Ross Video Limited

FSD-8240

HD/SD-SDI Frame Synchronizer with Dolby® Decoding

User Manual

ROSS

Live Production Technology

open**Gear**

FSD-8240 • HD/SD-SDI Frame Synchronizer with Dolby® Decoding User Manual

- Ross Part Number: **8240DR-004-01**
- Release Date: August 12, 2011. Printed in Canada.

The information contained in this manual is subject to change without notice or obligation.

Copyright

Patents

This product is protected by the following US Patents: 4,205,346; 5,115,314; 5,280,346; 5,561,404; 7,034,886; 7,508,455; 7,602,446; 7,834,886; 7,914,332. This product is protected by the following Canadian Patents: 2039277; 1237518; 1127289. Other patents pending.

Notice

The material in this manual is furnished for informational use only. It is subject to change without notice and should not be construed as commitment by Ross Video Limited. Ross Video Limited assumes no responsibility or liability for errors or inaccuracies that may appear in this manual.

Trademarks

- is a registered trademark of Ross Video Limited.
- Ross, ROSS, ROSS® are registered trademarks of Ross Video Limited.
- openGear® is a registered trademark of Ross Video Limited.
- DashBoard Control System™ is a trademark of Ross Video Limited.
- Dolby® is a registered trademark of Dolby Laboratories, Inc.
- 2.0-to-5.1 audio upmixer licensed feature uses the **AutoMAX-II™** upmix algorithm provided under license from **Linear Acoustic Inc**. **Linear Acoustic**, the "**LA**" symbol, **UPMAX**, **AutoMAX**, and **AutoMAX-II** are trademarks of Linear Acoustics Inc. All Rights Reserved.
- All other product names and any registered and unregistered trademarks mentioned in this guide are used for identification purposes only and remain the exclusive property of their respective owners.

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

This symbol on the equipment refers you to important operating and maintenance (servicing) instructions within the Product Manual Documentation. Failure to heed this information may present a major risk of damage or injury to persons or equipment.

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 — *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 — *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 — *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 — *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 — *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 — *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.*

CANADA

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

Cet appariel numerique de la classe "A" est conforme a la norme NMB-003 du Canada.

EUROPE

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

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.

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.*

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.
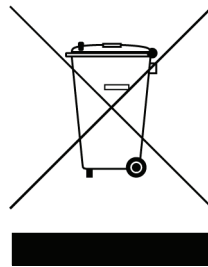
Environmental Information

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 for 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.

Company Address

Ross Video Limited

8 John Street
Iroquois, Ontario
Canada, K0E 1K0

Ross Video Incorporated

P.O. Box 880
Ogdensburg, New York
USA 13669-0880

General Business Office: (+1) 613 • 652 • 4886

Fax: (+1) 613 • 652 • 4425

Technical Support: (+1) 613 • 652 • 4886

After Hours Emergency: (+1) 613 • 349 • 0006

E-mail (Technical Support): techsupport@rossvideo.com

E-mail (General Information): solutions@rossvideo.com

Website: http://www.rossvideo.com

Contents

Introduction

In This Chapter

This chapter contains the following information:

- Overview
- Functional Block Diagram
- Functional Summary
- Manual Overview
- Documentation Terms and Conventions

A Word of Thanks

Congratulations on choosing an openGear FSD-8240 HD/SD-SDI Frame Synchronizer with Dolby® Decoding. Your FSD-8240 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 FSD-8240 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 FSD-8240, 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

The FSD-8240 is an HD/SD-SDI frame sync and Dolby® decoder, with 16 channels of audio embedding or de-embedding. When Dolby® Digital or Dolby® E is present on a discrete AES pair or on an embedded audio pair, the decoder produces up to 10 decoded channels, according to the Dolby® sub-format received by the metadata. The resulting channels are then available for mapping, inversion and level adjustment and then embedded into the video signal.

The FSD-8240 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.

The FSD-8240 can embed Dolby® metadata on the SDI output, sourced from either SDI input video or from the decoder as desired. With the optional metadata rear module's Dolby® META output can provide RS-485 metadata for downstream devices or systems. Metadata on the Dolby® META RS-485 output can also be sourced from either SDI input video or from the decoder as desired.

Features

The following features are standard with the FSD-8240:

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

Functional Block Diagram

This section provides a functional block diagram that outlines the workflow of the FSD-8240.
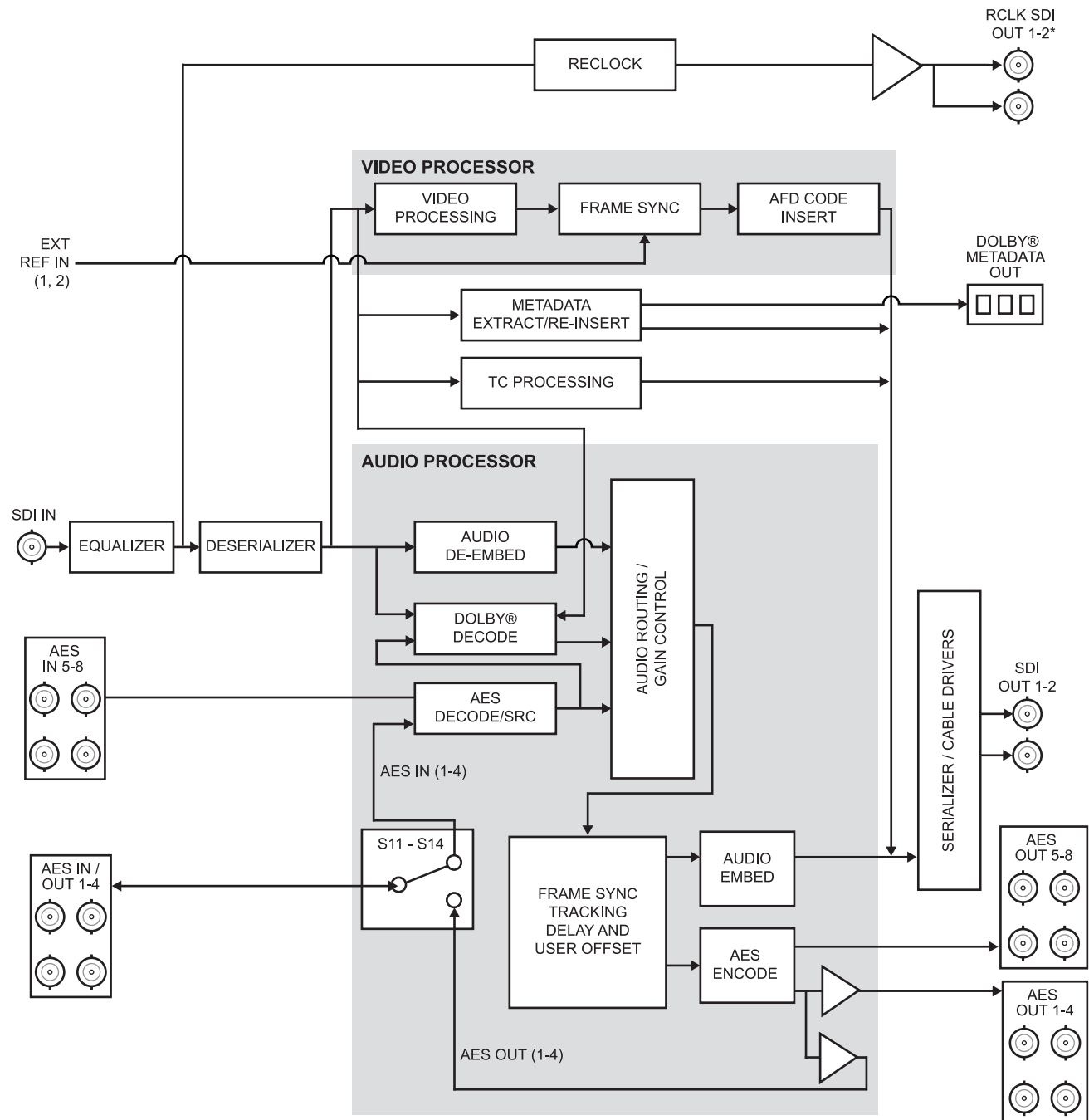
*Available on the R2-8240 rear modules only.

Figure 1.1 *Simplified Block Diagram — FSD-8240*

Functional Summary

Figure 1.1 shows a functional block diagram of the FSD-8240. The frame synchronizer also includes a full 16-channel audio embedder/de-embedder, and an 8-channel. The FSD-8240 also handles AFD code detection/insertion and transfer of Dolby® metadata. The FSD-8240 also performs Dolby® E and Dolby® Digital™ decoding and decoded channel routing.

Some of the functions described below are available only when using the DashBoard. Refer to the section "**User Control Interface**" on page 1-12 for user interface descriptions.

Input/Output Formats

The FSD-8240 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

The FSD-8240 provides the following outputs:

- **SDI OUT** – two dual-rate HD/SD-SDI buffered video outputs
- **RCK OUT** – two reclocked HD/SD-SDI input copies
- **AES OUT (1-8)** – dedicated AES outputs
- **AES I/O (1-4)** – user-switchable as AES inputs or AES outputs
- **DOLBY META** – RS-485 Dolby® metadata output (extracted from input video). Note that RS-485 Dolby® metadata output can consist of input video or Dolby® decoder metadata output.

The input/output complement listed above represents the maximum capability of the FSD-8240. The practical input/output complement is determined by the particular Rear Module used with the FSD-8240. Refer to the section "**Rear Modules**" on page 1-10 for more information.

Video Processor Description

Video Processor

The FSD-8240 provides full color processing control (luma gain and lift, chroma saturation, and color phase) of the output video.

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 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 FSD-8240 re-establishes video/audio sync following framesync changes by applying an offset in small, progressive amounts to provide a seamless, glitch-free retiming. A user-selectable hard resync function allows setting a threshold at which hard resync is applied if audio-video offset exceeds the threshold. Hard resync provides fastest

snyc-up suitable for off-air manipulation. Conversely, a threshold setting that avoids hard resync allows glitch-free on-air manipulation.

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

When Dolby® data is received and actively routed into embedded or AES output channels, the frame sync function delays the video by one frame (as required by the Dolby® decode processing delay) to maintain video/audio sync.

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 and ancillary data line number for the outputted AFD code.

Timecode Processor

This function provides for extraction of timecode data from the input video, and in turn re-insertion of timecode data into the output SDI. (**Figure 1.2**) The function can monitor the SDI video input of the card for supported timecode formats, and then select and prioritize among SDI VITC, SDI ATC VITC, and SDI ATC LTC timecode sources. If the preferred format is detected, the preferred format is used by the card; if the preferred format is not detected, the card uses other formats (where available) as desired.

The function provides conversion between various timecode formats and provides independent insertion and line number controls for each SDI timecode output format.
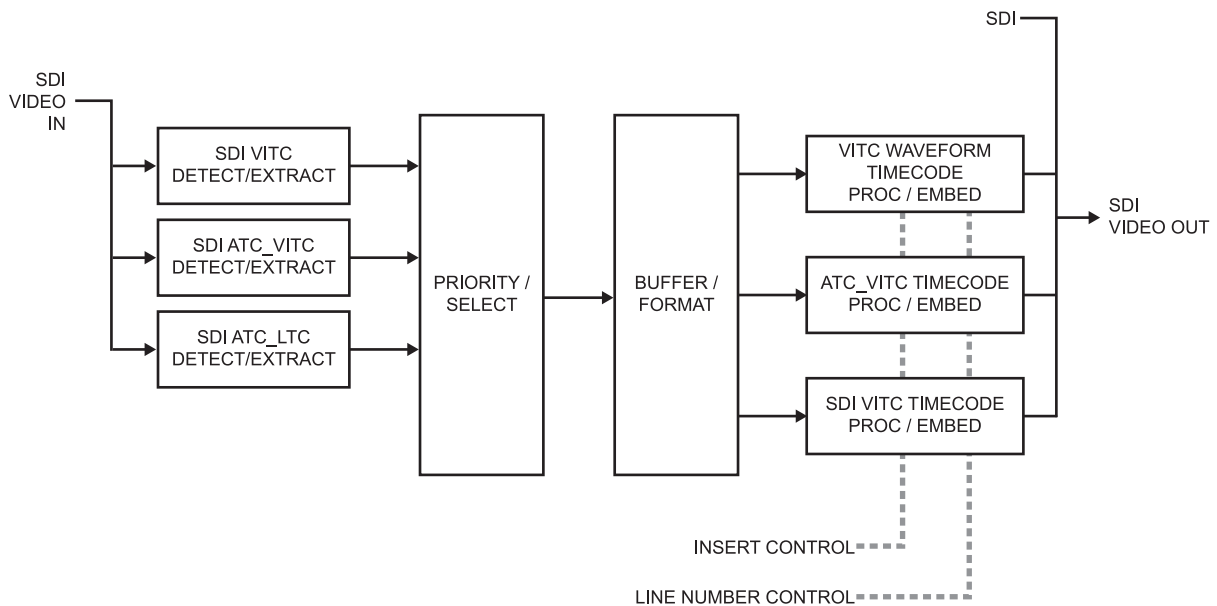
Figure 1.2 Timecode Processor

Audio Processor Description

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

- 16 channels of embedded audio from the SDI video
- 16 channels (8 pairs) of discrete AES input
- Four independent internal tone generators (described below)
- Digital silence (mute) setting
- Internal Down Mix and Mono Mixer outputs (described below)
- Decoded Dolby® channels

The router function provides the following audio outputs:

- 16 channels of embedded audio on the SDI output
- 16 channels of discrete AES output on eight AES pairs

The router acts as a full audio cross point. Each of the 32 output channels (16 embedded AES, 16 discrete AES) can receive signal from any one of the 32 (16 embedded AES, 16 discrete AES) input channels, four internal tone generators, or several mixer outputs. 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 pass through the 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 FSD-8240.) 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 1.2**, the FSD-8240 is equipped with eight discrete AES input pair ports and eight 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 FSD-8240 card.
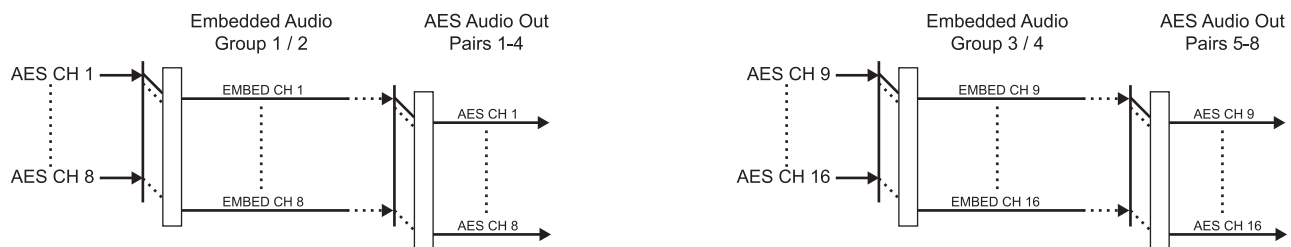


Figure 1.3 *Default Embed/De-Embed Audio Routing*

Audio Down Mixer and Mono Mixer Function

The Audio Down Mixer function provides for the selection of any five embedded, or AES discrete audio sources serving as Left (**L**), Right (**R**), Center (**C**), Left Surround (**Ls**), and Right Surround (**Rs**) individual signals to be multiplexed into a stereo pair (Down Mix Left (**DM-L**) and Down Mix Right (**DM-R**). (**Figure 1.4**) The resulting stereo pair **DM-L** and **DM-R** can in turn be routed and processed just like any of the other audio sources described earlier.
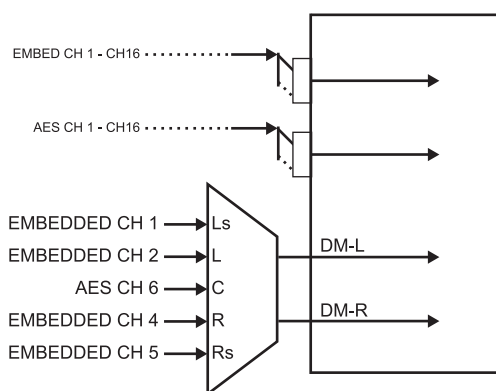
Figure 1.4 *Audio Mixing Functional Block Diagram with Example Sources*

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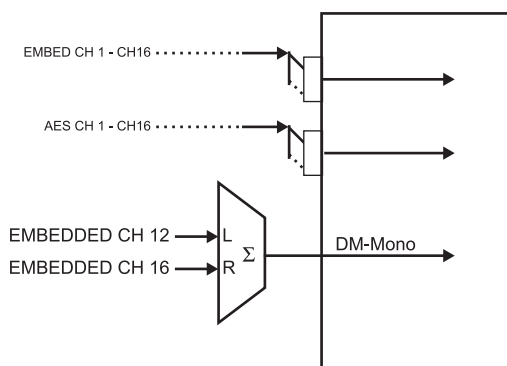
Figure 1.5 *Audio Mono Mix Functional Block Diagram with Example Sources*

Tone Generator Function

The FSD-8240 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).

Audio Routing Example

Figure 1.6 shows an example of using the FSD-8240 audio embedding/de-embedding and routing functions to de-embed audio, route the audio to discrete outputs for post-production processing (in this example, a console used for post-production EQ, levels, and monitor), 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 this example, a provision for a tone).

Note that the source and destination correlations shown here are only examples; any source can route to any destination.
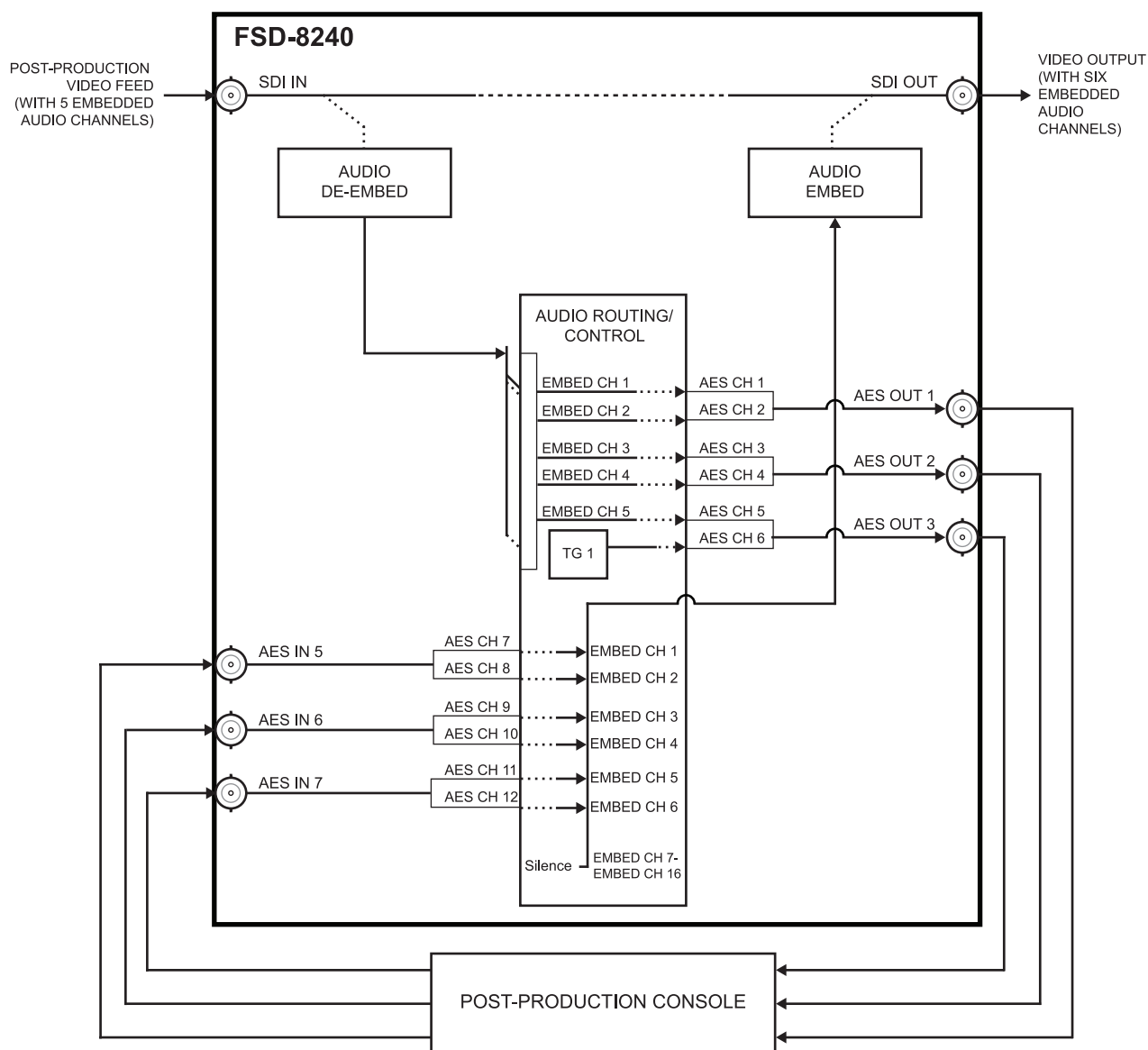
Figure 1.6 *Audio Routing Example*

AES Audio Input Advanced Features

AES Sample Rate Converter

The FSD-8240 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 non-PCM AES 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. For example if Dolby® E is to be embedded into video with no latency, additional delay may not be tolerable.

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.

Dolby® Decoding

When Dolby® E or Dolby® Digital™ is present on an embedded audio pair, the decoder produces up to 10 decoded channels (according to the Dolby® sub-format received from the metadata). All resulting channels are available as inputs to the audio router.

Dolby® Identification and Metadata Output Processing

All embedded channels are checked by the FSD-8240 for valid Dolby® status. (**Figure 1.7**) When a valid Dolby® encoded embedded pair is detected, the channel pair carrying the Dolby® format is displayed as "Present, Dolby E" or "Present, Dolby Digital", as applicable. (The decoder always uses the metadata associated with its respective pair.) A selected encoded channel pair can then be directed to the Dolby® decoder. The decoder then displays the Dolby® bitstream format and program configuration (for example, "Dolby E 20-bit 5.1+2" indicating 5-channel surround with LFE channel and stereo monitor pair) for the selected pair, as defined by its metadata.

The FSD-8240 can embed metadata on the SDI output, sourced from either SDI input video or from the decoder as desired. Similarly, the FSD-8240 **DOLBY META** output can provide RS-485 metadata for downstream devices or systems. Metadata on the **DOLBY META** RS-485 output can also be sourced from either SDI input video or from the decoder as desired.

Audio Decoding

Based on the channels carrying the Dolby® encoded pair and the format defined within, the Dolby® decoder provides up to 10 decoded audio channels (**Dolby Ch 1** thru **Dolby Ch 8**; **Dolby Mix 1**, **Dolby Mix 2**). (**Figure 1.7**) Each channel can be routed just as any other audio channel described in this section.
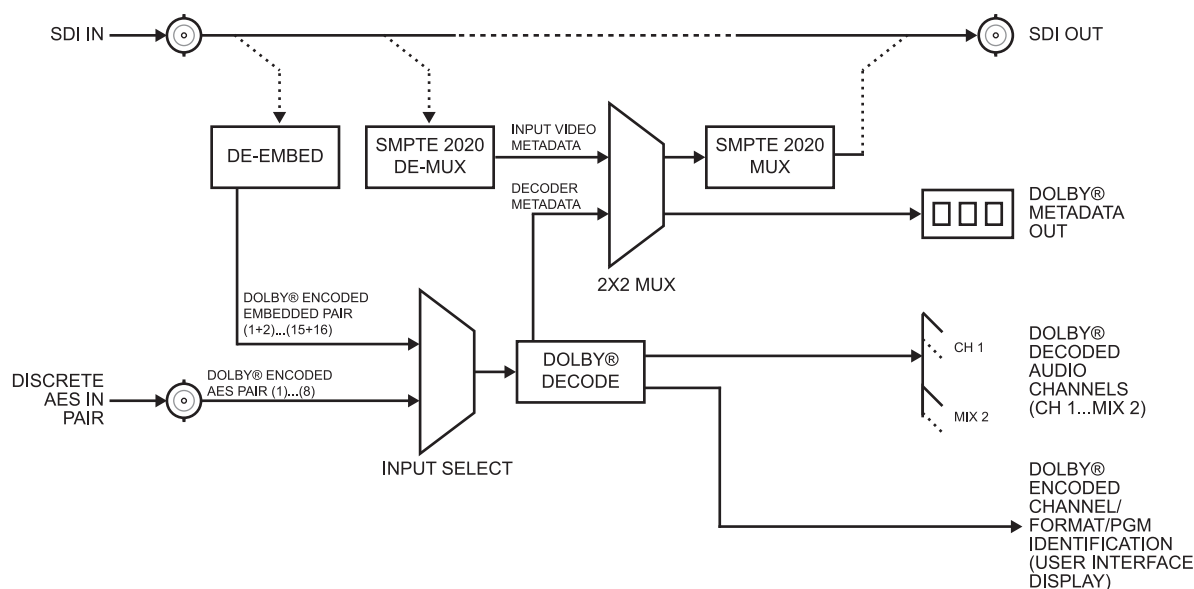
Figure 1.7 Dolby® Decoding and Metadata Output Processing

Rear Modules

The FSD-8240 physically interfaces to system video and audio connections using a Rear Module.

All inputs and outputs shown in **Figure 1.1** enter and exit the card via the card-edge backplane connector. The Rear Module breaks out the FSD-8240 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 described in the section "**Installing a Rear Module**" on page 2-4.

Supported Audio and Video Formats

The FSD-8240 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 FSD-8240.

Table 1.1 Supported Audio and Video Formats

Item	Description/Specification	
	Raster Structure:	Frame Rate:
	1080pSF	23.98; 24
	1080p	23.98; 24
Input / Output Video	1080i (1)	25; 29.97; 30
	720p	23.98; 24; 25; 29.97; 30; 50; 59.94; 60
	486i (1)	29.97
	575i (1)	25

Table 1.1 Supported Audio and Video Formats

Item	Description/Specification
Embedded Audio	The FSD-8240 supports all four groups (16 channels) of embedded audio at full 24-bit resolution in both SD (with extended data packets) and HD.
Discrete AES Audio Input	The FSD-8240 can accept 16 channels (8 pairs) of discrete AES audio on 75W BNC connections. Sample rate conversion can be employed to account for minor clock rate differences in the AES stream and the input video stream. Note: The AES signal must have a nominal rate of approximately 48kHz. The FSD-8240 does not support AES input at 32kHz, 44.1kHz, 96kHz or 192kHz rates.
Discrete AES Audio Output	The FSD-8240 can provide 16 channels (8 pairs) of discrete AES audio on 75W BNC connections.
Dolby® E/Dolby® Digital™ Audio Input Decode	The FSD-8240 provides up to 10 decoded AES channels when valid Dolby® E or Dolby® Digital™ audio is received on either discrete AES or embedded inputs with corresponding metadata.
(1) All rates displayed as frame rates; interlaced ("i") field rates are two times the rate value shown.	

User Control Interface

Figure 1.8 shows the user control interface options for the FSD-8240. 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.

DFR-8321-CN FRAME WITH MFC-8320-N

Card-edge Controls
The FSD-8240 can be controlled using built-in card-edge controls

In conjuction with a DFR-8321 frame equipped with an MFC-8320-N card, the FSD-8240 can be remotely controlled over a LAN

LAN

DashBoard
Using a computer with DashBoard installed, the FSD-8240 can be remotely controlled over a LAN
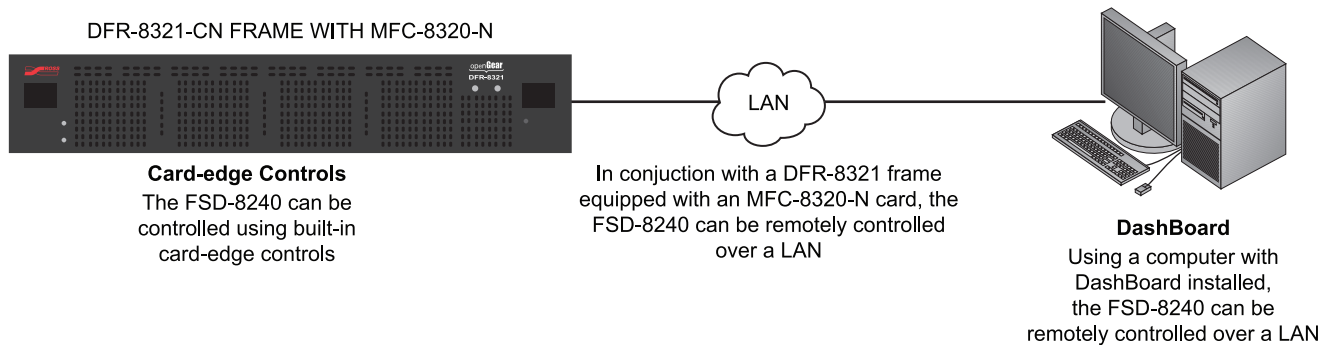
Figure 1.8 User Control Interface

Built-in Card-edge User Interface

Using the built-in card-edge controls and display, card control settings can be set using a front panel menu which is described in the section "**Control and Display Descriptions**" on page 3-2.

Some of the FSD-8240 functions described in this manual are available only when using DashBoard.

DashBoard User Interface

Using DashBoard, the FSD-8240 and other cards installed in the 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.

The DashBoard software can be downloaded from the Ross Video website. The DashBoard user interface is described in the section "**Accessing the FSD-8240 via Remote Control**" on page 3-11.

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*.

Manual Overview

This manual provides installation and operating instructions for the FSD-8240 HD/SD-SDI Frame Synchronizer with Dolby® Decoding card.

This manual consists of the following chapters:

- **Introduction** — Provides information about this manual and what is covered. Also provides general information regarding the FSD-8240.
- **Installation** — Provides instructions for installing the FSD-8240 in a frame, and optionally installing Rear Modules.
- **Operating Instructions** — Provides overviews of operating controls and instructions for using the FSD-8240.
- **Specifications** — Provides the technical specifications for the FSD-8240.
- **Service Information** — Provides troubleshooting solutions and warranty information.

Card Software Versions and this Manual

When applicable, Ross Video provides for continual openGear card 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 FSD-8240 and this manual at the same time, this manual reflects all facets of your card.

If your card was purchased earlier than receiving this manual, you can check the Software Version of your card and see if it matches the Software Version covered by this manual.

If necessary, the Software Release Number/Software Build Number of your FSD-8240 can be checked by viewing this information as displayed on the Info submenu on the card-edge display, or by checking the Card Info menu in DashBoard. Refer to the section "**Checking Card Information**" on page 3-13 for more information.

This section provides guidance when your card software does not match this manual.

Card software is an earlier version

Card is not loaded with the latest software. Not all functions and/or specified performance described in this manual may be available.

You can update your card by:

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

Software updates are field-installed without any need to remove the card from its frame.

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 FSD-8240 itself. Examples are provided below.

- Card-edge display messages are shown like this:

> Ch01

- Connector names are shown like this: **SDI OUT**

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

- All references to the **DFR-8300 series frame** also includes all version of the 20-slot frames and any available options unless otherwise noted.
- All references to the **FSD-8240** also includes all versions unless otherwise indicated.
- "**Board**", and "**Card**" refer to openGear terminal devices within openGear frames, including all components and switches.
- "**DashBoard**" refers to the DashBoard Control System™.
- "**Frame**" refers to DFR-8300 series frame that houses the FSD-8240 card, as well as any openGear frames.
- "**Operator**" and "**User**" refer to the person who uses FSD-8240.
- "**System**" and "**Video system**" refer to the mix of interconnected production and terminal equipment in your environment.
- The "**Operating Tips**" and "**Note**" boxes are used throughout this manual to provide additional user information.

Installation

In This Chapter

This chapter provides instructions for installing the FSD-8240, 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 the FSD-8240
- Cabling for the FSD-8240
- Setting up Network Remote Control

Before You Begin

Before proceeding with the instructions in this chapter, ensure that your DFR-8300 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 FSD-8240 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 FSD-8240 are to be used as outputs (the switches are set to input mode by factory default). The FSD-8240 is equipped with a four-section red DIP switch that sets AES pairs 1 thru 4 as either inputs or outputs. The factory default position is the input position for each pair.

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

Note switch **S11** thru **S14** settings for **AES I/O 1** thru **AES I/O 4** mode shown in **Figure 2.1**. For port to be used as an output, set switch to down position as shown in **Figure 2.1**.

Regardless of **S11** thru **S14** settings for **AES I/O 1** thru **AES I/O 4**, outputs **AES OUT (1-8)** are still available on cards equipped with a Rear Module having dedicated **AES OUT (1-8)** BNC connectors.
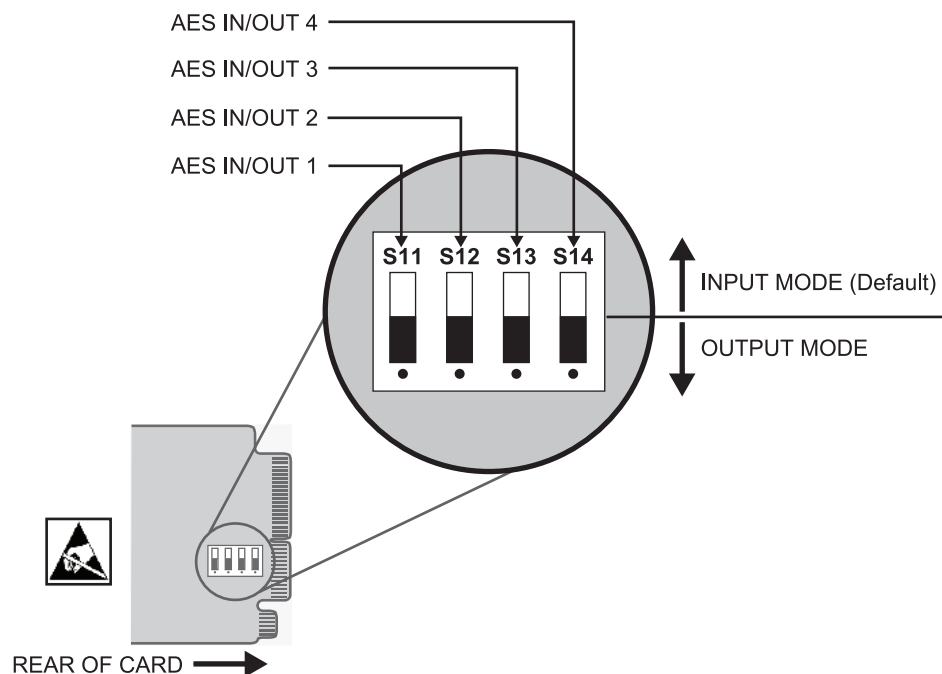
Figure 2.1 *AES I/O (1-4) Mode Switches*

Installing a Rear Module

This procedure is applicable only if a Rear Module is not currently installed in the slot where the FSD-8240 is to be installed.

Rear Modules

When installing the FSD-8240 in the DFR-8321 series frames, the **R2-8240** Full Rear Module or the **R2M-8240** can be used. Note that the available cable designations differ between the type of module used. Refer to the section

Installing a Rear Module

Use the following procedure to install a Rear Module in your DFR-8300 series frame:

1. Locate the card frame slots on the rear of the frame.

2. Remove the Blank Plate from the slot you have chosen for the FSD-8240 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**

Screw Hole

Module Seating Slot
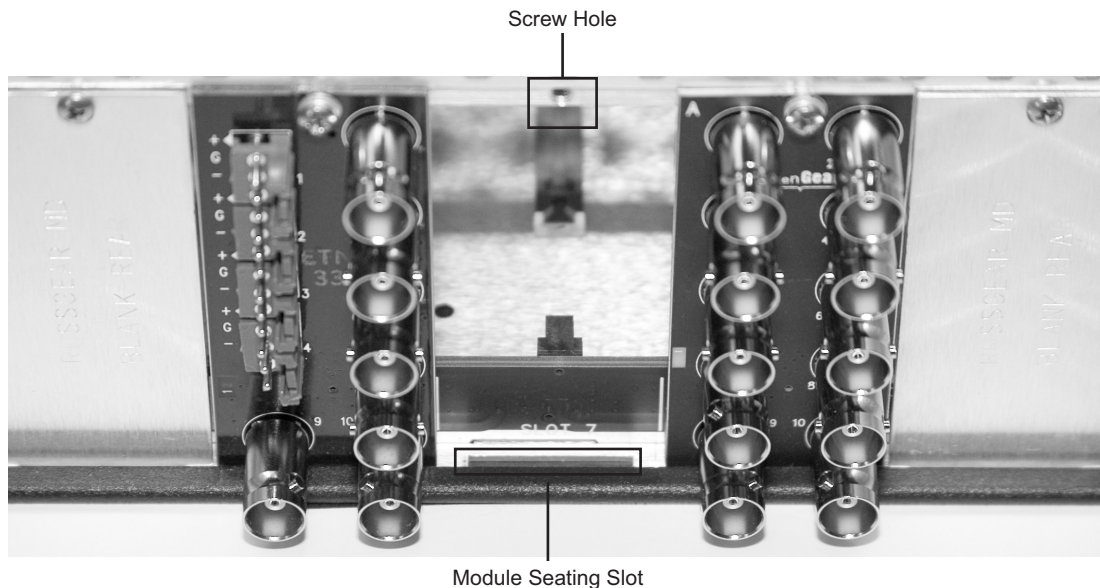
Figure 2.2 Rear Module Installation in a DFR-8310 Series Frame (FSD-8240 not shown)

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 your DFR-8300 series frame.

Installing the FSD-8240

This section outlines how to install a FSD-8240 card when the Rear Module is already installed in a DFR-8300 series frame. If you are installing the FSD-8240 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 FSD-8240 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 FSD-8240

Use the following procedure to install the FSD-8240 in a DFR-8300 series frame:

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 FSD-8240 is to be installed.

⚠ **Notice** — *Heat and power distribution requirements within a frame may dictate specific slot placements of cards. Cards with many heat-producing components should be arranged to avoid areas of excess heat build-up.*

3. Open the frame front access panel.

4. While holding the card by the card-edges, align the card such that the plastic ejector tab is on the bottom.

5. Align the card with the top and bottom guides of the slot in which the card is being installed.

6. Gradually slide the card into the slot. When resistance is noticed, gently continue pushing the card until its rear printed circuit edge terminals engage fully into the rear module mating connector.

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

7. Verify that the card is fully engaged in rear module mating connector.

8. Close the frame front access panel.

9. Connect the input and output cables as outlined in the section "**Cabling for the FSD-8240**" 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 module mating connector. Evenly draw the card from its slot.*

This completes the procedure for installing the FSD-8240 in a DFR-8300 series frame.

Cabling for the FSD-8240

This section provides information for connecting cables to the installed rear modules in the DFR-8300 series frame. Note that the FSD-8240 card BNC inputs are internally 75-ohm terminated. It is not necessary to terminate unused BNC inputs or outputs.
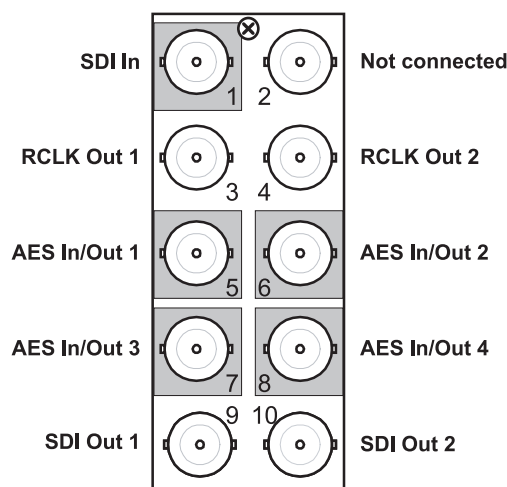
Figure 2.3 Cable Connections for the *R2-8240* Rear Module
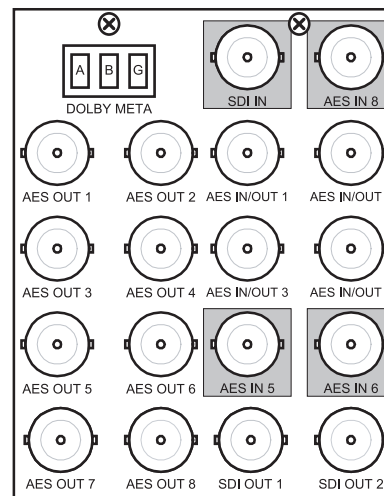
Figure 2.4 Cable Connections for the *R2M-8240* Rear Module

R2-8240 Full Rear Module

Each card occupies two slots and provides the following connections:

- HD/SD-SDI coaxial input (**SDI IN**)
- Two HD/SD-SDI reclocked input copies (**RCK OUT 1** and **RCK OUT 2**)
- Four AES I/O coaxial input/outputs (**AES I/O 1** thru **AES I/O 4**; I/O function of each connection is user-configurable)
- Two buffered SDI coaxial outputs (**SDI OUT 1** and **SDI OUT 2**)

R2M-8240 Full Rear Module

Each card occupies two slots and provides the following connections:

- HD/SD-SDI coaxial input (**SDI IN**)
- Four AES I/O coaxial input/outputs (**AES I/O 1** thru **AES I/O 4**; I/O function of each connection is user-configurable)
- Two dedicated AES coaxial audio inputs (**AES IN 5** and **AES IN 6**)
- Eight dedicated AES coaxial audio outputs (**AES OUT 1** thru **AES OUT 8**)
- Dolby® RS-485 metadata output (**DOLBY META**)
- Two buffered SDI coaxial outputs (**SDI OUT 1 and SDI OUT 2**)

> **Note** — *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.*

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 chapter describes the user interface controls, indicators, and displays (both on-card and remote controls) for using the FSD-8240 card. The FSD-8240 functions can be accessed and controlled using any of the user interfaces described here.

The following topics are discussed:

- Control and Display Descriptions
- Card-edge Controls, Indicators, and Display
- DashBoard User Interface
- Accessing the FSD-8240 via Remote Control
- Checking Card Information
- Ancillary Data Line Number Locations and Ranges

Control and Display Descriptions

The format in which the FSD-8240 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 FSD-8240 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 FSD-8240 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 FSD-8240 are organized into function submenus, which consist of parameter groups as shown below.

Figure 3.1 shows how the FSD-8240 card and its submenus are organized, and also provides an overview of how navigation is performed between cards, function submenus, and parameters.
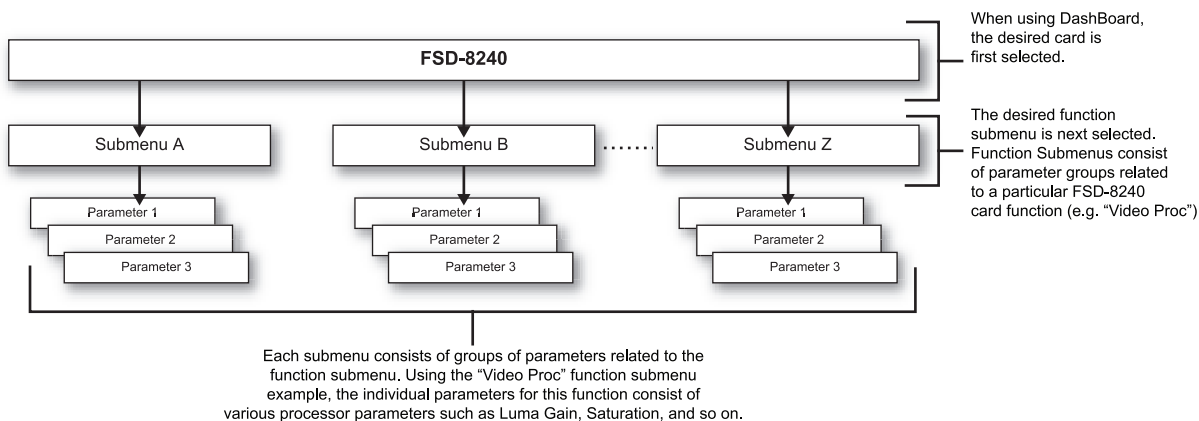
Figure 3.1 *Function Submenu/Parameter Submenu Overview*

Card-edge Controls, Indicators, and Display

Figure 3.2 shows and describes the FSD-8240 card-edge controls, indicators, and display.
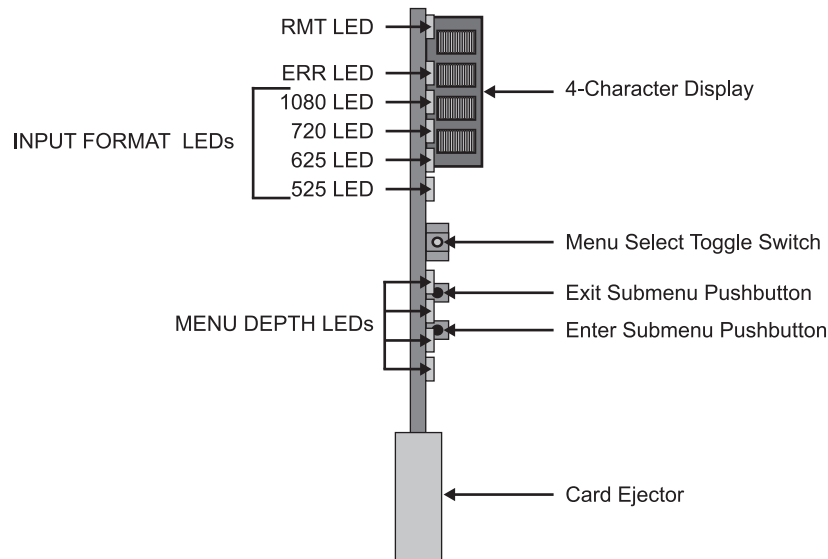
Figure 3.2 Controls, Indicators, and Display

Card-edge Controls

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

4-Character Display

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

Menu Selection Toggle Switch

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

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

Enter Menu Pushbutton

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

Exit Menu Pushbutton

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

Status and Selection LEDs on the Card-edge

The front-edge of the FSD-8240 has LED indicators for communication activity. Basic LED displays and descriptions are provided in **Table 3.1**.

Table 3.1 LEDs on the FSD-8240

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

Card-edge Control Menu/Submenu Structure

Using the menu system of group menus and submenus described earlier, the FSD-8240 parameters/controls are organized into menus and submenus.(**Table 3.2**) As appropriate, a submenu similarly may have its own further additional subordinate submenus.

Table 3.2 Card-edge Control Menu Structure

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

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

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

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

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

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

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

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

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

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

Submenu Depth				Description
	1	**2**	**3**	**4**	

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

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

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

Card-edge Display Orientation, Brightness, and Timeout Adjust

The card-edge 4-Character Alphanumeric Display can be changed between vertical or horizontal character orientation to suit the mounting position of the card as shown and described below.
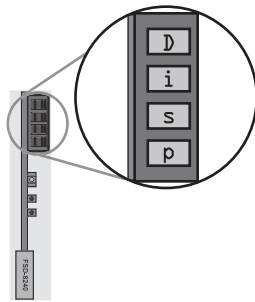
Figure 3.3 Vertical Orientation
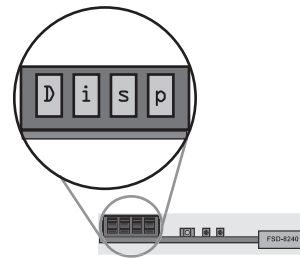
Figure 3.4 Horizontal Orientation

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

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

1. Access the **Displ** (Display) menu.

2. Select between Horizontal or Vertical as shown below.

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

Use the following procedure to adjust the display brightness:

1. Access the **Displ** (Display) menu.

2. Select from the relative brightness levels as shown below.

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

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

1. Access the **Displ** (Display) menu.

2. Use the **Menu Selection Toggle** switch to enter the desired timeout value as shown below.

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

DashBoard User Interface

The FSD-8240 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 FSD-8240 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.
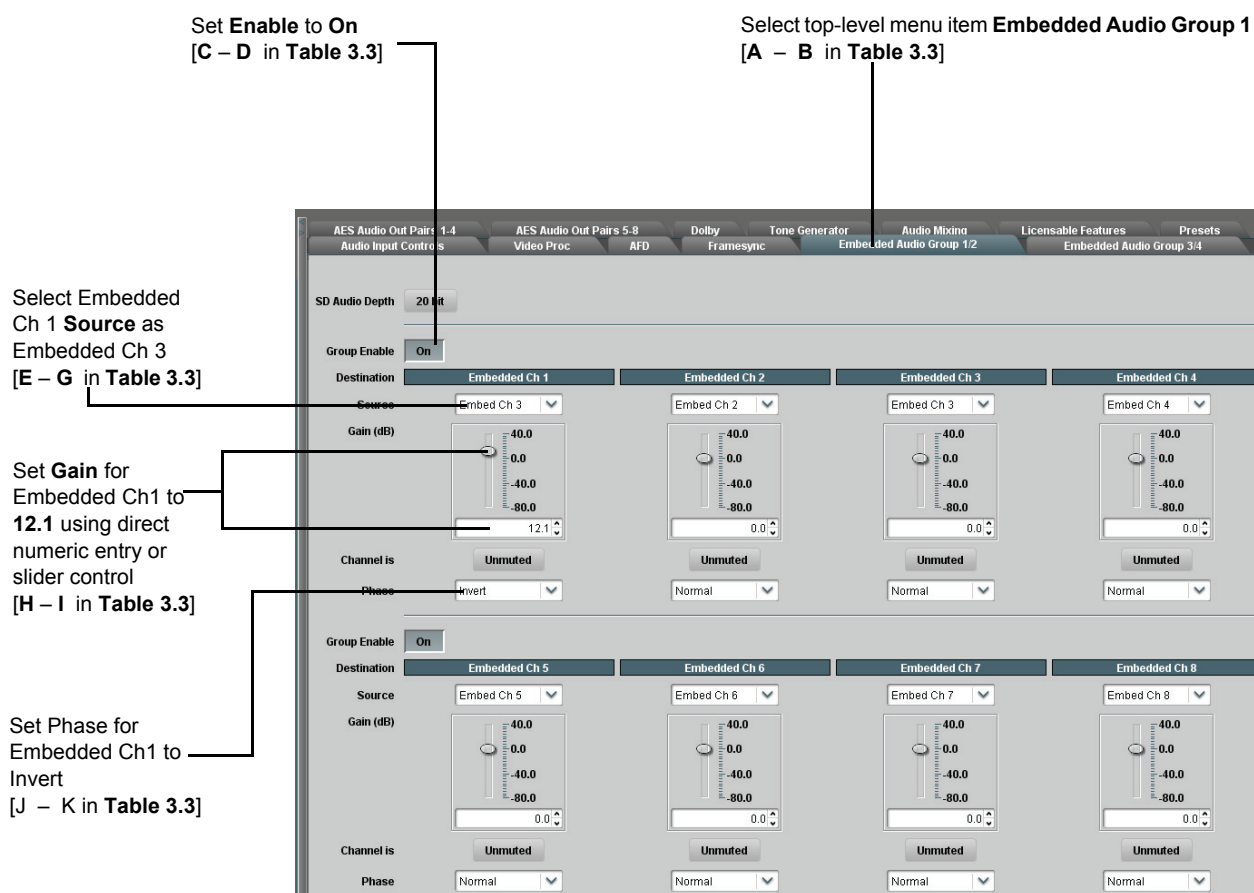
Figure 3.5 DashBoard Setup of Example Embedded Audio Function (1 of 2)

Select **AES Audio Out Pairs 1-4**
[**L** – **M** in **Table 3.3**]

Select Embedded Ch 1
as **Source** for **AES Ch1**
output
[**N** – **O** in **Table 3.3**]

Set **Gain** for AES Ch1
to **18.5** using direct
numeric entry or slider
control
[**P** – **Q** in **Table 3.3**]

Set **Phase** for AES
Ch1 to **Normal**
[**R** – **S** in **Table 3.3**]
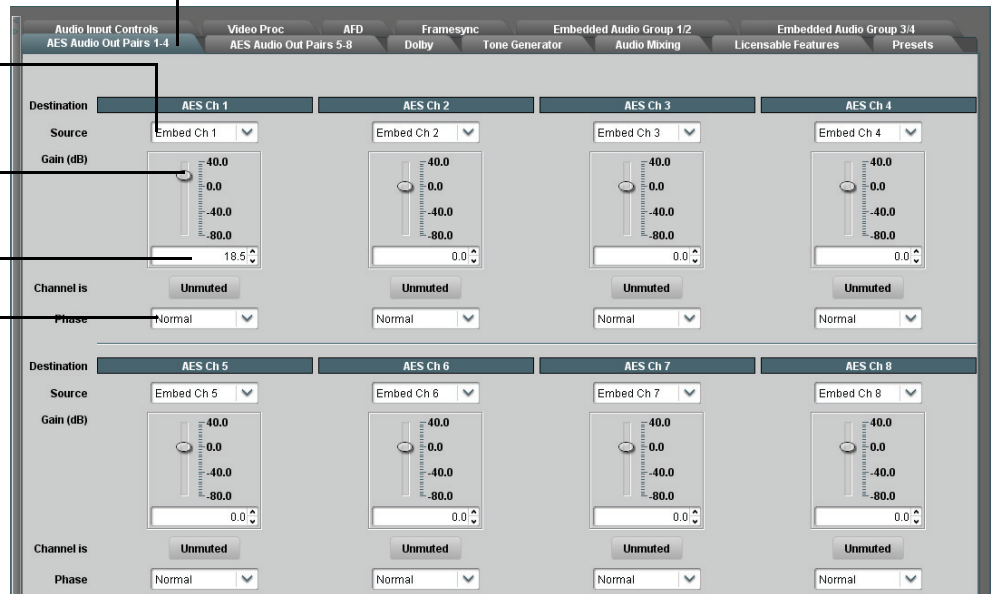
Figure 3.6 *DashBoard Setup of Example Embedded Audio Function (2 of 2)*

Accessing the FSD-8240 via Remote Control

Access the FSD-8240 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 FSD-8240 card to be accessed (in this example, Frame 1A).
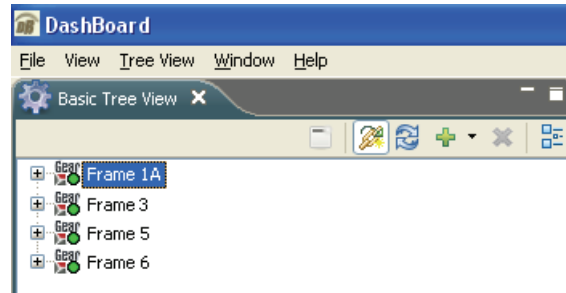
Basic Tree View — Selecting the Frame

3. As shown below, expand the tree to access the cards within the frame. Click on the card to be accessed (in this example, "Slot 7: FSD-8240").
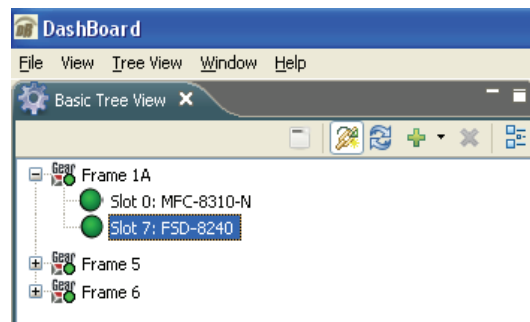
Basic Tree View — Selecting the FSD-8240

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).

Card Access/Navigation Tree Pane   Card Info Pane   Card Function Submenu and Controls Pane
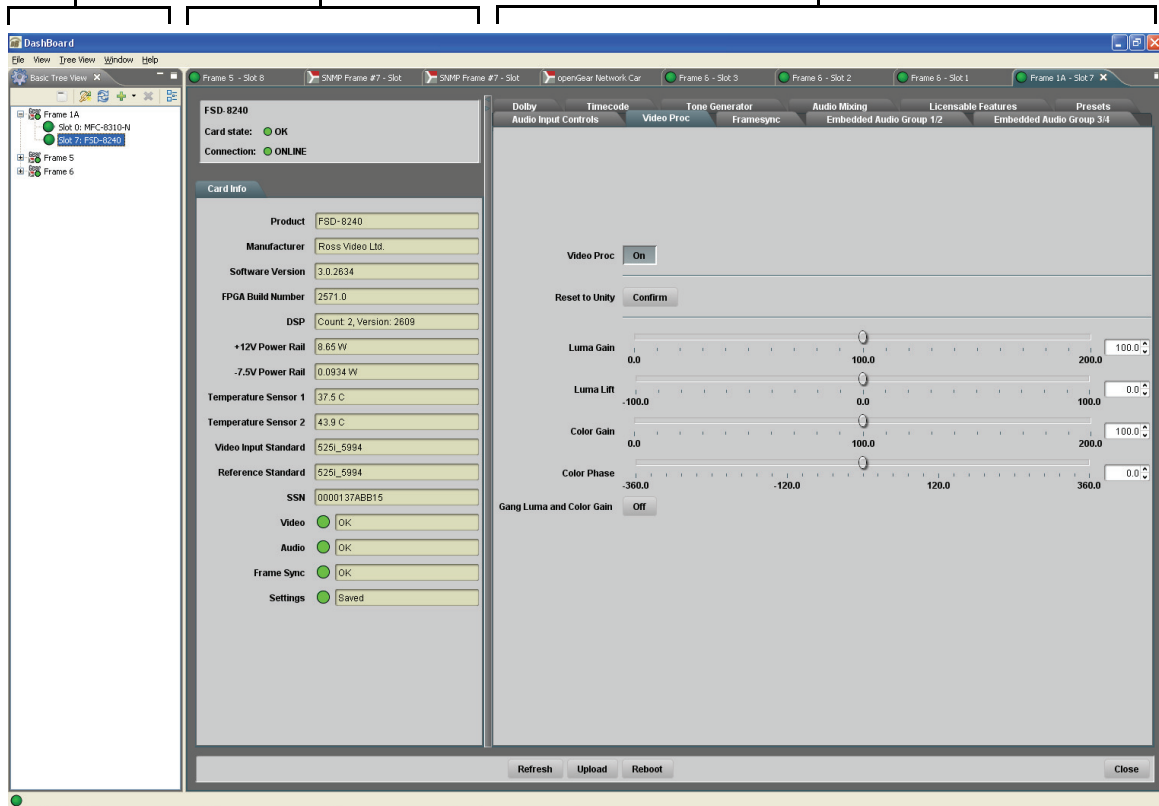
Figure 3.7 *FSD-8240 Tabs in DashBoard*

Checking Card Information

The operating status and software version the FSD-8240 card can be checked using DashBoard or the card-edge control user interface. **Figure 3.8** shows and describes the FSD-8240 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 3-60 for corrective action.

The **Tree View** shows the cards seen by DashBoard. In this example, Frame 1A is hosting a FSD-8240 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 FSD-8240 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 FSD-8240. Green Settings icon shows that any changes made on DashBoard are sucessfully saved on the card's memory.
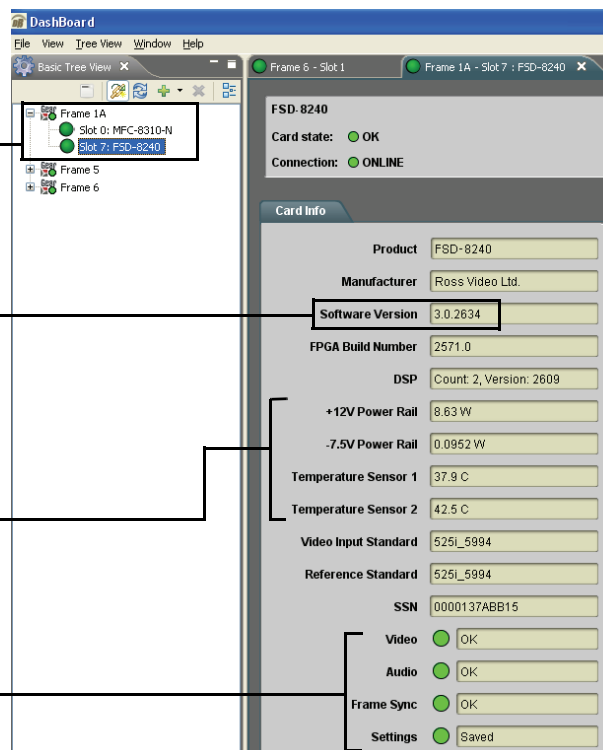
Checking Card Using Card-edge Controls Info

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

***Figure 3.8** Card Info Utility*

Ancillary Data Line Number Locations and Ranges

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

Table 3.4 Typical Ancillary Data Line Number Locations/Ranges

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

Notes:

1. The card does not check for conflicts on a given line number. Make certain the selected line is available and carrying no other data.

2. While range indicated by drop-down list on GUI may allow a particular range of choices, the actual range is automatically clamped (limited) to certain ranges to prevent inadvertent conflict with active picture area depending on video format. Limiting ranges for various output formats are as follows:

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

Because line number allocation is not standardized for all ancillary items, consideration should be given to all items when performing set-ups. **Figure 3.9** and **Figure 3.10** show an example of conflicted and resolved VANC allocation within an HD-SDI stream.
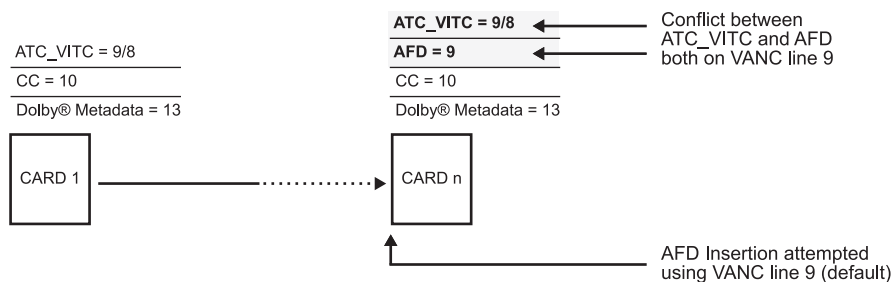
Figure 3.9 Example VANC Line Number Allocation — Conflicted
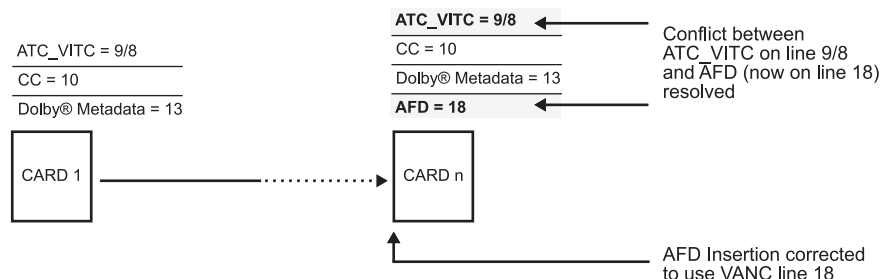
Figure 3.10 Example VANC Line Number Allocation — Resolved

Function Submenu List and Descriptions

This section individually lists and describes each FSD-8240 function submenu ('tab") and its related list selections, controls, and parameters. Where helpful, examples showing usage of a function are also provided. This information 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, $\updownarrow$ 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 for an explanation and an example of card-edge control menu structure navigation. Where this is not shown for a particular control, this indicates the control is not available using card-edge controls.

On DashBoard itself and in this section, the function submenu items are organized using tabs as shown below.

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

Function Submenu Item	Page	Function Submenu Item	Page
Audio Input Controls	3-16	Dolby Decoder	3-42
Video Proc	3-19	Dolby E Metadata	3-45
AFD	3-21	Dolby D Metadata	3-46
Framesync	3-22	Timecode	3-47
Embedded Audio Group 1/2	3-28	Audio Mixing	3-51
Embedded Audio Group 3/4	3-34	Tone Generator	3-53
AES Audio Out Pairs 1-4	3-36	Presets	3-53
AES Audio Out Pairs 5-8	3-41		

Audio Input Controls

Controls the AES Audio Input features for the eight AES 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 1-8 for detailed information regarding these functions.

AES SRC

AES	SRC
Pair 1	Disabled
Pair 2	Enabled
•	
•	
Pair 8	Disabled

Individual SRC Disable control for each AES pair (1 thru 8) disables or enables Sample Rate Conversion (SRC) bypass as follows:

- **Disabled On**: In this mode, AES SRC for the corresponding AES pair is bypassed (button pressed in). SRC is set to Disabled (bypass turned on) by default. This mode is preferred where the AES rate matches the input video rate. This mode is necessary when embedding non-PCM AES audio such a Dolby® E or Dolby Digital™ audio streams.

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

  Note: AES audio must be nominally 48 kHz.

- **Disable Off**: In this mode, AES SRC for the corresponding AES input pair is enabled (button in out position). SRC enabled allows the FSD-8240 to interface with asynchronous AES sources (sources in which the AES timing does not match the video reference timing). SRC can be used to compensate for minor clock rate differences in the AES stream and the input video stream.

Card-edge Control Menu: **Aud**

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

AES Passthrough

AES	Passthrough
Pair 1	Off
Pair 2	On
•	
•	
Pair 8	Off

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

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

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

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

Card-edge Control Menu: **Aud**

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

Audio Input Controls

(continued)

AES Zero Delay Embedding

AES	Zero Delay Embedding
Pair 1	Off
Pair 2	On
•	
•	
Pair 8	Off

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

- **Off**: Disables Zero-Delay Embedding for the selected AES input pair. Zero-delay embedding is set to Off by default.

- **On**: The selected pair directly embeds into its corresponding group (AES Pair 1 embeds into embedded channels 1 and 2; AES pair 2 embeds into embedded channels 3 and 4, and so on) with the normal frame sync audio delay being bypassed.

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

Card-edge Control Menu: **Aud**

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

Status Displays

AES	Status
Pair 1	Not Present
Pair 2	Present, Professional
•	
•	
Pair 8	Not Present

Embedded Group 1	Channel 1
Status	Present, Professional
•	
•	
Embedded Group 4	Channel 16
Status	Present, Dolby E

Individual signal status displays for AES pairs 1-8, and embedded audio channels 1-16 as follows:

- **Not Present:** Indicates AES pair or embedded channel does not contain recognized audio PCM data.

  Note: Channel displaying Not Present may still carry usable audio data with Not Present being displayed due to invalid headers.

- **Present, Professional**: Indicates AES pair or embedded channel contains recognized AES audio PCM data.
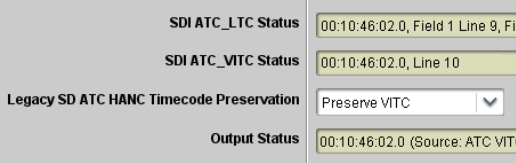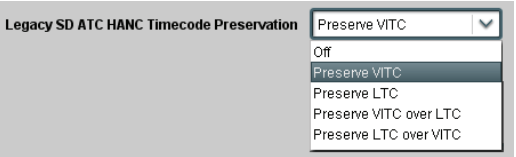
- **Present, Consumer**: Indicates AES pair or embedded channel contains audio PCM data other than AES (for example, S/PDIF).

- **Present, Dolby E**: Indicates AES pair or embedded channel contains Dolby® E encoded data.

- **Present, Dolby Digital**: Indicates AES pair or embedded channel contains Dolby® Digital encoded data.

  Note: Dolby status displays shown to the left only occur for valid Dolby® signals meeting SMPTE 337M standard.

  When Dolby® E or Dolby® Digital™ is present on a discrete AES pair or an embedded audio pair, the decoder can provide up to 10 decoded channels (according to the Dolby® sub-format and received metadata). All channels are available as inputs to audio routing.

Audio Input Controls

(continued)

Embedded Unity Channel Selection Embedded Unity Channel Selection [Embedded ▼] Embedded AES	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 AES Unity Channel Selection [Embedded ▼] Embedded AES	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 16 as sources to destination channels AES Ch 1 thru AES Ch 16. • ***AES***: Routes AES Ch 1 thru Ch 16 as sources to destination channels AES Ch 1 thru AES Ch 16.
Apply Audio Channel Selection Apply Audio Unity Settings [Confirm]	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 Tie AES and Embedded Controls [Enabled]	When set to Enabled, gangs **Gain**, **Phase**, and **Mute** controls for same-numbered Embedded and AES channels. Ganging is bilateral, with embedded channel control settings affecting corresponding AES channel controls, and vice-versa.
HANC Timecode Controls SDI ATC_LTC Status [00:10:46:02.0, Field 1 Line 9, Fi] SDI ATC_VITC Status [00:10:46:02.0, Line 10] Legacy SD ATC HANC Timecode Preservation [Preserve VITC ▼] Output Status [00:10:46:02.0 (Source: ATC VIT]	Where ATC_LTC or ATC_VITC timecode data is present on input video HANC space (which can be affected by audio processing), allows extracting and preserving HANC timecode data, with re-direction of the timecode data safely to the VANC space.
HANC Timecode Preservation Selection Legacy SD ATC HANC Timecode Preservation [Preserve VITC ▼] Off Preserve VITC Preserve LTC Preserve VITC over LTC Preserve LTC over VITC	Using the drop-down list, selects the action to take in presence or absence of HANC ATC_VITC and/or ATC_LTC timecode data. **Note**: For 525i2994 SD_ATC, field 1 and field 2 timecode data is redirected to VANC lines 12 and 275. For 625i50 SD_ATC, field 1 and field 2 timecode data is redirected to VANC lines 8 and 321. The card does not check for conflicts on a given line number. Make certain the selected line is available and carrying no other data. Refer to the section "**Ancillary Data Line Number Locations and Ranges**" on page 3-14 for more information.

Video Proc

Provides the following Video Proc parametric controls.

Video Proc	**Video Proc (On/Off)** provides master on/off control of all Video Proc functions.
Video Proc [On]	• When set to **Off**, all processing is bypassed.
	• When set to **On**, currently displayed parameter settings take effect.

Card-edge Control Menu: **Vid**

1	2	3	
Proc			
	Enbl		
		On	Video Proc on
		Off	Video Proc off

Reset to Unity

Reset to Unity [Confirm]

Reset to Unity provides unity reset control of all Video Proc functions.

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.

Card-edge Control Menu: **Vid**

1	2	3	
Proc			
	Unty		
		Y?	Move toggle switch in either direction to confirm unity reset. Reject reset by pressing Exit Menu pushbutton.

Luma Gain

Luma Gain   0.0

Adjusts gain percentage applied to Luma (Y channel).

(0% to 200% range in 0.1% steps; unity = 100%)

Card-edge Control Menu: **Vid**

1	2	3	
Proc			
	Gain		
		(value)	Luma gain in percent

Luma Lift

Luma Lift   -100.0

Adjusts lift applied to Luma (Y-channel).

(-100% to 100% range in 0.1% steps; null = 0.0%)

Card-edge Control Menu: **Vid**

1	2	3	
Proc			
	Lift		
		(#)	Luma lift in percent

Video Proc	(continued)
Color Gain Color Gain — 0.0 Card-edge Control Menu: **Vid** 	1	2	3
---	---	---
Proc		
	Sat	
		(value) Color gain in percent		Adjusts gain percentage (saturation) applied to Chroma (C-channel). (0% to 200% range in 0.1% steps; unity = 100%)
Color Phase Color Phase — -360.0 Card-edge Control Menu: **Vid** 	1	2	3
---	---	---
Proc		
	Phas	
		(value) Color phase angle applied in degrees		Adjusts phase angle applied to Chroma. (-360° to 360° range in 0.1° steps; null = 0°)
Gang Luma and Color Gain Gang Luma and Color Gain [On] Card-edge Control Menu: **Vid** 	1	2	3
---	---	---
Proc		
	Gang	
		On Ganging on
		Off Ganging off		When set to **On**, changing either the **Luma Gain** or **Color Gain** controls increases or decreases both the Luma and Chroma levels by equal amounts.

	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.

Incoming AFD	Displays incoming AFD setting as follows:
Incoming AFD: 16:9 coded frame - 1010 - 16:9 (image protecte	• 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 Mode: Pass If Present, Else Insert Pass If Present, Else Insert Pass Incoming Code Replace Incoming Code	

Output Code	Drop-down list assigns desired AFD to output SDI.

Output Code: No AFD
- No AFD
- 4:3 - 0000 - Undefined
- 4:3 - 0010 - Box 16:9 (top)
- 4:3 - 0011 - Box 14:9 (top)
- •
- •
- 16:9 - 1111 - 16:9 (w/alt 4:3 center)

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

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

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

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

Framesync	Provides video Frame Sync offset and audio re-sync tools.
Framesync Enable Framesync Enable: Reference 1 Off Reference 1 Reference 2 Input Video Card-edge Control Menu: **FS** 	**1**	**2**	 Enbl 		Off	Frame Sync Off (disabled)	 		Ref1	Reference 1 selected	 		Ref2	Reference 2 selected	 		V-In	Input Video reference		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 Frame Sync indication ![Frame Sync Reference Invalid] appears in the Card Info status portion of DashBoard, indicating invalid frame sync reference error. (Additionally, the card-edge ERR indicator illuminates indicating the same.) External reference signals Reference 1 and Reference 2 are distributed to the FSD-8240 and other cards via a frame bus. • **Input Video**: Uses the input video signal as the reference standard. **Note**: If **Input Video** is used for framesync, any timing instability on the input video will result in corresponding instability on the output video.
Vertical Delay Control Vertical Delay (Lines) -1124 Card-edge Control Menu: **FS** 	**1**	**2**	 VOS 		(value)	Vertical delay value (in number of lines)		When Framesync is enabled, sets vertical delay (in number of lines of output video/format) between the output video and the frame sync reference. (Range is -1124 thru 1124 lines.) **Note**: Lines refer to lines in the output video format, and not to the reference format.
Horizontal Delay Control Horizontal Delay (us) -64.000 Card-edge Control Menu: **FS** 	**1**	**2**	 HOS 		(value)	Horizontal delay value		When Framesync is enabled, sets (in µsec of output video timing) horizontal delay between the output video and the frame sync reference. (Range is -64.000 thru 64.000 µsec) **Note**: When an external framesync reference is used, the card will not produce a framesync reset until the variance between framesync reference and output video exceeds ± 2 clock periods. Therefore, a framesync reset will not result if offsets within this window are applied. To apply an offset/framesync reset within this window, first apply a relatively large offset, then apply the target smaller offset. Example: To apply a 1-period offset, first apply a 10-period positive offset and then apply a 9-period negative offset. This results in the target 1-period offset being applied to the output video.

Framesync

(continued)

Minimum Latency Control Minimum Latency (Frames) 0 Card-edge Control Menu: **FS** | **1** LATF	**2**

	(value)	Min. Latency (in frames)		When Framesync is enabled, specifies the smallest amount of latency allowed by the frame sync (latency measurement in output video frames). The frame sync will not output a frame unless the specified number of frames are captured in the buffer. The operational latency of the frame sync is always between the specified minimum latency and minimum latency plus one frame (not one field).
				
				(Maximum range is 0 to 13; default = 1.)
				
				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:
				
				Framesync Status On
				
				  • Latency frames selection within limits.
				
				Framesync Status Minimum Latency Frames set to 3 the maximum amount for this standard
				
				  • Latency frames selection exceeds limits.

Audio Hard Resync Threshold Control Audio Hard Resync Threshold (Frames) 1.5	Sets threshold at which hard resync is applied if audio-video offset exceeds threshold (see below). Hard resync provides fastest snyc-up suitable for off-air manipulation. Conversely, a threshold setting that avoids hard resync allows glitch-free on-air manipulation. (Range is 1.5 to 13.0 frames in 0.1 frame increments)

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

6   **9**

Video: 40msec   Audio: 240msec   *t*
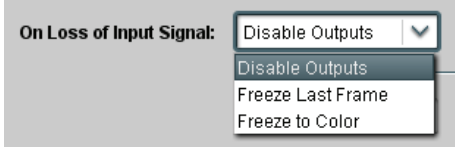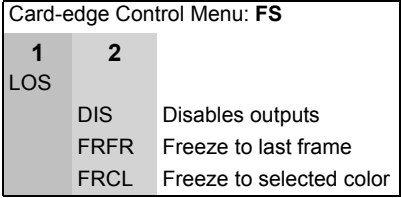
In this example, initial offset of 200 msec (appr. 6 frames) is **below** 9 frame threshold and results in soft resync being progressively applied.

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

12

9

Video: 40msec   Audio: 440msec   *t*

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

Framesync	(continued)

Audio Offset Control Audio Offset from Video (ms) -575.0 Card-edge Control Menu: **FS** **1** ADLY **2** ADJ **3** (value) Delay value	When Framesync is enabled, adds or reduces (offsets) audio delay from the matching video delay (audio delay offset setting adds or removes delay in addition to any delay included by other actions). This control is useful for correcting lip sync problems when video and audio paths in the chain experience differing overall delays. (-575.0 msec to 575.0 msec range; null = 0.0 msec) **Note**: Delay offset values of less than approximately 1 frame are progressively applied by the card to provide a seamless, glitch-free retiming. However, delay offset values exceeding 1-1/2 frames may result in a slight audio discontinuity at the moment when the offset is applied using this control if the Audio Hard Resync Threshold control is not at a setting greater than the delay offset. To prevent this condition during an on-air manipulation, it is recommended that the Audio Hard Resync Threshold control be set high enough such that expected delay offsets exceeding 1-1/2 frames are progressively applied. **Note**: If using Audio Offset control to perform off-air corrections, it is recommended to temporarily set the Audio Hard Resync Threshold control to its minimum setting, thereby allowing the offset to be assessed and corrected as fast as possible.
Current Audio Delay Display Current Audio Delay 2.02 ms / 0 Frames 31 lines Card-edge Control Menu: **FS** **1** ADLY **2** DVAL **3** (value) Delay value (in msec)	Displays the current input-to-output audio delay (in msec units) as well as in terms of Frames/fractional frame (in number of lines). **Note**: Value shown in column 3 is displayed value only. No control is available in this mode.
Video Delay Display Video Delay 0.06 ms / 0 Frames 1 lines Card-edge Control Menu: **FS** **1** VDLY **2** (value) Delay value (in msec)	Displays the current input-to-output video delay (in msec units) as well as in terms of Frames/fractional frame (in number of lines). **Note**: Value shown in column 2 is displayed value only. No control is available in this mode.

Framesync	(continued)

Framesync Status Display
 	
Framesync Status   On
	Displays the current framesync status as follows:
	
	Framesync Status On
	   • Framesync status OK.
	
	Framesync Status Off
	   • Framesync source off or not connected.
	
	Framesync Status Off no valid reference detected
	   • Improper or missing framesync reference.
	
	Framesync Status Minimum Latency Frames set to 3 the maximum amount for this standard
	   • Latency frames selection exceeds limits.
	      Note: See **Minimum Latency Frames Control** above for more information about this message.

Loss of Input Signal Selection
 	
On Loss of Input Signal: Disable Outputs ▾
   Disable Outputs
   Freeze Last Frame
   Freeze to Color
 	
Card-edge Control Menu: **FS**
 	
	1	**2**	

---	---	---
LOS		
	DIS	Disables outputs
	FRFR	Freeze to last frame

	FRCL	Freeze to selected color		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).

Framesync

(continued)

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

Framesync LOS Freeze Color [White ▼]

White
Yellow
Cyan
Green
Magenta
Red
Blue
Gray 10%
Gray 25%
Gray 50%
Black
Custom

Card-edge Control Menu: **FS**

1	**2**	
LOSC		
	WHT	White
	YELO	Yellow
	CYAN	Cyan
	GRN	Green
	MAGE	Magenta
	RED	Red
	BLUE	Blue
	GR10	Gray 10%
	GR25	Gray 25%
	GR50	Gray 50%
	BLK	Black
	CSTM	Custom

Custom Color Hue	Adjusts raster hue (phase angle) for custom LOS color.
	(-360° to 360° range in 0.1° steps; null = 0°)

Custom Color Hue
-360.0

Card-edge Control Menu: **FS**

1	**2**	
CHUE		
	(value)	Custom freeze color hue (in degrees)

Framesync

(continued)

Custom Color Saturation Custom Color Saturation 0.0 Card-edge Control Menu: **FS** **1** CSAT **2** (value) Color saturation level (in percent)	Adjusts raster saturation level for custom LOS color. (0% to 100% range in 0.1% steps)
Custom Color Y Level Custom Color Y Level 64 Card-edge Control Menu: **FS** **1** CVAL **2** (value) Luma level	Adjusts raster luma level for custom LOS color. (64 to 940 range)
Resync Video and Reference Resync Video and Reference Confirm Card-edge Control Menu: **FS** **1** RSYN **2** Y? Move toggle switch left (or up) to confirm reset. Reject resync by pressing Exit Menu pushbutton.	Resyncs video with external reference. When Confirm is clicked, a **Confirm?** pop-up appears, requesting confirmation. • Click **Yes** to resync. • Click **No** to reject resync.
Reset Framesync Reset Framesync Confirm Card-edge Control Menu: **FS** **1** RSET **2** Y? Move toggle switch left (or up) to confirm reset. Reject reset by pressing Exit Menu pushbutton.	Resets the frame sync, clearing any buffered audio and video. When Confirm is clicked, a **Confirm?** pop-up appears, requesting confirmation. • Click **Yes** to reset the frame sync. • Click **No** to reject reset.

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

SD Audio Depth   20 bit

Group Enable   On

Destination	Embedded Ch 1	Embedded Ch 2	Embedded Ch 3	Embedded Ch 4
Source	Embed Ch 12	Embed Ch 14	AES Ch 1	AES Ch 3
Gain (dB)	40.0 / 0.0 / -40.0 / -80.0	40.0 / 0.0 / -40.0 / -80.0	40.0 / 0.0 / -40.0 / -80.0	40.0 / 0.0 / -40.0 / -80.0
	0.0	0.0	0.0	0.0
Channel is	Unmuted	Unmuted	Unmuted	Unmuted
Phase	Normal	Normal	Normal	Normal

Group Enable   On

Destination	Embedded Ch 5	Embedded Ch 6	Embedded Ch 7	Embedded Ch 8
Source	AES Ch 5	AES Ch 6	AES Ch 8	Tone 1
Gain (dB)	40.0 / 0.0 / -40.0 / -80.0	40.0 / 0.0 / -40.0 / -80.0	40.0 / 0.0 / -40.0 / -80.0	40.0 / 0.0 / -40.0 / -80.0
	20.0	20.0	15.0	-10.0
Channel is	Unmuted	Unmuted	Unmuted	Unmuted
Phase	Normal	Normal	Invert	Normal

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

EMBEDDED CH 1 - CH 16

Embed Ch 12   0dB   +   CH 1
Embed Ch 14   0dB   +   CH 2

AES I/O (1 - 4)

AES Ch 1   0dB   +   CH 3
AES Ch 3   0dB   +   CH 4

Embedded Audio Group 1

AES IN (5-8)

AES Ch 5   20dB   +   CH 5
AES CH 6   20dB   +   CH 6
AES CH 8   20dB   +   CH 7
TG1   -10 dB   CH 8

Embedded Audio Group 1

Embedded Audio Group 1/2	(continued)

SD Audio Depth
 	
SD Audio Depth [20 bit]
 	
SD Audio Depth [24 bit]
	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 [On]

Card-edge Control Menu: **Aud**

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

When enabled (**On**), enables the embedding of the corresponding embedded audio group (Embedded Audio Group 1 or Embedded Audio Group 2).

• Embedded Audio Group 1 consists of embedded channels 1 thru 4.

• Embedded Audio Group 2 consists of embedded channels 5 thru 8.

Two Group Enable buttons correspondingly enable or disable Embedded Audio Group 1 and Embedded Audio Group 2.

Disabling a group removes the entire group of embedded audio channels while preserving the settings of the channels belonging to the group.

Note: **Embedded Ch 2** thru **Embedded Ch 8** have controls identical to the **Source**, **Gain**, **Mute**, and **Phase** controls described here for **Embedded Ch 1**. Therefore, only the **Embedded Ch 1** controls are shown here.

For each channel, its source and destination should be considered and appropriately set. Unused destination channels should be set to the **Silence** selection.

Embedded Channel Source

Destination	Embedded Ch 1
Source	[Embed Ch 1 ▼]

Card-edge Control Menu: **Aud**

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

Using the **Source** drop-down list, selects the audio input source to be embedded in the corresponding embedded channel from the choices described below.

Embedded Audio Group 1/2

(continued)

Embedded Ch 1 thru Ch 16 as Source
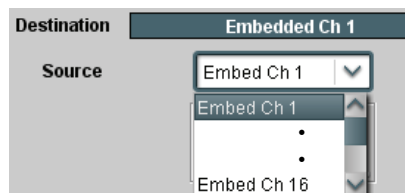
Destination	Embedded Ch 1
Source	Embed Ch 1 ▼

Embed Ch 1
•
•
Embed Ch 16

Card-edge Control Menu: **Aud**

1	**2**	**3**	**4**	
Embd				
	Grp			
		Ch#		
			Src	
			Em#	Source; Embedded Channel (1 -16)
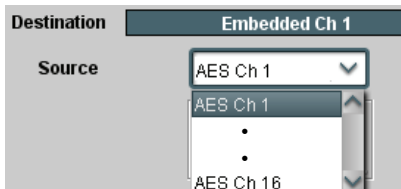
Embed Ch 1 thru **Embed Ch 16** range in Source drop-down list enables an embedded channel (Ch 1 thru Ch 16) to be the source for the selected destination Embedded Audio Group channel.

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

AES Ch 1 thru AES Ch 16 as Source

Destination	Embedded Ch 1
Source	AES Ch 1 ▼

AES Ch 1
•
•
AES Ch 16

Card-edge Control Menu: **Aud**

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

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

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

Down Mix Left or Right as Source

Destination	Embedded Ch 1
Source	Down Mix Left ▼

Down Mix Left
Down Mix Right

Card-edge Control Menu: **Aud**

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

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, C, R, 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 3-51 for more information.

Embedded Audio Group 1/2

(continued)

Mono Mix as Source

Destination	Embedded Ch 1
Source	Mono ⌄

Card-edge Control Menu: **Aud**

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

Mono selection in Source drop-down list allows mono mix content to be the source for the selected destination Embedded Audio Group channel.

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

Note: Mono mix content is set up using Mono Mixer Selection in the Audio Mixing function). Refer to Audio Mixing function description on page 3-51 for more information.

Dolby® Decoded Channel as Source

Destination	Embedded Ch 1
Source	Dolby Ch 1 ⌄
	Dolby Ch 1
	•
	•
	Dolby Mix 2

Card-edge Control Menu: **Aud**

1	**2**	**3**	**4**	
Embd				
	Grp			
		Ch#		
			Src	
			Db (#)	Source; Dolby® Channel (1 thru M2) selection as source

Dolby Ch 1 thru **Dolby Ch 8** range in Source drop-down list enables a Dolby® decoded channel to be the source for the selected destination Embedded Audio Group channel.

(In this example, Dolby® decoded Ch 1 is the source for destination Embedded Ch 1)

Note: Drop-down choices of Ch 1 thru Ch 8 and Mix 1/Mix 2 represent maximum channels available. Actual active channel complement is per received Dolby® format and upstream encoding. Inactive channels should not be used.

Refer to Dolby Metadata function description on page 3-42 for more information.

Refer to the section "**Dolby® E Processing and Routing Example**" on page 3-58 for an example of using Dolby® decoding.

Tone Generator 1 thru 4 as Source

Destination	Embedded Ch 1
Source	Tone 1 ⌄
	Tone 1
	Tone 2
	Tone 3
	Tone 4

Card-edge Control Menu: **Aud**

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

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

(In this example, Tone 1 (tone generator 1) is the source for destination Embedded Ch 1)

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

Refer to **Tone Generator** function description on page 3-53 for more information.

Embedded Audio Group 1/2

(continued)

Silence (Mute) as Source

Destination	Embedded Ch 1
Source	Silence ▾
	Silence

Card-edge Control Menu: **Aud**

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

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

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

Gain (dB) Control

Gain (dB)

40.0
0.0
-40.0
-80.0

21.0

Card-edge Control Menu: **Aud**

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

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

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

Mute Control

Channel is	Unmuted

Channel is	Muted

Card-edge Control Menu: **Aud**

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

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

Embedded Audio Group 1/2

(continued)

Phase Control

Phase	Normal ▼
	Invert
	Normal

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

Card-edge Control Menu: **Aud**

1	2	3	4	
Embd				
	Grp			
		Ch#		
			Pol	
			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). Also provides Gain, Phase Invert, and Muting controls for each channel.

SD Audio Depth	20 bit			

Group Enable   On

Destination	Embedded Ch 9	Embedded Ch 10	Embedded Ch 11	Embedded Ch 12
Source	Embed Ch 4	Embed Ch 8	AES Ch 1	AES Ch 2
Gain (dB)	40.0 / 0.0 / -40.0 / -80.0 6.0	40.0 / 0.0 / -40.0 / -80.0 6.0	40.0 / 0.0 / -40.0 / -80.0 10.0	40.0 / 0.0 / -40.0 / -80.0 10.0
Channel is	Unmuted	Unmuted	Unmuted	Unmuted
Phase	Normal	Normal	Normal	Normal

Group Enable   On

Destination	Embedded Ch 13	Embedded Ch 14	Embedded Ch 15	Embedded Ch 16
Source	AES Ch 14	AES Ch 16	Embed Ch 15	Silence
Gain (dB)	40.0 / 0.0 / -40.0 / -80.0 -20.0	40.0 / 0.0 / -40.0 / -80.0 -15.0	40.0 / 0.0 / -40.0 / -80.0 0.0	40.0 / 0.0 / -40.0 / -80.0 0.0
Channel is	Unmuted	Unmuted	Unmuted	Unmuted
Phase	Invert	Normal	Normal	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.

Embedded Audio Group 3/4

(continued)

SD Audio Depth SD Audio Depth [20 bit] SD Audio Depth [24 bit]	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 [On]	When enabled (**On**), enables the embedding of the corresponding embedded audio group (Embedded Audio Group 3 or Embedded Audio Group 4). • Embedded Audio Group 3 consists of embedded channels 9 thru 12. • Embedded Audio Group 4 consists of embedded channels 13 thru 16. Two Group Enable buttons correspondingly enable or disable Embedded Audio Group 3 and Embedded Audio Group 4. Disabling a group removes the entire group of embedded audio channels while preserving the settings of the channels belonging to the group.

Card-edge Control Menu: **Aud**

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

Note: Embedded Ch 9 thru Embedded Ch 16 have controls that are identical to the **Source**, **Gain**, **Mute**, and **Phase** controls described for Embedded Ch 1. Refer to **Embedded Audio Group 1/2** on page 3-28 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.

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, Phase Invert, and Muting controls for each channel.

Destination	AES Ch 1	AES Ch 2	AES Ch 3	AES Ch 4
Source	Embed Ch 4	Embed Ch 5	Embed Ch 6	Embed Ch 7
Gain (dB)	6.0	6.0	10.0	10.0
Channel is	Unmuted	Unmuted	Unmuted	Unmuted
Phase	Normal	Normal	Normal	Normal

Destination	AES Ch 5	AES Ch 6	AES Ch 7	AES Ch 8
Source	AES Ch 5	AES Ch 6	AES Ch 4	Tone 4
Gain (dB)	-10.0	-10.0	0.0	-6.0
Channel is	Unmuted	Unmuted	Unmuted	Unmuted
Phase	Invert	Normal	Normal	Normal

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

AES Audio Out Pairs 1-4 (Ch 1-8)

EMBEDDED CH 1 - CH 16

Embed Ch 4 — 6dB + → AES CH 1
Embed Ch 5 — 6dB + → AES CH 2
Embed Ch 6 — 10dB + → AES CH 3
Embed Ch 7 — 10dB + → AES CH 4

AES I/O (1 - 4)

AES Ch 4 — -10dB − → AES CH 5

AES IN (5-8)

AES Ch 5 — -10dB − → AES CH 6
AES Ch 6 — 0dB + → AES CH 7

TG 4 — -6dB → AES CH 8

AES Audio Out Pairs 1-4	(continued)

Note: **AES Ch 2** thru **AES Ch 8** have controls that are identical to the **Source**, **Gain**, **Mute**, and **Phase** controls described here for **AES Ch 1**. Therefore, only the **AES Ch 1** controls are shown here.

For each channel, its source and destination should be considered and appropriately set. Unused destination channels should be set to the **Silence** selection.

AES Channel Source **Destination** AES Ch 1 **Source** Embed Ch 1 Card-edge Control Menu: **Aud** **1** **2** **3** AES Ch# Destination channel number Src Set up to select Source	Using the Source drop-down list, selects the audio source to be routed to the corresponding AES output channel from the choices described below.
Embedded Ch 1 thru Ch 16 as Source **Destination** AES Ch 1 **Source** Embed Ch 1 Embed Ch 1 • • Embed Ch 16 Card-edge Control Menu: **Aud** **1** **2** **3** **4** AES Ch# Src Em# Source; Embedded Channel (1-16)	**Embed Ch 1** thru **Embed Ch 16** range in Source drop-down list enables an embedded channel (Ch 1 thru Ch 16) to be the source for the selected destination AES channel. (In this example, Embed Ch 1 (embedded Ch 1) is the source for destination AES Ch 1)
AES Ch 1 thru AES Ch 16 as Source **Destination** AES Ch 1 **Source** AES Ch 5 AES Ch 5 • • AES Ch 16 Card-edge Control Menu: **Aud** **1** **2** **3** **4** AES Ch# Src Ae# Source; AES Channel (1-16)	**AES Ch 1** thru **AES Ch 16** range in Source drop-down list enables a discrete AES channel (Ch 1 thru Ch 16) to be the source for the selected destination AES channel. (In this example, AES Ch 5 is the source for destination AES Ch 1)

AES Audio Out Pairs 1-4

(continued)

Down Mix Left or Right as Source

Destination	AES Ch 1
Source	Down Mix Left ⌄
	Down Mix Left
	Down Mix Right

Card-edge Control Menu: **Aud**

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

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, C, R, 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 3-51 for more information.

Mono Mix as Source

Destination	AES Ch 1
Source	Mono ⌄
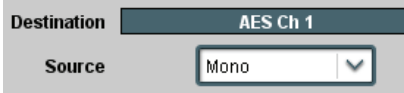
Card-edge Control Menu: **Aud**

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

Mono selection in Source drop-down list allows mono mix content to be the source for the selected destination 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 3-51 for more information.

Dolby® Decoded Channel as Source

Destination	AES Ch 1
Source	Dolby Ch 1 ⌄
	Dolby Ch 1
	•
	•
	Dolby Mix 2
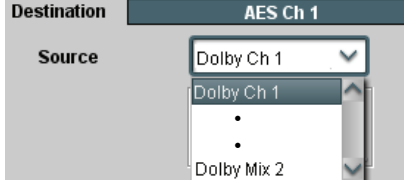
Card-edge Control Menu: **Aud**

1	**2**	**3**	**4**	
AES				
	Ch#			
		Src		
			Db(#)	Source; Dolby® channel (1-M2)

Dolby Ch 1 thru Dolby Ch 8 range in Source drop-down list enables a Dolby® decoded channel to be the source for the selected destination AES channel.

(In this example, Dolby® decoded Ch 1 is the source for destination AES Ch 1)

> **Note**: Drop-down choices of Ch 1 thru Ch 8 and Mix 1/Mix 2 represent maximum channels available. Actual active channel complement is per received Dolby® format and upstream encoding. Inactive channels should not be used.
>
> Refer to Dolby Metadata function description on page 3-42 for more information.
>
> Refer to Dolby® E Processing and Routing Example on page 3-58 for an example of using Dolby® decoding.

AES Audio Out Pairs 1-4   (continued)

Tone Generator 1 thru 4 as Source

Destination	AES Ch 1
Source	Tone 1 ▾

Tone 1
Tone 2
Tone 3
Tone 4

Card-edge Control Menu: **Aud**

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

Tone Generator 1 thru **Tone Generator 4** range in Source drop-down list enables one of four tone generators (Tone 1 thru Tone 4) to be the source for the selected destination 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 3-53 for more information.

Silence (Mute) as Source

Destination	AES Ch 1
Source	Silence ▾

Silence

Card-edge Control Menu: **Aud**

1	**2**	**3**	**4**	
AES				
	Ch#			
		Src		
			Off	Channel Silence

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

Gain (dB)

40.0
0.0
-40.0
-80.0

21.0

Card-edge Control Menu: **Aud**

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

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

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

AES Audio Out Pairs 1-4	(continued)

Mute Control Channel is Unmuted Channel is Muted	Allows pushbutton On/Off channel muting while saving all other settings.

Card-edge Control Menu: **Aud**

1	2	3	4	
AES				
	Ch#			
		Mute		
			Off	Unmuted
			On	Muted

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

Card-edge Control Menu: **Aud**

1	2	3	4	
AES				
	Ch#			
		Pol		
			Norm	Non-invert
			Inv	Inverted

AES Audio Out Pairs 5-8

Routes audio sources to AES output channels 9 thru 16 (AES Audio Out Pairs 5-8). Also provides Gain, Muting, 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 9** thru **AES Ch 16**, 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 receive sources. Available sources also include up to four
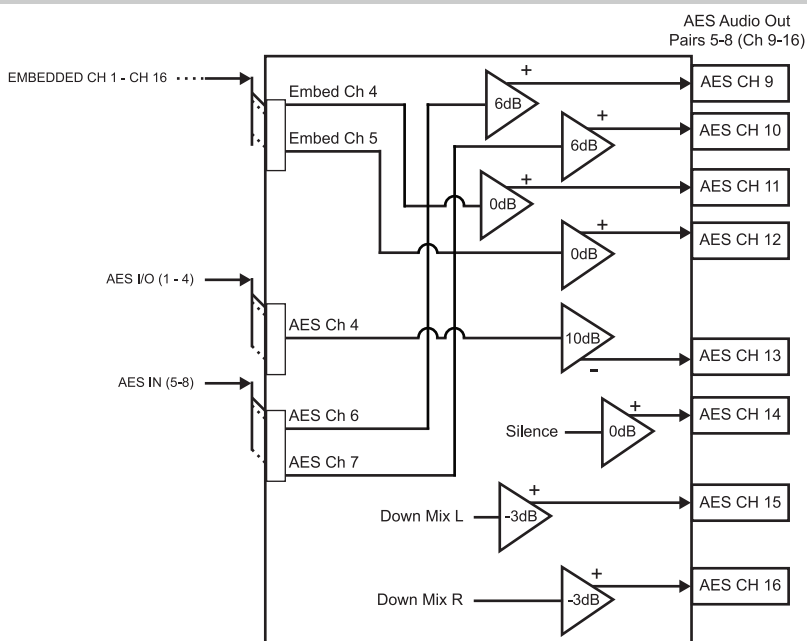
Note: **AES Ch 9** thru **AES Ch 16** have controls that are identical to the **Source**, **Gain**, **Mute**, and **Phase** controls described for AES Ch 1. Refer to **AES Audio Out Pairs 1-4** on page 3-36 for descriptions of these controls.

For each channel, its source and destination should be considered and appropriately set. Unused destination channels should be set to the Silence selection.

Dolby	Routes a Dolby® encoded pair to the Dolby® decoder, and provides Dolby® configuration display and metadata handling controls.

Note: The Dolby tab controls described here appear only on card equipped with Dolby Decoder option (-DEC).

If necessary, refer to th section "**Dolby® E Processing and Routing Example**" on page 3-58 for an example of using and routing Dolby® decoding.

Decoded channels shown in DashBoard 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.

Decoder Channels	E5.1+2	E7.1+2	E8x1
Ch 1	LF	LF	Ch 1
Ch 2	RF	RF	Ch 2
Ch 3	C	C	Ch 3
Ch 4	LFE	LFE	Ch 4
Ch 5	LS	LS	Ch 5
Ch 6	RS	RS	Ch 6
Ch 7	Aux 1	LB	Ch 7
Ch 8	Aux 2	RB	Ch 8
Mix 1	Lo	Lo	Mono Mix 1
Mix 2	Ro	Ro	Mono Mix 2

See other important notes in this subsection regarding the proper use of metadata embedding tools available with the decoder function.

AES Pair as Input
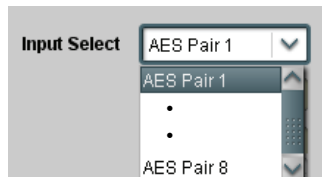
AES Pair 1 thru **AES Pair 8** range in Input Select drop-down list selects an AES Pair (1 thru 8) to be the input for the Dolby® decoder.

(In this example, AES Pair 1 is the input for the Dolby® decoder)

Embedded Channel Pair as Input
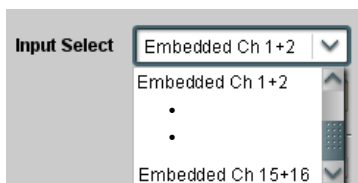
Embedded Ch 1+2 thru **Ch 15+16** range in Input Select drop-down list selects an embedded channel pair (1+2 thru 15+16) to be the input for the Dolby® decoder.
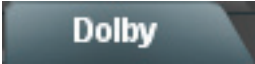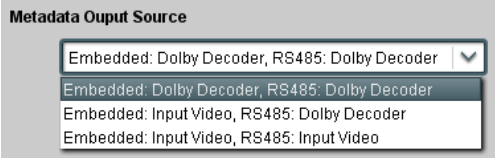
(In this example, embedded channel pair 1+2 is the input for the Dolby® decoder)

Dolby	(continued)

Decoder Mode Decoder Mode Auto Detect Format and Decode (Pass PCM) ▼ Auto Detect Format and Decode (Pass PCM) Only Decode Dolby E else Mute Only Decode Dolby Digital else Mute	Using the drop-down list, selects the action to take in presence or absence of Dolby® E or Digital source from the choices shown on the left.
Dolby® Mode Display **Bitstream Format** Dolby E 20-bit **Dolby E Program Configuration** 5.1 + 2	Shows specific bitstream information and Dolby® decoding type (Dolby® E or Dolby® Digital) for input applied to Dolby® decoder. (In this example, Dolby® E 20-bit with 5.1+2 decoded channel configuration is being decoded) If selected input has invalid or missing Dolby® data (such as if wrong channels are applied to decoder), PCM / No Dolby Stream is displayed. (In this case, PCM data passes undecoded and is present on Dolby Ch 1 and Dolby Ch 2 channels.)
Dolby® Digital Channel and Dynamic Range Controls **Dolby Digital 16-bit Channel Select** Channel 1 ▼ Channel 1 Channel 2 **Dolby Digital Dynamic Range Control** Line Mode ▼ Line Mode RF Mode Custom Bypass	**Channel Select** drop-down list sets the channel carrying the Dolby® Digital encoded signal for D1/0 formats as shown from choices on the left. **Dynamic Range Control** drop-down list selects from audio level compression scheme choices as shown to the left. (Line Mode is typical setting; RF Mode is used where signal may be fed through low-cost video/audio RF modulator, in which case RF Mode helps prevent over modulation. Refer to ATSC A/52B for more information.)
Metadata Embedding **Metadata Embedding** On	**Metadata Embedding (On/Off)** controls SMPTE 2020-1 metadata embedding in the SDI video output. • When set to **On**, metadata from selected source is embedded in the output SDI video. • When set to **Off**, metadata is not embedded in the output SDI video. **Note**: Metadata Embedding should **only** be set to "On" if new metadata is to be embedded. **Existing** metadata on the SDI input is passed through the card unaffected, requiring no operator intervention.

Dolby	(continued)
Metadata Output Source Metadata Ouput Source Embedded: Dolby Decoder, RS485: Dolby Decoder ▼ Embedded: Dolby Decoder, RS485: Dolby Decoder Embedded: Input Video, RS485: Dolby Decoder Embedded: Input Video, RS485: Input Video	Drop-down list allows embedding and RS485 metadata routing to the choices shown to the left and described below. • **Embedded: Dolby Decoder, RS485**: Dolby Decoder – Routes the metadata from the Dolby® decoder to both embedding on the output SDI and the RS485 port on card so equipped. • **Embedded: Input Video, RS485**: Dolby Decoder – Preserves input metadata and directly re-routes it to the output SDI. Routes the metadata from the Dolby® decoder to only the RS485 port on card so equipped. • **Embedded**: Input Video, RS485: Input Video – Routes the preserved input metadata to both embedding on the output SDI and the RS485 port on card so equipped. **Note**: Typically, Metadata Output Source should be set to **Embedded**: D**olby Decoder, RS485: Dolby Decoder**, since this is the new metadata produced by the card decoder and should also be made available in the SDI stream and to any other external systems. If embedding new metadata, make certain to set its line number such that such that any old metadata for the same purpose is overwritten (i.e., new metadata set to the same line number as the old metadata to be replaced).
Metadata Output Line Metadata Output Line 13 ▲▼	Allows selection of SMPTE 2020-1 metadata line location within the VANC space for source embedding selected above. (Range is 9 thru 41; default is line #13.) **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 unless existing metadata is to be intentionally overwritten.

Dolby E Metadata	Displays the status and programming details for each Dolby® E 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.

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.

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

	1	2	3 4 5 6 7 8
Update Metadata	Update		
Dolby E AC-3 Metadata	1	2	3 4 5 6 7 8
Bitstream Mode	Complete Main	Complete Main	
Audio Coding Mode	3/2 (L,C,R,Ls,Rs)	2/0 (L,R)	
Center Mix Level	Attenuation is -3dB	Attenuation is -3dB	
Surround Mix Level	Attenuation is -3dB	Attenuation is -3dB	
Dolby Surround Mode	Not Indicated	Not Indicated	
LFE Enable	LFE is On (coded)	LFE is Off (not coded)	
Dialog Normalization	-27 dBFS	-27 dBFS	
Audio Production Information	Not Present	Not Present	
Mix Level	80 dB	80 dB	

•
•
•

DC Highpass Filter	Bypassed	Bypassed	
Bandwidth Lowpass Filter	Bypassed	Bypassed	
LFE Channel Lowpass Filter	Bypassed	Bypassed	
Surround Channel 90 Degrees Phase Shift Filter	Bypassed	Bypassed	
Surround Channel -3 dB Attenuation	Bypassed	Bypassed	
Compression Words	Not Present	Not Present	
Compression Profile	Film: Standard	Film: Standard	
Dynamic Range Compression Words	Not Present	Not Present	
Dynamic Range Compression Profile	Film: Standard	Film: Standard	

Dolby D Metadata	Displays the status and programming details for Dolby® Digital 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.

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.

Update Metadata	Update
Bitstream Mode	Complete Main
Audio Coding Mode	2/0 (L,R)
Center Mix Level	Attenuation is -3dB
Surround Mix Level	Attenuation is -3dB
Dolby Surround Mode	Not Indicated
LFE Enable	LFE is Off (not coded)
Dialog Normalization	-27 dBFS
Audio Production Information	Present
Mix Level	105 dB
Room Type	Small Room (Flat EQ)
Copyright Bit	Copyright Protected
Original Bitstream	Original

LoRo Center Mix Level	Level is Adjusted +3.0 dB
LoRo Surround Mix Level	Level is Adjusted +3.0 dB
Extended Bitstream Group 2	Not Included
Dolby Surround EX Mode	Not Indicated
Compression Words	Present
Compression Profile	Unknown
Dynamic Range Compression Words	Present
Dynamic Range Compression Profile	None
Dynamic Range Compression Words	Present
Dynamic Range Compression Profile	None

Timecode

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

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

525i SDI with VITC Waveform → **FSD-8240** → 525i 59.94 with ATC_VITC with ATC_LTC

SDI VITC Waveform Status	21:41:29:17.0
SDI ATC_LTC Status	Unlocked
SDI ATC_VITC Status	Unlocked
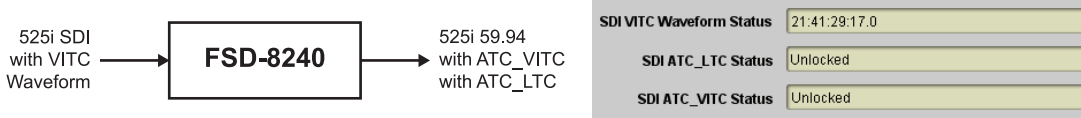
A Noting that the incoming video contains VITC waveform timecode data (as shown in the status display), set the Source Priority drop-down lists to include VITC Waveform timecode data (**SDI VITC**) as a choice. This extracts VITC Waveform timecode data from the incoming video.

Source Priority 1	SDI VITC
Source Priority 2	ATC_VITC
Source Priority 3	None
Source Priority 4	None

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

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

HD ATC VITC Insertion	Enabled
HD ATC VITC Insertion Line Field 1	9 - SMPTE 12M-2-2008 Recommended
HD ATC VITC Insertion Line Field 2	8 (571) - SMPTE 12M-2-2008 Recommended

HD ATC LTC Insertion	Enabled
HD ATC LTC Insertion Line	10 - SMPTE 12M-2-2008 Recommended

525i SDI with VITC Waveform →

SDI VITC DETECT/EXTRACT

SDI ATC_VITC DETECT/EXTRACT

SDI ATC_LTC DETECT/EXTRACT

A **A** PRIORITY / SELECT

BUFFER / FORMAT

SDI VITC TIMECODE PROC / EMBED

ATC_VITC TIMECODE PROC / EMBED **B**

ATC_LTC TIMECODE PROC / EMBED **B**

→ 525i SDI with ATC_VITC with ATC_LTC

INSERT CONTROL
LINE NUMBER CONTROL

ATC_VITC Insertion = Enabled
ATC_LTC Insertion = Enabled

ATC_VITC1 = Line 9 (default SMPTE 12M-2)
ATC_VITC2 = Line 8 (571) (default SMPTE 12M-2)
ATC_LTC = Line 10 (default SMPTE 12M-2)

Timecode	(continued)

Timecode Source Status Displays SDI VITC Waveform Status — Unlocked SDI ATC VITC Status — 00:10:46:02.0, Field 1 Line 9, Field 2 Line 571 SDI ATC LTC Status — 00:10:46:02.0, Line 10	Displays the current status and contents of the three supported timecode formats shown to the left. • If a format is receiving timecode data, the current content (timecode running count and line number) is displayed. • If a format is not receiving timecode data, Unlocked is displayed.

Incoming ATC Packet Removal Control Incoming ATC Packet Removal — Disabled Card-edge Control Menu: **TC** <table><tr><td>**1** Rmvl</td><td>**2** Off On</td><td> Packet removal disabled Packet removal enabled</td></tr></table>	Enables or disables removal of existing input video ATC timecode packets from the output. This allows removal of undesired existing timecodes from the output, resulting in a "clean slate" where only desired timecodes are then re-inserted into the output. (For example, if both SD VITC Waveform and SD ATC_VITC timecode data are present on the input video, and only ATC_VITC is desired, using the Removal control will remove both timecodes from the output. The ATC_VITC timecode by itself can then be re-inserted on the output using the other controls discussed here.) **Note**: When the Scaler is enabled, ATC packets are automatically removed. The Timecode function must be used to re-insert the timecode data into the output video.

Source Priority Source Priority 1 ▢ ⌄ Source Priority 2 ▢ ⌄ Source Priority 3 ▢ ⌄ Source Priority 4 ▢ ⌄ Card-edge Control Menu: **TC** <table><tr><td>**1** PRI (#)</td><td>**2** None SVIT ATCL ATCV</td><td>Priority (1 thru 4) No source selected SDI VITC ATC_LTC ATC_VITC</td></tr></table>	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: SDI VITC ⌄ None SDI VITC ATC LTC ATC VITC **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 Output Status — 00:04:46:06.1 (Source: SDI VITC)	Displays the current content and source being used for the timecode data as follows: Output Status — 00:04:46:06.1 (Source: SDI VITC) • Output status OK (in this example, running SDI VITC timecode received and outputted). Output Status — No Output Available • 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. Output Status — Insertion Disabled • **Timecode Insertion** button set to **Disabled**; output insertion disabled.

Timecode

(continued)

VITC Waveform Output Line

VITC Waveform Output 1 Line Number   14

VITC Waveform Output 2 Line Number   16

Card-edge Control Menu: **TC**

1	**2**	
VITO		
	(#)	VITC output 1 line number only (6 thru 22)

Selects the VITC1 and VITC2 line numbers (6 thru 22) where the VITC data is inserted when the output is SD. (The default is line #14/16.)

> **Note**: Although the output line drop-down will allow any choice within the 6 thru 22 range, the actual range is automatically clamped (limited) to certain ranges to prevent inadvertent conflict with active picture area depending on video format. Refer to the section "**Ancillary Data Line Number Locations and Ranges**" on page 3-14 for more information.
>
> The card does not check for conflicts on a given line number. Make certain the selected line is available and carrying no other data.
>
> If only one output line is to be used, set both controls for the same line number.

SD VITC Waveform Insertion Control

SD VITC Waveform Insertion   Disabled

Card-edge Control Menu: **TC**

1	**2**	
SDVC		
	Off	SD VITC TC insertion disabled
	On	SD VITC TC insertion enabled

Enables or disables VITC waveform timecode insertion into the SD-SDI output stream.

Note: **SD VITC Waveform Insertion** control only affects VITC waveforms inserted (or copied to a new line number) by this function. An existing VITC waveform on the SDI input is not affected by this control and in all cases is passes on the SDI output.

SD ATC Insertion Control

SD ATC Insertion   Disabled

Card-edge Control Menu: **TC**

1	**2**	
SDAT		
	Off	SD ATC TC insertion disabled
	On	SD ATC TC insertion enabled

For SD output, enables or disables SD ATC_VITC timecode insertion into the video stream.

Note: SD ATC_VITC is locked to line 12. The card does not check for conflicts on a given line number. Make certain this line is available if SD ATC_VITC is to be used. Refer to the section "**Ancillary Data Line Number Locations and Ranges**" on page 3-14 for more information.

HD ATC_VITC Insertion Control

HD ATC VITC Insertion   Disabled

Card-edge Control Menu: **TC**

1	**2**	
HFVC		
	Off	HD ATC_VITC TC insertion disabled
	On	HD ATC_VITC TC insertion enabled

For HD output, enables or disables SD ATC_VITC timecode insertion into the video stream.
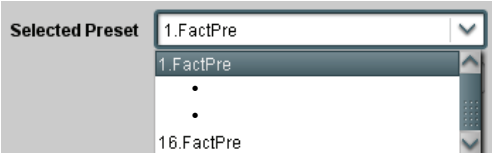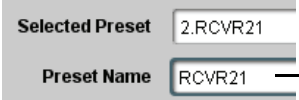
Timecode	(continued)

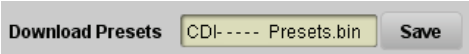|	
HD ATC_VITC Line Insertion Controls HD ATC_VITC Insertion Line Field 1 9 - SMPTE 12M-2-2008 Recommended ▼ HD ATC_VITC Insertion Line Field 2 8 (571) - SMPTE 12M-2-2008 Recommended ▼	For HD ATC_VITC timecode output, selects the line number for ATC_VITC1 and ATC_VITC2. **Note**: Although the output 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 HD ATC LTC Insertion **Disabled** Card-edge Control Menu: **TC** 	**1**	**2**	
---	---	---
HDLT		
	Off	HD ATC LTC timecode insertion disabled
	On	HD ATC LTC timecode insertion enabled		For HD output, enables or disables ATC_LTC timecode insertion into the video stream.
HD ATC_LTC Line Insertion Control HD ATC_LTC Insertion Line 10 - SMPTE 12M-2-2008 Recommended ▼	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 ATC VITC Legacy Support **Disabled** Card-edge Control Menu: **TC** 	**1**	**2**	
---	---	---
AVLS		
	Off	ATC VITC legacy support disabled
	On	ATC VITC legacy support enabled		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.

Audio Mixing

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

With an optional upmixer licensable feature activated, any normal PCM stereo pair can be fed to the upmixer to generate 5.1 surround sound audio which in turn can be applied to six user-selectable channels.

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

Down Mixer Selection

Left — Embed Ch 1
Right — Embed Ch 2
Center — Embed Ch 3
Left Surround — Embed Ch 4
Right Surround — Embed Ch 5

The example below shows selection from various sources and the resulting stereo pair DM-L and DM-R. The two signals comprising the pair can be routed and processed the same as any other audio input source.

Note: The stereo pair are basic L/R PCM signals with no additional encoded information.

Center Mix Ratio Control

Center Mix Ratio (dB) -10.0

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

- Minimum attenuation setting (**-0.0 dB**) applies no ratiometric reduction. Center channel content is restored as in-phase center-channel content with no attenuation, making center-channel content more predominate in the overall mix.

- Maximum attenuation setting (**-10.0 dB**) applies a -10 dB ratiometric reduction of center-channel content. Center-channel content is restored as in-phase center-channel content at a -10 dB ratio relative to overall level, making center-channel content less predominate in the overall mix.

(0.0 dB to -10.0 dB range in 0.1 dB steps; default = -3 dB)

Note: Default setting of -3.0 dB is recommended to maintain center-channel predominance in downmix representative to that of the original source 5-channel mix.

Audio Mixing

(continued)

|	
Surround Mix Ratio Control Surround Mix Ratio (dB) -10.0	Adjusts the attenuation ratio of surround-channel content from 5-channel source that is re-applied as Lo and Ro content to the DM-L and DM-R stereo mix. • Minimum attenuation setting (**-0.0 dB**) applies no ratiometric reduction. Surround-channel content is restored with no attenuation, making Lo and Ro content more predominate in the overall mix. • Maximum attenuation setting (**-10.0 dB**) applies a -10 dB ratiometric reduction of surround-channel content. Surround-channel content is restored at a -10 dB ratio relative to overall level, making surround-channel content less predominate in the overall mix. (0.0 dB to -10.0 dB range in 0.1 dB steps; default = -3 dB) **Note**: Default setting of -3.0 dB is recommended to maintain surround-channel predominance in downmix representative to that of the original source 5-channel mix.
Mono Mixer Selection Mono Mixer Selection Left Embed Ch 12 Right Embed Ch 16	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. Destination Embedded Ch 1 Mono Analog Ch 8 Down Mix Left Down Mix Right Mono Tone 1 EMBED CH1 - CH16 AES CH1 - CH16 EMBEDDED CH 12 → L EMBEDDED CH 16 → R Σ MONO **Note**: Selection of any two channels for mono mixing in no way affects the source channels themselves.
Auto Crossfade Speed Controls Auto Crossfade Speed Upmix to Bypass Very Slow Very Slow Slow Medium Quick Very Quick Instant Auto Crossfade Speed Bypass to Upmix Very Slow Very Slow Slow Medium Quick Very Quick Instant	Individual controls select the relative crossfade transition speed between Upmix to Bypass (going to inactive; from 5.1 to 2.0) and Bypass to Upmix (going to active; from 2.0 to 5.1) when upmixer enable is set to Auto and the active threshold (as set by the 5.1 Detection Threshold control) is crossed in either direction. To suit program material and production aesthetic preferences, several choices are available as shown to the left. Slower settings allow for a more gradual transition between modes, however with a longer interval before levels stabilize. Faster settings conversely allow for a smaller interval before levels stabilize, however with greater perceived abruptness.

Tone Generator

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

Frequency Selection Lists

| Tone Generator 1 Frequency | 1 KHz |
| Tone Generator 4 Frequency | 1 KHz |

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.

Card-edge Control Menu: **Aud**

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

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	RCVR21
Selected Preset	1.FactPre
Preset Name	FactPre
Preset Save	Confirm
Preset Load	Confirm
Reset Current Preset	Confirm
Download Presets	CDI- - - - 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 FSD-8240 cards.

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

Preset Save and Load

| Preset Save | Confirm |
| Preset Load | Confirm |

• **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.

(continued)

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.

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.

Reset Current Preset

• **Reset Current Preset** resets all parameters (including preset custom name entered) of the currently selected Preset (as displayed in the **Selected Preset** field) to factory default settings.

The above button has a **Confirm?** pop-up that appears, requesting confirmation.

The factory default settings are as follows:

Function	Parameter/Setting
Audio Mapping	Audio mapping reset for simultaneous embedding and de-embedding: • Discrete AES input channels 1-16 are mapped to embedded audio output channels 1-16. • Embedded audio input channels 1-16 are mapped to discrete AES output channels 1-16.
Audio Input Controls	**AES SRC**, **Passthrough**, and **Zero Delay** Embedding are all disabled.
Audio controls (all audio functions)	All **Gain** and **Phase** (polarity) controls are set to unity and normal, respectively.
Video Proc	All parameters set to unity/null settings.
Framesync	**Framesync** is disabled; Reference 1 or 2 must be selected to enable the frame sync.

Download Presets

Download Presets allows all 16 presets to be stored to a specified location on a network computer for use with other FSD-8240 cards.

Audio Routing Example Using DashBoard

Figure 3.11 shows an example of using the FSD-8240 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.

Note that the source and destination correlations shown here are only examples; any source can route to any destination.
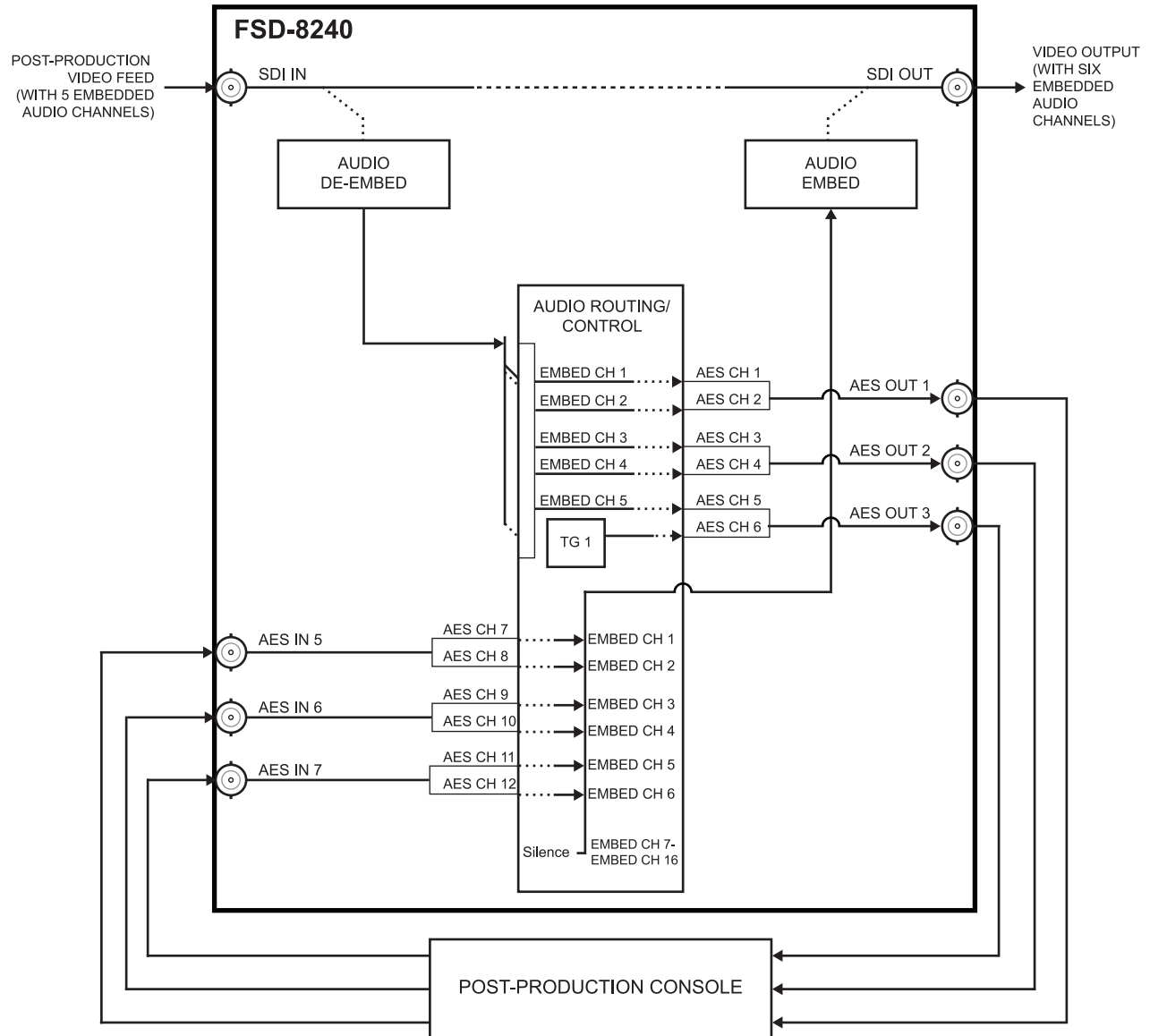
Figure 3.11 Audio Routing Example (1 of 3)

In the example here, Embedded Channels 1 thru 5 are de-embedded from the input SDI data and routed to discrete AES channels 1 thru 5. Also, an internal tone generator (TG1) is routed to AES channels 6 thru 8, respectively. **Figure 3.11** shows the FSD-8240 DashBoard control settings that result in this routing.

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 FSD-8240 control settings shown in **Figure 3.11**.
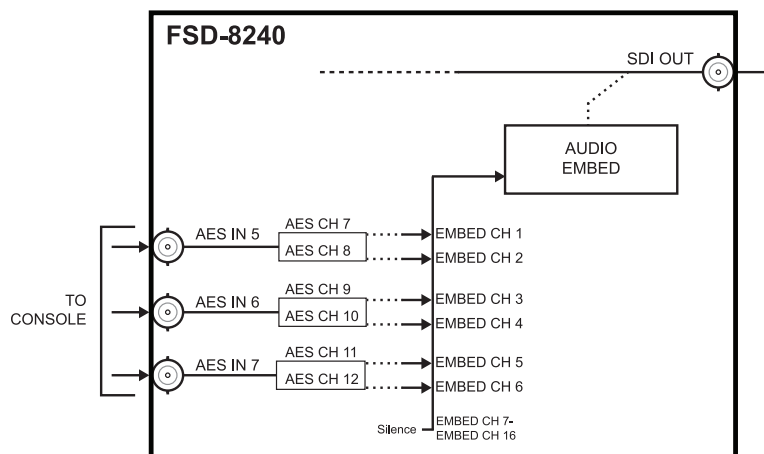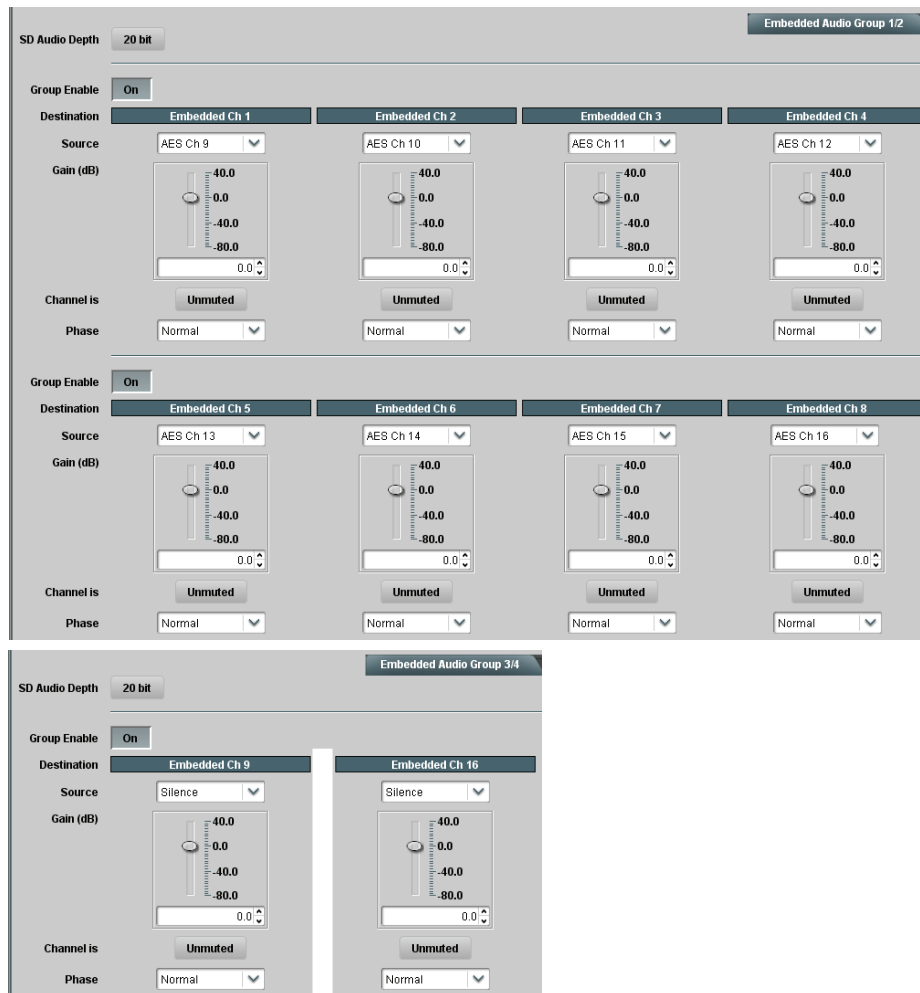
Figure 3.13 *Audio Routing Example (3 of 3)*

Dolby® E Processing and Routing Example

Figure 3.14 shows an example of using the FSD-8240 **Audio Input Controls**, **Dolby Decoder**, and **Embedded Audio Group 1/2** functions to decode a received Dolby® E encoded pair and route the decoded channels. The example also shows routing the metadata to the FSD-8240 **DOLBY META** output.

Note that the source and destination correlations shown here are only examples; any embedded channel pair carrying encoded Dolby® data can be decoded. Decoded Dolby® channels can in turn be routed route to any embedded channel destination.
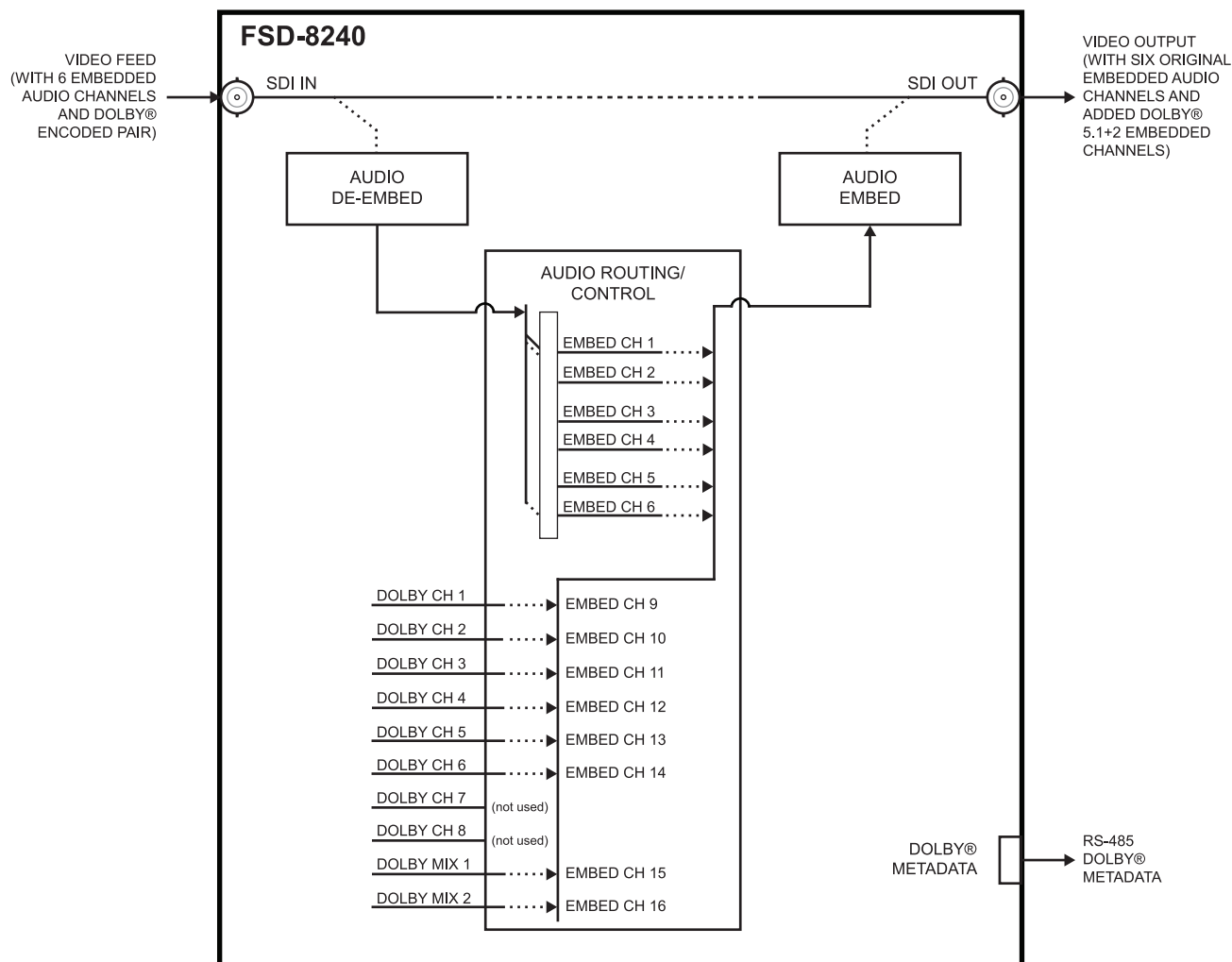
Figure 3.14 Dolby® E Processing Example (1 of 2)

In the example here, Dolby® E 5.1+2 data on embedded pair 7/8 is to be decoded and embedded (using spare embedded channels 9 thru 16) along with the existing embedded audio channels (embedded channels 1 thru 6). **Figure 3.14**, sheet 2 shows the FSD-8240 control settings (using DashBoard) that result in this routing.

Using the Status display in the Audio Input Controls function, embedded channel pair 7+8 shows Dolby® E data.

Embedded pair 7+8 can then be selected as the Dolby Decoder Input Select source. The Bitstream Format and Dolby E Program Configuration displays also show this signal as Dolby® E; 5.1+2

Metadata Embedding = On allows decoder metadata embedding into the SDI stream (on line 13 as shown).

Metadata Output Source can be set to **Embedded: Dolby Decoder, RS485: Dolby Decoder** to select the decoder metadata as the source for embedded and RS485 metadata.

In this example, since the decoder displays a "5.1+2" configuration, the eight channels comprising this configuration can be embedded using eight spare embedded channels.

As such, the eight total decoded channels produced (Dolby Ch 1 thru Dolby Ch 6, and Dolby Mix 1 / Dolby Mix 2 corresponding to L, R, C, LFE, LS, RS, and Lo/Ro monitors) can be respectively routed to embedded channels 9 thru 16 as shown to the left using the **Embedded Audio Group 3/4** function.

(Note that decoder channels 7 and 8 are not used in this format.)

DOLBY_EXNEW_C.PNG

Figure 3.15 *Dolby® E Processing Example (2 of 2)*

Troubleshooting

This section provides general troubleshooting information and specific symptom/corrective action for the FSD-8240 card and its remote control interface. The FSD-8240 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 FSD-8240 card itself and its remote control systems all (to varying degrees) provide error and failure indications. Depending on how the FSD-8240 card is being used (i.e, standalone or network controlled through DashBoard), check all available indications in the event of an error or failure condition.

The various 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 3-64
- "**Processing Error Troubleshooting**" on page 3-64

Card-edge Status/Error Indicators and Display

Figure 3.16 shows and describes the FSD-8240 card-edge status indicators and display. These indicators and the display show status and error conditions relating to the card itself and remote (network) communications (where applicable). Because these indicators are part of the card itself and require no external interface, the indicators are particularly useful in the event of communications problems with external devices such as network remote control devices.
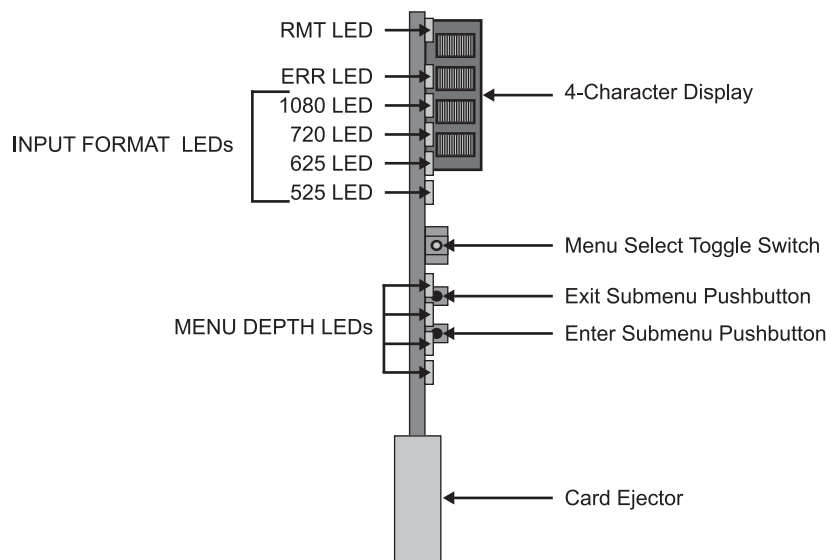
Figure 3.16 Card-edge Status Indicators and Display
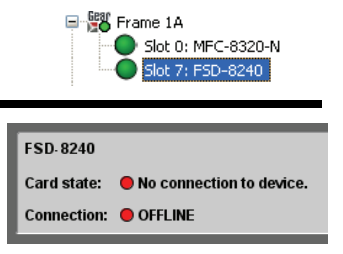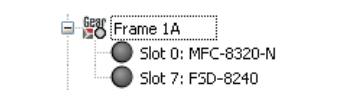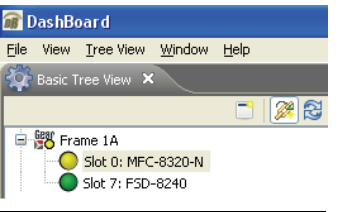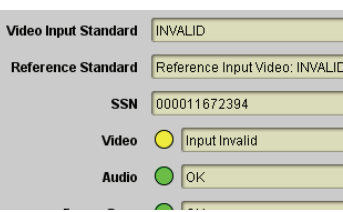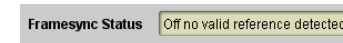
Table 3.5 LEDs on the FSD-8240

LED	Display and Description
Alphanumeric Display	Displays 4-digit alphanumeric code indicating status or errors as follows: • E0XX: Video Errors • E002: Video Acquiring Lock • E1XX: Audio Errors • E2XX: Frame Sync Errors • E200: Reference is Incompatible with Input Video • E201: Reference Standard is Invalid/No Reference Present • E202: Reference Standard is 720p 2398 (a reference standard not supported by the framesync) • E203: Reference Standard is 720p 2997 (a reference standard not supported by the framesync)
RMT	Blue LED flashes when FSD-8240 is receiving control message from remote network control (e.g., DashBoard)
REF	Blue LED illuminates indicating FSD-8240 is receiving valid reference when set up for framesync operation.
ERR	Red LED illuminates when FSD-8240 unable to lock to framesync, or unable to lock to input standard.
Input Format LEDs	Four blue LEDs indicate the input signal raster format being received and locked onto by the FSD-8240 (1080, 720, 625, 525). Continuous cycling of the LEDs indicates the FSD-8240 has not locked onto a particular format (as in the case of no signal input).

DashBoard Status/Error Indicators and Displays

Table 3.6 shows and describes the DashBoard status indicators and displays. These indicator icons and displays show status and error conditions relating to the FSD-8240 card itself and remote (network) communications.

Table 3.6 DashBoard Status/Error Indicators and Displays

Indicator Icon or Display	Error Description
	Red indicator icon in Card Access/Navigation Tree pane shows card with Error condition (in this example, the Card Access/Navigation Tree pane shows a general error issued by the FSD-8240 card in slot 7).
	Specific errors are displayed in the Card Info pane (in this example "No connection to device" indicating FSD-8240 card is not connecting to frame/LAN).
	If the FSD-8240 card is not connecting to the frame or LAN, all controls are grayed-out (as shown in the example here).
	Gray indicator icon in Card Access/Navigation Tree pane shows card(s) are not being seen by DashBoard due to lack of connection to frame LAN (in this example, both a FSD-8240 card in slot 7 and the MFC-8320-N Network Controller Card for its frame in slot 0 are not being seen).
	Yellow indicator icon in Card Access/Navigation Tree pane shows card with Alert condition (in this example, the Card Access/Navigation Tree pane shows a general alert issued by the MFC-8320-N Network Controller Card).
	Clicking the card slot position in the Card Access/Navigation Tree (in this example Network Controller Card "Slot 0: MFC-8320-N") opens the Card Info pane for the selected card. In this example, a "Fan Door Open" specific error is displayed.
	Yellow indicator icon in FSD-8240 Card Info pane shows error alert, along with cause for alert (in this example, the FSD-8240 is receiving no video input, or a video input that is invalid for the card and/or its current settings).
	Where available, error messages within a function submenu pane show highly specific information relating to detected errors (in this example, message shows an invalid or missing Framesync Enable reference selection).

Access Card Info panes for specific cards by clicking the card slot position in the Card Access/Navigation Tree pane (as shown in the example in **Figure 3.17**).
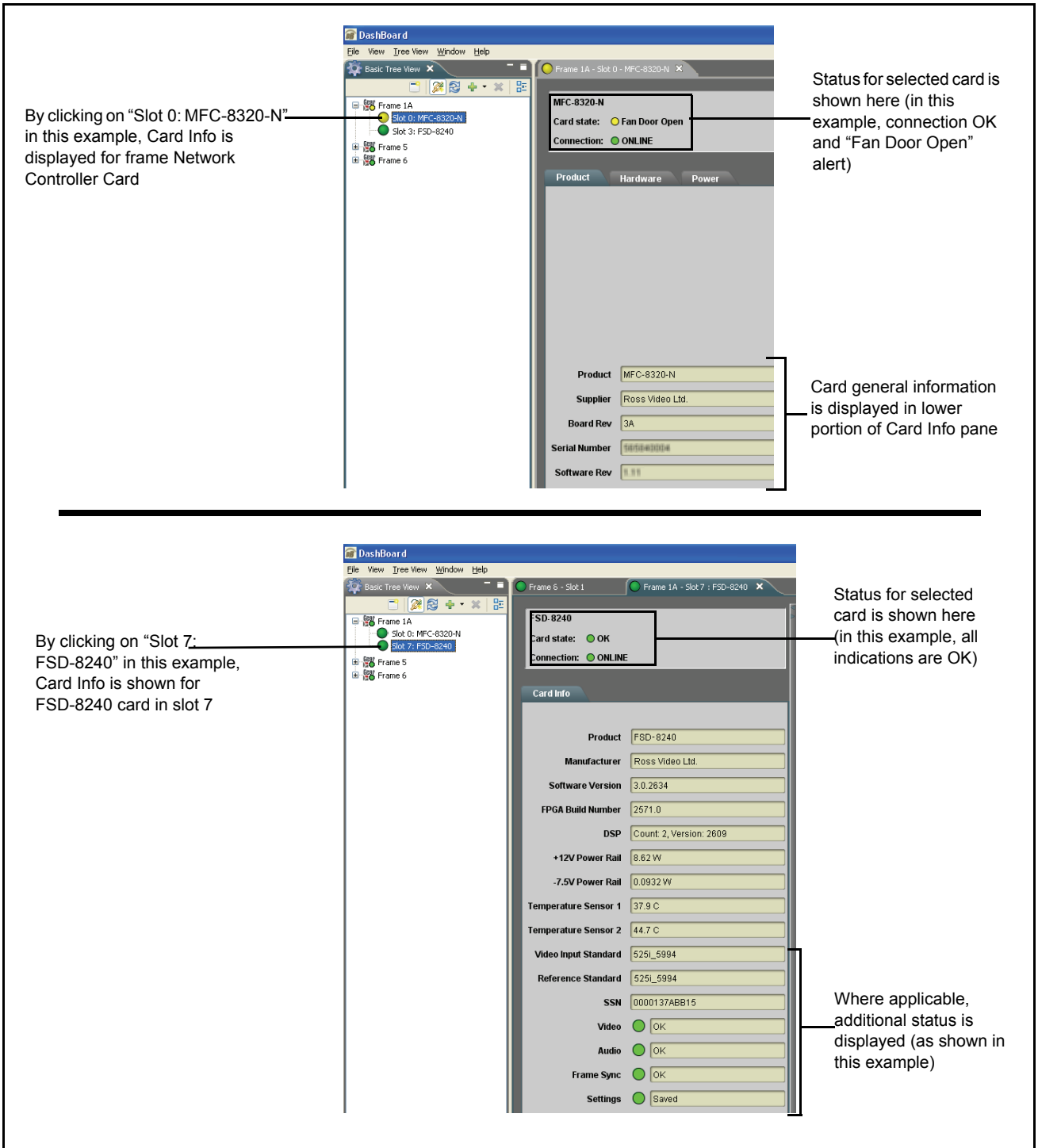
Figure 3.17 Selecting Specific Cards for Card Info Status Display

Basic Troubleshooting Checks

Failures of a general nature (affecting many cards and/or functions simultaneously), or gross inoperability errors are best addressed first by performing basic checks before proceeding further. **Table 3.7** provides basic system checks that typically locate the source of most general problems. If required and applicable, perform further troubleshooting in accordance with the other troubleshooting tables in this section.

Table 3.7 Basic Troubleshooting Checks

Item	Checks
Verify power presence and characteristics	On both the frame Network Controller Card and the FSD-8240, 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 FSD-8240 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 3-13.
	• If either of the rail supplies show no power being consumed, either the frame power supply, connections, or the FSD-8240 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 FSD-8240 card may be defective.
Check Cable connection secureness and connecting points	Make certain all cable connections are fully secure (including coaxial cable attachment to cable ferrules on BNC connectors). Also, make certain all connecting points are as intended. Make certain the selected connecting points correlate to the intended card inputs and/or outputs. Cabling mistakes are especially easy to make when working with large I/O modules.
Card seating within slots	Make certain all cards are properly seated within its frame slot. (It is best to assure proper seating by ejecting the card and reseating it again.)
Check status indicators and displays	On both DashBoard and the FSD-8240 card-edge indicators, red indications signify an error condition. If a status indicator signifies an error, proceed to the following tables in this section for further action.
Troubleshoot by substitution	All cards within the frame can be hot-swapped, replacing a suspect card or module with a known-good item.

Processing Error Troubleshooting
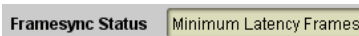
Table 3.8 provides FSD-8240 processing troubleshooting information. If the FSD-8240 card exhibits any of the symptoms listed in **Table 3.8**, follow the troubleshooting instructions provided.

In the majority of cases, most errors are caused by simple errors where the FSD-8240 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 FSD-8240 card-edge status indicators.

Where errors are displayed on both the FSD-8240 card and network remote controls, the respective indicators and displays are individually described in this section.

Table 3.8 Troubleshooting Processing Errors by Symptom

Symptom	Error/Condition	Corrective Action
• DashBoard shows Video yellow icon and Input Invalid message in FSD-8240 Card Info pane. **Video** ◯ Input Invalid • card-edge Input Format LEDs show continuous cycling.	No video input present	Make certain intended video source is connected to appropriate FSD-8240 card video input. Make certain BNC cable connections between frame rear module for the card and signal source are OK.
• DashBoard shows Frame Sync red icon and Reference Invalid message in FSD-8240 Card Info pane. **Frame Sync** ⬤ Reference Invalid • card-edge red ERR indicator illuminated.	Frame sync reference not properly selected or not being received	• If external frame sync reference is not intended to be used, make certain the Framesync Enable selection list is set to Off or Input Video as desired. • If external frame sync reference is intended to be used, make certain selected external frame sync reference is active on frame sync frame bus. (External reference signals Reference 1 and Reference 2 are distributed to the FSD-8240 and other cards via a frame bus.) • Refer to **Framesync** function submenu tab on page 3-22 for more information.
DashBoard shows Framesync Status error message in FSD-8240 Framesync function submenu screen. **Framesync Status** Minimum Latency Frames	Specified Minimum Latency Frames setting exceeds FSD-8240 card buffer space for the selected output video format	Reduce the Minimum Latency Frames setting as specified in the error message to correct the error. **Note**: Due to card memory limits, the maximum available Minimum Latency Frames is related to the output video format selected. For example, with a 1080i 5994 output, the maximum setting is 5. For a 1080i film (2398) output, the maximum setting is 3 (due to the increased buffer space needed for the slower frame rate). Conversely, greater maximum settings are allowed for SD formats such as 525i 5994, where the practical maximum limit is 13.
Video/audio synchronization or delay noted.	Source synchronization condition	Use the Audio Offset from Video control to compensate for video/audio delay. Refer to **Framesync** function submenu tab on page 3-22 for more information.
Ancillary data (closed captioning, timecode, Dolby® metadata, AFD) not transferred through FSD-8240.	Control(s) not enabled	Make certain respective control is set to On or Enabled (as appropriate).
	VANC line number conflict between two or more ancillary data items	Make certain each ancillary data item to be passed is assigned a unique line number. Refer to the section "**Ancillary Data Line Number Locations and Ranges**" on page 3-14.

Table 3.8 Troubleshooting Processing Errors by Symptom (Continued)

Symptom	Error/Condition	Corrective Action
Dolby® data indicated as Present on Audio Input Controls Status display does not process, or cannot be accessed as an audio source	Input Select in Dolby Decoder function selection not set for pair carrying locked Dolby® data	Make certain intended channels carrying locked Dolby® data are selected as the input for the Dolby® decoder.
	Upstream metadata not enabled	Check upstream device or system and enable as required.
Audio signal(s) do not route as expected. Parameter control not available as expected.	Audio Input Controls AES Passthrough or Zero Delay Embedding mode may inadvertently be enabled	When either of these modes is enabled, flexible routing and parametric controls are not available. When either of these modes is not intended for use, make sure they are disabled. Refer to **Audio Input Controls** function submenu tab on page 3-16 for more information. **Note**: Routing and parametric controls may appear functional when either of these mode are enabled, although the controls will not be functional.
Audio not processed or passed through card.	Input audio of type that cannot be locked by FSD-8240 card	AES discrete and embedded audio must be nominal 48 kHz input. **Note**: Although the Status Displays in Audio Input Controls function submenu tab will show audio formats other than "Present, Professional" as being locked (such as "Present, Consumer"), in any case the audio must be at nominal 48 kHz rate for lock and processing to occur.
	Enable control not turned on	Group Enable button for Embedded Audio Group 1/2 or Embedded Audio Group 3/4 function submenu must be turned on for sources to be embedded into respective embedded channels.
Audio not processed or passed through card	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.

In Case of Problems

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

Specifications

In This Chapter

This chapter provides the technical specification information for the FSD-8240. 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 FSD-8240.

Table 4.1 FSD-8240 Technical Specifications

Category	Parameter	Specification
SDI Inputs	Number of Inputs	
	SMPTE Standards Accommodated	SMPTE 292 HD-SDI: 1.485 Gbps or 1.485/1.001 Gbps SMPTE 259M-C SD-SDI: 270 Mbps
	Impedance	75W terminating
	Return Loss	>15dB at 5MHz – 1.485GHz
	Equalization	HD: 328ft (100m) Belden 1694A
		SD: 1000ft (305m) Belden 1694A
Post-Processor Serial Digital Video Outputs	Number of Outputs	Two HD/SD-SDI BNC per IEC 60169-8 Amendment 2
	Impedance	75W
	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) Serial Digital Video Outputs	Number of Outputs	Two HD/SD-SDI BNC per IEC 60169-8 Amendment 2
	Impedance	75 W
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	75W
	Return Loss	> 12dB at 100kHz to 6Hz
	Resolution	24-bit only
	Sample Rate	48kHz
	SRC	32-channel; 142dB S/N
AES Audio Outputs	Number of Outputs (maximum)	8 unbalanced
	SMPTE Standards Accommodated	SMPTE 276M
	Impedance	75W
	Return Loss	> 30dB 100kHz to 6MHz
	Sample Rate	48 kHz

Table 4.1 FSD-8240 Technical Specifications

Category	Parameter	Specification
Dolby® Metadata Output	Connection	2-wire RS-485 and/or embedded into SDI video output (user selectable)
Reference Video Input	Number of Inputs	Two non-terminating (looping) Frame Reference inputs
	SMPTE Standards Accommodated	HD: 720p 24; 25; 29.97; 30; 50; 59.94 1080i 25; 29.97 1080p 23.98; 24; 25; 29.97; 30 1080p/sF 23.98; 24
		SD: 486i 29.97 (NTSC); 575i 25 (PAL)
	Signal Level	1Vp-p nominal
	Signal Type	Analog video sync (black burst or tri-level)
	Impedance	75W
	Return Loss	> 30dB to 30MHz
	Allowable Maximum DC on Ref Input	±1.0V
Other	Internal Tone Generators	Four built-in tone generators, each configurable for 18 discrete sine wave frequencies ranging from 50Hz to 16kHz Generator source signal level is equivalent to -20dBu
	Resolution	10-bit video data path
	Frame Communication	10/100Mbps Ethernet with Auto-MDIX
Environment	Operating Temperature	32°F - 104°F (0°C - 40°C)
	Relative Humidity (operating or storage)	<95%, non-condensing
Power	Maximum 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 FSD-8240, 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 FSD-8240 is 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 FSD-8240 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 FSD-8240 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 FSD-8240 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 FSD-8240 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 FSD-8240, 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 FSD-8240. If required, a temporary replacement frame will be made available at a nominal charge. Any shipping costs incurred will be the responsibility of you, the customer. All products shipped to you from Ross Video Limited will be shipped collect.

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

Contact Us

Contact our friendly and professional support representatives for the following:

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

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

Visit Us

Please visit us at our website for:

- Company information
- Related products and full product lines
- On-line catalog
- News
- Testimonials

www.rossvideo.com

Ross Part Number: 8240DR-004-01