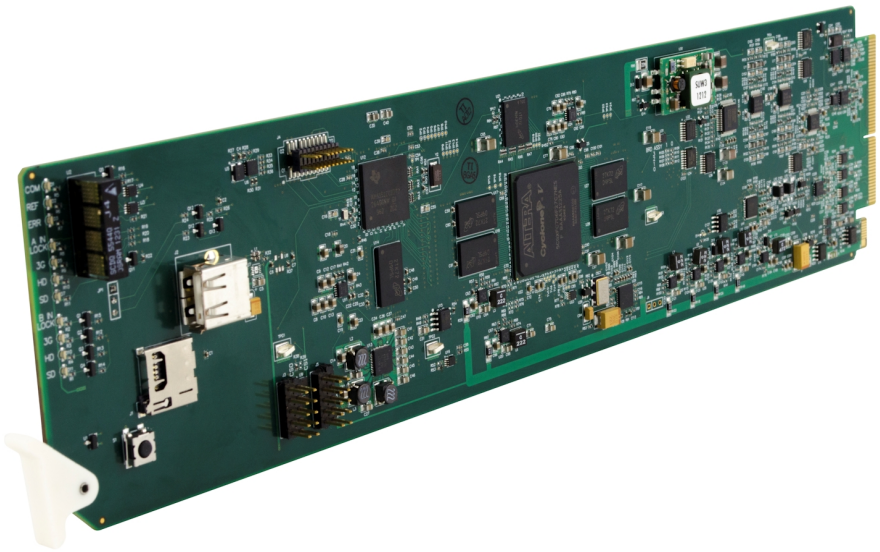
9902-2UDX-DI



3G/HD/SD-SDI Dual-Channel De-interlacing Up-Down-Cross Converter / Frame Sync

Product Manual

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9902-2UDXDI-OM (V1.0)

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Congratulations on choosing the Cobalt® 9902-2UDX-DI 3G/HD/SD-SDI Dual-Channel De-interlacing Up-Down-Cross Converter / Frame Sync. The 9902-2UDX-DI is part of a full line of modular processing and conversion gear for broadcast TV environments. The Cobalt Digital Inc. line includes video decoders and encoders, audio embedders and de-embedders, distribution amplifiers, format converters, remote control systems and much more. Should you have questions pertaining to the installation or operation of your 9902-2UDX-DI, please contact us at the contact information on the front cover.

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Description of product/manual changes:	- Initial release

Table of Contents

Chapter 1

Introduction

Overview

This manual provides installation and operating instructions for the 9902-2UDX-DI 3G/HD/SD-SDI 3G/HD/SD-SDI Dual-Channel De-interlacing Up-Down-Cross Converter / Frame Sync card (also referred to herein as the 9902-2UDX-DI).

This manual consists of the following chapters:

- **Chapter 1, "Introduction"** – Provides information about this manual and what is covered. Also provides general information regarding the 9902-2UDX-DI.
- **Chapter 2, "Installation and Setup"** – Provides instructions for installing the 9902-2UDX-DI in a frame, and optionally installing a 9902-2UDX-DI Rear I/O Module.
- **Chapter 3, "Operating Instructions"** – Provides overviews of operating controls and instructions for using the 9902-2UDX-DI.

This chapter contains the following information:

9902-2UDX-DI Card Software Versions and this Manual

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

The Software Version of your card can be checked by viewing the **Card Info** menu in DashBoard™. See Checking 9902-2UDX-DI Card Information (p. 3-8) in Chapter 3, “Operating Instructions” for more information. You can then check our website for the latest software version currently released for the card as described below.

Note: Not all functionality described in this manual may appear on cards with initial software versions.

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

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

Cobalt Reference Guides

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

Manual Conventions

In this manual, display messages and connectors are shown using the exact name shown on the 9902-2UDX-DI itself. Examples are provided below.

- Card-edge display messages are shown like this:

  BOOT

- Connector names are shown like this: **SDI IN A**

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

- **9902-2UDX-DI** refers to the 9902-2UDX-DI 3G/HD/SD-SDI Dual-Channel De-interlacing Up-Down-Cross Converter / Frame Sync card.
- **Frame** refers to the HPF-9000, oGx, OG3-FR, 8321, or similar 20-slot frame that houses Cobalt® or other cards.
- **Device** and/or **Card** refers to a Cobalt® or other card.
- **System** and/or **Video System** refers to the mix of interconnected production and terminal equipment in which the 9902-2UDX-DI and other cards operate.
- Functions and/or features that are available only as an option are denoted in this manual like this:

  

  Most options are covered in this manual. However, if your card has DashBoard tabs that are not described in this manual it indicates that the optional function/feature is covered in a separate Manual Supplement.

  You can download a pdf for the option by going to the card's web page and clicking on **Product Downloads**, where you can select from any available option Manual Supplements for the card.

Warnings, Cautions, and Notes

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

Warnings

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

Cautions

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

Notes

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

Labeling Symbol Definitions

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

Safety and Regulatory Summary

Warnings

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

Cautions

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

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

CAUTION **Heat and power distribution requirements within a frame may dictate specific slot placement of cards. Cards with many heat-producing components should be arranged to avoid areas of excess heat build-up, particularly in frames using only convection cooling. The 9902-2UDX-DI has a moderate power dissipation (<18 W). As such, avoiding placing the card adjacent to other cards with similar dissipation values if possible.**

CAUTION **If required, make certain Rear I/O Module(s) is installed before installing the 9902-2UDX-DI into the frame slot. Damage to card and/or Rear I/O Module can occur if module installation is attempted with card already installed in slot.**

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

CAUTION **The 9902-2UDX-DI FPGA is designed for a normal-range operating temperature around 85° C core temperature. Operation in severe conditions exceeding this limit for non-sustained usage are within device operating safe parameters, and can be allowed by setting this control to Disable. However, the disable (override) setting should be avoided under normal conditions to ensure maximum card protection.**

EMC Compliance Per Market

Market	Regulatory Standard or Code
United States of America	FCC "Code of Federal Regulations" Title 47 Part15, Subpart B, Class A
Canada	ICES-003
International	CISPR 24:2010 IEC 61000-4-2:2008 IEC 61000-4-3:2006 with A1:2007 and A2:2010 IEC 61000-4-4:2004 IEC 61000-4-6:2008 IEC 61000-6-3:2006 with A1:2010 CISPR 22:2008

9902-2UDX-DI Functional Description

Figure 1-1 shows a functional block diagram of the 9902-2UDX-DI. The 9902-2UDX-DI dual-channel card provides two independent signal paths (**Path 1** and **Path 2**) of UDX conversion, frame sync, and audio embedding and de-embedding on a single card. The two paths share an input and output SDI crosspoint to receive and send two discrete SDI inputs and outputs. The 9902-2UDX-DI also includes AES de-embedding. Using a basic signal presence input failover function, the card inputs can be set to failover to an alternate input source in cases of signal loss. Frame sync function can provide test patterns that can be enabled to serve as a confidence check even in cases where the input video image is lost.

The 9902-2UDX-DI also provides timecode/closed-captioning conversion from packet-based timecode formats and CEA608/708 HD formats to HD ATC, SD_ATC, and SD VITC waveform-based timecode.

9902-2UDX-DI Input/Output Formats

The 9902-2UDX-DI provides the following inputs and outputs (which can be independently used for Path 1 and/or Path 2:

- **Inputs:**
  - **3G/HD/SD SDI IN A** thru **SDI IN D** – four 3G/HD/SD-SDI inputs. **SDI IN A** or **SDI IN B** can be set to failover to **A** or **B** in absence of opposite channel of this pair.
- **Outputs:**
  - **3G/HD/SD-SDI OUT (1-4)** – four 3G/HD/SD-SDI buffered video outputs. Each output can be independently set as processed output video or selected input video reclocked.
  - **AES OUT –** BNC (AES-3id, 75Ω) ports as AES outputs (number of ports dependent on rear I/O module used).

Note: Input select also allows internal connection from one processing path output to the opposite processing path input. This allows “serial” processing connections without requiring external jumpering on the card rear I/O module.

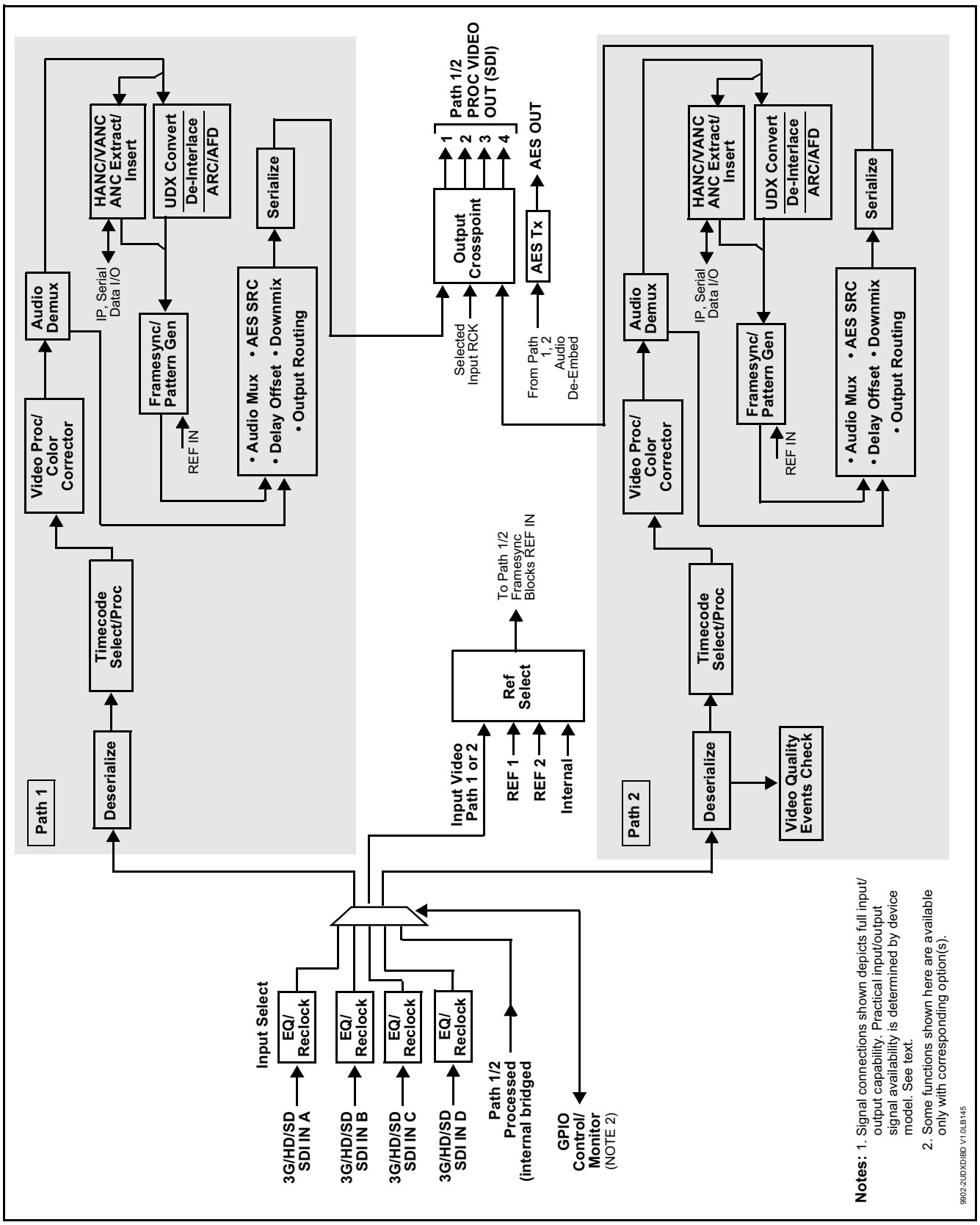

Figure 1-1 9902-2UDX-DI Functional Block Diagram

Video Processor Description

Note: Unless otherwise noted, the following functions are independently available for Path 1 and Path 2 processing paths.

The 9902-2UDX-DI video subsystem provides the functions described below.

Input Video Select

Used in common as a routing source for both **Path 1**/**Path 2** is a GUI-based control that allows the card to select from up to four 3G/HD/SD-SDI inputs. This function also allows processed outputs from one path to be routed to the alternate path input.

The input can be selected using DashBoard manual control, set to failover to an alternate input upon loss of the target input, and can be externally selected via a GPIO interface. An input **Allowed Rasters** and **Allowed Frame Rates** filter allows inputs to be filtered (screened) for only user-allowed raster sizes and frame rates, with unallowed raster/rates being rejected as an input (input unlock). Reclocked copies of any SDI input can be outputted by the card when selected as a choice on the output crosspoint.

Timecode Processor

(See Figure 1-2.) This function provides for extraction of timecode data from input video source, and in turn allow individual timecode strings to be embedded into the output video. The function can monitor any of the video inputs of the card for supported timecode formats such as ATC_LTC or ATC_VITC for down-conversions to HD, and ATC_VITC or VITC waveform (with selectable odd/even field line number control) for SD SDI or CVBS inputs. Waveform VITC timecode can also be extracted from a reference input and used as the output timecode value. 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. An internally-generated free-run timecode can be also be embedded on output video if desired.

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

Option When licensed with option **+LTC**, this function also can receive, send and translate between audio/RS-485 LTC timecode formats and the VBI formats described above.

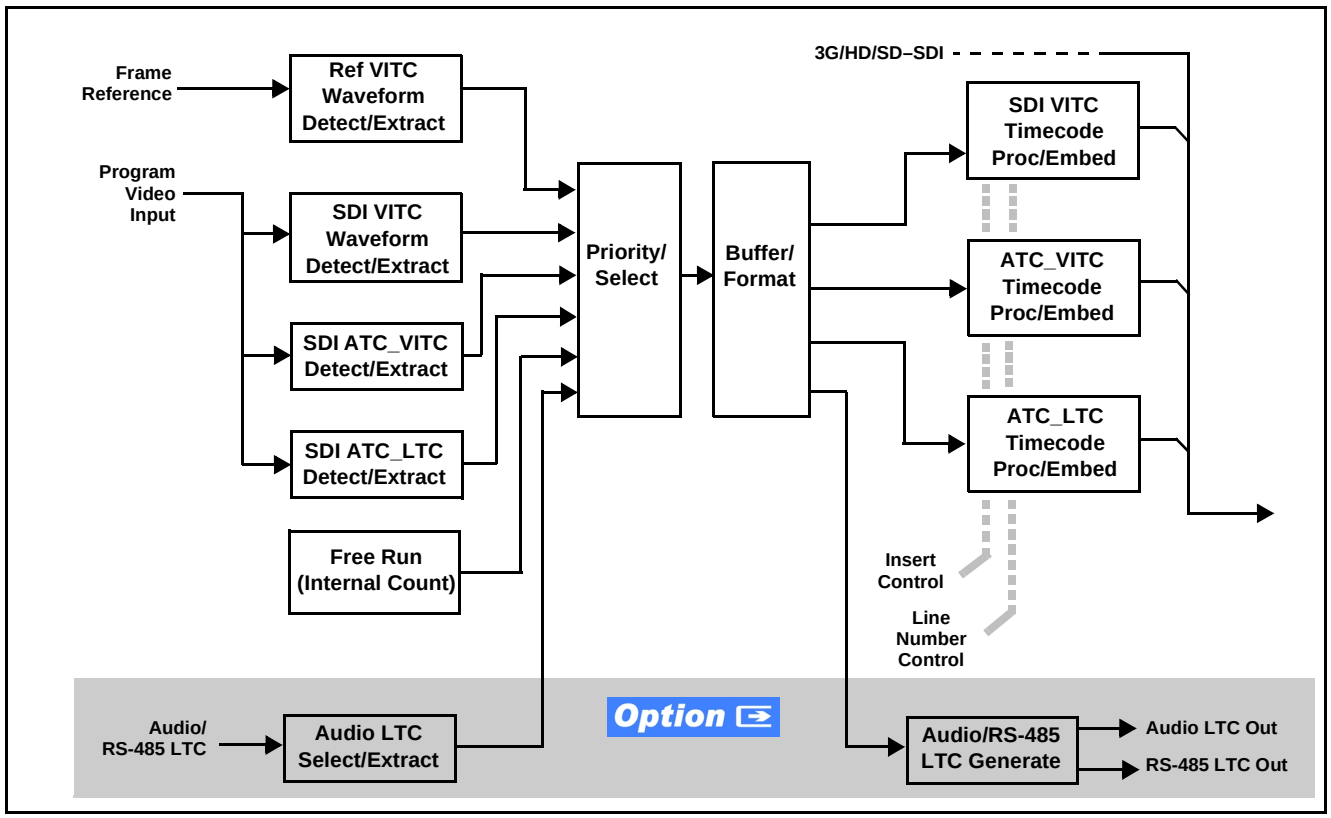

Figure 1-2 Timecode Processor

Frame Sync Function

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

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

Frame sync can select from either of two card frame reference sources, or free-run input video sync. Selectable failover allows alternate reference selection should the initial reference source become unavailable or invalid. In the event of input video loss of signal, the output can be set to disable video, go to black, go to an internal test signal generator pattern, or freeze to the last intact frame (last frame having valid SAV and EAV codes).

An internal test signal generator provides a selection of various standard patterns such as color bars, sweep patterns, and other technical patterns. The test patterns can be applied to the output video upon loss of input or manually inserted at any time.

Scaler Function

The scaler function provides path 1/2 independent up/down/cross-conversion to 3G/HD/SD from multiple SD and 3G/HD video formats and multiple frame rates, and cross-conversion between interlaced and progressive formats, with auto-format detect/down-conversion of SMPTE 424M/292M/259M formats. Both paths have independent de-interlacers which can for auto or manual enable. De-interlacing, when converting an interlaced input to a progressive output, can reduce the chance of artifacts or jittering when, for example, content consists of fast-motion paused scenes.

The scaler function also provides aspect ratio conversion that provides a choice from several standard aspect ratios. User-defined settings allow custom user-defined H and V aspect ratio control.

The scaler provides special modes that allow de-interlacing to be bypassed in certain cases to reduce processing latency (default mode auto-detects interlaced program and performs de-interlace). Also provided are selections to optimize 3:2 pulldown conversion where timecode or other timing references can be relied upon to indicate frame transitions.

Color Corrector Option

Option **+COLOR** converts the YCbCr SDI input video to the 4:4:4 RGB color space (where the color correction is applied), and then back to YCbCr SDI on the output. Controls are available to adjust each RGB level independently for both white levels (gain) and black levels (offset). Gamma can also be independently adjusted for each RGB channels. Various controls can be ganged to provide adjustment for all three color channels simultaneously. Color correction can be independently applied to either path.

Ancillary Data Processor Option

This function provides full VANC/HANC ancillary data de-embedding and embedding for 3G/HD/SD-SDI streams. Direct access to DID and SDID locations allows extraction or insertion of user data such as camera PTZ, SCTE 104, closed-captioning read/insert, GPI/GPO via ANC, or other specialized user payloads. Data can be extracted and inserted within the card (Bridge mode), or inserted and/or extracted to and from the card via serial or IP interfaces connecting to external devices/systems. A rear I/O module with a dedicated IP port can be used with the ancillary data processor function for data insertion or extraction via IP.

Video Output Crosspoint

Used in common as a routing source for both **Path 1**/**Path 2** is a four-output video matrix crosspoint that allows independently applying the card processed video output, reclocked input, or wings/key-fill previews to any of the four card discrete coaxial outputs (**SDI OUT 1** thru **SDI OUT 4**).

Audio Processor Description

Note: **Path 1** and **Path 2** have individual independent digital audio embed and de-embed banks for each of the processing path's 16-channels of embedded audio. The card's 16 channels of AES de-embed can be allocated individually to any or either path's embed or de-embed nodes.

The audio processor operates as an internal audio router. This function chooses from 16 channels of embedded audio from the SDI video input from either path (default 1-to-1 routing to SDI output)

The audio processing subsection is built around a card internal 16-channel audio bus for each path. This 16-channel bus receives inputs from an input routing crosspoint that routes de-embedded over the 16-channel card bus. Correspondingly, at the output end of the 16-channel bus is an output routing crosspoint that in turn distributes the 16-channel bus signals to embedded and discrete AES audio outputs.

An Input Audio Status display shows the presence and peak level of each input audio channel received by the card. Payload is identified (PCM or data such as Dolby® Digital or E). As such, the audio subsection provides a full crosspoint between all supported audio inputs and output types.

The audio output crosspoint for each path's embedded output allows embedded channel selection from the respective path's own channels, or channels from the alternate processing path.

Option **(Option +CQS)**. Clean and Quiet Switching allows SDI input selection to be changed from one source to another while ducking audio during controlled input video switching transitions to provide silence between input switches. The cross-fade is queued for the next available RP168 switch line following the switch command.

Note:
- Clean audio switching is assured only for intentional, controlled switches via user control. Clean audio switching cannot be assured for failover switches.
- Clean switching requires that both SDI signals (switch from and switch to) be stable and present.
- Clean audio switching function is designed for PCM audio. This function does not assure clean decoded audio when switching from/to Dolby or other non-PCM audio.

Audio Down Mix Function

(See Figure 1-3.) The Audio Down Mixer function provides for the selection of any five embedded channels serving as Left (**L**), Right (**R**), Center (**C**), Left Surround (**Ls**), and Right Surround (**Rs**) individual signals to be multiplexed into stereo pair Down Mix Left (**DM-L**) and Down Mix Right (**DM-R**). The resulting stereo pair **DM-L** and **DM-R** can in turn be routed to any embedded audio pair as desired (or de-embedded to an AES or analog audio output).

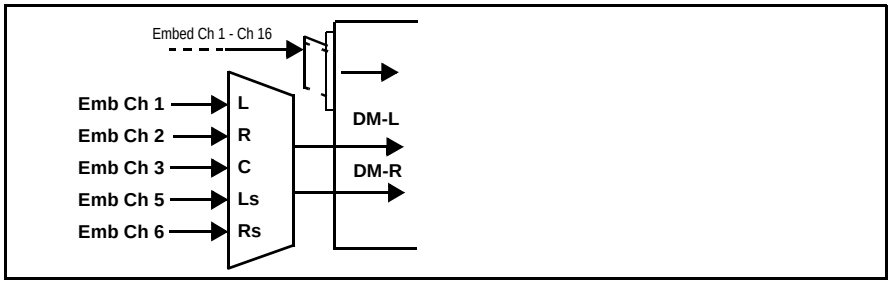

Figure 1-3 Audio Down Mix Functional Block Diagram with Example Sources

Flex Buses

For both input and output nodes before and after the card internal buses, flex buses provide flexible-structure mixer in which any of 16 summing nodes (**Flex Mix Bus A** thru **Flex Mix Bus P**) can receive any card audio input, thereby allowing several customizable mixing schemes. Similarly, any of the 16 card internal bus signals can be applied to an output flex bus mixer. The output flex bus allows cross-sourcing from both **Path 1** and **Path 2** embedded internal Audio Bus sources to the Path 1 and Path 2 discrete output audio crosspoints.

Control and Data Input/Output Interfaces

GPI Interface

Two independent ground-closure sensing GPI inputs (**GPI 1** and **GPI 2**; each sharing common ground connection as chassis potential) are available. Associated with each GPI user control is a selection of one of 32 user-defined card presets in which GPI activation invokes a card control preset. Because the GPI closure invokes a user-defined preset, the resulting setup is highly flexible and totally user-defined. Invoking a user preset to effect a change involves card setup communication limited **only** to the items being changed; the card remains on-line during the setup, and the called preset is rapidly applied.

GPI triggering can be user selected to consider the activity on discrete GPI ports, or combinations of logic states considering both GPI inputs, as well as be set for level or edge triggering. This flexibility allows multistage, progressive actions to be invoked if desired. Indication is provided showing whenever a GPI input has been invoked.

GPO Interface

Two independent phototransistor non-referenced (floating) contact pairs (**GPO 1/1** and **GPO 2/2**) are available. A GPO can be invoked by setting a GPO to be enabled when a card preset is in turn applied (i.e., when a preset is invoked (either manually or via event-based loading), the GPO is correspondingly also activated.

Serial (COMM) Ports

The 9902-2UDX-DI is equipped with two, 3-wire serial ports (**COM 1 - Serial Port 1**, **COM 2 - Serial Port 2**). The ports provide for SMPTE 2020 de-embedding to an output port, and provide RS-485 LTC I/O (when licensed with option **+LTC**). Either port can be configured as RS-232 Tx/Rx or RS-422 non-duplexed Tx or Rx.

Alarm Function

The card can be set to monitor input video/audio for input errors such as input LOS, frozen or black frame, loss of reference, and closed captioning ancillary data loss. These alarms can be propagated as a card general error or warning message, and can be downloaded as basic .txt logs or via a Syslog function.

User setup tables configure the alarm severity escalation as well as trigger holdoff/release and other thresholds as applicable.

User Control Interface

Figure 1-4 shows the user control interface options for the 9902-2UDX-DI. These options are individually described below.

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

- **DashBoard™ User Interface** – Using DashBoard™, the 9902-2UDX-DI and other cards installed in openGear®[1] frames 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 Cobalt Digital Inc. website: www.cobaltdigital.com (enter “DashBoard” in the search window). The DashBoard™ user interface is described in Chapter 3,“Operating Instructions”.

- **Cobalt® OGCP-9000 and OGCP-9000/CC Remote Control Panels** – The OGCP-9000 and OGCP-9000/CC Remote Control Panels conveniently and intuitively provide parameter monitor and control of the 9902-2UDX-DI and other video and audio processing terminal equipment meeting the open-architecture Cobalt® cards for openGear™ standard.

  In addition to circumventing the need for a computer to monitor and control signal processing cards, the Control Panels allow quick and intuitive access to hundreds of cards in a facility, and can monitor and allow adjustment of multiple parameters at one time.

  The Remote Control Panels are totally compatible with the openGear™ control software DashBoard™; any changes made with either system are reflected on the other. The Remote Control Panel user interface is described in Chapter 3,“Operating Instructions”.

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

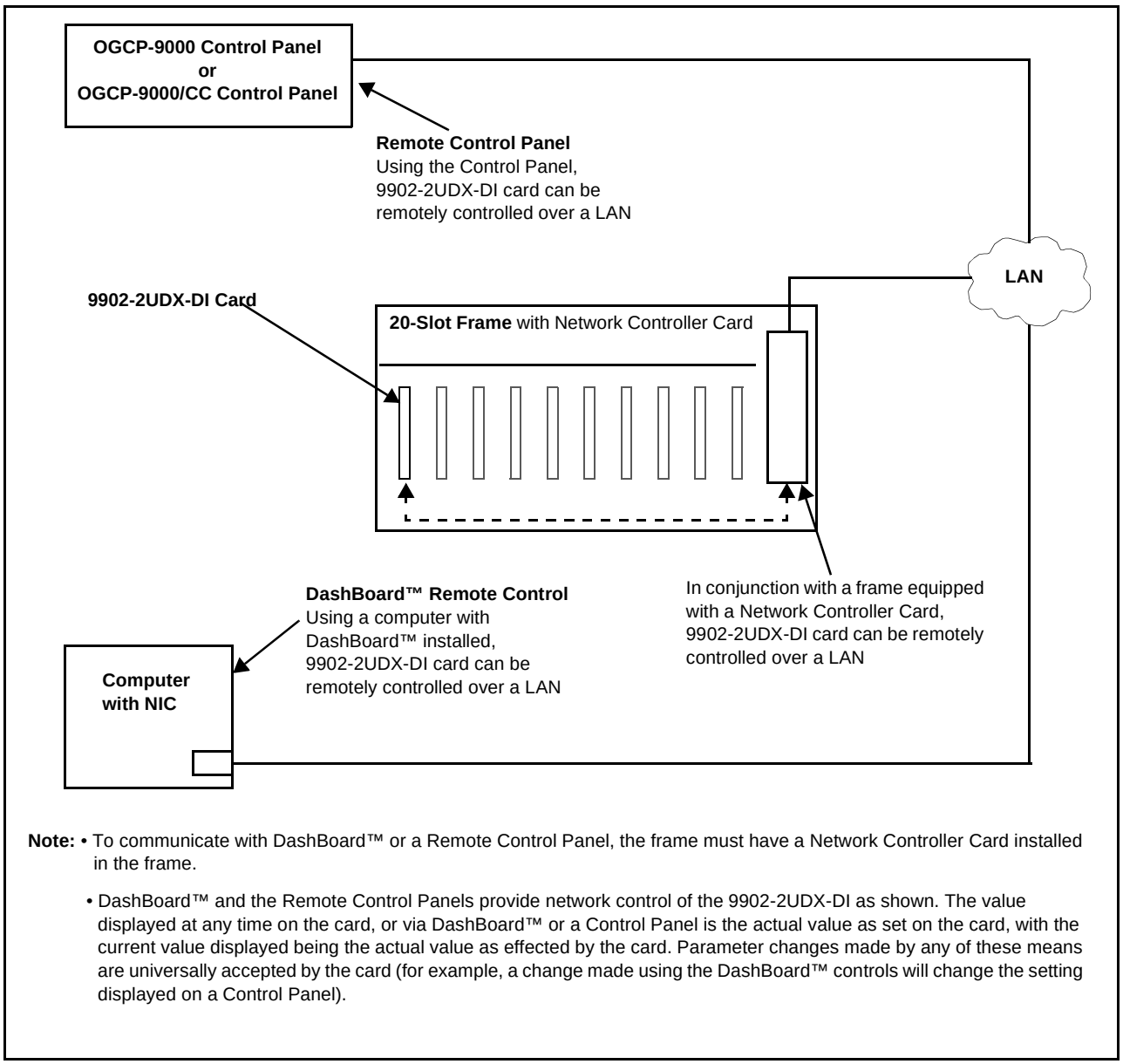

Figure 1-4 9902-2UDX-DI User Control Interface

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

Download a copy of this guide by clicking on the **Support>Reference Documents** link at www.cobaltdigital.com and then select DashBoard Remote Control Setup Guide as a download, or contact Cobalt® as listed in Contact Cobalt Digital Inc. (p. 1-20).

9902-2UDX-DI Rear I/O Modules

The 9902-2UDX-DI physically interfaces to system video connections at the rear of its frame using a Rear I/O Module.

All inputs and outputs shown in the 9902-2UDX-DI Functional Block Diagram (Figure 1-1) enter and exit the card via the card edge backplane connector. The Rear I/O Module breaks out the 9902-2UDX-DI card edge connections to coaxial and other connectors that interface with other components and systems in the signal chain.

The full assortment of 9902-2UDX-DI Rear I/O Modules is shown and described in 9902-2UDX-DI Rear I/O Modules (p. 2-4) in Chapter 2, “Installation and Setup”.

Technical Specifications

Table 1-1 lists the technical specifications for the 9902-2UDX-DI 3G/HD/SD-SDI Dual-Channel De-interlacing Up-Down-Cross Converter / Frame Sync card.

Table 1-1 Technical Specifications

Item	Characteristic
Part number, nomenclature	9902-2UDX-DI 3G/HD/SD-SDI Dual-Channel De-interlacing Up-Down-Cross Converter / Frame Sync
Installation/usage environment	Intended for installation and usage in frame meeting openGear™ modular system definition
Power consumption	< 18 Watts maximum
Installation Density	Up to 20 cards per 20-slot frame
Environmental: Operating temperature: Relative humidity (operating or storage):	 32° – 104° F (0° – 40° C) < 95%, non-condensing
Frame communication	10/100/1000 Mbps Ethernet with Auto-MDIX
Indicators	Card edge display and indicators as follows: • 4-character alphanumeric display • Status/Error LED indicator • Input Presence LED indicators
Serial Digital Video Input	Number of Inputs: Up to (4), with manual select or failover to alternate input Data Rates Supported: SMPTE 424M, 292M, SMPTE 259M-C

Table 1-1 Technical Specifications — continued

Item	Characteristic
Serial Digital Video Input (cont.)	Impedance: 75 Ω terminating Return Loss: > 15 dB up to 1.485 GHz > 10 dB up to 2.970 GHz
Post-Processor Serial Digital Video Outputs	Number of Outputs: Four 3G/HD/SD-SDI BNC Impedance: 75 Ω Return Loss: > 15 dB at 5 MHz – 270 MHz Signal Level: 800 mV ± 10% DC Offset: 0 V ± 50 mV Jitter (3G/HD/SD): < 0.3/0.2/0.2 UI Minimum Latency (frame sync disabled): SD: 127 pixels; 9.4 us 720p: 330 pixels; 4.45 us 1080i: 271 pixels; 3.65 us 1080p: 361 pixels; 2.43 us
Embedded Audio Output	16-ch embedded. User crosspoint allows routing of any embedded channel to any embedded channel output. Multi-frequency tone generator for each audio output. Master delay control; range of -33 msec to +3000 msec.
AES Audio Outputs	Standard: SMPTE 276M Number of Outputs: Up to 16 unbalanced; AES-3id Impedance: 75 Ω

Table 1-1 Technical Specifications — continued

Item	Characteristic
Frame Reference Input	Number of Inputs: Two, REF 1 and REF 2 from frame with selectable failover Standards Supported: SMPTE 170M/318M (“black burst”) SMPTE 274M/296M (“tri-level”) Return Loss: > 35 dB up to 5.75 MHz
GPIO	(2) GPI; (2) GPO; opto-isolated GPO Specifications: Max I: 120 mA Max V: 30 V Max P: 120 mW GPI Specifications: GPI LO @ Vin < 1.5 V GPI HI @ Vin > 2.3 V Max Vin: 9 V

Warranty and Service Information

Cobalt Digital Inc. Limited Warranty

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

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

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

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

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Technical Support:	support@cobaltdigital.com

Chapter 2

Installation and Setup

Overview

This chapter contains the following information:

Installing the 9902-2UDX-DI Into a Frame Slot

CAUTION

Heat and power distribution requirements within a frame may dictate specific slot placement of cards. Cards with many heat-producing components should be arranged to avoid areas of excess heat build-up, particularly in frames using only convection cooling. The 9902-2UDX-DI has a moderate power dissipation (<18 W). As such, avoiding placing the card adjacent to other cards with similar dissipation values if possible.

CAUTION

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

Note: **If installing the 9902-2UDX-DI in a slot with no rear I/O module, a Rear I/O Module is required** before cabling can be connected. Refer to Installing a Rear I/O Module (p. 2-3) for rear I/O module installation procedure.

CAUTION

If required, make certain Rear I/O Module(s) is installed before installing the 9902-2UDX-DI into the frame slot. Damage to card and/or Rear I/O Module can occur if module installation is attempted with card already installed in slot.

Note: Check the packaging in which the 9902-2UDX-DI was shipped for any extra items such as a Rear I/O Module connection label. In some cases, this label is shipped with the card and to be installed on the Rear I/O connector bank corresponding to the slot location of the card.

Install the 9902-2UDX-DI into a frame slot as follows:

1. Determine the slot in which the 9902-2UDX-DI is to be installed.
2. Open the frame front access panel.
3. While holding the card by the card edges, align the card such that the plastic ejector tab is on the bottom.
4. Align the card with the top and bottom guides of the slot in which the card is being installed.
5. Gradually slide the card into the slot. When resistance is noticed, gently continue pushing the card until its rear printed circuit edge terminals engage fully into the rear I/O module mating connector.

CAUTION

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

6. Verify that the card is fully engaged in rear I/O module mating connector.
7. Close the frame front access panel.
8. Connect the input and output cables as shown in 9902-2UDX-DI Rear I/O Modules (p. 2-4).
9. Repeat steps 1 through 8 for other 9902-2UDX-DI cards.

Note:
- The 9902-2UDX-DI BNC inputs are internally 75-ohm terminated. It is not necessary to terminate unused BNC inputs or outputs.
- External frame sync reference signals are received by the card over a reference bus on the card frame, and not on any card rear I/O module connectors. The frame has BNC connectors labeled **REF 1** and **REF 2** which receive the reference signal from an external source such as a house distribution.
- To remove a card, press down on the ejector tab to unseat the card from the rear I/O module mating connector. Evenly draw the card from its slot.

10. If network remote control is to be used for the frame and the frame has not yet been set up for remote control, perform setup in accordance with Setting Up 9902-2UDX-DI Network Remote Control (p. 2-9).

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

Installing a Rear I/O Module

Note: This procedure is applicable **only if a Rear I/O Module is not currently installed** in the slot where the 9902-2UDX-DI is to be installed.

If installing the 9902-2UDX-DI in a slot already equipped with a suitable I/O module, omit this procedure.

Install a Rear I/O Module as follows:

1. On the frame, determine the slot in which the 9902-2UDX-DI is to be installed.
2. In the mounting area corresponding to the slot location, install Rear I/O Module as shown in Figure 2-1.

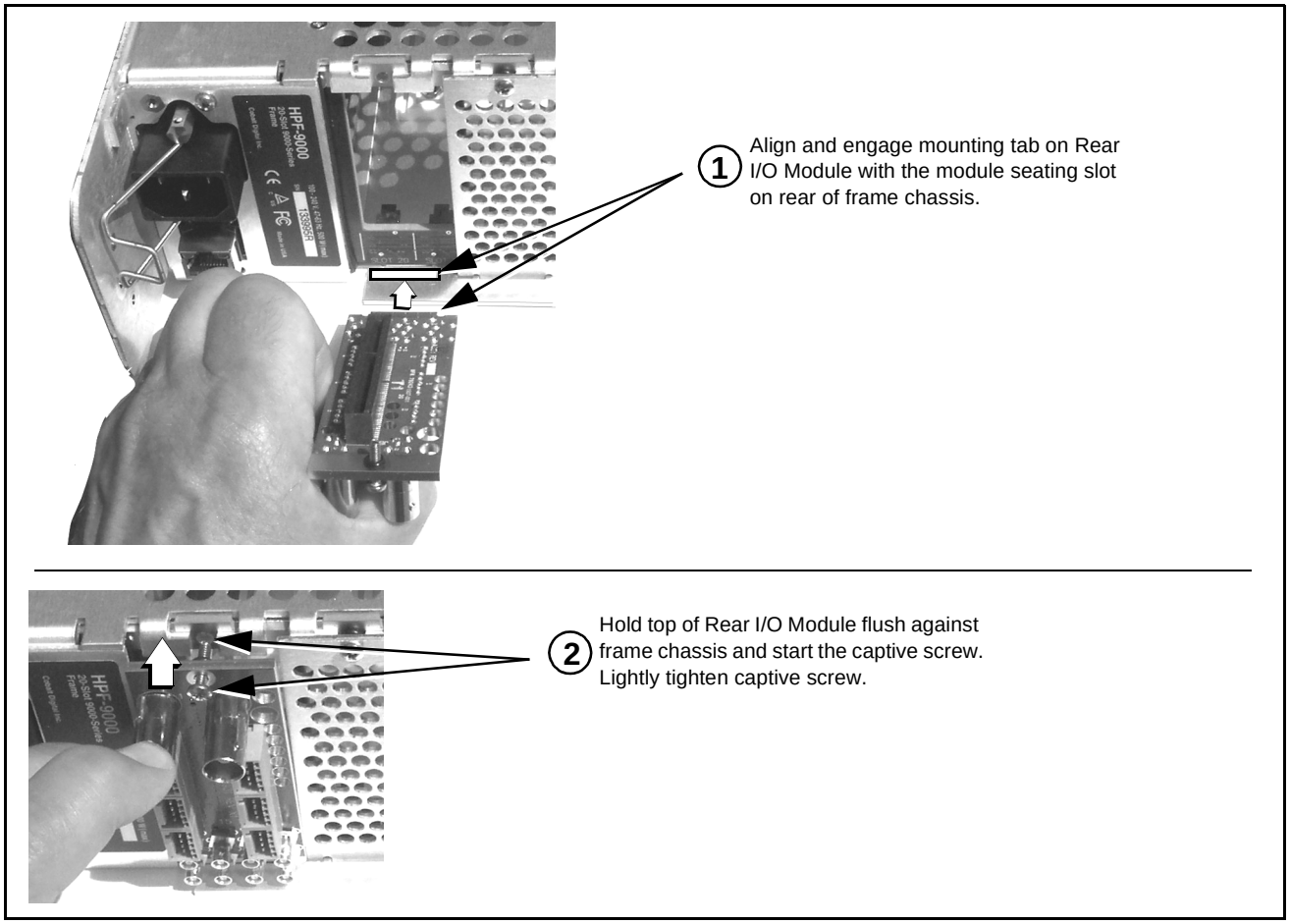


Figure 2-1 Rear I/O Module Installation

9902-2UDX-DI Rear I/O Modules

Table 2-1 shows and describes the full assortment of Rear I/O Modules specifically for use with the 9902-2UDX-DI.

Notes: Rear I/O Modules equipped with 3-wire Phoenix connectors are supplied with removable screw terminal block adapters. For clarity, the adapters are omitted in the drawings below.

Table 2-1 9902-2UDX-DI Rear I/O Modules

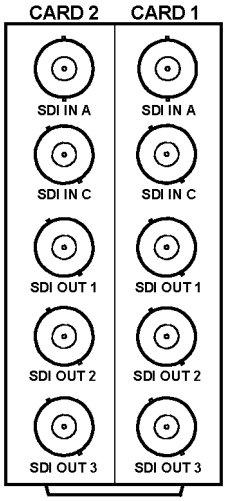
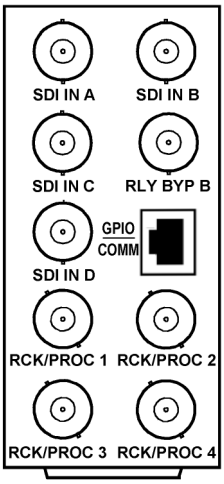
9902-2UDX-DI Rear I/O Module	Description
Note: Some Rear I/O Modules shown below are equipped with connectors for signals not supported by this card (such as multi-wire balanced audio connections, CVBS I/O, and AES IN). These Rear I/O Modules can be used with the card, however unsupported connections are N/C when used with this card.	
RM20-9902-2UDX-A/S 	Split Rear Module. Provides **each** of the following connections for two 9902-2UDX cards: • Two 3G/HD/SD-SDI coaxial input BNCs (**SDI IN A** and **SDI IN C**) • Three 3G/HD/SD-SDI Video Out BNCs (**SDI OUT 1** thru **SDI OUT 3**)
RM20-9902-2UDX-C Note: RCK/PROC 1 thru RCK/PROC 4 are DA outputs which can be individually set as reclocked or processed outputs of the currently-selected input. RLY BYP B is a relay-protected path which carries processed SDI out under normal conditions and passive routes SDI IN B to this BNC upon loss of power. 	Provides the following connections: • Four 3G/HD/SD-SDI video input BNCs (**SDI IN A** thru **SDI IN D**) • Four 3G/HD/SD-SDI video output BNCs (**RCK/PROC 1** thru **RCK/PROC 4**; each GUI selectable as processed out, selected-input reclocked, or wings/key-fill preview where available) • One relay-protected SDI processed output BNC (**RLY BYP B**; outputs a copy of **SDI OUT 1** under normal conditions, or passive outputs the SDI input on **SDI IN B** as a relay failover if card power is lost) • **COMM/GPIO** RJ-45 connector **Note:** Refer to GPIO, Serial (COMM) Connections (p. 2-9) for connector pinouts and important information regarding GPO electrical limits.

Table 2-1 9902-2UDX-DI Rear I/O Modules — continued

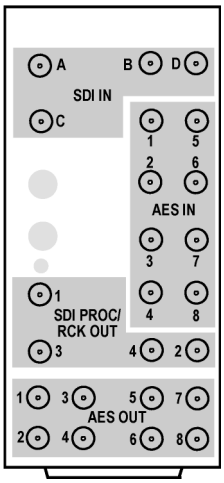
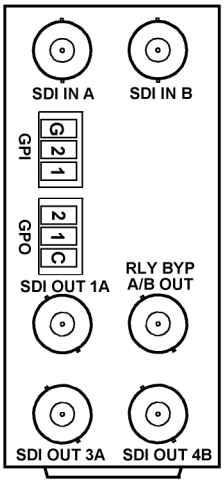
9902-2UDX-DI Rear I/O Module	Description
RM20-9902-2UDX-E 	Provides the following connections: • Four 3G/HD/SD-SDI video inputs (**SDI IN A** thru **SDI IN D**)• • Four 3G/HD/SD-SDI video outputs; selectable as processed or input reclocked out (**SDI PROC/RCK OUT 1** thru **SDI PROC/RCK OUT 4**) • Eight AES audio outputs (**AES OUT 1** thru **AES OUT 8**) • (AES IN 1 thru AES IN 8 are N/C) **Note:** Available equipped with High-Density BNC (HDBNC) or DIN1.0/2.3 connectors as: RM20-9902-2UDX-E-HDBNC or RM20-9902-2UDX-E-DIN, respectively.
RM20-9902-2UDX-F 	Provides the following connections: • Two 3G/HD/SD-SDI video input BNCs (**SDI IN A** and **SDI IN B**) • Three 3G/HD/SD-SDI video output BNCs (**SDI OUT 1A** thru **SDI OUT 4B**; each GUI selectable as selected-input reclocked or processed out) • One relay-protected SDI processed output BNC (**RLY BYP A/B OUT**) • Two opto-isolated GPI inputs (terminals **GPI 1-G** and **GPI 2-G**) • Two opto-coupled GPO (**GPO 1/G** and **GPO 2/G**) **Note:** Refer to GPIO, Serial (COMM) Connections (p. 2-9) for connector pinouts and important information regarding GPO electrical limits.

Table 2-1 9902-2UDX-DI Rear I/O Modules — continued

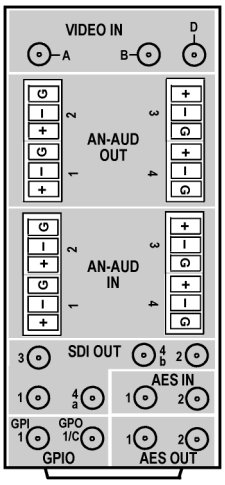
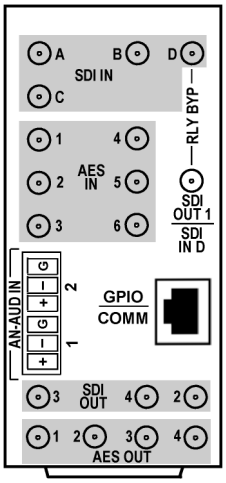
9902-2UDX-DI Rear I/O Module	Description
RM20-9902-2UDX-H  **Note:** Refer to GPIO, Serial (COMM) Connections (p. 2-9) for connector pinouts and important information regarding GPO electrical limits.	Provides the following connections: • Two 3G/HD/SD-SDI video input BNCs (**SDI IN A**, **SDI IN B**, and **SDI IN D**) • Three 3G/HD/SD-SDI video outputs, selectable as processed or reclocked input (**SDI OUT 1** thru **SDI OUT 3**) • 3G/HD/SD-SDI video output pair, selectable as processed or reclocked input as a pair (**SDI OUT 4a** and **SDI OUT 4b**) • Two AES audio outputs (**AES OUT 1** and **AES OUT 2**) • One GPI / 6Hz coaxial input (**GPI 1**) • One coaxial GPO with isolated return (**GPO 1**) • (AES IN 1 and AES IN 2 are N/C) • (AN-AUD IN 1 thru AN-AUD IN 4 are N/C) • (AN-AUD OUT 1 thru AN-AUD OUT 4 are N/C) **Note:** Available equipped with High-Density BNC (HDBNC) or DIN1.0/2.3 connectors as: RM20-9902-2UDX-H-HDBNC or RM20-9902-2UDX-H-DIN, respectively.
RM20-9902-2UDX-K  	Provides the following connections: • Four 3G/HD/SD-SDI video inputs (**SDI IN A** thru **SDI IN D**; IN D-to-OUT 1 as passive RLY bypass) • Four 3G/HD/SD-SDI video outputs (**SDI OUT 1** thru **SDI OUT 4**) • Four AES audio outputs (**AES OUT 1** thru **AES OUT 4**) • **COMM/GPIO** RJ-45 connector • (AES IN 1 thru AES IN 6 are N/C) • (AN-AUD IN 1 and AN-AUD IN 2 are N/C) **Note:** • Refer to GPIO, Serial (COMM) Connections (p. 2-9) for connector pinouts and important information regarding GPO electrical limits. • Available equipped with High-Density BNC (HDBNC) or DIN1.0/2.3 connectors as: RM20-9902-2UDX-K-HDBNC or RM20-9902-2UDX-K-DIN, respectively.

Table 2-1 9902-2UDX-DI Rear I/O Modules — continued

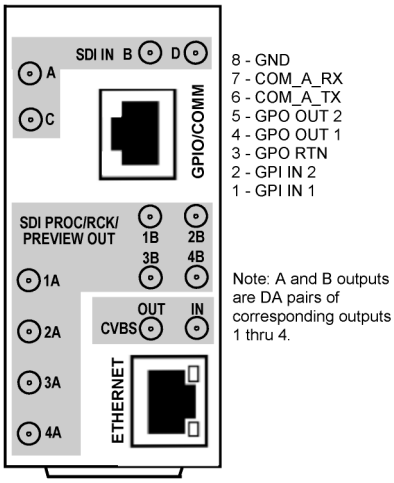
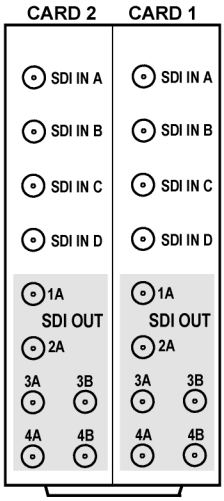
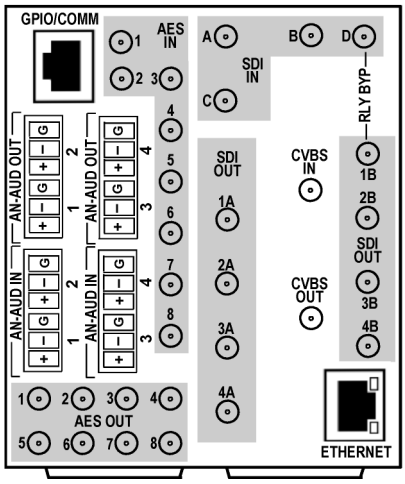
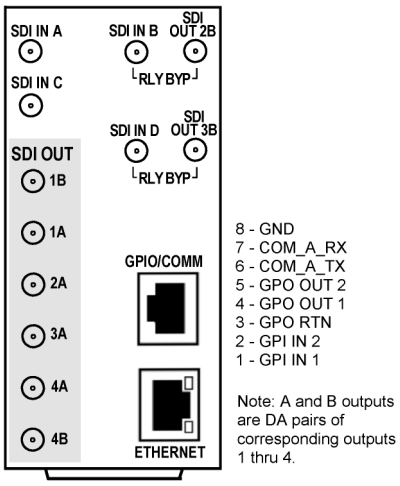
9902-2UDX-DI Rear I/O Module	Description
RM20-9902-2UDX-L 	Provides the following connections: • Four 3G/HD/SD-SDI video inputs (**SDI IN A** thru **SDI IN D** • Eight 3G/HD/SD-SDI video outputs (**SDI OUT 1A** thru **SDI OUT 4B**; 1x2 DA output of each crosspoint output) • **COMM/GPIO** RJ-45 connector • **ETHERNET** 100/1000 BaseT Ethernet connector • (CVBS IN is N/C) • (CVBS OUT is N/C) **Note:** Available equipped with High-Density BNC (HDBNC) or DIN1.0/2.3 connectors as: RM20-9902-2UDX-L-HDBNC or RM20-9902-2UDX-L-DIN, respectively.
RM20-9902-2UDX-M/S 	Split Rear Module. Provides **each** of the following connections for two 9902-2UDX cards: • Four 3G/HD/SD-SDI coaxial input BNCs (**SDI IN A** and **SDI IN D**) • Six 3G/HD/SD-SDI Video Out BNCs (**SDI OUT 1A** thru **SDI OUT 4B**) **Note:** Available equipped with High-Density BNC (HDBNC) or DIN1.0/2.3 connectors as: RM20-9902-2UDX-M/S-HDBNC or RM20-9902-2UDX-M/S-DIN, respectively.

Table 2-1 9902-2UDX-DI Rear I/O Modules — continued

9902-2UDX-DI Rear I/O Module	Description
RM20-9902-2UDX-N 	Double-width rear modules provides the following connections: • Four 3G/HD/SD-SDI video inputs (**SDI IN A** thru **SDI IN D** • Four 3G/HD/SD-SDI video outputs (**SDI OUT 1B** thru **SDI OUT 4B** (OUT 1B with relay bypass protect) • Eight AES audio outputs (**AES OUT 1** thru **AES OUT 8**) • **COMM/GPIO** RJ-45 connector • **ETHERNET** 100/1000 BaseT Ethernet connector • (CVBS IN is N/C) • (AN-AUD IN 1 thru AN-AUD IN 4 are N/C) • (AES IN 1 thru AES IN 8 are N/C) • (CVBS OUT is N/C) • (AN-AUD OUT 1 thru AN-AUD OUT 4 are N/C) **Note:** Available equipped with High-Density BNC (HDBNC) or DIN1.0/2.3 connectors as: RM20-9902-2UDX-N-HDBNC or RM20-9902-2UDX-N-DIN, respectively.
RM20-9902-2UDX-P 	Provides the following connections: • Two 3G/HD/SD-SDI video input BNCs (**SDI IN A** and **SDI IN C**) • Six 3G/HD/SD-SDI video output BNCs (**SDI OUT 1A** thru **SDI OUT 4B**; each GUI selectable as selected-input reclocked or processed out) • Two relay-protected SDI processed output BNC (**RLY BYP SDI IN B > SDI OUT 2B** and **RLY BYP SDI IN D > SDI OUT 3B**) • Two opto-isolated GPI inputs (terminals **GPI 1-G** and **GPI 2-G**) • Two opto-coupled GPO (**GPO OUT 1** and **GPO OUT 2**) **Note:** Available equipped with High-Density BNC (HDBNC) or DIN1.0/2.3 connectors as: RM20-9902-2UDX-P-HDBNC or RM20-9902-2UDX-P-DIN, respectively. **Note:** Refer to GPIO, Serial (COMM) Connections (p. 2-9) for connector pinouts and important information regarding GPO electrical limits.

GPIO, Serial (COMM) Connections

Figure 2-2 shows connections to the card multi-pin terminal block connectors. These connectors are used for card serial comm and GPIO connections.

Note: It is preferable to wire connections to plugs oriented as shown in Figure 2-2 rather than assessing orientation on rear module connectors. Note that the orientation of rear module 3-wire audio connectors is not necessarily consistent within a rear module, or between different rear modules. If wiring is first connected to plug oriented as shown here, the electrical orientation will be correct regardless of rear module connector orientation.

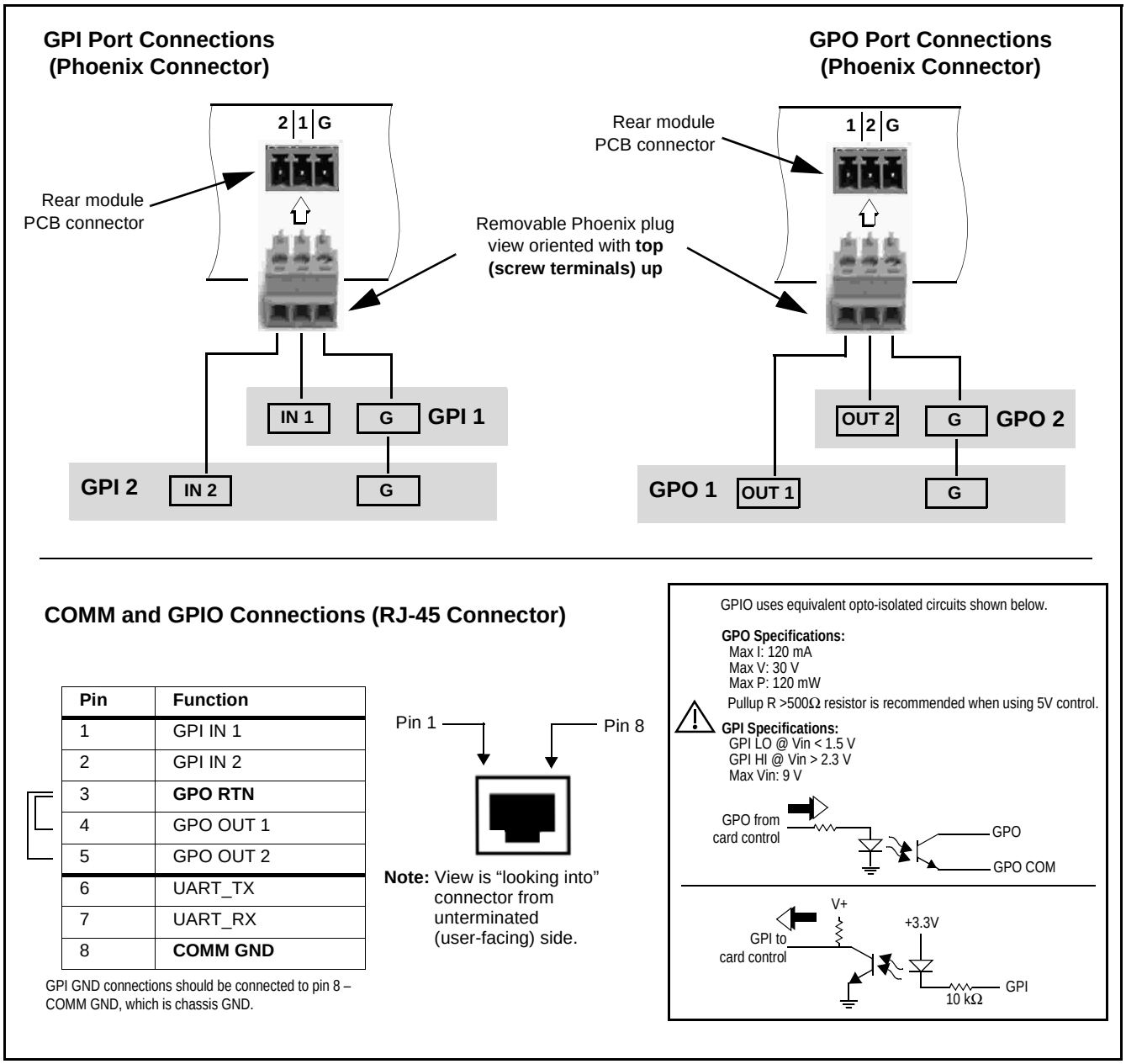
Setting Up 9902-2UDX-DI Network Remote Control

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

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

  Download a copy of this guide by clicking on the **Support>Reference Documents** link at www.cobaltdigital.com and then select DashBoard Remote Control Setup Guide as a download, or contact Cobalt® as listed in Contact Cobalt Digital Inc. (p. 1-20).

- 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.



Pin	Function
1	GPI IN 1
2	GPI IN 2
3	**GPO RTN**
4	GPO OUT 1
5	GPO OUT 2
6	UART_TX
7	UART_RX
8	**COMM GND**

GPI GND connections should be connected to pin 8 – COMM GND, which is chassis GND.

Figure 2-2 COMM and GPIO Connector Pinouts

Chapter 3

Operating Instructions

Overview

If you are already familiar with using DashBoard or a Cobalt Remote Control Panel to control Cobalt cards, please skip to 9902-2UDX-DI Function Menu List and Descriptions (p. 3-10).

This chapter contains the following information:

Control and Display Descriptions

This section describes the user interface controls, indicators, and displays for using the 9902-2UDX-DI card. The 9902-2UDX-DI functions can be accessed and controlled using any of the user interfaces described here.

The format in which the 9902-2UDX-DI 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 9902-2UDX-DI functions (and the controls, indicators, and displays related to a particular function) follows a general arrangement of Function Menus under which related controls can be accessed (as described in Function Menu/ Parameter Overview below).

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

Function Menu/Parameter Overview

The functions and related parameters available on the 9902-2UDX-DI card are organized into function **menus**, which consist of parameter groups as shown below.

Figure 3-1 shows how the 9902-2UDX-DI card and its menus are organized, and also provides an overview of how navigation is performed between cards, function menus, and parameters.

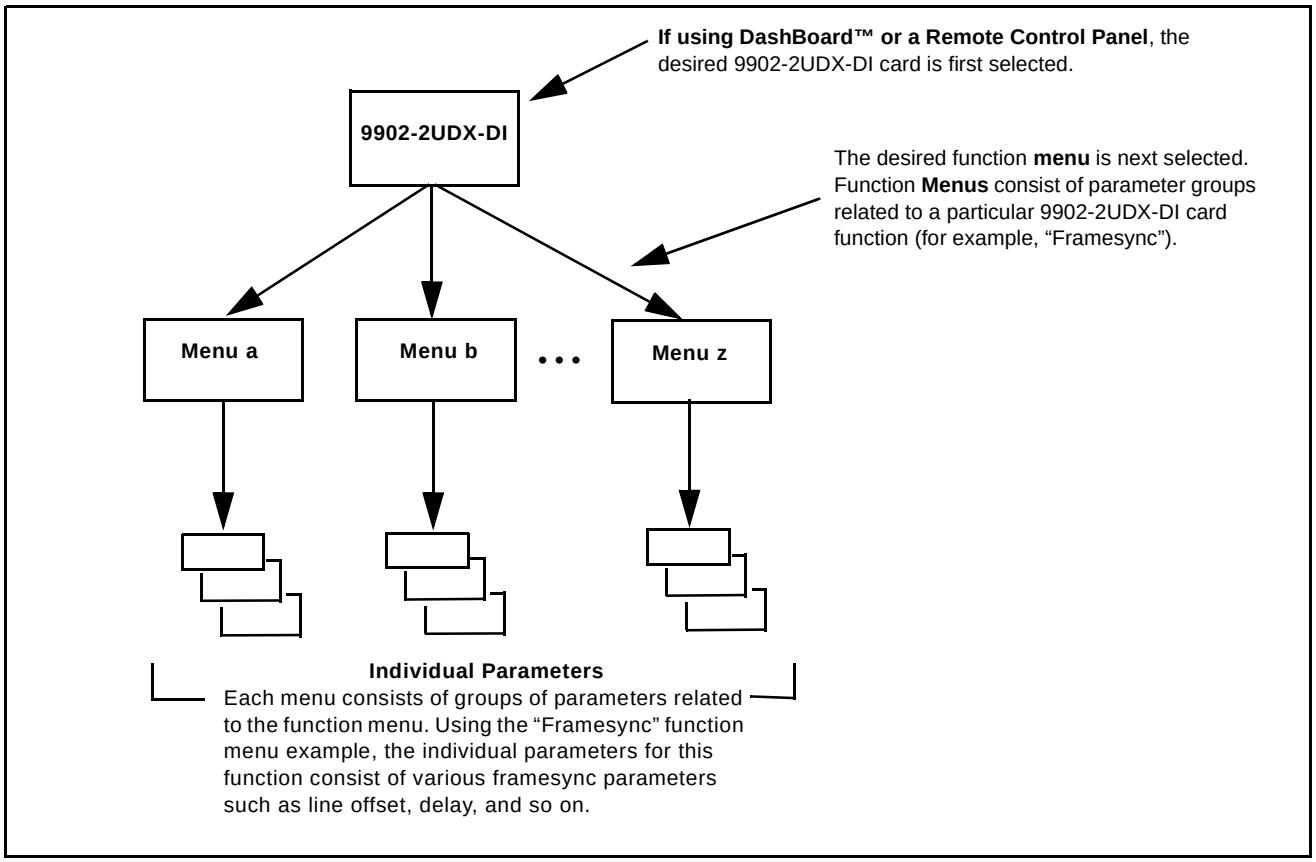


Figure 3-1 Function Menu/Parameter Overview

DashBoard™ User Interface

(See Figure 3-2.) The card function menus are organized in DashBoard™ using tabs. When a tab is selected, each parametric control or selection list item associated with the function is displayed. Scalar (numeric) parametric values can then be adjusted as desired using the GUI slider controls. Items in a list can then be selected using GUI drop-down lists.

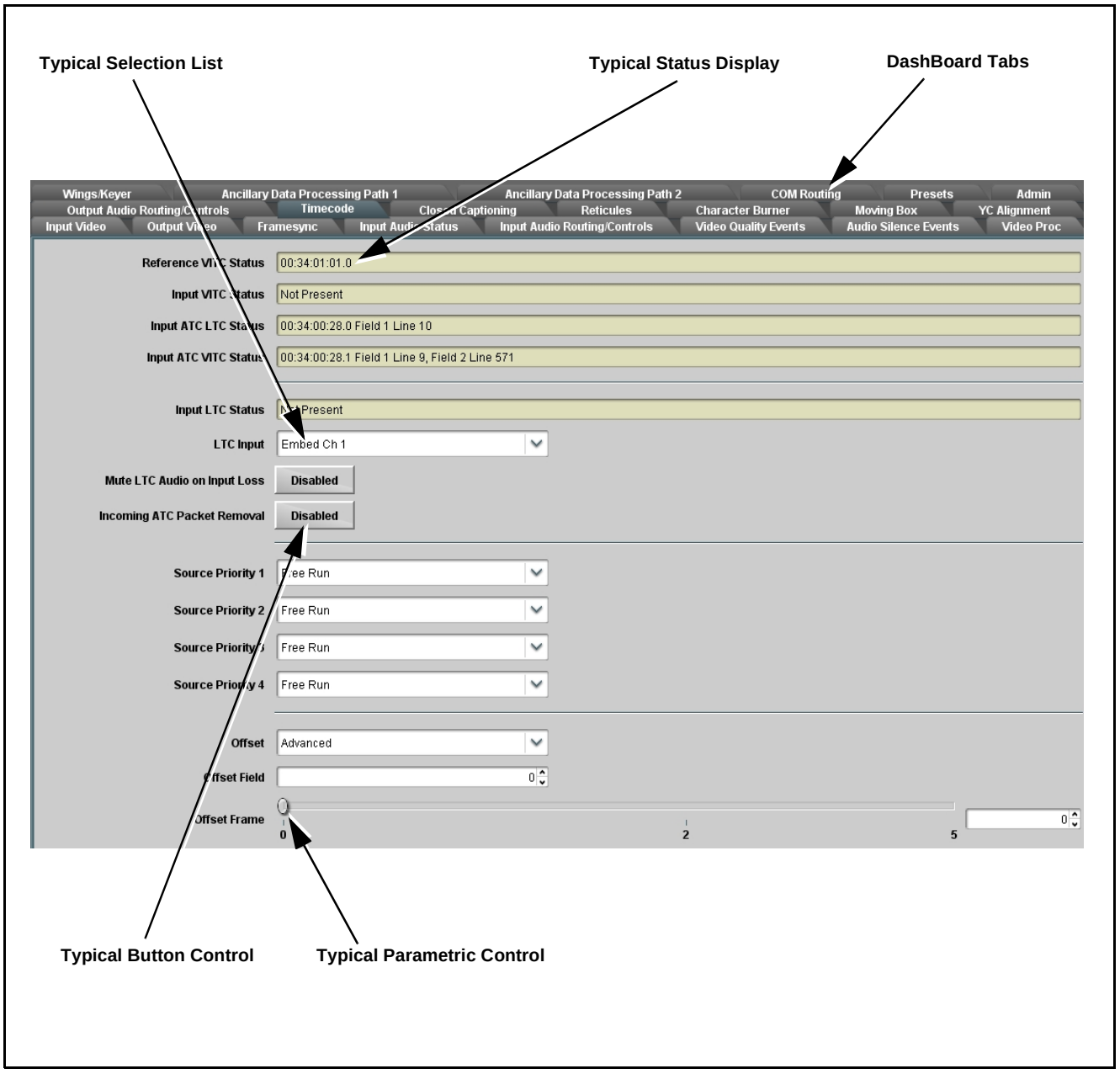


Figure 3-2 Typical DashBoard Tabs and Controls

Cobalt® Remote Control Panel User Interfaces

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

When the desired function submenu is selected, each parametric control or selection list item associated with the function is displayed. Scalar (numeric) parametric values can then be adjusted as desired using the control knobs, which act like a potentiometer. Items in a list can then be selected using the control knobs which correspondingly act like a rotary switch.

Figure 3-3 shows accessing a function submenu and its parameters (in this example, “Video Proc”) using the Control Panel as compared to using the card edge controls.

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

Figure 3-3 Remote Control Panel Setup of Example Video Proc Function Setup

Web HTML5 User Interface

(See Figure 3-4.) When equipped with a rear I/O module having an Ethernet port, the 9902-2UDX-DI controls can be accessed via a web network connection with no additional remote control software needed. The web GUI shows the same tabs, controls and status displays as those accessed using DashBoard™. This allows very convenient control access to the card, even if using a computer without DashBoard remote control or in case the frame network connection is down.

The card can be accessed in a web browser by entering the card IP address as set in the card **Admin** tab. (See Admin (p. 3-56) for more information.)

Note: Card must be equipped with a rear I/O module with an Ethernet port, or installed in a “smart” frame with per-slot Ethernet, to use html access. The card address is entirely independent of, and requires no association with, the frame openGear IP address.

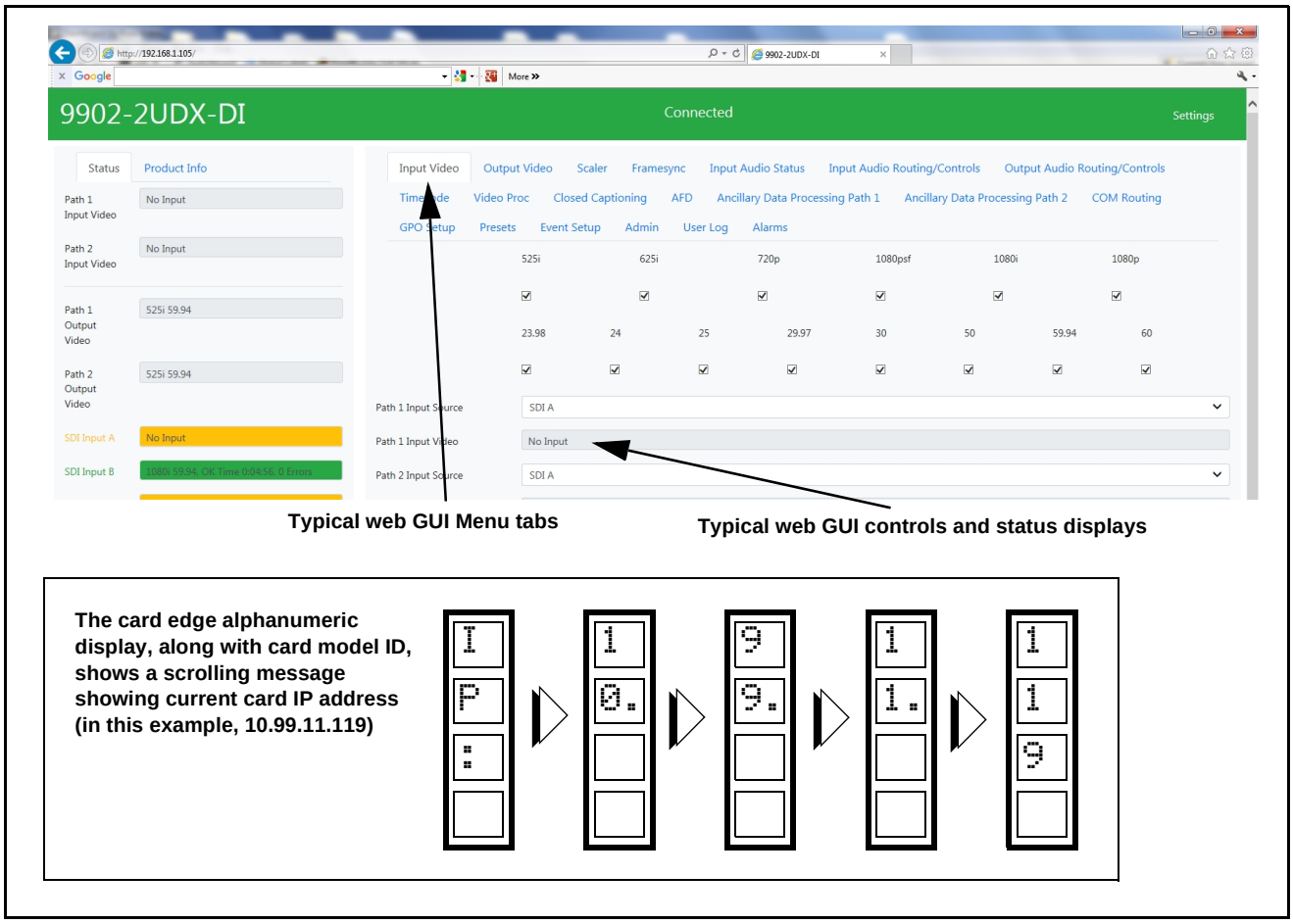


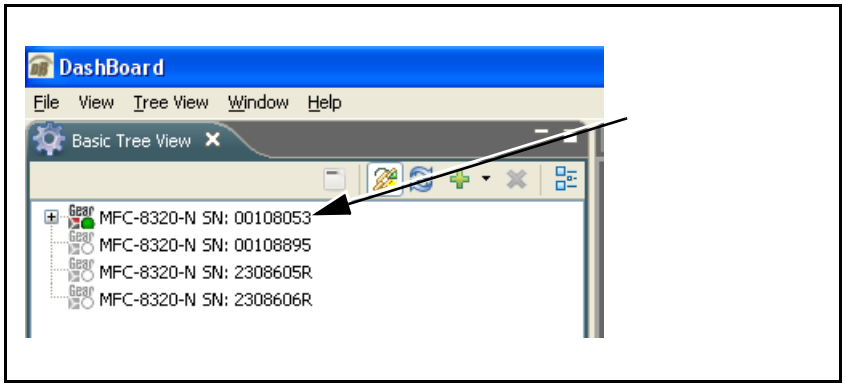
Figure 3-4 Typical Web GUI Tabs and Controls

Accessing the 9902-2UDX-DI Card via Remote Control

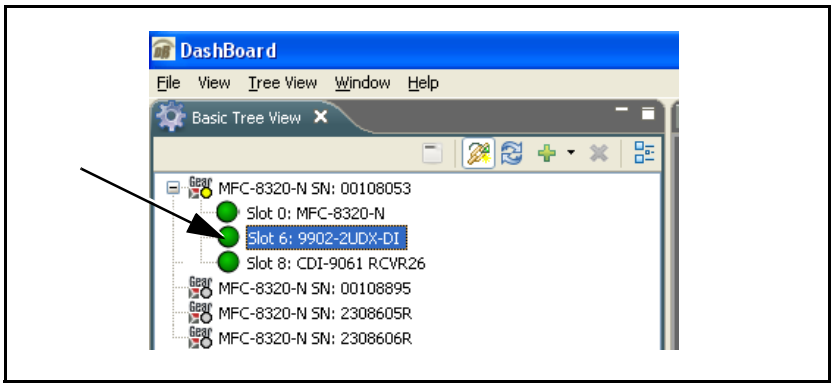
Access the 9902-2UDX-DI card using DashBoard™ or Cobalt® Remote Control Panel as described below.

Accessing the 9902-2UDX-DI Card Using DashBoard™

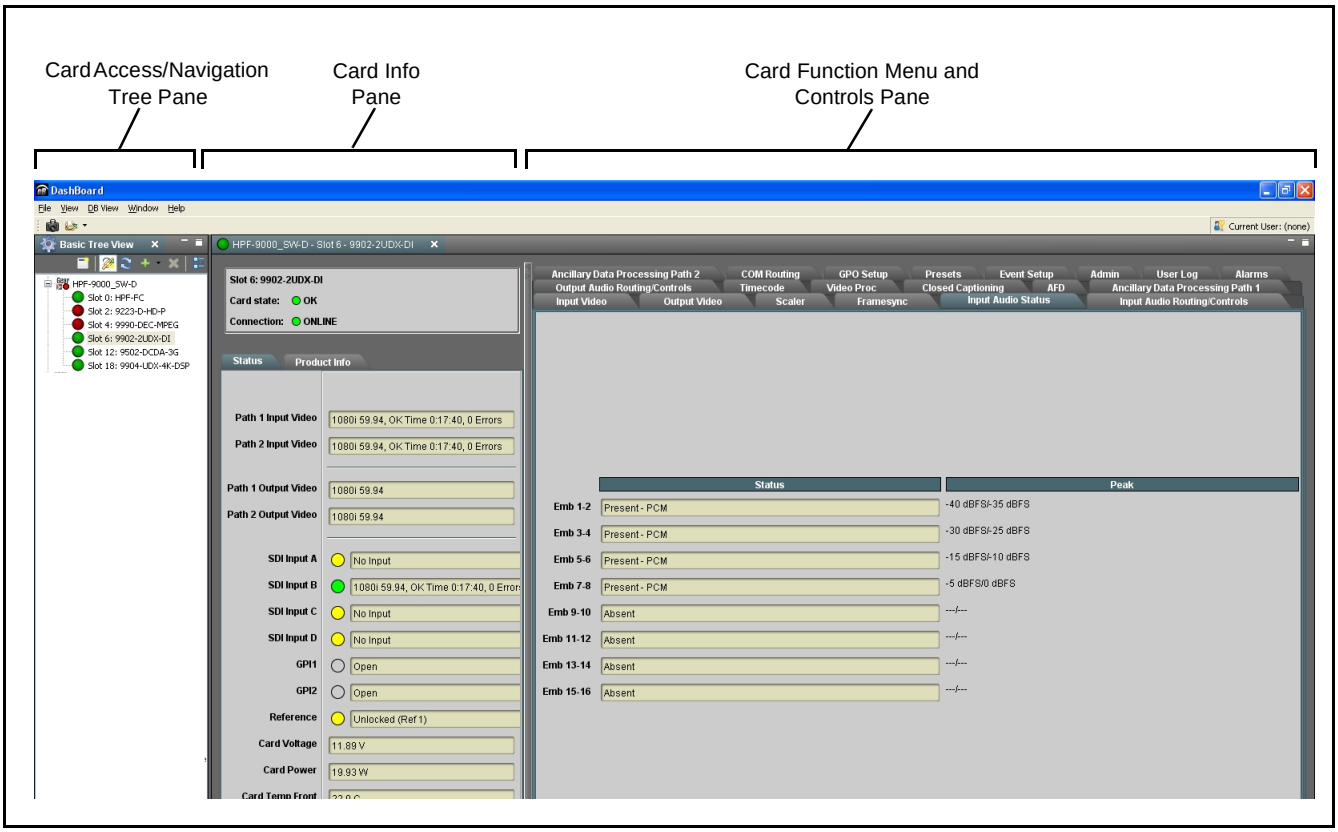
1. On the computer connected to the frame LAN, open DashBoard™.
2. As shown below, in the left side Basic View Tree locate the Network Controller Card associated with the frame containing the 9902-2UDX-DI card to be accessed (in this example, “MFC-8320-N SN: 00108053”).



3. As shown below, expand the tree to access the cards within the frame. Click on the card to be accessed (in this example, “Slot 6: 9902-2UDX-DI”).



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



Accessing the 9902-2UDX-DI Card Using a Cobalt® Remote Control Panel

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

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

This display shows the devices assigned to the Control Panel.

- Rotate any knob to select from the list of devices. The device selected using a knob is displayed with a reversed background (in this example, “1 9902 - Receiver 21 Input Processing”).
- Directly enter a device by entering its list number using the numeric keypad, and then pressing **Enter** or pressing in any knob).

Checking 9902-2UDX-DI Card Information

The operating status and software version the 9902-2UDX-DI card can be checked using DashBoard™ or the card edge control user interface. Figure 3-5 shows and describes the 9902-2UDX-DI card information screen using DashBoard™ and accessing card information using the card edge control user interface.

Note: Proper operating status in DashBoard™ is denoted by green icons for the status indicators shown in Figure 3-5. Yellow or red icons respectively indicate an alert or failure condition. Refer to Troubleshooting (p. 3-64) for corrective action.

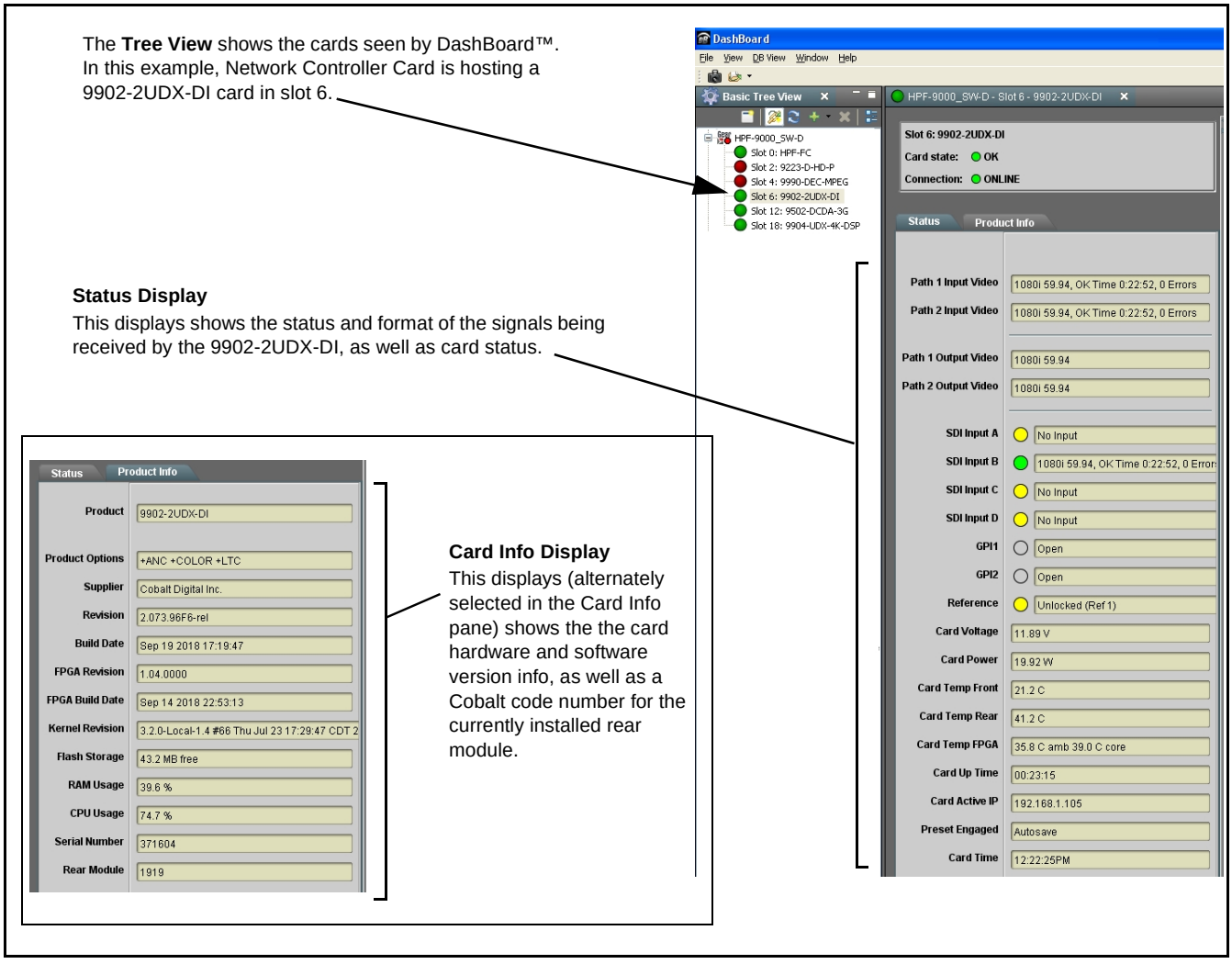


Figure 3-5 9902-2UDX-DI Card Info/Status Utility

Ancillary Data Line Number Locations and Ranges

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

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

Item	Default Line No. / Range	
	SD	HD
AFD	12 (Note 2)	9 (Note 2)
ATC_VITC	13 (Note 2)	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 3-6 shows an example of improper and corrected VANC allocation within an HD-SDI stream.

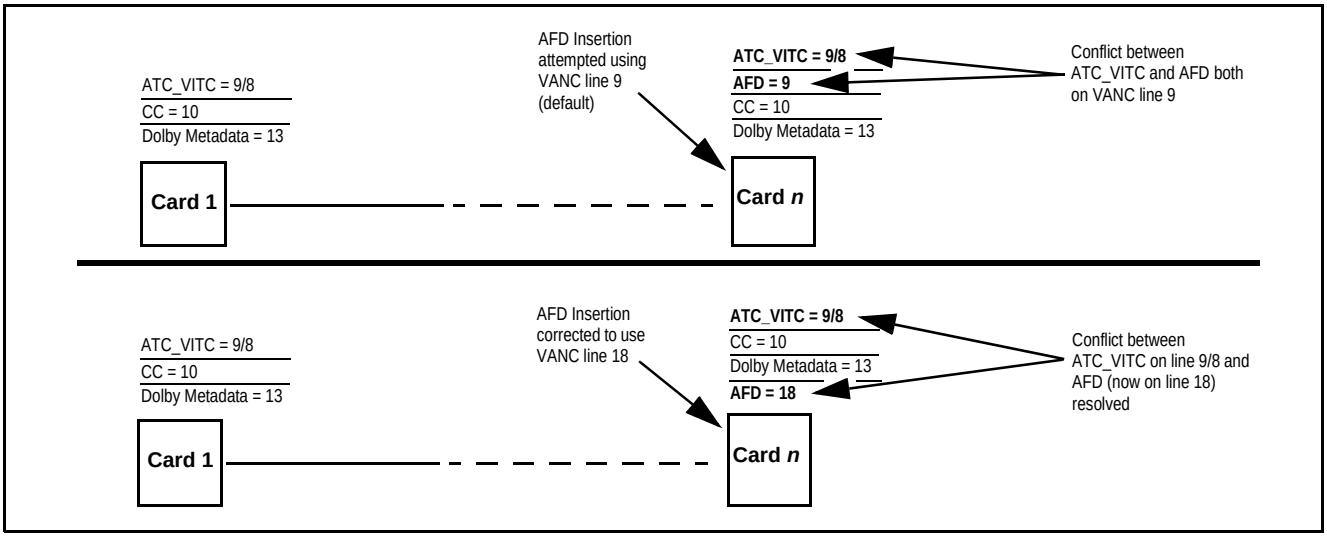


Figure 3-6 Example VANC Line Number Allocation Example

9902-2UDX-DI Function Menu List and Descriptions

Table 3-2 individually lists and describes each 9902-2UDX-DI function menu and its related list selections, controls, and parameters. Where helpful, examples showing usage of a function are also provided. Table 3-2 is primarily based upon using DashBoard™ to access each function and its corresponding menus and parameters.

Note: Option For any DashBoard tabs on card not appearing in this manual, this indicates the function is an option and covered in a separate Manual Supplement. Please refer to card web page Product Downloads for pdf Manual Supplements covering these options.

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

Some functions use **sub-tabs** to help maintain clarity and organization. In these instances, Table 3-2 shows the ordinate tab along with its sub-tabs. Highlighted sub-tabs indicate that controls described are found by selecting this sub-tab (in this example, the **Path 1** sub-tab on the **Framesync** page).

Note that selection of controls from one processing path to another is selected using this sub-tab which appears on many card function tabs.

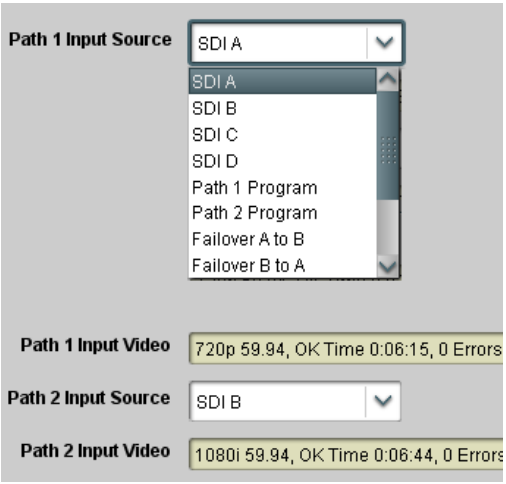
The table below provides a quick-reference to the page numbers where each function menu item can be found.

Table 3-2 9902-2UDX-DI Function Menu List

Input Video

Allows manual or failover selection of card SDI program video inputs and displays status and raster format of received SDI video.

• Input Video Source/Status



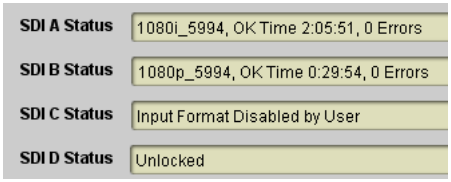
Selects the input video source to be applied to the card **Path 1** and **Path 2** program video inputs.

Note: • SDI inputs selected must be used with Rear I/O Module correspondingly equipped with intended input ports.

• Some choices shown are a function of card options.

• Input select also allows internal connection from one processing path output to the opposite processing path input. This allows "serial" or cascaded processing connections without requiring external jumpering on the card rear I/O module. Serial jumpering can, in addition to other functions, provide identical program video output streams with a delay offset between the two streams.

⚠ • Care should be taken to make certain an output from a video path is not applied as an input for the same path. Also, if framesync Lock to Input else Free Run is selected, the initial "upstream" path **must** be selected using Lock to Input Path control (for example, if Path 1 cascades to Path 2, this control must be set for Path 1 as lock source).



SDI A thru **SDI D Status** show raster/ format for all card inputs. If signal is not present or is invalid, **Unlocked** is displayed. (These status indications are also propagated to the Card Info pane.)

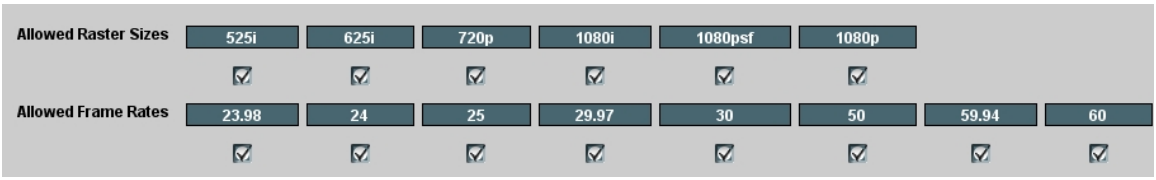
Input Format Disabled by User indicates raster size and/or frame rate has been rejected from being passed by card (as described below in Input SDI Raster Size / Frame Rate Filtering).

Note: Status display shows maximum card input complement. Input complement is determined by rear I/O module used.

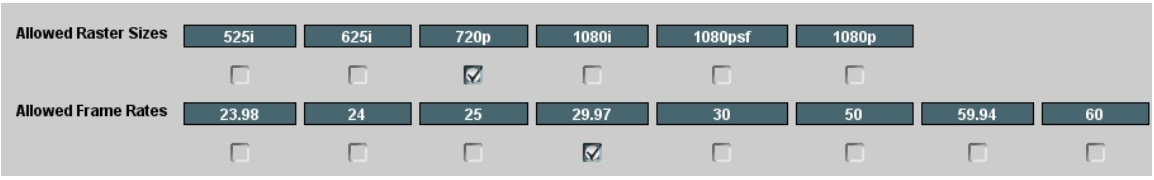
Input SDI Raster Size / Frame Rate Filtering

The controls shown below allow user filtering to exclude selected raster or rate formats from being received by a card input.

Default settings have all raster sizes and frame rates "checked", thereby providing no filtering (exclusion.)



In the example below, only 720p and 29.97 are checked, filtering allowed input to only be 720p 29.97 ("720p half-rate").



Note: Rates shown in selector are frame rates and not field rates.

Table 3-2 9902-2UDX-DI Function Menu List — continued

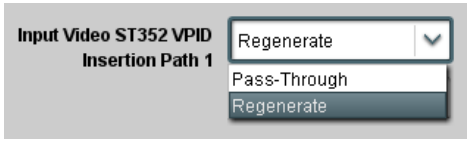
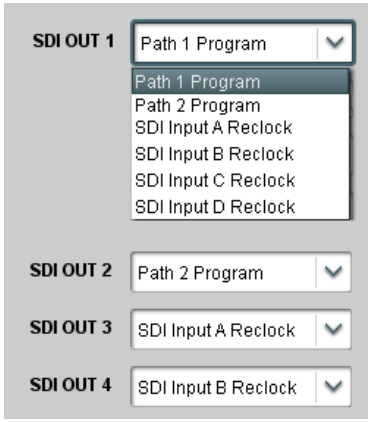
Output Video **Output Routing**	Allows selection of each of the four video output coaxial connectors as processed SDI out or reclocked SDI out.
• **ST352 VPID Insertion/Pass-Thru Select** 	Selects from default Regenerate mode and special Pass-Through mode (see below for important usage notes). • **Regenerate** makes certain ST352 is marked for whatever the card is passing, or if the payload is being modified by the card. (An example of where ST352 would have to be modified would be if the card Framesync is user-set to change the frame rate from 59.94 to 60.) • **Pass-Through** will extract and preserve the ST352 information from input SDI, and re-insert it on the output regardless of any changes the card has locally done to identifying characteristics carried in the ST352 metadata. **Note:** Path 2 has identical independent select control. Set control for other path using the respective Path 2 control. In all normal usages, it is recommended to leave this control set to default **Regenerate** setting. This ensures that downstream devices will "see" ST352 that represents the payload being provided by the card. Pass-Through is only used in highly specialized cases where special ST352 data must be preserved (even if the data may not match the payload).
• **Output Video Crosspoint** 	For each SDI output port supported by the card, provides a crosspoint for routing **Path 1** and **Path 2** program processed video or selected-input reclocked to an SDI output. In this example: - **SDI OUT 1** set to use Path 1 Program video out - **SDI OUT 2** set to use Path 2 Program video out - **SDI OUT 3** set to output SDI Input A reclocked copy - **SDI OUT 4** set to output SDI Input B reclocked copy **Note:** Outputs set to Input Reclocked will pass input SDI regardless of Input SDI Raster Size / Frame Rate Filtering. Input filtering applies only to the card program video path.

Table 3-2 9902-2UDX-DI Function Menu List — continued

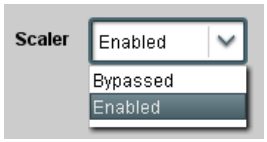
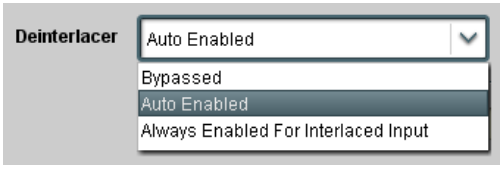
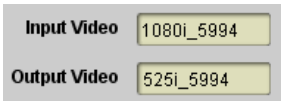
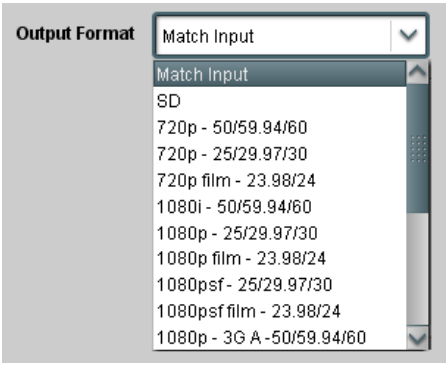
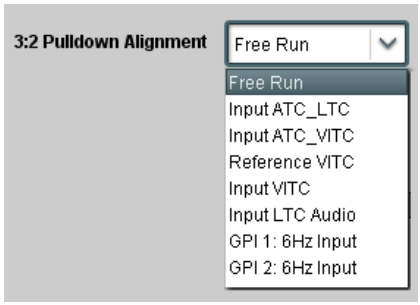
	Provides up/down/cross-converter, aspect ratio controls, and user H/V controls.
Note: Scaler tab has identical independent controls for both Path 1 and Path 2 using the **Path 1 / Path 2** sub-tabs. Therefore, only the **Path 1** controls are shown here. Set controls for other path using the respective sub-tab.	
• **Scaler Enable Control** 	Enables or disables Scaler function. **Note:** When scaler is disabled, all ancillary data is passed from input to output intact. If the scaler is enabled, ancillary data such as timecode and closed captioning must be set for re-insertion as desired. See Timecode (p. 3-34) and Closed Captioning (p. 3-25) for more information about insertion into scaled output video.
• **De-Interlacer Control** 	Allows de-interlacer to be bypassed to reduce processing latency. • **Bypassed:** De-interlacer is bypassed regardless of conversion being performed. When converting from interlaced to progressive, this results in reduced latency at the expense of fast-motion smoothness. • **Auto-Enable:** Applies de-interlacing for interlaced-to-interlaced conversions where useful (such as 1080i to 525i conversions). This is the default normal mode which also disables de-interlacing where not required (e.g., conversions within progressive formats). • **Always Enabled For Interlaced Input:** This setting enables de-interlacing always when an interlaced input format is being converted by the scaler. **Note:** De-interlacer is always bypassed when converting from a progressive format to a progressive format.
• **Input/Output Video Status** 	Displays signal format/status sent to scaler and output format/status. If invalid or no signal is present, **none** is displayed.
• **Output Format Selector** 	Provides conversions to formats as shown.

Table 3-2 9902-2UDX-DI Function Menu List — continued

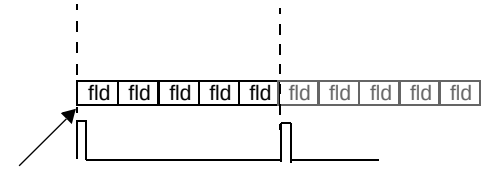
(continued)

• 3:2 Alignment Optimization Selector



Provides selection to optimize 3:2 pulldown conversion where timecode or other selections shown are to be relied upon to indicate frame transitions.

In the example below, A-frame is aligned using 6Hz pulse imported via GPI.



A-Frame alignment to 6Hz pulse via GPI

Note: If input video timecode or other marker cannot be relied upon for accurate and precise frame marking, leave control set to Free Run.

• Alignment Offset Selector

Based on alignment selection selected above, offsets A-frame by amount selected.

• Low-Latency PSF to Interlaced Control

Allows PsF to Interlaced conversions bypassing Scaler **ARC** and **Pan** controls to enhance processing latency performance over that available in normal mode.

- **Disabled:** This is card “normal” setting that locks out the low-latency processing function. Normal scaler processing latency (along with full ARC and pan control) is available with this setting.
- **Enabled (Use Both Fields):** This setting provides a highest-quality low-latency setting, and can be expected to provide an approximate latency of 12 msec for North American frame rates.
- **Enabled (Use Top Field):** This setting provides the lowest available latency with a slight reduction of motion smoothness due to alignment not waiting for both fields. This setting can be expected to provide an approximate latency of 6 msec for North American frame rates.

Note: When either low latency mode is enabled, image ARC scaling and/or panning is locked out.

• Standard Quick Set Aspect Ratio Conversion Selectors

Selects between the standard preset Aspect Ratio Conversions (ARC) shown below.

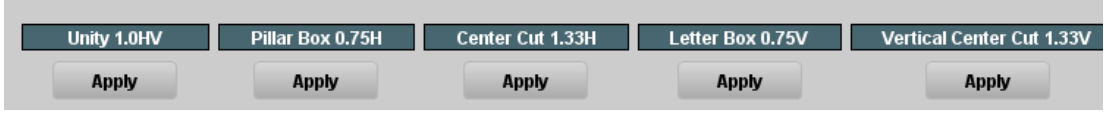


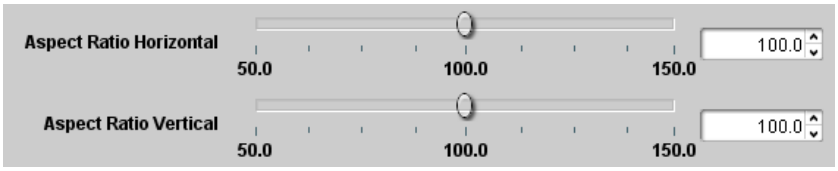
Table 3-2 9902-2UDX-DI Function Menu List — continued

(continued)

• User-defined Aspect Ratio Controls

Aspect Ratio Horizontal and **Aspect Ratio Vertical** controls adjust horizontal and vertical zoom percentage. Settings less than (<) 100% provide zoom-out; settings greater than (>) 100% provide zoom-in.

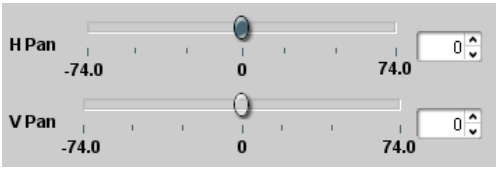
(50% to 150% range in 0.1% steps; null = 100.0)



Buttons allow standard ARC presets to be applied to output video. For any setting, using the **Horizontal** or **Vertical** controls allow user custom settings.

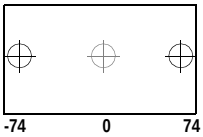
Pressing any of the preset buttons restores the ARC to the selected setting and overrides any previous custom settings.

• H Pan and V Pan Controls



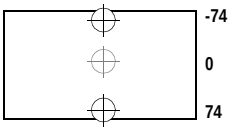
H Pan control shifts horizontal center of image left (negative settings) or right (positive settings)

(-74% to 74% range in 0.1% steps; null = 0.0)

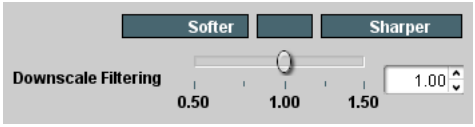


V Pan control shifts vertical center of image down (negative settings) or up (positive settings)

(-74% to 74% range in 0.1% steps; null = 0.0)



• Downscale Filtering Control



Provides edge enhancement of downscaled image which can sharpen image or suppress noise/artifacts.

(0.5 to 1.5 range; null = 1.0)

Table 3-2 9902-2UDX-DI Function Menu List — continued

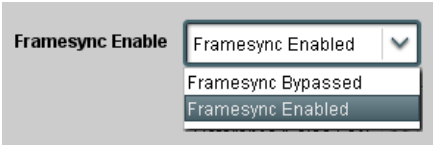
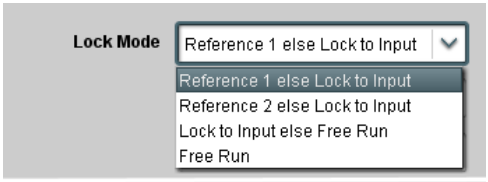
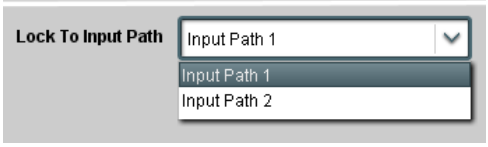
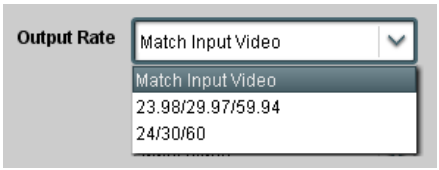
	Provides video frame sync/delay offset control and output control/loss of program video failover selection controls.
Note: Framesync tab has identical independent controls for both Path 1 and Path 2 using the **Path 1 / Path 2** sub-tabs. Therefore, only the **Path 1** controls are shown here. Set controls for other path using the respective sub-tab.	
• **Framesync Enable/Disable Control** 	Provides master enable/disable of all card framesync functions/controls.
• **Lock Mode Select**  	Selects Frame Sync functions from the choices shown to the left and described below. • **Lock to Reference:** Output video is locked to selected external reference received on the frame reference bus. (External reference signal Ref 1 / Ref 2 are distributed to the card and other cards via the Ref 1 / Ref 2 buses on the frame.) **Note:** If valid reference is not received, the Card state: Reference Invalid indication appears in the Card Info status portion of DashBoard™, indicating invalid frame sync reference error. • **Lock to Input:** Uses the selected program video for the path as the reference standard. **Lock To Input Path** selects the program video source which is used for ref. **Note:** If **Lock to Input** is used for framesync, any timing instability on the input video will result in corresponding instability on the output video. • **Free Run:** Output video is locked to the card internal clock. Output video is **not** locked to external reference. ⚠ • For cases where minimum latency is desired (no framesync), Mode should be set to Lock to Input with Framesync set to Enabled. If Disabled is selected when using dual paths, severe video and audio corruption can occur.
• **Output Rate Select** 	Allows frame rate to be outputted same as input video, or converted to from the choices shown to the left and described below. • **Auto** – output video frame rate tracks with input video. • **23.98/29.97/59.94** – forces standard North American frame rates. Can be used to convert 24/30/60 Hz camera frame rates to corresponding 23.98/29.97/59.94 standard North American frame rates. • **24/30/60** – forces 24/30/60 frame rates. Can be used to convert 23.98/29.97/59.94 Hz frame rates to corresponding 24/30/60 Hz frame rates.

Table 3-2 9902-2UDX-DI Function Menu List — continued

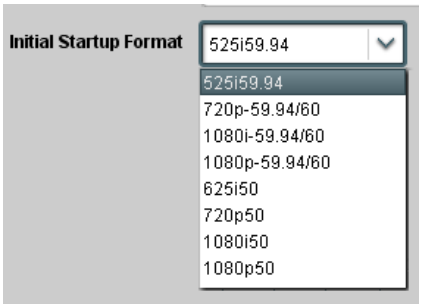
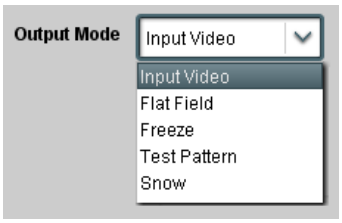
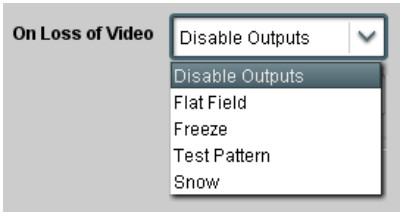
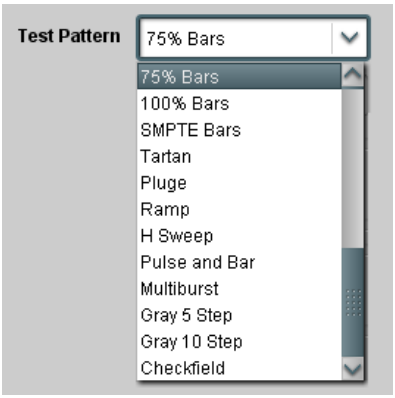
	**(continued)**
• Initial Startup Format Select 	Selects a frame sync format/rate to be invoked (from the choices shown to the left) in the time preceding stable lock to external reference. Set this control to that of the intended external reference to help ensure smoothest frame sync locking. This control also sets the card test pattern format where the card initial output at power-up is the internal pattern instead of program video.
• Program Video Output Mode Select 	Provides a convenient location to select between card program video output and other technical outputs from the choices shown to the left and described below. • **Input Video** – card outputs input program video (or loss of signal choices described below). • **Flat Field (Black)** – card outputs black flat field. • **Freeze** – card outputs last frame having valid SAV and EAV codes. • **Test Pattern** – card outputs standard technical test pattern (pattern is selected using the Pattern drop-down described below). • **Snow** – card outputs snow multi-color pattern.
• Loss of Input Signal Selection 	In the event of program input video Loss of Signal (LOS), determines action to be taken as follows: • **Disable Outputs:** Disable program video SDI outputs. • **Flat Field** – go to flat field on program video output. • **Freeze** – go to last frame having valid SAV and EAV codes on program video output. • **Test Pattern** – go to standard technical test pattern on program video output (pattern is selected using the Pattern drop-down described below). • **Snow** – output snow multi-color pattern.
• Test Pattern Select 	Provides a choice of standard technical patterns (shown to the left) when **Test Pattern** is invoked (either by LOS failover or directly by selecting Test Pattern on the Program Video Output Mode Select control).

Table 3-2 9902-2UDX-DI Function Menu List — continued

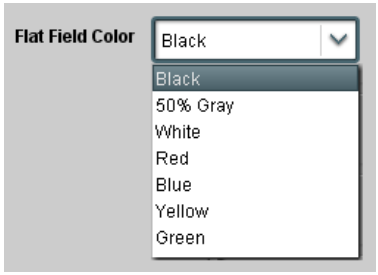
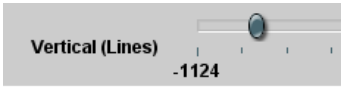
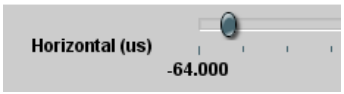
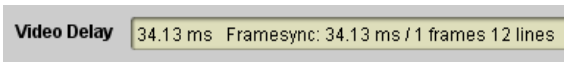
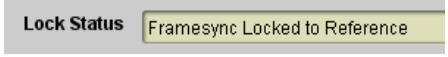
	**(continued)**
• **Flat Field Color Select** 	Provides a choice of flat field colors when **Flat Field** is invoked (either by LOS failover or directly by selecting Flat Field on the Program Video Output Mode Select control).
• **Output Video Reference Offset Controls**  	With framesync enabled, provides the following controls for offsetting the output video from the reference: • **Vertical (Lines)** – sets vertical delay (in number of lines of **output video**) between the output video and the frame sync reference. (Positive values provide delay; negative values provide advance) (Range is -1124 thru 1124 lines; null = 0 lines.) • **Horizontal (µs)** – sets horizontal delay (in µs of **output video**) between the output video and the frame sync reference. (Positive values provide delay; negative values provide advance) (Range is -64 thru 64 µsec; null = 0.000 µsec.) **Note:** Offset **advance** is accomplished by hold-off of the reference-directed release of the frame, thereby effectively advancing the program video relative to the reference.
• **Frame Delay Control** 	When Framesync is enabled, specifies the smallest amount of latency delay (frames held in buffer) allowed by the frame sync. 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).** **Note:** Due to card memory limits, the maximum available Minimum Latency Frames is related to the output video format selected. When using this control, be sure to check the **Report Delay** display to make certain desired amount of frames are delayed.
• **Video Delay Display** 	Displays the current input-to-output video delay (in msec units) as well as in terms of Frames/fractional frame (in number of lines). Status display shows total input-to-output video delay, along with any framesync delay.
• **Framesync Lock Status Display** 	Displays the current framesync status and reference source.
Note: Audio timing offset from video is performed using the delay controls on the Input Audio Routing/Controls tab. Refer to Input Audio Routing/Controls (p. 3-20) for these controls.	

Table 3-2 9902-2UDX-DI Function Menu List — continued

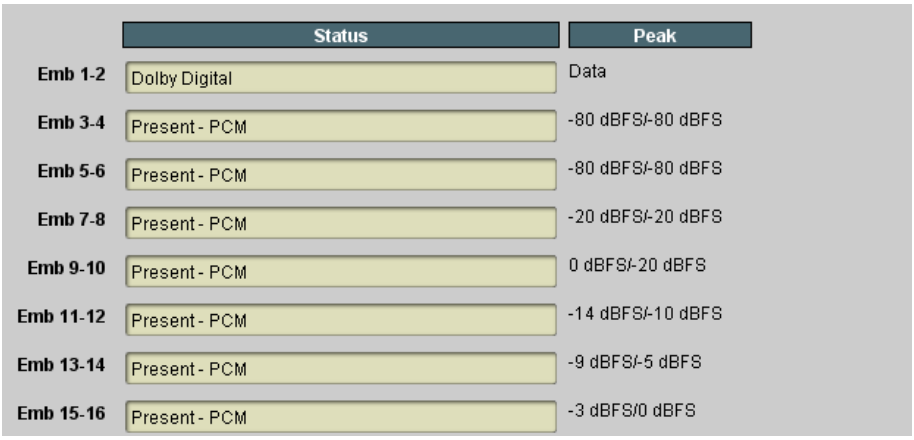
Displays signal status and payload for embedded and discrete audio received by the card.

Note: **Input Audio Status** tab has identical independent controls/status displays for both Path 1 and Path 2 using the **Path 1 / Path 2** sub-tabs. Therefore, only the **Path 1** controls are shown here. Access controls and status for other path using the respective sub-tab.

Individual signal status and peak level displays for embedded audio input pairs as described below.

- **Absent:** Indicates embedded channel pair does not contain recognized audio PCM data.
- **Present - PCM:** Indicates embedded channel contains recognized audio PCM data.
- **Dolby E:** Indicates embedded channel pair contains Dolby® E encoded data.
- **Dolby Digital:** Indicates embedded channel pair contains Dolby® Digital encoded data.

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



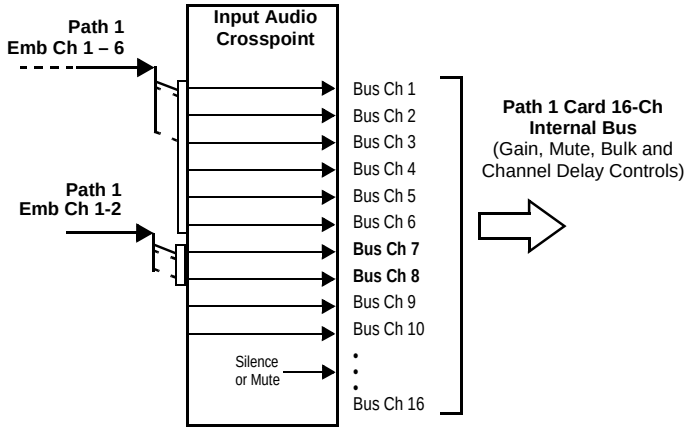
	Status	Peak
Emb 1-2	Dolby Digital	Data
Emb 3-4	Present - PCM	-80 dBFS/-80 dBFS
Emb 5-6	Present - PCM	-80 dBFS/-80 dBFS
Emb 7-8	Present - PCM	-20 dBFS/-20 dBFS
Emb 9-10	Present - PCM	0 dBFS/-20 dBFS
Emb 11-12	Present - PCM	-14 dBFS/-10 dBFS
Emb 13-14	Present - PCM	-9 dBFS/-5 dBFS
Emb 15-16	Present - PCM	-3 dBFS/0 dBFS

Table 3-2 9902-2UDX-DI Function Menu List — continued

Provides audio routing, gain, per-channel/bulk audio delay controls, and audio meters. These controls route selected audio sources onto the card 16-channel internal bus (which is used for all audio processing).

Note: **Input Audio Routing/Controls** tab has identical independent controls for both Path 1 and Path 2 using the **Path 1 / Path 2** sub-tabs. Therefore, only the **Path 1** controls are shown here. Set controls for other path using the respective sub-tab.

• • •



All audio inputs are transferred through the card via each path's 16-channel Internal Bus (**Bus Ch 1** thru **Bus Ch 16**).

The example above shows various Source selections that direct Emb Ch 1 thru Ch 6 and Emb Ch 1 and Ch 2 duped onto the card internal bus (unused bus channels can be set to Silence or Mute).

Each bus channel provides Gain, Mute, and Invert controls.

The source-to-destination correlation shown here is only an example; **any** of the sources described on the following pages can route to **any** of the internal bus channels.

Table 3-2 9902-2UDX-DI Function Menu List — continued

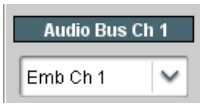
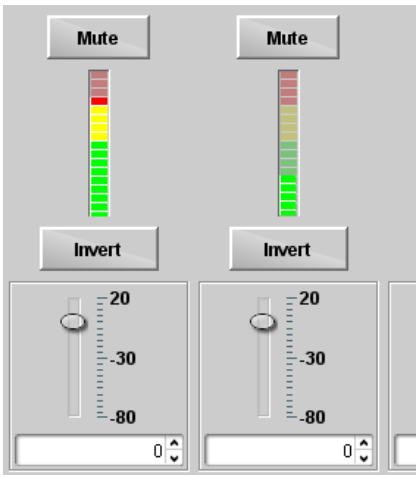
	**(continued)**
Note: • Default factory preset routing routes embedded Ch 1 thru Ch 16 to bus channels Audio Bus Ch 1 thru Ch 16. • **Bus Ch 2** thru **Bus Ch 16** have controls identical to the controls described here for **Bus Ch 1**. Therefore, only the **Bus Ch 1** controls are shown here.	
• **Bus Channel Source** 	Using the **Source** drop-down list, selects the audio input source to be routed to the card bus channel from the following choices: • Embedded input channel 1 thru 16 (**Emb Ch 1** thru **Emb Ch 16**) • Input Flex Bus summed mix output nodes A thru P (see Input Flex Mix (p. 3-23) **Note:** Embedded channel sources are only the embedded channels associated with the respective path.
• **Channel Mute/Phase Invert/Gain Controls and Peak Level Display** 	Provides **Mute** and phase **Invert** channel controls, as well as peak level meter for each output channel. (Meter shows level as affected by Level control.) **Gain** controls allow relative gain (in dB) control for the corresponding destination Embedded Audio Group channel. (-80 to +20 dB range in 1.0 dB steps; unity = 0 dB) **Note:** Although the card can pass non-PCM data such as Dolby® E or AC-3, setting the gain control to any setting other than default 0 will corrupt Dolby data.
	**Audio Delay** – Provides bulk (all four groups/master) and individual card audio bus channel delay offset controls and delay parametric displays.
• **Bulk (Master) Audio/Video Delay Control** 	**Bulk Delay** control adds bulk (all four groups) audio delay from any video delay (net audio delay offset setting adds 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. (-33 to +3000 msec range in 0.01-msec steps; null = 0 msec).

Table 3-2 9902-2UDX-DI Function Menu List — continued

(continued)

• **Per-Channel Audio/Video Delay Offset Controls**

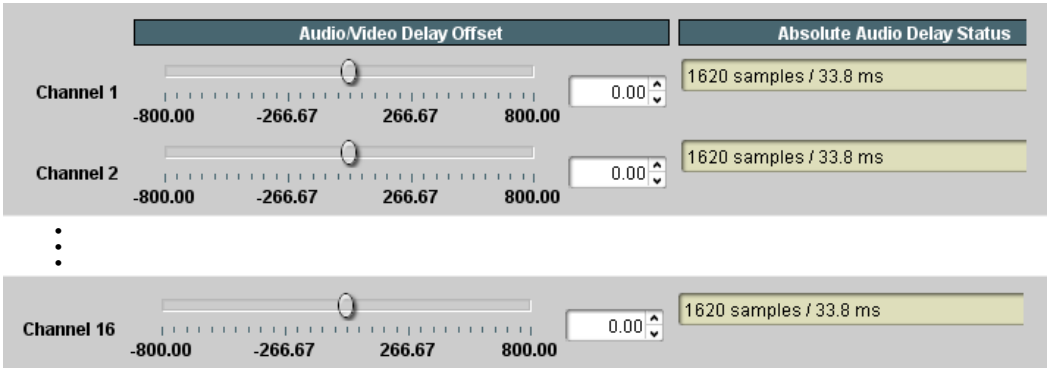
Offset control adds or reduces (offsets) channel audio delay from the matching video delay (audio delay offset setting adds or removes delay in addition to any delay included by other actions). This control is useful for correcting lip sync problems when video and audio paths in the chain experience differing overall delays.

(-800.0 to +800.0 msec range in 0.02 msec steps; null = 0.0 msec)

Delay Status shows current delay from video for the corresponding audio channel.

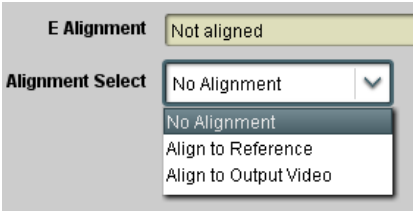
Note: • Maximum advance/delay offset is dependent on video format.

• Where a Dolby pair is present, adjustment of either channel control results in a matching delay setting for the other channel in the pair.



Dolby E Alignment – Provides selectable Dolby E alignment for embedded Dolby E to position the bitstream utilizing the Dolby E "guard band". This helps prevent frame errors that may occur in a bitstream upon switching or editing.

• **Dolby E Embedding Alignment Control**



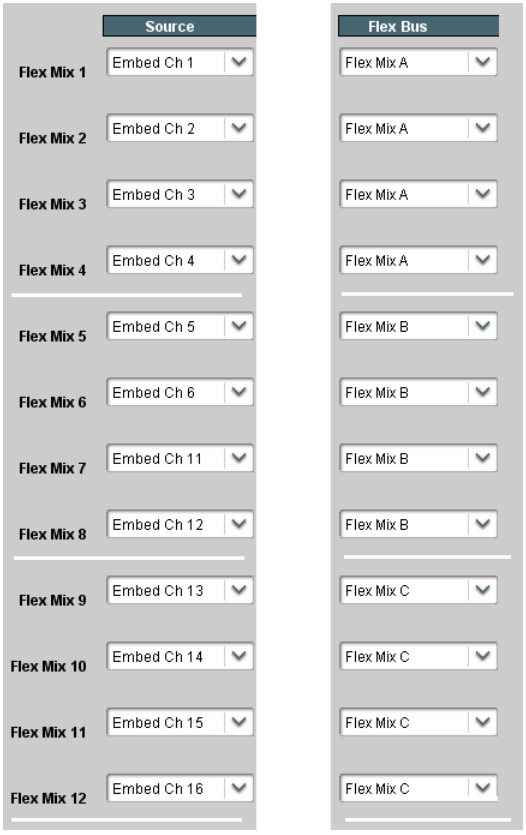
For incoming Dolby E data routed to the card audio bus, aligns the embedded Dolby data corresponding to selection. Alignment line as a result of selection is shown in **E Alignment** status display.

Note: Where a frame reference is available, it is recommended to use the **Align to Reference** selection. This helps ensure that the correct alignment is achieved even if the video is user delayed or output format is changed.

Refer to "Preferred Alignment for Dolby E in HD Systems" (http://www.dolby.com/about/news-events/newsletters-dtvaudio-dolby-e-alignment.html) for more information regarding Dolby E alignment.

Table 3-2 9902-2UDX-DI Function Menu List — continued

Input Flex Mix – Provides a 16-channel mixer in which each of the inputs can be mixed onto up to 16 independent output summing nodes. Each input channel has independent gain and mute controls.



In this example three, 4-input mono mixers are provided by selecting **Flex Mixer Bus A** for the Flex Mix 1 thru Flex Mix 4 inputs, and **Flex Mixer Bus B** for the next four inputs, and so on as shown.

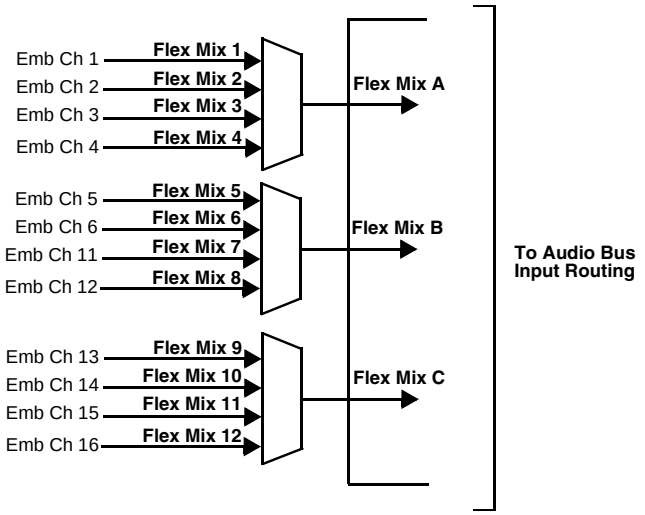
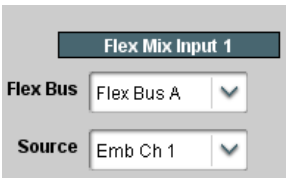


Table 3-2 9902-2UDX-DI Function Menu List — continued

(continued)

Note: • Flex Mix input channels **Flex Mix 2** thru **Flex Mix 16** have controls identical to that described here for Flex Mix 1. Therefore, only the **Flex Mix 1** controls are shown here.
• For each Flex Mix input channel, its source should be considered and appropriately set. Unused input channels should be set to the **Silence** selection.

• Flex Mix Input Channel Source/Bus Assignment



Using the **Source** drop-down list, selects the audio input source to be directed to the corresponding bus channel from the choices listed below.

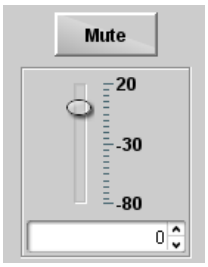
• **Silence**

• **Embed Ch 1** thru **Embed Ch 16**

The **Flex Bus** drop-down selects the bus (A thru P) to which the input is assigned to.

Note: See the examples on the previous page showing various types of mixers using multiple flex buses.

• Gain / Mute Control



Provides relative gain (in dB) control and a channel **Mute** checkbox.

(-80 to +20 dB range in 0.1 dB steps; unity = 0.0 dB)

Clean and Quiet Switching (option +CQS only) – Allows SDI input selection to be changed from one source to another while ducking audio during controlled input video switching transitions to provide silence between input switches.

Note: • Clean audio switching is assured only for intentional, controlled switches via user control. Clean audio switching cannot be assured for failover switches.
• Clean switching requires that both SDI signals (switch from and switch to) be stable and present, and of the same SDI format and rate.
• Clean audio switching function is designed for PCM audio. This function does not assure clean decoded audio when switching from/to Dolby or other non-PCM audio.

Switching Enabled check box enables Clean and Quiet Switching.
Duration sets the attack and decay ramp intervals (300 msec is recommended for typical use).

Table 3-2 9902-2UDX-DI Function Menu List — continued

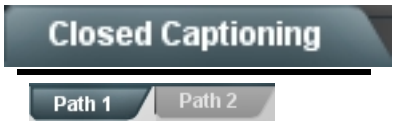
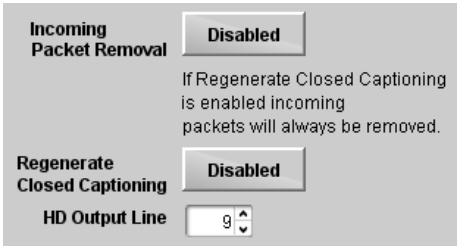
<table>
<tr><td> 
</td><td>Provides support for closed captioning setup.Also provides controls for setting closed captioning absence and presence detection thresholds.</td></tr>
<tr><td colspan="2">Note: • Closed Captioning tab has identical independent controls for both Path 1 and Path 2 using the Path 1 / Path 2 sub-tabs. Therefore, only the Path 1 controls are shown here. Set controls for other path using the respective sub-tab.
• SMPTE embedded CC controls and processing are correlated only to the path selected. CC data cannot be transferred from one path stream to another.</td></tr>
<tr><td>• Closed Captioning Input Status
 
</td><td>Displays incoming Closed Captioning status as follows:
• If closed captioning is present, a message similar to the example shown is displayed.
• If no closed captioning is present in the video signal, Not Present or Disabled is displayed.
Note: • Packet closed captioning status Captioning Rejected Due To message can appear due to the items described below. The closed captioning function assesses cdp_identifier, cdp_frame_rate, ccdata_present, and caption_service_active items contained in the packet header to make the determinations listed below. Refer to CEA-708-B for more information.
<table>
<tr><th>Message</th><th>Description</th></tr>
<tr><td>Unsupported Frame Rate</td><td>Film rate closed-captioning (either as pass-through or up/down conversion) is not supported by the card.</td></tr>
<tr><td>Data Not Present</td><td>Packet is marked from closed captioning source external to the card that no data is present.</td></tr>
<tr><td>No Data ID</td><td>Packet from closed captioning source external to the card is not properly identified with 0x9669 as the first word of the header (unidentified packet).</td></tr>
</table>
• caption service is marked as inactive display indicates bit in packet from upstream source may inadvertently be set as inactive. In this case, closed captioning data (if present) is still processed and passed by the card as normal.
• The closed captioning function does not support PAL closed captioning standards.</td></tr>
<tr><td>• Closed Captioning Remove/Regenerate and HD Insertion Line Controls
 
</td><td>Allows removal of closed captioning packets and regeneration of packets. This is useful where closed captioning must be moved to a different line than that received on.
Note: • Although the output line drop-down will allow any choice within the 9 thru 41 range, the actual range is automatically clamped (limited to) certain ranges to prevent inadvertent conflict with active picture area depending on video format. See Ancillary Data Line Number Locations and Ranges (p. 3-9) for more information.
• The card does not check for conflicts on a given line number. Make certain selected line is available and carrying no other data.</td></tr>
</table>

Table 3-2 9902-2UDX-DI Function Menu List — continued

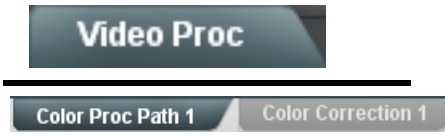
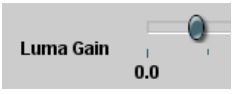
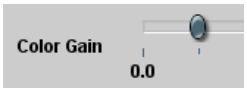
	Provides the following Video Proc and Color Correction parametric controls.
Note: **Video Proc** tab has identical independent controls for both Path 1 and Path 2 using the **Path 1 / Path 2** sub-tabs. Therefore, only the **Path 1** controls are shown here. Set controls for other path using the respective sub-tab.	
• **Video Proc** 	**Video Proc (Enable/Disable)** provides master on/off control of all Video Proc functions. • When set to **Disable**, Video Proc is bypassed. • When set to **Enable**, currently displayed parameter settings take effect.
• **Reset to Unity** 	**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.
• **Luma Gain** 	Adjusts gain percentage applied to Luma (Y channel). (0% to 200% range in 0.1% steps; unity = 100%)
• **Luma Lift** 	Adjusts lift applied to Luma (Y-channel). (-100% to 100% range in 0.1% steps; null = 0.0%)
• **Color Gain** 	Adjusts gain percentage (saturation) applied to Chroma (C-channel). (0% to 200% range in 0.1% steps; unity = 100%)
• **Color Phase** 	Adjusts phase angle applied to Chroma. (-360° to 360° range in 0.1° steps; null = 0°)
• **Gang Luma/Color Gain** 	When set to **On**, changing either the **Luma Gain** or **Color Gain** controls increases or decreases both the Luma and Color gain levels by equal amounts.

Table 3-2 9902-2UDX-DI Function Menu List — continued

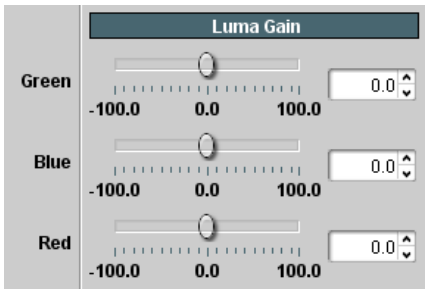
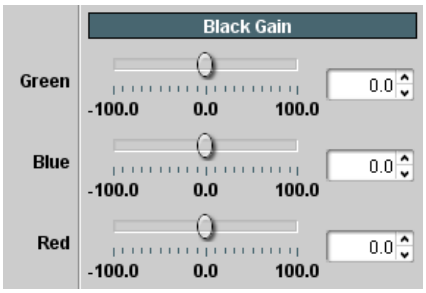
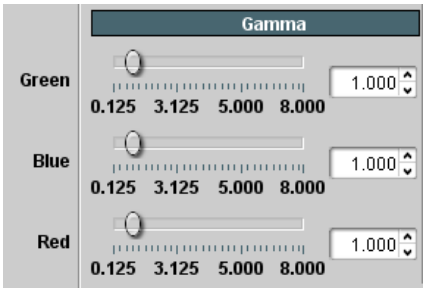
	**Option** (Option **+COLOR** only) Provides color corrector functions for the individual RGB channels for the card program video path.
• **Color Corrector** 	**Color Corrector (On/Off)** provides master on/off control of all Color Corrector functions. • When set to **Off**, all processing is bypassed. • When set to **On**, currently displayed parameters settings take effect.
• **Reset to Unity** 	**Reset to Unity** provides unity reset control of all Color Corrector 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.
• **Luma Gain R-G-B controls**  • **Black Gain R-G-B controls**  • **Gamma Factor R-G-B controls** 	Separate red, green, and blue channels controls for Luma Gain, Black Gain, and Gamma curve adjustment. Gain controls provide gain adjustment from 0.0 to 200.0% range in 0.1% steps (unity = 100.0) Gamma controls apply gamma curve adjustment in 0.125 to 8.000 range in thousandths steps (unity = 1.000) Each of the three control groups (Luma, Black, and Gamma have a **Gang Column** button which allows settings to be proportionally changed across a control group by changing any of the group's controls.

Table 3-2 9902-2UDX-DI Function Menu List — continued

	**(continued)**
• **Black Hard Clip** 	Applies black hard clip (limiting) at specified percentage. (-6.8% to 50.0%; null = -6.8%)
• **White Hard Clip** 	Applies white hard clip (limiting) at specified percentage. (50.0% to 109.1%; null = 109.1%)
• **White Soft Clip** 	Applies white soft clip (limiting) at specified percentage. (50.0% to 109.1%; null = 109.1%)
• **Chroma Saturation Clip** 	Applies chroma saturation clip (limiting) chroma saturation at specified percentage. (50.0% to 160.0%; null = 160.0%)

Table 3-2 9902-2UDX-DI Function Menu List — continued

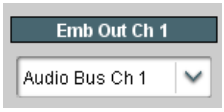
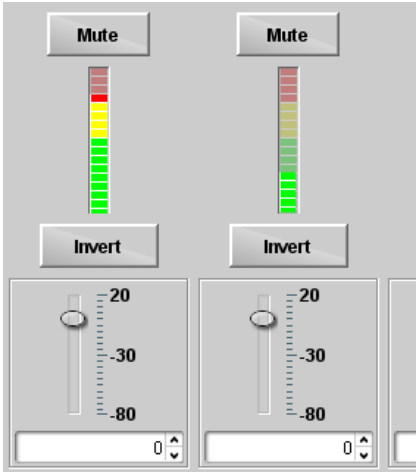
	Provides an audio crosspoint allowing the audio source selection for each embedded audio output channel. Also provides Gain, Phase Invert, and Muting controls and peak level meters for each output channel.
Note: • **Output Audio** tab has identical independent controls for both Embedded Path 1 and Path 2 using the **Path 1 / Path 2** sub-tabs. Therefore, only the **Path 1** controls are shown here. Set controls for other path using the respective sub-tab. • **Embedded Ch 2** thru **Embedded Ch 16** have controls identical to the **Source**, **Gain**, **Mute**, and **Invert** controls described here for **Embedded Ch 1**. Therefore, only the **Embedded Ch 1** controls are shown here. • Although either path can embed from, and de-embed to, discrete audio interfaces, the embedded channels within a path can only be cross-routed embedded within the respective path's 4-group embedded audio (e.g., Path 1 Emb Ch 1 can not be sourced from Path 2 Emb Ch 1).	
• **Group Enable/Disable Controls** 	Allows enable/disable of embedded audio groups 1 thru 4 on card program video output to accommodate some legacy downstream systems that may not support all four embedded audio groups. **Note:** Changing the setting of this control will result in a noise burst in all groups. This control should not be manipulated when carrying on-air content.
• **Embedded Output Channel Source** 	Using the drop-down list, selects the audio input source to be embedded in the corresponding embedded output channel from the following choices: • Card **Audio Bus Ch 1** thru **Ch 16** (Path1 or 2) • Built-in Tone generators **Tone *n*** (-20 dBFS level tone generators with *n* being frequencies of 100, 200, 300, 400, 500, 600, 700, 800, 900, 1k, 2k, 4k, 6k, 8k, 12k, and 16k) • **Flex Bus A** thru **P** mixer sum node outputs • Silence • Option Audio **LTC** • **Downmixer L** • **Downmixer R** • Option **Embedded Data L** and **R** (SMPTE 337 non-PCM data embedding with option **+ANC**) **Note:** Embedded data pair is pair associated with selected path only.
• **Channel Mute/Phase Invert/Gain Controls and Peak Level Display** 	Provides **Mute** and phase **Invert** channel controls, as well as peak level meter for each output channel. (Meter shows level as affected by Level control.) **Gain** controls allow relative gain (in dB) control for the corresponding destination Embedded Audio Group channel. (-80 to +20 dB range in 1.0 dB steps; unity = 0 dB) **Note:** Although the 9902-2UDX-DI can pass non-PCM data such as Dolby® E or AC-3, setting the gain control to any setting other than default 0 will corrupt Dolby data.

Table 3-2 9902-2UDX-DI Function Menu List — continued

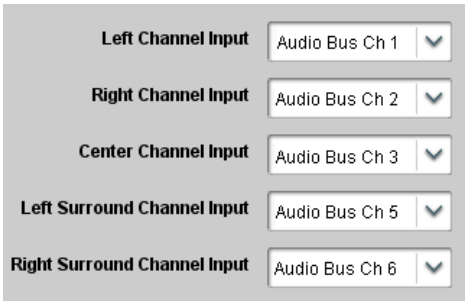
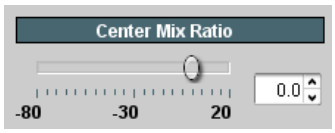
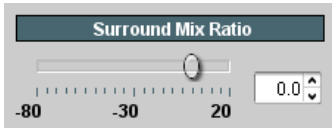
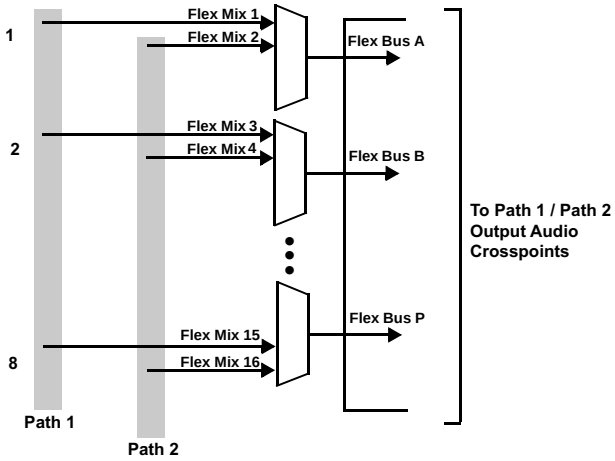
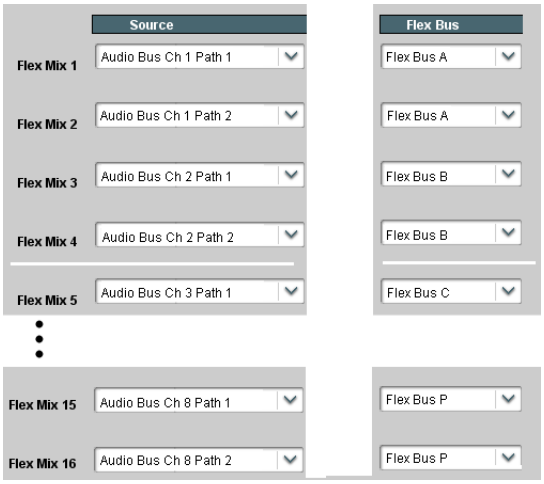
	Provides audio down-mix audio routing selections that multiplexes any five audio channel sources into a stereo pair.
Note: • **Downmixer** sub-tabs offer identical independent controls for both Embedded Path 1 and Path 2. Therefore, only the **Path 1** controls are shown here. Set controls for other path using the respective sub-tab. • Downmix L/R channel pair sources are available only within a respective path (e.g., Path 1 downmixed channels can only be sourced from Path 1).	
• **Downmixer Source Controls** 	**Left Channel Input** thru **Right Surround Channel Input** select the five audio bus source channels to be used for the downmix. Downmix channels **Downmixer L** and **Downmixer R** are available as sources for embedded audio outputs using the Channel Source controls described above.
• **Center Mix Ratio Control** 	Adjusts the attenuation ratio of center-channel content from 5-channel source that is re-applied as Lt and Rt content to the DM-L and DM-R stereo mix. • 0 dB setting 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 (-80 dB) applies a -80 dB ratiometric reduction of center-channel content. Center-channel content is restored as in-phase center-channel content at a -80 dB ratio relative to overall level, making center-channel content less predominate in the overall mix. (20 dB to -80 dB range in 0 dB steps; default = 0 dB) **Note:** Default setting is recommended to maintain center-channel predominance in downmix representative to that of the original source 5-channel mix.
• **Surround Mix Ratio Control** 	Adjusts the attenuation ratio of surround-channel content from 5-channel source that is re-applied as Lo and Ro content to the DM-L and DM-R stereo mix. • 0 dB setting 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 (-80 dB) applies a -80 dB ratiometric reduction of surround-channel content. Surround-channel content is restored at a -80 dB ratio relative to overall level, making surround-channel content less predominate in the overall mix. (20 dB to -80 dB range in 0 dB steps; default = 0 dB) **Note:** Default setting is recommended to maintain surround-channel predominance in downmix representative to that of the original source 5-channel mix.

Table 3-2 9902-2UDX-DI Function Menu List — continued

Output Flex Mix – Provides a 16-channel mixer in which each of the inputs can be mixed onto up to 16 independent output summing nodes. The input sources include audio bus channels from the card two embedded audio paths. Each input channel has independent gain and mute controls.

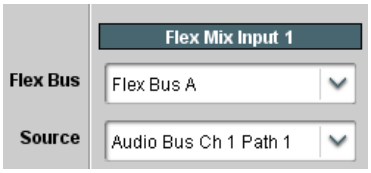
In this example, audio bus channels 1 thru 8 from each path are summed with the like-channel of the other path. These summed outputs can then be outputted on any of the card audio outputs. The output flex bus allows cross-sourcing from both Path 1 and Path 2 embedded internal Audio Bus sources to the Path 1 and Path 2 discrete output audio crosspoints.





Note: For each Flex Mix input channel, its source should be considered and appropriately set. Unused input channels should be set to the **Silence** selection.

- **Flex Bus Input Channel Source/Bus Assignment**

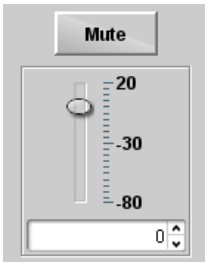


Using the **Source** drop-down list, selects the audio input source to be directed to the corresponding bus channel from the choices listed below.

- **Silence**
- **Audio Bus Ch 1** thru **Ch 16**
- **Tones** (100 Hz thru 16 kHz)
- **Downmix L** or **Downmix R**

The **Flex Bus** drop-down selects the bus (A thru P) to which the input is assigned to.

- **Gain / Mute Control**



Provides relative gain (in dB) control and a channel **Mute** checkbox.

(-80 to +20 dB range in 0.1 dB steps; unity = 0.0 dB)

Table 3-2 9902-2UDX-DI Function Menu List — continued

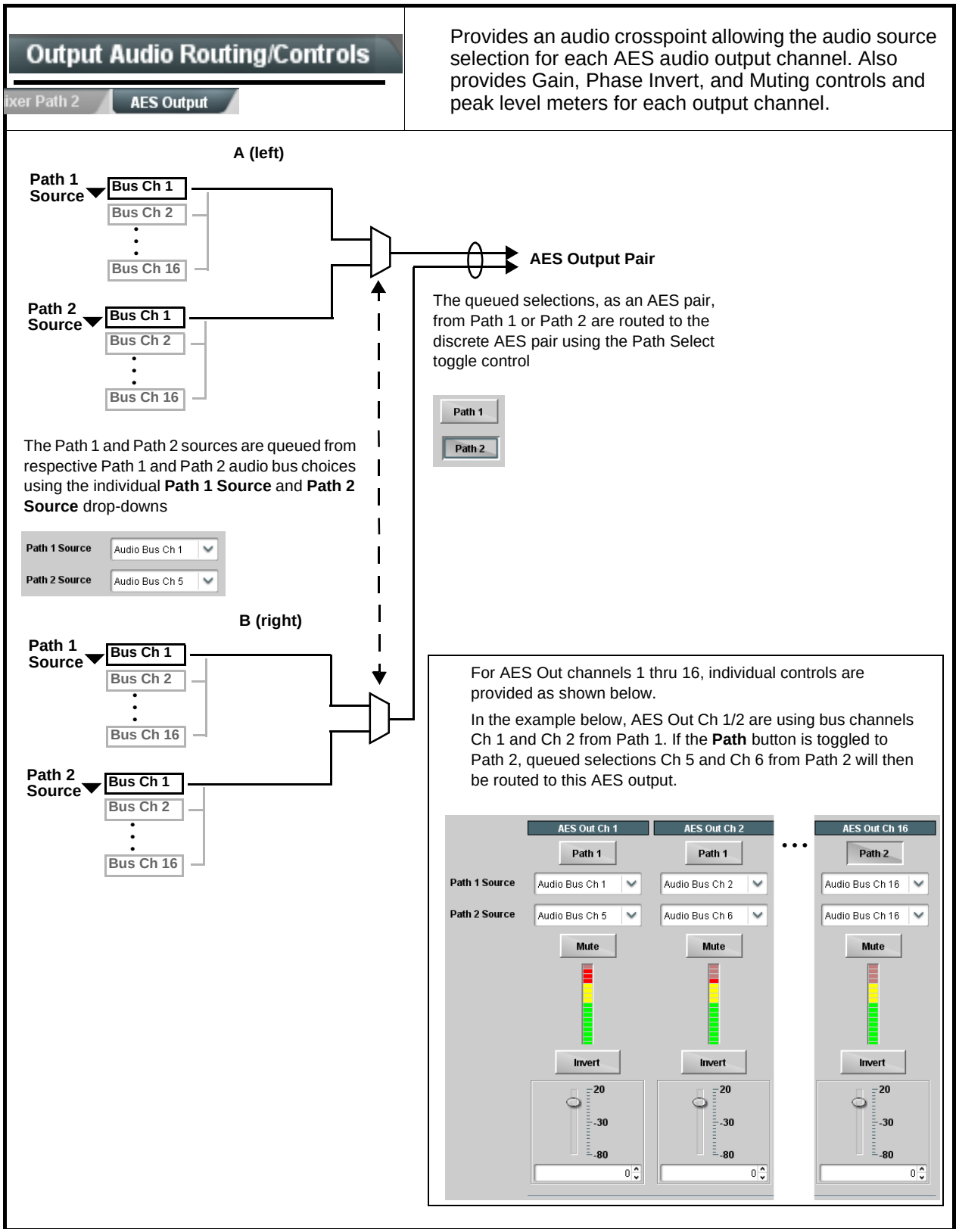


Table 3-2 9902-2UDX-DI Function Menu List — continued

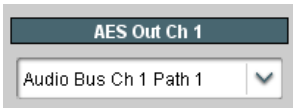
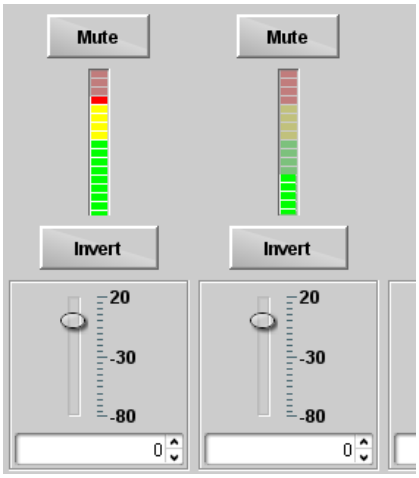
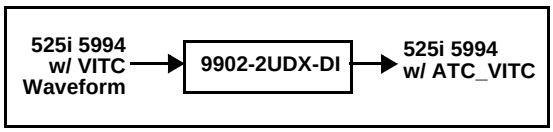
	**(continued)**
Note: • **AES Out Ch 2** and other channels have controls identical to the **Source**, **Gain**, **Mute**, and **Invert** controls described here for **AES Out Ch 1**. Therefore, only the **AES Out Ch 1** controls are shown here. • For each channel, its source and destination should be considered and appropriately set. Unused destination channels should be set to the **Silence** selection.	
• **AES Output Channel Source** 	Using the **Source** drop-down list, selects the audio input source to be routed to the corresponding AES output channel from the following choices: • Card **Audio Bus Ch 1** thru **Ch 16** (Path 1 or 2) • Built-in Tone generators **Tone *n*** (-20 dBFS level tone generators with *n* being frequencies of 100, 200, 300, 400, 500, 600, 700, 800, 900, 1k, 2k, 4k, 6k, 8k, 12k, and 16k) • **Flex Bus A** thru **P** mixer sum node outputs • Silence • ***Option*** Audio **LTC** (Path1 or 2) • **Downmixer L** (Path1 or 2) • **Downmixer R** (Path1 or 2)
• **Channel Mute/Phase Invert/Gain Controls and Peak Level Display** 	Provides **Mute** and phase **Invert** channel controls, as well as peak level meter for each output channel. (Meter shows level as affected by Level control.) **Gain** controls allow relative gain (in dB) control for the corresponding destination AES output channel. (-80 to +20 dB range in 1.0 dB steps; unity = 0 dB) **Note:** Although the 9902-2UDX-DI can pass non-PCM data such as Dolby® E or AC-3, setting the gain control to any setting other than default 0 will corrupt Dolby data.

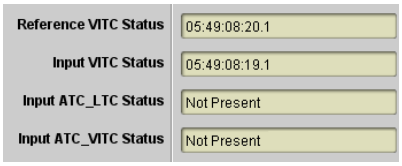
Table 3-2 9902-2UDX-DI Function Menu List — continued

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

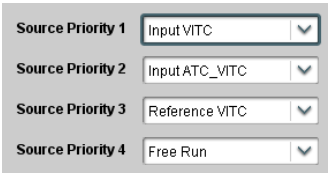
Note:
- **Timecode** tab has identical independent controls for both Path 1 and Path 2 using the **Path 1 / Path 2** sub-tabs. Therefore, only the **Path 1** controls are shown here. Set controls for other path using the respective sub-tab.
- SMPTE embedded timecode controls and processing are correlated only to the path selected. Timecode data cannot be transferred from one path stream to another.

Shown below is an example in which received 525i 5994 SDI video with VITC waveform timecode is being processed to output ATC_VITC timecode. To re-format and insert the timecode data, the following can be performed using the Timecode function. Each Timecode control is fully described on the pages that follow.



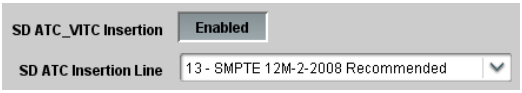


A Noting that the incoming video contains VITC waveform timecode data (as shown in the status display), set the Source Priority drop-down lists to include VITC Waveform timecode data (**SDI VITC**) as a choice. This extracts VITC Waveform timecode data from the incoming video.



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

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



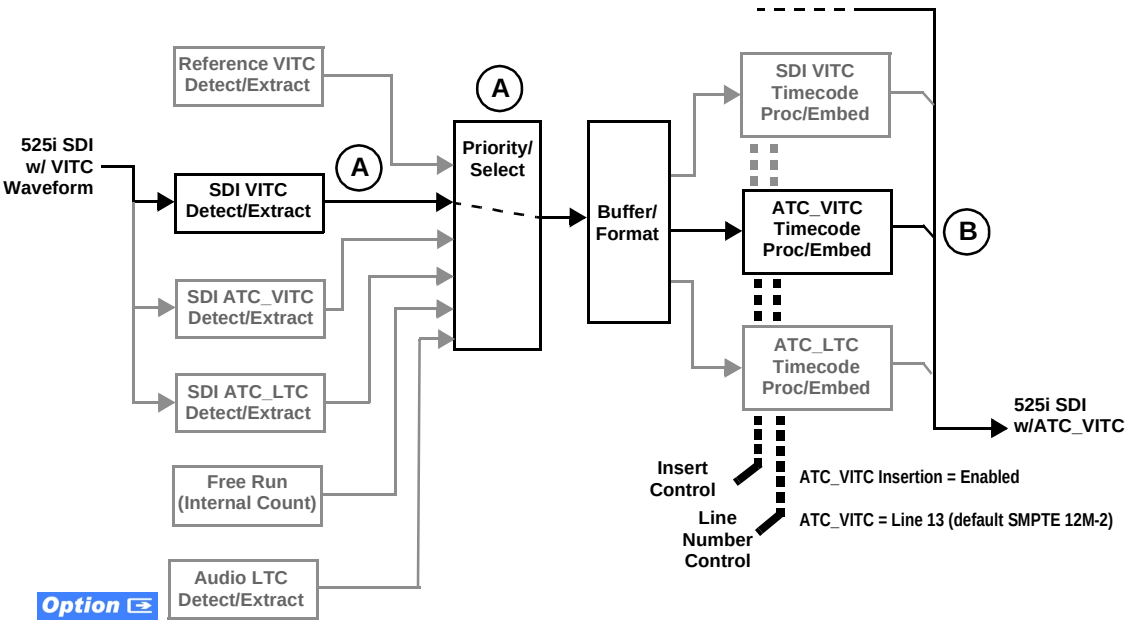


Table 3-2 9902-2UDX-DI Function Menu List — continued

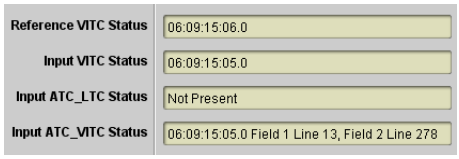
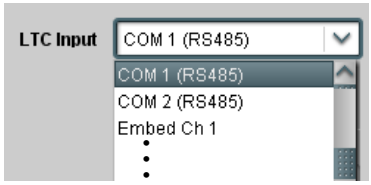
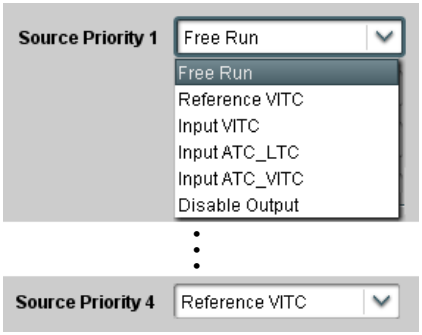
	**(continued)**
Option **Audio LTC** controls described below only appear on cards with **+LTC** licensed optional feature. This feature allows audio LTC from an audio channel to be used as a timecode source, with conversion to a selected SMPTE 12M format on the output video.	
• **Timecode Source Status Displays** 	Displays the current status and contents of the four supported external 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, Not Present is displayed.
• **LTC Input Control** 	Selects source to be used by card to **receive** LTC as listed below. • RS-485 over COM1 or COM 2 • Audio LTC over Emb Ch 1 thru Ch 16 **Note:** • **Audio LTC Source** must be appropriately set for card to receive and process received LTC. • If COM 1 or COM 2 is used for LTC receive, the port function must be set for LTC. See COMM Ports Setup Controls (p. 3-48) for more information. • Card audio inputs will not center inputs with DC offset. If input has DC offset, the source may need to be capacitively coupled to remove the offset. • LTC embedded channel selections are only channels associated with the selected path.
• **Mute LTC Control** 	Allows LTC audio or RS-485 output to mute upon loss of selected timecode inputs. • When set to **Enabled** and input timecode is lost: • RS-485 LTC output goes to frozen state. • Audio LTC output mutes. • When set to **Disabled** and input timecode is lost: • RS-485 LTC output keeps counting, with count value being free-run count. • Audio LTC output is not muted, with count value being free-run count. **Note:** If muting upon loss of a particular input format is desired, set all **Source Priority 1** thru **4** to that particular input format. If this is not done, the card failover timecode selection may substitute another format choice for the format not being received.
• **Incoming ATC Packet Removal Control** 	Enables or disables removal of existing input video ATC timecode packets from the output. This allows removal of undesired existing timecodes from the output, resulting in a “clean slate” where only desired timecodes are then re-inserted into the output. (For example, if both SDI ATC_VITC and ATC_LTC are present on the input video, and only ATC_LTC is desired, using the Removal control will remove both timecodes from the output. The ATC_LTC timecode by itself can then be re-inserted on the output using the other controls discussed here.) **Note:** Set this control to **Enabled** if Free-Run timecode is to be used. If incoming packets are not removed, output embedded SMPTE timecode may alternate between free-run and embedded SMPTE timecode values.

Table 3-2 9902-2UDX-DI Function Menu List — continued

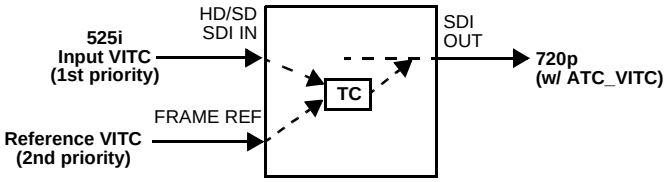
(continued)

• **Source Priority**



Selects the priority assigned to each of the four supported external formats, and internal Free Run in the event the preferred source is unavailable.

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. See example below.)



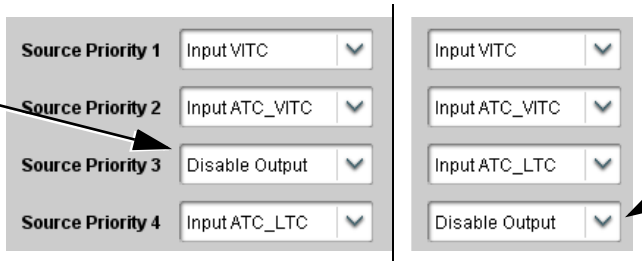
In this example, **Input VITC** 1st priority selection selects SDI VITC (received on SDI input) over reference VITC (received on frame reference) regardless of video input material source to be processed by the card.

The selected timecode source is embedded on the SDI video output (in this example, 720p) using the selected line number. In this example, if the SDI VITC on the SDI input becomes unavailable, the card then uses the reference VITC data received on the frame reference.

Note: Set Incoming ATC Packet Removal Control to **Enabled** if Free-Run timecode is to be used. If incoming packets are not removed, output embedded SMPTE timecode may alternate between free-run and embedded SMPTE timecode values.

⚠ Disable Output setting should be used with care. If Disable Output is selected with alternate intended format(s) set as a lower priority, the card will indeed disable **all** timecode output should the ordinate preferred format(s) become unavailable. Typically, choices other than Disable should be used if a timecode output is always desired, with Disable only being used to remove all timecode data.

In this example, even though and ATC_LTC could be available to substitute for ATC_VITC not being present, the card will revert to no timecode output since the choice of Disable Output "out-prioritizes" ATC_LTC with these settings.



The choices shown here will allow ATC_LTC to "out-prioritize" Disable Output if ATC_VITC is not available.

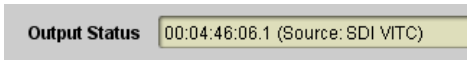
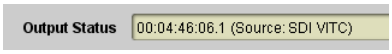
• **Offset Controls**

Allows the current timecode count to be advanced or delayed on the output video.

- **Offset Advance** or **Delay** selects offset advance or delay.
- **Offset Field** delays or advances or delays timecode by one field.
- **Offset Frame** delays or advances or delays timecode by up to 5 frames.

Note: Default settings are null, with both controls set at zero as shown.

Table 3-2 9902-2UDX-DI Function Menu List — continued

<table>
<tr><td> 
</td><td>(continued)</td></tr>
<tr><td>• Output Status Display
 
</td><td>Displays the current content and source being used for the timecode data as follows:
 

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

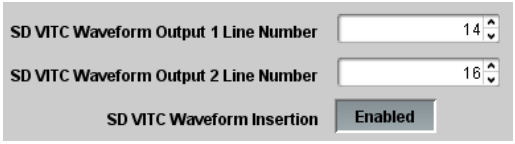
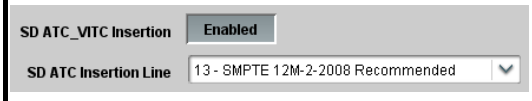
• Timecode Insertion button set to Disabled; output insertion disabled.
Note: • If timecode is not available from Source Priority selections performed, timecode on output reverts to Free Run (internal count) mode.
• Because the 1’s digit of the display Frames counter goes from 0 to 29, the fractional digit (along with the 1’s digit) indicates frame count as follows:
0.0 Frame 0
0.1 Frame 1
1.0 Frame 2
1.1 Frame 3
•
•
•
29.1 Frame 59</td></tr>
<tr><td>• Audio LTC Output
 
</td><td>Audio LTC output is routed to desired embedded audio outputs using the Output Audio Routing/Controls (p. 3-29). Whatever timecode is displayed on the Output Status is converted to audio LTC and available as an LTC audio output.</td></tr>
<tr><td colspan="2">Note: • Although the output line drop-down on the controls described below will allow a particular range of choices, the actual range is automatically clamped (limited) to certain ranges to prevent inadvertent conflict with active picture area depending on video format. See Ancillary Data Line Number Locations and Ranges (p. 3-9) for more information.
• The card does not check for conflicts on a given line number. Make certain the selected line is available and carrying no other data.</td></tr>
<tr><td>• SD VITC Waveform Insertion Controls
 
</td><td>For SD output, enables or disables SD VITC waveform timecode insertion into the output video, and selects the VITC1 and VITC2 line numbers (6 thru 22) where the VITC waveform is inserted.
Note: • If only one output line is to be used, set both controls for the same line number.
• SD VITC Waveform Insertion control only affects VITC waveforms inserted (or copied to a new line number) by this function. An existing VITC waveform on an unscaled SD SDI stream is not affected by this control and is passed on an SDI output.</td></tr>
<tr><td>• SD ATC Insertion Control
 
</td><td>For SD output, enables or disables SD ATC_VITC timecode insertion into the output video, and selects the line number for ATC_VITC.</td></tr>
</table>

Table 3-2 9902-2UDX-DI Function Menu List — continued

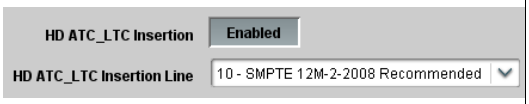
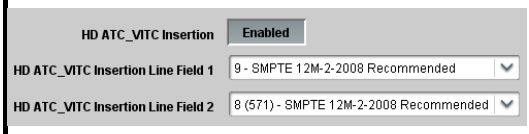
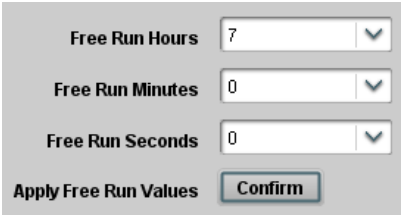
	**(continued)**
• HD ATC_LTC Insertion Control 	For HD output, enables or disables ATC_LTC timecode insertion into the output video, and selects the line number for ATC_LTC timecode data.
• HD ATC_VITC Insertion Control 	For HD output, enables or disables ATC_VITC timecode insertion into the output video, and selects the line number for ATC_VITC1 and ATC_VITC2.
• ATC_VITC Legacy Support Control 	When enabled, accommodates equipment requiring ATC_VITC packet in both fields as a “field 1” packet (non-toggling). **Note:** Non-toggling VITC1 and VITC2 packets do not conform to SMPTE 12M-2-2008 preferences. As such, ATC_VITC Legacy Support should be enabled only if required by downstream equipment.
• Free Run Timecode Controls 	Allows an initial (starting) count to be applied to output video timecode when Free Run insertion is enabled. **Note:** • Initialization can only be applied when card is outputting Free Run timecode (as shown by Output Status displaying “Free Run”). • If failover to Free Run occurs due to loss of external timecode(s), the Free Run count assumes its initial count from the last valid externally supplied count.

Table 3-2 9902-2UDX-DI Function Menu List — continued

AFD AFD/WSS/VI AFD Map	Allows assignment of AFD, WSS and/or VI codes to the SDI output video, and allows custom ARC settings to be applied for each code. Also allows translations between WSS, VI, and AFD active ARC formats. Provides active ARC re-aspecting, resulting in a properly scaled and cropped image area.

Note: **AFD** tab has identical independent controls for both Path 1 and Path 2 using the **Path 1 / Path 2** sub-tabs. Therefore, only the **Path 1** controls are shown here. Set controls for other path using the respective sub-tab.

Without AFD

NTSC-Coded (4:3) up-converted 1080i Video Signal → **Re-Aspect to 16:9** → **1080i Video Signal with 16:9 uncorrected ARC**

NTSC-Coded image on 16:9 display shows letterbox cropping

Uncompensated up-conversion results in “postage stamp” effect with both letterbox and sidebars visible on 16:9 display

With AFD

NTSC-Coded (4:3) 1080i Video Signal with 1010 AFD Code → **1010 AFD Code Received and Applied to Scaler** → **Re-Aspect to 16:9** → **1080i Video Signal with 16:9 corrected ARC**

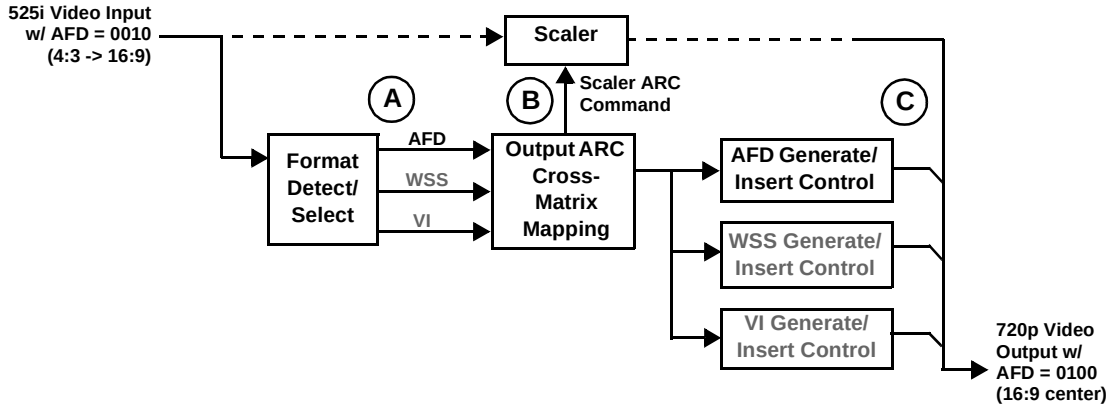
NTSC-Coded image on 16:9 display shows letterbox cropping

AFD Corrected up-conversion/ re-aspect results in intended image area properly visible on 16:9 display

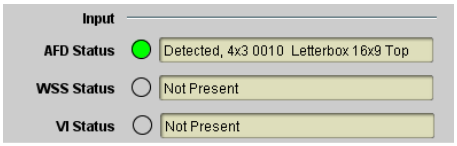
Table 3-2 9902-2UDX-DI Function Menu List — continued

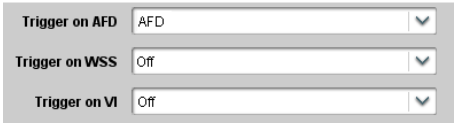
AFD AFD/WSS/VI AFD Map	**(continued)**

Shown below is an example in which received 525i5994 SDI video is being up-converted to 720p5994. The settings shown in the example below provide for directing the scaler to re-aspect the 4:3 input video to full, centered 16:9 re-aspecting, and mark the output video with the AFD code representing the new re-aspected H/V format.



A Noting that the incoming video contains AFD coding, **Trigger on AFD** is set to **AFD**, with other choices set to **Off**. The settings here allow ARC to trigger only on an AFD-coded input.





B In this example, it is desired to use the H/V re-aspecting inherent in the received video ARC, perform the re-aspecting with no modification, and output an AFD code representing the re-aspecting performed.

As such, **Force Input Mapping** is set to **Follow Trigger**, thereby bypassing the Output ARC Cross-Matrix Map table and directly perform the re-aspecting defined by the received code (in this example, Letterbox 16x9). Also in this example, the scaler is directed to apply the output AFD re-aspecting by setting **Scaler Follow AFD** to **Enabled**.

C In this example, since only AFD is to be outputted, **AFD Output** is set to **Enabled**, with WSS and VI choices set to **Disabled**.

AFD Status shows AFD code now being outputted.

The insertion line number (using its default value here), can be set using the **AFD Output Line** controls (for the progressive format in this example, the Field 1 control serves as the line number control).

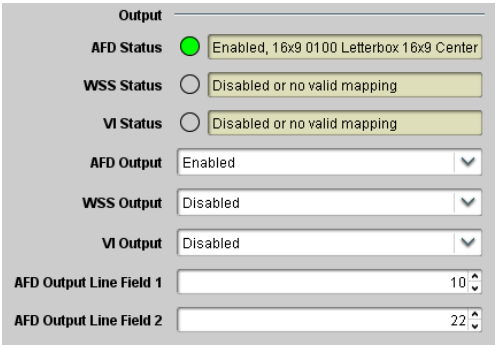


Table 3-2 9902-2UDX-DI Function Menu List — continued

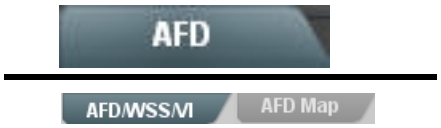
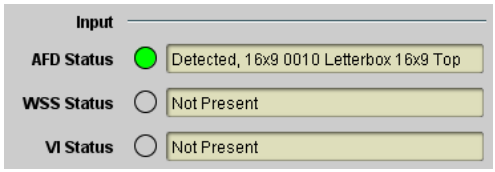
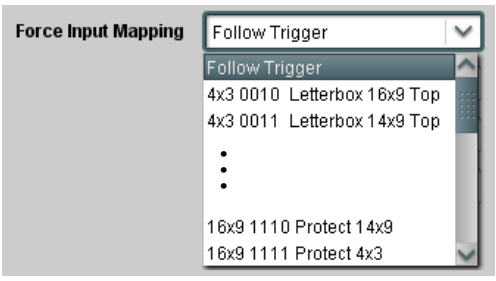
	**AFD/WSS/VI** sub-tab provides prioritized and gated input monitoring for AFD, WSS and/or VI formats. Also provides translation between input and output AFD, WSS, and VI ARC formats.
Note: • Line number control available only for AFD format. WSS and VI use fixed line numbers per applicable standards. • Some AFD codes are not supported in WSS and VI formats. Refer to AFD/WSS/VI Translation Matrix on page 3-43 for more information.	
• **Input Format Status Displays** 	Displays the current status and contents of the three supported ARC formats shown to the left. • If a format is received, the current formatting code and description is displayed (as shown in the example). • If a format is not receiving data, Not Present is displayed.
• **Scaler AFD Enable** 	Enables scaler to apply ARC settings provided by ARC controls in this function. • **Enabled** sets the output aspect ratio to track with AFD settings performed in this tab, overriding any other scaler manual ARC control settings. • **Disabled** allows ARC coding processing performed in this tab, but does not apply ARC settings in scaler. **Note:** • This control also appears on the **Scaler** tab and is mutually ganged with the selection performed on either tab. • **Scaler follows AFD** functions only when a valid AFD output format is being generated and enabled. The scaler only observes AFD code commands, with the controls on this tab set to generate an AFD-coded output. WSS and/or VI formats must be translated to a supported AFD cross-translation for scaler active ARC to function when using WSS or VI input formats.
• **Input Mapping** 	When received ARC code is received, applies H/V coding as follows: • **Follow Trigger** – Uses the ARC coding inherent in the received triggering ARC. • **4x3 ARC Codes** – For received triggering formats coded as 4x3, applies the H/V coding selected in this drop-down. • **16x9 ARC Codes** – For received triggering formats coded as 16x9, applies the H/V coding selected in this drop-down. **Note:** Settings performed here can be applied directly to the output video, or the settings applied here can be custom modified if desired for any of the 11 4x3 codes and any of the 11 16x9 codes available here using the **AFD Map** sub-tab. Refer to AFD/WSS/VI Translation Matrix on page 3-43 for more information and coding descriptions.

Table 3-2 9902-2UDX-DI Function Menu List — continued

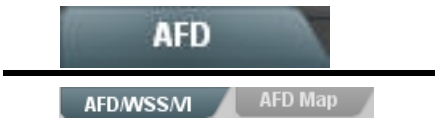
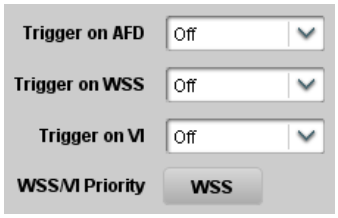
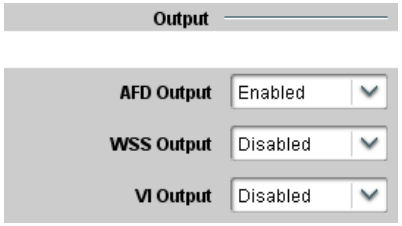
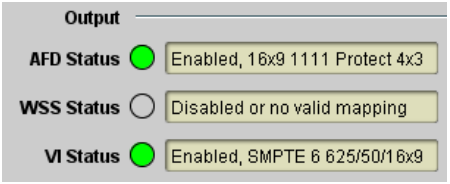
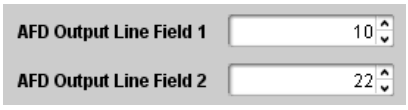
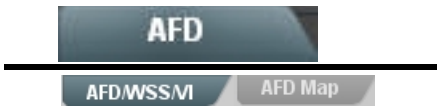
	**(continued)**
• Input Triggering Controls 	Individual ARC format input controls allow accepting or rejecting received ARC formats as follows: • **Trigger on AFD:** • **Off** rejects AFD-coded triggering. • **On** allows trigger on AFD. • **Trigger on WSS:** • **Off** rejects WSS-coded triggering. • **AFD** allows triggering on AFD-coded WSS. • **ETSI** allows triggering on ETSI-coded WSS. • **Trigger on VI:** • **Off** rejects VI-coded triggering. • **AFD** allows triggering on AFD-coded WSS. • **SMPTE** allows triggering on SMPTE-coded WSS. **Note:** If multiple formats are present on the input video, AFD preempts other formats, followed by WSS or VI (as set by the **WSS/VI Priority** control).
• Output Enable Controls 	Individual ARC format input controls allow accepting or rejecting received ARC formats as follows: • **AFD Output:** • **Disable** turns off AFD format on output. • **Enable** inserts AFD packet on output, and allows changing line number. • **Follow Input Line** inserts AFD packet on same line as received AFD line number (where applicable). • **WSS Output:** • **Disable** turns off WSS format on output. • **AFD Enabled** inserts AFD-coded WSS on output. • **ETSI Enabled** inserts ETSI-coded WSS on output. • **VI Output:** • **Disable** turns off WSS format on output. • **AFD Enabled** inserts AFD-coded VI on output. • **SMPTE Enabled** inserts SMPTE-coded VI on output.
• Output Status Displays 	Displays the current output status, coding, and H/V ratio for AFD, WSS, and VI formats. • If a format is active and enabled (as set with the Output Enable controls), the code and H/V description is displayed. • If a format is not outputting data, Disabled is displayed. **Note:** • The code displayed shows the outputted code. If the code is modified by user settings performed in the **AFD Map** sub-tab, these changes are shown here. Refer to **AFD Map** sub-tab for more information. • As shown in the example, settings that result in invalid mapping across format translations will display Disabled. In these cases, no output is inserted for the format.
• AFD Output Line Control 	Allows selecting the line location of the AFD data within the video signal Ancillary Data space. **Note:** • The card does not check for conflicts on a given line number. Make certain the selected line is available and carrying no other data. • For progressive formats, the Field 1 control serves as the line number control.

Table 3-2 9902-2UDX-DI Function Menu List — continued



(continued)

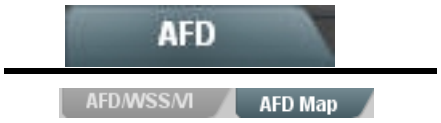
AFD/WSS/VI Translation Matrix

The table below lists valid translations between WSS, VI, and SMPTE 2016 AFD codes for both 4x3 and 16x9-coded frames.

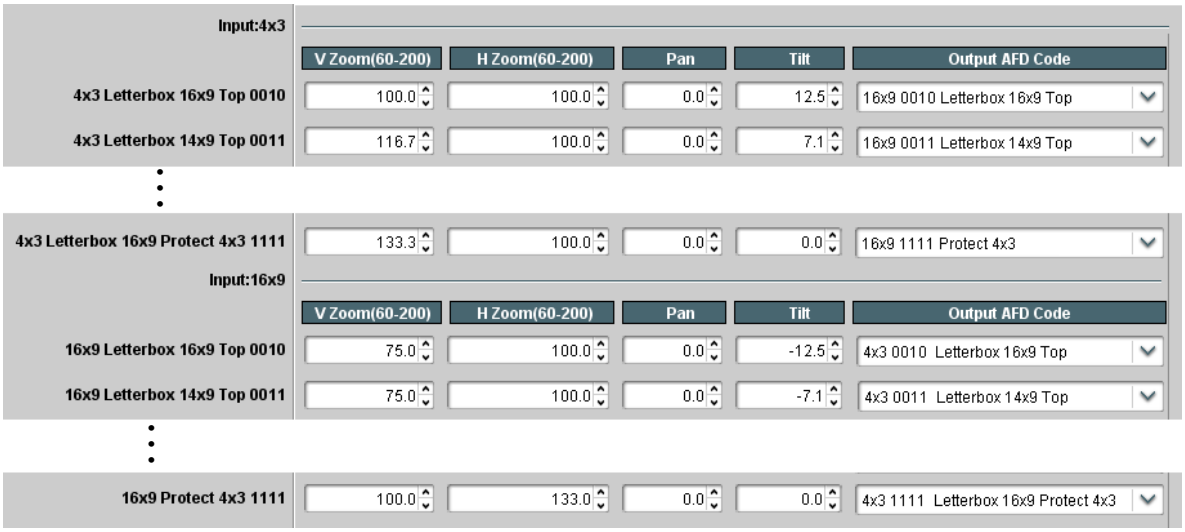
	Input					Output				
	AFD	**WSS ETSI 625**	**WSS ETSI 525**	**VI**	**Description**	**AFD**	**WSS ETSI 625**	**WSS ETSI 525**	**VI**	**Description**
4:3 Coded	0010	4			4x3 Letterbox 16x9 Top	0010	4	0	1 (NTSC) 2 (PAL)	4x3 Letterbox 16x9 Top
	0011	2			4x3 Letterbox 14x9 Top	0011	2	0	1 (NTSC) 2 (PAL)	4x3 Letterbox 14x9 Top
	0100	5	2		4x3 Letterbox 16x9 Center	0100	5	2	1 (NTSC) 2 (PAL)	4x3 Letterbox 16x9 Center
	0101, 0110, 0111				Undefined					
	1000	0	0	0 1 (NTSC) 2 (PAL)	4x3 Coded Frame	1000	0	0	1 (NTSC) 2 (PAL)	4x3 Coded Frame
	1001				4x3 Center	1001	0	0	1 (NTSC) 2 (PAL)	4x3 Center
	1010	3			4x3 16x9 Center	1010	3	2	1 (NTSC) 2 (PAL)	4x3 16x9 Center
	1011	1			4x3 14x9 Center	1011	1	0	1 (NTSC) 2 (PAL)	4x3 14x9 Center
	1100			3, 4, 7	Reserved	1100		0	1 (NTSC) 2 (PAL)	Reserved
	1101	6			4x3 Protect 14x9	1101	6	0	1 (NTSC) 2 (PAL)	4x3 Protect 14x9
	1110				4x3 Letterbox 16x9; Protect 14x9 Center	1110		2	1 (NTSC) 2 (PAL)	4x3 Letterbox 16x9; Protect 14x9 Center
	1111				4x3 Letterbox 16x9; Protect 4x3 Center	1111		2	1 (NTSC) 2 (PAL)	4x3 Letterbox 16x9; Protect 4x3 Center
16:9 Coded	0010				16x9 Letterbox 16x9 Top	0010		1	5 (NTSC) 6 (PAL)	16x9 Letterbox 16x9 Top
	0011				16x9 Letterbox 14x9 Top	0011		1	5 (NTSC) 6 (PAL)	16x9 Letterbox 14x9 Top
	0100				16x9 Letterbox 16x9 Center	0100		1	5 (NTSC) 6 (PAL)	16x9 Letterbox 16x9 Center
	0101, 0110, 0111				Undefined					
	1000	7	1	0 5 (NTSC) 6 (PAL)	16x9 Coded Frame	1000	7	11	5 (NTSC) 6 (PAL)	16x9 Coded Frame
	1001				16x9 4x3 Center	1001		1	5 (NTSC) 6 (PAL)	16x9 4x3 Center
	1010				16x9 Center Protect 16x9	1010	7	1	5 (NTSC) 6 (PAL)	16x9 Center Protect 16x9
	1100				Reserved	1100		1	5 (NTSC) 6 (PAL)	Reserved
	1101				16x9 4x3 Protect 14x9	1101		1	5 (NTSC) 6 (PAL)	16x9 4x3 Protect 14x9
	1110				16x9 Protect 14x9	1110		1	5 (NTSC) 6 (PAL)	16x9 Protect 14x9
	1111				16x9 Protect 4x3	1111		1	5 (NTSC) 6 (PAL)	16x9 Protect 4x3

Note: Shaded cells indicate invalid translation which cannot be used.

Table 3-2 9902-2UDX-DI Function Menu List — continued



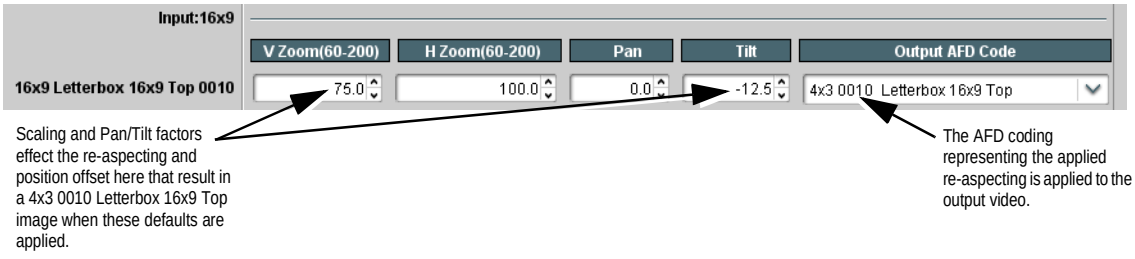
AFD Map sub-tab allows bidirectionally re-aspecting from 4x3 frames to companion 16x9 frames, and allows customizing aspect ratio settings for the AFD codes (and the corresponding WSS and VI translation equivalents) supported by the card.



Separate control groups for 4x3 and 16x9 coded input frames allow custom ARC (as well as pan/tilt) for various coded frames.

- By default, each row is set for its companion re-aspected output, along with output AFD code for the companion output (i.e., 4x3 frames get re-aspected to a companion 16x9 re-aspecting and AFD code, and similarly 16x9 frames get re-aspected to a companion 4x3 re-aspecting and AFD code).

In this example, default settings provide the scaling and tilt factors to convert a 16x9-coded 0010 frame to its companion 4x3 0010 Letterbox 16x9 Top frame.



- When the scaler is set to **Scaler follow AFD** any V, H, pan, or tilt custom changes made here are directly applied to the output video.
- To simply output an AFD code (without any re-aspecting to be done by the card) set the **No Input** row to the desired code to be outputted (in this example, “16x9 Letterbox 16x9 Center; 0100”).

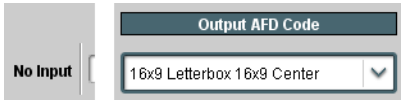


Table 3-2 9902-2UDX-DI Function Menu List — continued

Ancillary Data Processing

ADP Routing | IP Port Setup

Option

Provides controls for VANC/HANC ancillary data de-embedding and embedding to and from program video stream. Data can be extracted and inserted within the card (Bridge mode), or inserted and/or extracted to and from external interfaces via serial or IP interfaces.

Note: Separate **Path 1** and **Path 2** tabs are provided for this function with identical independent controls for both Path 1 and Path 2. Only the **Path 1** controls are shown here. Set controls for other path using the other tab.

Eight individual Ancillary Data Processors (ADPs) provide for insertion, extraction, or bridging ancillary data to and from the card program video SDI stream.

Mode controls select the type of ANC processing:

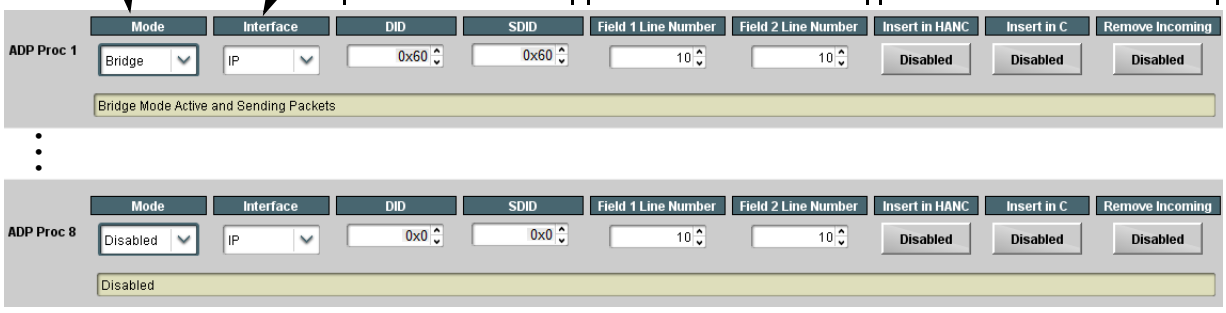
- **Bridge** extracts ANC from the deserialized input video and re-inserts in the output video, thereby allowing full control of specialized ANC packets
- **Insert** and **Extract** modes respectively allow insertion to the output stream or extraction from the input stream between external interfaces

Interface controls select either card IP or serial data (COM 1) interface where Mode is set to insertion or extraction
Note: COM1 is available for ADP Proc 1 only; all other ADPs use IP only for external import/export insertion/extraction.

DID and **SDID** controls select the desired packet to be handled by the corresponding ANC Data Processor

Line Number controls select the VANC location of packet insertion/extraction

Insertion controls allow special insertions in HANC or the C-channel, as well as removal of incoming packets



In the example above, **ADP Proc 1** is set to extract ATC timecode at DID60_h / SDID 60_h. Depending on the interface used to carry the extraction (COM or IP), status is displayed as shown below.

Extracting 15.0 Kbit/s, dropped 0.0 Kbit	When set to extract to **COM** interface, displays rate and dropped data (if any)
Extracting 18.75 Kbit/s, total 125.78 Kbit	When set to extract to **IP** interface, displays rate and total amount transferred

Note: DashBoard versions 4.1 and earlier display DID and SDID numbers in decimal; newer DashBoard versions display DID and SDID numbers in hexadecimal. Hexadecimal notation is denoted by the "0x" preceding the value.

Table 3-2 9902-2UDX-DI Function Menu List — continued

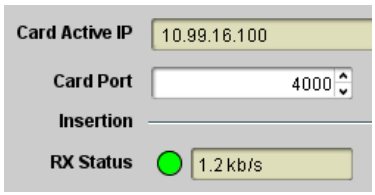
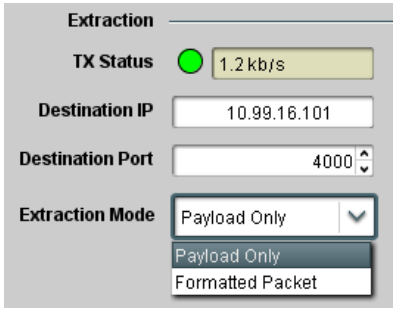
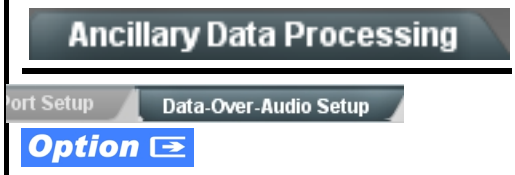
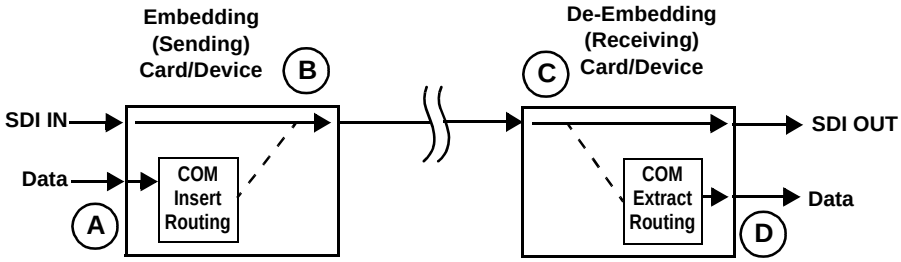
	**IP Port Setup** sub-tab provides IP setup for card UDP IP communications.
• **Card IP Receive Setup/Status** 	Shows card receiving IP address/status and sets port as follows: • **Card Active IP:** Shows the card IP address. (IP address is set using **Admin** tab Networking settings; see Admin on page 3-56). • **Card Port:** Sets card IP receive port. • **Insertion / Rx Status:** Shows card IP receive/Rx insertion status. - Stopped (with yellow indicator) means no data is being received. - Green indicator means data is being received and inserted. Data rate is also shown.
• **Card IP Transmit Setup/Status** 	Provides setup for destination IP address and shows card transmit status as follows: • **Extraction / Tx Status:** Shows card extraction from stream to Tx status. - Stopped (with yellow indicator) means no data is being sent. - Green indicator means data is being extracted and sent. Data rate is also shown. • **Destination IP/Port:** Allows setting destination IP address and port. • **Extraction Mode:** Sets the IP data sent to consist of only payload, or send as formatted packets.

Table 3-2 9902-2UDX-DI Function Menu List — continued



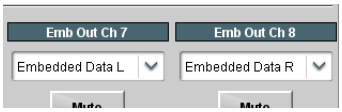
Data-Over-Audio sub-tab provides controls that allow SMPTE 337/338/339 non-PCM data to be embedded and de-embedded on embedded audio pairs, offering a very convenient self-contained transport within the program stream physical media.

Shown below is an example setup where serial data is embedded as SMPTE 337 non-PCM data on a sending embedded pair, and then extracted on a receiving pair and converted back to serial data using two cards/devices with the **+ANC** option.

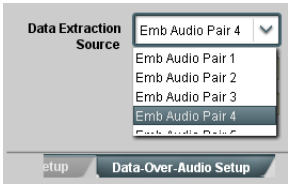


A The **COM Routing** tab and appropriate sub-tab is set to receive serial data, noting bit rate and parity settings to conform to the received serial data. (See COMM Ports Setup Controls (p. 3-48))

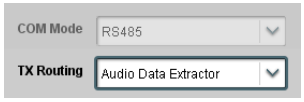
B The received serial data is then directed to an embedded audio output channel pair by setting a pair to Embedded Data using the **Output Audio Routing/Controls** tab (in this example, Emb pair 7/8).



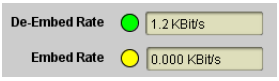
C The embedded data pair on the receiving end is then selected using the De-Embed Source select drop-down on the **Data-Over-Audio Setup** sub-tab (in this example, Emb Pair 4 (channels 7/8) as correspondingly set on the sending card).



D On the **COM Routing** tab, select Audio Data Extractor to extract and route the received SMPTE 337 data to the desired COM port, noting bit rate, protocol, and parity settings. (See COMM Ports Setup Controls (p. 3-48))



When data is successfully being de-embedded, the status display shows green and indicates the bit rate (bit rate is bit rate configured on sending end; typically SMPTE 337 data transfer is much faster than serial)



Notes: • Embedded channel pair selected must be a standard boundary pair (e.g., 1/2, 3/4 and so on).

• SMPTE 337/338/339 embedded pair carrying non-PCM data here is marked as “Non-PCM Data Unknown”. Any intermediate devices between the Cobalt sending card/device and the Cobalt receiving card/device will transfer this data intact, as long as these devices can transfer in a bit-accurate manner. Most devices capable of carrying Dolby® streams are capable of this. However, any intermediate devices must have functions such as PCM level controls and SRC disabled.

Table 3-2 9902-2UDX-DI Function Menu List — continued

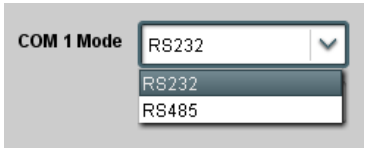
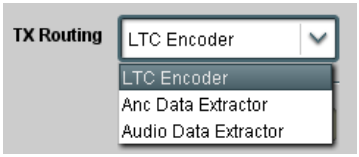
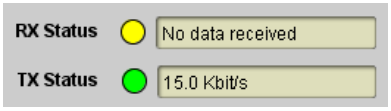
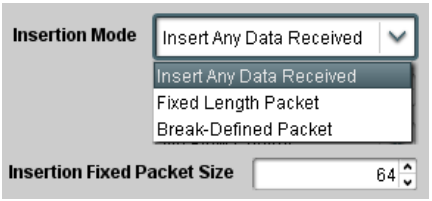
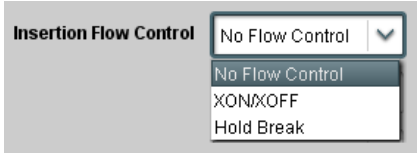
	Provides controls for setting up the two COMM (serial) ports for LTC or ANC functions, and setting comm protocol for each port.
Note: • **COM 1** and **COM 2** sub-tabs provide independent controls for COM1 and COM2. Therefore, only the **COM 1** controls are described here. • Controls provided here allow highly detailed setup of serial communications. Control settings must be carefully considered and set appropriately to correspond to both sending and receiving systems. Incorrectly set controls may result in loss of ANC serial comm. • **COM 1** and **COM 2** are multi-function interfaces and must be set for ANC Data Extractor for port(s) is to be used here. Set the port function as described in **COM Routing** in COMM Ports Setup Controls (p. 3-48).	
• **COM Mode (Protocol)** 	Selects serial comm protocol for the respective port as RS-232 or RS-485. **Note:** Protocol choices should consider the payload to be carried. Typically, LTC is sent or received using only RS-485 serial protocol.
• **COM Port Tx Routing Function** 	Selects port function for the respective port as LTC Encoder input or output, or ANC Data Extractor / Audio (SMPTE 337) non-PCM input or output.
• **Rx/Tx Status Display** 	Shows either no data received/sent, or where transfer is present shows data rate (in kbit/sec).
• **Insertion Mode Control** 	Where data is being inserted (received), sets the insertion as follows: • **Insert Any Data Received:** Insert all received data with no regard for packet size. • **Fixed Length Packet:** Sets receive to wait and accumulate *n*-number of packet bytes (as set using **Insertion Fixed Packet Size** control) before inserting data. • **Break-Defined Packet:** Card receiver looks for character-defined break from source being received to define breaks.
• **Insertion Flow Control** 	Allows communication between card receive and sending source to regulate data receive as follows: • **No Flow Control:** Data is received without buffering or checking to see if data is being received faster than it can be inserted. • **XON / XOFF:** The card UART Tx will tell the sending source whether it can or cannot accept data at current bit rate. • **Hold Break:** Card, if close to not being able to accept new data, tells the sending source to hold, and releases this hold when the card is again able to accept new data.

Table 3-2 9902-2UDX-DI Function Menu List — continued

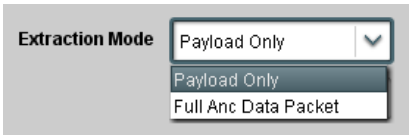
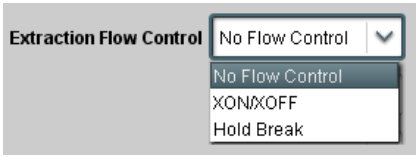
	**(continued)**
• **Insertion Sync Byte Control** 	Allows use of a sync byte from card receiver back to sending source to synchronize communication between card receive and sending source as follows: • **Disabled:** No special synchronization. • **Field Number at SOF:** The card sends a single byte telling sending source when start of field 1 or field 2 is occurring. • **Ack on Insertion:** Card sends a single byte back to sending source when data has been inserted.
• **Extraction Mode Control** 	Where data is being extracted from input video, sets the data to be sent as follows: • **Payload Only:** Sends payload only (for example, for closed captioning this would be only the ASCII character string representing the CC content). • **Full Anc Data Packet:** Sends the entire packet, including payload, DID, SDID, and any handling or marking characters.
• **Extraction Flow Control** 	Allows communication between card transmit and receiving destinations to regulate data receive as follows: • **No Flow Control:** Data is transmitted without buffering or checking to see if data is being transmitted faster than it can be received. • **XON / XOFF:** The card UART Rx will acknowledge from the receiving system whether it can or cannot accept data at current bit rate. • **Hold Break:** Card, if receiving notification from the receiving system that it is close to not being able to accept new data, tells the card to hold. Card releases this hold when the receiving system removes the break command, indicating destination is now ready again to accept new data.
• **Bit Rate/ Parity Gen Control** 	For both Rx and Tx, sets UART for bit rate and parity as follows: • **Bit Rate:** Sets Tx/Rx bit rate from 1 of 5 speeds ranging from 9600 to 230400 Baud. • **Parity:** Sets card Rx to expect odd or even parity from incoming data, and sets card Tx to generate a parity bit to satisfy selected parity. Where parity is set, incoming data not conforming to parity selection is rejected.

Table 3-2 9902-2UDX-DI Function Menu List — continued

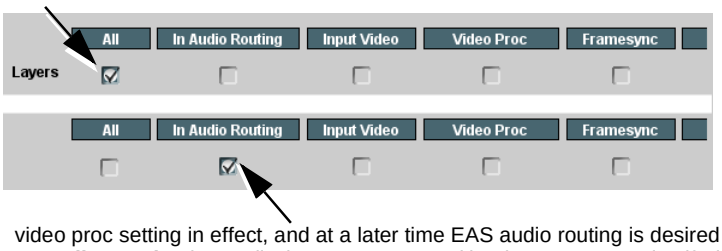
Presets

Allows user control settings to be saved in a Preset and then loaded (recalled) as desired, and provides a one-button restore of factory default settings.

• Preset Layer Select

Allows selecting a functional layer (or "area of concern") that the preset is concerned with. Limiting presets to a layer or area of concern allows for highly specific presets, and masks changing card settings in areas outside of the layer or area of concern.

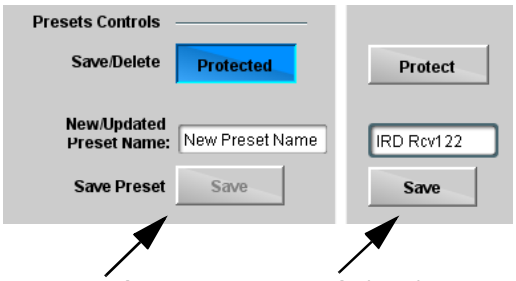
Default **All** setting will "look" at all card settings and save all settings to the defined preset with no masking.



Selecting a layer (in the example, "In Audio Routing") will set the preset to **only** "look at" and "touch" audio routing settings and save these settings under the preset. When the preset is loaded (recalled), the card will only "touch" the audio routing layer.

Example: Since EAS audio routing can be considered independent of video proc settings, if normal audio routing was set up with a particular video proc setting in effect, and at a later time EAS audio routing is desired to be saved and invoked as a preset, selecting **In Audio Routing** here tells the preset save and load to not concern itself with video proc settings. In this manner, any video proc settings in effect when the EAS preset is invoked will not affect any video proc settings that might be currently in effect.

• Preset Enter/Save/Delete



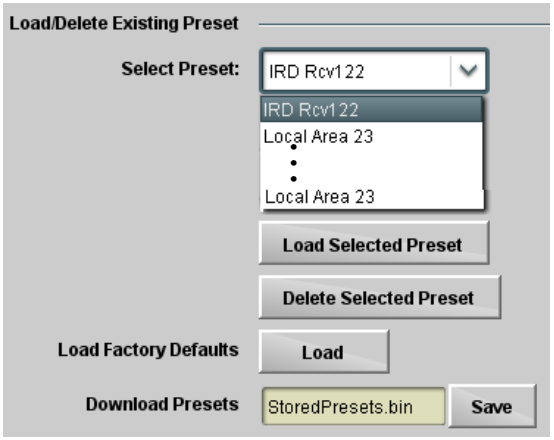
Protected state – changes locked out

Ready (open) state – changes can be applied

Locks and unlocks editing of presets to prevent accidental overwrite as follows:

- **Protect (ready):** This state awaits Protected and allows preset Save/Delete button to save or delete current card settings to the selected preset. **Use this setting when writing or editing a preset.**
- **Protected:** Toggle to this setting to lock down all presets from being inadvertently re-saved or deleted. **Use this setting when all presets are as intended.**
- **Create New Preset:** Field for entering user-defined name for the preset being saved (in this example, "IRD Rcv122").
- **Save:** Saves the current card settings under the preset name defined above.

• Preset Save/Load Controls



- **Select Preset:** drop-down allows a preset saved above to be selected to be loaded or deleted (in this example, custom preset "IRD Rcv122").
- **Load Selected Preset** button allows loading (recalling) the selected preset. When this button is pressed, the changes called out in the preset are immediately applied.
- **Delete Selected Preset** button deletes the currently selected preset.
- **Load Factory Defaults** button allows loading (recalling) the factory default preset. When this button is pressed, the changes called out in the preset are immediately applied.

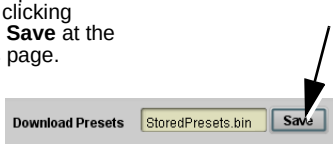
Note: Load Factory Defaults functions with no masking. The Preset Layer Select controls have no effect on this control and will reset **all** layers to factory default.

- **Download Presets** saving the preset files to a folder on the connected computer.

Table 3-2 9902-2UDX-DI Function Menu List — continued

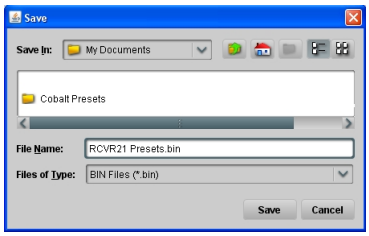
Presets	**(continued)**

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



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

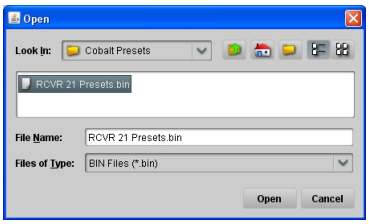
The file can then be renamed if desired (*RCVR21 Presets* in this example) before committing the save.



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

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

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

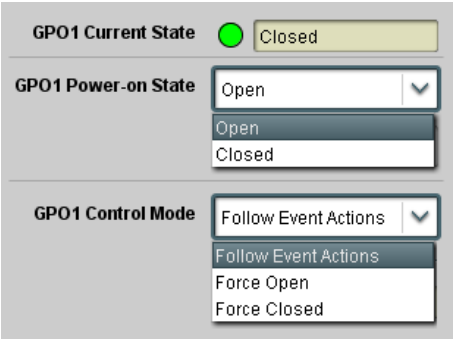


Note: • Preset transfer between card download and file upload is on a **group** basis (i.e., individual presets cannot be downloaded or uploaded separately).

• After uploading a presets file, engagement of a desired preset is only assured by selecting and loading a desired preset as described on the previous page.

GPO Setup	Provides controls for setting up the two GPO's power-up states as well as forced manual or event action triggered.

Note: This tab has identical independent controls for **GPO 1** and **2**. Therefore, only the **GPO 1** controls are described here.

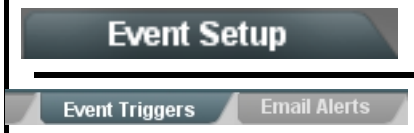


• **Current State** indicates GPO status regardless of any pre-setup.

• **Power-on State** allows the power-up GPO state to be set (initialized) upon power-up

• **Control Mode** allows GPO manual asserted open or closed states, or hands over control to Event Action triggering.

Table 3-2 9902-2UDX-DI Function Menu List — continued



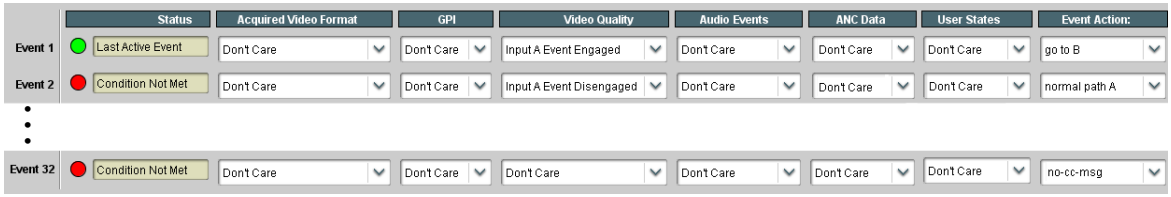
Provides event-based loading allowing a defined action to be automatically engaged upon various received signal status. Actions can be “canned” control commands or user-defined by going to a user preset.

- Event based preset loading is not passive and can result in very significant and unexpected card control and signal processing changes if not properly used. If event based presets are not to be used, make certain the **Event Based Loading** button is set to **Disabled**.
- Because event based preset loading can apply card control changes by invoking presets, loading conditions cannot be nested within a called preset (event-based loading settings performed here cannot be saved to presets, although the settings are persistent across power cycles).

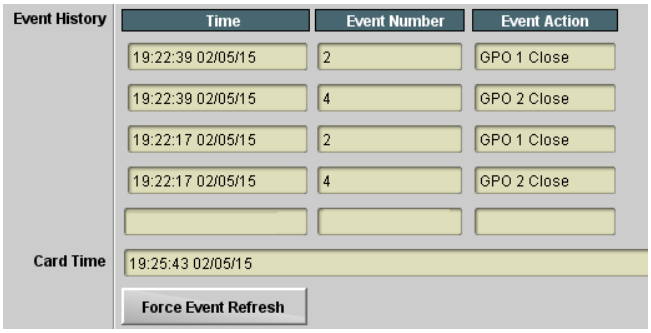
Event triggers allow a variety of event screening criteria, and in turn provide an Event Action “go to” in response to the detected event(s). For each screened criteria, categories can be set as “Don’t Care” or set to specific criteria to broaden or concentrate on various areas of concern.

- The **Event-Based Loading** button serves as a master enable/disable for the function.
- Go-to **Event Action:** can be user-defined presets, “canned” (hard-coded) selections (such as GPO triggers or routing changes), or automated E-mail alert to a respondent (see Email Alerts (p. 3-55) for setting up e-mail alerts).
- Each Event (**Event 1** thru **Event 32**) can be set to screen for any or several Definer criteria as shown in the example below. Up to 32 separate events can be defined. In addition to events screened for and triggered here, each Event can be set to trigger from Alarms detected on the Alarms page (see Alarms Setup Controls (p. 3-60)). **Engage Mode** (True/False) allows triggering on an inverse of a condition.
- Event 1 thru Event 32 are arranged with Event 1 having the highest priority, descending down to Event 32. Where multiple event screening is enabled, lower-priority events are serviced first, with the highest-priority event being the final event serviced and last action taken as well as last item logged in the Event History (see below). This helps ensure that a lower-priority event does not mask detection of higher-priority event(s).
- The **Status** indicator and message shows the activation status of each Event. Green indicator means event is currently engaged.
- Some columns in the DashBoard Event Setup table are present only when certain options are installed (for example, Video Quality column appears only with option **+QC**).

Event Definers
Each event can be uniquely set up for any of the condition types in these columns. Unless set to Don’t Care, all defined conditions will need to be true in order for the Event to be considered active



Note: Event criteria settings in any row comprise an AND function. Where multiple criteria are selected, a true (trigger) condition is not propagated unless **all** specified criteria are true. To independently screen for multiple criteria, rows should be set up where each criteria is screened in its own Event row. Examples of this are shown on the following pages.



The **Event History** log shows any triggered events in groups of five most recent events (newest at the top).

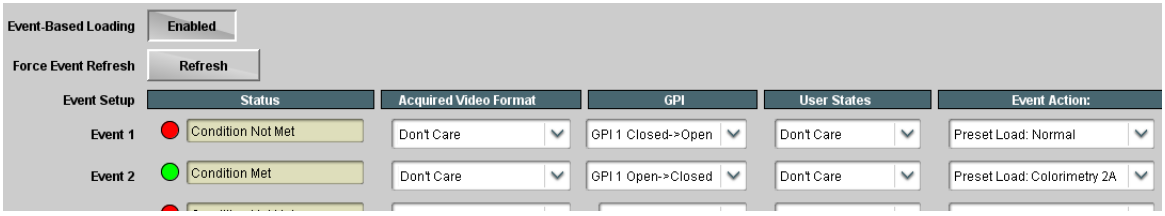
In the example here, log shows Event 2 as the most recent event, and its user-selected action of GPO 1 Close.

Pressing the **Force Event Refresh** button updates the list.

Table 3-2 9902-2UDX-DI Function Menu List — continued

(continued)

In the example here for Event 1 and Event 2, the device is set to invoke a preset that applies custom color correction settings nested in preset “Colorimetry 2A” whenever GPI 1 goes LO. When this GPI goes HI, corresponding action in preset “Normal” invokes another preset to revert the device to default settings.



Note: • Screened conditions are triggered upon start of event. Any event-based setup must be done in advance of the triggering event in order for event to be detected.

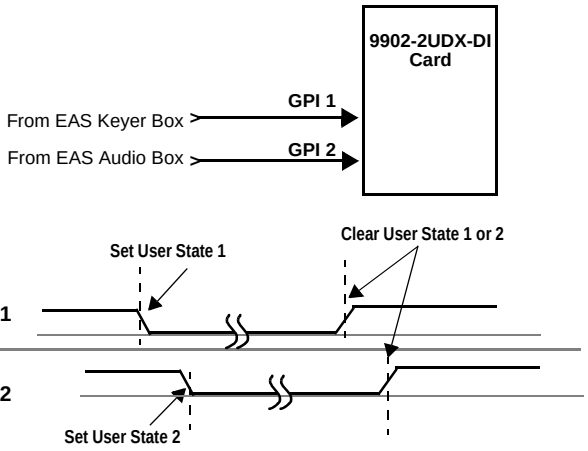
- If a desired user preset does not appear in the Event Action drop-down, press the DashBoard **Refresh** button at the bottom of the page to update the list in the drop-down.
- Loss of true conditions does not disengage an event-based triggering. A new set of true conditions must be defined and then occur to transition from one event-based trigger to another.
- Time required to engage an event-based trigger depends upon complexity of the called preset. (For example, a preset that invokes a video change will take longer to engage than a preset involving only an audio routing change.)
- Make certain all definable event conditions that the card might be expected to “see” are defined in any of the Event 1 thru Event 32 rows. This makes certain that the card will always have a defined “go-to” action if a particular event occurs. For example, if the card is expected to “see” a 720p5994 stream or as an alternate, a 525i5994 stream, make certain both of these conditions are defined (with your desired go-to presets) in any two of the Event 1 thru Event 32 condition definition rows.
- Event Actions defined using user presets must be used with care to prevent conditions that could cause looping or the removal or “override” of desired expected settings. When using presets, the Preset Layer selection should be used such that only required aspects are touched.
- Where multiple event screening is set up, the event you consider to be the highest priority should be set as higher priority than lesser events (as shown in the example above where Video Quality screening trumps CC absence). Also, this prioritization helps ensure that all desired events are screened for before a significant change (such as input video source change) is effected.

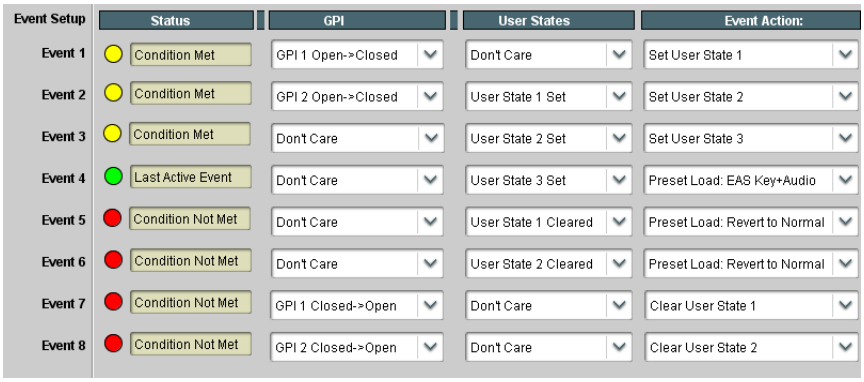
Table 3-2 9902-2UDX-DI Function Menu List — continued

(continued)

User States is a special column which allows a logic state to be set (similar to a register or latch) whenever a defined condition is first triggered. A user state (which is latched until cleared by some other definable action) can be sucessively used with other user states, thereby allowing a final action to be invoked only when subordinate user states have been sequentially satisfied as true.

In the example here, two independent units are used for an EAS alert input (one box supplies alert key video, and the other supplies automated alert audio). Both communicate their ready signal each using edge-trigger GPO's which are fed to the respective GPI 1 and GPI 2 on the card. Because these two boxes are independent and cannot be relied upon to provide coinciding triggers, a chain of user state definers are used here to engage a preset routing key video and EAS audio routing when both states from both boxes are true in the order of GPI 1 first and then GPI 2 second for this example.





Event Setup	Status	GPI	User States	Event Action:
Event 1	Condition Met	GPI 1 Open->Closed	Don't Care	Set User State 1
Event 2	Condition Met	GPI 2 Open->Closed	User State 1 Set	Set User State 2
Event 3	Condition Met	Don't Care	User State 2 Set	Set User State 3
Event 4	Last Active Event	Don't Care	User State 3 Set	Preset Load: EAS Key+Audio
Event 5	Condition Not Met	Don't Care	User State 1 Cleared	Preset Load: Revert to Normal
Event 6	Condition Not Met	Don't Care	User State 2 Cleared	Preset Load: Revert to Normal
Event 7	Condition Not Met	GPI 1 Closed->Open	Don't Care	Clear User State 1
Event 8	Condition Not Met	GPI 2 Closed->Open	Don't Care	Clear User State 2

GPI 1 (key) cue falling-edge sets user state 1

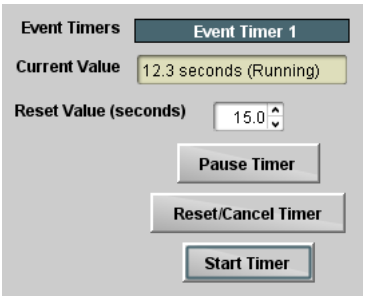
GPI 2 (audio) cue falling-edge sets user state 2

User state 2 (which requires user state 1 being true first) sets state 3, which then invokes a preset to load settings to route EAS key and audio

When either GPI 1 or GPI 2 has a rising-edge trigger (cease EAS), user states 1 or 2 are cleared, thereby clearing user state 3. Either state change calls a preset to revert to normal operation.

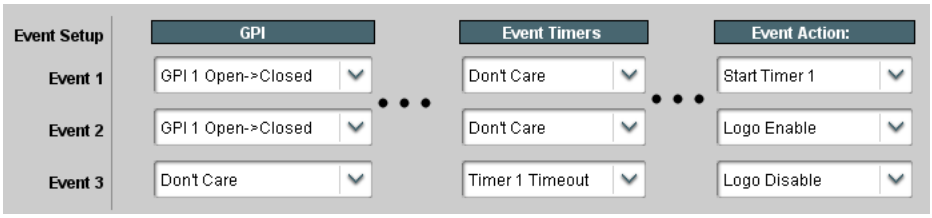
Table 3-2 9902-2UDX-DI Function Menu List — continued

Provides three general-purpose timers that can be triggered to start, pause, reset, or stop upon event actions. The state of each timer, in turn, can also be used to invoke other actions.



Event Timers 1 thru **3** (Timer 1 shown) can be set with count-down values. The Pause/Reset/Start control here are manual controls. The timers are typically used with automated cues to start and stop the timer(s), as shown below.

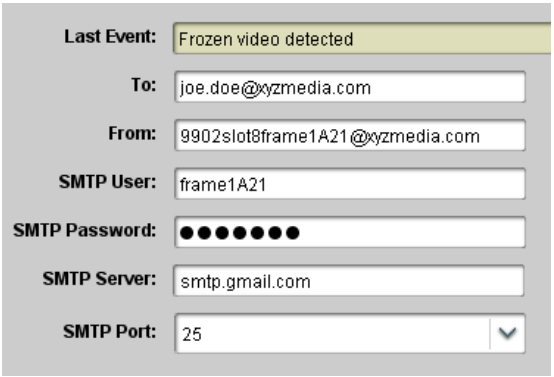
in the example here, **Event Timer 1** is used to set a logo insertion disable after a specific amount of elapsed time. A GPI inserts the logo, along with a time started at that time. Upon the timer timeout, a separate action sets logo insertion to Disabled.



Provides setup for automated Email alerts when an event has occurred.

As an Event Action choice on the Events Triggers sub-tab, an Email alert can be sent as a response. Set up email fields as shown in the example below.

Note: Frame hosting the card must be accessible to email recipient's network. It is recommended to set up and generate a test event to test the email send.



When fields are filled-in to specify recipient and sender, and email alert is selected for Event Action on Event Triggers sub-tab page, recipeient receives an email alert upon event, with the triggering event shown (in this example, "frozen video detected").

Table 3-2 9902-2UDX-DI Function Menu List — continued

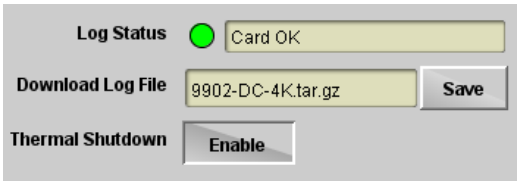
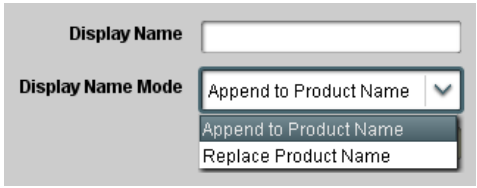
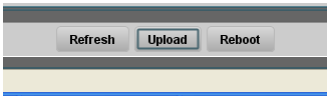
	Provides a global card operating status and allows a log download for factory engineering support. Also provides controls for selecting and loading card firmware upgrade files. Networking controls provide dedicated card networking setup in conjunction with rear module Ethernet port.
• **Log Status and Download Controls** 	• **Log Status** indicates overall card internal operating status. • **Download Log File** allows a card operational log file to be saved to a host computer. This log file can be useful in case of a card error or in the case of an operational error or condition. The file can be submitted to Cobalt engineering for further analysis. • **Thermal Shutdown** enable/disable allows the built-in thermal failover to be defeated. (Thermal shutdown is enabled by default). **CAUTION** **The 9940-ACO FPGA is designed for a normal-range operating temperature around 85° C core temperature. Operation in severe conditions exceeding this limit for non-sustained usage are within device operating safe parameters, and can be allowed by setting this control to Disable. However, the disable (override) setting should be avoided under normal conditions to ensure maximum card protection.**
• **Card DashBoard Name Control** 	Allows card name In DashBoard to be changed as desired. Click return to engage change. • **Append to Product Name** appends (or adds to) existing OEM name (for example, “9940-ACO *Processing 1A*”). • **Replace Product Name** completely replaces the OEM name OEM name (for example, “*Processing 1A*”). **Note:** DashBoard instance(s) may have to be refreshed before name change appears.
• **Firmware Upgrade Controls**	Firmware upgrade controls allow a selected firmware version (where multiple versions can be uploaded to the card’s internal memory) to invoke an upgrade to a selected version either instantly, or set to install on the next card reboot (thereby allowing card upgrade downtime to be controlled at a scheduled point in time).

Table 3-2 9902-2UDX-DI Function Menu List — continued

Admin / System / Networking	**(continued)**

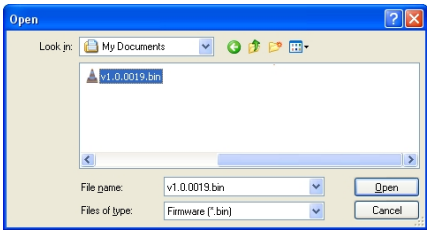
Note: The page/tab here allows managing multiple firmware versions saved on the card. New upgrade firmware from our web site can always be directly uploaded to the card without using this page. Instructions for firmware downloading to your computer and uploading to the card can be found at the **Support>Firmware Downloads** link at www.cobaltdigital.com.

1. Access a firmware upgrade file from a network computer by clicking **Upload** at the bottom of DashBoard.



2. Browse to the location of the firmware upgrade file (in this example, *My Documents\v1.0.0019.bin*).

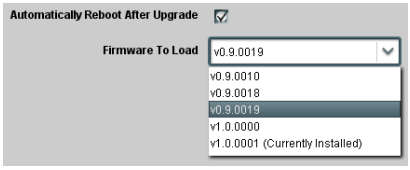
3. Select the desired file and click **Open** to upload the file to the card.



• **Immediate firmware upload.** The card default setting of **Automatically Reboot After Upgrade** checked allow a selected firmware version to be immediately uploaded as follows:

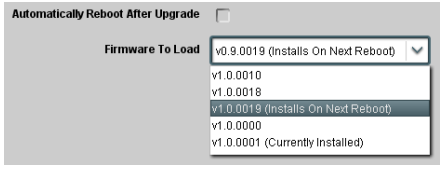
1. Click **Firmware To Load** and select the desired upgrade file to be loaded (in this example, “v1.0.0019”).

2. Click **Load Selected Firmware**. The card now reboots and the selected firmware is loaded.



• **Deferred firmware upload.** With **Automatically Reboot After Upgrade** unchecked, firmware upgrade loading is held off until the card is manually rebooted. This allows scheduling a firmware upgrade downtime event until when it is convenient to experience to downtime (uploads typically take about 60 seconds).

1. Click **Firmware To Load** and select the desired upgrade file to be loaded (in this example, “v1.0.0019”). Note now how the display shows “Installs on Next Reboot”.



2. Click **Load Selected Firmware**. The card holds directions to proceed with the upload, and performs the upload only when the card is manually rebooted (by pressing the **Reboot** button).

3. To cancel a deferred upload, press **Cancel Pending Upgrade**. The card reverts to the default settings that allow an immediate upload/upgrade.

Table 3-2 9902-2UDX-DI Function Menu List — continued

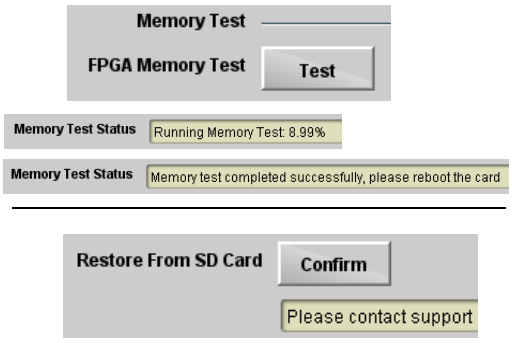
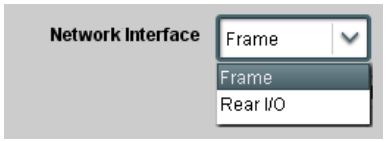
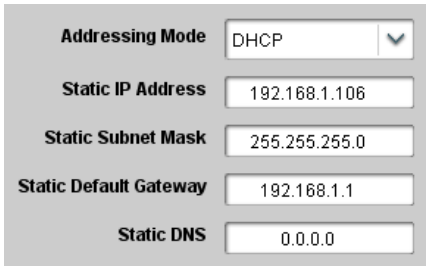
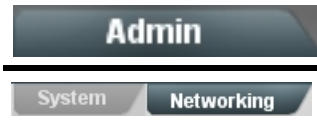
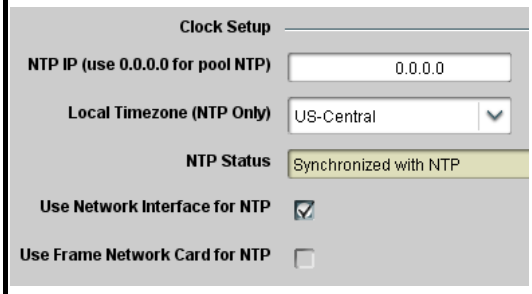
	**(continued)**
• **Card Check and Restore Utilities** 	**Memory Test** allows all cells of the card FPGA memory to be tested. This control should **only** be activated under direction of product support. Exercising the memory test is **not** part of normal card maintenance. **Restore from SD Card** allows card rendered inoperable to be restored using an SD memory card fitted to the card internal SD slot. Product support must be contacted prior to performing this operation. Use of any SD card not supplied by support can corrupt the card.
	The **Networking** sub-tab provides a dedicated Ethernet connection to card control and monitoring via a rear module Ethernet port. (This IP interface is entirely independent and separate from the card's DashBoard frame-based remote control/monitoring interface.) (Dedicated card control using IP has not been fully implemented at this release. Some functions may be reserved.)
• **Card IP Physical Port Select Control** 	Allows card dedicated IP interface (as set below) to use frame communications or dedicated rear I/O module Ethernet RJ-45 port. **Note:** • Frame net connection allows cards with per-card Ethernet connection to connect with network via a shared frame Ethernet port instead of per-card dedicated Ethernet connectors on the card's rear module. Frame net connection is available only on certain frame models. • Card slot must be fitted with a rear I/O module equipped with an Ethernet connector in order to use **Rear I/O** selection.
• **Card IP Setup Controls** 	Provides controls for setting up card dedicated IP interface. • **Addressing Mode** selsects either DHCP or static. Where Static is selected, standard IP fields allow entry of Address, Subnet Mask, and Default Gateway.
• **Card SNMP MIB Download** 	Where supported, allows card SNMP MIB files to be downloaded and saved using user-configured name.

Table 3-2 9902-2UDX-DI Function Menu List — continued

<table>
<tr><td> 
</td><td>(continued)</td></tr>
<tr><td>• NTP Clock Setup
 
</td><td>Allows device NTP clock IP source and localization. This is the clock/time device will use for logs and other recorded actions.
• NTP IP sets the IP address where NTP is to be obtained.
• Local Timezone sets the recorded time to the localized time.
• NTP Status shows if time is synced with NTP or if an error exists.
• Use Network Interface and User Frame Network Card checkboxes allows selecting the network source that will provide NTP time.</td></tr>
<tr><td> 
</td><td>Automatically maintains a log of user actions and input lock status.</td></tr>
<tr><td>User Log shows input lock and other user conditions (with most recent event at top of list).

Clear User Log clears all entries.

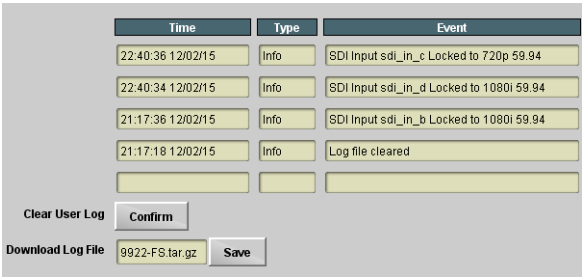
Download Log File opens a browser allowing the log file to be saved on the host machine.</td><td> 
</td></tr>
</table>

Table 3-2 9902-2UDX-DI Function Menu List — continued

Alarms

Provides controls for setting up controls which screen for and propagate input program video alarms for video, audio, and ancillary data defect conditions.

Conditions and alarm status can be propagated as DashBoard tree-view frame alarms, downloadable .txt files and/or Syslog IP-based alarms.

The **Alarms** tab has several sub-tabs which allow setting up detection and alarm severity/propagation for input program video alarms for video, audio, and ancillary data defect conditions (as described and shown below)

Video Alarm Setup

Video Alarm Setup sub-tab allows setting up screening engagement and disengagement holdoff for frozen and/or black video detection on the card's four SDI inputs (independent for each SDI input). In the default example settings shown here, engagement and disengagement of alarm generation occurs 3000 msec after event detect.

Factory default holdoff settings shown here are recommended for at least initial settings. If holdoff periods are too brief, nuisance alarms may be generated during transitions to and from programs and interstitials.

	Frozen Video Detection Setup			
	Engagement Holdoff (minutes)	Engagement Holdoff (ms)	Disengagement Holdoff (minutes)	Disengagement Holdoff (ms)
SDI Input A	0	3000	0	3000
SDI Input B	0	3000	0	3000
SDI Input C	0	3000	0	3000
SDI Input D	0	3000	0	3000
	Black Video Detection Setup			
	Engagement Holdoff (minutes)	Engagement Holdoff (ms)	Disengagement Holdoff (minutes)	Disengagement Holdoff (ms)
SDI Input A	0	3000	0	3000
SDI Input B	0	3000	0	3000
SDI Input C	0	3000	0	3000
SDI Input D	0	3000	0	3000

Audio Alarm Setup

Audio Failover Threshold (dBFS)	-60
Trigger Holdoff (minutes)	0
Trigger Holdoff (ms)	5000
Release Holdoff (minutes)	0
Release Holdoff (ms)	0

Audio Alarm Setup sub-tab allows setting up screening trigger threshold, engagement and disengagement holdoff for low or missing audio levels on the card's embedded audio input channels.

- Levels **above** the Failover Threshold are considered normal.
- Levels **below** the Failover Threshold (and exceeding the holdoff) are considered below normal.

Note: Audio channels screened are from the card SDI that is selected for the program video/audio path (for example, if SDI A is selected as the input source on the **Input Video** tab, the 16 embedded channels comprising this video/audio input are screened).

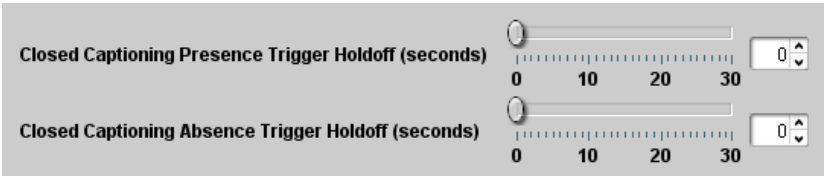
Factory default holdoff and threshold settings shown here are recommended for at least initial settings. If holdoff periods are too brief (or threshold set too high), nuisance alarms may be generated during transitions to and from programs and interstitials, as well as during certain content.

Table 3-2 9902-2UDX-DI Function Menu List — continued

Alarms	(continued)

Ancillary Data Alarm Setup sub-tab allows setting up screening engagement and disengagement holdoff for absence of closed captioning packets.

Note: • Video screened is the card SDI that is selected for the program video/audio path.
• Ancillary data condition detection is functional only for CEA608/708 packet-based closed captioning. This feature does not function for SD line 21 "waveform-based" closed captioning.



Alarm Propagation Tabs

Video, **Audio**, and **Ancillary Data** sub-tabs set alarm propagation attributes, including:
- Logging of alarms and conditions
- Propagation of alarms to the card general Card State/DashBoard frame-based tree-view pane
- Ignore alarm, or set severity as **Warning** (yellow "LED") or **Error** (red "LED")

Each of these sub-tabs is described below.

Video sub-tab independently shows for all four SDI inputs any LOS (loss of signal), frozen, or black conditions triggered for any of the SDI IN A thru SDI IN D inputs.

Condition/Status has LOS, Frozen, and Black status fields for all 4 SDI inputs. Illuminated "LED" indicates that condition is presently occurring. Color of LED is determined by user-set Severity level.

- **Log** (when checked) propagates the alarm to a log file.
- **Alarm** (when checked) propagates the alarm to the Card State and frame-level DashBoard tree-view "LEDs".
- **Severity** selects from Ignore/OK (green "LED"), Warning (yellow "LED"), and Error (red "LED") alarm escalation states.
- **Duration** and **Last Occurence** shows details for each triggered alarm event.

Note: The Log, Alarm, Severity, and Duration/Last Occurrence columns appear on the other alarm sub-tabs and function identically as described here.

Table 3-2 9902-2UDX-DI Function Menu List — continued

Alarms	(continued)

Path 1 Audio

Audio sub-tabs independently show for all 16 embedded channels (per path) any missing audio (whether absent due to low level, mute or unlocked status).

Note: • Audio screened is the audio associated with the selected card SDI program inputs.
• **Path 1 Audio** sub-tab is shown. An identical control sub-tab is present for Path 2 Audio (not shown here).

Unused audio channels should, at the minimum, have Severity set to Ignore/OK. If this is not done, nuisance alarms may occur.

Independent rows are present for each of the program path 16 embedded audio channels. Log, Alarm, Severity and Duration/ Last Occurrence controls and status function as described in Video (p. 3-61).

Ancillary Data

Ancillary Data sub-tab independently shows loss of closed captioning packet presence for both program video paths.

Note: • Closed captioning screened are the CC packet presence associated with the selected card SDI program inputs.
• Ancillary data condition detection is functional only for CEA608/708 packet-based closed captioning. This feature does not function for SD line 21 “waveform-based” closed captioning.

Independent rows are present for both program paths. Log, Alarm, Severity and Duration/Last Occurrence controls and status function as described in Video (p. 3-61).

Table 3-2 9902-2UDX-DI Function Menu List — continued

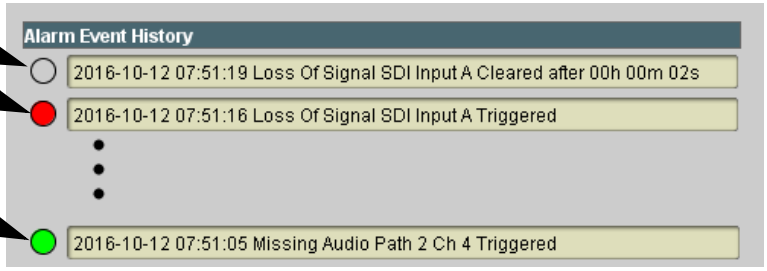
Alarms	**(continued)**

Alarm Event History shows the eight most-recent alarm events that have been detected (with most-recent at top of list).
The alarm severity (as set using the Severity drop-down for each alarm type) sets the "LED" color shown here.
In addition to alarms directly affecting performance, status such as cleared alarms are also displayed, as well as any actions related to enabling alarm propagation (such as "Logging Enabled" and "Logging Disabled").
All display rows shown here are retained in the overall log and can be downloaded as a .txt file (see Logging below).

Cleared alarms appear as an "open" LED

Alarms configured as **Error** or **Warning** correspondingly appear here as a red "LED" or yellow "LED"

Detected alarms event configured as **Ignore/OK** appear here as a green "LED"

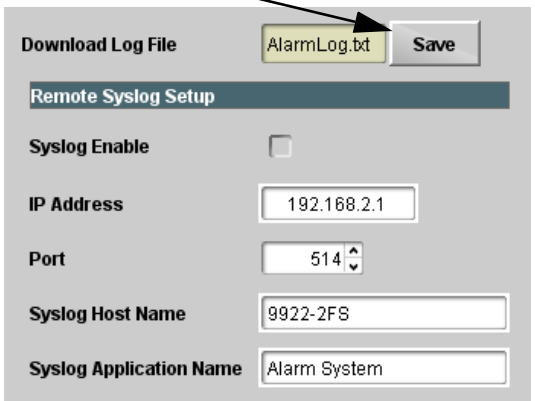


Logging

Logging sub-tab allows downloading of an overall running **AlarmLog.txt** file via DashBoard to a host computer.
This sub-tab also has setup controls for using Syslog IP connection of alarm log data (Linux and Unix).

Clicking **Save** opens a dialog to save the AlarmLog.txt file to a host computer.

Setup controls and fields for Syslog



Note: • Download Log File is performed via DashBoard connection; no external connection is required.
• For Syslog usage, default 514 port assignment is recommended.
• Syslog usage , is available only on certain frame models offering per-card dedicated Ethernet connection. If this frame type is not being used, card slot must be fitted with a rear I/O module equipped with an Ethernet connector (such as RM20-9902-2UDX-DI-L) in order to use Syslog.

Troubleshooting

This section provides general troubleshooting information and specific symptom/corrective action for the 9902-2UDX-DI card and its remote control interface. The 9902-2UDX-DI 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 9902-2UDX-DI card itself and its remote control systems all (to varying degrees) provide error and failure indications. Depending on how the 9902-2UDX-DI card is being used (i.e, standalone or network controlled through DashBoard™ or a Remote Control Panel), check all available indications in the event of an error or failure condition.

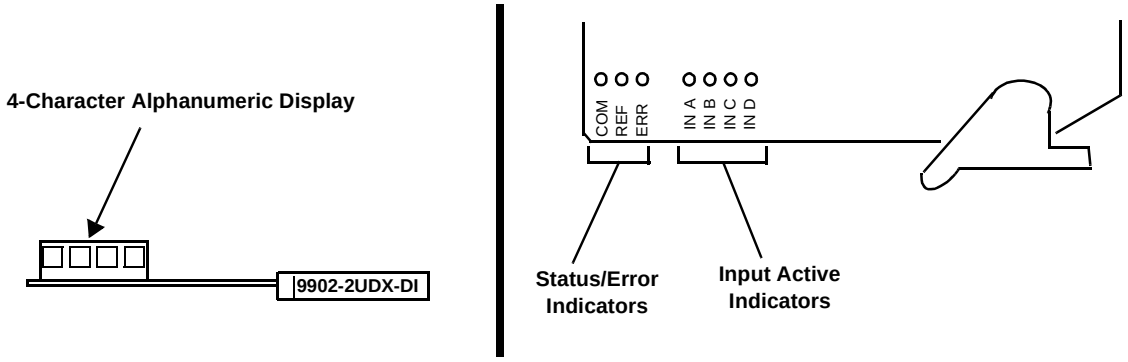
The various 9902-2UDX-DI card and remote control error and failure indicators are individually described below.

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

- Basic Troubleshooting Checks (p. 3-68)
- 9902-2UDX-DI Processing Error Troubleshooting (p. 3-69)
- Troubleshooting Network/Remote Control Errors (p. 3-70)

9902-2UDX-DI Card Edge Status/Error Indicators and Display

Figure 3-7 shows and describes the 9902-2UDX-DI card edge status indicators and display. These indicators and the display show status and error conditions relating to the card itself and remote (network) communications (where applicable). Because these indicators are part of the card itself and require no external interface, the indicators are particularly useful in the event of communications problems with external devices such as network remote control devices.



Item	Function
Alphanumeric Display	Shows card statuses (`BOOT` (card booting), (`9902-2UDX-DI` (card up and OK))
COM LED	Blue LED flashes when 9902-2UDX-DI is receiving control message from remote network control (e.g., DashBoard™ or Cobalt® Remote Control Panel)
REF LED	Blue LED illuminates indicating 9902-2UDX-DI is receiving selected reference when set up for framesync operation.
ERR LED	This function is currently reserved.
Input Active LEDs	Blue LEDs for each SDI input (A thru D) indicate signal presence for each corresponding card SDI input. No illumination of any of the LEDs indicates the 9902-2UDX-DI has not locked onto a valid signal on any input.

Figure 3-7 9902-2UDX-DI Card Edge Status Indicators and Display

DashBoard™ Status/Error Indicators and Displays

Figure 3-8 shows and describes the DashBoard™ status indicators and displays. These indicator icons and displays show status and error conditions relating to the 9902-2UDX-DI card itself and remote (network) communications.

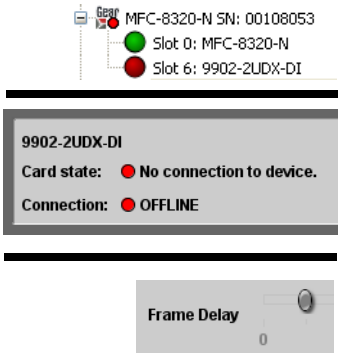
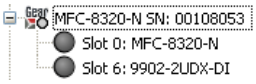
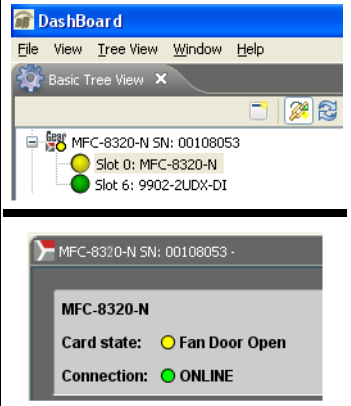
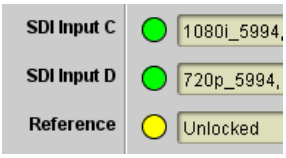
Indicator Icon or Display	Error Description
	Red indicator icon in Card Access/Navigation Tree pane shows card with Error condition (in this example, the Card Access/Navigation Tree pane shows a general error issued by the 9902-2UDX-DI card in slot 6). Specific errors are displayed in the Card Info pane (in this example “No connection to device” indicating 9902-2UDX-DI card is not connecting to frame/LAN). If the 9902-2UDX-DI 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 9902-2UDX-DI card in slot 6 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 9902-2UDX-DI Card Info pane shows error alert, along with cause for alert (in this example, the 9902-2UDX-DI is not receiving an enabled framesync source).

Figure 3-8 DashBoard™ Status Indicator Icons and Displays

Access Card Info panes for specific cards by clicking the card slot position in the Card Access/Navigation Tree pane (as shown in the example in Figure 3-9).

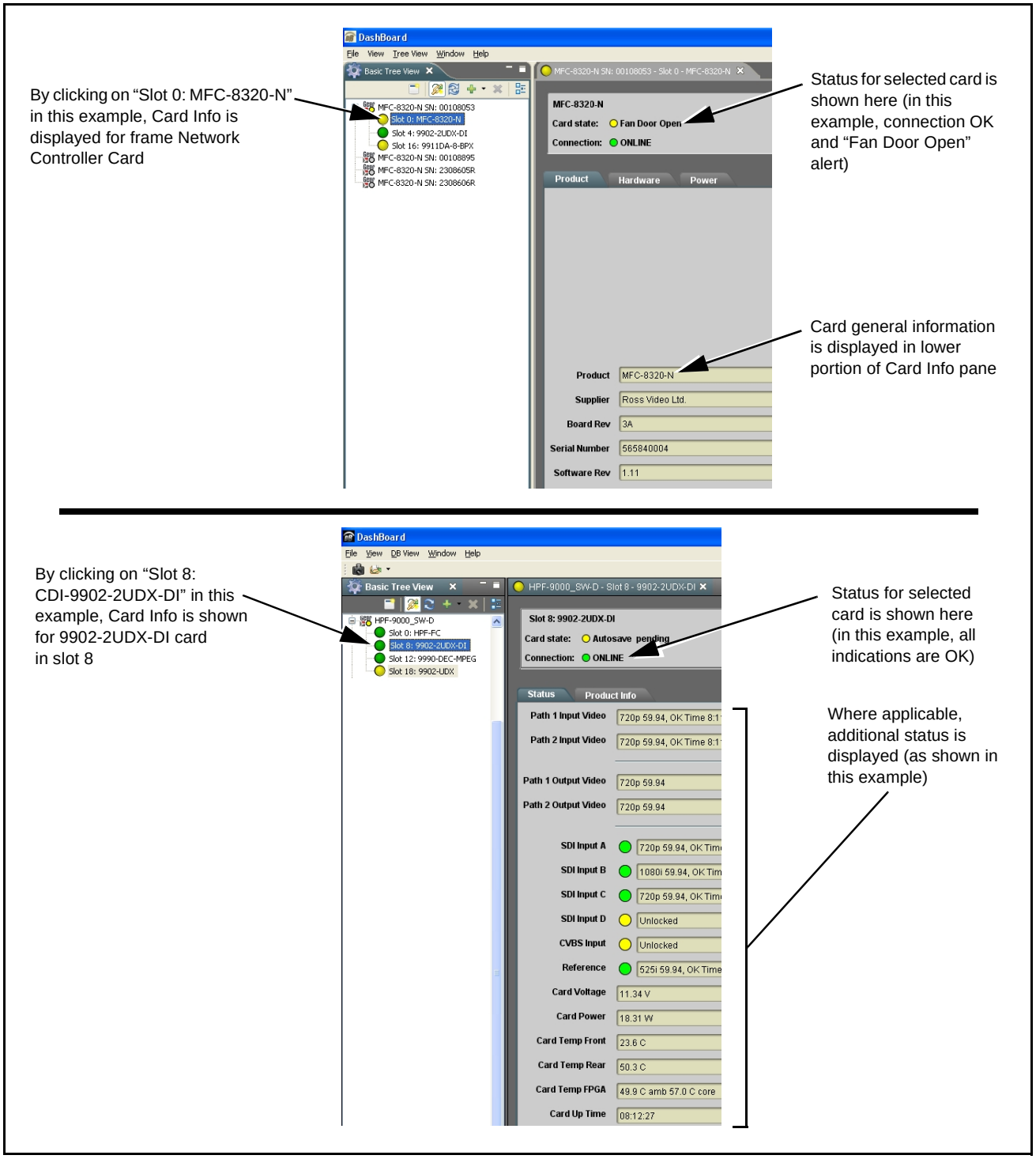


Figure 3-9 Selecting Specific Cards for Card Info Status Display

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 3-3 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 3-3 Basic Troubleshooting Checks

Item	Checks

Verify power presence and characteristics	• On both the frame Network Controller Card and the 9902-2UDX-DI, 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 indication for the 9902-2UDX-DI card. This can be observed using the DashBoard™ Card Info pane.
	  • If display shows **no** power being consumed, either the frame power supply, connections, or the 9902-2UDX-DI card itself is defective.
	  • If display shows **excessive** power being consumed (see Technical Specifications (p. 1-15) in Chapter 1, “Introduction”), the 9902-2UDX-DI 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 9902-2UDX-DI 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.

9902-2UDX-DI Processing Error Troubleshooting

Table 3-4 provides 9902-2UDX-DI processing troubleshooting information. If the 9902-2UDX-DI card exhibits any of the symptoms listed in Table 3-4, follow the troubleshooting instructions provided.

In the majority of cases, most errors are caused by simple errors where the 9902-2UDX-DI is not appropriately set for the type of signal being received by the card.

Note: The error indications shown below are typical for the corresponding error conditions listed. Other error indications not specified here may also be displayed on DashBoard™ and/or the 9902-2UDX-DI card edge status indicators.

Note: Where errors are displayed on both the 9902-2UDX-DI card and network remote controls, the respective indicators and displays are individually described in this section.

Table 3-4 Troubleshooting Processing Errors by Symptom

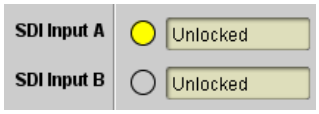
Symptom	Error/Condition	Corrective Action
• **DashBoard™** shows **Unlocked** message in 9902-2UDX-DI Card Info pane  • Card edge **Input** LED corresponding to input is not illuminated	No video input present	Make certain intended video source is connected to appropriate 9902-2UDX-DI card video input. Make certain BNC cable connections between frame Rear I/O Module for the card and signal source are OK.
Ancillary data (closed captioning, timecode) not transferred through 9902-2UDX-DI	• Control(s) not enabled	• Make certain respective control is set to **On** or **Enabled** (as appropriate).
	• VANC line number conflict between two or more ancillary data items	• Make certain each ancillary data item to be passed is assigned a unique line number (see Ancillary Data Line Number Locations and Ranges on page 3-9).
Audio not processed or passed through card	Enable control not turned on	On **Output Audio Routing/Controls** tab, **Audio Group Enable** control for group 1 thru 4 must be turned on for sources to be embedded into respective embedded channel groups.
Selected upgrade firmware will not upload	Automatic reboot after upgrade turned off	Card **Presets** > **Automatically Reboot After Upgrade** box unchecked. Either reboot the card manually, or leave this box checked to allow automatic reboot to engage an upgrade upon selecting the upgrade.

Table 3-4 Troubleshooting Processing Errors by Symptom — continued

Symptom	Error/Condition	Corrective Action
Card does not pass video or audio as expected. Control settings spontaneously changed from expected settings.	Event-based preset inadvertently invoked	Event-based preset loading (**Presets** tab > **Event Triggers** sub-tab) should be set to **Disabled** if this function is not to be used. Read and understand this control description before using these controls to make sure engagement for all expected conditions is considered. See Presets (p. 3-50) for more information.
Card will not retain user settings, or setting changes or presets spontaneously invoke.	**Event Based Loading** sub-tab inadvertently set to trigger on event	If event based loading is not to be used, make certain **Event Based Presets** is disabled (either using master **Enable/Disable** control or through events settings. See Presets (p. 3-50) for more information.

Troubleshooting Network/Remote Control Errors

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

In Case of Problems

Recovering Card From SD Memory Card

New production cards come equipped with an SD card installed in a slot receptacle on the underside of the card. The data on this SD card can be used to restore a card should the card become unresponsive (can’t communicate with DashBoard or other remote control). Recovering a card using the procedure here will restore the card to any installed option licenses and the most recent firmware installed.

1. (See Figure 3-10.) Make certain the card has the proper SD card installed in the under-card slot. If SD card is **not** installed, contact Product Support to obtain an SD card.

Note:
- (Option +TTS only) Cards shipped with option +TTS use an SD card for the TTS library in addition to recovery files. If your +TTS-equipped device was received **earlier than December 2015**, your SD may not contain the recovery files. Contact Product Support to obtain the updated SD card containing both TTS library and SD recovery files.
- If unit is a BBG-1000 Series device, remove the top cover before proceeding.

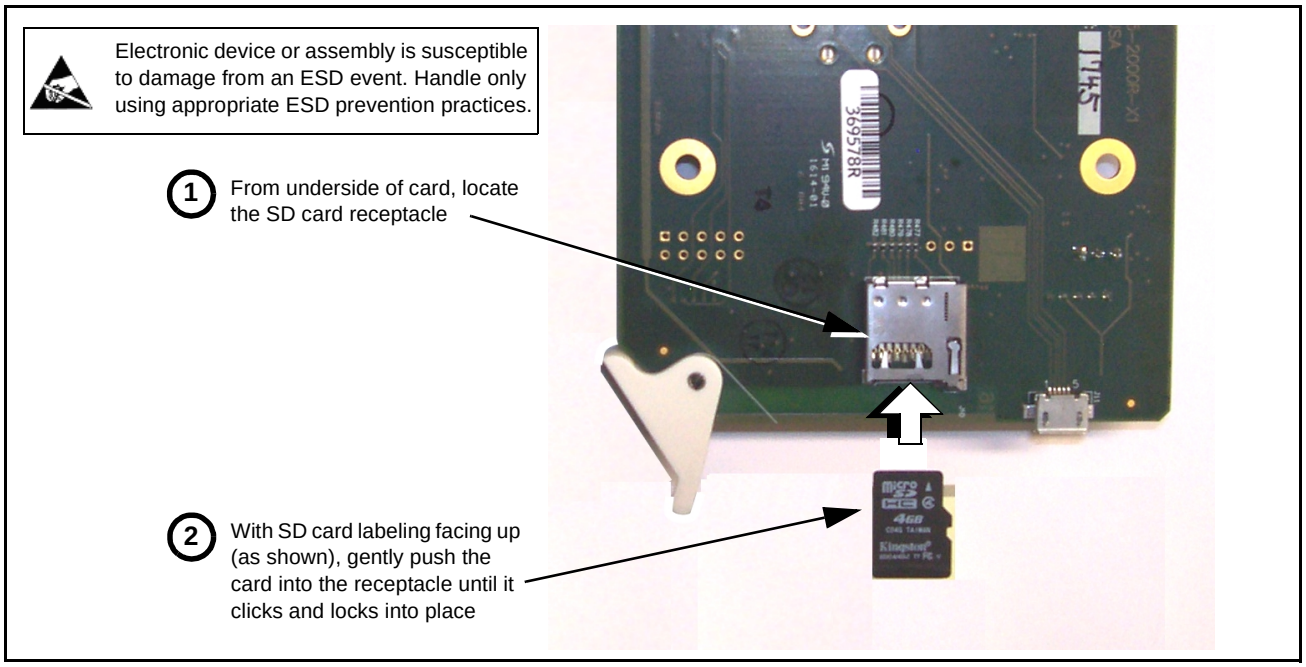


Figure 3-10 SD Card Installation

2. (See Figure 3-11.) With card powered-down, locate the **MMC BOOT** button on the card. Proceed as shown in picture.

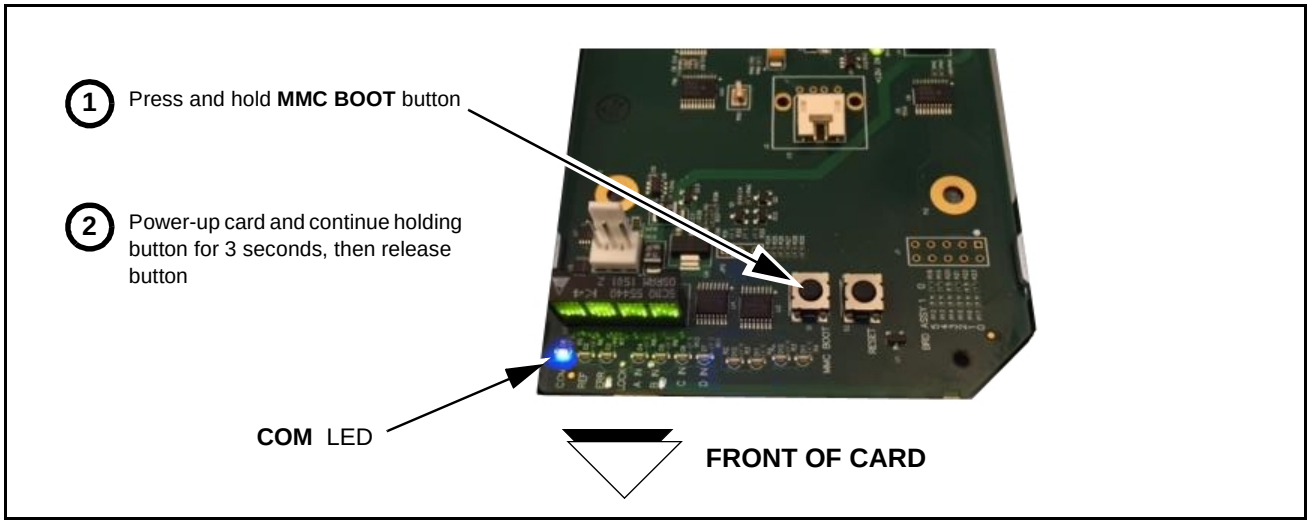


Figure 3-11 MMC Boot Button

3. With button now released, the card will begin reprogramming:
   - **COM** LED illuminates and remains illuminated.
   - When reprogram is complete, **COM** LED turns off, on, and then off again (entire process takes about 1-1/2 minute).

4. Remove power from the card (remove card from slot or power-down BBG-1000 Series unit).
5. Re-apply power to the card. The card/device will display as "***UNLICENSED***" in DashBoard/remote control.
6. In Dashboard or web remote control, go to **Admin** tab and click **Restore from SD Card**. After about 1/2-minute, the card license(s) will be restored and card will be using its most recently installed firmware.
7. Card/device can now be used as normal. On BBG-1000 Series unit, re-install top cover.

Contact and Return Authorization

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

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

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

See Contact Cobalt Digital Inc. (p. 1-20) in Chapter 1, "Introduction" for contact information.

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