



grass valley

A **BELDEN** BRAND

**HDA-1941/-1951**

**HDA-3941/-3951**

**Single/Dual 3G/HD/SD SDI Distribution Amplifiers**

**Guide to Installation and Operation**

M3058-9900-101

2016-02-12

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

## Electromagnetic Compatibility



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

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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
- ENV 50204 Radiated EMF Immunity – RF 900 MHz Pulsed
- EN 61000-3-2 Harmonic current emission limits
- EN 61000-3-3 Voltage fluctuations and flicker limitations
- EN 61000-4-2 Electrostatic discharge immunity
- EN 61000-4-3 Radiated electromagnetic field immunity – radio frequencies
- EN 61000-4-8 Power frequency magnetic field immunity
- EN 61000-4-11 Voltage-dips, short-interruption and voltage variation immunity

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*GUIDE TO INSTALLATION AND OPERATION*

# 1 HDA-1941/1951 and HDA-3941/3951 Single/Dual 3G-HD-SD SDI Distribution Amplifiers

## 1.1 Introduction

The HDA-1941/3941 is a 3G/HD/SD SDI video DA which supports a variety of compressed and uncompressed serial digital video signals. The HDA-1941/3941 provides up to nine reclocked outputs with automatic input equalization for up to 200 meters (656 feet) of cable using Belden 1694A at 1.5 Gb/s and up to 100 meters (328 feet) at 3 Gb/s.

The HDA-1951/3951 is a dual 3G/HD/SD SDI video DA, which supports a variety of compressed and uncompressed serial digital video signals. The HDA-1951/3951 provides up to ten reclocked outputs (dual 1x5) with automatic input equalization for up to 200 meters (656 feet) of cable using Belden 1694A at 1.5 Gb/s and up to 100 meters (328 feet) at 3 Gb/s.

Critical applications protection is provided by bypass relays available on selected rears.

Note: HDA-1941 and HDA-1951 are Densité-2 series cards. HDA-3941 and HDA-3951 are Densité-3 series cards. Apart from the size difference, they are functionally identical.

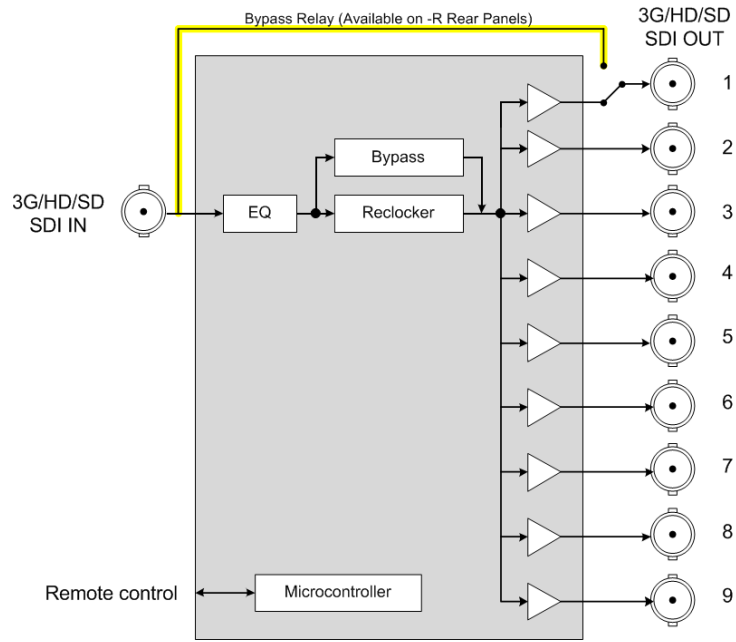
Function	Densité 2	Densité 3	
Single DA	HDA-1941	HDA-3941	← These two cards are functionally identical.
Dual DA	HDA-1951	HDA-3951	← These two cards are functionally identical

**Note on terminology** – to simplify the terminology in this document, the term “HDA” will be used to describe features that apply to all four products. Specific product names will be used in all other cases.

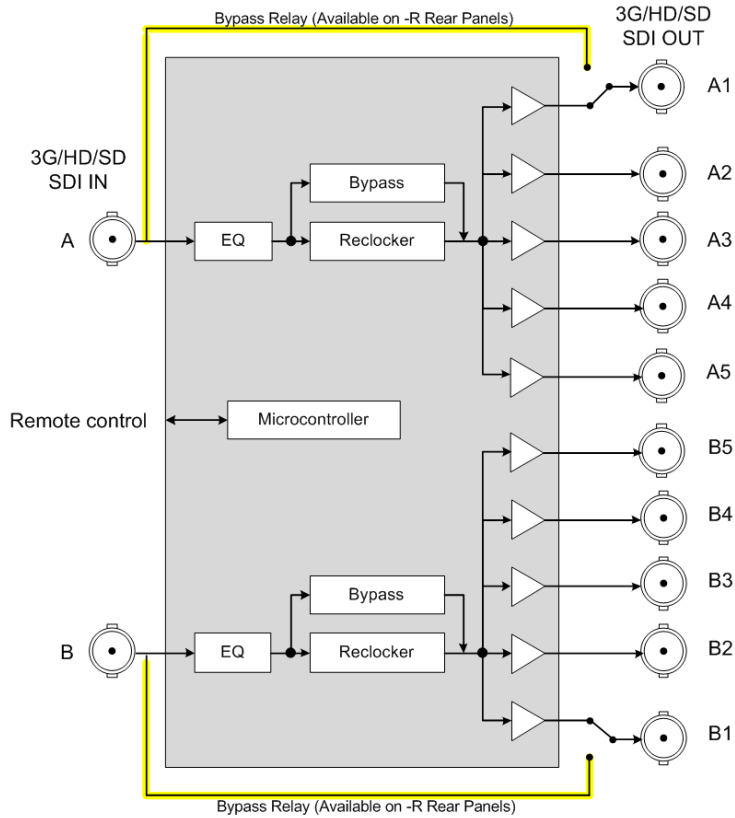
## 1.2 Features

- One (HDA-1941/3941) or two (HDA-1951/3951) inputs.
- Up to nine (HDA-1941), seven (3941), eight (HDA-1951) or ten (HDA-3951) 3G-HD-SD SDI outputs.
- Supports bit-rates up to 2.97 Gbps.
- Automatic format detection and cable equalization.
- Optional bypass relay protection on all inputs.
- All outputs are DVB-ASI compatible.

### 1.3 Block Diagrams



**Figure 1-1(a)** HDA-1941/3941 Functional Block Diagram

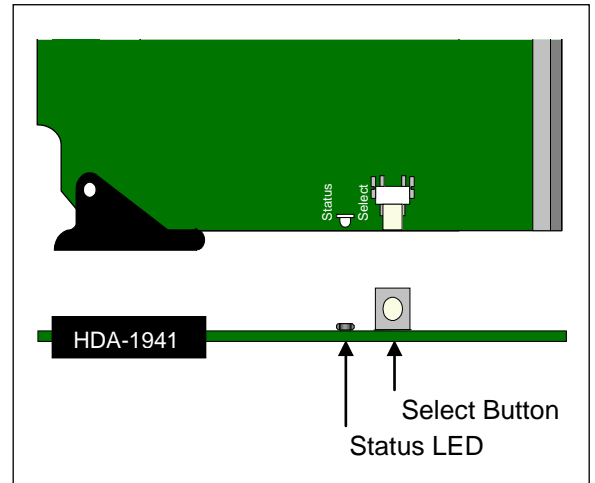


**Figure 1-1(b)** HDA-1951/3951 Functional Block Diagram

## 1.4 Front Card-edge Interface

The front card-edge of the HDA incorporates two elements:

- Status LED (see section 3.2)
- Select Button (see section 3.3)



**Figure 1.2** Front card-edge layout

## 2 Installation

### 2.1 Installing the 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.

Rear panels for HDA-1941/3941:

Rear panel	Densité	Connectors	Slots	Outputs	Bypass
HDA-194N-SRP	2	BNC	1	4	
HDA-194N-DRP	2	BNC	2	9	
HDA-194N-SRP-D	2	DIN	1	9	
HDA-394N-3SRP	3	BNC	1	7	
HDA-394N-3SRP-R	3	BNC	1	7	1

Rear panels for HDA-1951/3951:

Rear panel	Densité	Connectors	Slots	Outputs	Bypass
HDA-195N-DRP	2	BNC	2	2 x 4	
HDA-195N-DRP-R	2	BNC	2	2 x 4	2
HDA-195N-SRP-D	2	DIN	1	2 x 4	
HDA-395N-3SRP	3	BNC	1	2 x 3	
HDA-395N-3SRP-R	3	BNC	1	2 x 3	2
HDA-395N-3SRP-D	3	DIN	1	2 x 5	

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 install the connector panel:***

1. If a card is installed in the slot whose rear panel is being changed, remove it by tilting up the swivel handle on the front of the card to lever the connectors apart, then using the handle to pull the card straight out of the slot.
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 Installing the HDA Card

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



1. Open the front door of the frame.
2. Slide the HDA card into the slot and push gently on the swivel handle to seat the connectors.

If the card is used with a double-width rear panel, it should be inserted into the right-hand slot. 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.

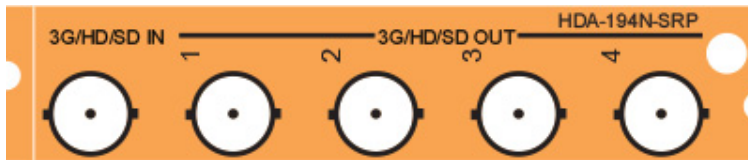
3. Close the front door of the frame.

### 2.3 Rear Connector Panels

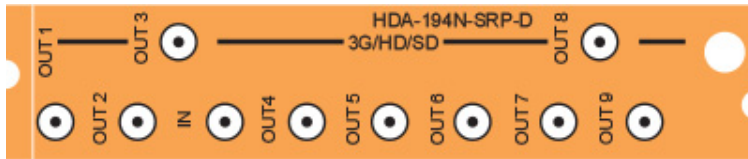
The following diagrams illustrate the layout and connectors on the HDA-1941, -1951, -3941 and -3951 rear panels. *(Note: some of these panels may not be immediately available; please check before ordering).*

#### HDA-1941 Rear Panels:

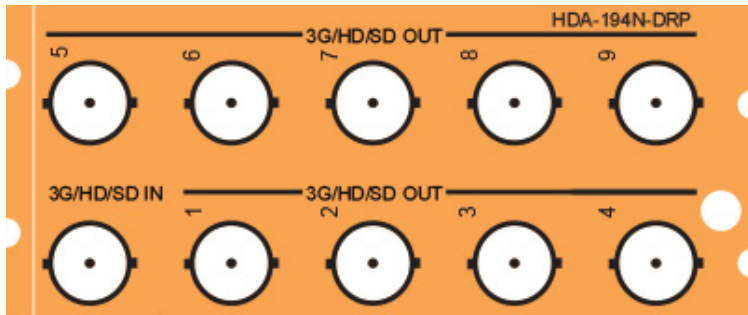
- **HDA-194N-SRP** Single rear for 1x4 operating mode with BNC connectors.



- **HDA-194N-SRP-D** Single rear for 1x9 operating mode with DIN connectors.

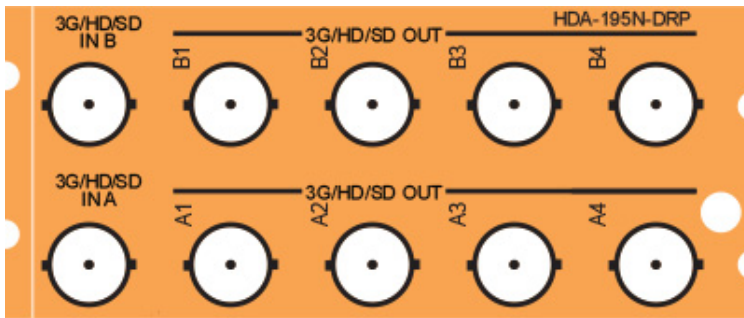


- **HDA-194N-DRP** Double rear for 1x9 operating mode with BNC connectors.

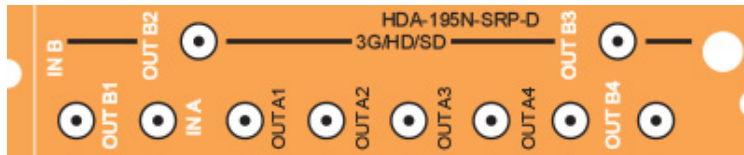


**HDA-1951 Rear Panels:**

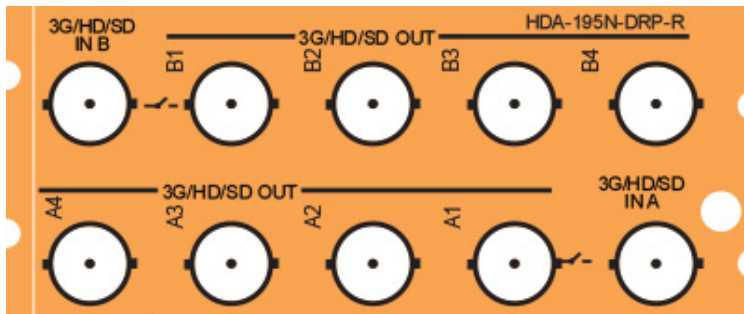
- **HDA-195N-DRP** Double rear for dual 1x4 operating mode with BNC connectors.



- **HDA-195N-SRP-D** Single rear for dual 1x4 operating mode with DIN connectors.

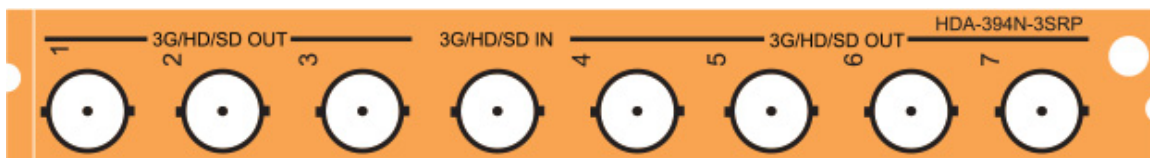


- **HDA-195N-DRP-R** Double rear for dual 1x4 operating mode with bypass relays and BNC connectors.

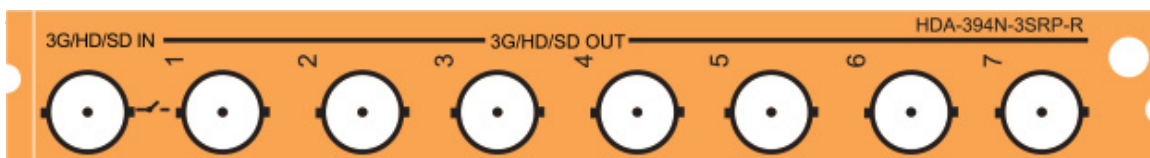


**HDA-3941 Rear Panels**

- **HDA-394N-3SRP** Single rear for 1x7 operating mode with BNC connectors

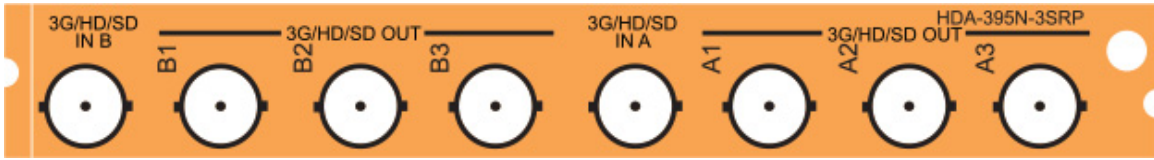


- **HDA-394N-3SRP-R** Single rear for 1x7 operating mode, with bypass relay and BNC connectors.

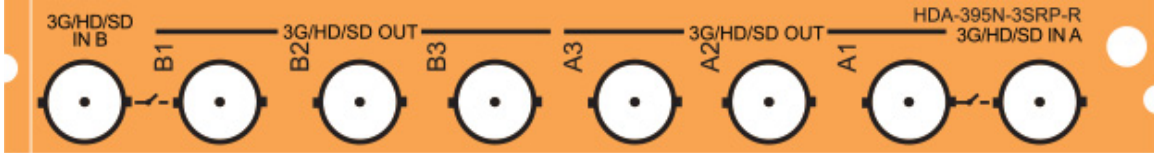


**HDA-3951 Rear Panels**

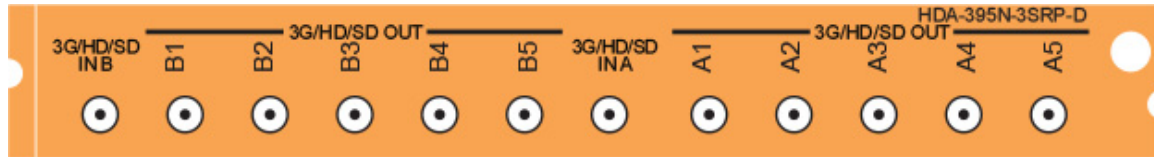
- **HDA-395N-3SRP** Single rear for dual 1x3 operating mode, with BNC connectors.



- **HDA-395N-3SRP-R** Single rear for dual 1x3 operating mode, with bypass relays and BNC connectors.



- **HDA-395N-3SRP-D** Single rear for dual 1x5 operating mode, with DIN connectors.



This table summarizes the input/output connections on the various rear panels shown above:

Rear panel type	I/O Connections			Use with			
	3G-HD-SD SDI IN	3G-HD-SD SDI OUT	Bypass	HDA-1941	HDA-3941	HDA-1951	HDA-3951
HDA-194N-SRP	1	4		✓			
HDA-194N-SRP-D	1	9		✓			
HDA-194N-DRP	1	9		✓			
HDA-195N-DRP	2	2 x 4				✓	
HDA-195N-SRP-D	2	2 x 4				✓	
HDA-195N-DRP-R	2	2 x 4	2			✓	
HDA-394N-3SRP	1	7			✓		
HDA-394N-3SRP-R	1	7	1		✓		
HDA-395N-3SRP	2	2 x 3					✓
HDA-395N-3SRP-R	2	2 x 3	2				✓
HDA-395N-3SRP-D	2	2 x 5					✓

### **3G-HD-SD IN – serial digital video inputs**

Connect a serial digital video signal, conforming to the SMPTE 424M for 3 Gbps input signals, the SMPTE 292M standard for HD input signals or SMPTE 259M standard for SD input signals, to the BNC labeled **3G-HD-SD IN**. DVB-ASI is also supported. The HDA will automatically switch to the detected video line format.

### **3G-HDSD OUT – serial digital video outputs**

The HDA provides multiple 3G/HD/SD SDI video outputs, labeled **3G-HD-SD OUT 1, 2**, etc. The SDI video signal conforms to the SMPTE 424M, SMPTE 292M or SMPTE 259M-C standard. All outputs are DVB-ASI compatible.

## **2.4 Bypass Relay**

Rear panels with an integrated bypass relay or relays are identified by a –R designation. The relays activate automatically if the card loses power, or is removed from the frame.

When activated, the relays connect the 3G-HD-SD SDI input directly to 3G-HD-SD SDI output **1**, ensuring that the signal is available downstream.

When the card is re-activated, the relay disengages.

### 3 Operation

#### 3.1 Control Options

All of the cards installed in a Densité frame are connected to the frame’s controller card, which handles all interaction between the cards and the outside world. There are no operating controls located on the cards themselves. The controller supports remote operation via its Ethernet ports, and local operation using its integrated control panel.

The HDA can be controlled in two 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 3.3).
- 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 3.4)

#### 3.2 Card-Edge Status LED

The status monitor LED is located on the front card-edge of the HDA, and is visible through the front access door of the DENSITÉ 3 frame. This multi-color LED indicates the status of the HDA by color, and by flashing/steady illumination.

The chart shows how the various error conditions that can be flagged on the HDA 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 3.4.4 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
No input signal presence			⚙️	
No lock on input signal		⚙️		
No rear				⚙️

⚙️ : 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 3.3 for details.

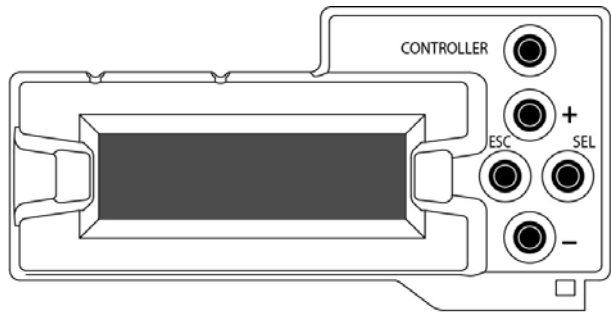
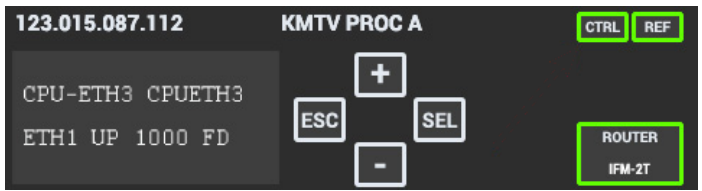
The LED will be Yellow when the card is in the “Firmware Update” mode.

### 3.3 Local control using the Densité frame control panel

Push the SELECT button on the HDA card edge (see Section 1.4) to assign the local control panel to operate the HDA. 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, beginning on page 20.

Two versions of the local control panel exist:

Panel type	Frame models	Appearance
Physical	Densité-2, 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 consists of a display capable of displaying two lines of text, each 16 characters in length, and four pushbuttons.

Assign the panel to operate the HDA by pushing the SELECT button on the front edge of the HDA card.

- The STATUS LED on the HDA flashes yellow.

The local control panel displays a menu that can be navigated using the four pushbuttons located beside the display. 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

### 3.4 Remote control using iControl

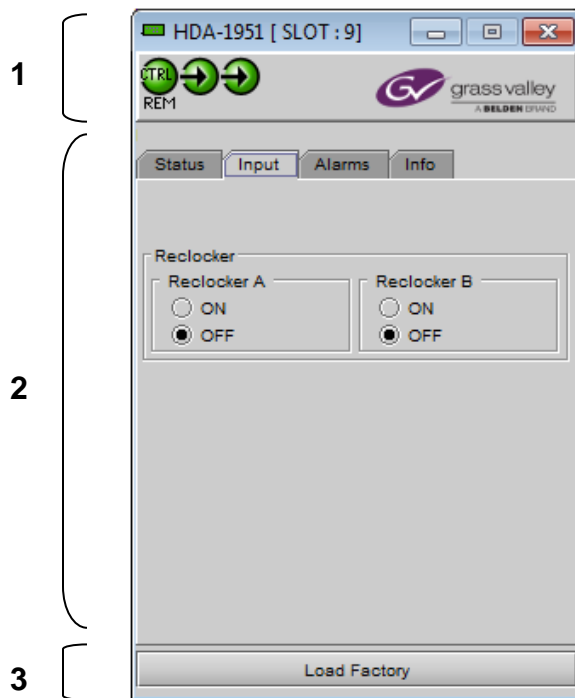
The operation of the HDA may be controlled using Grass Valley's iControl system.

- This manual describes the control panels associated with the HDA and their use.
- Please consult the iControl User's Guide for information about setting up and operating iControl.
- *Exception:* At the time of printing, the HDA was not supported by iControl Solo

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

#### 3.4.1 The iControl graphic interface window

The basic window structure for the HDA is shown in figure 3.2. The window identification line gives the card type (e.g. HDA-3951) and the slot number where the card is installed in its Densité frame.



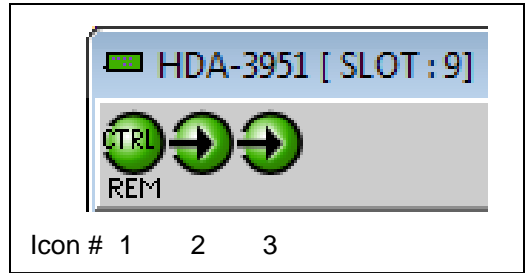
**Figure 3.1** HDA-3951 iControl graphic interface window:

There are three main sections in the window itself, shown in Figure 3.1:

1. The top section displays icons on the left. These icons report the status of some parameters associated with this HDA. Figure 3.2 shows the three icons that may appear.

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.











**Figure 3.2** iControl Status Icons

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

The table below lists 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 3.3. Any changes made using the iControl interface will have no effect on the card.
Icon #2 – Input A status	
 (green)	Signal detected and valid.
 (red)	Input signal error No rear
 (grey)	No input
Icon #3 – Input B status (only on HDA-1951 and HDA-3951)	
 (green)	Signal detected and valid.
 (red)	Input signal error No rear
 (grey)	No input



2. The center portion of the iControl graphic interface window contains a series of control and information panels, selected by tabs.
  - Click on a tab to display the associated panel.
  - Each of these panels is described individually in the following sections.
3. The Load Factory button is always visible at the bottom of the panel. Click the **Load Factory** button to reset all parameters on this HDA card to factory default values.
  - The factory default values are shown underlined in the menus found in the Annex to this document, beginning on page 20.

### 3.4.2 The Status panel

This panel shows the status of the inputs to this HDA.  
 For HDA-1941 and HDA-3941, only IN A is shown, because there is no IN B,

#### Input Status (A and B)

Data rate (270 Mbps / 1.5 Gbps / 3 Gbps) – the detected input data rate is indicated by a green status icon

No Lock / No Signal – either of these conditions is indicated by a red status icon

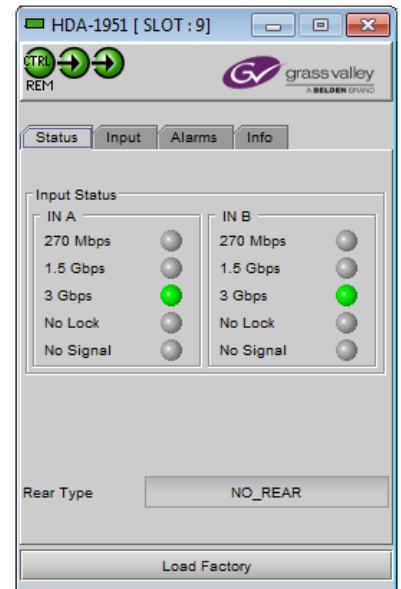


Figure 3.4 Status panel

### 3.4.3 The Input panel

This panel allows the user to set the reclocker status on the input channel(s).

#### Reclocker

Use the radio buttons to independently turn the reclockers for Channels A and B ON or OFF

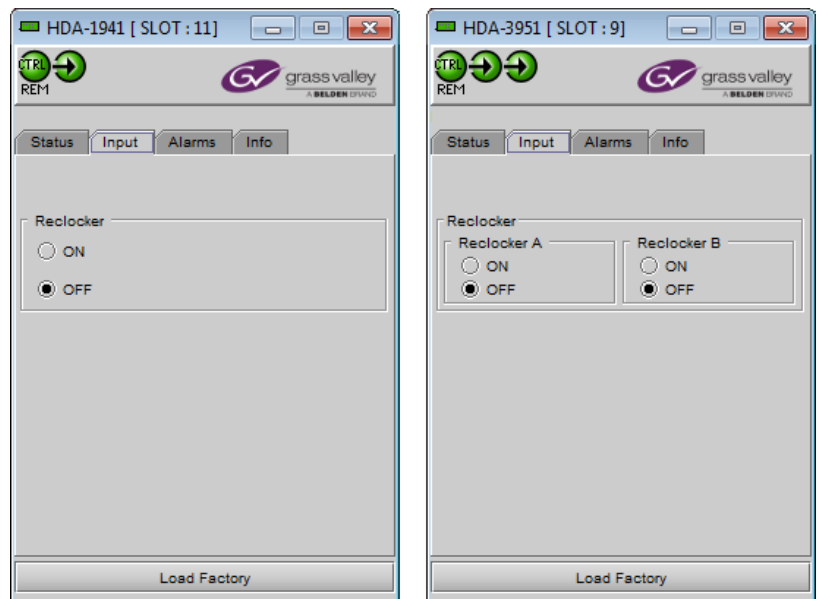


Figure 3.3 Input panels – HDA-1941 (left) and HDA-3951 (right)

### 3.4.4 The Alarms panel

This panel allows the alarm reporting of the HDA to be configured.

Click on the Alarm Config button to open the Alarm Configuration window.

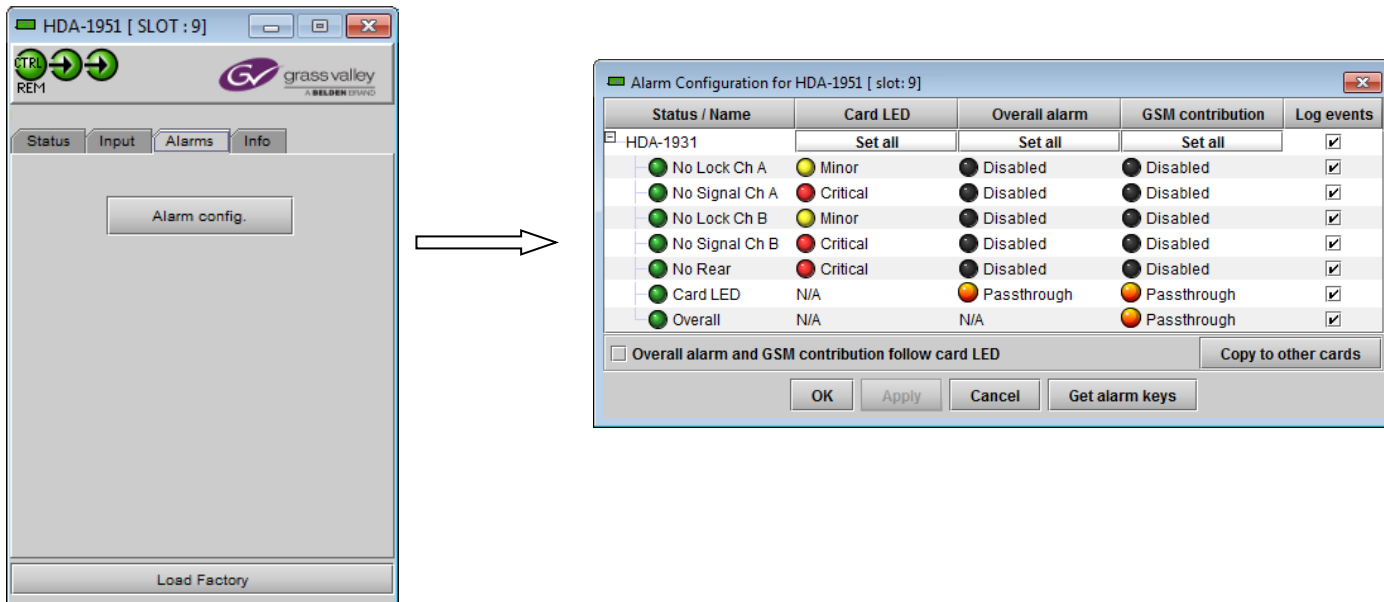


Figure 3.8 Alarms panel and Alarm Configuration window

The Alarm Configuration window is organized in columns

#### Status/Name

This contains an expandable tree listing all the alarms reported by this HDA card.

- Each alarm name includes an icon that shows its current status

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.

**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 on one of the “Set All” boxes in the Card LED, Overall Alarm or GSM Contribution columns, you will open a pulldown that lets you assign a level to all alarms in that section of the column simultaneously.

**Log Events**

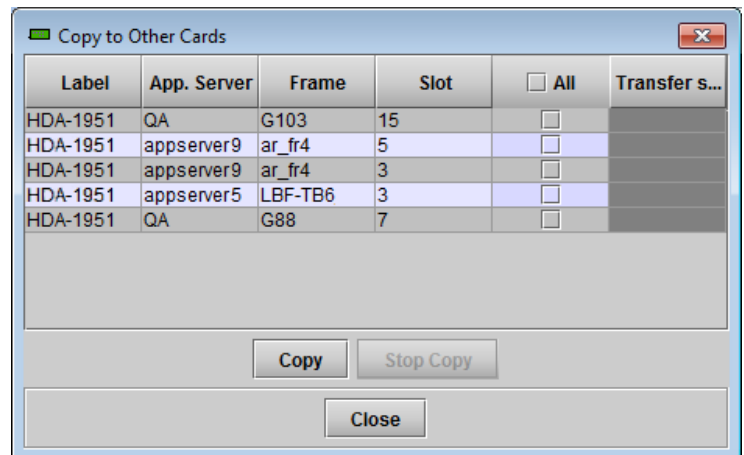
iControl maintains a log of alarm events associated with the card. The log is useful for troubleshooting and identifying event sequences. Click in the checkbox to enable logging of alarm events for each individual alarm.

At the bottom of the window are several other controls.

**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 HDA card **of the same type**.

- 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



**Figure 3.9** Copy to Other Cards

**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

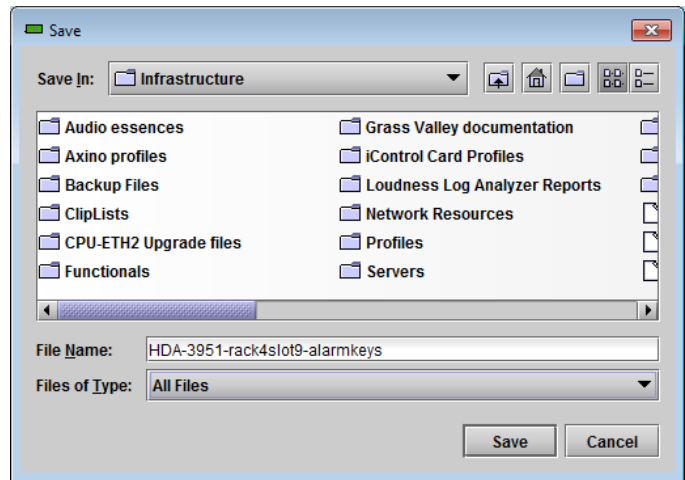


Figure 3.10 Save dialog for Get Alarm Keys

**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.

**3.4.5 The Info panel**

When the HDA 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.

**Label:** type the label that is shown for this HDA 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 HDA.

**Comments:** type any desired text.

The remaining data boxes show manufacturing information about this card.

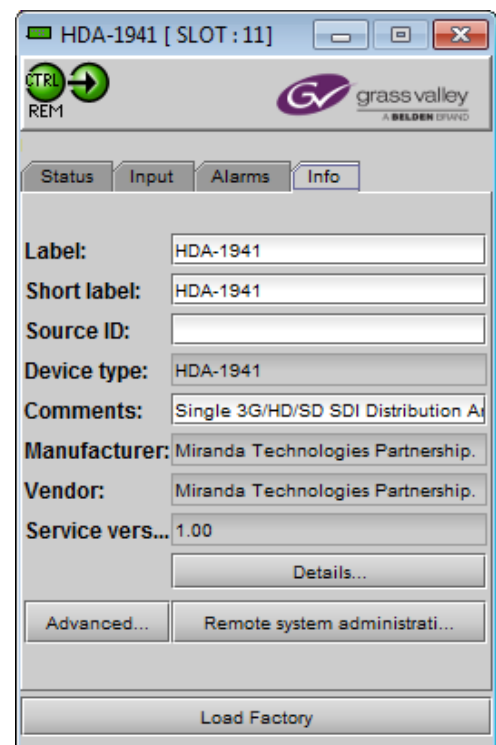


Figure 3.11 Info panel

Three buttons in the panel give access to other information.

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

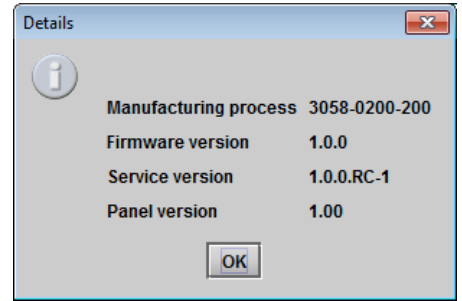


Figure 3.12 Details window

- **Advanced...:** Shows the Long ID, which is the address of this HDA in the iControl network.

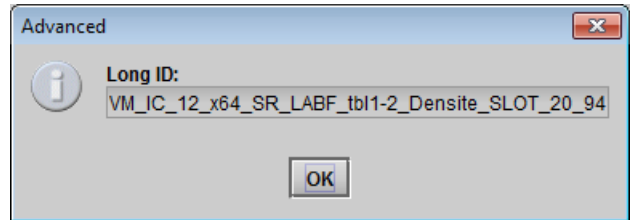


Figure 3.13 Advanced window

- **Remote System Administration:** opens the Joining Locators data box, which lists remote lookup services to which this HDA is registered.

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

jini://<ip\_address>

where <ip\_address> is the ip address of the server running the lookup service

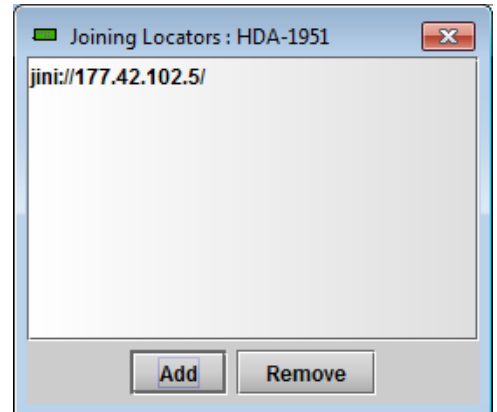
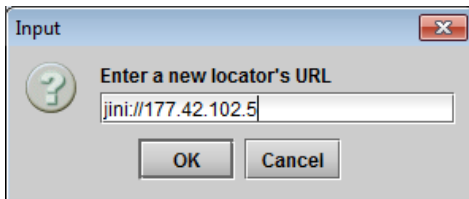
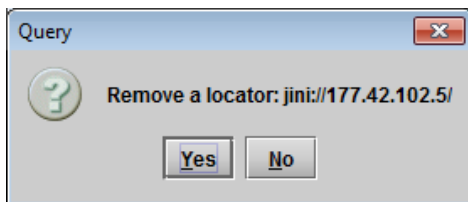


Figure 3.14 Joining Locators window



**Remove:** select one of the services listed in the Joining Locators window by clicking on it, and click *Remove* to delete it from the window. You will be asked to confirm the removal in a Query box.



## 4 Specifications

### ELECTRICAL INPUTS (1 or 2)

Signal:	3G/HD/SD SDI SMPTE 424M, 292M, and 259M-C compliant <ul style="list-style-type: none"><li>➤ Supports data rates of 270, 1483.5, 1485, 2967, 2970Mb/s</li></ul> EN50 83-9 DVI-ASI 270 Mbps
Cable length:	100 m (328') @ 3 Gbps for Belden 1694A 200 m (656') @ 1.5 Gbps for Belden 1694A 400 m (1312') @ 270 Mbps for Belden 1694A
Return loss:	> 15 dB for up to 1.5GHz, > 10 dB from 1.5GHz to 3GHz

### ELECTRICAL OUTPUTS (up to 10)

Signal:	3G/HD/SD SDI SMPTE 424M, 292M, and 259M-C compliant <ul style="list-style-type: none"><li>➤ Supports data rates of 270, 1483.5, 1485, 2967, 2970Mb/s</li></ul> EN50 83-9 DVB-ASI 270 Mbps (all outputs)
Return loss:	> 15 dB for up to 1.5GHz, > 10 dB from 1.5GHz to 3GHz
Jitter (wideband):	< 0.2 UI p-p
Rise / Fall time	Reclocker ON: < 135 ps, 20% to 80%, for HD and 3G 400 – 800 ps, 20% to 80%, for SD Reclocker OFF < 135 ps for all formats (3G, HD, SD)

### PROCESSING PERFORMANCE

Signal path:	10 bits
Processing delay:	7 ns typical
Power:	1.8 W max. HDA-1941/HDA-1951 2.1 W max. HDA-1941 with 1 relay on the Rear panel 2.4 W max. HDA-1951 with 2 relays on the Rear panel

## 5 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

Grass Valley  
3499 Douglas-B.-Floreani  
St-Laurent, Quebec H4S 2C6  
Canada

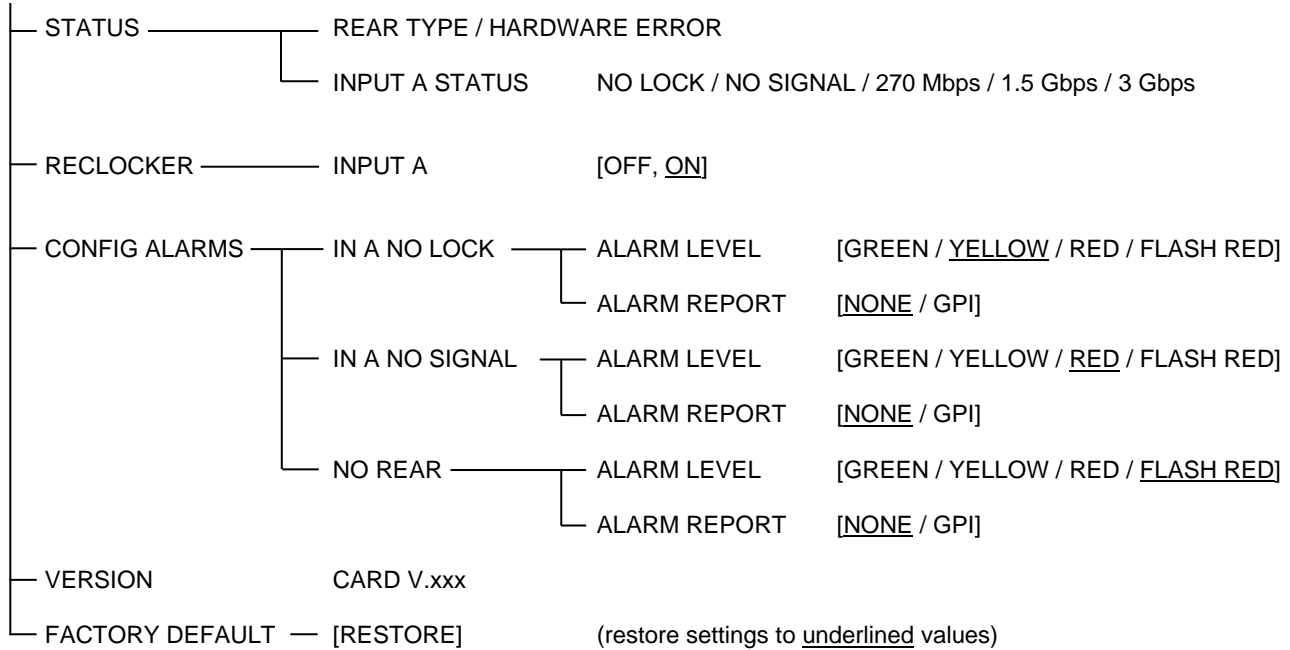
Telephone: +1 514 333 1772

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

## ANNEX 1 – HDA Local User Interface

### HDA-1941/3941





## HDA-1951/3951

