



grass valley

A **BELDEN** BRAND

# **MDX-3901**

12G/Quad Link 3G/3G/HD 16 Audio Channel AES/MADI  
Embedder/De-Embedder

## **Guide to Installation and Operation**

13-03078-010-AA

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

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This equipment has been tested and found to comply with the requirements of the EMC directive 2004/108/CE:

- EN 55022 Class A radiated and conducted emissions
  - 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
-

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# 1 MDX-3901 12G/Quad Link 3G/3G/HD 16 Audio Channel AES/MADI Embedder/De-embedder

## 1.1 Introduction

The MDX-3901 is an advanced, high-quality audio processor, which can embed up to 16 audio channels from a combination of eight discrete AES and/or one MADI signal into a 12G/Quad Link 3G/3G/HD SDI signal or de-embed up to 16 audio channels into eight AES and one MADI signal from a 12G/Quad Link 3G/3G/HD SDI signal.

When configured as an embedder, each AES input can accept different sample rates, or even asynchronous audio, and will be resampled at 48 kHz by a sample rate converter, which can be manually or automatically disabled in the presence of non-PCM audio. The MADI input supports a 64-channel payload at the industry standard 48 kHz sampling rate synchronized to the SDI signal. The MDX-3901 embedder can simultaneously process up to 16 channels of audio selected from 80 channels inputs - 16 from AES and 64 from MADI. Functions include channel shuffling, mixing and probing. Each channel can be delayed independently to correct any lip sync issues. All 16 audio channels can be mixed and shuffled to provide 16 channels for embedding in the SDI video output. A single-link video input will be distributed to outputs 1 & 2. When genlocked to the external reference input or through the frame reference using the internal URS signal, the MDX-3901 can handle video hot switches at the input without losing sync at the output. In the absence of a video input, the card can still output synchronous video and embed the discrete AES/MADI audio. The MDX-3901 can also embed linear timecode (LTC) as ancillary timecode (ATC) in 12G/Quad Link 3G/3G/HD.

When configured as a de-embedder, the MDX-3901 can simultaneously process up to 16 channels of audio from the embedded SDI input. Functions include channel shuffling, mixing and probing. Each channel can be delayed independently to correct any lip sync issues. All audio channels can be mixed and shuffled to provide 16 channels on the discrete AES outputs and on the first 16 channels of the MADI output. A single link video input will be distributed to outputs 1 & 2. When genlocked to the external reference input or through the frame reference using the internal URS signal, the MDX-3901 can handle video hot switches at the input without losing sync at the output. The MDX-3901 can de-embed ancillary timecode (ATC) in 12G/Quad Link 3G/3G/HD and provides a linear timecode output (LTC).

A fiber input and/or output cartridge is offered as an option on some rear modules. Once an appropriate fiber cartridge is installed, the input or outputs are selectable through the iControl interface. The input of the card allows you to select between fiber and copper inputs. The outputs are via copper and fiber simultaneously (when equipped with a fiber cartridge).



## 1.2 Features

### Video

- 12G/Quad Link 3G/3G/HD input
- Supports 3Gb/s level A (mapping 1) and level B
- Audio/Video deglitcher to handle video hot switch at the input
- Automatic detection of input video loss and switchover to local black or color bar for continuous audio/video output synchronization (embedder mode only)
- Flexible HD/SD reference using the internal URS frame reference or the external reference input
- Minimum processing delay of 1.1 line
- Optional 12G and 3G SFP (R, T, RT and TT models available)

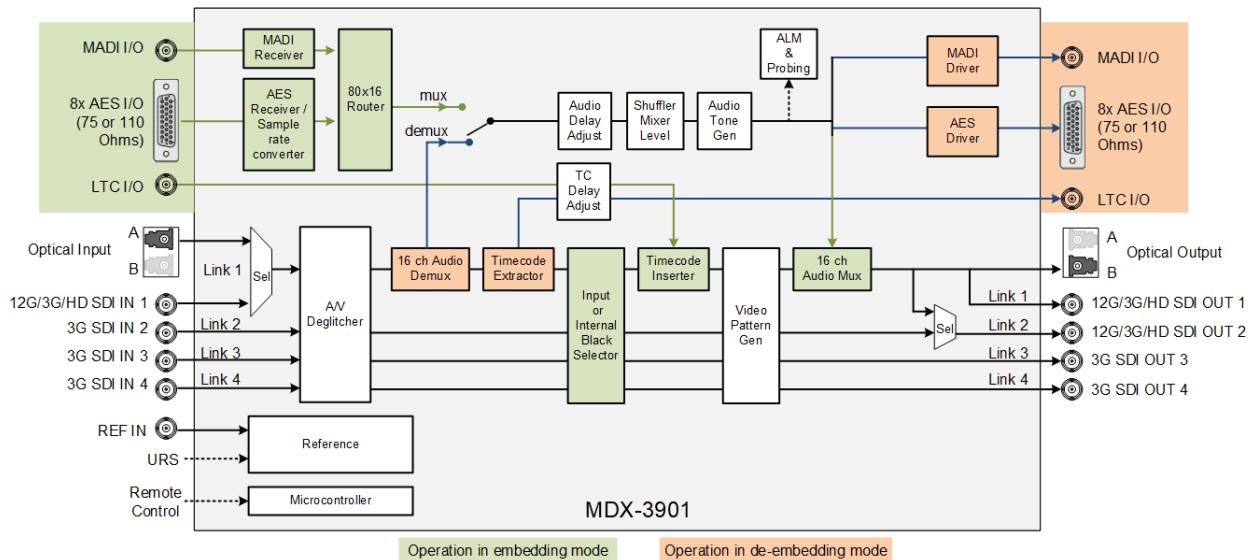
### Audio

- 8 AES inputs (embedder) or outputs (de-embedder)
- Sample rate conversion for asynchronous AES inputs (embedder)
- 1 MADI input (embedder) or output (de-embedder)
- Full audio shuffling and mixing on a per channel basis
- 16 audio channels internal audio processing
- Audio channel delay adjustment of up to 2.7 s to compensate for lip-sync issues

### Metadata

- Linear time code (LTC) input (embedder) or output (de-embedder)

## 1.3 Functional Block Diagram

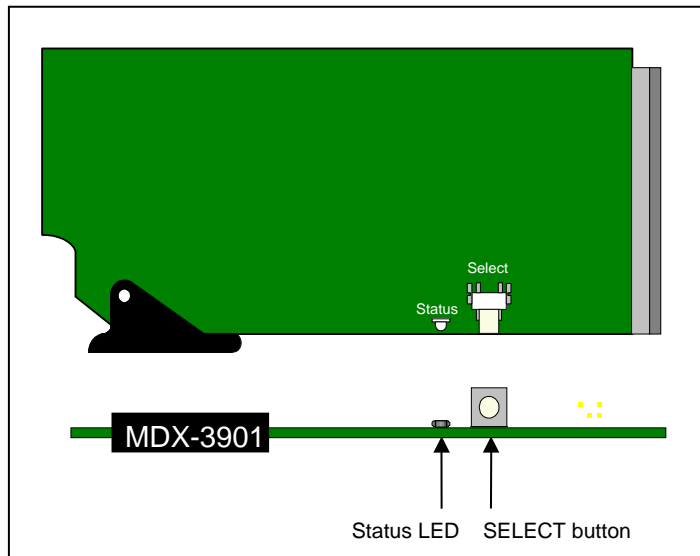


**Figure 1.1 MDX-3901 Embedder / De-embedder Functional Block Diagram**

## 1.4 Front Card-edge Interface

The front card-edge of the MDX-3901 incorporates two elements:

- Status LED (see section 3.2)
- Select Button (see section 0)



**Figure 1.2** Front card-edge layout



## 2 Installation

### 2.1 Installation of Rear Connector Panels

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.

The MDX-3901 card is designed to fit into Grass Valley's Densité-3 or Densité-3+ frame. Four different rear connector panels are available, the -3+SRP rear panel series fit only in a 3+ frame while the -3DRP rear panel series fit in 3 or 3+ frames:

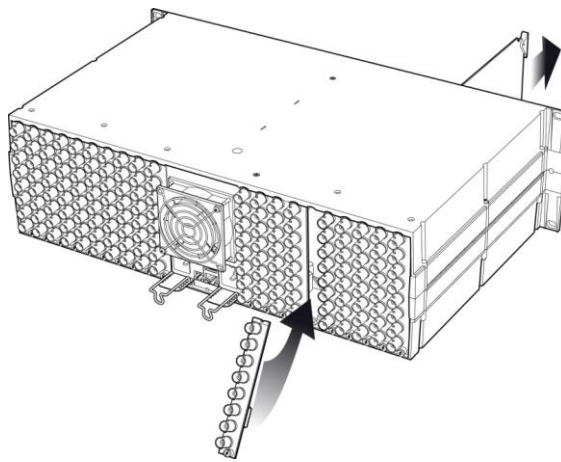
- MDX-3901-7-3+SRP-Q      Single-slot-width panel with 75Ω audio
- MDX-3901-1-3+SRP-Q      Single-slot-width panel with 110Ω audio
- MDX-3901-7-3DP-Q-F      Double-slot-width panel with 75Ω audio and fiber I/O cage
- MDX-3901-1-3DP-Q-F      Double-slot-width panel with 110Ω audio and fiber I/O cage

See section 2.3 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

#### **Step 1: 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.

**Step 2: To install the MDX-3901 Card:**

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

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

When using a double-slot-width rear panel, the card should be inserted into the right-most of the two slots. 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.

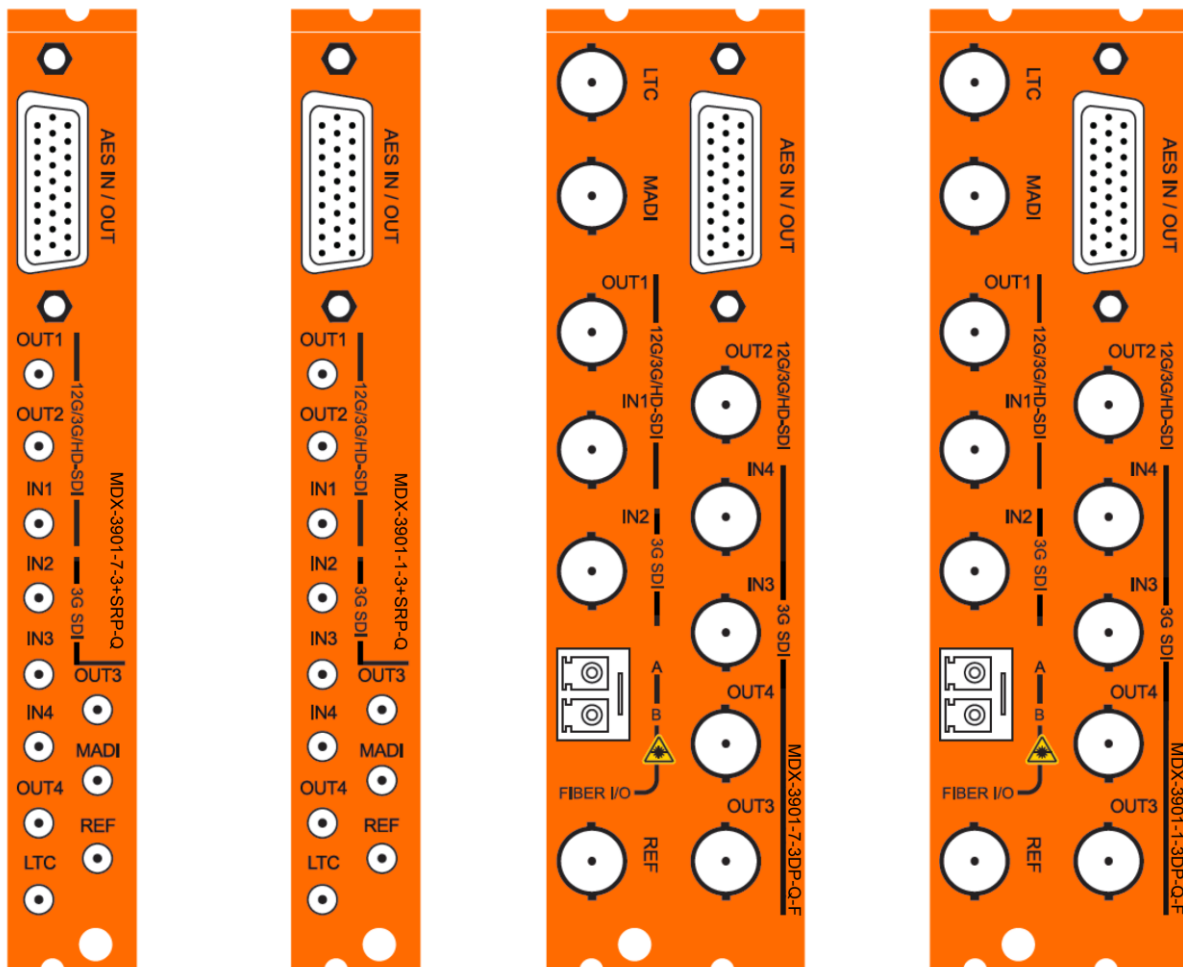
**2.2 Installation of the Optical Interface (option)**

Refer to [ANNEX 2 – Installing the Optical Interface](#).

**2.3 Rear Panels and Connectors**

**2.3.1 Images of Rear Panel Connectors**

The four available rear panels are shown in the figure below, and their various inputs and outputs are described.



**Figure 2.2 MDX-3901 Rear Panels (left to right): MDX-3901-7-3+SRP-Q, MDX-3901-1-3+SRP-Q, MDX-3901-7-3DP-Q-F, and MDX-3901-1-3DP-Q-F**

### 2.3.2 Summary of rear panel connections

<b>MDX-3901-7-3+SRP-Q</b>				
<b>MDX-3901-1-3+SRP-Q</b>				
<b>MDX-3901-7-3DP-Q-F</b>				
<b>MDX-3901-1-3DP-Q-F</b>				
Single-slot-width panel with HD-BNC			◆	◆
Double-slot-width panel with BNC	◆	◆		
<b>CONNECTORS</b>				
12G/3G/HD IN	1	1	1	1
3G IN	3	3	3	3
12G/3G/HD OUT	2	2	2	2
3G OUT	2	2	2	2
AES3 I/O (110Ω) on HD-SUB26	8		8	
AES3-id I/O (75Ω) on HD-SUB26		8		8
MADI I/O	◆	◆	◆	◆
LTC I/O	◆	◆	◆	◆
Fiber cage I/O	◆	◆		

### 2.3.3 Details of rear panel connections

#### 12G/3G/HD SDI IN1 – Serial digital video input (1)

Connect a serial digital video signal to the BNC or HD-BNC labeled **12G/3G/HD SDI IN1** conforming to the:

- SMPTE 2082-10 standard for a 12 G input signal.
- SMPTE 425-1 standard for a 3G input signal.
- SMPTE 292-1 standard for an HD input signal.
- SMPTE 425-5 standard for link #1 of a quad link 3G signal

#### 3G SDI IN2, IN3, IN4 – Serial digital video inputs (3)

Connect a serial digital video signal to the BNCs or HD-BNCs labeled **3G SDI IN2, IN3 & IN4** conforming to the:

- SMPTE 425-5 standard for link #2, #3 & #4 of a quad link 3G signal.

#### 12G/3G/HD SDI OUT1, OUT2 – Serial digital video outputs (2)

The MDX-3901 provides two 12G/3G/HD SDI video outputs on BNC or HD-BNC connectors, labeled **12G/3G/HD OUT1** and **OUT2**. The SDI video signal conforms to the standard of the selected input. The same signal is carried on both outputs, unless the input is an SMPTE 425-5 quad link signal, in which case **OUT1** is for Link #1 and **OUT2** is for Link #2 of a quad link 3G signal.

#### 3G SDI OUT3, OUT4 – Serial digital video outputs (2)

These 3G signal outputs conform to SMPTE 425-5 standard and are only for links #3 and #4 of a quad link 3G signal.

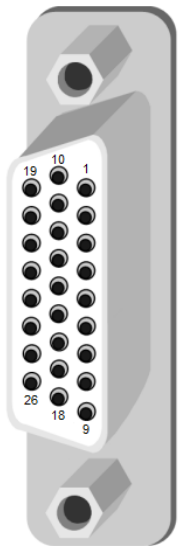
**AES IN / OUT – Discrete digital audio inputs (Embedder) or outputs (De-Embedder) (8):** see table below.

**MADI audio input (Embedder) or output (De-Embedder) (1):** see table below.

**LTC linear time code input (Embedder) or output (De-Embedder) (1):** see table below.

Rear connector panels are available for AES3 (110 Ω) or AES3-id (75 Ω) signals.

Rear Panel Type	Signal	Connector(s) / Impedance	Optional adapters
MDX-3901-1-3DP-Q-F	AES IN / OUT	HD-SUB 26 (1) 110 Ω	<b>NSH26M:</b> HD-Sub 26 to Terminal Block Adapter
MDX-3901-1-3+SRP-Q	AES IN / OUT	HD-SUB 26 (1) 110 Ω	<b>NSH26M:</b> HD-Sub 26 to Terminal Block Adapter
MDX-3901-7-3DP-Q-F	AES IN / OUT	HD-SUB 26 (1) 75 Ω	<b>BOC-DA26-8BNC-1:</b> 75Ω digital audio breakout cable
MDX-3901-7-3+SRP-Q	AES IN / OUT	HD-SUB 26 (1) 75 Ω	<b>BOC-DA26-8BNC-1</b> 75Ω digital audio breakout cable



AES IN/OUT - Pinout of HD-SUB26 connector for 110 ohm rear panels:	
MDX-3901-1-3+SRP-Q MDX-3901-1-3DP-Q-F	Pin #
AES 1 (Hi)	1
AES 1 (Lo)	10
AES 2 (Hi)	2
AES 2 (Lo)	11
AES 3 (Hi)	3
AES 3 (Lo)	12
AES 4 (Hi)	4
AES 4 (Lo)	13
AES 5 (Hi)	5
AES 5 (Lo)	14
AES 6 (Hi)	6
AES 6 (Lo)	15
AES 7 (Hi)	7
AES 7 (Lo)	16
AES 8 (Hi)	8
AES 8 (Lo)	17
GND	9, 18-26

AES IN/OUT - Pinout of HD-SUB26 connector for 75 ohm rear panels:	
MDX-3901-7-3+SRP-Q MDX-3901-7-3DP-Q-F	Pin #
AES 1 (Hi)	1
AES 1 (Gnd)	10
AES 2 (Hi)	2
AES 2 (Gnd)	11
AES 3 (Hi)	3
AES 3 (Gnd)	12
AES 4 (Hi)	4
AES 4 (Gnd)	13
AES 5 (Hi)	5
AES 5 (Gnd)	14
AES 6 (Hi)	6
AES 6 (Gnd)	15
AES 7 (Hi)	7
AES 7 (Gnd)	16
AES 8 (Hi)	8
AES 8 (Gnd)	17
GND	9, 18-26

**Fiber I/O Cage – Fiber-optic input 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 optional SFP interface module is plugged.
- An optional 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 2 – Installing the Optical Interface](#) for instructions on installing and removing the SFP interface module, and for plugging and unplugging the LC-terminated fibers.

The SFP modules supported by the MDX-3901 are:

SFP Modules	Description
<b>SFP-U-R-LC</b>	12G Single Rx Fiber with LC/PC connector
<b>SFP-U-RT-S13-LC</b>	12G Dual Rx/Tx Fiber 1310 nm with LC/PC connector
<b>SFP-U-T-S13-LC</b>	12G Single Tx Fiber 1310 nm with LC/PC connector
<b>SFP-U-TT-S13S13-LC</b>	12G Dual Tx Fiber 1310 nm with LC/PC connector
<b>SFP-R-LC</b>	3G Single Rx Fiber with LC/PC connector
<b>SFP-RT-S13-LC</b>	3G Dual Rx/Tx Fiber 1310 nm with LC/PC connector
<b>SFP-T-S13-LC</b>	3G Single Tx Fiber at 1310 nm with LC/PC connector
<b>SFP-TT-S13S13-LC</b>	3G Dual Tx Fiber at 1310 nm with LC/PC connector

### 3 User Interface

#### 3.1 Control options

The MDX-3901 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 (check for availability).

#### 3.2 Card-Edge Status LED









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

The various error conditions are specified in the Alarm Configuration panel accessible through iControl. See [Section 5.10](#) for details.

This chart shows the error which can be flagged on the front panel led of a MDX-3901 without the use of iControl.

- If a cell is gray, the error condition cannot cause the LED to assume that status
- 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 error				
FPGA error				
Dataflash Error				
No Rear				
Input Video error				
Quad Link Align				
Audio Mute error				
Test Mode				

- If the LED is Flashing Yellow, it means that either the card is selected for local control using the Densité frame’s control panel, or the firmware of the card is being updated. See [Section 4](#) for details.

## 4 Local control using the Densité frame control panel

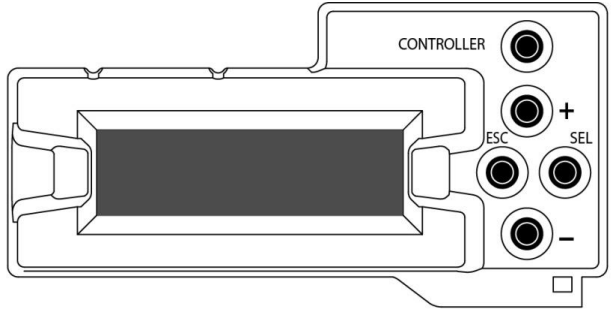
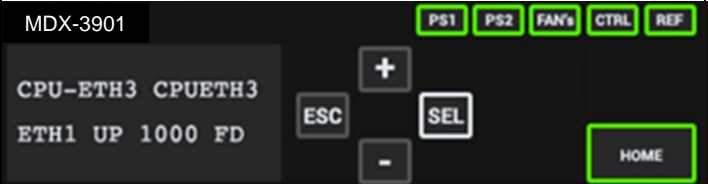
Push the SELECT button on the MDX-3901 card edge (see Section 1.4) to assign the local control panel to operate the MDX-3901.

- The STATUS LED on the MDX-3901 card edge flashes yellow.

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

- The complete menu structure is shown in [ANNEX 1](#) to this document.

Two versions of the local control panel exist:

Panel type	Frame models	Appearance
Physical	Densité-3, Densité-3+FR1,	
Touch screen	Densité 3+FR4, GV Node	

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 incorporates 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

[SELECT] 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 [SELECT] button for the card being controlled.

- Notes:
1. If you do not touch any buttons on the local control panel, the controller will revert to its normal standby mode after 30 seconds.
  2. If you changed a parameter from the control menu, but have not applied your change (you did not touch the SEL button on the control panel), once the 30-second timeout has occurred, the parameters will be confirmed as if you had touched the SEL button

## 5 Remote control using iControl

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

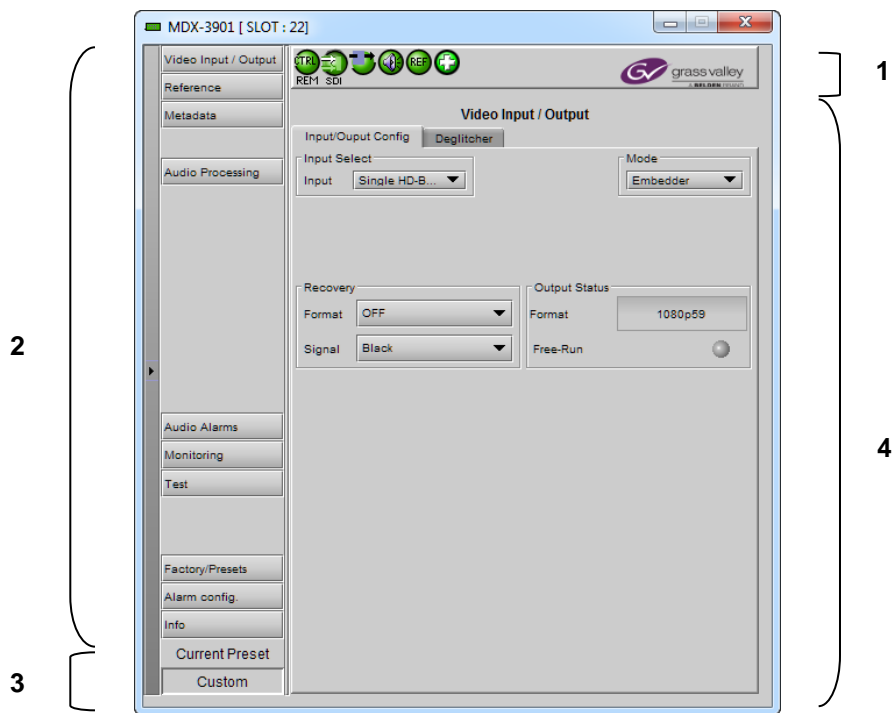
- This manual describes the control panels associated with the MDX-3901 and their use.
- Please consult the iControl User's Guide for information about setting up and operating iControl.

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

### 5.1 The iControl graphic interface window

The basic window structure for the MDX-3901 is shown in figure 5.1. The window identification line gives the card type (*MDX-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** MDX-3901 iControl graphic interface window



**Section 1.** The top section displays six 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

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**

Icon #1 – Manual Card Configuration	
 (green)	Remote card control activated. The iControl interface can be used to operate the card
 (yellow)	Local card control active, The card is being controlled using the Densité frame control panel, as described in section 0. Any changes made using the iControl interface will have no effect on the card.
Icon #2 – SDI Input status	
 (green)	Signal detected and valid. <ul style="list-style-type: none"> <li>• Beneath the icon, the format will be indicated as 12G, Quad Link 3G, 3G or HD and the specific format details will be listed if the cursor is moved over the icon.</li> </ul>
 (red)	Signal absent, No rear, Reference mismatch, Video/TRS error
Icon #3 – Operation Mode	
 (green)	Operation mode: process – normal processing of the input signal
 (yellow)	Operation mode: TEST – color bar and audio test tones enabled ( <a href="#">see Section 5.8</a> )

Icon #4 – Audio Status	
 (green)	Audio OK
 (yellow)	Yellow alarm condition detected on 1 or more channels
 (red)	Red alarm condition detected on 1 or more channels
Icon #5 – Reference	
 (green)	Reference OK. Mouse over to see the source of the reference, and its format, e.g. External, NTSC
 (red)	Reference missing. The reference is required only for correct deglitcher operation.
Icon #6 – Operation Mode	
 (green)	Hardware OK
 (red)	Hardware Health Monitoring (Fan, 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 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 and control of the deglitcher.

### 5.2.1 Input/Output Config tab

- *Input Select*: use the pulldown list to select between the copper input (BNC or HD-BNC), quad-link copper input (BNC or HD-BNC), and the fiber optic input (if available).
- *Mode*: sets the MDX-3901 operating mode: **Embedder**: embeds up to sixteen (16) channels from the discrete AES and/or the MADI inputs. **De-embedder**: de-embeds up to sixteen (16) channels available on the 8 AES discrete AES and the MADI output.
- *Fiber Output Config*: This will only be active if an Optic Fiber module with one or two outputs is installed in the rear panel.
- *Recovery* (embedder mode only): sets the MDX-3901 behavior upon signal loss. *Format* sets the video signal resolution (OFF disables this feature), and *Signal* sets a color bar or black pattern.
- Output Status shows the current video format and whether the recovery signal is locked to reference.

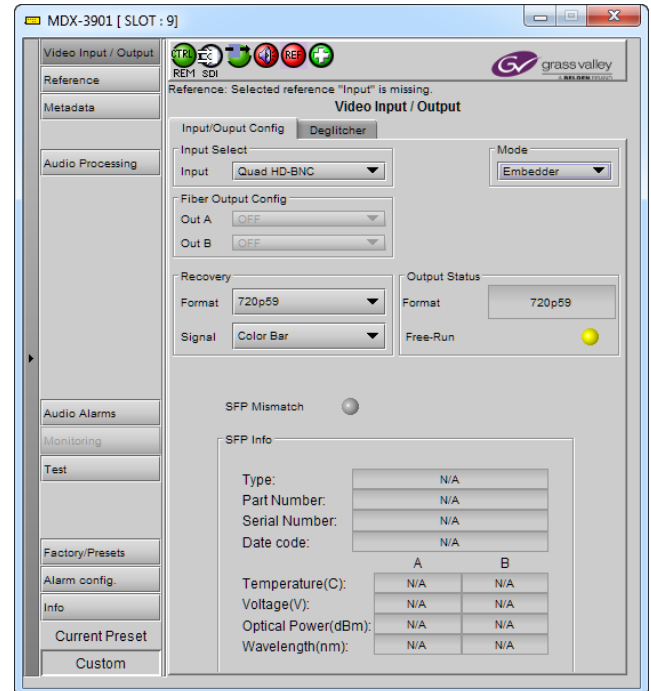


Figure 5.2 Input/Output Configuration tab

### 5.2.2 Deglitcher tab

When the Deglitcher is active, the card supports hot-switching between two signals without producing artifacts on the output.

- In order to enable the deglitcher, the URS signal or the External reference must be selected in the Reference panel (see section 5.3)

*Deglitcher*: select OFF or ON from the pulldown

For this mode to function correctly, the two signals switched before this equipment must meet the following requirements:

- They 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.

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 card 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”.



Figure 5.3 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.

Referring to the figure on the right, you may switch between signals A, B or C, without any glitch, and also between signals D  $\leftrightarrow$  E and signals F  $\leftrightarrow$  G. Any other transition, like A  $\leftrightarrow$  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 is only one way to measure the position of the signals with respect to the reference:

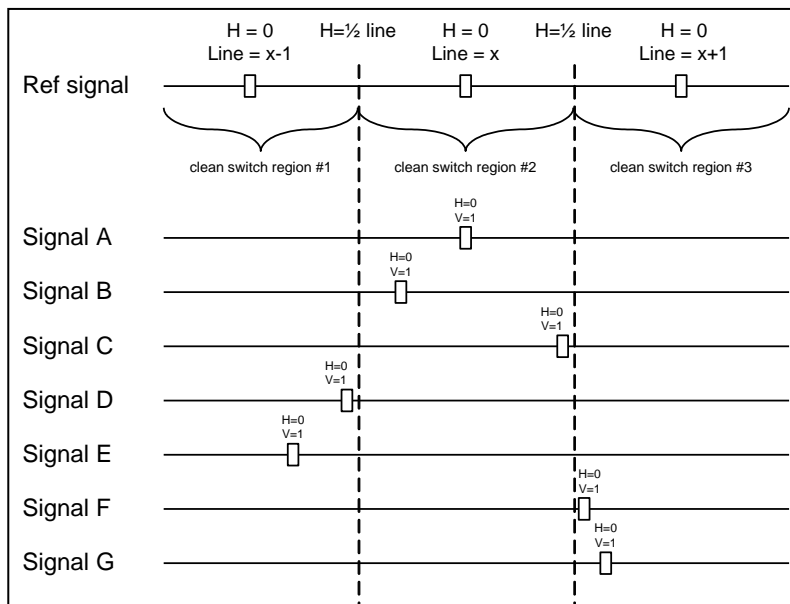
- Use the deglitcher tab in iControl (Input  $\rightarrow$  Deglitcher)

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 glitchless.

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 a 3G 59.94 signal the line length is  $14.83 \mu\text{s}$  and so the first region lies between  $-7.41 \mu\text{s}$  and  $7.41 \mu\text{s}$ . Other regions can be found by adding or removing a multiple of line length to the two boundaries.

Example: for a 3G 59.94 input signal, we have these clean switch regions:

- 1 line and  $-7.41 \mu\text{s}$  to 0 line and  $-7.41 \mu\text{s}$ ,
- 0 line and  $-7.41 \mu\text{s}$  to 0 line and  $7.41 \mu\text{s}$ ,
- 0 line and  $7.41 \mu\text{s}$  to 1 line and  $7.41 \mu\text{s}$ , etc....



## 5.3 Reference panel

Select the reference to be used by the MDX-3901.

### Reference Presence

Indicates the format and presence of an external reference signal and of the internal reference signal.

### Selected Reference

Indicates the reference used by the card and if the video signal is locked or not.

### Reference Source

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

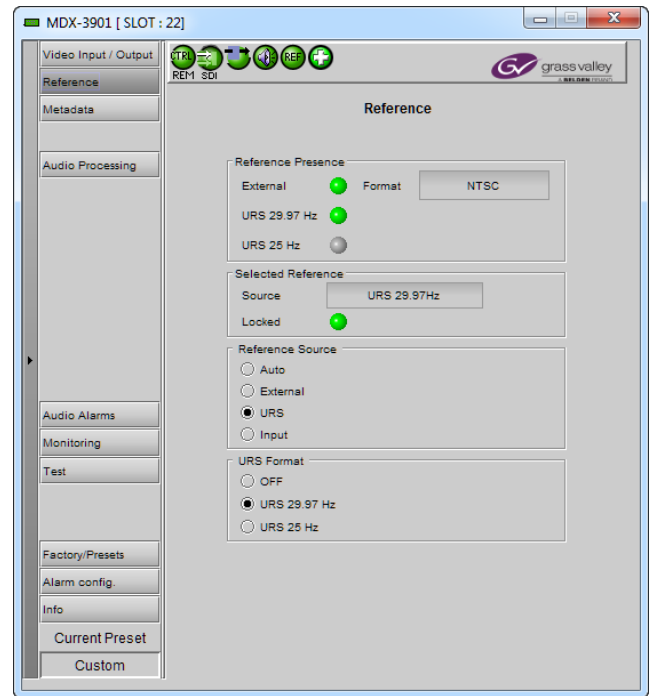
- Auto – this mode selects the first source detected in this order of priority:
  - External
  - URS
  - Selected Input signal
- External – selects the reference signal connected to the MDX-3901's rear panel BNC or HD-BNC connector "REF".
- URS (Universal Reference Signal) – selects the reference from the frame's backplane
- Input – uses the currently selected input signal.

### URS Format

Use the radio buttons in the 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.

*Note:* Make sure the input signal is locked to the selected reference signal at all times.



**Figure 5.4** Reference panel

## 5.4 Metadata panel

The configuration parameters for this panel depends on the MDX-3901's operating mode (Embedder / de-embedder).

### 5.4.1 TC tab in embedder mode

This tab controls LTC timecode embedding into the output SDI data stream.

#### Insertion

Select OFF to disable insertion and pass incoming signals through unchanged, or ON to embed both ATC-VITC and ATC-LTC from the LTC input on the rear panel into the output signal.

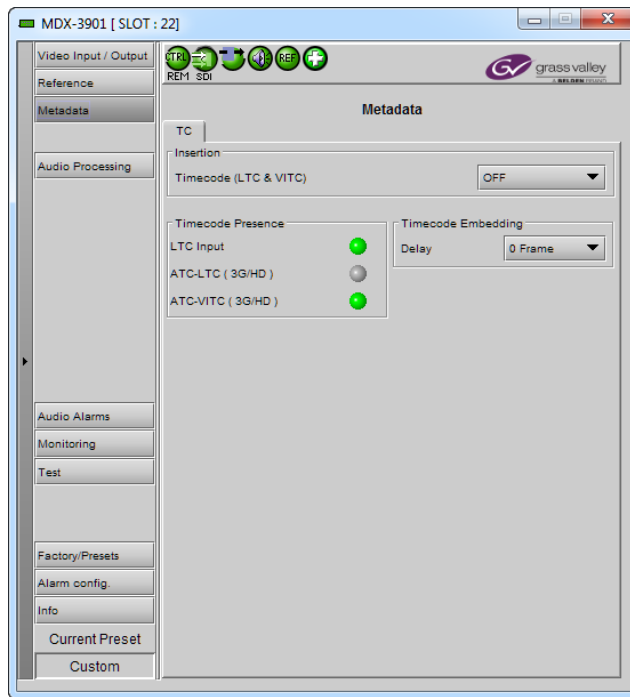
#### Timecode Presence

The Status icons indicate the presence of different time code formats:

- LTC input (BNC or HD-BNC on the rear panel)
- ATC-LTC (3G/HD) embedded in the SDI input
- ATC-VITC (3G/HD) embedded in the SDI input

#### Timecode Embedding

[0, 1, ..., 50 frames] delay may be applied to the Timecode before embedding.



### 5.4.2 TC tab in de-embedder mode

This tab controls LTC timecode de-embedding from the input SDI data stream.

#### Insertion:

This section is not available.

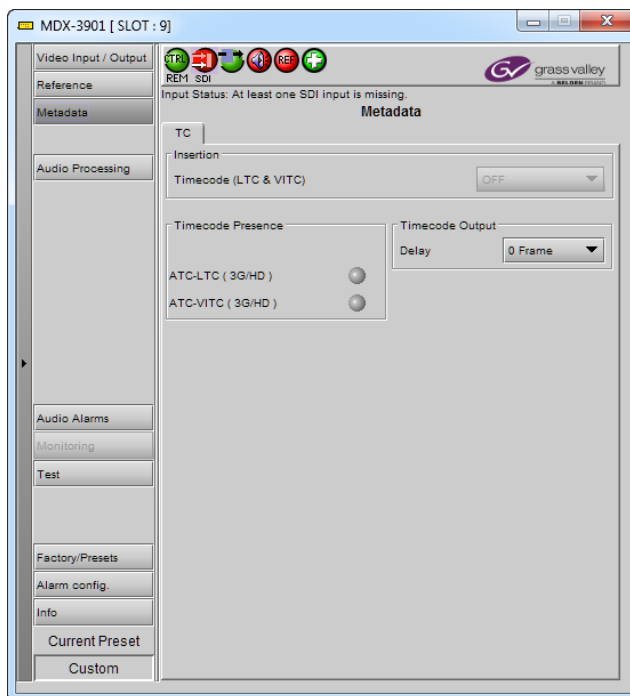
#### Timecode Presence

The Status icons indicate the presence of different time code formats:

- ATC-LTC (3G/HD) de-embedded from the SDI input
- ATC-VITC (3G/HD) de-embedded from the SDI input

#### Timecode Output

[0, 1, ..., 50 frames] delay may be applied to the Timecode after de-embedding.



**Figure 5.5** Reference panels; Embedder top, De-embedder bottom

## 5.5 Audio Processing panel

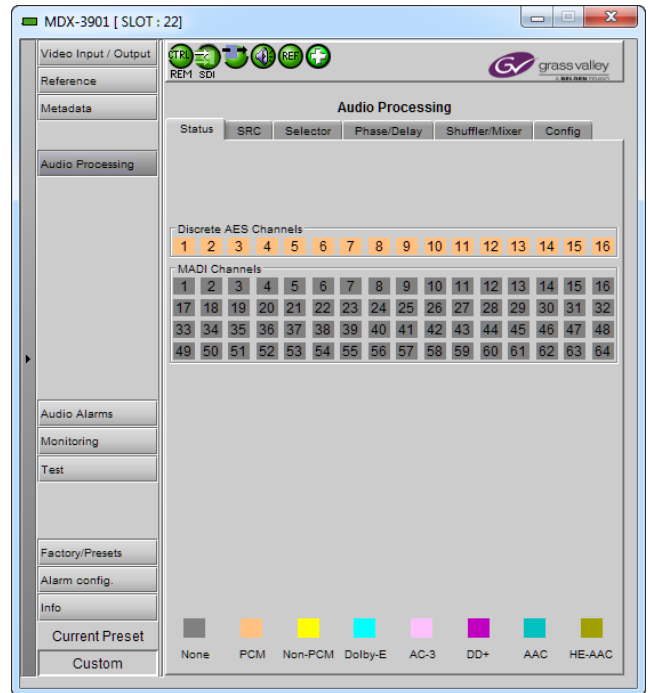
The Audio Processing panel provides input selection, full audio processing and delay parameters for the 16 channels that will be either embedded in the SDI or de-embedded and available on the discrete AES and the MADI outputs.

### 5.5.1 Status tab in embedder mode

In embedder mode, the Status tab shows the current audio type present at each of the discrete AES and MADI inputs.

Each audio type is color coded as follows.

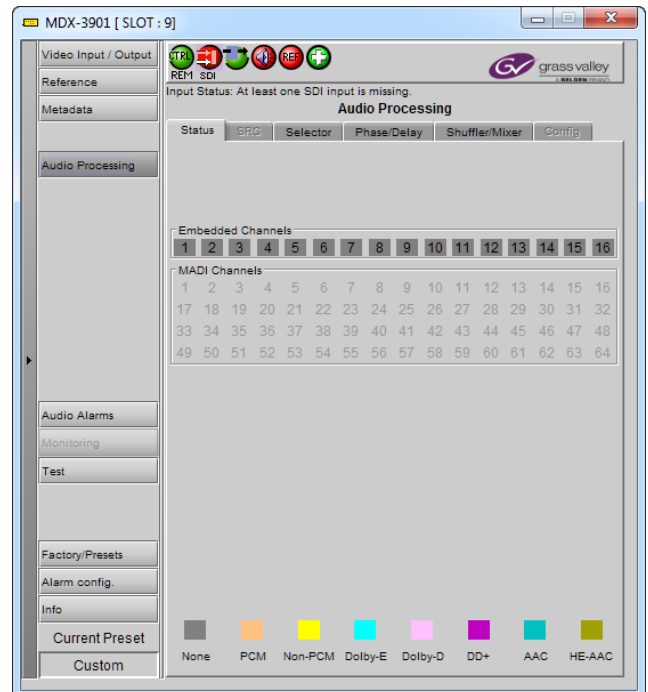
- PCM – the audio channel carries PCM audio (orange)
- Non-PCM – the audio channel carries non-PCM (yellow).
- Dolby-E – the audio channel carries Dolby-E encoded audio (blue)
- Dolby-D – the audio channel carries Dolby Digital encoded audio (pink)
- DD+ – the audio channel carries Dolby Digital Plus encoded audio (violet)
- AAC – the audio channel carries Advanced Audio Coding encoded audio (turquoise)
- HE-AAC – the audio channel carries High-Efficiency Advanced Audio Coding encoded audio (beige)



### 5.5.2 Status tab in de-embedder mode

In de-embedder mode, the Status tab shows the current AES audio type being de-embedded. Each audio type is represented by a specific color listed above.

*MADI Channels* is unavailable.



**Figure 5.6** Audio Processing panels, Status tab; Embedder top, De-embedder bottom

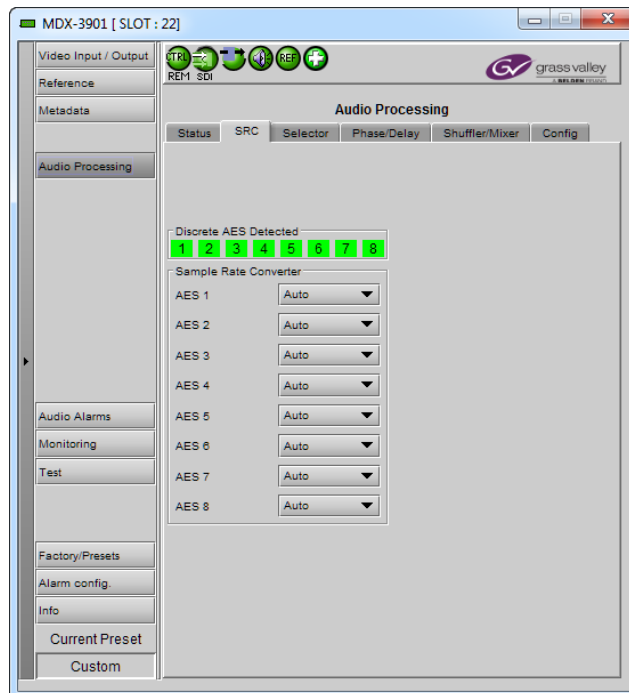
### 5.5.3 SRC tab

This tab is available in embedder mode only.

Each of the rear panel AES inputs is provided with a sample rate converter that will convert the sample rate of the AES input to match and synchronize the sample rate of the audio data embedded in the incoming SDI stream.

Each converter will be automatically bypassed if the detected audio type is other than PCM.

Each converter can be manually bypassed (set pulldown to OFF) if the incoming digital audio is already synchronized to the incoming SDI signal. In this case, the processing delay will be reduced by 1 ms.



**Figure 5.7** Audio Processing panels, SRC tab; Embedder mode only

### 5.5.4 Selector tab

#### Group Detected

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. 5.10)

#### Discrete AES Channels (embedder mode only)

Status indicators turn green when an AES signal is detected on the corresponding discrete AES input.

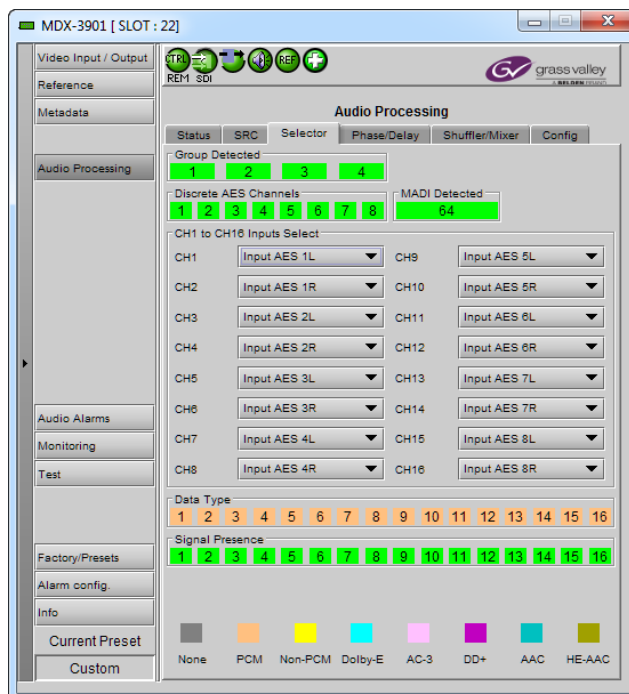
#### MADI Detected (embedder mode only)

Shows the current number of available channels on the MADI input.

#### CH1 to CH16 Inputs Select

An input shuffler allows any combination of the input channels. The pulldown labeling depends on the MDX-3901's operating mode.

- In embedder mode, use the 16 pulldowns to select an Input in the range of AES channel 1 to 16 or a MADI channel 1 to 64.
- In de-embedder mode, use the 16 pulldowns to select a signal in the range of Group 1 Channel 1 to Group 4 channel 4.



**Figure 5.8** Audio Processing panels, Selector tab



### Data Type

Shows the current signal type at the output of the shuffler. The same color code is used as in the Status tab.

### Signal Presence

When any signal type is detected (PCM or Non-PCM, including Dolby), the status indicators turn green.

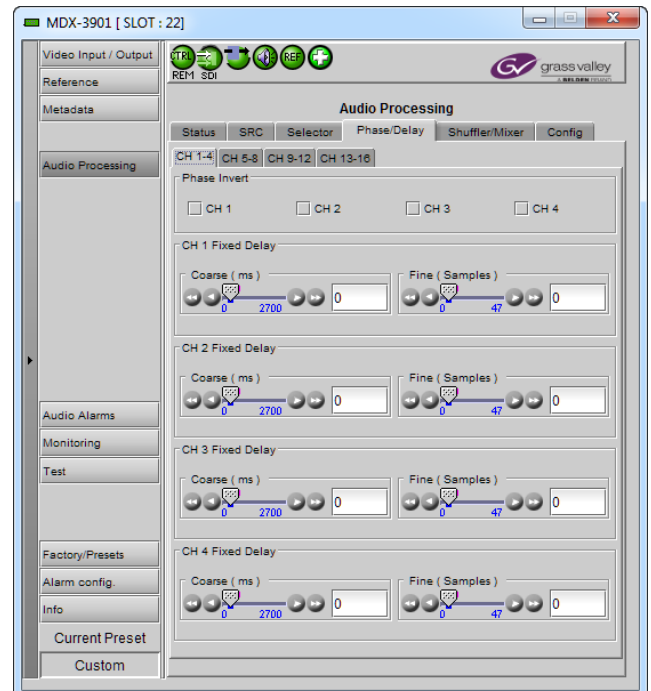
### 5.5.5 Phase/Delay tab

This tab controls audio phase inversion and delay for channels 1 to 16 across four tabs.

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

*Fixed Delay:* For each channel, two sliders allow the delay to be adjusted.

- *Coarse* – adjusts the delay in milliseconds.
- *Fine* – adjusts the delay in audio sample increments, from 0 to 47 samples.



**Figure 5.9** Audio Processing panels, Phase/Delay tab

### 5.5.6 Shuffler/Mixer tab

This tab controls the audio output mixers for channels 1 to 16 across eight tabs.

Each of these tabs provides all necessary controls for the output mixers. The example shown is for the output CH 1-2 tab, but all tabs have the same controls.

**Operation Mode (Off, A, SUM(A+B), Mix):** This pulldown 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 selected in sub-menu SOURCE A.

**SUM (A+B):** The output channel is the sum of the two channels sources 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 (0 dB, -3 dB or -6 dB).

**Mix:** The output channel is a mono mix of the selected channels in sub-menus SOURCE A and SOURCE B.

**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.

**Clipping:** This lights when the current program audio level exceeds the maximum level the equipment is capable of processing. Clipping indicates that the audio signal is being distorted and the **Level (dB)** or **SUM (A+B) Level** setting must be reduced to a level where clipping instances are avoided.

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

**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 when **Operation Mode** is **A** or **Mix**. For non-PCM audio, the level value is overridden to 0 dB.

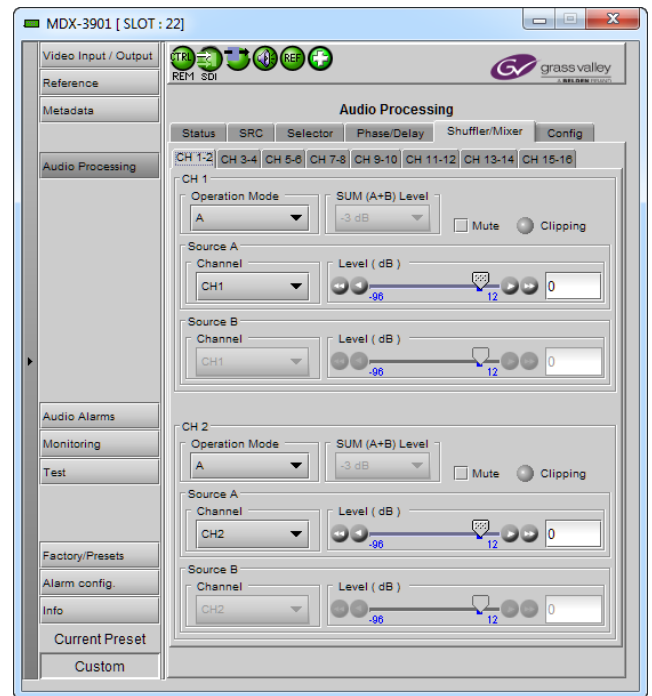


Figure 5.10 Audio Processing, Shuffler/Mixer tab

### 5.5.7 Config tab

This tab is available in embedder mode only.

It contains an Audio Insert pulldown for each of the four audio groups (1 to 4) embedded in the output SDI.

Use the pulldown to set the following options:

- *Pass*: the initial content of the group included in the SDI input is passed to the SDI output untouched.
- *Blank*: the group will be empty in the SDI output.
- *Embedding Out CHX-X*: embed these audio channels as the group source in the SDI output.

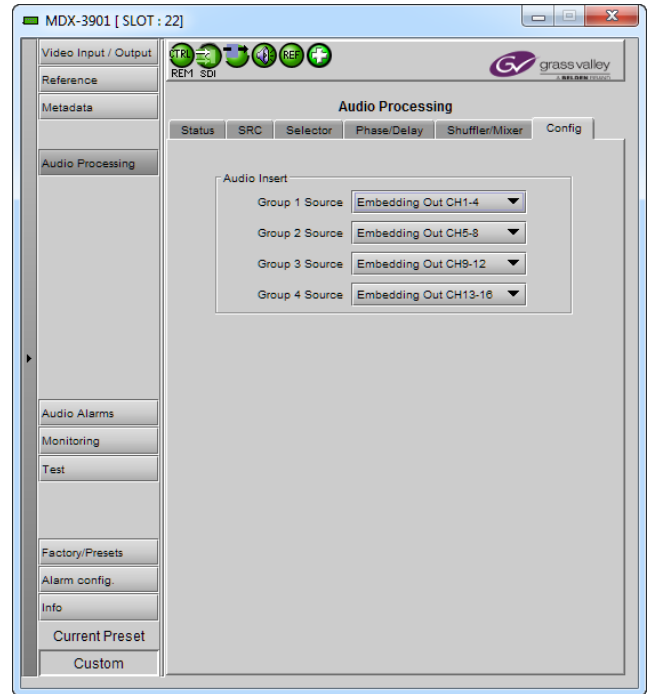


Figure 5.11 Audio Processing, Config tab

## 5.6 Audio Alarms panel

### 5.6.1 Overload tab

This tab sets the true peak overload alarm threshold and hysteresis for the 16 audio channels.

Select a *TP Overload CHX* row to configure it in the *Output* section below.

*Apply To All*: set to apply the settings made in the *Output* section to the *Output* settings of all *TP Overload CHX* channels at the same time.

*Enable*: set to enable overload alarms for the selected channel.

*Threshold (dBFS)*: sets the overload threshold level for the selected channel.

*Set Duration (sec)*: sets the amount of time the level must exceed the threshold before the overload alarm is triggered.

*Clear Duration (sec)*: sets the amount of time the level must be below the threshold before the overload alarm is cleared.

*LED Color*: sets the status color of the front panel led for the overload alarm when activated.

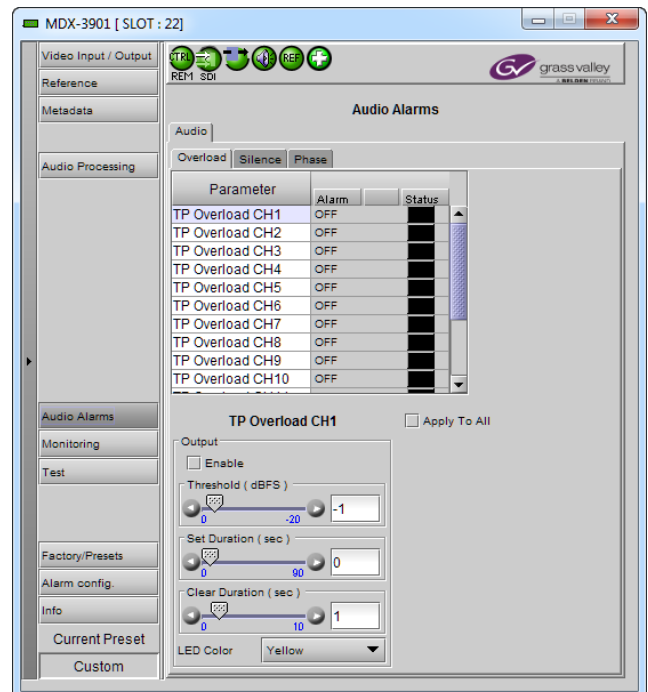


Figure 5.12 Audio Alarms, Overload tab

### 5.6.2 Silence tab

This tab sets the silence detection alarm threshold and hysteresis for the 16 audio channels.

Select a *Silence CHX* row to configure it in the *Output* section below.

*Apply To All*: set to apply the settings made in the *Output* section to the *Output* settings of all **Silence CHX** channels at the same time.

*Enable*: set to enable silence detection alarms for the selected channel.

*Threshold (dBFS)*: sets the silence threshold level for the selected channel where normal program signal would be considered to be lost. Set this level to be above the system noise floor, otherwise this alarm will never trigger.

*Set Duration (sec)*: sets the amount of time the level must be below the threshold before the silence alarm is triggered.

*Clear Duration (sec)*: sets the amount of time the level must exceed the threshold before the silence alarm is cleared.

*LED Color*: sets the status color of the front panel led for the silence alarm when activated.

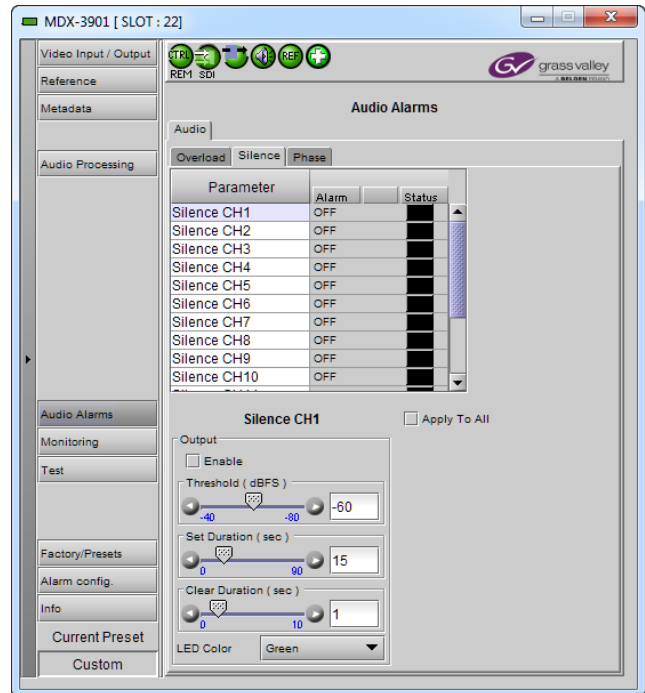


Figure 5.13 Audio Alarms, Silence tab

### 5.6.3 Phase tab

This tab sets the phase detection alarm threshold and hysteresis for the 8 audio channel pairs.

Select a *Phase CHX* row to configure it in the *Input* section below.

*Apply To All*: set to apply the settings made in the *Input* section to the *Input* settings of all **Phase CHX-X** channels at the same time.

*Enable*: set to enable phase detection alarms for the selected channel.

*Threshold (degrees)*: sets the phase imbalance threshold level for the selected channel pair.

*Set Duration (sec)*: sets the amount of time the level must exceed the threshold before the phase alarm is triggered.

*Clear Duration (sec)*: sets the amount of time the level must be below the threshold before the phase alarm is cleared.

*LED Color*: sets the status color of the front panel led for the phase alarm when activated.

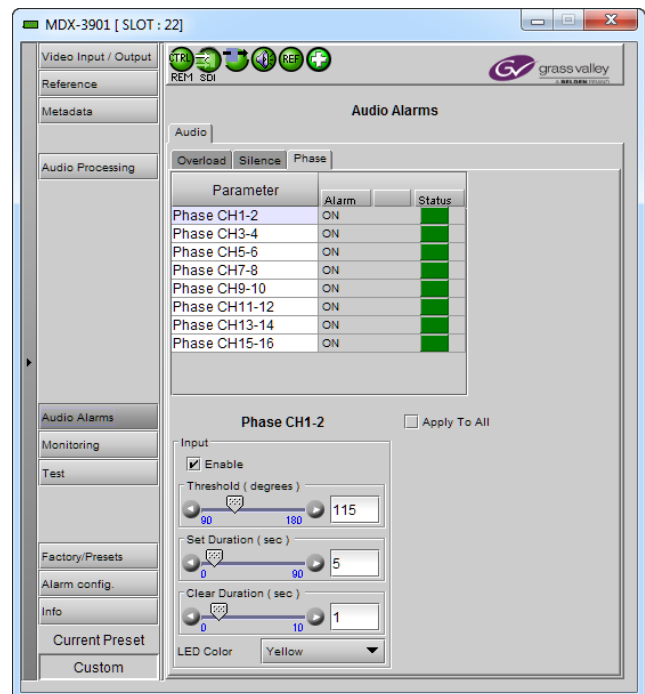


Figure 5.14 Audio Alarms, Phase tab

## 5.7 Monitoring panel

### 5.7.1 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 stereo meters will be present in the meter display window. The source for each meter is selected using the pull-downs in the RALM Remote Control area at the bottom of the control panel.

- OFF
- CH 1&2 up to 7&8, or CH 9&10 up to 15&16 (depends on the Group selection value)

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 ]

#### 5.7.1.1 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.

#### 5.7.1.2 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



Figure 5.15 Monitoring - RALM tab

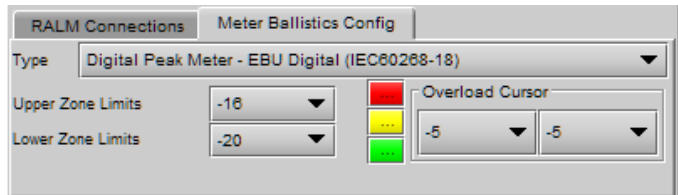


Figure 5.16 RALM - meter ballistics configuration

**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 any Non-PCM audio (Dolby-E, Dolby Digital, Dolby Digital Plus or other non-PCM types).

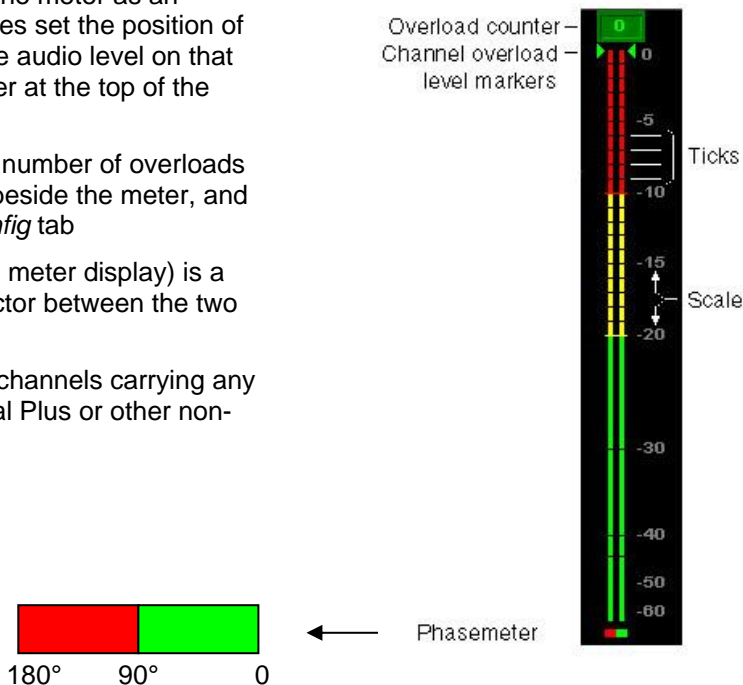


Figure 5.17 RALM meter display

## 5.8 Test panel

This panel is available only in embedder mode. It contains a pulldown that allows the user to select an internally-generated test signal to replace the SDI program signal at the MDX-3901's output.

**OFF:** the program signal appears at the output, and test signals are OFF.

**Color Bars and Tone:** 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 MDX-3901's output.

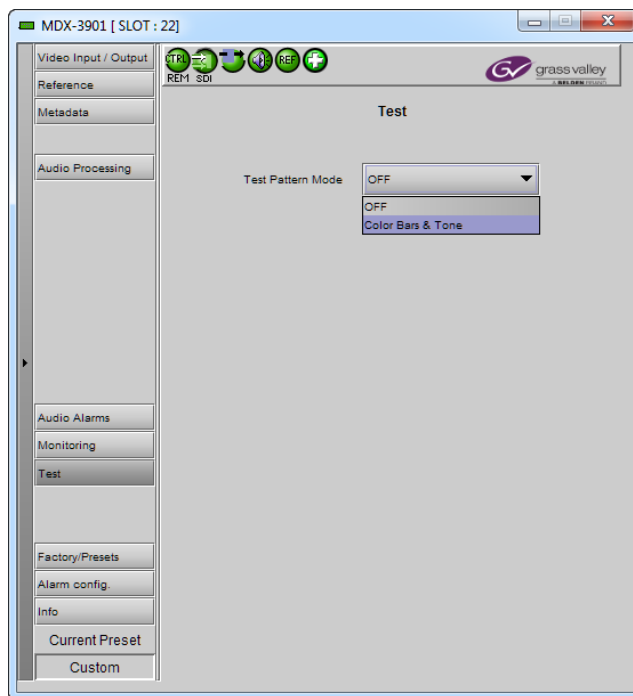


Figure 5.18 Test panel

## 5.9 Factory/Presets panel

### 5.9.1 Factory/Presets tab

#### 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.

The Input selection and the mode (Embedder/De-Embedder) are not part of a factory reset.

- Note that User Presets are not changed

#### User Presets section

The MDX-3901 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 pulldown box.

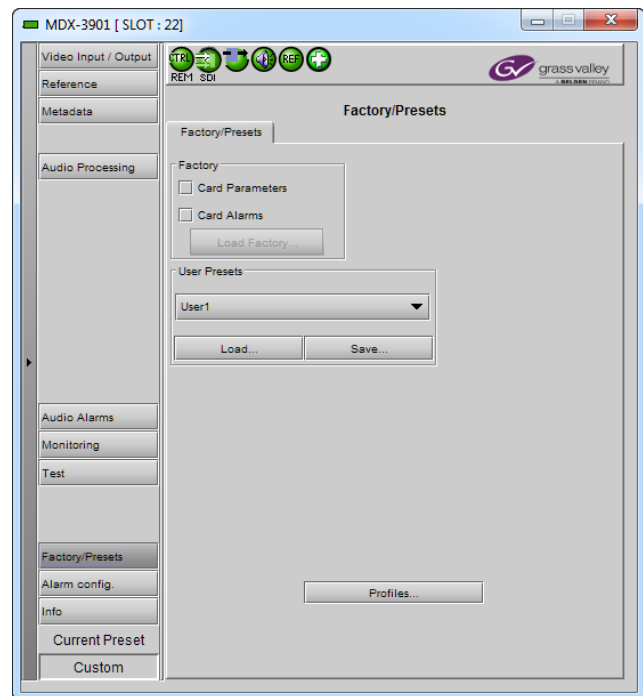
Click **Load** to load the contents of the selected User Preset into the MDX-3901. All parameter settings and values will be replaced by the contents of the selected User Preset.

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

#### 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 MDX-3901 card.

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



**Figure 5.19** Factory/Presets panel

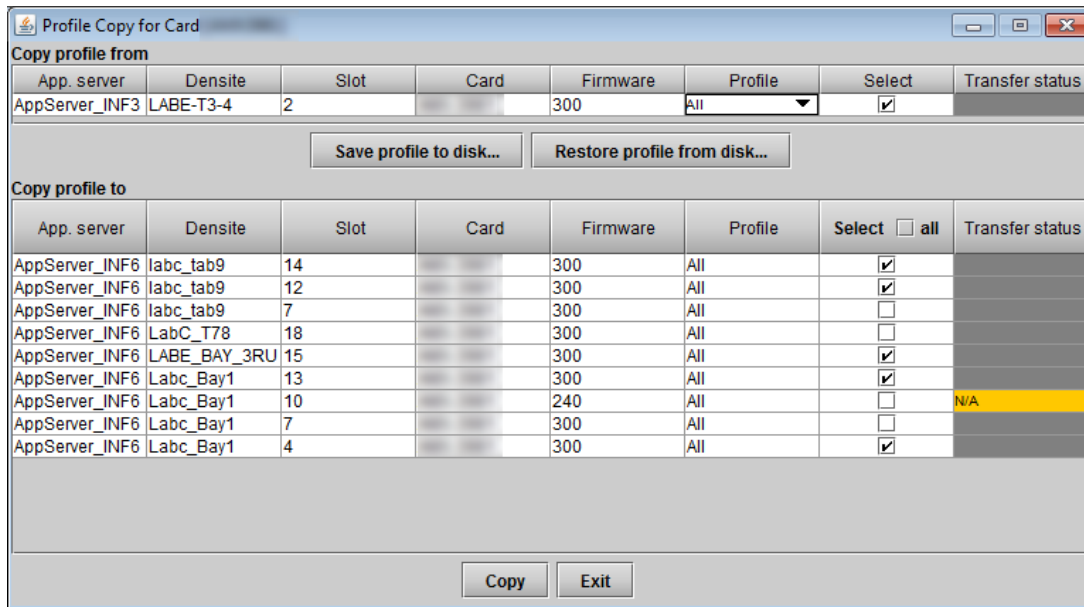


Figure 5.20 Profile Copy window (typical)

**Copy profile from**

This line shows this MDX-3901 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

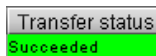
The *Select* column includes a checkbox (preselected checked) to confirm that you want to work with the current card.

**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 MDX-3901 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:

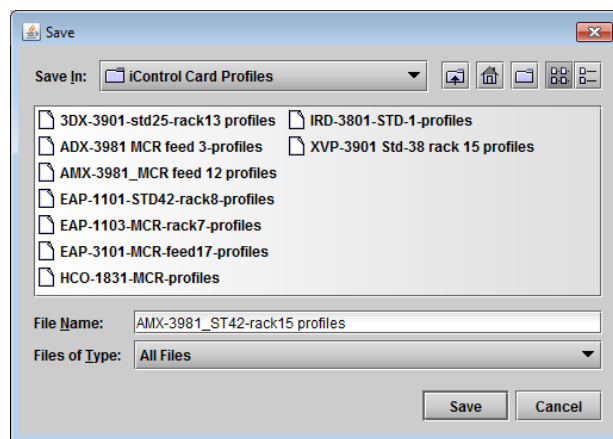
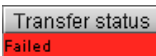


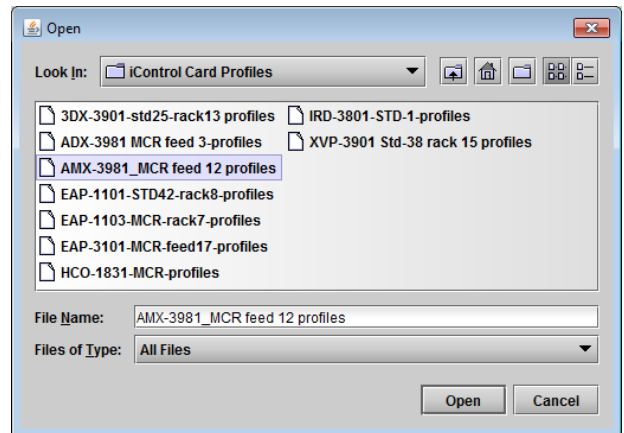
Figure 5.21 Save Profile to Disk dialog (typical)



### Restore profiles from disk...

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

- Click Open to read the contents of the file and to reconfigure this MDX-3901'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 5.22** Restore Profiles from Disk dialog (typical)

### Copy profile to

This line shows other MDX-3901 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

The *Select* column includes a checkbox to identify the MDX-3901 cards onto which you will copy profiles from the current card.

- For convenience, a *Select all* checkbox is provided in the column header
- Note that you can only select MDX-3901 cards with the same firmware version as the source card; cards with a different firmware version will show N/A against a yellow background in the *Transfer Status* column.

Click *Copy* to copy the selected profiles from this card into the selected other MDX-3901 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

## 5.10 Alarm Config panel

This panel allows the alarm reporting of the MDX-3901 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 MDX-3901 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.

- If there is no arrowhead in the box, there is no pulldown and the alarm is not user-configurable

### 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.

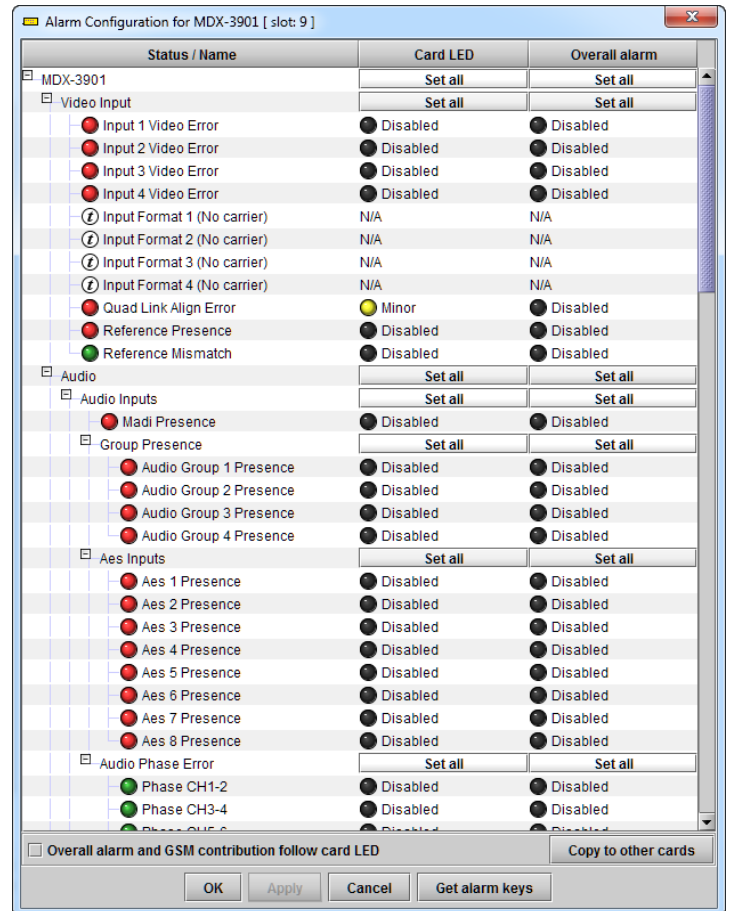







Figure 5.23 Alarm Configuration panel

**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, use the Apply button at the bottom of the tab to accept the changes and see the effect, otherwise they will not be effective.

**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.

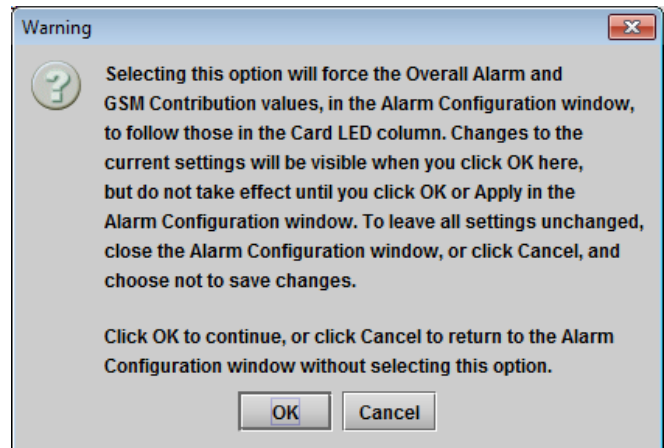
At the bottom of the window are several other controls

**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 5.24** 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 MDX-3901 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.5.9**), the alarm configuration is copied along with all the other settings.

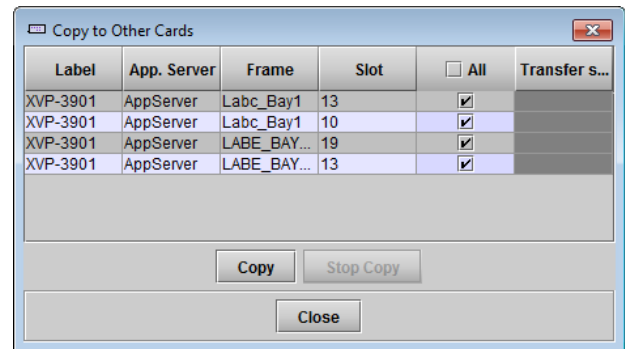


Figure 5.25 Copy to Other Cards window (typical)

### 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 .csv format

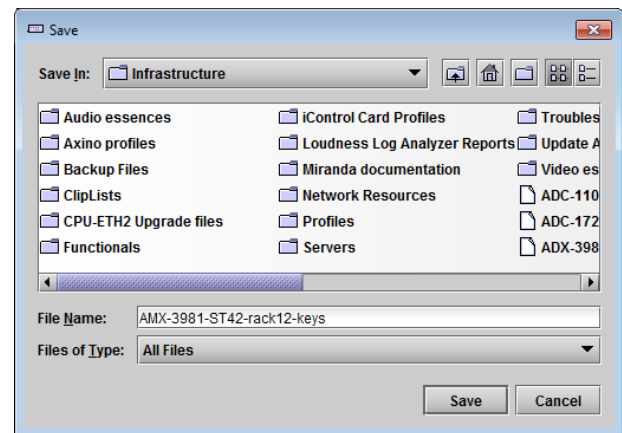


Figure 5.26 Get Alarm Keys dialog (typical)

### 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.

## 5.11 Info panel

When the MDX-3901 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.

- Rear Type: specifies the rear module currently in use.
- Label: type the label that is shown for this MDX-3901 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 MDX-3901
- Device Type: shows MDX-3901.
- Comments: type any desired text

The remaining data boxes show manufacturing information about this card.

Three buttons in the panel give access to other information.

- Details...: Reports the Firmware version, service version, and panel version for this card
- Advanced...: Shows the LongID for this card. The LongID is the address of this MDX-3901 in the iControl network.

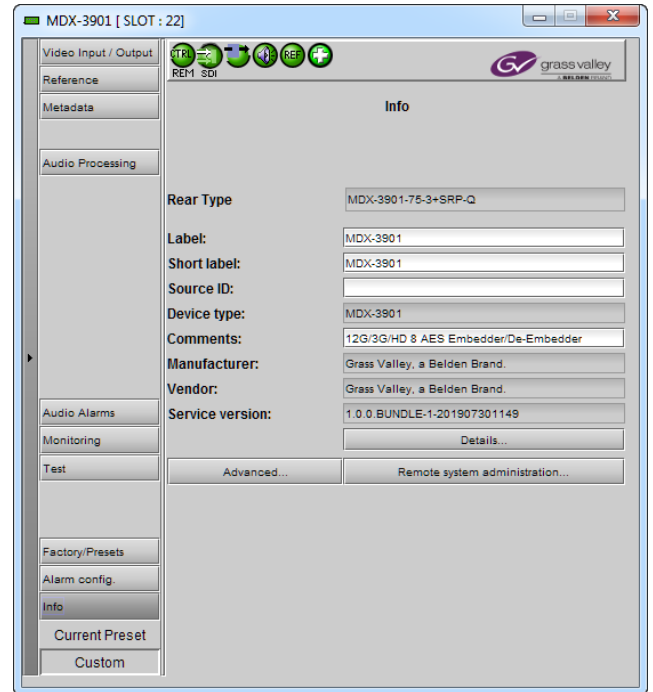


Figure 5.27 Info panel

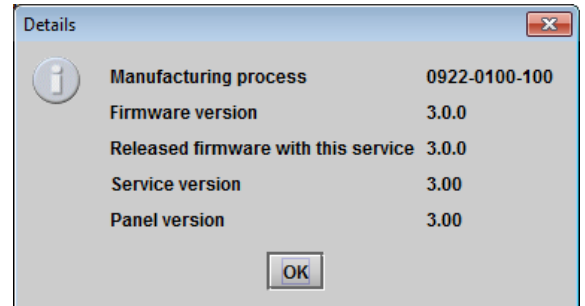


Figure 5.28 Details window (typical)

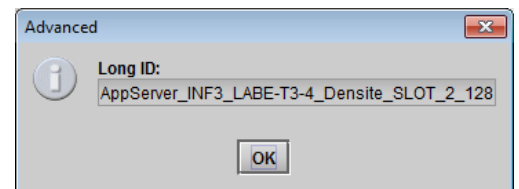


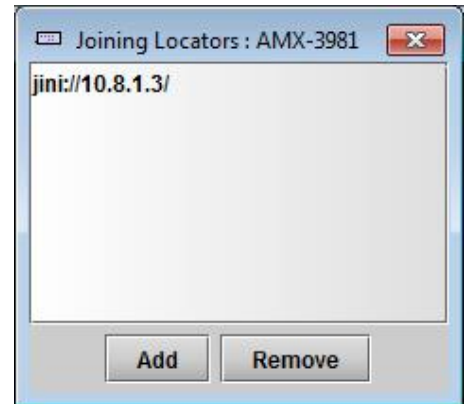
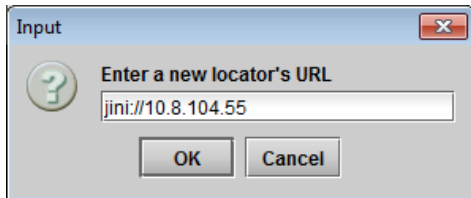
Figure 5.29 Advanced window (typical)

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

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

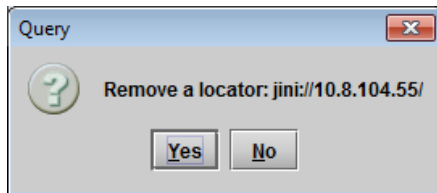
jini://<ip\_address>

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



**Figure 5.30** Joining Locators window (typical)

**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

### SDI Inputs (4) and Outputs (4)

#### Connectors:

8 BNC or HD-BNC

#### SDI Standard:

SMPTE ST 292 (1.485, 1.485/1.001 Gb/s)  
 SMPTE ST 424 (2.970, 2.970/1.001 Gb/s)  
 SMPTE ST 2082-1:2015 (on in 1 and outs 1 & 2)

#### Supported Formats:

HD: SMPTE ST 274: 1080i59.94, 1080i50  
 HD: SMPTE ST 296: 720p59.94, 720p50  
 3G: SMPTE ST 425 level A (mapping 1), level B dual link: 1080p59.94, 1080p50  
 4K UHD: Quad Link 3 Gb/s SMPTE ST 425-5: 1080p59.94, 1080p50  
 12G: SMPTE ST 2082-10: 2160p59.94, 2160p50

#### Cable length (Belden 1694A):

HD: 250m (820 ft.) at 1.485 Gb/s  
 3G: 145m (475 ft.) at 2.970 Gb/s

#### Cable length (Belden 4794R cable):

12G: 50m (180 ft.) at 11.88 Gb/s

#### Return loss:

>15 dB up to 1.5 GHz  
 >10 dB from 1.5 GHz to 3 GHz  
 >4 dB up to 11.88 Gb/s

#### Jitter:

HD: <0.2 UI (alignment jitter)  
 3G: <0.3 UI (alignment jitter)  
 12G: <0.3 UI (alignment jitter)

### Audio Inputs or Outputs (8)

#### Connector:

Female HD-Sub26

#### Sampling frequency:

Input: 30 to 53 kHz  
 Output: 48 kHz

#### Quantization:

Input: up to 24 bits  
 Output: 24 bits

#### AES3:

Input Level: 0.3 to 7 Vp-p  
 Output Level: 3.5 Vp-p  
 Impedance: 110Ω balanced

#### AES3-id:

Input Level: 0.3 to 2 Vp-p  
 Output Level: 1.0 Vp-p  
 Impedance: 75Ω

#### Return loss:

15 dB at 6.144 MHz

### MADI Input or Output (1)

**Connector:** BNC or HD-BNC

**Signal:** AES10

**Framing:** 64 subframes, 48 kHz

**Output:** 16 first channels of 64 subframes, 48 kHz

**Impedance:** 75 ohm

**Output Level:** 0.6 V

### LTC Input or Output (1)

**Connector:** BNC or HD-BNC

**Signal (1):** SMPTE 12M

**Impedance:** <10kΩ unbalanced

**Input Level:** 0.3 to 5 Vp-p

**Output Level:** 3 Vp-p

### Reference Input (1)

**Connector:** BNC or HD-BNC

**Signal:** SMPTE ST 170/SMPTE ST 318/ITU 624-4 blackburst

### Optical

**Signal:** Refer to SFP module specifications.

### Video Processing Performance

**Signal path:** 10 bits

**Processing delay:**

Deglitcher OFF: <1.1 line on all format except 3G Level B

Deglitcher ON: <1.6 line on all format except 3G Level B

### Audio Processing Performance

**Quantization:** 24 bits

**Sampling:** 48 kHz, synchronous

**Audio latency:**

embedding 2.27 ms w/SRC, 1.27 ms without SRC

de-embedding 1.83 ms

**Audio delay:** up to 2.7 s (1 ms steps + 0 to 47 samples)

Tone generator: -18 dBFS 1 kHz sine wave interrupted on left channel (250 ms every 3 s) per EBU R49

### Electrical

**Power:** 13 W max



## 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.

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## ANNEX 1 – MDX-3901 Local User Interface

LEV1	LEV2	LEV3	LEV4	VALUES	Conditions
STATUS	GENERAL STATUS			REAR TYPE / SFP TYPE / CARD TYPE / MODE / HW ERROR	Card type= mux/demux Mode=single/quad input
	VIDEO STATUS			NO CARRIER or "FORMAT"	
	AUDIO STATUS	GROUP IN		GROUP# "1 to 4" "VALID or NONE"	
		AES IN		AES# "1 to 8" "VALID or NO LOCK"	
		MADI IN		NO SIGNAL / nn CH	nn = last channel number
	REFERENCE STATUS			EXT. REF "NONE" or "TYPE", INT.URS "NONE" or "VALID"	
	METADATA STATUS	TIME CODE		LTC "VALID or NONE", VITC "VALID or NONE", ATC "VALID or NONE"	
CONFIG	LOAD SAVE			[USER1, USER2, USER3, USER4, USER5] [USER1, USER2, USER3, USER4, USER5]	
OPERATING MODE				EMBEDDER – DE-EMBEDDER	
VIDEO	INPUT SELECT SFP OUTPUT	SFP OUT 1 * SFP OUT 2 *		[SINGLE BNC, SINGLE SFP*, QUAD BNC] [OFF, ON] [OFF, ON]	*Requires –F rear module *Requires –F rear module
	REF SOURCE DEGLITCHER RECOVERY	SIGNAL FORMAT		[AUTO, EXTERNAL, URS, INPUT] [OFF, ON] [COLOR BAR, BLACK BURST] [OFF, 720p50, 720p59, 1080p25, 1080p29, 1080i50, 1080i59, 1080p50, 1080p59, 2160p50 12g, 2160p59 12g, 2160p50 4x3g 2SI, 2160p59 4x3g 2SI, 2160p50 4x3g SQD, 2160p59 4x3g SQD, OFF]	Requires valid Reference
METADATA	LTC	LTC INSERTION LTC DELAY		[OFF, ON] [0, 1, 2, ..., 50]	unit=frame
AUDIO	INPUT CONFIG	CH1...CH16	SELECT (embedder) SELECT (de-embedder) PHASE INVERT AUDIO DELAY	[AES1L, AES1R, ..., AES8R, MADI0, MADI1, MADI63] [GRP1 CH1, GRP1 CH 2, ..., GRP4 CH2] [OFF, ON] [0, 5000], [0, 47]	unit = ms, sample
	OUTPUT MIXER	OUTPUT 1-16	MIX MODE SOURCE A LEVELA SOURCE B LEVELB MUTE	[OFF, A, A+B, MIX] [CH01, ..., CH16] [-96, ..., 12] [CH01, ..., CH16] [-96, ..., 12] [OFF, ON]	step = .5dB step = .5dB
	AUDIO EMBEDDING (embedder only)	GROUP 1 GROUP 2 GROUP 3 GROUP 4		[PASS, BLANK, OUT1-4] [PASS, BLANK, OUT 5-8] [PASS, BLANK, OUT9-12] [PASS, BLANK, OUT 13-16]	
TEST PATTERN	(embedder only)			[OFF, COLOR BAR & TONE]	
VERSION	CARD VERSION CPU VERSION FPGA VERSION			V.nn.nn.nn.nn V.nn.nn.nn.nn V.nn.nn.nn.nn	
FACTORY DEFAULT	CARD PARAMETERS CARD LED ALARMS			[RESTORE] [RESTORE]	

## ANNEX 2 – Installing the Optical Interface

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

Some rear panels used with the MDX-3901 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

### 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.



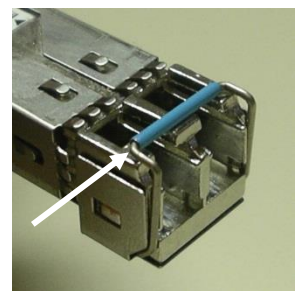
Never remove or install an SFP module with the fiber optic cables connected. Damage to the cables could result.



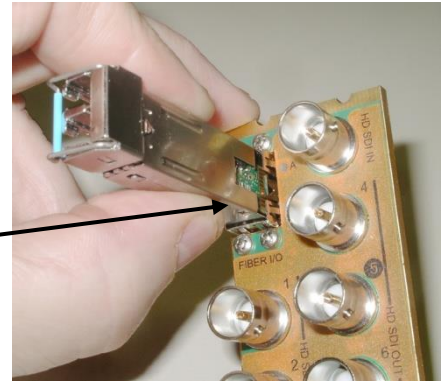
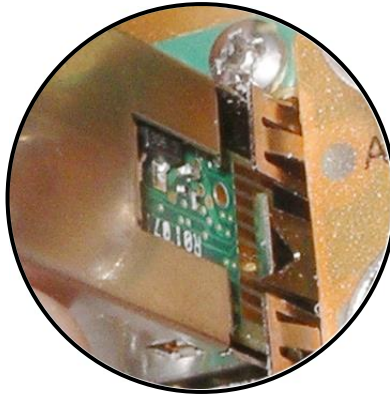
The presence of dust and debris can seriously degrade the performance of an optical interface. It is recommended that you insert a dust plug into the SFP module whenever a fiber optic cable is not connected.

### 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.



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

### Connecting the fiber optic cables

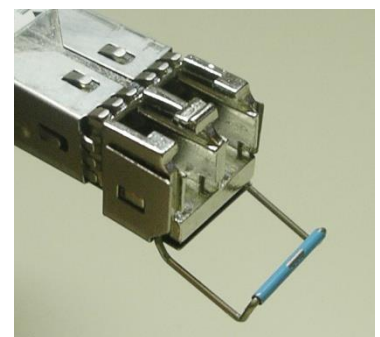
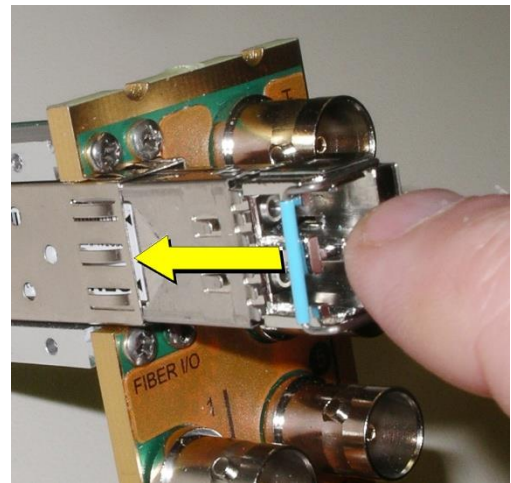
1. Remove the dust plug from the SFP module if present
2. Verify that the exposed end of the optical fiber in the LC connector is clean
  - Carefully remove any debris if necessary.
3. Plug the LC-terminated fiber optic cable into the SFP module

### Removing the fiber optic cables

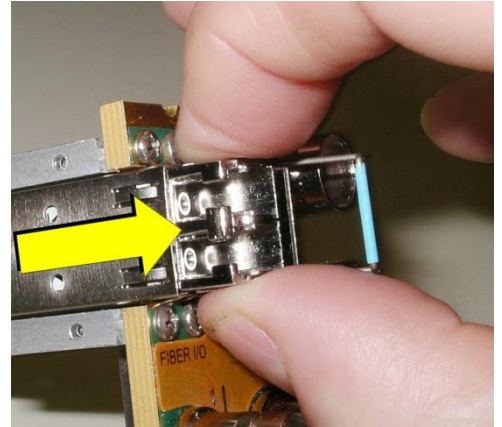
1. Grasp the LC fiber optic connector that is plugged into the SFP module, and pull it straight out to disengage the optical fiber from the SFP.
  - Never pull the fiber optic cable itself, as catastrophic damage may occur.
2. Insert a dust plug into the SFP module.

### Removing the SFP module

1. Move the bale clasp lever to the open position.



2. 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.



3. Insert a dust plug into the SFP module.