata physical source and control, and provides status and audio programming detail displays for the external metadata.
External Metadata Source 	Selects the physical source of external metadata to be used as shown to the left. **Note:** RS-485 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.

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 3-3-54.)

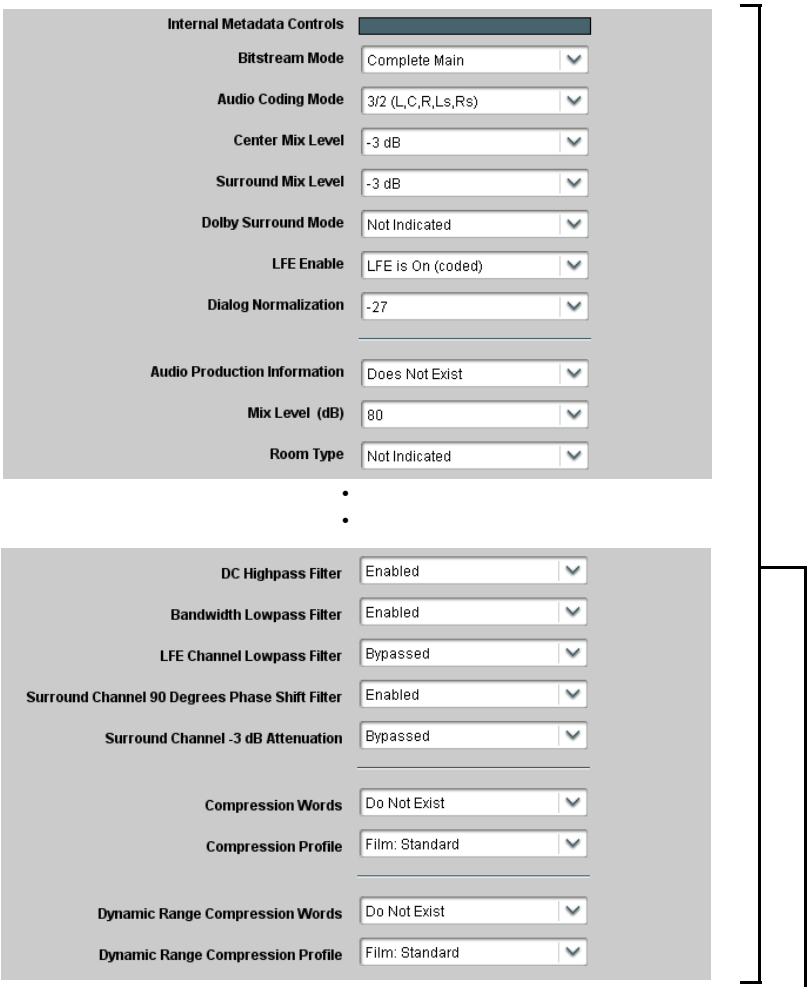
Where AC-3 programs exist for the current metadata coding, the columns show the details for the individual AC-3 programs

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.

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.



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.

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.

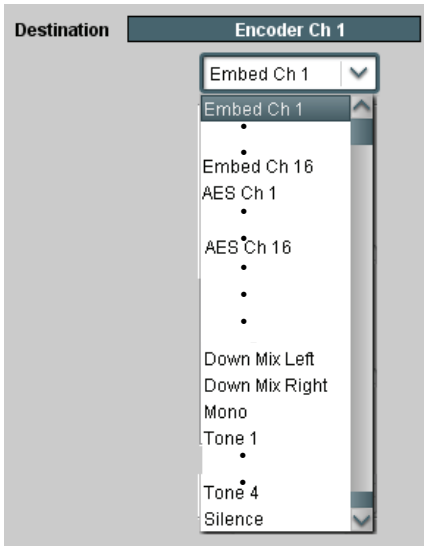
Note: Encoder input channels shown in DashBoard (destination channels Encoder Ch 1 thru Encoder Ch 6) correlate to typical channel designations as shown below. Note that channel designations are a function of encoding. Based on encoding, actual channel designations may vary from the examples shown here.

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

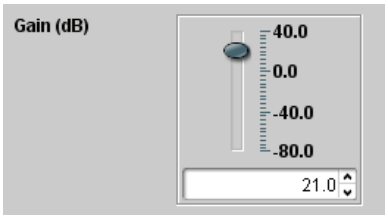
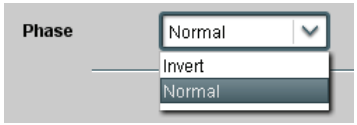
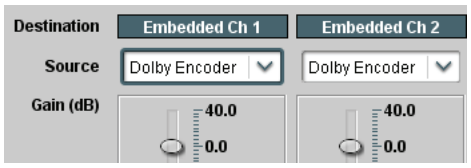
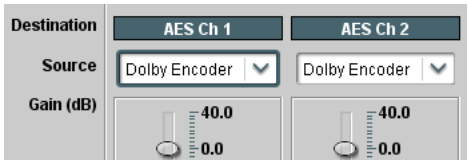
"L" modes (e.g., "3/0L") are LFE-enabled modes (**Internal Metadata** controls or external metadata coding set to produce an LFE channel).

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

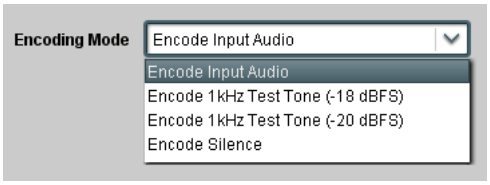
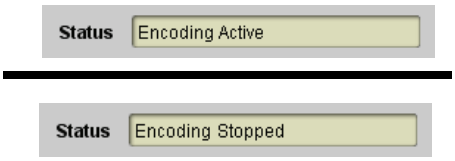
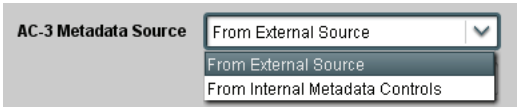
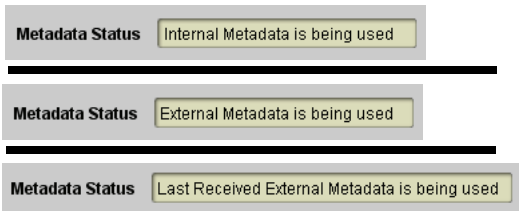
Audio Input Source Select



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, downmix, mono, or tone generator audio source as shown to the left.

	(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 FSE-8241 series card. 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 (FSE-8241-E only) Functions Submenu List

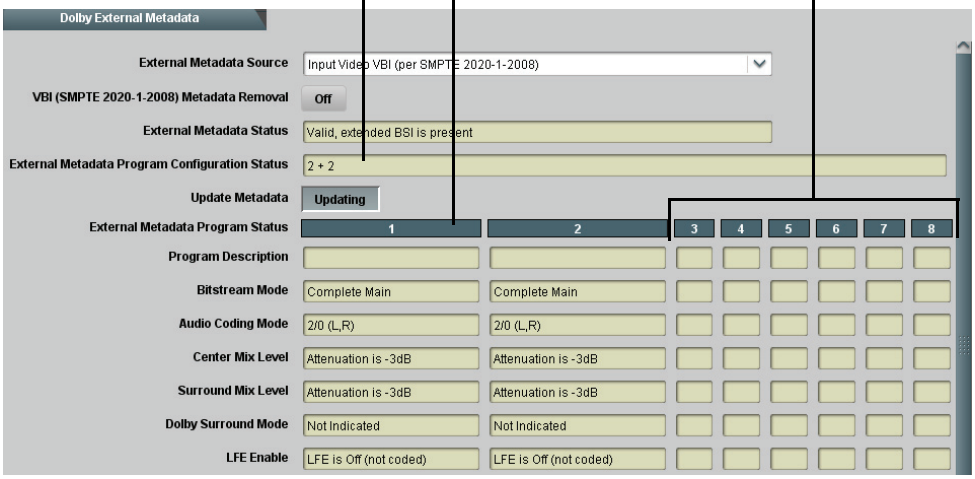
Dolby Encoder	Provides Dolby® metadata source selection/failover controls, AC-3 data handling controls, and metadata/encoding status displays.
Note: After familiarizing yourself with the controls described in the Dolby® functions sections that follow, refer to the section "**Dolby® E Setup and Routing Example (FSE-8241-E only)**" on page 3-72 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 (page 3-65).
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 (page 3-65) 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.

Dolby External Metadata

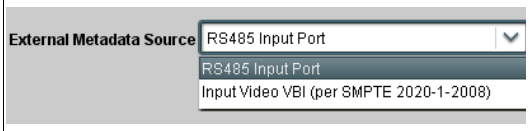
Provides selection of external metadata physical source and control, and provides status and audio programming detail displays for the external metadata.

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.

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

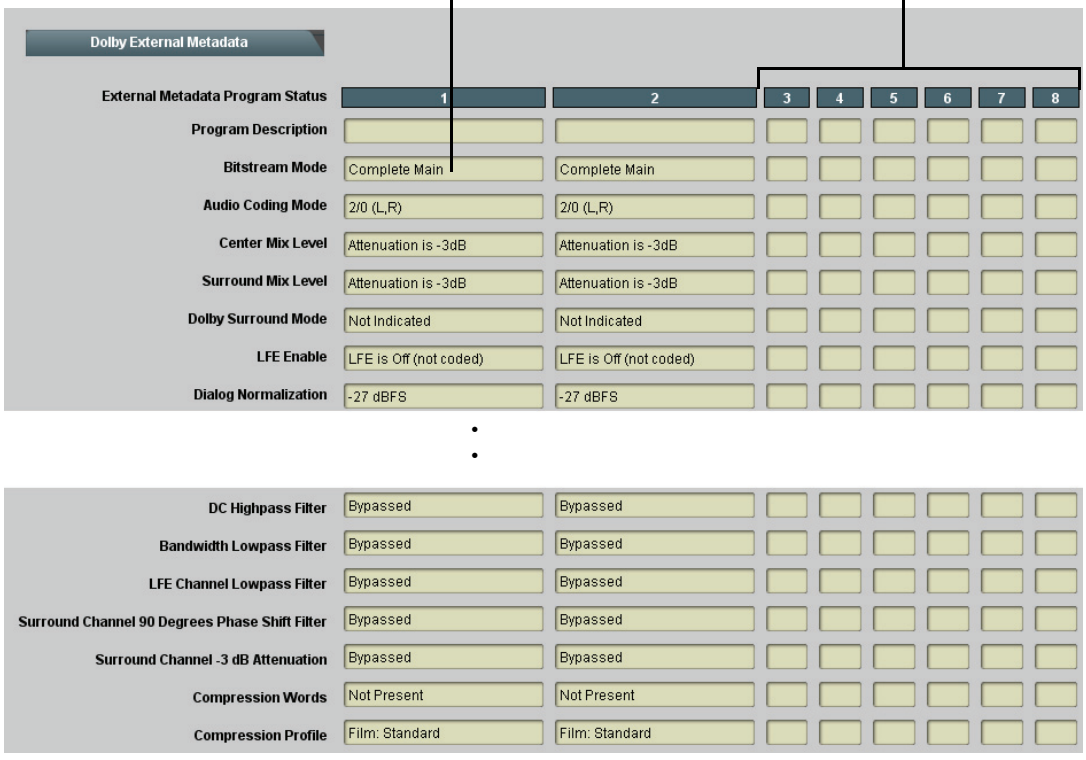
Displays the program configuration of the currently received external metadata (5.1+2 in this example).

Dolby External Metadata	(continued)
Update Metadata Update External Metadata [Update]	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.
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

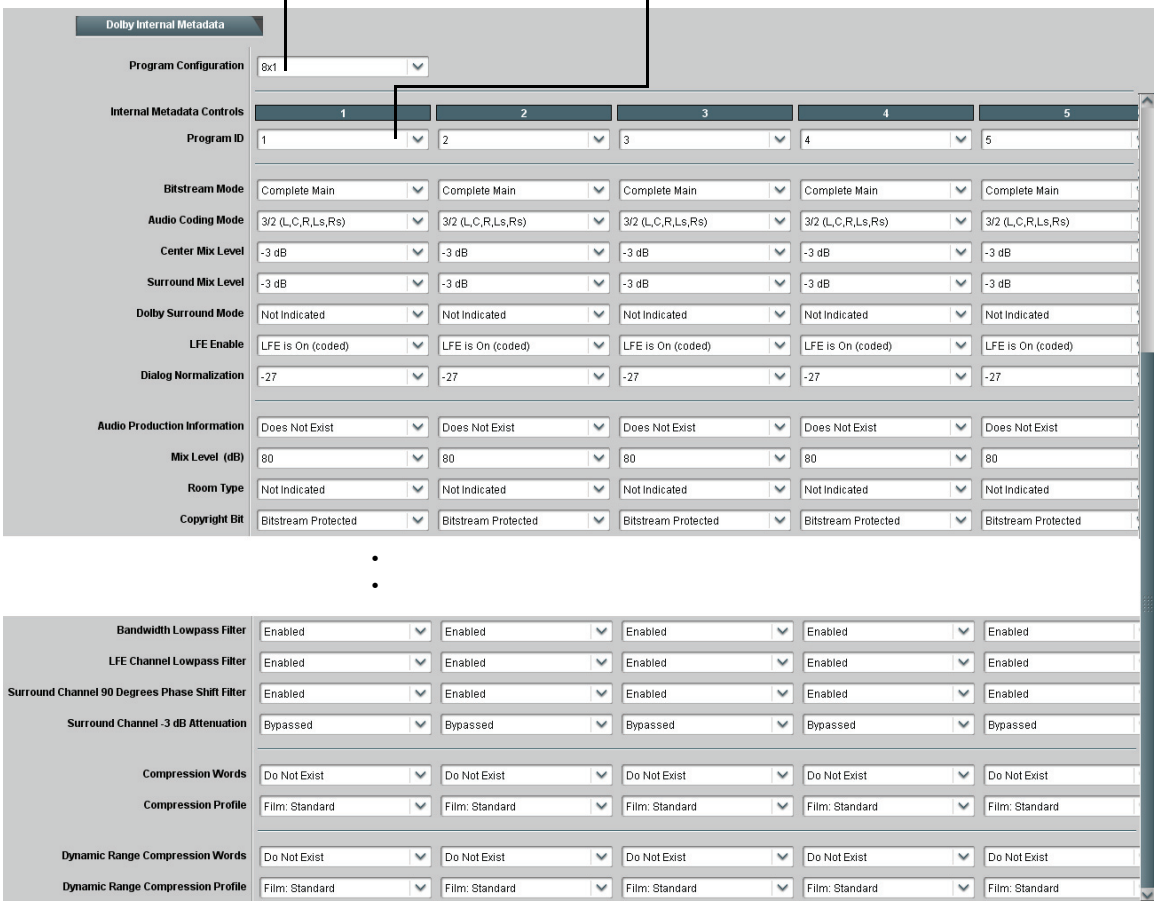


For each AC-3 program as applicable, individual audio production parametric settings and bitstream information is displayed in accordance with the programming inherent in the received metadata.

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.

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.

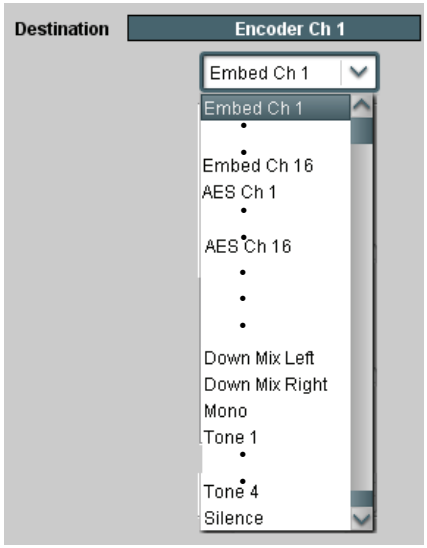
Unnumbered channel designations imply channel 1 where multiple programs exist.

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

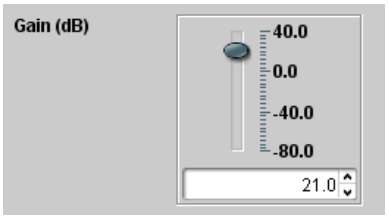
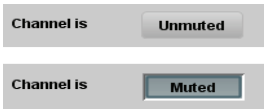
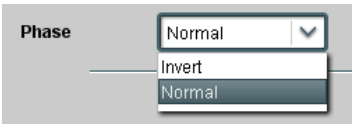
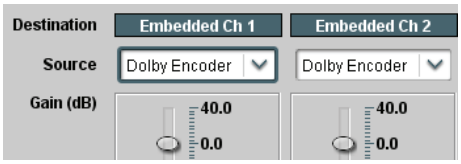
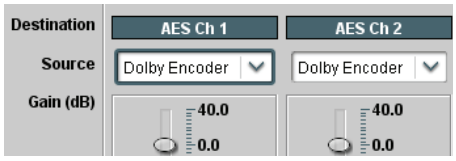
Encoder Input Channel	5.1 + 2	5.1 + 2x1	4 + 4	4 + 2x2	4+2+2x1	4 + 4x1	4 x 2	3x2 + 2x1	2x2 + 4x1	2+6+1	8x1	5.1
Ch 1	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	C	LF
Ch 2	RF	RF	RF	RF	RF	RF	RF	RF	RF	RF	2C	RF
Ch 3	C	C	C	C	C	C	3L	3L	3C	4C	3C	C
Ch 4	LFE	LFE	S	S	S	S	3R	3R	4C	5C	4C	LFE
Ch 5	LS	LS	2C	3L	3C	4C	4L	4C	5C	6C	5C	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 + 2x1	3 x 2	2x2 + 2x1	2 + 4x1	6 x 1	4	2 + 2	2 + 2x1	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, downmix, mono, or tone generator audio source as shown to the left.

	(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 FSE-8241 series card. 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 Card and DashBoard

Audio Routing Example Using DashBoard

Figure 3.11 shows an example of using the FSE-8241 series 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 internal tone generator sources can be embedded into the SDI output.

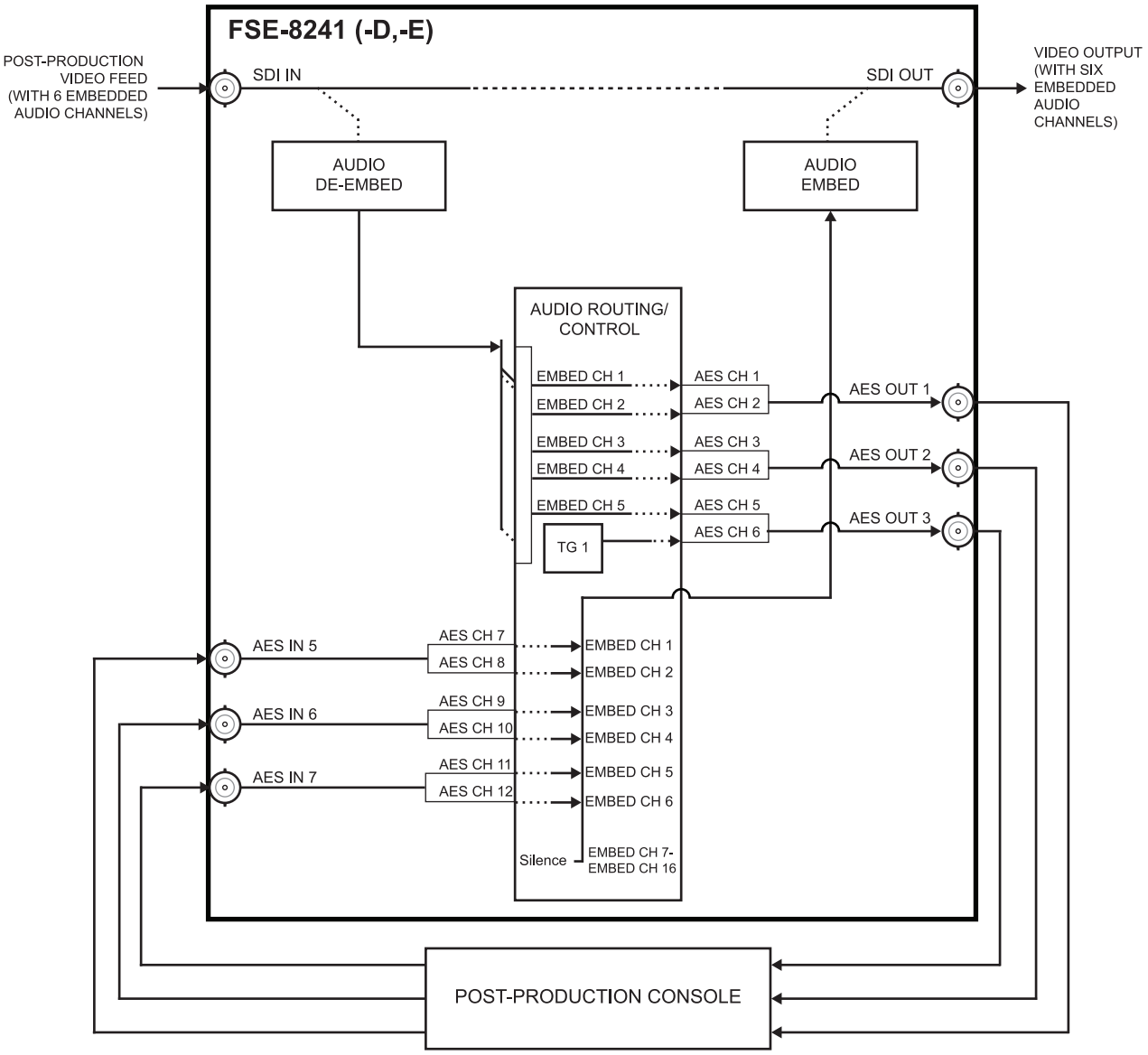
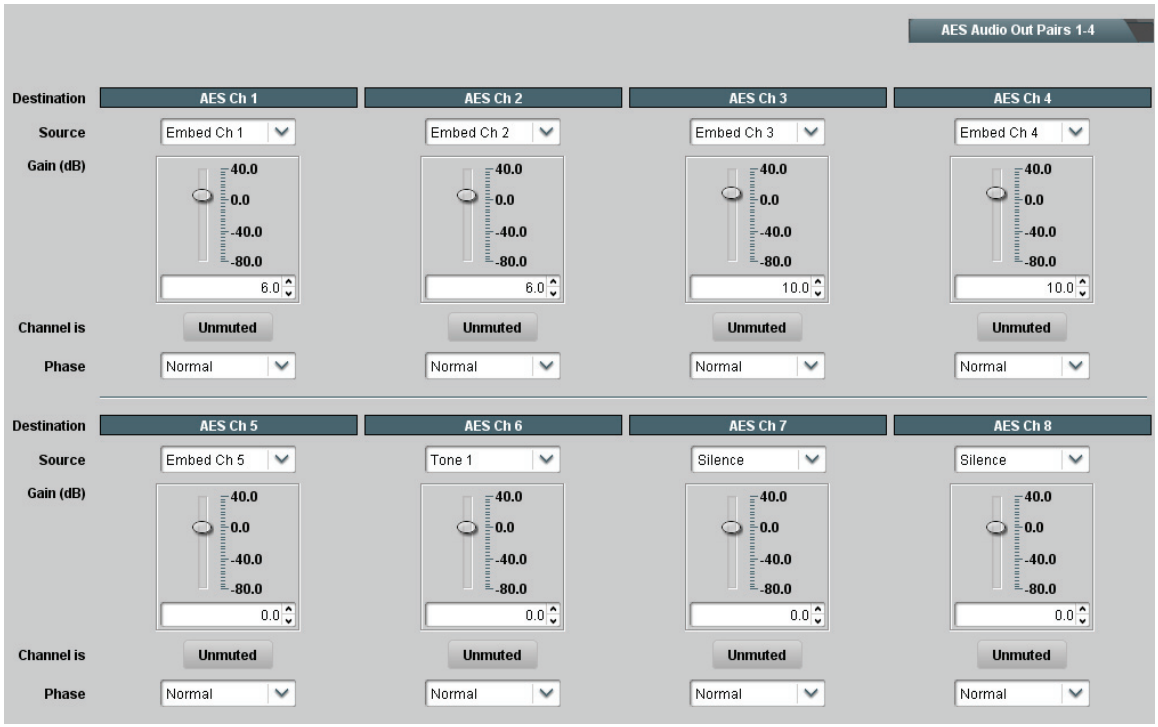
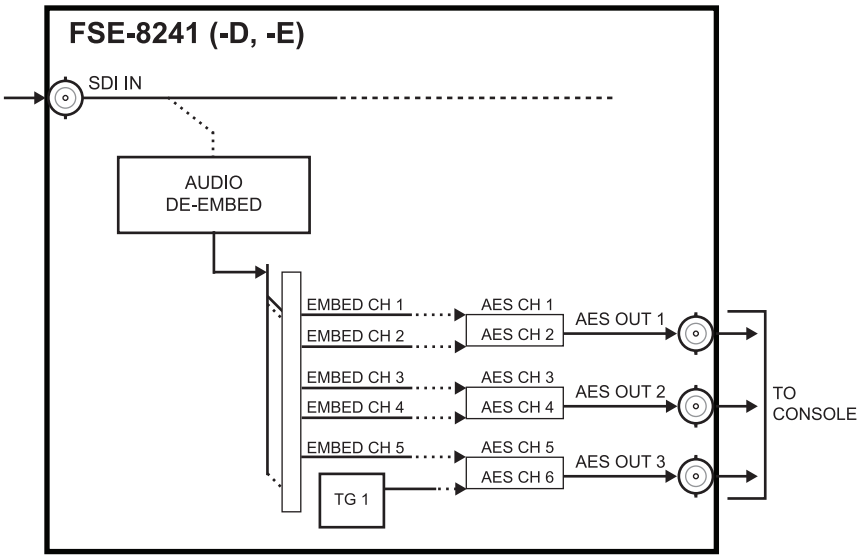


Figure 3.11 *Audio Routing Example (1 of 3)*

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) is routed to AES channel 6. **Figure 3.12** shows the card control settings that result in this routing.

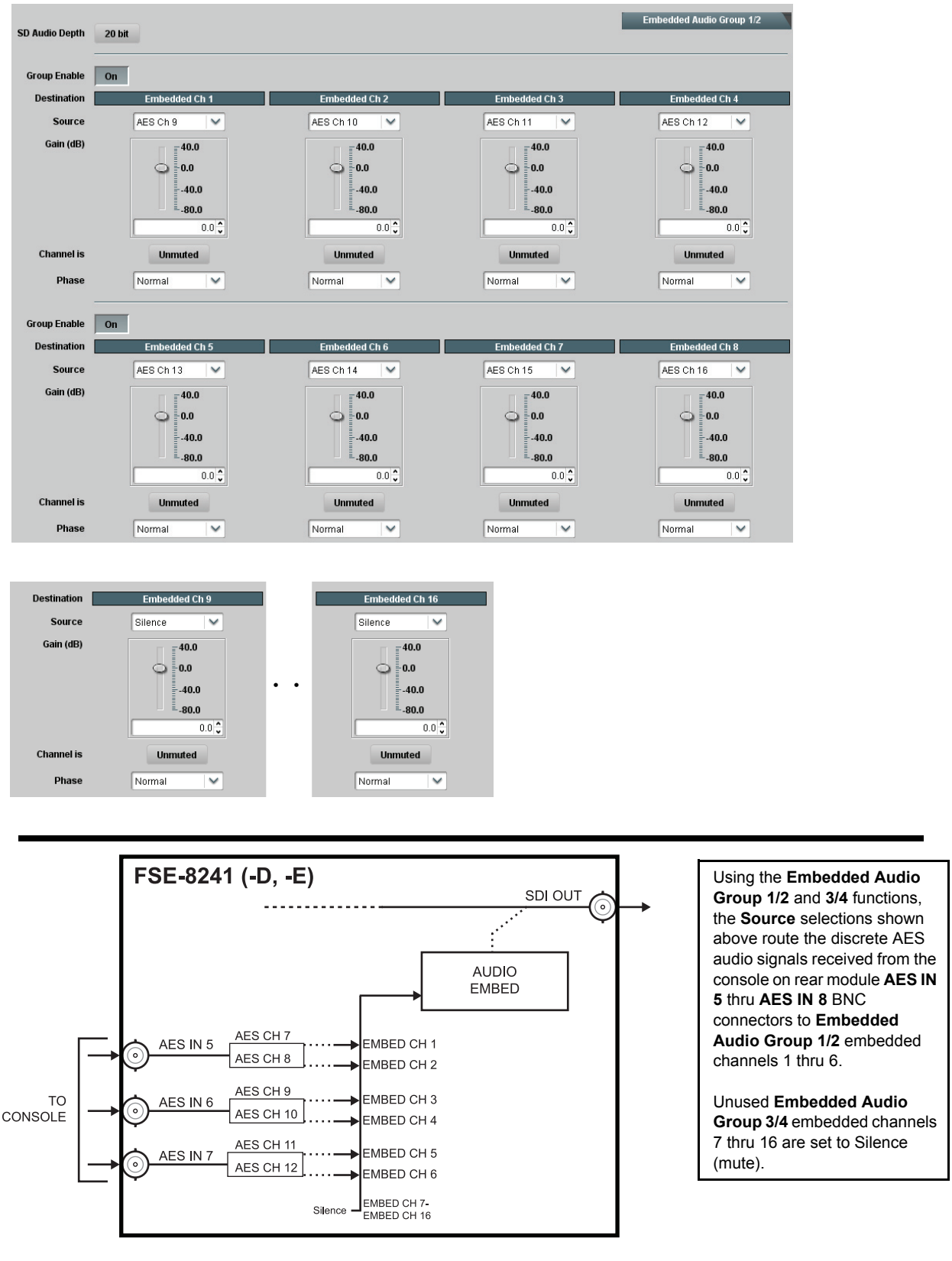




Using the **AES Audio Out Pairs 1-4** function, the **Source** selections shown above route the selected sources to discrete AES channels 1 through 6. These discrete outputs are then available on the card rear module **AES OUT 1** thru **AES OUT 3** BNC connectors to be fed to the console.

Figure 3.12 *Audio Routing Example (2 of 3)*

The discrete AES audio on AES channels 7 thru 16 is now re-embedded using the control settings shown in **Figure 3.13**.



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 module **AES IN 5** thru **AES IN 8** BNC connectors to **Embedded Audio Group 1/2** embedded channels 1 thru 6.

Unused **Embedded Audio Group 3/4** embedded channels 7 thru 16 are set to Silence (mute).

Figure 3.13 *Audio Routing Example (3 of 3)*

Dolby® Digital™ (AC-3) Setup and Routing Example (FSE-8241-D only)

Figure 3.14 shows an example setup of using the FSE-8241-D 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 3.14 shows this setup consisting of steps **A** through **G**. **Figure 3.14** correspondingly shows the DashBoard function tabs and control settings that are used for this setup.

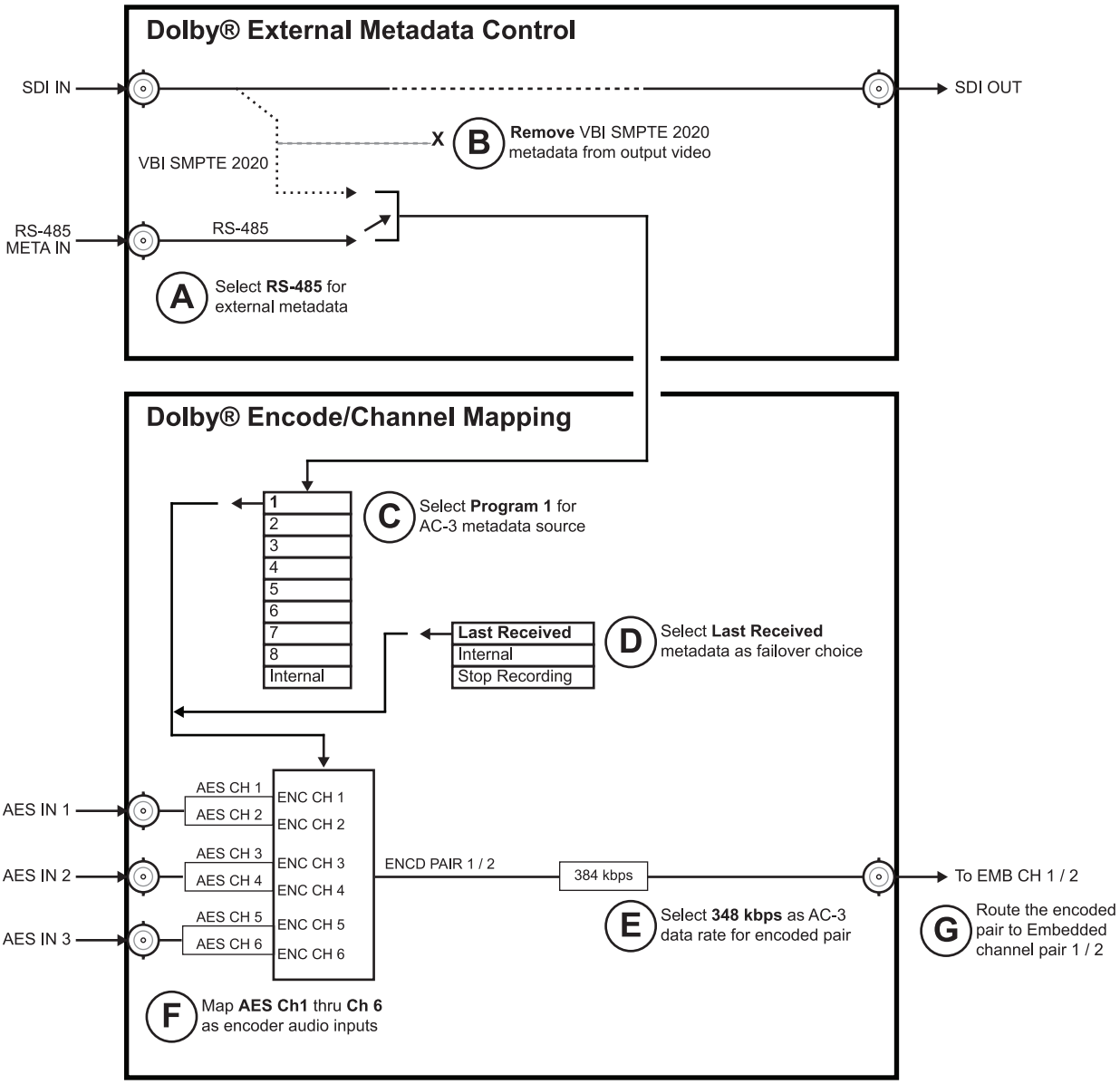


***Figure 3.14** Dolby® Digital™ (AC-3) Setup Example (1 of 2)*

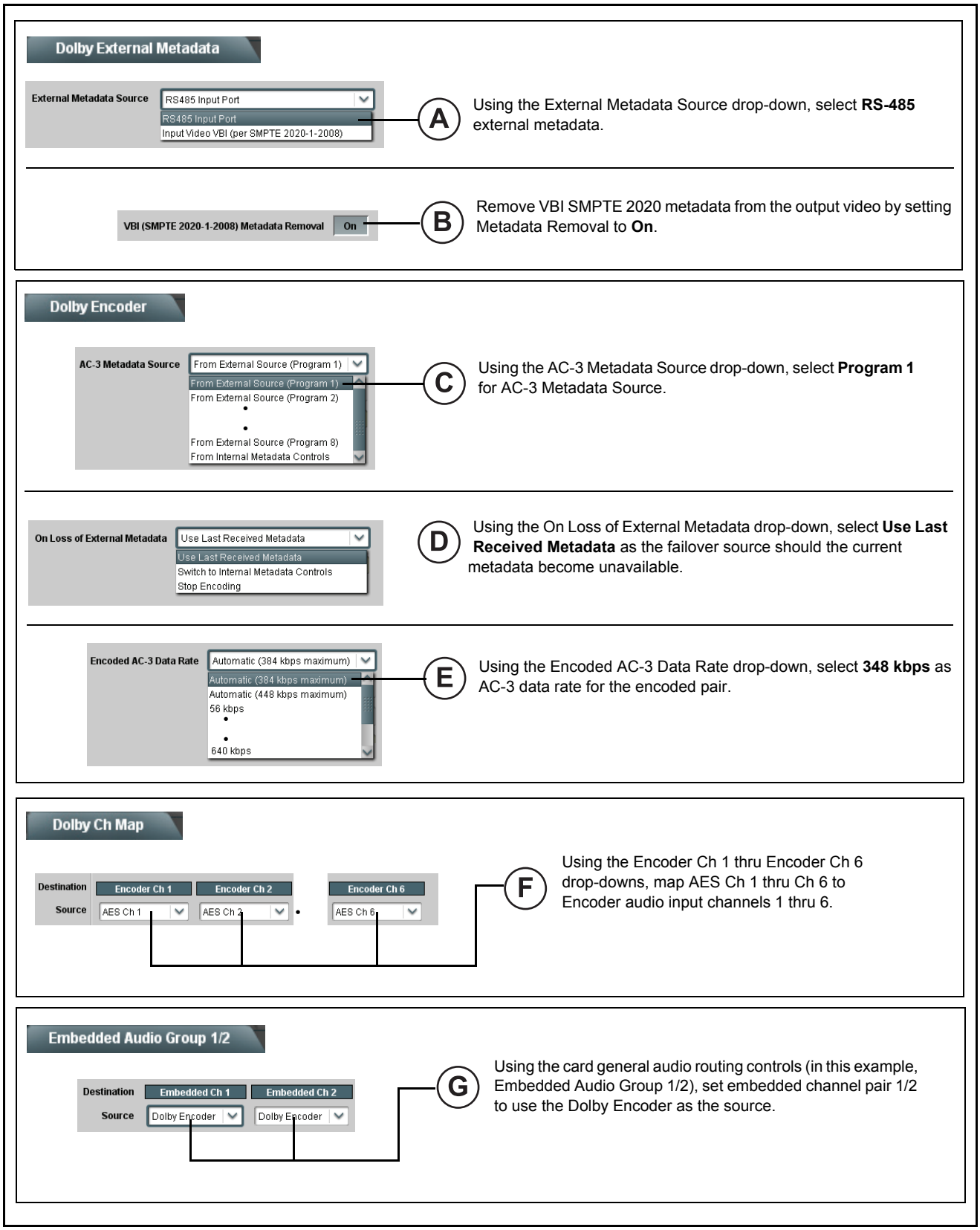


***Figure 3.15** Dolby® Digital™ (AC-3) Setup Example (2 of 2)*

Dolby® E Setup and Routing Example (FSE-8241-E only)

Figure 3.16 shows an example setup of using the FSE-8241-E 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 3.16 shows this setup consisting of steps **A** through **F**. **Figure 3.17** correspondingly shows the DashBoard function tabs and control settings that are used for this setup.

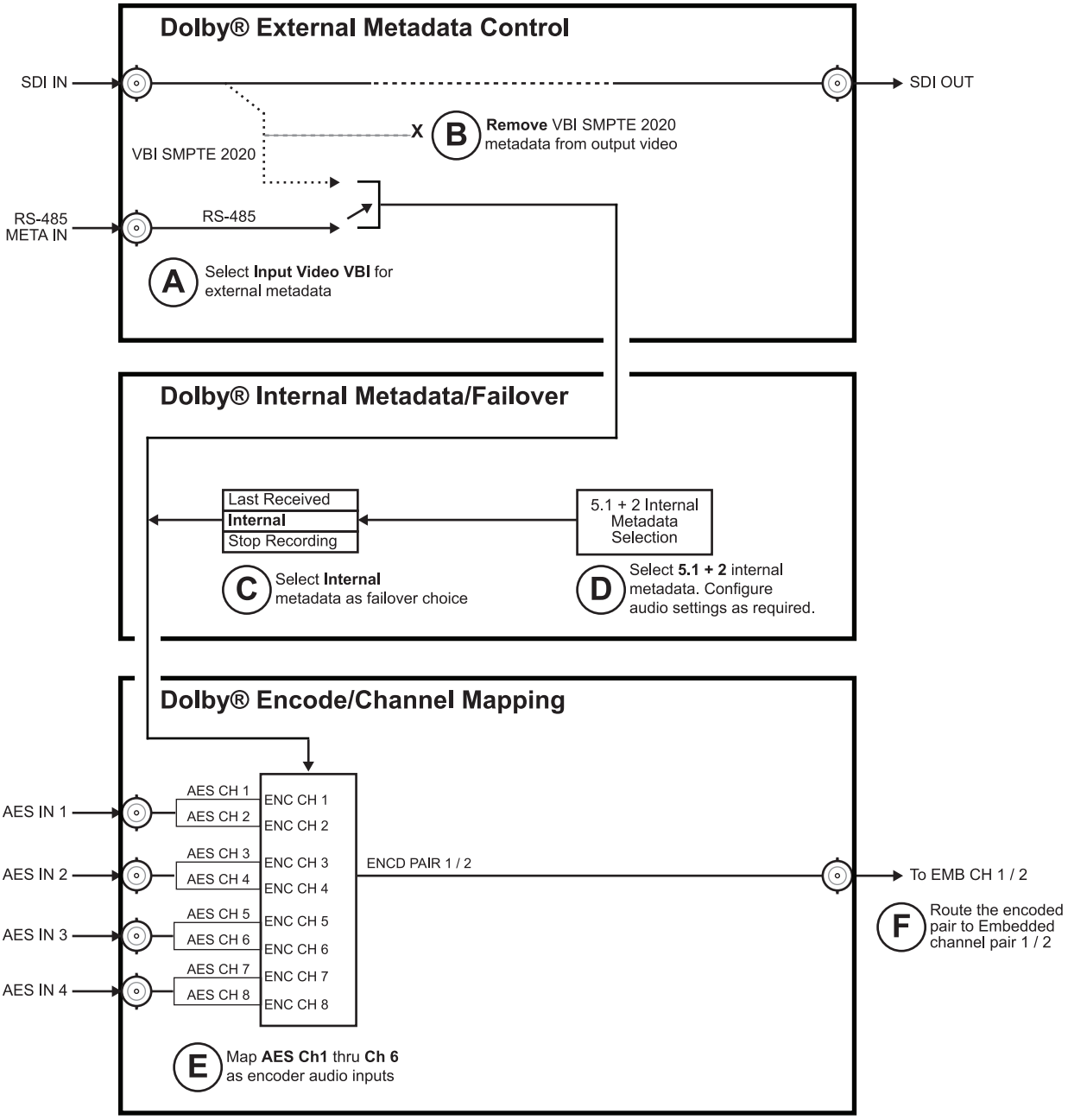


Figure 3.16 *Dolby® E Setup Example (1 of 2)*

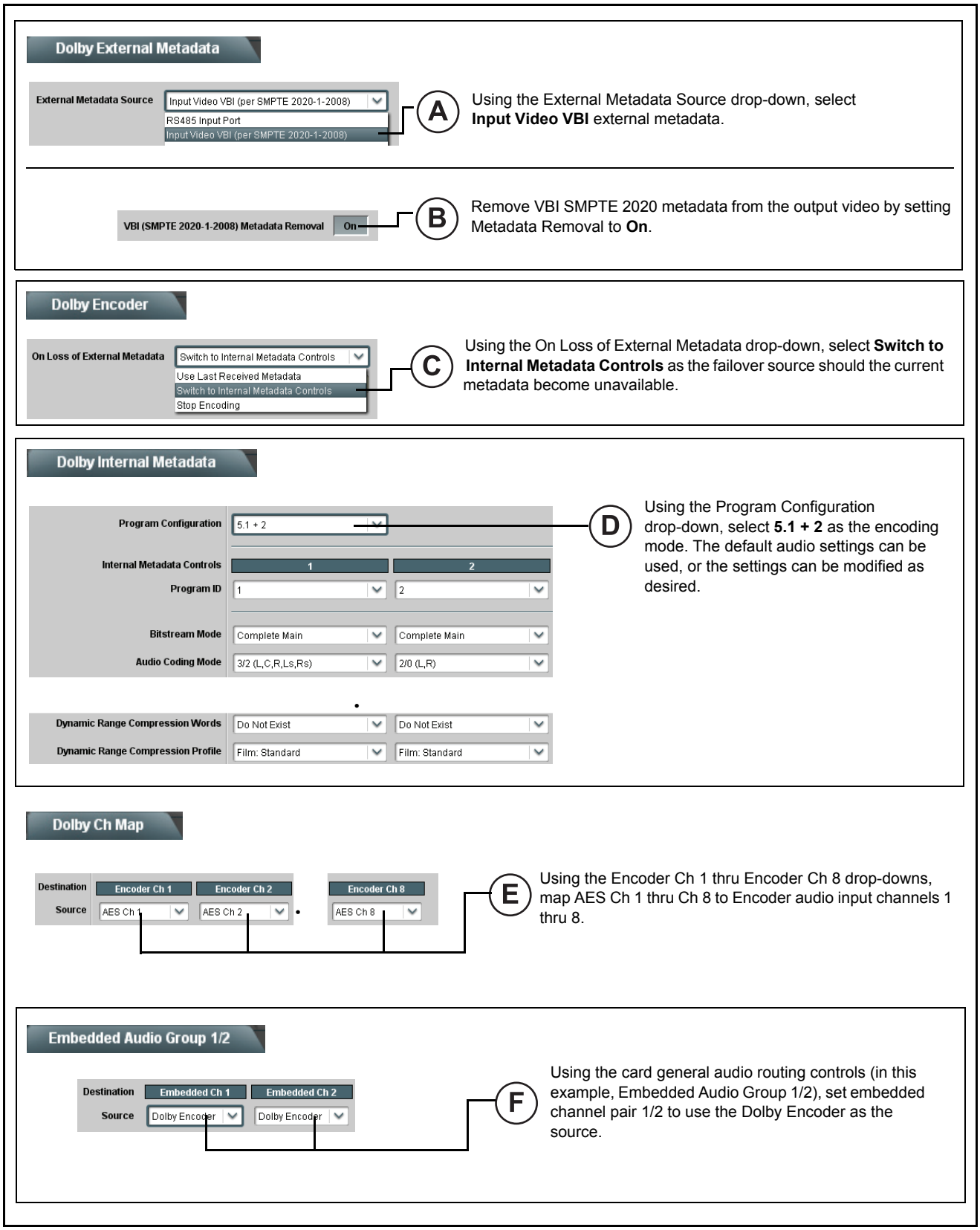


Figure 3.17 *Dolby® E Setup Example (2 of 2)*

Troubleshooting

This section provides general troubleshooting information and specific symptom/corrective action for the FSE-8241 series card. The 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 FSE-8241 series card itself and its remote control systems all (to varying degrees) provide error and failure indications. Depending on how the 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 FSE-8241 series card and remote control error and failure indicators are individually described below.

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**" on page 3-78
- "**Processing Error Troubleshooting**" on page 3-78

Card-edge Status/Error Indicators and Display

Figure 3.18 shows and describes the 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.

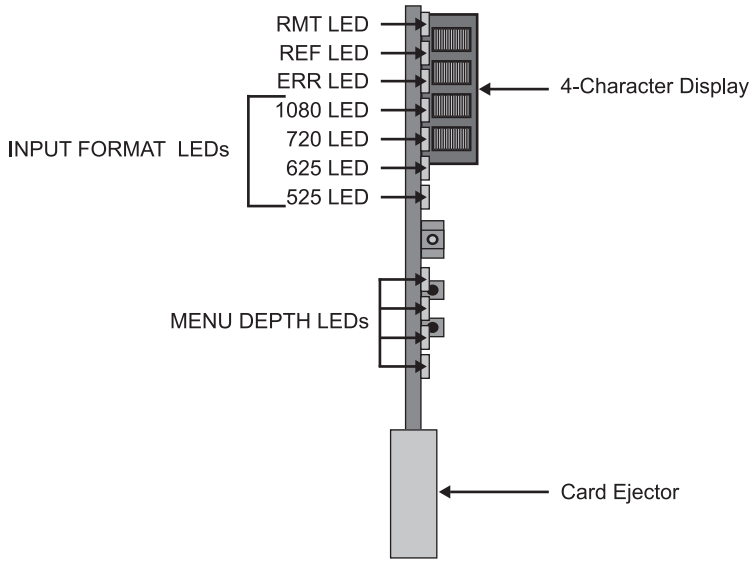


Figure 3.18 *Card-edge Status Indicators and Display*

Table 3.5 Status and Error Indicators

Item	Function
Alphanumeric Display	Displays 4-digit alphanumeric code indicating status or errors as follows: • E0XX: Video Errors • E002: Video Acquiring Lock • 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 720p 23.98 (a reference standard not supported by the framesync) • E203: Reference Standard is 720p 29.97 (a reference standard not supported by the framesync)
RMT LED	Blue LED flashes when card is receiving control message from remote network control (DashBoard)
REF LED	Blue LED illuminates indicating card is receiving valid reference when set up for framesync operation.
ERR LED	Red LED illuminates when card 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 card (1080, 720, 625, 525). Continuous cycling of the LEDs indicates the card has not locked onto a particular format (as in the case of no signal input).

DashBoard Status/Error Indicators and Displays

Table 3.6 shows and describes the DashBoard status indicators and displays. These indicator icons and displays show status and error conditions relating to the card itself and remote (network) communications.

Table 3.6 DashBoard Status Indicators Icons and Displays

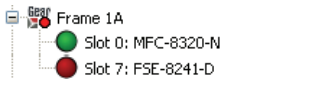
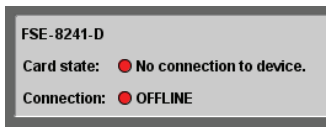
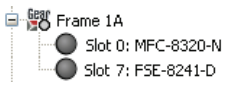
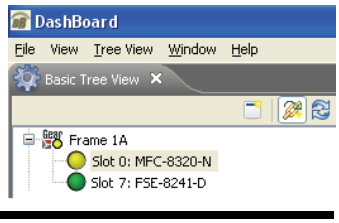
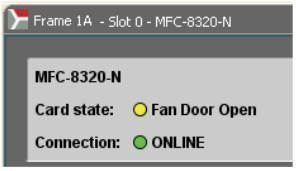
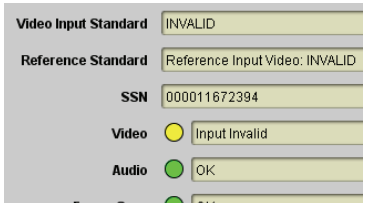
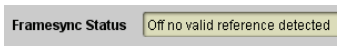
Indicator Icon or Display	Error Description
	Red indicator icon in Card Access/Navigation Tree pane shows card with Error condition (in this example, the Card Access/Navigation Tree pane shows a general error issued by the FSE-8241-D card in slot 7).
	Specific errors are displayed in the Card Info pane (in this example “No connection to device” indicating the card is not connecting to frame/LAN).
	If the 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 FSE-8241-D card in slot 7 and the MFC-8320-N Network Controller Card for its frame in slot 0 are not being seen).

Table 3.6 DashBoard Status Indicators Icons and Displays

Indicator Icon or Display	Error Description
	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 the Card Info pane shows error alert, along with cause for alert (in this example, the FSE-8241-D 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).

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 3.19**).

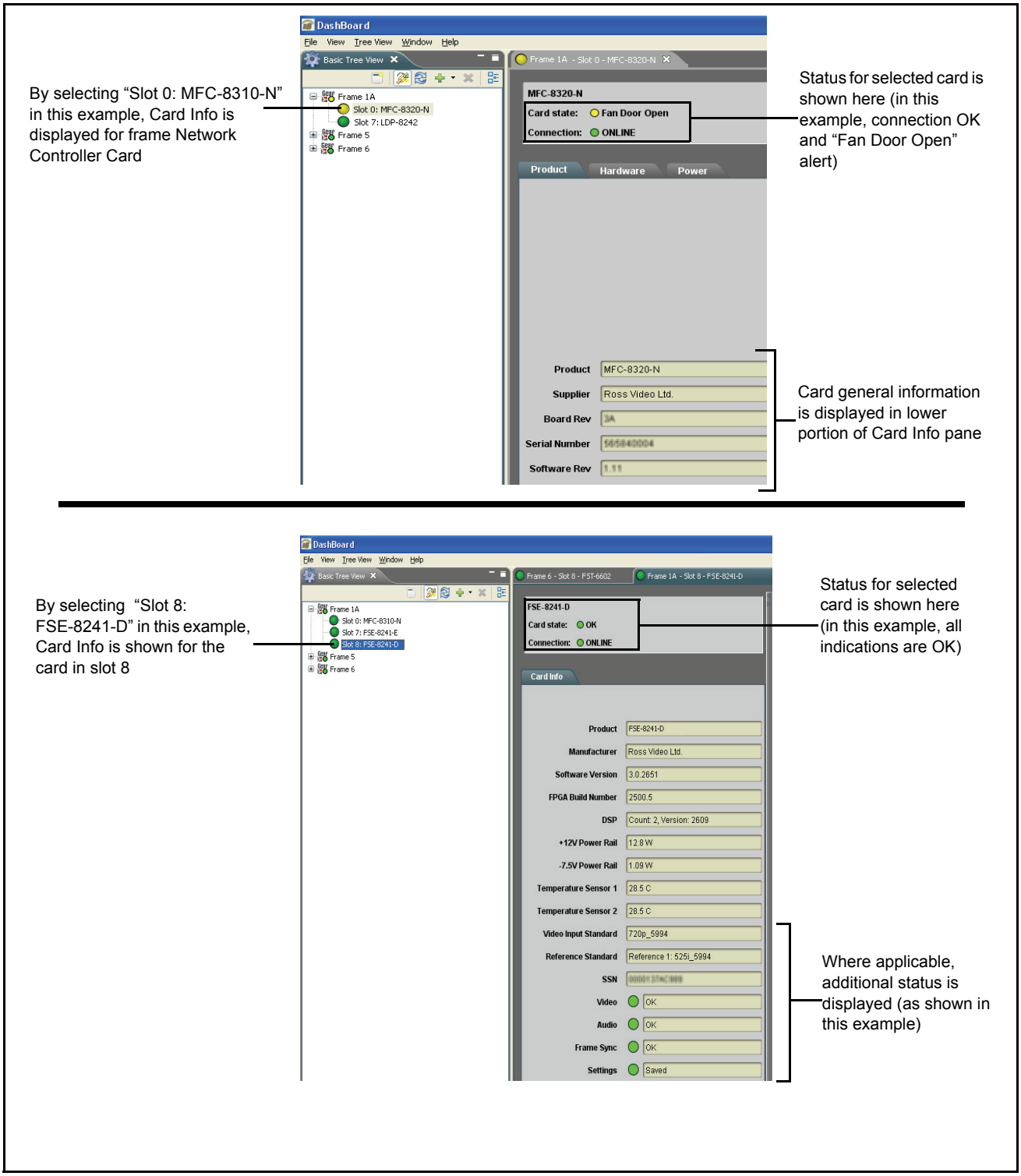


Figure 3.19 *Selecting Specific Cards for Card Info Status Display*

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 3.7** 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 3.7 Basic Troubleshooting Checks

Item	Checks
Verify power presence and characteristics	On both the frame Network Controller Card and the FSE-8241 series card, 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 FSE-8241 series card. This can be observed using the DashBoard Card Info pane, or using the card edge controls and indicators as shown in **Figure 3.8** on page 3-3-13. • If either of the rail supplies show **no** power being consumed, either the frame power supply, connections, or the FSE-8241 series card itself is defective. • If either of the rail supplies show **excessive** power being consumed (refer to the section "**Technical Specifications**" on page 4-2), the FSE-8241 series 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 FSE-8241 series 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.

Processing Error Troubleshooting

Table 3.8 provides FSE-8241 series processing troubleshooting information. If the FSE-8241 series card exhibits any of the symptoms listed in **Table 3.8**, follow the troubleshooting instructions provided.

In the majority of cases, most errors are caused by simple errors where the FSE-8241 series card is not appropriately set for the type of signal being received by the card.

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 FSE-8241 series card edge status indicators.

Where errors are displayed on both the FSE-8241 series card and network remote controls, the respective indicators and displays are individually described in this section.

Table 3.8 Troubleshooting Processing Errors by Symptom

Symptom	Error/Condition	Corrective Action
• **DashBoard** shows **Video** yellow icon and Input Invalid message in Card Info pane. • Card-edge **Input Format** LEDs show continuous cycling.	No video input present	Make certain intended video source is connected to appropriate FSE-8241 series card video input. Make certain BNC cable connections between frame Rear Module for the card and signal source are OK.
• **DashBoard** shows **Frame Sync** red icon and Reference Invalid message in 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 FSE-8241 series card and other cards via a frame bus.) Refer to **Framesync** function submenu tab on page 3-3-21 for more information.
DashBoard shows **Framesync Status** error message in FSE-8241 series card Framesync function submenu screen. 	Specified Minimum Latency Frames setting exceeds FSE-8241 series 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 3-3-21 for more information.
Ancillary data (closed captioning, timecode, Dolby® metadata, AFD) not transferred through the FSE-8241 series card.	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 (refer to the section "**Ancillary Data Line Number Locations and Ranges**" on page 3-14.

Table 3.8 Troubleshooting Processing Errors by Symptom

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 3-3-17 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 3-3-17 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 FSE-8241 series 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 3.8 Troubleshooting Processing Errors by Symptom

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. Refer to the section "**Setting I/O Switches for AES I/O (1-4) Ports**" on page 2-3 for more information.
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. Refer to the section "**Dolby Digital External Metadata**" on page 3-56 or the section "**Dolby E External Metadata**" on page 3-62 for details.
	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. Refer to the section "**Dolby Digital Encoder**" on page 3-53 or the section "**Dolby E Encoder**" on page 3-61 for details.

In Case of Problems

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

Specifications

In This Chapter

This chapter provides the technical specification information for the FSE-8241 series. Note that technical specifications are subject to change without notice.

The following topics are discussed:

- Technical Specifications

Technical Specifications

This section provides technical specifications for the FSE-8241 series.

Table 4.1 FSE-8241 series Technical Specifications

Category	Parameter	Specification
SDI Inputs	Number of Inputs	
	SMPTE Standards Accommodated	SMPTE 292 HD-SDI: 1.485 Gbps or 1.485/1.001 Gbps SMPTE 259M-C SD-SDI: 270 Mbps
	Impedance	75Ω terminating
	Equalization	HD: 328ft (100m) Belden 1694A
		SD: 1000ft (305m) Belden 1694A
	Return Loss	>15dB at 5MHz – 1.485GHz
SDI Outputs	Number of Outputs	2 processed HD/SD-SDI BNC per IEC 60169-8 Amendment 2 2 buffered reclocked input copies
	SMPTE Standards Accommodated	
	Impedance	75Ω
	Return Loss	>15dB at 5MHz – 270MHz
		>12dB at 270MHz – 1.485GHz
	Signal Level	800mV ± 10%
	DC Offset	0V ± 50mV
	Jitter	HD: <0.15UI (all outputs)
		SD: <0.10UI (all outputs)
	Overshoot	< 0.2% of amplitude
Pre-Processor (Reclocked) SDI Outputs	Number of Outputs	2 HD/SD-SDI BNC per IEC 60169-8 Amendment 2
	Impedance	75Ω
AES Audio Inputs	Number of Inputs (maximum)	8 unbalanced
	SMPTE Standards Accommodated	SMPTE 276M
	Input Level	0.1 to 2.5Vp-p (5Vp-p tolerant)
	Input Impedance	75Ω
	Return Loss	>12dB at 100kHz to 6MHz
	Resolution	24-bit only
	Sample Rate	48kHz
	SRC	32-channel; 142dB S/N

Table 4.1 FSE-8241 series Technical Specifications

Category	Parameter	Specification
AES Audio Outputs	Number of Outputs (maximum)	4 unbalanced AES 4 unbalanced Dolby® encoded pair output copies
	SMPTE Standards Accommodated	SMPTE 276M
	Output Impedance	75Ω
AES Audio Outputs	Return Loss	>30dB 100kHz to 6MHz
	Sample Rate	48kHz
FSE-8241-D	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.
FSE-8241-E	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.
Dolby® External Metadata	Inputs	User-selectable from de-muxed metadata on input video (per SMPTE 2020-1-2008), or from RS-485 interface
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
		SD: 486i 29.97 (NTSC), 575i 25 (PAL)
	Signal Level	1Vp-p nominal
	Signal Type	Analog video sync (black burst or tri-level)
	Impedance	75Ω
	Return Loss	> 30dB to 30MHz
	Allowable Maximum DC on Ref Input	±1.0V
Other	Internal Tone Generators	Four built-in tone generators, each configurable for 18 discrete sine wave frequencies ranging from 50Hz to 16kHz Generator source signal level is equivalent to -20dBu
	Frame Communications	10/100Mbps Ethernet with Auto-MDIX
Environment	Operating Temperature	32°F – 104°F (0°C – 40°C)
	Relative Humidity (operating or storage)	< 95%, non-condensing
Power	Max. Power Consumption	< 15W

Service Information

In This Chapter

This chapter contains the following sections:

- Troubleshooting Checklist
- Warranty and Repair Policy

Troubleshooting Checklist

Routine maintenance to this openGear product is not required. In the event of problems with your FSE-8241 series, the following basic troubleshooting checklist may help identify the source of the problem. If the frame still does not appear to be working properly after checking all possible causes, please contact your openGear products distributor, or the Technical Support department at the numbers listed under the "**Contact Us**" section.

1. **Visual Review** — Performing a quick visual check may reveal many problems, such as connectors not properly seated or loose cables. Check the card, the frame, and any associated peripheral equipment for signs of trouble.
2. **Power Check** — Check the power indicator LED on the distribution frame front panel for the presence of power. If the power LED is not illuminated, verify that the power cable is connected to a power source and that power is available at the power main. Confirm that the power supplies are fully seated in their slots. If the power LED is still not illuminated, replace the power supply with one that is verified to work.
3. **Re-seat the Card in the Frame** — Eject the card and re-insert it into the frame.
4. **Check Control Settings** — Refer to the Installation and User Controls sections of this manual to verify all user-adjustable component settings
5. **Input Signal Status** — Verify that source equipment is operating correctly and that a valid signal is being supplied.
6. **Output Signal Path** — Verify that destination equipment is operating correctly and receiving a valid signal.
7. **Unit Exchange** — Exchanging a suspect unit with a unit that is known to be working correctly is an efficient method for localizing problems to individual units.

Warranty and Repair Policy

The FSE-8241 series cards are warranted to be free of any defect with respect to performance, quality, reliability, and workmanship for a period of FIVE (5) years from the date of shipment from our factory. In the event that your FSE-8241 series card proves to be defective in any way during this warranty period, Ross Video Limited reserves the right to repair or replace this piece of equipment with a unit of equal or superior performance characteristics.

Should you find that this FSE-8241 series card has failed after your warranty period has expired, we will repair your defective product should suitable replacement components be available. You, the owner, will bear any labor and/or part costs incurred in the repair or refurbishment of said equipment beyond the FIVE (5) year warranty period.

In no event shall Ross Video Limited be liable for direct, indirect, special, incidental, or consequential damages (including loss of profits) incurred by the use of this product. Implied warranties are expressly limited to the duration of this warranty.

This FSE-8241 series User Manual provides all pertinent information for the safe installation and operation of your openGear Product. Ross Video policy dictates that all repairs to the FSE-8241 series cards are to be conducted only by an authorized Ross Video Limited factory representative. Therefore, any unauthorized attempt to repair this product, by anyone other than an authorized Ross Video Limited factory representative, will automatically void the warranty. Please contact Ross Video Technical Support for more information.

In Case of Problems

Should any problem arise with your FSE-8241 series card, please contact the Ross Video Technical Support Department. (Contact information is supplied at the end of this publication.)

A Return Material Authorization number (RMA) will be issued to you, as well as specific shipping instructions, should you wish our factory to repair your FSE-8241 series card. If required, a temporary replacement frame will be made available at a nominal charge. Any shipping costs incurred will be the responsibility of you, the customer. All products shipped to you from Ross Video Limited will be shipped collect.

The Ross Video Technical Support Department will continue to provide advice on any product manufactured by Ross Video Limited, beyond the warranty period without charge, for the life of the equipment.

Contact Us

Contact our friendly and professional support representatives for the following:

- Name and address of your local dealer
- Product information and pricing
- Technical support
- Upcoming trade show information

PHONE	**General Business Office and Technical Support**	613 • 652 • 4886
	After Hours Emergency	613 • 349 • 0006
	Fax	613 • 652 • 4425
E-MAIL	**General Information**	solutions@rossvideo.com
	Technical Support	techsupport@rossvideo.com
POSTAL SERVICE	**Ross Video Limited**	8 John Street, Iroquois, Ontario, Canada K0E 1K0
	Ross Video Incorporated	P.O. Box 880, Ogdensburg, New York, USA 13669-0880

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