



grass valley

A **BELDEN** BRAND

# **XVP-3901-DPI**

3G/HD/SD DPI INSERTER/EXTRACTOR  
WITH FRAME SYNC

## **Guide to Installation and Operation**

M886-3800-101

2016-10-20

[www.grassvalley.com](http://www.grassvalley.com)

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This equipment has been tested for verification of compliance with FCC Part 15, Subpart B requirements for Class A digital devices.

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- EN 55024 Immunity of Information Technology Equipment
- EN 61000-3-2 Harmonic current injection
- EN 61000-3-3 Limitation of voltage changes, voltage fluctuations and flicker
- EN 61000-4-2 Electrostatic discharge immunity
- EN 61000-4-3 Radiated electromagnetic field immunity – radio frequencies
- EN 61000-4-4 Electrical fast transient immunity
- EN 61000-4-5 Surge immunity
- EN 61000-4-11 Voltage dips, short interruptions and voltage variations immunity

*GUIDE TO INSTALLATION AND OPERATION*

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# 1 XVP-3901-DPI 3G/HD/SD DPI Inserter/Extractor with Frame Sync

## 1.1 Introduction

The XVP-3901-DPI from Grass Valley, a Belden Brand, is the perfect solution for digital program insertion (DPI) applications. It embeds SMPTE ST 2010 packets containing SCTE 104 DPI messages based on GPI triggers. It can also monitor embedded SMPTE ST 2010 packets for specific SCTE 104 split request messages and triggers the appropriate GPO. All DPI events can be monitored and logged through iControl.

Using the RS-422 serial port, the XVP-3901-DPI becomes an SCTE 104 injector and it can interface with an automation system to receive and insert a wider range of SCTE 104 messages. The card will return different acknowledge messages to the automation to indicate when the message has been received and when it has been inserted. This allows tracking and logging using the automation's as-run.

The support of AFD (Active Format Description) SMPTE ST 2016, VLI (Video Line Index) RP-186 and WSS (Wide Screen Signaling) allows the card to adjust its ARC automatically without any external intervention. It will also re-insert the proper AFD, VLI or WSS on the output along with other HANC and VANC information. With the integration of the frame sync, incoming feed signals can be synched to house and have the proper ARC when entering the facility. The XVP-3901-DPI also offers a video proc-amp with full YUV/RGB level controls and RGB gamut correction.

The XVP-3901-DPI provides audio capabilities with processing of up to 32 channels of audio, with automatic delay to keep lip-sync. It provides shuffling and down-mixing and four AES inputs/outputs for additional flexibility.

The XVP-3901 generates audio/video fingerprints for both outputs (via an iControl option) to detect and measure lip sync errors in a broadcast facility.

The XVP-3901-DPI allows up to 10 cards to fit in a Densité 3 frame. A bypass relay, on both the XVP-3901-75-3DRP-R and XVP-3901-110-3DRP-F rears, is available to automatically bypass the card's processing when the card loses power or if it is removed from the frame.

The XVP-3901-110-3DRP-F rear has integrated fiber I/O for applications where fiber connectivity is required. A fiber input/output cartridge is offered as an option. This integrates and makes fiber connectivity easier to install and configure. Once the cartridge is installed, the inputs or outputs are selectable through the control interface. The input of the card allows you to select between fiber and copper inputs. The outputs offer 3G/HD path on copper and the SD path on copper, but the fiber module allows you to select between the SD or 3G/HD outputs to be sent to each fiber connector.

All card parameters and statuses can be controlled or monitored through iControl.

## 1.2 Features

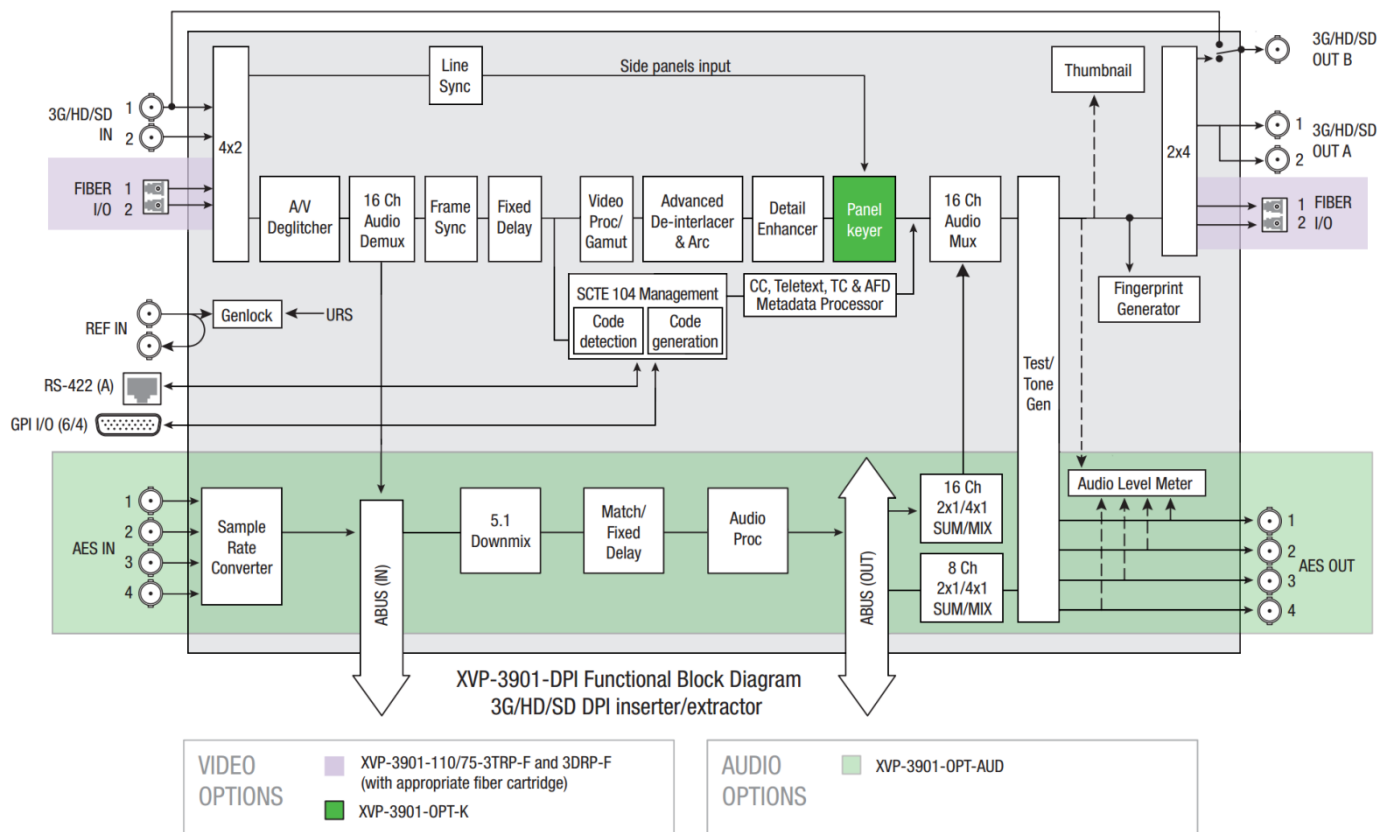
- Inserts SCTE104 messages into VANC as per SMPTE ST 2010
- Monitors and extracts SCTE 104 packets and triggers GPI
- 6 GPI inputs and 4 GPO outputs
- Serial port for SCTE 104 serial communication with an automation system such as Snell Morpheus, Florical Systems and DNF Controls GTP-32 Controls Processor
- Bypass relay on rear modules
- Offers a multi-rate 3G/HD/SD input and outputs
- Frame synchronizer and aspect ratio converter
- Supports 3G for both Level A (mapping 1) and Level B
- Flexible HD/SD/URS reference input

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- Advanced video de-interlacing for higher image quality
- User-programmable additional fixed video delay up to 15 frames
- Automatic ARC using AFD (SMPTE ST-2016), video index (SMPTE RP-186) and WSS
- Custom and fixed ARC presets
- Keyer option for filling black pillars and letter box
- Built-in proc amp with YUV/RGB color correction and legalizer
- Processes and converts ancillary data such as closed-captions (CEA-608-B/CEA-708B), teletext (ETSI EN 300 706/OP-47) and timecode.
- Optional optical fiber module on XVP-3901-110-3DRP-R-F rear
- Perfect audio/video synchronization plus additional audio fixed delay of up to 2 seconds
- Optional 16 channels of embedded full audio processing, shuffling and downmixing
- Offers 4 AES inputs and outputs
- Audio metadata insertion, extraction and processing
- Compatible with Grass Valley audio processing cards, including the UAP-1783, AAP-1741 and DAP-1781
- A/V fingerprint generation (an iControl option) for lip sync measurement.

### 1.3 Functional Block Diagram

The XVP-3901-DPI is a highly integrated 3G/HD/SD Digital Program Inserter/Extractor with frame synchronizer, aspect ratio converter and video/audio signal processor. It is similar to the XVP-3901-FS except that it does not have up/down/cross conversion capabilities and advanced audio processing capabilities.



**Figure 1.2** Functional block diagram XVP-3901-DPI



This chart shows the video formats supported by the XVP-3901-DPI at its inputs and outputs

XVP-3901-DPI									
Input \ Output		SD		HD				3G	
		525	625	720p50	720p59.94	1080i50	1080i59.94	1080p50	1080p59.94
SD	525	X							
	625		X						
HD	720p50			X					
	720p59.94				X				
	1080i50					X			
	1080i59.94						X		
	1080p23.98						X		
	1080pSF23.98						X		
	1080p25					X			
	1080p29.97						X		
3G	1080p50							X	
	1080p59.94								X

### 1.4 Front Card-edge Interface

The front card-edge of the XVP-3901-DPI incorporates three elements:

- Status LED (see [Card-Edge Status LED](#))
- Select Button (see [Local control panel](#))
- ABUS connector (see [ABUS Connection to Companion Audio Cards](#))

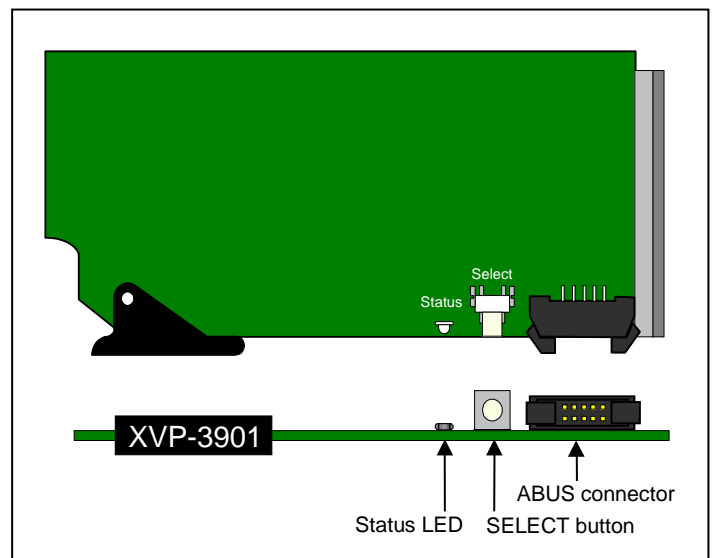


Figure 1.3 Front card-edge layout

## 2 Installation

### 2.1 Installation of Rear Connector Panels

The XVP-3901-DPI card is designed to fit into Grass Valley's Densité-3 frame.

Grass Valley Densité-series cards are each associated with a rear connector panel, which must be installed in the Densité frame before the card can be inserted. Two rear panels are available for the XVP-3901-DPI:

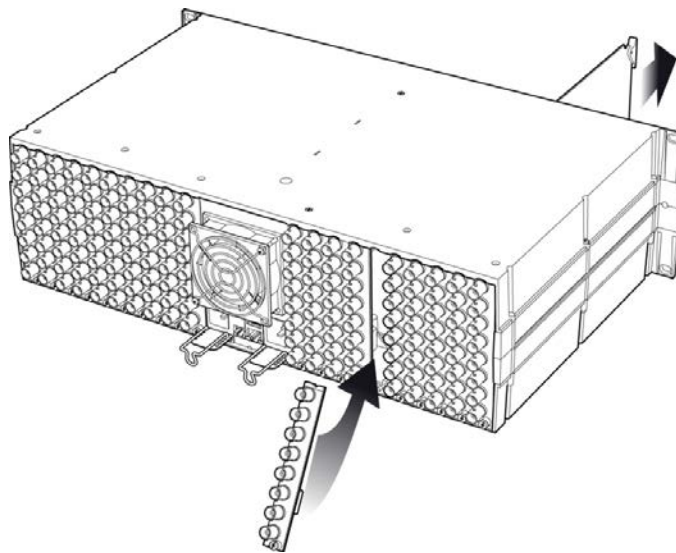
- XVP-3901-75-3DRP-R Double-slot-width panel with 75Ω audio and bypass relay.
- XVP-3901-110-3DRP-R-F Double-slot-width panel with 110Ω audio, bypass relay and fiber I/O.

See section 2.5 for details of the signal connections available on each of these panel types.

All cards and rear panels can be installed with the frame power on. The card has connectors which plug into a mid-frame mother board for distribution of power and for connection to the controller card, and a second connector which plugs directly into the rear connector panel for input and output.

***The rear connector panel must be installed with the card out of the frame.***

- To remove an existing card from the slot, tilt up the swivel handle on the front of the card to lever the connectors apart, then use the handle to pull the card straight out of the slot.



**Figure 2.1** Densité-3 frame – rear panel installation

#### ***To install the connector panel:***

1. If a card is installed in the slot whose rear panel is being changed, remove it as described above.
2. Remove the existing panel (either blank or belonging to an existing card that is being changed) by releasing the captive screw(s) at the bottom.

3. Position the new panel and secure it in place with the captive screw(s) at the bottom.

## 2.2 Card Installation

Once a matching rear connector panel has been installed, install the XVP-3901-DPI card as follows:

1. Open the front panel of the frame.
2. Slide the XVP-3901-DPI card into the slot and push gently on the handle to seat the connectors.

The card should be inserted into the right-most slot (as seen from the front of the frame) associated with the double-slot rear panel. Inserting the card into the wrong slot will not damage the card, and will be flagged by the on-card status LED flashing red to indicate that there is no connection to the rear panel.

3. Close the front panel of the frame.

## 2.3 Installation of the Optical Interface (option)

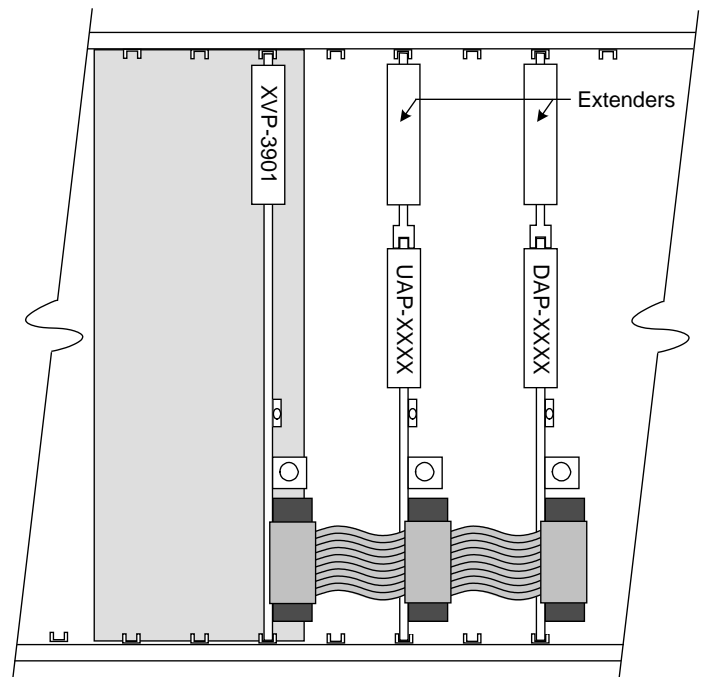
Refer to Annex 3 on page 80.

## 2.4 ABUS Connection to Companion Audio Cards

When the XVP-3901-DPI is used in conjunction with one or two companion audio cards (Grass Valley's AAP, DAP or UAP series), the ABUS flat cable must be installed between the ABUS connector of the XVP-3901-DPI and the connectors on the audio cards. The ABUS flat cable is supplied with the audio card.

Note that audio cards from the Densité 2RU series will require 3RU extenders for both the card and the associated rear panel in order to fit into the Densité 3RU frame with the XVP-3901-DPI.

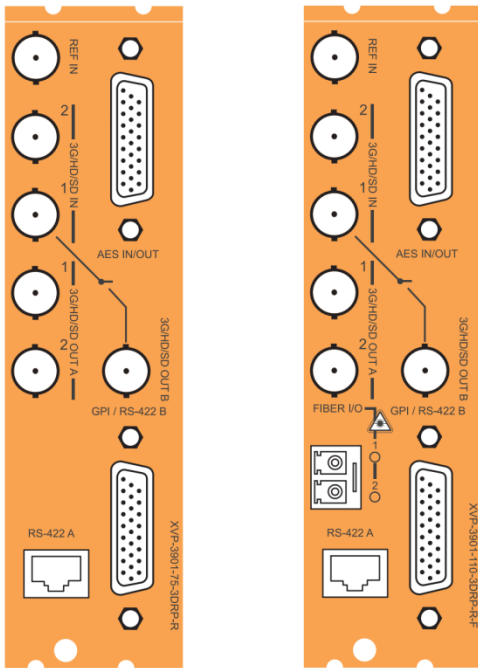
**Note:** If only one audio card is used, you must use the two end connectors on the ABUS cable, and leave the center connector unplugged



**Figure 2.2** ABUS flat cable installation

## 2.5 Rear Panels and Connectors

### 2.5.1 Images of rear connector panels



XVP-3901-75-3DRP-R

XVP-3901-110-3DRP-R-F

**Figure 2.3** XVP-3901-DPI Rear Panels

### 2.5.2 Summary of rear panel connections

The chart summarizes the connectors featured on each of the available XVP-3901-DPI rear panels.

XVP-3901-75-3DRP-R		
XVP-3901-110-3DRP-R-F		
CONNECTORS		
Ref IN	◆	◆
3G/HD/SD IN	2	2
3G/HD/SD OUT A	2	2
3G/HD/SD OUT B	1	1
AES I/O (110Ω balanced) on D-SUB	4/4	
AES I/O (75Ω unbalanced) on D-SUB		4/4
GPI (6 in/4 out) & RS-422 B on D-SUB	◆	◆
RS-422 A on RJ45	◆	◆
Fiber I/O module	◆	
Bypass Relay	◆	◆

### 2.5.3 Details of rear panel connections

#### REF IN – Studio reference input

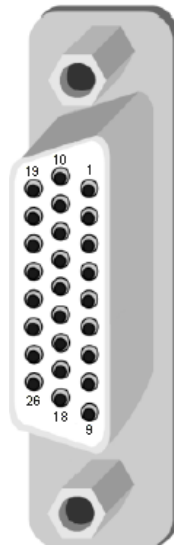
For external synchronization, connect a black studio reference signal to the BNC labeled **REF IN**.

The reference input must conform to SMPTE 170M/SMPTE 318M/ITU 624-4/BUT 470-6 for standard definition signals and SMPTE 274M / SMPTE 296M for high definition signals and is used to phase the HD/SD SDI outputs to the studio. A reference mismatch may occur if there is a difference between the input video format’s frame rate and the reference format’s frame rate. When a mismatch occurs, the output will freeze to the reference frame rate and produce an input error and the card-edge Status LED will turn red to indicate the mismatch.

Note that in the case of HD signals of the same frame rate, any reference signal may be used to genlock any output signal, regardless of scan type (progressive or interlaced). When a 720p/tri-level sync reference signal is used with an interlaced output, the output is synchronized but there may be a delay of one field depending on when the synchronization started.

#### AES IN / OUT – Discrete AES3 digital audio inputs and outputs (4/4)

The AES inputs and outputs connect via a 26-pin D-SUB connector. The two available rears present different impedances, as indicated in the rear designation.



XVP-3901-110-3DRP-R-F 110Ω rear	Pin #	XVP-3901-75-3DRP-R 75Ω rear
AES IN 1 (Hi)	1	AES IN 1
AES IN 1 (Lo)	10	GND
AES IN 2 (Hi)	2	AES IN 2
AES IN 2 (Lo)	11	GND
AES IN 3 (Hi)	3	AES IN 3
AES IN 3 (Lo)	12	GND
AES IN 4 (Hi)	4	AES IN 4
AES IN 4 (Lo)	13	GND
AES OUT 1 (Hi)	5	AES OUT 1
AES OUT 1 (Lo)	14	GND
AES OUT 2 (Hi)	6	AES OUT 2
AES OUT 2 (Lo)	15	GND
AES OUT 3 (Hi)	7	AES OUT 3
AES OUT 3 (Lo)	16	GND
AES OUT 4 (Hi)	8	AES OUT 4
AES OUT 4 (Lo)	17	GND
GND	19, 20, 21, 22, 23, 24, 25, 26	GND
N/C	9, 18	N/C

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### 3G/HD/SD SDI IN – Serial digital HD/SD input

Connect up to two serial digital video signals, conforming to the SMPTE 424M standard for 3G input signals, SMPTE 292M standard for HD input signals or SMPTE 259M standard for SD input signals, to the BNC labeled **HD/SD SDI IN**. The XVP-3901 will automatically switch to the detected line/frame rate format.

### 3G/HD/SD SDI OUT – Serial digital video outputs

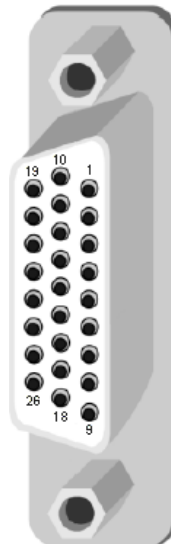
The XVP-3901 provides two pairs of 3G/HD/SD SDI video outputs on BNC connectors, labeled **3G/HD/SD SDI OUT A1 & A2**, and **3G/HD/SD SDI OUT B1 & B2**. The SDI video signal conforms to the SMPTE 424M, SMPTE 292M or SMPTE 259M-C standard.

### GPI– GPI I/O

The rear panel connector on a 26-pin D-SUB provides:

- 6 GPI: For SCTE-104 insertion
- 4 GPO: For SCTE-104 extraction.

GPI and GPO are both contact closure to ground.



Function	I/O	Pin #
GPI 1	In	14
GPI 2	In	5
GPI 3	In	15
GPI 4	In	6
GPI 5	In	7
GPI 6	In	17
GPO 1	Out	22
GPO 2	Out	23
GPO 3	Out	24
GPO 4	Out	25
n/a	-	26
n/a	-	18
n/a	-	19
n/a	-	11
n/a	-	12
n/a	-	21
GND	-	1, 2, 3, 4, 8, 9, 10, 13, 16, 20

### RS-422 A – Automation (RJ45 socket):



RS-422 Label	Pin #
RS422-TX+	1
RS422-TX-	2
RS422-RX+	3
RS422-RX-	6
N/C	4,5,7,8

**Fiber I/O – Fiber-optic inputs and outputs**

Rear panels whose part number ends in –F incorporate a fiber optic interface. The interface consists of two parts:

- A socket on the rear panel into which an SFP interface module is plugged
- An SFP (Small Form-factor Pluggable) module into which the optical fibers are plugged, and which incorporates the optical/electrical interface

The optical fibers must be terminated in an LC connector.

See [ANNEX 3](#) for instructions on installing and removing the SFP interface module, and for plugging and unplugging the LC-terminated fibers.

The current SFP modules supported are:

SFP Modules	Description
SFP-RR-LC	Dual Rx module with LC connector
SFP-TT-S13S13-LC	Dual Tx module at 1310 nm with LC connector
SFP-RT-S13-LC	Single Rx and Tx transceiver module at 1310 nm with LC connector
SFP-R-LC	Single Rx module with LC connector
SFP-T-S13-LC	Single Tx module at 1310 nm with LC connector

### 3 User Interface

#### 3.1 Control options

The XVP-3901-DPI can be controlled in three different ways:

- The local control panel and its push-buttons can be used to move through a menu of parameters and to adjust parameter values (see section 4).
- Grass Valley’s iControl system can be used to access the card’s operating parameters from a remote computer, using a convenient graphical user interface (GUI) (see section 5).
- Grass Valley’s RCP-200 panel.

#### 3.2 Card-Edge Status LED

The status monitor LED is located on the front card-edge of the XVP-3901-DPI, and is visible through the front access door of the DENSITÉ frame. This multi-color LED indicates the status of the XVP-3901-DPI by color, and by flashing/steady illumination.

The chart shows how the various error conditions that can be flagged on the XVP-3901-DPI affect the LED status.

- If a cell is gray, the error condition cannot cause the LED to assume that status
- If more than one LED status is possible for a particular error condition, the status is configurable. See Section 5.18 for details.
- The factory default status is shown by a ⚙️

The LED will always show the most severe detected error status that it is configured to display, and in the chart error severity increases from left to right, with green representing no error/disabled, and flashing red the most severe error.

Error Condition	LED Status			
	Green	Yellow	Red	Flashing Red
Cooling Fan 1 error				⚙️
Cooling Fan 2 error				⚙️
Health Error				⚙️
No Rear				⚙️
Input 1 video error			⚙️	
Input 2 video error			⚙️	
Input 2 format mismatch			⚙️	
Input 2 failover	⚙️			
Fiber selection error			⚙️	
Carrier 1 detect error			⚙️	
Carrier 2 detect error (keyer mode)	⚙️			
Carrier 2 detect error (switcher mode)			⚙️	
Carrier 2 detect error (failover mode)			⚙️	
Reference missing			⚙️	

(continued)



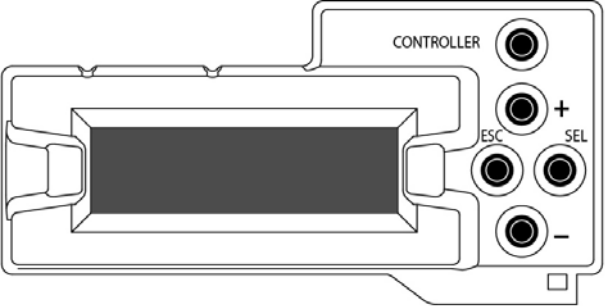

Error Condition	LED Status			
	Green	Yellow	Red	Flashing Red
Reference mismatch			✳	
Card System error			✳	
Manual Freeze		✳		
Test Mode		✳		
AES 1 presence error	✳			
AES 2 presence error	✳			
AES 3 presence error	✳			
AES 4 presence error	✳			
Silence detected Channel 1	✳			
Silence detected Channel 2	✳			
Silence detected Channel 3	✳			
Silence detected Channel 4	✳			
Silence detected Channel 5	✳			
Silence detected Channel 6	✳			
Silence detected Channel 7	✳			
Silence detected Channel 8	✳			
Silence detected Channel 9	✳			
Silence detected Channel 10	✳			
Silence detected Channel 11	✳			
Silence detected Channel 12	✳			
Silence detected Channel 13	✳			
Silence detected Channel 14	✳			
Silence detected Channel 15	✳			
Silence detected Channel 16	✳			

✳ : Factory default.

If the LED is Flashing Yellow, it means that the card is selected for local control using the Densité frame's control panel. See Section 4 for details.

## 4 Local control using the Densité frame control panel

There are two types of local control panel:

Panel type	Frame models	Appearance
Physical	Densité-3, Densité-3+FR1  <i>Open the frame door to access the panel.</i>	
Touch screen	Densité 3+FR4, GV Node  <i>Access the panel through an aperture in the frame door.</i>	

The local control panel is fastened to the front of the controller card.

- The physical panel is accessed by opening the front door of the frame.
- The touch screen panel is accessed through an aperture in the frame door.

The panel consists of a display capable of displaying two lines of text, each 16 characters in length, and four pushbuttons. The functionality of the pushbuttons is as follows:

[+] [-] Used for menu navigation and value modification

[SEL] Gives access to the next menu level. When a parameter value is shown, pushing this button once enables modification of the value using the [+] and [-] buttons; a second push confirms the new value

[ESC] Cancels the effect of parameter value changes that have not been confirmed; pushing [ESC] causes the parameter to revert to its former value.

Pushing [ESC] moves the user back up to the previous menu level. At the main menu, [ESC] does *not* exit the menu system. To exit, re-push the [SEL] button for the card being controlled.

If no controls are operated for 30 seconds, the controller reverts to its normal standby status, and the selected card's STATUS reverts to its normal operating mode.

### To assign the local control panel to the XVP-3901-DPI:

- Physical Panel: Push the SELECT button on the XVP-3901-DPI card edge (see Section 1.4).
- Touch-screen panel: In the home screen, touch the virtual button corresponding to this XVP-3901.

The STATUS LED on the XVP-3901 flashes yellow, and the touch-screen status shows yellow for the XVP-3901.

Use the control panel buttons to navigate through the menu, as described above.

See [ANNEX 1 – XVP-3901 Local User Interface](#) for a complete menu listing.

## 5 Remote control using iControl

The operation of the XVP-3901-DPI may be controlled using Grass Valley's iControl system.

- This manual describes the control panels associated with the XVP-3901-DPI and their use.
- Please consult the iControl User's Guide for information about setting up and operating iControl.

In iControl Navigator or iControl Websites, double-click on the XVP-3901-DPI icon to open the control panel.

### 5.1 The iControl graphic interface window

The basic window structure for the XVP-3901-DPI is shown in figure 5.1. The window identification line gives the card type (XVP-3901) and the slot number where the card is installed in its Densité frame.

There are four main sections in the window itself, identified in figure 5.1:

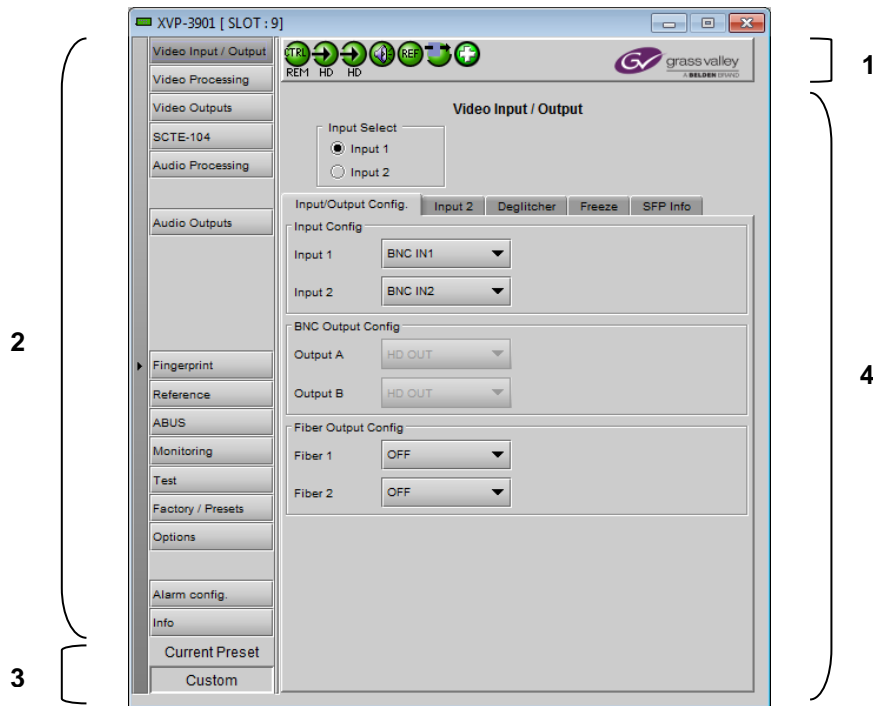


Figure 5-1 XVP-3901-DPI iControl graphic interface window

**Section 1.** The top section displays seven icons on the left. These icons report different statuses such as card communication status, input signal and reference signal format and statuses. In some instances, they relate to conditions defined through parameters settings.



Icon # 1 2 3 4 5 6 7

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Move the mouse over an icon and a status message appears below the icon providing additional information. If there is an error, the error status message appears in the message area without mouse-over.










- If there are multiple errors, the error messages cycle so all can be seen
- The icon whose status or error message is shown is highlighted with a mauve background



The table below describes the various status icons that can appear, and how they are to be interpreted.

- In cases where there is more than one possible interpretation, read the error message in the iControl window to see which applies.

**Table –iControl Status Icon interpretation**

<b>Icon #1 – Manual Card Configuration</b>	
	Remote card control activated. The iControl interface can be used to operate the card
	Local card control active, The card is being controlled using the Densité frame control panel, as described in section 4. Any changes made using the iControl interface will have no effect on the card.
<b>Icon #2 – Input 1 status</b>	
	Signal detected and valid. <ul style="list-style-type: none"> <li>• Beneath the icon, the format will be indicated as 3G, HD or SD, and the specific format details will be listed if the cursor is moved over the icon.</li> </ul>
	Signal absent No rear Reference mismatch Video/TRS error
<b>Icon #3 – Input 2 status</b>	
	Signal detected and valid
	Signal absent No rear Reference mismatch Format mismatch with output format (Key/Fill mode) Video/TRS error

<b>Icon #4 – Audio Status</b>	
 (green)	Audio OK
 (yellow)	Yellow alarm condition detected on 1 or more channels
 (red)	Red alarm condition detected on 1 or more channels
 (gray)	All audio disabled
 (red)	Card System Mismatch – the audio cards detected on the ABUS do not match the configuration selected in the ABUS panel
<b>Icon #5 – Reference</b>	
 (green)	Reference OK. Mouse over to see the source of the reference, and its format, e.g. External, NTSC
 (red)	Reference missing
 (gray)	Reference absent
<b>Icon #6 – Operation Mode</b>	
 (green)	Operation mode: process – normal processing of the input signal
 (yellow)	Operation mode: TEST – color bar and audio test tones enabled (see Sect. 5.15)
 (yellow)	Operation mode: Manual Freeze ON (see Sect. 5.2.4 – Freeze tab)

Icon #7 – Health Monitoring	
 (green)	Hardware OK
 (red)	Hardware Health Monitoring (Fan1, Fan2, Hardware fault detected) If this icon appears red, return the card to Grass Valley and specify the error code.

**Section 2.** The left portion of the window contains access buttons for all the parameter groups, which become highlighted when they are selected; the main panel (4) then displays the group’s set of parameters. Each of the groups is described in detail below.

**Section 3.** The lower left corner of the window identifies the Preset currently in use or “Custom” if none is applicable.

**Section 4.** The main panel contains all the parameters specific to the group selected. It may contain several tabs to help manage the different parameters.

Each of the panels associated with the groups accessed from the buttons in Section 2, and shown in Section 4, is described individually in the following sections.

## 5.2 Video Input/Output panel

This panel allows input selection, second input operation mode selection, and control of the deglitcher and freeze functions.

*Input Select:* choose one of the two inputs connected to the rear panel.

- Input 1&2 assignments are done in the Input/Output Config Tab below.
- Note that the XVP will switch the inputs on the switch line only when using this control and not while using the Input Config controls.
- The video input status in the top section (icon #2 and #3) refers only to the inputs selected here.



Figure 5-2 Video Input/Output panel

## 5.2.1 Input/Output Config Tab

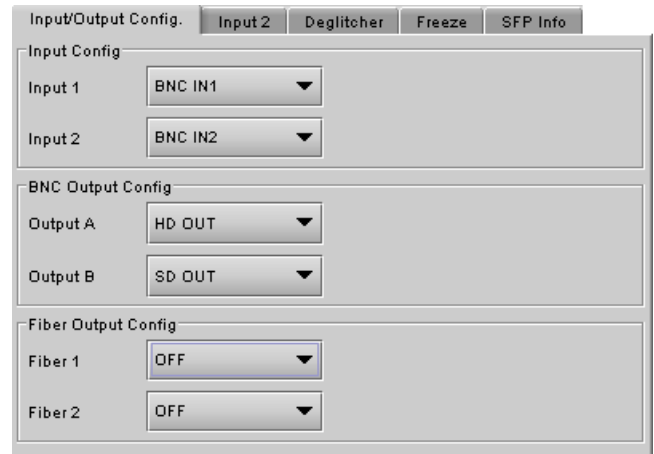
*Input Config:* use the pulldowns to select the rear panel input that will be used when the inputs are selected:

- BNC IN – use one of the electrical inputs
- Fiber IN – use one of the fiber optic inputs (1, 2 or both will be listed)
- The pulldowns are greyed and non-functional if the installed rear panel does not incorporate a fiber SFP socket
- If the Fiber Input name is red in the pulldown, it indicates that an appropriate fiber module has not been detected in the SFP socket

*BNC Output Config:* Use the pulldowns to select whether the named output will be HD or SD.

*Fiber Output Config:* Use the pulldowns to turn the fiber transmitters for each output ON (either HD OUT or SD OUT) or OFF

- This section of the panel only appears when a rear module with a fiber SFP socket is installed
- If the selection is invalid (e.g. no appropriate transmitter installed in the SFP socket) then the selection will be red in the pulldown and a warning message will appear if it is selected
- Information about the installed SFP module can be found in the SFP Info tab, which only appears when a rear module with a fiber SFP socket is installed

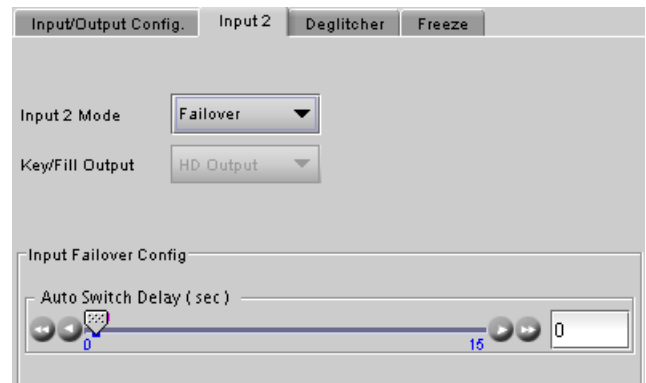


**Figure 5-3** Video Input/Output – I/O Config tab

## 5.2.2 Input 2 tab

*Input 2 Mode:* Specify the operation mode for the second input using the pulldown. Available choices are:

- **2x1 Switch:** when this mode is selected, the card can be manually switched between the 2 inputs, using the radio buttons in the *Input Select* area. Keep in mind that all current settings (ARC, audio, etc.) will remain and be applied to input 2.
- **Fail Over:** when this mode is selected, the card will automatically switch from input 1 to input 2 when input 1 is lost for a delay longer than the *Auto Switch Delay* set below.
  - All current settings (ARC, audio, etc.) will remain and be applied to input 2.
  - The card will remain on input 2, even if input 1 returns to normal, until it is manually reset to input 1



**Figure 5-4** Video Input/Output – Input 2 tab

*Auto Switch Delay (sec):* using the slider, set the *Auto Switch Delay*, from 0 to 15 seconds in steps of 1 second.

Some points to note for the Failover mode:

- The Failover mode only switches from input 1 to input 2, not from 2 to 1.

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- If input 2 and Failover mode are both selected, an error is reported by iControl and the card edge LED turns red. The second input is always required in this mode.
  - Both input signals must be present – the system cannot switch to input 2 if there is no signal there – and the absence of either of the signals will be flagged as an error (icon #2 and card-edge LED red)
  - If there is no input 2, the iControl carrier detect icon for input 2 will be red, but no input error will be flagged.
- **Key / Fill:** when this mode is selected, the card uses input 1 as the main video input, and the second input is used as background graphics to the output side panels or letterbox. For this mode to function properly:
- The second input must be the same format as the output.
  - In order for the two signals to be properly phased at the keyer, it is necessary for the second input to be timed between 414 pixels and 1 line+413 pixels ahead of the output timing.
  - If the second input is lost, the specified background color is used until the input comes back.
  - Input 2 selection in the Input Select area is disabled in the Key/Fill mode.

The format and status for the second input is displayed in an icon at the top of the interface.

*Key/Fill Output:* Use the pulldown to select whether the Key/Fill output will be SD or HD.

### 5.2.3 Deglitcher tab

When the Deglitcher is active, the card supports a hot-switch between two signals (either on the same input, or between the card's two inputs) without producing a freeze on the frame sync, and without producing artifacts on the output.

**The deglitcher must be disabled when the input is asynchronous to the reference. Otherwise, it will create audio and video glitches at the output.**

*Mode:* select OFF or ON from the pulldown.

- Note that the Deglitcher cannot be enabled for 1080p23, 1080p23sF, 1080p25 and 1080p29 sources

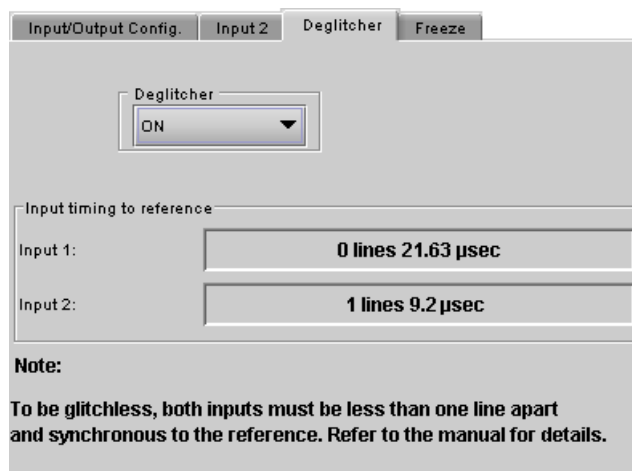
For this mode to function correctly, the following requirements must be met:

- The two inputs must be synchronized to the reference
- They must be phased within one line of each other
- They must be phased to within +/- ½ line of the HREF of the reference signal

The offset from the VREF can be variable, but a distance of greater than 10 lines could create an artifact in the active video. If the two signals are more than 1 line apart, we will see a vertical jump at the moment of switching that is proportional to the number of vertical lines of offset between the two signals. This will last for only one frame. There may also be problems in the transition when in the AFD automatic or forced mode.

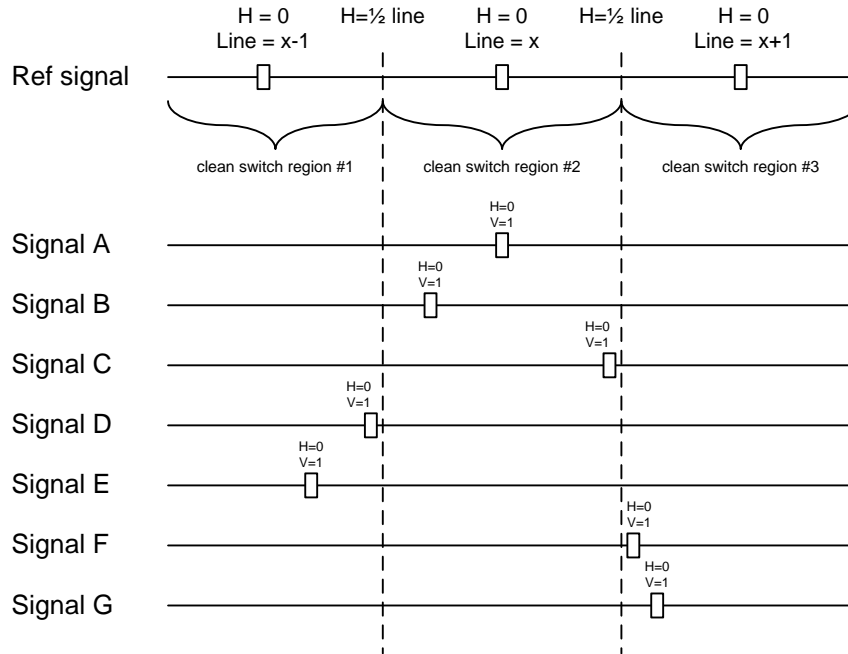
When a reference is present and the deglitcher is active, the card reports the difference in timing between the input and the reference when the transition occurs.

- If the reference is missing when the deglitcher is activated, the Input timing to reference box will indicate “Missing reference” in red, and the reference status icon at the top of the iControl window will turn red and show the message “Reference missing”.
- If the deglitcher is OFF, the reference status icon will be grey, and its message will read “Reference absent”



**Figure 5-5** Video Input/Output – Deglitcher tab





To perform a glitch-free switch between two sources, they must be in the same clean switch region. A clean switch region is contained within  $\pm \frac{1}{2}$  line about an H=0 point in the reference signal, as shown by the dotted lines in the figure. There is a clean switch region centered on every H interval. As you can see, vertical alignment with the reference is not important for the deglitcher to operate properly.

You may switch between signals A, B or C, without any glitch, and also between signals D ↔ E and signals F ↔ G. Any other transition, like A ↔ D, will cause a vertical image shift for one frame.

To determine whether a clean hot switch is possible, you need to determine whether the two input signals lie in the same clean switch region. There are two ways to measure the position of the signals with respect to the reference:

- Use the deglitcher tab in iControl (Input → Deglitcher)
- Use the controller menu in Appendix 2 (video → timing → in timing to ref).

When the deglitcher mode is on, each of these sources will display the alignment offset between the reference signal and the input signal. Knowing the offset for both input signals, you can determine if they are in the same clean switch region. If so, any hot-switch between those two signals will be glitch less.

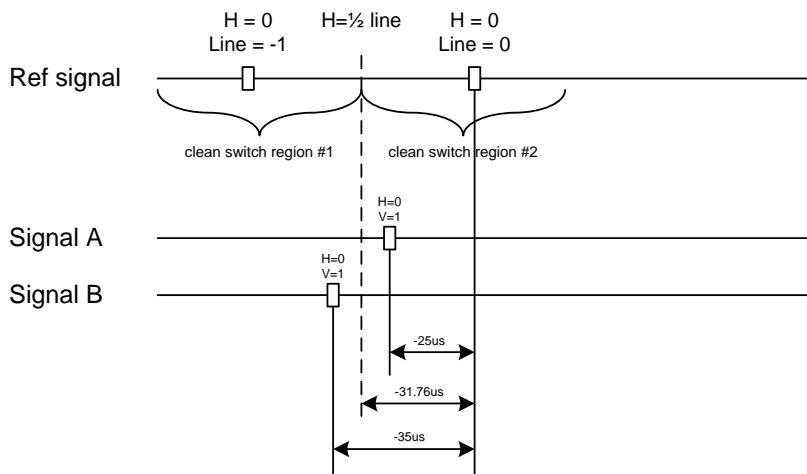
To determine the limits of a clean switch region, you must know the input's line length in  $\mu\text{s}$ . The first region is delimited by  $+\frac{1}{2}$  line and  $-\frac{1}{2}$  line of the reference. For example, with an SD (525) signal the line length is  $63.5 \mu\text{s}$  and so the first region lies between  $-31.76 \mu\text{s}$  and  $31.76 \mu\text{s}$ . Other regions can be found by adding or removing a multiple of line length to the two boundaries.

Example: for an SD (525) input signal, we have these clean switch regions:

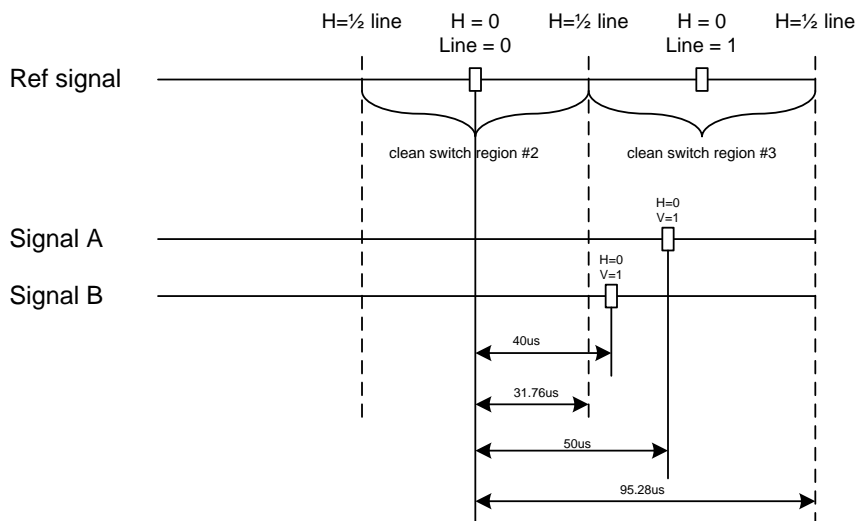
- 1 line and  $-31.76 \mu\text{s}$  to 0 line and  $-31.76 \mu\text{s}$
- 0 line and  $-31.76 \mu\text{s}$  to 0 line and  $31.76 \mu\text{s}$
- 0 line and  $31.76 \mu\text{s}$  to 1 line and  $31.76 \mu\text{s}$
- etc.

**Practical examples:**

*Example 1:* we have two SD (525) sources, one that indicates an offset of  $-25\ \mu\text{s}$  with respect to the reference (A) and the other an offset of  $-35\ \mu\text{s}$  (B). We know that a clean switch region limit is present at  $-\frac{1}{2}$  line, which corresponds to  $-31.76\ \mu\text{s}$ . We can now determine that this switch will not be clean, because the two sources are on opposite sides of the limit, and are therefore not in the same clean switch region.



*Example 2:* We have two SD (525) sources, one that indicates an offset of  $50\ \mu\text{s}$  with respect to the reference (A) and the other an offset of  $40\ \mu\text{s}$  (B). We know that a clean switch region limit is present at  $+\frac{1}{2}$  line and another one at  $\frac{1}{2}$  line plus one line. These correspond to  $31.76\ \mu\text{s}$  and  $95.28\ \mu\text{s}$ . We can now determine that this switch will be clean, because the two sources are inside the same clean switch region.



**5.2.4 Freeze tab**

*Freeze type:* This is a pull-down menu with four options – FIELD 1, FIELD 2, FRAME and BLACK. It determines the manner in which the XVP-3901 responds to a manual freeze, a video input switch (“hotswitch” as defined by SMPTE recommended practice RP-168, revised January 2002), a loss of input signal or other input errors. The four possible options yield the following results:



**Figure 5-6** Video Input/Output – Freeze tab

Freeze Option	Auto Freeze Mode	Manual Mode
• Field 1	Freeze to last valid FIELD	Freeze to last valid FIELD 1
• Field 2		Freeze to last valid FIELD 2
• Frame		Freeze to last valid FRAME
• Black	Freeze to BLACK	

*Auto Freeze:* This pulldown (ON/OFF) enables or disables the auto freeze function. In Auto Freeze mode, a reference must be present to ensure a glitchless output when a freeze is activated. There are only two freeze possibilities in Auto mode: freeze to last valid Field or freeze to black. When Auto Freeze mode is disabled, the content of the active picture will reflect whatever garbage is present at the input but, if a reference is present, the output synchronization will be maintained to avoid unlocking downstream equipment.

*Manual:* Select this checkbox to immediately freeze the output according to the mode selected in the Freeze Type pull-down.

**Note:** The manual freeze setting is saved in the non-volatile memory of the card. If the manual freeze is activated and the power is cycled, the card will start in freeze mode at the next power-up and the output will be invalid. Just turn off the manual freeze to restore the output.

In all cases, audio will be muted when there is an input error. See the audio section for more information.

### 5.2.5 SFP Info tab

This tab only appears when a rear panel with a fiber SFP socket is installed. These panels are identified by the suffix -F in the panel name.

The data boxes in this tab identify the vendor name and part number, and the incoming optical power in the case of a receiver.

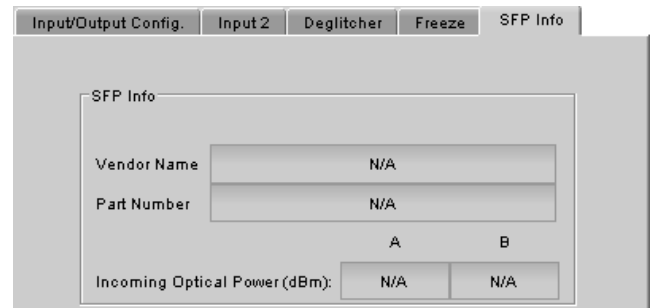


Figure 5-7 Video Input/Output – SFP Info tab

### 5.3 Video Processing panel

This panel contains color-correction parameters that apply to the input signal. You can configure the video processor differently for an SD input than for a 3G/HD input. The card will remember the different parameters and will load them automatically without user intervention based on whether the video input is SD or 3G/HD. Ensure the card has a video signal of the desired format before changing the configuration.

**Proc Mode:** Select whether the processing controls will be presented in YCbCr or RGB format.

- It is important to understand that gain/offset values from the current Proc Mode will be applied to the newly selected mode. This may cause adverse effect. To avoid it, return the gain/offset values to their default values (zero).

**RGB Gamut:** When ON, all illegal YCbCr colors in the RGB space will be clipped to a legal value.



Figure 5-8 Video Processing panel – Basic tab

#### 5.3.1 Basic tab

**All Gain:** Sets Luma and Chroma gains, or G, B and R gains to a specific value. When other gains are individually set, ALL GAIN reflects the average value of the combined gains.

The choice of processing mode made at the top of the panel determines what other controls are provided. The table below lists the sliders and the available control ranges.

- For gain control, a nominal value of 0 represents 100% gain, while -800 represents 0% gain, and +800 represents 200% gain.

Y Cb Cr mode	
Slider name	Range
All gain	-800 to +800
Y Gain	-800 to +800
Chrominance Gain	-800 to +800
Black Offset	-100 to +100
Hue (degrees)	-180 to +180

RGB mode	
Slider name	Range
All Gain	-800 to +800
G Gain	-800 to +800
B Gain	-800 to +800
R gain	-800 to +800

### 5.3.2 Advanced tab

This tab provides individual controls for each of these parameters.

Y Cb Cr mode		RGB mode	
Slider name	Range	Slider name	Range
Y Gain	-800 to +800	G Gain	-800 to +800
Cb Gain	-800 to +800	B Gain	-800 to +800
Cr Gain	-800 to +800	R Gain	-800 to +800
Y Offset	-100 to +100	G offset	-100 to +100
Cb Offset	-100 to +100	B Offset	-100 to +100
Cr Offset	-100 to +100	R Offset	-100 to +100

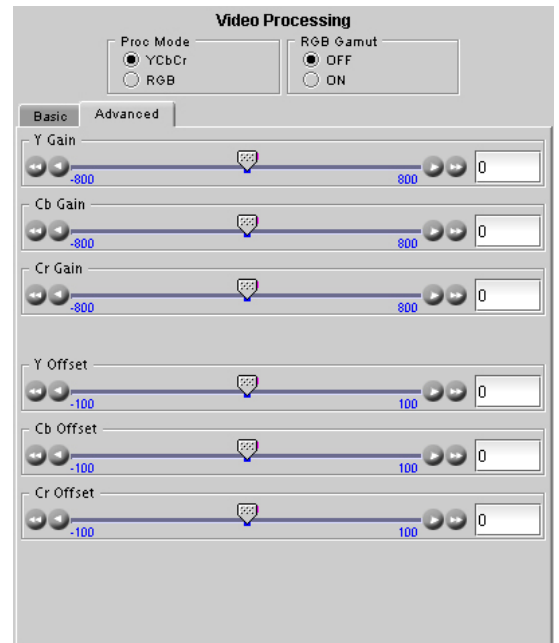


Figure 5-9 Video Processing – Advanced tab

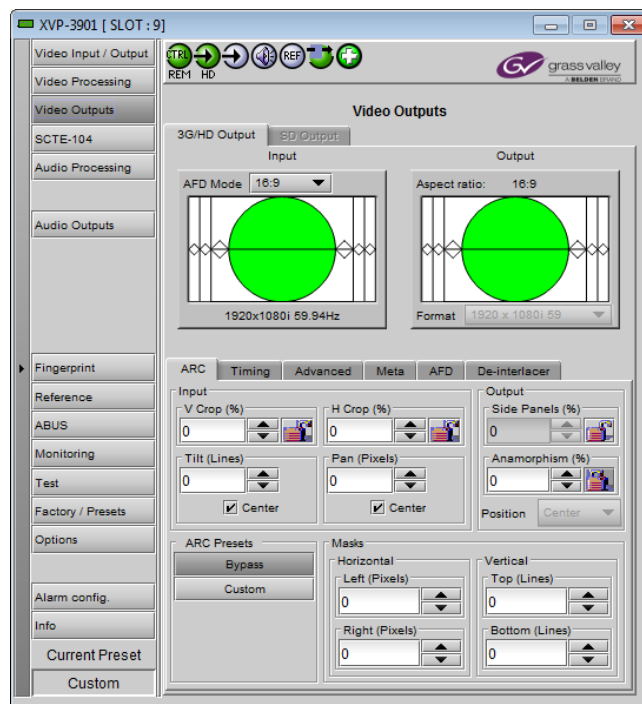
## 5.4 Video Outputs panel – 3G/HD Output tab

This panel allows control over several aspects of the video output:

- aspect ratio conversion
- timing control
- image quality processing
- metadata insertion.

**Note that since the XVP-3901-DPI does not include up/down/cross functionality, only limited functionality will be provided in this panel. Furthermore, this panel will be available only when the input video signal is HD or 3G, otherwise it will be dimmed.**

The upper portion of the panel is occupied by two video screen images, labeled *Input* and *Output*. These screens do not show the actual video being processed by the XVP-3901-DPI, but rather show graphic images that represent the geometric aspects of the input signal and the output that results after it is exposed to the current ARC processing functions. The image is a green circle on a white background; the circle is used because it is easy to see if it is asymmetrical. Lines on the images indicate protected areas for the AFD implementation.



**Figure 5-10** Video Outputs – 3G/HD Output

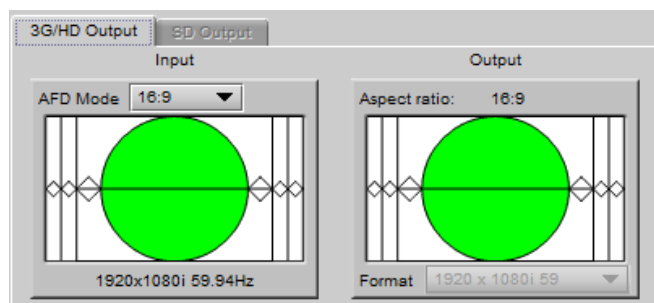
The ARC processing in the XVP-3901-DPI allows a wide range of symmetrical and asymmetrical picture size modification, coupled with cropping and background addition, to be applied to an input signal.

When the Input AFD Mode is set to *Auto*, all the ARC settings are set automatically according to the AFD flag (see the table in Annex 2 beginning on page 76) and cannot be changed by the user.

- There are some exceptions – with certain input AFD codes the masks can be customized. Each mask can be customized for each different AFD code allowing different mask settings according to each specific code. For certain AFD codes that are less used, the masks cannot be configured and will be de-activated.

### The Input Screen

The *Input* preview screen shows the portion of the input image which will be presented at the XVP-3901-DPI output. It has a pull-down *AFD Mode* menu at the top right corner through which the user specifies how AFD (Active Format Descriptor) information will be handled. Available choices are: [16:9, Auto, Forced] when HD inputs.



**Figure 5-11** Screens for 3G/HD output

**Note 1 – Auto mode:** When Auto is selected, all the ARC values are automatically set based on the AFD flag detected at the input, and the ARC controls and presets described below are **disabled**. Annex 2 shows the AFD functions implemented. If no AFD flag is detected at the input, the card uses the Default AFD flag specified in the AFD tab

**Note 2 – Forced mode:** Forced mode is useful when the input AFD flag is unreliable, missing or if the user wants a simple way to force the aspect ratio conversion. The function is the same as the Auto mode, except that the incoming AFD flag is ignored, and a user-specified forced flag is used instead. As in the Auto mode, the ARC controls and presets described below are **disabled**.

The input screen shows how much of the input signal will appear at the output after the ARC processing in the XVP-3901. It does so by showing any cropped portions of the image in blue.

### The Output Screen

The output screen shows the final result of the ARC processing.

- The side panels and letterbox regions are shown in the selected background color
- The masks are shown in Gray

3G/HD output – A pull-down menu is at the bottom of the screen displays the format of the video output which fixed according to the input video format according to the chart in Section 1.3. This value cannot be changed.

## 5.4.1 3G/HD Output – ARC tab

Under the ARC (Aspect Ratio Conversion) tab, several sub-sections are found allowing extended control over how the output will be displayed. Note that limited presets are available as input video format is limited to HD/3D in the XVP-3901-DPI which the same aspect ratio than the video output.

### 5.4.1.1 Input sub-section

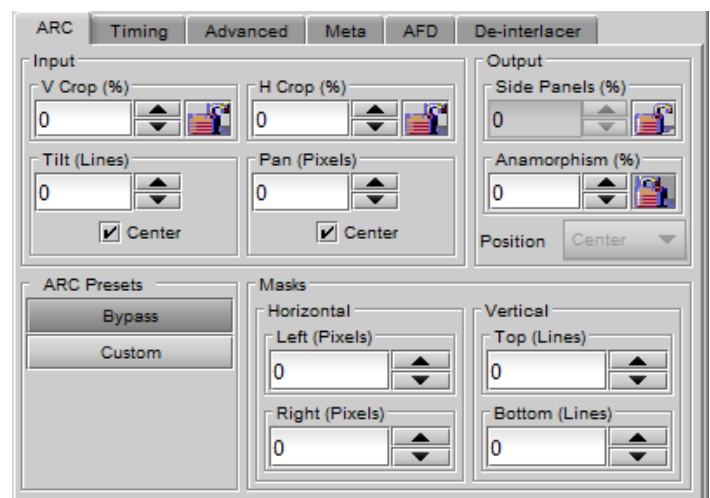
*Input: Crop – Horizontal and Vertical*

The crop controls allow selection of a portion of the original image – the amount of horizontal and vertical cropping is expressed as a percentage of the size of the original image.

The user can manually adjust the level of horizontal and vertical cropping. Horizontal cropping is done on an 8-pixel basis. Vertical cropping is done on 4-line basis. To achieve non-symmetrical vertical or horizontal cropping, uncheck the *Center* box underneath and position the image using the *Tilt* function described below.

Input cropping changes the scaling factor between the input and the output. If we crop the input (H&V) by 10%, the output image is resized and scaled by +10%. By providing different H and V cropping, the user can produce an anamorphic image.

The padlock icon appearing next to the data window allows the data to be “locked”. See the paragraph *Locking controls* under *Output sub-section* below for a discussion of this option.



**Figure 5-12** Video Output 3G/HD - ARC tab

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### *Input: Tilt*

Once a smaller window has been established by cropping the input signal, it can be moved vertically (*Tilt*, expressed in lines) within the original image to place the desired portion of the image in view. By default, a *Center* check box beneath the Tilt scroll box forces the cropping window to be centered on the input window. When it is checked, the necessary Tilt value will be calculated and displayed in the Tilt data window. You cannot tilt if the cropping value is zero.

### *Input: Pan*

Once this smaller window is established, it can be moved horizontally (*Pan*, expressed in pixels) within the original image to place the desired portion of the image in view. A *Center* check box beneath the Pan scroll box forces the cropping window to be centered on the input window. When checked, the necessary Pan value will be calculated and displayed in the data window. You cannot Pan if the cropping value is zero.

### **5.4.1.2 Output sub-section**

#### *Output: Side Panels*

This scrollable data entry box is used to shrink the width of the image so that the output image has blanked areas on each side of the displayed picture, which occupy the indicated percentage of the screen width. These areas are symmetric about the center, so a setting of 25% side panels would show a bar 12.5% of the screen width on each side of the image. 25% is the maximum value; entering a smaller value reduces the width of the side panels, but crops the image top and bottom. This control is disabled when the input is 16:9.

#### *Output: Anamorphism*

This control box allows the output image to be resized asymmetrically. Anamorphism is expressed in percent, where positive values indicate an increase in width with respect to height, and negative values a decrease in width with respect to height.

#### *Output: Position*

This pull-down allows the positioning of the output picture when side panels are in use. The picture can be moved totally to the left, centered or totally to the right. This control is not available in Auto AFD mode or Forced AFD mode. The picture will be centered by default when an ARC Preset is selected.

#### *Locking controls*

Represented by padlock icons, these buttons allow the *V Crop*, *H Crop*, *Side Panels* and *Anamorphism* controls to be "locked". When a control is locked, user access to that control is disabled. Changes to unlocked controls will not affect the data values of locked controls. There is some interactivity within the locking function, as follows:

- If either *V Crop* or *H Crop* is locked, *Anamorphism* is unlocked.
- If either *Side Panels* or *Anamorphism* is locked, the other is unlocked, along with *V Crop* and *H Crop*.

### **5.4.1.3 Presets sub-section**

Note that limited presets are available as input video format is limited to HD/3D in the XVP-3901-DPI which the same aspect ratio than the video output. You can selected between *Bypass* or *Custom*.

### **5.4.1.4 Masks sub-section**

#### *Mask: Horizontal and Vertical*

Sometimes with aspect ratio conversion, some of the edges of the original image are exposed in the output signal. Often, there will be artifacts in the source along these edges, extending for several lines vertically or several pixels horizontally after conversions. Masks are adjustable "curtains" which can be used to frame the output image, covering up the edge artifacts and leaving a clean transition from image to mask.



Four scroll boxes with data windows for reporting and direct data entry are used to set the mask position on the four sides of the output image. Top and bottom position are set in lines, while left and right position are set in pixels.

Masks should be adjusted by viewing the output on a video monitor and positioning the masks to cover edge effects with a minimum loss of clean picture content. Usually masks are the final adjustment to be made. The masking is shown on the top right Output screen by graying out the masked portion. Note that mask – or Background - color may be changed in the *Advanced* tab. The maximum amount of masking that can be introduced depends on the image format, and is measured starting from the edges of the displayed image, as shown in the following table. Masks can cover a maximum of 25% of the active area.

**Note:** all masks are adjusted in steps of 2 pixels or 2 lines. *Available Presets for various AFD Mode selections (16:9 output)*

### 5.4.2 3G/HD Output – Timing tab

The Timing tab provides access to timing adjustments which affect the signal outputs. There are two slider controls, each with a data reporting box which shows the current value, and into which values can be typed directly. The total delay is reported at the top of the window.

*Vertical (lines):* With this adjustment, a value ranging from –16 to +15 lines compared to the reference or the processing delay, may be set. This adjustment can be used in conjunction with the horizontal timing adjustment.

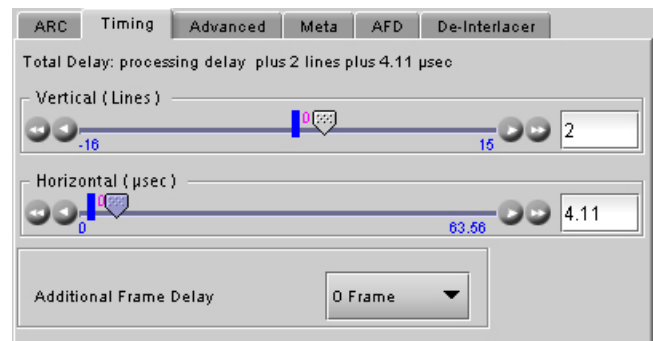
*Horizontal ( $\mu$ s):* With this adjustment, a value ranging from zero to the equivalent of 1 horizontal line in the current output format compared to the reference or the frame boundary may be set.

*Additional Frame Delay:* This parameter affects the overall processing delay of the card. It adds supplemental frame delay to the current processing delay. This parameter will add a delay ranging from 0 to 15 interlaced frames (steps of 33 ms in 59.94 Hz and 40 ms in 50 Hz) to the current processing delay. Without a reference, the normal processing delay is 1 frame. You can extend this delay up to 16 frames if the additional delay is 15. With a reference, up to 15 frames can be added to the frame sync delay which depends on the timings between the input and the reference.

Note that, in order to compensate for the processing delay of a Dolby-E/Dolby Digital decoder or a Dolby-E encoder installed on the XVP-3901-DPI or on the companion audio card, the additional frame delay must be set to at least one (1) frame. On the other hand, if a Dolby Digital encoder is installed, the additional frame delay must be set to at least six (6) frames for 59.94 Hz formats and at least five (5) frames for 50 Hz formats.

### 5.4.3 3G/HD Output – Advanced tab

The *Advanced* tab provides controls over the type and level of detail enhancement that will be performed, and the color of the mask. The panel differs between 3G/HD output and SD output



**Figure 5-13** Video Output 3G/HD - Timing

### 5.4.3.1 Image Processing section

**MPEG Preprocessor Mode:** This control changes the functionality of the detail enhancer. When MPEG preprocessor is activated ('ON'), the adaptive detail enhancer will use a psycho-visual model to increase the level of details and the sharpness of edges without adding high frequency content that may be difficult to encode at a lower bit rate on a downstream MPEG encoder.

When the MPEG preprocessor is deactivated (OFF), the adaptive detail enhancer will increase the details and the sharpness of edges without causing ringing on the HD output. In this mode ('OFF'), high frequency content is added to the HD video output to improve graphic contents and characters. This setting is very useful for upconverted material in character generation (CG) applications.

**Detail Enhancer:** Enhances the perceived sharpness of fine detail and edges. A single control adjusts both Horizontal and Vertical detail enhancement: a slider and a data reporting/entry box allow the user to select a value ranging from 0 (no enhancement) to 7 (maximum enhancement). The default value varies according to the processing mode: 4 for SD to HD mode and 0 for HD to HD mode.

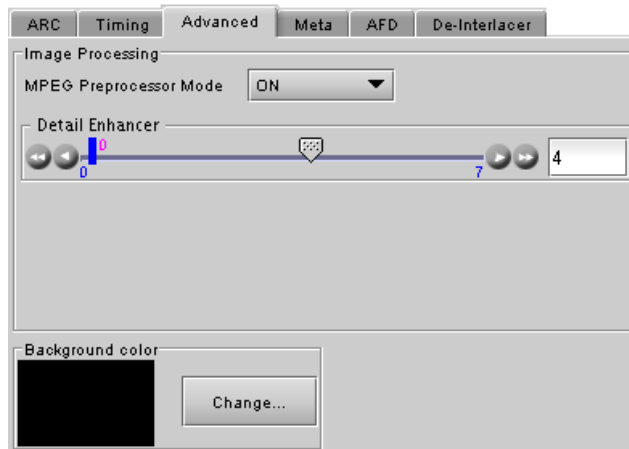


Figure 5-14 Video Output 3G/HD – Advanced tab

### 5.4.3.2 Background Color section

The color patch (black by default) indicates the color that will be used for the masks, and will therefore surround the output image when it does not occupy the full output screen. Click on the *Change...* button to open the Background Colors window. This window includes YCbCr sliders with data entry boxes, and a color preview patch. The color is represented by an 8-bit value for each component.

- If you have selected an illegal RGB color, it will be flagged as “Invalid RGB” beneath the color patch, and also within the color patch shown in the Advanced tab if you apply it. This invalid RGB color will not be clipped by the Gamut correction. Make sure you select a valid RGB color if you care about Gamut errors.
- Colors for HD and SD masks are specified independently when the corresponding output format is selected. The same color is used in 720p and 1080i.

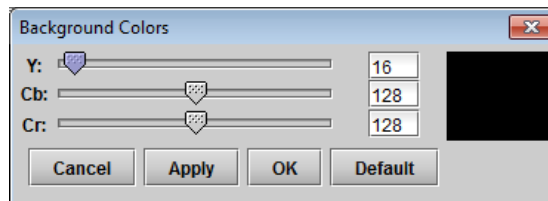


Figure 5-15 Background color

## 5.4.4 3G/HD Output – Meta tab

The Meta tab provides resources to deal with Metadata incorporated into the incoming signal. Since the XVP-3901-DPI HD/3G path is active only with HD/3G input, SD references will be always disable or have no behavior over the Metadata.

### 5.4.4.1 Meta / Meta sub-tab

#### Closed Caption section

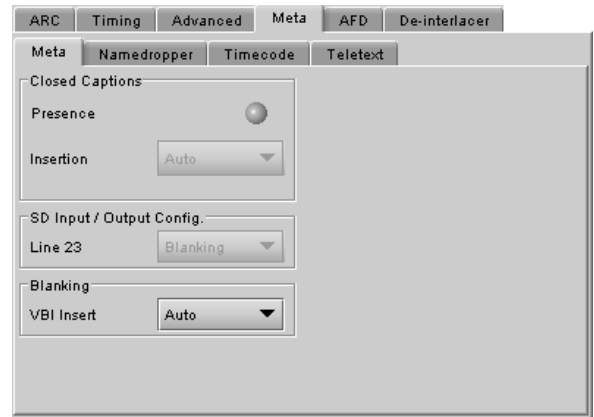
**Presence:** this icon turns green in the presence of valid incoming EIA-708-B or EIA-608-B closed captioning data as per SMPTE-334M in the incoming HD source.

*Insertion:* Will always be in *Auto* mode which means that closed captioning information is processed as follows:

- **3G/HD to 3G/HD Cross-conversion:**  
EIA-708-B closed captions are detected at the input and re-inserted into the output 3G/HD signal conforming to the selected output 3H/HD format. EIA-608-B closed captions as per SMPTE 334M are not converted. Closed captions insertion is disabled for 50Hz and 1080p23/1080p23sF/1080p25/1080p29 sources.

**SD Input/Output Config section**

*This has no effect in the 3G/HD Output Path.*



**Figure 5-16** 3G/HD Output – Meta / Meta tab

**Blanking section**

Insertion of the Vertical Blanking Interval content may be set to *OFF* or *Auto*, using the pull-down box. Insertion is disabled if no VBI data is present.

- For HD outputs, VBI insertion may only be enabled when the detected input is HD.
- Audio, closed-captioning, time-code, and AFD data is not handled by this parameter. The only exception is time code during HD-to-HD operation, in which case the user must enable this parameter along with the time code insertion pulldown menu, in order to properly process time code insertion.
- HD to HD (same format): All incoming HANC packets within H blanking and VANC packets within VBI may be bypassed to the output.
- HD to HD (different format) cross-conversions also supported.
- HD to HD blanking conversions are applied on luminance channel only. Packets in chrominance channel not supported.
- VBI insertion is disabled for 1080p23/1080p23sF/1080p25/1080p29 input HD formats
- 3G to 3G conversions: same as for HD to HD conversions

**5.4.4.2 Meta / Namedropper sub-tab**

Namedropper is a method of inserting control information for down-stream graphics inserters. It is a VANC packet on line 11 in HD. The XVP-3901-DPI detects the presence of Namedropper data in the program arriving at its input, and flags it using the status icon in this panel, which turns green when Namedropper data is detected.

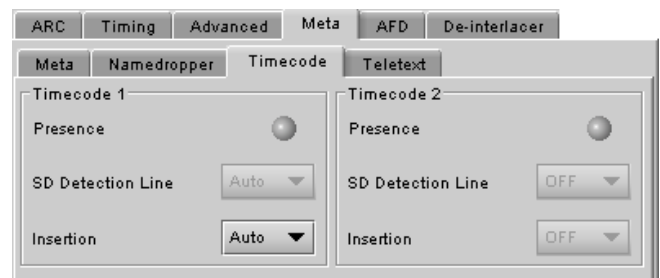


**Figure 5-17** 3G/HD Output - Meta / Namedropper

**5.4.4.3 Meta / Timecode sub-tab**

All incoming ATC packets (including type LTC) of the HD/3G input signal are bypassed to the HD output. **Make sure to enable both timecode and VBI (in Meta tab) parameters.**

The XVP-3901-DPI does not pass LTC type timecode detected within input HD formats 1080p23 / 1080p23sF / 1080p25 / 1080p29. It is not necessary to enable VBI to pass incoming VITC type time code for the aforementioned formats.



**Figure 5-18** 3G/HD Output - Meta / Timecode

Timecode binary group data is guaranteed to be transparent from input to output, except for 1080p23/1080p23sF/1080p25/1080p29 input formats.

**Presence:** A presence icon is available for each type of incoming ATC packet. The Timecode 1 Presence icon turns green when VITC type timecode is detected and the Timecode 2 Presence icon turns green when LTC type timecode is detected.

**SD Detection Line:** This selection is always disable because the XVP-3901-DPI HD/3G path is active with HD/3G input.

**Insertion:** Insertion options are available through a pull-down menu, offering these choices:

- AUTO: Time code is inserted if present; insertion is disabled if no time code is present.
- OFF: Time code insertion at the output is disabled.

#### 5.4.4.4 Meta / Teletext sub-tab

In **50 Hz operation only**, incoming teletext (OP-47) is passed through to the output as received (PASS mode).

The insertion mode pulldown offers two modes of operation:

- OFF – no teletext packets will be inserted as OP-47 at the output
- AUTO – the incoming teletext from the lines selected in the *Teletext to OP-47 Selection* checkboxes are passed in the line selected in the *Insertion Line* pulldown.

The *Teletext to OP-47 Selection* checkboxes have no effect on an HD source.

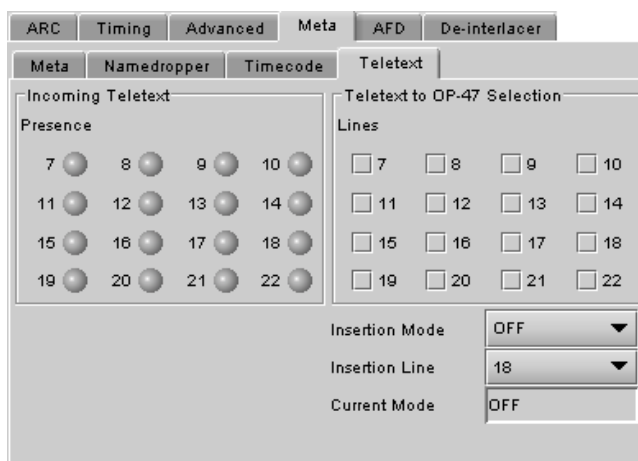


Figure 5-19 3G/HD Output - Meta / Teletext

**Current Mode** – this databox displays the current operating mode – OFF or PASS

#### 5.4.5 3G/HD Output – AFD tab

The Active Format Descriptor (AFD) flag is used to identify the aspect ratio and protected areas of a video signal. The XVP-3901-DPI uses this flag in some cases to adjust the output aspect ratio and image cropping to obtain the best possible presentation of the image. Since the XVP-3901-DPI 3G/HD Output will be active only with 3G/HD Input, the AFD flag (SMPTE 2016) is sent in an ancillary packet, normally found on line 11 in the vertical ancillary space. When an AFD flag is present at the input, the card will not perform an automatic adjustment of the aspect ratio, but the AFD generated will be according to the table in the appendix 2.

##### 5.4.5.1 Default settings section

**Default/Forced:** this text box is labeled according to the mode selected in the Input Screen pulldown in the Video Output Group – see page 25



Figure 5-20 3G/HD Output - AFD

- In AUTO mode, labeled DEFAULT and shows the current default AFD code to be used if no valid AFD code is detected at the input.
- In FORCED mode, labeled FORCED, and shows the code that is forced into the system input regardless of the actual input code.
- In 4:3 (SD input) or 16:9 mode, the data box is empty and the controls are grey

**Change:** Click the Change button to open the *Select AFD* panel showing the available AFD codes that could be used as the default. Click on one to select it, then click *Apply* or *OK* at the bottom of the panel.

**Keep Last:** click in this checkbox to use the last detected AFD code at the input as the default code to be used in the *Auto* mode when no AFD flag is detected. This box is disabled in the *Forced* mode.

### 5.4.5.2 Config section

**Incoming** – the three types of AFD are shown, with a presence icon for each, and a pulldown to establish the priority of each type. The priorities are reset with each new selection; e.g. if AFD is 1 and VLI is 2, and you use the pulldown to choose VLI priority as 1, then AFD will be bumped down to 2.

The available types depend on the input format – AFD only for HD inputs; AFD and VLI for SD-59.94 Hz inputs, and all three types for SD-50 Hz inputs.

The set priority is used only during AUTO mode. The XVP-3901-DPI will examine the incoming data in the selected order of priority in order to extract the AFD data. If, in AUTO mode, an AFD flag is set to priority 1 and is missing at the input, the XVP-3901-DPI will use the incoming AFD flag set to the next priority level.

The *Detected* box shows the AFD code detected.

**Outgoing** – on the HD output, the AFD code shown in the *Inserted* box will be inserted in the line selected in the *Insertion Line* pulldown, as an Ancillary Aspect Ratio packet (SMPTE 2016). Deselect the AFD checkbox to inhibit insertion.

### 5.4.6 3G/HD Output – De-interlacer tab

Some interlaced video sources are film-based originating from 24p film images. For optimum scaling performance, it would be best to de-interlace this type of source by simply merging the source's fields to recreate the original 24p image, thereby introducing no de-interlacing artifacts prior to scaling and format conversion.

**Film mode:** When The Film Mode selection is set to ON, the XVP-3901-DPI monitors the input for film-based sequences and applies the proper algorithm.

Film detection is provided for 3:2, 2:2 (59Hz and 50 Hz sources) and 5:5 sequences.

**Video Over Film:** When the film mode is enabled, turn ON the Video-Over-Film (VOF) function to detect and bypass field-merging on certain video regions such as scrolling video characters over an entire film frame, thereby preventing any unwanted combing effects.

There is only one de-interlacer on the card. Any changes made within this tab will be copied over to the De-interlacer tab in the Video Output (SD) panel.



**Figure 5-21** 3G/HD Output - De-interlacer

## 5.5 Video Outputs panel – SD Output tab

This panel allows control over several aspects of the standard definition video output:

- aspect ratio conversion
- timing control
- image quality processing
- metadata insertion.

**Note that since the XVP-3901-DPI does not include up/down/cross functionality, only limited functionality will be provided in this panel. Furthermore, this panel will be available only when the input video signal is SD, otherwise it will be dimmed.**

The upper portion of the panel is occupied by two video screen images, labelled *Input* and *Output*. These screens do not show the actual video being processed by the XVP-3901-DPI, but rather show graphic images that represent the geometric aspects of the input signal and the output that results after it is exposed to the current ARC processing functions. The image is a green circle on a white background; the circle is used because it is easy to see if it is asymmetrical. Lines on the images indicate protected areas for the AFD implementation.

Aspect Ratio Conversion (ARC) modifies the video active picture shape as the signal is converted between SD at 4:3 aspect ratio and SD at 16:9 aspect ratio. If the input is simply stretched or squeezed to fit the output, the image will be asymmetrically distorted; this is called *anamorphic* distortion. If the image is expanded or contracted symmetrically, it must be cropped, and/or have new blank background segments added to it, in order to fill the output picture. The ARC processing in the XVP-3901-DPI allows a wide range of symmetrical and asymmetrical picture size modification, coupled with cropping and background addition, to be applied to an input signal.



Figure 5-22 Video Outputs - SD Output

When the Input AFD Mode is set to *Auto*, all the ARC settings are set automatically according to the AFD flag (see the table in Annex 2 beginning on page 76) and cannot be changed by the user.

- There are some exceptions – with certain input AFD codes the masks can be customized. Each mask can be customized for each different AFD code allowing different mask settings according to each specific code. For certain AFD codes that are less used, the masks cannot be configured and will be de-activated.

### The Input Screen

The *Input* preview screen shows the portion of the input image which will be presented at the XVP-3901-DPI output. It has a pull-down *AFD Mode* menu at the top left corner through which the user selects the aspect ratio of the input signal.

- Available choices are: 4:3, 16:9, Auto, Forced.

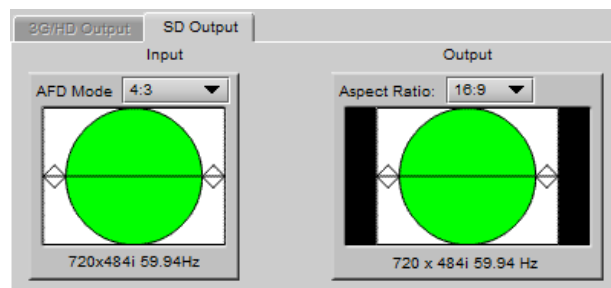


Figure 5-23 Screens for SD Output



**Note 1 – Auto mode:** When Auto is selected, all the ARC values are automatically set based on the AFD flag detected at the input, and the ARC controls and presets described below are **disabled**. Annex 2 shows the AFD functions implemented. If no AFD flag is detected at the input, the card uses the Default AFD flag specified in the AFD tab

**Note 2 – Forced mode:** Forced mode is useful when the input AFD flag is unreliable, missing or if the user wants a simple way to force the aspect ratio conversion. The function is the same as the Auto mode, except that the incoming AFD flag is ignored, and a user-specified forced flag is used instead. As in the Auto mode, the ARC controls and presets described below are **disabled**.

The input screen shows how much of the input signal will appear at the output after the ARC processing in the XVP-3901. It does so by showing any cropped portions of the image in blue.

**The Output Screen**

The output screen shows the final result of the ARC processing.

- The letterbox and side panel regions are shown in the selected background color
- The masks are shown in Gray

A pull-down menu at the top of the screen allows the user to select the output aspect ratio:

- either 4:3, 16:9, or AUTO.
- AUTO output setting allows the XVP-3901-DPI to automatically select between a 4:3 or 16:9 output aspect ratio. This decision is based on factors including the input AFD flag during input AUTO or FORCED modes, and the ARC settings during manual modes. The aim of this output AUTO mode is to reduce the amount of side panel or letterbox regions. Refer to the AFD table at the end of this document in order to understand visually this mode of operation.
- The output format is shown at the bottom of the window: 720x484i 59; 720x576i 50.

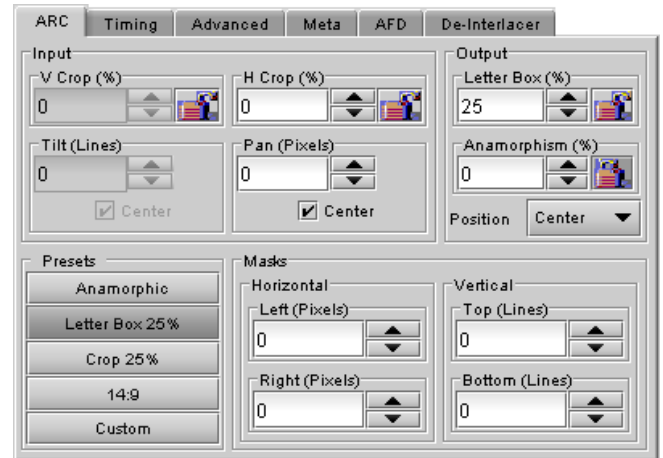
**5.5.1 SD Output – ARC tab**

Under the ARC tab, several sub-sections are found allowing extended control over how the output will be displayed. For convenience, ARC presets are available for frequently-encountered aspect ratio conversions.

- These controls are disabled when the ARC Mode pulldown on the Input Screen is set to *Auto* or *Forced*

When using manual aspect ratio mode (AFD mode is 4:3 or 16:9), the card will remember automatically all the parameters for the different combinations of input/output aspect ratio conversions (see the combinations below). This means you can configure the card once for each type of conversion and then the card will restore the configuration automatically when the proper input format and input/output aspect ratio is encountered.

- SD 4:3 to SD 4:3
- SD 4:3 to SD 16:9
- SD 16:9 to SD 4:3
- SD 16:9 to SD 16:9



**Figure 5-24 SD Outputs - ARC**

### 5.5.1.1 Input section

#### *Input: Crop – Horizontal and Vertical*

The crop controls allow selection of a portion of the original image – the amount of horizontal and vertical cropping is expressed as a percentage of the size of the original image.

The user can manually adjust the level of horizontal and vertical cropping. Horizontal cropping is done on an 8-pixel basis. Vertical cropping is done on 4-line basis. To achieve non-symmetrical vertical or horizontal cropping, uncheck the *Center* box underneath and position the image using the *Tilt* function described below.

Input cropping changes the scaling factor between the input and the output. If we crop the input (H&V) by 10%, the output image is resized and scaled by +10%. By providing different H and V cropping, the user can produce an anamorphic image.

The padlock icon appearing next to the data window allows the data to be “locked”. See the paragraph *Locking controls* under *Output sub-section* below for a discussion of this option.

#### *Input: Tilt*

Once a smaller window has been established by cropping the input signal, it can be moved vertically (*Tilt*, expressed in lines) within the original image to place the desired portion of the image in view. By default, a *Center* check box beneath the Tilt scroll box forces the cropping window to be centered on the input window. When it is checked, the necessary Tilt value will be calculated and displayed in the Tilt data window. You cannot tilt when cropping value is zero.

#### *Input: Pan*

Once this smaller window is established, it can be moved horizontally (*Pan*, expressed in pixels) within the original image to place the desired portion of the image in view. A *Center* check box beneath the Pan scroll box forces the cropping window to be centered on the input window. When checked, the necessary Pan value will be calculated and displayed in the data window. You cannot Pan if the cropping value is zero.

### 5.5.1.2 Output section

#### *Output: Side Panels / Letterbox*

This scrollable data entry box is used to shrink the width of the image so that the output image has blanked areas on each side of the displayed picture, which occupy the indicated percentage of the screen width. These areas are symmetric about the center, so a setting of 25% side panels would show a bar 12.5% of the screen width on each side of the image. 25% is the maximum value; entering a smaller value reduces the width of the side panels, but crops the image top and bottom. This control is disabled when the input is 16:9.

Treatment of Letterbox is similar, except that blanked areas are above and below the image.

#### *Output: Position*

This control allows the positioning of the output picture when side panels or letterbox are present. For side panels, the picture can be moved totally to the left, centered or totally to the right. When letterbox is present, the picture can be moved to the top, to the center or to the bottom of the frame. This control is not available in Auto AFD mode or Forced AFD mode. The picture will be centered by default when an ARC Preset is selected.

#### *Output: Anamorphism*

This control box allows the output image to be resized asymmetrically. Anamorphism is expressed in percent, where positive values indicate an increase in width with respect to height, and negative values a decrease in width with respect to height.

#### *Locking controls*

Represented by padlock icons, these buttons allow the *V Crop*, *H Crop*, *Anamorphism* and *Side Panels* controls to be “locked”. When a control is locked, user access to that control is disabled. Changes to unlocked controls will not affect the data values of locked controls. There is some interactivity within the locking function, as follows:

- If either *V Crop* or *H Crop* is locked, *Anamorphism* is unlocked.
- If either *Side Panels* or *Anamorphism* is locked, the other is unlocked, along with *V Crop* and *H Crop*.



**5.5.1.3 Presets section**

For convenience in manual operation, several of the most common conversion situations are pre-programmed into the XVP-3901-DPI, and can be quickly accessed. The available Presets change according to the AFD mode and Output Format selections made using the pulldowns on the input and output screens.

The charts in Tables 5.1 a and 5.1b illustrate graphically the effect of each preset on the input image.

- Only those presets for which an output is shown will appear on the Video Output panel.
- For example, when the input and output formats are the same, only the *Bypass* button will appear
- In all cases, a button labeled *Custom* will appear, and will be selected whenever the parameter settings do not correspond exactly to one of the available presets

The advantage of using Presets is to provide a unique conversion without having to specify the H&V scaling factor or the percentage of cropping/side panels and anamorphism. When an ARC Preset is selected, it re-centers the output picture in case of side panels or letterbox, but it does not affect the output masks.

Output Format 4:3 (when selected on the SD Video Output panel)		
Input Format (selected by AFD Mode pulldown)	4:3	16:9
Presets	Output after ARC processing	
Anamorphic		
Letter Box 25%		
Crop 25%		
14:9		
Bypass		

**Table 5.1a** Available Presets for AFD Mode selections (4:3 output)

Output Format 16:9 (when selected on the SD Video Output panel)		
Input Format (selected by AFD Mode pulldown)	4:3	16:9
Presets	Output after ARC processing	
Anamorphic		
Side Panels 25%		
Crop 25%		
14:9		
Bypass		

**Table 5.1b** Available Presets for various AFD Mode selections (16:9 output)

#### 5.5.1.4 Masks section

##### Mask: Horizontal and Vertical

Sometimes with aspect ratio conversion, some of the edges of the original image are exposed in the output signal. Often, there will be artifacts in the source along these edges, extending for several lines vertically or several pixels horizontally after conversions. Masks are adjustable “curtains” which can be used to frame the output image, covering up the edge artifacts and leaving a clean transition from image to mask.

Four Scroll boxes with data windows for reporting and direct data entry are used to set mask position on the four sides of the output image. Top and bottom position are set in lines, while left and right position are set in pixels.

Masks should be adjusted by viewing the output on a video monitor and positioning the masks to cover edge effects with a minimum loss of clean picture content. Usually masks are the final adjustment to be made. The masking is shown on the top right Output screen by graying out the masked portion. Note that mask – or Background - color may

be changed in the *Advanced* tab. The maximum amount of masking that can be introduced depends on the image format, and is measured starting from the edges of the displayed image, as shown in the following table. Masks can cover a maximum of 25% of the active area.

Image format	Pixels	Lines
525	106	76
625	106	88

**Note:** all masks are adjusted in steps of 2 pixels or 2 lines.

### 5.5.2 SD Output – Timing tab

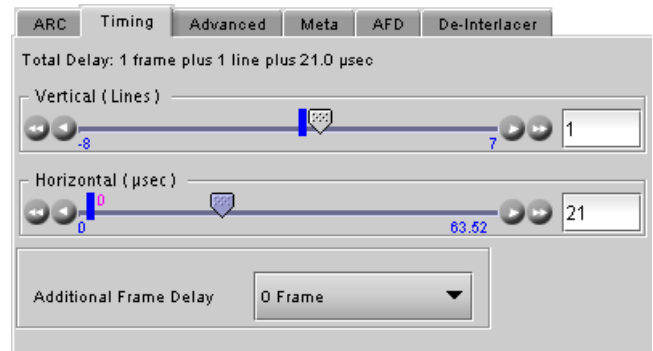
The Timing tab provides access to timing adjustments which affect the signal outputs. There are two slider controls, each with a data reporting box which shows the current value, and into which values can be typed directly. The total delay is reported at the top of the window.

*Vertical (lines):* With this adjustment, a value ranging from –16 to +15 lines, compared to the reference or the processing delay, may be set. This adjustment can be used in conjunction with the horizontal timing adjustment.

*Horizontal ( $\mu$ s):* With this adjustment, a value ranging from zero to the equivalent of 1 horizontal line in the current operating format (e.g. ranging from 0 to 63.46  $\mu$ s for 525-line operation and 0 to 64.00  $\mu$ s for 625-line operation) compared to the reference or the frame boundary, may be set.

*Additional Frame Delay:* This parameter affects the overall processing delay of the card. It affects both the HD and SD output by adding supplemental frame delay to the current processing delay. This parameter will add a delay ranging from 0 to 15 interlaced frames (i.e. steps of 33 ms in 59.94 Hz and 40 ms in 50 Hz) to the current processing delay. Without a reference, the normal processing delay is 1 frame. You can extend this delay up to 16 frames if the additional delay is 15. With a reference, up to 15 frames can be added to the frame sync delay which depends on the timings between the input and the reference.

Note that, in order to compensate for the processing delay of a Dolby-E/Dolby Digital decoder or a Dolby-E encoder installed on the XVP-3901-DPI or on the companion audio card, the additional frame delay must be set to at least one (1) frame. On the other hand, if a Dolby Digital encoder is installed, the additional frame delay must be set to at least six (6) frames for 59.94 Hz formats and at least five (5) frames for 50 Hz formats.



**Figure 5-25** SD Outputs - Timing

### 5.5.3 SD Output – Advanced tab

The *Advanced* tab provides controls over the type and level of detail enhancement that will be performed, and the color of the mask.

#### 5.5.3.1 Image Processing section

Separate controls are provided for Horizontal and Vertical detail enhancement:

*Horz. Detail Enhancer Mode*: this pull-down box controls the type of horizontal detail enhancement, which may improve sharpness of textures and contours.

- *High Freq* boosts high frequencies of the input signal
- *Medium Freq* boosts medium frequencies of the input signal

*Horz. Detail Enhancer*: a slider and a data reporting/entry box allow the user to select a value in the range 0 (no enhancement) to 7 (maximum enhancement). The default value is 1 for HD to SD mode, and 0 for SD to SD mode

*Vert Detail Enhancer Mode*: this pull-down box controls the type of vertical detail enhancement, which may improve sharpness of textures and contours.

- *High Freq* boosts high frequencies of the input signal
- *Medium Freq* boosts medium frequencies of the input signal

*Vert. Detail Enhancer*: a slider and a data reporting/entry box allow the user to select a value in the range -8 (some softening) to +7 (maximum enhancement). Set the value to 0 for no enhancement. The default value is 1 for HD to SD mode, and 0 for SD to SD mode

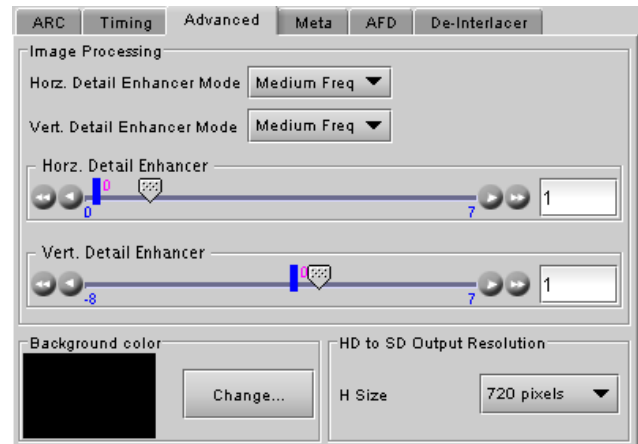


Figure 5-26 SD Outputs - Advanced

#### 5.5.3.2 Background color section

This color patch (black by default) indicates the color that will be used for the masks, and will therefore surround the output image when it does not occupy the full output screen. Click on the *Change...* button to open the Background Colors window. This window includes YCbCr sliders with data entry boxes, and a color preview patch. The color is represented by an 8-bit value for each component.

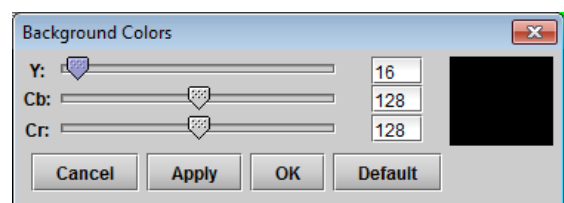


Figure 5-27 Background colors

- If you have selected an illegal RGB color, it will be flagged as “Invalid RGB” beneath the color patch, and also within the color patch shown in the Advanced tab if you apply it. This invalid RGB color will not be clipped by the Gamut correction. Make sure you select a valid RGB color if you care about Gamut errors.
- Colors for HD and SD masks are specified independently when the corresponding output format is selected.

### 5.5.3.3 HD to SD Output Resolution

This is not a feature available in the XVP-3901-DPI as input will always be SD when output SD video.

### 5.5.4 SD Output – Meta tab

The Meta tab provides resources to deal with Metadata incorporated into the incoming signal. It has three associated sub-tabs, described below.

#### 5.5.4.1 Warning messages

Warning messages may appear at the bottom of the Meta and AFD panels when conflicts arise because of the settings. See Figure 5.28 for an example. The possible messages and their meanings are as follows:

- **AFD/ VLI line insertion conflict. Refer to manual.** [message in red letters]  
*Conditions:* Both AFD and VLI flags are inserted and AFD is set to line 14 during 59 Hz or line 11 during 50 Hz operation.  
*Consequences:* Since the SMPTE-2016 AFD cannot reside on the same line as VLI, the VLI flag will not appear on the insertion.
- **Dolby Metadata/VLI line insertion conflict. Refer to manual.** [message in red letters]  
*Conditions:* SD to SD, line 14 (59 Hz) or line 11 (50 Hz) set for Dolby Metadata VANC Stream1 (or Stream 2) and VLI insertion enabled  
*Consequences:* Since VLI data is transmitted on line 14 for 525 output signals and line 11 for 625 output signals, VLI data will not appear on line 14 (or line 11 for 625) but Dolby metadata data will be inserted.
- **Dolby Metadata/Teletext line insertion conflict. Refer to manual.** [message in red letters]  
*Conditions:* SD to SD (625 only), same line set for Dolby Metadata VANC Stream1 (or Stream 2) and teletext insertion  
*Consequences:* Since teletext and Dolby metadata cannot reside on the same line, teletext data will not appear on the insertion line but Dolby metadata data will be inserted.
- **Teletext/VLI line insertion conflict. Refer to manual.** [message in red letters]  
*Conditions:* SD to SD (625 only), line 11 enabled for teletext and VLI insertion enabled  
*Consequences:* Since VLI data is transmitted on line 11 for 625 output signals, it shall be replaced by any down-converted teletext data to be inserted on line 11.
- **Teletext/Timecode line insertion conflict. Refer to manual.** [message in red letters]  
*Conditions:* SD to SD (625 only), same line enabled for teletext and Timecode 1 or Timecode 2 (duplicate time code included) insertion  
*Consequences:* Since DVITC timecode and teletext cannot reside on the same line, timecode data shall be replaced by any down-converted teletext data.
- **AFD insertion will overwrite incoming TC/Teletext on insertion line. Refer to manual.** [in blue letters]  
*Conditions:* SD to SD, both AFD and VBI insertion enabled  
*Consequences:* Since timecode and SMPTE-2016 AFD cannot reside on the same line, any incoming timecode is blanked and the AFD data is inserted. This occurs on the selected AFD insertion line.
- **Dolby Metadata insertion will overwrite incoming TC/Teletext on insertion line. Refer to manual.** [in blue letters]  
*Conditions:* SD to SD, both Dolby Metadata and VBI insertion enabled  
*Consequences:* Since Dolby metadata and ancillary data like timecode cannot reside on the same line, any incoming timecode is blanked and Dolby metadata is inserted. This occurs on the selected Dolby metadata insertion line.

- Dolby Metadata/AFD insertion will overwrite incoming TC/Teletext on insertion line. Refer to manual. [in blue letters]
  - Conditions:* SD to SD, both Dolby Metadata and AFD including VBI insertion enabled
  - Consequences:* Since Dolby metadata, AFD, and ancillary data like timecode cannot reside on the same line, any incoming timecode is blanked and Dolby metadata or AFD is inserted. This, of course, shall occur on the selected Dolby metadata or AFD insertion line.

### 5.5.4.2 Meta / Meta sub-tab

#### Closed Caption section

*Presence:* this icon turns green in the presence of incoming line 21 closed captions are detected when an SD source is installed.

*Insertion:* The pull-down is used to select between *Auto* or *OFF*. Availability of these controls is affected by whether or not Line 21 of the input SD or output SD signal has been configured as blanking; see *SD Input/Output Config* subsection below for details.

When *Auto* is selected, closed captioning information is processed as follows:

#### SD to SD operation:

In order to allow the XVP-3901-DPI to properly handle incoming closed captions on line 21, make sure to set *SD Input/Output Config* to *Blanking* and make sure to set *Insertion* to *Auto*.

#### SD Input/Output Config section

*Line 21:* Specifies if line 21 (or line 23 in PAL) shall be considered as blanking or active video; this selection affects *Close Caption* availability, controlled in the *Close Caption* sub-section of this tab (see above). Depending on the settings and input/output selected, it also affects the output video, as shown in this table:

For SD Output:

Input Format	Line 21 Status		CC Insertion Effect on SD Output
SD 60 Hz	Blanking	Off	Line 21 blanked.
		Auto	Input line 21 copied to output.
	Active	N/A	Line 21 has active video and may be resized.
SD 50 Hz	Blanking	N/A	Line 23 blanked, first active line is 24.
	Active	N/A	Line 23 has active video and may be resized.

The *Line 21* pulldown also appears in the HD Video Output Panel, and the two follow each other; change the selection in one and the other is also changed.

#### Blanking section

Insertion of the Vertical Blanking Interval may be set to *OFF* or *AUTO*, using the pull-down box. Insertion is disabled if no VBI data is present.

- For SD outputs, VBI insertion may only be enabled when the detected input is SD.
- Audio, closed-captioning, time-code, and AFD data is not handled by this parameter. The only exception is time code during SD to SD operation, in which case the user must use this parameter to enable/disable time code insertion.

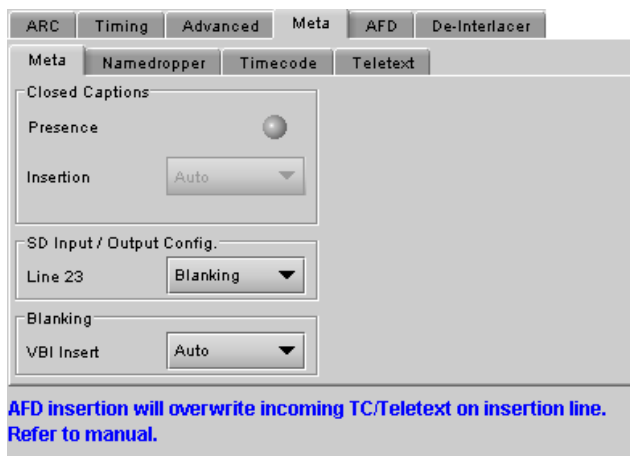


Figure 5-28 SD Outputs - Meta / Meta

- SD to SD: All incoming HANC packets within H blanking, VANC packets within VBI, and VBI lines may be bypassed to the output.

### 5.5.4.3 Meta / Namedropper sub-tab

Namedropper is a method of inserting control information for down-stream graphics inserters. It is a waveform-shape located on line 18 in SD.

The XVP-3901 detects the presence of Namedropper data in the program arriving at its input, and flags it using the status icon in this panel, which turns green when Namedropper data is detected.



Figure 5-29 SD Outputs - Meta / Namedropper

### 5.5.4.4 Meta / Timecode sub-tab

*Presence:* A presence icon is available for each type of incoming ATC packet. The Timecode 1 Presence icon turns green when VITC timecode is detected and the Timecode 2 Presence icon turns green when LTC timecode is detected. If the input is SD, then the presence of each icon depends on the selection of the SD Detection Line parameter.

*SD Detection Line:* This parameter is only available when the input signal is SD SDI, and is used only for timecode presence. Select *AUTO* mode to automatically detect the line that contains the timecode. If time code appears on multiple lines, the first is selected. Select a specific line if desired; this allows a choice to be made when multiple time code lines are present.

*SD Insertion Line:* This control is always disabled.

*Duplicate:* This control is always disabled.

*Insertion:* This control is disabled when the input and output are both SD. In this case, VBI Blanking may be used to enable/disable time code insertion – see *Blanking* sub-section above

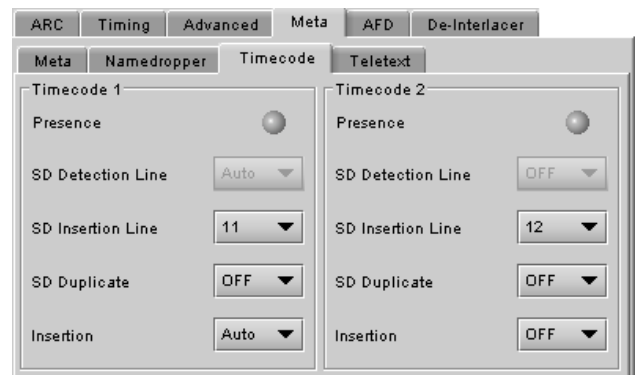


Figure 5-30 SD Outputs - Meta / Timecode

### 5.5.4.5 Meta / Teletext sub-tab

In **50 Hz operation only**, incoming teletext is passed through to the output as received; the lines cannot be changed (Pass mode).

- The Incoming Teletext Presence indicators 7 to 22 indicate the SD lines where teletext data, conforming to ETSI EN 300 706, has been detected.
- The *SD Output Teletext Insertion Lines* checkboxes are active, and can be configured so as to be ready when the input is switched to an HD source. They have no effect on an SD source..

**Current Mode** – this databox displays the current operating mode – AUTO, BULK or PASS

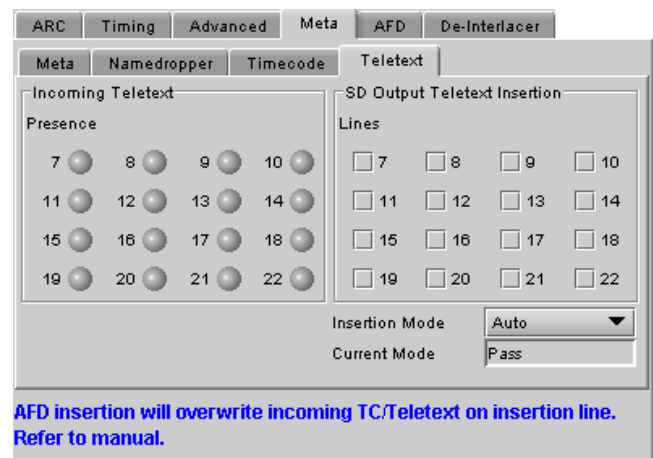


Figure 5-31 SD Outputs - Meta / Teletext



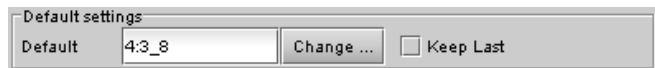
### 5.5.5 SD Output – AFD tab

The Active Format Descriptor (AFD) flag is used to identify the aspect ratio and protected areas of a video signal. The XVP-3901-DPI uses this flag in some cases to adjust the output aspect ratio and image cropping to obtain the best possible presentation of the image. The AFD flag may be sent as a VLI signal (RP 186), as a WSS signal (ITU-R BT.1119-2) for PAL only, and as an AFD packet (SMPTE 2016).

When an AFD flag is present at the input, the card can perform an automatic adjustment of the aspect ratio. See the appendix for more details.

#### 5.5.5.1 Default settings area

*Default/Forced:* this text box is labeled according to the mode selected in the Input Screen pulldown in the Video Output Group – see page 32.



- In AUTO mode, labeled DEFAULT and shows the current default AFD code to be used if no valid AFD code is detected at the input.
- In FORCED mode, labeled FORCED, and shows the code that is forced into the system input regardless of the actual input code.
- In 4:3 (SD input) or 16:9 mode, the data box is empty and the controls are grey

*Change:* Click the Change button to open the *Select AFD* panel showing the available AFD codes that could be used as the default. Click on one to select it, then click *Apply* or *OK* at the bottom of the panel.

*Keep Last:* click in this checkbox to use the last detected AFD code at the input as the default code to be used in the *Auto* mode when no AFD flag is detected. This box is disabled in the *Forced* mode.

#### 5.5.5.2 Config section

**Incoming** – the three types of AFD are shown, with a presence icon for each, and a pulldown to establish the priority of each type. The priorities are reset with each new selection; e.g. if AFD is 1 and VLI is 2, and you use the pulldown to choose VLI priority as 1, then AFD will be bumped down to 2.

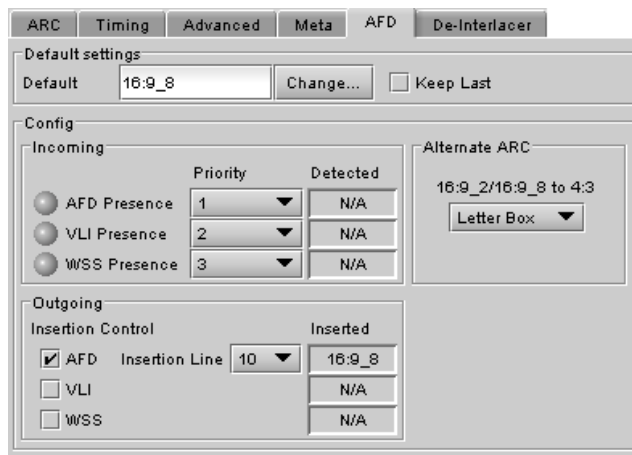


Figure 5-32 SD Outputs - AFD

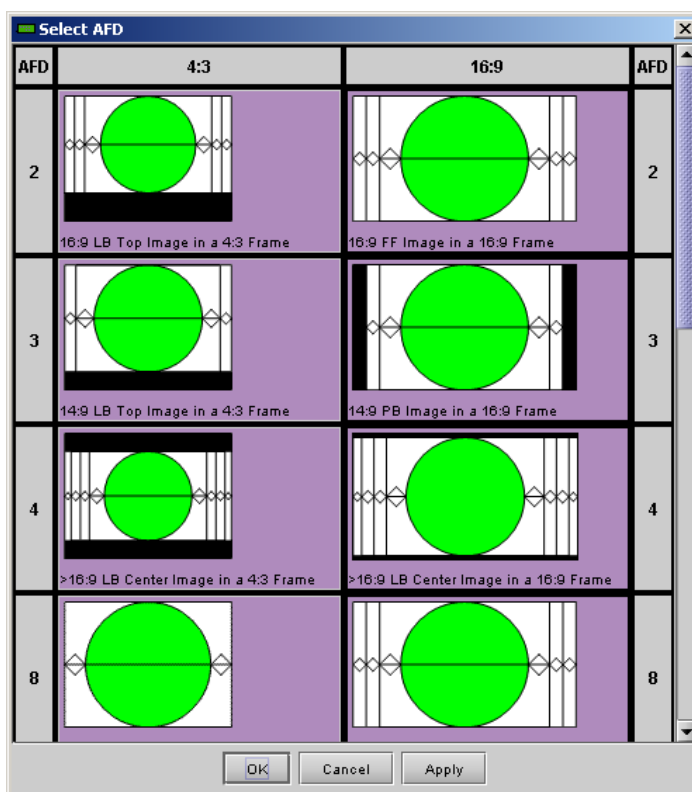


Figure 5-33 Select AFD



The available types depend on the input format –AFD and VLI for SD-59.94 Hz inputs, and all three types for SD-50 Hz inputs.

The set priority is used only during input AFD AUTO mode. The XVP-3901-DPI will examine the incoming data in the selected order of priority in order to extract the AFD data. If, in AUTO mode, an AFD flag is set to priority 1 and is missing at the input, the XVP-3901-DPI will use the incoming AFD flag set to the next priority level.

The *Detected* box shows the AFD code detected.

**Outgoing** – on the SD output, the AFD code shown in the *Inserted* box will be inserted in up to three different formats simultaneously. Supported formats are shown; select their respective checkboxes to enable insertion. AFD will be inserted in the line selected in the *Insertion Line* pulldown. Note that VLI is normally inserted on line 14, so if AFD is placed on line 14 using the pulldown, VLI will not be inserted.

#### Alternate ARC section

When the output is 4:3 SD, if the input AFD setting is set to Auto or Forced mode and the input AFD is a full screen 16:9 (AFD code 16:9\_2 or 16:9\_8), the output image may be scaled in one of 2 ways. Use the pulldown to select which will be used:

- *Letterbox*: Uses the traditional 16:9 letter box within a 4:3 frame where there is no loss of image.
- *Center Cut*: The XVP-3901 provides a second alternative – the input is horizontally cropped about the center to create a full screen 4:3 image. Choosing this alternative essentially removes 25% of the original image.

### 5.5.6 SD Output – De-interlacer tab

Some interlaced video sources are film-based originating from 24p film images. For optimum scaling performance, it would be best to de-interlace this type of source by simply merging the source's fields to recreate the original 24p image, thereby introducing no de-interlacer artifacts prior to scaling and format conversion.

*Film mode*: When The Film Mode selection is set to ON, the XVP-3901 monitors the input for film-based sequences and applies the proper algorithm.

Film detection is provided for 3:2, 2:2 (59Hz and 50 Hz sources) and 5:5 sequences.

*Video Over Film*: When the film mode is enabled, turn ON the Video-Over-Film (VOF) function to detect and bypass field-merging on certain video regions such as scrolling video characters over an entire film frame, thereby preventing any unwanted combing effects.



**Figure 5-34** SD Outputs - De-interlacer

There is only one de-interlacer on the card. Any changes made within this tab will be copied over to the De-interlacer tab in the Video Output – 3G/HD panel.

## 5.6 SCTE-104 panel

The XVP-3901-DPI can be configured as an inserter or an extractor. You can use the Operating Mode parameter to specify the desired mode of operation.

### 5.6.1 SCTE-104 Insert Tab

When the Operating Mode is configured as Insert, the card will insert SCTE messages in the video output. Those messages can be locally predefined on the card or they can be programmed by the automation and sent over the serial RS-422 port. The GPI are paired (1 & 2 / 3 & 4 / 5 & 6), and a selection pulldown is provided for each pair.

- Select “Local” to configure the SCTE events directly on the card as predefined SCTE events.
- Select “Automation” if the SCTE events are coming from the automation over the RS-422

RS-422 Configuration	
Baud rate	38400
Data size	8
Parity	N
Stop bit	1

#### 5.6.1.1 Local SCTE 104 Configuration

When the SCTE Messages Source is set to “Local” mode, the user can specify all the parameters of the Splice\_Request packet that will be inserted. This can be done for each GPI, however the GPI have been paired in groups of 2 to allow different insertion type for the same event or program ID.

These parameters can be configured for a Splice\_Request message:

- Splice Insert Type
- Splice Event ID
- Unique Pgm ID
- Pre-Roll Time
- Break Duration
- Avail Number
- Avails expected
- Auto Return Flag

Refer to the SCTE 104 specifications for more details about the possible values that could be assigned to each one.

#### 5.6.1.2 SCTE 104 Messages from Automation

When the SCTE Messages Source is set to “Automation” mode, the corresponding GPI tabs are disabled since the SCTE 104 messages will be coming from the automation over the RS-422 port of the card. Provisions have been made to allow those messages to come from an IP port through iControl in the future. When using the automation, the XVP-3901-DPI card supports more SCTE messages including Splice\_Null, Time, Segmentation Descriptor requests, etc...

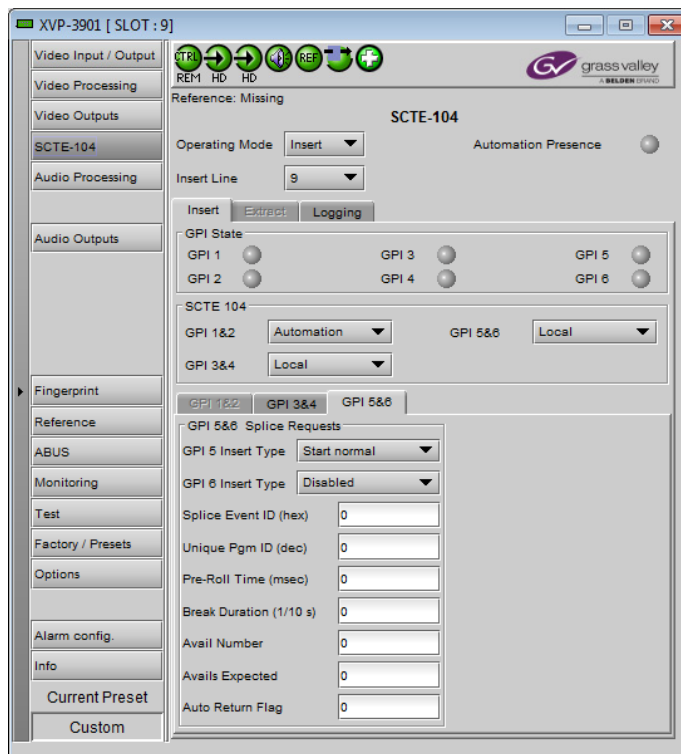


Figure 5-35 SCTE-104 - Insert

### 5.6.1.3 GPI

The GPI are used to trigger the corresponding SCTE 104 events. For example, when the GPI 1 is triggered the corresponding SCTE-104 messages will be inserted. At the same time, the SCTE message is also sent to iControl for monitoring.

The GPIs are all contact closures to ground (GND). To select a GPI trigger (GPI 1 to 6), simply short the corresponding GPI input pin to any GND pin.

GPI loading is a “single load” process triggered by a transition to ground: it needs to be activated only for a short period (around 10 milliseconds) to be detected by the card. Since it is not activated by a level, it is not necessary to maintain the level at ground after the activation.

## 5.6.2 SCTE-104 Extract Tab

When the Operating Mode is configured as “Extract”, the corresponding configuration tab will be enabled in iControl. The user can specify the exact SCTE 104 message that will trigger a GPI output.

### 5.6.2.1 Splice Request Detection

The user can specify the exact type of Splice\_Request that will trigger a GPI output. The Splice Event ID and Program ID are optional parameters. When not used, the GPI can be triggered on all Splice\_Requests of the specified type. Otherwise, you can narrow the GPI to trigger only on the specified Event ID and/or Program ID.

### 5.6.2.2 GPO

The GPO outputs are active low and will become a contact closure to GND when the GPO is activated. Otherwise, they are in an open high state.

#### GPO pulse duration

The GPO pulse duration can be adjusted to ensure that it triggers downstream equipment.

- Select the Default Pulse Duration checkbox to set the value at 17 ms.
- Move the slider or type in the databox to set the value between 20 milliseconds and 500 milliseconds in steps of 10 ms when the Default Pulse Duration checkbox is not selected.

The selected GPO pulse duration is global for all GPO.

The GPO pulse duration will be reset to default with Load Factory presets.



Figure 5-36 SCTE-104 - Extract

### 5.6.3 DPI Logging

Regardless if the card is configured for “Insert” or “Extract”, all SCTE 104 events inserted or detected by the card will appear in the “Logging” window in human readable format.

Refer to the picture on the right for an example log. When 2 GPIs are triggered at the same time, the 2 events will appear under the same timestamp.

All SCTE events are also logged by iControl in GSM.

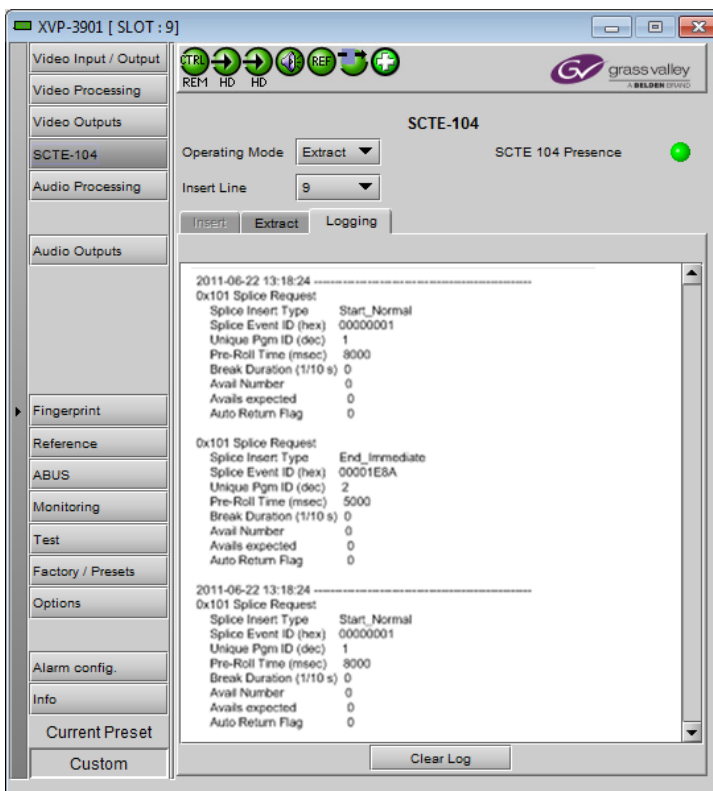


Figure 5-37 SCTE-104 - Logging

### 5.6.4 Extra SCTE Operating Modes

Two additional SCTE operating modes are available on the XVP-3901-DPI:

#### Keep Alive mode

- When this mode is enabled, it triggers the periodic insertion (every 29 seconds) of the SCTE KEEP\_ALIVE message into the VANC.
- When disabled, no KEEP\_ALIVE messages are inserted in the VANC.

Menu access: SCTE MODE → KEEP ALIVE → "ENABLED" or "DISABLED"

#### GPI Toggle mode

- When enabled, the GPI-5 is used to toggle the SCTE mode to "insert" and the GPI-6 is used to toggle the SCTE mode to "extract".
- When disabled, the GPI 5 & 6 can be used normally.

Menu access: SCTE MODE → GPI TOGGLE MODE → "ENABLED" or "DISABLED"

**NOTE –** These modes can ONLY be accessed from the local control menu, and there is no indication on the iControl interface to show that they are active.

## 5.7 Audio Processing panel

The Audio Processing panel provides full audio processing and delay parameters for up to 32 channels. The first 16 channels come from the embedded input channels and/or the discrete AES inputs. The second set of 16 channels comes from the output channels of the Downmix module:

The 32 processed audio channels can be assigned later to the 3G/HD output embedder, the SD output embedder, the discrete AES outputs, or sent to one or two DAP or UAP companion cards using the A-BUS. To enable the “Audio Processing” functionality, you must either have enabled the audio option or you must have an external audio card connected through the ABUS.

You can configure the audio processor differently for an SD input than for a 3G/HD input. The card will remember the different parameters and will load them automatically without user intervention based on whether the video input is SD or 3G/HD. Ensure the card has a video signal of the desired format before changing the configuration.

### Group Detected section

Status indicators turn green when audio groups 1, 2, 3 or 4 are detected in the incoming signal. The Group Detected warning color can be configured by the user in the Alarm Config panel (Sect. 5.18)

### Discrete AES Detected section

Signal presence indicators monitor the presence of AES inputs. The indicators turn green when AES input signals are detected. The Discrete AES Detected warning color can be configured by the user in the Alarm Config panel (Sect. 5.19)

### Signal Presence section

Signal presence indicators monitor the audio channel presence and are related to the Silence parameters defined in the Ch XX/Silence tab (see details below): the indicator is green when an active signal is present and configurable when a silence is detected according to the “no signal” threshold and the channel detection warning. The Signal Presence warning color can be configured by the user in the Alarm Config panel (Sect. 5.19)

### 5.7.1 Audio Processing Tab

#### CH 1-4, .... CH 29-32 Tabs

Each of these tabs controls *Levels*, *Fixed Delays* and *Silence* detection for four audio channels; each channel is provided with a set of controls.

*Levels sub-tab*: grouped by pair of channels, each channel has the following controls:

*Level* (slider and input box): Sets the audio gain from -96 to 12 dB in 0.5 dB steps. For non-PCM audio, the level value is overridden to 0 dB.

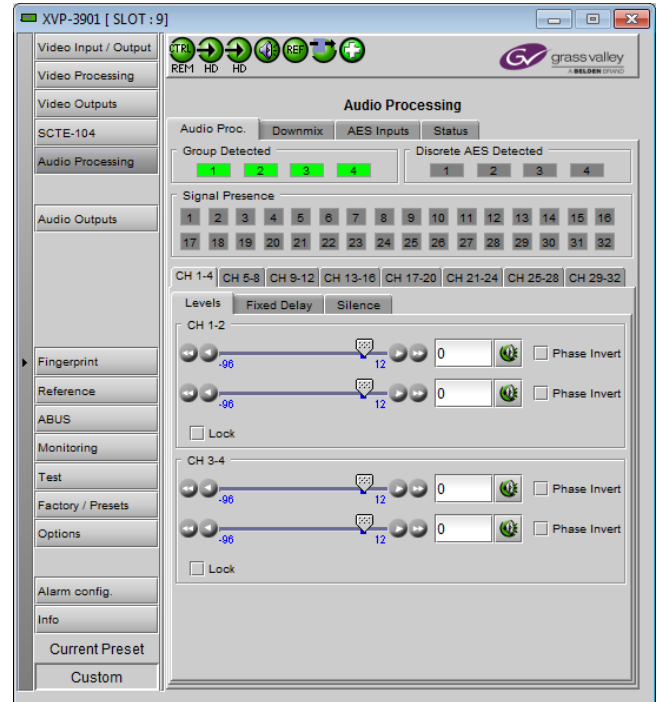


Figure 5-38 Audio Processing - Audio Proc tab

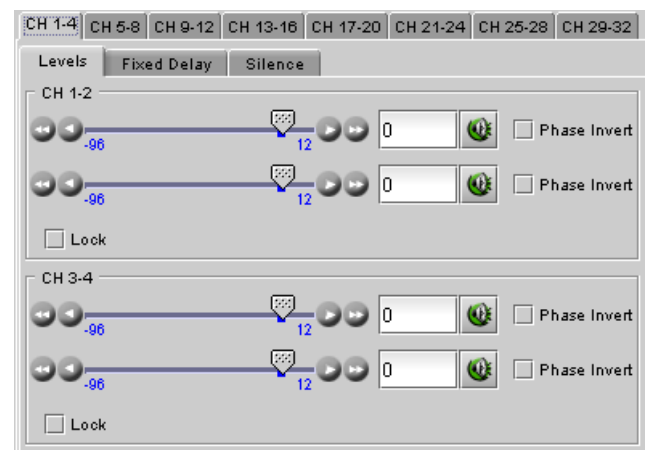


Figure 5-39 Audio Processing - Levels sub-tab

## GUIDE TO INSTALLATION AND OPERATION

**Mute** (speaker button): Mutes the selected audio channel

**Phase Invert**: When checked, inverts the selected audio channel phase.

**Lock**: “Locks” both channel sliders together for levels and delay (coarse only), so that moving one slider moves the other one as well.

**Fixed Delay sub-tab**: although the XVP-3901 automatically matches audio and video throughput timing, provision is made for the user to insert an audio delay offset from the nominal value, in order to deal with problems such as lip-sync errors and audio phase alignment in the incoming feed. For each channel, two sliders allow the delay to be adjusted.

- **Coarse** – adjusts the delay in milliseconds, over a range of values that depends on the Additional Frame Delay set on the timing tab in the Video Output group (see page 27), as follows:

Additional Frame Delay	Adjustment Range	
	(59.94 Hz)	(50 Hz)
0	0 to 2000 ms	0 to 2000 ms
1	-33 to 2000 ms	-40 to 2000 ms
2	-66 to 2000 ms	-80 to 2000 ms
3	-99 to 2000 ms	-120 to 2000 ms
...	...	...
15	-500 to 2000 ms	-600 to 2000 ms

- **Fine** – adjusts the delay in audio sample increments, from -100 to +100 samples.

### Silence sub-tab

This tab sets the card's behavior in the event of a loss or absence of audio signal. The Signal Presence indicators are then triggered according to these settings:

**Silence Detect**: select which audio channels to monitor for audio silences by checking their boxes. This enables the signal presence indicators to change color when there is no signal present which activates the audio silence alarm. Otherwise, when checkboxes are not checked, the signal presence indicator turns grey and the audio silence alarm is not activated

**Threshold**: Signal absence is declared when the signal level is lower than the signal threshold for a duration longer than the No Signal Delay. The threshold can be set to -72, -66, -60, -54, -48 dBFS. The default value is -60 dBFS.

**No Signal Delay**: The period for which signal must be continuously absent before an alarm can be triggered can be adjusted from 3 to 255 seconds in preset steps: 3, 5, 7, 10, 15, 20, 30, 40, 50, 60, 90, 120, 180, 210, 240, 255 sec. The default value is 15 seconds.

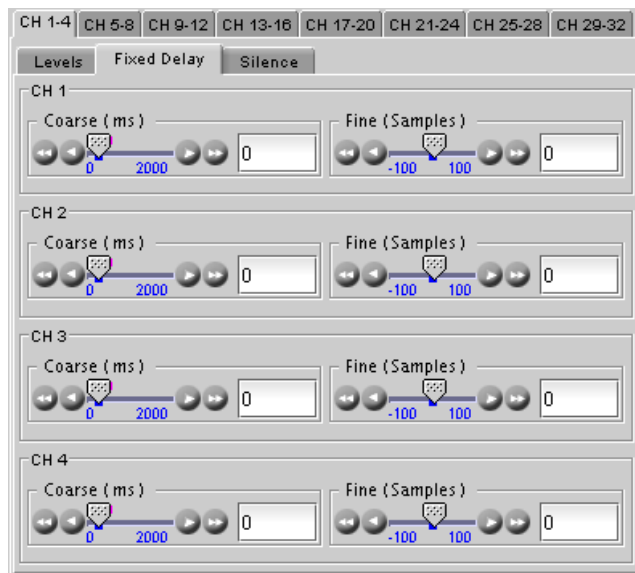


Figure 5-40 Audio Processing - Fixed Delay sub-tab

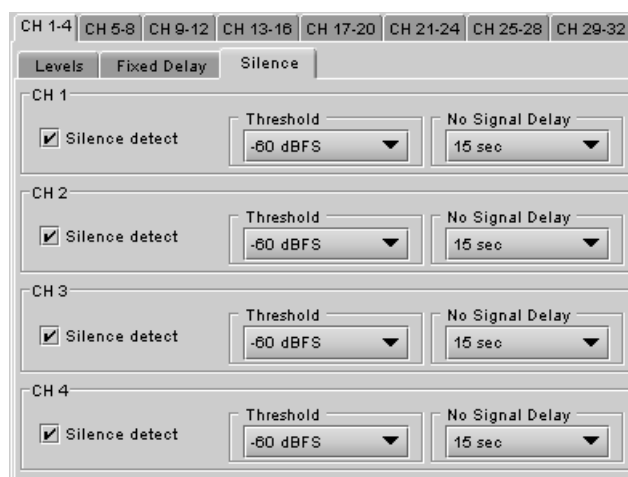


Figure 5-41 Audio Processing - Silence sub-tab

## 5.7.2 Downmix tab

This tab provides resources to control the downmix of a “5.1 channel” surround-sound audio signal into an LtRt or LoRo stereo pair. The 5.1 terminology refers to six discrete audio channels, with the low frequency effect (LFE) channel of limited bandwidth designated as the “.1” channel. The downmix can be done using any of the 32 audio channels processed by the audio processor using the Input Channels controls in the interface.

**Input Channels:** Use the 6 pulldowns to select the source channels for the downmix process.

### Downmix:

Operating Mode: Use the pulldown to select the downmix operating mode:

- OFF: Downmix is disabled. Output channels pass through unchanged.
- Manual: Downmix follows the downmix parameters manually configured by the user.
- Follow Metadata Path 1: Downmix follows the downmix parameters of Metadata Path 1.
- Follow Metadata Path 2: Downmix follows the downmix parameters of Metadata Path 2.

Normalization: use the pulldown to select the type of normalization to be applied on the downmix output level.

- OFF: Downmix output level is not normalized. Clipping may occur depending on the input channel levels and the selected mix levels.
- Level A: Downmix output level is normalized based on the applied mix levels to provide a uniform output over the range of mix levels available. Clipping will never occur, even with full scale input channels and mix levels.

- Level B: Downmix output level is normalized based on the channel configuration to provide a uniform output loudness between 3/2 and 2/0 programs. Downmixing a 3/2 program produces a loudness attenuation compared to the same program in 2/0 at the same input loudness. To provide a uniform output loudness, a loudness attenuation is applied only on 2/0 programs. If the operating mode is *Follow Metadata*, the channel configuration is given by the AC-3 coding mode parameter in the metadata. If the operating mode is *Manual*, the channel configuration is given by the selected mix levels: a 2/0 channel configuration is achieved by setting Center, Surround, and LFE Mix Levels to *Mute*. Any other combination of mix levels is assumed to be a 3/2 channel configuration. Level-B normalization also includes Level-A normalization, based on the applied mix levels. Clipping will never occur, even with full scale input channels and mix levels.

- This selection is not available when *Oper. Mode* is OFF.

Output Channels: Select the audio channels whose content will be replaced by the output of the downmix processor

- 7&8
- 15&16
- 23&24
- 31&32
- This selection is not available when the *Operating Mode* is OFF (downmix disabled).

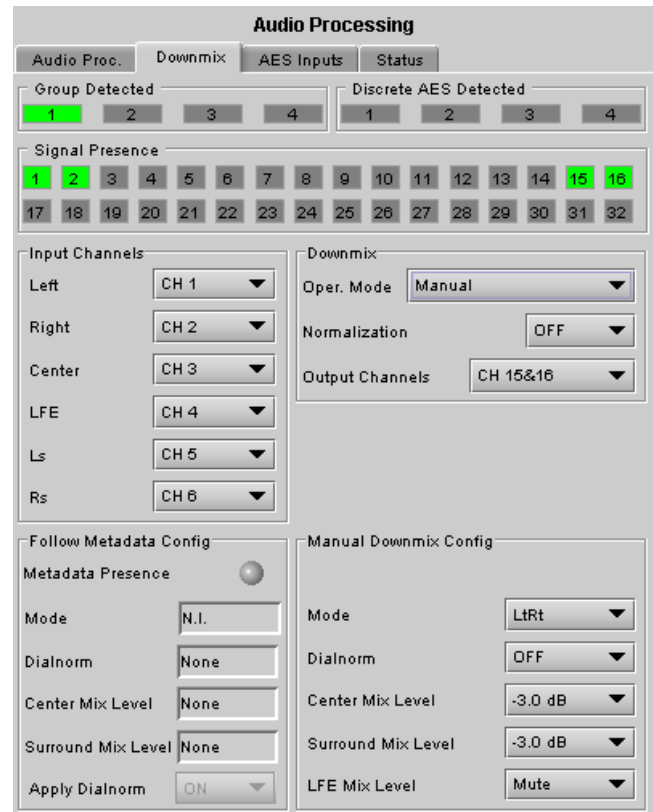


Figure 5-42 Audio Processing - Downmix tab



**Manual Downmix Config / Default Metadata Config**

The heading of this area of the panel changes depending on the selection in the *Operating Mode* pulldown above, but the available controls are the same in both cases.

- Operating Mode = Manual – the controls are used to set up the Manual Downmix parameters.
- Operating Mode = Follow Metadata Path 1 or 2 – the controls are used to set up the default downmix parameters for situations where the selected metadata path contains no data.

*Mode*: this pulldown menu selects the downmix mode:

- **LtRt**: Enables the downmix of 5.1 channels into an LtRt (Left total Right total) matrix surround encoded stereo pair. The input signals on the channel pair selected as the Output Channels are discarded.
- **LoRo**: Enables the downmix of 5.1 channels into an LoRo (Left only Right only) stereo pair, which is a conventional stereo signal. The input signals on the channel pair selected as the Output Channels are discarded.

*Dialnorm*: this pulldown selects the dialog normalization level. Select OFF to prevent the downmix from applying the dialnorm.

[OFF, -1 dBFS, -2 dBFS, -3 dBFS, ....., -31 dBFS]

*Center Mix Level* – sets the center channel downmix level to the selected value

[+3 dB, +1.5dB, 0 dB, -1.5 dB, -3 dB, -4.5 dB, -6 dB, Mute]

*Surround Mix Level* – sets the surround channels (Ls & Rs) downmix level to the selected value

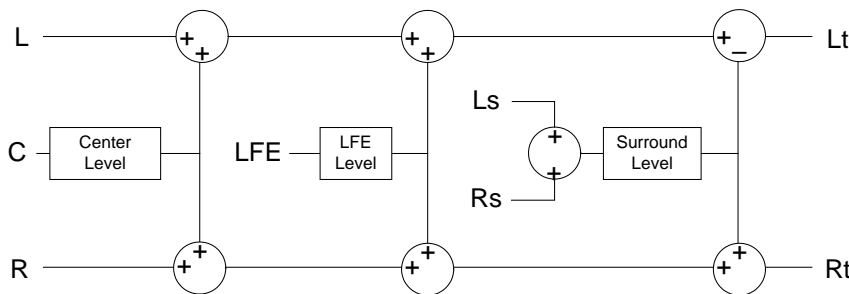
[+3 dB, +1.5dB, 0 dB, -1.5 dB, -3 dB, -4.5 dB, -6 dB, Mute]

*LFE Mix Level* – sets the LFE channels downmix level to the selected value.

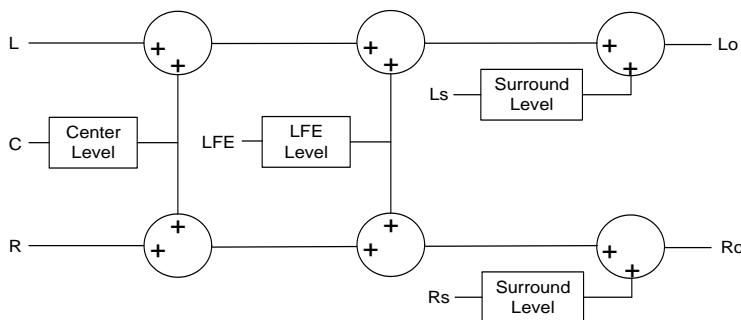
[+10 dB, +9 dB, +7.5, +6 dB, +4.5 dB, +3 dB, +1.5dB, 0 dB, -1.5 dB, -3 dB, -4.5 dB, -6 dB, Mute]

- Note: The *LFE Mix Level* pulldown sets the LFE downmix level for both *Manual* and *Follow Metadata Path 1 or 2* operation modes, whether or not the metadata is present in the selected path.

The block diagrams below show the configuration of the LtRt surround sound downmixer and the LoRo stereo downmixer.



**Figure 5-43 LtRt Surround Sound downmixer**



**Figure 5-44 LoRo Stereo downmixer**



**Follow Metadata Config:**

This section reports on Metadata presence in the selected path if the Follow Metadata Path 1 or 2 Operating Mode is selected. The four data boxes below the Metadata status icon indicate the current mode, plus the values in use for Dialnorm, Center Mix Level and Surround Mix Level.

**5.7.3 AES Inputs tab**

The status icons at the top of the tab indicate which Groups and discrete AES are detected, and which of the 32 channels have signal present.

**Audio Proc Input Selection**

This section provides a selection between the embedded audio and the discrete AES inputs. Channels 1 to 8 will always be the first 8 embedded channels. However, channels 9 to 16 can be either embedded channels 9 to 16 or the 8 discrete channels from the 4 AES inputs, selected using the pulldown.

**Sample Rate Converter**

Use the pulldowns to select between OFF and Auto for each of the four AES.

- OFF: Sample rate conversion is disabled. Use only if the AES input is always 48 kHz synchronous to the video input OR if the AES input carries non-PCM audio (Dolby or other) with its channel status indicating "Linear PCM".
- AUTO: Sample rate conversion is automatic, based on the input audio type. Sample rate conversion is enabled for PCM audio, and bypassed for non-PCM audio.

**5.7.4 Status tab**

The Status tab reports the type of audio present at the input and the Dolby-E alignment.

Audio Type Status:

- PCM – the audio channel carries PCM audio (orange)
- Dolby E – the audio channel carries Dolby E encoded audio (blue)
- AC3 – the audio channel carries Dolby Digital (AC-3) encoded audio (violet)
- NPCM – the audio channel carries non-PCM other than Dolby E or Dolby Digital (AC-3) (yellow).

Dolby-E Alignment:

- When Dolby-E audio is present, this panel will display the offset/delay between the Dolby-E and the video output timing of the card. You may click the Auto Align button to automatically adjust the audio timing delay to ensure a perfect alignment with the

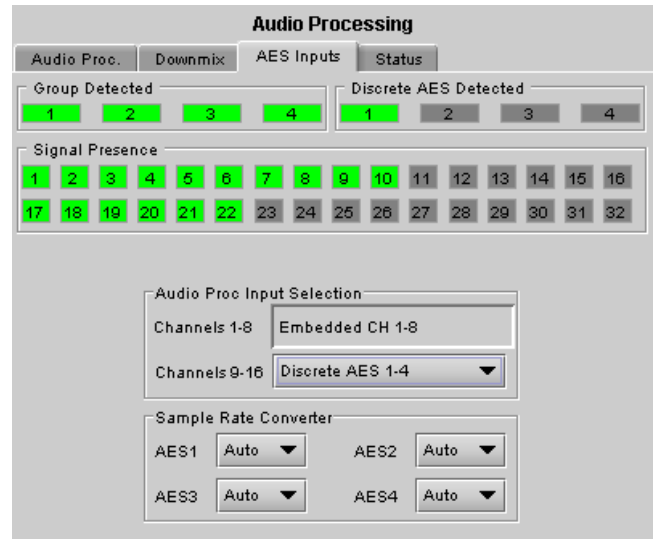


Figure 5-45 Audio Processing - AES Inputs tab



Figure 5-46 Audio Processing - Status tab

video. This is equivalent to changing manually the audio delay in the audio processor. If you change the output timing of the card or the video output format, you may have to re-align the Dolby-E.

- The offset is not available for any type of audio other than Dolby-E.

The measured Dolby-E offset can be a positive OR a negative value. A negative value indicates the Dolby-E is in advance compared to the video and additional delay should be added to the audio channel pair.

A positive value indicates the Dolby-E is late compared to the video and the audio delay must be reduced for this channel pair. Sometimes, the audio delay cannot be compensated because it would mean to have an audio delay lower than the processing delay of the card. In this case, you have to add an extra frame delay to the video to provide more range to the audio delay.

### 5.8 Audio Outputs panel

This panel provides additional audio processing for the 16 audio channels embedded in the 3G/HD and SD output, and for the four AES outputs:

- audio channel shuffling
- level adjustment
- mixing
- audio embedding mode.

The XVP-3901 may be paired with up to two DAP or UAP cards for additional audio channel inputs to the mixers and for discrete AES/analog outputs.

You can configure the audio output shufflers/mixers (3G/HD, SD and AES) differently for an SD input than for a 3G/HD input. The card will remember the different parameters and will load them automatically without user intervention based on whether the video input is SD or 3G/HD. Ensure the card has a video signal of the desired format before changing the configuration.

The panel has a set of tabs at the top to allow the appropriate audio channels to be accessed (figure 5.48). The available controls are virtually identical in all cases, so they will be described only once.

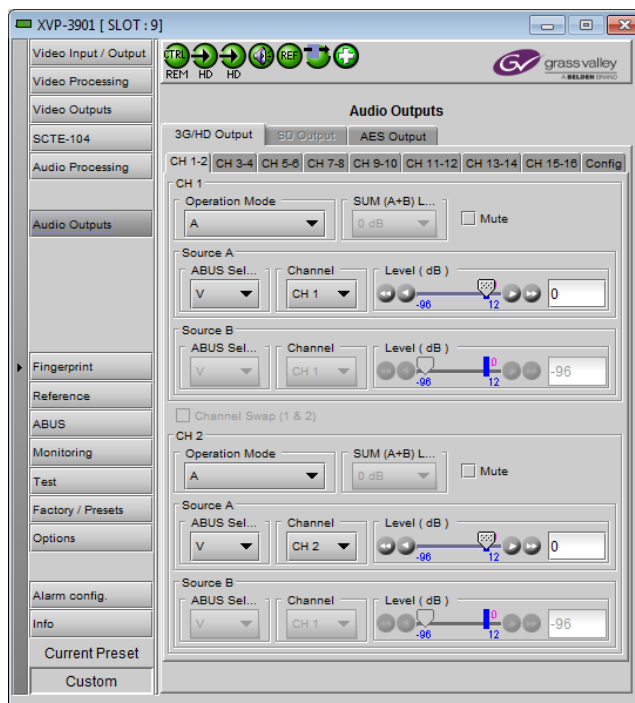


Figure 5-47 Audio Outputs panel

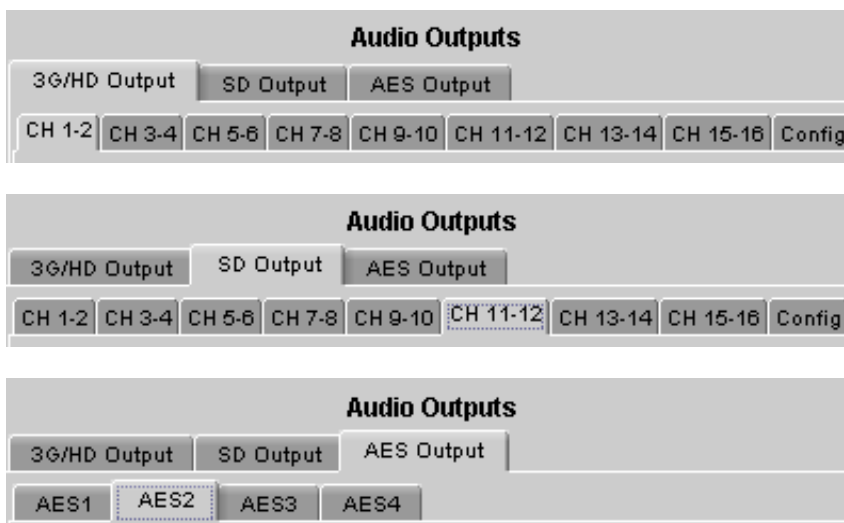


Figure 5-48 Audio outputs tab structure

### 5.8.1 CH 1-2, CH 3-4, ... CH 15-16 tabs, and AES1, ... AES4 tabs

Each of these tabs provides all necessary controls for the output mixers. The example shown is for 3G/HD Output, CH 1-2, but all panels have the same controls.

**Operation Mode (Off, A, SUM(A+B), Mix):** This menu allows the source(s) of each output channel to be selected – a single channel, the sum of two channels or a mix of two channels.

**Off:** The output channel is muted.

**A:** The output channel is the channel source (*ABUS Select* and *Channel*) selected in sub-menu SOURCE A.

**SUM (A+B):** The output channel is the sum of the two channels sources (*ABUS Select* and *Channel*) selected in sub-menus SOURCE A and SOURCE B.

- If you select this option, the SUM (A+B) Level pull-down is activated, allowing you to reduce the level of the summed output (0dB, -3dB or -6dB).

**Mix:** The output channel is a mono mix of the (*ABUS Select* and *Channel*) selected in sub-menus SOURCE A and SOURCE B.

**Mix 4Ch:** This mode allows a 3-input or 4-input mix on the chosen even output. A standard 2-input mix is available on the odd output. On the same tab, the two selected sources of the even channel are mixed with the one or two selected sources of the odd channel. The four sources are mixed, with the level of each source adjusted using its slider or data entry box. You can swap the odd and even output by putting a check mark in the Channel Swap (1&2) checkbox. Note that in the Mix 4Ch mode, if the Mute box is checked, only the even channel sources will be muted, the odd channel sources will still pass to the output.

**Note:** in the case of SUM and MIX, if either of the two input channels is non-PCM, the output will always be SOURCE A

**Mute:** Mute the audio channel by checking this box. In the MIX4Ch mode, checking this box will mute only the sources of the selected output channel.

**Source A & Source B:** These sub-sections allow the source channels (A and B) to be selected for each output channel.

**ABUS Select:** V, A1, A2: selects the embedded input audio (V), one of two audio companion cards (A1 or A2 channels 1-8) or one of two Dolby decoder modules installed on companion cards (A1 or A2 channels 9-16) to be used as the source for this channel. Note: The ABUS card system is configured in the *ABUS* panel.

**Channel:** Channel 1, ..., Channel 16: selects the channel to be used from the selected audio source.

**Level (dB):** Sets the audio gain of the channel source from -96 to +12 dB in 0.5 dB steps. For non-PCM audio, the level value is overridden to 0 dB.

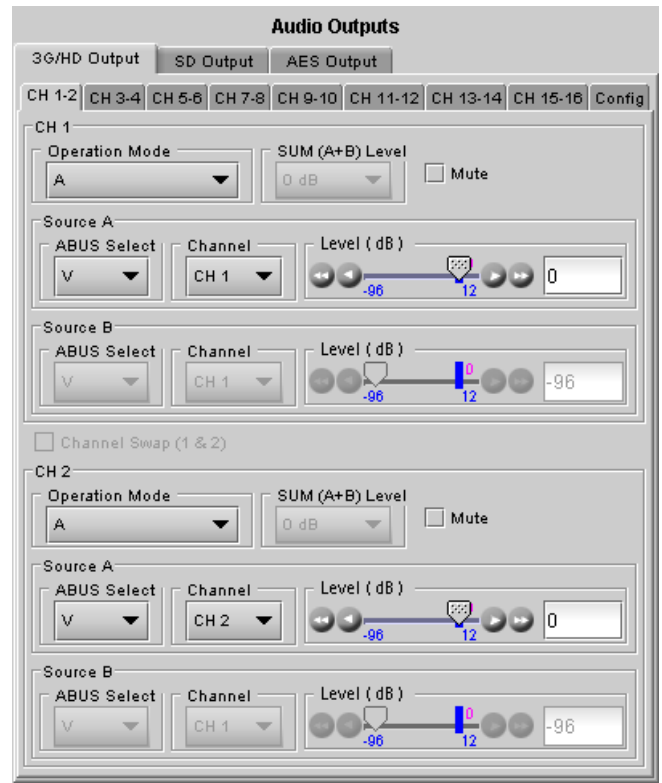


Figure 5-49 Audio Outputs operating controls

### 5.8.2 Config tab

A Config tab is available in the 3G/HD tab and the SD tab, but not in the AES tab,

In each case, the tab contains only an Output – Audio Insert pull-down.

Use the pull-down in this tab to enable (AUTO) or disable (OFF) audio embedding in the output.

- When OFF is selected, no audio is embedded in the HD output.
- When AUTO is selected, only those audio groups containing at least one audio channel will be embedded at the output.

For SD outputs, the number of bits to be embedded must also be selected, and so the options in the pull-down are:

- OFF
- Auto 20 bits
- Auto 24 bits

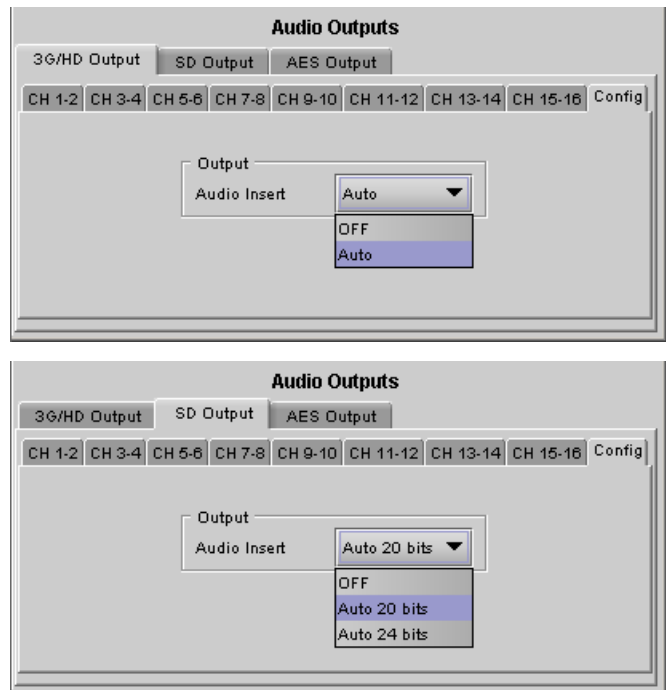


Figure 5-50 Audio Outputs - Config tabs

### 5.9 Fingerprint panel

Fingerprinting technology on this card functions in conjunction with iControl.

- **iControl 4.0 and higher is required.**

XVP-3901-DPI streaming is ON by default, but the management of the stream is handled in iControl, and there is no local control of the process at this card control panel, except to select the window, and to turn streaming OFF if there are problems with the stream or the network.

- Use the pull-down at the top of the panel to turn Fingerprint Streaming ON or OFF

See the iControl Version 4.00 User's Guide (Grass Valley document 226-99M00-271) for a description of Fingerprint management in iControl. The relevant text can be found in the section called 'Lip-Sync Detection and Monitoring' which is in the chapter titled 'Working with iControl as an Operator'

Individual, independently-adjustable fingerprints are generated for the 3G/HD output and for the SD output. Use the tabs in the panel to select one of these.



Figure 5-51 Fingerprint - 3G/HD output or SD output

**Zone**

Select the area of the image within which fingerprint data will be calculated and streamed.

- The selected area is shown as a blue outline on the control panel window, superimposed over a thumbnail of the video.
- The thumbnail is only available when the Input Control box is selected in the Thumbnail panel.

*Default Window* – a factory default is specified which is applied consistently to all Grass Valley fingerprinting devices. It places the window in the central “action area” of the image, generally avoiding letterboxes and static graphics that are usually found in the periphery of the image.

*Full Screen* – opens the window to include the complete video image.

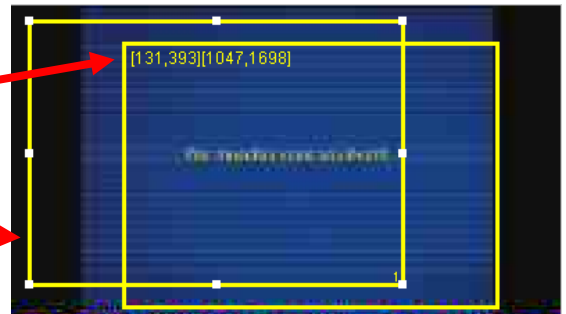
*Start/Stop Line & Pixel* – allows the user to create a custom window in response to particular or unusual image content.

- The custom window can be placed anywhere within the picture.
- Type the value into the data box and Enter, or use the scroll arrows to change the value

*Use a mouse to resize* – you may also use your mouse to move and resize the window. Click within the blue frame and it will turn yellow and display control handles. Mouse over a handle until the cursor switches to an arrow icon, and then drag the handle to resize the window. When you are not over a handle, the 4-arrow cursor allows you to drag the window to a new location

- While you are resizing with the mouse, the start and stop line and pixel are shown in the top left of the frame area, in this format:  
[start line, start pixel][stop line, stop pixel]

- The original position of the frame remains visible, so the amount of change can easily be seen



**Figure 5-52** Fingerprint – window resizing

## 5.10 Reference panel

This group of parameters allows the selection of the reference to be used by the XVP-3901-DPI.

Use the radio buttons in the Reference Source area to select from the following options:

- Auto – this mode selects the first source detected in this order of priority:
  - External Reference input
  - URS
  - Selected Input signal
- External – selects the signal connected to the rear-panel REF IN connector
- URS (Universal Reference Signal) – selects the internal reference from the backplane
- Input – uses the currently-selected input signal.

URS Format – use the radio buttons in the URS Format area to select whether the URS is OFF, 29.97 Hz or 25 Hz.

- When URS is OFF, the URS reference format source cannot be selected, and will also be ignored by the automatic detection mode.



Figure 5-53 Reference panel

## 5.11 A-BUS panel

When companion audio cards such as the DAP and UAP are used to provide additional audio channels, the A-BUS audio bus links the installed audio cards and the XVP-3901-DPI. This panel is used to instruct the XVP-3901-DPI about the presence of installed audio cards and the system configuration.

### Multiple Card Config sub-section

**A1/A2 Presence:** Monitors the presence of companion audio cards installed in the chassis (see section 2.2 XVP-3901-DPI Installation).

**Card System Config:** To enable the audio bus, use the pull-down box and select your system’s configuration. Selecting Video restricts available audio signals to audio signals on the video card; Video / A1 or Video / A1 / A2 adds the audio channels incoming from the installed audio cards that have been detected.



Figure 5-54 A-BUS panel



## 5.12 Monitoring panel

### 5.12.1 Thumbnails tab

The thumbnail area displays thumbnail images for the inputs and outputs selected in the Player area.

**Player** – Click the checkbox to display the thumbnail

**Control** – Click the checkboxes to apply the Mode, Format, Quality and Refresh Rate settings to these thumbnails.

**Mode** – select between Video mode and Test mode. Use Video mode for normal operation.

**Format** – choose the thumbnail size: small, medium, large

**Quality** – choose the quality of the displayed image by selecting Poor, Normal or HiQ (High Quality) from the pulldown list

**Refresh Rate** – select the desired refresh rate from the pulldown box. The choices are:

[Fast, 1 sec, 2 sec, ..., 9 sec, 10 sec.]



Figure 5-55 Monitoring - Thumbnails

### 5.12.2 RALM tab

The Remote Audio Level Meter (RALM) panel displays audio output level meters for up to 8 channels. Channels are displayed in pairs, so up to four meters will be present in the meter display window. The source for each meter is selected using the pulldowns in the RALM Remote Control area at the bottom of the control panel.

- OFF
- HD/SD Out CH 1&2 up to CH 15&16
- AES Out 1 to AES Out 4

The meter is divided into three zones, and the dividing points and color of each zone are individually configurable under the *Meter Ballistics Config* tab.

**Speed** – select the meter response from the pull-down list, options are [ fast, medium, slow ]



Figure 5-56 Monitoring - RALM tab

### 5.12.2.1 RALM Connections tab

Use the radio buttons to turn the meter display ON (RALM) or OFF for the indicated channels. The meter appears directly above the controls.

*Reset Counter:* click this button to reset the overload counter on the ALM display to zero. See the next section for instructions on setting up the overload counter.

### 5.12.2.2 Meter Ballistics Config tab

*Type* – select a type of meter from the pull-down list

*Upper Zone Limits* – select the crossover level between the upper and middle zones of the meter (the range of values shown in the pull-down list depends on the type of meter selected)

*Lower Zone Limits* – select the crossover level between the middle and lower zones of the meter (the range of values shown in the pull-down list depends on the type of meter selected)

*Color samples* – the three samples show the current selected color for the upper, middle and lower zones of the meter.

- Click on the color sample of a zone to open a color selection panel to choose a different color for that zone

*Overload Cursor* – The overload cursor appears on the meter as an arrowhead in the meter scale. The two pulldown boxes set the position of the overload cursor on the left and right meters. If the audio level on that channel goes above the cursor, the Overload Counter at the top of the meter is incremented.

The *Overload Counter* shows a running count of the number of overloads detected. The Overload level is shown by a marker beside the meter, and its position can be set under the *Meter Ballistics Config* tab

The *Phasemeter* (located at the bottom of the RALM meter display) is a small meter that represents the phase correlation factor between the two channels of a pair.  
 Note – The level and phase meters are disabled for channels carrying non-PCM audio (Dolby E, Dolby Digital or other non-PCM types).

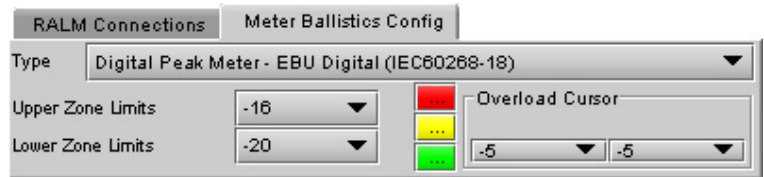


Figure 5-57 RALM - Meter Ballistics Config

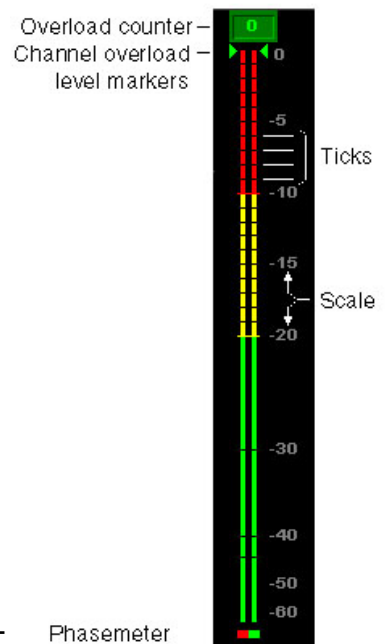


Figure 5-58 RALM meter display



### 5.13 Test panel

This panel contains a single checkbox that sends a 75% color bar test pattern (100% white), along with audio test tones (a continuous tone on right channel with pulsed tone on left channel in every pair) to the XVP-3901-DPI output.



Figure 5-59 Test panel

### 5.14 Factory/Presets panel

#### 5.14.1 Factory section

**Load Factory:** Clicking this button will restore the card to a factory default state. Two checkboxes enable the user to choose whether to include Parameters and/or Alarms in the restoration process

- Note that User Presets are not changed

#### 5.14.2 User Presets section

The XVP-3901-DPI has memory registers which can hold up to 5 user-defined parameter settings.

The *Current Preset* box (at the bottom left corner of the panel) displays the last loaded preset. Any change to the card configuration after a preset is loaded will change the display to "Custom" instead of the preset value.

**Select** any one of the five presets using the pull-down list. The name of the currently-selected User Preset is shown on the pull-down box.

Click **Load** to load the contents of the selected User Preset into the XVP-3901-DPI. All parameter settings and values will be replaced by the contents of the selected User Preset.

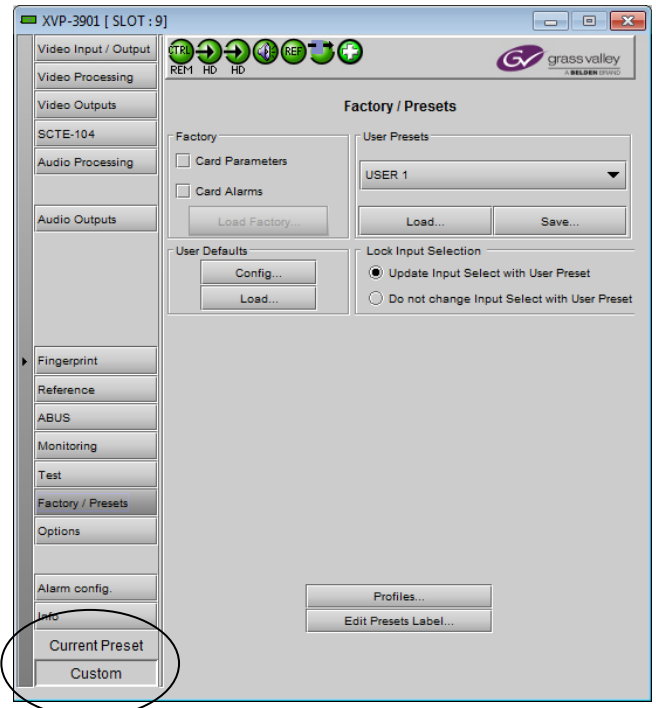


Figure 5-60 Factory / Presets panel

Click **Save** to store the current parameter settings and values from the XVP-3901-DPI into the selected User Preset. The existing contents of the preset will be overwritten.

### 5.14.3 Lock Input Selection section

When User Presets are saved, the input selection is saved as well. This means that changing User Preset may change input selection, depending on which one is associated with the User Preset. This is the normal behavior when "Update Input Select with User Preset" is chosen.

Selecting "Do Not Change Input Select with User Preset" forces the input selection to remain unchanged, while applying all other settings associated with the selected preset.

### 5.14.4 Edit Presets Label...

Click this button to open a window where you can define the name assigned to each user preset. This is the name that will appear on the pull-down in the User Presets section. The labels will also be copied from card to card when a copy profile is performed.

### 5.14.5 Profiles

This section provides the option to save and recover the entire card configuration (including user presets if desired) on an external disk, or to copy it to another XVP-3901-DPI card.

Click on *Profiles* to open the Profile Copy window.

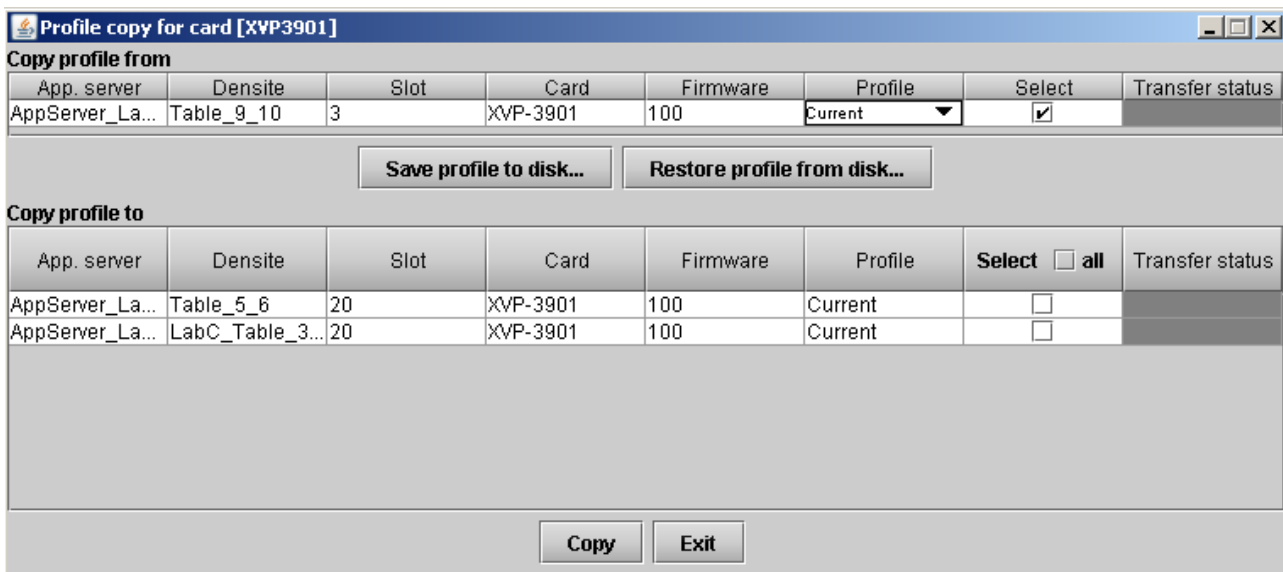


Figure 5-61 Profile copy for card window

#### 5.14.5.1 Copy profile from

This line shows this XVP-3901-DPI card, and identifies it by App server, Densité frame and slot number, card type and firmware version.

The *Profile* column has a pulldown that allows you to select which profiles you will work with, and gives these choices:

- Current, User1, User2, User3, User4, User5, All

The *Select* column includes a checkbox (preselected checked) to confirm that you want to work with the current card.

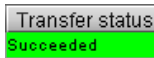
#### 5.14.5.2 Save Profile to Disk...

Click this button to open a Save dialog allowing you to specify a file name and location to which the selected profiles for this card will be saved.

*Hint - It is a good idea to create a folder for these files, because they are not explicitly identified as XVP-3901-DPI profiles, and will be difficult to find and identify if not clearly named and conveniently located.*

- Click the save button once the name and location have been identified in the Save box

- If the file is saved correctly, the Transfer Status box on the right of the *Copy profile from* line will indicate *Succeeded* against a green background



- If the file was not saved for some reason, the Transfer Status box to the right of the *Copy profile from* line will indicate *Failed* against a red background

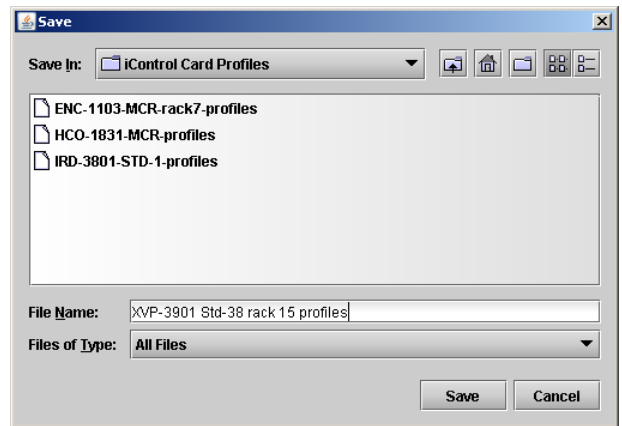
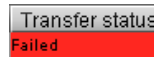


Figure 5-62 Save Profile to Disk dialog

#### 5.14.5.3 Restore profiles from disk...

Click this button to open an *Open* dialog box within which you can locate and select a valid XVP-3901-DPI profile file.

- Click Open to read the contents of the file and to reconfigure this XVP-3901-DPI's profiles according to its contents
- While the reconfiguration is in progress, the Transfer Status box on the right of the *Copy profile from* line will indicate *Working* against a yellow background
- When the reconfiguration is complete, the Transfer Status box on the right of the *Copy profile from* line will indicate *Succeeded* against a green background

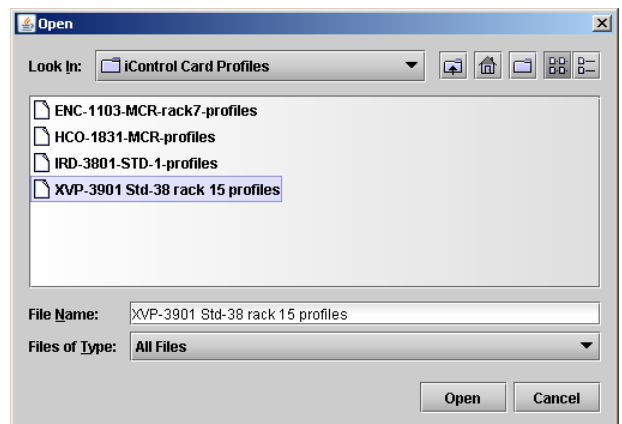


Figure 5-63 Restore profiles from disk dialog

#### 5.14.5.4 Copy profile to section

This line shows other XVP-3901-DPI cards that are available on the iControl network, each identified by App server, Densité frame and slot number, card type and firmware version.

The *Profile* column shows the same information as is shown for the current card in the *Copy profile from* line, i.e. one of the following:

- Current, User1, User2, User3, User4, User5, All

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The *Select* column includes a checkbox to identify which XVP-3901-DPI cards you wish to copy profiles into from the current card.

- For convenience, a *Select all* checkbox is provided in the column header

Click *Copy* to copy the selected profiles from this card into the selected other XVP-3901-DPI cards

- While the profile copy operation is in progress, the Transfer Status box on the right of the *Copy profile to* line will indicate *Working* against a yellow background
- When the profile copy operation is complete, the Transfer Status box on the right of the *Copy profile to* line will indicate *Succeeded* against a green background

### 5.15 Options panel

Two options are available for the XVP-3901-DPI:

- Discrete AES and 32 Channel Internal Audio Processing Option (XVP-3901-OPT-AUD)
- Key/fill option (XVP-3901-OPT-K)

To activate each of these options, you must

- Obtain a licence key from Grass Valley.
- Type the licence key in the box
- Click on ENABLE OPTION to enable the option's features.

#### 5.15.1 Audio option

Enables the discrete AES I/Os, the 32-channel internal audio processing and the Dolby metadata processing.

*Note: When the Audio option is not enabled, all discrete AES I/Os and audio processing features are disabled. If there is embedded audio and Dolby metadata in the input signal, they pass through to the output signal. However, when the Audio option is not enabled (using a software key) BUT there are companion audio cards installed and connected to the XVP-3901-DPI with the ABUS cable, the Audio Processing, Audio Output and Dolby metadata controls will be available and functional.*



Figure 5-64 Audio option

### 5.15.2 Key/Fill option:

This option is used to enable the background key/fill functionality for the side panels and letterbox.

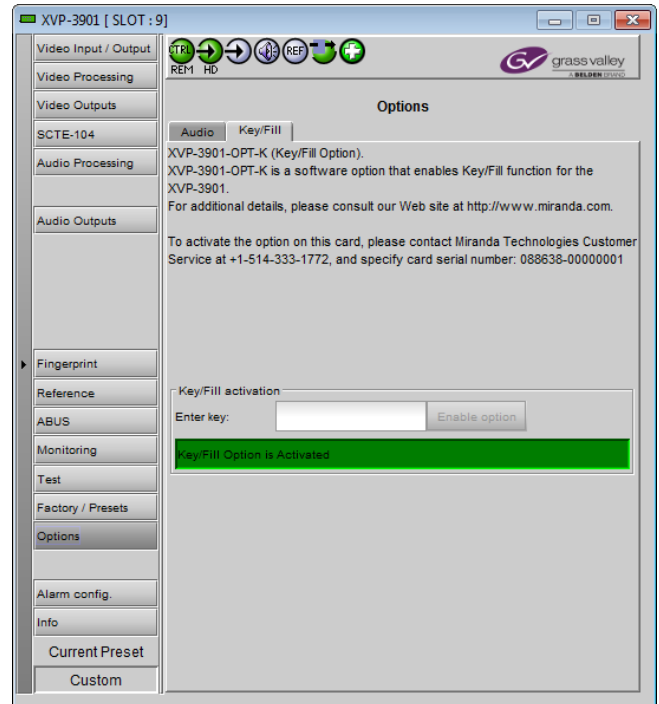


Figure 5-65 Key/Fill option

### 5.16 Alarm Config panel

This panel allows the alarm reporting of the XVP-3901-DPI to be configured. The panel opens in a new window when the button is clicked, and can be resized if needed.

The panel is organized in columns.

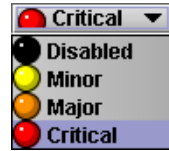
#### **Status/Name**

This contains an expandable tree listing all the alarms reported by this XVP-3901-DPI card.

- Each alarm name includes an icon that shows its current status
- Some alarms may be text-only and the alarm status is shown in the name and not by a status icon

The **Card LED**, **Overall alarm** and **GSM contribution** columns contain pulldown lists that allow the level of contribution of each individual alarm to the alarm named in the column heading to be set.

- Click on the alarm icon to see the available levels; then click on one to select it



**Card LED**

This column allows configuration of the contribution of selected individual alarms to the status LED located on the front card edge. The Card LED status is shown at the bottom of the alarm tree in the Status/Name column.

**Overall Alarm**

This column allows configuration of the contribution of each individual alarm to the Overall Alarm associated with this card. The Overall Alarm is shown in the upper left corner of the iControl panel, and also appears at the bottom of the Status/Name column.

**GSM Contribution**

This column allows configuration of the contribution of each individual alarm to the GSM Alarm Status associated with this card. GSM is a dynamic register of all iControl system alarms, and is also an alarm provider for external applications. The possible values for this contribution are related to the Overall alarm contribution:






- If the Overall alarm contribution is selected as Disabled, the GSM alarm contribution can be set to any available value
- If the Overall alarm contribution is selected as any level other than disabled, the GSM contribution is forced to follow the Overall Alarm.

Status / Name	Card LED	Overall alarm	GSM contribu...	Log ev...
XVP-3901	Set all	Set all	Set all	✓
Input	Set all	Set all	Set all	✓
Input 1 Carrier	Critical	Disabled	Disabled	✓
Input 2 Carrier	Disabled	Disabled	Disabled	✓
Input 1 Video Error	Critical	Disabled	Disabled	✓
Input 2 Video Error	Disabled	Disabled	Disabled	✓
Input 2 Format Mismatch	Critical	Disabled	Disabled	✓
Fail Over Mode Detected	Disabled	Disabled	Disabled	✓
Fiber Selection Error	Critical	Disabled	Disabled	✓
Input Format (Input 1: 1920x1080i 59.94N/A)	N/A	N/A	Disabled	✓
CC Presence	N/A	Disabled	Disabled	✓
Timecode Presence	N/A	Disabled	Disabled	✓
Output (Input 1)	N/A	N/A	Disabled	✓
Source Selected Input 1 (BNC1)	N/A	N/A	Disabled	✓
Source Selected Input 2 (BNC2)	N/A	N/A	Disabled	✓
Format Selected BNC Output 1 (HD OutN/A)	N/A	N/A	Disabled	✓
Format Selected BNC Output 2 (HD OutN/A)	N/A	N/A	Disabled	✓
Format Selected Fiber Output 1 (N/A)	N/A	N/A	Disabled	✓
Format Selected Fiber Output 2 (N/A)	N/A	N/A	Disabled	✓
Reference	Set all	Set all	Set all	✓
Reference Presence	Critical	Disabled	Disabled	✓
Reference Mismatch	Critical	Disabled	Disabled	✓
Reference (Missing)	N/A	N/A	Disabled	✓
Audio	Set all	Set all	Set all	✓
AES Presence	Set all	Set all	Set all	✓
Audio Proc.	Set all	Set all	Set all	✓
Rear	Critical	Disabled	Disabled	✓
Card System Mismatch	Critical	Disabled	Disabled	✓
Manual Freeze	Minor	Disabled	Disabled	✓
Color Bars & Tone	Minor	Disabled	Disabled	✓
Hardware Failure	Critical	Disabled	Disabled	✓
Hardware Failure Description (Hardware OKN/A)	N/A	N/A	Disabled	✓
AFD Presence	N/A	Disabled	Disabled	✓
VLI Presence	N/A	Disabled	Disabled	✓
WSS Presence	N/A	Disabled	Disabled	✓
Namedropper Presence	N/A	Disabled	Disabled	✓
Input AFD Mode (Manual - 16:9)	N/A	N/A	Disabled	✓
Selected Input AFD (16:9_9)	N/A	N/A	Disabled	✓
HD Out AFD Inserted (16:9_8)	N/A	N/A	Disabled	✓
SD Out AFD Inserted (16:9_8)	N/A	N/A	Disabled	✓
SD Out VLI Inserted (N/A)	N/A	N/A	Disabled	✓
SD Out WSS Inserted (N/A)	N/A	N/A	Disabled	✓
HD Output Format (1920 x 1080i 59)	N/A	N/A	Disabled	✓
Current Preset (Custom)	N/A	N/A	Disabled	✓
SCTE-104	Set all	Set all	Set all	✓
Cue Alarms	Set all	Set all	Set all	✓
Automation Presence	N/A	Disabled	Disabled	✓
SCTE 104 Presence	N/A	Disabled	Disabled	✓
User Defaults	Set all	Set all	Set all	✓
Video Processing	Set all	Set all	Set all	✓
Video Timing	Set all	Set all	Set all	✓
HD Out	Set all	Set all	Set all	✓
Vertical HD	N/A	Minor	Minor	✓
Horizontal HD	N/A	Minor	Minor	✓
SD Out	Set all	Set all	Set all	✓
Vertical SD	N/A	Minor	Minor	✓
Horizontal SD	N/A	Minor	Minor	✓
Audio Processing	Set all	Set all	Set all	✓
Levels	Set all	Set all	Set all	✓
Fixed Delays	Set all	Set all	Set all	✓
Card LED	N/A	Passthrough	Passthrough	✓
Overall	N/A	N/A	Passthrough	✓

Figure 5-66 Alarm Configuration panel

**Levels associated with these alarms:**

The pulldown lists may contain some or all of the following options:

-  Disabled      The alarm makes no contribution (black icon)
-  Minor      The alarm is of minor importance (yellow icon)
-  Major      The alarm is of major importance (orange icon)
-  Critical      The alarm is of critical importance (red icon)
-  Passthrough      The alarm exists but has no effect (used for text and composite alarms)

**Shortcut:** if you click in one of the Set All boxes beside a section heading, you will open a pulldown that lets you assign a level to all alarms in that section of the column simultaneously.

Once the alarms are configured, you may accept the changes or discard them:

**Log Events**

iControl maintains a log of alarm events associated with the card. The log is useful for troubleshooting and identifying event sequences. Click in the checkbox to enable logging of alarm events for each individual alarm.

At the bottom of the window are several other controls

**Overall alarm and GSM contribution follow card LED**

Click in the checkbox to force the Overall alarm and GSM contribution to be identical to the Card LED status

- All Overall alarms and GSM contributions for which there is a Card LED alarm will be forced to match the Card LED alarm
- All Overall Alarms and GSM contributions for which there is no Card LED alarm will be forced to Disabled

A warning box will open allowing you to confirm the action, since it will result in changes to the configuration and there is no *undo* function.

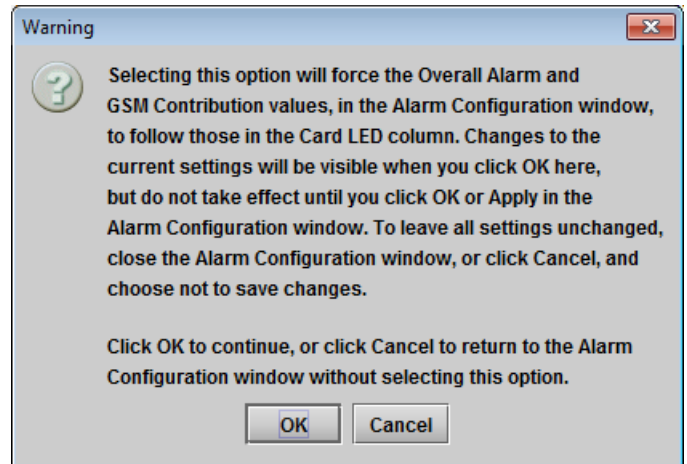


Figure 5-67 Warning for Follow LED change

**Copy to other cards**

Click this button to open a panel that allows the alarm configuration set for this card to be copied into another XVP-3901-DPI card.

- Select one or more destination cards from the list in the window by clicking in the checkboxes, or all of them by clicking in the *All* checkbox
- Note that when you do a Copy Profile for this card (see Sect.5.14), the alarm configuration is copied along with all the other settings.

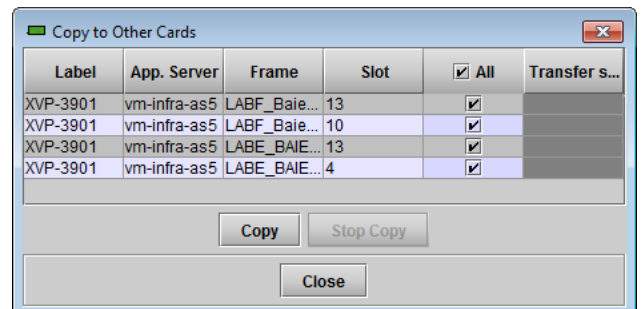


Figure 5-68 Copy to other cards window



**Get alarm keys**

Click this button to open a save dialog where you can save a file containing a list of all alarms on this card and their current values, along with an Alarm Key for each. The alarm keys are useful for system integration and troubleshooting.

- The file is saved in Excel.csv format

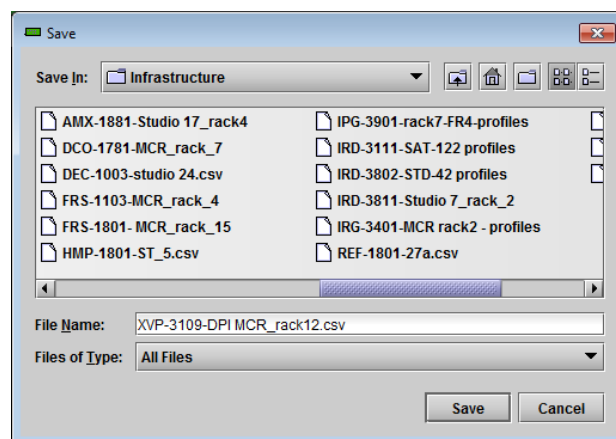


Figure 5-69 Get alarm keys dialog

**OK, Apply, Cancel**

- **OK** accepts the settings and closes the window once the card confirms that there are no errors.
- **Apply** accepts the settings, but leaves the window open
- **Cancel** closes the window without applying any changes, and leaves the previous settings intact.

**5.17 Info panel**

The top two lines in this panel identify the model of this XVP-3901-DPI, and the rear panel that is currently installed.

When the XVP-3901-DPI is included in an iControl environment, certain information about the card should be available to the iControl system. The user can enter labels and comments that will make this card easy to identify in a complex setup. This information is entered into data boxes in the Info control panel.

Card Model: specifies the card model

Rear Type: specifies the rear module currently installed.

Optic Fiber: specifies the optic fiber module currently inserted in the fiber module socket.

Label: type the label that is shown for this XVP-3901-DPI when it appears in iControl applications

Short Label: type the short-form label that iControl uses in some cases (8 characters)

Source ID: type a descriptive name for this XVP-3901-DPI

Comments: type any desired text

The remaining data boxes show manufacturing information about this card.



Figure 5-70 Info panel



Three buttons in the panel give access to other information.

- Details...: Reports the Firmware version, service version, and panel version for this card

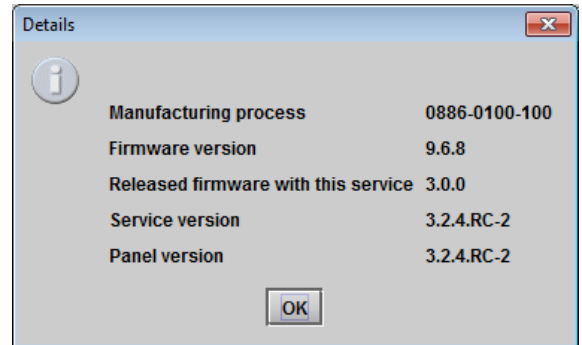


Figure 5-71 Details window

- Advanced...: Shows the LongID for this card. The LongID is the address of this XVP-3901-DPI in the iControl network.

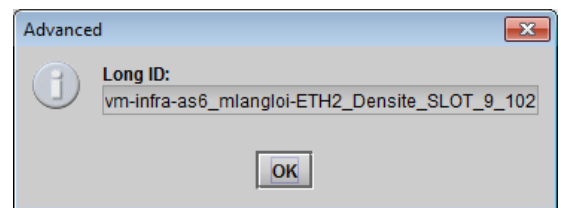


Figure 5-72 Advanced window

- Remote System Administration – opens the Joining Locators window, which lists remote lookup services to which this XVP-3901-DPI is registered.

**Add:** Force the iControl service for this XVP-3901-DPI to register itself on a user-specified Jini lookup service, using the following syntax in the data box:

`jini://<ip_address>`

where `<ip_address>` is the ip address of the server running the lookup service, e.g.:

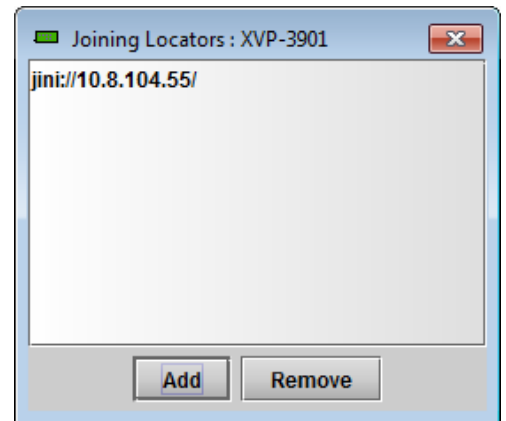
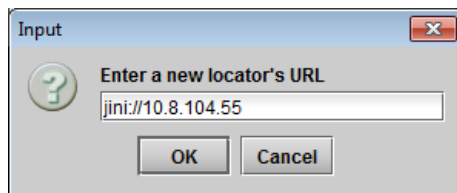
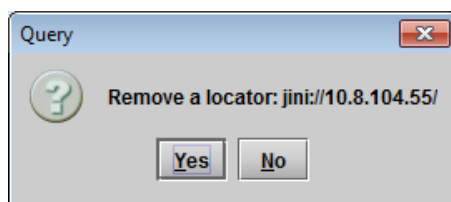


Figure 5-73 Joining Locators window



**Remove:** select one of the services listed in the window by clicking on it, and click *Remove* to open a query box allowing you to delete it from the window.



## 6 Specifications

### VIDEO INPUT (2) / OUTPUT (2)

SIGNAL	SMPTE ST 259:2008	270Mbps
	SMPTE ST 292-1:2012	1.485, 1.485/1.001 Gbps
	SMPTE ST 424:2012	2.970, 2.970/1.001 Gbps
SUPPORTED FORMATS		
	SD:	480i59.94, 576i50
	HD:	SMPTE ST 274:2008 1080i59.94, 1080i50, 1080p23, 1080p23sF, 1080p25, 1080p29
	HD:	SMPTE ST 296:2012 720p59.94, 720p50
	3G:	SMPTE ST 425-1:2014 Level A (mapping 1), Level B: 1080p59.94, 1080p50
CABLE LENGTH *	300 m Belden 1694A at 270 Mbps 150 m Belden 1694A at 1.485 Gbps 120 m Belden 1694A at 2.970 Gbps	
RETURN LOSS *	>15 dB up to 3 GHz	
JITTER	SD/HD: < 0.2 UI alignment jitter 3G: < 0.3 UI alignment jitter	

\* Cable length and return loss specifications will be reduced when using the output protected by the bypass relay on XVP-3901-110/75-3DRP-R rears. Refer to the manual for more detail.

### REFERENCE INPUT

SIGNAL (1)	ST 170:2004 / ST 318:2015 / ITU 624-4 ST 274:2008 / ST 296:2012	Black burst Tri-Level Sync
RETURN LOSS	>35 dB up to 5.75 MHz	

### VIDEO PROCESSING PERFORMANCE

SIGNAL PATH	10 bits minimum
LATENCY	1 frame in all processing modes
ADDITIONAL DELAY	Up to 15 additional frames of delay can be added.

### AUDIO INPUT (4)

SAMPLING FREQUENCY	32 to 96 KHz
QUANTIZATION	Up to 24 bits

#### AES3

- LEVEL 0.2 to 7 Vp-p
- INPUT IMPEDANCE 110 ohms balanced

#### AES3-id

- LEVEL 0.2 to 2 Vp-p
- INPUT IMPEDANCE 75 ohms
- RETURN LOSS 15 dB @ 6 MHz

**AUDIO OUTPUT (4)**

SAMPLING FREQUENCY	48 KHz
QUANTIZATION	24 bits

**AES3**

- LEVEL 2.75 Vp-p
- INPUT IMPEDANCE 110 ohms balanced

**AES3-id**

- LEVEL 1.0 Vp-p
- INPUT IMPEDANCE 75 ohms
- RETURN LOSS 15 dB @ 6 MHz

**AUDIO PROCESSING PERFORMANCE**

QUANTIZATION	24 bits
SAMPLING	48 KHz, synchronous
NUMBER OF CHANNELS	16, 8 pairs, 4 groups
FREQUENCY RESPONSE	±0.02 dB (20 Hz to 20 KHz)
SNR	123 dB (A weighted)
THD + N	-138 dB (20 Hz to 20 KHz)

**MISCELLANEOUS**

FIXED DELAY	0 to 2.0 s
STEP	1 ms (coarse), 1 sample (fine)

**GPI (6 in, 4 out)**

CONNECTOR	26-pin D-SUB, opto-isolated
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**RS-422 A (Automation)**

CONNECTOR	RJ-45
SIGNAL	Automation protocol

**A-BUS CONNECTOR**

As per A-BUS Standard, Grass Valley

**FIBER**

Full specifications are available on SFP optical plug-in cartridges webpage and datasheet.

## *GUIDE TO INSTALLATION AND OPERATION*

### **TEST PATTERN GENERATOR**

VIDEO	Color bars:	100% white bar with 75% color
AUDIO	Left channel:	pulsed 1 KHz tone
	Right channel:	steady 1 KHz tone

### **MISCELLANEOUS**

POWER	25 W
-------	------

## 7 Contact Us

### Grass Valley Technical Support

For technical assistance, contact our international support center, at 1-800-547-8949 (US and Canada) or +1 530 478 4148.

To obtain a local phone number for the support center nearest you, please consult the *Contact Us* section of Grass Valley's website ([www.grassvalley.com](http://www.grassvalley.com)).

An online form for e-mail contact is also available from the website.

### Corporate Head Office

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Telephone: +1 514 333 1772

Fax: +1 514 333 9828

[www.grassvalley.com](http://www.grassvalley.com)

**ANNEX 1 – XVP-3901 Local User Interface**










## ANNEX 2 – AFD FUNCTIONS

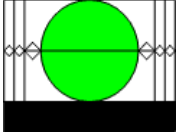
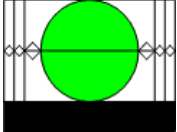
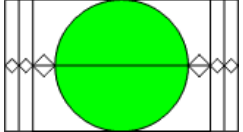
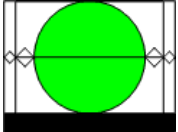
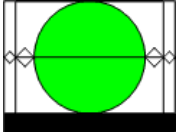
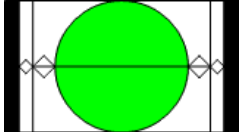
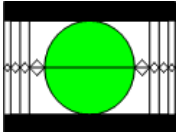
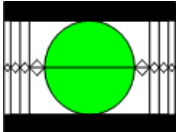
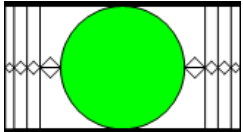
The charts below show the conversions that will be performed by the XVP-3901 when the Active Format Descriptor (AFD) processing is activated by selecting AUTO in the *AFD Mode* pulldown on the input screen of the HD Video Output or SD Video Output panels.

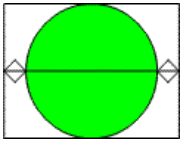
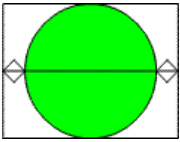
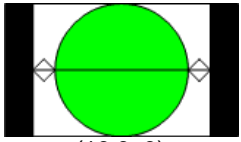
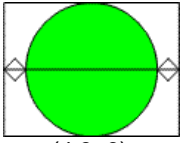
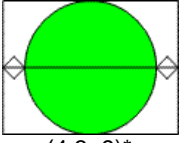
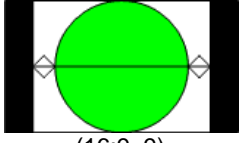
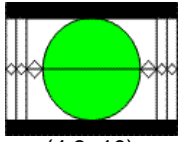
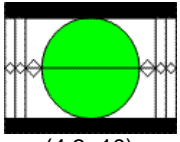
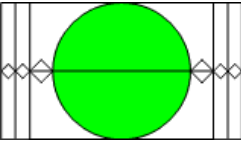
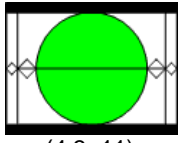
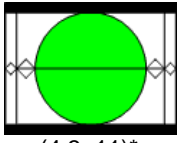
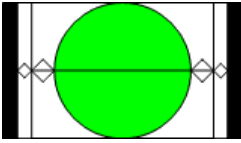
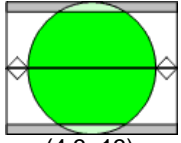
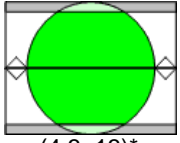
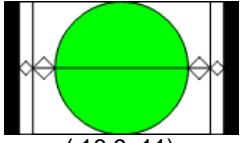
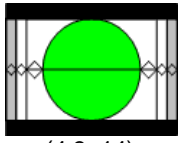
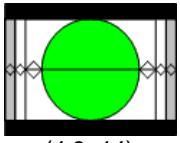
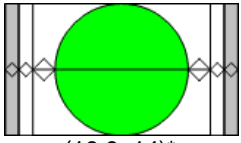
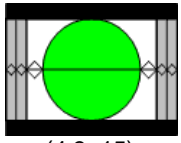
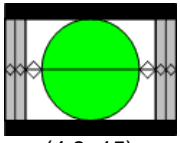
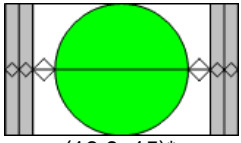
In the images shown in the chart:

BLACK  Indicates that this portion of the transmitted image will be black

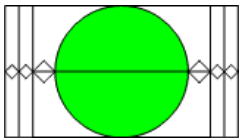
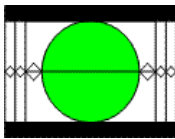
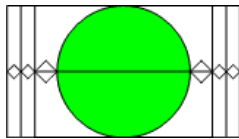
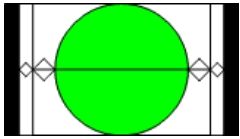
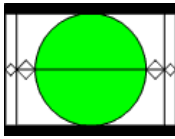
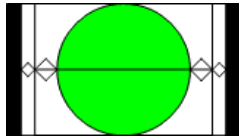
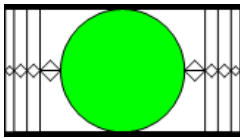
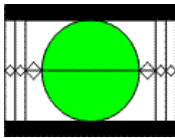
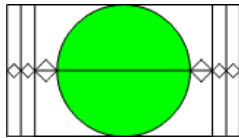
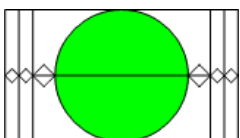
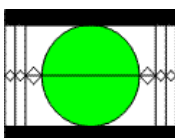
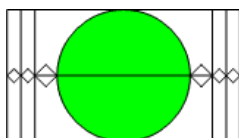
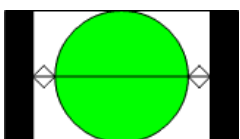
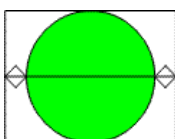
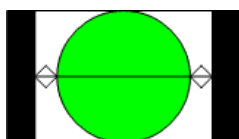
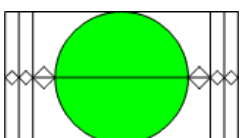
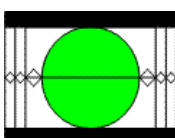
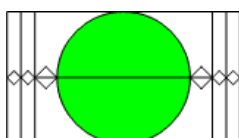
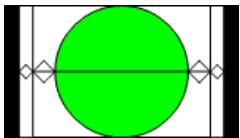
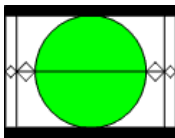
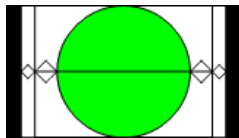
GREY  indicates Protected Area, consisting of picture content which may be cropped for optimum display on screens with a different aspect ratio.

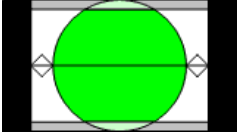
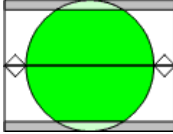
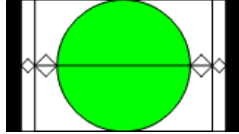
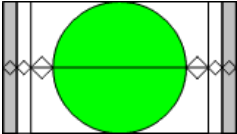
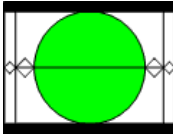
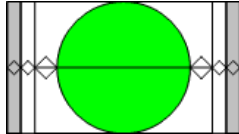
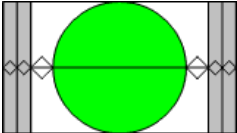
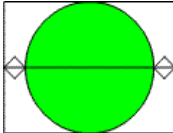
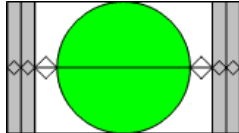
(\*) Asterisk indicates the output selection when the SD Output Aspect Ratio is set to AUTO.

Input signal	4:3	Output signal	16:9
16:9 Letterbox (top) image in a 4:3 frame  (4:3_2)	16:9 Letterbox (top) image in a 4:3 frame  (4:3_2)	16:9 Full frame image in a 16:9 frame  (16:9_8)*	
14:9 Letterbox (top) image in a 4:3 frame  (4:3_3)	14:9 Letterbox (top) image in a 4:3 frame  (4:3_3)*	14:9 Pillar-box image in a 16:9 frame  (16:9_11)	
> 16:9 Letterbox (center) image in a 4:3 frame  (4:3_4)	> 16:9 Letterbox (center) image in a 4:3 frame  (4:3_4)	> 16:9 Letterbox (center) image in a 16:9 frame  (16:9_4)*	

Input signal	4:3	Output signal	16:9
4:3 Full frame image in a 4:3 frame  (4:3_8)	4:3 Full frame image in a 4:3 frame  (4:3_8)*	4:3 Pillar-box image in 16:9 frame  (16:9_9)	
4:3 Full frame image in a 4:3 frame (use preferred 4:3_8 code instead)  (4:3_9)	4:3 Full frame image in a 4:3 frame  (4:3_9)*	4:3 Pillar-box image in 16:9 frame  (16:9_9)	
16:9 Letterbox image in 4:3 frame  (4:3_10)	16:9 Letterbox image in 4:3 frame  (4:3_10)	16:9 Full frame image in a 16:9 frame  (16:9_8)*	
14:9 Letterbox image in a 4:3 frame  (4:3_11)	14:9 Letterbox image in a 4:3 frame  (4:3_11)*	14:9 Pillar-box image in a 16:9 frame  (16:9_11)	
4:3 Image shoot and protect 14:9 in a 4:3 frame  (4:3_13)	4:3 Image shoot and protect 14:9 in a 4:3 frame  (4:3_13)*	14:9 Pillar-box image in a 16:9 frame  (16:9_11)	
16:9 Letterbox image shoot and protect 14:9 in a 4:3 frame  (4:3_14)	16:9 Letterbox image shoot and protect 14:9 in a 4:3 frame  (4:3_14)	16:9 Image shoot and protect 14:9 in a 16:9 frame  (16:9_14)*	
16:9 Letterbox image shoot and protect 16:9 in a 4:3 frame  (4:3_15)	16:9 Letterbox image shoot and protect 16:9 in a 4:3 frame  (4:3_15)	16:9 Image shoot and protect 14:9 in a 16:9 frame  (16:9_15)*	

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Input signal	4:3	Output signal 16:9
16:9 Full frame image in a 16:9 frame (use preferred 16:9_8 flag instead)  (16:9_2)	16:9 Letterbox image in 4:3 frame  (4:3_10)	16:9 Full frame image in a 16:9 frame  (16:9_2)*
14:9 Pillar-box image in a 16:9 frame (use preferred 16:9_11 flag instead)  (16:9_3)	14:9 Letterbox image in a 4:3 frame  (4:3_11)	14:9 Pillar-box image in a 16:9 frame  (16:9_3)*
> 16:9 Letterbox (center) image in a 16:9 frame  (16:9_4)	16:9 Letterbox image in 4:3 frame  (4:3_4)	16:9 Protected Full frame image in a 16:9 frame  (16:9_4)*
16:9 Full frame image in a 16:9 frame  (16:9_8)	16:9 Letterbox image in 4:3 frame  (4:3_10) as shown here, or (4:3_8) as in box below	16:9 Full frame image in a 16:9 frame  (16:9_8)*
4:3 Pillar-box image in 16:9 frame  (16:9_9)	4:3 Full frame image in a 4:3 frame  (4:3_8)*	4:3 Pillar-box image in 16:9 frame  (16:9_9)
16:9 Protected Full frame image in a 16:9 frame  (16:9_10)	16:9 Letterbox image in 4:3 frame  (4:3_10)	16:9 Protected Full frame image in a 16:9 frame  (16:9_10)*
14:9 Pillar-box image in a 16:9 frame  (16:9_11)	14:9 Letterbox image in a 4:3 frame  (4:3_11)	14:9 Pillar-box image in a 16:9 frame  (16:9_11)*

Input signal	4:3	Output signal 16:9
4:3 Pillar-box image Shoot and protect 14:9 in a 16:9 frame  (16:9_13)	4:3 Image shoot and protect 14:9 in a 4:3 frame  (4:3_13)*	14:9 Pillar-box image in a 16:9 frame  (16:9_11)
16:9 Image shoot and protect 14:9 in a 16:9 frame  (16:9_14)	14:9 Letterbox image in a 4:3 frame  (4:3_11)	16:9 Image shoot and protect 14:9 in a 16:9 frame  (16:9_14)*
16:9 Image shoot and protect 4:3 in a 16:9 frame  (16:9_15)	4:3 Full frame image in a 4:3 frame  (4:3_8)	16:9 Image shoot and protect 4:3 in a 16:9 frame  (16:9_15)*

## ANNEX 3 – Installing the Optical Interface

*Installing and removing the Fiber I/O interface cartridge requires special care. This annex describes the process.*

The XVP-3901-110-3DRP-R-F rear panel incorporates a fiber optic interface. The interface consists of two parts:

- A socket on the rear panel into which an SFP interface module is plugged
- An SFP (Small Form-factor Pluggable) module into which the optical fibers are plugged, and which incorporates the optical/electrical interface

### Cautions and Warnings



SFP Transmitter modules contain a class 1 laser, which emits invisible radiation whenever the module is powered up. Because the SFP is hot-swappable, the module may be powered up as soon as it is installed.

**DO NOT LOOK INTO AN OPERATING SFP MODULE'S CONNECTORS, AS EYE DAMAGE MAY RESULT.**



The SFP module is sensitive to electrostatic discharge (ESD). It is recommended that you use an ESD-preventive wrist strap grounded to the Densité chassis while handling the SFP module.



SFP modules are subject to wear, and their useful lifetime is reduced each time they are inserted or removed. Do not remove them more often than is absolutely necessary.



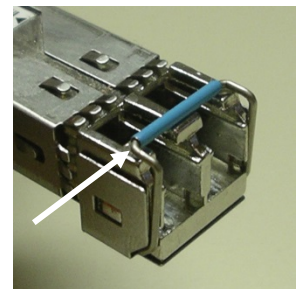
Never remove or install an SFP module with the fiber optic cables connected. Damage to the cables could result.



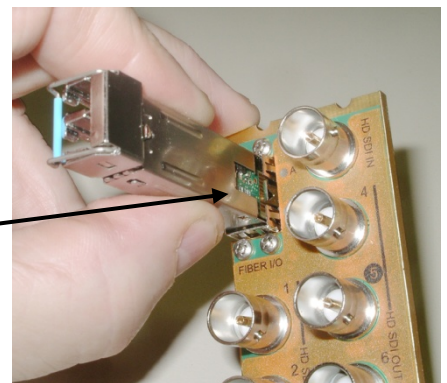
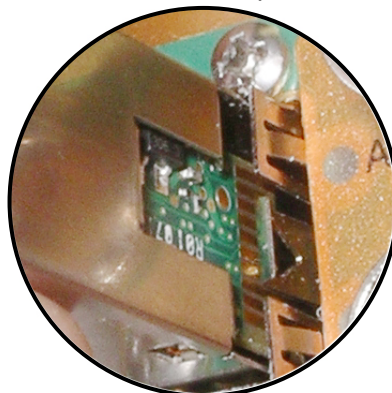
The presence of dust and debris can seriously degrade the performance of an optical interface. It is recommended that you insert a dust plug into the SFP module whenever a fiber optic cable is not connected.

### Installing an SFP module

1. Make sure that the bale clasp lever is in the closed position



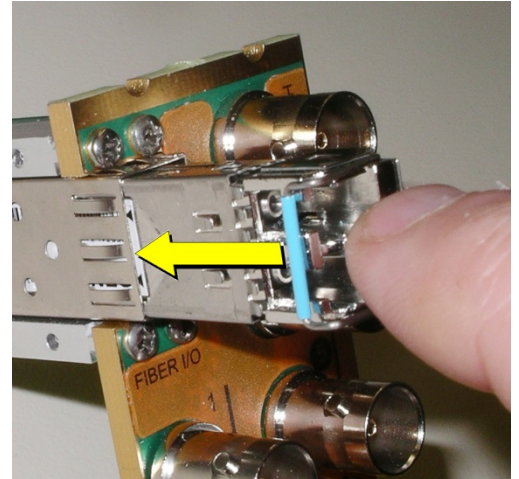
2. Position the SFP module so that the recessed slot is lined up with the tab side of the socket.



- Slide the module straight into the socket, and push gently until it clicks into position.

### Connecting the fiber optic cables

- Remove the dust plug from the SFP module if present
- Verify that the exposed end of the optical fiber in the LC connector is clean
  - Carefully remove any debris if necessary.
- Plug the LC-terminated fiber optic cable into the SFP module

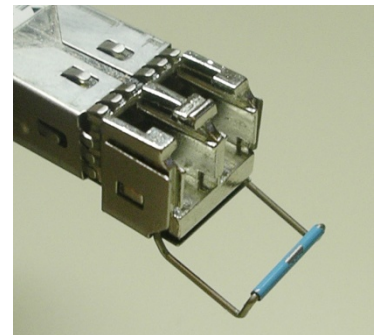


### Removing the fiber optic cables

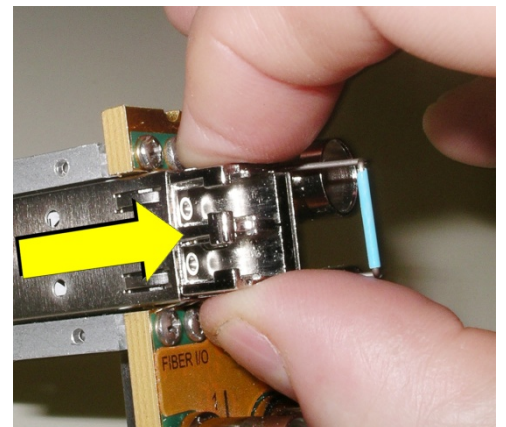
- Grasp the LC fiber optic connector that is plugged into the SFP module, and pull it straight out to disengage the optical fiber from the SFP.
  - Never pull the fiber optic cable itself, as catastrophic damage may occur.
- Insert a dust plug into the SFP module.

### Removing the SFP module

- Move the bale clasp lever to the open position.



- Grasp the SFP module between your thumb and forefinger, and pull it straight out of the slot.
  - Do NOT pull on the bale clasp lever to remove the module, as it is easily damaged
  - You may find that you need to wiggle the module, or perhaps push it into the slot a bit, before it will release and slide out.



- Insert a dust plug into the SFP module.