FSE-8241-D, FSE-8241-E
HD/SD-SDI Frame Synchronizer with Dolby® Encoding
User Manual
Important Regulatory and Safety Notices

Before using this product and any associated equipment, refer to the “Important Safety Instructions” listed below to avoid personnel injury and to prevent product damage.

Products may require specific equipment, and/or installation procedures to be carried out to satisfy certain regulatory compliance requirements. Notices have been included in this publication to call attention to these specific requirements.

Symbol Meanings

![Warning](Image) **Warning** — The symbol with the word “Warning” within the equipment manual indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

![Caution](Image) **Caution** — The symbol with the word “Caution” within the equipment manual indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

![Notice](Image) **Notice** — The symbol with the word “Notice” within the equipment manual indicates a situation, which if not avoided, may result in major or minor equipment damage or a situation which could place the equipment in a non-compliant operating state.

![ESD Susceptibility](Image) **ESD Susceptibility** — This symbol is used to alert the user that an electrical or electronic device or assembly is susceptible to damage from an ESD event.

Important Safety Instructions

![Caution](Image) **Caution** — This product is intended to be a component product of the DFR-8300 series frame. Refer to the DFR-8300 series frame User Manual for important safety instructions regarding the proper installation and safe operation of the frame as well as its component products.

![Warning](Image) **Warning** — Certain parts of this equipment namely the power supply area still present a safety hazard, with the power switch in the OFF position. To avoid electrical shock, disconnect all A/C power cards from the chassis’ rear appliance connectors before servicing this area.

![Warning](Image) **Warning** — Service barriers within this product are intended to protect the operator and service personnel from hazardous voltages. For continued safety, replace all barriers after any servicing. This product contains safety critical parts, which if incorrectly replaced may present a risk of fire or electrical shock. Components contained with the product’s power supplies and power supply area, are not intended to be customer serviced and should be returned to the factory for repair. To reduce the risk of fire, replacement fuses must be the same time and rating. Only use attachments/accessories specified by the manufacturer.
EMC Notices

**United States of America**

**FCC Part 15**

This equipment has been tested and found to comply with the limits for a class A Digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

---

**Notice** — Changes or modifications to this equipment not expressly approved by Ross Video Limited could void the user’s authority to operate this equipment.

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**CANADA**

This Class “A” digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe “A” est conforme à la norme NMB-003 du Canada.

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**EUROPE**

This equipment is in compliance with the essential requirements and other relevant provisions of CE Directive 93/68/EEC.

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**INTERNATIONAL**

This equipment has been tested to CISPR 22:1997 along with amendments A1:2000 and A2:2002, and found to comply with the limits for a Class A Digital device.

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**Notice** — This is a Class A product. In domestic environments, this product may cause radio interference, in which case the user may have to take adequate measures.

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**Maintenance/User Serviceable Parts**

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.
Environmental Information

The equipment that you purchased required the extraction and use of natural resources for its production. It may contain hazardous substances that could impact health and the environment.

To avoid the potential release of those substances into the environment and to diminish the need for the extraction of natural resources, Ross Video encourages you to use the appropriate take-back systems. These systems will reuse or recycle most of the materials from your end-of-life equipment in an environmentally friendly and health conscious manner. For product disposal, ensure the following:

- Do not dispose of this product as unsorted municipal waste.
- Collect this product separately.
- Use collection and return systems available to you.

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
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.

Figure 1.1 Simplified Block Diagram

*Available on the R2-8241 rear modules only
**Refer to the sections “FSE-8241-D Overview” and “FSE-8241-E Overview” for details.
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 handle 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 sync-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.
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.

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)
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.

![Audio Mono Mix Functional Block Diagram with Example Sources](image)

**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 function 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.

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<td>1080p</td>
<td>Raster Structure: 23.98; 24</td>
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<tr>
<td>1080i (1)</td>
<td>Raster Structure: 25; 29.97; 30</td>
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<tr>
<td>720p</td>
<td>Raster Structure: 23.98; 24; 25; 29.97; 30; 50; 59.94; 60</td>
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<tr>
<td>486i (1)</td>
<td>Raster Structure: 29.97</td>
</tr>
<tr>
<td>575i (1)</td>
<td>Raster Structure: 25</td>
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<td><strong>Embedded Audio</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Discrete AES Audio Input</strong></td>
<td>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. <strong>Note:</strong> 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.</td>
</tr>
<tr>
<td><strong>Discrete AES Audio Output</strong></td>
<td>The FSE-8241 series can provide 8 channels (AES pairs 1 thru 4) of discrete AES audio on 75Ω BNC connections.</td>
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</table>

(1) All rates displayed as frame rates; interlaced (“i”) field rates are two times the rate value shown.
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.

**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 metadata 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.

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 metadata 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:

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:

  *Card-Edge* display messages 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](image-url)
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.

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.

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.

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.

Each submenu consists of groups of parameters related to the function submenu. Using the “Framesync” function submenu example, the individual parameters for this function consist of various frame sync parameters such as Vertical Delay, Horizontal Delay, and so on.

*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.

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 increases 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

<table>
<thead>
<tr>
<th>LED</th>
<th>Color</th>
<th>Display and Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RMT</td>
<td>Blue</td>
<td>When flashing, this LED indicates when the card is receiving control messages from DashBoard.</td>
</tr>
<tr>
<td>REF</td>
<td>Blue</td>
<td>When lit, this LED indicates when the card is receiving valid frame sync enable when set up for reference frame sync.</td>
</tr>
<tr>
<td>ERR</td>
<td>Red</td>
<td>When lit, this LED indicates when the card is unable to lock to frame sync, or unable to lock to the input standard.</td>
</tr>
<tr>
<td>INPUT FORMAT</td>
<td>Blue</td>
<td>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)</td>
</tr>
</tbody>
</table>
| 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

<table>
<thead>
<tr>
<th>Menu Group Item</th>
<th>Menu Depth</th>
<th>Menu Depth as indicated by LEDs</th>
</tr>
</thead>
<tbody>
<tr>
<td>none</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Submenu 1</strong></td>
<td>1</td>
<td>⬤ ⬤ ⬤ ⬤</td>
</tr>
<tr>
<td>Submenu 1 selection items</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Submenu 2</strong></td>
<td>2</td>
<td>⬤ ⬤ ⬤ ⬤</td>
</tr>
<tr>
<td>Submenu 2 selection items</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Submenu 3</strong></td>
<td>3</td>
<td>⬤ ⬤ ⬤ ⬤</td>
</tr>
<tr>
<td>Submenu 3 selection items and/or parameter values</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Submenu 4</strong></td>
<td>4</td>
<td>⬤ ⬤ ⬤ ⬤ ⬤</td>
</tr>
<tr>
<td>Submenu 4 selection items and/or parameter values</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Submenu Depth</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong> Embd AES Tone</td>
<td>Press Enter Menu and in this example, select Embd (Embedded Audio Groups). This selects the embedded audio function of the Audio processor.</td>
</tr>
</tbody>
</table>
**Table 3.3 Card-edge Controls Setup of Example Embedded Audio Function Setup**

<table>
<thead>
<tr>
<th>Submenu Depth</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>B</strong></td>
<td>Grp1</td>
<td>Grp2</td>
<td>Grp3</td>
<td>Grp4</td>
</tr>
<tr>
<td><strong>C</strong></td>
<td>Enbl</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>D</strong></td>
<td>On</td>
<td>Off</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>E</strong></td>
<td>Ch01</td>
<td>Ch02</td>
<td>Ch03</td>
<td>Ch04</td>
</tr>
<tr>
<td><strong>F</strong></td>
<td>Src</td>
<td>Gain</td>
<td>Pol</td>
<td></td>
</tr>
<tr>
<td><strong>G</strong></td>
<td>Em01</td>
<td>Em02</td>
<td>Em03</td>
<td>...</td>
</tr>
<tr>
<td><strong>H</strong></td>
<td>Src</td>
<td>Gain</td>
<td>Pol</td>
<td></td>
</tr>
<tr>
<td><strong>I</strong></td>
<td>(gain value)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>J</strong></td>
<td>Src</td>
<td>Gain</td>
<td>Pol</td>
<td></td>
</tr>
<tr>
<td><strong>K</strong></td>
<td>Norm</td>
<td>Inv</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>L</strong></td>
<td>Embd AES Tone</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>M</strong></td>
<td>Ch01</td>
<td>Ch02</td>
<td>Ch03</td>
<td>...</td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>Src</td>
<td>Gain</td>
<td>Pol</td>
<td></td>
</tr>
<tr>
<td><strong>O</strong></td>
<td>Em01</td>
<td>Em02</td>
<td>Em03</td>
<td>...</td>
</tr>
</tbody>
</table>

Press **Enter Menu** again and in this example, select **Grp1** (Embedded Audio Group 1). This selects the embedded audio group to be accessed.

Press **Enter Menu** again and in this example, select **Enbl** (Enable).

Press **Enter Menu** again and in this example, select **On**. This sets the selected embedded audio group to **Enabled**.

Press **Exit Menu** and in this example, select **Ch01**. (Destination: Embedded Channel 1). This selects the embedded channel to be accessed.

Press **Enter Menu** and select in this example, **Src** (source for Embedded Channel 1). This selects the source for the embedded channel.

Press **Enter Menu** again and in this example, select **Em03** (Embedded Channel 3 as source for Embedded Channel 1).

Press **Exit Menu** and in this example, select **Gain** (gain adjustment field for selected embedded audio channel).

Press **Enter Menu** again and in this example, select a gain value of **12.1** for this channel.

Press **Exit Menu** and in this example, select **Pol** (phase for Embedded Channel 1).

Press **Enter Menu** again and in this example, select **Inv** (invert polarity for Embedded Channel 1).

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.

Press **Enter Menu** and in this example, select **Ch01** (AES Output Channel 1).

Press **Enter Menu** again and select in this example, **Src** (source for AES Output Channel 1).

Press **Enter Menu** again and in this example, select **Em01** (Embedded Channel 1 as source 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.

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 **Disp** (Display) menu.
2. Select between Horizontal or Vertical as shown below.

<table>
<thead>
<tr>
<th>Submenu Depth</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Src</strong></td>
</tr>
<tr>
<td>2</td>
<td><strong>Gain</strong></td>
</tr>
<tr>
<td>3</td>
<td><strong>Pol</strong></td>
</tr>
<tr>
<td>4</td>
<td><strong>Norm</strong></td>
</tr>
</tbody>
</table>

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

**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.
Use the following procedure to adjust the display brightness:

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

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BRGT</strong></td>
<td>100%</td>
<td>53%</td>
</tr>
<tr>
<td></td>
<td>40%</td>
<td>27%</td>
</tr>
<tr>
<td></td>
<td>20%</td>
<td>13%</td>
</tr>
<tr>
<td></td>
<td>6.6%</td>
<td></td>
</tr>
</tbody>
</table>

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

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

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TOUT</strong></td>
<td>(value)</td>
<td>Timeout value (in seconds)</td>
</tr>
</tbody>
</table>
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)
Set **Gain** for AES Ch1 to **18.5** using direct numeric entry or slider control

\[P - Q \text{ in Table 3.3}\]

Set **Phase** for AES Ch1 to **Normal**

\[R - S \text{ in Table 3.3}\]

Select **Embedded Ch 1** as **Source** for AES Ch1 output

\[N - O \text{ in Table 3.3}\]

Select **AES Audio Out Pairs 1-4**

\[L - M \text{ in Table 3.3}\]

**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).

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”).

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.

Table: Card Info Utility

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>+POW</td>
<td>+12V Watts consumed</td>
</tr>
<tr>
<td>-POW</td>
<td>-7.5V Watts consumed</td>
</tr>
<tr>
<td>SWR#</td>
<td>Software Release Number</td>
</tr>
<tr>
<td>SWB#</td>
<td>Software Build Number</td>
</tr>
<tr>
<td>FPG#</td>
<td>FPGA Build Number</td>
</tr>
</tbody>
</table>

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

Table 3.4  Typical Ancillary Data Line Number Locations/Ranges

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:

<table>
<thead>
<tr>
<th>Format</th>
<th>Line No. Limiting</th>
<th>Format</th>
<th>Line No. Limiting</th>
<th>Format</th>
<th>Line No. Limiting</th>
</tr>
</thead>
<tbody>
<tr>
<td>525i</td>
<td>12-19</td>
<td>720p</td>
<td>9-25</td>
<td>1080p</td>
<td>9-41</td>
</tr>
<tr>
<td>625i</td>
<td>9-22</td>
<td>1080i</td>
<td>9-20</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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.

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

<table>
<thead>
<tr>
<th>AES</th>
<th>SRC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pair 1</td>
<td>Disabled</td>
</tr>
<tr>
<td>Pair 2</td>
<td>Enabled</td>
</tr>
<tr>
<td>8</td>
<td>Disabled</td>
</tr>
</tbody>
</table>

**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 as 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.

## AES Passthrough

<table>
<thead>
<tr>
<th>AES</th>
<th>Passthrough</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pair 1</td>
<td>Off</td>
</tr>
<tr>
<td>Pair 2</td>
<td>On</td>
</tr>
<tr>
<td>8</td>
<td>Off</td>
</tr>
</tbody>
</table>

**Individual AES Passthrough On/Off control for each AES pair (1 thru 8) disables or enables Passthrough as follows:**

- **Off:** Disables AES passthrough for the selected AES input pair. Passthrough is set to **Off** by default.

- **On:** Passthrough is turned on, with the corresponding AES output pair to act as a bit-for-bit copy with zero delay of the corresponding AES input pair.

**Note:** AES Passthrough set to **On** overrides normal audio routing. Gain and polarity control is not available when AES passthrough is enabled.
AES Zero Delay Embedding

Individual AES Zero-Delay Embedding On/Off control for each AES pair (1 thru 8) disables or enables Zero-Delay Embedding as follows:

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

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

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.

  **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.
### 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.

### Apply Audio Unity Settings

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

<table>
<thead>
<tr>
<th>AFD Code</th>
<th>Description</th>
<th>AFD Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000</td>
<td>No code present</td>
<td>1001</td>
<td>Full frame</td>
</tr>
<tr>
<td>0000</td>
<td>Undefined</td>
<td>1010</td>
<td>16:9 (center)</td>
</tr>
<tr>
<td>0010</td>
<td>Box 16:9 (top)</td>
<td>1011</td>
<td>14:9 (center)</td>
</tr>
<tr>
<td>0011</td>
<td>Box 14:9 (top)</td>
<td>1101</td>
<td>4:3 (with alternate 14:9 center)</td>
</tr>
<tr>
<td>0100</td>
<td>Box &gt; 16:9 (center)</td>
<td>1110</td>
<td>16:9 (with alternate 14:9 center)</td>
</tr>
<tr>
<td>1000</td>
<td>Full frame</td>
<td>1111</td>
<td>16:9 (with alternate 4:3 center)</td>
</tr>
</tbody>
</table>

#### 16:9 Coded Frame

<table>
<thead>
<tr>
<th>AFD Code</th>
<th>Description</th>
<th>AFD Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000</td>
<td>No code present</td>
<td>1010</td>
<td>16:9 (image protected)</td>
</tr>
<tr>
<td>0010</td>
<td>Full frame</td>
<td>1011</td>
<td>14:9 (center)</td>
</tr>
<tr>
<td>0011</td>
<td>4:3 (center)</td>
<td>1101</td>
<td>4:3 (with alternate 14:9 center)</td>
</tr>
<tr>
<td>0100</td>
<td>Box &gt; 16:9 (center)</td>
<td>1110</td>
<td>16:9 (with alternate 14:9 center)</td>
</tr>
<tr>
<td>1000</td>
<td>Full frame</td>
<td>1111</td>
<td>16:9 (with alternate 4:3 center)</td>
</tr>
</tbody>
</table>

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.
Provides video Frame Sync offset and audio re-sync tools.

**Framesync Enable**

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 **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.

**Framesync Vertical Delay Control**

When Framesync is enabled, sets vertical delay (in number of lines of output video/format) between the output video and the frame sync reference.

(Range is -1124 thru 1124 lines.)

**Notes:** Lines refer to lines in the output video format, and not to the reference format.

**Horizontal Delay Control**

When Framesync is enabled, sets (in µsec of output video timing) horizontal delay between the output video and the frame sync reference.

(Range is -64.000 thru 64.000 µsec)

**Notes:** 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.
Minimum Latency Control

When Framesync is enabled, specifies the smallest amount of latency allowed by the frame sync (latency measurement in output video frames). The frame sync will not output a frame unless the specified number of frames are captured in the buffer. The operational latency of the frame sync is always between the specified minimum latency and minimum latency plus one frame (not one field).

(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 sync-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.)

With offset greater than selected hard resync threshold, resync is immediately applied.
### Audio Offset Control

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** control to its minimum setting, thereby allowing the offset to be assessed and corrected as fast as possible.

### Current Audio Delay Display

Displays the current input-to-output audio delay (in msec units) as well as in terms of Frames/fractional frame (in number of lines).

**Note:** Value shown in column 3 is displayed value only. No control is available in this mode.

### Video Delay Display

Displays the current input-to-output video delay (in msec units) as well as in terms of Frames/fractional frame (in number of lines).

**Note:** Value shown in column 2 is displayed value only. No control is available in this mode.
Framesync Status Display

<table>
<thead>
<tr>
<th>Framesync Status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>On</td>
<td>Framesync status OK.</td>
</tr>
<tr>
<td>Off</td>
<td>Framesync source off or not connected.</td>
</tr>
<tr>
<td></td>
<td>Improper or missing framesync reference.</td>
</tr>
</tbody>
</table>

Loss of Input Signal Selection

<table>
<thead>
<tr>
<th>On Loss of Input Signal</th>
<th>Disable Outputs</th>
<th>Freeze Last Frame</th>
<th>Freeze to Color</th>
</tr>
</thead>
</table>

Card-edge Control Menu: FS

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOS</td>
<td>DIS</td>
</tr>
<tr>
<td></td>
<td>Enables outputs</td>
</tr>
</tbody>
</table>

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).

Note: See Minimum Latency Frames Control above for more information about this message.
Framesync LOS Freeze Color

In the event of LOS with **Freeze to Color** enabled above, sets the image raster color from choices shown to the left.

Card-edge Control Menu: FS

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOSC</td>
<td></td>
</tr>
<tr>
<td>WHT</td>
<td>White</td>
</tr>
<tr>
<td>YELO</td>
<td>Yellow</td>
</tr>
<tr>
<td>CYAN</td>
<td>Cyan</td>
</tr>
<tr>
<td>GRN</td>
<td>Green</td>
</tr>
<tr>
<td>MAGE</td>
<td>Magenta</td>
</tr>
<tr>
<td>RED</td>
<td>Red</td>
</tr>
<tr>
<td>BLUE</td>
<td>Blue</td>
</tr>
<tr>
<td>GR10</td>
<td>Gray 10%</td>
</tr>
<tr>
<td>GR25</td>
<td>Gray 25%</td>
</tr>
<tr>
<td>GR50</td>
<td>Gray 50%</td>
</tr>
<tr>
<td>BLK</td>
<td>Black</td>
</tr>
<tr>
<td>CSTM</td>
<td>Custom</td>
</tr>
</tbody>
</table>

**Framesync LOS Freeze Color**

**Custom Color Hue**

Adjusts raster hue (phase angle) for custom LOS color.

(-360° to 360° range in 0.1° steps; null = 0°)
<table>
<thead>
<tr>
<th>Custom Color Saturation</th>
<th>Adjusts raster saturation level for custom LOS color. (0% to 100% range in 0.1% steps)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><img src="image" alt="Custom Color Saturation" /> 0.0</td>
</tr>
</tbody>
</table>

Card-edge Control Menu: FS

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 CSAT (value)</td>
<td>Color saturation level (in percent)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Custom Color Y Level</th>
<th>Adjusts raster luma level for custom LOS color. (64 to 940 range)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><img src="image" alt="Custom Color Y Level" /> 64</td>
</tr>
</tbody>
</table>

Card-edge Control Menu: FS

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 CVAL (value)</td>
<td>Luma level</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reset Framesync</th>
<th>Resets the frame sync, clearing any buffered audio and video. When Confirm is clicked, a Confirm? pop-up appears, requesting confirmation.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><img src="image" alt="Reset Framesync" /> Confirm</td>
</tr>
</tbody>
</table>

Card-edge Control Menu: FS

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 RSET Y? (or up)</td>
<td>Move toggle switch left (or up) to confirm reset. Reject reset by pressing Exit Menu pushbutton.</td>
</tr>
</tbody>
</table>
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

| 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

| 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

<table>
<thead>
<tr>
<th>1</th>
<th>Embd</th>
<th>2</th>
<th>Grp1</th>
<th>3</th>
<th>Enbl</th>
<th>4</th>
<th>Group 1 selected</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>On</strong></td>
<td>Enabled</td>
<td><strong>Off</strong></td>
<td>Disabled</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Embedded Channel Source

<table>
<thead>
<tr>
<th>Destination</th>
<th>Source</th>
<th>Embedded Ch 1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Source</strong></td>
<td><strong>Embed Ch 1</strong></td>
<td></td>
</tr>
</tbody>
</table>

#### Card-edge Control Menu: Aud

<table>
<thead>
<tr>
<th>1</th>
<th>Embd</th>
<th>2</th>
<th>Grp</th>
<th>3</th>
<th>Ch#</th>
<th>4</th>
<th>Destination channel Set up to select Source</th>
</tr>
</thead>
</table>
**Embedded Audio Group 1/2**

### 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)

![Diagram of Embedded Ch 1 thru Ch 16 as Source](image1)

### 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)

![Diagram of AES Ch 1 thru AES Ch 16 as Source](image2)

### 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.

![Diagram of Down Mix Left or Right as Source](image3)
Mono Mix as Source

Mono selection in Source drop-down list allows mono mix content to be the source for the selected destination Embedded Audio Group channel. (In this example, the mono content is the source for destination Embedded Ch 1)

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

Dolby® Encoded Pair as Source

Dolby Encoder selection in Source drop-down list allows Dolby® Encoder encoded pair to be the source for the selected destination Embedded Audio Group channel pair. When either channel of a companion pair is sourced from the encoder, the companion channel is automatically similarly selected. (In this example, the encoder output is the source for destination Embedded channel pair 1/2)

Note: Encoded channel pairs selected can only be applied to companion intact pairs (e.g., signals can be applied to embedded pair 1/2, or embedded pair 3/4 and so on, but not split to route through fabricated unrelated pairs such as embedded ch 2/ch 3).

Note: Although the Gain, Muting, and Phase controls will appear to be usable when an encoded pair is selected, the controls are disabled.

Tone Generator 1 thru 4 as Source

Tone Generator 1 thru Tone Generator 4 range in Source drop-down list enables one of four tone generators (Tone 1 thru Tone 4) to be the source for the selected destination Embedded Audio Group channel. (In this example, Tone 1 (tone generator 1) is the source for destination Embedded Ch 1)

Note: Tone generator frequencies can be independently set for the four tone generator sources.

Refer to Tone Generator function description on page 3-50 for more information.
### Silence (Mute) as Source

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

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

#### Card-edge Control Menu: Aud

<table>
<thead>
<tr>
<th>1 Embd Grp</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ch#</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Src Off</td>
<td>Channel Silence</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 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

<table>
<thead>
<tr>
<th>1 Embd Grp</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ch#</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gain (value)</td>
<td>Gain value (in dB)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Mute Control

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

#### Card-edge Control Menu: Aud

<table>
<thead>
<tr>
<th>1 Embd Grp</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ch#</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mute Off</td>
<td>Unmuted</td>
<td>Muted</td>
<td></td>
</tr>
<tr>
<td>On</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Phase Control**

Selects between Normal and Invert phase (relative to source original phase) for the destination Embedded Audio Group channel.

<table>
<thead>
<tr>
<th>Card-edge Control Menu: Aud</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>Embed</td>
</tr>
</tbody>
</table>

- **Norm**: Non-inverted
- **Inv**: Inverted
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.

<table>
<thead>
<tr>
<th>SD Audio Depth</th>
<th>20 bit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group Enable</td>
<td>On</td>
</tr>
</tbody>
</table>

### Embedded Ch 9
- **Source:** Embedded Ch 4
- **Gain (dB):**
  - 0.0
  - -0.0
  - -10.0
  - -20.0
- **Channels:** Unmuted
- **Phase:** Normal

### Embedded Ch 10
- **Source:** Embedded Ch 5
- **Gain (dB):**
  - 0.0
  - -0.0
  - -10.0
  - -20.0
- **Channels:** Unmuted
- **Phase:** Normal

### Embedded Ch 11
- **Source:** AES Ch 1
- **Gain (dB):**
  - -40.0
  - -60.0
  - -80.0
  - -100.0
- **Channels:** Unmuted
- **Phase:** Normal

### Embedded Ch 12
- **Source:** AES Ch 2
- **Gain (dB):**
  - -40.0
  - -60.0
  - -80.0
  - -100.0
- **Channels:** Unmuted
- **Phase:** Normal

### Embedded Ch 13
- **Source:** AES Ch 14
- **Gain (dB):**
  - -40.0
  - -60.0
  - -80.0
  - -100.0
- **Channels:** Unmuted
- **Phase:** Invert

### Embedded Ch 14
- **Source:** AES Ch 15
- **Gain (dB):**
  - -40.0
  - -60.0
  - -80.0
  - -100.0
- **Channels:** Unmuted
- **Phase:** Normal

### Embedded Ch 15
- **Source:** Down Mix Left
- **Gain (dB):**
  - -40.0
  - -60.0
  - -80.0
  - -100.0
- **Channels:** Unmuted
- **Phase:** Normal

### Embedded Ch 16
- **Source:** Down Mix Right
- **Gain (dB):**
  - -40.0
  - -60.0
  - -80.0
  - -100.0
- **Channels:** Unmuted
- **Phase:** Normal

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.
### 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:**

<table>
<thead>
<tr>
<th>Card-edge Control Menu: Aud</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Embd</td>
<td>Grp1</td>
<td>Enbl</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Group 1 select**

(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.”
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)
### 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)

### 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)

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.
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.
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

<table>
<thead>
<tr>
<th>Source</th>
<th>Dest Channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Embed Ch 1</td>
<td>AES Ch 1</td>
</tr>
</tbody>
</table>

Using the Source drop-down list, selects the audio source to be routed to the corresponding AES output channel from the choices described below.

### Card-edge Control Menu: Aud

<table>
<thead>
<tr>
<th>AES Ch #</th>
<th>Ch#</th>
<th>Src</th>
<th>Dest Channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>Source</td>
</tr>
</tbody>
</table>

### Embedded Ch 1 thru Ch 16 as Source

<table>
<thead>
<tr>
<th>Source</th>
<th>Dest Channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Embed Ch 1</td>
<td>AES Ch 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Card-edge Control Menu: Aud</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 AES Ch #</td>
</tr>
<tr>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Source</th>
<th>Dest Channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Embed Ch 1</td>
<td>AES Ch 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Card-edge Control Menu: Aud</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 AES Ch #</td>
</tr>
<tr>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Source</th>
<th>Dest Channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>AES Ch 1</td>
<td>AES Ch 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Card-edge Control Menu: Aud</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 AES Ch #</td>
</tr>
<tr>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Source</th>
<th>Dest Channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>AES Ch 5</td>
<td>AES Ch 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Card-edge Control Menu: Aud</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 AES Ch #</td>
</tr>
<tr>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Source</th>
<th>Dest Channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>AES Ch 16</td>
<td>AES Ch 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Card-edge Control Menu: Aud</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 AES Ch #</td>
</tr>
<tr>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Source</th>
<th>Dest Channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>AES Ch 16</td>
<td>AES Ch 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Card-edge Control Menu: Aud</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 AES Ch #</td>
</tr>
<tr>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Source</th>
<th>Dest Channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>AES Ch 16</td>
<td>AES Ch 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Card-edge Control Menu: Aud</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 AES Ch #</td>
</tr>
<tr>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Source</th>
<th>Dest Channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>AES Ch 16</td>
<td>AES Ch 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Card-edge Control Menu: Aud</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 AES Ch #</td>
</tr>
<tr>
<td>1</td>
</tr>
</tbody>
</table>
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.

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.

Dolby® Encoded Pair as Source

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

(In this example, the encoder output is the source for destination AES channel pair 1/2)

Note: Encoded channel pairs selected can only be applied to companion intact pairs (e.g., signals can be applied to AES pair 1/2, or AES pair 3/4 and so on, but not split to route through fabricated unrelated pairs such as AES ch 2/ch 3).

Note: Although the Gain, Muting, and Phase controls will appear to be usable when an encoded pair is selected, the controls are disabled.
### Tone Generator 1 thru 4 as Source

<table>
<thead>
<tr>
<th>Destination</th>
<th>AES Ch 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source</td>
<td></td>
</tr>
</tbody>
</table>

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.

### Silence (Mute) as Source

<table>
<thead>
<tr>
<th>Destination</th>
<th>AES Ch 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source</td>
<td>Silence</td>
</tr>
</tbody>
</table>

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

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

### Gain (dB) Control

<table>
<thead>
<tr>
<th>Card-edge Control Menu: Aud</th>
</tr>
</thead>
<tbody>
<tr>
<td>AES Ch#</td>
</tr>
<tr>
<td>Ch#</td>
</tr>
<tr>
<td>Src</td>
</tr>
<tr>
<td>TG#</td>
</tr>
</tbody>
</table>

**Note**: Gain value (in dB) applied to the corresponding destination AES channel.

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

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

<table>
<thead>
<tr>
<th>Channel Is</th>
<th>Unmuted</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Muted</td>
</tr>
</tbody>
</table>

### Phase Control

Selects between Normal and Invert phase (relative to source original phase) for the destination AES channel.

<table>
<thead>
<tr>
<th>Phase</th>
<th>Normal</th>
<th>Invert</th>
</tr>
</thead>
</table>

### Card-edge Control Menu: Aud

<table>
<thead>
<tr>
<th>AES Ch#</th>
<th>Mute</th>
<th>Unmuted</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Off</td>
<td>On</td>
</tr>
<tr>
<td>2</td>
<td>Mute</td>
<td>Unmuted</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>Muted</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AES Ch#</th>
<th>Pol</th>
<th>Non-invert</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Norm</td>
<td>Non-invert</td>
</tr>
<tr>
<td>2</td>
<td>Inv</td>
<td>Inverted</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
</tr>
</tbody>
</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

<table>
<thead>
<tr>
<th>Down Mixer Selection</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Left</td>
<td>Embed Ch 1</td>
</tr>
<tr>
<td>Right</td>
<td>Embed Ch 2</td>
</tr>
<tr>
<td>Center</td>
<td>Embed Ch 3</td>
</tr>
<tr>
<td>Left Surround (Ls)</td>
<td>Embed Ch 4</td>
</tr>
<tr>
<td>Right Surround (Rs)</td>
<td>Embed Ch 5</td>
</tr>
</tbody>
</table>

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.

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.
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 (\(-0.0 \text{ dB}\)) 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 (\(-10.0 \text{ dB}\)) 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.
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.

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%)
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.

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.

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.
### Timecode Source Status Displays

<table>
<thead>
<tr>
<th>Format</th>
<th>Status</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDI VITC Waveform</td>
<td>Unlocked</td>
<td>Displays the current status and contents of the three supported timecode formats shown to the left.</td>
</tr>
<tr>
<td>SDI ATC VITC</td>
<td></td>
<td>- If a format is receiving timecode data, the current content (timecode running count and line number) is displayed.</td>
</tr>
<tr>
<td>SDI ATC LTC</td>
<td></td>
<td>- If a format is not receiving timecode data, Unlocked is displayed.</td>
</tr>
</tbody>
</table>

### Incoming ATC Packet Removal Control

Enables or disables removal of existing input video ATC timecode packets from the output. This allows removal of undesired existing timecodes from the output, resulting in a “clean slate” where only desired timecodes are then re-inserted into the output. (For example, if both SD VITC Waveform and SD ATC_VITC timecode data are present on the input video, and only ATC_VITC is desired, using the Removal control will remove both timecodes from the output. The ATC_VITC timecode by itself can then be re-inserted on the output using the other controls discussed here.)

### Source Priority

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

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

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

### Output Status Display

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

- **Output status OK** (in this example, running SDI VITC timecode received and outputted).
- **Timecode not available due to lack of appropriate input timecode data on enabled formats.**

**Note:** Timecode output requires that source and priority are appropriately selected (as described above in **Source Priority**). Also, video input must contain appropriate timecode data.

- **Timecode Insertion** button set to **Disabled**; output insertion disabled.
| VITC Waveform Output Line | 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. |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>VITC Waveform Output 1 Line Number</td>
<td>14</td>
</tr>
<tr>
<td>VITC Waveform Output 2 Line Number</td>
<td>18</td>
</tr>
</tbody>
</table>

| SD VITC Waveform Insertion Control | 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. |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>SD VITC Waveform Insertion</td>
<td>Disabled</td>
</tr>
</tbody>
</table>

| SD ATC Insertion Control | 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. |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>SD ATC Insertion</td>
<td>Disabled</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HD ATC_VITC Insertion Control</th>
<th>For HD output, enables or disables SD ATC_VITC timecode insertion into the video stream.</th>
</tr>
</thead>
<tbody>
<tr>
<td>HD ATC_VITC Insertion</td>
<td>Disabled</td>
</tr>
</tbody>
</table>
### HD ATC_VITC Line Insertion Controls

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.

### HD ATC_LTC Insertion Control

For HD output, enables or disables ATC_LTC timecode insertion into the video stream.

### HD ATC_LTC Line Insertion Control

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.

### ATC_VITC Legacy Support Control

When enabled, accommodates equipment requiring ATC_VITC packet in both fields as a "field 1" packet (non-toggling).

**Note:** Non-toggling VITC1 and VITC2 packets do not conform to SMPTE 12M-2-2008 preferences. As such, ATC_VITC Legacy Support should be enabled only if required by downstream equipment.
Sets the test tone frequency for each of four tone generators (Tone Generator 1 thru 4).

**Frequency Selection Lists**

<table>
<thead>
<tr>
<th>Tone Generator 1 Frequency</th>
<th>1 kHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tone Generator 2 Frequency</td>
<td>1 kHz</td>
</tr>
<tr>
<td>Tone Generator 3 Frequency</td>
<td>1 kHz</td>
</tr>
<tr>
<td>Tone Generator 4 Frequency</td>
<td>1 kHz</td>
</tr>
</tbody>
</table>

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.

**Presets**

Allows up to 16 card user settings configuration presets to be saved in a Preset and then recalled (loaded) as desired. All current settings (including list selections and scalar (numeric) control settings such as Gain, etc.) are saved when a Preset Save is invoked.

- **Card Name**: DVR21
- **Selected Preset**: [1..FactPre]
- **Preset Name**: FactPre
- **Preset Save**: Confirm
- **Preset Load**: Confirm
- **Reset Current Preset**: Confirm
- **Download Presets**: [CD:<--- Presets.bin] Save

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.
### 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.
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:

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

**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

<table>
<thead>
<tr>
<th><strong>Dolby Encoder</strong></th>
<th>Provides Dolby\textsuperscript{®} metadata source selection/failover controls, AC-3 data handling controls, and metadata/encoding status displays.</th>
</tr>
</thead>
</table>

**Note:** After familiarizing yourself with the controls described in the Dolby\textsuperscript{®} 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

- **Encoding Mode**
  - **Encode Input Audio**
    - Encode Input Audio
    - Encode 1 kHz Test Tone (16 dBFS)
    - Encode 1 kHz Test Tone (20 dBFS)
    - Encode Silence

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

- **Status**
  - **Encoding Active**
  - **Encoding Stopped**

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

- **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

- **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

- **Encoded AC-3 Bitstream Format**

Sets AC-3 bitstream as full 32-bit, or channel-divided 16-bit bitstream.
Encoded AC-3 Data Rate

- Automatic (384 kbps maximum)
- Automatic (324 kbps maximum)
- Automatic (448 kbps maximum)
- 56 kbps
- 448 kbps

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).
### On Loss of External Metadata

<table>
<thead>
<tr>
<th>On Loss of External Metadata</th>
<th>Use Last Received Metadata</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Switch to Internal Metadata Controls</td>
</tr>
<tr>
<td></td>
<td>Stop Encoding</td>
</tr>
</tbody>
</table>

Selects the action to take in the event of loss of external metadata as shown to the left.

### Metadata Status Display

<table>
<thead>
<tr>
<th>Metadata Status</th>
<th>Internal Metadata is being used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metadata Status</td>
<td>External Metadata is being used</td>
</tr>
<tr>
<td>Metadata Status</td>
<td>Last Received External Metadata is being used</td>
</tr>
</tbody>
</table>

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.
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.

<table>
<thead>
<tr>
<th>Internal Metadata Controls</th>
<th>Dolby Surround Mode</th>
<th>LFE Enable</th>
<th>Dialogue Normalization</th>
<th>Audio Production Information</th>
<th>Mix Level (dB)</th>
<th>Room Type</th>
<th>DC Highpass Filter</th>
<th>Bandwidth Lowpass Filter</th>
<th>LFE Channel Lowpass Filter</th>
<th>Surround Channel 90 Degrees Phase Shift Filter</th>
<th>Surround Channel -3 dB Attenuation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bitstream Mode</td>
<td>Complete Main</td>
<td></td>
<td></td>
<td>Does Not Exist</td>
<td>-30</td>
<td></td>
<td>Enabled</td>
<td>Enabled</td>
<td>Disabled</td>
<td>Enabled</td>
<td>Disabled</td>
</tr>
<tr>
<td>Audio Coding Mode</td>
<td>3/2+L.C.R.Ls.Rs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Enabled</td>
<td>Enabled</td>
<td>Disabled</td>
<td>Enabled</td>
<td>Disabled</td>
</tr>
<tr>
<td>Center Mix Level</td>
<td>-3 dB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Enabled</td>
<td>Enabled</td>
<td>Disabled</td>
<td>Enabled</td>
<td>Disabled</td>
</tr>
<tr>
<td>Surround Mix Level</td>
<td>-3 dB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Enabled</td>
<td>Enabled</td>
<td>Disabled</td>
<td>Enabled</td>
<td>Disabled</td>
</tr>
<tr>
<td>Dolby Surround Mode</td>
<td>Not indicated</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LFE Enable</td>
<td>LFE is On (encoded)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dialogue Normalization</td>
<td>-27</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Audio Production Information</td>
<td>Does Not Exist</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mix Level (dB)</td>
<td>99</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Room Type</td>
<td>Not indicated</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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 Digital Channel Mapping

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

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

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

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

<table>
<thead>
<tr>
<th>Encoder Input Channel</th>
<th>1/0</th>
<th>2/0</th>
<th>3/0</th>
<th>2/1</th>
<th>3/1</th>
<th>2/2</th>
<th>3/2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ch 1</td>
<td></td>
<td></td>
<td>L</td>
<td>L</td>
<td>L</td>
<td>L</td>
<td></td>
</tr>
<tr>
<td>Ch 2</td>
<td>—</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td></td>
</tr>
<tr>
<td>Ch 3</td>
<td>C</td>
<td>—</td>
<td>—</td>
<td>C</td>
<td>—</td>
<td>—</td>
<td>C</td>
</tr>
<tr>
<td>Ch 4</td>
<td></td>
<td>—</td>
<td></td>
<td>—</td>
<td></td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>Ch 5</td>
<td>—</td>
<td>—</td>
<td>S</td>
<td>S</td>
<td>LS</td>
<td>LS</td>
<td></td>
</tr>
<tr>
<td>Ch 6</td>
<td>—</td>
<td>—</td>
<td></td>
<td></td>
<td></td>
<td>RS</td>
<td>RS</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Encoder Input Channel</th>
<th>3/0L</th>
<th>2/1L</th>
<th>3/1L</th>
<th>2/2L</th>
<th>3/2L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ch 1</td>
<td>L</td>
<td>L</td>
<td>L</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>Ch 2</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
</tr>
<tr>
<td>Ch 3</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>—</td>
<td>C</td>
</tr>
<tr>
<td>Ch 4</td>
<td>LFE</td>
<td>LFE</td>
<td>LFE</td>
<td>LFE</td>
<td>LFE</td>
</tr>
<tr>
<td>Ch 5</td>
<td>S</td>
<td>S</td>
<td>LS</td>
<td>LS</td>
<td></td>
</tr>
<tr>
<td>Ch 6</td>
<td></td>
<td></td>
<td></td>
<td>RS</td>
<td>RS</td>
</tr>
</tbody>
</table>

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.
### 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

<table>
<thead>
<tr>
<th>Dolby Encoder</th>
<th>Provides Dolby® metadata source selection/failover controls, AC-3 data handling controls, and metadata/encoding status displays.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Note:</strong> 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.</td>
<td></td>
</tr>
</tbody>
</table>

### Encoding Mode

| 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

<table>
<thead>
<tr>
<th>Status</th>
<th>Displays encoding status as follows:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Encoding Active</td>
<td>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.</td>
</tr>
<tr>
<td>Encoding Stopped</td>
<td>Indicates encoder is not receiving valid metadata from selected source.</td>
</tr>
</tbody>
</table>

### AC-3 Metadata Source

<table>
<thead>
<tr>
<th>AC-3 Metadata Source</th>
<th>Selects metadata source as follows:</th>
</tr>
</thead>
<tbody>
<tr>
<td>From External Source</td>
<td>Allows encoding using selected metadata from external source.</td>
</tr>
<tr>
<td>From Internal Metadata Controls</td>
<td>Allows encoding using internal metadata generator.</td>
</tr>
</tbody>
</table>

#### On Loss of External Metadata

| 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

<table>
<thead>
<tr>
<th>Metadata Status</th>
<th>Displays the metadata source currently being used as follows:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal Metadata is being used</td>
<td>Indicates internal metadata usage (either by manual selection or failover).</td>
</tr>
<tr>
<td>External Metadata is being used</td>
<td>Indicates external metadata usage; external metadata selected and available.</td>
</tr>
<tr>
<td>Last Received External Metadata is being used</td>
<td>When enabled (as described above), indicates last received external metadata is being used as a failover in lieu of valid current external metadata.</td>
</tr>
</tbody>
</table>
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 (SMPTE 2020-1-2008) Metadata Removal **On**

**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.

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

### Audio Input Source Select

**Source**

- 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.

| Channel | Encoder Input Channel | 5.1 + 2 | 5.1 + 2x1 | 4 + 4 | 4 + 2x2 | 4 + 2x1 | 4 + 4x1 | 4 x 2 | 3x2 + 2x1 | 2x2 + 4x1 | 2+6+1 | 8x1 | 5.1 | 7.1 | Screen |
|---------|----------------------|---------|-----------|-------|----------|---------|--------|-------|-----------|-----------|--------|-----|-----|-------|
| Ch 1    | LF                   | LF      | LF        | LF    | LF       | LF      | LF     | LF    | LF        | LF        | LF    | C   | LF  | LF    | Ch 1 LF |
| Ch 2    | RF                   | RF      | RF        | RF    | RF       | RF      | RF     | RF    | RF        | RF        | RF    | 2C  | RF  | RF    | Ch 2 RF |
| Ch 3    | C                    | C       | C         | C     | C        | C       | 3L     | 3C    | 4C        | 5C        | 6C    | 7C  | 6C  | RS    | Ch 3 C  |
| Ch 4    | LFE                  | LFE     | S         | S     | S        | S       | 3R     | 3R    | 4C        | 5C        | 6C    | 7C  | 6C  | RS    | Ch 4 LFE |
| Ch 5    | LS                   | LS      | 2C        | 3L    | 3C       | 4C      | 4L     | 4C    | 5C        | 6C        | 7C    | 6C  | 5C  | LS    | Ch 5 LS |
| Ch 6    | RS                   | RS      | 2S        | 3R    | 4C       | 5C      | 4R     | 5C    | 6C        | 7C        | 6C    | 5C  | 4C  | RS    | Ch 6 RS |
| Ch 7    | 2L                   | 2C      | 2L        | 2L    | 2C       | 2L      | 2L     | 2L    | 2C        | 2L        | 2C    | 7C  | 7C  | —     | Ch 7 —  |
| Ch 8    | 2R                   | 3C      | 2R        | 2R    | 3C       | 2R      | 2R     | 3R    | 3C        | 2R        | 3C    | 8C  | 6C  | —     | Ch 8 —  |

<table>
<thead>
<tr>
<th>Channel</th>
<th>Encoder Input Channel</th>
<th>4 + 2</th>
<th>4 + 2x1</th>
<th>3 x 2</th>
<th>2x2 + 2x1</th>
<th>2 + 4x1</th>
<th>6 x 1</th>
<th>4</th>
<th>2 + 2</th>
<th>2 + 2x1</th>
<th>4 x 1</th>
<th>7.1</th>
<th>Screen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ch 1</td>
<td>LF</td>
<td>LF</td>
<td>L</td>
<td>L</td>
<td>L</td>
<td>L</td>
<td>L</td>
<td>C</td>
<td>LF</td>
<td>LF</td>
<td>LF</td>
<td>LF</td>
<td>Ch 1 LF</td>
</tr>
<tr>
<td>Ch 2</td>
<td>RF</td>
<td>RF</td>
<td>R</td>
<td>R</td>
<td>L C</td>
<td>L</td>
<td>L</td>
<td>C</td>
<td>RF</td>
<td>RF</td>
<td>RF</td>
<td>LF</td>
<td>Ch 2 RF</td>
</tr>
<tr>
<td>Ch 3</td>
<td>C</td>
<td>C</td>
<td>3L</td>
<td>3C</td>
<td>4C</td>
<td>3C</td>
<td>4C</td>
<td>3C</td>
<td>4C</td>
<td>4C</td>
<td>4C</td>
<td>4C</td>
<td>Ch 3 C</td>
</tr>
<tr>
<td>Ch 4</td>
<td>S</td>
<td>S</td>
<td>3R</td>
<td>4C</td>
<td>5C</td>
<td>4C</td>
<td>4C</td>
<td>4C</td>
<td>5C</td>
<td>4C</td>
<td>4C</td>
<td>4C</td>
<td>Ch 4 LFE</td>
</tr>
<tr>
<td>Ch 5</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>Ch 5 LS</td>
</tr>
<tr>
<td>Ch 6</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>Ch 6 RS</td>
</tr>
<tr>
<td>Ch 7</td>
<td>2L</td>
<td>2C</td>
<td>2L</td>
<td>2L</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>2L</td>
<td>2C</td>
<td>—</td>
<td>—</td>
<td>BSL</td>
<td>LE</td>
</tr>
<tr>
<td>Ch 8</td>
<td>2R</td>
<td>3C</td>
<td>2R</td>
<td>2R</td>
<td>3C</td>
<td>—</td>
<td>—</td>
<td>2R</td>
<td>3C</td>
<td>—</td>
<td>—</td>
<td>BSR</td>
<td>RE</td>
</tr>
<tr>
<td>Gain (dB) Control</td>
<td>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)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>------------------</td>
<td>--------------------------------------------------------------------------------------------------</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Muting Control</td>
<td>Allows pushbutton On/Off muting of the corresponding encoder input while saving all other settings.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phase Control</td>
<td>Selects between Normal and Invert phase (relative to source original phase) for the corresponding encoder input.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Encoded Pair Output Routing

### Encoded Pair Carried By Embedded Channel Pair

<table>
<thead>
<tr>
<th>Destination</th>
<th>Embedded Ch 1</th>
<th>Embedded Ch 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source</td>
<td>Dolby Encoder</td>
<td>Dolby Encoder</td>
</tr>
<tr>
<td>Gain (dB)</td>
<td>40.0</td>
<td>40.0</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Destination</th>
<th>AES Ch 1</th>
<th>AES Ch 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source</td>
<td>Dolby Encoder</td>
<td>Dolby Encoder</td>
</tr>
<tr>
<td>Gain (dB)</td>
<td>40.0</td>
<td>40.0</td>
</tr>
</tbody>
</table>

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.
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.

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.

**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.

![Dolby® Digital™ (AC-3) Setup Example (1 of 2)](image-url)
Using the External Metadata Source drop-down, select RS-485 external metadata.

Remove VBI SMPTE 2020 metadata from the output video by setting Metadata Removal to On.

Using the AC-3 Metadata Source drop-down, select Program 1 for AC-3 Metadata Source.

Using the On Loss of External Metadata drop-down, select Use Last Received Metadata as the failover source should the current metadata become unavailable.

Using the Encoded AC-3 Data Rate drop-down, select 348 kbps as AC-3 data rate for the encoded pair.

Using the Encoder Ch 1 thru Encoder Ch 6 drop-downs, map AES Ch 1 thru Ch 6 to Encoder audio input channels 1 thru 6.

Using the card general audio routing controls (in this example, Embedded Audio Group 1/2), set embedded channel pair 1/2 to use the Dolby Encoder as the source.

Figure 3.15 Dolby® Digital™ (AC-3) Setup Example (2 of 2)
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.
Using the External Metadata Source drop-down, select **Input Video VBI external metadata**.

Remove VBI SMPTE 2020 metadata from the output video by setting Metadata Removal to **On**.

Using the On Loss of External Metadata drop-down, select **Switch to Internal Metadata Controls** as the failover source should the current metadata become unavailable.

Using the Program Configuration drop-down, select **5.1 + 2** as the encoding mode. The default audio settings can be used, or the settings can be modified as desired.

Using the Encoder Ch 1 thru Encoder Ch 8 drop-downs, map AES Ch 1 thru Ch 8 to Encoder audio input channels 1 thru 8.

Using the card general audio routing controls (in this example, Embedded Audio Group 1/2), set embedded channel pair 1/2 to use the Dolby Encoder as the source.

---

**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.

![Card-edge Status Indicators and Display](image-url)
Table 3.5 Status and Error Indicators

<table>
<thead>
<tr>
<th>Item</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display</td>
<td>Displays 4-digit alphanumeric code indicating status or errors as follows:</td>
</tr>
<tr>
<td></td>
<td>• E0XX: Video Errors</td>
</tr>
<tr>
<td></td>
<td>• E002: Video Acquiring Lock</td>
</tr>
<tr>
<td></td>
<td>• E100: Analog Input Clipping</td>
</tr>
<tr>
<td></td>
<td>• E2XX: Frame Sync Errors</td>
</tr>
<tr>
<td></td>
<td>• E200: Reference is Incompatible with Input Video</td>
</tr>
<tr>
<td></td>
<td>• E201: Reference Standard is Invalid/No Reference Present</td>
</tr>
<tr>
<td></td>
<td>• E202: Reference Standard is 720p 23.98 (a reference standard not supported by the framesync)</td>
</tr>
<tr>
<td></td>
<td>• E203: Reference Standard is 720p 29.97 (a reference standard not supported by the framesync)</td>
</tr>
<tr>
<td>RMT LED</td>
<td>Blue LED flashes when card is receiving control message from remote network control (DashBoard)</td>
</tr>
<tr>
<td>REF LED</td>
<td>Blue LED illuminates indicating card is receiving valid reference when set up for framesync operation.</td>
</tr>
<tr>
<td>ERR LED</td>
<td>Red LED illuminates when card unable to lock to framesync, or unable to lock to input standard.</td>
</tr>
<tr>
<td>Input Format LEDs</td>
<td>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).</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Indicator Icon or Display</th>
<th>Error Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Card Access/Navigation Tree pane" /></td>
<td>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).</td>
</tr>
<tr>
<td><img src="image" alt="Card Info pane" /></td>
<td>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).</td>
</tr>
<tr>
<td><img src="image" alt="Card Info pane" /></td>
<td>If the card is not connecting to the frame or LAN, all controls are grayed-out (as shown in the example here).</td>
</tr>
<tr>
<td><img src="image" alt="Card Info pane" /></td>
<td>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).</td>
</tr>
</tbody>
</table>
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).

<table>
<thead>
<tr>
<th>Indicator Icon or Display</th>
<th>Error Description</th>
</tr>
</thead>
</table>
| ![DashBoard Status Indicators Icons and Displays](image) | **Table 3.6 DashBoard Status Indicators Icons and Displays**

<table>
<thead>
<tr>
<th>Indicator Icon or Display</th>
<th>Error Description</th>
</tr>
</thead>
</table>
| ![Card Info pane](image) | 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).

| ![Video Input Standard](image) | 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.

| ![Framesync Status](image) | 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).

| ![Framesync Status](image) | 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).
By selecting “Slot 0: MFC-8310-N” in this example, Card Info is displayed for frame Network Controller Card.

By selecting “Slot 8: FSE-8241-D” in this example, Card Info is shown for the card in slot 8.

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

<table>
<thead>
<tr>
<th>Item</th>
<th>Checks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verify power presence and characteristics</td>
<td>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.</td>
</tr>
<tr>
<td>Check Cable connection secureness and connecting points</td>
<td>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.</td>
</tr>
<tr>
<td>Card seating within slots</td>
<td>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.)</td>
</tr>
<tr>
<td>Check status indicators and displays</td>
<td>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.</td>
</tr>
<tr>
<td>Troubleshoot by substitution</td>
<td>All cards within the frame can be hot-swapped, replacing a suspect card or module with a known-good item.</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Error/Condition</th>
<th>Corrective Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>- DashBoard shows <strong>Video</strong> yellow icon and Input Invalid message in Card Info pane.</td>
<td>- No video input present</td>
<td>- 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.</td>
</tr>
<tr>
<td>- Card-edge <strong>Input Format</strong> LEDs show continuous cycling.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- DashBoard shows <strong>Frame Sync</strong> red icon and Reference Invalid message in Card Info pane.</td>
<td>- Frame sync reference not properly selected or not being received</td>
<td>- If external frame sync reference is not intended to be used, make certain the Framesync Enable selection list is set to <strong>Off</strong> or <strong>Input Video</strong> as desired.</td>
</tr>
<tr>
<td>- Card-edge red <strong>ERR</strong> indicator illuminated.</td>
<td></td>
<td>- 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.</td>
</tr>
<tr>
<td>DashBoard shows <strong>Framesync Status</strong> error message in FSE-8241 series card Framesync function submenu screen.</td>
<td>- Specified Minimum Latency Frames setting exceeds FSE-8241 series card buffer space for the selected output video format</td>
<td>- Reduce the Minimum Latency Frames setting as specified in the error message to correct the error. <strong>Note:</strong> 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.</td>
</tr>
<tr>
<td>Video/audio synchronization or delay noted.</td>
<td>- Source synchronization condition</td>
<td>- Use the <strong>Audio Offset from Video</strong> control to compensate for video/audio delay. Refer to Framesync function submenu tab on page 3-3-21 for more information.</td>
</tr>
<tr>
<td>Ancillary data (closed captioning, timecode, Dolby® metadata, AFD) not transferred through the FSE-8241 series card.</td>
<td>- Control(s) not enabled</td>
<td>- Make certain respective control is set to <strong>On</strong> or <strong>Enabled</strong> (as appropriate).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- 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.)</td>
</tr>
</tbody>
</table>
### Table 3.8 Troubleshooting Processing Errors by Symptom

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Error/Condition</th>
<th>Corrective Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audio signal(s) do not route as expected.</td>
<td>Embedded or AES audio contains Dolby® E or Dolby Digital encoded signal</td>
<td>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.</td>
</tr>
<tr>
<td>Parameter control not available as expected.</td>
<td>Audio Input Controls AES Passthrough or Zero Delay Embedding mode may inadvertently be enabled</td>
<td>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. <strong>Note:</strong> Routing and parametric controls may appear functional when either of these modes are enabled, although the controls will not be functional.</td>
</tr>
<tr>
<td>Audio not processed or passed through card.</td>
<td>Input audio of type that cannot be locked by FSE-8241 series card</td>
<td>AES discrete and embedded audio must be nominal 48 kHz input. <strong>Note:</strong> 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.</td>
</tr>
<tr>
<td></td>
<td>Enable control not turned on</td>
<td><strong>Group Enable</strong> 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.</td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Error/Condition</th>
<th>Corrective Action</th>
</tr>
</thead>
</table>
| 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. |
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

<table>
<thead>
<tr>
<th>Category</th>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SDI Inputs</strong></td>
<td>Number of Inputs</td>
<td></td>
</tr>
</tbody>
</table>
| | 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 |
## AES Audio Outputs

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Outputs (maximum)</td>
<td>4 unbalanced AES 4 unbalanced Dolby® encoded pair output copies</td>
</tr>
<tr>
<td>SMPTE Standards Accommodated</td>
<td>SMPTE 276M</td>
</tr>
<tr>
<td>Output Impedance</td>
<td>75Ω</td>
</tr>
<tr>
<td>Return Loss</td>
<td>&gt;30dB 100kHz to 6MHz</td>
</tr>
<tr>
<td>Sample Rate</td>
<td>48kHz</td>
</tr>
</tbody>
</table>

## 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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Inputs</td>
<td>Two non-terminating (looping) Frame Reference inputs</td>
</tr>
<tr>
<td>Standards Supported</td>
<td>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)</td>
</tr>
<tr>
<td>Signal Level</td>
<td>1Vp-p nominal</td>
</tr>
<tr>
<td>Signal Type</td>
<td>Analog video sync (black burst or tri-level)</td>
</tr>
<tr>
<td>Impedance</td>
<td>75Ω</td>
</tr>
<tr>
<td>Return Loss</td>
<td>&gt; 30dB to 30MHz</td>
</tr>
<tr>
<td>Allowable Maximum DC on Ref Input</td>
<td>±1.0V</td>
</tr>
</tbody>
</table>

## 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**

## 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

<table>
<thead>
<tr>
<th>PHONE</th>
<th>General Business Office and Technical Support</th>
<th>613 • 652 • 4886</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>After Hours Emergency</td>
<td>613 • 349 • 0006</td>
</tr>
<tr>
<td></td>
<td>Fax</td>
<td>613 • 652 • 4425</td>
</tr>
<tr>
<td>E-MAIL</td>
<td>General Information</td>
<td><a href="mailto:solutions@rossvideo.com">solutions@rossvideo.com</a></td>
</tr>
<tr>
<td></td>
<td>Technical Support</td>
<td><a href="mailto:techsupport@rossvideo.com">techsupport@rossvideo.com</a></td>
</tr>
<tr>
<td>POSTAL SERVICE</td>
<td>Ross Video Limited</td>
<td>8 John Street, Iroquois, Ontario, Canada K0E 1K0</td>
</tr>
<tr>
<td></td>
<td>Ross Video Incorporated</td>
<td>P.O. Box 880, Ogdensburg, New York, USA 13669-0880</td>
</tr>
</tbody>
</table>

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